



APPENDIX 6-D

Solid Waste Disposal Area II Ash Grading and Final Cover Systems Plan



Proactive by Design

GEOTECHNICAL
ENVIRONMENTAL
ECOLOGICAL
WATER
CONSTRUCTION
MANAGEMENT

GZA GeoEnvironmental of NY
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Buffalo, NY 14202
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F: 716-248-1472
www.gza.com



January 16, 2020
File No. 21.0056921.00

Mr. Mark Zimmerman
Heorot Power - Somerset Operating Co., LLC
7725 Lake Road
Barker, New York 14012

Re: Ash Grading and Final Cover System Plans
Somerset Operating Co., LLC
Solid Waste Disposal Area II

Dear Mark:

GZA GeoEnvironmental of New York (GZA) prepared this final design in establishing top of ash waste grades, final cover system plans and final condition surface water drainage for Somerset Operating Co., LLC (Somerset) Solid Waste Disposal Area II (SWDA II) located in Barker, NY. Attached Drawing No. 56921-C-001 shows a Site Locus and Drawing Title Plan; Drawing No. 56921-C-002 shows the SWDA II Site Plan.

BACKGROUND & OBJECTIVES

Somerset is scheduled to close an approximate 35-acre area of SWDA II in 2020 and required a final grading plan to meet the requirements of their operating permit. SWDA II was not filled to final design capacity with portions of the area filled partially and/or having temporary cover (6" +/- vegetated topsoil). Somerset required a final grading plan to relocate existing ash waste to form 3H:1V maximum/4% minimum slopes to provide stability and surface drainage off of the SWDA II site. Surface water flowing off SWDA II is required to drain to the sedimentation basin located northeast of SWDA II prior to outflow to Fish Creek. Somerset additionally required surface water flow emanating upslope of SWDA II to drain directly to Fish Creek.

SCOPE OF SERVICES

To accomplish Somerset's final cover objectives, GZA provided the following services.

1. *Topographic Survey*

GZA subcontracted Wendel, Somerset's site land surveyor, to conduct a topographic survey of the SWDA II area. The survey was completed in September and October 2019 and defined and delineated the following.

- a. Topography of open ash areas (mainly Cells G & H East and internal haul road) and areas having temporary topsoil cover (portions of Cells A thru F). The survey extended to edges of open ash abutting temporary cover and final cover abutting temporary cover. The topography within the landfill cells was measured to achieve 1-foot contours and identify grade break lines



and significant low and high spot elevations. Topography outside the landfill cell containment berms was done to define drainage patterns.

- b. Topography of perimeter containment berms delineating the toe of waste in open waste areas, and the toe of temporary topsoil cover.
- c. Delineation of external and internal haul road edges.
- d. Measurement of drainage ditch/swale bottom invert and high bank elevations in areas outside the cell limits.

2. Waste Ash and Final Cover System Grading Design

Using Wendel's survey, GZA prepared an ash waste grading plan to provide maximum 3H:1V/minimum 4% slopes for final cover system construction. The grading roughly balanced cuts/fills of the existing ash and incorporated placement of additional materials (coal pile subbase and basin dredging materials) for disposal currently being done by Somerset. The design provides proper tie-in to containment berms and channels final cover surface water to drain to the existing perimeter channels draining to the northeast sedimentation basin.

Attached Drawing No. 56921-C-003 shows design cut/fill elevations for the top of ash/solid waste. Drawing No. 56921-C-004 shows the design top of final cover system elevations including surface water drainage structures (grass and riprap lined swales) to be constructed within the confines of SWDA II. Also shown on Dwg. 004 is a shallow drainage swale to drain surface water upslope of SWDA II towards Fish Creek.

Drawing Nos. 56921-C-005 through 011 show cross-sections depicting tie-in of the final cover system and stormwater drainage channels along the inside perimeter of SWDA II.

Final Cover System Components

After the top of ash/solid waste surface is constructed to design elevations, the final cover system will be constructed with the following components:

1. Low Permeability Soil Barrier will be constructed to a minimum 18-inch thickness and have a maximum coefficient of permeability of 1×10^{-5} cm/sec. The majority of the soil is expected to originate from Somerset's on-site borrow pile that has previously been used for final cover low permeability soil barrier construction¹. Any additional soil needed will be imported from a permitted off-site borrow source.
2. Vegetated Topsoil layer will be a nominal 6 inches thick. Topsoil will be a combination of on-site soil and imported material.
3. Perimeter grass or riprap-lined drainage swales will be contained within the SWDA II area to drain to the existing perimeter drainage channels that flow to the sedimentation basin northeast of SWDA II. Interior swales are also incorporated along channelized toes of slope as shown on Dwg. No. 56921-C-004. The riprap lined swales will be underlain with separation geotextile.

¹ Ref. "Construction Certification Report, Somerset Operating Co., LLC, Solid Waste Disposal Area II Phases A-C, Final Cover System Construction in 2016", prepared by GZA GeoEnvironmental of New York, dated February 20, 2017.



Technical Specifications and Quality Assurance/Quality Control Plan

Technical specifications and a Quality Assurance/Quality Control (QA/QC) Plan for construction of the final cover system are attached.

Sincerely,

GZA GeoEnvironmental of New York

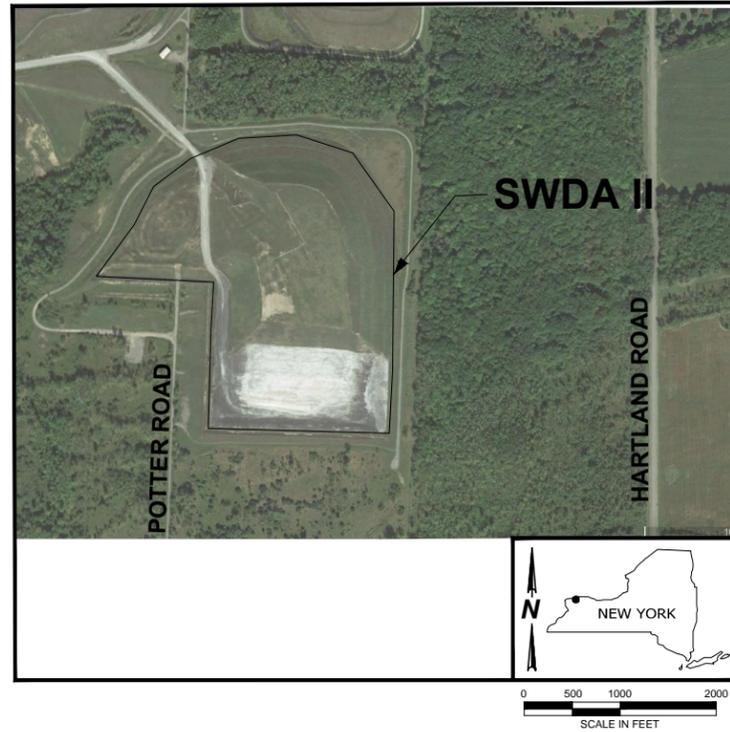
A handwritten signature in blue ink that reads "Bart A. Klettke".

Bart A. Klettke, P.E.
Principal/District Office Manager
716-570-2093
Bart.Klettke@gza.com

Attachments:

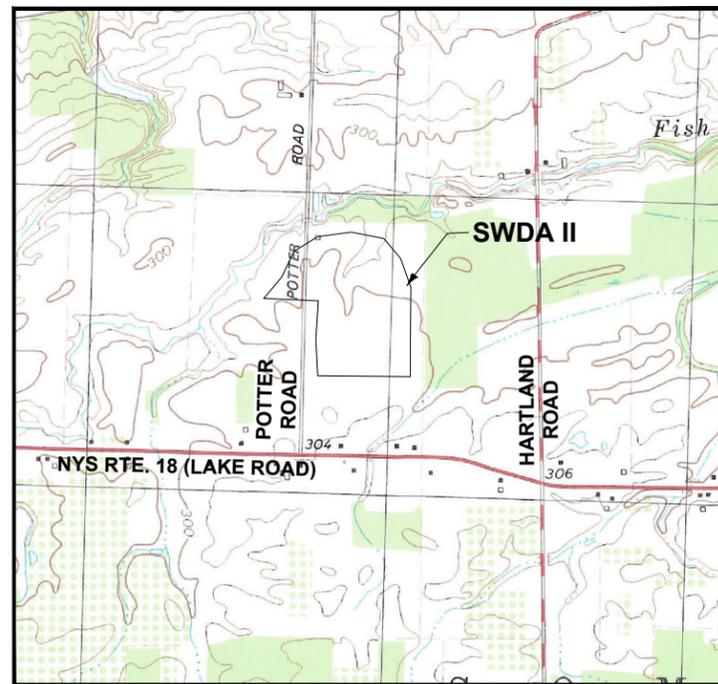
1. Design Drawings 56921-C-001 through 56921-C-011
2. Technical Specifications and QA/QC Plan

PERMIT DRAWINGS FOR SOMERSET OPERATING COMPANY, LLC SOLID WASTE DISPOSAL AREA II, FINAL COVER SYSTEM CONSTRUCTION IN 2020 TOWN OF SOMERSET, NIAGARA COUNTY, NEW YORK JANUARY 2020



SITE LOCATION PLAN

NOTE: BASE MAP ADAPTED FROM 2018 AERIAL PHOTOGRAPH
DOWNLOADED FROM http://www.nysgis.state.ny.us/gateway/mg/interactive_main.html.



REGIONAL MAP

NOTE: BASE MAP ADAPTED FROM U.S.G.S. TOPOGRAPHIC MAPS
DOWNLOADED FROM <http://www.terraserver.microsoft.com>.

DRAWING NO.	DRAWING TITLE
56921-C-001	COVER SHEET AND DRAWING INDEX
56921-C-002	SOLID WASTE DISPOSAL AREA II SITE PLAN
56921-C-003	TOP OF ASH GRADING PLAN
56921-C-004	TOP OF FINAL COVER SYSTEM GRADING PLAN
56921-C-005	CROSS-SECTION A-A - TYPICAL FINAL COVER TIE-IN TO EAST BERM, CELLS G & H
56921-C-006	CROSS-SECTION B-B - TYPICAL FINAL COVER TIE-IN TO SOUTH BERM, CELL H
56921-C-007	CROSS-SECTION C-C - TYPICAL FINAL COVER TIE-IN TO WEST BERMS CELLS E/F/G/H
56921-C-008	CROSS-SECTION D-D - TYPICAL FINAL COVER TIE-IN TO SOUTH BERM CELL D
56921-C-009	CROSS-SECTION E-E - FINAL COVER TIE-IN AND RIPRAP CHANNEL OUTLET IN SOUTHWEST CORNER BERM CELL D
56921-C-010	CROSS-SECTION F-F - FINAL COVER TIE-IN & ACCESS RAMP RECONSTRUCTION ALONG NORTH BERM OF CELL A
56921-C-011	CROSS-SECTION G-G - FINAL COVER TIE-IN TO PREVIOUSLY CONSTRUCTED CAP AREAS

**SOLID WASTE DISPOSAL AREA II
FINAL COVER SYSTEM CONSTRUCTION IN 2020
PERMIT DRAWINGS
TOWN OF SOMERSET, NIAGARA COUNTY, NEW YORK**

COVER SHEET AND DRAWING INDEX

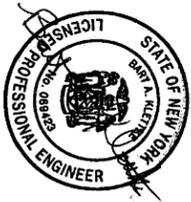
PREPARED BY: GZA GeoEnvironmental, Inc. Engineers and Scientists 300 PEARL STREET, SUITE 700 BUFFALO, NY 14202 (716) 685-2300		PREPARED FOR: SOMERSET OPERATING COMPANY, LLC	
PROJ MGR:	REVIEWED BY: BAK	CHECKED BY:	DRAWING No.
DESIGNED BY: BAK	DRAWN BY: TAK	SCALE: AS SHOWN	56921-C-001
DATE JANUARY 2020	PROJECT NO. 21.0056921.00	REVISION NO.	SHEET NO. 1 OF

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35-ACRE± AREA REQUIRING GRADING AND FINAL COVER SYSTEM CONSTRUCTION



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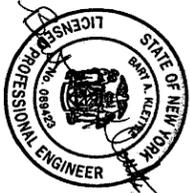
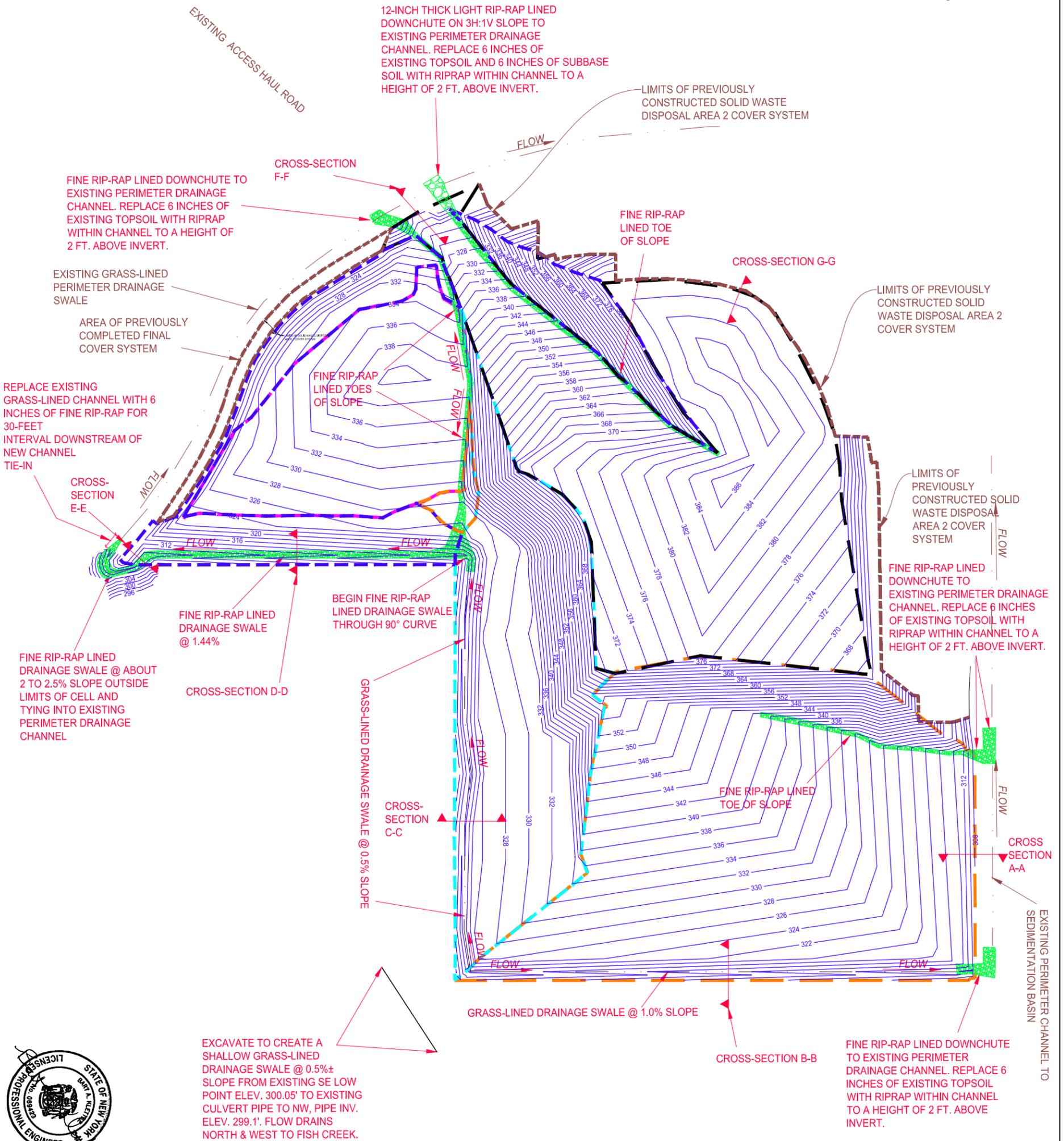
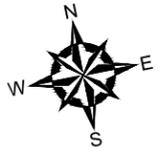
SOMERSET OPERATING COMPANY, LLC
BARKER, NY

SOLID WASTE DISPOSAL AREA II FINAL CLOSURE PLAN

SITE PLAN
PRE-CONSTRUCTION CONDITIONS

PREPARED FOR:
GZA GeoEnvironmental of NY
 Engineers and Scientists
 www.gza.com
 7725 LAKE ROAD, BARKER, NY 14012

PROJ MGR: BAK REVIEWED BY: TAK CHECKED BY: DJT FIG OR DWG
 DESIGNED BY: BAK DRAWN BY: BAK SCALE: AS SHOWN REVISION NO.:
 DATE: JANUARY, 2020 PROJECT NO.: 21.0066921.00 SHEET NO.: 56921-C-002
 SHEET NO. ## OF ##



EXCAVATE TO CREATE A SHALLOW GRASS-LINED DRAINAGE SWALE @ 0.5%± SLOPE FROM EXISTING SE LOW POINT ELEV. 300.05' TO EXISTING CULVERT PIPE TO NW, PIPE INV. ELEV. 299.1'. FLOW DRAINS NORTH & WEST TO FISH CREEK.

LEGEND

- DESIGN TOP OF FINAL COVER SYSTEM SURFACE CONTOUR
- AREA OF FINE RIPRAP (NYS DOT SPEC. SECTION 620 "FINE STONE FILLING") UNDERLAIN WITH NON-WOVEN GEOTEXTILE
- AREA OF LIGHT RIPRAP (NYS DOT SPEC. SECTION 620 "LIGHT STONE FILLING") UNDERLAIN WITH NON-WOVEN GEOTEXTILE



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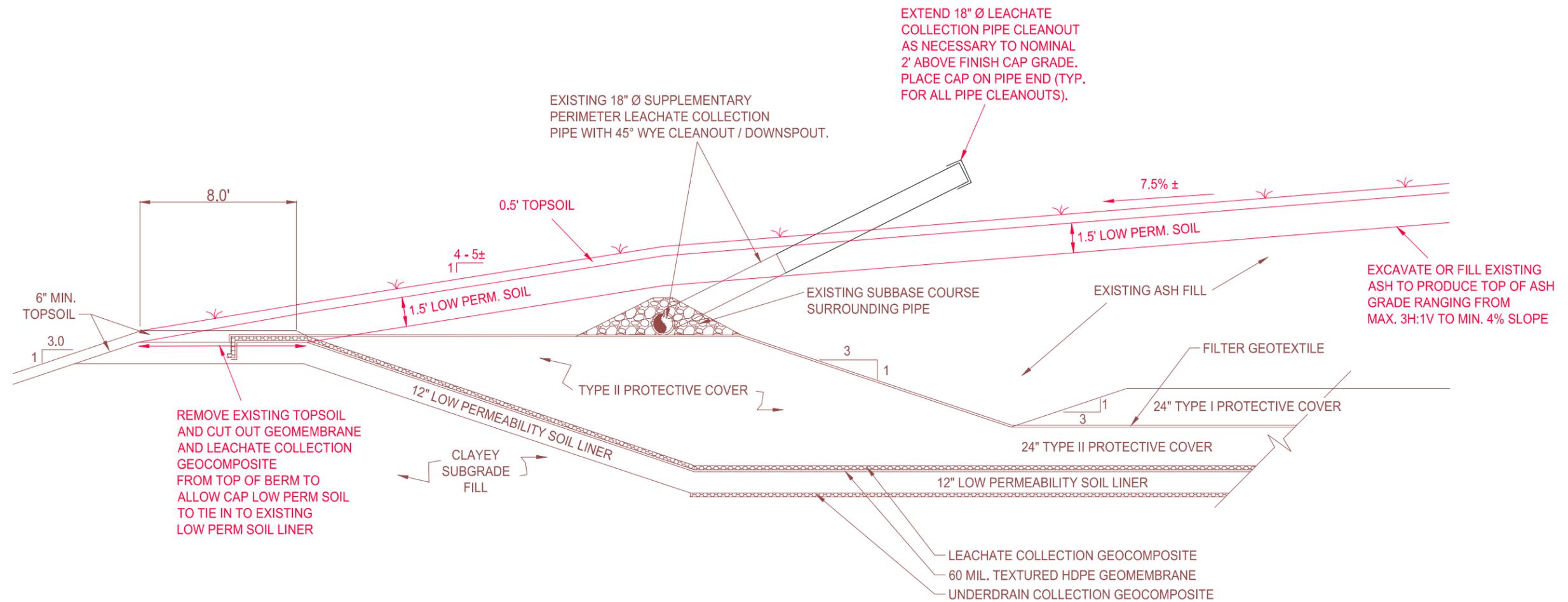
SOMERSET OPERATING COMPANY, LLC
BARKER, NY

TOP OF FINAL COVER SYSTEM GRADING PLAN
SOLID WASTE DISPOSAL AREA II FINAL CLOSURE PLAN

PREPARED FOR:
GZA GeoEnvironmental of NY
Engineers and Scientists
www.gza.com
7725 LAKE ROAD, BARKER, NY 14012

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DESIGNED BY: BAK | DRAWN BY: BAK | SCALE: AS SHOWN | REVISION NO.:
DATE: JANUARY, 2020 | PROJECT NO.: 21.006921.00 | SHEET NO.: 56921-C-004

© 2018 - GZA GeoEnvironmental, Inc. GZA\PROJECTS\6090\60921 Somerset 2019 Ash Grading\Ash Grading Plan GZA Working Draw Nov 2019.dwg [FIG 5, XSECT A-A] January 16, 2020 - 9:04am baskijl@k



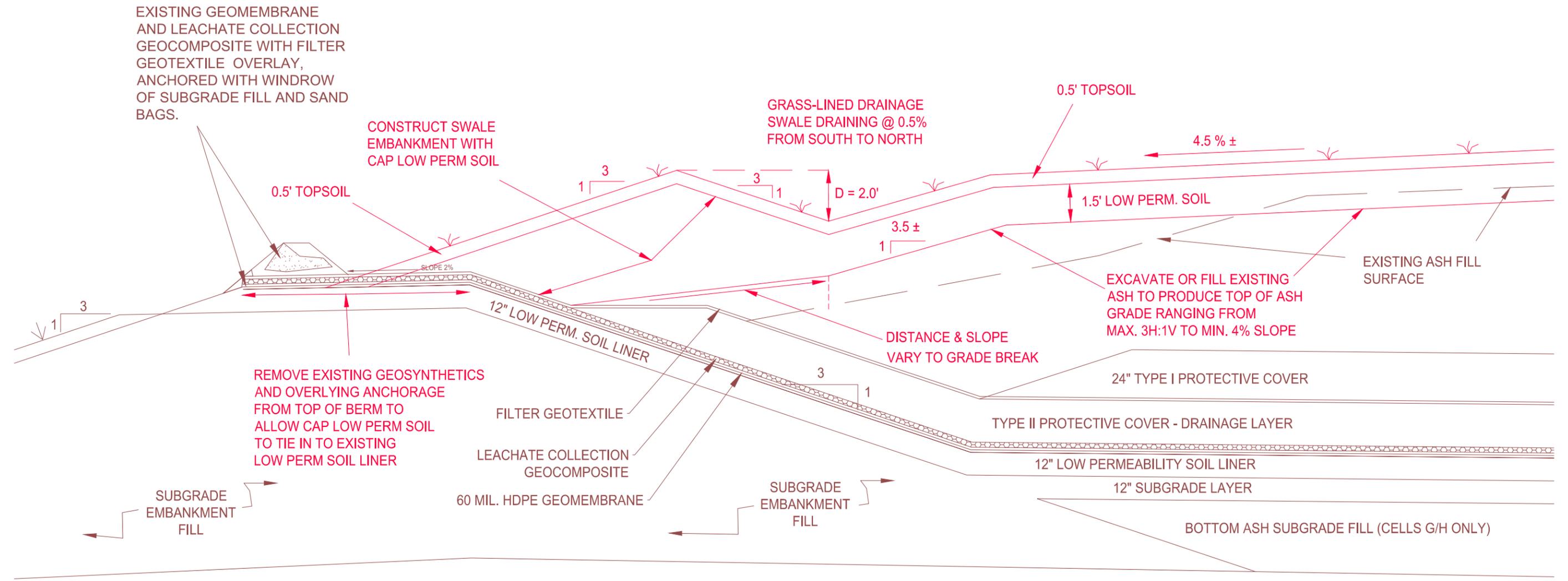
CROSS-SECTION A-A
TYPICAL FINAL COVER TIE-IN TO EAST BERM CELLS G & H



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SOMERSET OPERATING COMPANY, LLC BARKER, NY SOLID WASTE DISPOSAL AREA II FINAL CLOSURE PLAN			
CROSS-SECTION A-A TYP. FINAL COVER TIE-IN TO EAST BERM CELLS G & H			
<small>PREPARED BY:</small> GZA GeoEnvironmental of NY <small>Engineers and Scientists</small> <small>www.gza.com</small>		<small>PREPARED FOR:</small> SOMERSET OPERATING COMPANY, LLC <small>7725 LAKE ROAD, BARKER, NY 14012</small>	
<small>PROJ MGR:</small> BAK <small>DESIGNED BY:</small> BAK <small>DATE:</small> JANUARY, 2020	<small>REVIEWED BY:</small> TAK <small>DRAWN BY:</small> BAK <small>PROJECT NO.:</small> 21.0056921.00	<small>CHECKED BY:</small> DJT <small>SCALE:</small> AS SHOWN <small>REVISION NO.:</small> #####	<small>FIG OR DWG</small> 56921-C-005 <small>SHEET NO. ### OF ##</small>



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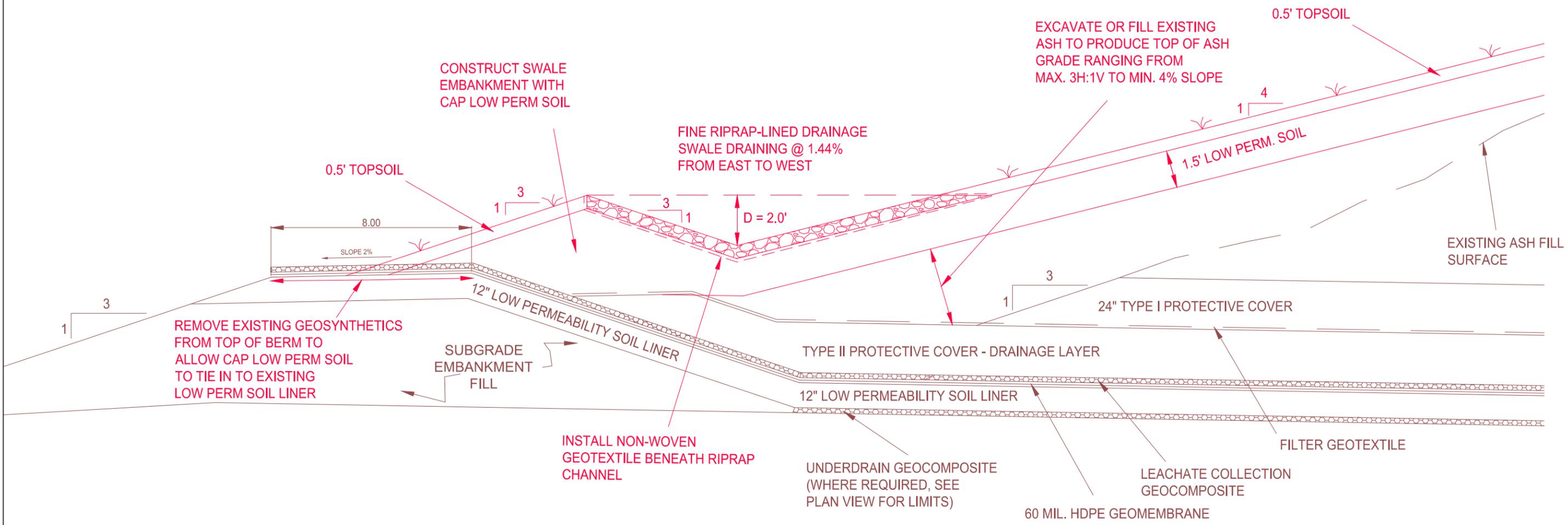


CROSS-SECTION C-C
TYPICAL FINAL COVER TIE-IN TO WEST BERMS OF CELLS E/F/G/H



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SOMERSET OPERATING COMPANY, LLC BARKER, NY SOLID WASTE DISPOSAL AREA II FINAL CLOSURE PLAN			
CROSS-SECTION C-C TYP. FINAL COVER TIE-IN TO WEST BERMS CELLS E/F/G/H			
<small>PREPARED BY:</small> GZA GeoEnvironmental of NY Engineers and Scientists www.gza.com		<small>PREPARED FOR:</small> SOMERSET OPERATING COMPANY, LLC 7725 LAKE ROAD, BARKER, NY 14012	
<small>PROJ MGR:</small> BAK <small>DESIGNED BY:</small> BAK <small>DATE:</small> JANUARY, 2020	<small>REVIEWED BY:</small> TAK <small>DRAWN BY:</small> BAK <small>PROJECT NO.:</small> 21.0056921.00	<small>CHECKED BY:</small> DJT <small>SCALE:</small> AS SHOWN <small>REVISION NO.:</small> #####	<small>FIG OR DWG</small> 56921-C-007 <small>SHEET NO. ## OF ##</small>

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CROSS-SECTION D-D
TYPICAL FINAL COVER TIE-IN TO SOUTH BERM OF CELL D



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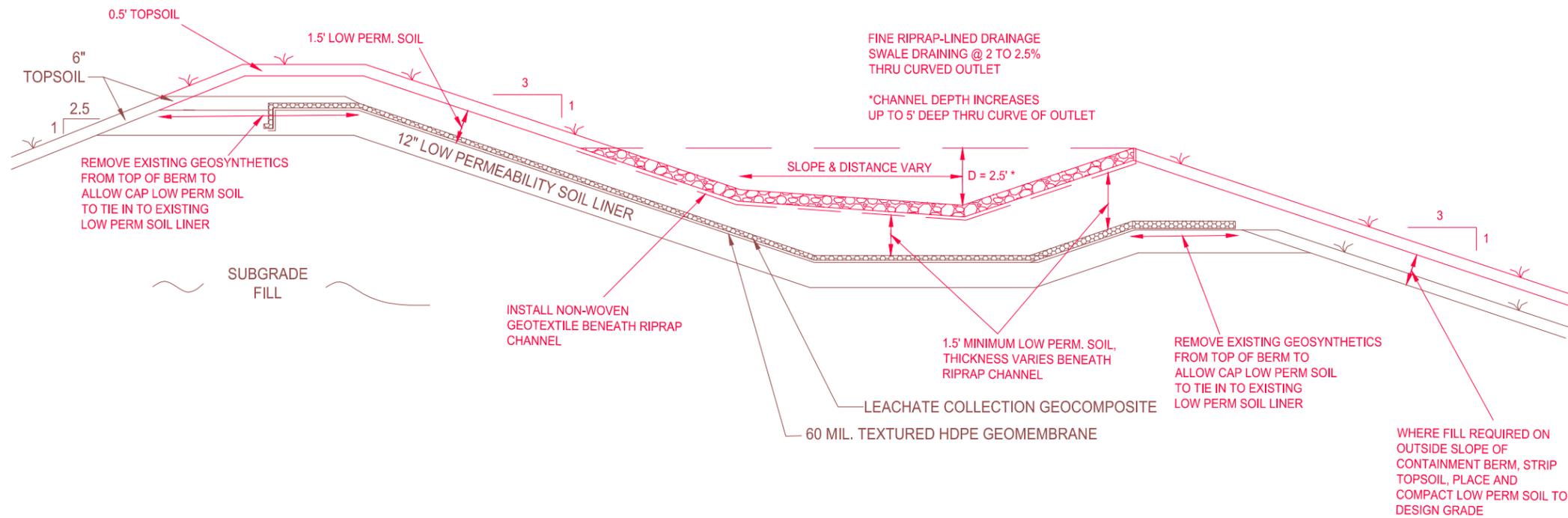
SOMERSET OPERATING COMPANY, LLC
BARKER, NY
SOLID WASTE DISPOSAL AREA II FINAL CLOSURE PLAN

CROSS-SECTION D-D
TYP. FINAL COVER TIE-IN TO SOUTH BERM CELL D

PREPARED BY: GZA GeoEnvironmental of NY Engineers and Scientists www.gza.com	PREPARED FOR: SOMERSET OPERATING COMPANY, LLC 7725 LAKE ROAD, BARKER, NY 14012
PROJ MGR: BAK DESIGNED BY: BAK DATE: JANUARY, 2020	REVIEWED BY: TAK DRAWN BY: BAK PROJECT NO. 21.0056921.00
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**CROSS-SECTION E-E
FINAL COVER TIE-IN AND RIPRAP CHANNEL OUTLET
IN SOUTHWEST CORNER BERM OF CELL D**



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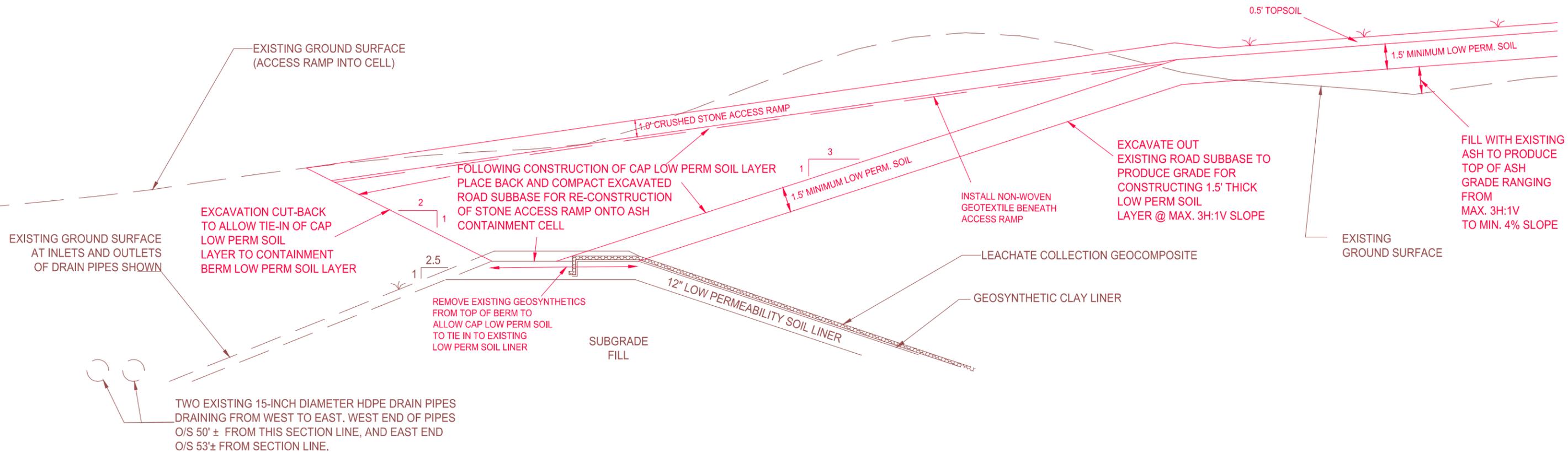
**SOMERSET OPERATING COMPANY, LLC
BARKER, NY
SOLID WASTE DISPOSAL AREA II FINAL CLOSURE PLAN**

CROSS-SECTION E-E - FINAL COVER TIE-IN AND RIPRAP CHANNEL OUTLET IN SOUTHWEST CORNER BERM CELL D

PREPARED BY: GZA GeoEnvironmental of NY Engineers and Scientists www.gza.com	PREPARED FOR: SOMERSET OPERATING COMPANY, LLC 7725 LAKE ROAD, BARKER, NY 14012
PROJ MGR: BAK DESIGNED BY: BAK DATE: JANUARY, 2020	REVIEWED BY: TAK DRAWN BY: BAK PROJECT NO. 21.0056921.00
CHECKED BY: DJT SCALE: AS SHOWN	FIG OR DWG REVISION NO. 56921-C-009 SHEET NO. #### OF ##



**CROSS-SECTION F-F
FINAL COVER TIE-IN AND ACCESS RAMP
RECONSTRUCTION ALONG NORTH BERM OF CELL A**



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**SOMERSET OPERATING COMPANY, LLC
BARKER, NY
SOLID WASTE DISPOSAL AREA II FINAL CLOSURE PLAN**

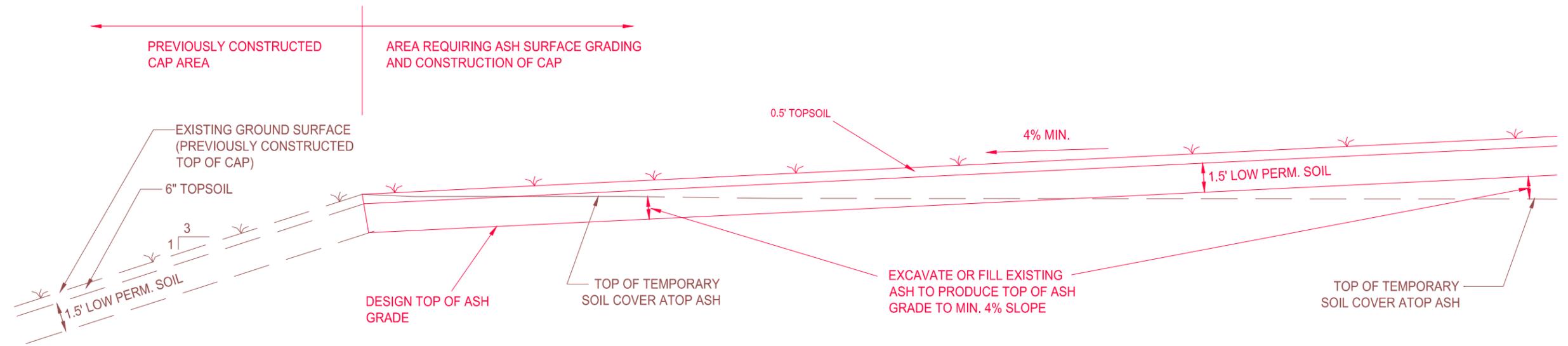
CROSS-SECTION F-F - FINAL COVER TIE-IN & ACCESS RAMP RECONSTRUCTION ALONG NORTH BERM OF CELL A

PREPARED BY:	GZA GeoEnvironmental of NY Engineers and Scientists www.gza.com	PREPARED FOR:	SOMERSET OPERATING COMPANY, LLC 7725 LAKE ROAD, BARKER, NY 14012
PROJ MGR:	BAK	REVIEWED BY:	TAK
DESIGNED BY:	BAK	DRAWN BY:	BAK
DATE:	JANUARY, 2020	PROJECT NO.:	21.0056921.00
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		SCALE:	AS SHOWN
		REVISION NO.:	#####
		FIG OR DWG	56921-C-010
		SHEET NO.	### OF ##



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**CROSS-SECTION G-G
FINAL COVER SYSTEM TIE-IN TO PREVIOUSLY
CONSTRUCTED CAP AREAS**



NO.	ISSUE/DESCRIPTION	BY	DATE

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**SOMERSET OPERATING COMPANY, LLC
BARKER, NY
SOLID WASTE DISPOSAL AREA II FINAL CLOSURE PLAN**

**CROSS-SECTION G-G - FINAL COVER TIE-IN TO PREVIOUSLY
CONSTRUCTED CAP AREAS**

PREPARED BY: GZA GeoEnvironmental of NY Engineers and Scientists www.gza.com	PREPARED FOR: SOMERSET OPERATING COMPANY, LLC 7725 LAKE ROAD, BARKER, NY 14012
PROJ MGR: BAK DESIGNED BY: BAK DATE: JANUARY, 2020	REVIEWED BY: TAK DRAWN BY: BAK PROJECT NO. 21.0056921.00
CHECKED BY: DJT SCALE: AS SHOWN	FIG OR DWG REVISION NO. 56921-C-011 SHEET NO. #### OF ##



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**SOMERSET OPERATING COMPLANY, LLC
7725 LAKE ROAD
BARKER, NEW YORK**

SOLID WASTE DISPOSAL AREA II FINAL CAPPING IN 2020

**TABLE OF CONTENTS FOR TECHNICAL SPECIFICATIONS
AND QA/QC PLAN**

Division 2 - Site Work

<u>Section No.</u>	<u>Description</u>
02120	Clearing & Grubbing
02210	Site Grading
02220	Earthwork
02270	Geosynthetics
02540	Seeding

- QA/QC Plan

SECTION 02120

CLEARING & GRUBBING

PART 1 - GENERAL

1.01 SCOPE:

- A. This section specifies the work required for clearing and grubbing.
- B. Related work Specified Elsewhere:
 - 1) Site Grading, Section 02210;
 - 2) Earthwork, Section 02220

1.02 DEFINITIONS:

- A. Clearing and Grubbing shall be defined as the removal of trees, brush, down timber, rotten wood, rubbish, riprap, concrete and objectionable material from surface areas within the Contractor's work areas and as directed by the Engineer and Somerset Operating Company, LLC

PART 2 - PRODUCTS

2.01 MATERIALS - None

PART 3 - EXECUTION

3.01 PROTECTION AND RESTORATION:

- A. The Contractor shall protect all utilities, manholes, drainage pipes, electrical systems, monitoring wells, structures, service roads, trees, wetlands, archaeological areas and other features unless stated or shown to be removed/modified. The Contractor shall not trespass beyond the Contractor's work area. Items damaged by the Contractor's activities shall be repaired to the Owner's satisfaction by the Contractor at no cost to the Owner.
- B. Upon completion of work, the Contractor shall remove protective materials, enclosures and guards.

3.02 CLEARING & GRUBBING:

- A. The Contractor shall perform clearing within the work area limits shown or as directed by the Engineer. The Contractor shall grub within the work area limits shown to remove all trees, brush, all inorganic material, tree stumps, roots, foundations and remove other unsuitable materials/soils, as directed by the Engineer and Somerset Operating Company, LLC.

3.03 DISPOSAL:

- A. Tree, brush and other non-topsoil materials shall be stockpiled at locations shown on the drawings.
- B. The Contractor shall not burn the debris resulting from the activities stated herein.

* * * * *

END OF SECTION

SECTION 02210

SITE GRADING

PART 1 - GENERAL

1.01 SCOPE:

- A. This section specifies site grading of earth and ash materials.
- B. Related work specified elsewhere:
 - (1) Clearing & Grubbing: Section 02120
 - (2) Earthwork: Section 02220

1.02 DEFINITIONS:

- A. Site grading consists of excavation, backfilling and grading to shape excavated slopes, landfill slopes, embankments and fills, and work areas to establish proper grades, remove irregularities and to provide positive drainage during construction and for restoring the site.

1.03 SUBMITTALS:

- A. None.

1.04 JOB CONDITIONS:

- A. The Contractor shall preserve, protect and maintain existing structures, channels, roads, drives, drains, sewers, utilities, monitoring wells and all other site features during construction unless otherwise stated and shown.
- B. Prior to all work, the Contractor shall become thoroughly familiar with the site, the site conditions, and all portions of the work.

PART 2 - PRODUCTS

2.01 MATERIALS: None

PART 3 - EXECUTION

3.01 GRUBBING AND EARTHWORK:

Perform grubbing and earthwork in accordance with Sections 02120 and 02220, respectively.

3.02 SITE GRADING DURING CONSTRUCTION:

- A. The Contractor shall grade work areas, as necessary, during construction to divert surface water runoff from excavations and to provide positive drainage of embankments or fills.
- B. The Contractor shall proof-roll all subgrades following site grading activities and prior to overlying construction, if deemed necessary and as directed by the Engineer.

3.03 FINISH GRADING:

On completion of the work, the Contractor shall: clean all ditches, channels and drainage pipes and restore them to their pre-construction condition or better; restore and finish the site in a neat and presentable condition as approved by both the Engineer and Somerset Operating Company, LLC including all haul roads, lay-down areas, parking areas and trailer areas and any other areas disturbed by the construction work. Restore stockpile areas, including topsoil, seed and mulch, to design restoration grades as shown. The Contractor shall grade the site to provide proper drainage as shown or as directed and approved by the Engineer and Somerset Operating Company, LLC

END OF SECTION

SECTION 02220

EARTHWORK

PART 1 – GENERAL

1.01 SCOPE:

- A. This section specifies the excavation and backfilling requirements for the various components of this project as shown on the contract drawings and as specified herein.
- B. Related Work Specified Elsewhere:
 - 1) Grades, Lines and Levels: Section 01050
 - 2) Clearing & Grubbing: Section 02120
 - 3) Site Grading: Section 02210.

1.02 DEFINITIONS:

- A. Earth excavation is the removal of in-place fill soils and natural overburden soils using proper earth moving equipment, except clearing and grubbing as defined in Section 02120.
- B. Fill placement or backfilling is the placement and compaction of earthen or coal ash materials to construct the various components of the project to the lines and grades shown.
- C. Authorized excavation is excavation of overburden soils below limits of clearing and grubbing to the excavation limits shown. It includes excavation of material considered unsuitable by the Engineer and other excavation as directed by Somerset Operating Company, LLC (Somerset) or the Engineer.
- D. Unauthorized excavation is excavation of materials beyond the limits shown or excavation not authorized by Somerset or the Engineer to be excavated.

1.03 JOB CONDITIONS:

- A. Protection of Aboveground and Underground Structures, Utilities and Facilities: Where shown, the locations of aboveground and underground facilities are approximate. The contract drawings do not define all above ground or below ground utilities, structures, wells and other existing facilities at, or adjacent to the project site and work area. The Contractor shall identify, properly locate and protect

all utilities, underground structures, above ground structures and appurtenances on, or adjacent to the project site. The Contractor shall contact Somerset or the Engineer to obtain further information, requirements, and restrictions, related to work procedures.

- B. Health and Safety: The Contractor shall at all times safeguard persons and properties in accordance with proper health and safety procedures as specified.
- C. Dust Control: The Contractor shall control dust in the work area and haul roads by sprinkling with potable water or by other methods approved by Somerset and in accordance with the requirements of NYSDEC DER-10 Technical Guidance for Site Investigation and Remediation (Appendix 1A – New York State Department of Health (NYSDOH) Generic Community Air Monitoring Plan). Petroleum products shall not be utilized.
- D. Access Roads, Ramps and Staging Areas:
 - 1) The Contractor shall construct temporary staging areas and access roads as necessary to provide access to the work areas, as approved by Somerset and the Engineer. Staging and material storage areas shall be constructed in the areas of the site shown for such purposes.
 - 2) The Contractor shall be responsible for maintaining temporary staging areas and access roads along with existing site access roads throughout the duration of the contract, as necessary to provide access to the site for both the Contractors operations and the operations of Somerset and others engaged by Somerset at the site.
 - 3) The Contractor shall remove all temporary roads, ramps and staging areas, when no longer needed, and restore the site to conditions as approved by Somerset and the Engineer.
- E. Contractor shall utilize all low permeability soil provided from the Owner's site stockpile. If needed, Contractor shall provide low permeability soil meeting these specifications.
- F. Contractor shall utilize the topsoil provided from the Owner's site stockpile. Contractor shall provide remaining topsoil needed.
- G. Contractor shall provide the stone products (riprap) required.
- H. Construction Quality Assurance/ Quality Control:
 - (1) A construction quality assurance/quality control (QA/QC) program will be implemented during construction to ensure that the in-place soils and materials meet the requirements of these specifications. A copy of the QA/QC Plan is included in the Contract Documents. The CQA Engineer

will oversee the quality program. The Contractor shall comply with the requirements of the QA/QC Plan and provide all necessary sampling, testing and documentation that is specified to be the responsibility of the Contractor or its subcontractors and suppliers. The Contractor shall assist the CQA Engineer to accommodate certain specified sampling and testing items at no additional cost to Somerset

1.04 SUBMITTALS:

- A. The Contractor shall submit dust control procedures, off-site material sources, and test data showing that proposed material sources meet the specified requirements, earthwork procedures, material handling and stockpiling procedures and locations, material placement procedures and quality control plans as required by Somerset and the Engineer.

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. Coal Pile Subbase Material/Ash Fill:

(1) Coal Pile Subbase Material /Ash Fill-Soil shall consist of:

- a) Coal Pile Subbase Material material excavated from on-site stockpiles, transported, placed and compacted by Somerset, and placed to the design top of ash grades.
- b) Ash Fill-Soil is the existing material located in un-capped areas of SWDA II, Phases A-G. Either Somerset or its Contractor is required to excavate to the design top of ash grades load, haul and place the material in areas requiring filling.
- c) Excavation shall require removal of soil and geosynthetics located atop containment berms, to facilitate tie-in of the cap low permeability soil barrier to the existing bottom liner low permeability soil barrier.

- B. Low Permeability Soil Cap Barrier:

- (1) Low permeability soil cap barrier material shall be obtained from Somerset's on-site stockpile.
- (2) In the event the on-site stockpile is exhausted of material, Contractor shall provide low permeability soil.
- (3) When placed and compacted the low permeability soil cap barrier must have a permeability less than or equal to 1×10^{-5} centimeters per second (cm/sec).

Imported low permeability soil cap barrier shall be free of particles greater than 4 inches in any dimension, and have a minimum plasticity index of 5.

- (4) The Contractor shall sample and test the material from the borrow source at least 3 weeks prior to construction. The Contractor shall contract with an Independent Geotechnical Laboratory to develop moisture-density-permeability relationships for the proposed soils to determine field control parameters for in-place moisture/density tests and determine that proposed soils will satisfy the permeability required at the specified moisture contents and densities for placement and compaction. The Contractor shall sample and test the proposed borrow source(s) in accordance with the quality control procedures defined in the QA/QC Plan.

C. Topsoil:

Topsoil shall be obtained by Somerset/Contractor from an on-site stockpile, and supplemented with an off-site source.

D. Riprap:

- (1) Riprap shall be provided by the Contractor from a NYSDOT approved source.
- (2) Fine Riprap shall be a crushed stone or crushed gravel free of dust, clays, organics, snow, ice and friable or deleterious particles and meet the requirements of NYSDOT Specifications Section 620, Item 620.02 (Fine Stone Filling) and additionally with the following gradation requirements.

<u>Stone Size</u>	<u>Percent of Total by Weight</u>
Smaller than 8 inches	90-100
Larger than 3 inches	50-100
Smaller than No. 10 Sieve	0-10

- (3) Light Riprap shall be a crushed stone or crushed gravel free of dust, clays, organics, snow, ice and friable or deleterious particles and meet the requirements of NYSDOT Specifications Section 620, Item 620.03 (Light Stone Filling) and additionally with the following gradation requirements.

<u>Stone Size/Weight</u>	<u>Percent of Total by Weight</u>
Lighter than 100 lbs.	90-100
Larger than 6 inches	50-100
Smaller than ½-inch	0-10

PART 3 - EXECUTION

3.01 TESTING REQUIRED

- A. The Contractor shall coordinate with the CQA Engineer for the Engineer to conduct in-place moisture-density testing and collect undisturbed tube samples of the constructed low permeability cap barrier, to be tested by the Engineer.

3.02 LAYOUT:

- A. The Contractor must accurately locate and maintain the location of all proposed construction components, and existing roads, utilities, monitoring wells, drainage structures and existing landfill components, features, and advise the Engineer of any discrepancies prior to commencing work.

3.03 PROTECTION OF SUBGRADES AND FILL GRADES:

- A. The subgrade soils that will be encountered will be of varying composition and strength properties. They are generally expected to be sensitive to disturbance from construction activity when in the presence of excessive moisture. Water shall not be allowed to collect on earthen subgrade surfaces. The Contractor shall also properly drain and protect all excavation and fill grades.
- B. The Contractor shall design and construct temporary haul roads with proper materials and thicknesses in order to protect subgrades, fill grades, underground utilities, constructed components and other work as shown and specified.
- C. Failure of the Contractor to properly excavate and protect approved subgrades resulting in additional excavation and backfill to attain a suitable subgrade in accordance with these specifications shall be at the expense of the Contractor.
- D. The Contractor shall maintain both work in progress and completed work until the construction is complete and accepted by Somerset. Any erosion or degradation of the Contractor's work shall be repaired by the Contractor at no additional cost to Somerset.
- E. The Contractor shall maintain the landfill side slopes until the construction is complete and accepted by the Owner. Any erosion, dessication, weathering and/or degradation of the Contractor's work shall be repaired by the Contractor at its own expense.
- F. Subgrade soils shall not be allowed to freeze prior to placement of additional overlying fill.

3.04 EQUIPMENT:

- A. It is the responsibility of the Contractor to select, furnish and properly maintain equipment which will perform the required excavation and compact the fill uniformly to the required density and/or permeability. The Contractor's selection of equipment shall be submitted to the Engineer for review prior to construction.
- B. Excavation shall not proceed, and no fill shall be placed until approved equipment is on the site and in working condition.

3.05 GENERAL EXCAVATION

- A. Excavation shall be made in the presence of the Engineer and shall extend to the lines and grades shown and described on the Contract Drawings and to suitable conditions, as determined by the Engineer. The Contractor shall use extreme caution when performing this work so as to minimize excavation into any of the existing landfill components. The Contractor shall immediately repair any damage it causes to the existing landfill system at no additional cost to Somerset.
- B. All excavation work shall be executed to the lines and grades shown on the drawings, unless directed otherwise by the Engineer. All excavation work shall be performed in such a way as to minimize disturbance and maintain stability of subgrade soils and slopes. Special care shall be taken not to disturb the bottom of excavations. Excavation to the final subgrade levels must be done by methods which minimize traffic on the subgrade.
- C. The excavation equipment must be of sufficient size and capacity to excavate the materials encountered and to the specified depths as shown. Excavation in sands, silts and soft clays represent potentially unstable subgrade conditions and proper protection should be implemented.
- D. The Contractor shall be responsible at all times for safe and prudent excavation operations so as to protect the workmen, the public, utilities and structures, and adjacent property. The Contractor shall perform all excavation in accordance with OSHA standards. The Contractor shall observe all applicable local, state and federal requirements and acquire all necessary permits.
- E. Subgrades and slopes which have been damaged or degraded as a result of Contractor's activities, or failure of the Contractor to properly protect them shall be repaired at the Contractor's expense as directed by the Engineer.
- F. Subgrades in which soft or unsuitable materials are encountered that are not a result of Contractor's operations or failure to protect subgrades shall be undercut and backfilled with appropriate fill as directed by the Engineer.
- G. No materials or fill shall be placed by the Contractor until the subgrades are observed and tested by the Engineer and surveys are completed as required.

3.06 FILLING AND BACKFILLING:

- A. Preparation: The Contractor shall not place fill or backfill until underlying subgrades have been observed and tested as necessary by the Engineer.
- B. Materials: The following materials shall be placed at the locations stated as shown and specified.
 - 1) Coal Pile Subbase Material /Ash Fill-Soil
 - a) Shall be placed in areas requiring fill to achieve design top of fill grade.
 - 2) Low permeability soil cap barrier:
 - a) Low permeability soil cap barrier for uncapped portions of the Landfill.
 - 3) Topsoil:
 - a) Top 6 inches of the final cover system.
 - b) Other locations as shown or as directed by the Engineer or Somerset
 - 4) Riprap:
 - a) For lining drainage swales and toes of slope where shown on the drawings.
- C. Placement and Compaction:
 - 1) Coal Pile Subbase Material /Ash Fill-Soil
 - a) Coal Pile Subbase Material /Ash Fill-Soil shall be placed in a maximum 12" thick loose lift thickness and compacted to a stable matrix.
 - 2) Low permeability soil cap barrier:
 - a) Low permeability soil cap barrier shall be placed in uniform 9-inch thick compacted lifts for a total layer thickness of 18 inches, and compacted to at least 90 percent of the maximum dry density, as determined by ASTM D-1557, and shall have an in-place permeability less than or equal to 1×10^{-5} cm/sec. Field compaction shall be done with the soil moisture content in the range between optimum and +6%.

- d) Low permeability soil cap barrier that is too dry must be moistened and properly blended to provide uniform moisture content. Low permeability soil cap barrier which is too wet shall be dried prior to compaction, unless otherwise authorized by the CQA Engineer. The Contractor shall scarify and moisten the in-place low permeability soil cap barrier, to the satisfaction of the CQA Engineer, just prior to placing an overlying subsequent lift of low permeability soil cap barrier. The Contractor shall moisten as necessary any desiccated areas to maintain the low permeability soil cap barrier moisture content a minimum of that specified by pre-construction laboratory testing.
- e) No frozen soil shall be placed during construction and no soil shall be placed on frozen soil. Each lift shall be scarified by the Contractor prior to the placement of subsequent lifts, to provide adequate layer bonding between lifts. The lifts shall be compacted with a vibratory sheepsfoot and smoothdrum rollers. No additional lifts of soil shall be placed after a damaging rain event until the previously placed soil material has dried out sufficiently or the top affected few inches of soil material has been reworked and/or removed.
- f) At the end of each day and prior to anticipated rain, the Contractor shall grade and smooth roll the low permeability soil cap surface, to the satisfaction of the CQA Engineer, to enhance runoff and minimize potential degradation due to excessive moisture.
- g) Maintain the integrity of all low permeability soil cap barrier fill surfaces. Any desiccation or degradation of the low permeability soil cap barrier fill surface shall be removed and replaced and/or repaired to the satisfaction of the CQA Engineer.

3) Topsoil

- a) The Contractor shall prepare all grades within the areas to be covered by topsoil so that the completed work, after topsoil is spread, conforms to the specified lines and grades. The Contractor shall scarify the surface of the subsoil, with the grousers of the bulldozer with the bulldozer traveling up and down the slopes, before topsoil is placed to permit bonding of the topsoil with the subsoil.
- b) Topsoil in an unworkable condition due to excessive moisture, frost or other conditions shall not be placed until it is suitable for spreading. Topsoil shall be placed and spread on the designated area and graded to 6 inches minimum thickness. After the topsoil is spread, all large stiff clods, rocks, roots or other foreign matter shall be cleared and disposed

of by the Contractor as approved so that the finished surface will be acceptable for subsequent compaction and seeding. Compaction shall be done by properly tracking the topsoil with a bulldozer traveling up and down the slope. At least two passes of the bulldozer tracks should be made over the entire topsoil area.

4) Riprap

- a) Prior to placement of stone riprap, the underlying materials must be properly placed, compacted and graded as specified, including placement of the non-woven geotextile.
- b) The Contractor shall place stone for riprap within the lines, grades and slopes specified and in such a manner as to produce a well graded mass of rock with a minimum percentage of voids.
- c) The Contractor shall place riprap to its full course thickness in one operation and in such a manner as to avoid displacing or damaging the underlying material. Placement on slopes shall commence at the toe of the slope and shall be in a systematic method while advancing up the slope. The larger stones should be well distributed, and the entire mass of stones in its final position shall conform to the grade specified. The finished layer of stone shall be free from objectionable pockets of small stones and clusters of larger stones. Placing stone in layers is not permitted.
- d) The dumping or casting of stone into place or by dumping into chutes or similar methods likely to cause segregation of the various sizes shall not be permitted. The riprap shall not be dropped from a height greater than 1.5 feet during placement.
- e) The desired distribution of the various sizes of stones throughout the mass shall be obtained by selective loading of the material at the quarry or by other methods of placement which will produce the specified results. Rearranging of individual stones by mechanical equipment or by hand, shall be required as necessary to obtain a well graded distribution of the stone sizes as specified. Stone placed mechanically shall be tamped in order to consolidate the mass and provide a uniform surface.
- f) The Contractor shall maintain the riprap to be free of soil, debris, vegetation and any other unsuitable material until final acceptance by Somerset.

* * * * *

END OF SECTION

SECTION 02270

GEOSYNTHETICS

PART 1 - GENERAL

1.01 DESCRIPTION:

A. This section specifies the material and construction requirements for:

- Separation Geotextile

B. Related work specified elsewhere:

- (1) Earthwork: Section 02220

1.02 DEFINITIONS:

A. Separation Geotextile is the (nominal 6-oz.) non-woven geotextile separating riprap from the underlying soil.

1.03 JOB CONDITIONS:

A. The Contractor shall coordinate with Somerset Operating Company, Inc. and the Engineer to properly schedule pre-construction testing, delivery and installation of geotextile to avoid delays in construction.

1.04 SUBMITTALS:

A. The Contractor, shall submit to Somerset Operating Company, Inc. and the Engineer, prior to product shipping, the following:

- (1) Geotextiles:

Geotextile supplier/manufacturer
Manufacturers product specifications
Manufacturers recommendations for installation and anchoring as appropriate for the intended use and application.

B. The Contractor shall submit to Somerset Operating Company, Inc. and the Engineer, a minimum of 2 weeks prior to product delivery to the site the following:

- (1) All Geosynthetic Products

Manufacturer's quality control test data and Independent Laboratory quality assurance test data, as specified, herein traceable to the lot numbers and roll numbers of geosynthetic material delivered to the project site.

Manufacturer's certificate or statement of compliance in accordance with Section 01400 of these specifications.

PART 2 - PRODUCTS

2.01 The following minimum requirements are specified for the geosynthetic material supplied/used for this project. The values listed shall be minimum average roll values, except as specified for geomembrane.

2.02 MATERIALS

A. Separation Geotextile:

Separation Geotextile shall be a non-woven, needle punched polypropylene or polyester, continuous filament material meeting or exceeding the following minimum requirements:

Property	Test Method	Minimum Value
Unit Weight (oz/yd ²)	ASTM D5261	6 (nominal)
Grab Tensile Strength (lbs)	ASTM D4632	150
Trapezoidal Tear Strength (lbs)	ASTM D4533	60
CBR Puncture Strength (lbs)	ASTM D6241	230
Apparent Opening Size (U.S. sieve number equivalent)	ASTM D4751	70-100

PART 3 - EXECUTION

3.01 GEOTEXTILES

A. Conformance Testing:

(1) The Contractor shall submit Manufacturer's quality control test data to the Engineer for the Separation Geotextile.

B. Installation:

- (1) Geotextile shall be installed as shown on the drawings and in accordance with the manufacturer's recommendations.
- (2) Separation Geotextile shall be overlapped at panel ends a minimum of 2 feet. Any joining of geotextile along sides of panel shall be sewn with a minimum 6-inch overlap, or overlapped a minimum of 2 feet.
- (3) On slopes, the geotextile shall be placed with the long dimension perpendicular to the toe of the slope.
- (4) At the time of installation, geotextile shall be rejected if it has defects, rips, holes, flaws, deterioration or damage incurred during manufacture, transportation or storage.
- (5) Geotextile shall be placed over underlying materials only after survey record information has been obtained by the Contractor's surveyor.
- (6) The maximum exposure time for geotextiles shall not exceed 30 days.
- (7) The fabric shall be protected at all times during construction from damage resulting from sunlight, excessive surface water, construction traffic, improper installation procedures, or any other condition which can result in damage to the fabric. Geotextile found to be damaged as a result of improper construction procedures or inadequate protection, shall be replaced by the Contractor at his expense.

* * * * *

END OF SECTION

SECTION 02540

SEEDING

1. DESCRIPTION:

A. General: This section specifies the minimum requirements for seeding and mulching.

2. PRODUCTS:

A. Materials

- 1) Seed shall conform to NYSDOT Standard Specifications, Section 713-04.
- 2) Mulch shall conform to NYSDOT Standard Specifications, Section 713-18 or 713-19.
- 3) Fertilizer shall conform to NYSDOT Standard Specifications, Section 713-03. It shall contain 9% nitrogen, 18% available phosphoric acid, and 9% soluble potash.
- 4) Limestone shall conform to NYSDOT Standard Specifications, Section 713-02.

3. EXECUTION:

A. Application

- 1) After the topsoil is placed to the grades and lines shown and specified, the Contractor shall fertilize, seed and mulch. Limestone shall be placed at the following rates according to the topsoil pH.

<u>Topsoil pH</u>	<u>Limestone Rate (lbs/1000 S.F.)</u>
6.5 or greater	0
6.0	40
5.5	80

- 2) Prior to seeding, the area shall be fertilized using 12 pounds of 9-18-9 fertilizer per 1,000 square feet (or as specified by the manufacturer) worked lightly into the soil.
- 3) Seed shall be applied at a rate of 6 pounds per 1,000 square feet and contain the following mixture by weight.

Common Name	Percent by weight
Fine Fescue (2 varieties min. must include creeping red)	50-70%
Perennial Ryegrass (2 varieties minimum)	15-40%
Annual Ryegrass	5-15%
Clover (White preferred)	5-10%

- 4) Immediately after seeding, mulch (hay or straw) shall be evenly applied to seeded areas at the rate of 100 pounds per 1,000 square feet.

B. Ground Preparation and Seeding

- 1) Areas to be seeded shall be maintained at approved grades. Irregularities which form low places which will hold water shall be eliminated. Fertilizers, seed and mulch in the amounts specified shall be evenly distributed on the surfaces to be seeded. All mechanical equipment for soil preparation or seeding shall be submitted to the Engineer for review prior to work.
- 2) Areas to be seeded shall be harrowed, disked, tracked with a dozer, or otherwise completely pulverized to a state of tillage acceptable to the Engineer. All stone or other undesirable material over two inches in greatest dimension shall be removed and disposed of as approved. Limestone and/or fertilizer as specified shall be incorporated to the depth of two inches below the finished grades unless otherwise specified. Mechanical drills or seeders shall place the seed to a depth not exceeding one-quarter inch. Seed distributed on the surface shall be covered to a depth not exceeding one-quarter inch by raking, brush or chain harrowing, or other approved method. Broadcast seeding shall not be done during windy weather. After sowing, the seeded areas shall be lightly rolled. Rollers shall be as approved.
- 3) Alternatively, the Contractor can apply the seed using an approved hydro-seed method. The Contractor shall submit the procedure to the Engineer for review prior to application.

C. Mulching

- 1) The surface of areas where mulch is to be applied shall be cleared of stones, stumps, wire or other obstacles which might hinder the subsequent seeding operations, and where required by the plans, the ground shall be harrowed or disked to produce a state of suitable tillage. The mulch shall be spread uniformly in a blanket of sufficient thickness to hide the soil from view. The rate of application shall be as specified and shall be considered a minimum

rate. The mulch may be spread by hand or by machinery. When mulching and seeding are specified, the mulch may be spread before or not later than three days after seeding unless otherwise approved. Anchorage will be required unless otherwise specified on the plans. Anchorage to hold the mulch in place may be applied by an approved method during the mulching operation or subsequently if the Contractor so desires.

- 2) The Contractor shall care for the mulched areas until final acceptance of the project. Such care shall consist of providing protection against traffic by approved warning signs or barricades, and repair of areas damaged by erosion, wind, fire or other causes. Such areas shall be repaired to re-establish the condition and grade of the soil prior to mulching and shall then be re-mulched as specified under this work.

D. Care During Construction

- 1) The Contractor shall care for the seeded and mulched areas until final acceptance of the project. Such care shall consist of providing protection against traffic by approved warning signs or barricades, and repairing of any areas damaged following the seeding or mulching operations due to wind, water, fire or other causes. Such damaged areas shall be repaired to re-establish the condition and grade of the area prior to seeding and shall then be re-fertilized, re-seeded and re-mulched as specified herein. The Contractor shall keep seeded areas mowed until acceptance of the contract by cutting to a height of three inches when growth reaches six inches or when the growth tends to smother seedlings or as directed.
- 2) Performance after six months or the following spring, from the time of seeding, whichever is greater but not exceeding one year, shall be reviewed by Somerset Operating Company, LLC, the Engineer and the Contractor. The vegetation must be to the satisfaction of the Somerset Operating Company, LLC. Any bare or spotty vegetated areas shall be reworked, fertilized, reseeded and mulched by the Contractor.

END OF SECTION

**SOMERSET OPERATING COMPANY, INC.
SOLID WASTE DISPOSAL AREA II
2020 FINAL COVER SYSTEM CONSTRUCTION
QUALITY ASSURANCE AND QUALITY CONTROL PLAN**

1.00 INTRODUCTION

This quality assurance/quality control (QA/QC) plan has been prepared for the construction of Somerset Operating Company, LLC Solid Waste Disposal Area (SWDA) II, 2020 Final Cover System construction. This plan presents the:

- GZA CQA Engineer staffing organization for monitoring construction of this project, the reporting chain-of-command, and the project and experience requirements of individuals in the plan; and
- QA/QC requirements for each material/component in the final cover system design including testing and sampling frequency, test methods (field and laboratory), equipment calibration standards, and criteria for satisfactory test performance.

2.00 STAFF ORGANIZATION

This section describes GZA's CQA staff organization and reporting procedures for this project. The responsibilities and recommended experience backgrounds of the CQA staff are described below.

2.10 PRINCIPAL-IN-CHARGE (PIC)

- Responsible for technical and administrative aspects of the construction monitoring program.
- Reviews work done by the project manager and consults with the project manager regularly.
- Experienced in solid waste engineering projects.
- Civil engineer, generally having over 20 years of experience, with a license to practice engineering in New York State.
- Manages the day-to-day technical and administrative aspects of the project.
- Supervises the field QA monitoring, coordinates sub-consultant activities (if any) and monitors the laboratory testing.
- Responsible for contacts with the Owner, the New York State Department of Public Services (DPS) and the New York State Department of Environmental Conservation (NYSDEC).
- Performs in-house quality control by reviewing the technical issues presented in reports and designs and recommendations presented in correspondence.

- Experienced in engineering and construction aspects related to solid waste engineering projects.

2.20 FIELD ENGINEER

- Responsible for implementing the field QA/QC program and coordinating QA/QC laboratory testing.
- Report directly to the PIC, typically several times per day.
- Prepares daily field summary reports that summarize each day's construction and construction monitoring activities.
- Coordinate sub-consultant field activities.
- Responsible for reporting field test data to the Owner and the contractor's field representative.
- Will need to operate a surface moisture-density gauge and is required to complete the certification course offered by the equipment manufacturer.
- Experienced with solid waste management facility engineering and construction.
- Will have documented experience in previous projects similar in scope and size.

2.30 SOILS LABORATORY

Laboratory tests on soil samples for this project shall be completed by a certified geotechnical laboratory in general accordance with the ASTM¹ standards listed below. The geotechnical testing laboratory shall be contracted by the Contractor and acceptable by the Engineer and Owner.

<u>Test Designation</u>	<u>Standard No.</u>
Method for Particle Size Analysis of Soils	ASTM D422
Test Method for Moisture-Density Relations of Soils and Soil Aggregate Mixtures by Modified Proctor Method	ASTM D1557
Method for Laboratory Determination of Water (Moisture) Content of Soil, Rock, and Soil - Aggregate Mixtures	ASTM D2216
Practice for Wet Preparation of Soil Samples for Particle Size Analysis and Determination of	

¹ ASTM standards are the more current standards published by ASTM International (see www.astm.org).

Soil Constants	ASTM D2217
Test Method for Permeability of Granular Soils (Constant Head)	ASTM D2434
Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils	ASTM D4318
Test Method Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter	ASTM D5084

Soil tests in the laboratory shall be completed by, or supervised by a laboratory manager (LM), who has 5 or more years of soils laboratory testing experience. The testing status and completed test results will be reported by the Contractor to the PIC in electronic format in a timely manner. Equipment used for the above listed tests shall be generally calibrated in accordance with accepted standards. Scales used in the tests shall be calibrated annually using weights traceable to the National Bureau of Standards. Pressure gauges and transducers shall be typically calibrated annually.

3.00 SUBGRADE PREPARATION AND CONSTRUCTION

3.10 BACKGROUND

Portions of the existing landfill footprint are currently covered with vegetation (grass) and will require clearing and grubbing. Vegetation and any topsoil from steep slopes removed will be placed in flatter areas (4 – 10%) and placed and compacted in nominal 12-inch lifts.

3.20 PRE-CONSTRUCTION TESTING

No pre-construction testing is to be done.

3.30 TESTING DURING SUBGRADE PREPARATION

No construction phase sampling is required for soil or bottom ash placed as subgrade fill. Soil or bottom ash is to be compacted to a stable matrix.

Survey Requirements

Pre-construction survey has previously been completed as shown on the drawings.

Following excavations to bottom cut design elevations or filling to top of subgrade design elevations, Somerset's certifying land surveyor shall measure the built subgrade. The survey data collected and recorded will be used to determine top of low permeability soil cap barrier elevation.

Measurements shall be made on a horizontal grid with maximum 50-foot spacing and at all grade breaks to adequately measure the topography.

A horizontal grid with control lines spaced no greater than 50 feet apart shall be developed when the subgrade fill nears the design elevation. Elevations shall be measured at the grid points and at grade breaks and compared to the design elevations.

4.00 LOW PERMEABILITY SOIL CAP BARRIER

4.10 PRE-CONSTRUCTION TESTING

Pre-construction testing has been completed for Somerset's on-site borrow source and has been qualified for use as low permeability soil for cap construction.

For any imported soils, preconstruction testing shall be performed by the Contractor on samples collected from the borrow pit (off-site) to:

- Identify the soil types(s);
- Estimate variability of soil properties at the pit;
- Determine viability of the borrow source for use as a low permeability soil; and
- Develop criteria for construction monitoring.

Pre-construction testing program shall be performed for the Potential Borrow Source. Steps to identify and characterize a Potential Borrow Source are as follows:

- Visit the potential source with the owner/contractor and identify the proposed limits of excavation and proposed excavation depth.
- Determine if a mining permit has been obtained from NYSDEC and the local municipality and compare permit information with the identified limits of excavation.
- Prepare a subsurface exploration program, the scope of which shall depend on

available subsurface data for the site. If there are no existing subsurface data, the exploration program could be a phased program, consisting of a preliminary screening in which widely spaced test pits or test borings are made to characterize the geology and identify the presence of suitable soil for landfill construction.

- Test soil samples from the explorations for index properties to confirm visual identifications and provide an initial assessment of permeability. Index tests are expected to include: natural moisture content (ASTM D2216), Atterberg limits (ASTM D4318) particle size distribution (ASTM D422) and moisture-density relationship (ASTM D1557).
- Compare the test data from the Potential Borrow Source to available test data from other sources to provide an initial estimate of permeability.
- Remold samples and measure their permeability to estimate the suitability for low permeable soil layer construction.

Laboratory Tests

Samples shall be laboratory tested for natural moisture content (ASTM D2216), Atterberg limits (ASTM D4318) and for particle size distribution (ASTM D422). These data shall be reviewed to estimate the suitability of Low Permeability Soil Cap Barrier (LPS) soils at the proposed borrow pit for landfill construction, to estimate the variability of the LPS properties, and to estimate the limits of suitable borrow at the proposed borrow pit. In addition and based on available test data, samples shall be tested for the moisture-density relationship using the modified Proctor test (ASTM D1557).

Several samples shall be selected and remolded at various dry densities and moisture contents and tested for permeability using a flexible wall permeameter (ASTM D 5084). Samples selected for this evaluation shall include those having the higher and lower Atterberg limits to measure the range of properties. It is expected that the:

- Dry density of remolded samples shall range from about 88 to 90 percent of the maximum dry density as measured by the modified Proctor test (ASTM D1557); and
- Remolded sample moisture content shall range from the optimum moisture content minus two percent to the optimum moisture content plus six percent.

These tests shall be done to estimate quantitatively the effect of moisture content and dry density on the LPS permeability and to establish parameters for field control (i.e. the combination of dry density and moisture content that can be used to achieve the desired permeability). It is expected that this relationship shall be established for two samples or more depending on the variability of the borrow source.

4.20 TEST PAD CONSTRUCTION

Test pad construction shall be done for all proposed off-site LPS borrow areas. The purpose of the proposed field test pad is to evaluate the suitability of the LPS construction procedures proposed by the contractor, to measure the soil properties when compacted in a construction site environment, and based on these data, to confirm or adjust the zone of acceptance for field control. Field variables that can affect the moisture-density-permeability relationship and are measured and controlled in the test pad and during construction of the full-scale LPS include the following:

- Compaction equipment type, configuration, and weight;
- Number of passes of the compaction equipment;
- Method used to break down clods before compaction and the maximum allowable clod size;
- Method used to control and adjust moisture content;
- Speed of the compaction equipment traveling over the cap soil; and
- Uncompacted and compacted lift thicknesses.

Additional variables to be evaluated by making measurements and sampling during the test pad construction include:

- Moisture-density permeability relationship; and
- Compactive effort required to achieve the minimum density.

The test pad shall be constructed at the SWDA II site on a 3H:1V side slope. Equipment used during test pad construction shall be that used during full scale facility construction. If equipment changes significantly during construction, a new test pad may be required by the CQA personnel. If any portion of the test pad does not satisfy the moisture, density or permeability requirements the area shall be reworked until tested to be satisfactory.

Test Pad set-up, construction and measurement techniques are as follows:

- Mark out an area where the test pad is to be constructed on prepared subgrade that is generally smooth and hard. The test pad shall be constructed on 3:1 side slopes. The test pad width shall be about 30 feet (allowing the establishment of two 15-foot wide “bays”) and a length of about 50 feet (allowing enough length for construction equipment to achieve and maintain a normal operating speed within the test pad area).
- Place survey stakes outside the test pad footprint and measure offsets across the test

pad to establish six (6) planned monitoring locations. A survey level and measuring tape shall be used take measurements of the subgrade, loose and compacted lift thicknesses.

- Record initial ground surface survey measurement at the planned monitoring locations. All planned monitoring locations are to be at least 5 feet from the perimeter of the test pad.
- The first loose lift of LPS material shall be placed to an approximate thickness of about 10-12 inches, using the same construction equipment and procedures that are expected during full-scale facility construction.
- Record the make, model, weight, and vibratory specifications of the construction and compaction equipment used for test pad construction.
- Vibratory sheepsfoot and smoothdrum rollers shall be used to effectively break up clods and achieve a uniform lift.
- Measure the maximum material clod size and material moisture content prior to compaction.
- Record measurements of uncompacted material at the planned monitoring locations and calculate the loose lift thickness.
- Operate the compaction equipment over the 2 bays making a total of 6 passes (4 with sheepsfoot and 2 with smoothdrum) in each bay. A “Pass” is defined as one forward or backward travel motion of the compaction equipment. The Engineer may adjust the number of passes dependent upon the material and compaction equipment.
- Record measurements of compacted material at the planned monitoring locations and calculate the compacted lift thickness.
- Perform in-place density and moisture (3 tests per bay per lift) at the planned monitoring locations to assess the efficiency of the compaction equipment.
- Collect two (2) thin-wall Shelby tube samples from each lift for laboratory permeability testing adjacent to moisture-density gauge test locations.
- One additional lift shall be placed over the test pad area for a total compacted thickness of 1.5 feet. The lift shall be spread and compacted using the same procedure and equipment as the first lift. Loose and compacted lift thicknesses shall

be measured and calculated similar to the first lift. In-place density and moisture measurements shall be performed similar to the first lift.

- Two (2) thin-wall Shelby tube samples shall be collected from the second lift.
- Shelby tube samples will be laboratory tested for permeability with the bottom portion of the tubes being tested.
- Granular Bentonite shall be used to fill all protrusions into the LPS, including Moisture-Density probes and Shelby tube locations.

4.30 TESTING DURING CONSTRUCTION

Field Tests and Observations

During construction, the Project Engineer and CQA personnel shall provide full-time construction observation and testing as noted below.

- Observe the placement and compaction of the 2 lifts of LPS cap barrier construction. The lifts shall be a maximum 10 to 12 inches loose to achieve a 9-inch thick compacted thickness.
- Observe the LPS upon delivery to identify any changes in its composition.
- Measure the in-place dry density and moisture content of the compacted LPS using a moisture-density gauge at a minimum testing frequency of at least nine tests per lift per acre per lift.
- Locations for in-situ testing shall be representative of the general compacted condition based on observations made during compaction.
- In-place moisture-density testing shall be performed in accordance with ASTM D2922 and ASTM D3017. The moisture-density gauges shall be factory calibrated every two years in accordance with the manufacturer's recommended frequency. Each unit shall be leak tested every six months. Periodic maintenance and services shall be completed as needed.
- All in-place moisture-density tests shall satisfy both the moisture and density criteria (established during pre-construction testing) before the next lift is placed.
- Each in-place test location will be recorded relative to the established survey control system. Approximate locations will be marked on a daily field report field sketch.
- Prepare plan sketches showing the approximate locations of acceptable in-place moisture and density tests for each lift.
- If any in-place moisture-density test results do not meet the project requirements, The Contractor will be advised and the following remedial efforts will be followed:

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- Dry Density too Low and Moisture Content Appears Suitable - Additional compactor passes shall be made.
 - Dry Density too Low and/or Moisture Content is Low - Scarification, water addition and recompaction.
 - Dry Density too Low and/or Moisture Content High - Scarification, aeration and drying, and recompaction.
 - Option for all Cases - Remove the lift requiring remediation and replace it with suitable material.
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- Following remediation efforts; retest within 5 feet of the original test location (unless the entire lift is removed). If the lift is removed and replaced, the subsequent in-place density and moisture test will be considered an original test.
 - Observe the surface of each completed and tested LPS lift before the placement of a subsequent overlying lift. Desiccated areas shall be noted and the contractor shall be required to remediate those areas (by wetting and scarification) before placing an overlying lift.
 - Observe the contractor grade and smooth-roll the LPS surface at the end of each day and prior to anticipated rain, to enhance runoff and minimize potential degradation due to excessive moisture. The contractor shall perform site grading to promote surface water runoff to the extent possible and practical. If surface water does collect on the low permeability soil cap, the contractor shall pump away water as soon as possible. Low permeability soil cap soils that have saturated and degraded due to exposure shall be remediated by reworking or excavation/replacement.
 - Collect thin-walled tube samples from each lift of LPS at the rate of one tube per acre after moisture-density test data have satisfied the required criteria. Shelby tubes shall be placed normal to the clay surface with the top of the tube covered with a protective wood block. The tube shall be pushed slowly, utilizing the contractor's bulldozer, to a depth of about 8 to 10 inches, covering the lift thickness. The tubes are then twisted to break the cohesion between the bottom of the LPS sample and the underlying soil; and extracted using the bulldozer blade and a chain attachment to the tube. The tube ends are sealed with caps and duct tape to limit moisture loss. The sample hole shall be filled with granulated bentonite by the CQA personnel.
 - Measure the location of thin-walled tube samples relative to the established field survey control system. This measurement should be done by the Contractor's surveyor (using location and elevation) in case its location needs to be established at a later date.
 - The Contractor shall deliver the thin-walled tube sample to the Contractor's soils laboratory where it shall be extruded and tested for permeability. The bottom portion of the tube sample shall be tested. Permeability test results are required to be

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- 1×10^{-5} cm/sec or less to be considered acceptable.
- Explore the causes for thin-walled tube samples that have a permeability greater than 1×10^{-5} cm/sec through the following methods.
 - Direct the contractor to excavate a 50-ft x 50-ft area centered around the thin-walled tube location with failing permeability data to the lift that the original tube was collected from.
 - The CQA Engineer shall observe the exposed lift to check if the failed tube was caused by non-clayey, coarse-grained soil or improper compaction/moisture content. If any of these conditions are observed the soil shall be removed and replaced to the extents of such conditions.
 - If the exposed lift appears clayey, moist and well-compacted, collect thin-walled tube samples from the 4 sides of the exposed lift in question and have each tube lab tested for permeability.
 - If all 4 tubes satisfy the permeability requirement, the exposed area shall be scarified with a sheepsfoot roller, watered and compacted. A minimum of 3 in-place moisture density tests shall be done of the reworked lift to check if the compacted lift meets the moisture density requirements. A thin-walled tube sample shall be collected from near the location of the original tube location and lab tested for permeability. If this tube does not meet the permeability requirement, the lift shall be removed and replaced to the extents of the tube samples meeting the permeability requirement. The replacement lift shall have a minimum of 3 in-place moisture density tests done to check if the compacted lift meets the moisture density requirements. A thin-walled tube sample shall be collected from the center of the area and lab tested for permeability.
 - For any of the 4 perimeter area tubes not meeting the permeability requirement, the lift in question shall be exposed further until satisfactory permeability is achieved, with remediation or replacement of lift as described above.

Laboratory Tests During Construction

The Contractor shall deliver thin-wall tube and bulk samples to their designated geotechnical testing laboratory.

Thin-Wall Tube Sample Testing:

- Measure its weight and dimension (height and diameter) and calculate the total unit weight of the sample collected.
- Extrude the sample from the thin-walled tube and observed its composition/structure.

- Defective (uncompacted) zones shall be noted and brought to the attention of the Project Manager, who may advise the contractor, depending on the magnitude and/or cause (e.g. sampling disturbance) of the defective zone, that remediation is required. The contractor shall then implement the remediation procedure, with guidance from the Field CQA Staff.
- Trim the bottom portion of the extruded sample, measure its height and diameter and place it in a flexible wall permeameter for permeability testing using the falling head permeability test method (ASTM D5084). The dry density of the sample shall be calculated. Samples trimmed from the extruded sample shall be combined into a composite sample and tested for moisture content.

Bulk Sample Testing:

The frequency of testing LPS material shall be based on preconstruction test results and visual observations of material variability. The minimum testing frequency combining both preconstruction and construction sampling is:

<u>Test Method</u>	<u>Minimum Test Frequency Total</u>
Moisture Content (ASTM D2216)	ea. 5,000 cubic yards
Atterberg Limits (ASTM D4318)	ea. 5,000 cubic yards
Gradation (ASTM D422)	ea. 5,000 cubic yards
Moisture/Density Relationship (ASTM D1557)	ea. 10,000 cubic yards
Remolded Permeability (ASTM D5084)	ea. 10,000 cubic yards
Shelby Tube Sample Permeability (ASTM D5084)	1/acre/lift

Survey Measurements

Following LPS cap construction, the Contractor's surveyor shall measure the elevation of the LPS cap surface in the same locations that measurements were made before construction to compute the thickness of the cap soil (minimum 18 inches). Locations not having a minimum 18 inches shall have additional soil placed and compacted, and the locations re-measured.

5.00 TOPSOIL & SEEDING

5.10 PRE-CONSTRUCTION TESTING

The Contractor shall provide the CQA Engineer test data from the proposed source(s) of samples tested by the Contractor. Each sample shall be tested for gradation, pH, and organic

content to evaluate the suitability of each proposed source. Topsoil shall be suitable to support vegetation or it shall not be approved.

5.20 TESTING DURING CONSTRUCTION

One sample for every 5,000 cubic yards of imported topsoil material shall be collected during construction and tested for gradation, pH and organic content. Additional samples shall be collected if the CQA Engineer visually observes that the material may not meet the pre-established criteria. If the soil laboratory test results do not meet the required criteria, the CQA Engineer shall notify Somerset and recommend procedures to remediate the situation or no additional topsoil material shall be placed until the material is supplied which meets the specified criteria.

5.30 POST-CONSTRUCTION AND OPTICAL SURVEY MEASUREMENTS

Following construction, the Contractor's surveyor shall measure the elevation of the topsoil in the same locations that measurements were made before construction to compute topsoil thickness. Locations not within design tolerances shall be regraded and the locations re-measured. All test data shall be required to satisfy the specified thickness

6.00 GEOTEXTILE

6.10 PRE-CONSTRUCTION MATERIAL EVALUATION

The Contractor shall submit manufacturer's quality control conformance test data as specified in the technical specifications. Geotextile installation shall not proceed until the pre-construction test results are completed, reviewed and accepted by the Engineer.

6.20 CONSTRUCTION

The Field CQA Staff shall:

- Check that the geotextile exposure time does not exceed 30 days;
- Observe the deployment of each geotextile roll;
- Advise the contractor of any observed defects, punctures and tears so that repairs can be made;
- Observe the seams and check them against specifications for compliance; and
- Observe that the deployment of geotextile is done manually.

6.30 SEAMS AND REPAIRS

All non-woven geotextile seams shall be joined as specified. Additionally, the methods and

materials for seaming shall be subject to the approval of the Project Manager or Project Engineer.

Tears shall be repaired by placing geotextile, as appropriate, over the damaged area such that a minimum overlap of 2 feet exists around the damaged area. The contractor shall be advised of the seam defects observed so that they can be corrected before the geotextile is covered.

At no time shall the installer use an open flame (blow torch) to seam, attach or secure the geotextile materials. Smoking, as well as fueling and re-fueling of equipment is prohibited on any geosynthetic materials.

7.00 RIPRAP

7.10 PRE-CONSTRUCTION MATERIAL EVALUATION

It is expected that riprap will be supplied by a NYSDOT approved source. If a non-approved source is proposed, then the Contractor will be required to provide additional laboratory test data to demonstrate that the proposed source meets the NYSDOT standards, as specified.

7.20 CONSTRUCTION QUALITY EVALUATION

Field Tests and Sampling

GZA will visually observe the riprap as it is unloaded at the site and compare the visual observations to the appropriate gradation specification. The QA Engineer will require additional samples of riprap be tested for gradation during construction if visual observations suggest that the riprap is not in compliance with the specifications.

7.30 SURVEY MEASUREMENTS

The Owner's Surveyor will measure the locations and elevations of the top of the riprap following construction and compare them to the design lines, grades and thicknesses. Locations not within design tolerances will be re-graded and the locations re-measured as appropriate.