



Engineering & Geosciences

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July 11, 2022

Utah Division of Waste Management and Radiation Control
Attention: Mr. Brian Speer, Solid Waste Program Manager
195 North 1950 West
Salt Lake City, UT 84114-4880

RECEIVED

By Division of Waste Management and Radiation Control at 11:46 am, Jul 12, 2022

RNI Ace Class IIIb Exploration and Production Waste Landfill Disposal
GeoStrata Project No. 524-099

RE: Request for Information – RNI Ace Class IIIb Exploration and Production Waste Landfill

Mr. Speer:

In a letter dated April 6, 2022, the Utah Division of Waste Management and Radiation Control (DWMRC) provided additional items for correction of the GeoStrata report titled “Ace Landfill Permit Application” submitted on behalf of RN Industries (RNI) and dated December 23, 2020. As requested by RNI, GeoStrata is responding to the additional questions and comments made by the DWMRC in its continued review. Updated pages of the permit application report have been prepared and are provided with this letter. These revised pages, which have been prepared for submission, incorporates the following responses to the Divisions comments of the April 6, 2022 letter:

Comment 1: *Part II, 3.2.3 – Waste Disposal – Unless Ace Landfill can justify the use of just 12” protective layer of drain sand, the Division recommends using at least an 18” to fully protect the liner before any waste is disposed of. Please make changes to Drawings B-4 and B-5 to reflect these changes.*

Response: Drawings B-4 and B-5 have been updated to meet this request of using 18 inches of drain sand. See attached permit drawings and incorporate them into the final permit.

Comment 2: *Part III, Figure 1, Pages 13 and 14 – Please remove the name Bluebell and replace it with Ace so the application is specific to the Ace Landfill.*

Response: The referenced pages have been updated and are attached to this letter.

Comment 3: *Part III, 3.2 – Design of the Final Cover. Please provide an updated evapotranspiration (ET) cover design by specifying a clay layer of adequate thickness and covering it with more topsoil to provide an effective and lasting landfill cover. Please make changes to Drawings B-4 and B-5 to reflect these changes.*

(a) The Division disagrees with the use of just 6 inches of a clayey soil layer placed on the waste prior to placing the topsoil layer. A thin layer such as this could not be compacted. ET covers, such as discussed in Part III, Section 3.2., have not been shown effective when designed less than 40" thick, and most are thicker.

(b) Although the Division previously provided approval of the ET cover for the RNI Bluebell landfill, that cover is similar to the one described in the Ace Landfill application and will not be effective. When it comes time for placing the final cover on the RNI Bluebell Landfill, it will also require a more protective design if RNI chooses to use an ET cover.

Response: GeoStrata's design of the final cover was based on the standard design criteria found in R315-303-3(4) (Standard Design). The design included, as recommended two layers, one to minimize infiltration and another to minimize erosion. GeoStrata investigated the permeability of the clayey soils at the Ace and site and proposed to reduce the thickness of the infiltration layer portion of the final cove due to the highly impermeable soils at the site. GeoStrata proposed an alternative design that included 6 inches of clayey be used for the cover to minimize infiltration in addition to the 6 inches of soil to sustain vegetative growth. Although it is our opinion that the alternative design on the cover layer to minimize infiltration is equivalent to the standard design and has followed the requirements of R315-303-3(4)c) of an alternative final cover design, the Ace Landfill final cover will follow the recommendations of the standard design.

GeoStrata has not found any documentation in the Standard Design recommendation in R315-303-3(4) that would require 40 inches of cover. GeoStrata is also not aware of any currently permitted E&P landfill in the Uinta Basin that has required a cover that is 40 inches thick. If RNI were required to have a 40-inch-thick cover as part of the design and were required to bond for this type of cover, then this would be unlike any other E&P landfill in the Uinta Basin. In addition, the Ace landfill would require additional funds for bonding and would be at an economic disadvantage as compared to all other landfills that take E&P waste. GeoStrata requests that RNI be allowed to use the Standard Design for the final cover and be allowed to bond for this type of cover upon approval of the permit.

As part of this request the design drawings have been updated to show a final cover based on the Standard Design. This updated design includes 18 inches of soil that have permeability of less than 1×10^{-5} in addition to the 8 inches of soil to support vegetative growth.

We look forward to having this permit application completed and approved by your office. Please let us know that you have received and reviewed our response letter. If you have any questions please contact our office at 801-501-0583.

Respectfully submitted,

GeoStrata

A handwritten signature in blue ink, appearing to read "Jon Peaden".

Jon Peaden
Environmental Scientist

A handwritten signature in black ink, appearing to read "Mike Vorkink".

Mike Vorkink, P.G.
Senior Geologist

RN INDUSTRIES ACE DISPOSAL FACILITY

POND 6 LANDFILL CONVERSION

June 30, 2022

BINDING EDGE

SECTION 3, TOWNSHIP 6 SOUTH, RANGE 20 EAST,
UINTAH SPECIAL BASE AND MERIDIAN



				SCALE NONE		LOCATION UINTAH COUNTY, UTAH	
						PROJECT ACE DISPOSAL LANDFILL	
A	10-18-19	BER	PERMIT DRAWINGS			TITLE COVER SHEET	NO
REV	DATE	BY	DESCRIPTION				

RN INDUSTRIES ACE DISPOSAL FACILITY

POND 6 LANDFILL CONVERSION

June 30, 2022

BINDING EDGE

SECTION 3, TOWNSHIP 6 SOUTH, RANGE 20 EAST,
UINTAH SPECIAL BASE AND MERIDIAN



				SCALE		LOCATION	UINTAH COUNTY, UTAH	
				NONE		PROJECT	ACE DISPOSAL LANDFILL	
A	10-18-19	BER	PERMIT DRAWINGS			TITLE	COVER SHEET	NO
REV	DATE	BY	DESCRIPTION					

BINDING EDGE

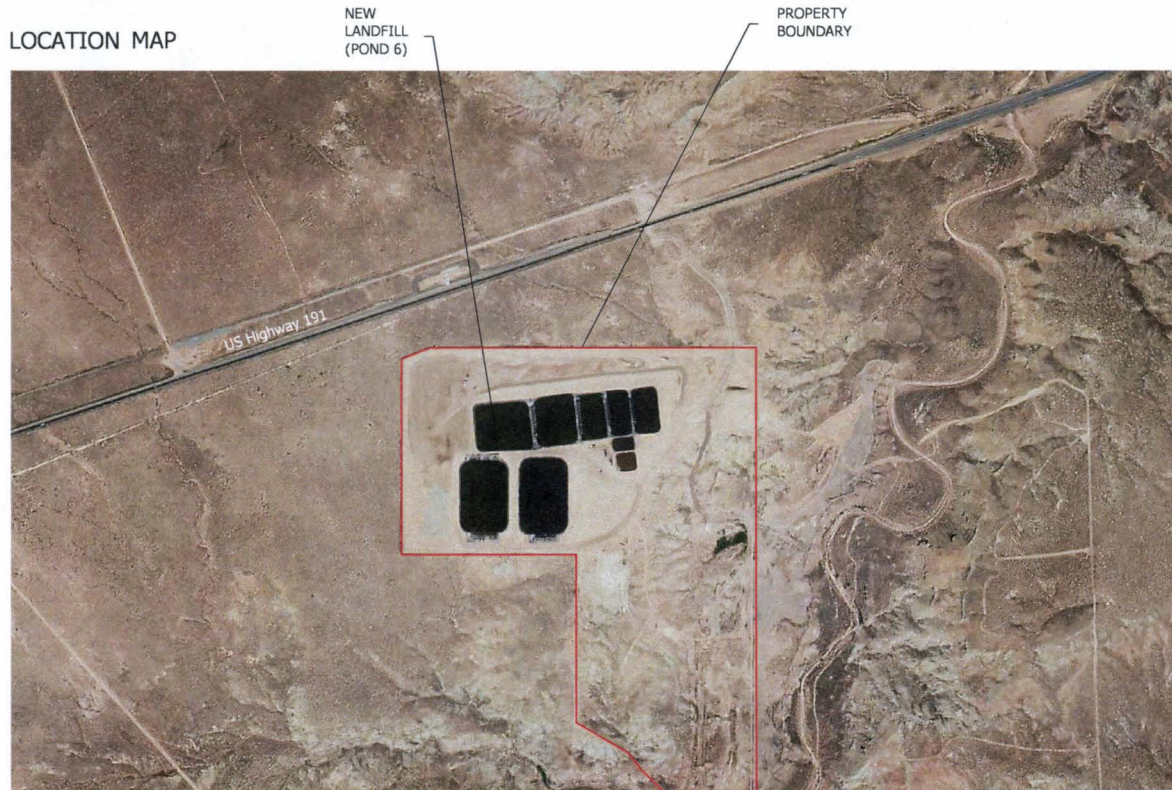
ABBREVIATIONS

ADJ	ADJUST
ADS	ADVANCE DRAINAGE SYSTEM
ARV	AIR RELEASE VALVE
BC	BAR AND CAP
BOW	BACK OF WALK
BVCE	BEGINNING VERTICAL CURVE ELEV.
BVCS	BEGINNING VERTICAL CURVE STATION
CB	CATCH BASIN
CH	CHORD BEARING
CL	CENTERLINE
CMP	CORRUGATED METAL PIPE
CO	CLEAN OUT
CONC	CONCRETE
COR	SECTION CORNER
D	DELTA ANGLE
DET	DETAIL
DIA	DIAMETER
DIP	DUCTILE IRON PIPE
DWG	DRAWING
EG	EXISTING GRADE
ELEV	ELEVATION
EOC	EDGE OF CONCRETE
EP	EDGE OF PAVEMENT
EVCE	END VERTICAL CURVE ELEV.
EVCS	END VERTICAL CURVE STATION
EW	EACH WAY
EX	EXISTING
FFE	FINISHED FLOOR ELEVATION
FG	FINISHED GRADE
FH	FIRE HYDRANT
FL	FLOWLINE
FO	FIBER OPTICS
FT	FOOT
GB	GRADE BREAK
HC	HANDICAP
HDPE	HIGH DENSIT POLYETHYLENE
HP	HIGH POINT
INV	INVERT
IRR	IRRIGATION
LF	LINEAR FEET
LIP	LIP OF CURB
LP	LOW POINT
LT	LEFT
MAX	MAXIMUM
MH	MANHOLE
MIN	MINIMUM
MON	MONUMENT
NTS	NOT TO SCALE
OC	ON CENTER
OHP	OVER HEAD POWER
PC	POINT OF CURVE
PI	POINT OF INTERSECTION
PL	PROPERTY LINE
PP	POWER POLE
PRC	POINT OF REVERSE CURVE
PRV	PRESSURE REDUCING
PT	POINT OF TANGENCY
PUE	PUBLIC UTILITY EASEMENT
PVC	POLYVINYL CHLORIDE PIPE
R	RADIUS
ROW	RIGHT OF WAY
RT	RIGHT
S	SEWER
SD	STORM DRAIN
SER	SOUTH END RADIUS
SSMH	SEWER MANHOLE
STA	STATION
STD	STANDARD
SW	SECONDARY WATER
TBC	TOP BACK OF CURB
TOA	TOP OF ASPHALT
TOE	TOE OF SLOPE
TOP	TOP OF SLOPE
TOW	TOP OF WALL
TYP	TYPICAL
UG	UNDERGROUND POWER
VPC	VERTICAL POINT OF CURVE
VPI	VERTICAL POINT OF INTERSECTION
VPT	VERTICAL POINT OF TANGENCY
W	WATER
WM	WATER METER
WV	WATER VALVE

SHEET INDEX

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B5	PLAN 7 PROFILE POND 6 NORTH TO SOUTH
B6	LANDFILL DETAILS
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B8	STAGING AREA DETAIL
B9	COMPLETED DETAIL

LOCATION MAP



GeoStrata
BLUFFDALE, UTAH

REV	DATE	BY	DESCRIPTION
A	10-18-19	BER	PERMIT DRAWINGS

SCALE
AS SHOWN



LOCATION	UINTAH COUNTY, UTAH	B-1
PROJECT	ACE DISPOSAL LANDFILL	
TITLE	INDEX & LEGEND	NO

BINDING EDGE

Blue Stakes of Utah
UTILITY NOTIFICATION CENTER, INC



GENERAL NOTES

1. THE DESIGN IS AN ORIGINAL UNPUBLISHED WORK AND MAY NOT BE DUPLICATED, PUBLISHED AND/OR USED WITHOUT THE WRITTEN CONSENT OF GEOSTRATA, LLC.
2. ALL WORK IS TO BE PERFORMED IN ACCORDANCE WITH PERTINENT JURISDICTIONAL CODES, RESTRICTIONS, COVENANTS, AND/OR ORDINANCES. ANY CONFLICT BETWEEN DESIGN AND REQUIREMENT SHALL BE REPORTED TO GEOSTRATA, LLC BEFORE PROCEEDING. FAILURE TO DO SO VOIDS THE DESIGN.
3. ANY AND ALL PROPOSED CHANGE, MODIFICATIONS AND/OR SUBSTITUTION SHALL BE REPORTED TO GEOSTRATA, LLC BEFORE PROCEEDING. ANY DEVIATION FROM THE CONTRACT DOCUMENTS, WITHOUT THE EXPRESS WRITTEN AUTHORIZATION OF GEOSTRATA, LLC VOIDS THE DESIGN.
4. IN THE EVENT OF CONFLICT BETWEEN THE DESIGN DOCUMENTS AND/OR JURISDICTIONAL REQUIREMENTS, THE MORE RESTRICTIVE FROM THE STANDPOINT OF SAFETY AND PHYSICAL SECURITY SHALL APPLY.
5. ANY INSTALLATION OR WORK NECESSARY TO THE FUNCTIONING, SAFETY AND/OR PHYSICAL SECURITY OF DESIGN THAT IS TO BE ENCAPSULATED OR OTHERWISE PERMANENTLY OBTSCURED FROM INSPECTION SHALL BE REPORTED TO GEOSTRATA, LLC A MINIMUM OF TWO (2) WORKING DAYS BEFORE ENCLOSURE.
6. ANY DAMAGE, DISRUPTION OR COMPROMISE OF AMBIENT RIGHTS-OF-WAY, UTILITIES, OR ENVIRONMENTAL QUALITY SHALL BE IMMEDIATELY RECTIFIED BY THE CONTRACTOR TO THE SATISFACTION OF GEOSTRATA, LLC AT NO COST TO THE OWNER.
7. ALL WORK SHALL BE INSPECTED BY GOVERNING AGENCIES IN ACCORDANCE WITH THEIR REQUIREMENTS. JURISDICTIONAL APPROVAL SHALL BE SECURED BEFORE PROCEEDING WITH WORK BY CONTRACTOR.

EROSION CONTROL NOTES

1. AT ALL TIMES DURING CONSTRUCTION, CONTRACTOR SHALL BE RESPONSIBLE FOR PREVENTING AND CONTROLLING EROSION DUE TO WIND AND RUNOFF. CONTRACTOR SHALL ALSO BE RESPONSIBLE FOR MAINTAINING THE EROSION STORM WATER CONTROL FACILITIES READ BY CONTRACT DOCUMENTS.
2. CONTRACTOR SHALL BE RESPONSIBLE FOR CLEANING DRAINAGE AND EROSION CONTROL FACILITIES AS REQUIRED. ROADWAYS SHALL BE KEPT CLEAN OF CONSTRUCTION DEBRIS.
3. FUGITIVE DUST SHALL BE CONTROLLED BY SPRAYING WATER ON THE DRY AREAS OF THE SITE.
4. NO RUBBISH, TRASH, GARBAGE, OR THE OTHER SUCH MATERIALS SHALL BE DISCHARGED INTO DRAINAGE DITCHES OR WATERS OF THE STATE.
5. ALL MATERIALS SPILLED, DROPPED, WASHED, OR TRACKED FROM VEHICLES ONTO ROADWAYS OR INTO STORM DRAINS SHALL BE REMOVED IMMEDIATELY.
6. CONTRACTOR SHALL BE RESPONSIBLE FOR ADJUSTING THE EROSION CONTROL MEASURES (SILT FENCES, STRAW BALES, ETC.) DUE TO GRADE CHANGES OR OTHER UNFORESEEN CONDITIONS DURING DEVELOPMENT OF THE PROJECT.

CAUTION NOTICE TO CONTRACTOR

THE CONTRACTOR IS SPECIFICALLY CAUTIONED THAT THE LOCATION AND/OR ELEVATION OF EXISTING UTILITIES AS SHOWN ON THESE PLANS ARE BASED ON RECORDS OF THE VARIOUS UTILITY COMPANIES AND, WHERE POSSIBLE, MEASUREMENTS TAKEN IN THE FIELD. THE INFORMATION IS NOT TO BE RELIED ON AS BEING EXACT OR COMPLETE. THE CONTRACTOR MUST CALL THE APPROPRIATE UTILITY COMPANY AT LEAST 48 HOURS BEFORE ANY EXCAVATION TO STAKING OF UTILITIES. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO RELOCATE ALL EXISTING UTILITIES WHICH CONFLICT WITH THE PROPOSED IMPROVEMENTS SHOWN ON THE PLANS.

CONTRACTOR AGREES THAT IT SHALL ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR JOB SITE CONDITIONS DURING THE COURSE OF CONSTRUCTION OF THIS PROJECT, INCLUDING SAFETY OF ALL PERSONS AND PROPERTY; THAT THIS REQUIREMENT SHALL APPLY CONTINUOUSLY AND NOT BE LIMITED TO THE NORMAL WORKING HOURS; AND THE CONTRACTOR SHALL DEFEND, INDEMNIFY, AND HOLD THE OWNER AND THE ENGINEER HARMLESS FROM ANY AND ALL LIABILITY, REAL OR ALLEGED, IN CONNECTION WITH THE PERFORMANCE OF WORK ON THIS PROJECT, EXPECTING FOR LIABILITY ARISING FROM SOLE NEGLIGENCE OF THE OWNER OR THE ENGINEER.

CONSTRUCTION NOTES

1. ALL WORK WITHIN THE SITE SHALL CONFORM TO CURRENT JURISDICTIONAL STANDARDS AND SPECIFICATIONS.
2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR MEETING ALL OF THE REQUIREMENTS ESTABLISHED FOR SAFE TRENCHING. (SEE OSHA AND UOHA REQUIREMENTS, LATEST EDITIONS).
3. CONTRACTOR SHALL LOCATE ALL UNDERGROUND UTILITIES BEFORE EXCAVATING WITHIN 200 FEET OF SAID UTILITIES WHICH MAY BE EXPOSED, DAMAGED, OR CROSSED AS SHOWN ON THE DRAWINGS OR AS "BLUE STAKED". THE CONTRACTOR SHALL MAKE ARRANGEMENTS WITH THE UTILITY COMPANY TO MOVE THE UTILITY IF NECESSARY OR OBTAIN PERMISSION FROM GEOSTRATA, LLC TO MODIFY GRADES OF PROJECT LINES IN ORDER TO GO AROUND EXISTING UTILITIES.
4. BURIED UTILITIES ARE SHOWN ON THE PLANS IN A GENERAL SCHEMATIC WAY ACCORDING TO INFORMATION RECEIVED FROM OTHERS. THE ACCURACY OR COMPLETENESS OF THE LOCATIONS SHOWN IS APPROXIMATE ONLY. THE CONTRACTOR SHALL DETERMINE THE ACTUAL LOCATION OF EXISTING SERVICE CONNECTIONS AND UTILITIES, VERIFY THE HORIZONTAL AND VERTICAL LOCATIONS AND TAKE THE NECESSARY STEPS TO AVOID THEM.

LANDFILL #1 (POND 6 CONVERSION)

1. BOTTOM OF LANDFILL, NOMINAL EL. = 4975 FT
2. TOP OF LANDFILL, NOMINAL EL. = 5,000 FT
3. INBOARD SLOPE = 3:1
4. OUTBOARD SLOPE = 3:1
5. FINAL COVER GRADE = 2%
6. LANDFILL VOLUME (EXCLUDING BASE AND CAP MATERIAL) = 106,855 CY
7. VOLUME OF 6" LEACHATE SAND = 2,600 CY
8. VOLUME OF 12" PROTECTIVE SOIL = 5,270 CY
9. VOLUME OF 8" OF TOP SOIL CAP = 3,500 CY
10. VOLUME OF 18" OF CLAY CAP (K=1x10^-5) = 7,900 CY
11. SURFACE AREA OF TOP SOIL = 150,000 SF

GeoStrata
BLUFFDALE, UTAH

				SCALE		LOCATION	UINTAH COUNTY, UTAH	B-2
				AS SHOWN		PROJECT	ACE DISPOSAL LANDFILL	
A	10-18-19	BER				TITLE	GENERAL NOTES	NO
REV	DATE	BY						

BINDING EDGE



WORK SITE

GeoStrata
BLUFFDALE, UTAH

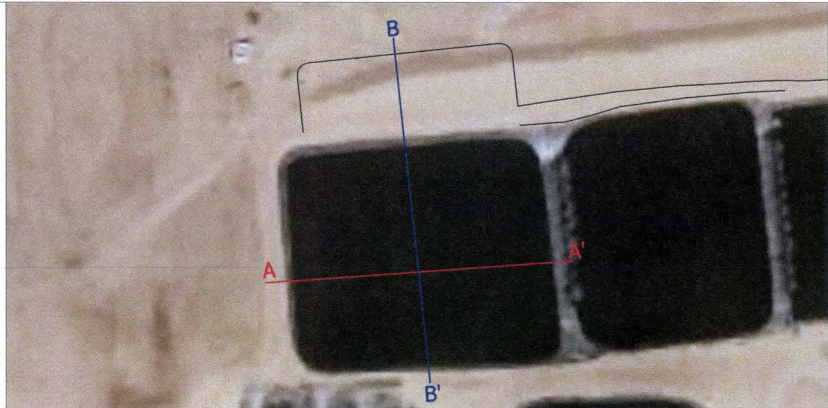
2016 PHOTOGRAPHY

REV	DATE	BY	DESCRIPTION
A	10-18-19	BER	PERMIT DRAWINGS

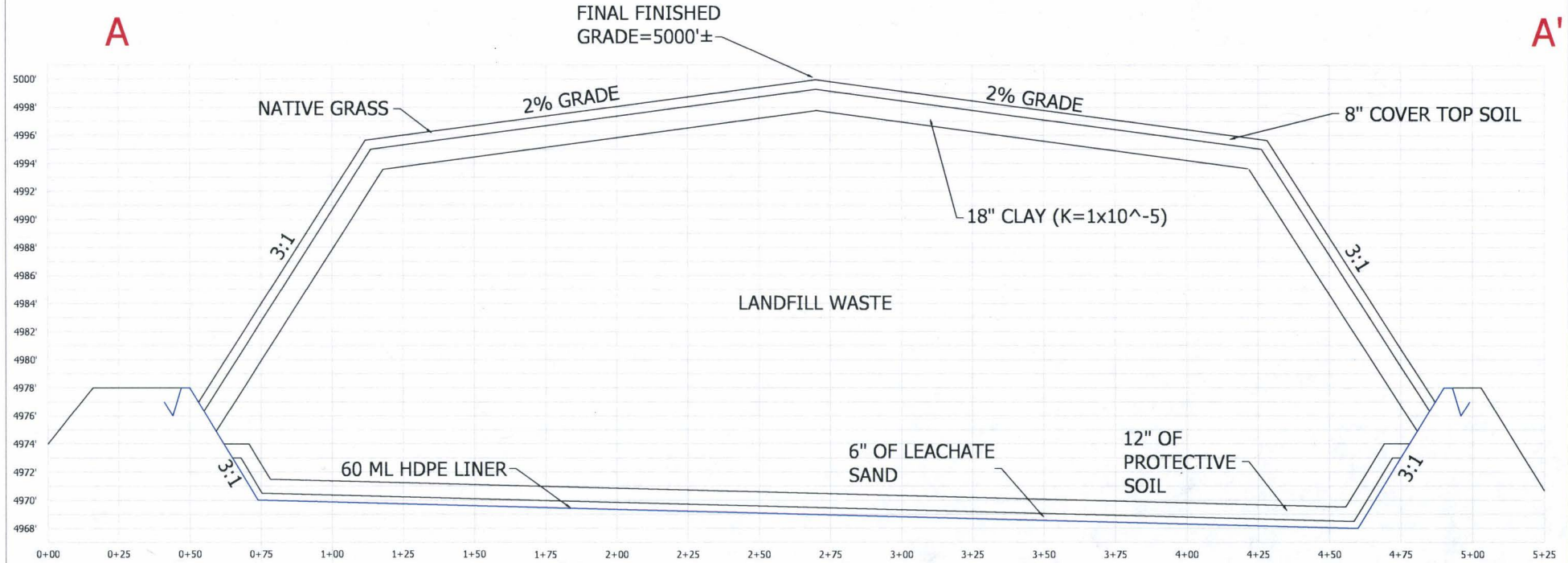
SCALE
AS SHOWN



LOCATION	UINTAH COUNTY, UTAH	B-3
PROJECT	ACE DISPOSAL LANDFILL	
TITLE	OVERALL SITE PLAN	NO



BINDING EDGE

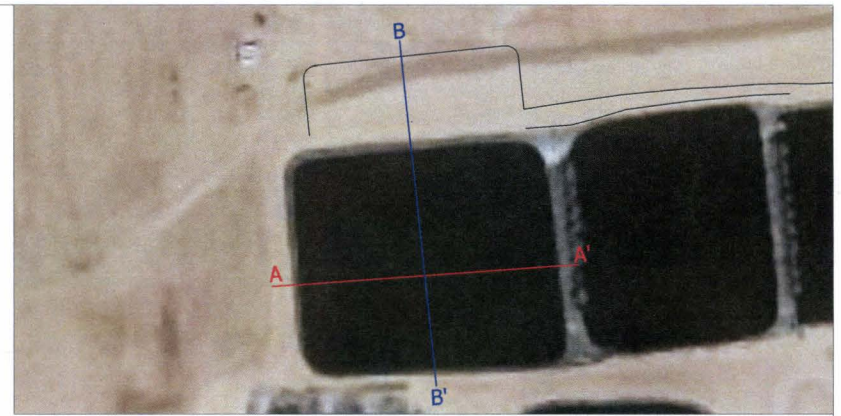


REV	DATE	BY	DESCRIPTION
A	10-18-19	BER	PERMIT DRAWINGS

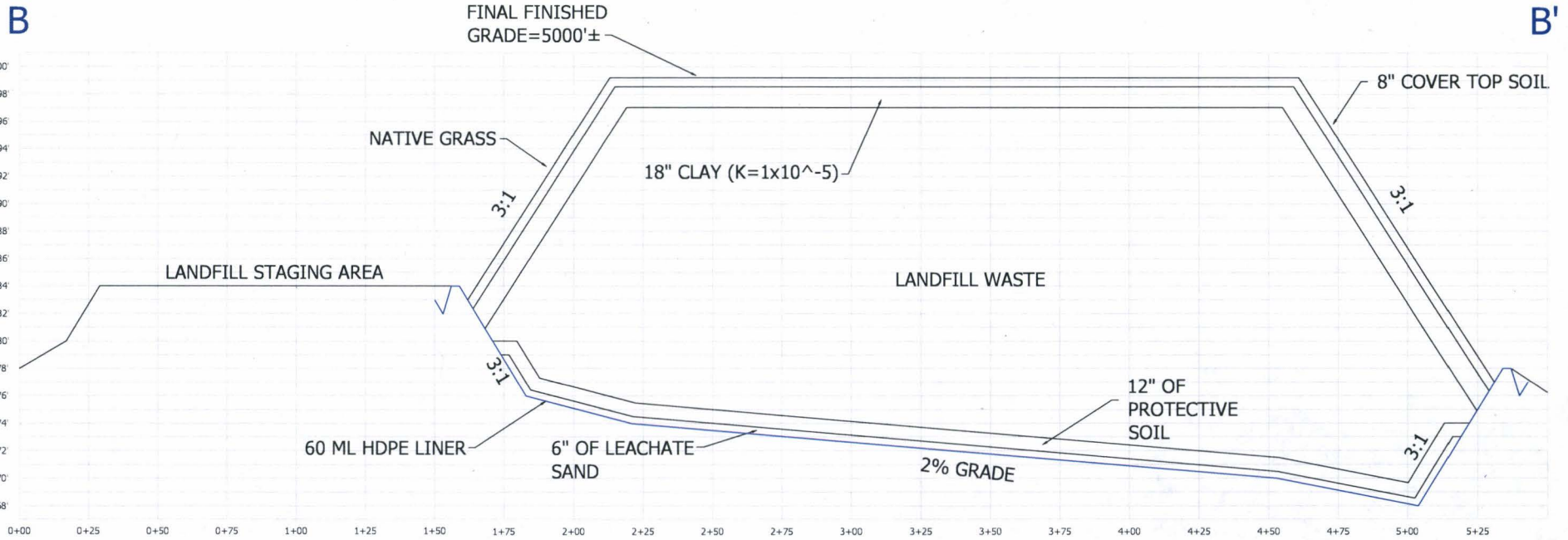
SCALE
AS SHOWN



LOCATION	DUCHESNE COUNTY, UTAH	B-4
PROJECT	ACE DISPOSAL LANDFILL	
TITLE	PLAN & PROFILE POND 6 EAST TO WEST	NO



BINDING EDGE



REV	DATE	BY	DESCRIPTION
A	10-18-19	BER	PERMIT DRAWINGS

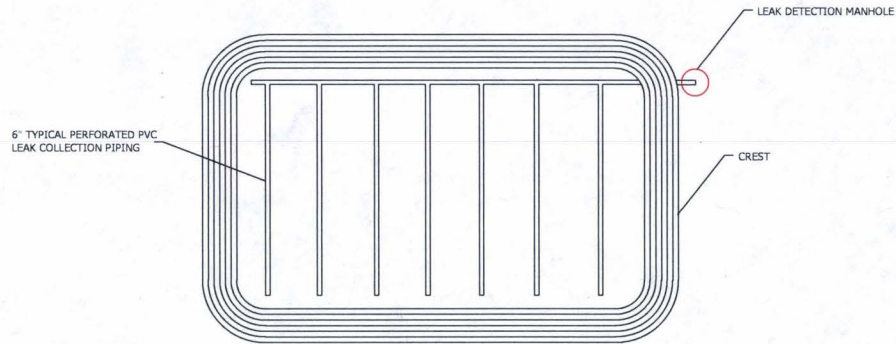
SCALE
AS SHOWN



LOCATION	DUCHESNE COUNTY, UTAH
PROJECT	ACE DISPOSAL LANDFILL
TITLE	PLAN & PROFILE POND 6 NORTH TO SOUTH

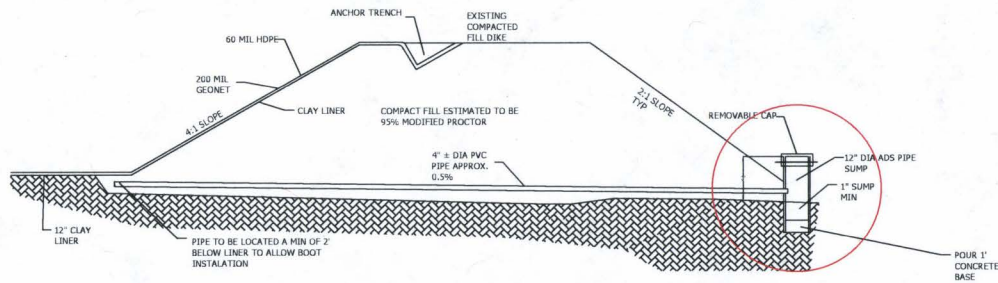
B-5

NO



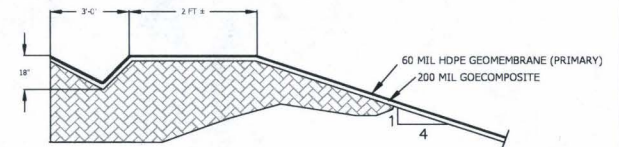
TYPICAL LEAK PIPING PLAN

LEAK COLLECTION PIPING IS SHOWN AS HAS BEEN DESCRIBED BY THE POND BUILDERS. IT IS AT BEST AN APPROXIMATE REPRESENTATION OF WHAT HAS BEEN INSTALLED. ACTUAL PIPE MATERIALS, SLOPES, PERFORATIONS, AND INSTALLATION DETAILS ARE UNKNOWN.



LEAK DETECTION DETAIL

(VERTICAL OR HORIZONTAL)
NOT TO SCALE



TYPICAL ANCHOR TRENCH (4:1 SLOPE)

NOT TO SCALE

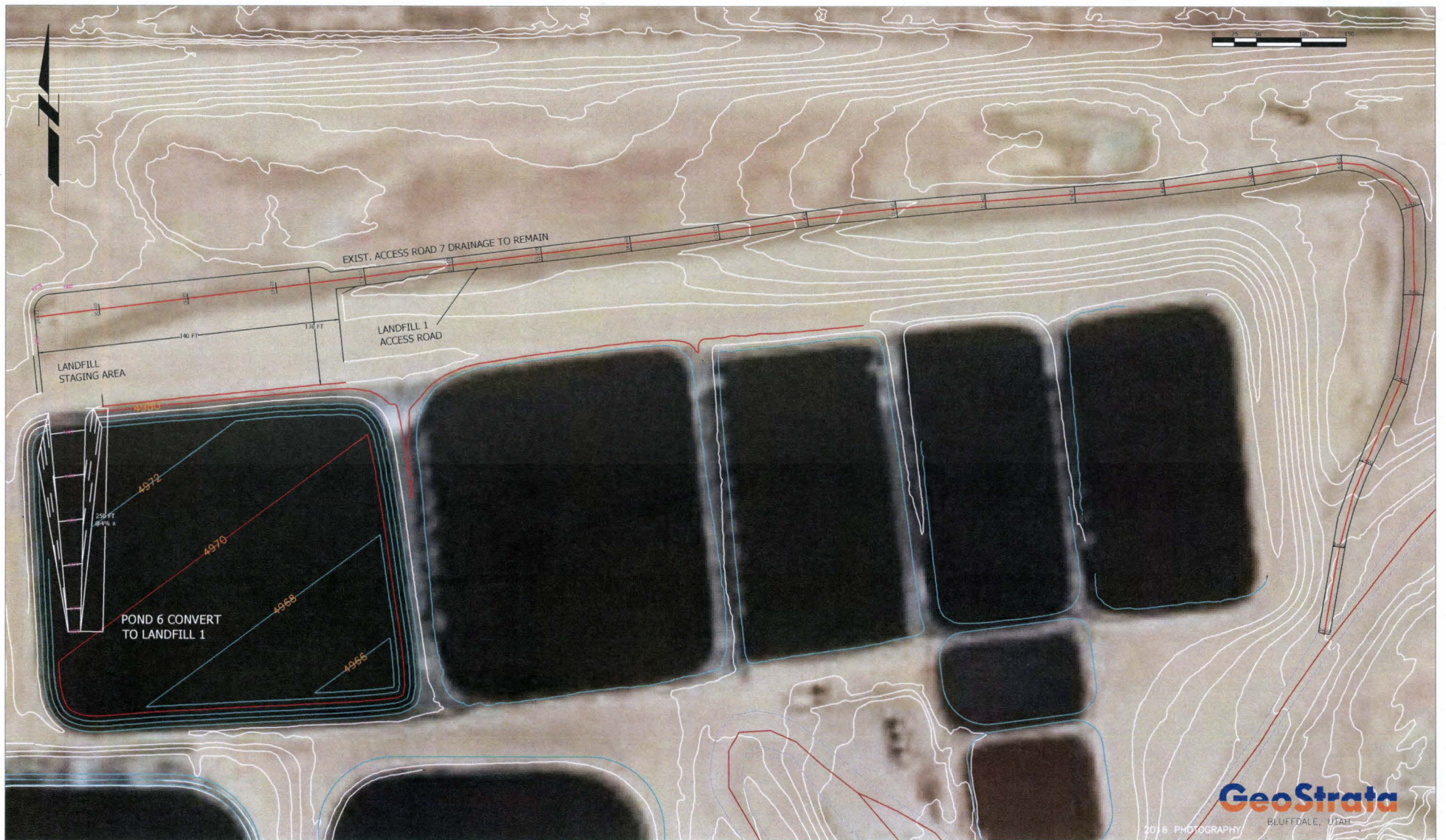


REV	DATE	BY	DESCRIPTION
A	10-18-19	BER	PERMIT DRAWINGS

SCALE
AS SHOWN



LOCATION	UINTAH COUNTY, UTAH	B-6
PROJECT	ACE DISPOSAL LANDFILL	
TITLE	LANDFILL DETAIL	NO



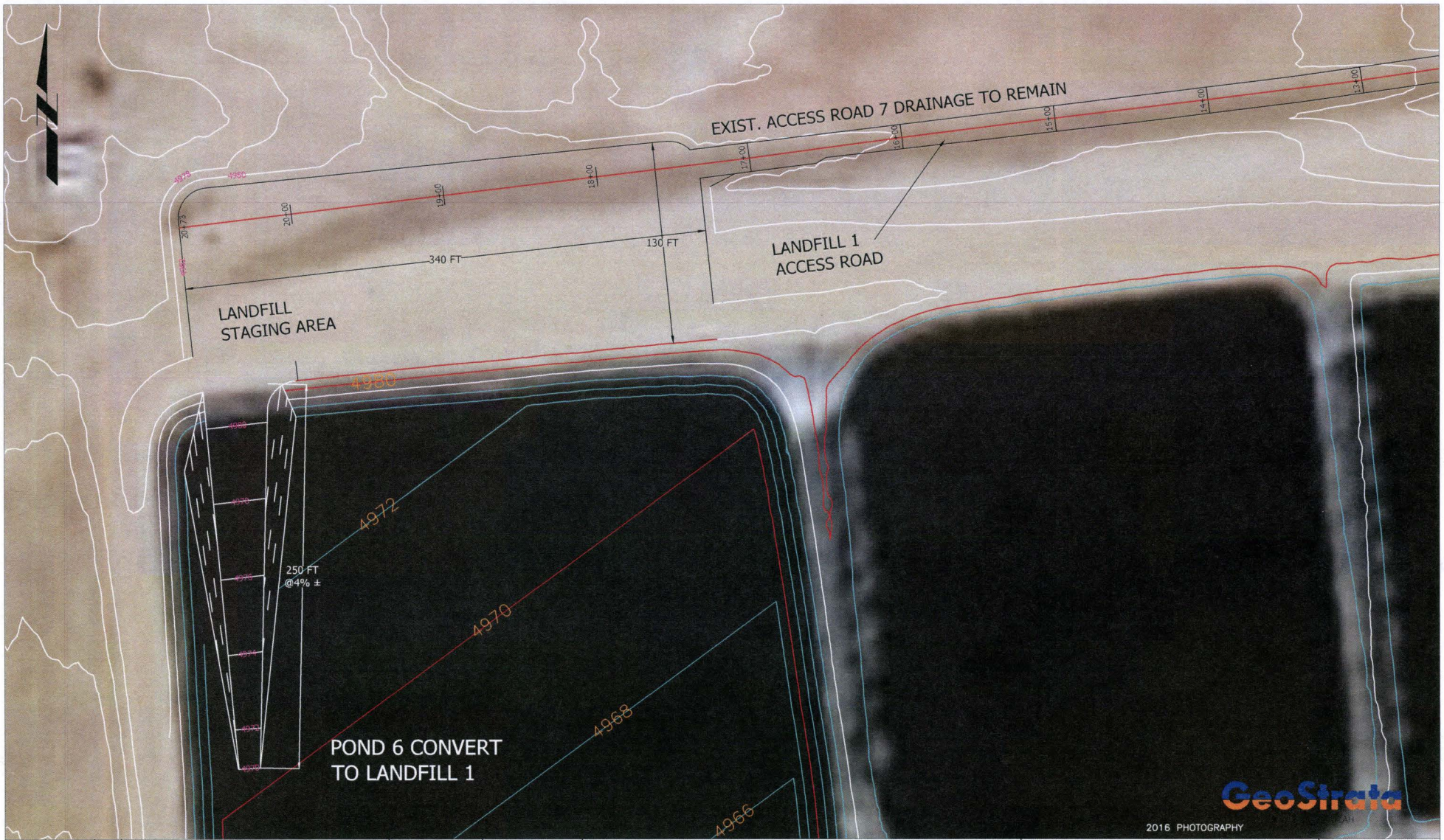
GeoStrata
 2016 PHOTOGRAPHY
 ELUFFDALE, UTAH

REV	DATE	BY	DESCRIPTION
A	10-18-19	BER	PERMIT DRAWINGS

SCALE
AS SHOWN



LOCATION	UINTAH COUNTY, UTAH	B-7
PROJECT	ACE DISPOSAL LANDFILL	
TITLE	WORK SITE DETAIL	NO



GeoStrata

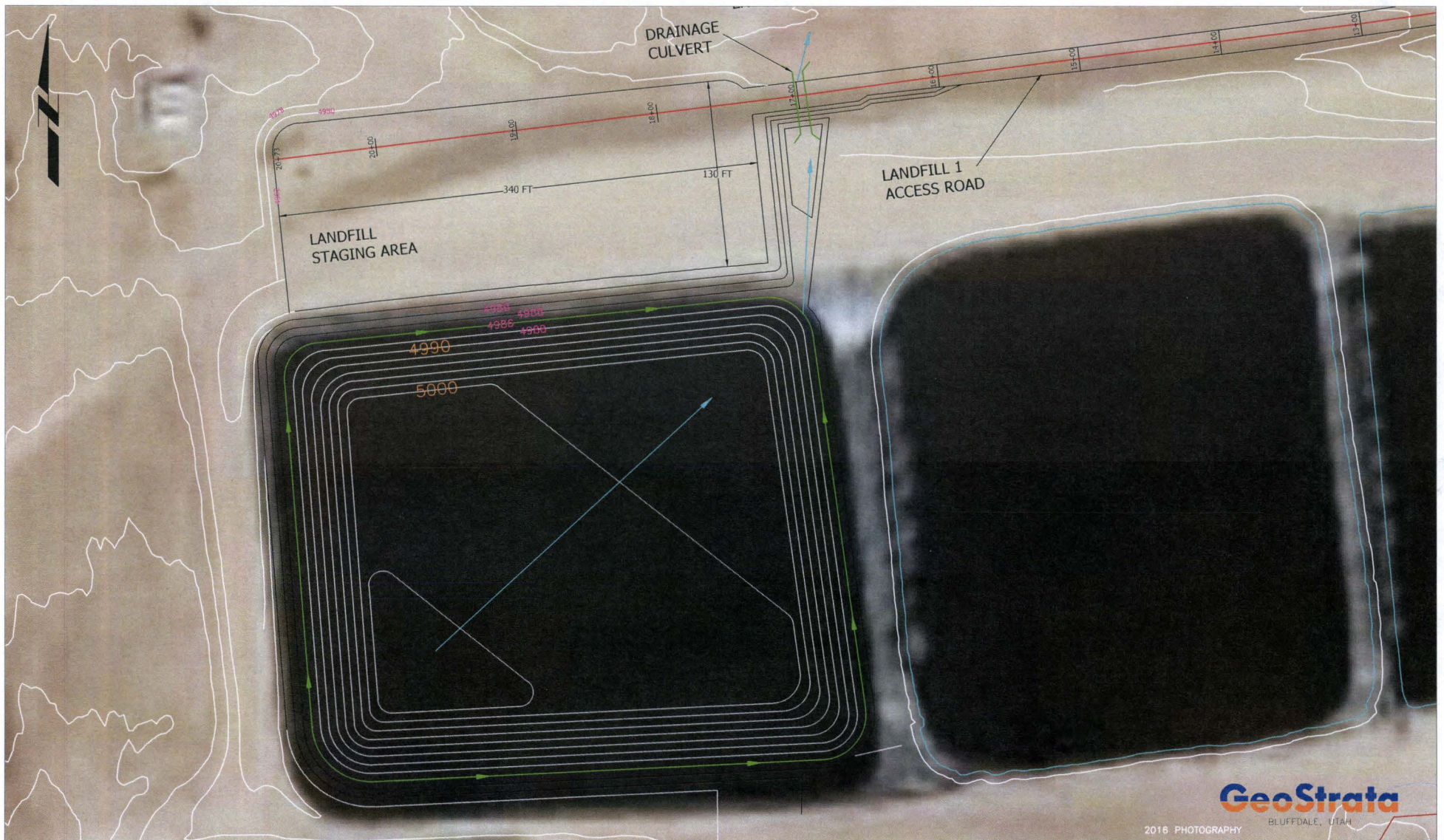
2016 PHOTOGRAPHY

REV	DATE	BY	DESCRIPTION
A	10-18-19	BER	PERMIT DRAWINGS

SCALE
AS SHOWN



LOCATION	UINTAH COUNTY, UTAH	B-8
PROJECT	ACE DISPOSAL LANDFILL	
TITLE	STAGING AREA DETAIL	NO



GeoStrata
 2016 PHOTOGRAPHY
 BLUFFDALE, UTAH

REV	DATE	BY	DESCRIPTION
A	10-18-19	BER	PERMIT DRAWINGS

SCALE
AS SHOWN



LOCATION	UINTAH COUNTY, UTAH	B-9
PROJECT	ACE DISPOSAL LANDFILL	
TITLE	STORMWATER DETAIL	NO

Figure1:

RN Industries
Proposed Ace Landfill
Alternative Closure Cap Equivalency to Standard Design prescribed by Rule R315-303-3

Alternative Closure Cap Equivalency to Standard Design prescribed by Rule R315-303-3(4)(c)
Infiltration and Erosion Equivalency

RN Industries proposes a six-inch thick Alternative Final Cover in place of Standard Design specified in Rule **R315-303-3 (4) (a) (i)**. Because Rule **R315-303-3(4)** does not provide a quantitative erosion standard, the equivalency of proposed Final Cover erosion will be demonstrated by showing geotechnical testing for and calculating annual erosion of the Alternative Final Cover Design. The following uses mathematical model based on the geotechnical testing to demonstrate equivalency as required in **R315-303-3(4)(d)**. This model will demonstrate that the alternative cover achieves an equivalent infiltration rate and protection from erosion as required in **R315-303-3(4)(c)(i and ii)**.

The Alternative Final Cover will be constructed from compacted soil native available in sufficient quantity at the Bluebell Disposal Site.

The following summary of soil test lab results, tables and narrative outline various geotechnical and agronomic characteristics of the Alternative Final Cover Design. These characteristics were chosen because they are parameters used both for geotechnical design of the Landfill and for USEPA/NRCS/USDA Revised Universal Soil Loss Equation.

References

- 1 EPA Stormwater Phase II Final Rule - EPA has updated its Rainfall Erosivity Factor Calculator to correct known problems and to use updated data from the Natural Resources Conservation Service's (NRCS) Revised Universal Soil Loss Equation, Version 2 (RUSLE2) database, 2012-09-26
- 2 Wischmeier, W. H., and Smith, D.D. 1978. Predicting rainfall erosion losses -- a guide to conservation planning. U.S. Department of Agriculture, Agriculture Handbook No. 537.
- 3 Renard, K.G., G.R. Foster, G.A. Weesies, D.K. McCool, and D.C. Yoder, coordinators. 1997. Predicting Soil Erosion by Water: A Guide to Conservation Planning With the Revised Universal Soil Loss Equation (RUSLE). U.S. Department of Agriculture, Agriculture Handbook No. 703, 404 pp.

Qualitative and Quantitative Effect of Erosion Computation Parameters Affecting RN Industries Alternative Landfill Cap Design				
Line	Erosion Computation Parameter	Alternative Design Final Cover		
1	ASTM D4647, Standard Test Methods for Identification and Classification of Dispersive Clay Soils Tests performed on sample compacted to optimum Procter Density confirmed Bluebell soil of interest is Non-Dispersive.	Exfiltration from sample had non-detectable turbidity which identifies a non-dispersive soil having a low erosion rate.		
2	ASTM D698 - 12e2, Standard Test Methods for Laboratory Compaction Characteristics.	Proctor optimum is 122 lb/cf at 14.6% moisture.		
3	ASTM D5084 - Method C, Standard Test Methods for Measurement of Hydraulic Conductivity. Lab measured Conductivity 7.74×10^{-7} cm/sec	Site soil used to construct the Alternative Design was selected and compacted to its Standard Proctor Optimum Density. It had a lab measured K value of 2.46×10^{-7} cm/sec. The lab measured conductivity is lower than 3.33×10^{-6} cm/sec required for Alternative Design infiltration equivalency. This meets the requirement of R315-303-3(4)(c)(i) .		
4	ASTM C117 - Standard Test Method for Materials Finer than 75-µm (No. 200) Sieve.	Classification	Sieve Size	Sieve Size (in) Passing (%)
		Cobble	100.0 mm 75.0 mm	4" 3" 100 100
		Very Coarse Gravel	50.0 mm 37.5 mm	2" 1.5" 100 100
		Coarse Gravel	25.0 mm 19.0 mm	1" 3/4" 100 100
		Medium Gravel	12.5 mm	1/2" 100
		Fine Gravel	9.5 mm 4.75 mm	3/8" No. 4 100 100
		Very Fine Gravel	2.36 mm	No. 8 99
		Coarse Sand	2.00 mm 1.18 mm	No. 10 No. 16 99 99
		Medium Sand	0.60 mm 0.43 mm	No. 30 No. 40 97 96

RN Industries
Proposed Ace Landfill
Alternative Closure Cap Equivalency to Standard Design prescribed by Rule R315-303-3

	Fine Sand	0.30 mm	No. 50	92
	Very Fine Sand	0.15 mm	No. 100	81
	Silt & Clay	0.08 mm	No. 200	66

RN Industries
Proposed Ace Landfill
Alternative Closure Cap Equivalency to Standard Design prescribed by Rule
R315-303-3

5	Five Wettest Year Total Precipitation & Average Annual Precipitation from USU Climatological Center for the Vernal Station. Data used as required in R315-303-3(4)(d)(i) and (ii)			Ratio of Wettest Year to Average Year = 13.18 Inches / ***** = 1.42 To adjust Rainfall-Runoff Factor for the five wettest years, multiply Rainfall-Runoff Factor from NRCS Iso Erodant map by 1.42	
	9.31 Inches-Avg Annual Precip	Rank	Year		Precip
		1	1938		13.18"
		2	1941		14.78"
		3	1983		11.47"
		4	1997		12.01"
5	2016	13.03"			
6	The following calculation uses procedures and data from USDA Handbooks No. 537 and its later revisions used by EPA and NRCS. NRCS has updated the original research for Handbook No. 537 and 703. The equations are now listed as Revised Universal Soil Loss Equation or RUSLE. Both the original and ongoing research to update, calibrate and automate RUSLE calculations were performed by University of Indiana, College of Agriculture staff over the past 40 years.				
7	Rainfall/Runoff Factor (EI Parameter NRCS Fig 1)	= 10 from Fig 1, Isoerodant Map	14.15682062		
8	Erodability Factor (NRCS Fig. 3 Nomograph)	using ASTM Gradation results	K = 0.64		
9	Topographic Factor (NRCS Slope-Length Nomograph)	Cap Slope = 3 on 1 or 33%	LS = 6		
10	Cover & Management Factor (NRCS Table 6)	using no cover and 80% mulch	S = 0.10		
11	Support Practice Factor (NRCS P Value limits for Contouring)	using 250 Ft slope length	C = 1.0		
12	Annual Soil Loss	A = R * K * LS * C (Tons/ Year)	A = 5.1 Ton/ Yr		
13	Erosion Equivalency				
	Soil erosion equivalency is demonstrated by the applying the standard model for erosion assessment used by US EPA. It is based on the empirical Revised Universal Soil Loss Equation.				
14	Calculated Annual Soil Erosion				
	Annual soil volume loss				
	a.	The soil density determined by ASTM D4647 lab test is 126 Lb per CF			
	b.	The RUSLE equation estimates an annual soil loss of 5.1 Tons / Yr			
	c.	The corresponding volume of soil loss will be 80 CF / Yr			
	d.	Each proposed Landfill cap has a finished surface area of 171,000 SF			
	e.	The annual uniform soil loss over entire cap will be 0.006 Inches			
15	Allowance for non-uniform soil loss and a reasonable Factor of Safety				
	Applying a Factor of Safety of 10				
	The estimated uniform soil loss over the entire cap will increase to 0.06 Inch / Yr				
	Unattended & unrepaired, the top half of the 6" thick cap has a life of about 50 Years				
16	Conclusions				
	GeoStrata engineers submits that the above geotechnical tests showing non-dispersive soils and the subsequent erosion calculations support the claim of the equivalency of the proposed Alternative Design for Ace Landfill Cap to the Standard Cap Design prescribed in Rule R315-303-3(4)(a)(i and ii) . The infiltration rate in Line 3 and Erosion rate in Line 15 of this model demonstrate that the cover design meets the rerequirements of R315-303-3(4)(c)(i and ii) . Line 3 demonstrates that the infiltration rate is less than the standard design. Line 15 shows that the cover after 20 years without any maintenance will have only lost 6 inches of soil. The post closure plan will have cover soils replaced.				