Tennessee Valley Authority
Regulatory Submittal for Kingston Fossil Plant

Documents submitted:
New Sluice Trench Road Work Plan
Geosyntec concurrence with Work Plan

Date Submitted:
01/07/2010

Submitted to whom
Leo Francendese

Concurrence

Received	Not Applicable	TVA
☒	☐	Mike Scott
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Approvals

TVA Michael T Scott Date 1/7/10

EPA Leo Francendese Date 1/12/10

consulted w/ TDEC

cc:

- ☒ Anda Ray, TVA
- ☒ Barbara Scott, TDEC
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- ☒ Mike Scott, TVA
- ☒ Dennis Yankee, TVA
- ☒ Kathryn Nash, TVA
- ☒ Cynthia Anderson, TVA
- ☒ Steve McCracken, TVA
- ☒ EDM
- ☒ Julie Pfeffer, Jacobs
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- ☒ Greg Signer, TVA
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- ☒ Katie Kline, TVA
- ☒ Gretchen Wahl, Jacobs
- ☒ Dannena Bowman, EPA
- ☒ Jeff Gary, Jacobs
- ☒ Robert Pullen, Jacobs

Work Plan for New Road Construction along Sluice Trench

1.0 Purpose of Work

The purpose of this work plan is to address the construction required to create a new roadway for vehicle traffic entering and exiting the work site. The new road will begin at the main entrance of the site and parallel the existing road approximately 750' before merging back to the existing roadway. The road along the sluice trench known as "Drag Line Alley", has become congested with haul trucks removing ash recovered from the sluice trench. The new road will provide additional area to dewater ash removed from the sluice trench and provide a safer work area for haul trucks to maneuver and haul recovered ash to disposal.

2.0 Design Components

The new roadway has been designed to parallel the existing sluice trench road before merging back into the existing sluice trench roadway approximately midway down the sluice trench. No heavy loads will be allowed to use the new road. The existing underground effluent line that parallels the entire length of the sluice trench road will remain in place and located between the new roadway and the existing haul road. Jersey Barriers will be placed along the center line of the pipe to serve as delineation between the haul road and the new road, as well as add protection to the water line. The HAZWOPER boundary will be relocated approximately 60' east of its existing location along the roadway. Silt fencing will be installed prior to construction. Construction of the new road will require the placement of approximately 4500 cubic yards of shot rock or compacted soil in accordance with the design. The new roadway will be approximately 22' wide allowing two-way traffic entering or exiting the site. Storm water and drainage will be directed to flow from the roadway towards the sluice trench. Silt fence will be installed along the toe of the fill in accordance with the design. The roadway will merge back to the existing roadway on the south side of an existing power line roadway. Geosyntec has approved the design and their approval is attached to this work plan.

3.0 Construction Management

Prior to the start of construction, vegetation will be mowed as low as possible in preparation of the installation of the geotextile noted in the design sketch. Trees greater than 2" in diameter will be cut at the base of the trunk and root ball will be removed and backfilled with manufactured sand. Vegetation and/or trees smaller than 2" in diameter may be removed while including root ball. Debris will be disposed of in accordance with established site debris removal practices. The new road will be constructed according to design drawing INF-SK-034.

4.0 Schedule

The schedule for completing this work plan would be as soon as possible to provide a safer work area as well as improve operations of disposing of ash that has been removed from the sluice trench and dewatered.

5.0 Waste Management

Storm water run off will flow towards the Sluice trench processing area. Approximately 850 feet of silt fence will be installed along the toe of the slope of the new road.

6.0 Health and Safety

All construction activities will be done in accordance with site-wide Health and Safety Plan.

RIM DITCH

SLUICE TRENCH

INTAKE CHANNEL

N 553528.62
E 2439786.33
MATCH EXIST EL

N 553505.26
E 2439806.69
EL 769.00

REMOVE 116'± OF EXISTING SNOW FENCE

N 553475.25
E 2439725.61
MATCH EXIST EL

N 553453.52
E 2439744.72
EL 769.00

N 553559.24
E 2439865.96
MATCH EXIST EL

N 553401.07
E 2439884.31
MATCH EXIST EL

N 553434.63
E 2439785.85
EL 769.00

N 553369.58
E 2439889.90
EL 767.83

NEW ROW OF JERSEY BARRIERS

NEW SILT FENCE

EXISTING SNOW FENCE

N 553066.30
E 2439300.76
EL 769.17

N 553142.18
E 2439424.21
EL 767.82

NEW SNOW FENCE/ NAZWOPER BOUNDARY

N 553030.15
E 2439258.15
EL 769.58

REMOVE 40'± OF EXISTING SNOW FENCE

N 553012.30
E 2439270.89
EL 769.31

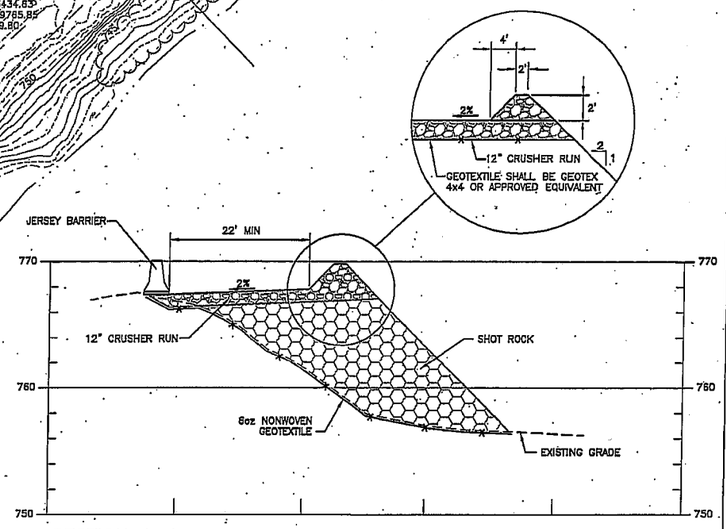
N 553049.52
E 2439314.99
EL 769.61

EXISTING WHEEL WASH

769.3

PLAN

SCALE: 1"=40'



SECTION A–A

SCALE: 1"=10' HORIZ
1"=5' VERT

INSTALLATION NOTES:

1. INSTALL SILT FENCE.
2. MOW AREA AS LOW AS POSSIBLE.
3. LIGHTLY SCRAPE AWAY VEGETATION.
4. INSTALL GEOTEXTILE.
5. PLACE SHOT ROCK.

0 40' 80' 120'

REVISION NO.	DATE	DESCRIPTION	DRAWN BY	CHECKED BY	APPROVAL
A	11/03/09	ISSUED FOR CONSTRUCTION			

SEAL

JACOBS

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY

DRAG LINE ROAD BYPASS

SCALE	DRAWING NO.	REV.
SHOWN	INF-SK-034	A

Geosyntec consultants

COMPUTATION COVER SHEET

Client: **TVA** Project: **Dredge Cells Recovery** Project/ Proposal No.: Task No. **GR4327**

Title of Computations **Stability Analyses for Proposed Drag Line Road Bypass**

Computations by:	Signature		17 December 2009
	Printed Name	Justin Wang	Date
	Title	Project Engineer	
Assumptions and Procedures Checked by: (peer reviewer)	Signature		17 December 2009
	Printed Name	Jill F. Simons	Date
	Title	Project Engineer	
Computations Checked by:	Signature		17 December 2009
	Printed Name	Jill F. Simons	Date
	Title	Project Engineer	
Computations backchecked by: (originator)	Signature		17 December 2009
	Printed Name	Justin Wang	Date
	Title	Project Engineer	
Approved by: (pm or designate)	Signature		17 December 2009
	Printed Name	Robert C. Bachus	Date
	Title	Principal	

Approval notes:

Revisions (number and initial all revisions)

No.	Sheet	Date	By	Checked by	Approval

Written by:	**J. Wang**	Date:	**12/17/09**	Reviewed by:	**J. Simons/R. Bachus**	Date:	**12/17/09**
Client:	**TVA**	Project:	**Dredge Cells Recovery**	Project/ Proposal No.:	**GR4327**	Task No.:	**105**

STABILITY ANALYSES FOR PROPOSED DRAG LINE ROAD BYPASS

PURPOSE

The purpose of this calculation package is to present static stability analyses performed by Geosyntec Consultants (Geosyntec) for a section from the proposed Drag Line Road Bypass (Bypass) to the Intake Channel at the Tennessee Valley Authority (TVA) Kingston Fossil Plant (KIF) Ball Field Site (Site). The static stability analyses are used to evaluate potential shallow- and deep-seated failures surfaces along a typical cross section.

BACKGROUND

TVA and Jacobs Engineering (Jacobs) plan to construct a Bypass along the east side of the existing sluice channel. Figure 1, prepared by Jacobs, shows the proposed Bypass Location. To construct the proposed Bypass, a new rock embankment will be constructed on the side slope located on the east side of the sluice channel. The side slope of the proposed rock embankment will be 2 Horizontal (H) : 1 Vertical (V). The elevation of the rock embankment toe is approximately 756 ft. The proposed Bypass will be constructed on top of the rock embankment with a minimum width of 22 feet. The Bypass elevation is approximately 768 feet (see details in Figure 1).

PREVIOUS SITE INVESTIGATION AND FINDINGS

In early 2009, numerous subsurface borings (by Mactec) and CPTu soundings (by ConeTec) were advanced in the Ball Field Site. The location of borings at the Site is presented in Figure 2. From this figure it is noted that Boring B-46, B-47 and CPT Sounding CPT-44 were located near the west side of the proposed Bypass. Based on review of Boring B-46, B-47 and CPT-44, the subsurface conditions in this area can be summarized as follows (from top to bottom):

- approximately 10- ft thick strong crust layer consisting of compacted bottom ash;
- 20- to 25- ft thick layer of bottom ash;

- 10- to 15- ft thick layer of relatively soft fly ash;
- 5- to 15-ft thick layer of relatively soft clayey foundation soils;
- 10- to 15-ft thick layer of sandy foundation soils; and
- bedrock.

The groundwater surface is located approximately 7- to 10-ft below ground surface. CPT Sounding CPT-44 encountered shallow refusal at a depth of approximately 8 feet below existing grade. Information obtained at Borings B-46 and B-47 indicates the N-values of this refusal material exceed 100 bpf.

HISTORICAL INFORMATION REVIEW

No borings/soundings were conducted by Mactec or ConeTec in the area between the proposed Bypass and the Intake Channel. To perform stability analyses, a better understanding of the subsurface conditions between the proposed Bypass and the Intake Channel is required. Therefore, Geosyntec has reviewed the historical drawings provided by TVA. The historical drawings have been included in Figures 3, 4, and 5.

Based on review of the historical drawings, Geosyntec understands the following:

1. The historical drawings indicate that an earth dike (East Dike) was constructed along the west side of the Intake channel. A typical section of the earth dike is shown in Figure 6. The top elevation of the west portion of East Dike was 750 ft and the top elevation of the east portion of East Dike was 735 ft.

2. The historical drawings indicate that East Dike was constructed on the existing ground. The existing ground elevation in 1951 was approximately 730 feet as shown in Figure 7.

3. The historical drawings indicate that an ash dike was planned to be constructed on the west side of the East Dike to increase the capacity of the ash pond, The proposed stage construction plan is shown in Figure 8. Based on current topographic information, the current ground elevation near the east side of sluice channel is approximately 768 ft. Since the top elevation of the original East

Dike was 750 ft, an ash dike must have been constructed to the west side of the East Dike to help increase the capacity of the ash pond.

SUBSURFACE STRATIGRAPHY & MATERIAL PROPERTIES

Based on review of the previous site investigation and historical drawings, Geosyntec has prepared a typical cross section to be used in the stability analyses. The location of the section is shown in Figure 1. The ground surface geometry is presented in Figure 9 and the subsurface stratigraphy is presented in Figure 10.

In selecting material properties for the stability analyses, Geosyntec relied on information provided in the previous [Geosyntec 2009a, 2009b, 2009c] documents, as well as the boring logs from Mactec. The material properties used in the stability analyses are summarized in Table 1.

Based on Mactec Borings B-46 and B-47, groundwater in the west side of the proposed Bypass was conservatively assumed to be at elevation 760 ft (highest groundwater level measured in the borings). As shown on Figure 1, the Intake Channel water level was approximately 740 feet. Since there is no groundwater data available between the borings and intake Channel, the groundwater level was assumed to be a straight line between groundwater level in the borings and the water level at the Intake Channel.

STABILITY ANALYSES METHODOLOGY

Static stability analyses were performed using Spencer's method (1973), as implemented in the computer program SLIDE, version 5.0 developed by Rocscience (2006).

Two failure modes were considered in the analyses: (i) rotational failure modes (i.e., circular slip surfaces); and (ii) translational failure modes (i.e., block slip surfaces). The purpose of the stability analyses is to evaluate the potential shallow- and deep-seated failure modes.

Spencer's method is chosen to analyze the rotational failure modes. Spencer's method, which satisfies both vertical and horizontal force equilibrium and moment equilibrium, is considered to be more rigorous than other methods, including the simplified Janbu method (Janbu, 1973) and the simplified Bishop method (Bishop, 1955).

The difficulty in analyzing a non-circular failure surface is that it is difficult to find a single point through which many of the force components act. So, the moment equilibrium method used for circular surfaces is no longer the most appropriate. Therefore, Janbu method is chosen instead to use the force equilibrium method in the transitional failure modes.

Information required for the static stability analyses includes slope geometry, subsurface ash/soil stratigraphy, groundwater table elevation, material properties of the subsurface soils, and external surface loading at the selected cross section locations. The traffic load is modeled as uniformly distributed vertical load equal but not less than 2 ft of earth pressure according to the latest AASHTO Article 3.20.3. A vertical external loading of 250 psf is applied on the top of the Bypass in the stability analyses.

Two factors of safety (FS) were considered for slope stability of the analyzed section, one for the end of construction condition and one for the long term condition. The end of construction condition is the condition during the Bypass construction and shortly after the Bypass is completed. The long term condition is the condition a relatively long time after the Bypass is completed.

The target FS was considered to be 1.3 for the end of construction 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].

ANALYZED CROSS SECTIONS

The plan view of the site is shown in Figure 1. The Cross Section C-C as shown in Figure 9 was selected in the static stability analyses. The Cross Section C-C is located near the center location of the proposed Bypass alighment and is a typical section for the majority areas along the Bypass.

In Cross Section C-C, the elevation of the top of the proposed Bypass is approximately 768 feet, the elevation of the bottom of the Intake Channel is approximately 725 feet. The elevation difference is approximately 43 feet over 230 feet horizontal distance. The average slope is approximately 6H: 1V. This indicates that a stability analysis needs to be performed for the section from the proposed Bypass to the Intake Channel.

In Cross Section C-C, the elevation of the bottom of the Sluice Channel is approximately 764 feet. The elevation difference between the top of the proposed Bypass and the bottom the Sluice Channel is approximately 4 feet over 200 feet horizontal distance. The average slope is approximately 50H: 1V. The average slope is relatively flat; therefore, a stability analysis is not required.

RESULTS AND CONCLUSIONS

Geosyntec computed the minimum FS for the section from the proposed Bypass to the Intake Channel. The results are shown in Table 2. In all cases, the calculation results are greater than the target values of 1.3 or 1.5. The critical failure surfaces for each of the considered slopes calculated from the stability analyses are shown graphically in Figures 11 through 16. An example SLIDE input file is presented in Attachment 2 of this calculation package.

The results of the slope stability analyses indicate the calculated values of FS are greater than the target values for the analyzed section under the short-term and long-term conditions. Therefore, shallow- and or deep-seated failures are not likely to occur along the analyzed section.

REFERENCES

Bishop, A. (1955), "The Use of the Slip Circle in the Stability Analysis of Slopes," Geotechnique, Volume 5, No. 1, Jan 1955, pp. 7-17.

Geosyntec Consultants (2009a), "Technical Summary – Proposed Modification Regarding Spacing/Depth of Prefabricated Vertical Drains at Ball Field Temporary Ash Disposal Site", March 17, 2009

Geosyntec Consultants (2009b), "Slope Stability Analyses for Dike 2", July 31, 2009

Geosyntec Consultants (2009c), "Rapid Dewatering System and Filter Press System Foundation Assessment", December 16, 2009

Hammer, D.P., and Blackburn, E.D. (1977), "Design and Construction of Retaining Dikes for Containment of Dredged Material", Technical Report D-77-9, U.S. Army Engineer Water Experiment Station, Vicksburg, Mississippi, August 1977, pp. 93.

Janbu, N. (1973), "Slope Stability Computations," Embankment Dam Engineering, Casagrande Memorial Volume, R. C. Hirschfield and S. J. Poulos, Eds., John Wiley, New York, 1973, pp. 47-86.

Rocscience (2006), "SLIDE – 2-D Limit Equilibrium Slope Stability for Soil and Rock Slopes," User's Guide, Rocscience Software, Inc., Toronto, Ontario, Canada, 2006.

Spencer, E. (1973), "The Thrust Line Criterion in Embankment Stability Analysis," Géotechnique, Vol. 23, No. 1, pp. 85-100, March 1973.

U.S. Army Corps of Engineers (USACE) (2003), "Engineering and Design – Slope Stability", Engineering Manual EM 1110-2-1902, October 2003, pp. 3-2.

TABLES

Table 1. Summary of Subsurface Stratigraphy and Material Properties

Material	Unit Weight (pcf)	Drained Shear Strength	Undrained Shear Strength
Crusher Run (1)	135	c=0, ϕ=35°	c=0, ϕ=35°
Shot Rock (1)	135	c=0, ϕ=35°	c=0, ϕ=35°
East Dike Material (Compacted Clay)(1)	120	c=100psf, ϕ=28°	c=1,500psf, ϕ=0°
Crust Layer (Compacted Ash) (2)	120	c=500psf, ϕ=25°	c=500psf, ϕ=25°
Sluiced Ash (Bottom/Fly Ash)(2)	75	c=0, ϕ=20°	c=0, ϕ=20°
Clayey Foundation Soils (2)	100	c=0, ϕ=28°	c=1,200psf, ϕ=0°
Sandy Foundation Soils (2)	100	c=0, ϕ=30°	c=0, ϕ=30°

Notes:

1. Material properties were estimated based on experience.
2. Material properties were obtained based on previous [Geosyntec 2009a, 2009b, 2009c] documents.

Table 2: Results of Slope Stability Analysis

Failure Mode	Condition	Calculated FS	Target FS	Is FS OK?	Results Shown in Figure
Circular Slip	Long Term	1.58	1.5	Yes	11
Circular Slip	End of Construction	1.58	1.3	Yes	12
Block Slip (Shallow)	Long Term	1.70	1.5	Yes	13
Block Slip (Shallow)	End of Construction	1.70	1.3	Yes	14
Block Slip (Deep)	Long Term	2.10	1.5	Yes	15
Block Slip (Deep)	End of Construction	2.41	1.3	Yes	16

FIGURES

Written by: J. Wang Date: 12/17/09 Reviewed by: J. Simons/R. Bachus Date: 12/17/09

Client: TVA Project: Dredge Cells Recovery Project/ Proposal No.: GR4327 Task No.: 105

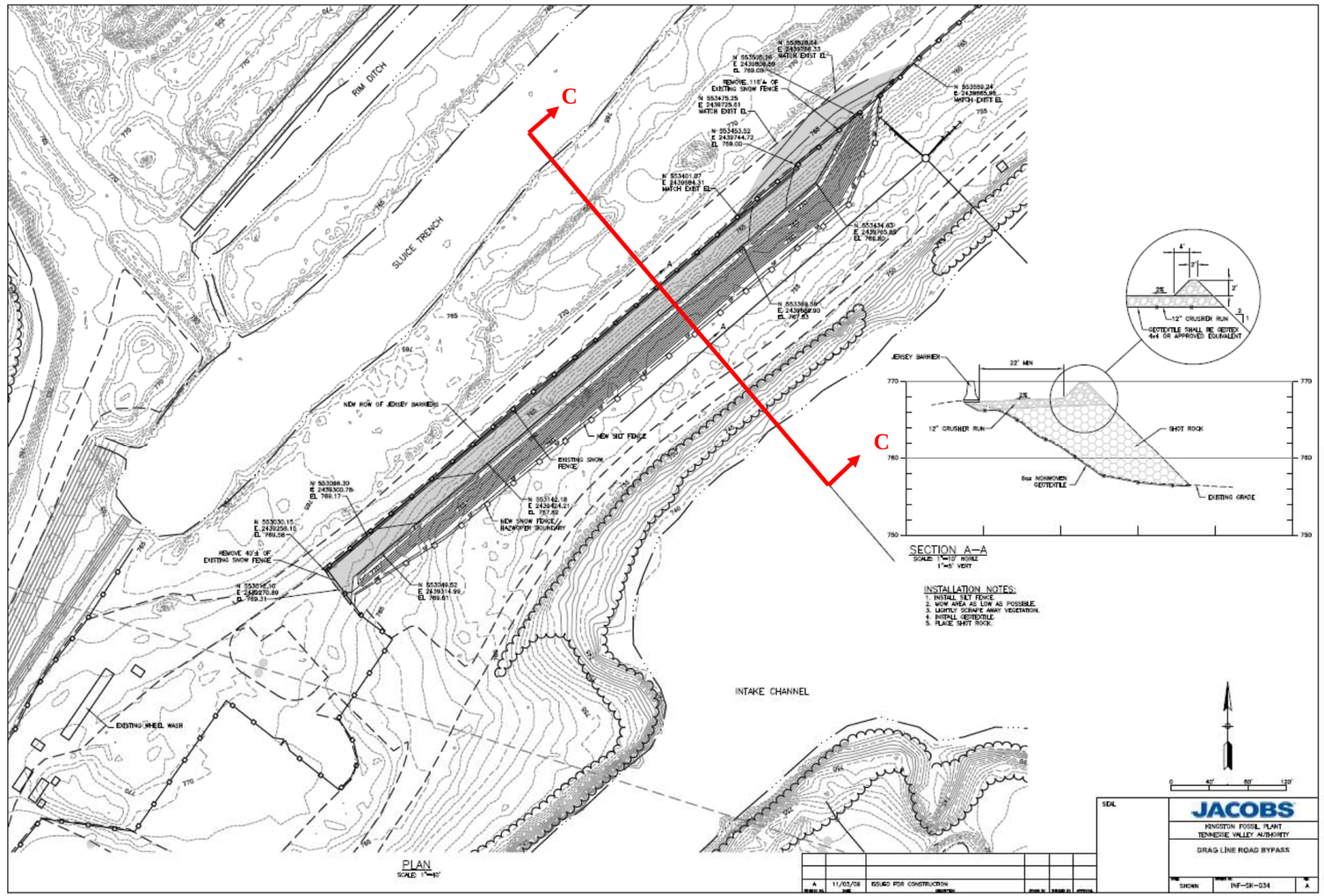


Figure 1. Proposed Drag Line Road Bypass (prepared by Jacobs)

Written by:	J. Wang	Date:	12/17/09	Reviewed by:	J. Simons/R. Bachus	Date:	12/17/09
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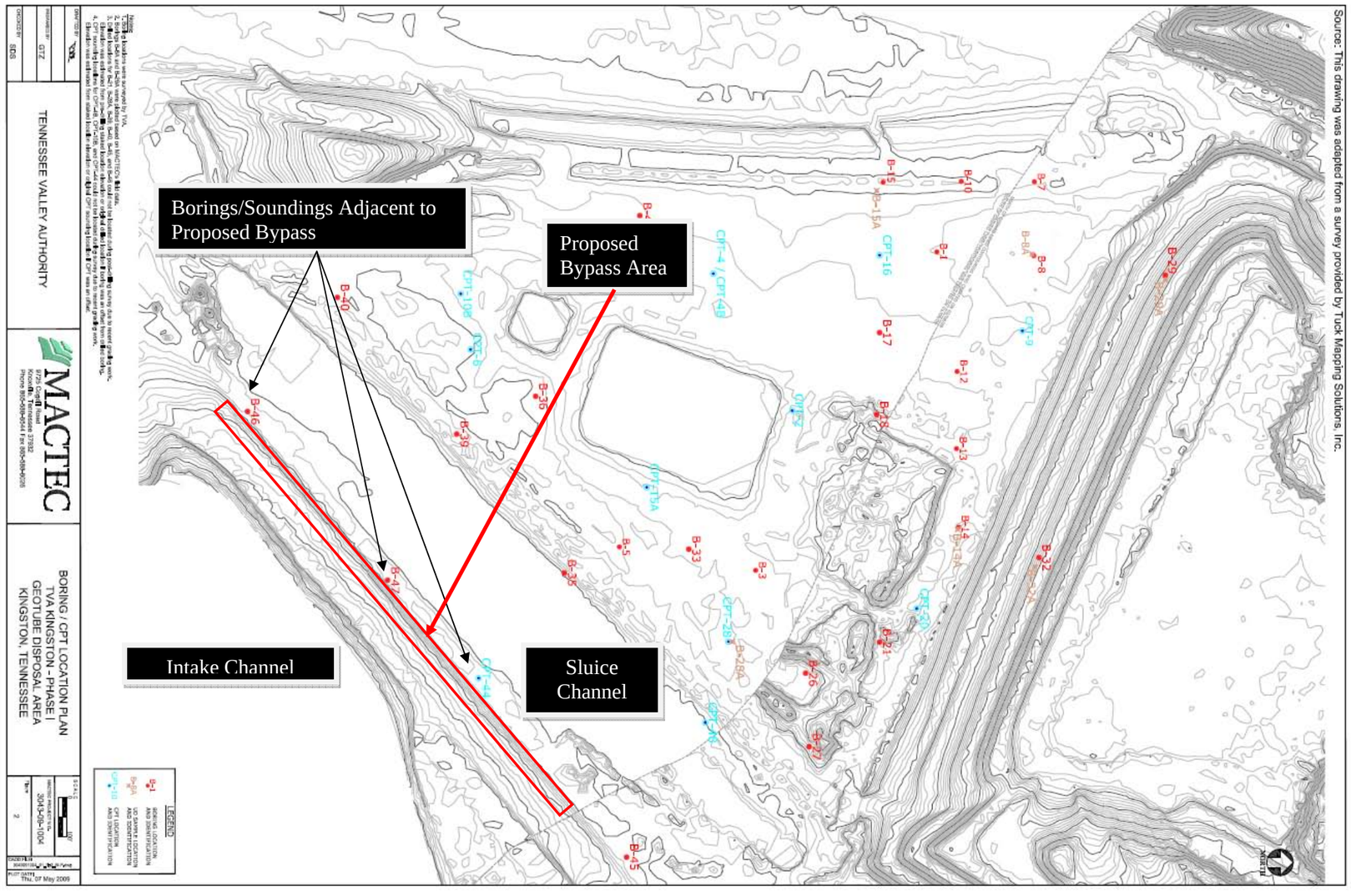

Figure 2. Location of Existing Borings

Written by:	J. Wang	Date:	12/17/09	Reviewed by:	J. Simons/R. Bachus	Date:	12/17/09
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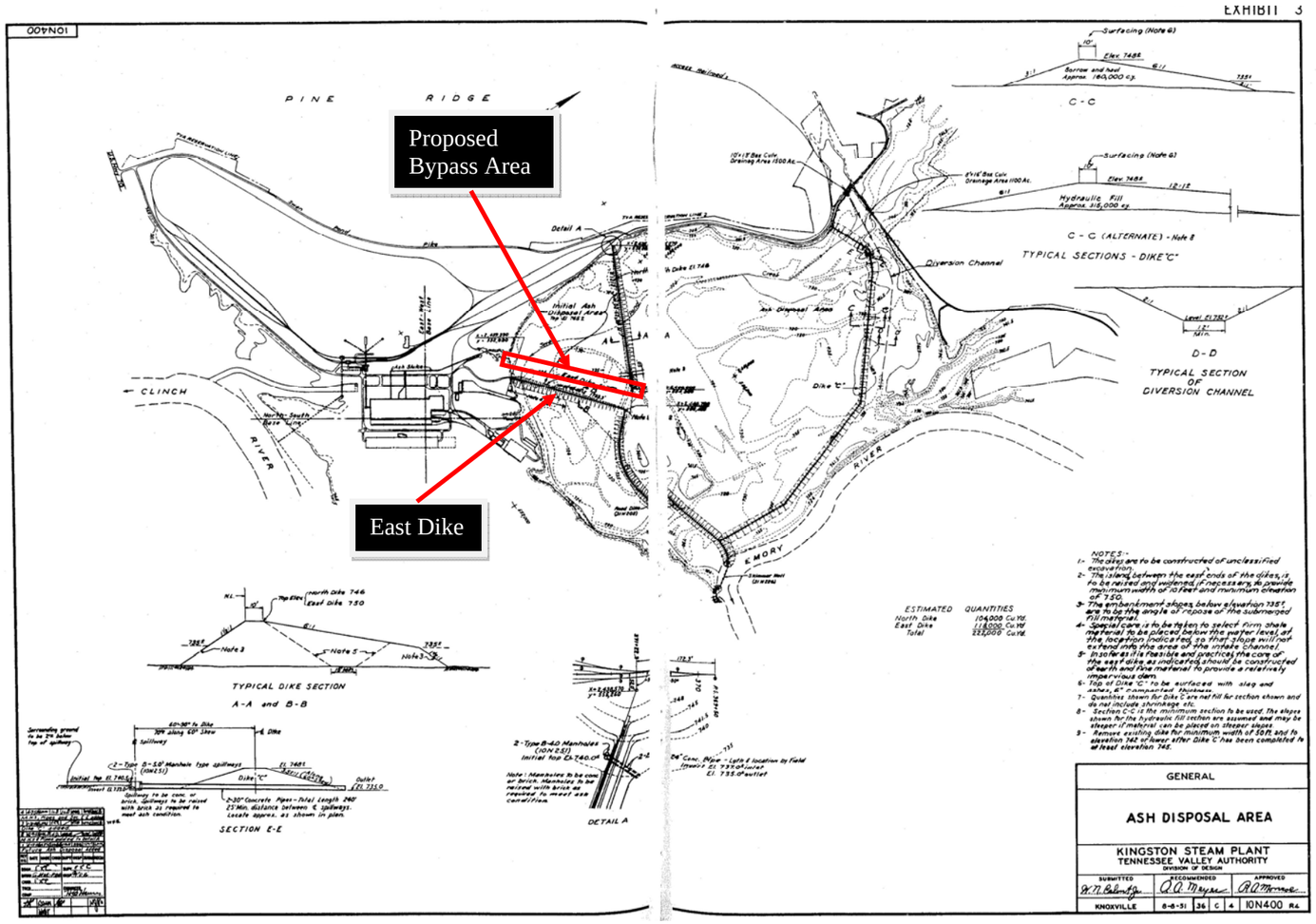


Figure 3. Ash Disposal Area (TVA Drawing No. 10N400R4 Dated 8/8/1951)

Written by:	J. Wang	Date:	12/17/09	Reviewed by:	J. Simons/R. Bachus	Date:	12/17/09
Client:	TVA	Project:	Dredge Cells Recovery	Project/ Proposal No.:	GR4327	Task No.:	105

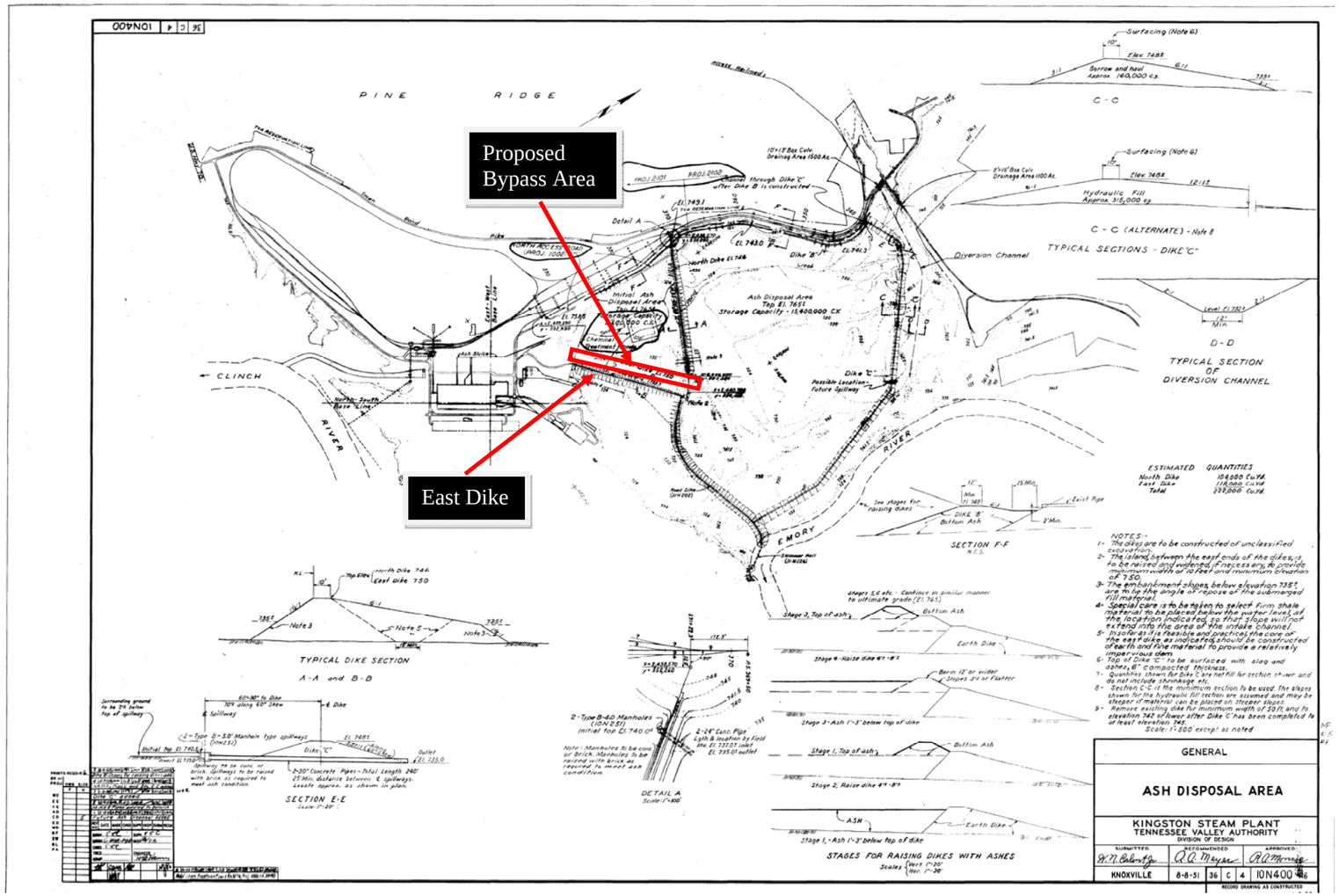


Figure 4. Ash Disposal Area (TVA Drawing No. 10N400R6 Dated 8/8/1951)

Written by: J. Wang Date: 12/17/09 Reviewed by: J. Simons/R. Bachus Date: 12/17/09

Client: TVA Project: Dredge Cells Recovery Project/ Proposal No.: GR4327 Task No.: 105

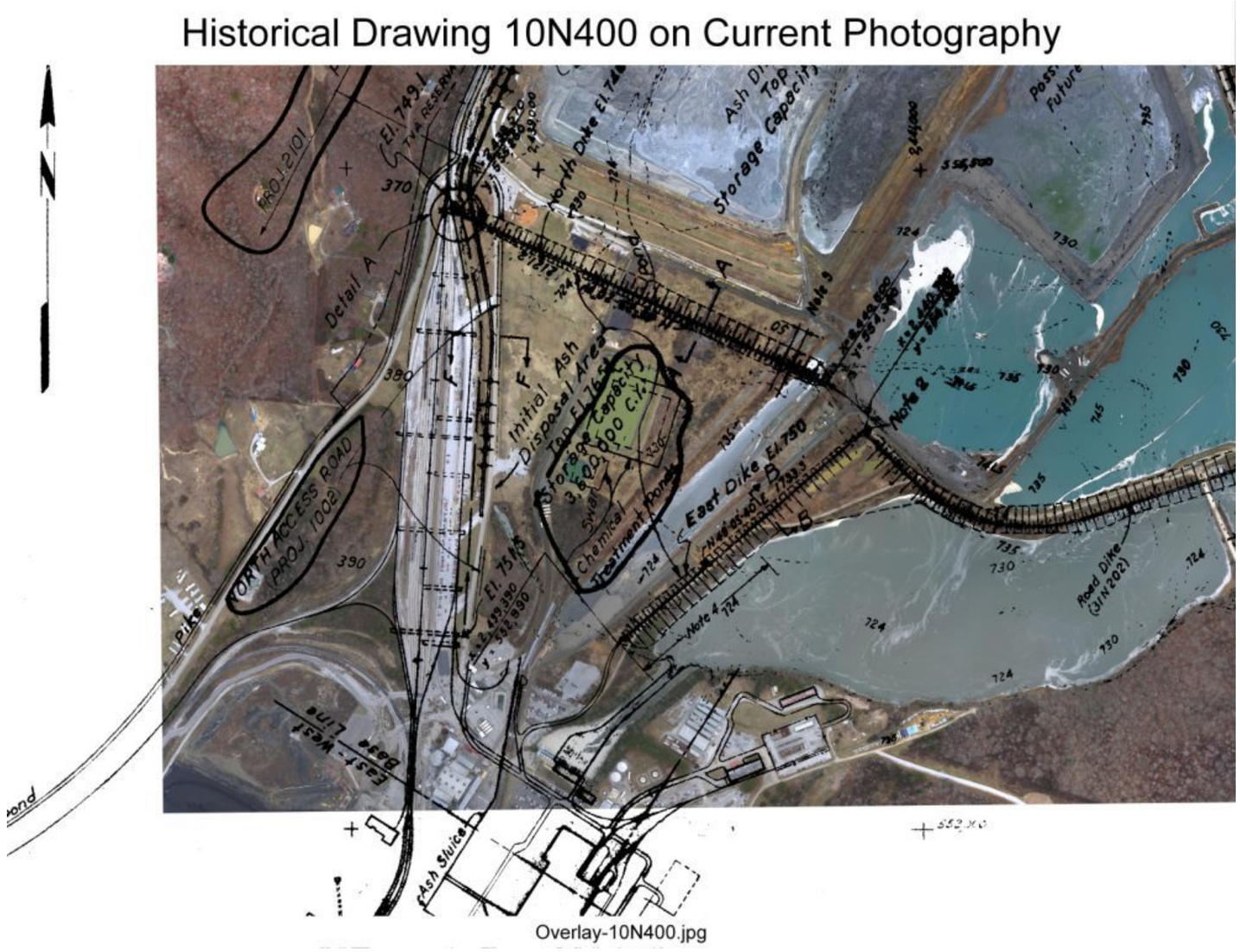
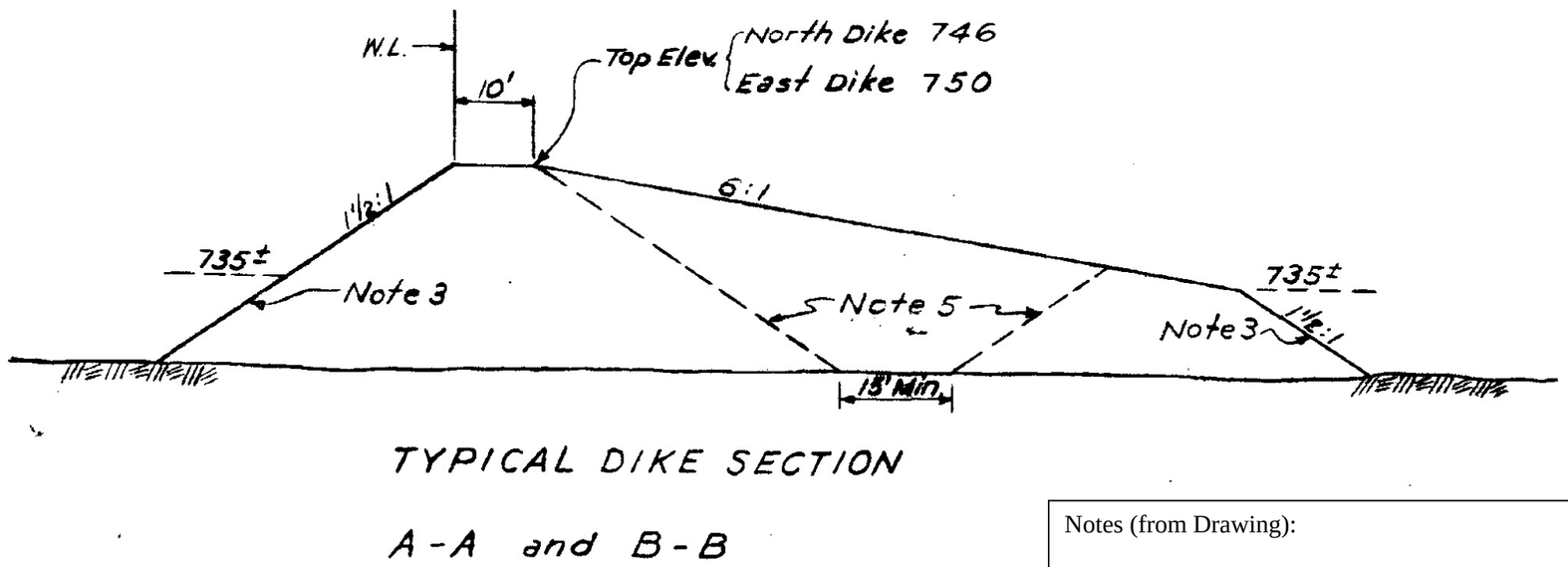


Figure 5. Historical Drawing 10N400 on Current Photography

Written by:	J. Wang	Date:	12/17/09	Reviewed by:	J. Simons/R. Bachus	Date:	12/17/09
Client:	TVA	Project:	Dredge Cells Recovery	Project/ Proposal No.:	GR4327	Task No.:	105



Notes (from Drawing):

3- The embankment slopes, below elevation 735+/-, are to be the angle of repose of the submerged fill material.

5- In so far as it is feasible and practical, the core of the east dike, as indicated, should be constructed of earth and fine material to provide a relatively impervious dam.

Figure 6. East Dike Section (TVA Drawing No. 10N400R6 Dated 8/8/1951)

Written by: J. Wang Date: 12/17/09 Reviewed by: J. Simons/R. Bachus Date: 12/17/09

Client: TVA Project: Dredge Cells Recovery Project/ Proposal No.: GR4327 Task No.: 105

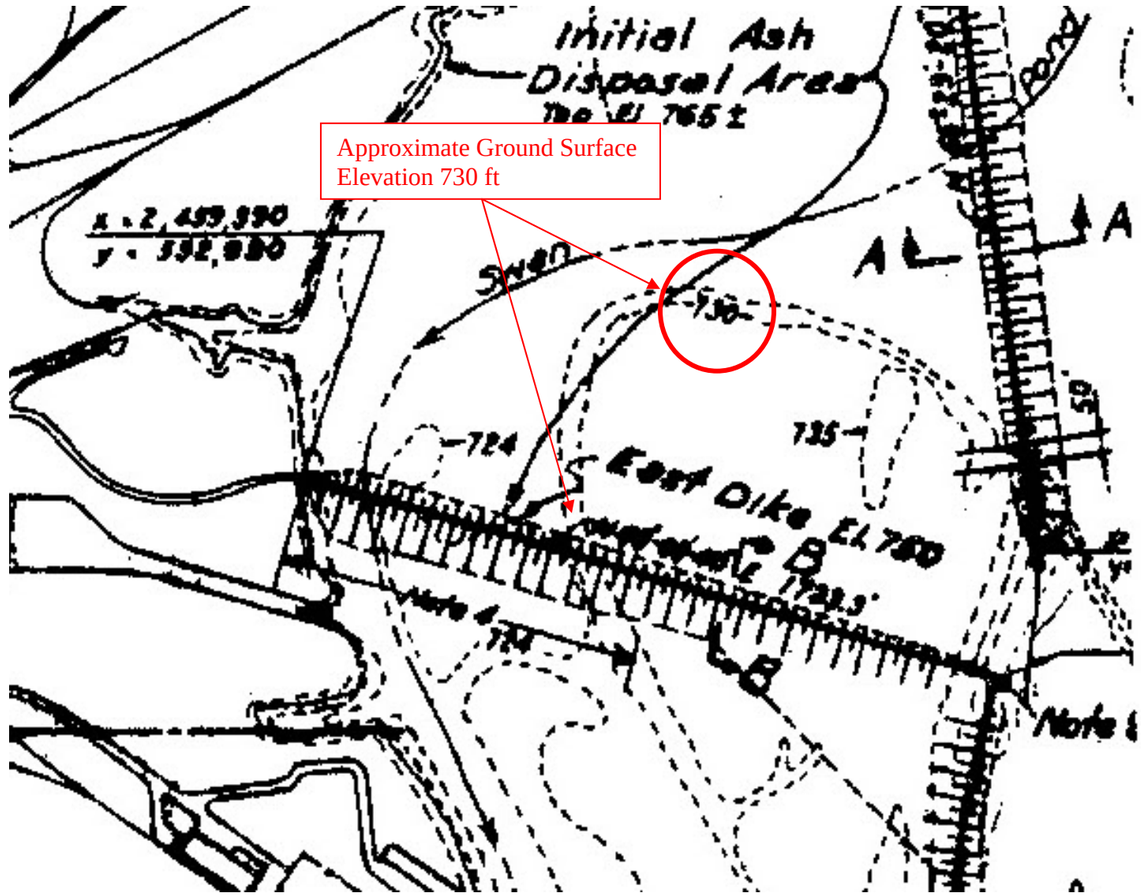


Figure 7. Existing Ground Elevation in 1951 (TVA Drawing No. 10N400R4 Dated 8/8/1951)

Written by:	J. Wang	Date:	12/17/09	Reviewed by:	J. Simons/R. Bachus	Date:	12/17/09
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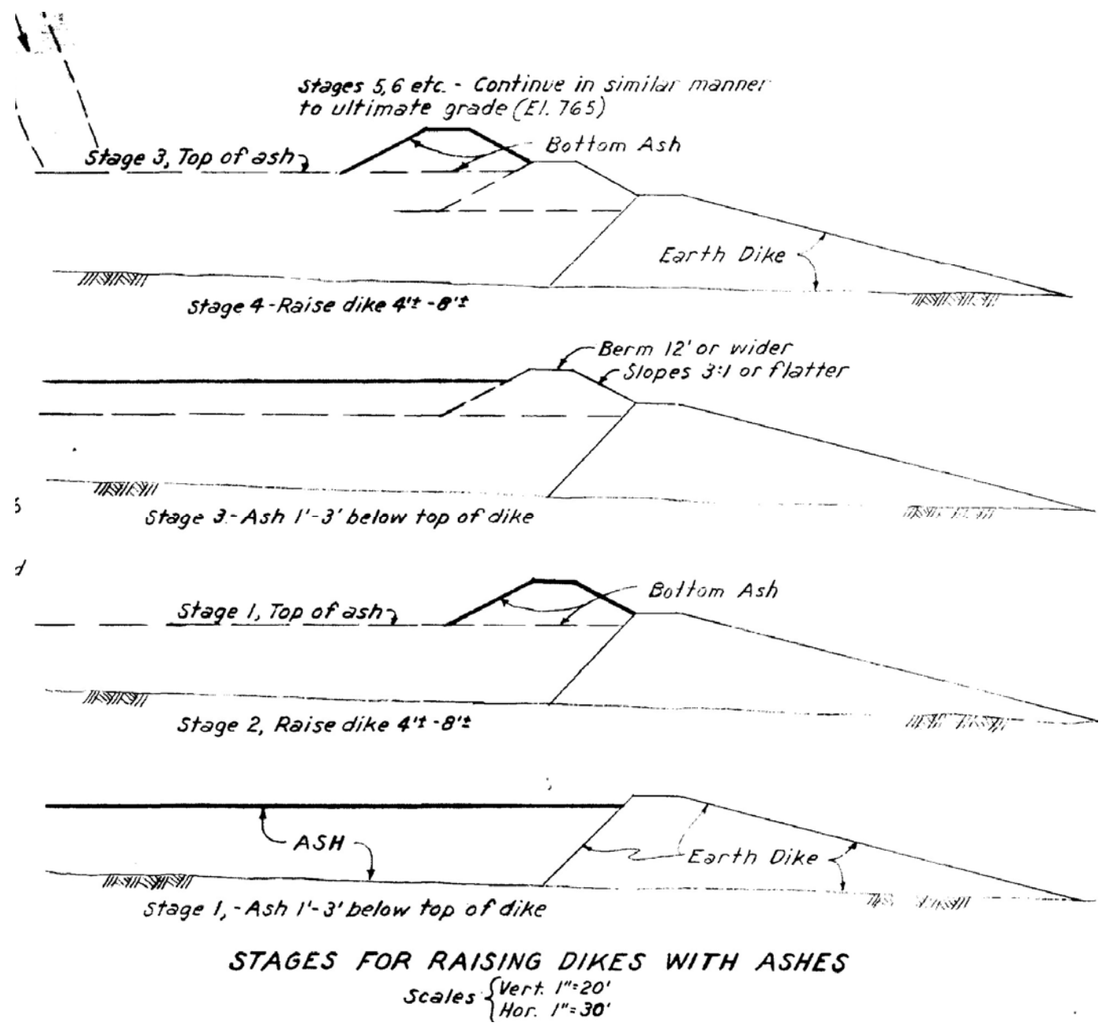

Figure 8. Staged Construction for Raising Dikes with Ashes (TVA Drawing No. 10N400R6 Dated 8/8/1951)

Written by: J. Wang Date: 12/17/09 Reviewed by: J. Simons/R. Bachus Date: 12/17/09

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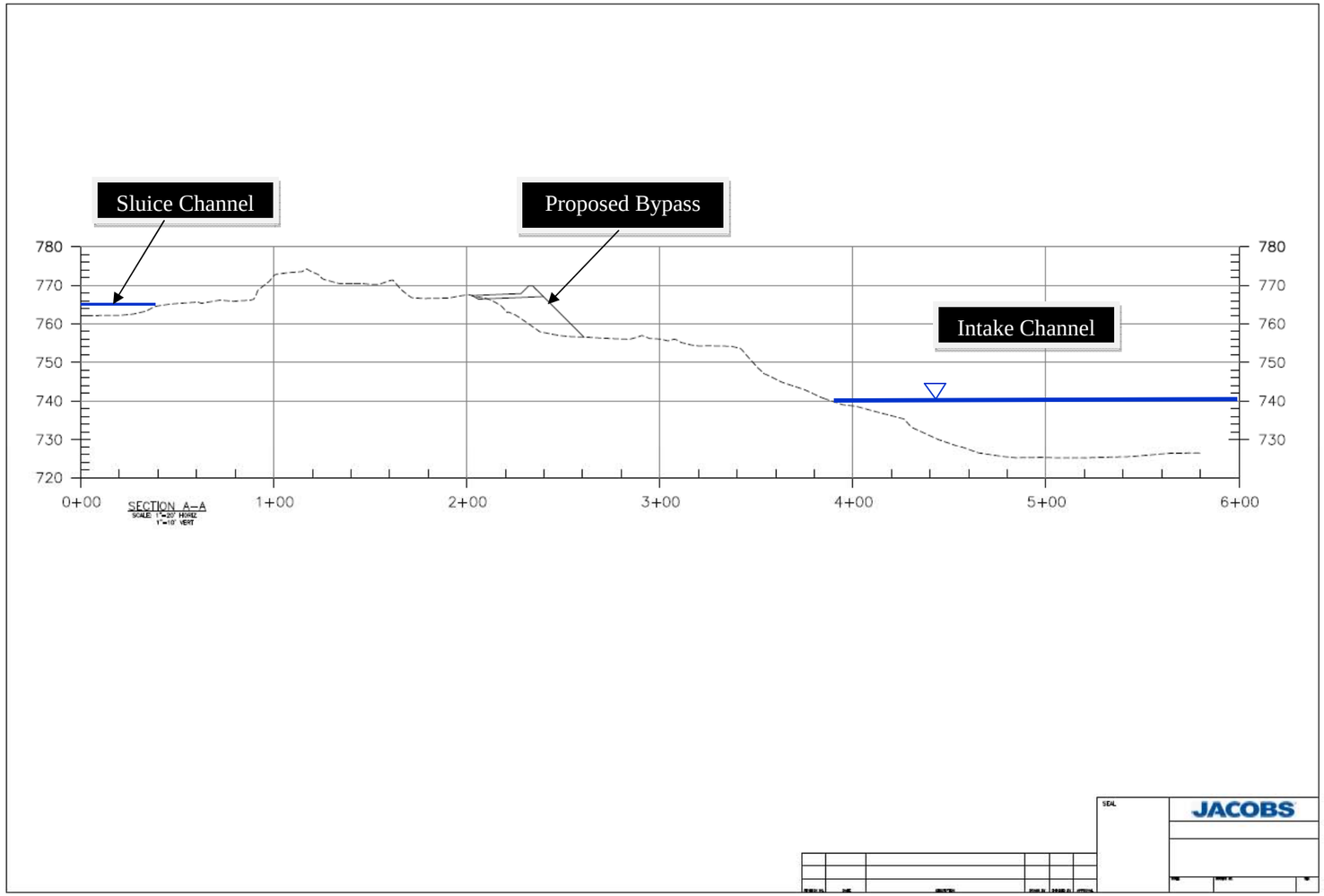

Figure 9. Ground Surface Geometry (Drawing Provided by Jacobs)

Written by: J. Wang Date: 12/17/09 Reviewed by: J. Simons/R. Bachus Date: 12/17/09

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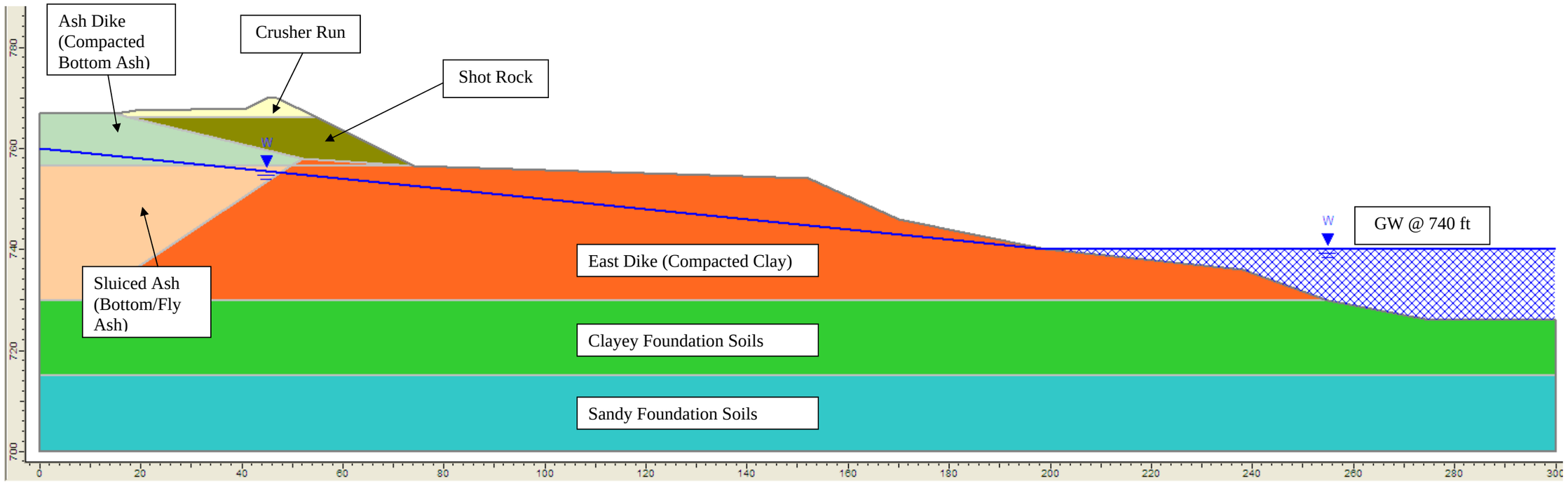

Figure 10. Subsurface Stratigraphy

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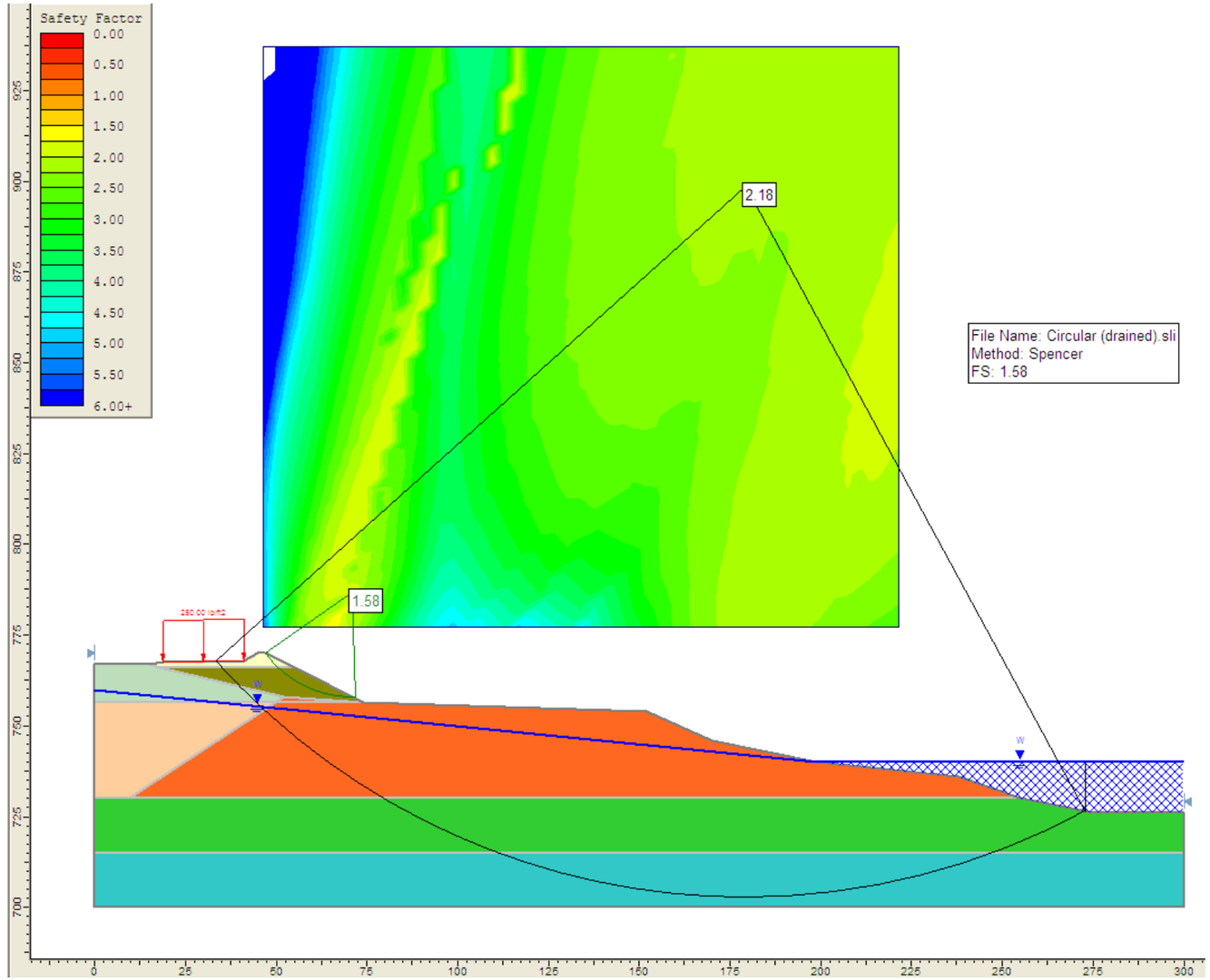


Figure 11. Stability Analysis Result (Circular Type, Drained Condition)

Written by: J. Wang Date: 12/17/09 Reviewed by: J. Simons/R. Bachus Date: 12/17/09

Client: TVA Project: Dredge Cells Recovery Project/ Proposal No.: GR4327 Task No.: 105

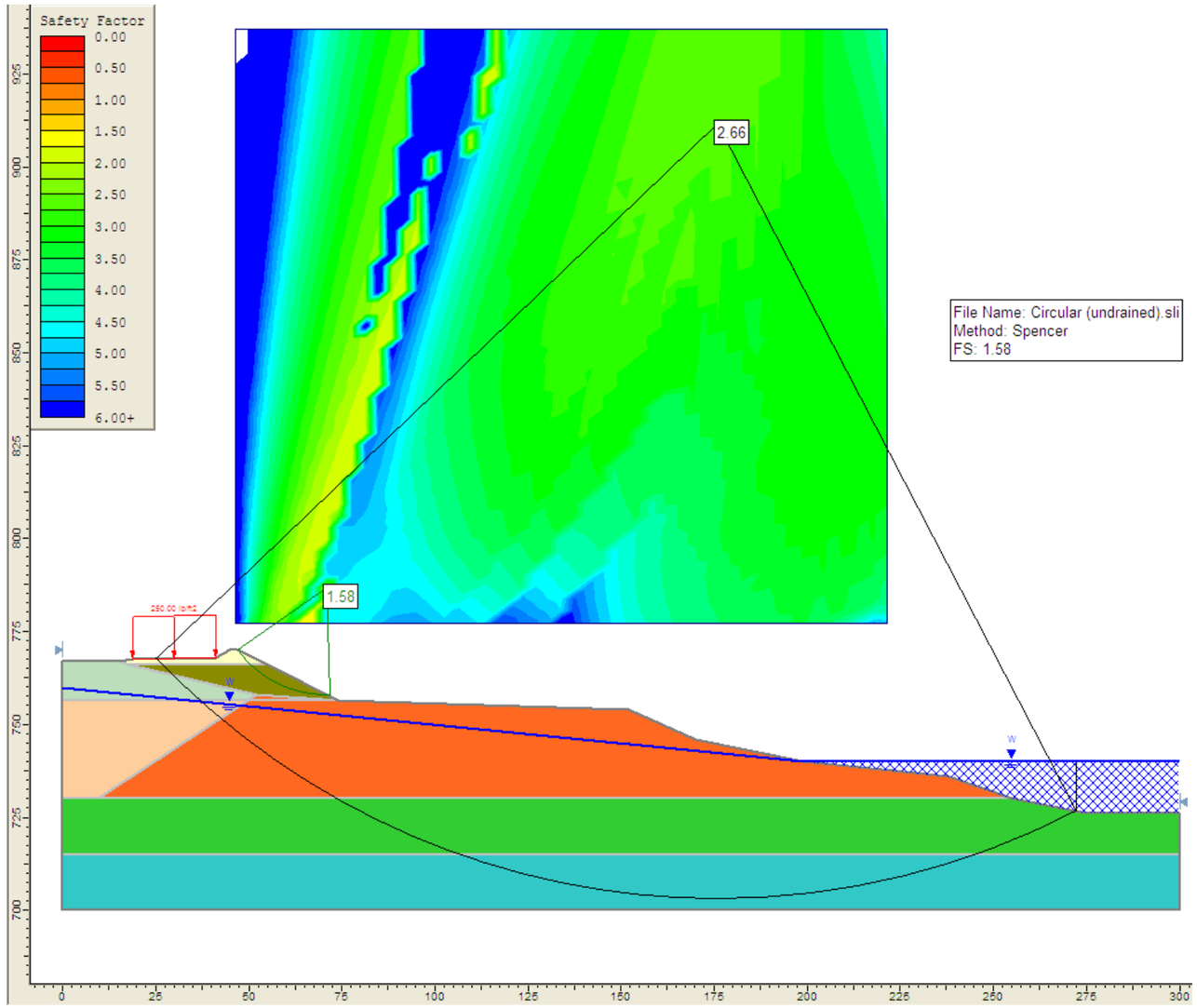


Figure 12. Stability Analysis Result (Circular Type, Undrained Condition)

Written by: J. Wang Date: 12/17/09 Reviewed by: J. Simons/R. Bachus Date: 12/17/09

Client: TVA Project: Dredge Cells Recovery Project/ Proposal No.: GR4327 Task No.: 105

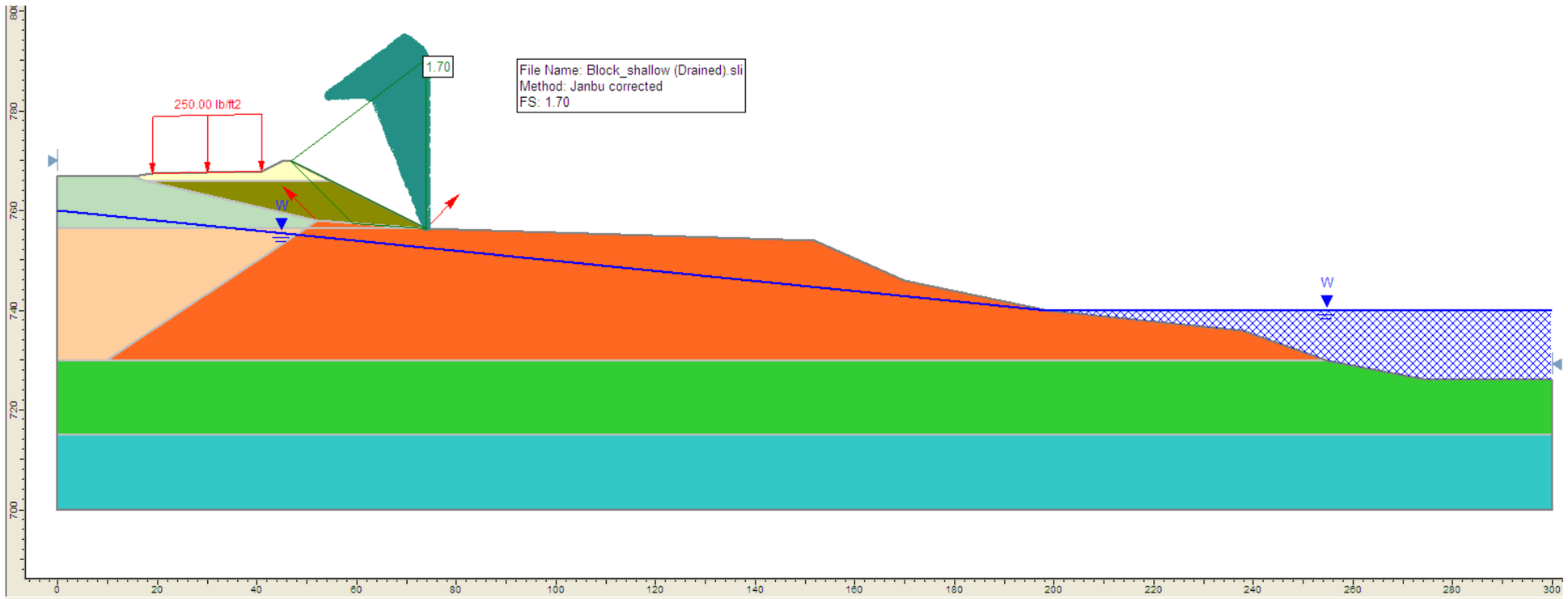


Figure 13. Stability Analysis Result (Shallow Block Type, Drained Condition)

Written by: J. Wang Date: 12/17/09 Reviewed by: J. Simons/R. Bachus Date: 12/17/09

Client: TVA Project: Dredge Cells Recovery Project/ Proposal No.: GR4327 Task No.: 105

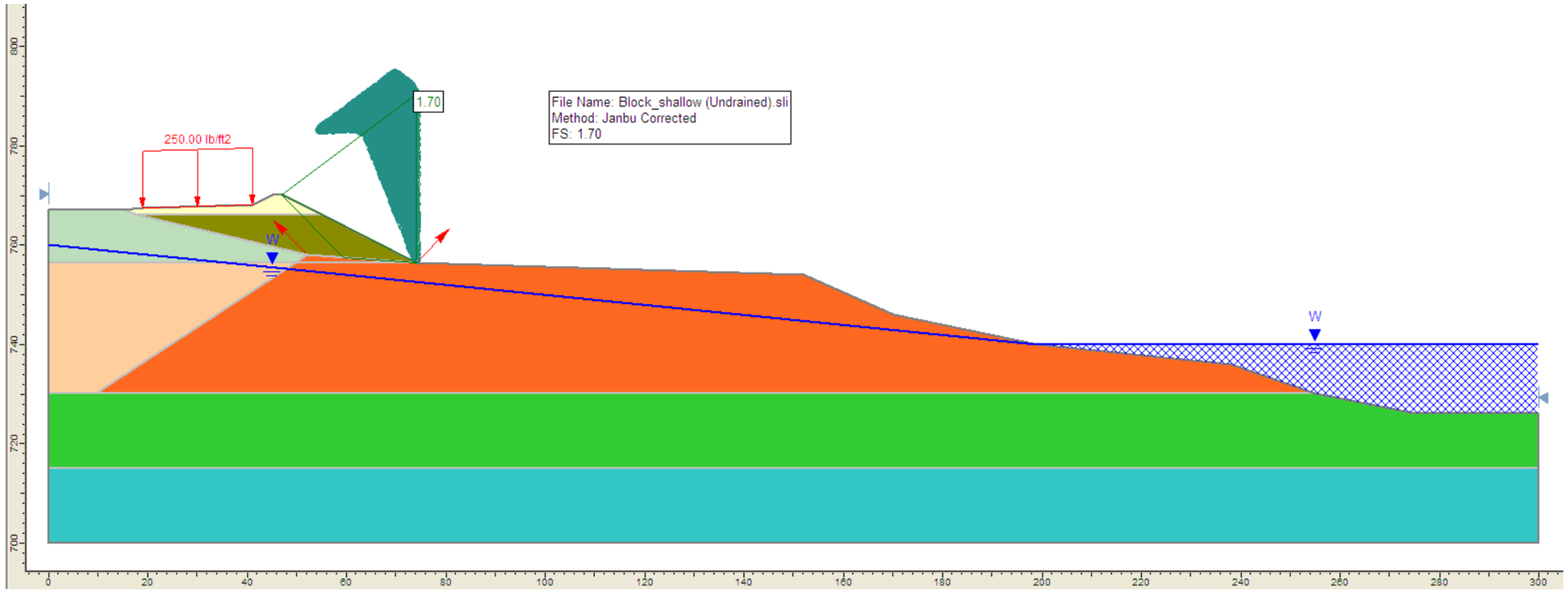


Figure 14. Stability Analysis Result (Shallow Block Type, Undrained Condition)

Written by: J. Wang Date: 12/17/09 Reviewed by: J. Simons/R. Bachus Date: 12/17/09

Client: TVA Project: Dredge Cells Recovery Project/ Proposal No.: GR4327 Task No.: 105

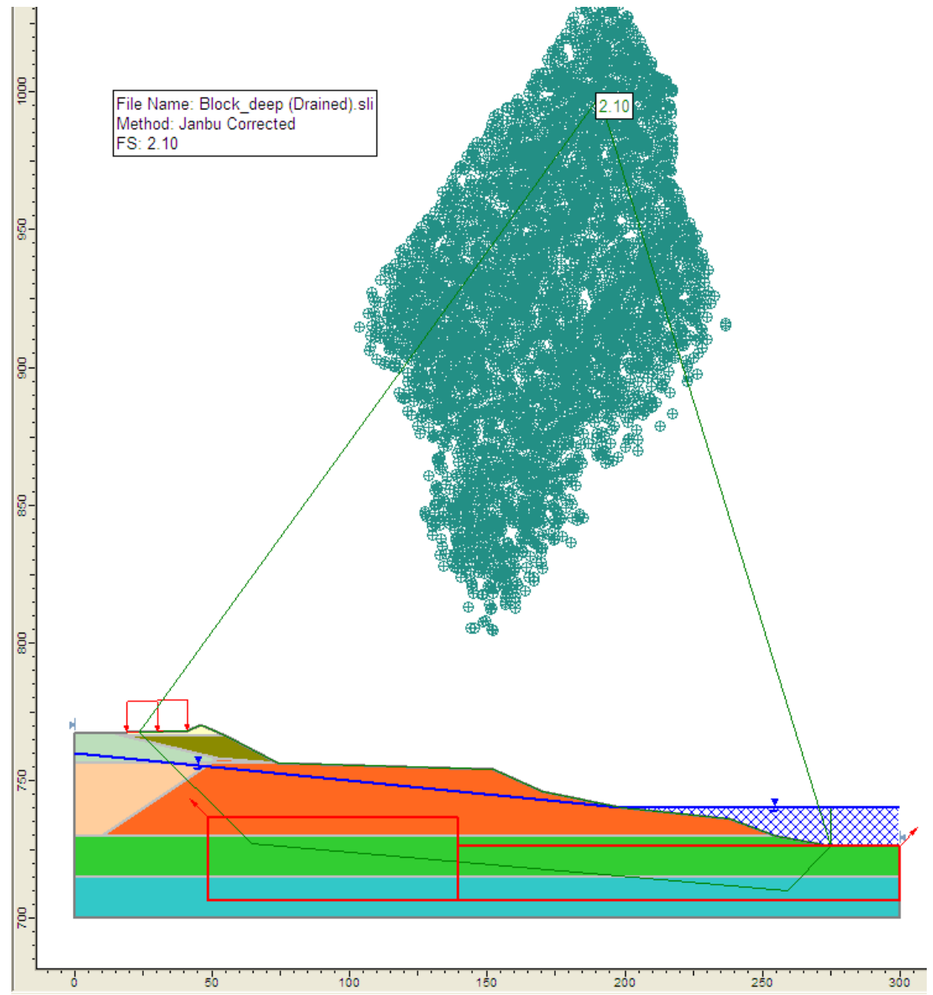


Figure 15. Stability Analysis Result (Deep Block Type, Drained Condition)

Written by: J. Wang Date: 12/17/09 Reviewed by: J. Simons/R. Bachus Date: 12/17/09

Client: TVA Project: Dredge Cells Recovery Project/ Proposal No.: GR4327 Task No.: 105

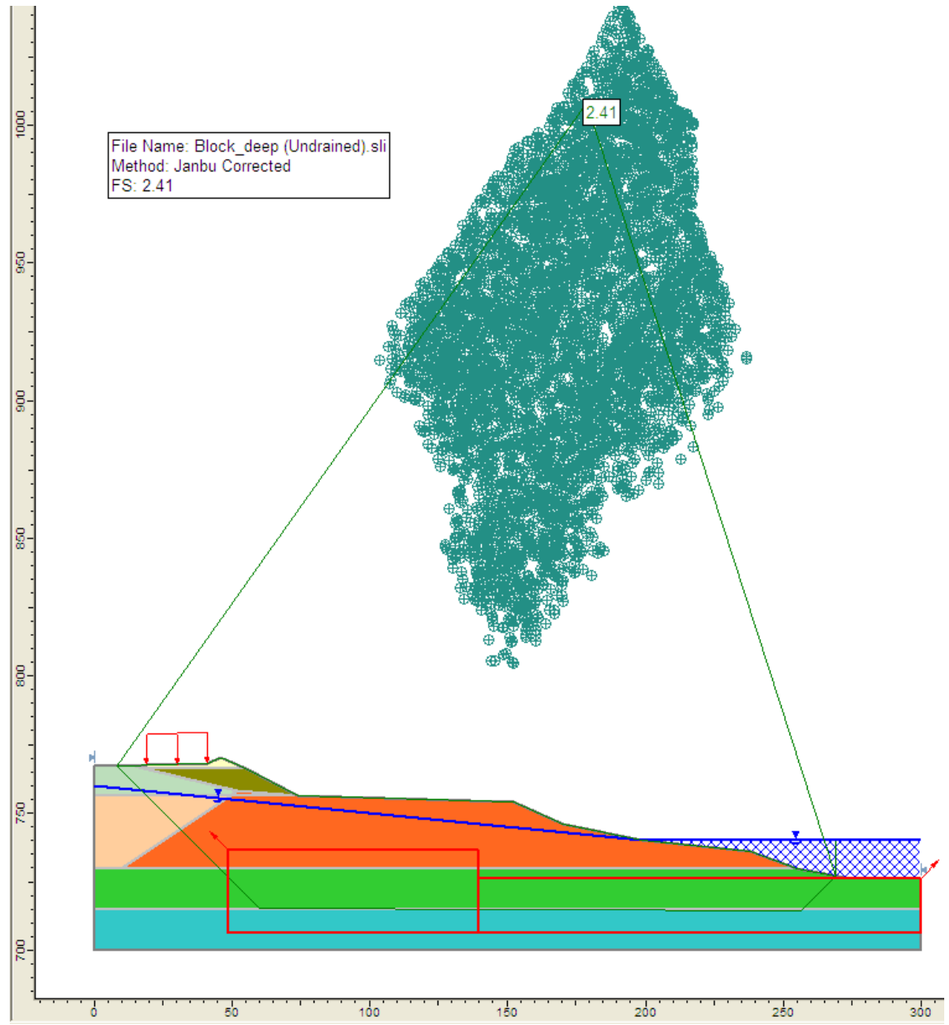
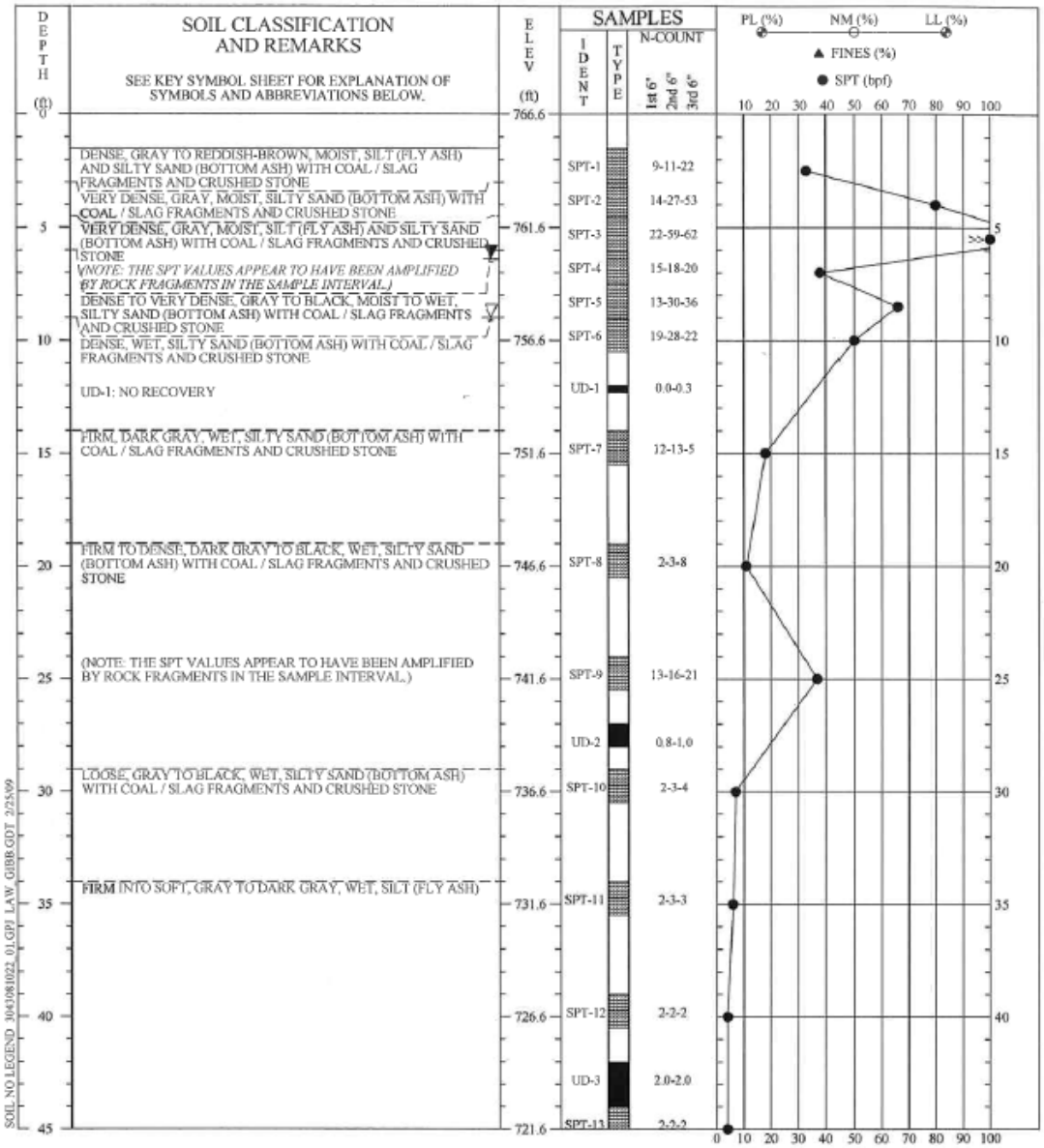


Figure 15. Stability Analysis Result (Deep Block Type, Undrained Condition)

ATTACHMENT 1

MACTEC Boring Logs and ConeTec CPT Log

Written by:	**J. Wang**	Date:	**12/17/09**	Reviewed by:	**J. Simons/R. Bachus**	Date:	**12/17/09**
Client:	**TVA**	Project:	**Dredge Cells Recovery**	Project/ Proposal No.:	**GR4327**	Task No.:	**105**



REMARKS: STANDARD PENETRATION RESISTANCE TESTING PERFORMED USING AN AUTOMATIC HAMMER.

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

Driller : Tri-State
Logged By: VM
Checked By: ALB

SOIL TEST BORING RECORD

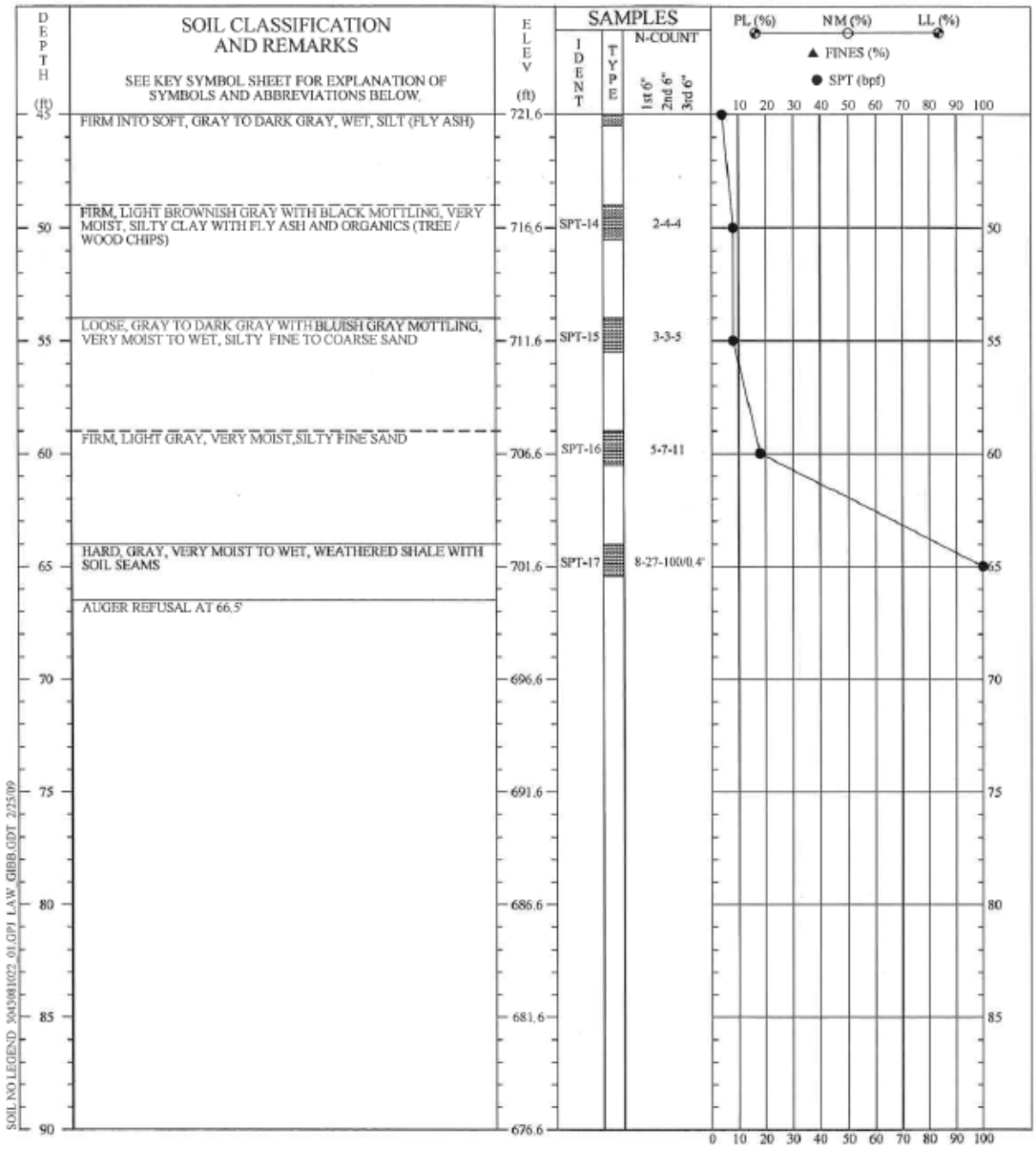
PROJECT: TVA Kingston - Phase I Geotube Disposal Area

DRILLED: January 30, 2009 **BORING NO.:** B-46

PROJ. NO.: 3043-09-1004 **PAGE** 1 **OF** 2

MACTEC

Written by:	**J. Wang**	Date:	**12/17/09**	Reviewed by:	**J. Simons/R. Bachus**	Date:	**12/17/09**
Client:	**TVA**	Project:	**Dredge Cells Recovery**	Project/ Proposal No.:	**GR4327**	Task No.:	**105**



REMARKS: STANDARD PENETRATION RESISTANCE TESTING PERFORMED USING AN AUTOMATIC HAMMER.

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Driller : Tri-State
Logged By: VM
Checked By: ALB

SOIL TEST BORING RECORD

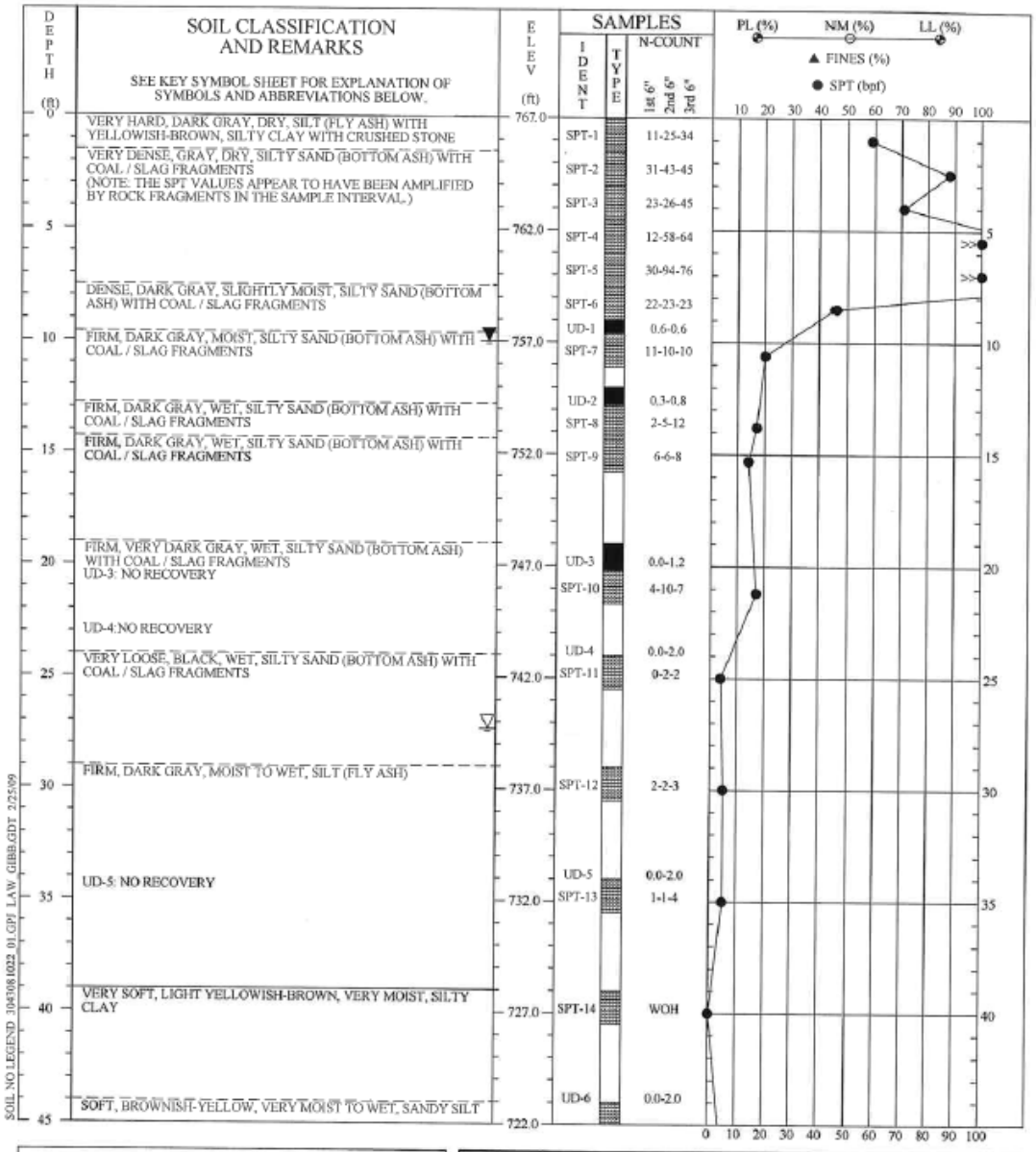
PROJECT: TVA Kingston - Phase I Geotube Disposal Area

DRILLED: January 30, 2009 **BORING NO.:** B-46

PROJ. NO.: 3043-09-1004 **PAGE 2 OF 2**

MACTEC

Written by:	**J. Wang**	Date:	**12/17/09**	Reviewed by:	**J. Simons/R. Bachus**	Date:	**12/17/09**
Client:	**TVA**	Project:	**Dredge Cells Recovery**	Project/ Proposal No.:	**GR4327**	Task No.:	**105**



REMARKS: STANDARD PENETRATION RESISTANCE TESTING PERFORMED USING AN AUTOMATIC HAMMER.

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

Driller : Tri-State
Logged By: JET
Checked By: ALB

SOIL TEST BORING RECORD

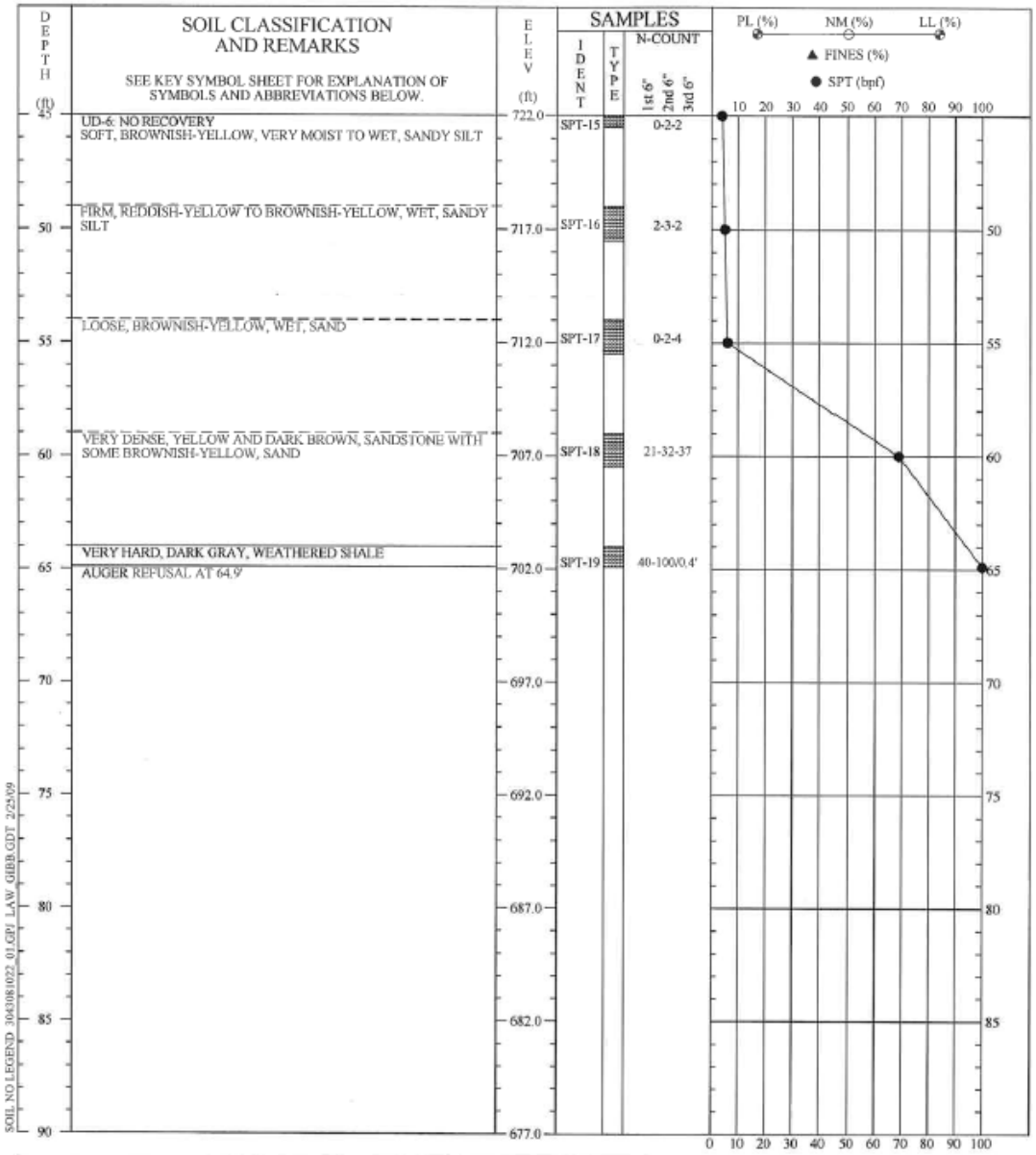
PROJECT: TVA Kingston - Phase I Geotube Disposal Area

DRILLED: January 31, 2009 **BORING NO.:** B-47

PROJ. NO.: 3043-09-1004 **PAGE 1 OF 2**

MACTEC

Written by:	**J. Wang**	Date:	**12/17/09**	Reviewed by:	**J. Simons/R. Bachus**	Date:	**12/17/09**
Client:	**TVA**	Project:	**Dredge Cells Recovery**	Project/ Proposal No.:	**GR4327**	Task No.:	**105**



REMARKS: STANDARD PENETRATION RESISTANCE TESTING PERFORMED USING AN AUTOMATIC HAMMER.

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Driller : Tri-State
Logged By: JET
Checked By: ALB

SOIL TEST BORING RECORD

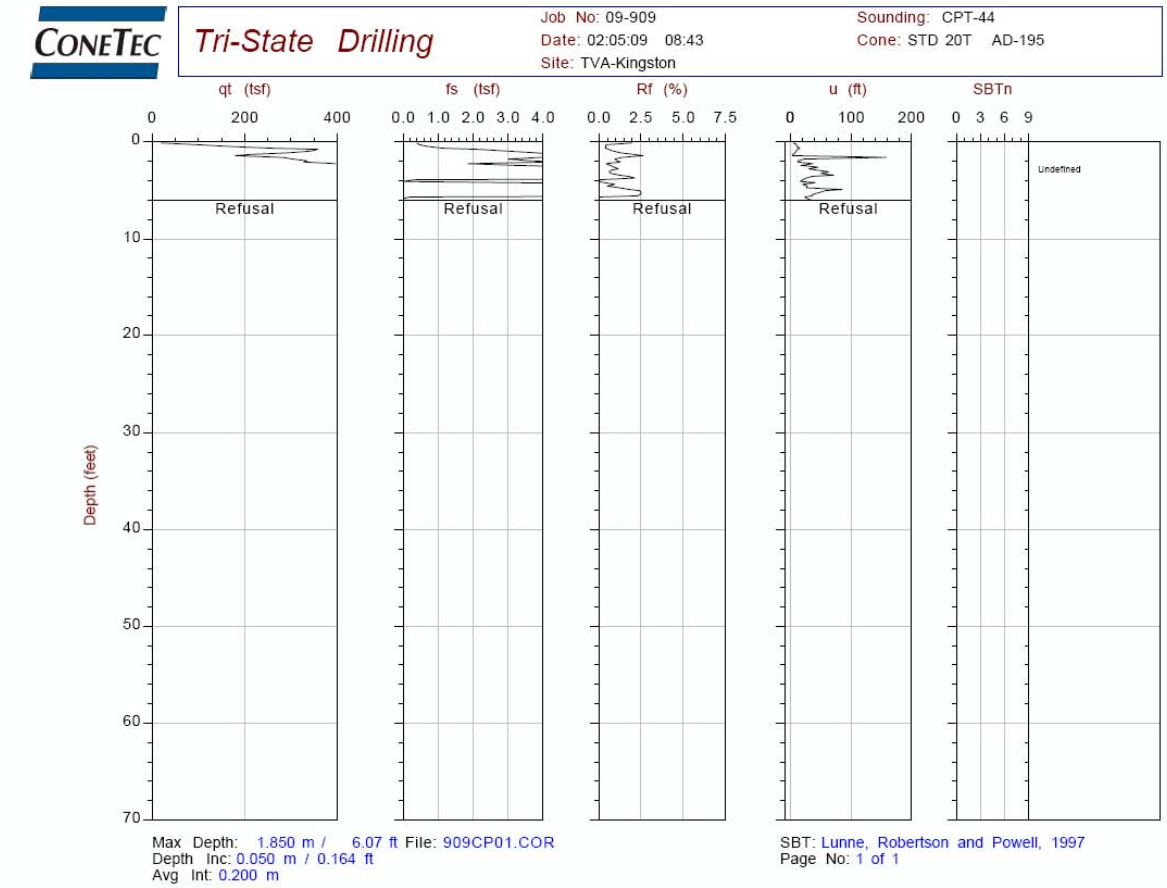
PROJECT: TVA Kingston - Phase I Geotube Disposal Area

DRILLED: January 31, 2009 **BORING NO.:** B-47

PROJ. NO.: 3043-09-1004 **PAGE 2 OF 2**

MACTEC

Written by:	**J. Wang**	Date:	**12/17/09**	Reviewed by:	**J. Simons/R. Bachus**	Date:	**12/17/09**
Client:	**TVA**	Project:	**Dredge Cells Recovery**	Project/ Proposal No.:	**GR4327**	Task No.:	**105**



ATTACHMENT 2

EXAMPLE SLIDE INPUT FILE

Written by:	**J. Wang**	Date:	**12/17/09**	Reviewed by:	**J. Simons/R. Bachus**	Date:	**12/17/09**
Client:	**TVA**	Project:	**Dredge Cells Recovery**	Project/ Proposal No.:	**GR4327**	Task No.:	**105**

File Name: Circular (Drained).sli

Document Name

File Name: Circular (drained).sli

Project Settings

Project Title: SLIDE - An Interactive Slope Stability Program
Failure Direction: Left to Right
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:
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: 3

Loading

1 Distributed Load present:
Distributed Load Constant Distribution, Orientation: Vertical, Magnitude: 250 lb/ft2

Material Properties

Material: Crush Run
Strength Type: Mohr-Coulomb
Unit Weight: 135 lb/ft3
Cohesion: 0 psf
Friction Angle: 35 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Crust Layer
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 500 psf
Friction Angle: 25 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Ash
Strength Type: Mohr-Coulomb
Unit Weight: 75 lb/ft3
Cohesion: 0 psf
Friction Angle: 20 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Shot Rock
Strength Type: Mohr-Coulomb
Unit Weight: 135 lb/ft3
Cohesion: 0 psf
Friction Angle: 35 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: East Dike
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 100 psf
Friction Angle: 28 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Clayey Foundation Soil
Strength Type: Mohr-Coulomb
Unit Weight: 100 lb/ft3
Cohesion: 0 psf
Friction Angle: 28 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Sandy Foundation Soils
Strength Type: Mohr-Coulomb
Unit Weight: 100 lb/ft3
Cohesion: 0 psf
Friction Angle: 30 degrees
Water Surface: Water Table
Custom Hu value: 1

Probabilistic Analysis Input

Project Settings
Sensitivity Analysis: On
Probabilistic Analysis: Off

Material: Crush Run
Property: Phi
Distribution: Normal
Minimum: 35 (relative minimum: 0)
Mean: 35
Maximum: 45 (relative maximum: 10)

Material: Ash
Property: Phi
Distribution: Normal
Minimum: 20 (relative minimum: 0)
Mean: 20
Maximum: 30 (relative maximum: 10)

Material: Ash
Property: Unit Weight
Distribution: Normal
Minimum: 75 (relative minimum: 0)
Mean: 75
Maximum: 100 (relative maximum: 25)

List of All Coordinates

Material Boundary

15.000	767.000
18.000	766.000
52.000	758.000
74.000	756.500

Material Boundary

0.000	756.500
49.723	756.500
74.000	756.500

Material Boundary

18.000	766.000
55.000	766.000

Material Boundary

0.000	730.000
9.500	730.000
33.500	730.000
255.000	730.000

Material Boundary

9.500	730.000
49.723	756.500
52.000	758.000

Material Boundary

0.000	715.000
300.000	715.000

External Boundary

152.000	754.000
74.000	756.500
55.000	766.000
47.000	770.000
45.000	770.000
41.000	768.000
19.000	767.500
15.000	767.000
0.000	767.000
0.000	756.500
0.000	730.000
0.000	715.000
0.000	700.000
300.000	700.000
300.000	715.000
300.000	726.000

275.000	726.000
255.000	730.000
238.000	736.000
199.000	740.000
170.000	746.000

Water Table

0.000	760.000
199.000	740.000
299.826	740.000

Search Grid

46.414	777.361
221.369	777.361
221.369	937.106
46.414	937.106

Distributed Load

41.000	768.000
19.000	767.500