APPENDIX D

DIRECT SHEAR INTERFACE TEST RESULTS

5 April 2009

Mr. David Steele
Parsons
290 Elwood Davis Road, Suite 312
Liverpool, NY 13088

Subject: Laboratory Test Results Transmittal
Interface Direct Shear Testing

Dear Mr. Barker,

SGI Testing Services, LLC (SGI) is pleased to present the attached results for the above-mentioned testing program. The note section below addresses sample preparation, sample disposal and a disclosure statement.

SGI appreciates the opportunity to provide laboratory testing services to Parsons. Should you have any questions regarding the attached document(s), or if you require additional information, please do not hesitate to contact the undersigned.

Sincerely,

Zehong Yuan, Ph.D., P.E.
Laboratory Manager

Attachments

Notes:
(1) Unless otherwise noted in the test results the sample(s)/specimen(s) were prepared in accordance with the applicable test standards or generally accepted sampling procedures.
(2) Contaminated/chemical samples and all related laboratory generated waste (i.e., test liquids, PPE, absorbents, etc.) will be returned to the client or designated representative(s), at the client's cost, within 60 days following the completion of the testing program, unless special arrangements for proper disposal are made with SGI.
(3) Materials that are not contaminated will be discarded after test specimens and archived specimens are obtained. Archived specimens will be discarded 30 days after the completion of the testing program, unless long-term storage arrangements are specifically made with SGI.
(4) The reported results apply only to the materials and test conditions used in the laboratory testing program. The results do not necessarily apply to other materials or test conditions. The test results should not be used in engineering analysis unless the test conditions model the anticipated field conditions. The testing was performed in accordance with general engineering testing standards and requirements. The reported results are submitted for the exclusive use of the client to whom they are addressed.

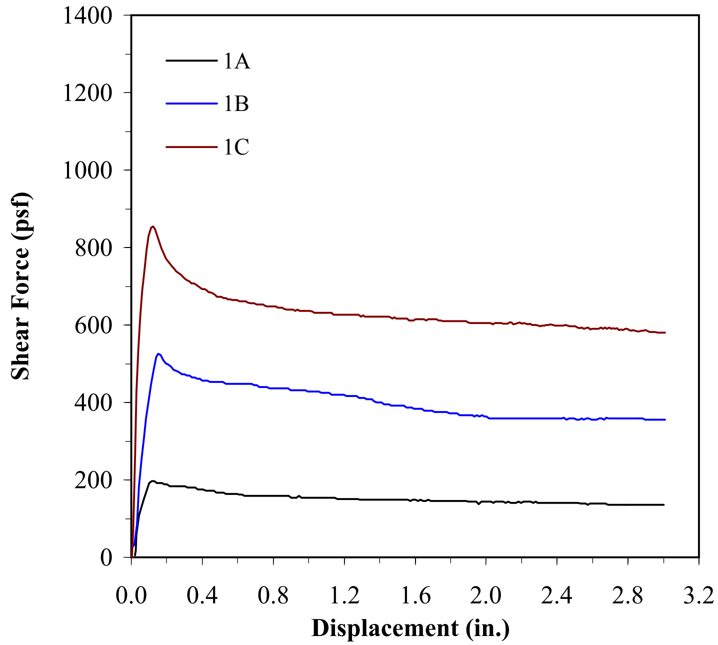
SGI9002.REPORT.09.01

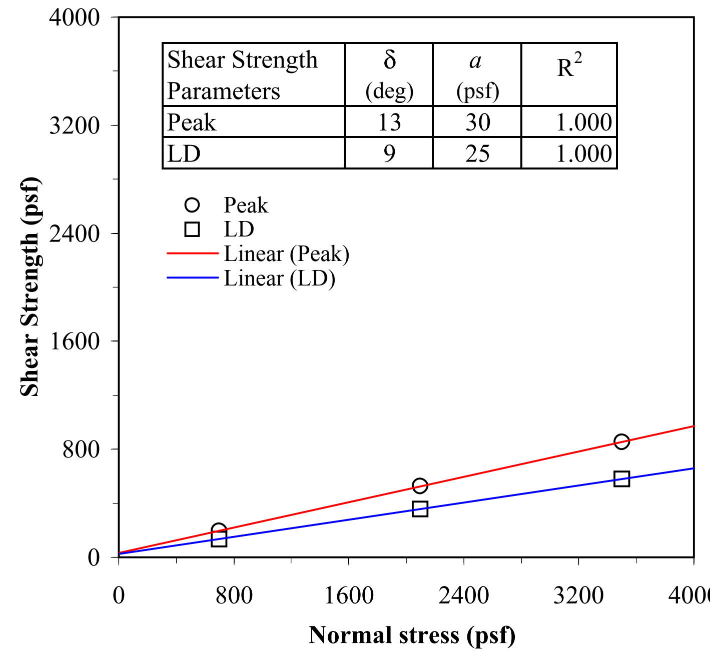
ATTACHMENT A

INTERFACE DIRECT SHEAR TEST RESULTS

PARSONS
INTERFACE DIRECT SHEAR TESTING (ASTM D 5321)

Upper Shear Box: Concrete sand
TenCate S1600 (16 oz) nonwoven geotextile #000167745 with non heat-treated side down/
GSE 40-mil double smooth HDPE geomembrane # 101130132/
Lower Shear Box: Clay soil compacted to approximately 95% of max modified Proctor density at 3% wet of optimum moisture content





Shear Strength Parameters	δ (deg)	*a* (psf)	R^2
Peak	13	30	1.000
LD	9	25	1.000

Test No.	Shear Box Size (in. x in.)	Normal Stress (psf)	Shear Rate (in./min)	GCL Soaking		Consolidation		Clay Soil			Upper Soil			GCL		Shear Stress		Failure Mode
				Stress (psf)	Time (hour)	Stress (psf)	Time (hour)	γ_d (pcf)	ω_i (%)	ω_f (%)	γ_d (pcf)	ω_i (%)	ω_f (%)	ω_i (%)	ω_f (%)	τ_P (psf)	τ_{LD} (psf)	
1A	12 x 12	700	0.04	-	-	-	-	118.6	13.9	13.1	-	-	-	-	-	196	135	(1)
1B	12 x 12	2100	0.04	-	-	-	-	118.9	13.6	12.5	-	-	-	-	-	526	355	(1)
1C	12 x 12	3500	0.04	-	-	-	-	119.3	13.2	12.7	-	-	-	-	-	855	580	(1)

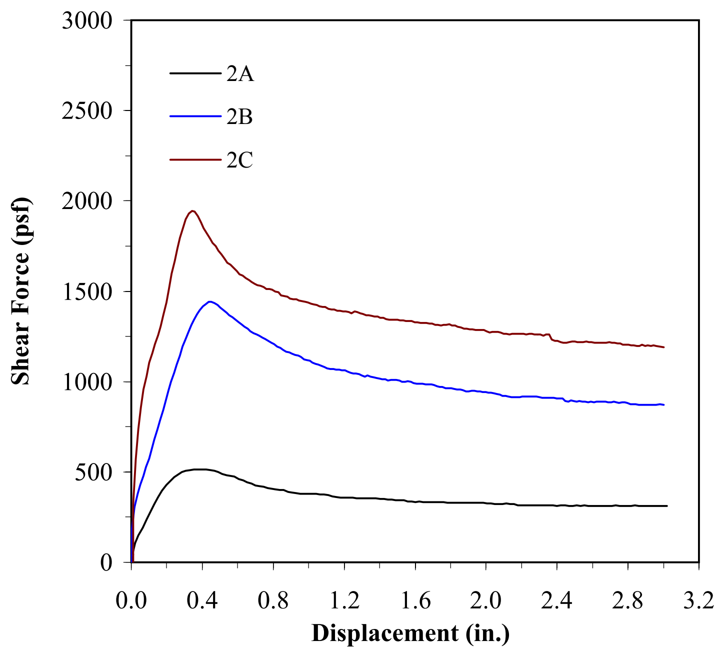
NOTES:
(1) Sliding (i.e., shear failure) occurred at the interface between the non heat-treated side of 16 oz nonwoven geotextile and geomembrane.
(2) Each geosynthetic specimen was tested in the machine direction (i.e., direction of shearing parallel to MD)

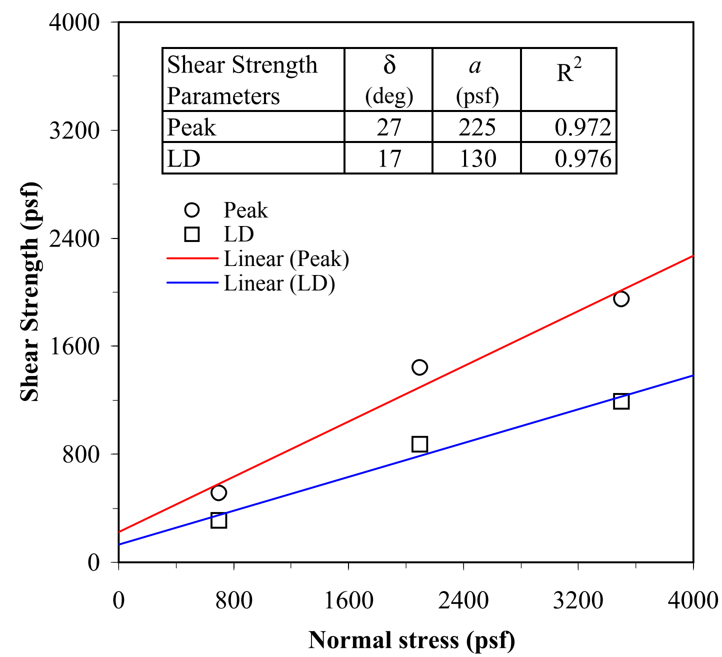
DATE OF REPORT:	2/2/2009
FIGURE NO.	C-1
PROJECT NO.	SGI9002
DOCUMENT NO.	
FILE NO.	

SGI TESTING SERVICES, LLC

PARSONS
INTERFACE DIRECT SHEAR TESTING (ASTM D 5321)

Upper Shear Box: Concrete sand
TenCate S1600 (16 oz) nonwoven geotextile #000167745 with non heat-treated side down/
GSE 40-mil double textured HDPE geomembrane # 105140273/
Lower Shear Box: Clay soil compacted to approximately 95% of max modified Proctor density at 3% wet of optimum moisture content





Test No.	Shear Box Size (in. x in.)	Normal Stress (psf)	Shear Rate (in./min)	GCL Soaking Stress (psf)	GCL Soaking Time (hour)	Consolidation Stress (psf)	Consolidation Time (hour)	Clay Soil γ_d (pcf)	Clay Soil ω_i (%)	Clay Soil ω_f (%)	Upper Soil γ_d (pcf)	Upper Soil ω_i (%)	Upper Soil ω_f (%)	GCL ω_i (%)	GCL ω_f (%)	Shear Stress τ_P (psf)	Shear Stress τ_{LD} (psf)	Failure Mode
2A	12 x 12	700	0.04	-	-	-	-	119.6	12.9	12.2	-	-	-	-	-	514	310	(1)
2B	12 x 12	2100	0.04	-	-	-	-	119.9	12.6	12.0	-	-	-	-	-	1441	870	(1)
2C	12 x 12	3500	0.04	-	-	-	-	118.9	13.6	12.9	-	-	-	-	-	1946	1189	(1)

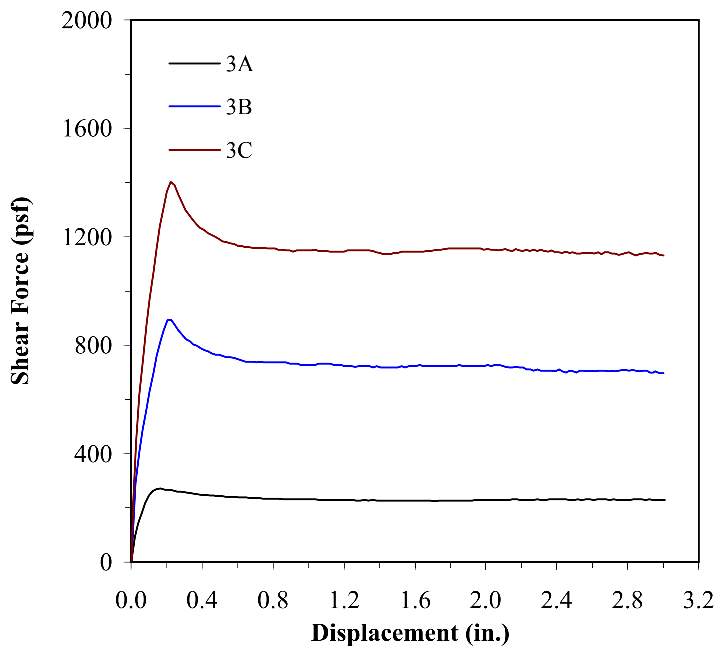
NOTES:
(1) Sliding (i.e., shear failure) occurred at the interface between the non heat-treated side of 16 oz nonwoven geotextile and geomembrane.
(2) Each geosynthetic specimen was tested in the machine direction (i.e., direction of shearing parallel to MD)

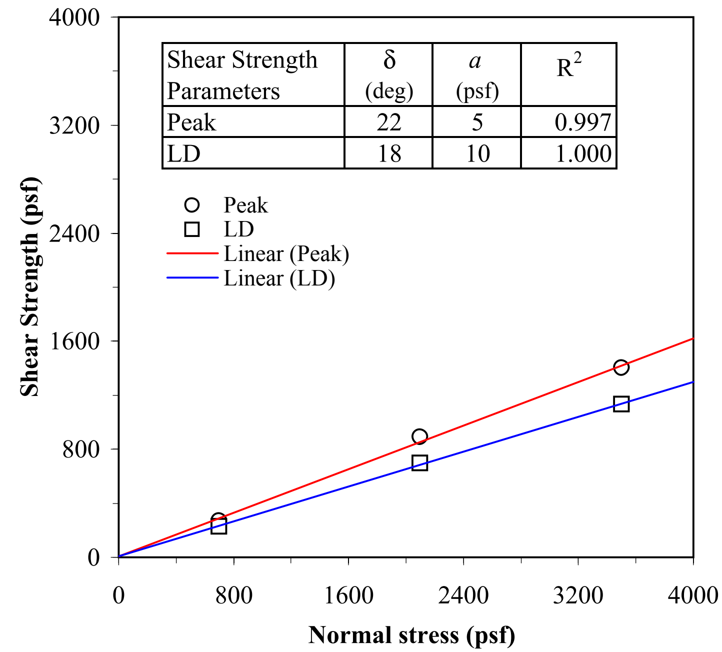
DATE OF REPORT:	2/2/2009
FIGURE NO.	C-2
PROJECT NO.	SGI9002
DOCUMENT NO.	
FILE NO.	

SGI TESTING SERVICES, LLC

PARSONS
INTERFACE DIRECT SHEAR TESTING (ASTM D 5321)

Upper Shear Box: Concrete sand
TenCate S1600 (16 oz) nonwoven geotextile #000167745 with non heat-treated side down/
40-mil EPDM geomembrane # AZ 12343/
Lower Shear Box: Clay soil compacted to approximately 95% of max modified Proctor density at 3% wet of optimum moisture content





Shear Strength Parameters	δ (deg)	*a* (psf)	R^2
Peak	22	5	0.997
LD	18	10	1.000

Test No.	Shear Box Size (in. x in.)	Normal Stress (psf)	Shear Rate (in./min)	GCL Soaking Stress (psf)	GCL Soaking Time (hour)	Consolidation Stress (psf)	Consolidation Time (hour)	Clay Soil γ_d (pcf)	Clay Soil ω_i (%)	Clay Soil ω_f (%)	Upper Soil γ_d (pcf)	Upper Soil ω_i (%)	Upper Soil ω_f (%)	GCL ω_i (%)	GCL ω_f (%)	Shear Stress τ_P (psf)	Shear Stress τ_{LD} (psf)	Failure Mode
3A	12 x 12	700	0.04	-	-	-	-	119.8	12.7	12.3	-	-	-	-	-	271	228	(1)
3B	12 x 12	2100	0.04	-	-	-	-	119.4	13.1	12.5	-	-	-	-	-	892	697	(1)
3C	12 x 12	3500	0.04	-	-	-	-	119.1	13.4	12.8	-	-	-	-	-	1402	1132	(1)

NOTES:
(1) Sliding (i.e., shear failure) occurred at the interface between the non heat-treated side of 16 oz nonwoven geotextile and geomembrane.
(2) Each geosynthetic specimen was tested in the machine direction (i.e., direction of shearing parallel to MD)

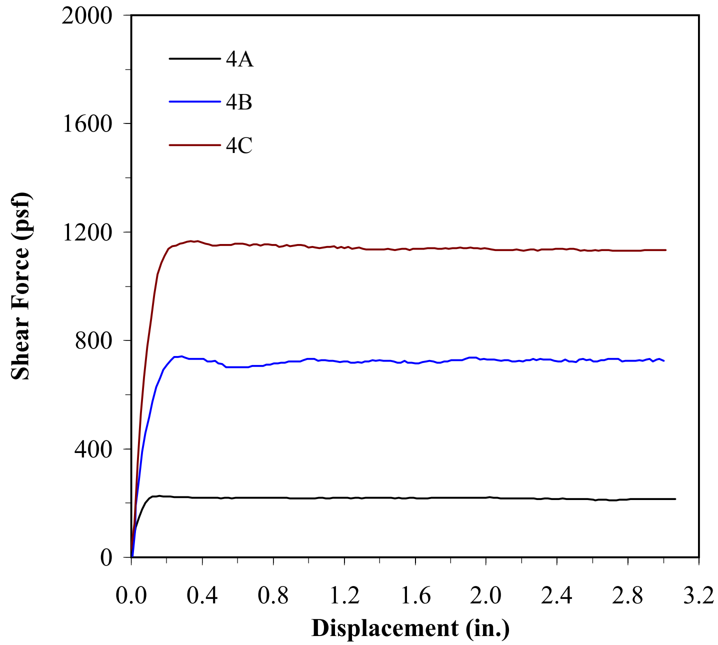
DATE OF REPORT:	2/4/2009
FIGURE NO.	C-3
PROJECT NO.	SGI9002
DOCUMENT NO.	
FILE NO.	

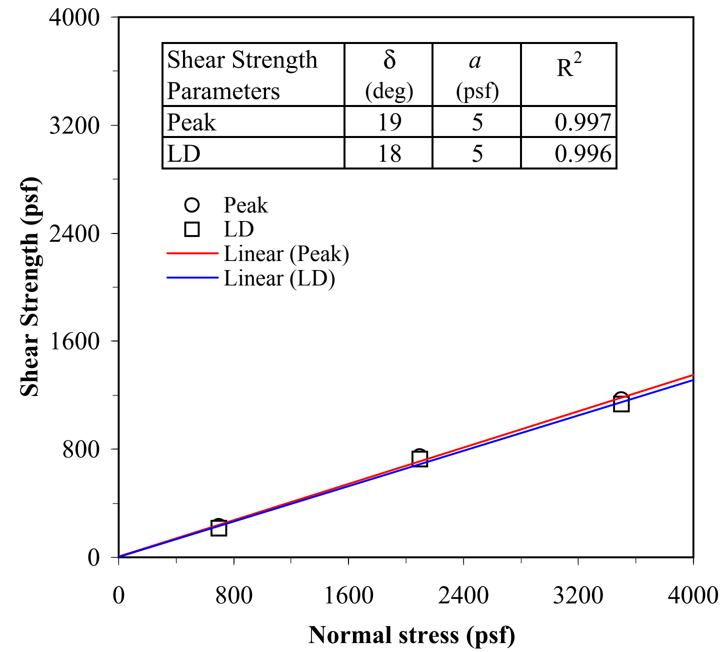
SGI TESTING SERVICES, LLC

PARSONS

INTERFACE DIRECT SHEAR TESTING (ASTM D 5321)

Upper Shear Box: Concrete sand
TenCate S1600 (16 oz) nonwoven geotextile #000167745 with non heat-treated side down/
40-mil PP geomembrane with rough side up to geotextile and smooth side down to clay soil/
Lower Shear Box: Clay soil compacted to approximately 95% of max modified Proctor density at 3% wet of optimum moisture content





Test No.	Shear Box Size (in. x in.)	Normal Stress (psf)	Shear Rate (in./min)	GCL Soaking		Consolidation		Clay Soil			Upper Soil			GCL		Shear Stress		Failure Mode
				Stress (psf)	Time (hour)	Stress (psf)	Time (hour)	γ_d (pcf)	ω_i (%)	ω_f (%)	γ_d (pcf)	ω_i (%)	ω_f (%)	ω_i (%)	ω_f (%)	τ_P (psf)	τ_{LD} (psf)	
4A	12 x 12	700	0.04	-	-	-	-	118.6	13.9	13.3	-	-	-	-	-	226	215	(1)
4B	12 x 12	2100	0.04	-	-	-	-	119.0	13.5	12.9	-	-	-	-	-	742	726	(1)
4C	12 x 12	3500	0.04	-	-	-	-	118.8	13.7	12.5	-	-	-	-	-	1166	1133	(1)

NOTES:
(1) Sliding (i.e., shear failure) occurred at the interface between the non heat-treated side of 16 oz nonwoven geotextile and rough side of geomembrane.
(2) Each geosynthetic specimen was tested in the machine direction (i.e., direction of shearing parallel to MD)

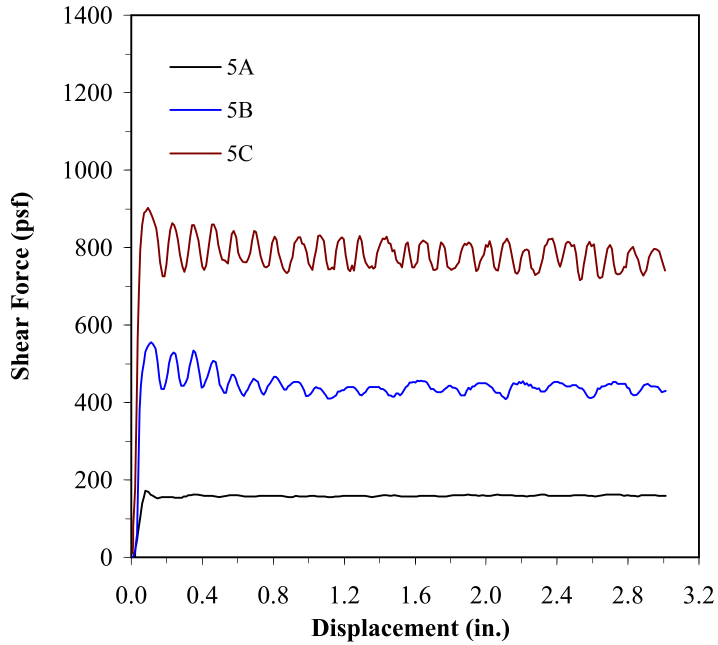
DATE OF REPORT:	2/4/2009
FIGURE NO.	C-4
PROJECT NO.	SGI9002
DOCUMENT NO.	
FILE NO.	

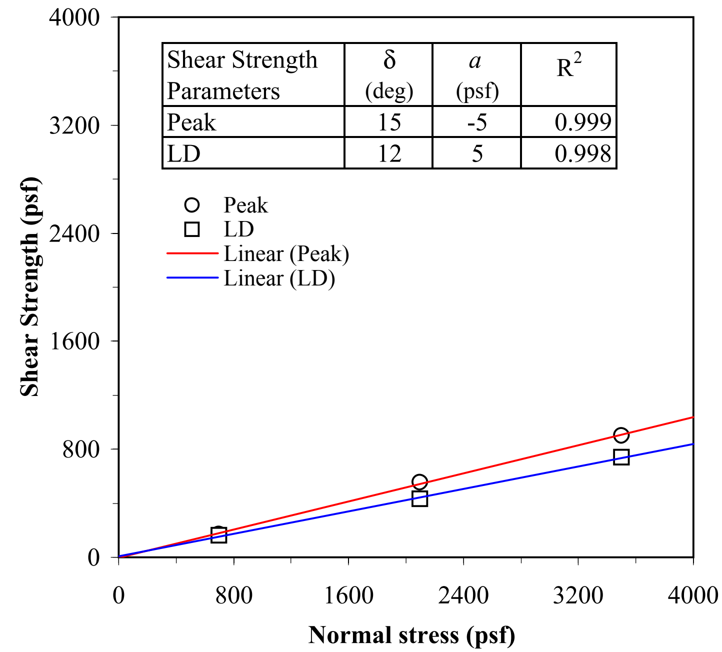
SGI TESTING SERVICES, LLC

PARSONS

INTERFACE DIRECT SHEAR TESTING (ASTM D 5321)

Upper Shear Box: Rigid substrate
TenCate GT500 geotextile #021812318 in the machine direction/
TenCate GT500 geotextile #021812318 in the machine direction
Lower Shear Box: Concrete sand





Shear Strength Parameters	δ (deg)	*a* (psf)	R^2
Peak	15	-5	0.999
LD	12	5	0.998

Test No.	Shear Box Size (in. x in.)	Normal Stress (psf)	Shear Rate (in./min)	GCL Soaking Stress (psf)	GCL Soaking Time (hour)	Consolidation Stress (psf)	Consolidation Time (hour)	Clay Soil γ_d (pcf)	Clay Soil ω_i (%)	Clay Soil ω_f (%)	Upper Soil γ_d (pcf)	Upper Soil ω_i (%)	Upper Soil ω_f (%)	GCL ω_i (%)	GCL ω_f (%)	Shear Stress τ_P (psf)	Shear Stress τ_{LD} (psf)	Failure Mode
5A	12 x 12	700	0.04	-	-	-	-	-	-	-	-	-	-	-	-	172	159	(1)
5B	12 x 12	2100	0.04	-	-	-	-	-	-	-	-	-	-	-	-	555	429	(1)
5C	12 x 12	3500	0.04	-	-	-	-	-	-	-	-	-	-	-	-	902	741	(1)

NOTES:
(1) Sliding (i.e., shear failure) occurred at the interface between the GT500 geotextile and GT500 geotextile.
(2) Each geosynthetic specimen was tested in the machine direction (i.e., direction of shearing parallel to MD)

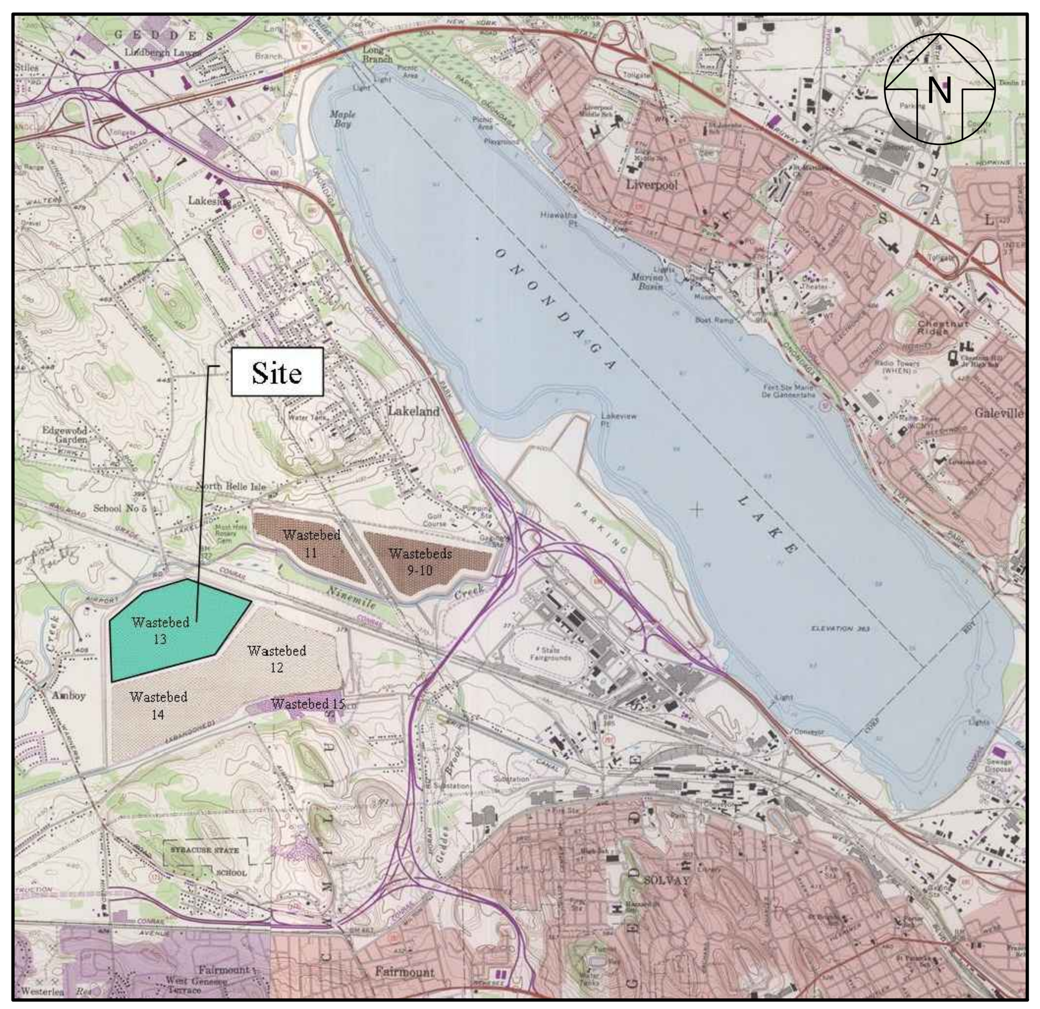
SGI TESTING SERVICES, LLC

DATE OF REPORT:	2/2/2009
FIGURE NO.	C-5
PROJECT NO.	SGI9002
DOCUMENT NO.	
FILE NO.	

APPENDIX E

DRAWINGS

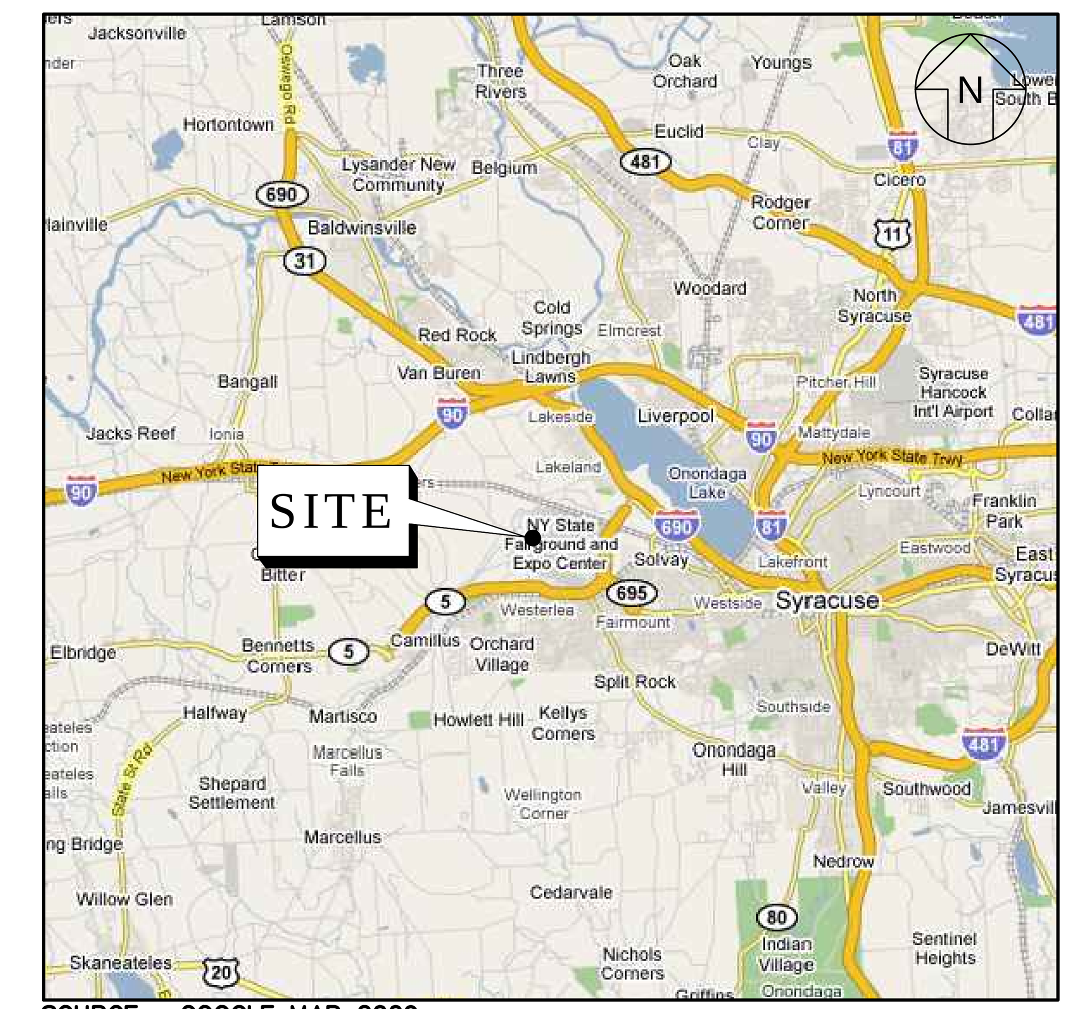
SEDIMENT CONSOLIDATION AREA INITIAL DESIGN
CAMILLUS, NEW YORK
GJ4299.03
AUGUST 2009



VICINITY MAP
NOT TO SCALE

LIST OF DRAWINGS

DRAWING NO.	DRAWING TITLE
1	COVER SHEET
2	EXISTING SITE CONDITIONS
3	BERM AND SUBGRADE GRADING PLAN
4	TOP OF LOW PERMEABILITY SOIL LINER
5	SUMP GRADING PLAN
6	TOP OF GRAVEL DRAINAGE LAYER
7	INSTRUMENTATION AND MONITORING PLAN
8	POST-SETTLEMENT CROSS SECTIONS
9	LINER SYSTEM DETAILS
10	LIQUIDS MANAGEMENT SYSTEM DETAILS
11	INSTRUMENTATION AND MONITORING DETAILS
12	CONCEPTUAL TOP OF GEOTEXTILE TUBES
13	CONCEPTUAL TOP OF FINAL COVER
14	CONCEPTUAL SURFACE WATER MANAGEMENT PLAN
15	OPTIONAL CONCEPTUAL TOP OF GEOTEXTILE TUBES
16	OPTIONAL CONCEPTUAL TOP OF FINAL COVER



SOURCE: GOOGLE MAP 2009

LOCATION MAP
NOT TO SCALE

NOT FOR CONSTRUCTION

PREPARED FOR:

Honeywell

101 COLUMBIA ROAD
P.O. BOX 2105
MORRISTOWN, NJ 07962

DETAIL NUMBER
4 / 6
SHEET ON WHICH ABOVE DETAIL IS PRESENTED

DETAIL NUMBER — 4 / 3 — DETAIL
SHEET ON WHICH ABOVE DETAIL WAS FIRST REFERENCED
TITLE OF DETAIL
SCALE: 1"=2'

EXAMPLE: DETAIL NUMBER 4 PRESENTED ON SHEET NO. 6 WAS REFERENCED FOR THE FIRST TIME ON SHEET NO.3.

ABOVE SYSTEM ALSO APPLIES TO SECTION IDENTIFICATIONS.

DETAIL IDENTIFICATION LEGEND

PREPARED BY:

Geosyntec consultants
1255 ROBERTS BOULEVARD, NW, SUITE 200
KENNESAW, GEORGIA 30144-3694
TELEPHONE: 678.202.9500

PARSONS
301 PLAINFIELD ROAD, SUITE 350
SYRACUSE, NEW YORK 13212
TELEPHONE: 315.451.9560

NOTES:

Geosyntec consultants
1255 ROBERTS BOULEVARD, N.W., SUITE 200
KENNESAW, GEORGIA 30144 USA
PHONE: 678.202.9500

NO.	DESCRIPTION	DATE	DRAWN	CHK'D	APPV'D
A	INITIAL DESIGN SUBMITTAL				

	DATE
DRAWN BY JHS	AUG 2009
CHECKED BY RK	AUG 2009
APPROVED BY JFB	AUG 2009
PROJECT MGR. JFB	AUG 2009

SEAL

PARSONS
COMMERCIAL TECHNOLOGY GROUP

OFFICE
301 PLAINFIELD ROAD
SYRACUSE, NY 13212
(315) 451-9560

JOB 444853
WBS

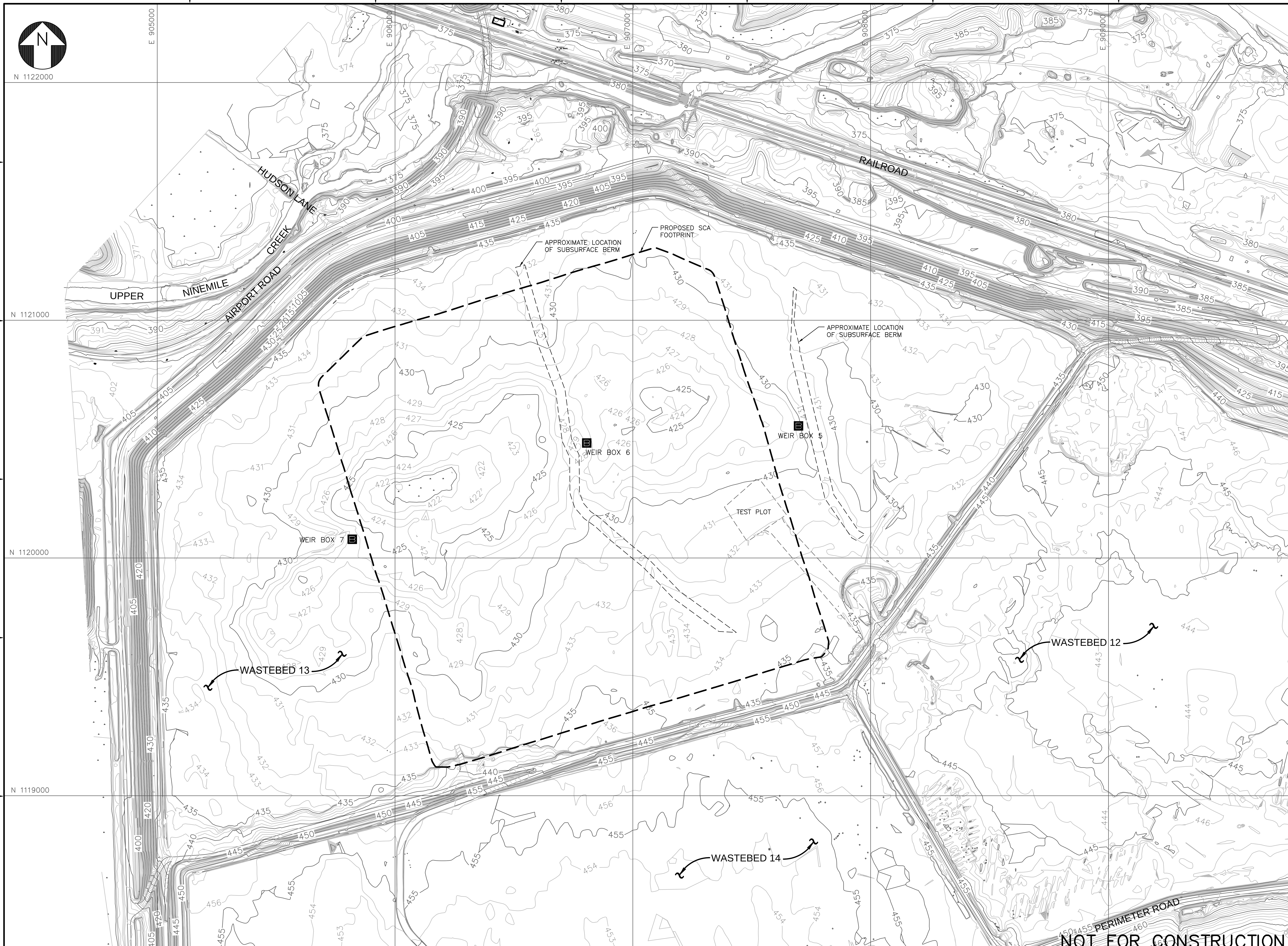
PROJECT TITLE
Honeywell
SEDIMENT CONSOLIDATION AREA
ONONDAGA LAKE BOTTOM
SUBSITE REMEDIAL DESIGN

DRAWING TITLE
COVER SHEET

SCALE
SCALE: NOT TO SCALE

DRAWING NO. 444853-101-C-001
REV. A

NOTICE:
THIS DRAWING, THE PROPERTY OF HONEYWELL IS FURNISHED SUBJECT TO RETURN ON DEMAND AND THE CONDITION THAT THE INFORMATION AND TECHNOLOGY EMBODIED HEREIN SHALL NOT BE DISCLOSED OR USED AND THE DRAWING SHALL NOT BE REPRODUCED OR COPIED IN WHOLE OR IN PART EXCEPT AS PREVIOUSLY AUTHORIZED IN WRITING. ANY PERSON WHO MAY RECEIVE OR OBSERVE THIS DESIGN WILL BE HELD STRICTLY LIABLE FOR ANY VIOLATION WHETHER WILLFUL OR NEGLIGENT.



NOT FOR CONSTRUCTION

NOTES:

1. THE TOPOGRAPHIC CONTOURS SHOWN ON THIS DRAWING WERE OBTAINED FROM A TOPOGRAPHIC MAP COMPILED BY TVGA CONSULTANTS USING PHOTOGRAMMETRIC METHODS BASED ON AERIAL PHOTOGRAPHY PERFORMED ON 6 APRIL 2008. THE MAP WAS COMPILED IN ACCORDANCE WITH NATIONAL MAP ACCURACY STANDARDS FOR 1 INCH EQUAL TO 50 FEET SCALE. THE TOPOGRAPHIC MAP WAS PROVIDED TO GEOSYNTEC BY PARSONS.
2. COORDINATES SHOWN HEREIN ARE EXPRESSED IN U.S. SURVEY FEET AND REFERENCED TO THE NORTH AMERICAN DATUM OF 1983/1996 (NAD 83/96) – NEW YORK STATE PLANE GRID, ZONE CENTRAL. ELEVATIONS SHOWN HEREIN ARE EXPRESSED IN FEET AND REFERENCED TO THE NATIONAL GEODETIC VERTICAL DATUM OF 1988 (NGVD 88).
3. A FIELD SURVEY SHOULD BE PERFORMED FOR THE PROPOSED SCA AREA BEFORE FINALIZING CONSTRUCTION LEVEL DRAWINGS.

LEGEND

430 — EXISTING GROUND ELEVATION (FEET) (NOTE 1)

EXISTING ROAD

WEIR BOX 5 — EXISTING WEIR BOX

0 200' 400'
SCALE IN FEET

Geosyntec consultants
1255 ROBERTS BOULEVARD, N.W., SUITE 200
KENNESAW, GEORGIA 30144 USA
PHONE: 678.202.9500

NO.	DESCRIPTION	DATE	DRAWN	CHK'D	APPV'D
A	INITIAL DESIGN SUBMITTAL				

DRAWN BY: JHS	DATE: AUG 2009	SEAL
CHECKED BY: RK	DATE: AUG 2009	
APPROVED BY: JFB	DATE: AUG 2009	
PROJECT MGR.: JFB	DATE: AUG 2009	

PARSONS
COMMERCIAL TECHNOLOGY GROUP
OFFICE: 301 PLAINFIELD ROAD, SYRAUSE, NY 13212, (315) 451-9560

JOB: 444853
WBS:

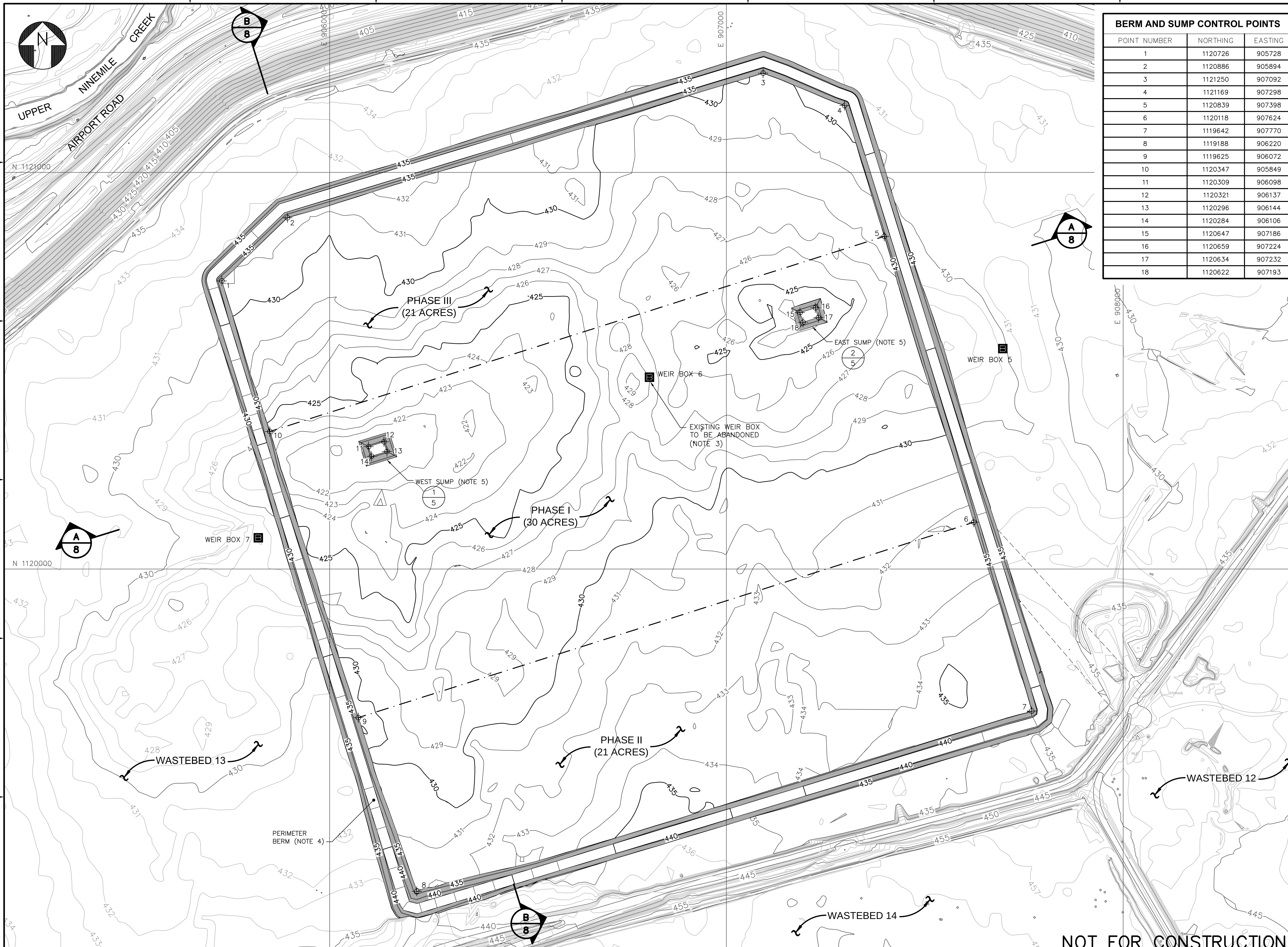
PROJECT TITLE: **Honeywell**
SEDIMENT CONSOLIDATION AREA
ONONDAGA LAKE BOTTOM
SUBSITE REMEDIAL DESIGN

DRAWING TITLE: EXISTING SITE CONDITIONS

SCALE: 1" = 200'

DRAWING NO.: 444853-101-C-002 REV.: A

FILE NAME: L:\CADD\O\ONONDAGA LAKE\PERMIT\SCA GEOTUBES\50-PERCENT DESIGN GJ4299.01.01\DRAWINGS\4299-002.DWG
PLOT DATE: 4/16/2007 12:45 PM PLOTTED BY: JONATHAN SPEED



BERM AND SUMP CONTROL POINTS

POINT NUMBER	NORTHING	EASTING
1	1120726	905728
2	1120886	905894
3	1121250	907092
4	1121169	907298
5	1120839	907398
6	1120118	907624
7	1119642	907770
8	1119188	906220
9	1119625	906072
10	1120347	905849
11	1120309	906098
12	1120321	906137
13	1120296	906144
14	1120284	906106
15	1120647	907186
16	1120659	907224
17	1120634	907232
18	1120622	907193

NOTES:

1. THE TOPOGRAPHIC CONTOURS SHOWN ON THIS DRAWING WERE OBTAINED FROM A TOPOGRAPHIC MAP COMPILED BY TVGA CONSULTANTS USING PHOTOGRAMMETRIC METHODS BASED ON AERIAL PHOTOGRAPHY PERFORMED ON 6 APRIL 2008. THE MAP WAS COMPILED IN ACCORDANCE WITH NATIONAL MAP ACCURACY STANDARDS FOR 1 INCH EQUAL TO 50 FEET SCALE. THE TOPOGRAPHIC MAP WAS PROVIDED TO GEOSYNTEC BY PARSONS.
2. THE SCA DESIGN SHOWN ON THIS DRAWING IS FOR A CAPACITY OF 2.65 MILLION CUBIC YARDS.
3. WEIR BOX NO. 6 SHALL BE ABANDONED BEFORE BEGINNING CONSTRUCTION. AN EVALUATION OF THE STRUCTURAL INTEGRITY OF WEIR BOXES NOS. 5 AND 7 SHALL BE PERFORMED.
4. THE PERIMETER BERM SHALL HAVE A MINIMUM HEIGHT OF 5 FEET WITH 2.5H:1V SIDE SLOPES.
5. EXCAVATIONS SHALL BE PERFORMED AT PROPOSED SUMP LOCATIONS PER THE GRADES PRESENTED ON DRAWING NO. 5.

LEGEND

- 430 — EXISTING GROUND ELEVATION (FEET) (NOTE 1)
- 440 — PROPOSED PERIMETER BERM (NOTE 4)
- EXISTING ROAD
- WEIR BOX 5 — EXISTING WEIR BOX
- PHASE BOUNDARY

0 120' 240'
SCALE IN FEET

Geosyntec consultants
1255 ROBERTS BOULEVARD, N.W., SUITE 200
KENNESAW, GEORGIA 30144 USA
PHONE: 678.202.9500

NO.	DESCRIPTION	DATE	DRAWN	CHK'D	APPV'D
A	INITIAL DESIGN SUBMITTAL				

	DATE
DRAWN BY JHS	AUG 2009
CHECKED BY RK	AUG 2009
APPROVED BY JFB	AUG 2009
PROJECT MGR. JFB	AUG 2009

SEAL

PARSONS
COMMERCIAL TECHNOLOGY GROUP
OFFICE
301 PLAINFIELD ROAD
SYRACUSE, NY 13212
(315) 451-9560

JOB 444853
WBS

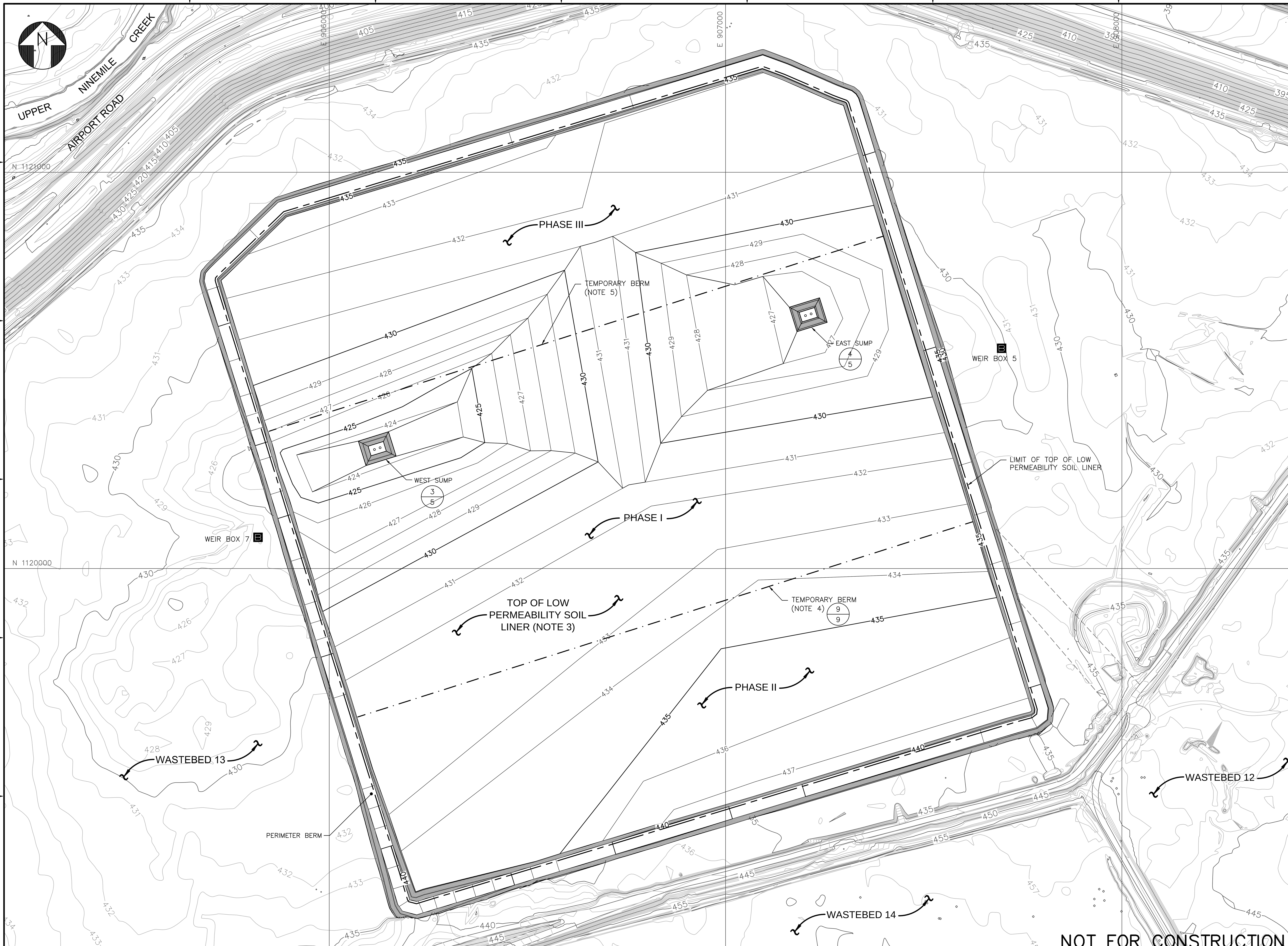
PROJECT TITLE
Honeywell
SEDIMENT CONSOLIDATION AREA
ONONDAGA LAKE BOTTOM
SUBSITE REMEDIAL DESIGN

DRAWING TITLE
BERM AND SUBGRADE
GRADING PLAN

SCALE: 1" = 120'

DRAWING NO. 444853-101-C-003 REV. A

FILE NAME: L:\CADD\01\ONONDAGA LAKE\PERMIT\SCA GEOTUBES\50-PERCENT DESIGN GJ4299.01.01\DRAWINGS\4299-003.DWG
PLOT DATE: 4/16/2007 12:45 PM PLOTTED BY: JONATHAN SPEED



NOTES:

1. THE TOPOGRAPHIC CONTOURS SHOWN ON THIS DRAWING WERE OBTAINED FROM A TOPOGRAPHIC MAP COMPILED BY TVGA CONSULTANTS USING PHOTOGRAMMETRIC METHODS BASED ON AERIAL PHOTOGRAPHY PERFORMED ON 6 APRIL 2008. THE MAP WAS COMPILED IN ACCORDANCE WITH NATIONAL MAP ACCURACY STANDARDS FOR 1 INCH EQUAL TO 50 FEET SCALE. THE TOPOGRAPHIC MAP WAS PROVIDED TO GEOSYNTEC BY PARSONS.
2. THE SCA DESIGN SHOWN ON THIS DRAWING IS FOR A CAPACITY OF 2.65 MILLION CUBIC YARDS.
3. LOW PERMEABILITY SOIL LAYER THICKNESS WILL BE USED TO VERIFY THAT THE MINIMUM THICKNESS REQUIREMENTS ARE MET AS PRESENTED IN THE TECHNICAL SPECIFICATIONS. THE ELEVATION MEASUREMENTS OF THE TOP OF THE LOW PERMEABILITY SOIL LAYER TAKEN AFTER THE CONSTRUCTION SHALL BE USED TO VERIFY GENERAL CONFORMANCE WITH DESIGN SLOPES TO MEET POSITIVE DRAINAGE REQUIREMENTS AS PRESENTED IN THE TECHNICAL SPECIFICATIONS. DUE TO THE COMPRESSIBLE NATURE OF THE FOUNDATION, A STRICT CONFORMANCE WITH THE DESIGN ELEVATIONS IS NOT REQUIRED.
4. THE TEMPORARY BERM ON THE SOUTHERN PERIMETER OF PHASE I LINER SYSTEM SHALL BE REMOVED TO TIE-IN PHASE II LINER SYSTEM.
5. THE TEMPORARY BERM ON THE NORTHERN PERIMETER OF PHASE I LINER SYSTEM SHALL BE REMOVED TO TIE-IN PHASE III LINER SYSTEM IF NEEDED.

LEGEND

Symbol	Description
—430—	EXISTING GROUND ELEVATION (FEET) (NOTE 1)
—440—	PROPOSED PERIMETER BERM
	EXISTING ROAD
WEIR BOX 5	EXISTING WEIR BOX
— · —	PHASE BOUNDARY

0 120' 240'
SCALE IN FEET

Geosyntec consultants
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NO.	DESCRIPTION	DATE	DRAWN	CHK'D	APPV'D
A	INITIAL DESIGN SUBMITTAL				

	DATE
DRAWN BY JHS	AUG 2009
CHECKED BY RK	AUG 2009
APPROVED BY JFB	AUG 2009
PROJECT MGR. JFB	AUG 2009

SEAL

PARSONS
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JOB 444853
WBS

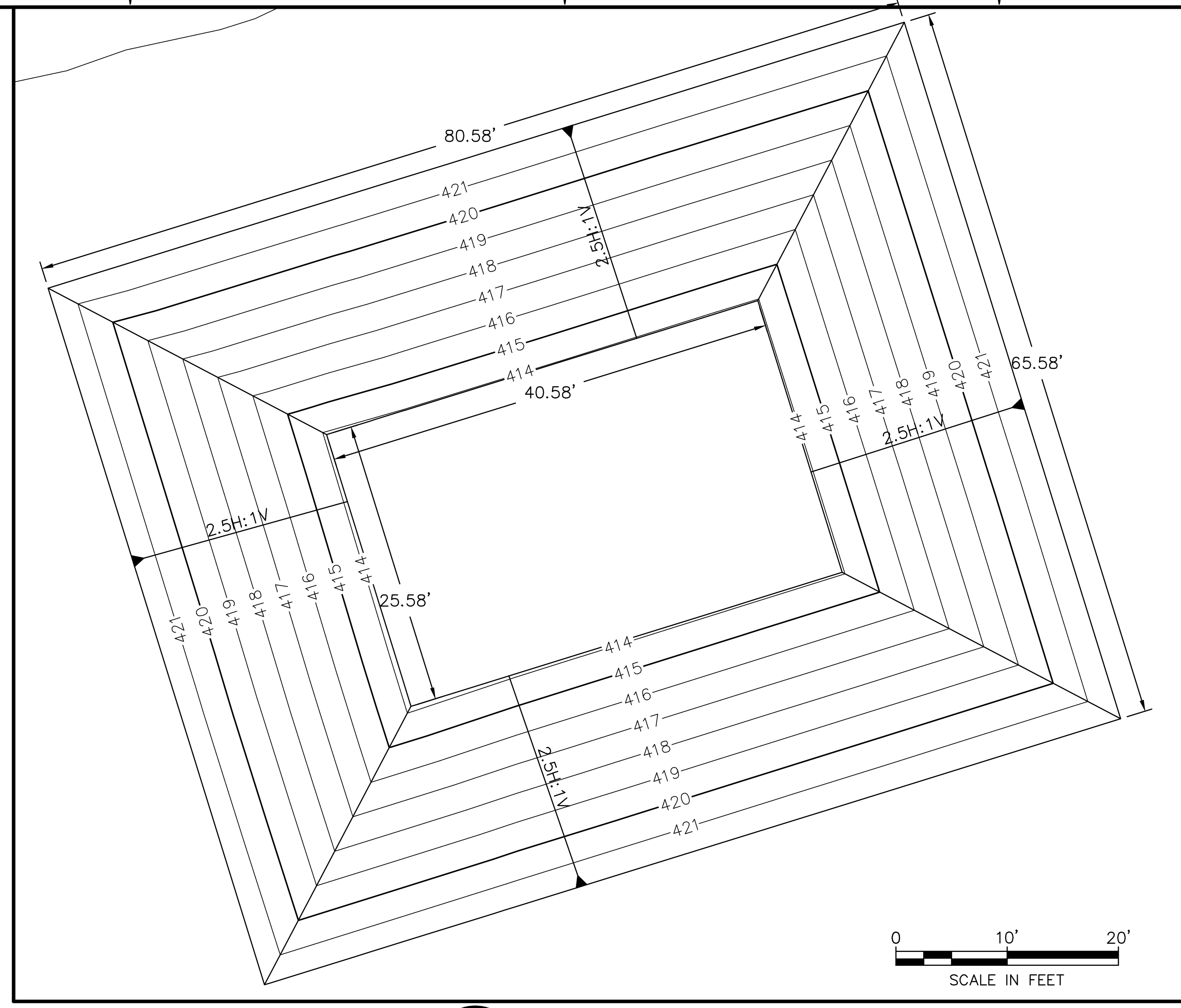
PROJECT TITLE
Honeywell
SEDIMENT CONSOLIDATION AREA
ONONDAGA LAKE BOTTOM
SUBSITE REMEDIAL DESIGN

DRAWING TITLE
TOP OF LOW PERMEABILITY SOIL LINER

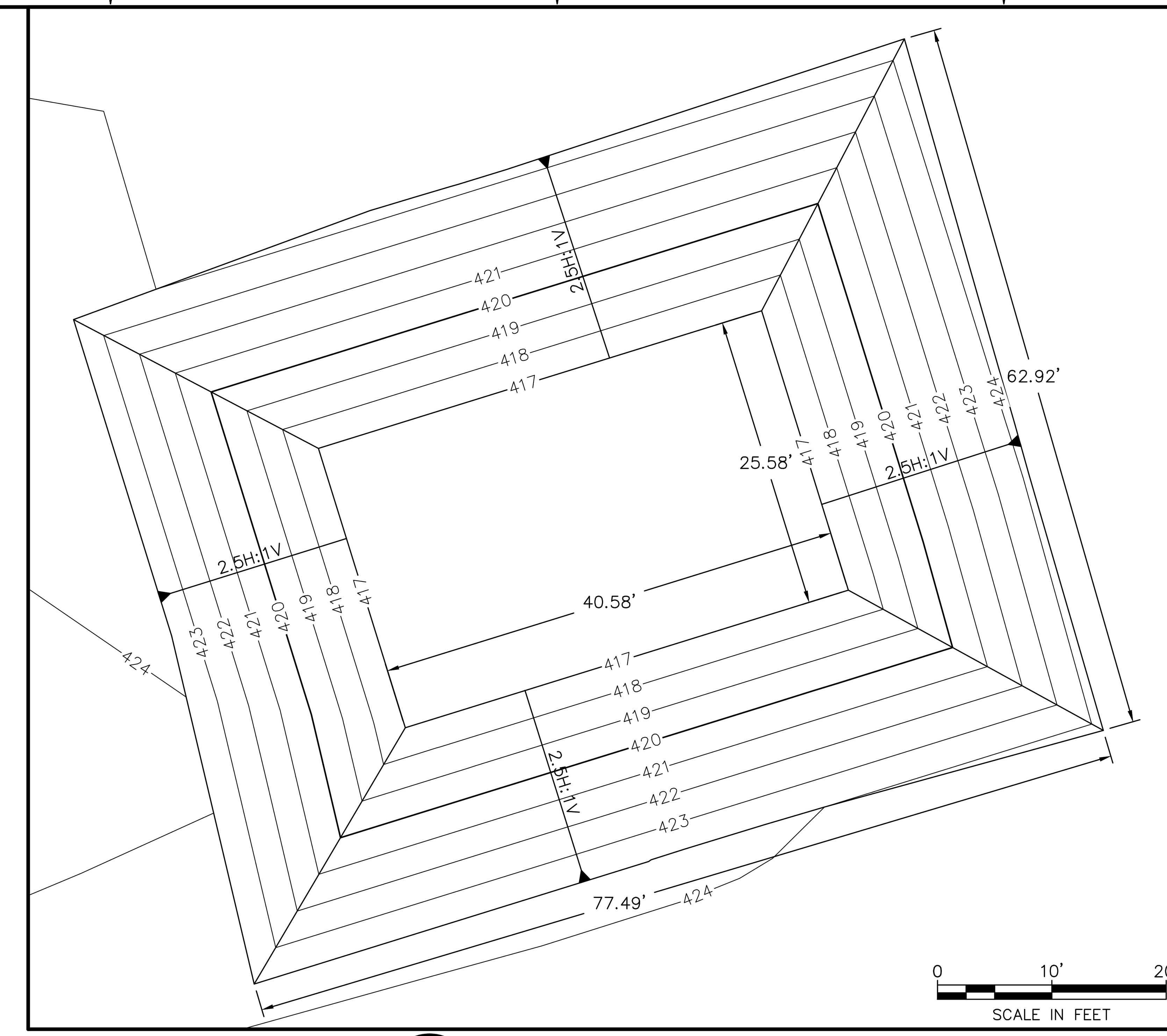
SCALE: 1" = 120'

DRAWING NO. 444853-101-C-004 REV. A

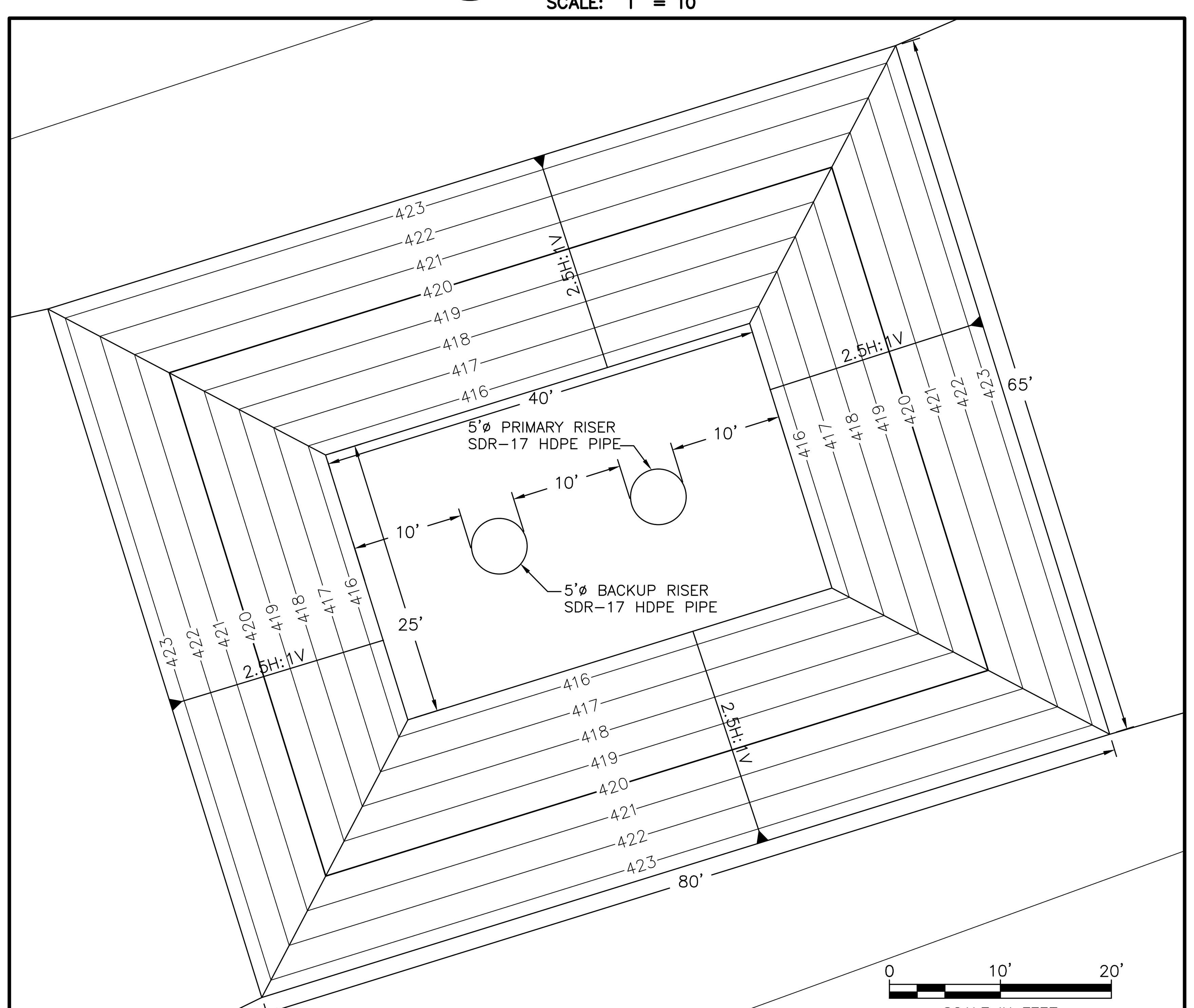
FILE NAME: L:\CADD\D\ONONDAGA LAKE\PERMIT\SCA GEOTUBES\50-PERCENT DESIGN GJ4299.01.01\DRAWINGS\4299-004.DWG
PLOT DATE: 4/16/2007 12:45 PM PLOTTED BY: JONATHAN SPEED



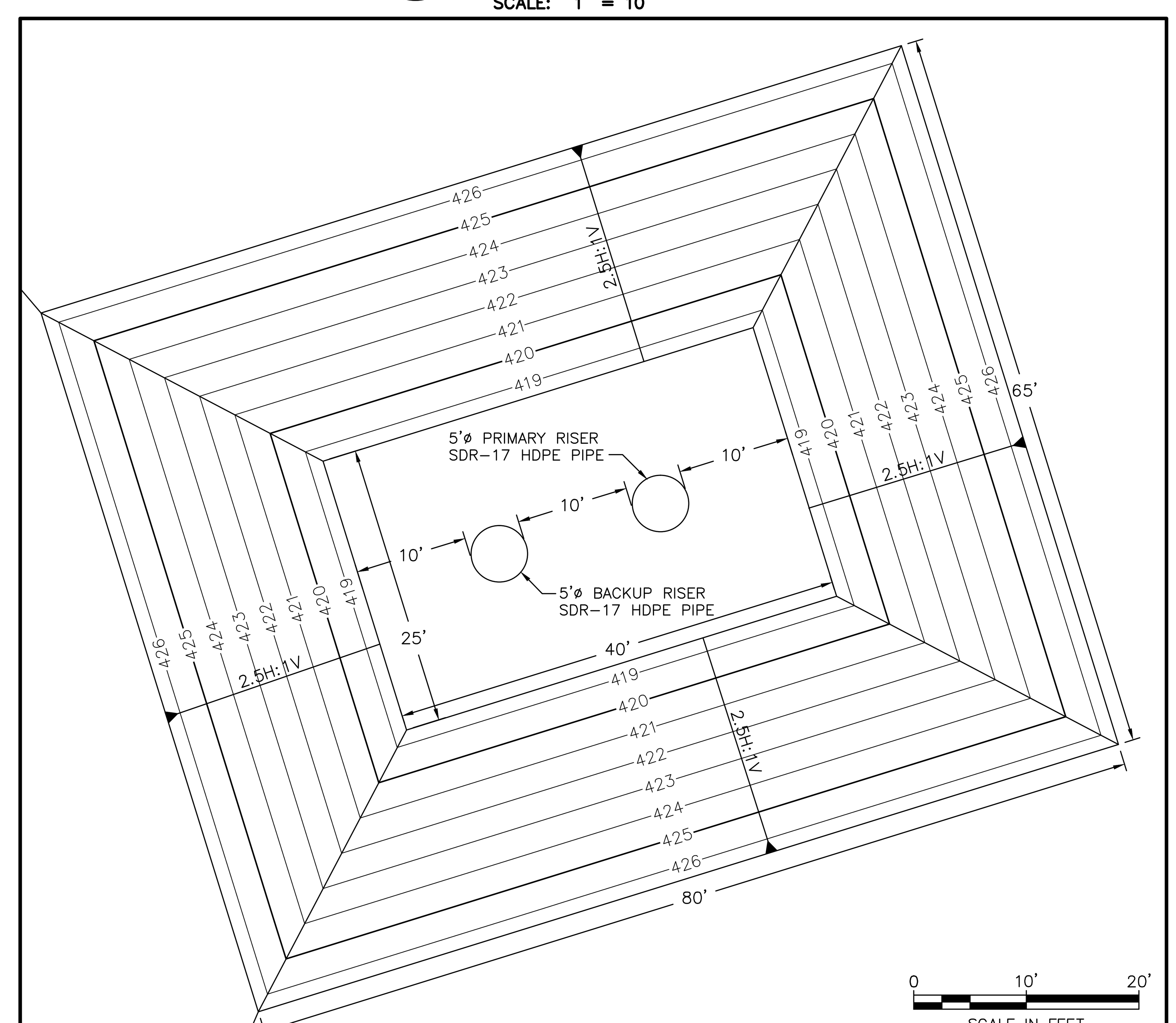
1/3 DETAIL
WEST SUMP SUBGRADE
SCALE: 1" = 10'



2/3 DETAIL
EAST SUMP SUBGRADE
SCALE: 1" = 10'



3/4 DETAIL
WEST SUMP TOP OF LOW PERMEABILITY SOIL LINER
SCALE: 1" = 10'



4/4 DETAIL
EAST SUMP TOP OF LOW PERMEABILITY SOIL LINER
SCALE: 1" = 10'

NOTES:

1. THE SUMPS, RISER PIPES, AND PUMPS ARE DESIGNED FOR POST-CLOSURE CONDITIONS. ADDITIONAL DEWATERING MEASURES WILL BE IMPLEMENTED DURING OPERATIONS AS NEEDED.

NOT FOR CONSTRUCTION

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NO.	DESCRIPTION	DATE	DRAWN	CHK'D	APPV'D
A	INITIAL DESIGN SUBMITTAL				

	DATE
DRAWN BY: JHS	AUG 2009
CHECKED BY: RK	AUG 2009
APPROVED BY: JFB	AUG 2009
PROJECT MGR.: JFB	AUG 2009

SEAL

PARSONS
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JOB: 444853
WBS:

PROJECT TITLE:
Honeywell
SEDIMENT CONSOLIDATION AREA
ONONDAGA LAKE BOTTOM
SUBSITE REMEDIAL DESIGN

DRAWING TITLE:
SUMP GRADING PLAN

SCALE: 1" = 10'

DRAWING NO.: 444853-101-C-005
REV.: A

NOTES:

1. THE TOPOGRAPHIC CONTOURS SHOWN ON THIS DRAWING WERE OBTAINED FROM A TOPOGRAPHIC MAP COMPILED BY TVGA CONSULTANTS USING PHOTOGRAMMETRIC METHODS BASED ON AERIAL PHOTOGRAPHY PERFORMED ON 6 APRIL 2008. THE MAP WAS COMPILED IN ACCORDANCE WITH NATIONAL MAP ACCURACY STANDARDS FOR 1 INCH EQUAL TO 50 FEET SCALE. THE TOPOGRAPHIC MAP WAS PROVIDED TO GEOSYNTEC BY PARSONS.
2. THE SCA DESIGN SHOWN ON THIS DRAWING IS FOR A CAPACITY OF 2.65 MILLION CUBIC YARDS.
3. GRAVEL DRAINAGE LAYER THICKNESS WILL BE USED TO VERIFY THAT THE MINIMUM THICKNESS REQUIREMENTS ARE MET AS PRESENTED IN THE TECHNICAL SPECIFICATIONS. THE ELEVATION MEASUREMENTS OF THE TOP OF THE LOW PERMEABILITY SOIL LAYER TAKEN AFTER THE CONSTRUCTION SHALL BE USED TO VERIFY GENERAL CONFORMANCE WITH DESIGN SLOPES AS PRESENTED IN THE TECHNICAL SPECIFICATIONS. DUE TO THE COMPRESSIBLE NATURE OF THE FOUNDATION, A STRICT CONFORMANCE WITH THE DESIGN ELEVATIONS IS NOT REQUIRED. GRAVEL DRAINAGE LAYER MATERIAL CAN BE USED TO LOCALLY ADJUST THE SLOPES DURING FILLING OF GEOTEXTILE TUBES AS NEEDED.

LEGEND

- 430 — EXISTING GROUND ELEVATION (FEET) (NOTE 1)
- 440 — PROPOSED PERIMETER BERM
- EXISTING ROAD
- WEIR BOX 5 — EXISTING WEIR BOX
- PHASE BOUNDARY

0 120' 240'
SCALE IN FEET

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NO.	DESCRIPTION	DATE	DRAWN	CHK'D	APPV'D
A	INITIAL DESIGN SUBMITTAL				

DRAWN BY: JHS	DATE: AUG 2009	SEAL
CHECKED BY: RK	DATE: AUG 2009	
APPROVED BY: JFB	DATE: AUG 2009	
PROJECT MGR.: JFB	DATE: AUG 2009	

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WBS:

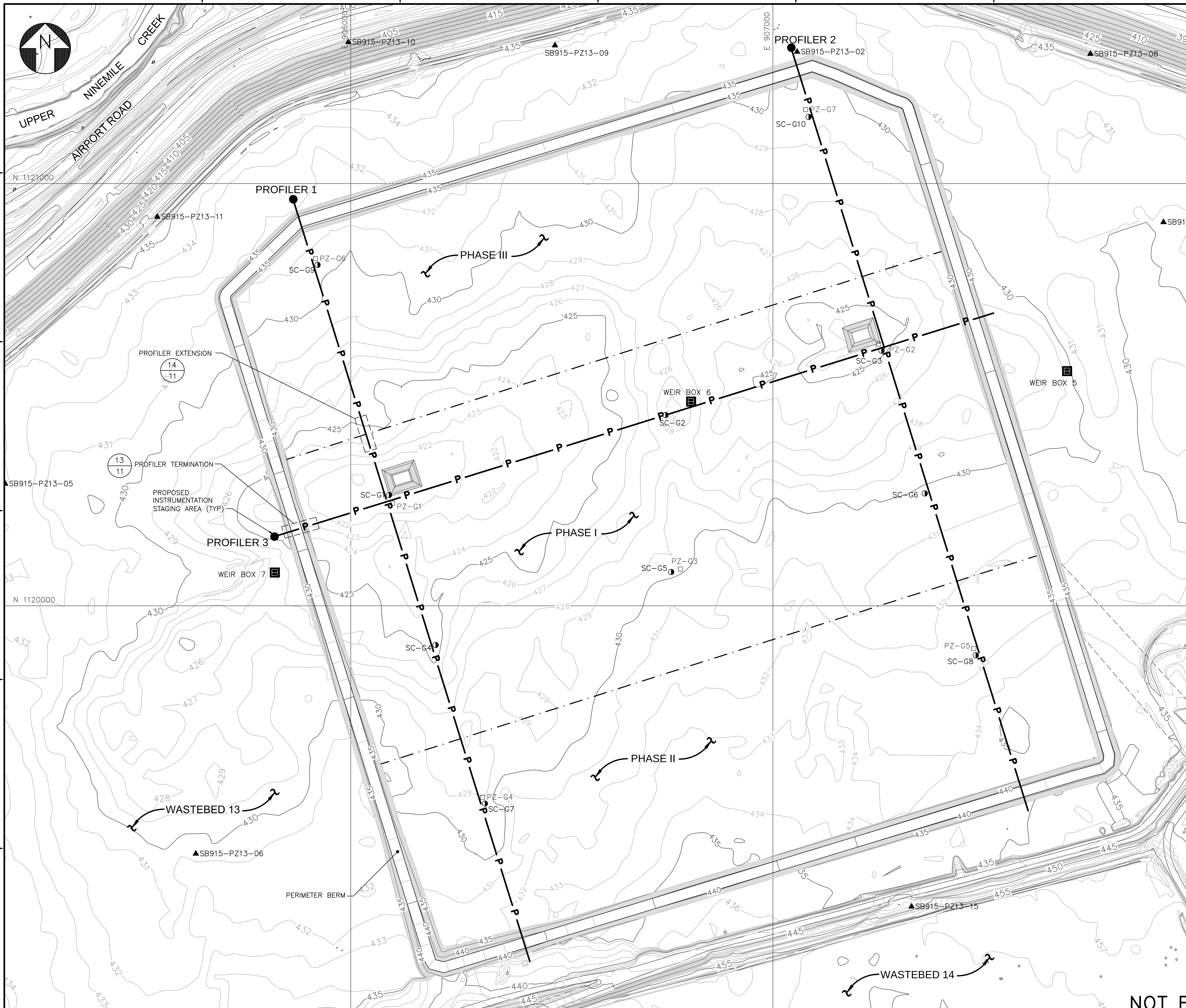
PROJECT TITLE:
Honeywell
SEDIMENT CONSOLIDATION AREA
ONONDAGA LAKE BOTTOM
SUBSITE REMEDIAL DESIGN

DRAWING TITLE:
TOP OF GRAVEL DRAINAGE LAYER

SCALE: SCALE: 1" = 120'

DRAWING NO.: 444853-101-C-006 REV.: A

NOTICE:
THIS DRAWING, THE PROPERTY OF HONEYWELL, IS FURNISHED SUBJECT TO RETURN ON DEMAND AND THE CONDITION THAT THE INFORMATION AND TECHNOLOGY EMBODIED HEREIN SHALL NOT BE DISCLOSED OR USED AND THE DRAWING SHALL NOT BE REPRODUCED OR COPIED IN WHOLE OR IN PART EXCEPT AS PREVIOUSLY AUTHORIZED IN WRITING. ANY PERSON WHO MAY RECEIVE OR OBSERVE THIS DESIGN WILL BE HELD STRICTLY LIABLE FOR ANY VIOLATION WHETHER WILLFUL OR NEGLIGENT.



NOT FOR CONSTRUCTION

LEGEND

Symbol	Description
430	EXISTING GROUND ELEVATION (FEET)
440	PROPOSED SCA PERIMETER BERM
	EXISTING ROAD
WEIR BOX 5	EXISTING WEIR BOX
▲SB915-PZ13-06	EXISTING PIEZOMETER
□PZ-G4	PROPOSED PIEZOMETER
◑ SC-G7	PROPOSED SETTLEMENT CELL
— · — · —	PHASE BOUNDARY
— P —	PROPOSED SETTLEMENT PROFILER ALIGNMENT

NOTES:

1. A SURVEY GRID WILL BE SET UP WITHIN THE FOOTPRINT OF THE PROPOSED SCA PRIOR TO CONSTRUCTION. AN INITIAL SURVEY WILL BE PERFORMED TO OBTAIN THE ELEVATION OF THE EXISTING GROUND AT EACH GRID POINT. AFTER CONSTRUCTION OF THE GRAVEL DRAINAGE LAYER, A SURVEY WILL BE PERFORMED TO OBTAIN THE ELEVATION OF THE TOP OF GRAVEL DRAINAGE LAYER AT EACH GRID POINT. THICKNESS OF LOW PERMEABILITY SOIL LINER AND GRAVEL DRAINAGE LAYER WILL ALSO BE DIRECTLY MEASURED AT THESE LOCATIONS DURING CONSTRUCTION.
2. BEFORE CONSTRUCTION OF THE SCA, AN APPROXIMATELY 1.5-FT WIDE BY 1-FT DEEP TRENCH WILL BE EXCAVATED ALONG THE LENGTH OF EACH SETTLEMENT PROFILER LINE. AFTER EXCAVATION OF THE TRENCH, TWO 4-INCH NOMINAL DIAMETER SINGLE-WALL CORRUGATED PIPES WILL BE PLACED IN THE TRENCH, AND THE TRENCH WILL BE BACKFILLED.
3. A SURVEY BENCHMARK WILL BE SET UP FOR THE SETTLEMENT PROFILER SYSTEM. THE WATER TANKS FOR THE SETTLEMENT PROFILER SYSTEM MAY BE SET UP AT FIXED LOCATIONS OR MOVED BY TRUCKS TO EACH LOCATION AS NEEDED. THE LEVEL OF THE WATER IN THE TANK SHOULD BE SURVEYED RELATIVE TO THE BENCHMARK EACH TIME PRIOR TO THE MEASUREMENT.
4. BEFORE CONSTRUCTION OF THE SCA, VIBRATING WIRE PIEZOMETERS WILL BE INSTALLED TO THE DESIGN DEPTHS. AT EACH PROPOSED LOCATION THREE PIEZOMETERS WILL BE INSTALLED AT DEPTHS OF 15-FT, 30-FT, AND 45-FT. THE INSTALLATION PROCEDURE SHOULD BE IN ACCORDANCE WITH THE SPECIFIC MANUFACTURER'S INSTRUCTIONS.
5. SETTLEMENT CELLS WILL BE INSTALLED IN THE GROUND BEFORE CONSTRUCTION OF THE SCA.
6. WIRES FOR THE SETTLEMENT CELLS AND THE PIEZOMETERS WILL BE PLACED IN ½ INCH PVC PIPES FOR PROTECTION. THE PIPES SHOULD BE BURIED BY USING THE TRENCHING FOR THE SETTLEMENT PROFILERS OR DIGGING SMALL SHALLOW TRENCHES.
7. THE INSTRUMENTATION SHOWN ON THIS PLAN WILL BE CONSTRUCTED IN THREE PHASES ACCORDING TO THE PHASING PLAN.

0 120' 240'
SCALE IN FEET

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	DATE
DRAWN BY JHS	AUG 2009
CHECKED BY RK	AUG 2009
APPROVED BY JFB	AUG 2009
PROJECT MGR. JFB	AUG 2009

SEAL

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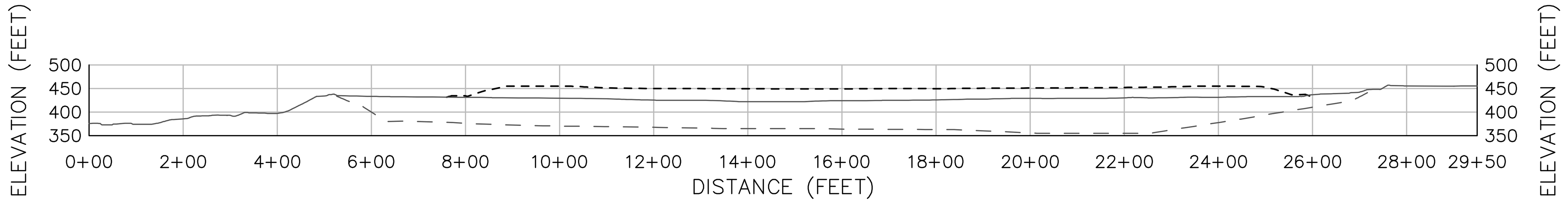
PROJECT TITLE
Honeywell
SEDIMENT CONSOLIDATION AREA
ONONDAGA LAKE BOTTOM
SUBSITE REMEDIAL DESIGN

DRAWING TITLE
INSTRUMENTATION AND MONITORING PLAN

SCALE
SCALE: 1" = 120'

DRAWING NO. 444853-101-C-007
REV. A

FILE NAME: L:\CADD\0\ONONDAGA LAKE\PERMIT\SCA GEOTUBES\50-PERCENT DESIGN GJ4299.01.01\DRAWINGS\4299-007.DWG
PLOT DATE: 4/16/2007 12:45 PM PLOTTED BY: JONATHAN SPEED



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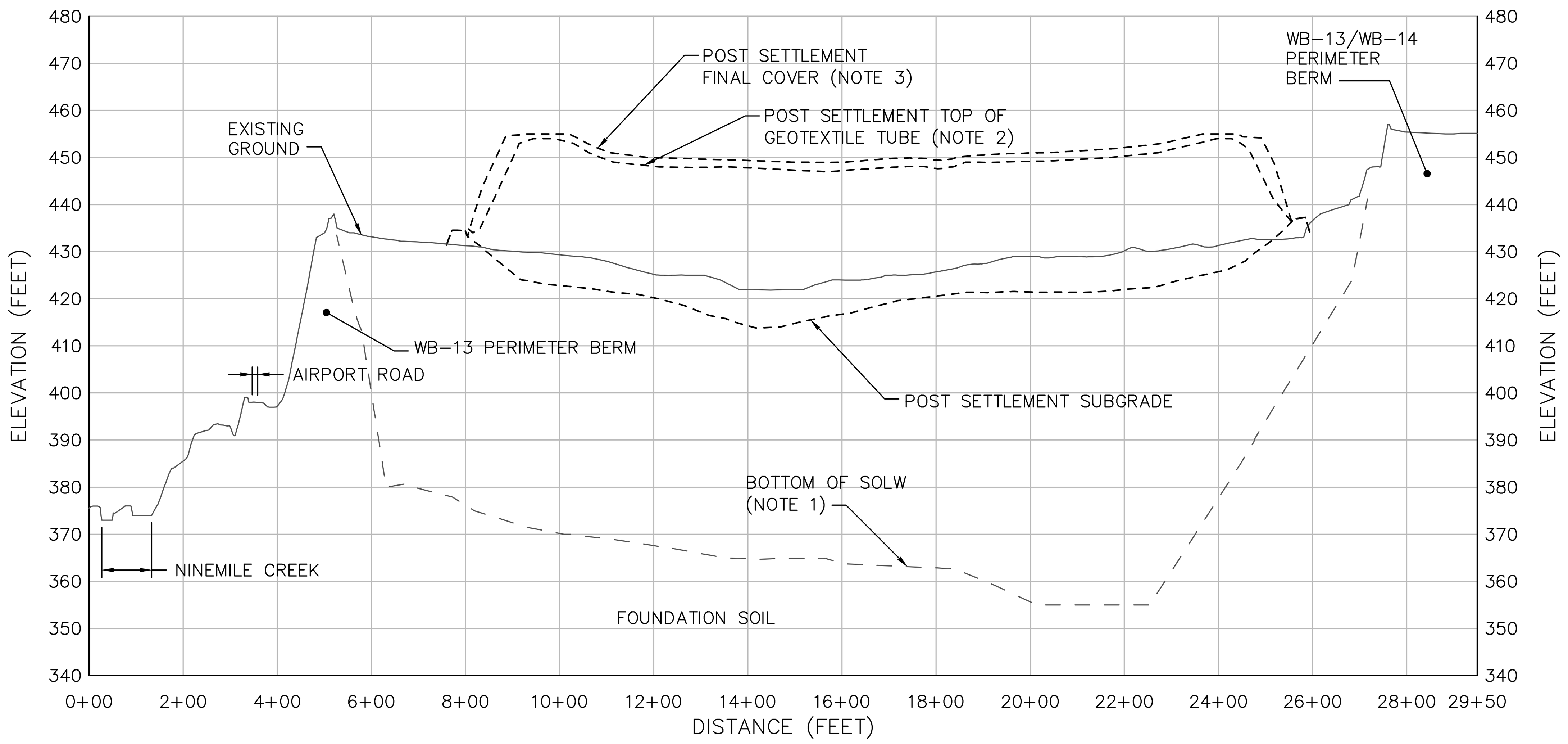
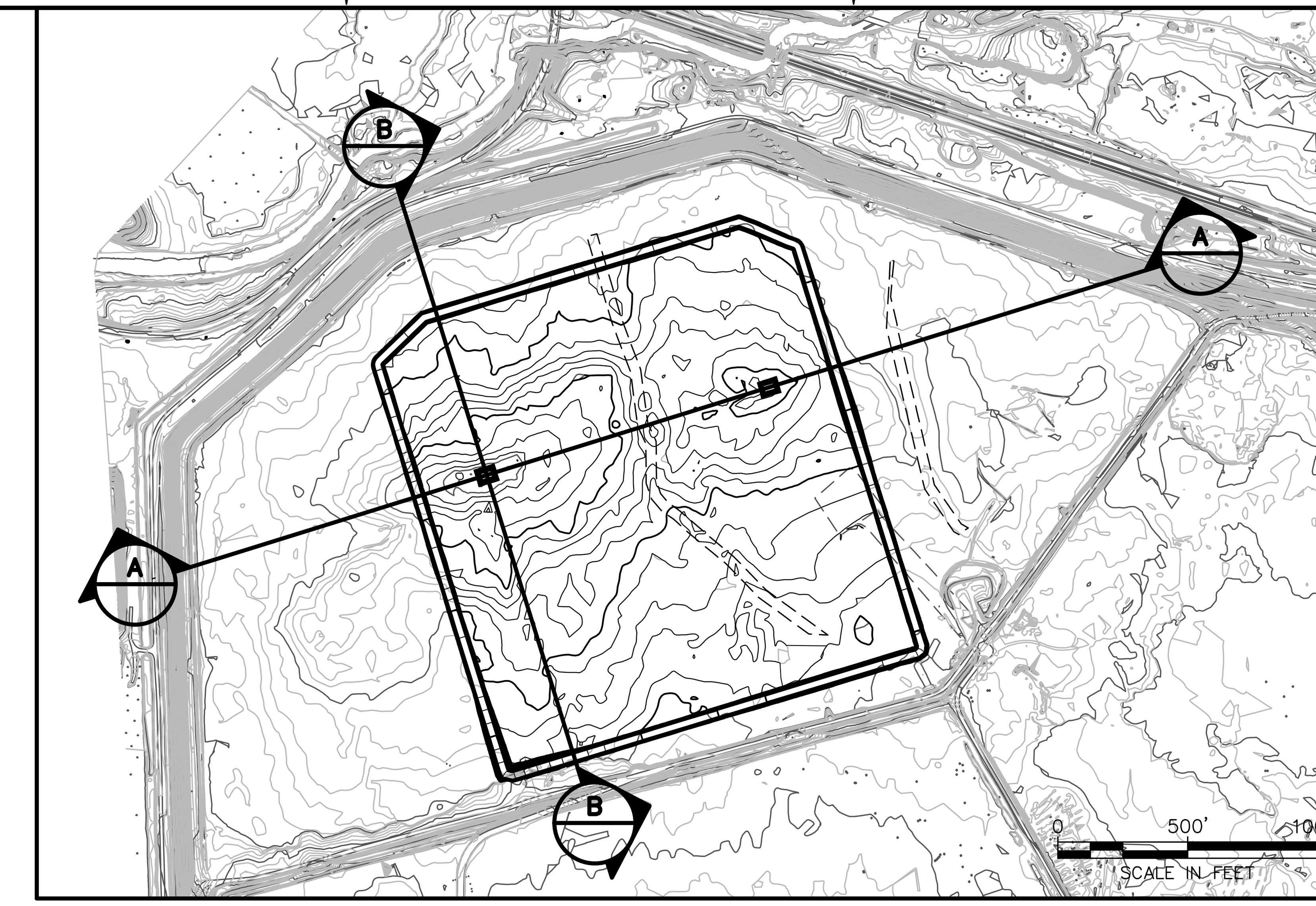


B / 3 CROSS SECTION

CROSS SECTION B-B'

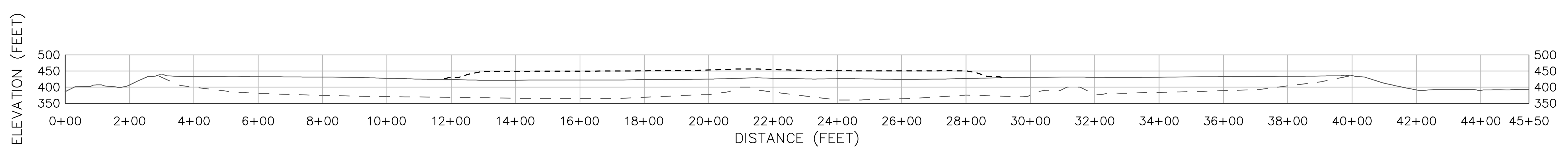
SCALE: 1"=250' (HOR) : 1"=25' (VERT)



KEY MAP

NOTES:

1. BOTTOM OF SOLW ELEVATIONS WERE INTERPRETED BASED ON DATA FROM GEOTECHNICAL INVESTIGATIONS.
3. THE TOP OF GEOTEXTILE TUBE ELEVATIONS SHOWN ON THIS DRAWING ARE BASED ON SETTLEMENT CALCULATIONS PERFORMED TO ESTIMATE ELEVATIONS AT THE END OF 4 YEARS OF DEWATERING OPERATIONS. ACTUAL ELEVATIONS MAY VARY FROM THE CALCULATED ELEVATIONS.
3. THE TOP OF FINAL COVER ELEVATIONS SHOWN ON THIS DRAWING ARE BASED ON THE CALCULATED SETTLED TOP OF GEOTEXTILE TUBE ELEVATIONS CORRESPONDING TO THE END OF DEWATERING OPERATIONS. ACTUAL FINAL COVER ELEVATIONS MAY VARY FROM THE PROPOSED ELEVATIONS IF THE CALCULATED AND ACTUAL TOP OF GEOTEXTILE TUBE ELEVATIONS AT THE END OF DEWATERING OPERATIONS ARE DIFFERENT. THE THICKNESS AND SOME DESIGN FEATURES OF THE FINAL COVER MAY VARY DEPENDING ON THE SELECTED FINAL COVER TYPE.



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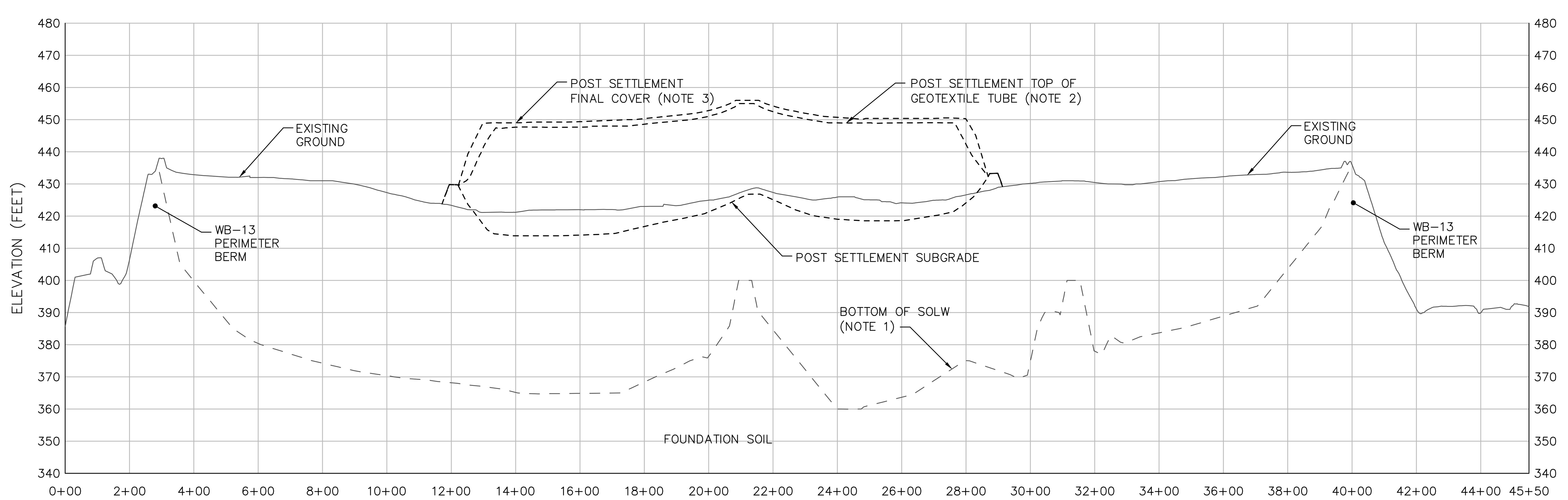

A / 3 CROSS SECTION

CROSS SECTION A-A'

SCALE: 1"=250' (HOR) : 1"=25' (VERT)

NOT FOR CONSTRUCTION

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PROJECT MGR. JFB	AUG 2009

SEAL

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WBS:

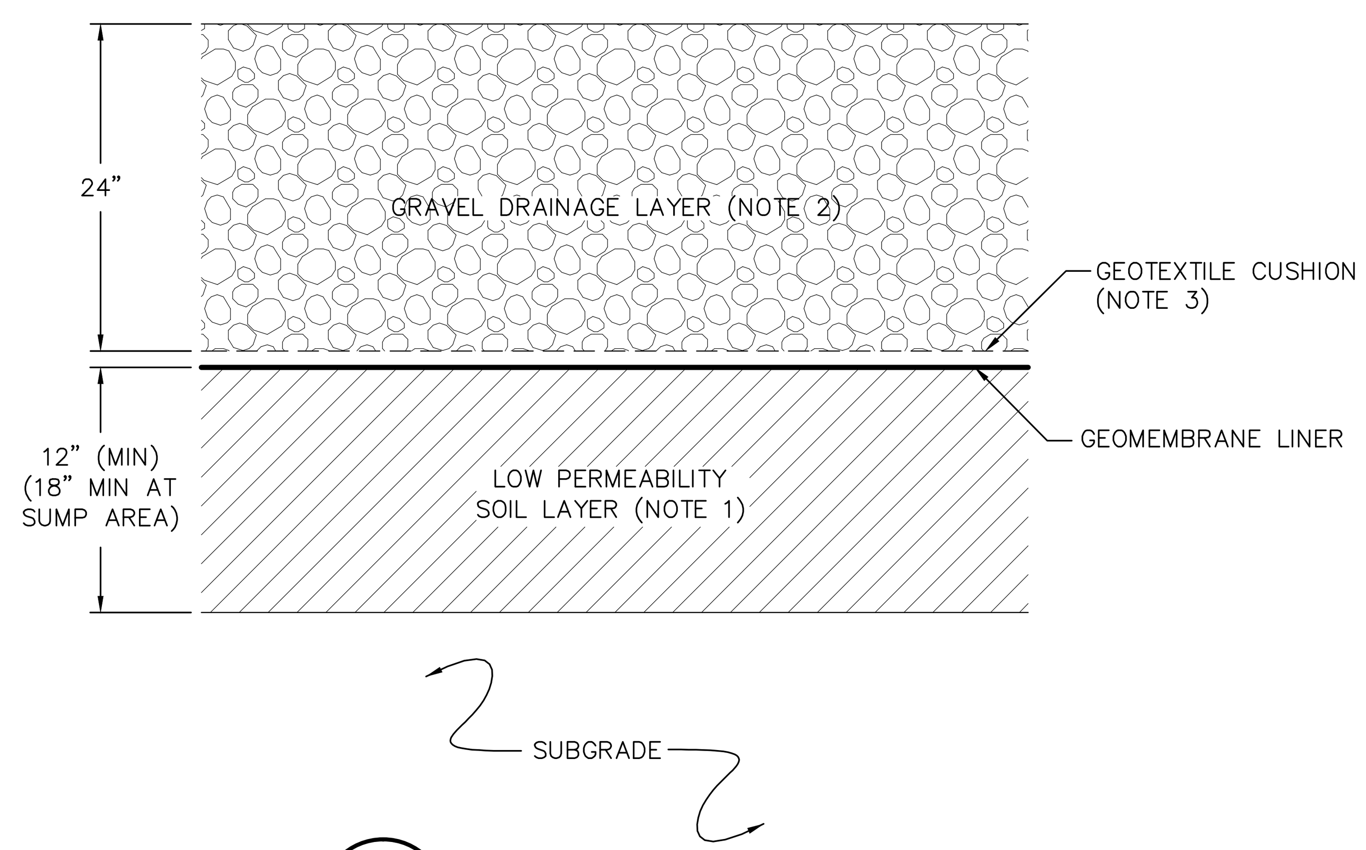
PROJECT TITLE: Honeywell
SEDIMENT CONSOLIDATION AREA
ONONDAGA LAKE BOTTOM
SUBSITE REMEDIAL DESIGN

DRAWING TITLE: POST-SETTLEMENT CROSS SECTIONS

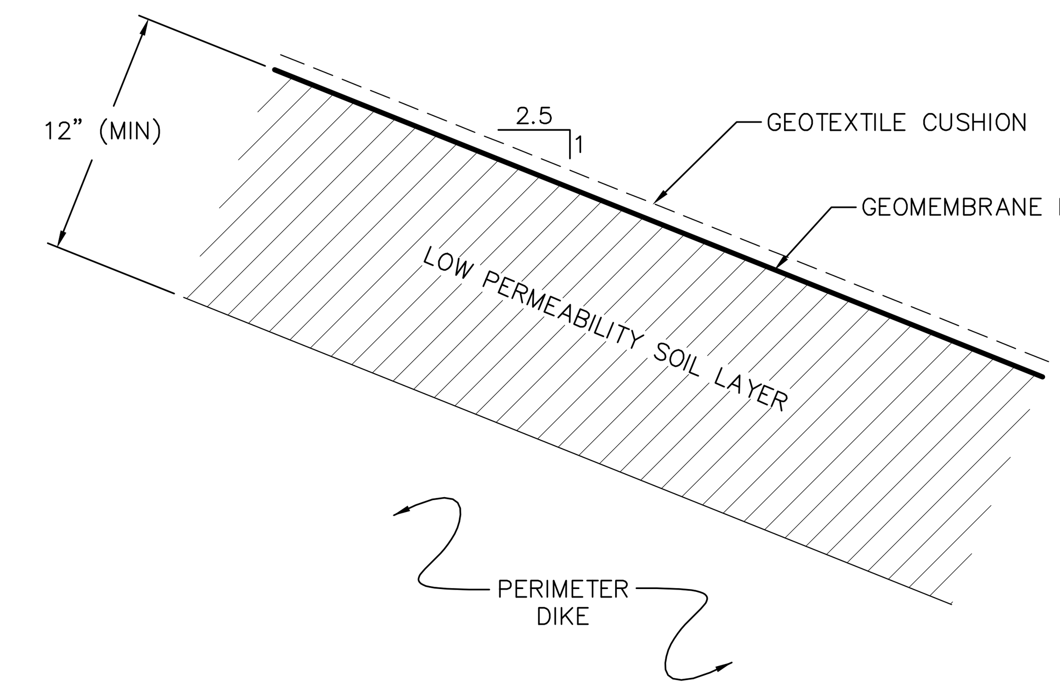
SCALE: AS SHOWN

DRAWING NO.: 444853-101-C-008

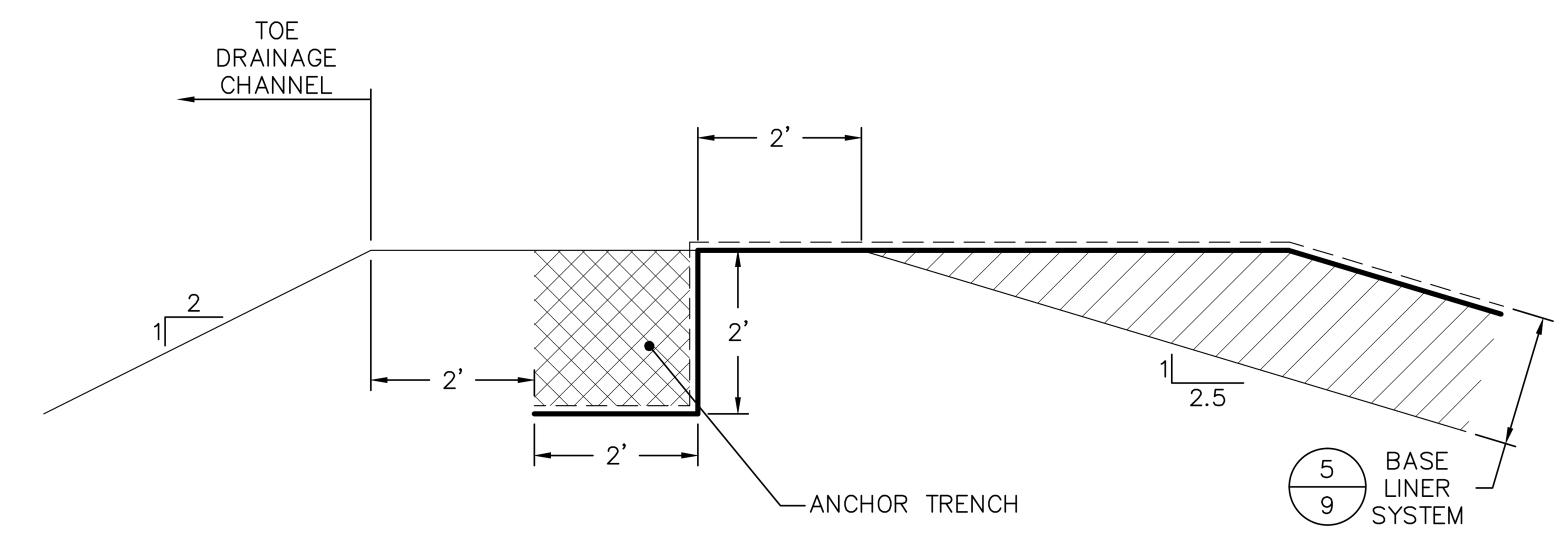
REV.: A



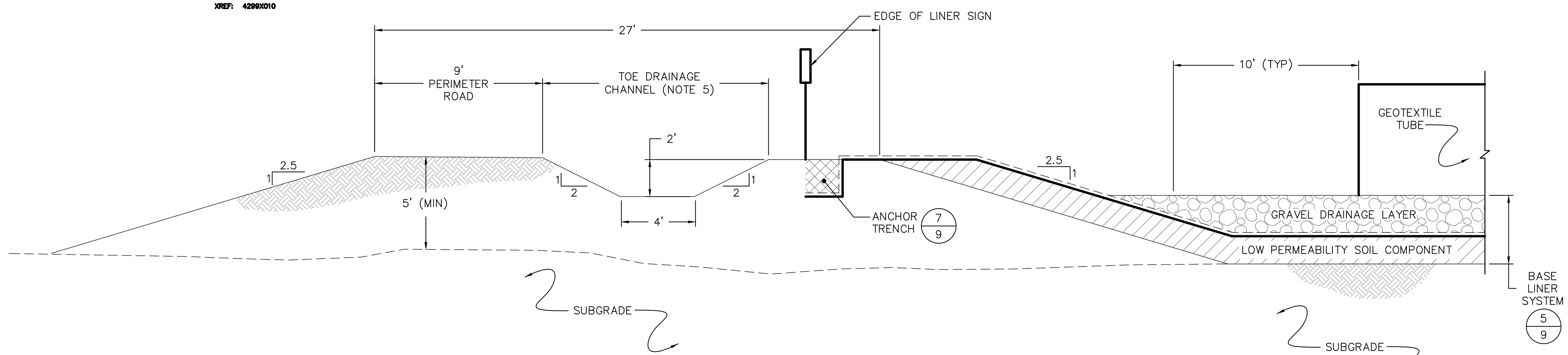
5/6 DETAIL
BASE LINER SYSTEM
SCALE: 1" = 1'
XREF: 4299X010



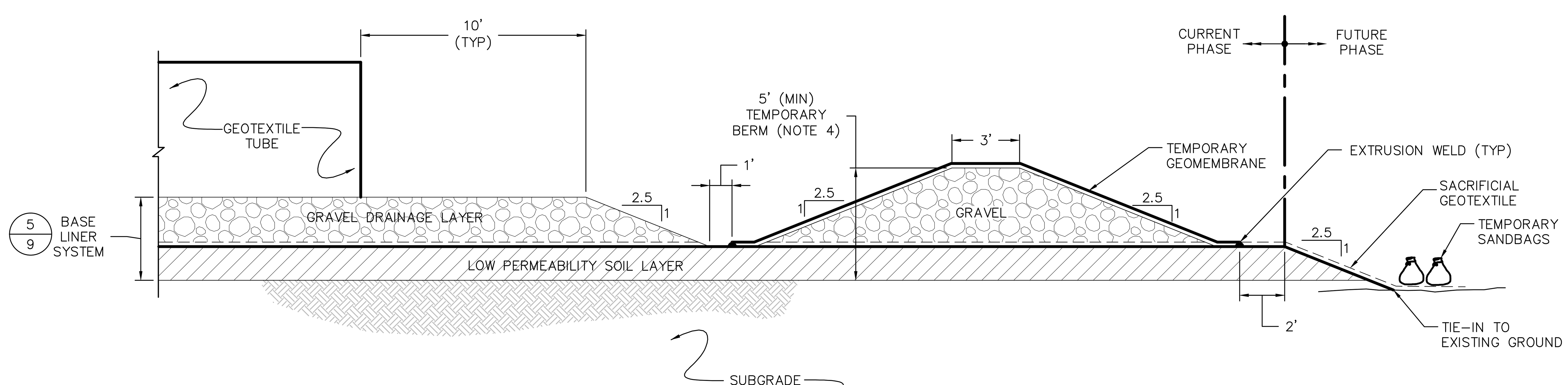
6/6 DETAIL
SIDESLOPE LINER SYSTEM
SCALE: 1" = 1'
XREF: 4299X010



7/9 DETAIL
ANCHOR TRENCH
SCALE: 1" = 2'
XREF: 4299X010



8/3 DETAIL
LINER SYSTEM TERMINATION AT ANCHOR TRENCH
SCALE: 1" = 4'
XREF: 4299X010



9/4 DETAIL
LINER SYSTEM TERMINATION AT TEMPORARY BERM
SCALE: 1" = 4'
XREF: 4299X010

NOT FOR CONSTRUCTION

NOTES:

1. THE TOP SIX (6) INCHES OF THE LOW PERMEABILITY SOIL LAYER SHALL HAVE A HYDRAULIC CONDUCTIVITY NOT MORE THAN 1 X 10–6 CENTIMETER PER SECOND (CM/S) AND MEET ALL REQUIREMENTS OF THE TECHNICAL SPECIFICATIONS.
2. THE GRAVEL DRAINAGE LAYER SHALL HAVE A HYDRAULIC CONDUCTIVITY NOT LESS THAN 10 CENTIMETER PER SECOND (CM/S) AND MEET ALL REQUIREMENTS OF THE TECHNICAL SPECIFICATIONS.
3. THE REQUIRED MINIMUM DENSITY FOR THE GEOTEXTILE CUSHION WILL BE DETERMINED AFTER SPECIFIC GRAVEL SOURCE IS IDENTIFIED.
4. TEMPORARY BERM SHALL BE REMOVED TO TIE–IN LINER SYSTEM EXPANSION.
5. TOE DRAINAGE CHANNEL CAN BE INSTALLED AT THE TIME OF CLOSURE.

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PROJECT MGR. JFB	AUG 2009

SEAL

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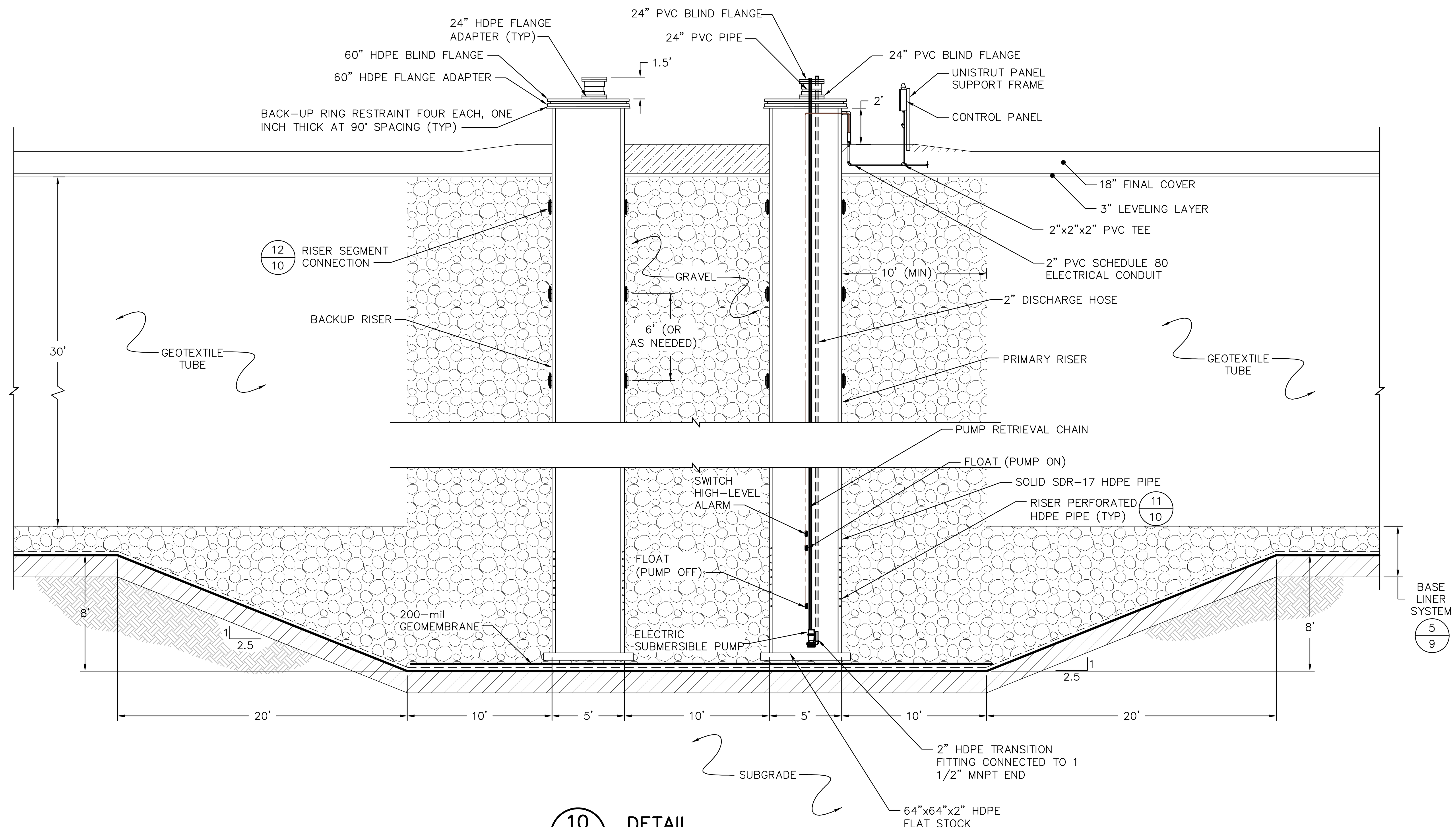
PROJECT TITLE
Honeywell
SEDIMENT CONSOLIDATION AREA
ONONDAGA LAKE BOTTOM
SUBSITE REMEDIAL DESIGN

DRAWING TITLE
LINER SYSTEM DETAILS

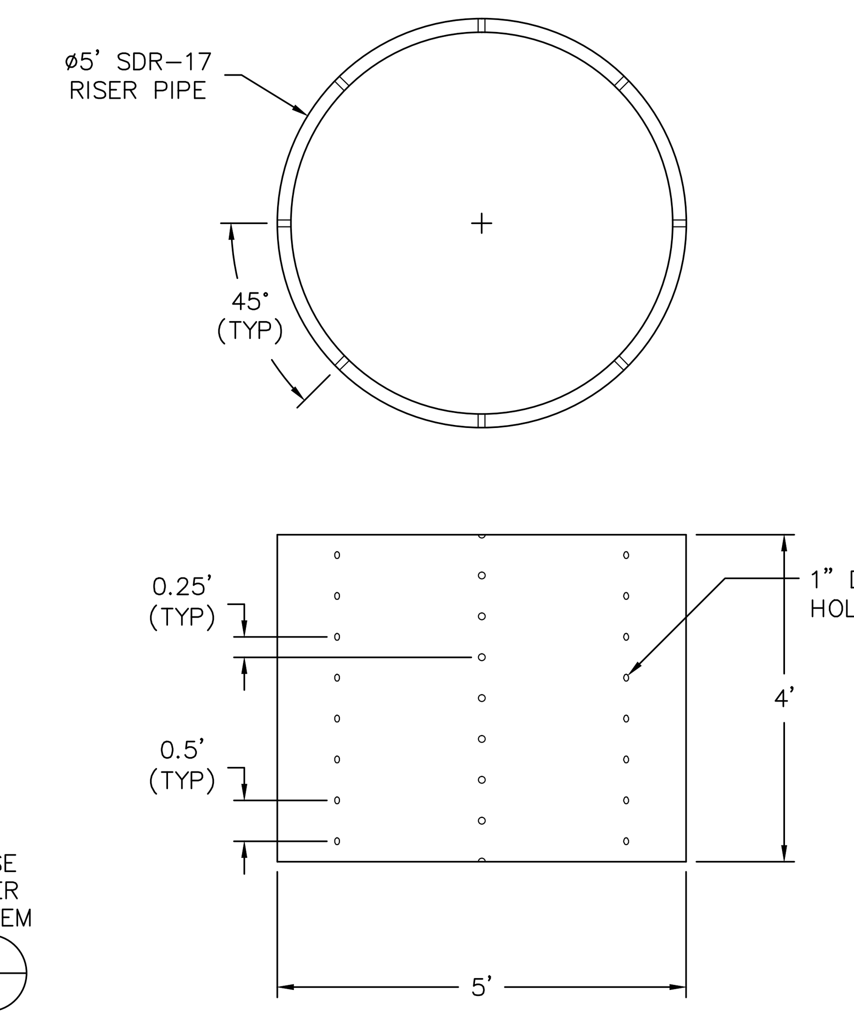
SCALE: AS SHOWN

DRAWING NO. 444853-101-C-009 REV. A



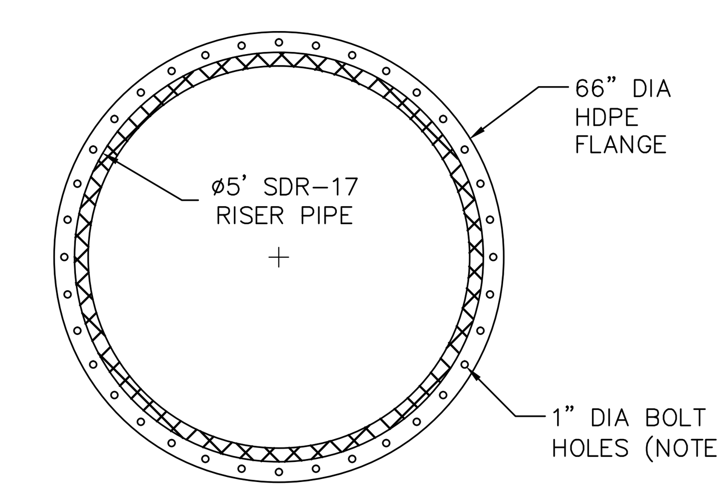
10/6 DETAIL
SUMP AND RISERS

SCALE: 1" = 5'
XREF: 4299X010



11/10 DETAIL
RISER PERFORATED HDPE PIPE

SCALE: 1" = 2'
XREF: 4299X010



12/10 DETAIL
RISER SEGMENT CONNECTION

SCALE: 1" = 2'
XREF: 4299X010

NOT FOR CONSTRUCTION

NOTES:

1. THE SUMPS, RISER PIPES, AND PUMPS ARE DESIGNED FOR POST-CLOSURE CONDITIONS. ADDITIONAL DEWATERING MEASURES WILL BE IMPLEMENTED DURING OPERATIONS AS NEEDED.
2. THE LENGTHS OF RISER PIPE SEGMENTS CAN BE CHANGED BASED ON FIELD CONDITIONS SUCH AS GEOTEXTILE TUBE FILLING SEQUENCE AND ACTUAL DEWATERED GEOTEXTILE TUBE HEIGHTS ACHIEVED.
3. ELECTRICAL SUBMERSIBLE PUMPS SHALL BE PROVIDED FOR EACH PRIMARY RISER PIPE. PUMP SYSTEM SHALL INCLUDE CONTROL PANEL AND THREE FLOAT SYSTEM WITH INTRINSICALLY SAFE RELAY SWITCHES. THE SPECIFIC MODELS SELECTED MUST USE 3-PHASE POWER. PUMP FOR THE WESTERN SUMP SHALL BE CAPABLE OF PUMPING AT A RATE OF 30 GALLONS PER MINUTE (GPM) WITH 50 FEET OF HEAD. PUMP FOR THE EASTERN SUMP SHALL BE CAPABLE OF PUMPING AT A RATE OF 20 GALLONS PER MINUTE (GPM) WITH 50 FEET OF HEAD. ALTERNATE PUMP CAPACITIES CAN BE CONSIDERED BASED ON SPECIFICATIONS FOR PARTICULAR PRODUCTS. EACH PUMP SYSTEM SHALL BE PROVIDED WITH A COUNTER OR EQUIVALENT DEVICE TO RECORD TOTAL FLOW.
4. PUMPS NEED NOT BE INSTALLED IN BACKUP RISERS UNDER NORMAL POST-CLOSURE CONDITIONS.
5. DETAILS OF THE SUMP, PUMP, CONNECTIONS, AND OTHER COMPONENTS ARE PRELIMINARY AND WILL BE UPDATED AS PART OF THE FINAL DESIGN. SPECIFICS MAY BE CHANGED TO ACCOMMODATE FIELD CONDITIONS AND AVAILABLE PRODUCTS WHILE MAINTAINING THE GENERAL CONCEPTS PRESENTED HEREIN.

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	DATE
DRAWN BY: JHS	AUG 2009
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PROJECT MGR.: JFB	AUG 2009

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PROJECT TITLE: Honeywell
SEDIMENT CONSOLIDATION AREA
ONONDAGA LAKE BOTTOM
SUBSITE REMEDIAL DESIGN

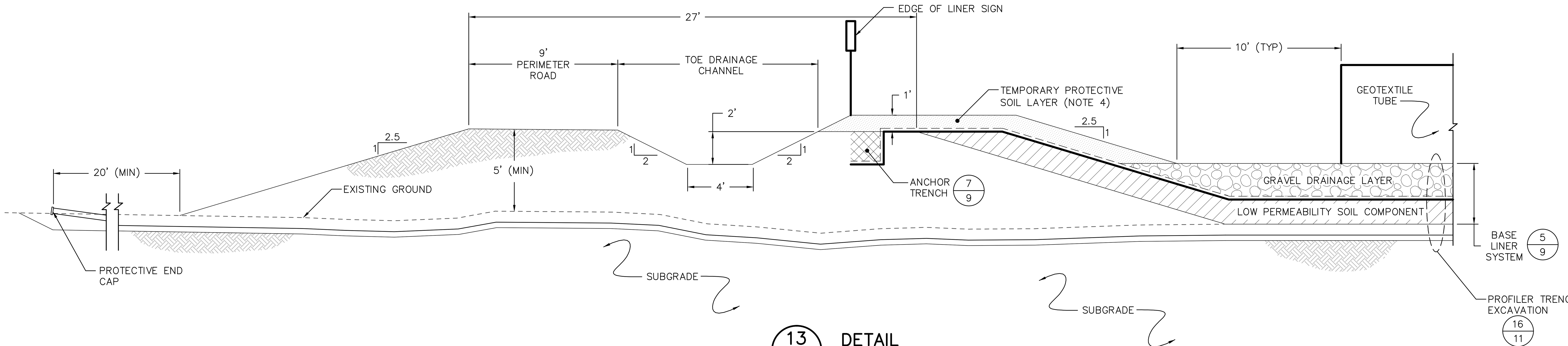
DRAWING TITLE: LIQUIDS MANAGEMENT SYSTEM DETAILS

SCALE: AS SHOWN

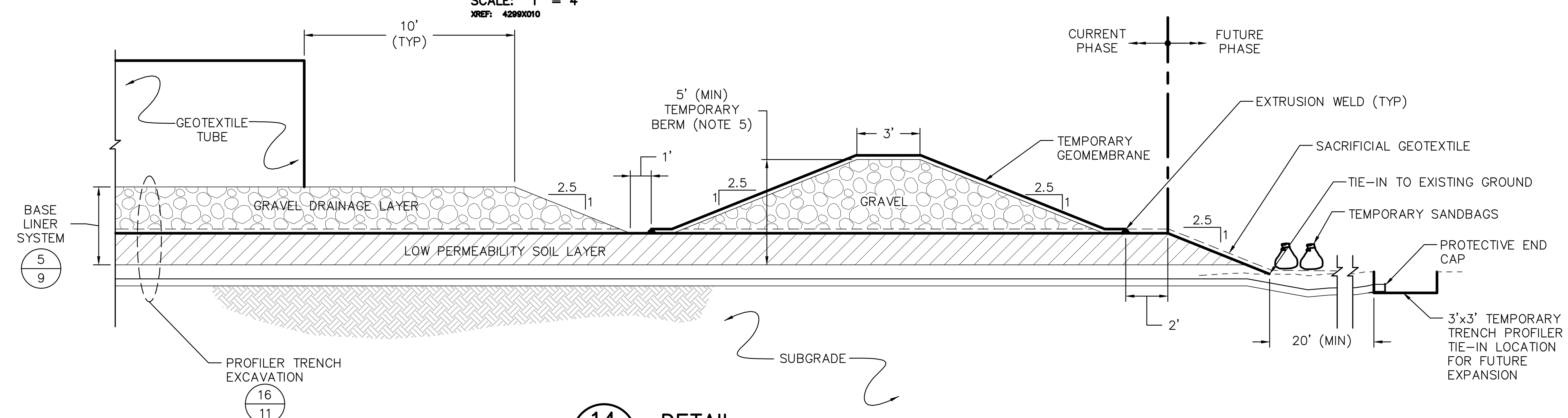
DRAWING NO. 444853-101-C-010 REV. A

NOTES:

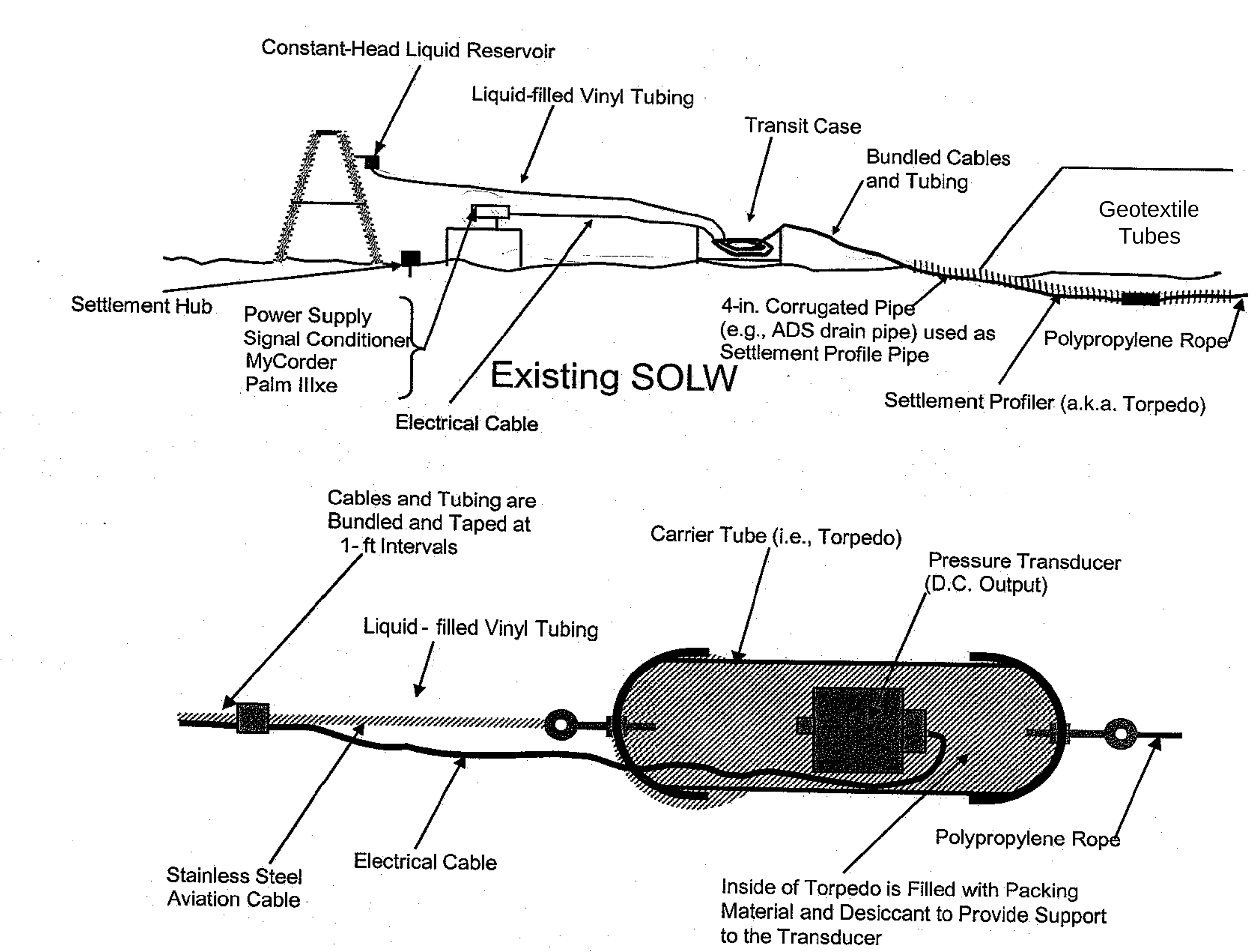
1. PROFILER TERMINATION DETAIL WILL BE DEVELOPED LATER TO INCLUDE PROTECTION AGAINST VEHICLE LOADS.



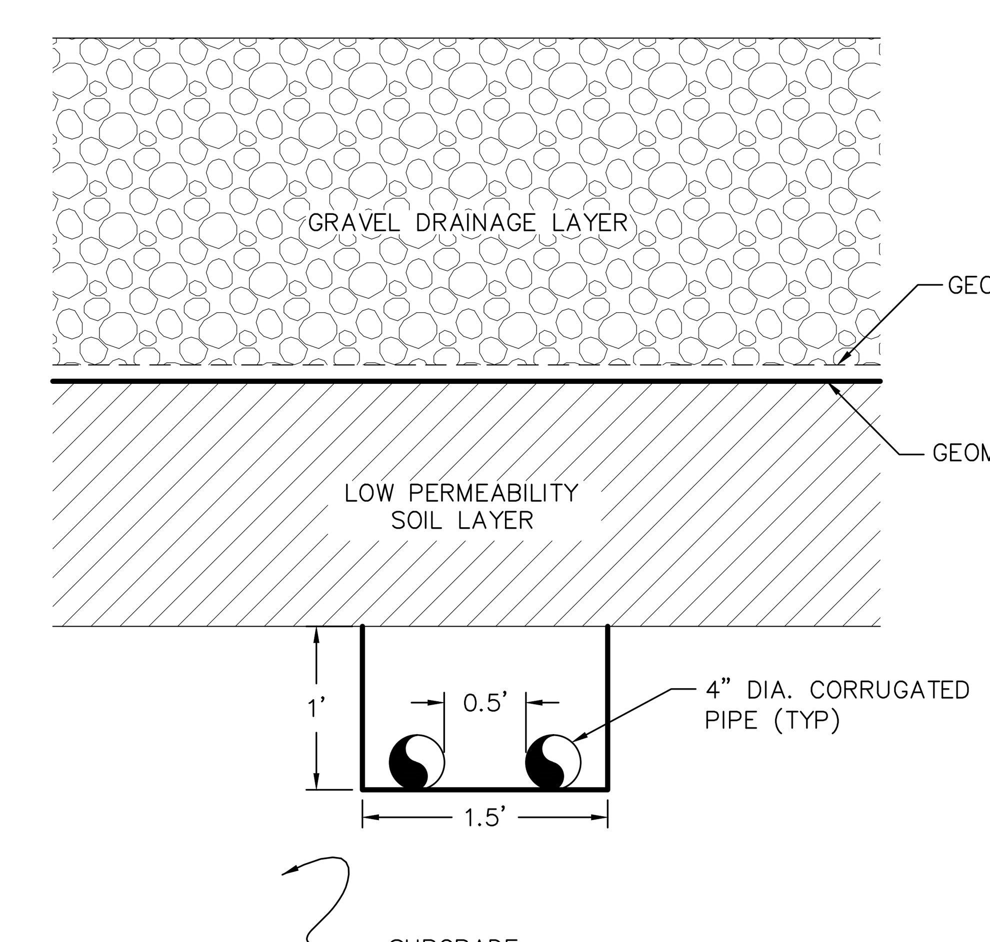
13/7 DETAIL
PROFILER TERMINATION
SCALE: 1" = 4'
XREF: 4299X010



14/7 DETAIL
PROFILER EXTENSION
SCALE: 1" = 4'
XREF: 4299X010



15/– DETAIL
SETTLEMENT PROFILER SYSTEM
SCALE: N.T.S.



16/11 DETAIL
PROFILER TRENCH EXCAVATION
SCALE: 1"=1'
XREF: 4299X010.DWG

NOT FOR CONSTRUCTION

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PROJECT MGR. JFB	AUG 2009

SEAL

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JOB: 444853
WBS:

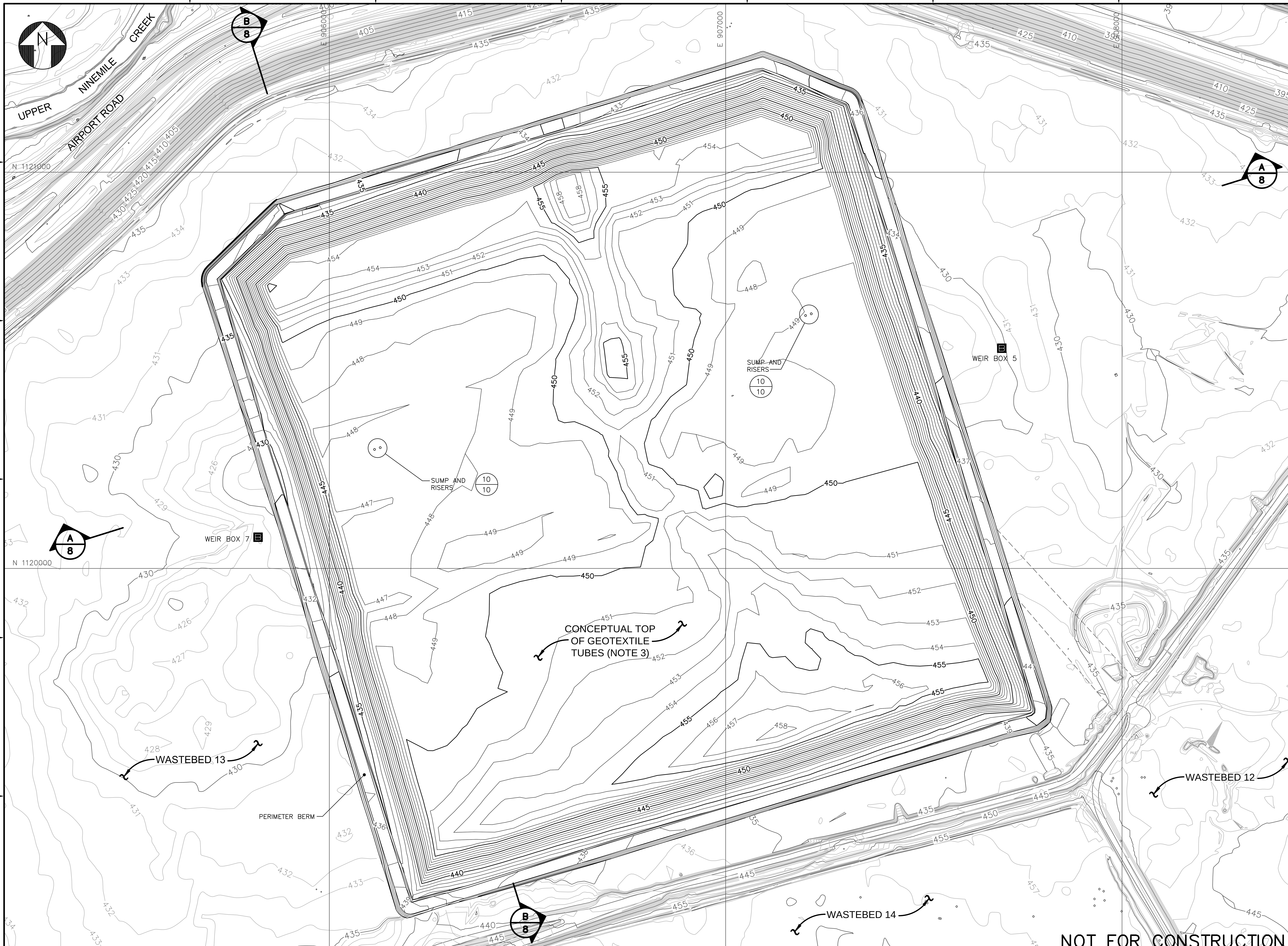
PROJECT TITLE: Honeywell
SEDIMENT CONSOLIDATION AREA
ONONDAGA LAKE BOTTOM
SUBSITE REMEDIAL DESIGN

DRAWING TITLE: INSTRUMENTATION AND MONITORING DETAILS

SCALE: AS SHOWN

DRAWING NO. 444853-101-C-011 REV. A

FILE NAME: L:\CADD\O\ONONDAGA LAKE\PERMIT\SCA GEOTUBES\50-PERCENT DESIGN GJ4299.01.01\DRAWINGS\4299-009.DWG
PLOT DATE: 4/16/2007 12:45 PM PLOTTED BY: JONATHAN SPEED



NOTES:

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2. THE SCA DESIGN SHOWN ON THIS DRAWING IS FOR A CAPACITY OF 2.65 MILLION CUBIC YARDS.
3. THE TOP OF GEOTEXTILE TUBE ELEVATIONS SHOWN ON THIS DRAWING ARE BASED ON SETTLEMENT CALCULATIONS PERFORMED TO ESTIMATE ELEVATIONS AT THE END OF 4 YEARS OF DEWATERING OPERATIONS. ACTUAL ELEVATIONS MAY VARY FROM THE CALCULATED ELEVATIONS.

LEGEND

430	EXISTING GROUND ELEVATION (FEET) (NOTE 1)
440	PROPOSED PERIMETER BERM
	EXISTING ROAD
WEIR BOX 5	EXISTING WEIR BOX

0 120' 240'
SCALE IN FEET

Geosyntec consultants
1255 ROBERTS BOULEVARD, N.W., SUITE 200
KENNESAW, GEORGIA 30144 USA
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NO.	DESCRIPTION	DATE	DRAWN	CHK'D	APPV'D
A	INITIAL DESIGN SUBMITTAL				

	DATE
DRAWN BY: JHS	AUG 2009
CHECKED BY: RK	AUG 2009
APPROVED BY: JFB	AUG 2009
PROJECT MGR.: JFB	AUG 2009

SEAL

PARSONS
COMMERCIAL TECHNOLOGY GROUP

OFFICE: 301 PLAINFIELD ROAD, SYRACUSE, NY 13212, (315) 451-9560
JOB: 444853
WBS:

PROJECT TITLE:
Honeywell
SEDIMENT CONSOLIDATION AREA
ONONDAGA LAKE BOTTOM
SUBSITE REMEDIAL DESIGN

DRAWING TITLE:
CONCEPTUAL TOP OF GEOTEXTILE TUBES

SCALE: SCALE: 1" = 120'

DRAWING NO.: 444853-101-C-012 REV.: A

FILE NAME: L:\CADD\D\ONONDAGA LAKE\PERMIT\SCA GEOTUBES\50-PERCENT DESIGN GJ4299.01.01\DRAWINGS\4299-012.DWG
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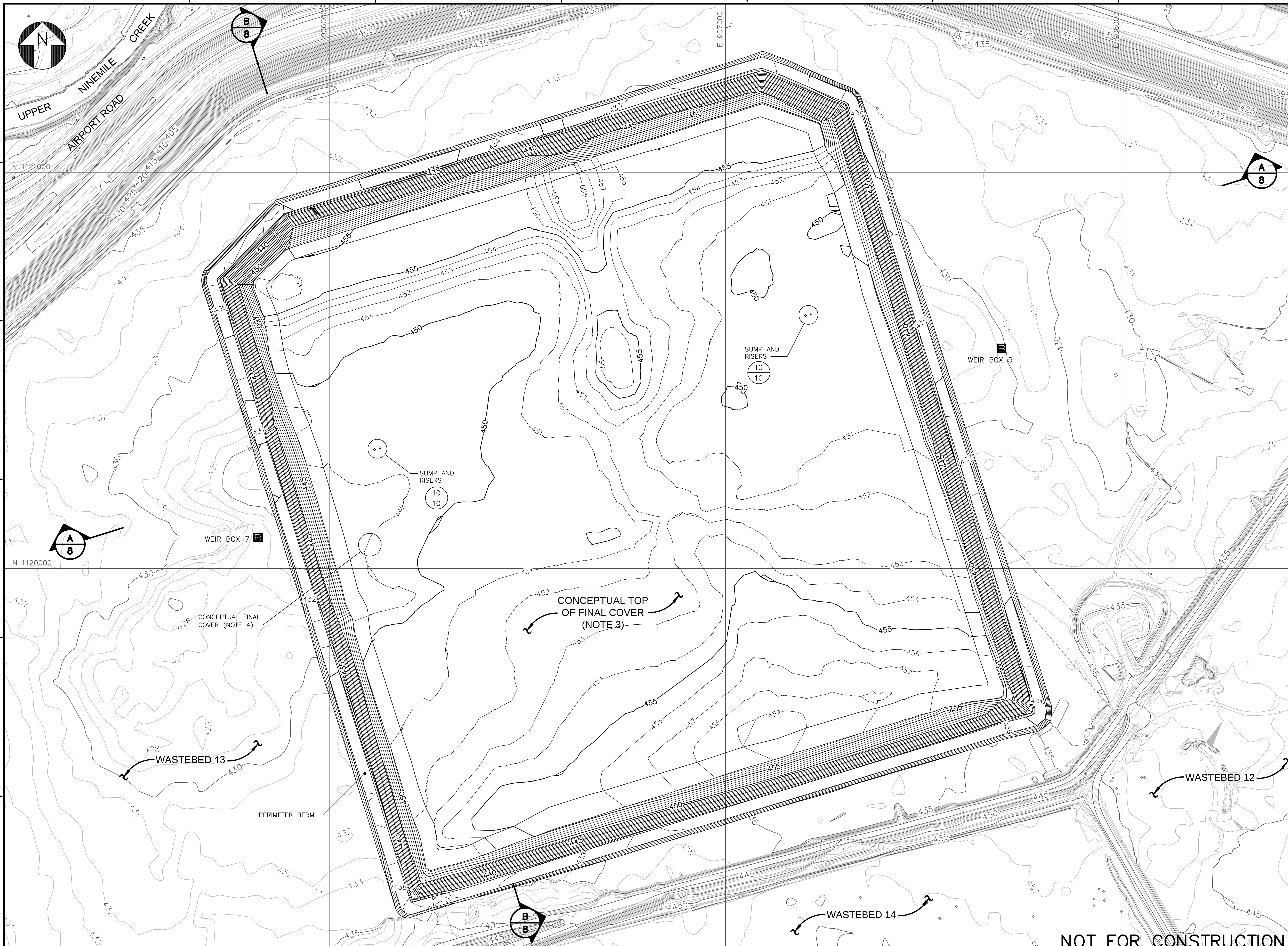

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4. CONCEPTUAL FINAL COVER IS ASSUMED TO CONSIST OF A 3-INCH LEVELING LAYER AND 18-INCH VEGETATED SOIL LAYER.

LEGEND

430	EXISTING GROUND ELEVATION (FEET) (NOTE 1)
440	PROPOSED PERIMETER BERM
	EXISTING ROAD
WEIR BOX 5	EXISTING WEIR BOX

0 120' 240'
SCALE IN FEET

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PROJECT MGR.: JFB	DATE: AUG 2009	

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JOB: 444853
WBS:

PROJECT TITLE:
Honeywell
SEDIMENT CONSOLIDATION AREA
ONONDAGA LAKE BOTTOM
SUBSITE REMEDIAL DESIGN

DRAWING TITLE:
CONCEPTUAL TOP OF FINAL COVER

SCALE: SCALE: 1" = 120'

DRAWING NO.: 444853-101-C-013 REV. A

FILE NAME: L:\CADD\O\ONONDAGA LAKE\PERMIT\SCA GEOTUBES\50-PERCENT DESIGN GJ4299.01.01\DRAWINGS\4299-013.DWG
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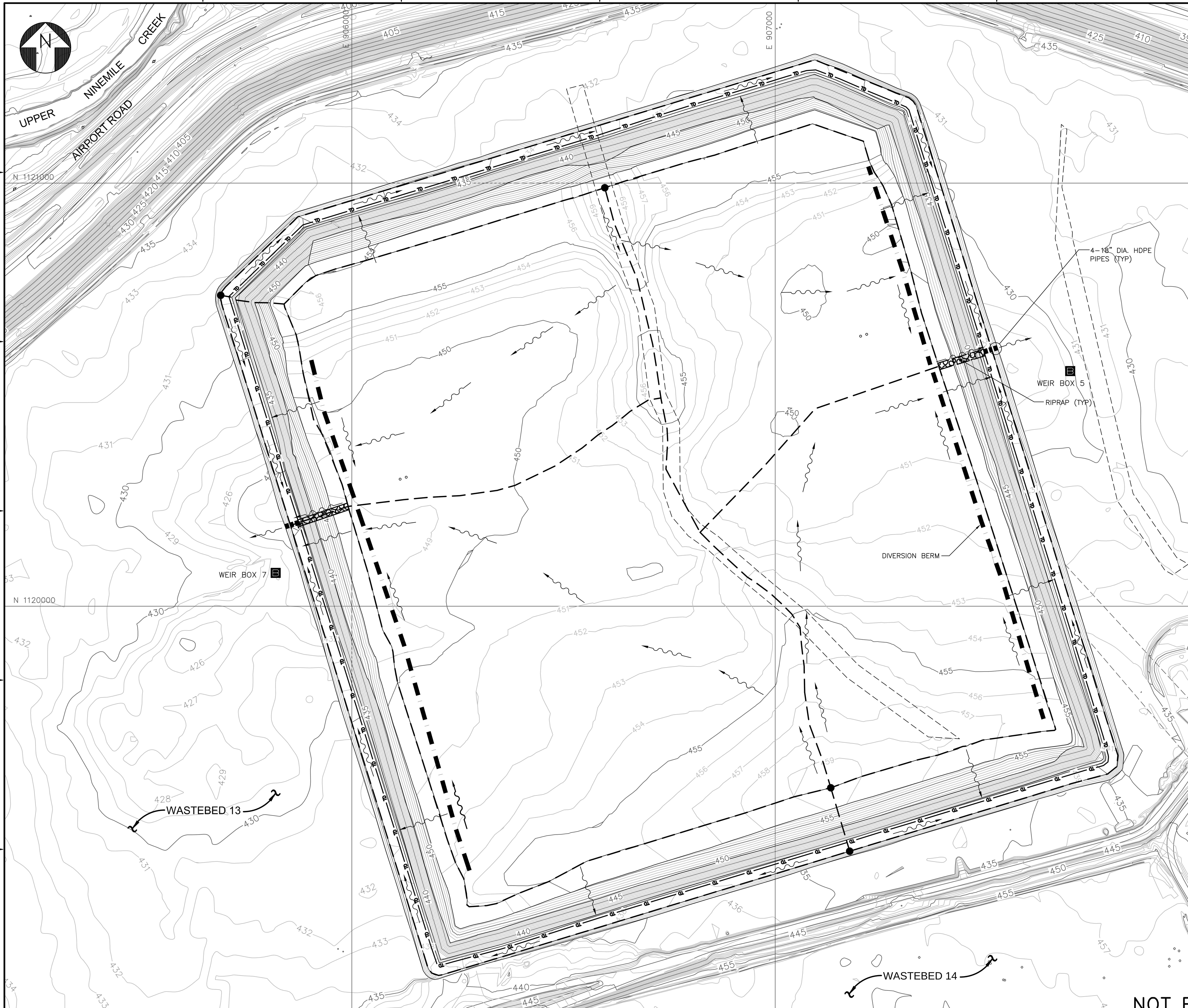

LEGEND

Symbol	Description
430	EXISTING GROUND ELEVATION (FEET) (NOTE 1)
	EXISTING ROAD
WEIR BOX 5	EXISTING WEIR BOX
	DIVERSION BERMS
TD	TOE DRAINAGE CHANNEL
	RIPRAP CHUTES
	PERIMETER CULVERTS
	SURFACE WATER FLOW DIRECTION
	HIGH ELEVATION ON GRADE

NOTES:

1. THE TOPOGRAPHIC CONTOURS SHOWN ON THIS DRAWING WERE OBTAINED FROM A TOPOGRAPHIC MAP COMPILED BY TVGA CONSULTANTS USING PHOTOGRAMMETRIC METHODS BASED ON AERIAL PHOTOGRAPHY PERFORMED ON 6 APRIL 2008. THE MAP WAS COMPILED IN ACCORDANCE WITH NATIONAL MAP ACCURACY STANDARDS FOR 1 INCH EQUAL TO 50 FEET SCALE. THE TOPOGRAPHIC MAP WAS PROVIDED TO GEOSYNTEC BY PARSONS.
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4. SURFACE WATER MANAGEMENT FEATURES SUCH AS SURFACE WATER CONTROL BERMS AND DITCHES ARE NOT GRADED IN THE DRAWING AT THIS TIME.
5. DETAIL PLANS TO ROUTE THE WATER FROM SCA TO LOCATIONS OUTSIDE OF WASTEBED 13 ARE NOT PRESENTED ON THIS DRAWING.

0 120' 240'
SCALE IN FEET

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NO.	DESCRIPTION	DATE	DRAWN	CHK'D	APP'D
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CHECKED BY: RK	DATE: AUG 2009	
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PROJECT MGR.: JFB	DATE: AUG 2009	

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OFFICE: 301 PLAINFIELD ROAD SYRACUSE, NY 13212 (315) 451-9560

JOB: 444853
WBS:

PROJECT TITLE: Honeywell
SEDIMENT CONSOLIDATION AREA
ONONDAGA LAKE BOTTOM
SUBSITE REMEDIAL DESIGN

DRAWING TITLE:
CONCEPTUAL SURFACE WATER MANAGEMENT PLAN

SCALE: SCALE: 1" = 120'

DRAWING NO.: 444853-101-C-014 REV.: A

FILE NAME: L:\CADD\01\ONONDAGA LAKE\PERMIT\SCA GEOTUBES\50-PERCENT DESIGN GJ4299.01.01\DRAWINGS\4299-014.DWG
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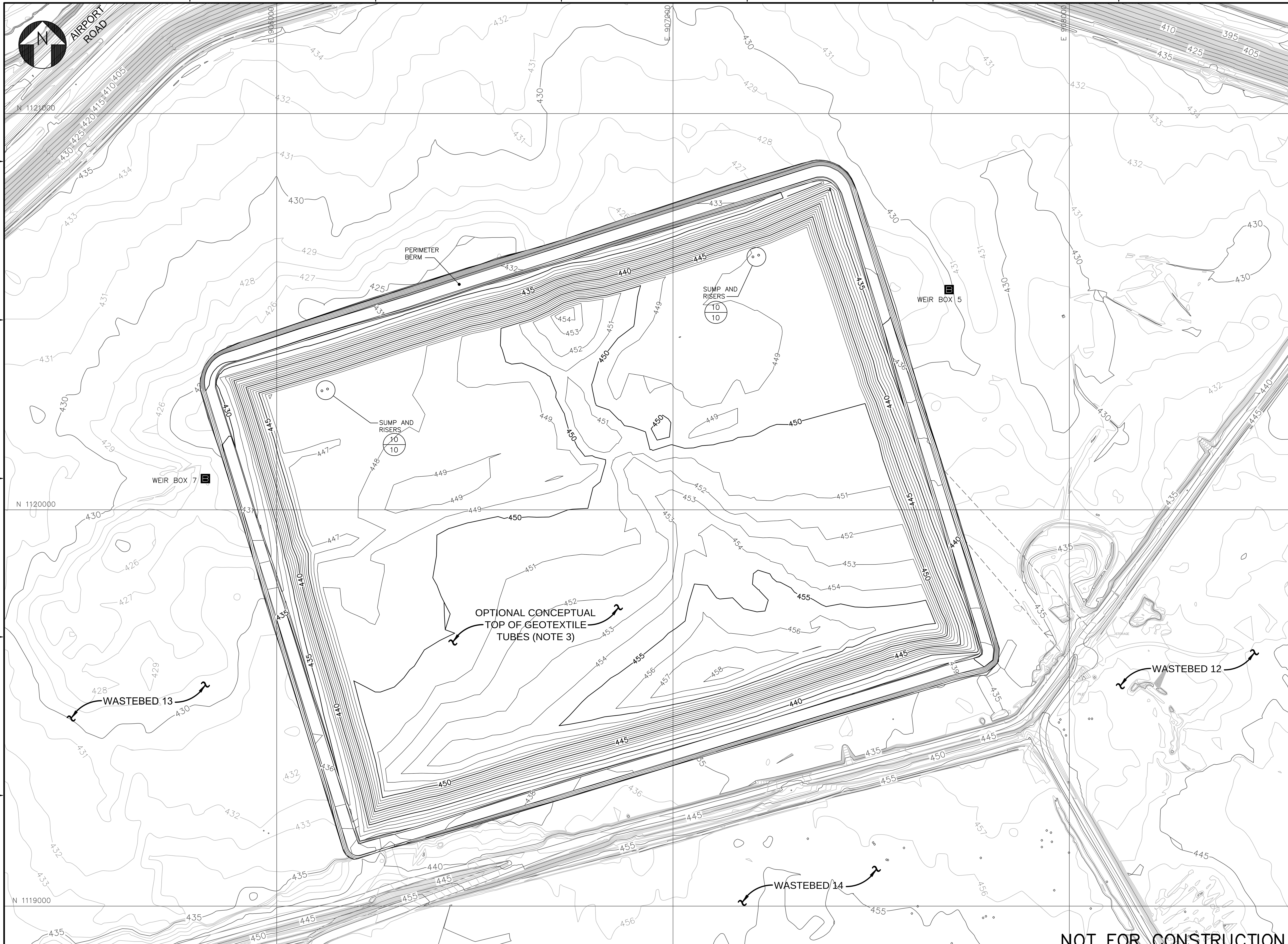

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4. THE SETTLEMENTS FOR THE 1.9 MILLION CUBIC YARDS OPTION WERE ESTIMATED BASED ON CALCULATIONS PERFORMED FOR THE 2.65 MILLION CUBIC YARDS OPTION.

LEGEND

430	EXISTING GROUND ELEVATION (FEET) (NOTE 1)
440	PROPOSED PERIMETER BERM
	EXISTING ROAD
WEIR BOX 5	EXISTING WEIR BOX

0 120' 240'
SCALE IN FEET

Geosyntec consultants
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APPROVED BY JFB	AUG 2009	
PROJECT MGR. JFB	AUG 2009	

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ONONDAGA LAKE BOTTOM
SUBSITE REMEDIAL DESIGN

DRAWING TITLE
OPTIONAL CONCEPTUAL TOP OF GEOTEXTILE TUBES

SCALE: 1" = 120'

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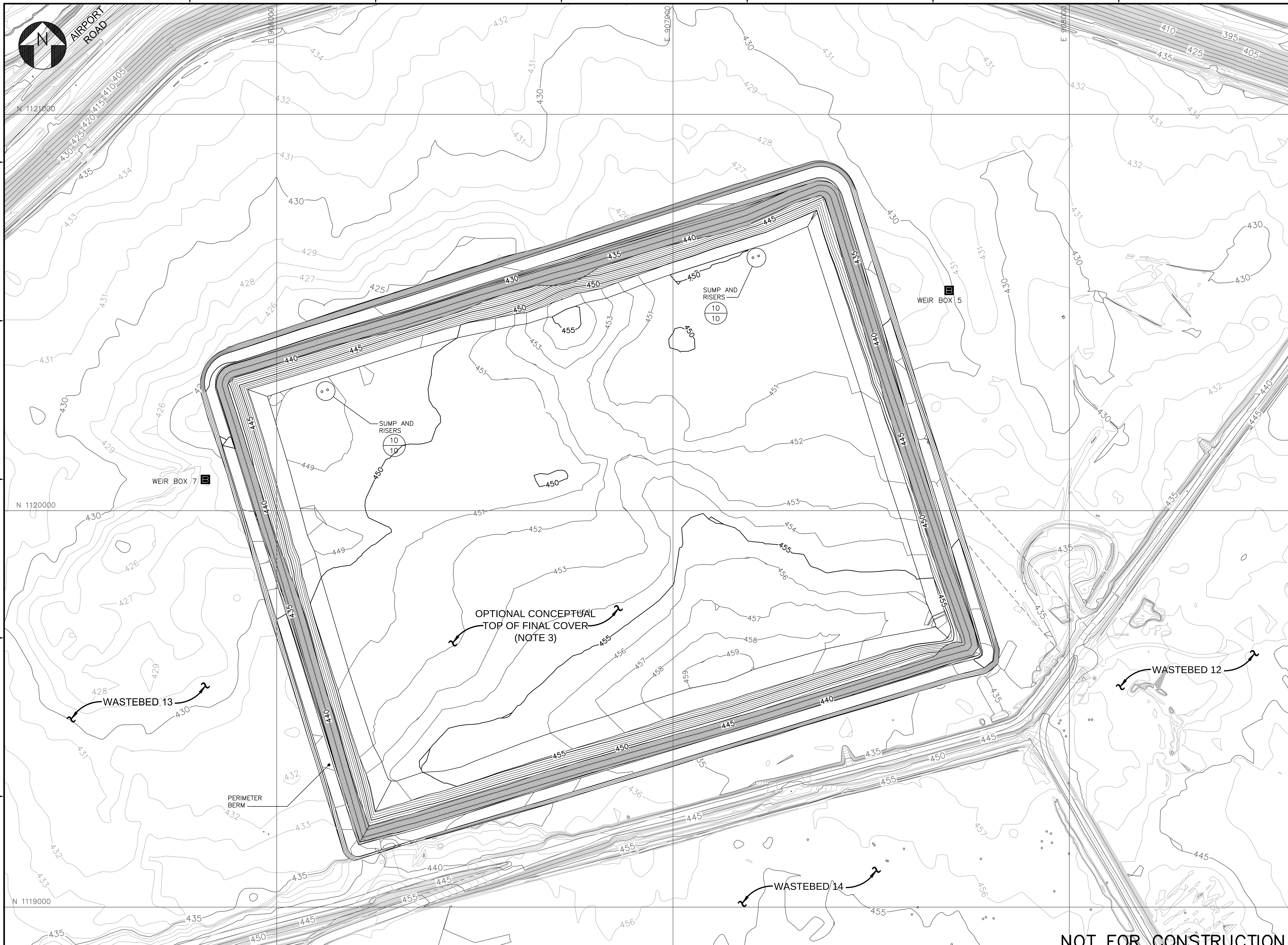

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Honeywell
SEDIMENT CONSOLIDATION AREA
ONONDAGA LAKE BOTTOM
SUBSITE REMEDIAL DESIGN

DRAWING TITLE
OPTIONAL CONCEPTUAL
TOP OF FINAL COVER

SCALE
SCALE: 1" = 120'

DRAWING NO. 444853-101-C-016
REV. A

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APPENDIX F

VOLUME CALCULATIONS FOR SCA DESIGN

GEOSYNTEC CONSULTANTS

COMPUTATION COVER SHEET

Client: Honeywell **Project:** Onondaga Lake SCA IDS **Project/Proposal #:** GJ4299 **Task #:** 03

TITLE OF COMPUTATIONS **VOLUME CALCULATIONS FOR SCA DESIGN**

COMPUTATIONS BY:

Signature [signature] 8/4/2009
DATE

Printed Name and Title: Joseph Sura, Staff Engineer

ASSUMPTIONS AND PROCEDURES CHECKED BY:
(Peer Reviewer)

Signature R. Kulasingam [signature] 08/4/2009
DATE

Printed Name and Title: R. Kulasingam, Project Engineer

COMPUTATIONS CHECKED BY:

Signature R. Kulasingam [signature] 08/4/2009
DATE

Printed Name and Title: R. Kulasingam, Project Engineer

COMPUTATIONS BACKCHECKED BY:
(Originator)

Signature [signature] 8/4/2009
DATE

Printed Name and Title: Joseph Sura, Staff Engineer

APPROVED BY:
(PM or Designate)

Signature [signature] 4 AUG 2009
DATE

Printed Name and Title: Jay Beech, Principal

STATE OF NEW YORK JOHN F. BEECH No. 066337 LICENSED PROFESSIONAL ENGINEER

APPROVAL NOTES: ______

REVISIONS (Number and initial all revisions)

NO.	SHEET	DATE	BY	CHECKED BY	APPROVAL

Written by:	Joseph Sura	Date:	6/8/2009	Reviewed by:	R. Kulasingam	Date:	6/8/2009
Client:	Honeywell	Project:	Onondaga Lake SCA IDS	Project/ Proposal No.:	GJ4299	Task No.:	03

VOLUME CALCULATIONS FOR SCA DESIGN

INTRODUCTION

This package was prepared in support of the design of the Sediment Consolidation Area (SCA) for the Onondaga Lake Bottom Site, which will be constructed on Wastebed 13 (WB-13). The primary goal of this package is to present capacity calculations for the proposed SCA. Calculations of the thicknesses and volume of the low permeability soil liner, gravel drainage layer, and SCA perimeter dike material are also presented.

CURRENT SCA DESIGN

The Consent Decree (CD) states that the Onondaga Lake remedy includes dredging of up to 2,653,000 cubic yards (cy) of material from Onondaga Lake. This calculation package presents a viable SCA footprint for two volume options: (i) consolidation of the upper bound dredge volume of 2,653,000 cy of material; and (ii) consolidation of an alternate volume of 1,900,000 cy of material.

The current SCA design includes a composite liner system, five layers of geotextile tubes (geo-tubes), and a final cover system, surrounded by a perimeter dike with a minimum height of five feet. Based on discussions with New York State Department of Environmental Conservation (NYSDEC), the low-permeability soil layer component of the composite liner system shall have a minimum thickness of 1 ft with a 1.5-ft thickness near the sump areas. A gravel drainage layer with an average thickness of approximately 2 ft will be placed above the low-permeability liner. The current design includes stacking of up to five layers of geo-tubes on top of the gravel drainage layer to result in a dewatered total geo-tube height of 30 ft. The geo-tubes are planned to be offset by a minimum distance of ten feet from the perimeter dike as needed to facilitate operations.

The area difference between the outside perimeter dike edge of the Option 1 (2,653,000 cy) and Option 2 (1,900,000 cy) footprints is approximately 21 acres (see Figure 1). The east-west dimension is the same for both options; therefore, the SCA is shorter in the north-south direction for Option 2 as compared to Option 1. This results in Option 2 having a greater buffer zone between the edge of the SCA and the exterior dike of WB-13.

Written by:	Joseph Sura	Date:	6/8/2009	Reviewed by:	R. Kulasingam	Date:	6/8/2009
Client:	Honeywell	Project:	Onondaga Lake SCA IDS	Project/ Proposal No.:	GJ4299	Task No.:	03

METHODOLOGY

The calculations presented in this package were computed using the proposed SCA grading plans and AutoCAD 2010. AutoCAD creates 3-D surfaces (Triangular Irregular Network surfaces) based on the contours on the grading plans and uses these surfaces to calculate the volume and thickness of each layer. The thicknesses are then graphed as isopachs, which are contours connecting points of equal thickness.

CALCULATIONS

The proposed grading plans for the berm and subgrade, low permeability soil liner, gravel drainage layer, and top of geo-tubes for Option 1 are provided in Attachment A, Figures A1 through A4. The calculated total dredge material capacity for Option 1 is calculated as the difference between the grades shown in Figures A4 and A3 and is shown in Figure 2. Isopachs of the low permeability soil liner (difference between Figures A2 and A1) and gravel drainage layer (difference between Figures A3 and A2) are shown in Figures 3 and 4, respectively. The calculated SCA perimeter dike volume for Option 1 is calculated as the difference between the existing grades and the proposed berm grading plan shown in Figure A1 and is shown in Figure 5.

The proposed grading plans for the berm and subgrade, low permeability soil liner, gravel drainage layer, and top of geo-tubes for Option 2 are provided in Attachment B, Figures B1 through B4. The calculated total dredge material capacity for Option 2 is calculated as the difference between the grades shown in Figures B4 and B3 and is shown in Figure 6. Isopachs of the low permeability soil liner (difference between Figures B2 and B1) and gravel drainage layer (difference between Figures B3 and B2) are shown in Figures 7 and 8, respectively. The calculated SCA perimeter dike volume for Option 1 is calculated as the difference between the existing grades and the proposed berm grading plan (Figure A1) and is shown in Figure 9.

RESULTS

The calculated SCA capacity for dredge material and volumes of low-permeability soil, gravel drainage material, and SCA perimeter dike material for Options 1 and 2 are shown in Table 1. The results indicate that the proposed SCA footprints for Options 1 and 2 meet their respective target capacities. For Option 1, the footprint areas to the outside and inside edges of the perimeter dike were estimated to be approximately 72 acres and 65 acres, respectively. The average thicknesses of low permeability soil and gravel drainage material were calculated to be 2.5 ft and 2.0 ft, respectively. For Option 2, the footprint areas to the outside and inside edges of the perimeter dike were estimated to be approximately 51 acres and 47 acres, respectively. The average thicknesses of low permeability soil and gravel drainage material were calculated to be 2.5 ft and 2.1 ft, respectively. Review of Figures 3 and 7 (for Options 1 and 2, respectively) indicates that the low permeability soil layer has a minimum thickness of 1 ft in the SCA footprint with a thickness of at least 1.8 ft near the sump areas. Also the review of Figures 4 and 8 (for Options 1 and 2, respectively) indicates that the gravel drainage layer has a minimum thickness of 1 ft in the SCA footprint with a thickness of at least 4 ft near the sump areas.

Written by:	**Joseph Sura**	Date:	**6/8/2009**	Reviewed by:	**R. Kulasingam**	Date:	**6/8/2009**
Client:	**Honeywell**	Project:	**Onondaga Lake SCA IDS**	Project/ Proposal No.:	**GJ4299**	Task No.:	**03**

Tables

Written by: Joseph Sura Date: 6/8/2009 Reviewed by: R. Kulasingam Date: 6/8/2009

Client: Honeywell Project: Onondaga Lake SCA 50% Design Project/ Proposal No.: GJ4299 Task No.: 03

Table 1: Calculated Volumes (cy)

	Geo-tube Capacity	Low Permeability Clay	Gravel Drainage Material	Perimeter Dike
Option 1	2,720,222	263,723	207,409	57,053
Option 2	1,908,289	191,507	163,435	54,215

Written by: **Joseph Sura** Date: **6/8/2009** Reviewed by: **R. Kulasingam** Date: **6/8/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA 50% Design** Project/ Proposal No.: **GJ4299** Task No.: **03**

Figures

Geosyntec consultants

Written by: **Joseph Sura** Date: **6/5/2009** Reviewed by: **R. Kulasingam** Date: **6/8/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA 50% Design** Project/ Proposal No.: **GJ4299** Task No.: **03**

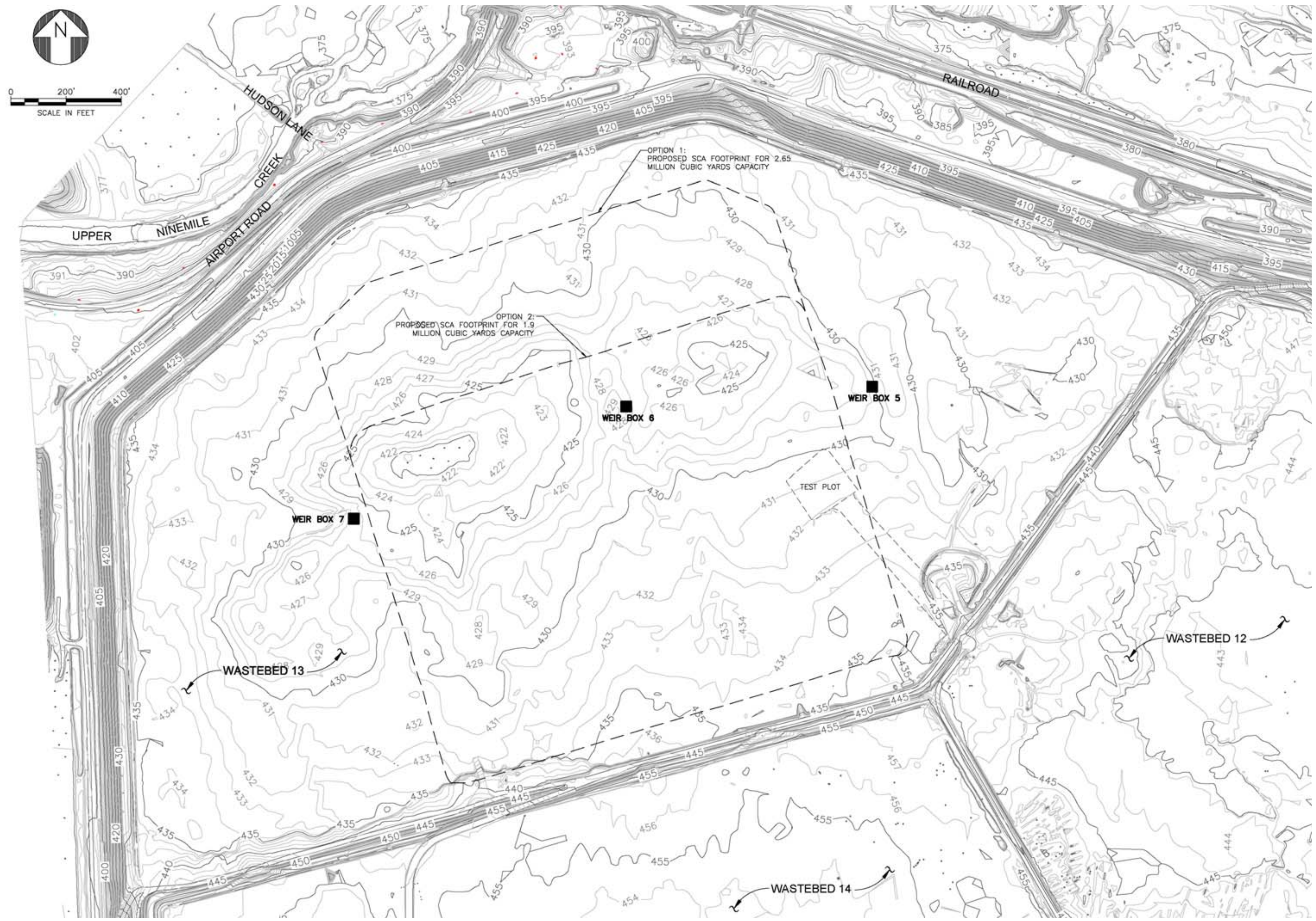
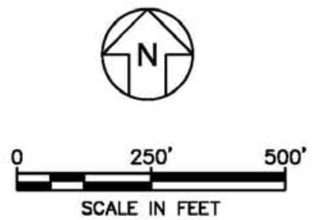


Figure 1: Proposed SCA footprints for Options 1 and 2

Written by: Joseph Sura Date: 6/5/2009 Reviewed by: R. Kulasingam Date: 6/8/2009

Client: Honeywell Project: Onondaga Lake SCA 50% Design Project/ Proposal No.: GJ4299 Task No.: 03



Volume
Base Surface TOP OF GRAVEL (2.65)
Comparison Surface PRE–FINAL COVER (2.65)
Cut volume (unadjusted) 56.99 Cu. Yd.
Fill volume (unadjusted) 2720278.75 Cu. Yd.
Net volume (unadjusted) 2720221.75 Cu. Yd.<Fill>

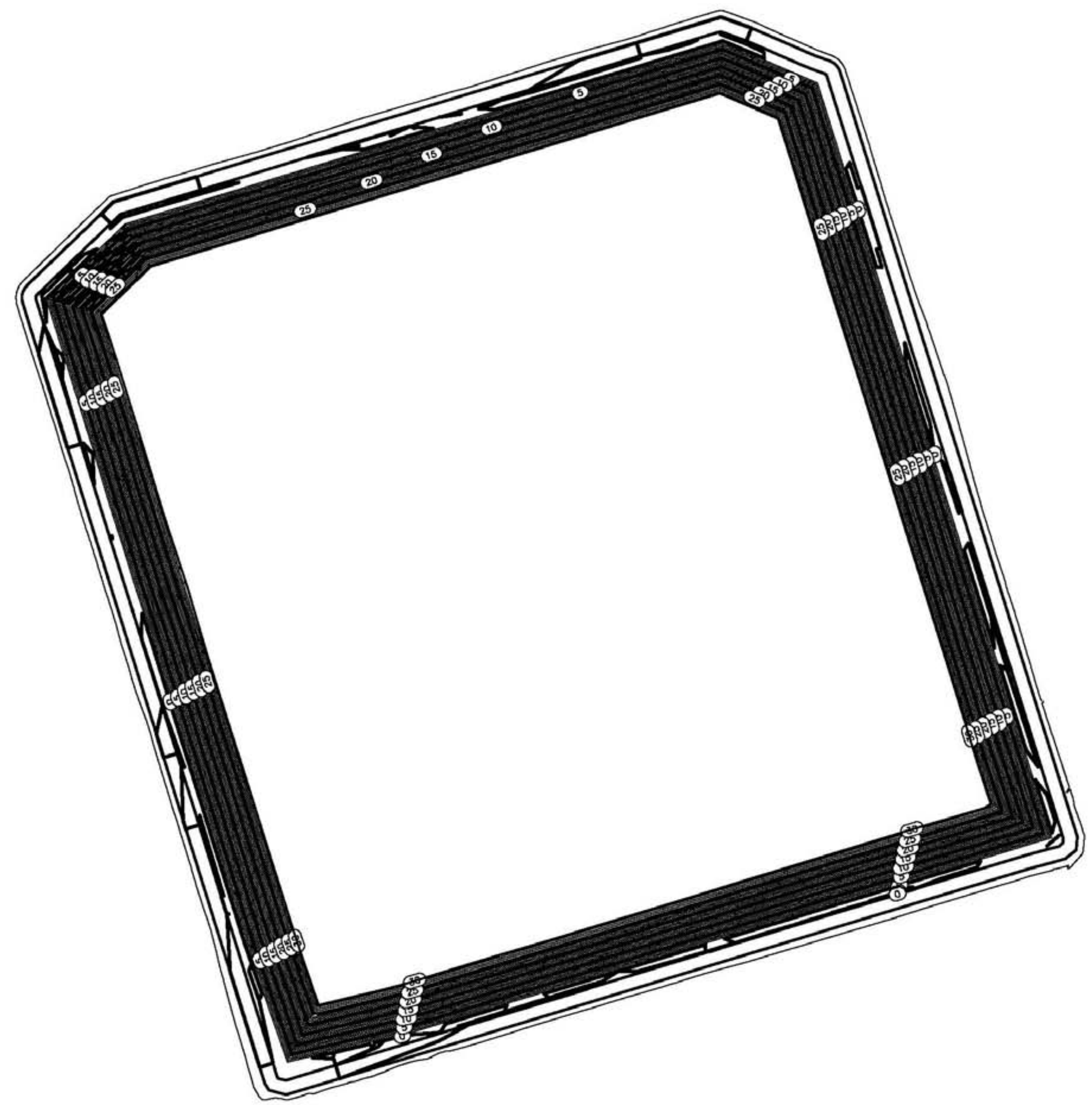


Figure 2: Total Capacity for Option 1 (2.65 million cy)

Written by: **Joseph Sura** Date: **6/5/2009** Reviewed by: **R. Kulasingam** Date: **6/8/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA 50% Design** Project/ Proposal No.: **GJ4299** Task No.: **03**

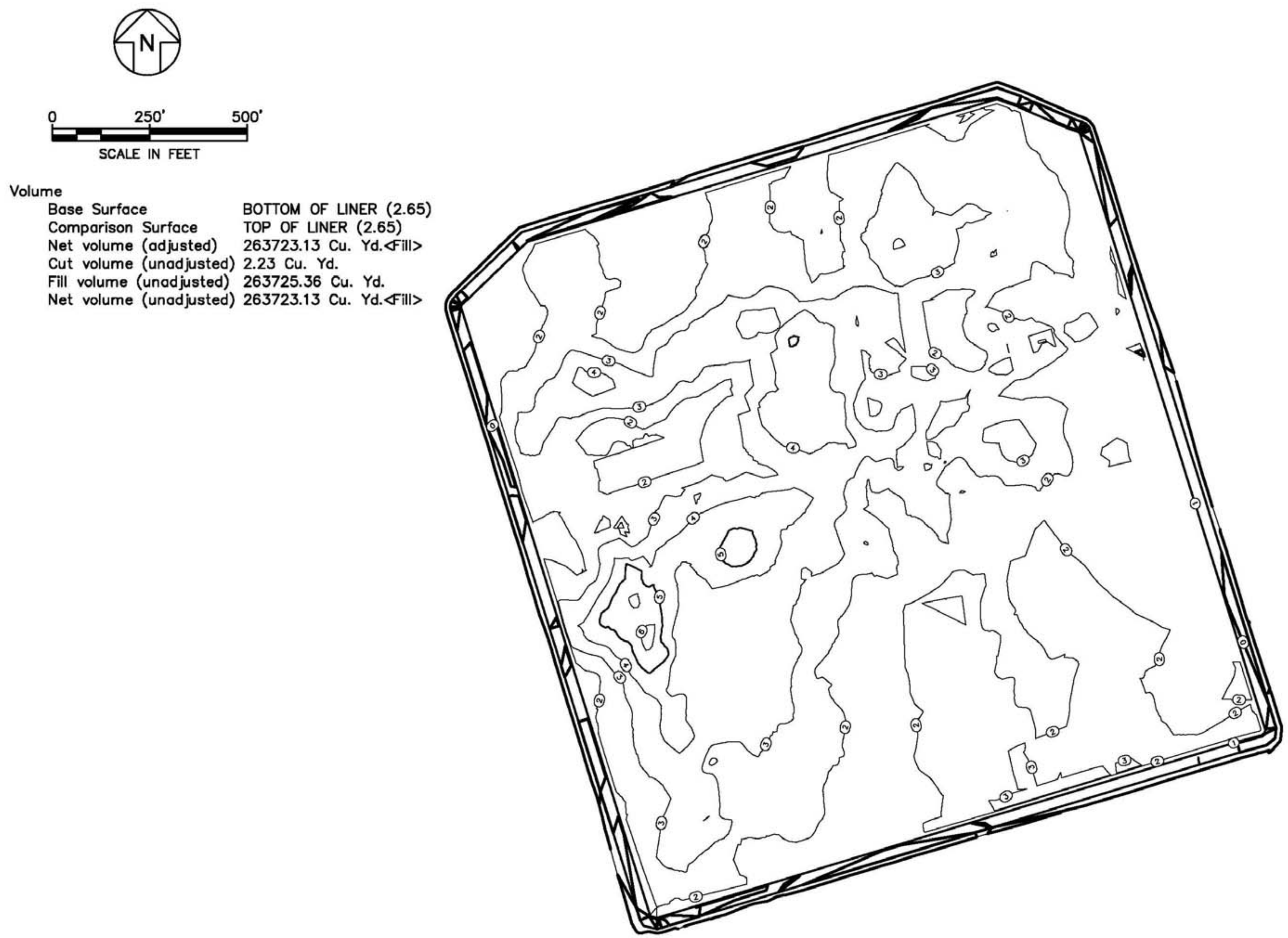


Figure 3: Isopach of Low Permeability Soil Liner Thickness for Option 1 (2.65 million cy)

Written by:	**Joseph Sura**	Date:	**6/5/2009**	Reviewed by:	**R. Kulasingam**	Date:	**6/8/2009**
Client:	**Honeywell**	Project:	**Onondaga Lake SCA 50% Design**	Project/ Proposal No.:	**GJ4299**	Task No.:	**03**

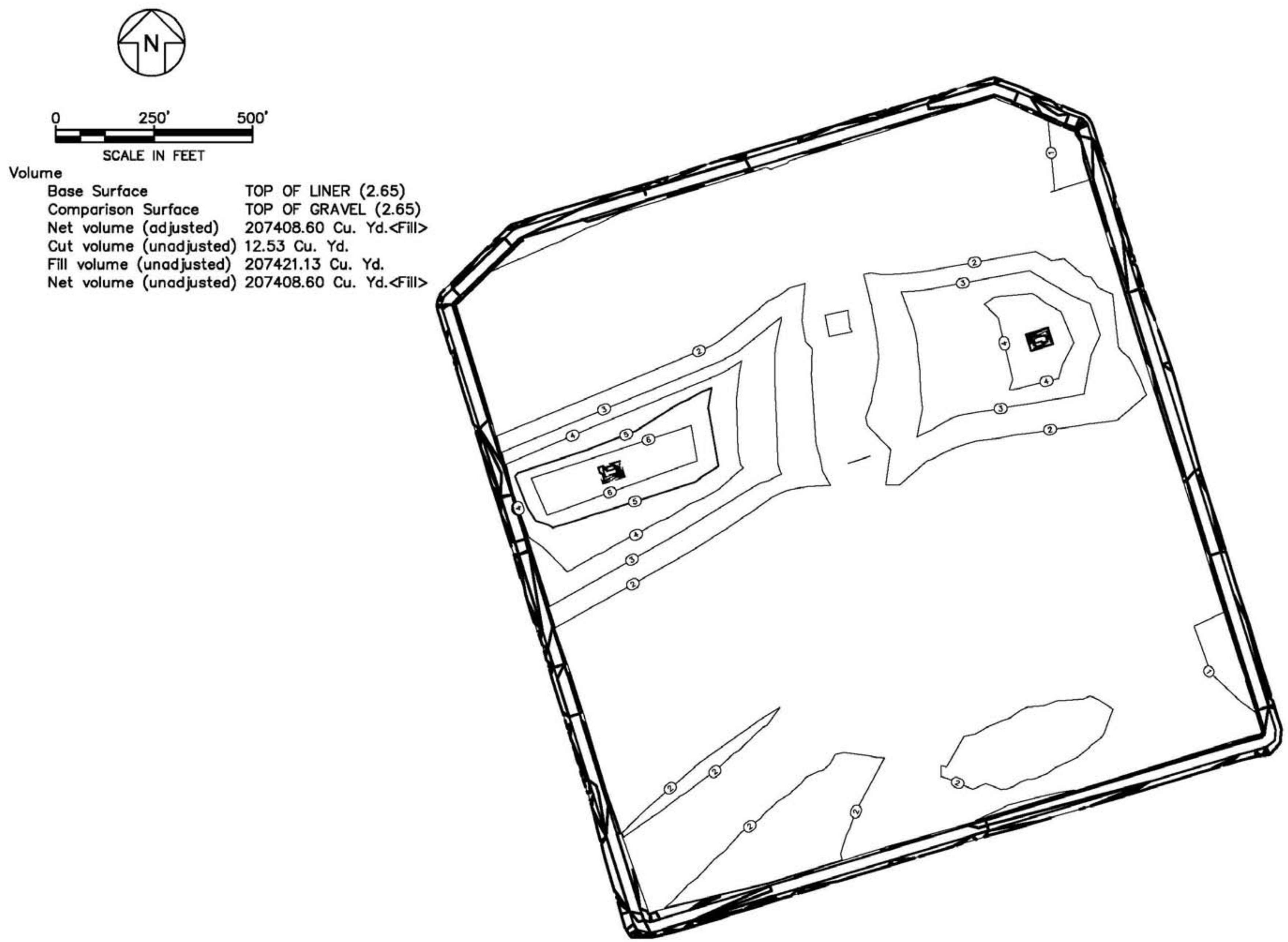


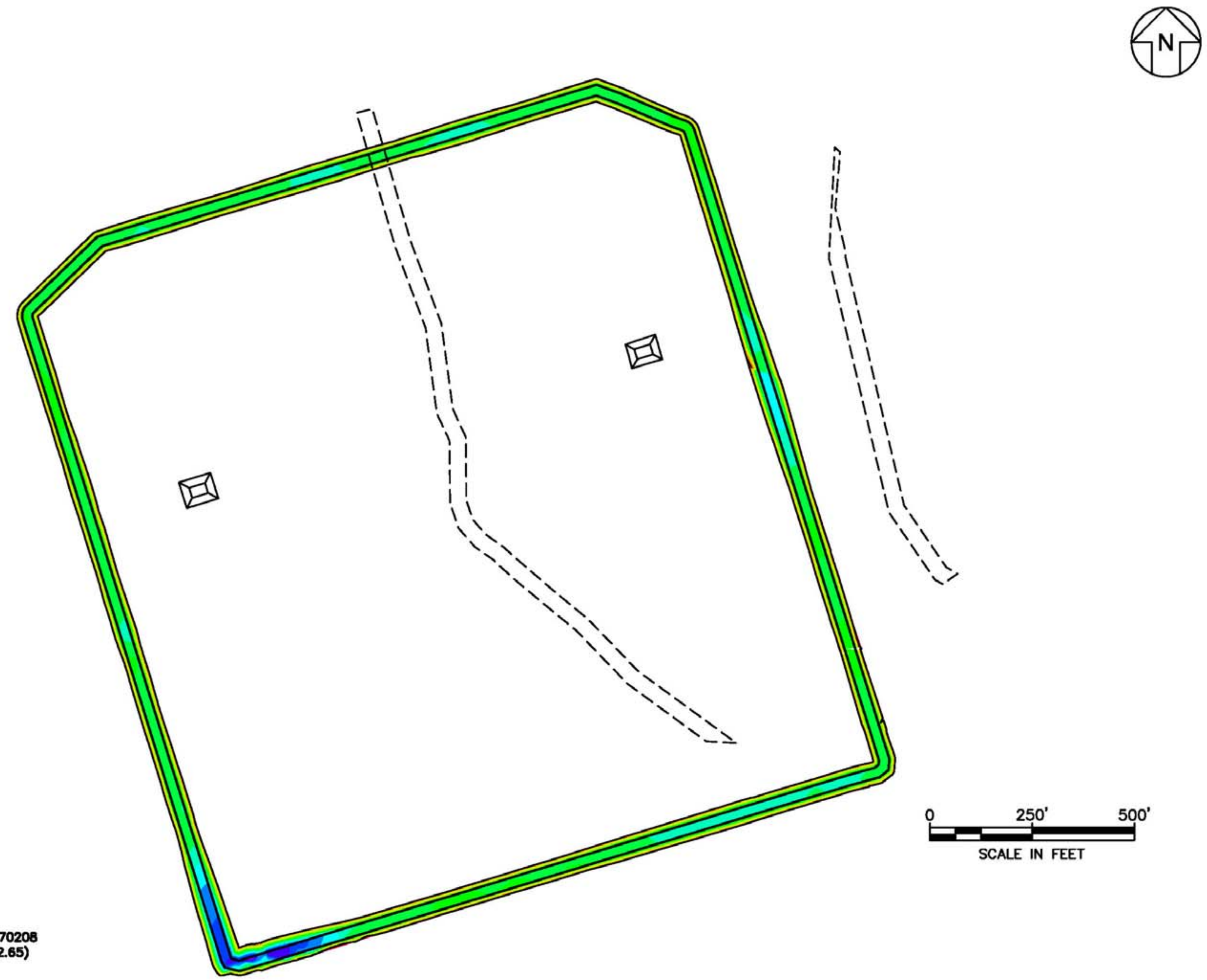
Figure 4: Isopach of Gravel Drainage Layer Thickness for Option 1 (2.65 million cy)

Written by: **Joseph Sura** Date: **6/5/2009** Reviewed by: **R. Kulasingam** Date: **6/8/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA 50% Design** Project/ Proposal No.: **GJ4299** Task No.: **03**

Elevations Table

Number	Minimum Elevation	Maximum Elevation	Color
1	−2.797	−1.000	
2	−1.000	0.000	
3	0.000	1.000	
4	1.000	2.000	
5	2.000	3.000	
6	3.000	4.000	
7	4.000	5.000	
8	5.000	6.000	
9	6.000	7.000	
10	7.000	8.000	
11	8.000	9.000	
12	9.000	10.000	
13	10.000	11.000	
14	11.000	12.000	



Volume
Base Surface EXISTING GROUND_070208
Comparison Surface BOTTOM OF LINER (2.65)
Cut volume (unadjusted) 26.27 Cu. Yd.
Fill volume (unadjusted) 57079.21 Cu. Yd.
Net volume (unadjusted) 57052.94 Cu. Yd.<Fill>

Figure 5: Isopach of Berm Thickness for Option 1 (2.65 million cy)

Written by: **Joseph Sura** Date: **6/5/2009** Reviewed by: **R. Kulasingam** Date: **6/8/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA 50% Design** Project/ Proposal No.: **GJ4299** Task No.: **03**

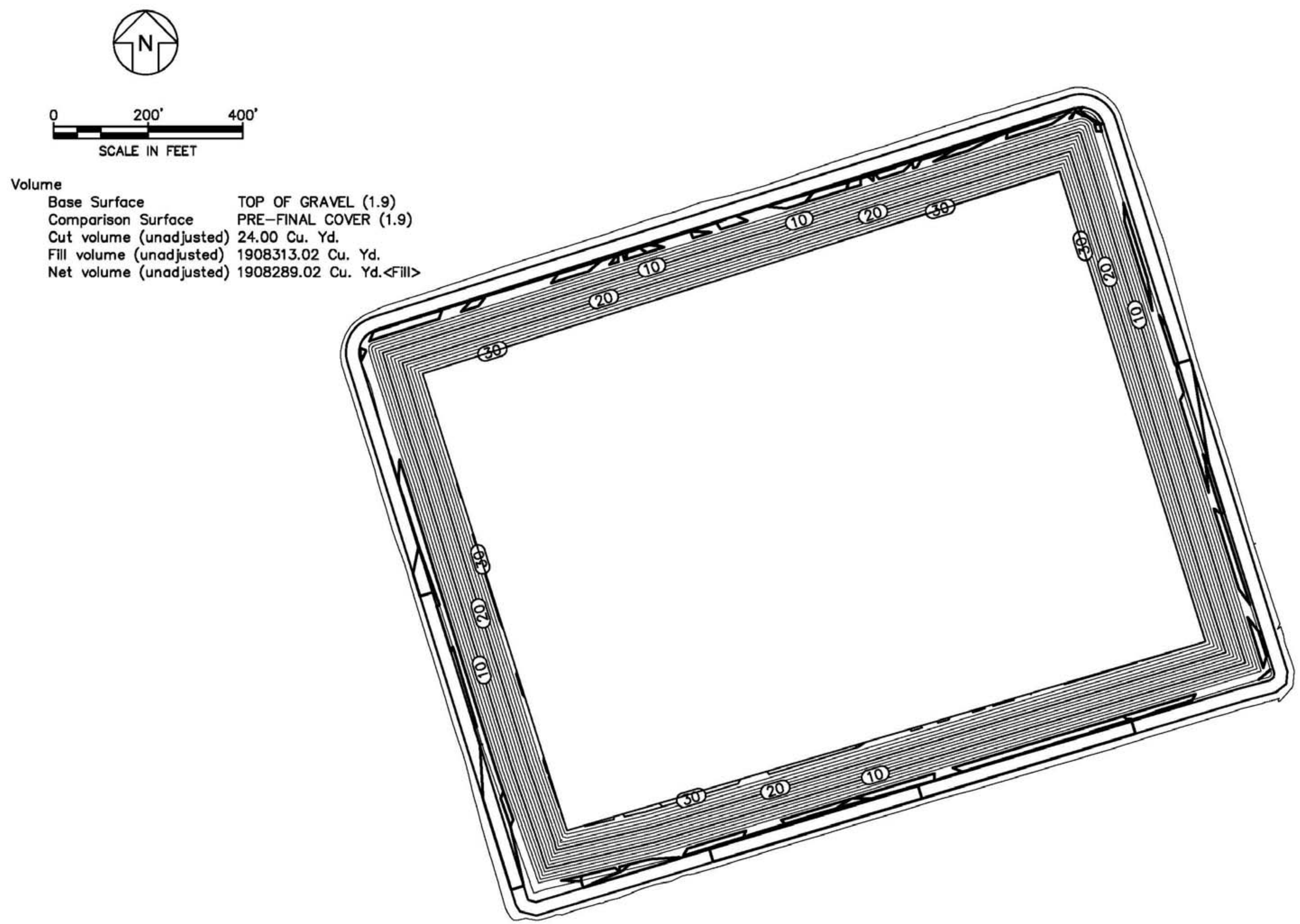


Figure 6: Total Capacity of Option 2 (1.9 million cy)

Written by: **Joseph Sura** Date: **6/5/2009** Reviewed by: **R. Kulasingam** Date: **6/8/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA 50% Design** Project/ Proposal No.: **GJ4299** Task No.: **03**

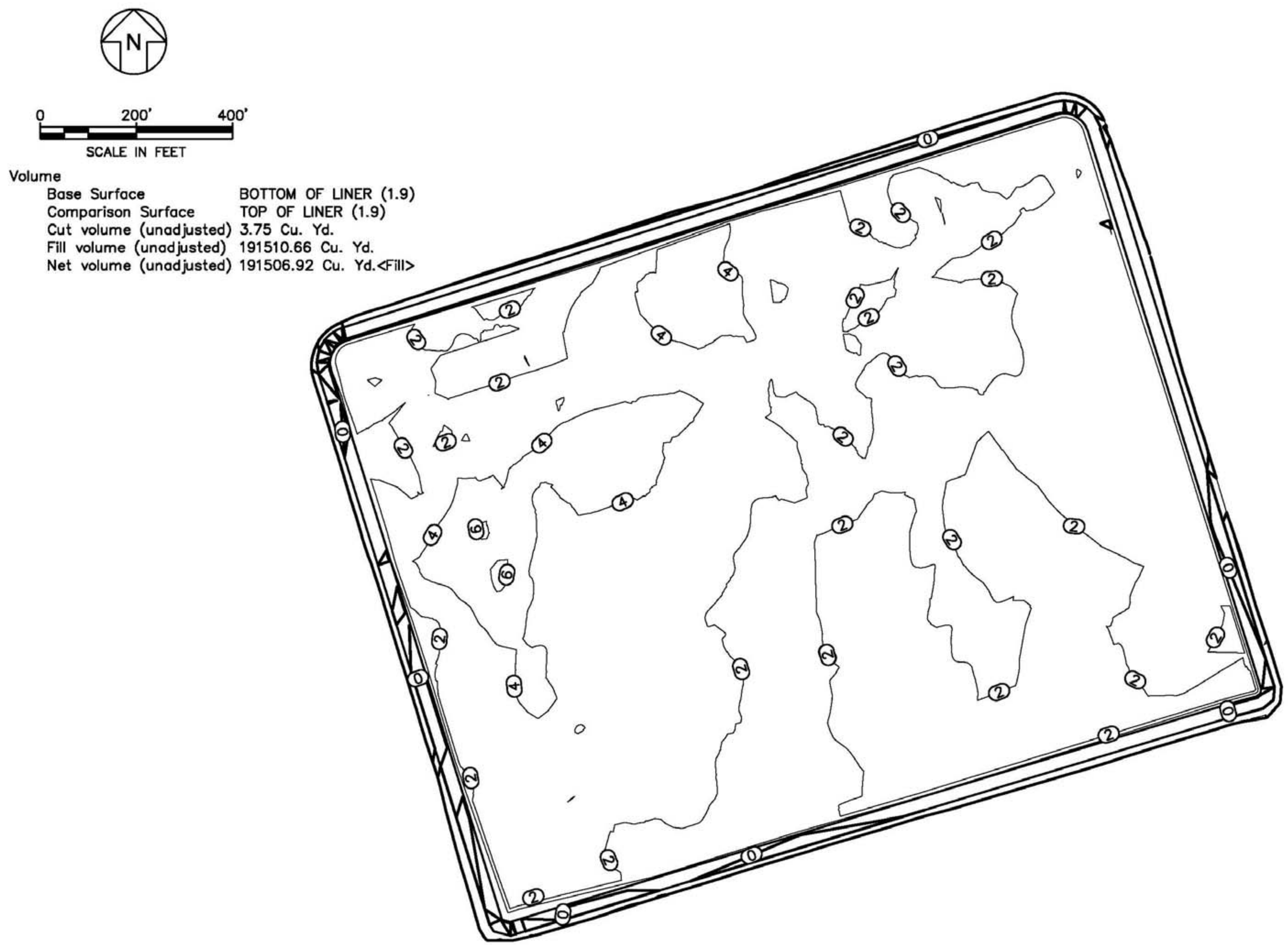


Figure 7: Isopach of Low Permeability Soil Liner Thickness for Option 2 (1.9 million cy)

Written by: **Joseph Sura** Date: **6/5/2009** Reviewed by: **R. Kulasingam** Date: **6/8/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA 50% Design** Project/ Proposal No.: **GJ4299** Task No.: **03**

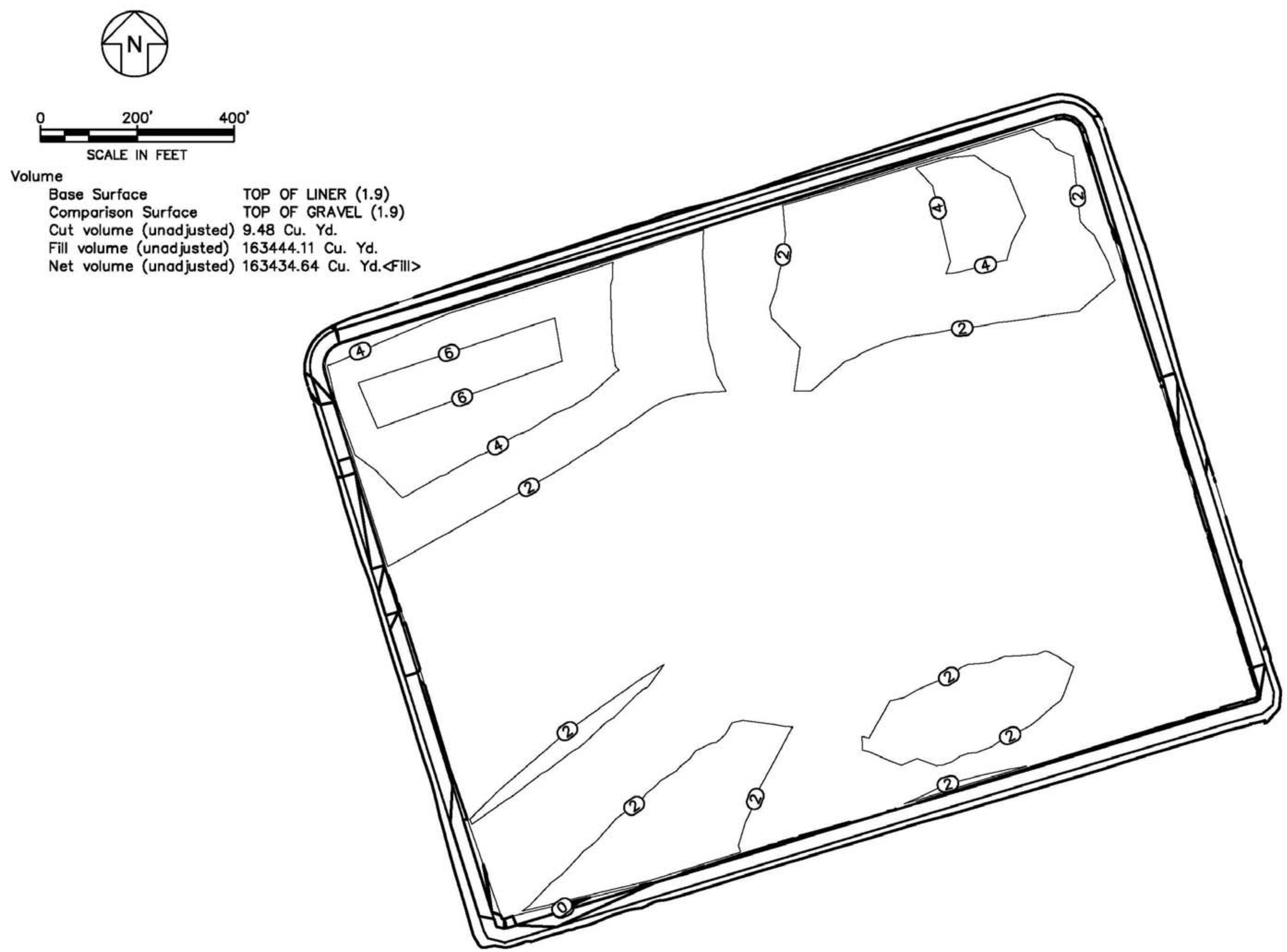


Figure 8: Isopach of Gravel Drainage Layer Thickness for Option 2 (1.9 million cy)

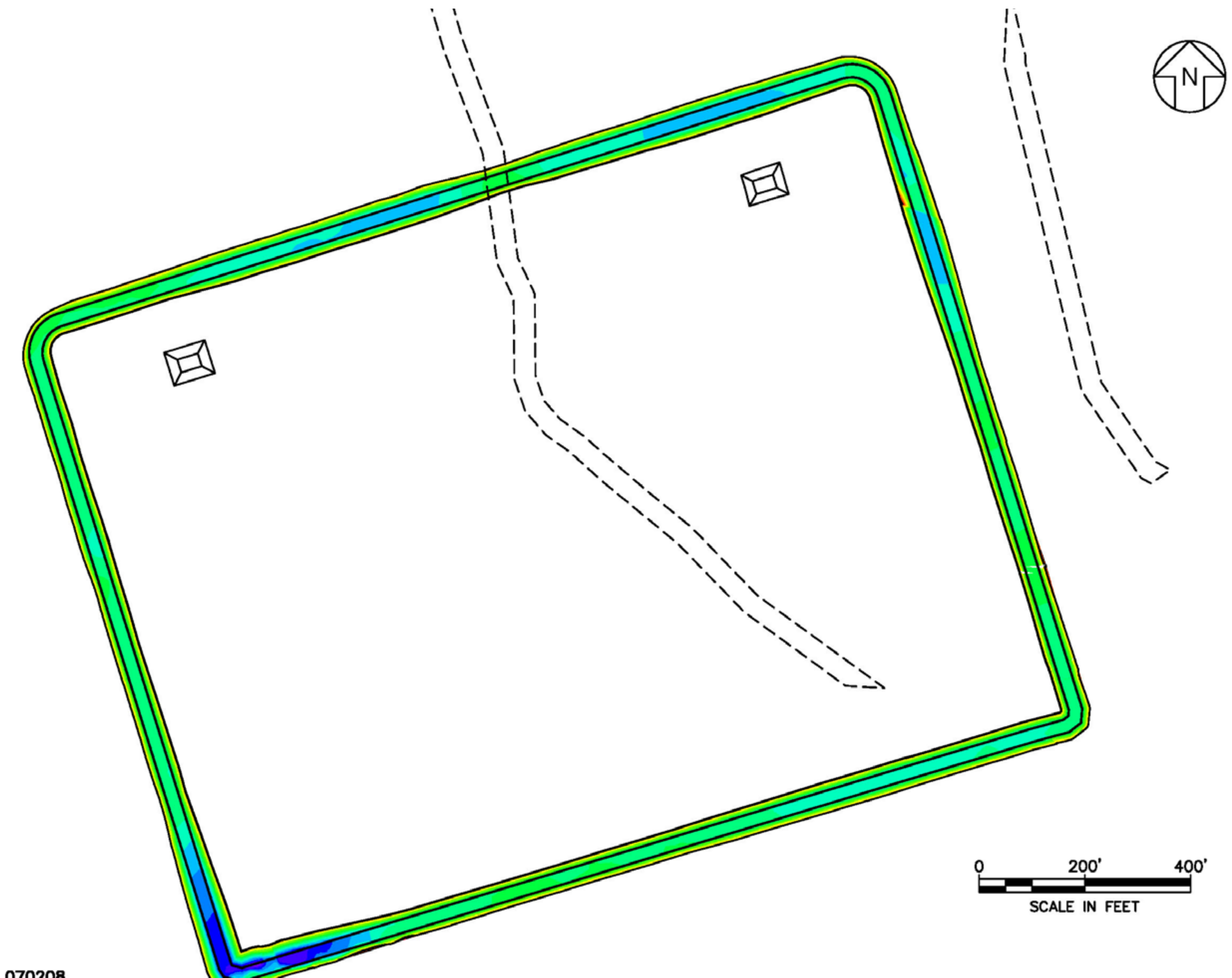
Geosyntec
consultants

Written by: **Joseph Sura** Date: **6/5/2009** Reviewed by: **R. Kulasingam** Date: **6/8/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA 50% Design** Project/ Proposal No.: **GJ4299** Task No.: **03**

Elevations Table

Number	Minimum Elevation	Maximum Elevation	Color
1	-2.829	-2.000	
2	-2.000	-1.000	
3	-1.000	0.000	
4	0.000	1.000	
5	1.000	2.000	
6	2.000	3.000	
7	3.000	4.000	
8	4.000	5.000	
9	5.000	6.000	
10	6.000	7.000	
11	7.000	8.000	
12	8.000	9.000	
13	9.000	10.000	
14	10.000	11.000	
15	11.000	12.000	



Volume
Base Surface EXISTING GROUND_070208
Comparison Surface BOTTOM OF LINER (1.9)
Cut volume (unadjusted) 34.28 Cu. Yd.
Fill volume (unadjusted) 54248.98 Cu. Yd.
Net volume (unadjusted) 54214.69 Cu. Yd.<Fill>

Figure 9: Isopach of Berm Thickness for Option 2 (1.9 million cy)

Written by:	**Joseph Sura**	Date:	**6/5/2009**	Reviewed by:	**R. Kulasingam**	Date:	**6/8/2009**
Client:	**Honeywell**	Project:	**Onondaga Lake SCA 50% Design**	Project/ Proposal No.:	**GJ4299**	Task No.:	**03**

Attachment A: Grading Plans for Option 1

Geosyntec consultants

Written by:	**Joseph Sura**	Date:	**6/5/2009**	Reviewed by:	**R. Kulasingam**	Date:	**6/8/2009**
Client:	**Honeywell**	Project:	**Onondaga Lake SCA 50% Design**	Project/ Proposal No.:	**GJ4299**	Task No.:	**03**

Figure A1: Proposed Berm and Subgrade Grading Plan for Option 1 (2.65 million cy)

Written by: **Joseph Sura** Date: **6/5/2009** Reviewed by: **R. Kulasingam** Date: **6/8/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA 50% Design** Project/ Proposal No.: **GJ4299** Task No.: **03**

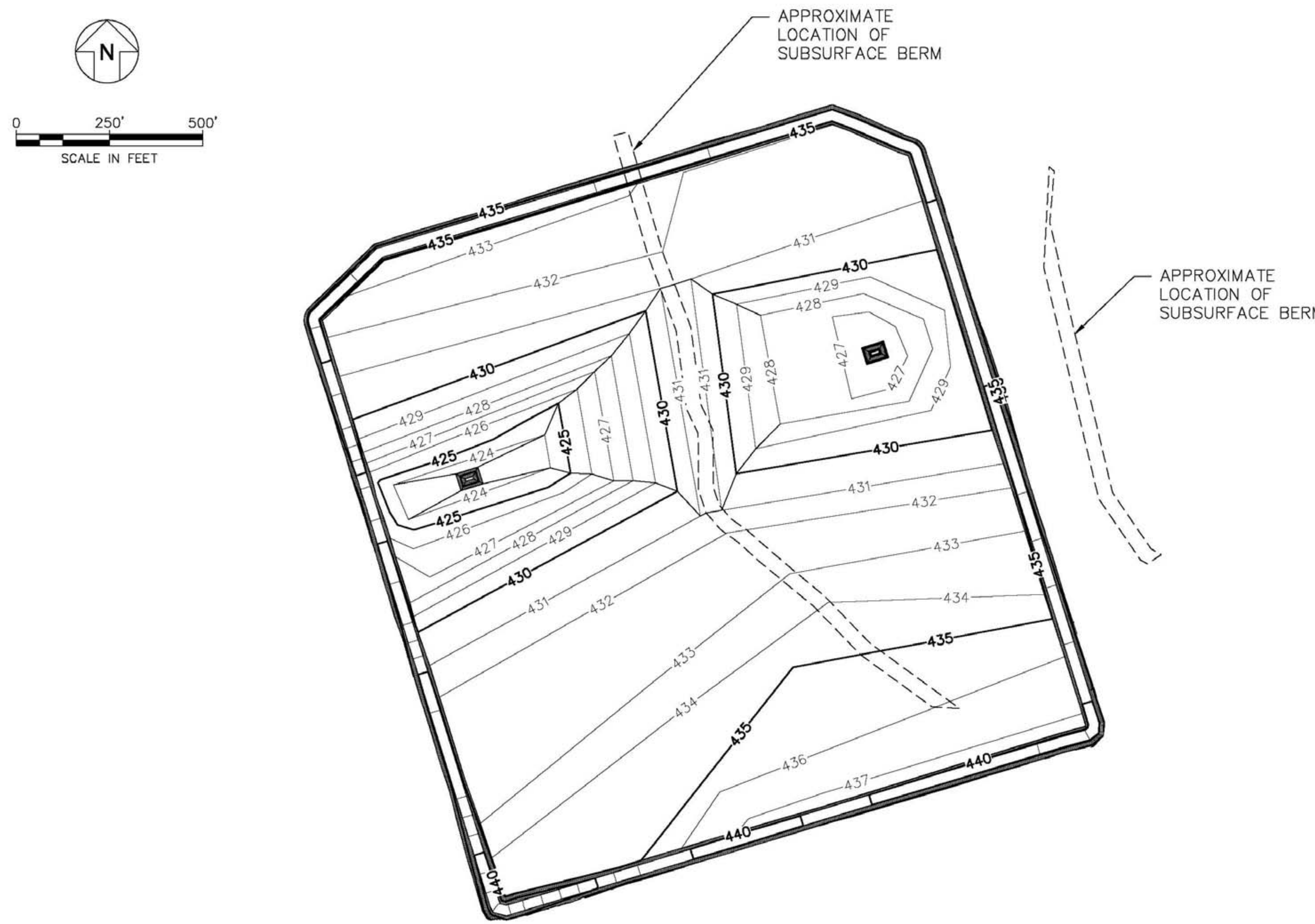


Figure A2: Proposed Low Permeability Soil Liner Grading Plan for Option 1 (2.65 million cy)

Geosyntec consultants

Written by:	Joseph Sura	Date:	6/5/2009	Reviewed by:	R. Kulasingam	Date:	6/8/2009

Client:	Honeywell	Project:	Onondaga Lake SCA 50% Design	Project/ Proposal No.:	GJ4299	Task No.:	03

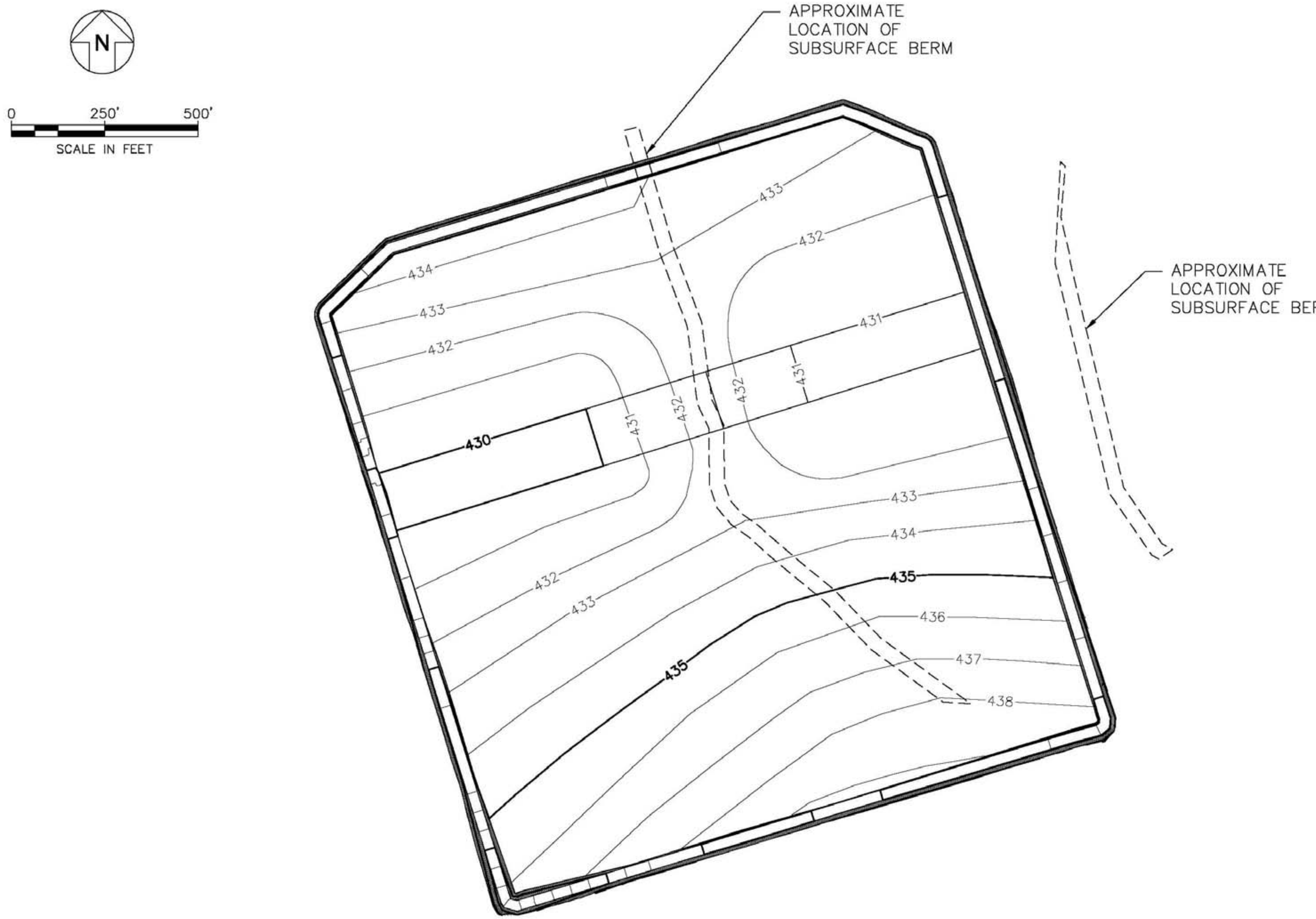


Figure A3: Proposed Gravel Drainage Layer Grading Plan for Option 1 (2.65 million cy)

Geosyntec consultants

Written by: **Joseph Sura** Date: **6/5/2009** Reviewed by: **R. Kulasingam** Date: **6/8/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA 50% Design** Project/ Proposal No.: **GJ4299** Task No.: **03**

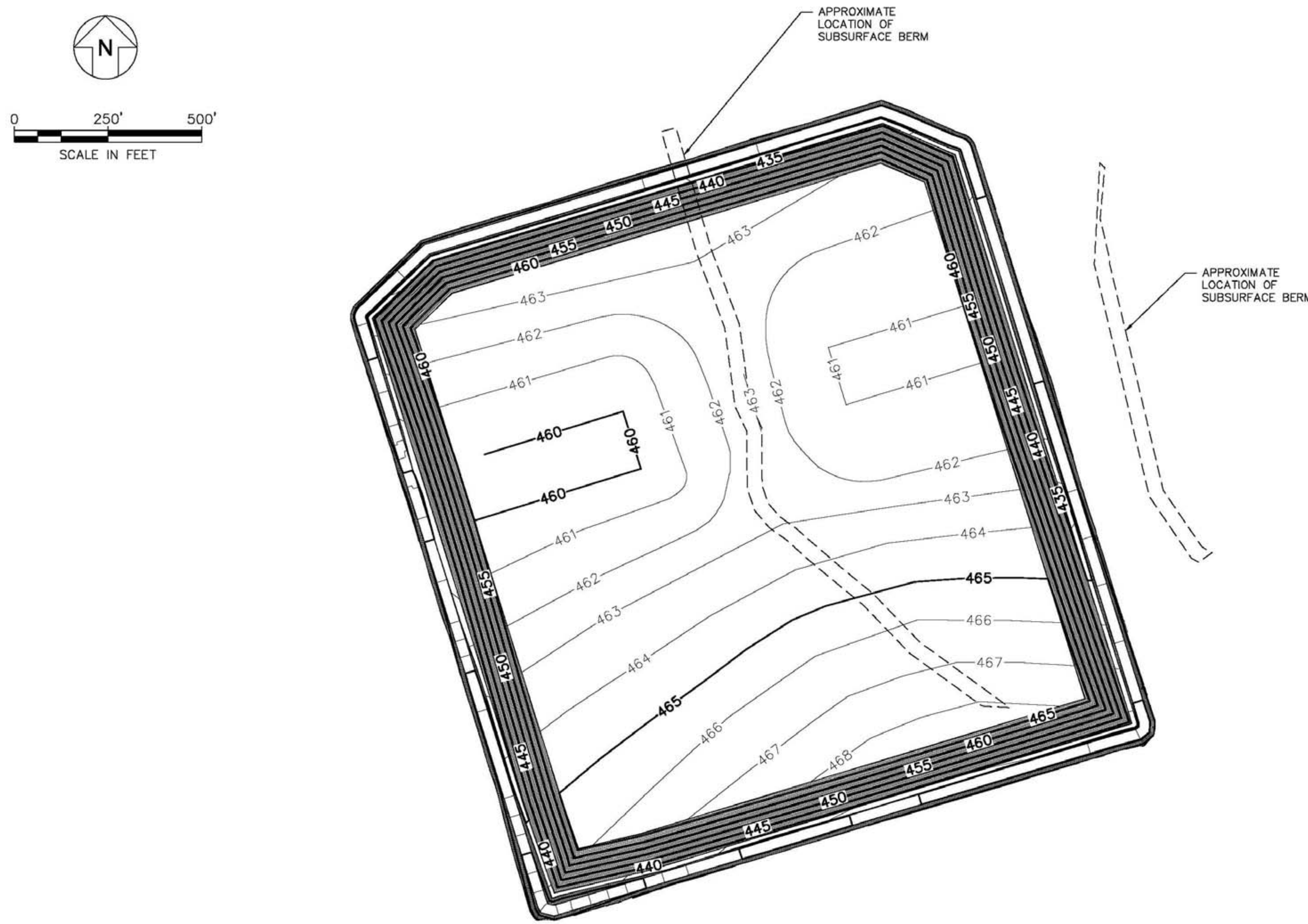


Figure A4: Proposed Top of Geo-tube Grading Plan for Option 1 (2.65 million cy)

Written by:	Joseph Sura	Date:	6/5/2009	Reviewed by:	R. Kulasingam	Date:	6/8/2009
Client:	Honeywell	Project:	Onondaga Lake SCA 50% Design	Project/ Proposal No.:	GJ4299	Task No.:	03

Attachment B: Grading Plans for Option 2

Written by: **Joseph Sura** Date: **6/5/2009** Reviewed by: **R. Kulasingam** Date: **6/8/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA 50% Design** Project/ Proposal No.: **GJ4299** Task No.: **03**

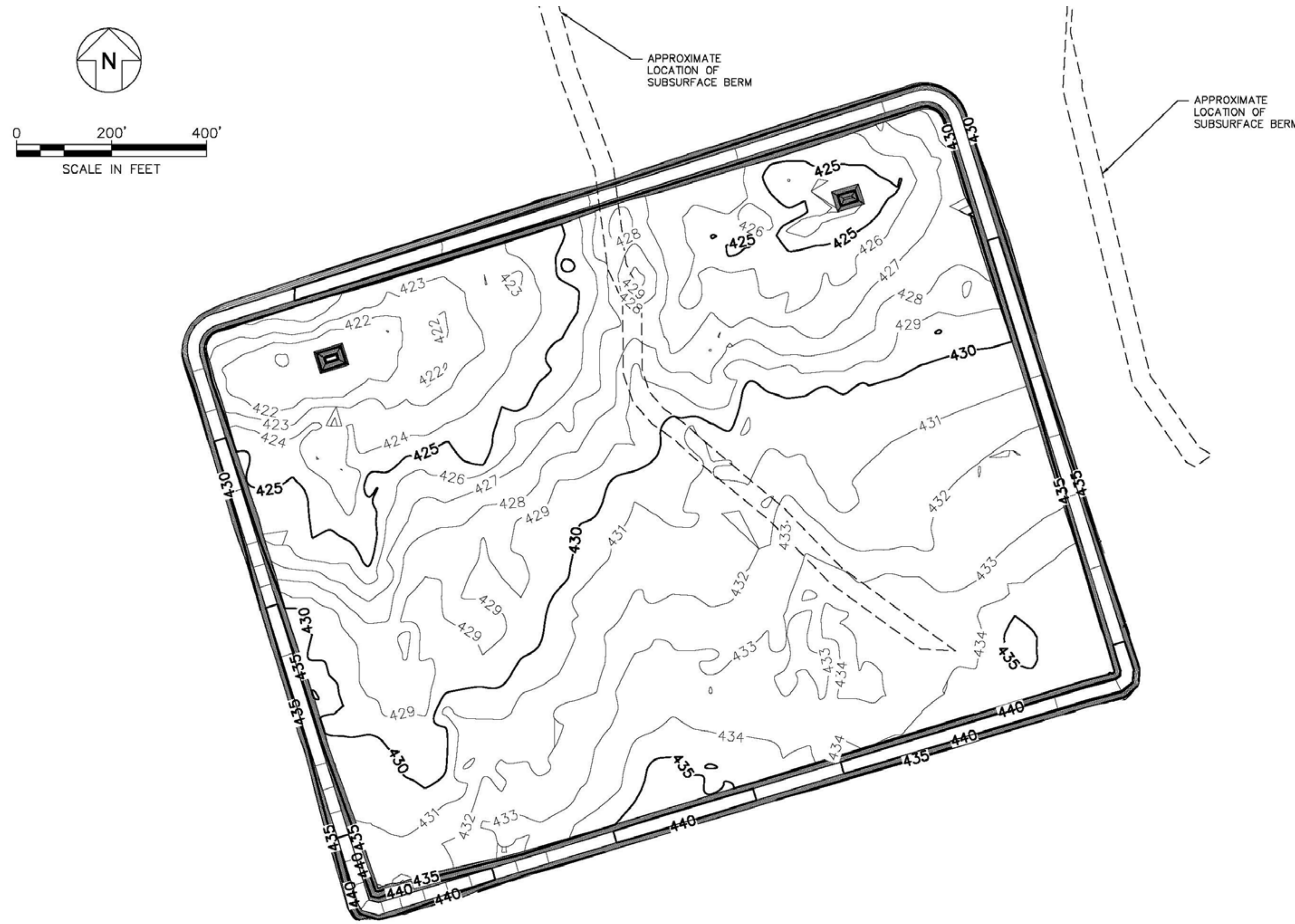


Figure B1: Proposed Berm and Subgrade Grading Plan for Option 2 (1.9 million cy)

Written by: **Joseph Sura** Date: **6/5/2009** Reviewed by: **R. Kulasingam** Date: **6/8/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA 50% Design** Project/ Proposal No.: **GJ4299** Task No.: **03**

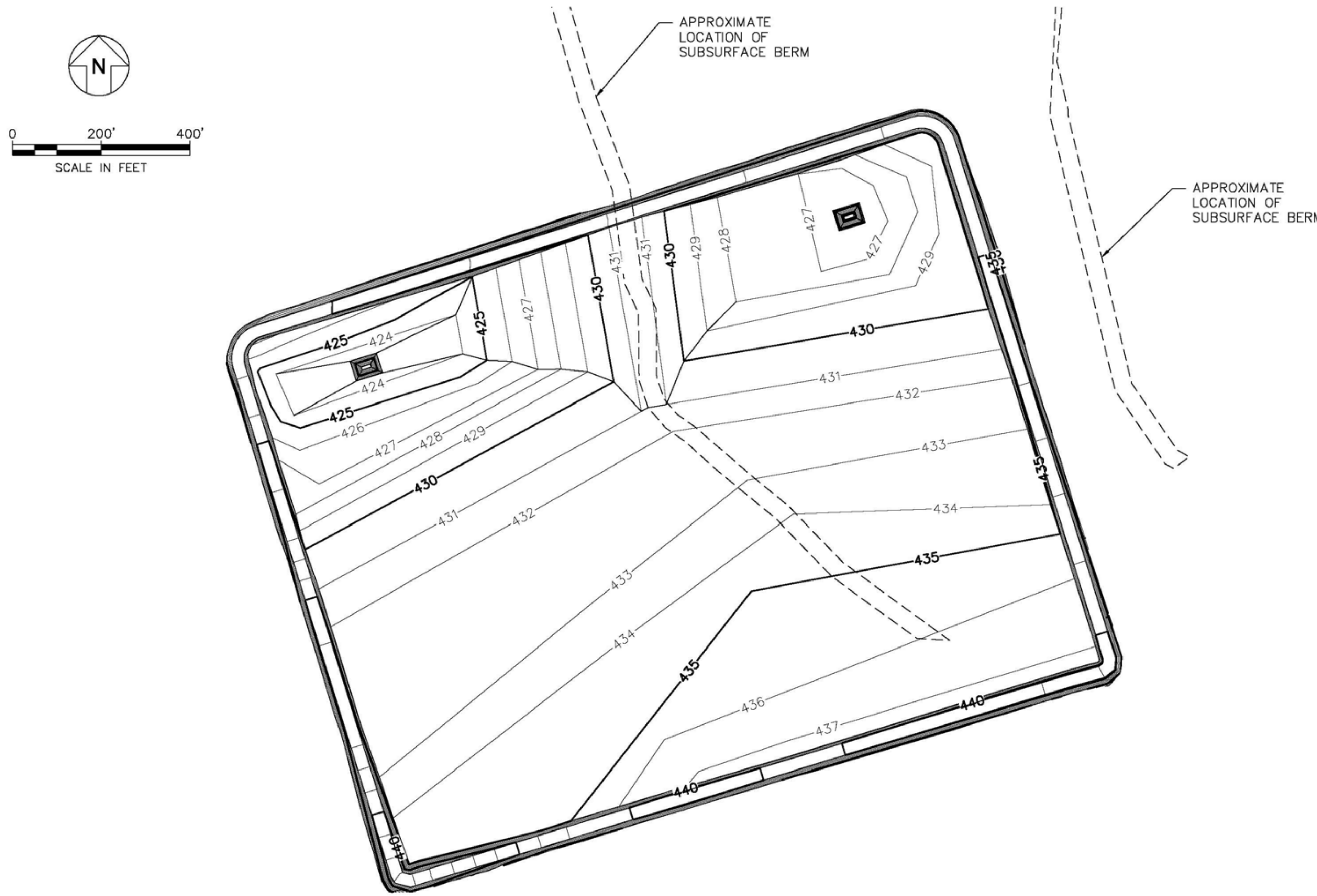


Figure B2: Proposed Low Permeability Soil Liner Grading Plan for Option 2 (1.9 million cy)

Written by: Joseph Sura Date: 6/5/2009 Reviewed by: R. Kulasingam Date: 6/8/2009

Client: Honeywell Project: Onondaga Lake SCA 50% Design Project/ Proposal No.: GJ4299 Task No.: 03

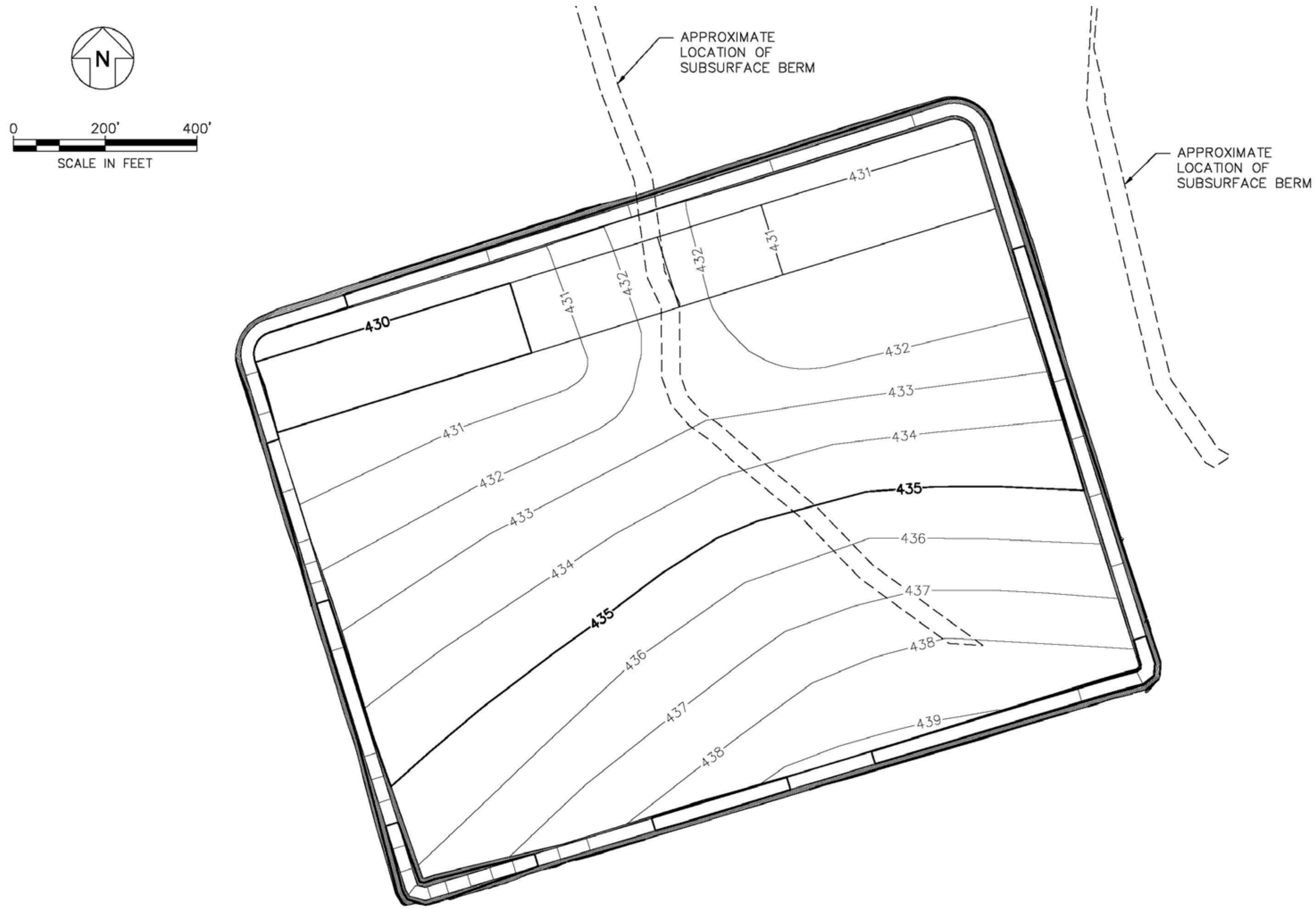


Figure B3: Proposed Gravel Drainage Layer Grading Plan for Option 2 (1.9 million cy)

Written by: **Joseph Sura** Date: **6/5/2009** Reviewed by: **R. Kulasingam** Date: **6/8/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA 50% Design** Project/ Proposal No.: **GJ4299** Task No.: **03**

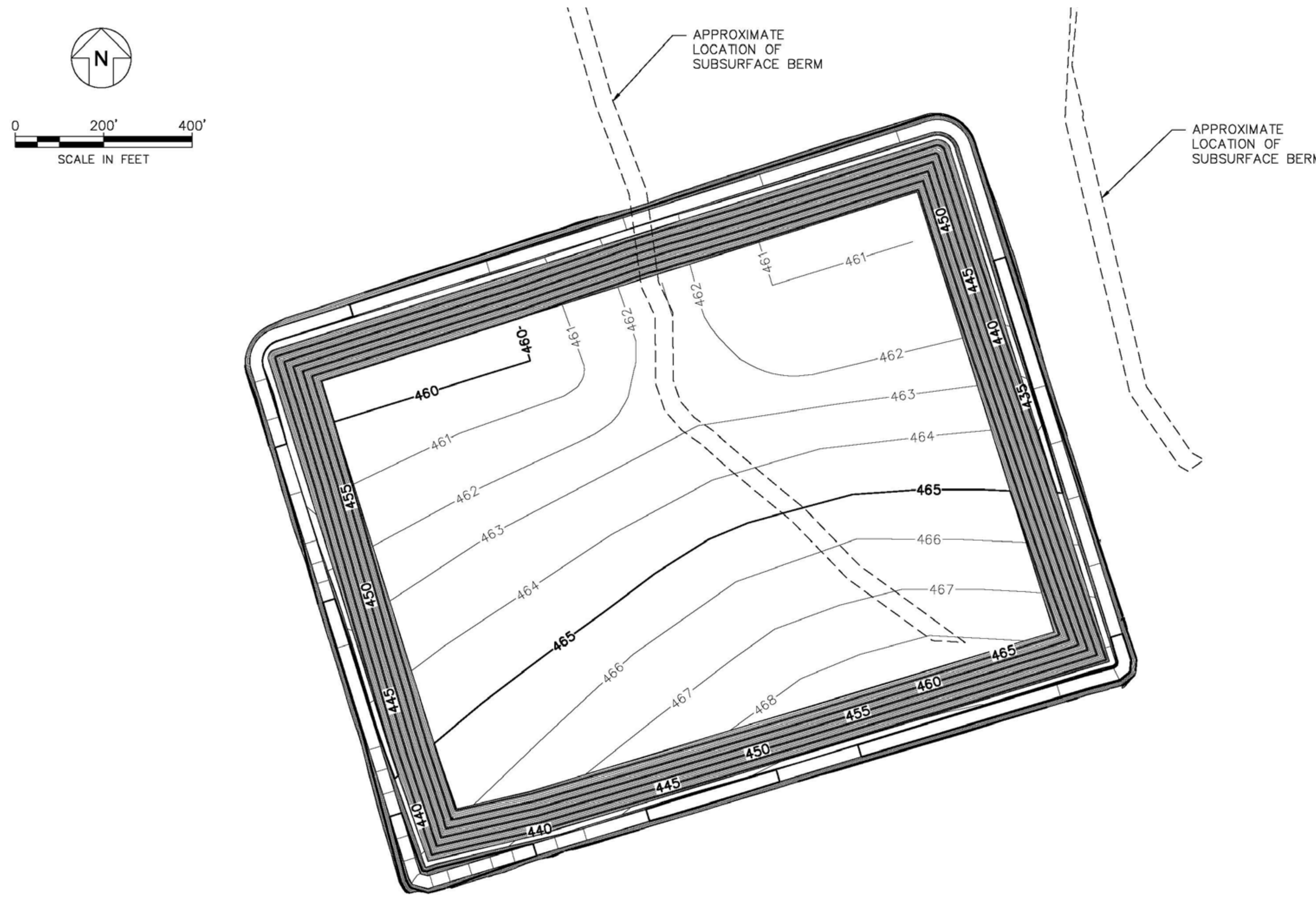


Figure B4: Proposed Top of Geo-tube Grading Plan for Option 2 (1.9 million cy)

APPENDIX G

SLOPE STABILITY ANALYSES FOR SCA DESIGN

GEOSYNTEC CONSULTANTS

COMPUTATION COVER SHEET

Client: Honeywell **Project:** Onondaga Lake SCA IDS **Project/Proposal #:** GJ4299 **Task #:** 05

TITLE OF COMPUTATIONS **SLOPE STABILITY ANALYSES**

COMPUTATIONS BY:

Signature [signature] 8/4/2009
DATE

Printed Name and Title: Joseph Sura, Staff Engineer

ASSUMPTIONS AND PROCEDURES CHECKED BY:
(Peer Reviewer)

Signature R. Kulasingam 8/4/2009
DATE

Printed Name and Title: R. Kulasingam, Project Engineer

COMPUTATIONS CHECKED BY:

Signature Nicholas J. Yafrate 8/4/2009
DATE

Printed Name and Title: Nicholas Yafrate, Senior Staff Engineer

COMPUTATIONS BACKCHECKED BY:
(Originator)

Signature [signature] 8/4/2009
DATE

Printed Name and Title: Joseph Sura, Staff Engineer

APPROVED BY:
(PM or Designate)

Signature [signature] 4 AUG 2009
DATE

Printed Name and Title: Jay Beech, Principal

STATE OF NEW YORK JOHN F. BEECH No. 066337 LICENSED PROFESSIONAL ENGINEER

APPROVAL NOTES:

REVISIONS (Number and initial all revisions)

NO.	SHEET	DATE	BY	CHECKED BY	APPROVAL

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009
Client:	Honeywell	Project:	Onondaga Lake SCA IDS	Project/ Proposal No.:	GJ4299	Task No.:	05

SLOPE STABILITY ANALYSES FOR SCA DESIGN

INTRODUCTION

This package was prepared in support of the design of the Sediment Consolidation Area (SCA) for the Onondaga Lake Bottom Site, which will be constructed on Wastebed 13 (WB-13). Specifically, this package presents static slope stability analyses for the SCA, which will consist of geotextile tubes (geo-tubes) filled with dredged material surrounded by a perimeter dike (SCA perimeter dike). For purposes of this calculation package, the SCA perimeter dike refers to the dike that will be constructed around the geo-tubes within WB-13; whereas, the WB-13 perimeter dike refers to the exterior perimeter dike around WB-13.

Seismic slope stability analyses were not performed because the site is not located in a seismic impact zone, as defined by New York State Department of Environmental Conservation (NYSDEC) Regulations Section 360-2.7(b)(7). A detailed explanation regarding the seismic impact zone assessment is presented in Attachment 1 of this package.

METHODOLOGY

Static Slope Stability

Static slope stability analyses were performed using Janbu's method and Spencer's method, using the computer program SLIDE version 5.039 [Rocscience, 2006]. Four potential slip modes were evaluated in the analyses: (i) block slip mode along geo-tube interfaces; (ii) block slip mode along the liner system; (iii) circular slip surfaces through dredge material contained in geo-tubes and WB-13 foundation materials; and (iv) circular slip surfaces through existing WB-13 perimeter dikes.

Spencer's method [Spencer, 1973] satisfies both force and moment equilibrium and is therefore considered more rigorous than other methods, such as Janbu's method [Janbu, 1973] and the simplified Bishop method [Bishop, 1955]. However, Spencer's method often encounters numerical convergence difficulties when considering block slip surfaces. Therefore, Spencer's method was used for the circular slip surfaces, while Janbu's method was used for block slip surfaces.

Information required for the static slope stability analyses included the slope geometry, the subsurface soil stratigraphy, the groundwater table elevation, the material properties of the subsurface soils, dredge material, liner and cover system materials, and the external surface loading, if any, at the selected cross section locations.

Target Factor of Safety

Target factors of safety (FSs) were considered for slope stability of the proposed SCA, one for the interim condition and one for the long-term condition. The interim condition is the condition during the SCA construction and dredge operation period and shortly after the SCA is capped with the final cover system. The long-term condition is the condition a relatively long time after the SCA is capped. In addition, both peak and residual shear strengths were considered in identifying the appropriate FSs for interim and final conditions, as appropriate for geosynthetic materials.

The target FS corresponding to the peak shear strength was considered to be 1.3 for the interim condition and 1.5 for the long-term condition according to U.S. Army Engineer Waterways Experiment Station Technical Report D-77-9 [Hammer and Blackburn, 1977] and U.S. Army Corps of Engineers Engineering Manual 1110-2-1902 [USACE, 2003]. The target FS corresponding to large displacement (i.e., residual) shear strength was considered to be 1.1 for the interim condition and 1.3 for the long-term condition, consistent with general engineering practice.

SUBSURFACE STRATIGRAPHY

Detailed information regarding the subsurface stratigraphy was presented in a calculation package titled "*Subsurface Stratigraphy Model of Wastebed 13 for the Design of Sediment Consolidation Area*" (referred to as the Data Package). In summary, the subsurface stratigraphy consists primarily of three types of material: the Solvay waste (SOLW), the existing WB-13 perimeter dike soil, and the foundation soil, as shown schematically in Figure 1. The SOLW was divided into three zones (i.e., Zone 1, Zone 2, and Zone 3, as shown in the figure) based on its distinct characteristics.

The groundwater table was found to be approximately 50 ft below ground surface (bgs) of the wastebed (or at approximately El. 375 ft) as presented in the Data Package. However, it is noted that "perched" water zones exist in WB-13 according to the site investigation results presented in the Data Package. These "perched" water zones vary spatially and seasonally according to the piezometer data presented in the Data Package but have an average elevation of approximately 15 ft bgs. The slope stability analysis presented in this package conservatively assumes the "perched" water zones are connected to the groundwater table. The groundwater table was, therefore, modeled using a single groundwater table 15 ft bgs. Additionally, within the gravel drainage layer in the liner system, a second water table one foot above the top of the liner layer was assumed in the model. This represents the one foot maximum allowable head within the gravel drainage layer. It should be noted that this water table is confined by the liner system and will only affect the gravel drainage layer in the slope stability analysis.

ANALYZED CROSS-SECTIONS

The proposed SCA consists of a single containment cell surrounded by the SCA perimeter dike as shown in Figure 2. Two cross sections (i.e., Cross-Section A-A and B-B, as shown in Figure 3) were analyzed for static slope stability. As can be seen in Figure 3, Cross-Section A-A has significantly more vertical interfaces to consider than Cross-Section B-B because of geo-tube orientation. The design height of the proposed SCA perimeter dikes is 5 ft above the existing ground surface. The elevations of the dikes will vary, as the existing ground elevations vary along the perimeter. The SCA perimeter dikes are 25 ft wide at the top and have a 2.5 horizontal:1 vertical (2.5H:1V) side slope. There is a 10 ft setback distance between the edge of the lowest geo-tube layer and the dikes.

Cross-Section A-A

Cross-Section A-A was selected because it follows the direction of minimum overlap between the geo-tube stacks, which is expected to result in the lowest FS for block slip mode stability. Cross-Section A-A runs approximately north-south through WB-13. The geo-tubes are assumed to be 40 ft in width and between 250 ft to 320 ft in length. In the direction of Cross-Section A-A, each additional stack of geo-tubes will straddle geo-tubes that are already in place. This results in each stack of geo-tubes being offset approximately 20 feet from the layer below.

The existing ground below the liner at Cross-Section A-A (i.e., top of existing SOLW elevation) is naturally sloped. The thickness of the SOLW underneath the liner varies, but typically is between 50 and 60 ft. Cross-Section A-A was extended to include the existing WB-13 perimeter dike.

Cross-Section B-B

Cross-Section B-B runs approximately east-west through WB-13. In this direction, the geo-tubes are assumed to be between 250 ft and 320 ft long for purposes of this analysis. At the edge

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009
Client:	Honeywell	Project:	Onondaga Lake SCA IDS	Project/ Proposal No.:	GJ4299	Task No.:	05

of the geo-tube layers, tubes are offset approximately 20 ft. Through the interior of the SCA, the offsets between geo-tube layers vary because of the different lengths and number of geo-tubes per layer, but is planned to be a minimum of 20 ft. Cross-Section B-B has also been extended to analyze the stability of the WB-13 perimeter dike, as shown in Figure 4.

MATERIAL PROPERTIES

Table 1 summarizes the material properties (i.e., unit weights and shear strengths) of the SOLW, the dike soil, the foundation soil, the dredged material, the final cover soil, and geosynthetic materials used in the slope stability analyses. The unit weight and the shear strength of the SOLW in WB-13 were considered to be the same for Zone 1, Zone 2, and Zone 3 according to the Data Package. In the stability models presented in this package, the existing WB-13 perimeter dike soil was treated the same as the base foundation material based on previous investigations indicating that these existing WB-13 perimeter dikes were constructed using the native foundation material from beneath WB-13. The term "dike soil" as used in this package therefore refers only to the five foot SCA perimeter dikes that will be constructed. The interfaces between adjacent geo-tubes and between the bottom geo-tube and gravel drainage layer are modeled as thin layers of frictional material. Figures 5 and 6 show a representation of the layers included in the model.

Unit Weight

The unit weights of the SOLW, the dike soil, and the foundation soil were considered to be 82 pcf, 120 pcf, and 120 pcf, respectively, according to the Data Package. The unit weights of the proposed liner soil and gravel drainage layer were assumed to be 100 pcf and 120 pcf, respectively. The unit weight of the interface between the gravel drainage layer and the geo-tubes was assumed to have the same calculated unit weight as the dredge material (i.e., 86 pcf). The unit weight of the dredged material was calculated to be approximately 86 pcf as presented in Attachment 2 to the package titled "*Settlement Analysis for SCA*" (Appendix H of the IDS). The unit weights of the vertical and horizontal interfaces between geo-tubes were assumed to be 43 pcf and 86 pcf, respectively, based on the calculated unit weight of dredged material and the geometry of the tubes after deformation. The unit weight of the final cover soil was assumed to be 120 pcf.

Drained Shear Strength

The drained shear strength was used for the slope stability analyses under the long-term condition. The effective stress friction angles of the SOLW, the dike soil, and the foundation soil were considered to be 34 degrees, 35 degrees, and 37 degrees, respectively, according to the Data Package. For the liner system, laboratory interface direct shear testing was performed on four liner types (i.e., smooth and textured high density polyethylene [HDPE], ethylene propylene diene monomer [EPDM], and polypropylene [PP]), and the results are included in Attachment 2. The peak effective stress friction angle of the proposed liner system varied depending on the type of geomembrane (GM) chosen. Based on these results, smooth HDPE GM is not being considered for use on this project. Among the remaining GM options tested, the peak effective stress friction angle varied from 19 degrees to 27 degrees; therefore, 19 degrees was conservatively assumed in Table 1. The effective stress friction angle of the gravel layer was assumed to be 38 degrees.

The effective stress friction angle for the interface between the bottom geo-tube layer and the gravel drainage layer was considered to be 24 degrees, based on data presented by Koerner [1994] for the interface between woven geotextiles and sand. The geotextiles composing the geo-tubes are modeled as two-end anchored geotextile sheets. The ultimate tensile strength was assumed to be 4800 lb/ft based on standard strength parameters for commercially available geo-tubes. A reduction factor of 3.0 [GRI, 1992] was then applied to result in a design tensile strength of 1600 lb/ft. Current information indicates the dredge material from the In Lake Waste Deposit (ILWD) has a drained friction angle of 37 degrees and, as indicated previously, the existing SOLW in WB-13 has a drained friction angle of 34 degrees. Considering the dredge material as remolded SOLW, the long-term drained effective stress friction angle of the dredge material was conservatively assumed to be 30 degrees. Under short-term conditions, the dredge material was assumed to have half of the drained effective stress friction angle of the material under long-term conditions (i.e., 15 degrees).

The effective stress friction angle of the vertical geo-tube/geo-tube interface was assumed to be negligible due to gaps between the geo-tubes. A value of 0.1 degrees was chosen for this interface to maintain numerical stability of the SLIDE program. Using representative geo-tube samples, the peak effective stress friction angle of the horizontal geo-tube/geo-tube interface was measured to be 15 degrees in laboratory interface direct shear testing (see Attachment 2 for results), which is the assumed value provided in Table 1. The effective stress friction angle for the final cover was assumed to be 30 degrees.

As indicated in the Analyzed Cases section of this calculation package, once the critical stability cases were established using the minimum value of liner system friction angle (both peak and residual) from laboratory testing, the critical cases were rerun using the maximum liner system friction angle (both peak and residual)_from laboratory testing. These analyses were performed to provide an approximate range of FS values that may be expected with the GM types currently under consideration. The range of calculated FS values based on the variability in test results is discussed further in Attachment 3.

The final liner system components will be selected based on the results of the chemical compatibility testing and stability analyses performed using the values established during the laboratory testing. Stability analyses were also performed to back-calculate the range in effective stress friction angles that would be acceptable for a given target FS, thus providing a range in values that can be used to establish the acceptability of actual geo-tube and liner system components based on laboratory testing, without needing to perform additional analyses. The back-calculation of this range in values is described further in Attachment 4. In cases involving the drained shear strength, the effective stress cohesion intercept was conservatively assumed to be zero.

Undrained Shear Strength

The undrained shear strength (S_u) of the WB-13 SOLW was used for the slope stability analyses under the interim condition. It is noted that undrained shear strengths were not assigned to the dike soil, the foundation soil, and the proposed gravel drainage layer because they primarily consist of coarse soil particles and drain relatively quickly under loading. Undrained shear strengths were also not assigned to the models used to represent the vertical and horizontal interfaces between geo-tubes because these interfaces are extremely thin and also drain quickly under loading. For these layers, the drained shear strengths were used for the interim condition as well.

The S_u of SOLW was developed using the SHANSEP (i.e., stress history and normalized soil engineering properties) method developed by Ladd and Foott [1974], based on the results of the laboratory consolidated-undrained (CU) triaxial compression tests and consolidation tests as presented in the Data Package. The SHANSEP method can be expressed using the following equation:

$$S_u = S \times \sigma'_{vc} \times OCR^m \quad (1)$$

where,

S = undrained shear strength ratio under normal consolidation, obtained from CU tests;

σ_{vc}' = effective vertical consolidation stress for a given loading;

OCR = over-consolidation ratio, obtained from consolidation tests which is the ratio of the preconsolidation pressure (p_c') to the in-situ vertical effective stress (σ_v'); and

m = SHANSEP modeling parameter (m = 0.8 for most cohesive soils and typical applications [Ladd and DeGroot, 2003]).

As presented in the Data Package, an S of 0.3 was established from CU tests on the WB-13 SOLW samples. Data of p_c', preconsolidation pressure, were obtained from the Data Package and are plotted in Figure 7 together with the profile of σ_v', the effective in-situ vertical stress. An initial OCR profile was also developed in the Data Package for the SOLW, as shown in Figure 8.

Due to the effective stress increase ($\Delta\sigma_v'$) imposed by the liner system and geo-tubes, the SOLW will gain additional undrained shear strength as indicated by Equation 1. However, the undrained shear strength gain will occur gradually as the SOLW consolidates over time. To consider the shear strength gain of SOLW during the process of consolidation under the geo-tube load, three S_u profiles were calculated and are described below.

Initial S_u profile: This S_u profile represents the in-situ shear strength of the SOLW before construction of the SCA liner system. The S_u was calculated by Equation 1 using the in-situ effective stress $\sigma_{v,}'_{initial}$ in the SOLW. The calculated initial S_u profile is presented in Figure 9 along with the S_u measured by the UU tests.

S_u profile for U_{avg} = 75%: This S_u profile corresponds to the shear strength of the SOLW after it achieves an average degree of consolidation (U_{avg}) of 75%. The S_u in the SOLW at U_{avg}=75% ($\sigma_v'_{75\%}$) was calculated as a four-step process. The time factor T_v necessary to reach an average degree of consolidation of 75% is 0.477 [Das, 2005]. This time factor was used to calculate the variation of the consolidation ratio with depth (U_z) for an average consolidation ratio of U_{avg}=75%, as shown in Figure 10 [Lambe and Whitman, 1969]. Next, $\sigma_v'_{75\%}$ was calculated using Equation 2.

$$\sigma'_{v75\%} = \sigma'_{v,initial} + U_z \times \Delta\sigma_v \qquad (2)$$

Third, the OCR at U_{avg} = 75% was back-calculated using the original preconsolidation pressure p_c' and the current effective stress $\sigma_v'_{75\%}$. Lastly, these OCR values are applied to the SHANSEP formula to derive the S_u profile when the SOLW achieves U_{avg}=75%. Note that to calculate the S_u profile for U_{avg} =75%, the additional effective stress $\Delta\sigma_v'$ was based on three layers (18 ft) of dredged material in geo-tubes, 1 ft of gravel, and 1 ft of low permeability soil.

The actual thicknesses of gravel and low permeability soil are greater or equal to 1 ft, however, with regards to shear strength gain, this assumption is conservative. The selection of three layers of geo-tubes as additional loading was based on the minimum number of geo-tube layers that would likely be placed the first year and the required time to consolidate, which is explained in detail below.

S_u profile for U_{avg} = 100%: This S_u profile corresponds to the shear strength of the SOLW after it reaches full consolidation under the same loading conditions as the U_{avg} =75% condition (i.e., three layers [18 ft] of dredged material in geo-tubes, 1 ft of gravel, and 1 ft of low permeability soil). The effective stress after consolidation was calculated using Equation 3. Due to the large additional load of the geo-tubes, the OCR for SOLW when the soil is fully consolidated was assumed to be 1.0. The SHANSEP formula was applied to calculate the final S_u profile.

$$\sigma'_v = \sigma'_{v,initial} + \Delta\sigma_v \quad (3)$$

Vertical effective stress profiles for these three stages of consolidation are shown in Figure 11. The resulting undrained shear strength profiles are shown in Figure 12.

<u>Consolidation Rate</u>

The time to achieve a U_{avg} of 75% can be calculated using Equation 4 below [Das, 2005]:

$$t = \frac{T_v H_{dr}^2}{c_v} \quad (4)$$

where, c_v is the coefficient of consolidation, H_{dr} is the 50 ft distance to the drainage layer, and T_v is the time factor based on the required degree of consolidation. For U_{avg} of 75%, T_v equals 0.477 [Das, 2005]. Using a c_v of 0.009 cm^2/sec from the laboratory consolidation tests and a c_v of 0.14 cm^2/sec from the field test as presented in the Data Package, the time for the SOLW to achieve a U_{avg} of 75% was calculated to range from approximately 90 to 1420 days (3.9 years). As discussed in the Data Package, the consolidation rate in the field occurred at a much faster rate than in the lab due to lateral drainage. However, since the actual loaded area of the SCA is large enough that lateral drainage likely will not greatly affect the consolidation rate, the lab test rate of c_v = 0.009 cm^2/sec is considered more representative than the field test rate of actual conditions during SCA construction and operation. Therefore, it is conservatively assumed herein that the SOLW will require approximately 1420 days (3 years, 11 months) to reach the U_{avg} = 75% condition.

Based on the current phasing plan, the anticipated effective stress increase of the first year of construction was used to calculate the SOLW undrained shear strength at U_{avg} = 75%. The consolidation due to the first year of geo-tube placement will have adequate time to consolidate to be at or near a U_{avg} = 75% condition after placement of the final cover. However, consolidation due to years 2, 3, and 4 of geo-tube construction may not have sufficient time to reach U_{avg} = 75% conditions, therefore the additional strength gain from these stages of construction was conservatively ignored in calculation of the U_{avg} = 75% profile. Additionally, the edges of the geo-tube loaded area will not have the full $\Delta\sigma_v'$ load calculated above. Therefore, in calculation of the U_{avg} = 75% profile, undrained shear strength gain in locations under the side slopes of the SCA was conservatively ignored. A potential first-year geo-tube phasing plan is shown in Figure 13.

In summary, the following items should be noted regarding the incorporation of the S_u profiles into the slope stability analyses:

- The groundwater table was considered to be at 50 feet bgs (or at approximately El. 375 ft) in the calculation of the undrained shear strength. However, in the SLIDE program, the effect of the perched water zones was taken into account and modeled as a single groundwater table at 15 feet bgs as previously discussed.
- The S_u profile for U_{avg} = 100% was not used in the analyses. The maximum undrained shear strength that the SOLW can achieve under loading was considered to be the S_u profile for U_{avg} = 75% under three stacks of geo-tube loading.
- The initial S_u profile as a function of depth was input directly into the SLIDE program and used for calculations with the exception of calculating global stability after placement of the final cover, for which the S_u profile for U_{avg} = 75% was used.
- In order to facilitate the calculations of the undrained shear strength, the initial stepwise S_u profile of SOLW and the OCR profile recommended in the Data Package have been slightly modified to be smooth curves in this package.

- Due to the low permeability soil liner system, it was assumed that SOLW consolidation will occur in a single-drained state at the foundation soil layer at an average depth of 50 feet bgs.
- The computations for U_{avg}=75% and U_{avg}=100% are based on calculations of the expected required consolidation time. The actual field consolidation will be monitored through field instrumentation, and the construction will be adjusted accordingly if necessary.

ANALYZED CASES

Both Cross-Sections A-A and B-B were analyzed for conditions without the final cover and with the final cover for the four potential slip modes mentioned earlier. A more detailed discussion of the analyzed cases is presented below.

Geo-tube Slip Mode

The block slip of geo-tubes represents potential sliding within the interfaces between individual geo-tubes, resulting in multiple geo-tubes sliding off of the mass of geo-tubes. Computations were performed using short-term strength parameters, including the initial S_u profile (Figure 9) to represent the undrained shear strength of the underlying SOLW layer. Since the slip surfaces do not pass through the existing SOLW, the S_u values of SOLW do not affect the calculated FS. This mode was analyzed for 12 different cases for Cross-Section A-A and five different cases for Cross-Section B-B, as summarized on Tables 2 and 3, respectively. More cases were considered for Cross-Section A-A because of the higher number of vertical interfaces to be considered in that cross section, as compared to Cross-Section B-B, due to tube orientation/geometry. The number of stacks indicated in the tables represents the tiers, counting from the top downwards, involved in the potential slip. The number of columns represents the number of geo-tubes per stack involved in the potential slip.

As indicated previously, establishing a range in friction angles that would be considered acceptable for the geo-tube/geo-tube interface is also a goal of the stability analyses presented herein. Therefore, based on the initial analyses using the friction angles established through laboratory testing, which yielded acceptable FS values, the most critical case for geo-tube slip was identified (i.e., Top 4 stacks; 1 column, as indicated on Table 2). This critical case is illustrated in Figure 14 without a final cover and in Figure 15 with a final cover.

In addition, this critical case was used to back-calculate the required effective stress friction angle of the horizontal geo-tube/geo-tube interface to achieve the target FS for both peak and residual conditions. This procedure was followed for Cross-Section A-A without the final cover (target peak FS=1.3, target residual FS=1.1) and for Cross-Section A-A with the final cover (target peak FS=1.5, target residual FS=1.3). Since the geo-tube slip mode is more critical for Cross-Section A-A due to the geometry involved (see results on Table 2 as compared to 3), the back-calculated values from Cross-Section A-A are also considered acceptable for Cross-Section B-B. This is discussed in more detail in Attachment 4.

Liner Stability

Block slip of the liner represents sliding along the proposed liner. Computations using this mode were performed using short-term strength parameters and the initial S_u profile (Figure 9) to represent the undrained shear strength of the SOLW layer. Since the slip surfaces do not pass through the existing SOLW, these S_u values do not affect the calculated FS.

Similar to the geo-tube slip mode analysis, first the most critical case for liner stability was identified using the minimum friction angle established during laboratory testing. For liner stability, the critical case involves the liner failing underneath the first column of geo-tubes, as illustrated in Figures 16 and 17 without and with final cover, respectively. Once the critical case was identified, the analysis was also performed using the maximum laboratory measured liner friction angle. Table 2 provides the results using the minimum liner friction angle established in the laboratory testing, and Attachment 3 provides the results (critical case only) using the maximum liner friction angle established in the laboratory testing.

As indicated previously, establishing a range in friction angles that would be considered acceptable for the liner system is also a goal of the stability analyses. Using the critical case identified above, the required effective stress friction angle of the proposed liner system to achieve the target FS could be back-calculated. To establish a range in friction angle values, the sensitivity of the liner friction angle to changes in the geo-tube/geo-tube horizontal interface friction angle was also evaluated. The geo-tube/geo-tube horizontal interface friction angle was changed, and the required liner friction angle to achieve the target FS against liner slip was back-calculated using SLIDE. Based on the results presented in Tables 2 and 3, the Cross-Section A-A geometry is considered to be more critical than the Cross-Section B-B geometry; therefore, the additional analyses were performed on Cross-Section A-A. The results of these calculations before and after placement of the final cover are shown and discussed further in Attachment 4.

Global Stability (Circular slip surfaces)

Global stability of the proposed SCA was evaluated with circular potential slip surfaces. The global stability through the foundation material prior to placement of the final cover was evaluated using undrained strength parameters (the initial S_u profile shown in Figure 9) to represent the undrained shear strength of the SOLW layer. The global stability after placement of the final cover was evaluated for three cases: (i) Interim stability with the initial S_u profile; (ii) Interim stability with U_{avg}=75%; and (iii) Long-term stability.

The interim global stability case immediately after placement of the final cover was evaluated using the initial S_u profile to represent the undrained shear strength of the SOLW layer. The interim global stability case immediately after placement of the final cover was also evaluated using the S_u profile after consolidation to U_{avg}=75% to represent the undrained shear strength of the SOLW layer.

The long-term global stability after cover placement was evaluated using drained strength parameters. This long-term global stability evaluation was performed by assuming that the geotextile support of the geo-tubes will be degraded and therefore have no shear strength. The long-term evaluation was performed by also assuming the effective stress friction angle of the dredge material will increase to 30 degrees due to consolidation of the material (i.e., the long-term value provided in Table 1).

Global Stability of WB-13 Perimeter Dikes (Circular slip surfaces)

Potential global stability for slip surfaces through the SCA and existing WB-13 perimeter dike was evaluated for Cross-Sections A-A and B-B. This slip mode was analyzed for three cases: (i) Interim stability before final cover placement; (ii) Interim stability after final cover placement; and (iii) Long-term global stability.

In addition, global stability of the WB-13 perimeter dike was considered by focusing on potential slip surfaces through the dike. For these analyses, the WB-13 perimeter dike was modeled with a 2-ft thick crusty surficial layer with a cohesion intercept of 50 psf and a friction angle of 37 degrees to represent the effects of desiccation and roots. The inner portion of the WB-13 perimeter dike was modeled only with a friction angle of 37 degrees, consistent with the other cases analyzed. Two cases were considered to model the groundwater table within the WB-13 perimeter dike. The first case considered a water table that varies from the conservatively assumed 15 feet below ground level at the dike-SOLW interface to the ground surface level at the toe of the dike. The second case considered a water table that varies from 15 feet below ground level at the dike-SOLW interface to a level at the outside dike face that is 10 feet above the ground surface level at the toe of the dike.

RESULTS AND DISCUSSION

Slope Stability Analysis

The results of the slope stability analyses for Cross-Sections A-A and B-B are summarized in Tables 2, 3, and 4. The results of the analyses for the most important cases are also shown graphically in Figures 18 through 38. The associated SLIDE runs are presented in Attachment 5 of this package.

The calculation results for Cross-Section A-A are summarized in Table 2 and indicate that the calculated FS values for cases without and with the final cover satisfy the target FS of 1.3 and 1.5, respectively, for the geo-tube slip mode, liner stability, and global stability. Since the global stability case using the initial S_u profile achieved the interim FS=1.3 criterion, a check of global stability using the U_{avg} = 75% profile was not performed for Cross-Section A-A.

The calculation results for Cross-Section B-B are summarized in Table 3 and indicate that the calculated FS values for cases without and with the final cover satisfy the target FS of 1.3 and 1.5, respectively, for the slip modes evaluated (i.e., geo-tubes slip mode, liner stability, and global stability). Slope stability analyses performed to evaluate a potential global slip mechanism resulted in a calculated FS satisfying the interim target FS of 1.3 using the initial S_u profile It is noted that the actual S_u profile will be greater than the initial due to consolidation of the foundation soils under the loading from the geo-tubes. When the U_{avg} = 75% S_u profile is used, the calculated FS is greater than when the initial S_u profile is used. The calculated FS for long-term global stability satisfies the target FS of 1.5.

Slope stability analyses performed to evaluate the potential global slip mechanisms through the SCA and existing WB-13 perimeter dikes resulted in FS values much greater than the target FS. Cross-Section A-A, as expected, has a lower factor of safety than for Cross-Section B-B with regards to global slip of existing WB-13 perimeter dikes, however, the calculated FS for Cross-Section A-A still greatly exceeds the target FS for both interim and long-term conditions.

Slope stability analyses were also performed for slip surfaces through the WB-13 perimeter dike that do not extend to the SCA (i.e., analyses focused on the dike only). For the case with the water table at the toe of the dike, minimum FS values of 3.2 for the critical global slip surface extending to the top of the WB-13 perimeter dike and 1.8 for the critical shallow slip surface within the slope were calculated, as shown in Figure 27a. For the case with the water table at 10 feet above the toe of the dike, minimum FS values of 1.7 for the critical global slip surface extending to the top of the WB-13 perimeter dike and 1.1 for the critical shallow slip surface within the slope were calculated, as shown in Figure 27b. This shallow slip surface is located near the toe under the estimated water table level within the WB-13 perimeter dike. A FS of 1.1 for shallow slip surfaces is indicative of the potential for surficial sloughing. During final design, the condition of the WB-13 perimeter dike surface will be evaluated and areas that are identified as needing restoration or erosion protection will be addressed.

FS values were also calculated using residual shear strengths for the geosynthetic components. For Cross-Section A-A, the critical geo-tube slip case of one column of four stacks of geo-tubes and the critical liner slip case of one column of geotubes before and after final cover placement were evaluated. The calculated FS values using residual shear strengths satisfy the target residual FS values for both interim and long-term conditions.

Additionally, the back-calculation presented in Attachment 4 indicates that the required values for the peak laboratory friction angles for the horizontal geo-tube/geo-tube interface and liner system are 13.9 degrees and 17.9 degrees, respectively, to meet the target FS values. The required values for the residual laboratory friction angles for the horizontal geo-tube/geo-tube interface and liner system are 11.7 degrees and 15.7 degrees, respectively, to meet the target FS values. The minimum required values of peak and residual effective stress friction angle to meet the target FS values are shown in Figures 39 and 40. It is recommended that site-specific testing be performed on the selected liner system to verify the strength parameters meet or exceed these back-calculated values.

SUMMARY AND CONCLUSIONS

This package evaluates the static slope stability of the proposed SCA. Four potential slip modes were evaluated using the computer computation program SLIDE: (i) block slip mode along geo-tube interfaces; (ii) block slip mode along the liner system, (iii) circular slip surfaces through dredge material contained in geo-tubes and WB-13 foundation materials; and (iv) circular slip surfaces through existing WB-13 perimeter dikes.

Analyses of two critical cross-sections indicate that the calculated FSs for the four potential slip modes meet the target FS for interim and long-term conditions. However, placement of five layers of geo-tubes and the final cover system within the same season results in a calculated FS that only slightly exceeds the target value, a limitation that should be considered during design of the phasing plan for geo-tube construction. Instrumentation to monitor the field consolidation is recommended to verify adequate strength gain occurs before placement of the final cover.

Minimum required parameters for the interface between geo-tubes and the liner system have been back-calculated. In order to meet the target factor of safety values against block slip, the peak effective stress friction angle for the interface between geo-tubes should be at least 13.9 degrees and the peak effective stress friction angle for the liner system should be at least 17.9 degrees. In order to meet the target factor of safety values against block slip, the residual effective stress friction angle for the interface between geo-tubes should be at least 11.7 degrees and the peak effective stress friction angle for the liner system should be at least 15.8 degrees. Laboratory testing indicates that these values are achievable with a variety of common commercially available geosynthetics. Testing of material delivered to the project during construction will be performed to verify components meet the specified strength.

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Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009
Client:	Honeywell	Project:	Onondaga Lake SCA IDS	Project/ Proposal No.:	GJ4299	Task No.:	05

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Tables

Written by: **Joseph Sura** Date: **4/3/2009** Reviewed by: **R. Kulasingam/Ming Zhu/Jay Beech** Date: **4/7/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA 50% Design** Project/ Proposal No.: **GJ4299** Task No.: **05**

Table 1. Summary of Material Properties for Slope Stability Analysis

Material	Unit Weight (pcf)	Undrained Shear Strength (psf)	Drained Shear Strength Effective Stress Friction Angle (degree)
SOLW	82	See Figures 8 through 11	34
SCA Perimeter Dike Soil	120	---	35
Foundation Soil (including WB-13 perimeter dike)	120	---	37
Liner	100	---	19[1]
Gravel Drainage	120	---	38
Geo-tube/Gravel Interface	86	---	24[2]
Geo-tube	---	Design Tensile Strength = 1600 lb/ft[3]	
Dredge Material (Short Term)	86	---	15[4]
Dredge Material (Long-Term)	86	---	30
Geo-tube/Geo-tube Interface (Vertical)	43[5]	---	0.1[6]
Geo-tube/Geo-tube Interface (Horizontal)	86	---	15[1]
Final Cover Soil	120	---	30

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009
Client:	Honeywell	Project:	Onondaga Lake SCA 50% Design	Project/ Proposal No.:	GJ4299	Task No.:	05

Table 1. Summary of Material Properties for Slope Stability Analysis (Continued)

Notes:

1. The values presented in this table (i.e., 15 degrees and 19 degrees) are the measured peak effective friction angles for geo-tube/geo-tube interface and liner, respectively (see Attachment 2).
2. Taken from Koerner [1994]. A typical value of interface effective friction angle between woven geotextile and sand was assumed.
3. The design tensile strength was modeled using a two-end anchored geotextile sheet. Based on commercially available products, the ultimate tensile strength of geo-tubes was assumed to be 4800 lb/ft and a strength reduction factor of 3.0 was applied to calculate the design tensile strength, taking into account creep deformation, chemical degradation, and strength loss within seams, connections, and joints [GRI, 1992].
4. Under short-term conditions, the dredge material was assumed to have half of the friction angle of the material under long-term conditions.
5. The vertical interface was assumed to have a unit weight equal to half of the unit weight of the dredge material. This was based on the geometry of the geo-tubes after deformation. The volume of material in the vertical interface after deformation was assumed to be approximately half the total volume available if the geo-tubes could be placed in direct contact with each other along the entire interface.
6. The geo-tube/geo-tube vertical interface has insignificant side friction, but a small value of friction angle was necessary for numerical stability of the SLIDE calculation program.

Table 2. Summary of Slope Stability Analysis: Cross-Section A-A

Case		Without Final Cover				With Final Cover			
		Calculated FS[1]		Figure Number	Target F.S.	Calculated FS[1]		Figure Number	Target F.S.
		Spencer's Method[2]	Janbu's Method[2]			Spencer's Method[2]	Janbu's Method[2]		
Slip of Geo-tubes (Block Mode)	Top 1 stack; 1 column	--	8.57	--	1.30	--	11.95	--	1.50
	Top 1 stack; 2 columns	--	27.37	--	1.30	--	-- [5]	--	--
	Top 2 stacks; 1 column	--	2.44	--	1.30	--	3.56	--	1.50
	Top 2 stacks; 2 columns	--`	5.41	--	1.30	--	-- [5]	--	--
	Top 3 stacks; 1 column	--	1.73	--	1.30	--	2.01	--	1.50
	Top 3 stacks; 2 columns	--	3.51	--	1.30	--	4.00	--	1.50
	Top 4 stacks; 1 column	--	1.52	18	1.30	--	1.61	22	1.50
	Top 4 stacks; 2 columns	--	2.44	--	1.30	--	2.86	--	1.50
	Top 4 stacks; 3 columns	--	3.90	--	1.30	--	-- [5]	--	--
	5 stacks; 1 column	--	1.72	--	1.30	--	1.73	--	1.50
	5 stacks; 2 columns	--	2.69	--	1.30	--	2.94	--	1.50
	5 stacks; 3 columns	--	4.46	--	1.30	--	-- [5]	--	--
Liner Stability (Block Mode)	One column of geo-tubes	--	1.65	19	1.30	--	1.60	23	1.50
	Two columns of geo-tubes	--	2.30	--	1.30	--	2.47	--	1.50
Global Stability (Circular Mode)	Through Foundation Material (U_{avg}=0%) – Interim	1.68[3]	--	20	1.30	1.48[3]	--	24	1.30
	Through Foundation Material (U_{avg}=75%) – Interim	--	--	--	--	--[6]	--[6]	--	--
	Through Foundation Material – Long-Term	--	--	--	--	2.00[7]	--	25	1.50
Global Stability (Circular Mode)	Through SCA and Existing WB-13 Perimeter Dike – Interim	3.95[4]	--	21	1.30	3.25[4]	--	26	1.30
	Through SCA and Existing WB-13 Perimeter Dike – Long Term	--	--	--	--	3.45	--	27	1.50

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009
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Table 2. Summary of Slope Stability Analysis: Cross-Section A-A (Continued)

Notes:
1. These values are calculated using the laboratory values of peak effective stress friction angle for the geo-tube/geo-tube horizontal interface (15 degrees) and the liner (19 degrees). The laboratory test data are shown in Figures 2-4 and 2-5 of Attachment 2.
2. Spencer’s method is considered more rigorous than Janbu’s method because Spencer’s method satisfies both force and moment equilibrium. However, Spencer's method often encounters numerical convergence difficulty when complicated block slip surfaces are considered, as in this analysis. Therefore, Spencer's method was used for the circular mode analysis, while Janbu's method was used for the block mode analysis
3. This calculation uses the initial S_u profile for the undrained shear strength of the existing SOLW.
4. This was modeled by forcing the slip circle to pass through the existing WB-13 perimeter dike.
5. This case was not analyzed due to the acceptable FS values found for similar cases.
6. The U_{avg}=75% case was not analyzed for Cross-Section A-A because the interim FS was acceptable using the initial S_u profile.
7. For long-term, the geotextile of the geo-tubes was assumed to be degraded and therefore have no shear strength. The dredge material was modeled with the long-term friction angle of 30 degrees.
8. Figures are only included for the most important cases.

Table 3. Summary of Slope Stability Analysis: Cross-Section B-B

Case		Without Final Cover				With Final Cover			
		Calculated FS[1]		Figure Number	Target F.S.	Calculated FS[1]		Figure Number	Target F.S.
		Spencer's Method[2]	Janbu's Method[2]			Spencer's Method[2]	Janbu's Method[2]		
Slip of Geo-tubes[3] (Block Mode)	Top 1 stack; 1 column	--	48.23	--	1.30	--	48.90	--	1.50
	Top 2 stacks; 1 column	--	15.52	--	1.30	--	14.99	--	1.50
	Top 3 stacks; 1 column	--	10.25	--	1.30	--	10.23	--	1.50
	Top 4 stacks; 1 column	--	7.68	28	1.30	--	6.67	32	1.50
	5 stacks; 1 column	--	9.66	--	1.30	--	9.81	--	1.50
Liner Stability[3] (Block Mode)	One column of geo-tubes	--	2.06	29	1.30	--	1.93	33	1.50
Global Stability (Circular Mode)	Through Foundation Material (U_{avg}=0%) – Interim	1.52[3]	--	30	1.30	1.31[3]	--	34	1.30
	Through Foundation Material (U_{avg}=75%) – Interim	--	--	--	--	1.32[4]	--	35	1.30
	Through Foundation Material – Long-Term[5]	--	--	--	--	1.94	--	36	1.50
Global Stability (Circular Mode)	Through SCA and Existing WB-13 Perimeter Dike – Interim	10.14	--	31	1.30	7.78	--	37	1.30
	Through SCA and Existing WB-13 Perimeter Dike – Long-Term	--	--	--	--	17.17	--	38	1.50

Notes:

1. These values are calculated using the laboratory values of peak effective stress friction angle for the geo-tube/geo-tube horizontal interface (15 degrees) and the liner (19 degrees). The laboratory test data are shown in Figures 2-4 and 2-5 of Attachment 2.
2. Spencer's method is considered more rigorous than Janbu's method because Spencer's method satisfies both force and moment equilibrium. However, Spencer's method often encounters numerical convergence difficulty when complicated block slip surfaces are considered, as in this analysis. Therefore, Spencer's method was used for the circular mode analysis, while Janbu's method was used for the block mode analysis.
3. This calculation uses the initial S_u profile for the undrained shear strength of the existing SOLW.
4. This calculation uses the U_{avg}=75% profile for the undrained shear strength of the existing SOLW under the gravel, liner system, and three layers of geo-tubes.
5. For long-term, the geotextile of the geo-tubes was assumed to be degraded and therefore have no shear strength. The dredge material uses the long-term friction angle of 30 degrees.
6. Figures are only included for the most important cases.

Written by: **Joseph Sura** Date: **4/3/2009** Reviewed by: **R. Kulasingam/Ming Zhu/Jay Beech** Date: **4/7/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA 50% Design** Project/ Proposal No.: **GJ4299** Task No.: **05**

Table 4. Summary of Slope Stability Analysis: Residual Conditions for Cross-Section A-A

Case		Without Final Cover (Interim)		With Final Cover (Long-Term)	
		Calculated FS[1]	Target FS	Calculated FS[1]	Target FS
		Janbu's Method[2]		Janbu's Method[2]	
Slip of Geotubes (Block Mode)	Top 4 stacks; 1 column	1.21	1.10	1.33	1.30
Liner Stability (Block Mode)	One column of geo-tubes	1.41	1.10	1.37	1.30

Notes:
1. These values are calculated using the laboratory values of residual effective stress friction angle for the geo-tube/geo-tube horizontal interface (12 degrees) and the liner (17 degrees). The laboratory test data are shown in Figures 2-2 and 2-5 of Attachment 2.
2. The Janbu method was used for the block mode analyses presented here because Spencer's method often encounters numerical convergence difficulty with these types of analyses.
3. The target residual FS is 1.1 for the interim condition and 1.3 for long-term conditions.

Written by:	**Joseph Sura**	Date:	**4/3/2009**	Reviewed by:	**R. Kulasingam/Ming Zhu/Jay Beech**	Date:	**4/7/2009**
Client:	**Honeywell**	Project:	**Onondaga Lake SCA 50% Design**	Project/ Proposal No.:	**GJ4299**	Task No.:	**05**

Figures

Written by: **Joseph Sura** Date: **4/3/2009** Reviewed by: **R. Kulasingam/Ming Zhu/Jay Beech** Date: **4/7/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA 50% Design** Project/ Proposal No.: **GJ4299** Task No.: **05**

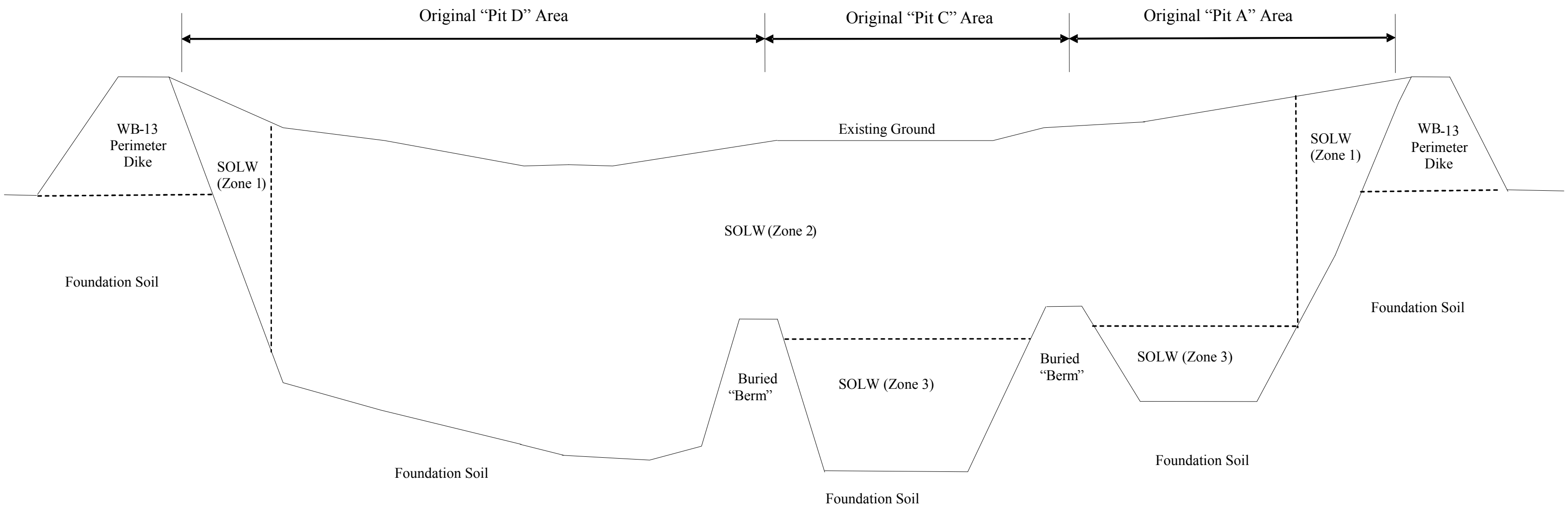
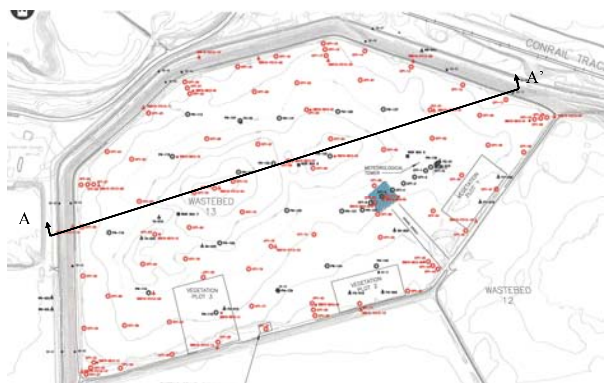


Figure 1. Schematic of Subsurface Profile
[not to scale; for purpose of showing subsurface stratigraphy only; location of the section is shown below]



Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009
Client:	Honeywell	Project:	Onondaga Lake SCA 50% Design	Project/ Proposal No.:	GJ4299	Task No.:	05

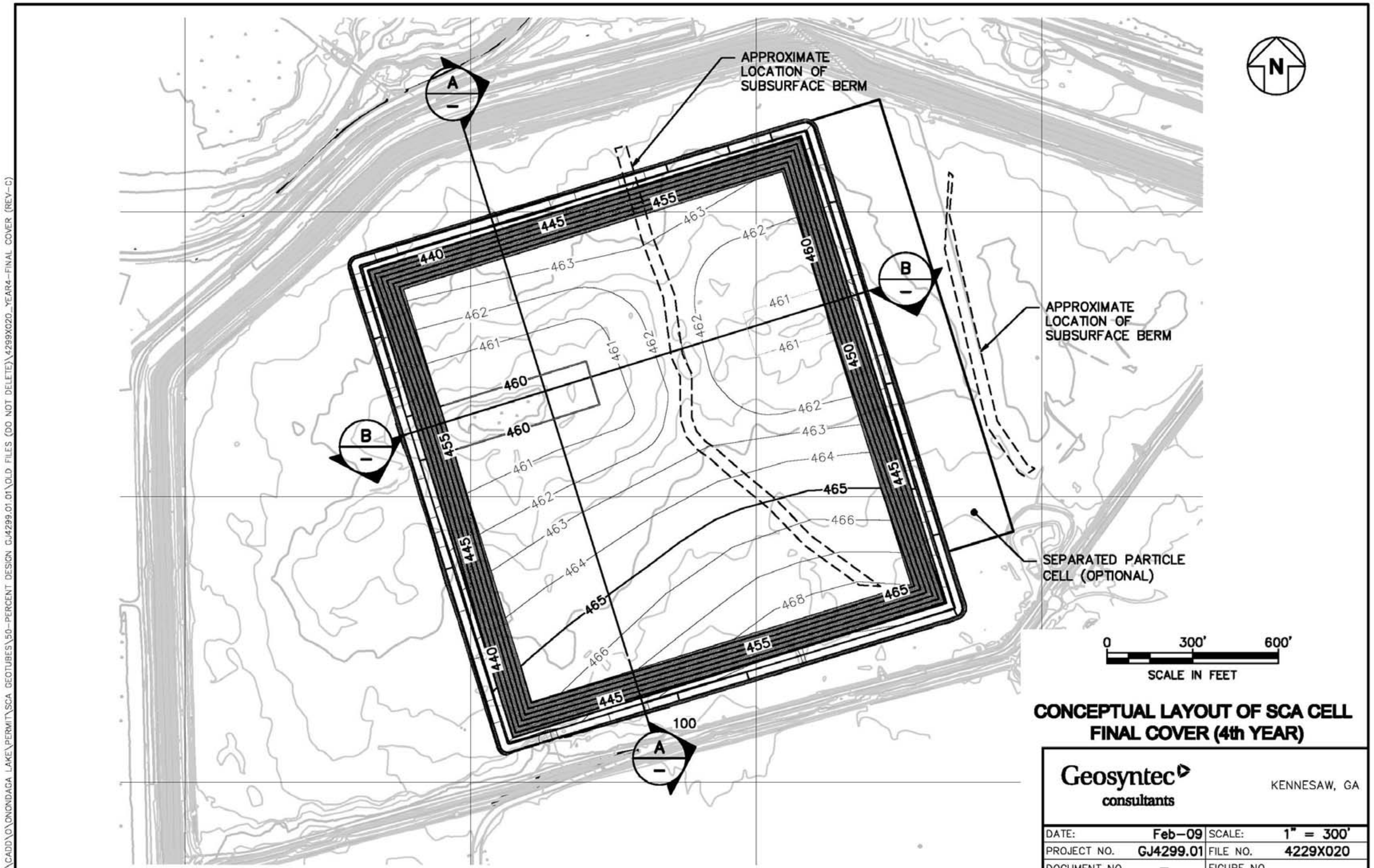


Figure 2. Locations of Analyzed Cross Sections

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009
Client:	Honeywell	Project:	Onondaga Lake SCA 50% Design	Project/ Proposal No.:	GJ4299	Task No.:	05

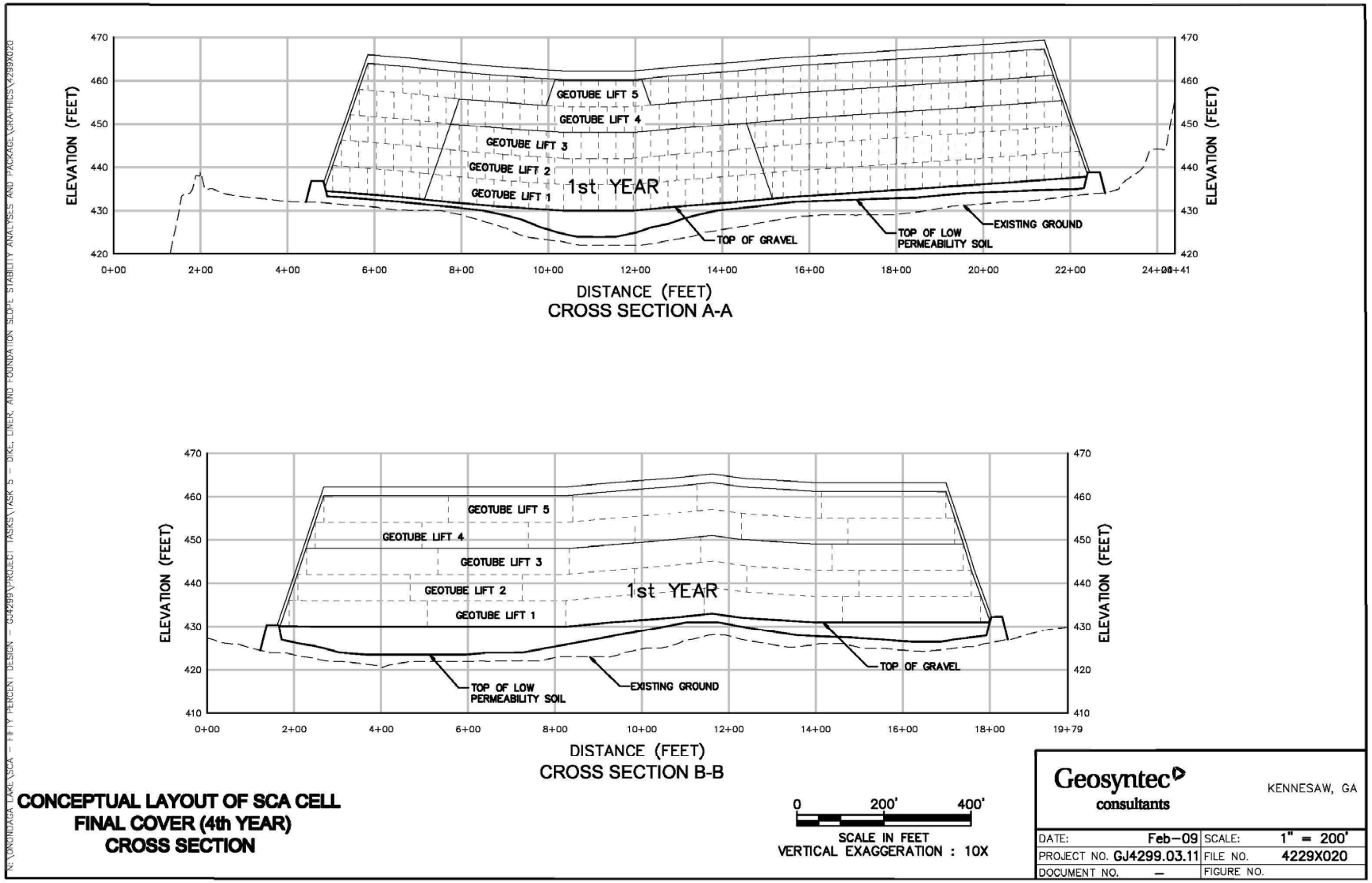


Figure 3. Layout of Cross-Sections A-A and B-B

Note: The geo-tube lift numbers and filling sequence presented in this figure are representative of a potential fill sequence for purposes of the evaluations provided herein.

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009
Client:	Honeywell	Project:	Onondaga Lake SCA 50% Design	Project/ Proposal No.:	GJ4299	Task No.:	05

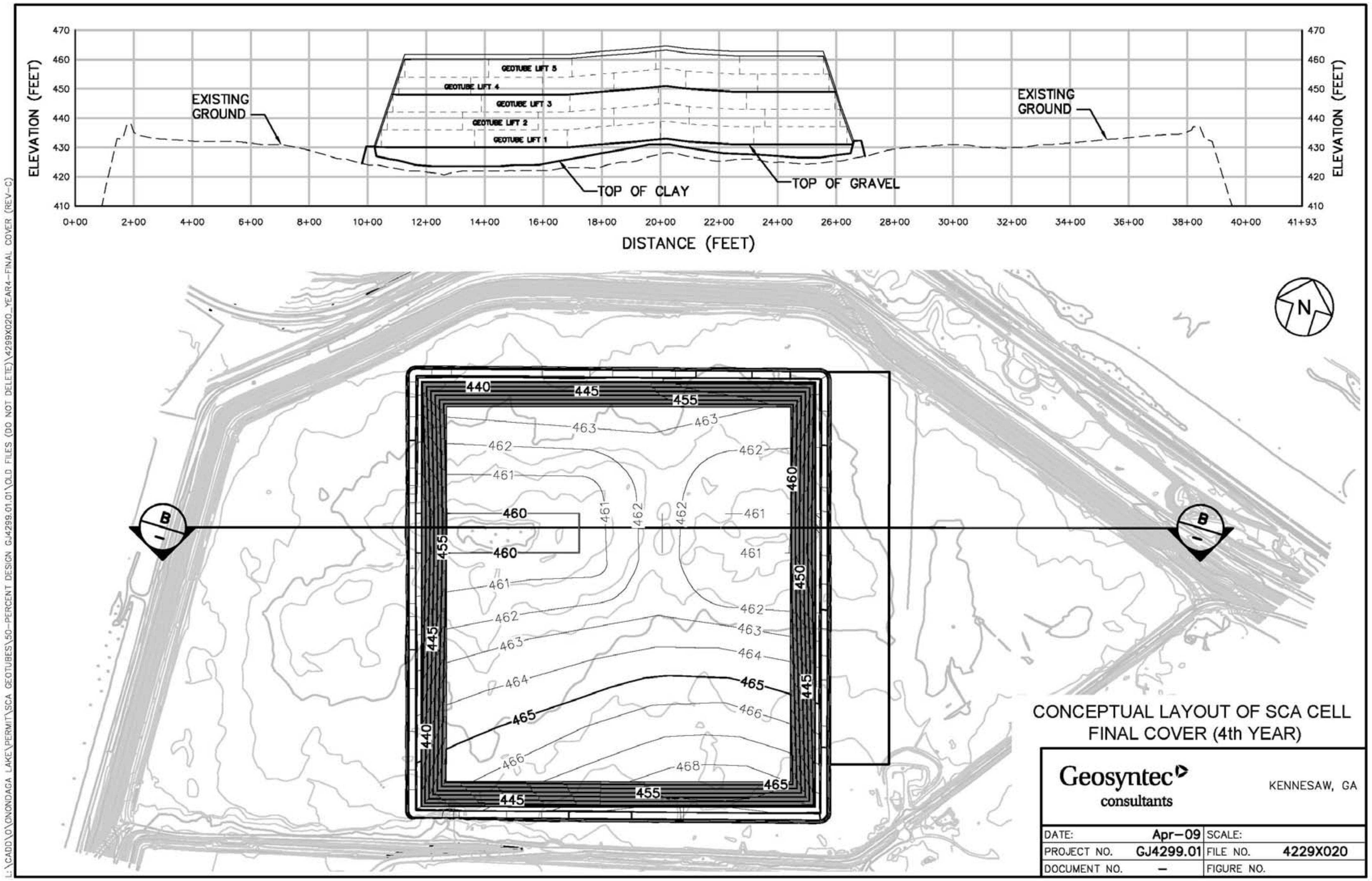


Figure 4. Cross-Section B-B including WB-13 Perimeter Dike

Note: Cross-Section B-B shown here has the same geometry and location as in Figure 3, however the cross-section has been extended to show the existing WB-13 perimeter dike.

Written by: **Joseph Sura** Date: **4/3/2009** Reviewed by: **R. Kulasingam/Ming Zhu/Jay Beech** Date: **4/7/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA 50% Design** Project/ Proposal No.: **GJ4299** Task No.: **05**

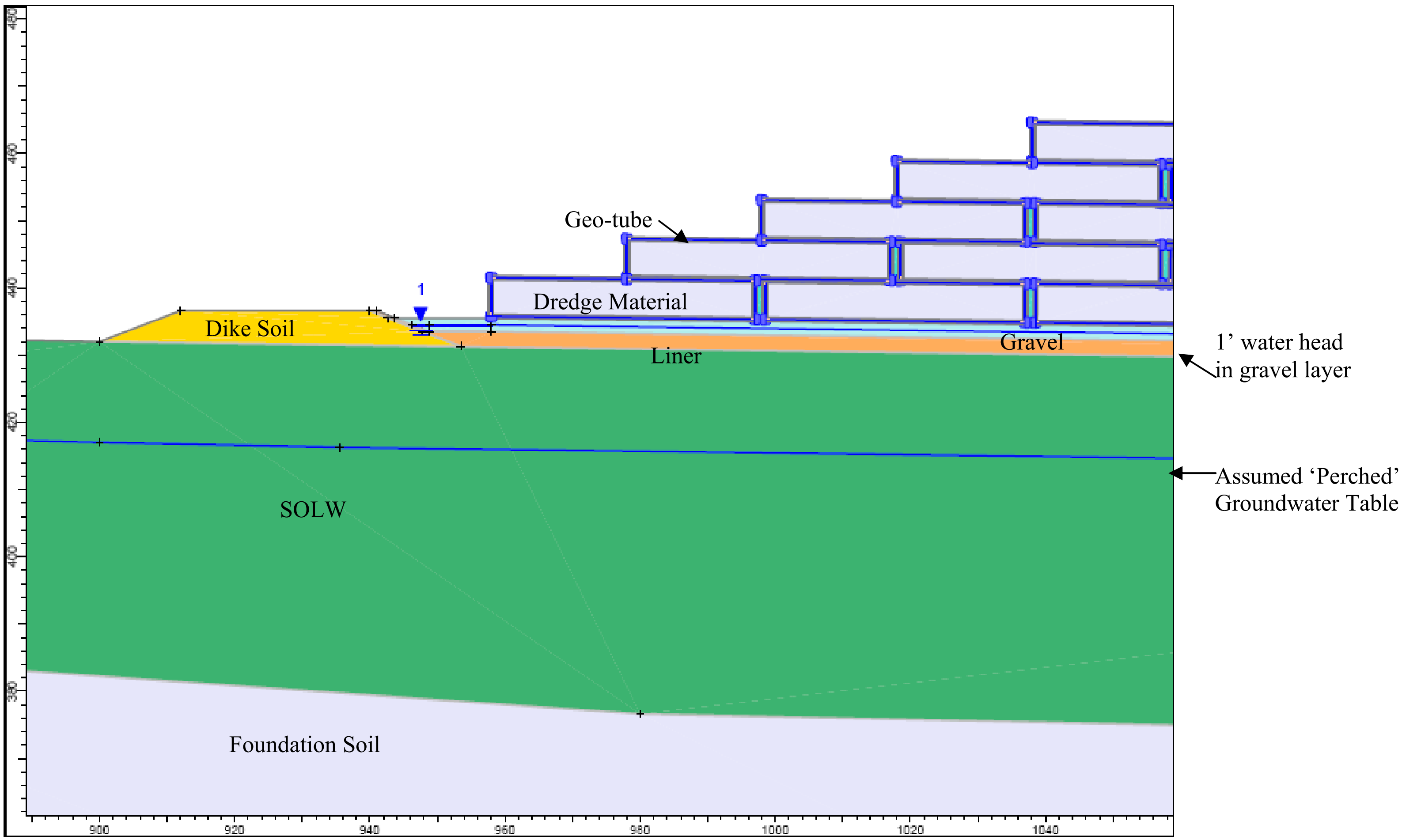


Figure 5. Layers included within the SLIDE Model

Written by: **Joseph Sura** Date: **4/3/2009** Reviewed by: **R. Kulasingam/Ming Zhu/Jay Beech** Date: **4/7/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA 50% Design** Project/ Proposal No.: **GJ4299** Task No.: **05**

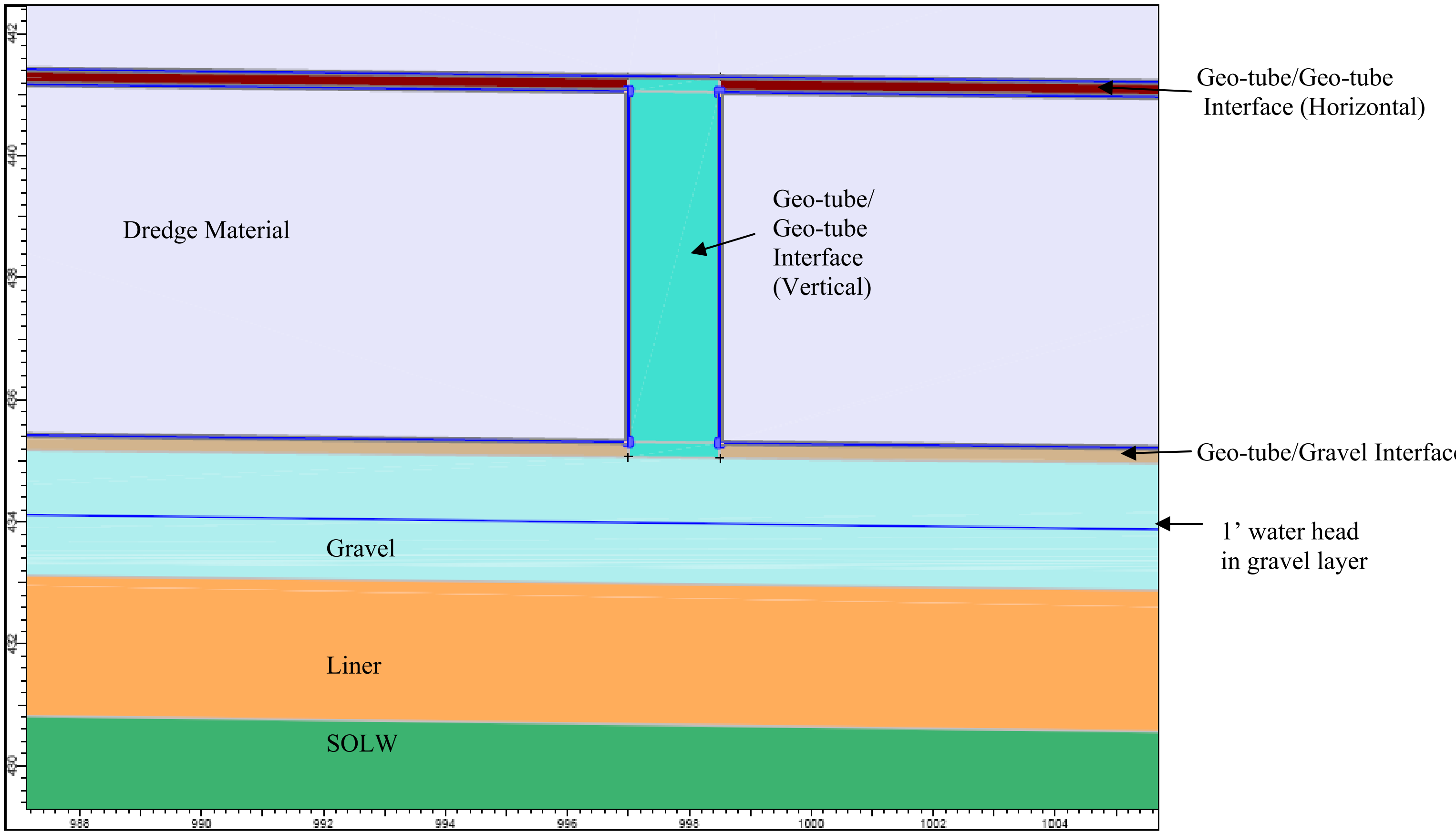


Figure 6. Close view of layers included within the SLIDE Model

Written by: **Joseph Sura** Date: **4/3/2009** Reviewed by: **R. Kulasingam/Ming Zhu/Jay Beech** Date: **4/7/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA 50% Design** Project/ Proposal No.: **GJ4299** Task No.: **05**

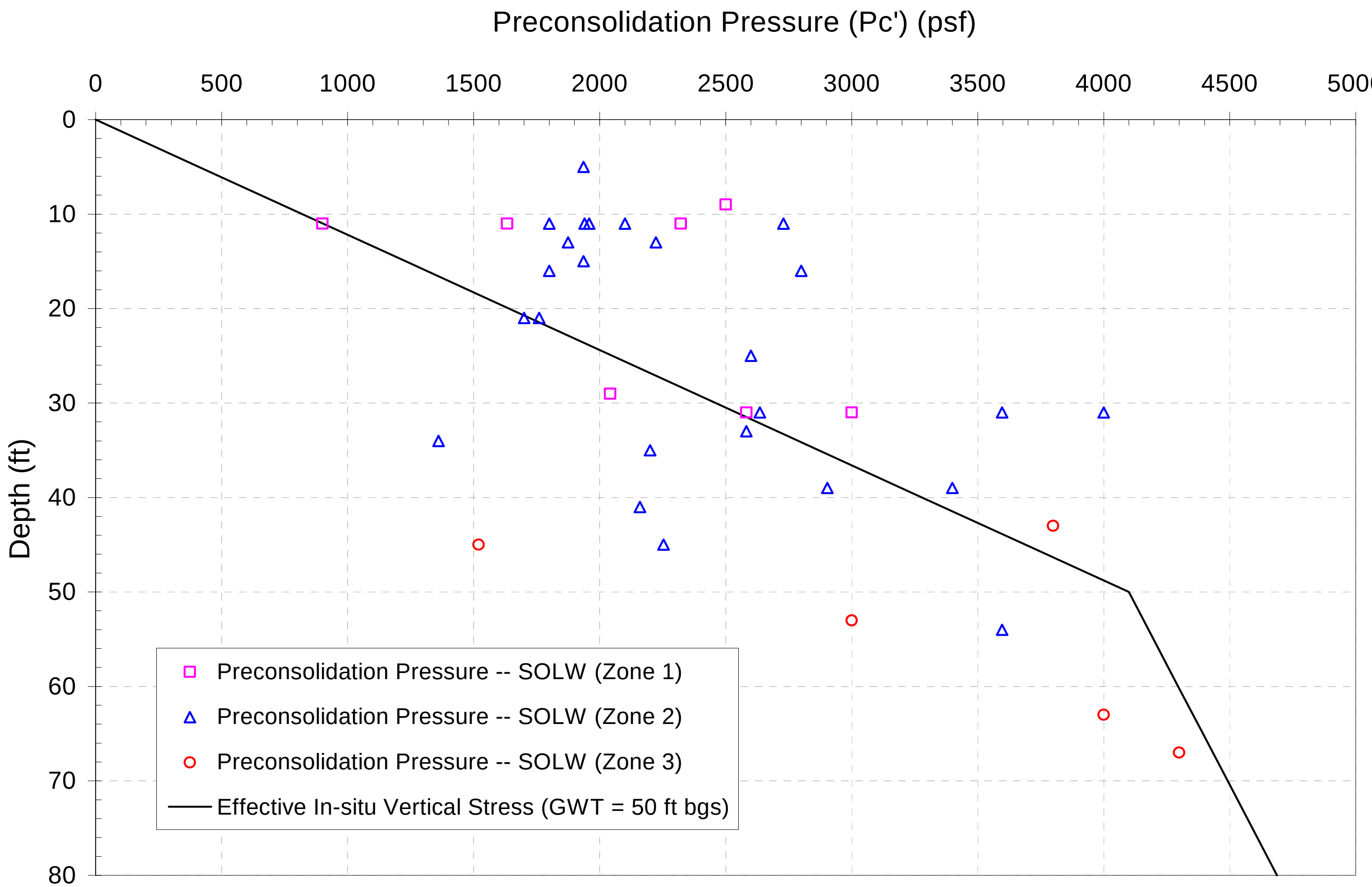


Figure 7. Preconsolidation Pressure of SOLW from Consolidation Tests

Written by: **Joseph Sura** Date: **4/3/2009** Reviewed by: **R. Kulasingam/Ming Zhu/Jay Beech** Date: **4/7/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA 50% Design** Project/ Proposal No.: **GJ4299** Task No.: **05**

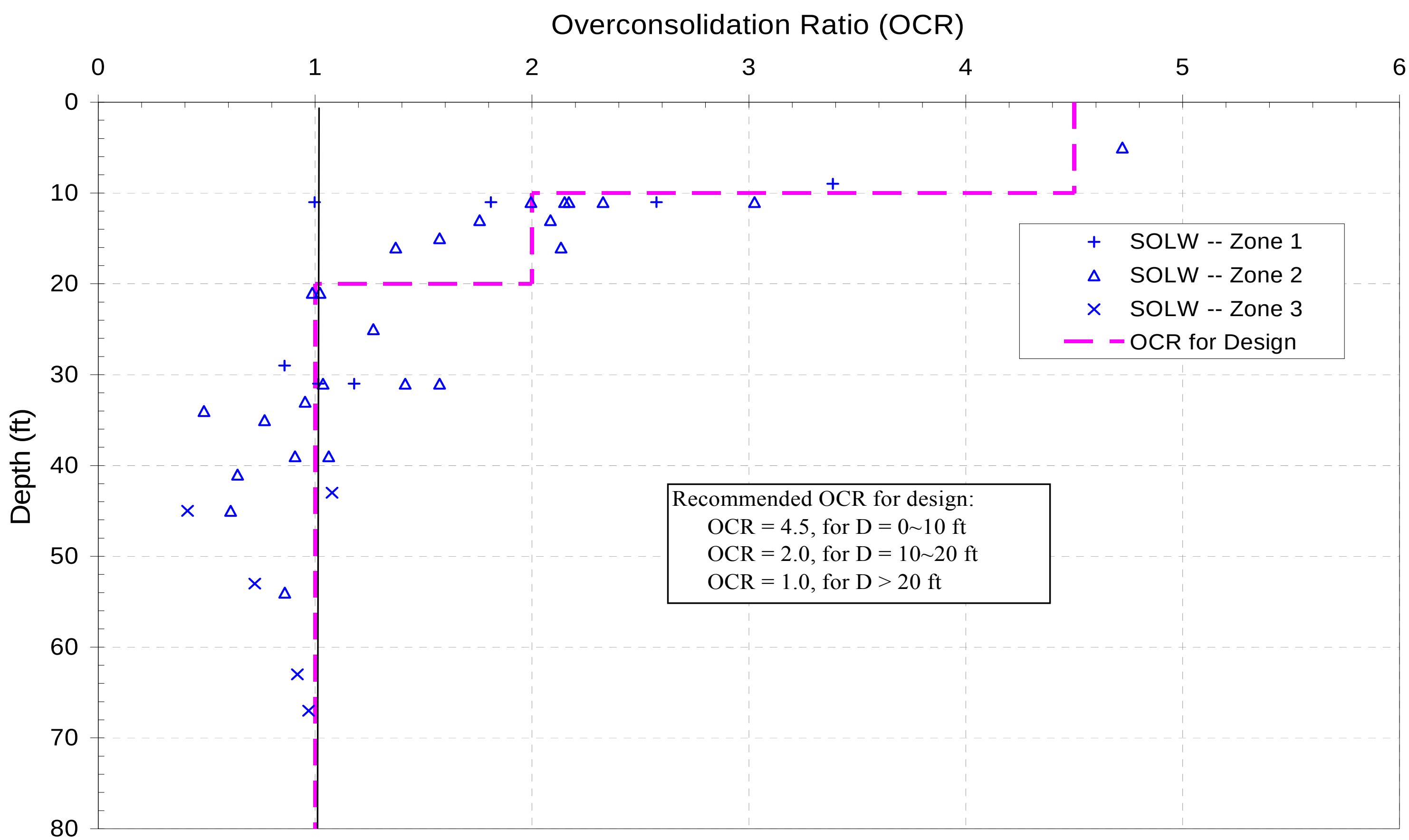


Figure 8. Overconsolidation Ratio of SOLW before Construction

Written by: **Joseph Sura** Date: **4/3/2009** Reviewed by: **R. Kulasingam/Ming Zhu/Jay Beech** Date: **4/7/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA 50% Design** Project/ Proposal No.: **GJ4299** Task No.: **05**

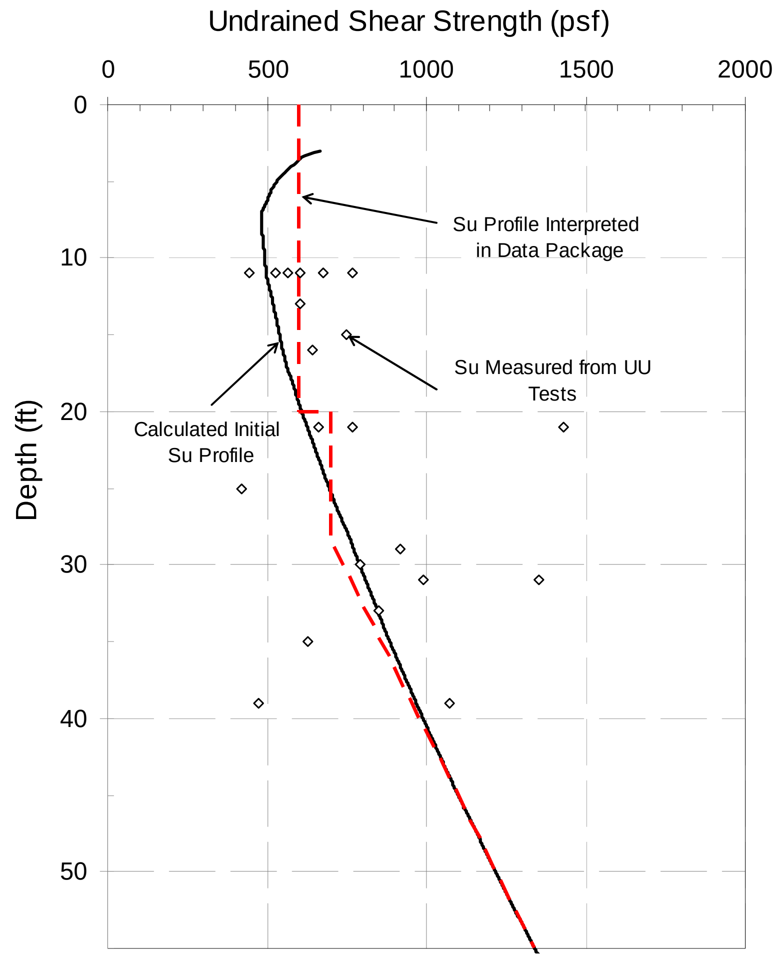


Figure 9. Initial S_U Profile of SOLW

Written by: **Joseph Sura** Date: **4/3/2009** Reviewed by: **R. Kulasingam/Ming Zhu/Jay Beech** Date: **4/7/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA 50% Design** Project/ Proposal No.: **GJ4299** Task No.: **05**

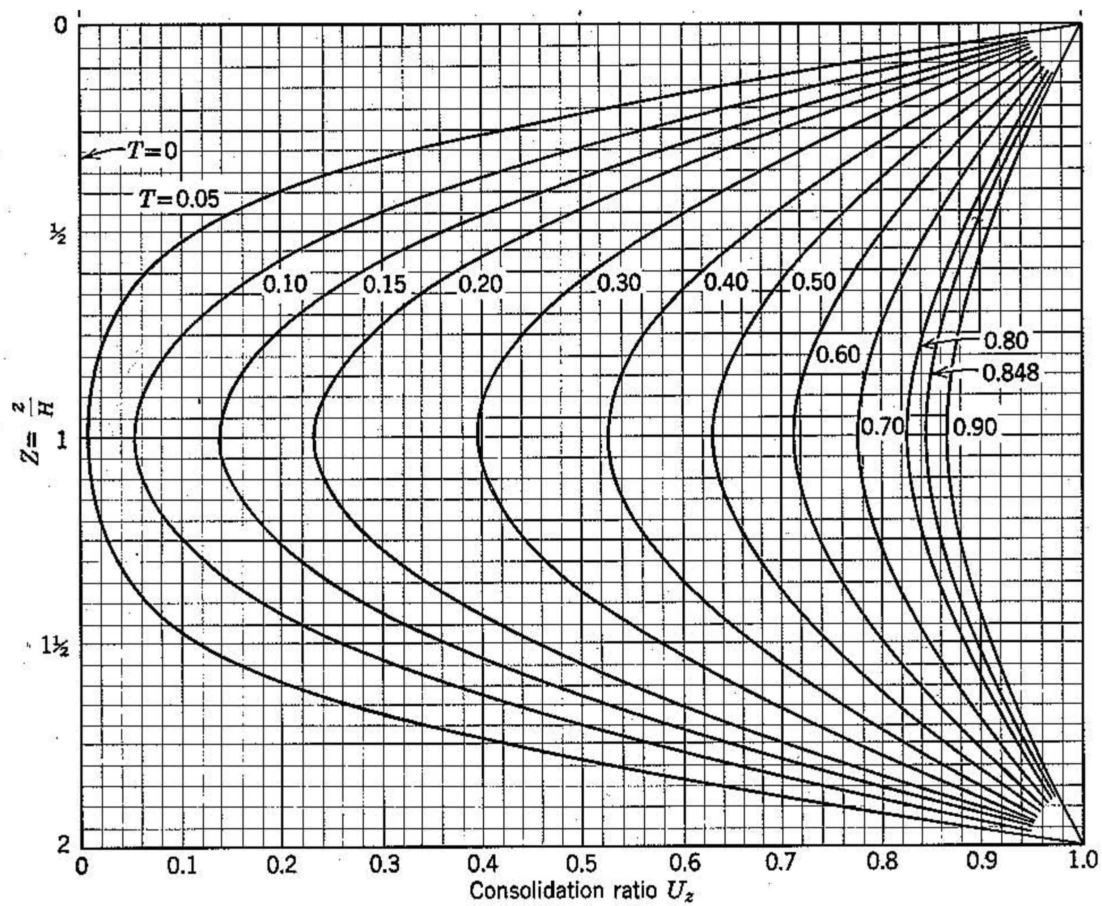


Figure 10. Consolidation Ratio as a Function of Depth [Lambe and Whitman, 1969]
Note: The thickness of the layer was assumed to be 50 ft based on the average depth of the existing SOLW.

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Client: **Honeywell** Project: **Onondaga Lake SCA 50% Design** Project/ Proposal No.: **GJ4299** Task No.: **05**

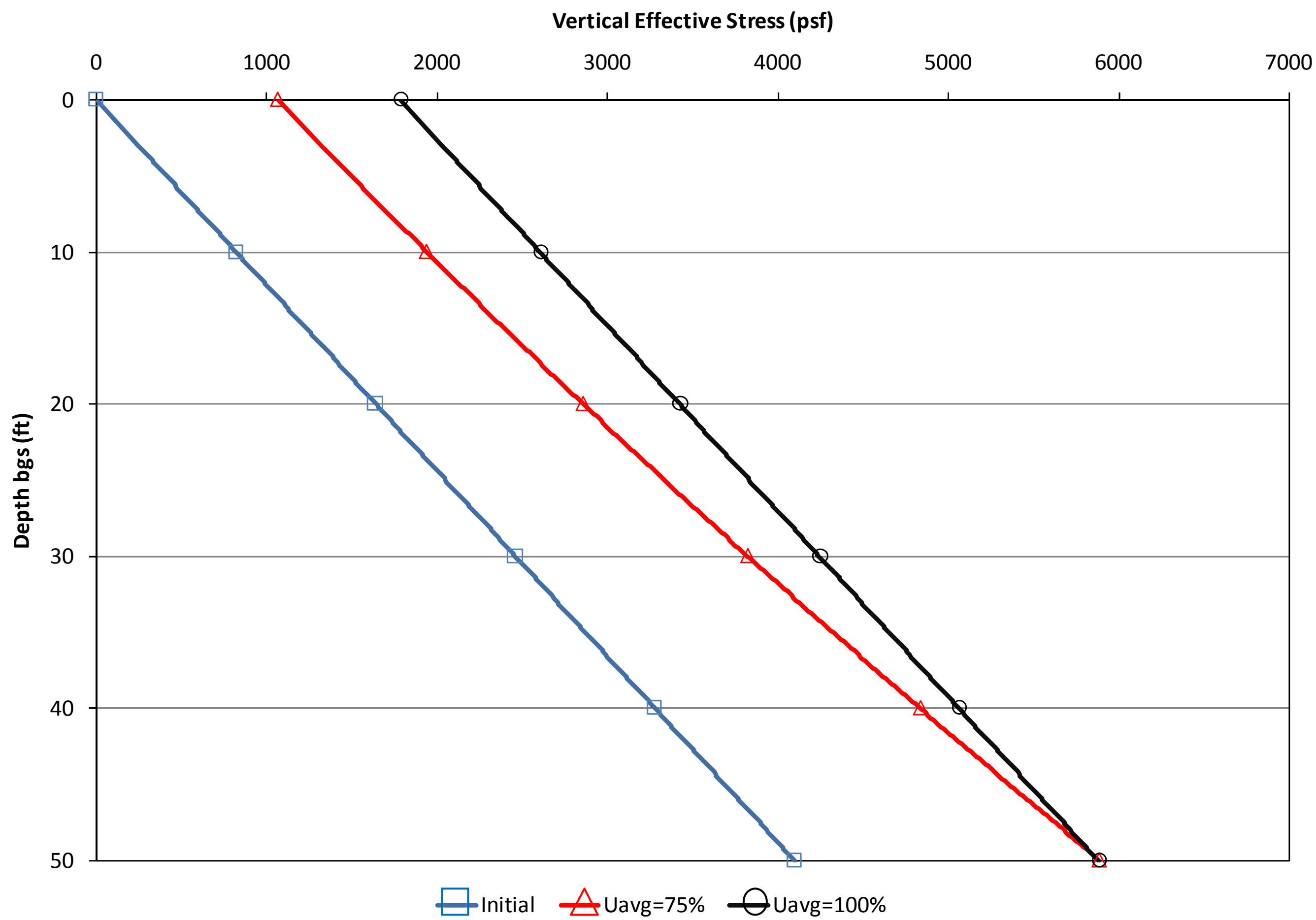

Figure 11. Vertical Effective Stress Profiles of SOLW

Note: Additional vertical effective stress is due to the loading from the liner system and three layers of geo-tubes.

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Client: **Honeywell** Project: **Onondaga Lake SCA 50% Design** Project/ Proposal No.: **GJ4299** Task No.: **05**

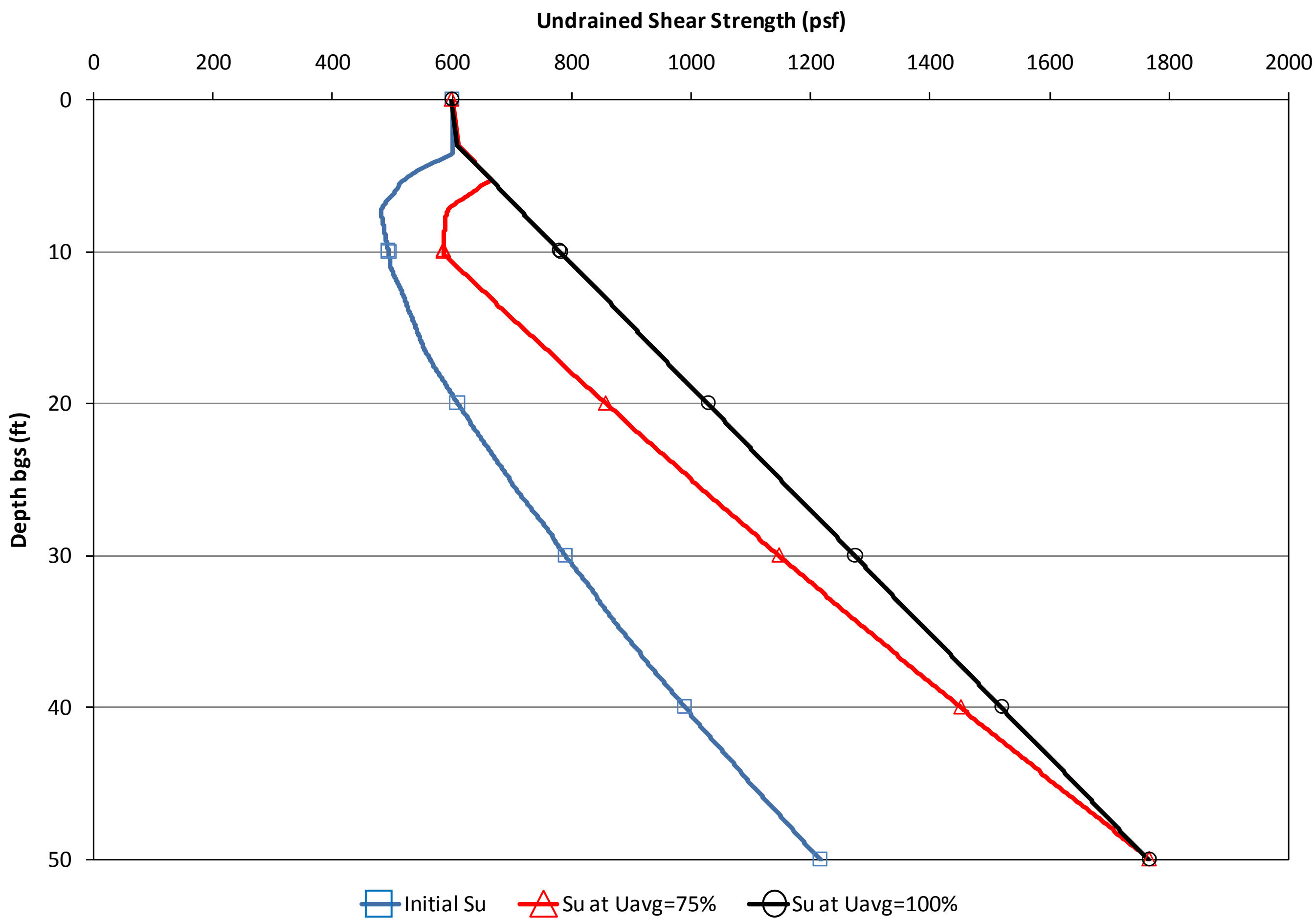


Figure 12. S_U Profiles of SOLW

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009
Client:	Honeywell	Project:	Onondaga Lake SCA 50% Design	Project/ Proposal No.:	GJ4299	Task No.:	05

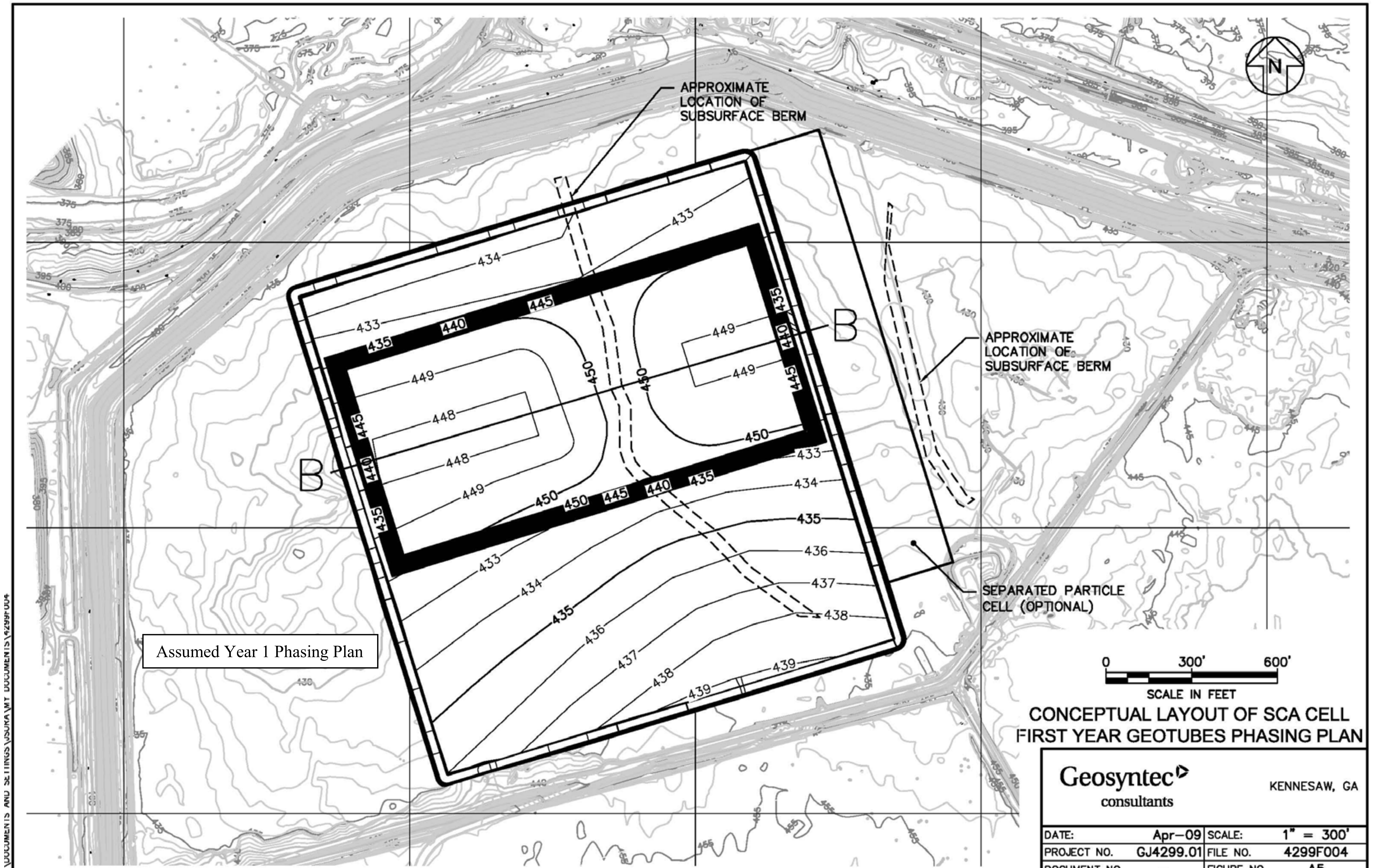


Figure 13: Potential First Year Geo-tube Phasing Plan

Written by: **Joseph Sura** Date: **4/3/2009** Reviewed by: **R. Kulasingam/Ming Zhu/Jay Beech** Date: **4/7/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA 50% Design** Project/ Proposal No.: **GJ4299** Task No.: **05**

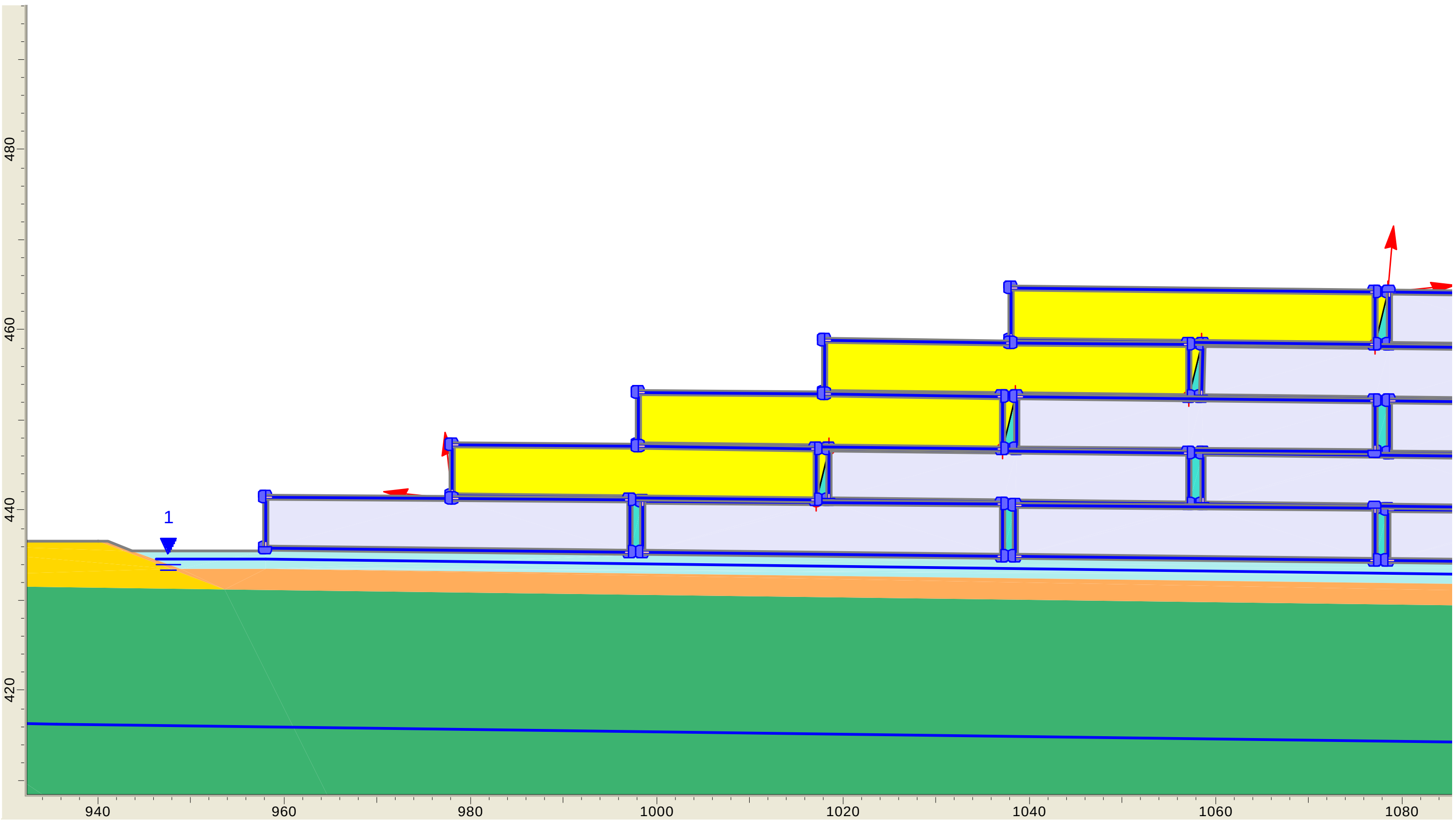


Figure 14. SLIDE Diagram of Critical Surface for Geo-tube Slip (4 stacks, 1 column) before Final Cover

Written by: **Joseph Sura** Date: **4/3/2009** Reviewed by: **R. Kulasingam/Ming Zhu/Jay Beech** Date: **4/7/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA 50% Design** Project/ Proposal No.: **GJ4299** Task No.: **05**

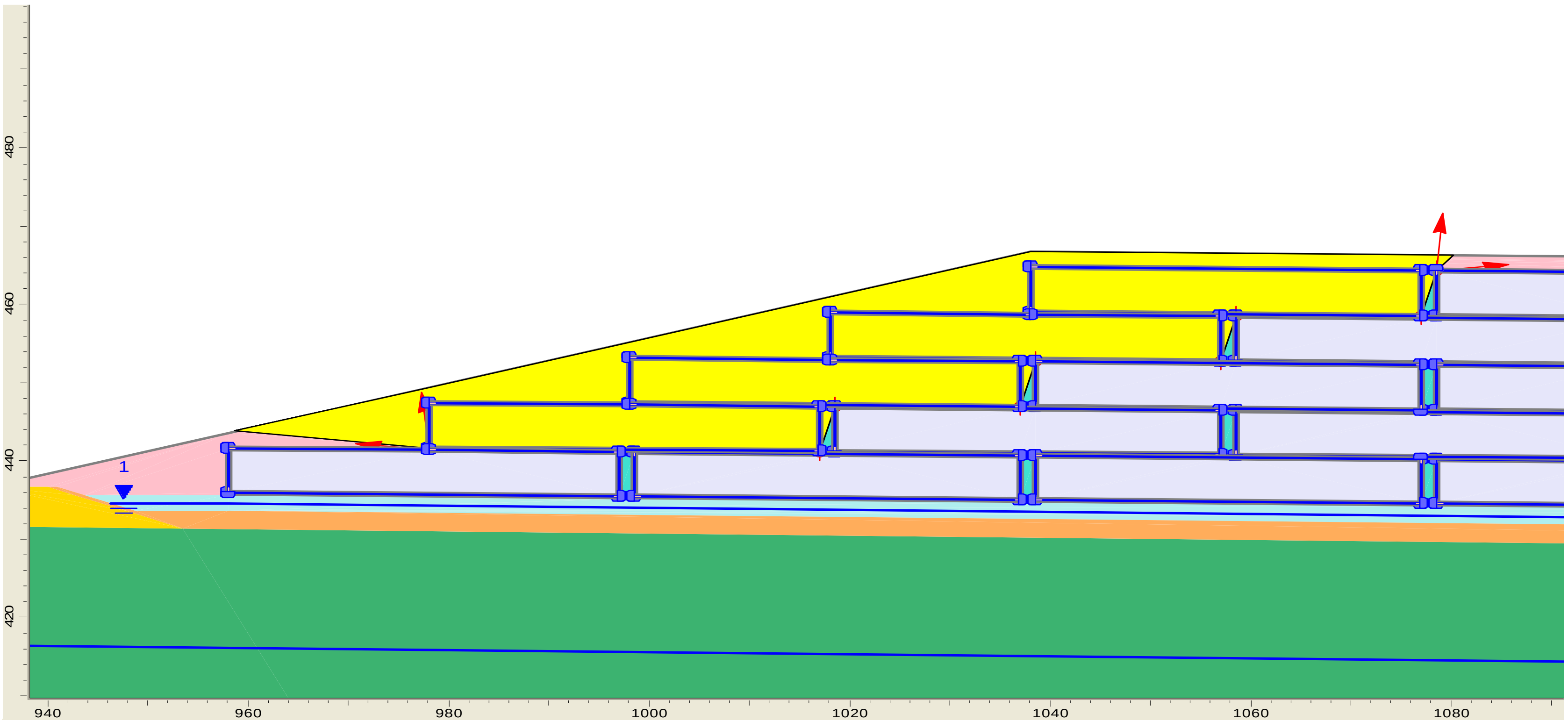


Figure 15. SLIDE Diagram of Critical Surface for Geo-tube Slip (4 stacks, 1 column) after Final Cover

Written by: Joseph Sura Date: 4/3/2009 Reviewed by: R. Kulasingam/Ming Zhu/Jay Beech Date: 4/7/2009

Client: Honeywell Project: Onondaga Lake SCA 50% Design Project/ Proposal No.: GJ4299 Task No.: 05

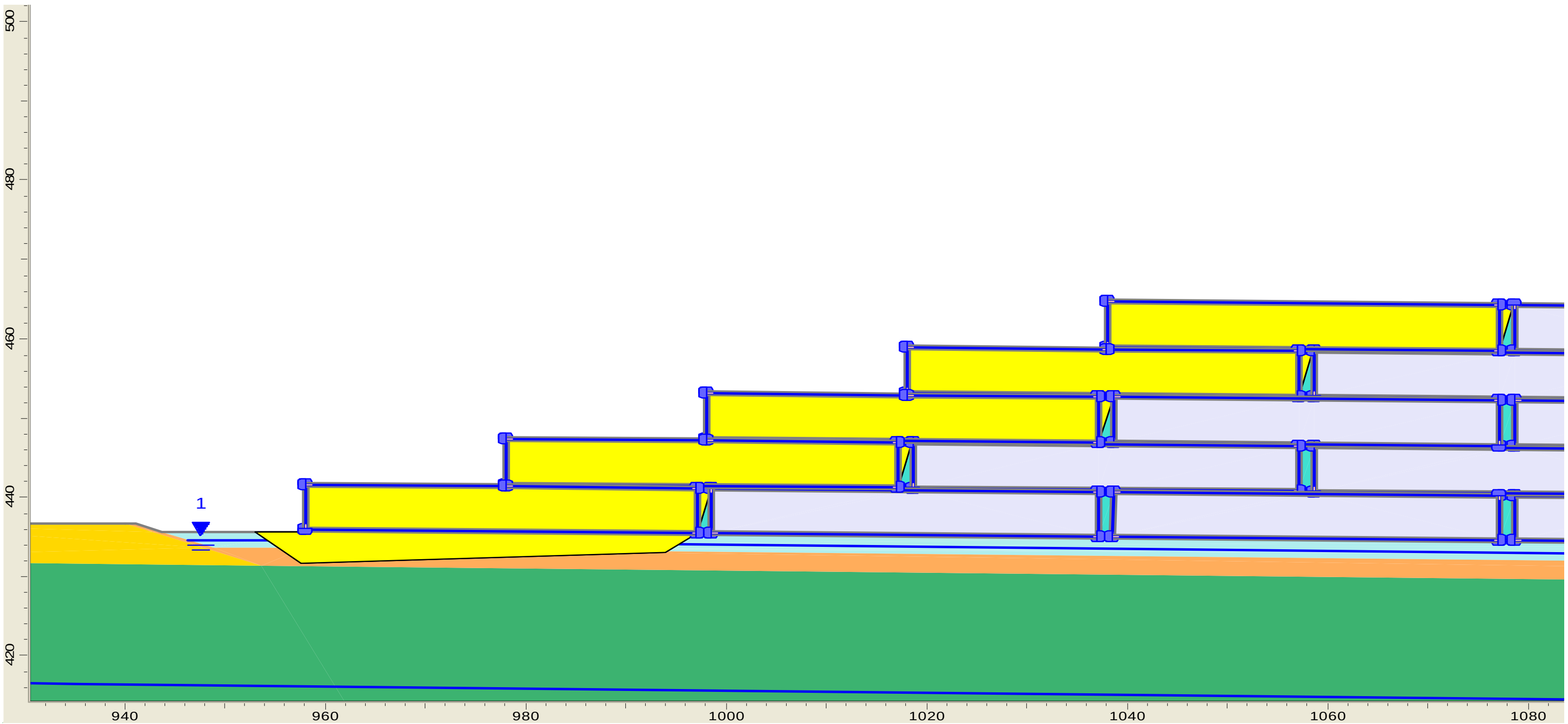


Figure 16. SLIDE Diagram of Critical Surface for Liner Stability (1 column) before Final Cover

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009
Client:	Honeywell	Project:	Onondaga Lake SCA 50% Design	Project/ Proposal No.:	GJ4299	Task No.:	05

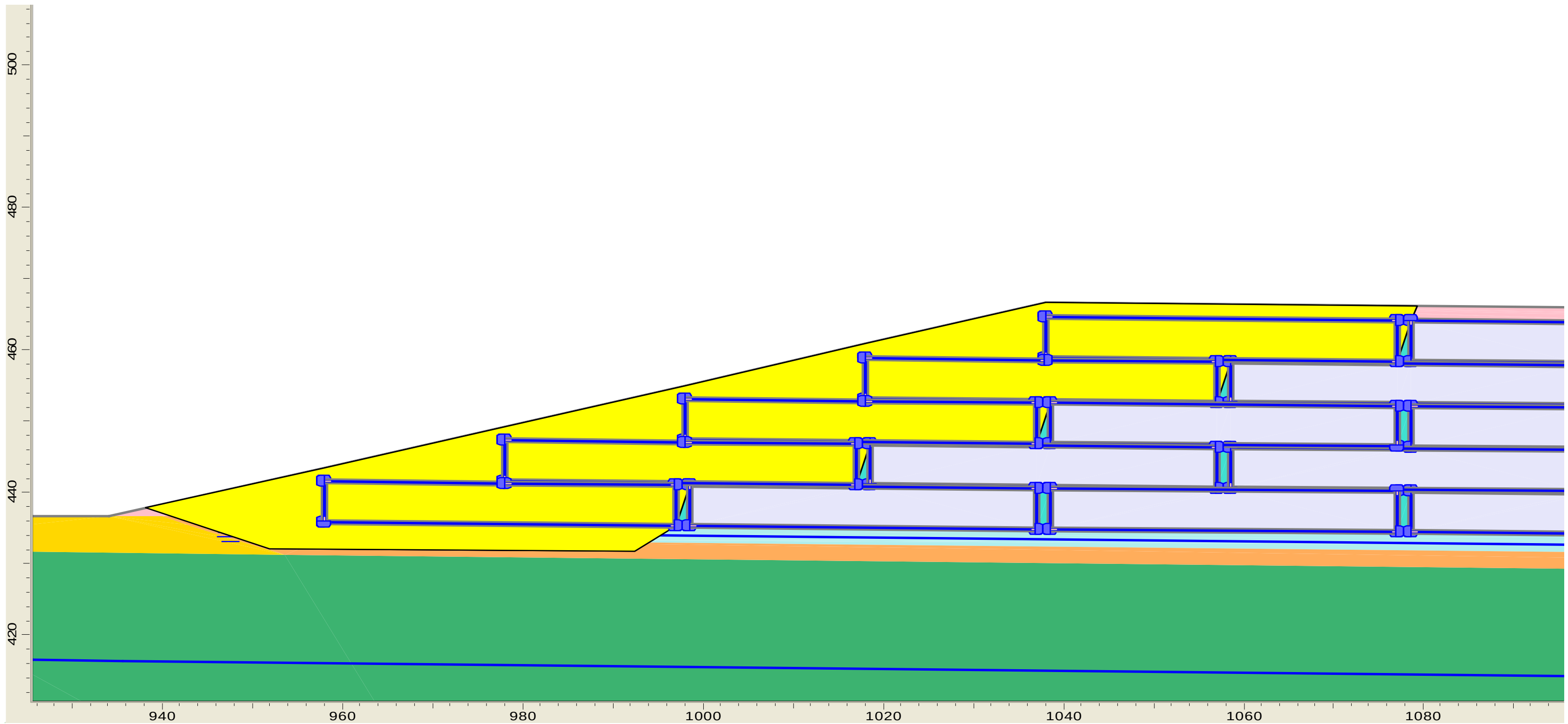


Figure 17. SLIDE Diagram of Critical Surface for Liner Stability (1 column) after Final Cover

Written by: Joseph Sura Date: 4/3/2009 Reviewed by: R. Kulasingam/Ming Zhu/Jay Beech Date: 4/7/2009

Client: Honeywell Project: Onondaga Lake SCA 50% Design Project/ Proposal No.: GJ4299 Task No.: 05

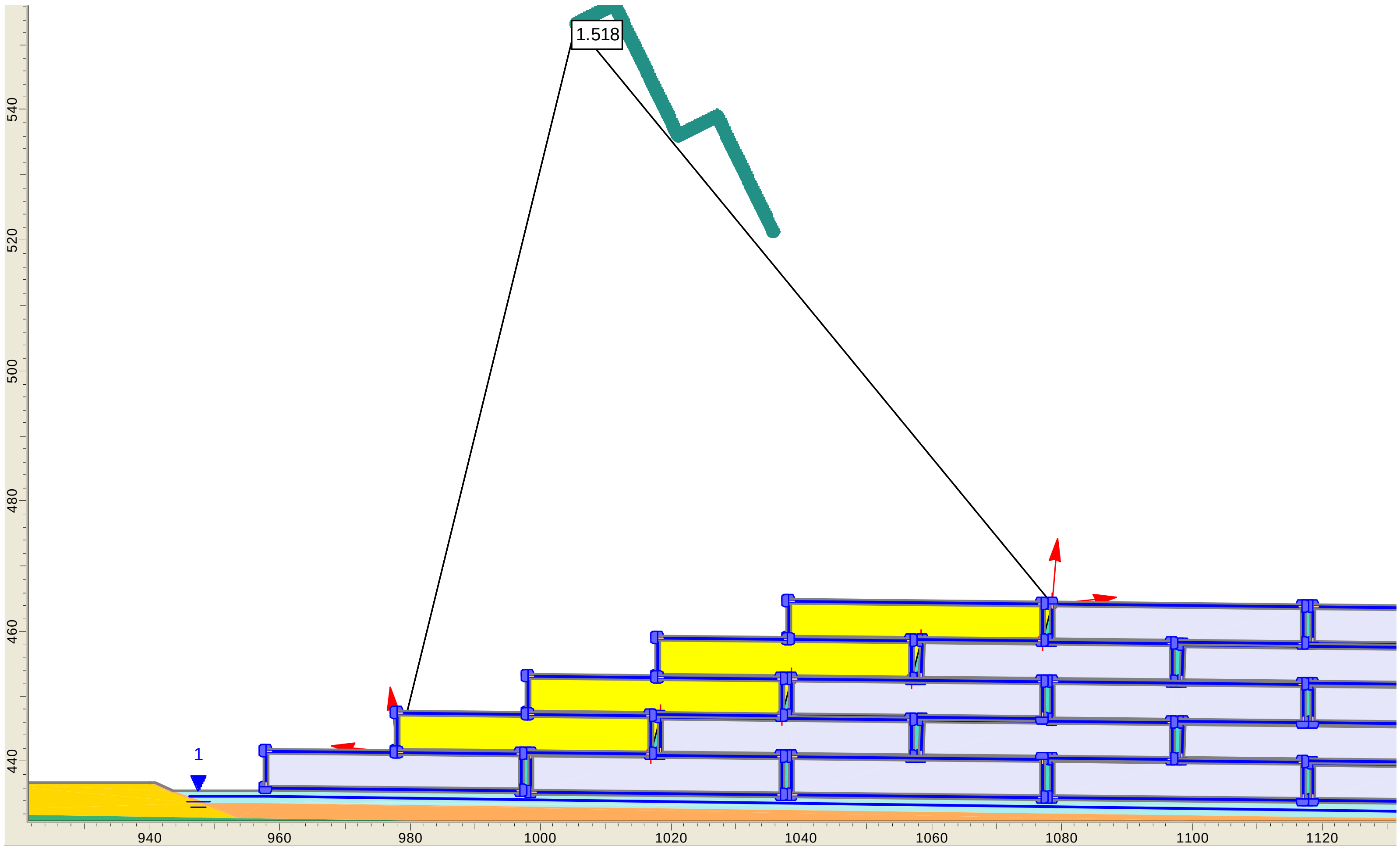


Figure 18. Slope Stability Analysis Result for Section A-A without Final Cover: NorthSide_NoCover_Tube_07_Lab

Written by:	**Joseph Sura**	Date:	**4/3/2009**	Reviewed by:	**R. Kulasingam/Ming Zhu/Jay Beech**	Date:	**4/7/2009**
Client:	**Honeywell**	Project:	**Onondaga Lake SCA 50% Design**	Project/ Proposal No.:	**GJ4299**	Task No.:	**05**

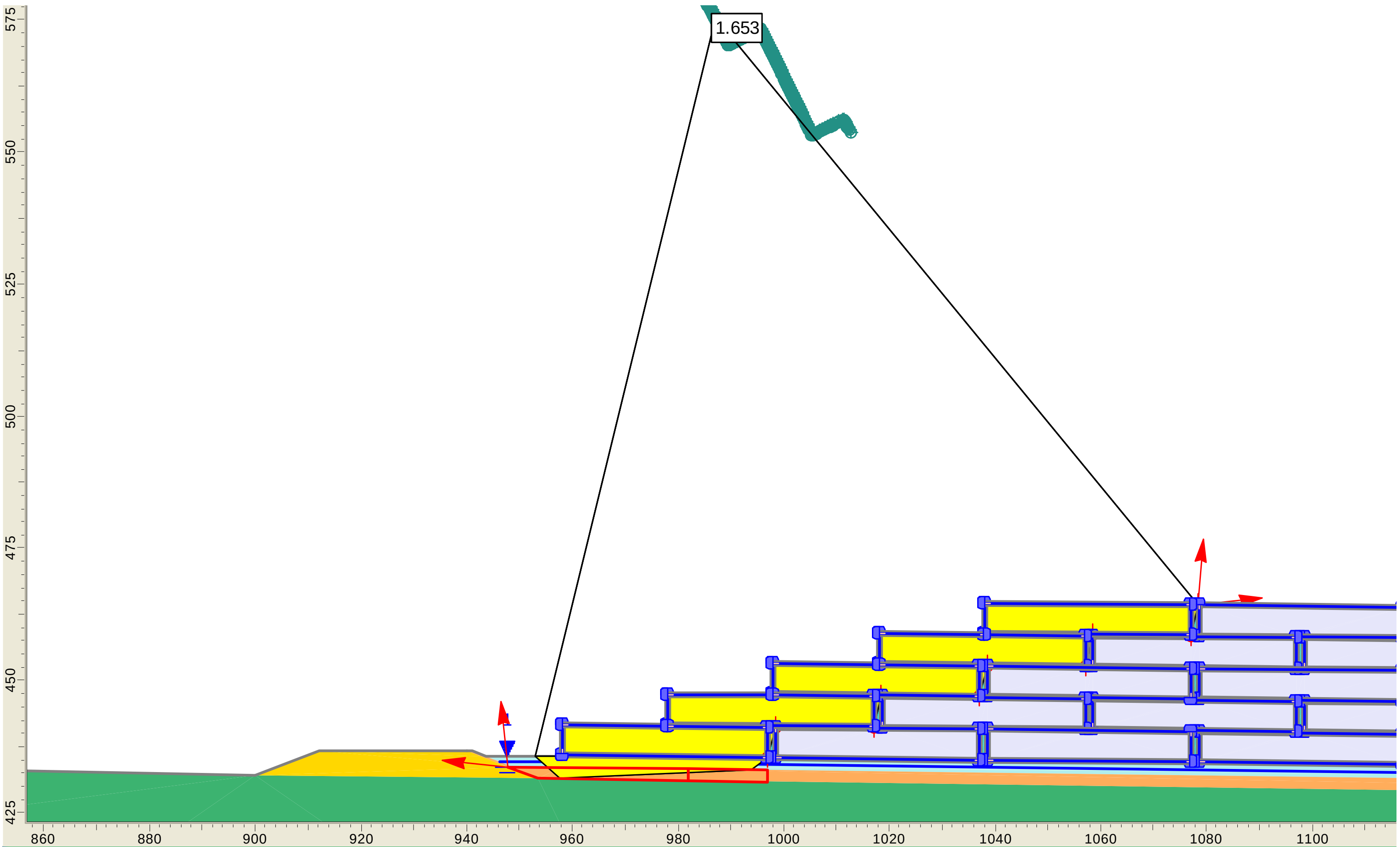


Figure 19. Slope Stability Analysis Result for Section A-A without Final Cover: NorthSide_NoCover_Liner_I_Lab

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009
Client:	Honeywell	Project:	Onondaga Lake SCA 50% Design	Project/ Proposal No.:	GJ4299	Task No.:	05

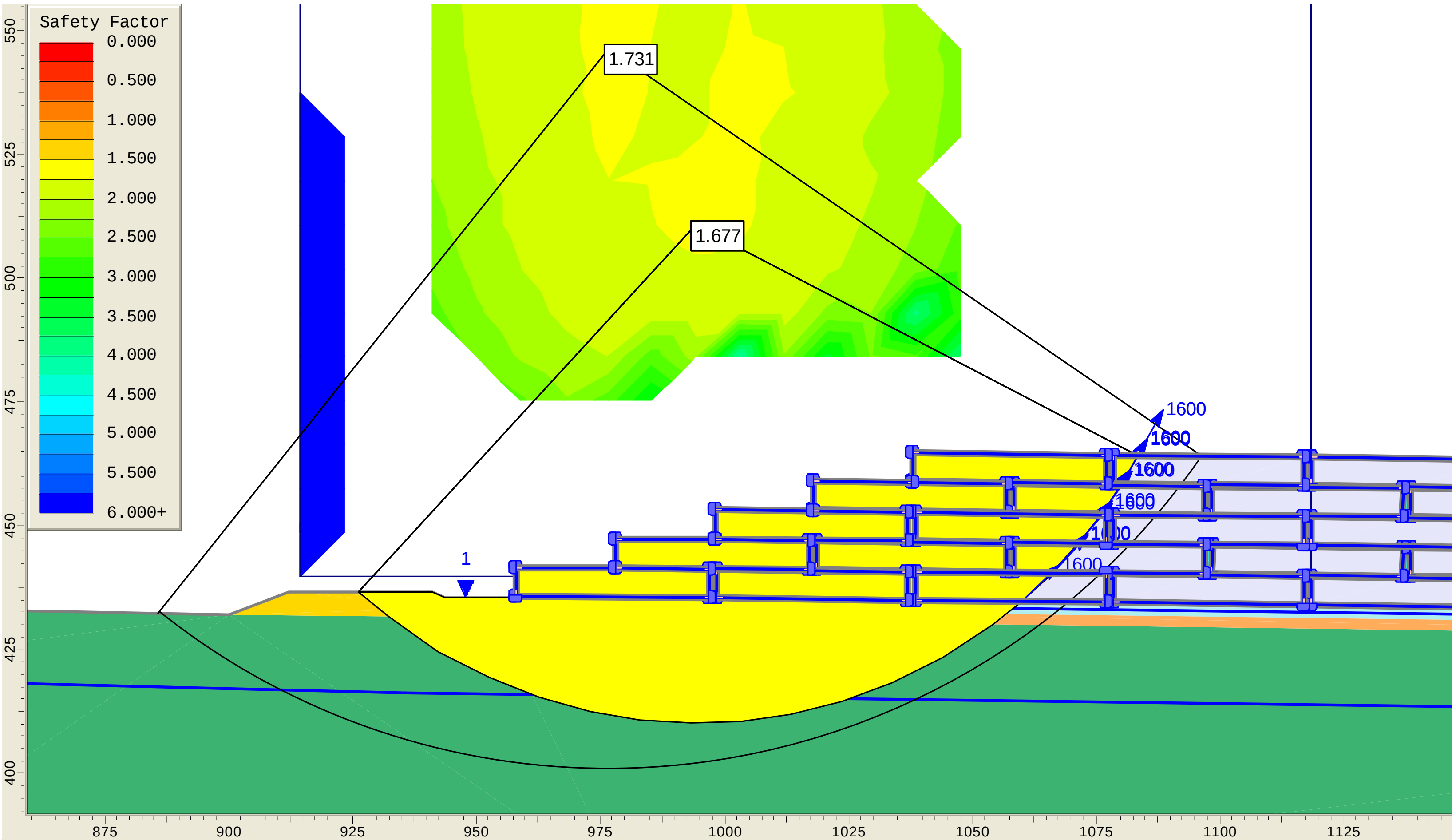


Figure 20. Slope Stability Analysis Result for Section A-A without Final Cover: NorthSide_NoCover_Global_Su_Lab
Note: This Figure shows the FS calculated using Spencer's Method.

Written by: **Joseph Sura** Date: **4/3/2009** Reviewed by: **R. Kulasingam/Ming Zhu/Jay Beech** Date: **4/7/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA 50% Design** Project/ Proposal No.: **GJ4299** Task No.: **05**

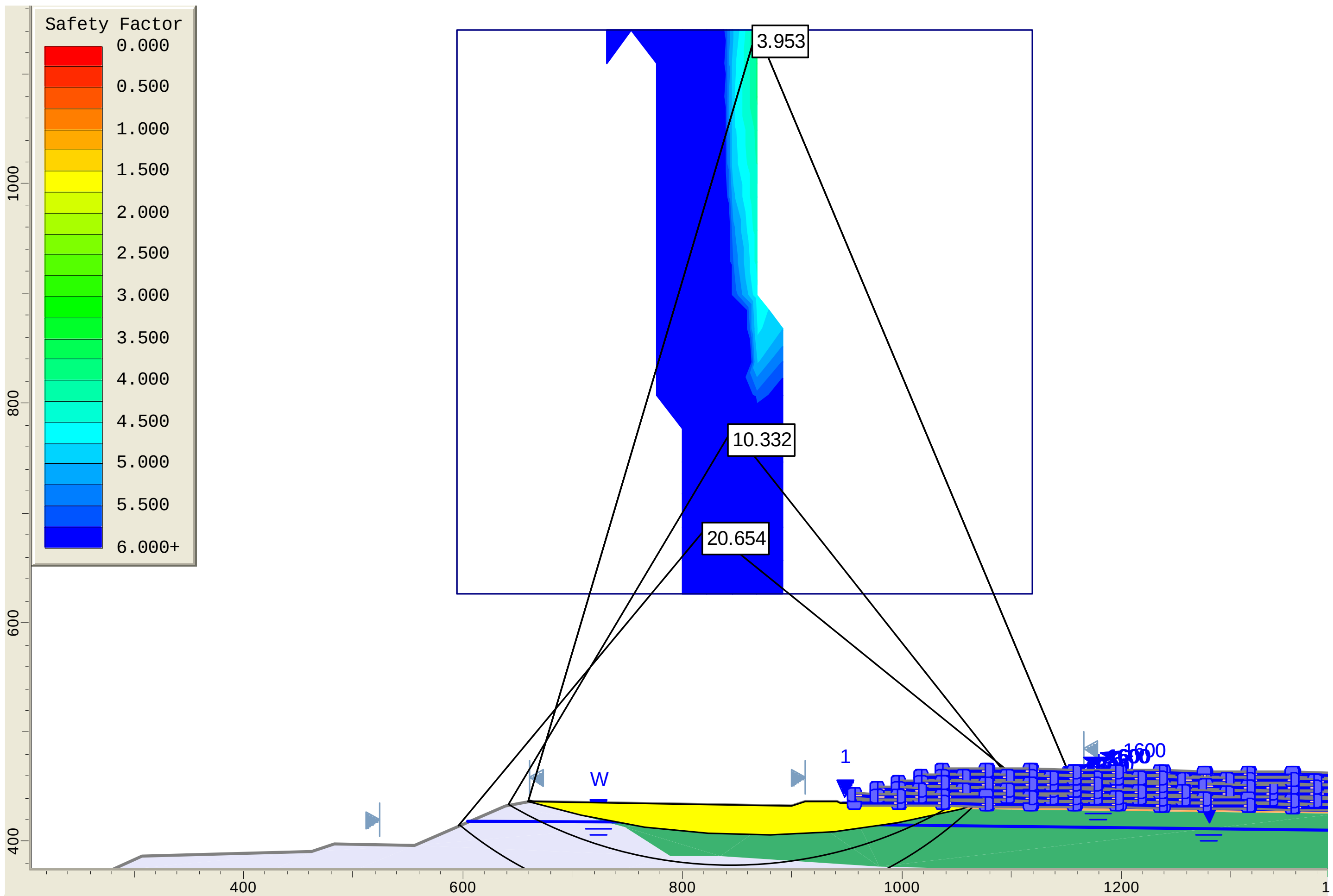


Figure 21. Slope Stability Analysis Result for Section A-A without Final Cover: NorthSide_NoCover_External_Lab
Note: This Figure shows the FS calculated using Spencer's Method.

Written by: **Joseph Sura** Date: **4/3/2009** Reviewed by: **R. Kulasingam/Ming Zhu/Jay Beech** Date: **4/7/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA 50% Design** Project/ Proposal No.: **GJ4299** Task No.: **05**

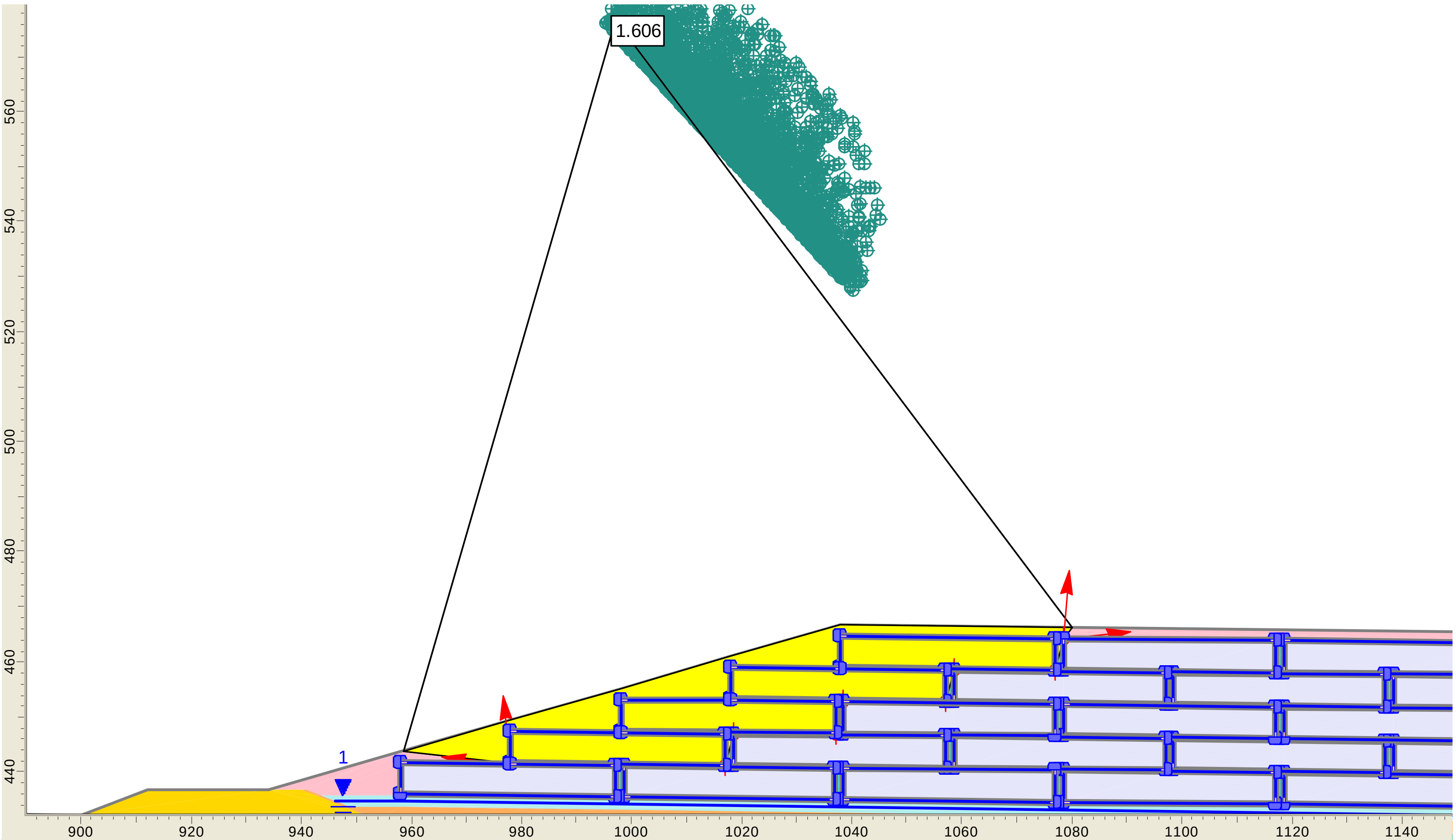


Figure 22. Slope Stability Analysis Result for Section A-A after Final Cover: NorthSide_Cover_Tube_07_Lab

Written by:	**Joseph Sura**	Date:	**4/3/2009**	Reviewed by:	**R. Kulasingam/Ming Zhu/Jay Beech**	Date:	**4/7/2009**
Client:	**Honeywell**	Project:	**Onondaga Lake SCA 50% Design**	Project/ Proposal No.:	**GJ4299**	Task No.:	**05**

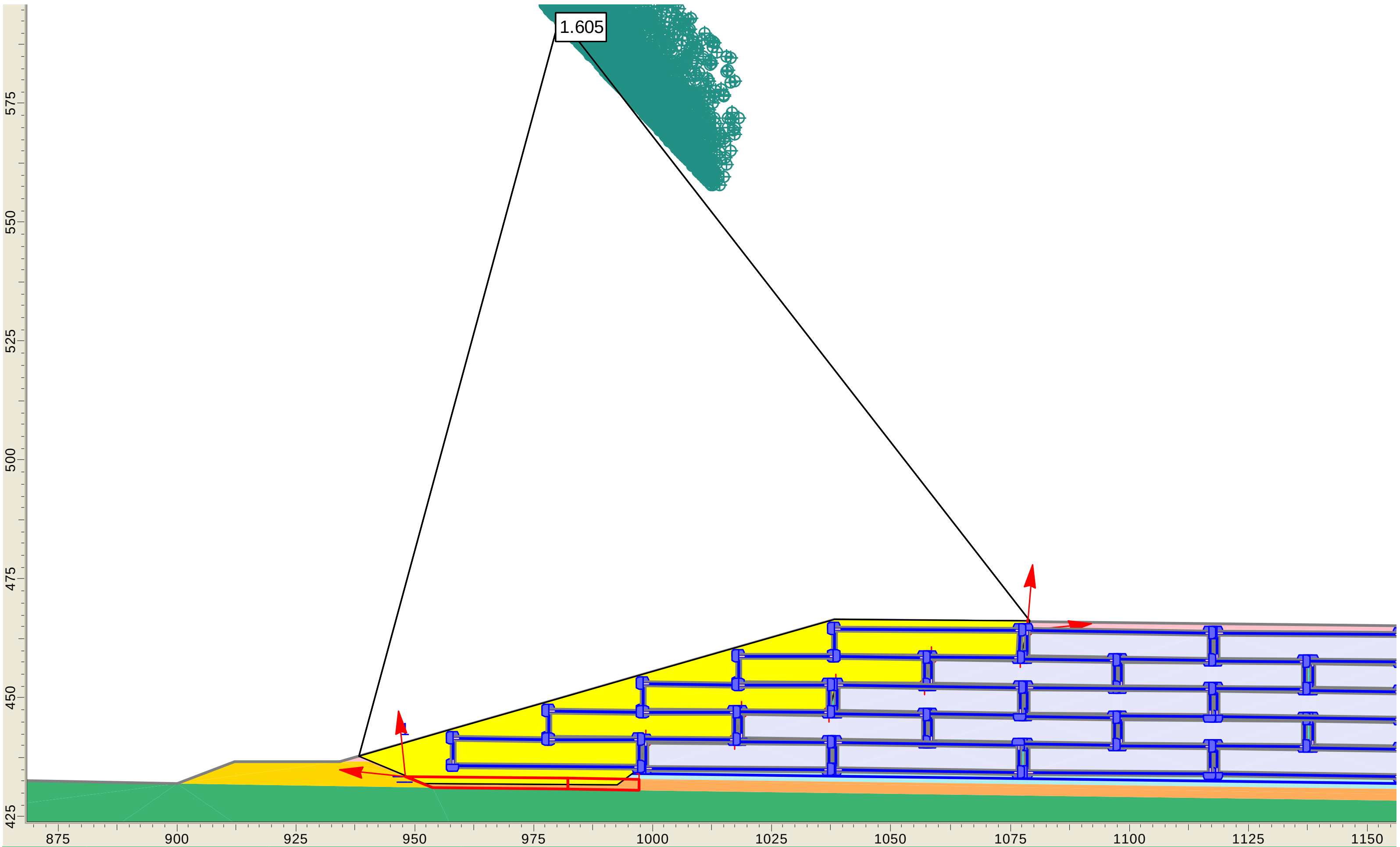


Figure 23. Slope Stability Analysis Result for Section A-A after Final Cover: NorthSide_Cover_Liner_I_Lab

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009
Client:	Honeywell	Project:	Onondaga Lake SCA 50% Design	Project/ Proposal No.:	GJ4299	Task No.:	05

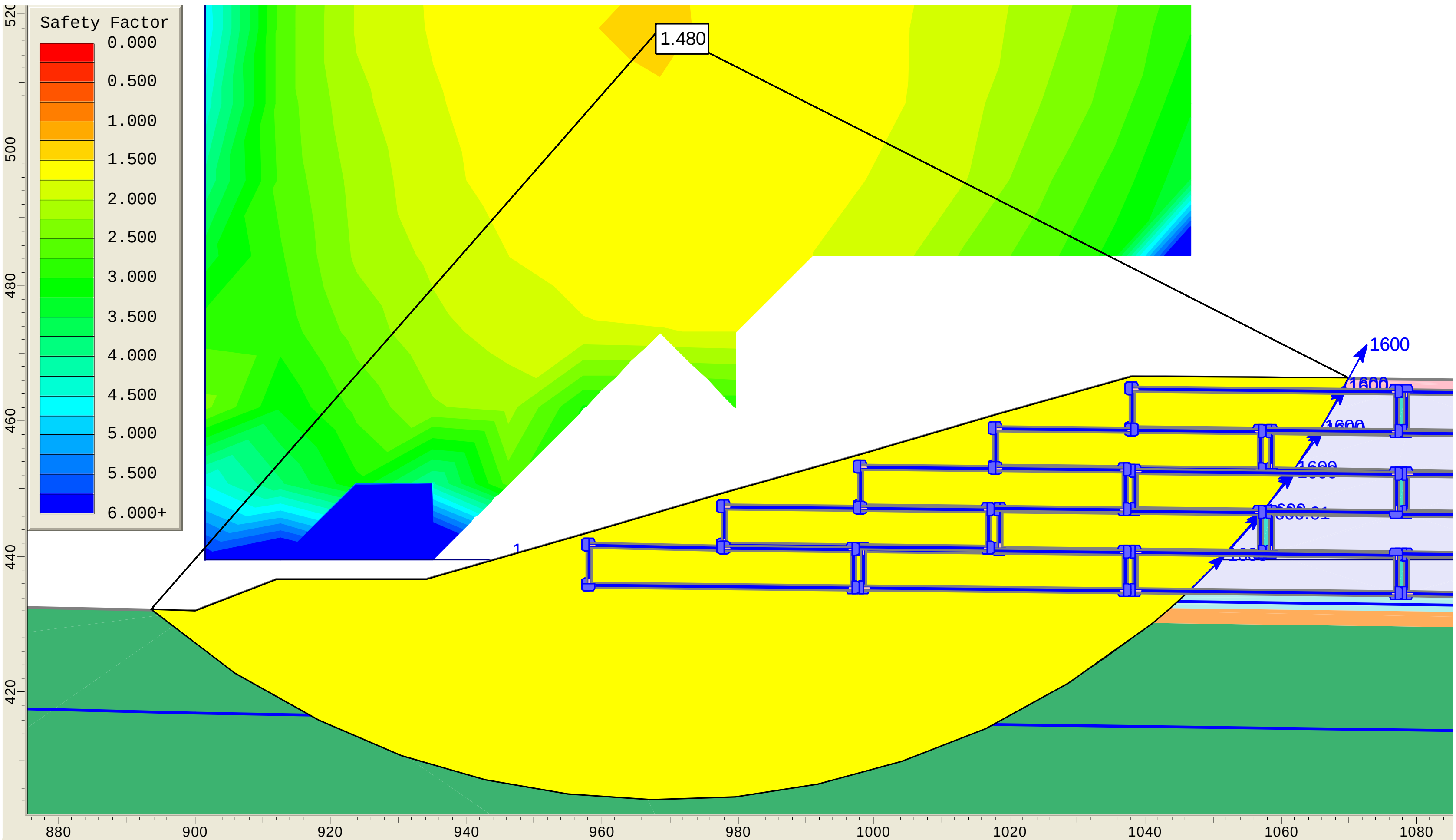


Figure 24. Slope Stability Analysis Result for Section A-A after Final Cover: NorthSide_Cover_Global_Su_Lab
Note: This Figure shows the FS calculated using Spencer's Method.

Written by: **Joseph Sura** Date: **4/3/2009** Reviewed by: **R. Kulasingam/Ming Zhu/Jay Beech** Date: **4/7/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA 50% Design** Project/ Proposal No.: **GJ4299** Task No.: **05**

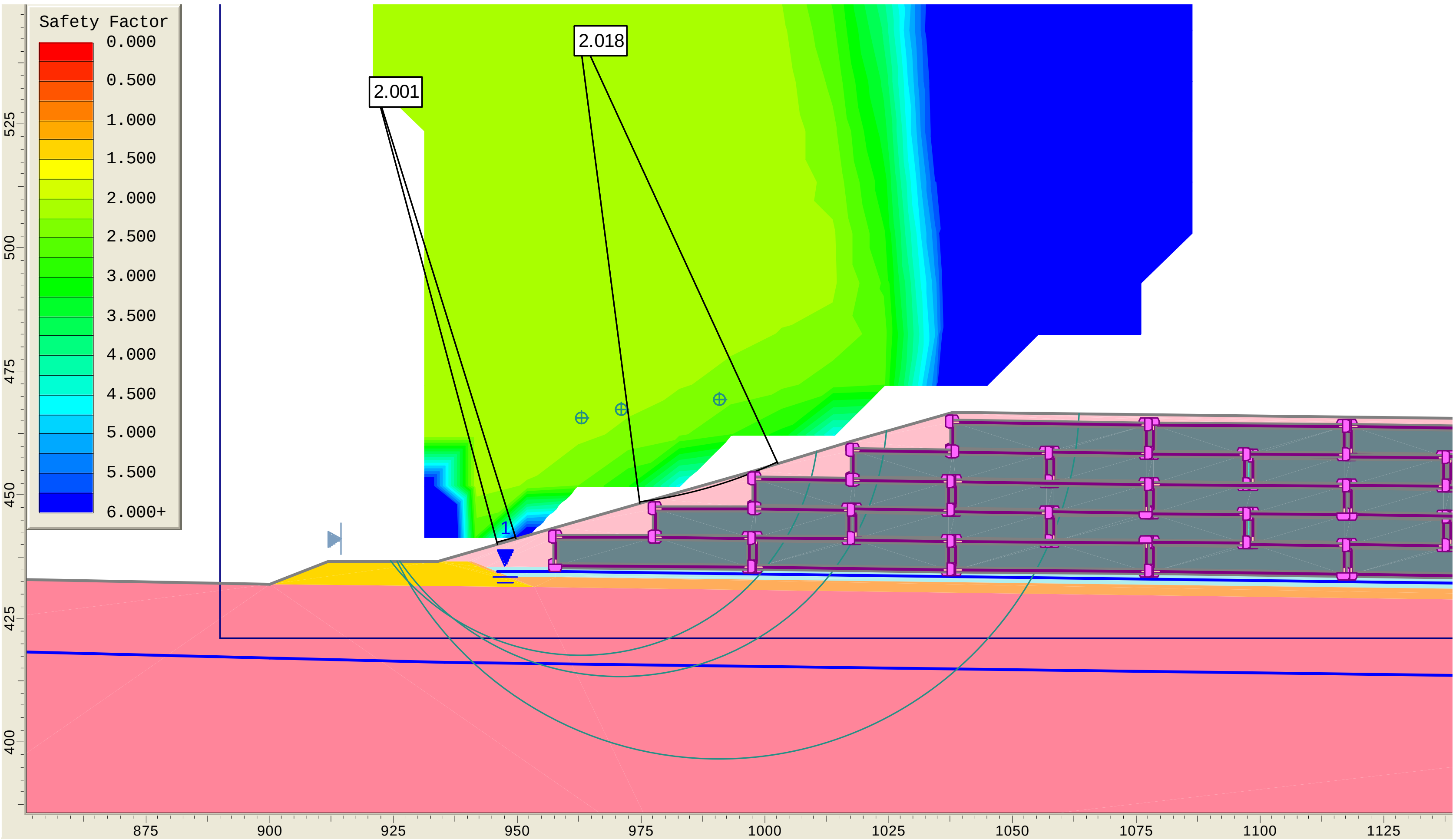


Figure 25. Slope Stability Analysis Result for Section A-A after Final Cover: NorthSide_Cover_LongTerm_Lab
Note: This Figure shows the FS calculated using Spencer's Method.

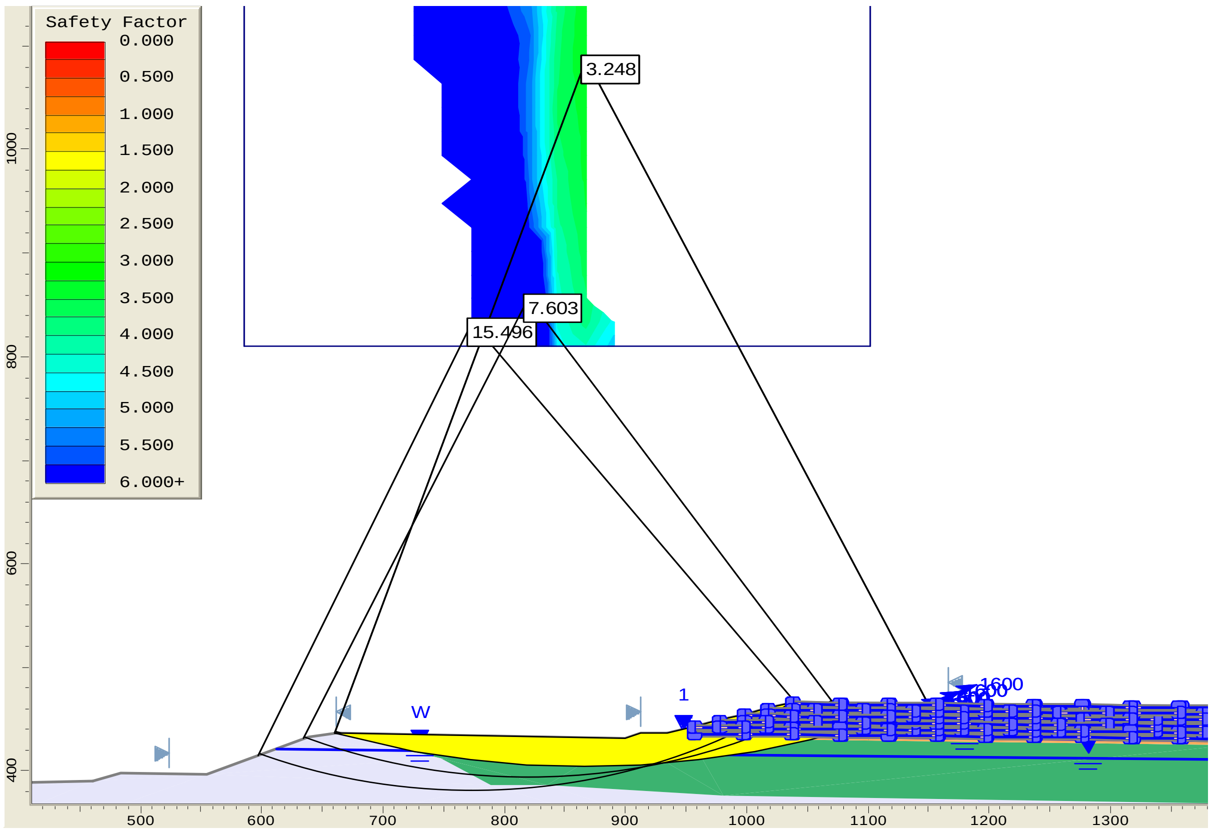


Figure 26. Slope Stability Analysis Result for Section A-A after Final Cover: NorthSide_Cover_Global_External_Lab
Note: This Figure shows the FS calculated using Spencer's Method.

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009

Client:	Honeywell	Project:	Onondaga Lake SCA 50% Design	Project/ Proposal No.:	GJ4299	Task No.:	05

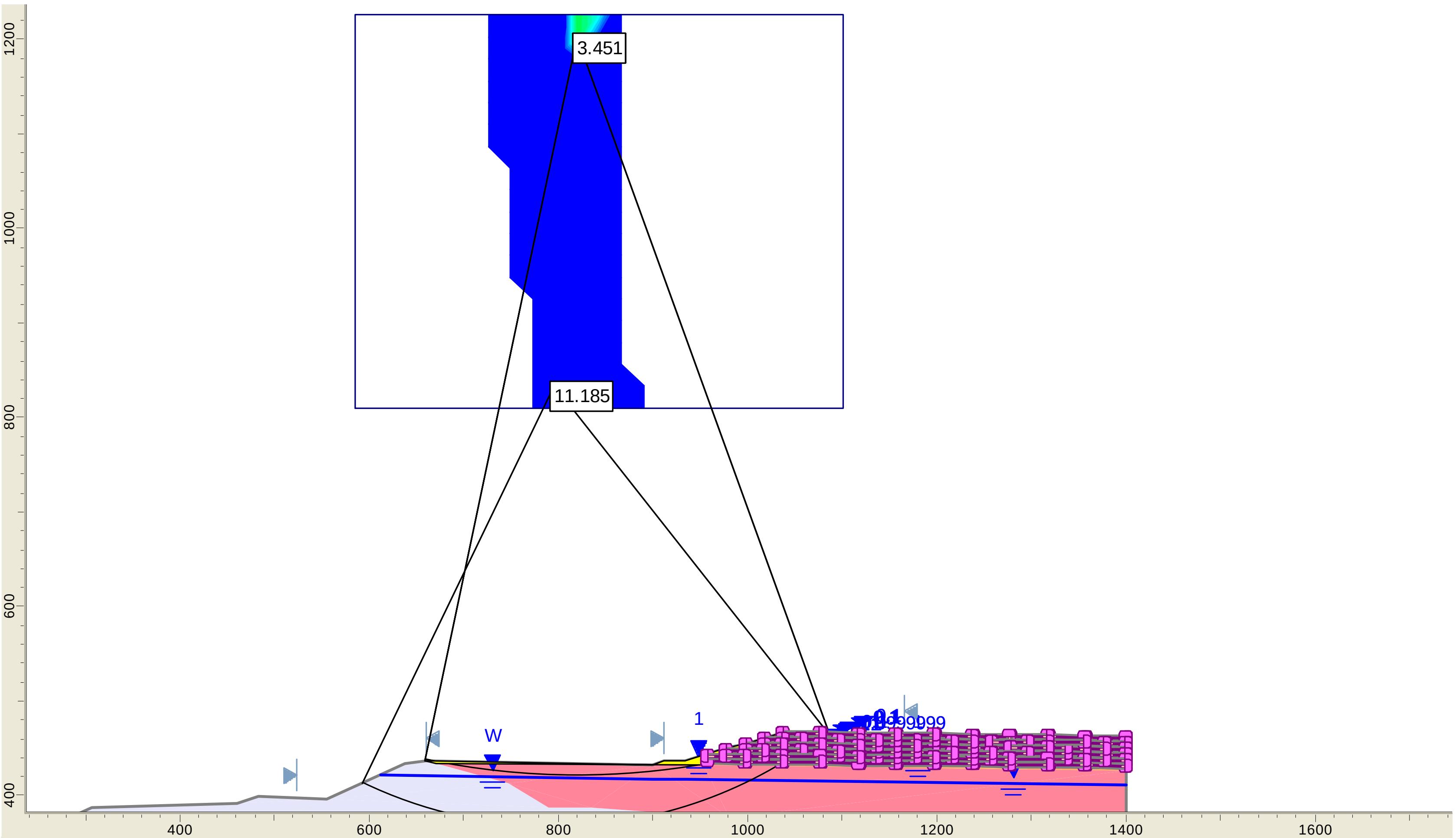


Figure 27. Slope Stability Analysis Result for Section A-A after Final Cover: NorthSide_Cover_Global_External_LongTerm_Lab
Note: This Figure shows the FS calculated using Spencer's Method.

Written by: **Joseph Sura** Date: **4/3/2009** Reviewed by: **R. Kulasingam/Ming Zhu/Jay Beech** Date: **4/7/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA 50% Design** Project/ Proposal No.: **GJ4299** Task No.: **05**

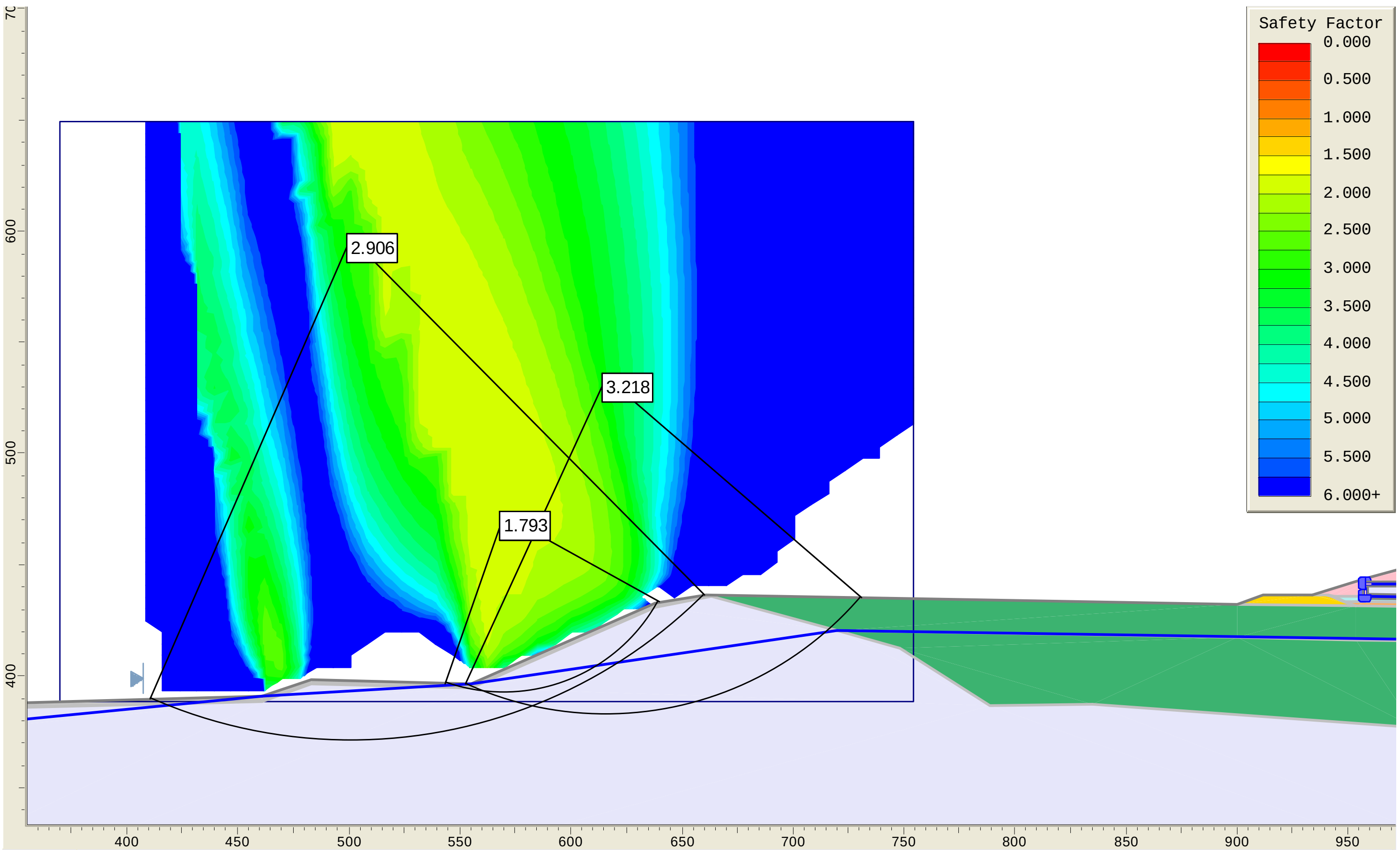


Figure 27a. Slope Stability Analysis Result for WB-13 Perimeter Berm at Section A-A: NorthSide_Cover_External_Lab_GWT_15ft_Exit_at_Toe of Berm
Note: This Figure shows the FS calculated using Spencer's Method.

Written by: **Joseph Sura** Date: **4/3/2009** Reviewed by: **R. Kulasingam/Ming Zhu/Jay Beech** Date: **4/7/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA 50% Design** Project/ Proposal No.: **GJ4299** Task No.: **05**

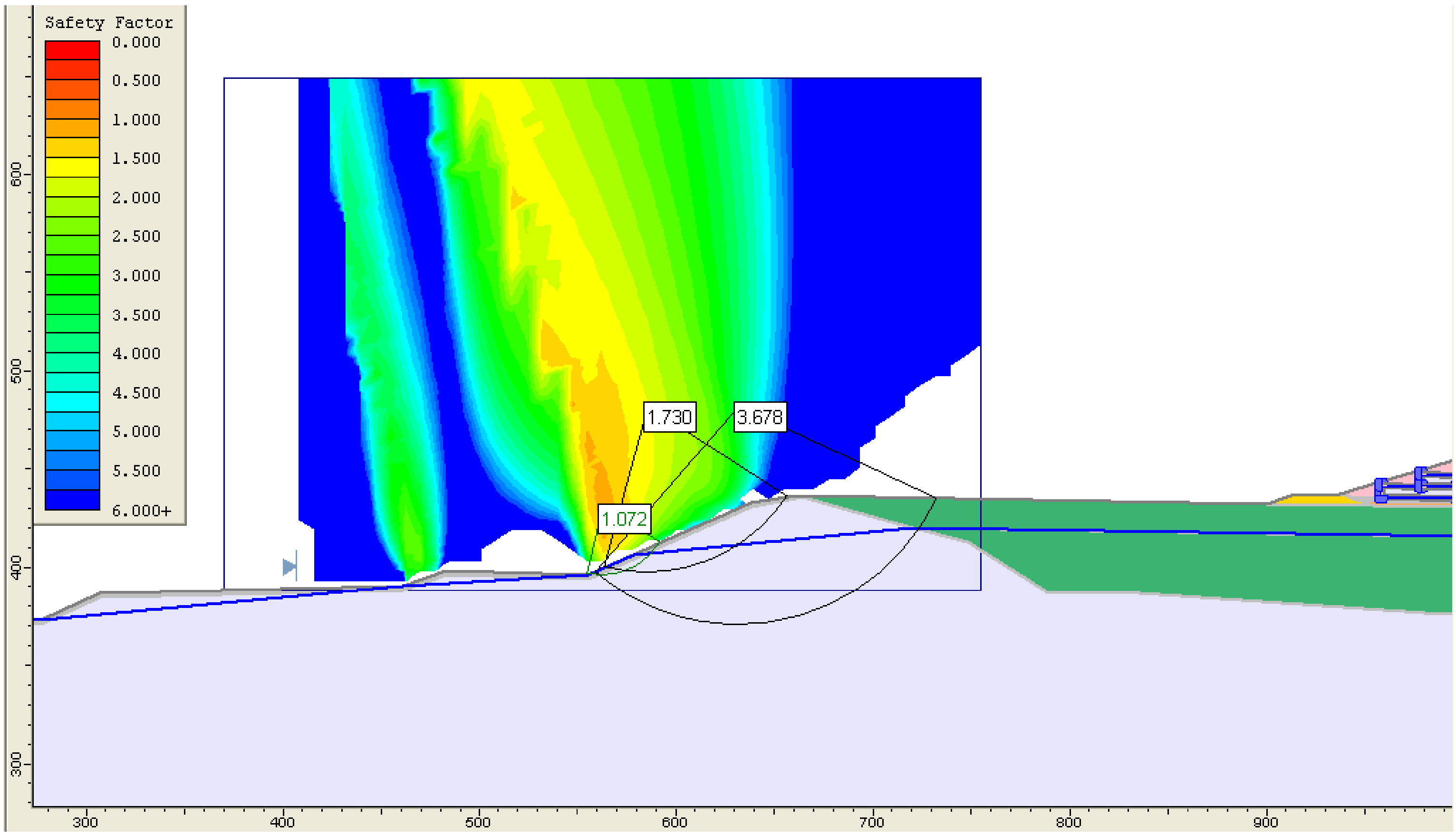


Figure 27b. Slope Stability Analysis Result for WB-13 Perimeter Berm at Section A-A: NorthSide_Cover_External_Lab_GWT_15ft_Exit_10 ft_up_from Toe of Berm
Note: This Figure shows the FS calculated using Spencer's Method.

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009

Client:	Honeywell	Project:	Onondaga Lake SCA 50% Design	Project/ Proposal No.:	GJ4299	Task No.:	05

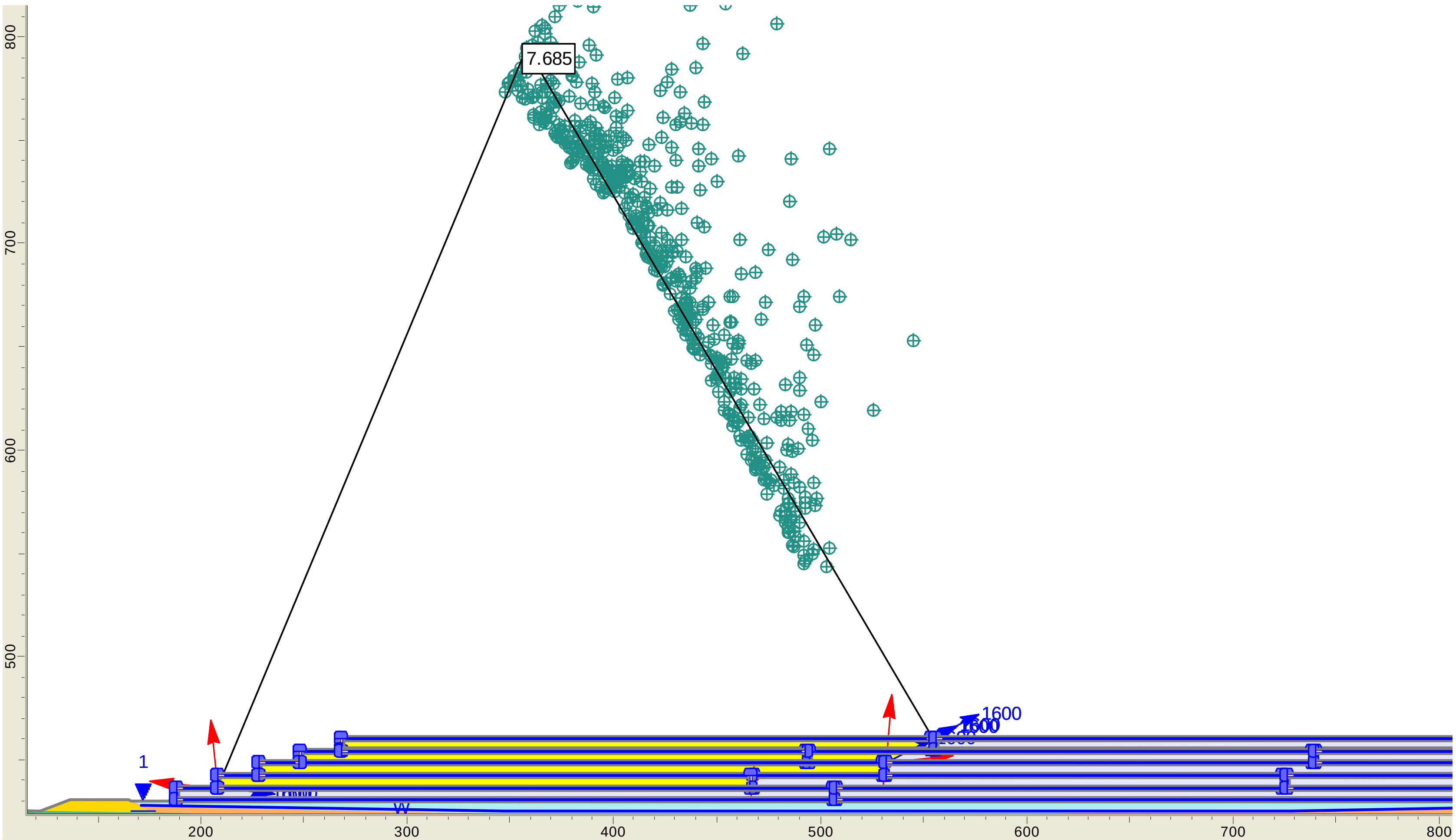


Figure 28. Slope Stability Analysis Result for Section B-B before Final Cover: EastWest_NoCover_Tube_04_Lab

Written by: **Joseph Sura** Date: **4/3/2009** Reviewed by: **R. Kulasingam/Ming Zhu/Jay Beech** Date: **4/7/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA 50% Design** Project/ Proposal No.: **GJ4299** Task No.: **05**

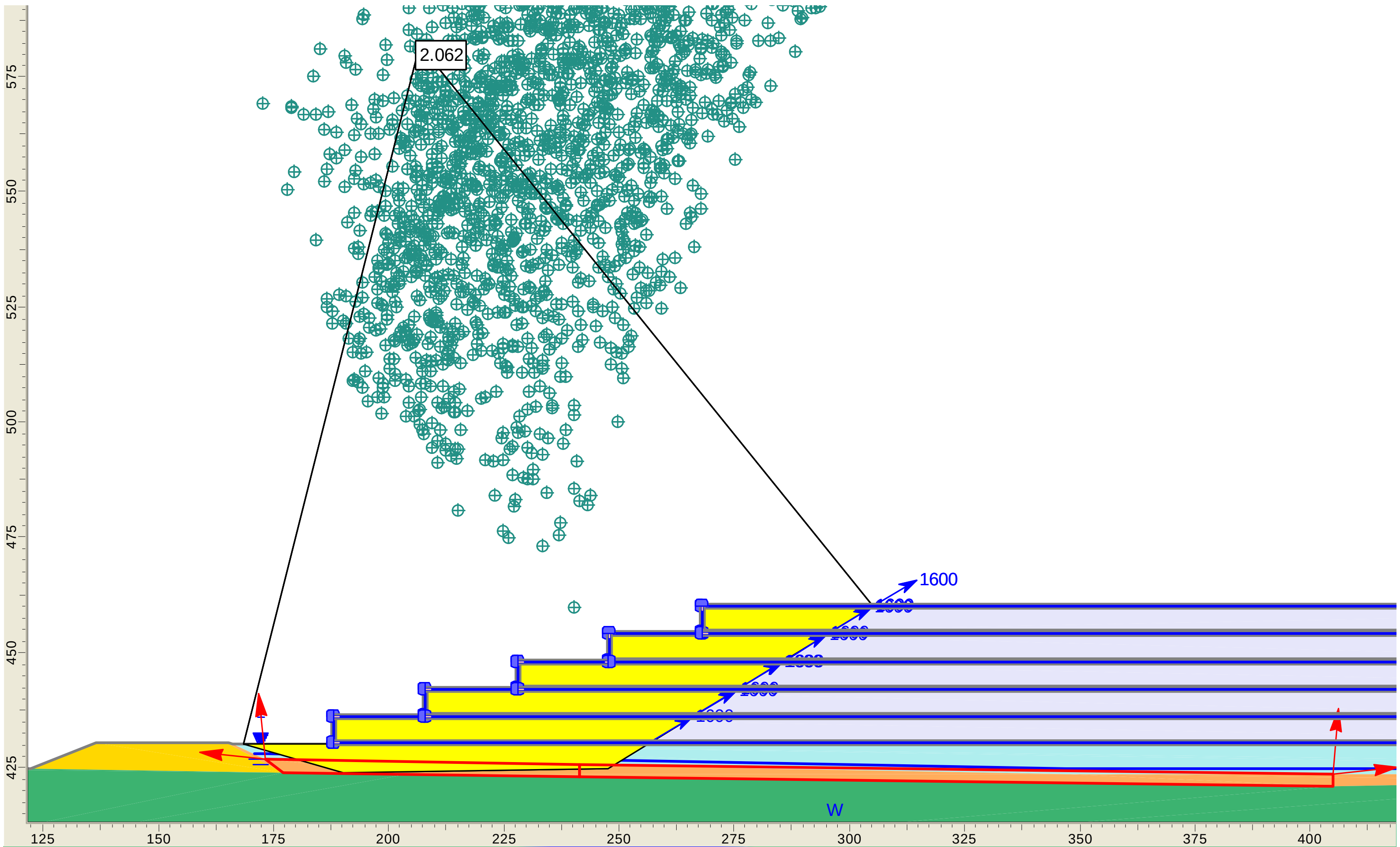


Figure 29. Slope Stability Analysis Result for Section B-B before Final Cover: EastWest_NoCover_Liner_Lab

Written by: **Joseph Sura** Date: **4/3/2009** Reviewed by: **R. Kulasingam/Ming Zhu/Jay Beech** Date: **4/7/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA 50% Design** Project/ Proposal No.: **GJ4299** Task No.: **05**

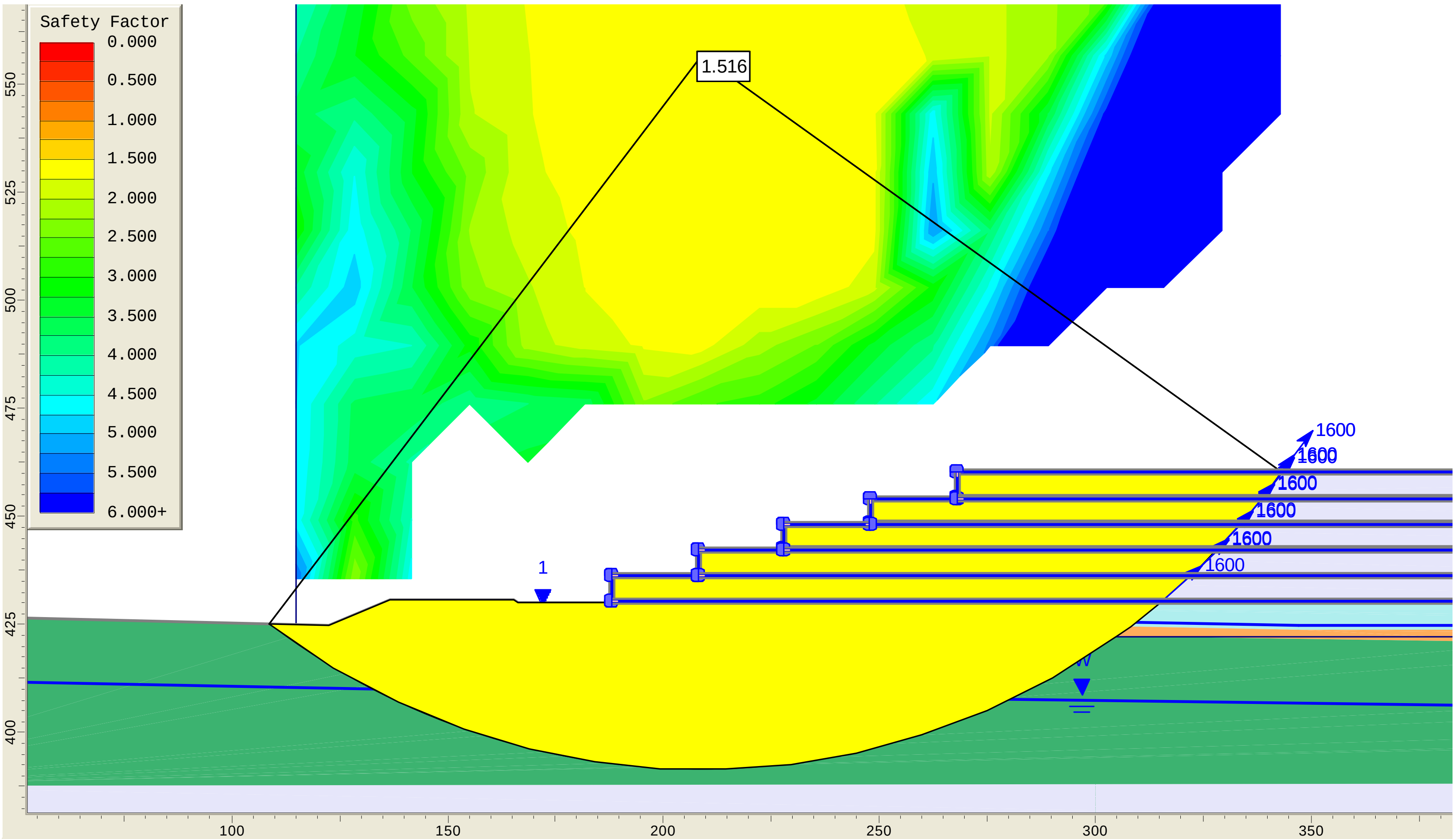


Figure 30. Slope Stability Analysis Result for Section B-B before Final Cover: EastWest_NoCover_Global_Su_Lab
Note: This Figure shows the FS calculated using Spencer's Method.

Written by: **Joseph Sura** Date: **4/3/2009** Reviewed by: **R. Kulasingam/Ming Zhu/Jay Beech** Date: **4/7/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA 50% Design** Project/ Proposal No.: **GJ4299** Task No.: **05**

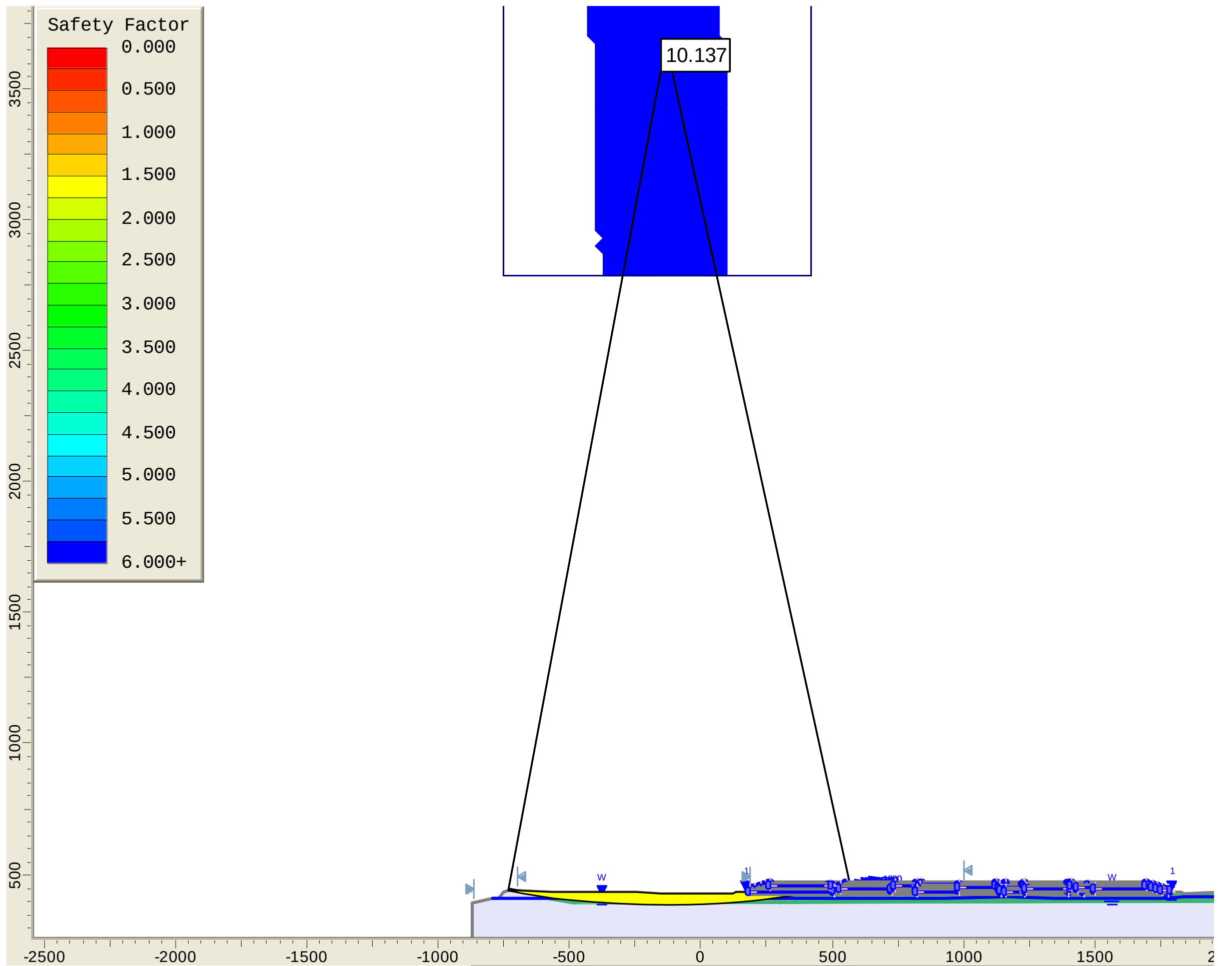


Figure 31. Slope Stability Analysis Result for Section B-B before Final Cover: EastWest_NoCover_External_Lab
Note: This Figure shows the FS calculated using Spencer's Method.

Written by: **Joseph Sura** Date: **4/3/2009** Reviewed by: **R. Kulasingam/Ming Zhu/Jay Beech** Date: **4/7/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA 50% Design** Project/ Proposal No.: **GJ4299** Task No.: **05**

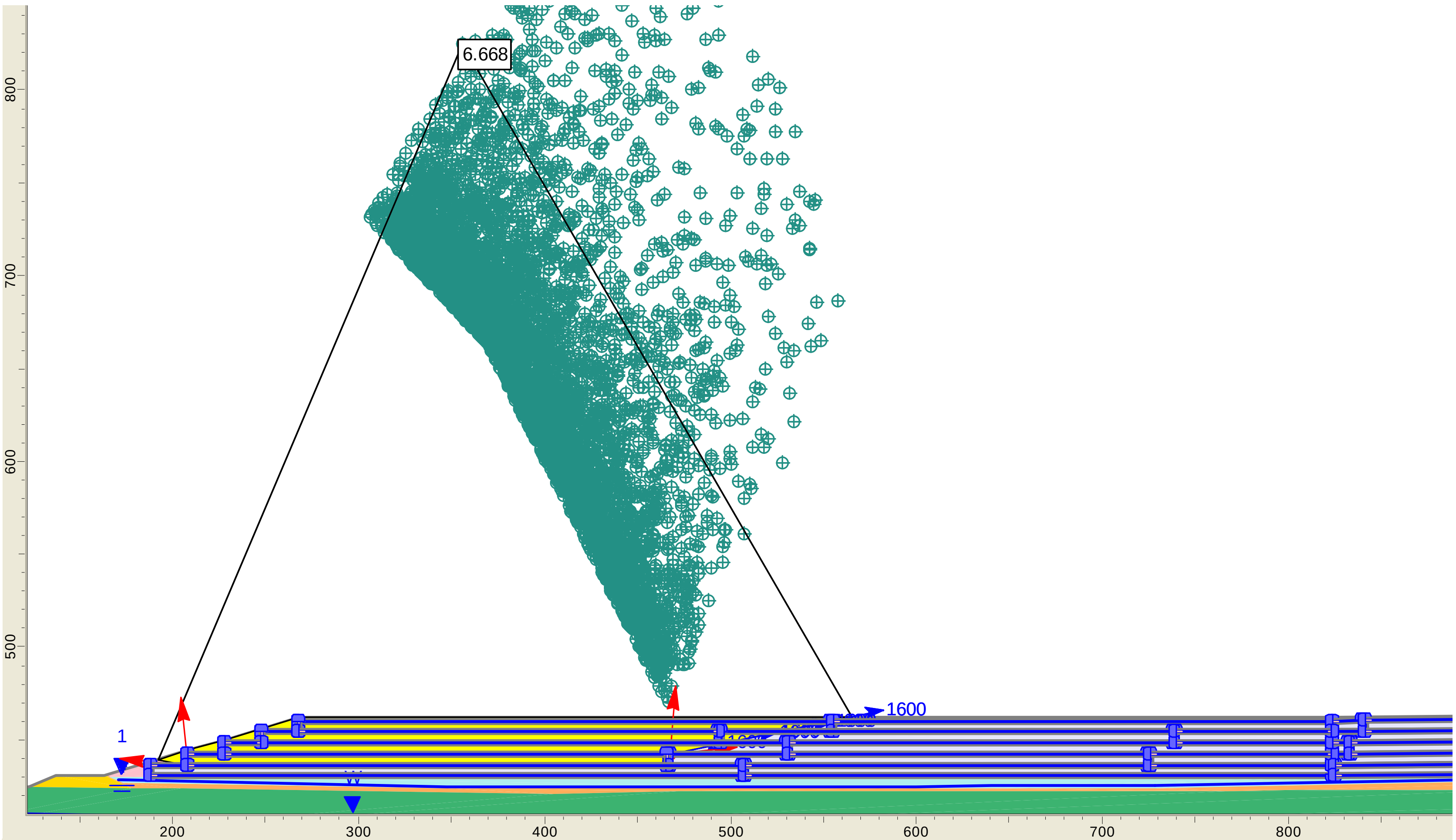


Figure 32. Slope Stability Analysis Result for Section B-B after Final Cover: EastWest_Cover_Tube_04_Lab

Written by: **Joseph Sura** Date: **4/3/2009** Reviewed by: **R. Kulasingam/Ming Zhu/Jay Beech** Date: **4/7/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA 50% Design** Project/ Proposal No.: **GJ4299** Task No.: **05**

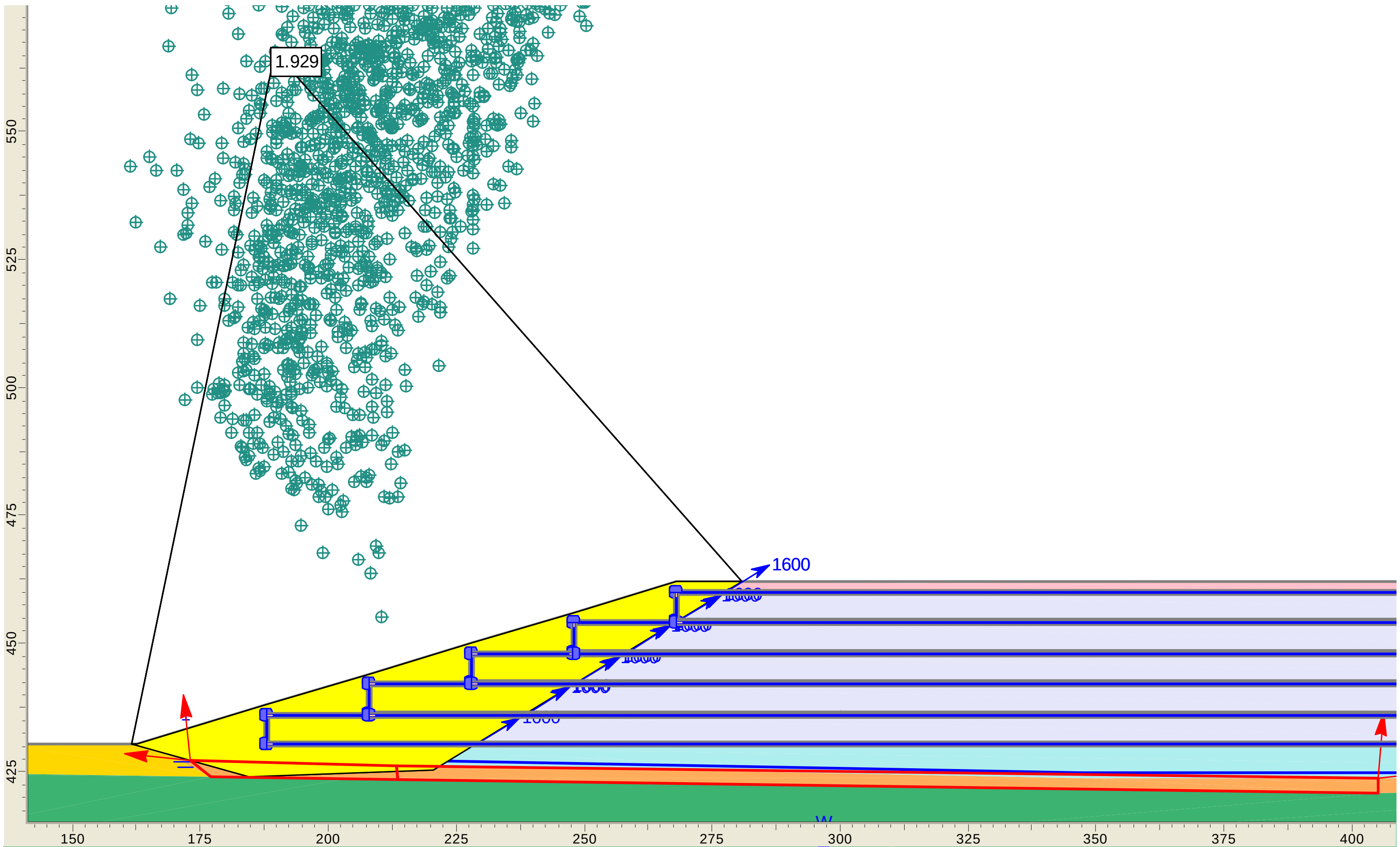


Figure 33. Slope Stability Analysis Result for Section B-B after Final Cover: EastWest_Cover_Liner_Lab

Written by: **Joseph Sura** Date: **4/3/2009** Reviewed by: **R. Kulasingam/Ming Zhu/Jay Beech** Date: **4/7/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA 50% Design** Project/ Proposal No.: **GJ4299** Task No.: **05**

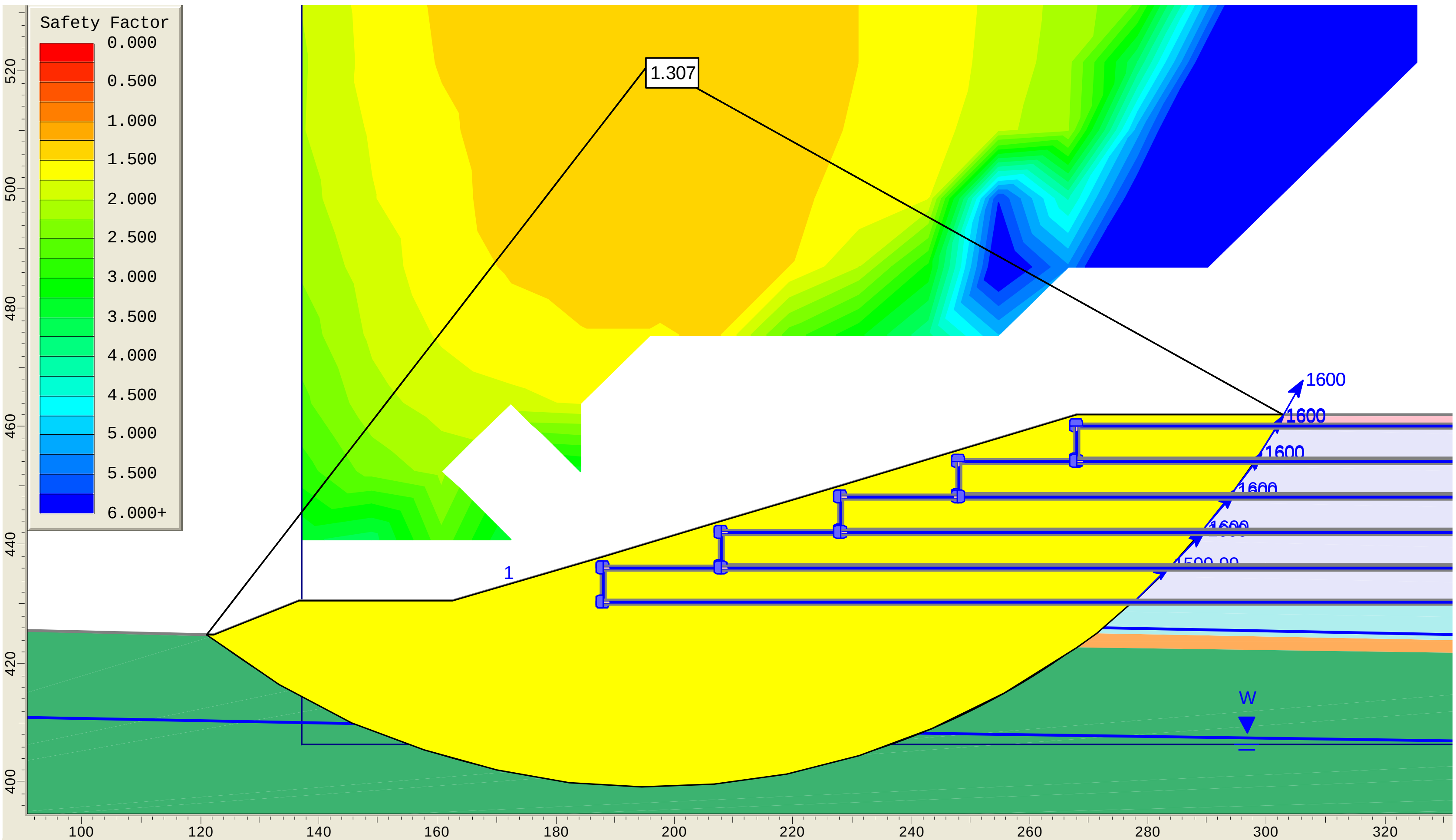


Figure 34. Slope Stability Analysis Result for Section B-B after Final Cover: EastWest_Cover_Global_Su_Lab
Note: This Figure shows the FS calculated using Spencer's Method.

Written by: **Joseph Sura** Date: **4/3/2009** Reviewed by: **R. Kulasingam/Ming Zhu/Jay Beech** Date: **4/7/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA 50% Design** Project/ Proposal No.: **GJ4299** Task No.: **05**

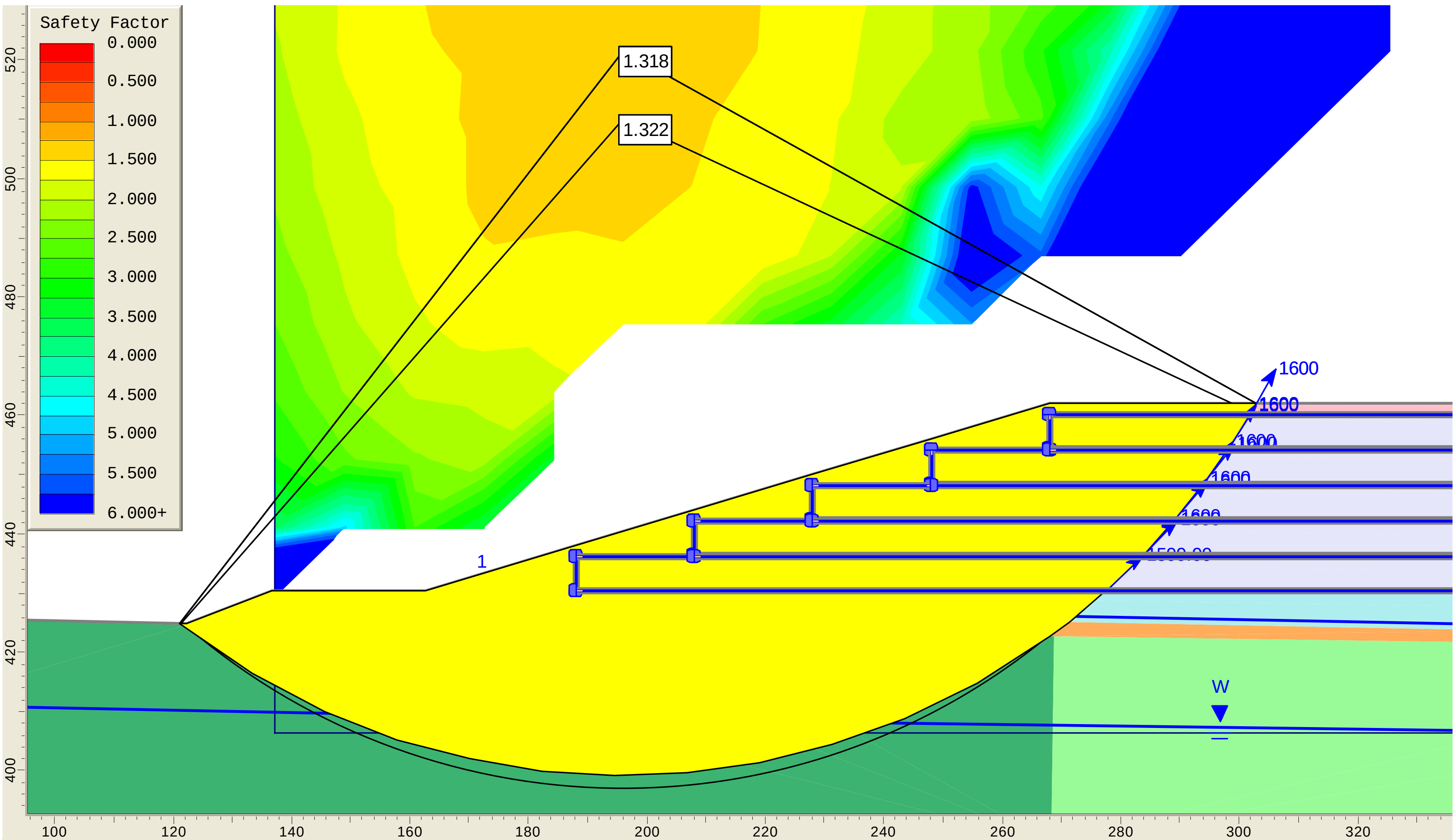


Figure 35. Slope Stability Analysis Result for Section B-B after Final Cover: EastWest_Cover_Global_U75_Lab
Note: This Figure shows the FS calculated using Spencer's Method.

Written by: **Joseph Sura** Date: **4/3/2009** Reviewed by: **R. Kulasingam/Ming Zhu/Jay Beech** Date: **4/7/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA 50% Design** Project/ Proposal No.: **GJ4299** Task No.: **05**

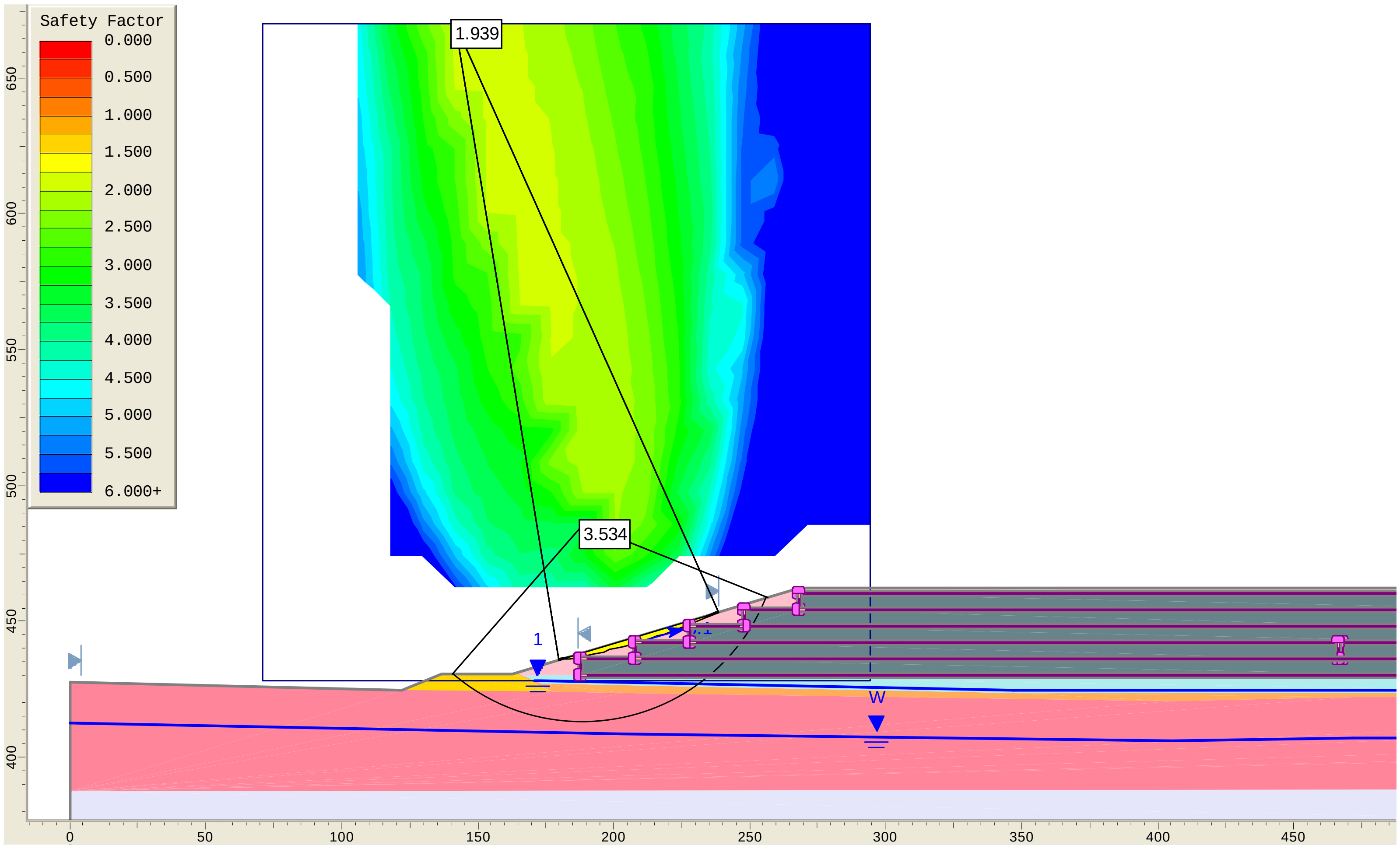


Figure 36. Slope Stability Analysis Result for Section B-B after Final Cover: EastWest_Cover_LongTerm_Lab
Note: This Figure shows the FS calculated using Spencer's Method.

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009

Client:	Honeywell	Project:	Onondaga Lake SCA 50% Design	Project/ Proposal No.:	GJ4299	Task No.:	05

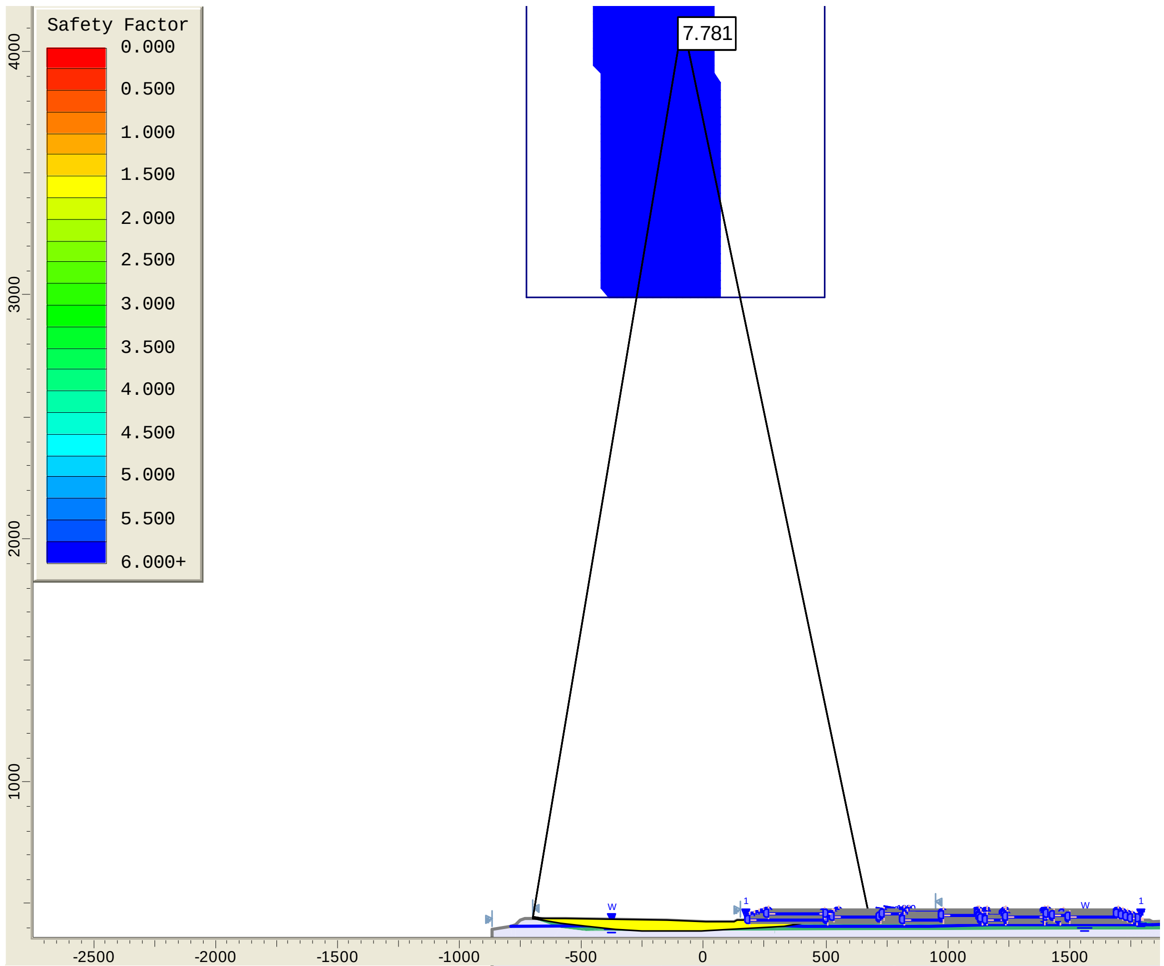


Figure 37. Slope Stability Analysis Result for Section B-B after Final Cover: EastWest_Cover_External_Lab
Note: This Figure shows the FS calculated using Spencer's Method

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009

Client:	Honeywell	Project:	Onondaga Lake SCA 50% Design	Project/ Proposal No.:	GJ4299	Task No.:	05

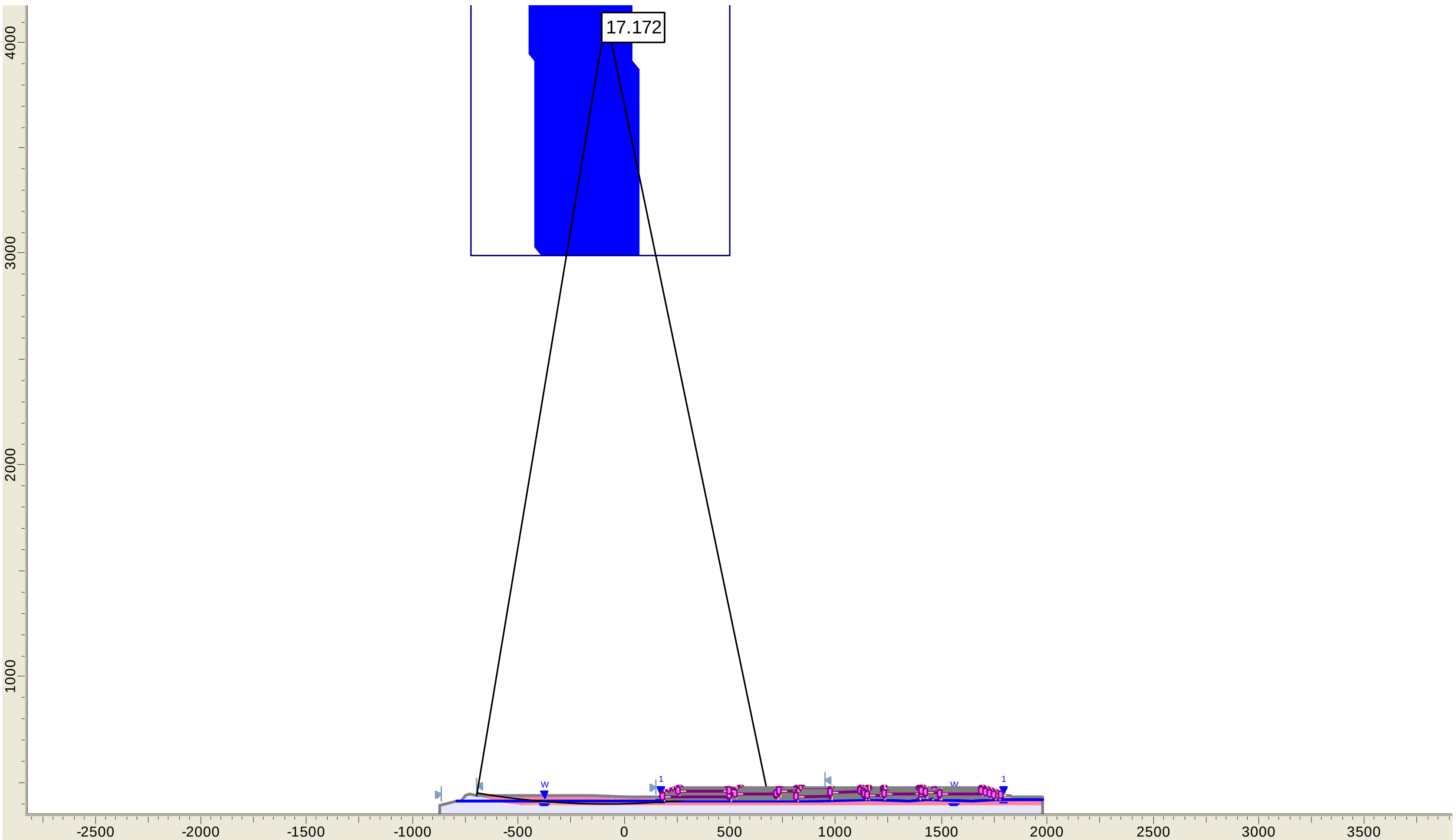


Figure 38. Slope Stability Analysis Result for Section B-B after Final Cover: EastWest_Cover_External_LongTerm_Lab
Note: This Figure shows the FS calculated using Spencer's Method

Written by: **Joseph Sura** Date: **4/3/2009** Reviewed by: **R. Kulasingam/Ming Zhu/Jay Beech** Date: **4/7/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA 50% Design** Project/ Proposal No.: **GJ4299** Task No.: **05**

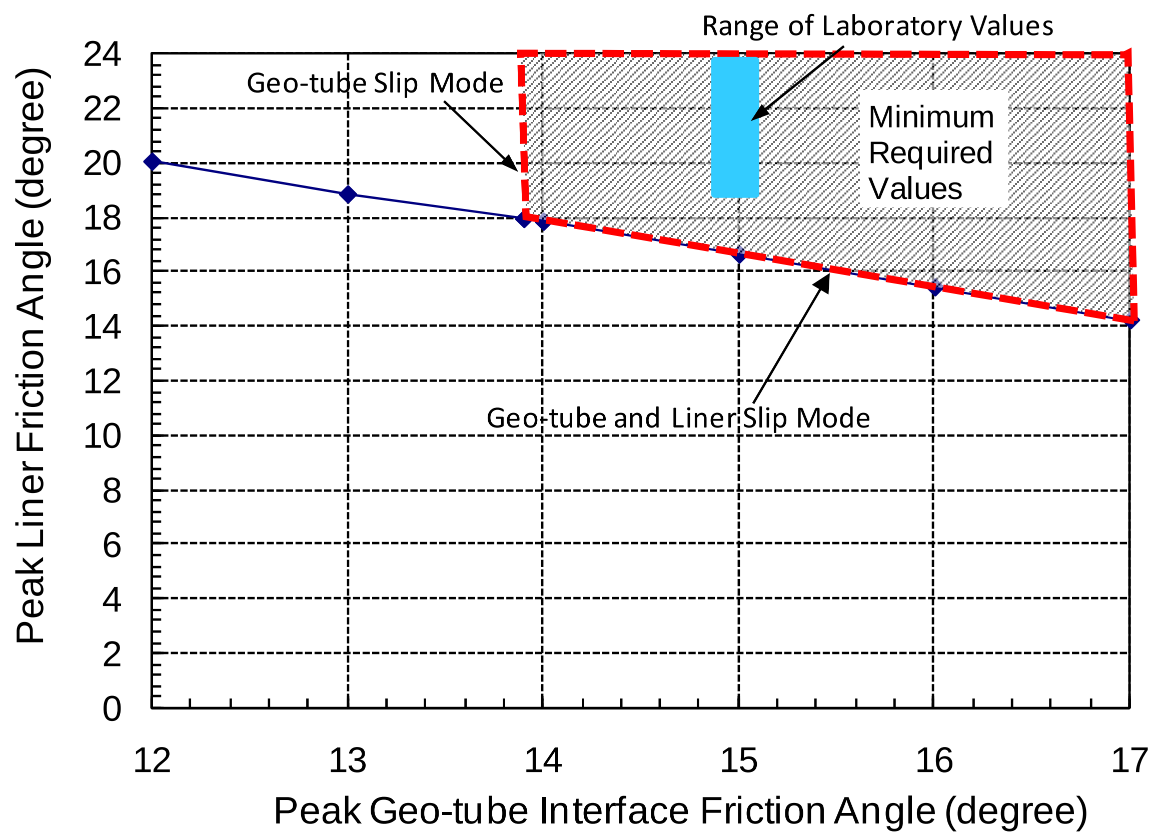


Figure 39. Sensitivity Analysis of Peak Liner Friction Angle: Minimum required values

Written by:	**Joseph Sura**	Date:	**4/3/2009**	Reviewed by:	**R. Kulasingam/Ming Zhu/Jay Beech**	Date:	**4/7/2009**
Client:	**Honeywell**	Project:	**Onondaga Lake SCA 50% Design**	Project/ Proposal No.:	**GJ4299**	Task No.:	**05**

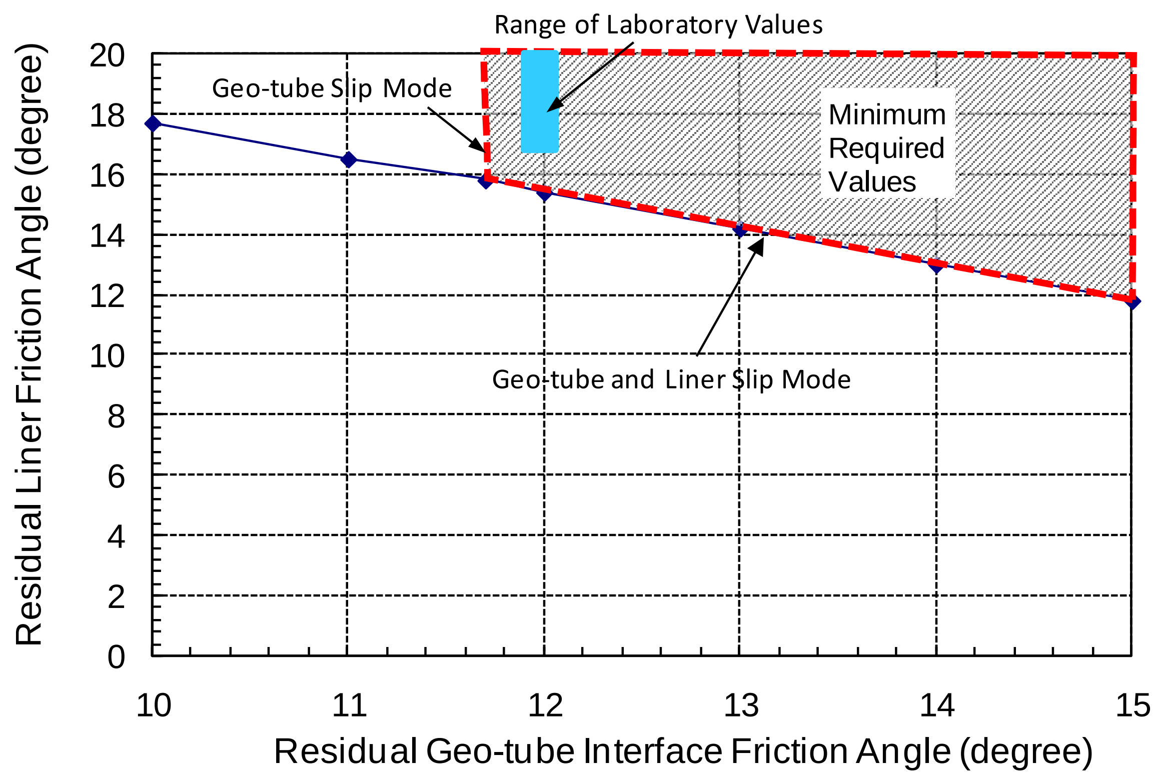


Figure 40. Sensitivity Analysis of Residual Liner Friction Angle: Minimum required values

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009
Client:	Honeywell	Project:	Onondaga Lake SCA 50% Design	Project/ Proposal No.:	GJ4299	Task No.:	05

Attachment 1
Seismic Impact Zone

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009
Client:	Honeywell	Project:	Onondaga Lake SCA 50% Design	Project/ Proposal No.:	GJ4299	Task No.:	05

NYSDEC Regulations Section 360-2.7(b)(7) states that a seismic analysis is required "*for new landfills, lateral expansions of existing landfills, and subsequent development of any landfill permitted pursuant to these provisions located in a seismic impact zone.*" The seismic impact zone is defined as "*an area with a 10 percent or greater probability that the maximum horizontal acceleration in lithified earth material, expressed as a percentage of the earth's gravitational pull (g), will exceed 0.10g in 250 years.*"

According to the 2008 USGS National Seismic Hazard Map [Petersen et al, 2008], the SCA site falls within an area characterized by a peak ground acceleration (i.e., maximum horizontal acceleration in lithified earth material) of 0.0784g with 2 percent probability of exceedance in 50 years, which is approximately equivalent to 10 percent of exceedance in 250 years. The USGS Seismic Hazard Curves and Uniform Response Spectra computer analysis program was also used to calculate the peak ground acceleration with 10 percent of exceedance in 250 years directly, resulting in an estimated peak ground acceleration of 0.0765g. Table 1-1 presents the peak ground accelerations based on the site location, as calculated by the software, and Figure 1-1 shows the location of the SCA on the USGS National Seismic Hazard Map.

Therefore, based on the maximum horizontal acceleration, the SCA is not located in a seismic impact zone as defined by NYSDEC Regulations. As a result, a seismic slope stability analysis is not required.

Table 1-1. Peak Ground Accelerations Based on SCA Site Location

Hazard Curve for PGA, Latitude = 43.0600, Longitude = -76.2500

PGA (%g)	%PE	Time
7.84	2%	50 years
7.65	10%	250 years

Seismic Hazard Curves and Uniform Response Spectra. USGS, October 2008.

Written by: **Joseph Sura** Date: **4/3/2009** Reviewed by: **R. Kulasingam/Ming Zhu/Jay Beech** Date: **4/7/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA 50% Design** Project/ Proposal No.: **GJ4299** Task No.: **05**

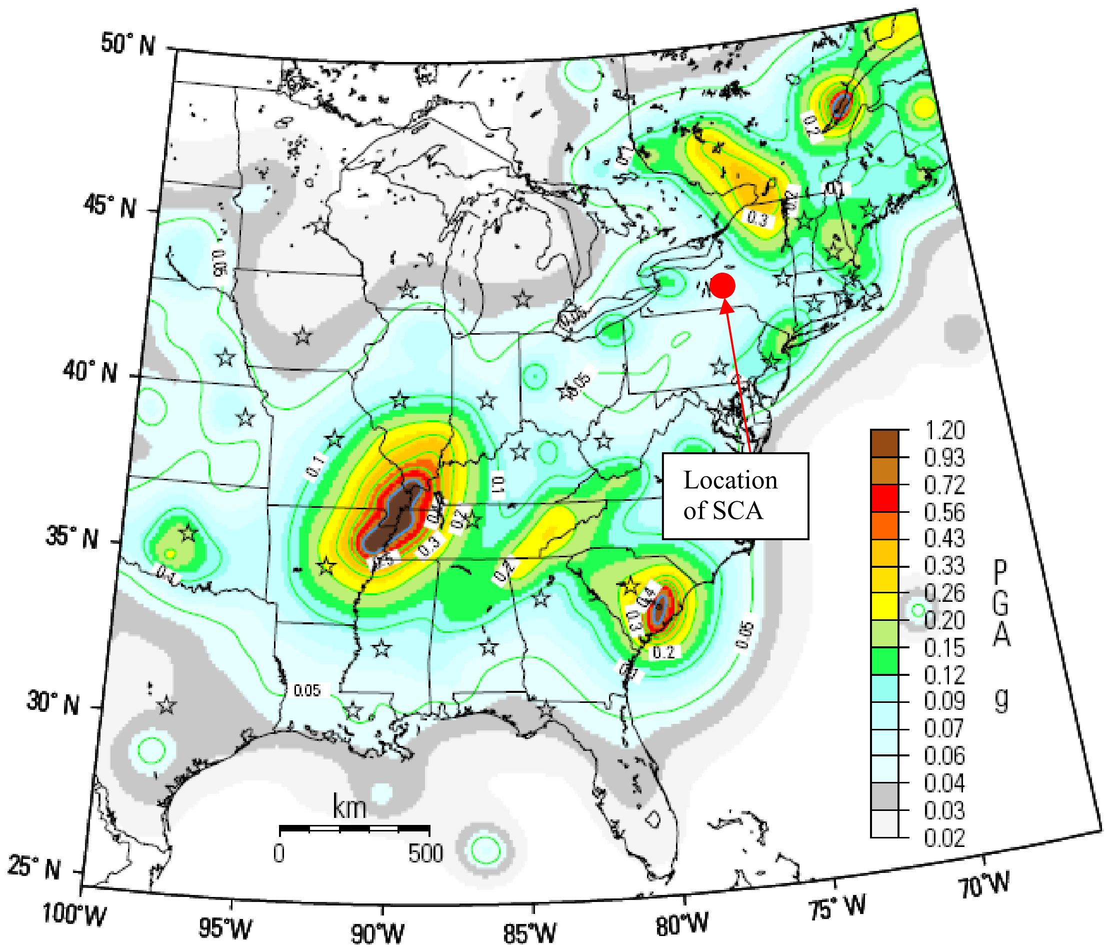


Figure 1-1. Location of the SCA on the USGS National Seismic Hazard Map

Written by:	**Joseph Sura**	Date:	**4/3/2009**	Reviewed by:	**R. Kulasingam/Ming Zhu/Jay Beech**	Date:	**4/7/2009**
Client:	**Honeywell**	Project:	**Onondaga Lake SCA 50% Design**	Project/ Proposal No.:	**GJ4299**	Task No.:	**05**

Attachment 2
Interface Direct Shear Testing
(Results provided to Geosyntec by Parsons)

Attachment 2 Notes:

This attachment contains a summary of interface direct shear tests performed by SGI Testing Services at the request of Parsons. These tests focus on measuring shear strengths for several possible slip interfaces.

Test	Figure	Upper Shear Box	Top Liner	Bottom Liner	Lower Shear Box	Φ'_{PEAK} (°)[1]	c'_{PEAK} (psf)[2]	$\Phi'_{RESIDUAL}$ (°)[1]	$c'_{RESIDUAL}$ (psf)[2]	Figure Number
C-1	2-1	Concrete Sand	Non-Woven Geotextile	Smooth HDPE Geomembrane	Compacted Clay	13[3]	30[3]	9	25	2-1
C-2	2-2	Concrete Sand	Non-Woven Geotextile	Textured HDPE Geomembrane	Compacted Clay	27	225	17	130	2-2
C-3	2-3	Concrete Sand	Non-Woven Geotextile	EPDM Geomembrane	Compacted Clay	22	5	18	10	2-3
C-4	2-4	Concrete Sand	Non-Woven Geotextile	PP Geomembrane	Compacted Clay	19[4]	5	18	5	2-4
C-5	2-5	Rigid Substrate	Geo-tube Geotextile	Geo-tube Geotextile	Concrete Sand	15[5]	-5[6]	12	5	2-5

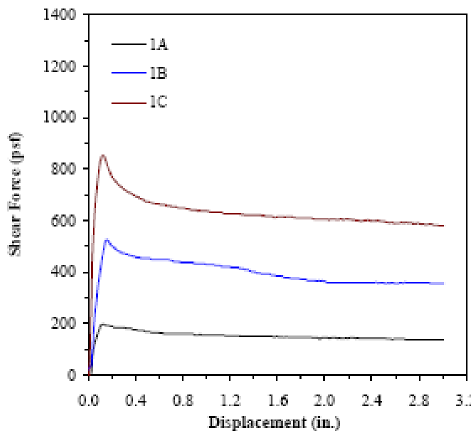
1. This is the friction angle. The laboratory designated the friction angle as δ, however in this table, it has been labeled Φ' for consistency with the rest of this package.
2. This is the cohesion intercept. The laboratory designated the cohesion intercept as α, however in this table, it has been labeled c' for consistency with the rest of this package. In stability calculations, this value was conservatively modeled to be zero.
3. Smooth HDPE Geomembrane is not considered for use in this project.
4. This peak effective stress friction angle between the geomembrane and compacted clay layer was used in the analyses presented herein because it had the lowest value of the three geomembrane types under consideration for this project. This liner friction angle value was input into SLIDE. Final selection of geomembrane will be made based on the results of ongoing chemical compatibility testing.
5. This peak effective stress friction angle for the geo-tube/geo-tube interface was input into SLIDE for calculation of FS values.
6. This negative value is due to the linear interpolation method used to interpret strength parameters.

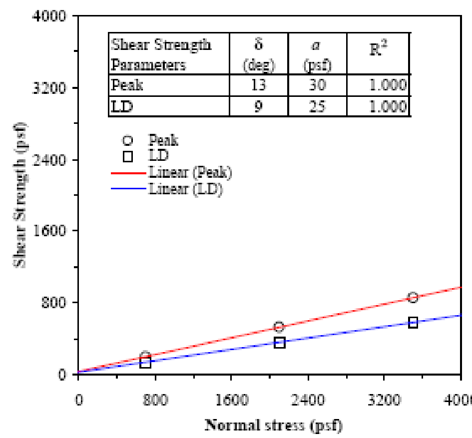
Written by:	**Joseph Sura**	Date:	**4/3/2009**	Reviewed by:	**R. Kulasingam/Ming Zhu/Jay Beech**	Date:	**4/7/2009**
Client:	**Honeywell**	Project:	**Onondaga Lake SCA 50% Design**	Project/ Proposal No.:	**GJ4299**	Task No.:	**05**

PARSONS

INTERFACE DIRECT SHEAR TESTING (ASTM D 5321)

Upper Shear Box: Concrete sand
TenCate S1600 (16 oz) nonwoven geotextile #000167745 with non heat-treated side down/
GSE 40-mil double smooth HDPE geomembrane # 101130132/
Lower Shear Box: Clay soil compacted to approximately 95% of max modified Proctor density at 3% wet of optimum moisture content





Test No.	Shear Box Size (in. x in.)	Normal Stress (psf)	Shear Rate (in./min)	GCL Soaking Stress (psf)	GCL Soaking Time (hour)	Consolidation Stress (psf)	Consolidation Time (hour)	Clay Soil γ_d (pcf)	Clay Soil ω_i (%)	Clay Soil ω_f (%)	Upper Soil γ_d (pcf)	Upper Soil ω_i (%)	Upper Soil ω_f (%)	GCL ω_i (%)	GCL ω_f (%)	Shear Stress τ_P (psf)	Shear Stress τ_{LD} (psf)	Failure Mode
1A	12 x 12	700	0.04	-	-	-	-	118.6	13.9	13.1	-	-	-	-	-	196	135	(1)
1B	12 x 12	2100	0.04	-	-	-	-	118.9	13.6	12.5	-	-	-	-	-	526	355	(1)
1C	12 x 12	3500	0.04	-	-	-	-	119.3	13.2	12.7	-	-	-	-	-	855	580	(1)

NOTES:
(1) Sliding (i.e., shear failure) occurred at the interface between the non heat-treated side of 16 oz nonwoven geotextile and geomembrane.
(2) Each geosynthetic specimen was tested in the machine direction (i.e., direction of shearing parallel to MD)

SGI TESTING SERVICES, LLC

DATE OF REPORT:	2/2/2009
FIGURE NO.	C-1
PROJECT NO.	SGI9002
DOCUMENT NO.	
FILE NO.	

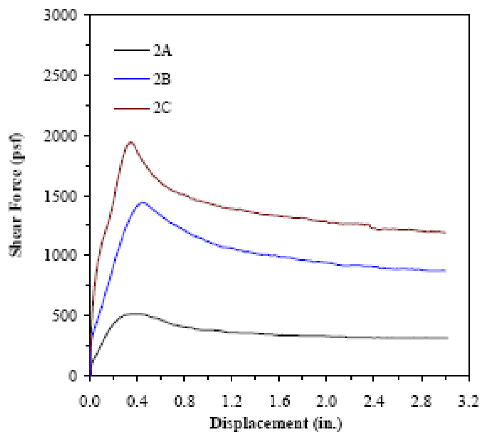
Figure 2-1: Direct Shear Testing of Geotextile/Smooth HDPE Geomembrane Interface

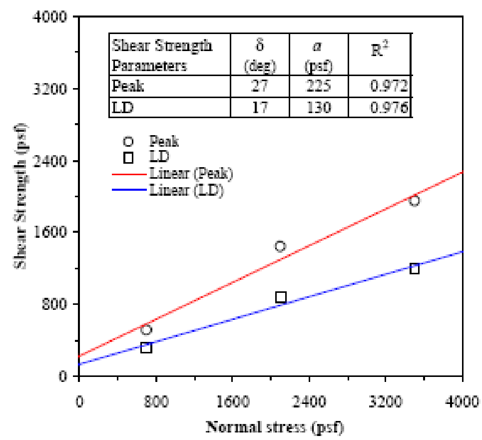
Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009
Client:	Honeywell	Project:	Onondaga Lake SCA 50% Design	Project/ Proposal No.:	GJ4299	Task No.:	05

PARSONS

INTERFACE DIRECT SHEAR TESTING (ASTM D 5321)

Upper Shear Box: Concrete sand
TenCate S1600 (16 oz) nonwoven geotextile #000167745 with non heat-treated side down/
GSE 40-mil double textured HDPE geomembrane # 105140273/
Lower Shear Box: Clay soil compacted to approximately 95% of max modified Proctor density at 3% wet of optimum moisture content





Test No.	Shear Box Size (in. x in.)	Normal Stress (psf)	Shear Rate (in./min)	GCL Soaking Stress (psf)	GCL Soaking Time (hour)	Consolidation Stress (psf)	Consolidation Time (hour)	Clay Soil γ_d (pcf)	Clay Soil ω_i (%)	Clay Soil ω_f (%)	Upper Soil γ_d (pcf)	Upper Soil ω_i (%)	Upper Soil ω_f (%)	GCL ω_i (%)	GCL ω_f (%)	Shear Stress τ_P (psf)	Shear Stress τ_{LD} (psf)	Failure Mode
2A	12 x 12	700	0.04	-	-	-	-	119.6	12.9	12.2	-	-	-	-	-	514	310	(1)
2B	12 x 12	2100	0.04	-	-	-	-	119.9	12.6	12.0	-	-	-	-	-	1441	870	(1)
2C	12 x 12	3500	0.04	-	-	-	-	118.9	13.6	12.9	-	-	-	-	-	1946	1189	(1)

NOTES:
(1) Sliding (i.e., shear failure) occurred at the interface between the non heat-treated side of 16 oz nonwoven geotextile and geomembrane.
(2) Each geosynthetic specimen was tested in the machine direction (i.e., direction of shearing parallel to MD)

SGI TESTING SERVICES, LLC

DATE OF REPORT:	2/2/2009
FIGURE NO.	C-2
PROJECT NO.	SGI9002
DOCUMENT NO.	
FILE NO.	

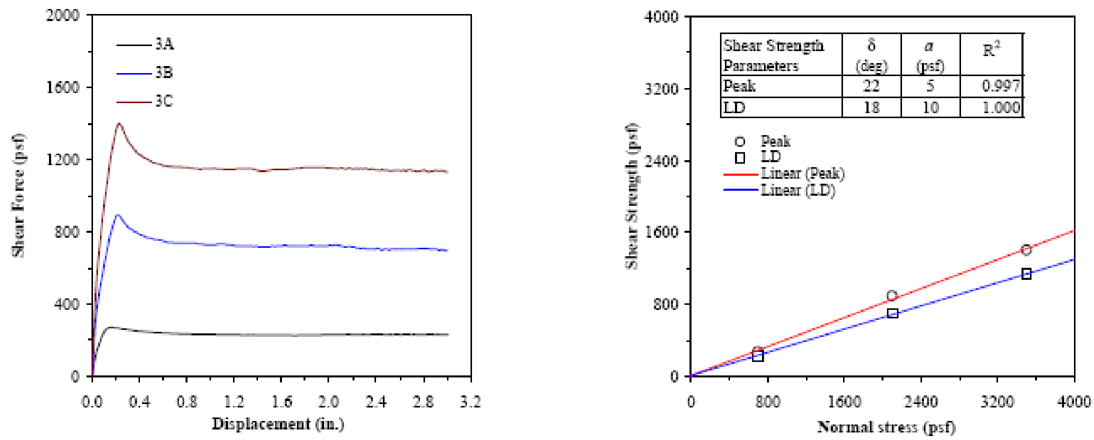
Figure 2-2: Direct Shear Testing of Geotextile/Textured HDPE Geomembrane Interface

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009
Client:	Honeywell	Project:	Onondaga Lake SCA 50% Design	Project/ Proposal No.:	GJ4299	Task No.:	05

PARSONS

INTERFACE DIRECT SHEAR TESTING (ASTM D 5321)

Upper Shear Box: Concrete sand
TenCate S1600 (16 oz) nonwoven geotextile #000167745 with non heat-treated side down/
40-mil EPDM geomembrane # AZ 12343/
Lower Shear Box: Clay soil compacted to approximately 95% of max modified Proctor density at 3% wet of optimum moisture content



Test No.	Shear Box Size (in. x in.)	Normal Stress (psf)	Shear Rate (in./min)	GCL Soaking Stress (psf)	GCL Soaking Time (hour)	Consolidation Stress (psf)	Consolidation Time (hour)	Clay Soil γ_d (pcf)	Clay Soil ω_i (%)	Clay Soil ω_f (%)	Upper Soil γ_d (pcf)	Upper Soil ω_i (%)	Upper Soil ω_f (%)	GCL ω_i (%)	GCL ω_f (%)	Shear Stress τ_P (psf)	Shear Stress τ_{LD} (psf)	Failure Mode
3A	12 x 12	700	0.04	-	-	-	-	119.8	12.7	12.3	-	-	-	-	-	271	228	(1)
3B	12 x 12	2100	0.04	-	-	-	-	119.4	13.1	12.5	-	-	-	-	-	892	697	(1)
3C	12 x 12	3500	0.04	-	-	-	-	119.1	13.4	12.8	-	-	-	-	-	1402	1132	(1)

NOTES:
(1) Sliding (i.e., shear failure) occurred at the interface between the non heat-treated side of 16 oz nonwoven geotextile and geomembrane.
(2) Each geosynthetic specimen was tested in the machine direction (i.e., direction of shearing parallel to MD)

SGI TESTING SERVICES, LLC

DATE OF REPORT:	2/4/2009
FIGURE NO.	C-3
PROJECT NO.	SGI9002
DOCUMENT NO.	
FILE NO.	

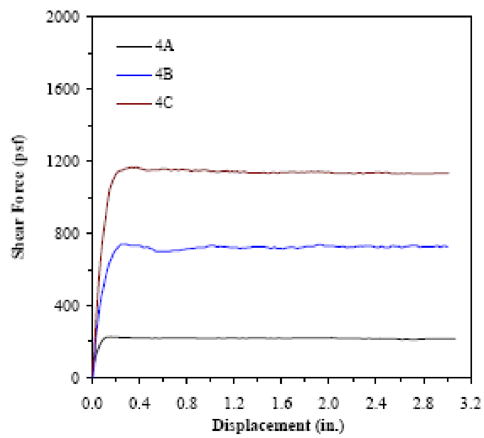
Figure 2-3: Direct Shear Testing of Geotextile/EPDM Geomembrane Interface

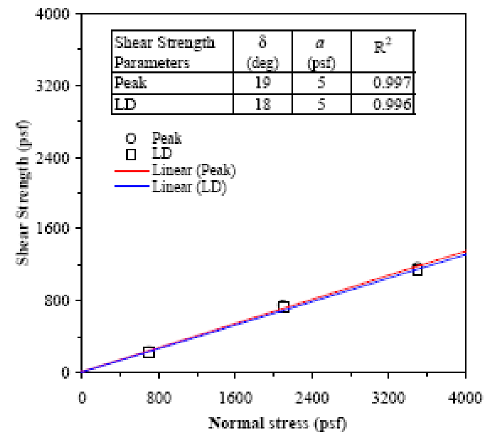
Written by:	**Joseph Sura**	Date:	**4/3/2009**	Reviewed by:	**R. Kulasingam/Ming Zhu/Jay Beech**	Date:	**4/7/2009**
Client:	**Honeywell**	Project:	**Onondaga Lake SCA 50% Design**	Project/ Proposal No.:	**GJ4299**	Task No.:	**05**

PARSONS

INTERFACE DIRECT SHEAR TESTING (ASTM D 5321)

Upper Shear Box: Concrete sand
TenCate S1600 (16 oz) nonwoven geotextile #000167745 with non heat-treated side down/
40-mil PP geomembrane with rough side up to geotextile and smooth side down to clay soil/
Lower Shear Box: Clay soil compacted to approximately 95% of max modified Proctor density at 3% wet of optimum moisture content





Shear Strength Parameters	δ (deg)	a (psf)	R^2
Peak	19	5	0.997
LD	18	5	0.996

Test No.	Shear Box Size (in. x in.)	Normal Stress (psf)	Shear Rate (in./min)	GCL Soaking Stress (psf)	GCL Soaking Time (hour)	Consolidation Stress (psf)	Consolidation Time (hour)	Clay Soil γ_d (pcf)	Clay Soil ω_i (%)	Clay Soil ω_f (%)	Upper Soil γ_d (pcf)	Upper Soil ω_i (%)	Upper Soil ω_f (%)	GCL ω_i (%)	GCL ω_f (%)	Shear Stress τ_P (psf)	Shear Stress τ_{LD} (psf)	Failure Mode
4A	12 x 12	700	0.04	-	-	-	-	118.6	13.9	13.3	-	-	-	-	-	226	215	(1)
4B	12 x 12	2100	0.04	-	-	-	-	119.0	13.5	12.9	-	-	-	-	-	742	726	(1)
4C	12 x 12	3500	0.04	-	-	-	-	118.8	13.7	12.5	-	-	-	-	-	1166	1133	(1)

NOTES:
(1) Sliding (i.e., shear failure) occurred at the interface between the non heat-treated side of 16 oz nonwoven geotextile and rough side of geomembrane.
(2) Each geosynthetic specimen was tested in the machine direction (i.e., direction of shearing parallel to MD)

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DATE OF REPORT:	2/4/2009
FIGURE NO.	C-4
PROJECT NO.	SGI9002
DOCUMENT NO.	
FILE NO.	

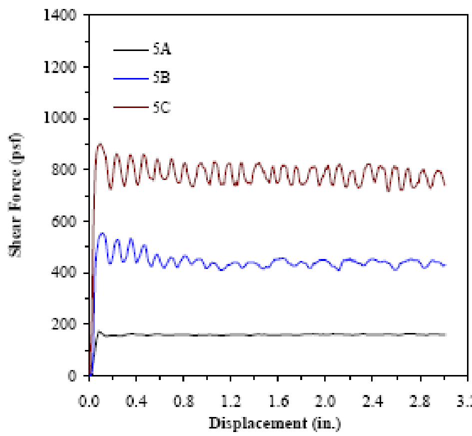
Figure 2-4: Direct Shear Testing of Geotextile/PP Geomembrane Interface

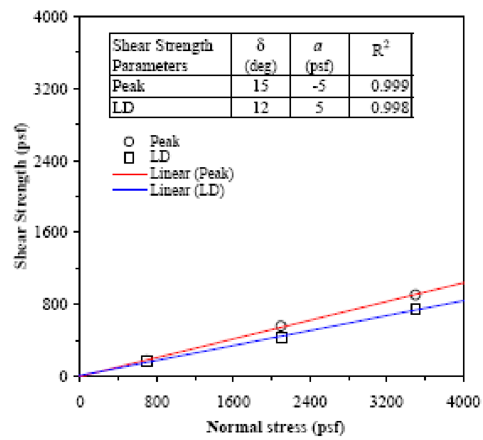
Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009
Client:	Honeywell	Project:	Onondaga Lake SCA 50% Design	Project/ Proposal No.:	GJ4299	Task No.:	05

PARSONS

INTERFACE DIRECT SHEAR TESTING (ASTM D 5321)

Upper Shear Box: Rigid substrate
TenCate GT500 geotextile #021812318 in the machine direction/
TenCate GT500 geotextile #021812318 in the machine direction
Lower Shear Box: Concrete sand





Test No.	Shear Box Size (in. x in.)	Normal Stress (psf)	Shear Rate (in./min)	GCL Soaking Stress (psf)	GCL Soaking Time (hour)	Consolidation Stress (psf)	Consolidation Time (hour)	Clay Soil γ_d (pcf)	Clay Soil ω_i (%)	Clay Soil ω_f (%)	Upper Soil γ_d (pcf)	Upper Soil ω_i (%)	Upper Soil ω_f (%)	GCL ω_i (%)	GCL ω_f (%)	Shear Stress τ_p (psf)	Shear Stress τ_{LD} (psf)	Failure Mode
5A	12 x 12	700	0.04	-	-	-	-	-	-	-	-	-	-	-	-	172	159	(1)
5B	12 x 12	2100	0.04	-	-	-	-	-	-	-	-	-	-	-	-	555	429	(1)
5C	12 x 12	3500	0.04	-	-	-	-	-	-	-	-	-	-	-	-	902	741	(1)

NOTES:
(1) Sliding (i.e., shear failure) occurred at the interface between the GT500 geotextile and GT500 geotextile.
(2) Each geosynthetic specimen was tested in the machine direction (i.e., direction of shearing parallel to MD)

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DATE OF REPORT:	2/2/2009
FIGURE NO.	C-5
PROJECT NO.	SGI9002
DOCUMENT NO.	
FILE NO.	

Figure 2-5: Direct Shear Testing of Geo-tube/Geo-tube Interface

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009
Client:	Honeywell	Project:	Onondaga Lake SCA 50% Design	Project/ Proposal No.:	GJ4299	Task No.:	05

Attachment 3
Slope Stability Analyses Using the Maximum Laboratory Measured Liner Friction Angles

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009
Client:	Honeywell	Project:	Onondaga Lake SCA 50% Design	Project/ Proposal No.:	GJ4299	Task No.:	05

Slope stability analyses were performed for the critical cases of Cross-Section A-A using the maximum friction angles found from laboratory testing of possible liner system materials. This is intended to show an expected range of calculated FS values based on the laboratory variability in effective stress friction angle. The maximum liner effective stress peak and residual friction angles found in laboratory testing are 27 degrees and 18 degrees, respectively.

It is noted that the horizontal geo-tube/geo-tube interface has been modeled with peak and residual effective stress friction angles of 15 degrees and 12 degrees, respectively, in the following analyses, and other material properties are modeled as discussed in the main text.

Table 3-1 on the following page shows the FS for the critical liner case of one column of the liner slipping under one column geo-tubes. This case was evaluated using Janbu's method for peak and residual shear strengths before and after construction of the final cover. These cases can be compared with the equivalent Cross-Section A-A case from Table 2 for the minimum measured peak friction angle.

Table 3-1: Critical Liner Case for Cross-Section A-A using the Maximum Laboratory Effective Stress Friction Angle

Case	Calculated FS	Target FS
Peak Friction Angle, without Final Cover[1]	1.97	1.3
Residual Friction Angle, without Final Cover[2]	1.44	1.1
Peak Friction Angle, with Final Cover[1]	1.96	1.5
Residual Friction Angle, with Final Cover[2]	1.41	1.3

Notes:
1. These FS values are calculated using the laboratory values of peak effective stress friction angle for the geo-tube/geo-tube horizontal interface (15 degrees) and maximum peak effective stress friction angle for the liner system (27 degrees). The laboratory test data are shown in Figures 2-2 and 2-5 of Attachment 2.
2. These FS values are calculated using the laboratory values of residual effective stress friction angle for the geo-tube/geo-tube horizontal interface (12 degrees) and maximum residual effective stress friction angle for the liner system (18 degrees). The laboratory test data are shown in Figures 2-4 and 2-5 of Attachment 2.
3. This table calculates the FS for the critical liner case of one column of geo-tubes.

Written by:	**Joseph Sura**	Date:	**4/3/2009**	Reviewed by:	**R. Kulasingam/Ming Zhu/Jay Beech**	Date:	**4/7/2009**
Client:	**Honeywell**	Project:	**Onondaga Lake SCA 50% Design**	Project/ Proposal No.:	**GJ4299**	Task No.:	**05**

Attachment 4
Back-Calculation of Required Geo-tube\Geo-tube and Liner System Interface Shear Strengths

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009
Client:	Honeywell	Project:	Onondaga Lake SCA 50% Design	Project/ Proposal No.:	GJ4299	Task No.:	05

Notes:

The stability analyses discussed in the Results and Discussion section of this package were performed using friction angles from laboratory testing on materials that will likely be used for the geo-tubes and liner. Since the required FS values were met, the ability to achieve adequate stability using typical construction materials has been established. However, the use of different materials may be preferred; therefore, development of a range of acceptable parameters is required.

As described in the Analyzed Cases section, once the critical cases were identified for geo-tube and liner stability slip modes, peak and residual effective stress friction angles for the geo-tube interface and the proposed liner could be back-calculated. Since Cross-Section A-A was the more critical cross section of the two, the back-calculations were only performed on that cross section. These back-calculations indicated the following:

- For the interim condition before final cover placement, peak effective stress friction angles of 12.9 degrees for the horizontal geo-tube interface and 12.8 degrees for the proposed liner are required. In addition, residual effective stress friction angles of 11 degrees for the horizontal geo-tube interface and 10.3 degrees for the proposed liner are required.
- For the final condition after final cover placement, peak effective stress friction angles of 13.9 degrees for the horizontal geo-tube interface and 17.9 degrees for the proposed liner are required. In addition, residual effective stress friction angles of 11.7 degrees for the horizontal geo-tube interface and 15.8 degrees for the proposed liner are required.
- Therefore, the minimum required peak effective stress friction angles to meet the target FS values for both interim and final conditions are 13.9 degrees for the horizontal geo-tube interface and 17.9 degrees for the proposed liner system. The minimum required residual effective stress friction angles to meet the target FS values for both the interim and final conditions are 11.7 degrees for the horizontal geo-tube interface and 15.8 degrees for the proposed liner.

These back-calculated friction angles for interim and final conditions are plotted in Figures 4-1 through 4-6. The blue boxes indicate the friction angles found from the laboratory testing of commercially available products, as shown in Attachment 2. The combinations of horizontal geo-tube and liner interface friction angles required to reach the target FS are shown in Tables 4-1 through 4-4. The calculated FS values using the back-calculated friction angles are shown in Tables 4-5 and 4-6.

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Client:	Honeywell	Project:	Onondaga Lake SCA 50% Design	Project/ Proposal No.:	GJ4299	Task No.:	05

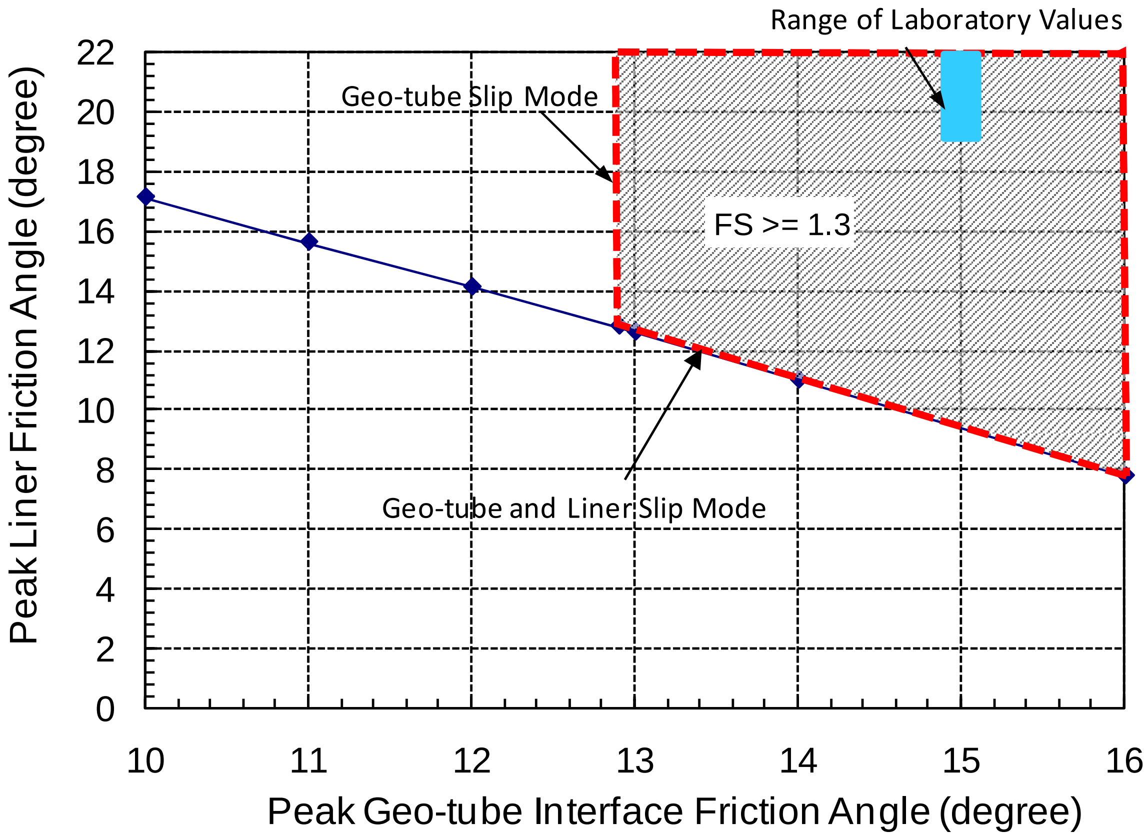

Figure 4-1: Sensitivity Analysis of Liner Interface Friction Angle Without Final Cover, using Peak Strengths

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009
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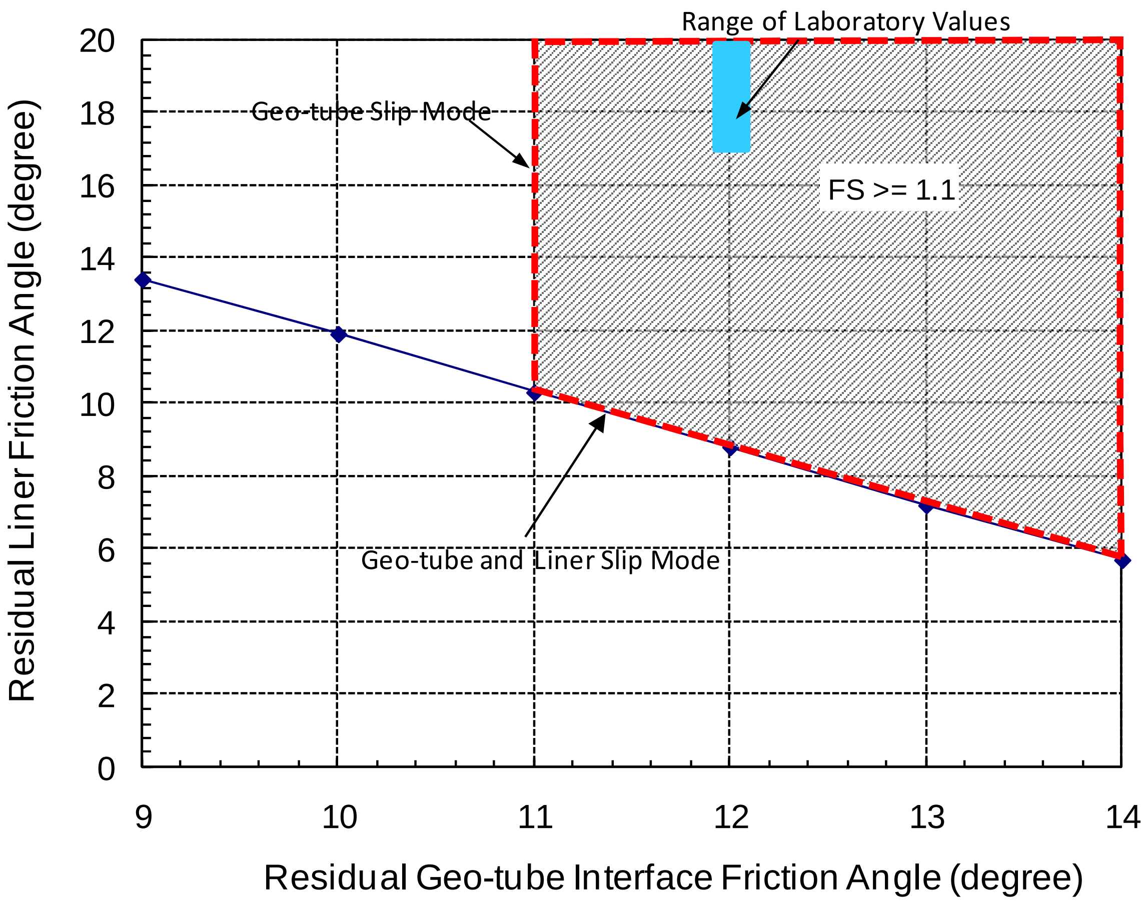

Figure 4-2: Sensitivity Analysis of Liner Interface Friction Angle Without Final Cover, using Residual Strengths

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009
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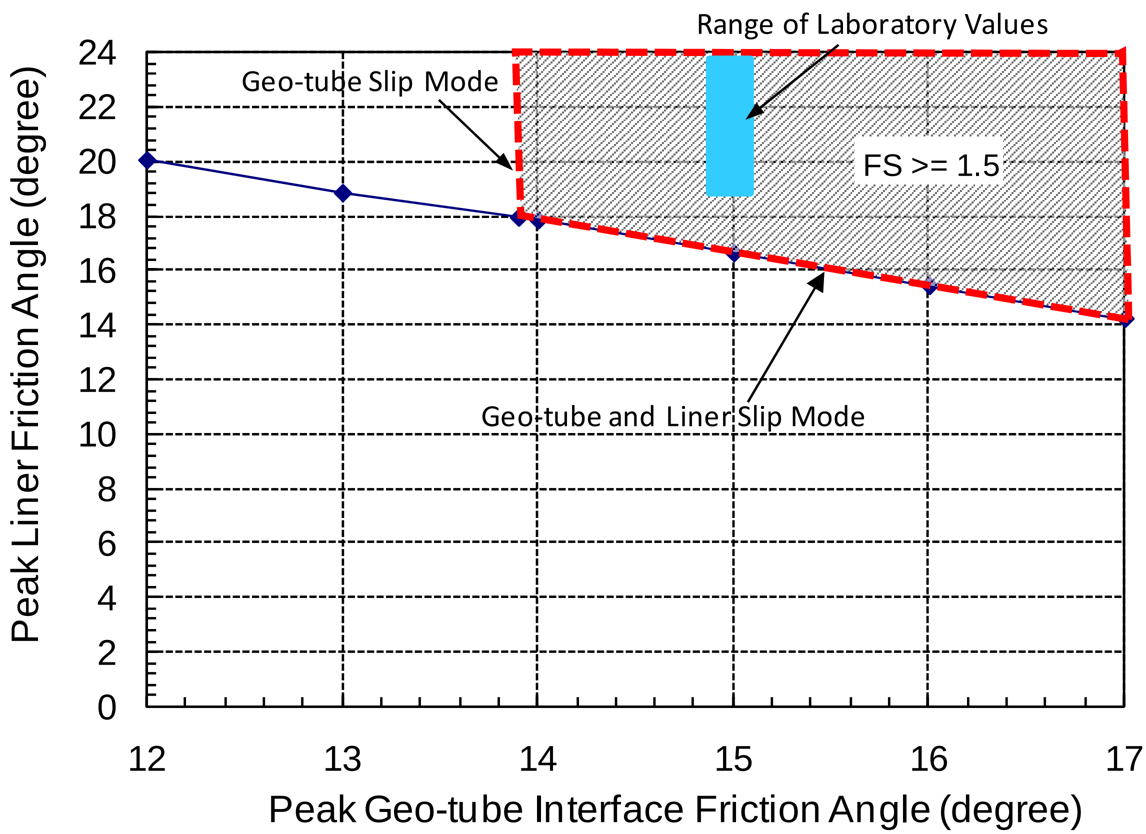

Figure 4-3: Sensitivity Analysis of Liner Interface Friction Angle after Final Cover Placement, using Peak Strengths

Written by:	**Joseph Sura**	Date:	**4/3/2009**	Reviewed by:	**R. Kulasingam/Ming Zhu/Jay Beech**	Date:	**4/7/2009**
Client:	**Honeywell**	Project:	**Onondaga Lake SCA 50% Design**	Project/ Proposal No.:	**GJ4299**	Task No.:	**05**

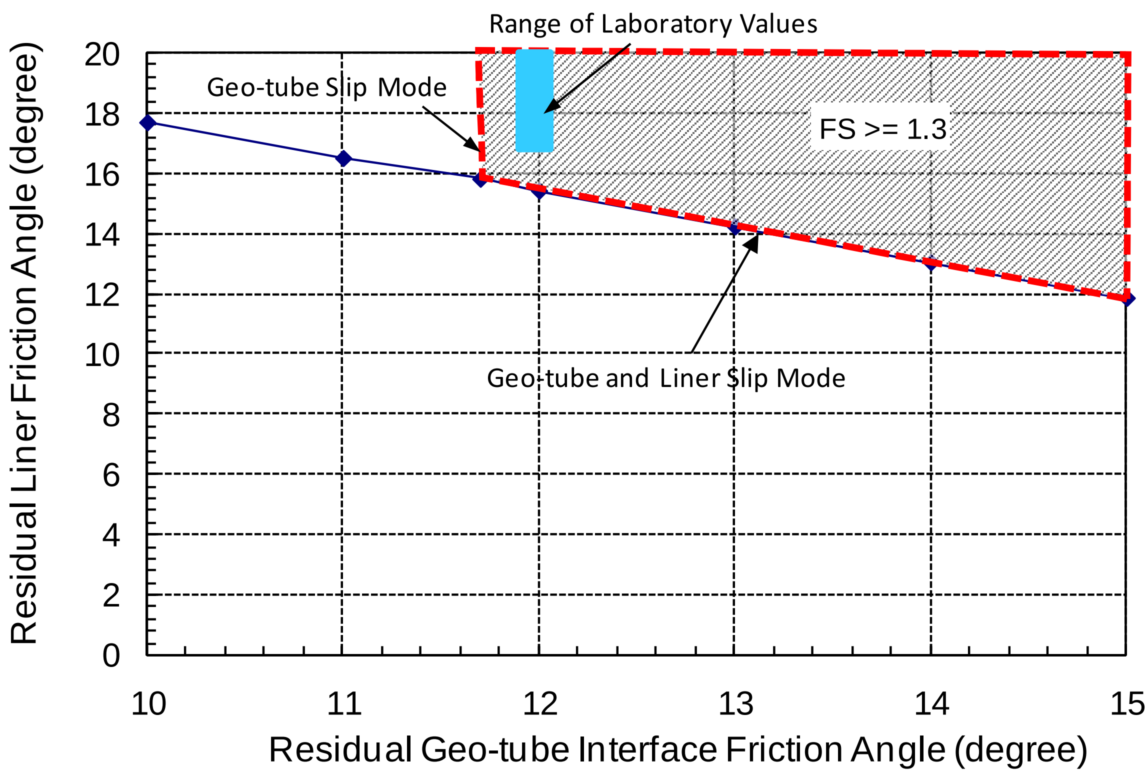

Figure 4-4: Sensitivity Analysis of Liner Interface Friction Angle after Final Cover Placement, using Residual Strengths

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009
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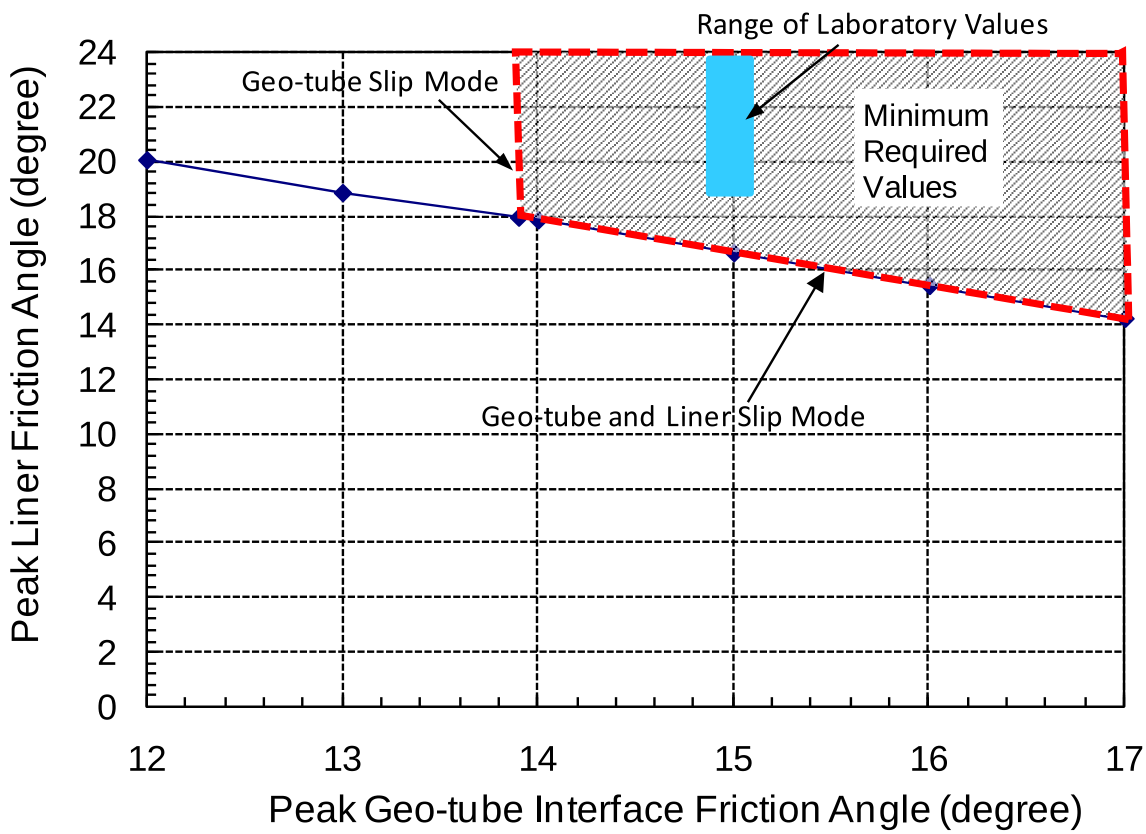

Figure 4-5: Sensitivity Analysis of Peak Liner Friction Angle: Minimum Required Values

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009
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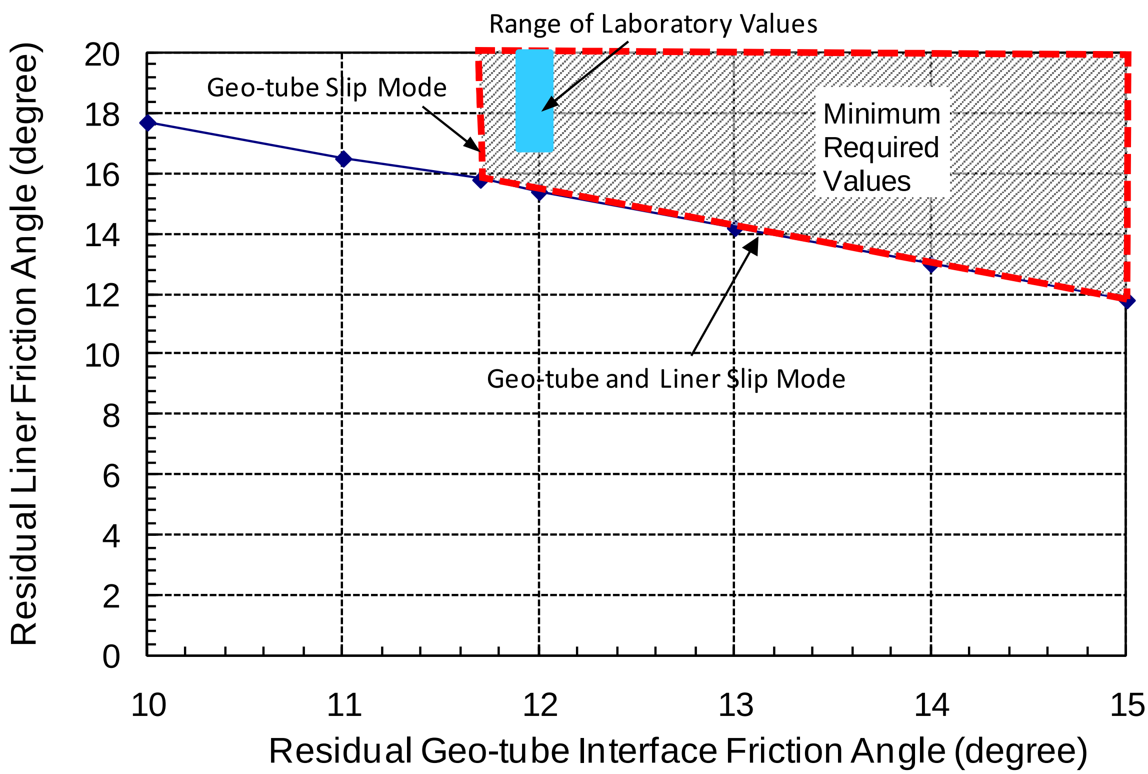

Figure 4-6: Sensitivity Analysis of Residual Liner Friction Angle: Minimum Required Values

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009
Client:	Honeywell	Project:	Onondaga Lake SCA 50% Design	Project/ Proposal No.:	GJ4299	Task No.:	05

Table 4-1. Sensitivity Analysis of Liner Interface Friction Angle Without Final Cover, using Peak Strengths

Geo-tube interface friction angle (degree)	Liner friction angle (degree)
10	17.1
11	15.6
12	14.1
12.9	12.8
13	12.6
14	11
16	7.8

Notes:

1. For peak shear strengths, this table presents the minimum required liner friction angles and corresponding geo-tube/geo-tube interface friction angles to achieve the target FS of 1.3 for the liner slip mode.
2. These values were calculated using Cross-Section A-A without cover for the most critical liner slip case involving one column of geo-tubes.
3. These values are plotted graphically in Figure 4-1.
4. For peak shear strengths, in order to achieve the target FS of 1.3 for the geo-tube slip mode, the minimum required geo-tube/geo-tube horizontal interface friction angle was back-calculated to be 12.9 degrees, which corresponds to a minimum liner friction angle of 12.8 degrees.

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Table 4-2. Sensitivity Analysis of Liner Interface Friction Angle Without Final Cover, using Residual Strengths

Geo-tube interface friction angle (degree)	Liner friction angle (degree)
9	13.4
10	11.9
11	10.3
12	8.8
13	7.2
14	5.7

Notes:

1. For residual strengths, this table presents the minimum required liner friction angles and corresponding geo-tube/geo-tube interface friction angles to achieve the target FS of 1.1 for the liner slip mode.
2. These values were calculated using Cross-Section A-A without cover for the most critical liner slip case involving one column of geo-tubes.
3. These values are plotted graphically in Figure 4-2.
4. For residual strengths, in order to achieve the target FS of 1.1 for the geo-tube slip mode, the minimum required geo-tube/geo-tube horizontal interface friction angle was back-calculated to be 11.0 degrees, which corresponds to a minimum liner friction angle of 10.3 degrees.

Table 4-3. Sensitivity Analysis of Liner Interface Friction Angle after Final Cover Placement, using Peak Strengths

Geo-tube interface friction angle (degree)	Liner friction angle (degree)
12	20
13	18.8
13.9	17.9
14	17.9
15	16.6
16	15.4
17	14.2

Notes:

1. For peak shear strengths, this table presents the minimum required liner friction angles and corresponding geo-tube/geo-tube interface friction angles to achieve the target FS of 1.5 for the liner slip mode.
2. These values were calculated using Cross-Section A-A without cover for the most critical liner slip case involving one column of geo-tubes.
3. These values are plotted graphically in Figure 4-3.
4. For peak shear strengths, in order to achieve the target FS of 1.5 for the geo-tube slip mode, the minimum required geo-tube/geo-tube horizontal interface friction angle was back-calculated to be 13.9 degrees, which corresponds to a minimum liner friction angle of 17.9 degrees.

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Table 4-4. Sensitivity Analysis of Liner Interface Friction Angle after Final Cover Placement, using Residual Strengths

Geo-tube interface friction angle (degree)	Liner friction angle (degree)
10	17.7
11	16.5
11.7	15.8
12	15.4
13	14.2
14	13
15	11.8

Notes:

1. For residual strengths, this table presents the minimum required liner friction angles and corresponding geo-tube/geo-tube interface friction angles to achieve the target FS of 1.3 for the liner slip mode.
2. These values were calculated using Cross-Section A-A without cover for the most critical liner slip case involving one column of geo-tubes.
3. These values are plotted graphically in Figure 4-4.
4. For residual strengths, in order to achieve the target FS of 1.3 for the geo-tube slip mode, the minimum required geo-tube/geo-tube horizontal interface friction angle was back-calculated to be 11.7 degrees, which corresponds to a minimum liner friction angle of 15.8 degrees.

Table 4-5. Summary of Slope Stability Analysis using Back-Calculated Friction Angles: Cross-Section A-A

Case		Without Final Cover	With Final Cover
		Calculated FS[1]	Calculated FS[1]
		Janbu's Method[2]	Janbu's Method[2]
Slip of Geo-tubes (Block Mode)	Top 1 stack; 1 column	7.33	11.44
	Top 1 stack; 2 columns	23.40	-- [4]
	Top 2 stacks; 1 column	2.09	3.36
	Top 2 stacks; 2 columns	4.63	-- [4]
	Top 3 stacks; 1 column	1.48	1.89
	Top 3 stacks; 2 columns	3.00	3.74
	Top 4 stacks; 1 column	1.30	1.50
	Top 4 stacks; 2 columns	2.09	2.67
	Top 4 stacks; 3 columns	3.33	-- [4]
	5 stacks; 1 column	1.58	1.67
	5 stacks; 2 columns	2.55	2.87
	5 stacks; 3 columns	4.31	-- [4]
Liner Stability (Block Mode)	One column of geo-tubes	1.30	1.50
	Two columns of geo-tubes	1.73	2.32

Notes:
1. The calculated FS values without final cover utilize back-calculated values of peak effective stress friction angle for the geo-tube/geo-tube horizontal interface (12.9 degrees) and liner (12.8 degrees) for the critical case with 4 stacks and 1 column.
2. The Janbu method was used for the block mode analyses presented here because Spencer's method often encounters numerical convergence difficulty with these types of analyses.
3. The calculated FS values with final cover utilize back-calculated values of peak effective stress friction angle for the geo-tube/geo-tube horizontal interface (13.9 degrees) and liner (17.9 degrees) for the critical case with 4 stacks and 1 column.
4. This case was not analyzed due to the acceptable FS values found for similar cases.

Table 4-6. Summary of Slope Stability Analysis using Back-Calculated Friction Angles: Cross-Section B-B

Case		Without Final Cover Calculated FS[1] Janbu's Method[2]	With Final Cover Calculated FS[1] Janbu's Method[2]
Slip of Geo-tubes (Block Mode)	Top 1 stack; 1 column	41.23	42.43
	Top 2 stacks; 1 column	14.77	12.94
	Top 3 stacks; 1 column	9.96	8.96
	Top 4 stacks; 1 column	6.65	5.86
	5 stacks; 1 column	9.66	9.81
Liner Stability (Block Mode)	One column of geo-tubes	1.74	2.79

Notes:
1. The calculated FS values in this table utilize the back-calculated values of peak effective stress friction angle from Cross-Section A-A without cover for the geo-tube/geo-tube horizontal interface (12.9 degrees) and liner (12.8 degrees) for the critical case with 4 stacks and 1 column.
2. The Janbu method was used for the block mode analyses presented here because Spencer's method often encounters numerical convergence difficulty with these types of analyses.

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Client:	Honeywell	Project:	Onondaga Lake SCA 50% Design	Project/ Proposal No.:	GJ4299	Task No.:	05

Attachment 5
SLIDE Output Files

Notes

1.) The error messages in the output files are a result of invalid slip surfaces generated by the SLIDE program during the automatic search for the most critical slip surface. The invalid slip surfaces included surfaces that are beyond the defined model boundaries, surfaces that are kinematically not feasible, and surfaces that mathematically do not converge to a solution. The invalid slip surfaces do not affect the valid slip surfaces from which the critical slip surface is identified. A list of error codes identifying the meaning of each message is included immediately after this notes page.
2.) In the SLIDE output files, the model boundaries and definitions are only included twice for each Cross-Section: once before placement of cover and once after the final cover placement, to avoid redundancy.

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009

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-101 = Only one (or zero) surface/slope interactions.

-103 = Two surface / slope intersections, but one or more surface / nonslope external polygon intersections lie between them. This usually occurs when the slip surface extends past the bottom of the soil region, but may also occur on a benched slope model with two sets of Slope Limits.

-105 = More than two surface / slope intersections with no valid slip surface.

-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.

-107 = Total driving moment or total driving force is negative. This will occur if the wrong failure direction is specified, or if high external or anchor loads are applied against the failure direction.

-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).

-110 = The water table or a piezoline does not span the slip region for a given slip surface, when Water Surfaces is specified as the method of pore pressure calculation. If this error occurs, check that the water table or piezoline(s) span the appropriate soil cells.

-111 = safety factor equation did not converge

-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F)< 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.

-113 = Surface intersects outside slope limits.

-116 = Not enough slices to analyze the surface. Increase the number of slices in the job control in the modeler.

-1000 = No valid slip surfaces are generated at a grid center. Unable to draw a surface.

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Cross-Section A-A: Before Placement of Final Cover

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Slide Analysis Information

[illegible]

File Name:
NorthSide_NoCover_Tube_07_Lab.sli

P[illegible]

Project Title: SLIDE - An Interactive Slope Stability Program
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

A[illegible] M[illegible]

Analysis Methods used:
Bishop simplified
Janbu simplified
Spencer

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50

[illegible]

Surface Type: Non-Circular Block Search
Number of Surfaces: 5000
Pseudo-Random Surfaces: Enabled
Convex Surfaces Only: Disabled
Left Projection Angle (Start Angle): 95
Left Projection Angle (End Angle): 175
Right Projection Angle (Start Angle): 5
Right Projection Angle (End Angle): 85
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

M[illegible] P[illegible]

Material: Dike Soil
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 35 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Gravel
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 38 degrees
Water Surface: Piezometric Line 1
Custom Hu value: 1

Material: SOLW (undrained)
Strength Type: Discrete function
Unit Weight: 82 lb/ft3
Water Surface: Water Table
Custom Hu value: 1

Material: Dredge Material
Strength Type: Mohr-Coulomb
Unit Weight: 86 lb/ft3
Cohesion: 0 psf
Friction Angle: 15 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Tube-Tube Interface (Horizontal)
Strength Type: Mohr-Coulomb
Unit Weight: 86 lb/ft3
Cohesion: 0 psf
Friction Angle: 15 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Tub-Tube Interface (Vertical)
Strength Type: Mohr-Coulomb
Unit Weight: 43 lb/ft3
Cohesion: 0 psf
Friction Angle: 0.1 degrees
Water Surface: Water Table
Custom Hu value: 1

Written by: **Joseph Sura** Date: **4/3/2009** Reviewed by: **R. Kulasingam/Ming Zhu/Jay Beech** Date: **4/7/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA 50% Design** Project/ Proposal No.: **GJ4299** Task No.: **05**

Material: Tube-Gravel Interface
Strength Type: Mohr-Coulomb
Unit Weight: 86 lb/ft3
Cohesion: 0 psf
Friction Angle: 24 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Liner
Strength Type: Mohr-Coulomb
Unit Weight: 100 lb/ft3
Cohesion: 0 psf
Friction Angle: 19 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Foundation
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 37 degrees
Water Surface: Water Table
Custom Hu value: 1

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Support: Geotube
Geotube
Support Type: GeoTextile
Force Application: Passive
Force Orientation: Tangent to Slip Surface
Anchorage: Both Ends
Shear Strength Model: Linear
Strip Coverage: 100 percent
Tensile Strength: 1600 lb/ft
Pullout Strength Adhesion: 5 lb/ft2
Pullout Strength Friction Angle: 40 degrees

□□□□□□M□□□ □□ □

Method: bishop simplified
FS: 1.554620
Axis Location: 1005.379, 553.131
Left Slip Surface Endpoint: 978.000, 441.315
Right Slip Surface Endpoint: 1078.405, 464.138
Left Slope Intercept: 978.000 447.274
Right Slope Intercept: 1078.405 464.138
Resisting Moment=2.1429e+006 lb-ft
Driving Moment=1.37841e+006 lb-ft

Method: janbu simplified
FS: 1.518390
Axis Location: 1005.379, 553.131
Left Slip Surface Endpoint: 978.000, 441.315
Right Slip Surface Endpoint: 1078.405, 464.138
Left Slope Intercept: 978.000 447.274
Right Slope Intercept: 1078.405 464.138
Resisting Horizontal Force=20291.2 lb
Driving Horizontal Force=13363.6 lb

Method: spencer
FS: 2.321740
Axis Location: 1005.633, 553.258
Left Slip Surface Endpoint: 978.000, 441.568
Right Slip Surface Endpoint: 1078.405, 464.138
Left Slope Intercept: 978.000 447.274
Right Slope Intercept: 1078.405 464.138
Resisting Moment=2.56875e+006 lb-ft
Driving Moment=1.10639e+006 lb-ft
Resisting Horizontal Force=23638 lb
Driving Horizontal Force=10181.1 lb

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Method: bishop simplified
Number of Valid Surfaces: 3900
Number of Invalid Surfaces: 1100
Error Codes:
Error Code -108 reported for 1098 surfaces
Error Code -112 reported for 2 surfaces

Method: janbu simplified
Number of Valid Surfaces: 3859
Number of Invalid Surfaces: 1141
Error Codes:
Error Code -108 reported for 1139 surfaces
Error Code -112 reported for 2 surfaces

Method: spencer
Number of Valid Surfaces: 2786
Number of Invalid Surfaces: 2214
Error Codes:
Error Code -108 reported for 2176 surfaces
Error Code -111 reported for 36 surfaces
Error Code -112 reported for 2 surfaces

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Piezo Line

946.230	434.500
948.793	434.500
958.000	434.500
1400.000	428.700

Water Table

715.262	421.594
900.000	417.000
935.504	416.272
1400.000	410.200

Material Boundary

948.793	433.500
958.000	433.500
1400.000	427.700

Material Boundary

978.000	441.524
997.000	441.309
998.500	441.292
1017.009	441.083
1018.508	441.066
1037.000	440.856
1038.500	440.839
1057.015	440.630
1058.509	440.613
1096.999	440.178
1098.506	440.161
1117.012	439.951
1118.512	439.934
1137.006	439.725
1138.505	439.708
1157.006	439.499
1158.500	439.482
1176.999	439.273
1178.492	439.256
1197.013	439.046
1198.512	439.029
1217.005	438.820
1218.499	438.803
1237.000	438.594
1238.506	438.577
1257.010	438.368
1258.509	438.351
1277.013	438.141
1278.513	438.124
1296.975	437.915
1298.469	437.899
1317.013	437.689
1318.507	437.672
1336.969	437.463
1338.469	437.446
1357.000	437.236
1358.510	437.219
1376.969	437.011
1378.475	436.993
1400.000	436.750

Material Boundary

998.000	447.048
1017.014	446.832
1018.514	446.815
1037.015	446.606
1038.521	446.589
1057.021	446.380
1058.520	446.363
1077.016	446.154
1078.515	446.137
1097.005	445.928
1098.523	445.910
1117.022	445.701
1118.509	445.684
1137.023	445.475
1138.511	445.458
1157.009	445.249
1158.509	445.232
1177.011	445.023
1178.494	445.006
1197.022	444.796
1198.509	444.779
1217.011	444.570
1218.511	444.553
1237.016	444.344
1238.509	444.327
1257.015	444.117
1258.515	444.101
1277.009	443.891
1278.515	443.874
1296.975	443.665
1298.475	443.648
1317.016	443.439
1318.515	443.422
1336.981	443.213

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1338.481	443.196
1357.016	442.986
1358.516	442.969
1376.981	442.760
1378.481	442.743
1400.000	442.500

Material Boundary

998.000	447.298
1017.014	447.082
1018.514	447.066
1037.016	446.856
1038.521	446.839
1057.021	446.630
1058.521	446.613
1077.016	446.404
1078.516	446.387
1097.005	446.178
1098.524	446.160
1117.022	445.951
1118.510	445.934
1137.024	445.725
1138.511	445.708
1157.010	445.499
1158.510	445.482
1177.011	445.273
1178.494	445.256
1197.022	445.046
1198.510	445.029
1217.011	444.820
1218.511	444.803
1237.016	444.594
1238.509	444.577
1257.016	444.368
1258.515	444.351
1277.010	444.141
1278.516	444.124
1296.975	443.915
1298.475	443.898
1317.016	443.689
1318.516	443.672
1336.981	443.463
1338.481	443.446
1357.016	443.236
1358.516	443.219
1376.981	443.010
1378.481	442.993
1400.000	442.750

Material Boundary

1018.000	452.821
1037.021	452.606
1038.521	452.589
1057.007	452.380
1058.501	452.363
1077.021	452.154
1078.527	452.137
1096.995	451.928
1098.501	451.911
1117.028	451.701
1118.527	451.684
1137.001	451.475
1138.501	451.458
1157.027	451.249
1158.521	451.232
1176.995	451.023
1178.495	451.006
1197.028	450.796
1198.521	450.779
1217.001	450.570
1218.501	450.553
1237.022	450.344
1238.515	450.327
1257.007	450.118
1258.501	450.101
1277.021	449.891
1278.521	449.874
1297.001	449.665
1298.501	449.648
1317.028	449.439
1318.521	449.422
1337.008	449.213
1338.501	449.196
1357.022	448.986
1358.521	448.969
1377.008	448.760
1378.508	448.743
1400.000	448.500

Material Boundary

1018.000	453.071
1037.022	452.856
1038.521	452.839
1057.007	452.630
1058.501	452.613
1077.022	452.404

Written by: **Joseph Sura** Date: **4/3/2009** Reviewed by: **R. Kulasingam/Ming Zhu/Jay Beech** Date: **4/7/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA 50% Design** Project/ Proposal No.: **GJ4299** Task No.: **05**

1078.528	452.387
1096.996	452.178
1098.501	452.161
1117.028	451.951
1118.528	451.934
1137.002	451.725
1138.501	451.708
1157.028	451.499
1158.522	451.482
1176.996	451.273
1178.496	451.256
1197.028	451.046
1198.522	451.029
1217.001	450.820
1218.501	450.803
1237.022	450.594
1238.515	450.577
1257.007	450.368
1258.501	450.351
1277.022	450.141
1278.522	450.124
1297.002	449.915
1298.502	449.898
1317.028	449.689
1318.522	449.672
1337.008	449.463
1338.502	449.446
1357.022	449.236
1358.522	449.219
1377.008	449.010
1378.508	448.993
1400.000	448.750

Material Boundary

1038.000	458.595
1057.013	458.380
1058.512	458.363
1077.005	458.154
1078.505	458.137
1097.013	457.928
1098.513	457.911
1117.011	457.701
1118.498	457.685
1137.019	457.475
1138.507	457.458
1157.005	457.249
1158.498	457.232
1177.013	457.023
1178.518	457.006
1197.005	456.796
1198.498	456.779
1217.007	456.570
1218.501	456.553
1237.005	456.344
1238.511	456.327
1257.007	456.118
1258.507	456.101
1277.005	455.891
1278.505	455.874
1297.013	455.665
1298.513	455.648
1317.005	455.439
1318.505	455.422
1337.014	455.213
1338.507	455.196
1357.006	454.986
1358.511	454.969
1377.021	454.760
1378.513	454.743
1400.000	454.500

Material Boundary

1038.000	458.845
1057.013	458.630
1058.513	458.613
1077.006	458.404
1078.505	458.387
1097.013	458.178
1098.513	458.161
1117.011	457.951
1118.499	457.934
1137.020	457.725
1138.507	457.708
1157.005	457.499
1158.499	457.482
1177.013	457.273
1178.519	457.255
1197.006	457.046
1198.499	457.029
1217.007	456.820
1218.501	456.803
1237.006	456.594
1238.511	456.577
1257.007	456.368
1258.507	456.351
1277.005	456.141

Written by: **Joseph Sura** Date: **4/3/2009** Reviewed by: **R. Kulasingam/Ming Zhu/Jay Beech** Date: **4/7/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA 50% Design** Project/ Proposal No.: **GJ4299** Task No.: **05**

1278.505	456.124
1297.014	455.915
1298.514	455.898
1317.005	455.689
1318.505	455.672
1337.014	455.463
1338.507	455.446
1357.006	455.236
1358.511	455.219
1377.021	455.010
1378.514	454.993
1400.000	454.750

Material Boundary

958.000	435.500
997.000	435.059
998.500	435.042
1037.000	434.606
1038.494	434.589
1077.000	434.154
1078.500	434.137
1117.000	433.701
1118.494	433.684
1156.994	433.249
1158.494	433.232
1197.006	432.796
1198.500	432.779
1236.994	432.344
1238.494	432.327
1277.007	431.891
1278.507	431.874
1317.007	431.439
1318.507	431.422
1357.000	430.986
1358.499	430.969
1400.000	430.500

Material Boundary

978.000	441.274
997.000	441.059
998.500	441.042
1017.008	440.832
1018.508	440.816
1037.000	440.606
1038.500	440.589
1057.015	440.380
1058.508	440.363
1077.006	440.154
1078.494	440.137
1096.999	439.928
1098.505	439.911
1117.012	439.701
1118.511	439.684
1137.005	439.475
1138.505	439.458
1157.006	439.249
1158.500	439.232
1176.999	439.023
1178.492	439.006
1197.012	438.796
1198.512	438.779
1217.005	438.570
1218.499	438.553
1237.000	438.344
1238.506	438.327
1257.009	438.118
1258.509	438.101
1277.013	437.891
1278.512	437.874
1296.975	437.665
1298.469	437.649
1317.013	437.439
1318.507	437.422
1336.969	437.213
1338.469	437.196
1357.000	436.986
1358.510	436.969
1376.969	436.761
1378.475	436.743
1400.000	436.500

Material Boundary

958.000	435.750
997.000	435.309
998.500	435.292
1037.000	434.856
1038.494	434.839
1077.000	434.404
1078.500	434.387
1117.001	433.951
1118.494	433.934
1156.994	433.499
1158.494	433.482
1197.007	433.046
1198.500	433.029
1236.994	432.594

Written by: **Joseph Sura** Date: **4/3/2009** Reviewed by: **R. Kulasingam/Ming Zhu/Jay Beech** Date: **4/7/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA 50% Design** Project/ Proposal No.: **GJ4299** Task No.: **05**

1238.494 432.577
1277.007 432.141
1278.507 432.124
1317.007 431.689
1318.507 431.672
1357.000 431.236
1358.500 431.219
1400.000 430.750

Material Boundary
900.000 432.000
953.504 431.272
1400.000 425.200

Material Boundary
661.000 436.500
748.000 412.600
789.000 386.700
835.000 386.800
980.000 376.600
1400.000 367.800

Material Boundary
942.667 435.500
947.793 433.500
953.504 431.272

Material Boundary
1357.000 430.986
1357.000 431.236
1357.000 436.986
1357.000 437.236

Material Boundary
1358.499 430.969
1358.500 431.219
1358.510 436.969
1358.510 437.219

Material Boundary
1277.007 431.891
1277.007 432.141
1277.013 437.891
1277.013 438.141

Material Boundary
1278.507 431.874
1278.507 432.124
1278.512 437.874
1278.513 438.124

Material Boundary
1317.007 431.439
1317.007 431.689
1317.013 437.439
1317.013 437.689

Material Boundary
1318.507 431.422
1318.507 431.672
1318.507 437.422
1318.507 437.672

Material Boundary
1077.000 434.154
1077.000 434.404
1077.006 440.154

Material Boundary
1078.494 440.137
1078.500 434.387
1078.500 434.137

Material Boundary
1117.000 433.701
1117.001 433.951
1117.012 439.701
1117.012 439.951

Material Boundary
1118.494 433.684
1118.494 433.934
1118.511 439.684
1118.512 439.934

Material Boundary
1156.994 433.249
1156.994 433.499
1157.006 439.249
1157.006 439.499

Material Boundary
1158.494 433.232
1158.494 433.482
1158.500 439.232
1158.500 439.482

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009
Client:	Honeywell	Project:	Onondaga Lake SCA 50% Design	Project/ Proposal No.:	GJ4299	Task No.:	05

Material Boundary

1197.006	432.796
1197.007	433.046
1197.012	438.796
1197.013	439.046

Material Boundary

1198.500	432.779
1198.500	433.029
1198.512	438.779
1198.512	439.029

Material Boundary

1236.994	432.344
1236.994	432.594
1237.000	438.344
1237.000	438.594

Material Boundary

1238.494	432.327
1238.494	432.577
1238.506	438.327
1238.506	438.577

Material Boundary

997.000	435.059
997.000	435.309
997.000	441.059
997.000	441.309

Material Boundary

998.500	435.042
998.500	435.292
998.500	441.042
998.500	441.292

Material Boundary

1037.000	434.606
1037.000	434.856
1037.000	440.606
1037.000	440.856

Material Boundary

1038.494	434.589
1038.494	434.839
1038.500	440.589
1038.500	440.839

Material Boundary

1296.975	437.665
1296.975	437.915
1296.975	443.665
1296.975	443.915

Material Boundary

1298.469	437.649
1298.469	437.899
1298.475	443.648
1298.475	443.898

Material Boundary

1336.969	437.213
1336.969	437.463
1336.981	443.213
1336.981	443.463

Material Boundary

1338.469	437.196
1338.469	437.446
1338.481	443.196
1338.481	443.446

Material Boundary

1376.969	436.761
1376.969	437.011
1376.981	442.760
1376.981	443.010

Material Boundary

1378.475	436.743
1378.475	436.993
1378.481	442.743
1378.481	442.993

Material Boundary

1257.009	438.118
1257.010	438.368
1257.015	444.117
1257.016	444.368

Material Boundary

1258.509	438.101
1258.509	438.351
1258.515	444.101
1258.515	444.351

Written by: **Joseph Sura** Date: **4/3/2009** Reviewed by: **R. Kulasingam/Ming Zhu/Jay Beech** Date: **4/7/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA 50% Design** Project/ Proposal No.: **GJ4299** Task No.: **05**

Material Boundary

1096.999	439.928
1096.999	440.178
1097.005	445.928
1097.005	446.178

Material Boundary

1098.505	439.911
1098.506	440.161
1098.523	445.910
1098.524	446.160

Material Boundary

1137.005	439.475
1137.006	439.725
1137.023	445.475
1137.024	445.725

Material Boundary

1138.505	439.458
1138.505	439.708
1138.511	445.458
1138.511	445.708

Material Boundary

1176.999	439.023
1176.999	439.273
1177.011	445.023
1177.011	445.273

Material Boundary

1178.492	439.006
1178.492	439.256
1178.494	445.006
1178.494	445.256

Material Boundary

1217.005	438.570
1217.005	438.820
1217.011	444.570
1217.011	444.820

Material Boundary

1218.499	438.553
1218.499	438.803
1218.511	444.553
1218.511	444.803

Material Boundary

1017.008	440.832
1017.009	441.083
1017.014	446.832
1017.014	447.082

Material Boundary

1018.508	440.816
1018.508	441.066
1018.514	446.815
1018.514	447.066

Material Boundary

1057.015	440.380
1057.015	440.630
1057.021	446.380
1057.021	446.630

Material Boundary

1058.508	440.363
1058.509	440.613
1058.520	446.363
1058.521	446.613

Material Boundary

1037.015	446.606
1037.016	446.856
1037.021	452.606
1037.022	452.856

Material Boundary

1038.521	446.589
1038.521	446.839
1038.521	452.589
1038.521	452.839

Material Boundary

1077.016	446.154
1077.016	446.404
1077.021	452.154
1077.022	452.404

Material Boundary

1078.515	446.137
1078.516	446.387
1078.527	452.137
1078.528	452.387

Written by: **Joseph Sura** Date: **4/3/2009** Reviewed by: **R. Kulasingam/Ming Zhu/Jay Beech** Date: **4/7/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA 50% Design** Project/ Proposal No.: **GJ4299** Task No.: **05**

Material Boundary

1117.022	445.701
1117.022	445.951
1117.028	451.701
1117.028	451.951

Material Boundary

1118.509	445.684
1118.510	445.934
1118.527	451.684
1118.528	451.934

Material Boundary

1157.009	445.249
1157.010	445.499
1157.027	451.249
1157.028	451.499

Material Boundary

1158.509	445.232
1158.510	445.482
1158.521	451.232
1158.522	451.482

Material Boundary

1197.022	444.796
1197.022	445.046
1197.028	450.796
1197.028	451.046

Material Boundary

1198.509	444.779
1198.510	445.029
1198.521	450.779
1198.522	451.029

Material Boundary

1237.016	444.344
1237.016	444.594
1237.022	450.344
1237.022	450.594

Material Boundary

1238.509	444.327
1238.509	444.577
1238.515	450.327
1238.515	450.577

Material Boundary

1277.009	443.891
1277.010	444.141
1277.021	449.891
1277.022	450.141

Material Boundary

1278.515	443.874
1278.516	444.124
1278.521	449.874
1278.522	450.124

Material Boundary

1317.016	443.439
1317.016	443.689
1317.028	449.439
1317.028	449.689

Material Boundary

1318.515	443.422
1318.516	443.672
1318.521	449.422
1318.522	449.672

Material Boundary

1357.016	442.986
1357.016	443.236
1357.022	448.986
1357.022	449.236

Material Boundary

1358.516	442.969
1358.516	443.219
1358.521	448.969
1358.522	449.219

Material Boundary

1057.007	452.380
1057.007	452.630
1057.013	458.380
1057.013	458.630

Material Boundary

1058.501	452.363
1058.501	452.613
1058.512	458.363
1058.513	458.613

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009

Client:	Honeywell	Project:	Onondaga Lake SCA 50% Design	Project/ Proposal No.:	GJ4299	Task No.:	05

Material Boundary

1098.501	451.911
1098.501	452.161
1098.513	457.911
1098.513	458.161

Material Boundary

1096.995	451.928
1096.996	452.178
1097.013	457.928
1097.013	458.178

Material Boundary

1137.001	451.475
1137.002	451.725
1137.019	457.475
1137.020	457.725

Material Boundary

1138.501	451.458
1138.501	451.708
1138.507	457.458
1138.507	457.708

Material Boundary

1176.995	451.023
1176.996	451.273
1177.013	457.023
1177.013	457.273

Material Boundary

1178.495	451.006
1178.496	451.256
1178.518	457.006
1178.519	457.255

Material Boundary

1217.001	450.570
1217.001	450.820
1217.007	456.570
1217.007	456.820

Material Boundary

1218.501	450.553
1218.501	450.803
1218.501	456.553
1218.501	456.803

Material Boundary

1257.007	450.118
1257.007	450.368
1257.007	456.118
1257.007	456.368

Material Boundary

1258.501	450.101
1258.501	450.351
1258.507	456.101
1258.507	456.351

Material Boundary

1297.001	449.665
1297.002	449.915
1297.013	455.665
1297.014	455.915

Material Boundary

1298.501	449.648
1298.502	449.898
1298.513	455.648
1298.514	455.898

Material Boundary

1337.008	449.213
1337.008	449.463
1337.014	455.213
1337.014	455.463

Material Boundary

1338.501	449.196
1338.502	449.446
1338.507	455.196
1338.507	455.446

Material Boundary

1377.008	448.760
1377.008	449.010
1377.021	454.760
1377.021	455.010

Material Boundary

1378.508	448.743
1378.508	448.993
1378.513	454.743
1378.514	454.993

Written by: **Joseph Sura** Date: **4/3/2009** Reviewed by: **R. Kulasingam/Ming Zhu/Jay Beech** Date: **4/7/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA 50% Design** Project/ Proposal No.: **GJ4299** Task No.: **05**

Material Boundary
1077.005 458.154
1077.006 458.404
1077.017 464.154

Material Boundary
1078.505 458.137
1078.505 458.387
1078.517 464.137

Material Boundary
1117.011 457.701
1117.011 457.951
1117.011 463.701

Material Boundary
1118.498 457.685
1118.499 457.934
1118.511 463.684

Material Boundary
1157.005 457.249
1157.005 457.499
1157.011 463.249

Material Boundary
1158.498 457.232
1158.499 457.482
1158.511 463.232

Material Boundary
1197.005 456.796
1197.006 457.046
1197.017 462.796

Material Boundary
1198.498 456.779
1198.499 457.029
1198.517 462.779

Material Boundary
1237.005 456.344
1237.006 456.594
1237.024 462.344

Material Boundary
1238.511 456.327
1238.511 456.577
1238.517 462.327

Material Boundary
1277.005 455.891
1277.005 456.141
1277.011 461.891

Material Boundary
1278.505 455.874
1278.505 456.124
1278.505 461.874

Material Boundary
1317.005 455.439
1317.005 455.689
1317.011 461.439

Material Boundary
1318.505 455.422
1318.505 455.672
1318.517 461.422

Material Boundary
1357.006 454.986
1357.006 455.236
1357.017 460.986

Material Boundary
1358.511 454.969
1358.511 455.219
1358.511 460.969

Material Boundary
943.667 435.500
948.793 433.500

Material Boundary
940.000 436.600
942.667 435.500

External Boundary
940.000 436.600
912.000 436.600
900.000 432.000
661.000 436.500
638.000 432.900
555.000 396.200

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009

Client:	Honeywell	Project:	Onondaga Lake SCA 50% Design	Project/ Proposal No.:	GJ4299	Task No.:	05

483.000	398.300
461.000	390.500
307.000	386.700
277.000	373.000
1.726	374.590
1.726	167.800
1400.000	167.800
1400.000	367.800
1400.000	425.200
1400.000	427.700
1400.000	430.500
1400.000	430.750
1400.000	436.500
1400.000	436.750
1400.000	442.500
1400.000	442.750
1400.000	448.500
1400.000	448.750
1400.000	454.500
1400.000	454.750
1400.000	460.500
1358.511	460.969
1357.017	460.986
1318.517	461.422
1317.011	461.439
1278.505	461.874
1277.011	461.891
1238.517	462.327
1237.024	462.344
1198.517	462.779
1197.017	462.796
1158.511	463.232
1157.011	463.249
1118.511	463.684
1117.011	463.701
1078.517	464.137
1077.017	464.154
1038.000	464.595
1038.000	458.845
1038.000	458.595
1018.000	458.821
1018.000	453.071
1018.000	452.821
998.000	453.048
998.000	447.298
998.000	447.048
978.000	447.274
978.000	441.524
978.000	441.274
958.000	441.500
958.000	435.750
958.000	435.500
943.667	435.500
941.000	436.600

Focus/Block Search Line

1038.000	458.616
1077.037	458.372

Focus/Block Search Point

1077.037	458.372

Focus/Block Search Point

1078.405	464.138

Support

1358.511	460.969
1400.000	460.500

Support

1400.000	454.750
1400.000	460.500

Support

1400.000	454.750
1358.511	455.219

Support

1358.511	455.219
1358.511	460.969

Support

1378.513	454.743
1378.508	448.993

Support

1378.508	448.993
1400.000	448.750

Support

1400.000	448.750
1400.000	454.500

Support

1400.000	454.500
1378.513	454.743

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009

Client:	Honeywell	Project:	Onondaga Lake SCA 50% Design	Project/ Proposal No.:	GJ4299	Task No.:	05

Support
1400.000 448.500
1400.000 442.750

Support
1400.000 442.750
1358.516 443.219

Support
1358.516 443.219
1358.521 448.969

Support
1358.521 448.969
1400.000 448.500

Support
1400.000 442.500
1400.000 436.750

Support
1400.000 436.750
1378.475 436.993

Support
1378.475 436.993
1378.481 442.743

Support
1378.481 442.743
1400.000 442.500

Support
1400.000 430.750
1400.000 436.500

Support
1400.000 436.500
1358.510 436.969

Support
1358.510 436.969
1358.500 431.219

Support
1358.500 431.219
1400.000 430.750

Support
1376.969 437.011
1376.981 442.760

Written by: **Joseph Sura** Date: **4/3/2009** Reviewed by: **R. Kulasingam/Ming Zhu/Jay Beech** Date: **4/7/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA 50% Design** Project/ Proposal No.: **GJ4299** Task No.: **05**

Slide Analysis Information

□□□□□ □□□□□□□ □

File Name: NorthSide_NoCover_Liner_i_Lab.sli

P□□□□□□□□□□□□□

Project Title: SLIDE - An Interactive Slope Stability Program
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

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Analysis Methods used:
Bishop simplified
Janbu simplified
Spencer

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50

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Surface Type: Non-Circular Block Search
Number of Surfaces: 5000
Pseudo-Random Surfaces: Enabled
Convex Surfaces Only: Disabled
Left Projection Angle (Start Angle): 95
Left Projection Angle (End Angle): 175
Right Projection Angle (Start Angle): 5
Right Projection Angle (End Angle): 85
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

M□□□□□□□□P□□□□□□□□

Material: Dike Soil
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 35 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Gravel
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 38 degrees
Water Surface: Piezometric Line 1
Custom Hu value: 1

Material: SOLW (undrained)
Strength Type: Discrete function
Unit Weight: 82 lb/ft3
Water Surface: Water Table
Custom Hu value: 1

Material: Dredge Material
Strength Type: Mohr-Coulomb
Unit Weight: 86 lb/ft3
Cohesion: 0 psf
Friction Angle: 15 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Tube-Tube Interface (Horizontal)
Strength Type: Mohr-Coulomb
Unit Weight: 86 lb/ft3
Cohesion: 0 psf
Friction Angle: 15 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Tub-Tube Interface (Vertical)
Strength Type: Mohr-Coulomb
Unit Weight: 43 lb/ft3
Cohesion: 0 psf
Friction Angle: 0.1 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Tube-Gravel Interface

Strength Type: Mohr-Coulomb
Unit Weight: 86 lb/ft3
Cohesion: 0 psf
Friction Angle: 24 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Liner
Strength Type: Mohr-Coulomb
Unit Weight: 100 lb/ft3
Cohesion: 0 psf
Friction Angle: 19 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Foundation
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 37 degrees
Water Surface: Water Table
Custom Hu value: 1

□□□□□□□P□□□□□□□

Support: Geotube
Geotube
Support Type: GeoTextile
Force Application: Passive
Force Orientation: Tangent to Slip Surface
Anchorage: Both Ends
Shear Strength Model: Linear
Strip Coverage: 100 percent
Tensile Strength: 1600 lb/ft
Pullout Strength Adhesion: 5 lb/ft2
Pullout Strength Friction Angle: 40 degrees

□□□□□□M□□□ □□ □

Method: bishop simplified
FS: 1.708060
Axis Location: 987.056, 575.241
Left Slip Surface Endpoint: 952.983, 435.500
Right Slip Surface Endpoint: 1078.405, 464.138
Resisting Moment=4.58013e+006 lb-ft
Driving Moment=2.68148e+006 lb-ft

Method: janbu simplified
FS: 1.653050
Axis Location: 987.056, 575.241
Left Slip Surface Endpoint: 952.983, 435.500
Right Slip Surface Endpoint: 1078.405, 464.138
Resisting Horizontal Force=33864.3 lb
Driving Horizontal Force=20486 lb

Method: spencer
FS: 2.766000
Axis Location: 984.930, 579.492
Left Slip Surface Endpoint: 948.732, 435.500
Right Slip Surface Endpoint: 1078.405, 464.138
Resisting Moment=4.93587e+006 lb-ft
Driving Moment=1.78448e+006 lb-ft
Resisting Horizontal Force=35329.5 lb
Driving Horizontal Force=12772.8 lb

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Method: bishop simplified
Number of Valid Surfaces: 3832
Number of Invalid Surfaces: 1168
Error Codes:
Error Code -108 reported for 74 surfaces
Error Code -110 reported for 5 surfaces
Error Code -111 reported for 42 surfaces
Error Code -112 reported for 1047 surfaces

Method: janbu simplified
Number of Valid Surfaces: 3766
Number of Invalid Surfaces: 1234
Error Codes:
Error Code -108 reported for 77 surfaces
Error Code -110 reported for 5 surfaces
Error Code -111 reported for 52 surfaces
Error Code -112 reported for 1100 surfaces

Method: spencer
Number of Valid Surfaces: 2004
Number of Invalid Surfaces: 2996
Error Codes:
Error Code -108 reported for 960 surfaces
Error Code -110 reported for 5 surfaces
Error Code -111 reported for 879 surfaces
Error Code -112 reported for 1152 surfaces

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009

Client:	Honeywell	Project:	Onondaga Lake SCA 50% Design	Project/ Proposal No.:	GJ4299	Task No.:	05

Slide Analysis Information

[illegible]

File Name: NorthSide_NoCover_Global_Su_Lab.sli

P[illegible]

Project Title: SLIDE - An Interactive Slope Stability Program
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

A[illegible] M[illegible]

Analysis Methods used:
Bishop simplified
Janbu simplified
Spencer

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50

[illegible]

Surface Type: Circular
Search Method: Grid Search
Radius increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Create Tension Crack
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

M[illegible] P[illegible]

Material: Dike Soil
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 35 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Gravel
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 38 degrees
Water Surface: Piezometric Line 1
Custom Hu value: 1

Material: SOLW (undrained)
Strength Type: Discrete function
Unit Weight: 82 lb/ft3
Water Surface: Water Table
Custom Hu value: 1

Material: Dredge Material
Strength Type: Mohr-Coulomb
Unit Weight: 86 lb/ft3
Cohesion: 0 psf
Friction Angle: 15 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Tube-Tube Interface (Horizontal)
Strength Type: Mohr-Coulomb
Unit Weight: 86 lb/ft3
Cohesion: 0 psf
Friction Angle: 15 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Tub-Tube Interface (Vertical)
Strength Type: Mohr-Coulomb
Unit Weight: 43 lb/ft3
Cohesion: 0 psf
Friction Angle: 0.1 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Tube-Gravel Interface
Strength Type: Mohr-Coulomb

Written by:	**Joseph Sura**	Date:	**4/3/2009**	Reviewed by: **R. Kulasingam/Ming Zhu/Jay Beech**	Date: **4/7/2009**
Client:	**Honeywell**	Project:	**Onondaga Lake SCA 50% Design**	Project/ Proposal No.: **GJ4299**	Task No.: **05**

Unit Weight: 86 lb/ft3
Cohesion: 0 psf
Friction Angle: 24 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Liner
Strength Type: Mohr-Coulomb
Unit Weight: 100 lb/ft3
Cohesion: 0 psf
Friction Angle: 19 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Foundation
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 37 degrees
Water Surface: Water Table
Custom Hu value: 1

□□□□□□□P□□□□□□□□

Support: Geotube
Geotube
Support Type: GeoTextile
Force Application: Passive
Force Orientation: Tangent to Slip Surface
Anchorage: Both Ends
Shear Strength Model: Linear
Strip Coverage: 100 percent
Tensile Strength: 1600 lb/ft
Pullout Strength Adhesion: 5 lb/ft2
Pullout Strength Friction Angle: 40 degrees

□□□□□□M□□□ □□ □

Method: bishop simplified
FS: 1.671880
Center: 994.208, 510.713
Radius: 100.625
Left Slip Surface Endpoint: 926.145, 436.600
Right Slip Surface Endpoint: 1083.376, 464.082
Resisting Moment=1.09555e+007 lb-ft
Driving Moment=6.55279e+006 lb-ft

Method: janbu simplified
FS: 1.686150
Center: 976.451, 546.228
Radius: 145.729
Left Slip Surface Endpoint: 885.616, 432.271
Right Slip Surface Endpoint: 1096.718, 463.931
Resisting Horizontal Force=140011 lb
Driving Horizontal Force=83035.9 lb

Method: spencer
FS: 1.676630
Center: 994.208, 510.713
Radius: 100.625
Left Slip Surface Endpoint: 926.145, 436.600
Right Slip Surface Endpoint: 1083.376, 464.082
Resisting Moment=1.09866e+007 lb-ft
Driving Moment=6.55279e+006 lb-ft
Resisting Horizontal Force=92221.5 lb
Driving Horizontal Force=55004.1 lb

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Method: bishop simplified
Number of Valid Surfaces: 2854
Number of Invalid Surfaces: 1898
Error Codes:
Error Code -105 reported for 1 surface
Error Code -106 reported for 237 surfaces
Error Code -107 reported for 882 surfaces
Error Code -108 reported for 4 surfaces
Error Code -110 reported for 21 surfaces
Error Code -112 reported for 695 surfaces
Error Code -113 reported for 5 surfaces
Error Code -116 reported for 53 surfaces

Method: janbu simplified
Number of Valid Surfaces: 2360
Number of Invalid Surfaces: 2392
Error Codes:
Error Code -105 reported for 1 surface
Error Code -106 reported for 237 surfaces
Error Code -107 reported for 882 surfaces
Error Code -108 reported for 482 surfaces
Error Code -110 reported for 21 surfaces
Error Code -111 reported for 2 surfaces
Error Code -112 reported for 709 surfaces
Error Code -113 reported for 5 surfaces
Error Code -116 reported for 53 surfaces

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009
Client:	Honeywell	Project:	Onondaga Lake SCA 50% Design	Project/ Proposal No.:	GJ4299	Task No.:	05

Method: spencer
Number of Valid Surfaces: 768
Number of Invalid Surfaces: 3984
Error Codes:
Error Code -105 reported for 1 surface
Error Code -106 reported for 237 surfaces
Error Code -107 reported for 882 surfaces
Error Code -108 reported for 556 surfaces
Error Code -110 reported for 21 surfaces
Error Code -111 reported for 1509 surfaces
Error Code -112 reported for 720 surfaces
Error Code -113 reported for 5 surfaces
Error Code -116 reported for 53 surfaces

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009

Client:	Honeywell	Project:	Onondaga Lake SCA 50% Design	Project/ Proposal No.:	GJ4299	Task No.:	05

Slide Analysis Information

Document Name

File Name: NorthSide_NoCover_External_Lab.sli

Project Settings

Project Title: SLIDE - An Interactive Slope Stability Program
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
Bishop simplified
Janbu simplified
Spencer

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Create Tension Crack
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Material Properties

Material: Dike Soil
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 35 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Gravel
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 38 degrees
Water Surface: Piezometric Line 1
Custom Hu value: 1

Material: SOLW (undrained)
Strength Type: Discrete function
Unit Weight: 82 lb/ft3
Water Surface: Water Table
Custom Hu value: 1

Material: Dredge Material
Strength Type: Mohr-Coulomb
Unit Weight: 86 lb/ft3
Cohesion: 0 psf
Friction Angle: 15 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Tube-Tube Interface (Horizontal)
Strength Type: Mohr-Coulomb
Unit Weight: 86 lb/ft3
Cohesion: 0 psf
Friction Angle: 15 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Tub-Tube Interface (Vertical)
Strength Type: Mohr-Coulomb
Unit Weight: 43 lb/ft3
Cohesion: 0 psf
Friction Angle: 0.1 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Tube-Gravel Interface
Strength Type: Mohr-Coulomb
Unit Weight: 86 lb/ft3
Cohesion: 0 psf
Friction Angle: 24 degrees
Water Surface: Water Table

Custom Hu value: 1

Material: Liner
Strength Type: Mohr-Coulomb
Unit Weight: 100 lb/ft3
Cohesion: 0 psf
Friction Angle: 19 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Foundation
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 37 degrees
Water Surface: Water Table
Custom Hu value: 1

[illegible]

Support: Geotube
Geotube
Support Type: GeoTextile
Force Application: Passive
Force Orientation: Tangent to Slip Surface
Anchorage: Both Ends
Shear Strength Model: Linear
Strip Coverage: 100 percent
Tensile Strength: 1600 lb/ft
Pullout Strength Adhesion: 5 lb/ft2
Pullout Strength Friction Angle: 40 degrees

[illegible]

Method: bishop simplified
FS: 3.951600
Center: 867.694, 1138.896
Radius: 732.909
Left Slip Surface Endpoint: 659.311, 436.236
Right Slip Surface Endpoint: 1151.834, 463.307
Resisting Moment=2.19241e+008 lb-ft
Driving Moment=5.54816e+007 lb-ft

Method: janbu simplified
FS: 3.988630
Center: 867.694, 1078.515
Radius: 675.141
Left Slip Surface Endpoint: 659.522, 436.269
Right Slip Surface Endpoint: 1145.934, 463.374
Resisting Horizontal Force=308948 lb
Driving Horizontal Force=77457.1 lb

Method: spencer
FS: 3.953430
Center: 867.694, 1138.896
Radius: 732.909
Left Slip Surface Endpoint: 659.311, 436.236
Right Slip Surface Endpoint: 1151.834, 463.307
Resisting Moment=2.19343e+008 lb-ft
Driving Moment=5.54816e+007 lb-ft
Resisting Horizontal Force=293070 lb
Driving Horizontal Force=74130.6 lb

[illegible]

Method: bishop simplified
Number of Valid Surfaces: 765
Number of Invalid Surfaces: 3987
Error Codes:
Error Code -101 reported for 11 surfaces
Error Code -107 reported for 108 surfaces
Error Code -110 reported for 731 surfaces
Error Code -113 reported for 288 surfaces
Error Code -1000 reported for 2849 surfaces

Method: janbu simplified
Number of Valid Surfaces: 763
Number of Invalid Surfaces: 3989
Error Codes:
Error Code -101 reported for 11 surfaces
Error Code -107 reported for 108 surfaces
Error Code -108 reported for 2 surfaces
Error Code -110 reported for 731 surfaces
Error Code -113 reported for 288 surfaces
Error Code -1000 reported for 2849 surfaces

Method: spencer
Number of Valid Surfaces: 616
Number of Invalid Surfaces: 4136
Error Codes:
Error Code -101 reported for 11 surfaces
Error Code -107 reported for 108 surfaces
Error Code -108 reported for 8 surfaces
Error Code -110 reported for 731 surfaces
Error Code -111 reported for 141 surfaces
Error Code -113 reported for 288 surfaces
Error Code -1000 reported for 2849 surfaces

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009
Client:	Honeywell	Project:	Onondaga Lake SCA 50% Design	Project/ Proposal No.:	GJ4299	Task No.:	05

Cross-Section A-A: After Placement of Final Cover

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009

Client:	Honeywell	Project:	Onondaga Lake SCA 50% Design	Project/ Proposal No.:	GJ4299	Task No.:	05

Slide Analysis Information

□□□□□ □□□□□□□ □

File Name: NorthSide_Cover_Tube_07_Lab.sli

P□□□□□□□□□□□□□

Project Title: SLIDE - An Interactive Slope Stability Program
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

A□□□□□□ M□□□□□□

Analysis Methods used:
Bishop simplified
Janbu simplified
Spencer

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50

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Surface Type: Non-Circular Block Search
Number of Surfaces: 5000
Pseudo-Random Surfaces: Enabled
Convex Surfaces Only: Disabled
Left Projection Angle (Start Angle): 95
Left Projection Angle (End Angle): 175
Right Projection Angle (Start Angle): 5
Right Projection Angle (End Angle): 85
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

M□□□□□□□P□□□□□□□□

Material: Final Cover Soil
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 30 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Dike Soil
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 35 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Gravel
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 38 degrees
Water Surface: Piezometric Line 1
Custom Hu value: 1

Material: SOLW (undrained)
Strength Type: Discrete function
Unit Weight: 82 lb/ft3
Water Surface: Water Table
Custom Hu value: 1

Material: Dredge Material
Strength Type: Mohr-Coulomb
Unit Weight: 86 lb/ft3
Cohesion: 0 psf
Friction Angle: 15 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Tube-Tube Interface (Horizontal)
Strength Type: Mohr-Coulomb
Unit Weight: 86 lb/ft3
Cohesion: 0 psf
Friction Angle: 15 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Tub-Tube Interface (Vertical)
Strength Type: Mohr-Coulomb
Unit Weight: 43 lb/ft3

Cohesion: 0 psf
Friction Angle: 0.1 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Tube-Gravel Interface
Strength Type: Mohr-Coulomb
Unit Weight: 86 lb/ft3
Cohesion: 0 psf
Friction Angle: 24 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Liner
Strength Type: Mohr-Coulomb
Unit Weight: 100 lb/ft3
Cohesion: 0 psf
Friction Angle: 19 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Foundation
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 37 degrees
Water Surface: Water Table
Custom Hu value: 1

[illegible]P[illegible]

Support: Geotube
Geotube
Support Type: GeoTextile
Force Application: Passive
Force Orientation: Tangent to Slip Surface
Anchorage: Both Ends
Shear Strength Model: Linear
Strip Coverage: 100 percent
Tensile Strength: 1600 lb/ft
Pullout Strength Adhesion: 5 lb/ft2
Pullout Strength Friction Angle: 40 degrees

[illegible]M[illegible]

Method: bishop simplified
FS: 1.659040
Axis Location: 996.989, 576.397
Left Slip Surface Endpoint: 958.668, 443.693
Right Slip Surface Endpoint: 1080.160, 466.118
Resisting Moment=4.84653e+006 lb-ft
Driving Moment=2.92129e+006 lb-ft

Method: janbu simplified
FS: 1.606060
Axis Location: 996.989, 576.397
Left Slip Surface Endpoint: 958.668, 443.693
Right Slip Surface Endpoint: 1080.160, 466.118
Resisting Horizontal Force=37037.9 lb
Driving Horizontal Force=23061.4 lb

Method: spencer
FS: 1.842680
Axis Location: 996.295, 578.528
Left Slip Surface Endpoint: 957.212, 443.272
Right Slip Surface Endpoint: 1081.050, 466.108
Resisting Moment=5.41614e+006 lb-ft
Driving Moment=2.93928e+006 lb-ft
Resisting Horizontal Force=39891.4 lb
Driving Horizontal Force=21648.6 lb

[illegible]

Method: bishop simplified
Number of Valid Surfaces: 3980
Number of Invalid Surfaces: 1020
Error Codes:
Error Code -107 reported for 70 surfaces
Error Code -108 reported for 561 surfaces
Error Code -111 reported for 19 surfaces
Error Code -112 reported for 370 surfaces

Method: janbu simplified
Number of Valid Surfaces: 3937
Number of Invalid Surfaces: 1063
Error Codes:
Error Code -107 reported for 70 surfaces
Error Code -108 reported for 602 surfaces
Error Code -111 reported for 33 surfaces
Error Code -112 reported for 358 surfaces

Method: spencer
Number of Valid Surfaces: 2338
Number of Invalid Surfaces: 2662
Error Codes:
Error Code -107 reported for 70 surfaces
Error Code -108 reported for 1716 surfaces
Error Code -111 reported for 475 surfaces
Error Code -112 reported for 401 surfaces

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009

Client:	Honeywell	Project:	Onondaga Lake SCA 50% Design	Project/ Proposal No.:	GJ4299	Task No.:	05

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Material Boundary

948.793	433.500
958.000	433.500
1400.000	427.700

Material Boundary

978.000	441.524
997.000	441.309
998.500	441.292
1017.009	441.083
1018.508	441.066
1037.000	440.856
1038.500	440.839
1057.015	440.630
1058.509	440.613
1096.999	440.178
1098.506	440.161
1117.012	439.951
1118.512	439.934
1137.006	439.725
1138.505	439.708
1157.006	439.499
1158.500	439.482
1176.999	439.273
1178.492	439.256
1197.013	439.046
1198.512	439.029
1217.005	438.820
1218.499	438.803
1237.000	438.594
1238.506	438.577
1257.010	438.368
1258.509	438.351
1277.013	438.141
1278.513	438.124
1296.975	437.915
1298.469	437.899
1317.013	437.689
1318.507	437.672
1336.969	437.463
1338.469	437.446
1357.000	437.236
1358.510	437.219
1376.969	437.011
1378.475	436.993
1400.000	436.750

Material Boundary

998.000	447.048
1017.014	446.832
1018.514	446.815
1037.015	446.606
1038.521	446.589
1057.021	446.380
1058.520	446.363
1077.016	446.154
1078.515	446.137
1097.005	445.928
1098.523	445.910
1117.022	445.701
1118.509	445.684
1137.023	445.475
1138.511	445.458
1157.009	445.249
1158.509	445.232
1177.011	445.023
1178.494	445.006
1197.022	444.796
1198.509	444.779
1217.011	444.570
1218.511	444.553
1237.016	444.344
1238.509	444.327
1257.015	444.117
1258.515	444.101
1277.009	443.891
1278.515	443.874
1296.975	443.665
1298.475	443.648
1317.016	443.439
1318.515	443.422
1336.981	443.213
1338.481	443.196
1357.016	442.986
1358.516	442.969
1376.981	442.760
1378.481	442.743
1400.000	442.500

Material Boundary

998.000	447.298
1017.014	447.082
1018.514	447.066
1037.016	446.856

Written by: **Joseph Sura** Date: **4/3/2009** Reviewed by: **R. Kulasingam/Ming Zhu/Jay Beech** Date: **4/7/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA 50% Design** Project/ Proposal No.: **GJ4299** Task No.: **05**

1038.521	446.839
1057.021	446.630
1058.521	446.613
1077.016	446.404
1078.516	446.387
1097.005	446.178
1098.524	446.160
1117.022	445.951
1118.510	445.934
1137.024	445.725
1138.511	445.708
1157.010	445.499
1158.510	445.482
1177.011	445.273
1178.494	445.256
1197.022	445.046
1198.510	445.029
1217.011	444.820
1218.511	444.803
1237.016	444.594
1238.509	444.577
1257.016	444.368
1258.515	444.351
1277.010	444.141
1278.516	444.124
1296.975	443.915
1298.475	443.898
1317.016	443.689
1318.516	443.672
1336.981	443.463
1338.481	443.446
1357.016	443.236
1358.516	443.219
1376.981	443.010
1378.481	442.993
1400.000	442.750

Material Boundary

1018.000	452.821
1037.021	452.606
1038.521	452.589
1057.007	452.380
1058.501	452.363
1077.021	452.154
1078.527	452.137
1096.995	451.928
1098.501	451.911
1117.028	451.701
1118.527	451.684
1137.001	451.475
1138.501	451.458
1157.027	451.249
1158.521	451.232
1176.995	451.023
1178.495	451.006
1197.028	450.796
1198.521	450.779
1217.001	450.570
1218.501	450.553
1237.022	450.344
1238.515	450.327
1257.007	450.118
1258.501	450.101
1277.021	449.891
1278.521	449.874
1297.001	449.665
1298.501	449.648
1317.028	449.439
1318.521	449.422
1337.008	449.213
1338.501	449.196
1357.022	448.986
1358.521	448.969
1377.008	448.760
1378.508	448.743
1400.000	448.500

Material Boundary

1018.000	453.071
1037.022	452.856
1038.521	452.839
1057.007	452.630
1058.501	452.613
1077.022	452.404
1078.528	452.387
1096.996	452.178
1098.501	452.161
1117.028	451.951
1118.528	451.934
1137.002	451.725
1138.501	451.708
1157.028	451.499
1158.522	451.482
1176.996	451.273
1178.496	451.256
1197.028	451.046

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009
Client:	Honeywell	Project:	Onondaga Lake SCA 50% Design	Project/ Proposal No.:	GJ4299	Task No.:	05

1198.522	451.029
1217.001	450.820
1218.501	450.803
1237.022	450.594
1238.515	450.577
1257.007	450.368
1258.501	450.351
1277.022	450.141
1278.522	450.124
1297.002	449.915
1298.502	449.898
1317.028	449.689
1318.522	449.672
1337.008	449.463
1338.502	449.446
1357.022	449.236
1358.522	449.219
1377.008	449.010
1378.508	448.993
1400.000	448.750

Material Boundary

1038.000	458.595
1057.013	458.380
1058.512	458.363
1077.005	458.154
1078.505	458.137
1097.013	457.928
1098.513	457.911
1117.011	457.701
1118.498	457.685
1137.019	457.475
1138.507	457.458
1157.005	457.249
1158.498	457.232
1177.013	457.023
1178.518	457.006
1197.005	456.796
1198.498	456.779
1217.007	456.570
1218.501	456.553
1237.005	456.344
1238.511	456.327
1257.007	456.118
1258.507	456.101
1277.005	455.891
1278.505	455.874
1297.013	455.665
1298.513	455.648
1317.005	455.439
1318.505	455.422
1337.014	455.213
1338.507	455.196
1357.006	454.986
1358.511	454.969
1377.021	454.760
1378.513	454.743
1400.000	454.500

Material Boundary

1038.000	458.845
1057.013	458.630
1058.513	458.613
1077.006	458.404
1078.505	458.387
1097.013	458.178
1098.513	458.161
1117.011	457.951
1118.499	457.934
1137.020	457.725
1138.507	457.708
1157.005	457.499
1158.499	457.482
1177.013	457.273
1178.519	457.255
1197.006	457.046
1198.499	457.029
1217.007	456.820
1218.501	456.803
1237.006	456.594
1238.511	456.577
1257.007	456.368
1258.507	456.351
1277.005	456.141
1278.505	456.124
1297.014	455.915
1298.514	455.898
1317.005	455.689
1318.505	455.672
1337.014	455.463
1338.507	455.446
1357.006	455.236
1358.511	455.219
1377.021	455.010
1378.514	454.993
1400.000	454.750

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009

Client:	Honeywell	Project:	Onondaga Lake SCA 50% Design	Project/ Proposal No.:	GJ4299	Task No.:	05

Material Boundary

958.000	435.500
997.000	435.059
998.500	435.042
1037.000	434.606
1038.494	434.589
1077.000	434.154
1078.500	434.137
1117.000	433.701
1118.494	433.684
1156.994	433.249
1158.494	433.232
1197.006	432.796
1198.500	432.779
1236.994	432.344
1238.494	432.327
1277.007	431.891
1278.507	431.874
1317.007	431.439
1318.507	431.422
1357.000	430.986
1358.499	430.969
1400.000	430.500

Material Boundary

978.000	441.274
997.000	441.059
998.500	441.042
1017.008	440.832
1018.508	440.816
1037.000	440.606
1038.500	440.589
1057.015	440.380
1058.508	440.363
1077.006	440.154
1078.494	440.137
1096.999	439.928
1098.505	439.911
1117.012	439.701
1118.511	439.684
1137.005	439.475
1138.505	439.458
1157.006	439.249
1158.500	439.232
1176.999	439.023
1178.492	439.006
1197.012	438.796
1198.512	438.779
1217.005	438.570
1218.499	438.553
1237.000	438.344
1238.506	438.327
1257.009	438.118
1258.509	438.101
1277.013	437.891
1278.512	437.874
1296.975	437.665
1298.469	437.649
1317.013	437.439
1318.507	437.422
1336.969	437.213
1338.469	437.196
1357.000	436.986
1358.510	436.969
1376.969	436.761
1378.475	436.743
1400.000	436.500

Material Boundary

958.000	435.750
997.000	435.309
998.500	435.292
1037.000	434.856
1038.494	434.839
1077.000	434.404
1078.500	434.387
1117.001	433.951
1118.494	433.934
1156.994	433.499
1158.494	433.482
1197.007	433.046
1198.500	433.029
1236.994	432.594
1238.494	432.577
1277.007	432.141
1278.507	432.124
1317.007	431.689
1318.507	431.672
1357.000	431.236
1358.500	431.219
1400.000	430.750

Material Boundary

900.000	432.000
953.504	431.272

Written by: **Joseph Sura** Date: **4/3/2009** Reviewed by: **R. Kulasingam/Ming Zhu/Jay Beech** Date: **4/7/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA 50% Design** Project/ Proposal No.: **GJ4299** Task No.: **05**

1400.000 425.200

Material Boundary
661.000 436.500
748.000 412.600
789.000 386.700
835.000 386.800
980.000 376.600
1400.000 367.800

Material Boundary
942.667 435.500
947.793 433.500
953.504 431.272

Material Boundary
1357.000 430.986
1357.000 431.236
1357.000 436.986
1357.000 437.236

Material Boundary
1358.499 430.969
1358.500 431.219
1358.510 436.969
1358.510 437.219

Material Boundary
1277.007 431.891
1277.007 432.141
1277.013 437.891
1277.013 438.141

Material Boundary
1278.507 431.874
1278.507 432.124
1278.512 437.874
1278.513 438.124

Material Boundary
1317.007 431.439
1317.007 431.689
1317.013 437.439
1317.013 437.689

Material Boundary
1318.507 431.422
1318.507 431.672
1318.507 437.422
1318.507 437.672

Material Boundary
1077.000 434.154
1077.000 434.404
1077.006 440.154

Material Boundary
1078.494 440.137
1078.500 434.387
1078.500 434.137

Material Boundary
1117.000 433.701
1117.001 433.951
1117.012 439.701
1117.012 439.951

Material Boundary
1118.494 433.684
1118.494 433.934
1118.511 439.684
1118.512 439.934

Material Boundary
1156.994 433.249
1156.994 433.499
1157.006 439.249
1157.006 439.499

Material Boundary
1158.494 433.232
1158.494 433.482
1158.500 439.232
1158.500 439.482

Material Boundary
1197.006 432.796
1197.007 433.046
1197.012 438.796
1197.013 439.046

Material Boundary
1198.500 432.779
1198.500 433.029
1198.512 438.779
1198.512 439.029

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009

Client:	Honeywell	Project:	Onondaga Lake SCA 50% Design	Project/ Proposal No.:	GJ4299	Task No.:	05

Material Boundary

1236.994	432.344
1236.994	432.594
1237.000	438.344
1237.000	438.594

Material Boundary

1238.494	432.327
1238.494	432.577
1238.506	438.327
1238.506	438.577

Material Boundary

997.000	435.059
997.000	435.309
997.000	441.059
997.000	441.309

Material Boundary

998.500	435.042
998.500	435.292
998.500	441.042
998.500	441.292

Material Boundary

1037.000	434.606
1037.000	434.856
1037.000	440.606
1037.000	440.856

Material Boundary

1038.494	434.589
1038.494	434.839
1038.500	440.589
1038.500	440.839

Material Boundary

1296.975	437.665
1296.975	437.915
1296.975	443.665
1296.975	443.915

Material Boundary

1298.469	437.649
1298.469	437.899
1298.475	443.648
1298.475	443.898

Material Boundary

1336.969	437.213
1336.969	437.463
1336.981	443.213
1336.981	443.463

Material Boundary

1338.469	437.196
1338.469	437.446
1338.481	443.196
1338.481	443.446

Material Boundary

1376.969	436.761
1376.969	437.011
1376.981	442.760
1376.981	443.010

Material Boundary

1378.475	436.743
1378.475	436.993
1378.481	442.743
1378.481	442.993

Material Boundary

1257.009	438.118
1257.010	438.368
1257.015	444.117
1257.016	444.368

Material Boundary

1258.509	438.101
1258.509	438.351
1258.515	444.101
1258.515	444.351

Material Boundary

1096.999	439.928
1096.999	440.178
1097.005	445.928
1097.005	446.178

Material Boundary

1098.505	439.911
1098.506	440.161
1098.523	445.910
1098.524	446.160

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009
Client:	Honeywell	Project:	Onondaga Lake SCA 50% Design	Project/ Proposal No.:	GJ4299	Task No.:	05

Material Boundary

1137.005	439.475
1137.006	439.725
1137.023	445.475
1137.024	445.725

Material Boundary

1138.505	439.458
1138.505	439.708
1138.511	445.458
1138.511	445.708

Material Boundary

1176.999	439.023
1176.999	439.273
1177.011	445.023
1177.011	445.273

Material Boundary

1178.492	439.006
1178.492	439.256
1178.494	445.006
1178.494	445.256

Material Boundary

1217.005	438.570
1217.005	438.820
1217.011	444.570
1217.011	444.820

Material Boundary

1218.499	438.553
1218.499	438.803
1218.511	444.553
1218.511	444.803

Material Boundary

1017.008	440.832
1017.009	441.083
1017.014	446.832
1017.014	447.082

Material Boundary

1018.508	440.816
1018.508	441.066
1018.514	446.815
1018.514	447.066

Material Boundary

1057.015	440.380
1057.015	440.630
1057.021	446.380
1057.021	446.630

Material Boundary

1058.508	440.363
1058.509	440.613
1058.520	446.363
1058.521	446.613

Material Boundary

1037.015	446.606
1037.016	446.856
1037.021	452.606
1037.022	452.856

Material Boundary

1038.521	446.589
1038.521	446.839
1038.521	452.589
1038.521	452.839

Material Boundary

1077.016	446.154
1077.016	446.404
1077.021	452.154
1077.022	452.404

Material Boundary

1078.515	446.137
1078.516	446.387
1078.527	452.137
1078.528	452.387

Material Boundary

1117.022	445.701
1117.022	445.951
1117.028	451.701
1117.028	451.951

Material Boundary

1118.509	445.684
1118.510	445.934
1118.527	451.684
1118.528	451.934

Written by: **Joseph Sura** Date: **4/3/2009** Reviewed by: **R. Kulasingam/Ming Zhu/Jay Beech** Date: **4/7/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA 50% Design** Project/ Proposal No.: **GJ4299** Task No.: **05**

Material Boundary

1157.009	445.249
1157.010	445.499
1157.027	451.249
1157.028	451.499

Material Boundary

1158.509	445.232
1158.510	445.482
1158.521	451.232
1158.522	451.482

Material Boundary

1197.022	444.796
1197.022	445.046
1197.028	450.796
1197.028	451.046

Material Boundary

1198.509	444.779
1198.510	445.029
1198.521	450.779
1198.522	451.029

Material Boundary

1237.016	444.344
1237.016	444.594
1237.022	450.344
1237.022	450.594

Material Boundary

1238.509	444.327
1238.509	444.577
1238.515	450.327
1238.515	450.577

Material Boundary

1277.009	443.891
1277.010	444.141
1277.021	449.891
1277.022	450.141

Material Boundary

1278.515	443.874
1278.516	444.124
1278.521	449.874
1278.522	450.124

Material Boundary

1317.016	443.439
1317.016	443.689
1317.028	449.439
1317.028	449.689

Material Boundary

1318.515	443.422
1318.516	443.672
1318.521	449.422
1318.522	449.672

Material Boundary

1357.016	442.986
1357.016	443.236
1357.022	448.986
1357.022	449.236

Material Boundary

1358.516	442.969
1358.516	443.219
1358.521	448.969
1358.522	449.219

Material Boundary

1057.007	452.380
1057.007	452.630
1057.013	458.380
1057.013	458.630

Material Boundary

1058.501	452.363
1058.501	452.613
1058.512	458.363
1058.513	458.613

Material Boundary

1098.501	451.911
1098.501	452.161
1098.513	457.911
1098.513	458.161

Material Boundary

1096.995	451.928
1096.996	452.178
1097.013	457.928
1097.013	458.178

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009
Client:	Honeywell	Project:	Onondaga Lake SCA 50% Design	Project/ Proposal No.:	GJ4299	Task No.:	05

Material Boundary

1137.001	451.475
1137.002	451.725
1137.019	457.475
1137.020	457.725

Material Boundary

1138.501	451.458
1138.501	451.708
1138.507	457.458
1138.507	457.708

Material Boundary

1176.995	451.023
1176.996	451.273
1177.013	457.023
1177.013	457.273

Material Boundary

1178.495	451.006
1178.496	451.256
1178.518	457.006
1178.519	457.255

Material Boundary

1217.001	450.570
1217.001	450.820
1217.007	456.570
1217.007	456.820

Material Boundary

1218.501	450.553
1218.501	450.803
1218.501	456.553
1218.501	456.803

Material Boundary

1257.007	450.118
1257.007	450.368
1257.007	456.118
1257.007	456.368

Material Boundary

1258.501	450.101
1258.501	450.351
1258.507	456.101
1258.507	456.351

Material Boundary

1297.001	449.665
1297.002	449.915
1297.013	455.665
1297.014	455.915

Material Boundary

1298.501	449.648
1298.502	449.898
1298.513	455.648
1298.514	455.898

Material Boundary

1337.008	449.213
1337.008	449.463
1337.014	455.213
1337.014	455.463

Material Boundary

1338.501	449.196
1338.502	449.446
1338.507	455.196
1338.507	455.446

Material Boundary

1377.008	448.760
1377.008	449.010
1377.021	454.760
1377.021	455.010

Material Boundary

1378.508	448.743
1378.508	448.993
1378.513	454.743
1378.514	454.993

Material Boundary

1077.005	458.154
1077.006	458.404
1077.017	464.154

Material Boundary

1078.505	458.137
1078.505	458.387
1078.517	464.137

Material Boundary

Written by: **Joseph Sura** Date: **4/3/2009** Reviewed by: **R. Kulasingam/Ming Zhu/Jay Beech** Date: **4/7/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA 50% Design** Project/ Proposal No.: **GJ4299** Task No.: **05**

1117.011 457.701
1117.011 457.951
1117.011 463.701

Material Boundary
1118.498 457.685
1118.499 457.934
1118.511 463.684

Material Boundary
1157.005 457.249
1157.005 457.499
1157.011 463.249

Material Boundary
1158.498 457.232
1158.499 457.482
1158.511 463.232

Material Boundary
1197.005 456.796
1197.006 457.046
1197.017 462.796

Material Boundary
1198.498 456.779
1198.499 457.029
1198.517 462.779

Material Boundary
1237.005 456.344
1237.006 456.594
1237.024 462.344

Material Boundary
1238.511 456.327
1238.511 456.577
1238.517 462.327

Material Boundary
1277.005 455.891
1277.005 456.141
1277.011 461.891

Material Boundary
1278.505 455.874
1278.505 456.124
1278.505 461.874

Material Boundary
1317.005 455.439
1317.005 455.689
1317.011 461.439

Material Boundary
1318.505 455.422
1318.505 455.672
1318.517 461.422

Material Boundary
1357.006 454.986
1357.006 455.236
1357.017 460.986

Material Boundary
1358.511 454.969
1358.511 455.219
1358.511 460.969

Material Boundary
943.667 435.500
948.793 433.500

Material Boundary
940.000 436.600
942.667 435.500

Material Boundary
943.667 435.500
958.000 435.500
958.000 435.750
958.000 441.500
978.000 441.274
978.000 441.524
978.000 447.274
998.000 447.048
998.000 447.298
998.000 453.048
1018.000 452.821
1018.000 453.071
1018.000 458.821
1038.000 458.595
1038.000 458.845
1038.000 464.595
1077.017 464.154
1078.517 464.137

Written by: **Joseph Sura** Date: **4/3/2009** Reviewed by: **R. Kulasingam/Ming Zhu/Jay Beech** Date: **4/7/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA 50% Design** Project/ Proposal No.: **GJ4299** Task No.: **05**

1117.011	463.701
1118.511	463.684
1157.011	463.249
1158.511	463.232
1197.017	462.796
1198.517	462.779
1237.024	462.344
1238.517	462.327
1277.011	461.891
1278.505	461.874
1317.011	461.439
1318.517	461.422
1357.017	460.986
1358.511	460.969
1400.000	460.500

Material Boundary

934.093	436.600
940.000	436.600
941.000	436.600
943.667	435.500

External Boundary

934.093	436.600
912.000	436.600
900.000	432.000
661.000	436.500
638.000	432.900
555.000	396.200
483.000	398.300
461.000	390.500
307.000	386.700
277.000	373.000
1.726	374.590
1.726	167.800
1400.000	167.800
1400.000	367.800
1400.000	425.200
1400.000	427.700
1400.000	430.500
1400.000	430.750
1400.000	436.500
1400.000	436.750
1400.000	442.500
1400.000	442.750
1400.000	448.500
1400.000	448.750
1400.000	454.500
1400.000	454.750
1400.000	460.500
1400.000	462.500
1038.000	466.595
1018.000	460.821
998.000	455.048
978.000	449.274
958.000	443.500

Piezo Line

946.230	434.500
948.793	434.500
958.000	434.500
1400.000	428.700

Water Table

715.262	421.594
900.000	417.000
935.504	416.272
1400.000	410.200

Focus/Block Search Line

1038.000	458.625
1077.014	458.394

Focus/Block Search Point

1078.516	464.136

Focus/Block Search Point

1077.014	458.394

Support

1358.511	460.969
1400.000	460.500

Support

1400.000	454.750
1400.000	460.500

Support

1400.000	454.750
1358.511	455.219

Support

1358.511	455.219
1358.511	460.969

Support

1378.513	454.743
1378.508	448.993

Support

1378.508	448.993
1400.000	448.750

Support

1400.000	448.750
1400.000	454.500

Support

1400.000	454.500
1378.513	454.743

Support

1400.000	448.500
1400.000	442.750

Support

1400.000	442.750
1358.516	443.219

Support

1358.516	443.219
1358.521	448.969

Support

1358.521	448.969
1400.000	448.500

Support

1400.000	442.500
1400.000	436.750

Support

1400.000	436.750
1378.475	436.993

Support

1378.475	436.993
1378.481	442.743

Support

1378.481	442.743
1400.000	442.500

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009

Client:	Honeywell	Project:	Onondaga Lake SCA 50% Design	Project/ Proposal No.:	GJ4299	Task No.:	05

Slide Analysis Information

□□□□□ □□□□□□ □

File Name: NorthSide_Cover_Liner_I_Lab.sli

P□□□□□□□□□□□□□

Project Title: SLIDE - An Interactive Slope Stability Program
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

A□□□□□□ M□□□□□□

Analysis Methods used:
Bishop simplified
Janbu simplified
Spencer

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50

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Surface Type: Non-Circular Block Search
Number of Surfaces: 5000
Pseudo-Random Surfaces: Enabled
Convex Surfaces Only: Disabled
Left Projection Angle (Start Angle): 95
Left Projection Angle (End Angle): 175
Right Projection Angle (Start Angle): 5
Right Projection Angle (End Angle): 85
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

M□□□□□□□P□□□□□□□□

Material: Final Cover Soil
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 30 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Dike Soil
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 35 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Gravel
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 38 degrees
Water Surface: Piezometric Line 1
Custom Hu value: 1

Material: SOLW (undrained)
Strength Type: Discrete function
Unit Weight: 82 lb/ft3
Water Surface: Water Table
Custom Hu value: 1

Material: Dredge Material
Strength Type: Mohr-Coulomb
Unit Weight: 86 lb/ft3
Cohesion: 0 psf
Friction Angle: 15 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Tube-Tube Interface (Horizontal)
Strength Type: Mohr-Coulomb
Unit Weight: 86 lb/ft3
Cohesion: 0 psf
Friction Angle: 15 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Tub-Tube Interface (Vertical)
Strength Type: Mohr-Coulomb
Unit Weight: 43 lb/ft3
Cohesion: 0 psf

Written by:	**Joseph Sura**	Date:	**4/3/2009**	Reviewed by:	**R. Kulasingam/Ming Zhu/Jay Beech**	Date:	**4/7/2009**
Client:	**Honeywell**	Project:	**Onondaga Lake SCA 50% Design**	Project/ Proposal No.:	**GJ4299**	Task No.:	**05**

Friction Angle: 0.1 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Tube-Gravel Interface
Strength Type: Mohr-Coulomb
Unit Weight: 86 lb/ft3
Cohesion: 0 psf
Friction Angle: 24 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Liner
Strength Type: Mohr-Coulomb
Unit Weight: 100 lb/ft3
Cohesion: 0 psf
Friction Angle: 19 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Foundation
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 37 degrees
Water Surface: Water Table
Custom Hu value: 1

[illegible]
Support: Geotube
Geotube
Support Type: GeoTextile
Force Application: Passive
Force Orientation: Tangent to Slip Surface
Anchorage: Both Ends
Shear Strength Model: Linear
Strip Coverage: 100 percent
Tensile Strength: 1600 lb/ft
Pullout Strength Adhesion: 5 lb/ft2
Pullout Strength Friction Angle: 40 degrees

[illegible]
Method: bishop simplified
FS: 1.672370
Axis Location: 980.377, 593.071
Left Slip Surface Endpoint: 938.169, 437.777
Right Slip Surface Endpoint: 1079.288, 466.128
Resisting Moment=8.67639e+006 lb-ft
Driving Moment=5.18808e+006 lb-ft

Method: janbu simplified
FS: 1.604750
Axis Location: 980.377, 593.071
Left Slip Surface Endpoint: 938.169, 437.777
Right Slip Surface Endpoint: 1079.288, 466.128
Resisting Horizontal Force=55843.7 lb
Driving Horizontal Force=34799.1 lb

Method: spencer
FS: 2.184250
Axis Location: 968.036, 617.483
Left Slip Surface Endpoint: 914.486, 436.600
Right Slip Surface Endpoint: 1080.612, 466.113
Resisting Moment=1.20949e+007 lb-ft
Driving Moment=5.53732e+006 lb-ft
Resisting Horizontal Force=66120.4 lb
Driving Horizontal Force=30271.5 lb

[illegible]
Method: bishop simplified
Number of Valid Surfaces: 3668
Number of Invalid Surfaces: 1332
Error Codes:
Error Code -108 reported for 51 surfaces
Error Code -110 reported for 3 surfaces
Error Code -111 reported for 66 surfaces
Error Code -112 reported for 1212 surfaces

Method: janbu simplified
Number of Valid Surfaces: 3624
Number of Invalid Surfaces: 1376
Error Codes:
Error Code -108 reported for 52 surfaces
Error Code -110 reported for 3 surfaces
Error Code -111 reported for 89 surfaces
Error Code -112 reported for 1232 surfaces

Method: spencer
Number of Valid Surfaces: 2845
Number of Invalid Surfaces: 2155
Error Codes:
Error Code -108 reported for 652 surfaces
Error Code -110 reported for 3 surfaces
Error Code -111 reported for 175 surfaces
Error Code -112 reported for 1325 surfaces

Written by: **Joseph Sura** Date: **4/3/2009** Reviewed by: **R. Kulasingam/Ming Zhu/Jay Beech** Date: **4/7/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA 50% Design** Project/ Proposal No.: **GJ4299** Task No.: **05**

Slide Analysis Information

□□□□□ □□□□□□ □

File Name:
NorthSide_Cover_Global_Su_Lab.sli

P□□□□□□□□□□□□□

Project Title: SLIDE - An Interactive Slope Stability Program
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

A□□□□□□□ M□□□□□□

Analysis Methods used:
Bishop simplified
Janbu simplified
Spencer

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50

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Surface Type: Circular
Search Method: Grid Search
Radius increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Create Tension Crack
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

M□□□□□□□P□□□□□□□□

Material: Final Cover Soil
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 30 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Dike Soil
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 35 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Gravel
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 38 degrees
Water Surface: Piezometric Line 1
Custom Hu value: 1

Material: SOLW (undrained)
Strength Type: Discrete function
Unit Weight: 82 lb/ft3
Water Surface: Water Table
Custom Hu value: 1

Material: Dredge Material
Strength Type: Mohr-Coulomb
Unit Weight: 86 lb/ft3
Cohesion: 0 psf
Friction Angle: 15 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Tube-Tube Interface (Horizontal)
Strength Type: Mohr-Coulomb
Unit Weight: 86 lb/ft3
Cohesion: 0 psf
Friction Angle: 15 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Tub-Tube Interface (Vertical)
Strength Type: Mohr-Coulomb

Unit Weight: 43 lb/ft3
Cohesion: 0 psf
Friction Angle: 0.1 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Tube-Gravel Interface
Strength Type: Mohr-Coulomb
Unit Weight: 86 lb/ft3
Cohesion: 0 psf
Friction Angle: 24 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Liner
Strength Type: Mohr-Coulomb
Unit Weight: 100 lb/ft3
Cohesion: 0 psf
Friction Angle: 19 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Foundation
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 37 degrees
Water Surface: Water Table
Custom Hu value: 1

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Support: Geotube
Geotube
Support Type: GeoTextile
Force Application: Passive
Force Orientation: Tangent to Slip Surface
Anchorage: Both Ends
Shear Strength Model: Linear
Strip Coverage: 100 percent
Tensile Strength: 1600 lb/ft
Pullout Strength Adhesion: 5 lb/ft2
Pullout Strength Friction Angle: 40 degrees

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Method: bishop simplified
FS: 1.483420
Center: 968.528, 517.918
Radius: 113.858
Left Slip Surface Endpoint: 893.681, 432.119
Right Slip Surface Endpoint: 1069.979, 466.233
Resisting Moment=1.50304e+007 lb-ft
Driving Moment=1.01322e+007 lb-ft

Method: janbu simplified
FS: 1.416210
Center: 968.528, 517.918
Radius: 113.858
Left Slip Surface Endpoint: 893.681, 432.119
Right Slip Surface Endpoint: 1069.979, 466.233
Resisting Horizontal Force=112469 lb
Driving Horizontal Force=79415.4 lb

Method: spencer
FS: 1.480300
Center: 968.528, 517.918
Radius: 113.858
Left Slip Surface Endpoint: 893.681, 432.119
Right Slip Surface Endpoint: 1069.979, 466.233
Resisting Moment=1.49987e+007 lb-ft
Driving Moment=1.01322e+007 lb-ft
Resisting Horizontal Force=112267 lb
Driving Horizontal Force=75840.8 lb

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Method: bishop simplified
Number of Valid Surfaces: 2641
Number of Invalid Surfaces: 2111
Error Codes:
Error Code -107 reported for 1452 surfaces
Error Code -108 reported for 2 surfaces
Error Code -110 reported for 51 surfaces
Error Code -112 reported for 460 surfaces
Error Code -113 reported for 53 surfaces
Error Code -116 reported for 93 surfaces

Method: janbu simplified
Number of Valid Surfaces: 2485
Number of Invalid Surfaces: 2267
Error Codes:
Error Code -107 reported for 1452 surfaces
Error Code -108 reported for 146 surfaces
Error Code -110 reported for 51 surfaces
Error Code -111 reported for 3 surfaces

Error Code -112 reported for 469 surfaces
Error Code -113 reported for 53 surfaces
Error Code -116 reported for 93 surfaces

Method: spencer
Number of Valid Surfaces: 1244
Number of Invalid Surfaces: 3508
Error Codes:
Error Code -107 reported for 1452 surfaces
Error Code -108 reported for 204 surfaces
Error Code -110 reported for 51 surfaces
Error Code -111 reported for 1178 surfaces
Error Code -112 reported for 477 surfaces
Error Code -113 reported for 53 surfaces
Error Code -116 reported for 93 surfaces

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009
Client:	Honeywell	Project:	Onondaga Lake SCA 50% Design	Project/ Proposal No.:	GJ4299	Task No.:	05

Slide Analysis Information

Document Name

File Name: NorthSide_Cover_LongTerm_Lab.sli

Project Summary

Project Title: SLIDE - An Interactive Slope Stability Program
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
Bishop simplified
Janbu simplified
Spencer

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Create Tension Crack
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Material Properties

Material: Final Cover Soil
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 30 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Dike Soil
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 35 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Gravel
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 38 degrees
Water Surface: Piezometric Line 1
Custom Hu value: 1

Material: SOLW (Drained)
Strength Type: Mohr-Coulomb
Unit Weight: 82 lb/ft3
Cohesion: 0 psf
Friction Angle: 34 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Dredge Material (Long)
Strength Type: Mohr-Coulomb
Unit Weight: 86 lb/ft3
Cohesion: 0 psf
Friction Angle: 30 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Tube-Tube Interface (Horizontal)
Strength Type: Mohr-Coulomb
Unit Weight: 86 lb/ft3
Cohesion: 0 psf
Friction Angle: 15 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Tub-Tube Interface (Vertical)
Strength Type: Mohr-Coulomb

Unit Weight: 43 lb/ft3
Cohesion: 0 psf
Friction Angle: 0.1 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Tube-Gravel Interface
Strength Type: Mohr-Coulomb
Unit Weight: 86 lb/ft3
Cohesion: 0 psf
Friction Angle: 24 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Liner
Strength Type: Mohr-Coulomb
Unit Weight: 100 lb/ft3
Cohesion: 0 psf
Friction Angle: 19 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Foundation
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 37 degrees
Water Surface: Water Table
Custom Hu value: 1

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Support: Geotube (Long Term)
Geotube (Long Term)
Support Type: GeoTextile
Force Application: Passive
Force Orientation: Tangent to Slip Surface
Anchorage: Both Ends
Shear Strength Model: Linear
Strip Coverage: 100 percent
Tensile Strength: 0.1 lb/ft
Pullout Strength Adhesion: 5 lb/ft2
Pullout Strength Friction Angle: 40 degrees

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Method: bishop simplified
FS: 2.000700
Center: 920.957, 533.689
Radius: 96.944
Left Slip Surface Endpoint: 945.977, 440.030
Right Slip Surface Endpoint: 949.691, 441.102
Resisting Moment=319.946 lb-ft
Driving Moment=159.917 lb-ft

Method: janbu simplified
FS: 1.996180
Center: 962.317, 543.934
Radius: 112.424
Left Slip Surface Endpoint: 928.872, 436.600
Right Slip Surface Endpoint: 1043.849, 466.529
Resisting Horizontal Force=66487.9 lb
Driving Horizontal Force=33307.6 lb

Method: spencer
FS: 2.000720
Center: 920.957, 533.689
Radius: 96.944
Left Slip Surface Endpoint: 945.977, 440.030
Right Slip Surface Endpoint: 949.691, 441.102
Resisting Moment=319.949 lb-ft
Driving Moment=159.917 lb-ft
Resisting Horizontal Force=3.17091 lb
Driving Horizontal Force=1.58488 lb

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Method: bishop simplified
Number of Valid Surfaces: 1985
Number of Invalid Surfaces: 3067
Error Codes:
Error Code -106 reported for 9 surfaces
Error Code -107 reported for 1371 surfaces
Error Code -108 reported for 91 surfaces
Error Code -110 reported for 46 surfaces
Error Code -112 reported for 692 surfaces
Error Code -113 reported for 203 surfaces
Error Code -116 reported for 94 surfaces
Error Code -1000 reported for 561 surfaces

Method: janbu simplified
Number of Valid Surfaces: 1996
Number of Invalid Surfaces: 3056
Error Codes:
Error Code -106 reported for 9 surfaces
Error Code -107 reported for 1371 surfaces

Error Code -108 reported for 101 surfaces
Error Code -110 reported for 46 surfaces
Error Code -111 reported for 1 surface
Error Code -112 reported for 670 surfaces
Error Code -113 reported for 203 surfaces
Error Code -116 reported for 94 surfaces
Error Code -1000 reported for 561 surfaces

<u>Method: spencer</u>
Number of Valid Surfaces: 1957
Number of Invalid Surfaces: 3095
Error Codes:
Error Code -106 reported for 9 surfaces
Error Code -107 reported for 1371 surfaces
Error Code -108 reported for 111 surfaces
Error Code -110 reported for 46 surfaces
Error Code -111 reported for 3 surfaces
Error Code -112 reported for 697 surfaces
Error Code -113 reported for 203 surfaces
Error Code -116 reported for 94 surfaces
Error Code -1000 reported for 561 surfaces

Written by: **Joseph Sura** Date: **4/3/2009** Reviewed by: **R. Kulasingam/Ming Zhu/Jay Beech** Date: **4/7/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA 50% Design** Project/ Proposal No.: **GJ4299** Task No.: **05**

Slide Analysis Information

[illegible]

File Name: NorthSide_Cover_External_Lab.sli

P[illegible]

Project Title: SLIDE - An Interactive Slope Stability Program
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

A[illegible] M[illegible]

Analysis Methods used:
Bishop simplified
Janbu simplified
Spencer

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50

[illegible]

Surface Type: Circular
Search Method: Grid Search
Radius increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Create Tension Crack
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

M[illegible] P[illegible]

Material: Final Cover Soil
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 30 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Dike Soil
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 35 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Gravel
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 38 degrees
Water Surface: Piezometric Line 1
Custom Hu value: 1

Material: SOLW (undrained)
Strength Type: Discrete function
Unit Weight: 82 lb/ft3
Water Surface: Water Table
Custom Hu value: 1

Material: Dredge Material
Strength Type: Mohr-Coulomb
Unit Weight: 86 lb/ft3
Cohesion: 0 psf
Friction Angle: 15 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Tube-Tube Interface (Horizontal)
Strength Type: Mohr-Coulomb
Unit Weight: 86 lb/ft3
Cohesion: 0 psf
Friction Angle: 15 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Tub-Tube Interface (Vertical)
Strength Type: Mohr-Coulomb
Unit Weight: 43 lb/ft3
Cohesion: 0 psf

Friction Angle: 0.1 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Tube-Gravel Interface
Strength Type: Mohr-Coulomb
Unit Weight: 86 lb/ft3
Cohesion: 0 psf
Friction Angle: 24 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Liner
Strength Type: Mohr-Coulomb
Unit Weight: 100 lb/ft3
Cohesion: 0 psf
Friction Angle: 19 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Foundation
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 37 degrees
Water Surface: Water Table
Custom Hu value: 1

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Support: Geotube
Geotube
Support Type: GeoTextile
Force Application: Passive
Force Orientation: Tangent to Slip Surface
Anchorage: Both Ends
Shear Strength Model: Linear
Strip Coverage: 100 percent
Tensile Strength: 1600 lb/ft
Pullout Strength Adhesion: 5 lb/ft2
Pullout Strength Friction Angle: 40 degrees

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Method: bishop simplified
FS: 3.248820
Center: 866.814, 1086.360
Radius: 682.354
Left Slip Surface Endpoint: 659.492, 436.264
Right Slip Surface Endpoint: 1149.538, 465.333
Resisting Moment=2.16755e+008 lb-ft
Driving Moment=6.67182e+007 lb-ft

Method: janbu simplified
FS: 3.255920
Center: 866.814, 1086.360
Radius: 682.354
Left Slip Surface Endpoint: 659.492, 436.264
Right Slip Surface Endpoint: 1149.538, 465.333
Resisting Horizontal Force=310309 lb
Driving Horizontal Force=95305.9 lb

Method: spencer
FS: 3.248080
Center: 866.814, 1086.360
Radius: 682.354
Left Slip Surface Endpoint: 659.492, 436.264
Right Slip Surface Endpoint: 1149.538, 465.333
Resisting Moment=2.16706e+008 lb-ft
Driving Moment=6.67182e+007 lb-ft
Resisting Horizontal Force=310231 lb
Driving Horizontal Force=95512.4 lb

□□□□ □□□□□□□ □□□□□□□□

Method: bishop simplified
Number of Valid Surfaces: 868
Number of Invalid Surfaces: 3939
Error Codes:
Error Code -101 reported for 4 surfaces
Error Code -107 reported for 67 surfaces
Error Code -110 reported for 1060 surfaces
Error Code -113 reported for 3 surfaces
Error Code -1000 reported for 2805 surfaces

Method: janbu simplified
Number of Valid Surfaces: 867
Number of Invalid Surfaces: 3940
Error Codes:
Error Code -101 reported for 4 surfaces
Error Code -107 reported for 67 surfaces
Error Code -108 reported for 1 surface
Error Code -110 reported for 1060 surfaces
Error Code -113 reported for 3 surfaces
Error Code -1000 reported for 2805 surfaces

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009
Client:	Honeywell	Project:	Onondaga Lake SCA 50% Design	Project/ Proposal No.:	GJ4299	Task No.:	05

Method: spencer
Number of Valid Surfaces: 735
Number of Invalid Surfaces: 4072
Error Codes:
Error Code -101 reported for 4 surfaces
Error Code -107 reported for 67 surfaces
Error Code -108 reported for 3 surfaces
Error Code -110 reported for 1060 surfaces
Error Code -111 reported for 130 surfaces
Error Code -113 reported for 3 surfaces
Error Code -1000 reported for 2805 surfaces

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009

Client:	Honeywell	Project:	Onondaga Lake SCA 50% Design	Project/ Proposal No.:	GJ4299	Task No.:	05

Slide Analysis Information

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File Name: NorthSide_Cover_External_LongTerm_Lab.sli

P□□□□□□□□□□□□□

Project Title: SLIDE - An Interactive Slope Stability Program
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

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Analysis Methods used:
Bishop simplified
Janbu simplified
Spencer

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50

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Surface Type: Circular
Search Method: Grid Search
Radius increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Create Tension Crack
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

M□□□□□□□P□□□□□□□□

Material: Final Cover Soil
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 30 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Dike Soil
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 35 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Gravel
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 38 degrees
Water Surface: Piezometric Line 1
Custom Hu value: 1

Material: SOLW (Drained)
Strength Type: Mohr-Coulomb
Unit Weight: 82 lb/ft3
Cohesion: 0 psf
Friction Angle: 34 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Dredge Material (Long)
Strength Type: Mohr-Coulomb
Unit Weight: 86 lb/ft3
Cohesion: 0 psf
Friction Angle: 30 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Tube-Tube Interface (Horizontal)
Strength Type: Mohr-Coulomb
Unit Weight: 86 lb/ft3
Cohesion: 0 psf
Friction Angle: 15 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Tub-Tube Interface (Vertical)
Strength Type: Mohr-Coulomb
Unit Weight: 43 lb/ft3
Cohesion: 0 psf
Friction Angle: 0.1 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Tube-Gravel Interface
Strength Type: Mohr-Coulomb
Unit Weight: 86 lb/ft3
Cohesion: 0 psf
Friction Angle: 24 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Liner
Strength Type: Mohr-Coulomb
Unit Weight: 100 lb/ft3
Cohesion: 0 psf
Friction Angle: 19 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Foundation
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 37 degrees
Water Surface: Water Table
Custom Hu value: 1

□□□□□□□P□□□□□□□□

Support: Geotube (Long Term)
Geotube (Long Term)
Support Type: GeoTextile
Force Application: Passive
Force Orientation: Tangent to Slip Surface
Anchorage: Both Ends
Shear Strength Model: Linear
Strip Coverage: 100 percent
Tensile Strength: 0.1 lb/ft
Pullout Strength Adhesion: 5 lb/ft2
Pullout Strength Friction Angle: 40 degrees

□□□□□□M□□□ □□ □

Method: bishop simplified
FS: 3.438800
Center: 819.842, 1201.710
Radius: 782.304
Left Slip Surface Endpoint: 658.815, 436.158
Right Slip Surface Endpoint: 1085.940, 466.053
Resisting Moment=1.00679e+008 lb-ft
Driving Moment=2.92773e+007 lb-ft

Method: janbu simplified
FS: 3.391630
Center: 819.842, 1201.710
Radius: 782.304
Left Slip Surface Endpoint: 658.815, 436.158
Right Slip Surface Endpoint: 1085.940, 466.053
Resisting Horizontal Force=126037 lb
Driving Horizontal Force=37161.1 lb

Method: spencer
FS: 3.451200
Center: 819.842, 1201.710
Radius: 782.304
Left Slip Surface Endpoint: 658.815, 436.158
Right Slip Surface Endpoint: 1085.940, 466.053
Resisting Moment=1.01042e+008 lb-ft
Driving Moment=2.92773e+007 lb-ft
Resisting Horizontal Force=126552 lb
Driving Horizontal Force=36668.8 lb

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Method: bishop simplified
Number of Valid Surfaces: 868
Number of Invalid Surfaces: 3939
Error Codes:
Error Code -101 reported for 4 surfaces
Error Code -107 reported for 67 surfaces
Error Code -110 reported for 1060 surfaces
Error Code -113 reported for 3 surfaces
Error Code -1000 reported for 2805 surfaces

Method: janbu simplified
Number of Valid Surfaces: 868
Number of Invalid Surfaces: 3939
Error Codes:
Error Code -101 reported for 4 surfaces
Error Code -107 reported for 67 surfaces
Error Code -110 reported for 1060 surfaces

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009

Client:	Honeywell	Project:	Onondaga Lake SCA 50% Design	Project/ Proposal No.:	GJ4299	Task No.:	05

Error Code -113 reported for 3 surfaces
Error Code -1000 reported for 2805 surfaces

Method: spencer
Number of Valid Surfaces: 867
Number of Invalid Surfaces: 3940
Error Codes:
Error Code -101 reported for 4 surfaces
Error Code -107 reported for 67 surfaces
Error Code -108 reported for 1 surface
Error Code -110 reported for 1060 surfaces
Error Code -113 reported for 3 surfaces
Error Code -1000 reported for 2805 surfaces

Written by:	**Joseph Sura**	Date:	**4/3/2009**	Reviewed by:	**R. Kulasingam/Ming Zhu/Jay Beech**	Date:	**4/7/2009**
Client:	**Honeywell**	Project:	**Onondaga Lake SCA 50% Design**	Project/ Proposal No.:	**GJ4299**	Task No.:	**05**

Cross-Section B-B: Before Placement of Final Cover

Slide Analysis Information

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File Name: EastWest_NoCover_Tube_04_Lab.sli

P□□□□□□□□□□□□□□

Project Title: SLIDE - An Interactive Slope Stability Program
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

A□□□□□□ M□□□□□□

Analysis Methods used:
Bishop simplified
Janbu simplified
Spencer

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50

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Surface Type: Non-Circular Block Search
Number of Surfaces: 500
Pseudo-Random Surfaces: Enabled
Convex Surfaces Only: Disabled
Left Projection Angle (Start Angle): 95
Left Projection Angle (End Angle): 175
Right Projection Angle (Start Angle): 5
Right Projection Angle (End Angle): 85
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

M□□□□□□□P□□□□□□□□

Material: Final Cover Soil
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 30 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Dike Soil
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 35 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Gravel
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 38 degrees
Water Surface: Piezometric Line 1
Custom Hu value: 1

Material: SOLW (undrained)
Strength Type: Discrete function
Unit Weight: 82 lb/ft3
Water Surface: Water Table
Custom Hu value: 1

Material: Dredge Material
Strength Type: Mohr-Coulomb
Unit Weight: 86 lb/ft3
Cohesion: 0 psf
Friction Angle: 15 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Tube-Tube Interface (Horizontal)
Strength Type: Mohr-Coulomb
Unit Weight: 86 lb/ft3
Cohesion: 0 psf
Friction Angle: 15 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Tub-Tube Interface (Vertical)

Written by: **Joseph Sura** Date: **4/3/2009** Reviewed by: **R. Kulasingam/Ming Zhu/Jay Beech** Date: **4/7/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA 50% Design** Project/ Proposal No.: **GJ4299** Task No.: **05**

Strength Type: Mohr-Coulomb
Unit Weight: 43 lb/ft3
Cohesion: 0 psf
Friction Angle: 0.1 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Tube-Gravel Interface
Strength Type: Mohr-Coulomb
Unit Weight: 86 lb/ft3
Cohesion: 0 psf
Friction Angle: 24 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Liner
Strength Type: Mohr-Coulomb
Unit Weight: 100 lb/ft3
Cohesion: 0 psf
Friction Angle: 19 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Foundation
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 37 degrees
Water Surface: Water Table
Custom Hu value: 1

□□□□□□□P□□□□□□□□

Support: Geotube
Geotube
Support Type: GeoTextile
Force Application: Passive
Force Orientation: Tangent to Slip Surface
Anchorage: Both Ends
Shear Strength Model: Linear
Strip Coverage: 100 percent
Tensile Strength: 1600 lb/ft
Pullout Strength Adhesion: 5 lb/ft2
Pullout Strength Friction Angle: 40 degrees

□□□□□□M□□□ □□ □

Method: bishop simplified
FS: 7.286630
Axis Location: 357.794, 794.745
Left Slip Surface Endpoint: 208.000, 436.563
Right Slip Surface Endpoint: 554.463, 460.000
Left Slope Intercept: 208.000 442.000
Right Slope Intercept: 554.463 460.000
Resisting Moment=5.89609e+007 lb-ft
Driving Moment=8.09165e+006 lb-ft

Method: janbu simplified
FS: 7.684780
Axis Location: 357.794, 794.745
Left Slip Surface Endpoint: 208.000, 436.563
Right Slip Surface Endpoint: 554.463, 460.000
Left Slope Intercept: 208.000 442.000
Right Slope Intercept: 554.463 460.000
Resisting Horizontal Force=162764 lb
Driving Horizontal Force=21180.1 lb

Method: spencer
Resisting Moment=0 lb-ft
Driving Moment=0 lb-ft
Resisting Horizontal Force=0 lb
Driving Horizontal Force=0 lb

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Method: bishop simplified
Number of Valid Surfaces: 77
Number of Invalid Surfaces: 423
Error Codes:
Error Code -107 reported for 287 surfaces
Error Code -108 reported for 135 surfaces
Error Code -112 reported for 1 surface

Method: janbu simplified
Number of Valid Surfaces: 59
Number of Invalid Surfaces: 441
Error Codes:
Error Code -107 reported for 287 surfaces
Error Code -108 reported for 153 surfaces
Error Code -112 reported for 1 surface

Method: spencer
Number of Valid Surfaces: 0
Number of Invalid Surfaces: 500
Error Codes:
Error Code -107 reported for 287 surfaces
Error Code -108 reported for 170 surfaces
Error Code -111 reported for 42 surfaces
Error Code -112 reported for 1 surface

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009

Client:	Honeywell	Project:	Onondaga Lake SCA 50% Design	Project/ Proposal No.:	GJ4299	Task No.:	05

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Material Boundary

0.000	427.500
122.000	424.650
122.359	424.645
177.171	423.910
204.000	423.550
405.000	420.750
472.000	422.050
768.000	422.250
805.000	423.150
925.000	423.250
1165.000	428.350
1347.000	425.150
1436.000	426.150
1642.000	424.450
1786.163	426.261
1841.000	426.950
1841.123	426.953

Material Boundary

122.000	424.500
122.359	424.645

Material Boundary

166.176	430.000
173.133	426.959
347.000	423.600
600.000	423.600
640.000	424.000
728.000	424.000
1102.000	431.000
1176.000	431.000
1356.000	428.000
1474.000	427.500
1619.000	426.500
1689.000	426.500
1790.000	428.000
1798.000	431.000

Material Boundary

1827.000	432.300
1841.123	426.953

Material Boundary

188.000	430.000
824.000	430.000
1161.000	433.000
1236.000	432.000
1400.000	431.000
1778.100	431.000

Material Boundary

188.000	430.250
506.200	430.250
507.700	430.250
824.000	430.250
824.200	430.252
825.700	430.265
1142.148	433.082
1143.812	433.097
1161.000	433.250
1236.000	432.250
1400.000	431.250
1460.199	431.250
1461.784	431.250
1778.100	431.250

Material Boundary

208.000	436.000
506.200	436.000
507.700	436.000
824.000	436.000
824.200	436.002
825.700	436.015
1142.148	438.832
1143.812	438.847
1161.000	439.000
1236.000	438.000
1400.000	437.000
1460.199	437.000
1461.784	437.000
1758.000	437.000

Material Boundary

208.000	436.250
466.200	436.250
467.700	436.250
724.201	436.250
725.697	436.250
824.000	436.250
982.197	437.658
983.718	437.672
1161.000	439.250

Written by: **Joseph Sura** Date: **4/3/2009** Reviewed by: **R. Kulasingam/Ming Zhu/Jay Beech** Date: **4/7/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA 50% Design** Project/ Proposal No.: **GJ4299** Task No.: **05**

1236.000	438.250
1240.193	438.224
1241.724	438.215
1400.000	437.250
1498.182	437.250
1499.766	437.250
1758.000	437.250

Material Boundary

228.000	442.000
466.200	442.000
467.700	442.000
724.201	442.000
725.697	442.000
824.000	442.000
982.197	443.408
983.718	443.422
1161.000	445.000
1236.000	444.000
1240.193	443.974
1241.724	443.965
1400.000	443.000
1498.182	443.000
1499.766	443.000
1738.000	443.000

Material Boundary

228.000	442.250
530.200	442.250
531.700	442.250
824.000	442.250
832.191	442.323
833.715	442.336
1134.188	445.011
1135.719	445.025
1161.000	445.250
1236.000	444.250
1400.000	443.250
1436.205	443.250
1437.780	443.250
1738.000	443.250

Material Boundary

248.000	448.000
530.200	448.000
531.700	448.000
824.000	448.000
832.191	448.073
833.715	448.086
1134.188	450.761
1135.719	450.775
1161.000	451.000
1236.000	450.000
1400.000	449.000
1436.205	449.000
1437.780	449.000
1718.000	449.000

Material Boundary

248.000	448.250
493.200	448.250
494.700	448.250
738.195	448.250
739.701	448.250
824.000	448.250
983.182	449.667
984.724	449.681
1161.000	451.250
1228.192	450.354
1229.723	450.334
1236.000	450.250
1400.000	449.250
1473.204	449.250
1474.788	449.250
1718.000	449.250

Material Boundary

268.000	454.000
493.200	454.000
494.700	454.000
738.195	454.000
739.701	454.000
824.000	454.000
983.182	455.417
984.724	455.431
1161.000	457.000
1228.192	456.104
1229.723	456.084
1236.000	456.000
1400.000	455.000
1473.204	455.000
1474.788	455.000
1698.000	455.000

Material Boundary

268.000	454.250

Written by: **Joseph Sura** Date: **4/3/2009** Reviewed by: **R. Kulasingam/Ming Zhu/Jay Beech** Date: **4/7/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA 50% Design** Project/ Proposal No.: **GJ4299** Task No.: **05**

554.200 454.250
555.700 454.250
824.000 454.250
840.193 454.394
841.706 454.408
1126.178 456.940
1127.707 456.954
1161.000 457.250
1236.000 456.250
1400.000 455.250
1412.195 455.250
1413.743 455.250
1698.000 455.250

Material Boundary
506.200 430.250
506.200 436.000

Material Boundary
507.700 430.250
507.700 436.000

Material Boundary
466.200 436.250
466.200 442.000

Material Boundary
467.700 436.250
467.700 442.000

Material Boundary
530.200 442.250
530.200 448.000

Material Boundary
531.700 442.250
531.700 448.000

Material Boundary
493.200 448.250
493.200 454.000

Material Boundary
494.700 448.250
494.700 454.000

Material Boundary
554.200 454.250
554.200 460.000

Material Boundary
555.700 454.250
555.700 460.000

Material Boundary
824.200 430.252
824.200 436.002

Material Boundary
825.700 430.265
825.700 436.015

Material Boundary
724.201 436.250
724.201 442.000

Material Boundary
725.697 436.250
725.697 442.000

Material Boundary
738.195 448.250
738.195 454.000

Material Boundary
739.701 448.250
739.701 454.000

Material Boundary
840.193 454.394
840.193 460.144

Material Boundary
841.706 454.408
841.706 460.158

Material Boundary
832.191 442.323
832.191 448.073

Material Boundary
833.715 442.336
833.715 448.086

Material Boundary
982.197 437.658

Written by: **Joseph Sura** Date: **4/3/2009** Reviewed by: **R. Kulasingam/Ming Zhu/Jay Beech** Date: **4/7/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA 50% Design** Project/ Proposal No.: **GJ4299** Task No.: **05**

982.197 443.408

Material Boundary
983.182 449.667
983.182 455.417

Material Boundary
983.718 437.672
983.718 443.422

Material Boundary
984.724 449.681
984.724 455.431

Material Boundary
1134.188 445.011
1134.188 450.761

Material Boundary
1135.719 445.025
1135.719 450.775

Material Boundary
1436.205 443.250
1436.205 449.000

Material Boundary
1437.780 443.250
1437.780 449.000

Material Boundary
1126.178 456.940
1126.178 462.690

Material Boundary
1127.707 456.954
1127.707 462.704

Material Boundary
1142.148 433.082
1142.148 438.832

Material Boundary
1143.812 433.097
1143.812 438.847

Material Boundary
1228.192 450.354

1228.192 456.104

Material Boundary
1229.723 450.334
1229.723 456.084

Material Boundary
1240.193 438.224
1240.193 443.974

Material Boundary
1241.724 438.215
1241.724 443.965

Material Boundary
1412.195 455.250
1412.195 461.000

Material Boundary
1413.743 455.250
1413.743 461.000

Material Boundary
1460.199 431.250
1460.199 437.000

Material Boundary
1461.784 431.250
1461.784 437.000

Material Boundary
1498.182 437.250
1498.182 443.000

Material Boundary
1499.766 437.250
1499.766 443.000

Material Boundary
1473.204 449.250
1473.204 455.000

Material Boundary
1474.788 449.250
1474.788 455.000

Material Boundary
165.176 430.000

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009

Client:	Honeywell	Project:	Onondaga Lake SCA 50% Design	Project/ Proposal No.:	GJ4299	Task No.:	05

177.171 423.910

Material Boundary
0.000 387.500
1979.000 390.050

Material Boundary
1786.163 426.261
1799.372 431.000

Material Boundary
164.400 430.400
165.176 430.000

Material Boundary
1799.372 431.000
1803.000 432.300

External Boundary
1798.000 431.000
1778.100 431.000
1778.100 431.250
1778.100 437.000
1758.000 437.000
1758.000 437.250
1758.000 443.000
1738.000 443.000
1738.000 443.250
1738.000 449.000
1718.000 449.000
1718.000 449.250
1718.000 455.000
1698.000 455.000
1698.000 455.250
1698.000 461.000
1413.743 461.000
1412.195 461.000
1400.000 461.000
1236.000 462.000
1161.000 463.000
1127.707 462.704
1126.178 462.690
841.706 460.158
840.193 460.144
824.000 460.000
555.700 460.000
554.200 460.000
268.000 460.000
268.000 454.250
268.000 454.000
248.000 454.000
248.000 448.250
248.000 448.000
228.000 448.000
228.000 442.250
228.000 442.000
208.000 442.000
208.000 436.250
208.000 436.000
188.000 436.000
188.000 430.250
188.000 430.000
166.176 430.000
165.257 430.401
164.400 430.400
136.600 430.400
122.359 424.645
0.000 427.500
0.000 387.500
0.000 347.500
1979.000 350.000
1979.000 390.050
1979.000 430.050
1841.123 426.953
1841.000 427.000
1827.000 432.300
1803.000 432.300
1801.461 432.301

Piezo Line
170.846 427.959
173.133 427.959
347.000 424.600
600.000 424.600
640.000 425.000
728.000 425.000
1102.000 432.000
1176.000 432.000
1356.000 429.000
1474.000 428.500
1619.000 427.500
1689.000 427.500
1790.000 429.000
1792.668 429.000

Water Table

Written by: **Joseph Sura** Date: **4/3/2009** Reviewed by: **R. Kulasingam/Ming Zhu/Jay Beech** Date: **4/7/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA 50% Design** Project/ Proposal No.: **GJ4299** Task No.: **05**

0.000	412.500
204.000	408.550
405.000	405.750
472.000	407.050
557.156	407.108
768.000	407.250
805.000	408.150
925.000	408.250
1165.000	413.350
1347.000	410.150
1436.000	411.150
1642.000	409.450
1768.160	411.260
1841.123	411.953
1979.000	415.050

Focus/Block Search Line

268.000	454.014
554.268	454.169

Focus/Block Search Point

555.549	460.000

Focus/Block Search Point

554.268	454.169

Focus/Block Search Point

268.276	454.014

Support

554.200	454.250
554.200	460.000

Support

554.200	460.000
268.000	460.000

Support

268.000	454.000
248.000	454.000

Support

248.000	454.000
248.000	448.250

Support

248.000	448.250
493.200	448.250

Support

493.200	454.000
493.200	448.250

Support

268.000	460.000
268.000	454.250

Support

268.000	454.250
554.200	454.250

Support

555.700	454.250
555.700	460.000

Support

555.700	460.000
824.000	460.000

Support

824.000	460.000
840.193	460.144

Support

840.193	460.144
840.193	454.394

Support

840.193	454.394
824.000	454.250

Support

824.000	454.250
555.700	454.250

Support

738.195	454.000
738.195	448.250

Support

739.701	454.000
739.701	448.250

Support

738.195	454.000
494.700	454.000

Written by: **Joseph Sura** Date: **4/3/2009** Reviewed by: **R. Kulasingam/Ming Zhu/Jay Beech** Date: **4/7/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA 50% Design** Project/ Proposal No.: **GJ4299** Task No.: **05**

Support
494.700 454.000
494.700 448.250

Support
494.700 448.250
738.195 448.250

Support
724.201 442.000
724.201 436.250

Support
724.201 436.250
467.700 436.250

Support
467.700 436.250
467.700 442.000

Support
467.700 442.000
724.201 442.000

Support
228.000 448.000
228.000 442.250

Support
248.000 448.000
530.200 448.000

Support
530.200 448.000
530.200 442.250

Support
531.700 442.250
531.700 448.000

Support
530.200 442.250
228.000 442.250

Support
228.000 448.000
248.000 448.000

Support
208.000 436.250
208.000 442.000

Support
208.000 442.000
228.000 442.000

Support
228.000 442.000
466.200 442.000

Support
466.200 442.000
466.200 436.250

Support
466.200 436.250
208.000 436.250

Support
188.000 430.250
188.000 436.000

Support
188.000 436.000
208.000 436.000

Support
208.000 436.000
506.200 436.000

Support
507.700 436.000
507.700 430.250

Support
506.200 436.000
506.200 430.250

Support
506.200 430.250
188.000 430.250

Support
507.700 430.250
824.200 430.252

Written by: **Joseph Sura** Date: **4/3/2009** Reviewed by: **R. Kulasingam/Ming Zhu/Jay Beech** Date: **4/7/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA 50% Design** Project/ Proposal No.: **GJ4299** Task No.: **05**

Support
824.200 430.252
824.200 436.002

Support
824.200 436.002
507.700 436.000

Support
832.191 442.323
832.191 448.073

Support
833.715 442.336
833.715 448.086

Support
832.191 448.073
824.000 448.000

Support
824.000 448.000
531.700 448.000

Support
531.700 442.250
824.000 442.250

Support
824.000 442.250
832.191 442.323

Support
841.706 460.158
841.706 454.408

Support
825.700 436.015
825.700 430.265

Support
725.697 442.000
725.697 436.250

Support
725.697 436.250
824.000 436.250

Support
824.000 436.250
982.197 437.658

Support
982.197 437.658
982.197 443.408

Support
982.197 443.408
824.000 442.000

Support
824.000 442.000
725.697 442.000

Support
739.701 448.250
824.000 448.250

Support
824.000 448.250
983.182 449.667

Support
983.182 449.667
983.182 455.417

Support
983.182 455.417
824.000 454.000

Support
824.000 454.000
739.701 454.000

Support
841.706 454.408
1126.178 456.940

Support
1126.178 456.940
1126.178 462.690

Support
1126.178 462.690
841.706 460.158

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009
Client:	Honeywell	Project:	Onondaga Lake SCA 50% Design	Project/ Proposal No.:	GJ4299	Task No.:	05

Support
833.715 448.086
1134.188 450.761

Support
1134.188 450.761
1134.188 445.011

Support
1134.188 445.011
833.715 442.336

Support
825.700 436.015
1142.148 438.832

Support
1142.148 438.832
1142.148 433.082

Support
1142.148 433.082
825.700 430.265

Support
984.724 455.431
984.724 449.681

Support
983.718 443.422
983.718 437.672

Support
983.718 437.672
1161.000 439.250

Support
1161.000 439.250
1236.000 438.250

Support
1236.000 438.250
1240.193 438.224

Support
1240.193 438.224
1240.193 443.974

Support
1240.193 443.974
1236.000 444.000

Support
1236.000 444.000
1161.000 445.000

Support
1161.000 445.000
983.718 443.422

Support
984.724 455.431
1161.000 457.000

Support
1161.000 457.000
1228.192 456.104

Support
1228.192 456.104
1228.192 450.354

Support
1228.192 450.354
1161.000 451.250

Support
1161.000 451.250
984.724 449.681

Support
268.000 454.000
493.200 454.000

Support
1127.707 462.704
1127.707 456.954

Support
1127.707 462.704
1161.000 463.000

Support
1161.000 463.000
1236.000 462.000

Written by: **Joseph Sura** Date: **4/3/2009** Reviewed by: **R. Kulasingam/Ming Zhu/Jay Beech** Date: **4/7/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA 50% Design** Project/ Proposal No.: **GJ4299** Task No.: **05**

Support
1236.000 462.000
1400.000 461.000

Support
1400.000 461.000
1412.195 461.000

Support
1412.195 461.000
1412.195 455.250

Support
1412.195 455.250
1400.000 455.250

Support
1400.000 455.250
1236.000 456.250

Support
1236.000 456.250
1161.000 457.250

Support
1161.000 457.250
1127.707 456.954

Support
1135.719 450.775
1135.719 445.025

Support
1135.719 450.775
1161.000 451.000

Support
1161.000 445.250
1135.719 445.025

Support
1161.000 445.250
1236.000 444.250

Support
1236.000 444.250
1400.000 443.250

Support
1400.000 443.250
1436.205 443.250

Support
1436.205 443.250
1436.205 449.000

Support
1437.780 449.000
1437.780 443.250

Support
1436.205 449.000
1400.000 449.000

Support
1400.000 449.000
1236.000 450.000

Support
1236.000 450.000
1161.000 451.000

Support
1229.723 456.084
1229.723 450.334

Support
1229.723 450.334
1236.000 450.250

Support
1236.000 456.000
1229.723 456.084

Support
1236.000 456.000
1400.000 455.000

Support
1400.000 455.000
1473.204 455.000

Support
1473.204 455.000
1473.204 449.250

Written by: **Joseph Sura** Date: **4/3/2009** Reviewed by: **R. Kulasingam/Ming Zhu/Jay Beech** Date: **4/7/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA 50% Design** Project/ Proposal No.: **GJ4299** Task No.: **05**

Support
1474.788 449.250
1474.788 455.000

Support
1473.204 449.250
1400.000 449.250

Support
1400.000 449.250
1236.000 450.250

Support
1241.724 438.215
1241.724 443.965

Support
1143.812 438.847
1143.812 433.097

Support
1143.812 433.097
1161.000 433.250

Support
1161.000 439.000
1143.812 438.847

Support
1161.000 439.000
1236.000 438.000

Support
1236.000 438.000
1400.000 437.000

Support
1400.000 437.000
1460.199 437.000

Support
1460.199 437.000
1460.199 431.250

Support
1461.784 431.250
1461.784 437.000

Support
1460.199 431.250
1400.000 431.250

Support
1400.000 431.250
1236.000 432.250

Support
1236.000 432.250
1161.000 433.250

Support
1241.724 438.215
1400.000 437.250

Support
1400.000 437.250
1498.182 437.250

Support
1498.182 443.000
1498.182 437.250

Support
1499.766 437.250
1499.766 443.000

Support
1498.182 443.000
1400.000 443.000

Support
1400.000 443.000
1241.724 443.965

Support
1413.743 461.000
1413.743 455.250

Support
1413.743 461.000
1698.000 461.000

Support
1698.000 461.000
1698.000 455.250

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009
Client:	Honeywell	Project:	Onondaga Lake SCA 50% Design	Project/ Proposal No.:	GJ4299	Task No.:	05

Support
1698.000 455.250
1413.743 455.250

Support
1474.788 449.250
1718.000 449.250

Support
1718.000 449.250
1718.000 455.000

Support
1698.000 455.000
1474.788 455.000

Support
1461.784 431.250
1778.100 431.250

Support
1778.100 431.250
1778.100 437.000

Support
1758.000 437.000
1461.784 437.000

Support
1437.780 443.250
1738.000 443.250

Support
1738.000 443.250
1738.000 449.000

Support
1718.000 449.000
1437.780 449.000

Support
1499.766 437.250
1758.000 437.250

Support
1758.000 437.250
1758.000 443.000

Support
1738.000 443.000
1499.766 443.000

Support
1718.000 455.000
1698.000 455.000

Support
1718.000 449.000
1738.000 449.000

Support
1738.000 443.000
1758.000 443.000

Support
1758.000 437.000
1778.100 437.000

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009

Client:	Honeywell	Project:	Onondaga Lake SCA 50% Design	Project/ Proposal No.:	GJ4299	Task No.:	05

Slide Analysis Information

□□□□□ □□□□□□□ □

File Name: EastWest_NoCover_Liner_Lab.sli

P□□□□□□□□□□□□

Project Title: SLIDE - An Interactive Slope Stability Program
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

A□□□□□□□ M□□□□□□

Analysis Methods used:
Bishop simplified
Janbu simplified
Spencer

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50

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Surface Type: Non-Circular Block Search
Number of Surfaces: 5000
Pseudo-Random Surfaces: Enabled
Convex Surfaces Only: Disabled
Left Projection Angle (Start Angle): 95
Left Projection Angle (End Angle): 175
Right Projection Angle (Start Angle): 5
Right Projection Angle (End Angle): 85
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

M□□□□□□□P□□□□□□□□

Material: Final Cover Soil
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 30 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Dike Soil
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 35 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Gravel
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 38 degrees
Water Surface: Piezometric Line 1
Custom Hu value: 1

Material: SOLW (undrained)
Strength Type: Discrete function
Unit Weight: 82 lb/ft3
Water Surface: Water Table
Custom Hu value: 1

Material: Dredge Material
Strength Type: Mohr-Coulomb
Unit Weight: 86 lb/ft3
Cohesion: 0 psf
Friction Angle: 15 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Tube-Tube Interface (Horizontal)
Strength Type: Mohr-Coulomb
Unit Weight: 86 lb/ft3
Cohesion: 0 psf
Friction Angle: 15 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Tub-Tube Interface (Vertical)
Strength Type: Mohr-Coulomb
Unit Weight: 43 lb/ft3
Cohesion: 0 psf
Friction Angle: 0.1 degrees
Water Surface: Water Table

Written by:	**Joseph Sura**	Date:	**4/3/2009**	Reviewed by:	**R. Kulasingam/Ming Zhu/Jay Beech**	Date:	**4/7/2009**
Client:	**Honeywell**	Project:	**Onondaga Lake SCA 50% Design**	Project/ Proposal No.:	**GJ4299**	Task No.:	**05**

Custom Hu value: 1

Material: Tube-Gravel Interface
Strength Type: Mohr-Coulomb
Unit Weight: 86 lb/ft3
Cohesion: 0 psf
Friction Angle: 24 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Liner
Strength Type: Mohr-Coulomb
Unit Weight: 100 lb/ft3
Cohesion: 0 psf
Friction Angle: 19 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Foundation
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 37 degrees
Water Surface: Water Table
Custom Hu value: 1

□□□□□□□P□□□□□□□

Support: Geotube
Geotube
Support Type: GeoTextile
Force Application: Passive
Force Orientation: Tangent to Slip Surface
Anchorage: Both Ends
Shear Strength Model: Linear
Strip Coverage: 100 percent
Tensile Strength: 1600 lb/ft
Pullout Strength Adhesion: 5 lb/ft2
Pullout Strength Friction Angle: 40 degrees

□□□□□□M□□□ □□ □

Method: bishop simplified
FS: 2.021260
Axis Location: 206.790, 581.778
Left Slip Surface Endpoint: 168.400, 430.000
Right Slip Surface Endpoint: 305.179, 460.000
Resisting Moment=1.28832e+007 lb-ft
Driving Moment=6.37384e+006 lb-ft

Method: janbu simplified
FS: 2.062140
Axis Location: 206.790, 581.778
Left Slip Surface Endpoint: 168.400, 430.000
Right Slip Surface Endpoint: 305.179, 460.000
Resisting Horizontal Force=75770.2 lb
Driving Horizontal Force=36743.5 lb

Method: spencer
FS: 2.007080
Axis Location: 206.790, 581.778
Left Slip Surface Endpoint: 168.400, 430.000
Right Slip Surface Endpoint: 305.179, 460.000
Resisting Moment=1.29191e+007 lb-ft
Driving Moment=6.43674e+006 lb-ft
Resisting Horizontal Force=75710.4 lb
Driving Horizontal Force=37721.6 lb

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Method: bishop simplified
Number of Valid Surfaces: 3194
Number of Invalid Surfaces: 1806
Error Codes:
Error Code -107 reported for 449 surfaces
Error Code -108 reported for 706 surfaces
Error Code -110 reported for 19 surfaces
Error Code -111 reported for 10 surfaces
Error Code -112 reported for 622 surfaces

Method: janbu simplified
Number of Valid Surfaces: 3004
Number of Invalid Surfaces: 1996
Error Codes:
Error Code -107 reported for 449 surfaces
Error Code -108 reported for 964 surfaces
Error Code -110 reported for 19 surfaces
Error Code -111 reported for 18 surfaces
Error Code -112 reported for 546 surfaces

Method: spencer
Number of Valid Surfaces: 522
Number of Invalid Surfaces: 4478
Error Codes:
Error Code -107 reported for 449 surfaces
Error Code -108 reported for 1393 surfaces
Error Code -110 reported for 19 surfaces
Error Code -111 reported for 1982 surfaces
Error Code -112 reported for 635 surfaces

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009

Client:	Honeywell	Project:	Onondaga Lake SCA 50% Design	Project/ Proposal No.:	GJ4299	Task No.:	05

Slide Analysis Information

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File Name: EastWest_NoCover_Global_Su_Lab.sli

P□□□□□□□□□□□□□

Project Title: SLIDE - An Interactive Slope Stability Program
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

A□□□□□□□ M□□□□□□

Analysis Methods used:
Bishop simplified
Janbu simplified
Spencer

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50

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Surface Type: Circular
Search Method: Grid Search
Radius increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Create Tension Crack
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

M□□□□□□□P□□□□□□□□

Material: Final Cover Soil
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 30 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Dike Soil
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 35 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Gravel
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 38 degrees
Water Surface: Piezometric Line 1
Custom Hu value: 1

Material: SOLW (undrained)
Strength Type: Discrete function
Unit Weight: 82 lb/ft3
Water Surface: Water Table
Custom Hu value: 1

Material: Dredge Material
Strength Type: Mohr-Coulomb
Unit Weight: 86 lb/ft3
Cohesion: 0 psf
Friction Angle: 15 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Tube-Tube Interface (Horizontal)
Strength Type: Mohr-Coulomb
Unit Weight: 86 lb/ft3
Cohesion: 0 psf
Friction Angle: 15 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Tub-Tube Interface (Vertical)
Strength Type: Mohr-Coulomb
Unit Weight: 43 lb/ft3

Written by: **Joseph Sura** Date: **4/3/2009** Reviewed by: **R. Kulasingam/Ming Zhu/Jay Beech** Date: **4/7/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA 50% Design** Project/ Proposal No.: **GJ4299** Task No.: **05**

Cohesion: 0 psf
Friction Angle: 0.1 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Tube-Gravel Interface
Strength Type: Mohr-Coulomb
Unit Weight: 86 lb/ft3
Cohesion: 0 psf
Friction Angle: 24 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Liner
Strength Type: Mohr-Coulomb
Unit Weight: 100 lb/ft3
Cohesion: 0 psf
Friction Angle: 19 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Foundation
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 37 degrees
Water Surface: Water Table
Custom Hu value: 1

[illegible]P[illegible]

Support: Geotube
Geotube
Support Type: GeoTextile
Force Application: Passive
Force Orientation: Tangent to Slip Surface
Anchorage: Both Ends
Shear Strength Model: Linear
Strip Coverage: 100 percent
Tensile Strength: 1600 lb/ft
Pullout Strength Adhesion: 5 lb/ft2
Pullout Strength Friction Angle: 40 degrees

[illegible]M[illegible]

Method: bishop simplified
FS: 1.513050
Center: 235.509, 489.351
Radius: 84.874
Left Slip Surface Endpoint: 174.838, 430.000
Right Slip Surface Endpoint: 315.146, 460.000
Resisting Moment=8.47269e+006 lb-ft
Driving Moment=5.59976e+006 lb-ft

Method: janbu simplified
FS: 1.451530
Center: 208.705, 543.147
Radius: 155.107
Left Slip Surface Endpoint: 108.238, 424.975
Right Slip Surface Endpoint: 339.643, 460.000
Resisting Horizontal Force=158709 lb
Driving Horizontal Force=109339 lb

Method: spencer
FS: 1.516370
Center: 208.705, 556.595
Radius: 165.435
Left Slip Surface Endpoint: 108.489, 424.969
Right Slip Surface Endpoint: 343.011, 460.000
Resisting Moment=2.8756e+007 lb-ft
Driving Moment=1.89637e+007 lb-ft
Resisting Horizontal Force=154756 lb
Driving Horizontal Force=102057 lb

[illegible]

Method: bishop simplified
Number of Valid Surfaces: 1267
Number of Invalid Surfaces: 3595
Error Codes:
Error Code -103 reported for 2769 surfaces
Error Code -106 reported for 109 surfaces
Error Code -107 reported for 213 surfaces
Error Code -108 reported for 69 surfaces
Error Code -110 reported for 34 surfaces
Error Code -112 reported for 248 surfaces
Error Code -116 reported for 153 surfaces

Method: janbu simplified
Number of Valid Surfaces: 1062
Number of Invalid Surfaces: 3800
Error Codes:
Error Code -103 reported for 2769 surfaces
Error Code -106 reported for 109 surfaces
Error Code -107 reported for 213 surfaces
Error Code -108 reported for 270 surfaces

Written by: **Joseph Sura** Date: **4/3/2009** Reviewed by: **R. Kulasingam/Ming Zhu/Jay Beech** Date: **4/7/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA 50% Design** Project/ Proposal No.: **GJ4299** Task No.: **05**

Error Code -110 reported for 34 surfaces
Error Code -111 reported for 3 surfaces
Error Code -112 reported for 249 surfaces
Error Code -116 reported for 153 surfaces

Method: spencer
Number of Valid Surfaces: 628
Number of Invalid Surfaces: 4234
Error Codes:
Error Code -103 reported for 2769 surfaces
Error Code -106 reported for 109 surfaces
Error Code -107 reported for 213 surfaces
Error Code -108 reported for 325 surfaces
Error Code -110 reported for 34 surfaces
Error Code -111 reported for 377 surfaces
Error Code -112 reported for 254 surfaces
Error Code -116 reported for 153 surfaces

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009

Client:	Honeywell	Project:	Onondaga Lake SCA 50% Design	Project/ Proposal No.:	GJ4299	Task No.:	05

Slide Analysis Information

[illegible]

File Name: EastWest_NoCover_External_Lab.sli

P[illegible]

Project Title: SLIDE - An Interactive Slope Stability Program
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

A[illegible] M[illegible]

Analysis Methods used:
Bishop simplified
Janbu simplified
Spencer

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50

[illegible]

Surface Type: Circular
Search Method: Grid Search
Radius increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Create Tension Crack
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

M[illegible] P[illegible]

Material: Final Cover Soil
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 30 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Dike Soil
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 35 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Gravel
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 38 degrees
Water Surface: Piezometric Line 1
Custom Hu value: 1

Material: SOLW (undrained)
Strength Type: Discrete function
Unit Weight: 82 lb/ft3
Water Surface: Water Table
Custom Hu value: 1

Material: Dredge Material
Strength Type: Mohr-Coulomb
Unit Weight: 86 lb/ft3
Cohesion: 0 psf
Friction Angle: 15 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Tube-Tube Interface (Horizontal)
Strength Type: Mohr-Coulomb
Unit Weight: 86 lb/ft3
Cohesion: 0 psf
Friction Angle: 15 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Tub-Tube Interface (Vertical)
Strength Type: Mohr-Coulomb
Unit Weight: 43 lb/ft3

Cohesion: 0 psf
Friction Angle: 0.1 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Tube-Gravel Interface
Strength Type: Mohr-Coulomb
Unit Weight: 86 lb/ft3
Cohesion: 0 psf
Friction Angle: 24 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Liner
Strength Type: Mohr-Coulomb
Unit Weight: 100 lb/ft3
Cohesion: 0 psf
Friction Angle: 19 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Foundation
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 37 degrees
Water Surface: Water Table
Custom Hu value: 1

[illegible]

Support: Geotube
Geotube
Support Type: GeoTextile
Force Application: Passive
Force Orientation: Tangent to Slip Surface
Anchorage: Both Ends
Shear Strength Model: Linear
Strip Coverage: 100 percent
Tensile Strength: 1600 lb/ft
Pullout Strength Adhesion: 5 lb/ft2
Pullout Strength Friction Angle: 40 degrees

[illegible]

Method: bishop simplified
FS: 10.135800
Center: -135.799, 3669.491
Radius: 3285.601
Left Slip Surface Endpoint: -731.846, 438.406
Right Slip Surface Endpoint: 567.298, 460.000
Resisting Moment=3.08629e+009 lb-ft
Driving Moment=3.04492e+008 lb-ft

Method: janbu simplified
FS: 10.148100
Center: -135.799, 3669.491
Radius: 3285.601
Left Slip Surface Endpoint: -731.846, 438.406
Right Slip Surface Endpoint: 567.298, 460.000
Resisting Horizontal Force=933845 lb
Driving Horizontal Force=92021.8 lb

Method: spencer
FS: 10.136500
Center: -135.799, 3669.491
Radius: 3285.601
Left Slip Surface Endpoint: -731.846, 438.406
Right Slip Surface Endpoint: 567.298, 460.000
Resisting Moment=3.08649e+009 lb-ft
Driving Moment=3.04492e+008 lb-ft
Resisting Horizontal Force=933895 lb
Driving Horizontal Force=92131.9 lb

[illegible]

Method: bishop simplified
Number of Valid Surfaces: 6541
Number of Invalid Surfaces: 11950
Error Codes:
Error Code -107 reported for 53 surfaces
Error Code -110 reported for 1627 surfaces
Error Code -113 reported for 425 surfaces
Error Code -1000 reported for 9845 surfaces

Method: janbu simplified
Number of Valid Surfaces: 6537
Number of Invalid Surfaces: 11954
Error Codes:
Error Code -107 reported for 53 surfaces
Error Code -108 reported for 4 surfaces
Error Code -110 reported for 1627 surfaces
Error Code -113 reported for 425 surfaces
Error Code -1000 reported for 9845 surfaces

Method: spencer

Written by:	**Joseph Sura**	Date:	**4/3/2009**	Reviewed by:	**R. Kulasingam/Ming Zhu/Jay Beech**	Date:	**4/7/2009**
Client:	**Honeywell**	Project:	**Onondaga Lake SCA 50% Design**	Project/ Proposal No.:	**GJ4299**	Task No.:	**05**

Number of Valid Surfaces: 6168
Number of Invalid Surfaces: 12323
Error Codes:
Error Code -107 reported for 53 surfaces
Error Code -108 reported for 30 surfaces
Error Code -110 reported for 1627 surfaces
Error Code -111 reported for 343 surfaces
Error Code -113 reported for 425 surfaces
Error Code -1000 reported for 9845 surfaces

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009
Client:	Honeywell	Project:	Onondaga Lake SCA 50% Design	Project/ Proposal No.:	GJ4299	Task No.:	05

Cross-Section B-B: After Placement of Final Cover

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009
Client:	Honeywell	Project:	Onondaga Lake SCA 50% Design	Project/ Proposal No.:	GJ4299	Task No.:	05

Slide Analysis Information

[illegible]

File Name: EastWest_Cover_Tube_04_Lab.sli

P[illegible]

Project Title: SLIDE - An Interactive Slope Stability Program
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

A[illegible] M[illegible]

Analysis Methods used:
Bishop simplified
Janbu simplified
Spencer

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50

[illegible]

Surface Type: Non-Circular Block Search
Number of Surfaces: 5000
Pseudo-Random Surfaces: Enabled
Convex Surfaces Only: Disabled
Left Projection Angle (Start Angle): 95
Left Projection Angle (End Angle): 175
Right Projection Angle (Start Angle): 5
Right Projection Angle (End Angle): 85
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

M[illegible] P[illegible]

Material: Final Cover Soil
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 30 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Dike Soil
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 35 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Gravel
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 38 degrees
Water Surface: Piezometric Line 1
Custom Hu value: 1

Material: SOLW (undrained)
Strength Type: Discrete function
Unit Weight: 82 lb/ft3
Water Surface: Water Table
Custom Hu value: 1

Material: Dredge Material
Strength Type: Mohr-Coulomb
Unit Weight: 86 lb/ft3
Cohesion: 0 psf
Friction Angle: 15 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Tube-Tube Interface (Horizontal)
Strength Type: Mohr-Coulomb
Unit Weight: 86 lb/ft3
Cohesion: 0 psf
Friction Angle: 15 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Tub-Tube Interface (Vertical)

Strength Type: Mohr-Coulomb
Unit Weight: 43 lb/ft3
Cohesion: 0 psf
Friction Angle: 0.1 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Tube-Gravel Interface
Strength Type: Mohr-Coulomb
Unit Weight: 86 lb/ft3
Cohesion: 0 psf
Friction Angle: 24 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Liner
Strength Type: Mohr-Coulomb
Unit Weight: 100 lb/ft3
Cohesion: 0 psf
Friction Angle: 19 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Foundation
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 37 degrees
Water Surface: Water Table
Custom Hu value: 1

□□□□□□□P□□□□□□□

Support: Geotube
Geotube
Support Type: GeoTextile
Force Application: Passive
Force Orientation: Tangent to Slip Surface
Anchorage: Both Ends
Shear Strength Model: Linear
Strip Coverage: 100 percent
Tensile Strength: 1600 lb/ft
Pullout Strength Adhesion: 5 lb/ft2
Pullout Strength Friction Angle: 40 degrees

□□□□□□M□□□ □□ □

Method: bishop simplified
FS: 6.343380
Axis Location: 324.954, 765.418
Left Slip Surface Endpoint: 190.649, 438.795
Right Slip Surface Endpoint: 505.669, 462.000
Resisting Moment=5.80387e+007 lb-ft
Driving Moment=9.14949e+006 lb-ft

Method: janbu simplified
FS: 6.668040
Axis Location: 355.727, 824.205
Left Slip Surface Endpoint: 191.775, 439.132
Right Slip Surface Endpoint: 565.414, 462.000
Resisting Horizontal Force=185422 lb
Driving Horizontal Force=27807.6 lb

Method: spencer
Resisting Moment=0 lb-ft
Driving Moment=0 lb-ft
Resisting Horizontal Force=0 lb
Driving Horizontal Force=0 lb

□□□□ □□□□□□□ □□□□□□□□

Method: bishop simplified
Number of Valid Surfaces: 810
Number of Invalid Surfaces: 4190
Error Codes:
Error Code -107 reported for 2114 surfaces
Error Code -108 reported for 2050 surfaces
Error Code -112 reported for 26 surfaces

Method: janbu simplified
Number of Valid Surfaces: 675
Number of Invalid Surfaces: 4325
Error Codes:
Error Code -107 reported for 2114 surfaces
Error Code -108 reported for 2189 surfaces
Error Code -112 reported for 22 surfaces

Method: spencer
Number of Valid Surfaces: 0
Number of Invalid Surfaces: 5000
Error Codes:
Error Code -107 reported for 2114 surfaces
Error Code -108 reported for 2364 surfaces
Error Code -111 reported for 495 surfaces
Error Code -112 reported for 27 surfaces

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009
Client:	Honeywell	Project:	Onondaga Lake SCA 50% Design	Project/ Proposal No.:	GJ4299	Task No.:	05

[illegible]

Material Boundary

0.000	427.500
122.000	424.650
122.359	424.645
177.171	423.910
204.000	423.550
405.000	420.750
472.000	422.050
768.000	422.250
805.000	423.150
925.000	423.250
1165.000	428.350
1347.000	425.150
1436.000	426.150
1642.000	424.450
1786.163	426.261
1841.000	426.950
1841.123	426.953

Material Boundary

122.000	424.500
122.359	424.645

Material Boundary

166.176	430.000
173.133	426.959
347.000	423.600
600.000	423.600
640.000	424.000
728.000	424.000
1102.000	431.000
1176.000	431.000
1356.000	428.000
1474.000	427.500
1619.000	426.500
1689.000	426.500
1790.000	428.000
1798.000	431.000

Material Boundary

1827.000	432.300
1841.123	426.953

Material Boundary

188.000	430.000
824.000	430.000
1161.000	433.000
1236.000	432.000
1400.000	431.000
1778.100	431.000

Material Boundary

188.000	430.250
506.200	430.250
507.700	430.250
824.000	430.250
824.200	430.252
825.700	430.265
1142.148	433.082
1143.812	433.097
1161.000	433.250
1236.000	432.250
1400.000	431.250
1460.199	431.250
1461.784	431.250
1778.100	431.250

Material Boundary

208.000	436.000
506.200	436.000
507.700	436.000
824.000	436.000
824.200	436.002
825.700	436.015
1142.148	438.832
1143.812	438.847
1161.000	439.000
1236.000	438.000
1400.000	437.000
1460.199	437.000
1461.784	437.000
1758.000	437.000

Material Boundary

208.000	436.250
466.200	436.250
467.700	436.250
724.201	436.250
725.697	436.250
824.000	436.250
982.197	437.658
983.718	437.672
1161.000	439.250
1236.000	438.250

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009
Client:	Honeywell	Project:	Onondaga Lake SCA 50% Design	Project/ Proposal No.:	GJ4299	Task No.:	05

1240.193	438.224
1241.724	438.215
1400.000	437.250
1498.182	437.250
1499.766	437.250
1758.000	437.250

Material Boundary

228.000	442.000
466.200	442.000
467.700	442.000
724.201	442.000
725.697	442.000
824.000	442.000
982.197	443.408
983.718	443.422
1161.000	445.000
1236.000	444.000
1240.193	443.974
1241.724	443.965
1400.000	443.000
1498.182	443.000
1499.766	443.000
1738.000	443.000

Material Boundary

228.000	442.250
530.200	442.250
531.700	442.250
824.000	442.250
832.191	442.323
833.715	442.336
1134.188	445.011
1135.719	445.025
1161.000	445.250
1236.000	444.250
1400.000	443.250
1436.205	443.250
1437.780	443.250
1738.000	443.250

Material Boundary

248.000	448.000
530.200	448.000
531.700	448.000
824.000	448.000
832.191	448.073
833.715	448.086
1134.188	450.761
1135.719	450.775
1161.000	451.000
1236.000	450.000
1400.000	449.000
1436.205	449.000
1437.780	449.000
1718.000	449.000

Material Boundary

248.000	448.250
493.200	448.250
494.700	448.250
738.195	448.250
739.701	448.250
824.000	448.250
983.182	449.667
984.724	449.681
1161.000	451.250
1228.192	450.354
1229.723	450.334
1236.000	450.250
1400.000	449.250
1473.204	449.250
1474.788	449.250
1718.000	449.250

Material Boundary

268.000	454.000
493.200	454.000
494.700	454.000
738.195	454.000
739.701	454.000
824.000	454.000
983.182	455.417
984.724	455.431
1161.000	457.000
1228.192	456.104
1229.723	456.084
1236.000	456.000
1400.000	455.000
1473.204	455.000
1474.788	455.000
1698.000	455.000

Material Boundary

268.000	454.250
554.200	454.250

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009
Client:	Honeywell	Project:	Onondaga Lake SCA 50% Design	Project/ Proposal No.:	GJ4299	Task No.:	05

555.700 454.250
824.000 454.250
840.193 454.394
841.706 454.408
1126.178 456.940
1127.707 456.954
1161.000 457.250
1236.000 456.250
1400.000 455.250
1412.195 455.250
1413.743 455.250
1698.000 455.250

Material Boundary
506.200 430.250
506.200 436.000

Material Boundary
507.700 430.250
507.700 436.000

Material Boundary
466.200 436.250
466.200 442.000

Material Boundary
467.700 436.250
467.700 442.000

Material Boundary
530.200 442.250
530.200 448.000

Material Boundary
531.700 442.250
531.700 448.000

Material Boundary
493.200 448.250
493.200 454.000

Material Boundary
494.700 448.250
494.700 454.000

Material Boundary
554.200 454.250
554.200 460.000

Material Boundary
555.700 454.250
555.700 460.000

Material Boundary
824.200 430.252
824.200 436.002

Material Boundary
825.700 430.265
825.700 436.015

Material Boundary
724.201 436.250
724.201 442.000

Material Boundary
725.697 436.250
725.697 442.000

Material Boundary
738.195 448.250
738.195 454.000

Material Boundary
739.701 448.250
739.701 454.000

Material Boundary
840.193 454.394
840.193 460.144

Material Boundary
841.706 454.408
841.706 460.158

Material Boundary
832.191 442.323
832.191 448.073

Material Boundary
833.715 442.336
833.715 448.086

Material Boundary
982.197 437.658
982.197 443.408

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009
Client:	Honeywell	Project:	Onondaga Lake SCA 50% Design	Project/ Proposal No.:	GJ4299	Task No.:	05

Material Boundary
983.182 449.667
983.182 455.417

Material Boundary
983.718 437.672
983.718 443.422

Material Boundary
984.724 449.681
984.724 455.431

Material Boundary
1134.188 445.011
1134.188 450.761

Material Boundary
1135.719 445.025
1135.719 450.775

Material Boundary
1436.205 443.250
1436.205 449.000

Material Boundary
1437.780 443.250
1437.780 449.000

Material Boundary
1126.178 456.940
1126.178 462.690

Material Boundary
1127.707 456.954
1127.707 462.704

Material Boundary
1142.148 433.082
1142.148 438.832

Material Boundary
1143.812 433.097
1143.812 438.847

Material Boundary
1228.192 450.354
1228.192 456.104

Material Boundary
1229.723 450.334
1229.723 456.084

Material Boundary
1240.193 438.224
1240.193 443.974

Material Boundary
1241.724 438.215
1241.724 443.965

Material Boundary
1412.195 455.250
1412.195 461.000

Material Boundary
1413.743 455.250
1413.743 461.000

Material Boundary
1460.199 431.250
1460.199 437.000

Material Boundary
1461.784 431.250
1461.784 437.000

Material Boundary
1498.182 437.250
1498.182 443.000

Material Boundary
1499.766 437.250
1499.766 443.000

Material Boundary
1473.204 449.250
1473.204 455.000

Material Boundary
1474.788 449.250
1474.788 455.000

Material Boundary
165.176 430.000
177.171 423.910

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009
Client:	Honeywell	Project:	Onondaga Lake SCA 50% Design	Project/ Proposal No.:	GJ4299	Task No.:	05

Material Boundary

0.000	387.500
1979.000	390.050

Material Boundary

1786.163	426.261
1799.372	431.000

Material Boundary

164.400	430.400
165.176	430.000

Material Boundary

1799.372	431.000
1803.000	432.300

Material Boundary

162.619	430.400
164.400	430.400
165.257	430.401
166.176	430.000
188.000	430.000
188.000	430.250
188.000	436.000
208.000	436.000
208.000	436.250
208.000	442.000
228.000	442.000
228.000	442.250
228.000	448.000
248.000	448.000
248.000	448.250
248.000	454.000
268.000	454.000
268.000	454.250
268.000	460.000

Material Boundary

268.000	462.000
268.000	460.000
554.200	460.000
555.700	460.000
824.000	460.000
840.193	460.144
841.706	460.158
1126.178	462.690
1127.707	462.704
1161.000	463.000
1236.000	462.000
1400.000	461.000
1412.195	461.000
1413.743	461.000
1698.000	461.000

Material Boundary

1698.000	463.000
1698.000	461.000
1698.000	455.250
1698.000	455.000
1718.000	455.000
1718.000	449.250
1718.000	449.000
1738.000	449.000
1738.000	443.250
1738.000	443.000
1758.000	443.000
1758.000	437.250
1758.000	437.000
1778.100	437.000
1778.100	431.250
1778.100	431.000
1798.000	431.000
1801.461	432.301

External Boundary

1698.000	463.000
1400.000	463.000
1236.000	464.000
1161.000	465.000
824.000	462.000
268.000	462.000
248.000	456.000
228.000	450.000
208.000	444.000
188.000	438.000
162.619	430.400
136.600	430.400
122.359	424.645
0.000	427.500
0.000	387.500
0.000	347.500
1979.000	350.000
1979.000	390.050
1979.000	430.050
1841.123	426.953

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009
Client:	Honeywell	Project:	Onondaga Lake SCA 50% Design	Project/ Proposal No.:	GJ4299	Task No.:	05

1841.000	427.000
1827.000	432.300
1803.000	432.300
1801.461	432.301
1778.100	439.000
1758.000	445.000
1738.000	451.000
1718.000	457.000

Piezo Line

170.846	427.959
173.133	427.959
347.000	424.600
600.000	424.600
640.000	425.000
728.000	425.000
1102.000	432.000
1176.000	432.000
1356.000	429.000
1474.000	428.500
1619.000	427.500
1689.000	427.500
1790.000	429.000
1792.668	429.000

Water Table

0.000	412.500
204.000	408.550
405.000	405.750
472.000	407.050
557.156	407.108
768.000	407.250
805.000	408.150
925.000	408.250
1165.000	413.350
1347.000	410.150
1436.000	411.150
1642.000	409.450
1768.160	411.260
1841.123	411.953
1979.000	415.050

Focus/Block Search Line

268.000	454.014
554.211	454.235

Focus/Block Search Point

554.211	454.235

Focus/Block Search Point

555.691	459.992

Support

554.200	454.250
554.200	460.000

Support

554.200	460.000
268.000	460.000

Support

268.000	454.000
248.000	454.000

Support

248.000	454.000
248.000	448.250

Support

248.000	448.250
493.200	448.250

Support

493.200	454.000
493.200	448.250

Support

268.000	460.000
268.000	454.250

Support

268.000	454.250
554.200	454.250

Support

555.700	454.250
555.700	460.000

Support

555.700	460.000
824.000	460.000

Support

824.000	460.000
840.193	460.144

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009
Client:	Honeywell	Project:	Onondaga Lake SCA 50% Design	Project/ Proposal No.:	GJ4299	Task No.:	05

Support
840.193 460.144
840.193 454.394

Support
840.193 454.394
824.000 454.250

Support
824.000 454.250
555.700 454.250

Support
738.195 454.000
738.195 448.250

Support
739.701 454.000
739.701 448.250

Support
738.195 454.000
494.700 454.000

Support
494.700 454.000
494.700 448.250

Support
494.700 448.250
738.195 448.250

Support
724.201 442.000
724.201 436.250

Support
724.201 436.250
467.700 436.250

Support
467.700 436.250
467.700 442.000

Support
467.700 442.000
724.201 442.000

Support
228.000 448.000
228.000 442.250

Support
248.000 448.000
530.200 448.000

Support
530.200 448.000
530.200 442.250

Support
531.700 442.250
531.700 448.000

Support
530.200 442.250
228.000 442.250

Support
228.000 448.000
248.000 448.000

Support
208.000 436.250
208.000 442.000

Support
208.000 442.000
228.000 442.000

Support
228.000 442.000
466.200 442.000

Support
466.200 442.000
466.200 436.250

Support
466.200 436.250
208.000 436.250

Support
188.000 430.250
188.000 436.000

Written by:	**Joseph Sura**	Date:	**4/3/2009**	Reviewed by:	**R. Kulasingam/Ming Zhu/Jay Beech**	Date:	**4/7/2009**
Client:	**Honeywell**	Project:	**Onondaga Lake SCA 50% Design**	Project/ Proposal No.:	**GJ4299**	Task No.:	**05**

Support
188.000 436.000
208.000 436.000

Support
208.000 436.000
506.200 436.000

Support
507.700 436.000
507.700 430.250

Support
506.200 436.000
506.200 430.250

Support
506.200 430.250
188.000 430.250

Support
507.700 430.250
824.200 430.252

Support
824.200 430.252
824.200 436.002

Support
824.200 436.002
507.700 436.000

Support
832.191 442.323
832.191 448.073

Support
833.715 442.336
833.715 448.086

Support
832.191 448.073
824.000 448.000

Support
824.000 448.000
531.700 448.000

Support
531.700 442.250
824.000 442.250

Support
824.000 442.250
832.191 442.323

Support
841.706 460.158
841.706 454.408

Support
825.700 436.015
825.700 430.265

Support
725.697 442.000
725.697 436.250

Support
725.697 436.250
824.000 436.250

Support
824.000 436.250
982.197 437.658

Support
982.197 437.658
982.197 443.408

Support
982.197 443.408
824.000 442.000

Support
824.000 442.000
725.697 442.000

Support
739.701 448.250
824.000 448.250

Support
824.000 448.250
983.182 449.667

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009
Client:	Honeywell	Project:	Onondaga Lake SCA 50% Design	Project/ Proposal No.:	GJ4299	Task No.:	05

Support
983.182 449.667
983.182 455.417

Support
983.182 455.417
824.000 454.000

Support
824.000 454.000
739.701 454.000

Support
841.706 454.408
1126.178 456.940

Support
1126.178 456.940
1126.178 462.690

Support
1126.178 462.690
841.706 460.158

Support
833.715 448.086
1134.188 450.761

Support
1134.188 450.761
1134.188 445.011

Support
1134.188 445.011
833.715 442.336

Support
825.700 436.015
1142.148 438.832

Support
1142.148 438.832
1142.148 433.082

Support
1142.148 433.082
825.700 430.265

Support
984.724 455.431
984.724 449.681

Support
983.718 443.422
983.718 437.672

Support
983.718 437.672
1161.000 439.250

Support
1161.000 439.250
1236.000 438.250

Support
1236.000 438.250
1240.193 438.224

Support
1240.193 438.224
1240.193 443.974

Support
1240.193 443.974
1236.000 444.000

Support
1236.000 444.000
1161.000 445.000

Support
1161.000 445.000
983.718 443.422

Support
984.724 455.431
1161.000 457.000

Support
1161.000 457.000
1228.192 456.104

Support
1228.192 456.104
1228.192 450.354

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009
Client:	Honeywell	Project:	Onondaga Lake SCA 50% Design	Project/ Proposal No.:	GJ4299	Task No.:	05

Support
1228.192 450.354
1161.000 451.250

Support
1161.000 451.250
984.724 449.681

Support
268.000 454.000
493.200 454.000

Support
1127.707 462.704
1127.707 456.954

Support
1127.707 462.704
1161.000 463.000

Support
1161.000 463.000
1236.000 462.000

Support
1236.000 462.000
1400.000 461.000

Support
1400.000 461.000
1412.195 461.000

Support
1412.195 461.000
1412.195 455.250

Support
1412.195 455.250
1400.000 455.250

Support
1400.000 455.250
1236.000 456.250

Support
1236.000 456.250
1161.000 457.250

Support
1161.000 457.250
1127.707 456.954

Support
1135.719 450.775
1135.719 445.025

Support
1135.719 450.775
1161.000 451.000

Support
1161.000 445.250
1135.719 445.025

Support
1161.000 445.250
1236.000 444.250

Support
1236.000 444.250
1400.000 443.250

Support
1400.000 443.250
1436.205 443.250

Support
1436.205 443.250
1436.205 449.000

Support
1437.780 449.000
1437.780 443.250

Support
1436.205 449.000
1400.000 449.000

Support
1400.000 449.000
1236.000 450.000

Support
1236.000 450.000
1161.000 451.000

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009
Client:	Honeywell	Project:	Onondaga Lake SCA 50% Design	Project/ Proposal No.:	GJ4299	Task No.:	05

Support
1229.723 456.084
1229.723 450.334

Support
1229.723 450.334
1236.000 450.250

Support
1236.000 456.000
1229.723 456.084

Support
1236.000 456.000
1400.000 455.000

Support
1400.000 455.000
1473.204 455.000

Support
1473.204 455.000
1473.204 449.250

Support
1474.788 449.250
1474.788 455.000

Support
1473.204 449.250
1400.000 449.250

Support
1400.000 449.250
1236.000 450.250

Support
1241.724 438.215
1241.724 443.965

Support
1143.812 438.847
1143.812 433.097

Support
1143.812 433.097
1161.000 433.250

Support
1161.000 439.000
1143.812 438.847

Support
1161.000 439.000
1236.000 438.000

Support
1236.000 438.000
1400.000 437.000

Support
1400.000 437.000
1460.199 437.000

Support
1460.199 437.000
1460.199 431.250

Support
1461.784 431.250
1461.784 437.000

Support
1460.199 431.250
1400.000 431.250

Support
1400.000 431.250
1236.000 432.250

Support
1236.000 432.250
1161.000 433.250

Support
1241.724 438.215
1400.000 437.250

Support
1400.000 437.250
1498.182 437.250

Support
1498.182 443.000
1498.182 437.250

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009
Client:	Honeywell	Project:	Onondaga Lake SCA 50% Design	Project/ Proposal No.:	GJ4299	Task No.:	05

Support
1499.766 437.250
1499.766 443.000

Support
1498.182 443.000
1400.000 443.000

Support
1400.000 443.000
1241.724 443.965

Support
1413.743 461.000
1413.743 455.250

Support
1413.743 461.000
1698.000 461.000

Support
1698.000 461.000
1698.000 455.250

Support
1698.000 455.250
1413.743 455.250

Support
1474.788 449.250
1718.000 449.250

Support
1718.000 449.250
1718.000 455.000

Support
1698.000 455.000
1474.788 455.000

Support
1461.784 431.250
1778.100 431.250

Support
1778.100 431.250
1778.100 437.000

Support
1758.000 437.000
1461.784 437.000

Support
1437.780 443.250
1738.000 443.250

Support
1738.000 443.250
1738.000 449.000

Support
1718.000 449.000
1437.780 449.000

Support
1499.766 437.250
1758.000 437.250

Support
1758.000 437.250
1758.000 443.000

Support
1738.000 443.000
1499.766 443.000

Support
1718.000 455.000
1698.000 455.000

Support
1718.000 449.000
1738.000 449.000

Support
1738.000 443.000
1758.000 443.000

Support
1758.000 437.000
1778.100 437.000

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009
Client:	Honeywell	Project:	Onondaga Lake SCA 50% Design	Project/ Proposal No.:	GJ4299	Task No.:	05

Slide Analysis Information

□□□□□ □□□□□□□ □

File Name: EastWest_Cover_Liner_Lab.sli

P□□□□□□□□□□□□

Project Title: SLIDE - An Interactive Slope Stability Program
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

A□□□□□□ M□□□□□□

Analysis Methods used:
Bishop simplified
Janbu simplified
Spencer

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50

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Surface Type: Non-Circular Block Search
Number of Surfaces: 5000
Pseudo-Random Surfaces: Enabled
Convex Surfaces Only: Disabled
Left Projection Angle (Start Angle): 95
Left Projection Angle (End Angle): 175
Right Projection Angle (Start Angle): 5
Right Projection Angle (End Angle): 85
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

M□□□□□□P□□□□□□□□

Material: Final Cover Soil
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 30 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Dike Soil
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 35 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Gravel
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 38 degrees
Water Surface: Piezometric Line 1
Custom Hu value: 1

Material: SOLW (undrained)
Strength Type: Discrete function
Unit Weight: 82 lb/ft3
Water Surface: Water Table
Custom Hu value: 1

Material: Dredge Material
Strength Type: Mohr-Coulomb
Unit Weight: 86 lb/ft3
Cohesion: 0 psf
Friction Angle: 15 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Tube-Tube Interface (Horizontal)
Strength Type: Mohr-Coulomb
Unit Weight: 86 lb/ft3
Cohesion: 0 psf
Friction Angle: 15 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Tub-Tube Interface (Vertical)
Strength Type: Mohr-Coulomb
Unit Weight: 43 lb/ft3
Cohesion: 0 psf
Friction Angle: 0.1 degrees
Water Surface: Water Table

Custom Hu value: 1

Material: Tube-Gravel Interface
Strength Type: Mohr-Coulomb
Unit Weight: 86 lb/ft3
Cohesion: 0 psf
Friction Angle: 24 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Liner
Strength Type: Mohr-Coulomb
Unit Weight: 100 lb/ft3
Cohesion: 0 psf
Friction Angle: 19 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Foundation
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 37 degrees
Water Surface: Water Table
Custom Hu value: 1

□□□□□□□P□□□□□□□

Support: Geotube
Geotube
Support Type: GeoTextile
Force Application: Passive
Force Orientation: Tangent to Slip Surface
Anchorage: Both Ends
Shear Strength Model: Linear
Strip Coverage: 100 percent
Tensile Strength: 1600 lb/ft
Pullout Strength Adhesion: 5 lb/ft2
Pullout Strength Friction Angle: 40 degrees

□ □□□□□M□□□ □□ □

Method: bishop simplified
FS: 1.914070
Axis Location: 189.639, 565.563
Left Slip Surface Endpoint: 161.557, 430.400
Right Slip Surface Endpoint: 280.920, 462.000
Resisting Moment=1.01028e+007 lb-ft
Driving Moment=5.27817e+006 lb-ft

Method: janbu simplified
FS: 1.928540
Axis Location: 189.639, 565.563
Left Slip Surface Endpoint: 161.557, 430.400
Right Slip Surface Endpoint: 280.920, 462.000
Resisting Horizontal Force=66700.8 lb
Driving Horizontal Force=34586.2 lb

Method: spencer
FS: 1.906510
Axis Location: 189.639, 565.563
Left Slip Surface Endpoint: 161.557, 430.400
Right Slip Surface Endpoint: 280.920, 462.000
Resisting Moment=1.01013e+007 lb-ft
Driving Moment=5.29833e+006 lb-ft
Resisting Horizontal Force=66625 lb
Driving Horizontal Force=34946.1 lb

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Method: bishop simplified
Number of Valid Surfaces: 3284
Number of Invalid Surfaces: 1716
Error Codes:
Error Code -107 reported for 403 surfaces
Error Code -108 reported for 584 surfaces
Error Code -110 reported for 41 surfaces
Error Code -111 reported for 11 surfaces
Error Code -112 reported for 677 surfaces

Method: janbu simplified
Number of Valid Surfaces: 3112
Number of Invalid Surfaces: 1888
Error Codes:
Error Code -107 reported for 403 surfaces
Error Code -108 reported for 807 surfaces
Error Code -110 reported for 41 surfaces
Error Code -111 reported for 18 surfaces
Error Code -112 reported for 619 surfaces

Method: spencer
Number of Valid Surfaces: 859
Number of Invalid Surfaces: 4141
Error Codes:
Error Code -107 reported for 403 surfaces
Error Code -108 reported for 1276 surfaces
Error Code -110 reported for 41 surfaces
Error Code -111 reported for 1731 surfaces
Error Code -112 reported for 690 surfaces

Written by:	**Joseph Sura**	Date:	**4/3/2009**	Reviewed by:	**R. Kulasingam/Ming Zhu/Jay Beech**	Date:	**4/7/2009**
Client:	**Honeywell**	Project:	**Onondaga Lake SCA 50% Design**	Project/ Proposal No.:	**GJ4299**	Task No.:	**05**

Slide Analysis Information

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File Name: EastWest_Cover_Global_Su_Lab.sli

P□□□□□□□□□□□□

Project Title: SLIDE - An Interactive Slope Stability Program
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

A□□□□□□ M□□□□□□

Analysis Methods used:
Bishop simplified
Janbu simplified
Spencer

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50

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Surface Type: Circular
Search Method: Grid Search
Radius increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Create Tension Crack
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

M□□□□□□□P□□□□□□□□

Material: Final Cover Soil
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 30 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Dike Soil
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 35 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Gravel
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 38 degrees
Water Surface: Piezometric Line 1
Custom Hu value: 1

Material: SOLW (undrained)
Strength Type: Discrete function
Unit Weight: 82 lb/ft3
Water Surface: Water Table
Custom Hu value: 1

Material: Dredge Material
Strength Type: Mohr-Coulomb
Unit Weight: 86 lb/ft3
Cohesion: 0 psf
Friction Angle: 15 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Tube-Tube Interface (Horizontal)
Strength Type: Mohr-Coulomb
Unit Weight: 86 lb/ft3
Cohesion: 0 psf
Friction Angle: 15 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Tub-Tube Interface (Vertical)
Strength Type: Mohr-Coulomb
Unit Weight: 43 lb/ft3
Cohesion: 0 psf

Written by:	**Joseph Sura**	Date:	**4/3/2009**	Reviewed by:	**R. Kulasingam/Ming Zhu/Jay Beech**	Date:	**4/7/2009**
Client:	**Honeywell**	Project:	**Onondaga Lake SCA 50% Design**	Project/ Proposal No.:	**GJ4299**	Task No.:	**05**

Friction Angle: 0.1 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Tube-Gravel Interface
Strength Type: Mohr-Coulomb
Unit Weight: 86 lb/ft3
Cohesion: 0 psf
Friction Angle: 24 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Liner
Strength Type: Mohr-Coulomb
Unit Weight: 100 lb/ft3
Cohesion: 0 psf
Friction Angle: 19 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Foundation
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 37 degrees
Water Surface: Water Table
Custom Hu value: 1

[illegible]P[illegible]

Support: Geotube
Geotube
Support Type: GeoTextile
Force Application: Passive
Force Orientation: Tangent to Slip Surface
Anchorage: Both Ends
Shear Strength Model: Linear
Strip Coverage: 100 percent
Tensile Strength: 1600 lb/ft
Pullout Strength Adhesion: 5 lb/ft2
Pullout Strength Friction Angle: 40 degrees

[illegible]M[illegible]

Method: bishop simplified
FS: 1.312040
Center: 195.928, 521.455
Radius: 122.340
Left Slip Surface Endpoint: 121.090, 424.675
Right Slip Surface Endpoint: 302.849, 462.000
Resisting Moment=1.55928e+007 lb-ft
Driving Moment=1.18844e+007 lb-ft

Method: janbu simplified
FS: 1.233240
Center: 195.928, 509.946
Radius: 113.333
Left Slip Surface Endpoint: 121.280, 424.670
Right Slip Surface Endpoint: 298.619, 462.000
Resisting Horizontal Force=108264 lb
Driving Horizontal Force=87787.9 lb

Method: spencer
FS: 1.306740
Center: 195.928, 521.455
Radius: 122.340
Left Slip Surface Endpoint: 121.090, 424.675
Right Slip Surface Endpoint: 302.849, 462.000
Resisting Moment=1.55298e+007 lb-ft
Driving Moment=1.18844e+007 lb-ft
Resisting Horizontal Force=108610 lb
Driving Horizontal Force=83115.2 lb

[illegible]

Method: bishop simplified
Number of Valid Surfaces: 2295
Number of Invalid Surfaces: 2545
Error Codes:
Error Code -103 reported for 2126 surfaces
Error Code -107 reported for 18 surfaces
Error Code -108 reported for 52 surfaces
Error Code -110 reported for 34 surfaces
Error Code -112 reported for 281 surfaces
Error Code -116 reported for 34 surfaces

Method: janbu simplified
Number of Valid Surfaces: 2172
Number of Invalid Surfaces: 2668
Error Codes:
Error Code -103 reported for 2126 surfaces
Error Code -107 reported for 18 surfaces
Error Code -108 reported for 165 surfaces
Error Code -110 reported for 34 surfaces
Error Code -111 reported for 7 surfaces
Error Code -112 reported for 284 surfaces

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009
Client:	Honeywell	Project:	Onondaga Lake SCA 50% Design	Project/ Proposal No.:	GJ4299	Task No.:	05

Error Code -116 reported for 34 surfaces

Method: spencer
Number of Valid Surfaces: 1531
Number of Invalid Surfaces: 3309
Error Codes:
Error Code -103 reported for 2126 surfaces
Error Code -107 reported for 18 surfaces
Error Code -108 reported for 227 surfaces
Error Code -110 reported for 34 surfaces
Error Code -111 reported for 578 surfaces
Error Code -112 reported for 292 surfaces
Error Code -116 reported for 34 surfaces

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009
Client:	Honeywell	Project:	Onondaga Lake SCA 50% Design	Project/ Proposal No.:	GJ4299	Task No.:	05

Slide Analysis Information

Document Name

File Name: EastWest_Cover_Global_U75_Lab.sli

Project Settings

Project Title: SLIDE - An Interactive Slope Stability Program
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
Bishop simplified
Janbu simplified
Spencer

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Create Tension Crack
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Material Properties

Material: Final Cover Soil
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 30 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Dike Soil
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 35 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Gravel
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 38 degrees
Water Surface: Piezometric Line 1
Custom Hu value: 1

Material: SOLW (undrained)
Strength Type: Discrete function
Unit Weight: 82 lb/ft3
Water Surface: Water Table
Custom Hu value: 1

Material: Dredge Material
Strength Type: Mohr-Coulomb
Unit Weight: 86 lb/ft3
Cohesion: 0 psf
Friction Angle: 15 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Tube-Tube Interface (Horizontal)
Strength Type: Mohr-Coulomb
Unit Weight: 86 lb/ft3
Cohesion: 0 psf
Friction Angle: 15 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Tub-Tube Interface (Vertical)
Strength Type: Mohr-Coulomb
Unit Weight: 43 lb/ft3
Cohesion: 0 psf

Friction Angle: 0.1 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Tube-Gravel Interface
Strength Type: Mohr-Coulomb
Unit Weight: 86 lb/ft3
Cohesion: 0 psf
Friction Angle: 24 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Liner
Strength Type: Mohr-Coulomb
Unit Weight: 100 lb/ft3
Cohesion: 0 psf
Friction Angle: 19 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Foundation
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 37 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: SOLW U=75%
Strength Type: Discrete function
Unit Weight: 82 lb/ft3
Water Surface: Water Table
Custom Hu value: 1

□□□□□□□P□□□□□□□□

Support: Geotube
Geotube
Support Type: GeoTextile
Force Application: Passive
Force Orientation: Tangent to Slip Surface
Anchorage: Both Ends
Shear Strength Model: Linear
Strip Coverage: 100 percent
Tensile Strength: 1600 lb/ft
Pullout Strength Adhesion: 5 lb/ft2
Pullout Strength Friction Angle: 40 degrees

□ □□□□□M□□□ □□ □

Method: bishop simplified
FS: 1.322850
Center: 195.928, 521.455
Radius: 122.340
Left Slip Surface Endpoint: 121.090, 424.675
Right Slip Surface Endpoint: 302.849, 462.000
Resisting Moment=1.57212e+007 lb-ft
Driving Moment=1.18844e+007 lb-ft

Method: janbu simplified
FS: 1.246300
Center: 195.928, 509.946
Radius: 113.333
Left Slip Surface Endpoint: 121.280, 424.670
Right Slip Surface Endpoint: 298.619, 462.000
Resisting Horizontal Force=109084 lb
Driving Horizontal Force=87526.1 lb

Method: spencer
FS: 1.317790
Center: 195.928, 521.455
Radius: 122.340
Left Slip Surface Endpoint: 121.090, 424.675
Right Slip Surface Endpoint: 302.849, 462.000
Resisting Moment=1.56611e+007 lb-ft
Driving Moment=1.18844e+007 lb-ft
Resisting Horizontal Force=109472 lb
Driving Horizontal Force=83072.5 lb

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Method: bishop simplified
Number of Valid Surfaces: 2288
Number of Invalid Surfaces: 2552
Error Codes:
Error Code -103 reported for 2126 surfaces
Error Code -107 reported for 18 surfaces
Error Code -108 reported for 52 surfaces
Error Code -110 reported for 34 surfaces
Error Code -112 reported for 282 surfaces
Error Code -116 reported for 40 surfaces

Method: janbu simplified
Number of Valid Surfaces: 2168
Number of Invalid Surfaces: 2672
Error Codes:

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009
Client:	Honeywell	Project:	Onondaga Lake SCA 50% Design	Project/ Proposal No.:	GJ4299	Task No.:	05

Error Code -103 reported for 2126 surfaces
Error Code -107 reported for 18 surfaces
Error Code -108 reported for 163 surfaces
Error Code -110 reported for 34 surfaces
Error Code -111 reported for 7 surfaces
Error Code -112 reported for 284 surfaces
Error Code -116 reported for 40 surfaces

Method: spencer
Number of Valid Surfaces: 1536
Number of Invalid Surfaces: 3304
Error Codes:
Error Code -103 reported for 2126 surfaces
Error Code -107 reported for 18 surfaces
Error Code -108 reported for 220 surfaces
Error Code -110 reported for 34 surfaces
Error Code -111 reported for 574 surfaces
Error Code -112 reported for 292 surfaces
Error Code -116 reported for 40 surfaces

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009
Client:	Honeywell	Project:	Onondaga Lake SCA 50% Design	Project/ Proposal No.:	GJ4299	Task No.:	05

Slide Analysis Information

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File Name: EastWest_Cover_LongTerm_Lab.sli

P□□□□□□□□□□□□

Project Title: SLIDE - An Interactive Slope Stability Program
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

A□□□□□□□ M□□□□□□

Analysis Methods used:
Bishop simplified
Janbu simplified
Spencer

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50

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Surface Type: Circular
Search Method: Grid Search
Radius increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Create Tension Crack
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

M□□□□□□□P□□□□□□□□

Material: Final Cover Soil
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 30 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Dike Soil
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 35 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Gravel
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 38 degrees
Water Surface: Piezometric Line 1
Custom Hu value: 1

Material: SOLW (Drained)
Strength Type: Mohr-Coulomb
Unit Weight: 82 lb/ft3
Cohesion: 0 psf
Friction Angle: 34 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Dredge Material (Long)
Strength Type: Mohr-Coulomb
Unit Weight: 86 lb/ft3
Cohesion: 0 psf
Friction Angle: 30 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Tube-Tube Interface (Horizontal)
Strength Type: Mohr-Coulomb
Unit Weight: 86 lb/ft3
Cohesion: 0 psf
Friction Angle: 15 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Tub-Tube Interface (Vertical)
Strength Type: Mohr-Coulomb
Unit Weight: 43 lb/ft3
Cohesion: 0 psf
Friction Angle: 0.1 degrees
Water Surface: Water Table
Custom Hu value: 1

Written by:	**Joseph Sura**	Date:	**4/3/2009**	Reviewed by:	**R. Kulasingam/Ming Zhu/Jay Beech**	Date:	**4/7/2009**
Client:	**Honeywell**	Project:	**Onondaga Lake SCA 50% Design**	Project/ Proposal No.:	**GJ4299**	Task No.:	**05**

Material: Tube-Gravel Interface
Strength Type: Mohr-Coulomb
Unit Weight: 86 lb/ft3
Cohesion: 0 psf
Friction Angle: 24 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Liner
Strength Type: Mohr-Coulomb
Unit Weight: 100 lb/ft3
Cohesion: 0 psf
Friction Angle: 19 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Foundation
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 37 degrees
Water Surface: Water Table
Custom Hu value: 1

[illegible]

Support: Geotube (Long)
Geotube (Long)
Support Type: GeoTextile
Force Application: Passive
Force Orientation: Tangent to Slip Surface
Anchorage: Both Ends
Shear Strength Model: Linear
Strip Coverage: 100 percent
Tensile Strength: 0.1 lb/ft
Pullout Strength Adhesion: 5 lb/ft2
Pullout Strength Friction Angle: 40 degrees

[illegible]

Method: bishop simplified
FS: 1.939080
Center: 141.584, 669.770
Radius: 237.350
Left Slip Surface Endpoint: 179.597, 435.484
Right Slip Surface Endpoint: 238.781, 453.234
Resisting Moment=1.31e+006 lb-ft
Driving Moment=675582 lb-ft

Method: janbu simplified
FS: 1.931940
Center: 141.584, 669.770
Radius: 237.350
Left Slip Surface Endpoint: 179.597, 435.484
Right Slip Surface Endpoint: 238.781, 453.234
Resisting Horizontal Force=5277.77 lb
Driving Horizontal Force=2731.86 lb

Method: spencer
FS: 1.934590
Center: 141.584, 669.770
Radius: 237.350
Left Slip Surface Endpoint: 179.597, 435.484
Right Slip Surface Endpoint: 238.781, 453.234
Resisting Moment=1.30697e+006 lb-ft
Driving Moment=675582 lb-ft
Resisting Horizontal Force=5278.37 lb
Driving Horizontal Force=2728.42 lb

[illegible]

Method: bishop simplified
Number of Valid Surfaces: 2608
Number of Invalid Surfaces: 2232
Error Codes:
Error Code -103 reported for 1143 surfaces
Error Code -110 reported for 42 surfaces
Error Code -112 reported for 134 surfaces
Error Code -1000 reported for 913 surfaces

Method: janbu simplified
Number of Valid Surfaces: 2630
Number of Invalid Surfaces: 2210
Error Codes:
Error Code -103 reported for 1143 surfaces
Error Code -110 reported for 42 surfaces
Error Code -112 reported for 112 surfaces
Error Code -1000 reported for 913 surfaces

Method: spencer
Number of Valid Surfaces: 2606
Number of Invalid Surfaces: 2234
Error Codes:
Error Code -103 reported for 1143 surfaces
Error Code -110 reported for 42 surfaces
Error Code -111 reported for 1 surface
Error Code -112 reported for 135 surfaces
Error Code -1000 reported for 913 surfaces

Written by:	**Joseph Sura**	Date:	**4/3/2009**	Reviewed by:	**R. Kulasingam/Ming Zhu/Jay Beech**	Date:	**4/7/2009**
Client:	**Honeywell**	Project:	**Onondaga Lake SCA 50% Design**	Project/ Proposal No.:	**GJ4299**	Task No.:	**05**

Slide Analysis Information

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File Name: EastWest_Cover_External_Lab.sli

P□□□□□□□□□□□□

Project Title: SLIDE - An Interactive Slope Stability Program
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

A□□□□□□ M□□□□□□

Analysis Methods used:
Bishop simplified
Janbu simplified
Spencer

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50

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Surface Type: Circular
Search Method: Grid Search
Radius increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Create Tension Crack
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

M□□□□□□□ P□□□□□□□□□

Material: Final Cover Soil
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 30 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Dike Soil
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 35 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Gravel
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 38 degrees
Water Surface: Piezometric Line 1
Custom Hu value: 1

Material: SOLW (undrained)
Strength Type: Discrete function
Unit Weight: 82 lb/ft3
Water Surface: Water Table
Custom Hu value: 1

Material: Dredge Material
Strength Type: Mohr-Coulomb
Unit Weight: 86 lb/ft3
Cohesion: 0 psf
Friction Angle: 15 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Tube-Tube Interface (Horizontal)
Strength Type: Mohr-Coulomb
Unit Weight: 86 lb/ft3
Cohesion: 0 psf
Friction Angle: 15 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Tub-Tube Interface (Vertical)
Strength Type: Mohr-Coulomb
Unit Weight: 43 lb/ft3
Cohesion: 0 psf
Friction Angle: 0.1 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Tube-Gravel Interface

Strength Type: Mohr-Coulomb
Unit Weight: 86 lb/ft3
Cohesion: 0 psf
Friction Angle: 24 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Liner
Strength Type: Mohr-Coulomb
Unit Weight: 100 lb/ft3
Cohesion: 0 psf
Friction Angle: 19 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Foundation
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 37 degrees
Water Surface: Water Table
Custom Hu value: 1

□□□□□□□P□□□□□□□□

Support: Geotube
Geotube
Support Type: GeoTextile
Force Application: Passive
Force Orientation: Tangent to Slip Surface
Anchorage: Both Ends
Shear Strength Model: Linear
Strip Coverage: 100 percent
Tensile Strength: 1600 lb/ft
Pullout Strength Adhesion: 5 lb/ft2
Pullout Strength Friction Angle: 40 degrees

□ □□□□□M□□□ □□ □

Method: bishop simplified
FS: 7.781420
Center: -82.847, 4119.349
Radius: 3734.560
Left Slip Surface Endpoint: -697.422, 435.704
Right Slip Surface Endpoint: 672.625, 462.000
Resisting Moment=3.7689e+009 lb-ft
Driving Moment=4.84345e+008 lb-ft

Method: janbu simplified
FS: 7.775130
Center: -82.847, 4119.349
Radius: 3734.560
Left Slip Surface Endpoint: -697.422, 435.704
Right Slip Surface Endpoint: 672.625, 462.000
Resisting Horizontal Force=1.00385e+006 lb
Driving Horizontal Force=129110 lb

Method: spencer
FS: 7.780860
Center: -82.847, 4119.349
Radius: 3734.560
Left Slip Surface Endpoint: -697.422, 435.704
Right Slip Surface Endpoint: 672.625, 462.000
Resisting Moment=3.76862e+009 lb-ft
Driving Moment=4.84345e+008 lb-ft
Resisting Horizontal Force=1.00379e+006 lb
Driving Horizontal Force=129007 lb

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Method: bishop simplified
Number of Valid Surfaces: 6498
Number of Invalid Surfaces: 11993
Error Codes:
Error Code -107 reported for 22 surfaces
Error Code -110 reported for 1555 surfaces
Error Code -113 reported for 21 surfaces
Error Code -1000 reported for 10395 surfaces

Method: janbu simplified
Number of Valid Surfaces: 6498
Number of Invalid Surfaces: 11993
Error Codes:
Error Code -107 reported for 22 surfaces
Error Code -110 reported for 1555 surfaces
Error Code -113 reported for 21 surfaces
Error Code -1000 reported for 10395 surfaces

Method: spencer
Number of Valid Surfaces: 6285
Number of Invalid Surfaces: 12206
Error Codes:
Error Code -107 reported for 22 surfaces
Error Code -108 reported for 4 surfaces
Error Code -110 reported for 1555 surfaces
Error Code -111 reported for 209 surfaces
Error Code -113 reported for 21 surfaces
Error Code -1000 reported for 10395 surfaces

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009
Client:	Honeywell	Project:	Onondaga Lake SCA 50% Design	Project/ Proposal No.:	GJ4299	Task No.:	05

Slide Analysis Information

[illegible]

File Name: EastWest_Cover_External_LongTerm_Lab.sli

P[illegible]

Project Title: SLIDE - An Interactive Slope Stability Program
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

A[illegible] M[illegible]

Analysis Methods used:
Bishop simplified
Janbu simplified
Spencer

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50

[illegible]

Surface Type: Circular
Search Method: Grid Search
Radius increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Create Tension Crack
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

M[illegible] P[illegible]

Material: Final Cover Soil
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 30 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Dike Soil
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 35 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Gravel
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 38 degrees
Water Surface: Piezometric Line 1
Custom Hu value: 1

Material: SOLW (Drained)
Strength Type: Mohr-Coulomb
Unit Weight: 82 lb/ft3
Cohesion: 0 psf
Friction Angle: 34 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Dredge Material (Long)
Strength Type: Mohr-Coulomb
Unit Weight: 86 lb/ft3
Cohesion: 0 psf
Friction Angle: 30 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Tube-Tube Interface (Horizontal)
Strength Type: Mohr-Coulomb
Unit Weight: 86 lb/ft3
Cohesion: 0 psf
Friction Angle: 15 degrees
Water Surface: Water Table
Custom Hu value: 1

Written by:	Joseph Sura	Date:	4/3/2009	Reviewed by:	R. Kulasingam/Ming Zhu/Jay Beech	Date:	4/7/2009
Client:	Honeywell	Project:	Onondaga Lake SCA 50% Design	Project/ Proposal No.:	GJ4299	Task No.:	05

Material: Tub-Tube Interface (Vertical)
Strength Type: Mohr-Coulomb
Unit Weight: 43 lb/ft3
Cohesion: 0 psf
Friction Angle: 0.1 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Tube-Gravel Interface
Strength Type: Mohr-Coulomb
Unit Weight: 86 lb/ft3
Cohesion: 0 psf
Friction Angle: 24 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Liner
Strength Type: Mohr-Coulomb
Unit Weight: 100 lb/ft3
Cohesion: 0 psf
Friction Angle: 19 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Foundation
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 37 degrees
Water Surface: Water Table
Custom Hu value: 1

[illegible]

Support: Geotube (Long)
Geotube (Long)
Support Type: GeoTextile
Force Application: Passive
Force Orientation: Tangent to Slip Surface
Anchorage: Both Ends
Shear Strength Model: Linear
Strip Coverage: 100 percent
Tensile Strength: 0.1 lb/ft
Pullout Strength Adhesion: 5 lb/ft2
Pullout Strength Friction Angle: 40 degrees

[illegible]

Method: bishop simplified
FS: 17.167300
Center: -82.847, 4119.349
Radius: 3734.560
Left Slip Surface Endpoint: -697.422, 435.704
Right Slip Surface Endpoint: 672.625, 462.000
Resisting Moment=8.3149e+009 lb-ft
Driving Moment=4.84345e+008 lb-ft

Method: janbu simplified
FS: 17.035700
Center: -52.324, 2991.992
Radius: 2636.429
Left Slip Surface Endpoint: -697.422, 435.704
Right Slip Surface Endpoint: 689.227, 462.000
Resisting Horizontal Force=3.48013e+006 lb
Driving Horizontal Force=204285 lb

Method: spencer
FS: 17.171900
Center: -82.847, 4119.349
Radius: 3734.560
Left Slip Surface Endpoint: -697.422, 435.704
Right Slip Surface Endpoint: 672.625, 462.000
Resisting Moment=8.31713e+009 lb-ft
Driving Moment=4.84345e+008 lb-ft
Resisting Horizontal Force=2.21562e+006 lb
Driving Horizontal Force=129026 lb

[illegible]

Method: bishop simplified
Number of Valid Surfaces: 6498
Number of Invalid Surfaces: 11993
Error Codes:
Error Code -107 reported for 22 surfaces
Error Code -110 reported for 1555 surfaces
Error Code -113 reported for 21 surfaces
Error Code -1000 reported for 10395 surfaces

Method: janbu simplified
Number of Valid Surfaces: 6498
Number of Invalid Surfaces: 11993
Error Codes:
Error Code -107 reported for 22 surfaces
Error Code -110 reported for 1555 surfaces
Error Code -113 reported for 21 surfaces
Error Code -1000 reported for 10395 surfaces

Written by:	**Joseph Sura**	Date:	**4/3/2009**	Reviewed by:	**R. Kulasingam/Ming Zhu/Jay Beech**	Date:	**4/7/2009**
Client:	**Honeywell**	Project:	**Onondaga Lake SCA 50% Design**	Project/ Proposal No.:	**GJ4299**	Task No.:	**05**

Method: spencer
Number of Valid Surfaces: 6498
Number of Invalid Surfaces: 11993
Error Codes:
Error Code -107 reported for 22 surfaces
Error Code -110 reported for 1555 surfaces
Error Code -113 reported for 21 surfaces
Error Code -1000 reported for 10395 surfaces