NM1 - __66___

PART 36 PERMIT APPLICATION

Volume 2

2 of 3

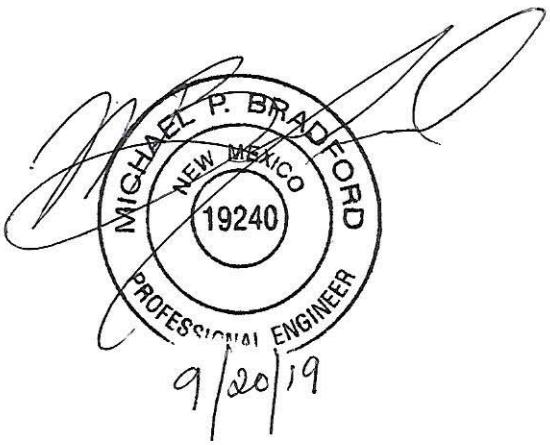
Revised Application

October 3, 2019

Permit Application For
Surface Waste Management Facility

North Ranch Surface Waste Management Facility
Lea County, New Mexico

September 2019
Project No. 35187378





Prepared for:
NGL Waste Services, LLC
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Denver, CO 80209
303-815-1010

Prepared by:
Terracon Consultants, Inc.
25809 Interstate 30 South
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Volume 2 of 2

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Terracon

Environmental ■ Facilities ■ Geotechnical ■ Materials

Appendix I
Hydrogeological Report

Hydrogeological Report

North Ranch Surface Waste Management Facility
Lea County, New Mexico

September 2019
Project No. 35187378



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Attachment A Geotechnical Engineering Report
Attachment B United States Department of Agriculture, Web Soil Survey Report

1.0 Introduction

This Hydrogeological Report documents investigations conducted for the proposed NGL Waste Services, LLC (NGL) North Ranch Surface Waste Management Facility (Facility) located near Jal, Lea County, New Mexico. Data were compiled by Terracon Consultants, Inc. (Terracon), in accordance with the Energy, Minerals and Natural Resources Department, Oil Conservation Division (NMOCD or Division) requirements and the *New Mexico Administrative Code (NMAC)* Section **19.15.36**. NGL owns the property proposed for the landfill and associated facilities.

Section 2.0 of this report describes the regional geologic and hydrogeological characterization for the area surrounding the NGL North Ranch facility. Section 3.0 references site-specific information gathered for the generation of this document. Section 4.0 presents a summary of the investigation results and Section 5.0 lists the references used.

1.1 Site Location

The NGL North Ranch SWMF site is located within Section 9 and 10 of, T25S, R34E approximately 16 miles west of the City of Jal in Lea County, New Mexico as seen in **Figure 1**.

1.2 Background

NGL is currently preparing a Permit Application to develop a new Surface Waste Management Facility (SWMF). The location of the site and the proposed development areas are shown on **Figure 1**. This application will establish an oil field solid waste landfill footprint area consisting of approximately 205 acres with a waste capacity of approximately 40,743,946 cubic yards. **Figure 2** illustrates the site layout within the permitted boundary. The NMOCD requires a review and summary of the hydrogeology and geology of the region and facility that illustrates the location of the SWMF facilities.

2.0 Regional Characterization

This section discusses the regional hydrogeologic setting of the area surrounding the SWMF including hydrology, geology, hydrogeology, and groundwater quality. This information was compiled from published sources including sections of the 1961 Geology and Ground-Water Condition in Southern Lea County, New Mexico report by the State Bureau of Mines and Mineral Resources, New Mexico Institute of Mining and Technology and Terracon's January 2019 Geotechnical Engineering Report of the site.

2.1 Regional Hydrology

The SWMF landfill is located within Pecos watershed ,a tributary to the Rio Grande Watershed. Surface drainage from the landfill property generally flows downward towards the east, see **Figure 3** for a regional watershed map. No integrated drainage is present in southern Lea County, thus there is no discharge to the Pecos River, which is located southwest of the area. Tributaries of the Pecos River are located approximately 20 miles southwest of the landfill site in southwestern Lea County. The Pecos River flows south and merges with the Rio Grande in southern Texas along the Texas-Mexico border.

2.2 Regional Geology

This section describes the geologic setting of the region, including soils, regional stratigraphy, and regional structural geology and geomorphology. A geologic map of the region around the Facility is provided in **Figure 4.** A map showing the location of water wells within a one-mile radius of the site is presented in **Figure 5**, and a local depth to groundwater surface map is provided in **Figure 6**.

The New Mexico State Geologic Map (1:500 000) indicates the general surface geology of the landfill site consists of Quaternary eolian and piedmont deposits (Qep) (Holocene to middle Pleistocene). Qep is comprised of interlayered eolian sands and piedmont-slope deposits. The unconsolidated eolian sands consist of sands and loess; the piedmont-slope deposits include deposits of higher gradient tributaries near major stream valleys, alluvial veneers of the piedmont slope, and alluvial fans and may locally include uppermost Pliocene deposits.

2.2.1 Regional Soils

Based on the information provided by the Web Soil Survey (March 26, 2019) and the United States Department of Agriculture Soil Conservation Service (USDA SCS), the primary soils at the site are the Ratliff-Wink fine sandy loam in the southern portion (42%), the Wink loamy fine sand (WK) in the middle and southwestern portions (31%), and the Pyote and Maljamar fine sands (PU) in the northern portion (27%).

The Ratliff-Wink is a fine sandy loam from 0 to 4 inches overlying clay loam from 4 to 60 inches. The Wink loamy fine sand is described as a loamy fine sand from 0 to 12 inches and

a sandy loam from 12 to 60 inches. Both the Ratliff-Wink and Wink loamy fine sand are well drained with a high capacity to transmit water (2.0 to 6.0 in/hr). The depth to water is greater than 80 inches.

The Pyote and Maljamar fine sands consist of fine sand from 0 to 24 inches, sandy clay loam from 24 to 50 inches, and cemented material from 50 to 60 inches. The Pyote is well drained with a very low to moderately low capacity to transmit water (0.00 to 0.06 in/hr). The depth to water is reported to be greater than 80 inches. See USDA SCS Web Soil Survey Report for the proposed site in **Attachment B.**

Based on the January 2019 Geotechnical Engineering report (**Attachment A**), encountered soils during drilling activities at the site were divided into three stratums: the first strata consisted of silty sand, silty sand with gravel, silty clayey sand, and poorly graded sand with interbedded layers of caliche and ranged in depths from 20 to 27 feet bgs; the second strata consisted of silty sand, poorly graded sand, interbedded caliche layers and ranged in depth from 27 to 65 feet bgs; the third strata ranged in depths between 40 to 65 feet bgs and consisted of fine-grained, poorly to moderately compacted sandstone.

The observed caliche materials are underlain by medium to finely weathered sandstone extending to boring-termination depths to 165 feet below existing grades. Soil porosity and permeability observed during drilling ranged from 0.34 to 0.36 and 1.12×10^{-12} to 6.72×10^{-11} cm^2, respectively, and hydraulic conductivity ranged from 1.09×10^{-07} to 5.56×10^{-06} cm/sec.

2.2.2 Regional Stratigraphy

The surface geology of the landfill site consists of the Quaternary Eolian and Piedmont Deposits (Qep) (Holocene to middle Pleistocene), which is the primary geologic formation at the surface in this area. Small outcrops of Quaternary Piedmont Alluvial Deposits (Qp) (Holocene to lower Pleistocene) are located to the north and east of the site and overlie the Qep deposits. Furthermore, Quaternary Older Alluvial Deposits of Upland Plains and Piedmont Areas (Qoa) (Middle to lower Pleistocene) are west of the site and typically underlie the Qep deposits. The Tertiary Ogallala Formation (To) (lower Pliocene and middle Miocene) underlies the Qoa and is exposed northwest and east of the site. The Ogallala consists of alluvial and eolian deposits and petrocalcic soils of the southern high plains.

Triassic rocks of the Chinle Formation and Santa Rosa Sandstone of the Dockum Group underlie southern Lea County and is exposed southwest of the site. The Chinle Formation is described as a red to green claystone with minor fine-grained sandstone and siltstones. The Chinle is present in all of the eastern part of southern Lea County but thins westward and is absent in extreme western portions. Thickness of the Chinle varies from 0 to 1,270 feet. The Santa Rosa Sandstone is described as a primarily red, fine-to-coarse grained sandstone, is exposed only in minor outcrops, and the thickness ranges from 140 to 300 feet.

Undifferentiated Paleozoic rocks, consisting of siltstone, shale and sandstone, underlie the Dockum Group in southern Lea County. Thickness of these undifferentiated rocks is approximately 90 to 400 feet.

2.2.3 Regional Structural Geology and Geomorphology

The major structure features of southern Lea County are the Permian age Delaware Basin and the Central Basin Platform in the subsurface. Few structural features are present in the area due to the lack of tectonic movement within the basin since the close of the Permian.

The landfill site is located within the Southern High Plains physiographic region of the state. The High Plains covers the eastern quarter of the state and consists of mildly deformed Permian and Triassic sedimentary rocks capped by the late Miocene-Pliocene Ogallala Formation and Quaternary deposits, which are exposed in the southeastern and east-central parts of the state. Furthermore, the northwest part of the oil and gas-rich Permian Basin underlies southeastern New Mexico. No major surface faults or structural features are located in the vicinity of the landfill site.

Geomorphic features consist of windblown eolian and loess deposits in generally flat terrain that lacks integrated drainage systems.

Figure 12 provides a structural geology map for the region surrounding the Facility.

2.3 Regional Hydrogeology

Potable groundwater in southern Lea County comes from three principal geologic units: the Dockum Group, Tertiary Ogallala Formation, and Quaternary Alluvium. The Triassic Santa Rosa sandstone, or the basal unit of the Dockum Group, is the principal aquifer in the western third of southern Lea County, which includes the landfill area. The Ogallala Formation and Quaternary Alluvium aquifers are the principal aquifers in the eastern portion of Lea County and are considered unsaturated in the western portion.

According to published data, the Santa Rosa Sandstone yields an average of about 47 gallons per minute (gpm); however, some wells are reported to yield as much as 100 gpm in some areas. The Sandstone is recharged by precipitation on sand dunes, by precipitation and runoff on outcrops, and groundwater flow from the overlying Ogallala Formation and Quaternary Alluvium. Porosity of the Santa Rosa Sandstone is reported at around 13 percent with very low permeability, and incomplete well-test data indicate a specific capacity of less than 0.2 gpm per foot of drawdown. **Figure 7** provides a contour map of the approximated elevations of the top of the Chinle Formation below the Facility. **Figure 8** provides a contour map of the approximated top of the Santa Rosa Sandstone formation below the Facility. **Figure 9** provides a cross section of the geologic formation lithology as it relates to the Facility's proposed base grades.

Depth to water reported for water wells within the Township and Range of the landfill vary from approximately 165 feet in the southern portion to 230 feet in the northern portion.

2.4 Regional Groundwater Quality

The Dockum Group is the principal potable aquifer in the landfill area. Several domestic and municipal wells penetrate this aquifer in the western portion of the region.

Groundwater from the Triassic rocks of the Dockum Group are typically low in silica, vary in range in calcium and magnesium, high in sodium, moderately high in sulfate, and moderately low in chloride. The dissolved solid concentrations are typically higher than water derived from the Ogallala Formation.

Geohydrology of the local aquifers was summarized in U.S. Geological Survey report 84-4077, 1985. Published water quality data from selected wells in the Santa Rosa Sandstone in Lea County ranged from 426 to 1950 ppm for Total Dissolved Solids. A value of 685 ppm was reported for wells in the Cenezoic Alluvium in Lea County.

3.0 Site Hydrogeologic Investigation

The material presented in this section describes site-specific information gathered for the generation of this document.

3.1 Geotechnical Engineering Report

A Geotechnical Engineering Report was prepared by Terracon to present subsurface exploration, geologic, hydrogeologic and geotechnical engineering findings. Several recommendations related to subsurface soil/rock conditions, groundwater conditions, seismic site classification, site preparation and earthwork and site excavation are presented and were generated in conformance with the Siting and Subsurface Investigation Work Plan dated October 17, 2018 submitted to and approved by the NMOCD. A copy of the Geotechnical Engineering Report is attached to this narrative in **Attachment A**.

3.2 Site Geology

The NGL North Ranch SWMF is located within an area of historical oil and gas production, largely in undeveloped ranch areas covered with creosote and mesquite trees. The area is underlain by interlayered eolian sands and piedmont-slope deposits which are underlain by the Dockum Group. Subsurface soil and rock are illustrated on geological cross-section figures attached to this report. **Figure 10** shows the alignments of the cross-sections on a Facility map. **Figure 11a** through **Figure 11c** show geologic cross-sections based on the boring data collected in the Geotechnical Engineering Report in **Attachment A**.

3.3 Site Hydrogeology

Groundwater was not encountered at the site during the boring program which advanced seven borings to a depth of approximately 165 feet below ground surface. The uppermost aquifer is estimated to be encountered at depths of around 175 to 200 feet below ground surface. **Figure 6** shows the approximate depth to groundwater in the Facility area.

4.0 References

New Mexico Bureau of Geology and Mineral Resources, Scholle, Peter A., State Geologist, Geologic Map of New Mexico (1:500 000), 2003.

New Mexico Bureau of Geology and Mineral Resources. Provinces of New Mexico – Geologic Tour of the High Plains, https://geoinfo.nmt.edu/tour/provinces/high_plains/home.html, accessed March 2019.

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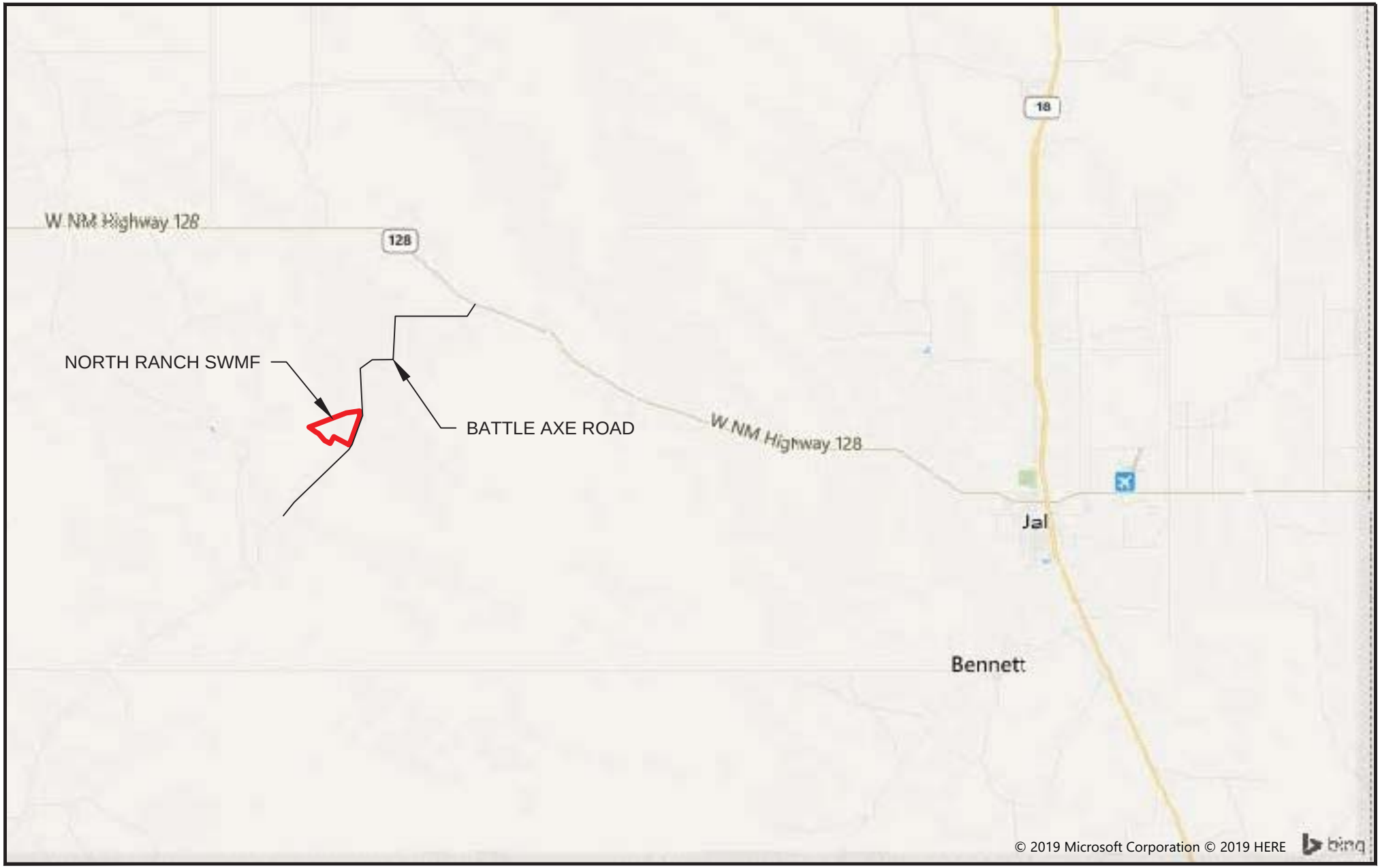
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Terracon, Geotechnical Engineering Report, McCloy Ranch Landfill – January 2019.

United State Department of Agriculture (USDA) Soil Conservation Service. Soil Survey of Lea County, New Mexico – March 2019.

U.S. Geological Survey. Geohydrology of the Delaware Basin and Vicinity, Texas and New Mexico – Water-Resources Investigations Report 84-4077, 1985.
Web Soil Survey, McCloy Ranch Landfill – March 2019.

Figures



REV.	DATE	BY	DESCRIPTION

Terracon
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25809 I-30 SOUTH BRYANT, AR 72022
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SITE LOCATION MAP

PERMIT APPLICATION FIGURE

SURFACE WASTE MANAGEMENT FACILITY

NORTH RANCH

LEA COUNTY NEW MEXICO

FIG. 1

DESIGNED BY:	-
DRAWN BY:	DEW
APPVD. BY:	MPB
SCALE:	1" = 100'
DATE:	SEPTEMBER 2019
JOB NO.	35187378
ACAD NO.	572/002
SHEET NO.:	1 OF 1

N:\GEC\ARCHIVE\CAD\572\002\MCCLOY\PERMIT TEXT FIGURES\PERMIT NARRATIVE\FIG 1 - SITE LOCATION MAP.DWG

T25S R34E, SEC 9 | T25S R34E, SEC 10

LEGEND:

- 3300 — EXISTING GRADE CONTOURS (11-30-2018, 2' CONTOURS)
- PERMIT BOUNDARY AND SECURITY FENCELINE
- OE — OVERHEAD ELECTRIC
- G — EXISTING GAS LINES / GAS EASEMENT
- BH # — W — EXISTING WATER LINE
- EXISTING ROAD CENTERLINE
- BOREHOLE LOCATIONS
- NGL PROPERTY LINE
- SURVEY SECTION LINE
- CELL BOUNDARIES
- PHASE BOUNDARIES
- 40' WIDE CELL ACCESS ROAD

PHASE 1
PHASE 2
PHASE 3

CELL E-1 (9.6 AC.)
CELL E-2 (9.6 AC.)
CELL E-3 (28.2 AC.)
CELL E-4 (18.4 AC.)
CELL E-5 (18.6 AC.)
CELL E-6 (21.6 AC.)
CELL W-1 (15.3 AC.)
CELL W-2 (11.8 AC.)
CELL W-3 (15.2 AC.)
CELL W-4 (23.9 AC.)
CELL W-5 (24.7 AC.)

BH 1
BH 2
BH 3
BH 4
BH 5
BH 7

NORTH STORMWATER POND
WEST STORMWATER POND
EAST STORMWATER POND
LEACHATE EVAP POND
SCALES AND SCALEHOUSE
SITE ENTRANCE
ENTRANCE GATE
PAVED DRIVEWAY
PROPOSED DRYING PAD
PROPOSED WASH PAD
EMERGENCY SECONDARY ACCESS GATE
BATTLE AXE ROAD (HWY 2)

82 999.818 IRS "#20666"
84 999.818 IRS "#20666"
4 3334.647 CP
83
85

N

500 0 250 500
SCALE IN FEET

REV.	DATE	BY	DESCRIPTION

SITE DEVELOPMENT
PERMIT APPLICATION FIGURE
SURFACE WASTE MANAGEMENT FACILITY
NORTH RANCH
LEA COUNTY NEW MEXICO

Terracon
Consulting Engineers and Scientists
25809 I-30 SOUTH BRYANT, AR 72022
PH. (501) 847-9232 FAX: (501) 847-9210

FIGURE 2

DESIGNED BY:	MPB
DRAWN BY:	DEW
APPVD. BY:	MPB
SCALE:	SEE SCALEBAR
DATE:	APRIL 2019
JOB NO.	35187378
ACAD NO.	572/002
SHEET NO.:	OF

N:\GEC\ARCHIVE\CAD\572\002\MCCLOY\PERMIT TEXT FIGURES\PERMIT NARRATIVE\RG 8 - NEW SITE DEVELOPMENT MAP.DWG

Rio Grande Watershed



IMAGE SOURCE: TEXAS COMMISSION OF ENVIRONMENTAL QUALITY
https://www.tceq.texas.gov/assets/public/comm_exec/pubs/sfr/057_16/RGMap.jpg

N:\GEC\ARCHIVE\CAD\572\002\MCCLOY\PERMIT TEXT FIGURES\HYDRO GEO\FIG 3 - WATERSHED MAP.DWG

Project Mngr:	MPB
Drawn By:	DEW
Checked By:	MPB
Approved By:	FOC

Project No.	35187378
Scale:	AS SHOWN
File No.	572-002
Date:	SEPT. 2019

Terracon
Consulting Engineers and Scientists
25809 INTERSTATE 30 S BRYANT, ARKANSAS 72022
PH. (501) 847-9292 FAX. (501) 847-2910

RIO GRANDE WATERSHED

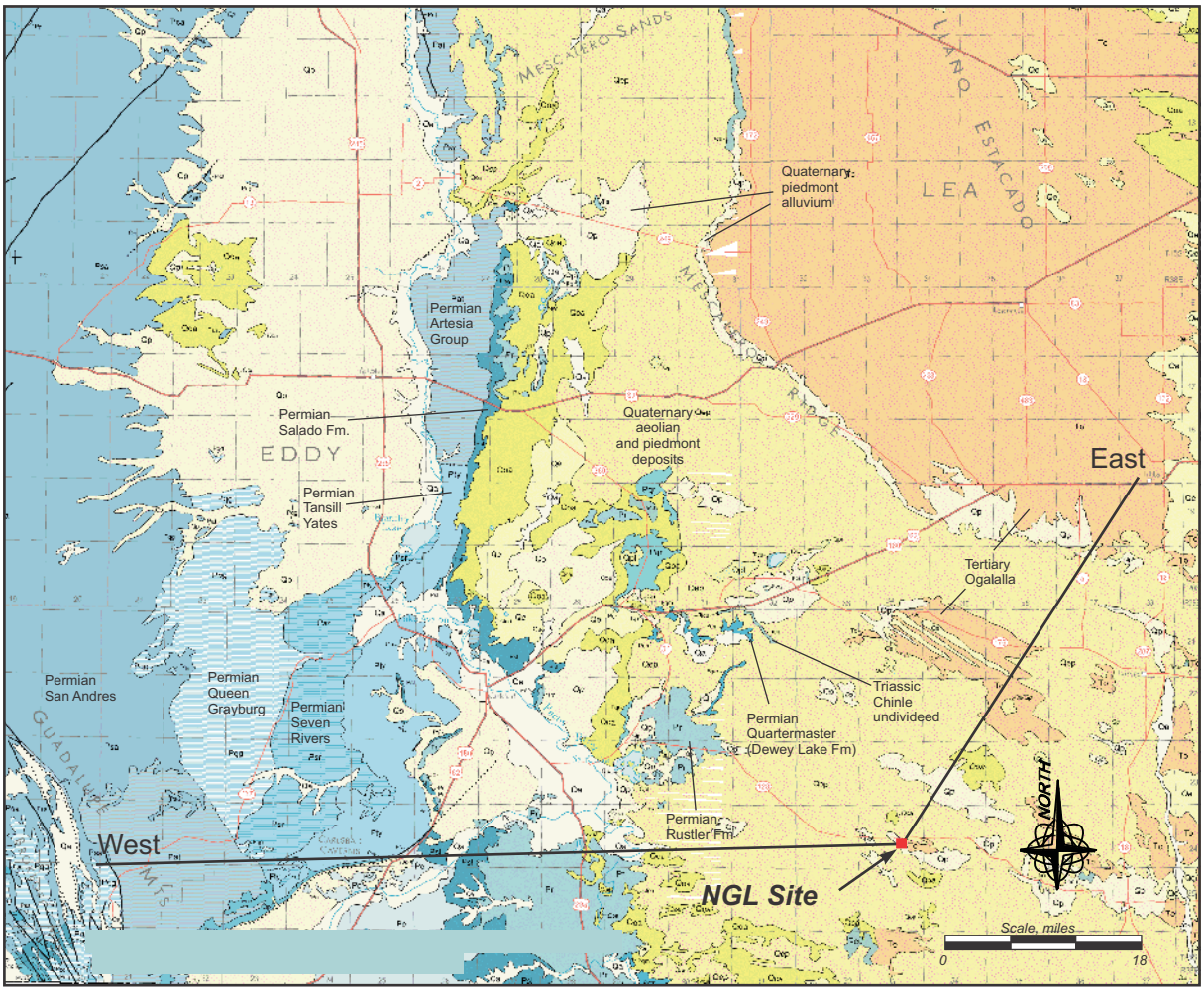
PERMIT APPLICATION FIGURE

NGL WASTE SERVICES, LLC

NORTH RANCH SURFACE WASTE MANAGEMENT FACILITY

LEA COUNTY NEW MEXICO

FIG. No. 3



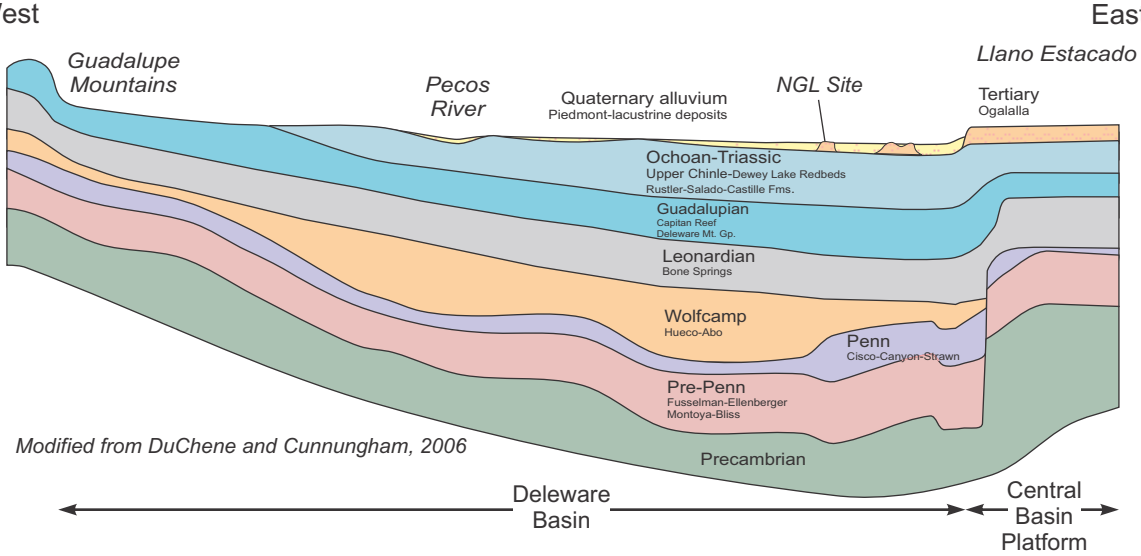


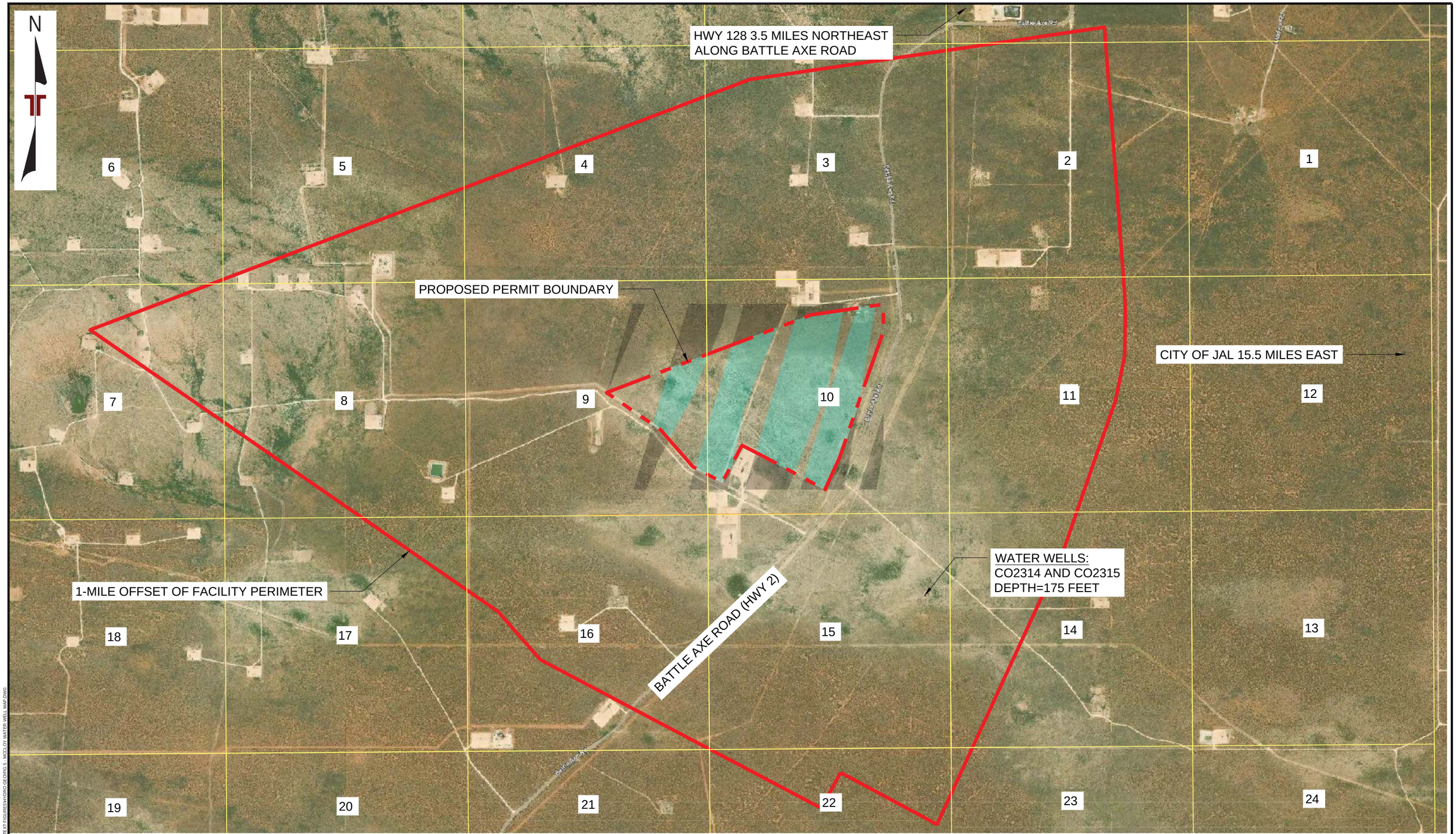
Fig 4

NGL North Ranch SWMF, Lea County, NM

Regional Surface Geology and Generalized Stratigraphy, Southeastern New Mexico

Modified from NM Bureau of Geology and Minerals, 2003
1:500,000 Geologic Map of New Mexico

Terracon



NOTE:

1. WATER WELL INFORMATION OBTAINED FROM NEW MEXICO OFFICE OF THE STATE ENGINEER POD LOCATION GIS APPLICATION.
3. SHOWN TOWNSHIP 25S RANGE 34 E, SECTIONS AS LABELED

Project Mngr:	MPB
Drawn By:	JBM
Checked By:	MPB
Approved By:	MPB
Project No.	35187378
Scale:	1"=2000'
File No.	572-002
Date:	APRIL 2019

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WATER WELLS WITHIN 1 MILE
PERMIT DRAWING
SURFACE WASTE MANAGEMENT FACILITY
NORTH RANCH
LEA COUNTY NEW MEXICO

FIG. No. 5

N:\GEOARCHIVE\DATA\2019\000\CIVIL\PERMIT TEXT FIGURES\HYDRO GEO\FIG 5 - MODLOW WATER WELL MAP.DWG

LEGEND:

- PERMIT BOUNDARY AND SECURITY FENCELINE
- OE — OVERHEAD ELECTRIC
- G — EXISTING GAS LINES / GAS EASEMENT
- W — EXISTING WATER LINE
- EXISTING CENTERLINE
- BH # — SITE INVESTIGATION GEOTECHNICAL BOREHOLE LOCATIONS
- NGL PROPERTY LINE
- SL — SURVEY SECTION LINE
- 3170 — POTENTIOMETRIC SURFACE CONTOURS

BH 1
BH 2
BH 3
BH 4
BH 5
BH 7
BH 8

30-025-29127
(PLUGGED)

T25S, R34E
SEC. 10

T25S, R34E
SEC. 9

GAS & OHE TO BE RELOCATED
BY OWNER PRIOR TO CELL
CONSTRUCTION IN THIS AREA

QUARTER
SECTION LINE

SURVEY SECTION LINE

3+00 6+00 9+00 12+00 15+00 18+00 21+00 24+00 27+00 30+00 33+00 36+00 39+00 42+00 45+00 48+00

A 6 — 0+00

A' 6 — 50+35

3336.65

30-025-20906
(PLUGGED)

EXISTING
TANK PAD

BATTLE AXE ROAD (HWY 2)

3340 3150 3160 3170

N

500 0 250 500

SCALE IN FEET

NOTE:

1. APPROXIMATE TOP OF UPPERMOST AQUIFER ELEVATIONS ADAPTED FROM CHEVRON TEXACO 2005 LEA COUNTY DEPTH TO GROUNDWATER MAP.

FOR PERMITTING PURPOSES ONLY

REV.	DATE	BY	DESCRIPTION

APPROXIMATE REGIONAL POTENTIOMETRIC SURFACE
NORTH RANCH SURFACE WASTE MANAGEMENT FACILITY
NGL WASTE SERVICES, LLC
LEA COUNTY NEW MEXICO

Terracon
Consulting Engineers and Scientists
BRYANT, AR 72022
25809 I-30 SOUTH
PH: (501) 847-9292
FAX: (501) 847-9210

FIGURE 6

DESIGNED BY:	FOC
DRAWN BY:	JBM
APPVD. BY:	FOC
SCALE:	SEE SCALEBAR
DATE:	SEPT. 2019
JOB NO.	35187378
ACAD NO.	572-002
SHEET NO.:	5 OF 7

N:\SEC\ARCHIVE\CAD\572-002\MCCLOY\35187378 DESIGN PERMITTING\VADOSE ZONE MONITORING\005 - REGIONAL POT SURFACE.DWG

LEGEND:

- PERMIT BOUNDARY AND SECURITY FENCELINE
- OE — OVERHEAD ELECTRIC
- G — EXISTING GAS LINES / GAS EASEMENT
- W — EXISTING WATER LINE
- EXISTING CENTERLINE
- BH # — SITE INVESTIGATION GEOTECHNICAL BOREHOLE LOCATIONS
- NGL PROPERTY LINE
- SL — SURVEY SECTION LINE
- 3300 — APPROXIMATE TOP OF CHINLE CONTOURS

BH 1
BH 2
BH 3
BH 4
BH 5
BH 7
BH 8

30-025-29127
(PLUGGED)

T25S, R34E
SEC. 10

T25S, R34E
SEC. 9

3290
3280

SURVEY SECTION LINE

GAS & OHE TO BE RELOCATED
BY OWNER PRIOR TO CELL
CONSTRUCTION IN THIS AREA

QUARTER
SECTION LINE

QUARTER
SECTION LINE

QUARTER
SECTION LINE

BATTLE AXE ROAD (HWY 2)

3+00 6+00 9+00 12+00 15+00 18+00 21+00 24+00 27+00 30+00 33+00 36+00 39+00 42+00 45+00 48+00

A 6 — 0+00

A' 6 — 50+35

N

500 0 250 500

SCALE IN FEET

NOTE:

1. TOP OF CHINLE FORMATION (REDBEDS) DERIVED FROM SITE INVESTIGATION BORINGS

FOR PERMITTING PURPOSES ONLY

REV.	DATE	BY	DESCRIPTION

APPROXIMATE TOP OF CHINLE FORMATION
NORTH RANCH SURFACE WASTE MANAGEMENT FACILITY
NGL WASTE SERVICES, LLC
LEA COUNTY
NEW MEXICO

Terracon
Consulting Engineers and Scientists
BRYANT, AR 72022
25809 I-30 SOUTH
PH: (501) 847-9292
FAX: (501) 847-9210

FIGURE 7

DESIGNED BY:	FOC
DRAWN BY:	JBM
APPVD. BY:	FOC
SCALE:	SEE SCALEBAR
DATE:	SEPT. 2019
JOB NO.	35187378
ACAD NO.	572-002
SHEET NO.:	3 OF 7

N:\GEC\ARCHIVE\CAD\572\002\MCCLOY\35187378 DESIGN PERMITTING\SVADOSE ZONE MONITORING\003 - TOP OF CHINLE.DWG

LEGEND:

- PERMIT BOUNDARY AND SECURITY FENCELINE
- OE — OVERHEAD ELECTRIC
- G — EXISTING GAS LINES / GAS EASEMENT
- W — EXISTING WATER LINE
- EXISTING CENTERLINE
- BH # — SITE INVESTIGATION GEOTECHNICAL BOREHOLE LOCATIONS
- NGL PROPERTY LINE
- SL — SURVEY SECTION LINE
- APPROXIMATE TOP OF SANTA ROSA SANDSTONE CONTOURS

BH 1
BH 2
BH 3
BH 4
BH 5
BH 7
BH 8

30-025-29127
(PLUGGED)

T25S, R34E
SEC. 10

T25S, R34E
SEC. 9

GAS & OHE TO BE RELOCATED BY OWNER PRIOR TO CELL CONSTRUCTION IN THIS AREA

QUARTER SECTION LINE

SURVEY SECTION LINE

3336.65

BATTLE AXE ROAD (HWY 2)

A 6 — 0+00

A' 6 — 50+35

3+00 6+00 9+00 12+00 15+00 18+00 21+00 24+00 27+00 30+00 33+00 36+00 39+00 42+00 45+00 48+00

2770 2760 2750 2740 2730 2720 2710 2700

N

500 0 250 500

SCALE IN FEET

NOTE:

1. DERIVED FROM STRUCTURAL TOP OF SANTA ROSA SANDSTONE MAP, GORDON ENVIRONMENTAL/GOLDER ASSOCIATES, 2016

FOR PERMITTING PURPOSES ONLY

REV.	DATE	BY	DESCRIPTION

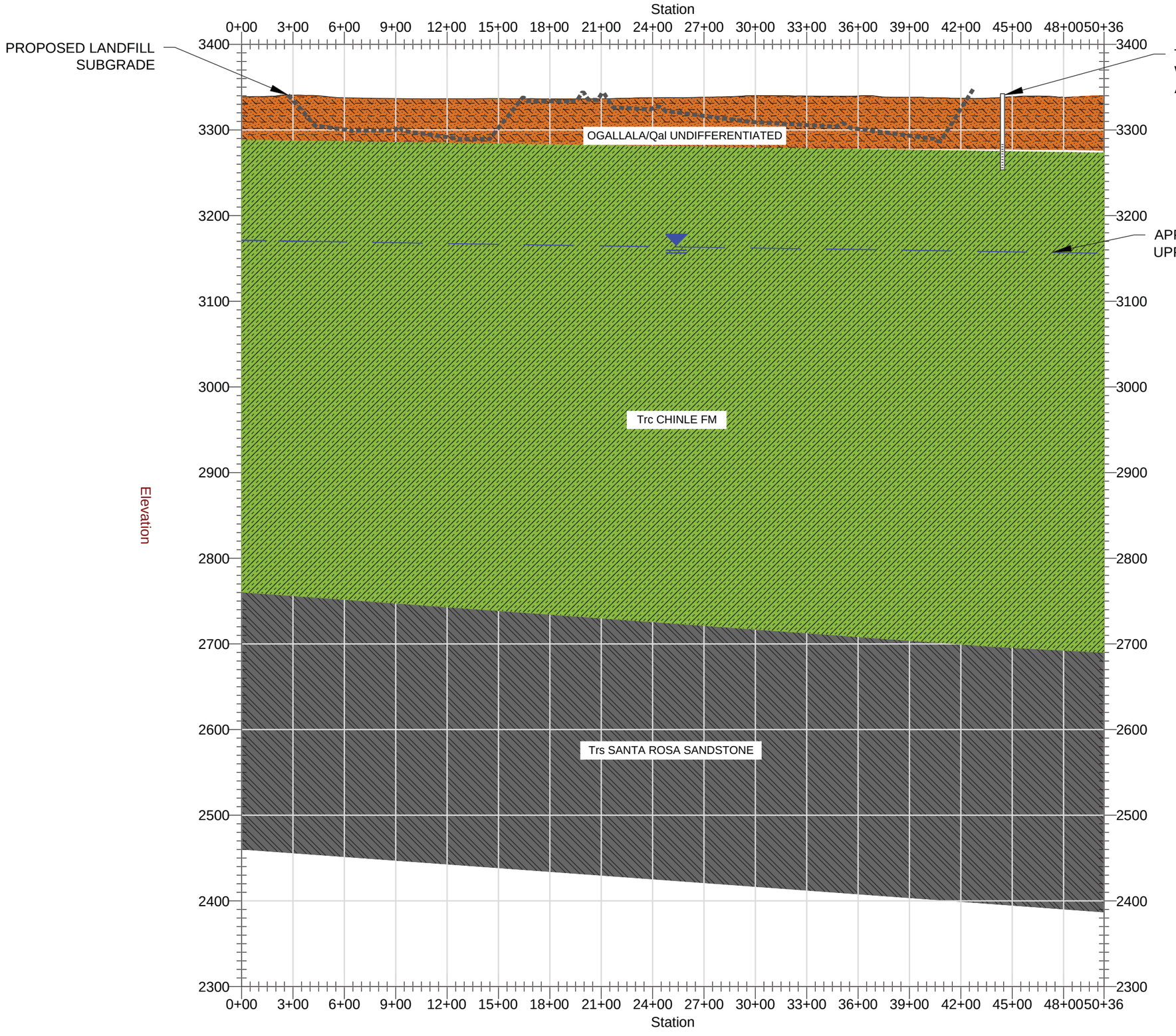
APPROXIMATE TOP OF SANTA ROSA SANDSTONE
NORTH RANCH SURFACE WASTE MANAGEMENT FACILITY
NGL WASTE SERVICES, LLC
LEA COUNTY NEW MEXICO

Terracon
Consulting Engineers and Scientists
BRYANT, AR 72022
25809 I-30 SOUTH
PH: (501) 847-9210
FAX: (501) 847-9292

FIGURE 8

DESIGNED BY:	FOC
DRAWN BY:	JBM
APPVD. BY:	FOC
SCALE:	SEE SCALEBAR
DATE:	SEPT. 2019
JOB NO.	35187378
ACAD NO.	572-002
SHEET NO.:	4 OF 7

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REV.	DATE	BY	DESCRIPTION

VADOSE ZONE CROSS SECTION

NORTH RANCH SURFACE WASTE MANAGEMENT FACILITY

NGL WASTE SERVICES, LLC

LEA COUNTY NEW MEXICO

Terracon
Consulting Engineers and Scientists
BRYANT, AR 72022
25809 I-30 SOUTH
PH: (501) 847-9232
FAX: (501) 847-9210

FIGURE 9

DESIGNED BY:	FOC
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APPVD. BY:	FOC
SCALE:	SEE SCALEBAR
DATE:	SEPT. 2019
JOB NO.	35187378
ACAD NO.	572-002
SHEET NO.:	6 OF 7

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LEGEND:

- 3300 — EXISTING GRADE CONTOURS
- PERMIT BOUNDARY
- OE — OVERHEAD ELECTRIC
- G — G — EXISTING GAS LINES / GAS EASEMENT
- W — EXISTING WATER LINE
- EXISTING CENTERLINE
- CROSS-SECTION (TYPICAL)
- BH # — BOREHOLE LOCATIONS
- 3000 — SPOT ELEVATIONS

EXISTING WELL PAD

EXISTING WELL PAD

C BH 1 E

D BH 2

3342.55

3342.48

3342.96

SP: 0+00.00

C BH 3

B

3339.74

3340

PI: 19+97.38

BH 8

EP: 42+53.56

BH 7 B'

3336.77

3340

3340

3340

3337.58

3336.65

3340

BATTLE AXE ROAD (HWY 2)

EXISTING WELL PAD

3336.66

3335.63

D' BH 4 A

E' BH 5 A'

EXISTING WELL PAD

EXISTING WELL PAD

N

500 0 250 500

SCALE IN FEET

FOR PERMITTING PURPOSES ONLY

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REV.	DATE	BY	DESCRIPTION
1	9/19	KHJ	UPDATED PER JIM JORDAN COMMENTS

GEOLOGICAL CROSS-SECTIONS

NORTH RANCH SURFACE WASTE MANAGEMENT FACILITY

NGL WASTE SERVICES, LLC

PERMIT APPLICATION DRAWING

LEA COUNTY NEW MEXICO

Terracon
Consulting Engineers and Scientists
2809 I-30 SOUTH
PH. (501) 847-9292
BRYANT, AR 72022
FAX. (501) 847-9210

FIGURE 10

DESIGNED BY:	MPB
DRAWN BY:	DEW
APPVD. BY:	MPB
SCALE:	SEE SCALEBAR
DATE:	SEPT. 2019
JOB NO.	35187378
ACAD NO.	572-002
SHEET NO.:	OF

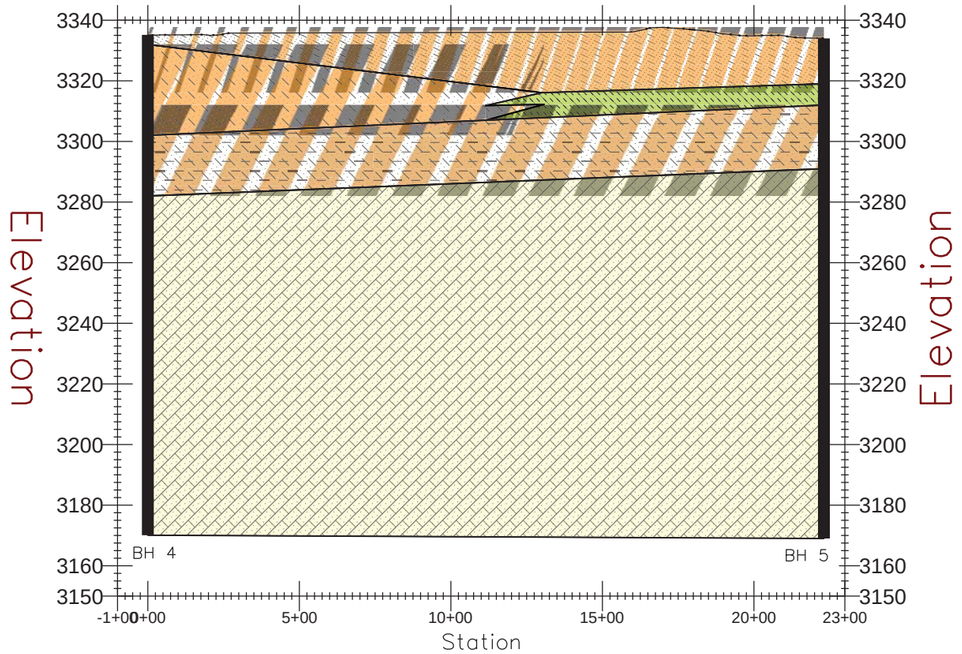
General Notes:

1. Lithologic information provided is based on field site investigation information collected by Terracon. Interpretations may change as additional information is gathered.
2. No groundwater was encountered during drilling.
3. Existing topography was performed November 30, 2018 and vertical elevations are based on the NAVD 88 NM_E.

Note:

Information depicted in this lithology shown was derived from "Geotechnical Engineering Report - McCloy Ranch Landfill" dated January 18, 2019, and was prepared by Terracon Consultants, Inc.

B TO B'

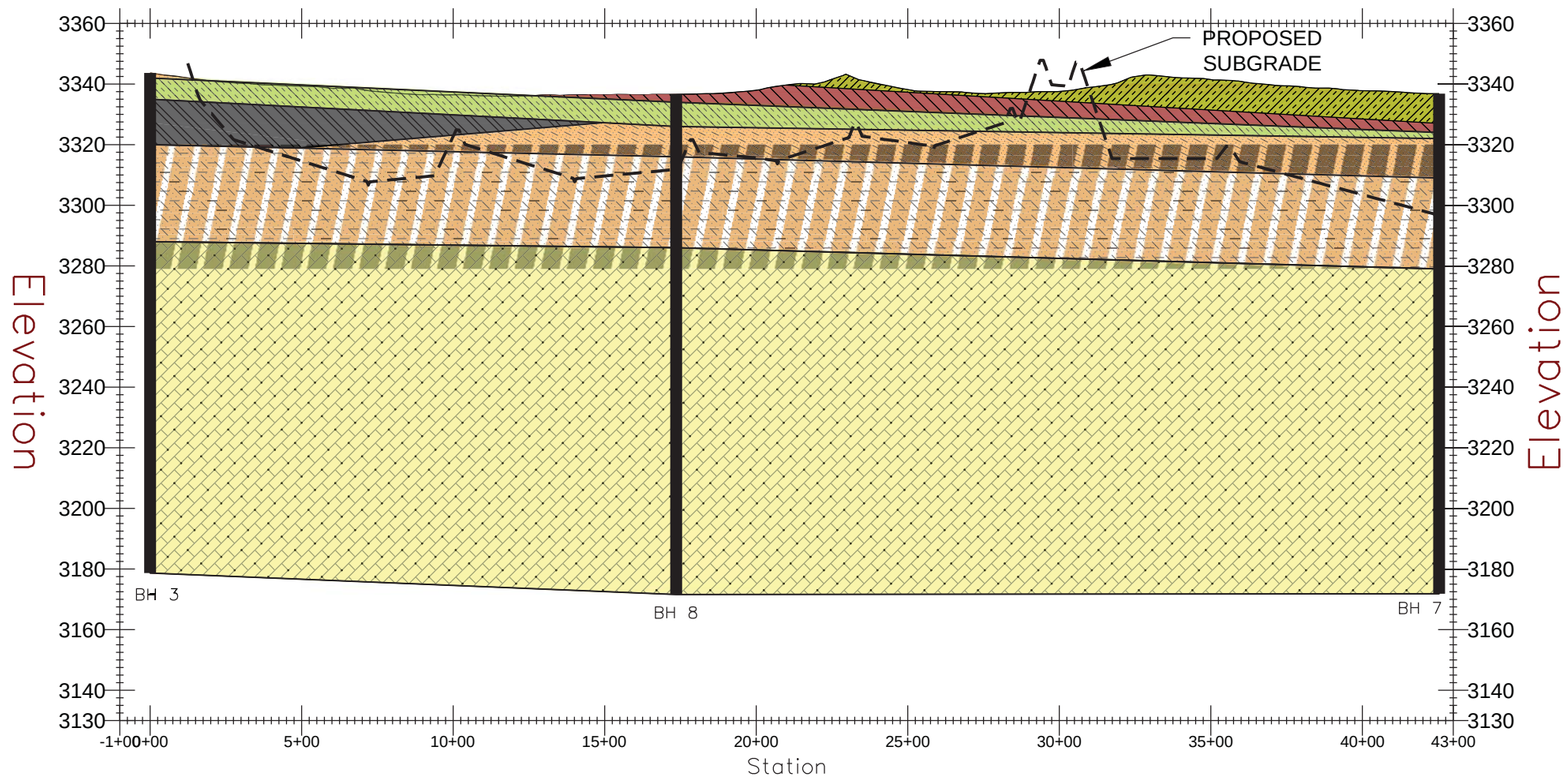


LEGEND:

- Poorly Graded Sand with Silt
- Clayey Sand with Interbedded Caliche
- Caliche
- Silty Sand
- Sandstone
- Poorly Graded Sand
- Poorly Graded Sand with Interbedded Caliche
- Silty Sand with Interbedded Caliche
- Bore Hole (BH 8)

Horizontal Scale: 1" = 500'
Vertical Scale: 1" = 50'

B TO B'



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REV.	DATE	BY	DESCRIPTION
1	9/19	KHJ	UPDATED PER JIM JORDAN COMMENTS

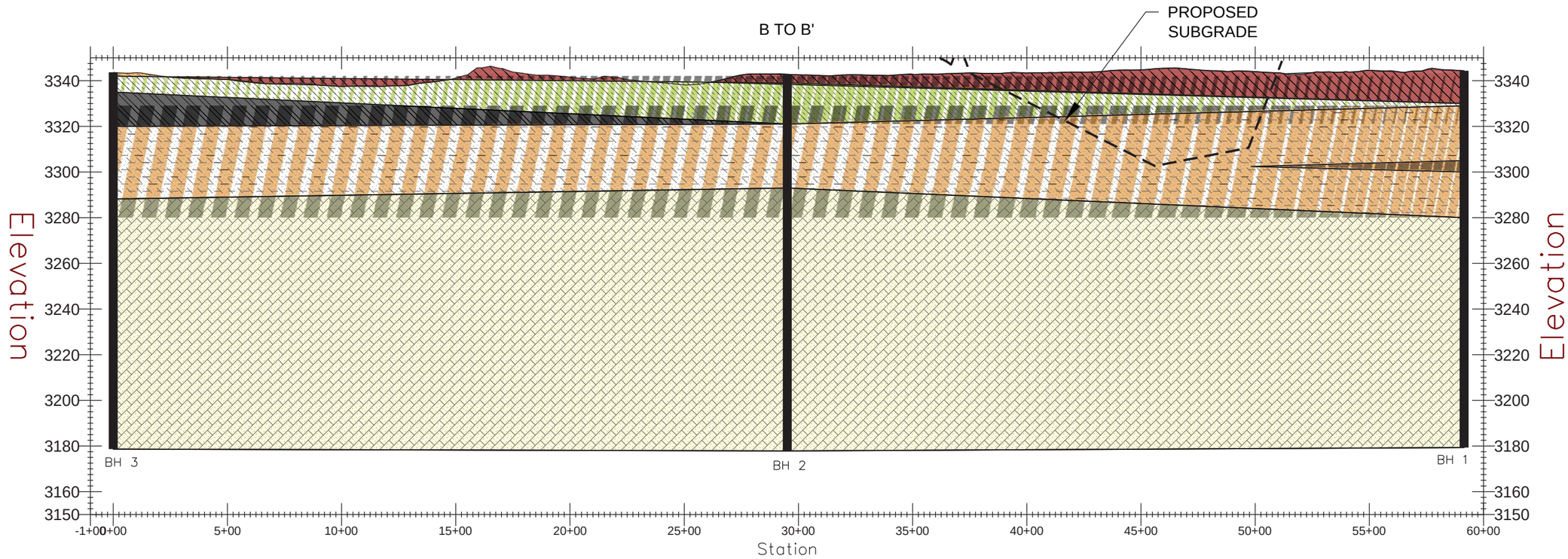
GEOLOGICAL CROSS-SECTION A - A' & B - B'
NORTH RANCH SURFACE WASTE MANAGEMENT FACILITY
NGL WASTE SERVICES, LLC
PERMIT APPLICATION DRAWING
LEA COUNTY
NEW MEXICO

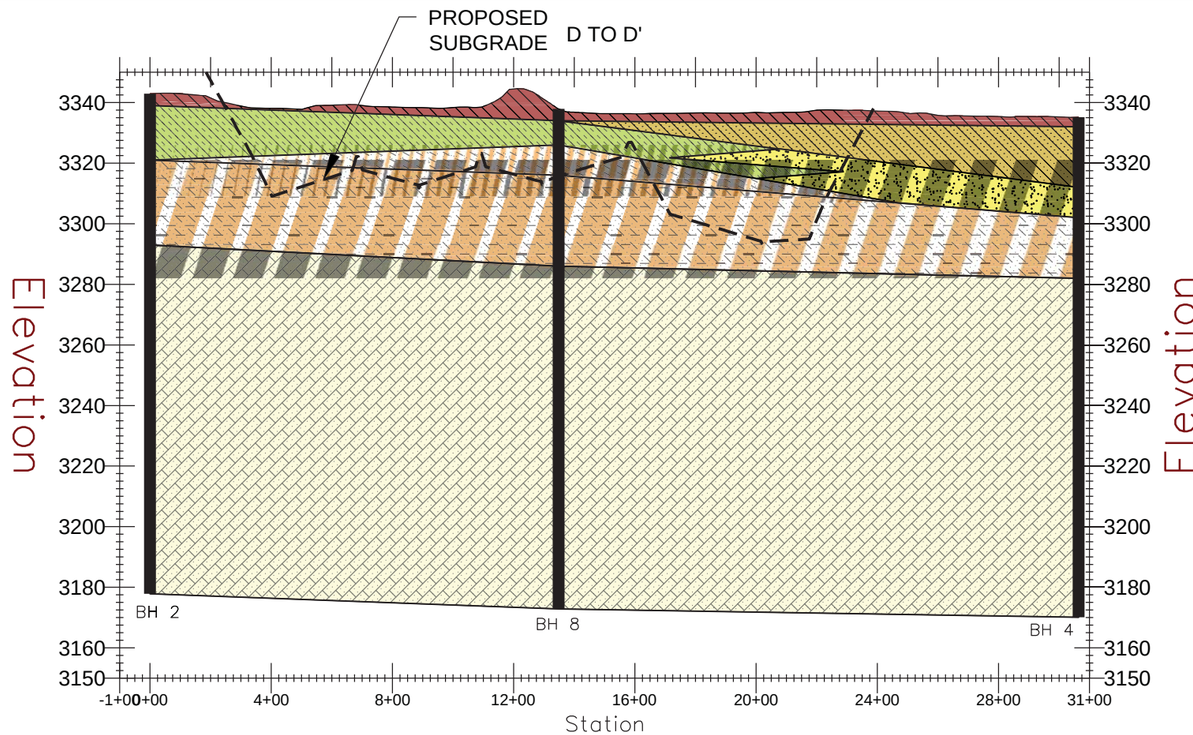
Terracon
Consulting Engineers and Scientists
25809 I-30 SOUTH
PH. (501) 847-9292
BRYANT, AR 72022
FAX: (501) 847-9210

FIGURE 11A

DESIGNED BY:	MPB
DRAWN BY:	DEW
APPVD. BY:	MPB
SCALE:	SEE SCALEBAR
DATE:	SEPT. 2019
JOB NO.	35187378
ACAD NO.	572-002
SHEET NO.:	OF

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LEGEND:

- Poorly Graded Sand with Silt
- Clayey Sand with Interbedded Caliche
- Caliche
- Silty Sand
- Sandstone
- Poorly Graded Sand
- Poorly Graded Sand with Interbedded Caliche
- Silty Clayey Sand with Interbedded Caliche
- Silty Sand with Interbedded Caliche
- Bore Hole (BH 8)

Horizontal Scale: 1" = 500'
Vertical Scale: 1" = 50'

General Notes:

1. Lithologic information provided is based on field site investigation information collected by Terracon. Interpretations may change as additional information is gathered.
2. No groundwater was encountered during drilling.
3. Existing topography was performed November 30, 2018 and vertical elevations are based on the NAVD 88 NM_E.

Note:

Information depicted in this lithology shown was derived from "Geotechnical Engineering Report - McCloy Ranch Landfill" dated January 18, 2019, and was prepared by Terracon Consultants, Inc.

FOR PERMITTING PURPOSES ONLY

REV.	DATE	BY	DESCRIPTION
1	9/19	KHJ	UPDATED PER JIM JORDAN COMMENTS

GEOLOGICAL CROSS-SECTION C - C' & D - D'
NORTH RANCH SURFACE WASTE MANAGEMENT FACILITY
NGL WASTE SERVICES, LLC
PERMIT APPLICATION DRAWING
LEA COUNTY NEW MEXICO

Terracon
Consulting Engineers and Scientists
25809 I-30 SOUTH
PH. (501) 847-9292
BRYANT, AR 72022
FAX: (501) 847-9210

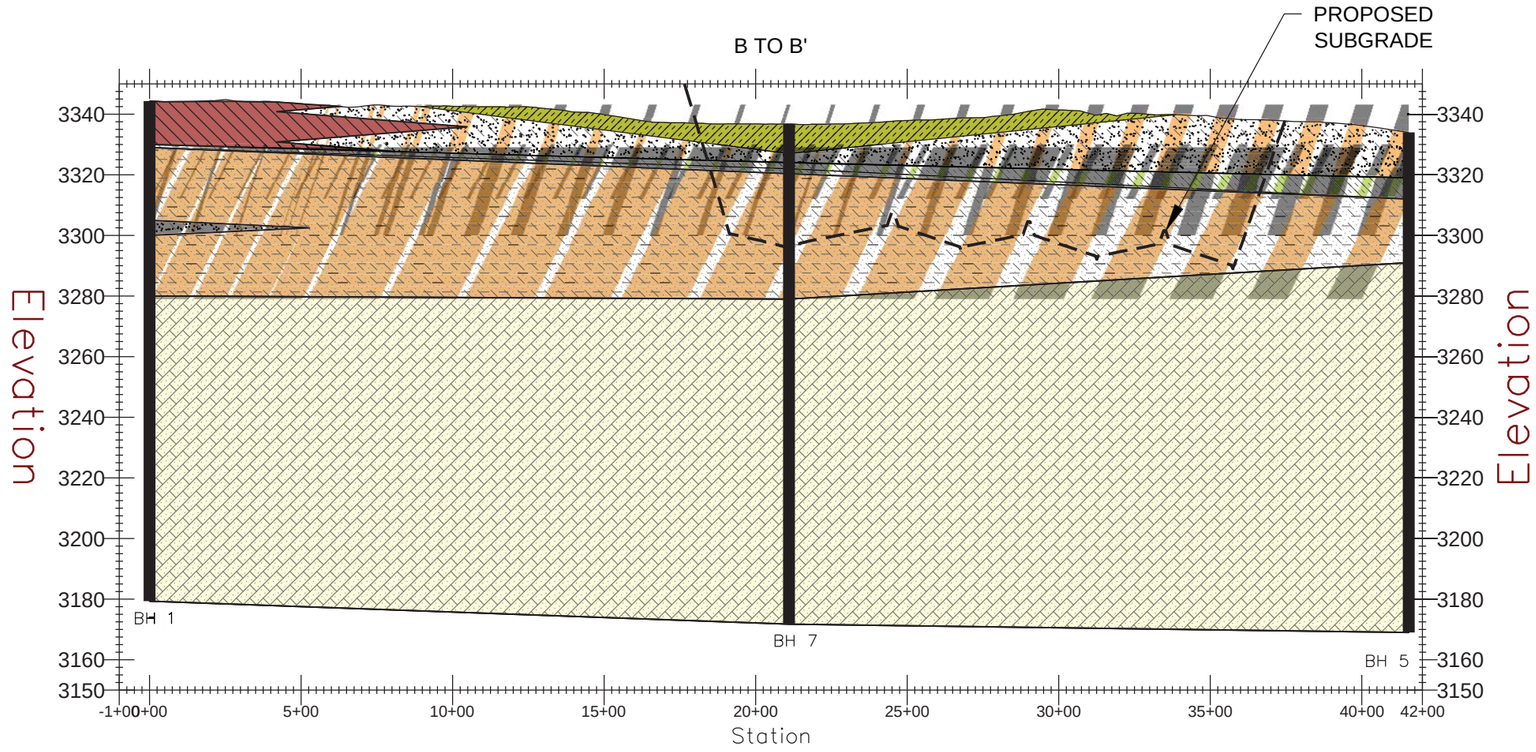
FIGURE 11B

DESIGNED BY:	MPB
DRAWN BY:	DEW
APPVD. BY:	MPB
SCALE:	SEE SCALEBAR
DATE:	SEPT. 2019
JOB NO.	35187378
ACAD NO.	572-002
SHEET NO.:	OF

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General Notes:

1. Lithologic information provided is based on field site investigation information collected by Terracon. Interpretations may change as additional information is gathered.
2. No groundwater was encountered during drilling.
3. Existing topography was performed November 30, 2018 and vertical elevations are based on the NAVD 88 NM_E.



LEGEND:

- Poorly Graded Sand with Silt
- Clayey Sand with Interbedded Caliche
- Caliche
- Silty Sand
- Sandstone
- Poorly Graded Sand
- Poorly Graded Sand with Interbedded Caliche
- Silty Sand with Interbedded Caliche
- Bore Hole — BH 8

Horizontal Scale: 1" = 500'
Vertical Scale: 1" = 50'

Note:

Information depicted in this lithology shown was derived from "Geotechnical Engineering Report - McCloy Ranch Landfill" dated January 18, 2019, and was prepared by Terracon Consultants, Inc.

FOR PERMITTING PURPOSES ONLY

REV.	DATE	BY	DESCRIPTION
1	9/19	KHJ	UPDATED PER JIM JORDAN COMMENTS

GEOLOGICAL CROSS-SECTION E - E'
NORTH RANCH SURFACE WASTE MANAGEMENT FACILITY
NGL WASTE SERVICES, LLC
PERMIT APPLICATION DRAWING
LEA COUNTY NEW MEXICO

Terracon
Consulting Engineers and Scientists
25809 I-30 SOUTH BRYANT, AR 72022
PH. (501) 847-9292 FAX. (501) 847-9210

FIGURE 11C

DESIGNED BY:	MPB
DRAWN BY:	DEW
APPVD. BY:	MPB
SCALE:	SEE SCALEBAR
DATE:	SEPT. 2019
JOB NO.	35187378
ACAD NO.	572-002
SHEET NO.:	OF

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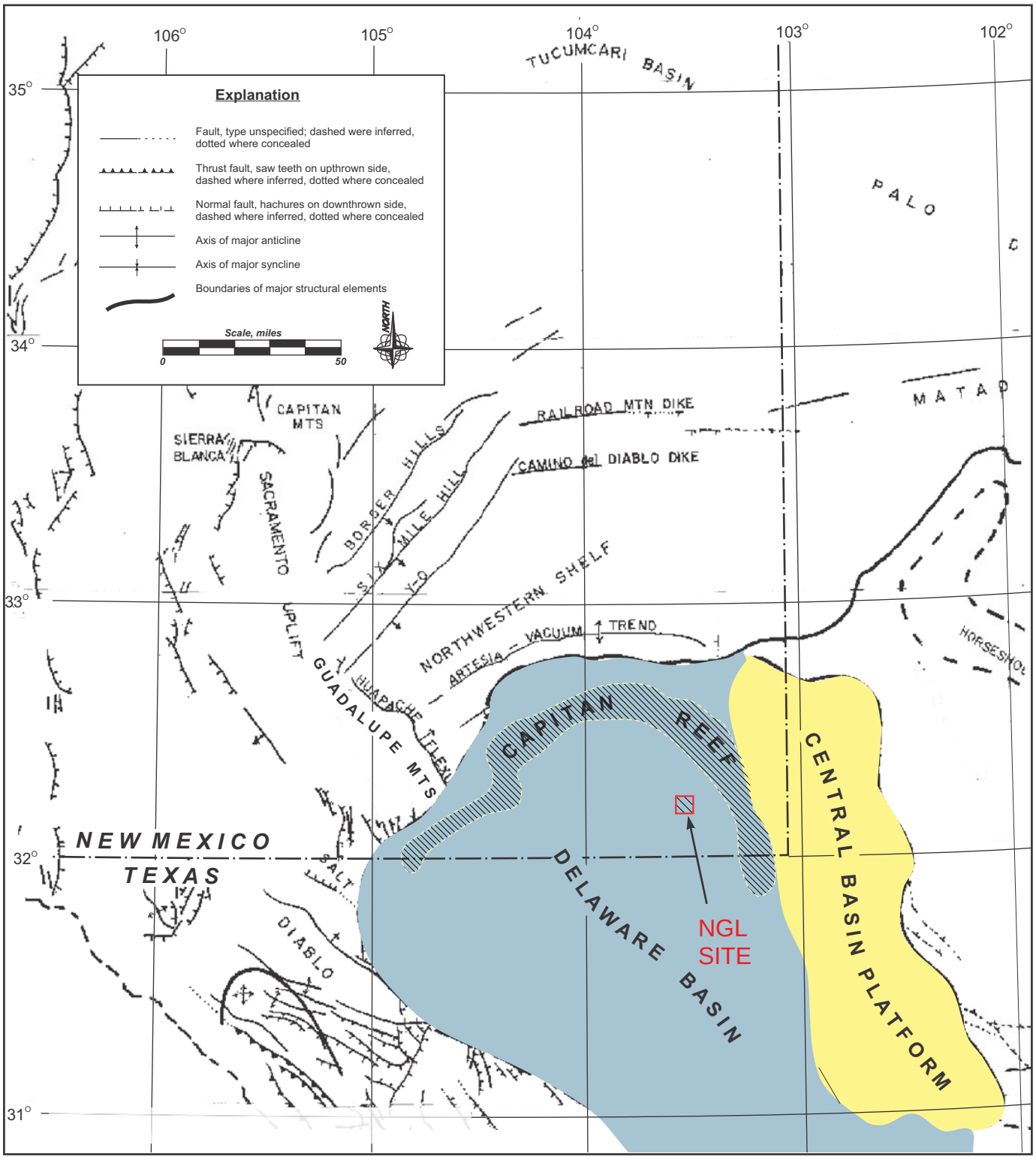


Fig 12

NGL North Ranch SWMF, Lea County, NM

Structures of the Delaware Basin,

Southeastern New Mexico and West Texas

Major Regional Structural Features of Southeastern New Mexico
Modified from Powers, 1978

Terracon

Attachment A

Geotechnical Engineering Report (Terracon, January 2019)

Terracon GeoReport

Geotechnical Engineering Report

McCloy Ranch Landfill

Jal, Lea County, New Mexico

January 25, 2019

Terracon Project No. A4187129

Prepared for:

Trammco Environmental Solutions, LLC

Fernandina Beach, FL

Prepared by:

Terracon Consultants, Inc.

Midland, Texas

terracon.com

Terracon

Environmental ■ Facilities ■ Geotechnical ■ Materials

January 25, 2019

Terracon GeoReport

Trammco Environmental Solutions, LLC
P.O. Box 2283
Fernandina Beach, FL 79760

Attn: Mr. Matthew Trammell
E: matt@trammco.com

Re: Geotechnical Engineering Report
McCloy Ranch Landfill
Lea County, New Mexico
Terracon Project No. A4187129

Dear Mr. Trammell:

We have completed the Hydrogeological/Geotechnical investigations for the above referenced project. This study was performed in general accordance with Terracon Proposal No. P35187312 dated October 17, 2018. This report presents the findings of the subsurface exploration and provides hydrological/geotechnical recommendations for the proposed project.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report or if we may be of further service, please contact us.

Sincerely,
Terracon Consultants, Inc.

Naga Velpuri
Staff Geotechnical Engineer

JAMES D. COSPER, II NEW MEXICO 14477 1-25-19 REGISTERED PROFESSIONAL ENGINEER

J. Dan Cosper, P.E.
Senior Associate/Office Manager

Copy: file

REPORT TOPICS

REPORT SUMMARY I
INTRODUCTION 1
SITE CONDITIONS 1
PROJECT DESCRIPTION 2
DRILLING PROCEDURES 3
GEOTECHNICAL CHARACTERIZATION 3
GEOTECHNICAL OVERVIEW 5
EARTHWORK 5
SEISMIC CONSIDERATIONS 10
GENERAL COMMENTS 10

Note: This report was originally delivered in a web-based format. **Orange Bold** text in the report indicates a referenced section heading. The PDF version also includes hyperlinks which direct the reader to that section and clicking on the Terracon GeoReport logo will bring you back to this page. For more interactive features, please view your project online at client.terracon.com.

ATTACHMENTS

EXPLORATION AND TESTING PROCEDURES
SITE LOCATION AND EXPLORATION PLANS
SUBSURFACE PROFILE (5 profiles)
EXPLORATION RESULTS (Boring Logs and Laboratory Data)
SUPPORTING INFORMATION (General Notes and Unified Soil Classification System and Description of Rock Properties)

REPORT SUMMARY

Topic [1]	Overview Statement [2]
Project Description	Landfill facility will be constructed on a 306-acre surface waste disposal facility within Section 9 and 10 of, T25S, R34E approximately 16 miles west of the City of Jal in Lea County, New Mexico.
Geotechnical Characterization	▪ Based on the field exploration, we classified the soils we encountered into three soil stratums, first strata with depths ranging between 20 feet to 27 feet below grade surface (bgs) consisting of silty sand, silty sand with gravel, silty clayey sand, poorly graded sand with interbedded layers of caliche. The second strata was penetrated at depths ranging between 20 feet to 27 feet bgs consisting of silty sand, poorly graded sand, interbedded caliche layers classified as, silty sand, poorly graded sand. The third strata was penetrated at depths ranging between 40 feet to 65 feet bgs and consisted of fine-grain, poorly to moderately compacted sandstone. ▪ Very dense/hard calcareous materials with varying degrees of cementation, or locally called “caliche” materials, which are typically classified as silty sand, poorly graded sand, were encountered in all the borings ranging from the upper approximately 2 to 65 feet of existing grades. Caliche interval thicknesses ranged from 1 inch to over 10 feet. The caliche materials are underlain by medium to finely weathered sandstone extending to boring-termination depths of 165 feet below existing grades. On-site subsurface soils are not expected to experience substantial volumetric changes (shrink/swell) with fluctuations in moisture content. Potential vertical rise (PVR) of on-site soils is estimated to be less than 1 inch. On-site soils are generally suitable for use as structural fill. ▪ Caliche bears a strong resemblance to rock and is therefore difficult to excavate. Based on the conditions encountered, we believe landfill excavations in the upper 2 to 65 feet of existing grades will require a hoe ram, a heavy dozer equipped with a ripper, a rock saw or a jack hammer. Bedrock was encountered beneath caliche materials, thus rock excavation by means of ripping and blasting is expected. Recommendations regarding excavation conditions of on-site subsurface materials and definitions of rock in various conditions are included in section Excavations Conditions of this report. ▪ The 2012 International Building Code (Section 1613.3.2) seismic site classification for this site is estimated to be C. ▪ No groundwater was encountered in the borings within the drilling depths of 165 feet below existing grades at the time of drilling. Based on these data, we do not expect groundwater would impact the landfill development. ▪ Laboratory permeability were measured on samples. Results of laboratory permeability measurements on samples collected from BH-1, and BH-4 were in a range of $1.09x10^{-6}$ to $6.5x10^{-5}$ cm/sec. Detailed permeability measurement results are presented in Geotechnical Characterization section of this report. ▪ Bedrocks (sandstone) were encountered at depths of 30 to 165 feet below existing grades. Please refer to boring logs and subsurface profiles provided in the Appendices.

Topic [1]	Overview Statement [2]
Below Grade Structures	The landfill development itself is considered a below grade structure.
General Comments	This section contains important information about the limitations of this geotechnical engineering report.

1. If the reader is reviewing this report as a pdf, the topics above can be used to access the appropriate section of the report by simply clicking on the topic itself.
2. This summary is for convenience only. It should be used in conjunction with the entire report for design purposes.

Geotechnical Engineering Report

McCloy Ranch Landfill

IH-20 and FM-866

Jal, Lea County, New Mexico

Terracon Project No. A4187129

January 25, 2019

INTRODUCTION

This report presents the results of Terracon's subsurface exploration and geotechnical engineering services performed for the proposed Landfill to be located within Section 9 and 10 of, T25S, R34E approximately 16 miles west of the City of Jal in Lea County, New Mexico. The purpose of these services is to provide geologic and hydrogeologic findings and geotechnical engineering recommendations relative to:

- Subsurface soil (and rock) conditions
- Groundwater conditions
- Seismic site classification per IBC
- Site preparation and earthwork
- Excavation considerations

The geotechnical engineering scope of services for this project included the advancement of seven test borings (BH-1 to BH-5, BH-7 and BH-8) to depths approximately 165 feet below existing site grades. **Please note that boring BH-6 was mislabeled as BH-8.** Although the original scope of services consisted of a total of 14 geotechnical soil testing samples. Due to the homogeneity of soils and based on the project coordination with the client during the site exploration, a total of three samples were collected for lab testing.

Maps showing the site and boring locations are shown in the **Site Location** and **Exploration Plan** sections, respectively. The results of the laboratory testing performed on soil samples obtained from the site during the field exploration are included on the boring logs and as separate graphs in the **Exploration Results** section of this report.

SITE CONDITIONS

The following description of site conditions is derived from Terracon's site visit in association with the field exploration and our review of publicly available geologic and topographic maps.

Item	Description
Parcel Information	The project site is located within Section 9 and 10 of, T25S, R34E approximately 16 miles west of the City of Jal in Lea County, New Mexico. See **Site Location** for site location information.
Existing Improvements	Undeveloped ranch covered with creosote and mesquite tress.
Current Ground Cover	Site covered with sparse vegetation and mesquite trees
Existing Topography	The site slopes downward towards the east.
Geology	▪ Expected Geologic Conditions: o Pecos alluvium overlying Dockum Group ▪ Geologic Map Details: o Unconsolidated, interlayered eolian sands and piedmont-slope deposits: ▪ Unconsolidated, interlayered eolian sands • Sands, loesse ▪ Piedmont-slope deposits • Includes deposits of higher gradient tributaries bordering major stream valleys, alluvial veneers of the piedmont slope, and alluvial fans. May locally include uppermost Pliocene deposits. ▪ Underlying Upper Chinle Group, Garita Creek through Redonda Formations, undivided (Upper Triassic) ▪ Major mudstone, sandstone and minor conglometrate

PROJECT DESCRIPTION

Terracon's initial understanding of the project was provided in our proposal and was discussed in the project planning stage. A period of collaboration has transpired since the project was initiated, and our final understanding of the project conditions is as follows:

Item	Description
Project Description	One recycling and landfill facility will be constructed on a 306-acre tract of land.
Finished Floor Elevation	Elevation of deepest excavation is expected to be 65 feet below existing grade.
Below Grade Structures	Landfill

DRILLING PROCEDURES

▪ FIELD SUBSURFACE BORING INVESTIGATION WORK PLAN

Seven boring locations were identified for drilling within the property. The boring program was designed to evaluate the lithology and subsurface conditions throughout the property. Terracon mobilized a sonic drilling unit to the site. However, due to drilling requirements, rock coring and/or air rotary drilling was required to advance the borings to final depth.

The drilling at this location was completed by a State of New Mexico licensed well driller. Oversight of the drilling program and the logging of the lithology was conducted by a Terracon field geologist.

▪ Drilling Methodology

Soil borings were performed using sonic drilling methods to the proposed depth in accordance with ASTM D-6914/D6914M-16. The drilling rig was equipped with coring tools capable of providing a minimum borehole diameter of 6 inches with a core barrel 4 inches, 5 or 10 feet in length as drilling depth dictates. Borings BH-1, BH-5, and BH-7 were cored to a total depth of 165 feet bgs. Continuous cores were collected from the remaining borings (BH-2, BH-3, BH-4, and BH-8) to the depth of bedrock (40 to 67 feet below grade) where compressed air-rotary drilling was implemented after approval from the State of New Mexico.

▪ Soil Boring Advancement

Each soil boring was advanced to a depth of 165 feet below grade. This is over 100 feet below the proposed maximum depth of the landfill, if a landfill cell were to be located in the area of the soil boring. If a potential groundwater bearing zone (moist to saturated soils) was visible in any of the core samples, the depth would be noted and the drill casing would be raised to a depth 2 feet above the potential groundwater bearing zone. The boring would be gauged every hour for 3 hours, if no measurable amount of water had accumulated as measured with a water level meter (less than 0.01 feet) drilling would continue past this zone until either another potential groundwater bearing zone was encountered or the total depth of the boring was reached.

GEOTECHNICAL CHARACTERIZATION

Subsurface Profile

Subsurface conditions encountered at the boring locations are indicated on the boring logs **Exploration Results**. Stratification boundaries on the boring logs represent the approximate locations of changes in soil types; in-situ, the transition between materials may be gradual. Details for the boring locations can be found on the boring logs of this report. Based on the results of the borings, subsurface conditions on the project site can be generalized as follows:

As noted in **General Comments**, the stratum characterization is based upon lithologic descriptions by a Terracon field geologist. The widely spaced exploration points across the site may result in lithologic variations.

Stratum	Approximate Depth to Bottom of Stratum (feet)	Material Encountered[1]	Consistency/Density
Stratum I	20 to 27	Silty sand, silty sand with gravel, silty clayey sand, poorly graded sand; brown; with interbedded layers of caliche	Loose to medium
Stratum II	40 to 65	Silty sand, poorly graded sand, interbedded caliche layers classified as, silty sand, poorly graded sand; brown, light brown, reddish brown	Medium dense to very dense
Stratum III	>165	Sandstone, light brown, brown, tannish brown, to tan, dark reddish brown	Fine to medium, poorly to well Cemented

Conditions encountered at each boring location are indicated on the individual boring logs shown in the **Exploration Results** section and are attached to this report. Stratification boundaries on the boring logs represent the approximate location of changes in native soil types; in situ the transition between materials may be gradual.

Groundwater Conditions

Groundwater was not identified during boring advancement. In addition, each boring was allowed to recharge for a period of 24 hours to determine if groundwater was present. Prior to plugging each boring, the boring was gauged with a water level probe to evaluate the boring for the presence of groundwater. No measurable groundwater infiltration (greater than 0.01 feet) was present; therefore, the installation of monitoring wells was not required.

Groundwater level fluctuations occur due to seasonal variations in the amount of rainfall, runoff and other factors not evident at the time the borings were performed. Therefore, groundwater levels during construction or at other times in the life of the structure may be higher or lower than the levels indicated on the boring logs. The possibility of groundwater level fluctuations should be considered when developing the design and construction plans for the project.

Laboratory Permeability Tests

Terracon conducted 3 laboratory permeability tests on cored stratum samples, the results are tabulated in the following table:

Test Number	Boring Number	Sample Depth (feet)	Permeability, K (cm/sec)
1	BH-1	0 to 65	$6.56x10^{-6}$
2	BH-4	0 to 20	$1.09x10^{-7}$
3	BH-4	20 to 52	$6.56x10^{-6}$

Laboratory Direct Shear Tests

Terracon conducted three laboratory direct shear tests on the samples and the results are tabulated in the following table:

Test Number	Boring Number	Sample Depth (feet)	Strain rate, (in./min.)
1	BH-1	0 to 65	0.004
2	BH-4	0 to 20	0.005
3	BH-4	20 to 52	0.005

GEOTECHNICAL OVERVIEW

On-site soils generally consist of fine to medium sandy soils and strongly cemented, calcareous interbedded caliche materials in the upper approximately 2 to 65 feet of existing grades, underlain by sandstone extending to boring termination depths of 165 feet bgs. On-site subsurface soils are not expected to experience substantial volumetric changes (shrink/swell) with fluctuations in moisture content. Potential vertical rise (PVR) of on-site soils is estimated to be less than 1 inch. On-site soils are generally suitable for use as structural fill.

The 2012 International Building Code (Section 1613.3.2) seismic site classification for this site is C.

No groundwater was encountered in any of the borings within the drilling depths at the time of drilling. Based on site exploration, we do not expect groundwater would impact the landfill development, provided expected depth of excavation (EDE) is kept at 65 feet below existing grades.

The **General Comments** section provides an understanding of the report limitations.

EARTHWORK

Earthwork will include clearing and grubbing, excavations and fill placement. The following sections provide recommendations for use in the preparation of specifications for the work.

Recommendations include critical quality criteria as necessary to render the site in the state considered in our geotechnical engineering evaluation for landfill construction.

Site Preparation

Any topsoil or vegetation within areas to receive new fill or structures foundation footprint should be stripped and grubbed and removed. Subsequently, the exposed subgrade should be proof-rolled prior to the placement of any fill or base materials. The proof-rolling should be performed with a fully loaded, tandem-axle dump truck or other equipment providing an equivalent subgrade loading. A minimum gross weight of 20 tons is recommended for the proof-rolling equipment. The proof-rolling should consist of several overlapping passes in mutually perpendicular directions over a given area. Any soft or pumping areas should be excavated to firm ground. Excavated areas should be backfilled with properly placed and compacted fill as discussed in Section **Fill Compaction Requirements**.

Fill Material Types

The on-site subsurface materials, which are free of vegetation, debris, and rocks greater than 4 inches in maximum dimension, are generally suitable to be used for structural fill. Cemented caliche materials that look like rock are present on the project site. Caliche materials need to be crushed into sizes less than 4 inches in maximum dimension and thoroughly mixed with soils before they can be used for structural fill. Structural fill should be clean soil with a Liquid Limit (LL) of less than 35 and a Plasticity Index (PI) less than 15.

Fill Compaction Requirements

Recommendations for compaction are presented in the following table. Terracon recommends that engineered fill be tested for moisture content and compaction during placement. Should the results of the in-place density tests indicate the specified moisture or compaction limits have not been met, the area represented by the test should be reworked and retested as required until the specified moisture and compaction requirements are achieved.

Item	Description
General subgrade preparation to receive fill	Surface scarified to a minimum depth of 6 inches, moisture conditioned and compacted
Lift thickness	9 inches or less loose lift thickness
Compaction	At least 95% maximum standard Proctor dry density (ASTM D 698) in the range of ±2 percentage points of optimum moisture

Utilities

Care should be taken that utility trenches are properly backfilled. Backfilling should be accomplished with properly compacted engineered fill with loose lift thickness of generally 9 inches except for the first lift above the utility pipes that can be relaxed to 12 inches. Compaction should be accomplished with a hand-held compaction device inside utility trenches. Engineered fill should be compacted to at least 95% maximum standard Proctor dry density (ASTM D 698) in the range of ±2 percentage points of optimum moisture for the engineered fill.

Excavation Conditions and Construction Slopes

Terracon understands that EDE in the landfill is expected to be 65 feet below ground surface and construction of the proposed waste facility will involve mass excavation of subsurface materials. For this reason, we aim to determine the expected excavation conditions and rippability of the on-site subsurface materials within approximately 25 feet of existing grades. We note that actual rippability will depend heavily on the equipment and tools used as well as the skill and experience of operators, among other factors. There is no method more effective to determine material rippability than a field production test with equipment similar or identical to that planned for use in project construction.

Caliche layers were encountered from existing grade to depths of approximately 2 to 65 feet bgs. Interbedded caliche and sand layers were underlain by sandstone bedrock extending to the borings termination depths of 165 feet bgs in the borings. Caliche bears a strong resemblance to rock and is therefore difficult to excavate. Based on the conditions encountered, we believe excavation of caliche may require a hoe ram, a heavy dozer equipped with a ripper, a rock saw or a jack hammer or with rock-excavation or blasting equipment. Excavation of rock, sandstone, will likely require controlled blasting.

Soils can generally be excavated by conventional scrapers and loaders. Caliche, partially weathered rock (PWR) or heavily fractured rock typically requires loosening by ripping with large dozers pulling single tooth rippers in mass excavation or blasting in confined (trench) excavation. Relatively sound, massive, rock typically requires blasting for removal in mass or trench excavation.

All excavations must comply with the applicable Federal, State, and local safety regulations and codes, and especially with the excavation standards of the Occupational Safety and Health Administration (OSHA). According to the OSHA soil classification, the on-site materials are generally classified as Type B soils. Temporary slopes of 1H:1V and permanent slopes of 3H:1V may be used. Construction site safety, including excavation safety, is the sole responsibility of the Contractor as part of its overall responsibility for the mean, methods, and sequencing of construction operations.

These descriptions are a guide to conditions generally encountered. Excavation techniques will vary based on the weathering of the materials, fracturing and jointing in the rock, and the overall stratigraphy of the feature. Actual field conditions usually display a gradual weathering progression with poorly defined and uneven boundaries between layers of different materials.

Terracon recommends that the following definitions for rock in earthwork excavation construction be included in bid documents:

Mass Excavation: Any material occupying an original volume of more than 1 cubic yard which cannot be excavated with a single-toothed ripper drawn by a crawler tractor having a minimum draw bar pull rating of not less than 80,000 pounds (Caterpillar D-8 or larger).

Trench Excavation: Any material occupying an original volume of more than 1/2 cubic yard which cannot be excavated with a backhoe having a bucket curling rate of not less than 40,000 pounds, using a rock bucket and rock teeth (a John Deere 790 or larger).

In applicable areas, Terracon recommends that soils which can be excavated with conventional equipment be removed first. Then, if necessary, heavy-duty or oversized equipment can be used to excavate cemented caliche by ripping. Blasting should only be conducted where materials cannot be excavated by other trench excavation techniques such as ripping.

Grading and Drainage

All grades must provide effective drainage away from structures during and after construction and should be maintained throughout the life of the structures. Water retained next to structures can result in soil movements greater than those discussed in this report. Greater movements can result in unacceptable differential floor slab and/or foundation movements, cracked slabs and walls, and roof leaks. The roof should have gutters/drains with downspouts that discharge onto splash blocks at a distance of at least 10 feet from structures

Exposed ground should be sloped and maintained at a minimum 5 percent away from structures for at least 10 feet beyond the perimeter of the structures. Locally, flatter grades may be necessary to transition ADA access requirements for flatwork. After construction and landscaping, final grades should be verified to document effective drainage has been achieved. Grades around the structure should also be periodically inspected and adjusted as necessary as part of the structure's maintenance program. Where paving or flatwork abuts the structure a maintenance program should be established to effectively seal and maintain joints and prevent surface water infiltration.

Earthwork Construction Considerations

Shallow excavations, for the landfill structures and buildings, are anticipated to be accomplished with conventional construction equipment. Upon completion of filling and grading, care should be taken to maintain the subgrade water content prior to construction of floor slabs. Construction traffic over the completed subgrades should be avoided. The site should also be graded to prevent ponding of surface water on the prepared subgrades or in excavations. Water collecting over, or adjacent to, construction areas should be removed. If the subgrade freezes, desiccates, saturates, or is disturbed, the affected material should be removed, or the materials should be scarified, moisture conditioned, and recompacted, prior to floor slab construction.

As a minimum, excavations should be performed in accordance with OSHA 29 CFR, Part 1926, Subpart P, “Excavations” and its appendices, and in accordance with any applicable local, and/or state regulations.

Construction site safety is the sole responsibility of the contractor who controls the means, methods, and sequencing of construction operations. Under no circumstances shall the information provided herein be interpreted to mean Terracon is assuming responsibility for construction site safety, or the contractor's activities; such responsibility shall neither be implied nor inferred.

Construction Observation and Testing

The earthwork efforts should be monitored under the direction of the Geotechnical Engineer. Monitoring should include documentation of adequate removal of vegetation and top soil, proof-rolling and mitigation of areas delineated by the proof-roll to require mitigation.

Each lift of compacted fill should be tested, evaluated, and reworked as necessary until approved by the Geotechnical Engineer prior to placement of additional lifts. Each lift of fill should be tested for density and water content at a frequency of at least one test for every 2,500 square feet of compacted fill in the building areas and 5,000 square feet in pavement areas. One density and water content test for every 50 linear feet of compacted utility trench backfill.

In areas of foundation excavations, the bearing subgrade should be evaluated under the direction of the Geotechnical Engineer. In the event that unanticipated conditions are encountered, the Geotechnical Engineer should prescribe mitigation options.

In addition to the documentation of the essential parameters necessary for construction, the continuation of the Geotechnical Engineer into the construction phase of the project provides the continuity to maintain the Geotechnical Engineer’s evaluation of subsurface conditions, including assessing variations and associated design changes.

SEISMIC CONSIDERATIONS

Description	Value
2012 International Building Code Site Classification	C [1, 2]
Site Latitude	32.139862°
Site Longitude	- 103.465597°
S_{DS} Spectral Acceleration for a Short Period [3]	0.153g
S_{D1} Spectral Acceleration for a 1-Second Period [3]	0.052g

1. Seismic site classification in general accordance with the *2012 International Building Code*, which refers to ASCE 7-10.
2. The 2012 International Building Code (IBC) uses a site profile extending to a depth of 100 feet for seismic site classification. Borings at this site were extended to a maximum depth of 165 feet.
3. These values were obtained using online seismic design maps and tools provided by the USGS (http://earthquake.usgs.gov/hazards/designmaps/).

GENERAL COMMENTS

As the construction project progresses, we address assumptions by incorporating information provided by the design team, if any. Revised project information that reflects actual conditions important to our services is reflected in the final report. The design team should collaborate with Terracon to confirm these assumptions and to prepare the final design plans and specifications. This facilitates the incorporation of our opinions related to implementation of our geotechnical recommendations. Any information conveyed prior to the final report is for informational purposes only and should not be considered or used for decision-making purposes.

Our analysis and opinions are based upon our understanding of the project, the geotechnical conditions in the area, and the data obtained from our site exploration. Natural variations will occur between exploration point locations or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. Terracon should be retained as the Geotechnical Engineer, where noted in the final report, to provide observation and testing services during pertinent construction phases. If variations appear, we can provide further evaluation and supplemental recommendations. If variations are noted in the absence of our observation and testing services on-site, we should be immediately notified so that we can provide evaluation and supplemental recommendations.

Our scope of services does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

Our services and any correspondence or collaboration through this system are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and

are accomplished in accordance with generally accepted geotechnical engineering practices with no third party beneficiaries intended. Any third party access to services or correspondence is solely for information purposes to support the services provided by Terracon to our client. Reliance upon the services and any work product is limited to our client, and is not intended for third parties. Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

Site characteristics as provided are for design purposes and not to estimate excavation cost. Any use of our report in that regard is done at the sole risk of the excavating cost estimator as there may be variations on the site that are not apparent in the data that could significantly impact excavation cost. Any parties charged with estimating excavation costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing. Site safety, and cost estimating including, excavation support, and dewatering requirements/design are the responsibility of others. If changes in the nature, design, or location of the project are planned, our conclusions and recommendations shall not be considered valid unless we review the changes and either verify or modify our conclusions in writing.

ATTACHMENTS

EXPLORATION AND TESTING PROCEDURES

Borings

As client requested, Terracon conducted a total of Seven (7) soil-testing borings as tabulated in the following table:

Boring Location	Number of Borings	Boring Depth (feet)[1]	Drilling Footage (feet)[1]
McCloy Ranch Landfill	7	165	1,155

[1] The borings at the proposed center were extended to auger refusal/rock depths, and then rock coring was conducted.

Boring Layout and Elevations: Location of soil borings are provided on our **Site Location and Exploration Plans**. Location is established in the field by Terracon's exploration team using a measuring wheel/tape and/or a hand-held GPS unit to establish boring location with reference to known points. The accuracy of the exploration points is usually within 10 feet of the noted location.

Subsurface Exploration Procedures: All borings will be performed using sonic drilling methods to the minimum depth of 50 feet bgs in accordance with ASTM D-6914/D6914M-16. The sonic drilling rig was equipped with coring tools capable of providing a minimum borehole diameter of 6 inches with a core barrel was be advanced into the subsurface and tocollect an undisturbed soil core. Prior to placing an additional core casing section onto the drill stem, the soil core was removed from the core barrel and the undisturbed soil core was extracted, characterized for geological lithology, and logged. The empty coring barrel was replaced inside the drill casing, and the drilling continued. This process was continued until either a boring depth of 165 feet bgs was achieved or until groundwater was encountered. Compressed air-rotary drilling and plain water was utilized to remove the cores and/or cuttings and speed up the operation further, depending on subsurface conditions.

The sampling depths, penetration distances, and other sampling information were recorded on the field boring logs. The samples were placed in appropriate containers and taken to our soil laboratory for testing and classification by a geotechnical engineer. Our exploration team prepared field boring logs as part of the drilling operations. These field logs include visual classifications of the materials encountered during drilling and our interpretation of the subsurface conditions between samples. Final boring logs are prepared from the field logs. The final boring logs represent the geotechnical engineer's interpretation of the field logs and include modifications based on observations and tests of the samples in our laboratory.

Laboratory Testing

The project engineer reviews the field data and assigns various laboratory tests to better understand the engineering properties of the various soil and rock strata as necessary for this project. Procedural standards noted below are for reference to methodology in general. In some

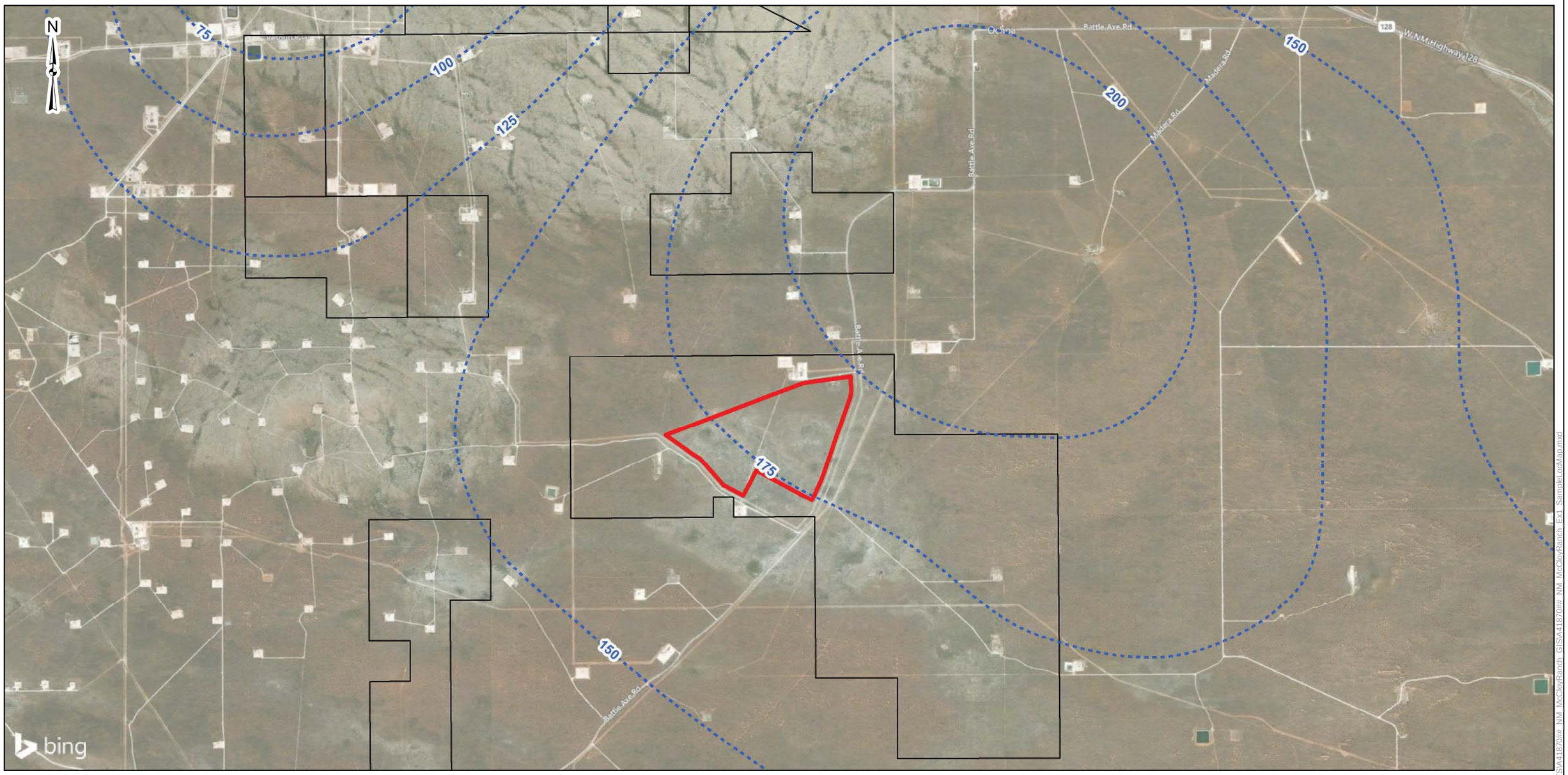
cases, variations to methods are applied because of local practice or professional judgment. Standards noted below include reference to other, related standards. Such references are not necessarily applicable to describe the specific test performed.

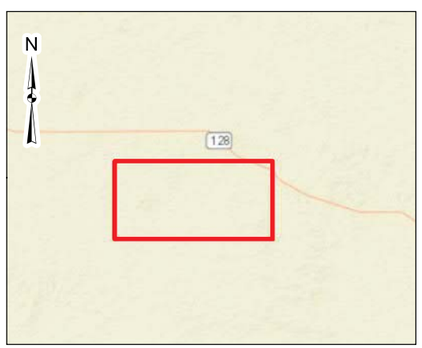
- Moisture Content (ASTM D854)
- Particle Size (ASTM D1140, D422)
- Atterburg Limits (ASTM D4318)
- Laboratory Compaction (ASTM D698)
- ASTM D5084 Standard Test Method for Permeability Tests
- Direct Shear of Soil (ASTM D3080)

The laboratory testing program often includes examination of soil samples by an engineer. Based on the material's texture and plasticity, we describe and classify the soil samples in accordance with the Unified Soil Classification System.

Rock classification is conducted using locally accepted practices for engineering purposes; petrographic analysis may reveal other rock types. Rock core samples typically provide an improved specimen for this classification. Boring log rock classification is determined using the Description of Rock Properties.

SITE LOCATION AND EXPLORATION PLANS





Proposed Landfill

- Proposed Landfill
- Inferred Depth to Water Contour (ft. bgs)
- McCloy Ranch Boundaries

Notes:
-Exhibit is for general location only, is not indended for construction purposes, and should not be used seperatedly from original report.

0 0.5 1 2 Miles

Fractional Scale: 1:37,883

DATA SOURCES:
Bing Maps - Aerial Imagery, World Street Map

Project No.:	35187312
Date:	Sep 2018
Drawn By:	SW
Reviewed By:	MB

Terracon
10400 Highway 191 Midland, TX 79707
PH. (432) 684-9600 terracon.com

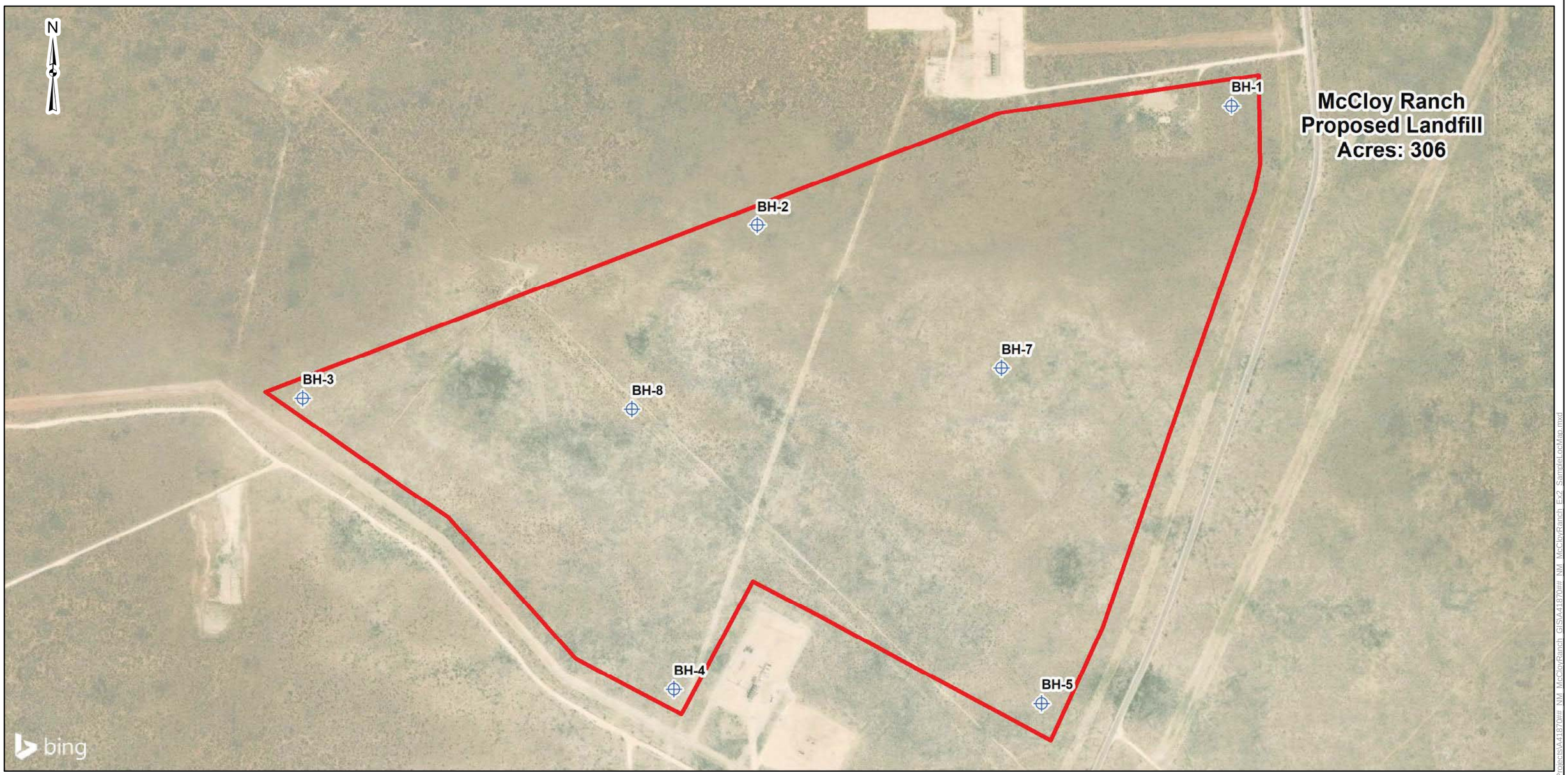
Proposed Landfill Map

Project Name
Client Name
Project Address
Project City, State
GPS: 32.143736°, -103.461678°

Exhibit

1

C:\Users\swarner\Desktop\GIS Midland_SI GIS PROJECTS\44870## NM McCloyRanch GIS\44870## NM McCloyRanch Ex1 Sample\Ex1_SampleLocMap.mxd





Proposed Landfill

Soil Boring (BH)

Proposed Landfill

Notes:
-Exhibit is for general location only, is not indended for construction purposes, and should not be used seperatedly from original report.

0 500 1,000 2,000 Feet

Fractional Scale: 1:7,055

DATA SOURCES:
Bing Maps - Aerial Imagery, World Street Map

Project No.:	A4187129
Date:	Jan 2019
Drawn By:	SW
Reviewed By:	DC

Terracon
10400 Highway 191 Midland, TX 79707
PH. (432) 684-9600 terracon.com

Proposed Landfill Sample Location Map

Trammco Environmental Solutions
McCloy Ranch - Proposed Landfill
Lea County, New Mexico
GPS: 32.143736°, -103.461678°

Exhibit

2

C:\Users\swarner\Desktop\GIS Midland Projects\SI GIS Projects\A4187077 NM McCloyRanch GISA4187077 NM McCloyRanch Ex2 SampleLocMap.mxd

EXPLORATION RESULTS

BORING LOG NO. BH-1

PROJECT: McCloy Ranch Landfill

CLIENT: Trammco Environmental Solutions, LLC
Fermandina Beach, Florida

SITE: Section 9 and 10 of, T25S, R34E
Jal, Lea County, New Mexico

LOCATION See Exploration Plan

Latitude: 32.15° Longitude: -103.4539°

Approximate Surface Elev.: 3345 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	Description
1.0	3344+/-	**POORLY GRADED SAND (SP)**, brown, dry, -Loose to very dense
		SILTY SAND (SM), brown to dark reddish brown, dry, -Medium dense to very dense
5.0	3340+/-	
		POORLY GRADED SAND (SP), brown, dry, -Medium dense to very dense
10.0	3335+/-	
		SILTY SAND (SM), light brown to gray, dry, -Medium dense to very dense
15.0	3330+/-	
16.0	3329+/-	**CALICHE**, white, dry
18.0	3327+/-	**POORLY GRADED SAND (SP)**, brown, dry, -Medium dense to very dense
		POORLY GRADED SAND (SP), brown to light brown, dry, -Medium dense to very dense
40.0	3305+/-	
		SILTY SAND (SM), brown to light brown, dry, -Medium dense to very dense
45.0	3300+/-	
		POORLY GRADED SAND WITH SILT (SP-SM), reddish brown to light brown, dry, -Medium dense to very dense

DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
30			7	20-17-3	23

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Sonic/Coring

Abandonment Method:
Boring backfilled with bentonite chips upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

No groundwater encountered during drilling

Dry after 24 hours of drilling

Terracon
10400 State Highway 191
Midland, TX

Boring Started: 11-02-2018 | Boring Completed: 11-06-2018

Drill Rig: CME 75 | Driller: Alec

Project No.: A4187129

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL A4187129 - MCCLOY SITE.GPJ MODELLAYER.GPJ 1/17/19

BORING LOG NO. BH-1

PROJECT: McCloy Ranch Landfill

CLIENT: Trammco Environmental Solutions, LLC
Fermandina Beach, Florida

SITE: Section 9 and 10 of, T25S, R34E
Jal, Lea County, New Mexico

LOCATION See Exploration Plan

Latitude: 32.15° Longitude: -103.4539°

Approximate Surface Elev.: 3345 (Ft.) +/-

GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	POORLY GRADED SAND WITH SILT (SP-SM), reddish brown to light brown, dry, -Medium dense to very dense *(continued)*							
	65.0	3280+/-	65					
	SANDSTONE, brown to dark reddish brown, dry, -Moderately to highly weathered		70					
			75					
			80					
			85					
			90					
			95					
			100					
			105					
			110					
			115					
			120					

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Sonic/Coring

Abandonment Method:
Boring backfilled with bentonite chips upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

No groundwater encountered during drilling

Dry after 24 hours of drilling

Terracon
10400 State Highway 191
Midland, TX

Boring Started: 11-02-2018 | Boring Completed: 11-06-2018

Drill Rig: CME 75 | Driller: Alec

Project No.: A4187129

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL A4187129 - MCCLOY SITE.GPJ MODELLAYER.GPJ 1/17/19

BORING LOG NO. BH-1

PROJECT: McCloy Ranch Landfill

CLIENT: Trammco Environmental Solutions, LLC
Fermandina Beach, Florida

SITE: Section 9 and 10 of, T25S, R34E
Jal, Lea County, New Mexico

LOCATION See Exploration Plan

Latitude: 32.15° Longitude: -103.4539°

Approximate Surface Elev.: 3345 (Ft.) +/-

GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		SANDSTONE, brown to dark reddish brown, dry, -Moderately to highly weathered *(continued)*	125					
			130					
			135					
			140					
			145					
			150					
			155					
			160					
	165.0	3180+/-	165					
		Boring Terminated at 165 Feet						

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Sonic/Coring

Abandonment Method:
Boring backfilled with bentonite chips upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

No groundwater encountered during drilling

Dry after 24 hours of drilling

Terracon
10400 State Highway 191
Midland, TX

Boring Started: 11-02-2018 | Boring Completed: 11-06-2018

Drill Rig: CME 75 | Driller: Alec

Project No.: A4187129

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL A4187129 - MCCLOY SITE.GPJ MODELLAYER.GPJ 1/17/19

BORING LOG NO. BH-2

PROJECT: McCloy Ranch Landfill

CLIENT: Trammco Environmental Solutions, LLC
Fermandina Beach, Florida

SITE: Section 9 and 10 of, T25S, R34E
Jal, Lea County, New Mexico

LOCATION See Exploration Plan

Latitude: 32.1481° Longitude: -103.4638°

Approximate Surface Elev.: 3343 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	
		POORLY GRADED SAND (SP), light brownish gray to reddish brown, dry, -Loose to very dense
4.0	3339+/-	
		CALICHE, white to light brown, dry, -Loose to moderately compacted
22.0	3321+/-	
		POORLY GRADED SAND WITH SILT (SP-SM), reddish brown to light brown, dry, -Medium dense to very dense
50.0	3293+/-	
		SANDSTONE, light brown to dark reddish brown, dry, -Moderately to highly weathered

GRAPHIC LOG | DEPTH (Ft.) | WATER LEVEL OBSERVATIONS | SAMPLE TYPE | WATER CONTENT (%) | ATTERBERG LIMITS LL-PL-PI | PERCENT FINES

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Sonic/Coring

Abandonment Method:
Boring backfilled with bentonite chips upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

No groundwater encountered during drilling

Dry after 24 hours of drilling

Terracon
10400 State Highway 191
Midland, TX

Boring Started: 11-26-2018 | Boring Completed: 11-28-2018

Drill Rig: CME 75 | Driller: Alec

Project No.: A4187129

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL A4187129 - MCCLOY SITE.GPJ MODELLAYER.GPJ 1/17/19

BORING LOG NO. BH-2

PROJECT: McCloy Ranch Landfill

CLIENT: Trammco Environmental Solutions, LLC
Fermandina Beach, Florida

SITE: Section 9 and 10 of, T25S, R34E
Jal, Lea County, New Mexico

LOCATION See Exploration Plan

Latitude: 32.1481° Longitude: -103.4638°

Approximate Surface Elev.: 3343 (Ft.) +/-

GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	SANDSTONE, light brown to dark reddish brown, dry, -Moderately to highly weathered *(continued)*		65 70 75 80 85 90 95 100 105 110 115 120					

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Sonic/Coring

Abandonment Method:
Boring backfilled with bentonite chips upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

No groundwater encountered during drilling

Dry after 24 hours of drilling

Terracon
10400 State Highway 191
Midland, TX

Boring Started: 11-26-2018 | Boring Completed: 11-28-2018

Drill Rig: CME 75 | Driller: Alec

Project No.: A4187129

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL A4187129 - MCCLOY SITE.GPJ MODELLAYER.GPJ 1/17/19

BORING LOG NO. BH-2

PROJECT: McCloy Ranch Landfill

CLIENT: Trammco Environmental Solutions, LLC
Fermandina Beach, Florida

SITE: Section 9 and 10 of, T25S, R34E
Jal, Lea County, New Mexico

LOCATION See Exploration Plan

Latitude: 32.1481° Longitude: -103.4638°

Approximate Surface Elev.: 3343 (Ft.) +/-

GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		SANDSTONE, light brown to dark reddish brown, dry, -Moderately to highly weathered *(continued)*	125					
			130					
			135					
			140					
			145					
			150					
			155					
			160					
	165.0	3178+/-	165					
		Boring Terminated at 165 Feet						

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Sonic/Coring

Abandonment Method:
Boring backfilled with bentonite chips upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

No groundwater encountered during drilling

Dry after 24 hours of drilling

Terracon
10400 State Highway 191
Midland, TX

Boring Started: 11-26-2018 | Boring Completed: 11-28-2018

Drill Rig: CME 75 | Driller: Alec

Project No.: A4187129

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL A4187129 - MCCLOY SITE.GPJ MODELLAYER.GPJ 1/17/19

BORING LOG NO. BH-3

PROJECT: McCloy Ranch Landfill

CLIENT: Trammco Environmental Solutions, LLC
Fermandina Beach, Florida

SITE: Section 9 and 10 of, T25S, R34E
Jal, Lea County, New Mexico

LOCATION See Exploration Plan

Latitude: 32.1451° Longitude: -103.4733°

Approximate Surface Elev.: 3345 (Ft.) +/-

GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	SILTY SAND (SM), reddish brown, dry, -Loose to very dense							
	3.0	3342+/-						
	CALICHE, white, dry							
	10.0	3335+/-						
	SILTY SAND, with interbedded CALICHE (SM), light brownish gray to reddish brown, dry, -Medium dense to very dense							
	25.0	3320+/-						
	POORLY GRADED SAND WITH SILT (SP-SM), brown to light brown, dry, -Medium dense to very dense							
	57.0	3288+/-						
	SANDSTONE, light brown to dark reddish brown, dry, -Moderately to highly weathered							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Sonic/Coring

Abandonment Method:
Boring backfilled with bentonite chips upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

No groundwater encountered during drilling

Dry after 24 hours of drilling

Terracon
10400 State Highway 191
Midland, TX

Boring Started: 11-26-2018 | Boring Completed: 11-28-2018

Drill Rig: CME 75 | Driller: Alec

Project No.: A4187129

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL A4187129 - MCCLOY SITE.GPJ MODELLAYER.GPJ 1/17/19

BORING LOG NO. BH-3

PROJECT: McCloy Ranch Landfill

CLIENT: Trammco Environmental Solutions, LLC
Fermandina Beach, Florida

SITE: Section 9 and 10 of, T25S, R34E
Jal, Lea County, New Mexico

LOCATION See Exploration Plan

Latitude: 32.1451° Longitude: -103.4733°

Approximate Surface Elev.: 3345 (Ft.) +/-

GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		SANDSTONE, light brown to dark reddish brown, dry, -Moderately to highly weathered *(continued)*	65 70 75 80 85 90 95 100 105 110 115 120					

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Sonic/Coring

Abandonment Method:
Boring backfilled with bentonite chips upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

No groundwater encountered during drilling

Dry after 24 hours of drilling

Terracon
10400 State Highway 191
Midland, TX

Boring Started: 11-26-2018 | Boring Completed: 11-28-2018

Drill Rig: CME 75 | Driller: Alec

Project No.: A4187129

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL A4187129 - MCCLOY SITE.GPJ MODELLAYER.GPJ 1/17/19

BORING LOG NO. BH-3

PROJECT: McCloy Ranch Landfill

CLIENT: Trammco Environmental Solutions, LLC
Fermandina Beach, Florida

SITE: Section 9 and 10 of, T25S, R34E
Jal, Lea County, New Mexico

LOCATION See Exploration Plan

Latitude: 32.1451° Longitude: -103.4733°

Approximate Surface Elev.: 3345 (Ft.) +/-

GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		SANDSTONE, light brown to dark reddish brown, dry, -Moderately to highly weathered *(continued)*	125					
			130					
			135					
			140					
			145					
			150					
			155					
			160					
	165.0	3180+/-	165					
		Boring Terminated at 165 Feet						

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Sonic/Coring

Abandonment Method:
Boring backfilled with bentonite chips upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

No groundwater encountered during drilling

Dry after 24 hours of drilling

Terracon
10400 State Highway 191
Midland, TX

Boring Started: 11-26-2018 | Boring Completed: 11-28-2018

Drill Rig: CME 75 | Driller: Alec

Project No.: A4187129

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL A4187129 - MCCLOY SITE.GPJ MODELLAYER.GPJ 1/17/19

BORING LOG NO. BH-4

PROJECT: McCloy Ranch Landfill

CLIENT: Trammco Environmental Solutions, LLC
Fermandina Beach, Florida

SITE: Section 9 and 10 of, T25S, R34E
Jal, Lea County, New Mexico

LOCATION See Exploration Plan

Latitude: 32.1399° Longitude: -103.4656°

Approximate Surface Elev.: 3332 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	Description
0.0	3332+/-	**CLAYEY SAND with interbedded CALICHE (SC)**, light brownish gray to reddish brown, dry, -Loose to very dense
20.0	3312+/-	**SILTY CLAYEY SAND, with interbedded CALICHE (SC-SM)**, reddish brown to light brown, dry, -Medium dense to very dense
30.0	3302+/-	**POORLY GRADED SAND (SP)**, brown, dry, -Dense
50.0	3282+/-	**SANDSTONE**, brown to dark reddish brown, dry, -Moderately to highly weathered, well cemented

DEPTH (Ft.)	SAMPLE TYPE	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
10		5	23-14-9	39
35		8	25-18-7	26

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Sonic/Coring

Abandonment Method:
Boring backfilled with bentonite chips upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

No groundwater encountered during drilling

Dry after 24 hours of drilling

Terracon
10400 State Highway 191
Midland, TX

Boring Started: 11-15-2018 | Boring Completed: 11-18-2018

Drill Rig: CME 75 | Driller: Alec

Project No.: A4187129

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL A4187129 - MCCLOY SITE.GPJ MODELLAYER.GPJ 1/17/19

BORING LOG NO. BH-4

PROJECT: McCloy Ranch Landfill

CLIENT: Trammco Environmental Solutions, LLC
Fermandina Beach, Florida

SITE: Section 9 and 10 of, T25S, R34E
Jal, Lea County, New Mexico

LOCATION See Exploration Plan

Latitude: 32.1399° Longitude: -103.4656°

Approximate Surface Elev.: 3332 (Ft.) +/-

GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		SANDSTONE, brown to dark reddish brown, dry, -Moderately to highly weathered, well cemented *(continued)*	65 70 75 80 85 90 95 100 105 110 115 120					

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Sonic/Coring

Abandonment Method:
Boring backfilled with bentonite chips upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

No groundwater encountered during drilling

Dry after 24 hours of drilling

Terracon
10400 State Highway 191
Midland, TX

Boring Started: 11-15-2018 | Boring Completed: 11-18-2018

Drill Rig: CME 75 | Driller: Alec

Project No.: A4187129

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL A4187129 - MCCLOY SITE.GPJ MODELLAYER.GPJ 1/17/19

BORING LOG NO. BH-4

PROJECT: McCloy Ranch Landfill

CLIENT: Trammco Environmental Solutions, LLC
Fermandina Beach, Florida

SITE: Section 9 and 10 of, T25S, R34E
Jal, Lea County, New Mexico

LOCATION See Exploration Plan

Latitude: 32.1399° Longitude: -103.4656°

Approximate Surface Elev.: 3332 (Ft.) +/-

GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		SANDSTONE, brown to dark reddish brown, dry, -Moderately to highly weathered, well cemented *(continued)*	125					
			130					
			135					
			140					
			145					
			150					
			155					
			160					
	165.0	3167+/-	165					
		Boring Terminated at 165 Feet						

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Sonic/Coring

Abandonment Method:
Boring backfilled with bentonite chips upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

No groundwater encountered during drilling

Dry after 24 hours of drilling

Terracon
10400 State Highway 191
Midland, TX

Boring Started: 11-15-2018 | Boring Completed: 11-18-2018

Drill Rig: CME 75 | Driller: Alec

Project No.: A4187129

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL A4187129 - MCCLOY SITE.GPJ MODELLAYER.GPJ 1/17/19

BORING LOG NO. BH-5

PROJECT: McCloy Ranch Landfill

CLIENT: Trammco Environmental Solutions, LLC
Fermandina Beach, Florida

SITE: Section 9 and 10 of, T25S, R34E
Jal, Lea County, New Mexico

LOCATION See Exploration Plan

Latitude: 32.1394° Longitude: -103.4584°

Approximate Surface Elev.: 3331 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	
2.0	3329+/-	**POORLY GRADED SAND (SP)**, light brownish gray to reddish brown, dry, -Loose to very dense
		SILTY SAND (SM), reddish brown to light brown, dry, -Loose to very dense
12.0	3319+/-	
		CALICHE, white, dry
19.0	3312+/-	
		POORLY GRADED SAND WITH SILT (SP-SM), brown to light brown, dry, -Medium dense to very dense
40.0	3291+/-	
		SANDSTONE, brown to dark reddish brown, dry, -Medium dense to very dense

GRAPHIC LOG | DEPTH (Ft.) | WATER LEVEL OBSERVATIONS | SAMPLE TYPE | WATER CONTENT (%) | ATTERBERG LIMITS LL-PL-PI | PERCENT FINES

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Sonic/Coring

Abandonment Method:
Boring backfilled with bentonite chips upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

No groundwater encountered during drilling

Dry after 24 hours of drilling

Terracon
10400 State Highway 191
Midland, TX

Boring Started: 11-09-2018 | Boring Completed: 11-14-2018

Drill Rig: CME 75 | Driller: Alec

Project No.: A4187129

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL A4187129 - MCCLOY SITE.GPJ MODELLAYER.GPJ 1/17/19

BORING LOG NO. BH-5

PROJECT: McCloy Ranch Landfill

CLIENT: Trammco Environmental Solutions, LLC
Fermandina Beach, Florida

SITE: Section 9 and 10 of, T25S, R34E
Jal, Lea County, New Mexico

LOCATION See Exploration Plan

Latitude: 32.1394° Longitude: -103.4584°

Approximate Surface Elev.: 3331 (Ft.) +/-

GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		SANDSTONE, brown to dark reddish brown, dry, -Medium dense to very dense *(continued)*	65 70 75 80 85 90 95 100 105 110 115 120					

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Sonic/Coring

Abandonment Method:
Boring backfilled with bentonite chips upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

No groundwater encountered during drilling

Dry after 24 hours of drilling

Terracon
10400 State Highway 191
Midland, TX

Boring Started: 11-09-2018 | Boring Completed: 11-14-2018

Drill Rig: CME 75 | Driller: Alec

Project No.: A4187129

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL A4187129 - MCCLOY SITE.GPJ MODELLAYER.GPJ 1/17/19

BORING LOG NO. BH-5

PROJECT: McCloy Ranch Landfill

CLIENT: Trammco Environmental Solutions, LLC
Fermandina Beach, Florida

SITE: Section 9 and 10 of, T25S, R34E
Jal, Lea County, New Mexico

LOCATION See Exploration Plan

Latitude: 32.1394° Longitude: -103.4584°

Approximate Surface Elev.: 3331 (Ft.) +/-

GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		SANDSTONE, brown to dark reddish brown, dry, -Medium dense to very dense *(continued)*	125 130 135 140 145 150 155 160					
	165.0	3166+/-	165					
		Boring Terminated at 165 Feet						

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Sonic/Coring

Abandonment Method:
Boring backfilled with bentonite chips upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

No groundwater encountered during drilling

Dry after 24 hours of drilling

Terracon
10400 State Highway 191
Midland, TX

Boring Started: 11-09-2018 | Boring Completed: 11-14-2018

Drill Rig: CME 75 | Driller: Alec

Project No.: A4187129

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL A4187129 - MCCLOY SITE.GPJ MODELLAYER.GPJ 1/17/19

BORING LOG NO. BH-7

PROJECT: McCloy Ranch Landfill

CLIENT: Trammco Environmental Solutions, LLC
Fermandina Beach, Florida

SITE: Section 9 and 10 of, T25S, R34E
Jal, Lea County, New Mexico

LOCATION See Exploration Plan

Latitude: 32.1454° Longitude: -103.4585°

Approximate Surface Elev.: 3334 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	
0.0	3334+/-	**POORLY GRADED SAND, with interbedded CALICHE (SP)**, light brownish gray to gray, dry, -Loose to very dense
7.0	3327+/-	**SILTY SAND (SM)**, light brown to gray, dry, -Loose to very dense
10.0	3324+/-	**CALICHE**, white, dry
12.0	3322+/-	**SILTY SAND (SM)**, light brown to gray, dry, -Medium dense to very dense
25.0	3309+/-	**POORLY GRADED SAND WITH SILT (SP-SM)**, reddish brown, dry, -Medium dense to very dense
55.0	3279+/-	**SANDSTONE**, brown to dark reddish brown, dry, -Moderately to highly weathered

GRAPHIC LOG | DEPTH (Ft.) | WATER LEVEL OBSERVATIONS | SAMPLE TYPE | WATER CONTENT (%) | ATTERBERG LIMITS LL-PL-PI | PERCENT FINES

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Sonic/Coring

Abandonment Method:
Boring backfilled with bentonite chips upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

No groundwater encountered during drilling

Dry after 24 hours of drilling

Terracon
10400 State Highway 191
Midland, TX

Boring Started: 11-06-2018 | Boring Completed: 11-08-2018

Drill Rig: CME 75 | Driller: Alec

Project No.: A4187129

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL A4187129 - MCCLOY SITE.GPJ MODELLAYER.GPJ 1/17/19

BORING LOG NO. BH-7

PROJECT: McCloy Ranch Landfill

CLIENT: Trammco Environmental Solutions, LLC
Fermandina Beach, Florida

SITE: Section 9 and 10 of, T25S, R34E
Jal, Lea County, New Mexico

LOCATION See Exploration Plan

Latitude: 32.1454° Longitude: -103.4585°

Approximate Surface Elev.: 3334 (Ft.) +/-

GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	SANDSTONE, brown to dark reddish brown, dry, -Moderately to highly weathered *(continued)*		65 70 75 80 85 90 95 100 105 110 115 120					

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Sonic/Coring

Abandonment Method:
Boring backfilled with bentonite chips upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

No groundwater encountered during drilling

Dry after 24 hours of drilling

Terracon
10400 State Highway 191
Midland, TX

Boring Started: 11-06-2018 | Boring Completed: 11-08-2018

Drill Rig: CME 75 | Driller: Alec

Project No.: A4187129

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL A4187129 - MCCLOY SITE.GPJ MODELLAYER.GPJ 1/17/19

BORING LOG NO. BH-7

PROJECT: McCloy Ranch Landfill

CLIENT: Trammco Environmental Solutions, LLC
Fermandina Beach, Florida

SITE: Section 9 and 10 of, T25S, R34E
Jal, Lea County, New Mexico

LOCATION See Exploration Plan

Latitude: 32.1454° Longitude: -103.4585°

Approximate Surface Elev.: 3334 (Ft.) +/-

GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	SANDSTONE, brown to dark reddish brown, dry, -Moderately to highly weathered *(continued)*		125					
			130					
			135					
			140					
			145					
			150					
			155					
			160					
	165.0	3169+/-	165					
	Boring Terminated at 165 Feet							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Sonic/Coring

Abandonment Method:
Boring backfilled with bentonite chips upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

No groundwater encountered during drilling

Dry after 24 hours of drilling

Terracon
10400 State Highway 191
Midland, TX

Boring Started: 11-06-2018 | Boring Completed: 11-08-2018

Drill Rig: CME 75 | Driller: Alec

Project No.: A4187129

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL A4187129 - MCCLOY SITE.GPJ MODELLAYER.GPJ 1/17/19

BORING LOG NO. BH-8

PROJECT: McCloy Ranch Landfill

CLIENT: Trammco Environmental Solutions, LLC
Fermandina Beach, Florida

SITE: Section 9 and 10 of, T25S, R34E
Jal, Lea County, New Mexico

LOCATION See Exploration Plan

Latitude: 32.1448° Longitude: -103.4665°

Approximate Surface Elev.: 3336 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	
0.0	3334+/-	**POORLY GRADED SAND (SP)**, light brownish gray to reddish brown, -Loose to very dense, dry
2.0		**CALICHE**, white
10.0	3326+/-	**SILTY SAND (SM)**, brown to light brown, -Medium dense to very dense, dry
20.0	3316+/-	**POORLY GRADED SAND WITH SILT (SP-SM)**, brown to dark reddish brown, -Medium dense to very dense, dry
50.0	3286+/-	**SANDSTONE**, brown to dark reddish brown, -Moderately to highly weathered, dry

GRAPHIC LOG | DEPTH (Ft.) | WATER LEVEL OBSERVATIONS | SAMPLE TYPE | WATER CONTENT (%) | ATTERBERG LIMITS LL-PL-PI | PERCENT FINES

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Sonic/Coring

Abandonment Method:
Boring backfilled with bentonite chips upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

No groundwater encountered during drilling

Dry after 24 hours of drilling

Terracon
10400 State Highway 191
Midland, TX

Boring Started: 11-16-2018 | Boring Completed: 11-16-2018

Drill Rig: CME 75 | Driller: Alec

Project No.: A4187129

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL A4187129 - MCCLOY SITE.GPJ MODELLAYER.GPJ 1/17/19

BORING LOG NO. BH-8

PROJECT: McCloy Ranch Landfill

CLIENT: Trammco Environmental Solutions, LLC
Fermandina Beach, Florida

SITE: Section 9 and 10 of, T25S, R34E
Jal, Lea County, New Mexico

LOCATION See Exploration Plan

Latitude: 32.1448° Longitude: -103.4665°

Approximate Surface Elev.: 3336 (Ft.) +/-

GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		SANDSTONE, brown to dark reddish brown, -Moderately to highly weathered, dry *(continued)*	65					
			70					
			75					
			80					
			85					
			90					
			95					
			100					
			105					
			110					
			115					
			120					

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Sonic/Coring

Abandonment Method:
Boring backfilled with bentonite chips upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

No groundwater encountered during drilling

Dry after 24 hours of drilling

Terracon
10400 State Highway 191
Midland, TX

Boring Started: 11-16-2018 | Boring Completed: 11-16-2018

Drill Rig: CME 75 | Driller: Alec

Project No.: A4187129

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL A4187129 - MCCLOY SITE.GPJ MODELLAYER.GPJ 1/17/19

BORING LOG NO. BH-8

PROJECT: McCloy Ranch Landfill

CLIENT: Trammco Environmental Solutions, LLC
Fermandina Beach, Florida

SITE: Section 9 and 10 of, T25S, R34E
Jal, Lea County, New Mexico

LOCATION See Exploration Plan

Latitude: 32.1448° Longitude: -103.4665°

Approximate Surface Elev.: 3336 (Ft.) +/-

GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		SANDSTONE, brown to dark reddish brown, -Moderately to highly weathered, dry *(continued)*	125					
			130					
			135					
			140					
			145					
			150					
			155					
			160					
	165.0	3171+/-	165					
		Boring Terminated at 165 Feet						

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Sonic/Coring

Abandonment Method:
Boring backfilled with bentonite chips upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

No groundwater encountered during drilling

Dry after 24 hours of drilling

Terracon
10400 State Highway 191
Midland, TX

Boring Started: 11-16-2018 | Boring Completed: 11-16-2018

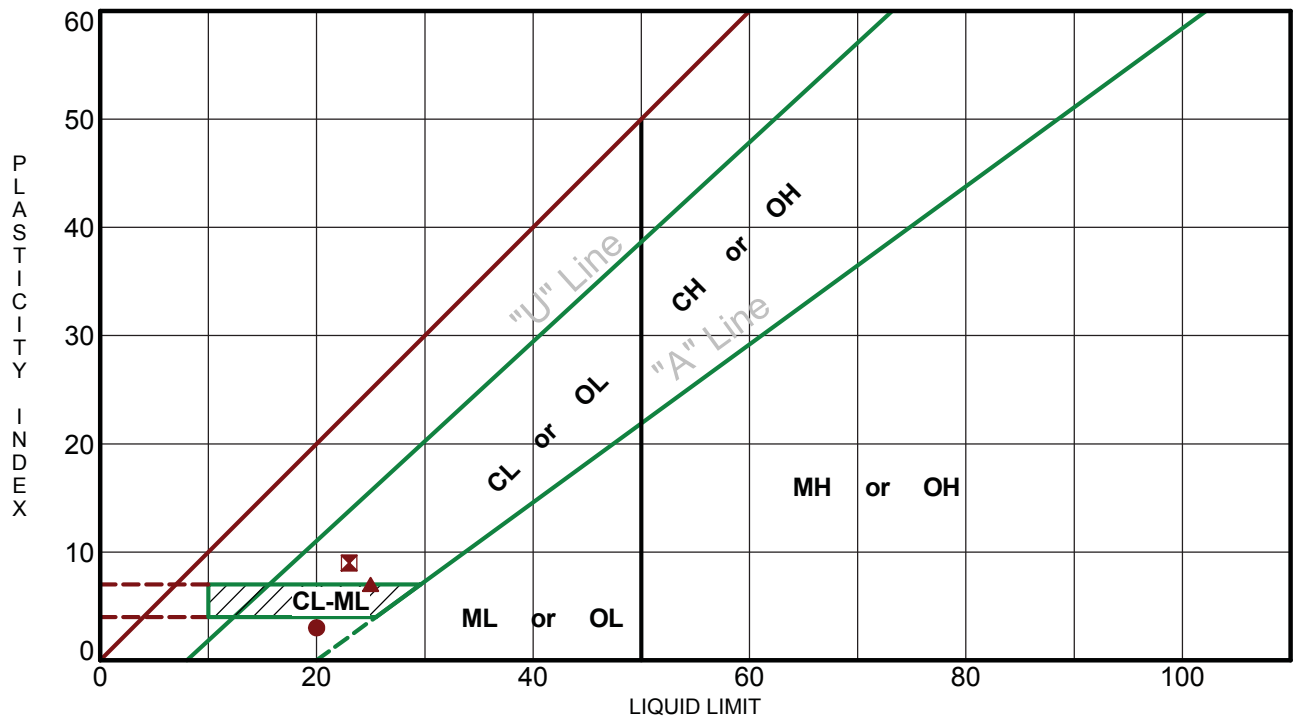
Drill Rig: CME 75 | Driller: Alec

Project No.: A4187129

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL A4187129 - MCCLOY SITE.GPJ MODELLAYER.GPJ 1/17/19

ATTERBERG LIMITS RESULTS

ASTM D4318



Boring ID		Depth	LL	PL	PI	Fines	USCS	Description
●	BH-1	0 - 65	20	17	3	23	SM	SILTY SAND with GRAVEL
⊠	BH-4	0 - 20	23	14	9	39	SC	CLAYEY SAND
▲	BH-4	20 - 52	25	18	7	26	SC-SM	SILTY, CLAYEY SAND

PROJECT: McCloy Ranch Landfill

SITE: Section 9 and 10 of, T25S, R34E
Jal, Lea County, New Mexico

Terracon
10400 State Highway 191
Midland, TX

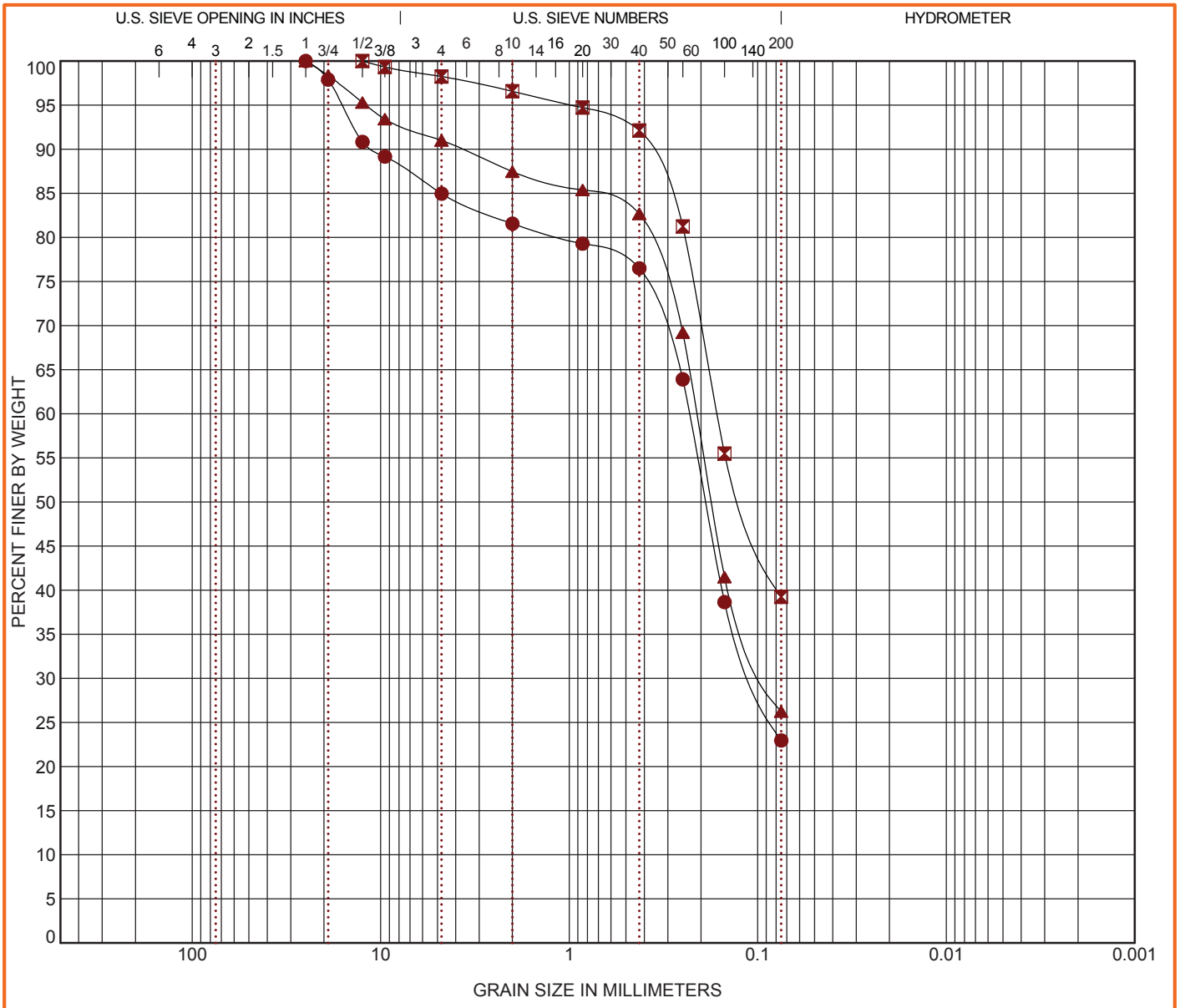
PROJECT NUMBER: A4187129

CLIENT: Trammco environmental Solutions, LLC
Fermandina Beach, Florida

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. ATTERBERG LIMITS A4187129 - MCCLOY SITE.GPJ TERRACON_DATATEMPLATE.GDT 1/15/19

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring ID		Depth	USCS Classification	WC (%)	LL	PL	PI	Cc	Cu
●	BH-1	0 - 65	SILTY SAND with GRAVEL (SM)	7	20	17	3		
⊠	BH-4	0 - 20	CLAYEY SAND (SC)	5	23	14	9		
▲	BH-4	20 - 52	SILTY, CLAYEY SAND (SC-SM)	8	25	18	7		

Boring ID		Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Fines	%Clay
●	BH-1	0 - 65	25	0.231	0.102		15.0	62.0		23.0	
⊠	BH-4	0 - 20	12.5	0.164			1.8	59.0		39.2	
▲	BH-4	20 - 52	25	0.211	0.089		9.0	64.8		26.2	

PROJECT: McCloy Ranch Landfill

SITE: Section 9 and 10 of, T25S, R34E
Jal, Lea County, New Mexico

Terracon
10400 State Highway 191
Midland, TX

PROJECT NUMBER: A4187129

CLIENT: Trammco environmental Solutions, LLC
Fermandina Beach, Florida

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS-2 A4187129 - MCCLOY SITE.GPJ TERRACON_DATATEMPLATE.GDT 1/15/19

Terracon

HYDRAULIC CONDUCTIVITY DETERMINATION
FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project :	Beckham and McCloy Landfill							
Date:	12/21/2018	Panel Number : P-1						
Project No. :	A4187129	Permometer Data						
Boring No.:	BH-4	a_p =	0.031416	cm^2	Set Mercury to Pipet Rp at beginning	Equilibrium	1.6	cm^3
Sample:	composite 1	a_a =	0.767120	cm^2		Pipet **Rp**	**16.8**	cm^3
Depth (ft):	0-20	M_1 =	0.030180	C = 0.0004288		Annulus **Ra**	1.0	cm^3
Other Location:	McCloy Site	M_2 =	1.040953	T = 0.0658646				

Material Description : light brown clayey sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			575.30	g				
Tare or ring Wt. :			0.0	g				
Wet Wt: of Sample :			575.30	g	Tare No.:	102	Tare No.:	N/A
Diameter :	2.80	in	7.11	cm^2	Wet Wt.+tare:	115.70	Wet Wt.+tare:	578.70
Length :	2.80	in	7.11	cm	Dry Wt.+tare:	100.00	Dry Wt.+tare:	484.11
Area:	6.16	in^2	39.73	cm^2	Tare Wt:	0.00	Tare Wt:	0.00
Volume :	17.24	in^3	282.53	cm^3	Dry Wt.:	100	Dry Wt.:	484.11
Unit Wt.(wet):	**127.06**	pcf	**2.04**	g/cm^3	Water Wt.:	15.7	Water Wt.:	94.59
Unit Wt.(dry):	**109.82**	pcf	**1.76**	g/cm^3	% moist.:	**15.7**	% moist.:	**19.5**

Assumed Specific Gravity:	**2.70**	Max Dry Density(pcf) =	115.6	OMC =	13.7
		% of max =	95.0	+/- OMC =	2.00
Calculated % saturation:	98.63	Void ratio (e) =	**0.53**	Porosity (n)=	**0.35**

Test Pressures During Hydraulic Conductivity Test

Cell Pressure (psi) = 55.00 Back Pressure (psi) = 50.00 Confining Pressure = 5.00 psi

Note: The above value is Effective Confining Pressure

TEST READINGS

Z_1(Mercury Height Difference @ t_1): 15.8 cm Hydraulic Gradient = 28.00

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZp (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
12/20/2018	300	15.7	1.082666	21	0.977	1.03E-07	2.93E-04	
12/20/2018	600	14.6	2.182666	21	0.977	1.08E-07	3.07E-04	
12/20/2018	900	13.5	3.282666	21	0.977	1.13E-07	3.21E-04	
12/20/2018	1200	12.6	4.182666	21	0.977	1.12E-07	3.19E-04	

SUMMARY

k_a =	1.09E-07	cm/sec		Acceptance criteria =	50 %
ki			Vm		
k1 =	1.03E-07	cm/sec	5.6	%	Vm = $\frac{\lvert k_a - k_i \rvert}{k_a} \times 100$
k2 =	1.08E-07	cm/sec	0.9	%	
k3 =	1.13E-07	cm/sec	3.7	%	
k4 =	1.12E-07	cm/sec	2.8	%	

Hydraulic conductivity	k =	**1.09E-07**	cm/sec	**3.10E-04**	ft/day
Void Ratio	e =	**0.53**			
Porosity	n =	**0.35**			
Bulk Density	γ =	**2.04**	g/cm^3	**127.1**	pcf
Water Content	W =	**0.28**	cm^3/cm^3	(at 20 deg C)	
Intrinsic Permeability	k_{int} =	**1.12E-12**	cm^2	(at 20 deg C)	

Terracon

HYDRAULIC CONDUCTIVITY DETERMINATION
FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project :	Beckham and McCloy Landfill							
Date:	12/21/2018	Panel Number : P-1						
Project No. :	A4187129	Permometer Data						
Boring No.:	BH-4	a_p =	0.031416	cm^2	Set Mercury to Pipet Rp at beginning	Equilibrium	1.6	cm^3
Sample:	composite 2	a_a =	0.767120	cm^2		Pipet **Rp**	**16.8**	cm^3
Depth (ft):	20.0-52.0	M_1 =	0.030180	C = 0.0004288		Annulus **Ra**	1.0	cm^3
Other Location:	McCloy Site	M_2 =	1.040953	T = 0.0658646				

Material Description : light brown silty, clayey sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			566.34	g	Tare No.:	103	Tare No.:	N/A
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	115.70	Wet Wt.+tare:	579.47
Wet Wt: of Sample :			566.34	g	Dry Wt.+tare:	100.00	Dry Wt.+tare:	481.39
Diameter :	2.80	in	7.11	cm^2	Tare Wt:	0.00	Tare Wt:	0.00
Length :	2.80	in	7.11	cm	Dry Wt.:	100	Dry Wt.:	481.39
Area:	6.16	in^2	39.73	cm^2	Water Wt.:	15.7	Water Wt.:	98.08
Volume :	17.24	in^3	282.53	cm^3	% moist.:	**15.7**	% moist.:	**20.4**
Unit Wt.(wet):	**125.08**	pcf	**2.00**	g/cm^3				
Unit Wt.(dry):	**108.11**	pcf	**1.73**	g/cm^3				

Assumed Specific Gravity:	**2.70**	Max Dry Density(pcf) =	113.8	OMC =	13.7
		% of max =	95.0	+/- OMC =	2.00
Calculated % saturation:	98.38	Void ratio (e) =	**0.56**	Porosity (n)=	**0.36**

Test Pressures During Hydraulic Conductivity Test

Cell Pressure (psi) = 55.00 Back Pressure (psi) = 50.00 Confining Pressure = 5.00 psi

Note: The above value is Effective Confining Pressure

TEST READINGS

Z_1(Mercury Height Difference @ t_1): 15.8 cm Hydraulic Gradient = 28.00

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZp (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
12/20/2018	5	15.7	1.082666	21	0.977	6.20E-06	1.76E-02	
12/20/2018	10	14.6	2.182666	21	0.977	6.50E-06	1.84E-02	
12/20/2018	15	13.5	3.282666	21	0.977	6.80E-06	1.93E-02	
12/20/2018	20	12.6	4.182666	21	0.977	6.75E-06	1.91E-02	

SUMMARY

	k_a =	6.56E-06 cm/sec		Acceptance criteria =	50 %
	ki		Vm		
	k1 =	6.20E-06 cm/sec	5.6	%	Vm = $\frac{\lvert k_a - k_i \rvert}{k_a} \times 100$
	k2 =	6.50E-06 cm/sec	0.9	%	
	k3 =	6.80E-06 cm/sec	3.7	%	
	k4 =	6.75E-06 cm/sec	2.8	%	

Hydraulic conductivity	k =	**6.56E-06**	cm/sec	**1.86E-02**	ft/day
Void Ratio	e =	**0.56**			
Porosity	n =	**0.36**			
Bulk Density	γ =	**2.00**	g/cm^3	**125.1**	pcf
Water Content	W =	**0.27**	cm^3/cm^3	(at 20 deg C)	
Intrinsic Permeability	k_{int} =	**6.72E-11**	cm^2	(at 20 deg C)	

Terracon

HYDRAULIC CONDUCTIVITY DETERMINATION
FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project :	Beckham and McCloy Landfill							
Date:	12/21/2018	Panel Number : P-1						
Project No. :	A4187129	Permometer Data						
Boring No.:	BH-1	a_p =	0.031416	cm^2	Set Mercury to Pipet Rp at beginning	Equilibrium	1.6	cm^3
Sample:	composite	a_a =	0.767120	cm^2		Pipet **Rp**	**16.8**	cm^3
Depth (ft):	0-65	M_1 =	0.030180	C = 0.0004288		Annulus **Ra**	1.0	cm^3
Other Location:	McCloy Site	M_2 =	1.040953	T = 0.0658646				
Material Description :	light brown silty sand with gravel							

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			575.26	g				
Tare or ring Wt. :			0.0	g				
Wet Wt: of Sample :			575.26	g	Tare No.:	101	Tare No.:	N/A
Diameter :	2.80	in	7.11	cm^2	Wet Wt.+tare:	114.70	Wet Wt.+tare:	586.52
Length :	2.80	in	7.11	cm	Dry Wt.+tare:	100.00	Dry Wt.+tare:	492.33
Area:	6.16	in^2	39.73	cm^2	Tare Wt:	0.00	Tare Wt:	0.00
Volume :	17.24	in^3	282.53	cm^3	Dry Wt.:	100	Dry Wt.:	492.33
Unit Wt.(wet):	**127.05**	pcf	**2.04**	g/cm^3	Water Wt.:	14.7	Water Wt.:	94.19
Unit Wt.(dry):	**110.77**	pcf	**1.78**	g/cm^3	% moist.:	**14.7**	% moist.:	**19.1**

Assumed Specific Gravity:	**2.70**	Max Dry Density(pcf) =	116.6	OMC =	12.7
		% of max =	95.0	+/- OMC =	2.00
Calculated % saturation:	99.01	Void ratio (e) =	**0.52**	Porosity (n)=	**0.34**

Test Pressures During Hydraulic Conductivity Test

Cell Pressure (psi) = 55.00 Back Pressure (psi) = 50.00 Confining Pressure = 5.00 psi

Note: The above value is Effective Confining Pressure

TEST READINGS

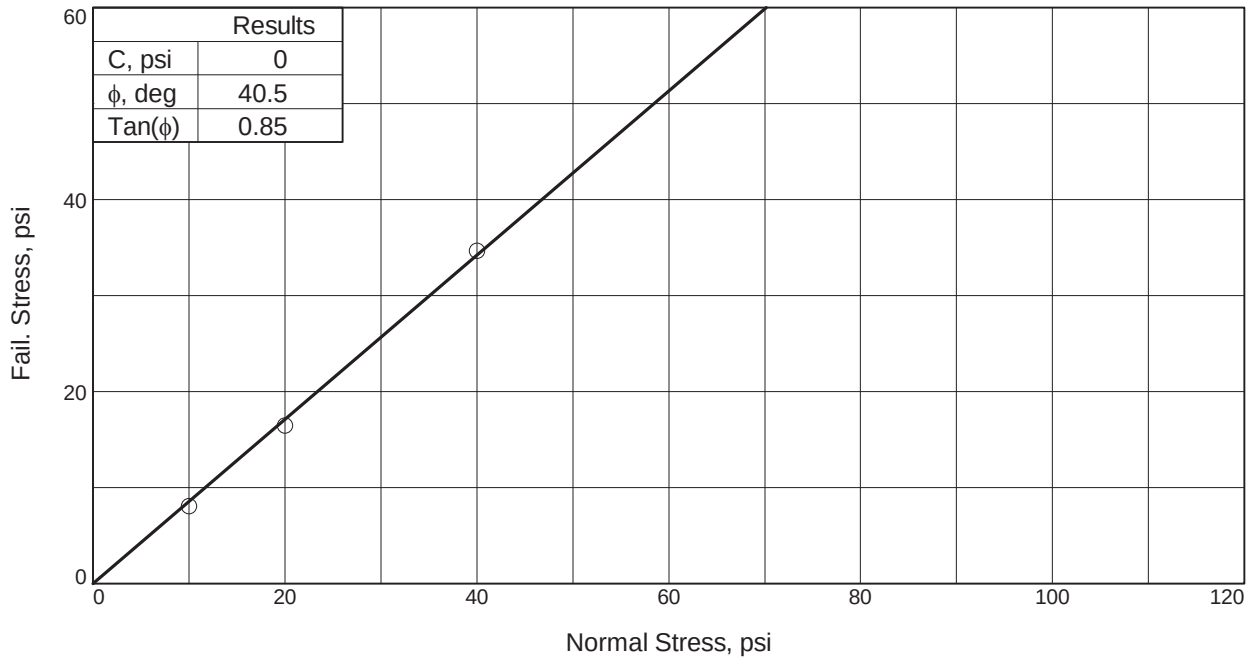
Z_1(Mercury Height Difference @ t_1): 15.8 cm Hydraulic Gradient = 28.00

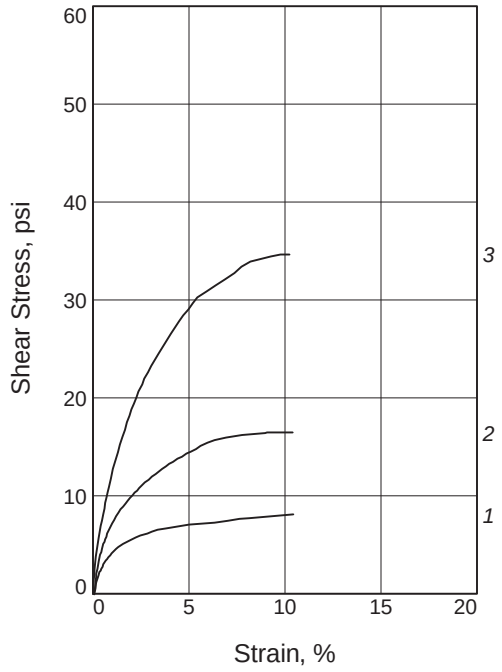
Date	elapsed t (seconds)	Z (pipet @ t)	ΔZp (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
12/20/2018	5	15.7	1.082666	21	0.977	6.20E-06	1.76E-02	
12/20/2018	10	14.6	2.182666	21	0.977	6.50E-06	1.84E-02	
12/20/2018	15	13.5	3.282666	21	0.977	6.80E-06	1.93E-02	
12/20/2018	20	12.6	4.182666	21	0.977	6.75E-06	1.91E-02	

SUMMARY

	k_a =	6.56E-06 cm/sec		Acceptance criteria =	50 %
	ki		Vm		
	k1 =	6.20E-06 cm/sec	5.6 %	Vm =	$\frac{\lvert ka-ki \rvert}{ka} \times 100$
	k2 =	6.50E-06 cm/sec	0.9 %		
	k3 =	6.80E-06 cm/sec	3.7 %		
	k4 =	6.75E-06 cm/sec	2.8 %		

Hydraulic conductivity	k =	**6.56E-06**	cm/sec	**1.86E-02**	ft/day
Void Ratio	e =	**0.52**			
Porosity	n =	**0.34**			
Bulk Density	γ =	**2.04**	g/cm^3	**127.1**	pcf
Water Content	W =	**0.26**	cm^3/cm^3	(at 20 deg C)	
Intrinsic Permeability	k_{int} =	**6.72E-11**	cm^2	(at 20 deg C)	





Sample No.		1	2	3
Initial	Water Content, %	14.7	14.7	14.7
	Dry Density, pcf	110.8	110.8	110.8
	Saturation, %	76.1	76.1	76.1
	Void Ratio	0.5218	0.5218	0.5218
	Diameter, in.	2.500	2.500	2.500
	Height, in.	1.000	1.000	1.000
At Test	Water Content, %	17.5	15.9	15.1
	Dry Density, pcf	114.3	117.8	119.5
	Saturation, %	99.7	99.5	99.2
	Void Ratio	0.4744	0.4312	0.4107
	Diameter, in.	2.500	2.500	2.500
	Height, in.	0.969	0.941	0.927
Normal Stress, psi		10.00	20.00	40.00
Fail. Stress, psi		8.08	16.43	34.65
Strain, %		10.4	9.1	10.2
Ult. Stress, psi				
Strain, %				
Strain rate, in./min.		0.004	0.004	0.004

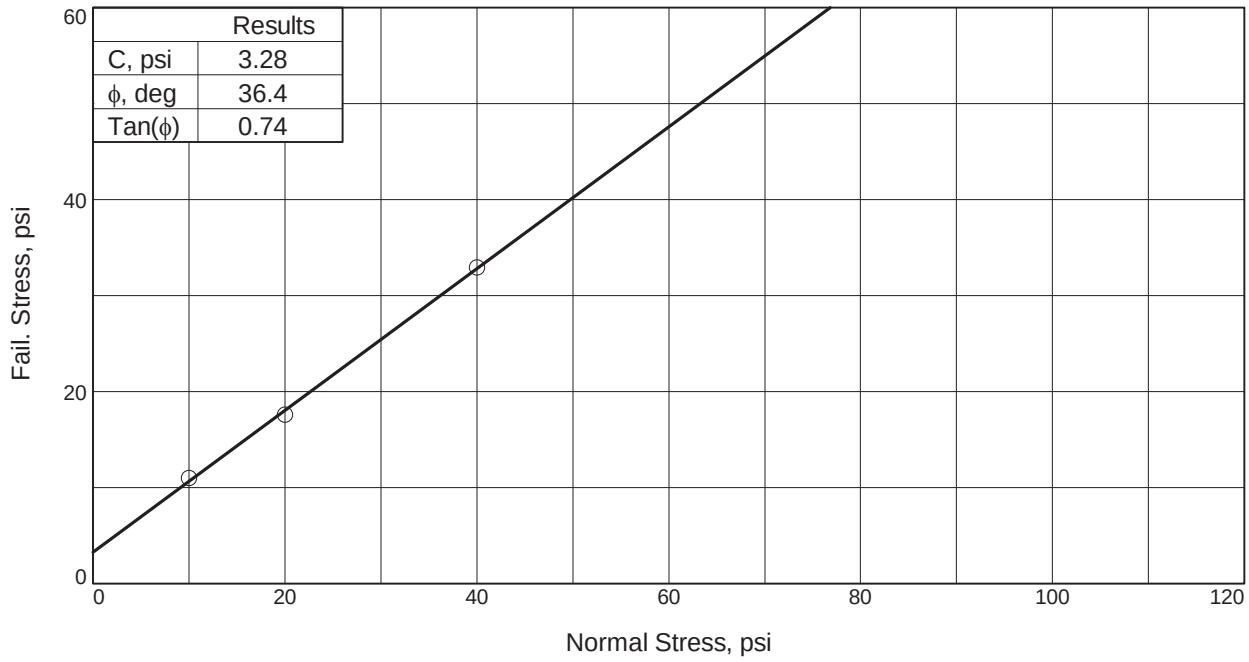
Sample Type: Remolded
Description: light brown silty sand with gravel (SM)
LL= 20 **PL=** 17 **PI=** 3
Assumed Specific Gravity= 2.7
Remarks: Compaction based on D698 efforts. Specimens remolded to 95% of maximum dry density and +2% of optimum moisture.

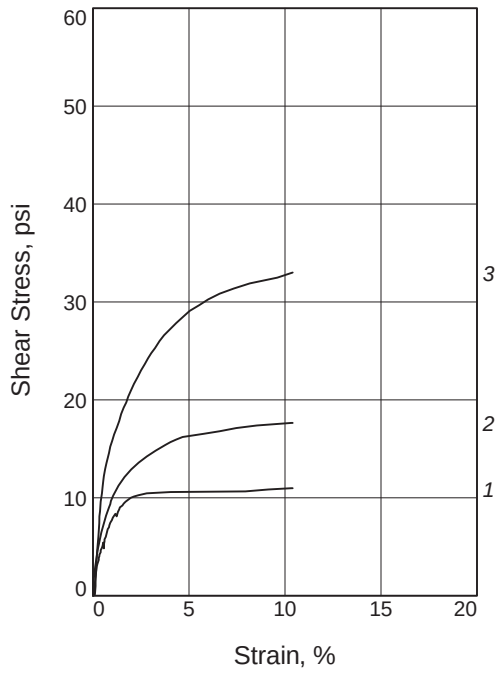
Client: Trammco Environmental Solutions LLC

Project: McCloy and Beckham Landfill

Source of Sample: BH-1 **Depth:** 0.0-65.0 ft
Sample Number: Composite
Proj. No.: A4187129 **Date Sampled:** N/A

DIRECT SHEAR TEST REPORT
Terracon Consultants, Inc.
Chattanooga, TN





Sample No.		1	2	3
Initial	Water Content, %	15.7	15.7	15.7
	Dry Density, pcf	109.8	109.8	109.8
	Saturation, %	79.2	79.2	79.2
	Void Ratio	0.5350	0.5350	0.5350
	Diameter, in.	2.500	2.500	2.500
	Height, in.	1.000	1.000	1.000
At Test	Water Content, %	18.2	17.9	15.8
	Dry Density, pcf	112.4	113.6	117.5
	Saturation, %	98.2	100.0	98.1
	Void Ratio	0.4994	0.4833	0.4346
	Diameter, in.	2.500	2.500	2.500
	Height, in.	0.977	0.966	0.935
Normal Stress, psi		10.00	20.00	40.00
Fail. Stress, psi		10.96	17.61	32.97
Strain, %		10.4	10.3	10.4
Ult. Stress, psi				
Strain, %				
Strain rate, in./min.		0.005	0.005	0.005

Sample Type: Remolded
Description: light brown clayey sand (SC)

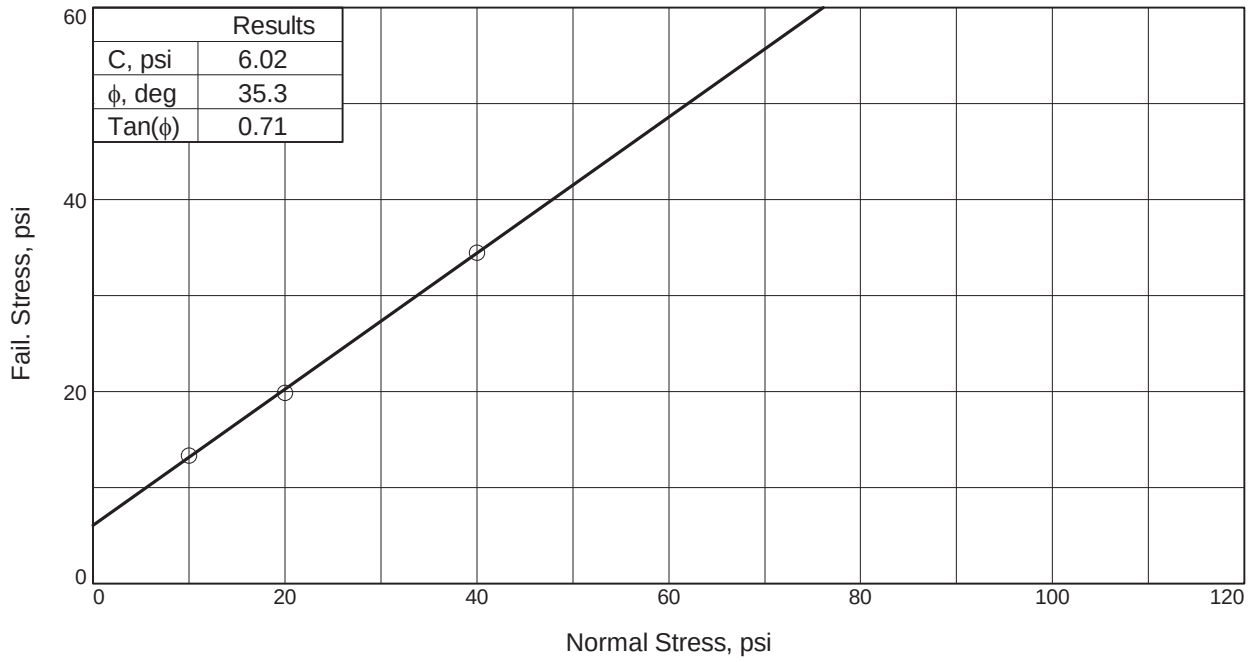
LL= 23 **PL=** 14 **PI=** 9
Assumed Specific Gravity= 2.7
Remarks: Compaction based on D698 efforts. Specimens remolded to 95% of maximum dry density and +2% of optimum moisture content.

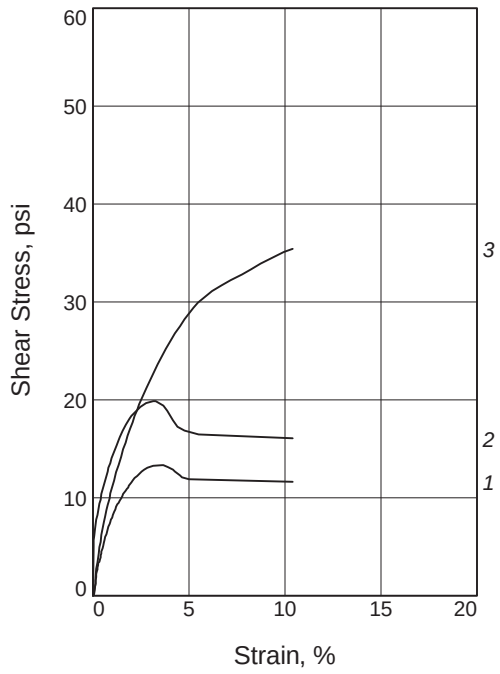
Client: Trammco Environmental Solutions LLC

Project: McCloy and Beckham Landfill

Source of Sample: BH-4 **Depth:** 0.0-20.0 ft
Sample Number: Composite 1
Proj. No.: A4187129 **Date Sampled:** N/A

DIRECT SHEAR TEST REPORT
Terracon Consultants, Inc.
Chattanooga, TN





Sample No.		1	2	3
Initial	Water Content, %	15.7	15.7	15.7
	Dry Density, pcf	108.1	108.1	108.1
	Saturation, %	75.7	75.7	75.7
	Void Ratio	0.5598	0.5598	0.5598
	Diameter, in.	2.500	2.500	2.500
	Height, in.	1.000	1.000	1.000
At Test	Water Content, %	19.8	18.8	16.0
	Dry Density, pcf	109.4	111.4	117.4
	Saturation, %	98.6	98.7	99.1
	Void Ratio	0.5409	0.5135	0.4355
	Diameter, in.	2.500	2.500	2.500
	Height, in.	0.988	0.970	0.920
Normal Stress, psi		10.00	20.00	40.00
Fail. Stress, psi		13.35	19.85	34.50
Strain, %		3.6	3.1	9.3
Ult. Stress, psi				
Strain, %				
Strain rate, in./min.		0.005	0.005	0.005

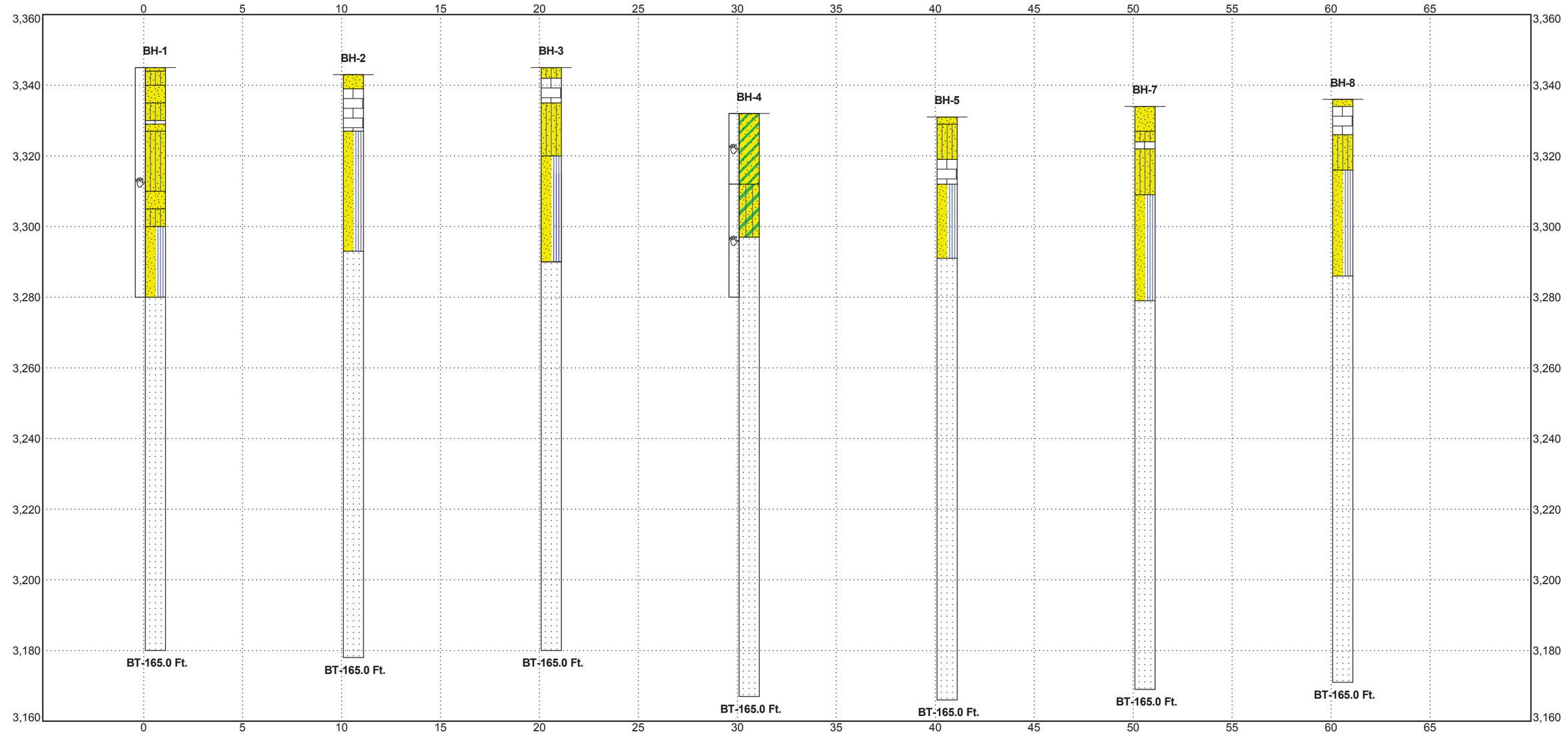
Sample Type: Remolded
Description: light brown silty, clayey sand (SC-SM)
LL= 25 **PL=** 18 **PI=** 7
Assumed Specific Gravity= 2.7
Remarks: Compaction based on D698 efforts. Specimens remolded to 95% maximum dry density and +2% of optimum moisture content.

Client: Trammco Environmental Solutions LLC

Project: McCloy and Beckham Landfill

Source of Sample: BH-4 **Depth:** 20.0-52.0 ft
Sample Number: Composite 2
Proj. No.: A4187129 **Date Sampled:** N/A

DIRECT SHEAR TEST REPORT
Terracon Consultants, Inc.
Chattanooga, TN



Explanation

BH-1 — Borehole Number
Moisture Content — %w
LL PL — Liquid and Plastic Limits
Sampling (See General Notes)
Borehole Lithology
AR
BT — Borehole Termination Type

Water Level Reading at time of drilling.

Water Level Reading after drilling.

Poorly-graded Sand
Silty Sand
CALICHE - USGS Standard
Poorly-graded Sand with Silt
Sandstone
Clayey Sand
Silty Clayey Sand

NOTES:

See Exploration Plan for orientation of soil profile.
See General Notes in Supporting Information for symbols and soil classifications.
Soils profile provided for illustration purposes only.
Soils between borings may differ
AR - Auger Refusal
BT - Boring Termination

Project No.: A4187129	Terracon 10400 State Highway 191 Midland, TX	**SUBSURFACE PROFILE**
Date: 1/15/2019		MCCLOY RANCH LANDFILL SECTION 9 AND 10 OF, T25S, R34E JAL, LEA COUNTY, NEW MEXICO
Scale: N.T.S		

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. SMART FENCE A4187129 - MCCLOY SITE.GPJ TERRACON_DATATEMPLATE.GDT 1/15/19

SUPPORTING INFORMATION

UNIFIED SOIL CLASSIFICATION SYSTEM

McCloy Ranch Landfill ■ Jal, Lea County, New Mexico

January 25, 2019 ■ Terracon Project No. A4187129

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]					Soil Classification	
					Group Symbol	Group Name [B]
Coarse-Grained Soils: More than 50% retained on No. 200 sieve	**Gravels:** More than 50% of coarse fraction retained on No. 4 sieve	**Clean Gravels:** Less than 5% fines [C]	Cu ≥ 4 and 1 ≤ Cc ≤ 3 [E]		GW	Well-graded gravel [F]
			Cu < 4 and/or 1 > Cc > 3 [E]		GP	Poorly graded gravel [F]
		Gravels with Fines: More than 12% fines [C]	Fines classify as ML or MH		GM	Silty gravel [F, G, H]
			Fines classify as CL or CH		GC	Clayey gravel [F, G, H]
	Sands: 50% or more of coarse fraction passes No. 4 sieve	**Clean Sands:** Less than 5% fines [D]	Cu ≥ 6 and 1 ≤ Cc ≤ 3 [E]		SW	Well-graded sand [I]
			Cu < 6 and/or 1 > Cc > 3 [E]		SP	Poorly graded sand [I]
		Sands with Fines: More than 12% fines [D]	Fines classify as ML or MH		SM	Silty sand [G, H, I]
			Fines classify as CL or CH		SC	Clayey sand [G, H, I]
Fine-Grained Soils: 50% or more passes the No. 200 sieve	**Silts and Clays:** Liquid limit less than 50	**Inorganic:**	PI > 7 and plots on or above "A"		CL	Lean clay [K, L, M]
			PI < 4 or plots below "A" line [J]		ML	Silt [K, L, M]
		Organic:	Liquid limit - oven dried / Liquid limit - not dried	< 0.75	OL	Organic clay [K, L, M, N] / Organic silt [K, L, M, O]
	Silts and Clays: Liquid limit 50 or more	**Inorganic:**	PI plots on or above "A" line		CH	Fat clay [K, L, M]
			PI plots below "A" line		MH	Elastic Silt [K, L, M]
		Organic:	Liquid limit - oven dried / Liquid limit - not dried	< 0.75	OH	Organic clay [K, L, M, P] / Organic silt [K, L, M, Q]
Highly organic soils:	Primarily organic matter, dark in color, and organic odor				PT	Peat

[A] Based on the material passing the 3-inch (75-mm) sieve

[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay

[E] $Cu = D_{60}/D_{10}$ $\quad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains ≥ 15% sand, add "with sand" to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add "with organic fines" to group name.

[I] If soil contains ≥ 15% gravel, add "with gravel" to group name.

[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

[L] If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.

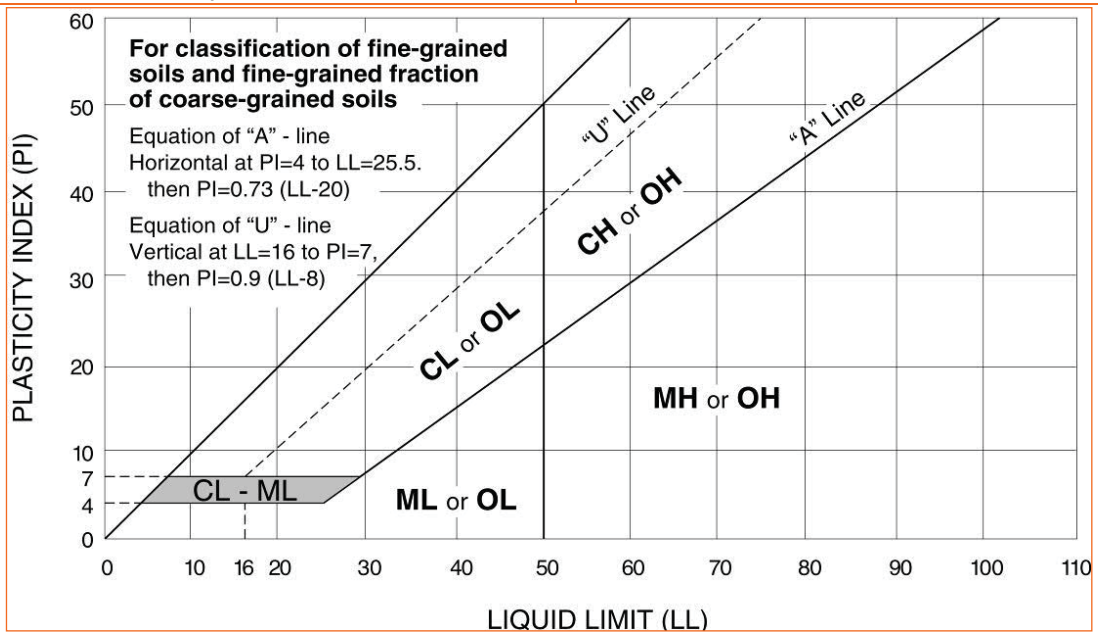
[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

[N] PI ≥ 4 and plots on or above "A" line.

[O] PI < 4 or plots below "A" line.

[P] PI plots on or above "A" line.

[Q] PI plots below "A" line.



DESCRIPTION OF ROCK PROPERTIES

McCloy Ranch Landfill ■ Jal, Lea County, New Mexico

January 25, 2019 ■ Terracon Project No. A4187129

WEATHERING	
Term	**Description**
Unweathered	No visible sign of rock material weathering, perhaps slight discoloration on major discontinuity surfaces.
Slightly weathered	Discoloration indicates weathering of rock material and discontinuity surfaces. All the rock material may be discolored by weathering and may be somewhat weaker externally than in its fresh condition.
Moderately weathered	Less than half of the rock material is decomposed and/or disintegrated to a soil. Fresh or discolored rock is present either as a continuous framework or as corestones.
Highly weathered	More than half of the rock material is decomposed and/or disintegrated to a soil. Fresh or discolored rock is present either as a discontinuous framework or as corestones.
Completely weathered	All rock material is decomposed and/or disintegrated to soil. The original mass structure is still largely intact.
Residual soil	All rock material is converted to soil. The mass structure and material fabric are destroyed. There is a large change in volume, but the soil has not been significantly transported.

STRENGTH OR HARDNESS		
Description	**Field Identification**	**Uniaxial Compressive Strength, psi (MPa)**
Extremely weak	Indented by thumbnail	40-150 (0.3-1)
Very weak	Crumbles under firm blows with point of geological hammer, can be peeled by a pocket knife	150-700 (1-5)
Weak rock	Can be peeled by a pocket knife with difficulty, shallow indentations made by firm blow with point of geological hammer	700-4,000 (5-30)
Medium strong	Cannot be scraped or peeled with a pocket knife, specimen can be fractured with single firm blow of geological hammer	4,000-7,000 (30-50)
Strong rock	Specimen requires more than one blow of geological hammer to fracture it	7,000-15,000 (50-100)
Very strong	Specimen requires many blows of geological hammer to fracture it	15,000-36,000 (100-250)
Extremely strong	Specimen can only be chipped with geological hammer	>36,000 (>250)

DISCONTINUITY DESCRIPTION			
Fracture Spacing (Joints, Faults, Other Fractures)		**Bedding Spacing (May Include Foliation or Banding)**	
Description	**Spacing**	**Description**	**Spacing**
Extremely close	< ¾ in (<19 mm)	**Laminated**	< ½ in (<12 mm)
Very close	¾ in – 2-1/2 in (19 - 60 mm)	**Very thin**	½ in – 2 in (12 – 50 mm)
Close	2-1/2 in – 8 in (60 – 200 mm)	**Thin**	2 in – 1 ft. (50 – 300 mm)
Moderate	8 in – 2 ft. (200 – 600 mm)	**Medium**	1 ft. – 3 ft. (300 – 900 mm)
Wide	2 ft. – 6 ft. (600 mm – 2.0 m)	**Thick**	3 ft. – 10 ft. (900 mm – 3 m)
Very Wide	6 ft. – 20 ft. (2.0 – 6 m)	**Massive**	> 10 ft. (3 m)

Discontinuity Orientation (Angle): Measure the angle of discontinuity relative to a plane perpendicular to the longitudinal axis of the core. (For most cases, the core axis is vertical; therefore, the plane perpendicular to the core axis is horizontal.) For example, a horizontal bedding plane would have a 0-degree angle.

ROCK QUALITY DESIGNATION (RQD) [1]	
Description	**RQD Value (%)**
Very Poor	0 - 25
Poor	25 – 50
Fair	50 – 75
Good	75 – 90
Excellent	90 - 100

1. The combined length of all sound and intact core segments equal to or greater than 4 inches in length, expressed as a percentage of the total core run length.

Reference: U.S. Department of Transportation, Federal Highway Administration, Publication No FHWA-NHI-10-034, December 2009 Technical Manual for Design and Construction of Road Tunnels – Civil Elements

DESCRIPTION OF ROCK PROPERTIES

McCloy Ranch Landfill ■ Jal, Lea County, New Mexico

January 25, 2019 ■ Terracon Project No. A4187129

WEATHERING	
Fresh	Rock fresh, crystals bright, few joints may show slight staining. Rock rings under hammer if crystalline.
Very slight	Rock generally fresh, joints stained, some joints may show thin clay coatings, crystals in broken face show bright. Rock rings under hammer if crystalline.
Slight	Rock generally fresh, joints stained, and discoloration extends into rock up to 1 in. Joints may contain clay. In granitoid rocks some occasional feldspar crystals are dull and discolored. Crystalline rocks ring under hammer.
Moderate	Significant portions of rock show discoloration and weathering effects. In granitoid rocks, most feldspars are dull and discolored; some show clayey. Rock has dull sound under hammer and shows significant loss of strength as compared with fresh rock.
Moderately severe	All rock except quartz discolored or stained. In granitoid rocks, all feldspars dull and discolored and majority show kaolinization. Rock shows severe loss of strength and can be excavated with geologist's pick.
Severe	All rock except quartz discolored or stained. Rock "fabric" clear and evident, but reduced in strength to strong soil. In granitoid rocks, all feldspars kaolinized to some extent. Some fragments of strong rock usually left.
Very severe	All rock except quartz discolored or stained. Rock "fabric" discernible, but mass effectively reduced to "soil" with only fragments of strong rock remaining.
Complete	Rock reduced to "soil". Rock "fabric" no discernible or discernible only in small, scattered locations. Quartz may be present as dikes or stringers.

HARDNESS (for engineering description of rock – not to be confused with Moh's scale for minerals)	
Very hard	Cannot be scratched with knife or sharp pick. Breaking of hand specimens requires several hard blows of geologist's pick.
Hard	Can be scratched with knife or pick only with difficulty. Hard blow of hammer required to detach hand specimen.
Moderately hard	Can be scratched with knife or pick. Gouges or grooves to ¼ in. deep can be excavated by hard blow of point of a geologist's pick. Hand specimens can be detached by moderate blow.
Medium	Can be grooved or gouged 1/16 in. deep by firm pressure on knife or pick point. Can be excavated in small chips to pieces about 1-in. maximum size by hard blows of the point of a geologist's pick.
Soft	Can be gouged or grooved readily with knife or pick point. Can be excavated in chips to pieces several inches in size by moderate blows of a pick point. Small thin pieces can be broken by finger pressure.
Very soft	Can be carved with knife. Can be excavated readily with point of pick. Pieces 1-in. or more in thickness can be broken with finger pressure. Can be scratched readily by fingernail.

Joint, Bedding, and Foliation Spacing in Rock [1]		
Spacing	**Joints**	**Bedding/Foliation**
Less than 2 in.	Very close	Very thin
2 in. – 1 ft.	Close	Thin
1 ft. – 3 ft.	Moderately close	Medium
3 ft. – 10 ft.	Wide	Thick
More than 10 ft.	Very wide	Very thick

1. Spacing refers to the distance normal to the planes, of the described feature, which are parallel to each other or nearly so.

Rock Quality Designator (RQD) [1]	
RQD, as a percentage	**Diagnostic description**
Exceeding 90	Excellent
90 – 75	Good
75 – 50	Fair
50 – 25	Poor
Less than 25	Very poor

1. RQD (given as a percentage) = length of core in pieces 4 inches and longer / length of run

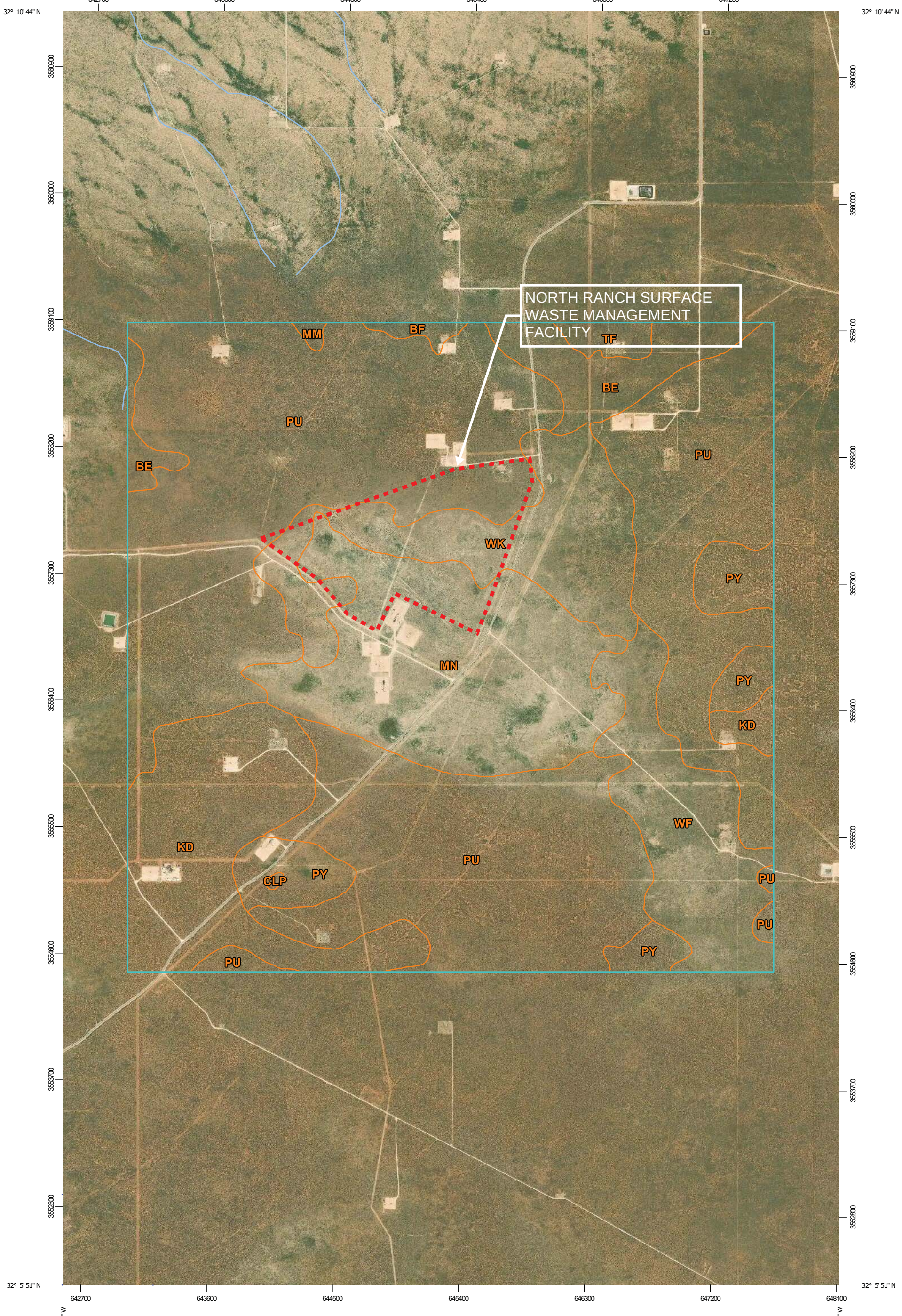
Joint Openness Descriptors	
Openness	**Descriptor**
No Visible Separation	Tight
Less than 1/32 in.	Slightly Open
1/32 to 1/8 in.	Moderately Open
1/8 to 3/8 in.	Open
3/8 in. to 0.1 ft.	Moderately Wide
Greater than 0.1 ft.	Wide

References: American Society of Civil Engineers. Manuals and Reports on Engineering Practice - No. 56. Subsurface Investigation for Design and Construction of Foundations of Buildings. New York: American Society of Civil Engineers, 1976. U.S. Department of the Interior, Bureau of Reclamation, Engineering Geology Field Manual.

Attachment B

United States Department of Agriculture
Web Soil Survey Report

Soil Map—Lea County, New Mexico



Map Scale: 1:25,400 if printed on B portrait (11" x 17") sheet.

Meters: 0 350 700 1400 2100

Feet: 0 1000 2000 4000 6000

N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Lea County, New Mexico
Survey Area Data: Version 15, Sep 12, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 31, 2009—Sep 17, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
BE	Berino-Cacique loamy fine sands association	195.6	3.7%
BF	Berino-Cacique fine sandy loams association	18.3	0.3%
CLP	Caliche pit	2.6	0.0%
KD	Kermit-Palomas fine sands, 0 to 12 percent slopes	547.4	10.4%
MM	Ratliff loam	7.4	0.1%
MN	Ratliff-Wink fine sandy loams	707.6	13.4%
PU	Pyote and maljamar fine sands	2,736.8	51.9%
PY	Pyote soils and dune land	222.3	4.2%
TF	Tonuco loamy fine sand, 0 to 3 percent slopes	36.0	0.7%
WF	Wink fine sand	372.4	7.1%
WK	Wink loamy fine sand	431.2	8.2%
Totals for Area of Interest		**5,277.6**	**100.0%**

Appendix J
Design and Construction Plan

Engineering Design Report

North Ranch Surface Waste Management Facility
Lea County, New Mexico

September 2019
Project No. 35187378



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Environmental ■ Facilities ■ Geotechnical ■ Materials

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Attachment B Revised Universal Soil Loss Equation (RUSLE) Calculation
Attachment C Leachate Evaporation Pond Sizing – Incidental Precipitation Volume
Attachment D Hydraulic Evaluation of Landfill Performance (HELP) Report
Attachment E Liner System Design Calculations
Attachment F Leachate Pipe Design Calculations
Attachment G Slope Stability Analysis
Attachment H Construction Quality Assurance Plan

1.0 INTRODUCTION

This engineering design report (EDR) was prepared by Terracon Consultants, Inc. (Terracon) for NGL Waste Services, LLC (NGL) to support the Permit Application for the proposed North Ranch Surface Waste Management Facility (Facility) located near Jal, Lea County, New Mexico. The following sections and appendices provide backup engineering calculations and documentation for the proposed landfill configuration as presented on the permit drawings in **Appendix K** of the Permit Application (PA).

1.1 Regulatory Oversight

Due to its function the Facility will be regulated by New Mexico Administrative Code, Title 19 – Natural Resources and Wildlife, Chapter 15 – Oil and Gas, Part 36 – Surface Waste Management Facilities, or 19.15.36. The Facility is defined as a commercial landfill facility by **19.15.36.7.A(2)** and **(4)** accepting exempt oil field waste from nearby oil field development customers. In general, this EDR will focus on providing the engineering calculations and documentation to satisfy design requirements specified in **19.15.36.14.C** – **19.15.36.14.F**. In addition, NGL proposes to manage and dispose of the Facility's leachate with an evaporation pond. Therefore, this EDR will also provide engineering calculations for the proposed evaporation pond in compliance with **19.15.36.17.A** and **19.15.36.17.B**.

1.2 General Facility Description

The Facility consists of approximately (~) 303 acres of which ~205 acres will be dedicated for lined landfill disposal cells. The remaining ~98 acres consists of a ~26-acre entrance and waste acceptance area including an ~2.2-acre leachate evaporation pond; ~12.5 acres making up three stormwater retention ponds; and ~57.3 acres of ancillary space for perimeter roadways, drainage channels and landfill structural berms.

The landfill area will be subdivided in to three phases. Phase 1 will have six disposal cells ranging in size from 9.6 acres to 28.2 acres for a total disposal area of ~111 acres. Phase 2 will have five disposal cells ranging in size from 11.8 acres, to 24.7 acres for a total disposal area ~88.5 acres. Phase 1 and 2 have maximum depths below existing grade of ~50-feet. Phase 1 and 2 are separated by ~100 feet. During operation of the Phase 1 and 2 this area will be used for roadways and drainage channels. However, upon completion of Phase 1 and 2 this separation area and the valley between the Phase 1 and 2 waste slopes will be developed into Phase 3. Phase 3 will fill the valley between Phases 1 and 2 and ultimately reach the proposed final elevations.

Each of the Phase 1 and 2 disposal cells will be separated by a 4-foot tall soil divider berm. All disposal areas will be lined with a multilayered geosynthetic liner system with both leachate collection and recovery and leak detection systems. Final waste surfaces will be covered with a geosynthetic and soil based final cover system. Full descriptions of the liner and cover systems

are provided in this EDR. Ultimately the proposed configuration of the landfill area will result in a total design operational capacity (waste and routine soil) of ~40,264,324 Cubic Yards (CY).

Detailed design of the Facility is presented within this EDR and attached including supporting calculations and analyses.

2.0 PROPOSED FACILITY DESIGN

2.1 Landfill Geometry

In general compliance with **19.15.36.14.C** and **19.15.36.14.D**, all landfill cells have been designed with 3H:1V side slopes. Each cell floor will be graded at a minimum of 2% laterally to a center leachate collection pipeline which is sloped at 2% towards a central leachate collection sump. The liner system and leachate collection lines will be protected with 2-feet of protective soil, see Section 2.7 for greater details regarding the liner system design. Cell depths ranging from eight (8) at the high end of the cell to 71 feet at the leachate collection sump, the maximum excavation depth below existing grade is ~48 feet. The intermediate, final waste and final cover slopes will be nominally 4H:1V and the top deck will have a minimum grade of 4%. The final cover system will include 2.5 feet of soil over the liner system. The landfill will have a maximum final waste grade of 3,541.0 feet above mean sea level (AMSL), and maximum final cover grade will be 3,543.5 feet AMSL. See **Permit Drawings** in **Appendix K** of the PA for visual representation of the proposed geometry.

2.2 Landfill Design Capacity

The following Table 2.1 provides the design operational capacity (waste and routine and intermediate soil cover), routine and intermediate soil cover volume assuming 15% soil to waste ratio, and waste capacity of each disposal cell, phase and overall landfill. Per-cell capacities assume an intermediate waste fill slope of 4V:1H and that fill sequencing occurs as shown on **Drawing 24** of **Appendix K** of the PA. Operational capacities were calculated using AutoDesk© Civil3D® 2019 (Civil 3D) software.

Table 2.1 Design Capacity Summary

Cell	Operational Capacity (CY)	Routine and Intermediate Soil Cover [10% of Operational Waste Capacity] (CY)	Waste Capacity [90% of Operational Capacity] (CY)
		PHASE 1	
E-1	933,202	93,320	839,882
E-2	2,111,021	211,102	1,899,919
E-3	5,116,491	511,649	4,604,842
E-4	3,939,124	393,912	3,545,212
E-5	3,840,751	384,075	3,456,676
E-6	2,564,850	256,485	2,308,365
PHASE 1	**18,505,439**	**1,850,543**	**16,654,896**
		PHASE 2	
W-1	1,108,726	110,873	997,853
W-2	1,322,275	132,228	1,190,048
W-3	2,075,688	207,569	1,868,119
W-4	4,148,670	414,867	3,733,803
W-5	4,679,514	467,951	4,211,563
PHASE 2	**13,334,873**	**1,333,493**	**12,001,391**
PHASE 3	**8,424,012**	**842,401**	**7,581,611**
TOTAL	**40,264,324**	**4,026,432**	**36,237,892**

2.3 Site Soil Balance

Landfill cell construction, routine operations, and closure will require large quantities of soil over the life of the landfill. The proposed Facility-wide grading plan shown in the **Permit Drawings** in **Appendix K** of the PA, which includes all grading activities for landfill cells, roads, stormwater infrastructure (channels and ponds), and the leachate evaporation pond, will generate soils for these activities. Table 2.2 below summarizes the soil balance for known operational and construction activities through buildout of the Facility. All cut and fill volumes provided in Table 2.2 are calculated using Civil 3D.

Table 2.2 Soil Balance Summary

Area	Cut (CY)	Fill (CY)
Facility Wide Grading	8,166,740	514,465
Phase 1 Base Liner Protective Cover	0	357,923
Phase 2 Base Liner Protective Cover	0	292,892
Phase 3 Base Liner Protective Cover	0	19,522
Operational Cover (Routine and Intermediate, From Table 2.1)	0	4,026,432
Final Cover System	0	1,495,694
TOTALS	**8,166,740**	**6,706,928**
FACILITY SOIL BALANCE = +1,459,812 EXCESS SOIL		

2.4 Stormwater Management System

The proposed surface-water management system for both run-on and run-off for the Facility is shown on the **Permit Drawings** in **Appendix K** of the PA. The proposed configuration of the run-off management system was modeled in AutoDesk© Storm and Sanitary Analysis® 2019 (SSA) software. The run-on management system has been sized using the USDA, NRCS, Technical Release 55 (TR-55) method. Both the SAA and TR-55 simulated the 25-year, 24-hour storm (design storm) event for the Lea County, New Mexico area.

Facility Storm Run-off Management System Design

All proposed stormwater run-off conveyance structures (channels, berms, letdowns, culverts) have been designed to handle the peak flow from the design storm. The three stormwater ponds have been designed to retain at least the total run-off volume from the design storm. The Facility also has a 2-foot earth berm at the permit boundary to retain onsite any potential storm pond over flow during greater storm events. In short, the Facility has been designed to be a non-discharging facility.

Facility Run-on Management System Design

The run-on drainage area is potentially a 5,555-acre area northwest of the Facility. It is likely that only a small portion of the potential run-on area impacts the Facility perimeter. However, to

designed to collect the peak flow from the design storm event for the entire potential run-off area.

Attachment A provides a detailed report of the SSA and TR-55 analysis, including figures and modeling results.

2.5 Erosion Loss (RUSLE)

The purpose of the erosion calculation is to determine potential soil losses due to rainfall erosion under closure conditions. Using the Revised Universal Soil Loss Equation (RUSLE), projected soil loss from rainfall is approximately 4.96 tons/acre/year (t/a/y), which is below the NRCS established criterion of 5.0 t/a/y. Detailed RUSLE calculations are provided in **Attachment B**.

2.6 Leachate Evaporation Pond Geometry and Sizing

Geometry
A proposed leachate evaporation pond (LEP) is to be located near the site entrance in the northeast portion of the Facility. In general, the LEP geometry is in compliance with **19.15.36.17.A** and **19.15.36.17.B** having 3H:1V side slopes and a floor sloped laterally at 2% towards a central leak detection sump. In addition, the LEP has a 2-3-foot-high perimeter berm to prevent external surface water intrusion. The LEP plan footprint is approximately 2.25 acres with depths varying from 3.25 feet – 13.3 feet, with a 2-foot deep leak detection sump at the lowest point.

The LEP was sized assuming a worst-case condition defined as follows:

- Assumes the Facility will only construct and operate one disposal cell at a time. In this case:
- The largest Cell (E-3, 28.2 acres) has been constructed and hasn't received waste.
- Run-off from the intermediate 4H:1V waste slope from the previous Cell (E-2) is draining into the new cell (E-3) leachate collection system.
- Little to no waste has been placed over the new cell's liner system.

Under this condition leachate generation is governed by incidental precipitation, thus two calculation methods to determine the require storage in the LEP are considered:

- 25-year, 24-hour precipitation volume incidental to the open area defined above, which totals to 37.3 acres.
- Leachate generation from the open cell (28.2 acres).

To be conservative, the LEP is sized to fully contain the greater of the volumes generated from the two sources. **Attachment C** provides a TR-55 run-off volume calculation from the 37.3-acre

area indicating that 8.5 acre-feet of storage is required to contain incidental precipitation volume. A Hydraulic Evaluation of Landfill Performance (HELP) analysis was performed to determine the leachate generation rate from the open cell. The HELP analysis indicated that ~2.8 acre-feet annually of leachate is collected over the liner and would be required to contain the leachate generation volume from the largest cell (Cell E-3) when it is open with no waste over the liner. This required capacity diminishes as waste thickness is increased over the liner system. A HELP analysis summary memo and results are provided in **Attachment D**. In either case, the LEP must also provide storage for incidental precipitation over the 2-acre pond footprint, requiring an additional 0.77 acre-feet.
Therefore, the LEP has a design storage capacity of 9.3 acre-feet. The LEP will also have three feet of freeboard above the design waterline which is not included in the design capacity. This complies with **19.15.36.17.B(12)** requiring three feet of freeboard and **19.15.36.17.B(12)** limiting the maximum size of evaporation ponds to 10 acre-feet.

2.7 Base Liner System

The Facility is proposing two base liner systems one for the landfill cells and one for the leachate evaporation pond. Details showing the bottom liner systems can be found in the **Permit Drawings** in **Appendix K** of the PA.

The typical landfill liner system will consist of (from bottom to top):

- A prepared subgrade layer on the cell floor and on the side slopes to provide a smooth surface for geosynthetic deployment;
- Low Permeability Clay Base Layer. The field geologic/hydrogeological investigation (See **Appendix I** of the PA) generally characterized the potential excavated soil as sandy with permeabilities ranging from $1.09x10^{-6}$ cm/sec to $6.5x10^{-5}$ cm/s. Thus, this soil is not favorable for a compacted clay liner. In addition, groundwater was not encountered within 100 feet of the lowest proposed landfill cell elevation. Therefore, NGL proposes to install a geosynthetic clay liner (GCL) in lieu of the prescriptive base layer (**19.15.36.14.C(1)**) two-feet of compacted clay with hydraulic conductivity of $1x10^{-7}$ cm/s or less. GCLs are commonly installed in landfill liner systems as an alternative to compacted clay in similar conditions, and have hydraulic conductivities as low as $1x10^{-8}$ – $1x10^{-10}$ cm/s (Daniel 1993)
- A secondary 60-mil thick textured high-density polyethylene (HDPE) geomembrane liner, in compliance with **19.15.36.14.C(2)**;
- Leak detection drainage layer. For ease of construction and to maximize potential landfill airspace, NGL proposes using a 200-mil HDPE bi-planar geonet composite (Geocomposite) leak detection drainage layer in lieu of the prescriptive (**19.15.36.14.C(3)**) two feet of compacted soil with a hydraulic

conductivity of $1x10^{-5}$ cm/s or greater. Drainage geocomposites consist of a biplanar geonet with geotextile filters heat bonded to both sides and are commonly installed in landfill liner leak detection systems as an alternative to a soil drainage layer due to their superior hydraulic performance obtaining hydraulic conductivities of up to 10 cm/s. The geocomposite, in conjunction with the textured geomembrane, also provides additional friction for greater slope stability;

- A primary 60-mil thick textured HDPE geomembrane liner in compliance with **19.15.36.14.C(4)**);
- Leachate collection and removal system. For ease of construction and to maximize potential landfill airspace, NGL proposes 200-mil HDPE bi-planar geocomposite leachate drainage layer in lieu of the prescriptive (**19.15.36.14.C(5)**) two-feet of compacted soil with a hydraulic conductivity of $1x10^{-2}$ cm/s or greater. This concept provides a high transmissivity (K up to 10 cm/s) blanket over the entire cell rather than intermittent collection laterals, giving greater leachate collection coverage;
- 2-feet of highly permeable protective cover soil, $1x10^{-2}$ cm/s or greater, in compliance with (**19.15.36.14.C(6)**).

The typical leachate evaporation pond liner system will consist of (from bottom to top):

- A prepared subgrade layer on the cell floor and on the side slopes to provide a smooth surface for geosynthetic deployment;
- Secondary 60-mil thick HDPE geomembrane liner, in compliance with **19.15.36.17.B(8)**.
- Leak detection drainage layer. For ease of construction, NGL proposes a 200-mil Geocomposite leak detection drainage layer in lieu of the prescriptive (**19.15.36.17.B(9)**) two-feet of compacted soil with a hydraulic conductivity of $1x10^{-5}$ cm/s or greater. Geocomposites are commonly installed in leak detection systems as an alternative to soil drainage layers due to their superior hydraulic performance obtaining hydraulic conductivities of up to 1-5 cm/s;
- Primary 60-mil thick textured HDPE geomembrane liner in compliance with **19.15.36.17.B(7)**).

See **Attachment D** for a HELP model demonstrating equivalent performance to the prescriptive base line system defined in **19.15.36.14.C**. The modeling was performed in two tiers as directed by the New Mexico Environmental Department guidance document; *Performance Demonstration for an Alternative Cover Design Under Section 502.A.2 of the New Mexico Solid Waste Regulations (20 NMAC 9.1) Using HELP Modeling.* Tier 1 of the modeling first demonstrates the alternative liner's equivalent performance to the prescriptive liner and compliance with maintaining no more than 12-inches over the liner under open cell conditions. Tier 2 of the modeling demonstrates the alternative liner's performance under four operational

conditions: open, partially filled, completely filled and closed with no established vegetation, and completely filled and closed with established vegetation. Tier 2 demonstrates that in all conditions no liquids will percolate through the liner and into the subsurface, thus protective of groundwater.

See **Attachment E** for liner design calculations of the following:

- E1 - Foundation and Waste Settlement and resulting tensile stresses on the base liner and final cover systems
- E2 - Tensile Stress due to equipment loading
- E3 - Anchor trench pullout
- E4 - Geocomposite performance under overburden compression

2.8 Leachate and Leak Detection Collection and Recovery System

Landfill

The leachate and leak detection collection and recovery systems follow identical flow paths. Leachate generated from each landfill cell and leaks (if any) through the primary liner will flow through the associated lateral geocomposite drainage layer sloped at a minimum of 2% and directed towards a leachate and leak detection collection sump. The leachate collection system incorporates a perforated six-inch HDPE SDR-11 collection pipe embedded in a gravel trench one foot deep, generally along the cell centerline, with flow towards and terminating in the leachate collection sump.

The leachate collection sumps have a top dimension of 35 feet by 35 feet and are two feet deep with 3H:1V side slopes. The leak detection sumps sit directly below the leachate collection sumps and are a continuation of the leachate sump geometry another two feet deeper. The leachate sump and leak detection sump are separated by the 60-mil HDPE primary geomembrane. Each sump is equipped with an 18-inch HDPE SDR-17 leachate pump side-slope riser pipe, a 6-inch HDPE SDR-11 collection line cleanout riser, and a 12-inch HDPE SDR-17 leak detection witness riser. The riser pipes will be embedded into a side-slope trench for protection of the pipes and the liner system. The risers will daylight at the top of landfill cell slope and be protected by a concrete headwall and capped with blind flanges. The 18-inch riser will be equipped with a submersible pump that will transfer the liquids collected in the sump via a flexible hose to a 4-inch force main/carrier pipe. The force 4-inch main/carrier pipe will transfer the liquids to the on-site leachate evaporation pond. A typical pump cycle stroke that the operator may use is ON at 6-inches, OFF at 20-inches, HIGH ALARM at 22-inchs, and HIGH-HIGH ALARM at 24-inchs. The operator may alter this pump stroke as needed by operations. The HIGH ALARM typically will illuminate a beacon and/or sound an audible alarm until the level drops. The HIGH-HIGH ALARM will be equipped with an auto dialer that will notify the site manager so that the liquid level can be managed and reduced.

Leachate Evaporation Pond

The leak detection collection and recovery system for the leachate evaporation pond will collect leaks (if any) through the primary liner. Liquids collected will flow through the associated lateral geocomposite drainage layer sloped at a minimum of 2% and directly towards a leachate and leak detection collection sump.

The leak detection collection sump has a top dimension of 20-feet by 20-feet and is 2-feet deep with 3H:1V side slopes. The sump is equipped with a 12-inch HDPE SDR-17 leak detection witness riser.

Details I-O of the Permit Drawings in **Appendix K** of the PA depict the general configuration of the leachate and leak detection systems for both the landfill cells and the leachate evaporation pond.

See **Attachment E** for pipe design calculations of the following:

- Leachate Pipe Size and Perforation Design
- Drainage Rock sizing and Bedding Strain
- Pipe Ring Deflection
- HDPE pipe wall buckling under waste compression
- HDPE pipe wall crushing under waste compression

2.9 Final Cover System

Final waste slopes will be no steeper than 4H:1V. A final cover system will be installed over the final waste surface which will include surface-water control berms that will be constructed on the final cover system with approximately 25 ft. of vertical spacing between benches. While the interior of the berms will be 4H:1V, the exterior bench slope will be 3H:1V. The berms will be directed to rip-rap lined let-down structures built into the final cover system. The typical final cover system for the landfill will consist of (from top to bottom):

- A soil erosion/vegetation layer composed of at least 12-inches of vegetated soil. A 70% coverage of at least two native grasses shall be maintained in accordance with the post closure provisions of 19.15.36.18.C.2.b. The seed list shall conform to the most recent list from NMDOT Revegetation Zone 5 – Southern Desertic Basins, Plains, and Mountains.
- A compacted soil infiltration barrier layer composed of at least 36-inches of soil with a permeability of 1x10-5 cm/s or less.
- A compacted soil intermediate cover layer composed of at least 12-inches of soil with a permeability of 1x10 5 cm/s or less.

See **Attachment D** for a HELP model demonstrating equivalent performance to the prescriptive base line system defined in **19.15.36.14.C**. The modeling was performed in two tiers as

directed by the New Mexico Environmental Department guidance document; *Performance Demonstration for an Alternative Cover Design Under Section 502.A.2 of the New Mexico Solid Waste Regulations (20 NMAC 9.1) Using HELP Modeling.* Tier 1 of the modeling first demonstrates the alternative liner's equivalent performance to the prescriptive liner and compliance with maintaining no more than 12-inches over the liner under open cell conditions. Tier 2 of the modeling demonstrates the alternative liner's performance under four operational conditions: open, partially filled, completely filled and closed with no established vegetation, and completely filled and closed with established vegetation. Tier 2 demonstrates that in all conditions no liquids will percolate through the liner and into the subsurface, thus protective of groundwater. All HELP model simulations assumed that native soils can achieve a compacted hydraulic conductivity of at least $1x10^{-5}$ cm/s based on the permeability testing results of onsite soils presented in **Attachment A of Appendix I** of the Permit Narrative. When approaching a closure selected stockpiles or borrow areas to be used for closure material will be sampled and tested. If testing results in a permeability greater than $1x10^{-5}$ cm/s the alternative cap thickness shall be adjusted accordingly at that time to maintain equivalent performance.

2.10 Slope Stability Analysis

Terracon has performed a comprehensive slope stability analysis of the cell excavation side slopes, base liner configuration, final waste slopes, and final cover system configuration as defined in previous sections. This analysis was performed using Geo-Slope International SLOPE-W® software. In summary, the 3H:1V excavation slope is stable upon placement of the base liner system with a minimum factor of safety of 1.6 in the Phase 2 critical slope. The 4H:1V waste fill slopes and final cover system are stable with a minimum factor of safety of 2.3 on the Phase 2 critical slope. Please see **Attachment G** for a comprehensive slope stability report and summary of modeling results.

3.0 19.15.36 DESIGN COMPLIANCE SUMMARY

The New Mexico design criteria for surface waste management landfills are contained in **19.15.36.14** and the design criteria for leachate evaporation ponds are contained in **19.15.36.17**. The following discussion lists the design criteria contained in these regulations and how the proposed Facility design complies.

Landfill Base Liner Design Requirements:
19.15.36.14.C Landfill Design Specification

As discussed in Sections 2.7 – 2.9, the proposed landfill has been designed with the required components.

19.15.36.14.C(1) Base Layer

As discussed in Section 2.7, due to the absence of suitable clayey materials onsite, and the groundwater setting, NGL proposes an alternative base layer consisting of a reinforced geosynthetic clay liner. Typical GCLs specified for landfill liner systems have hydraulic conductivities less than $1x10^{-9}$ cm/s (EPA 2001).

19.15.36.14.C(2) Lower Geomembrane

As discussed in Section 2.7, the lower membrane shall consist of 60-mil HDPE, in compliance with this regulation.

19.15.36.14.C(3) Leak Detection System

As discussed in Sections 2.6 - 2.8 NGL proposes to install an alternative leak detection system comprised of a 200-mil HDPE geocomposite blanket drainage collection system in lieu of soil and piping as prescribed. HDPE has high chemical resistance to oil field wastes and the leak detection system is sloped at 2% in the lateral direction compliant with this regulation.

19.15.36.14.C(4) Upper Geomembrane

As discussed in Sections 2.7 the upper membrane shall consist of 60-mil HDPE, in compliance with this regulation.

19.15.36.14.C(5) Leachate Collection and Removal System

As discussed in Sections 2.6 - 2.8 NGL proposes to install an alternative leachate collection and removal system comprised of a 200-mil HDPE Geocomposite blanket drainage collection system in lieu of soil and piping as prescribed.

In compliance with this regulation, HDPE is the material proposed for geomembrane and piping, which has high chemical resistance and is proven to withstand attack from oil field wastes. The leachate collection and removal systems are sloped at 2% in the lateral direction. The central collection trench pipe is a perforated 6-inch HDPE pipe, which will be protected by a drainage rock backfill and equipped with a solid cleanout riser embedded into a side slope riser trench. The leachate is collected in a centralized sump and conveyed to a leachate evaporation pond outside of landfill perimeter within a 4-inch double-walled HDPE force main.

19.15.36.14.C(6) Liner Protection Layer

As discussed Section 2.7 the liner system will be overlain with two-feet of protective soil cover with a saturated hydraulic conductivity of $1x10^{-2}$ cm/s or greater, in compliance with this regulation.

Landfill Final Cover System Design Requirements:

19.15.36.14.C(8) Final Cover System

As discussed in Section 2.6, 2.7, and 2.9, the final waste slopes shall not exceed 4H:1V or be less than 4% in compliance with this regulation. The final cover system shall include an alternative final cover system as defined in **Section 2.**

19.15.36.14.C(9) Alternative materials

NGL is proposing the use of reinforced GCL as the base foundation layer in place of two feet of compacted clay and 200-mil HDPE geocomposite in place of high permeability soils for drainage. **Attachment E** provides a demonstration of geocomposite hydraulic performance under these conditions.

19.15.36.14.C(10) External Piping

All leachate and leak detection riser piping will be installed along the side slopes of the cells in compliance with this regulation. Liner penetrations are not proposed.

19.15.36.14.D(1) Liner Specifications and Requirements - Geomembranes

(a) In compliance with this regulation, all geomembranes are specified as 60-mil textured HDPE. HDPE geomembranes have published permeabilities as low as $1x10^{-15}$ cm/s (Webber 2005) and have high chemical resistance with proven resistance to hydrocarbons, salts, acidic and alkaline solutions. HDPE also has a high UV resistance when exposed to sunlight.

(b) As provided in **Attachment E,** the membrane is designed to withstand projected stresses and settling from overlying waste and equipment operations.

(c) As designed, the base liner system maintains a minimum 2% lateral slope to promote positive drainage and to facilitate leachate collection and leak detection.

19.15.36.14.D(2) Liner Specifications and Requirements – Additional Geomembrane Requirements

(a) HDPE geomembranes have published and field proven high chemical resistance with resistance to chemical attack from oil field waste and resulting leachate.

(b) The base liner system has a maximum slope of 3H:1V which has been shown to be stable in the slope stability analysis in **Attachment G,** which considers the soil-geosynthetic and geosynthetic-geosynthetic interface friction angles.

(c) In general, all HDPE liner systems will be installed in compliance with this regulation as specified in the Construction Quality Assurance Plan provided in **Attachment H**.

19.15.36.14.E Requirements for Soil Components

(1) The prepared subgrade for the base liner system will be compacted to at least 90% standard Proctor (ASTM D-698), see **Attachment H**.

(2) All soil surfaces to receive geosynthetics will be prepared in compliance with this regulation, See **Attachment H.**

(3) As previously discussed, NGL proposes to replace the compacted clay foundation layer with a reinforced GCL, thus this regulation in not applicable.

19.15.36.14.F Soil Material Requirements for the Leachate Collection and Recovery System and Leak Detection System

(1) As previously discussed, NGL proposes to replace the prescribed soil drainage materials with a 200-mil HDPE geocomposite, thus this regulation in not applicable.

19.15.36.14.G Landfill Gas Control System

NGL is not required to, nor is proposing to install a landfill gas control system for this landfill at this time.

Leachate Evaporation Pond (LEP) Construction Standards:

19.15.36.17.A Engineering Design Plan

This EDR includes design information for the LEP and its liner system, which is certified by Michael Bradford, P.E. The overall PA for the Facility incorporates and integrates the LEP operation and maintenance procedures (**Appendices D** and **E** of the PA), closure planning (**Appendix G** of the PA), and hydrologic information (**Appendix I** of the PA). Thus, the overall PA demonstrates compliance with this regulation.

19.15.36.17.B Construction Standards

(1) The LEP has been designed as prescribed in the Regulations, thus protective of fresh water, public health, and the environment.

(2) The proposed LEP is designed with a primary and secondary 60-mil HDPE geomembrane with a leak detection layer between them.

(3) In compliance with this regulation, the primary and secondary liners are specified as 60-mil textured HDPE. HDPE geomembranes have published permeabilities as low as $1x10^{-15}$ cm/s (Webber 2005) and have high chemical resistance with proven resistance to hydrocarbons, salts, acidic and alkaline solutions. HDPE with carbon black also has a high UV resistance when exposed to sunlight.

(4) NGL is proposing to use 200-mil HDPE geocomposite in place of high permeability soils for drainage. **Attachment E** provides a demonstration of geocomposite hydraulic performance under these conditions.

(5) As discussed in Section 2.6 and **Attachment H,** the pond has been designed and will be constructed in compliance with this regulation.

(6) The discharge point of the leachate force main into the pond will be reinforced to protect the liner system from excessive hydrostatic force. No liner penetrations are proposed.

(7) As discussed in Section 2.7 the primary liner shall consist of 60-mil HDPE, in compliance with this regulation.

(8) As discussed in Section 2.7 the secondary liner shall consist of 60-mil HDPE, in compliance with this regulation.

(9) As discussed in Sections 2.6 - 2.8 NGL proposes to install an alternative leak detection system comprised of a 200-mil HDPE geocomposite blanket drainage collection system in lieu of soil and piping as prescribed. HDPE has high chemical resistance to oil field wastes and the leak detection system is sloped at 2% in the lateral direction, compliant with this regulation. Discharge from this pond is not proposed.

(10) Not applicable

(11) The LEP has been designed with 3-feet of freeboard under the worst-case leachate generation condition, See **Attachment C.**

(12) The LEP has a leachate storage capacity of approximately 9.3 acre-feet, in compliance with this regulation which limits the capacity of evaporation ponds to 10 acre-feet.

4.0 REFERENCES

Daniel, D.E. and Estornell P. (1991) “Hydraulic Conductivity of Three Geosynthetic Clay Liners” *Journal of Civil Engineering* 118(10) 2605.

U.S. EPA. 2001. **Geosynthetic Clay Liners Used in Municipal Solid Waste Landfills**. EPA530-F-97-002. Solid Waste and Emergency Response. December.

Weber, C.T., and Zornberg, J.G. (2005). Leakage through Liners under High Hydraulic Heads." Geosynthetics Research and Development in Progress, Eighteenth Geosynthetic Research Institute Conference (GRI-18), Austin, Texas, January 26

Attachment A
Run-on and Run-off Surface Water Management Report

CALCULATIONS BY: Michael P. Bradford, P.E. – Senior Project Manager
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I. RUN-OFF SURFACE WATER MODELING

MODELING METHOD

Autodesk Storm and Sanitary Analysis 2019 (SSA)

ANALYSIS

A detailed engineering analysis was performed on the components that comprise the stormwater management system for surface water run-off within the facility boundaries. The components analyzed for this permit modification include:

1. Stormwater Let-down Structures
2. Slope Integrated diversion channels
3. Perimeter Ditches
4. Stormwater Ponds

As required by ***NMAC 19.15.36***, the hydrologic analysis was performed utilizing a 25-year, 24-hour rainfall event. SSA was utilized to perform the engineering analysis to assure compliance with the above regulations. The analysis was performed for the post development conditions of the Facility. This is considered to be a conservative approach for the design capacity of the stormwater pond and other conveyance features.

SSA was utilized to illustrate the capacity of the stormwater let-down structures, slope integrated berms, and perimeter ditches. These results were generated to assure that the conveyance parameters of stormwater design elements are adequate.

PARAMETERS USED IN THE ANALYSES

The following are the lists of parameters that were considered for stormwater management:

Based on ***NMAC 19.15.36,*** a 25-year, 24-hour rainfall event was considered for design of the proposed landfill permit area. The proposed disposal area was first segregated into 69 sub-basins, 99 nodes, and 102 links, then the areas were determined. It was concluded that the Landfill would fall into the Type II rainfall distribution as published by the Nation Resource Conservation Service (NRCS). The 25-year, 24-hour rainfall data for Lea

County was available within the SSA. The EPA SWMM hydrology method was used due to its flexibility, such as allowances for existing soil moisture and evaporation.

For each element in the design, the following parameters, if applicable, were input or calculated using the SSA software and dialogue box selections, typical values or site design information:

- Run-off Curve Number
  - Data gathered from NRCS Web Soil Survey and TR-55 Tables
    - Ratliff-Wink Fine Sandy Loams and Kermit-Palomas Fine Sands.
      - Hydraulic Soil Group B.
    - CN = 86 from Table 2-2a of the TR-55 Manual for “Newly Graded, Pervious Areas, No Vegetation”
- Area (Ac);
  - Automatically calculated based on site design
- Impervious Area (%);
  - 0% assumed globally this site is not expected to have significant areas of pavement
- Drying Time (days);
  - 2 days assumed globally
- Average Slope (%);
  - 1% for side slope berms
  - 1.5% min for perimeter channels
  - 4 horizontal to 1 vertical for waste side slopes
  - 4% waste top deck
  - 0.5% for entrance/admin/staging area
- Equivalent Width (ft)
  - Critical flow path as determined by site design
- Pervious Area Manning’s Roughness, taken from SSA databases;
  - 0.22 for Landfill – “poor grass cover, moderately rough surface”
  - 0.15 for Entrance/Admin/Staging area – “Gravel”
  - 0.35 for Let-down Structures, “rip-rap”
- Link Invert Information (elevation)
  - Taken from site design
- Link Cross Section
  - V-ditch for all side slope diversion channels
  - Trapezoidal ditch for all let-down structures and perimeter ditches
  - Circular for all culverts

SUMMARY OF RESULTS

Stormwater Let-down Structures

Four (4) stormwater let-down structures are planned for the final landfill configuration, beginning with let-down structure 1 in the northeast landfill face of the finished landfill and distributed clockwise around the landfill to let-down structure 4 on the northwest face of the landfill. Each of these let-down structures has been designed with a 10-foot bottom width, 2' depth, 3:1 side slopes, and 25% flowline slope. The flow capacity of these let-down structures is approximately 850 cubic feet per second (cfs). The SSA calculated maximum peak flow values from a 25-year, 24-hour rainfall event for lower most design segments of the let-down structures range from 150 CFS to 280 cfs. The SSA generated output tables for the stormwater analysis can be found in **Exhibit A.2, also see Figures depicting links, junctions, basins, and storage nodes for visual reference in Exhibit A.1**.

Slope Integrated Berms

The landfill slope integrated berms were designed assuming that the berms would collect and transfer the entire area of each let-down sub-basin run-off volume. With this assumption, the maximum flow to be carried in a slope integrated berm is ~24 cubic feet per second (cfs). Each let-down has at least seven slope integrated berms with contributing drainage areas varying in size. The slope integrated berms will be sloped at 1 percent and have a depth of 1.5-feet, providing a maximum flow capacity of approximately ~42 cfs. The side slopes of the berms will be 4:1 (using the 4:1 final cover system of the landfill for the interior side) and 3H:1V on the exterior slope.

Perimeter Ditches

The perimeter channels along the west, south, and north sides have been designed with a 10-foot bottom width, 3-foot depth, 4:1 side slopes, and a flowline slope of 1.5% minimum. The perimeter channel along the east side has been designed with a 6-foot bottom width, 3-foot depth and 4:1 side slopes.

- West Ditch (Link 9 and Link 28)
  - Design Capacity ~415 cfs
  - Peak Flow during design storm ~304 cfs
- South Ditch – 1 (Link 48)
  - Design Capacity ~585 cfs
  - Peak Flow during design storm ~14 cfs
- South Ditch – 2 (Link 51)
  - Design Capacity ~400 cfs
  - Peak Flow during design storm ~34 cfs
- East Ditch (Link 18 and Link 50)
  - Design Capacity ~310 cfs
  - Peak Flow during design storm ~297 cfs
- Northeast Ditch (Link 26 and Link 49)

- Design Capacity ~395 cfs
- Peak Flow during design storm ~196 cfs

- Northwest Ditch (Link 27)
  - Design Capacity ~714 cfs
  - Peak Flow during design storm ~553 cfs

See **Exhibit A.1** for results

Culverts

Each of the perimeter ditches must transition through a culvert below the main access/haul roads prior to entering one of the three retention ponds. Culverts are size to flow approximately half full at peak discharge. To minimize entrance losses and surcharging, the culverts will be installed with approximately half of the pipe installed below the flow line of the channel. The following is a summary of the culverts proposed:

- Northeast Culvert (Link 99)
  - 3 barrel, 36-inch concrete pipe
  - Design Flow = 223 cfs
  - Peak Flow during design storm = 164 cfs
- Northwest Culvert (Link 100)
  - 3 barrel, 36-inch concrete pipe
  - Design Flow = 222 cfs
  - Peak Flow during design storm = 195 cfs
- East Culvert (Link 40)
  - 2 barrel, 48-inch concrete pipe
  - Design Flow = 375 cfs
  - Peak Flow during design storm = 297 cfs
- Southeast Culvert (Link 39)
  - 2 barrel, 36-inch concrete pipe
  - Design Flow = 204 cfs
  - Peak Flow during design storm = 34 cfs
- Southwest Culvert (Link 38)
  - 2 barrel, 24-inch concrete pipe
  - Design Flow = 55 cfs
  - Peak Flow during design storm = 13 cfs
- West Culvert (Link 37)
  - 2 barrel, 48-inch concrete pipe
  - Design Flow = 350 cfs
  - Peak Flow during design storm = 304 cfs

Stormwater culvert sizing is presented in **Exhibit A.1, also see Figures depicting links, junctions, basins, and storage nodes for visual reference**.

Stormwater/Sedimentation Ponds

The facility will be required to hold the run-off from a 25-year, 24-hour storm. As shown in **Exhibit A.2,** the three proposed ponds will provide sufficient capacity to retain the entire run-off volume from their associated contributing basins from the 25-year, 24-hour storm event. Each pond has been size to be 10-feet deep with 3:1 side slopes in order to maximize borrow soil generation. These ponds will each have a minimum of 3' freeboard, and some additional capacity in the case that the pond is retaining some liquids already at the time of the design storm event.

II. RUN-ON SURFACE WATER MODELING

MODELING METHOD

USDA, NRCS, Technical Release 55 (TR-55) via Microsoft Excel Spreadsheet

ANALYSIS

A detailed engineering analysis was performed on the stormwater run-on management system. The run-on area is assumed to flow perpendicularly to the Northwest permit boundary. Thus a stormwater run-on diversion channel is proposed along the north boundary that will intercept run-on flow and divert it around the north east and southwest permit boundary corners. Once the flow has passed these corners, the diversion channel will daylight and allow the collected stormwater run-on to dissipate to native ground. The components analyzed for this permit modification include:

1. Run-on Control Diversion Ditch

As required by ***NMAC 19.15.36***, the hydrologic analysis was performed utilizing a 25-year, 24-hour rainfall event. TR-55 manual was utilized to perform the engineering analysis to assure compliance with the above regulations. The analysis was performed for the undeveloped current conditions of the assumed run-on area. This is considered to be a conservative approach for the design capacity of the stormwater pond and other conveyance features.

TR-55 modeled through Microsoft Excel spreadsheet was utilized to illustrate the capacity of the run-on control ditch. These results were generated to assure that the conveyance parameters of stormwater design elements are adequate.

PARAMETERS USED IN THE ANALYSIS

Stormwater Run-on Drainage Basin

The assumed stormwater run-on contributing drainage basin is bound by the Northwest permit boundary and the Highway 128 North of the site. The stormwater run-on contributing drainage basin is approximately 5,555 acres in size. See Figure 1A for a map of the approximated run-on drainage area.

Overland Gradient

It is determined based on USGS Quadrangle Maps and site-specific topographic survey of this facility that the natural surface water gradient is Northwest to Southeast at 0.9%.

Run-off Curve Number

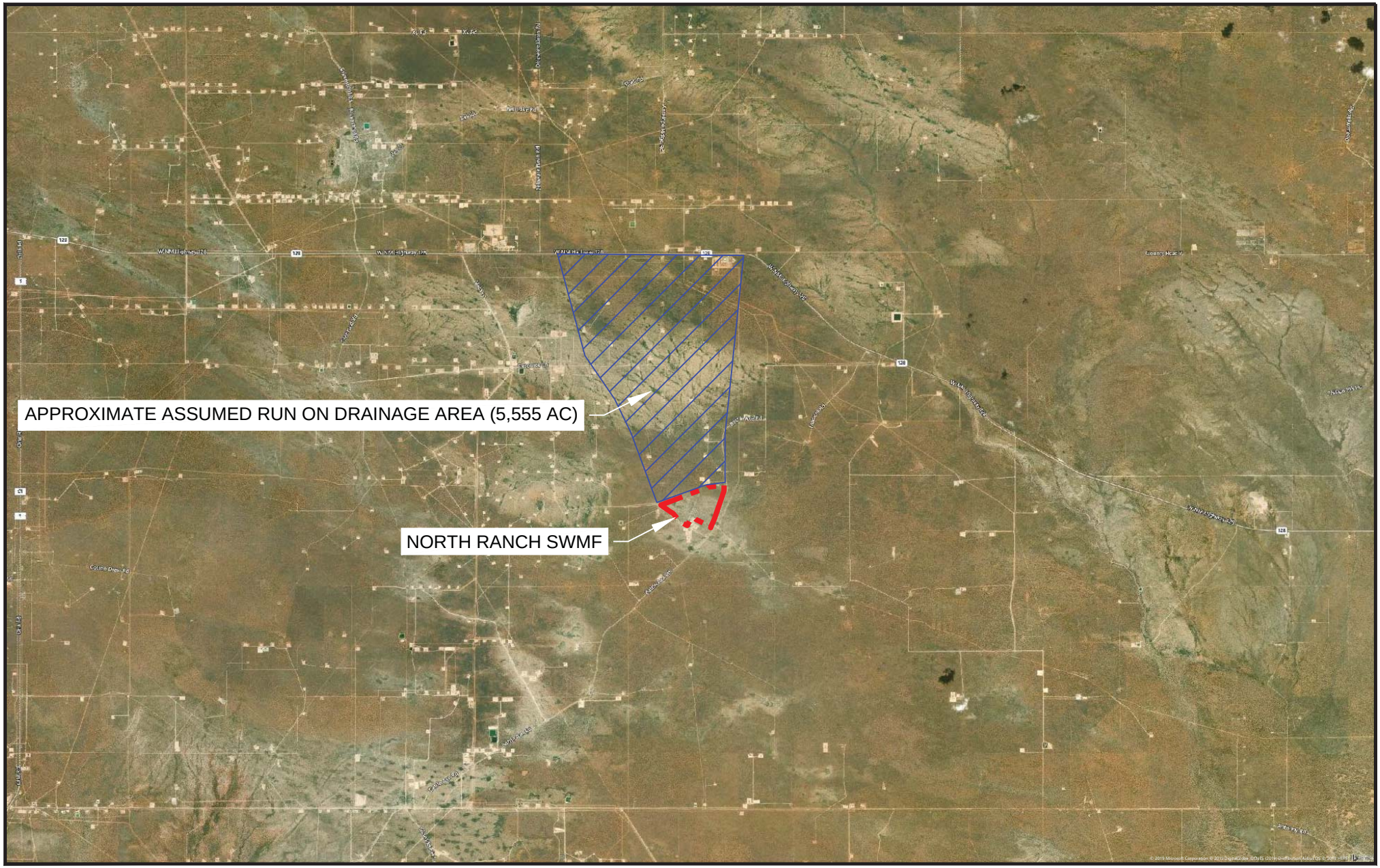
A composite curve number (CN) was generated using the approximate assumed run-on drainage area, and hydraulic soil group, CN information, and approximate areas as calculated using the NRCS web soil survey. Using this information, a composite CN of 42 was calculated for the assumed run-on control area.

SUMMARY OF RESULTS

The TR-55 calculation summarized in **Exhibit A.3** demonstrates that a run-on diversion channel with a 7-foot bottom width, 2 feet deep, with 3:1 side slopes will control the peak discharge from a 25-year, 24-hour storm event from the run-on drainage basin.

In general, a channel with these dimensions, with a traverse slope of 0.1% will have a design capacity of 67cfs. The peak flow from the run-on drainage basin is 132 cfs. However, this flow is split and diverted north and south, thus each channel must have a design capacity of 66 cfs. The proposed run-on diversion ditch will also provide an additional 0.3-feet of freeboard.

Figure A-1
Approximate Run-on Drainage Basin Map



REV.	DATE	BY	DESCRIPTION

Terracon
Consulting Engineers and Scientists
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APPROXIMATE RUN-ON DRAINAGE BASIN MAP

PERMIT APPLICATION FIGURE

SURFACE WASTE MANAGEMENT FACILITY

NORTH RANCH

LEA COUNTY NEW MEXICO

FIG. A-1

DESIGNED BY:	-
DRAWN BY:	DEW
APPVD. BY:	MPB
SCALE:	1" = 100'
DATE:	SEPTEMBER 2019
JOB NO.	35187378
ACAD NO.	572/002
SHEET NO.:	1 OF 1

N:\GEC\ARCHIVE\CAD\572\002\MCCLOY\PERMIT TEXT FIGURES\STORMWATER\FIG 1 - SITE LOCATION MAP.DWG

Exhibit A.1
Run-off Design Figures

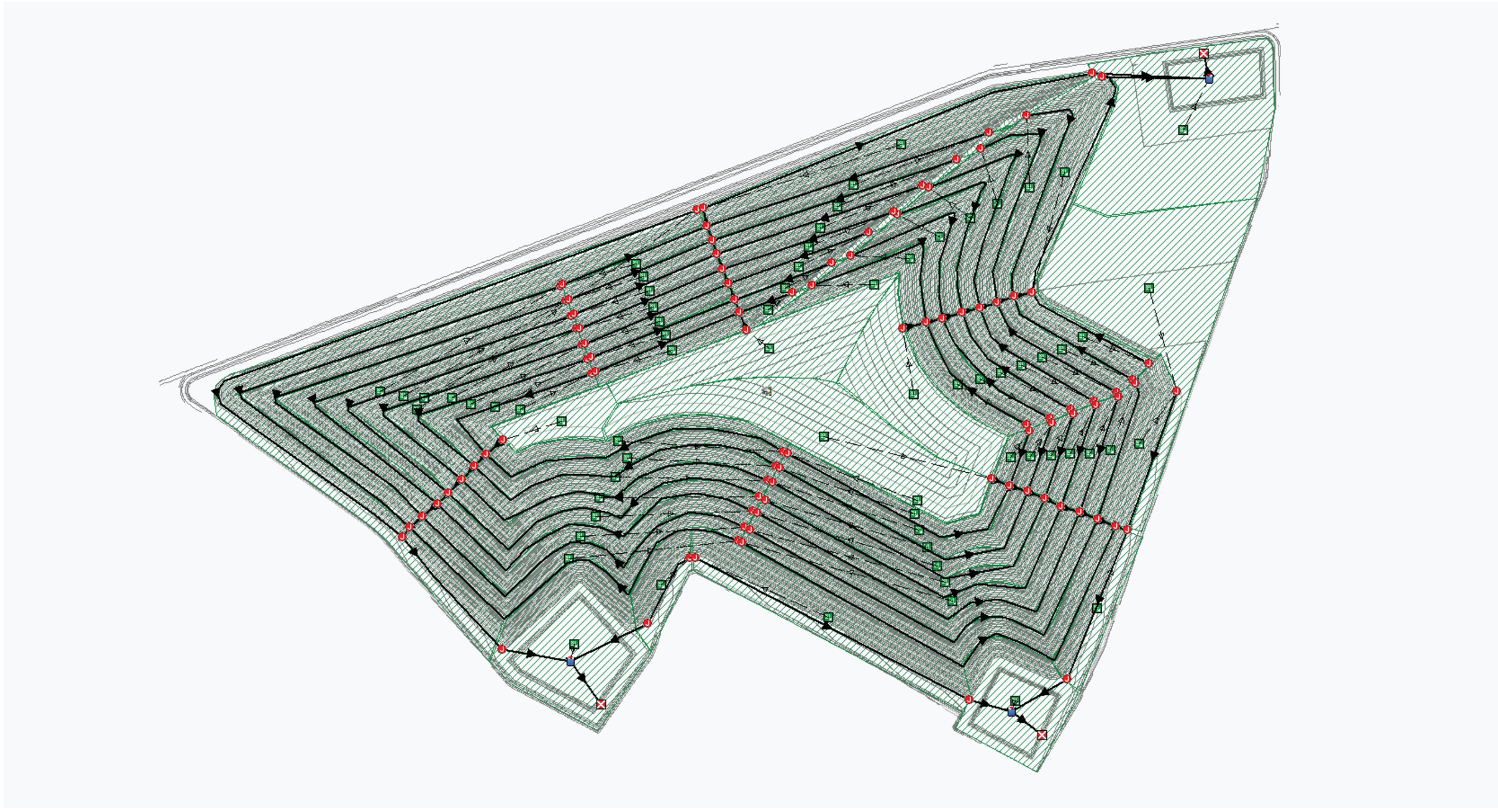
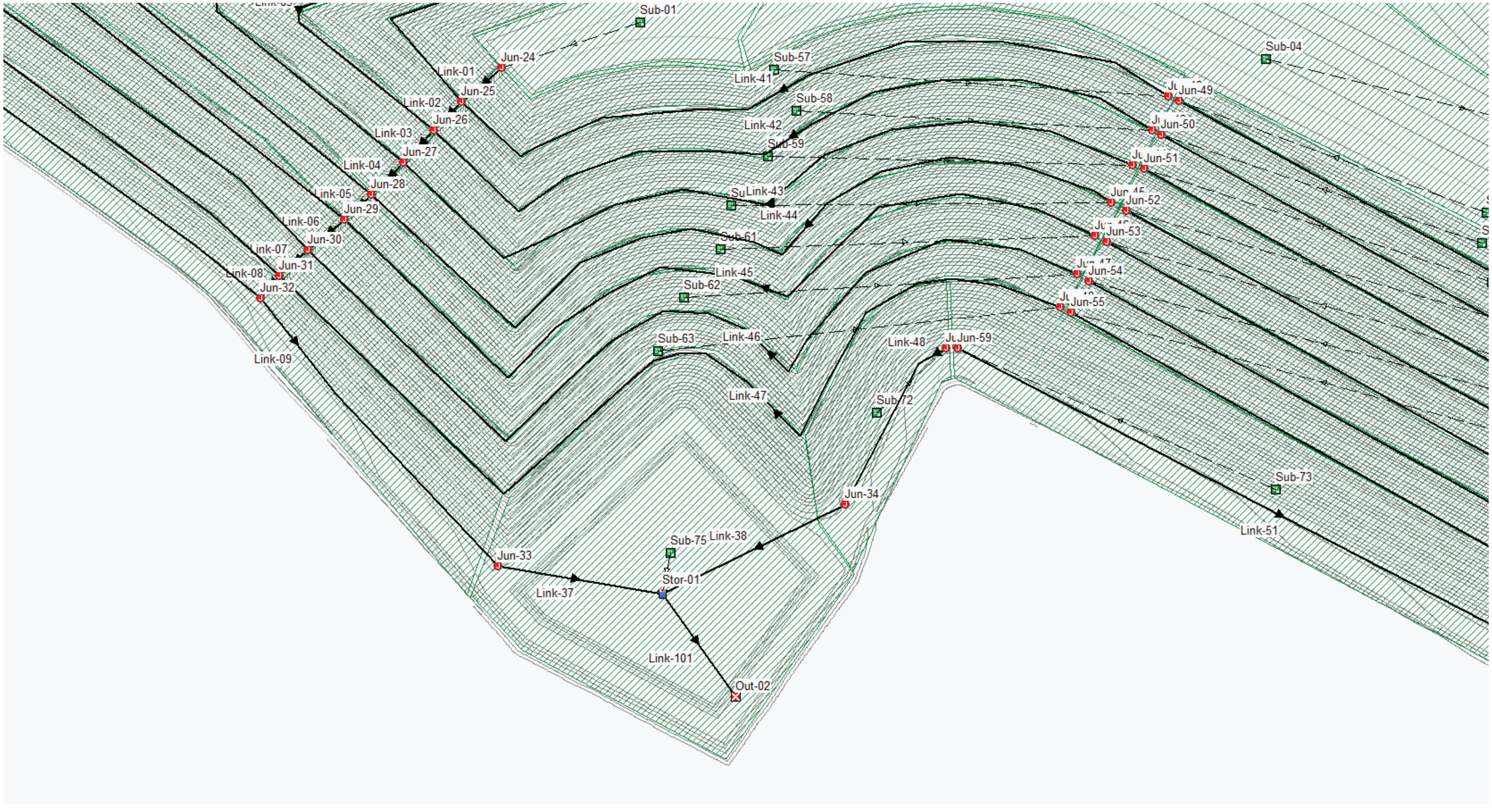
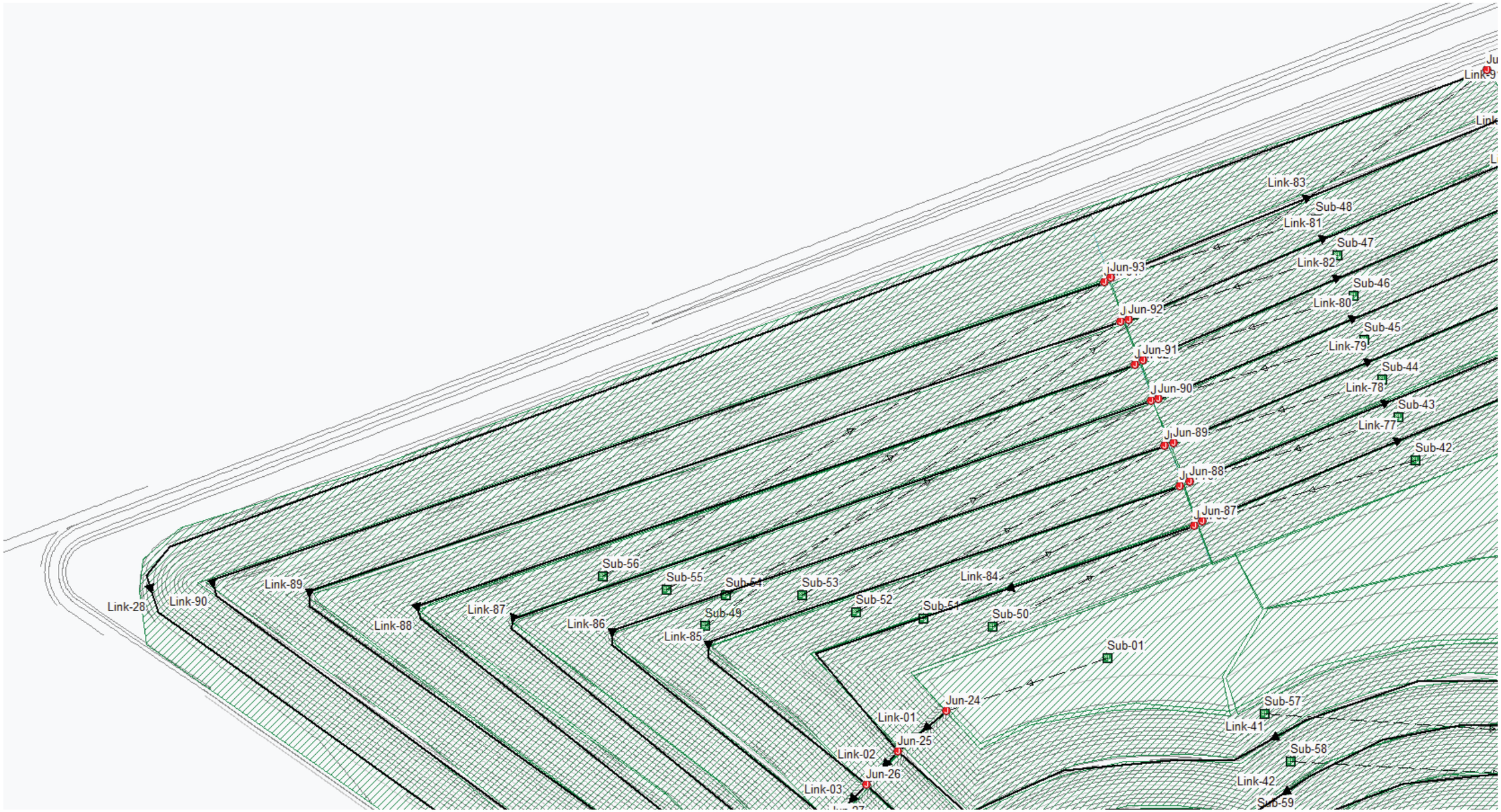
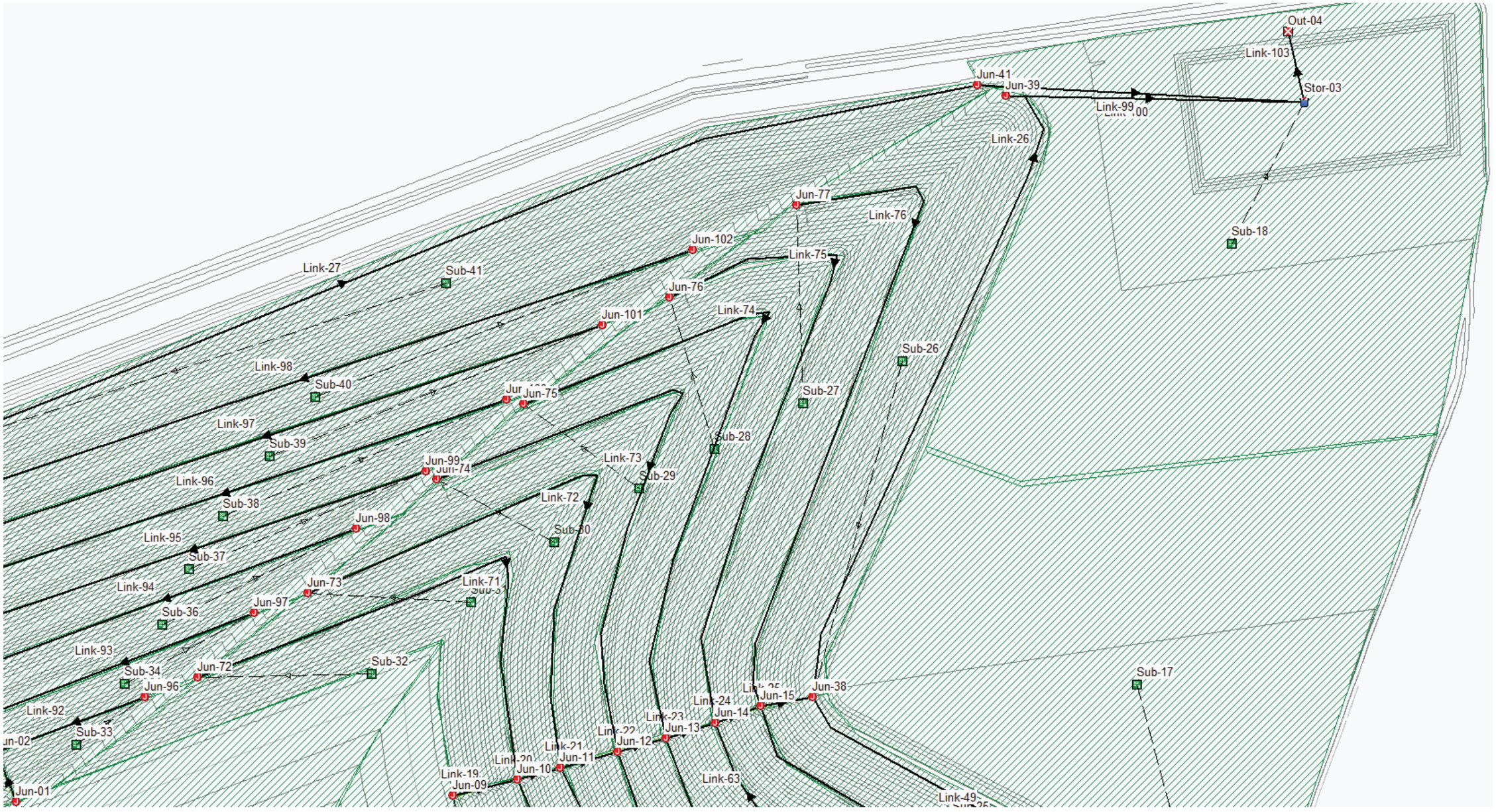
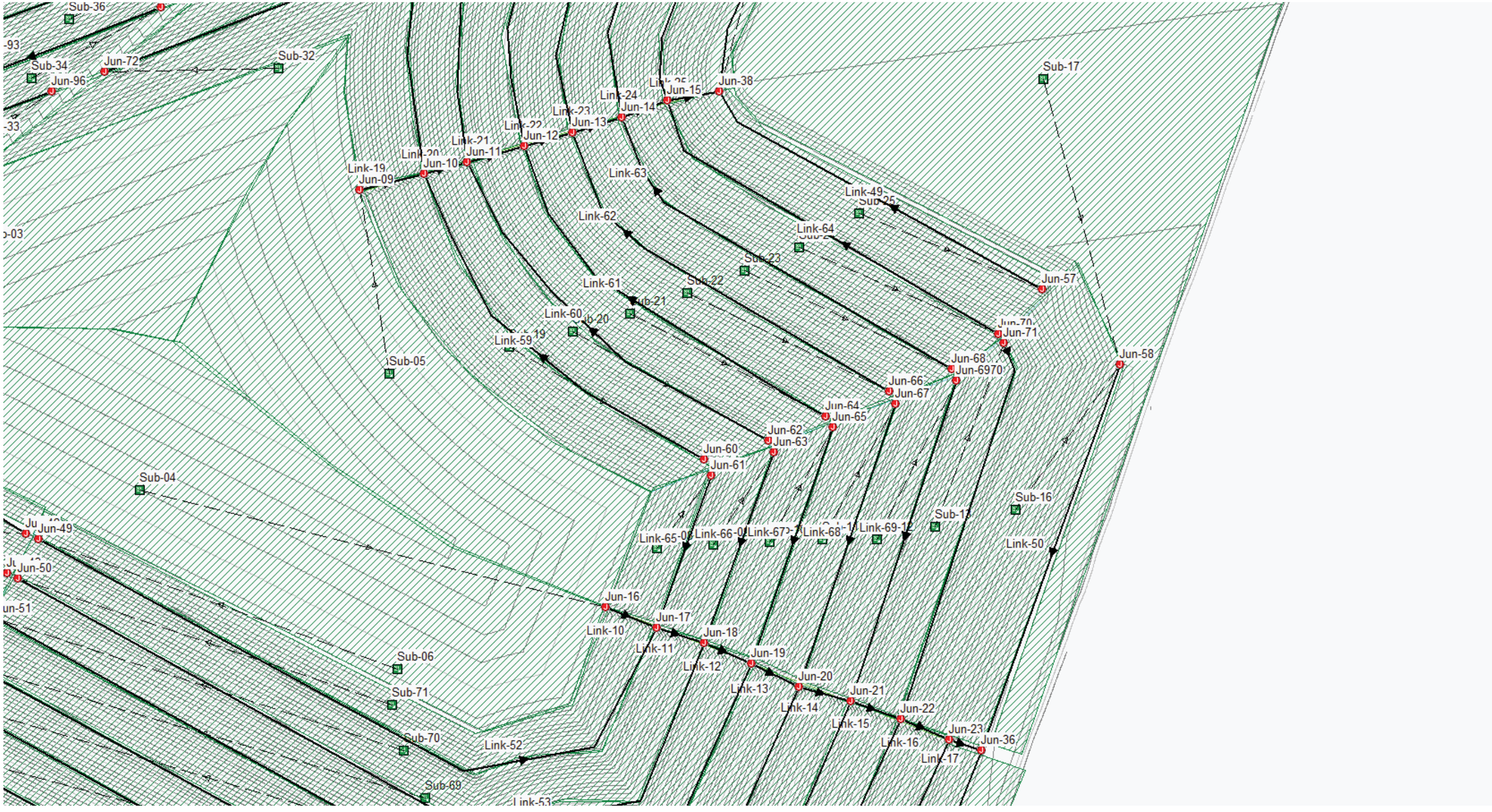


FIGURE 1 - WHOLE SITE


Sub-01
Jun-24
Link-01
Jun-25
Link-02
Jun-26
Link-03
Jun-27
Link-04
Jun-28
Link-05
Jun-29
Link-06
Jun-30
Link-07
Jun-31
Link-08
Jun-32
Link-09
Sub-57
Link-41
Sub-58
Link-42
Sub-59
Link-43
Link-44
Sub-61
Link-45
Sub-62
Sub-63
Link-46
Link-47
Sub-72
Link-48
Jun-59
Sub-04
Jun-49
Jun-50
Jun-51
Jun-52
Jun-53
Jun-54
Jun-55
Sub-73
Link-51
Jun-34
Link-38
Sub-75
Jun-33
Stor-01
Link-37
Link-101
Out-02


Link-83
Sub-48
Link-81
Sub-47
Link-82
Sub-46
Link-80
Sub-45
Link-79
Sub-44
Link-78
Sub-43
Link-77
Sub-42
Jun-93
Jun-92
Jun-91
Jun-90
Jun-89
Jun-88
Jun-87
Link-28
Link-90
Link-89
Link-88
Link-87
Link-86
Link-85
Sub-56
Sub-55
Sub-54
Sub-53
Sub-52
Sub-51
Sub-50
Sub-49
Link-84
Sub-01
Jun-24
Link-01
Jun-25
Link-02
Jun-26
Link-03
Sub-57
Link-41
Sub-58
Link-42
Sub-59


Out-04
Link-103
Stor-03
Jun-41
Jun-39
Link-99
Link-26
Jun-77
Link-76
Sub-18
Jun-102
Link-75
Link-27
Sub-41
Jun-76
Jun-101
Link-74
Sub-26
Link-98
Sub-40
Jun-75
Sub-27
Link-97
Sub-39
Sub-28
Link-73
Jun-99
Jun-74
Sub-29
Link-96
Sub-38
Link-72
Jun-98
Sub-30
Link-95
Sub-37
Link-94
Jun-73
Link-71
Jun-97
Sub-36
Link-93
Sub-32
Jun-72
Sub-34
Jun-96
Sub-17
Jun-38
Jun-15
Link-24
Jun-14
Link-92
Sub-33
Jun-13
Jun-12
Jun-11
Jun-10
Link-19
Jun-09
Link-63
Jun-01
Link-49


Sub-36
Sub-34
Jun-72
Jun-96
Sub-32
Sub-17
Jun-38
Jun-15
Jun-14
Jun-13
Jun-12
Jun-11
Jun-10
Jun-09
Link-24
Link-23
Link-22
Link-21
Link-20
Link-19
Link-63
Link-62
Link-61
Link-60
Link-59
Link-49
Link-64
Sub-25
Sub-23
Sub-22
Sub-21
Sub-20
Sub-19
Sub-05
Jun-57
Jun-71
Jun-70
Jun-68
Jun-6970
Jun-58
Jun-66
Jun-67
Jun-64
Jun-65
Jun-62
Jun-63
Jun-60
Jun-61
Sub-04
Jun-49
Jun-50
Sub-06
Sub-71
Sub-70
Sub-69
Link-52
Link-53
Jun-16
Jun-17
Jun-18
Jun-19
Jun-20
Jun-21
Jun-22
Jun-23
Jun-36
Link-10
Link-11
Link-12
Link-13
Link-14
Link-15
Link-16
Link-17
Link-65-0
Link-66-0
Link-67-1
Link-68
Link-69-12
Sub-13
Sub-16
Link-50

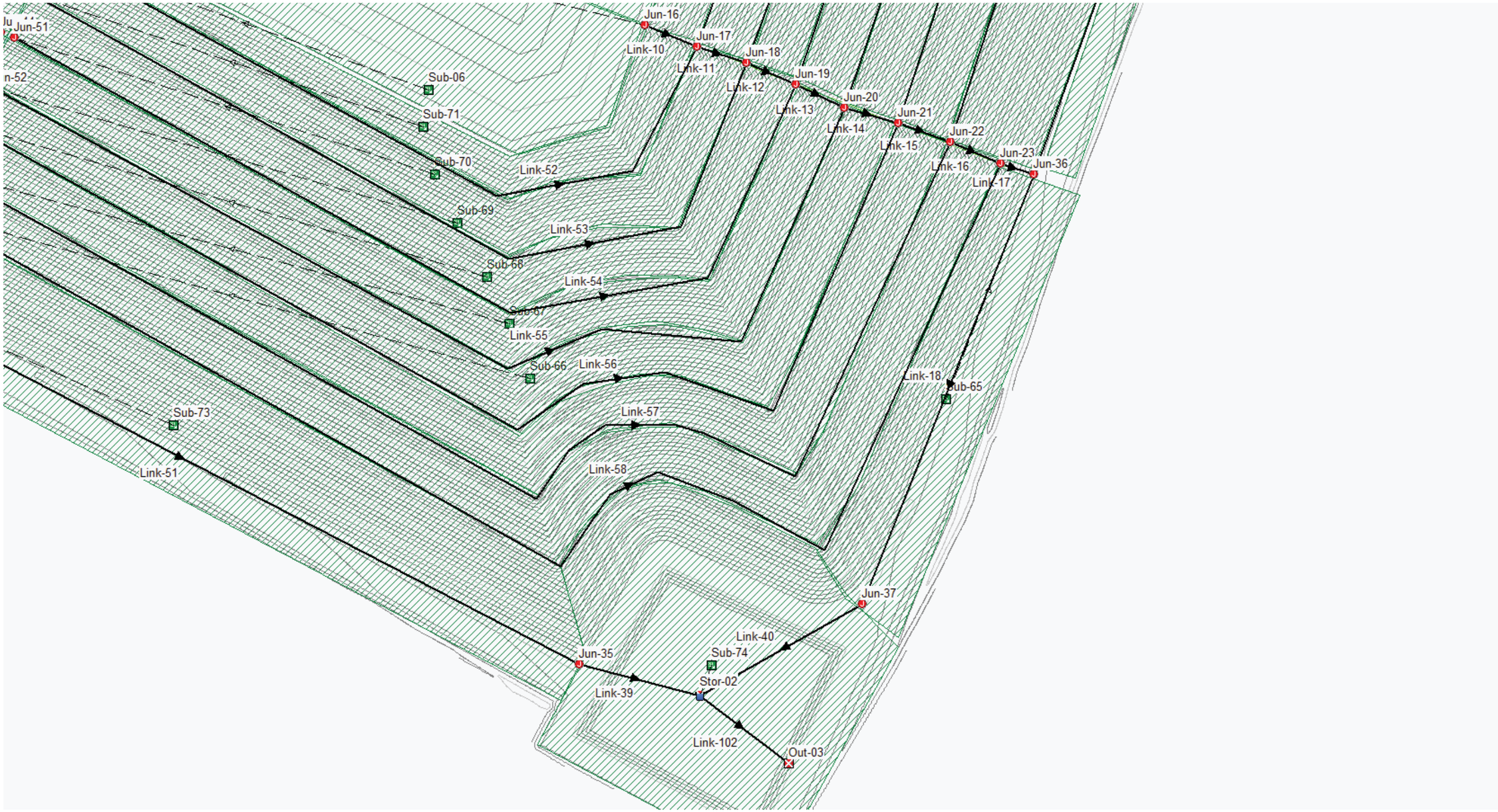

Jun-51
Jun-16
Jun-17
Jun-18
Jun-19
Jun-20
Jun-21
Jun-22
Jun-23
Jun-36
Jun-37
Jun-35
Link-10
Link-11
Link-12
Link-13
Link-14
Link-15
Link-16
Link-17
Link-18
Link-39
Link-40
Link-51
Link-52
Link-53
Link-54
Link-55
Link-56
Link-57
Link-58
Link-102
Sub-06
Sub-65
Sub-66
Sub-67
Sub-68
Sub-69
Sub-70
Sub-71
Sub-73
Sub-74
Stor-02
Out-03

Exhibit A.2
Run-off Design Results
Storm and Sanitary Analysis Results

SN	Element ID	Description	From (Inlet) Node	To (Outlet) Node	Length	Inlet Invert Elevation	Inlet Invert Offset	Outlet Invert Elevation	Outlet Invert Offset	Total Drop	Average Slope	Pipe Shape	Pipe Diameter or Height	Pipe Width	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow	Flap Gate	Lengthening Factor	Peak Flow	Time of Peak Flow Occurrence	Max Flow Velocity	Travel Time	Design Flow Capacity	Max Flow / Design Flow Ratio	Max Flow Depth / Total Depth Ratio	Total Time Surcharged	Max Flow Depth	Reported Condition
					(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(%)		(inches)	(inches)					(cfs)			(cfs)	(days hh:mm)	(ft/sec)	(min)	(cfs)			(min)	(ft)	
1	Link-100		64	Stor-03	576.94	3342.70	0.00	3333.20	0.00	9.50	1.6500	CIRCULAR	36.000	36.00	0.0150	0.5000	0.5000	0.0000	0.00	NO	1.00	194.92	0 12:09	11.90	0.81	222.53	0.88	0.73	0.00	2.14	Calculated
2	Link-37		64	Stor-01	375.70	3330.40	0.00	3323.00	0.00	7.40	1.9700	CIRCULAR	48.000	48.00	0.0150	0.5000	0.5000	0.0000	0.00	NO	1.00	303.60	0 12:11	15.68	0.40	349.43	0.87	0.72	0.00	2.85	Calculated
3	Link-38		64	Stor-01	459.60	3332.00	0.00	3323.00	0.00	9.00	1.9600	CIRCULAR	20.040	20.04	0.0150	0.5000	0.5000	0.0000	0.00	NO	1.00	13.25	0 12:02	7.30	1.05	33.74	0.39	0.44	0.00	0.70	Calculated
4	Link-39		64	Stor-02	233.95	3328.30	0.00	3321.00	0.00	7.30	3.1200	CIRCULAR	20.040	20.04	0.0150	0.5000	0.5000	0.0000	0.00	NO	1.00	33.74	0 12:09	10.84	0.36	42.60	0.79	0.67	0.00	1.12	Calculated
5	Link-40		64	Stor-02	348.09	3328.90	0.50	3321.00	0.00	7.90	2.2700	CIRCULAR	48.000	48.00	0.0150	0.5000	0.5000	0.0000	0.00	NO	1.00	297.37	0 12:08	16.57	0.35	375.09	0.79	0.67	0.00	2.63	Calculated
6	Link-99		64	Stor-03	632.04	3343.60	0.00	3333.20	0.00	10.40	1.6500	CIRCULAR	36.000	36.00	0.0150	0.5000	0.5000	0.0000	0.00	NO	1.00	163.61	0 12:11	11.54	0.91	222.45	0.74	0.64	0.00	1.90	Calculated

SN	Element ID	Description	From (Inlet) Node	To (Outlet) Node	Length	Inlet Invert Elevation	Inlet Invert Offset	Outlet Invert Elevation	Outlet Invert Offset	Total Drop	Average Slope	Channel Type	Channel Height	Channel Width	Left Overbank Manning's Roughness	Channel Manning's Roughness	Right Overbank Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow	Flap Gate	Lengthening Factor	Peak Flow	Time of Peak Flow Occurrence	Max Flow Velocity	Travel Time	Design Flow Capacity	Max Flow / Design Flow Ratio	Max Flow Depth / Total Depth Ratio	Total Time Surcharged	Max Flow Depth	Reported Condition
					(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(%)		(ft)	(ft)							(cfs)			(cfs)	(days hh:mm)	(ft/sec)	(min)	(cfs)			(min)	(ft)	
1	Link-01		64	64	120.88	3527.50	0.00	3495.50	0.00	32.00	26.4700	Trapezoidal	2.000	22.00	0.0000	0.0350	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	12.86	0 12:00	6.75	0.30	880.17	0.01	0.09	0.00	0.18	Calculated
2	Link-02		64	64	88.42	3495.50	0.00	3471.70	0.00	23.80	26.9200	Trapezoidal	2.000	22.00	0.0000	0.0350	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	34.62	0 12:05	9.75	0.15	887.52	0.04	0.16	0.00	0.32	Calculated
3	Link-03		64	64	99.97	3471.70	0.00	3447.80	0.00	23.90	23.9100	Trapezoidal	2.000	22.00	0.0000	0.0350	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	69.88	0 12:07	12.02	0.14	836.43	0.08	0.25	0.00	0.50	Calculated
4	Link-04		64	64	102.50	3447.80	0.00	3423.90	0.00	23.90	23.3200	Trapezoidal	2.000	22.00	0.0000	0.0350	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	101.11	0 12:07	13.52	0.13	826.04	0.12	0.31	0.00	0.62	Calculated
5	Link-05		64	64	83.29	3423.90	0.00	3401.60	0.00	22.30	26.7700	Trapezoidal	2.000	22.00	0.0000	0.0350	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	134.26	0 12:07	15.55	0.09	885.16	0.15	0.36	0.00	0.69	Calculated
6	Link-06		64	64	106.97	3401.60	0.00	3375.90	0.00	25.70	24.0300	Trapezoidal	2.000	22.00	0.0000	0.0350	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	167.57	0 12:08	16.11	0.11	838.50	0.20	0.42	0.00	0.81	Calculated
7	Link-07		64	64	87.17	3375.90	0.00	3353.30	0.00	22.60	25.9300	Trapezoidal	2.000	22.00	0.0000	0.0350	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	238.39	0 12:08	18.50	0.08	871.04	0.27	0.50	0.00	0.98	Calculated
8	Link-08		64	64	65.76	3353.30	0.00	3334.90	0.00	18.40	27.9800	Trapezoidal	2.000	22.00	0.0000	0.0350	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	279.75	0 12:09	19.96	0.05	904.89	0.31	0.53	0.00	1.06	Calculated
9	Link-09		64	64	808.14	3334.90	0.00	3330.40	0.00	4.50	0.5600	Trapezoidal	3.000	34.00	0.0000	0.0270	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	303.85	0 12:11	5.94	2.27	415.80	0.73	0.86	0.00	2.57	Calculated
10	Link-10		64	64	105.66	3527.50	0.00	3498.00	0.00	29.50	27.9200	Trapezoidal	2.000	22.00	0.0000	0.0350	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	69.95	0 12:00	12.64	0.14	903.90	0.08	0.24	0.00	0.48	Calculated
11	Link-101		Stor-01	Out-02	40.00	3333.00	10.00	3330.00	0.00	3.00	7.5000	Trapezoidal	3.000	58.00	0.0000	0.0320	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	0.00	0 00:00	0.00		3436.82	0.00	0.00	0.00	0.00	Calculated
12	Link-102		Stor-02	Out-03	207.25	3331.00	10.00	3328.00	0.00	3.00	1.4500	Trapezoidal	3.000	58.00	0.0000	0.0320	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	0.00	0 00:00	0.00		1509.87	0.00	0.00	0.00	0.00	Calculated
13	Link-103		Stor-03	Out-04	139.10	3343.20	10.00	3340.20	0.00	3.00	2.1600	Trapezoidal	4.000	72.00	0.0000	0.0320	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	0.00	0 00:00	0.00		3226.20	0.00	0.00	0.00	0.00	Calculated
14	Link-11		64	64	97.41	3498.00	0.00	3473.00	0.00	25.00	25.6600	Trapezoidal	2.000	22.00	0.0000	0.0350	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	80.38	0 12:00	12.91	0.13	866.63	0.09	0.27	0.00	0.53	Calculated
15	Link-12		64	64	100.65	3473.00	0.00	3448.00	0.00	25.00	24.8400	Trapezoidal	2.000	22.00	0.0000	0.0350	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	94.85	0 12:01	13.51	0.12	852.57	0.11	0.30	0.00	0.59	Calculated
16	Link-13		64	64	100.50	3448.00	0.00	3423.00	0.00	25.00	24.8800	Trapezoidal	2.000	22.00	0.0000	0.0350	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	112.58	0 12:02	14.31	0.12	853.21	0.13	0.33	0.00	0.64	Calculated
17	Link-14		64	64	105.53	3423.00	0.00	3398.00	0.00	25.00	23.6900	Trapezoidal	2.000	22.00	0.0000	0.0350	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	133.13	0 12:03	14.88	0.12	832.62	0.16	0.37	0.00	0.73	Calculated
18	Link-15		64	64	102.02	3398.00	0.00	3373.00	0.00	25.00	24.5000	Trapezoidal	2.000	22.00	0.0000	0.0350	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	155.39	0 12:04	15.83	0.11	846.83	0.18	0.40	0.00	0.79	Calculated
19	Link-16		64	64	102.31	3373.00	0.00	3348.00	0.00	25.00	24.4400	Trapezoidal	2.000	22.00	0.0000	0.0350	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	179.79	0 12:07	16.58	0.10	845.62	0.21	0.43	0.00	0.86	Calculated
20	Link-17		64	64	65.85	3348.00	0.00	3333.30	0.50	14.70	22.3200	Trapezoidal	2.000	22.00	0.0000	0.0350	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	200.85	0 12:07	16.65	0.07	808.25	0.25	0.47	0.00	0.93	Calculated
21	Link-18		64	64	864.47	3332.80	0.00	3328.40	0.00	4.40	0.5100	Trapezoidal	3.000	30.00	0.0000	0.0270	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	297.54	0 12:08	5.83	2.47	308.70	0.96	0.98	0.00	2.92	Calculated
22	Link-19		64	64	128.77	3527.50	0.00	3492.95	0.00	34.55	26.8300	Trapezoidal	2.000	22.00	0.0000	0.0350	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	38.96	0 12:00	10.19	0.21	886.10	0.04	0.17	0.00	0.35	Calculated
23	Link-20		64	64	86.14	3492.95	0.00	3468.80	0.00	24.15	28.0400	Trapezoidal	2.000	22.00	0.0000	0.0350	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	60.14	0 12:02	12.02	0.12	905.78	0.07	0.22	0.00	0.43	Calculated
24	Link-21		64	64	115.25	3468.80	0.00	3444.60	0.00	24.20	21.0000	Trapezoidal	2.000	22.00	0.0000	0.0350	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	79.62	0 12:02	12.04	0.16	783.89	0.10	0.28	0.00	0.56	Calculated
25	Link-22		64	64	95.83	3444.60	0.00	3420.40	0.00	24.20	25.2500	Trapezoidal	2.000	22.00	0.0000	0.0350	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	100.53	0 12:03	13.85	0.12	859.65	0.12	0.31	0.00	0.61	Calculated
26	Link-23		64	64	100.32	3420.40	0.00	3396.20	0.00	24.20	24.1200	Trapezoidal	2.000	22.00	0.0000	0.0350	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	122.61	0 12:03	14.57	0.11	840.20	0.15	0.35	0.00	0.69	Calculated
27	Link-24		64	64	94.59	3396.20	0.00	3372.70	0.00	23.50	24.8400	Trapezoidal	2.000	22.00	0.0000	0.0350	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	144.28	0 12:03	15.52	0.10	852.66	0.17	0.38	0.00	0.75	Calculated
28	Link-25		64	64	101.09	3372.70	0.00	3349.20	0.00	23.50	23.2500	Trapezoidal	2.000	22.00	0.0000	0.0350	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	167.57	0 12:04	15.94	0.11	824.80	0.20	0.42	0.00	0.84	Calculated
29	Link-26		64	64	1297.91	3349.20	0.00	3342.70	0.00	6.50	0.5000	Trapezoidal	3.000	34.00	0.0000	0.0270	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	195.17	0 12:08	5.36	4.04	394.32	0.49	0.71	0.00	2.11	Calculated
30	Link-27		64	64	2239.31	3354.40	0.00	3343.60	0.00	10.80	0.4800	Trapezoidal	4.000	42.00	0.0000	0.0270	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	163.94	0 12:10	5.37	6.95	716.40	0.23	0.48	0.00	1.90	Calculated
31	Link-28		64	64	4070.59	3354.40	0.00	3334.90	0.00	19.50	0.4800	Trapezoidal	3.000	34.00	0.0000	0.0270	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	34.06	0 12:17	3.39	20.01	385.66	0.09	0.28	0.00	0.83	Calculated
32	Link-29		64	64	104.08	3527.50	0.00	3497.50	0.00	30.00	28.8200	Trapezoidal	2.000	22.00	0.0000	0.0350	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	28.28	0 12:06	9.26	0.19	918.42	0.03	0.14	0.00	0.28	Calculated
33	Link-30		64	64	73.45	3497.50	0.00	3476.90	0.00	20.60	28.0500	Trapezoidal	2.000	22.00	0.0000	0.0350	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	38.91	0 12:06	10.30	0.12	905.95	0.04	0.17	0.00	0.34	Calculated
34	Link-31		64	64	90.85	3476.90	0.00	3456.30	0.00	20.60	22.6700	Trapezoidal	2.000	22.00	0.0000	0.0350	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	51.28	0 12:04	10.61	0.14	814.59	0.06	0.21	0.00	0.43	Calculated
35	Link-32		64	64	86.06	3456.30	0.00	3435.70	0.00	20.60	23.9400	Trapezoidal	2.000	22.00	0.0000	0.0350	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	67.05	0 12:04	11.86	0.12	836.95	0.08	0.25	0.00	0.49	Calculated
36	Link-33		64	64	86.06	3435.70	0.00	3416.40	0.00	19.30	22.4300	Trapezoidal	2.000	22.00	0.0000	0.0350	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	83.47	0 12:03	12.51	0.11	810.11	0.10	0.28	0.00	0.57	Calculated
37	Link-34		64	64	78.65	3416.40	0.00	3394.00	0.00	22.40	28.4800	Trapezoidal	2.000	22.00	0.0000	0.0350	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	101.47	0 12:04	14.46	0.09	912.94	0.11	0.30	0.00	0.59	Calculated
38	Link-35		64	64	81.77	3394.00	0.00	3374.60	0.00	19.40	23.7300	Trapezoidal	2.000	22.00	0.0000	0.0350	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	121.43	0 12:04	14.45	0.09	833.24	0.15	0.35	0.00	0.69	Calculated
39	Link-41		64	64	1723.57	3514.90	0.00	3495.50	0.00	19.40	1.1300	Triangular	1.500	12.00	0.0000	0.0270	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	14.28	0 12:08	4.59	6.26	42.51	0.34	0.65	0.00	0.97	Calculated
40	Link-42		64	64	1797.17	3492.00	0.00	3471.70	0.00	20.30	1.1300	Triangular	1.500	12.00	0.0000	0.0270	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	15.92	0 12:08	4.67	6.41	42.59	0.37	0.68	0.00	1.01	Calculated
41	Link-43		64	64	1836.80	3468.70	0.00	3447.80	0.00	20.90	1.1400	Triangular	1.500	12.00	0.0000	0.0270	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	17.50	0 12:08	4.73	6.47	42.74	0.41	0.70	0.00	1.05	Calculated
42	Link-44		64	64	1967.89	3446.00	0.00	3423.90	0.00	22.10	1.1200	Triangular	1.500	12.00	0.0000	0.0270	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	17.77	0 12:08	4.75	6.90	42.46	0.42	0.71	0.00	1.06	Calculated
43	Link-45		64	64	2033.88	3424.30	0.00	3401.60	0.00	22.70	1.1200	Triangular	1.500	12.00	0.0000	0.0270	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	16.40	0 12:08	4.72	7.18	42.33	0.39	0.68	0.00	1.02	Calculated
44	Link-46		64	64	2205.75	3400.20	0.00	3375.90	0.00	24.30	1.1000	Triangular	1.500	12.00	0.0000	0.0270	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	20.60	0 12:09	4.83	7.61	42.06	0.49	0.75	0.00	1.12	Calculated
45	Link-47		64	64	2345.80	3379.00	0.00	3353.30	0.00	25.70	1.1000	Triangular	1.500	12.00	0.0000	0.0270	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	19.44	0 12:09	4.81	8.13	41.94	0.46	0.73	0.00	1.09	Calculated
46	Link-48		64	64	429.05	3336.70	0.00	3332.00	0.00	4.70	1.1000	Trapezoidal	3.000	34.00	0.0000	0.0270	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	13.36	0 12:01	2.89	2.47	583.20	0.02	0.13	0.00	0.40	Calculated
47	Link-49		64	64	741.37	3352.90	0.00	3349.20	0.00	3.70	0.5000	Trapezoidal	3.000	34.00	0.0000	0.0270	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	10.92	0 12:04	2.37	5.21	393.64	0.03	0.15	0.00	0.44	Calculated
48	Link-50		64	64	792.86	3336.75	0.00	3332.80	0.00	3.95	0.5000	Trapezoidal	3.000	30.00	0.0000	0.0270	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	84.55	0 12:07	4.26	3.10	305.41	0.28	0.55	0.00	1.64	Calculated
49	Link-51		64	64	1661.72	3336.70	0.00	3328.30	0.00	8.40	0.5100	Trapezoidal	3.000	34.00	0.0000	0.0270	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	33.76	0 12:09	3.37	8.22	396.17	0.09	0.27	0.00	0.81	Calculated
50	Link-52		64	64	1455.37	3514.90	0.00	3498.00	0.00	16.90	1.1600	Triangular	1.500	12.00	0.0000	0.0270	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	10.62	0 12:07	4.39	5.53	43.18	0.25	0.58	0.00	0.87	Calculated
51	Link-53		64	64	1667.38	3492.00	0.00	3473.00	0.00	19.00	1.1400	Triangular	1.500	12.00	0.0000	0.0270	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	15.17	0 12:08	4.61	6.03	42.77	0.35	0.66	0.00	1.00	Calculated
52	Link-54		64	64	1830.27	3468.70	0.00	3448.00	0.00	20.70	1.1300	Triangular	1.500	12.00	0.0000	0.0270	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	16.97	0 12:08	4.71	6.48	42.61	0.40	0.69	0.00	1.04	Calculated
53	Link-55		64	64	2025.36	3446.00	0.00	3423.00	0.00	23.00	1.1400	Triangular	1.500	12.00	0.0000	0.0270	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	18.10	0 12:08	4.79	7.05	42.70	0.42	0.71	0.00	1.06	Calculated
54	Link-56		64	64	2275.01	3424.30	0.00	3398.00	0.00	26.30	1.1600	Triangular	1.500	12.00	0.0000	0.0270	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	19.33	0 12:09	4.89	7.75	43.08	0.45	0.72	0.00	1.08	Calculated
55	Link-57		64	64	2512.72	3400.20	0.00	3373.00	0.00	27.20	1.0800	Triangular	1.500	12.00	0.0000	0.0270	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	20.76	0 12:09	4.82	8.69	41.69	0.50	0.75	0.00	1.11	Calculated
56	Link-58		64	64	2758.84	3379.00	0.00	3348.00	0.00	31.00	1.1200	Triangular	1.500	12.00	0.0000	0.0270	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	23.37	0 12:10	4.96	9.27	42.48	0.55	0.78	0.00	1.15	Calculated
57	Link-59		64	64	801.43	3503.10	0.00	3492.95	0.00	10.15	1.2700	Triangular	1.500	12.00	0.0000	0.0270	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	10.35	0 12:03	3.95	3.38	45.10	0.23	0.57	0.00	0.85	Calculated
58	Link-60		64	64	813.64	3479.00	0.00	3468.80	0.00	10.20	1.2500	Triangular	1.500	12.00	0.0000	0.0270	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	9.00	0 12:03	3.88	3.50	44.87	0.20	0.55	0.00	0.81	Calculated
59	Link-61		64	64	812.50	3454.90	0.00	3444.60	0.00	10.30	1.2700	Triangular	1.500	12.00	0.0000	0.0270	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	9.37	0 12:03	3.91	3.46	45.12	0.21	0.55	0.00	0.82	Calculated
60	Link-62		64	64	820.78	3430.70	0.00	3420.40	0.00	10.30	1.2500	Triangular	1.500	12.00	0.0000	0.0270	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	9.48	0 12:03	3.91	3.50	44.89	0.21	0.56	0.00	0.82	Calculated
61	Link-63		64	64	827.27	3406.60	0.00	3396.20	0.00	10.40	1.2600	Triangular	1.500	12.00	0.0000	0.0270	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	9.28	0 12:03	3.91	3.53	44.93	0.21	0.55	0.00	0.81	Calculated
62	Link-64		64	64	807.16	3382.90	0.00	3372.70	0.00	10.20	1.2600	Triangular	1.500	12.00	0.0000	0.0270	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	9.29	0 12:03	3.90	3.45	45.05	0.21	0.55	0.00	0.81	Calculated
63	Link-65		64	64	312.43	3503.10	0.00	3498.00	0.00	5.10	1.6300	Triangular	1.500	12.00	0.0000	0.0270	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	3.39	0 12:01	2.94	1.77	51.20	0.07	0.36	0.00	0.54	Calculated
64	Link-66		64	64	393.21	3479.00	0.00	3473.00	0.00	6.00	1.5300	Triangular	1.500	12.00	0.0000	0.0270	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	4.51	0 12:01	3.12	2.10	49.50	0.09	0.41	0.00	0.61	Calculated
65	Link-67		64	64	484.40	3454.90	0.00	3448.00	0.00	6.90	1.4200	Triangular	1.500	12.00	0.0000	0.0270	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	5.31	0 12:01	3.30	2.45	47.82	0.11	0.44	0.00	0.65	Calculated
66	Link-68		64	64	577.71	3430.70	0.00	3423.00	0.00	7.70	1.3300	Triangular	1.500	12.00	0.0000	0.0270	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	6.66	0 12:02	3.49	2.76	46.26	0.14	0.48	0.00	0.72	Calculated
67	Link-69		64	64	653.38	3406.60	0.00	3398.00	0.00	8.60	1.3200	Triangular	1.500	12.00	0.0000	0.0270	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	7.30	0 12:02	3.63	3.00	45.97	0.16	0.50	0.00	0.74	Calculated
68	Link-70		64	64	765.64	3382.90	0.00	3373.00	0.00	9.90	1.2900	Triangular	1.500	12.00	0.0000	0.0270	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	8.47	0 12:02	3.83	3.33	45.57	0.19	0.53	0.00	0.78	Calculated
69	Link-71		64	64	1072.75	3505.80	0.00	3492.95	0.00	12.85	1.2000	Triangular	1.500	12.00	0.0000	0.0270	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	13.05	0 12:04	4.27	4.19	43.86	0.30	0.63	0.00	0.94	Calculated
70	Link-72		64	64	1185.76	3482.30	0.00	3468.80	0.00	13.50	1.1400	Triangular	1.500	12.00	0.0000	0.0270	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	11.08	0 12:04	4.21	4.69	42.76	0.26	0.60	0.00	0.89	Calculated
71	Link-73		64	64	1233.29	3458.90	0.00	3444.60	0.00	14.30	1.1600	Triangular	1.500	12.00	0.0000	0.0270	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	11.89	0 12:07	4.30	4.78	43.15	0.28	0.61	0.00	0.91	Calculated
72	Link-74		64	64	1380.13	3435.40	0.00	3420.40	0.00	15.00	1.0900	Triangular	1.500	12.00	0.0000	0.0270	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	13.40	0 12:07	4.36	5.28	41.77	0.32	0.64	0.00	0.96	Calculated
73	Link-75		64	64	1293.75	3411.10	0.00	3396.20	0.00	14.90	1.1500	Triangular	1.500	12.00	0.0000	0.0270	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	12.82	0 12:07	4.37	4.93	43.00	0.30	0.63	0.00	0.94	Calculated
74	Link-76		64	64	1303.59	3387.60	0.00	3372.70	0.00	14.90	1.1400	Triangular	1.500	12.00	0.0000	0.0270	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	14.58	0 12:07	4.42	4.92	42.84	0.34	0.66	0.00	0.99	Calculated
75	Link-77		64	64	836.21	3508.00	0.00	3497.50	0.00	10.50	1.2600	Triangular	1.500	12.00	0.0000	0.0270	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	8.85	0 12:03	3.90	3.57	44.90	0.20	0.54	0.00	0.80	Calculated
76	Link-78		64	64	834.19	3487.40	0.00	3476.90	0.00	10.50	1.2600	Triangular	1.500	12.00	0.0000	0.0270	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	8.42	0 12:03	3.88	3.58	44.96	0.19	0.53	0.00	0.78	Calculated
77	Link-79		64	64

83	Link-85	64	64	1376.77	3487.40	0.00	3471.70	0.00	15.70	1.1400	Triangular	1.500	12.00	0.0000	0.0270	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	19.97	0	12:07	4.62	4.97	42.79	0.47	0.74	0.00	1.11	Calculated
84	Link-86	64	64	1693.36	3466.70	0.00	3447.80	0.00	18.90	1.1200	Triangular	1.500	12.00	0.0000	0.0270	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	14.07	0	12:08	4.56	6.19	42.33	0.33	0.65	0.00	0.97	Calculated
85	Link-87	64	64	2022.22	3446.10	0.00	3423.90	0.00	22.20	1.1000	Triangular	1.500	12.00	0.0000	0.0270	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	15.83	0	12:08	4.68	7.20	41.98	0.38	0.68	0.00	1.01	Calculated
86	Link-88	64	64	2326.22	3426.80	0.00	3401.60	0.00	25.20	1.0800	Triangular	1.500	12.00	0.0000	0.0270	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	17.31	0	12:09	4.74	8.18	41.71	0.42	0.70	0.00	1.04	Calculated
87	Link-89	64	64	2678.46	3404.50	0.00	3375.90	0.00	28.60	1.0700	Triangular	2.000	16.00	0.0000	0.0270	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	52.54	0	12:10	5.29	8.44	89.17	0.59	0.81	0.00	1.60	Calculated
88	Link-90	64	64	2987.76	3385.00	0.00	3353.30	0.00	31.70	1.0600	Triangular	1.500	12.00	0.0000	0.0270	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	22.85	0	12:11	4.84	10.29	41.27	0.55	0.77	0.00	1.15	Calculated
89	Link-91	64	64	99.73	3374.60	0.00	3354.40	0.00	20.20	20.2500	Trapezoidal	2.000	22.00	0.0000	0.0350	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	141.21	0	12:04	14.39	0.12	769.89	0.18	0.40	0.00	0.79	Calculated
90	Link-92	64	64	305.54	3501.20	0.00	3497.50	0.00	3.70	1.2100	Triangular	1.500	12.00	0.0000	0.0270	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	3.21	0	12:01	2.61	1.95	44.10	0.07	0.37	0.00	0.56	Calculated
91	Link-93	64	64	559.36	3482.80	0.00	3476.90	0.00	5.90	1.0500	Triangular	1.500	12.00	0.0000	0.0270	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	4.66	0	12:02	3.11	3.00	41.15	0.11	0.44	0.00	0.65	Calculated
92	Link-94	64	64	810.33	3464.35	0.00	3456.30	0.00	8.05	0.9900	Triangular	1.500	12.00	0.0000	0.0270	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	7.92	0	12:03	3.58	3.77	39.94	0.20	0.54	0.00	0.80	Calculated
93	Link-95	64	64	970.22	3445.90	0.00	3435.70	0.00	10.20	1.0500	Triangular	1.500	12.00	0.0000	0.0270	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	7.94	0	12:03	3.80	4.26	41.09	0.19	0.54	0.00	0.79	Calculated
94	Link-96	Jun-100	64	1169.17	3428.70	0.00	3416.40	0.00	12.30	1.0500	Triangular	1.500	12.00	0.0000	0.0270	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	10.03	0	12:04	4.06	4.80	41.10	0.24	0.59	0.00	0.87	Calculated
95	Link-97	Jun-101	64	1387.08	3408.80	0.00	3394.00	0.00	14.80	1.0700	Triangular	1.500	12.00	0.0000	0.0270	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	12.25	0	12:07	4.30	5.38	41.39	0.30	0.62	0.00	0.93	Calculated
96	Link-98	Jun-102	64	1602.60	3391.40	0.00	3374.60	0.00	16.80	1.0500	Triangular	1.500	12.00	0.0000	0.0270	0.0000	0.5000	0.5000	0.0000	0.00	NO	1.00	13.50	0	12:08	4.41	6.06	41.03	0.33	0.65	0.00	0.97	Calculated

SN	Element ID	X Coordinate	Y Coordinate	Description	Invert Elevation	Boundary Type	Flap Gate	Fixed Water Elevation	Peak Inflow	Peak Lateral Inflow	Maximum HGL Depth Attained	Maximum HGL Elevation Attained
					(ft)			(ft)	(cfs)	(cfs)	(ft)	(ft)
1	Out-02	809866.45	415888.87		3330.00	NORMAL	NO		0.00	0.00	0.00	3330.00
2	Out-03	812235.52	415724.82		3328.00	NORMAL	NO		0.00	0.00	0.00	3328.00
3	Out-04	813106.52	419384.56		3340.20	NORMAL	NO		0.00	0.00	0.00	3340.20

SN	Element ID	X Coordinate	Y Coordinate	Description	Invert Elevation (ft)	Max (Rim) Elevation (ft)	Max (Rim) Offset (ft)	Initial Water Elevation (ft)	Initial Water Depth (ft)	Ponded Area (ft^2)	Evaporation Loss	Peak Inflow (cfs)	Peak Lateral Inflow (cfs)	Peak Outflow (cfs)	Peak Exfiltration Flow Rate (cfm)	Maximum HGL Elevation Attained (ft)	Maximum HGL Depth Attained (ft)	Average HGL Elevation Attained (ft)	Average HGL Depth Attained (ft)	Time of Maximum HGL Occurrence (days hh:mm)	Total Exfiltration Volume ($1000\text{-}ft^3$)	Total Flooded Volume (ac-inches)	Total Time Flooded (minutes)	Total Retention Time (seconds)
1	Stor-01	809701.38	416120.10		3323.00	3333.00	10.00	0.00	-3323.00	0.00	0.00	336.93	32.25	0.00	0.00	3326.59	3.59	3324.58	1.58	1 00:00	0.00	0.00	0.00	0.00
2	Stor-02	812070.74	415850.52		3321.00	3331.00	10.00	0.00	-3321.00	0.00	0.00	351.60	24.20	0.00	0.00	3326.36	5.36	3323.37	2.37	1 00:00	0.00	0.00	0.00	0.00
3	Stor-03	813137.03	419248.84		3333.20	3343.20	10.00	0.00	-3333.20	0.00	0.00	405.50	65.95	0.00	0.00	3339.65	6.45	3336.06	2.86	1 00:00	0.00	0.00	0.00	0.00

SN	Element ID	X Coordinate	Y Coordinate	Description	Invert Elevation	Ground/Rim (Max) Elevation	Ground/Rim (Max) Offset	Initial Water Elevation	Initial Water Depth	Surcharge Elevation	Surcharge Depth	Ponded Area	Minimum Pipe Cover	Peak Inflow	Peak Lateral Inflow	Maximum HGL Elevation Attained	Maximum HGL Depth Attained	Maximum Surcharge Depth Attained	Minimum Freeboard Attained	Average HGL Elevation Attained	Average HGL Depth Attained	Time of Maximum HGL Occurrence	Time of Peak Flooding Occurrence	Total Flooded Volume	Total Time Flooded
					(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft^2)	(inches)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(days hh:mm)	(days hh:mm)	(ac-inches)	(minutes)
1	64	810645.90	417896.29		3527.50	3529.50	2.00	0.00	-3527.50	0.00	-3529.50	0.00	0.00	28.35	28.35	3527.78	0.28	0.00	1.72	3527.53	0.03	0 12:06	0 00:00	0.00	0.00
2	64	810607.24	417992.93		3497.50	3499.50	2.00	0.00	-3497.50	0.00	-3499.50	0.00	0.00	38.92	0.00	3498.32	0.82	0.00	1.18	3497.63	0.13	0 12:03	0 00:00	0.00	0.00
3	64	810583.39	418062.39		3476.90	3478.90	2.00	0.00	-3476.90	0.00	-3478.90	0.00	0.00	51.27	0.00	3477.70	0.80	0.00	1.20	3477.03	0.13	0 12:03	0 00:00	0.00	0.00
4	64	810549.41	418146.65		3456.30	3458.30	2.00	0.00	-3456.30	0.00	-3458.30	0.00	0.00	67.05	0.00	3457.12	0.82	0.00	1.18	3456.43	0.13	0 12:03	0 00:00	0.00	0.00
5	64	810518.16	418226.83		3435.70	3437.70	2.00	0.00	-3435.70	0.00	-3437.70	0.00	0.00	83.49	0.00	3436.51	0.81	0.00	1.19	3435.83	0.13	0 12:03	0 00:00	0.00	0.00
6	64	810486.90	418307.02		3416.40	3418.40	2.00	0.00	-3416.40	0.00	-3418.40	0.00	0.00	101.46	0.00	3417.28	0.88	0.00	1.12	3416.55	0.15	0 12:04	0 00:00	0.00	0.00
7	64	810462.44	418381.76		3394.00	3396.00	2.00	0.00	-3394.00	0.00	-3396.00	0.00	0.00	121.43	0.00	3394.95	0.95	0.00	1.05	3394.16	0.16	0 12:07	0 00:00	0.00	0.00
8	64	810432.54	418457.87		3374.60	3376.60	2.00	0.00	-3374.60	0.00	-3376.60	0.00	0.00	141.24	0.00	3375.59	0.99	0.00	1.01	3374.76	0.16	0 12:08	0 00:00	0.00	0.00
9	64	811490.32	417908.37		3527.50	3529.50	2.00	0.00	-3527.50	0.00	-3529.50	0.00	0.00	39.17	39.17	3527.85	0.35	0.00	1.65	3527.53	0.03	0 12:00	0 00:00	0.00	0.00
10	64	811615.35	417939.17		3492.95	3494.95	2.00	0.00	-3492.95	0.00	-3494.95	0.00	0.00	60.12	0.00	3493.90	0.95	0.00	1.05	3493.11	0.16	0 12:04	0 00:00	0.00	0.00
11	Jun-100	811594.50	418673.95		3428.70	3429.70	1.00	0.00	-3428.70	0.00	-3429.70	0.00	0.00	11.20	11.20	3429.62	0.92	0.00	0.58	3428.85	0.15	0 12:00	0 00:00	0.00	0.00
12	Jun-101	811779.40	418817.18		3408.80	3409.80	1.00	0.00	-3408.80	0.00	-3409.80	0.00	0.00	13.55	13.55	3409.79	0.99	0.00	0.51	3408.96	0.16	0 12:00	0 00:00	0.00	0.00
13	Jun-102	811953.88	418961.71		3391.40	3392.40	1.00	0.00	-3391.40	0.00	-3392.40	0.00	0.00	14.87	14.87	3392.43	1.03	0.00	0.47	3391.57	0.17	0 12:00	0 00:00	0.00	0.00
14	64	811698.70	417960.92		3468.80	3470.80	2.00	0.00	-3468.80	0.00	-3470.80	0.00	0.00	79.64	0.00	3469.70	0.90	0.00	1.10	3468.95	0.15	0 12:04	0 00:00	0.00	0.00
15	64	811809.23	417993.53		3444.60	3446.60	2.00	0.00	-3444.60	0.00	-3446.60	0.00	0.00	100.55	0.00	3445.53	0.93	0.00	1.07	3444.75	0.15	0 12:07	0 00:00	0.00	0.00
16	64	811901.65	418018.90		3420.40	3422.40	2.00	0.00	-3420.40	0.00	-3422.40	0.00	0.00	122.61	0.00	3421.38	0.98	0.00	1.02	3420.56	0.16	0 12:07	0 00:00	0.00	0.00
17	64	811997.69	418047.89		3396.20	3399.20	3.00	0.00	-3396.20	0.00	-3399.20	0.00	12.00	144.31	0.00	3397.15	0.95	0.00	2.05	3396.36	0.16	0 12:07	0 00:00	0.00	0.00
18	64	812086.48	418080.51		3372.70	3374.70	2.00	0.00	-3372.70	0.00	-3374.70	0.00	0.00	167.57	0.00	3373.70	1.00	0.00	1.00	3372.87	0.17	0 12:07	0 00:00	0.00	0.00
19	64	811966.88	417102.01		3527.50	3529.50	2.00	0.00	-3527.50	0.00	-3529.50	0.00	0.00	70.26	70.26	3527.98	0.48	0.00	1.52	3527.54	0.04	0 12:00	0 00:00	0.00	0.00
20	64	812064.73	417062.14		3498.00	3500.00	2.00	0.00	-3498.00	0.00	-3500.00	0.00	0.00	80.32	0.00	3498.89	0.89	0.00	1.11	3498.15	0.15	0 12:07	0 00:00	0.00	0.00
21	64	812157.15	417031.34		3473.00	3475.00	2.00	0.00	-3473.00	0.00	-3475.00	0.00	0.00	94.75	0.00	3474.02	1.02	0.00	0.98	3473.17	0.17	0 12:08	0 00:00	0.00	0.00
22	64	812249.56	416991.48		3448.00	3450.00	2.00	0.00	-3448.00	0.00	-3450.00	0.00	0.00	112.57	0.00	3449.06	1.06	0.00	0.94	3448.18	0.18	0 12:08	0 00:00	0.00	0.00
23	64	812340.16	416947.99		3423.00	3425.00	2.00	0.00	-3423.00	0.00	-3425.00	0.00	0.00	133.16	0.00	3424.09	1.09	0.00	0.91	3423.18	0.18	0 12:08	0 00:00	0.00	0.00
24	64	812441.64	416918.99		3398.00	3400.00	2.00	0.00	-3398.00	0.00	-3400.00	0.00	0.00	155.38	0.00	3399.11	1.11	0.00	0.89	3398.19	0.19	0 12:09	0 00:00	0.00	0.00
25	64	812537.67	416884.56		3373.00	3375.00	2.00	0.00	-3373.00	0.00	-3375.00	0.00	0.00	179.68	0.00	3374.15	1.15	0.00	0.85	3373.20	0.20	0 12:09	0 00:00	0.00	0.00
26	64	812631.90	416844.70		3348.00	3351.00	3.00	0.00	-3348.00	0.00	-3351.00	0.00	12.00	200.90	0.00	3349.20	1.20	0.00	1.80	3348.21	0.21	0 12:10	0 00:00	0.00	0.00
27	64	809339.43	417308.58		3527.50	3529.50	2.00	0.00	-3527.50	0.00	-3529.50	0.00	0.00	12.87	12.87	3527.68	0.18	0.00	1.82	3527.52	0.02	0 12:00	0 00:00	0.00	0.00
28	64	809247.01	417230.66		3495.50	3497.50	2.00	0.00	-3495.50	0.00	-3497.50	0.00	0.00	34.63	0.00	3496.50	1.00	0.00	1.00	3495.67	0.17	0 12:08	0 00:00	0.00	0.00
29	64	809185.40	417167.24		3471.70	3473.70	2.00	0.00	-3471.70	0.00	-3473.70	0.00	0.00	69.86	0.00	3472.83	1.13	0.00	0.87	3471.89	0.19	0 12:07	0 00:00	0.00	0.00
30	64	809116.54	417094.76		3447.80	3449.80	2.00	0.00	-3447.80	0.00	-3449.80	0.00	0.00	101.07	0.00	3448.87	1.07	0.00	0.93	3447.98	0.18	0 12:08	0 00:00	0.00	0.00
31	64	809044.06	417022.28		3423.90	3425.90	2.00	0.00	-3423.90	0.00	-3425.90	0.00	0.00	134.30	0.00	3424.98	1.08	0.00	0.92	3424.08	0.18	0 12:08	0 00:00	0.00	0.00
32	64	808984.27	416964.29		3401.60	3403.60	2.00	0.00	-3401.60	0.00	-3403.60	0.00	0.00	167.59	0.00	3402.68	1.08	0.00	0.92	3401.78	0.18	0 12:09	0 00:00	0.00	0.00
33	64	808900.91	416897.25		3375.90	3377.90	2.00	0.00	-3375.90	0.00	-3377.90	0.00	0.00	238.43	0.00	3377.54	1.64	0.00	0.36	3376.22	0.32	0 12:10	0 00:00	0.00	0.00
34	64	808837.49	416837.45		3353.30	3355.30	2.00	0.00	-3353.30	0.00	-3355.30	0.00	0.00	279.72	0.00	3354.50	1.20	0.00	0.80	3353.51	0.21	0 12:11	0 00:00	0.00	0.00
35	64	808795.12	416787.17		3334.90	3337.90	3.00	0.00	-3334.90	0.00	-3337.90	0.00	0.00	305.84	0.00	3337.49	2.59	0.00	0.41	3335.20	0.30	0 12:09	0 00:00	0.00	0.00
36	64	809331.04	416183.29		3330.40	3333.40	3.00	0.00	-3330.40	0.00	-3333.40	0.00	0.00	303.85	0.00	3333.29	2.89	0.00	1.11	3330.73	0.33	0 12:11	0 00:00	0.00	0.00
37	64	810113.85	416322.82		3332.00	3334.50	2.50	0.00	-3332.00	0.00	-3334.50	0.00	0.00	13.36	0.00	3332.73	0.73	0.00	2.27	3332.08	0.08	0 12:01	0 00:00	0.00	0.00
38	64	811844.39	415909.67		3328.30	3330.80	2.50	0.00	-3328.30	0.00	-3330.80	0.00	0.00	33.76	0.00	3329.42	1.12	0.00	1.88	3328.43	0.13	0 12:09	0 00:00	0.00	0.00
39	64	812694.57	416824.47		3332.80	3335.80	3.00	0.00	-3332.80	0.00	-3335.80	0.00	0.00	298.48	16.89	3335.76	2.96	0.00	0.04	3333.43	0.63	0 12:07	0 00:00	0.00	0.00
40	64	812373.83	416021.70		3328.40	3331.40	3.00	0.00	-3328.40	0.00	-3331.40	0.00	0.00	297.54	0.00	3331.59	3.19	0.00	1.31	3329.20	0.80	0 12:08	0 00:00	0.00	0.00
41	64	812185.97	418098.40		3349.20	3352.20	3.00	0.00	-3349.20	0.00	-3352.20	0.00	0.00	199.97	22.60	3351.36	2.16	0.00	0.84	3349.41	0.21	0 12:03	0 00:00	0.00	0.00
42	64	812560.18	419259.53		3342.70	3345.70	3.00	0.00	-3342.70	0.00	-3345.70	0.00	0.00	195.17	0.00	3344.88	2.18	0.00	0.82	3342.92	0.22	0 12:08	0 00:00	0.00	0.00
43	64	810383.10	418542.24		3354.40	3356.40	2.00	0.00	-3354.40	0.00	-3356.40	0.00	0.00	47.25	47.25	3355.43	1.03	0.00	1.97	3354.51	0.11	0 12:06	0 00:00	0.00	0.00
44	64	812505.82	419281.27		3343.60	3346.60	3.00	0.00	-3343.60	0.00	-3346.60	0.00	0.00	163.94	0.00	3345.57	1.97	0.00	2.03	3343.82	0.22	0 12:10	0 00:00	0.00	0.00
45	64	810845.21	417243.24		3514.90	3516.40	1.50	0.00	-3514.90	0.00	-3516.40	0.00	0.00	15.68	15.68	3515.93	1.03	0.00	0.47	3515.07	0.17	0 12:00	0 00:00	0.00	0.00
46	64	810808.77	417166.45		3492.00	3493.00	1.00	0.00	-3492.00	0.00	-3493.00	0.00	0.00	17.32	17.32	3493.07	1.07	0.00	0.43	3492.18	0.18	0 12:00	0 00:00	0.00	0.00
47	64	810763.22	417088.36		3468.70	3481.70	13.00	0.00	-3468.70	0.00	-3481.70	0.00	138.00	18.87	18.87	3469.80	1.10	0.00	11.90	3468.88	0.18	0 12:00	0 00:00	0.00	0.00
48	64	810716.36	417003.76		3446.00	3447.00	1.00	0.00	-3446.00	0.00	-3447.00	0.00	0.00	19.22	19.22	3447.11	1.11	0.00	0.39	3446.18	0.18	0 12:00	0 00:00	0.00	0.00
49	64	810678.62	416928.28		3424.30	3425.30	1.00	0.00	-3424.30	0.00	-3425.30	0.00	0.00	17.96	17.96	3425.39	1.09	0.00	0.41	3424.48	0.18	0 12:00	0 00:00	0.00	0.00
50	64	810639.57	416841.08		3400.20	3401.20	1.00	0.00	-3400.20	0.00	-3401.20	0.00	0.00	22.12	22.12	3401.38	1.18	0.00	0.32	3400.40	0.20	0 12:00	0 00:00	0.00	0.00
51	64	810601.40	416766.88		3379.00	3380.00	1.00	0.00	-3379.00	0.00	-3380.00	0.00	0.00	21.18	21.18	3380.16	1.16	0.00	0.34	3379.19	0.19	0 12:00	0 00:00	0.00	0.00
52	64	810868.64	417232.83		3514.90	3515.90	1.00	0.00	-3514.90	0.00	-3515.90	0.00	0.00	11.88	11.88	3515.82	0.92	0.00	0.58	3515.05	0.15	0 12:00	0 00:00	0.00	0.00
53	64	810828.29	417157.34		3492.00	3493.00	1.00	0.00	-3492.00	0.00	-3493.00	0.00	0.00	16.53	16.53	3493.05	1.05	0.00	0.45	3492.17	0.17	0 12:00	0 00:00	0.00	0.00
54	64	810789.25	417079.25		3468.70	3469.70	1.00	0.00	-3468.70	0.00	-3469.70	0.00	0.00	18.36	18.36	3469.79	1.09	0.00	0.41	3468.88	0.18	0 12:00	0 00:00	0.00	0.00
55	64	810748.90	416985.54		3446.00	3447.00	1.00	0.00	-3446.00	0.00	-3447.00	0.00	0.00	19.58	19.58	3447.12	1.12	0.00	0.38	3446.19	0.19	0 12:00	0 00:00	0.00	0.00
56	64	810705.95	416915.26		3424.30	3425.30	1.00	0.00	-3424.30	0.00	-3425.30	0.00	0.00	20.95	20.95	3425.44	1.14	0.00	0.36	3424.49	0.19	0 12:00	0 00:00	0.00	0.00
57	64	810664.30	416826.76		3400.20	3401.20	1.00	0.00	-3400.20	0.00	-3401.20	0.00	0.00	22.61	22.61	3401.39	1.19	0.00	0.31	3400.40	0.20	0 12:00	0 00:00	0.00	0.00
58	64	810624.83	416755.17		3379.00	3380.00	1.00	0.00	-3379.00	0.00	-3380.00	0.00	0.00	25.29	25.29	3380.23	1.23	0.00	0.27	3379.21	0.21	0 12:00	0 00:00	0.00	0.00
59	64	810342.27	416673.93		3336.70	3339.20	2.50	0.00	-3336.70	0.00	-3339.20	0.00	0.00	13.82	13.82	3337.11	0.41	0.00	2.59	3336.73	0.03	0 12:00	0 00:00	0.00	0.00
60	64	812811.29	417716.54		3352.90	3355.90	3.00	0.00	-3352.90	0.00	-3355.90	0.00	0.00	12.03	12.03	3353.37	0.47	0.00	2.53	3352.94	0.04	0 12:00	0 00:00	0.00	0.00
61	64	812962.28	417570.76		3336.75	3339.75	3.00	0.00	-3336.75	0.00	-3339.75	0.00	0.00	83.59	83.59	3338.40	1.65	0.00	1.35	3336.93	0.18	0 12:06	0 00:00	0.00	0.00
62	64	810369.35	416674.89		3336.70	3339.20	2.50	0.00	-3336.70	0.00	-3339.20	0.00	0.00	35.39	35.39	3337.57	0.87	0.00	2.13	3336.78	0.08	0 12:06	0 00:00	0.00	0.00
63	64	812156.81	417387.65		3503.10	3504.10	1.00	0.00	-3503.10	0.00	-3504.10	0.00	0.00	11.06	11.06	3503.99	0.89	0.00	0.61	3503.24	0.14	0 12:00	0 00:00	0.00	0.00
64	64	812170.02	417356.30		3503.10	3504.10	1.00	0.00	-3503.10	0.00	-3504.10	0.00	0.00	3.46	3.46	3503.65	0.55	0.00	0.95	3503.19	0.09	0 12:00	0 00:00	0.00	0.00
65	64	812281.98	417422.69		3479.00	3480.00	1.00	0.00	-3479.00	0.00	-3480.00	0.00	0.00	9.66	9.66	3479.84	0.84	0.00	0.66	3479.13	0.13	0 12:00	0 00:00	0.00	0.00
66	64	812292.39	417400.56		3479.00	3480.00	1.00	0.00	-3479.00	0.00	-3480.00	0.00	0.00	4.65	4.65	3479.62	0.62	0.00	0.88	3479.10	0.10	0 12:00	0 00:00	0.00	0.00
67	64	812392.64	417470.86		3454.90	3455.90	1.00	0.00	-3454.90	0.00	-3455.90	0.00	0.00	10.05	10.05	3455.75	0.85	0.00	0.65	3455.04	0.14	0 12:00	0 00:00	0.00	0.00

68	64	812405.66	417450.03	3454.90	3455.90	1.00	0.00	-3454.90	0.00	-3455.90	0.00	0.00	5.52	5.52	3455.57	0.67	0.00	0.83	3455.00	0.10	0	12:00	0	00:00	0.00	0.00
69	64	812515.01	417517.73	3430.70	3431.70	1.00	0.00	-3430.70	0.00	-3431.70	0.00	0.00	10.17	10.17	3431.56	0.86	0.00	0.64	3430.84	0.14	0	12:00	0	00:00	0.00	0.00
70	64	812528.03	417494.29	3430.70	3431.70	1.00	0.00	-3430.70	0.00	-3431.70	0.00	0.00	7.00	7.00	3431.44	0.74	0.00	0.76	3430.82	0.12	0	12:00	0	00:00	0.00	0.00
71	64	812636.08	417561.99	3406.60	3407.60	1.00	0.00	-3406.60	0.00	-3407.60	0.00	0.00	9.97	9.97	3407.45	0.85	0.00	0.65	3406.74	0.14	0	12:00	0	00:00	0.00	0.00
72	64	812645.19	417539.86	3406.60	3407.60	1.00	0.00	-3406.60	0.00	-3407.60	0.00	0.00	7.74	7.74	3407.37	0.77	0.00	0.73	3406.72	0.12	0	12:00	0	00:00	0.00	0.00
73	64	812727.21	417629.68	3382.90	3383.90	1.00	0.00	-3382.90	0.00	-3383.90	0.00	0.00	9.96	9.96	3383.75	0.85	0.00	0.65	3383.04	0.14	0	12:00	0	00:00	0.00	0.00
74	64	812737.62	417611.46	3382.90	3383.90	1.00	0.00	-3382.90	0.00	-3383.90	0.00	0.00	9.05	9.05	3383.72	0.82	0.00	0.68	3383.03	0.13	0	12:00	0	00:00	0.00	0.00
75	64	810997.81	418136.69	3505.80	3506.80	1.00	0.00	-3505.80	0.00	-3506.80	0.00	0.00	14.21	14.21	3506.78	0.98	0.00	0.52	3505.96	0.16	0	12:00	0	00:00	0.00	0.00
76	64	811209.58	418299.86	3482.30	3483.30	1.00	0.00	-3482.30	0.00	-3483.30	0.00	0.00	12.30	12.30	3483.24	0.94	0.00	0.56	3482.45	0.15	0	12:00	0	00:00	0.00	0.00
77	64	811459.54	418518.58	3458.90	3459.90	1.00	0.00	-3458.90	0.00	-3459.90	0.00	0.00	13.18	13.18	3459.86	0.96	0.00	0.54	3459.05	0.15	0	12:00	0	00:00	0.00	0.00
78	64	811627.92	418664.39	3435.40	3436.40	1.00	0.00	-3435.40	0.00	-3436.40	0.00	0.00	14.70	14.70	3436.41	1.01	0.00	0.49	3435.56	0.16	0	12:00	0	00:00	0.00	0.00
79	64	811909.13	418870.95	3411.10	3412.10	1.00	0.00	-3411.10	0.00	-3412.10	0.00	0.00	14.11	14.11	3412.09	0.99	0.00	0.51	3411.26	0.16	0	12:00	0	00:00	0.00	0.00
80	64	812155.61	419049.74	3387.60	3388.60	1.00	0.00	-3387.60	0.00	-3388.60	0.00	0.00	15.86	15.86	3388.63	1.03	0.00	0.47	3387.77	0.17	0	12:00	0	00:00	0.00	0.00
81	64	809790.19	417741.30	3487.40	3488.40	1.00	0.00	-3487.40	0.00	-3488.40	0.00	0.00	20.95	20.95	3488.55	1.15	0.00	0.35	3487.59	0.19	0	12:00	0	00:00	0.00	0.00
82	64	809760.89	417818.93	3466.70	3467.70	1.00	0.00	-3466.70	0.00	-3467.70	0.00	0.00	15.45	15.45	3467.73	1.03	0.00	0.47	3466.87	0.17	0	12:00	0	00:00	0.00	0.00
83	64	809734.67	417906.40	3446.10	3447.10	1.00	0.00	-3446.10	0.00	-3447.10	0.00	0.00	17.39	17.39	3447.18	1.08	0.00	0.42	3446.28	0.18	0	12:00	0	00:00	0.00	0.00
84	64	809704.50	417974.92	3426.80	3427.80	1.00	0.00	-3426.80	0.00	-3427.80	0.00	0.00	19.11	19.11	3427.92	1.12	0.00	0.38	3426.99	0.19	0	12:00	0	00:00	0.00	0.00
85	64	809675.21	418057.68	3404.50	3405.50	1.00	0.00	-3404.50	0.00	-3405.50	0.00	0.00	57.89	57.89	3406.20	1.70	0.00	0.30	3404.82	0.32	0	12:06	0	00:00	0.00	0.00
86	64	809645.18	418134.57	3385.00	3386.00	1.00	0.00	-3385.00	0.00	-3386.00	0.00	0.00	25.15	25.15	3386.25	1.25	0.00	0.25	3385.21	0.21	0	12:00	0	00:00	0.00	0.00
87	64	809817.99	417665.11	3508.00	3509.00	1.00	0.00	-3508.00	0.00	-3509.00	0.00	0.00	10.06	10.06	3508.86	0.86	0.00	0.64	3508.14	0.14	0	12:00	0	00:00	0.00	0.00
88	64	809834.37	417673.68	3508.00	3509.00	1.00	0.00	-3508.00	0.00	-3509.00	0.00	0.00	9.53	9.53	3508.84	0.84	0.00	0.66	3508.13	0.13	0	12:00	0	00:00	0.00	0.00
89	64	809809.96	417749.85	3487.40	3488.40	1.00	0.00	-3487.40	0.00	-3488.40	0.00	0.00	9.08	9.08	3488.22	0.82	0.00	0.68	3487.53	0.13	0	12:00	0	00:00	0.00	0.00
90	64	809778.72	417824.06	3466.70	3467.70	1.00	0.00	-3466.70	0.00	-3467.70	0.00	0.00	8.64	8.64	3467.51	0.81	0.00	0.69	3466.83	0.13	0	12:00	0	00:00	0.00	0.00
91	64	809749.42	417909.01	3446.10	3447.10	1.00	0.00	-3446.10	0.00	-3447.10	0.00	0.00	9.20	9.20	3446.93	0.83	0.00	0.67	3446.23	0.13	0	12:00	0	00:00	0.00	0.00
92	64	809719.15	417983.22	3426.80	3427.80	1.00	0.00	-3426.80	0.00	-3427.80	0.00	0.00	8.73	8.73	3427.61	0.81	0.00	0.69	3426.93	0.13	0	12:00	0	00:00	0.00	0.00
93	64	809690.83	418062.31	3404.50	3405.50	1.00	0.00	-3404.50	0.00	-3405.50	0.00	0.00	8.91	8.91	3405.32	0.82	0.00	0.68	3404.63	0.13	0	12:00	0	00:00	0.00	0.00
94	64	809656.66	418142.38	3385.00	3386.00	1.00	0.00	-3385.00	0.00	-3386.00	0.00	0.00	8.04	8.04	3385.79	0.79	0.00	0.71	3385.12	0.12	0	12:00	0	00:00	0.00	0.00
95	64	810415.50	418556.13	3354.40	3357.40	3.00	0.00	-3354.40	0.00	-3357.40	0.00	0.00	172.72	31.69	3356.42	2.02	0.00	1.98	3354.60	0.20	0	12:04	0	00:00	0.00	0.00
96	64	810893.99	418098.44	3501.20	3502.20	1.00	0.00	-3501.20	0.00	-3502.20	0.00	0.00	3.29	3.29	3501.77	0.57	0.00	0.93	3501.29	0.09	0	12:00	0	00:00	0.00	0.00
97	64	811106.23	418261.20	3482.80	3483.80	1.00	0.00	-3482.80	0.00	-3483.80	0.00	0.00	4.94	4.94	3483.48	0.68	0.00	0.82	3482.91	0.11	0	12:00	0	00:00	0.00	0.00
98	64	811304.14	418423.96	3464.35	3465.35	1.00	0.00	-3464.35	0.00	-3465.35	0.00	0.00	8.59	8.59	3465.19	0.84	0.00	0.66	3464.48	0.13	0	12:00	0	00:00	0.00	0.00
99	64	811438.25	418534.63	3445.90	3446.90	1.00	0.00	-3445.90	0.00	-3446.90	0.00	0.00	8.76	8.76	3446.74	0.84	0.00	0.66	3446.03	0.13	0	12:00	0	00:00	0.00	0.00

SN	Element ID	Description	Data Source	Data Source ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)	Rainfall Distribution
1	Rain Gage-04		Time Series	NEW MEXICO, LEA COUNTY 25Y-24H	Cumulative	inches					User Defined

SN	Element ID	Description	Area	Drainage Node ID	Weighted Curve Number	Conductivity	Drying Time	Average Slope	Equivalent Width	Impervious Area	Impervious Area No Depression	Impervious Area Depression Depth	Impervious Area Manning's Roughness	Pervious Area Depression Depth	Pervious Area Manning's Roughness	Curb & Gutter Length	Rain Gage ID	Total Precipitation	Total Runon	Total Evaporation	Total Infiltration	Total Runoff	Peak Runoff	Time of Concentration
			(acres)			(inches/hr)	(days)	(%)	(ft)	(%)	(%)	(inches)		(inches)		(ft)		(inches)	(inches)	(inches)	(inches)	(inches)	(cfs)	(days hh:mm:ss)
1	Sub-01		2.88	64	86.00	0.1500	2.00	4.0000	616.95	0.00	0.00	0.0800	0.0150	0.2000	0.1000	0.00	Rain Gage-04	4.88	0.00	0.0000	1.2210	3.43	12.87	0 00:28:26
2	Sub-03		8.47	64	86.00	0.1500	2.00	4.0000	554.59	0.00	0.00	0.0800	0.0150	0.2000	0.1000	0.00	Rain Gage-04	4.88	0.00	0.0000	1.2210	3.38	28.35	0 00:57:57
3	Sub-04		13.13	64	86.00	0.1500	2.00	4.0000	1697.95	0.00	0.00	0.0800	0.0150	0.2000	0.0220	0.00	Rain Gage-04	4.88	0.00	0.0000	1.2210	3.45	70.26	0 00:15:31
4	Sub-05		7.96	64	86.00	0.1500	2.00	4.0000	571.63	0.00	0.00	0.0800	0.0150	0.2000	0.0220	0.00	Rain Gage-04	4.88	0.00	0.0000	1.2210	3.44	39.17	0 00:22:07
5	Sub-06		2.26	64	86.00	0.1500	2.00	25.0000	100.00	0.00	0.00	0.0800	0.0150	0.2000	0.0220	0.00	Rain Gage-04	4.88	0.00	0.0000	1.2210	3.45	11.88	0 00:17:03
6	Sub-08		0.61	64	86.00	0.1500	2.00	25.0000	100.00	0.00	0.00	0.0800	0.0150	0.2000	0.0220	0.00	Rain Gage-04	4.88	0.00	0.0000	1.2210	3.46	3.46	0 00:07:45
7	Sub-09		0.82	64	86.00	0.1500	2.00	25.0000	100.00	0.00	0.00	0.0800	0.0150	0.2000	0.0220	0.00	Rain Gage-04	4.88	0.00	0.0000	1.2210	3.46	4.65	0 00:09:18
8	Sub-10		0.98	64	86.00	0.1500	2.00	25.0000	100.00	0.00	0.00	0.0800	0.0150	0.2000	0.0220	0.00	Rain Gage-04	4.88	0.00	0.0000	1.2210	3.46	5.52	0 00:10:21
9	Sub-11		1.26	64	86.00	0.1500	2.00	25.0000	100.00	0.00	0.00	0.0800	0.0150	0.2000	0.0220	0.00	Rain Gage-04	4.88	0.00	0.0000	1.2210	3.45	7.00	0 00:12:01
10	Sub-12		1.41	64	86.00	0.1500	2.00	25.0000	100.00	0.00	0.00	0.0800	0.0150	0.2000	0.0220	0.00	Rain Gage-04	4.88	0.00	0.0000	1.2210	3.45	7.74	0 00:12:49
11	Sub-13		1.67	64	86.00	0.1500	2.00	25.0000	100.00	0.00	0.00	0.0800	0.0150	0.2000	0.0220	0.00	Rain Gage-04	4.88	0.00	0.0000	1.2210	3.45	9.05	0 00:14:12
12	Sub-16		3.69	64	86.00	0.1500	2.00	25.0000	100.00	0.00	0.00	0.0800	0.0150	0.2000	0.0220	0.00	Rain Gage-04	4.88	0.00	0.0000	1.2210	3.44	17.96	0 00:22:54
13	Sub-17		16.94	64	86.00	0.1500	2.00	0.5000	959.36	0.00	0.00	0.0800	0.0150	0.2000	0.0150	0.00	Rain Gage-04	4.88	0.00	0.0000	1.2210	3.41	67.80	0 00:37:48
14	Sub-18		18.06	Stor-03	86.00	0.1500	2.00	0.5000	666.62	0.00	0.00	0.0800	0.0150	0.2000	0.0150	0.00	Rain Gage-04	4.88	0.00	0.0000	1.2210	3.39	65.95	0 00:48:52
15	Sub-19		2.08	64	86.00	0.1500	2.00	25.0000	100.00	0.00	0.00	0.0800	0.0150	0.2000	0.0220	0.00	Rain Gage-04	4.88	0.00	0.0000	1.2210	3.45	11.06	0 00:16:14
16	Sub-20		1.79	64	86.00	0.1500	2.00	25.0000	100.00	0.00	0.00	0.0800	0.0150	0.2000	0.0220	0.00	Rain Gage-04	4.88	0.00	0.0000	1.2210	3.45	9.66	0 00:14:50
17	Sub-21		1.87	64	86.00	0.1500	2.00	25.0000	100.00	0.00	0.00	0.0800	0.0150	0.2000	0.0220	0.00	Rain Gage-04	4.88	0.00	0.0000	1.2210	3.45	10.05	0 00:15:14
18	Sub-22		1.90	64	86.00	0.1500	2.00	25.0000	100.00	0.00	0.00	0.0800	0.0150	0.2000	0.0220	0.00	Rain Gage-04	4.88	0.00	0.0000	1.2210	3.45	10.17	0 00:15:21
19	Sub-23		1.85	64	86.00	0.1500	2.00	25.0000	100.00	0.00	0.00	0.0800	0.0150	0.2000	0.0220	0.00	Rain Gage-04	4.88	0.00	0.0000	1.2210	3.45	9.97	0 00:15:09
20	Sub-24		1.85	64	86.00	0.1500	2.00	25.0000	100.00	0.00	0.00	0.0800	0.0150	0.2000	0.0220	0.00	Rain Gage-04	4.88	0.00	0.0000	1.2210	3.45	9.96	0 00:15:08
21	Sub-25		2.29	64	86.00	0.1500	2.00	25.0000	100.00	0.00	0.00	0.0800	0.0150	0.2000	0.0220	0.00	Rain Gage-04	4.88	0.00	0.0000	1.2210	3.45	12.03	0 00:17:12
22	Sub-26		4.97	64	86.00	0.1500	2.00	25.0000	100.00	0.00	1.00	0.0800	0.0150	0.2000	0.0220	0.00	Rain Gage-04	4.88	0.00	0.0000	1.2210	3.43	22.60	0 00:27:22
23	Sub-27		3.17	64	86.00	0.1500	2.00	25.0000	100.00	0.00	0.00	0.0800	0.0150	0.2000	0.0220	0.00	Rain Gage-04	4.88	0.00	0.0000	1.2210	3.44	15.86	0 00:20:53
24	Sub-28		2.76	64	86.00	0.1500	2.00	25.0000	100.00	0.00	0.00	0.0800	0.0150	0.2000	0.0220	0.00	Rain Gage-04	4.88	0.00	0.0000	1.2210	3.44	14.11	0 00:19:13
25	Sub-29		2.90	64	86.00	0.1500	2.00	25.0000	100.00	0.00	0.00	0.0800	0.0150	0.2000	0.0220	0.00	Rain Gage-04	4.88	0.00	0.0000	1.2210	3.44	14.70	0 00:19:47
26	Sub-30		2.54	64	86.00	0.1500	2.00	25.0000	100.00	0.00	0.00	0.0800	0.0150	0.2000	0.0220	0.00	Rain Gage-04	4.88	0.00	0.0000	1.2210	3.44	13.18	0 00:18:19
27	Sub-31		2.35	64	86.00	0.1500	2.00	25.0000	100.00	0.00	0.00	0.0800	0.0150	0.2000	0.0220	0.00	Rain Gage-04	4.88	0.00	0.0000	1.2210	3.44	12.30	0 00:17:28
28	Sub-32		2.78	64	86.00	0.1500	2.00	25.0000	100.00	0.00	0.00	0.0800	0.0150	0.2000	0.0220	0.00	Rain Gage-04	4.88	0.00	0.0000	1.2210	3.44	14.21	0 00:19:18
29	Sub-33		0.58	64	86.00	0.1500	2.00	25.0000	100.00	0.00	0.00	0.0800	0.0150	0.2000	0.0220	0.00	Rain Gage-04	4.88	0.00	0.0000	1.2210	3.46	3.29	0 00:07:31
30	Sub-34		0.88	64	86.00	0.1500	2.00	25.0000	100.00	0.00	0.00	0.0800	0.0150	0.2000	0.0220	0.00	Rain Gage-04	4.88	0.00	0.0000	1.2210	3.46	4.94	0 00:09:39
31	Sub-36		1.57	64	86.00	0.1500	2.00	25.0000	100.00	0.00	0.00	0.0800	0.0150	0.2000	0.0220	0.00	Rain Gage-04	4.88	0.00	0.0000	1.2210	3.45	8.59	0 00:13:44
32	Sub-37		1.61	64	86.00	0.1500	2.00	25.0000	100.00	0.00	0.00	0.0800	0.0150	0.2000	0.0220	0.00	Rain Gage-04	4.88	0.00	0.0000	1.2210	3.45	8.76	0 00:13:54
33	Sub-38		2.11	Jun-100	86.00	0.1500	2.00	25.0000	100.00	0.00	0.00	0.0800	0.0150	0.2000	0.0220	0.00	Rain Gage-04	4.88	0.00	0.0000	1.2210	3.45	11.20	0 00:16:23
34	Sub-39		2.63	Jun-101	86.00	0.1500	2.00	25.0000	100.00	0.00	0.00	0.0800	0.0150	0.2000	0.0220	0.00	Rain Gage-04	4.88	0.00	0.0000	1.2210	3.44	13.55	0 00:18:40
35	Sub-40		2.94	Jun-102	86.00	0.1500	2.00	25.0000	100.00	0.00	0.00	0.0800	0.0150	0.2000	0.0220	0.00	Rain Gage-04	4.88	0.00	0.0000	1.2210	3.44	14.87	0 00:19:57
36	Sub-41		7.82	64	86.00	0.1500	2.00	25.0000	100.00	0.00	0.00	0.0800	0.0150	0.2000	0.0220	0.00	Rain Gage-04	4.88	0.00	0.0000	1.2210	3.41	31.69	0 00:35:55
37	Sub-42		1.76	64	86.00	0.1500	2.00	25.0000	100.00	0.00	0.00	0.0800	0.0150	0.2000	0.0220	0.00	Rain Gage-04	4.88	0.00	0.0000	1.2210	3.45	9.53	0 00:14:42
38	Sub-43		1.67	64	86.00	0.1500	2.00	25.0000	100.00	0.00	0.00	0.0800	0.0150	0.2000	0.0220	0.00	Rain Gage-04	4.88	0.00	0.0000	1.2210	3.45	9.08	0 00:14:14
39	Sub-44		1.59	64	86.00	0.1500	2.00	25.0000	100.00	0.00	0.00	0.0800	0.0150	0.2000	0.0220	0.00	Rain Gage-04	4.88	0.00	0.0000	1.2210	3.45	8.64	0 00:13:47
40	Sub-45		1.70	64	86.00	0.1500	2.00	25.0000	100.00	0.00	0.00	0.0800	0.0150	0.2000	0.0220	0.00	Rain Gage-04	4.88	0.00	0.0000	1.2210	3.45	9.20	0 00:14:21
41	Sub-46		1.60	64	86.00	0.1500	2.00	25.0000	100.00	0.00	0.00	0.0800	0.0150	0.2000	0.0220	0.00	Rain Gage-04	4.88	0.00	0.0000	1.2210	3.45	8.73	0 00:13:52
42	Sub-47		1.64	64	86.00	0.1500	2.00	25.0000	100.00	0.00	0.00	0.0800	0.0150	0.2000	0.0220	0.00	Rain Gage-04	4.88	0.00	0.0000	1.2210	3.45	8.91	0 00:14:03
43	Sub-48		1.47	64	86.00	0.1500	2.00	25.0000	100.00	0.00	0.00	0.0800	0.0150	0.2000	0.0220	0.00	Rain Gage-04	4.88	0.00	0.0000	1.2210	3.45	8.04	0 00:13:09
44	Sub-49		12.89	64	86.00	0.1500	2.00	25.0000	100.00	0.00	0.00	0.0800	0.0150	0.2000	0.0220	0.00	Rain Gage-04	4.88	0.00	0.0000	1.2210	3.39	47.25	0 00:48:30
45	Sub-50		1.87	64	86.00	0.1500	2.00	25.0000	100.00	0.00	0.00	0.0800	0.0150	0.2000	0.0220	0.00	Rain Gage-04	4.88	0.00	0.0000	1.2210	3.45	10.06	0 00:15:14
46	Sub-51		4.49	64	86.00	0.1500	2.00	25.0000	100.00	0.00	0.00	0.0800	0.0150	0.2000	0.0220	0.00	Rain Gage-04	4.88	0.00	0.0000	1.2210	3.43	20.95	0 00:25:46
47	Sub-52		3.07	64	86.00	0.1500	2.00	25.0000	100.00	0.00	0.00	0.0800	0.0150	0.2000	0.0220	0.00	Rain Gage-04	4.88	0.00	0.0000	1.2210	3.44	15.45	0 00:20:30
48	Sub-53		3.55	64	86.00	0.1500	2.00	25.0000	100.00	0.00	0.00	0.0800	0.0150	0.2000	0.0220	0.00	Rain Gage-04	4.88	0.00	0.0000	1.2210	3.44	17.39	0 00:22:22
49	Sub-54		3.99	64	86.00	0.1500	2.00	25.0000	100.00	0.00	0.00	0.0800	0.0150	0.2000	0.0220	0.00	Rain Gage-04	4.88	0.00	0.0000	1.2210	3.43	19.11	0 00:24:00
50	Sub-55		17.26	64	86.00	0.1500	2.00	25.0000	100.00	0.00	0.00	0.0800	0.0150	0.2000	0.0220	0.00	Rain Gage-04	4.88	0.00	0.0000	1.2210	3.38	57.89	0 00:57:46
51	Sub-56		5.75	64	86.00	0.1500	2.00	25.0000	100.00	0.00	0.00	0.0800	0.0150	0.2000	0.0220	0.00	Rain Gage-04	4.88	0.00	0.0000	1.2210	3.42	25.15	0 00:29:51
52	Sub-57		3.13	64	86.00	0.1500	2.00	25.0000	100.00	0.00	0.00	0.0800	0.0150	0.2000	0.0220	0.00	Rain Gage-04	4.88	0.00	0.0000	1.2210	3.44	15.68	0 00:20:43
53	Sub-58		3.53	64	86.00	0.1500	2.00	25.0000	100.00	0.00	0.00	0.0800	0.0150	0.2000	0.0220	0.00	Rain Gage-04	4.88	0.00	0.0000	1.2210	3.44	17.32	0 00:22:17
54	Sub-59		3.93	64	86.00	0.1500	2.00	25.0000	100.00	0.00	0.00	0.0800	0.0150	0.2000	0.0220	0.00	Rain Gage-04	4.88	0.00	0.0000	1.2210	3.43	18.87	0 00:23:46
55	Sub-60		4.02	64	86.00	0.1500	2.00	25.0000	100.00	0.00	0.00	0.0800	0.0150	0.2000	0.0220	0.00	Rain Gage-04	4.88	0.00	0.0000	1.2210	3.43	19.22	0 00:24:06
56	Sub-61		3.69	64	86.00	0.1500	2.00	25.0000	100.00	0.00	0.00	0.0800	0.0150	0.2000	0.0220	0.00	Rain Gage-04	4.88	0.00	0.0000	1.2210	3.44	17.96	0 00:22:54
57	Sub-62		4.83	64	86.00	0.1500	2.00	25.0000	100.00	0.00	0.00	0.0800	0.0150	0.2000	0.0220	0.00	Rain Gage-04	4.88	0.00	0.0000	1.2210	3.43	22.12	0 00:26:54
58	Sub-63		4.56	64	86.00	0.1500	2.00	25.0000	100.00	0.00	0.00	0.0800	0.0150	0.2000	0.0220	0.00	Rain Gage-04	4.88	0.00	0.0000	1.2210	3.43	21.18	0 00:25:59
59	Sub-65		3.42	64	86.00	0.1500	2.00	25.0000	100.00	0.00	0.00	0.0800	0.0150	0.2000	0.0220	0.00	Rain Gage-04	4.88	0.00	0.0000	1.2210	3.44	16.89	0 00:21:53
60	Sub-66		5.79	64	86.00	0.1500	2.00	25.0000	100.00	0.00	0.00	0.0800	0.0150	0.2000	0.0220	0.00	Rain Gage-04	4.88	0.00	0.0000	1.2210	3.42	25.29	0 00:30:00
61	Sub-67		4.97	64	86.00	0.1500	2.00	25.0000	100.00	0.00	0.00	0.0800	0.0150	0.2000	0.0220	0.00	Rain Gage-04	4.88	0.00	0.0000	1.2210	3.43	22.61	0 00:27:22
62	Sub-68		4.49	64	86.00	0.1500	2.00	25.0000	100.00	0.00	0.00	0.0800	0.0150	0.2000	0.0220	0.00	Rain Gage-04	4.88	0.00	0.0000	1.2210	3.43	20.95	0 00:25:46
63	Sub-69		4.12	64	86.00	0.1500	2.00	25.0000	100.00	0.00	0.00	0.0800	0.0150	0.2000	0.0220	0.00	Rain Gage-04	4.88	0.00	0.0000	1.2210	3.43	19.58	0 00:24:27
64	Sub-70		3.80	64	86.00	0.1500	2.00	25.0000	100.00	0.00	0.00	0.0800	0.0150	0.2000	0.0220	0.00	Rain Gage-04	4.88	0.00	0.0000	1.2210	3.43	18.36	0 00:23:17
65	Sub-71		3.33	64	86.00	0.1500	2.00	25.0000	100.00	0.00	0.00	0.0800	0.0150	0.2000	0.0220	0.00	Rain Gage-04	4.88	0.00	0.0000	1.2210	3.44	16.53	0 00:21:32
66	Sub-72		2.69	64	86.00	0.1500	2.00	25.0000	100.00	0.00	0.00	0.0800	0.0150	0.2000	0.0220	0.00	Rain Gage-04	4.88	0.00	0.0000	1.2210	3.44	13.82	0 00:18:56
67	Sub-73		8.91	64	86.00	0.1500	2.00	25.0000	100.00	0.00	0.00	0.0800	0.0150	0.2000	0.0220	0.00	Rain Gage-04	4.88	0.00	0.0000	1.2210	3.41	35.39	0 00:38:51

68	Sub-74	6.98	Stor-02	86.00	0.1500	2.00	5.0000	100.00	0.00	0.00	0.0800	0.0150	0.2000	0.0220	0.00	Rain Gage-04	4.88	0.00	0.0000	1.2210	3.38	24.20	0	00:54:24
69	Sub-75	11.06	Stor-01	86.00	0.1500	2.00	5.0000	100.00	0.00	0.00	0.0800	0.0150	0.2000	0.0220	0.00	Rain Gage-04	4.88	0.00	0.0000	1.2210	3.35	32.25	0	01:11:42

Exhibit A.3
Run-on Design Results
TR-55 Method Calculations

North Ranch Surface Waste Management Facility

Run-On Diversion Channel Design

Parameter	Symbol	Value	Unit	Source
A. PEAK DISCHARGE (TR-55 Method)				
1. Site Data				

Composite N Based on USGS Web Soil Survey - Approximate Upstream AOI

Soil Type ID[2]	Soil Type Description[2]	Hydraulic Soil Group[2]	CN[1]	Area (Acres)[2]	CN x Area
BE	Berino-Cacique loamy fine sands association	B	35	467.5	16362.5
BF	Berino-Cacique fine sandy loams association	B	35	228.3	7990.5
BH	Berino-Cacique association, hummocky	B	35	306.8	10738
MM	Ratliff loam	B	35	79.2	2772
MN	Ratliff-Wink fine sandy loams	B	35	40.2	1407
MW	Mobeetie-Potter association, 1 to 15 percent slopes	A	30	93.3	2799
PU	Pyote and maljamar fine sands	A	30	1,890.50	56715
SE	Simona fine sandy loam, 0 to 3 percent slopes	D	55	0.9	49.5
SR	Simona-Upton association	D	55	2,422.20	133221
TF	Tonuco loamy fine sand, 0 to 3 percent slopes	D	55	22.4	1232
WK	Wink loamy fine sand	A	30	4.5	135
			Totals	5555.8	233421.5
			Composite CN (Total CN x Area / Total Area)		**42.0**

[1] TR-55 Manual, Table 2-2d for "Sage brush with Grass Understory - Good Conditions"

[2] From USDA Web Soil Survey for Site AOI includes area north of site up to New Mexico State Highway 128.

Hydraulic Soil Group		Variable	Unitless	
Curve Number	CN	42	Unitless	
Drainage Area (Assume Whole Site to One Channel)				
- Site Area	A1	5555.8	Acres	AutoCAD
2 year-24 hour Rainfall Depth	P_2	2.24	Inches	NOAA Atlas 14, Volume 1, Version 5. Jal, New Mexico, USA
25 year-24 hour Rainfall Depth	P_{25}	4.59	Inches	NOAA Atlas 14, Volume 1, Version 5. Jal, New Mexico, USA
25 year-24 hour Rainfall Intensity	I_{25}	0.191	In/hour	NOAA Atlas 14, Volume 1, Version 5. Jal, New Mexico, USA

2. Direct Run-off Calculation

Direct Run-off	Q	0.2	Inches	TR-55 Manual, Figure 2-1 using CN and P above.

3. Time of Concentration

Equations:

$$Sheet\ Flow\ (T_1) = 0.007\left(\frac{(n_1 L_1)^{0.8}}{P_2^{0.5} {s_1}^{0.4}}\right)$$

TR-55 Manual Chapter 3, eq. 3-3

$$Shallow\ Concentrated\ (T_2) = \frac{L_2}{3600 V_{sc}}$$

where: Velocity (V2) is taken from Figure 3-1 of the TR-55 Manual

Sheet Flow Time of Concentration:TOP DECK

Mannings	n_1	0.011	unitless	TR-55 Manual, Table 3-1 for bare soil
Flow Length	L_1	150	Feet	Maximum shallow flow length
2 year-24 hour Rainfall Depth	P_2	2.24	Inches	NOAA Atlas 14, Volume 1, Version 5. Jal, New Mexico, USA
Slope	s_1	0.04	ft/ft	Assumed
Shallow Flow Time of Concentration (TOP DECK):	**T_1**	**0.03637046**	**Hour**	

Shallow Concentrated Time of Concentration: (TOP DECK)_

Flow Length	L_2	23000	Feet	From GoogleEarth, no decernable channelization
Slope	s_1	0.009	ft/ft	USGS Quadrangle Map
Velocity	V_{sc1}	1.5	feet per second	TR-55 Manual, Figure 3-1 for unpaved surface
Shallow Concentrated Time of Concentration (TOP DECK):	**T_2**	**4.259259259**	**Hour**	

TOTAL TIME OF CONCENTRATION	**T_C**	**4.296**	**Hour**

4. Peak Discharge Calculation

Equations:

$Peak\ Discharge\ (q_p) = q_u A_m Q F_p$ — TR-55 Manual Chapter 3, eq. 4-1

where

q_u	=		unit peak discharge (csm/in)
A_m	=		Drainage Area (mi^2)
Q	=		Direct Runoff (in)
F_p	=		pond and swamp adjustment factor

Data:

Total Drainage Area ($A_1 + A_2$)	A_m		8.6809375	mi^2	summed from above converted to square miles
Curve Number	CN		42	unitless	from above
Time of Concentration	T_C		4.30	hour	calculated above
Rainfall Distribution	-	II		unitless	TR-55 Manual Figure B-2
Swamps in Area	-	none		unitless	site data
Initial Abstraction	I_a		2.762	in	TR-55 Manual Table 4-1
Initial Abstraction / Rainfall Depth	I_a / P_{25}		0.50	unitless	calculated
Unit Peak Discharge	q_u		76	csm/in	TR-55 Manual Exhibit 4-II
Direct Runoff	Q		0.2	in	calculated above
Pond and Swamp Adjustment Factor	F_p		1	unitless	TR-55 Manual Figure 4-2

q_p (peak discharge)	**=**	**132.0**	**cubic feet per second (CFS)**
Half Peak Discharge, flow split along Northwest property boundary		**66.0**	**cfs**

B. STORMWATER CONVEYANCE CHANNEL SIZING

Section Data

Mannings Coefficient	n_2	0.022	unitless	https://www.lmnoeng.com/manningn.htm, Excavated Earth Channel - Clean
Channel Slope	s_5	0.001	ft/ft	Design Minimum

Hydraulic Radius — R_n

Flow Depth(d)	*d*	*2.00*	*ft*
Side Slope	*Z*	*3.00*	*H:V*
Bottom Width	*b*	*7.00*	*ft*
Hydraulic Radius	R	1.323	FT
Note: assumed cross section			

Velocity	**V_{oc3}**	**2.58**	**feet per second**

1. Size Channel Check — **Mannings Equation for V-ditch**

Channel Discharge Check	**Q_n**	**67.1**	**Cubic Feet Per Second**	$Q_n = V_n A$

Design Depth	**2.30**	**ft**
Design Freeboard	**0.30**	**Ft**

Attachment B

Revised Universal Soil Loss Equation (RUSLE) Calculation

NORTH RANCH SURFACE WASTE MANAGEMENT FACILITY
REVISED UNIVERSAL SOIL LOSS EVALUATION (RUSLE)

ASSUMPTIONS:
- 2 areas or basin types to consider top deck of landfill and side slope of landfill between collection at diversion berms
- There is 1 top deck area and 38 areas between letdowns subdivided by side slope diversion berms

Basin Type Definition

Basin	Description	Slope (%)	Length (ft)
1	Top Deck	4	400
2	Side Slope Area Between Diversion Berms and Letdowns	25	100

C - Factor Calculation

C	=	$C_{PLU}*C_{CC}*C_{SC}*C_{SR}*C_{SM}$		
C_{PLU}	-	Prior Land Use Subfactor		
	=	1	For Rangeland	
C_{CC}	-	Canopy Cover Subfactor		
	=	1-FC*exp(-0.1*H)		Equation 5-11, NRCS Agricultural Handbook #703
		F_C = Fraction Land Covered by Canopy		
		F_C = 0.5	Conservative Estimate	
		H = Canopy Cover Height		
		H = 1	Conservative Estimate	
	=	0.55		
C_{SC}	-	Surface Cover Subfactor		
	=	$exp[-b*S_P(0.24/R_U)^{.08}]$		Equation 5-12, NRCS Agricultural Handbook #703
		b = 0.39	Simanton et. al (1984)	
		$S_P = [1-exp(-\alpha*B_S)]*100$		Equation 5-13, NRCS Agricultural Handbook #703
		α = 0.00055	Table 5-1, NRCS Agricultural Handbook #703	
		B_S = 5 ton/acre^{-1}		
		S_P = 93.61		
		R_U = 0.8	Short Grass, Desert	Table 5-6, NRCS Agricultural Handbook #703
	=	0.036		
C_{SR}	-	Surface Roughness Subfactor		
	=	$exp[-0.66*(R_U-0.24)]$		Equation 5-23, NRCS Agricultural Handbook #703
	=	0.691		
C_{SM}	-	Soil Moisture Subfactor		
	=	1	Rangeland	
C	=	0.014		

RUSLE Equation Calculation

R	-	Rainfall Value Factor		
	=	45		Fig 2-1 & 2-2, NRCS Agricultural Handbook #703
K	-	Soil Erodibility Factor		
	=	0.13		Soil Type Poorly Graded Silty Sand
LS	-	Slope Length Factor		
	=	Basin	LS	Table 4-3, NRCS Agricultural Handbook #703
		1	1.14	
		2	1.56	
C	-	Covering Management Factor		
	=	0.014		see C factor calculation sheet
P	-	Support Practices Factor		
	=	1		Conservative Estimate
A	-	Calculated Soils Loss in tons/acre-year		
		Basin	A (tons/acrea-year)	
		1	0.093	
		2	0.128	

Total Soil Loss

Basin Type	Calculated Soil Loss A per Basin Type (tons/acre-year)	Number of Basins Types	Total Soil Loss (tons/acre-year)
1	0.093	1	**0.093**
2	0.128	38	**4.864**
Total Side Wide Soil Loss			**4.957**

Attachment C
Leachate Evaporation Pond Sizing – Incidental Precipitation Volume

NORTH RANCH SURFACE WASTE MANAGEMENT FACILITY
LEACHATE EVAPORATION POND SIZING - INCIDENTAL PRECIPITATION VOLUME

ASSUMPTIONS:
- Area Assumes Largest Cell Open, Cell E-3, and Waste Slope in from Cell C-2
- Incidental precipitation from 25-year, 24-hour storm event

HYDROLOGY PARAMETERS SCS METHOD	**VALUE**	**SOURCE**
Precipitation (25-YEAR/24-HOUR EVENT, INCHES)	4.59	NOAA Atlas 14, Volume 1, Version 5. Jal, New Mexico, USA
Curve Number (unitless)	83	TR-55 Manual, Table 2-2a for "Streets/Roads-Dirt" for Hydraulic Soil Group B
Direct Runoff (inches)	2.75	TR-55 Manual, Figure 2-1 using CN and P above.
RUNOFF VOLUME		
Area (acres)	37.3	CALCULATED IN CAD
Runoff Volume (Ac-ft^3)	8.5	calculated
Runoff Volume (CY)	13790.6	calculated
INCIDENTAL RAINFALL OVER POND		
- Area From Site Development Design		
HYDROLOGY PARAMETERS SCS METHOD	VALUE	SOURCE
Precipitation (25-YEAR/24-HOUR EVENT, INCHES)	4.59	NOAA Atlas 14, Volume 1, Version 5. Jal, New Mexico, USA
Curve Number (unitless)	100	Exposed HDPE Impervious Surface
Direct Runoff (inches)	4.59	TR-55 Manual, Figure 2-1 using CN and P above.
RUNOFF VOLUME		
Area (acres)	2	CALCULATED IN CAD
Runoff Volume (Ac-ft^3)	0.765	calculated
Runoff Volume (CY)	1234.2	calculated
TOTAL Runoff Volume (Ac-ft3)	9.3	
TOTAL Runoff Volume (CY)	15024.8	
TOTAL Runoff Volume (CF)	405670.7	

Attachment D
Hydraulic Evaluation of Landfill Performance (HELP) Report

CALCULATIONS BY: Kyle Jackson – Staff Engineer
Michael P. Bradford, P.E. – Senior Project Manager

SOFTWARE: HELP Version 3.95D,
Hydrologic Evaluation of the Landfill Performance - A USACOE model for predicting landfill hydrologic and infiltration processes and testing of effectiveness of landfill designs that was updated by Institute of Soil Science, University of Hamburg, Germany dated August 10, 2012.

METHODOLOGY: *Guidance Document for Performance for an Alternate Cover/Liner Design Under Section 502.A.2 of the New Mexico Solid Waste Management Regulations (20 NMAC 9.1) Using HELP Modeling, New Mexico Environmental Department Solid Waste Bureau Permit Section, April 1, 1998 (Guidance)*
Provided in Exhibit I.

INTRODUCTION:

The following document comprises the HELP modeling for the NGL Water Solutions Permian, LLC (NGL) North Ranch Surface Waste Management Facility (Facility). The site is located 16 miles west Jal, New Mexico and is approximately 303 acres in size. The primary waste accepted by the Facility will be oil field waste.

The applicant proposes to permit, construct and operate the Facility and associated leachate evaporation pond and appurtenances. The facility design is split into Phase 1 and Phase 2, with a centrally located temporary road running between the phases. Each phase is divided into cells ranging from 15 acres to 23 acres in size with a total waste disposal size of 205 acres. The proposed disposal area design is expected to yield approximately 40,264,324 cubic yards of airspace. The weather data was obtained from NOAA using monthly averages for precipitation of the 5 wettest consecutive years (manually entered) and the monthly averages for temperature of the corresponding years (manually entered) (see **Exhibit J**) and solar inputs based on the corresponding years. The weather data used was the more complete data set from the Roswell Industrial Air Park station.

ANALYSIS:

The HELP Model version 3.95D was used to calculate approximate leachate flow rates and liquid heads above the liner system under eight different scenarios. The scenarios were to compare the alternate cover/liner systems proposed by Terracon and the prescriptive cover/liner system defined by NMAC 19.15.36.14.

Final Cover Demonstration – Tier 1 Analysis
- Scenario 1 portrays the prescriptive final cover system outlined in NMAC 19.15.36.14. See **Table D.1,** and **Exhibit A** for modeling results.
- Scenario 2 portrays the alternate final cover system designed by Terracon. See **Table D.2,** and **Exhibit B** for modeling results.

Base Liner Demonstration – Tier 1 Analysis
- Scenario 3 portrays the prescriptive liner system set forth by NMAC 19.15.36.14 of the largest cell in the disposal area. See **Table D.3,** and **Exhibit C** for modeling results.
- Scenario 4 portrays the alternate liner system designed by Terracon of the largest cell in the disposal area prior to waste being placed over the cell. See **Table D.4,** and **Exhibit D** for modeling results.

Base Liner Demonstration – Tier 2 Analysis

- Scenario 5 portrays the alternate liner system designed by Terracon of the largest cell in the disposal area prior to waste being placed over the cell. See **Table D.4,** and **Exhibit E** for modeling results.
- Scenario 6 portrays the alternate liner system of the entire disposal area with 20' of waste placed. See **Table D.5,** and **Exhibit F** for modeling results.
- Scenario 7 portrays the alternate liner system of the entire disposal area completely filled with alternative final cover placed but with no vegetation developed. See **Table D.6,** and **Exhibit G** for modeling results.
- Scenario 8 portrays the alternate liner system of the entire disposal area completely filled with alternative final cover placed with vegetation developed. See **Table D.7,** and **Exhibit H** for modeling results.

The layers for each scenario analyzed using the HELP Model are described below in **the following tables.**

Table D.1 Scenario 1 - Prescriptive Final Cover Design

Layer	Description	Thickness	K_{sat} (cm/se)
1	Erosion Layer	12-in	1×10^{-5}
2	Final Cover	12-in	1×10^{-5}
3	Drainage Sand	12-in	1×10^{-2}
4	Geomembrane	60-mil	2×10^{-13}
5	Drainage Sand	12-in	1×10^{-2}
6	Intermediate Cover	12-in	1×10^{-5}

Table D.2 Scenario 2 - Alternate Final Cover

Layer	Description	Thickness	K_{sat} (cm/se)
1	Erosion Layer	12-in	1×10^{-5}
2	Final Cover	36-in	1×10^{-5}
3	Intermediate Cover	12-in	1×10^{-5}

Table D.3 Scenario 3 - Prescriptive Liner

Layer	Description	Thickness	K_{sat} (cm/se)
1	Protective/Drainage Soil	24-in	1×10^{-2}
2	Geomembrane	60-mil	2×10^{-13}
3	On-Site Soil	24-in	1×10^{-5}
4	Geomembrane	60-mil	2×10^{-13}
5	Compacted Clay Liner	24-in	1×10^{-7}

Table D.4 Scenario 4 and 5 - Alternate Liner System Design

Layer	Description	Thickness	K_{sat} (cm/se)
1	Protective/Drainage Soil	24-in	1×10^{-5}
2	Geocomposite	200-mil	10
3	Geomembrane	60-mil	2×10^{-13}
4	Geocomposite Leak Detection	200-mil	10
5	Geomembrane	60-mil	2×10^{-13}
6	Geosynthetic Clay Liner	240-mil	3×10^{-9}

Table D.5 Scenario 6 - Alternate Liner - 20' Filled

Layer	Description	Thickness	K_{sat} (cm/se)
1	Waste	20-ft	1×10^{-3}
2	Protective/Drainage Soil	24-in	1×10^{-5}
3	Geocomposite	200-mil	10
4	Geomembrane	60-mil	2×10^{-13}
5	Geocomposite Leak Detection	200-mil	10
6	Geomembrane	60-mil	2×10^{-13}
7	Geosynthetic Clay Liner	240-mil	3×10^{-9}

Table D.6 Scenario 7 - Alternate Liner - Filled with Final Cover No Vegetation

Layer	Description	Thickness	K_{sat} (cm/se)
1	Erosion Layer	12-in	1×10^{-5}
2	Final Cover	36-in	1×10^{-5}
3	Intermediate Cover	12-in	1×10^{-5}
4	Waste	227-ft	1×10^{-3}
5	Protective/Drainage Soil	24-in	1×10^{-5}
6	Geocomposite	200-mil	10
7	Geomembrane	60-mil	2×10^{-13}

8	Geocomposite Leak Detection	200-mil	10
9	Geomembrane	60-mil	2×10^{-13}
10	Geosynthetic Clay Liner	240-mil	3×10^{-9}

Table D.7 Scenario 8 - Alternate Liner - Filled Established Vegetation

Layer	Description	Thickness	K_{sat} (cm/se)
1	Erosion Layer	12-in	1×10^{-5}
2	Final Cover	36-in	1×10^{-5}
3	Intermediate Cover	12-in	1×10^{-5}
4	Waste	227-ft	1×10^{-3}
5	Protective/Drainage Soil	24-in	1×10^{-5}
6	Geocomposite	200-mil	10
7	Geomembrane	60-mil	2×10^{-13}
8	Geocomposite Leak Detection	200-mil	10
9	Geomembrane	60-mil	2×10^{-13}
10	Geosynthetic Clay Liner	240-mil	3×10^{-9}

Site specific soil and climate conditions and parameters are established using HELP Model predefined input data. The cell floor is modeled assuming a 600 ft maximum lateral drainage length at 2% grade. The final cover is modeled with a maximum lateral drainage length of 750 ft at 4% grade. Initial moisture of soil components is calculated using the 25% rule stated in the Guidance. The individual HELP Model evaluation results stating the various conditions of the different scenarios can be found in **Exhibit A-H**.

SUMMARY OF RESULTS:

The following **Table D.8** is a summary of the HELP modeling results as related to the Guidance and NMAC requirements.

Table D.8 Summary of HELP Modeling Results

Scenario	Critical Layer	Percolation Through Critical Layer (inches)	Maximum Head on Primary Liner (Inches)	Comments
Tier I - Alternative Final Cover Equivalency Demonstration				
1 - Prescriptive Final Cover (NMAC 19.15.36.14.C(8))	Layer 4	0.0	n/a	none
2 – Alternative Final Cover	Layer 3	0.0	n/a	Equivalent hydraulic performance to prescriptive final cover system

Scenario	Critical Layer	Percolation Through Critical Layer (inches)	Maximum Head on Primary Liner (Inches)	Comments
Tier I – Alternative Base Liner Equivalency Demonstration				
3 – Prescriptive Liner Over Largest Cell (NMAC 19.15.26.14.C)	Layer 5	0.0	26.4	none
4 – Alternative Liner Over Largest Cell	Layer 6	0.0	0.257	Performance exceeds performance of the prescriptive line system. Is in compliance with NMAC 19.15.36.14.F as head over the liner does not exceed 1-ft.
Tier II – Alternative Base Liner Groundwater Protection Demonstration				
5 – Alternative Liner Over Entire Landfill, Prior to Waste Placement	Layer 6	0.0	0.025	No percolation through the clay barrier, thus protective of groundwater.
6 – Alternative Liner Over Entire Landfill, with 20' of Waste Placement	Layer 7	0.0	0.0	No percolation through the clay barrier, thus protective of groundwater.
7 – Alternative Liner Over Entire Landfill, Filled to Final Grade with Alternative Final Cover with no vegetation established	Layer 10	0.0	0.0	No percolation through the clay barrier, thus protective of groundwater.
8 – Alternative Liner Over Entire Landfill, Filled to Final Grade with Alternative Final Cover with poor cover vegetation established	Layer 10	0.0	0.0	No percolation through the clay barrier, thus protective of groundwater.

In conclusion, the proposed alternative final cover and base liner systems have demonstrated equivalent or better hydraulic performance to that of the NMAC prescriptive systems. In addition, as shown there is no percolation anticipated through the proposed alternative final cover system. The cap is designed to remove moisture from the cap by either evaporation or plant transpiration before moving through the cap's thickness. Therefore, the final cover system effectively prevents the "bathtub effect" and is in compliance with NMAC 19.15.39.14.C.(9).

Exhibit A
SCENARIO 1 HELP MODEL RESULTS

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 ******************************************************************************
 ******************************************************************************
 **                                                                          **
 **                                                                          **
 **              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
 **                                                                          **
 **              HELP Version 3.95 D          (10 August 2012)              **
 **                            developed at                                  **
 **        Institute of Soil Science, University of Hamburg, Germany         **
 **                              based on                                    **
 **              US HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)               **
 **                  DEVELOPED BY ENVIRONMENTAL LABORATORY                   **
 **                    USAE WATERWAYS EXPERIMENT STATION                     **
 **             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY              **
 **                                                                          **
 **                                                                          **
 ******************************************************************************
 ******************************************************************************


 TIME:  16.24     DATE:  24.09.2019


 PRECIPITATION DATA FILE:       N:\Projects\2018\35187378\Working Files\DRAFTS (Proposal-Reports-
Communications)\McCloy Permit Narrative\092019 FINAL SUBMITTAL to OCD\VOLUME 2\App J - Engineering
Report\AttD-HELP\exhibits a-i\From Edward\PRECCOV-.D4
 TEMPERATURE DATA FILE:         N:\Projects\2018\35187378\Working Files\DRAFTS (Proposal-Reports-
Communications)\McCloy Permit Narrative\092019 FINAL SUBMITTAL to OCD\VOLUME 2\App J - Engineering
Report\AttD-HELP\exhibits a-i\From Edward\TEMPCOV-.D7
 SOLAR RADIATION DATA FILE:     N:\Projects\2018\35187378\Working Files\DRAFTS (Proposal-Reports-
Communications)\McCloy Permit Narrative\092019 FINAL SUBMITTAL to OCD\VOLUME 2\App J - Engineering
Report\AttD-HELP\exhibits a-i\From Edward\SOLCOV-.D13
 EVAPOTRANSPIRATION DATA F. 1: N:\Projects\2018\35187378\Working Files\DRAFTS (Proposal-Reports-
Communications)\McCloy Permit Narrative\092019 FINAL SUBMITTAL to OCD\VOLUME 2\App J - Engineering
Report\AttD-HELP\exhibits a-i\From Edward\EVAPCOV-.D11
 SOIL AND DESIGN DATA FILE  1: N:\Projects\2018\35187378\Working Files\DRAFTS (Proposal-Reports-
Communications)\McCloy Permit Narrative\092019 FINAL SUBMITTAL to OCD\VOLUME 2\App J - Engineering
Report\AttD-HELP\exhibits a-i\ExA-FinalCoverPrescriptive\Soil and Design Data.d10
 OUTPUT DATA FILE:              N:\Projects\2018\35187378\Working Files\DRAFTS (Proposal-Reports-
Communications)\McCloy Permit Narrative\092019 FINAL SUBMITTAL to OCD\VOLUME 2\App J - Engineering
Report\AttD-HELP\exhibits a-i\ExA-FinalCoverPrescriptive\Summary Output Files.out
 YEARLY OUTPUT DATA FILE:       N:\Projects\2018\35187378\Working Files\DRAFTS (Proposal-Reports-
Communications)\McCloy Permit Narrative\092019 FINAL SUBMITTAL to OCD\VOLUME 2\App J - Engineering
Report\AttD-HELP\exhibits a-i\ExA-FinalCoverPrescriptive\Summary Output Files.YR

 COLUMNS OF YEARLY OUTPUT DATA FILE:

      1    DATE OF ULTIMO (yyyy1231, years 2101 to 2200 from weather generator)
      2    PRECIPITATION (INCH)
      3    RUNOFF (INCH)
      4    POTENTIAL EVAPOTRANSPIRATION (INCH)
      5    ACTUAL EVAPOTRANSPIRATION (INCH)
      6    DRAIN #1: LATERAL DRAINAGE FROM LAYER  3 (INCH)
      7    LEAK  #1: PERCOLATION/LEAKAGE THROUGH LAYER  4 (INCH)
      8    LEAK  #2: PERCOLATION/LEAKAGE THROUGH LAYER  5 (INCH)
      9    CHANGE IN TOTAL WATER STORAGE (INCH)
     10    CHANGE IN SOIL WATER STORAGE (INCH)
     11    CHANGE IN INTERCEPTION WATER STORAGE (INCH)
     12    CHANGE IN SNOW WATER STORAGE (INCH)
     13    ANNUAL WATER BUDGET BALANCE (INCH)


 ******************************************************************************

      TITLE:  Prescriptive Final Cover

 ******************************************************************************


                              WEATHER DATA SOURCES
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NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ROSWELL NEW MEXICO

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
0.35	0.72	0.30	0.67	2.01	3.48
1.90	2.74	1.83	1.90	0.81	0.86

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ROSWELL NEW MEXICO

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
39.40	45.20	52.50	61.00	69.50	76.10
79.30	78.50	71.00	61.10	50.00	40.40

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ROSWELL NEW MEXICO
AND STATION LATITUDE = 33.24 DEGREES

****

LAYER DATA 1

VALID FOR 5 YEARS

NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER
WERE SPECIFIED BY THE USER.

LAYER 1

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	12.00	INCHES
POROSITY	=	0.4730	VOL/VOL
FIELD CAPACITY	=	0.2220	VOL/VOL
WILTING POINT	=	0.1040	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.1340	VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.	=	0.1000E-04	CM/SEC

LAYER 2

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	12.00	INCHES
POROSITY	=	0.4730	VOL/VOL
FIELD CAPACITY	=	0.2220	VOL/VOL
WILTING POINT	=	0.1040	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.1720	VOL/VOL

EFFECTIVE SAT. HYD. CONDUCT.= 0.1000E-04 CM/SEC

LAYER 3

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 1

THICKNESS	=	12.00	INCHES
POROSITY	=	0.4170	VOL/VOL
FIELD CAPACITY	=	0.0450	VOL/VOL
WILTING POINT	=	0.0180	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0250	VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.	=	0.1000E-01	CM/SEC
SLOPE	=	4.00	PERCENT
DRAINAGE LENGTH	=	750.0	FEET

LAYER 4

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.06	INCHES
EFFECTIVE SAT. HYD. CONDUCT.	=	0.2000E-12	CM/SEC
FML PINHOLE DENSITY	=	4.00	HOLES/ACRE
FML INSTALLATION DEFECTS	=	4.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	3 - GOOD	

LAYER 5

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 1

THICKNESS	=	12.00	INCHES
POROSITY	=	0.4170	VOL/VOL
FIELD CAPACITY	=	0.0450	VOL/VOL
WILTING POINT	=	0.0180	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.1720	VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.	=	0.1000E-01	CM/SEC

****

GENERAL DESIGN AND EVAPORATIVE ZONE DATA 1

VALID FOR 5 YEARS

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE # 7 WITH A POOR STAND OF GRASS, A SURFACE SLOPE OF 4.% AND A SLOPE LENGTH OF 750. FEET.

SCS RUNOFF CURVE NUMBER	=	82.43	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	205.000	ACRES
EVAPORATIVE ZONE DEPTH	=	24.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	3.672	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	11.352	INCHES
FIELD CAPACITY OF EVAPORATIVE ZONE	=	5.328	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	2.496	INCHES
SOIL EVAPORATION ZONE DEPTH	=	24.000	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL INTERCEPTION WATER	=	0.000	INCHES

INITIAL WATER IN LAYER MATERIALS = 6.036 INCHES
TOTAL INITIAL WATER = 6.036 INCHES
TOTAL SUBSURFACE INFLOW = 0.00 INCHES/YEAR

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EVAPOTRANSPIRATION DATA 1

VALID FOR 5 YEARS

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
ROSWELL NEW MEXICO

STATION LATITUDE	=	33.24 DEGREES
MAXIMUM LEAF AREA INDEX	=	1.20
START OF GROWING SEASON (JULIAN DATE)	=	76
END OF GROWING SEASON (JULIAN DATE)	=	310
EVAPORATIVE ZONE DEPTH	=	24.0 INCHES
AVERAGE ANNUAL WIND SPEED	=	8.70 MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	49.0 %
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	40.0 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	53.0 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	52.0 %

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ANNUAL TOTALS FOR YEAR 1

	INCHES	CU. FEET	PERCENT
PRECIPITATION	12.67	9428383.000	100.00
RUNOFF	2.440	1815890.500	19.26
POTENTIAL EVAPOTRANSPIRATION	76.038	56583840.000	
ACTUAL EVAPOTRANSPIRATION	10.243	7622132.000	80.84
DRAINAGE COLLECTED FROM LAYER 3	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 4	0.0000		
PERC./LEAKAGE THROUGH LAYER 5	1.327622	987949.812	10.48
CHANGE IN WATER STORAGE	-1.341	-997593.688	-10.58
SOIL WATER AT START OF YEAR	6.336	4714927.000	
SOIL WATER AT END OF YEAR	4.995	3717333.250	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	3.548	0.00

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ANNUAL TOTALS FOR YEAR 2

	INCHES	CU. FEET	PERCENT
PRECIPITATION	22.13	16468041.000	100.00
RUNOFF	6.346	4722008.500	28.67
POTENTIAL EVAPOTRANSPIRATION	75.116	55897788.000	
ACTUAL EVAPOTRANSPIRATION	14.357	10683393.000	64.87
DRAINAGE COLLECTED FROM LAYER 3	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 4	0.0000		
PERC./LEAKAGE THROUGH LAYER 5	0.063343	47136.418	0.29
CHANGE IN WATER STORAGE	1.365	1015503.750	6.17
SOIL WATER AT START OF YEAR	4.995	3717333.250	
SOIL WATER AT END OF YEAR	6.360	4732837.000	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.710	0.00

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ANNUAL TOTALS FOR YEAR 3

	INCHES	CU. FEET	PERCENT
PRECIPITATION	18.51	13774217.000	100.00
RUNOFF	4.117	3063777.250	22.24
POTENTIAL EVAPOTRANSPIRATION	75.152	55924352.000	
ACTUAL EVAPOTRANSPIRATION	14.163	10539217.000	76.51
DRAINAGE COLLECTED FROM LAYER 3	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 4	0.0000		
PERC./LEAKAGE THROUGH LAYER 5	0.033784	25140.037	0.18

CHANGE IN WATER STORAGE	0.196	146084.109	1.06
SOIL WATER AT START OF YEAR	6.360	4732837.000	
SOIL WATER AT END OF YEAR	6.244	4646806.500	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.312	232114.266	1.69
ANNUAL WATER BUDGET BALANCE	0.0000	-1.153	0.00

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ANNUAL TOTALS FOR YEAR 4

	INCHES	CU. FEET	PERCENT
PRECIPITATION	14.91	11095278.000	100.00
RUNOFF	4.511	3356853.000	30.25
POTENTIAL EVAPOTRANSPIRATION	75.777	56389536.000	
ACTUAL EVAPOTRANSPIRATION	11.845	8814219.000	79.44
DRAINAGE COLLECTED FROM LAYER 3	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 4	0.0000		
PERC./LEAKAGE THROUGH LAYER 5	0.022665	16865.910	0.15
CHANGE IN WATER STORAGE	-1.468	-1092660.125	-9.85
SOIL WATER AT START OF YEAR	6.244	4646806.500	
SOIL WATER AT END OF YEAR	5.088	3786261.000	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.312	232114.266	2.09
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.444	0.00

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ANNUAL TOTALS FOR YEAR 5

	INCHES	CU. FEET	PERCENT
PRECIPITATION	19.18	14272800.000	100.00
RUNOFF	5.755	4282273.500	30.00
POTENTIAL EVAPOTRANSPIRATION	74.468	55415588.000	
ACTUAL EVAPOTRANSPIRATION	12.905	9603489.000	67.29
DRAINAGE COLLECTED FROM LAYER 3	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 4	0.0000		
PERC./LEAKAGE THROUGH LAYER 5	0.016789	12493.663	0.09
CHANGE IN WATER STORAGE	0.503	374542.531	2.62
SOIL WATER AT START OF YEAR	5.088	3786261.000	
SOIL WATER AT END OF YEAR	5.591	4160803.750	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	2.306	0.00

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FINAL WATER STORAGE AT END OF YEAR 5

LAYER	(INCHES)	(VOL/VOL)
1	3.1436	0.2620
2	1.2480	0.1040
3	0.3000	0.0250
4	0.0000	0.0000
5	0.5998	0.0500
TOTAL WATER IN LAYERS	5.291	
SNOW WATER	0.000	
INTERCEPTION WATER	0.000	
TOTAL FINAL WATER	5.291	

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 5

	(INCHES)	(CU. FT.)
PRECIPITATION	3.22	2396163.000
RUNOFF	2.565	1908494.6250
DRAINAGE COLLECTED FROM LAYER 3	0.00000	0.00000
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.000000	0.00000
AVERAGE HEAD ON TOP OF LAYER 4	0.000	
MAXIMUM HEAD ON TOP OF LAYER 4	0.000	
LOCATION OF MAXIMUM HEAD IN LAYER 3 (DISTANCE FROM DRAIN)	0.0 FEET	
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.436997	325191.65625
SNOW WATER	2.39	1774816.8750
MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.2385	
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.1040	

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas
ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 5

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	0.25	0.43	0.33	0.48	2.06	2.41
	2.29	2.42	1.75	1.44	2.05	1.57
STD. DEVIATIONS	0.28	0.11	0.29	0.39	1.94	2.94
	1.07	1.68	1.12	1.68	2.50	1.09
RUNOFF						
TOTALS	0.028	0.000	0.000	0.037	0.661	1.365
	0.481	0.491	0.127	0.529	0.630	0.284
STD. DEVIATIONS	0.063	0.000	0.000	0.036	0.887	1.950
	0.366	0.445	0.238	1.016	0.947	0.364
POTENTIAL EVAPOTRANSPIRATION						
TOTALS	3.006	3.630	5.121	7.372	9.278	10.074
	10.034	8.741	6.610	5.205	3.692	2.548
STD. DEVIATIONS	0.194	0.200	0.191	0.353	0.460	0.188
	0.100	0.266	0.307	0.177	0.178	0.242

ACTUAL EVAPOTRANSPIRATION

TOTALS	0.475	0.346	0.279	0.471	2.406	1.509
	1.759	1.935	1.260	0.739	0.810	0.712
STD. DEVIATIONS	0.171	0.087	0.097	0.182	1.017	1.562
	0.726	1.058	0.675	0.455	0.506	0.291

LATERAL DRAINAGE COLLECTED FROM LAYER 3

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

PERCOLATION/LEAKAGE THROUGH LAYER 4

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

PERCOLATION/LEAKAGE THROUGH LAYER 5

TOTALS	0.2098	0.0202	0.0134	0.0093	0.0077	0.0062
	0.0056	0.0050	0.0043	0.0041	0.0037	0.0035
STD. DEVIATIONS	0.4606	0.0380	0.0224	0.0140	0.0105	0.0078
	0.0065	0.0054	0.0044	0.0039	0.0033	0.0030

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 4

AVERAGES	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 5

	INCHES		CU. FEET	PERCENT
PRECIPITATION	17.48	(3.719)	13007743.0	100.00
RUNOFF	4.634	(1.5231)	3448160.75	26.509
POTENTIAL EVAPOTRANSPIRATION	75.310	(0.6175)	56042220.00	
ACTUAL EVAPOTRANSPIRATION	12.702	(1.7099)	9452490.00	72.668
LATERAL DRAINAGE COLLECTED FROM LAYER 3	0.00000	(0.00000)	0.000	0.00000
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.00000	(0.00000)	0.000	0.00000

AVERAGE HEAD ON TOP OF LAYER 4	0.000	(0.000)		
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.29284	(0.57874)	217917.188	1.67529
CHANGE IN WATER STORAGE	-0.149	(1.2244)	-110824.68	-0.852

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Exhibit B
SCENARIO 2 HELP MODEL RESULTS

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 **                                                                           **
 **                                                                           **
 **              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE                **
 **                                                                           **
 **              HELP Version 3.95 D          (10 August 2012)              **
 **                              developed at                                 **
 **        Institute of Soil Science, University of Hamburg, Germany          **
 **                                 based on                                  **
 **              US HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                **
 **                  DEVELOPED BY ENVIRONMENTAL LABORATORY                    **
 **                    USAE WATERWAYS EXPERIMENT STATION                      **
 **             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY               **
 **                                                                           **
 **                                                                           **
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 TIME:  16.29     DATE:  24.09.2019

 PRECIPITATION DATA FILE:       N:\Projects\2018\35187378\Working Files\DRAFTS (Proposal-Reports-
Communications)\McCloy Permit Narrative\092019 FINAL SUBMITTAL to OCD\VOLUME 2\App J - Engineering
Report\AttD-HELP\exhibits a-i\From Edward\PRECCOV-.D4
 TEMPERATURE DATA FILE:         N:\Projects\2018\35187378\Working Files\DRAFTS (Proposal-Reports-
Communications)\McCloy Permit Narrative\092019 FINAL SUBMITTAL to OCD\VOLUME 2\App J - Engineering
Report\AttD-HELP\exhibits a-i\From Edward\TEMPCOV-.D7
 SOLAR RADIATION DATA FILE:     N:\Projects\2018\35187378\Working Files\DRAFTS (Proposal-Reports-
Communications)\McCloy Permit Narrative\092019 FINAL SUBMITTAL to OCD\VOLUME 2\App J - Engineering
Report\AttD-HELP\exhibits a-i\From Edward\SOLCOV-.D13
 EVAPOTRANSPIRATION DATA F. 1: N:\Projects\2018\35187378\Working Files\DRAFTS (Proposal-Reports-
Communications)\McCloy Permit Narrative\092019 FINAL SUBMITTAL to OCD\VOLUME 2\App J - Engineering
Report\AttD-HELP\exhibits a-i\From Edward\EVAPCOV-.D11
 SOIL AND DESIGN DATA FILE  1: N:\Projects\2018\35187378\Working Files\DRAFTS (Proposal-Reports-
Communications)\McCloy Permit Narrative\092019 FINAL SUBMITTAL to OCD\VOLUME 2\App J - Engineering
Report\AttD-HELP\exhibits a-i\ExB-FinalCoverAlternate\Soil and Design.d10
 OUTPUT DATA FILE:              N:\Projects\2018\35187378\Working Files\DRAFTS (Proposal-Reports-
Communications)\McCloy Permit Narrative\092019 FINAL SUBMITTAL to OCD\VOLUME 2\App J - Engineering
Report\AttD-HELP\exhibits a-i\ExB-FinalCoverAlternate\Summary Output Files.out
 YEARLY OUTPUT DATA FILE:       N:\Projects\2018\35187378\Working Files\DRAFTS (Proposal-Reports-
Communications)\McCloy Permit Narrative\092019 FINAL SUBMITTAL to OCD\VOLUME 2\App J - Engineering
Report\AttD-HELP\exhibits a-i\ExB-FinalCoverAlternate\Summary Output Files.YR

 COLUMNS OF YEARLY OUTPUT DATA FILE:

      1    DATE OF ULTIMO (yyyy1231, years 2101 to 2200 from weather generator)
      2    PRECIPITATION (INCH)
      3    RUNOFF (INCH)
      4    POTENTIAL EVAPOTRANSPIRATION (INCH)
      5    ACTUAL EVAPOTRANSPIRATION (INCH)
      6    LEAK  #1: PERCOLATION/LEAKAGE THROUGH LAYER  3 (INCH)
      7    CHANGE IN TOTAL WATER STORAGE (INCH)
      8    CHANGE IN SOIL WATER STORAGE (INCH)
      9    CHANGE IN INTERCEPTION WATER STORAGE (INCH)
     10    CHANGE IN SNOW WATER STORAGE (INCH)
     11    ANNUAL WATER BUDGET BALANCE (INCH)


 *******************************************************************************

      TITLE:  Alternate Final Cover

 *******************************************************************************


                            WEATHER DATA SOURCES
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NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ROSWELL NEW MEXICO

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
0.35	0.72	0.30	0.67	2.01	3.48
1.90	2.74	1.83	1.90	0.81	0.86

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ROSWELL NEW MEXICO

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
39.40	45.20	52.50	61.00	69.50	76.10
79.30	78.50	71.00	61.10	50.00	40.40

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ROSWELL NEW MEXICO
AND STATION LATITUDE = 33.24 DEGREES

****

LAYER DATA 1

VALID FOR 5 YEARS

NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER
WERE SPECIFIED BY THE USER.

LAYER 1

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	12.00	INCHES
POROSITY	=	0.4300	VOL/VOL
FIELD CAPACITY	=	0.3210	VOL/VOL
WILTING POINT	=	0.2210	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2460	VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.	=	0.1000E-04	CM/SEC

LAYER 2

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	36.00	INCHES
POROSITY	=	0.4750	VOL/VOL
FIELD CAPACITY	=	0.3780	VOL/VOL
WILTING POINT	=	0.2650	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2930	VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.	=	0.1000E-04	CM/SEC

LAYER 3

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	12.00	INCHES
POROSITY	=	0.4750	VOL/VOL
FIELD CAPACITY	=	0.3780	VOL/VOL
WILTING POINT	=	0.2650	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2930	VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.	=	0.1000E-04	CM/SEC

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GENERAL DESIGN AND EVAPORATIVE ZONE DATA 1

VALID FOR 5 YEARS

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE #13 WITH A POOR STAND OF GRASS, A SURFACE SLOPE OF 4.% AND A SLOPE LENGTH OF 750. FEET.

SCS RUNOFF CURVE NUMBER	=	91.59	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	205.000	ACRES
EVAPORATIVE ZONE DEPTH	=	24.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	6.468	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	10.860	INCHES
FIELD CAPACITY OF EVAPORATIVE ZONE	=	8.388	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	5.832	INCHES
SOIL EVAPORATION ZONE DEPTH	=	24.000	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL INTERCEPTION WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	17.016	INCHES
TOTAL INITIAL WATER	=	17.016	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

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EVAPOTRANSPIRATION DATA 1

VALID FOR 5 YEARS

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM ROSWELL NEW MEXICO

STATION LATITUDE	=	33.24	DEGREES
MAXIMUM LEAF AREA INDEX	=	1.20	
START OF GROWING SEASON (JULIAN DATE)	=	76	
END OF GROWING SEASON (JULIAN DATE)	=	310	
EVAPORATIVE ZONE DEPTH	=	24.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	8.70	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	49.0	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	40.0	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	53.0	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	52.0	%

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ANNUAL TOTALS FOR YEAR 1

	INCHES	CU. FEET	PERCENT
PRECIPITATION	12.67	9428383.000	100.00
RUNOFF	2.573	1914555.500	20.31
POTENTIAL EVAPOTRANSPIRATION	76.038	56583840.000	
ACTUAL EVAPOTRANSPIRATION	10.036	7468518.500	79.21
PERC./LEAKAGE THROUGH LAYER 3	0.000000	0.000	0.00
CHANGE IN WATER STORAGE	0.061	45305.766	0.48
SOIL WATER AT START OF YEAR	17.016	12662415.000	
SOIL WATER AT END OF YEAR	17.077	12707720.000	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	2.129	0.00

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ANNUAL TOTALS FOR YEAR 2

	INCHES	CU. FEET	PERCENT
PRECIPITATION	22.13	16468041.000	100.00
RUNOFF	7.130	5306129.500	32.22
POTENTIAL EVAPOTRANSPIRATION	75.116	55897788.000	
ACTUAL EVAPOTRANSPIRATION	13.297	9895285.000	60.09
PERC./LEAKAGE THROUGH LAYER 3	0.000000	0.000	0.00
CHANGE IN WATER STORAGE	1.702	1266625.375	7.69
SOIL WATER AT START OF YEAR	17.077	12707720.000	
SOIL WATER AT END OF YEAR	18.779	13974345.000	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	2.129	0.00

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ANNUAL TOTALS FOR YEAR 3

	INCHES	CU. FEET	PERCENT
PRECIPITATION	18.51	13774217.000	100.00
RUNOFF	4.766	3546614.750	25.75
POTENTIAL EVAPOTRANSPIRATION	75.152	55924352.000	
ACTUAL EVAPOTRANSPIRATION	13.899	10342769.000	75.09
PERC./LEAKAGE THROUGH LAYER 3	0.000000	0.000	0.00
CHANGE IN WATER STORAGE	-0.155	-115164.930	-0.84
SOIL WATER AT START OF YEAR	18.779	13974345.000	
SOIL WATER AT END OF YEAR	18.312	13627067.000	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.312	232114.266	1.69
ANNUAL WATER BUDGET BALANCE	0.0000	-1.419	0.00

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ANNUAL TOTALS FOR YEAR 4

	INCHES	CU. FEET	PERCENT
PRECIPITATION	14.91	11095278.000	100.00
RUNOFF	4.913	3655879.750	32.95
POTENTIAL EVAPOTRANSPIRATION	75.777	56389536.000	
ACTUAL EVAPOTRANSPIRATION	11.153	8299259.500	74.80
PERC./LEAKAGE THROUGH LAYER 3	0.000000	0.000	0.00
CHANGE IN WATER STORAGE	-1.155	-859862.812	-7.75
SOIL WATER AT START OF YEAR	18.312	13627067.000	
SOIL WATER AT END OF YEAR	17.469	12999317.000	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.312	232114.266	2.09

SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	1.419	0.00

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ANNUAL TOTALS FOR YEAR 5

	INCHES	CU. FEET	PERCENT
PRECIPITATION	19.18	14272800.000	100.00
RUNOFF	6.201	4614677.000	32.33
POTENTIAL EVAPOTRANSPIRATION	74.468	55415588.000	
ACTUAL EVAPOTRANSPIRATION	12.973	9653585.000	67.64
PERC./LEAKAGE THROUGH LAYER 3	0.000000	0.000	0.00
CHANGE IN WATER STORAGE	0.006	4534.834	0.03
SOIL WATER AT START OF YEAR	17.469	12999317.000	
SOIL WATER AT END OF YEAR	17.475	13003852.000	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	2.839	0.00

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FINAL WATER STORAGE AT END OF YEAR 5

LAYER	(INCHES)	(VOL/VOL)
1	3.7468	0.3122
2	10.2119	0.2837
3	3.5160	0.2930
TOTAL WATER IN LAYERS	17.475	
SNOW WATER	0.000	
INTERCEPTION WATER	0.000	
TOTAL FINAL WATER	17.475	

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 5

	(INCHES)	(CU. FT.)
PRECIPITATION	3.22	2396163.000
RUNOFF	2.561	1905583.0000
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.000000	0.00000
SNOW WATER	2.39	1774816.8750
MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.3582	
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.2430	

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 5

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	0.25	0.43	0.33	0.48	2.06	2.41
	2.29	2.42	1.75	1.44	2.05	1.57
STD. DEVIATIONS	0.28	0.11	0.29	0.39	1.94	2.94
	1.07	1.68	1.12	1.68	2.50	1.09
RUNOFF						
TOTALS	0.033	0.000	0.000	0.064	0.747	1.434
	0.546	0.555	0.151	0.575	0.688	0.324
STD. DEVIATIONS	0.073	0.000	0.000	0.061	0.915	2.014
	0.415	0.502	0.243	1.004	1.055	0.388
POTENTIAL EVAPOTRANSPIRATION						
TOTALS	3.006	3.630	5.121	7.372	9.278	10.074
	10.034	8.741	6.610	5.205	3.692	2.548
STD. DEVIATIONS	0.194	0.200	0.191	0.353	0.460	0.188
	0.100	0.266	0.307	0.177	0.178	0.242
ACTUAL EVAPOTRANSPIRATION						
TOTALS	0.489	0.362	0.415	0.435	2.219	0.993
	1.777	1.921	1.216	0.764	0.908	0.774
STD. DEVIATIONS	0.248	0.087	0.295	0.124	0.989	1.105
	0.815	1.274	0.837	0.539	0.556	0.292
PERCOLATION/LEAKAGE THROUGH LAYER 3						
TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 5

	INCHES		CU. FEET	PERCENT
PRECIPITATION	17.48	(3.719)	13007743.0	100.00
RUNOFF	5.117	(1.7225)	3807571.25	29.272
POTENTIAL EVAPOTRANSPIRATION	75.310	(0.6175)	56042220.00	
ACTUAL EVAPOTRANSPIRATION	12.272	(1.6156)	9131883.00	70.203
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.00000	(0.00000)	0.000	0.00000
CHANGE IN WATER STORAGE	0.092	(1.0269)	68287.65	0.525

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Exhibit C
SCENARIO 3 HELP MODEL RESULTS

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 **                                                                          **
 **                                                                          **
 **              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
 **                                                                          **
 **              HELP Version 3.95 D          (10 August 2012)              **
 **                            developed at                                  **
 **        Institute of Soil Science, University of Hamburg, Germany         **
 **                              based on                                    **
 **              US HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)               **
 **                  DEVELOPED BY ENVIRONMENTAL LABORATORY                   **
 **                    USAE WATERWAYS EXPERIMENT STATION                     **
 **             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY              **
 **                                                                          **
 **                                                                          **
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 ******************************************************************************


 TIME:  15.39     DATE:  24.09.2019


 PRECIPITATION DATA FILE:       N:\Projects\2018\35187378\Working Files\DRAFTS (Proposal-Reports-
Communications)\McCloy Permit Narrative\092019 FINAL SUBMITTAL to OCD\VOLUME 2\App J - Engineering
Report\AttD-HELP\exhibits a-i\From Edward\PRECIP~-.D4
 TEMPERATURE DATA FILE:         N:\Projects\2018\35187378\Working Files\DRAFTS (Proposal-Reports-
Communications)\McCloy Permit Narrative\092019 FINAL SUBMITTAL to OCD\VOLUME 2\App J - Engineering
Report\AttD-HELP\exhibits a-i\From Edward\TEMPER~-.D7
 SOLAR RADIATION DATA FILE:     N:\Projects\2018\35187378\Working Files\DRAFTS (Proposal-Reports-
Communications)\McCloy Permit Narrative\092019 FINAL SUBMITTAL to OCD\VOLUME 2\App J - Engineering
Report\AttD-HELP\exhibits a-i\From Edward\SOLARR~-.D13
 EVAPOTRANSPIRATION DATA F. 1: N:\Projects\2018\35187378\Working Files\DRAFTS (Proposal-Reports-
Communications)\McCloy Permit Narrative\092019 FINAL SUBMITTAL to OCD\VOLUME 2\App J - Engineering
Report\AttD-HELP\exhibits a-i\From Edward\EVAPOT~-.D11
 SOIL AND DESIGN DATA FILE  1: N:\Projects\2018\35187378\Working Files\DRAFTS (Proposal-Reports-
Communications)\McCloy Permit Narrative\092019 FINAL SUBMITTAL to OCD\VOLUME 2\App J - Engineering
Report\AttD-HELP\exhibits a-i\ExC-PrescriptiveLiner\Soil and Design Data.d10
 OUTPUT DATA FILE:              N:\Projects\2018\35187378\Working Files\DRAFTS (Proposal-Reports-
Communications)\McCloy Permit Narrative\092019 FINAL SUBMITTAL to OCD\VOLUME 2\App J - Engineering
Report\AttD-HELP\exhibits a-i\ExC-PrescriptiveLiner\Summary Output.out
 YEARLY OUTPUT DATA FILE:       N:\Projects\2018\35187378\Working Files\DRAFTS (Proposal-Reports-
Communications)\McCloy Permit Narrative\092019 FINAL SUBMITTAL to OCD\VOLUME 2\App J - Engineering
Report\AttD-HELP\exhibits a-i\ExC-PrescriptiveLiner\Summary Output.YR

 COLUMNS OF YEARLY OUTPUT DATA FILE:

      1    DATE OF ULTIMO (yyyy1231, years 2101 to 2200 from weather generator)
      2    PRECIPITATION (INCH)
      3    RUNOFF (INCH)
      4    POTENTIAL EVAPOTRANSPIRATION (INCH)
      5    ACTUAL EVAPOTRANSPIRATION (INCH)
      6    DRAIN #1: LATERAL DRAINAGE FROM LAYER  1 (INCH)
      7    LEAK  #1: PERCOLATION/LEAKAGE THROUGH LAYER  2 (INCH)
      8    LEAK  #2: PERCOLATION/LEAKAGE THROUGH LAYER  4 (INCH)
      9    LEAK  #3: PERCOLATION/LEAKAGE THROUGH LAYER  5 (INCH)
     10    CHANGE IN TOTAL WATER STORAGE (INCH)
     11    CHANGE IN SOIL WATER STORAGE (INCH)
     12    CHANGE IN INTERCEPTION WATER STORAGE (INCH)
     13    CHANGE IN SNOW WATER STORAGE (INCH)
     14    ANNUAL WATER BUDGET BALANCE (INCH)


 ******************************************************************************

      TITLE:  Prescriptive Liner

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WEATHER DATA SOURCES

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ROSWELL NEW MEXICO

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
0.35	0.72	0.30	0.67	2.01	3.48
1.90	2.74	1.83	1.90	0.81	0.86

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ROSWELL NEW MEXICO

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
39.40	45.20	52.50	61.00	69.50	76.10
79.30	78.50	71.00	61.10	50.00	40.40

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ROSWELL NEW MEXICO
AND STATION LATITUDE = 33.24 DEGREES

****

LAYER DATA 1

VALID FOR 5 YEARS

NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER
WERE SPECIFIED BY THE USER.

LAYER 1

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 1

THICKNESS	=	24.00	INCHES
POROSITY	=	0.4170	VOL/VOL
FIELD CAPACITY	=	0.0450	VOL/VOL
WILTING POINT	=	0.0180	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0250	VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.	=	0.1000E-01	CM/SEC
SLOPE	=	2.00	PERCENT
DRAINAGE LENGTH	=	600.0	FEET

LAYER 2

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.06	INCHES
EFFECTIVE SAT. HYD. CONDUCT.	=	0.2000E-12	CM/SEC

FML PINHOLE DENSITY = 4.00 HOLES/ACRE
FML INSTALLATION DEFECTS = 4.00 HOLES/ACRE
FML PLACEMENT QUALITY = 3 - GOOD

LAYER 3

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	= 24.00	INCHES
POROSITY	= 0.5010	VOL/VOL
FIELD CAPACITY	= 0.2840	VOL/VOL
WILTING POINT	= 0.1350	VOL/VOL
INITIAL SOIL WATER CONTENT	= 0.2930	VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.	= 0.1000E-04	CM/SEC

LAYER 4

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

THICKNESS	= 0.06	INCHES
EFFECTIVE SAT. HYD. CONDUCT.	= 0.2000E-12	CM/SEC
FML PINHOLE DENSITY	= 4.00	HOLES/ACRE
FML INSTALLATION DEFECTS	= 4.00	HOLES/ACRE
FML PLACEMENT QUALITY	= 3 - GOOD	

LAYER 5

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 16

THICKNESS	= 24.00	INCHES
POROSITY	= 0.4270	VOL/VOL
FIELD CAPACITY	= 0.4180	VOL/VOL
WILTING POINT	= 0.3670	VOL/VOL
INITIAL SOIL WATER CONTENT	= 0.3800	VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.	= 0.1000E-06	CM/SEC

****

GENERAL DESIGN AND EVAPORATIVE ZONE DATA 1

VALID FOR 5 YEARS

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE # 1 WITH BARE GROUND CONDITIONS, A SURFACE SLOPE OF 2.% AND A SLOPE LENGTH OF 600. FEET.

SCS RUNOFF CURVE NUMBER	=	71.76	
FRACTION OF AREA ALLOWING RUNOFF	=	0.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	24.000	ACRES
EVAPORATIVE ZONE DEPTH	=	14.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	0.350	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	5.838	INCHES
FIELD CAPACITY OF EVAPORATIVE ZONE	=	0.630	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	0.252	INCHES
SOIL EVAPORATION ZONE DEPTH	=	11.722	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL INTERCEPTION WATER	=	0.000	INCHES

```
        INITIAL WATER IN LAYER MATERIALS    =     16.752  INCHES
        TOTAL INITIAL WATER                 =     16.752  INCHES
        TOTAL SUBSURFACE INFLOW             =      0.00   INCHES/YEAR


********************************************************************************

                        EVAPOTRANSPIRATION DATA   1
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                            VALID FOR   5 YEARS


         NOTE:  EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
                  ROSWELL               NEW MEXICO
             STATION LATITUDE                      =  33.24 DEGREES
             MAXIMUM LEAF AREA INDEX               =   0.00
             START OF GROWING SEASON (JULIAN DATE) =     76
             END OF GROWING SEASON (JULIAN DATE)   =    310
             EVAPORATIVE ZONE DEPTH                =  14.0  INCHES
             AVERAGE ANNUAL WIND SPEED             =   8.70 MPH
             AVERAGE 1ST QUARTER RELATIVE HUMIDITY =  49.0  %
             AVERAGE 2ND QUARTER RELATIVE HUMIDITY =  40.0  %
             AVERAGE 3RD QUARTER RELATIVE HUMIDITY =  53.0  %
             AVERAGE 4TH QUARTER RELATIVE HUMIDITY =  52.0  %

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                           ANNUAL TOTALS FOR YEAR    1
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                                       INCHES          CU. FEET     PERCENT
                                      --------        ----------    -------
  PRECIPITATION                         12.67        1103810.625    100.00

  RUNOFF                                 0.000             0.000      0.00

  POTENTIAL EVAPOTRANSPIRATION          76.038       6624449.500

  ACTUAL EVAPOTRANSPIRATION              8.888        774333.812     70.15

  DRAINAGE COLLECTED FROM LAYER  1       1.2060       105063.555      9.52

  PERC./LEAKAGE THROUGH LAYER  2        0.062961       5485.164      0.50

  AVG. HEAD ON TOP OF LAYER  2           1.7421

  PERC./LEAKAGE THROUGH LAYER  4        0.001302        113.420      0.01

  AVG. HEAD ON TOP OF LAYER  4           0.9239

  PERC./LEAKAGE THROUGH LAYER  5        0.000000          0.000      0.00

  CHANGE IN WATER STORAGE                2.576        224413.000     20.33

  SOIL WATER AT START OF YEAR           24.828       2163015.000

  SOIL WATER AT END OF YEAR             27.404       2387428.000

  INTERCEPTION WATER AT START OF YEAR    0.000             0.000

  INTERCEPTION WATER AT END OF YEAR      0.000             0.000

  SNOW WATER AT START OF YEAR            0.000             0.000      0.00
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SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.125	0.00

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ANNUAL TOTALS FOR YEAR 2

	INCHES	CU. FEET	PERCENT
PRECIPITATION	22.13	1927965.875	100.00
RUNOFF	0.000	0.000	0.00
POTENTIAL EVAPOTRANSPIRATION	75.116	6544130.500	
ACTUAL EVAPOTRANSPIRATION	12.436	1083456.750	56.20
DRAINAGE COLLECTED FROM LAYER 1	6.3987	557453.562	28.91
PERC./LEAKAGE THROUGH LAYER 2	0.324183	28242.811	1.46
AVG. HEAD ON TOP OF LAYER 2	9.2551		
PERC./LEAKAGE THROUGH LAYER 4	0.001808	157.552	0.01
AVG. HEAD ON TOP OF LAYER 4	1.3247		
PERC./LEAKAGE THROUGH LAYER 5	0.000000	0.000	0.00
CHANGE IN WATER STORAGE	3.295	287055.406	14.89
SOIL WATER AT START OF YEAR	27.404	2387428.000	
SOIL WATER AT END OF YEAR	30.699	2674483.250	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.166	0.00

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ANNUAL TOTALS FOR YEAR 3

	INCHES	CU. FEET	PERCENT
PRECIPITATION	18.51	1612591.375	100.00
RUNOFF	0.000	0.000	0.00
POTENTIAL EVAPOTRANSPIRATION	75.152	6547241.500	
ACTUAL EVAPOTRANSPIRATION	11.720	1021062.312	63.32

DRAINAGE COLLECTED FROM LAYER 1	6.4143	558813.438	34.65
PERC./LEAKAGE THROUGH LAYER 2	0.324821	28298.393	1.75
AVG. HEAD ON TOP OF LAYER 2	9.3013		
PERC./LEAKAGE THROUGH LAYER 4	0.002970	258.735	0.02
AVG. HEAD ON TOP OF LAYER 4	2.2782		
PERC./LEAKAGE THROUGH LAYER 5	0.000000	0.000	0.00
CHANGE IN WATER STORAGE	0.376	32715.861	2.03
SOIL WATER AT START OF YEAR	30.699	2674483.250	
SOIL WATER AT END OF YEAR	30.762	2680024.750	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.312	27174.352	1.69
ANNUAL WATER BUDGET BALANCE	0.0000	-0.457	0.00

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ANNUAL TOTALS FOR YEAR 4

	INCHES	CU. FEET	PERCENT
PRECIPITATION	14.91	1298959.375	100.00
RUNOFF	0.000	0.000	0.00
POTENTIAL EVAPOTRANSPIRATION	75.777	6601701.500	
ACTUAL EVAPOTRANSPIRATION	8.401	731919.438	56.35
DRAINAGE COLLECTED FROM LAYER 1	6.3879	556517.500	42.84
PERC./LEAKAGE THROUGH LAYER 2	0.323517	28184.820	2.17
AVG. HEAD ON TOP OF LAYER 2	9.2427		
PERC./LEAKAGE THROUGH LAYER 4	0.004641	404.294	0.03
AVG. HEAD ON TOP OF LAYER 4	3.6860		
PERC./LEAKAGE THROUGH LAYER 5	0.000000	0.000	0.00
CHANGE IN WATER STORAGE	0.121	10522.437	0.81
SOIL WATER AT START OF YEAR	30.762	2680024.750	
SOIL WATER AT END OF YEAR	31.195	2717721.750	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	

SNOW WATER AT START OF YEAR	0.312	27174.352	2.09
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.042	0.00

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ANNUAL TOTALS FOR YEAR 5

	INCHES	CU. FEET	PERCENT
PRECIPITATION	19.18	1670962.000	100.00
RUNOFF	0.000	0.000	0.00
POTENTIAL EVAPOTRANSPIRATION	74.468	6487678.500	
ACTUAL EVAPOTRANSPIRATION	13.799	1202167.750	71.94
DRAINAGE COLLECTED FROM LAYER 1	6.5856	573738.438	34.34
PERC./LEAKAGE THROUGH LAYER 2	0.333020	29012.693	1.74
AVG. HEAD ON TOP OF LAYER 2	9.5428		
PERC./LEAKAGE THROUGH LAYER 4	0.006290	548.008	0.03
AVG. HEAD ON TOP OF LAYER 4	5.1238		
PERC./LEAKAGE THROUGH LAYER 5	0.000000	0.000	0.00
CHANGE IN WATER STORAGE	-1.205	-104944.695	-6.28
SOIL WATER AT START OF YEAR	31.195	2717721.750	
SOIL WATER AT END OF YEAR	29.991	2612777.000	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.499	0.00

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FINAL WATER STORAGE AT END OF YEAR 5

LAYER	(INCHES)	(VOL/VOL)
1	4.3941	0.1831
2	0.0000	0.0000
3	8.3835	0.3493

4	0.0000	0.0000
5	9.1370	0.3807
TOTAL WATER IN LAYERS	21.915	
SNOW WATER	0.000	
INTERCEPTION WATER	0.000	
TOTAL FINAL WATER	21.915	

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 5

	(INCHES)	(CU. FT.)
PRECIPITATION	3.22	280526.406
RUNOFF	0.000	0.0000
DRAINAGE COLLECTED FROM LAYER 1	0.03383	2947.16040
PERCOLATION/LEAKAGE THROUGH LAYER 2	0.001691	147.28467
AVERAGE HEAD ON TOP OF LAYER 2	17.908	
MAXIMUM HEAD ON TOP OF LAYER 2	26.376	
LOCATION OF MAXIMUM HEAD IN LAYER 1 (DISTANCE FROM DRAIN)	158.0 FEET	
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.000020	1.71703
AVERAGE HEAD ON TOP OF LAYER 4	5.916	
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.000000	0.00000
SNOW WATER	2.39	207783.4375
MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.2869	
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.0187	

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas
ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 5

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC

PRECIPITATION						
TOTALS	0.25	0.43	0.33	0.48	2.06	2.41
	2.29	2.42	1.75	1.44	2.05	1.57
STD. DEVIATIONS	0.28	0.11	0.29	0.39	1.94	2.94
	1.07	1.68	1.12	1.68	2.50	1.09
RUNOFF						
TOTALS	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATIONS	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
POTENTIAL EVAPOTRANSPIRATION						
TOTALS	3.006	3.630	5.121	7.372	9.278	10.074
	10.034	8.741	6.610	5.205	3.692	2.548
STD. DEVIATIONS	0.194	0.200	0.191	0.353	0.460	0.188
	0.100	0.266	0.307	0.177	0.178	0.242
ACTUAL EVAPOTRANSPIRATION						
TOTALS	0.550	0.318	0.275	0.368	1.234	0.905
	1.492	1.594	1.407	0.939	1.128	0.838
STD. DEVIATIONS	0.331	0.106	0.129	0.210	1.223	0.814
	0.607	1.011	0.674	0.710	0.740	0.425
LATERAL DRAINAGE COLLECTED FROM LAYER 1						
TOTALS	0.4670	0.3633	0.3406	0.2808	0.2827	0.3999
	0.5049	0.5231	0.5429	0.5407	0.5675	0.5852
STD. DEVIATIONS	0.3065	0.2387	0.2225	0.1837	0.1897	0.2805
	0.3627	0.3196	0.2190	0.1860	0.1887	0.1957
PERCOLATION/LEAKAGE THROUGH LAYER 2						
TOTALS	0.0236	0.0184	0.0174	0.0145	0.0146	0.0203
	0.0255	0.0264	0.0275	0.0274	0.0287	0.0296
STD. DEVIATIONS	0.0153	0.0120	0.0112	0.0093	0.0096	0.0141
	0.0181	0.0159	0.0107	0.0091	0.0092	0.0096
PERCOLATION/LEAKAGE THROUGH LAYER 4						
TOTALS	0.0002	0.0002	0.0003	0.0003	0.0003	0.0003
	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003
STD. DEVIATIONS	0.0002	0.0001	0.0002	0.0002	0.0002	0.0002
	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
PERCOLATION/LEAKAGE THROUGH LAYER 5						
TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 2

AVERAGES	7.9744	6.7955	5.8165	4.9546	4.8278	7.0561
	8.6216	8.9336	9.5805	9.2329	10.0144	9.9938
STD. DEVIATIONS	5.2343	4.4419	3.8000	3.2408	3.2393	4.9506
	6.1944	5.4581	3.8647	3.1764	3.3294	3.3415

DAILY AVERAGE HEAD ON TOP OF LAYER 4

AVERAGES	2.1288	2.2304	2.3441	2.4670	2.5877	2.6799
	2.7518	2.8147	2.8821	2.9605	3.0403	3.1205
STD. DEVIATIONS	1.5464	1.5660	1.5931	1.6249	1.6600	1.7046
	1.7476	1.7951	1.8444	1.8941	1.9292	1.9684

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 5

	INCHES		CU. FEET	PERCENT
PRECIPITATION	17.48	(3.719)	1522857.6	100.00
RUNOFF	0.000	(0.0000)	0.00	0.000
POTENTIAL EVAPOTRANSPIRATION	75.310	(0.6175)	6561040.00	
ACTUAL EVAPOTRANSPIRATION	11.049	(2.3247)	962588.00	63.209
LATERAL DRAINAGE COLLECTED FROM LAYER 1	5.39850	(2.34509)	470317.281	30.88386
PERCOLATION/LEAKAGE THROUGH LAYER 2	0.27370	(0.11787)	23844.775	1.56579
AVERAGE HEAD ON TOP OF LAYER 2	7.817	(3.398)		
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.00340	(0.00206)	296.402	0.01946
AVERAGE HEAD ON TOP OF LAYER 4	2.667	(1.737)		
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.00000	(0.00000)	0.000	0.00000
CHANGE IN WATER STORAGE	1.033	(1.8553)	89952.40	5.907

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Exhibit D

SCENARIO 4 HELP MODEL RESULTS

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 ******************************************************************************
 ******************************************************************************
 **                                                                          **
 **                                                                          **
 **              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
 **                                                                          **
 **              HELP Version 3.95 D          (10 August 2012)              **
 **                            developed at                                  **
 **        Institute of Soil Science, University of Hamburg, Germany         **
 **                              based on                                    **
 **              US HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)               **
 **                  DEVELOPED BY ENVIRONMENTAL LABORATORY                   **
 **                    USAE WATERWAYS EXPERIMENT STATION                     **
 **             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY              **
 **                                                                          **
 **                                                                          **
 ******************************************************************************
 ******************************************************************************


 TIME:  15.57     DATE:  24.09.2019


 PRECIPITATION DATA FILE:       N:\Projects\2018\35187378\Working Files\DRAFTS (Proposal-Reports-
Communications)\McCloy Permit Narrative\092019 FINAL SUBMITTAL to OCD\VOLUME 2\App J - Engineering
Report\AttD-HELP\exhibits a-i\From Edward\PRECIP~-.D4
 TEMPERATURE DATA FILE:         N:\Projects\2018\35187378\Working Files\DRAFTS (Proposal-Reports-
Communications)\McCloy Permit Narrative\092019 FINAL SUBMITTAL to OCD\VOLUME 2\App J - Engineering
Report\AttD-HELP\exhibits a-i\From Edward\TEMPER~-.D7
 SOLAR RADIATION DATA FILE:     N:\Projects\2018\35187378\Working Files\DRAFTS (Proposal-Reports-
Communications)\McCloy Permit Narrative\092019 FINAL SUBMITTAL to OCD\VOLUME 2\App J - Engineering
Report\AttD-HELP\exhibits a-i\From Edward\SOLARR~-.D13
 EVAPOTRANSPIRATION DATA F. 1: N:\Projects\2018\35187378\Working Files\DRAFTS (Proposal-Reports-
Communications)\McCloy Permit Narrative\092019 FINAL SUBMITTAL to OCD\VOLUME 2\App J - Engineering
Report\AttD-HELP\exhibits a-i\From Edward\EVAPOT~-.D11
 SOIL AND DESIGN DATA FILE  1: N:\Projects\2018\35187378\Working Files\DRAFTS (Proposal-Reports-
Communications)\McCloy Permit Narrative\092019 FINAL SUBMITTAL to OCD\VOLUME 2\App J - Engineering
Report\AttD-HELP\exhibits a-i\ExD-Alternate Liner\Soil and Design Data.d10
 OUTPUT DATA FILE:              N:\Projects\2018\35187378\Working Files\DRAFTS (Proposal-Reports-
Communications)\McCloy Permit Narrative\092019 FINAL SUBMITTAL to OCD\VOLUME 2\App J - Engineering
Report\AttD-HELP\exhibits a-i\ExD-Alternate Liner\Summary Output.out
 YEARLY OUTPUT DATA FILE:       N:\Projects\2018\35187378\Working Files\DRAFTS (Proposal-Reports-
Communications)\McCloy Permit Narrative\092019 FINAL SUBMITTAL to OCD\VOLUME 2\App J - Engineering
Report\AttD-HELP\exhibits a-i\ExD-Alternate Liner\Summary Output.YR

 COLUMNS OF YEARLY OUTPUT DATA FILE:

      1    DATE OF ULTIMO (yyyy1231, years 2101 to 2200 from weather generator)
      2    PRECIPITATION (INCH)
      3    RUNOFF (INCH)
      4    POTENTIAL EVAPOTRANSPIRATION (INCH)
      5    ACTUAL EVAPOTRANSPIRATION (INCH)
      6    DRAIN #1: LATERAL DRAINAGE FROM LAYER  2 (INCH)
      7    LEAK  #1: PERCOLATION/LEAKAGE THROUGH LAYER  3 (INCH)
      8    DRAIN #2: LATERAL DRAINAGE FROM LAYER  4 (INCH)
      9    LEAK  #2: PERCOLATION/LEAKAGE THROUGH LAYER  6 (INCH)
     10    CHANGE IN TOTAL WATER STORAGE (INCH)
     11    CHANGE IN SOIL WATER STORAGE (INCH)
     12    CHANGE IN INTERCEPTION WATER STORAGE (INCH)
     13    CHANGE IN SNOW WATER STORAGE (INCH)
     14    ANNUAL WATER BUDGET BALANCE (INCH)


 ******************************************************************************

      TITLE:  Alternate Liner

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WEATHER DATA SOURCES

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ROSWELL NEW MEXICO

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
0.35	0.72	0.30	0.67	2.01	3.48
1.90	2.74	1.83	1.90	0.81	0.86

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ROSWELL NEW MEXICO

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
39.40	45.20	52.50	61.00	69.50	76.10
79.30	78.50	71.00	61.10	50.00	40.40

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ROSWELL NEW MEXICO
AND STATION LATITUDE = 33.24 DEGREES

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LAYER DATA 1

VALID FOR 5 YEARS

NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER
WERE SPECIFIED BY THE USER.

LAYER 1

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	24.00 INCHES
POROSITY	=	0.4170 VOL/VOL
FIELD CAPACITY	=	0.0450 VOL/VOL
WILTING POINT	=	0.0180 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0250 VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.	=	0.1000E-04 CM/SEC

LAYER 2

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 20

THICKNESS	=	0.20 INCHES
POROSITY	=	0.8500 VOL/VOL
FIELD CAPACITY	=	0.0100 VOL/VOL
WILTING POINT	=	0.0050 VOL/VOL

INITIAL SOIL WATER CONTENT	=	0.0250	VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.	=	10.00	CM/SEC
SLOPE	=	2.00	PERCENT
DRAINAGE LENGTH	=	600.0	FEET

LAYER 3

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.06	INCHES
EFFECTIVE SAT. HYD. CONDUCT.	=	0.2000E-12	CM/SEC
FML PINHOLE DENSITY	=	4.00	HOLES/ACRE
FML INSTALLATION DEFECTS	=	4.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	3 - GOOD	

LAYER 4

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 20

THICKNESS	=	0.20	INCHES
POROSITY	=	0.8500	VOL/VOL
FIELD CAPACITY	=	0.0100	VOL/VOL
WILTING POINT	=	0.0050	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0060	VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.	=	10.00	CM/SEC
SLOPE	=	2.00	PERCENT
DRAINAGE LENGTH	=	600.0	FEET

LAYER 5

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.06	INCHES
EFFECTIVE SAT. HYD. CONDUCT.	=	0.2000E-12	CM/SEC
FML PINHOLE DENSITY	=	4.00	HOLES/ACRE
FML INSTALLATION DEFECTS	=	4.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	3 - GOOD	

LAYER 6

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 17

THICKNESS	=	0.24	INCHES
POROSITY	=	0.7500	VOL/VOL
FIELD CAPACITY	=	0.7470	VOL/VOL
WILTING POINT	=	0.4000	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.7500	VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.	=	0.3000E-08	CM/SEC

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GENERAL DESIGN AND EVAPORATIVE ZONE DATA 1

VALID FOR 5 YEARS

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT
SOIL DATA BASE USING SOIL TEXTURE # 1 WITH BARE
GROUND CONDITIONS, A SURFACE SLOPE OF 2.% AND
A SLOPE LENGTH OF 600. FEET.

SCS RUNOFF CURVE NUMBER	=	71.76	
FRACTION OF AREA ALLOWING RUNOFF	=	0.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	24.000	ACRES
EVAPORATIVE ZONE DEPTH	=	14.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	0.350	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	5.838	INCHES
FIELD CAPACITY OF EVAPORATIVE ZONE	=	0.630	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	0.252	INCHES
SOIL EVAPORATION ZONE DEPTH	=	14.000	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL INTERCEPTION WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	0.786	INCHES
TOTAL INITIAL WATER	=	0.786	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

****

EVAPOTRANSPIRATION DATA 1

VALID FOR 5 YEARS

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
ROSWELL NEW MEXICO

STATION LATITUDE	=	33.24 DEGREES
MAXIMUM LEAF AREA INDEX	=	0.00
START OF GROWING SEASON (JULIAN DATE)	=	76
END OF GROWING SEASON (JULIAN DATE)	=	310
EVAPORATIVE ZONE DEPTH	=	14.0 INCHES
AVERAGE ANNUAL WIND SPEED	=	8.70 MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	49.0 %
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	40.0 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	53.0 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	52.0 %

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ANNUAL TOTALS FOR YEAR 1

	INCHES	CU. FEET	PERCENT
PRECIPITATION	12.67	1103810.625	100.00
RUNOFF	0.000	0.000	0.00
POTENTIAL EVAPOTRANSPIRATION	76.038	6624449.500	
ACTUAL EVAPOTRANSPIRATION	9.453	823558.688	74.61
DRAINAGE COLLECTED FROM LAYER 2	0.0013	115.256	0.01
PERC./LEAKAGE THROUGH LAYER 3	0.001679	146.256	0.01
AVG. HEAD ON TOP OF LAYER 3	0.0000		
DRAINAGE COLLECTED FROM LAYER 4	0.0009	76.550	0.01

PERC./LEAKAGE THROUGH LAYER 6	0.000000	0.010	0.00
AVG. HEAD ON TOP OF LAYER 5	0.0000		
CHANGE IN WATER STORAGE	3.215	280060.156	25.37
SOIL WATER AT START OF YEAR	0.791	68928.914	
SOIL WATER AT END OF YEAR	4.006	348989.062	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.047	0.00

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ANNUAL TOTALS FOR YEAR 2

	INCHES	CU. FEET	PERCENT
PRECIPITATION	22.13	1927965.875	100.00
RUNOFF	0.000	0.000	0.00
POTENTIAL EVAPOTRANSPIRATION	75.116	6544130.500	
ACTUAL EVAPOTRANSPIRATION	18.113	1578003.500	81.85
DRAINAGE COLLECTED FROM LAYER 2	0.4908	42761.152	2.22
PERC./LEAKAGE THROUGH LAYER 3	0.845434	73654.188	3.82
AVG. HEAD ON TOP OF LAYER 3	0.0007		
DRAINAGE COLLECTED FROM LAYER 4	0.8454	73654.008	3.82
PERC./LEAKAGE THROUGH LAYER 6	0.000002	0.146	0.00
AVG. HEAD ON TOP OF LAYER 5	0.0012		
CHANGE IN WATER STORAGE	2.681	233547.109	12.11
SOIL WATER AT START OF YEAR	4.006	348989.062	
SOIL WATER AT END OF YEAR	6.687	582536.188	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.036	0.00

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ANNUAL TOTALS FOR YEAR 3

	INCHES	CU. FEET	PERCENT
PRECIPITATION	18.51	1612591.375	100.00
RUNOFF	0.000	0.000	0.00
POTENTIAL EVAPOTRANSPIRATION	75.152	6547241.500	
ACTUAL EVAPOTRANSPIRATION	14.649	1276185.125	79.14
DRAINAGE COLLECTED FROM LAYER 2	2.6341	229479.203	14.23
PERC./LEAKAGE THROUGH LAYER 3	2.079291	181147.859	11.23
AVG. HEAD ON TOP OF LAYER 3	0.0038		
DRAINAGE COLLECTED FROM LAYER 4	2.0748	180756.109	11.21
PERC./LEAKAGE THROUGH LAYER 6	0.000003	0.253	0.00
AVG. HEAD ON TOP OF LAYER 5	0.0030		
CHANGE IN WATER STORAGE	-0.847	-73829.203	-4.58
SOIL WATER AT START OF YEAR	6.687	582536.188	
SOIL WATER AT END OF YEAR	5.527	481532.594	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.312	27174.352	1.69
ANNUAL WATER BUDGET BALANCE	0.0000	-0.312	0.00

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ANNUAL TOTALS FOR YEAR 4

	INCHES	CU. FEET	PERCENT
PRECIPITATION	14.91	1298959.375	100.00
RUNOFF	0.000	0.000	0.00
POTENTIAL EVAPOTRANSPIRATION	75.777	6601701.500	
ACTUAL EVAPOTRANSPIRATION	10.638	926813.562	71.35
DRAINAGE COLLECTED FROM LAYER 2	1.8845	164181.453	12.64
PERC./LEAKAGE THROUGH LAYER 3	2.002334	174443.344	13.43
AVG. HEAD ON TOP OF LAYER 3	0.0027		

DRAINAGE COLLECTED FROM LAYER 4	2.0047	174645.422	13.45
PERC./LEAKAGE THROUGH LAYER 6	0.000003	0.253	0.00
AVG. HEAD ON TOP OF LAYER 5	0.0029		
CHANGE IN WATER STORAGE	0.382	33318.848	2.57
SOIL WATER AT START OF YEAR	5.527	481532.594	
SOIL WATER AT END OF YEAR	6.222	542025.812	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.312	27174.352	2.09
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.208	0.00

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ANNUAL TOTALS FOR YEAR 5

	INCHES	CU. FEET	PERCENT
PRECIPITATION	19.18	1670962.000	100.00
RUNOFF	0.000	0.000	0.00
POTENTIAL EVAPOTRANSPIRATION	74.468	6487678.500	
ACTUAL EVAPOTRANSPIRATION	16.005	1394371.125	83.45
DRAINAGE COLLECTED FROM LAYER 2	1.6368	142594.156	8.53
PERC./LEAKAGE THROUGH LAYER 3	2.021057	176074.484	10.54
AVG. HEAD ON TOP OF LAYER 3	0.0024		
DRAINAGE COLLECTED FROM LAYER 4	2.0225	176200.438	10.54
PERC./LEAKAGE THROUGH LAYER 6	0.000003	0.255	0.00
AVG. HEAD ON TOP OF LAYER 5	0.0029		
CHANGE IN WATER STORAGE	-0.484	-42204.152	-2.53
SOIL WATER AT START OF YEAR	6.222	542025.812	
SOIL WATER AT END OF YEAR	5.737	499821.656	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.125	0.00

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FINAL WATER STORAGE AT END OF YEAR 5

LAYER	(INCHES)	(VOL/VOL)
1	5.5474	0.2311
2	0.0020	0.0100
3	0.0000	0.0000
4	0.0027	0.0136
5	0.0000	0.0000
6	0.1800	0.7500
TOTAL WATER IN LAYERS	5.732	
SNOW WATER	0.000	
INTERCEPTION WATER	0.000	
TOTAL FINAL WATER	5.732	

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 5

	(INCHES)	(CU. FT.)
PRECIPITATION	3.22	280526.406
RUNOFF	0.000	0.0000
DRAINAGE COLLECTED FROM LAYER 2	0.24451	21301.91602
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.052686	4589.96191
AVERAGE HEAD ON TOP OF LAYER 3	0.129	
MAXIMUM HEAD ON TOP OF LAYER 3	0.257	
LOCATION OF MAXIMUM HEAD IN LAYER 2 (DISTANCE FROM DRAIN)	5.1 FEET	
DRAINAGE COLLECTED FROM LAYER 4	0.04531	3947.60962
PERCOLATION/LEAKAGE THROUGH LAYER 6	0.000000	0.00144
AVERAGE HEAD ON TOP OF LAYER 5	0.024	
MAXIMUM HEAD ON TOP OF LAYER 5	0.043	
LOCATION OF MAXIMUM HEAD IN LAYER 4 (DISTANCE FROM DRAIN)	0.0 FEET	
SNOW WATER	2.39	207783.4375

MAXIMUM VEG. SOIL WATER (VOL/VOL) 0.3807

MINIMUM VEG. SOIL WATER (VOL/VOL) 0.0180

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas
ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 5

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	0.25	0.43	0.33	0.48	2.06	2.41
	2.29	2.42	1.75	1.44	2.05	1.57
STD. DEVIATIONS	0.28	0.11	0.29	0.39	1.94	2.94
	1.07	1.68	1.12	1.68	2.50	1.09
RUNOFF						
TOTALS	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATIONS	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
POTENTIAL EVAPOTRANSPIRATION						
TOTALS	3.006	3.630	5.121	7.372	9.278	10.074
	10.034	8.741	6.610	5.205	3.692	2.548
STD. DEVIATIONS	0.194	0.200	0.191	0.353	0.460	0.188
	0.100	0.266	0.307	0.177	0.178	0.242
ACTUAL EVAPOTRANSPIRATION						
TOTALS	0.579	0.352	0.301	0.472	1.620	1.691
	1.954	2.011	1.430	1.208	1.270	0.883
STD. DEVIATIONS	0.350	0.145	0.174	0.322	1.417	2.149
	1.304	1.042	0.807	0.819	0.872	0.476
LATERAL DRAINAGE COLLECTED FROM LAYER 2						
TOTALS	0.1090	0.0592	0.0423	0.0268	0.0163	0.0173
	0.1894	0.0901	0.0598	0.0903	0.3797	0.2494
STD. DEVIATIONS	0.1155	0.0780	0.0427	0.0256	0.0153	0.0195
	0.2918	0.1217	0.0814	0.1130	0.4915	0.4263
PERCOLATION/LEAKAGE THROUGH LAYER 3						
TOTALS	0.1339	0.0954	0.0903	0.0716	0.0549	0.0460
	0.1613	0.1210	0.0944	0.1267	0.2031	0.1914
STD. DEVIATIONS	0.1263	0.1013	0.0844	0.0660	0.0501	0.0413
	0.1801	0.1267	0.0987	0.0924	0.2150	0.2229

LATERAL DRAINAGE COLLECTED FROM LAYER 4

TOTALS	0.1334	0.0957	0.0905	0.0717	0.0550	0.0457
	0.1600	0.1216	0.0946	0.1248	0.2019	0.1946
STD. DEVIATIONS	0.1260	0.1022	0.0847	0.0662	0.0502	0.0413
	0.1782	0.1273	0.1001	0.0895	0.2163	0.2270

PERCOLATION/LEAKAGE THROUGH LAYER 6

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 3

AVERAGES	0.0019	0.0011	0.0007	0.0005	0.0003	0.0003
	0.0032	0.0015	0.0011	0.0015	0.0067	0.0043
STD. DEVIATIONS	0.0020	0.0015	0.0007	0.0005	0.0003	0.0003
	0.0050	0.0021	0.0014	0.0019	0.0087	0.0073

DAILY AVERAGE HEAD ON TOP OF LAYER 5

AVERAGES	0.0023	0.0018	0.0015	0.0013	0.0009	0.0008
	0.0027	0.0021	0.0017	0.0021	0.0036	0.0033
STD. DEVIATIONS	0.0022	0.0019	0.0014	0.0012	0.0009	0.0007
	0.0030	0.0022	0.0018	0.0015	0.0038	0.0039

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 5

	INCHES		CU. FEET	PERCENT
PRECIPITATION	17.48	(3.719)	1522857.6	100.00
RUNOFF	0.000	(0.0000)	0.00	0.000
POTENTIAL EVAPOTRANSPIRATION	75.310	(0.6175)	6561040.00	
ACTUAL EVAPOTRANSPIRATION	13.772	(3.6425)	1199786.38	78.785
LATERAL DRAINAGE COLLECTED FROM LAYER 2	1.32950	(1.06909)	115826.242	7.60585
PERCOLATION/LEAKAGE THROUGH LAYER 3	1.38996	(0.93170)	121093.227	7.95171
AVERAGE HEAD ON TOP OF LAYER 3	0.002	(0.002)		
LATERAL DRAINAGE COLLECTED FROM LAYER 4	1.38965	(0.93180)	121066.500	7.94995
PERCOLATION/LEAKAGE THROUGH	0.00000	(0.00000)	0.183	0.00001

LAYER 6

AVERAGE HEAD ON TOP OF LAYER 5	0.002	(0.001)		
CHANGE IN WATER STORAGE	0.989	(1.8525)	86178.55	5.659

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Exhibit E

SCENARIO 5 HELP MODEL RESULTS

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 **                                                                      **
 **                                                                      **
 **              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE           **
 **                                                                      **
 **              HELP Version 3.95 D          (10 August 2012)           **
 **                              developed at                            **
 **        Institute of Soil Science, University of Hamburg, Germany     **
 **                                 based on                             **
 **              US HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)           **
 **                  DEVELOPED BY ENVIRONMENTAL LABORATORY               **
 **                    USAE WATERWAYS EXPERIMENT STATION                 **
 **             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY          **
 **                                                                      **
 **                                                                      **
 **************************************************************************
 **************************************************************************

 TIME:   9.27     DATE:  19.09.2019

 PRECIPITATION DATA FILE:       N:\Projects\2018\35187378\Working Files\DRAFTS (Proposal-Reports-
Communications)\McCloy Permit Narrative\092019 FINAL SUBMITTAL to OCD\10-Appendix J\Attachment D -
HELP\ATT D2 - Results\Alternate Liner - Open\Precipitation Data.d4
 TEMPERATURE DATA FILE:         N:\Projects\2018\35187378\Working Files\DRAFTS (Proposal-Reports-
Communications)\McCloy Permit Narrative\092019 FINAL SUBMITTAL to OCD\10-Appendix J\Attachment D -
HELP\ATT D2 - Results\Alternate Liner - Open\Temperature Data.d7
 SOLAR RADIATION DATA FILE:     N:\Projects\2018\35187378\Working Files\DRAFTS (Proposal-Reports-
Communications)\McCloy Permit Narrative\092019 FINAL SUBMITTAL to OCD\10-Appendix J\Attachment D -
HELP\ATT D2 - Results\Alternate Liner - Open\Solar Radiation Data.d13
 EVAPOTRANSPIRATION DATA F. 1: N:\Projects\2018\35187378\Working Files\DRAFTS (Proposal-Reports-
Communications)\McCloy Permit Narrative\092019 FINAL SUBMITTAL to OCD\10-Appendix J\Attachment D -
HELP\ATT D2 - Results\Alternate Liner - Open\Evapotranspiration Parameters.d11
 SOIL AND DESIGN DATA FILE  1: N:\Projects\2018\35187378\Working Files\DRAFTS (Proposal-Reports-
Communications)\McCloy Permit Narrative\092019 FINAL SUBMITTAL to OCD\10-Appendix J\Attachment D -
HELP\ATT D2 - Results\Alternate Liner - Open\Soil and Design Data.d10
 OUTPUT DATA FILE:              N:\Projects\2018\35187378\Working Files\DRAFTS (Proposal-Reports-
Communications)\McCloy Permit Narrative\092019 FINAL SUBMITTAL to OCD\10-Appendix J\Attachment D -
HELP\ATT D2 - Results\Alternate Liner - Open\Summary Output.out
 YEARLY OUTPUT DATA FILE:       N:\Projects\2018\35187378\Working Files\DRAFTS (Proposal-Reports-
Communications)\McCloy Permit Narrative\092019 FINAL SUBMITTAL to OCD\10-Appendix J\Attachment D -
HELP\ATT D2 - Results\Alternate Liner - Open\Summary Output.YR

 COLUMNS OF YEARLY OUTPUT DATA FILE:

      1    DATE OF ULTIMO (yyyy1231, years 2101 to 2200 from weather generator)
      2    PRECIPITATION (INCH)
      3    RUNOFF (INCH)
      4    POTENTIAL EVAPOTRANSPIRATION (INCH)
      5    ACTUAL EVAPOTRANSPIRATION (INCH)
      6    DRAIN #1: LATERAL DRAINAGE FROM LAYER  2 (INCH)
      7    LEAK  #1: PERCOLATION/LEAKAGE THROUGH LAYER  3 (INCH)
      8    DRAIN #2: LATERAL DRAINAGE FROM LAYER  4 (INCH)
      9    LEAK  #2: PERCOLATION/LEAKAGE THROUGH LAYER  6 (INCH)
     10    CHANGE IN TOTAL WATER STORAGE (INCH)
     11    CHANGE IN SOIL WATER STORAGE (INCH)
     12    CHANGE IN INTERCEPTION WATER STORAGE (INCH)
     13    CHANGE IN SNOW WATER STORAGE (INCH)
     14    ANNUAL WATER BUDGET BALANCE (INCH)


 **************************************************************************

      TITLE:  Alternate Liner

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                              WEATHER DATA SOURCES
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NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ROSWELL NEW MEXICO

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
0.24	0.28	0.27	0.37	0.77	0.91
1.38	2.17	1.72	0.99	0.33	0.27

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ROSWELL NEW MEXICO

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
41.40	45.90	52.80	61.90	70.30	79.00
81.40	79.20	72.30	61.70	49.10	42.50

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ROSWELL NEW MEXICO
AND STATION LATITUDE = 33.24 DEGREES

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LAYER DATA 1

VALID FOR 2 YEARS

NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER
WERE SPECIFIED BY THE USER.

LAYER 1

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	24.00	INCHES
POROSITY	=	0.4170	VOL/VOL
FIELD CAPACITY	=	0.0450	VOL/VOL
WILTING POINT	=	0.0180	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0250	VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.	=	0.1000E-04	CM/SEC

LAYER 2

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 20

THICKNESS	=	0.20	INCHES
POROSITY	=	0.8500	VOL/VOL
FIELD CAPACITY	=	0.0100	VOL/VOL
WILTING POINT	=	0.0050	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0250	VOL/VOL

EFFECTIVE SAT. HYD. CONDUCT.= 10.00 CM/SEC
SLOPE = 2.00 PERCENT
DRAINAGE LENGTH = 600.0 FEET

LAYER 3

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

THICKNESS = 0.06 INCHES
EFFECTIVE SAT. HYD. CONDUCT.= 0.2000E-12 CM/SEC
FML PINHOLE DENSITY = 4.00 HOLES/ACRE
FML INSTALLATION DEFECTS = 4.00 HOLES/ACRE
FML PLACEMENT QUALITY = 3 - GOOD

LAYER 4

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 20

THICKNESS = 0.20 INCHES
POROSITY = 0.8500 VOL/VOL
FIELD CAPACITY = 0.0100 VOL/VOL
WILTING POINT = 0.0050 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.0060 VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.= 10.00 CM/SEC
SLOPE = 2.00 PERCENT
DRAINAGE LENGTH = 600.0 FEET

LAYER 5

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

THICKNESS = 0.06 INCHES
EFFECTIVE SAT. HYD. CONDUCT.= 0.2000E-12 CM/SEC
FML PINHOLE DENSITY = 4.00 HOLES/ACRE
FML INSTALLATION DEFECTS = 4.00 HOLES/ACRE
FML PLACEMENT QUALITY = 3 - GOOD

LAYER 6

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 17

THICKNESS = 0.24 INCHES
POROSITY = 0.7500 VOL/VOL
FIELD CAPACITY = 0.7470 VOL/VOL
WILTING POINT = 0.4000 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.7500 VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.= 0.3000E-08 CM/SEC

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GENERAL DESIGN AND EVAPORATIVE ZONE DATA 1

VALID FOR 2 YEARS

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT

SOIL DATA BASE USING SOIL TEXTURE # 1 WITH BARE
GROUND CONDITIONS, A SURFACE SLOPE OF 2.% AND
A SLOPE LENGTH OF 600. FEET.

SCS RUNOFF CURVE NUMBER	=	71.76	
FRACTION OF AREA ALLOWING RUNOFF	=	0.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	205.000	ACRES
EVAPORATIVE ZONE DEPTH	=	14.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	0.350	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	5.838	INCHES
FIELD CAPACITY OF EVAPORATIVE ZONE	=	0.630	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	0.252	INCHES
SOIL EVAPORATION ZONE DEPTH	=	14.000	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL INTERCEPTION WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	0.786	INCHES
TOTAL INITIAL WATER	=	0.786	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

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EVAPOTRANSPIRATION DATA 1

VALID FOR 2 YEARS

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
ROSWELL NEW MEXICO

STATION LATITUDE	=	33.24 DEGREES
MAXIMUM LEAF AREA INDEX	=	0.00
START OF GROWING SEASON (JULIAN DATE)	=	76
END OF GROWING SEASON (JULIAN DATE)	=	310
EVAPORATIVE ZONE DEPTH	=	14.0 INCHES
AVERAGE ANNUAL WIND SPEED	=	8.70 MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	49.0 %
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	40.0 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	53.0 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	52.0 %

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ANNUAL TOTALS FOR YEAR 1

	INCHES	CU. FEET	PERCENT
PRECIPITATION	8.70	6474105.500	100.00
RUNOFF	0.000	0.000	0.00
POTENTIAL EVAPOTRANSPIRATION	77.421	57612976.000	
ACTUAL EVAPOTRANSPIRATION	6.515	4848156.500	74.89
DRAINAGE COLLECTED FROM LAYER 2	0.0013	984.471	0.02
PERC./LEAKAGE THROUGH LAYER 3	0.001677	1247.987	0.02
AVG. HEAD ON TOP OF LAYER 3	0.0000		
DRAINAGE COLLECTED FROM LAYER 4	0.0009	652.646	0.01
PERC./LEAKAGE THROUGH LAYER 6	0.000000	0.022	0.00

AVG. HEAD ON TOP OF LAYER 5	0.0000		
CHANGE IN WATER STORAGE	2.183	1624312.375	25.09
SOIL WATER AT START OF YEAR	0.791	588767.812	
SOIL WATER AT END OF YEAR	2.974	2213080.250	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.248	0.00

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ANNUAL TOTALS FOR YEAR 2

	INCHES	CU. FEET	PERCENT
PRECIPITATION	10.35	7701953.500	100.00
RUNOFF	0.000	0.000	0.00
POTENTIAL EVAPOTRANSPIRATION	76.577	56984972.000	
ACTUAL EVAPOTRANSPIRATION	10.126	7535160.500	97.83
DRAINAGE COLLECTED FROM LAYER 2	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 3	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0000		
DRAINAGE COLLECTED FROM LAYER 4	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 6	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 5	0.0000		
CHANGE IN WATER STORAGE	0.224	166794.609	2.17
SOIL WATER AT START OF YEAR	2.974	2213080.250	
SOIL WATER AT END OF YEAR	3.198	2379874.750	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-1.419	0.00

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FINAL WATER STORAGE AT END OF YEAR 2

LAYER	(INCHES)	(VOL/VOL)
1	3.0091	0.1254
2	0.0020	0.0100
3	0.0000	0.0000
4	0.0020	0.0100
5	0.0000	0.0000
6	0.1800	0.7500
TOTAL WATER IN LAYERS	3.193	
SNOW WATER	0.000	
INTERCEPTION WATER	0.000	
TOTAL FINAL WATER	3.193	

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 2

	(INCHES)	(CU. FT.)
PRECIPITATION	1.05	781357.438
RUNOFF	0.000	0.0000
DRAINAGE COLLECTED FROM LAYER 2	0.00132	984.47137
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.001677	1247.98718
AVERAGE HEAD ON TOP OF LAYER 3	0.001	
MAXIMUM HEAD ON TOP OF LAYER 3	0.025	
LOCATION OF MAXIMUM HEAD IN LAYER 2 (DISTANCE FROM DRAIN)	0.0 FEET	
DRAINAGE COLLECTED FROM LAYER 4	0.00059	437.39902
PERCOLATION/LEAKAGE THROUGH LAYER 6	0.000000	0.00520
AVERAGE HEAD ON TOP OF LAYER 5	0.000	
MAXIMUM HEAD ON TOP OF LAYER 5	0.001	
LOCATION OF MAXIMUM HEAD IN LAYER 4 (DISTANCE FROM DRAIN)	0.0 FEET	
SNOW WATER	0.61	455364.3438
MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.2295	
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.0180	

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas
ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 2

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	0.22	0.18	0.22	0.44	0.76	0.92
	1.18	2.13	2.15	0.21	0.61	0.48
STD. DEVIATIONS	0.31	0.01	0.28	0.16	1.05	1.30
	0.21	0.62	1.04	0.30	0.39	0.52
RUNOFF						
TOTALS	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATIONS	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
POTENTIAL EVAPOTRANSPIRATION						
TOTALS	3.103	3.653	5.266	7.550	9.144	10.440
	10.356	8.756	6.951	5.374	3.675	2.733
STD. DEVIATIONS	0.354	0.277	0.005	0.400	0.417	0.399
	0.128	0.512	0.288	0.004	0.184	0.297
ACTUAL EVAPOTRANSPIRATION						
TOTALS	0.489	0.200	0.166	0.195	0.676	1.049
	0.798	1.687	1.738	0.575	0.395	0.354
STD. DEVIATIONS	0.553	0.176	0.128	0.022	0.832	1.371
	0.662	0.470	0.989	0.210	0.147	0.206
LATERAL DRAINAGE COLLECTED FROM LAYER 2						
TOTALS	0.0007	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0009	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH LAYER 3						
TOTALS	0.0008	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0012	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LATERAL DRAINAGE COLLECTED FROM LAYER 4						

TOTALS	0.0004	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0006	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

PERCOLATION/LEAKAGE THROUGH LAYER 6

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 3

AVERAGES	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

DAILY AVERAGE HEAD ON TOP OF LAYER 5

AVERAGES	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 2

	INCHES		CU. FEET		PERCENT
PRECIPITATION	9.53	(1.167)	7088030.0		100.00
RUNOFF	0.000	(0.0000)	0.00		0.000
POTENTIAL EVAPOTRANSPIRATION	76.999	(0.5962)	57298972.00		
ACTUAL EVAPOTRANSPIRATION	8.320	(2.5532)	6191658.00		87.354
LATERAL DRAINAGE COLLECTED FROM LAYER 2	0.00066	(0.00094)	492.236		0.00694
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.00084	(0.00119)	623.994		0.00880
AVERAGE HEAD ON TOP OF LAYER 3	0.000	(0.000)			
LATERAL DRAINAGE COLLECTED FROM LAYER 4	0.00044	(0.00062)	326.323		0.00460
PERCOLATION/LEAKAGE THROUGH LAYER 6	0.00000	(0.00000)	0.011		0.00000
AVERAGE HEAD ON TOP	0.000	(0.000)			

OF LAYER 5

CHANGE IN WATER STORAGE 1.203 (1.3850) 895553.50 12.635

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Exhibit F

SCENARIO 6 HELP MODEL RESULTS

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 *******************************************************************************
 **                                                                           **
 **                                                                           **
 **              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE                **
 **                                                                           **
 **              HELP Version 3.95 D          (10 August 2012)              **
 **                              developed at                                 **
 **        Institute of Soil Science, University of Hamburg, Germany          **
 **                                 based on                                  **
 **              US HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                **
 **                  DEVELOPED BY ENVIRONMENTAL LABORATORY                    **
 **                    USAE WATERWAYS EXPERIMENT STATION                      **
 **             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY               **
 **                                                                           **
 **                                                                           **
 *******************************************************************************
 *******************************************************************************

 TIME:   9.20     DATE:  19.09.2019

 PRECIPITATION DATA FILE:       N:\Projects\2018\35187378\Working Files\DRAFTS (Proposal-Reports-
Communications)\McCloy Permit Narrative\092019 FINAL SUBMITTAL to OCD\10-Appendix J\Attachment D -
HELP\ATT D2 - Results\Alternate Liner - 20' Filled\Precipitation Data.d4
 TEMPERATURE DATA FILE:         N:\Projects\2018\35187378\Working Files\DRAFTS (Proposal-Reports-
Communications)\McCloy Permit Narrative\092019 FINAL SUBMITTAL to OCD\10-Appendix J\Attachment D -
HELP\ATT D2 - Results\Alternate Liner - 20' Filled\Temperature Data.d7
 SOLAR RADIATION DATA FILE:     N:\Projects\2018\35187378\Working Files\DRAFTS (Proposal-Reports-
Communications)\McCloy Permit Narrative\092019 FINAL SUBMITTAL to OCD\10-Appendix J\Attachment D -
HELP\ATT D2 - Results\Alternate Liner - 20' Filled\Solar Radiation Data.d13
 EVAPOTRANSPIRATION DATA F. 1: N:\Projects\2018\35187378\Working Files\DRAFTS (Proposal-Reports-
Communications)\McCloy Permit Narrative\092019 FINAL SUBMITTAL to OCD\10-Appendix J\Attachment D -
HELP\ATT D2 - Results\Alternate Liner - 20' Filled\Evapotranspiration Parameters.d11
 SOIL AND DESIGN DATA FILE  1: N:\Projects\2018\35187378\Working Files\DRAFTS (Proposal-Reports-
Communications)\McCloy Permit Narrative\092019 FINAL SUBMITTAL to OCD\10-Appendix J\Attachment D -
HELP\ATT D2 - Results\Alternate Liner - 20' Filled\Soil and Design Data.d10
 OUTPUT DATA FILE:              N:\Projects\2018\35187378\Working Files\DRAFTS (Proposal-Reports-
Communications)\McCloy Permit Narrative\092019 FINAL SUBMITTAL to OCD\10-Appendix J\Attachment D -
HELP\ATT D2 - Results\Alternate Liner - 20' Filled\Summary Output.out
 YEARLY OUTPUT DATA FILE:       N:\Projects\2018\35187378\Working Files\DRAFTS (Proposal-Reports-
Communications)\McCloy Permit Narrative\092019 FINAL SUBMITTAL to OCD\10-Appendix J\Attachment D -
HELP\ATT D2 - Results\Alternate Liner - 20' Filled\Summary Output.YR

 COLUMNS OF YEARLY OUTPUT DATA FILE:

      1    DATE OF ULTIMO (yyyy1231, years 2101 to 2200 from weather generator)
      2    PRECIPITATION (INCH)
      3    RUNOFF (INCH)
      4    POTENTIAL EVAPOTRANSPIRATION (INCH)
      5    ACTUAL EVAPOTRANSPIRATION (INCH)
      6    DRAIN #1: LATERAL DRAINAGE FROM LAYER  3 (INCH)
      7    LEAK  #1: PERCOLATION/LEAKAGE THROUGH LAYER  4 (INCH)
      8    DRAIN #2: LATERAL DRAINAGE FROM LAYER  5 (INCH)
      9    LEAK  #2: PERCOLATION/LEAKAGE THROUGH LAYER  7 (INCH)
     10    CHANGE IN TOTAL WATER STORAGE (INCH)
     11    CHANGE IN SOIL WATER STORAGE (INCH)
     12    CHANGE IN INTERCEPTION WATER STORAGE (INCH)
     13    CHANGE IN SNOW WATER STORAGE (INCH)
     14    ANNUAL WATER BUDGET BALANCE (INCH)

 *******************************************************************************

      TITLE:  Alternate Liner - 20' Filled

 *******************************************************************************

                              WEATHER DATA SOURCES
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NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ROSWELL NEW MEXICO

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
0.24	0.28	0.27	0.37	0.77	0.91
1.38	2.17	1.72	0.99	0.33	0.27

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ROSWELL NEW MEXICO

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
41.40	45.90	52.80	61.90	70.30	79.00
81.40	79.20	72.30	61.70	49.10	42.50

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ROSWELL NEW MEXICO
AND STATION LATITUDE = 33.24 DEGREES

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LAYER DATA 1

VALID FOR 5 YEARS

NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER
WERE SPECIFIED BY THE USER.

LAYER 1

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 18

THICKNESS	= 240.00	INCHES
POROSITY	= 0.6710	VOL/VOL
FIELD CAPACITY	= 0.2920	VOL/VOL
WILTING POINT	= 0.0770	VOL/VOL
INITIAL SOIL WATER CONTENT	= 0.2000	VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.	= 0.1000E-02	CM/SEC

LAYER 2

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	= 24.00	INCHES
POROSITY	= 0.4170	VOL/VOL
FIELD CAPACITY	= 0.0450	VOL/VOL
WILTING POINT	= 0.0180	VOL/VOL
INITIAL SOIL WATER CONTENT	= 0.0250	VOL/VOL

EFFECTIVE SAT. HYD. CONDUCT.= 0.1000E-04 CM/SEC

LAYER 3

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 20

THICKNESS	=	0.20	INCHES
POROSITY	=	0.8500	VOL/VOL
FIELD CAPACITY	=	0.0100	VOL/VOL
WILTING POINT	=	0.0050	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0060	VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.	=	10.00	CM/SEC
SLOPE	=	2.00	PERCENT
DRAINAGE LENGTH	=	600.0	FEET

LAYER 4

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.06	INCHES
EFFECTIVE SAT. HYD. CONDUCT.	=	0.2000E-12	CM/SEC
FML PINHOLE DENSITY	=	4.00	HOLES/ACRE
FML INSTALLATION DEFECTS	=	4.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	3 - GOOD	

LAYER 5

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 20

THICKNESS	=	0.20	INCHES
POROSITY	=	0.8500	VOL/VOL
FIELD CAPACITY	=	0.0100	VOL/VOL
WILTING POINT	=	0.0050	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0060	VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.	=	10.00	CM/SEC
SLOPE	=	2.00	PERCENT
DRAINAGE LENGTH	=	600.0	FEET

LAYER 6

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.06	INCHES
EFFECTIVE SAT. HYD. CONDUCT.	=	0.2000E-12	CM/SEC
FML PINHOLE DENSITY	=	4.00	HOLES/ACRE
FML INSTALLATION DEFECTS	=	4.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	3 - GOOD	

LAYER 7

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 17

THICKNESS	=	0.24	INCHES
POROSITY	=	0.7500	VOL/VOL
FIELD CAPACITY	=	0.7470	VOL/VOL
WILTING POINT	=	0.4000	VOL/VOL

INITIAL SOIL WATER CONTENT = 0.7500 VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.= 0.3000E-08 CM/SEC

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GENERAL DESIGN AND EVAPORATIVE ZONE DATA 1

VALID FOR 5 YEARS

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE #18 WITH BARE GROUND CONDITIONS, A SURFACE SLOPE OF 4.% AND A SLOPE LENGTH OF 750. FEET.

SCS RUNOFF CURVE NUMBER	=	79.20	
FRACTION OF AREA ALLOWING RUNOFF	=	0.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	205.000	ACRES
EVAPORATIVE ZONE DEPTH	=	14.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	2.800	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	9.394	INCHES
FIELD CAPACITY OF EVAPORATIVE ZONE	=	4.088	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	1.078	INCHES
SOIL EVAPORATION ZONE DEPTH	=	14.000	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL INTERCEPTION WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	48.782	INCHES
TOTAL INITIAL WATER	=	48.782	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

****

EVAPOTRANSPIRATION DATA 1

VALID FOR 5 YEARS

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM ROSWELL NEW MEXICO

STATION LATITUDE	=	33.24 DEGREES
MAXIMUM LEAF AREA INDEX	=	0.00
START OF GROWING SEASON (JULIAN DATE)	=	76
END OF GROWING SEASON (JULIAN DATE)	=	310
EVAPORATIVE ZONE DEPTH	=	14.0 INCHES
AVERAGE ANNUAL WIND SPEED	=	8.70 MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	49.0 %
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	40.0 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	53.0 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	52.0 %

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ANNUAL TOTALS FOR YEAR 1

	INCHES	CU. FEET	PERCENT
PRECIPITATION	8.70	6474105.500	100.00
RUNOFF	0.000	0.000	0.00

POTENTIAL EVAPOTRANSPIRATION	77.421	57612976.000	
ACTUAL EVAPOTRANSPIRATION	8.016	5964840.500	92.13
DRAINAGE COLLECTED FROM LAYER 3	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 4	0.0000		
DRAINAGE COLLECTED FROM LAYER 5	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 7	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 6	0.0000		
CHANGE IN WATER STORAGE	0.684	509261.219	7.87
SOIL WATER AT START OF YEAR	48.784	36302292.000	
SOIL WATER AT END OF YEAR	49.468	36811552.000	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	3.548	0.00

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ANNUAL TOTALS FOR YEAR 2

	INCHES	CU. FEET	PERCENT
PRECIPITATION	10.35	7701953.500	100.00
RUNOFF	0.000	0.000	0.00
POTENTIAL EVAPOTRANSPIRATION	76.577	56984972.000	
ACTUAL EVAPOTRANSPIRATION	9.421	7010889.500	91.03
DRAINAGE COLLECTED FROM LAYER 3	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 4	0.0000		
DRAINAGE COLLECTED FROM LAYER 5	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 7	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 6	0.0000		
CHANGE IN WATER STORAGE	0.929	691066.188	8.97
SOIL WATER AT START OF YEAR	49.468	36811552.000	
SOIL WATER AT END OF YEAR	50.397	37502620.000	

INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-2.129	0.00

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ANNUAL TOTALS FOR YEAR 3

	INCHES	CU. FEET	PERCENT
PRECIPITATION	10.33	7687068.500	100.00
RUNOFF	0.000	0.000	0.00
POTENTIAL EVAPOTRANSPIRATION	76.472	56906980.000	
ACTUAL EVAPOTRANSPIRATION	10.757	8004682.500	104.13
DRAINAGE COLLECTED FROM LAYER 3	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 4	0.0000		
DRAINAGE COLLECTED FROM LAYER 5	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 7	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 6	0.0000		
CHANGE IN WATER STORAGE	-0.427	-317614.406	-4.13
SOIL WATER AT START OF YEAR	50.397	37502620.000	
SOIL WATER AT END OF YEAR	49.970	37185004.000	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.710	0.00

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ANNUAL TOTALS FOR YEAR 4

	INCHES	CU. FEET	PERCENT
PRECIPITATION	9.25	6883389.500	100.00

RUNOFF	0.000	0.000	0.00
POTENTIAL EVAPOTRANSPIRATION	77.070	57351340.000	
ACTUAL EVAPOTRANSPIRATION	9.044	6730242.500	97.78
DRAINAGE COLLECTED FROM LAYER 3	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 4	0.0000		
DRAINAGE COLLECTED FROM LAYER 5	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 7	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 6	0.0000		
CHANGE IN WATER STORAGE	0.206	153145.406	2.22
SOIL WATER AT START OF YEAR	49.970	37185004.000	
SOIL WATER AT END OF YEAR	50.176	37338148.000	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	2.129	0.00

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ANNUAL TOTALS FOR YEAR 5

	INCHES	CU. FEET	PERCENT
PRECIPITATION	9.68	7203372.000	100.00
RUNOFF	0.000	0.000	0.00
POTENTIAL EVAPOTRANSPIRATION	75.845	56440384.000	
ACTUAL EVAPOTRANSPIRATION	9.039	6726316.500	93.38
DRAINAGE COLLECTED FROM LAYER 3	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 4	0.0000		
DRAINAGE COLLECTED FROM LAYER 5	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 7	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 6	0.0000		
CHANGE IN WATER STORAGE	0.641	477056.031	6.62
SOIL WATER AT START OF YEAR	50.176	37338148.000	

SOIL WATER AT END OF YEAR	50.817	37815204.000	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.710	0.00

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FINAL WATER STORAGE AT END OF YEAR 5

LAYER	(INCHES)	(VOL/VOL)
1	50.0330	0.2085
2	0.6000	0.0250
3	0.0012	0.0060
4	0.0000	0.0000
5	0.0012	0.0060
6	0.0000	0.0000
7	0.1800	0.7500

TOTAL WATER IN LAYERS	50.815
SNOW WATER	0.000
INTERCEPTION WATER	0.000
TOTAL FINAL WATER	50.815

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 5

	(INCHES)	(CU. FT.)
PRECIPITATION	1.17	870655.500
RUNOFF	0.000	0.0000
DRAINAGE COLLECTED FROM LAYER 3	0.00000	0.00000
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.000000	0.00000
AVERAGE HEAD ON TOP OF LAYER 4	0.000	
MAXIMUM HEAD ON TOP OF LAYER 4	0.000	
LOCATION OF MAXIMUM HEAD IN LAYER 3		

(DISTANCE FROM DRAIN)	0.0 FEET	
DRAINAGE COLLECTED FROM LAYER 5	0.00000	0.00000
PERCOLATION/LEAKAGE THROUGH LAYER 7	0.000000	0.00000
AVERAGE HEAD ON TOP OF LAYER 6	0.000	
MAXIMUM HEAD ON TOP OF LAYER 6	0.000	
LOCATION OF MAXIMUM HEAD IN LAYER 5		
(DISTANCE FROM DRAIN)	0.0 FEET	
SNOW WATER	0.61	455364.3438
MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.3367	
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.0965	

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas
ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 5

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	0.18	0.17	0.29	0.26	0.78	0.63
	1.66	1.91	1.64	0.79	0.84	0.49
STD. DEVIATIONS	0.19	0.04	0.26	0.21	0.74	0.77
	0.78	1.32	1.04	0.91	1.02	0.34
RUNOFF						
TOTALS	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATIONS	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
POTENTIAL EVAPOTRANSPIRATION						
TOTALS	3.134	3.701	5.148	7.467	9.389	10.427
	10.279	8.815	6.728	5.253	3.633	2.703
STD. DEVIATIONS	0.197	0.192	0.191	0.353	0.446	0.205
	0.101	0.268	0.309	0.179	0.177	0.208
ACTUAL EVAPOTRANSPIRATION						
TOTALS	0.339	0.298	0.301	0.221	0.756	0.752
	0.928	1.885	1.461	1.022	0.694	0.599
STD. DEVIATIONS	0.073	0.079	0.062	0.024	0.736	0.669
	0.809	1.387	0.690	0.595	0.533	0.269

LATERAL DRAINAGE COLLECTED FROM LAYER 3

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

PERCOLATION/LEAKAGE THROUGH LAYER 4

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

LATERAL DRAINAGE COLLECTED FROM LAYER 5

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

PERCOLATION/LEAKAGE THROUGH LAYER 7

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 4

AVERAGES	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

DAILY AVERAGE HEAD ON TOP OF LAYER 6

AVERAGES	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 5

	INCHES		CU. FEET	PERCENT
PRECIPITATION	9.66	(0.710)	7189978.0	100.00
RUNOFF	0.000	(0.0000)	0.00	0.000
POTENTIAL EVAPOTRANSPIRATION	76.677	(0.6011)	57059340.00	

ACTUAL EVAPOTRANSPIRATION	9.255	(0.9887)	6887394.00	95.792
LATERAL DRAINAGE COLLECTED FROM LAYER 3	0.00000	(0.00000)	0.000	0.00000
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.00000	(0.00000)	0.000	0.00000
AVERAGE HEAD ON TOP OF LAYER 4	0.000	(0.000)		
LATERAL DRAINAGE COLLECTED FROM LAYER 5	0.00000	(0.00000)	0.000	0.00000
PERCOLATION/LEAKAGE THROUGH LAYER 7	0.00000	(0.00000)	0.000	0.00000
AVERAGE HEAD ON TOP OF LAYER 6	0.000	(0.000)		
CHANGE IN WATER STORAGE	0.407	(0.5338)	302582.88	4.208

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Exhibit G

SCENARIO 7 HELP MODEL RESULTS

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**                                                                           **
**                                                                           **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE                **
**                                                                           **
**              HELP Version 3.95 D          (10 August 2012)               **
**                             developed at                                  **
**        Institute of Soil Science, University of Hamburg, Germany          **
**                               based on                                    **
**              US HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                **
**                  DEVELOPED BY ENVIRONMENTAL LABORATORY                    **
**                    USAE WATERWAYS EXPERIMENT STATION                      **
**                FOR USEPA RISK REDUCTION ENGINEERING LABORATORY            **
**                                                                           **
**                                                                           **
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 TIME:  15.44     DATE:  24.09.2019

 PRECIPITATION DATA FILE:       N:\Projects\2018\35187378\Working Files\DRAFTS (Proposal-Reports-
Communications)\McCloy Permit Narrative\092019 FINAL SUBMITTAL to OCD\VOLUME 2\App J - Engineering
Report\AttD-HELP\exhibits a-i\ExG-AltLiner-FilledBare\Precipitation Data.d4
 TEMPERATURE DATA FILE:         N:\Projects\2018\35187378\Working Files\DRAFTS (Proposal-Reports-
Communications)\McCloy Permit Narrative\092019 FINAL SUBMITTAL to OCD\VOLUME 2\App J - Engineering
Report\AttD-HELP\exhibits a-i\ExG-AltLiner-FilledBare\Temperature Data.d7
 SOLAR RADIATION DATA FILE:     N:\Projects\2018\35187378\Working Files\DRAFTS (Proposal-Reports-
Communications)\McCloy Permit Narrative\092019 FINAL SUBMITTAL to OCD\VOLUME 2\App J - Engineering
Report\AttD-HELP\exhibits a-i\ExG-AltLiner-FilledBare\Solar Radiation Data.d13
 EVAPOTRANSPIRATION DATA F. 1: N:\Projects\2018\35187378\Working Files\DRAFTS (Proposal-Reports-
Communications)\McCloy Permit Narrative\092019 FINAL SUBMITTAL to OCD\VOLUME 2\App J - Engineering
Report\AttD-HELP\exhibits a-i\ExG-AltLiner-FilledBare\Evapotranspiration Parameters.d11
 SOIL AND DESIGN DATA FILE  1: N:\Projects\2018\35187378\Working Files\DRAFTS (Proposal-Reports-
Communications)\McCloy Permit Narrative\092019 FINAL SUBMITTAL to OCD\VOLUME 2\App J - Engineering
Report\AttD-HELP\exhibits a-i\ExG-AltLiner-FilledBare\Soil and Design Data.d10
 OUTPUT DATA FILE:              N:\Projects\2018\35187378\Working Files\DRAFTS (Proposal-Reports-
Communications)\McCloy Permit Narrative\092019 FINAL SUBMITTAL to OCD\VOLUME 2\App J - Engineering
Report\AttD-HELP\exhibits a-i\ExG-AltLiner-FilledBare\Summary Output.out
 YEARLY OUTPUT DATA FILE:       N:\Projects\2018\35187378\Working Files\DRAFTS (Proposal-Reports-
Communications)\McCloy Permit Narrative\092019 FINAL SUBMITTAL to OCD\VOLUME 2\App J - Engineering
Report\AttD-HELP\exhibits a-i\ExG-AltLiner-FilledBare\Summary Output.YR

 COLUMNS OF YEARLY OUTPUT DATA FILE:

      1    DATE OF ULTIMO (yyyy1231, years 2101 to 2200 from weather generator)
      2    PRECIPITATION (INCH)
      3    RUNOFF (INCH)
      4    POTENTIAL EVAPOTRANSPIRATION (INCH)
      5    ACTUAL EVAPOTRANSPIRATION (INCH)
      6    DRAIN #1: LATERAL DRAINAGE FROM LAYER  6 (INCH)
      7    LEAK  #1: PERCOLATION/LEAKAGE THROUGH LAYER  7 (INCH)
      8    DRAIN #2: LATERAL DRAINAGE FROM LAYER  8 (INCH)
      9    LEAK  #2: PERCOLATION/LEAKAGE THROUGH LAYER 10 (INCH)
     10    CHANGE IN TOTAL WATER STORAGE (INCH)
     11    CHANGE IN SOIL WATER STORAGE (INCH)
     12    CHANGE IN INTERCEPTION WATER STORAGE (INCH)
     13    CHANGE IN SNOW WATER STORAGE (INCH)
     14    ANNUAL WATER BUDGET BALANCE (INCH)


 *******************************************************************************

      TITLE:  Alternate Liner

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WEATHER DATA SOURCES

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ROSWELL NEW MEXICO

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
0.24	0.28	0.27	0.37	0.77	0.91
1.38	2.17	1.72	0.99	0.33	0.27

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ROSWELL NEW MEXICO

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
41.40	45.90	52.80	61.90	70.30	79.00
81.40	79.20	72.30	61.70	49.10	42.50

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ROSWELL NEW MEXICO
AND STATION LATITUDE = 33.24 DEGREES

****

LAYER DATA 1

VALID FOR 2 YEARS

NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER
WERE SPECIFIED BY THE USER.

LAYER 1

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	12.00 INCHES
POROSITY	=	0.4730 VOL/VOL
FIELD CAPACITY	=	0.2220 VOL/VOL
WILTING POINT	=	0.1040 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.1340 VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.	=	0.1000E-04 CM/SEC

LAYER 2

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	36.00 INCHES
POROSITY	=	0.4730 VOL/VOL
FIELD CAPACITY	=	0.2220 VOL/VOL
WILTING POINT	=	0.1040 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.1340 VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.= 0.1000E-04 CM/SEC

LAYER 3

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	12.00	INCHES
POROSITY	=	0.4730	VOL/VOL
FIELD CAPACITY	=	0.2220	VOL/VOL
WILTING POINT	=	0.1040	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.1340	VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.	=	0.1000E-04	CM/SEC

LAYER 4

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 18

THICKNESS	=	2724.00	INCHES
POROSITY	=	0.6710	VOL/VOL
FIELD CAPACITY	=	0.2920	VOL/VOL
WILTING POINT	=	0.0770	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2000	VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.	=	0.1000E-02	CM/SEC

LAYER 5

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	24.00	INCHES
POROSITY	=	0.4170	VOL/VOL
FIELD CAPACITY	=	0.0450	VOL/VOL
WILTING POINT	=	0.0180	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0250	VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.	=	0.1000E-04	CM/SEC

LAYER 6

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 20

THICKNESS	=	0.20	INCHES
POROSITY	=	0.8500	VOL/VOL
FIELD CAPACITY	=	0.0100	VOL/VOL
WILTING POINT	=	0.0050	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0060	VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.	=	10.00	CM/SEC
SLOPE	=	2.00	PERCENT
DRAINAGE LENGTH	=	600.0	FEET

LAYER 7

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.06	INCHES
EFFECTIVE SAT. HYD. CONDUCT.	=	0.2000E-12	CM/SEC
FML PINHOLE DENSITY	=	4.00	HOLES/ACRE

FML INSTALLATION DEFECTS = 4.00 HOLES/ACRE
FML PLACEMENT QUALITY = 3 - GOOD

LAYER 8

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 20

THICKNESS	=	0.20	INCHES
POROSITY	=	0.8500	VOL/VOL
FIELD CAPACITY	=	0.0100	VOL/VOL
WILTING POINT	=	0.0050	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0060	VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.	=	10.00	CM/SEC
SLOPE	=	2.00	PERCENT
DRAINAGE LENGTH	=	600.0	FEET

LAYER 9

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.06	INCHES
EFFECTIVE SAT. HYD. CONDUCT.	=	0.2000E-12	CM/SEC
FML PINHOLE DENSITY	=	4.00	HOLES/ACRE
FML INSTALLATION DEFECTS	=	4.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	3 - GOOD	

LAYER 10

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 17

THICKNESS	=	0.24	INCHES
POROSITY	=	0.7500	VOL/VOL
FIELD CAPACITY	=	0.7470	VOL/VOL
WILTING POINT	=	0.4000	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.7500	VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.	=	0.3000E-08	CM/SEC

****

GENERAL DESIGN AND EVAPORATIVE ZONE DATA 1

VALID FOR 2 YEARS

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE # 7 WITH BARE GROUND CONDITIONS, A SURFACE SLOPE OF 4.% AND A SLOPE LENGTH OF 750. FEET.

SCS RUNOFF CURVE NUMBER	=	87.89	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	205.000	ACRES
EVAPORATIVE ZONE DEPTH	=	14.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	1.876	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	6.622	INCHES
FIELD CAPACITY OF EVAPORATIVE ZONE	=	3.108	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	1.456	INCHES
SOIL EVAPORATION ZONE DEPTH	=	14.000	INCHES
INITIAL SNOW WATER	=	0.000	INCHES

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        INITIAL INTERCEPTION WATER          =      0.000  INCHES
        INITIAL WATER IN LAYER MATERIALS    =    553.622  INCHES
        TOTAL INITIAL WATER                 =    553.622  INCHES
        TOTAL SUBSURFACE INFLOW             =      0.00   INCHES/YEAR


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                        EVAPOTRANSPIRATION DATA   1
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                             VALID FOR   2 YEARS


         NOTE:  EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
                  ROSWELL             NEW MEXICO
             STATION LATITUDE                      =  33.24 DEGREES
             MAXIMUM LEAF AREA INDEX               =   0.00
             START OF GROWING SEASON (JULIAN DATE) =     76
             END OF GROWING SEASON (JULIAN DATE)   =    310
             EVAPORATIVE ZONE DEPTH                =  14.0  INCHES
             AVERAGE ANNUAL WIND SPEED             =   8.70 MPH
             AVERAGE 1ST QUARTER RELATIVE HUMIDITY =  49.0  %
             AVERAGE 2ND QUARTER RELATIVE HUMIDITY =  40.0  %
             AVERAGE 3RD QUARTER RELATIVE HUMIDITY =  53.0  %
             AVERAGE 4TH QUARTER RELATIVE HUMIDITY =  52.0  %

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                           ANNUAL TOTALS FOR YEAR    1
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                                        INCHES          CU. FEET     PERCENT
                                       --------        ----------    -------
  PRECIPITATION                          8.70        6474105.500    100.00

  RUNOFF                                 1.489       1108083.750     17.12

  POTENTIAL EVAPOTRANSPIRATION          77.421      57612976.000

  ACTUAL EVAPOTRANSPIRATION              6.051       4502638.500     69.55

  DRAINAGE COLLECTED FROM LAYER  6       0.0000            0.000      0.00

  PERC./LEAKAGE THROUGH LAYER  7         0.000000          0.000      0.00

  AVG. HEAD ON TOP OF LAYER  7           0.0000

  DRAINAGE COLLECTED FROM LAYER  8       0.0000            0.000      0.00

  PERC./LEAKAGE THROUGH LAYER 10         0.000000          0.000      0.00

  AVG. HEAD ON TOP OF LAYER  9           0.0000

  CHANGE IN WATER STORAGE                1.160        863375.688     13.34

  SOIL WATER AT START OF YEAR          553.624     411979008.000

  SOIL WATER AT END OF YEAR            554.784     412842368.000

  INTERCEPTION WATER AT START OF YEAR    0.000            0.000

  INTERCEPTION WATER AT END OF YEAR      0.000            0.000

  SNOW WATER AT START OF YEAR            0.000            0.000      0.00
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SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	7.452	0.00

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ANNUAL TOTALS FOR YEAR 2

	INCHES	CU. FEET	PERCENT
PRECIPITATION	10.35	7701953.500	100.00
RUNOFF	1.657	1233255.375	16.01
POTENTIAL EVAPOTRANSPIRATION	76.577	56984972.000	
ACTUAL EVAPOTRANSPIRATION	8.419	6264959.500	81.34
DRAINAGE COLLECTED FROM LAYER 6	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 7	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 7	0.0000		
DRAINAGE COLLECTED FROM LAYER 8	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 10	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 9	0.0000		
CHANGE IN WATER STORAGE	0.274	203751.047	2.65
SOIL WATER AT START OF YEAR	554.784	412842368.000	
SOIL WATER AT END OF YEAR	555.058	413046144.000	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-12.065	0.00

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FINAL WATER STORAGE AT END OF YEAR 2

LAYER	(INCHES)	(VOL/VOL)
1	3.1020	0.2585
2	4.7640	0.1323
3	1.6080	0.1340

4	544.8000	0.2000
5	0.6000	0.0250
6	0.0012	0.0060
7	0.0000	0.0000
8	0.0012	0.0060
9	0.0000	0.0000
10	0.1800	0.7500

TOTAL WATER IN LAYERS 555.056

SNOW WATER 0.000

INTERCEPTION WATER 0.000

TOTAL FINAL WATER 555.056

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 2

	(INCHES)	(CU. FT.)
PRECIPITATION	1.05	781357.438
RUNOFF	0.644	479548.8438
DRAINAGE COLLECTED FROM LAYER 6	0.00000	0.00000
PERCOLATION/LEAKAGE THROUGH LAYER 7	0.000000	0.00000
AVERAGE HEAD ON TOP OF LAYER 7	0.000	
MAXIMUM HEAD ON TOP OF LAYER 7	0.000	
LOCATION OF MAXIMUM HEAD IN LAYER 6 (DISTANCE FROM DRAIN)	0.0 FEET	
DRAINAGE COLLECTED FROM LAYER 8	0.00000	0.00000
PERCOLATION/LEAKAGE THROUGH LAYER 10	0.000000	0.00000
AVERAGE HEAD ON TOP OF LAYER 9	0.000	
MAXIMUM HEAD ON TOP OF LAYER 9	0.000	
LOCATION OF MAXIMUM HEAD IN LAYER 8 (DISTANCE FROM DRAIN)	0.0 FEET	
SNOW WATER	0.61	455364.3438
MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.2898	
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.1078	

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas

ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 2

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	0.22	0.18	0.22	0.44	0.76	0.92
	1.18	2.13	2.15	0.21	0.61	0.48
STD. DEVIATIONS	0.31	0.01	0.28	0.16	1.05	1.30
	0.21	0.62	1.04	0.30	0.39	0.52
RUNOFF						
TOTALS	0.041	0.000	0.000	0.000	0.000	0.197
	0.130	0.707	0.353	0.012	0.079	0.055
STD. DEVIATIONS	0.058	0.000	0.000	0.000	0.000	0.278
	0.180	0.093	0.439	0.017	0.111	0.077
POTENTIAL EVAPOTRANSPIRATION						
TOTALS	3.103	3.653	5.266	7.550	9.144	10.440
	10.356	8.756	6.951	5.374	3.675	2.733
STD. DEVIATIONS	0.354	0.277	0.005	0.400	0.417	0.399
	0.128	0.512	0.288	0.004	0.184	0.297
ACTUAL EVAPOTRANSPIRATION						
TOTALS	0.261	0.195	0.151	0.256	0.667	0.839
	0.533	1.313	1.545	0.518	0.561	0.398
STD. DEVIATIONS	0.007	0.001	0.051	0.242	0.800	1.058
	0.628	0.686	0.313	0.258	0.394	0.037
LATERAL DRAINAGE COLLECTED FROM LAYER 6						
TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH LAYER 7						
TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LATERAL DRAINAGE COLLECTED FROM LAYER 8						
TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

PERCOLATION/LEAKAGE THROUGH LAYER 10

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 7

AVERAGES	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

DAILY AVERAGE HEAD ON TOP OF LAYER 9

AVERAGES	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 2

	INCHES		CU. FEET	PERCENT
PRECIPITATION	9.53	(1.167)	7088030.0	100.00
RUNOFF	1.573	(0.1189)	1170669.62	16.516
POTENTIAL EVAPOTRANSPIRATION	76.999	(0.5962)	57298972.00	
ACTUAL EVAPOTRANSPIRATION	7.235	(1.6746)	5383798.50	75.956
LATERAL DRAINAGE COLLECTED FROM LAYER 6	0.00000	(0.00000)	0.000	0.00000
PERCOLATION/LEAKAGE THROUGH LAYER 7	0.00000	(0.00000)	0.000	0.00000
AVERAGE HEAD ON TOP OF LAYER 7	0.000	(0.000)		
LATERAL DRAINAGE COLLECTED FROM LAYER 8	0.00000	(0.00000)	0.000	0.00000
PERCOLATION/LEAKAGE THROUGH LAYER 10	0.00000	(0.00000)	0.000	0.00000
AVERAGE HEAD ON TOP OF LAYER 9	0.000	(0.000)		
CHANGE IN WATER STORAGE	0.717	(0.6268)	533563.31	7.528

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Exhibit H

SCENARIO 8 HELP MODEL RESULTS

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 *******************************************************************************
 **                                                                           **
 **                                                                           **
 **              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE                **
 **                                                                           **
 **              HELP Version 3.95 D          (10 August 2012)              **
 **                              developed at                                 **
 **        Institute of Soil Science, University of Hamburg, Germany          **
 **                                 based on                                  **
 **              US HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                **
 **                  DEVELOPED BY ENVIRONMENTAL LABORATORY                    **
 **                    USAE WATERWAYS EXPERIMENT STATION                      **
 **             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY               **
 **                                                                           **
 **                                                                           **
 *******************************************************************************
 *******************************************************************************

 TIME:  15.46     DATE:  24.09.2019

 PRECIPITATION DATA FILE:       N:\Projects\2018\35187378\Working Files\DRAFTS (Proposal-Reports-
Communications)\McCloy Permit Narrative\092019 FINAL SUBMITTAL to OCD\VOLUME 2\App J - Engineering
Report\AttD-HELP\exhibits a-i\ExH-AltLiner-FilledPoor\Precipitation Data.d4
 TEMPERATURE DATA FILE:         N:\Projects\2018\35187378\Working Files\DRAFTS (Proposal-Reports-
Communications)\McCloy Permit Narrative\092019 FINAL SUBMITTAL to OCD\VOLUME 2\App J - Engineering
Report\AttD-HELP\exhibits a-i\ExH-AltLiner-FilledPoor\Temperature Data.d7
 SOLAR RADIATION DATA FILE:     N:\Projects\2018\35187378\Working Files\DRAFTS (Proposal-Reports-
Communications)\McCloy Permit Narrative\092019 FINAL SUBMITTAL to OCD\VOLUME 2\App J - Engineering
Report\AttD-HELP\exhibits a-i\ExH-AltLiner-FilledPoor\Solar Radiation Data.d13
 EVAPOTRANSPIRATION DATA F. 1: N:\Projects\2018\35187378\Working Files\DRAFTS (Proposal-Reports-
Communications)\McCloy Permit Narrative\092019 FINAL SUBMITTAL to OCD\VOLUME 2\App J - Engineering
Report\AttD-HELP\exhibits a-i\ExH-AltLiner-FilledPoor\Evapotranspiration Parameters.d11
 SOIL AND DESIGN DATA FILE  1: N:\Projects\2018\35187378\Working Files\DRAFTS (Proposal-Reports-
Communications)\McCloy Permit Narrative\092019 FINAL SUBMITTAL to OCD\VOLUME 2\App J - Engineering
Report\AttD-HELP\exhibits a-i\ExH-AltLiner-FilledPoor\Soil and Design Data.d10
 OUTPUT DATA FILE:              N:\Projects\2018\35187378\Working Files\DRAFTS (Proposal-Reports-
Communications)\McCloy Permit Narrative\092019 FINAL SUBMITTAL to OCD\VOLUME 2\App J - Engineering
Report\AttD-HELP\exhibits a-i\ExH-AltLiner-FilledPoor\Summary Output.out
 YEARLY OUTPUT DATA FILE:       N:\Projects\2018\35187378\Working Files\DRAFTS (Proposal-Reports-
Communications)\McCloy Permit Narrative\092019 FINAL SUBMITTAL to OCD\VOLUME 2\App J - Engineering
Report\AttD-HELP\exhibits a-i\ExH-AltLiner-FilledPoor\Summary Output.YR

 COLUMNS OF YEARLY OUTPUT DATA FILE:

      1    DATE OF ULTIMO (yyyy1231, years 2101 to 2200 from weather generator)
      2    PRECIPITATION (INCH)
      3    RUNOFF (INCH)
      4    POTENTIAL EVAPOTRANSPIRATION (INCH)
      5    ACTUAL EVAPOTRANSPIRATION (INCH)
      6    DRAIN #1: LATERAL DRAINAGE FROM LAYER  6 (INCH)
      7    LEAK  #1: PERCOLATION/LEAKAGE THROUGH LAYER  7 (INCH)
      8    DRAIN #2: LATERAL DRAINAGE FROM LAYER  8 (INCH)
      9    LEAK  #2: PERCOLATION/LEAKAGE THROUGH LAYER 10 (INCH)
     10    CHANGE IN TOTAL WATER STORAGE (INCH)
     11    CHANGE IN SOIL WATER STORAGE (INCH)
     12    CHANGE IN INTERCEPTION WATER STORAGE (INCH)
     13    CHANGE IN SNOW WATER STORAGE (INCH)
     14    ANNUAL WATER BUDGET BALANCE (INCH)


 *******************************************************************************

      TITLE:  Alternate Liner

 *******************************************************************************


                              WEATHER DATA SOURCES
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NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ROSWELL NEW MEXICO

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
0.24	0.28	0.27	0.37	0.77	0.91
1.38	2.17	1.72	0.99	0.33	0.27

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ROSWELL NEW MEXICO

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
41.40	45.90	52.80	61.90	70.30	79.00
81.40	79.20	72.30	61.70	49.10	42.50

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ROSWELL NEW MEXICO
AND STATION LATITUDE = 33.24 DEGREES

****

LAYER DATA 1

VALID FOR 28 YEARS

NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER
WERE SPECIFIED BY THE USER.

LAYER 1

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	12.00	INCHES
POROSITY	=	0.4730	VOL/VOL
FIELD CAPACITY	=	0.2220	VOL/VOL
WILTING POINT	=	0.1040	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.1340	VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.	=	0.1000E-04	CM/SEC

LAYER 2

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	36.00	INCHES
POROSITY	=	0.4730	VOL/VOL
FIELD CAPACITY	=	0.2220	VOL/VOL
WILTING POINT	=	0.1040	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.1340	VOL/VOL

EFFECTIVE SAT. HYD. CONDUCT.= 0.1000E-04 CM/SEC

LAYER 3

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	12.00	INCHES
POROSITY	=	0.4730	VOL/VOL
FIELD CAPACITY	=	0.2220	VOL/VOL
WILTING POINT	=	0.1040	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.1340	VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.	=	0.1000E-04	CM/SEC

LAYER 4

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 18

THICKNESS	=	2724.00	INCHES
POROSITY	=	0.6710	VOL/VOL
FIELD CAPACITY	=	0.2920	VOL/VOL
WILTING POINT	=	0.0770	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2000	VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.	=	0.1000E-02	CM/SEC

LAYER 5

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	24.00	INCHES
POROSITY	=	0.4170	VOL/VOL
FIELD CAPACITY	=	0.0450	VOL/VOL
WILTING POINT	=	0.0180	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0250	VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.	=	0.1000E-04	CM/SEC

LAYER 6

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 20

THICKNESS	=	0.20	INCHES
POROSITY	=	0.8500	VOL/VOL
FIELD CAPACITY	=	0.0100	VOL/VOL
WILTING POINT	=	0.0050	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0060	VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.	=	10.00	CM/SEC
SLOPE	=	2.00	PERCENT
DRAINAGE LENGTH	=	600.0	FEET

LAYER 7

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.06	INCHES
EFFECTIVE SAT. HYD. CONDUCT.	=	0.2000E-12	CM/SEC
FML PINHOLE DENSITY	=	4.00	HOLES/ACRE
FML INSTALLATION DEFECTS	=	4.00	HOLES/ACRE

FML PLACEMENT QUALITY = 3 - GOOD

LAYER 8

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 20

THICKNESS	=	0.20	INCHES
POROSITY	=	0.8500	VOL/VOL
FIELD CAPACITY	=	0.0100	VOL/VOL
WILTING POINT	=	0.0050	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0060	VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.	=	10.00	CM/SEC
SLOPE	=	2.00	PERCENT
DRAINAGE LENGTH	=	600.0	FEET

LAYER 9

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.06	INCHES
EFFECTIVE SAT. HYD. CONDUCT.	=	0.2000E-12	CM/SEC
FML PINHOLE DENSITY	=	4.00	HOLES/ACRE
FML INSTALLATION DEFECTS	=	4.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	3 - GOOD	

LAYER 10

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 17

THICKNESS	=	0.24	INCHES
POROSITY	=	0.7500	VOL/VOL
FIELD CAPACITY	=	0.7470	VOL/VOL
WILTING POINT	=	0.4000	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.7500	VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.	=	0.3000E-08	CM/SEC

****

GENERAL DESIGN AND EVAPORATIVE ZONE DATA 1

VALID FOR 28 YEARS

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE #13 WITH A POOR STAND OF GRASS, A SURFACE SLOPE OF 4.% AND A SLOPE LENGTH OF 750. FEET.

SCS RUNOFF CURVE NUMBER	=	91.59	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	205.000	ACRES
EVAPORATIVE ZONE DEPTH	=	24.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	3.216	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	11.352	INCHES
FIELD CAPACITY OF EVAPORATIVE ZONE	=	5.328	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	2.496	INCHES
SOIL EVAPORATION ZONE DEPTH	=	24.000	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL INTERCEPTION WATER	=	0.000	INCHES

```
        INITIAL WATER IN LAYER MATERIALS    =    553.622  INCHES
        TOTAL INITIAL WATER                 =    553.622  INCHES
        TOTAL SUBSURFACE INFLOW             =      0.00   INCHES/YEAR


*******************************************************************************

                        EVAPOTRANSPIRATION DATA   1
-------------------------------------------------------------------------------

                             VALID FOR  28 YEARS


         NOTE:  EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
                  ROSWELL             NEW MEXICO
              STATION LATITUDE                      =  33.24 DEGREES
              MAXIMUM LEAF AREA INDEX               =   1.20
              START OF GROWING SEASON (JULIAN DATE) =     76
              END OF GROWING SEASON (JULIAN DATE)   =    310
              EVAPORATIVE ZONE DEPTH                =  24.0  INCHES
              AVERAGE ANNUAL WIND SPEED             =   8.70 MPH
              AVERAGE 1ST QUARTER RELATIVE HUMIDITY =  49.0  %
              AVERAGE 2ND QUARTER RELATIVE HUMIDITY =  40.0  %
              AVERAGE 3RD QUARTER RELATIVE HUMIDITY =  53.0  %
              AVERAGE 4TH QUARTER RELATIVE HUMIDITY =  52.0  %

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                           ANNUAL TOTALS FOR YEAR    1
-------------------------------------------------------------------------------

                                       INCHES          CU. FEET     PERCENT
                                      --------        ----------    -------
  PRECIPITATION                         8.70        6474105.500    100.00

  RUNOFF                                0.896        666436.812     10.29

  POTENTIAL EVAPOTRANSPIRATION         77.421      57612976.000

  ACTUAL EVAPOTRANSPIRATION             7.845       5837720.000     90.17

  DRAINAGE COLLECTED FROM LAYER  6      0.0000            0.000      0.00

  PERC./LEAKAGE THROUGH LAYER  7       0.000000          0.000      0.00

  AVG. HEAD ON TOP OF LAYER  7          0.0000

  DRAINAGE COLLECTED FROM LAYER  8      0.0000            0.000      0.00

  PERC./LEAKAGE THROUGH LAYER 10       0.000000          0.000      0.00

  AVG. HEAD ON TOP OF LAYER  9          0.0000

  CHANGE IN WATER STORAGE              -0.040        -30022.164     -0.46

  SOIL WATER AT START OF YEAR         553.624     411979008.000

  SOIL WATER AT END OF YEAR           553.583     411948960.000

  INTERCEPTION WATER AT START OF YEAR   0.000            0.000

  INTERCEPTION WATER AT END OF YEAR     0.000            0.000

  SNOW WATER AT START OF YEAR           0.000            0.000      0.00
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SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-29.097	0.00

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ANNUAL TOTALS FOR YEAR 2

	INCHES	CU. FEET	PERCENT
PRECIPITATION	10.35	7701953.500	100.00
RUNOFF	0.875	650883.688	8.45
POTENTIAL EVAPOTRANSPIRATION	76.577	56984972.000	
ACTUAL EVAPOTRANSPIRATION	9.244	6878927.500	89.31
DRAINAGE COLLECTED FROM LAYER 6	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 7	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 7	0.0000		
DRAINAGE COLLECTED FROM LAYER 8	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 10	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 9	0.0000		
CHANGE IN WATER STORAGE	0.231	172139.188	2.24
SOIL WATER AT START OF YEAR	553.583	411948960.000	
SOIL WATER AT END OF YEAR	553.815	412121120.000	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	3.548	0.00

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ANNUAL TOTALS FOR YEAR 3

	INCHES	CU. FEET	PERCENT
PRECIPITATION	10.33	7687068.500	100.00
RUNOFF	0.542	403351.406	5.25
POTENTIAL EVAPOTRANSPIRATION	76.472	56906980.000	
ACTUAL EVAPOTRANSPIRATION	9.527	7089696.000	92.23

DRAINAGE COLLECTED FROM LAYER 6	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 7	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 7	0.0000		
DRAINAGE COLLECTED FROM LAYER 8	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 10	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 9	0.0000		
CHANGE IN WATER STORAGE	0.261	194031.297	2.52
SOIL WATER AT START OF YEAR	553.815	412121120.000	
SOIL WATER AT END OF YEAR	554.075	412315136.000	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-9.935	0.00

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ANNUAL TOTALS FOR YEAR 4

	INCHES	CU. FEET	PERCENT
PRECIPITATION	9.25	6883389.500	100.00
RUNOFF	1.576	1172830.250	17.04
POTENTIAL EVAPOTRANSPIRATION	77.070	57351340.000	
ACTUAL EVAPOTRANSPIRATION	8.161	6072664.500	88.22
DRAINAGE COLLECTED FROM LAYER 6	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 7	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 7	0.0000		
DRAINAGE COLLECTED FROM LAYER 8	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 10	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 9	0.0000		
CHANGE IN WATER STORAGE	-0.487	-362128.156	-5.26
SOIL WATER AT START OF YEAR	554.075	412315136.000	
SOIL WATER AT END OF YEAR	553.589	411953024.000	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	

SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	22.710	0.00

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ANNUAL TOTALS FOR YEAR 5

	INCHES	CU. FEET	PERCENT
PRECIPITATION	9.68	7203372.000	100.00
RUNOFF	0.474	353023.469	4.90
POTENTIAL EVAPOTRANSPIRATION	75.845	56440384.000	
ACTUAL EVAPOTRANSPIRATION	8.282	6162752.500	85.55
DRAINAGE COLLECTED FROM LAYER 6	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 7	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 7	0.0000		
DRAINAGE COLLECTED FROM LAYER 8	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 10	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 9	0.0000		
CHANGE IN WATER STORAGE	0.924	687557.562	9.54
SOIL WATER AT START OF YEAR	553.589	411953024.000	
SOIL WATER AT END OF YEAR	554.513	412640608.000	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0001	38.323	0.00

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ANNUAL TOTALS FOR YEAR 6

	INCHES	CU. FEET	PERCENT
PRECIPITATION	6.14	4569081.000	100.00
RUNOFF	0.036	26800.961	0.59
POTENTIAL EVAPOTRANSPIRATION	77.114	57384016.000	

ACTUAL EVAPOTRANSPIRATION	6.951	5172790.500	113.21
DRAINAGE COLLECTED FROM LAYER 6	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 7	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 7	0.0000		
DRAINAGE COLLECTED FROM LAYER 8	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 10	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 9	0.0000		
CHANGE IN WATER STORAGE	-0.847	-630465.438	-13.80
SOIL WATER AT START OF YEAR	554.513	412640608.000	
SOIL WATER AT END OF YEAR	553.665	412010112.000	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	-0.0001	-45.064	0.00

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ANNUAL TOTALS FOR YEAR 7

	INCHES	CU. FEET	PERCENT
PRECIPITATION	10.91	8118676.500	100.00
RUNOFF	1.570	1168274.375	14.39
POTENTIAL EVAPOTRANSPIRATION	76.817	57163692.000	
ACTUAL EVAPOTRANSPIRATION	9.108	6777628.000	83.48
DRAINAGE COLLECTED FROM LAYER 6	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 7	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 7	0.0000		
DRAINAGE COLLECTED FROM LAYER 8	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 10	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 9	0.0000		
CHANGE IN WATER STORAGE	0.232	172729.641	2.13
SOIL WATER AT START OF YEAR	553.665	412010112.000	
SOIL WATER AT END OF YEAR	553.898	412182816.000	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	

INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0001	45.419	0.00

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ANNUAL TOTALS FOR YEAR 8

	INCHES	CU. FEET	PERCENT
PRECIPITATION	9.25	6883388.000	100.00
RUNOFF	1.531	1139458.625	16.55
POTENTIAL EVAPOTRANSPIRATION	77.523	57688988.000	
ACTUAL EVAPOTRANSPIRATION	7.651	5693326.000	82.71
DRAINAGE COLLECTED FROM LAYER 6	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 7	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 7	0.0000		
DRAINAGE COLLECTED FROM LAYER 8	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 10	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 9	0.0000		
CHANGE IN WATER STORAGE	0.068	50642.531	0.74
SOIL WATER AT START OF YEAR	553.898	412182816.000	
SOIL WATER AT END OF YEAR	553.966	412233472.000	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	-0.0001	-39.032	0.00

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ANNUAL TOTALS FOR YEAR 9

	INCHES	CU. FEET	PERCENT
PRECIPITATION	10.01	7448942.000	100.00
RUNOFF	1.880	1399259.625	18.78

POTENTIAL EVAPOTRANSPIRATION	76.850	57187568.000	
ACTUAL EVAPOTRANSPIRATION	8.270	6153983.500	82.62
DRAINAGE COLLECTED FROM LAYER 6	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 7	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 7	0.0000		
DRAINAGE COLLECTED FROM LAYER 8	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 10	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 9	0.0000		
CHANGE IN WATER STORAGE	-0.140	-104328.156	-1.40
SOIL WATER AT START OF YEAR	553.966	412233472.000	
SOIL WATER AT END OF YEAR	553.825	412129152.000	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	26.968	0.00

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ANNUAL TOTALS FOR YEAR 10

	INCHES	CU. FEET	PERCENT
PRECIPITATION	6.96	5179284.000	100.00
RUNOFF	1.010	751703.250	14.51
POTENTIAL EVAPOTRANSPIRATION	77.489	57663276.000	
ACTUAL EVAPOTRANSPIRATION	6.420	4777680.500	92.25
DRAINAGE COLLECTED FROM LAYER 6	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 7	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 7	0.0000		
DRAINAGE COLLECTED FROM LAYER 8	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 10	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 9	0.0000		
CHANGE IN WATER STORAGE	-0.470	-350092.031	-6.76
SOIL WATER AT START OF YEAR	553.825	412129152.000	
SOIL WATER AT END OF YEAR	553.355	411779072.000	

INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-7.097	0.00

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ANNUAL TOTALS FOR YEAR 11

	INCHES	CU. FEET	PERCENT
PRECIPITATION	11.58	8617257.000	100.00
RUNOFF	1.473	1095850.250	12.72
POTENTIAL EVAPOTRANSPIRATION	77.254	57488208.000	
ACTUAL EVAPOTRANSPIRATION	9.658	7186683.500	83.40
DRAINAGE COLLECTED FROM LAYER 6	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 7	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 7	0.0000		
DRAINAGE COLLECTED FROM LAYER 8	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 10	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 9	0.0000		
CHANGE IN WATER STORAGE	0.450	334694.906	3.88
SOIL WATER AT START OF YEAR	553.355	411779072.000	
SOIL WATER AT END OF YEAR	553.805	412113760.000	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	28.387	0.00

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ANNUAL TOTALS FOR YEAR 12

	INCHES	CU. FEET	PERCENT
PRECIPITATION	10.55	7850782.000	100.00

RUNOFF	1.304	970393.500	12.36
POTENTIAL EVAPOTRANSPIRATION	76.673	57056368.000	
ACTUAL EVAPOTRANSPIRATION	9.011	6705824.500	85.42
DRAINAGE COLLECTED FROM LAYER 6	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 7	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 7	0.0000		
DRAINAGE COLLECTED FROM LAYER 8	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 10	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 9	0.0000		
CHANGE IN WATER STORAGE	0.235	174591.828	2.22
SOIL WATER AT START OF YEAR	553.805	412113760.000	
SOIL WATER AT END OF YEAR	554.039	412288352.000	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-28.387	0.00

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ANNUAL TOTALS FOR YEAR 13

	INCHES	CU. FEET	PERCENT
PRECIPITATION	10.66	7932641.500	100.00
RUNOFF	2.074	1543183.125	19.45
POTENTIAL EVAPOTRANSPIRATION	77.232	57471952.000	
ACTUAL EVAPOTRANSPIRATION	9.097	6769792.500	85.34
DRAINAGE COLLECTED FROM LAYER 6	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 7	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 7	0.0000		
DRAINAGE COLLECTED FROM LAYER 8	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 10	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 9	0.0000		
CHANGE IN WATER STORAGE	-0.511	-380341.344	-4.79
SOIL WATER AT START OF YEAR	554.039	412288352.000	

SOIL WATER AT END OF YEAR	553.528	411908000.000	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	7.097	0.00

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ANNUAL TOTALS FOR YEAR 14

	INCHES	CU. FEET	PERCENT
PRECIPITATION	11.01	8193092.500	100.00
RUNOFF	1.548	1151899.000	14.06
POTENTIAL EVAPOTRANSPIRATION	75.901	56481776.000	
ACTUAL EVAPOTRANSPIRATION	9.126	6791020.000	82.89
DRAINAGE COLLECTED FROM LAYER 6	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 7	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 7	0.0000		
DRAINAGE COLLECTED FROM LAYER 8	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 10	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 9	0.0000		
CHANGE IN WATER STORAGE	0.336	250214.984	3.05
SOIL WATER AT START OF YEAR	553.528	411908000.000	
SOIL WATER AT END OF YEAR	553.864	412158208.000	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	-0.0001	-41.161	0.00

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ANNUAL TOTALS FOR YEAR 15

	INCHES	CU. FEET	PERCENT

PRECIPITATION	10.43	7761484.500	100.00
RUNOFF	2.205	1641222.375	21.15
POTENTIAL EVAPOTRANSPIRATION	78.085	58106976.000	
ACTUAL EVAPOTRANSPIRATION	8.243	6134048.500	79.03
DRAINAGE COLLECTED FROM LAYER 6	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 7	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 7	0.0000		
DRAINAGE COLLECTED FROM LAYER 8	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 10	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 9	0.0000		
CHANGE IN WATER STORAGE	-0.019	-13852.891	-0.18
SOIL WATER AT START OF YEAR	553.864	412158208.000	
SOIL WATER AT END OF YEAR	553.846	412144384.000	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0001	66.000	0.00

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ANNUAL TOTALS FOR YEAR 16

	INCHES	CU. FEET	PERCENT
PRECIPITATION	7.36	5476944.500	100.00
RUNOFF	0.929	691114.188	12.62
POTENTIAL EVAPOTRANSPIRATION	77.147	57409100.000	
ACTUAL EVAPOTRANSPIRATION	7.177	5340730.000	97.51
DRAINAGE COLLECTED FROM LAYER 6	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 7	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 7	0.0000		
DRAINAGE COLLECTED FROM LAYER 8	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 10	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 9	0.0000		
CHANGE IN WATER STORAGE	-0.746	-554887.688	-10.13

SOIL WATER AT START OF YEAR	553.846	412144384.000	
SOIL WATER AT END OF YEAR	553.100	411589504.000	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-12.065	0.00

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ANNUAL TOTALS FOR YEAR 17

	INCHES	CU. FEET	PERCENT
PRECIPITATION	6.70	4985805.000	100.00
RUNOFF	1.405	1045202.812	20.96
POTENTIAL EVAPOTRANSPIRATION	78.052	58082228.000	
ACTUAL EVAPOTRANSPIRATION	5.298	3942235.250	79.07
DRAINAGE COLLECTED FROM LAYER 6	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 7	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 7	0.0000		
DRAINAGE COLLECTED FROM LAYER 8	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 10	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 9	0.0000		
CHANGE IN WATER STORAGE	-0.002	-1589.676	-0.03
SOIL WATER AT START OF YEAR	553.100	411589504.000	
SOIL WATER AT END OF YEAR	553.098	411587872.000	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	-0.0001	-43.645	0.00

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ANNUAL TOTALS FOR YEAR 18

	INCHES	CU. FEET	PERCENT
PRECIPITATION	7.77	5782045.500	100.00
RUNOFF	1.201	893559.688	15.45
POTENTIAL EVAPOTRANSPIRATION	77.282	57509108.000	
ACTUAL EVAPOTRANSPIRATION	6.259	4657980.000	80.56
DRAINAGE COLLECTED FROM LAYER 6	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 7	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 7	0.0000		
DRAINAGE COLLECTED FROM LAYER 8	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 10	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 9	0.0000		
CHANGE IN WATER STORAGE	0.310	230503.000	3.99
SOIL WATER AT START OF YEAR	553.098	411587872.000	
SOIL WATER AT END OF YEAR	553.408	411818400.000	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	2.484	0.00

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ANNUAL TOTALS FOR YEAR 19

	INCHES	CU. FEET	PERCENT
PRECIPITATION	6.21	4621171.500	100.00
RUNOFF	1.203	895374.188	19.38
POTENTIAL EVAPOTRANSPIRATION	75.597	56255460.000	
ACTUAL EVAPOTRANSPIRATION	4.779	3555970.750	76.95
DRAINAGE COLLECTED FROM LAYER 6	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 7	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 7	0.0000		
DRAINAGE COLLECTED FROM LAYER 8	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 10	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 9	0.0000		

CHANGE IN WATER STORAGE	0.228	169822.797	3.67
SOIL WATER AT START OF YEAR	553.408	411818400.000	
SOIL WATER AT END OF YEAR	553.636	411988224.000	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	3.903	0.00

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ANNUAL TOTALS FOR YEAR 20

	INCHES	CU. FEET	PERCENT
PRECIPITATION	7.13	5305789.500	100.00
RUNOFF	0.636	473141.250	8.92
POTENTIAL EVAPOTRANSPIRATION	78.745	58597860.000	
ACTUAL EVAPOTRANSPIRATION	6.670	4963255.000	93.54
DRAINAGE COLLECTED FROM LAYER 6	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 7	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 7	0.0000		
DRAINAGE COLLECTED FROM LAYER 8	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 10	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 9	0.0000		
CHANGE IN WATER STORAGE	-0.176	-130625.938	-2.46
SOIL WATER AT START OF YEAR	553.636	411988224.000	
SOIL WATER AT END OF YEAR	553.460	411857568.000	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	19.161	0.00

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ANNUAL TOTALS FOR YEAR 21

	INCHES	CU. FEET	PERCENT
PRECIPITATION	10.95	8148443.500	100.00
RUNOFF	3.359	2499398.500	30.67
POTENTIAL EVAPOTRANSPIRATION	77.824	57912380.000	
ACTUAL EVAPOTRANSPIRATION	7.733	5754294.500	70.62
DRAINAGE COLLECTED FROM LAYER 6	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 7	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 7	0.0000		
DRAINAGE COLLECTED FROM LAYER 8	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 10	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 9	0.0000		
CHANGE IN WATER STORAGE	-0.141	-105236.539	-1.29
SOIL WATER AT START OF YEAR	553.460	411857568.000	
SOIL WATER AT END OF YEAR	553.319	411752352.000	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-13.484	0.00

ANNUAL TOTALS FOR YEAR 22

	INCHES	CU. FEET	PERCENT
PRECIPITATION	7.16	5328114.000	100.00
RUNOFF	0.746	555316.750	10.42
POTENTIAL EVAPOTRANSPIRATION	76.666	57050800.000	
ACTUAL EVAPOTRANSPIRATION	6.168	4589947.500	86.15
DRAINAGE COLLECTED FROM LAYER 6	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 7	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 7	0.0000		
DRAINAGE COLLECTED FROM LAYER 8	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 10	0.000000	0.000	0.00

AVG. HEAD ON TOP OF LAYER 9	0.0000		
CHANGE IN WATER STORAGE	0.246	182812.734	3.43
SOIL WATER AT START OF YEAR	553.319	411752352.000	
SOIL WATER AT END OF YEAR	553.565	411935200.000	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	36.903	0.00

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ANNUAL TOTALS FOR YEAR 23

	INCHES	CU. FEET	PERCENT
PRECIPITATION	6.48	4822092.500	100.00
RUNOFF	0.858	638535.500	13.24
POTENTIAL EVAPOTRANSPIRATION	77.183	57436084.000	
ACTUAL EVAPOTRANSPIRATION	5.565	4141166.000	85.88
DRAINAGE COLLECTED FROM LAYER 6	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 7	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 7	0.0000		
DRAINAGE COLLECTED FROM LAYER 8	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 10	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 9	0.0000		
CHANGE IN WATER STORAGE	0.057	42421.637	0.88
SOIL WATER AT START OF YEAR	553.565	411935200.000	
SOIL WATER AT END OF YEAR	553.622	411977600.000	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-31.226	0.00

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ANNUAL TOTALS FOR YEAR 24

	INCHES	CU. FEET	PERCENT
PRECIPITATION	11.13	8282390.000	100.00
RUNOFF	2.192	1630820.500	19.69
POTENTIAL EVAPOTRANSPIRATION	77.005	57303156.000	
ACTUAL EVAPOTRANSPIRATION	8.662	6445582.000	77.82
DRAINAGE COLLECTED FROM LAYER 6	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 7	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 7	0.0000		
DRAINAGE COLLECTED FROM LAYER 8	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 10	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 9	0.0000		
CHANGE IN WATER STORAGE	0.277	205976.578	2.49
SOIL WATER AT START OF YEAR	553.622	411977600.000	
SOIL WATER AT END OF YEAR	553.898	412183552.000	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	10.645	0.00

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ANNUAL TOTALS FOR YEAR 25

	INCHES	CU. FEET	PERCENT
PRECIPITATION	12.07	8981895.000	100.00
RUNOFF	1.561	1161613.250	12.93
POTENTIAL EVAPOTRANSPIRATION	75.945	56514708.000	
ACTUAL EVAPOTRANSPIRATION	10.626	7907093.500	88.03
DRAINAGE COLLECTED FROM LAYER 6	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 7	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 7	0.0000		
DRAINAGE COLLECTED FROM LAYER 8	0.0000	0.000	0.00

PERC./LEAKAGE THROUGH LAYER 10	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 9	0.0000		
CHANGE IN WATER STORAGE	-0.117	-86796.305	-0.97
SOIL WATER AT START OF YEAR	553.898	412183552.000	
SOIL WATER AT END OF YEAR	553.782	412096768.000	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-15.613	0.00

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ANNUAL TOTALS FOR YEAR 26

	INCHES	CU. FEET	PERCENT
PRECIPITATION	11.66	8676789.000	100.00
RUNOFF	2.070	1540065.875	17.75
POTENTIAL EVAPOTRANSPIRATION	77.882	57955628.000	
ACTUAL EVAPOTRANSPIRATION	9.942	7398248.500	85.26
DRAINAGE COLLECTED FROM LAYER 6	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 7	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 7	0.0000		
DRAINAGE COLLECTED FROM LAYER 8	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 10	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 9	0.0000		
CHANGE IN WATER STORAGE	-0.351	-261524.391	-3.01
SOIL WATER AT START OF YEAR	553.782	412096768.000	
SOIL WATER AT END OF YEAR	553.430	411835264.000	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.710	0.00

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ANNUAL TOTALS FOR YEAR 27

	INCHES	CU. FEET	PERCENT
PRECIPITATION	14.86	11058069.000	100.00
RUNOFF	1.860	1384078.375	12.52
POTENTIAL EVAPOTRANSPIRATION	77.591	57739340.000	
ACTUAL EVAPOTRANSPIRATION	12.460	9272262.000	83.85
DRAINAGE COLLECTED FROM LAYER 6	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 7	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 7	0.0000		
DRAINAGE COLLECTED FROM LAYER 8	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 10	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 9	0.0000		
CHANGE IN WATER STORAGE	0.540	401688.375	3.63
SOIL WATER AT START OF YEAR	553.430	411835264.000	
SOIL WATER AT END OF YEAR	553.970	412236928.000	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0001	41.161	0.00

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ANNUAL TOTALS FOR YEAR 28

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.54	10075791.000	100.00
RUNOFF	1.323	984453.438	9.77
POTENTIAL EVAPOTRANSPIRATION	74.171	55194268.000	
ACTUAL EVAPOTRANSPIRATION	12.523	9318839.000	92.49
DRAINAGE COLLECTED FROM LAYER 6	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 7	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 7	0.0000		

DRAINAGE COLLECTED FROM LAYER 8	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 10	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 9	0.0000		
CHANGE IN WATER STORAGE	-0.306	-227459.922	-2.26
SOIL WATER AT START OF YEAR	553.970	412236928.000	
SOIL WATER AT END OF YEAR	553.665	412009472.000	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	-0.0001	-42.581	0.00

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FINAL WATER STORAGE AT END OF YEAR 28

LAYER	(INCHES)	(VOL/VOL)
1	2.0089	0.1674
2	4.4640	0.1240
3	1.6080	0.1340
4	544.8000	0.2000
5	0.6000	0.0250
6	0.0012	0.0060
7	0.0000	0.0000
8	0.0012	0.0060
9	0.0000	0.0000
10	0.1800	0.7500
TOTAL WATER IN LAYERS	553.663	
SNOW WATER	0.000	
INTERCEPTION WATER	0.000	
TOTAL FINAL WATER	553.663	

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 28

	(INCHES)	(CU. FT.)
PRECIPITATION	2.28	1696662.000
RUNOFF	1.704	1268329.1250
DRAINAGE COLLECTED FROM LAYER 6	0.00000	0.00000
PERCOLATION/LEAKAGE THROUGH LAYER 7	0.000000	0.00000
AVERAGE HEAD ON TOP OF LAYER 7	0.000	
MAXIMUM HEAD ON TOP OF LAYER 7	0.000	
LOCATION OF MAXIMUM HEAD IN LAYER 6 (DISTANCE FROM DRAIN)	0.0 FEET	
DRAINAGE COLLECTED FROM LAYER 8	0.00000	0.00000
PERCOLATION/LEAKAGE THROUGH LAYER 10	0.000000	0.00000
AVERAGE HEAD ON TOP OF LAYER 9	0.000	
MAXIMUM HEAD ON TOP OF LAYER 9	0.000	
LOCATION OF MAXIMUM HEAD IN LAYER 8 (DISTANCE FROM DRAIN)	0.0 FEET	
SNOW WATER	0.61	455364.3438
MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.1941	
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.1040	

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas
ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 28

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	0.25	0.29	0.23	0.37	0.72	0.80
	1.32	2.24	1.49	1.07	0.45	0.37
STD. DEVIATIONS	0.24	0.20	0.22	0.42	0.79	0.63
	0.69	1.60	0.90	1.04	0.55	0.30
RUNOFF						
TOTALS	0.001	0.000	0.000	0.061	0.115	0.089
	0.098	0.425	0.296	0.240	0.014	0.028
STD. DEVIATIONS	0.005	0.000	0.000	0.146	0.242	0.160

	0.174	0.596	0.364	0.367	0.045	0.092

POTENTIAL EVAPOTRANSPIRATION

TOTALS	3.125	3.589	5.452	7.559	9.413	10.513
	10.027	8.928	6.935	5.169	3.497	2.769
STD. DEVIATIONS	0.193	0.240	0.300	0.309	0.281	0.270
	0.251	0.283	0.253	0.271	0.194	0.206

ACTUAL EVAPOTRANSPIRATION

TOTALS	0.226	0.187	0.182	0.336	1.273	0.872
	1.214	1.598	1.057	0.618	0.384	0.285
STD. DEVIATIONS	0.104	0.064	0.119	0.167	0.555	0.631
	0.653	0.953	0.556	0.377	0.259	0.156

LATERAL DRAINAGE COLLECTED FROM LAYER 6

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

PERCOLATION/LEAKAGE THROUGH LAYER 7

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

LATERAL DRAINAGE COLLECTED FROM LAYER 8

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

PERCOLATION/LEAKAGE THROUGH LAYER 10

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 7

AVERAGES	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

DAILY AVERAGE HEAD ON TOP OF LAYER 9

AVERAGES	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 28

	INCHES		CU. FEET	PERCENT
PRECIPITATION	9.60	(2.272)	7144638.0	100.00
RUNOFF	1.369	(0.6754)	1018830.19	14.260
POTENTIAL EVAPOTRANSPIRATION	76.979	(0.9113)	57283916.00	
ACTUAL EVAPOTRANSPIRATION	8.230	(1.9033)	6124720.00	85.725
LATERAL DRAINAGE COLLECTED FROM LAYER 6	0.00000	(0.00000)	0.000	0.00000
PERCOLATION/LEAKAGE THROUGH LAYER 7	0.00000	(0.00000)	0.000	0.00000
AVERAGE HEAD ON TOP OF LAYER 7	0.000	(0.000)		
LATERAL DRAINAGE COLLECTED FROM LAYER 8	0.00000	(0.00000)	0.000	0.00000
PERCOLATION/LEAKAGE THROUGH LAYER 10	0.00000	(0.00000)	0.000	0.00000
AVERAGE HEAD ON TOP OF LAYER 9	0.000	(0.000)		
CHANGE IN WATER STORAGE	0.001	(0.3981)	1088.44	0.015

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Exhibit I

HELP MODEL GUIDANCE DOCUMENT

Guidance Document

for

Performance Demonstration for an Alternate Cover Design under Section 502.A.2 of the New Mexico Solid Waste Management Regulations (20 NMAC 9.1) Using HELP Modeling

and

Performance Demonstration for an Alternate Liner Design under Section 306.A.2 of the New Mexico Solid Waste Management Regulations (20 NMAC 9.1) Using HELP Modeling

This document is for guidance only and is subject to change. However, any deviations from this document must be fully justified to the satisfaction of the Department.

Prepared by the
New Mexico Environment Department
Solid Waste Bureau
Permit Section
April 1, 1998

Performance Demonstration for an Alternative Cover Design under Section 502.A.2 of the New Mexico Solid Waste Management Regulations (20 NMAC 9.1) Using HELP Modeling

1. Existing Solid Waste Landfills without a Liner System:

A prescriptive landfill cover system must, in accordance with Section 502.A.1, consist of an infiltration layer comprised of a minimum of 18 inches of earthen material with the required hydraulic conductivity (K) and a minimum of 6 inches of soil that is capable of sustaining native plant growth as an erosion layer (Figure 1). The cover component of 18 inches of earthen material must be equivalent to the least hydraulically conductive natural subsoils or a saturated hydraulic conductivity of no greater than 1×10^{-5} cm/sec. For example, if the hydraulic conductivity of the natural subsoils is 5×10^{-6} cm/sec, then the K of the infiltration layer material must be equivalent to these soils. *However, this example is for modeling purposes only. If the K of the underlying subsoils is less than 1×10^{-5} cm/sec (e.g., 5×10^{-6} cm/sec), then an alternative cover design must be proposed since 1×10^{-5} cm/sec is the lowest acceptable actual K for soils used in covers due to desiccation and root penetration (see example below).* If the hydraulic conductivity of the natural subsoils is greater than 1×10^{-5} cm/sec (e.g., 1×10^{-4} cm/sec), the K of the infiltration layer material must equate to the 1×10^{-5} cm/sec requirement.

If the infiltration layer meets the minimum hydraulic conductivity of 1×10^{-5} cm/sec or that of the natural subsoils and the minimum 18 inch condition then a Hydrologic Evaluation of Landfill Performance (HELP) Model simulation is not required. If an alternative cover design is proposed, it must achieve an equivalent reduction in infiltration as the infiltration layer specified in Section 502.A.1.a. Therefore, a HELP Model simulation is required to demonstrate that the design of such a cover provides equivalent reduction in infiltration as the prescriptive cover design. If the natural subsoils have a hydraulic conductivity of less than 1×10^{-5} cm/sec (e.g., 5×10^{-6} cm/sec), then the cover must achieve equivalent reduction in infiltration as that of the prescriptive cover but with an 18 inch infiltration layer with a hydraulic conductivity of 5×10^{-6} cm/sec.

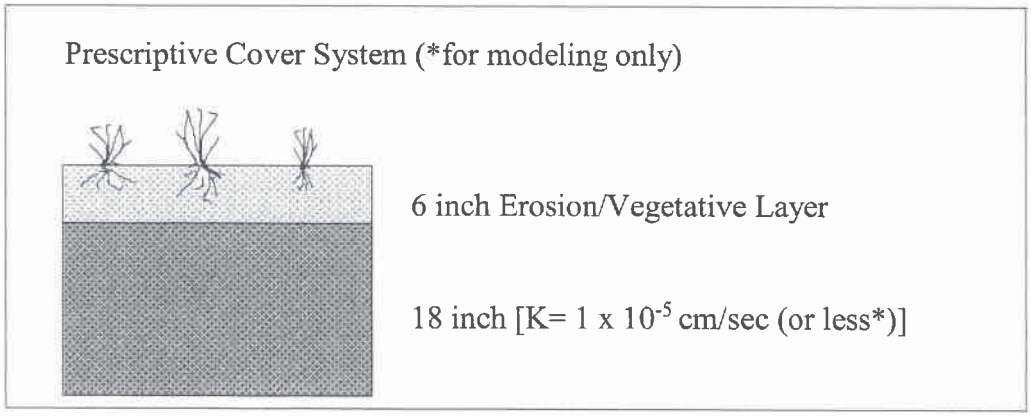


Figure 1. Prescriptive Cover System

A demonstration of equivalent reduction in infiltration is determined by using the EPA HELP Model. The HELP Model simulations need to compare the prescriptive cover and the alternative cover design (Figure 2). The simulation for the prescriptive cover must include the erosion, infiltration and intermediate cover layers. The alternative cover design simulation includes the intermediate and alternative cover layers. The two designs are to be simulated for years 1 through 5 with "poor" vegetation during the post-closure care period to demonstrate equivalency (Simulations #1 & #2). In New Mexico, it is assumed for a conservative value that the vegetation will be between "bare ground" and "fair vegetation" designated as "poor vegetation". Precipitation (wettest 5 consecutive year period using Climatedata CD or NOAA data files: discs or manual entry), evapotranspiration, temperature (use values associated with wettest 5 consecutive years of precipitation), and solar radiation data must be site specific and identical for both alternative and prescriptive cover designs simulations. Provide justification for all input parameters in the model utilizing the attached forms. Indicate characteristics of on-site or other sources of soil proposed for the construction of cover and the parameter values in the model. It is anticipated that the entire area of the landfill or cell will be modeled. The Department recommends initializing the soil moisture content to be the value of the wilting point plus 25% of the difference between the wilting point and the field capacity [i.e., (field capacity - wilting point) x 0.25 + wilting point]. Other values deviating from this range may be used but must be fully justified. The leaf area index may be between 0.8 and 1.6 depending on the site location. The evaporative zone depth may be between 18" and 28" depending on the site location.

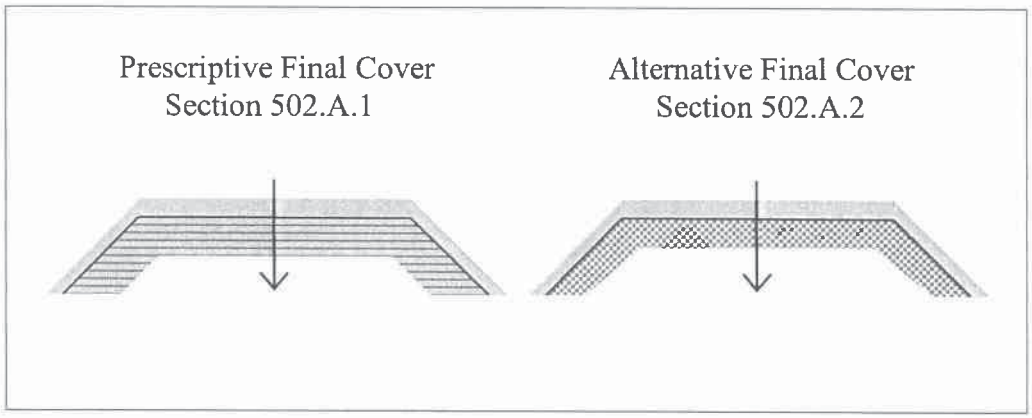


Figure 2

For example, comparing the prescriptive cover of:

1) 6 inches of topsoil
2) 18 inches of compacted soil ($K = 5 \times 10^{-6}$ cm/sec* - to meet natural subsoils $K = 5 \times 10^{-6}$)
3) Intermediate cover layer (optional* for modeling purposes) [*unless an intermediate cover layer is used for modeling purposes with a proposed alternative cover system (see below), then an intermediate cover layer must be used for modeling purposes]

with a proposed alternative cover system of:

1) 6 inches of topsoil
2) 30 inches of compacted ($K = 1 \times 10^{-5}$ cm/sec*)
3) Intermediate cover layer (optional for modeling purposes)

* $K = 5 \times 10^{-6}$ cm/sec is for modeling purposes only since 1×10^{-5} cm/sec is the lowest acceptable actual K for soils used in covers. Even if soils with $K = 5 \times 10^{-6}$ cm/sec are available for use in the cover, over time the K will increase to 1×10^{-5} cm/sec due to desiccation and root penetration.

Input Parameters for HELP Simulation #1 (Prescriptive Cover)

Weather data

City/State: The weather data should be from the nearest reporting station that has at least 40 years of data.

Latitude: The latitude must be specific for the site to use in synthesizing solar radiation data.

Evaporative zone depth: 18" to 28" corresponding with "poor" vegetation (see EPA Engineering Documentation for Version 3, Figure 5 - e.g., Clovis would be 20"; Santa Fe and Roswell would be 24"; Las Cruces, Albuquerque, and Farmington would be 28")

Maximum leaf area index: 0.8 to 1.6 corresponding with "poor" vegetation (see EPA Engineering Documentation for Version 3, Figure 3 - e.g., Clovis would be 1.6; Santa Fe and Roswell would be 1.2; Farmington would be 1.0; Las Cruces and Albuquerque would be 0.8)

Growing season start and end day: from solar radiation data (default)

Average wind speed: from solar radiation data (default)

Relative humidity: from solar radiation data (default)

Precipitation: daily precipitation from the wettest 5 consecutive years for the appropriate weather reporting station

Temperature: daily* minimum and maximum temperatures corresponding with the wettest 5 consecutive years for the appropriate weather reporting station
(*may be monthly averages if manual entry is used)

Solar radiation data: synthetically generated using coefficients for the appropriate* default (HELP) weather reporting station (*should be the closest by distance or latitude - consult with the Department if the appropriate station is not obvious)

Landfill Cover Data

Type of vegetation: Type 2 for "poor"

SCS Runoff curve #: may be generated from HELP or user specified* (*must be justified)

% of area allowing runoff: 100%; "closed"

Surface area: entire disposal area of landfill

Soil and Design Data

Source of soil characteristics: geotechnical data should be obtained from the source material.

Number of layers: There should be a layer for each type of material used (or compacted v. non-compacted)

Layer Number: (There should be a justification sheet for each layer.)

Thickness: 6" of topsoil, 18" of infiltration layer, 12" of intermediate cover layer* [*optional for modeling purposes (unless an intermediate cover layer is used for modeling purposes with a proposed alternative cover system in Simulation #2, then an intermediate cover layer must be used for modeling purposes)]

Layer type: "1" vertical percolation layer for all cover materials

Soil texture: The texture # should approximate the geotechnical characteristics (see EPA HELP User's Guide for Version 3, Table 4).

Total porosity: If the actual porosity is not known, then the default value may be used that most closely approximates the geotechnical characteristics.

Field capacity: If the actual field capacity is not known, then the default value may be used that most closely approximates the geotechnical characteristics.

Wilting point: If the actual wilting point is not known, then the default value may be used that most closely approximates the geotechnical characteristics.

Moisture content: The moisture content should be initialized to be the value of the wilting point plus 25% of the difference between the wilting point and the field capacity [i.e., (field capacity - wilting point) x 0.25 + wilting point].

Saturated hydraulic conductivity (K): The K of the infiltration layer must be the greatest actual value (unless greater than $1x\ 10^{-5}$ cm/sec*) of the underlying soil [e.g., If the actual (two tested samples - different locations) K of the underlying soil = $1x\ 10^{-6}$ cm/sec and $2 x\ 10^{-6}$, then model 18" of $2 x\ 10^{-6}$ cm/sec for the infiltration layer; *If the K of the underlying soil = $5 x\ 10^{-5}$ cm/sec, then model 18" of $1x\ 10^{-5}$ cm/sec].

Input Parameters for HELP Simulation #2 (Proposed Alternate Cover)

Weather data (must be the same as Simulation #1)

City/State: The weather data should be from the nearest reporting station that has at least 40 years of data.

Latitude: The latitude must be specific for the site to use in synthesizing solar radiation data.

Evaporative zone depth: 18" to 28" corresponding with "poor" vegetation (see EPA Engineering Documentation for Version 3, Figure 5 - e.g., Clovis would be 20"; Santa Fe and Roswell would be 24"; Las Cruces, Albuquerque, and Farmington would be 28")

Maximum leaf area index: 0.8 to 1.6 corresponding with "poor" vegetation (see EPA Engineering Documentation for Version 3, Figure 3 - e.g., Clovis would be 1.6; Santa Fe and Roswell would be 1.2; Farmington would be 1.0; Las Cruces and Albuquerque would be 0.8)

Growing season start and end day: from solar radiation data (default)

Average wind speed: from solar radiation data (default)

Relative humidity: from solar radiation data (default)

Precipitation: daily precipitation from the wettest 5 consecutive years for the appropriate weather reporting station

Temperature: daily* minimum and maximum temperatures corresponding with the wettest 5 consecutive years for the appropriate weather reporting station
(*may be monthly averages if manual entry is used)

Solar radiation data: synthetically generated using coefficients for the appropriate* default (HELP) weather reporting station (*should be the closest by distance or latitude - consult with the Department if the appropriate station is not obvious)

Landfill Cover Data

Type of vegetation: Type 2 for "poor"

SCS Runoff curve #: may be generated from HELP or user specified* (*must be justified)

% of area allowing runoff: 100%; "closed"

Surface area: entire disposal area of landfill

Soil and Design Data

Source of soil characteristics: geotechnical data should be obtained from the source material.

Number of layers: There should be a layer for each type of material used (or compacted v. non-compacted)

Layer Number: (There should be a justification sheet for each layer.)

Thickness: 6" of topsoil, 18" to proposed thickness of infiltration layer, 12" of intermediate cover layer* (*optional for modeling purposes)

Layer type: "1" vertical percolation layer for all* cover materials including GCLs used (*consult with the Department if a FML is proposed to be used in the cover)

Soil texture: The texture # should approximate the geotechnical characteristics (see EPA HELP User's Guide for Version 3, Table 4).

Total porosity: If the actual porosity is not known, then the default value may be used that most closely approximates the geotechnical characteristics.

Field capacity: If the actual field capacity is not known, then the default value may be used that most closely approximates the geotechnical characteristics.

Wilting point: If the actual wilting point is not known, then the default value may be used that most closely approximates the geotechnical characteristics.

Moisture content: The moisture content should be initialized to be the value of the wilting point plus 25% of the difference between the wilting point and the field capacity [i.e., (field capacity - wilting point) x 0.25 + wilting point].

Saturated hydraulic conductivity (K): The K must be tested for the actual value unless the K is less than 1×10^{-5} cm/sec* (e.g., If the tested K is 5×10^{-5} cm/sec, then model the proposed thickness of the infiltration layer at 5×10^{-5} cm/sec. However, if the tested K is 2×10^{-6}, the lowest value to be modeled would be 1×10^{-5} cm/sec). *1×10^{-5} cm/sec is the lowest acceptable K for soils used in covers due to desiccation and root penetration; unless a GCL is proposed, then the actual K may be modeled for the GCL layer (i.e., 0.24" at 3×10^{-9} cm/sec).

2. New Solid Waste Landfills:

As in the above case, the cover for the proposed landfill with a prescriptive or alternative liner must achieve an equivalent protection as the liner. If an alternative final cover is proposed for the landfill, then a demonstration must be submitted to the Bureau for approval pursuant to Section 502.A. It must be determined by this demonstration that the proposed final cover design includes an infiltration layer that achieves an equivalent reduction in infiltration as the bottom liner (Figure 3). A HELP Model simulation comparison is acceptable for this demonstration for a 5 year period with vegetation. Precipitation (wettest 5 consecutive year period using Climatedata CD or NOAA data files: discs or manual entry), evapotranspiration, temperature (use values associated with wettest 5 consecutive years of precipitation) , and solar radiation data must be site specific and identical for both liner and cover design simulations. Provide justification for all input parameters in the model utilizing the attached forms. Demonstrate the relationship of the characteristics of on-site or other sources of soil proposed for the construction of cover or liner and the parameter values in the model. It is anticipated that the entire area of the landfill or cell will be modeled. The Department recommends initializing the soil moisture content to be at least the value of the wilting point plus 25% of the difference between the wilting point and the field capacity [i.e., (field capacity - wilting point) x 0.25 + wilting point]. Other values deviating from this range may be used but must be fully justified.

For example, the comparison must include a HELP Model simulation for the liner and the proposed final cover systems as below (see Simulations #4 & #3, respectively).

The simulation for an alternative liner system* could include:

1) the drainage/protective layer of the liner with leachate collection system,
2) the 60-mil HDPE FML,
3) the 0.25 inch ($K = 3 \times 10^{-9}$) GCL (geosynthetic clay liner),
4) the 6 inches of compacted in situ soil used as the prepared subgrade, and
5) with the solid waste cell open and no runoff.

*Any alternative liner system must meet the demonstration as described in the "Performance Demonstration For An Alternative Liner Design under Section 306.A.2 of the New Mexico Solid Waste Management Regulations (20 NMAC 9.1) Using HELP Modeling".

A liner system is compared with a HELP Model simulation for a proposed final cover:

1) 18 inches non-compacted material (6 inches of topsoil with poor grass and 12 inches of non-compacted soil),
2) the 0.25 inch GCL ($K = 3 \times 10^{-9}$),
3) 12 inches of intermediate cover (6 inches of compacted soil and 6 inches of non-compacted soil), and
4) with the solid waste cell closed and final placement of the cover to include runoff.

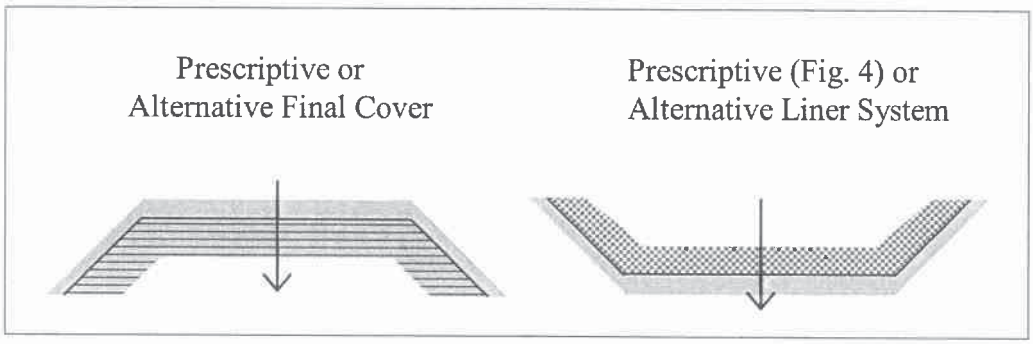


Figure 3

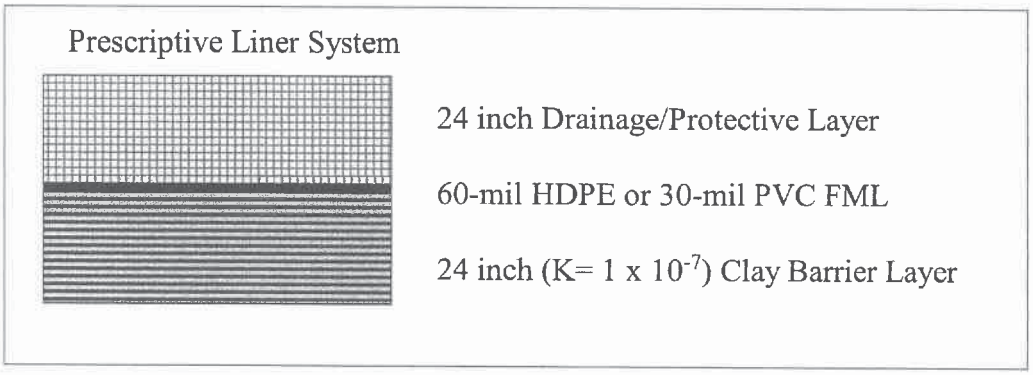


Figure 4

Input Parameters for HELP Simulation #3 (Proposed Alternate Cover)

Weather data

City/State: The weather data should be from the nearest reporting station that has at least 40 years of data.

Latitude: The latitude must be specific for the site to use in synthesizing solar radiation data.

Evaporative zone depth: 18" to 28" corresponding with "poor" vegetation (see EPA Engineering Documentation for Version 3, Figure 5 - e.g., Clovis would be 20"; Santa Fe and Roswell would be 24"; Las Cruces, Albuquerque, and Farmington would be 28")

Maximum leaf area index: 0.8 to 1.6 corresponding with "poor" vegetation (see EPA Engineering Documentation for Version 3, Figure 3 - e.g., Clovis would be 1.6; Santa Fe and Roswell would be 1.2; Farmington would be 1.0; Las Cruces and Albuquerque would be 0.8)

Growing season start and end day: from solar radiation data (default)

Average wind speed: from solar radiation data (default)

Relative humidity: from solar radiation data (default)

Precipitation: daily precipitation from the wettest 5 consecutive years for the appropriate weather reporting station

Temperature: daily* minimum and maximum temperatures corresponding with the wettest 5 consecutive years for the appropriate weather reporting station
(*may be monthly averages if manual entry is used)

Solar radiation data: synthetically generated using coefficients for the appropriate* default (HELP) weather reporting station (*should be the closest by distance or latitude - consult with the Department if the appropriate station is not obvious)

Landfill Cover Data

Type of vegetation: Type 2 for "poor"

SCS Runoff curve #: may be generated from HELP or user specified* (*must be justified)

% of area allowing runoff: 100%; "closed"

Surface area: entire disposal area of landfill or cell (leachate collection basin)

Soil and Design Data

Source of soil characteristics: geotechnical data should be obtained from the source material.

Number of layers: There should be a layer for each type of material used (or compacted v. non-compacted)

Layer Number: (There should be a justification sheet for each layer.)

Thickness: 6" of topsoil, Proposed thickness of infiltration layer or rooting medium or drainage layer, Possible GCL (0.24") or FML, subgrade thickness for GCL or FML (minimum of 6"), 12" of intermediate cover layer* (*optional for modeling purposes)

Layer type: Type "1" - vertical percolation layer for all* cover materials including GCLs used (*consult with the Department if a FML is proposed to be used in the cover)

Soil texture: The texture # should approximate the geotechnical characteristics (see EPA HELP User's Guide for Version 3, Table 4).

Total porosity: If the actual porosity is not known, then the default value may be used that most closely approximates the geotechnical characteristics.

Field capacity: If the actual field capacity is not known, then the default value may be used that most closely approximates the geotechnical characteristics.

Wilting point: If the actual wilting point is not known, then the default value may be used that most closely approximates the geotechnical characteristics.

Moisture content: The moisture content should be initialized to be the value of the wilting point plus 25% of the difference between the wilting point and the field capacity [i.e., (field capacity - wilting point) x 0.25 + wilting point].

Saturated hydraulic conductivity (K): The K must be tested for the actual value unless the K is less than 1×10^{-5} cm/sec* (e.g., If the tested K is 5×10^{-5} cm/sec, then model the proposed thickness of the infiltration layer at 5×10^{-5} cm/sec. However, if the tested K is 2×10^{-6}, the lowest value to be modeled would be 1×10^{-5} cm/sec). *1×10^{-5} cm/sec is the lowest acceptable K for soils used in covers due to desiccation and root penetration; unless a GCL is proposed, then the actual K may be modeled for the GCL layer (i.e., 0.24" at 3×10^{-9} cm/sec).

Input Parameters for HELP Simulation #4 (Prescriptive Liner or Proposed Alternate Liner - Tier I)

Weather data (must be the same as Simulation #3)

City/State: The weather data should be from the nearest reporting station that has at least 40 years of data.

Latitude: The latitude must be specific for the site to use in synthesizing solar radiation data.

Evaporative zone depth: 12" to 18" corresponding with bare ground (see EPA Engineering Documentation for Version 3, Figure 5 - e.g., Santa Fe and Roswell would be 14"; Las Cruces, Albuquerque, and Farmington would be 18")

Maximum leaf area index: 0.0 corresponding with bare ground

Growing season start and end day: from solar radiation data (default)

Average wind speed: from solar radiation data (default)

Relative humidity: from solar radiation data (default)

Precipitation: daily precipitation from the wettest 5 consecutive years for the appropriate weather reporting station

Temperature: daily* minimum and maximum temperatures corresponding with the wettest 5 consecutive years for the appropriate weather reporting station
(*may be monthly averages if manual entry is used)

Solar radiation data: synthetically generated using coefficients for the appropriate* default (HELP) weather reporting station (*should be the closest by distance or latitude - consult with the Department if the appropriate station is not obvious)

Landfill Cover Data

Type of vegetation: Type 1 for "bare ground"

SCS Runoff curve #: may be generated from HELP or user specified* (*must be justified)

% of area allowing runoff: 0%; "open"

Surface area: entire disposal area of landfill or cell (leachate collection basin)

Soil and Design Data

Source of soil characteristics: geotechnical data should be obtained from the source material.

Number of layers: There should be a layer for each type of material used (or compacted v. non-compacted)

Layer Number: (There should be a justification sheet for each layer.)

Thickness: 24" of drainage/protection layer, possible geonet*, FML, 24" of 1 x 10^{-7} cm/sec clay barrier layer for prescriptive liner or GCL or other proposed thickness of clay barrier layer for an alternate liner. (*A demonstration that no more than one foot of head will be on the liner must be made for this simulation. Therefore, a geonet may be necessary if the 24" drainage layer material is incapable of transmitting leachate so 12" of head is not on the liner.)

Layer type: Type "2" for lateral drainage layer - slope (minimum of 2%) and drainage length must be designated (consult with the Department if leachate recirculation is proposed); Type "4" for geomembrane liners - geomembrane pinhole density of 1/acre, geomembrane installation defects of 4/acre and liner installation quality of "good"; Type "3" for barrier soil layers including GCLs (any soil layer underlying a geomembrane must be considered to be a barrier soil layer)

Soil texture: The texture # should approximate the geotechnical characteristics (see EPA HELP User's Guide for Version 3, Table 4).

Total porosity: If the actual porosity is not known, then the default value may be used that most closely approximates the geotechnical characteristics.

Field capacity: If the actual field capacity is not known, then the default value may be used that most closely approximates the geotechnical characteristics.

Wilting point: If the actual wilting point is not known, then the default value may be used that most closely approximates the geotechnical characteristics.

Moisture content: The moisture content should be initialized to be the value of the wilting point plus 25% of the difference between the wilting point and the field capacity [i.e., (field capacity - wilting point) x 0.25 + wilting point].

Saturated hydraulic conductivity (K): For the 24" of drainage/protection layer use the tested K* for modeling the prescriptive liner design and for a proposed alternate liner design; for a possible geonet use the lowest value from the manufacture's specifications; for the FML use a K* value which is the greatest value from the manufacture's specifications; 24" of 1 x 10^{-7} cm/sec clay barrier layer for prescriptive liner or GCL (3 x 10^{-9} cm/sec) or other proposed soil barrier layer for an alternate liner. (*must be the same value in both Simulation #5 & #6)

Performance Demonstration for an Alternate Liner Design under Section 306.A.2 of the New Mexico Solid Waste Management Regulations (20 NMAC 9.1) Using HELP Modeling

1. Permit applicants proposing an alternate liner in accordance with Section 306.A.2 must demonstrate the liner "... provides equivalent protection as the composite liner ... and ensures concentration values listed in Section 1110 will not be exceeded in the uppermost aquifer ... ". This requires that a two tier demonstration be made:

Tier 1 - the alternative liner provides equivalent protection, and

Tier 2 - the alternate liner ensures the uppermost aquifer will be protected.

The first tier of this demonstration may be satisfied through mathematical modeling using the EPA Hydrologic Evaluation of Landfill Performance (HELP) model. Two computer modeling analyses must be performed - (1) an analysis of the composite liner as specified in Section 306.A.1 and (2) an analysis of the proposed alternate liner as specified in Section 306.A.2. Each of these analyses must be performed under identical hydrologic and climatologic loading conditions of five years with no solid waste in the landfill (see Simulations #5 & 6). This time period is necessary to adequately evaluate the performance of the two liners. A successful demonstration of equivalent protection has been made when the analyses show equal or less percolation/leakage through the bottom layer of the proposed alternate liner than the percolation/leakage through the bottom layer of the Section 306.A.1 composite liner (Figure 5).

annual average

The second tier of the demonstration must include HELP modeling of the actual design conditions and the entire operational development of the landfill as closely as possible by doing a succession of model simulations which consider the factors in Section 306.A.2.a. To aid in accomplishing this, each successive computer simulation must use the previous simulation's moisture content output as the input for the following simulation (Figure 6). The modeling design method must be fully described. If no leakage is indicated at the end of the second simulation (#8) and subsequent simulations (#9 & #10) continue to indicate no leakage, then a successful demonstration has been made that the uppermost aquifer will be protected as required by Section 306.A.2 and it will not be necessary to perform a fate and transport modeling.

2. Justification for all input parameters in the HELP modeling must be provided utilizing the attached forms. Demonstrate the relationship of the characteristics of the soil proposed for the construction and operation of the landfill and the parameter values used in the model. Show justification for the soil and waste moisture content parameters as well as geomembrane liner data and storm water runoff fractions. The initial moisture content of the soil should be initialized by the use in the HELP model. The Department recommends initializing the soil moisture content to be the value of the wilting point plus 25% of the difference between the wilting point and the field capacity [i.e., (field capacity - wilting point) x 0.25 + wilting point]. Other values deviating from this range may be used but must be fully justified.

3(1) First Tier of the Demonstration

Two simulations must be made, one of the Section 306.A.1 specified liner and one of the proposed alternate liner, both using the same precipitation (wettest 5 consecutive year period using Climatedata or NOAA tapes), temperature (use values associated with 5 wettest consecutive years), solar radiation, and evapotranspiration data (see Simulations #5 & #6). Current historic NOAA weather data from the nearest representative weather station as published by the National Climatic Data Center in Asheville, North Carolina must be used for the precipitation and temperature files. Both simulations must be made for the landfill in the open condition with no run-off and a Leaf Area Index of zero. *Simulations:*

#5 A simulation for the specified liner design must be performed using a 24 inch protective layer, a lateral drainage layer (which may be integral with the protective layer), an FML, and a 24 inch barrier layer of soil with a saturated hydraulic conductivity of 1 x 10^{-7} cm/sec. This simulation must be performed using no solid waste and for a five year period.

#6 A simulation for the proposed alternate liner design must be performed using a 24 inch protective layer, a lateral drainage layer (which may be integral with the protective layer), and the other proposed liner layer (the bottom layer must be modeled as a barrier layer). This simulation must be performed using no solid waste and for a five year period.

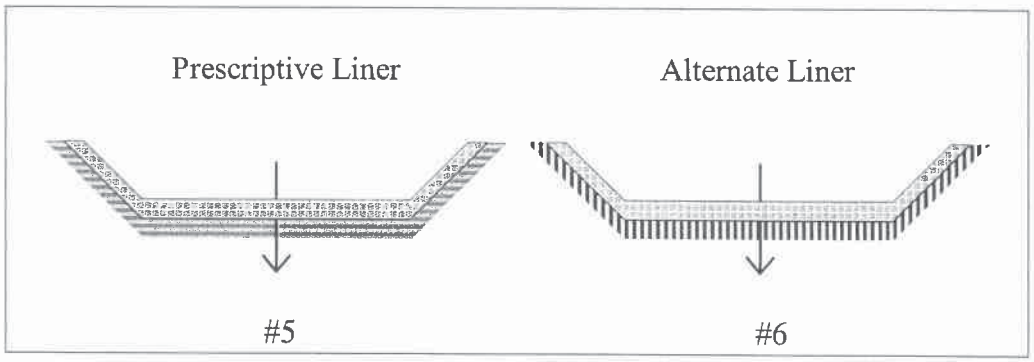


Figure 5

Compare the average annual percolation from the bottom layer of the two simulations. If the percolation is equivalent, a successful demonstration has been made for the first tier.

Input Parameters for HELP Simulation #5* (Prescriptive Liner - Tier I)

same as Simulation #4 with prescriptive liner design

Input Parameters for HELP Simulation #6* (Proposed Alternate Liner - Tier I)

same as Simulation #4 with proposed alternate liner design

*One of these simulations will also serve for the alternate cover design equivalency demonstration.

3(2) Second Tier of the Demonstration

Four simulations encompassing the entire life cycle of the facility to model actual design conditions and operational development as closely as possible must be performed (see Simulations #7, #8, #9 & #10). This is accomplished through a succession of four model simulations: one simulation of the open landfill, a second with the landfill partially filled with solid waste, a third with the landfill in the closed condition with bare ground, and a fourth with the landfill in the closed condition with "poor" vegetation. *Simulations:*

#7 The initial simulation must model the open landfill at start-up when the landfill contains no solid waste. The time period should extend for the anticipated duration of this condition (a minimum of two years).

#8 A succeeding simulation to model conditions of the partially filled landfill for a five year period*. This would incorporate daily and intermediate covers. (*This period may vary in accordance with anticipated operations.)

#9 Model the landfill in the closed condition with bare ground (a minimum of a two years).

#10 Finally, perform a simulation to model the landfill in the closed condition with poor vegetation for remainder of the post-closure care period (a minimum of 28 years).

If the simulations indicate no leakage after the third simulation (#9) and the subsequent simulation (#10), then the simulations have served to demonstrate the concentration values delineated in Section 1110 of the Regulations will not be exceeded in the uppermost aquifer at the relative point of compliance. Therefore, a successful demonstration has been made for the second tier.

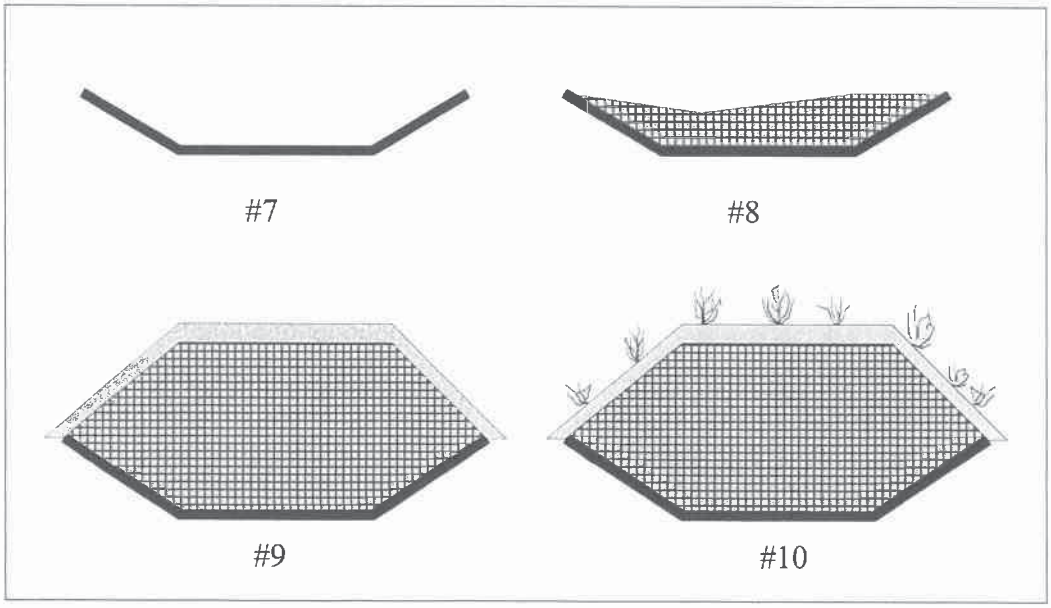


Figure 6

Input Parameters for HELP Simulation #7 (Proposed Alternate Liner - Tier II)

Weather data (must be the same as Simulation #3)

City/State: The weather data should be from the nearest reporting station that has at least 40 years of data.

Latitude: The latitude must be specific for the site to use in synthesizing solar radiation data.

Evaporative zone depth: 12" to 18" corresponding with bare ground (see EPA Engineering Documentation for Version 3, Figure 5 - e.g., Santa Fe and Roswell would be 14"; Las Cruces, Albuquerque, and Farmington would be 18")

Maximum leaf area index: 0.0 corresponding with bare ground

Growing season start and end day: from solar radiation data (default)

Average wind speed: from solar radiation data (default)

Relative humidity: from solar radiation data (default)

Precipitation: daily precipitation from 2 consecutive years for the appropriate weather reporting station

Temperature: daily* minimum and maximum temperatures corresponding with 2 consecutive years for the appropriate weather reporting station
(*may be monthly averages if manual entry is used)

Solar radiation data: synthetically generated using coefficients for the appropriate* default (HELP) weather reporting station (*should be the closest by distance or latitude - consult with the Department if the appropriate station is not obvious)

Landfill Cover Data

Type of vegetation: Type 1 for "bare ground"

SCS Runoff curve #: may be generated from HELP or user specified* (*must be justified)

% of area allowing runoff: 0%; "open"

Surface area: entire disposal area of landfill or cell (leachate collection basin)

Soil and Design Data

Source of soil characteristics: geotechnical data should be obtained from the source material.

Number of layers: There should be a layer for each type of material used (or compacted v. non-compacted)

Layer Number: (There should be a justification sheet for each layer.)

Thickness: 24" of drainage/protection layer, possible geonet, FML, 24" of 1 x 10^{-7} cm/sec clay barrier layer for prescriptive liner or GCL or other proposed thickness of clay barrier layer for an alternate liner.

Layer type: Type "2" for lateral drainage layer - slope (minimum of 2%) and drainage length must be designated (consult with the Department if leachate recirculation is proposed); Type "4" for geomembrane liners - geomembrane pinhole density of 1/acre, geomembrane installation defects of 4/acre and liner installation quality of "good"; Type "3" for barrier soil layers including GCLs (any soil layer underlying a geomembrane must be considered to be a barrier soil layer)

Soil texture: The texture # should approximate the geotechnical characteristics (see EPA HELP User's Guide for Version 3, Table 4).

Total porosity: If the actual porosity is not known, then the default value may be used that most closely approximates the geotechnical characteristics.

Field capacity: If the actual field capacity is not known, then the default value may be used that most closely approximates the geotechnical characteristics.

Wilting point: If the actual wilting point is not known, then the default value may be used that most closely approximates the geotechnical characteristics.

Moisture content: The moisture content should be initialized to be the value of the wilting point plus 25% of the difference between the wilting point and the field capacity [i.e., (field capacity - wilting point) x 0.25 + wilting point].

Saturated hydraulic conductivity (K): For the 24" of drainage/protection layer use the tested K for modeling the proposed alternate liner design; for a possible geonet use the lowest value from the manufacture's specifications; for the FML use a K value which is the greatest value from the manufacture's specifications; GCL (3 x 10^{-9} cm/sec) or other proposed soil barrier layer for an alternate liner.

Input Parameters for HELP Simulation #8 (Proposed Alternate Liner - Tier II)

Weather data (must be the same as Simulation #3)

City/State: The weather data should be from the nearest reporting station that has at least 40 years of data.

Latitude: The latitude must be specific for the site to use in synthesizing solar radiation data.

Evaporative zone depth: 12" to 18" corresponding with bare ground (see EPA Engineering Documentation for Version 3, Figure 5 - e.g., Santa Fe and Roswell would be 14"; Las Cruces, Albuquerque, and Farmington would be 18")

Maximum leaf area index: 0.0 corresponding with bare ground

Growing season start and end day: from solar radiation data (default)

Average wind speed: from solar radiation data (default)

Relative humidity: from solar radiation data (default)

Precipitation: daily precipitation from 2 to 5* consecutive years for the appropriate weather reporting station (*may vary with landfill operations)

Temperature: daily* minimum and maximum temperatures corresponding with 2 to 5 years (same years as precipitation) for the appropriate weather reporting station
(*may be monthly averages if manual entry is used)

Solar radiation data: synthetically generated using coefficients for the appropriate* default (HELP) weather reporting station (*should be the closest by distance or latitude - consult with the Department if the appropriate station is not obvious)

Landfill Cover Data

Type of vegetation: bare ground

SCS Runoff curve #: may be generated from HELP or user specified* (*must be justified)

% of area allowing runoff: 0%; "open"

Surface area: entire disposal area of landfill or cell (leachate collection basin)

Soil and Design Data

Source of soil characteristics: geotechnical data should be obtained from the source material.

Number of layers: There should be a layer for each type of material used (or compacted v. non-compacted)

Layer Number: (There should be a justification sheet for each layer.)

Thickness: 240" of solid waste (this thickness may vary depending on landfill operations); 24" of drainage/protection layer; possible geonet*; FML; 24" of 1 x 10^{-7} cm/sec clay barrier layer for prescriptive liner or GCL or other proposed thickness of clay barrier layer for an alternate liner.

Layer type: Type "1", vertical percolation layer, must be used for solid waste. Type "2" for lateral drainage layer - slope (minimum of 2%) and drainage length must be designated (consult with the Department if leachate recirculation is proposed); Type "4" for geomembrane liners - geomembrane pinhole density of 1/acre, geomembrane installation defects of 4/acre and liner installation quality of "good"; Type "3" for barrier soil layers including GCLs (any soil layer underlying a geomembrane must be considered to be a barrier soil layer)

Soil texture: The texture # should approximate the geotechnical characteristics (see EPA HELP User's Guide for Version 3, Table 4).

Total porosity: If the actual porosity is not known, then the default value may be used that most closely approximates the geotechnical characteristics.

Field capacity: If the actual field capacity is not known, then the default value may be used that most closely approximates the geotechnical characteristics.

Wilting point: If the actual wilting point is not known, then the default value may be used that most closely approximates the geotechnical characteristics.

Moisture content: The moisture content must be initialized to be the value of the previous simulation's (from Simulation #7) moisture content output as the input for the following simulation (Simulation #8). For compacted municipal solid waste with a HELP soil texture number of "18" use 20%* by volume/volume (which is greater than per mass basis - see EPA HELP User's Guide for Version 3 for conversion) (*a lower value may be used if justified)

Saturated hydraulic conductivity (K): For compacted municipal solid waste with a HELP soil texture number of "18" will have a K of 1 x 10^{-3} cm/sec. For the 24" of drainage/protection layer use the tested K for modeling the proposed alternate liner design; for a possible geonet use the lowest value from the manufacture's specifications; for the FML use a K value which is the greatest value from the manufacture's specifications; GCL (3 x 10^{-9} cm/sec) or other proposed soil barrier layer for an alternate liner.

Input Parameters for HELP Simulation #9 (Proposed Alternate Liner - Tier II)

Weather data

City/State: The weather data should be from the nearest reporting station that has at least 40 years of data.

Latitude: The latitude must be specific for the site to use in synthesizing solar radiation data.

Evaporative zone depth: 12" to 18" corresponding with bare ground (see EPA Engineering Documentation for Version 3, Figure 5 - e.g., Santa Fe and Roswell would be 14"; Las Cruces, Albuquerque, and Farmington would be 18")

Maximum leaf area index: 0.0 corresponding with bare ground

Growing season start and end day: from solar radiation data (default)

Average wind speed: from solar radiation data (default)

Relative humidity: from solar radiation data (default)

Precipitation: daily precipitation from 2 consecutive years for the appropriate weather reporting station

Temperature: daily* minimum and maximum temperatures corresponding with 2 consecutive years for the appropriate weather reporting station
(*may be monthly averages if manual entry is used)

Solar radiation data: synthetically generated using coefficients for the appropriate* default (HELP) weather reporting station (*should be the closest by distance or latitude - consult with the Department if the appropriate station is not obvious)

Landfill Cover Data

Type of vegetation: Type 1 for "bare ground"

SCS Runoff curve #: may be generated from HELP or user specified* (*must be justified)

% of area allowing runoff: 100%; "closed"

Surface area: entire disposal area of landfill or cell (leachate collection basin)



Soil and Design Data

Source of soil characteristics: geotechnical data should be obtained from the source material.

Number of layers: There should be a layer for each type of material used (or compacted v. non-compacted)

Layer Number: (There should be a justification sheet for each layer.)

Thickness: 6" of topsoil, Proposed thickness of infiltration layer or rooting medium or drainage layer, Possible GCL (0.24") or FML, subgrade thickness for GCL or FML (minimum of 6"), 12" of intermediate cover layer* (*optional for modeling); Proposed thickness of solid waste (this thickness will vary depending on landfill design); 24" of drainage/protection layer; possible geonet*; FML; 24" of 1 x 10^{-7} cm/sec clay barrier layer for prescriptive liner or GCL or other proposed thickness of clay barrier layer for an alternate liner.

Layer type: Type "1" - vertical percolation layer for all* cover materials including GCLs used in the cover (*consult with the Department if a FML is proposed to be used in the cover).Type "1", vertical percolation layer, must be used for solid waste. Type "2" for lateral drainage layer - slope (minimum of 2%) and drainage length must be designated (consult with the Department if leachate recirculation is proposed); Type "4" for geomembrane liners - geomembrane pinhole density of 1/acre, geomembrane installation defects of 4/acre and liner installation quality of "good"; Type "3" for barrier soil layers including GCLs (any soil layer underlying a geomembrane must be considered to be a barrier soil layer)

Soil texture: The texture # should approximate the geotechnical characteristics (see EPA HELP User's Guide for Version 3, Table 4).

Total porosity: If the actual porosity is not known, then the default value may be used that most closely approximates the geotechnical characteristics.

Field capacity: If the actual field capacity is not known, then the default value may be used that most closely approximates the geotechnical characteristics.

Wilting point: If the actual wilting point is not known, then the default value may be used that most closely approximates the geotechnical characteristics.

Moisture content: The moisture content must be initialized to be the value of the previous simulation's (from Simulation #8) moisture content output as the input for the following simulation (Simulation #9).

Saturated hydraulic conductivity (K): The K must be tested for the actual value unless the K is less than 1×10^{-5} cm/sec* (e.g., If the tested K is 5×10^{-5} cm/sec, then model the proposed thickness of the infiltration layer at 5×10^{-5} cm/sec. However, if the tested K is 2×10^{-6}, the lowest value to be modeled would be 1×10^{-5} cm/sec). *1×10^{-5} cm/sec is the lowest acceptable K for soils used in covers due to desiccation and root penetration; unless a GCL is proposed, then the actual K may be modeled for the GCL layer (i.e., 0.24" at 3×10^{-9} cm/sec). For compacted municipal solid waste with a HELP soil texture number of "18" will have a K of 1×10^{-3} cm/sec. For the 24" of drainage/protection layer use the tested K for modeling the proposed alternate liner design; for a possible geonet use the lowest value from the manufacture's specifications; for the FML use a K value which is the greatest value from the manufacture's specifications; GCL (3×10^{-9} cm/sec) or other proposed soil barrier layer for an alternate liner.

Input Parameters for HELP Simulation #10 (Proposed Alternate Liner - Tier II)

Weather data

City/State: The weather data should be from the nearest reporting station that has at least 40 years of data.

Latitude: The latitude must be specific for the site to use in synthesizing solar radiation data.

Evaporative zone depth: 18" to 28" corresponding with "poor" vegetation (see EPA Engineering Documentation for Version 3, Figure 5 - e.g., Clovis would be 20"; Santa Fe and Roswell would be 24"; Las Cruces, Albuquerque, and Farmington would be 28")

Maximum leaf area index: 0.8 to 1.6 corresponding with "poor" vegetation (see EPA Engineering Documentation for Version 3, Figure 3 - e.g., Clovis would be 1.6; Santa Fe and Roswell would be 1.2; Farmington would be 1.0; Las Cruces and Albuquerque would be 0.8)

Growing season start and end day: from solar radiation data (default)

Average wind speed: from solar radiation data (default)

Relative humidity: from solar radiation data (default)

Precipitation: daily precipitation from 28 consecutive years for the appropriate weather reporting station

Temperature: daily* minimum and maximum temperatures corresponding with 28 consecutive years for the appropriate weather reporting station
(*may be monthly averages if manual entry is used)

Solar radiation data: synthetically generated using coefficients for the appropriate* default (HELP) weather reporting station (*should be the closest by distance or latitude - consult with the Department if the appropriate station is not obvious)

Landfill Cover Data

Type of vegetation: Type 2 for "poor"

SCS Runoff curve #: may be generated from HELP or user specified* (*must be justified)

% of area allowing runoff: 100%; "closed"

Surface area: entire disposal area of landfill or cell (leachate collection basin)

Soil and Design Data

Source of soil characteristics: geotechnical data should be obtained from the source material.

Number of layers: There should be a layer for each type of material used (or compacted v. non-compacted)

Layer Number: (There should be a justification sheet for each layer.)

Thickness: 6" of topsoil, Proposed thickness of infiltration layer or rooting medium or drainage layer, Possible GCL (0.24") or FML, subgrade thickness for GCL or FML (minimum of 6"), 12" of intermediate cover layer* (*optional for modeling); Proposed thickness of solid waste (this thickness will vary depending on landfill design); 24" of drainage/protection layer; possible geonet*; FML; 24" of 1 x 10^{-7} cm/sec clay barrier layer for prescriptive liner or GCL or other proposed thickness of clay barrier layer for an alternate liner.

Layer type: Type "1" - vertical percolation layer for all* cover materials including GCLs used (*consult with the Department if a FML is proposed to be used in the cover). Type "1", vertical percolation layer, must be used for solid waste. Type "2" for lateral drainage layer - slope (minimum of 2%) and drainage length must be designated (consult with the Department if leachate recirculation is proposed); Type "4" for geomembrane liners - geomembrane pinhole density of 1/acre, geomembrane installation defects of 4/acre and liner installation quality of "good"; Type "3" for barrier soil layers including GCLs (any soil layer underlying a geomembrane must be considered to be a barrier soil layer)

Soil texture: The texture # should approximate the geotechnical characteristics (see EPA HELP User's Guide for Version 3, Table 4).

Total porosity: If the actual porosity is not known, then the default value may be used that most closely approximates the geotechnical characteristics.

Field capacity: If the actual field capacity is not known, then the default value may be used that most closely approximates the geotechnical characteristics.

Wilting point: If the actual wilting point is not known, then the default value may be used that most closely approximates the geotechnical characteristics.

Moisture content: The moisture content must be initialized to be the value of the previous simulation's (from Simulation #9) moisture content output as the input for the following simulation (Simulation #10).

Saturated hydraulic conductivity (K): The K must be tested for the actual value unless the K is less than 1×10^{-5} cm/sec* (e.g., If the tested K is 5×10^{-5} cm/sec, then model the proposed thickness of the infiltration layer at 5×10^{-5} cm/sec. However, if the tested K is 2×10^{-6}, the lowest value to be modeled would be 1×10^{-5} cm/sec). *1×10^{-5} cm/sec is the lowest acceptable K for soils used in covers due to desiccation and root penetration; unless a GCL is proposed, then the actual K may be modeled for the GCL layer (i.e., 0.24" at 3×10^{-9} cm/sec). For compacted municipal solid waste with a HELP soil texture number of "18" will have a K of 1×10^{-3} cm/sec. For the 24" of drainage/protection layer use the tested K for modeling the proposed alternate liner design; for a possible geonet use the lowest value from the manufacture's specifications; for the FML use a K value which is the greatest value from the manufacture's specifications; GCL (3×10^{-9} cm/sec) or other proposed soil barrier layer for an alternate liner.

Equivalency Demonstrations

Typical "New" Landfill:

Alternate Cover Design Equivalency Demonstration (two simulations)

Simulation #3 & (either Simulation #5 or #6)

Average Annual Percolation from bottom layer of Simulation #3 must be less than or equal to (equivalent*) the Average Annual Percolation from the bottom layer of Simulation #5 or #6 (depending on the proposed liner design).

Alternate Liner Design Equivalency Demonstration

Tier I (two simulations) - Simulation #5 & Simulation #6

Average Annual Percolation from bottom layer of Simulation #6 must be less than or equal to (equivalent*) the Average Annual Percolation from the bottom layer of Simulation #5.

Tier II (four simulations) - Simulations #7, #8, #9, #10

Average Annual Percolation from bottom layer of Simulation #7 must decrease to zero for Simulations #9 & #10.

For closing an "old" (no liner system) landfill:

Alternate Cover Design Equivalency Demonstration (two simulations)

Simulation #1 & Simulation #2

Average Annual Percolation from bottom layer of Simulation #2 must be less than or equal to (equivalent*) the Average Annual Percolation from the bottom layer of Simulation #1

Submit hardcopies of all output files and submit all input files on 3.5" diskette.

*If the two Average Annual Percolation values are within 0.00001" of each other, then the demonstration is successful since these values are practically equal (the definition of equivalent) and well within modeling uncertainty.

Exhibit J

NOAA Data for 5 Wettest Consecutive Years

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data, and Information Service

Global Summary of the Month for 1984

Generated on 09/25/2019

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Current Location: Elev: 3664 ft. Lat: 33.4594° N Lon: -104.4041° W

Station: **BITTER LAKES WL REFUGE, NM US USC00290992**

Date	Temperature (F)													Precipitation (Inches)								
Elem ->	TAVG	TMAX	TMIN	HTDD	CLDD	EMXT		EMNT		DX90	DX32	DT32	DT00	PRCP	EMXP		SNOW	EMSD		DP01	DP10	DP1X
Month	Mean	Mean Max.	Mean Min	Heating Degree Days	Cooling Degree Days	Highest	High Date	Lowest	Low Date	Number of Days				Total	Greatest Observed		Snow, Sleet			Number of Days		
										Max >= 90	Max <= 32	Min <= 32	Min <= 0		Amount	Date	Total Fall	Max Depth	Max Date	>=.01	>=.10	>=1.0
Jan	36.2	52.2	20.2	748	0	73	30	0	19	0	3	26	1	0.04	0.04	18	1.3	2	18	1	0	0
Feb	43.4	64.6	22.2	568	0	77	15	14	29	0	0	23	0	0.03	0.03	27	0.0	0	29	1	0	0
Mar	49.9	68.7	31.1	413	0	86	17	15	06	0	0	17	0	0.20	0.15	05	1.5	2	05	2	1	0
Apr	57.7	77.0	38.4	238	29	92	18	24	04	2	0	6	0	0.22	0.18	08	0.0	0	30	2	1	0
May														1.99	1.10	16	0.0	0	31	3	3	1
Jun	76.0	89.9	62.2	0	276	99	11	52	06	14	0	0	0	5.83	1.81	28	0.0	0	30	13	9	2
Jul	77.6	92.3	62.9	0	353	98	21	59	19	22	0	0	0	2.05	1.10	28	0.0	0	31	7	4	1
Aug	75.8	88.6	63.0	0	281	97	01	58	16	15	0	0	0	5.82	1.73	10	0.0	0	31	9	7	3
Sep														0.82	0.73	28	0.0	0	30	4	1	0
Oct	56.1	70.8	41.4	238	8	86	15	28	19	0	0	2	0	3.17	1.24	04	0.0	0	31	12	8	1
Nov	48.5	65.9	31.2	444	0	84	09	21	11	0	0	14	0	1.81	0.00	30	0.0	0	30	0	0	0
Dec	40.9	54.2	27.7	722	0	72	09	14	05	0	2	21	0	1.52	0.65	14	4.5	3	14	7	5	0

Notes

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A Accumulated amount.

X Monthly means or totals based on incomplete time series.

T Trace Amount.

U.S. Department of Commerce
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Global Summary of the Month for 1985

Generated on 09/25/2019

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Current Location: Elev: 3664 ft. Lat: 33.4594° N Lon: -104.4041° W

Station: **BITTER LAKES WL REFUGE, NM US USC00290992**

Date	Temperature (F)													Precipitation (Inches)								
Elem ->	TAVG	TMAX	TMIN	HTDD	CLDD	EMXT		EMNT		DX90	DX32	DT32	DT00	PRCP	EMXP		SNOW	EMSD		DP01	DP10	DP1X
Month	Mean	Mean Max.	Mean Min	Heating Degree Days	Cooling Degree Days	Highest	High Date	Lowest	Low Date	Number of Days				Total	Greatest Observed		Snow, Sleet			Number of Days		
										Max >= 90	Max <= 32	Min <= 32	Min <= 0		Amount	Date	Total Fall	Max Depth	Max Date	>=.01	>=.10	>=1.0
Jan	36.7	54.2	19.2			75	20	8	31	0	1	26	0	0.31	0.15	27	1.5	1	13	4	1	0
Feb	39.3	57.0	21.5	598	0	75	26	-1	02	0	2	23	1	0.16	0.10	02				4	1	0
Mar	53.9	72.4	35.4			85	28	16	05	0	0	12	0	0.82	0.61	20	0.0	0	31	3	3	0
Apr	62.7	81.8	43.6	92	37	93	16	26	02	2	0	1	0	1.52	1.26	28	0.0	0	30	4	2	1
May	68.8	87.1	50.4	28	134	100	31	35	15	9	0	0	0	0.57	0.25	19	0.0	0	31	4	2	0
Jun	75.4	91.3	59.5	7	298	101	22	45	06	18	0	0	0	4.38	1.82	06	0.0	0	30	7	6	2
Jul	78.9	96.3	61.5	0	389	109	15	53	02	26	0	0	0	3.51	1.63	26	0.0	0	31	10	7	1
Aug	79.4	96.9	61.9	0	432	104	23	52	30	29	0	0	0	0.28	0.22	12	0.0	0	31	3	1	0
Sep	70.4	86.6	54.3	33	186	103	04	41	29	12	0	0	0	2.44	0.66	15	0.0	0	30	12	7	0
Oct	59.1	75.0	43.3	169	15	93	08	33	05	2	0	0	0	1.07	0.37	09	0.0			6	3	0
Nov	51.0	71.1	31.0	359	0	84	10	15	21	0	0	14	0	0.11	0.08	04	0.0	0	30	3	0	0
Dec	38.5	59.6	17.4	687	0	78	08	3	14	0	1	26	0	0.00	0.00	31	0.0	0	31	0	0	0

Notes

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Global Summary of the Month for 1986

Generated on 09/25/2019

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Current Location: Elev: 3664 ft. Lat: 33.4594° N Lon: -104.4041° W

Station: **BITTER LAKES WL REFUGE, NM US USC00290992**

Date	Temperature (F)													Precipitation (Inches)								
Elem ->	TAVG	TMAX	TMIN	HTDD	CLDD	EMXT		EMNT		DX90	DX32	DT32	DT00	PRCP	EMXP		SNOW	EMSD		DP01	DP10	DP1X
Month	Mean	Mean Max.	Mean Min	Heating Degree Days	Cooling Degree Days	Highest	High Date	Lowest	Low Date	Number of Days				Total	Greatest Observed		Snow, Sleet			Number of Days		
										Max >= 90	Max <= 32	Min <= 32	Min <= 0		Amount	Date	Total Fall	Max Depth	Max Date	>=.01	>=.10	>=1.0
Jan	42.0	62.6	21.3	663	0	78	29	10	08	0	0	30	0	0.54	0.54	07	4.0	4	07	1	1	0
Feb	45.6	63.5	27.6	533	0	89	21	12	10	0	3	19	0	0.44	0.27	10	5.3			3	2	0
Mar	53.5	73.1	33.9	328	2	86	09	22	21	0	0	17	0	0.08	0.05	20	0.0	0	31	2	0	0
Apr	63.8	83.0	44.6	90	59	94	08	28	20	6	0	4	0	0.15	0.10	09	0.0	0	30	4	1	0
May	69.0	88.6	49.3	25	145	102	22	32	18	15	0	1	0	2.11	0.91	31	0.0	0	31	5	4	0
Jun	74.3	89.2	59.4	4	233	105	17	49	10	17	0	0	0	3.48	1.67	25	0.0	0	30	11	5	1
Jul	77.8	93.5	62.2	0	357	103	28	58	25	23	0	0	0	2.05	1.84	02	0.0	0	31	3	2	1
Aug	78.1	93.2	63.0	0	342	103	21	55	20	22	0	0	0	6.13	1.66	22	0.0	0	31	13	10	3
Sep	70.6	85.7	55.4	4	138	93	20	42	27	5	0	0	0	2.76			0.0	0	30			
Oct	57.9	72.2	43.6	202	6	88	02	31	15	0	0	4	0	2.69	1.25	10	0.0	0	31	11	5	1
Nov														1.87	0.90	03	0.0	0	30	6	2	0
Dec	38.7	52.2	25.2	762	0	68	03	17	31	0	1	27	0	1.44	0.58	22	0.0	0	31	6	5	0

Notes

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National Centers for Environmental Information
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Asheville, North Carolina 28801

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Station: **BITTER LAKES WL REFUGE, NM US USC00290992**

Date	Temperature (F)													Precipitation (Inches)								
Elem ->	TAVG	TMAX	TMIN	HTDD	CLDD	EMXT		EMNT		DX90	DX32	DT32	DT00	PRCP	EMXP		SNOW	EMSD		DP01	DP10	DP1X
Month	Mean	Mean Max.	Mean Min	Heating Degree Days	Cooling Degree Days	Highest	High Date	Lowest	Low Date	Number of Days				Total	Greatest Observed		Snow, Sleet			Number of Days		
										Max >= 90	Max <= 32	Min <= 32	Min <= 0		Amount	Date	Total Fall	Max Depth	Max Date	>=.01	>=.10	>=1.0
Jan	39.0	56.5	21.5			74	28	8	21	0	1	26	0	0.46	0.21	21	5.8	6	21	3	3	0
Feb	44.8	61.3	28.4	519	0	78	12	7	22	0	0	19	0	1.39	0.91	22	0.0	5	20	3	2	0
Mar														0.37	0.15	29	1.0	0	31	3	3	0
Apr														0.18	0.18	06	0.0	0	30	1	1	0
May														2.32	1.15	06	0.0	0	31	6	4	1
Jun	75.1	92.0	58.3	0	254	102	24	51	23	17	0	0	0	3.09	1.70	04	0.0	0	30	4	3	1
Jul	79.5	96.8	62.2	0	402	108	05	57	06	26	0	0	0	0.24	0.05	28	0.0	0	31	1	0	0
Aug	77.8	93.4	62.2	0	371	103	02	51	31	19	0	0	0	3.23	1.66	10	0.0	0	31	11	6	1
Sep	68.9	85.5	52.2	16	125	95	14	43	25	5	0	0	0	1.04	0.31	15	0.0	0	30	7	3	0
Oct	60.9	79.9	41.9	117	11	93	09	35	17	1	0	0	0	0.30	0.30	15	0.0	0	31	1	1	0
Nov			28.4					9	19			18	0	0.58	0.48	02	0.0	0	30	4	1	0
Dec	35.8	53.7	18.0	776	0	78	12	-8	15	0	5	28	3	0.58	0.39	14	13.0			3	2	0

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National Centers for Environmental Information
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Asheville, North Carolina 28801

Current Location: Elev: 3664 ft. Lat: 33.4594° N Lon: -104.4041° W

Station: **BITTER LAKES WL REFUGE, NM US USC00290992**

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Elem ->	TAVG	TMAX	TMIN	HTDD	CLDD	EMXT		EMNT		DX90	DX32	DT32	DT00	PRCP	EMXP		SNOW	EMSD		DP01	DP10	DP1X
Month	Mean	Mean Max.	Mean Min	Heating Degree Days	Cooling Degree Days	Highest	High Date	Lowest	Low Date	Number of Days				Total	Greatest Observed		Snow, Sleet			Number of Days		
										Max >= 90	Max <= 32	Min <= 32	Min <= 0		Amount	Date	Total Fall	Max Depth	Max Date	>=.01	>=.10	>=1.0
Jan														0.05	0.00	31	0.0	0	31	0	0	0
Feb	42.5	60.8	24.2	616	0	79	29	6	08	0	1	24	0	1.45	1.43	05	16.0	16	05	2	1	1
Mar														0.00	0.00	31	0.0	0	31	0	0	0
Apr	57.5	77.3	37.7	198	11	90	09	24	16	1	0	8	0	0.34	0.11	01	0.0	0	30	3	1	0
May														2.24	0.67	20	0.0	0	31	6	3	0
Jun														1.04	0.72	29	0.0	0	30	4	3	0
Jul														3.03	1.22	20	0.0	0	31	9	6	2
Aug														0.47	0.24	19	0.0	0	31	7	1	0
Sep																	0.0	0	30			
Oct														0.04	0.04	08	0.0	0	31	1	0	0
Nov														0.01	0.01	15	0.0	0	30	1	0	0
Dec														0.45	0.28	09	3.3	3	09	2	2	0

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National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Current Location: Elev: 3649 ft. Lat: 33.3075° N Lon: -104.5083° W

Station: **ROSWELL INDUSTRIAL AIR PARK, NM US USW00023009**

Date	Temperature (F)													Precipitation (Inches)								
Elem ->	TAVG	TMAX	TMIN	HTDD	CLDD	EMXT		EMNT		DX90	DX32	DT32	DT00	PRCP	EMXP		SNOW	EMSD		DP01	DP10	DP1X
Month	Mean	Mean Max.	Mean Min	Heating Degree Days	Cooling Degree Days	Highest	High Date	Lowest	Low Date	Number of Days				Total	Greatest Observed		Snow, Sleet			Number of Days		
										Max >= 90	Max <= 32	Min <= 32	Min <= 0		Amount	Date	Total Fall	Max Depth	Max Date	>=.01	>=.10	>=1.0
Jan	38.5	50.5	26.5	822	0	72	29	8	18	0	4	24	0	0.04	0.02	18	0.5	1	18	3	0	0
Feb	46.5	61.7	31.3	537	0	74	14	22	29	0	0	17	0	0.00	0.00	26	0.0	0	29	0	0	0
Mar	51.7	66.8	36.6	414	2	83	17	19	06	0	0	9	0	0.46	0.42	05	4.8	1	06	2	1	0
Apr	60.1	75.9	44.4	171	24	89	17	32	04	0	0	1	0	0.03	0.03	07	0.0	0	30	1	0	0
May	72.4	86.1	58.8	21	251	98	27	41	08	13	0	0	0	1.62	0.89	15	0.0	0	31	4	3	0
Jun	75.8	87.4	64.2	0	324	97	10	57	04	15	0	0	0	4.51	0.91	19	0.0	0	30	13	9	0
Jul	79.0	90.8	67.2	0	434	96	15	63	26	24	0	0	0	0.85	0.78	24	0.0	0	31	3	1	0
Aug	76.2	86.8	65.6	0	347	94	29	63	29	13	0	0	0	5.03	2.45	08	0.0	0	31	12	6	2
Sep	69.3	82.0	56.5	57	186	97	09	44	30	10	0	0	0	1.05	0.74	28	0.0	0	30	6	2	0
Oct	57.6	69.4	45.9	233	6	82	14	36	19	0	0	0	0	2.74	0.86	03	0.0	0	31	9	5	0
Nov	48.5	61.1	35.8	497	0	83	07	25	28	0	0	11	0	1.57	0.74	24	0.0	0	30	4	3	0
Dec	42.1	53.1	31.0	711	0	72	08	20	16	0	1	19	0	0.85	0.31	13	5.4	4	15	7	3	0

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Month	Mean	Mean Max.	Mean Min	Heating Degree Days	Cooling Degree Days	Highest	High Date	Lowest	Low Date	Number of Days				Total	Greatest Observed		Snow, Sleet			Number of Days		
										Max >= 90	Max <= 32	Min <= 32	Min <= 0		Amount	Date	Total Fall	Max Depth	Max Date	>=.01	>=.10	>=1.0
Jan	36.9	49.4	24.4	870	0	75	19	9	31	0	3	28	0	0.37	0.09	26	1.9	0	31	10	0	0
Feb	43.2	57.7	28.6	612	0	73	21	3	02	0	1	19	0	0.04	0.02	21	0.3	1	02	2	0	0
Mar	54.4	68.8	40.0	329	6	83	10	24	05	0	0	5	0	0.70	0.32	20	0.0	0	31	3	2	0
Apr	63.4	78.4	48.4	88	41	88	15	35	02	0	0	0	0	2.48	1.48	28	0.0	0	30	4	3	1
May	70.1	84.0	56.2	11	169	96	29	43	14	6	0	0	0	2.22	0.92	18	0.0	0	31	6	5	0
Jun	75.8	89.5	62.0	2	325	100	21	52	06	19	0	0	0	2.59	1.25	09	0.0	0	30	5	4	1
Jul	79.4	92.8	66.0	0	447	101	05	61	02	25	0	0	0	2.71	1.65	25	0.0	0	31	6	4	1
Aug	80.4	93.3	67.5	0	477	100	06	62	31	26	0	0	0	0.34	0.14	21	0.0	0	31	7	1	0
Sep	70.7	82.4	59.0	48	218	96	01	43	30	7	0	0	0	1.93	0.79	18	0.0	0	30	12	6	0
Oct	61.1	73.6	48.7	136	16	89	07	42	31	0	0	0	0	0.98	0.43	16	0.0	0	31	6	4	0
Nov	53.2	68.4	38.0	354	0	81	05	23	15	0	0	7	0	0.12	0.12	01	0.0	0	30	1	1	0
Dec	40.2	57.0	23.4	768	0	72	30	9	14	0	2	28	0	0.07	0.07	12	1.1	0	31	1	0	0

Notes

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A Accumulated amount.

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T Trace Amount.

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data, and Information Service

Global Summary of the Month for 1986

Generated on 09/25/2019

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Current Location: Elev: 3649 ft. Lat: 33.3075° N Lon: -104.5083° W

Station: **ROSWELL INDUSTRIAL AIR PARK, NM US USW00023009**

Date	Temperature (F)													Precipitation (Inches)								
Elem ->	TAVG	TMAX	TMIN	HTDD	CLDD	EMXT		EMNT		DX90	DX32	DT32	DT00	PRCP	EMXP		SNOW	EMSD		DP01	DP10	DP1X
Month	Mean	Mean Max.	Mean Min	Heating Degree Days	Cooling Degree Days	Highest	High Date	Lowest	Low Date	Number of Days				Total	Greatest Observed		Snow, Sleet			Number of Days		
										Max >= 90	Max <= 32	Min <= 32	Min <= 0		Amount	Date	Total Fall	Max Depth	Max Date	>=.01	>=.10	>=1.0
Jan	44.1	60.8	27.4	648	0	77	28	13	09	0	0	26	0	0.67	0.47	07	5.4	3	08	2	2	0
Feb	46.8	60.6	33.0	510	0	85	26	14	10	0	5	11	0	0.50	0.31	09	4.9	4	12	5	1	0
Mar	56.2	72.5	39.8	279	5	88	31	30	21	0	0	4	0	0.12	0.05	19	0.0	0	31	4	0	0
Apr	64.6	80.7	48.5	81	69	92	07	37	20	2	0	0	0	0.31	0.31	08	0.0	0	30	1	1	0
May	69.5	85.2	53.9	16	158	97	21	38	18	9	0	0	0	1.20	0.51	30	0.0	0	31	7	3	0
Jun	75.8	88.7	63.0	0	324	102	16	53	01	17	0	0	0	5.02	1.44	24	0.0	0	30	9	5	3
Jul	79.2	92.4	65.9	0	439	101	27	62	19	23	0	0	0	1.11	0.66	01	0.0	0	31	8	3	0
Aug	78.6	90.9	66.3	0	421	103	20	61	25	21	0	0	0	3.11	0.85	26	0.0	0	31	13	9	0
Sep	72.1	85.0	59.2	0	213	93	19	48	30	5	0	0	0	3.93	1.71	02	0.0	0	30	8	5	1
Oct	59.3	71.6	47.0	186	9	88	01	36	14	0	0	0	0	5.48	3.46	10	0.0	0	31	8	6	1
Nov	46.0	59.3	32.7	570	0	76	17	22	25	0	1	15	0	1.89	0.79	03	0.5	0	13	6	4	0
Dec	39.9	51.0	28.9	777	0	67	07	20	12	0	1	23	0	1.47	0.44	22	3.4	0	22	7	6	0

Notes

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T Trace Amount.

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data, and Information Service

Global Summary of the Month for 1987

Generated on 09/25/2019

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Current Location: Elev: 3649 ft. Lat: 33.3075° N Lon: -104.5083° W

Station: **ROSWELL INDUSTRIAL AIR PARK, NM US USW00023009**

Date	Temperature (F)													Precipitation (Inches)								
Elem ->	TAVG	TMAX	TMIN	HTDD	CLDD	EMXT		EMNT		DX90	DX32	DT32	DT00	PRCP	EMXP		SNOW	EMSD		DP01	DP10	DP1X
Month	Mean	Mean Max.	Mean Min	Heating Degree Days	Cooling Degree Days	Highest	High Date	Lowest	Low Date	Number of Days				Total	Greatest Observed		Snow, Sleet			Number of Days		
										Max >= 90	Max <= 32	Min <= 32	Min <= 0		Amount	Date	Total Fall	Max Depth	Max Date	>=.01	>=.10	>=1.0
Jan	39.7	54.9	24.5	784	0	74	27	8	21	0	2	27	0	0.45	0.19	20	5.5	4	18	5	2	0
Feb	44.9	58.1	31.7	562	0	78	02	14	22	0	0	12	0	2.02	0.91	20	8.7	6	20	8	5	0
Mar	49.1	64.3	33.8	493	0	77	06	14	30	0	1	9	0	0.20	0.11	26	0.5	0	31	4	1	0
Apr	57.3	73.6	41.0	248	16	93	18	26	03	2	0	3	0	0.26	0.12	04	0.0	0	30	3	2	0
May	67.4	81.7	53.1	25	100	91	17	43	04	1	0	0	0	1.54	0.46	24	0.0	0	31	7	5	0
Jun	75.8	89.9	61.7	0	323	101	23	56	05	17	0	0	0	3.70	1.22	03	0.0	0	30	9	8	1
Jul	80.2	94.6	65.7	0	470	104	03	60	06	26	0	0	0	0.40	0.20	10	0.0	0	31	5	1	0
Aug	78.7	91.5	65.9	0	423	101	08	57	31	19	0	0	0	4.72	2.20	22	0.0	0	31	13	6	2
Sep	70.5	84.5	56.6	4	170	94	13	48	24	4	0	0	0	0.78	0.38	14	0.0	0	30	6	2	0
Oct	63.8	79.3	48.4	75	38	93	08	41	21	1	0	0	0	0.28	0.24	14	0.0	0	31	3	1	0
Nov	49.0	64.3	33.6	481	0	79	04	20	19	0	0	17	0	0.46	0.43	01	0.0	0	30	2	1	0
Dec	39.3	54.1	24.5	797	0	79	11	-3	27	0	5	22	2	1.41	0.61	13	15.3	10	15	6	5	0

Notes

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T Trace Amount.

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data, and Information Service

Global Summary of the Month for 1988

Generated on 09/25/2019

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Current Location: Elev: 3649 ft. Lat: 33.3075° N Lon: -104.5083° W

Station: **ROSWELL INDUSTRIAL AIR PARK, NM US USW00023009**

Date	Temperature (F)													Precipitation (Inches)								
Elem ->	TAVG	TMAX	TMIN	HTDD	CLDD	EMXT		EMNT		DX90	DX32	DT32	DT00	PRCP	EMXP		SNOW	EMSD		DP01	DP10	DP1X
Month	Mean	Mean Max.	Mean Min	Heating Degree Days	Cooling Degree Days	Highest	High Date	Lowest	Low Date	Number of Days				Total	Greatest Observed		Snow, Sleet			Number of Days		
										Max >= 90	Max <= 32	Min <= 32	Min <= 0		Amount	Date	Total Fall	Max Depth	Max Date	>=.01	>=.10	>=1.0
Jan	37.5	51.2	23.8	852	0	72	15	14	25	0	1	30	0	0.22	0.11	06	0.4	0	31	4	1	0
Feb	44.4	59.6	29.3	596	0	77	28	12	08	0	1	21	0	1.48	1.05	05	16.9	9	06	3	2	1
Mar	51.3	69.2	33.3	425	0	85	24	16	14	0	0	14	0	0.03	0.03	03	0.0	0	31	1	0	0
Apr	59.7	76.2	43.1	169	9	90	08	27	02	1	0	2	0	0.27	0.15	16	0.0	0	30	4	1	0
May	68.1	83.4	52.9	39	137	98	15	37	03	6	0	0	0	3.42	1.41	28	0.0	0	31	6	4	2
Jun	77.4	92.0	62.9	0	373	99	22	51	01	20	0	0	0	1.27	0.47	27	0.0	0	30	7	3	0
Jul	78.6	91.7	65.5	0	422	102	13	59	22	24	0	0	0	4.45	3.32	19	0.0	0	31	10	5	1
Aug	78.7	90.4	67.0	7	432	99	13	56	28	25	0	0	0	0.51	0.12	09	0.0	0	31	10	2	0
Sep	72.2	87.2	57.1	7	222	99	08	46	30	12	0	0	0	1.56	0.72	20	0.0	0	30	6	2	0
Oct	63.9	79.4	48.5	63	29	93	17	41	29	1	0	0	0	0.01	0.01	07	0.0	0	31	1	0	0
Nov	53.3	70.1	36.5	366	15	87	08	20	28	0	0	13	0	0.03	0.03	08	0.0	0	30	1	0	0
Dec	40.6	54.9	26.4	756	0	68	03	15	28	0	0	28	0	0.51	0.28	08	3.9	4	09	3	2	0

Notes

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National Environmental Satellite, Data, and Information Service

Global Summary of the Year
1969 - 1994

Generated on 09/27/2019

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Current Location: Elev: 3649 ft. Lat: 33.3075° N Lon: -104.5083° W

Station: **ROSWELL INDUSTRIAL AIR PARK, NM US USW00023009**

Date	Liquid Precipitation (Inches)			Frozen Precipitation (Inches)					Number of Days		
Elem->	PRCP	EMXP		SNOW	EMSN		EMSD		DP01	DP10	DP1X
Year	Total Liquid Content	Extreme Max Precip	Date of Occurrence	Snowfall	Extreme Max Snowfall	Date of Occurrence	Extreme Max Snow Depth	Date of Occurrence	Precip >= 0.01"	Precip >= 0.10"	Precip >= 1.00"
1973	11.61	1.35	Mar-10	15.9	4.7	Feb-22	3+	Feb-22	44	25	2
1974	18.66	2.32	Aug-11	2.6	1.1	Dec-25	1	Dec-26	50	33	7
1975	9.61	1.26	Sep-11	6.9	2.5	Feb-22	3	Feb-23	49	27	1
1976	11.57	1.54	Aug-01	11.9	3.1	Oct-28	4+	Nov-14	45	23	2
1977	10.96	3.63	Aug-11	1.7	0.9	Mar-05	0+	Feb-26	44	17	3
1978	18.26	2.15	Jun-27	14.4	4.5	Dec-07	6	Dec-09	70	38	4
1979	8.56	0.68	Aug-17	11.3	5.4	Feb-05	5	Feb-06	53	22	0
1980	13.20	2.55	Sep-09	27.1	7.3	Jan-22	6+	Nov-26	49	29	3
1981	24.33	4.22	Jul-09	5.3	2.4	Jan-17	4	Jan-18	54	29	9
1982	9.05	1.59	Sep-30	25.7	4.0+	Dec-26	6+	Dec-27	49	23	1
1983	10.04	1.47	Oct-19	12.1	3.0+	Dec-28	4	Jan-01	55	29	1
1984	18.76	2.45	Aug-08	10.7	4.4	Mar-05	4+	Dec-15	64	33	2
1985	14.55	1.65	Jul-25	3.3	1.1	Dec-12	1+	Feb-02	63	30	3
1986	24.81	3.46	Oct-10	14.2	5.4	Jan-07	4+	Feb-12	78	45	5
1987	16.23	2.20	Aug-22	30.0	8.5	Dec-13	10	Dec-15	71	39	3
1988	13.78	3.32	Jul-19	21.2	11.5	Feb-05	9+	Feb-06	56	22	4
1989	6.08	0.91	Sep-12	5.5	2.5	Mar-04	2	Mar-21	44	16	0
1990	7.48	0.48	Apr-21	5.2	2.7	Jan-18	2	Jan-19	52	29	0
1991	21.05	4.34	Jul-13	6.0	2.4	Dec-25	2	Dec-26	65	39	3
1992	13.29	1.61	May-22	9.4	3.5	Dec-05	4+	Dec-07	70	33	2
1993	10.37	1.98	Jul-14	1.8	1.3	Oct-29	2	Oct-30	59	26	2
1994	10.78	1.36	May-21	1.5	0.9	Mar-27	0+	Jan-31	57	25	2

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Global Summary of the Year
1969 - 1994

Generated on 09/27/2019

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Current Location: Elev: 3649 ft. Lat: 33.3075° N Lon: -104.5083° W

Station: **ROSWELL INDUSTRIAL AIR PARK, NM US USW00023009**

Date	Temperature (Fahrenheit)			Degree Days (Base 65 degrees)		Extremes				Number of Days			
Elem->	TAVG	TMAX	TMIN	HTDD	CLDD	EMXT		EMNT		DX90	DX32	DT32	DT00
Year	Annual Mean Temp	Mean Max Temp	Mean Min Temp	Heating Degree Days	Cooling Degree Days	Extreme Max Temp	Date of Occurrence	Extreme Min Temp	Date of Occurrence	Max Temp >= 90F	Max Temp <= 32F	Min Temp <= 32F	Min Temp <= 0F
1973	59.3	74.0	44.5		1430	104	Jun-28	8	Dec-20	72	5	80	0
1974	60.0	74.2	45.9	3080	1620	102	Jun-18	9+	Jan-04	83	4	99	0
1975	59.3	74.3	44.3	3776	1404	101	Jun-14	12	Jan-12	66	2	104	0
1976	60.6	74.9	46.4	2879	1746	104	Jun-21	4	Nov-29	79	4	92	0
1977	63.8	78.2	49.4	3572	2381	107+	Jun-17	3	Jan-09	115	1	75	0
1978	60.8	73.8	47.8	2854	1949	106+	Jun-24	-8	Dec-09	92	10	85	2
1979	59.2	73.2	45.2	3785	1642	101+	Jul-11	-9	Jan-02	89	9	107	2
1980	60.5	74.2	46.7	3608	2000	106+	Jun-28	0	Jan-23	95	11	99	1
1981	61.2	75.1	47.2	3343	1581	109	Jun-21	6	Feb-11	69	2	82	0
1982	59.9	73.4	46.4	3149	1761	101	Jun-05	-3	Jan-14	91	15	86	1
1983	60.3	73.6	47.0	3698	1869	103	Jun-19	-5	Dec-29	90	10	86	2
1984	59.8	72.6	47.0	3415	1575	98+	May-27	8	Jan-18	75	5	81	0
1985	60.7	74.6	46.8	3410	1701	101	Jul-05	3	Feb-02	83	6	87	0
1986	61.0	74.9	47.1	2841	1639	103	Aug-20	13+	Jan-09	77	7	79	0
1987	59.6	74.2	45.0	3646	1541	104	Jul-03	-3	Dec-27	70	8	90	2
1988	60.5	75.5	45.5	3438	1640	102	Jul-13	12	Feb-08	89	2	108	0
1989	62.2	77.7	46.7	2858	2078	109	Jul-02	5	Dec-23	114	5	87	0
1990	62.5	77.0	48.1	3176	2073	110+	Jun-25	5	Dec-23	97	1	80	0
1991	61.4	74.9	48.0	2780	1824	105	Jun-18	14	Oct-31	89	2	78	0
1992	60.8	75.6	46.1	3339	1699	107	Jul-06	8+	Dec-06	94	2	87	0
1993	61.3	76.4	46.2	3135	1970	107	Jul-06	11	Nov-26	113	0	93	0
1994	62.9	77.9	47.9	3337	2216	114	Jun-27	9	Feb-02	111	1	84	0

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Global Summary of the Year
1995 - 2018

Generated on 09/27/2019

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Current Location: Elev: 3649 ft. Lat: 33.3075° N Lon: -104.5083° W
Station: **ROSWELL INDUSTRIAL AIR PARK, NM US USW00023009**

Date	Liquid Precipitation (Inches)			Frozen Precipitation (Inches)					Number of Days		
Elem->	PRCP	EMXP		SNOW	EMSN		EMSD		DP01	DP10	DP1X
Year	Total Liquid Content	Extreme Max Precip	Date of Occurrence	Snowfall	Extreme Max Snowfall	Date of Occurrence	Extreme Max Snow Depth	Date of Occurrence	Precip >= 0.01"	Precip >= 0.10"	Precip >= 1.00"
1995	8.46	1.58	Jun-29	2.7	1.0	Nov-28	1+	Nov-28	47	21	2
1996	14.20	2.52	Jul-14						49	23	2
1997	18.60	1.35	Apr-24						80	39	3
1998	11.75	1.79	Oct-30						47	25	3
1999	14.22	2.54	Jul-10						45	25	4
2000	8.20	1.12	Oct-28						43	17	2
2001	8.68	2.08	Mar-07						59	22	2
2002	12.86	1.47	Jun-20						49	26	2
2003	2.91	0.42	Feb-20						27	10	0
2004	16.48	2.01	Sep-24						53	34	3
2005	10.63	1.85	Aug-14	6.8	6.8	Mar-15	0	Mar-15	57	29	1
2006	11.50	2.45	Sep-03	6.5	3.1	Nov-29	5	Nov-30	45	21	2
2007	12.55	1.72	Jul-11	21.7	6.2	Nov-23	9	Nov-24	55	27	2
2008	12.11	1.95	Aug-16	3.0	2.5	Mar-03	3	Mar-03	46	22	2
2009	8.57	1.05	Jul-06	8.2	3.9	Dec-03	2	Dec-24	56	21	1
2010	15.20	1.81	Jun-23	10.4	6.8	Feb-22	7	Feb-23	59	28	4
2011	5.57	0.69	Aug-11	18.0	4.8	Dec-23	8+	Dec-25	32	17	0
2012	6.21	1.00	May-10	0.8	0.8	Dec-09	1	Dec-10	39	18	1
2013	9.48	2.82	Sep-11	6.7	3.2	Nov-23	3	Nov-24	43	16	2
2014	18.02	4.44	May-24	3.5	1.8	Nov-16	2+	Dec-31	54	25	4
2015	18.02	1.83	Oct-20	29.7	12.4	Dec-27	15	Dec-28	75	40	3
2016	10.65	2.19	Aug-21	1.0	1.0	Jan-05	7+	Jan-02	47	24	1
2017	11.18	1.57	Sep-23	2.5	2.5	Jan-06	3	Jan-07	44	25	4
2018	9.71	1.06	Oct-23	5.8	3.3	Dec-28	4	Dec-29	48	26	1

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National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Current Location: Elev: 3649 ft. Lat: 33.3075° N Lon: -104.5083° W

Station: **ROSWELL INDUSTRIAL AIR PARK, NM US USW00023009**

Date	Temperature (Fahrenheit)			Degree Days (Base 65 degrees)		Extremes				Number of Days			
Elem->	TAVG	TMAX	TMIN	HTDD	CLDD	EMXT		EMNT		DX90	DX32	DT32	DT00
Year	Annual Mean Temp	Mean Max Temp	Mean Min Temp	Heating Degree Days	Cooling Degree Days	Extreme Max Temp	Date of Occurrence	Extreme Min Temp	Date of Occurrence	Max Temp >= 90F	Max Temp <= 32F	Min Temp <= 32F	Min Temp <= 0F
1995	63.0	77.7	48.3	2711	1974	111	Jul-27	19+	Dec-10	103	1	68	0
1996	62.7	78.0	47.3	2842	2186	108+	Jun-20	8+	Dec-19	110	4	94	0
1997	59.1	73.3	44.9	3429	1718	105	Jun-30	0	Dec-28	90	9	98	1
1998	61.5	76.9	46.2	3830	2102	110	Jun-28	11	Dec-22	128	2	84	0
1999	61.5	77.2	45.7	2876	1650	104	Jun-30	13	Dec-15	98	0	83	0
2000	62.4	77.8	47.1	2800	2263	107	May-24	11	Jan-04	131	2	99	0
2001	62.0	76.9	47.1	3605	2093	105	Jun-11	12	Jan-19	113	3	85	0
2002	61.6	76.1	47.2	3033	2095	107+	Aug-26	9	Mar-03	112	2	88	0
2003	62.9	78.0	47.6	3064	2008	106+	Jul-14	13	Dec-29	102	0	81	0
2004	60.6	73.8	47.4	2979	1674	104	Jun-15	7	Dec-25	88	4	76	0
2005	61.7	76.5	46.8	3314	1928	108	Jul-03	4	Dec-08	102	1	71	0
2006	62.4	77.6	47.2	2772	1998	108	Jun-15	12	Jan-10	93	0	89	0
2007	61.0	75.7	46.4	3468	1821	107	Aug-20	14	Jan-21	98	2	91	0
2008	61.4	77.3	45.5	2933	1765	106+	Jun-16	13+	Dec-22	85	0	102	0
2009	61.5	77.3	45.7	2993	1910	105	Jul-20	10	Dec-04	109	3	107	0
2010	61.1	76.5	45.7	3590	1894	110	Jun-05	9	Jan-09	100	2	102	0
2011	62.5	79.3	45.7	2994	2429	109	Jun-26	-11	Feb-04	136	8	99	2
2012	63.8	80.3	47.4	3048	2309	108	Jun-18	12+	Dec-29	141	0	88	0
2013	61.7	76.7	46.6	3041	2132	109	Jun-26	14	Jan-02	113	7	99	0
2014	61.3	76.4	46.2	3315	1887	106	Jun-29	8+	Nov-17	102	7	98	0
2015	61.7	76.6	46.8	3276	2042	107	Aug-06	4	Dec-29	113	9	87	0
2016	62.6	78.3	46.8	3078	2025	110	Jul-11	6	Dec-18	110	3	84	0
2017	63.9	79.7	48.2	2478	2130	110	Jun-17	2	Jan-07	115	2	69	0
2018	63.1	78.3	47.9	2779	2416	109	Jun-22	8	Jan-02	126	2	88	0

(blank) Data element not reported or missing.

+ Occurred on one or more previous dates during the month. The date in the Date field is the last day of occurrence.

A Accumulated amount.

T Trace amount

GSOM (Global Summary of the Month) documentation

I. Description

The Global Summary of the Month (GSOM) dataset includes climate data for thousands of locations worldwide. Data files contain over 50 climatological variables computed from the summary of the day observations of the Global Historical Climatology Network Daily dataset (GHCN-D). A description of each of these is included below. GSOM data can be accessed at https://www.ncdc.noaa.gov/cdo-web/search?datasetid=GSOM or for bulk delivery at https://www.ncei.noaa.gov/data/gsom.

II. Format/Observation Definitions

Users are given the choice between the following two delivery formats:

1) Portable Document Format (PDF) output. All units are standard.

2) CSV file for use in spreadsheet applications. Users will be able to choose between standard or metric units with this option.

A. Data observations

Each record represents all selected observations (i.e. elements) available for a given station-month. The initial section of each record is ordered as follows with the following definitions:

STATION (11 characters) is the station identification code.

STATION_NAME (max 50 characters) is the name of the station (usually city/airport name). This is an optional output field.

LATITUDE (8 characters) is the latitude (decimated degrees w/Northern Hemisphere values > 0). This is an optional output field.

LONGITUDE (9 characters) is the longitude (decimated degrees w/Western Hemisphere values < 0 and Eastern Hemisphere values > 0). This is an optional output field.

ELEVATION (13 characters) is the elevation above mean sea level in meters (to nearest thousandth of a meter). This is an optional output field.

DATE is the year of the record (4 digits) followed by a month (2 digits).

GHCN-Daily Dataset Measurement Flag (M) These flags that pertain to temperature, precipitation and wind measurement are given in the attribute fields following many of the data variables described below as noted.

Blank = no measurement information applicable

A = value in precipitation or snow is a multi-day total, accumulated since last measurement (used on Daily Form pdf file)
B = precipitation total formed from two twelve-hour totals
D = precipitation total formed from four six-hour totals
H = represents highest or lowest hourly temperature (TMAX or TMIN) or average of hourly values (TAVG)
K = converted from knots
L = temperature appears to be lagged with respect to reported hour of observation
O = converted from oktas
P = identified as "missing presumed zero" in DSI 3200 and 3206
T = trace of precipitation, snowfall, or snow depth
W = converted from 16-point WBAN code (for wind direction)

Table A (variables)

AWND – Monthly Average Wind Speed. Given in miles per hour for PDF output and miles per hour or meters per second depending on user specification for CSV output. Missing if more than 5 days within the month are missing or flagged or if more than 3 consecutive values within the month are missing or flagged.

AWND_ATTRIBUTES – a,S where:

a = DaysMissing (Numeric value): The number of days (from 1 to 5) missing or flagged is provided
S = GHCN-Daily Dataset Source Code (values are given below in Table B)

CDSD – Cooling Degree Days (season-to-date). Running total of monthly cooling degree days through the end of the most recent month. Each month is summed to produce a season-to-date total. Season starts in January in Northern Hemisphere and July in Southern Hemisphere. Given in Fahrenheit degrees in PDF output and Celsius or Fahrenheit degrees depending on user specification in CSV output.

CDSD_ATTRIBUTES – S where:

S = GHCN-Daily Dataset Source Code (values are given below in Table B)

CLDD - Cooling Degree Days. Computed when daily average temperature is more than 65 degrees Fahrenheit/18.3 degrees Celsius. CDD = mean daily temperature - 65 degrees Fahrenheit/18.3 degrees Celsius. Each day is summed to produce a monthly total. Given in Fahrenheit units on PDF output. CSV output is Fahrenheit or Celsius units depending on user specification.

CLDD_ATTRIBUTES – a,S where:

a = DaysMissing (Numeric value): The number of days (from 1 to 5) missing or flagged is provided
S = GHCN-Daily Dataset Source Code (values are given below in Table B)

DP01 – Number of days with >= 0.01 inch/0.254 millimeter in the month

DP01_ATTRIBUTES – a,S where:

a = DaysMissing (Numeric value): The number of days (from 1 to 5) missing or flagged is provided
S = GHCN-Daily Dataset Source Code (values are given below in Table B)

DP10 – Number of days with >= 0.1 inch/2.54 millimeters in the month.

DP10_ATTRIBUTES – a,S where:

a = DaysMissing (Numeric value): The number of days (from 1 to 5) missing or flagged is provided
S = GHCN-Daily Dataset Source Code (values are given below in Table B)

DP1X – Number of days with >= 1 inch/25.4 millimeters in the month.

DP1X_ATTRIBUTES – a,S where:

a = DaysMissing (Numeric value): The number of days (from 1 to 5) missing or flagged is provided
S = GHCN-Daily Dataset Source Code (values are given below in Table B)

DSND – Number of days with snow depth >= 1 inch/25 millimeters.

DSND_ATTRIBUTES – a,S where:

a = DaysMissing (Numeric value): The number of days (from 1 to 5) missing or flagged is provided
S = GHCN-Daily Dataset Source Code (values are given below in Table B)

DSNW – Number of days with snowfall >= 1 inch/25 millimeters.

DSNW_ATTRIBUTES – a,S where:

a = DaysMissing (Numeric value): The number of days (from 1 to 5) missing or flagged is provided
S = GHCN-Daily Dataset Source Code (values are given below in Table B)

DT00 – Number of days with maximum temperature <= 0 degrees Fahrenheit/-17.8 degrees Celsius.

DT00_ATTRIBUTES – a,S where:

a = DaysMissing (Numeric value): The number of days (from 1 to 5) missing or flagged is provided
S = GHCN-Daily Dataset Source Code (values are given below in Table B)

DT32 – Number of days with maximum temperature <= 32 degrees Fahrenheit/0 degrees Celsius.

DT32_ATTRIBUTES – a,S where:

a = DaysMissing (Numeric value): The number of days (from 1 to 5) missing or flagged is provided
S = GHCN-Daily Dataset Source Code (values are given below in Table B)

DX32 – Number of days with maximum temperature <= 32 degrees Fahrenheit/0 degrees Celsius.
DX32_ATTRIBUTES – a,S where:

a = DaysMissing (Numeric value): The number of days (from 1 to 5) missing or flagged is provided
S = GHCN-Daily Dataset Source Code (values are given below in Table B)

DX70 – Number of days with maximum temperature <= 70 degrees Fahrenheit/21.1 degrees Celsius.

DX70_ATTRIBUTES – a,S where:

a = DaysMissing (Numeric value): The number of days (from 1 to 5) missing or flagged is provided
S = GHCN-Daily Dataset Source Code (values are given below in Table B)

DX90 – Number of days with maximum temperature >= 90 degrees Fahrenheit/32.2 degrees Celsius.

DX90_ATTRIBUTES – a,S where:

a = DaysMissing (Numeric value): The number of days (from 1 to 5) missing or flagged is provided
S = GHCN-Daily Dataset Source Code (values are given below in Table B)

EMNT – Extreme minimum temperature for month. Lowest daily minimum temperature for the month. Given in Fahrenheit units on PDF output. CSV output is Fahrenheit or Celsius units depending on user specification.

EMNT_ATTRIBUTES – a,S,cc,d where:

a = DaysMissing (Numeric value): The number of days (from 1 to 5) missing or flagged is provided
S = GHCN-Daily Dataset Source Code (values are given below in Table B)
cc = two-digit date during the month when the EMNT value occurred (always latest date if more than one occurrence)
d = + if there is more than one date of occurrence, blank if only one date of occurrence

EMSD – Highest daily snow depth in the month. Given in inches for PDF output. CSV output is in inches or millimeters depending on user specification.

EMSD_ATTRIBUTES – a,M,S,cc,d where:

a = DaysMissing (Numeric value): The number of days (from 1 to 5) missing or flagged is provided
M = GHCN-Daily Dataset Measurement Flag (values are given below in Table C)
S = GHCN-Daily Dataset Source Code (values are given below in Table B)
cc = two-digit date during the month when the EMNT value occurred (always latest date if more than one occurrence)

d = + if there is more than one date of occurrence, blank if only one date of occurrence

EMSN – Highest daily snowfall in the month. Given in inches for PDF output. CSV output is in inches or millimeters depending on user specification.

EMSN_ATTRIBUTES – a,M,S,cc,d where:

a = DaysMissing (Numeric value): The number of days (from 1 to 5) missing or flagged is provided
M = GHCN-Daily Dataset Measurement Flag (values are given below in Table C)
S = GHCN-Daily Dataset Source Code (values are given below in Table B)
cc = two-digit date during the month when the EMNT value occurred (always latest date if more than one occurrence)
d = + if there is more than one date of occurrence, blank if only one date of occurrence

EMXP – Highest daily total of precipitation in the month. Given in inches for PDF output. CSV output is in inches or millimeters depending on user specification.

EMXP_ATTRIBUTES – a,M,S,cc,d where:

a = DaysMissing (Numeric value): The number of days (from 1 to 5) missing or flagged is provided
M = GHCN-Daily Dataset Measurement Flag (values are given below in Table C)
S = GHCN-Daily Dataset Source Code (values are given below in Table B)
cc = two-digit date during the month when the EMNT value occurred (always latest date if more than one occurrence)
d = + if there is more than one date of occurrence, blank if only one date of occurrence

EMXT – Extreme maximum temperature for month. Highest daily maximum temperature for the month. Given in Fahrenheit units on PDF output. CSV output is Fahrenheit or Celsius units depending on user specification.

EMXT_ATTRIBUTES – a,S,cc,d where:

a = DaysMissing (Numeric value): The number of days (from 1 to 5) missing or flagged is provided
S = GHCN-Daily Dataset Source Code (values are given below in Table B)
cc = two-digit date during the month when the EMNT value occurred (always latest date if more than one occurrence)
d = + if there is more than one date of occurrence, blank if only one date of occurrence

EVAP – Total Monthly Evaporation. Given in inches for PDF output. CSV output is in inches or millimeters depending on user specification. Measurement Flags: T is used for trace amount, *a* is used for any accumulation within a month that includes missing days. If no days are missing, no flag is used. Source Flag: Source flag from GHCN-Daily (see separate documentation for GHCN-Daily). Days Miss Flag: Number of days missing or flagged.

EVAP_ATTRIBUTES = a,M,Q,S where:

a = DaysMissing (Numeric value): The number of days (from 1 to 5) missing or flagged is provided
M = GHCN-Daily Dataset Measurement Flag (values are given below in Table C)

Q = GHCN-Daily Dataset Quality Flag (values are given below in Table D)
S = GHCN-Daily Dataset Source Code (values are given below in Table B)

HDSD – Heating Degree Days (season-to-date). Running total of monthly heating degree days through the end of the most recent month. Each month is summed to produce a season-to-date total. Season starts in July in Northern Hemisphere and January in Southern Hemisphere. Given in Fahrenheit degrees in PDF output and Celsius or Fahrenheit degrees depending on user specification in CSV output.

HDSD_ATTRIBUTES – S where:

S = GHCN-Daily Dataset Source Code (values are given below in Table B)

HNyz – Highest minimum soil temperature for the month. Given in Fahrenheit for PDF output and Fahrenheit or Celsius depending on user specification for CSV output. Missing if more than 5 days within the month are missing or flagged or if more than 3 consecutive values within the month are missing or flagged. Note: "yz" portion of variable name correspond with values in Table E below.

HNyz_ATTRIBUTES = a,M,Q,S,y,z where:

a = DaysMissing (Numeric value): The number of days (from 1 to 5) missing or flagged is provided
M = GHCN-Daily Dataset Measurement Flag (values are given below in Table C)
Q = GHCN-Daily Dataset Quality Flag (values are given below in Table D)
S = GHCN-Daily Dataset Source Code (values are given below in Table B)
y = ground cover code (see table E below)
z = soil depth code (see table E below)

HTDD - Heating Degree Days. Computed when daily average temperature is less than 65 degrees Fahrenheit/18.3 degrees Celsius. HDD = 65(F)/18.3(C) – mean daily temperature. Each day is summed to produce a monthly total. Given in Fahrenheit units on PDF output. CSV output is Fahrenheit or Celsius units depending on user specification.

HTDD_ATTRIBUTES – a,S where:

a = DaysMissing (Numeric value): The number of days (from 1 to 5) missing or flagged is provided
S = GHCN-Daily Dataset Source Code (values are given below in Table B)

HXyz – Highest maximum soil temperature for the month. Given in Fahrenheit for PDF output and Fahrenheit or Celsius depending on user specification for CSV output. Missing if more than 5 days within the month are missing or flagged or if more than 3 consecutive values within the month are missing or flagged. Note: "yz" portion of variable name correspond with values in Table E below.

HXyz_ATTRIBUTES = a,M,Q,S,y,z where:

a = DaysMissing (Numeric value): The number of days (from 1 to 5) missing or flagged is provided
M = GHCN-Daily Dataset Measurement Flag (values are given below in Table C)
Q = GHCN-Daily Dataset Quality Flag (values are given below in Table D)
S = GHCN-Daily Dataset Source Code (values are given below in Table B)

y = ground cover code (see table E below)
z = soil depth code (see table E below)

LNyz – Lowest minimum soil temperature for the month. Given in Fahrenheit for PDF output and Fahrenheit or Celsius depending on user specification for CSV output. Missing if more than 5 days within the month are missing or flagged or if more than 3 consecutive values within the month are missing or flagged. Note: "yz" portion of variable name correspond with values in Table E below.

LNyz_ATTRIBUTES = a,M,Q,S,y,z where:

a = DaysMissing (Numeric value): The number of days (from 1 to 5) missing or flagged is provided
M = GHCN-Daily Dataset Measurement Flag (values are given below in Table C)
Q = GHCN-Daily Dataset Quality Flag (values are given below in Table D)
S = GHCN-Daily Dataset Source Code (values are given below in Table B)
y = ground cover code (see table E below)
z = soil depth code (see table E below)

LXyz – Lowest maximum soil temperature for the month. Given in Fahrenheit for PDF output and Fahrenheit or Celsius depending on user specification for CSV output. Missing if more than 5 days within the month are missing or flagged or if more than 3 consecutive values within the month are missing or flagged. Note: "yz" portion of variable name correspond with values in Table E below.

LXyz_ATTRIBUTES = a,M,Q,S,y,z where:

a = DaysMissing (Numeric value): The number of days (from 1 to 5) missing or flagged is provided
M = GHCN-Daily Dataset Measurement Flag (values are given below in Table C)
Q = GHCN-Daily Dataset Quality Flag (values are given below in Table D)
S = GHCN-Daily Dataset Source Code (values are given below in Table B)
y = ground cover code (see table E below)
z = soil depth code (see table E below)

MNPN – Monthly Mean Minimum Temperature of evaporation pan water. Given in Fahrenheit units for PDF output and Celsius or Fahrenheit units in CSV output depending on user specification. Missing if more than 5 days within the month are missing or flagged or if more than 3 consecutive values within the month are missing or flagged.

MNPN_ATTRIBUTES = a,M,Q,S where:

a = DaysMissing (Numeric value): The number of days (from 1 to 5) missing or flagged is provided
M = GHCN-Daily Dataset Measurement Flag (values are given below in Table C)
Q = GHCN-Daily Dataset Quality Flag (values are given below in Table D)
S = GHCN-Daily Dataset Source Code (values are given below in Table B)

MNyz – Monthly Mean of daily minimum soil temperature. Given in Fahrenheit for PDF output and Fahrenheit or Celsius depending on user specification for CSV output. Missing if more than 5 days within the month are missing or flagged or if more than 3 consecutive values within the month are missing or flagged.

MNyz_ATTRIBUTES = a,M,Q,S,y,z where:

a = DaysMissing (Numeric value): The number of days (from 1 to 5) missing or flagged is provided
M = GHCN-Daily Dataset Measurement Flag (values are given below in Table C)
Q = GHCN-Daily Dataset Quality Flag (values are given below in Table D)
S = GHCN-Daily Dataset Source Code (values are given below in Table B)
y = ground cover code (see table E below)
z = soil depth code (see table E below)

MXPN – Monthly Mean Maximum Temperature of evaporation pan water. Given in Fahrenheit units for PDF output and Celsius or Fahrenheit units in CSV output depending on user specification. Missing if more than 5 days within the month are missing or flagged or if more than 3 consecutive values within the month are missing or flagged.

MXPN_ATTRIBUTES = a,M,Q,S where:

a = DaysMissing (Numeric value): The number of days (from 1 to 5) missing or flagged is provided
M = GHCN-Daily Dataset Measurement Flag (values are given below in Table C)
Q = GHCN-Daily Dataset Quality Flag (values are given below in Table D)
S = GHCN-Daily Dataset Source Code (values are given below in Table B)

MXyz – Monthly Mean of daily maximum soil temperature. Given in Fahrenheit for PDF output and Fahrenheit or Celsius depending on user specification for CSV output. Missing if more than 5 days within the month are missing or flagged or if more than 3 consecutive values within the month are missing or flagged.

MXyz_ATTRIBUTES = a,M,Q,S,y,z where:

a = DaysMissing (Numeric value): The number of days (from 1 to 5) missing or flagged is provided
M = GHCN-Daily Dataset Measurement Flag (values are given below in Table C)
Q = GHCN-Daily Dataset Quality Flag (values are given below in Table D)
S = GHCN-Daily Dataset Source Code (values are given below in Table B)
y = ground cover code (see table E below)
z = soil depth code (see table E below)

PRCP – Total Monthly Precipitation. Given in inches for PDF output. CSV output is in inches or millimeters depending on user specification. Measurement Flags: T is used for trace amount, a is used for any accumulation within a month that includes missing days. If no days are missing, no flag is used.

PRCP_ATTRIBUTES = a,M,Q,S where:

a = DaysMissing (Numeric value): The number of days (from 1 to 5) missing or flagged is provided
M = GHCN-Daily Dataset Measurement Flag (values are given below in Table C)
Q = GHCN-Daily Dataset Quality Flag (values are given below in Table D)
S = GHCN-Daily Dataset Source Code (values are given below in Table B)

PSUN – Monthly Average of the daily percents of possible sunshine.

PSUN_ATTRIBUTES – a,S where:

a = DaysMissing (Numeric value): The number of days (from 1 to 5) missing or flagged is provided
S = GHCN-Daily Dataset Source Code (values are given below in Table B)

SNOW – Total Monthly Snowfall. Given in inches for PDF output. CSV output is in inches or millimeters depending on user specification. Measurement Flags: T is used for trace amount, *a* is used for any accumulation within a month that includes missing days. If no days are missing, no flag is used. Source Flag: Source flag from GHCN-Daily (see separate documentation for GHCN-Daily). Days Miss Flag: Number of days missing or flagged.

SNOW_ATTRIBUTES = a,M,Q,S where:

a = DaysMissing (Numeric value): The number of days (from 1 to 5) missing or flagged is provided
M = GHCN-Daily Dataset Measurement Flag (values are given below in Table C)
Q = GHCN-Daily Dataset Quality Flag (values are given below in Table D)
S = GHCN-Daily Dataset Source Code (values are given below in Table B)

TAVG – Average Monthly Temperature. Computed by adding the unrounded monthly/annual maximum and minimum temperatures and dividing by 2. Fahrenheit units on PDF output. CSV output is Fahrenheit or Celsius units depending on user specification. Missing if more than 5 days within the month are missing or flagged or if more than 3 consecutive values within the month are missing or flagged.

TAVG_ATTRIBUTES – a,S where:

a = DaysMissing (Numeric value): The number of days (from 1 to 5) missing or flagged is provided
S = GHCN-Daily Dataset Source Code (values are given below in Table B)

TMAX – Monthly Maximum Temperature. Average of daily maximum temperature given in Fahrenheit on PDF output. CSV output is given in Fahrenheit or Celsius depending on user specification. Missing if more than 5 days within the month are missing or flagged or if more than 3 consecutive values within the month are missing or flagged.

TMAX_ATTRIBUTES = a,M,Q,S where:

a = DaysMissing (Numeric value): The number of days (from 1 to 5) missing or flagged is provided
M = GHCN-Daily Dataset Measurement Flag (values are given below in Table C)
Q = GHCN-Daily Dataset Quality Flag (values are given below in Table D)
S = GHCN-Daily Dataset Source Code (values are given below in Table B)

TMIN – Monthly Minimum Temperature. Average of daily minimum temperature given in Fahrenheit units on PDF output. CSV output is given in Fahrenheit or Celsius units depending on user specification. Missing if more than 5 days within the month are missing or flagged or if more than 3 consecutive values within the month are missing or flagged.

TMIN_ATTRIBUTES = a,M,Q,S where:

a = DaysMissing (Numeric value): The number of days (from 1 to 5) missing or flagged is provided

M = GHCN-Daily Dataset Measurement Flag (values are given below in Table C)
Q = GHCN-Daily Dataset Quality Flag (values are given below in Table D)
S = GHCN-Daily Dataset Source Code (values are given below in Table B)

TSUN – Monthly total sunshine in minutes.

TSUN_ATTRIBUTES – a,S where:

a = DaysMissing (Numeric value): The number of days (from 1 to 5) missing or flagged is provided
S = GHCN-Daily Dataset Source Code (values are given below in Table B)

WDF1 – Wind Direction for Maximum Wind Speed/Fastest 1-Minute (WSF1). Given in 360-degree compass point directions (e.g. 360 = north, 180 = south, etc.). Missing if more than 5 days within the month are missing or flagged or if more than 3 consecutive values within the month are missing or flagged.

WDF1_ATTRIBUTES – a,S where:

a = DaysMissing (Numeric value): The number of days (from 1 to 5) missing or flagged is provided
S = GHCN-Daily Dataset Source Code (values are given below in Table B)

WDF2 – Wind Direction for Maximum Wind Speed/Fastest 2-Minute (WSF2). Given in 360-degree compass point directions (e.g. 360 = north, 180 = south, etc.). Missing if more than 5 days within the month are missing or flagged or if more than 3 consecutive values within the month are missing or flagged.

WDF2_ATTRIBUTES – a,S where:

a = DaysMissing (Numeric value): The number of days (from 1 to 5) missing or flagged is provided
S = GHCN-Daily Dataset Source Code (values are given below in Table B)

WDF5 – Wind Direction for Peak Wind Gust Speed – Fastest 5-second (WSF5). Given in 360-degree compass point directions (e.g. 360 = north, 180 = south, etc.). Missing if more than 5 days within the month are missing or flagged or if more than 3 consecutive values within the month are missing or flagged.

WDF5_ATTRIBUTES – a,S where:

a = DaysMissing (Numeric value): The number of days (from 1 to 5) missing or flagged is provided
S = GHCN-Daily Dataset Source Code (values are given below in Table B)

WDFG – Wind Direction for Peak Wind Gust Speed (WSFG). Given in 360-degree compass point directions (e.g. 360 = north, 180 = south, etc.). Missing if more than 5 days within the month are missing or flagged or if more than 3 consecutive values within the month are missing or flagged.

WDFG_ATTRIBUTES – a,S where:

a = DaysMissing (Numeric value): The number of days (from 1 to 5) missing or flagged is provided

S = GHCN-Daily Dataset Source Code (values are given below in Table B)

WDFI –Direction of highest instantaneous wind speed (WDFI). Given in 360-degree compass point directions (e.g. 360 = north, 180 = south, etc.). Missing if more than 5 days within the month are missing or flagged or if more than 3 consecutive values within the month are missing or flagged.

WDFI_ATTRIBUTES – a,S where:

a = DaysMissing (Numeric value): The number of days (from 1 to 5) missing or flagged is provided
S = GHCN-Daily Dataset Source Code (values are given below in Table B)

WDFM – Wind Direction for Maximum Wind Speed/Fastest Mile (WSFM). Given in 360-degree compass point directions (e.g. 360 = north, 180 = south, etc.).

WDFM_ATTRIBUTES – a,S where:

a = DaysMissing (Numeric value): The number of days (from 1 to 5) missing or flagged is provided
S = GHCN-Daily Dataset Source Code (values are given below in Table B)

WDMV – Total Monthly Wind Movement over evaporation pan. Given in miles for PDF output and miles or kilometers depending on user specification for CSV output.

WDMV_ATTRIBUTES = a,M,Q,S where:

a = DaysMissing (Numeric value): The number of days (from 1 to 5) missing or flagged is provided
M = GHCN-Daily Dataset Measurement Flag (values are given below in Table C)
Q = GHCN-Daily Dataset Quality Flag (values are given below in Table D)
S = GHCN-Daily Dataset Source Code (values are given below in Table B)

WSF1 - Maximum Wind Speed/Fastest 1-minute. Maximum wind speed for the month reported as the fastest 1-minute. Given in miles per hour for PDF output and miles per hour or meters per second depending on user specification for CSV output. Missing if more than 5 days within the month are missing or flagged or if more than 3 consecutive values within the month are missing or flagged.

WSF1_ATTRIBUTES – a,S where:

a = DaysMissing (Numeric value): The number of days (from 1 to 5) missing or flagged is provided
S = GHCN-Daily Dataset Source Code (values are given below in Table B)

WSF2 – Maximum Wind Speed/Fastest 2-minute. Maximum wind speed for the month reported as the fastest 2-minute. Given in miles per hour for PDF output and miles per hour or meters per second depending on user specification for CSV output. Missing if more than 5 days within the month are missing or flagged or if more than 3 consecutive values within the month are missing or flagged.

WSF2_ATTRIBUTES – a,S where:

a = DaysMissing (Numeric value): The number of days (from 1 to 5) missing or flagged is provided
S = GHCN-Daily Dataset Source Code (values are given below in Table B)

WSF5 – Peak Wind Gust Speed – Fastest 5-second wind. Maximum wind gust for the month. Given in miles per hour for PDF output and miles per hour or meters per second depending on user specification for CSV output. Missing if more than 5 days within the month are missing or flagged or if more than 3 consecutive values within the month are missing or flagged.

WSF5_ATTRIBUTES – a,S where:

a = DaysMissing (Numeric value): The number of days (from 1 to 5) missing or flagged is provided
S = GHCN-Daily Dataset Source Code (values are given below in Table B)

WSFG – Peak Wind Gust Speed. Maximum wind gust for the month. Given in miles per hour for PDF output and miles per hour or meters per second depending on user specification for CSV output. Missing if more than 5 days within the month are missing or flagged or if more than 3 consecutive values within the month are missing or flagged.

WSFG_ATTRIBUTES – a,S where:

a = DaysMissing (Numeric value): The number of days (from 1 to 5) missing or flagged is provided
S = GHCN-Daily Dataset Source Code (values are given below in Table B)

WSFI – Highest instantaneous wind speed for the month. Given in miles per hour for PDF output and miles per hour or meters per second depending on user specification for CSV output. Missing if more than 5 days within the month are missing or flagged or if more than 3 consecutive values within the month are missing or flagged.

WSFI_ATTRIBUTES – a,S where:

a = DaysMissing (Numeric value): The number of days (from 1 to 5) missing or flagged is provided
S = GHCN-Daily Dataset Source Code (values are given below in Table B)

WSFM – Maximum Wind Speed/Fastest Mile. Maximum wind speed for the month reported as the fastest mile. Given in miles per hour for PDF output and miles per hour or meters per second depending on user specification for CSV output. Missing if more than 5 days within the month are missing or flagged or if more than 3 consecutive values within the month are missing or flagged.

WSFM_ATTRIBUTES – a,S where:

a = DaysMissing (Numeric value): The number of days (from 1 to 5) missing or flagged is provided
S = GHCN-Daily Dataset Source Code (values are given below in Table B)

Table B - GHCN-Daily Dataset Source Codes:

Blank = No source (i.e., data value missing)
0 = U.S. Cooperative Summary of the Day (NCDC DSI-3200)
6 = CDMP Cooperative Summary of the Day (NCDC DSI-3206)
7 = U.S. Cooperative Summary of the Day -- Transmitted via WxCoder3 (NCDC DSI-3207)

A = U.S. Automated Surface Observing System (ASOS)
real-time data (since January 1, 2006)
a = Australian data from the Australian Bureau of Meteorology
B = U.S. ASOS data for October 2000-December 2005 (NCDC DSI-3211)
b = Belarus update
C = Environment Canada
E = European Climate Assessment and Dataset (Klein Tank et al., 2002)
F = U.S. Fort data
G = Official Global Climate Observing System (GCOS) or other government-supplied data
H = High Plains Regional Climate Center real-time data
I = International collection (non U.S. data received through personal contacts)
K = U.S. Cooperative Summary of the Day data digitized from paper observer forms
(from 2011 to present)
M = Monthly METAR Extract (additional ASOS data)
N = Community Collaborative Rain, Hail,and Snow (CoCoRaHS)
Q = Data from several African countries that had been "quarantined", that is, withheld from
public release until permission was granted from the respective meteorological services
R = NCEI Reference Network Database (Climate Reference Network and Regional Climate
Reference Network)
r = All-Russian Research Institute of Hydrometeorol Information-World Data Center
S = Global Summary of the Day (NCDC DSI-9618)

NOTE: "S" values are derived from hourly synoptic reports
exchanged on the Global Telecommunications System (GTS).
Daily values derived in this fashion may differ significantly
from "true" daily data, particularly for precipitation (i.e., use with caution).

s = China Meteorological Administration/National Meteorological Information Center/
Climatic Data Center (http://cdc.cma.gov.cn)
T = SNOwpack TELemtry (SNOTEL) data obtained from the U.S. Department of Agriculture's Natural
Resources Conservation Service
U = Remote Automatic Weather Station (RAWS) data obtained from the Western Regional
Climate Center
u = Ukraine update
W = WBAN/ASOS Summary of the Day from NCDC's Integrated Surface Data (ISD).
X = U.S. First-Order Summary of the Day (NCDC DSI-3210)
Z = Datzilla official additions or replacements
z = Uzbekistan update

Table C - GHCN-Daily Dataset Measurement Flags:

Blank = no measurement information applicable
B = precipitation total formed from two 12-hour totals
D = precipitation total formed from four six-hour totals
H = represents highest or lowest hourly temperature (TMAX or TMIN)
or the average of hourly values (TAVG)
K = converted from knots

L = temperature appears to be lagged with respect to reported hour of observation
O = converted from oktas
P = identified as "missing presumed zero" in DSI 3200 and 3206
T = trace of precipitation, snowfall, or snow depth
W = converted from 16-point WBAN code (for wind direction)

Table D - GHCN-Daily Dataset Quality Flags (as of 1/9/2017):

Blank = did not fail any quality assurance check
D = failed duplicate check
G = failed gap check
I = failed internal consistency check
K = failed streak/frequent-value check
L = failed check on length of multiday period
M = failed megaconsistency check
N = failed naught check
O = failed climatological outlier check
R = failed lagged range check
S = failed spatial consistency check
T = failed temporal consistency check
W = temperature too warm for snow
X = failed bounds check
Z = flagged as a result of an official Datzilla investigation

Table E – Ground cover code (y) and soil depth code (z) for HXyz, HNyz, LXyz, LNyz, MNYZ and MXYZ

Y (ground cover):
1 = grass
2 = fallow
3 = bare ground
4 = brome grass
5 = sod
6 = straw mulch
7 = grass muck
8 = bare muck
0 = unknown

Z (soil depth):
1 = 2 inches or 5 centimeters depth
2 = 4 inches or 10 centimeters depth
3 = 8 inches or 20 centimeters depth
4 = 20 inches or 50 centimeters depth
5 = 40 inches or 100 centimeters depth
6 = 60 inches or 150 centimeters depth
7 = 72 inches or 180 centimeters depth
0 = unknown

Attachment E

Liner System Design Calculations

Attachment E1

Settlement and Liner Stress Calculations

CALCULATIONS BY: Deep K. Khatri, P.E. (TX) – Senior Staff Geotechnical Engineer
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PURPOSE

This calculation package includes settlement analyses for the proposed North Ranch landfill to be located within Section 9 and 10 of T25S, R34E approximately 16 miles west of the City of Jal in Lea County, New Mexico. The settlement analyses include both foundation and waste settlements. The settlement analyses were performed to determine that the final cover slope, liner, and leachate collection system (after settlement) are consistent with the performance specifications of the project. The following calculations show the anticipated strains on the geosynthetic materials are less the allowable strains and the designed grades for final cover and leachate collection system will allow adequate drainage even after settlement.

METHOD OF ANALYSIS

The methodology for estimating settlements involves calculating settlements at multiple points and evaluating the resultant change in the designed grade and its impact on the landfill elements. Points were conservatively selected from a cross-section based on the thickness of waste material. The location of the cross-section is shown on the liner and final cover grading plans (Figures 1 and 2). The cross-section drawing and settlement location points are shown in Figure 3.

Foundation Soil Settlement

On-site (native) soils predominately consist of granular soils, medium to very dense sandy soils and strongly cemented, calcareous interbedded caliche materials in the upper approximately 2 to 65 feet of existing grades, underlain by sandstone extending to boring termination depths of 165 feet below existing grade. For granular soils, settlement is caused by the compression of the soil skeleton as the particles rearrange due to the applied loads. The immediate (elastic) settlement of the foundation soils was calculated using the following equation:

$$S = \Delta\sigma/M_s*H$$

where: S = elastic settlement of soil layer
H = thickness of soil layer
$\Delta\sigma$ = Applied Stress
M_s = constrained modulus of soils

Waste Material Settlements

The compression settlement of oil field wastes can be analyzed using the one-dimensional consolidation theory, commonly used for cohesive soils. Based on this theory, waste settlement has two components: settlement due to primary consolidation and settlement due to secondary consolidation. The primary settlement component of waste material is related to the increase in effective vertical stresses resulting from the additional waste material and landfill final cover system. The secondary settlement component is typically related to compression of the waste structure (skeleton) and is time-dependent.

Settlements resulting from primary consolidation of the waste were calculated using the general form of the 1-D consolidation theory settlement equation as given below [Holtz and Kovacs, 1981]:

$$Sp = Cer * H * log(\sigma'p/\sigma'vo) + Cec * H * log(\sigma'f\ /\sigma'p)$$

where: Sp = primary settlement
C_{ec} = primary compression index ratio
C_{er} = recompression index ratio
H = initial thickness of the waste layer before settlement
σ'_{vo} = initial effective pressure in the waste layer
σ'_{p} = effective pressure in the waste layer
σ'_{p} = pre-consolidation stress
σ'_{f} = final overburden pressure applied at the mid-level of the waste layer

The mechanisms for secondary settlement are mechanical creep, chemical reactions, and biodegradation. This type of compression is dependent on time, not applied loads. Settlements resulting from secondary settlement of the waste may be calculated according to the following equation [Qian, Koerner, and Gray, 2002]:

$$\Delta H_\alpha = C'_\alpha * H_o * log\frac{t_2}{t_1}$$

where: ΔH_α = long-term secondary settlement
C'_α = modified secondary compression index
t_2 = ending time of the time period for which long-term settlement of the layer is desired
t_1 = starting time of the time period for which long-term settlement of the layer is desire
t_1 = 1 year
t_2 = 30 years

However, from the best available information and discussions with the project team members, it is considered that waste materials for this landfill will typically be granular soils, contaminated silty sands/sands. Therefore, a secondary settlement of the waste material was neglected in our analyses.

Final Cover Settlement

Since (1) the waste material and foundation soils are permeable and will experience an immediate primary consolidation settlement under applied load, and (2) foundation soil settlement resulting from the final cover will be minimal, the total final cover settlement will be due to the primary compression of the waste material only with the increase in effective vertical stresses resulting from the final cover system. The settlement equation presented above for the waste material settlement calculation was used for the final cover settlement estimates.

Tensile Strains

The effects of waste settlement on the final cover and foundation settlement on the liner system were evaluated as described below.

Tensile strains in the final cover and the liner were estimated by the following general equation:

$$\varepsilon_{tens} = L_o - \frac{L_f}{L_o}$$

where: ε_{tens} = strain in the cover/liner (tension is negative)
L_o = initial length of cover/liner between adjacent points
L_f = length of cover/liner between adjacent points after settlement

MATERIAL PARAMETERS

The waste materials for this landfill are assumed to be granular soils, contaminated silty sands/sands. Based on the available typical compression parameters for sandy soils and our experience for similar waste materials and project, a compression index ratio C_{ec} of 0.014, a recompression index ratio Cer of about one-third of Cec, the total unit weight of 120 pcf, and a pre-consolidation pressure σ'_p of 1,000 psf were selected for the presented analyses. Based on the available typical compression parameters for native silty sands/sands and our experience for similar materials, a constrained modulus Ms of about 850 ksf was used for the foundation settlement estimate.

Table 1. Material Properties

Cover System	γ, pcf	120
Waste	γ, pcf	120
	$C_{c\varepsilon}$	0.014
	$C_{r\varepsilon}$	0.004
	σ'_p, psf	1,000
Foundation Soils-Silty Sands/Sands (Medium to Very Dense)	Ms, ksf	850

RESULTS

The foundation soil, waste, and final cover settlement estimates are presented in Tables 2, 3, and 4 respectively. The spreadsheet output that details settlement estimates for the foundation soil, waste, and final cover settlement are also included in Tables 2, 3, and 4, respectively.

SUMMARY AND CONCLUSIONS

Based on our calculations, the foundation soils will settle about 1.8 feet (max.) near area (Station 10+00) where foundation (native) soil is thick (no excavation was planned near this area) and about 1.2 feet (max.) for the remaining area. The estimated settlements resulted in a maximum grade change of 0.6% near Station 10+00 and minimal grade change for the remaining area. The required 2.0% slope of the leachate collection system will not adversely be affected by the foundation settlements. Additionally, a maximum tensile stress on the liner was estimated to be 0.1%, which was less than the allowable strain on the geosynthetic liner system.

The final cover will settle on the order of 1 inch due to compression of waste material, resulting from the increase in effective stress due to the placement of the final cover system. Grade changes induced by differential waste settlement were estimated to be minimal and the final cover system will maintain positive drainage on the side slopes. Additionally, negligible tensile strains are expected to develop in the final cover system due to waste settlement.

REFERENCES

Holtz, R. D., and Kovacs, W. D. (1981) An Introduction to Geotechnical Engineering, Prentice-Hall Inc., Englewood Cliffs, N.J.

Qian, X., Koerner, R. M., and Gray, D. H. (2002) “Geotechnical Aspects of Landfill Design and Construction” Prentice Hall, Upper Saddle River, NJ

LEGEND:

- 3300 — EXISTING GRADE CONTOURS (11-30-2018, 2' CONTOURS)
- 3300 — SUBGRADE CONTOURS (5' CONTOURS)
- 3300 — PERIMETER INFRASTRUCTURE CONTOURS (5' CONTOURS)
- SITE ROAD
- A8 — SETTLEMENT ANALYSIS POINT

NORTH STORMWATER POND

LEACHATE EVAP POND

CELL E-1 (9.6 AC.)

CELL E-2 (9.6 AC.)

CELL E-3 (28.2 AC.)

CELL E-4 (18.4 AC.)

CELL E-5 (18.6 AC.)

CELL E-6 (21.6 AC.)

CELL W-1 (15.3 AC.)

CELL W-2 (11.8 AC.)

CELL W-3 (15.2 AC.)

CELL W-4 (23.9 AC.)

CELL W-5 (24.7 AC.)

WEST STORMWATER POND

EAST STORMWATER POND

BATTLE AXE ROAD (HWY 2)

A0 A1 A2 A3 A4 A5 A6 A7 A8 A9 A10 A11 A12 A13 A14 A15 A16

N

SCALE IN FEET
500 0 250 500

FOR PERMITTING PURPOSES ONLY

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REV.	DATE	BY	DESCRIPTION

SITE EXCAVATION (CUT) PLAN

NORTH RANCH SURFACE WASTE MANAGEMENT FACILITY

NGL WATER SOLUTIONS PERMIAN, LLC

PERMIT APPLICATION DRAWING

LEA COUNTY NEW MEXICO

Terracon
Consulting Engineers and Scientists
25809 I-30 SOUTH BRYANT, AR 72022
PH: (501) 847-9292 FAX: (501) 847-9210

FIGURE 1

DESIGNED BY:	MPB
DRAWN BY:	DEW
APPVD. BY:	MPB
SCALE:	SEE SCALEBAR
DATE:	APRIL 2019
JOB NO.	35187378
ACAD NO.	572-002
SHEET NO.:	1 OF 3

LEGEND:

- 3300 — EXISTING GRADE CONTOURS (11/30/18)
- 3300 — PROTECTIVE COVER CONTOURS
- 3300 — PERIMETER INFRASTRUCTURE CONTOURS
- SITE ROAD
- A8 — SETTLEMENT ANALYSIS POINTS



N

500 0 250 500

SCALE IN FEET

REV	DATE	BY	DESCRIPTION

TOP OF WASTE FINAL

PERMIT DRAWING

SURFACE WASTE MANAGEMENT FACILITY

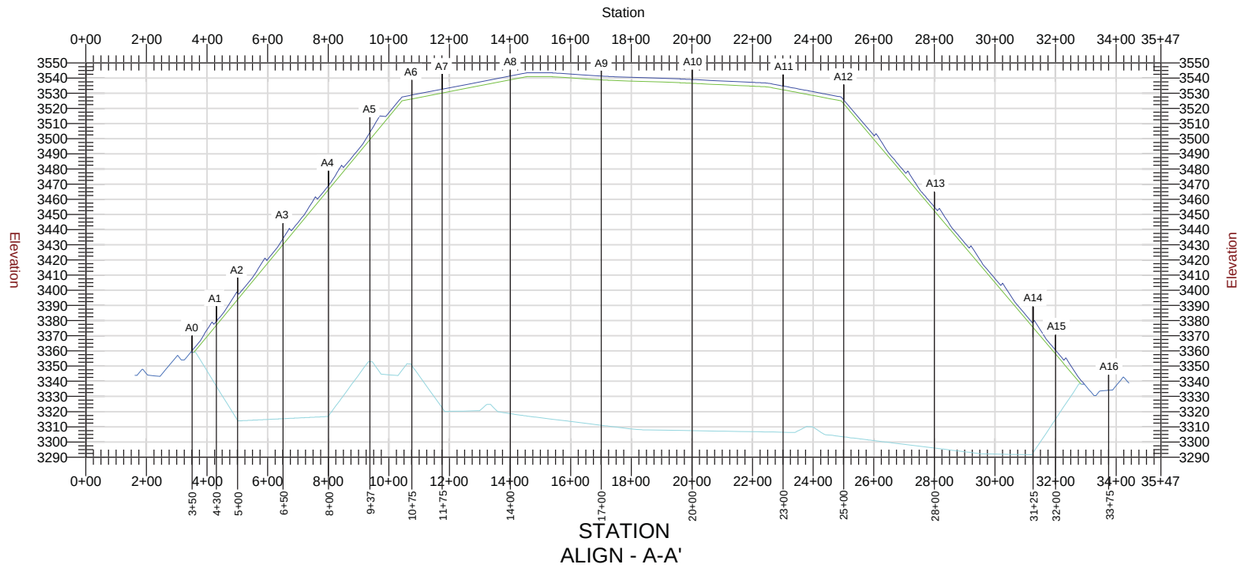
NORTH RANCH

LEA COUNTY NEW MEXICO

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FIGURE 2

DESIGNED BY:	MPB
DRAWN BY:	DEW
APPVD. BY:	MPB
SCALE:	SEE SCALEBAR
DATE:	APRIL 2019
JOB NO.	572-002-35187378
ACAD NO.	
SHEET NO.:	2 OF 3



STATION
ALIGN - A-A'

LEGEND:

- PROPOSED TOP OF FINAL COVER
- PROPOSED TOP OF WASTE
- PROPOSED TOP OF PROTECTIVE COVER
- PROPOSED TOP OF PERIMETER INFRASTRUCTURE
- PROPOSED INTERMEDIATE COVER
- A0 / 3+50 — SETTLEMENT ANALYSIS POINTS

NOTES:

1. OPERATIONAL = WASTE PLUS ROUTINE AND INTERIM SOIL COVER.

SCALES:
1" = 500' (HORIZONTAL)
1" = 100' (VERTICAL)
VERTICAL EXAGGERATION = x 5

500 0 250 500

SCALE IN FEET

REV.	DATE	BY	DESCRIPTION

FINAL GRADE CROSS-SECTIONS

PERMIT DRAWING

SURFACE WASTE MANAGEMENT FACILITY

NORTH RANCH

LEA COUNTY NEW MEXICO

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FAX: (501) 847-9210

FIGURE 3

DESIGNED BY:	MPB
DRAWN BY:	DEW
APPVD. BY:	MPB
SCALE:	SEE SCALEBAR
DATE:	APRIL 2019
JOB NO.	572-002-35187378
ACAD NO.	
SHEET NO.:	3 OF 3

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TABLE 2 FOUNDATION SOIL SETTLEMENT CALCULATIONS

Point	A0	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	A16
Station	3+50	4+30	5+00	6+50	8+00	9+37	10+75	11+75	14+00	17+00	20+00	23+00	25+00	28+00	31+25	32+00	33+75
Linear Horizontal Distance (ft.)	350	430	500	650	800	937	1075	1175	1400	1700	2000	2300	2500	2800	3125	3200	3375
Final Cover Elevation (ft.)	3360	3380	3395	3430	3465	3500	3530	3530	3540	3540	3540	3533	3530	3450	3380	3360	3340
Final Cover Above Waste (ft.)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Final Waste Elevation (ft.)	3356.5	3376.5	3391.5	3426.5	3461.5	3496.5	3526.5	3526.5	3536.5	3536.5	3536.5	3529.5	3526.5	3446.5	3376.5	3356.5	3336.5
Clay Liner Thickness (ft.)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Top of Clay Liner Elevation (ft.)	3356.5	3334	3312	3312	3314	3350	3350	3320	3318	3308	3305	3302	3300	3295	3290	3315	3336.5
Waste Thickness (ft.)	0.0	42.5	79.5	114.5	147.5	146.5	176.5	206.5	218.5	228.5	231.5	227.5	226.5	151.5	86.5	41.5	0.0
Unit Weight of Final Cover (pcf)	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120
Unit Weight of Waste (pcf)	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120
Applied Pressure (psf)	540	5640	10080	14280	18240	18120	21720	25320	26760	27960	28320	27840	27720	18720	10920	5520	540
Founfation Bedrock Elevation (ft.)	3279	3279	3279	3279	3279	3279	3279	3279	3279	3279	3279	3279	3279	3279	3279	3279	3279
Foundation-Sand Thickness (ft.)	76.5	54.0	32.0	32.0	34.0	70.0	70.0	40.0	38.0	28.0	25.0	22.0	20.0	15.0	10.0	35.0	56.5
Foundation- Sand Constrained Modulus (ksf)	850.0	850.0	850.0	850.0	850.0	850.0	850.0	850.0	850.0	850.0	850.0	850.0	850.0	850.0	850.0	850.0	850.0
SETTLEMENT																	
Settlement (ft.)	0.0	0.4	0.4	0.5	0.7	1.5	1.8	1.2	1.2	0.9	0.8	0.7	0.7	0.3	0.1	0.2	0.0
Settlement (in.)	0.6	4.3	4.6	6.5	8.8	17.9	21.5	14.3	14.4	11.1	10.0	8.6	7.8	4.0	1.5	2.7	0.4
Differential Settlement (ft.)		0.3	0.0	0.2	0.2	0.8	0.3	-0.6	0.0	-0.3	-0.1	-0.1	-0.1	-0.3	-0.2	0.1	-0.2
GRADES AND STRAINS																	
Bottom of Clay Liner Elevation Prior to Settlement (ft.)	3355.5	3333.0	3311.0	3311.0	3313.0	3349.0	3349.0	3319.0	3317.0	3307.0	3304.0	3301.0	3299.0	3294.0	3289.0	3314.0	3335.5
Bottom of Clay Liner Elevation After settlement (ft.)	3355.5	3332.6	3310.6	3310.5	3312.3	3347.5	3347.2	3317.8	3315.8	3306.1	3303.2	3300.3	3298.3	3293.7	3288.9	3313.8	3335.5
Initial Liner Cover GeoMembrane Segment Length (ft.)		83.1	73.4	150.0	150.0	141.7	138.0	104.4	225.0	300.2	300.0	300.0	200.0	300.0	325.0	79.1	176.3
PostSettlement Final Cover GeoMemberane Segment Length (ft.)		83.2	73.4	150.0	150.0	141.5	138.0	104.2	225.0	300.2	300.0	300.0	200.0	300.0	325.0	79.0	176.3
Strain (+ Compression/- Tension)		-0.1%	0.0%	0.0%	0.0%	0.1%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
PreSettlement Slope (+ up/- down)		-28.1%	-31.4%	0.0%	1.3%	26.3%	0.0%	-30.0%	-0.9%	-3.3%	-1.0%	-1.0%	-1.0%	-1.7%	-1.5%	33.3%	12.3%
Post Settlement Slope (+ up/- down)		-28.5%	-31.5%	-0.1%	1.2%	25.7%	-0.2%	-29.4%	-0.9%	-3.2%	-1.0%	-1.0%	-1.0%	-1.6%	-1.5%	33.2%	12.4%
Grade Change (+ Steeper/- Milder)		0.4%	0.0%	0.1%	-0.1%	-0.6%	0.2%	-0.6%	0.0%	-0.1%	0.0%	0.0%	0.0%	-0.1%	-0.1%	-0.1%	0.1%

TABLE 3 WASTE SETTLEMENT CALCULATIONS

Point	A0	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	A16	
Station	3+50	4+30	5+00	6+50	8+00	9+37	10+75	11+75	14+00	17+00	20+00	23+00	25+00	28+00	31+25	32+00	33+75	
Linear Horizontal Distance (ft.)	350	430	500	650	800	937	1075	1175	1400	1700	2000	2300	2500	2800	3125	3200	3375	
Final Cover Elevation (ft.)	3360	3380	3395	3430	3465	3500	3530	3530	3540	3540	3540	3533	3530	3450	3380	3360	3340	
Final Cover Above Waste (ft.)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	
Final Waste Elevation (ft.)	3356.5	3376.5	3391.5	3426.5	3461.5	3496.5	3526.5	3526.5	3536.5	3536.5	3536.5	3529.5	3526.5	3446.5	3376.5	3356.5	3336.5	
Top of Clay Liner (ft.)	3356.5	3334	3312	3312	3314	3350	3350	3320	3318	3308	3305	3302	3300	3295	3290	3315	3336.5	
Waste Thickness (ft.)	0.0	42.5	79.5	114.5	147.5	146.5	176.5	206.5	218.5	228.5	231.5	227.5	226.5	151.5	86.5	41.5	0.0	
Number of Layers	0	4	8	11	15	15	18	20	20	20	20	20	20	15	9	4	0	
Layer Thickness (ft.)	0	11	10	10	10	10	10	10	11	11	12	11	11	10	10	10	0	
Unit Weight of Final Cover (pcf)	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	
Unit Weight of Waste (pcf)	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	
Pre Consolidation Pressure (psf)	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	
Modified Primary Compression Index	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012	
Modified Recompression Index	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	
Modified Secondary Compression Index	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
SUB LAYER	**1**																	
Top of Layer Elevation (ft.)		3376.5	3391.5	3426.5	3461.5	3496.5	3526.5	3526.5	3536.5	3536.5	3536.5	3529.5	3526.5	3446.5	3376.5	3356.5		
Bottom of Layer Elevation (ft.)		3365.9	3381.6	3416.1	3451.7	3486.7	3516.7	3516.2	3525.6	3525.1	3524.9	3518.1	3515.2	3436.4	3366.9	3346.1		
Layer Midpoint Elevation (ft.)		3371.2	3386.5	3421.3	3456.6	3491.6	3521.6	3521.3	3531.0	3530.8	3530.7	3523.8	3520.8	3441.5	3371.7	3351.3		
Initial Effective Stress (psf)		637.5	596.3	624.5	590.0	586.0	588.3	619.5	655.5	685.5	694.5	682.5	679.5	606.0	576.7	622.5		
Final Effective Stress (psf)		1057.5	1016.3	1044.5	1010.0	1006.0	1008.3	1039.5	1075.5	1105.5	1114.5	1102.5	1099.5	1026.0	996.7	1042.5		
Primary Settlement (ft.)		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Primary Settlement (in.)		0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.1	0.1	0.1		
SUB LAYER	**2**																	
Top of Layer Elevation (ft.)		3365.9	3381.6	3416.1	3451.7	3486.7	3516.7	3516.2	3525.6	3525.1	3524.9	3518.1	3515.2	3436.4	3366.9	3346.1		
Bottom of Layer Elevation (ft.)		3355.3	3371.6	3405.7	3441.8	3477.0	3506.9	3505.9	3514.7	3513.7	3513.4	3506.8	3503.9	3426.3	3357.3	3335.8		
Layer Midpoint Elevation (ft.)		3360.6	3376.6	3410.9	3446.8	3481.9	3511.8	3511.0	3520.1	3519.4	3519.1	3512.4	3509.5	3431.4	3362.1	3340.9		
Initial Effective Stress (psf)		637.5	596.3	624.5	590.0	586.0	588.3	619.5	655.5	685.5	694.5	682.5	679.5	606.0	576.7	622.5		
Final Effective Stress (psf)		2332.5	2208.8	2293.6	2190.0	2178.0	2185.0	2278.5	2386.5	2476.5	2503.5	2467.5	2458.5	2238.0	2150.0	2287.5		
Primary Settlement (ft.)		0.1	0.0	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1		
Primary Settlement (in.)		0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.8	0.7	0.7	0.6	0.6	0.6		
SUB LAYER	**3**																	
Top of Layer Elevation (ft.)		3355.3	3371.6	3405.7	3441.8	3477.0	3506.9	3505.9	3514.7	3513.7	3513.4	3506.8	3503.9	3426.3	3357.3	3335.8		
Bottom of Layer Elevation (ft.)		3344.6	3361.7	3395.3	3432.0	3467.2	3497.1	3495.5	3503.7	3502.2	3501.8	3495.4	3492.5	3416.2	3347.7	3325.4		
Layer Midpoint Elevation (ft.)		3349.9	3366.7	3400.5	3436.9	3472.1	3502.0	3500.7	3509.2	3507.9	3507.6	3501.1	3498.2	3421.3	3352.5	3330.6		
Initial Effective Stress (psf)		637.5	596.3	624.5	590.0	586.0	588.3	619.5	655.5	685.5	694.5	682.5	679.5	606.0	576.7	622.5		
Final Effective Stress (psf)		3607.5	3401.3	3542.7	3370.0	3350.0	3361.7	3517.5	3697.5	3847.5	3892.5	3832.5	3817.5	3450.0	3303.3	3532.5		
Primary Settlement (ft.)		0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1		
Primary Settlement (in.)		1.0	0.9	0.9	0.9	0.8	0.9	0.9	1.0	1.1	1.1	1.0	1.0	0.9	0.8	0.9		
SUB LAYER	**4**																	
Top of Layer Elevation (ft.)		3344.6	3361.7	3395.3	3432.0	3467.2	3497.1	3495.5	3503.7	3502.2	3501.8	3495.4	3492.5	3416.2	3347.7	3325.4		
Bottom of Layer Elevation (ft.)		3334.0	3351.8	3384.9	3422.2	3457.4	3487.3	3485.2	3492.8	3490.8	3490.2	3484.0	3481.2	3406.1	3338.1	3315.0		
Layer Midpoint Elevation (ft.)		3339.3	3356.7	3390.1	3427.1	3462.3	3492.2	3490.4	3498.3	3496.5	3496.0	3489.7	3486.9	3411.2	3342.9	3320.2		
Initial Effective Stress (psf)		637.5	596.3	624.5	590.0	586.0	588.3	619.5	655.5	685.5	694.5	682.5	679.5	606.0	576.7	622.5		
Final Effective Stress (psf)		4882.5	4593.8	4791.8	4550.0	4522.0	4538.3	4756.5	5008.5	5218.5	5281.5	5197.5	5176.5	4662.0	4456.7	4777.5		
Primary Settlement (ft.)		0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1		
Primary Settlement (in.)		1.2	1.1	1.1	1.0	1.0	1.0	1.1	1.2	1.3	1.3	1.3	1.3	1.1	1.0	1.1		

TABLE 3 WASTE SETTLEMENT CALCULATIONS (CONTINUED)

Point	A0	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	A16
Station	3+50	4+30	5+00	6+50	8+00	9+37	10+75	11+75	14+00	17+00	20+00	23+00	25+00	28+00	31+25	32+00	33+75
SUB LAYER									**5**								
Top of Layer Elevation (ft.)			3351.8	3384.9	3422.2	3457.4	3487.3	3485.2	3492.8	3490.8	3490.2	3484.0	3481.2	3406.1	3338.1		
Bottom of Layer Elevation (ft.)			3341.8	3374.5	3412.3	3447.7	3477.5	3474.9	3481.9	3479.4	3478.6	3472.6	3469.9	3396.0	3328.4		
Layer Midpoint Elevation (ft.)			3346.8	3379.7	3417.3	3452.6	3482.4	3480.0	3487.3	3485.1	3484.4	3478.3	3475.5	3401.1	3333.3		
Initial Effective Stress (psf)			596.3	624.5	590.0	586.0	588.3	619.5	655.5	685.5	694.5	682.5	679.5	606.0	576.7		
Final Effective Stress (psf)			5786.3	6040.9	5730.0	5694.0	5715.0	5995.5	6319.5	6589.5	6670.5	6562.5	6535.5	5874.0	5610.0		
Primary Settlement (ft.)			0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1		
Primary Settlement (in.)			1.2	1.3	1.2	1.2	1.2	1.3	1.4	1.4	1.5	1.4	1.4	1.2	1.1		
SUB LAYER									**6**								
Top of Layer Elevation (ft.)			3341.8	3374.5	3412.3	3447.7	3477.5	3474.9	3481.9	3479.4	3478.6	3472.6	3469.9	3396.0	3328.4		
Bottom of Layer Elevation (ft.)			3331.9	3364.0	3402.5	3437.9	3467.7	3464.6	3471.0	3468.0	3467.1	3461.3	3458.6	3385.9	3318.8		
Layer Midpoint Elevation (ft.)			3336.8	3369.3	3407.4	3442.8	3472.6	3469.7	3476.4	3473.7	3472.8	3466.9	3464.2	3391.0	3323.6		
Initial Effective Stress (psf)			596.3	624.5	590.0	586.0	588.3	619.5	655.5	685.5	694.5	682.5	679.5	606.0	576.7		
Final Effective Stress (psf)			6978.8	7290.0	6910.0	6866.0	6891.7	7234.5	7630.5	7960.5	8059.5	7927.5	7894.5	7086.0	6763.3		
Primary Settlement (ft.)			0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1		
Primary Settlement (in.)			1.3	1.4	1.3	1.3	1.3	1.4	1.5	1.6	1.6	1.6	1.6	1.3	1.3		
SUB LAYER									**7**								
Top of Layer Elevation (ft.)			3331.9	3364.0	3402.5	3437.9	3467.7	3464.6	3471.0	3468.0	3467.1	3461.3	3458.6	3385.9	3318.8		
Bottom of Layer Elevation (ft.)			3321.9	3353.6	3392.7	3428.1	3457.9	3454.2	3460.0	3456.5	3455.5	3449.9	3447.2	3375.8	3309.2		
Layer Midpoint Elevation (ft.)			3326.9	3358.8	3397.6	3433.0	3462.8	3459.4	3465.5	3462.2	3461.3	3455.6	3452.9	3380.9	3314.0		
Initial Effective Stress (psf)			596.3	624.5	590.0	586.0	588.3	619.5	655.5	685.5	694.5	682.5	679.5	606.0	576.7		
Final Effective Stress (psf)			8171.3	8539.1	8090.0	8038.0	8068.3	8473.5	8941.5	9331.5	9448.5	9292.5	9253.5	8298.0	7916.7		
Primary Settlement (ft.)			0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1		
Primary Settlement (in.)			1.4	1.5	1.4	1.4	1.4	1.5	1.6	1.7	1.7	1.7	1.7	1.4	1.4		
SUB LAYER									**8**								
Top of Layer Elevation (ft.)			3321.9	3353.6	3392.7	3428.1	3457.9	3454.2	3460.0	3456.5	3455.5	3449.9	3447.2	3375.8	3309.2		
Bottom of Layer Elevation (ft.)			3312.0	3343.2	3382.8	3418.4	3448.1	3443.9	3449.1	3445.1	3443.9	3438.5	3435.9	3365.7	3299.6		
Layer Midpoint Elevation (ft.)			3317.0	3348.4	3387.8	3423.3	3453.0	3449.1	3454.6	3450.8	3449.7	3444.2	3441.6	3370.8	3304.4		
Initial Effective Stress (psf)			596.3	624.5	590.0	586.0	588.3	619.5	655.5	685.5	694.5	682.5	679.5	606.0	576.7		
Final Effective Stress (psf)			9363.8	9788.2	9270.0	9210.0	9245.0	9712.5	10252.5	10702.5	10837.5	10657.5	10612.5	9510.0	9070.0		
Primary Settlement (ft.)			0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1		
Primary Settlement (in.)			1.5	1.6	1.5	1.5	1.5	1.6	1.7	1.8	1.8	1.8	1.8	1.5	1.4		
SUB LAYER									**9**								
Top of Layer Elevation (ft.)				3343.2	3382.8	3418.4	3448.1	3443.9	3449.1	3445.1	3443.9	3438.5	3435.9	3365.7	3299.6		
Bottom of Layer Elevation (ft.)				3332.8	3373.0	3408.6	3438.3	3433.6	3438.2	3433.7	3432.3	3427.1	3424.6	3355.6	3290.0		
Layer Midpoint Elevation (ft.)				3338.0	3377.9	3413.5	3443.2	3438.7	3443.6	3439.4	3438.1	3432.8	3430.2	3360.7	3294.8		
Initial Effective Stress (psf)				624.5	590.0	586.0	588.3	619.5	655.5	685.5	694.5	682.5	679.5	606.0	576.7		
Final Effective Stress (psf)				11037.3	10450.0	10382.0	10421.7	10951.5	11563.5	12073.5	12226.5	12022.5	11971.5	10722.0	10223.3		
Primary Settlement (ft.)				0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.1	0.1		
Primary Settlement (in.)				1.7	1.6	1.5	1.5	1.6	1.8	1.9	1.9	1.9	1.8	1.6	1.5		
SUB LAYER									**10**								
Top of Layer Elevation (ft.)				3332.8	3373.0	3408.6	3438.3	3433.6	3438.2	3433.7	3432.3	3427.1	3424.6	3355.6			
Bottom of Layer Elevation (ft.)				3322.4	3363.2	3398.8	3428.4	3423.3	3427.3	3422.3	3420.8	3415.8	3413.3	3345.5			
Layer Midpoint Elevation (ft.)				3327.6	3368.1	3403.7	3433.3	3428.4	3432.7	3428.0	3426.5	3421.4	3418.9	3350.6			
Initial Effective Stress (psf)				624.5	590.0	586.0	588.3	619.5	655.5	685.5	694.5	682.5	679.5	606.0			
Final Effective Stress (psf)				12286.4	11630.0	11554.0	11598.3	12190.5	12874.5	13444.5	13615.5	13387.5	13330.5	11934.0			
Primary Settlement (ft.)				0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.1			
Primary Settlement (in.)				1.7	1.6	1.6	1.6	1.7	1.8	1.9	2.0	1.9	1.9	1.7			

TABLE 3 WASTE SETTLEMENT CALCULATIONS (CONTINUED)

Point	A0	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	A16
Station	3+50	4+30	5+00	6+50	8+00	9+37	10+75	11+75	14+00	17+00	20+00	23+00	25+00	28+00	31+25	32+00	33+75
SUB LAYER									**11**								
Top of Layer Elevation (ft.)				3322.4	3363.2	3398.8	3428.4	3423.3	3427.3	3422.3	3420.8	3415.8	3413.3	3345.5			
Bottom of Layer Elevation (ft.)				3312.0	3353.3	3389.1	3418.6	3412.9	3416.3	3410.8	3409.2	3404.4	3401.9	3335.4			
Layer Midpoint Elevation (ft.)				3317.2	3358.3	3394.0	3423.5	3418.1	3421.8	3416.5	3415.0	3410.1	3407.6	3340.5			
Initial Effective Stress (psf)				624.5	590.0	586.0	588.3	619.5	655.5	685.5	694.5	682.5	679.5	606.0			
Final Effective Stress (psf)				13535.5	12810.0	12726.0	12775.0	13429.5	14185.5	14815.5	15004.5	14752.5	14689.5	13146.0			
Primary Settlement (ft.)				0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.1			
Primary Settlement (in.)				1.8	1.7	1.7	1.7	1.8	1.9	2.0	2.0	2.0	2.0	1.7			
SUB LAYER									**12**								
Top of Layer Elevation (ft.)					3353.3	3389.1	3418.6	3412.9	3416.3	3410.8	3409.2	3404.4	3401.9	3335.4			
Bottom of Layer Elevation (ft.)					3343.5	3379.3	3408.8	3402.6	3405.4	3399.4	3397.6	3393.0	3390.6	3325.3			
Layer Midpoint Elevation (ft.)					3348.4	3384.2	3413.7	3407.8	3410.9	3405.1	3403.4	3398.7	3396.3	3330.4			
Initial Effective Stress (psf)					590.0	586.0	588.3	619.5	655.5	685.5	694.5	682.5	679.5	606.0			
Final Effective Stress (psf)					13990.0	13898.0	13951.7	14668.5	15496.5	16186.5	16393.5	16117.5	16048.5	14358.0			
Primary Settlement (ft.)					0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.1			
Primary Settlement (in.)					1.7	1.7	1.7	1.8	2.0	2.1	2.1	2.1	2.1	1.8			
SUB LAYER									**13**								
Top of Layer Elevation (ft.)					3343.5	3379.3	3408.8	3402.6	3405.4	3399.4	3397.6	3393.0	3390.6	3325.3			
Bottom of Layer Elevation (ft.)					3333.7	3369.5	3399.0	3392.3	3394.5	3388.0	3386.0	3381.6	3379.3	3315.2			
Layer Midpoint Elevation (ft.)					3338.6	3374.4	3403.9	3397.4	3399.9	3393.7	3391.8	3387.3	3384.9	3320.3			
Initial Effective Stress (psf)					590.0	586.0	588.3	619.5	655.5	685.5	694.5	682.5	679.5	606.0			
Final Effective Stress (psf)					15170.0	15070.0	15128.3	15907.5	16807.5	17557.5	17782.5	17482.5	17407.5	15570.0			
Primary Settlement (ft.)					0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2			
Primary Settlement (in.)					1.8	1.8	1.8	1.9	2.0	2.1	2.2	2.1	2.1	1.8			
SUB LAYER									**14**								
Top of Layer Elevation (ft.)					3333.7	3369.5	3399.0	3392.3	3394.5	3388.0	3386.0	3381.6	3379.3	3315.2			
Bottom of Layer Elevation (ft.)					3323.8	3359.8	3389.2	3382.0	3383.6	3376.6	3374.5	3370.3	3368.0	3305.1			
Layer Midpoint Elevation (ft.)					3328.8	3364.7	3394.1	3387.1	3389.0	3382.3	3380.2	3375.9	3373.6	3310.2			
Initial Effective Stress (psf)					590.0	586.0	588.3	619.5	655.5	685.5	694.5	682.5	679.5	606.0			
Final Effective Stress (psf)					16350.0	16242.0	16305.0	17146.5	18118.5	18928.5	19171.5	18847.5	18766.5	16782.0			
Primary Settlement (ft.)					0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2			
Primary Settlement (in.)					1.8	1.8	1.8	1.9	2.1	2.2	2.2	2.2	2.2	1.9			
SUB LAYER									**15**								
Top of Layer Elevation (ft.)					3323.8	3359.8	3389.2	3382.0	3383.6	3376.6	3374.5	3370.3	3368.0	3305.1			
Bottom of Layer Elevation (ft.)					3314.0	3350.0	3379.4	3371.6	3372.6	3365.1	3362.9	3358.9	3356.6	3295.0			
Layer Midpoint Elevation (ft.)					3318.9	3354.9	3384.3	3376.8	3378.1	3370.8	3368.7	3364.6	3362.3	3300.1			
Initial Effective Stress (psf)					590.0	586.0	588.3	619.5	655.5	685.5	694.5	682.5	679.5	606.0			
Final Effective Stress (psf)					17530.0	17414.0	17481.7	18385.5	19429.5	20299.5	20560.5	20212.5	20125.5	17994.0			
Primary Settlement (ft.)					0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2			
Primary Settlement (in.)					1.9	1.9	1.9	2.0	2.1	2.2	2.3	2.2	2.2	1.9			
SUB LAYER									**16**								
Top of Layer Elevation (ft.)							3379.4	3371.6	3372.6	3365.1	3362.9	3358.9	3356.6				
Bottom of Layer Elevation (ft.)							3369.6	3361.3	3361.7	3353.7	3351.3	3347.5	3345.3				
Layer Midpoint Elevation (ft.)							3374.5	3366.5	3367.2	3359.4	3357.1	3353.2	3351.0				
Initial Effective Stress (psf)							588.3	619.5	655.5	685.5	694.5	682.5	679.5				
Final Effective Stress (psf)							18658.3	19624.5	20740.5	21670.5	21949.5	21577.5	21484.5				
Primary Settlement (ft.)							0.2	0.2	0.2	0.2	0.2	0.2	0.2				
Primary Settlement (in.)							1.9	2.0	2.2	2.3	2.3	2.3	2.3				

TABLE 3 WASTE SETTLEMENT CALCULATIONS (CONTINUED)

Point	A0	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	A16
Station	3+50	4+30	5+00	6+50	8+00	9+37	10+75	11+75	14+00	17+00	20+00	23+00	25+00	28+00	31+25	32+00	33+75
SUB LAYER									**17**								
Top of Layer Elevation (ft.)							3369.6	3361.3	3361.7	3353.7	3351.3	3347.5	3345.3				
Bottom of Layer Elevation (ft.)							3359.8	3351.0	3350.8	3342.3	3339.7	3336.1	3334.0				
Layer Midpoint Elevation (ft.)							3364.7	3356.1	3356.2	3348.0	3345.5	3341.8	3339.6				
Initial Effective Stress (psf)							588.3	619.5	655.5	685.5	694.5	682.5	679.5				
Final Effective Stress (psf)							19835.0	20863.5	22051.5	23041.5	23338.5	22942.5	22843.5				
Primary Settlement (ft.)							0.2	0.2	0.2	0.2	0.2	0.2	0.2				
Primary Settlement (in.)							1.9	2.1	2.2	2.3	2.4	2.3	2.3				
SUB LAYER									**18**								
Top of Layer Elevation (ft.)							3359.8	3351.0	3350.8	3342.3	3339.7	3336.1	3334.0				
Bottom of Layer Elevation (ft.)							3350.0	3340.7	3339.9	3330.9	3328.2	3324.8	3322.7				
Layer Midpoint Elevation (ft.)							3354.9	3345.8	3345.3	3336.6	3333.9	3330.4	3328.3				
Initial Effective Stress (psf)							588.3	619.5	655.5	685.5	694.5	682.5	679.5				
Final Effective Stress (psf)							21011.7	22102.5	23362.5	24412.5	24727.5	24307.5	24202.5				
Primary Settlement (ft.)							0.2	0.2	0.2	0.2	0.2	0.2	0.2				
Primary Settlement (in.)							2.0	2.1	2.2	2.4	2.4	2.4	2.3				
SUB LAYER									**19**								
Top of Layer Elevation (ft.)								3340.7	3339.9	3330.9	3328.2	3324.8	3322.7				
Bottom of Layer Elevation (ft.)								3330.3	3328.9	3319.4	3316.6	3313.4	3311.3				
Layer Midpoint Elevation (ft.)								3335.5	3334.4	3325.1	3322.4	3319.1	3317.0				
Initial Effective Stress (psf)								619.5	655.5	685.5	694.5	682.5	679.5				
Final Effective Stress (psf)								23341.5	24673.5	25783.5	26116.5	25672.5	25561.5				
Primary Settlement (ft.)								0.2	0.2	0.2	0.2	0.2	0.2				
Primary Settlement (in.)								2.1	2.3	2.4	2.4	2.4	2.4				
SUB LAYER									**20**								
Top of Layer Elevation (ft.)								3330.3	3328.9	3319.4	3316.6	3313.4	3311.3				
Bottom of Layer Elevation (ft.)								3320.0	3318.0	3308.0	3305.0	3302.0	3300.0				
Layer Midpoint Elevation (ft.)								3325.2	3323.5	3313.7	3310.8	3307.7	3305.7				
Initial Effective Stress (psf)								619.5	655.5	685.5	694.5	682.5	679.5				
Final Effective Stress (psf)								24580.5	25984.5	27154.5	27505.5	27037.5	26920.5				
Primary Settlement (ft.)								0.2	0.2	0.2	0.2	0.2	0.2				
Primary Settlement (in.)								2.2	2.3	2.4	2.5	2.4	2.4				
SETTLEMENT																	
Total Primary Settlement (in.)	0.0	2.9	8.1	13.8	20.0	19.8	25.7	31.8	34.1	36.0	36.6	35.8	35.6	20.7	9.2	2.8	0.0
Total Secondary Settlement (in.)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Settlement (in.)	0.0	2.9	8.1	13.8	20.0	19.8	25.7	31.8	34.1	36.0	36.6	35.8	35.6	20.7	9.2	2.8	0.0
Total Settlement (ft.)	0.0	0.2	0.7	1.1	1.7	1.7	2.1	2.6	2.8	3.0	3.1	3.0	3.0	1.7	0.8	0.2	0.0

TABLE 4 FINAL COVER SETTLEMENT CALCULATIONS

Point	A0	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	A16
Station	3+50	4+30	5+00	6+50	8+00	9+37	10+75	11+75	14+00	17+00	20+00	23+00	25+00	28+00	31+25	32+00	33+70
Linear Horizontal Distance (ft.)	350	430	500	650	800	937	1075	1175	1400	1700	2000	2300	2500	2800	3125	3200	3370
Final Cover Elevation (ft.)	3360	3380	3395	3430	3465	3500	3530	3530	3540	3540	3540	3533	3530	3450	3380	3363	3330
Final Cover Above Waste (ft.)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Final Waste Elevation (ft.)	3356.5	3376.5	3391.5	3426.5	3461.5	3496.5	3526.5	3526.5	3536.5	3536.5	3536.5	3529.5	3526.5	3446.5	3376.5	3359.5	3326.5
Top of Clay Liner (ft.)	3356.5	3334	3312	3312	3314	3350	3350	3320	3318	3308	3305	3302	3300	3295	3290	3315	3331.5
Waste Thickness (ft.)	0.0	42.5	79.5	114.5	147.5	146.5	176.5	206.5	218.5	228.5	231.5	227.5	226.5	151.5	86.5	44.5	-5.0
Number of Layers	0	4	8	11	15	15	18	20	20	20	20	20	20	15	9	4	0
Layer Thickness (ft.)	0	11	10	10	10	10	10	10	11	11	12	11	11	10	10	11	0
Unit Weight of Final Cover (pcf)	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120
Unit Weight of Waste (pcf)	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120
Pre Consolidation Pressure (psf)	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Modified Primary Compression Index	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012
Modified Recompression Index	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004
Modified Secondary Compression Index	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SUB LAYER									1								
Top of Layer Elevation (ft.)		3376.5	3391.5	3426.5	3461.5	3496.5	3526.5	3526.5	3536.5	3536.5	3536.5	3529.5	3526.5	3446.5	3376.5	3359.5	
Bottom of Layer Elevation (ft.)		3365.9	3381.6	3416.1	3451.7	3486.7	3516.7	3516.2	3525.6	3525.1	3524.9	3518.1	3515.2	3436.4	3366.9	3348.4	
Layer Midpoint Elevation (ft.)		3371.2	3386.5	3421.3	3456.6	3491.6	3521.6	3521.3	3531.0	3530.8	3530.7	3523.8	3520.8	3441.5	3371.7	3353.9	
Initial Effective Stress (psf)		637.5	596.3	624.5	590.0	586.0	588.3	619.5	655.5	685.5	694.5	682.5	679.5	606.0	576.7	667.5	
Final Effective Stress (psf)		1057.5	1016.3	1044.5	1010.0	1006.0	1008.3	1039.5	1075.5	1105.5	1114.5	1102.5	1099.5	1026.0	996.7	1087.5	
Primary Settlement (ft.)		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Primary Settlement (in.)		0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.1	0.1	0.2	
SUB LAYER									2								
Top of Layer Elevation (ft.)		3365.9	3381.6	3416.1	3451.7	3486.7	3516.7	3516.2	3525.6	3525.1	3524.9	3518.1	3515.2	3436.4	3366.9	3348.4	
Bottom of Layer Elevation (ft.)		3355.3	3371.6	3405.7	3441.8	3477.0	3506.9	3505.9	3514.7	3513.7	3513.4	3506.8	3503.9	3426.3	3357.3	3337.3	
Layer Midpoint Elevation (ft.)		3360.6	3376.6	3410.9	3446.8	3481.9	3511.8	3511.0	3520.1	3519.4	3519.1	3512.4	3509.5	3431.4	3362.1	3342.8	
Initial Effective Stress (psf)		1912.5	1788.8	1873.6	1770.0	1758.0	1765.0	1858.5	1966.5	2056.5	2083.5	2047.5	2038.5	1818.0	1730.0	2002.5	
Final Effective Stress (psf)		2332.5	2208.8	2293.6	2190.0	2178.0	2185.0	2278.5	2386.5	2476.5	2503.5	2467.5	2458.5	2238.0	2150.0	2422.5	
Primary Settlement (ft.)		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Primary Settlement (in.)		0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
SUB LAYER									3								
Top of Layer Elevation (ft.)		3355.3	3371.6	3405.7	3441.8	3477.0	3506.9	3505.9	3514.7	3513.7	3513.4	3506.8	3503.9	3426.3	3357.3	3337.3	
Bottom of Layer Elevation (ft.)		3344.6	3361.7	3395.3	3432.0	3467.2	3497.1	3495.5	3503.7	3502.2	3501.8	3495.4	3492.5	3416.2	3347.7	3326.1	
Layer Midpoint Elevation (ft.)		3349.9	3366.7	3400.5	3436.9	3472.1	3502.0	3500.7	3509.2	3507.9	3507.6	3501.1	3498.2	3421.3	3352.5	3331.7	
Initial Effective Stress (psf)		3187.5	2981.3	3122.7	2950.0	2930.0	2941.7	3097.5	3277.5	3427.5	3472.5	3412.5	3397.5	3030.0	2883.3	3337.5	
Final Effective Stress (psf)		3607.5	3401.3	3542.7	3370.0	3350.0	3361.7	3517.5	3697.5	3847.5	3892.5	3832.5	3817.5	3450.0	3303.3	3757.5	
Primary Settlement (ft.)		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Primary Settlement (in.)		0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	

TABLE 4 FINAL COVER SETTLEMENT CALCULATIONS (CONTINUED)

Point	A0	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	A16
Station	3+50	4+30	5+00	6+50	8+00	9+37	10+75	11+75	14+00	17+00	20+00	23+00	25+00	28+00	31+25	32+00	33+70
SUB LAYER									**4**								
Top of Layer Elevation (ft.)		3344.6	3361.7	3395.3	3432.0	3467.2	3497.1	3495.5	3503.7	3502.2	3501.8	3495.4	3492.5	3416.2	3347.7	3326.1	
Bottom of Layer Elevation (ft.)		3334.0	3351.8	3384.9	3422.2	3457.4	3487.3	3485.2	3492.8	3490.8	3490.2	3484.0	3481.2	3406.1	3338.1	3315.0	
Layer Midpoint Elevation (ft.)		3339.3	3356.7	3390.1	3427.1	3462.3	3492.2	3490.4	3498.3	3496.5	3496.0	3489.7	3486.9	3411.2	3342.9	3320.6	
Initial Effective Stress (psf)		4462.5	4173.8	4371.8	4130.0	4102.0	4118.3	4336.5	4588.5	4798.5	4861.5	4777.5	4756.5	4242.0	4036.7	4672.5	
Final Effective Stress (psf)		4882.5	4593.8	4791.8	4550.0	4522.0	4538.3	4756.5	5008.5	5218.5	5281.5	5197.5	5176.5	4662.0	4456.7	5092.5	
Primary Settlement (ft.)		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Primary Settlement (in.)		0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
SUB LAYER									**5**								
Top of Layer Elevation (ft.)			3351.8	3384.9	3422.2	3457.4	3487.3	3485.2	3492.8	3490.8	3490.2	3484.0	3481.2	3406.1	3338.1		
Bottom of Layer Elevation (ft.)			3341.8	3374.5	3412.3	3447.7	3477.5	3474.9	3481.9	3479.4	3478.6	3472.6	3469.9	3396.0	3328.4		
Layer Midpoint Elevation (ft.)			3346.8	3379.7	3417.3	3452.6	3482.4	3480.0	3487.3	3485.1	3484.4	3478.3	3475.5	3401.1	3333.3		
Initial Effective Stress (psf)			5366.3	5620.9	5310.0	5274.0	5295.0	5575.5	5899.5	6169.5	6250.5	6142.5	6115.5	5454.0	5190.0		
Final Effective Stress (psf)			5786.3	6040.9	5730.0	5694.0	5715.0	5995.5	6319.5	6589.5	6670.5	6562.5	6535.5	5874.0	5610.0		
Primary Settlement (ft.)			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Primary Settlement (in.)			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
SUB LAYER									**6**								
Top of Layer Elevation (ft.)			3341.8	3374.5	3412.3	3447.7	3477.5	3474.9	3481.9	3479.4	3478.6	3472.6	3469.9	3396.0	3328.4		
Bottom of Layer Elevation (ft.)			3331.9	3364.0	3402.5	3437.9	3467.7	3464.6	3471.0	3468.0	3467.1	3461.3	3458.6	3385.9	3318.8		
Layer Midpoint Elevation (ft.)			3336.8	3369.3	3407.4	3442.8	3472.6	3469.7	3476.4	3473.7	3472.8	3466.9	3464.2	3391.0	3323.6		
Initial Effective Stress (psf)			6558.8	6870.0	6490.0	6446.0	6471.7	6814.5	7210.5	7540.5	7639.5	7507.5	7474.5	6666.0	6343.3		
Final Effective Stress (psf)			6978.8	7290.0	6910.0	6866.0	6891.7	7234.5	7630.5	7960.5	8059.5	7927.5	7894.5	7086.0	6763.3		
Primary Settlement (ft.)			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Primary Settlement (in.)			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
SUB LAYER									**7**								
Top of Layer Elevation (ft.)			3331.9	3364.0	3402.5	3437.9	3467.7	3464.6	3471.0	3468.0	3467.1	3461.3	3458.6	3385.9	3318.8		
Bottom of Layer Elevation (ft.)			3321.9	3353.6	3392.7	3428.1	3457.9	3454.2	3460.0	3456.5	3455.5	3449.9	3447.2	3375.8	3309.2		
Layer Midpoint Elevation (ft.)			3326.9	3358.8	3397.6	3433.0	3462.8	3459.4	3465.5	3462.2	3461.3	3455.6	3452.9	3380.9	3314.0		
Initial Effective Stress (psf)			7751.3	8119.1	7670.0	7618.0	7648.3	8053.5	8521.5	8911.5	9028.5	8872.5	8833.5	7878.0	7496.7		
Final Effective Stress (psf)			8171.3	8539.1	8090.0	8038.0	8068.3	8473.5	8941.5	9331.5	9448.5	9292.5	9253.5	8298.0	7916.7		
Primary Settlement (ft.)			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Primary Settlement (in.)			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
SUB LAYER									**8**								
Top of Layer Elevation (ft.)			3321.9	3353.6	3392.7	3428.1	3457.9	3454.2	3460.0	3456.5	3455.5	3449.9	3447.2	3375.8	3309.2		
Bottom of Layer Elevation (ft.)			3312.0	3343.2	3382.8	3418.4	3448.1	3443.9	3449.1	3445.1	3443.9	3438.5	3435.9	3365.7	3299.6		
Layer Midpoint Elevation (ft.)			3317.0	3348.4	3387.8	3423.3	3453.0	3449.1	3454.6	3450.8	3449.7	3444.2	3441.6	3370.8	3304.4		
Initial Effective Stress (psf)			8943.8	9368.2	8850.0	8790.0	8825.0	9292.5	9832.5	10282.5	10417.5	10237.5	10192.5	9090.0	8650.0		
Final Effective Stress (psf)			9363.8	9788.2	9270.0	9210.0	9245.0	9712.5	10252.5	10702.5	10837.5	10657.5	10612.5	9510.0	9070.0		
Primary Settlement (ft.)			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Primary Settlement (in.)			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		

TABLE 4 FINAL COVER SETTLEMENT CALCULATIONS (CONTINUED)

Point	A0	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	A16
Station	3+50	4+30	5+00	6+50	8+00	9+37	10+75	11+75	14+00	17+00	20+00	23+00	25+00	28+00	31+25	32+00	33+70
SUB LAYER									**9**								
Top of Layer Elevation (ft.)				3343.2	3382.8	3418.4	3448.1	3443.9	3449.1	3445.1	3443.9	3438.5	3435.9	3365.7	3299.6		
Bottom of Layer Elevation (ft.)				3332.8	3373.0	3408.6	3438.3	3433.6	3438.2	3433.7	3432.3	3427.1	3424.6	3355.6	3290.0		
Layer Midpoint Elevation (ft.)				3338.0	3377.9	3413.5	3443.2	3438.7	3443.6	3439.4	3438.1	3432.8	3430.2	3360.7	3294.8		
Initial Effective Stress (psf)				10617.3	10030.0	9962.0	10001.7	10531.5	11143.5	11653.5	11806.5	11602.5	11551.5	10302.0	9803.3		
Final Effective Stress (psf)				11037.3	10450.0	10382.0	10421.7	10951.5	11563.5	12073.5	12226.5	12022.5	11971.5	10722.0	10223.3		
Primary Settlement (ft.)				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Primary Settlement (in.)				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
SUB LAYER									**10**								
Top of Layer Elevation (ft.)				3332.8	3373.0	3408.6	3438.3	3433.6	3438.2	3433.7	3432.3	3427.1	3424.6	3355.6			
Bottom of Layer Elevation (ft.)				3322.4	3363.2	3398.8	3428.4	3423.3	3427.3	3422.3	3420.8	3415.8	3413.3	3345.5			
Layer Midpoint Elevation (ft.)				3327.6	3368.1	3403.7	3433.3	3428.4	3432.7	3428.0	3426.5	3421.4	3418.9	3350.6			
Initial Effective Stress (psf)				11866.4	11210.0	11134.0	11178.3	11770.5	12454.5	13024.5	13195.5	12967.5	12910.5	11514.0			
Final Effective Stress (psf)				12286.4	11630.0	11554.0	11598.3	12190.5	12874.5	13444.5	13615.5	13387.5	13330.5	11934.0			
Primary Settlement (ft.)				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
Primary Settlement (in.)				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
SUB LAYER									**11**								
Top of Layer Elevation (ft.)				3322.4	3363.2	3398.8	3428.4	3423.3	3427.3	3422.3	3420.8	3415.8	3413.3	3345.5			
Bottom of Layer Elevation (ft.)				3312.0	3353.3	3389.1	3418.6	3412.9	3416.3	3410.8	3409.2	3404.4	3401.9	3335.4			
Layer Midpoint Elevation (ft.)				3317.2	3358.3	3394.0	3423.5	3418.1	3421.8	3416.5	3415.0	3410.1	3407.6	3340.5			
Initial Effective Stress (psf)				13115.5	12390.0	12306.0	12355.0	13009.5	13765.5	14395.5	14584.5	14332.5	14269.5	12726.0			
Final Effective Stress (psf)				13535.5	12810.0	12726.0	12775.0	13429.5	14185.5	14815.5	15004.5	14752.5	14689.5	13146.0			
Primary Settlement (ft.)				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
Primary Settlement (in.)				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
SUB LAYER									**12**								
Top of Layer Elevation (ft.)					3353.3	3389.1	3418.6	3412.9	3416.3	3410.8	3409.2	3404.4	3401.9	3335.4			
Bottom of Layer Elevation (ft.)					3343.5	3379.3	3408.8	3402.6	3405.4	3399.4	3397.6	3393.0	3390.6	3325.3			
Layer Midpoint Elevation (ft.)					3348.4	3384.2	3413.7	3407.8	3410.9	3405.1	3403.4	3398.7	3396.3	3330.4			
Initial Effective Stress (psf)					13570.0	13478.0	13531.7	14248.5	15076.5	15766.5	15973.5	15697.5	15628.5	13938.0			
Final Effective Stress (psf)					13990.0	13898.0	13951.7	14668.5	15496.5	16186.5	16393.5	16117.5	16048.5	14358.0			
Primary Settlement (ft.)					0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
Primary Settlement (in.)					0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
SUB LAYER									**13**								
Top of Layer Elevation (ft.)					3343.5	3379.3	3408.8	3402.6	3405.4	3399.4	3397.6	3393.0	3390.6	3325.3			
Bottom of Layer Elevation (ft.)					3333.7	3369.5	3399.0	3392.3	3394.5	3388.0	3386.0	3381.6	3379.3	3315.2			
Layer Midpoint Elevation (ft.)					3338.6	3374.4	3403.9	3397.4	3399.9	3393.7	3391.8	3387.3	3384.9	3320.3			
Initial Effective Stress (psf)					14750.0	14650.0	14708.3	15487.5	16387.5	17137.5	17362.5	17062.5	16987.5	15150.0			
Final Effective Stress (psf)					15170.0	15070.0	15128.3	15907.5	16807.5	17557.5	17782.5	17482.5	17407.5	15570.0			
Primary Settlement (ft.)					0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
Primary Settlement (in.)					0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
SUB LAYER									**14**								
Top of Layer Elevation (ft.)					3333.7	3369.5	3399.0	3392.3	3394.5	3388.0	3386.0	3381.6	3379.3	3315.2			
Bottom of Layer Elevation (ft.)					3323.8	3359.8	3389.2	3382.0	3383.6	3376.6	3374.5	3370.3	3368.0	3305.1			
Layer Midpoint Elevation (ft.)					3328.8	3364.7	3394.1	3387.1	3389.0	3382.3	3380.2	3375.9	3373.6	3310.2			
Initial Effective Stress (psf)					15930.0	15822.0	15885.0	16726.5	17698.5	18508.5	18751.5	18427.5	18346.5	16362.0			
Final Effective Stress (psf)					16350.0	16242.0	16305.0	17146.5	18118.5	18928.5	19171.5	18847.5	18766.5	16782.0			
Primary Settlement (ft.)					0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
Primary Settlement (in.)					0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			

TABLE 4 FINAL COVER SETTLEMENT CALCULATIONS (CONTINUED)

Point	A0	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	A16
Station	3+50	4+30	5+00	6+50	8+00	9+37	10+75	11+75	14+00	17+00	20+00	23+00	25+00	28+00	31+25	32+00	33+70
SUB LAYER									**15**								
Top of Layer Elevation (ft.)					3323.8	3359.8	3389.2	3382.0	3383.6	3376.6	3374.5	3370.3	3368.0	3305.1			
Bottom of Layer Elevation (ft.)					3314.0	3350.0	3379.4	3371.6	3372.6	3365.1	3362.9	3358.9	3356.6	3295.0			
Layer Midpoint Elevation (ft.)					3318.9	3354.9	3384.3	3376.8	3378.1	3370.8	3368.7	3364.6	3362.3	3300.1			
Initial Effective Stress (psf)					17110.0	16994.0	17061.7	17965.5	19009.5	19879.5	20140.5	19792.5	19705.5	17574.0			
Final Effective Stress (psf)					17530.0	17414.0	17481.7	18385.5	19429.5	20299.5	20560.5	20212.5	20125.5	17994.0			
Primary Settlement (ft.)					0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
Primary Settlement (in.)					0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
SUB LAYER									**16**								
Top of Layer Elevation (ft.)							3379.4	3371.6	3372.6	3365.1	3362.9	3358.9	3356.6				
Bottom of Layer Elevation (ft.)							3369.6	3361.3	3361.7	3353.7	3351.3	3347.5	3345.3				
Layer Midpoint Elevation (ft.)							3374.5	3366.5	3367.2	3359.4	3357.1	3353.2	3351.0				
Initial Effective Stress (psf)							18238.3	19204.5	20320.5	21250.5	21529.5	21157.5	21064.5				
Final Effective Stress (psf)							18658.3	19624.5	20740.5	21670.5	21949.5	21577.5	21484.5				
Primary Settlement (ft.)							0.0	0.0	0.0	0.0	0.0	0.0	0.0				
Primary Settlement (in.)							0.0	0.0	0.0	0.0	0.0	0.0	0.0				
SUB LAYER									**17**								
Top of Layer Elevation (ft.)							3369.6	3361.3	3361.7	3353.7	3351.3	3347.5	3345.3				
Bottom of Layer Elevation (ft.)							3359.8	3351.0	3350.8	3342.3	3339.7	3336.1	3334.0				
Layer Midpoint Elevation (ft.)							3364.7	3356.1	3356.2	3348.0	3345.5	3341.8	3339.6				
Initial Effective Stress (psf)							19415.0	20443.5	21631.5	22621.5	22918.5	22522.5	22423.5				
Final Effective Stress (psf)							19835.0	20863.5	22051.5	23041.5	23338.5	22942.5	22843.5				
Primary Settlement (ft.)							0.0	0.0	0.0	0.0	0.0	0.0	0.0				
Primary Settlement (in.)							0.0	0.0	0.0	0.0	0.0	0.0	0.0				
SUB LAYER									**18**								
Top of Layer Elevation (ft.)							3359.8	3351.0	3350.8	3342.3	3339.7	3336.1	3334.0				
Bottom of Layer Elevation (ft.)							3350.0	3340.7	3339.9	3330.9	3328.2	3324.8	3322.7				
Layer Midpoint Elevation (ft.)							3354.9	3345.8	3345.3	3336.6	3333.9	3330.4	3328.3				
Initial Effective Stress (psf)							20591.7	21682.5	22942.5	23992.5	24307.5	23887.5	23782.5				
Final Effective Stress (psf)							21011.7	22102.5	23362.5	24412.5	24727.5	24307.5	24202.5				
Primary Settlement (ft.)							0.0	0.0	0.0	0.0	0.0	0.0	0.0				
Primary Settlement (in.)							0.0	0.0	0.0	0.0	0.0	0.0	0.0				
SUB LAYER									**19**								
Top of Layer Elevation (ft.)								3340.7	3339.9	3330.9	3328.2	3324.8	3322.7				
Bottom of Layer Elevation (ft.)								3330.3	3328.9	3319.4	3316.6	3313.4	3311.3				
Layer Midpoint Elevation (ft.)								3335.5	3334.4	3325.1	3322.4	3319.1	3317.0				
Initial Effective Stress (psf)								22921.5	24253.5	25363.5	25696.5	25252.5	25141.5				
Final Effective Stress (psf)								23341.5	24673.5	25783.5	26116.5	25672.5	25561.5				
Primary Settlement (ft.)								0.0	0.0	0.0	0.0	0.0	0.0				
Primary Settlement (in.)								0.0	0.0	0.0	0.0	0.0	0.0				

TABLE 4 FINAL COVER SETTLEMENT CALCULATIONS (CONTINUED)

Point	A0	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	A16
Station	3+50	4+30	5+00	6+50	8+00	9+37	10+75	11+75	14+00	17+00	20+00	23+00	25+00	28+00	31+25	32+00	33+70
SUB LAYER									20								
Top of Layer Elevation (ft.)								3330.3	3328.9	3319.4	3316.6	3313.4	3311.3				
Bottom of Layer Elevation (ft.)								3320.0	3318.0	3308.0	3305.0	3302.0	3300.0				
Layer Midpoint Elevation (ft.)								3325.2	3323.5	3313.7	3310.8	3307.7	3305.7				
Initial Effective Stress (psf)								24160.5	25564.5	26734.5	27085.5	26617.5	26500.5				
Final Effective Stress (psf)								24580.5	25984.5	27154.5	27505.5	27037.5	26920.5				
Primary Settlement (ft.)								0.0	0.0	0.0	0.0	0.0	0.0				
Primary Settlement (in.)								0.0	0.0	0.0	0.0	0.0	0.0				
SETTLEMENT																	
Total Primary Settlement (in.)	0.0	0.4	0.5	0.6	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.7	0.6	0.4	0.0
Total Secondary Settlement (in.)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Settlement (in.)	0.0	0.4	0.5	0.6	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.7	0.6	0.4	0.0
Total Settlement (ft.)	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0
Differential Settlement (ft.)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GRADES AND STRAINS																	
Final Waste Elevation Prior to Settlement (ft.)	3356.5	3376.5	3391.5	3426.5	3461.5	3496.5	3526.5	3526.5	3536.5	3536.5	3536.5	3529.5	3526.5	3446.5	3376.5	3359.5	3326.5
Final Waste Elevation After settlement (ft.)	3356.5	3376.5	3391.5	3426.4	3461.4	3496.4	3526.4	3526.4	3536.4	3536.4	3536.4	3529.4	3526.4	3446.4	3376.5	3359.5	3326.5
Initial Final Cover GeoMembrane Segment Length (ft.)	0.0	82.5	71.6	154.0	154.0	141.4	141.2	100.0	225.2	300.0	300.0	300.1	200.0	310.5	332.5	76.9	173.2
PostSettlement Final Cover GeoMemberane Segment	0.0	82.5	71.6	154.0	154.0	141.4	141.2	100.0	225.2	300.0	300.0	300.1	200.0	310.5	332.5	76.9	173.2
Strain (+ Compression/- Tension)		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
PreSettlement Slope (+ up/- down)		25.0%	21.4%	23.3%	23.3%	25.5%	21.7%	0.0%	4.4%	0.0%	0.0%	-2.3%	-1.5%	-26.7%	-21.5%	-22.7%	-19.4%
Post Settlement Slope (+ up/- down)		25.0%	21.4%	23.3%	23.3%	25.5%	21.7%	0.0%	4.4%	0.0%	0.0%	-2.3%	-1.5%	-26.7%	-21.5%	-22.7%	-19.4%
Grade Change (+ Steeper/- Milder)		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%