Stantec Consulting Services Inc.
10509 Timberwood Circle Suite 100
Louisville, KY 40223-5301
Tel: (502) 212-5000
Fax: (502) 212-5055

February 15, 2012 ltr_001_175551015

Mr. Michael S. Turnbow
Tennessee Valley Authority
1101 Market Street, LP 2G-C
Chattanooga, Tennessee 37402-2801

Re: Results of Pseudostatic Slope Stability Analysis
Active CCP Disposal Facilities
Cumberland Fossil Plant (CUF)

Dear Mr. Turnbow:

As requested, Stantec Consulting Services Inc. (Stantec) has conducted pseudostatic slope stability analyses for ground motion levels corresponding to a return period of 2,500 years to support the U.S. Environmental Protection Agency's assessment of TVA's CCP disposal facilities. The results for Cumberland's Ash Pond and Dry Fly Ash Stack are provided in this letter.

Approach

The analyses were performed for current conditions using pseudostatic stability methods, where the added inertial load from an earthquake is assumed to be represented by a simple horizontal pseudostatic coefficient. Specifics related to the analyses/approach are as follows:

- Subsurface data was obtained from the Stantec's recent geotechnical studies performed in 2009 and 2010 time frame.
- SLOPE/W software (from GEO-SLOPE International, Inc.) was used to perform the calculations.
- One existing SLOPE/W cross-section model per disposal facility was selected from the previous studies for analysis. For the Ash Pond, the selected section represents the facility's lowest current static (long-term) factor of safety. The section selected for the Dry Fly Ash Stack is located along the north side where a failure may impact the adjacent Ash Pond. The SLOPE/W models were updated to reflect current conditions.
- Undrained shear strength parameters were used.
- A ground motion level corresponding to a return period of 2,500 years (or approximate exceedance probability of 2% in 50 years) was used for selection of a horizontal seismic coefficient. For simplicity, the horizontal seismic coefficient was selected to equal the total hazard peak ground acceleration (rock) for 2,500 year return periods as shown in Table 16

of TVA's March 28, 2011 region-specific seismic hazard study performed by AMEC Geomatrix, Inc.

- A target factor of safety (FS) of 1.0 was considered for comparing results.

Results

The results of the pseudostatic stability analyses are enclosed (summary spreadsheet, SLOPE/W cross-sections, and plan views showing cross-section locations). The results indicate factors of safety greater than or equal to the target of 1.0.

Stantec appreciates the opportunity to provide these services. If you have questions, or if we can provide additional information, please let us know.

Sincerely,

STANTEC CONSULTING SERVICES INC.

Randy L. Roberts, PE
Principal

Enclosures

/cdm

Pseudostatic Stability Analysis Summary - TVA Active CCP Disposal Facilities

Cumberland Fossil Plant

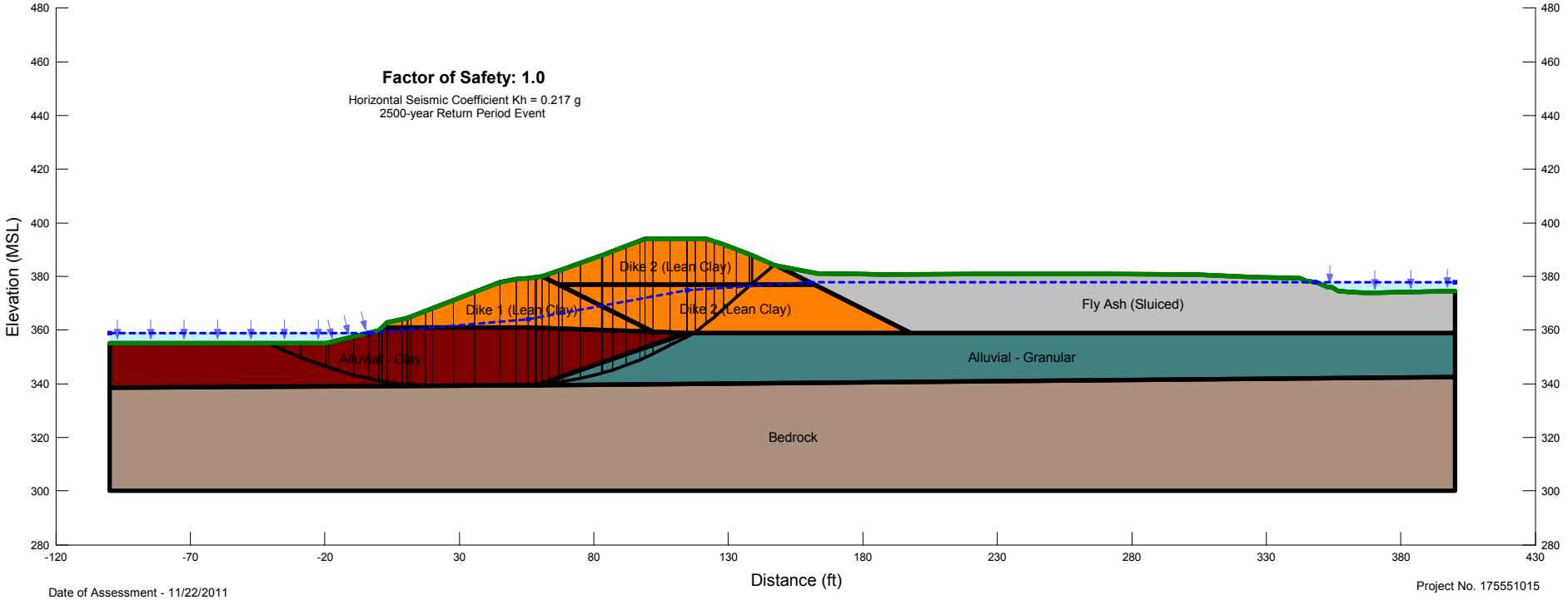
Plant	CCP Disposal Facility		Cross-Section	2,500 yr Return	
	Name	Type		PGA (g)	Factor of Safety
CUF	Ash Pond	Wet Stack	P	0.217	1.0
	Dry Fly Ash Stack	Stack	A		1.1 for shallower surface through divider dike; 1.0 for deeper surface beneath divider dike

Pseudostatic Slope Stability Analysis
CCP Storage Facilities - Existing Conditions
Tennessee Valley Authority Fossil Plants

Section P - Ash Pond
Cumberland Fossil Plant
Cumberland City, Tennessee

Note:
The results of analysis shown here are based on available subsurface information, laboratory test results and approximate soil properties. No warranties can be made regarding the continuity of subsurface conditions between the borings.

Material Type	Unit Weight	Cohesion	Friction Angle
Dike 1 (Lean Clay)	123 pcf	800 psf	20 °
Dike 2 (Lean Clay)	123 pcf	500 psf	21 °
Fly Ash (Sluiced)	100 pcf	140 psf	11 °
Alluvial - Clay	124 pcf	450 psf	20 °
Alluvial - Granular	130 pcf	100 psf	20 °
Bedrock			

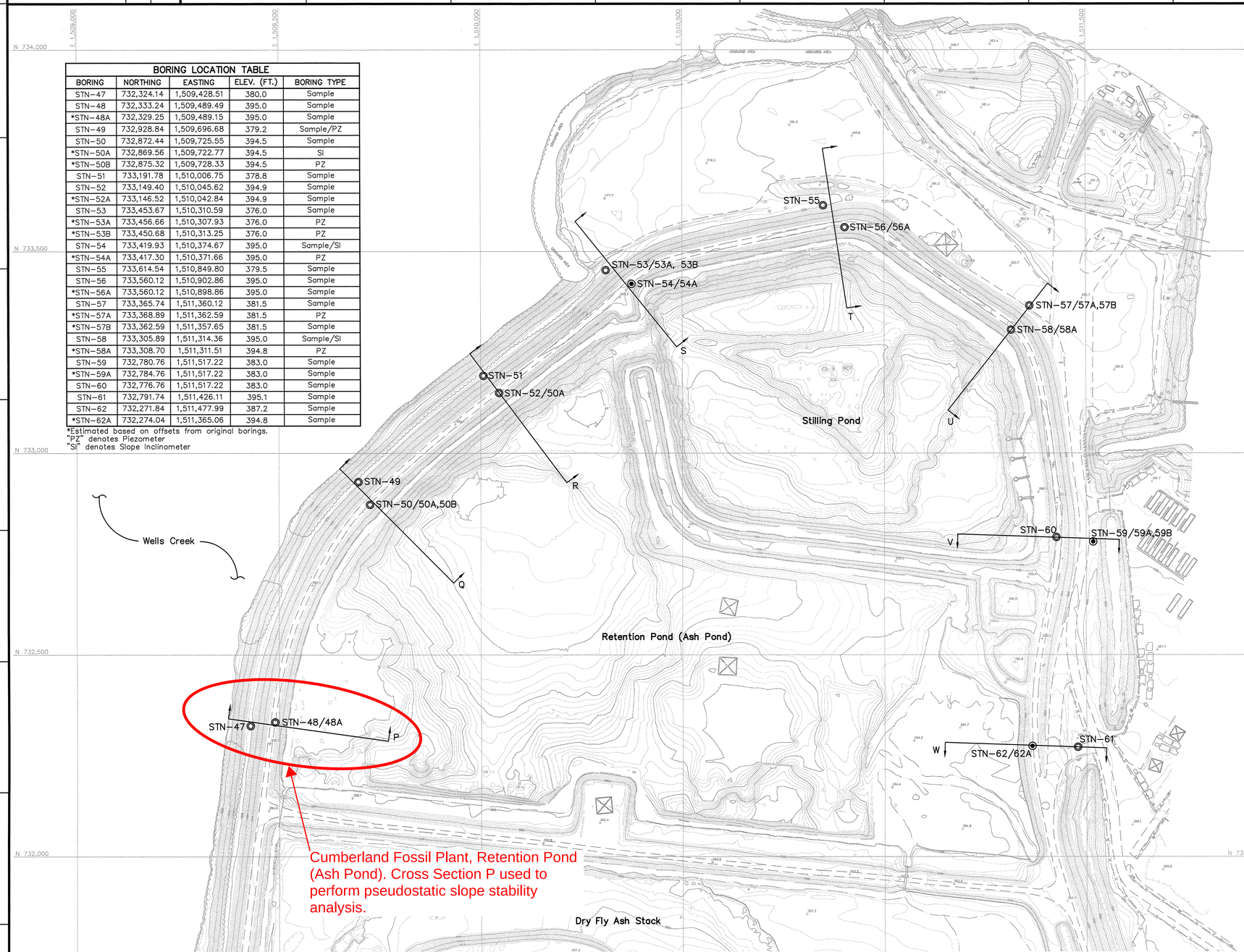


Date of Assessment - 11/22/2011

Project No. 175551015

BORING LOCATION TABLE				
BORING	NORTHING	EASTING	ELEV. (FT.)	BORING TYPE
STN-47	732,324.14	1,509,428.51	380.0	Sample
STN-48	732,333.24	1,509,489.49	395.0	Sample
*STN-48A	732,329.25	1,509,489.15	395.0	Sample
STN-49	732,928.84	1,509,696.68	379.2	Sample/PZ
STN-50	732,872.44	1,509,725.55	394.5	Sample
*STN-50A	732,869.56	1,509,722.77	394.5	SI
*STN-50B	732,875.32	1,509,728.33	394.5	PZ
STN-51	733,191.78	1,510,006.75	378.8	Sample
STN-52	733,149.40	1,510,045.62	394.9	Sample
*STN-52A	733,146.52	1,510,042.84	394.9	Sample
STN-53	733,453.67	1,510,310.59	376.0	Sample
*STN-53A	733,456.66	1,510,307.93	376.0	PZ
*STN-53B	733,450.68	1,510,313.25	376.0	PZ
STN-54	733,419.93	1,510,374.67	395.0	Sample/SI
*STN-54A	733,417.30	1,510,371.66	395.0	PZ
STN-55	733,614.54	1,510,849.80	379.5	Sample
STN-56	733,560.12	1,510,902.86	395.0	Sample
*STN-56A	733,560.12	1,510,898.86	395.0	Sample
STN-57	733,365.74	1,511,360.12	381.5	Sample
*STN-57A	733,368.89	1,511,362.59	381.5	PZ
*STN-57B	733,362.59	1,511,357.65	381.5	Sample
STN-58	733,305.89	1,511,314.36	395.0	Sample/SI
*STN-58A	733,308.70	1,511,311.51	394.8	PZ
STN-59	732,780.76	1,511,517.22	383.0	Sample
*STN-59A	732,784.76	1,511,517.22	383.0	Sample
STN-60	732,776.76	1,511,517.22	383.0	Sample
STN-61	732,791.74	1,511,426.11	395.1	Sample
STN-62	732,271.84	1,511,477.99	387.2	Sample
*STN-62A	732,274.04	1,511,365.06	394.8	Sample

*Estimated based on offsets from original borings.
"PZ" denotes Piezometer
"SI" denotes Slope Inclinometer



Cumberland Fossil Plant, Retention Pond (Ash Pond). Cross Section P used to perform pseudostatic slope stability analysis.

BORING LAYOUT
SCALE: 1"=100'

50 0 100 200 FEET
GRAPHIC SCALE: 1" = 100'
CONTOUR INTERVAL = 1'

LEGEND

- Soil Boring with Undisturbed (Shelby) Tube Samples and/or Standard Penetration Tests
- Soil Boring with Undisturbed (Shelby) Tube Samples and/or Standard Penetration Tests and Rock Core

NOTE:

The topographic mapping provided is based on horizontal datum NAD27 and vertical datum NGV29 using State Plane Tennessee coordinate system. The site photography was performed on 4/17/2009.

FOR INFORMATION ONLY
This Record Drawing which has been previously submitted to TVA is provided for Information Only.

RECORD DRAWING

For Supporting Design Calculations see FPGCUFFESCDX0000002010002

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST	REV. ON
R –	–	–	–	–	–	–	–	–	–	–	–
R 0	03/29/10	DBR	CW	DBR	SAH	SAH	SAH	TJ	–	–	–
RECORD DRAWING											DISCIPLINE INTERFACE

SCALE: 1"=100' EXCEPT AS NOTED

STAN A. HARRIS REGISTERED ENGINEER LICENSE NUMBER 021705 STATE OF TENNESSEE 3/25/10

YARD
RETENTION AND STILLING PONDS

GEOTECHNICAL EXPLORATION
BORING LAYOUT

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
D. ROGERS	C. WITHERS	D. ROGERS	S. HARRIS	S. HARRIS	S. HARRIS	T. JOHNSON

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CUMBERLAND FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2000	DATE: 03/29/10	46	C	10W544-01	R 0

STANTEC	0
TASK COMPLETED BY:	REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

PLOT DATE: 03/29/2010 USER: WITHERS, CHERYLNE
S:\V1755\ACTIVE\175535001\GEOTECH\CAD\BORING\REVS_RECORD\10W544-01-R0.DWG

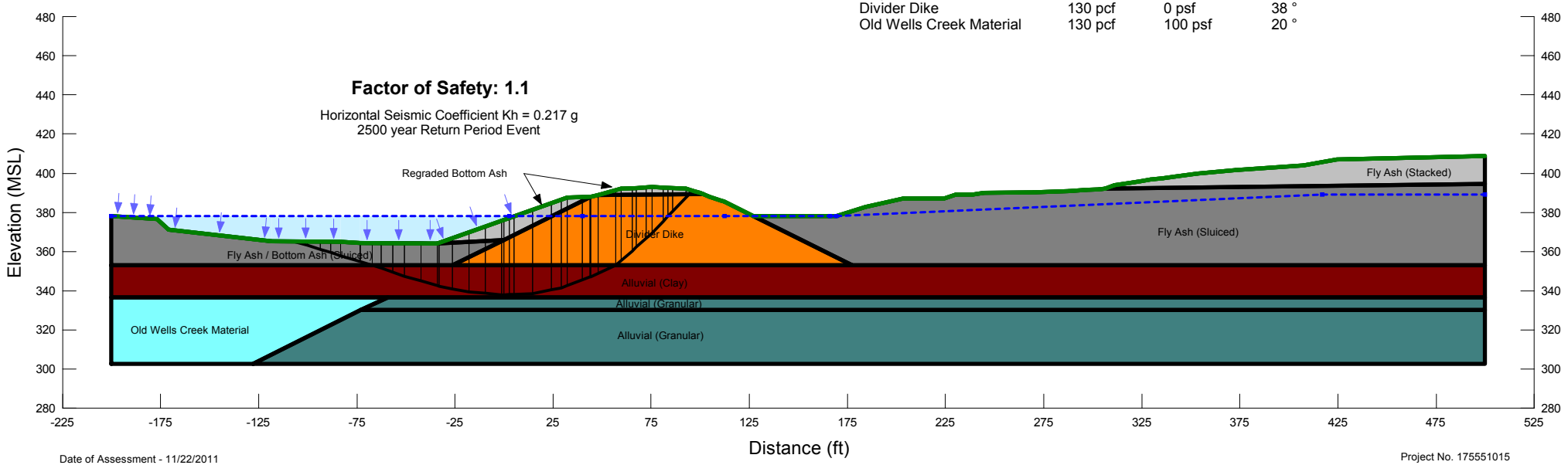
Psuedostatic Slope Stability Analysis
CCP Storage Facilities - Existing Conditions
Tennessee Valley Authority Fossil Plants

Section A - Dry Fly Ash Stack
Cumberland Fossil Plant
Cumberland City, Tennessee

Stantec

Note:
The results of the analysis shown here are based on available subsurface information, laboratory test results, and approximate soil properties. No warranties can be made regarding the continuity of subsurface conditions between the borings.

Material Type	Unit Weight	Cohesion	Friction Angle
Alluvial (Clay)	121 pcf	450 psf	21 °
Alluvial (Granular)	130 pcf	0 psf	32 °
Fly Ash (Stacked)	100 pcf	0 psf	32 °
Fly Ash (Sluiced)	100 pcf	280 psf	11 °
Fly Ash / Bottom Ash (Sluiced)	100 pcf	0 psf	25 °
Regraded Bottom Ash	105 pcf	0 psf	32 °
Divider Dike	130 pcf	0 psf	38 °
Old Wells Creek Material	130 pcf	100 psf	20 °



Date of Assessment - 11/22/2011

Project No. 175551015

Psuedostatic Slope Stability Analysis
CCP Storage Facilities - Existing Conditions
Tennessee Valley Authority Fossil Plants

Section A - Dry Fly Ash Stack
Cumberland Fossil Plant
Cumberland City, Tennessee

Stantec

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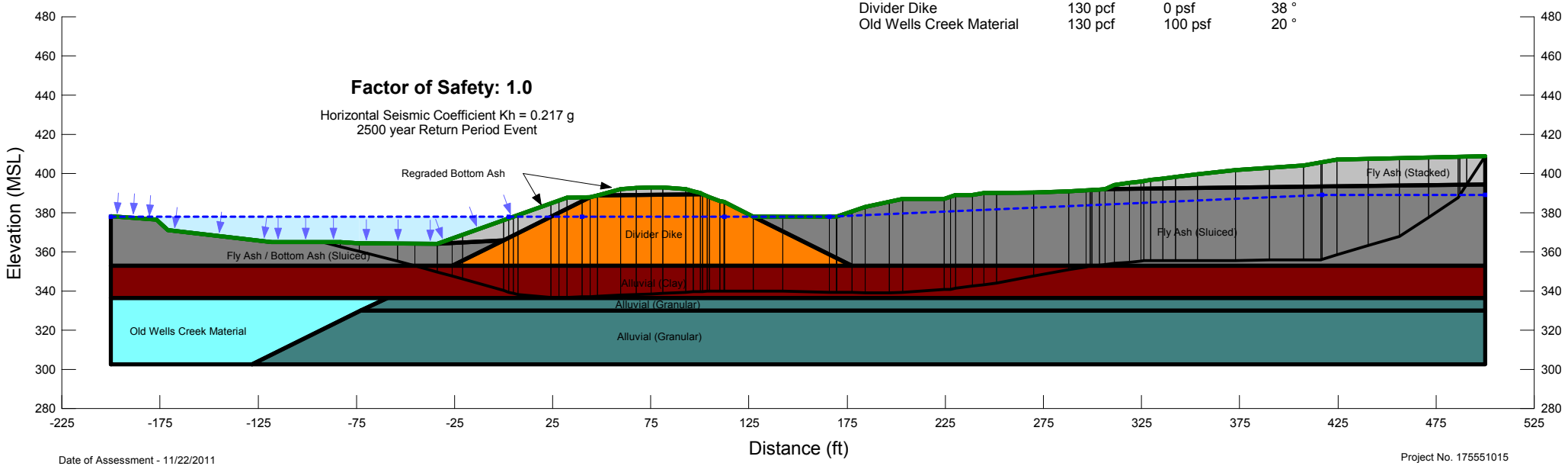
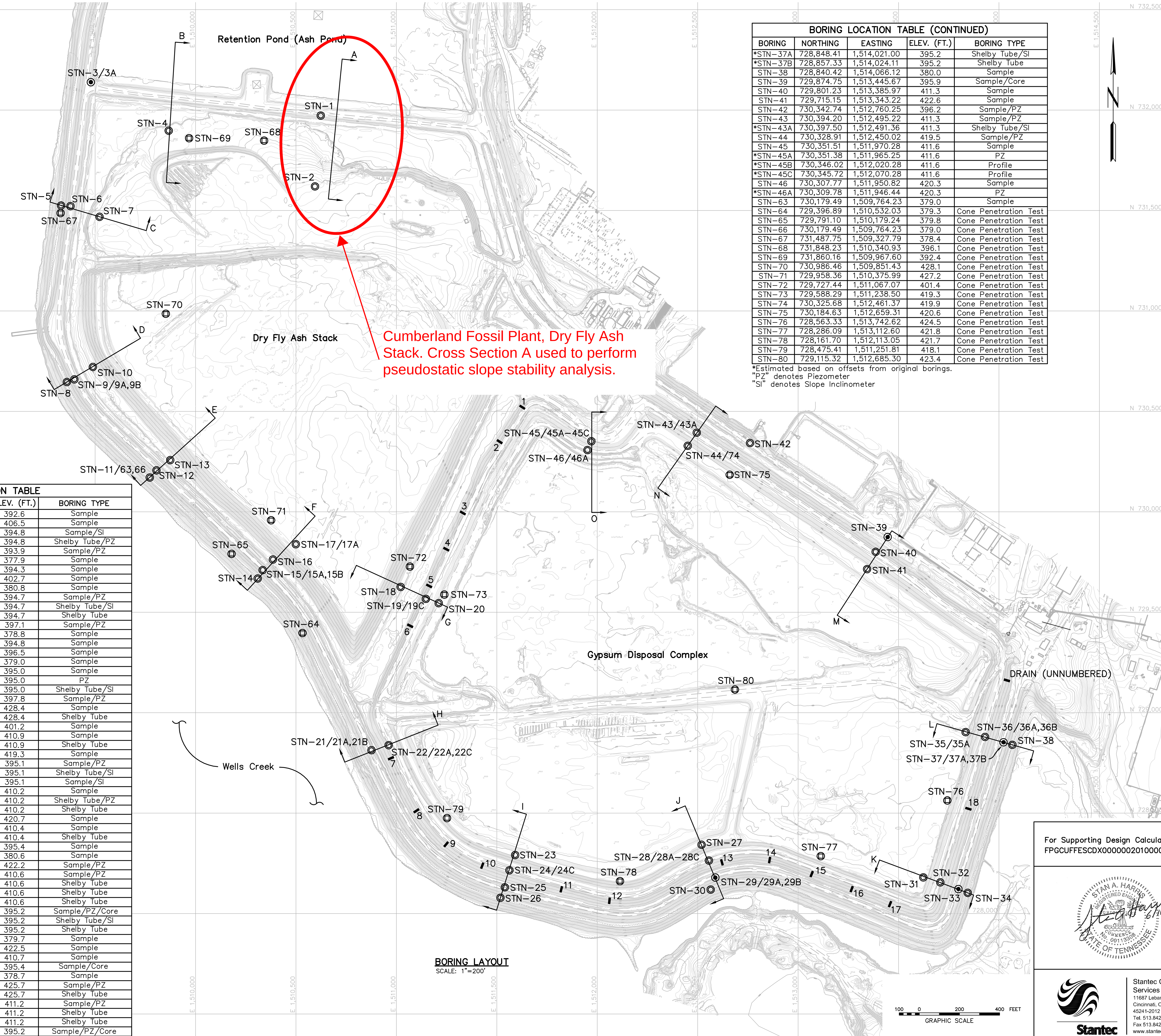


Date of Assessment - 11/22/2011

Project No. 175551015



Cumberland Fossil Plant, Dry Fly Ash Stack. Cross Section A used to perform pseudostatic slope stability analysis.

BORING LAYOUT
SCALE: 1"=200'

100 0 200 400 FEET
GRAPHIC SCALE

BORING LOCATION TABLE				
BORING	NORTHING	EASTING	ELEV. (FT.)	BORING TYPE
STN-1	731,972.89	1,510,623.03	392.6	Sample
STN-2	731,620.35	1,510,594.16	406.5	Sample
STN-3	732,139.24	1,509,478.38	394.8	Sample/SI
*STN-3A	732,139.24	1,509,474.38	394.8	Shelby Tube/PZ
STN-4	731,897.61	1,509,866.05	393.9	Sample/PZ
STN-5	731,525.23	1,509,330.56	377.9	Sample
STN-6	731,522.23	1,509,376.77	394.3	Sample
STN-7	731,468.66	1,509,521.56	402.7	Sample
STN-8	730,646.60	1,509,359.17	380.8	Sample
STN-9	730,659.51	1,509,396.49	394.7	Sample/PZ
*STN-9A	730,655.56	1,509,398.56	394.7	Shelby Tube/SI
*STN-9B	730,663.13	1,509,394.84	394.7	Shelby Tube
STN-10	730,721.30	1,509,488.66	397.1	Sample/PZ
STN-11	730,171.02	1,509,771.93	378.8	Sample
STN-12	730,206.65	1,509,805.16	394.8	Sample
STN-13	730,257.53	1,509,873.48	396.5	Sample
STN-14	729,668.17	1,510,309.27	379.0	Sample
STN-15	729,710.31	1,510,333.99	395.0	Sample
*STN-15A	729,713.11	1,510,331.12	395.0	PZ
*STN-15B	729,715.91	1,510,328.25	395.0	Shelby Tube/SI
STN-16	729,763.04	1,510,385.22	397.8	Sample/PZ
STN-17	729,839.12	1,510,498.97	428.4	Sample
*STN-17A	729,842.82	1,510,494.59	428.4	Shelby Tube
STN-18	729,626.30	1,511,020.93	401.2	Sample
STN-19	729,567.00	1,511,146.57	410.9	Sample
*STN-19C	729,562.64	1,511,144.49	410.9	Shelby Tube
STN-20	729,545.69	1,511,210.45	419.3	Sample
STN-21	728,813.36	1,510,875.59	395.1	Sample/PZ
*STN-21A	728,808.93	1,510,877.54	395.1	Shelby Tube/SI
*STN-21B	728,804.50	1,510,879.50	395.1	Sample/SI
STN-22	728,838.52	1,510,961.21	410.2	Sample
*STN-22A	728,829.60	1,510,964.76	410.2	Shelby Tube/PZ
*STN-22C	728,834.06	1,510,962.99	410.2	Shelby Tube
STN-23	728,291.47	1,511,590.83	420.7	Sample
STN-24	728,215.90	1,511,562.59	410.4	Sample
*STN-24C	728,217.51	1,511,558.03	410.4	Shelby Tube
STN-25	728,130.72	1,511,539.43	395.4	Sample
STN-26	728,079.09	1,511,517.81	380.6	Sample
STN-27	728,342.65	1,512,519.26	422.2	Sample/PZ
STN-28	728,264.15	1,512,555.40	410.6	Sample/PZ
*STN-28A	728,265.77	1,512,559.91	410.6	Shelby Tube
*STN-28B	728,262.26	1,512,550.95	410.6	Shelby Tube
*STN-28C	728,260.38	1,512,546.50	410.6	Shelby Tube
STN-29	728,179.37	1,512,587.54	395.2	Sample/PZ/Core
*STN-29A	728,181.10	1,512,591.60	395.2	Shelby Tube/SI
*STN-29B	728,177.54	1,512,583.48	395.2	Shelby Tube
STN-30	728,119.63	1,512,564.49	379.7	Sample
STN-31	728,180.44	1,513,622.99	422.5	Sample
STN-32	728,155.57	1,513,707.59	410.7	Sample
STN-33	728,122.27	1,513,797.59	395.4	Sample/Core
STN-34	728,103.27	1,513,844.16	378.7	Sample
STN-35	728,903.76	1,513,833.70	425.7	Sample/PZ
*STN-35A	728,899.92	1,513,832.70	425.7	Shelby Tube
STN-36	728,879.61	1,513,930.45	411.2	Sample/PZ
*STN-36A	728,875.02	1,513,928.98	411.2	Shelby Tube
*STN-36B	728,883.94	1,513,932.09	411.2	Shelby Tube
STN-37	728,853.00	1,514,022.47	395.2	Sample/PZ/Core

BORING LOCATION TABLE (CONTINUED)				
BORING	NORTHING	EASTING	ELEV. (FT.)	BORING TYPE
*STN-37A	728,848.41	1,514,021.00	395.2	Shelby Tube/SI
*STN-37B	728,857.33	1,514,024.11	395.2	Shelby Tube
STN-38	728,840.42	1,514,066.12	380.0	Sample
STN-39	729,874.75	1,513,445.67	395.9	Sample/Core
STN-40	729,801.23	1,513,385.97	411.3	Sample
STN-41	729,715.15	1,513,343.22	422.6	Sample
STN-42	730,342.74	1,512,760.25	396.2	Sample/PZ
STN-43	730,394.20	1,512,495.22	411.3	Sample/PZ
*STN-43A	730,397.50	1,512,491.36	411.3	Shelby Tube/SI
STN-44	730,328.91	1,512,450.02	419.5	Sample/PZ
STN-45	730,351.51	1,511,970.28	411.6	Sample
*STN-45A	730,351.38	1,511,965.25	411.6	PZ
*STN-45B	730,346.02	1,512,020.28	411.6	Profile
*STN-45C	730,345.72	1,512,070.28	411.6	Profile
STN-46	730,307.77	1,511,950.82	420.3	Sample
*STN-46A	730,309.78	1,511,946.44	420.3	PZ
STN-63	730,179.49	1,509,764.23	379.0	Sample
STN-64	729,396.89	1,510,532.03	379.3	Cone Penetration Test
STN-65	729,791.10	1,510,179.24	379.8	Cone Penetration Test
STN-66	730,179.49	1,509,764.23	379.0	Cone Penetration Test
STN-67	731,487.75	1,509,327.79	378.4	Cone Penetration Test
STN-68	731,848.23	1,510,340.93	396.1	Cone Penetration Test
STN-69	731,860.16	1,509,967.60	392.4	Cone Penetration Test
STN-70	730,986.46	1,509,851.43	428.1	Cone Penetration Test
STN-71	729,958.36	1,510,375.99	427.2	Cone Penetration Test
STN-72	729,727.44	1,511,067.07	401.4	Cone Penetration Test
STN-73	729,588.29	1,511,238.50	419.3	Cone Penetration Test
STN-74	730,325.68	1,512,461.37	419.9	Cone Penetration Test
STN-75	730,184.63	1,512,659.31	420.6	Cone Penetration Test
STN-76	728,563.33	1,513,742.62	424.5	Cone Penetration Test
STN-77	728,286.09	1,513,112.60	421.8	Cone Penetration Test
STN-78	728,161.70	1,512,113.05	421.7	Cone Penetration Test
STN-79	728,475.41	1,511,251.81	418.1	Cone Penetration Test
STN-80	729,115.32	1,512,685.30	423.4	Cone Penetration Test

*Estimated based on offsets from original borings.
"PZ" denotes Piezometer
"SI" denotes Slope Inclinometer

FOR INFORMATION ONLY
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NOTE:

The topographic mapping provided is based on horizontal datum NAD27 and vertical datum NGV29 using State Plane Tennessee coordinate system. The site photography was performed on 4/17/2009.

LEGEND

- Soil Boring with Undisturbed (Shelby) Tube Samples and/or Standard Penetration Tests
- Soil Boring with Undisturbed (Shelby) Tube Samples and/or Standard Penetration Tests and Rock Core
- Cone Penetration Test
- Drain, Number

RECORD DRAWING

For Supporting Design Calculations see FPGCUFFESCDX00000020100001

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST	REV CD
R –	–	–	–	–	–	–	–	–	–	–	–
R 0	06/11/10	DBR	CW	DBR	SAH	SAH	SAH	TJ	–	–	–
RECORD DRAWING											

SCALE: 1"=200' EXCEPT AS NOTED

YARD
DRY FLY ASH STACK AND GYPSUM DISPOSAL COMPLEX

GEOTECHNICAL EXPLORATION BORING LAYOUT

STAN A. HARRIS REGISTERED ENGINEER AGRICULTURE COMMERCE No. 00113308 STATE OF TENNESSEE 6/11/10

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
D. ROGERS	C. WITHERS	D. ROGERS	S. HARRIS	S. HARRIS	S. HARRIS	T. JOHNSON

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CUMBERLAND FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2000 | DATE 06/11/10 | 46 | C | 10W543-01 | R 0

STANTEC | 0
TASK COMPLETED BY: | REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

DISCIPLINE INTERFACE