RIVERSIDE COUNTY
DEPARTMENT OF
WASTE RESOURCES

Hans W. Kernkamp, General Manager-Chief Engineer

ADDENDUM NO. 2

TO CONTRACT DOCUMENTS FOR

The Construction of P2S1 Liner Expansion Project at Badlands Sanitary Landfill
May 25 2023

BIDS DUE: Wednesday, June 7, 2023; 11:00 a.m.
Department of Waste Resources Office
14310 Frederick Street, Moreno Valley, CA 92553

This Addendum to the Contract Documents for Construction of P2S1 Liner Expansion Project at Badlands Sanitary Landfill is issued by the Riverside County Department of Waste Resources for the County of Riverside ("County").

Per the Notice Inviting Bids to Contractors in the administrative provisions section of the Contract Documents, all questions and requests for clarification or interpretation of the Contract Documents must be submitted in writing by 5:00 PM on Friday, May 19, 2023. This document addresses all the questions received prior to and up to the specified deadline. Questions received from Contractors shall be denoted in ***bold italic*** *font*.

Q1: ***Are there any Buy America requirements on the project?***

A1: Negative, there is no Buy America requirements on this project. There is an Iran Contracting Act Certification and Compliance with Economic Sanctions in Response to Russia's Action in Ukraine (refer to Bid Proposal Section of Administrative Provisions).

Q2: ***Detail 18A and Detail 18E on plan page 45 show a box culvert being constructed near the LCRS Clean out, but there is no location of this culvert on the plan pages. Please provide a plan page showing its location as well as the existing drainage system that it ties into.***

A2: Sheet 6 of the Construction Drawings has been updated to with the location of the Box Culvert. The Box Culvert shall be placed in-line with parts of the open trap channel along the North Perimeter Road.

Q3: ***Plan page 39 shows the skimmer construction and pipe profile. Detail 12A calls for Concrete Water Stops every 20 feet, but there is no detail for these water stops. Please provide a detail.***

A3: A Concrete Water Stop detail has been added to sheet 39.

Q4: ***The demo plan pages 4 & 5 call out the removal of existing BMP's, but have no clear quantities or locations for removal. Can you please provide a quantity for removal?***

A4: The contractor is encouraged to estimate demolition costs using the lengths, areas and cross sections shown on sheets 4, 5, 28, 29, 30 and 31. Approximately 53 cubic yards of gabion baskets will need to be demolished.

Q5: ***Does the work to raise the groundwater well need to be performed by a contractor with a C57 – Well Drilling license?***

A5: The contracted work to adjust the elevation of the groundwater monitoring well will not require a contractor with a C-57 Well Drilling License barring any unforeseen circumstances. The County will remove the concrete pad, outer well monument, and bollards before construction. The groundwater monitoring well casing will be raised by the County to a height above finished grade. The Contractor will need to protect the groundwater monitoring well casing during construction. The Contractor will need to finish construction of the groundwater monitoring well elevation adjustment per Detailed Provision 33 1153 – Groundwater Monitoring Well Elevation Adjustment.

Q6: ***Stockpile Drainage plan pages 15 & 17 call out the construction of a V-ditch drain made entirely out of gravel. It is a concern that the gravel will not stay in place on a 2:1 slope and will continue to fall into the centerline of the ditch. Would the Owner consider changing the design and constructing these V-ditches out of a low strength concrete instead of the gravel?***

A6: The County may consider changing the design and specifying the construction of V-ditches out of a different material prior to construction. However, for bidding purposes, please continue to provide a price for Bid Item No. 24, "Drainage Features" to construct the V-ditch drain on pages 15 & 17 per the specified material, gravel. Please ensure the cost of work associated the gravel V-ditch drain is reflected on the schedule of values to be submitted after the Contract is awarded. Any future change to the material of the V-ditch will be submitted by the County via a Contract Change Order.

Q7: ***Plan page 15 shows a plan view of the gravel v-ditch. The details show that the ditch is to transition back and forth between detail 8A and 8D. The detail 8A channel has a depth of 1.25' and the 8D channel has a depth of 2.0'. It will be extremely difficult to construct a ditch on grade that properly flows with the depth fluctuating that drastically and that often. Would the owner consider utilizing one size of trap channel for this work or utilizing a more gradual transition?***

A7: Sheet 15 has been updated with an additional construction note which states, "All slope drains shall transition for 10 feet before and after the portions of drains on benches unless noted otherwise."

Q8: ***Should the 1" HDPE Pneumatic line be anchored down with anything such as a sandbag or piece of rebar to prevent it from moving over time?***

A8: In regards to anchoring down the 1" HDPE pneumatic line Detailed Provision 43 2371.23 Section 3.02 has been updated with additional language as follows:

"4. Sand bags shall be used to constrain the above ground portions of the 1" air pressure extension airline every 50 linear feet. The sand bags shall be placed so as to butt up against the unconstrained or downhill side of the air pressure line. A corner of the sand bags may be placed on the airline. Do not place sand bags on the pneumatic airline on slopes greater than 2 to 1 unless directed otherwise."

Sheet 27 has been updated with language regarding anchoring the 1" HDPE pneumatic airline before it travels down a 1.5 to 1 slope.

Q9: ***Does the owner have a recommended source for the imported clay material?***

A9: The County does not have a recommended source for the imported clay material. Previously the County has interacted with Corona Clay and Pacific Aggregates for clay material. The Contractor may be able to find a clay source closer to the project site.

Q10: ***Appendix A Section 3 – Low-Permeability Layer states that the contractor shall process off-site clay material and onsite excavated material to remove particles and break down clods larger than one inch. Is the contractor going to be paid to screen clay & onsite material to 1" under bid item 32 or should the contractor include cost of screening clay & onsite material to 1" within bid item 13 & 14?***

A10: The Contractor should include the cost of screening the Low-Permeability Layer with bid items 13 & 14.

Q11: ***Appendix A Section 3 – Low-Permeability Layer states that LPL shall be a blended material that consists of clay from an offsite source and excavated material from the project limits. Can the owner please provide a ratio of blending for the 2 materials? (Example: 50/50 blend or 25/75 blend)***

A11: Per Detailed Provision 31 3526.13 Section 2.01 the contractor is to provide the QA/QC Consultant a clay sample to blend with soil taken from the project site. The QA/QC Consultant will then test the project site soil and clay mixes at different ratios until the necessary hydraulic conductivity conditions are met. The QA/QC Consultant will suggest blending ratios to the Contractor for the LPL test pads creation. During the most recent Liner Expansion Project at Badlands that required the construction of a Low-Permeability Layer (C4P3), a mixture of processed material consisting of 50% clay import and 50% Canyon 6 native material (Attachment 2), was used to construct the Low Perm Layer at a specified permeability rate less than $1x10^{-7}$ cm/sec. The final representative permeability values averaged 4.9×10^{-9} cm/sec for three flexible wall permeability tests and 8.7×10^{-8} cm/sec for 7 BAT permeability tests. The blending rate utilized by the Contractor will also be dependent on the soil characteristics of the clay import. For reference, the soil characteristics for both the clay import and Canyon 6 native material are provided in the Badlands C4P3 Hydraulic Conductivity Testing Program Results (Attachment 3).

Q12: ***Detail 26A on plan page 53 shows that the K-rail shall be pinned in the asphalt road by installing 2 pieces of #8 rebar. Does this detail apply to every piece of K-rail?***

A12: The K-rails are not to be installed on asphalt concrete. Every piece of K-rail shall be pinned into the final grade per Detail 26A on sheet 53 of the Badlands Sanitary Landfill P2S1 Liner Expansion Plans.

Q13: ***Plan page 7 shows a plan view of the concrete trap channel. The details show that the channel is to transition from detail 5C to 5B to 5C to 5B and then back to 5C within about 600 LF. The detail 5B channel has a depth of 2.0' and the 5C channel has a depth of 3.25'. It will be extremely difficult to construct a channel on grade that properly flows with the depth fluctuating that drastically and that often. Would the owner consider utilizing one size of trap channel for this work or utilizing a more gradual transition?***

A13: Sheet 7 has been updated with an additional construction note which states, "All slope drains shall transition for 10 feet before and after the portions of drains on benches unless noted otherwise."

Q14: ***Plan page 6 & 7 show the proposed liner limits terminating inside the proposed concrete trap channel. Can you please confirm there be enough room to install an anchor trench alongside the trap channel?***

A14: The proposed liner limits do not terminate inside the trap channel. The anchor trench is placed nearest the hinge before the trap channel as shown on Detail 5A of Sheet 32 (5A/32); the anchor trench does terminate inside the trap channel. Refer to Sheets 20 and 21 for Construction Note 33. Detail 5A/32 is referenced by Construction Note 33.

Q15: ***Detail 16B on plan page 43 shows an S-Fence with steel stakes and sandbags being installed along an existing drainage channel. Can you please indicate on the plans where this is to take place? Should the cost for this work be carried under Bid Item 2?***

A15: Detail 16B of sheet 43 shall be removed from the project drawings.

Q16: ***The Bidder Qualifications and Project References requires the Bidder to have completed two projects in the past 5 years with a minimum of 3 million cubic yards of mass excavation and to have completed one landfill liner project with a minimum of 2 million square feet of finished subgrade. Will this be upheld or is the owner willing to accept only one project of 3 million cubic yards of mass excavation?***

A16: The County will have to uphold these qualifications.

Q17*: Please clearly identify what part of Bench P needs to be left in place until the P2S1 lined landfill expansion can accept waste. At which time, please clearly identify where that material will be hauled and stockpiled.*

A17: Along Bench 216 / Bench P, between stations 17+96 to 28+45 and the North Access Road between stations 12+18 to 13+68; upon which time the County will provide where to haul and stockpile the excavated material.

Q18*: The specification refers to the excavation as rippable <u>with the use</u> of a Cat D-9 with a single ripper type equipment. This is helpful but should be based on a typical rippable quantity per hour over a certain duration as well. For instance….Ripplable with <u>the use</u> of a Cat D-9 with a single ripper type equipment capable of ripping 1,500 Cy/Hr over a 4 hour period.*

A18: The County is currently utilizing a CAT D-9T with three rippers to loosen material in our borrow area. On Tuesday May 23, 2023, the County CAT D-9T with three rippers was able to rip 330 cubic yards per hour for two hours within the P2S1 Subgrade Limits. Photos of the ripped area location are provided in Attachment 4.

Q19*: Where do you want items that pertain to the liner work (expose existing slope and floor liner, liner sub support, as-built liner survey, bench operations layer, protective cover installation on benches?*

A19: Bid item costs shall reflect the cost of work intended per unit of measure. For example protective cover soil installed on benches is 1" minus which is part of Bid Item 32.

Q20*: How thick is the gravel for details 8A, 8D, 8J on sheet 35? Is there filter fabric between the soil and rock?*

A20: The gravel is six inches thick for the Gravel V-Ditch drains. There is no filter fabric between the soil and rock.

Q21: Is the contractor to assume that all the parts and pieces of the skimmer are in working condition for the reinstallation?

A21: Yes, all parts and pieces of the skimmer are in working condition.

Q22*: What ratio of import should the contractor use for the import of Low-Pem layer in order to mix with on site materials?*

A22: Per Detailed Provision 31 3526.13 Clay Containment Barriers' Section 2.01 "The Contractor shall provide the QA/QC Consultant with a clay sample from a source approved by the County. The QA/QC Consultant will mix the clay sample with earthen material from the project site to determine the proper mixing ratios to achieve the $1x10^{-6}$ cm/sec and $1x10^{-7}$ cm/sec or less requirements for the LPL. The Contractor shall create two LPL test pads, one for $1x10^{-6}$ or less requirement and the other for $1x10^{-7}$ cm/sec or less requirement, utilizing the QA/QC Consultant mixing ratios. The QA/QC Consultant shall take samples from the test pads for hydraulic conductivity testing." Please refer to A11 for additional information.

Q23*: Are we to assume that the existing water in the excavation area will be gone by the time the contractor arrived? If there is wet materials that will require special handling be covered as extra work?*

A23: The County will drain the existing standing water within the excavation area prior to the Contractor mobilizing onsite. The County aims to drain the existing standing water with enough time for the remaining soil to dry enough for acceptable excavation conditions. Per Section 3.01 of Detailed Provision 31 2300 – Earthwork, "Notify County if indicated conditions on Project Drawings conflict with actual conditions. Non-notification of discrepancies between actual field conditions and the conditions shown on the Project

Drawings, in writing, shall indicate Contractor's acceptance of such field conditions. Adjustments/modifications to the construction to accommodate the inconsistencies (without notification) shall be at no additional cost to the County." Any atypical conditions to the soil, including muddy or wet material, may qualify as extra work as long as Contractor notifies County prior to beginning work.

Q24*:* ***The detail 18A on sheet 45 shows a box culvert per detail 18E/45. Is that only from station 10+15.00 to 10+21.00?***

A24: The box culvert stationing has been changed to Sta. NPR 10+10 to Sta. NPR 10+22. Construct a 10 foot transition along the Open Concrete Trap Channel leading into and out of the box culvert. CAD information regarding the horizontal stationing for the NAR can be made available upon request.

Contract Documents Updates

1. Construction Drawing Sheet 6 – Box Culvert: Please replace sheet 6 with revised sheet 6. Changes includes: Addition of the box culvert location. The updated construction drawing can be found in attachment 2. Changes include the added location of the Box Culvert. The updated construction drawing can be found in attachment 1.
2. Construction Drawing Sheet 39 – Concrete Water Stop: Please replace sheet 39 with revised sheet 39. Addition of a concrete water stop detail has been added. The updated construction drawing can be found in attachment 2. Changes include the addition of a concrete water stop detail. The updated construction drawing can be found in attachment 1.
3. Construction Drawing Sheet 15 – Drainage Channel Transitions: Please replace sheet 15 with revised sheet 15. A construction note regarding drainage channel transitions has been added. The updated construction drawing can be found in attachment 1.
4. Page 4, Section 3.02 of the Detailed Provision 43 2371 – Air Operated Diaphragm Pump, has been revised to include the following:

   4. Sand bags shall be used to constrain the above ground portions of the 1" air pressure extension airline every 50 linear feet. The sand bags shall be placed so as to butt up against the unconstrained or downhill side of the air pressure line. A corner of the sand bags may be placed on the airline. Do not place sand bags on the pneumatic airline on slopes greater than 2 to 1 unless directed otherwise.

5. Construction Drawing Sheet 27 – Downslope Anchoring of Pneumatic 1" HDPE Airline: Please replace sheet 27 with revised sheet 27. Changes include the addition of a construction callout regarding anchoring the 1" HDPE pneumatic airline with sand bags before the 1" HDPE pneumatic airline goes down a 1.5 to 1 slope. The updated construction drawing can be found in attachment 1.
6. Construction Drawing Sheet 7 – Drainage Channel Transitions: Please replace sheet 7 with revised sheet 7. A construction note regarding drainage channel transitions has been added. The updated construction drawing can be found in attachment 1.
7. Construction Drawing Sheet 43 – Removal of Silt Fence Installation Cross Section Detail and Anchor Trench PCS Slope Update: Please replace sheet 43 with revised sheet 43. Changes include: The removal of the Silt Fence Installation Cross Section detail and anchor trench pcs slope update. The updated construction drawing can be found in attachment 1.
8. Construction Drawing Sheet 45 – North Perimeter Road Cross Section Detail and Box Culvert Stationing update: Please replace sheet 45 with revised sheet 45. Changes include: update of the North Perimeter Road (NPR) with LCRS Clean-Out detail update and Box Culvert stationing adjustment. The updated construction drawing can be found in attachment 1.

NOTE:

Bidders are required to acknowledge receipt of all addenda at the bottom of Sheet XVII of the CONTRACTOR'S PROPOSAL.

Riverside County Department of Waste Resources

Andy Cortez Digitally signed by Andy Cortez
Date: 2023.05.24 17:18:27 -07'00'

_____

Andrew Cortez, P.E.
Assistant Chief Engineer

List of Attachments:

Attachment 1 – Updated Construction Drawings
Attachment 2 – Badlands C4P3 Liner Expansion QA/QC Report Section 5 Low-Permeability Layer
Attachment 3 - Badlands C4P3 Hydraulic Conductivity Testing Program Results
Attachment 4 – Photos of ripped area within P2S1 Subgrade Limits (May 23, 2023)

PD# 314528(word) PD# 314712(PDF)

Attachment 1

Updated Construction Drawings

Construction Notes

(12) Construct Open Concrete Trap Channel

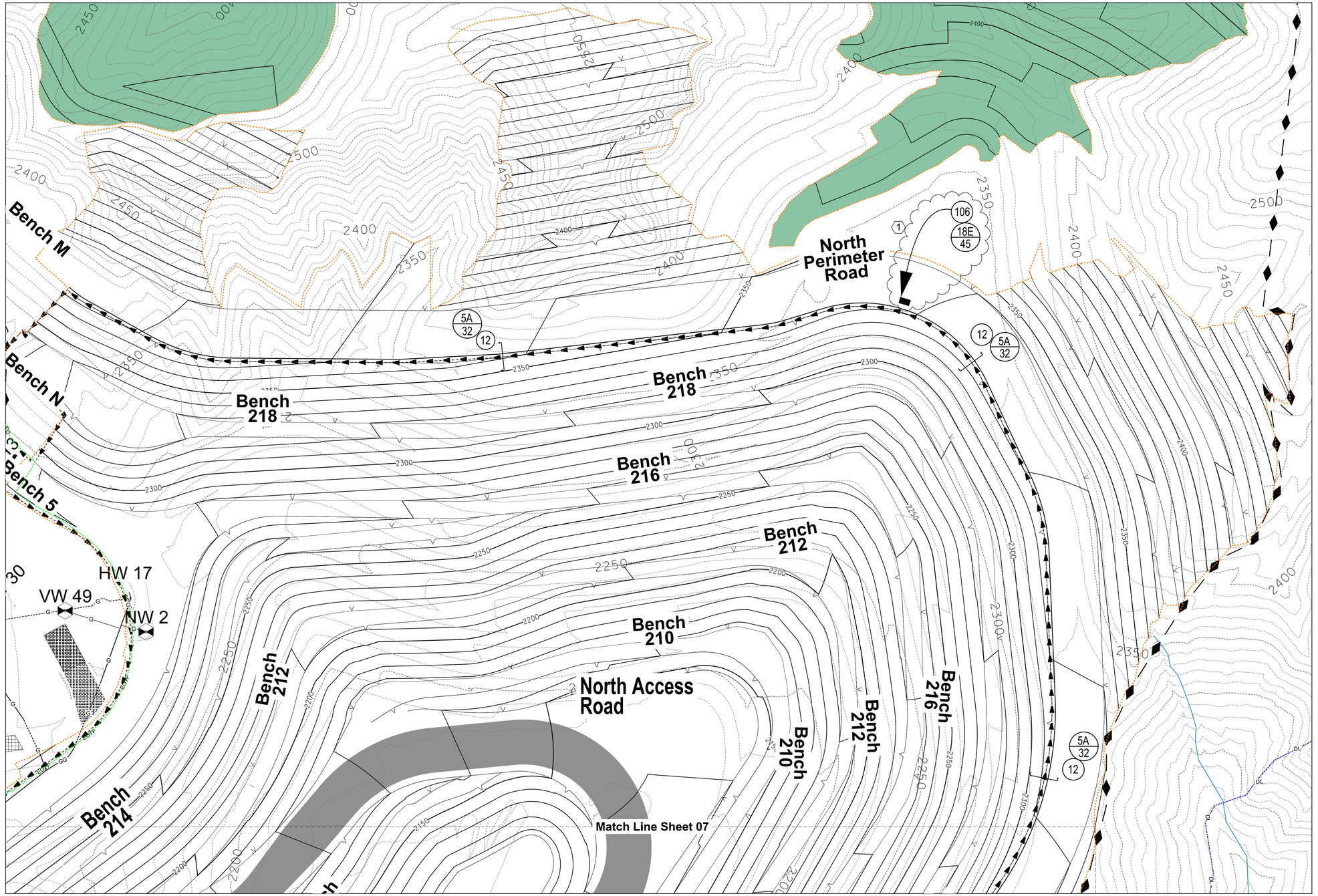
(106) Construct Box Culvert from Sta. NPR 10+10 to 10+22. Construct 10 foot transitions along the Open Concrete Trap Channel leading into and out of the Box Culvert.

(1)

LEGEND

- Project Limits
- 2200 Existing Ground Contours
- 2200 Final Design Grade (10ft Interval)
- EOTF Edge of (Trash) Fill
- Existing HDPE Liner Limits
- Aggregate Base Road
- Stockpile Fill Areas
- Structure to Protect in Place
- Drainage Design Alignment
- G Gasline (Protect in Place)
- DL Disturbance Limits
- Streambed
- Grading Limits
- Proposed HDPE Liner Limits
- Hinge Line
- Toe Line

Note: All quantities are approximate



NO.	REVISIONS	BY	APPROVED	DATE
(1)	Construct Box Culvert Location	BH	MR	24 May 23

LICENSED PROFESSIONAL ENGINEER — ANDREW CORTESE — C 82528 EXP. 12/31/2023 — CIVIL — STATE OF CALIFORNIA

DESIGNED BY:	CRQ
DRAWN BY:	CRQ
CHECKED BY:	SNL
DATE:	April 26, 2023
DATE OF PHOTOGRAPHY:	May 2022

RIVERSIDE COUNTY DEPARTMENT OF WASTE RESOURCES

Hans Kernkamp — General Manager-Chief Engineer

Scale: 1" = 60' @ 22x34 1"=120' @ 11x17

0 60 120 180 240 300

Badlands Sanitary Landfill
Liner System Construction - Phase 2, Stage 1

Drainage Improvement Plan - North

SCALE:	1"=120' @ 11x17 1"=60' @ 22x34
SERVER:	/Waste-16fs03/BL-ENG
FOLDER:	Ba/Exp/P2S1/Design/Plans
FOLDER:	P2S1-S06-DrainImprovPlan-N.dgn
MODEL:	N/A
SHEET	06 OF 60

Construction Notes

(12) Construct open Concrete Trap Channel

(14) Construct Concrete Bench Crossing

(15) Construct Rip Rap Apron

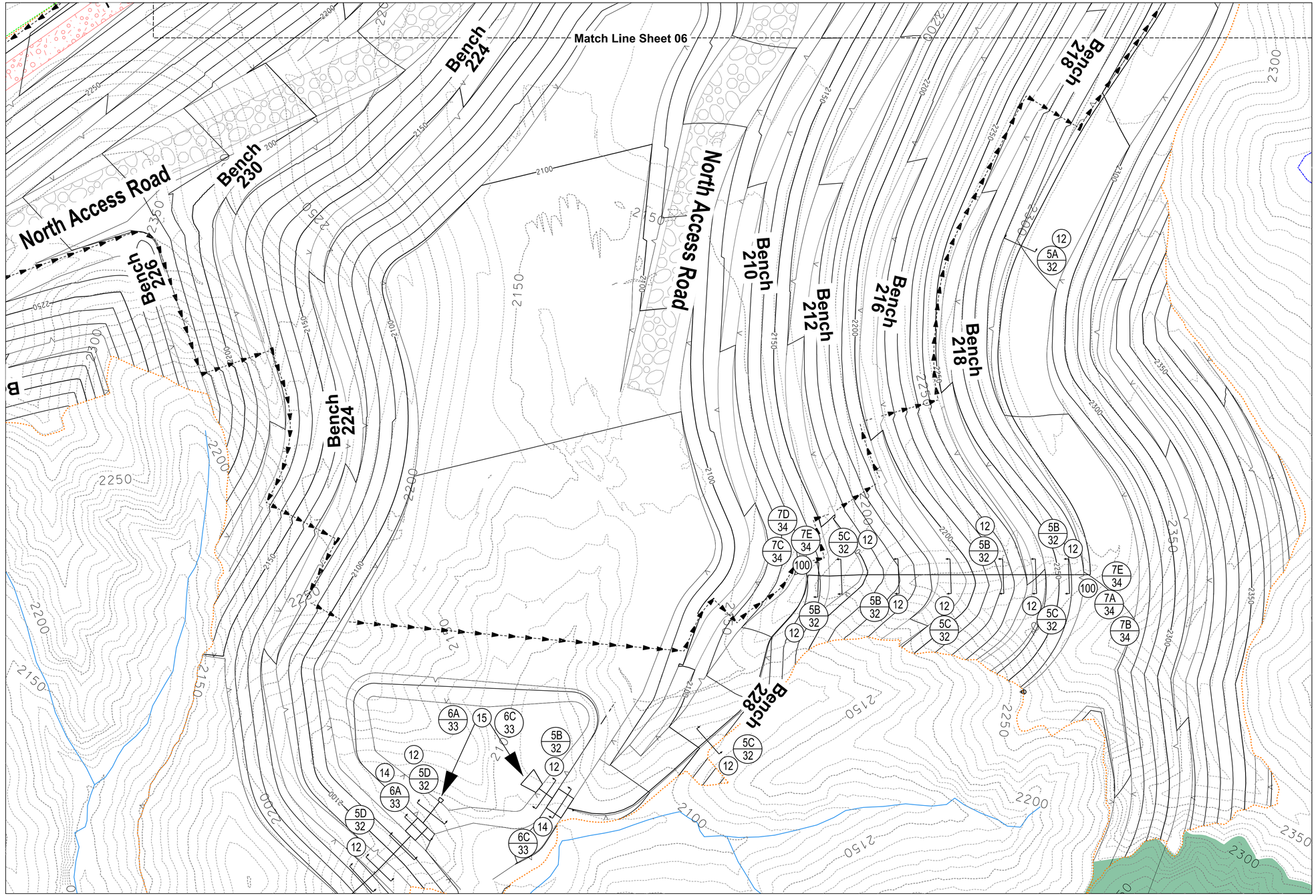
(100) Construct Masonry Splash-Wall

(107) All slope drains shall transition for 10 feet before and after the portions of drains on benches unless noted otherwise. (1)

LEGEND

- Soil Cement
- Project Limits
- 2200 Existing Ground Contours
- 2200 Final Design Grade (10ft Interval)
- EOTF Edge of (Trash) Fill
- Existing HDPE Liner Limits
- Stockpile Fill Areas
- Buried Culvert to be Removed
- G Gasline (Protect in Place)
- DL Disturbance Limits
- Streambed
- Grading Limits
- Proposed HDPE Liner Limits
- Drainage Design Alignment

Note: All quantities are approximate



NO.	REVISIONS	BY	APPROVED	DATE
1	Drainage Channel Transitions	BH	MR	23 May 23

LICENSED PROFESSIONAL ENGINEER — ANDREW CORTESI — C 62528 EXP. 12/31/2023 — CIVIL — STATE OF CALIFORNIA

DESIGNED BY:	CRQ
DRAWN BY:	CRQ
CHECKED BY:	SNL
DATE:	April 26, 2023
DATE OF PHOTOGRAPHY:	May 2022

RIVERSIDE COUNTY DEPARTMENT OF WASTE RESOURCES

Hans Kernkamp — General Manager-Chief Engineer

Scale: 1" = 60' @ 22x34 1"=120' @ 11x17

0 60 120 180 240 300

Badlands Sanitary Landfill
Liner System Construction - Phase 2, Stage 1

Drainage Improvement Plan - South

SCALE:	1"=120' @ 11x17 1"=60' @ 22x34
SERVER:	/Waste-16fs03/BL-ENG
FOLDER:	Ba/Exp/P2S1/Design/Plans
FOLDER:	P2S1-S07-DrainImprovPlan-South.dgn
MODEL:	N/A
SHEET	07 OF 60

Construction Notes

(13) Construct Gravel "V" Ditch Channel

(15) Construct Rip-Rap Apron

(16) Place Engineered Fill to shown elevations

(19) Over-Excavate prior to placing Engineered Fill to shown elevations.

(107) All slope drains shall transition for 10 feet before and after the portions of drains on benches unless noted otherwise. (1)

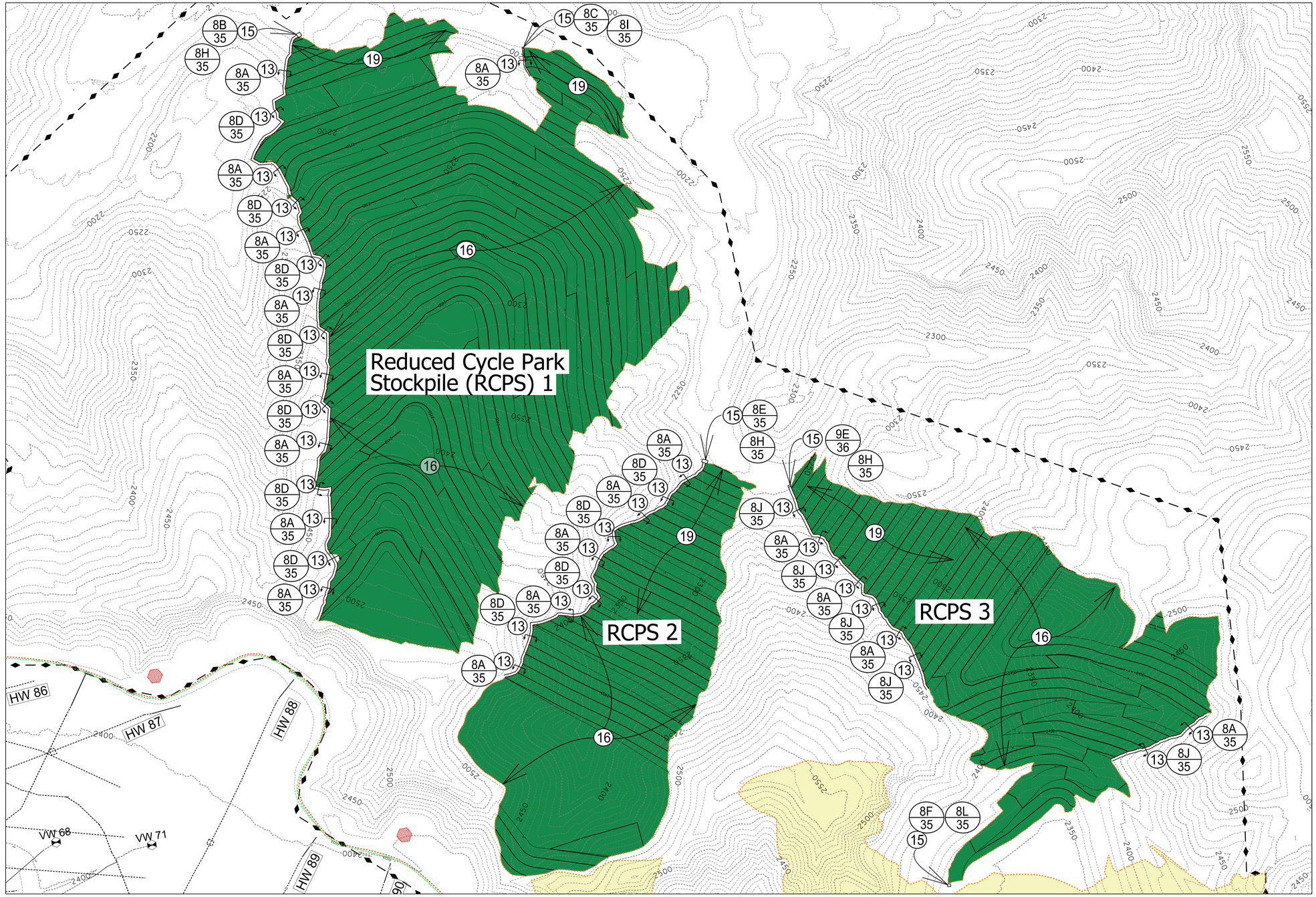
Estimated Fill:

RCPS #1 =	781,470 CY
RCPS #2 =	458,077 CY
RCPS #3 =	427,196 CY
Total =	1,666,743 CY

LEGEND

- Project Limits
- Existing Ground Contours
- RCPS Design Grade (10ft Interval)
- Edge of (Trash) Fill
- Existing HDPE Liner Limits
- Aggregate Base Road
- Stockpile Fill Areas
- Subgrade Design Area
- Drainage Design Alignment
- Gasline (Protect in Place)
- Disturbance Limits
- Streambed
- Grading Limits
- Cut/Fill Line
- Hinge Line
- Toe Line
- Gas Probe - Protect in Place

Note: All quantities are approximate



NO.	REVISIONS	BY	APPROVED	DATE
(1)	Drainage Channel Transitions	BH	MR	23 May 23

LICENSED PROFESSIONAL ENGINEER — ANDREW CORTEZ — 62528 — EXP. 12/31/2023 — CIVIL — STATE OF CALIFORNIA

DESIGNED BY:	SNL/CRQ
DRAWN BY:	EZ
CHECKED BY:	SNL
DATE:	April 26, 2023
DATE OF PHOTOGRAPHY:	May 2022

RIVERSIDE COUNTY DEPARTMENT OF WASTE RESOURCES

Hans Kernkamp — General Manager-Chief Engineer

Scale: 1" = 200' @ 11x17 1"=100' @ 22x34

0 100 200 300 400 500

Datum is mean sea level

Badlands Sanitary Landfill
Liner System Construction - Phase 2, Stage 1

RCPS Grading and Drainage Plan

SCALE:	1"=100'@ 22x34 1"=200' @ 11x17
SERVER:	/Waste-16fs03/BL-ENG
FOLDER:	Ba/Exp/P2S1/Design/Plans
FOLDER:	P2S1-S15-RCPS Stockpiles.dgn
MODEL:	N/A
SHEET	15 OF 60

Construction Notes

(35) Prepare Subgrade and Construct Bench P tie-in with No Road

(66) Prepare Subgrade and Construct North Access Road (NAR) Entrance with 4" thick Crushed Misc. Base over 8" thick of 2-4" Rock per Detail 17A, from Sta. NAR 13+69 to NAR 18+60

(67) Prepare Subgrade and Construct North Access Road (NAR) Part 2 with 4" thick Crushed Misc. Base over 8" thick of 2-4" Rock per Detail 17B, from Sta. NAR 18+60 to NAR 22+04

(68) Prepare Subgrade and Construct North Access Road (NAR) Par 3 Curved with 4" thick Crushed Misc. Base over 8" thick of 2-4" Rock per Detail 17C, from Sta. NAR 23+04 to NAR 28+82

(69) Prepare Subgrade and Construct North Access Road (NAR) Part 4 with 4" thick Crushed Misc. Base over 8" thick of 2-4" Rock per Detail 17A, from Sta. NAR 29+82 to end of alignment

(70) Prepare Subgrade and Construct Northern Perimeter Road (NPR) with 4" Crushed Misc. Base (CMB) over 8" of 2-4" Rock

(73) Place a Padded Marker at End of K-Rail

(74) Place K-Rails per Details shown on Sheet 53

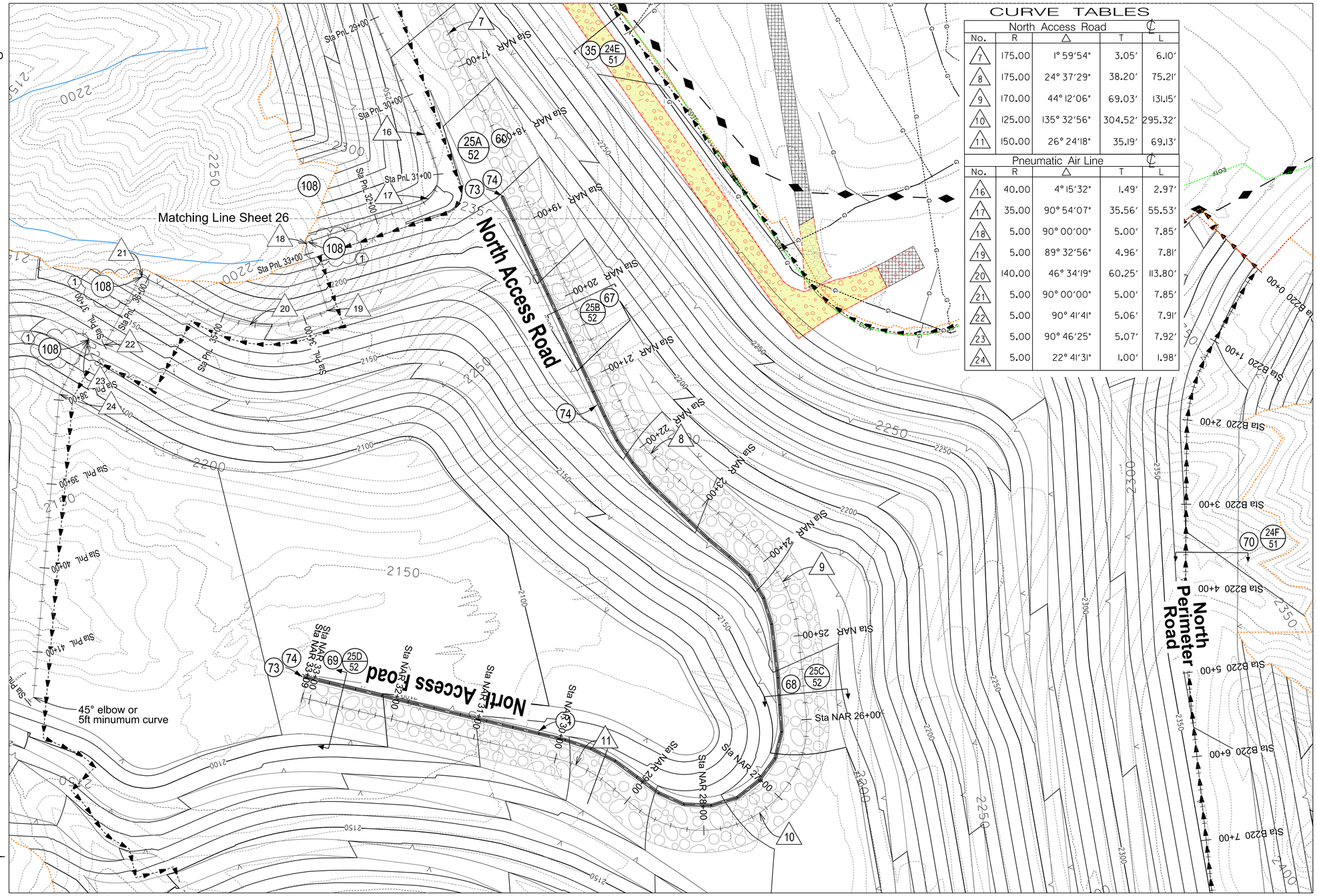
(108) Before placing down slope, constrain 1" HDPE pneumatic airline against toe of slope with two sand bags stacked on top of one another. The uppermost sandbag will rest on lower sandbag and pneumatic airline.

(1)

LEGEND

- Soil Cement
- PELP — Protect Existing Liner System in Place
- Project Limits
- 2200 — Existing Ground Contours
- 2200 — Final Design Grade (10ft Interval)
- EOTF — Edge of (Trash) Fill
- Existing HDPE Liner Limits
- Proposed HDPE Liner Limits
- Aboveground structure to be removed
- Aggregate Base Road
- Structure to Protect in Place
- 6 — Gasline (Protect in Place)
- Streambed
- Grading Limits

Note: All quantities are approximate



CURVE TABLES

North Access Road

No.	R	Δ	T	℄ L
7	175.00	1° 59′54″	3.05′	6.10′
8	175.00	24° 37′29″	38.20′	75.21′
9	170.00	44° 12′06″	69.03′	131.15′
10	125.00	135° 32′56″	304.52′	295.32′
11	150.00	26° 24′18″	35.19′	69.13′

Pneumatic Air Line

No.	R	Δ	T	℄ L
16	40.00	4° 15′32″	1.49′	2.97′
17	35.00	90° 54′07″	35.56′	55.53′
18	5.00	90° 00′00″	5.00′	7.85′
19	5.00	89° 32′56″	4.96′	7.81′
20	140.00	46° 34′19″	60.25′	113.80′
21	5.00	90° 00′00″	5.00′	7.85′
22	5.00	90° 41′41″	5.06′	7.91′
23	5.00	90° 46′25″	5.07′	7.92′
24	5.00	22° 41′31″	1.00′	1.98′

NO.	REVISIONS	BY	APPROVED	DATE
1	Downslope Anchoring of Pneumatic 1" HDPE Airline	BH	MR	23 May 23

LICENSED PROFESSIONAL ENGINEER — ANDREW CORTEZ — # 62528 — EXP 12/31/2023 — CIVIL — STATE OF CALIFORNIA

DESIGNED BY:	BH
DRAWN BY:	EZ
CHECKED BY:	SNL
DATE:	April 26, 2023
DATE OF PHOTOGRAPHY:	May 2022

RIVERSIDE COUNTY DEPARTMENT OF WASTE RESOURCES

Hans Kernkamp — General Manager-Chief Engineer

Scale: 1" = 120' @ 11x17 1"=60' @ 22x34

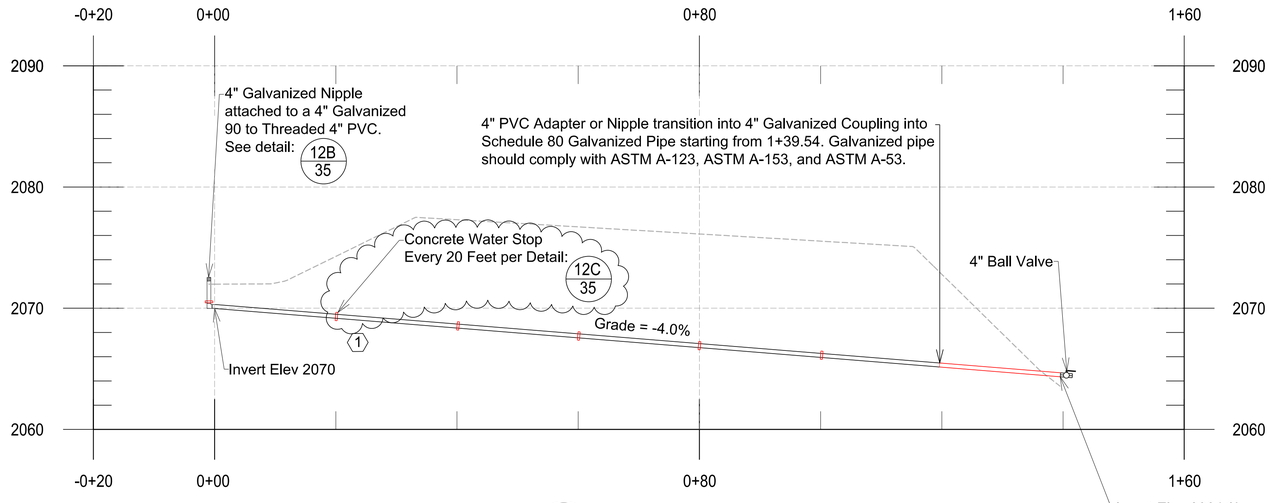
0 60 120 180 240 300

Datum is mean sea level

Badlands Sanitary Landfill
Liner System Construction -Phase 2, Stage 1

Road Improvement Plan -East

SCALE:	1"=120' @ 11x17 1"=60' @ 22x34
SERVER:	/Waste-16fs03/BL-ENG
FOLDER:	Ba/Exp/P2S1/Design/Plans
FOLDER:	P2S1-S27-RdImprovPlan-East.dgn
MODEL:	N/A
SHEET	27 OF 60

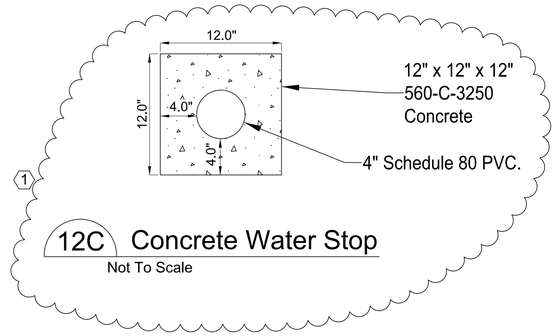


12A Profile along Culvert

Not To Scale

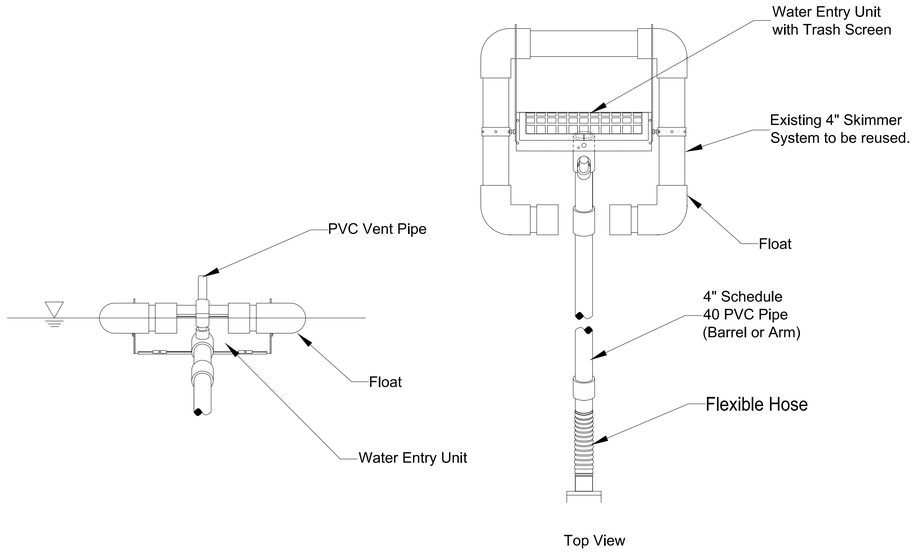
Notes:

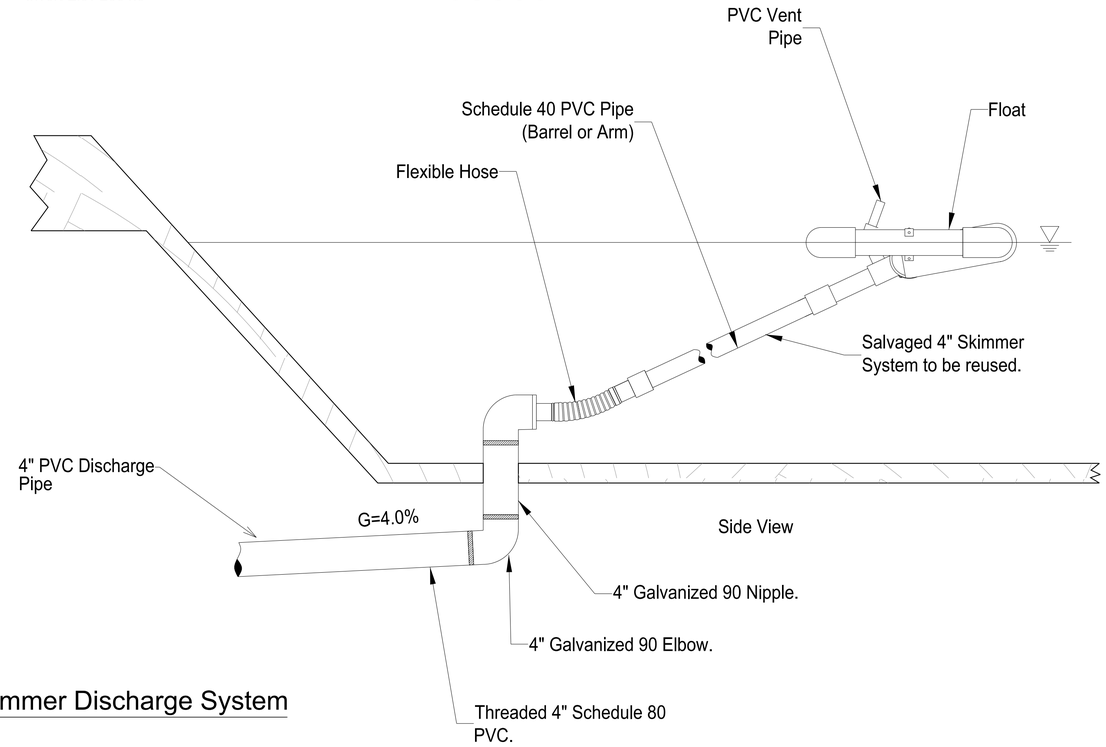
1. Salvage and remove existing 4" Faircloth Skimmer from Canyon 6.
2. Furnish and install 4" Schedule 80 NPT threaded PVC pipe per details: 12A/35 12B/35
3. Proper design must be completed to minimize piping around discharge pipe.
4. Embankment must be compacted to design specifications.
5. Inspect system regulary to ensure it is functioning in a correct manner.



12C Concrete Water Stop

Not To Scale





12B Relocated Faircloth Skimmer Discharge System

Not To Scale

NO.	REVISIONS	BY	APPROVED	DATE
1	Concrete Water Stop	BH	MR	23 May 23

LICENSED PROFESSIONAL ENGINEER ANDREW CORTEZ 62528 EXP 12/31/2023 CIVIL STATE OF CALIFORNIA

DESIGNED BY:	BRH
DRAWN BY:	BRH
CHECKED BY:	SNL
DATE:	April 26, 2023
DATE OF PHOTOGRAPHY:	N/A

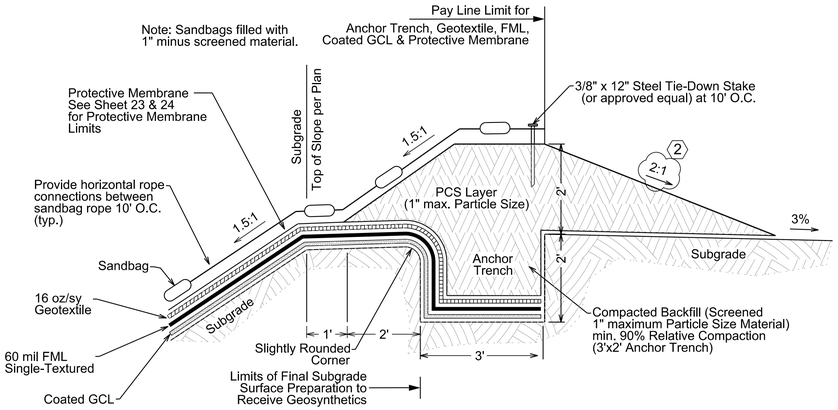
RIVERSIDE COUNTY DEPARTMENT OF WASTE RESOURCES

Hans Kernkamp General Manager-Chief Engineer

Badlands Sanitary Landfill
Liner System Construction - Phase 2, Stage 1

Construction Details (12) Skimmer Details

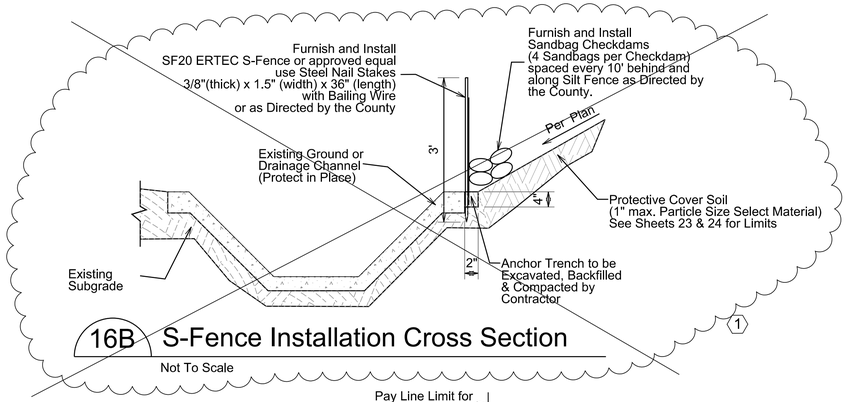
SCALE:	as shown
SERVER:	/Waste-16fs03/BL-ENG
FOLDER:	Ba/Exp/P2S1/Design/Details
FILE:	P2S1-S39-ConsDetail (12) Skimmer.dgn
MODEL:	
SHEET	39 OF 60



16A Liner Termination along Northern Perimeter Road (NPR)

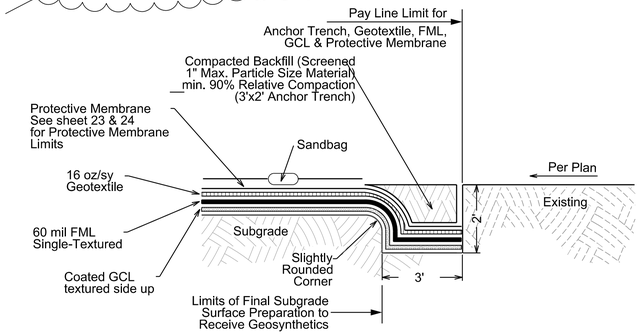
Not to Scale

Anchor Trench starts at Sta. NPR 00+00 to 19+15



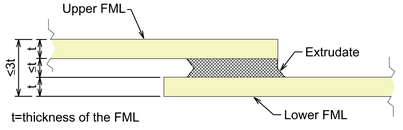
16B S-Fence Installation Cross Section

Not To Scale



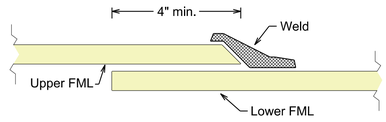
16C Liner System Termination in 3x2 Anchor Trench along Side Slopes (Protective Membrane)

Not to Scale



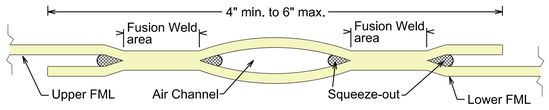
16E Typical Flat Extrusion Weld

Not to Scale



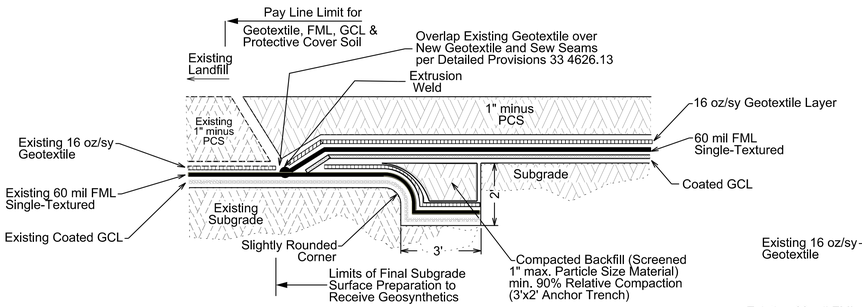
16F Typical Fillet Extrusion Weld

Not to Scale



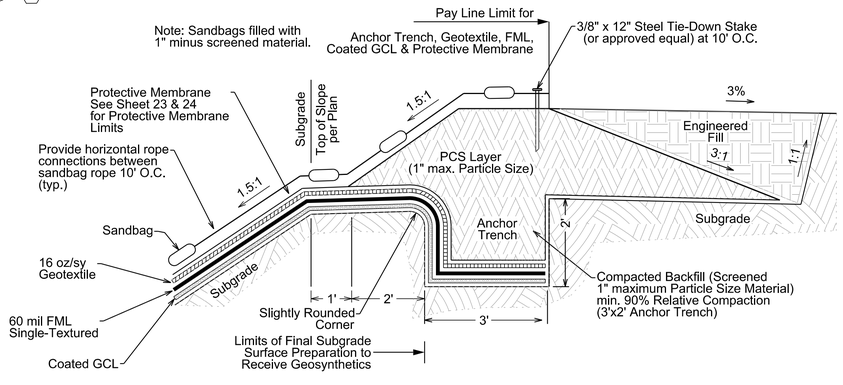
16G Typical Double Track Fusion Weld

Not to Scale



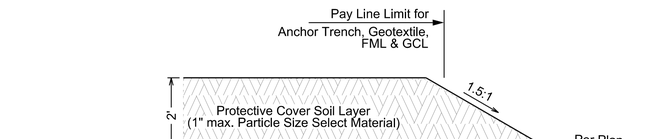
Join New Side Slope Liner to Existing Canyon 2, Phase 5/Canyon 3, Phase 2 Side Slope Liner (PCS) 16D

Not to Scale



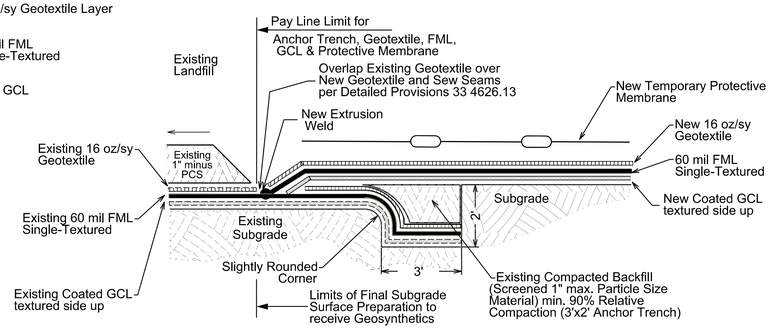
16J Anchor Trench and Liner Termination at Upper Benches

Not to Scale



Liner System Termination in 3x2 Anchor Trench along Side Slopes (Protective Cover Soil) 16H

Not to Scale



Join New Side Slope Liner to Existing Canyon 2, Phase 5/Canyon 3, Phase 2 Side Slope Liner (Protective Membrane) 16I

Not to Scale

NO.	REVISIONS	BY	APPROVED	DATE
1	Removal of S-Fence Installation Cross Section Detail	BH	MR	23 May 23
2	Anchor Trench PCS Slope Change	BH	MR	23 May 23

LICENSED PROFESSIONAL ENGINEER — ANDREW CORTEZ — C 62528 — EXP12/31/2023 — CIVIL — STATE OF CALIFORNIA

DESIGNED BY:	BH
DRAWN BY:	EZ
CHECKED BY:	SNL
DATE:	April 26, 2023
DATE OF PHOTOGRAPHY:	N/A

RIVERSIDE COUNTY DEPARTMENT OF WASTE RESOURCES

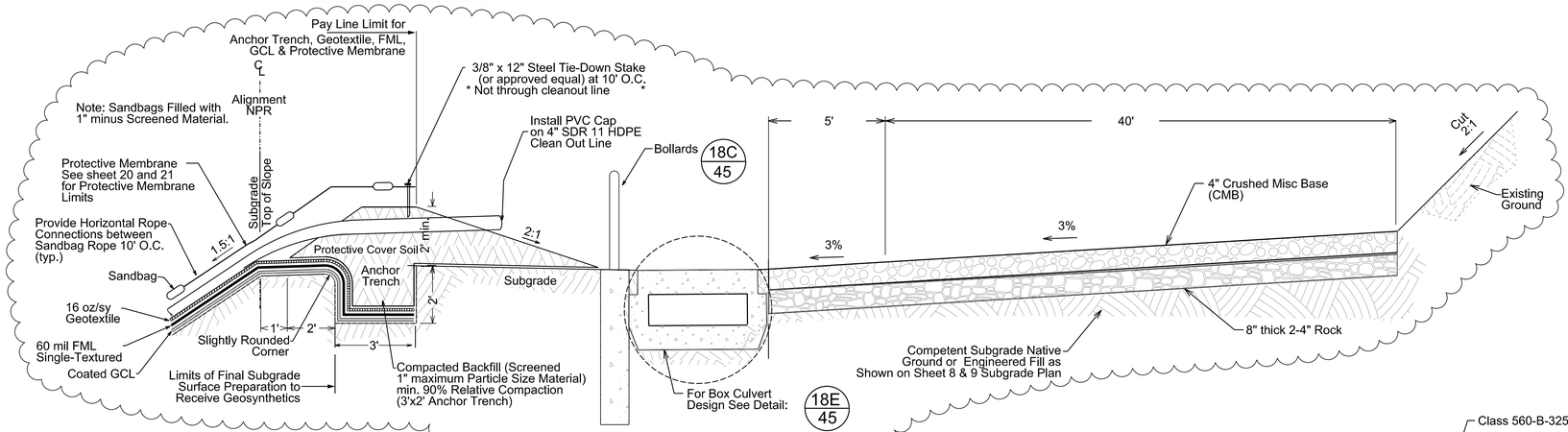
Hans Kernkamp, General Manager-Chief Engineer

Badlands Sanitary Landfill

Liner System Construction - Phase 2, Stage 1

Construction Details (16) Liner Tie-in

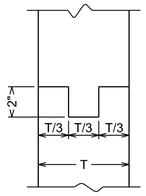
SCALE:	as shown
SERVER:	/Waste-16fs03/ BL-Eng
FOLDER:	Ba/Exp/P2S1/Design/Details
FILE:	P2S1-S43-ConsDetails (16) Liner Tie-in.dgn
MODEL:	
SHEET	43 OF 60



18A North Perimeter Road (NPR) with LCRS Clean-out

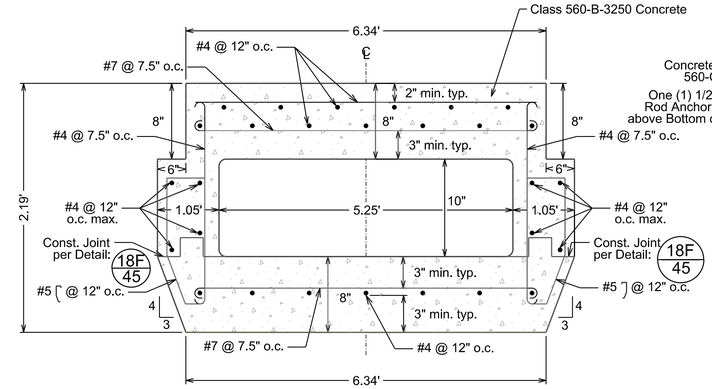
Not to Scale — Sta. NPR 10+16.00

(1)



18F Transverse Construction Joint Detail

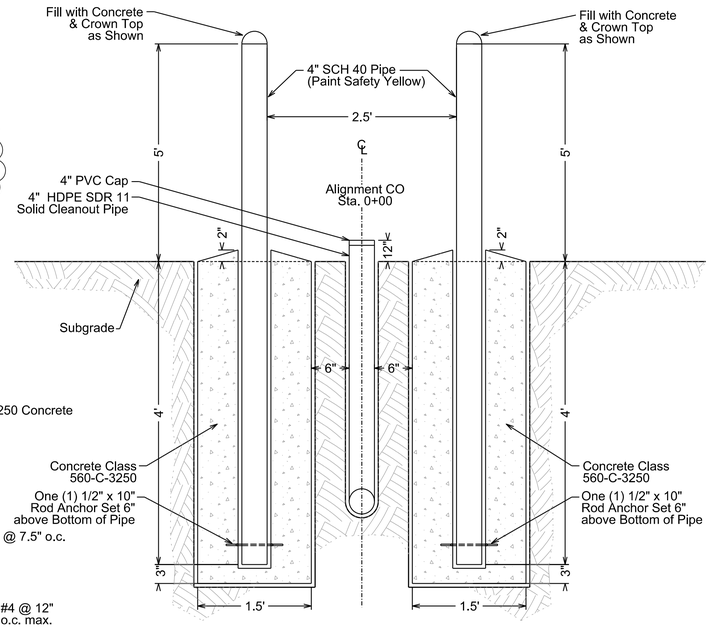
Not to Scale



18E Typical 5.25' x 10" Box Culvert

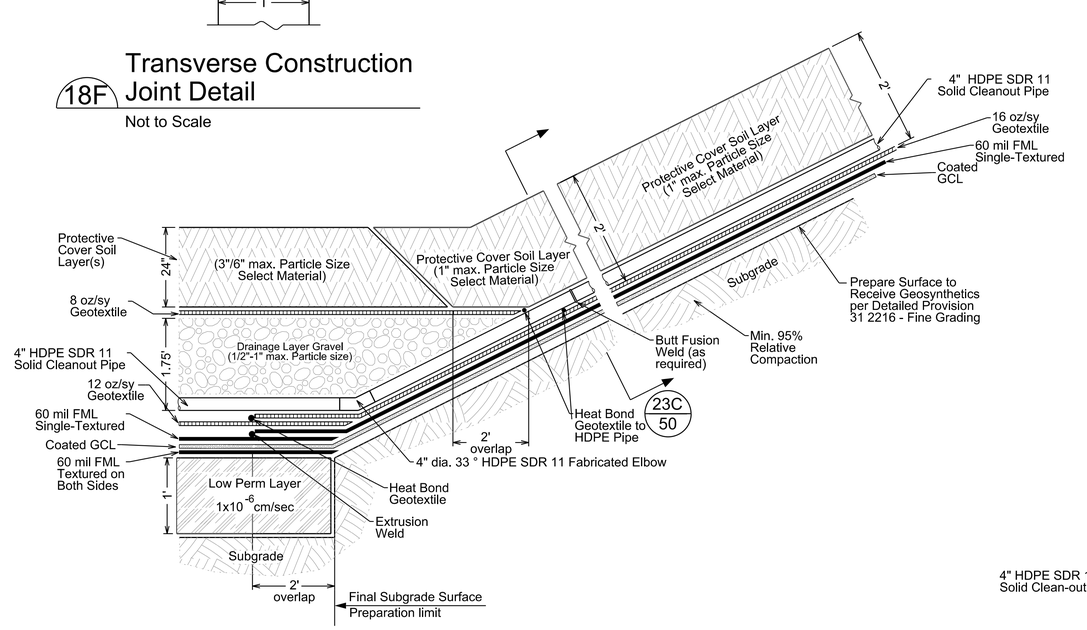
Not to Scale — Sta. NPR 10+10.00 to NPR 10+22.00

(2)



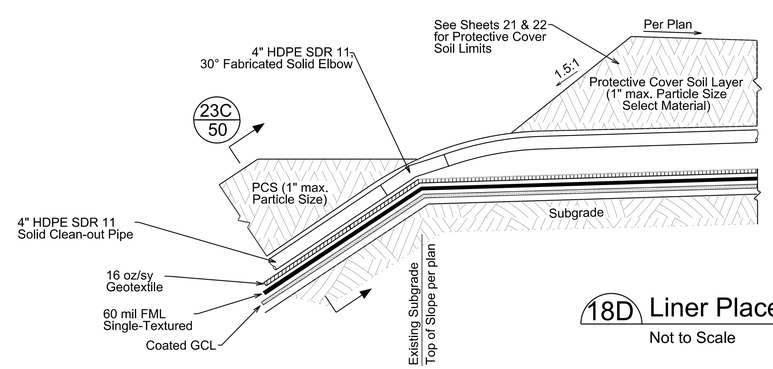
18C Bollard Installation at Clean-out Line Termination along NPR Road

Not to Scale



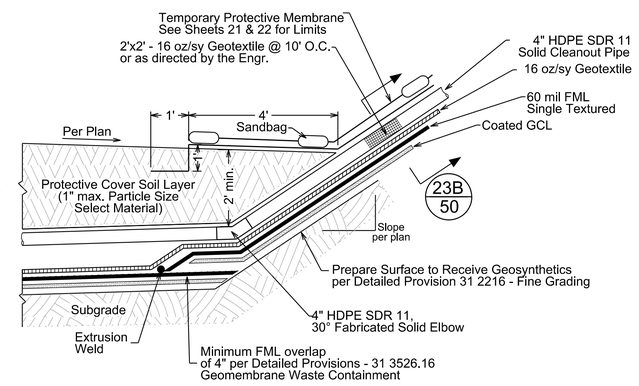
18B LCRS Clean-out along Liner Sideslope and B3 Bottom

Not to Scale — Sta. CO 07+40 to 07+90



18D Liner Placement along Benches at LCRS Clean-out

Not to Scale — Sta. CO 05+00 to 07+40



NO.	REVISIONS	BY	APPROVED	DATE
1	North Perimeter Road with LCRS Clean-out Update	BH	MR	23 May 23
2	Box Culvert Stationing Adjustment	BH	MR	23 May 23

LICENSED PROFESSIONAL ENGINEER — ANDREW CORTENS — C 82528 — EXP 12/31/2023 — CIVIL — STATE OF CALIFORNIA

DESIGNED BY:	BH
DRAWN BY:	EZ
CHECKED BY:	SNL
DATE:	April 26, 2023
DATE OF PHOTOGRAPHY:	N/A

RIVERSIDE COUNTY DEPARTMENT OF WASTE RESOURCES

Hans Kernkamp — General Manager-Chief Engineer

Badlands Sanitary Landfill
Liner System Construction - Phase 2, Stage 1

Construction Details (18) LCRS Cleanout

SCALE:	as shown
SERVER:	/Waste-16fs03/BL-ENG
FOLDER:	Ba/Exp/P2S1/Design/Details
FILE:	P2S1-S45-ConsDetail-(18) LCRS Cleanout.dgn
MODEL:	
SHEET	45 OF 60

Attachment 2

Badlands C4P3 Liner Expansion QA/QC Report Section 5 Low-Permeability Layer

5. LOW-PERMEABILITY LAYER

5.1 General Overview

The base liner specified in the construction documents for the C4P3 composite liner system requires a minimum 24-inch thick low-permeability layer having a hydraulic conductivity of less than or equal to 1×10^{-7} cm/s and particle size of less than 1 inch. Approximately 6,200 yd^3 of low-permeability material was used by Independent to construct the low-permeability layer. Geosyntec provided CQA services during the processing and construction of the demonstration fill and low-permeability layer using methods and frequencies specified in the Project Documents. Laboratory and field test results performed on the processed low-permeability material, demonstration fill, and low-permeability layer are summarized in Tables 2 and 3 and are included in Appendix D.

5.2 Low-Permeability Layer Submittals

Independent submitted their proposed work plan to construct the demonstration fill and the low-permeability layer for review by Geosyntec. The submitted work plan indicated that the proposed placement methods would meet the requirements specified in the Project Documents and the work plan is included as Appendix D-1.

5.3 Low-Permeability Material Processing and Conformance Testing

Material used for the low permeability layer originated from two borrow sources; a clay material which had been stockpiled onsite, but originating from an off-site source and a sandy material from Canyon 6. The clay material was processed to remove particles greater than 1" and stockpiled near Independent's field offices. The sandy material was then hauled from Canyon 6 to the clay stockpile where it was combined using a pug mill. The material was processed and directly hauled to the Canyon 4 floor and stockpiled for installation. Processed material consisted of 50% clay stockpile and 50% Canyon 6 stockpile material.

Processing consisted of crushing and screening the low-permeability material through a 1-inch screen and moisture conditioning the screened material to approximately plus 2% to plus 4% above the optimum moisture content.

The low permeability material was run through a 1-inch screen as is typical practice in Southern California. Sieve analyses and field observations indicated that the processed low-permeability material contained particles primarily less than 1 inch, which meets the requirements specified in the Project Documents for both the demonstration fill and

low-permeability layer. Random particles larger than 1 inch may occasionally pass through the screen, but are not considered to impact the functional of the completed liner system.

Geosyntec observed the processing activities and obtained a total of seven samples (LP-01 through LP-07) for laboratory testing. This sampling frequency met the minimum frequency required by the Project Documents. Tests conducted on the samples included the following:

- Modified Proctor Density (ASTM D 1557);
- Sieve Analysis with Hydrometer (ASTM D 422);
- Moisture Content (ASTM D 2216);
- Hydraulic Conductivity (ASTM D 5084);
- Atterberg Limits (ASTM D 4318); and
- Soil Classification (ASTM D 2488).

The above-mentioned test results are included in Appendix D-2 and summarized in Table 2.

During the low-permeability material screening process, samples were collected to determine the moisture content of the stockpile and to verify whether the screened material was being properly moisture conditioned relative to the modified proctor optimum moisture content.

5.4 Demonstration Test Pad

5.4.1 General

The 20-foot long by 40-foot wide demonstration test pad was constructed by Independent on between 25 November 2013 and 27 November 2013 on a prepared portion near the gravel access road to the west of the proposed cell. (A first test pad conducted near Independent's trailer was attempted but subsequently abandoned for the gravel access road location.) Independent placed the material in approximately 8-inch lifts and compacted each lift with a minimum of 10 passes of a padded foot compactor. The demonstration fill was over built to allow a motorized grader to trim the surface to within the 24-inch thick tolerance.

5.4.2 Demonstration Fill – CQA Monitoring

Geosyntec CQA personnel monitored the activities performed prior to and during construction of the demonstration fill. CQA monitoring activities performed during

demonstration fill construction included monitoring of processed material placement, measurement of lift thickness, documentation of the number of passes performed by compaction equipment, and a visual assessment of incoming soil. In general, the methods used to construct the demonstration fill were in compliance with the approved work plan previously submitted by Independent.

Final compaction procedures including equipment type and number of passes were established during the demonstration fill as previously described in Section 5.2.

5.4.3 Demonstration Fill – CQA Testing

CQA testing was conducted on the demonstration fill to monitor the effectiveness of the compaction procedures and to evaluate the properties of the low-permeability soil. Geosyntec performed the following tests during and after the construction of the demonstration fill:

- Nuclear Gauge Density/Moisture Content (ASTM D 6938);
- Microwave Oven Moisture Content (ASTM 4643)
- Sand Cone Density Test (ASTM D 1556)
- BAT Hydraulic Conductivity; and
- Flexible Wall Hydraulic Conductivity (Shelby Tube) (ASTM D 5084).

Geosyntec performed compaction testing using the nuclear gauge (9 tests) and sand cone (2 tests) during the construction of the demonstration fill. Compaction test results indicate that a relative compaction equal to or greater than 95% and a moisture content of 2% to 4% over the optimum moisture content were achieved by a minimum of 10 passes of a CAT 825 Padfoot Compactor. These test results are summarized in Table 2 and included in Appendix D-3.

A total of three representative BAT permeability tests were performed on the demonstration fill. The results of the representative BAT test met the specified value of a hydraulic conductivity of equal to or less than 1×10^{-7} cm/s.

Geosyntec also obtained three Shelby tube samples from the demonstration fill for laboratory flexible wall hydraulic conductivity testing. Results from these tests indicate that the demonstration fill had a hydraulic conductivity of less than 1×10^{-7} cm/s and therefore met the project requirements. Test results of the BAT and flexible wall hydraulic conductivity tests are summarized in Table 2 and included in Appendix D-3.

5.5 Low-Permeability Layer Construction

5.5.1 General

The construction of the low-permeability layer began on 18 February 2014 and was substantially completed on 18 March 2014. Independent employed the same equipment and construction techniques as those used to construct the demonstration fill.

5.5.2 Low-Permeability Layer – CQA Monitoring

Geosyntec CQA personnel continuously monitored activities performed prior to and during construction of the low-permeability layer. As documented in Section 4.5 of this report, CQA personnel observed that the subgrade was firm and free of protruding rocks or construction debris and that no yielding or rutting was present. During the construction of the low-permeability layer, Geosyntec CQA personnel monitored for the following:

- material used consisted of the processed low-permeability material and was free of organics, debris, and other non-conforming soil;
- the low-permeability material was placed in approximately 8-inch loose lifts by using scrapers;
- water was added periodically to maintain the required moisture content;
- a padded foot compactor made a minimum of ten passes per lift;
- a motorized grader was used to trim the surface of the low-permeability layer to final grade;
- a smooth drum roller created a smooth surface prior to the geomembrane deployment; and
- water was added periodically to minimize surface desiccation (per the contractor's subgrade maintenance plan) prior to placement of geomembrane.

The thickness of the low-permeability layer was measured by comparing the as-built survey of the prepared subgrade and the as-built survey of the top of the low-permeability layer. A comparison of these as-built surveys indicates that the thickness of the low-permeability layer is at least 24 inches and that the designed grades were obtained. The survey data indicating the thickness of the low-permeability layer is included in Appendix I-1.

5.5.3 Low-Permeability Layer – CQA Testing

Geosyntec conducted CQA testing on the low-permeability layer to monitor the effectiveness of the compaction procedures and to obtain permeability results on the as-built low-permeability layer. Geosyntec collected samples to send to a geotechnical laboratory and performed in the field the following tests during the construction of the low-permeability layer:

- Nuclear Gauge Density/Moisture Content (ASTM D 6938);
- Microwave Oven Moisture Content (ASTM 4643)
- Sand Cone Density Test (ASTM D 1556)
- BAT Hydraulic Conductivity;
- Atterberg Limits (ASTM D 4318);
- Particle Size Analysis (ASTM D 422);
- Visual Soil Classification (ASTM D 2488);
- Moisture Density Relationship using Modified Proctor (ASTM D 1557); and
- Flexible Wall Hydraulic Conductivity (Shelby Tube) (ASTM D 5084).

In-place field compaction tests were performed by Geosyntec. Geosyntec conducted 40 density tests (37 nuclear gauge and 3 sand cone), which met the required testing frequency as specified in the Project Documents. All of the tests were conducted on the second lift of low permeability layer. Results that did not meet the specified requirements were reworked by Independent and retested. Final test results indicate that the low-permeability layer had a relative compaction equal to or greater than 95% and a moisture content of 2% to 4% over the optimum moisture content. The results of these tests are summarized in Table 3. Test results and corresponding test locations are included in Appendix D-4.

Field hydraulic conductivity was measured by Geosyntec CQA personnel using the BAT test. Geosyntec performed 7 BAT tests which met the required testing frequency as specified in the Project Documents. The test results indicated that the low-permeability layer had a hydraulic conductivity of less than the specified 1×10^{-7} cm/s. The results of the BAT tests are summarized in Table 3 with detailed results and test locations included in Appendix D-4.

The CQA Plan for the project called for three single flexible wall permeability tests to be conducted (ST-04 through ST-06) within the low-permeability layer for a total of three flexible wall permeability tests.

The final representative permeability values for the three test locations ranged from 2.2×10^{-9} cm/sec to 8.6×10^{-9} cm/sec and had a geometric mean of 4.9×10^{-9} cm/sec. These test results indicate that the hydraulic conductivity of the low permeability layer at each of the tested locations was less than the specified 1×10^{-7} cm/sec.

These results showed good agreement with the BAT permeability test results which ranged from 8.1×10^{-9} cm/sec to 1.4×10^{-8} cm/sec and had a geometric mean of 8.7×10^{-8} cm/sec.

APPENDIX D

LOW-PERMEABILITY MATERIAL

Geosyntec
consultants

APPENDIX D-1

LOW-PERMEABILITY SUBMITTALS

Independent Construction Co.
24930 Ave Kearney Unit #5
Valencia CA, 91353

Submittal: 038-R3

Date: December 31, 2013

Badlands Canyon Landfill Canyon 4 Phase 3 Liner Expansion

Submittal Name: **Third Revision - LPL Construction Plan**

Description:
Proposed LPL Construction Methods
Per Section 12

Prepared By
Independent Construction Co.

Contact
Vernon W. Huntsinger

Submitted to
County Of Riverside Waste Management District

Contact
Manuel Ruiz

Vernon W. Huntsinger

Independent Construction Co.

December 31, 2013

Proposed LPL Construction Methods R3

Our proposed methods for the construction of the LPL are as follows:

1. Screen clay stockpile at existing location Material processed to 1” minus. Oversize or reject material was re-processed multiple times in an attempt to maximize 1” minus product. Small reject pile remains.
2. Move screening plant to Canyon 6. Process canyon 6 material to 1” minus to be utilized for mixing with clay.
3. Mobilize pug mill to area adjacent to clay stockpile. Material will be fed to a proportioning hopper to maintain correct revised ratio of 50% Clay Stockpile to 50% Canyon 6 Stockpile. Material is than fed into the pug mill where mixing and moisture conditioning will take place. Moisture condition during mixing to 2 to 4 percent over optimum.
4. Layout test pad area to the South East of Screening/Mixing operations. Test pad to be topo'd for sub-grade and final thickness verification. Test pad shall be a minimum 20' wide by 40' long.
5. Place LPL within test pad area in loose lifts not to exceed 8”. Thickness will be maintained utilizing equipment mounted laser/GPS and checked by grade checker. Maintain moisture at 2 to 4 percent over optimum. Over fill by .3' to provide protective layer prior to final trim.
6. Equipment used for placement: Front loader to excavate mixed LPL, Articulated Dump to haul LPL. 14H/16G Blade and D8/D6 Dozer to spread LPL.
7. Compact LPL material to a minimum dry density of 95% utilizing CAT 825 Compactor making a minimum 10 passes.
8. Final finish by 14H/16G Blade, and proof rolling final finished grade with a steel drum roller per Section 12.3.8. 24” minimum final thickness.
9. Maintain moisture content of test pad by the application of water to the surface daily including weekends.
10. Cell placement same as above. Clay to be mixed at time of placement. Mixed material will go directly into articulated dump trucks and hauled to final placement location.

Submitted By: Vernon Huntsinger
Independent Construction Co.

APPENDIX D-2

CONFORMANCE TEST RESULTS

Excel Geotechnical Testing, Inc.
"Excellence in Testing"
953 Forrest Street, Roswell, Georgia 30075
Tel: (770) 910 7537 Fax: (770) 910 7538

FLEXIBLE WALL PERMEABILITY TEST [1]

ASTM D 5084 *

Project Name:	Badlands Landfill
Project Number:	607
Client Name:	Geosyntec Consultants
Site Sample ID:	ST-04
Lab Sample Number:	14B041
Material Type:	Soil
Specified Value (cm/sec):	NA
Date Test Started:	2/27/2014

Specimen	Test Specimen Initial Condition					Test Conditions					Hydraulic
No.	Spec. Prep. [2] (-)	Spec. Length (cm)	Spec. Diameter (cm)	Dry Unit Weight (pcf)	Moisture Content (%)	Cell Press. (psi)	Back Press. (psi)	Consolid. Press. (psi)	Permeant Liquid [3] (-)	Average Gradient (-)	Conductivity (cm/s)
1	ST	5.67	7.27	119.3	14.4	90.0	70.0	20.0	DTW	14	2.2E-9

Notes:

1. Method C, "Falling-Head, Increasing-Tailwater" test procedures were followed during the testing.
2. Specimen preparation: ST = Shelby Tube, R = Remolded, B = Block Sample.
3. Type of permeant liquid: DTW = Deaired Tap Water, DDI = Deaired Deionized Water

* Deviations:

Laboratory temperature at 22±3 °C.
Test specimen final conditions are not presented.

3-18-14
MSK

Excel Geotechnical Testing, Inc.
"Excellence in Testing"
953 Forrest Street, Roswell, Georgia 30075
Tel: (770) 910 7537 Fax: (770) 910 7538

FLEXIBLE WALL PERMEABILITY TEST [1]

ASTM D 5084 *

Project Name:	Badlands Landfill
Project Number:	607
Client Name:	Geosyntec Consultants
Site Sample ID:	ST-05
Lab Sample Number:	14B043
Material Type:	Soil
Specified Value (cm/sec):	NA
Date Test Started:	2/27/2014

Specimen	Test Specimen Initial Condition					Test Conditions					Hydraulic
No.	Spec. Prep. [2] (-)	Spec. Length (cm)	Spec. Diameter (cm)	Dry Unit Weight (pcf)	Moisture Content (%)	Cell Press. (psi)	Back Press. (psi)	Consolid. Press. (psi)	Permeant Liquid [3] (-)	Average Gradient (-)	Conductivity (cm/s)
1	ST	5.67	7.31	116.5	12.9	90.0	70.0	20.0	DTW	10	8.6E-9

Notes:

1. Method C, "Falling-Head, Increasing-Tailwater" test procedures were followed during the testing.
2. Specimen preparation: ST = Shelby Tube, R = Remolded, B = Block Sample.
3. Type of permeant liquid: DTW = Deaired Tap Water, DDI = Deaired Deionized Water

* Deviations:

Laboratory temperature at 22±3 °C.
Test specimen final conditions are not presented.

3-18-14
JSK

Excel Geotechnical Testing, Inc.
"Excellence in Testing"
953 Forrest Street, Roswell, Georgia 30075
Tel: (770) 910 7537 Fax: (770) 910 7538

FLEXIBLE WALL PERMEABILITY TEST [1]

ASTM D 5084 *

Project Name:	Badlands Landfill
Project Number:	607
Client Name:	Geosyntec Consultants
Site Sample ID:	ST-06
Lab Sample Number:	14C068
Material Type:	Soil
Specified Value (cm/sec):	NA
Date Test Started:	3/20/2014

Specimen	Test Specimen Initial Condition					Test Conditions					Hydraulic
No.	Spec. Prep. [2] (-)	Spec. Length (cm)	Spec. Diameter (cm)	Dry Unit Weight (pcf)	Moisture Content (%)	Cell Press. (psi)	Back Press. (psi)	Consolid. Press. (psi)	Permeant Liquid [3] (-)	Average Gradient (-)	Conductivity (cm/s)
1	ST	5.66	7.29	115.3	14.6	90.0	70.0	20.0	DTW	15	3.9E-9

Notes:

1. Method C, "Falling-Head, Increasing-Tailwater" test procedures were followed during the testing.
2. Specimen preparation: ST = Shelby Tube, R = Remolded, B = Block Sample.
3. Type of permeant liquid: DTW = Deaired Tap Water, DDI = Deaired Deionized Water

* Deviations:

Laboratory temperature at 22±3 °C.

Test specimen final conditions are not presented.

11-13-14

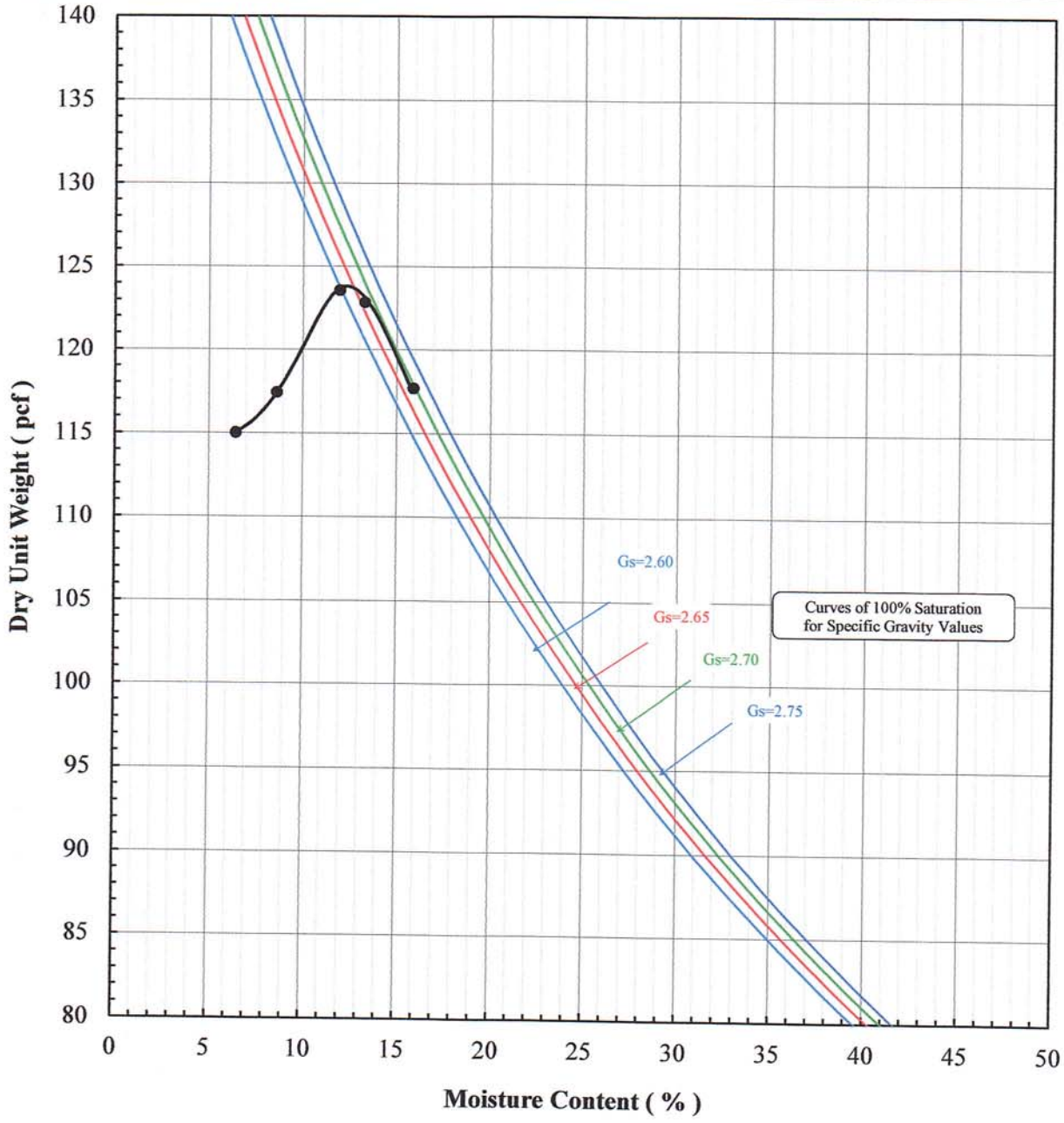
Excel Geotechnical Testing, Inc.
"Excellence in Testing"
953 Forrest Street, Roswell, Georgia 30075
Tel: (770) 910 7537 Fax: (770) 910 7538

Project Name:	Badlands Landfill
Project No:	607
Client Sample ID	LPL-05
Lab Sample No:	14B006

ASTM D 1557 - Method B

MODIFIED PROCTOR COMPACTION

Moist Preparation



Client/Site Sample ID.	Lab Sample No:	Maximum Dry Unit Weight (pcf)	Optimum Moist. Content (%)	Visiual Soil Description (%)
LPL-05	14B006	123.9	12.3	Tan brown sandy silty clay

Note(s): Unless coarse correction is required, all particles passed through 1.0 in. Sieve were used.

From the bucket received, all particles were smaller than 1.0 inch.

2-23-14
NSR

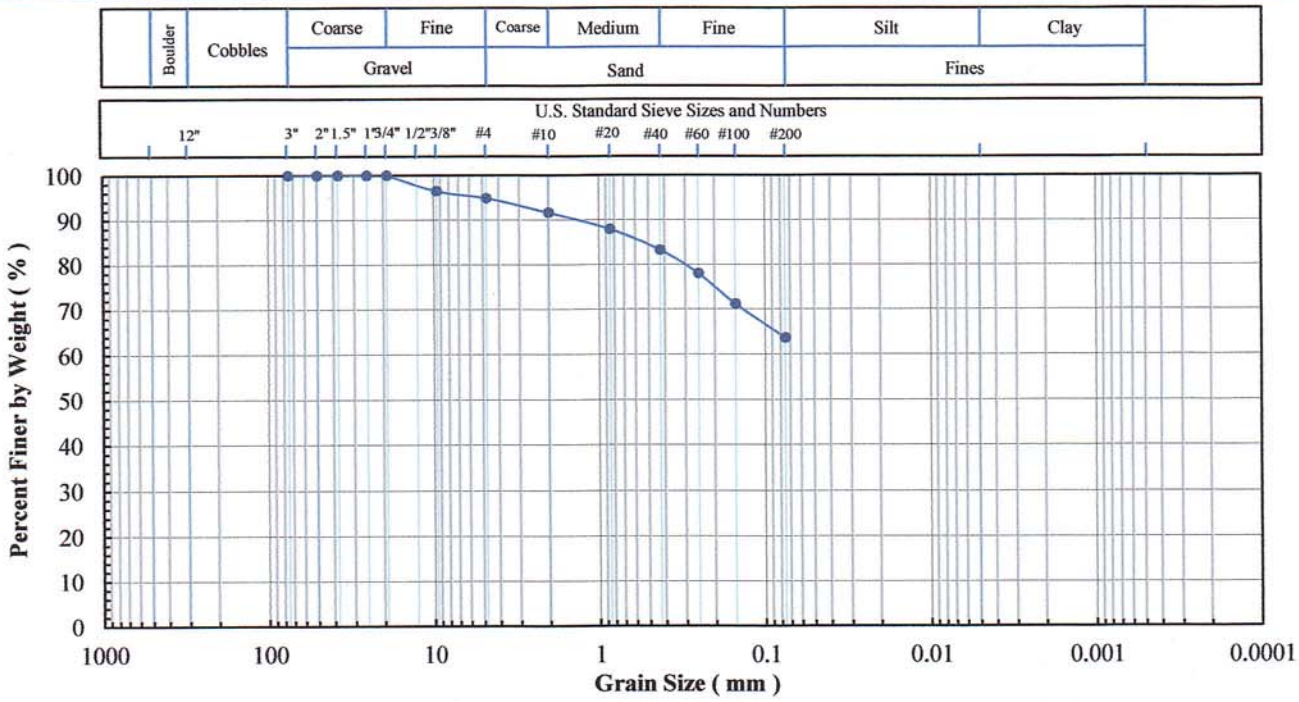
Excel Geotechnical Testing, Inc.
"Excellence in Testing"
953 Forrest Street, Roswell, Georgia 30075
Tel: (770) 910 7537 Fax: (770) 910 7538

Project Name:	Badlands Landfill
Project No:	607
Client Sample ID:	LPL-05
Lab Sample No:	14B006

ASTM C 136, D 422, D 854, D 1140, D2216, D 2487, D4318

SOIL INDEX PROPERTIES

Grain Size, Spec. Gravity, Moist. Content, Eng. Classification, Atterberg Limits



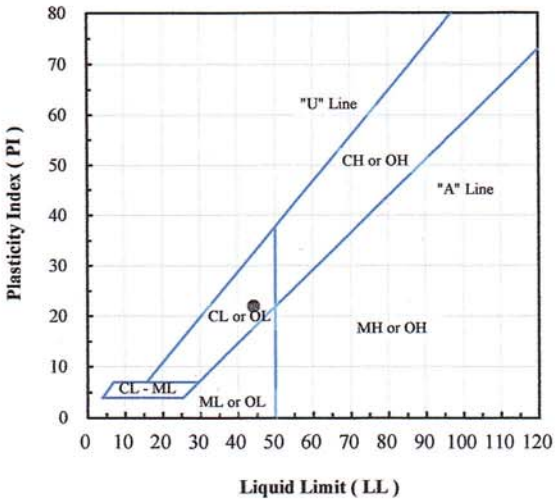
Sieve No.	Size (mm)	% Finer
3"	75	100.0
2"	50	100.0
1.5"	37.5	100.0
1"	25	100.0
3/4"	19	100.0
3/8"	9.5	96.5
#4	4.75	94.9
#10	2.00	91.7
#20	0.850	88.0
#40	0.425	83.3
#60	0.250	78.0
#100	0.150	71.2
#200	0.075	63.7

Specific Gravity (-):	

Hydrometer Particle Diameter (mm)	% Finer

Gravel (%):	5.1
Sand (%):	31.2
Fines (%):	63.7
Silt (%):	
Clay (%):	

Coeff. Unif. (Cu):	
Coeff. Curv. (Cc):	



Client Sample ID.	Lab Sample No:	Moisture Content (%)	Fines Content < No. 200 (%)	Atterberg Limits LL (-)	Atterberg Limits PL (-)	Atterberg Limits PI (-)	Engineering Classification
LPL-05	14B006	13.8	63.7	44	22	22	CL - Sandy lean clay

Note(s):

2-25-14 NSR

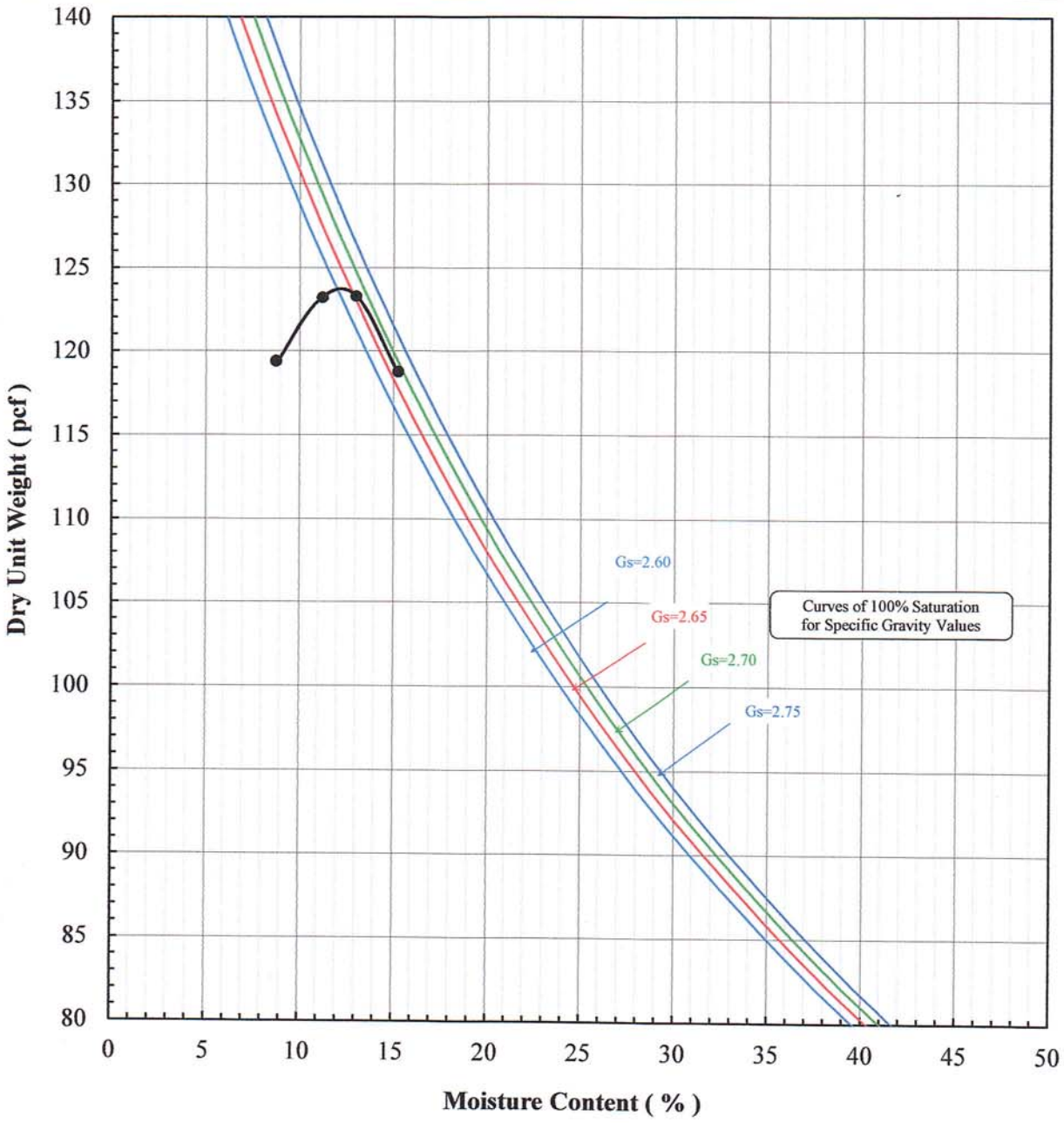
Excel Geotechnical Testing, Inc.
"Excellence in Testing"
953 Forrest Street, Roswell, Georgia 30075
Tel: (770) 910 7537 Fax: (770) 910 7538

Project Name:	Badlands Landfill
Project No:	607
Client Sample ID	LPL-06
Lab Sample No:	14B007

ASTM D 1557 - Method B

MODIFIED PROCTOR COMPACTION

Moist Preparation



Client/Site Sample ID.	Lab Sample No:	Maximum Dry Unit Weight (pcf)	Optimum Moist. Content (%)	Visiual Soil Description (%)
LPL-06	14B007	123.8	12.2	Tan brown sandy silty clay

Note(s): Unless coarse correction is required, all particles passed through 1.0 in. Sieve were used.

From the bucket received, all particles were smaller than 1.0 inch.

2-23-14
NSA

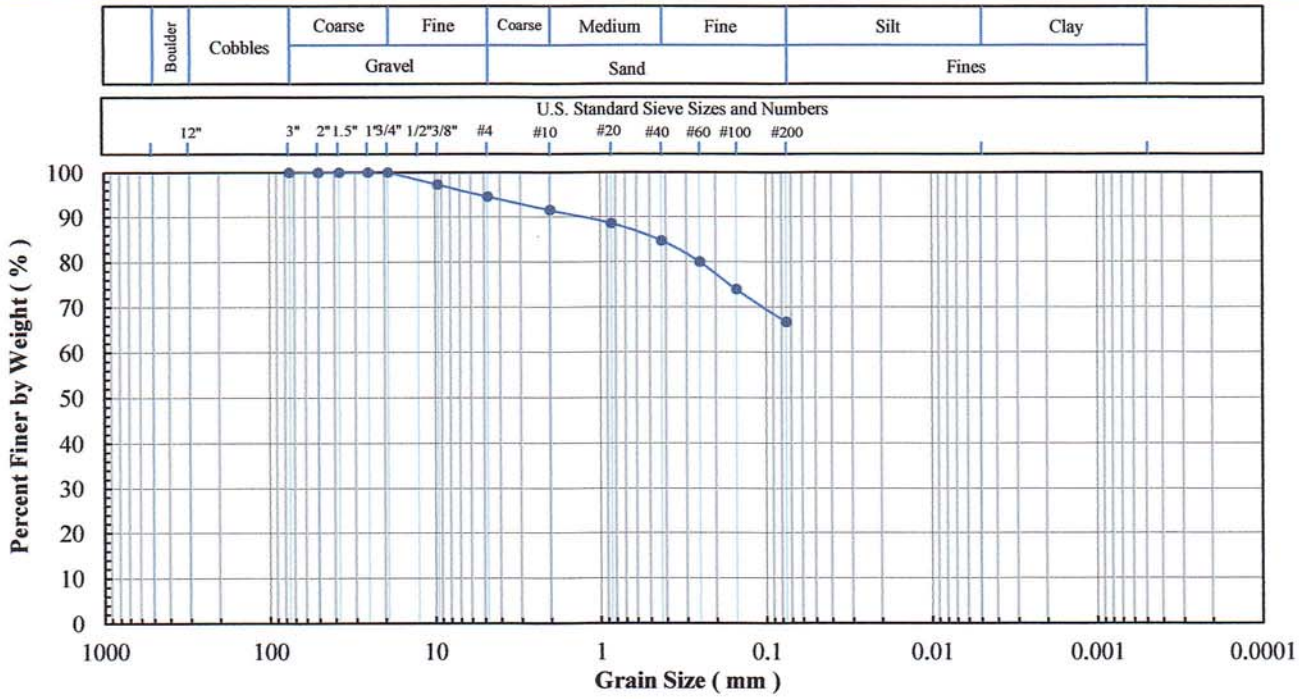
Excel Geotechnical Testing, Inc.
"Excellence in Testing"
953 Forrest Street, Roswell, Georgia 30075
Tel: (770) 910 7537 Fax: (770) 910 7538

Project Name:	Badlands Landfill
Project No:	607
Client Sample ID:	LPL-06
Lab Sample No:	14B007

ASTM C 136, D 422, D 854, D 1140, D2216, D 2487, D4318

SOIL INDEX PROPERTIES

Grain Size, Spec. Gravity, Moist. Content, Eng. Classification, Atterberg Limits



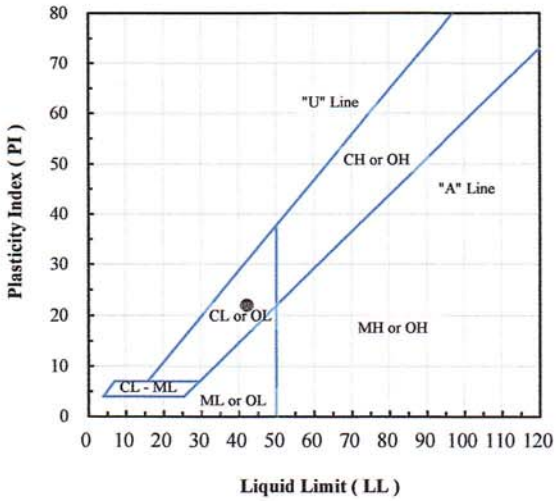
Sieve No.	Size (mm)	% Finer
3"	75	100.0
2"	50	100.0
1.5"	37.5	100.0
1"	25	100.0
3/4"	19	100.0
3/8"	9.5	97.3
#4	4.75	94.6
#10	2.00	91.6
#20	0.850	88.6
#40	0.425	84.7
#60	0.250	80.0
#100	0.150	73.9
#200	0.075	66.7

Specific Gravity (-):	

Hydrometer Particle Diameter (mm)	% Finer

Gravel (%):	5.4
Sand (%):	27.9
Fines (%):	66.7
Silt (%):	
Clay (%):	

Coeff. Unif. (Cu):	
Coeff. Curv. (Cc):	



Client Sample ID.	Lab Sample No:	Moisture Content (%)	Fines Content < No. 200 (%)	Atterberg Limits LL (-)	Atterberg Limits PL (-)	Atterberg Limits PI (-)	Engineering Classification
LPL-06	14B007	12.9	66.7	42	20	22	CL - Sandy lean clay

Note(s):

2-25-14
NSR

Geosyntec consultants

APPENDIX D-3

DEMONSTRATION FILL TEST RESULTS

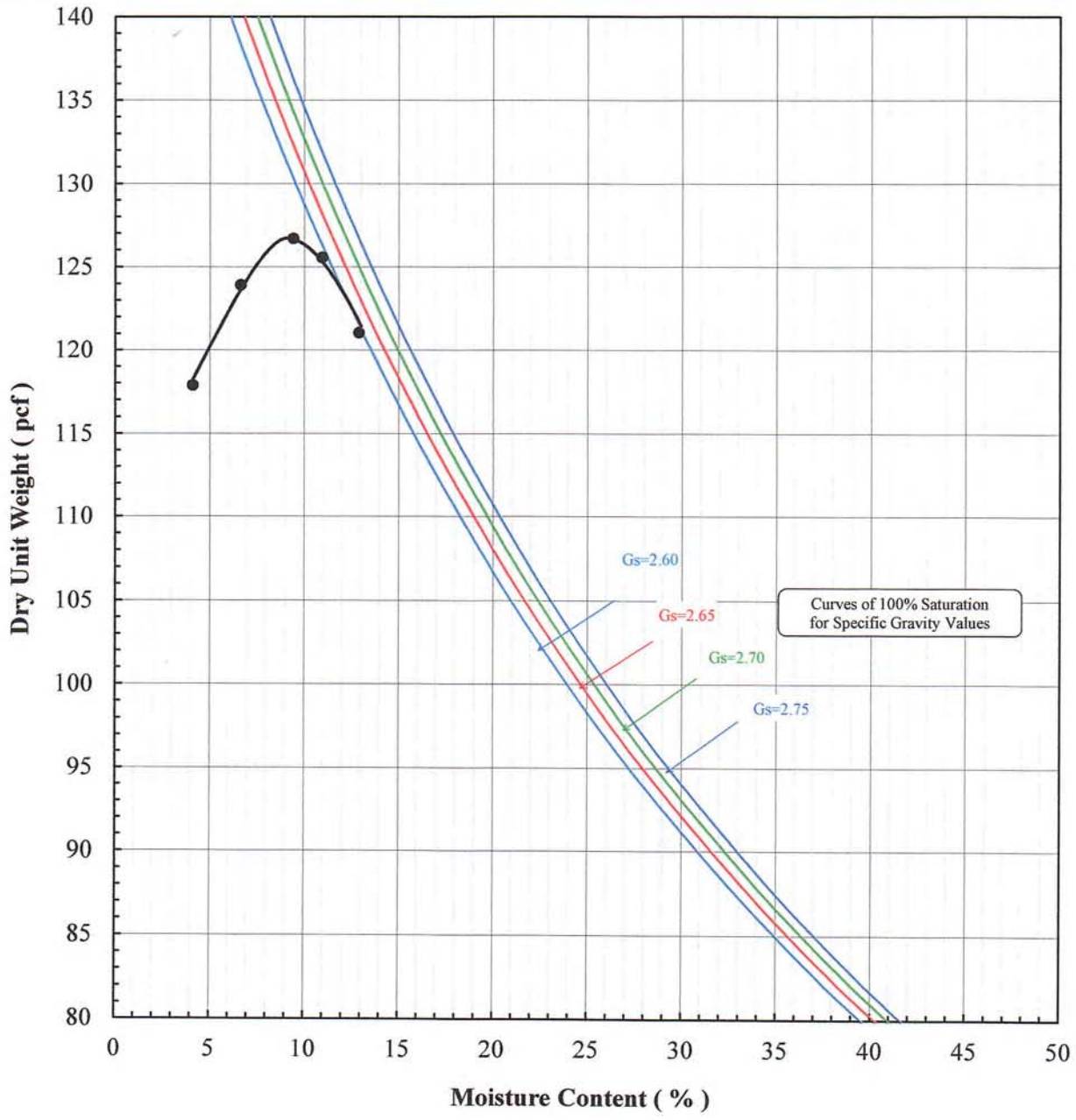
Excel Geotechnical Testing, Inc.
"Excellence in Testing"
953 Forrest Street, Roswell, Georgia 30075
Tel: (770) 910 7537 Fax: (770) 910 7538

Project Name:	Badlands Landfill
Project No:	607
Client Sample ID	LPL-01
Lab Sample No:	13H049

ASTM D 1557 - Method B

MODIFIED PROCTOR COMPACTION

Moist Preparation



Client/Site Sample ID.	Lab Sample No:	Maximum Dry Unit Weight (pcf)	Optimum Moist. Content (%)	Visiual Soil Description (%)
LPL-01	13H049	126.9	9.2	Tan, gray silty sand with gravel

Note(s): Unless coarse correction is required, all particles passed through 1.0 in. Sieve were used.

From the bucket received, all particles were smaller than 1.0 inch.

8-22-13 NSK

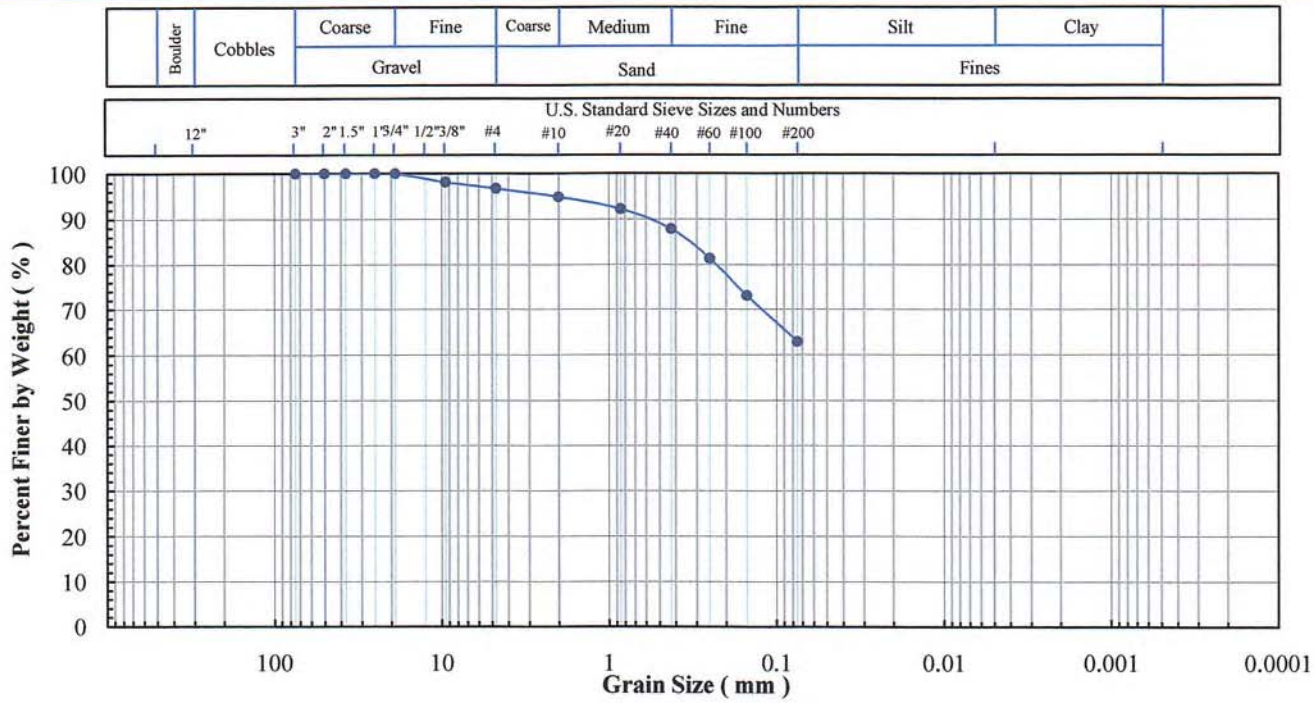
Excel Geotechnical Testing, Inc.
"Excellence in Testing"
953 Forrest Street, Roswell, Georgia 30075
Tel: (770) 910 7537 Fax: (770) 910 7538

Project Name:	Badlands Landfill
Project No:	607
Client Sample ID:	LPL-01
Lab Sample No:	13H049

ASTM C 136, D 422, D 854, D 1140, D2216, D 2487, D4318

SOIL INDEX PROPERTIES

Grain Size, Spec. Gravity, Moist. Content, Eng. Classification, Atterberg Limits



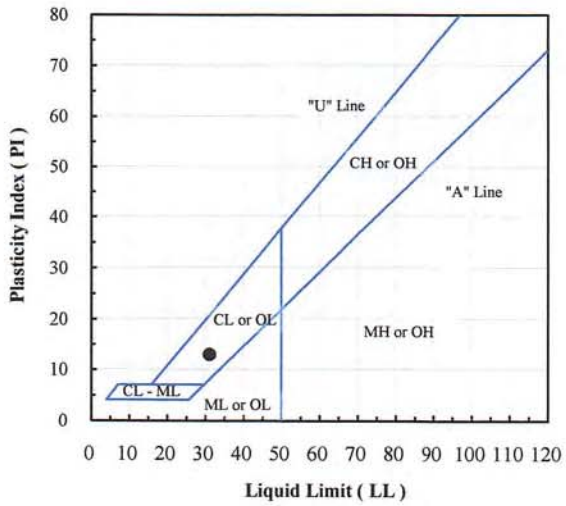
Sieve No.	Size (mm)	% Finer
3"	75	100.0
2"	50	100.0
1.5"	37.5	100.0
1"	25	100.0
3/4"	19	100.0
3/8"	9.5	98.1
#4	4.75	96.7
#10	2.00	94.9
#20	0.850	92.2
#40	0.425	87.8
#60	0.250	81.3
#100	0.150	73.0
#200	0.075	62.9

Specific Gravity (-):	

Hydrometer Particle Diameter (mm)	% Finer

Gravel (%):	3.3
Sand (%):	33.8
Fines (%):	62.9
Silt (%):	
Clay (%):	

Coeff. Unif. (Cu):	
Coeff. Curv. (Cc):	



Client Sample ID.	Lab Sample No:	Moisture Content (%)	Fines Content < No. 200 (%)	Atterberg Limits LL (-)	Atterberg Limits PL (-)	Atterberg Limits PI (-)	Engineering Classification
LPL-01	13H049	4.3	62.9	31	18	13	CL - Sandy lean clay

Note(s):

8-23-13 NDR

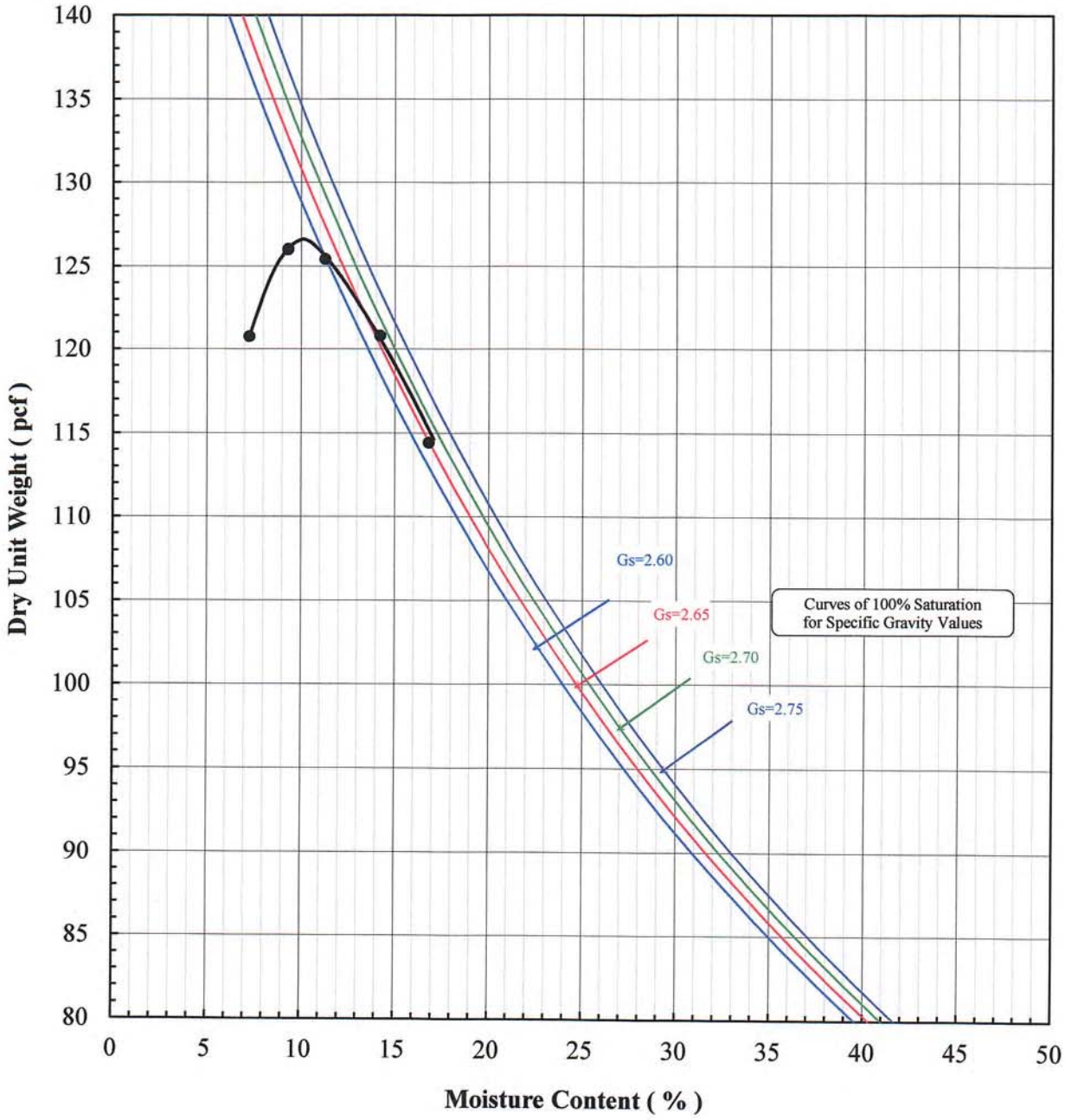
Excel Geotechnical Testing, Inc.
"Excellence in Testing"
953 Forrest Street, Roswell, Georgia 30075
Tel: (770) 910 7537 Fax: (770) 910 7538

Project Name:	Badlands Landfill
Project No:	607
Client Sample ID:	LPL-02
Lab Sample No:	13K089

ASTM D 1557 - Method B

MODIFIED PROCTOR COMPACTION

Moist Preparation



Client/Site Sample ID.	Lab Sample No:	Maximum Dry Unit Weight (pcf)	Optimum Moist. Content (%)	Visiual Soil Description (%)
LPL-02	13K089	126.7	10.1	Dark tan sandy silt with gravel

Note(s): Unless coarse correction is required, all particles passed through 1.0 in. Sieve were used.

From the bucket received, all particles were smaller than 1.0 inch.

11-19-13 MSR

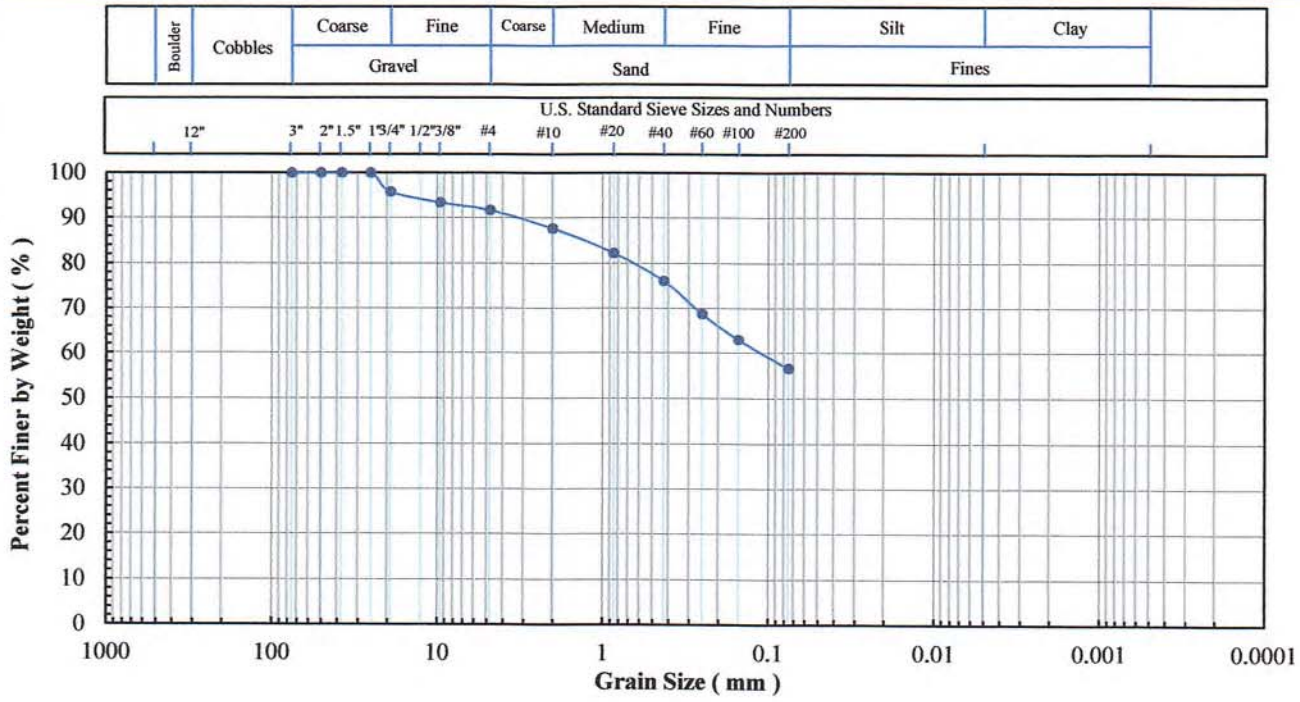
Excel Geotechnical Testing, Inc.
"Excellence in Testing"
953 Forrest Street, Roswell, Georgia 30075
Tel: (770) 910 7537 Fax: (770) 910 7538

Project Name:	Badlands Landfill
Project No:	607
Client Sample ID:	LPL-02
Lab Sample No:	13K089

ASTM C 136, D 422, D 854, D 1140, D2216, D 2487, D4318

SOIL INDEX PROPERTIES

Grain Size, Spec. Gravity, Moist. Content, Eng. Classification, Atterberg Limits



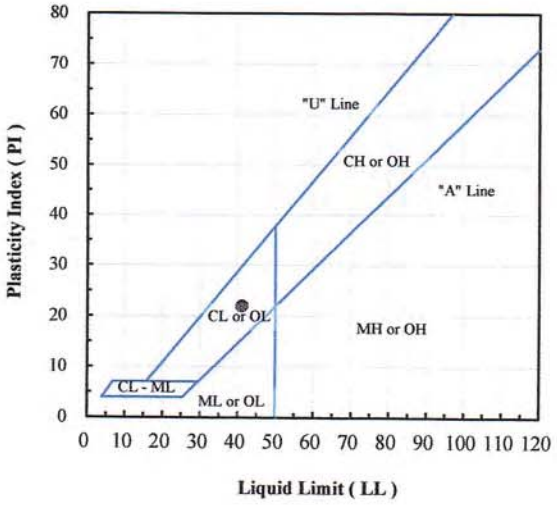
Sieve No.	Size (mm)	% Finer
3"	75	100.0
2"	50	100.0
1.5"	37.5	100.0
1"	25	100.0
3/4"	19	95.8
3/8"	9.5	93.4
#4	4.75	91.7
#10	2.00	87.7
#20	0.850	82.3
#40	0.425	76.1
#60	0.250	68.8
#100	0.150	63.0
#200	0.075	56.6

Specific Gravity (-):	

Hydrometer Particle Diameter (mm)	% Finer

Gravel (%):	8.3
Sand (%):	35.1
Fines (%):	56.6
Silt (%):	
Clay (%):	

Coeff. Unif. (Cu):	
Coeff. Curv. (Cc):	



Client Sample ID.	Lab Sample No:	Moisture Content (%)	Fines Content < No. 200 (%)	Atterberg Limits LL (-)	Atterberg Limits PL (-)	Atterberg Limits PI (-)	Engineering Classification
LPL-02	13K089	12.4	56.6	41	19	22	CL - Sandy lean clay

Note(s):

11-30-13 NSR

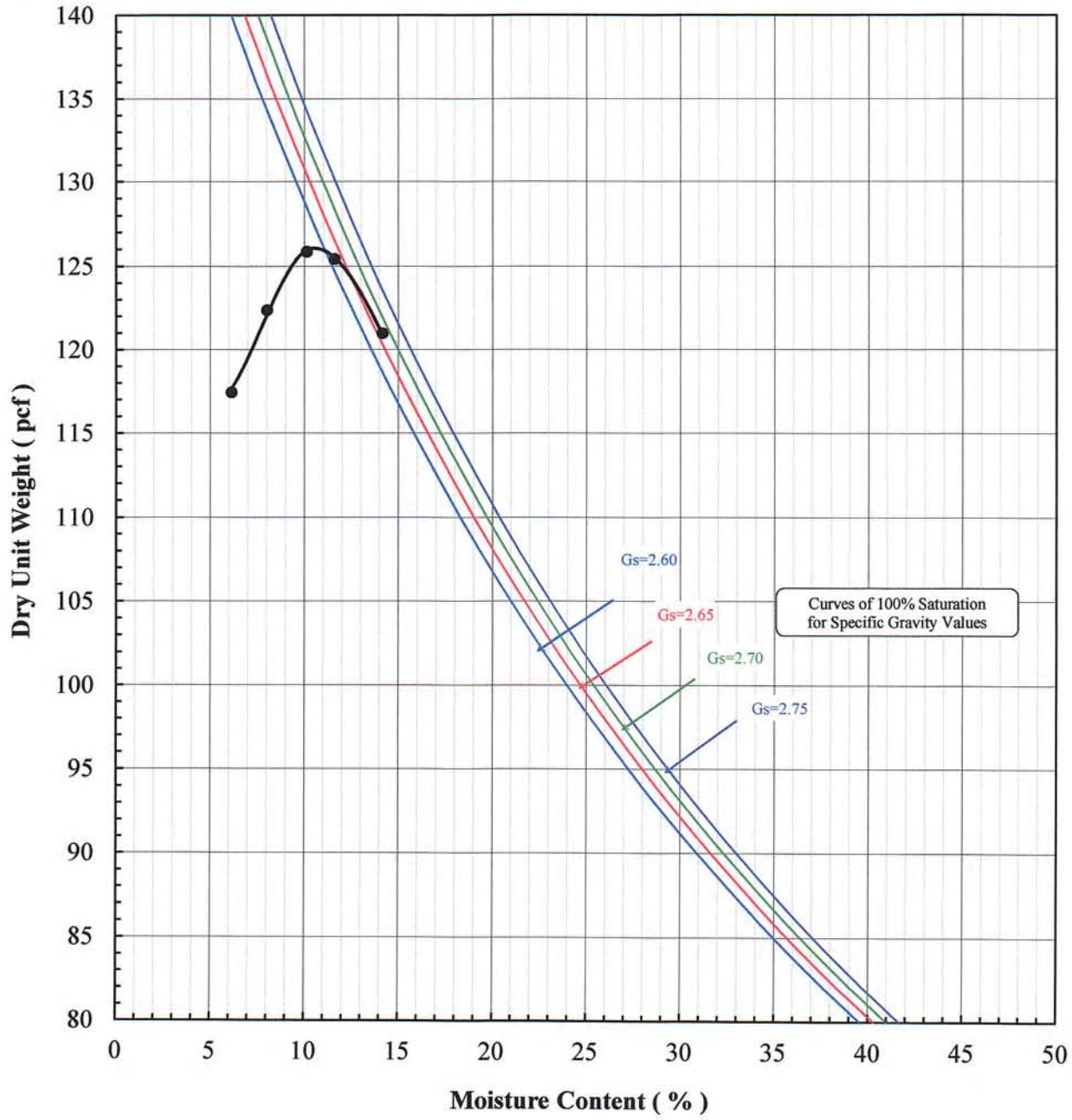
Excel Geotechnical Testing, Inc.
"Excellence in Testing"
953 Forrest Street, Roswell, Georgia 30075
Tel: (770) 910 7537 Fax: (770) 910 7538

Project Name:	Badlands Landfill
Project No:	607
Client Sample ID:	LPL-03
Lab Sample No:	13K094

ASTM D 1557 - Method B

MODIFIED PROCTOR COMPACTION

Moist Preparation



Client/Site Sample ID.	Lab Sample No:	Maximum Dry Unit Weight (pcf)	Optimum Moist. Content (%)	Visiual Soil Description (%)
LPL-03	13K094	126.1	10.5	Dark tan sandy silt with gravel

Note(s): Unless coarse correction is required, all particles passed through 1.0 in. Sieve were used.

From the bucket received, all particles were smaller than 1.0 inch.

11-20-13
NSK

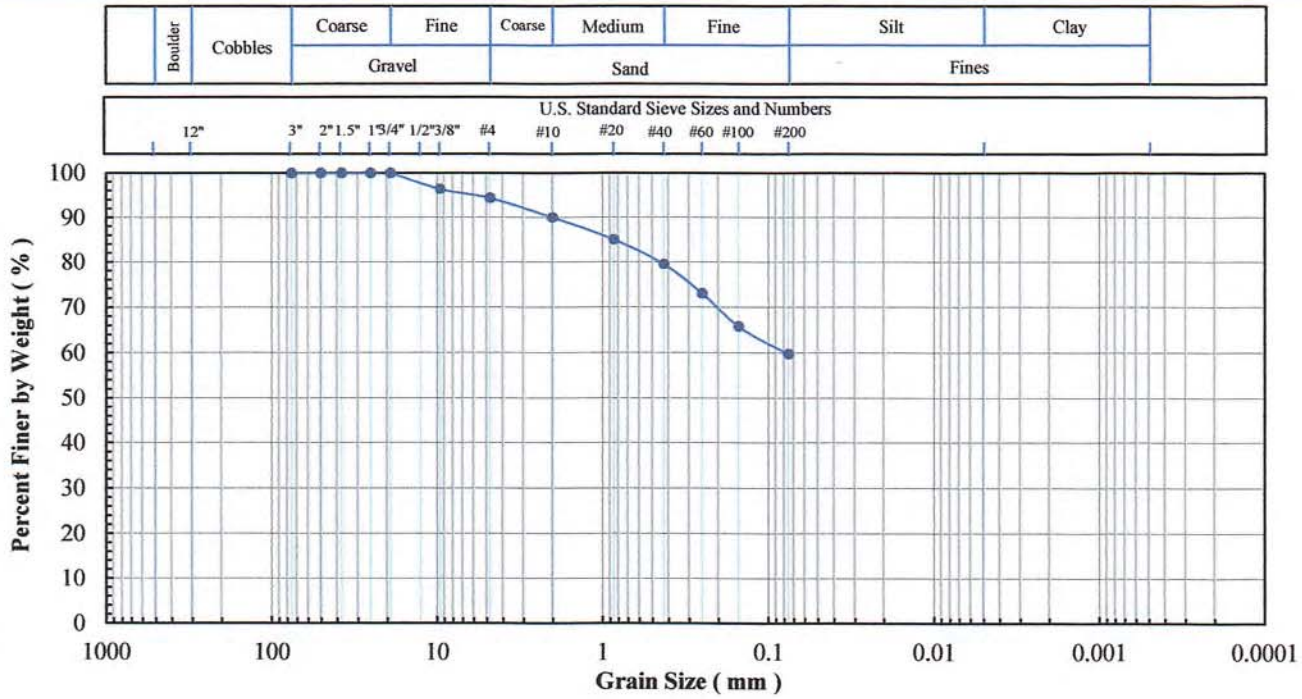
Excel Geotechnical Testing, Inc.
"Excellence in Testing"
953 Forrest Street, Roswell, Georgia 30075
Tel: (770) 910 7537 Fax: (770) 910 7538

Project Name:	Badlands Landfill
Project No:	607
Client Sample ID:	LPL-03
Lab Sample No:	13K094

ASTM C 136, D 422, D 854, D 1140, D2216, D 2487, D4318

SOIL INDEX PROPERTIES

Grain Size, Spec. Gravity, Moist. Content, Eng. Classification, Atterberg Limits



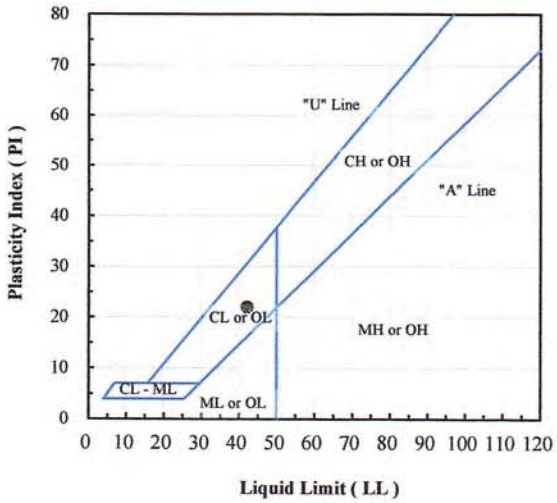
Sieve No.	Size (mm)	% Finer
3"	75	100.0
2"	50	100.0
1.5"	37.5	100.0
1"	25	100.0
3/4"	19	100.0
3/8"	9.5	96.4
#4	4.75	94.4
#10	2.00	90.1
#20	0.850	85.1
#40	0.425	79.5
#60	0.250	73.1
#100	0.150	65.8
#200	0.075	59.8

Specific Gravity (-):	

Hydrometer Particle Diameter (mm)	% Finer

Gravel (%):	5.6
Sand (%):	34.6
Fines (%):	59.8
Silt (%):	
Clay (%):	

Coeff. Unif. (Cu):	
Coeff. Curv. (Cc):	



Client Sample ID.	Lab Sample No:	Moisture Content (%)	Fines Content < No. 200 (%)	Atterberg Limits LL (-)	Atterberg Limits PL (-)	Atterberg Limits PI (-)	Engineering Classification
LPL-03	13K094	13.0	59.8	42	20	22	CL - Sandy lean clay

Note(s):

11-30-13 NSR

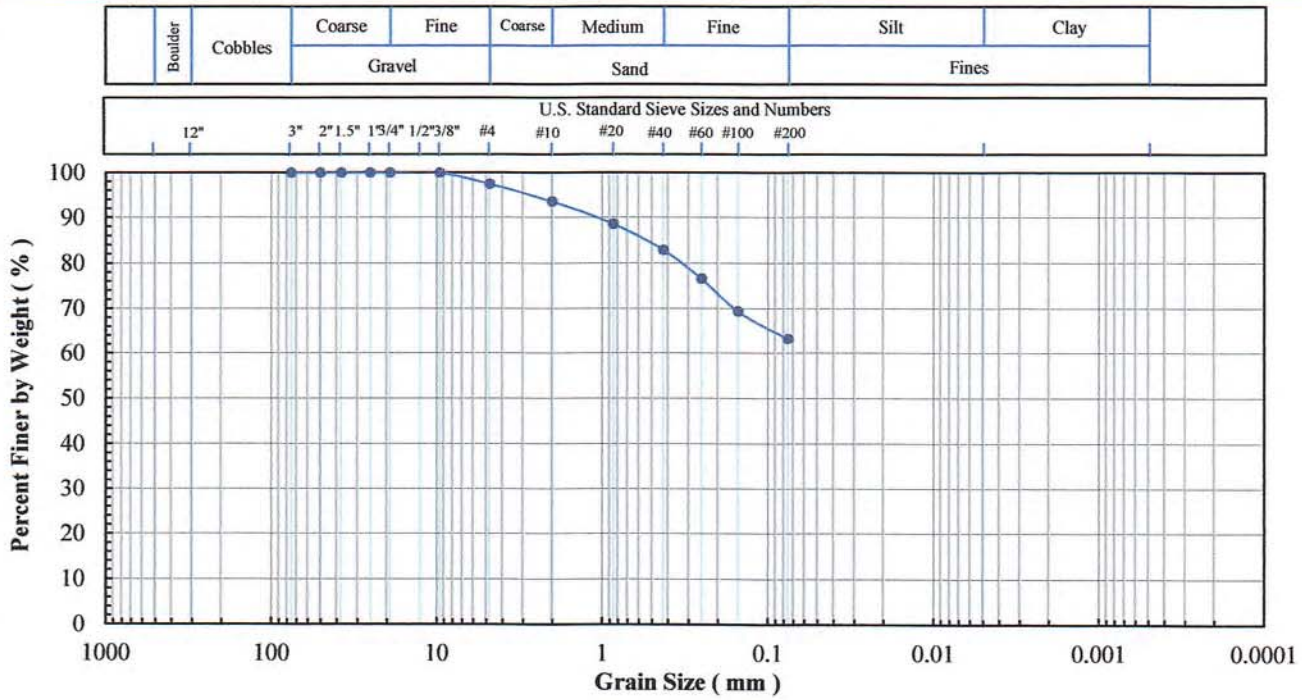
Excel Geotechnical Testing, Inc.
"Excellence in Testing"
953 Forrest Street, Roswell, Georgia 30075
Tel: (770) 910 7537 Fax: (770) 910 7538

Project Name:	Badlands Landfill
Project No:	607
Client Sample ID:	LPL-04
Lab Sample No:	13K095

ASTM C 136, D 422, D 854, D 1140, D2216, D 2487, D4318

SOIL INDEX PROPERTIES

Grain Size, Spec. Gravity, Moist. Content, Eng. Classification, Atterberg Limits



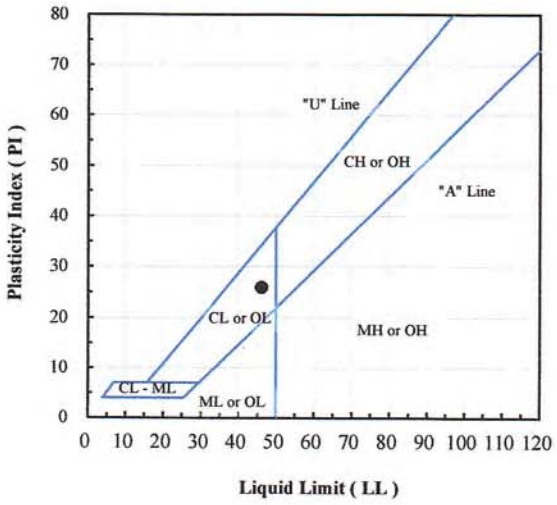
Sieve No.	Size (mm)	% Finer
3"	75	100.0
2"	50	100.0
1.5"	37.5	100.0
1"	25	100.0
3/4"	19	100.0
3/8"	9.5	100.0
#4	4.75	97.5
#10	2.00	93.6
#20	0.850	88.6
#40	0.425	82.9
#60	0.250	76.6
#100	0.150	69.4
#200	0.075	63.3

Specific Gravity (-):	

Hydrometer Particle Diameter (mm)	% Finer

Gravel (%):	2.5
Sand (%):	34.2
Fines (%):	63.3
Silt (%):	
Clay (%):	

Coeff. Unif. (Cu):	
Coeff. Curv. (Cc):	



Client Sample ID.	Lab Sample No:	Moisture Content (%)	Fines Content < No. 200 (%)	Atterberg Limits LL (-)	Atterberg Limits PL (-)	Atterberg Limits PI (-)	Engineering Classification
LPL-04	13K095	13.2	63.3	46	20	26	CL - Sandy lean clay

Note(s):

11-30-13

Excel Geotechnical Testing, Inc.
"Excellence in Testing"
953 Forrest Street, Roswell, Georgia 30075
Tel: (770) 910 7537 Fax: (770) 910 7538

FLEXIBLE WALL PERMEABILITY TEST [1]

ASTM D 5084 *

Project Name:	Badlands Landfill
Project Number:	607
Client Name:	Geosyntec Consultants
Site Sample ID:	ST-01
Lab Sample Number:	13L001
Material Type:	Soil
Specified Value (cm/sec):	NA
Date Test Started:	12/02/2013

Specimen	Test Specimen Initial Condition					Test Conditions					Hydraulic
No.	Spec. Prep. [2] (-)	Spec. Length (cm)	Spec. Diameter (cm)	Dry Unit Weight (pcf)	Moisture Content (%)	Cell Press. (psi)	Back Press. (psi)	Consolid. Press. (psi)	Permeant Liquid [3] (-)	Average Gradient (-)	Conductivity (cm/s)
1	ST	5.66	7.26	120.3	12.9	90.0	70.0	20.0	DTW	13	6.9E-9

Notes:

1. Method C, "Falling-Head, Increasing-Tailwater" test procedures were followed during the testing.
2. Specimen preparation: ST = Shelby Tube, R = Remolded, B = Block Sample.
3. Type of permeant liquid: DTW = Deaired Tap Water, DDI = Deaired Deionized Water

* Deviations:

Laboratory temperature at 22±3 °C.
Test specimen final conditions are not presented.

12-15-13
NSR

Excel Geotechnical Testing, Inc.
"Excellence in Testing"
953 Forrest Street, Roswell, Georgia 30075
Tel: (770) 910 7537 Fax: (770) 910 7538

FLEXIBLE WALL PERMEABILITY TEST [1]

ASTM D 5084 *

Project Name:	Badlands Landfill
Project Number:	607
Client Name:	Geosyntec Consultants
Site Sample ID:	ST-02
Lab Sample Number:	13L003
Material Type:	Soil
Specified Value (cm/sec):	NA
Date Test Started:	12/02/2013

Specimen	Test Specimen Initial Condition					Test Conditions					Hydraulic
No.	Spec. Prep. [2] (-)	Spec. Length (cm)	Spec. Diameter (cm)	Dry Unit Weight (pcf)	Moisture Content (%)	Cell Press. (psi)	Back Press. (psi)	Consolid. Press. (psi)	Permeant Liquid [3] (-)	Average Gradient (-)	Conductivity (cm/s)
1	ST	5.66	7.30	121.8	13.1	90.0	70.0	20.0	DTW	15	3.5E-9

Notes:

1. Method C, "Falling-Head, Increasing-Tailwater" test procedures were followed during the testing.
2. Specimen preparation: ST = Shelby Tube, R = Remolded, B = Block Sample.
3. Type of permeant liquid: DTW = Deaired Tap Water, DDI = Deaired Deionized Water

* Deviations:

Laboratory temperature at 22±3 °C.
Test specimen final conditions are not presented.

12-15-13
NSR

Excel Geotechnical Testing, Inc.
"Excellence in Testing"
953 Forrest Street, Roswell, Georgia 30075
Tel: (770) 910 7537 Fax: (770) 910 7538

FLEXIBLE WALL PERMEABILITY TEST [1]

ASTM D 5084 *

Project Name:	Badlands Landfill
Project Number:	607
Client Name:	Geosyntec Consultants
Site Sample ID:	ST-03
Lab Sample Number:	13L005
Material Type:	Soil
Specified Value (cm/sec):	NA
Date Test Started:	12/02/2013

Specimen	Test Specimen Initial Condition					Test Conditions					Hydraulic
No.	Spec. Prep. [2] (-)	Spec. Length (cm)	Spec. Diameter (cm)	Dry Unit Weight (pcf)	Moisture Content (%)	Cell Press. (psi)	Back Press. (psi)	Consolid. Press. (psi)	Permeant Liquid [3] (-)	Average Gradient (-)	Conductivity (cm/s)
1	ST	5.69	7.26	119.1	12.7	90.0	70.0	20.0	DTW	9	1.2E-8

Notes:

1. Method C, "Falling-Head, Increasing-Tailwater" test procedures were followed during the testing.
2. Specimen preparation: ST = Shelby Tube, R = Remolded, B = Block Sample.
3. Type of permeant liquid: DTW = Deaired Tap Water, DDI = Deaired Deionized Water

* Deviations:

Laboratory temperature at 22±3 °C.
Test specimen final conditions are not presented.

12-15-13
NSR

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Page 1 of 1

SUMMARY OF BAT PERMEABILITY TEST DATA - DEMO PAD

PROJECT: BADLANDS CANYON 4 PHASE 3

LOCATION: BADLANDS SANITARY LANDFILL, MORENO VALLEY, CA **PROJECT NO.:** HL1255BL **TASK NO.:** 4

DESCRIPTION: LOW PERMEABILITY LAYER - DEMONSTRATION **MATERIAL TYPE:** GREY LOW PLASTICITY SILT

Specification Requirements:

Source: LPL Stockpile **Permissible Conductivity:** ≤ 1.0E-07 cm/s

Date of Test	BAT Test ID	Test Container vol. (ml)	Ext. cylinder vol. (ml)	Liquid start level (ml)	Initial gas vol. (ml)	Container x-sect. area (cm^2)	Static pore pressure (m H_2O)	Initial test pressure (m H_2O)	Initial liquid vol (ml)	Final Hyd. Conduct. (cm/s)
12/11/2013	BAT-1	35	0.5	0.34	5.5	1.96	-4.73	15.44	30	6.46E-09
12/12/2013	BAT-2	35	0.5	0.34	5.5	1.96	6.84	20.00	30	1.37E-08
12/12/2013	BAT-3	35	0.5	0.34	5.5	1.96	5.02	17.41	30	1.29E-08

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LPL Test Pad Summary - Badlands C4P3 Landfill Expansion

PROJECT: BADLANDS CANYON 4 PHASE 3 **PROJECT NO.:** HL1255BL

LOCATION: BADLANDS SANITARY LANDFILL, MORENO VALLEY, CA **TASK NO.:** 4

DESCRIPTION: LOW PERMEABILITY LAYER - DEMONSTRATION **MATERIAL TYPE:** GREY LOW PLASTICITY SILT

Test Location[4,5]	Nuclear Gauge					Sand Cone				Hydraulic Conductivity, k (cm/sec)			
										BAT Permeability		Laboratory[3] (ASTM D5084)	
	Lift	Dry Density (DD) (pcf)	Wet Density (WD) (pcf)	w (%)[2]	RC (%)[1]	DD (pcf)	WD (pcf)	w (%)[1]	RC (%)[2]	Test ID	Value	Test ID	Value
11	1&2	115.3	129.6	12.4%	91.2%	-	-	-	-	-	-	-	-
12	1&2	116.2	132.6	14.1%	91.9%	-	-	-	-	-	-	-	-
11A	1&2	120.5	135.3	12.3%	95.3%	-	-	-	-	-	-	-	-
12A	1&2	120.3	135.6	12.7%	95.2%	-	-	-	-	-	-	-	-
13	3	120.5	136.0	12.9%	95.3%	-	-	-	-	-	-	-	-
14	3	121.3	137.0	12.9%	96.0%	-	-	-	-	-	-	-	-
15	4	121.2	137.2	13.2%	95.9%	-	-	-	-	-	-	-	-
16	4	122.3	138.6	13.3%	96.8%	-	-	-	-	-	-	-	-
17	5	116.6	132.6	13.7%	92.3%	-	-	-	-	-	-	-	-
18	5	114.2	129.0	13.0%	90.3%	-	-	-	-	-	-	-	-
17A[6]	5	120.5	136.0	12.9%	95.3%	119.2	136.0	12.7%	94.3%	BAT-1	6.5E-09	ST-01	6.9E-09
18A	5	123.7	139.7	12.9%	97.9%	-	-	-	-	BAT-2	1.4E-08	ST-02	3.5E-09
19	5	123.3	139.3	13.0%	97.5%	120.6	136	13.0%	95.4%	BAT-3	1.3E-08	ST-03	1.2E-08
								Average			1.1E-08		6.6E-09
								Requirement			1.0E-07		1.0E-07

[1] Maximum dry density of 126.3 pcf and optimum moisture content of 10.3% was based on the average of compaction curves LPL-02 and LPL-03.

[2] Required optimum moisture content range of +2 to +4 percent is 12.3% to 14.3%.

[3] Testing conducted on Shelby Tube Samples recovered from the Demo Pad. Testing conducted at 20 psi confining stress.

[4] The "A" suffix at a test location indicates a "retest" with the Nuclear Gage was conducted.

[5] Test 1 through 10 (not shown above) were performed on previous LPL test pad trails. Test 11 through 19 represent the test pad that was relocated to Gravel Road.

[6] The sandcone for test 17A did not meet the 95% compaction requirement. However, hydraulic conductivities performed in this area met the project requirements; therefore, the sandcone result was accepted.

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APPENDIX D-4

LOW-PERMEABILITY LAYER FIELD TEST RESULTS

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2100 Main Street, Suite 150
Huntington Beach, California 92648
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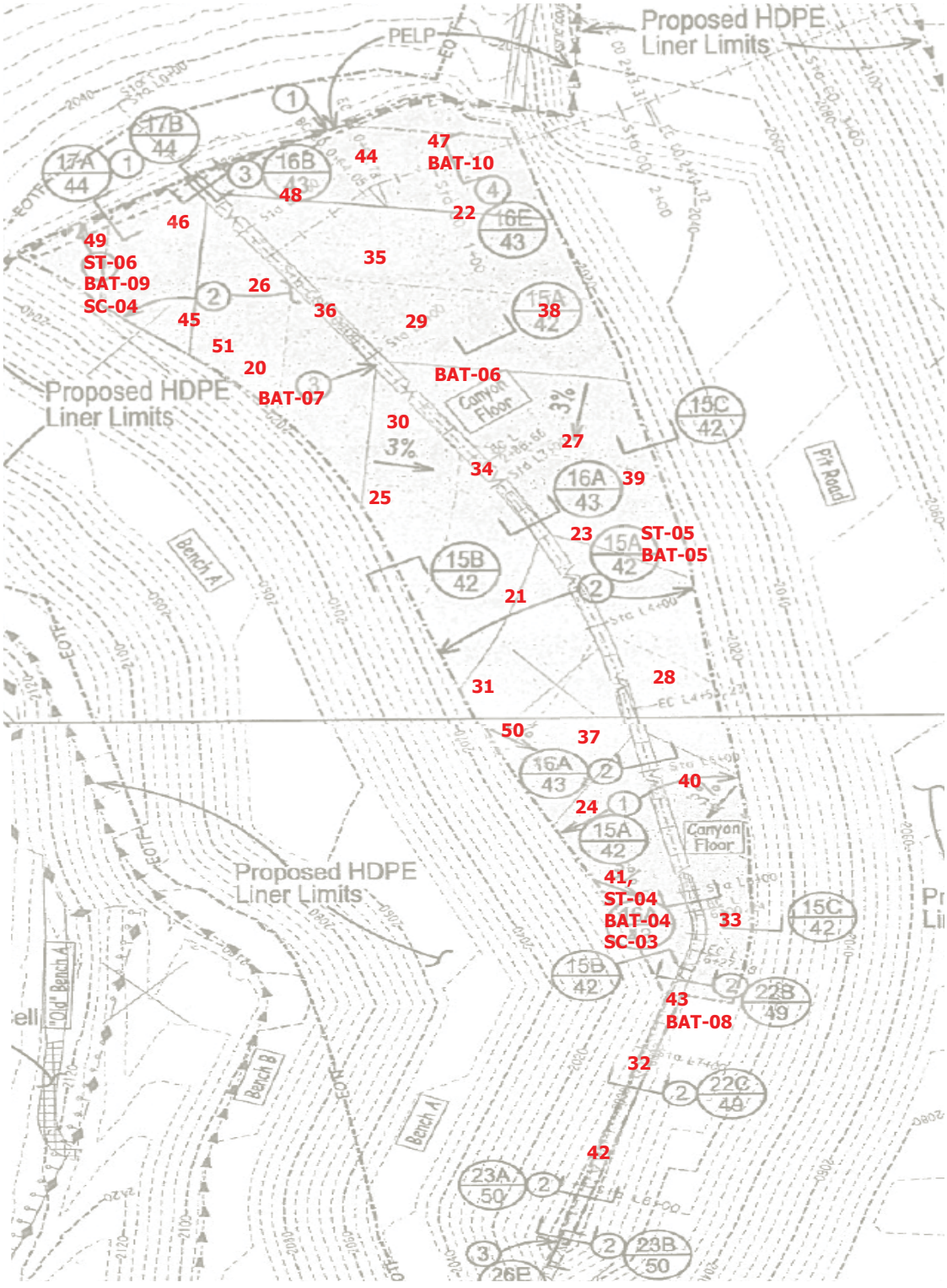
LPL TESTING LOCATIONS: 20 - 51

CANYON 4 PHASE 3 LINER EXPANSION

Badlands Sanitary Landfill – Riverside County Waste Management Department

C4P3 – LPL



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SUMMARY OF FIELD DENSITY TESTS

PROJECT: Badlands Landfill - C4P3 Liner Expansion
LOCATION: Moreno Valley, California PROJECT NO.: HL1255BL TASK NO.: C1.01
CONTRACTOR: Independent Construction DESCRIPTION: LPL

SPECIFICATION REQUIREMENTS:
Source: on-site Lift Thickness (Loose): 6 to 8-in Nuclear Gauge Type: Troxler 3440 Cor. Factor: N/A
% Compaction: ≥ 95% Moisture Range: +2% to +4% of OMC Nuclear Gauge Serial N 20202

Date of Test (dd/mm/yr)	Test No.	Test Location	Lab Results			Field Test Results (ASTM D 6938)					Pass	Fail	Retest No.	QA I.D.
			Sample No.	O.M.C. (%)	Max. Unit Wt (pcf)	Elev. (ft)	FMC (%)	Wet Unit Wt (pcf)	Dry Unit Wt (pcf)	Percent Compact (%)				
19-Feb-14	20	LPL West Half	LPL-02 and 03	10.3	126.4	Lift 1	14.2%	137.2	120.1	95.0%	X			SCM
19-Feb-14	21	LPL West Half	LPL-02 and 03	10.3	126.4	Lift 1	14.4%	135.5	118.4	93.7%		X		SCM
19-Feb-14	21A	LPL West Half	LPL-02 and 03	10.3	126.4	Lift 1	13.7%	137.3	120.8	95.5%	X		21	SCM
20-Feb-14	22	LPL East Half	LPL-02 and 03	10.3	126.4	Lift 1	12.9%	137.3	121.6	96.2%	X			SCM
20-Feb-14	23	LPL East Half	LPL-02 and 03	10.3	126.4	Lift 1	13.4%	137.9	121.6	96.2%	X			SCM
20-Feb-14	24	LPL West Half	LPL-02 and 03	10.3	126.4	Lift 2	13.2%	136.0	120.1	95.0%	X			SCM
20-Feb-14	25	LPL West Half	LPL-02 and 03	10.3	126.4	Lift 2	13.0%	133.5	118.1	93.5%		X		SCM
20-Feb-14	25A	LPL West Half	LPL-02 and 03	10.3	126.4	Lift 2	12.6%	136.1	120.9	95.6%	X		25	SCM
20-Feb-14	26	LPL West Half	LPL-02 and 03	10.3	126.4	Lift 2	13.5%	130.1	114.6	90.7%		X		SCM
20-Feb-14	26A	LPL West Half	LPL-02 and 03	10.3	126.4	Lift 2	14.4%	134.9	117.9	93.3%		X	26	SCM
20-Feb-14	26B	LPL West Half	LPL-02 and 03	10.3	126.4	Lift 2	13.6%	134.7	118.6	93.8%		X	26,26A	SCM
21-Feb-14	26C	LPL West Half	LPL-02 and 03	10.3	126.4	Lift 2	12.3%	138.7	123.5	97.7%	X		26,26A,26B	SCM
21-Feb-14	27	LPL East Half	LPL-02 and 03	10.3	126.4	Lift 2	12.8%	135.5	120.1	95.0%	X			SCM
21-Feb-14	28	LPL East Half	LPL-02 and 03	10.3	126.4	Lift 2	14.2%	134.0	117.3	92.8%		X		SCM
21-Feb-14	28A	LPL East Half	LPL-02 and 03	10.3	126.4	Lift 2	14.5%	130.0	113.5	89.8%		X	28	SCM
21-Feb-14	28B	LPL East Half	LPL-02 and 03	10.3	126.4	Lift 2	13.4%	136.1	120.0	95.0%	X		28,28A	SCM
21-Feb-14	29	LPL East Half	LPL-02 and 03	10.3	126.4	Lift 2	13.1%	135.8	120.1	95.0%	X			SCM
21-Feb-14	30	LPL West Half	LPL-02 and 03	10.3	126.4	Lift 3	13.4%	132.1	116.5	92.2%		X		SCM
21-Feb-14	30A	LPL West Half	LPL-02 and 03	10.3	126.4	Lift 3	12.5%	135.6	120.5	95.4%	X		30	SCM
21-Feb-14	31	LPL West Half	LPL-02 and 03	10.3	126.4	Lift 3	12.3%	133.4	118.8	94.0%		X		SCM
21-Feb-14	31A	LPL West Half	LPL-02 and 03	10.3	126.4	Lift 3	13.3%	136.3	120.3	95.2%	X		31	SCM
21-Feb-14	32	LCRS Riser Trench	LPL-02 and 03	10.3	126.4	Lift 1	11.7%	126.7	113.4	89.7%		X		SCM
24-Feb-14	32A	LCRS Riser Trench	LPL-02 and 03	10.3	126.4	Lift 1	12.8%	128.4	113.8	90.1%		X	32	SCM
25-Feb-14	32B	LCRS Riser Trench	LPL-02 and 03	10.3	126.4	Lift 1	12.3%	134.9	120.1	95.0%	X		32,32A	SCM
24-Feb-14	33	LPL East Half	LPL-02 and 03	10.3	126.4	Lift 3	12.7%	137.8	122.3	96.7%	X			SCM
24-Feb-14	34	LPL East Half	LPL-02 and 03	10.3	126.4	Lift 3	12.3%	135.3	120.5	95.3%	X			SCM
24-Feb-14	35	LPL East Half	LPL-02 and 03	10.3	126.4	Lift 3	12.6%	136.6	121.3	96.0%	X			SCM
24-Feb-14	36	LPL West Half	LPL-02 and 03	10.3	126.4	Lift 4	12.3%	135.0	120.2	95.1%	X			SCM
24-Feb-14	37	LPL West Half	LPL-02 and 03	10.3	126.4	Lift 4	12.6%	136.7	121.4	96.0%	X			SCM
25-Feb-14	38	LPL East Half	LPL-02 and 03	10.3	126.4	Lift 4	14.3%	135.1	118.2	93.5%		X		SCM
25-Feb-14	38A	LPL East Half	LPL-02 and 03	10.3	126.4	Lift 4	13.0%	137.4	121.6	96.2%	X		38	SCM
25-Feb-14	39	LPL East Half	LPL-02 and 03	10.3	126.4	Lift 4	14.1%	138.2	121.1	95.8%	X			SCM
25-Feb-14	40	LPL East Half	LPL-02 and 03	10.3	126.4	Lift 4	12.4%	134.9	120.0	95.0%	X			SCM
26-Feb-14	41	LPL West Half	LPL-02 and 03	10.3	126.4	Lift 4	12.3%	137.3	122.3	96.7%	X			SCM
26-Feb-14	42	LCRS Riser Trench	LPL-03 and 06	11.4	125.0	Lift 4	13.7%	135.1	118.8	95.1%	X			SCM
12-Mar-14	43	LCRS Riser Trench	LPL-03 and 06	11.4	125.0	Lift 4	13.9%	136.1	119.5	95.6%	X			SCM
14-Mar-14	44	LPL Northwest	LPL-03 and 06	11.4	125.0	Lift 1	14.2%	135.8	118.9	95.1%	X			SCM
14-Mar-14	45	LPL Northeast	LPL-03 and 06	11.4	125.0	Lift 1	13.4%	136.4	120.3	96.2%	X			SCM
17-Mar-14	46	LPL Northwest	LPL-03 and 06	11.4	125.0	Lift 2	14.1%	132.9	116.5	93.2%		X		SCM
17-Mar-14	46A	LPL Northwest	LPL-03 and 06	11.4	125.0	Lift 2	13.9%	136.3	119.7	95.7%	X		46	SCM
17-Mar-14	47	LPL Northeast	LPL-03 and 06	11.4	125.0	Lift 3	12.7%	131.9	117.0	93.6%		X		SCM
17-Mar-14	47A	LPL Northeast	LPL-03 and 06	11.4	125.0	Lift 3	14.2%	137.4	120.3	96.3%	X		47	SCM
17-Mar-14	48	LPL Northwest	LPL-03 and 06	11.4	125.0	Lift 4	14.1%	135.5	118.8	95.0%	X			SCM
19-Mar-14	49	LPL Northwest	LPL-03 and 06	11.4	125.0	Lift 4	14.0%	136.5	119.7	95.8%	X			SCM
25-Mar-14	50	LPL Southwest	LPL-03 and 06	11.4	125.0	Lift 4	13.4%	137.2	121.0	96.8%	X			SCM
25-Mar-14	51	LPL Northwest	LPL-03 and 06	11.4	125.0	Lift 4	13.7%	135.7	119.3	95.5%	X			SCM
6-May-14	52	LCRS Riser Trench	LPL-03 and 06	11.4	125.0	Lift 4	11.2%	133.3	119.9	95.9%	X			AJS
17-Jul-14	53	LPL West Half	LPL-03 and 06	11.4	125.0	Lift 4	13.9%	136.9	120.2	96.2%	X			AJS
17-Jul-14	54	LPL West Half	LPL-03 and 06	11.4	125.0	Lift 4	13.8%	138.1	121.4	97.1%	X			AJS
17-Jul-14	55	LPL East Half	LPL-03 and 06	11.4	125.0	Lift 4	13.8%	136.1	119.6	95.7%	X			AJS
17-Jul-14	56	LPL East Half	LPL-03 and 06	11.4	125.0	Lift 4	13.9%	136.5	119.8	95.9%	X			AJS

COMMENTS:

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Page 1 of 1

SUMMARY OF BAT PERMEABILITY TEST DATA - DEMO PAD

PROJECT: BADLANDS CANYON 4 PHASE 3

LOCATION: BADLANDS SANITARY LANDFILL, MORENO VALLEY, CA **PROJECT NO.:** HL1255BL **TASK NO.:** 4

DESCRIPTION: LOW PERMEABILITY LAYER - DEMONSTRATION **MATERIAL TYPE:** GREY LOW PLASTICITY SILT

Specification Requirements:

Source: LPL Stockpile **Permissible Conductivity:** ≤ 1.0E-07 cm/s

Date of Test	BAT Test ID	Test Location	Test Container vol. (ml)	Ext. cylinder vol. (ml)	Liquid start level (ml)	Initial gas vol. (ml)	Container x-sect. area (cm^2)	Static pore pressure (m H_2O)	Initial test pressure (m H_2O)	Initial liquid vol (ml)	Final Hyd. Conduct. (cm/s)
2/26/2014	BAT-4	See Figure	35	0.5	0.34	5.5	1.96	-0.9	16.18	30	1.97E-08
3/12/2014	BAT-5	See Figure	35	0.5	0.34	5.5	1.96	0.17	30.42	30	1.53E-08
3/18/2014	BAT-6	See Figure	35	0.5	0.34	5.5	1.96	1.12	28.1	30	1.74E-08
3/18/2014	BAT-7	See Figure	35	0.5	0.34	5.5	1.96	0.64	25.87	30	7.55E-09
3/19/2014	BAT-8	See Figure	35	0.5	0.34	5.5	1.96	0.64	27.93	30	5.33E-09
3/19/2014	BAT-9	See Figure	35	0.5	0.34	5.5	1.96	0.9	22.58	30	8.08E-09
3/20/2014	BAT-10	See Figure	35	0.5	0.34	5.5	1.96	1.28	24.02	30	1.37E-08

Attachment 3

Badlands C4P3 Hydraulic Conductivity Testing Program Results

Geosyntec consultants

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29 March 2013

Mr. Andy Cortez, P.E.
Senior Civil Engineer
Riverside County Waste Management Department
14310 Frederick Street
Moreno Valley, CA 92553

Subject: Hydraulic Conductivity Testing Program Results
Badlands Sanitary Landfill, Canyon 4, Phase 3 Expansion
Riverside County, California

Dear Mr. Cortez:

INTRODUCTION

This letter summarizes the results of a site-specific hydraulic conductivity testing program of low permeability material recovered from two potential borrow sources at the Badlands Sanitary Landfill (BSL) in Riverside County, California. The testing of these borrow source materials was conducted in support of the Canyon 4, Phase 3 (C4P3) Expansion composite liner system design. The C4P3 design calls for a composite landfill liner along the landfill base, with a compacted clay liner (CCL) component that is approximately 2 ft thick. Up to 225 ft of waste will be placed over the CCL during the design life of the landfill.

CANDIDATE LOW PERMEABILITY SOIL BORROW SOURCES

The candidate low permeability (i.e., low hydraulic conductivity) borrow sources are located in the areas of BSL known as Canyon 6 Stockpile and the Clay Stockpile. The current approximate locations of these two stockpiles are shown in Figure 1.

The Clay Stockpile is a relatively small volume stockpile in the pre-liner landfill area adjacent to the facility entrance. A composite sample was taken from several locations on the surface of this stockpile in an attempt to produce a representative sample.

The Canyon 6 stockpile is a very large stockpile (approximately 1.7 million cubic yards) which represents a significant potential source of material for CCL. The source of this material is past excavation from the Canyon 3 Phase 1 and Canyon 4 Phase 2

areas. A sample was taken at a location judged to be representative of the typical conditions on the surface of this Canyon 6 stockpile.

The sampling location and condition in the Canyon 6 stockpile are further illustrated in the photographs in Appendix A.

TESTING PROGRAM

General

The laboratory testing program consisted of common soil classification and characterization tests, and specialty testing of saturated soil hydraulic conductivity. Samples were remolded and compacted prior to hydraulic conductivity testing.

Soil Classification and Characterization Testing

The soil classification and characterization testing program consisted of the following tests:

- Grain Size Distribution (ASTM 422),
- Atterberg Limits (ASTM D4318),
- Moisture Content (ASTM D2216), and
- Modified Proctor Compaction Moisture Density Relationship (ASTM D1557).

The results of soil classification testing are summarized in Table 1 and are presented in Figures 2 and 3. The laboratory testing sheets are enclosed in Appendix B.

Table 1: Results of Soil Classification and Characterization Testing

Sample Identification	Passing No. 200 Sieve (%)	Plasticity Index	Soil Type	Maximum Density (pcf)	Optimum Moisture (%)
Clay Stockpile	84.2	23	CL	119.3	13.3
Canyon 6 Stockpile	44.3	34	SC	130.8	8.6

The results of soil classification testing indicate that sampled and tested materials have significantly different properties due to their fines content The Clay Stockpile material is classified as lean clay with sand (CL), and the Canyon 6 Stockpile material is classified as Clayey Sand (SC) in accordance with the Unified Soil Classification System (USCS; ASTM D 2487).

The results of soil moisture density characterization testing presented as soil compaction curves in Figure 3 show that the standard amount of compaction energy applied to the Canyon 6 material achieves a higher density than the Clay Stockpile material.

Specialty Soil Testing

The specialty soil testing consisted of saturated hydraulic conductivity testing of remolded soil samples from the Red and Grey soil stockpiles. The testing was conducted in a triaxial apparatus in accordance with the following standard:

- Flexible Wall Permeability (ASTM D5084)

The soil samples were prepared and testing conditions were specified in accordance with typical practice in Southern California. This included preparation of remolded soil samples at relative compactions equal to 92% and 95% of maximum dry density as

established by the modified Proctor compaction test (ASTM D1557), moisture content of 3% over optimum moisture content, as established in the same test, and confining stresses expected during the construction of the landfill. In particular, confining stresses of 5, 25 and 50 psi were selected. These confining stress correspond to the conditions immediately after placement of first lift of waste (10-ft thick lift), and to "half-full" landfill (100-ft thick waste pile). The intermediate condition corresponding to a confining stress of 25 psi (50-ft thick waste pile) was tested for quality control purposes (test results should fall in-between extremes).

The hydraulic conductivity testing conditions for the Clay and Canyon 6 soil stockpiles are summarized in Table 2. The results of testing are also included in Table 2 and are further presented in a graphical form in Figure 4. The laboratory testing sheets are enclosed in Appendix C.

Table 2 – Summary of Hydraulic Conductivity Testing Conditions and Results

Sample/Test Condition	Hydraulic Conductivity Testing Conditions		Confining Stress	Waste Column Thickness[3]	Hydraulic Conductivity (cm/s)
	Density (pcf)[1]	Moisture Content[2] (%)			
Clay Stockpile (95%)	113.1 (95%)	16.3	5 psi	10 ft	$7.7*10^{-8}$
			25 psi	50 ft	$2.6*10^{-8}$
			50 psi	100 ft	$8.1*10^{-9}$
Clay Stockpile (92%)	109.4 (92%)	16.4	5 psi	10 ft	$9.8*10^{-8}$
			25 psi	50 ft	$4.1*10^{-8}$
			50 psi	100 ft	$1.1*10^{-8}$
Canyon 6 Stockpile (95%)	124.2 (95%)	11.5	5 psi	10 ft	$3.3*10^{-6}$
			25 psi	50 ft	$2.1*10^{-6}$
			50 psi	100 ft	$1.1*10^{-6}$
Canyon 6 Stockpile (92%)	120.0 (92%)	11.7	5 psi	10 ft	$1.1*10^{-5}$
			25 psi	50 ft	$6.9*10^{-6}$
			50 psi	100 ft	$3.0*10^{-6}$

(1) Target was 92% or 95% of max dry density as established by ASTM D1557.
(2) Target was 3% above the optimum moisture content as established by ASTM D1557.
(3) Approximate waste column thickness simulated by the testing conditions.

Interpretation of Hydraulic Conductivity Testing Results.

The interpretation of hydraulic conductivity testing results is presented in Figure 4. Review of Figure 4 indicates the following.

- The testing program produced consistent results with expected trends - results are strongly dependent on percent compaction while hydraulic conductivity decreases with confining stress applied.
- The measured hydraulic conductivities are typical for the soil types and testing conditions employed.
- All tests results for the clay stockpile produced acceptable results ($k < 1x10^{-7}$ cm/s) for the range of testing conditions considered.
- None of the tests results for the Canyon 6 stockpile produced acceptable results ($k < 1x10^{-7}$ cm/s) for the range of testing conditions considered.

CONCLUSIONS AND RECOMMENDATIONS

Clay Stockpile

This stockpile contains predominantly low plasticity clay with sand (CL). The plasticity index (PI) of this soil is 23% and the fines content is approximately 84%. These characteristics produce a soil that has the ability to achieve the desired hydraulic conductivity with moderate compactive effort.

Use of the Clay Stockpile material, as characterized by tested remolded samples, is recommended for construction of the compacted clay liner (CCL) at BSL.

Canyon 6 Stockpile

The soil sampled from the Canyon 6 soil stockpile is clayey sand (SC) with approximately 45% fines and a PI of 17. Typical requirements for percent fines in CCL range from 30% to 50%. The plasticity index and classification of fines is within the normal range of CCL materials. On this basis, this soils tested may be regarded as a marginal low permeability material given its moderate fines content. The minimum hydraulic conductivity achieved during testing of these soils was 1.1×10^{-6} cm/sec, approximately 1 order of magnitude over the required hydraulic conductivity.

Further study of the Canyon 6 Stockpile material is recommended to establish it as a recommended material for construction of the CCL at BSL.

Discussion and Recommendations

We recommend the following:

- The Clay stockpile is suitable for use as CCL as-is. The recommended construction compaction specification is 92% of the modified proctor density at a moisture content of 2% to 4% above optimum moisture content.

- The soils represented by the single sample taken from the Canyon 6 stockpile are not suitable for use in the CCL as-is. However, the Canyon 6 Stockpile is a very large and it is possible that a single surficial sample although composite is not representative of the entire stockpile (approximately 1.7 million cubic yards).

- A more rigorous sampling program should be carried out by establishing a grid of sampling locations across the Canyon 6 stockpile. Samples from each grid location should be classified in the field to ascertain whether there is significant variability in the fines content and plasticity of the material. Additionally trenches or bucket auger borings may be required to profile the composition of the stockpile with depth.

- If this sampling program indicates soils may be acceptable for use a CCL, additional laboratory testing may be then undertaken.

- If further evaluations indicate that the materials is still unacceptable as-is and acceptable material cannot be selectively excavated, we recommend performing a study of potential amendments to the Canyon 6 stockpile material which would allow this soil to used as CCL. A series of mix designs with varying compositions of amendments (both on-site or off site) should be evaluated for ability to efficiently achieve the required hydraulic conductivities.

We also recommend an internal meeting between Geosyntec and RCWMD representatives to further discuss soil sampling and testing options for the Canyon 6 material.

Geosyntec consultants

CLOSURE

If you have any questions or require further explanation of the analyses documented herein, please do not hesitate to contact either of the undersigned at (714) 969-0800.

Sincerely,

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Neven Matasovic, Ph.D., P.E., G.E.
Associate
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FIGURES

Symbol	Sample Location
▲	Clay Stockpile
■	Canyon 6 Stockpile

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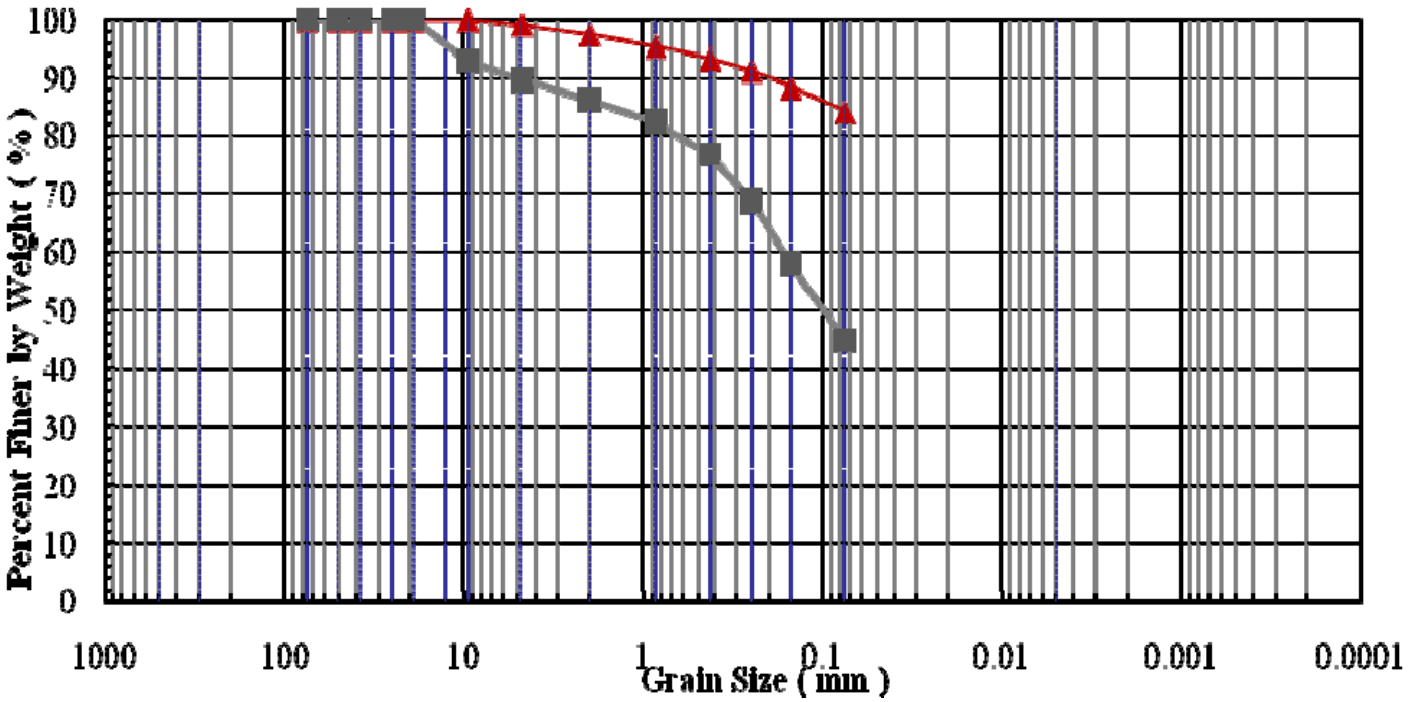
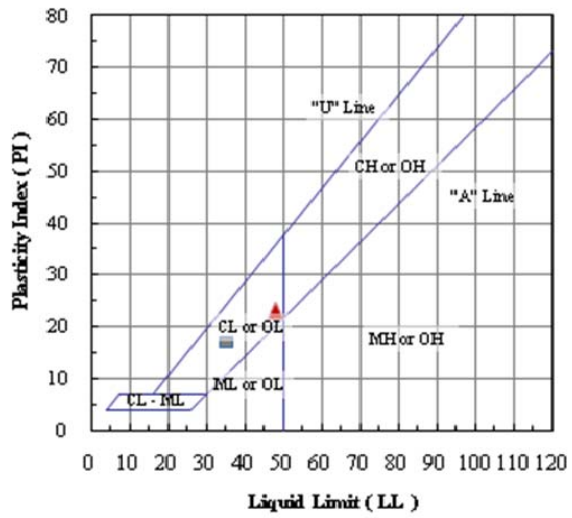
STOCKPILE SAMPLE LOCATIONS
BADLANDS C4P3 EXPANSION
RIVERSIDE COUNTY, CALIFORNIA

DATE:	**OCT 2010**	**FILE NO.**	**FIGURE 1.DOC**
PROJECT NO.	**HL1255-A2**	**FIGURE**	**1**



Symbol	Sample Identification	Percent passing No 200 Sieve	Soil Type
▲	Clay Stockpile	84.2	CL
■	Canyon 6 Stockpile	44.8	SC



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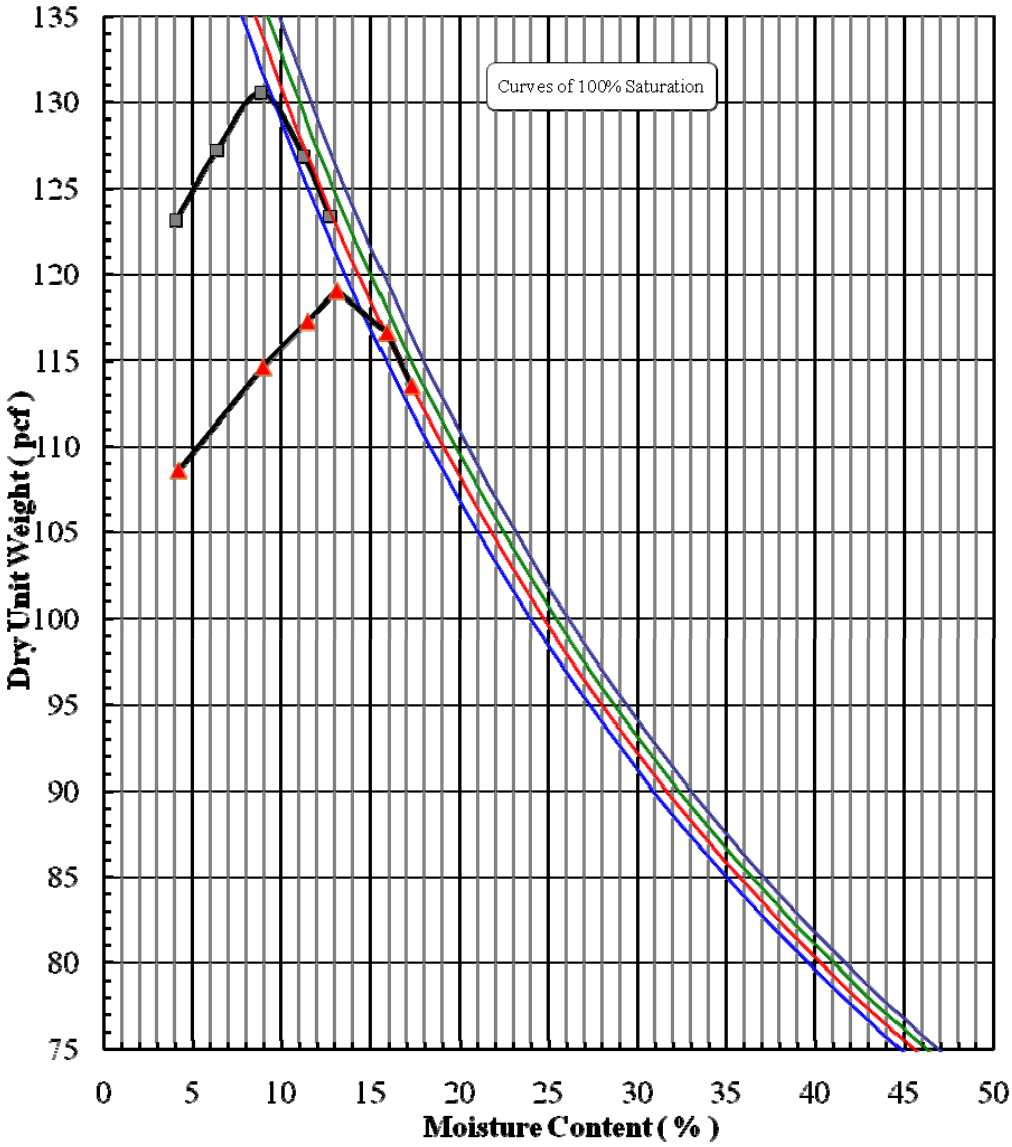
GRAINSIZE DISTRIBUTION CURVE
BADLANDS C4P3 EXPANSION
RIVERSIDE COUNTY, CALIFORNIA

DATE:	OCT 2010	FILE NO.	FIGURE 2.DOC
PROJECT NO.	HL1255-A2	FIGURE	2



Symbol	Sample Identification	Maximum Dry Unit Weight (pcf)	Optimum Moisture Content (%)
▲	Clay Stockpile	119.3	13.3
■	Canyon 6 Stockpile	130.8	8.6

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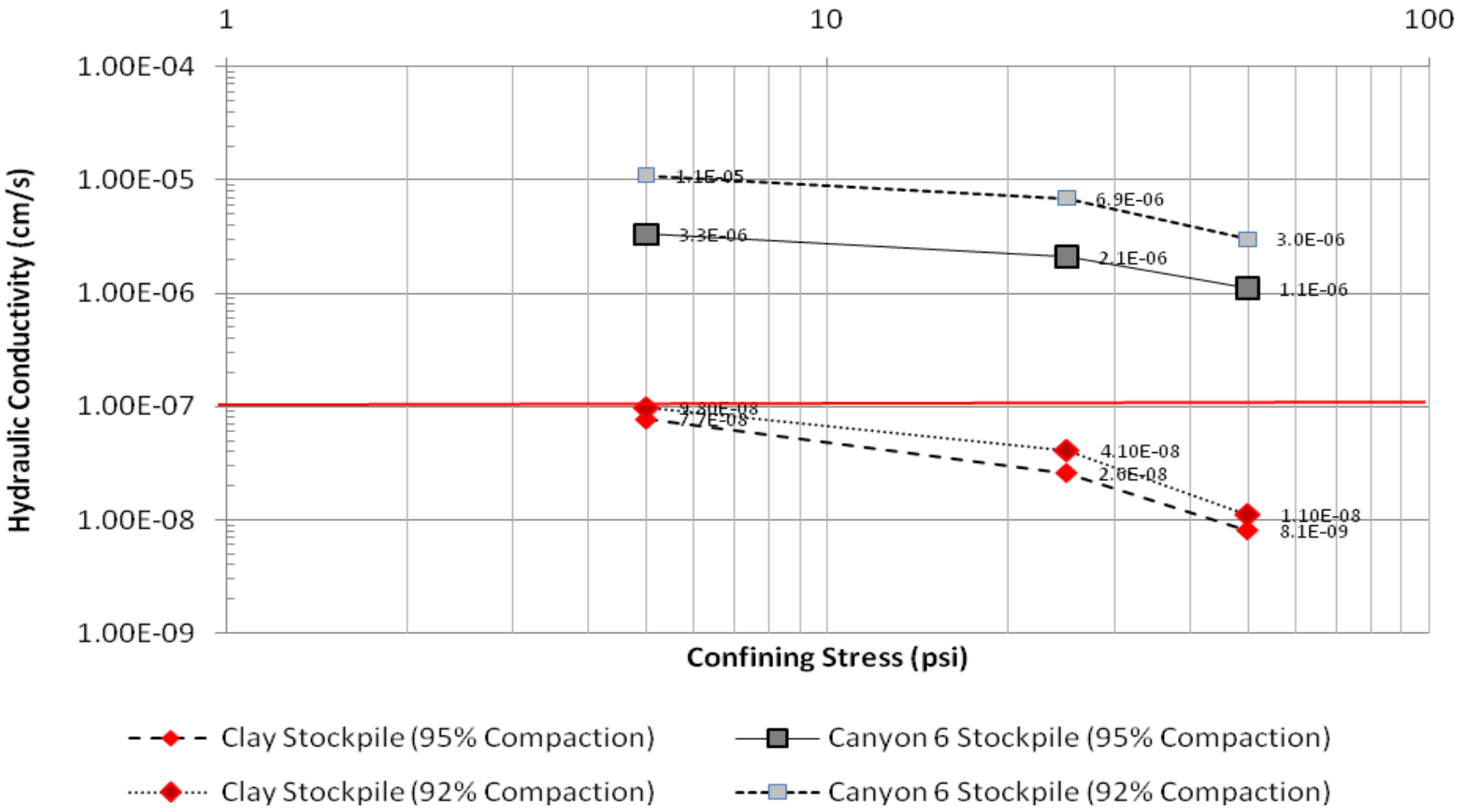
COMPACTION MOISTURE-DENSITY RELATIONSHIP
BADLANDS SANITARY LANDFILL C4P3 EXPANSION
RIVERSIDE COUNTY, CALIFORNIA

DATE:	OCT 2010	FILE NO.	FIGURE 3.DOC
PROJECT NO.	HL1255-A2	FIGURE	3



Geosyntec consultants

SUMMARY OF HYDRAULIC CONDUCTIVITY TESTING PROGRAM
BADLANDS C4P3 EXPANSION
RIVERSIDE COUNTY, CALIFORNIA

DATE:	OCT 2010	FILE NO.	FIGURE 4.DOC
PROJECT NO.	HL1255-A2	FIGURE	4

APPENDIX A

PHOTOGRAPHS OF SAMPLING LOCATIONS

Photo No.:	1	**Date:**	8/11/10
Photographer:	Robert Kovacs		
Subject:	Badlands Sanitary Landfill, Canyon 6 Stockpile Looking Northwest		

Photo No.:	2	**Date:**	8/11/10
Photographer:	Robert Kovacs		
Subject:	Badlands Sanitary Landfill, Canyon 6 Stockpile Looking West		

APPENDIX B

EXCEL GEOTECHNICAL INDEX TESTING REPORT

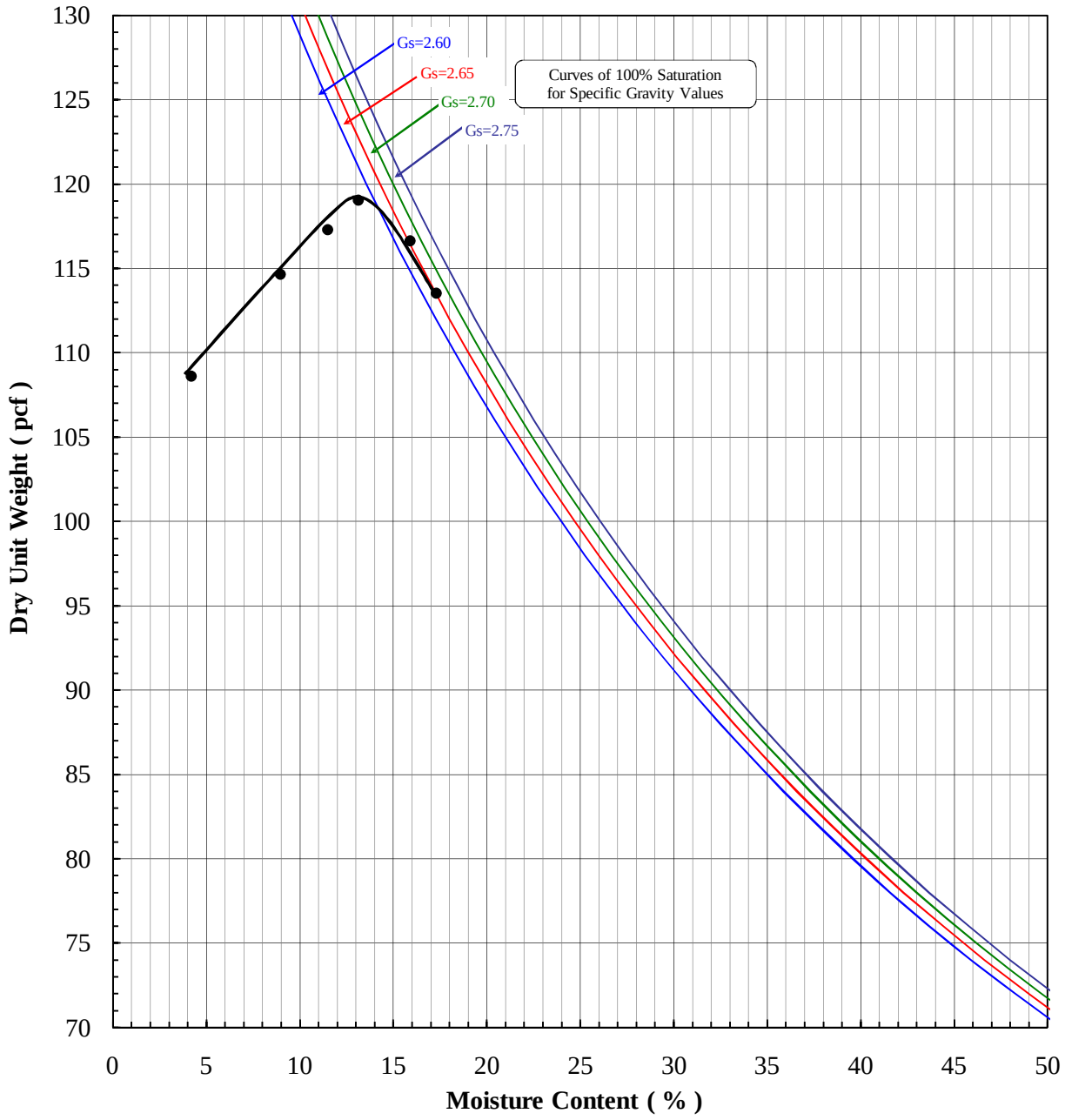
Excel Geotechnical Testing, Inc.
"Excellence in Testing"
941 Forrest Street, Roswell, Georgia 30075
Tel: (770) 650 1666 Fax: (770) 650 5786

Project Name:	Riverside County
Project No:	445
Client Sample ID:	Bad Lands Clay SP
Lab Sample No:	H129

ASTM D 698

COMPACTION MOISTURE-DENSITY RELATIONSHIP

Standard - Method B



Client/Site Sample ID.	Lab Sample No:	Maximum Dry Unit Weight (pcf)	Optimum Moisture Content (%)	Remarks
Bad Lands Clay SP	H129	119.3	13.3	

Note(s):

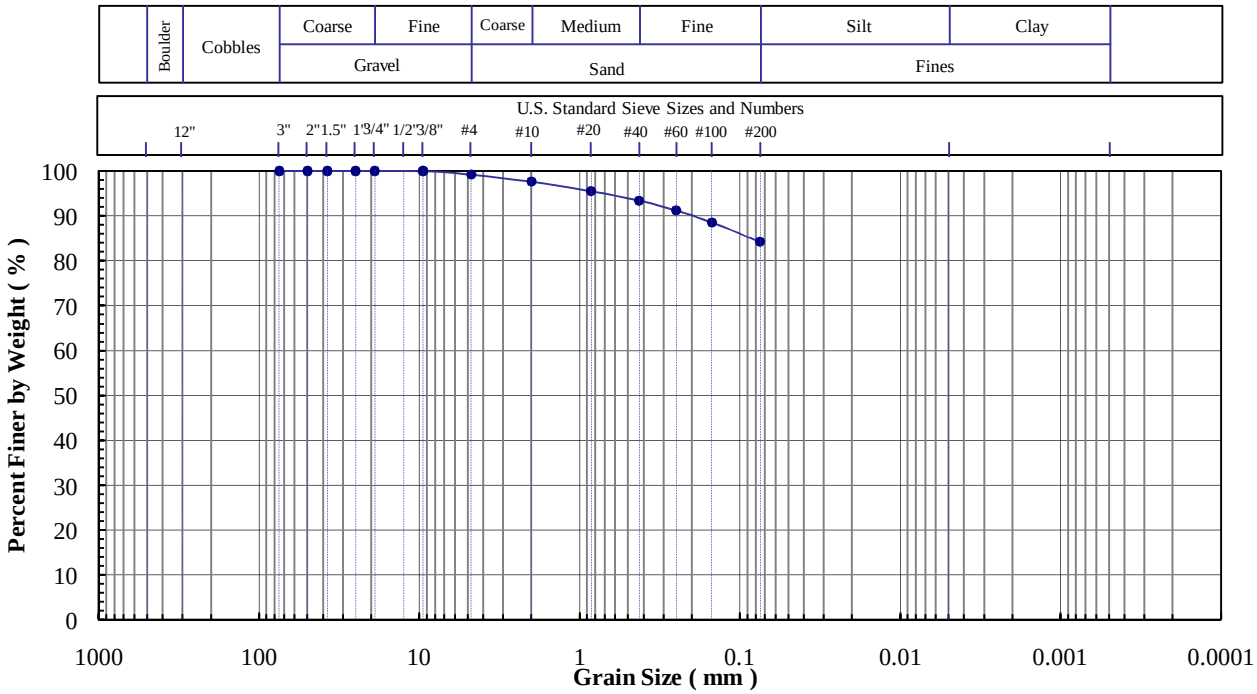
Excel Geotechnical Testing, Inc.
"Excellence in Testing"
941 Forrest Street, Roswell, Georgia 30075
Tel: (770) 650 1666 Fax: (770) 650 5786

Project Name:	Riverside County
Project No:	445
Client Sample ID:	Bad Lands Clay SP
Lab Sample No:	H129

ASTM C 136, D 422, D 854, D 1140, D2216, D 2487, D4318

SOIL INDEX PROPERTIES

Grain Size, Spec. Gravity, Moist. Content, Eng. Classification, Atterberg Limits



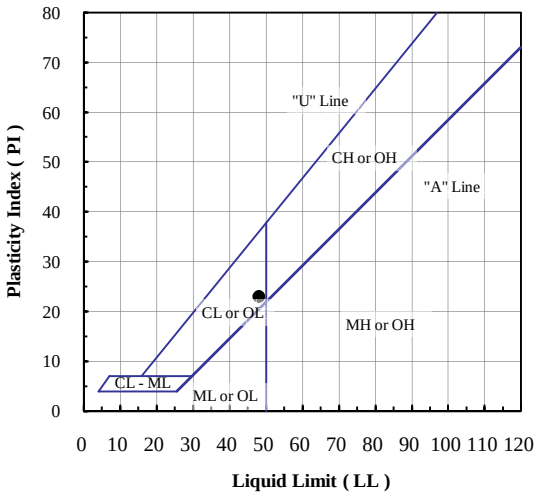
Sieve No.	Size (mm)	% Finer
3"	75	100.0
2 "	50	100.0
1.5"	37.5	100.0
1"	25	100.0
3/4"	19	100.0
3/8"	9.5	100.0
#4	4.75	99.2
#10	2.00	97.6
#20	0.850	95.5
#40	0.425	93.4
#60	0.250	91.2
#100	0.150	88.5
#200	0.075	84.2

Specific Gravity (-):	

Hydrometer Particle Diameter (mm)	% Finer

Gravel (%):	0.8
Sand (%):	15.0
Fines (%):	84.2
Silt (%):	
Clay (%):	

Coeff. Unif. (Cu):	
Coeff. Curv. (Cc):	



Client Sample ID.	Lab Sample No:	Moisture Content (%)	Fines Content < No. 200 (%)	Atterberg Limits LL (-)	Atterberg Limits PL (-)	Atterberg Limits PI (-)	Engineering Classification
Bad Lands Clay SP	H129	4.0	84.2	48	25	23	CL - Lean clay with sand

Note(s):

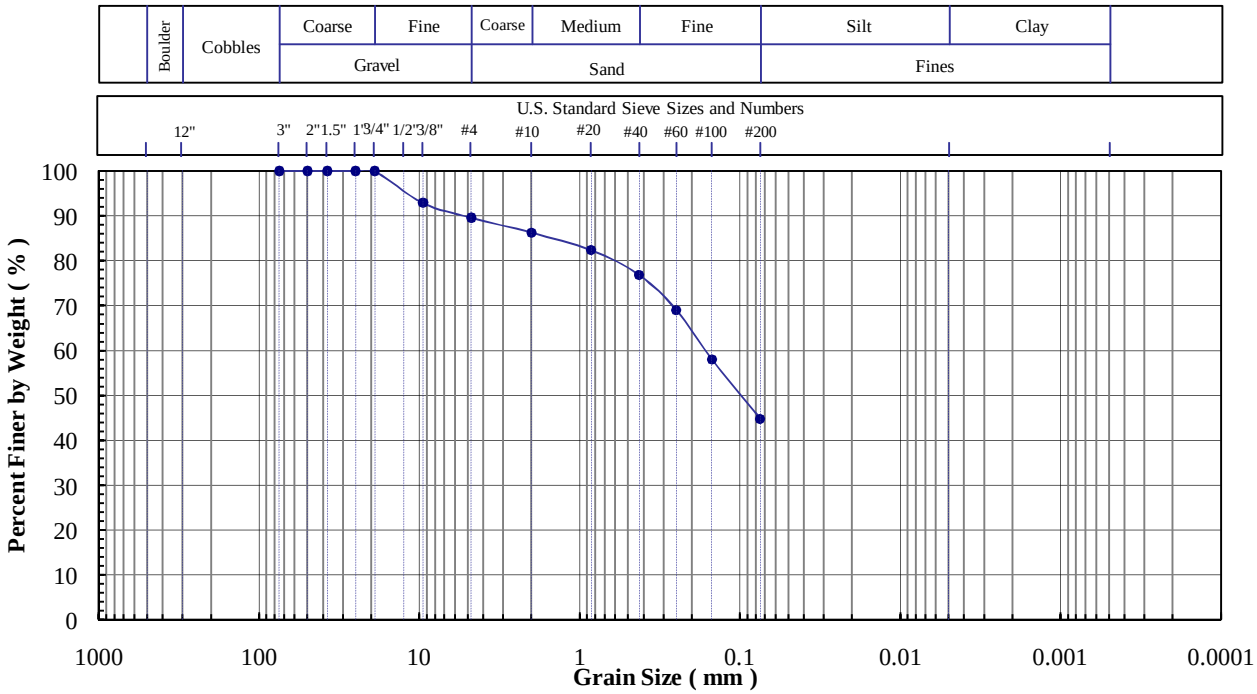
Excel Geotechnical Testing, Inc.
"Excellence in Testing"
941 Forrest Street, Roswell, Georgia 30075
Tel: (770) 650 1666 Fax: (770) 650 5786

Project Name:	Riverside County
Project No:	445
Client Sample ID:	Bad Lands Canyon 6 SP
Lab Sample No:	H130

ASTM C 136, D 422, D 854, D 1140, D2216, D 2487, D4318

SOIL INDEX PROPERTIES

Grain Size, Spec. Gravity, Moist. Content, Eng. Classification, Atterberg Limits



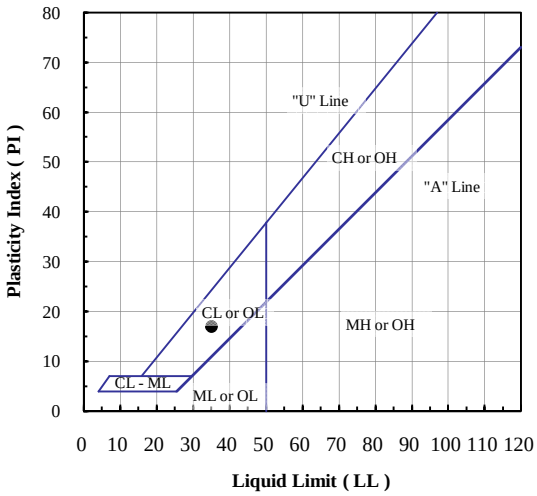
Sieve No.	Size (mm)	% Finer
3"	75	100.0
2 "	50	100.0
1.5"	37.5	100.0
1"	25	100.0
3/4"	19	100.0
3/8"	9.5	92.9
#4	4.75	89.6
#10	2.00	86.3
#20	0.850	82.4
#40	0.425	76.8
#60	0.250	69.0
#100	0.150	58.0
#200	0.075	44.8

Specific Gravity (-):	

Hydrometer Particle Diameter (mm)	% Finer

Gravel (%):	10.4
Sand (%):	44.8
Fines (%):	44.8
Silt (%):	
Clay (%):	

Coeff. Unif. (Cu):	
Coeff. Curv. (Cc):	



Client Sample ID.	Lab Sample No:	Moisture Content (%)	Fines Content < No. 200 (%)	Atterberg Limits LL (-)	PL (-)	PI (-)	Engineering Classification
Bad Lands Canyon 6 SP	H130	4.1	44.8	35	18	17	SC - Clayey sand

Note(s):

Engineering classification is based on the assumption that the fines are either CL or CH.

Excel Geotechnical Testing, Inc.
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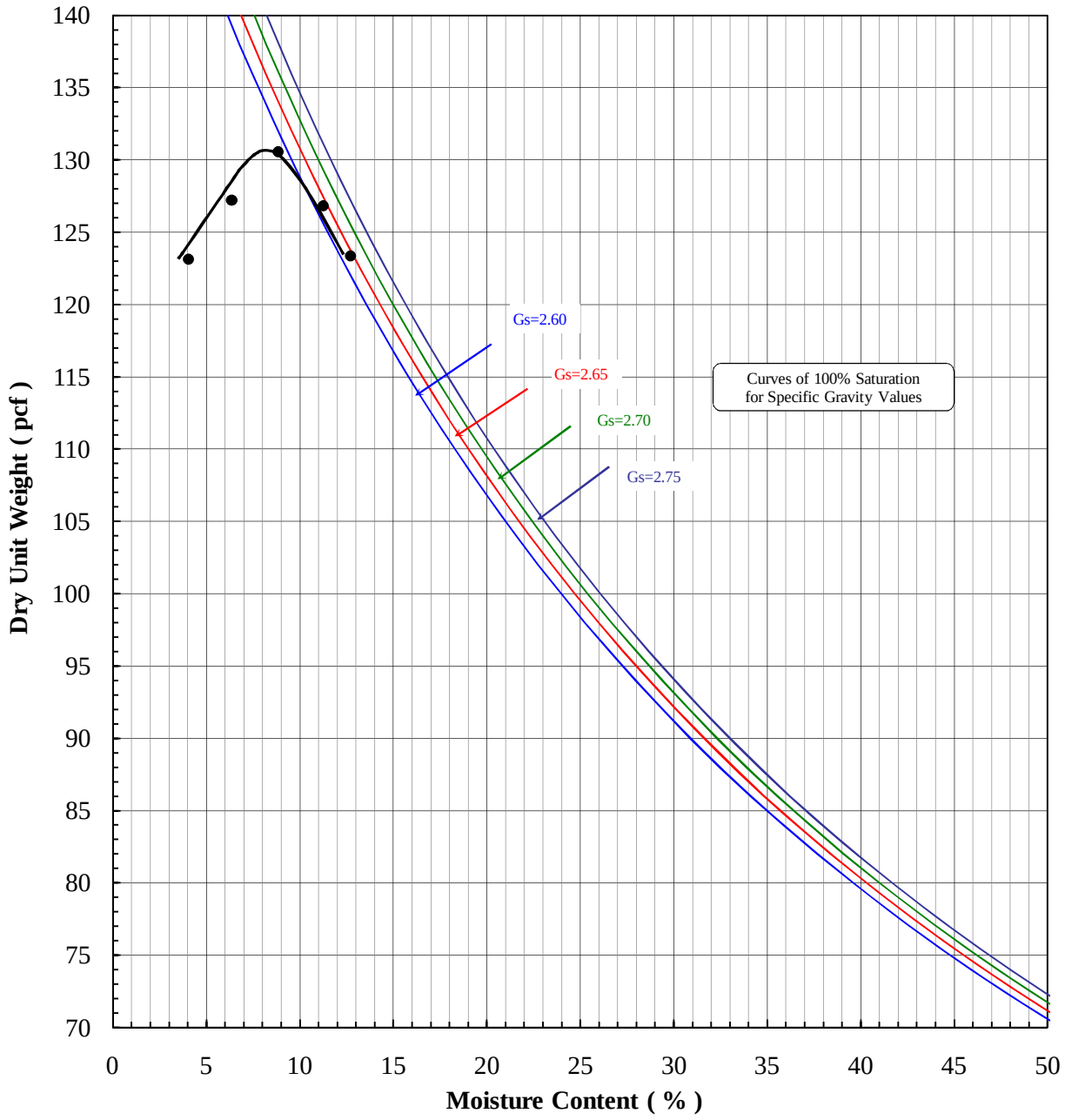
Tel: (770) 650 1666 Fax: (770) 650 5786

Project Name:	Riverside County
Project No:	445
Client Sample ID:	Bad Lands Canyon 6 SP
Lab Sample No:	H130

ASTM D 698 **COMPACTION MOISTURE-DENSITY RELATIONSHIP** **Standard - Method B**



Client/Site Sample ID.	Lab Sample No:	Maximum Dry Unit Weight (pcf)	Optimum Moisture Content (%)	Remarks
Bad Lands Canyon 6 SP	H130	130.8	8.6	

Note(s):

APPENDIX C

EXCEL GEOTECHNICAL HYDRAULIC CONDUCTIVITY TESTING REPORT

Excel Geotechnical Testing, Inc.
"Excellence in Testing"
941 Forrest Street, Roswell, Georgia 30075
Tel: (770) 650 1666 Fax: (770) 650 5786

FLEXIBLE WALL PERMEABILITY TEST [1]

ASTM D5084 *

Project Name:	Riverside County
Project Number:	445
Client Name:	Geosyntec Consultants
Site Sample ID:	Bad Lands Clay Stock Pile
Lab Sample Number:	H129
Material Type:	Soil
Specified Value (cm/sec):	NA
Date Test Started:	9/01/2010

Remolded Specimen	Proctor [5] Compaction		Specimen Initial Conditions [6]		Test Conditions					Hydraulic Conductivity
	Max. DUW	Opt. MC	Dry Unit Weight	Moisture Content	Cell Press.	Back Press.	Consolid. Press.	Permeant Liquid [7]	Average Gradient	
(-)	(pcf)	(%)	(pcf)	(%)	(psi)	(psi)	(psi)	(-)	(-)	(cm/s)
Notes 2 , 3 & 4	119.3	13.3	109.4	16.4	55.0	50.0	5.0	DTW	20	9.8E-8
					75.0		25.0		18	4.1E-8
					100.0		50.0		21	1.1E-8

Notes:

1. Method C, "Falling-Head, Increasing-Tailwater" test procedures were followed during the testing.
2. All particles larger than 3/8 inch, if any, were discarded when forming the remolded specimen.
3. Remolded specimen was formed by tamping the soil in one-centimeter-thick layers.
4. Remolded specimen approximately 2.87 inches in diameter and 2.36 inches in height.
5. Maximum Dry Unit Weight (DUW) and Optimum Moisture Content (MC) based on the Modified Proctor Compaction Test (ASTM D 1557).
6. Based on the target values of 92% of the maximum dry unit weight and the optimum moisture content plus 3%.
7. Type of permeant liquid: DTW = Deaired Tap Water, DDI = Deaired Deionized Water

* Deviations:

Laboratory temperature at 22±3 °C.
Test specimen final conditions are not presented.

Excel Geotechnical Testing, Inc.
"Excellence in Testing"
941 Forrest Street, Roswell, Georgia 30075
Tel: (770) 650 1666 Fax: (770) 650 5786

FLEXIBLE WALL PERMEABILITY TEST [1]

ASTM D5084 *

Project Name:	Riverside County
Project Number:	445
Client Name:	Geosyntec Consultants
Site Sample ID:	Bad Lands Clay Stock Pile
Lab Sample Number:	H129
Material Type:	Soil
Specified Value (cm/sec):	NA
Date Test Started:	9/02/2010

Remolded Specimen	Proctor [5] Compaction		Specimen Initial Conditions [6]		Test Conditions					Hydraulic Conductivity
	Max. DUW	Opt. MC	Dry Unit Weight	Moisture Content	Cell Press.	Back Press.	Consolid. Press.	Permeant Liquid [7]	Average Gradient	
(-)	(pcf)	(%)	(pcf)	(%)	(psi)	(psi)	(psi)	(-)	(-)	(cm/s)
Notes 2 , 3 & 4	119.3	13.3	113.1	16.3	55.0	50.0	5.0	DTW	18	7.7E-8
					75.0		25.0		20	2.6E-8
					100.0		50.0		21	8.1E-9

Notes:

1. Method C, "Falling-Head, Increasing-Tailwater" test procedures were followed during the testing.
2. All particles larger than 3/8 inch, if any, were discarded when forming the remolded specimen.
3. Remolded specimen was formed by tamping the soil in one-centimeter-thick layers.
4. Remolded specimen approximately 2.87 inches in diameter and 2.36 inches in height.
5. Maximum Dry Unit Weight (DUW) and Optimum Moisture Content (MC) based on the Modified Proctor Compaction Test (ASTM D 1557).
6. Based on the target values of 95% of the maximum dry unit weight and the optimum moisture content plus 3%.
7. Type of permeant liquid: DTW = Deaired Tap Water, DDI = Deaired Deionized Water

* Deviations:

Laboratory temperature at 22±3 °C.
Test specimen final conditions are not presented.

Excel Geotechnical Testing, Inc.
"Excellence in Testing"
941 Forrest Street, Roswell, Georgia 30075
Tel: (770) 650 1666 Fax: (770) 650 5786

FLEXIBLE WALL PERMEABILITY TEST [1]

ASTM D5084 *

Project Name:	Riverside County
Project Number:	445
Client Name:	Geosyntec Consultants
Site Sample ID:	Bad Lands Canyon 6 Stock Pile
Lab Sample Number:	H130
Material Type:	Soil
Specified Value (cm/sec):	NA
Date Test Started:	9/02/2010

Remolded Specimen	Proctor [5] Compaction		Specimen Initial Conditions [6]		Test Conditions					Hydraulic Conductivity
	Max. DUW	Opt. MC	Dry Unit Weight	Moisture Content	Cell Press.	Back Press.	Consolid. Press.	Permeant Liquid [7]	Average Gradient	
(-)	(pcf)	(%)	(pcf)	(%)	(psi)	(psi)	(psi)	(-)	(-)	(cm/s)
Notes 2 , 3 & 4	130.8	8.6	120.0	11.7	55.0	50.0	5.0	DTW	13	1.1E-5
					75.0		25.0		4	6.9E-6
					100.0		50.0		4	3.0E-6

Notes:

1. Method C, "Falling-Head, Increasing-Tailwater" test procedures were followed during the testing.
2. All particles larger than 3/8 inch, if any, were discarded when forming the remolded specimen.
3. Remolded specimen was formed by tamping the soil in one-centimeter-thick layers.
4. Remolded specimen approximately 2.87 inches in diameter and 2.36 inches in height.
5. Maximum Dry Unit Weight (DUW) and Optimum Moisture Content (MC) based on the Modified Proctor Compaction Test (ASTM D 1557).
6. Based on the target values of 92% of the maximum dry unit weight and the optimum moisture content plus 3%.
7. Type of permeant liquid: DTW = Deaired Tap Water, DDI = Deaired Deionized Water

* Deviations:

Laboratory temperature at 22±3 °C.
Test specimen final conditions are not presented.

Excel Geotechnical Testing, Inc.
"Excellence in Testing"
941 Forrest Street, Roswell, Georgia 30075
Tel: (770) 650 1666 Fax: (770) 650 5786

FLEXIBLE WALL PERMEABILITY TEST (1)

ASTM D5084 *

Project Name:	Riverside County
Project Number:	445
Client Name:	Geosyntec Consultants
Site Sample ID:	Bad Lands Canyon 6 Stock Pile
Lab Sample Number:	H130
Material Type:	Soil
Specified Value (cm/sec):	NA
Date Test Started:	9/02/2010

Remolded Specimen	Proctor (5) Compaction		Specimen Initial Conditions (6)		Test Conditions					Hydraulic Conductivity
	Max. DUW	Opt. MC	Dry Unit Weight	Moisture Content	Cell Press.	Back Press.	Consolid. Press.	Permeant Liquid (7)	Average Gradient	
(-)	(pcf)	(%)	(pcf)	(%)	(psi)	(psi)	(psi)	(-)	(-)	(cm/s)
Notes 2 , 3 & 4	130.8	8.6	124.2	11.5	55.0	50.0	5.0	DTW	9	3.3E-6
					75.0		25.0		14	2.1E-6
					100.0		50.0		13	1.1E-6

Notes:

1. Method C, "Falling-Head, Increasing-Tailwater" test procedures were followed during the testing.
2. All particles larger than 3/8 inch, if any, were discarded when forming the remolded specimen.
3. Remolded specimen was formed by tamping the soil in one-centimeter-thick layers.
4. Remolded specimen approximately 2.87 inches in diameter and 2.36 inches in height.
5. Maximum Dry Unit Weight (DUW) and Optimum Moisture Content (MC) based on the Modified Proctor Compaction Test (ASTM D 1557).
6. Based on the target values of 95% of the maximum dry unit weight and the optimum moisture content plus 3%.
7. Type of permeant liquid: DTW = Deaired Tap Water, DDI = Deaired Deionized Water

* Deviations:

Laboratory temperature at 22±3 °C.
Test specimen final conditions are not presented.

Attachment 4

Photos of ripped area within P2S1 Subgrade Limits (May 23, 2023)