TENNESSEE VALLEY AUTHORITY
KINGSTON FOSSIL PLANT

OPERATIONS MANUAL
DREDGE CELL LATERAL EXPANSION

VOLUME 2
IDL 73-0094

JUNE 1, 2004
REVISED—MAY 2006

TVA

PREPARED BY

TENNESSEE VALLEY AUTHORITY
FOSSIL ENGINEERING SERVICES

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LEGEND

EXISTING		NEW
	BENCH MARK	NA
780	GRADE CONTOUR	780
	ASPHALT ROAD	
	GRAVEL ROAD	
	RAILROAD TRACK	NA
23-12"	STORM SEWER	30-15"
	OVERHEAD ELECTRICAL UTILITY POLE	
	LIGHT POLE	
	OVERHEAD ELECTRICAL UTILITY TOWER	NA
OE	OVERHEAD UTILITY LINES	OE
NA	ACCESS ROUTE	
NA	℄ DITCH	
NA	TERRACE DITCH	
NA	LET DOWN CHANNEL	
NA	METAL SPILLWAY	
NA	POND DISCHARGE WEIR W/SKIMMER	
NA	SURFACE WATER COMPLIANCE MONITORING POINT	
NA	SILT FENCE	S S
× 430.5	SPOT ELEVATION	430.5
	PIEZOMETER	
	SOIL BORING	
	MONITORING WELL	NA
NA	PERMIT BOUNDARY	
NA	TOE DRAIN	UD-6"
NA	FORCEMAIN	FM
NA	MANHOLE	DM4
NA	TVA RESERVATION BOUNDARY	NA
NA	EARTH	
NA	ASH	
NA	GYPSUM	
NA	RANDOM SOIL	
NA	SELECT SOIL	
NA	CLAY	
NA	RIP RAP	
NA	FINAL COVER/ VEGATATIVE LAYER	

BENCH MARKS

STATION	NORTHING	EASTING	ELEVATION
ASH-10	N 555847.28	E 2440155.92	795.44
ASH-25	N 554992.49	E 2440317.38	795.07
ASH-26	N 555411.74	E 2440890.62	794.13
ASH-27	N 555650.29	E 2442663.70	763.48
ASH-28	N 553804.15	E 2441106.67	765.01
ASH-29	N 554404.56	E 2441901.34	763.58
ASH-3	N 554059.57	E 2442837.34	765.03
ASH-30	N 555663.76	E 2440392.74	804.90
ASH-4	N 555226.29	E 2442813.17	764.73
BM-3	N 554448.02	E 2441855.56	754.54

SOIL BORING NEW

STATION	NORTHING	EASTING	ELEVATION
B1	N 556952.5	E 2439763.5	781.8
B2	N 556902.7	E 2439813.7	795.3
B-3	N 556858.8	E 2439865.4	810.8
B-4	N 556619.1	E 2440896.8	810.6
B-5	N 555593.8	E 2440245.5	810.2
B-5A	N 555595.7	E 2440246.9	810.2
B-6	N 555292.2	E 2439807.6	809.5
B-8A	N 554787.1	E 2440526.3	773.6
B-9	N 554857.6	E 2442197.4	764.4
B-10	N 554428.1	E 2441665.3	762.6
B-11	N 554760.7	E 2442843.6	765.0
B-12	N 556265.2	E 2442463.6	763.9

MONITORING WELLS

STATION	NORTHING	EASTING
6A	N 554403	E 2442891
4B	N 558118	E 2440564
16A	N 556533	E 2439081
13B	N 554657	E 2440311

SOIL BORING EXISTING

STATION	NORTHING	EASTING	ELEVATION
SS-35	N 554375	E 2442873	795.44
SS-36	N 554516	E 2442871	795.07
SS-37	N 554271	E 2442874	794.13
SS-38	N 554439	E 2442892	763.48
AH-1	N 554084	E 2442869	765.01
AH-2	N 554714	E 2442873	763.58
AH-3	N 554917	E 442874	765.03
AH-4	N 555118	E 2442875	804.80
AH-5	N 555228	E 2442862	764.73
AH-6	N 555606	E 2442732	764.54
AH-7	N 555985	E 2442589	795.44
AH-8	N 556364	E 2442464	795.07
AH-9	N 556743	E 2442328	794.13
AH-10	N 557082	E 2441965	763.48
AH-11	N 557335	E 2441532	765.01
AH-12	N 557808	E 2440750	763.58
AH-13	N 553906	E 2442840	765.03
AH-14	N 553673	E 2441862	804.90

REV. NO.	DATE	DRAWN	DESIGN	CHKD	SUPV	PMGR	APPR	DMG	PROJECT ID	AS BUILT	REVISION INTERVICE
R 0		DRS	BSJ	WPT	HLP	REP	DLL				
ISSUED FOR DREDGE CELL EXPANSION											

SCALE: NONE — EXCEPT AS NOTED

YARD

DREDGE CELL LATERAL EXPANSION INDEX AND LEGEND

DESIGNED BY	DRAWN BY	CHECKED BY	SUPERVISED BY	REVIEWED BY	APPROVED BY	ISSUED BY
D.R. SMITH	B.S. BURT	W.P. TAYLOR	H.L. PETTY	R.E. PURKEY	D.L. LUNDY	

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R14 | DATE | 36 | C | 10W425-20 | R 0

PLOT FACTOR:1 W_TVA

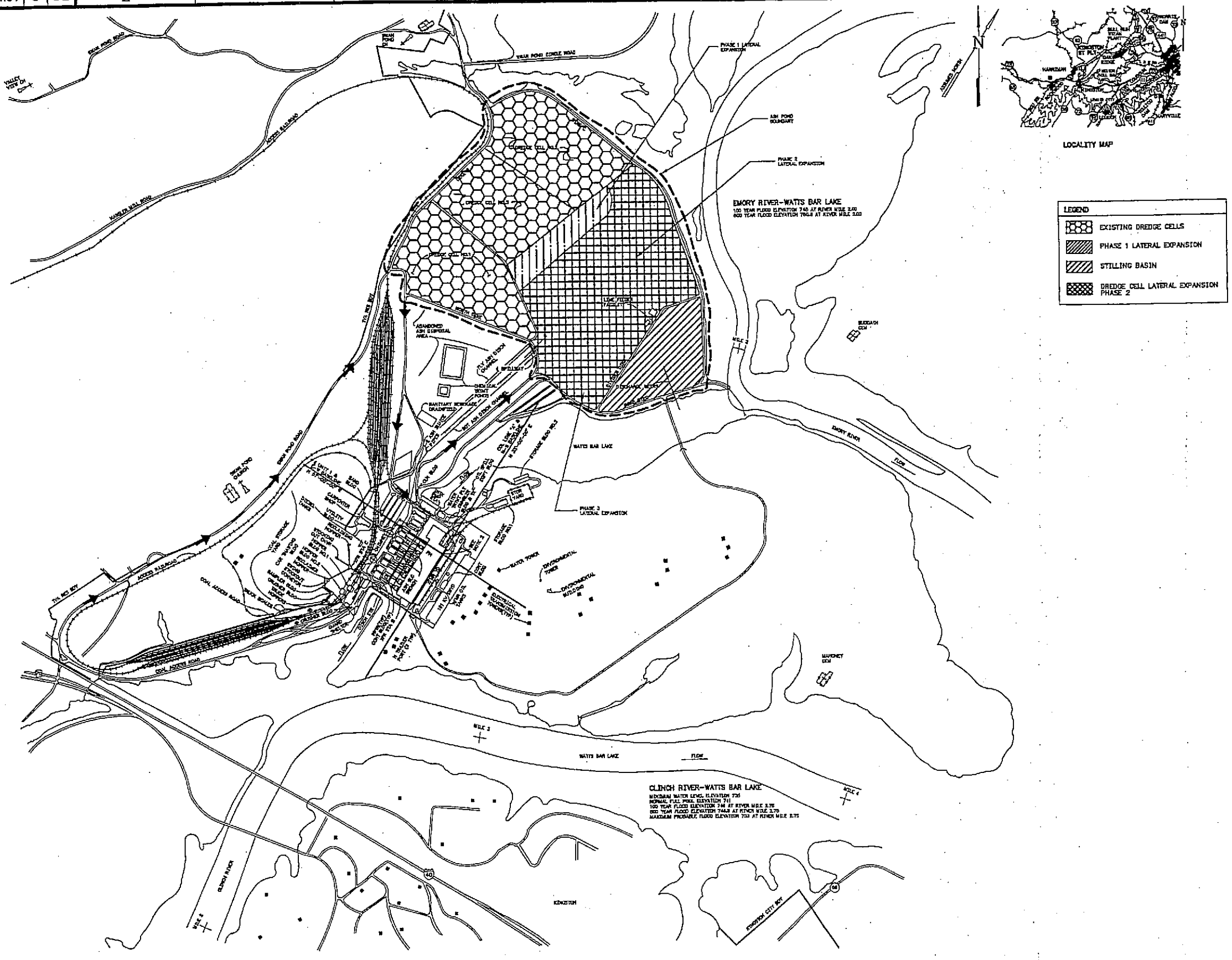
C.A.D. DRAWING DO NOT ALTER MANUALLY

PARSONS — TASK COMPLETED BY: | REV NO. 0

36 C 10W425-20

TVA-00018488

36 C 10W425-21



SITE PLAN- KINGSTON FOSSIL PLANT

TOPOGRAPHY TRACED BY M.P. TERMOK 1/20/1981

R 0	DRS	BSB	NPT	HLP	RCP	JGA		
ISSUED FOR DREDGE CELL EXPANSION								
REV NO.	DATE	DRN	DSGN	CHKD	SUPV	PVED	APPD	ISSD

SCALE: 1"=100' EXCEPT AS NOTED

YARD

DREDGE CELL
LATERAL EXPANSION
SITE LOCATION PLAN

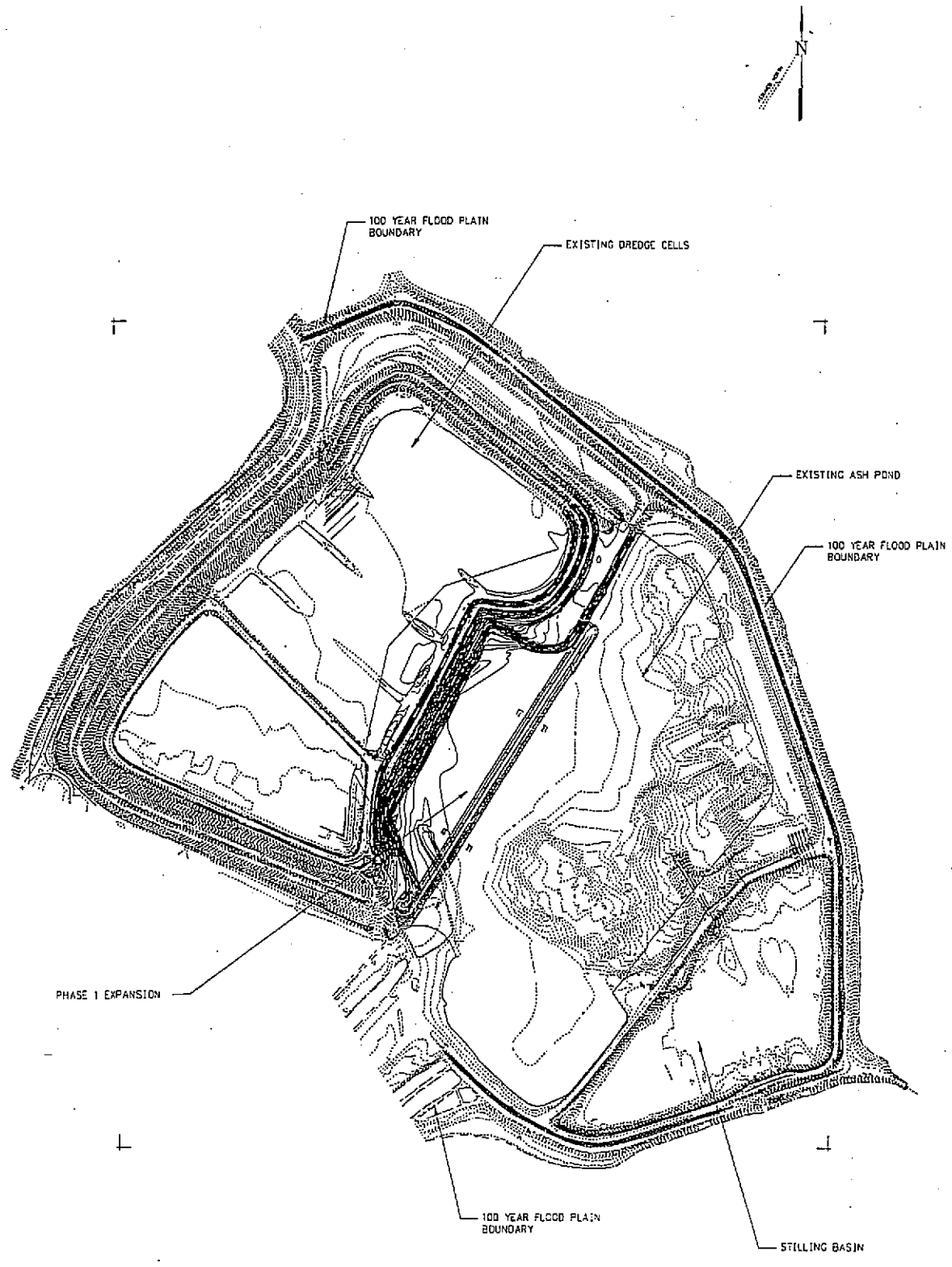
DESIGNED BY	DRAWN BY	CHECKED BY	SUPERVISED BY	REVIEWED BY	APPROVED BY	ISSUED BY
D.R. SMITH	B.S. BURT	M.P. TAYLOR	H.L. PETTY	R.E. PURKEY	J.G. ADAIR	

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

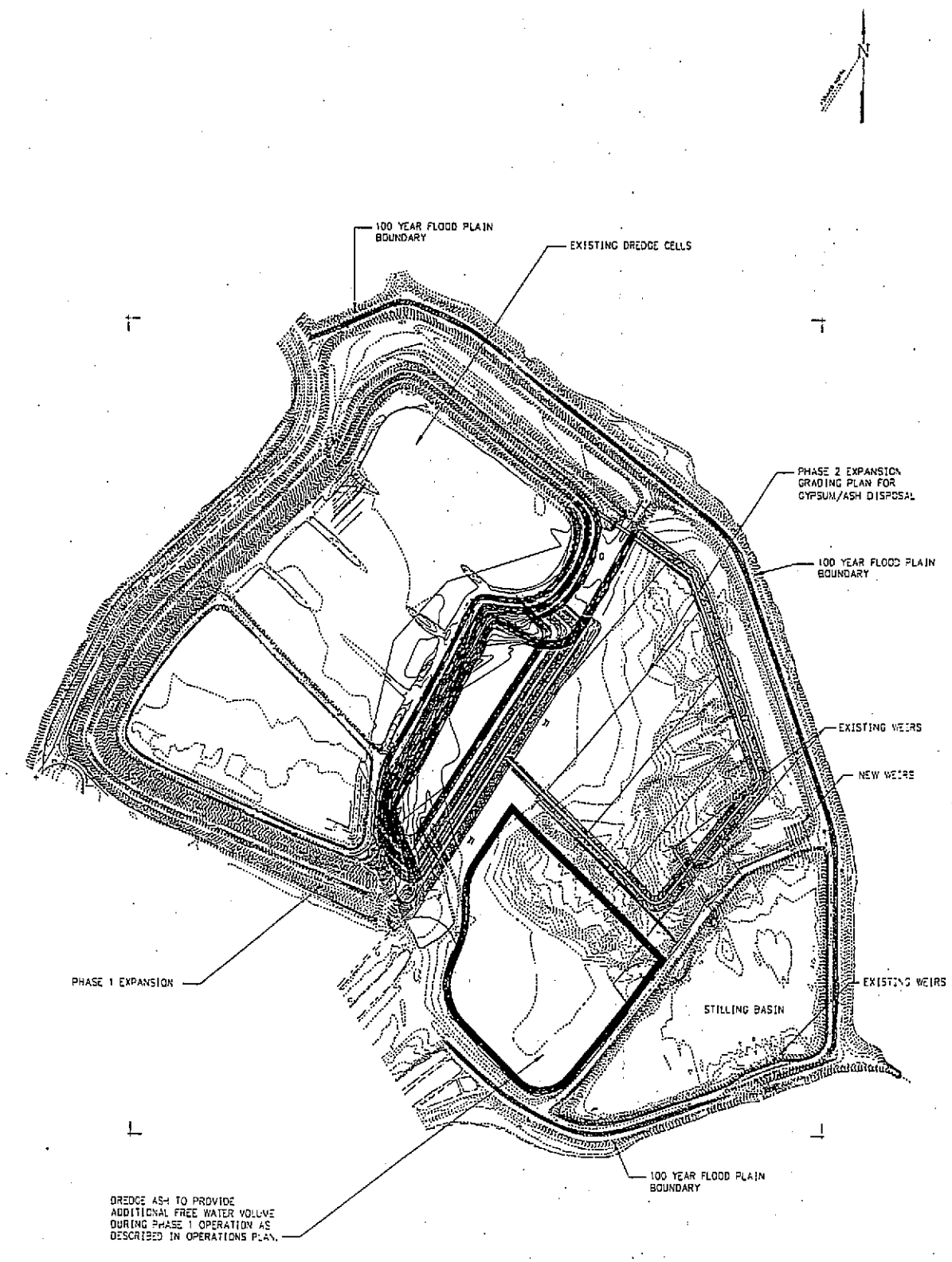
AUTOCAD R14 | DATE 04/28/91 | 36 | C | 10W425-21 | R 0

PARSONS	0	THIS DRAWING HAS BEEN DEVELOPED FROM :(10W200-01 R4)	PLOT FACTOR:1200 W_TVA	C.A.D. DRAWING DO NOT ALTER MANUALLY
TASK COMPLETED BY:	REV NO.			

TVA-00018489



EXISTING CONDITIONS 2004



PHASE 2 EXPANSION

NOTES:

1. FOR DRAWING INDEX AND LEGEND, SEE DRAWING 10W425-20.

2. DRAWINGS 10W425-22 AND -23 DEPICT PHASING OF EXPANSION CONSTRUCTION. CONSTRUCTION DRAWINGS BEGIN WITH 10W425-26.

EMORY RIVER-WATTS BAR LAKE

100 YEAR FLOOD ELEVATION 748 AT RIVER MILE 2.00
500 YEAR FLOOD ELEVATION 750.5 AT RIVER MILE 2.00

REV NO.	DATE	DESIGN	DRAWN	CHKD	SUPV	PROJ	APPD	ISSUED	PROJECT ID	AS CONST	REV
R 0		DRB	BSB	WPT	HLP	REP	JGA				

ISSUED FOR DREDGE CELL EXPANSION

SCALE: 1"=300' EXCEPT AS NOTED

YARD

DREDGE CELL
LATERAL EXPANSION
PHASING SHEET 1

DESIGNED BY	DRAWN BY	CHECKED BY	SUPERVISED BY	REVIEWED BY	APPROVED BY	ISSUED BY
D.R. SMITH	B.S. BURT	W.P. TAYLOR	H.L. PETTY	R.E. PORKEY	J.G. ADAIR	

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

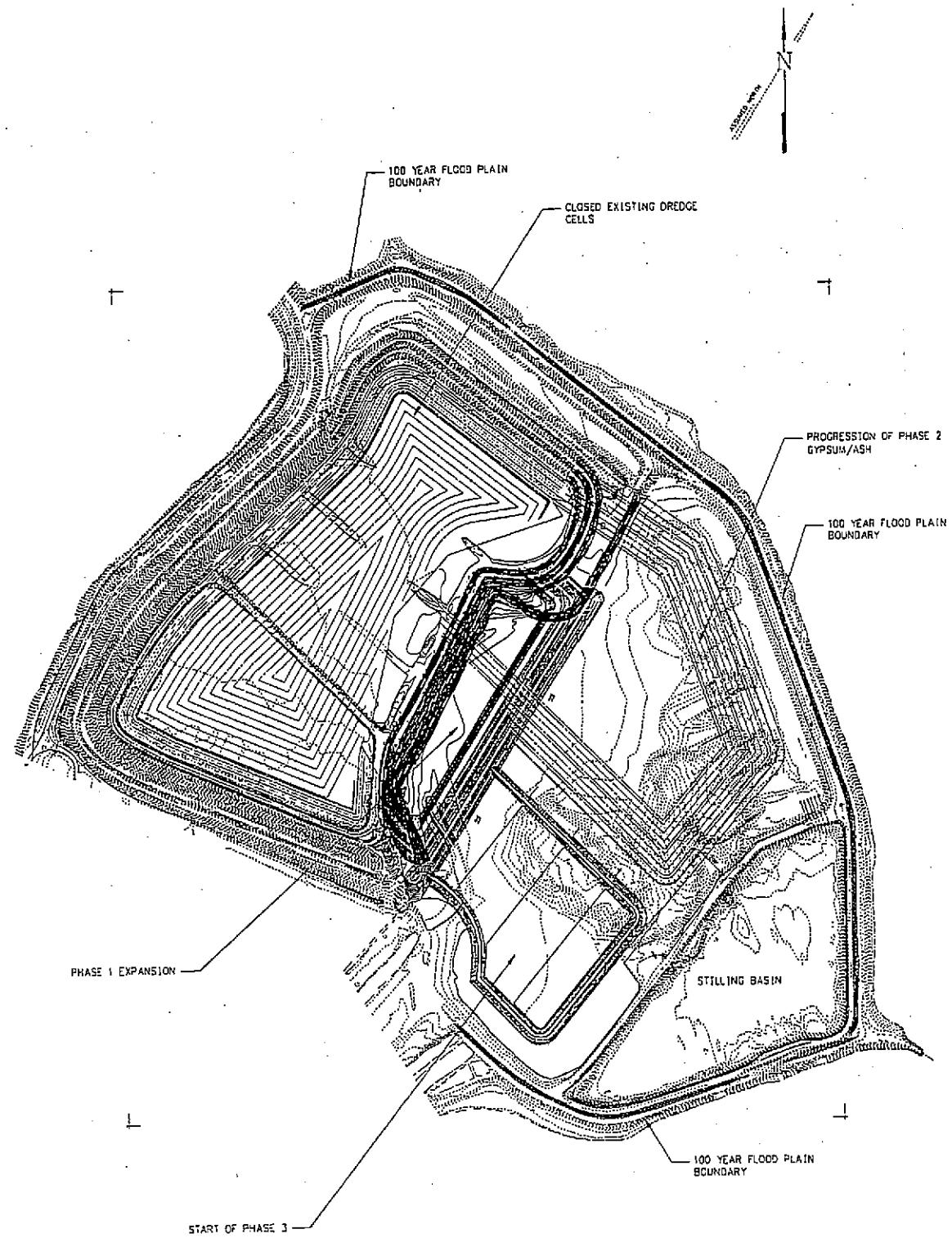
AUTOCAD R14 | DATE | 36 | C | 10W425-22 | R 0

PARSONS | 0
TASK COMPLETED BY: | REV NO.

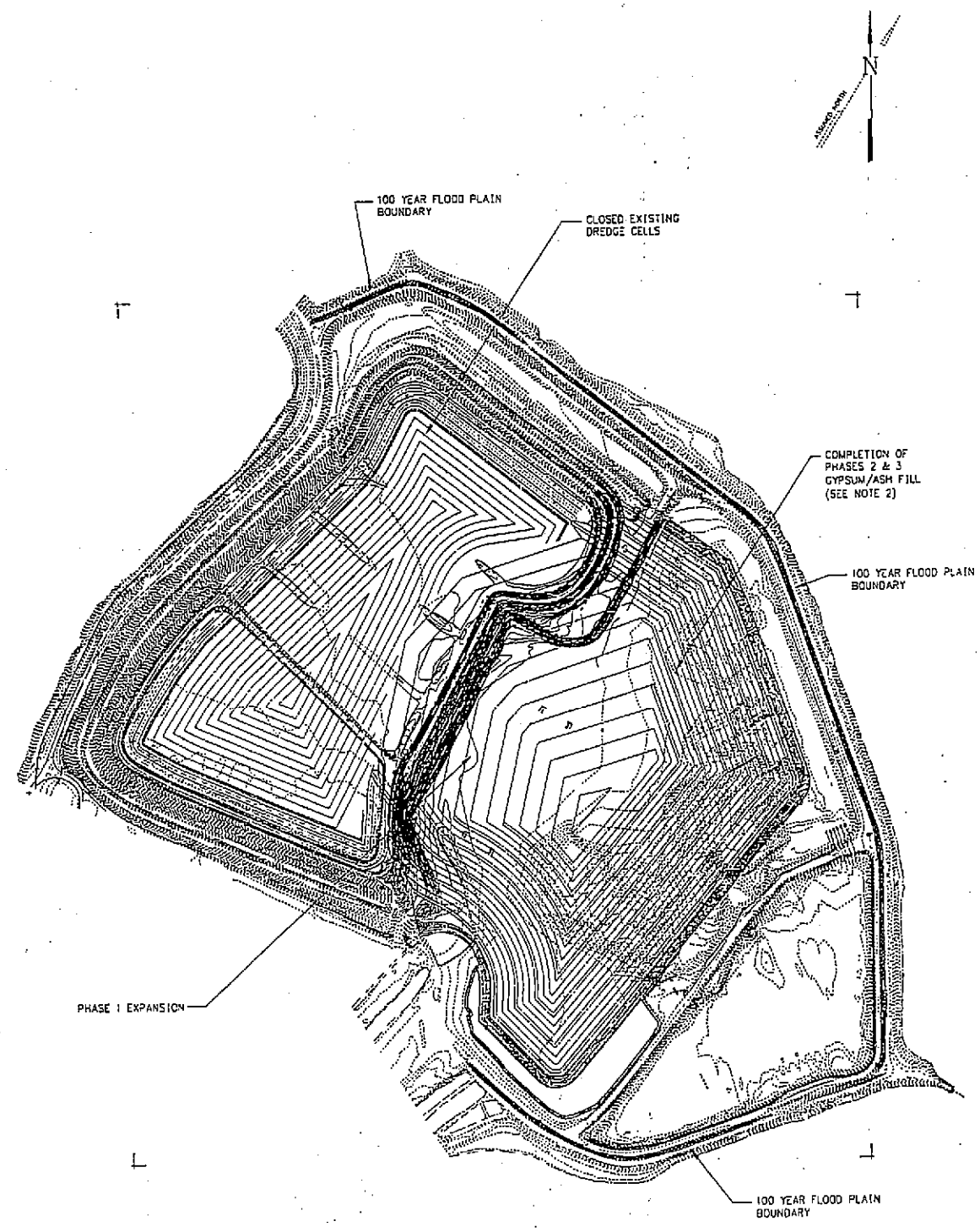
PLOT FACTOR: 300
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

TVA-00018490



PHASE 2 – START OF PHASE 3 EXPANSION



PROPOSED FINAL GRADE OF LATERAL EXPANSION

NOTES:

1. FOR NOTES SEE 10W425-22.

2. PHASE 2/3 CAN BE FILLED WITH DREDGED FLY ASH AND DRY FLY ASH. SEE 10W425-64 FOR A CROSS SECTION DEPICTING FLY ASH PLACEMENT.

EMORY RIVER–WATTS BAR LAKE
100 YEAR FLOOD ELEVATION 748 AT RIVER MILE 2.00
500 YEAR FLOOD ELEVATION 750.5 AT RIVER MILE 2.00

REV NO.	DATE	DRN	CHKD	SUPV	APPD	DESCRIPTION
R 0		DRS	BSB	WPT	MLP	REP JGA
ISSUED FOR DREDGE CELL EXPANSION						

SCALE: 1"=300' EXCEPT AS NOTED

YARD

DREDGE CELL
LATERAL EXPANSION
PHASING SHEET 2

DESIGNED BY	DRAWN BY	CHECKED BY	SUPERVISED BY	REVIEWED BY	APPROVED BY	ISSUED BY
D.R. SMITH	B.S. BURT	W.P. TAYLOR	M.L. PETTY	R.E. PURKEY	J.G. ADAIR	

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R14 | DATE | 36 | C | 10W425-23 | R 0

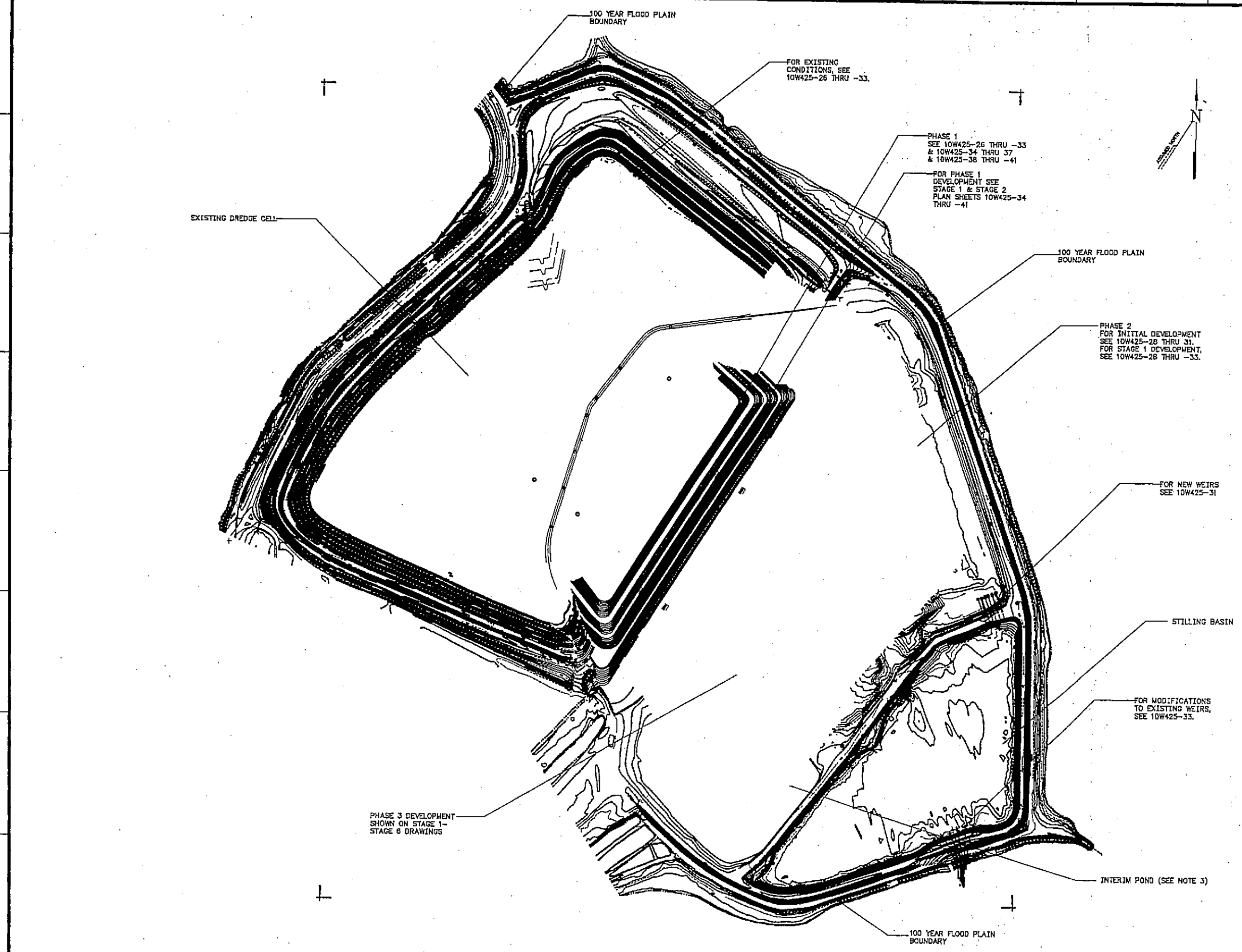
PLOT FACTOR:300
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

PARSONS | 0
TASK COMPLETED BY: | REV NO.

36 | C | 10W425-23

TVA-00018491



NOTES:

1. FOR DRAWING INDEX AND LEGEND, SEE DRAWING 10W425-20.
2. DRAWINGS 10W425-24 AND -25 DEPICT PHASED CONSTRUCTION INFORMATION. INITIAL CONSTRUCTION DRAWINGS BEGIN WITH 10W425-25
3. FOR INTERIM POND DEVELOPMENT, SEE NOTE 3 ON 10W425-28.

EMORY RIVER-WATTS BAR LAKE
100 YEAR FLOOD ELEVATION 748 AT RIVER MILE 2.00
500 YEAR FLOOD ELEVATION 750.5 AT RIVER MILE 2.00

REV NO.	DATE	DRWN	DSGN	CHKD	SUPV	ENGD	APPD	CHRG	PROJECT ID	AE CONT	
R 0		DRS	DSB	WPT	HLP	RDP	JGA				
REVISED FOR DREDGE CELL EXPANSION											

SCALE: 1"=200' EXCEPT AS NOTED

YARD

PHASE 1 DREDGE CELL
LATERAL EXPANSION
DEVELOPMENT PLAN SHEET 1

DESIGNED BY	DRAWN BY	CHECKED BY	SUPERVISED BY	REVIEWED BY	APPROVED BY	ISSUED BY
D.R. SMITH	D.S. BURST	W.P. TAYLOR	H.L. PETTY	R.E. PURKEY	J.G. ADAIR	

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R14 | SIZE 36 | C | 10W425-24 | R 0

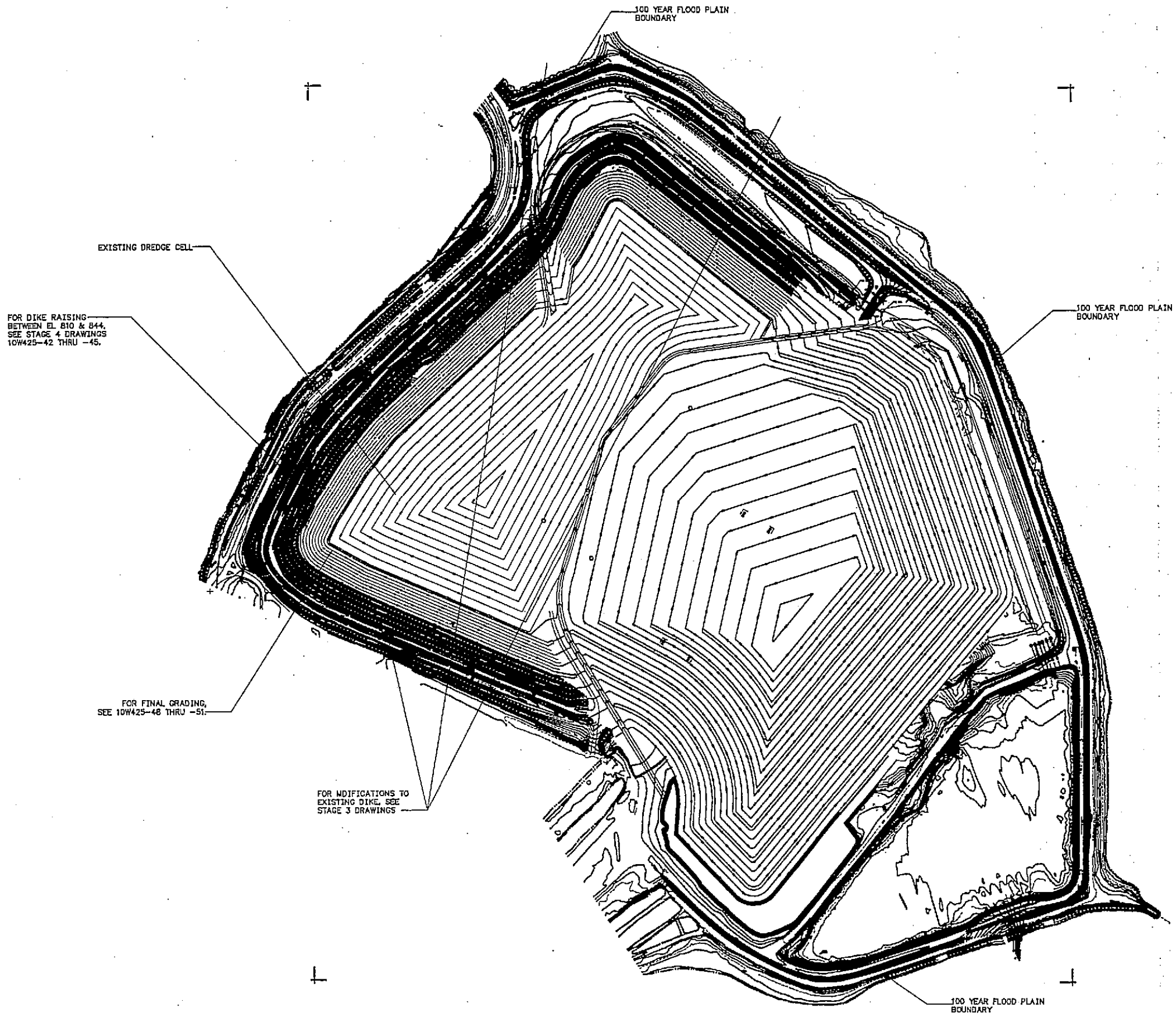
PLOT FACTOR:1200
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

PARSONS	0
TASK COMPLETED BY:	REV NO.

36 C 10W425-24

TVA-00018492



NOTES:

1. FOR NOTES SEE 10W425-24.

EMORY RIVER-WATTS BAR LAKE
100 YEAR FLOOD ELEVATION 748 AT RIVER MILE 2.00
500 YEAR FLOOD ELEVATION 750.5 AT RIVER MILE 2.00

REV NO.	DATE	DRN	DSN	CHD	SUPV	ENG	APVD	SRD	PROJECT ENGR	AS CONST	DISCIPLINE INTERFACE
R 0		DRS	BSB	NPT	HLP	REP	JGA				
REVISED FOR DREDGE CELL EXPANSION											

SCALE: 1"=200' EXCEPT AS NOTED

YARD

PHASE 2 DREDGE CELL
LATERAL EXPANSION
DEVELOPMENT PLAN SHEET 2

DESIGNED BY	DRAWN BY	CHECKED BY	SUPERVISED BY	REVIEWED BY	APPROVED BY	ISSUED BY
D.R. SMITH	B.S. SURT	W.P. TAYLOR	H.L. PETTY	R.E. PURKEY	J.G. ADAIR	

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R14 | DATE | 36 | C | 10W425-25 | R 0

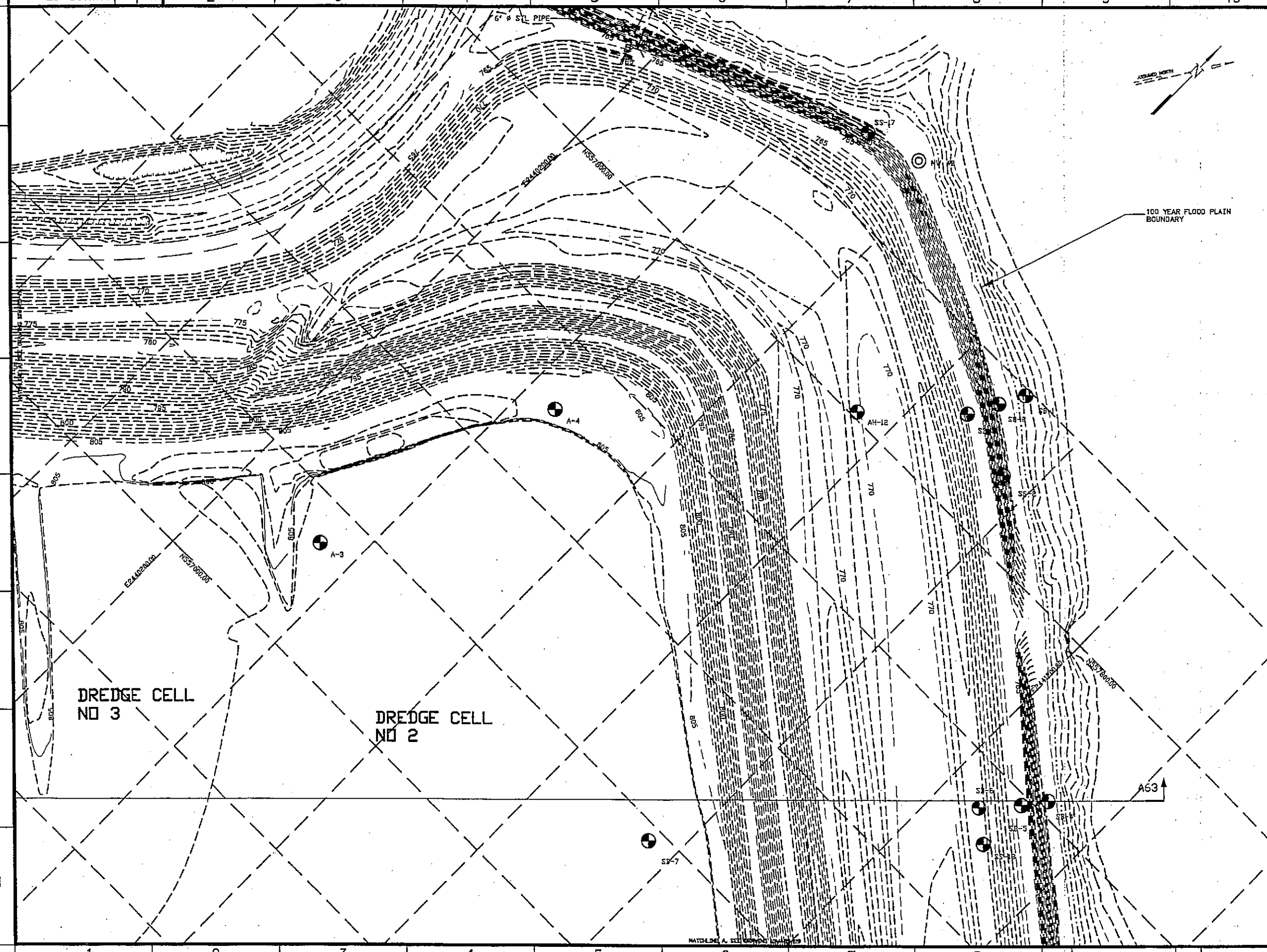
PARSONS | 0
TASK COMPLETED BY: | REV NO.

PLOT FACTOR:1200
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

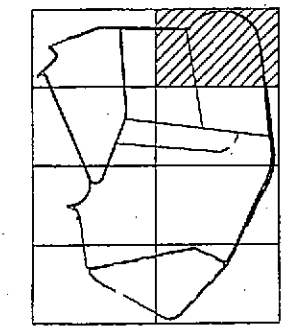
36 | C | 10W425-25

TVA-00018493



GENERAL NOTES

1. FOR GENERAL NOTES SEE 10W425-26.



KEY PLAN

EMORY RIVER-WATTS BAR LAKE
100 YEAR FLOOD ELEVATION 748 AT RIVER MILE 2.00
500 YEAR FLOOD ELEVATION 750.6 AT RIVER MILE 2.00

REV NO.	DATE	DRN	DSN	CHKD	SUPV	PMD	APPD	DRD	PROJECT ID	AS CONST
R 0		DRS	DSD	MPT	MLP	REP	JCA			
ISSUED FOR DREDGE CELL EXPANSION										

SCALE: 1"=50' EXCEPT AS NOTED

YARD

DREDGE CELL
EXISTING CONDITIONS &
DRAINAGE LAYER - SHEET 2

DESIGNED BY	DRAWN BY	CHECKED BY	SUPERVISED BY	REVIEWED BY	APPROVED BY	ISSUED BY
D.R. SMITH	S.S. BURT	M.P. TAYLOR	M.L. PETTY	R. E. FURREY	J. C. ADAIR	

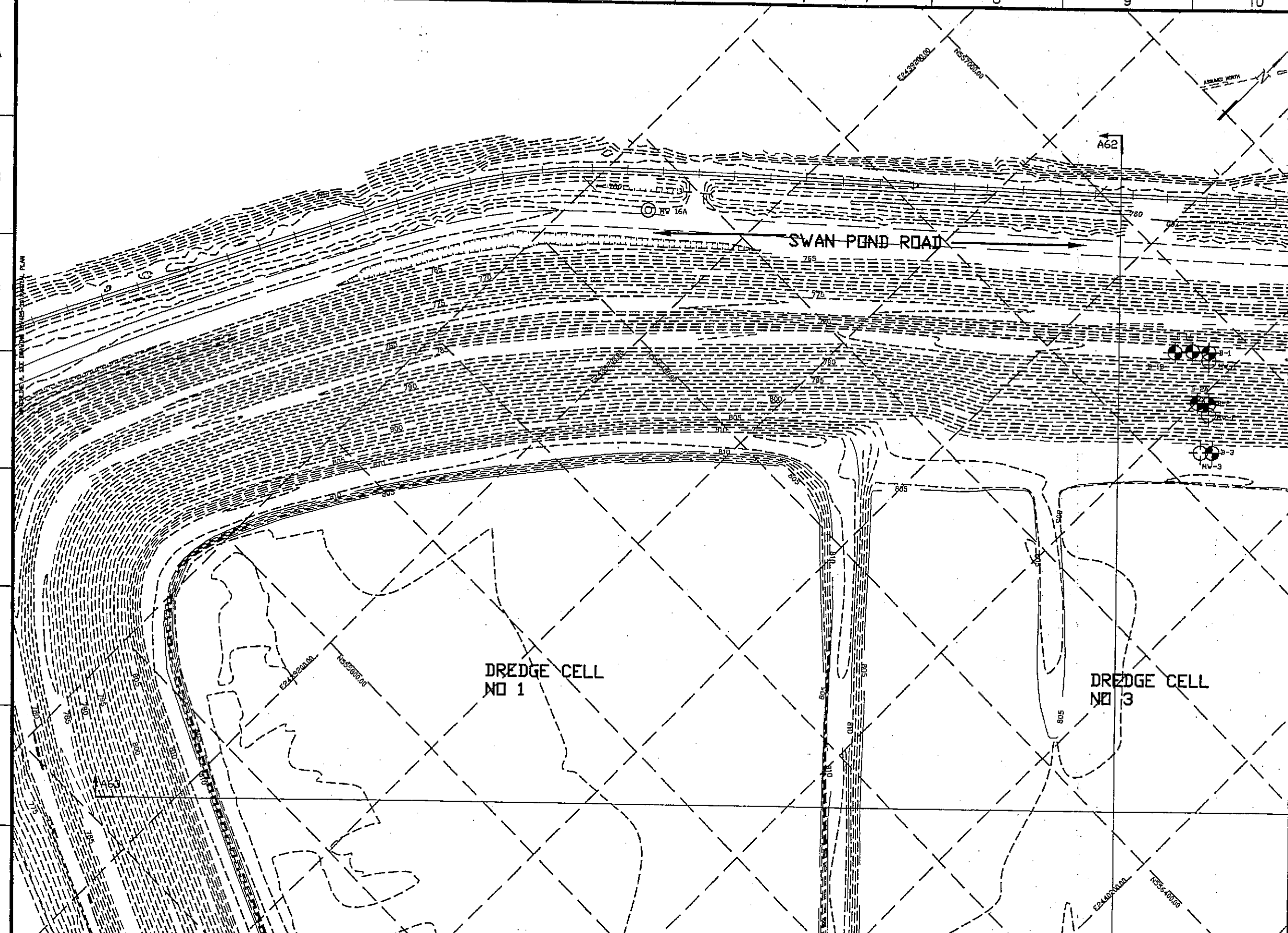
KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R14 | SIZE 36 | C | 10W425-27 | R 0

PARSONS	0
TASK COMPLETED BY:	REV NO.

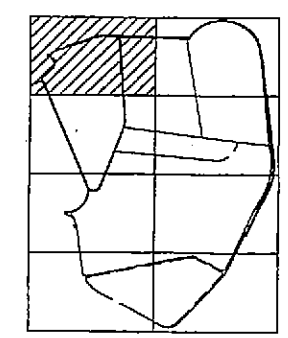
PLOT FACTOR:600
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY



GENERAL NOTES

1. FOR DRAWING INDEX AND LEGEND, SEE DRAWING 10W425-20.
2. EXISTING TOPOGRAPHY AND SITE FEATURES OBTAINED FROM A SURVEY PERFORMED BY TVA, DATED OCTOBER 2003. SUPPLEMENTAL SURVEYING FOR PHASE 1 EXPANSION WERE PERFORMED MARCH 2004. EXISTING MONITORING WELL LOCATIONS WERE PROVIDED BY TVA. EXISTING ELEVATION CONTOURS ARE SHOWN AT 1-FOOT INTERVALS UNLESS NOTED OTHERWISE. ELEVATION CONTOURS FOR DREDGE CELL EXPANSION ARE SHOWN AT 2-FOOT INTERVALS UNLESS NOTED OTHERWISE.
3. SURVEY COORDINATES ARE REFERENCED TO TENNESSEE STATE PLANE COORDINATE SYSTEM, NAD 27. COORDINATES FOR UTILITY STRUCTURES AND PIPING ARE TO CENTERLINE OF STRUCTURE OR PIPE UNLESS NOTED OTHERWISE.
4. HORIZONTAL AND VERTICAL CONTROL SHALL BE ESTABLISHED BY USING THE EXISTING BENCHMARK LOCATIONS LISTED ON 10W425-20, AND DEPICTED ON THESE DRAWINGS.
FOR BENCHMARK DESCRIPTIONS, CONTACT TVA MAPPING, 1101 MARKET ST, CHATTANOOGA, TN 37402.
5. THE ASH POND HAS AN EXISTING STILLING BASIN TO PROVIDE SEDIMENTATION CONTROL DURING CONSTRUCTION AND OPERATION. EROSION CONTROL MEASURES (TEMPORARY SILT FENCING, CHECK DAMS) ARE NOT DEPICTED ON THE DRAWINGS BUT MAY BE UTILIZED BY THE CONSTRUCTOR AND OPERATOR TO CONTROL SEDIMENT DISCHARGE TO THE STILLING BASIN.
6. THE CONSTRUCTOR AND OPERATOR SHALL PROVIDE A MEANS TO CONTROL DUST DURING CONSTRUCTION AND OPERATION. CONTROLS MAY INCLUDE THE USE OF WATER TRUCKS, OR COMMERCIALLY AVAILABLE APPLIED SPRAY-ON MEMBRANE EROSION CONTROL PRODUCTS.
7. SECTION NUMBERS REFER DIRECTLY TO TVA SPECIFICATION T-1, UNLESS NOTED OTHERWISE.
8. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH TVA SPECIFICATION T-1, AND THE FOLLOWING ASH POND EXPANSION DOCUMENTS: OPERATIONS MANUAL; THE CLOSURE/POST CLOSURE PLAN; AND THE QA/QC PLAN.
9. WHERE ENCOUNTERED, VERIFY AMPLE CLEARANCE UNDER OVERHEAD ELECTRICAL LINES FOR CONSTRUCTION EQUIPMENT. CONSTRUCTOR SHALL NOTIFY CONSTRUCTION MANAGER BEFORE ANY WORK STARTS NEAR OVERHEAD ELECTRICAL LINES.
10. THE CONSTRUCTOR IS HEREBY ADVISED THAT THERE MAY UNDERGROUND UTILITIES PRESENT AT THIS SITE WHICH ARE NOT SHOWN ON THESE DRAWINGS. THE CONSTRUCTOR SHALL LOCATE AND VERIFY EXISTING UNDERGROUND UTILITIES THAT MAY NOT BE SHOWN ON THIS DRAWING THAT ARE WITHIN ANY AREA TO BE DISTURBED.
11. THE CONSTRUCTOR SHALL VERIFY THAT ANY UNDERGROUND ELECTRICAL UTILITIES ARE LOCKED OUT/TAGGED OUT AND ARE NOT ACTIVATED PRIOR TO REMOVAL.
12. CONSTRUCTOR SHALL EXERCISE CARE TO PREVENT DAMAGE TO EXISTING MONITORING WELLS AND/OR EXISTING STRUCTURES.
13. DISPOSAL OF DEMOLISHED ITEMS SUCH AS EXISTING STORM SEWER PIPING OR OTHER MISCELLANEOUS ITEMS SHALL BE AS DIRECTED BY TVA.
13. FOR CONSTRUCTION OF THE PHASE 2 BASE AND STARTER DIKE SEE ON DRAWING 10W425-65 AND THE QA/QC PLAN.
14. ELEVATION CONTOURS SHOWN ON THE OUTER SLOPES OF THE PHASE 2 AND 3 EXPANSION ARE FINISHED GRADE.
15. ELEVATIONS SHOWN INSIDE THE PHASE 2 AND 3 STARTER DIKES ARE TO TOP OF THE FLY ASH BASE AS SHOWN ON TYPICAL CROSS SECTION SHOWN ON 10W425-65.
16. FOR COMPLIANCE MONITORING WELL CONSTRUCTION, SEE HYDROGEOLOGICAL REPORT.



KEY PLAN

EMORY RIVER-WATTS BAR LAKE
100 YEAR FLOOD ELEVATION 748 AT RIVER MILE 2.00
500 YEAR FLOOD ELEVATION 750.5 AT RIVER MILE 2.00

REV	DATE	DRN	DSN	CHK	SUPV	APPD	ISSUED FOR
R 0		DRS	DSB	NPT	HLP	RCP	JGA

ISSUED FOR DREDGE CELL EXPANSION

SCALE: 1"=50' EXCEPT AS NOTED

YARD

DREDGE CELL
EXISTING CONDITIONS &
DRAINAGE LAYER - SHEET 1

DESIGNED BY	DRAWN BY	CHECKED BY	SUPERVISED BY	REVIEWED BY	APPROVED BY	ISSUED BY
D.R. SMITH	B.S. BURT	W.P. TAYLOR	H.L. PETTY	R. E. PURKEY	J. G. ADAIR	

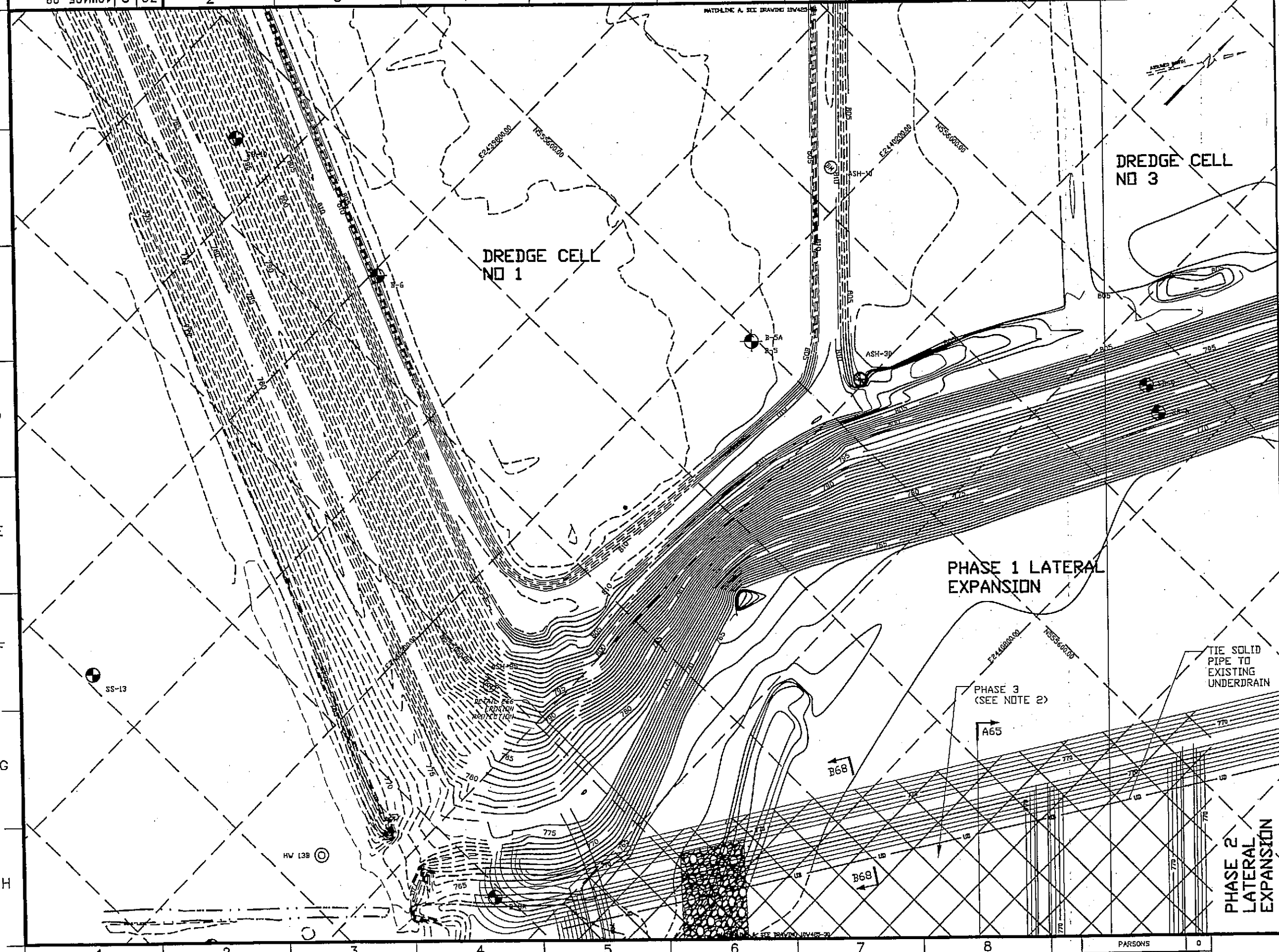
KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R14 | DATE | 36 | C | 10W425-26 | R 0

PARSONS | 0
TASK COMPLETED BY | REV NO.

PLOT FACTOR:600
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

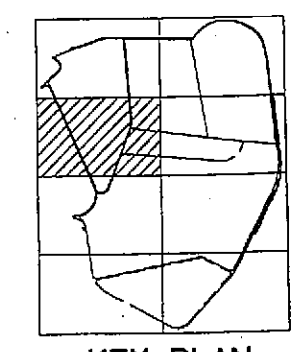


GENERAL NOTES

1. FOR GENERAL NOTES SEE 10W425-26.

2. PHASE 3 LATERAL EXPANSION SHOWN. PHASE 3 MAY BE BUILT AT LATER DATE. SEE DRAWING 10W425-22 FOR PHASING OF LATERAL EXPANSION.

3. CONCURRENT WITH PHASE 2 CONSTRUCTION, TVA WILL CONSTRUCT A POND SHOWN ON 10W425-24 TO MAINTAIN ADEQUATE FREE WATER VOLUME DURING WET ASH HANDLING OPERATIONS. SEE 10W425-22 FOR POND CONFIGURATION.



KEY PLAN

EMORY RIVER–WATTS BAR LAKE
100 YEAR FLOOD ELEVATION 748 AT RIVER MILE 2.00
500 YEAR FLOOD ELEVATION 750.5 AT RIVER MILE 2.00

REV. NO.	DATE	DRWN	DSGN	CHKD	SUPV	PMGR	APPD	ENGR	PROJECT ID	AS CONST
R 0		DRS	BSB	WPT	RLP	RGP	JCA			
ISSUED FOR DREDGE CELL EXPANSION										

SCALE: 1"=50' EXCEPT AS NOTED

YARD

DREDGE CELL
EXISTING CONDITIONS &
DRAINAGE LAYER – SHEET 3

DESIGNED BY	DRAWN BY	CHECKED BY	SUPERVISED BY	REVIEWED BY	APPROVED BY	SHALL BE
D.R. SMITH	B.S. BURT	R.P. TAYLOR	H.L. PETTY	R. E. FURNEY	J. C. ADAIR	

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R14 | SIZE 36 | C | 10W425-28 | R 0

PARSONS | 0
TASK COMPLETED BY | REV NO.

PLOT FACTOR:600
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

36 | C | 10W425-28

TVA-00018496

DREDGE CELL NO 3

DREDGE CELL NO 2

PHASE 1 LATERAL EXPANSION

PHASE 2 LATERAL EXPANSION

100 YEAR FLOOD PLAIN BOUNDARY

CURVE #10 R220.0'

DETAIL E66 EROSION PROTECTION

EROSION PROTECTION CHANNEL FOR INITIAL GYPSUM FILL

SEE NOTE 15, DRW 10W425-26

GEOTEXTILE W/ 3' STONE PLACED 1' THICK TO PREVENT EROSION

SEE NOTES 13 & 14 10W425-26

TIE SOLID PIPE TO EXISTING PHASE 1 UNDERDRAINS

A65

B68

GENERAL NOTES

1. FOR GENERAL NOTES SEE 10W425-26.

KEY PLAN

EMORY RIVER-WATTS BAR LAKE

100 YEAR FLOOD ELEVATION 748 AT RIVER MILE 2.00

500 YEAR FLOOD ELEVATION 750.5 AT RIVER MILE 2.00

REV	DATE	DRN	DSN	CHK	SUPV	PMD	APPR	DWG	PROJECT ID	AS CONST	REV
R 0	ISSUED FOR DREDGE CELL EXPANSION	DRS	RSB	MPT	HLP	RCP	JCA				B

SCALE: 1"=50' EXCEPT AS NOTED

YARD

DREDGE CELL

EXISTING CONDITIONS &

DRAINAGE LAYER – SHEET 4

DESIGNED BY	DRAWN BY	CHECKED BY	SUPERVISED BY	REVIEWED BY	APPROVED BY	ISSUED BY
D.R. SMITH	B.S. SURT	M.P. TAYLOR	H.L. PETIT	R. E. FURKEY	J. C. ADAIR	

KINGSTON FOSSIL PLANT

TENNESSEE VALLEY AUTHORITY

FOSSIL AND HYDRO ENGINEERING

AUTOCAD R14 | SIZE 36 | C | 10W425-29 | R 0

PARSONS | 0

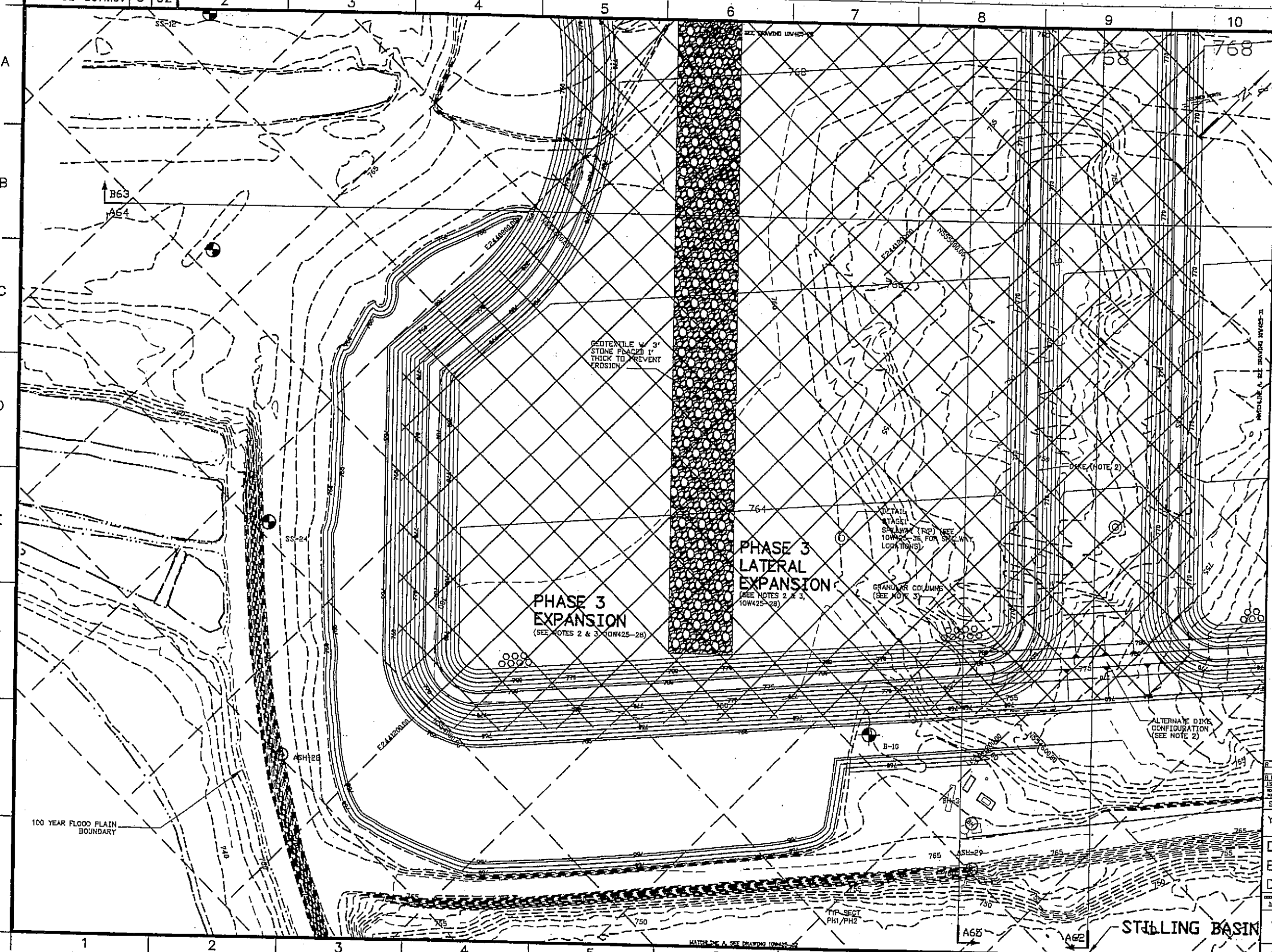
TASK COMPLETED BY: | REV NO.

PLOT FACTOR:600

W_TVA

C.A.D. DRAWING DO NOT ALTER MANUALLY

TVA-00018497



GENERAL NOTES

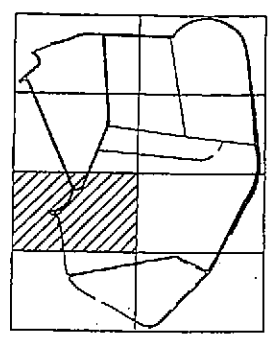
1. FOR GENERAL NOTES SEE 10W425-26.

2. PHASE 3 DIKE SHOWN. IF ALTERNATE DIKE IS CONSTRUCTED, PHASE 3 DIKE MAY NOT BE REQUIRED.

3. INSTALL GRANULAR COLUMNS IN ACCORDANCE WITH 10W425-55. GRANULAR COLUMNS SHALL BE INSTALLED AFTER CONSTRUCTION OF FLY ASH BASE.

EMORY RIVER-WATTS BAR LAKE

100 YEAR FLOOD ELEVATION 748 AT RIVER MILE 2.00
500 YEAR FLOOD ELEVATION 750.5 AT RIVER MILE 2.00



KEY PLAN

REV	DATE	DRN	DSGN	CHKD	SUPV	PMG	APPD	DRD	PROJECT ENGR	AS CONST
R 0		DRS	BSB	MPT	HLP	REP	JGA			

ISSUED FOR DREDGE CELL EXPANSION

SCALE: 1"=50' EXCEPT AS NOTED

YARD

DREDGE CELL
EXISTING CONDITIONS &
DRAINAGE LAYER - SHEET 5

DESIGNED BY	DRAWN BY	CHECKED BY	SUPERVISED BY	REVIEWED BY	APPROVED BY	ISSUED BY
D.R. SMITH	B.S. BURT	M.P. TAYLOR	H.L. PETTY	R. E. PURKEY	J. G. AGUIR	

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R14 | 36 | C | 10W425-30 | R 0

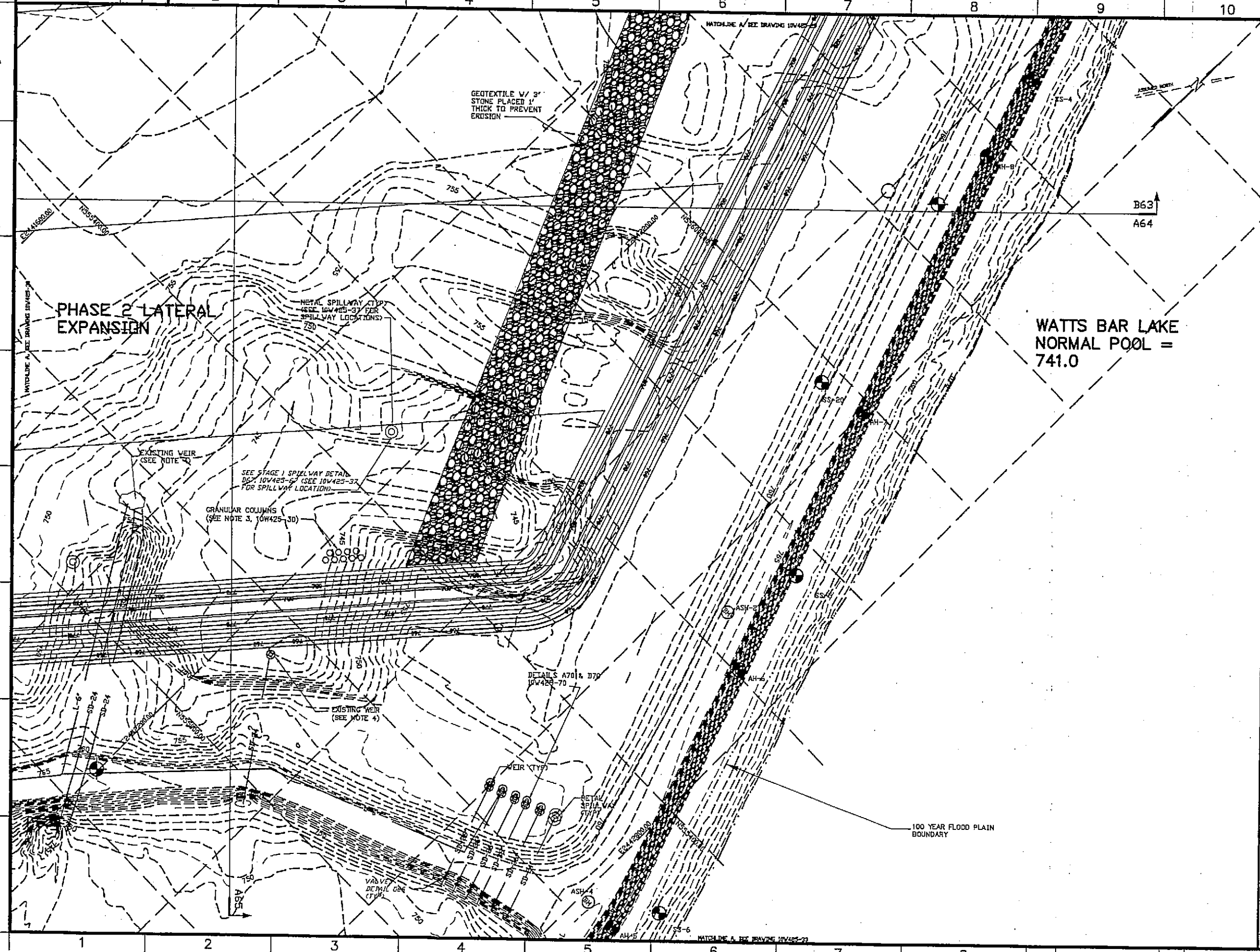
PLOT FACTOR:500

C.A.D. DRAWING

PARSONS | 0

36 C 10W425-30

TVA-00018498



NOTES:

1. FOR GENERAL NOTES SEE 10W425-26.

2. PRIOR TO CONSTRUCTING DIKES FOR PHASE 2, REMOVE EXISTING STORMDRAIN WHERE SHOWN AND BACKFILL WITH SOIL MEETING THE REQUIREMENTS OF RANDOM SOIL AS DEFINED IN THE QA/QC PLAN. REGRADE AREA AS SHOWN AND INSTALL NEW STORMDRAIN TO DIRECT DRAINAGE TO EXISTING ASH POND.

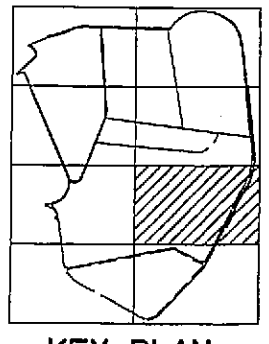
3. WEIRS MAY BE FIELD LOCATED PROVIDED THAT REQUIREMENTS SHOWN ON WEIR INSTALLATION DETAILS (10W425-70) ARE MET. PROVIDE MINIMUM 40' SPACING BETWEEN WEIRS.

4. AFTER INSTALLATION OF NEW WEIRS, TREMIE GROUT STORM DRAINS CONNECTED TO EXISTING WEIRS. GROUT SHALL CONSIST OF A MIXTURE OF FLY ASH, PORTLAND CEMENT TYPE II, & BENTONITE CLAY PROPORTIONED AS REQUIRED BY TVA FES. MIXTURE SHALL BE PUMPABLE, YET STIFF ENOUGH TO INSTALL UNDERWATER. INSTALL TREMIE PIPE & VERIFY FULL PENETRATION TO OUTLET END OF STORM DRAIN. SEAL WELD 1/4" THICK A36 STEEL PLATE TO END OF STORMDRAIN TO PREVENT FLOWING WATER. PUMP GROUT MIXTURE INTO PIPE AND GRADUALLY WITHDRAW TREMIE PIPE DURING FILLING. MAINTAIN TREMIE PIPE WITHIN GROUT TO PREVENT THE FORMATION OF AIR POCKETS OR HONEYCOMB AREAS.

5. INSTALL METAL SPILLWAY & PLACE STOP LOGS TO EL 760. CLOSE VALVES WHEN POND NEEDS TO BE TEMPORARILY RAISED DURING OPERATION. DON NOT LEAVE POND RAISED FOR EXTENDED PERIODS OF TIME.

EMORY RIVER–WATTS BAR LAKE

100 YEAR FLOOD ELEVATION 748 AT RIVER MILE 2.00
500 YEAR FLOOD ELEVATION 750.5 AT RIVER MILE 2.00



KEY PLAN

REV. NO.	DATE	DRWN	DSGN	CHKD	DWN	CHKD	APPD	CHKD	PROJECT ID	AS SHWN	SIZE
R 0		GRS	BSB	WPT	HLP	REP	JGA				D
ISSUED FOR DREDGE CELL EXPANSION											

SCALE: 1"=50' EXCEPT AS NOTED

YARD

DREDGE CELL
EXISTING CONDITIONS &
DRAINAGE LAYER – SHEET 6

DESIGNED BY	DRAWN BY	CHECKED BY	SUPERVISED BY	REVIEWED BY	APPROVED BY	ISSUED BY
D.R. SMITH	B.S. BLAIR	W.P. TAYLOR	H.L. PETTIT	R. E. PURKEY	J. C. ADAIR	

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

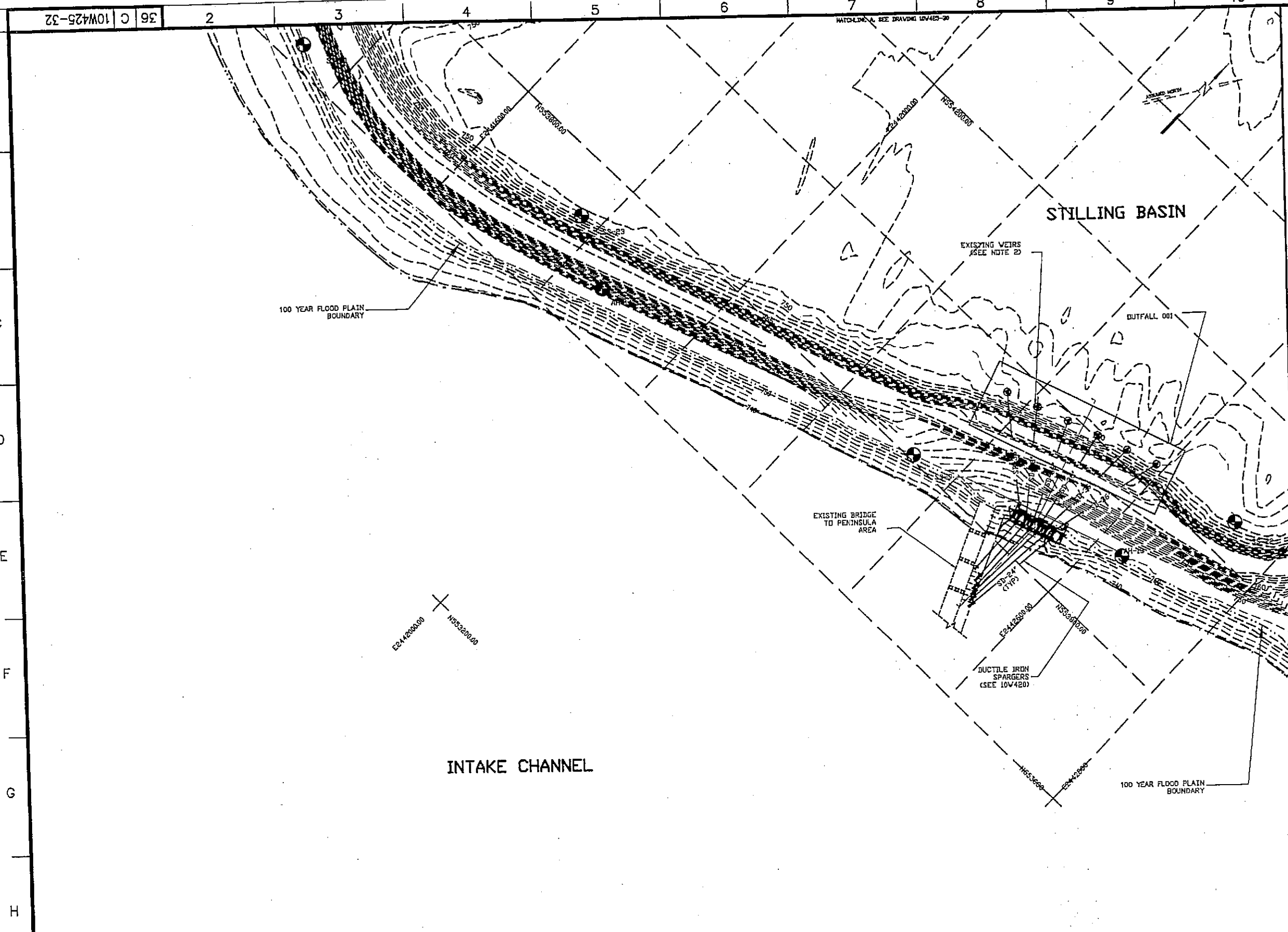
AUTOCAD R14 | SIZE 36 C | 10W425-31 | R 0

PARSONS | 0
TASK COMPLETED BY: | REV NO.

PLOT FACTOR:600
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

TVA-00018499

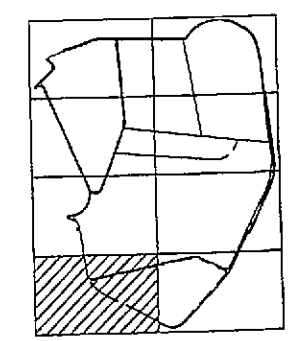


NOTES:

1. FOR GENERAL NOTES SEE 10W425-25.

2. PRIOR TO CONSTRUCTING DIKES FOR PHASE 2, RAISE EXISTING WEIRS TO ELEVATION 757.

EMORY RIVER-WATTS BAR LAKE
100 YEAR FLOOD ELEVATION 748 AT RIVER MILE 2.00
500 YEAR FLOOD ELEVATION 750.5 AT RIVER MILE 2.00



KEY PLAN

REV NO.	DATE	DRN	DWN	CHD	SUPV	TYPD	APVD	ISSD	PROJECT ID	AS CONT	REV CD
R 0		DRS	BSB	WPT	HLP	RCP	JGA				D
ISSUED FOR DREDGE CELL EXPANSION											

SCALE: 1"=50' EXCEPT AS NOTED

YARD

DREDGE CELL
EXISTING CONDITIONS &
DRAINAGE LAYER - SHEET 7

DESIGNED BY	DRAWN BY	CHECKED BY	SUPERVISED BY	REVIEWED BY	APPROVED BY	ISSUED BY
D.R. SMITH	S.S. BURT	W.P. TAYLOR	H.L. PETTY	R. E. PURKEY	J. G. ADAIR	

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

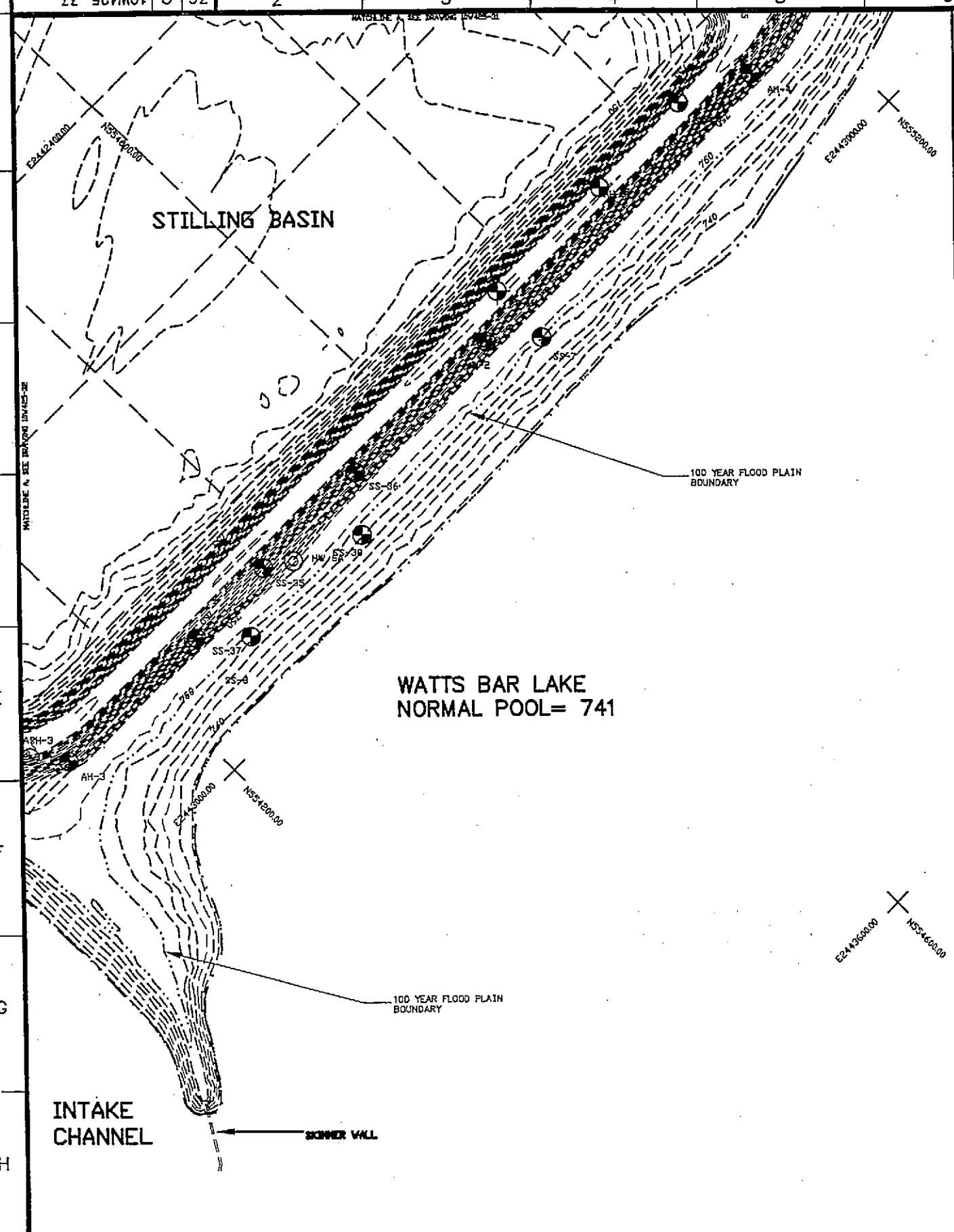
AUTOCAD R14 | 36 | C | 10W425-32 | R 0

PLOT FACTOR:600
W_TVA

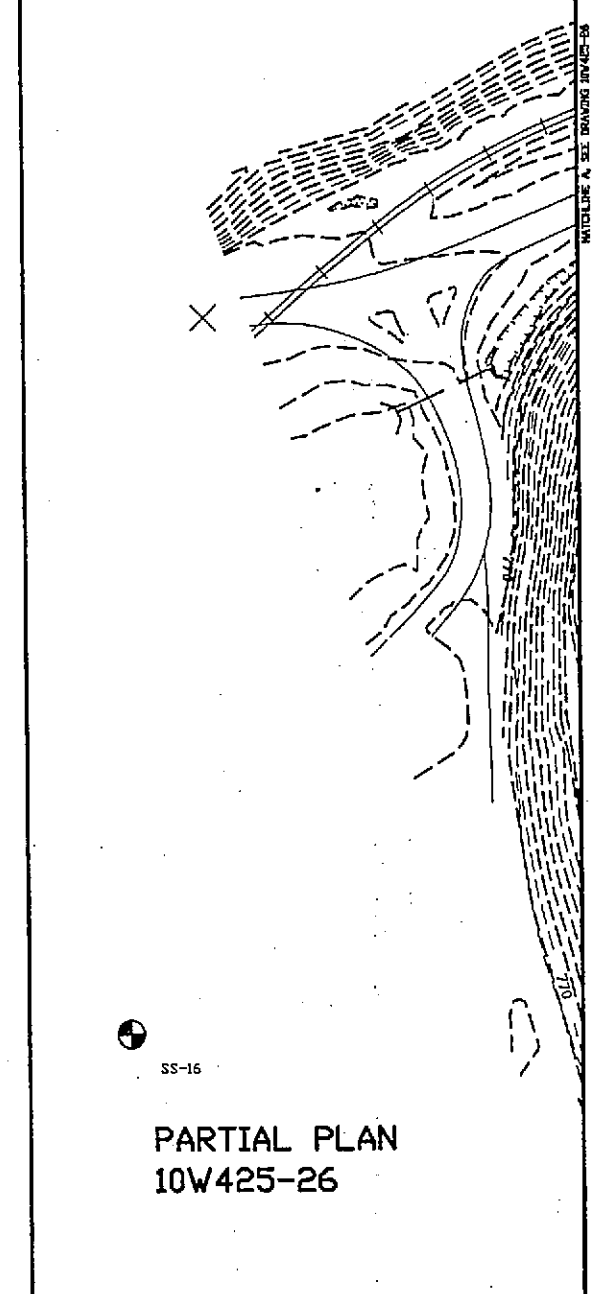
C.A.D. DRAWING
DO NOT ALTER MANUALLY

PARSONS | 0
TASK COMPLETED BY: | REV NO.

TVA-00018500



WATTS BAR LAKE
NORMAL POOL= 741

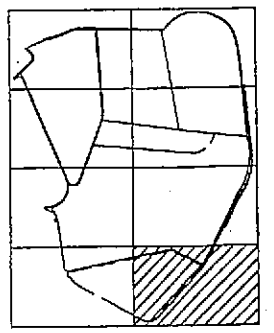


PARTIAL PLAN
10W425-26

NOTES:

1. FOR GENERAL NOTES SEE 10W425-26.

EMORY RIVER-WATTS BAR LAKE
100 YEAR FLOOD ELEVATION 748 AT RIVER MILE 2.00
500 YEAR FLOOD ELEVATION 750.5 AT RIVER MILE 2.00



KEY PLAN

REV NO.	DATE	DRN	DSGN	CHKD	SUPV	PROJ ENG	APPR	ENG	PROJECT ID	AS CONST
R 0		DRS	RSB	WPT	HLP	RDP	JCA			
ISSUED FOR DREDGE CELL EXPANSION										

SCALE: 1"=50' EXCEPT AS NOTED

YARD

DREDGE CELL
EXISTING CONDITIONS &
DRAINAGE LAYER - SHEET 8

DESIGNED BY	DRAWN BY	CHECKED BY	SUPERVISED BY	REVIEWED BY	APPROVED BY	ISSUED BY
D.R. SMITH	B.S. BURT	W.P. TAYLOR	H.L. PETTIT	R. E. PURKEY	J. C. ADAIR	

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

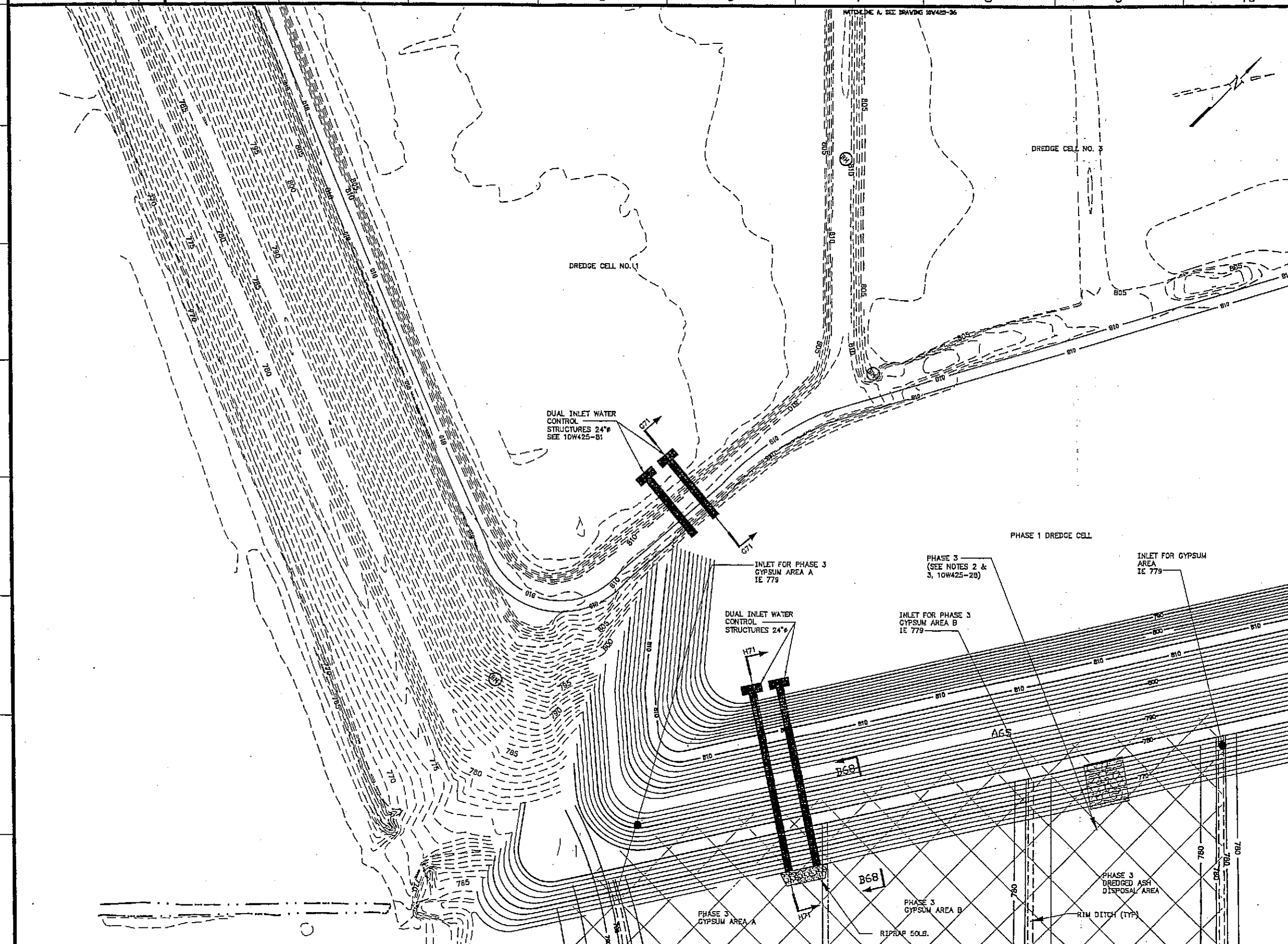
AUTOCAD R14 | DATE | 36 | C | 10W425-33 | R 0

PARSONS | 0
TASK COMPLETED BY: | REV NO.

PLOT FACTOR:600
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

TVA-00018501



DIKE RAISING NOTES:
1. FOR DRAWING INDEX AND LEGEND, SEE DRAWING 10W425-20.
2. FOR GENERAL NOTES SEE 10W425-26.
3. PROVIDE A MINIMUM OF TWO (2) FEET OF FREEBOARD TO THE FINISHED DIKE ELEVATION DURING ASH DREDGING/ GYPSUM PLACEMENT ACTIVITIES.
4. LOCATE METAL SPILLWAYS SO THAT THEY COINCIDE WITH PERMANENT LETDOWN CHANNELS.
5. PROPOSED CONTOUR ELEVATIONS SHOWN FOR THE OUTER 3:1 SLOPES ARE FINISHED SURFACE ELEVATIONS (INCLUDING FINAL COVER).
6. FINAL CLOSURE GRADE WILL BE PLACED AT TWO (2) FEET PLUS OR MINUS OF THE ACTUAL GRADE SHOWN.
7. SLOPES SHALL BE 3:1 (HORIZONTAL TO VERTICAL) OR FLATTER, UNLESS NOTED OTHERWISE.
8. FOR CONSTRUCTION OF AND RAISING OF GYPSUM DIKES, SEE DETAIL A68 ON DRAWING 10W425-68. FOR RAISING FLY ASH DIKES, SEE DETAIL A72, 10W425-72.
9. PERIMETER DRAINS WITHIN THE OUTER WET-CAST GYPSUM DIKES AND COMPACTED ASH DIKES ARE NOT SHOWN ON THESE DRAWINGS. SEE DIKE CONSTRUCTION DETAILS REFERENCED IN NOTE.

EMORY RIVER–WATTS BAR LAKE
100 YEAR FLOOD ELEVATION 748 AT RIVER MILE 2.00
500 YEAR FLOOD ELEVATION 750.5 AT RIVER MILE 2.00

KEY PLAN

REV NO.	DATE	DRWN	DSGN	CHKD	SUPV	DWG	APPR	DWG	PROJECT ID	AS CONST
R 0		DRS	DSB	WPT	HLP	RCP	JCA			0
REVISED FOR DREDGE CELL EXPANSION PH3										

SCALE: 1"=50' EXCEPT AS NOTED

YARD

DREDGE CELL
LATERAL EXPANSION STAGE 1
SHEET 1 (665–780)

DESIGNED BY	DRAWN BY	CHECKED BY	SUPERVISED BY	REVIEWED BY	APPROVED BY	DRAWN BY
D.R. SMITH	B.S. BURT	W.P. TAYLOR	H.L. PETTY	R. E. PURKEY	J. C. ADAIR	

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

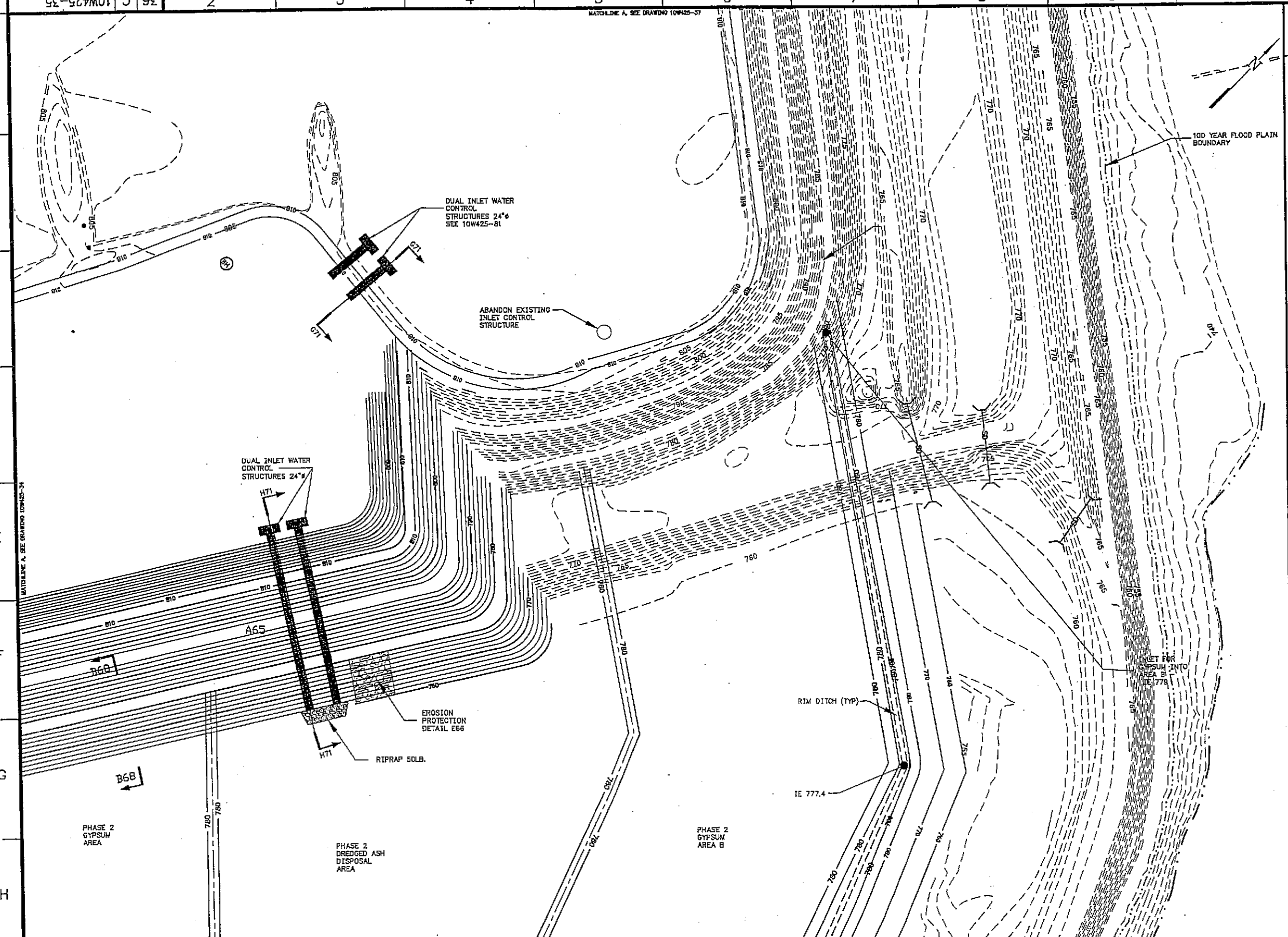
AUTOCAD R14 | SIZE 36 | C | 10W425–34 | R 0

PARSONS | 0
TASK COMPLETED BY: | REV NO.

PLOT FACTOR:600
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

TVA-00018502

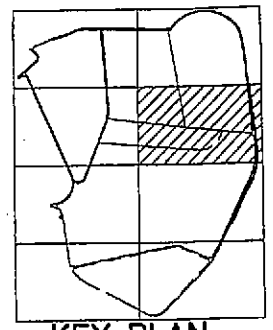


NOTES:

1. FOR GENERAL NOTES SEE 10W425-26.
2. FOR DIKE RAISING NOTES, SEE 10W425-34.

EMORY RIVER–WATTS BAR LAKE

100 YEAR FLOOD ELEVATION 748 AT RIVER MILE 2.00
500 YEAR FLOOD ELEVATION 750.5 AT RIVER MILE 2.00



KEY PLAN

REV NO.	DATE	DESIGN	DRAWN	CHKD	SUPV	SYND	APPR	CERT	PROJECT ID	AS CONST
R 0		DRS	RSD	WPT	HLP	REP	JCA			

REVISED FOR DREDGE CELL EXPANSION PH2

SCALE: 1"=50' EXCEPT AS NOTED

YARD

DREDGE CELL
LATERAL EXPANSION STAGE 1
SHEET 2

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	SEALED BY:
D.R. SMITH	B.S. BURT	W.P. TAYLOR	H.L. PETTY	R. E. PURKEY	J. C. ADAIR	

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R14 | SHEET 36 | C | 10W425-35 | R 0

PARSONS | 0
TASK COMPLETED BY: | REV NO.

PLOT FACTOR:600
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

TVA-00018503

36 | C | 10W425-36

MATCHLINE A, SEE DRAWING 10W425-34

PHASE 3 EXPANSION (SEE NOTES 2 & 3, 10W425-30)

B63

A64

PHASE 3 GYPSUM AREA A

PHASE 3 GYPSUM AREA B

PHASE 3 DREDGED ASH DISPOSAL AREA

RIM DITCH (TYP)

DETAIL D7 (STAGE 1 SPILLWAY)(TYP)

IE 776.4

RIM DITCH CORNER (SEE NOTE 3)

IE 775.6

IE 775.6

IE 776.4

IE 774.8

PHASE 3 EXPANSION (SEE NOTES 2 & 3, 10W425-30)

100 YEAR FLOOD PLAIN BOUNDARY

A65

A62

MATCHLINE A, SEE DRAWING 10W425-32

MATCHLINE A, SEE DRAWING 10W425-37

NOTES:

1. FOR GENERAL NOTES SEE 10W425-26.
2. FOR DIKE RAISING NOTES, SEE 10W425-34.
3. WHERE RIM DITCHES HAVE SHARP TURNS, WIDEN DITCH IN THE TURN TO 10 FT.

KEY PLAN

EMORY RIVER-WATTS BAR LAKE
100 YEAR FLOOD ELEVATION 748 AT RIVER MILE 2.00
500 YEAR FLOOD ELEVATION 750.5 AT RIVER MILE 2.00

REV NO.	DATE	DRAWN	DESIGN	CHKD	SUPV	SUPVD	APVD	APVD	PROJECT ENG	LD CONST	REV CD
R 0		DRS	RGD	WPT	HLP	REP	JCA				D
REVISED FOR DREDGE CELL EXPANSION PH2											

SCALE: 1"=50' EXCEPT AS NOTED

YARD

DREDGE CELL
LATERAL EXPANSION STAGE 1
SHEET 3

DESIGNED BY	DRAWN BY	CHECKED BY	SUPERVISED BY	REVIEWED BY	APPROVED BY	ISSUED BY
D.R. SMITH	B.S. SURT	W.P. TAYLOR	H.P. PETTY	R. E. PURKEY	J. G. ADAIR	

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

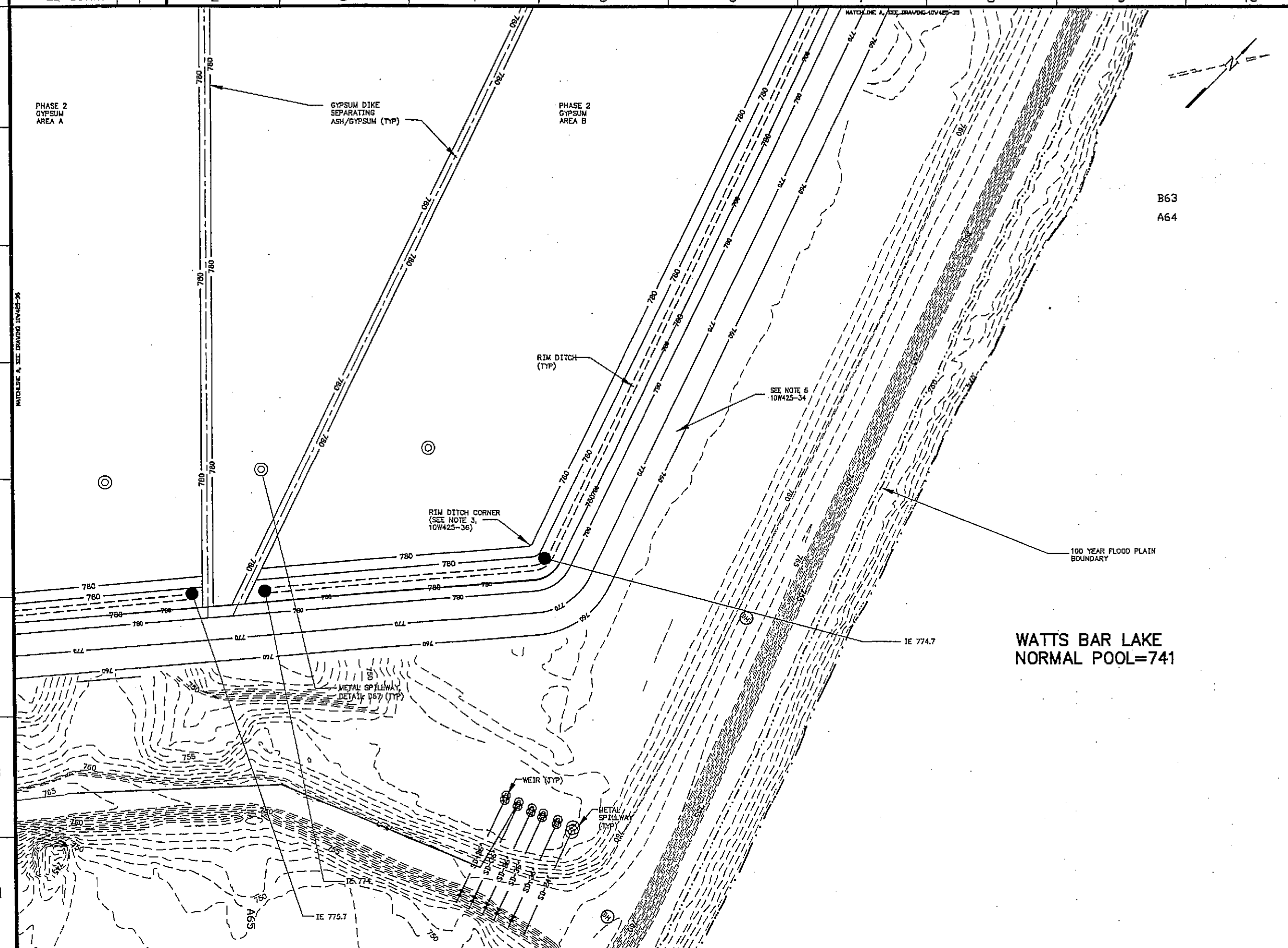
AUTOCAD R14 | SIZE 36 | C | 10W425-36 | R 0

PARSONS | 0
TASK COMPLETED BY | REV NO.

PLOT FACTOR:600
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

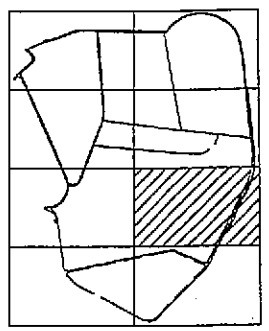
TVA-00018504



NOTES:

1. FOR GENERAL NOTES SEE 10W425-26.
2. FOR DIKE RAISING NOTES, SEE 10W425-34.
3. WHERE RIM DITCHES HAVE SHARP TURNS, WIDEN DITCH IN THE TURN TO 10 FT.

EMORY RIVER–WATTS BAR LAKE
100 YEAR FLOOD ELEVATION 748 AT RIVER MILE 2.00
500 YEAR FLOOD ELEVATION 750.5 AT RIVER MILE 2.00



KEY PLAN

REV NO.	DATE	DRN	SPEC	CHKD	RVWD	APVD	ISSD	PROJECT ID	AS CONST
R 0		DRS	RSB	WPT	HLP	RCP	JGA		D

REVISED FOR DREDGE CELL EXPANSION PH2

SCALE: 1"=50' EXCEPT AS NOTED

YARD

DREDGE CELL
LATERAL EXPANSION STAGE 1
SHEET 4

DRAWN BY	DRAWN BY	CHECKED BY	SUPERVISED BY	REVIEWED BY	APPROVED BY	ISSUED BY
D.R. SMITH	B.S. BURT	W.P. TAYLOR	H.L. PETTY	R. E. PURKEY	J. G. ADAIR	

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

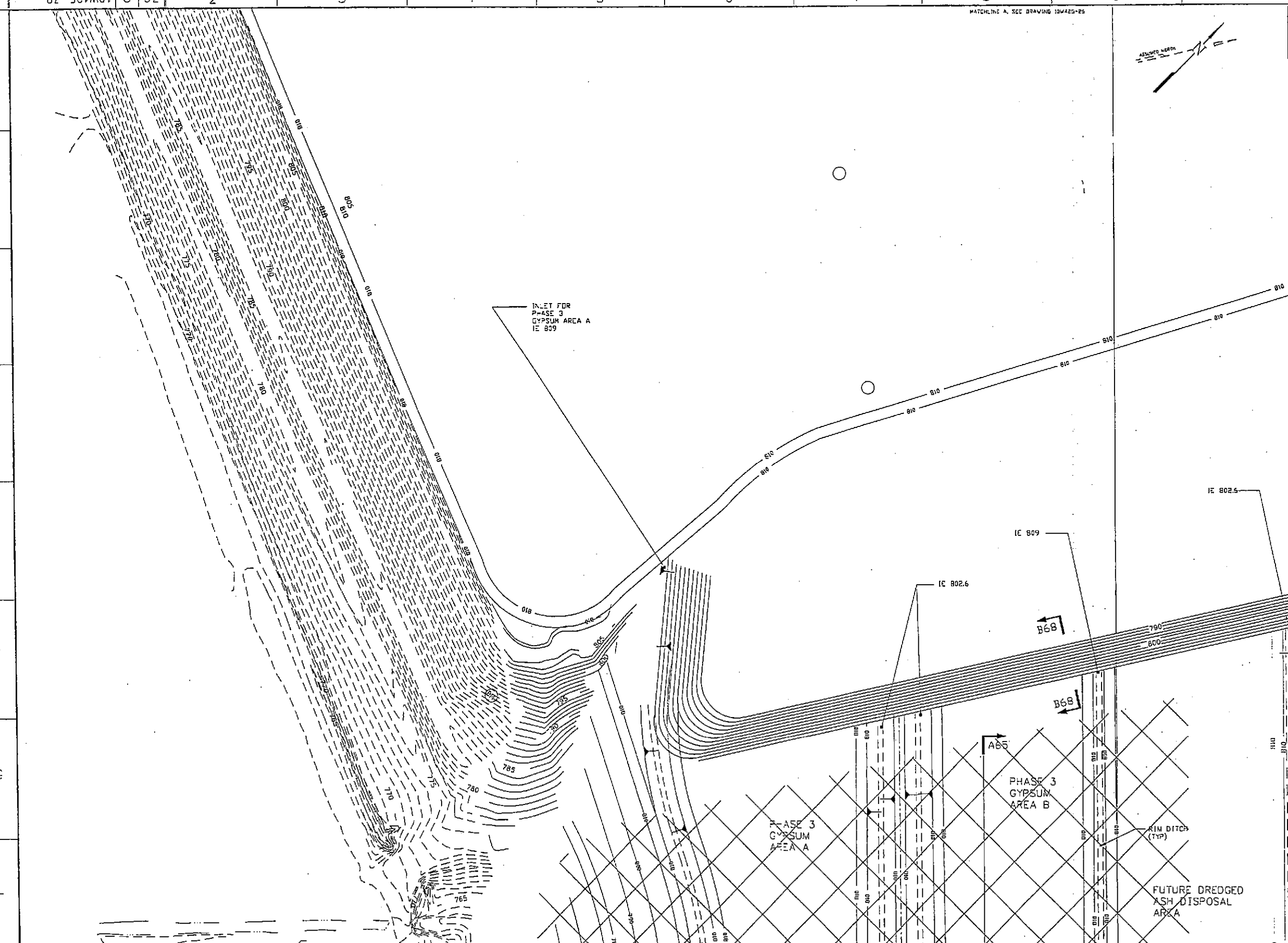
AUTOCAD R14 | SIZE | 36 | C | 10W425–37 | R 0

PARSONS | 0
TASK COMPLETED BY: | REV NO.

PLOT FACTOR:800
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

TVA-00018505



DIKE RAISING NOTES:
1. FOR DRAWING INDEX AND LEGEND, SEE DRAWING 10W425-20.
2. FOR GENERAL NOTES SEE 10W425-26.
3. PROVIDE A MINIMUM OF TWO (2) FEET OF FREEBOARD TO THE FINISHED DIKE ELEVATION DURING AS- DREDGING/ GYPSUM PLACEMENT ACTIVITIES.
4. LOCATE METAL SPILLWAYS TO TIE INTO EXISTING METAL SPILLWAYS FOR PREVIOUS STAGE AS S-OWN ON 10W425-67.
5. PROPOSED CONTOUR ELEVATIONS SHOWN FOR THE OUTER 3:1 SLOPES ARE FINISHED SURFACE ELEVATIONS (INCLUDING FINAL COVER).
6. FINAL CLOSURE GRADE WILL BE PLACED AT TWO (2) FEET PLUS OR MINUS OF THE ACTUAL GRADE SHOWN.
7. SLOPES SHALL BE 3:1 (HORIZONTAL TO VERTICAL) OR FLATTER UNLESS NOTED OTHERWISE.
8. FOR CONSTRUCTION OF AND RAISING OF GYPSUM DIKES, SEE DETAIL A68 ON DRAWING 10W425-65. FOR RAISING COMPACTED ASH DIKES, SEE DETAIL A72, 10W425-72.
9. PERIMETER DRAINS WITHIN THE OUTER WET-CAST GYPSUM DIKES AND COMPACTED ASH DIKES ARE NOT SHOWN ON THESE DRAWINGS. SEE DIKE CONSTRUCTION DETAILS REFERENCED IN NOTE 8.
10. RIM DITCH WIDTHS ARE SHOWN LARGER FOR CLARITY.
11. WIDEN RIM DITCHES IN CORNERS TO 10 FEET.
12. THE LAYOUT DEPICTED FOR COMBINED ASH & GYPSUM DISPOSAL IS SHOWN FOR STAGE 2. LAYOUTS ARE DEPICTED FOR STAGE 1 AND STAGES 3-5 ON OTHER PLAN SHEETS. THESE LAYOUTS ARE SUBJECT TO CHANGE DEPENDING UPON THE RATE OF GYPSUM GENERATED AS EXPLAINED IN THE OPERATIONS PLAN. TVA FES AND YARD OPERATIONS WILL EVALUATE AND MODIFY THESE LAYOUTS AS NECESSARY.

EMORY RIVER-WATTS BAR LAKE
100 YEAR FLOOD ELEVATION 748 AT RIVER MILE 2.00
500 YEAR FLOOD ELEVATION 750.5 AT RIVER MILE 2.00

KEY PLAN

REV NO	DATE	DSN	DWN	CHK	SUPV	PROC	APPD	TYD	SHEET SIZE	AS CONST	REV NO
R 01	DRS	BSB	AS	HLP	REP	JGA					R 0

ISSUED FOR DREDGE CELL EXPANSION PHASE

SCALE: 1"=50' EXCEPT AS NOTED

YARD

DREDGE CELL
LATERAL EXPANSION STAGE 2
SHEET 1 (780-810)

DESIGNED BY	DRAWN BY	CHECKED BY	APPROVED BY	REVIEWED BY	ANALYZED BY	ISSUED BY
D.S. SMITH	B.S. BURT	B.P. TAYLOR	H.L. PETTY	A. E. PURKEY	A. E. ADAMS	

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R14 | DATE | 36 | C | 10W425-38 | R 0

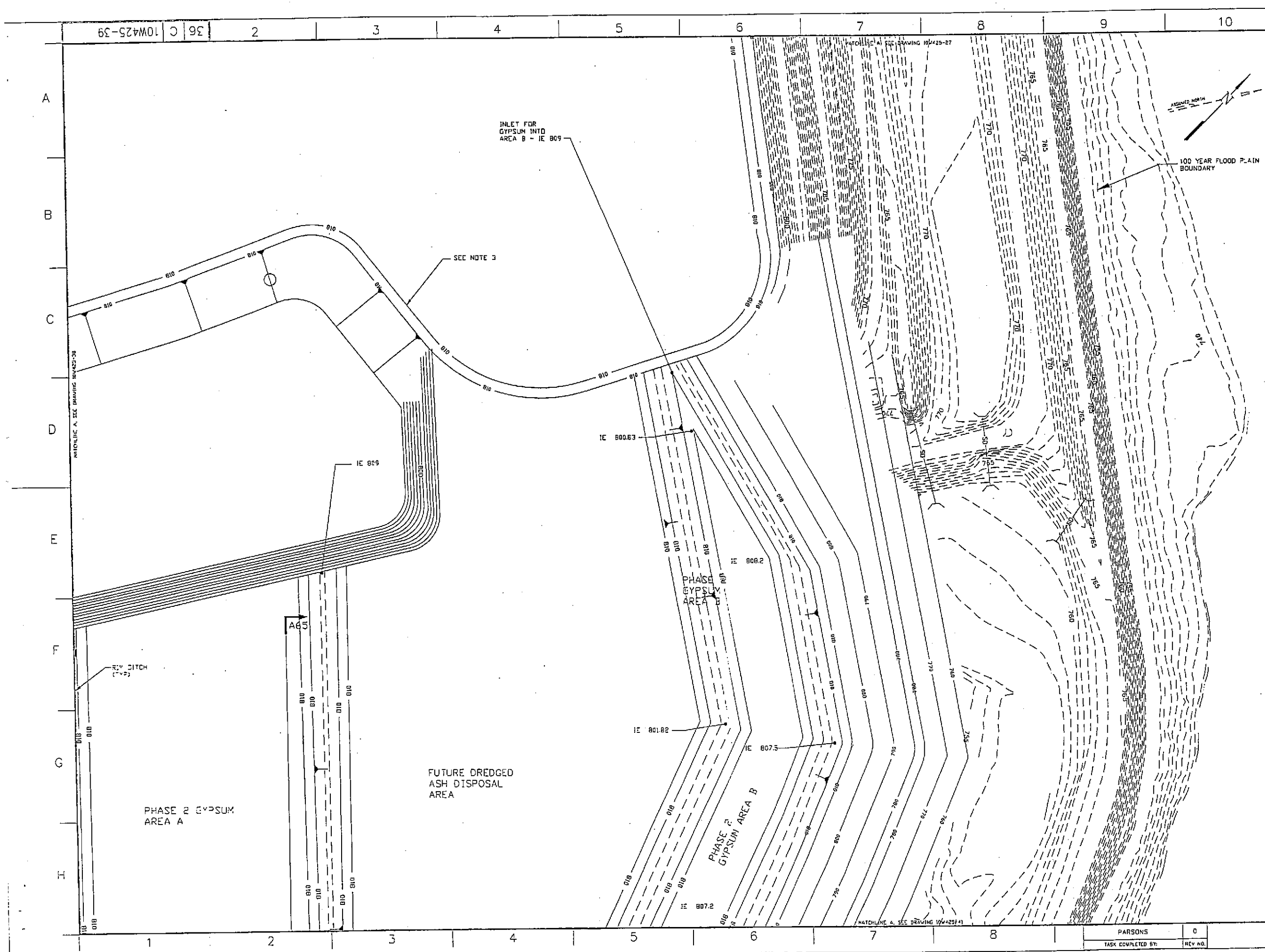
PARSONS | 0
TASK COMPLETED BY: | REV NO.

PLOT FACTOR:600
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

36 | C | 10W425-38

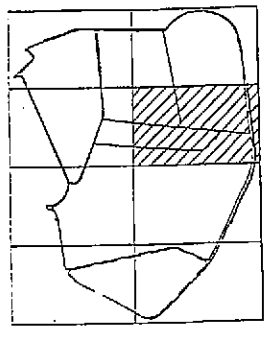
TVA-00018506



NOTES:

1. FOR GENERAL NOTES SEE 10W425-26.
2. FOR DIKE RAISING NOTES, SEE 10W425-38.
3. EXISTING DREDGE CELL SHOWN TO ELEVATION 810. TVA MAY RAISE EXISTING DREDGE CELL TO ELEVATION 840 OR HIGHER PRIOR TO DEVELOPING PHASE 2 TO ELEVATION 810.

EMORY RIVER–WATTS BAR LAKE
100 YEAR FLOOD ELEVATION 748 AT RIVER MILE 2.00
500 YEAR FLOOD ELEVATION 750.5 AT RIVER MILE 2.00



KEY PLAN

REV NO	DATE	DRAWN	CHKD	SUPV	APPD	APPD	PROJ ENGR	REGIONAL ENGINEER	DATE
R 0		SRS	BEB	KRT	MLP	REP	JGA		

ISSUED FOR DREDGE CELL EXPANSION PHZ

SCALE: 1"=50' EXCEPT AS NOTED

YARD

DREDGE CELL
LATERAL EXPANSION STAGE 2
SHEET 2

DESIGNED BY	DRAWN BY	CHECKED BY	SUPERVISED BY	REVIEWED BY	APPROVED BY	ISSUED BY
D.M. SMITH	S.S. SMITH	R.F. TAYLOR	M.L. FERTY	R.E. PURKEY	J.G. ADAIR	

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R14 | SCL | 36 | C | 10W425-39 | R 0

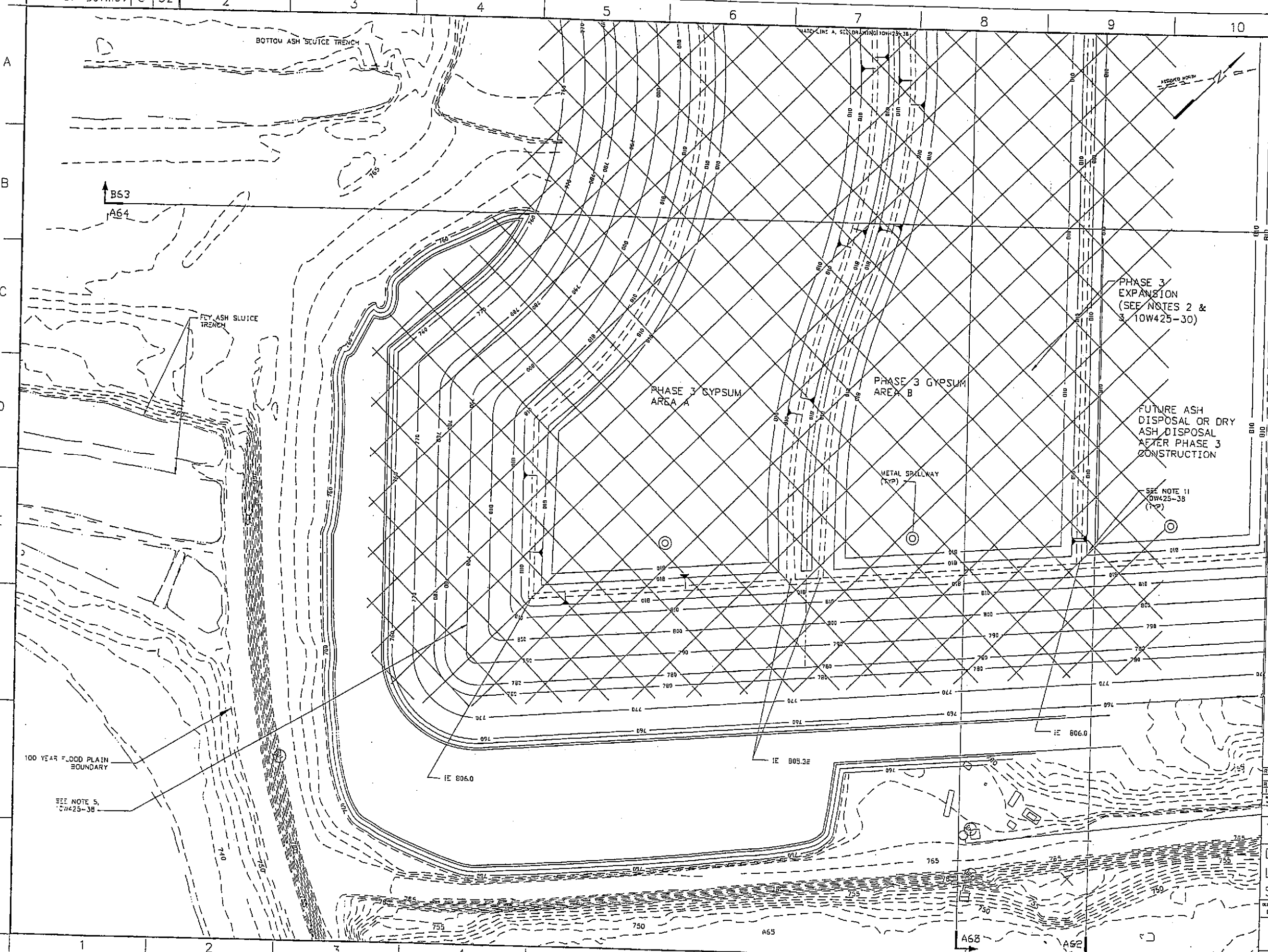
PARSONS | 0
TASK COMPLETED BY: | REV NO.

PLOT FACTOR:600
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

36 C 10W425-39

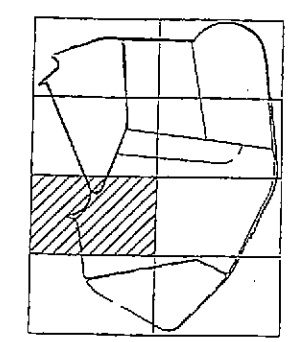
TVA-00018507



NOTES:

1. FOR GENERAL NOTES SEE 10W425-26.
2. FOR DIKE RAISING NOTES, SEE 10W425-38.

EMORY RIVER—WATTS BAR LAKE
100 YEAR FLOOD ELEVATION 748 AT RIVER MILE 2.00
500 YEAR FLOOD ELEVATION 750.5 AT RIVER MILE 2.00



KEY PLAN

R 0		DRS	BSB	WPT	MLP	RED	JGA	0
ISSUED FOR DREDGE CELL EXPANSION PH2								

SCALE: 1"=50'
EXCEPT AS NOTED

YARD

DREDGE CELL
LATERAL EXPANSION STAGE 2
SHEET 3

DESIGNED BY D.R. SMITH | DRAWN BY B.S. BRY | CHECKED BY W.P. TAYLOR | SUPERVISED BY M.L. PETTY | REVIEWED BY R.E. PLASSEY | APPROVED BY A.G. ADAIR | ISSUED BY

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R14 | 36 | C | 10W425-40 | R 0

PARSONS

36 | C | 10W425-40

TVA-00018508

RIM DITCH (TYP)

GYPSUM DIKE SEPARATING ASH/GYPSUM (TYP)

INNER DIKE (TYP)

PHASE 2 GYPSUM AREA A

FUTURE ASH DISPOSAL OR DRY ASH DISPOSAL AFTER PHASE 3 CONSTRUCTION

METAL SPILLWAY (TYP)

RIM DITCH (TYP)

PHASE 2 GYPSUM AREA B

IE 805.32

IE 804.9

100 YEAR FLOOD PLAIN BOUNDARY

WATTS BAR LAKE
NORMAL POOL=741

METAL SPILLWAY (TYP)

IE 804.45

METAL SPILLWAY (TYP)

WEIR, TYPICAL (UNLESS NOTED OTHERWISE)

IE 836.0

B63

A64

A65

MATCHLINE A, SEE DRAWING 10W425-33

NOTES:

1. FOR GENERAL NOTES SEE 10W425-26.
2. FOR DIKE RAISING NOTES, SEE 10W425-38.

EMORY RIVER-WATTS BAR LAKE
100 YEAR FLOOD ELEVATION 748 AT RIVER MILE 2.00
500 YEAR FLOOD ELEVATION 750.5 AT RIVER MILE 2.00

KEY PLAN

SCALE: 1"=50'

EXCEPT AS NOTED

YARD

DREDGE CELL
LATERAL EXPANSION STAGE 2
SHEET 4

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R14 | 36 | C | 10W425-41 | R 0

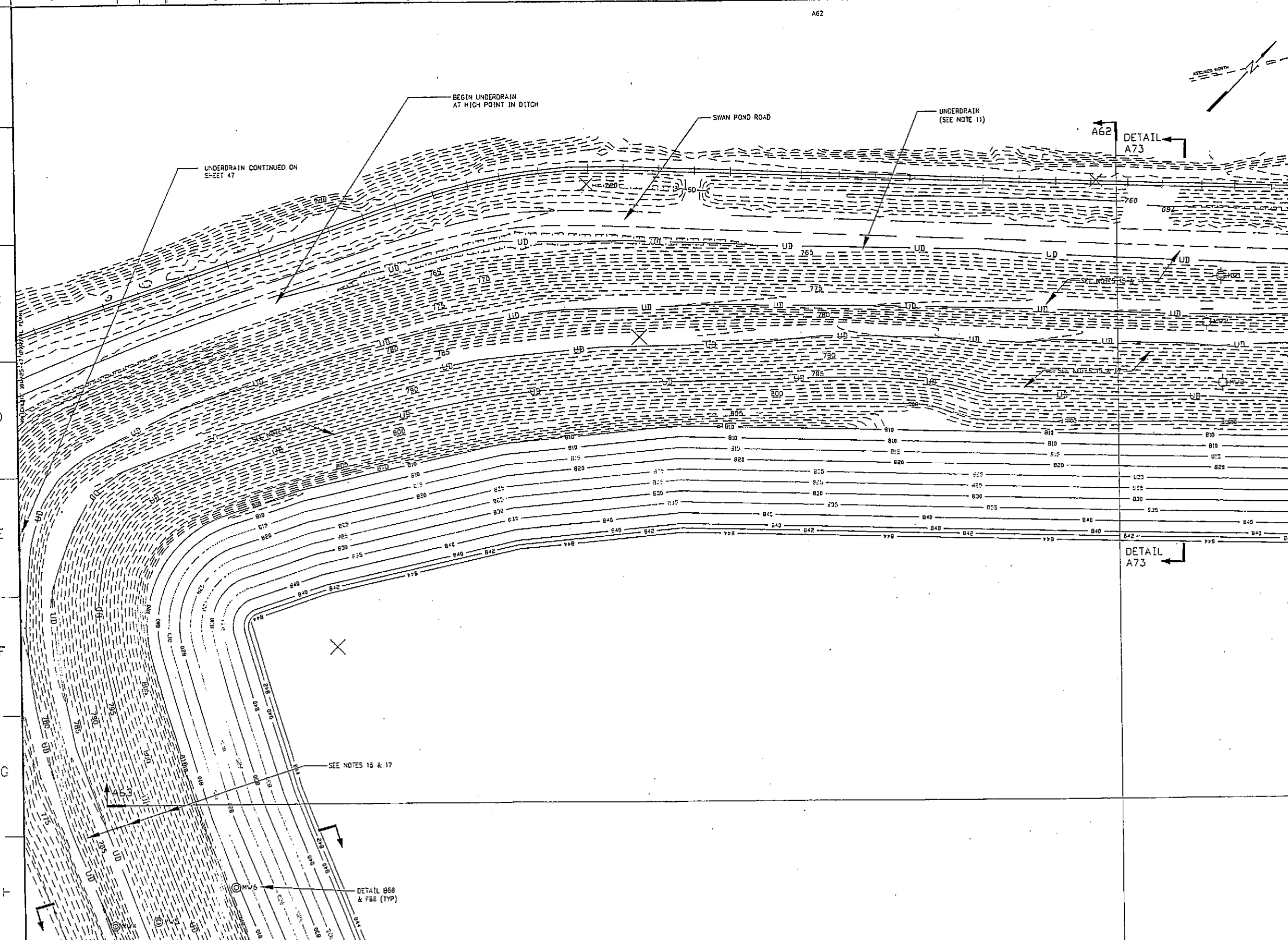
PARSONS | 0
TASK COMPLETED BY: | REV NO.

PLOT FACTOR:600
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

36 C 10W425-41

TVA-00018509

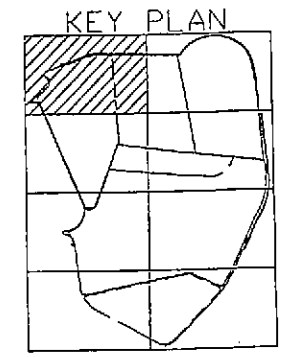


DIKE RAISING NOTES:

1. FOR DRAWING INDEX AND LEGEND, SEE DRAWING 10W425-20.
2. FOR GENERAL NOTES SEE 10W425-25.
3. PROVIDE A MINIMUM OF TWO (2) FEET OF FREEBOARD TO THE FINISHED DIKE ELEVATION DURING ASH DREDGING/ GYPSUM PLACEMENT ACTIVITIES.
4. LOCATE METAL SPILLWAYS TO TIE INTO EXISTING METAL SPILLWAYS FOR PREVIOUS STAGE AS SHOWN ON 10W425-67.
5. PROPOSED CONTOUR ELEVATIONS SHOWN FOR THE OUTER 3:1 SLOPES ARE FINISHED SURFACE ELEVATIONS (INCLUDING FINAL COVER).
6. FINAL CLOSURE GRADE WILL BE PLACED AT TWO (2) FEET PLUS OR MINUS OF THE ACTUAL GRADE SHOWN.
7. SLOPES SHALL BE 3:1 (HORIZONTAL TO VERTICAL) OR FLATTER, UNLESS NOTED OTHERWISE.
8. FOR CONSTRUCTION OF AND RAISING OF WET CAST GYPSUM DIKES, SEE DETAIL A68 ON DRAWING 10W425-68. FOR CONSTRUCTION OF AND RAISING OF COMPACTED ASH DIKES, SEE DETAIL A72 ON DRAWING 10W425-72.
9. PERIMETER DRAINS WITHIN THE OUTER WET-CAST GYPSUM DIKES AND ASH DIKES ARE NOT SHOWN ON THESE DRAWINGS. SEE DETAILS REFERENCED IN NOTE 8.
10. INSTALL UNDERDRAINS FOR EXISTING DREDGE CELL SLOPE PRIOR TO RAISING DIKES ABOVE EL 810, AND PRIOR TO RESUMPTION OF DREDGING OPERATIONS.
11. NOTIFY TENNESSEE ONE CALL (ECO) 351-1111 PRIOR TO EXCAVATING FOR INSTALLATION.
12. PRIOR TO RESUMPTION OF DREDGING OPERATIONS, INSTALL MW-4 THRU MW-9.
13. WHEN DREDGING OPERATIONS RESUME, MONITOR WATER SURFACE ELEVATION AT MW 1-9 ON A WEEKLY BASIS WHILE DREDGE POND IS BEING FILLED. REPORT OBSERVATIONS TO TVA FOSSIL ENGINEERING SERVICE (FES). FES WILL NOTIFY WHEN TO INCREASE FREQUENCY OF, OR SUSPEND MONITORING.
14. REPORT IMMEDIATELY TO TVA FES ANY SIGNS OF SEEPAGE THRU THE DIKE, OR IF SATURATED GROUND CONDITIONS SUDDENLY EXIST.
15. INSTALL UNDER DRAIN AS SHOWN ON DETAIL A73 ON 10W425-73. SLOPE UNDERDRAIN 1% MIN SLOPE & PROVIDE OUTLET PIPE ON APPROXIMATE 200 FT SPACING. PLACE OUTLETS AT LOW POINTS OF ELEVATION.
16. TERRACE AT EL. 795? NOT SHOWN. INSTALL UNDERDRAIN AT THIS TERRACE.
17. PRIOR TO FINAL CLOSURE, STRIP EXISTING COVER SOIL AND VEGETATION AND INSTALL GEOCOMPOSITE DRAINAGE LAYER BENEATH LOW PERMEABLE CLAY LAYER OR GEOMEMBRANE, AS SHOWN ON FINAL COVER DETAILS.

EMORY RIVER-WATTS BAR LAKE
100 YEAR FLOOD ELEVATION 748 AT RIVER MILE 2.00
500 YEAR FLOOD ELEVATION 750.5 AT RIVER MILE 2.00

KEY PLAN



REV NO.	DATE	DRAWN	CHKD	SUPV	APPD	APPD	ISSUED	PROJECT ID	AS CONST
R 0		2-25	8-98	WPT	W.P.	REP	JGA		

ISSUED FOR DREDGE CELL EXPANSION

SCALE: 1"=50' EXCEPT AS NOTED

YARD

EXISTING DREDGE CELL
STAGE 3
SHEET 1 (810-840)

DESIGNED BY	DRAWN BY	CHECKED BY	SUPERVISED BY	REVIEWED BY	APPROVED BY	ISSUED BY
D.R. SMITH	B.S. SLATT	W.P. TAYLOR	[illegible]	R.E. PURKEY	JG ADAIR	

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

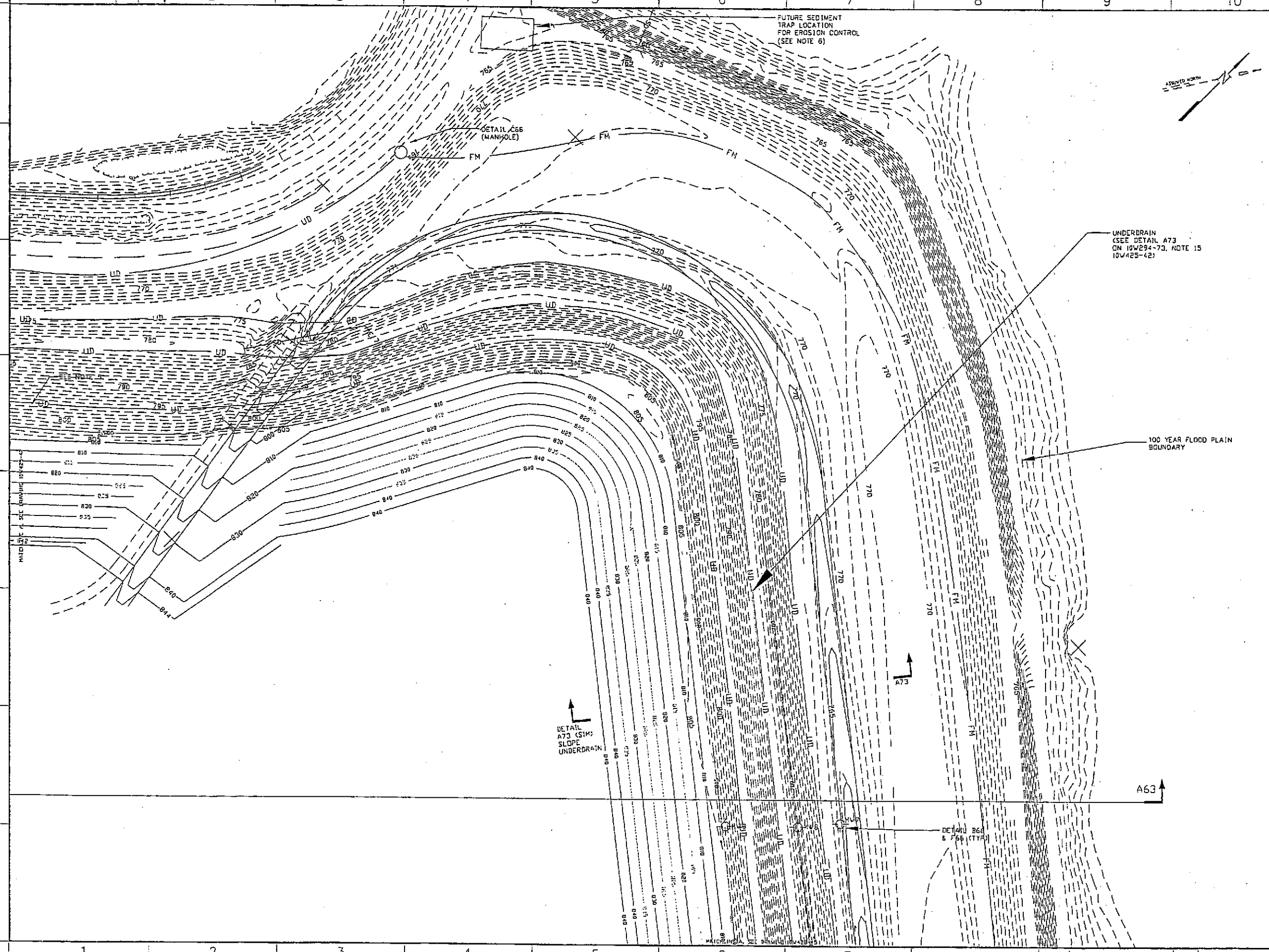
AUTOCAD R14 | DATE | 36 | 10W425-42 | R 0

PLOT FACTOR:600
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

PARSONS	0
TASK COMPLETED BY:	REV NO.

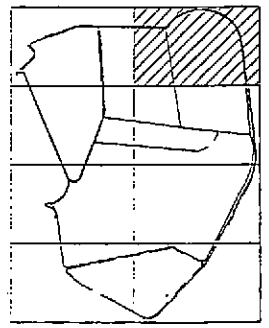
TVA-00018510



NOTES:
1. FOR GENERAL NOTES SEE 10W425-26.
2. FOR DIKE RAISING NOTES, SEE 10W425-42.
3. REGRADE DITC- AS SHOWN PRIOR TO RAISING EXISTING DREDGE CELL FROM 810-840.
4. INSTALL UNDERDRAIN AND FORCE MAIN PRIOR TO RAISING DIKES FROM 810-840. LOCATION AND CONFIGURATION OF UNDERDRAIN SYSTEM; FORCE MAIN, AND MANHOLES/PUMPS WILL BE PROVIDED LATER.
5. TERRACE AT EL. 795 NOT SHOWN.
6. PROVIDE EROSION CONTROLS INTAKE AREA DURING UNDERDRAIN INSTALLATION AND FINAL CLOSURE. STORMWATER POLLUTION PLAN (SWPPP) TO BE PREPARED BY TVA FES (LATER).

EMORY RIVER-WATTS BAR LAKE
100 YEAR FLOOD ELEVATION 748 AT RIVER MILE 2.00
500 YEAR FLOOD ELEVATION 750.5 AT RIVER MILE 2.00

KEY PLAN



REV NO	DATE	DRN	CHKD	ENG	APPD	ISSUED	PROJECT ID	AS BUILT	REV NO
R 0		CFS	BSB	WDT	JGA	REP	JGA		
ISSUED FOR DREDGE CELL EXPANSION									

SCALE: 1"=50' EXCEPT AS NOTED

YARD

EXISTING DREDGE CELL
STAGE 3
SHEET 2 (810-840)

DESIGNED BY D.R. SMITH | DRAWN BY B.S. BAILEY | CHECKED BY R.P. TAYLOR | SUPERVISED BY H.L. PETTY | REVIEWED BY R.E. PURKEY | APPROVED BY J.G. ADAIR | ISSUED BY

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND YARD ENGINEERING

AUTOCAD R14 | SIZE 36 | C | 10W425-43 | R 0

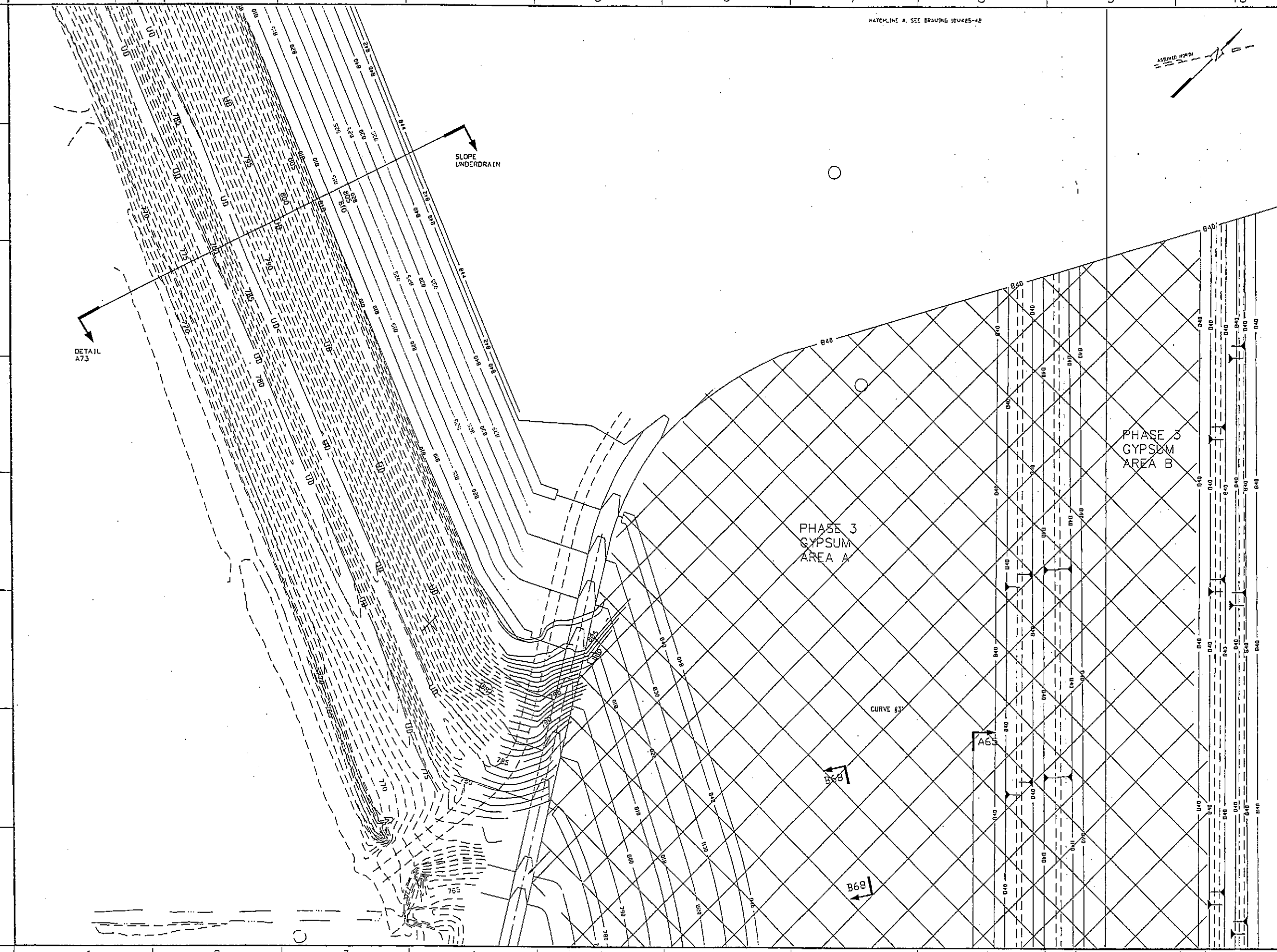
PLOT FACTOR:600
W_TVA

C.A.D. DRAWING DO NOT ALTER MANUALLY

PARSONS	0
TASK COMPLETED BY:	REV NO.

36 C 10W425-43

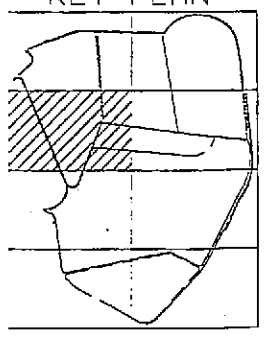
TVA-00018511



NOTES:
1. FOR GENERAL NOTES SEE 10W425-26.
2. FOR DIKE RAISING NOTES, SEE 10W425-42.
3. RIV DITCH ELEVATIONS ARE NOT SHOWN. IN GENERAL, INLET ELEVATIONS WILL BE LOWER THAN DIKE ELEVATION, WITH A NOMINAL 0.5% SLOPE.
4. AREA 3 EXPANSION SHOWN CONCURRENT WITH PHASE 2 EXPANSION. SEE PHASED CONSTRUCTION DRAWINGS 10W425-22 & -23, AND OPERATION PLAN FOR DESCRIPTION OF DEVELOPMENTS.

EMORY RIVER–WATTS BAR LAKE
100 YEAR FLOOD ELEVATION 748 AT RIVER MILE 2.00
500 YEAR FLOOD ELEVATION 750.5 AT RIVER MILE 2.00

KEY PLAN



REV NO	DATE	DRN	CHKD	APPD	ISSUED	ISSUE DT	IS DWG NO
R 0		DES T BSS	WPT		REP	JCA	
ISSUED FOR DREDGE CELL EXPANSION PH 2							

SCALE: 1"=50' EXCEPT AS NOTED

YARD

DREDGE CELL LATERAL EXPANSION
STAGE 3
SHEET 3 (810–840)

DESIGNED BY	DRAWN BY	CHECKED BY	SUPERVISED BY	REVIEWED BY	APPROVED BY	ISSUED BY
DR. SMITH	B.S. BLST	W.P. TAYLOR	L. BETTY	R.E. PURKEY	J.C. ADAIR	

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R14 | DATE | 36 | C | 10W425–44 | R 0

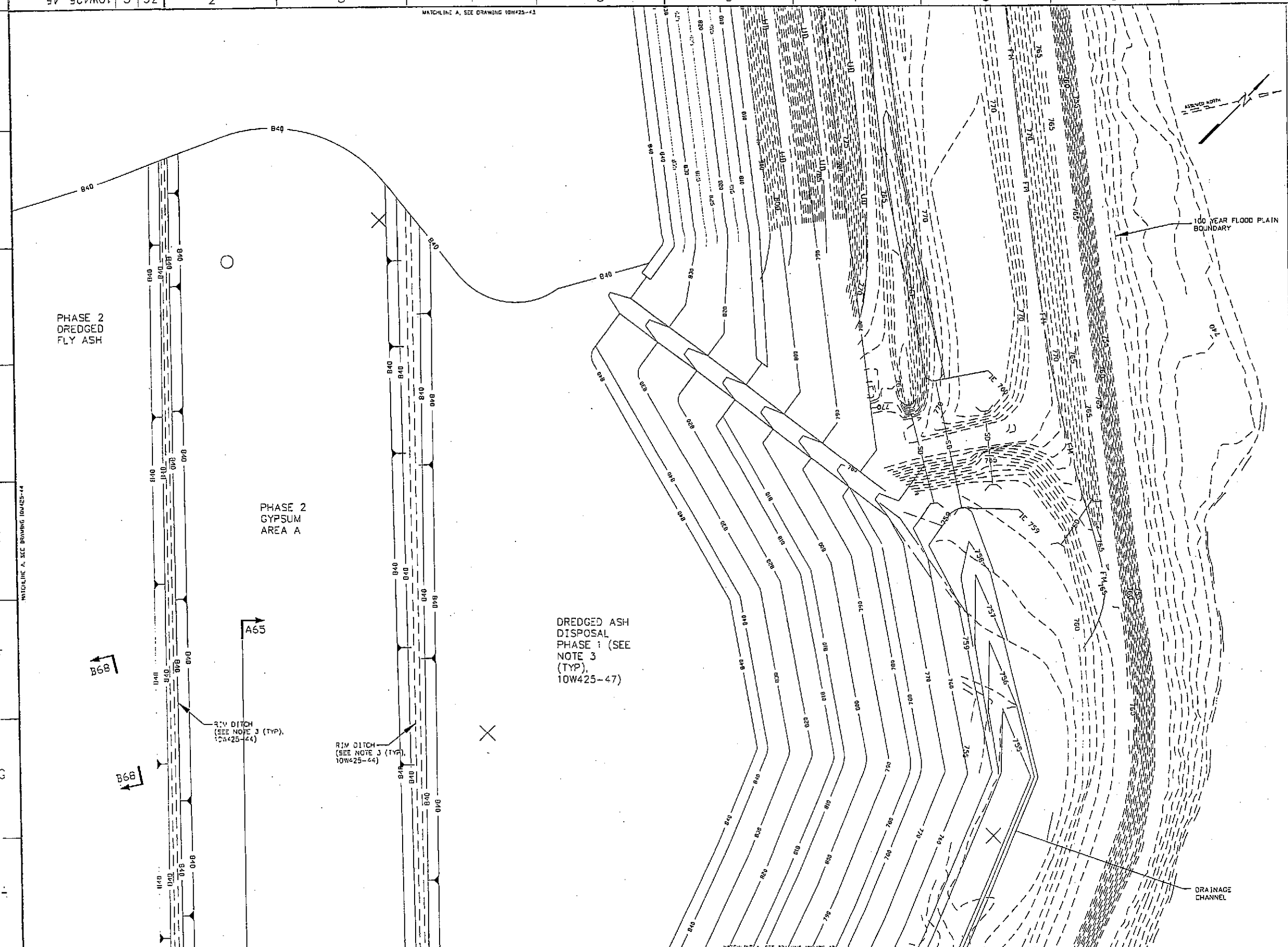
PARSONS | 0
TASK COMPLETED BY: | REV NO.

PLOT FACTOR:600
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

36 C 10W425-44

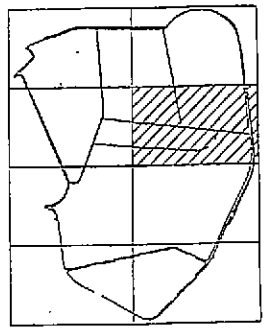
TVA-00018512



NOTES:
1. FOR GENERAL NOTES SEE 10W425-26.
2. FOR DIKE RAISING NOTES, SEE 10W425-42.

EMORY RIVER-WATTS BAR LAKE
100 YEAR FLOOD ELEVATION 748 AT RIVER MILE 2.00
500 YEAR FLOOD ELEVATION 750.6 AT RIVER MILE 2.00

KEY PLAN



REV NO.	DATE	DSGN	DWN	CHKD	SUPV	MANG	APPD	PROJECT ID	AS CONT	REV NO.
R 0	035	353	APT	H.L.	RCP	JGA			1	0
ISSUED FOR DREDGE CEL. EXPANSION PH2										

SCALE: 1"=50' EXCEPT AS NOTED

YARD

DREDGE CELL LATERAL EXPANSION
STAGE 3
SHEET 4 (810-840)

DESIGNED BY	DRAWN BY	CHECKED BY	SUPERVISED BY	REVIEWED BY	APPROVED BY	ISSUED BY
D.R. SMITH	B.S. BURT	APT TAYLOR	H.L. PETTY	R.E. PURKEY	J.G. ADAIR	

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

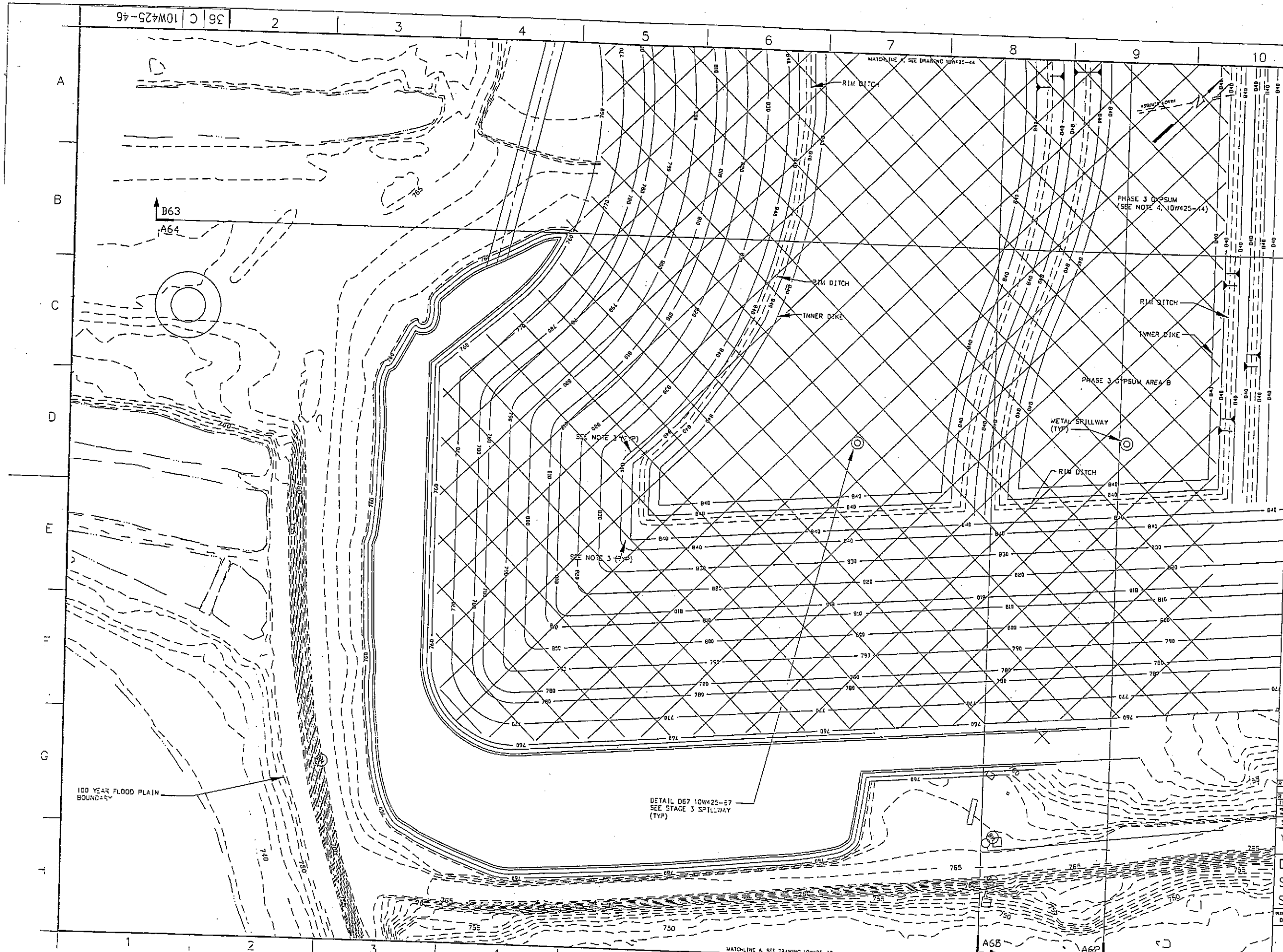
AUTOCAD R14 | SHT 36 | C | 10W425-45 | R 0

PLOT FACTOR:600
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

PARSONS	0
TASK COMPLETED BY:	REV NO.

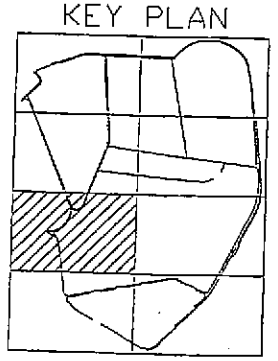
TVA-00018513



NOTES:
1. FOR GENERAL NOTES SEE 10W425-26.
2. FOR DIKE RAISING NOTES, SEE 10W425-42.
3. WIDEN RIM DITCH IN CORNERS.

EMORY RIVER–WATTS BAR LAKE
100 YEAR FLOOD ELEVATION 748 AT RIVER MILE 2.00
500 YEAR FLOOD ELEVATION 750.5 AT RIVER MILE 2.00

KEY PLAN



REV NO	DATE	DSN	DRN	CHKD	SUPV	APVD	ISSD	PROJECT ID	AS CONST	REV CD
0		DSB	WRT	MLP	RCP	JCA				0

ISSUED FOR DREDGE CELL EXPANSION PH2

SCALE: 1"=50' EXCEPT AS NOTED

YARD

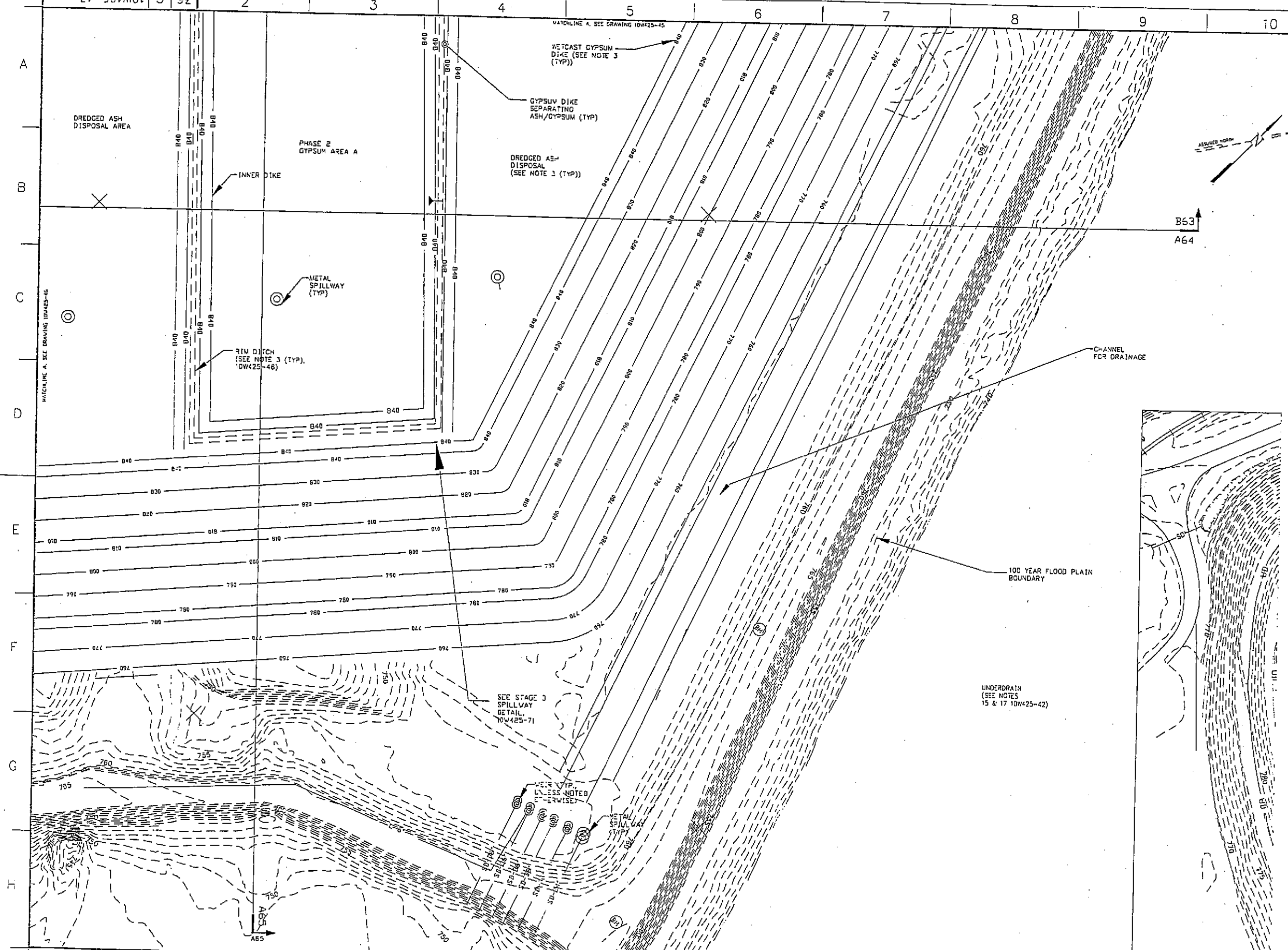
DREDGE CELL LATERAL EXPANSION
STAGE 3
SHEET 5 (EL 810–840)

DESIGNED BY	DRAWN BY	CHECKED BY	SUPERVISED BY	ADVISED BY	APPROVED BY	ISSUED BY
D.R. SMITH	B.S. BURT	W.P. TAYLOR	H.L. PETTY	R.E. PURKEY	J.C. ADAIR	

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R14 | 36 | C | 10W425-46

TVA-00018514

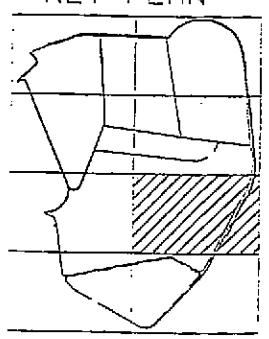


NOTES:
1. FOR GENERAL NOTES SEE 10W425-26.
2. FOR DIKE RAISING NOTES, SEE 10W425-42.
3. AT TOP OF DIKE EL. 840, PHASE 2 GYPSUM POND B TRANSITIONS TO OUTER WETCAST DIKE. PHASE 2 GYPSUM AREA A MUST BE DIVIDED INTO 2 PONDS IF PHASE 3 IS NOT CONSTRUCTED. SEE OPERATION PLAN.

EMORY RIVER–WATTS BAR LAKE

100 YEAR FLOOD ELEVATION 748 AT RIVER MILE 2.00
500 YEAR FLOOD ELEVATION 750.5 AT RIVER MILE 2.00

KEY PLAN



REV NO	DATE	DRAWN	CHKD	SUPV	PROJ	APPD	ISSUED	PROJECT ID	PROJECT NO	REV BY
R 0	DRS	BSB	WPT	RCP	RCP	JCA				D
ISSUED FOR DREDGE CELL EXPANSION PH2										

SCALE: 1"=50' EXCEPT AS NOTED

YARD

DREDGE CELL LATERAL EXPANSION
STAGE 3
SHEET 6 (ELEVATION 810–840)

DESIGNED BY	DRAWN BY	CHECKED BY	SUPERVISED BY	REVIEWED BY	APPROVED BY	ISSUED BY
D.R. SMITH	B.S. BURT	W.P. TAYLOR	[illegible]	R.E. PURKEY	J.C. ADAIR	

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R14 | SIZE J6 | C | 10W425-47 | R 0

PLOT FACTOR:600

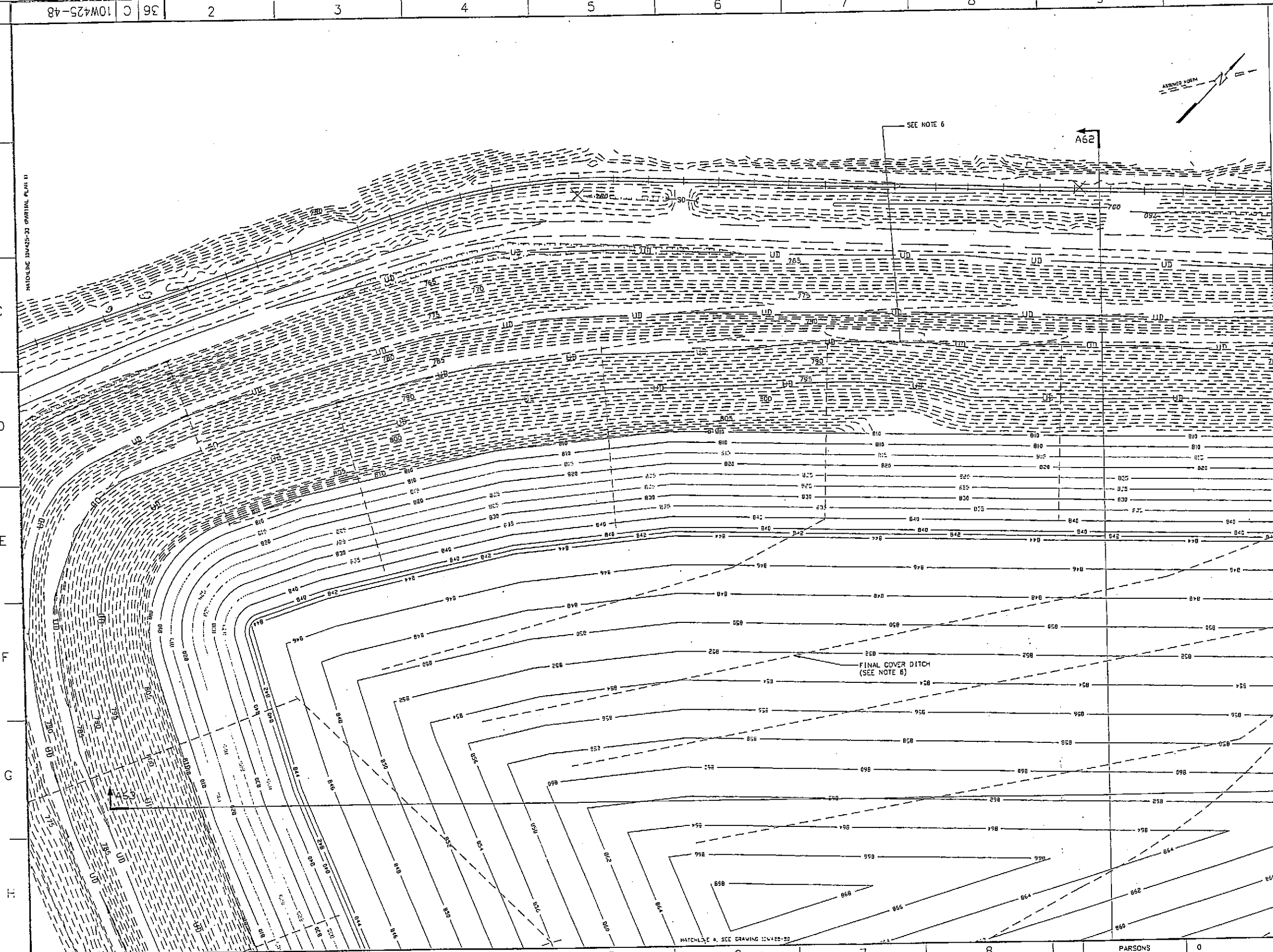
PARSONS | 0

TVA-00018515

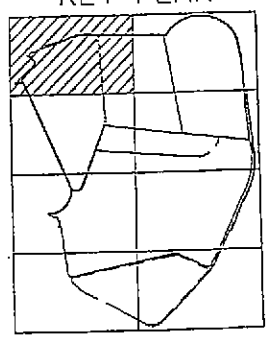
NOTES:

1. FOR GENERAL NOTES SEE 10W425-26.
2. FOR DIKE RAISING NOTES, SEE 10W425-49.
3. ASH PLACED ABOVE EL. 840 SHALL BE DRY ASH. SEE OPERATIONS PLAN PER DESCRIPTION.
4. SLOPE UNDERDRAINS NOT SHOWN.
5. GRADING SHOWN FOR EXISTING DREDGE CELL IS FINAL GRADE.
6. FOR DITCHES CONSTRUCTED AS PART OF THE FINAL CONSTRUCTION, SEE DRAWING 10W425-76.

EMORY RIVER–WATTS BAR LAKE
100 YEAR FLOOD ELEVATION 746 AT RIVER MILE 2.00
500 YEAR FLOOD ELEVATION 750.5 AT RIVER MILE 2.00



KEY PLAN



REV NO.	DATE	DRN	CHKD	DSGN	ENGR	APPD	CHKD	PROJECT ID	AS BUILT	REV NO.
R 0		DRS	DSB	WPT	W_P	RED	JGA			
ISSUED FOR DREDGE CELL EXPANSION										

SCALE: 1"=50' EXCEPT AS NOTED

YARD

EXISTING DREDGE CELL
STAGE 4
SHEET 1 (840–868)

DESIGNED BY	DRAWN BY	CHECKED BY	SUPERVISED BY	REVIEWED BY	APPROVED BY	ISSUED BY
D.R. SWINN	B.S. BLAY	W.P. TAYLOR	W. FEITY	R.E. PURKEY	JG. ADAIR	

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

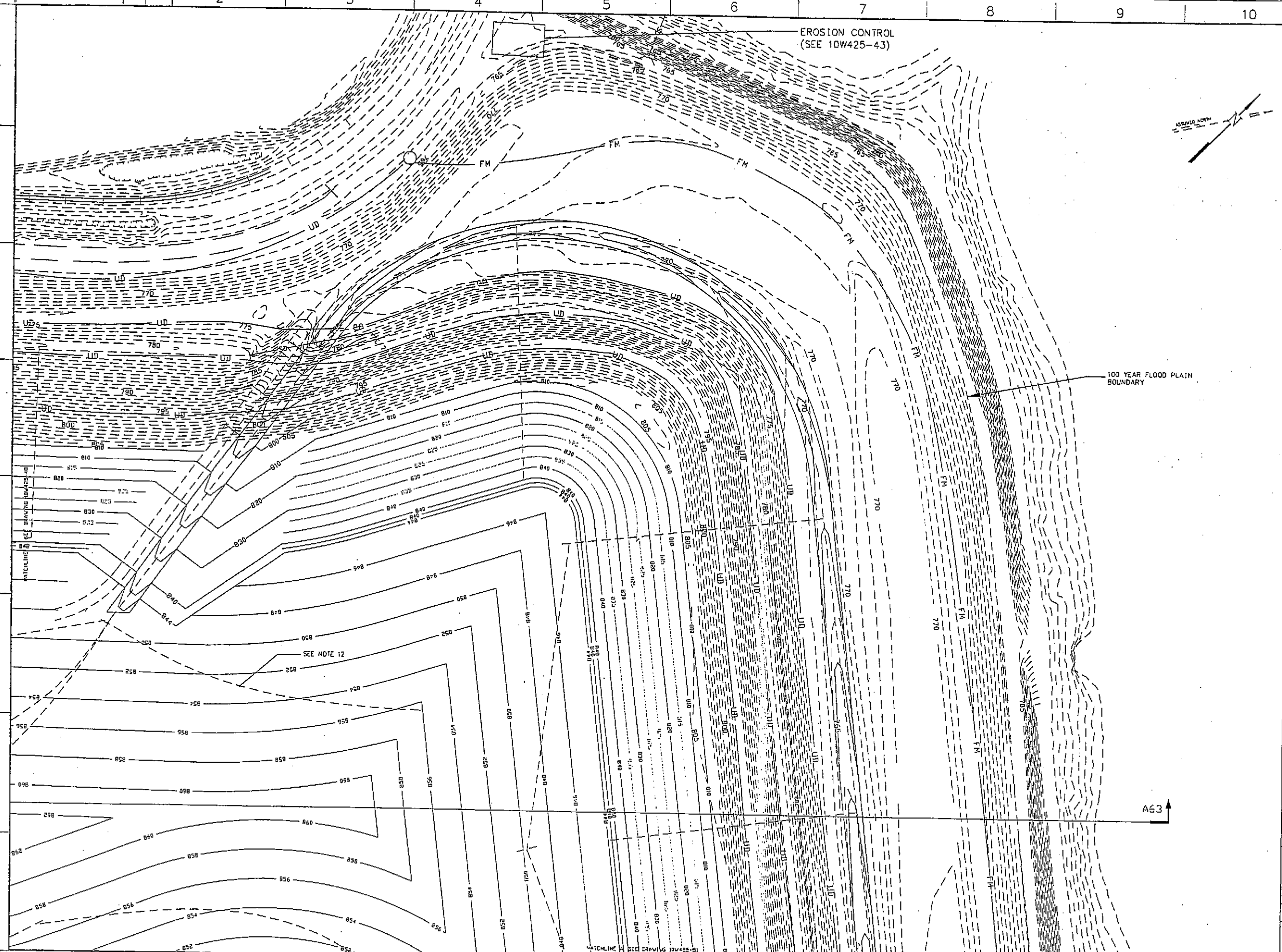
AUTOCAD R14 | DATE | 36 | C | 10W425-48 | R 0

PARSONS | 0
TASK COMPLETED BY | REV NO.

PLOT FACTOR:600
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

TVA-00018516

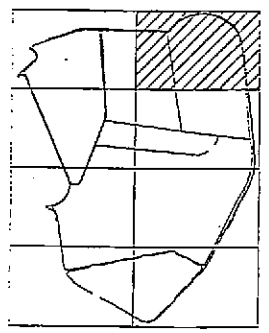


1. FOR DRAWING INDEX AND LEGEND, SEE DRAWING 10W425-20.
2. FOR GENERAL NOTES SEE 10W425-26.
3. PROVIDE A MINIMUM OF TWO (2) FEET OF FREEBOARD TO THE FINISHED DIKE ELEVATION DURING ASH DREDGING/ GYPSUM PLACEMENT ACTIVITIES.
4. LOCATE METAL SPILLWAYS TO TIE INTO EXISTING METAL SPILLWAYS FOR PREVIOUS STAGE AS SHOWN ON 10W425-67.
5. PROPOSED CONTOUR ELEVATIONS SHOWN FOR THE OUTER 3:1 SLOPES ARE FINISHED SURFACE ELEVATIONS (INCLUDING FINAL COVER).
6. FINAL CLOSURE GRADE WILL BE PLACED AT TWO (2) FEET PLUS OR MINUS OF THE ACTUAL GRADE SHOWN.
7. MAXIMUM SLOPE SHALL BE 3:1 (HORIZONTAL TO VERTICAL).
8. FOR CONSTRUCTION OF AND RAISING OF DIKES, SEE DETAIL A69 ON DRAWING 10W425-66.
9. PERIMETER DRAINS WITHIN THE OUTER WET-CAST GYPSUM DIKES ARE NOT SHOWN ON THESE DRAWINGS. SEE DETAIL A69 ON DRAWING 10W425-69.
10. CONSTRUCTION OF THE FINAL COVER OVER THE EXISTING DREDGE CELL SHALL BE IN ACCORDANCE WITH THE OA/OC PLAN AND SPECIFICATIONS APPENDED TO THE OPERATION PLAN.
11. SLOPE UNDERDRAINS ARE NOT SHOWN.
12. FOR DITCHES CONSTRUCTED AS PART OF THE FINAL CONSTRUCTION, SEE DRAWING 10W425-75.

EMORY RIVER–WATTS BAR LAKE

100 YEAR FLOOD ELEVATION 746 AT RIVER MILE 2.00
500 YEAR FLOOD ELEVATION 750.5 AT RIVER MILE 2.00

KEY PLAN



REV. NO.	DATE	DRN.	DWG.	SUPV.	ENG.	APPD.	TITLE	PROJECT ID	AS BUILT	REV. NO.
R 0	02-8-89	MPT	HLP	RED	JGA					

ISSUED FOR DREDGE CELL EXPANSION

SCALE: 1"=50' EXCEPT AS NOTED

YARD

EXISTING DREDGE CELL
STAGE 4
SHEET 2

DESIGNED BY	DRAWN BY	CHECKED BY	SUPERVISED BY	REVIEWED BY	APPROVED BY	ISSUED BY
DR. SMITH	B.S. BUR	W.P. TAYLOR	H.L. PETTY	R.E. BURGER	J.G. ADAIR	

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

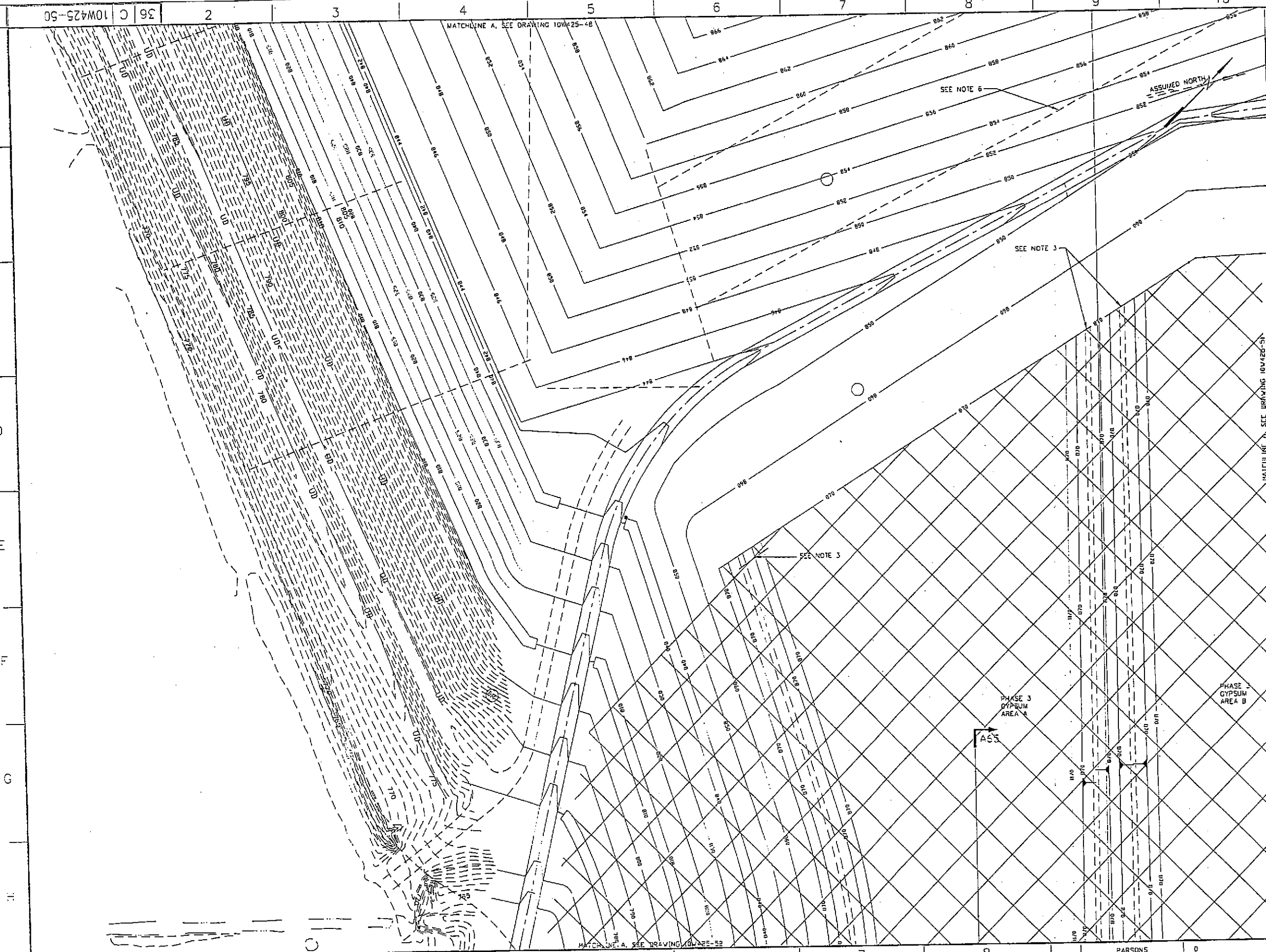
AUTOCAD R14 | 36 | C | 10W425-49 | R 0

PLOT FACTOR: 6CD
W TVA

C.A.D. DRAWING

PARSONS | 0
TASK COMPLETED BY

TVA-00018517



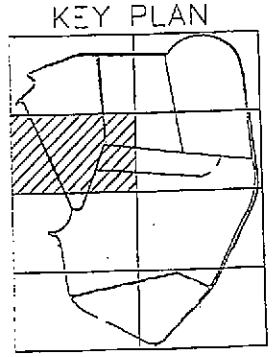
NOTES:

1. FOR GENERAL NOTES SEE 10W425-25.
2. FOR DIKE RAISING NOTES, SEE 10W425-49.
3. RIM DITCH ELEVATIONS ARE NOT SHOWN. IN GENERAL, INLET ELEVATIONS WILL BE LOWER THAN DIKE ELEVATION, WITH A NOMINAL 0.5% SLOPE.
4. SLOPE UNDERDRAINS ARE NOT SHOWN.
5. FOR DESCRIPTION OF COMBINED GYPSUM AND ASH DISPOSAL, SEE OPERATIONS PLAN. FOR DESCRIPTION OF ASH DISPOSAL ONLY, SEE OPERATIONS PLAN.
6. FOR DITCH DETAILS, SEE 10W425-76.

EMORY RIVER-WATTS BAR LAKE

100 YEAR FLOOD ELEVATION 748 AT RIVER MILE 2.00
500 YEAR FLOOD ELEVATION 750.5 AT RIVER MILE 2.00

KEY PLAN



REV NO	DATE	DSN	DWN	CHKD	CAD	APVD	APPD	ISS	PROJECT ID	AS BUILT	DATE
R 0		DSS	BSS	KPT	MLP	REP	JGA				
ISSUED FOR DREDGE CELL EXPANSION PHS											

SCALE: 1"=50' EXCEPT AS NOTED

YARD

DREDGE CELL LATERAL EXPANSION
STAGE 4
SHEET 3 (840-870)

DESIGNED BY	DRAWN BY	CHECKED BY	SUPERVISED BY	REVIEWED BY	APPROVED BY	ISSUED BY
D.R. SVIEN	BS BLAT	AR TAYLOR	ML PETTY	RE PURKEY	JG JONES	

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R14 | 36 | C | 10W425-50 | R 0

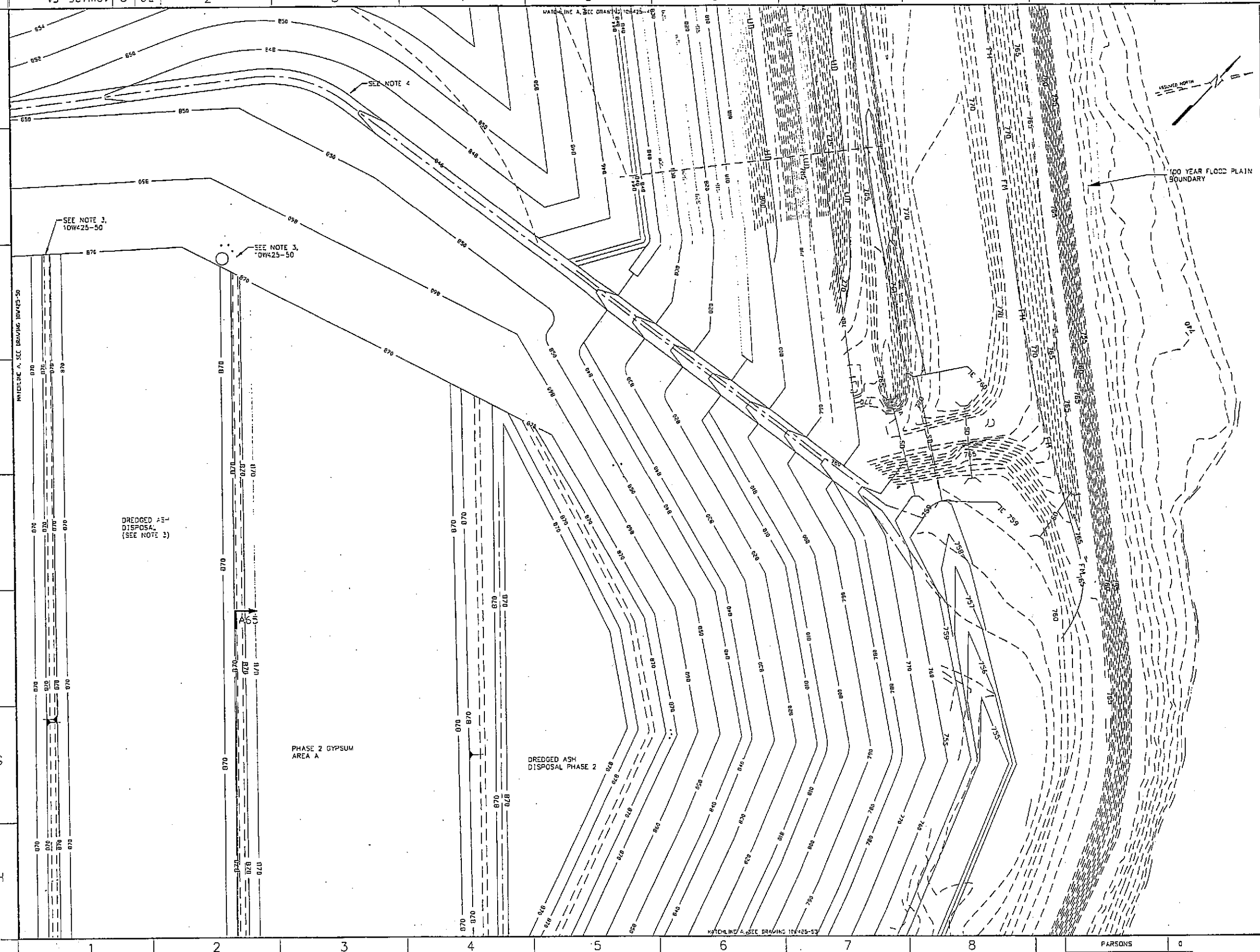
PARSONS | 0
TASK COMPLETED BY: | REV NO.

PLOT FACTOR:600
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

36 C 10W425-50

TVA-00018518

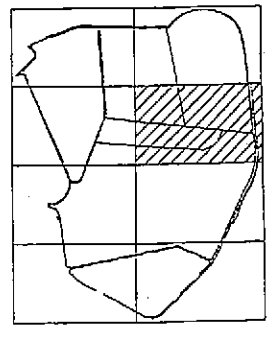


NOTES:

1. FOR GENERAL NOTES SEE 10W425-26.
2. FOR DIKE RAISING NOTES, SEE 10W425-49.
3. FOR DESCRIPTION OF COMBINED GYPSUM AND ASH DISPOSAL, SEE OPERATIONS PLAN. FOR DESCRIPTION OF ASH DISPOSAL ONLY, SEE OPERATIONS PLAN.
4. FOR DITCH DETAILS, SEE 10W425-76.

EMORY RIVER-WATTS BAR LAKE
100 YEAR FLOOD ELEVATION 748 AT RIVER MILE 2.00
500 YEAR FLOOD ELEVATION 750.5 AT RIVER MILE 2.00

KEY PLAN



REV NO.	DATE	DESN	DRWN	CHKD	SURV	HYDD	APPD	ISSD	PROJECT ENGR	AS BUILT	REV NO.
R 0		DRS	BSB	WPT	HLP	REP	JGA				0
ISSUED FOR DREDGE CELL EXPANSION PH2											

SCALE: 1"=50' EXCEPT AS NOTED

YARD

DREDGE CELL LATERAL EXPANSION
STAGE 4
SHEET 4 (840-870)

DESIGNED BY	DRAWN BY	CHECKED BY	SUPERVISED BY	REVIEWED BY	APPROVED BY	ISSUED BY
D.R. SMITH	B.S. BURT	W.P. TAYLOR	H.L. PETTY	R. E. PURNELL	J. C. ADAIR	

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R14 | DATE | 36 | C | 10W425-51 | R 0

PARSONS | 0
TASK COMPLETED BY: | REV NO.

PLOT FACTOR:600
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

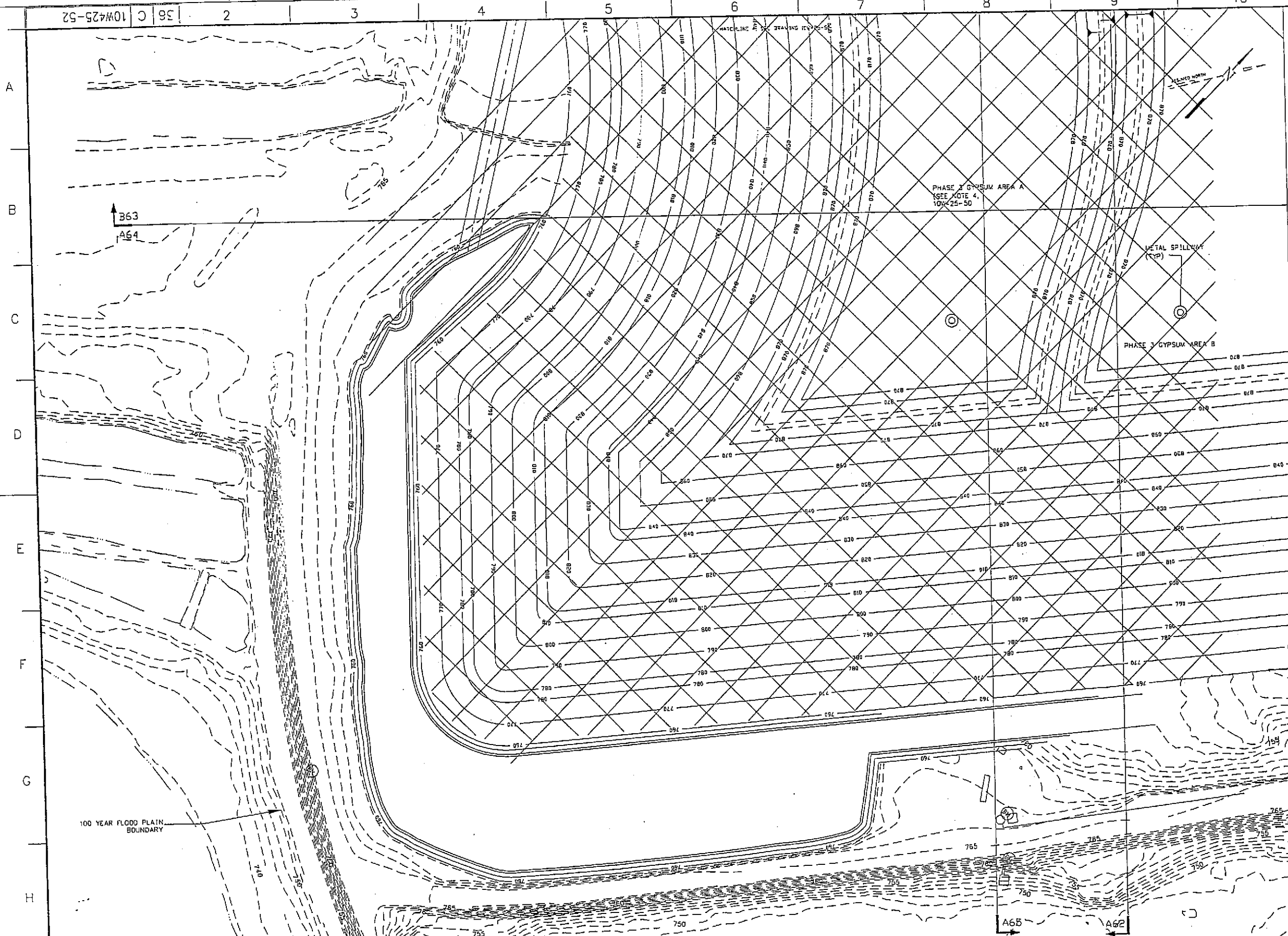
36 C 10W425-51

TVA-00018519

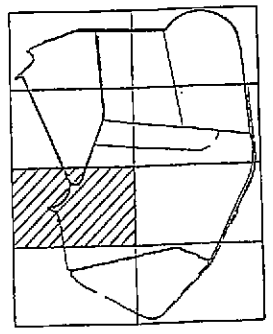
NOTES:

1. FOR GENERAL NOTES SEE 10W425-26.
2. FOR DIKE RAISING NOTES, SEE 10W425-45.

EMORY RIVER-WATTS BAR LAKE
100 YEAR FLOOD ELEVATION 748 AT RIVER MILE 2.00
500 YEAR FLOOD ELEVATION 750.5 AT RIVER MILE 2.00



KEY PLAN



REV NO.	DATE	DSN	DRN	CHD	APV	PMD	APMD	IND	PROJ ENGR	AS CHKD	REV
R 0		DRS	BSB	WPT	HLP	RED	JGA				10

ISSUED FOR DREDGE CELL EXPANSION PH2

SCALE: 1"=50' EXCEPT AS NOTED

YARD

DREDGE CELL LATERAL EXPANSION
STAGE 4
SHEET 5

DESIGNED BY	DRAWN BY	CHECKED BY	SUPERVISED BY	REVIEWED BY	APPROVED BY	ISSUED BY
D.R. SMITH	B.S. BURT	W.P. TAYLOR	H.L. PETTY	R.E. PURCEY	J.G. ADAIR	

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

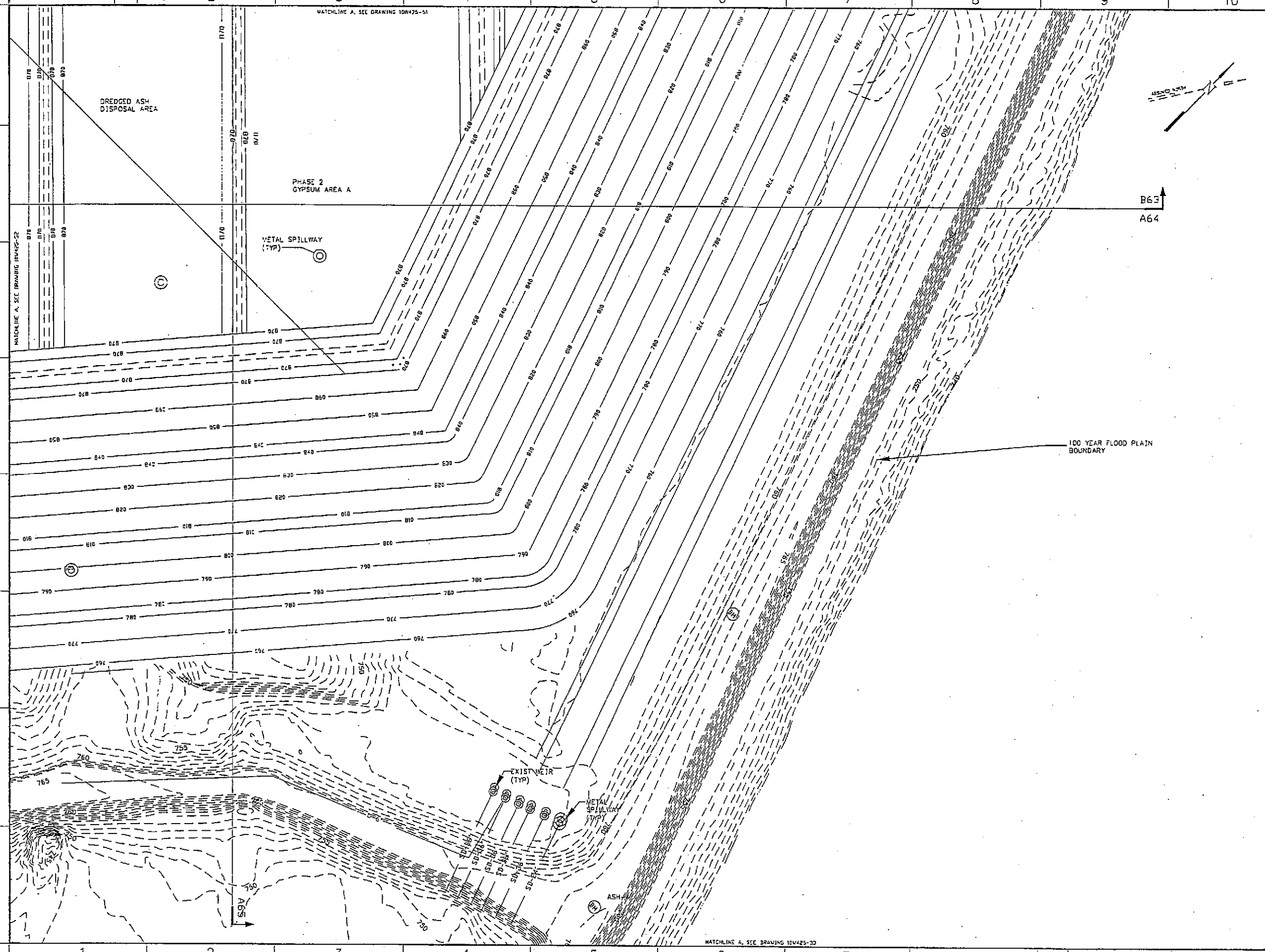
AUTOCAD R14 | DATE | 36 | C | 10W425-52 | R 0

PLOT FACTOR:600 W_TVA

C.A.D. DRAWING DO NOT ALTER MANUAL

PARSONS | D
TASK COMPLETED BY: | REV NO.

TVA-00018520



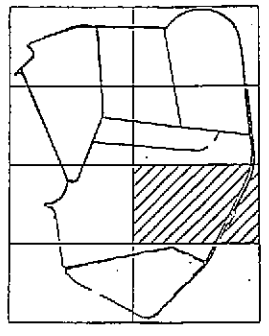
NOTES:

1. FOR GENERAL NOTES SEE 10W425-26.
2. FOR DIKE RAISING NOTES, SEE 10W425-48.

EMORY RIVER–WATTS BAR LAKE

100 YEAR FLOOD ELEVATION 748 AT RIVER MILE 2.00
500 YEAR FLOOD ELEVATION 750.5 AT RIVER MILE 2.00

KEY PLAN



REV NO.	DATE	CHCK	DRWN	CHKD	SUPV	PMGR	APPD	ISSD	PROJECT ID	AS CONST	REV CD
R 0		DRS	BSB	WPT	HLP	REP	JGA				0

ISSUED FOR DREDGE CELL EXPANSION PH2

SCALE: 1"=50' EXCEPT AS NOTED

YARD

DREDGE CELL LATERAL EXPANSION
STAGE 4
SHEET 6

DESIGNED BY	DRAWN BY	CHECKED BY	SUPERVISED BY	REVIEWED BY	APPROVED BY	ISSUED BY
D.R. SMITH	B.S. BURT	W.P. TAYLOR	H.L. PERRY	R.E. PURKEY	J.G. ADAIR	

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R14 | DATE | 36 | C | 10W425-53 | R 0

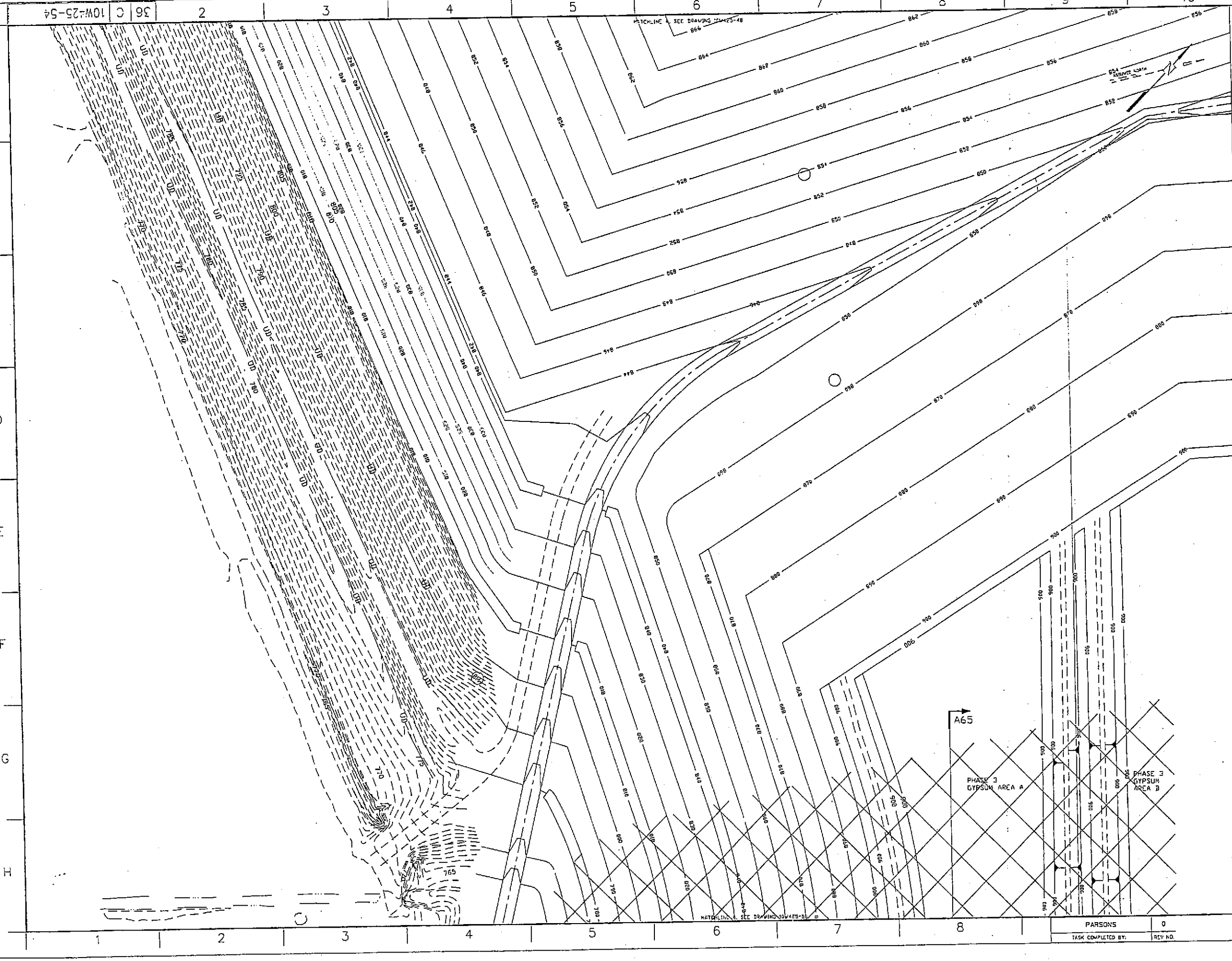
PLOT FACTOR:600
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

PARSONS | 0
TASK COMPLETED BY: | REV NO.

36 C 10W425-53

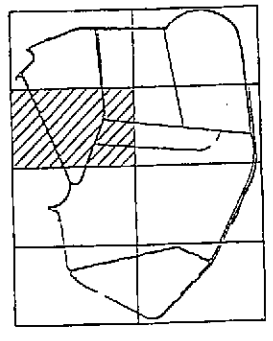
TVA-00018521



NOTES:
1. FOR GENERAL NOTES SEE 10W425-26.
2. FOR DIKE RAISING NOTES, SEE 10W425-55.

EMORY RIVER–WATTS BAR LAKE
100 YEAR FLOOD ELEVATION 748 AT RIVER MILE 2.00
500 YEAR FLOOD ELEVATION 750.5 AT RIVER MILE 2.00

KEY PLAN



R 0 1		DRS	BSS	WPT	HLP	RLP	JGA				
ISSUED FOR DREDGE CELL EXPANSION											
REV NO.	DATE	DSGN	DRWN	CHKD	SUPV	PVWD	APPD	ISSD	PROJECT ID	AS BUILT	REV NO.

SCALE: 1"=50' EXCEPT AS NOTED

YARD

DREDGE CELL LATERAL EXPANSION
STAGE 5
SHEET 1 (ELEVATION. 870–900)

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
D.R. SMITH	B.S. BART	W.P. TAYLOR	H.L. PETTY	R. L. PURKEY	J. G. ADAIR	

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

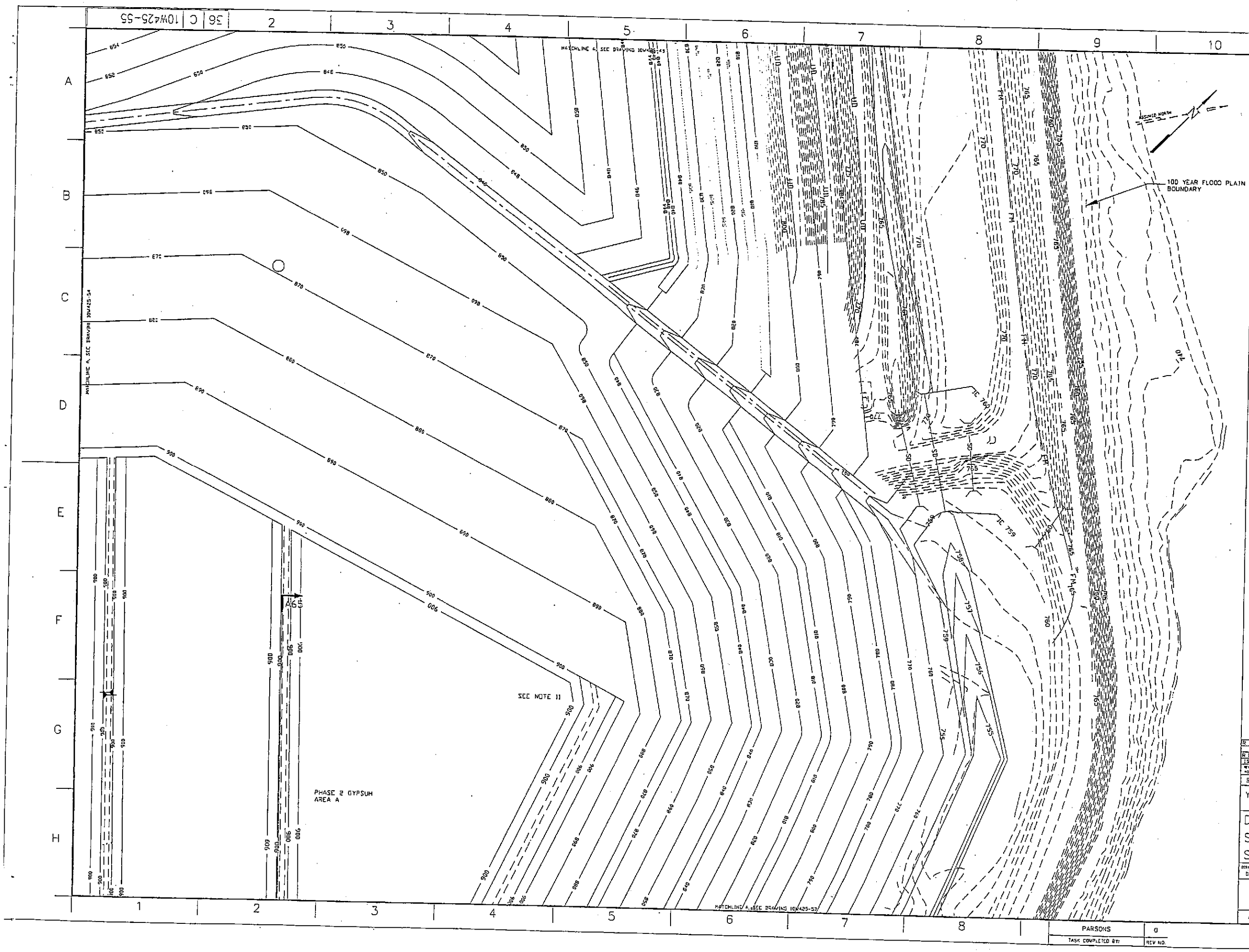
AUTOCAD R14 | DATE | 36 | C | 10W425-54 | R 0

PARSONS | 0
TASK COMPLETED BY: | REV NO.

PLOT FACTOR:600
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUA

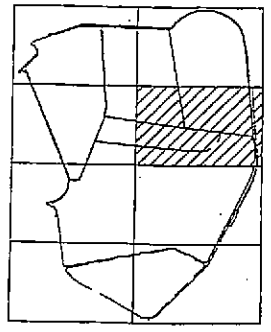
TVA-00018522



NOTES:
1. FOR DRAWING INDEX AND LEGEND, SEE DRAWING 10W425-20.
2. FOR GENERAL NOTES SEE 10W425-26.
3. PROVIDE A MINIMUM OF TWO (2) FEET OF FREEBOARD TO THE FINISHED DIKE ELEVATION DURING ASH DREDGING/ GYPSUM PLACEMENT ACTIVITIES.
4. RELOCATE METAL SPILLWAYS TO TIE INTO EXISTING METAL SPILLWAYS FOR PREVIOUS STAGE AS SHOWN ON 10W425-XX.
5. PROPOSED CONTOUR ELEVATIONS SHOWN FOR THE OUTER 3:1 SLOPES ARE FINISHED SURFACE ELEVATIONS (INCLUDING FINAL COVER).
6. FINAL CLOSURE GRADE WILL BE PLACED AT TWO (2) FEET PLUS OR MINUS OF THE ACTUAL GRADE SHOWN.
7. MAXIMUM SLOPE SHALL BE 3:1 (HORIZONTAL TO VERTICAL).
8. FOR CONSTRUCTION OF AND RAISING OF DIKES, SEE DETAIL A65 ON DRAWING 10W425-65.
9. PERIMETER DRAINS WITHIN THE OUTER WET-CAST GYPSUM DIKES ARE NOT SHOWN ON THESE DRAWINGS. SEE DETAILS XX ON DRAWING 10W425-XX.
10. FOR DITCH ELEVATIONS ARE NOT SHOWN. IN GENERAL, INLET ELEVATIONS WILL BE LOWER THAN DIKE ELEVATION, WITH A NOMINAL 0.5% SLOPE.
11. DREDGED FLY ASH AREA WITHIN PHASE 2 WILL NOT EXIST ABOVE EL. 872. SEE OPERATION PLAN FOR ASH STACKING FOR COMBINED GYPSUM/ASH AND FLY ASH ONLY.

EMORY RIVER-WATTS BAR LAKE
100 YEAR FLOOD ELEVATION 748 AT RIVER MILE 2.00
500 YEAR FLOOD ELEVATION 750.5 AT RIVER MILE 2.00

KEY PLAN



REV NO.	DATE	DRN	CHKD	SUPV	APVD	MANG	ISSD	PROJECT ID	AS CONST	REV CD
R 0	085	258	MPT	HLP	BEP	JGA				D
ISSUED FOR DREDGE CELL EXPANSION										

SCALE: 1"=50'
EXCEPT AS NOTED

YARD

DREDGE CELL LATERAL EXPANSION
STAGE 5
SHEET 2 (ELEVATION 870-900)

DESIGNED BY	DRAWN BY	CHECKED BY	SUPERVISED BY	REVIEWED BY	APPROVED BY	ISSUED BY
D.R. SMITH	D.S. BURT	M.P. TAYLOR	H.L. PETTY	R. E. PURKEY	J. G. ADAIR	

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

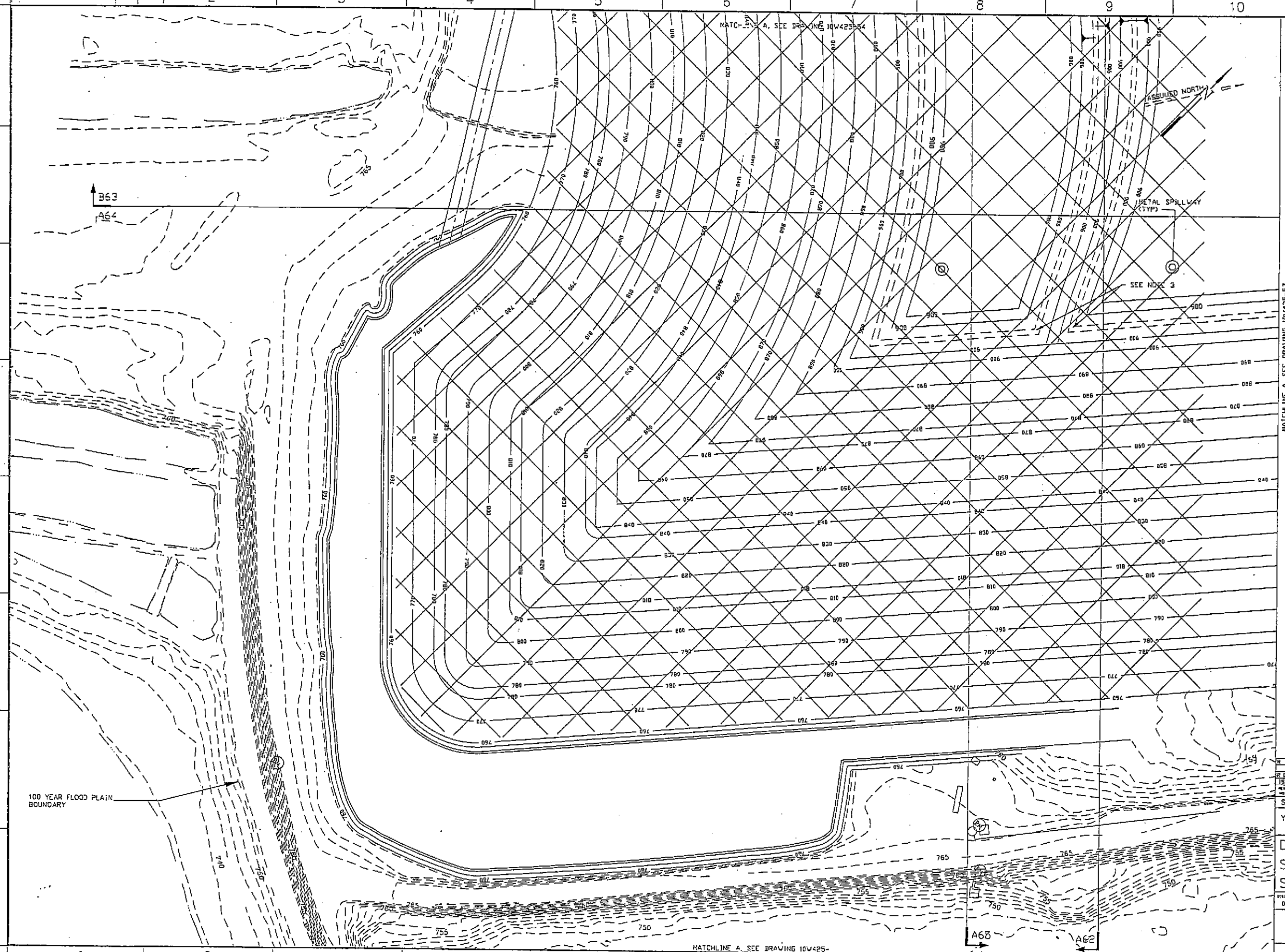
AUTOCAD R14 | DATE | 36 | C | 10W425-55 | R 0

PARSONS | 0
TASK COMPLETED BY: | REV NO.

PLOT FACTOR:600
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

TVA-00018523

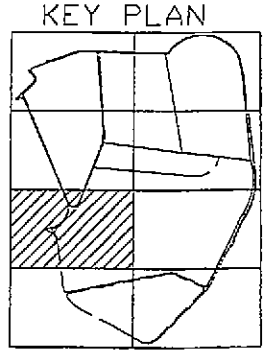


NOTES:
1. FOR GENERAL NOTES SEE 10W425-26.
2. FOR DIKE RAISING NOTES, SEE 10W425-55.
3. WIDEN RIM DOTS AT CORNERS.

EMORY RIVER-WATTS BAR LAKE

100 YEAR FLOOD ELEVATION 748 AT RIVER MILE 2.00
500 YEAR FLOOD ELEVATION 750.5 AT RIVER MILE 2.00

KEY PLAN



REV NO.	DATE	DSGN	DRN	CHKD	SUPV	APVD	APVD	ISSD	PROJECT ID	AS CONST	REV NO.
R D		DRS	DSB	WPT	HLP	RFP	JGA				D

ISSUED FOR DREDGE CELL EXPANSION

SCALE: 1"=50' EXCEPT AS NOTED

YARD

DREDGE CELL LATERAL EXPANSION
STAGE 5
SHEET 3

DESIGNED BY	DRAWN BY	CHECKED BY	SUPERVISED BY	REVIEWED BY	APPROVED BY	ISSUED BY
D.R. SUTTH	B.S. BURT	W.P. TAYLOR	H.L. PETTY	R. E. PURKEY	J. C. ADKIN	

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

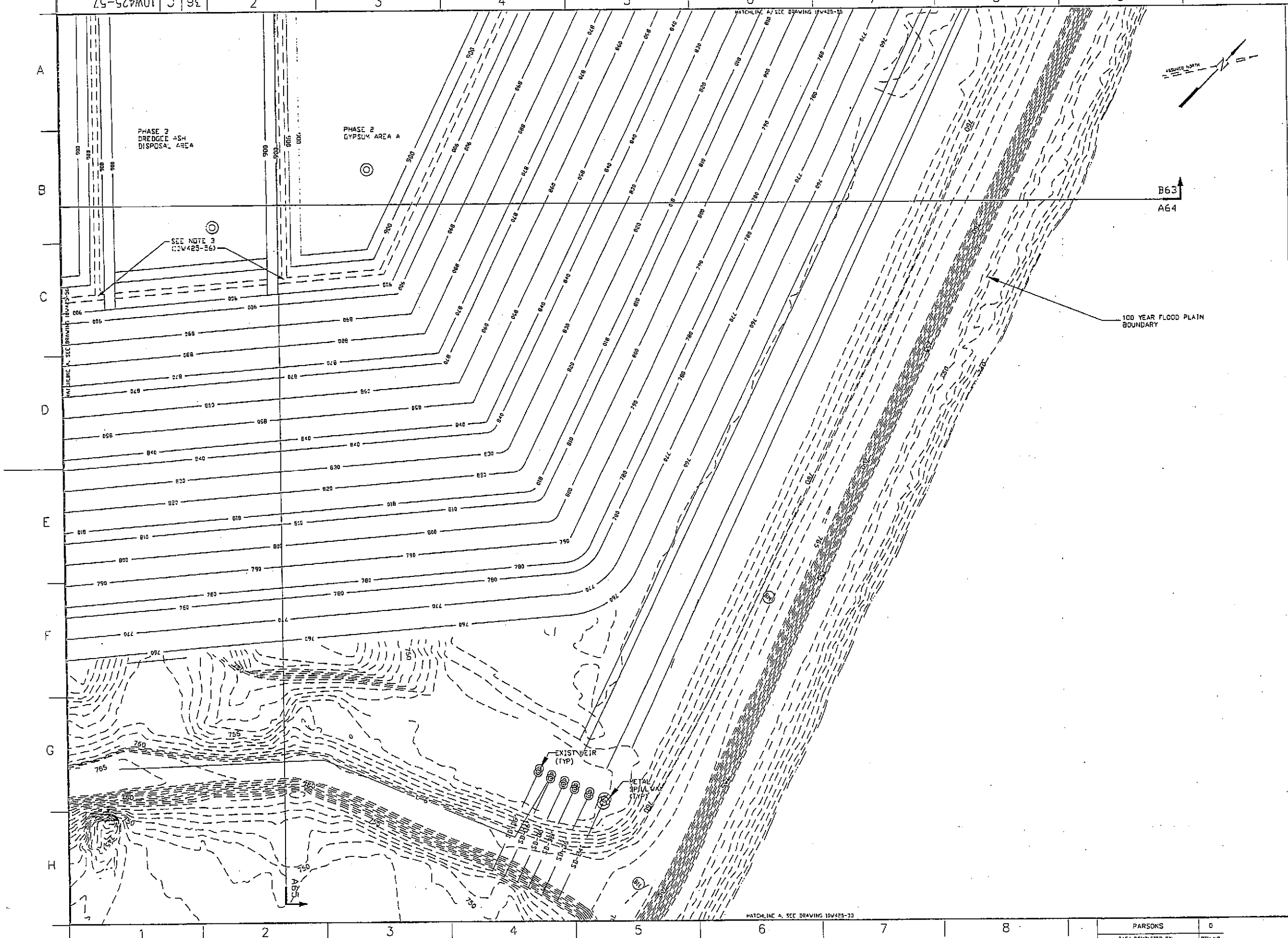
AUTOCAD R14 | SIZE 36 | C | 10W425-56 | R D

PARSONS | 0
TASK COMPLETED BY: | REV NO.

PLOT FACTOR:600
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

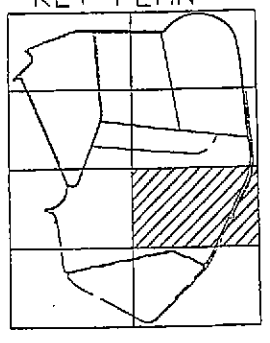
TVA-00018524



NOTES:
1. FOR GENERAL NOTES SEE 10W425-26.
2. FOR DIKE RAISING NOTES, SEE 10W425-55.

EMORY RIVER–WATTS BAR LAKE
100 YEAR FLOOD ELEVATION 748 AT RIVER MILE 2.00
500 YEAR FLOOD ELEVATION 750.5 AT RIVER MILE 2.00

KEY PLAN



REV NO.	DATE	DSGN	DRN	CHKD	SUPV	APVD	ISSD	PROJECT ID	AS CONST	REV CD
R D		DRS	BSS	WOT	HLR	RCP	JCA			1D
ISSUED FOR DREDGE CELL EXPANSION										

SCALE: 1"=50' EXCEPT AS NOTED

YARD

DREDGE CELL LATERAL EXPANSION
STAGE 5
SHEET 4

DESIGNED BY	DRAWN BY	CHECKED BY	SUPERVISED BY	REVIEWED BY	APPROVED BY	ISSUED BY
D.R. SMITH	B.S. BURT	W.P. TAYLOR	H.L. FEITY	R. C. PURKEY	J. C. ADAIR	

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R14 | DATE | 36 | C | 10W425-57 | R D

PARSONS | 0
TASK COMPLETED BY: | REV NO.

PLOT FACTOR:600
W_TVA

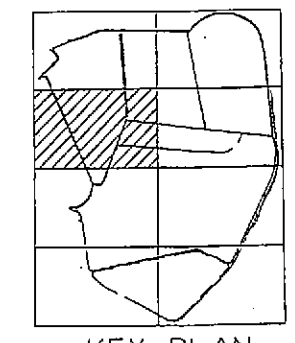
C.A.D. DRAWING
DO NOT ALTER MANUALLY

36 | C | 10W425-57

TVA-00018525

NOTES:
1. FOR GENERAL NOTES SEE 10W425-26.
2. FOR CLOSURE NOTES, SEE 10W425-89.

EMORY RIVER–WATTS BAR LAKE
100 YEAR FLOOD ELEVATION 745 AT RIVER MILE 2.00
500 YEAR FLOOD ELEVATION 750.5 AT RIVER MILE 2.00



KEY PLAN

REV NO.	DATE	STAN	SPAN	BMD	SJM	RYND	MMS	DTD	MADE BY	AS CONST	REV NO.
R 0		DRS	BSB	NPT	HLP	RTP	JGA				D
REVISED FOR DREDGE CELL EXPANSION PH2											

SCALE: 1"=50' EXCEPT AS NOTED

YARD

DREDGE CELL LATERAL EXPANSION
STAGE 6
SHEET 1 (900–960)

DESIGNED BY	DRAWN BY	CHECKED BY	SUPERVISED BY	REVIEWED BY	APPROVED BY	ISSUED BY
D.R. SMITH	B.S. BURT	W.P. TAYLOR	H.L. PETTY	R. E. PURKEY	J. C. ADAIR	

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R14 | SIZE | 36 | C | 10W425-58 | R 0

PARSONS | 0
TASK COMPLETED BY: | REV NO.

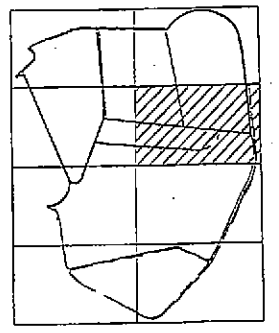
PLOT FACTOR:600
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

TVA-00018526

NOTES:
1. FOR DRAWING INDEX AND LEGEND, SEE DRAWING 10W425-20.
2. FOR GENERAL NOTES SEE 10W425-26.
3. PROPOSED CONTOUR ELEVATIONS SHOWN FOR THE OUTER 3:1 SLOPES ARE FINISHED SURFACE ELEVATIONS (INCLUDING FINAL COVER). CONTOURS SHOWN ARE FINISHED GRADE ELEVATION.
4. FINAL CLOSURE GRADE WILL BE PLACED AT TWO (2) FEET PLUS OR MINUS OF THE ACTUAL GRADE SHOWN.
5. SLOPES SHALL BE 3:1 (HORIZONTAL TO VERTICAL) OR FLATTER.
6. CONSTRUCTION OF THE FINAL COVER SHALL BE IN ACCORDANCE WITH THE DA/CC PLAN AND SPECIFICATIONS APPENDED TO THE OPERATION PLAN.
7. SLOPE UNDERDRAINS ARE NOT SHOWN
8. FOR DITCHES CONSTRUCTED AS PART OF THE FINAL CLOSURE, SEE DRAWING 10W425-76.

EMORY RIVER-WATTS BAR LAKE
100 YEAR FLOOD ELEVATION 768 AT RIVER MILE 2.00
500 YEAR FLOOD ELEVATION 750.5 AT RIVER MILE 2.00



KEY PLAN

REV. NO.	DATE	TSOW	DRWN	CHKD	SUPV	DWND	APPD	ISSD	PROJECT ID	AS CONST
R D		DRS	BSB	WPT	HLP	RCP	JGA			D

REVISED FOR DREDGE CELL EXPANSION PH2

SCALE: 1"=50' EXCEPT AS NOTED

YARD

DREDGE CELL LATERAL EXPANSION
STAGE 6
SHEET 2

DESIGNED BY	DRAWN BY	CHECKED BY	SUPERVISED BY	REVIEWED BY	APPROVED BY	ISSUED BY
D.R. SMITH	B.S. BURT	N.P. TAYLOR	H.L. FETTY	R. E. PURCEY	J. G. ADAIR	

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

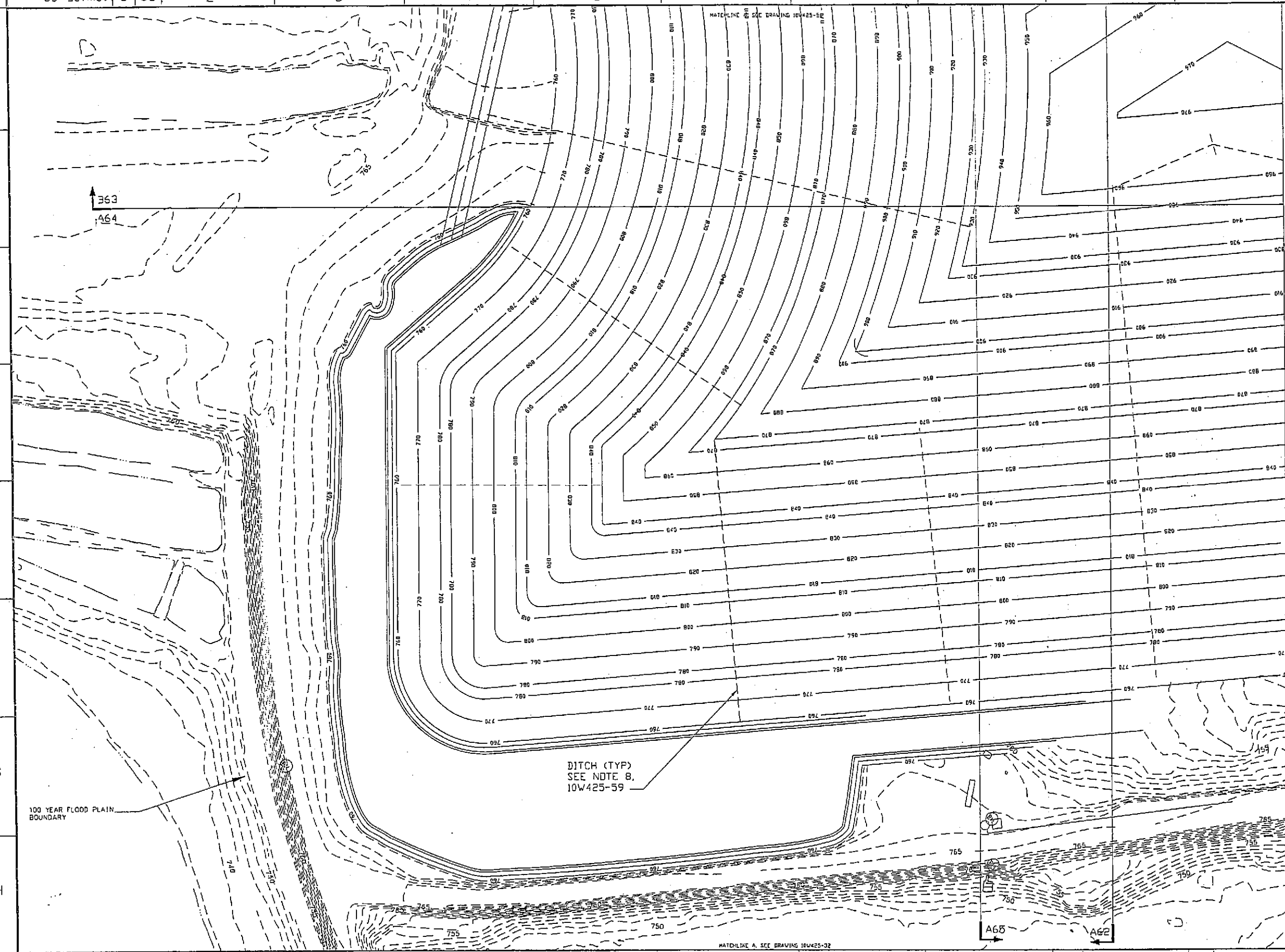
AUTOCAD R14 | DATE | 36 | C | 10W425-59 | R D

PARSONS | 0
TASK COMPLETED BY: | REV NO.

PLOT FACTOR:600
W_TVA

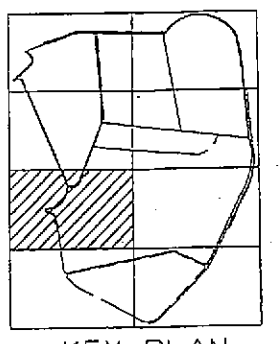
C.A.D. DRAWING
DO NOT ALTER MANUALLY

TVA-00018527



NOTES:
1. FOR GENERAL NOTES SEE 10W425-26.
2. FOR CLOSURE NOTES, SEE 10W425-59.

EMORY RIVER—WATTS BAR LAKE
100 YEAR FLOOD ELEVATION 748 AT RIVER MILE 2.00
500 YEAR FLOOD ELEVATION 750.5 AT RIVER MILE 2.00



KEY PLAN

REV NO.	DATE	DRAWN	DRAWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS BUILT	REV CODE
2 0		DRS	BSB	WPT	HLP	REP	JGA				1D
REVISED FOR DREDGE CELL EXPANSION PH2											

SCALE: 1"=50' EXCEPT AS NOTED

YARD

DREDGE CELL LATERAL EXPANSION
STAGE 6
SHEET 3

DESIGNED BY:	DRAWN BY:	CHECKED BY:	APPROVED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
D.N. SMITH	B.S. BURT	W.P. TAYLOR	H.L. PETTY	R. E. PURKEY	J. G. ADAIR	

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R14 | SIZE | 36 | C | 10W425-60 | R 0

PARSONS | 0
TASK COMPLETED BY: | REV NO.

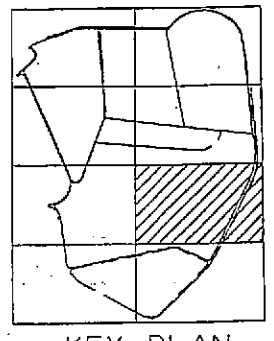
PLOT FACTOR:500
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

TVA-00018528

NOTES:
1. FOR GENERAL NOTES SEE 10W425-26.
2. FOR CLOSURE NOTES, SEE 10W425-59.

EMORY RIVER–WATTS BAR LAKE
100 YEAR FLOOD ELEVATION 748 AT RIVER MILE 2.00
500 YEAR FLOOD ELEVATION 750.5 AT RIVER MILE 2.00



KEY PLAN

R	DRS	BSB	WPT	HLP	REP	JGA	1	D
ISSUED FOR DREDGE CELL EXPANSION PH2								

SCALE: 1"=50' EXCEPT AS NOTED

YARD

DREDGE CELL LATERAL EXPANSION
STAGE 6
SHEET 4

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
D.R. SMITH	B.S. BURR	W.P. TAYLOR	H.L. PETTY	A. C. PURKEY	J. G. ADAIR	

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R14 | 36 | C | 10W425-61 | R 0

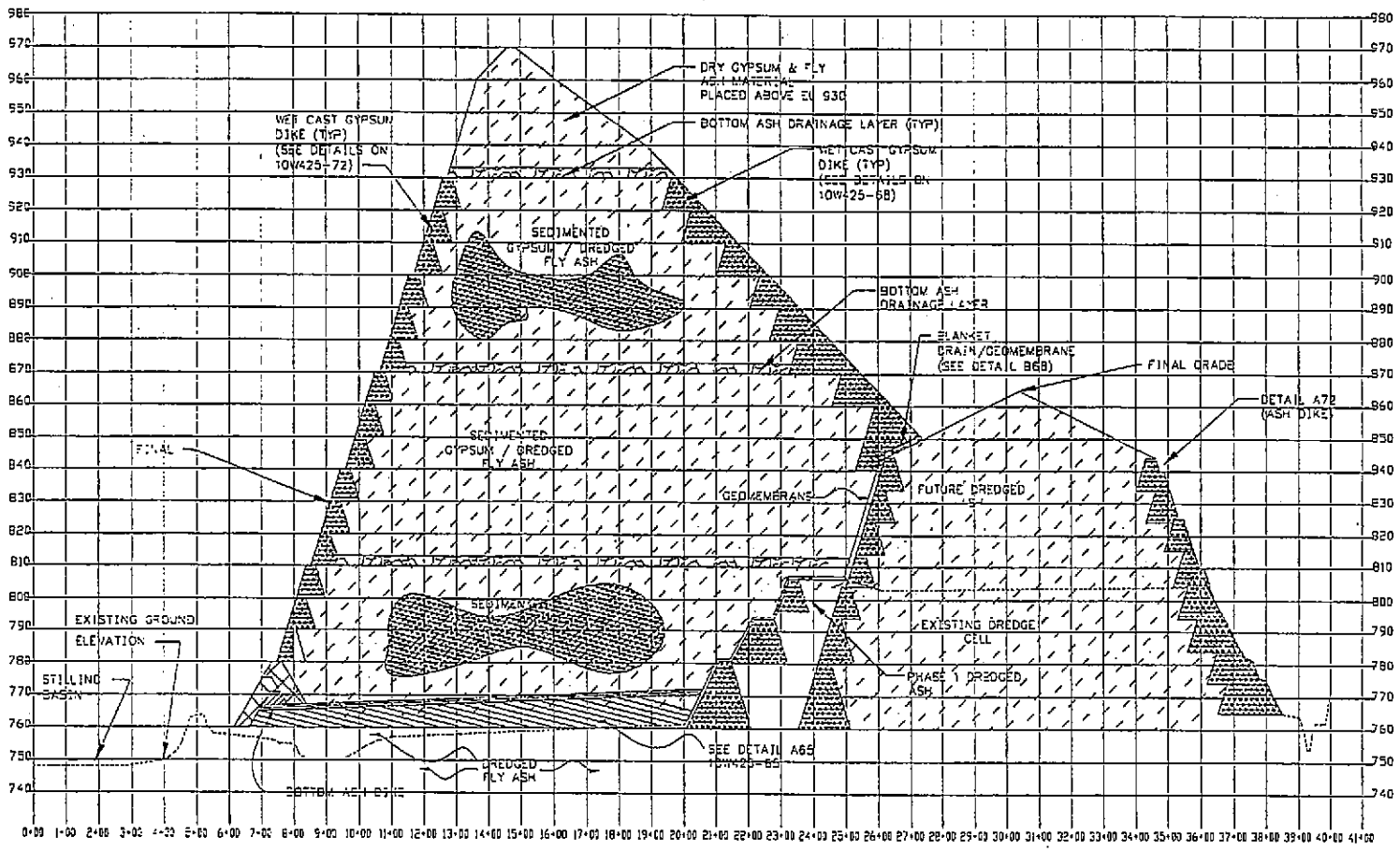
PARSONS | 0
TASK COMPLETED BY: | REV NO.

PLOT FACTOR:600
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

TVA-00018529

NOTES:
1. FOR DRAWINGS LIST AND LEGEND SEE 10W425-20
2. FOR GENERAL NOTES SEE 10W425-26



SECTION A62

SCALE: 1" = 200' HORIZONATAL
1" = 20' VERTICAL

R 01	DRS	BSS	WPT	HLP	REP	JGA	105057	
ISSUED FOR DREDGE CELL EXPANSION								

SCALE: 1"=100' EXCEPT AS NOTED

YARD

DREDGE CELL LATERAL EXPANSION
SECTIONS
SHEET #1

DESIGNED BY	DRAWN BY	CHECKED BY	SUPERVISED BY	REVIEWED BY	APPROVED BY	ISSUED BY
D.R. SMITH	B.S. BURT	W.P. TAYLOR	H.L. PETTY	R.E. PURKEY	J.G. ADAIR	

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

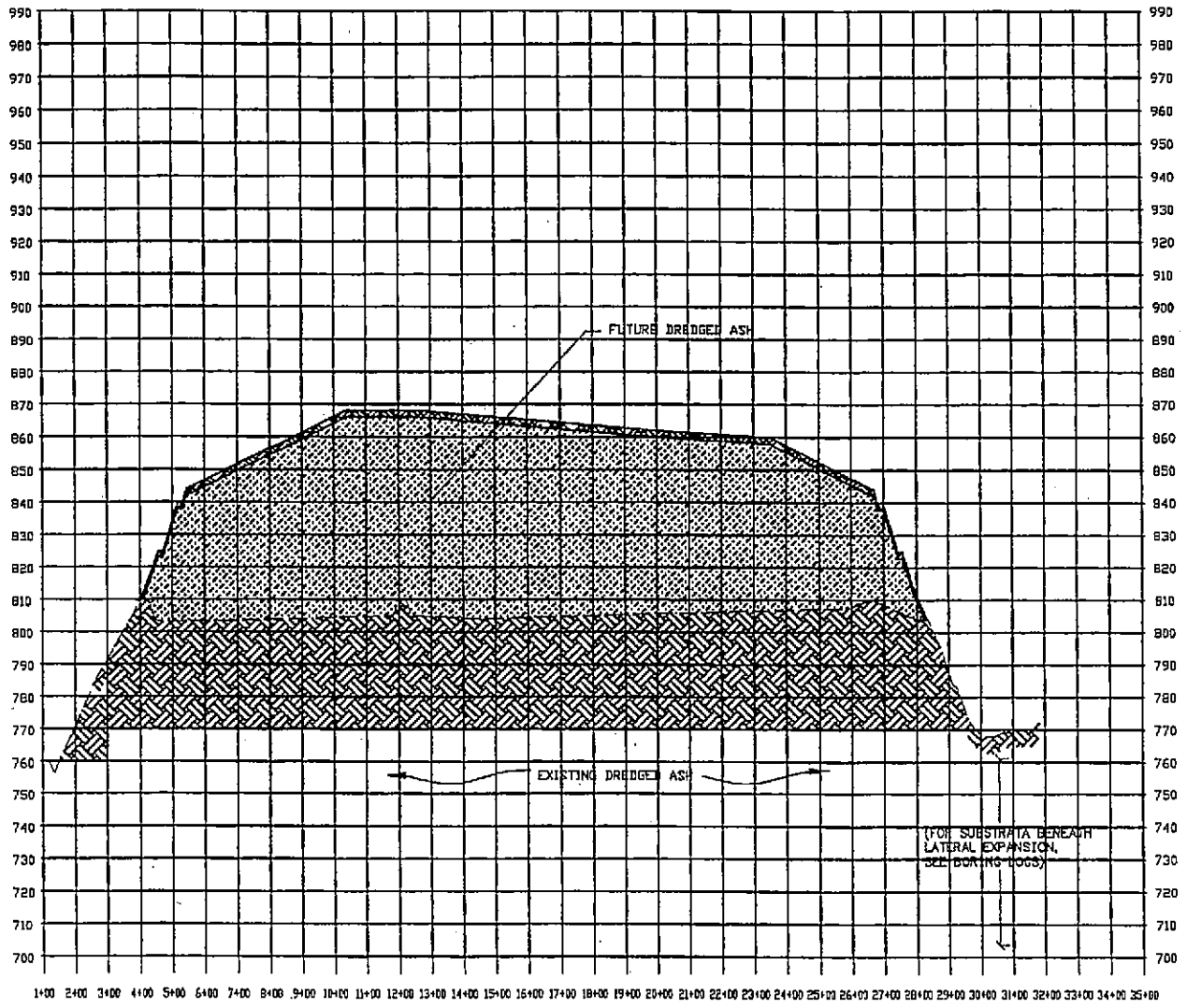
AUTOCAD R14 | DATE | 36 | C | 10W425-62 | R 0

PARSONS | 0
TASK COMPLETED BY: | REV NO.

PLOT FACTOR:1200
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

TVA-00018530

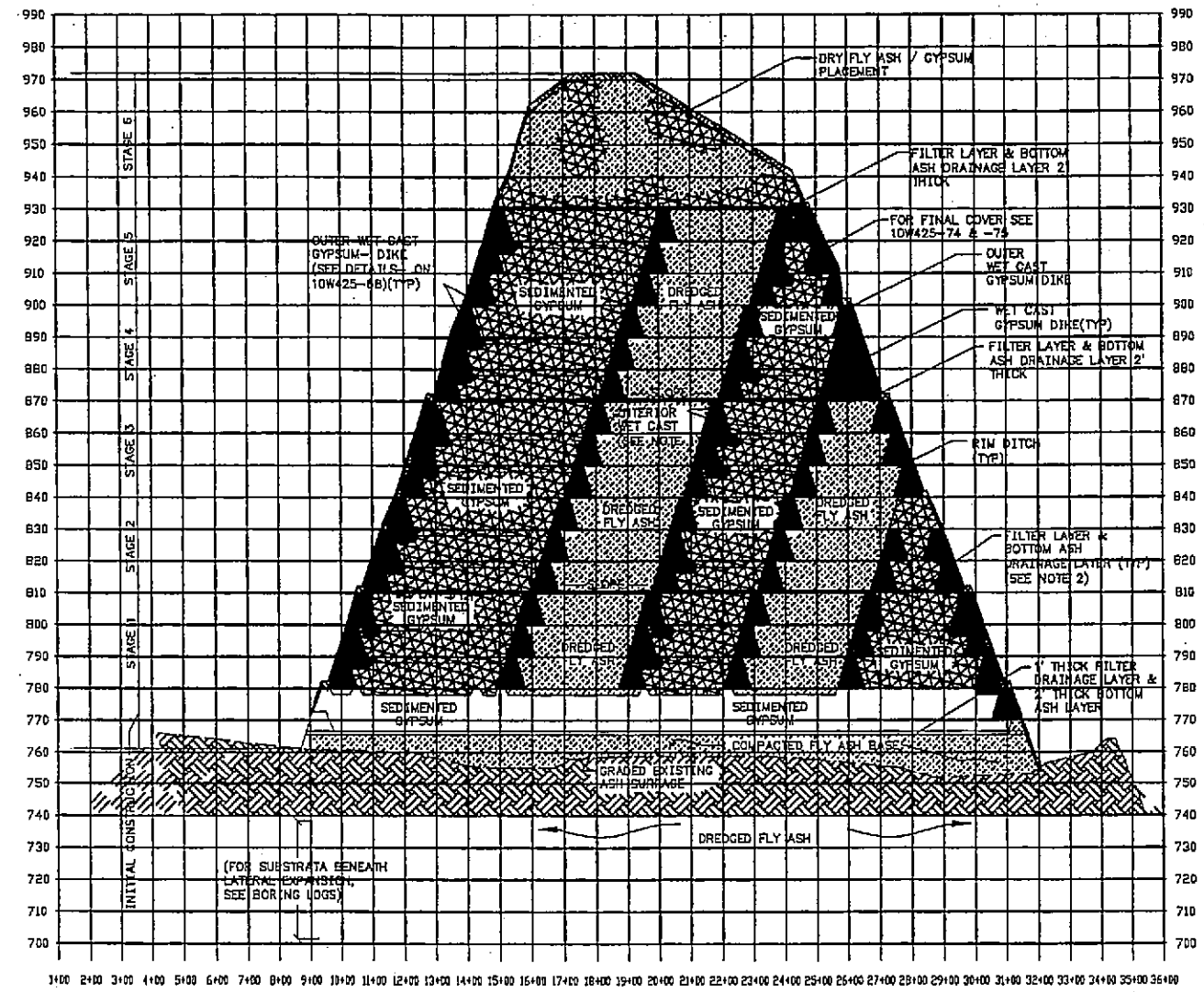


SECTION A63

CLOSED EXISTING DREDGE CELLS

1" = 200' HORIZONTAL

1" = 20' VERTICAL



SECTION B63

CLOSED PHASE 2 & 3

1" = 200' HORIZONTAL

1" = 20' VERTICAL

NOTES FOR SECTION B63

1. CONSTRUCT INTERIOR WET CAST DIKES IN ACCORDANCE WITH DETAIL A72 ON 10W425-72, EXCEPT THAT PERIMETER UNDERDRAIN IS NOT REQUIRED.
2. BOTTOM ASH DRAINAGE LAYER SHALL CONSIST OF 1' THICK FILTER LAYER (BOTTOM ASH/FLY ASH MIXTURE). CROWN THE DRAIN IN THE CENTER SO THAT IS DRAINS TO EITHER SIDE AS SHOWN. MAINTAIN ELEVATION HIGHER IN THE CENTER OF FACILITY. DECANT WATER FROM CELL AND PLACE WET ASH & GYPSUM INTO CELL TO OBTAIN PROPER ELEVATION PRIOR TO PLACEMENT OF BOTTOM ASH LAYER. FLY ASH & GYPSUM DISPOSAL AREAS SHOWN IN PLAN VIEW MAY BE SUBDIVIDED AS NECESSARY TO FACILITATE SEQUENCED DRAINAGE LAYER CONSTRUCTION.
3. GRANULAR DRAINS BENEATH COMPACTED FLY ASH BASE NOT SHOWN. SEE DETAIL A65.

REV NO.	DATE	DRN	DSN	CHKD	SUPV	DWG	APPD	ENG	PROJECT ID	AS CONST	REV NO.
R 0		DRS	BSB	WPT	HLP	REP	JGA		F05042		

ISSUED FOR DREDGE CELL EXPANSION

SCALE: EXCEPT AS NOTED

YARD

DREDGE CELL

DREDGED FLY ASH/DRY FLY ASH

DISPOSAL OPTION SECTIONS SHEET#2

DESIGNED BY	DRAWN BY	CHECKED BY	SUPERVISED BY	REVIEWED BY	APPROVED BY	ISSUED BY
D.R. SMITH	B.S. DURT	W.P. TAYLOR	H.L. PETTY	R.E. PURKEY	J.G. ADAIR	

KINGSTON FOSSIL PLANT

TENNESSEE VALLEY AUTHORITY

FOSSIL AND HYDRO ENGINEERING

AUTOCAD R14 | SIZE 36 | 10W425-63 | R 0

PARSONS	0
TASK COMPLETED BY:	REV NO.

PLOT FACTOR:1200

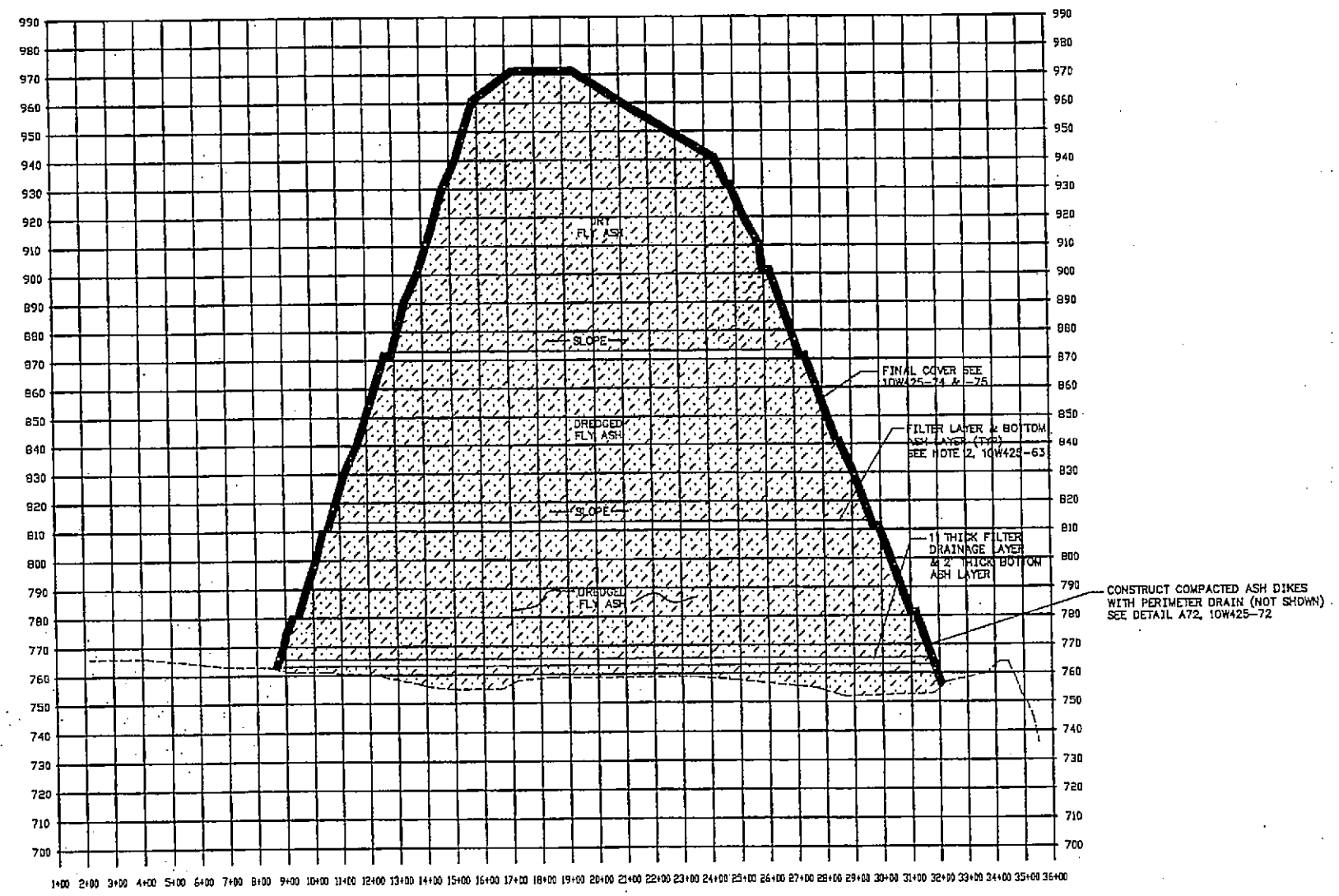
W_TVA

C.A.D. DRAWING DO NOT ALTER MANUALLY

TVA-00018531

NOTES:

1. FOR DRAWINGS LIST AND LEGEND SEE 10W425-20
2. FOR GENERAL NOTES SEE 10W425-26



SECTION A64

REV NO.	DATE	DESCR	DRWN	CHKD	SUPV	APPD	APPD	CODE	PROJECT ID	AS BUILT
R 0			DWS	BSH	WPT	HJP	RLP	JGA		
ISSUED FOR DREDGE CELL EXPANSION										

SCALE: 1"=100' EXCEPT AS NOTED

YARD

DREDGE CELL EXPANSION
DREDGED FLY ASH/DRY FLY ASH
DISPOSAL OPTION SHEET #1

DESIGNED BY	DRAWN BY	CHECKED BY	SUPERVISED BY	REVIEWED BY	APPROVED BY	ISSUED BY
D.P. SMITH	B.S. BURT	W.P. TAYLOR	H.L. PETTY	R.E. PURSEY	J.G. ADAIR	

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R14 | SIZE 36 | C | 10W425-64 | R 0

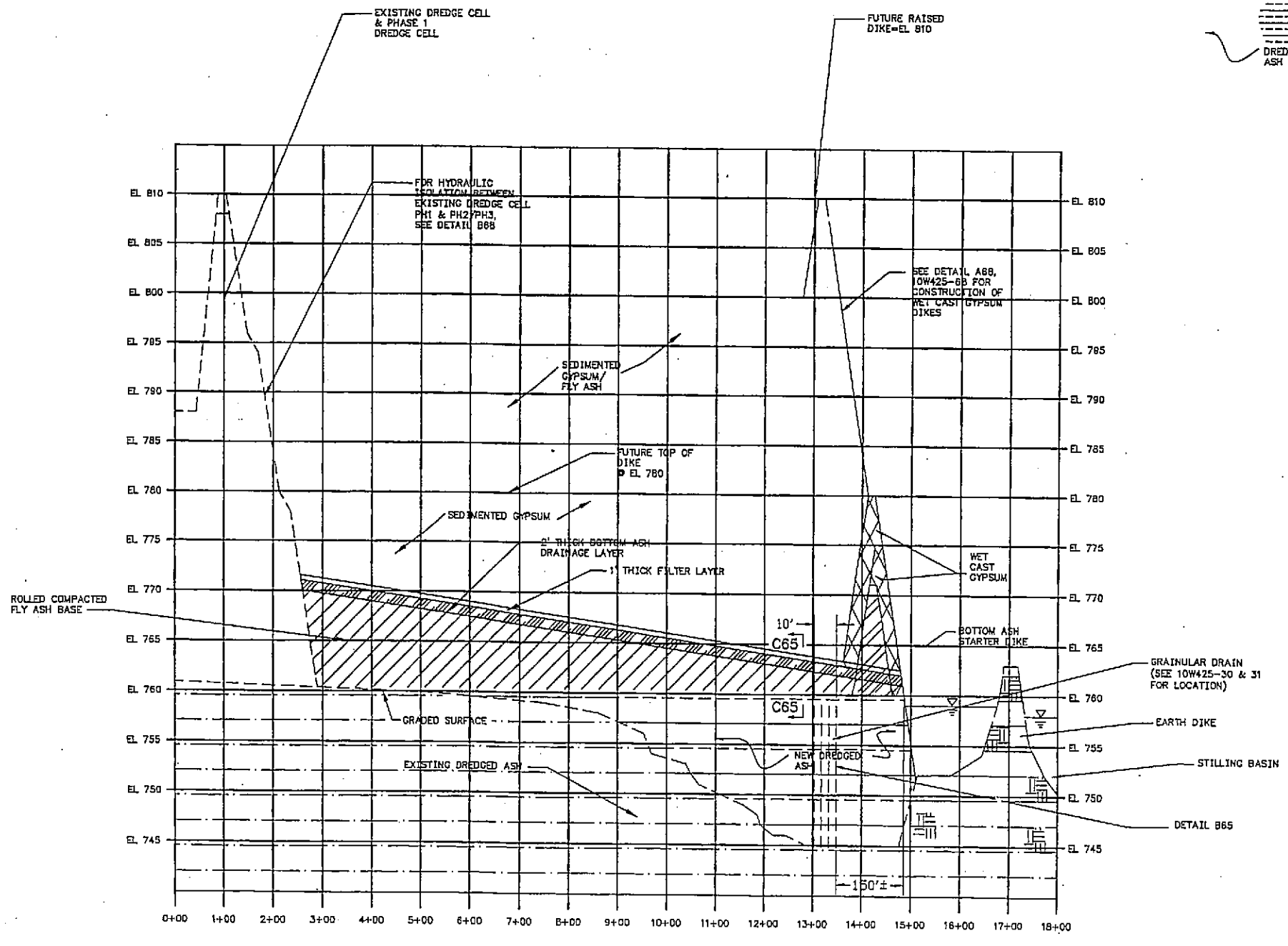
PARSONS | 0
TASK COMPLETED BY: | REV NO.

PLOT FACTOR:1200
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUAL

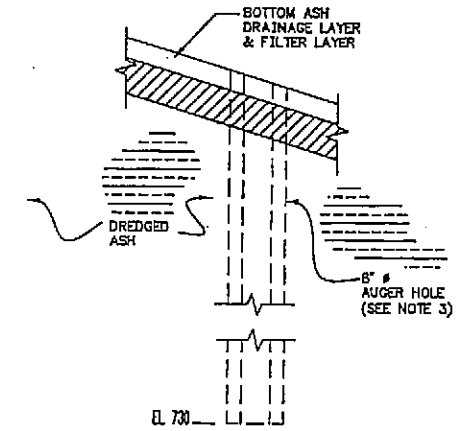
36 C 10W425-64

TVA-00018532



SECTION A 65
TYPICAL CROSS SECTION
INITIAL PHASE 2/PHASE 3 CONSTRUCTION

SCALE: 1" = 100' HORIZONTAL
1" = 5' VERTICAL



DETAIL B65

NOTES:

1. FOR DRAWINGS LIST AND LEGEND SEE 10W425-20

2. FOR GENERAL NOTES SEE 10W425-26

3. INSTALL GRAINULAR DRAINS IN 2 ROWS. SPACING SHALL BE 10' STAGGERED HOLES IN EACH ROW BY 5 FT. GRAINULAR MATERIAL FOR DRAIN SHALL BE BOTTOW ASH. INSTALLATION SHALL BE BY SPECIALITY CONTRACTOR SUBCONTRACTED BY TVA FES.

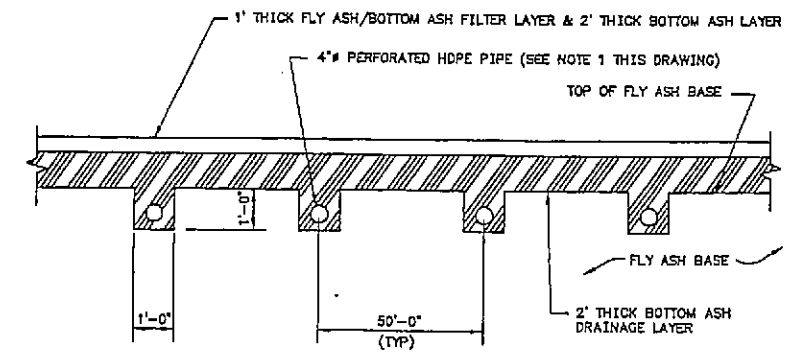
4. INSTALL GRANNULAR COLUMNS AFTER CONSTRUCTION OF FLY ASH BASE.

NOTES FOR HDPE PIPING:

1. PIPE AND FITTINGS SHALL BE HIGH-DENSITY POLYETHYLENE (HDPE) PE 3408 PIPE, CELL CLASSIFICATION 345444C, IN ACCORDANCE WITH ASTM D 3350. ALL PIPING AND FITTINGS SHALL BE NEW AND THE SAME MATERIAL AND HAVE A DIMENSION RATION OF 35 IN ACCORDANCE WITH ASTM D 714.

2. HDPE PIPING AND FITTINGS SHALL BE JOINED BY BUTT FUSION WELDING, IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS.

3. UNDERDRAIN PIPING SHALL BE PERFORATED 1/8 INCH DIA IN ACCORDANCE WITH ASTM F810. HOLES SHALL BE EQUALLY SPACED, ON 5-INCH OUTERS, ROWS AND SPACES SHALL BE PARALLEL TO THE AXIS OF THE PIPE AND SHALL BE 120±5.



SECTION C65

REV NO.	DATE	DRWN	DSGN	CHKD	SUPV	SYND	APPD	ENGD	PROJECT ENG	AS CONST	REV CD
R											
R 0		DKS	JJH	MPT	HLP	REP	JGA				
ISSUED FOR DREDGE CELL EXPANSION											

SCALE: EXCEPT AS NOTED

YARD

DREDGE CELL
LATERAL EXPANSION PHASE 2/3
TYPICAL CROSS SECTION & DETAILS

DESIGNED BY	DRAWN BY	CHECKED BY	SUPERVISED BY	REVIEWED BY	APPROVED BY	ISSUED BY
D.R. SMITH	J.L. WILES	W.P. TAYLOR	H.L. PETTY	R.E. PURKEY	J.G. ADAIR	

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

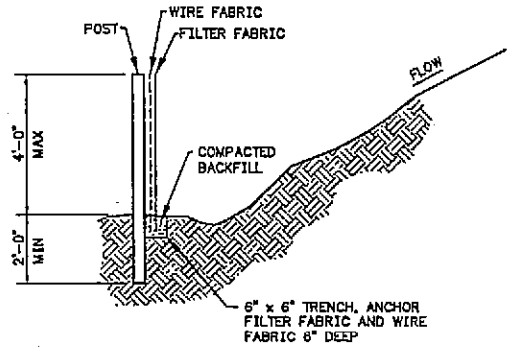
AUTOCAD R14 | DATE | 36 | C | 10W425-65 | R 0

PARSONS | 0
TASK COMPLETED BY: | REV NO.

PLOT FACTOR:100
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

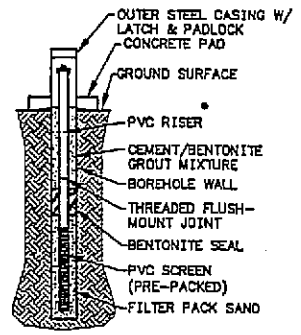
TVA-00018533



DETAIL A66
TEMPORARY SILT FENCE

NOTES:

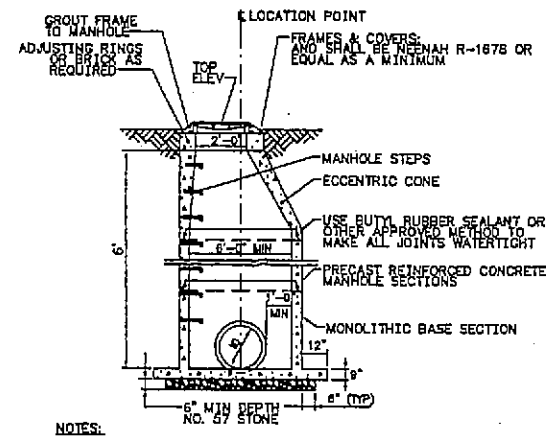
1. FILTER FABRIC FENCE TO BE PLACED PRIOR TO THE START OF ROUGH GRADING.
2. STEEL POSTS SHALL BE METAL "T" POSTS – 6'-0" LONG.
3. WOOD POSTS SHALL BE 2" x 2" NOMINAL OR LARGER (CCA TREATED).
4. POSTS SHALL BE PLACED AT 5' INTERVALS MAX.
5. WIRE FABRIC AND FILTER FABRIC SHALL BE SECURELY BOUND TO POSTS WITH EITHER STAPLES OR WIRE TIES.
6. SUBCONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING CONDITION OF FILTER FABRIC FENCE IN A CONDITION THAT IS SATISFACTORY UNTIL FINAL ACCEPTANCE OF WORK.
7. FILTER FABRIC SHALL BE A CLASS A FABRIC IN ACCORDANCE WITH TVA SPECIFICATION T-1, SECTION 571.



DETAIL B66
TYPICAL PVC MONITORING WELL MW-1 THROUGH 8

NOTES:

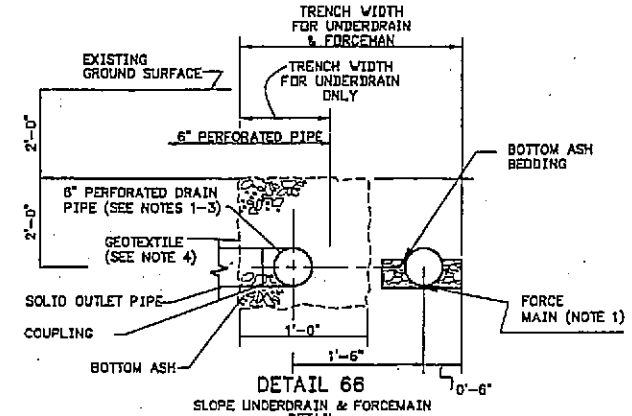
1. MONITORING WELL INSTALLATION RECORDS ARE CONTAINED IN THE HYDROGEOLOGICAL REPORT APRENDED TO THE OPERATIONS PLAN.
2. BOLLARDS ARE SHOWN ON DETAIL F66.



NOTES:

1. ALL PRECAST RISERS, CONES, BASES, TOPS, AND STEPS SHALL CONFORM TO ASTM C 478.
2. GROUT ANNULAR SPACE BETWEEN WALL AND PIPE WITH NON-SHRINK MORTAR TO ENSURE WATERTIGHT SEAL.

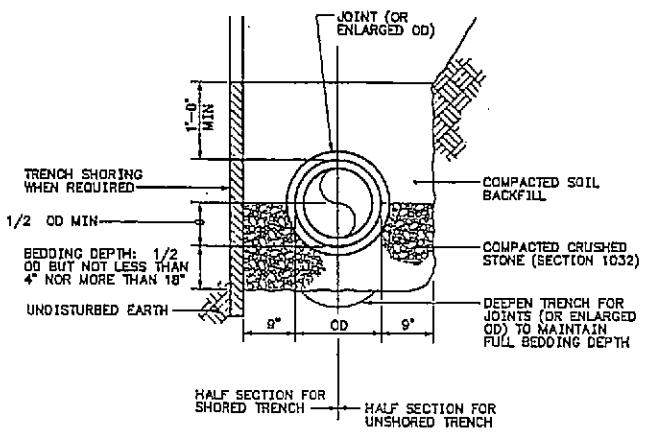
DETAIL C66 – PRECAST CONCRETE MANHOLE
NOT TO SCALE



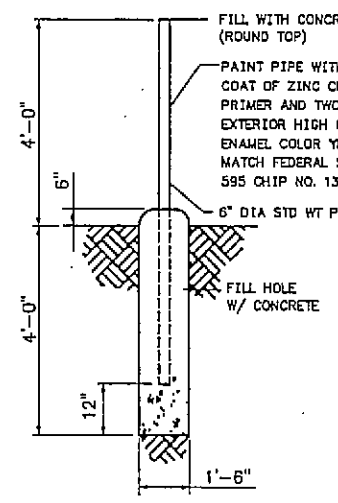
DETAIL 66
SLOPE UNDERDRAIN & FORCEMAIN DETAIL

NOTES:

1. FOR DRAWINGS LIST AND LEGEND SEE 10W425-20
2. FOR GENERAL NOTES SEE 10W425-26

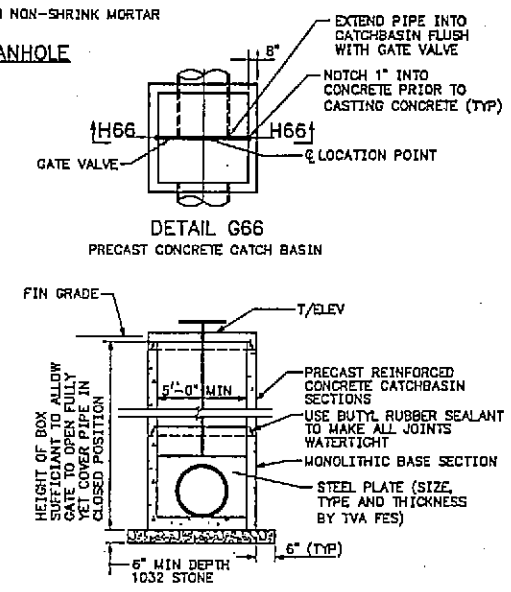


DETAIL E66
CLASS "B" PIPE BEDDING



NOTE FOR DETAIL F66:
PLACE 4 BOLLARDS AROUND EACH MONITORING WELL 5 FT FROM WELL

DETAIL F66
PIPE BOLLARD



DETAIL G66
PRECAST CONCRETE CATCH BASIN

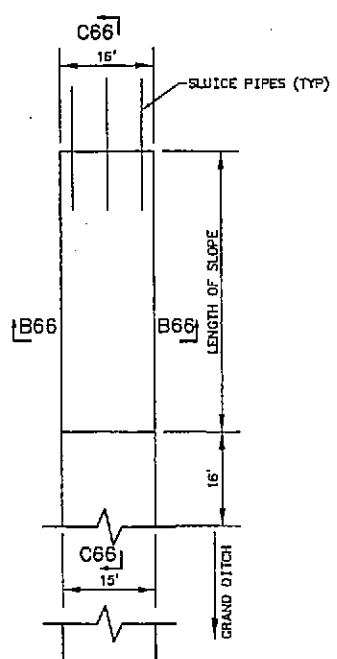
NOTES:

1. ALL PRECAST RISERS, CONES, BASES, TOPS, AND STEPS SHALL CONFORM TO ASTM C 478.
2. GROUT ANNULAR SPACE BETWEEN WALL AND PIPE WITH NON-SHRINK MORTAR TO ENSURE WATERTIGHT SEAL.

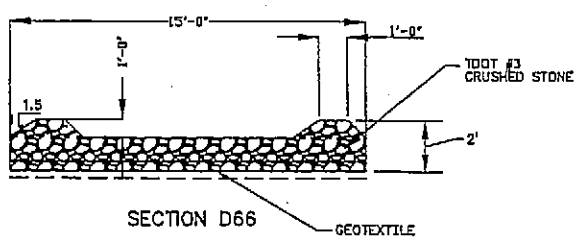
SECTION H66

NOTES FOR SLOPE UNDERDRAIN

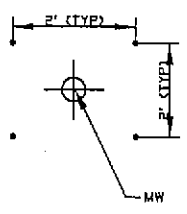
1. PIPE AND FITTINGS USED TO CONSTRUCT FORCE MIN PIPING SHALL BE HIGH-DENSITY POLYETHYLENE (HDPE) PE 3408 PIPE, CELL CLASSIFICATION 345444C, IN ACCORDANCE WITH ASTM D 3350. ALL PIPING AND FITTINGS SHALL BE NEW AND THE SAME MATERIAL AND HAVE A DIMENSION RATION OF 35 IN ACCORDANCE WITH ASTM D 714.
2. ALL HDPE PIPING AND FITTINGS SHALL BE JOINED BY BUTT FUSION WELDING, IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS.
3. PLACE WARNING TAPE APPROXIMATELY 1 FT ABOVE ALL HDPE PIPING AS BACKFILL IS BEING PLACED WITHIN TRENCH EXCAVATED FOR PIPE INSTALLATION UNDERGROUND WARNING TAPE SHALL CONSIST OF A ALUMINUM CORE, A COATED IMPRINT, AND A REINFORCED PROTECTIVE PLASTIC JACKET BONDED TO THE FOIL CORE. THE TAPE SHALL STATE THE FOLLOWING WARNING, UNDERGROUND STORM WATER FORCE MAIN.
4. GEOTEXTILE SHALL BE A WOVEN MONOFILAMENT WITH AN APPARENT OPENING SIZE (AOS) OF 70 TO 140 (US STANDARD SIEVE SIZE) WHEN TESTED IN ACCORDANCE WITH ASTM D 4751. THE GEOTEXTILE SHALL BE GEOTEX 104F AS MANUFACTURED BY SYNTHETIC INDUSTRIES OR APPROVED EQUAL. TVA FES WILL SELECT APPROPRIATE AOS FOR FABRIC.
5. PREFORATED DRAIN PIPE SHALL BE NEW MATERIAL & SHALL BE SLOTTED HDPE DRAIN TUBING AS MANUFACTURED BY ADVANCED DRAINAGE SYSTEM (APS) OR APPROVED EQUAL. SOLID OUTLET PIPE SHALL BE NON-PERFORATED PIPE BY SAME MANUFACTURER. PIPE SHALL BE JOINED BY COUPLINGS MANUFACTURED BY ADS, OR EQUAL.



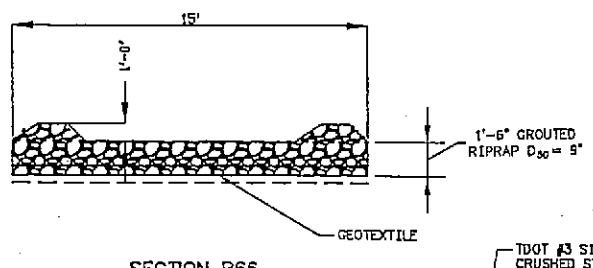
PLAN E66
EROSION PROTECTION FOR SUBGRADE



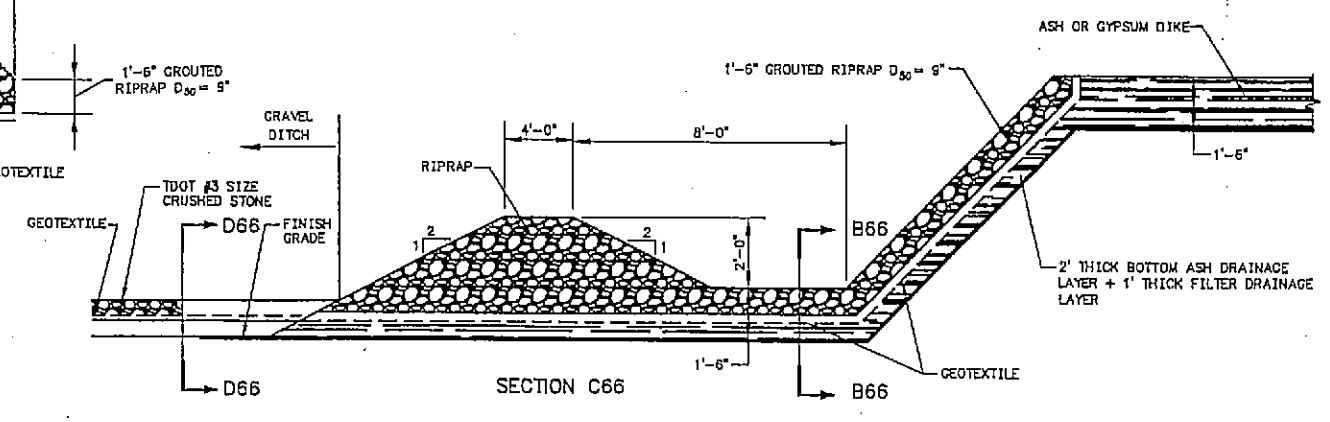
SECTION D66



PLAN
BOLLARDS @ MW



SECTION B66



SECTION C66

REV NO.	DATE	DRN	DSN	CHKD	SUPV	PMD	APPD	SMD	PROJECT ID	AS CONST	REV CD
R 0		DRS	JJM	WPT	HCP	RDP	JCA				D
ISSUED FOR DREDGE CELL EXPANSION											

SCALE: NOT TO SCALE — EXCEPT AS NOTED

YARD

DREDGE CELL LATERAL EXPANSION
DETAILS
SHEET #1

DESIGNED BY	DRAWN BY	CHECKED BY	SUPERVISED BY	REVIEWED BY	APPROVED BY	ISSUED BY
D.R. SMITH	J.L. MILES	W.A. TAYLOR	H.L. PETTY	R.E. PURKEY	J.C. ADAIR	

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R14 | SIZE 36 | C | 10W425-66 | R 0

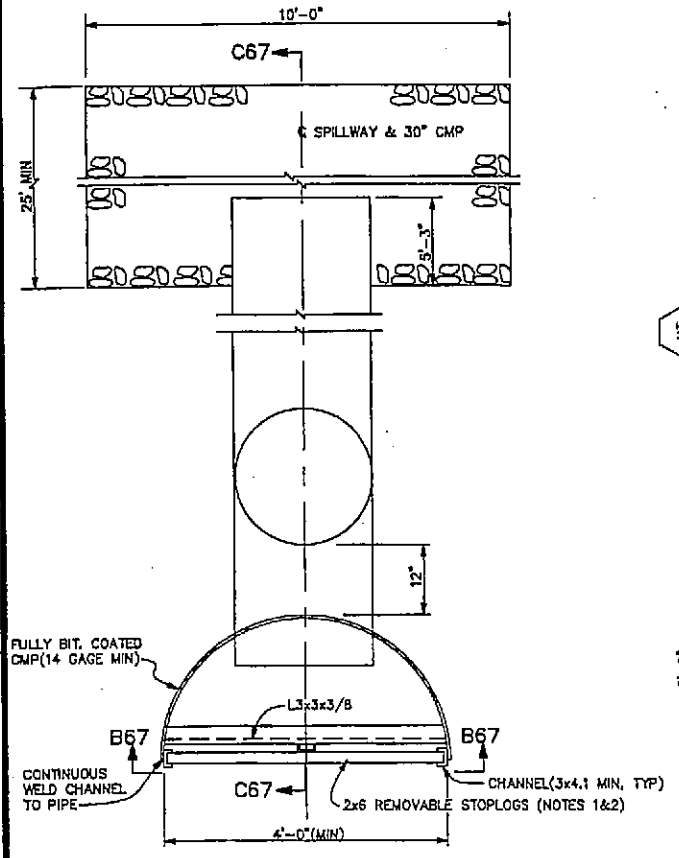
PARSONS | 0
TASK COMPLETED BY: | REV NO.

PLOT FACTOR:48
W_TVA

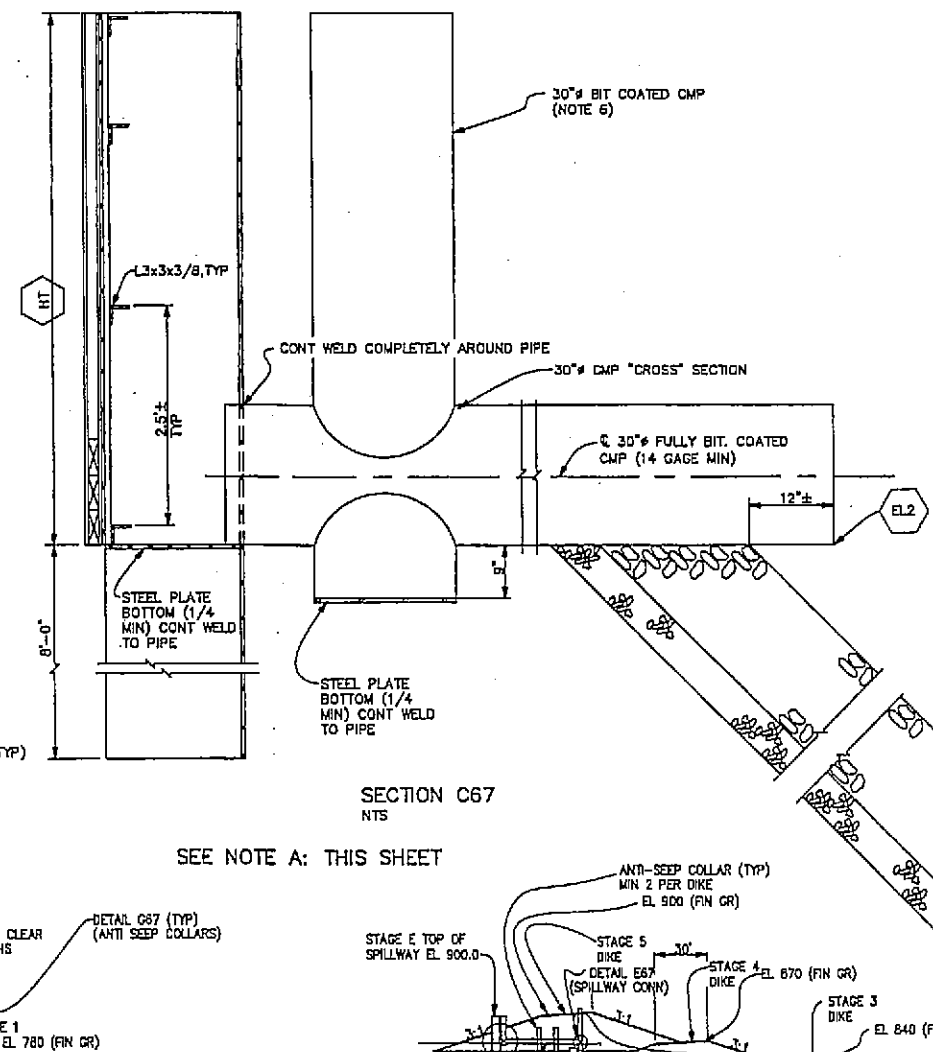
C.A.D. DRAWING
DO NOT ALTER MANUALLY

TVA-00018534

NOTES:
1. ALL TIMBER STOPLOGS SHALL BE SOUTHERN PINE NO. 2 DENSE SELECT TIMBER
2. ALL WOOD SHALL BE PRESSURE TREATED WITH 0.4–0.6 POUNDS OF PRESERVATIVE PER CUBIC FOOT OF WOOD. THE PRESERVATIVE SHALL BE WOLMAN PRESERVATIVE CCA BY KOPPERS OR EQUAL. SYNTHETIC MATERIALS (I.E. HDPE) MAY BE USED IN LIEU OF TIMBER STOPLOGS. MATERIAL SELECTION SELECTION BY TVA FES.
3. ALL NAILS SHALL BE GALVANIZED.
4. 30 INCH CORRUGATED METAL PIPE SHALL BE FULLY BITUMINOUS COATED AND 14 GAGE (MIN) THICKNESS.
5. RIPRAP SHALL CONSIST OF 50% OF THE STONES WEIGHING 100 LBS EACH OR GREATER, PER SECTION 575.
6. 30 INCH CROSS SECTION AND STANDPIPE NOT REQUIRED FOR STAGE E SPILLWAY.
7. A 6' x 6' HOLE SHALL BE EXCAVATED TO A DEPTH OF 8' FOR PLACEMENT OF THE 48" HALF-PIPE. THE AREA IS TO BE BACKFILLED WITH 1032 CRUSHED STONE AND COMPACTED UNTIL A STABLE BASE IS ACHIEVED.

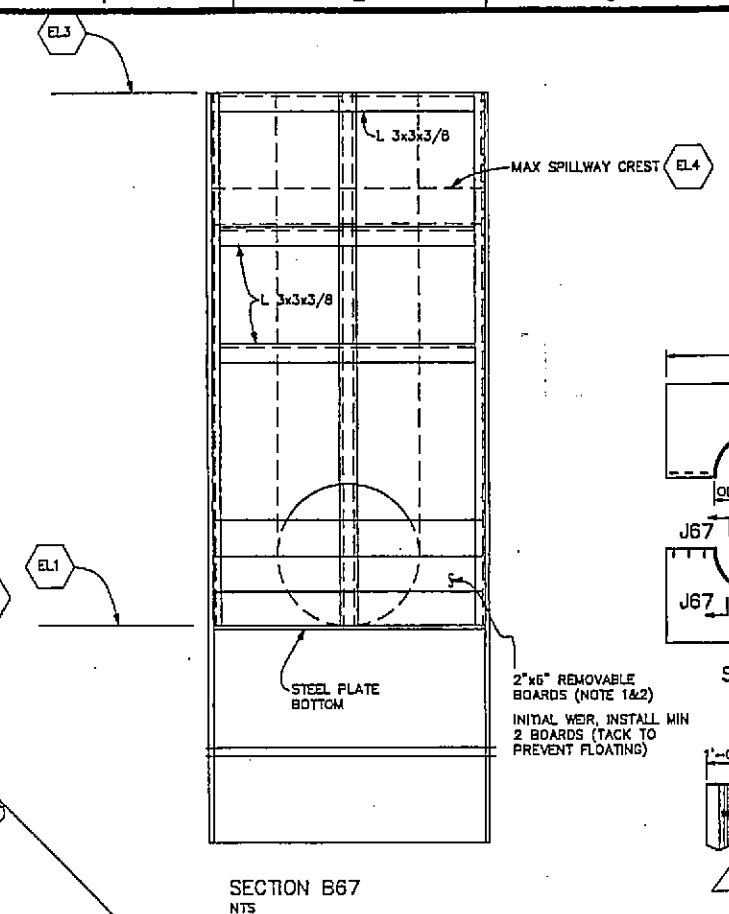


DETAIL A67
PLAN–METAL SPILLWAY
NTS



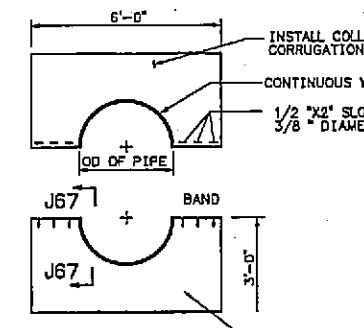
SECTION C67
NTS

SEE NOTE A: THIS SHEET

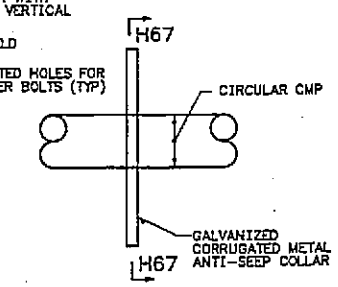


SECTION B67
NTS

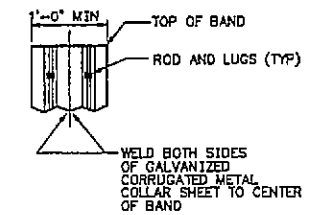
SEE NOTE A: THIS SHEET



SECTION H67



DETAIL G67
CORRUGATED METAL ANTI-SEEP COLLAR

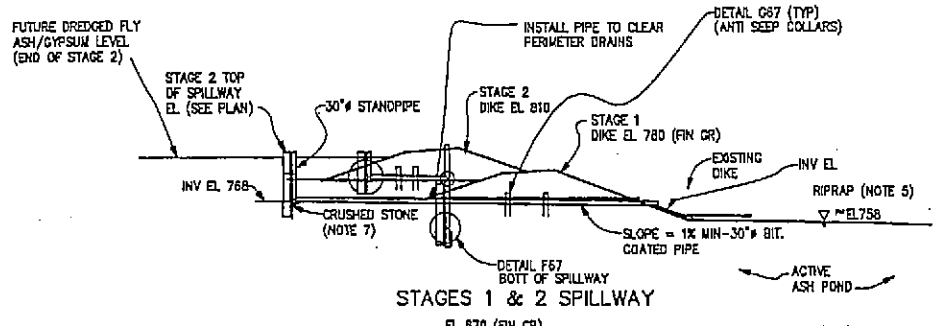


SECTION J67

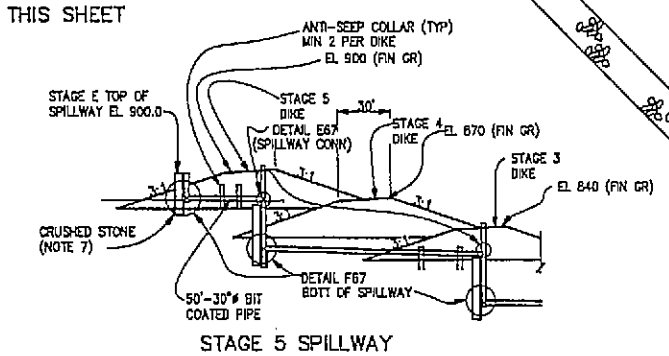
NOTES FOR METAL COLLARS:
1. UNASSEMBLED COLLARS SHALL BE MARKED BY PAINTING OR TAGGING TO IDENTIFY MATCHING PAIRS.
2. THE LAP BETWEEN THE TWO HALF SECTIONS INCLUDING BOLTS AND BETWEEN THE PIPE AND CONNECTING BAND SHALL BE CAULKED WITH ASPHALT MASTIC AT TIME OF INSTALLATION.
3. EACH COLLAR SHALL BE FURNISHED WITH TWO 1/2 " DIA RODS WITH STANDARD TANK LUGS FOR CONNECTING COLLARS TO PIPE.
4. CONTRACTOR MAY CONSTRUCT ANTI-SEEP COLLARS USING 1 FT THICK CONCRETE, 3,000 PSI MIN., TO THE SAME DIMENSIONS SHOWN.

NOTE A:

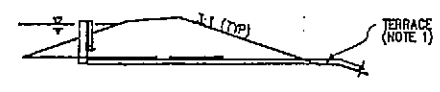
AN AGRI-DRAIN INLET (24" BY 120" WCS) IS AN ALLOWABLE ALTERNATIVE TO THIS STRUCTURE AT THE ENTRANCE AND EXIT OF THE PHASE I DREDGE CELL. SEE 10W425-77



STAGES 1 & 2 SPILLWAY



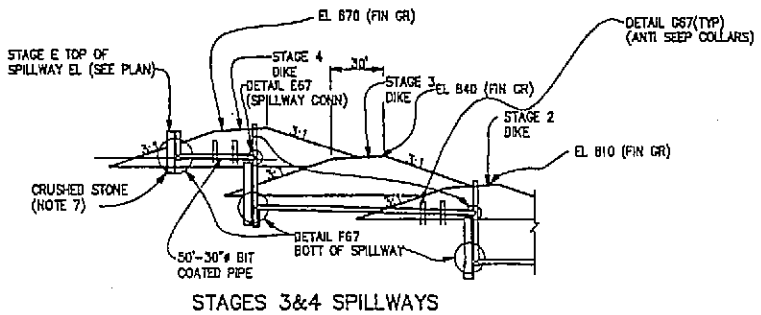
STAGE 5 SPILLWAY



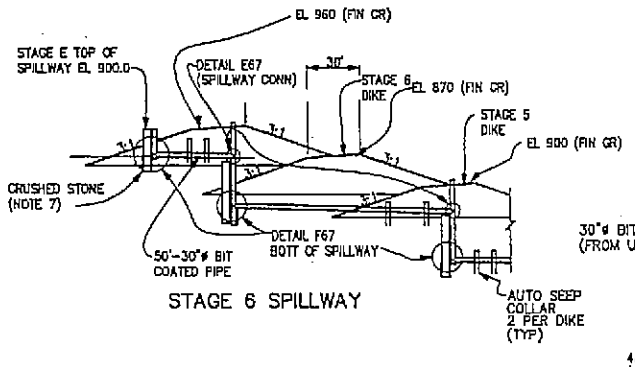
DETAIL K67

OPTIONAL METAL SPILLWAY CONFIGURATION

NOTE: DO NOT USE THIS DETAIL WHERE VEHICLE TRAFFIC MUST TRAVEL ON TERRACE.



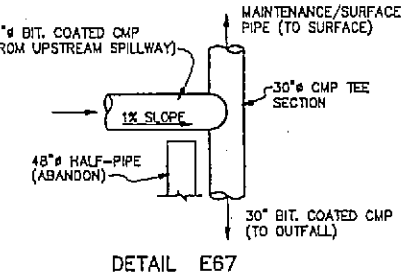
STAGES 3&4 SPILLWAYS



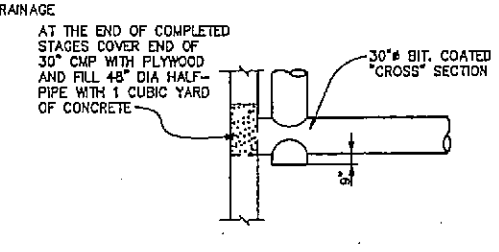
STAGE 6 SPILLWAY

DETAIL D67

METAL SPILLWAY STAGED CONSTRUCTION
(SEE OPTIONAL DETAIL K67)



DETAIL E67
SPILLWAY CONNECTION
1"=5'



DETAIL F67
BOTTOM OF SPILLWAY
1"=5'

REV NO.	DATE	DRAWN	DSGN	CHKD	SUPV	SVSD	APRD	SBCD	PROJECT ID	AS CONST REV NO.
R 0		DRS	JJM	WPT	HLP	RCP	JCA			D
ISSUED FOR DREDGE CELL EXPANSION										

SCALE: 1"=40' EXCEPT AS NOTED

YARD

DREDGE CELL LATERAL EXPANSION METAL SPILLWAY DETAILS SHEET 2

DESIGNED BY	DRAWN BY	CHECKED BY	SUPERVISED BY	REVIEWED BY	APPROVED BY	ISSUED BY
D.R. SMITH	J.L. MILES	W.P. TAYLOR	H.L. PETTY	R.E. PURKEY	L.G. ADAIR	

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

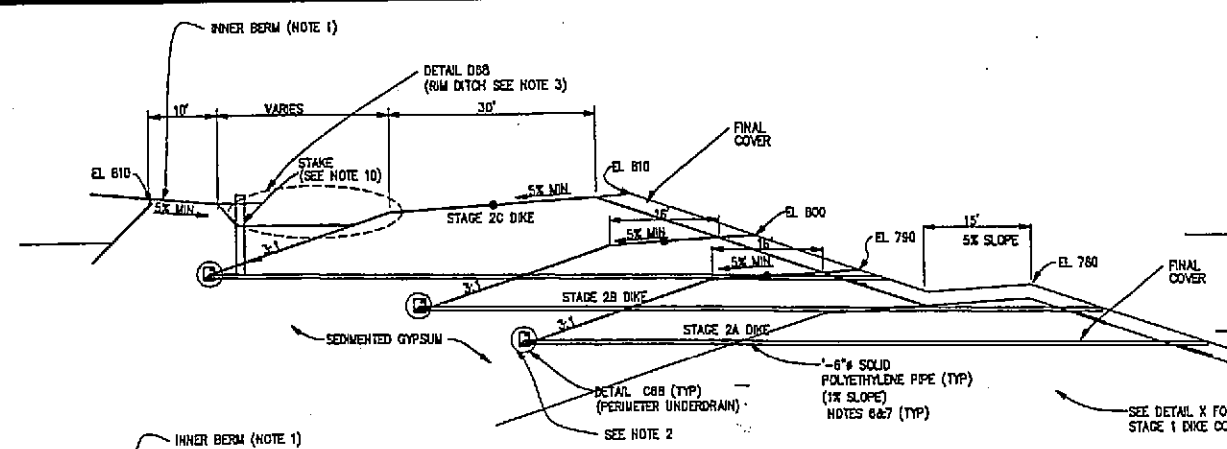
AUTOCAD R14 | SIZE 36 | C | 10W425-67 | R 0

PARSONS | TASK COMPLETED BY: | REV NO.

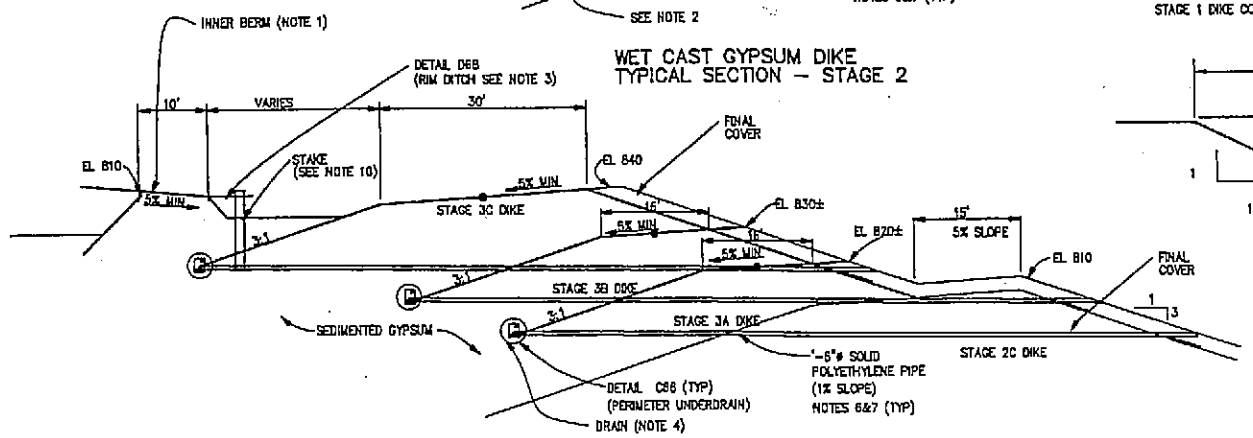
PLOT FACTOR:1=1
W_TVA

C.A.D. DRAWING DO NOT ALTER MANUALLY

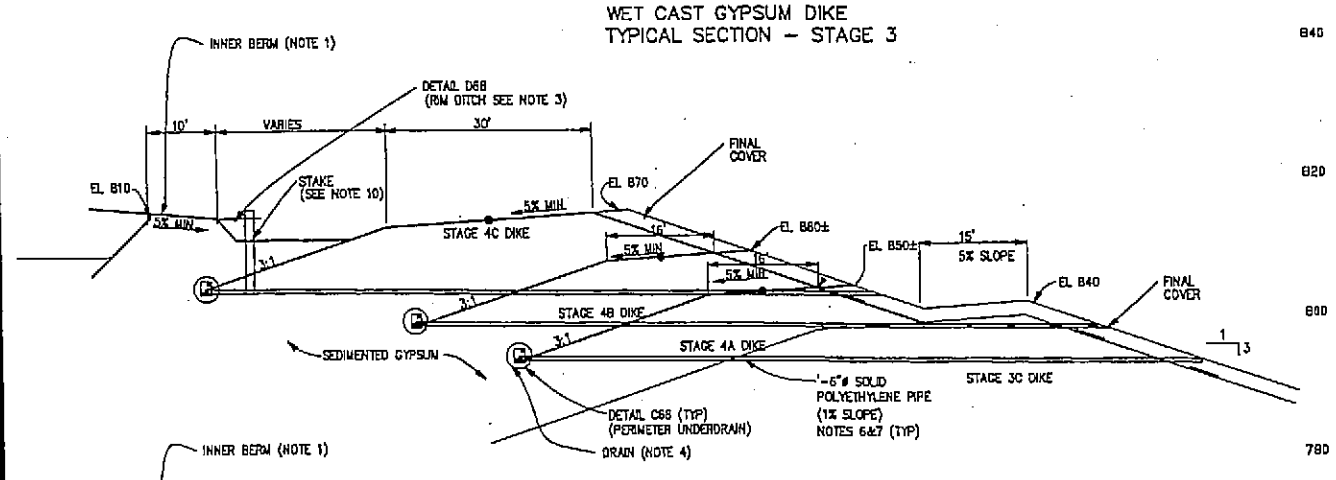
TVA-00018535



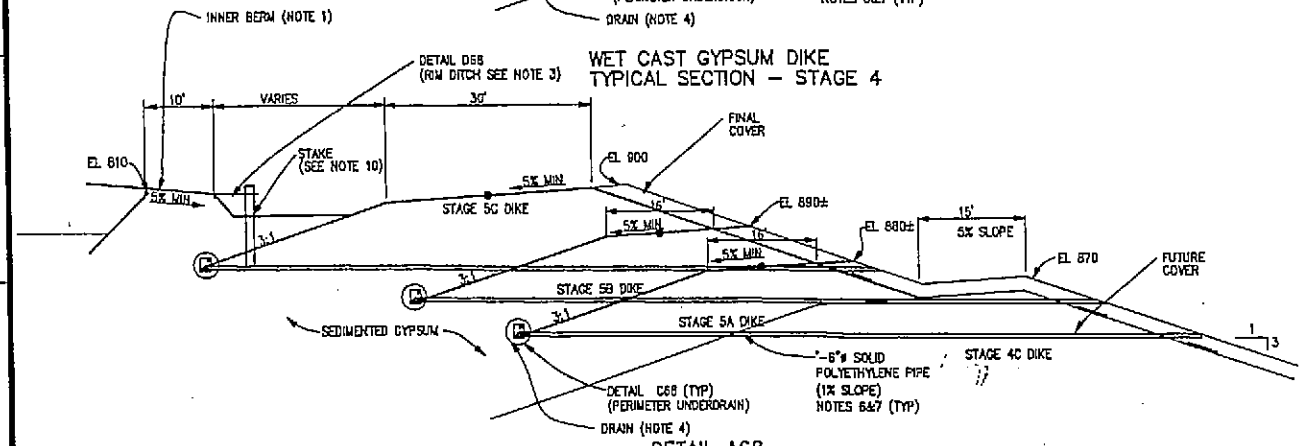
WET CAST GYPSUM DIKE
TYPICAL SECTION – STAGE 2



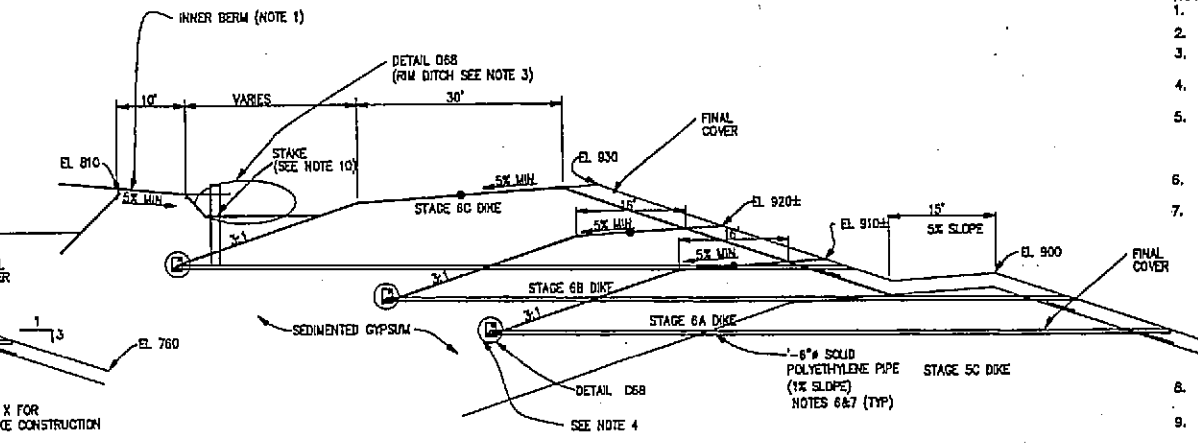
WET CAST GYPSUM DIKE
TYPICAL SECTION – STAGE 3



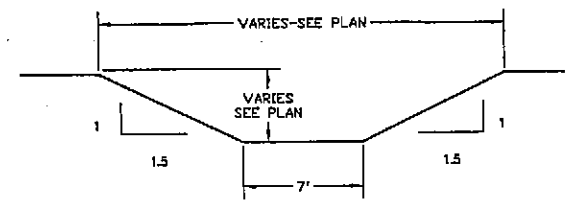
WET CAST GYPSUM DIKE
TYPICAL SECTION – STAGE 4



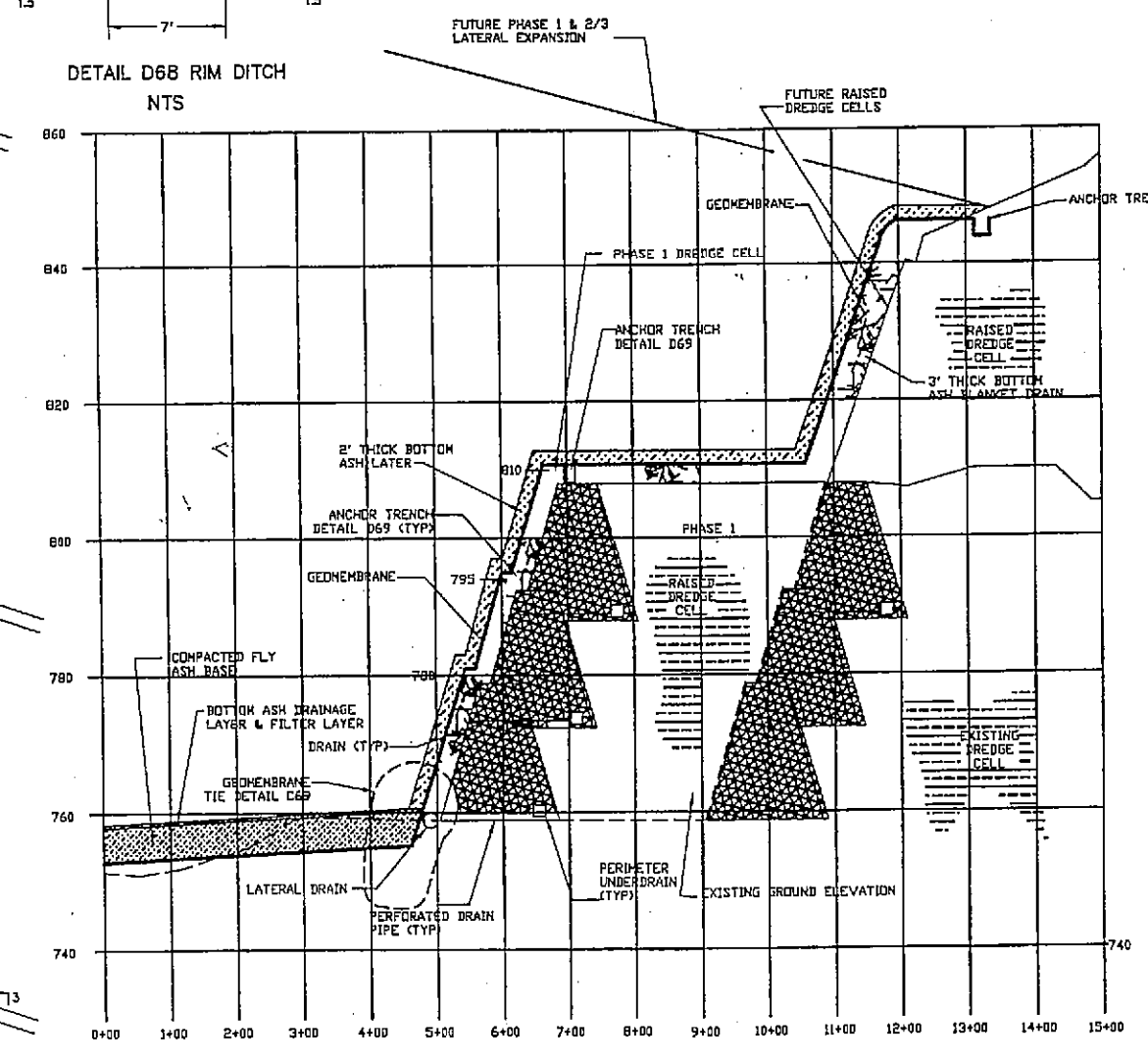
DETAIL A68
WET CAST GYPSUM DIKE
TYPICAL SECTION – STAGE 5



WET CAST GYPSUM DIKE
TYPICAL SECTION – STAGE 6

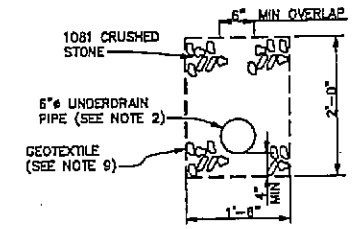


DETAIL D68 RIM DITCH
NTS



DETAIL B68
BLANKET DRAIN/HYDRAULIC ISOLATION
PHASE 1 & 2/3 INTERFACE

NOTES:
1. FOR DRAWINGS LIST AND LEGEND SEE 10W425-20.
2. FOR GENERAL NOTES SEE 10W425-26.
3. CONSTRUCT RIM DITCHES AT EACH INTERMEDIATE A,B, & C DIKE RIM DITCHES FOR A & B DIKES NOT SHOWN FOR CLARITY.
4. INSTALL DRAINS SO THAT THEY ARE BENEATH INVERT ELEVATION OF RIM DITCH.
5. UNDERDRAIN PIPE SHALL BE PERFORATED POLYETHYLENE CORRUGATED TUBING AS MANUFACTURED BY ADVANCED DRAINAGE SYSTEMS, INC., COLUMBUS, OHIO (614) 457-3051 OR EQUAL. UNDERDRAINS SHALL BE CONSTRUCTED IN ACCORDANCE WITH SECTION 500.
6. PERIMITER UNDERDRAIN SHALL HAVE MIN 1% SLOPE FROM HIGH PTS TO LOW POINTS PLACE LOCATOR OUTLET PIPES AT LOW POINTS.
7. LATERAL OUTLET PIPE SHALL BE NON-PERFORATED POLYETHYLENE CORRUGATED TUBING AS MANUFACTURED BY ADVANCED DRAINAGE SYSTEMS, INC., COLUMBUS, OHIO (614) 457-3051 OR EQUAL.
8. LATERAL OUTLET PIPES SHALL BE PLACED EVERY 200 FEET ON CENTER.
9. GEOTEXTILE SHALL BE A WOVEN MONOFILAMENT WITH AN APPARENT OPENING SIZE (AOS) SELECTED BY TVA FES (US STANDARD SIEVE SIZE) WHEN TESTED IN ACCORDANCE WITH ASTM D 4751. THE GEOTEXTILE SHALL BE GEOTEX 104F AS MANUFACTURED BY SYNTHETIC INDUSTRIES OR APPROVED EQUAL.
10. AFTER INSTALLATION OF PERIMETER DRAIN, INSTALL STAKES AT DRAINAGE OUTLET. PROVIDE A MARK ON THE STAKE INDICATING THE DEPTH TO THE DRAIN PIPE VISIBLE TO EQUIPMENT OPERATOR TO PREVENT DAMAGE TO DRAIN PIPE.



DETAIL C68
PERIMETER UNDERDRAIN
1" = 1'-0"

NOTES FOR PHASE 1 & 2/3 INTERFACE:
1. CONSTRUCT BLANKET DRAIN & GEOMEMBRANE IN SEGMENTS AS EACH STAGE IS COMPLETED.
2. EXPOSED GEOMEMBRANE SHALL BE COVERED WITH NON-WOVEN GEOTEXTILE.
3. PROVIDE A SYSTEM OF SANDBAGS OR OTHER APPROVED METHOD TO SECURE EXPOSED GEOMEMBRANE FROM WIND.

REV NO.	DATE	DRN	DSGN	CHKD	SUPV	SYMB	APPD	DSGN	PROJECT ENGR	AS BUILT
R 0		DRS	BSB	WPT	HLP	REP	JGA		FDS052	
ISSUED FOR DREDGE CELL EXPANSION										

SCALE: NTS — EXCEPT AS NOTED

YARD

DREDGE CELL LATERAL EXPANSION
PHASE 2/3
TYPICAL CROSS SECTION & DETAILS

DESIGNED BY	DRAWN BY	CHECKED BY	SUPERVISED BY	REVIEWED BY	APPROVED BY	ISSUED BY
D.R. SMITH	B.S. BURT	W.P. TAYLOR	H.L. PETTY	R.E.PURKEY	J.G. ADAIR	

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

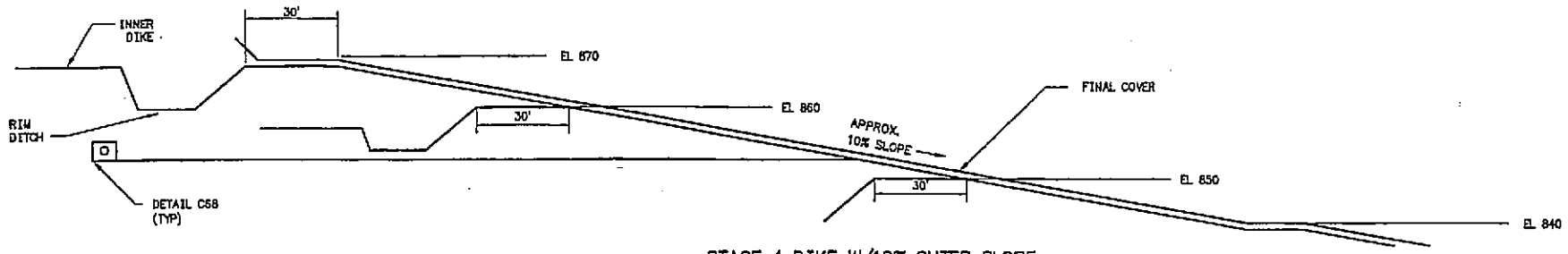
AUTOCAD R14 | DATE | 36 | C | 10W425-68 | R 0

PARSONS | 0
TASK COMPLETED BY | REV NO.

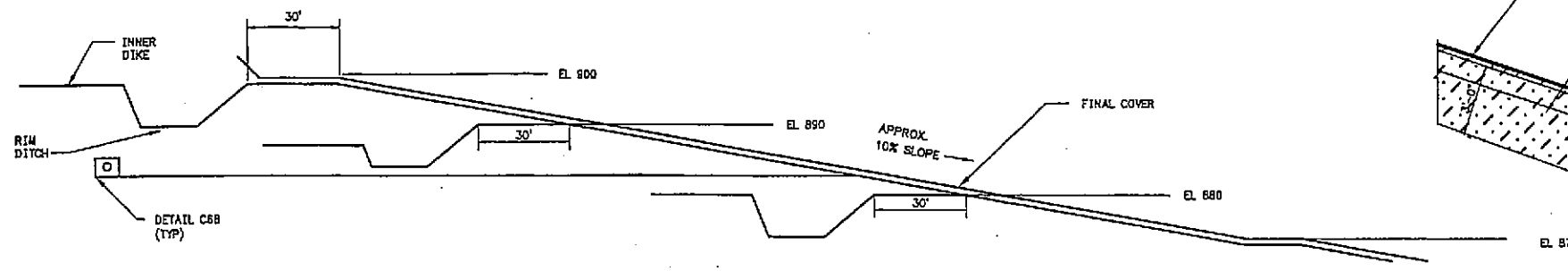
PLOT FACTOR: W_TVA

C.A.D. DRAWING DO NOT ALTER MANUALLY

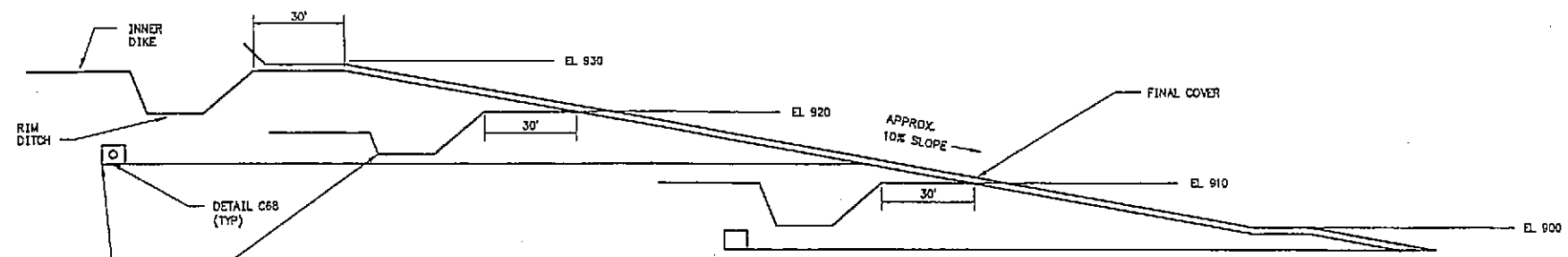
TVA-00018536



STAGE 4 DIKE W/10% OUTER SLOPE



STAGE 5 DIKE W/10% OUTER SLOPE



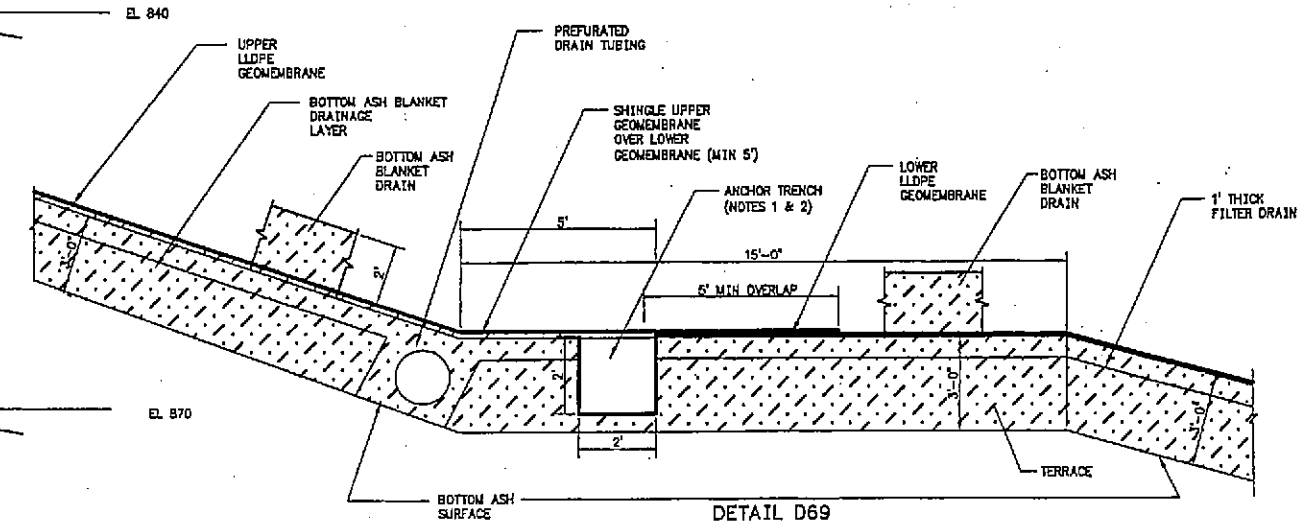
STAGE 6 DIKE W/10% OUTER SLOPE

DETAIL A69

INSTALL DRAIN AT EACH APPROXIMATE 10' LIFT. ENSURE THAT DRAIN CLEARS RIM DITCH. INSTALL STAKES & MARK ELEV. OF DRAIN PIPES SO THAT EQUIPMENT OPERATORS DO NOT DAMAGE DRAIN PIPES.

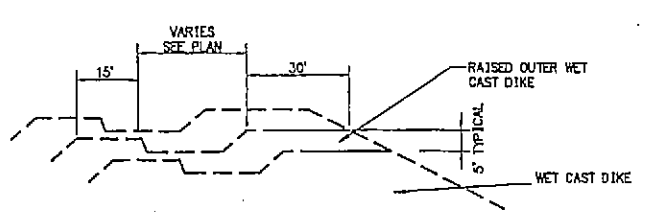
NOTES:

1. FOR DRAWINGS LIST AND LEGEND SEE 10W425-20
2. FOR GENERAL NOTES SEE 10W425-26

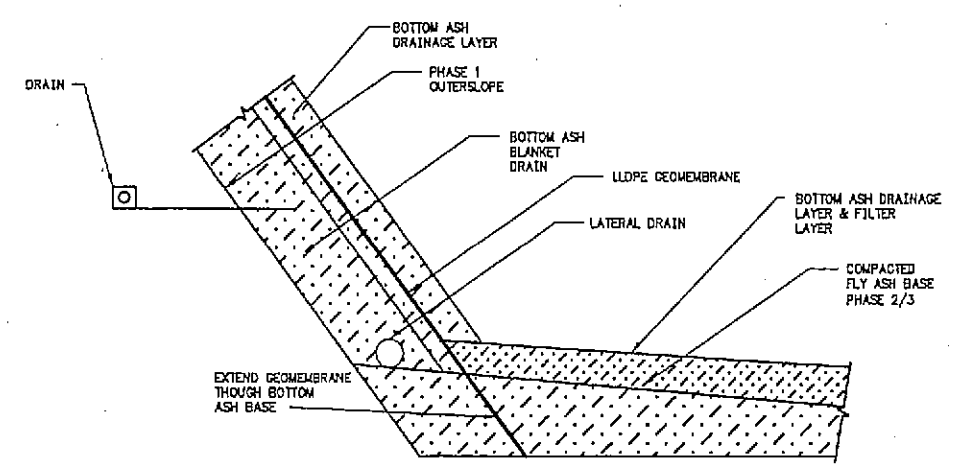


DETAIL D69
GEOMEMBRANE ANCHOR DETAIL
FOR HYDRAULIC ISOLATION

1. EXCAVATE ANCHOR TRENCH INTO BOTTOM ASH DRAINAGE LAYER BACKFILL WITH EXCAVATED BOTTOM ASH & COMPACT TO 95% STANDARD PROCTOR DENSITY
2. OMIT ANCHOR TRENCH FOR TERRACE AT EL 760.



DETAIL B69
DIKE RAISING 5' INCREMENT



DETAIL C69
GEOMEMBRANE TIE DETAIL
(10W425-68)

REV NO.	DATE	DRWN	DSGN	CHKD	SUPV	SYMB	APPD	CHKD	PROJECT ID	AS BUILT	REV NO.
R 0		DRS	BSB	MPT	HLP	REP	JGA		FUSS02		
ISSUED FOR DREDGE CELL EXPANSION											

SCALE: NTS EXCEPT AS NOTED

YARD

DREDGE CELL LATERAL EXPANSION
DETAILS- WET CAST GYPSUM
DIKE RAISING SHEET #4

DESIGNED BY	DRAWN BY	CHECKED BY	SUPERVISED BY	REVIEWED BY	APPROVED BY	ISSUED BY
D.R. SMITH	B.S. BURT	M.P. TAYLOR	H.L. PETTY	R.E. PURKEY	J.G. ADAIR	

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R14 | SIZE 36 | C | 10W425-69 | R 0

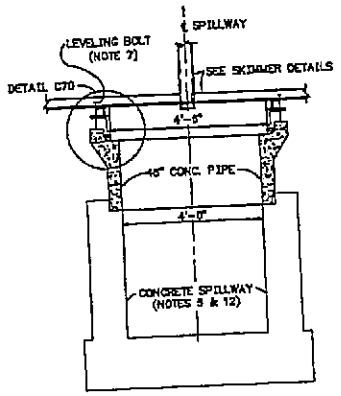
PARSONS | 0
TASK COMPLETED BY: | REV NO.

PLOT FACTOR:1
W_TVA

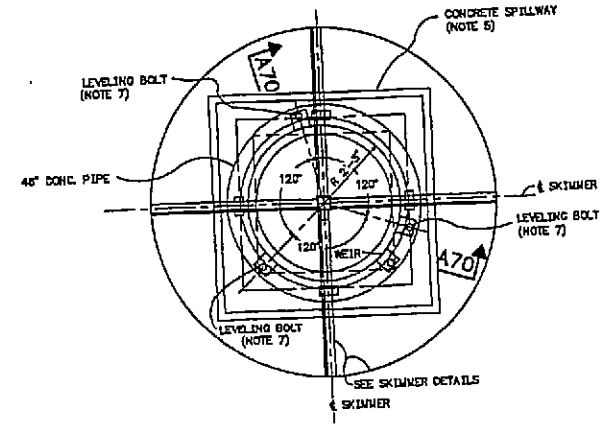
C.A.D. DRAWING
DO NOT ALTER MANUALLY

36 C 10W425-69

TVA-00018537

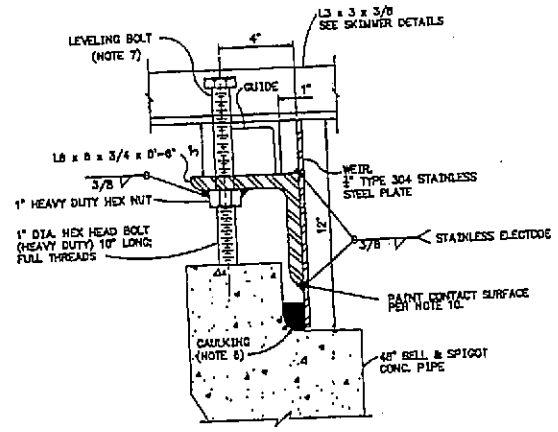


SECTION A70



PLAN

DETAIL B70
WEIR DETAILS



DETAIL C70
3 REQUIRED
3"=1'-0"

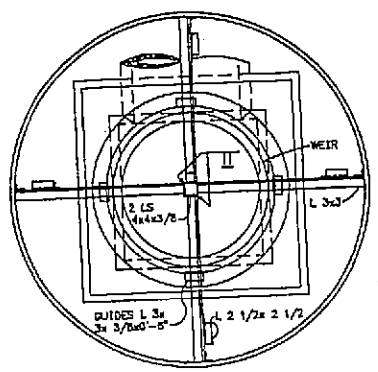
WEIR DISCHARGE *
IN CUBIC FEET PER SECOND

HEAD IN FEET	0.0	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	.0	.04	.11	.21	.35	.52	.72	.95	1.20	1.34
0.1	1.54	1.75	1.97	2.20	2.44	2.70	2.96	3.24	3.52	3.81
0.2	4.11	4.41	4.72	5.04	5.36	5.69	6.04	6.38	6.73	7.10
0.3	7.47	7.85	8.23	8.62	9.00	9.41	9.82	10.20	10.60	11.10
0.4	11.50	11.90	12.40	12.80	13.30	13.70	14.20	14.70	15.10	15.60
0.5	16.10	16.60	17.10	17.60	18.10	18.60	19.10	19.60	20.10	20.70
0.6	21.20	21.70	22.30	22.80	23.40	23.90	24.50	25.00	25.60	26.20
0.7	26.70	27.30	27.90	28.50	29.10	29.70	30.30	30.90	31.50	32.10
0.8	32.70	33.40	34.00	34.60	35.20	35.90	36.50	37.20	37.80	38.50
0.9	39.10	39.80	40.40	41.10	41.80	42.50	43.10	43.80	44.50	45.20
1.0	45.90									

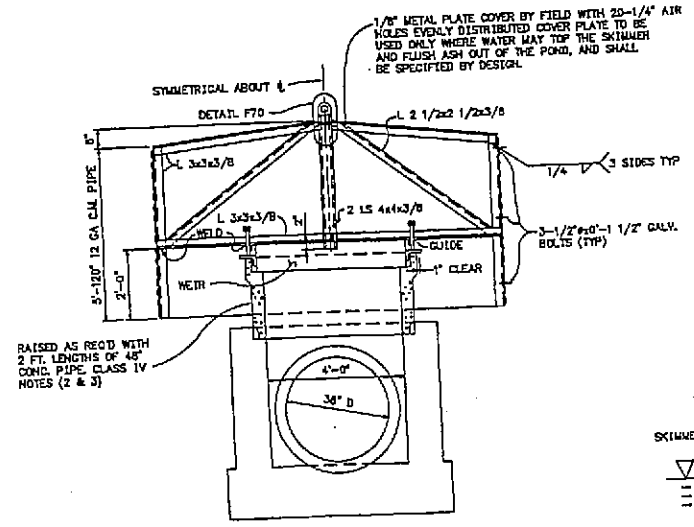
* 4'-6" DIAMETER

BILL OF MATERIAL

ITEM	DESCRIPTION	NO. SPLWYS.	PER SPLWY.	TOTAL REQ'D.
	WEIR			
ANGLE	6 x 6 x 3/4 x 0'-6"		3	
BOLT	1"Øx0'-10" HEAVY DUTY (FULL THREADS) WITH NUT		3	
PL	1/4x12 x 14'-2" TYPE 430 STAINLESS BY FIELD		1	
CAULKING				
	SKIMMER			
660	120"x12 GAGE CORRUGATED METAL PIPE (NOTE 4)		5 FT.	
BOLT	1/2"Øx0'-1 1/2 GALVANIZED		12	
PL	1/8" METAL COVER (BY FIELD SEE DETAILS)		1	
ANGLE	2 1/2 x 2 1/2 x 3/8		23 FT.	
ANGLE	3 x 3 x 3/8		64 FT.	
ANGLE	4 x 4 x 3/8		8 FT.	

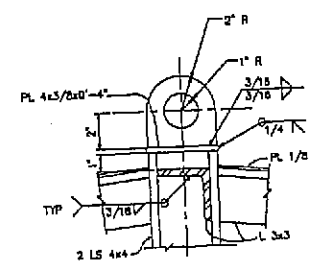


SECTIONAL PLAN

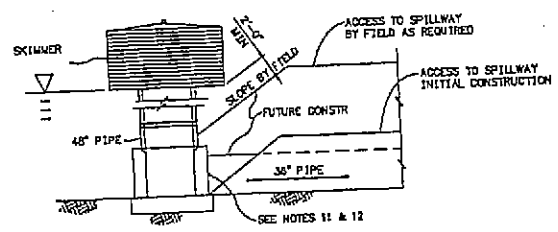


SECTIONAL ELEVATION

DETAIL D70
SKIMMER DETAILS



DETAIL F70
3"=1'-0"



DETAIL E70
TYPICAL SECTION FOR
ACCESS TO SPILLWAY
3/16"= 1'-0"

BENT BAR LIST

BAR MARK	NO REQ'D	BENDING DIMENSIONS a	b	c	e
4L6-3	10	4-4	EX		
4T20-6	1	5-0	5-0		
4U14-9	1	5-0	5-0	EX	
4L2-8	4	1-3	EX		

TYPE A SPILLWAYS

BENT BAR LIST

BAR MARK	NO REQ'D	BENDING DIMENSIONS a	b	c	e
4L6-3	16	4-4	EX		
4T20-6	1	5-0	5-0		
4U14-9	3	5-0	5-0	EX	

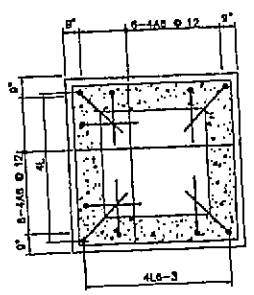
TYPE B SPILLWAYS

BILL OF MATERIAL

ITEM	DESCRIPTION	NO. OF SPLWYS	PER SPLWY	TOTAL REQD
402	CLASS X CONCRETE		5 CU. YD.	
418	REINFORCING STEEL		170 LB.	
	18" D REINFORCED CONCRETE PIPE-CLASS II			
	36" D REINFORCED CONCRETE PIPE-CLASS III			
803	48" D REINFORCED CONCRETE PIPE-CLASS IV			

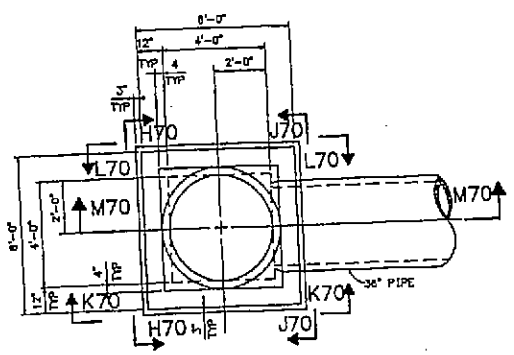
NOTES:
1. A SECTION OF 120" DIA. CORRUGATED METAL PIPE, FULLY COATED, SHALL BE USED FOR THE SKIMMER DEVICE. ALL SEAMS AND JOINTS SHALL BE RIVETED. FABRICATION OF THE PIPE SHALL BE COMPLETE PRIOR TO COATING.
2. ONE SECTION OF 48" PIPE SHALL BE INSTALLED DURING INITIAL CONSTRUCTION.
3. AS ADDITIONAL SECTIONS OF 48" PIPE ARE ADDED, GROUT THE JOINT TO FORM A STABLE AND WATER TIGHT CONNECTION.
4. ALL CONNECTIONS TO BE WELDED.
5. FOR SPILLWAY DETAILS SEE STD. DWG. SD-C11.1.
6. CAULKING SHALL EXTEND COMPLETELY AROUND THE WEIR AND FORM A WATER TIGHT SEAL.
7. WHEN THE WEIR IS INSTALLED THE TOP SHALL BE LEVELED WITH THE USE OF LEVELING BOLTS.
8. ALL WELDS BY TVA FIELD SHALL BE MADE AND INSPECTED IN ACCORDANCE WITH TVA CONSTRUCTION SPECIFICATION G29C.
9. ALL WELDS BY TVA TO HAVE VISUAL INSPECTION.
10. ALL SURFACES OF FABRICATED STEEL ITEMS SHALL BE PAINTED IN ACCORDANCE WITH CONSTRUCTION SPECIFICATION G14, PART XIX.
11. DEWATER AREA WHERE WEIRS ARE TO BE INSTALLED BY CONSTRUCTING ASH DIKES OR INSTALLING SHEET PILE, AND REMOVING WATER FROM THE INSTALLATION AREA. DESIGN OF ASH DIKES AND/OR SHEET PILE BY TVA FES.
12. PROVIDE ADEQUATE FIRM BASE FOR INSTALLATION OF CONCRETE SPILLWAY BY INSTALLING ROCK BASE OR TENSAR GEOGRID. SELECTION OF TENSAR GEOGRID. SELECTION OF TENSAR GEOGRID BY TVA FES.

NOTES:
1. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE T-1 SPECIFICATIONS, UNLESS OTHERWISE NOTED.
2. ALL CONCRETE SHALL BE CLASS "X" IN ACCORDANCE WITH SECTION 400.
3. ALL REINFORCEMENT SHALL CONFORM TO ASTM SPECIFICATION A615 GRADE 60, DEFORMED.
4. DIMENSIONS SHOWN ARE TO THE CENTERLINE OF REINFORCING BARS, UNLESS OTHERWISE NOTED.
5. CONCRETE CLEAR COVER DIMENSIONS ARE AS FOLLOWS:
   3 INCHES FOR FACES CAST AGAINST EARTH OR ROCK;
   2 INCHES FOR ALL OTHER FACES.

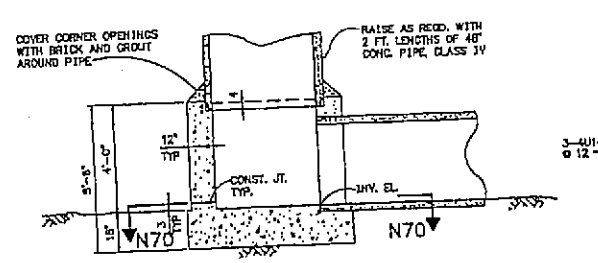


SECTION N70
(TYPE A & B)

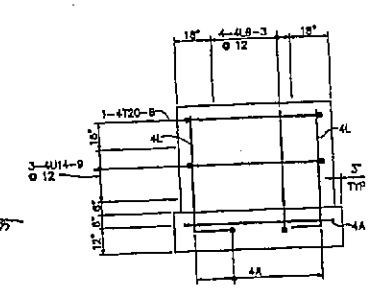
NOTE:
PIPES NOT SHOWN



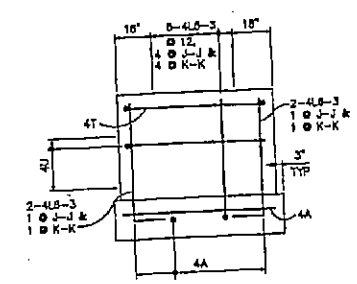
DETAIL G70
PLAN-SPILLWAY TYPE B



SECTION M70



SECTION H70
SECTION J70
(OPPOSITE HAND)



SECTION K70
SECTION L70
(OPPOSITE HAND)

REV NO.	DATE	ORIG	DRAW	CHKD	SUPV	APVD	APVD	DRAW	PROJECT ENGR	AS CONST
R 0		DKS	J.L.M	WPT	H.L.P	RCP	JCA			
ISSUED FOR DREDGE CELL EXPANSION										

SCALE: 1/2"=1'-0" EXCEPT AS NOTED

YARD

ASH DISPOSAL AREA LATERAL EXPANSION
WEIR & SKIMMER DETAILS

DRAWN BY	CHKD BY	CHECKED BY	SUPERVISED BY	REVIEWED BY	APPROVED BY	ISSUED BY
D.R. SMITH	J.L. MILES	V.P. TAYLOR	H.L. PETTY	R.C. PURKEY	J.C. ADAIR	

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

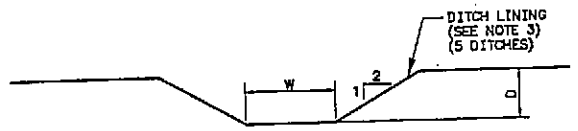
AUTOCAD R14 | DWG 36 | C | 10W425-70 | R 0

PLOT FACTOR:1
W_TVA

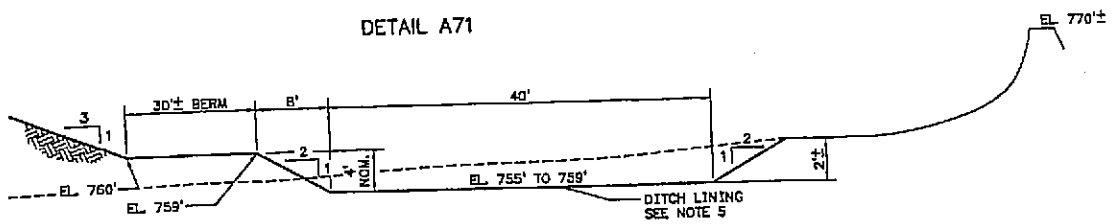
C.A.D. DRAWING
DO NOT ALTER MANUALLY

PARSONS | 0
TASK COMPLETED BY: | REV NO.

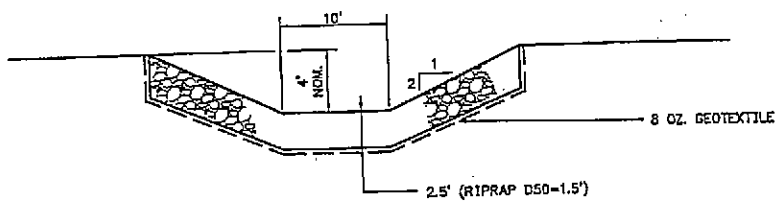
TVA-00018538



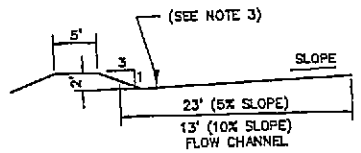
DETAIL A71



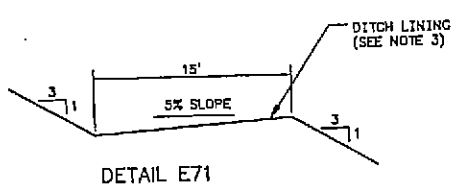
DETAIL B71



DETAIL C71

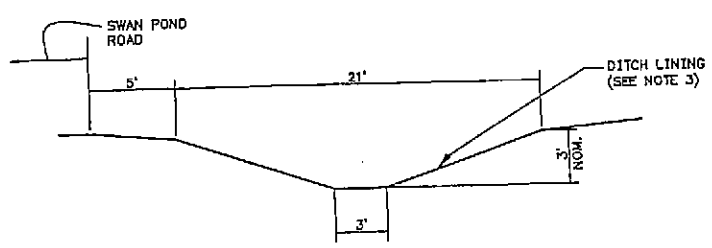


DETAIL D71

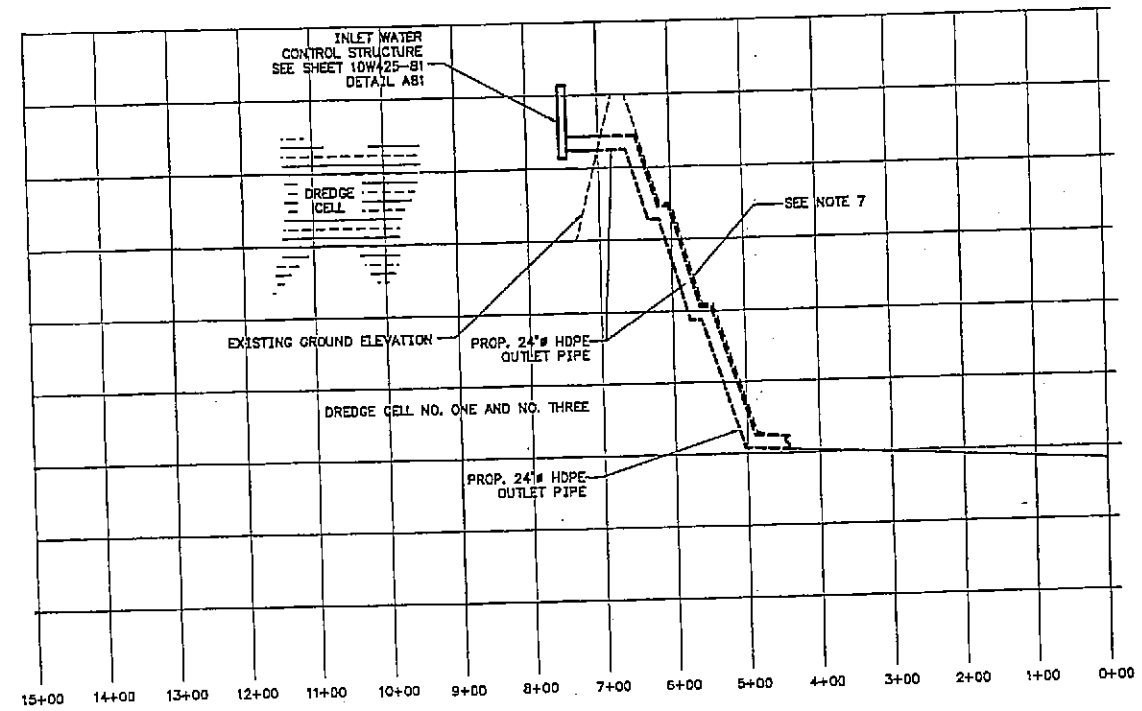


DETAIL E71

TERRACE DITCH



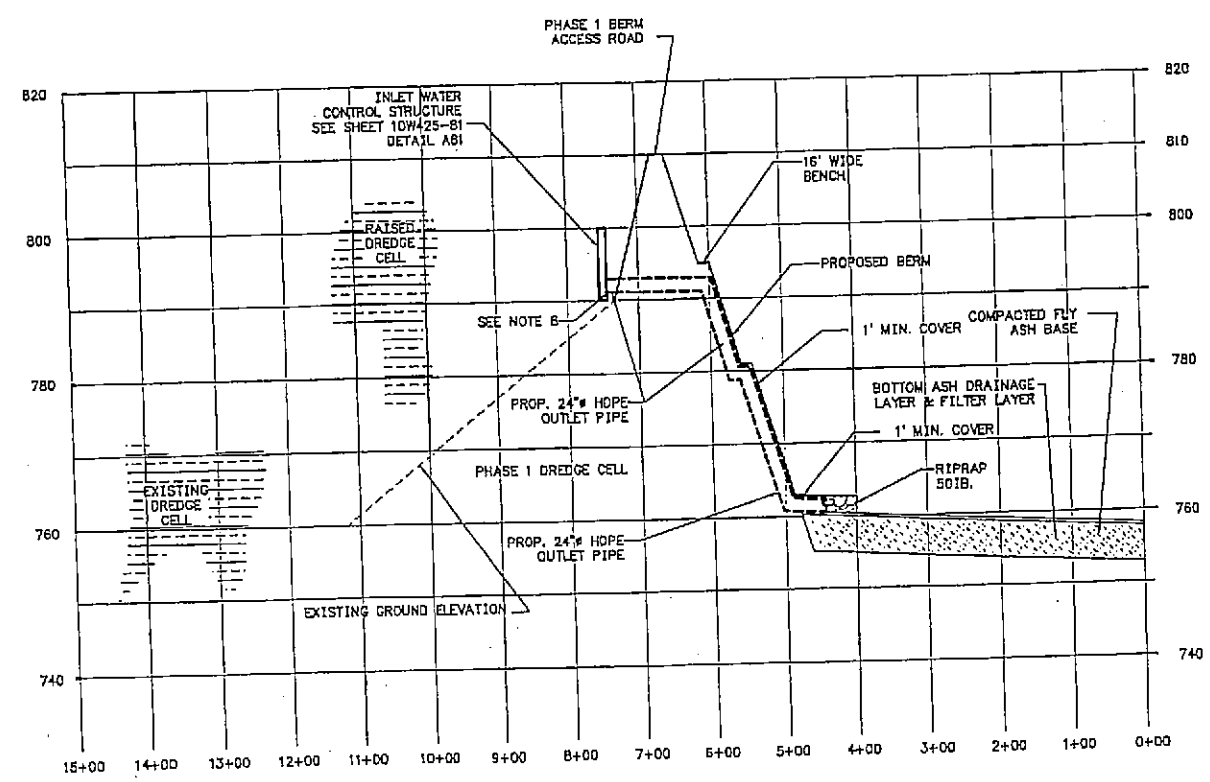
DETAIL F71



DETAIL G71

SECTION WITH OUTLET DRAIN PIPE

INTO PHASE 1 DREDGE CELL



DETAIL H71

SECTION WITH OUTLET DRAIN PIPE

PHASE 1 DREDGE CELL OUTLET

NOTES:

1. FOR DRAWINGS LIST AND LEGEND SEE 10W425-20
2. FOR GENERAL NOTES SEE 10W425-26
3. SEED DITCH IN ACCORDANCE WITH SECTION 581. INSTALL JUTE MATTING (NORTH AMERICAN GREEN 5150 OR SYNTHETIC INDUSTRIES LAND LOK-2) ON SEEDED AREAS WITHIN THE TOP WIDTH OF DITCH IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.
4. FOR LETDOWN CHANNELS SEE 10W425-74 & -75.
5. PERMANENT SOIL REINFORCEMENT/LINER SHALL BE PYRAMAT BY SYNTHETIC INDUSTRIES, INC. OR EQUAL INSTALLED AND ANCHORED PER MANUFACTURERS INSTRUCTIONS.
6. FOR DITCH DRAINAGE PLAN & SCHEDULE, SEE 10W425-76.
7. PROGRESSIVE RAISING OF THE INLET CONTROL STRUCTURE ARE BY FIELD. (THREE SHOWN)
8. INVERT ELEVATION BY FIELD.

REV. NO.	DATE	DRWN	DSGN	CHKD	SUPV	RVWD	APVD	MGR	PROJECT ID	LU CONST
R										0
R 0		DRS 1	J.J.	MPT	H.L.P.	REP	JCIA			

ISSUED FOR DREDGE CELL EXPANSION

SCALE: NOT TO SCALE — EXCEPT AS NOTED

YARD

DREDGE CELL LATERAL EXPANSION
DITCH DETAILS & MISC DETAILS
SHEET #1

DESIGNED BY	DRAWN BY	CHECKED BY	SUPERVISED BY	REVIEWED BY	APPROVED BY	ISSUED BY
D.A. SMITH	J.L. SALES	W.P. TAYLOR	H.L. PETTY	R.E. PURKEY	J.G. ADAIR	

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

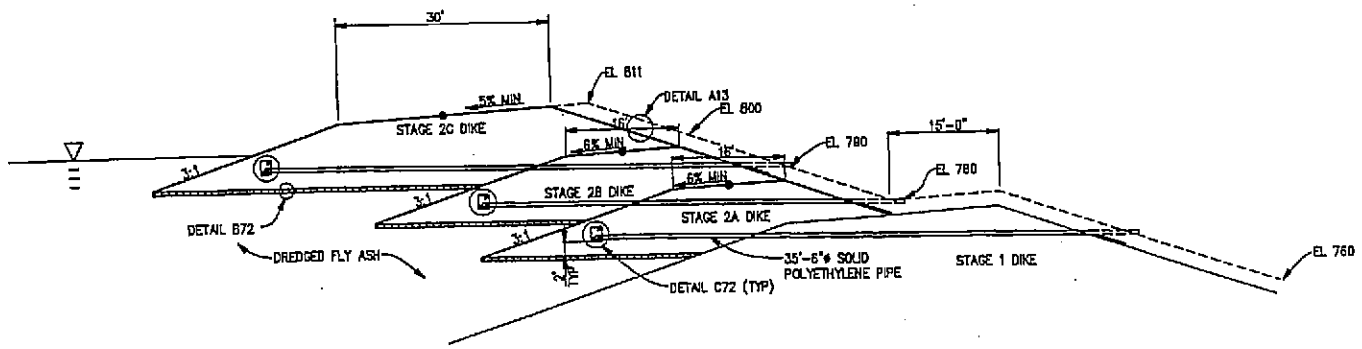
AUTOCAD R14 | DATE | 36 | C | 10W425-71 | R 0

PARSONS | 0
TASK COMPLETED BY: | REV NO.

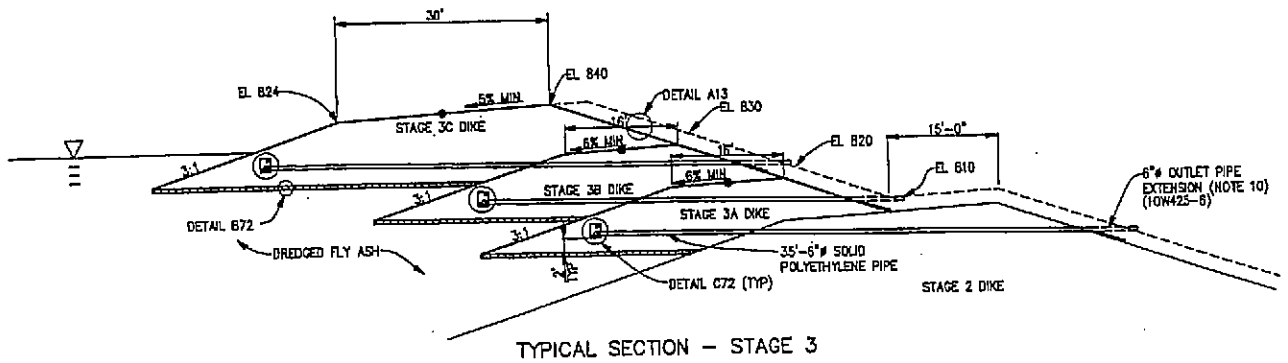
PLOT FACTOR:56
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

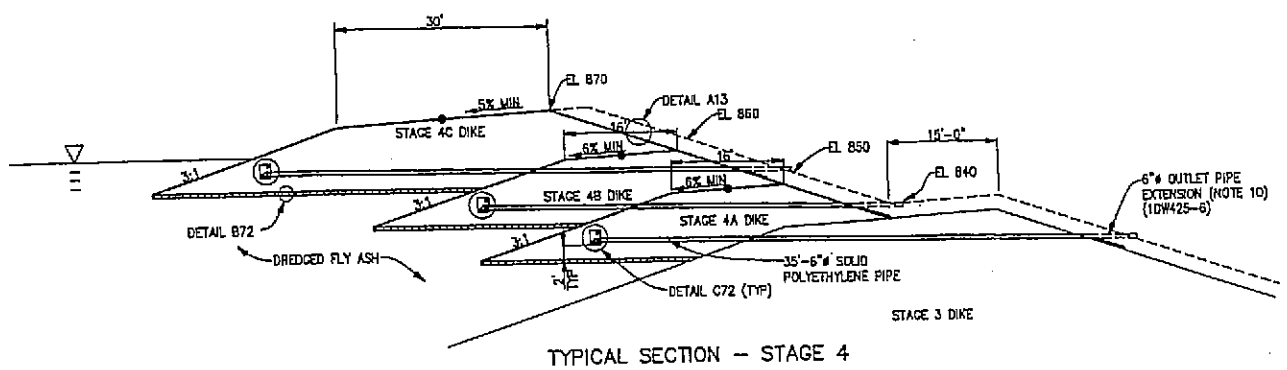
TVA-00018539



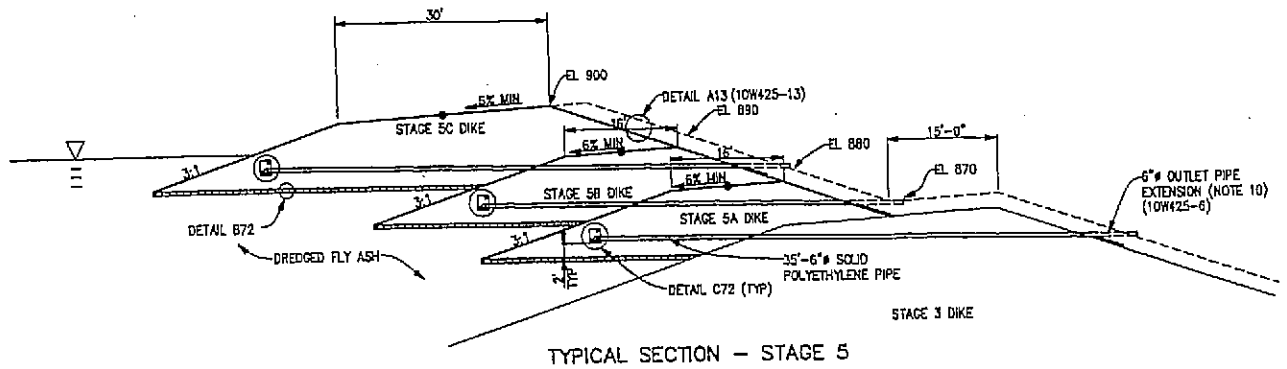
TYPICAL SECTION – STAGES 1&2



TYPICAL SECTION – STAGE 3

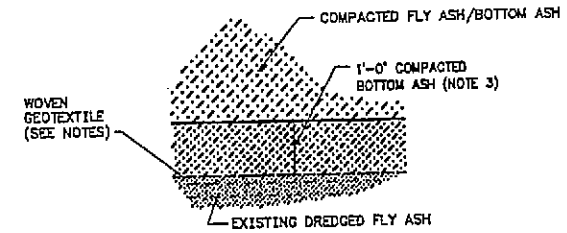


TYPICAL SECTION – STAGE 4



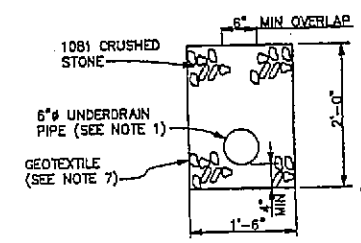
TYPICAL SECTION – STAGE 5

DETAIL A72 – ASH DIKES



DETAIL B72
BONDING DETAIL

NOTES:
1. WOVEN GEOTEXTILE SHALL BE CLASS C IN ACCORDANCE WITH SECTION 571.
2. OMIT WOVEN GEOTEXTILE IF A SUITABLY FIRM BASE EXISTS.
3. BOTTOM ASH THICKNESS MAY BE INCREASED OR DECREASED AS REQUIRED TO OBTAIN REQUIRED COMPACTION.



DETAIL C72
PERIMETER DRAIN
1" = 1'-0"

NOTES:
1. FOR NOTES, SEE 10W425-6.
2. PLATE AND COMPACT ASH DIKES IN ACCORDANCE WITH THE QA/QC PLAN.
3. ELEVATION SHOWN ARE TYPICAL NOMINAL ELEVATIONS. ACTUAL ELEVATIONS WILL VARY AS SHOWN ON FINAL GRADING PLAN ON DRAWING 10W425-XXX.
4. PREFORATED DRAIN PIPE SHALL BE NEW MATERIAL & SHALL BE SLOTTED HDPE DRAIN TUBING AS MANUFACTURED BY ADVANCED DRAINAGE SYSTEM (APS) OR APPROVED EQUAL. SOLID OUTLET PIPE SHALL BE NON-PERFORATED PIPE BY SAME MANUFACTURER. PIPE SHALL BE JOINED BY COUPLINGS MANUFACTURED BY ADS, OR EQUAL.
5. LATERAL OUTLET PIPE SHALL BE NON-PERFORATED POLYETHYLENE CORRUGATED TUBING AS MANUFACTURED BY ADVANCED DRAINAGE SYSTEMS, INC., COLUMBUS, OHIO (614) 457-3051 OR EQUAL.
6. LATERAL OUTLET PIPES SHALL BE PLACED EVERY 200 FEET ON CENTER.
7. GEOTEXTILE SHALL BE A WOVEN MONOFILAMENT WITH AN APPARENT OPENING SIZE (AOS) SELECTED BY TVA FES (US STANDARD SIEVE SIZE) WHEN TESTED IN ACCORDANCE WITH ASTM D 4751. THE GEOTEXTILE SHALL BE GEOTEX 104F AS MANUFACTURED BY SYNTHETIC INDUSTRIES OR APPROVED EQUAL.

REV NO.	DATE	DRWN	DSGN	CHKD	SUPV	PROJ ENG	APPD	MGR	PROJECT ID	AS CONST
0										
R 0 1		DRS	JLM	WPT	HLP	RDP	JCA		KFD44	

ISSUED FOR DREDGE CELL EXPANSION

SCALE: 1"=10' EXCEPT AS NOTED

YARD

DREDGE CELL EXPANSION
TYPICAL SECTIONS– FLY ASH OPTION
STAGES 1–5

DESIGNED BY	DRAWN BY	CHECKED BY	SUPERVISED BY	REVIEWED BY	APPROVED BY	ISSUED BY
D.R. SMITH	J.L. MILES	W.P. TAYLOR	H.L. PETTY	R.E. PURKEY	J.G. ADAIR	

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

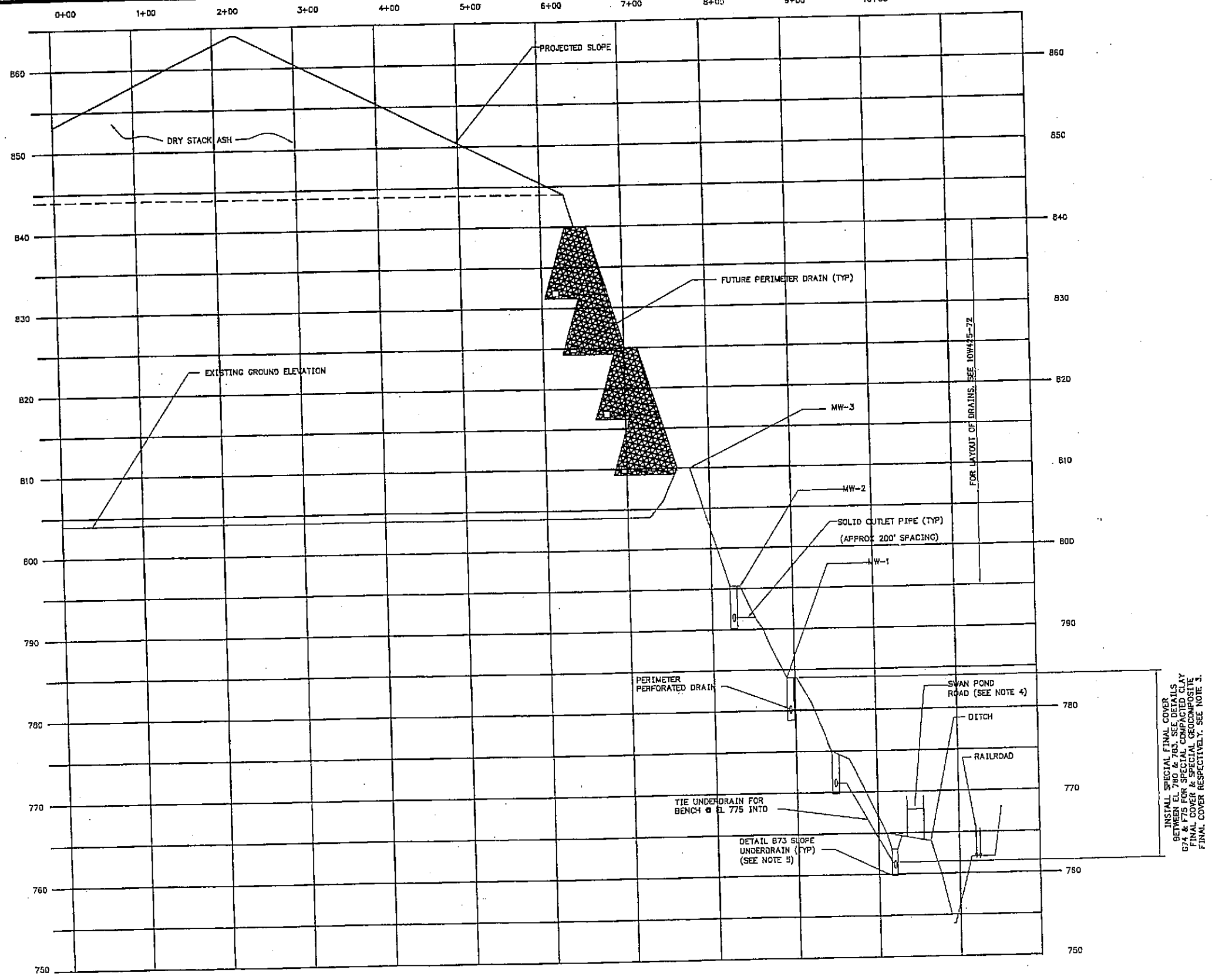
AUTOCAD R14 | SIZE 36 | C | 10W425-72 | R 0

PLOT FACTOR:1=1
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

PARSONS | 0
TASK COMPLETED BY: | REV NO.

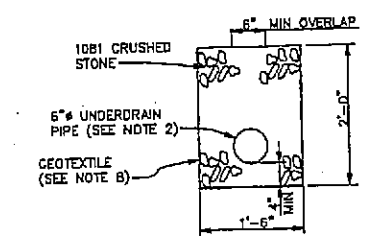
TVA-00018540



DETAIL A73

NOTES:

1. FOR DRAWINGS LIST AND LEGEND SEE 10W425-20
2. FOR GENERAL NOTES SEE 10W425-26
3. BETWEEN EL 760 & 783, STRIP EXISTING 1'-0" SOIL COVER WITHIN THE LIMITS SHOWN ON DRAWINGS 10W425-42 THRU 10W425-45, PRIOR TO INSTALLING FINAL COVER. STOCK PILE SOIL AND REUSE AS RANDOM FILL VEGETATIVE LAYER FOR FINAL COVER.
4. DETAIL DEPICTS SECTION THROUGH EXISTING DREDGE CELLS ADJACENT TO SWAN POND ROAD. BASE ELEVATION OF DREDGE CELL VARIES.
5. UNDERDRAIN AT THIS LOCATION ONLY REQUIRED ALONG DREDGE CELL ADJACENT TO SWAN POND ROAD. SEE DRAWINGS 10W425-42 THRU 10W425-45 FOR LOCATION.
6. LATERAL OUTLET PIPE SHALL BE NON-PERFORATED POLYETHYLENE CORRUGATED TUBING AS MANUFACTURED BY ADVANCED DRAINAGE SYSTEMS, INC., COLUMBUS, OHIO (614) 457-3051 OR EQUAL.
7. LATERAL OUTLET PIPES SHALL BE PLACED EVERY 200 FEET ON CENTER.
8. GEOTEXTILE SHALL BE A WOVEN MONOFILAMENT WITH AN APPARENT OPENING SIZE (AOS) SELECTED BY TVA FES (US STANDARD SIEVE SIZE) WHEN TESTED IN ACCORDANCE WITH ASTM D 4751. THE GEOTEXTILE SHALL BE GEOTEX 104F AS MANUFACTURED BY SYNTHETIC INDUSTRIES OR APPROVED EQUAL.



DETAIL B73
PERIMETER UNDERDRAIN
1" = 1'-0"

REV NO.	DATE	DRN	DSN	CHD	SUPV	TYPD	APPR	CHD	PROJECT ID	AS CONST	B SHEET OF
R 0		DRS	BSB	WPT	HLP	REP	JGA				

ISSUED FOR DREDGE CELL EXPANSION

SCALE: 1"=50' EXCEPT AS NOTED

YARD

EXISTING DREDGE CELL UNDERDRAIN INSTALLATION ON EXISTING SLOPE EL 760-795

DESIGNED BY	DRAWN BY	CHECKED BY	SUPERVISED BY	REVIEWED BY	APPROVED BY	ISSUED BY
D.R. SMITH	B.S. BURT	W.P. TAYLOR	H.L. PETTY	R.E. PURKEY	J.G. ADAIR	

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

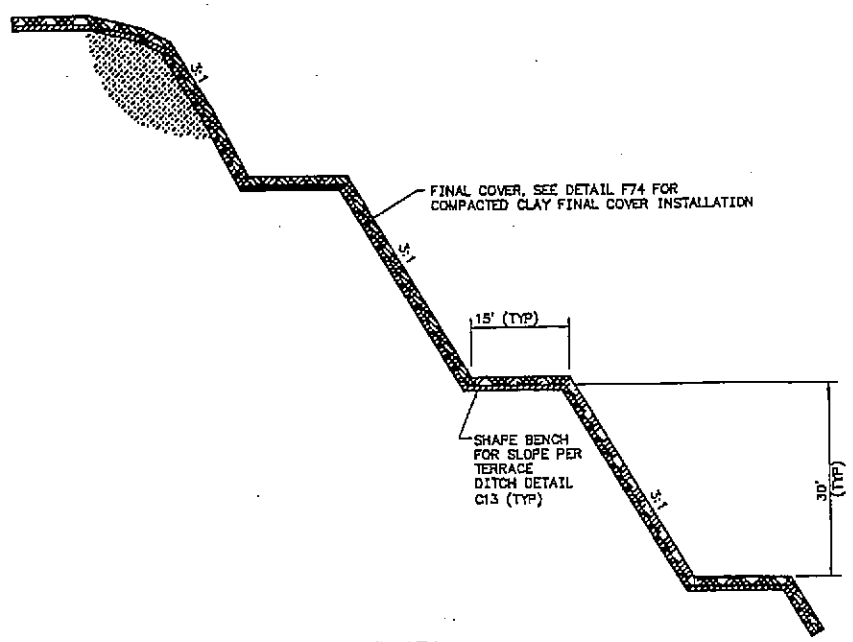
AUTOCAD R14 | DATE | 36 | C | 10W425-73 | R 0

PLOT FACTOR:50
W_TVA

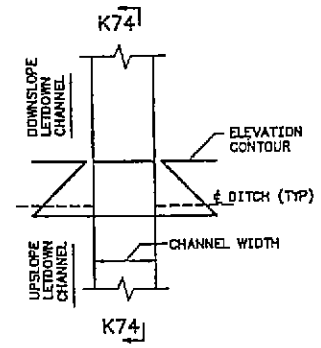
C.A.D. DRAWING
DO NOT ALTER MANUALLY

PARSONS	0
TASK COMPLETED BY:	REV NO.

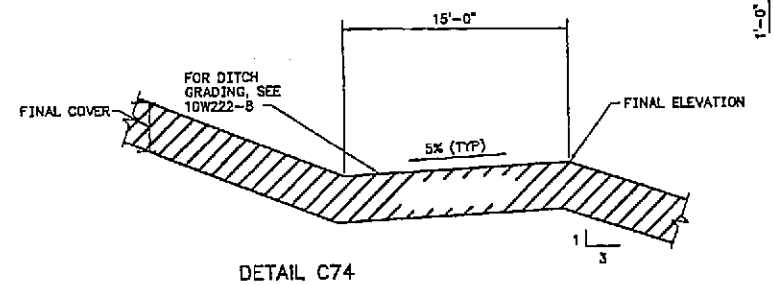
TVA-00018541



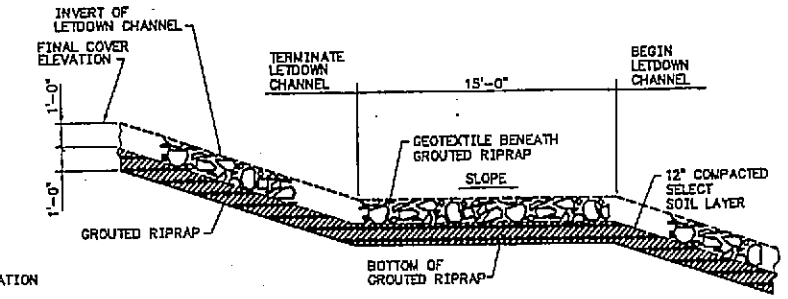
DETAIL A74
TYPICAL FILL PROFILE
COMPACTED CLAY FINAL COVER



DETAIL B74
PLAN VIEW
TERRACE DITCH
LETDOWN CHANNEL INTERSECTION

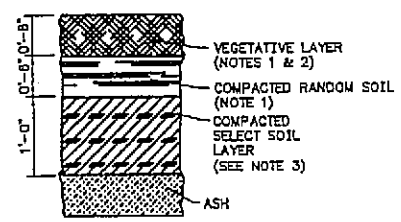


DETAIL C74
TERRACE DITCH
COMPACTED CLAY FINAL COVER

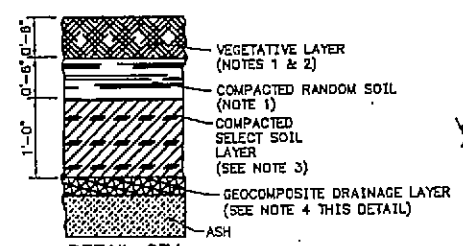


NOTE:
CHANNEL BERM NOT SHOWN FOR CLARITY

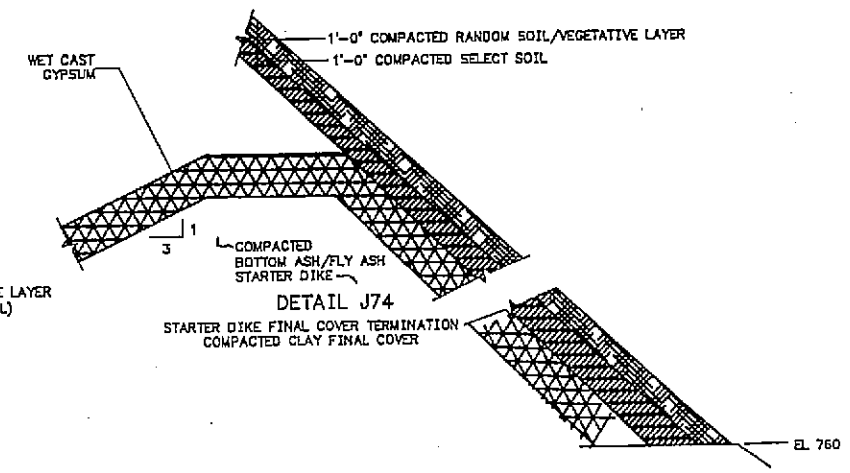
SECTION K74



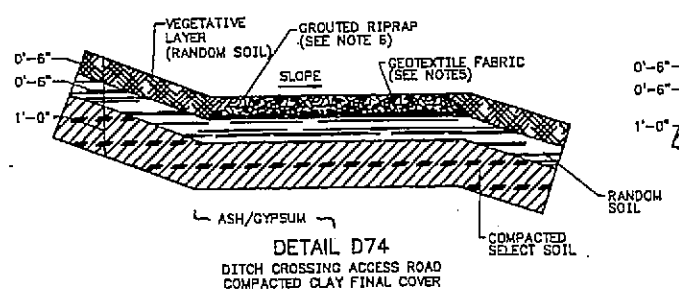
DETAIL F74
FINAL COVER
COMPACTED CLAY FINAL COVER



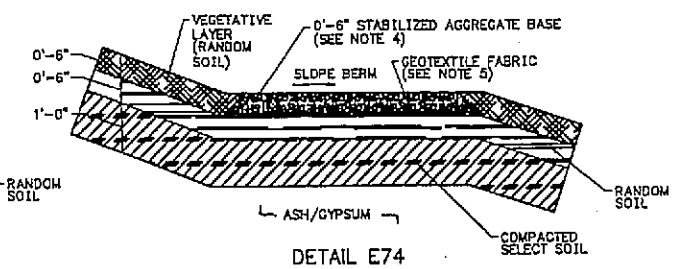
DETAIL G74
SPECIAL GEOCOMPOSITE FINAL COVER
COMPACTED CLAY FINAL COVER



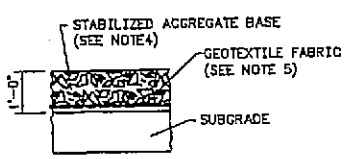
DETAIL J74
STARTER DIKE FINAL COVER TERMINATION
COMPACTED CLAY FINAL COVER



DETAIL D74
DITCH CROSSING ACCESS ROAD
COMPACTED CLAY FINAL COVER



DETAIL E74
COVER ACCESS ROAD
COMPACTED CLAY FINAL COVER



DETAIL H74
ACCESS ROAD

NOTES:
1. THE UPPERMOST 1 FT. OF THE FINAL COVER SHALL CONSIST OF RANDOM SOIL PLACED IN ACCORDANCE WITH THE QA/QC PLAN FOR THIS FACILITY. THE UPPER 6 IN. SHALL BE PREPARED FOR SEEDING. PRIOR TO SEEDING, A MINIMUM OF 3 SOIL SAMPLES OF VEGETATIVE LAYER SOIL SHALL BE TESTED TO DETERMINE APPROPRIATE AMOUNTS OF LIME, FERTILIZER, ETC. TO BE SPREAD PRIOR TO SEEDING.

2. SEED ALL AREAS (EXCLUDING ROAD & LET DOWN CHANNELS) IN ACCORDANCE WITH TVA SPECIFICATION T-1, SECTION 583.

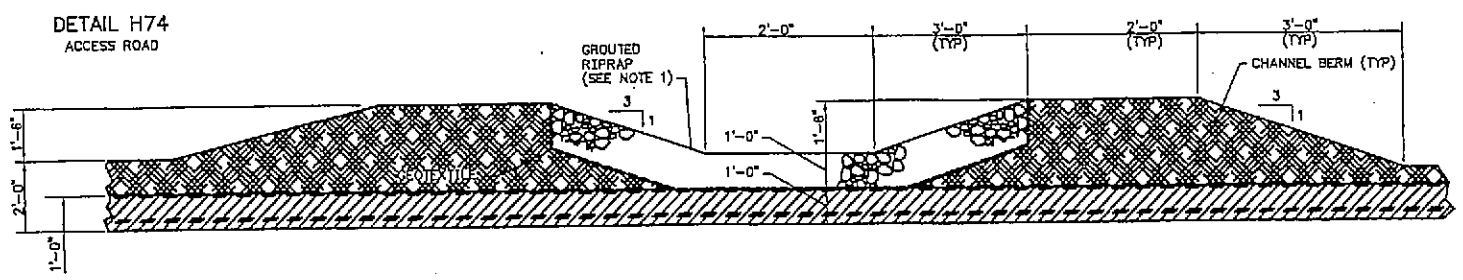
3. CONSTRUCT COMPACTED SELECT SOIL LAYER IN ACCORDANCE WITH THE CONSTRUCTION QA/QC PLAN FOR THIS FACILITY. THE COMPACTED SELECT SOIL LAYER SHALL BE CONSTRUCTED USING SELECT SOIL BACKFILL OBTAINED FROM STOCKPILED MATERIAL USED TO CONSTRUCT THE CLAY LAYER FOR THE LINER.

4. THE GEOCOMPOSITE DRAINAGE LAYER BENEATH THE COMPACTED SOIL LAYER SHALL CONSIST OF THE FOLLOWING COMPONENTS PLACED IN ORDER FROM ASH SURFACE UPWARD:
- A CALENDERED WOVEN GEOTEXTILE WITH AOS DETERMINED BY TVA FES;
- THE CALENDERED WOVEN GEOTEXTILE SHALL BE HEAT BONDED TO THE GEONET;
- THE UPPER GEOTEXTILE SHALL BE A NON-WOVEN NEEDLEPUNCHED GEOTEXTILE.

4. STABILIZED AGGREGATE BASE SHALL BE IN ACCORDANCE WITH SECTION 1081.

5. GEOTEXTILE FABRIC SHALL BE A NON-WOVEN NEEDLE PUNCHED FABRIC CLASS C IN ACCORDANCE WITH SECTION 571.

6. EXTEND GROUTED RIPRAP TO MATCH THE FULL WIDTH OF THE LETDOWN CHANNEL. GROUTED RIPRAP IN ACCORDANCE WITH SECTION 577.



NOTES:
1. GROUTED RIPRAP SHALL BE IN ACCORDANCE WITH SECTION 577.

2. GEOTEXTILE FABRIC SHALL BE A NON-WOVEN NEEDLE PUNCHED FABRIC, CLASS C, IN ACCORDANCE WITH SECTION 571.

3. EXTEND GROUTED RIPRAP TO MATCH THE FULL WIDTH OF THE LETDOWN CHANNEL. GROUTED RIPRAP IN ACCORDANCE WITH SECTION 577.

DETAIL M74
TYPICAL LET DOWN CHANNEL
COMPACTED CLAY FINAL COVER

REV NO.	DATE	DRN	DSN	CHKD	SUPV	SVR	APVD	SSD	PROJECT ID	AS CONST
R 0		DRS	JJM	WPT	HLP	RCP	JGA			

ISSUED FOR DREDGE CELL EXPANSION

SCALE: NOT TO SCALE — EXCEPT AS NOTED

YARD

DREDGE CELL LATERAL EXPANSION
COMPACTED CLAY DETAILS
FINAL COVER

DESIGNED BY	DRAWN BY	CHECKED BY	SUPERVISED BY	REVIEWED BY	APPROVED BY	SUBMITTED BY
D.R. SMITH	J. WILES	W.P. TAYLOR	H.L. PETTY	R.E. PURKEY	J.G. ADAIR	

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

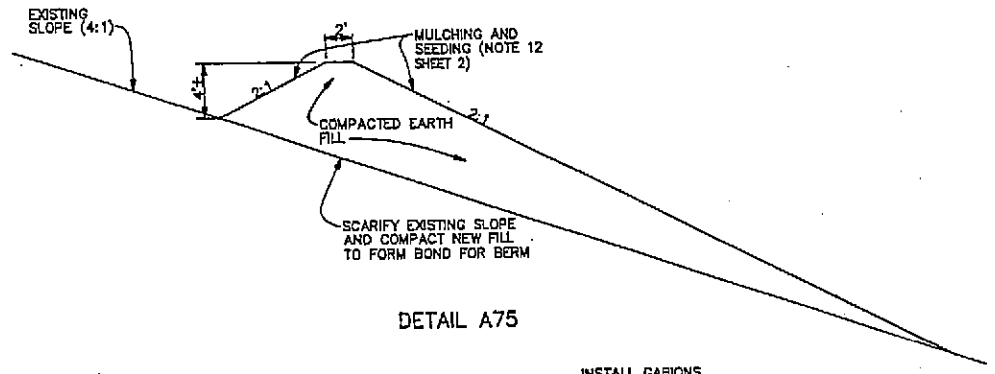
AUTOCAD R14 | SIZE 36 | C | 10W425-74 | R 0

PLOT FACTOR:96
W_TVA

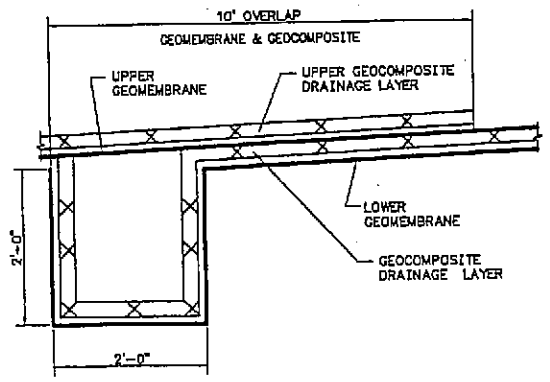
C.A.D. DRAWING
DO NOT ALTER MANUALLY

PARSONS | 0
TASK COMPLETED BY: | REV NO.

TVA-00018542



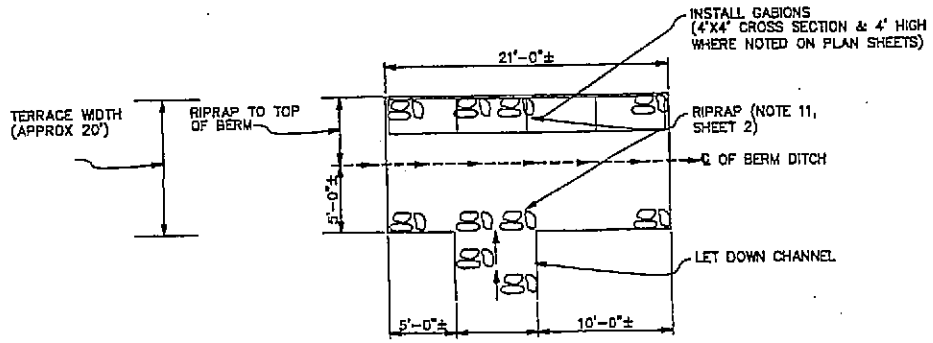
DETAIL A75



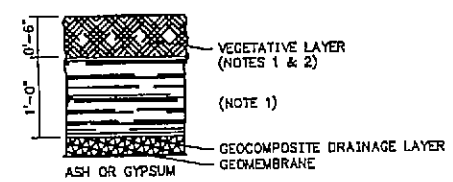
DETAIL D75
ANCHOR TRENCH

NOTES:

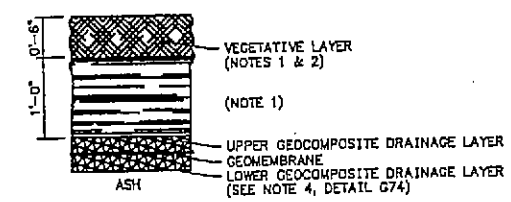
1. FOR DRAWINGS LIST AND LEGEND SEE 10W425-20
2. FOR GENERAL NOTES SEE 10W425-26



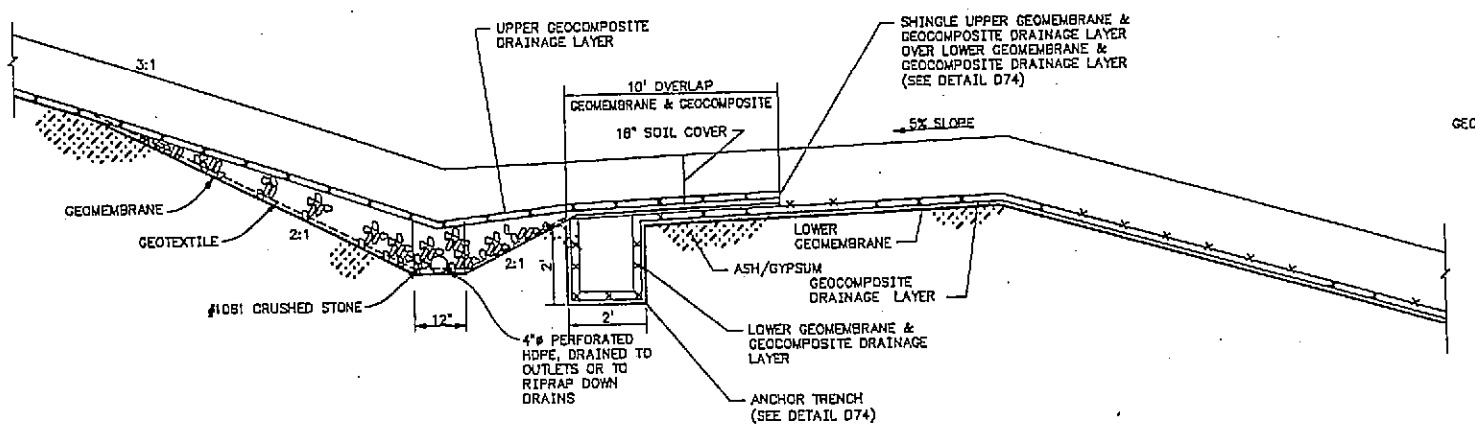
DETAIL B75
LETDOWN CHANNEL EXIT



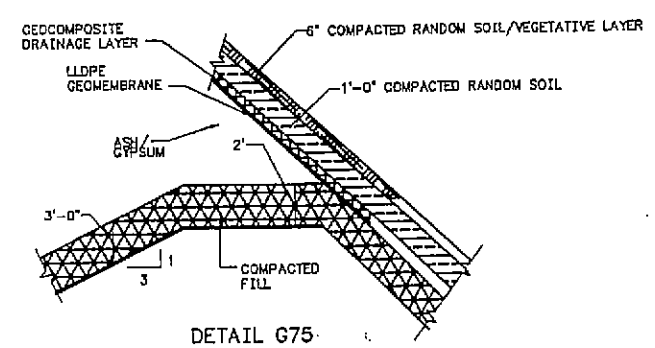
DETAIL E75
GEOCOMPOSITE FINAL COVER DETAIL



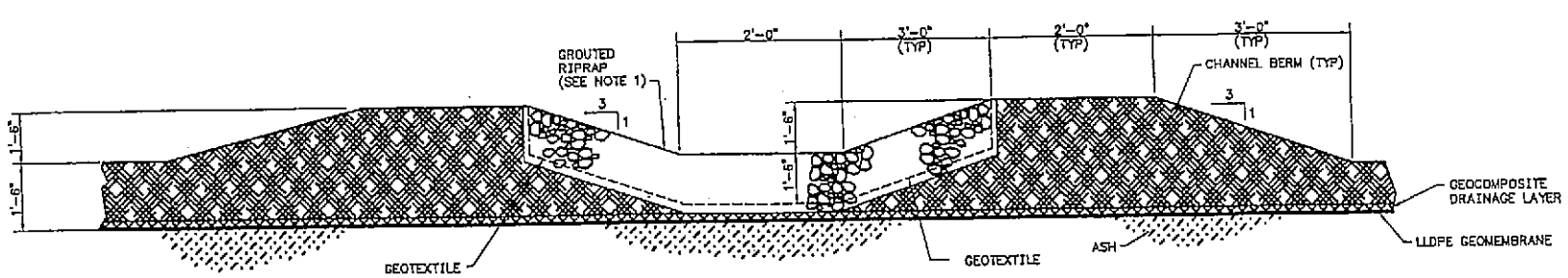
DETAIL F75
SPECIAL GEOCOMPOSITE FINAL COVER DETAIL



DETAIL C75
TYPICAL TERRACE DITCH CROSS SECTION FOR GEOCOMPOSITE FINAL COVER



DETAIL G75
STARTER DIKE FINAL COVER TERMINATION GEOCOMPOSITE FINAL COVER



NOTES:
1. GROUTED RIPRAP SHALL BE IN ACCORDANCE WITH SECTION 577.
2. GEOTEXTILE FABRIC BENEATH RIPRAP SHALL BE A NON-WOVEN NEEDLE PUNCHED FABRIC, CLASS C, IN ACCORDANCE WITH SECTION 571.
3. EXTEND GROUTED RIPRAP TO MATCH THE FULL WIDTH OF THE LETDOWN CHANNEL. GROUTED RIPRAP IN ACCORDANCE WITH SECTION 577.

DETAIL H75
TYPICAL LET DOWN CHANNEL GEOCOMPOSITE FINAL COVER

REV NO.	DATE	DRWN	DWG	SUPV	SYMD	APVD	SRD	PROJECT ID	AS BUILT	REV NO.
R										
R.0	DRS	JLM	WPT	HLP	REP	JGA				0
ISSUED FOR DREDGE CELL EXPANSION										

SCALE: NOT TO SCALE — EXCEPT AS NOTED

YARD

DREDGE CELL LATERAL EXPANSION
GEOCOMPOSITE
FINAL COVER DETAILS

DESIGNED BY	DRAWN BY	CHECKED BY	SUPERVISED BY	REVIEWED BY	APPROVED BY	VALID BY
D.R. SMITH	J.L. MILES	W.P. TAYLOR	H.L. PETTY	R.E. PURKEY	J.G. AGAR	

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R14 | SHEET 36 | C | 10W425-75 | R 0

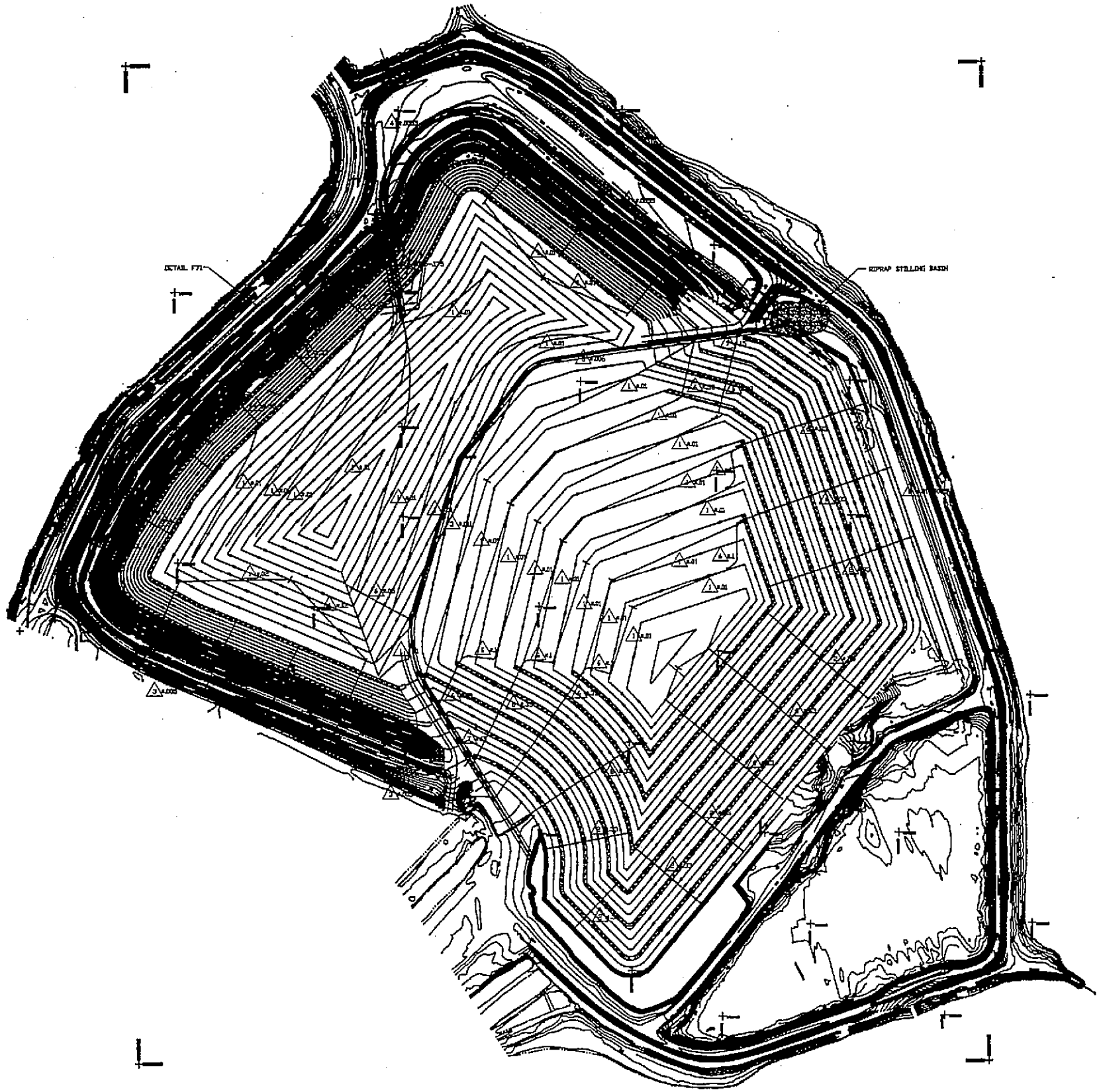
PLOT FACTOR:96
W_TVA

C.A.D. DRAWING DO NOT ALTER MANUALLY

PARSONS | 0
TASK COMPLETED BY: | REV NO.

TVA-00018543

36 | C | 10W425-76



DITCH SCHEDULES

DITCH SCHD	DITCH DEPTH-D	BOTTOM WIDTH-W	LINING
1	2.5' NOM/2' MIN	-	SEE NOTE 3, DET D71
2	2.5' NOM/2' MIN	5' NOM/4' MIN	SEE NOTE 5, DET A71
3	3.5' NOM/3' MIN	10' NOM/9' MIN	SEE NOTE 3, DET A71
4	3.5' NOM/3' MIN	20' NOM/18' MIN	SEE NOTE 3, DET A71
5	4' NOM/2.5' MIN	40' NOM/35' MIN	SEE NOTE 3, DET B71
6	2.5' NOM/ 2' MIN	5' NOM/ 4' MIN	SEE NOTE 5, DET A71
7	4' NOM/ 2.5' MIN	10' NOM/ 9' MIN	DET D71
8	3.5' NOM/ 3' MIN	5' NOM/ 4.5' MIN	SEE NOTE 5, DET A71

LEGEND

- ROCK CHUTES
- TRUNK DITCHES
- DITCHES
- TERRACE DITCHES
- △ DITCH CLASS
- •.01 DITCH SLOPE

NOTE:

1. FOR TERRACE DITCH DETAIL SEE DETAIL E71, 10W425-71

EMORY RIVER-WATTS BAR LAKE
100 YEAR FLOOD ELEVATION 748 AT RIVER MILE 2.00
500 YEAR FLOOD ELEVATION 750.5 AT RIVER MILE 2.00

REV NO.	DATE	DRWN	CHKD	SUPV	SYSD	APPD	ISSD	PROJECT	AS CONST	REV NO.
R 0		DRS	BSB	WPT	HLP	REP	JGA			0
ISSUED FOR DREDGE CELL EXPANSION										

SCALE: 1"=200' EXCEPT AS NOTED

YARD

DREDGE CELL
LATERAL EXPANSION FINAL COVER
DRAINAGE PLAN & SCHEDULE

DESIGNED BY	DRAWN BY	CHECKED BY	SUPERVISED BY	REVIEWED BY	APPROVED BY	ISSUED BY
O.R. SMITH	B.S. BURT	W.P. TAYLOR	H.L. PETTY	R.E. PURKEY	J.G. ADAIR	

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R14 | DATE | 36 | C | 10W425-76 | R 0

PARSONS | 0
TASK COMPLETED BY: | REV NO.

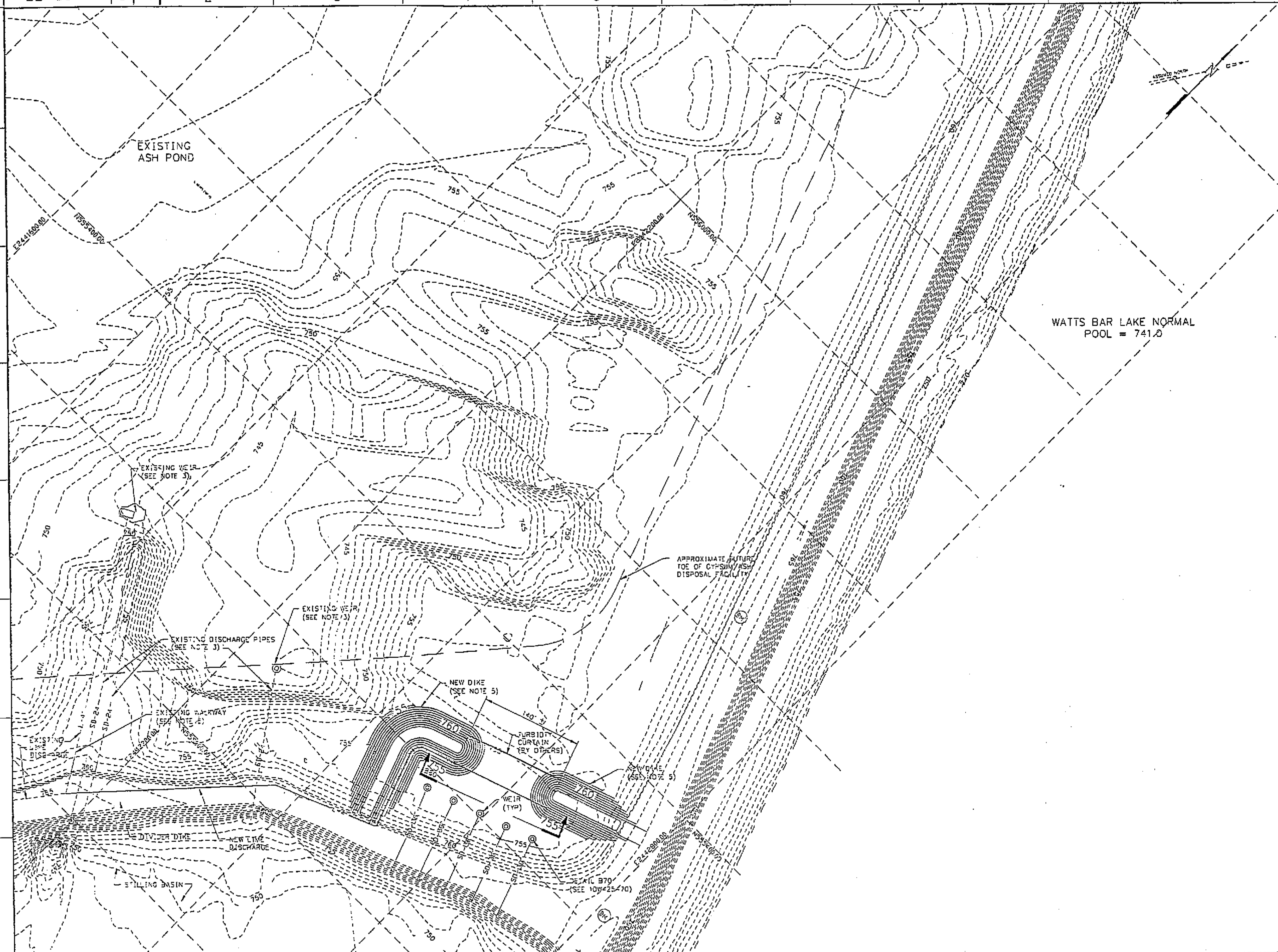
PLOT FACTOR:200
W_TVA

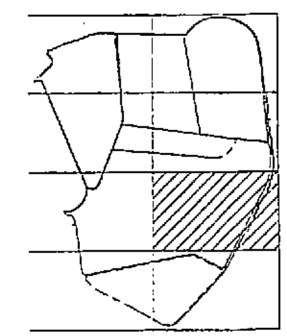
C.A.D. DRAWING
DO NOT ALTER MANUALLY

TVA-00018544

WEIR REPLACEMENT GENERAL NOTES:

1. FOR DRAWING INDEX & LEGEND SEE 10W425-20
2. FOR GENERAL NOTES SEE 10W426-26.
3. AFTER INSTALLATION OF NEW WEIRS, DISCONNECT STORM DRAIN FROM WEIR AT LOCATION NEAR DIVIDE DIKE. TREMIE GROUT STORM DRAINS CONNECTED TO EXISTING WEIRS. GROUT SHALL CONSIST OF VOLCLAY GROUT OR VOLCLAY GRANULAR GROUT, AS MANUFACTURED BY CETCO. MIX AND PLACE GROUT AS RECOMMENDED BY THE MANUFACTURER. VOLCLAY GRANULAR GROUT MAY BE MIXED WITH FLYASH IN LIEU OF SILICA SAND. MIXTURE SHALL BE PUMPABLE, YET STIFF ENOUGH TO INSTALL UNDERWATER. INSTALL TREMIE PIPE & VERIFY FULL PENETRATION TO OUTLET END OF STORM DRAIN. SEAL WELD 1/4" THICK A36 STEEL PLATE TO END OF STORMDRAIN TO PREVENT FLOWING WATER. PUMP GROUT MIXTURE INTO PIPE AND GRADUALLY WITHDRAW TREMIE PIPE DURING FILLING. MAINTAIN TREMIE PIPE WITHIN GROUT TO PREVENT THE FORMATION OF AIR POCKETS OR HONEYCOMB AREAS.
4. OTHER METHODS MAY BE USED BY THE CONTRACTOR TO GROUT WEIR DISCHARGE PIPING, IF APPROVED BY ENGINEERING.
5. NEW DIKE SHOWN IN FINAL CONFIGURATION. SEE DRAWING 10W425-78 FOR DIKE CONSTRUCTION
6. REMOVE TWO SECTIONS (APPROXIMATELY 20 FT) OF THE EXISTING WALKWAY AT THE DIVIDER DIKE SIDE TO PREVENT PERSONNEL FROM ACCESSING THE EXISTING WEIR. THE REMAINING SECTION OF THE WALKWAY SHALL REMAIN IN PLACE. EXISTING WOODEN POLES SHALL BE LEFT IN PLACE AND NOT REMOVED.





KEY PLAN

SCALE: 1" = 50'	EXCEPT AS NOTED
YARD	
DREDGE CELL LATERAL EXPANSION WEIR REPLACEMENT OVERALL PLAN	
DESIGNED BY J.R. SMITH · DRAWN BY ... · CHECKED BY W.P. TAKER · SUPERVISED BY ... · REVIEWED BY R.E. PURKEY · APPROVED BY J.G. ADAIR	
KINGSTON FOSSIL PLANT TENNESSEE VALLEY AUTHORITY FOSSIL AND HYDRO ENGINEERING	
AUTOCAD R14 · 36 · C · 10W425-77	R 0

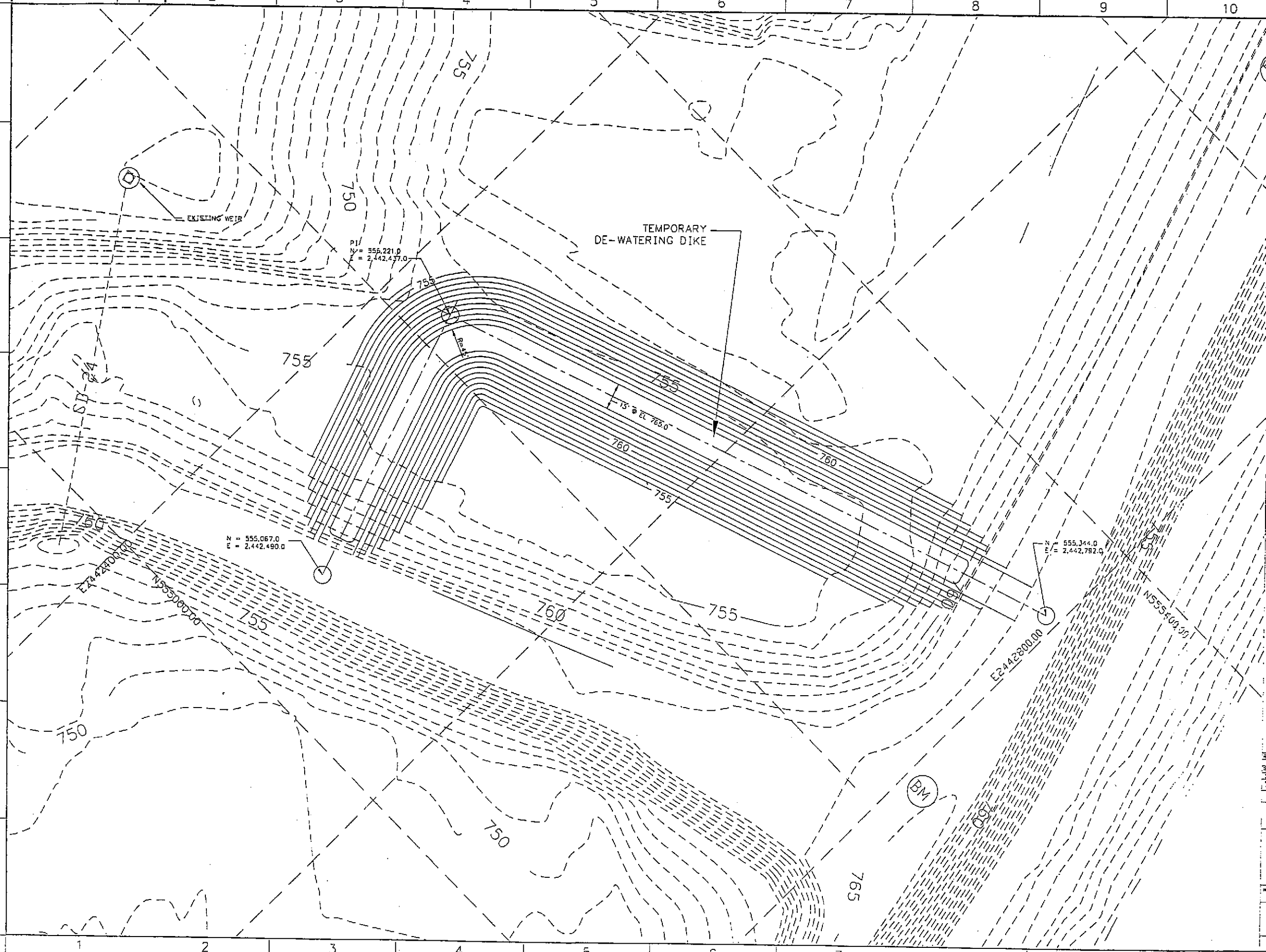
PLOT FACTOR:96 W_TVA

C.A.D. DRAWING DO NOT ALTER MANUALLY

PARSONS · TASK COMPLETED BY: · 0 · REV NO

36 | C | 10W425-77

36 | C | 10W425-78



NOTES:

1. FOR WEIR REPLACEMENT GENERAL NOTES, SEE 10W425-77
2. NEW DIKE SHALL BE CONSTRUCTED AS SHOWN TO ALLOW FOR DEWATERING OF THE CONSTRUCTION AREA. CONSTRUCT THE NEW DIKE IN CONFORMANCE WITH DETAILS SHOWN ON 10W425-6 AND 10W425-72, EXCEPT THAT UNDERDRAINS ARE NOT REQUIRED. ASH SHALL BE BOTTOM ASH OR A MIXTURE OF FLYASH AND BOTTOM ASH OBTAINED FROM THE DREDGE CELL. PLACE BOTTOM ASH AND COMPACT TO ESTABLISH AN INITIAL WORKING BASE SUITABLE TO SUSTAIN EQUIPMENT LOADS. THEN PLACE ASH IN THIN LIFTS AND COMPACT.
3. TESTING FOR COMPACTED DIKES AS PRESCRIBED IN THE QA/QC PLAN IS NOT REQUIRED FOR THIS DIKE, BECAUSE IT IS NOT A LOAD-BEARING DIKE FOR ASH DISPOSAL. AFTER A FIRM BASE IS ESTABLISHED, PERFORM COMPACTION TESTING AT FOUR TESTS PER LIFT.

SCALE: 1"=20'
EXCEPT AS NOTED

DREDGE CELL LATERAL EXPANSION
WEIR REPLACEMENT
INITIAL DIKE LAYOUT

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

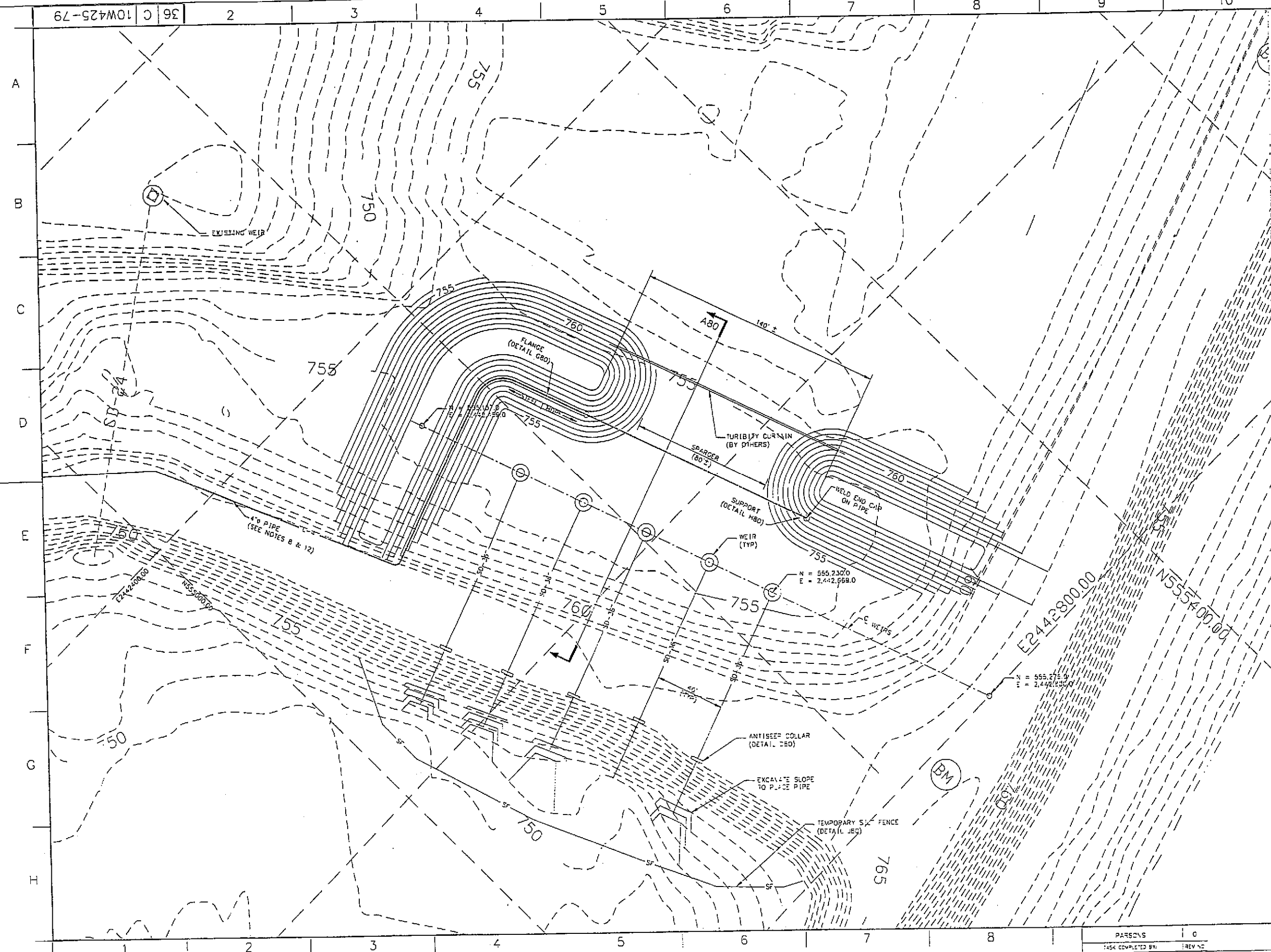
AUTOCAD R14 | 2/23/05 | 36 | C | 10W425-78 | R 0

PARSONS

PLOT FACTOR:98

CAD DRAWING
DO NOT ALTER MANUALLY

TVA-00018546



NOTES:

1. FOR WEIR REPLACEMENT GENERAL NOTES, SEE 10W425-77.
2. REMOVE EXISTING LIME SLUDGE DISCHARGE LINE WHERE IT IS ROUTED FROM THE BANK TO THE EXISTING WEIR. PIPE MAY BE REUSED AT CONSTRUCTOR'S OPTION, OR A NEW PIPE USED TO REROUTE THE LIME SLUDGE DISCHARGE LINE TO THE NEW WEIRS. NEW PIPE SHALL BE STEEL PIPE TO MATCH DIAMETER AND WALL THICKNESS OF EXISTING. BUTT WELD OR USE FLANGE CONNECTION TO SPLICE THE PIPE TOGETHER WHERE IT IS REROUTED TO THE NEW WEIR. INSTALL LIME SLUDGE DISCHARGE LINE TO THE NEW WEIRS AS SHOWN.
3. WHERE DISCHARGE PIPE IS TO BE SUBMERGED, PIPING SHALL BE HDPE. FOR 11. WELD A STEEL FLANGE ADAPTOR TO THE FABRICATED AS A SPARGER. SEE DETAILS ON 10W425-80.
4. AFTER COMPLETION OF WEIR INSTALLATION, EXCAVATE THE CENTER SECTION FROM THE DIKE AS SHOWN, TO ALLOW THE ASH POND TO DISCHARGE TO THE STILLING BASIN.
5. REMOVE SECTIONS OF DISCHARGE FROM EXISTING WEIRS, AND TREMIE GROUT AS DISCUSSED IN NOTE 3 ON 10W425-77.
6. PIPE AND FITTING USED TO CONSTRUCT HDPE LIME SLUDGE DISCHARGE PIPING SHALL BE HIGH-DENSITY POLYTHYLENE (HDPE) PE 3408 PIPE. CELL CLASSIFICATIONS 345444C IN ACCORDANCE WITH ASTM D 3350. ALL PIPING AND FITTINGS SHALL BE NEW MATERIAL AND BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS.
7. ALL HDPE PIPING AND FITTINGS SHALL BE JOINED BY BUTT FUSION WELDING, IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS.
8. PROVIDE MINIMUM 0.5% SLOPE ON LIME SLURRY PIPE.
9. INSTALL WEIR AT EL 760 AS SHOWN. WEIR WILL BE LOWERED TO EL 758 PRIOR TO GYPSUM/ASH DISPOSAL FACILITY CONSTRUCTION.
10. PROTECT EXCAVATIONS BY SHORING, BRACING, SHEET PILING, OR OTHER METHODS AS REQUIRED TO PREVENT CAVE-IN OF LOOSE SOIL INTO EXCAVATION IN ACCORDANCE WITH OSHA 29 CFR 1926, SUBPART P - EXCAVATION.
11. PRIOR TO REMOVING INSULATION FROM EXISTING LIME SLURRY DISCHARGE PIPE, DETERMINE WHETHER INSULATION CONTAINS ASBESTOS. CONTACT KIF ENVIRONMENTAL PROGRAM ADMINISTRATOR PA(E) (LINDA CAMPBELL) PRIOR TO REMOVING INSULATION. REMOVE INSULATION IN ACCORDANCE WITH OSHA REQUIREMENTS. IF IT CONTAINS ASBESTOS, DISPOSE OF ASBESTOS-CONTAINING MATERIALS IN ACCORDANCE WITH STATE OF TENNESSEE SOLID WASTE REQUIREMENTS.
12. SPACE SUPPORTS FOR 4" Ø LIME SLURRY PIPING ON 10' CENTER TO CENTER. SEE PIPE SUPPORT DETAIL HBD ON 10A425-80

R 1					
R 0	CRS			REV	
ISSUED FOR DREDGE CELL EXPANSION					

SCALE: 1"=20'

EXCEPT AS NOTED

MARO

DREDGE CELL LATERAL EXPANSION
WEIR REPLACEMENT
FINAL DIKE & WEIR LAYOUT

DESIGNED BY JB SMITH | DRAWN BY AL WEBB | CHECKED BY AP TAYLER | SUPERVISED BY H. POPE | REVIEWED BY RS PURSLEY | APPROVED BY JG ADAIR | ISSUED BY

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

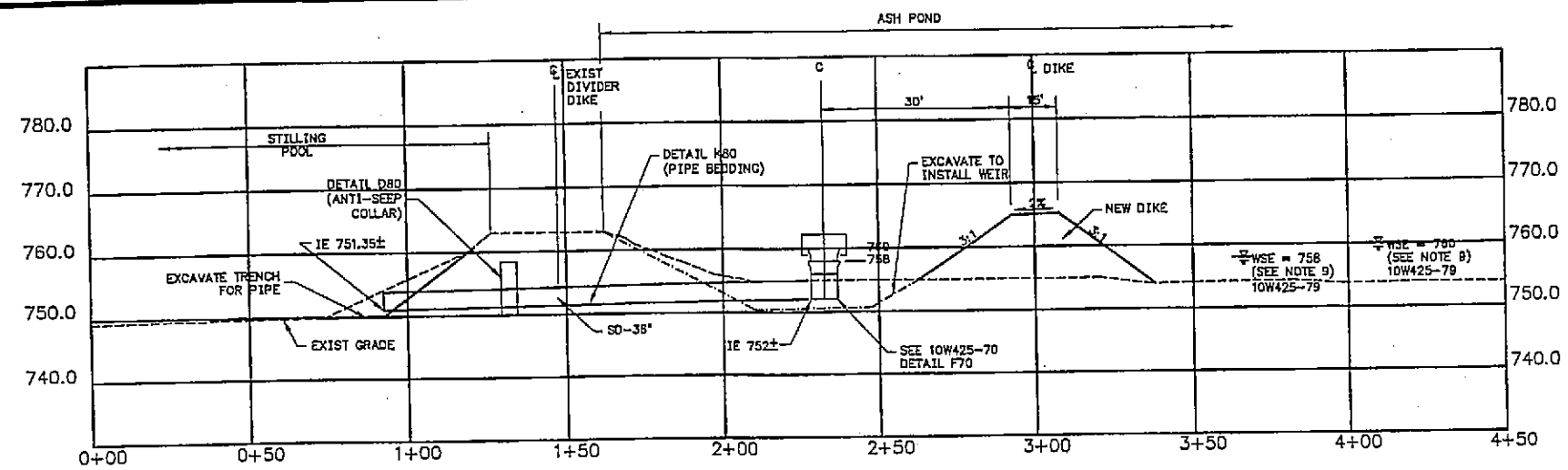
AUTOCAD R14 | DATE 2/23/2 | 36 | C | 10W425-79 | R 0

PARSONS | C
TASK COMPLETED BY: | REV NO

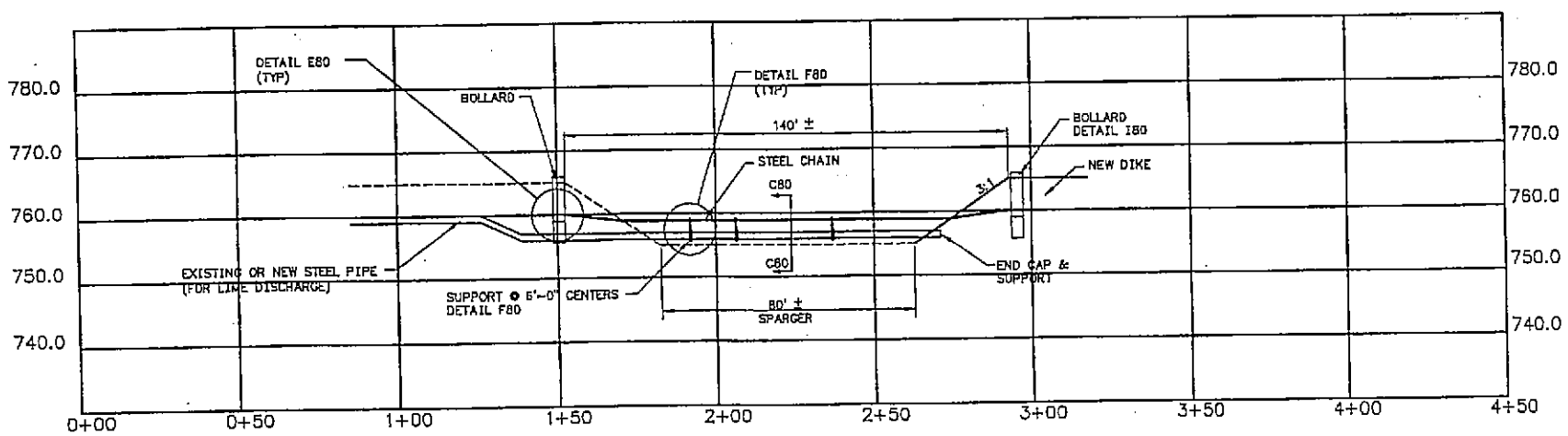
PLOT FACTOR .96
AUTO

CAD DRAWING
DO NOT ALTER MANUALLY

TVA-00018547



SECTION A80–A80
SCALE: HORIZONTAL:1"=20'
VERTICAL:1"=10'



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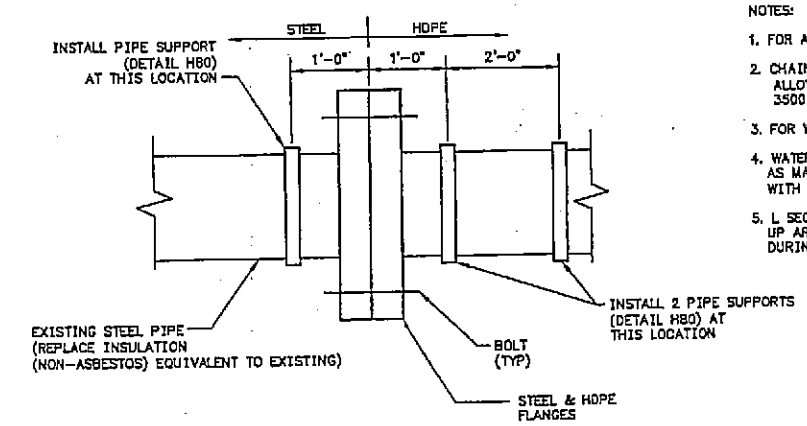
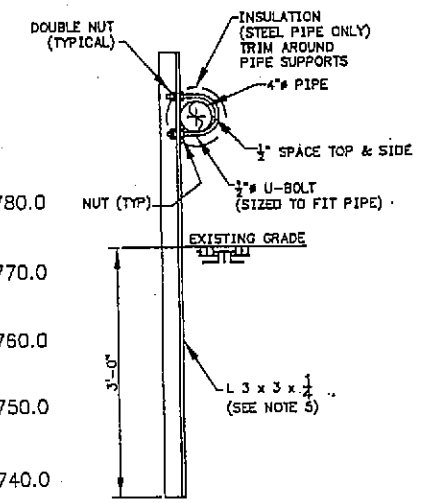


DETAIL G80
N.T.S.

NOTES:

1. FOR ADDITIONAL NOTES SEE 10W425-79.
2. CHAIN SHALL BE HIGH STRENGTH GRADE 80 ALLOY STEEL CHAIN TRADE SIZE 9/32", .28"ø, 3500 LB WLL, McMASTER-CARR, PART #3457T31.
3. FOR WEIR REPLACEMENT NOTES, SEE 10W425-77.
4. WATER STOP SHALL BE AKWASTOP GASKET WATERSTOP AS MANUFACTURED BY CETCO. INSTALL IN ACCORDANCE WITH MANUFACTURER'S INSTALLATION INSTRUCTIONS.
5. L SECTION SHALL BE GALVANIZED FINISH, TOUCH UP AREAS WHERE GALAVANIZED FINISH IS REMOVED DURING CONSTRUCTION WITH ZINC RICH PAINT.



DETAIL H80
PIPE SUPPORT
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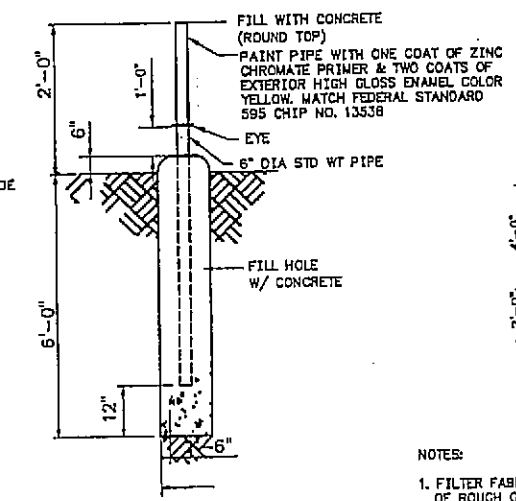

DETAIL I80
PIPE BOLLARD
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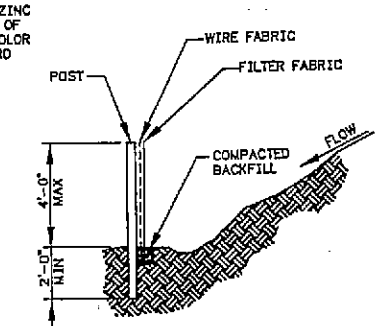

DETAIL J80
TEMPORARY SILT FENCE
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NOTES:

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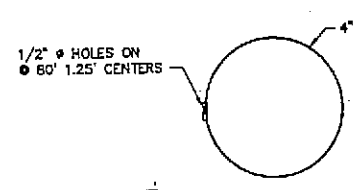
3. POSTS SHALL BE PLACED AT 4' INTERVALS MAX.
4. WIRE FABRIC AND FILTER FABRIC SHALL BE SECURELY BOUND TO POSTS WITH EITHER STAPLES OR WIRE TIES.
5. CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING CONDITION OF FILTER FABRIC FENCE IN A CONDITION THAT IS SATISFACTORY TO TVA UNTIL FINAL ACCEPTANCE OF WORK. REMOVE SEDIMENT WHEN SEDIMENT HEIGHT IS ONE-THIRD THE HEIGHT OF THE FENCE.
6. FILTER FABRIC SHALL BE A CLASS A FABRIC IN ACCORDANCE WITH TVA SPECIFICATION T-1, SECTION 571.



NOTE:
HOLES POSITIONED TO FACE DOWNSTREAM

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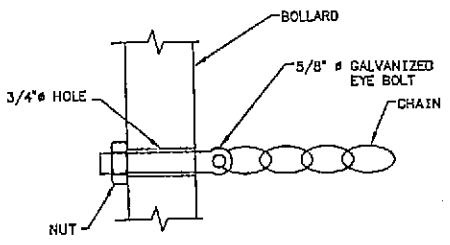

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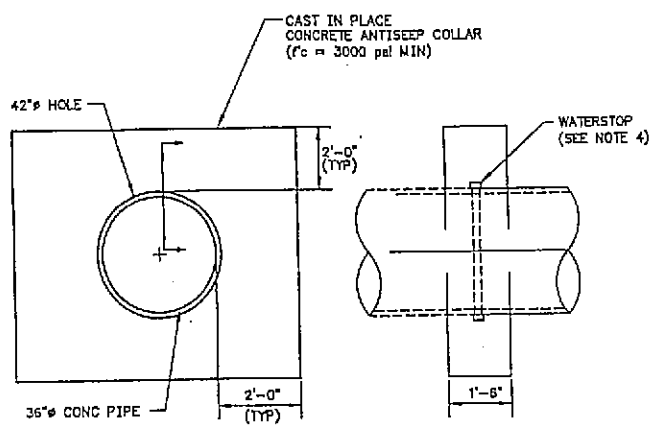

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(ANTI SEEP COLLAR)
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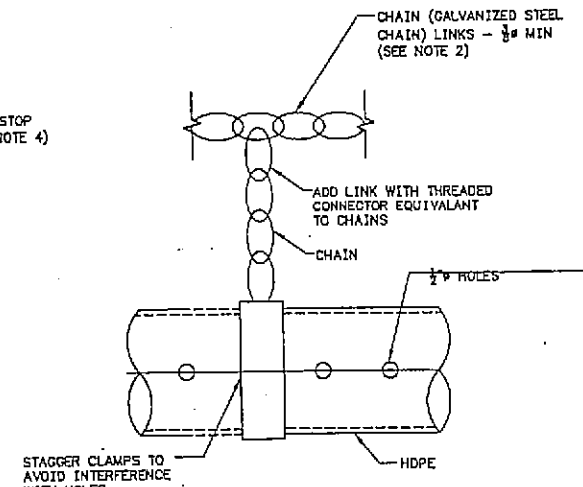

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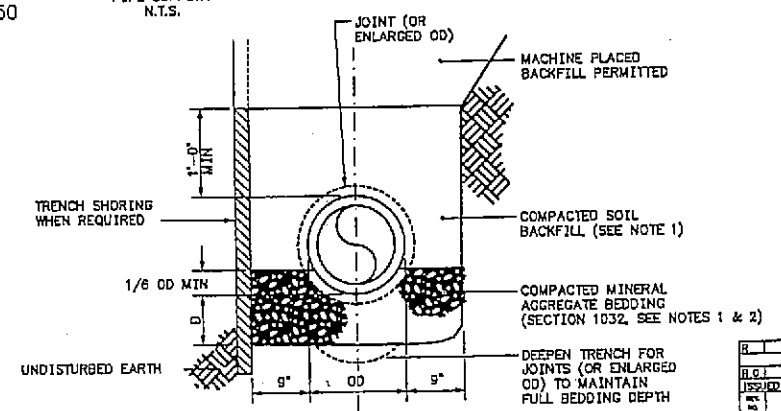

BEDDING DEPTH (D)

DIAMETER	D MIN
27" & SMALLER	3"
30" TO 60"	4"
66" & LARGER	6"

DETAIL K80
N.T.S.

NOTES:

1. PLACE COMPACTED MINERAL AGGREGATE BEDDING SOIL BACKFILL IN LOOSE LIFTS NOT EXCEEDING 8" IN THICKNESS & COMPACT TO 95% STANDARD PROCTOR DENSITY IN ACCORDANCE WITH ASTM D 698. MOISTURE & DENSITY TESTING SHALL BE IN ACCORDANCE WITH ASTM D 2922, AT A FREQUENCY OF NOT LESS THAN 6 TESTS PER LIFT. SCARIFY EXISTING SOIL TO A DEPTH OF 3" PRIOR TO PLACEMENT OF THE FIRST LIFT. COMPACTION TESTING FOR COMPACTED FILL AROUND STORM DRAIN PIPING AND DITCH ONLY REQUIRES 2 TESTS PER LIFT.
2. STORM DRAIN PIPING FOR WEIR INSTALLATION IS PLACED ON THE STILLING POND SIDE OF THE DIVIDER DIKE. BEDDING MAY BE DUMPED INTO THE TRENCHES. DO NOT PLACE DUMPED MATERIAL BENEATH ANY ROADWAYS.

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ISSUED FOR DREDGE CELL EXPANSION											

SCALE: NOT TO SCALE — EXCEPT AS NOTED

YARD

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DRAWN BY	CHKD BY	SUPERVISED BY	REVIEWED BY	APPROVED BY	SEALED BY
D.A. SMITH	A.L. UILES	W.P. TAYLOR	R.L. PETTY	R.E. PURKEY	J.C. ADAIR

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
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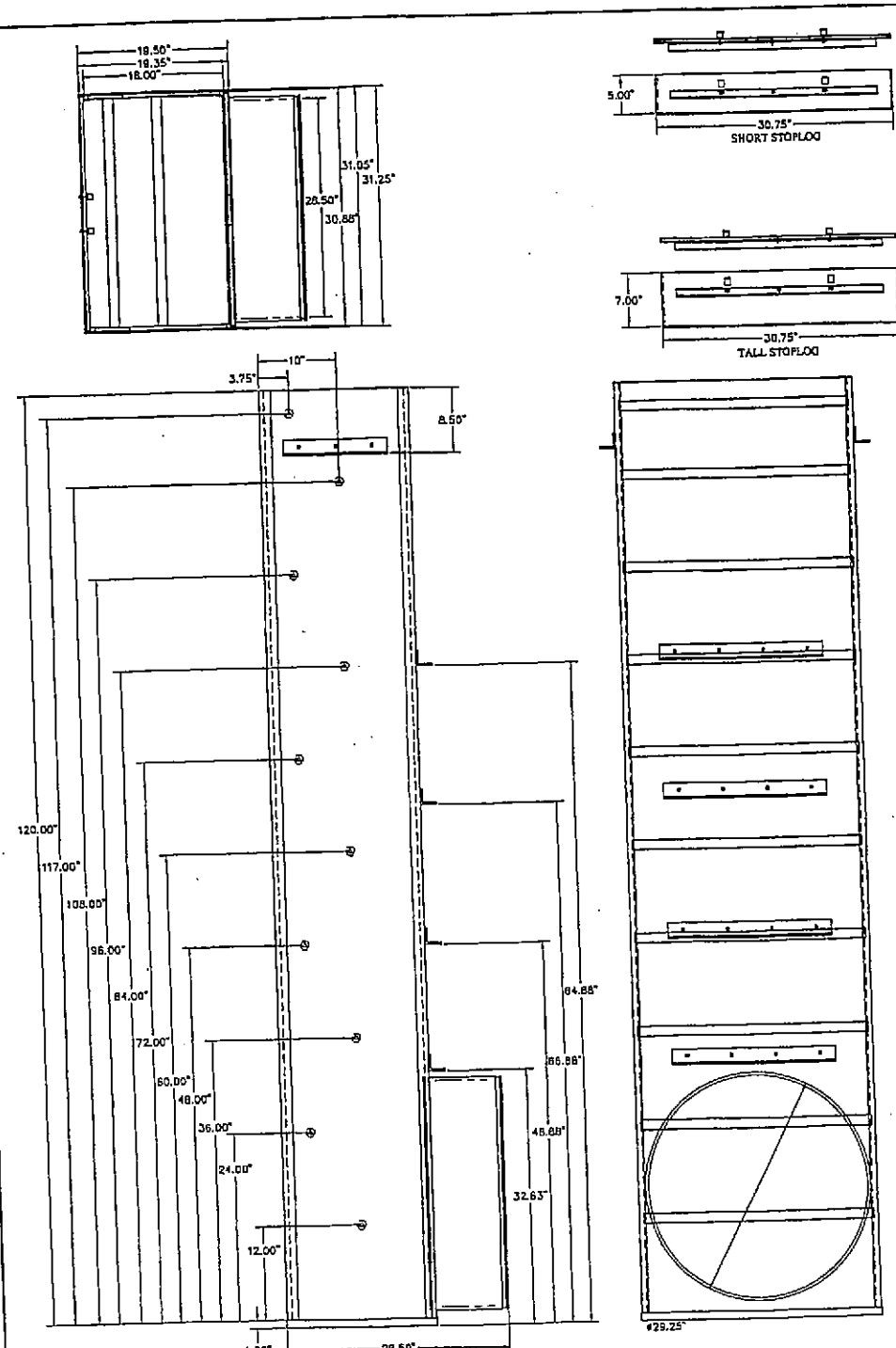

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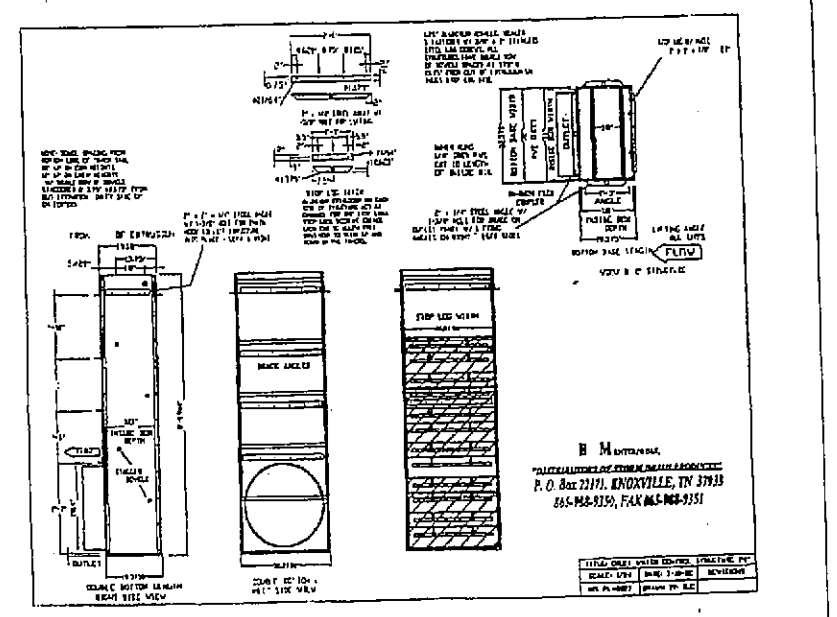

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TVA-00018549

APPENDIX E

Hydrogeologic Evaluation of Ash Pond Area

TENNESSEE VALLEY AUTHORITY
River System Operations & Environment
Research & Technology Applications
Environmental Engineering Services - East

KINGSTON FOSSIL PLANT

HYDROGEOLOGIC EVALUATION OF COAL-COMBUSTION BYPRODUCT DISPOSAL FACILITY EXPANSION

WR2004-2-36-130

Prepared by

J. Mark Boggs, P.G.
and
Hank E. Julian, P.E., P.G.

Knoxville, Tennessee
November 2004

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SUMMARY

The expansion of Class II coal-combustion byproduct (CCB) disposal facilities proposed within the existing Ash Disposal Area of Kingston Fossil Plant (KIF) was evaluated for two possible disposal options. The first (Option A) would involve future codisposal of coal ash and gypsum derived from flue-gas desulfurization. Under Option B the facility would receive only coal ash. Hydrogeological evaluations of the proposed facilities associated with both options were performed to examine their suitability relative to the appropriate standards of the Tennessee Department of Environment and Conservation (TDEC) Rule 1200-1-7. Evaluations addressed effects of proposed disposal facilities on local groundwater and surface water resources during both the operational and post-closure periods. Comparisons of water quality impacts for facility designs with and without a constructed three-foot geologic buffer were also provided as the basis for an alternative to an artificial geologic buffer.

Recent site investigations supporting these evaluations included 12 soil borings, installation and monitoring of three piezometers, and field hydraulic conductivity (K) testing at two sites and laboratory K testing of two ash samples. A survey of private water wells and public water supplies within two miles of the site was also conducted to determine current water use. Additional hydrogeologic data was obtained from previous studies in the existing Ash Disposal Area, and included 25 soil borings, water level data for 16 monitoring wells, 7 field aquifer tests in soil and bedrock wells, and lab K measurements for 10 soil and ash samples.

The Lower Conasauga Group and the Rome formation comprise bedrock beneath the proposed disposal area, and consist primarily of shale with thin, interbedded limestone, siltstone, and conglomerate. Drilling within the Conasauga and Rome in and around the disposal site revealed no evidence of karstification. A mantle of predominantly alluvial soils consisting of clay, silt, and sand with occasional gravel lies above bedrock. Thickness of the alluvium is highly variable, ranging from about 5 to 65 ft. Ash and ash-soil fill materials ranging up to 83 ft in thickness are present above the alluvium. Ash deposits are composed almost entirely of fly ash, with bottom ash comprising less than 10% of the ash fill. The first occurrence of groundwater below the area is generally within the existing ash fill. Groundwater movement at the site generally follows topography with groundwater flowing eastward from Pine Ridge toward Swan Pond Creek embayment, the Emory River, and the plant intake channel. An exception occurs in the Ash Dredge Cell area where mounding of the water table produces localized groundwater movement toward an on-site drainage feature that flows northeastward along the base of Pine Ridge. All groundwater originating on, or flowing beneath, the proposed disposal site ultimately discharges to the reservoir without traversing private property.

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The proposed CCB disposal facilities would be developed entirely on existing ash deposits. Laboratory testing indicates the ash would not meet the hydraulic conductivity requirements of TDEC Rule 1200-1-7-.04 or Policy Memorandum SW-93. The environmental benefit of constructing an artificial 3-ft clay buffer at the base of the Phase 2 and 3 disposal areas was examined by numerically simulating leachate seepage from these disposal facilities with and without a clay buffer. The evaluation focused on the effects of ash and gypsum leachate on stream water quality, since leachate from proposed disposal facilities would ultimately discharge to the Emory River. Estimates of maximum in-stream concentrations were performed for selected CCB-related constituents under low stream flow conditions.

Hydrogeologic conditions at the proposed disposal site appear to satisfy geologic and hydrologic standards for Class II disposal facilities. Key findings and recommendations are summarized as follows:

- A survey of water use in May 2004 identified 13 residential wells and one public water supply spring located within approximately one mile of the proposed disposal facility boundary. Neither the public spring nor any of the residential wells is located downgradient of the proposed facility. Furthermore, there is no potential for future development of groundwater supplies downgradient of the facility since all property between the disposal site and surface water boundaries lies within the plant reservation.

- Modeling results indicate that construction of an artificial 3-ft clay buffer, having a hydraulic conductivity of 10^{-6} cm/s or less, beneath the Phase 2 and 3 disposal areas would not provide a substantial environmental benefit. During the operational phase, predicted leachate seepage rates for the no-buffer and buffer designs for Option A differed by 38% or less. Similar comparisons for Option B showed differences of 28% or less. Following facility closure, differences in seepage rates would be less than 1% due to the infiltration-limiting effect of the 10^{-6} cm/s clay cap. On this basis, construction of an artificial clay buffer is not recommended.

- Evaluation of CCB leachate seepage effects on local stream water quality further supports the suitability of the site for the proposed disposal options without an artificial geologic buffer. Under Option A, maximum cumulative COC stream loadings predicted for the Emory River during low flow conditions would not produce in-stream concentrations exceeding the drinking water standards maximum contaminant limit (MCL) or aquatic life criteria for either the buffer or no-buffer cases. Predicted COC concentrations for the Emory River under disposal Option B were below drinking water and aquatic life standards for all COC except ammonia. Worst-case NH_3-N concentrations of 0.58 and 0.47 mg/L estimated for the no-buffer and buffer designs pose no threat to human health, but could exceed the criteria continuous concentration (CCC) under

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coincident conditions of extreme pH, temperature, and low flow in the Emory River. Historical data suggest the joint probability of such an occurrence would be less than 0.3%. The potential risk associated with ammonia under Option B can be addressed by future monitoring. Periodic sampling of ash ammonia content and groundwater downgradient of the facility would be performed to assure ammonia levels remain within the limits assumed in this evaluation.

- There is no evidence of Holocene-age faulting within the required 200-ft facility exclusion zone. In addition, there are no indications of karstification or other geologic features which might adversely affect facility containment.

- No streams, springs or lakes are located within 200 ft of the site, and facility would lie entirely above the projected 100-year flood stage of the Emory and Clinch Rivers.

TVA-00018559

1. INTRODUCTION

1.1 Background

The proposed coal-combustion byproduct (CCB) facility at TVA's Kingston Fossil Plant (KIF) is located on the west bank of the Emory River (mile 2 to 2.5) in Roane County, Tennessee (Figure 1-1). The disposal site encompasses approximately 244 acres and is located within the existing Ash Disposal Area. Land surface across the disposal site ranges from elevation 760 to 805 ft (above mean seal level), and is entirely above the 100-year flood stage of elevation 748 ft.

The facility Part II Permit Application, submitted to TDEC on June 10, 2004, considers two options for future CCB disposal at KIF. The first option (referred to in this report as Option A) proposes codisposal of coal ash and flue gas desulfurization (FGD) derived gypsum. If approved, a total of 12.4 million cubic yards (CY) of fly ash and bottom ash and 7.20 million CY of gypsum would be deposited in the area between 2004 and 2029. Under Option B the facility would receive only coal ash. A total of 21.4 million CY of fly ash and bottom ash would be deposited in the facility between 2004 and 2048.

1.2 Purpose and Scope

The objective of this report is to evaluate the suitability of the proposed CCB disposal facility in terms of the hydrogeologic features of the site and compliance with the design standards of TDEC Rule 1200-1-7. The potential effects of the facility on local groundwater and surface water resources are addressed for both the operational and post-closure periods. The focus is on stream water quality effects since shallow groundwater originating on, or flowing beneath, the site ultimately discharges to streams without traversing off-site property. Numerical models were used to estimate leachate generation rates from each disposal area. Leachate seepage estimates were used along with CCB leachate chemical compositions in predicting worst-case in-stream concentrations of selected constituents under low stream flow conditions. Separate evaluations were performed for Options A and B. Additionally, comparisons of water quality impacts for facility designs with and without a constructed 3-ft geologic buffer are provided for each disposal option. Hydrogeologic data used to support the analysis were derived from recent geotechnical investigations at the site conducted by MACTEC Engineering and Consulting, Inc. (2004) and from several previous site investigations (described in Section 1.3). A survey of private water wells and public water supplies within two miles of the site was conducted to establish local water use.

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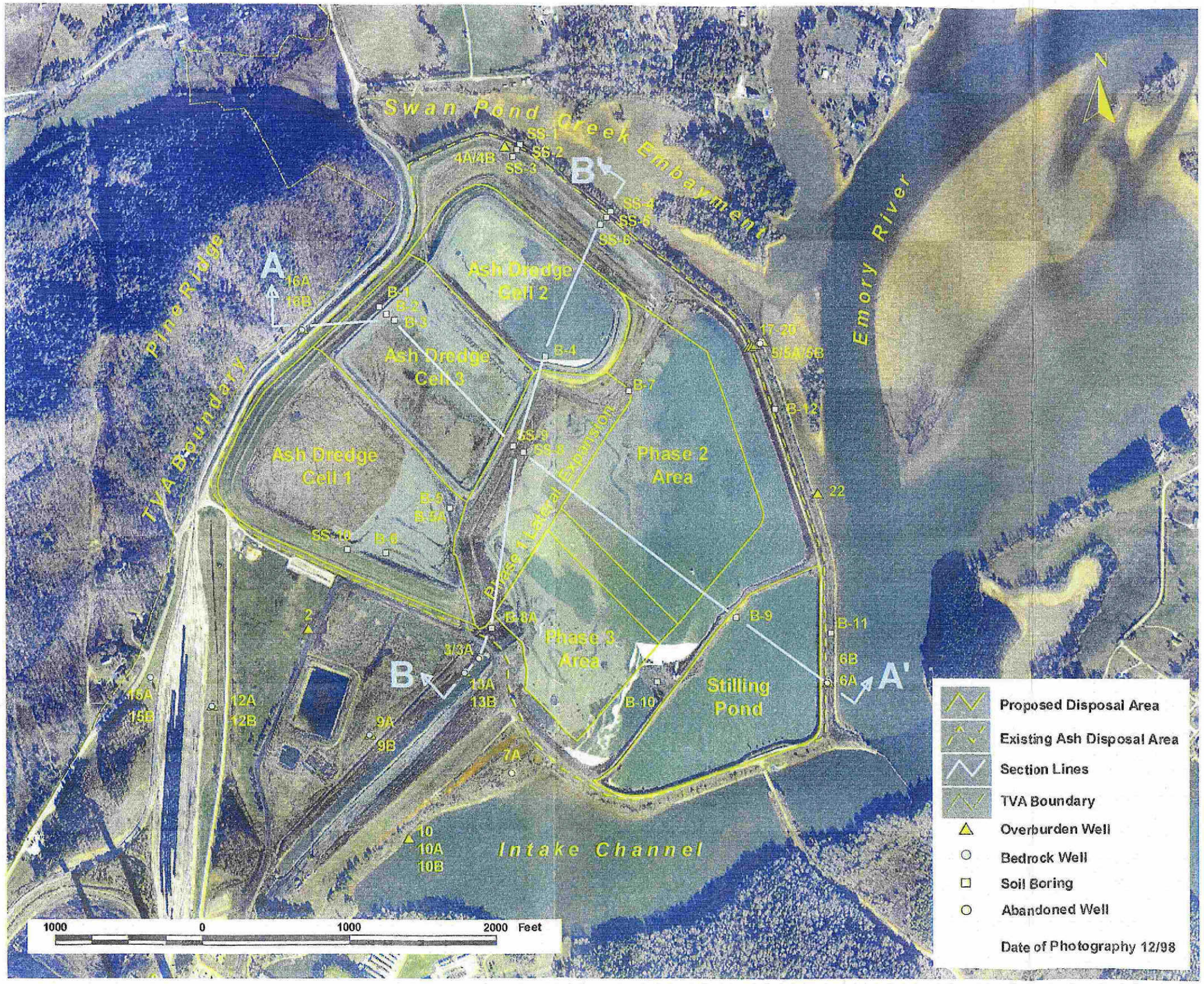

Figure 1-1. Site Location Map Showing Soil Borings and Monitoring Wells

TVA-00018561

Results of recent geotechnical investigations supporting disposal facility design and the hydrogeological evaluation are reported in MACTEC Engineering and Consulting, Inc. (2004). Investigations included 12 geotechnical borings (B-1 through B-12) drilled to refusal at locations in and around the proposed site to characterize overburden stratigraphy and to acquire samples for laboratory testing (Figure 1-1). Sample collection and standard penetration resistance testing were performed at 5-ft intervals. Appendix A contains lithologic logs for these borings and a description of soil sampling methods. Laboratory hydraulic conductivity tests were performed on two remolded ash samples collected from the existing Ash Dredge Cell Area. Three additional auger borings were completed at existing ash deposits for in-situ hydraulic conductivity testing (designated B-1A, B-1B, and B-2A). Three piezometers were installed adjacent to borings B-1 through B-3 for periodic water level monitoring. These piezometers are located on the northwest-facing slope of Ash Dredge Cell 3. Cone penetrometer soundings were performed at 11 locations within the proposed disposal site to supplement boring data. Complete descriptions of sampling and testing procedures used in these investigations are presented in MACTEC (2004).

1.3 Previous Investigations

The hydrogeologic data used in the present evaluation are partially based on three previous investigations at the KIF site. The first was an EPA-sponsored study by Milligan and Ruane (1980) to examine the effects of coal ash leachate on groundwater quality. This study was initiated in 1976 with core sampling and monitoring well construction at eight sites, J1 through J8 (Figure 1-1). (Note that the "J" well prefix was dropped in later investigations and does not appear on figure well labels in the present report.) Soil samples were collected using a 2-inch diameter split-spoon sampler through a 12-inch outer diameter hollow-stem auger. Fourteen, four-inch diameter PVC wells, screened over the lower 1.5 ft, were installed through the auger following core sampling. Wells were installed either singly or in staged multiple-well clusters. Lithologic logs for these wells are presented in Appendix A. In addition, laboratory permeameter measurements of the horizontal and vertical components of hydraulic conductivity were performed on selected core samples. Soil column studies were also performed to examine the potential for geochemical attenuation of ash-related contaminants, particularly trace metals.

Velasco and Bohac (1991) performed a site-wide assessment of groundwater conditions at the KIF reservation. Single-well or multiple-well clusters were installed at eight additional sites (sites 9 through 16) in 1988 as part of the investigation. Wells were constructed with 2-inch PVC casing and were screened over the lower 10 ft. Lithologic logs for these wells are included in Appendix A along with a description of sampling methods. Well construction diagrams are presented in Appendix B. These wells, and those installed in 1976, were sampled six times between 1988 and

TVA-00018562

1990 to examine spatial and temporal trends in groundwater quality at the plant site. Constant-rate injection tests were performed at eight wells to determine bulk hydraulic conductivities of the overburden and shallow bedrock materials. These data were used in development of a groundwater flow model of the site. In addition, their investigations included an evaluation of the potential of geochemical attenuation of ash-related contaminants. Mineralogical analyses were conducted on 20 soil samples collected adjacent to monitoring wells 1 through 6 (Figure 1-1). X-ray diffraction analysis indicated clay minerals predominantly consisted of kaolinite and illite with trace amounts of other minerals, all of which tend to adsorb cations present in groundwater. Iron oxides were detected at contents of 0.33 to 0.60%, and are also known to adsorb several metals, e.g. arsenic, chromium, and zinc. Soil cation exchange capacities ranging from 6.6 to 34 meq/100 g were reported. Application of the MINTEQ geochemical speciation model using site soils data and representative chemical data for ash leachate indicated significant adsorption of arsenic, lead, and zinc. Attenuation of barium, chromium, and iron were predicted to occur by precipitation reactions (Velasco and Bohac, 1991).

Singleton Laboratories (1994) performed drilling and sampling investigations in the Ash Dredge Cell area at 10 locations (SS-1 through SS-10). Two-inch split-spoon and three-inch Shelby tube samples were collected for laboratory geotechnical testing. Top-of-rock and groundwater level elevations were established at each site. Boring logs are included in Appendix A.

A hydrogeologic evaluation was prepared by Boggs et al. (1995) for closure of the existing Ash Disposal Area on which the proposed CCB facility would be developed. The evaluation focused on the long-term impacts of the Ash Disposal Area on local groundwater and surface water resources following facility closure. The study was initiated with an examination of local hydrogeologic conditions, groundwater quality, and groundwater use in the site vicinity. Hydrogeologic and water quality data were derived from previous groundwater investigations at the plant site. Local groundwater use was established by a survey of residents within a two-mile radius of the disposal site. A water budget simulation of the closed facility was performed to quantify ash leachate production rates during a 30-year post-closure period. The ultimate impact of the closed facility was evaluated using the predicted leachate discharge in conjunction with leachate chemical characteristics and groundwater flow patterns in the site vicinity.

TVA-00018563

2. HYDROGEOLOGIC CONDITIONS

2.1 Geology and Soils

Kingston Fossil Plant resides within the Valley and Ridge physiographic province, a region characterized by narrow, subparallel ridges and valleys trending northeast-southwest. The controlling structural feature of the region is a series of northeast-striking thrust faults which have forced older rocks from the southeast over younger units. Bedrock units of the Rome Formation (lower Cambrian age), the Conasauga Group (middle to upper Cambrian), and the Knox Group (upper Cambrian to Ordovician) subcrop beneath the site in northeast-trending bands (Figure 2-1). These units generally dip to the southeast at angles averaging 45 to 50 degrees (Benziger and Kellberg, 1951). The band of Rome on the northwest side of the site, along with the overlying Conasauga and Knox formations, represent a thrust fault block which has been forced over the Knox outcrop to the northwest. The two major faults associated with this thrust block, shown on Figure 2-1, constitute the two closest faults to the proposed disposal site. Both faults are located in excess of 1000 ft from the proposed disposal area, placing them outside of the 200-ft exclusion zone required by Rule 1200-1-7-.04(1)(u). Foundation exploration in the plant powerhouse area indicated bedrock jointing but no evidence of faulting (Benziger and Kellberg, 1951). Drilling of the overlying Quaternary age alluvium there and elsewhere on the reservation has showed no evidence of faulting in these sediments.

The site lies within the Eastern Tennessee seismic zone (ETSZ), a 300-km long, northeast-trending seismic feature running through the lower mid-Atlantic and southeastern United States (Powell et al., 1994). With the exception of the New Madrid seismic zone, the rate of earthquake activity in the ETSZ has been the highest of any area east of the Rocky Mountains. However, the mean focal depth of recorded earthquakes within the ETSZ is 15 km, placing earthquakes in crystalline basement rocks and not in the overlying sedimentary rocks. Thrust faulting in the region was associated with the Applachian Orogeny which ended in late Permian time, i.e., at least 250 million years ago. Further movement along these faults is improbable. The areas specifically proposed for future CCB disposal are underlain by the Lower Conasauga Group, with the exception of a narrow band along the northwestern side of the proposed site which is underlain by the Rome formation (Figure 2-1). The Nolichucky, Maryville, Rogersville, Rutledge, and Pumpkin Valley formations make up the Lower Conasauga Group, whereas the Maynardville formation is associated with the Upper Conasauga. Total aggregate thickness of these units is unknown but estimated to be approximately 1500 ft (Harris and Foxx, 1982). These units

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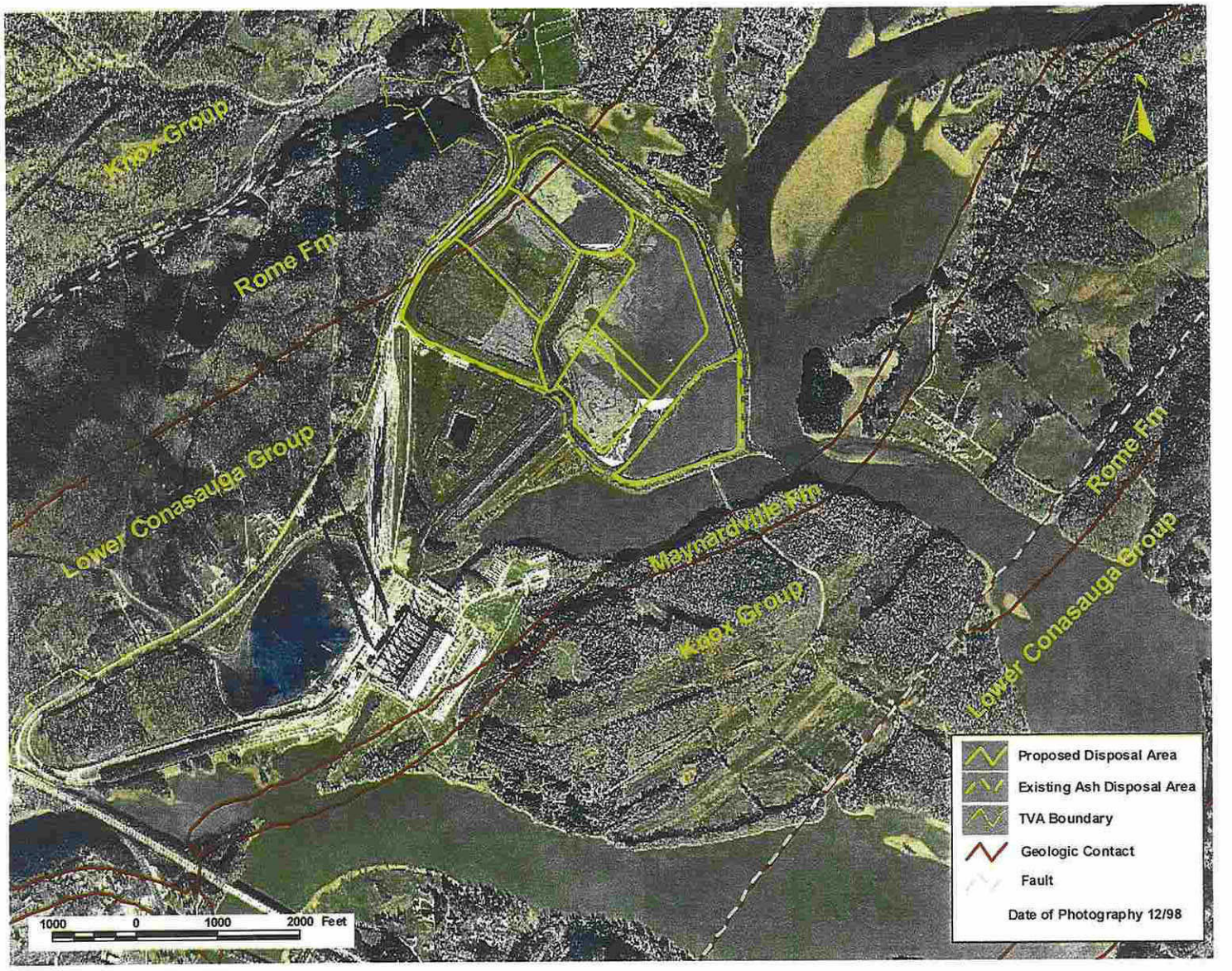

Figure 2-1. Site Geologic Map

TVA-00018565

predominantly consist of shale with interbedded siltstone, limestone, and conglomerate, and are locally of low water-producing capacity. Extensive rock coring of the Conasauga in the plant powerhouse area indicates that limestone accounts for only about 20% of the total cored material, and is present in relatively thin beds ranging from an inch to several feet in thickness (Benziger and Kellberg, 1951). This accounts for the absence of local evidence of karstification in areas underlain of the Lower Conasauga. The Rome formation which lies beneath the northwestern edge of the proposed disposal area consists of interbedded shale, sandstone, and siltstone.

The elevation of the top of rock directly beneath the proposed disposal area is relatively uniform, ranging from approximately 700 to 715 ft and averaging about 705 ft (Figure 2-2). Outside this area the bedrock surface rises steeply to the west and southwest. The lower bedrock terrace corresponding to the disposal area apparently represents an erosion surface associated with the ancestral Emory River. The upper few feet of bedrock generally consists of weathered fissile shale with occasional limestone fragments.

A mantle of predominantly alluvial soils (Quaternary age) generally lies above bedrock in the ash pond area as indicated in the hydrogeologic profiles presented on Figures 2-3 and 2-4 and the soil isopachous map of Figure 2-5. Soil thickness is highly variable, ranging from about 5 ft along a portion of the northern perimeter of the site to a maximum of 65 ft on the western boundary. The alluvial deposits are unconsolidated and heterogeneous mixtures of clay, silt, sand, and gravel that typically grade coarser with depth. Laboratory testing of recently collected alluvial soil samples from the site typically fall into the CL and SM classifications (MACTEC, 2004). A thin, discontinuous layer of residuum, composed of clay and silt with weathered shale fragments, is present directly above bedrock.

The ash and ash-soil fill present above the alluvial/residual soils range up to 83 ft in thickness. Ash deposits consist almost entirely of fly ash, with bottom ash comprising less than 10% of the ash fill. Particle size analysis indicates the existing ash is generally composed of silt and sand size particles with lesser amounts of clay and gravel size material (MACTEC, 2004). Ash pond dikes are constructed of mixtures of fly ash, bottom ash, and silty clay soil. The phreatic surface generally lies within the ash deposits.

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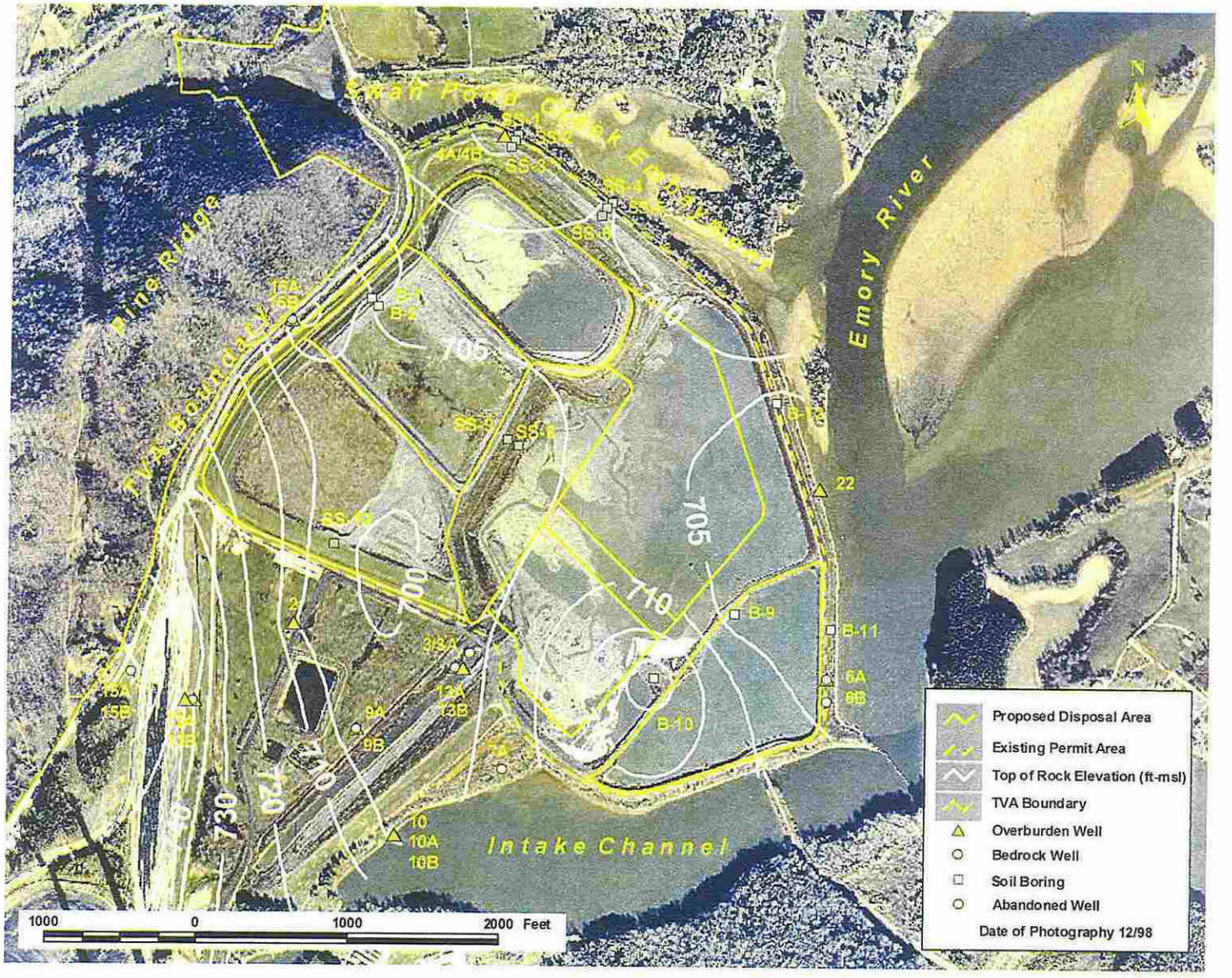

Figure 2-2. Top-of-Rock Elevation Map

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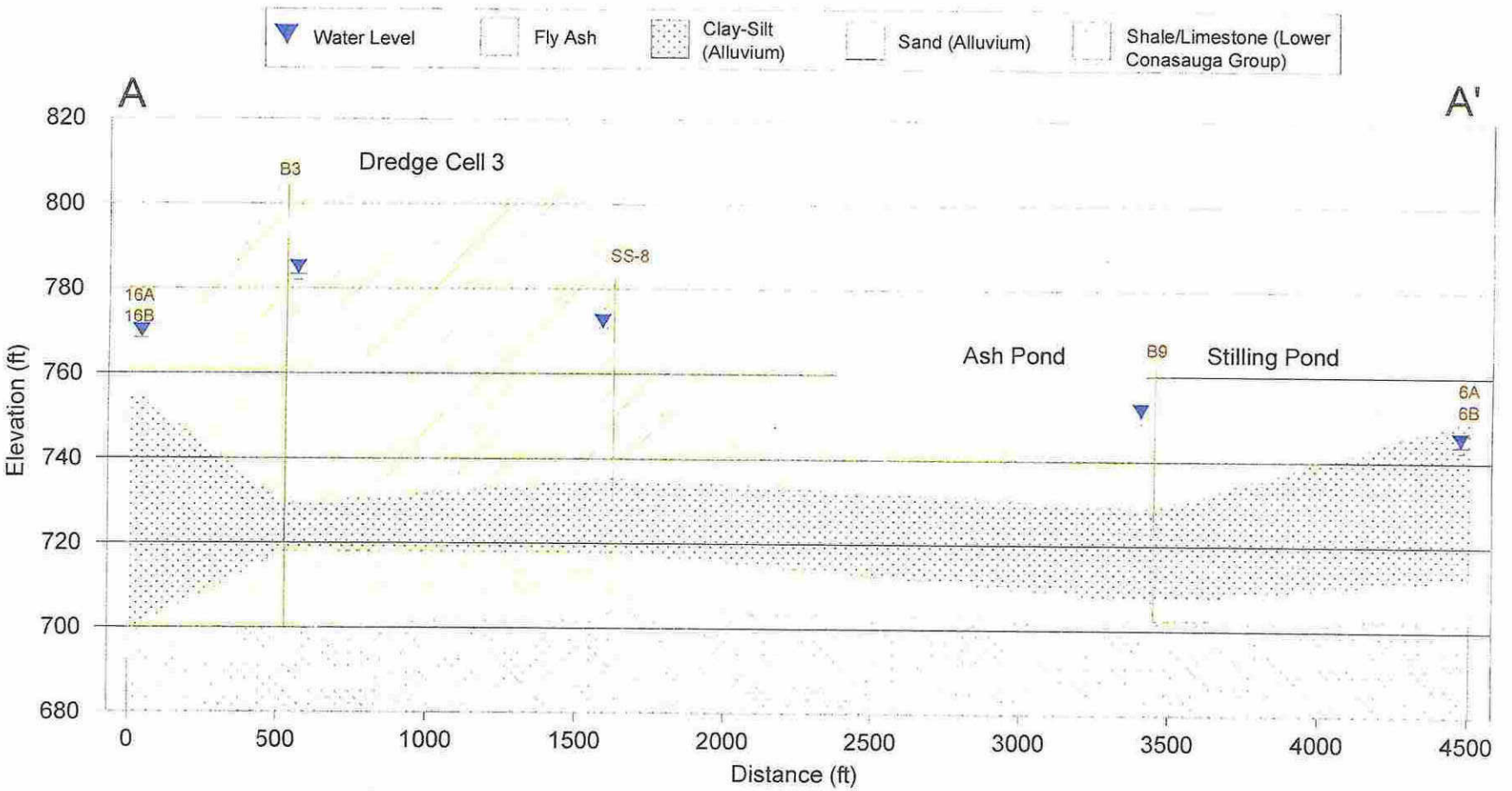

Figure 2-3. Hydrogeologic Section A-A'

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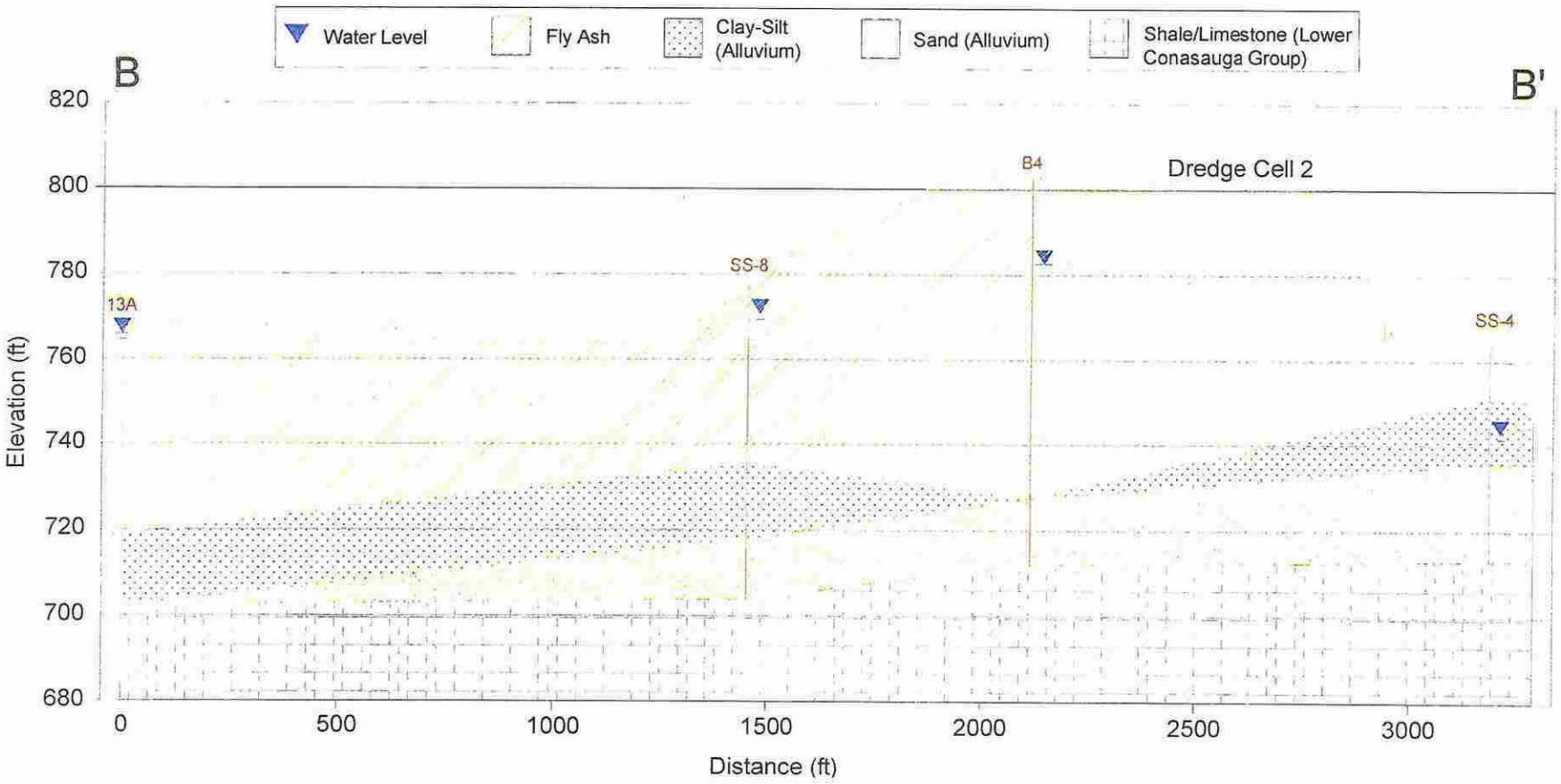

Figure 2-4. Hydrogeologic Section B-B'

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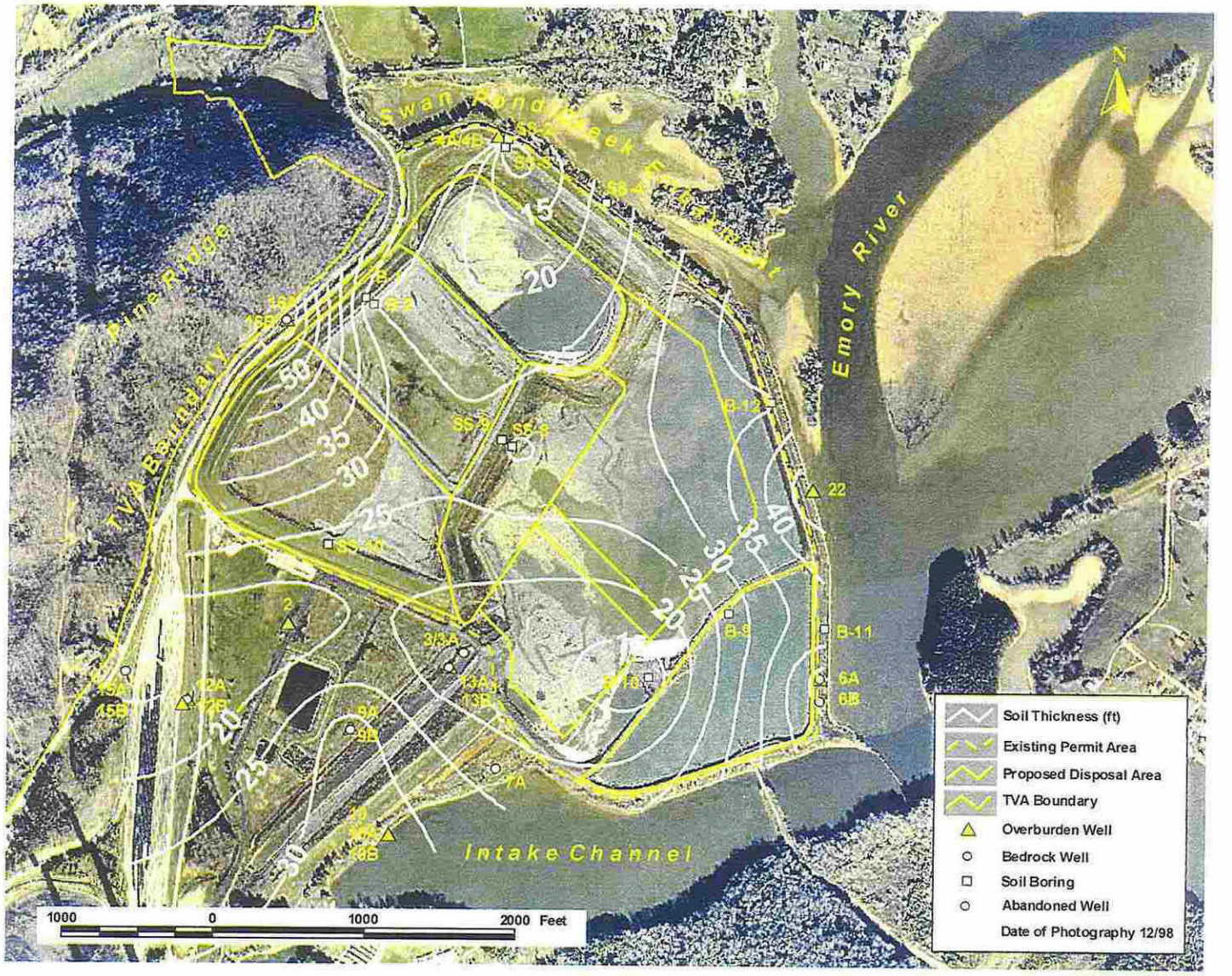

Figure 2-5. Alluvium-Residuum Thickness Map

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Appendix C provides a compilation of grain-size data for unconsolidated soil and ash samples associated with several previous investigations. Atterberg limits and natural moisture content data are included where available along with a description of laboratory testing procedures.

While the number and density of soil borings and rock coreholes in some areas may be below the minimum requirements of the Division of Solid Waste Management's (DSWM's) Hydrogeologic Guidance Document, we believe the available data are sufficient to characterize subsurface conditions at the proposed CCB disposal site. A total of 30 soil borings have been completed within and immediately around the footprint of the proposed site in the unconsolidated ash and underlying alluvial deposits. Drilling has been limited by necessity to locations along perimeter dikes bounding the existing ash pond, stilling pond, and dredge cells. Characterization of the unconsolidated overburden should be adequate because coal ash, which comprises the upper 20 to 80 ft of overburden and represents the "natural" geologic buffer, exhibits a high-degree of homogeneity requiring fewer borings/samples for adequate characterization. In addition, available information indicates the thickness of the underlying alluvium and top-of-rock surface elevation to be relatively uniform, reducing the need for further exploratory drilling. Only two coreholes (i.e., 13B and 16B) have penetrated the underlying bedrock to depths ranging from 7 to 17 ft. However, three additional coring sites (9B, 12B, and 15B) are located within about a 1000 ft of the proposed disposal site, and extensive coring data are available from foundation studies in the plant powerhouse situated approximately 0.5 mile to the southwest.

2.2 Groundwater Occurrence

The first occurrence of groundwater below the proposed CCB disposal areas is generally within the existing ash fill. Under present conditions, groundwater is derived from infiltration of precipitation, seepage from various ash-related impoundments, and from lateral inflow along the western boundary of the reservation. Groundwater movement, as inferred from potentiometric maps developed from water-level measurements in shallow monitoring wells primarily located outside of existing ash disposal areas, is generally eastward from Pine Ridge toward Swan Pond Creek embayment, the Emory River and the plant intake channel (Figure 2-6). However, continuous recharge by ash sluice water in the active ash pond and dredge cells produces local mounding of the water table that is largely undetected by peripheral monitoring wells. Accounting for the measured water surface levels in Ash Dredge Cell 2, the ash pond, and stilling pond results in the alternative potentiometric surface shown on Figure 2-7. This figure indicates radial movement of groundwater away from the surface impoundments, including movement from Cell 2 toward Pine Ridge. Groundwater movement from the dredge cells toward Pine Ridge converges with groundwater flowing down slope. Groundwater entering the region of convergence either discharges into the ephemeral drainage feature paralleling Swan Pond Road on the northwest side,

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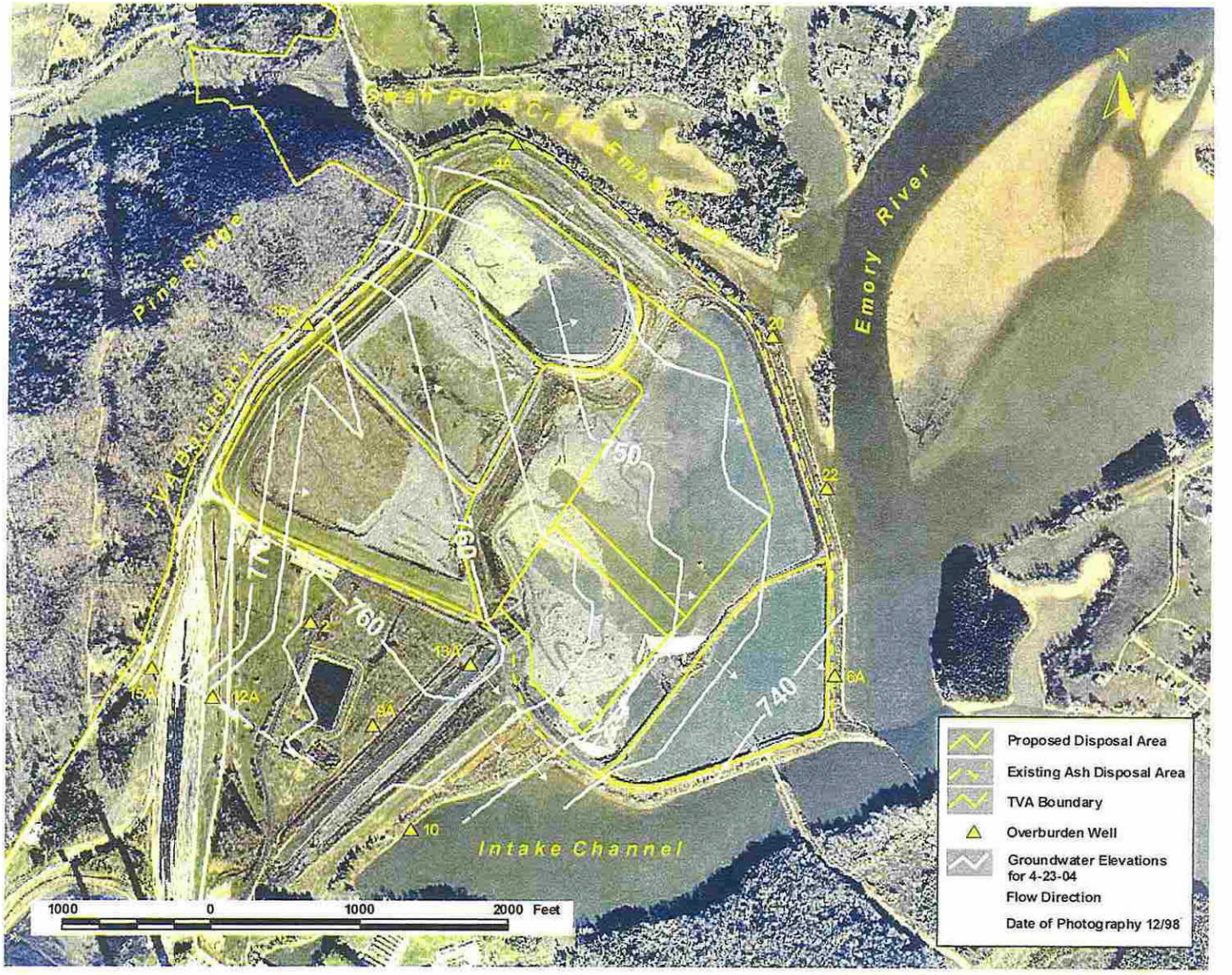

Figure 2-6. Groundwater Potentiometric Surface on April 23, 2004

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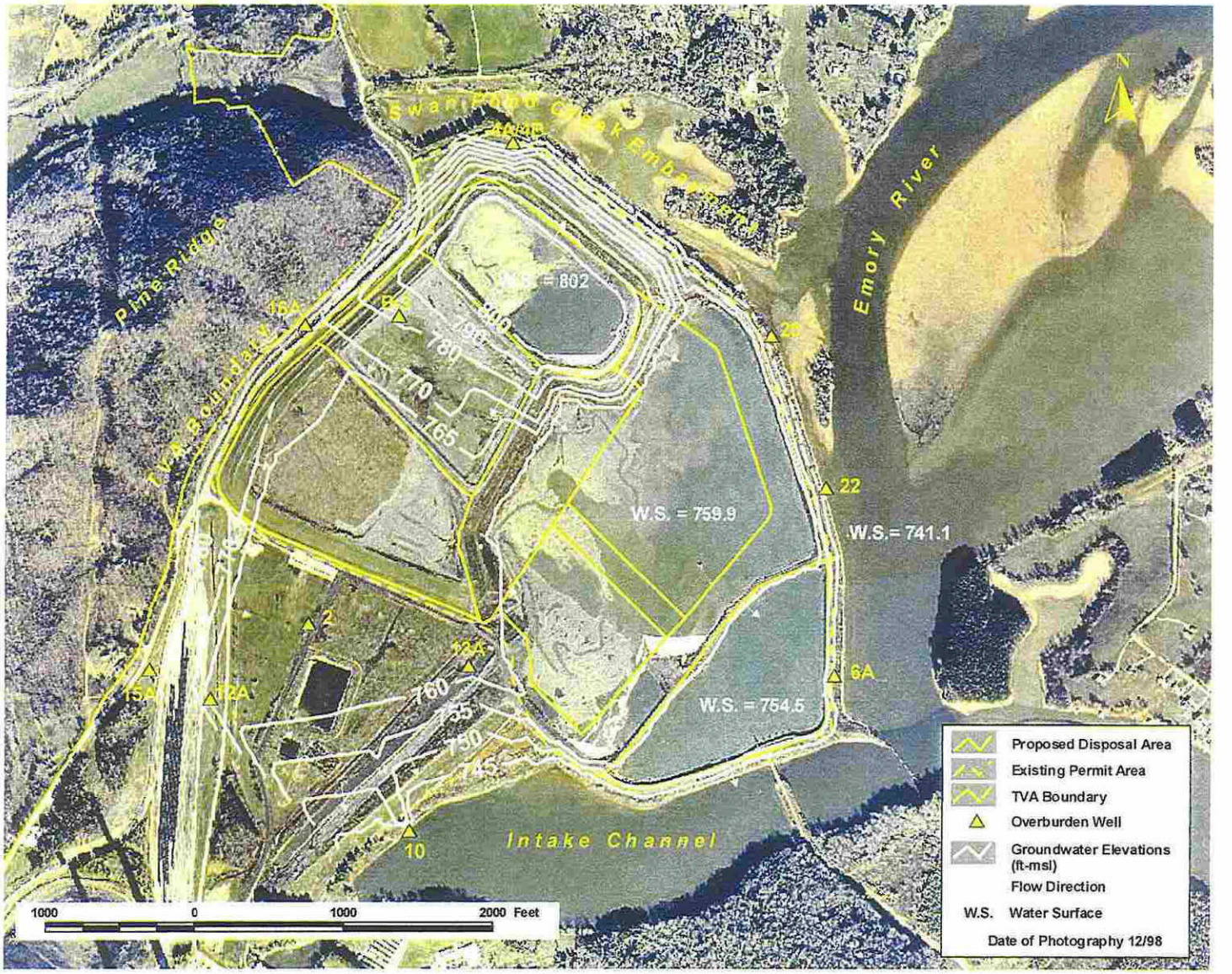

Figure 2-7. Groundwater Potentiometric Surface for April 23, 2004 Accounting for Surface Impoundments

TVA-00018573

or flows around the dredge cells to the northeast or southwest. Since the drainage paralleling Swan Pond Road lies on the KIF reservation, off-site movement of groundwater appears unlikely. In general, all groundwater originating on, or flowing beneath, the proposed disposal site ultimately discharges to the reservoir without traversing private property.

Long-term hydrographs for 10 monitoring wells surrounding the disposal site are presented on Figures 2-8(a) and 2-8(b). Groundwater level data used in these figures are tabulated in Appendix D. Natural seasonality in groundwater level trends is not discernable, due in part to the infrequency of the measurements, i.e., only four or fewer observations were made per year. However, the close proximity of most monitoring wells to the active ash pond, dredge cells, and/or the reservoir, suggests that these surface water features may largely control local groundwater levels. For example, the upward water level trends observed over the past 5 to 6 years in wells 16A and 13B, both of which are situated near ash disposal areas but away from the stabilizing influence of the reservoir, can be attributed to increasing impoundment heads in the existing Ash Pond and Ash Dredge Cells 1-3.

Short-term hydrographs for piezometers B-1 through B-3 are given on Figure 2-9 with data tabulated in Appendix D. These piezometers were installed along the northwestern slope of Ash Dredge Cell 2 in April 2004, and were monitored frequently over a three-month period. The relatively high potentiometric heads observed at these wells compared to neighboring wells (e.g., 4A, 16A) reflect mounding of the water table in the Ash Dredge Cell area created by sluice water recharge. Overall differences in the potentiometric head elevations in the three wells (i.e., highest at B-3 and lowest at B-1) can be attributed to differences in topographic position of piezometers on the dredge cell slope. Decreasing water levels were observed for all piezometers over the period, probably due to pumping from a recently installed toe drain on the northwest side of Cell 3 and perhaps to limited rainfall during the period (Appendix D).

Determination of the seasonal high water table for the proposed disposal site is problematic due to the artificial influence of multiple surface water impoundments on local groundwater levels. As noted earlier, shallow groundwater levels observed in local monitoring wells are largely controlled by reservoir stage and by recharge from adjacent impoundments. Consequently, natural variability of groundwater levels produced by seasonal differences in precipitation and evaporation is generally not discernable in temporal groundwater level records. Nevertheless, Figure 2-10 provides an estimate of the seasonal high water table based on the maximum water level observed in each monitoring well during the period of record (see Appendix D). There is little noticeable difference between overall groundwater levels and gradients indicated for the seasonal high water table configuration compared to that shown for the recent water table snapshot presented on Figure 2-7.

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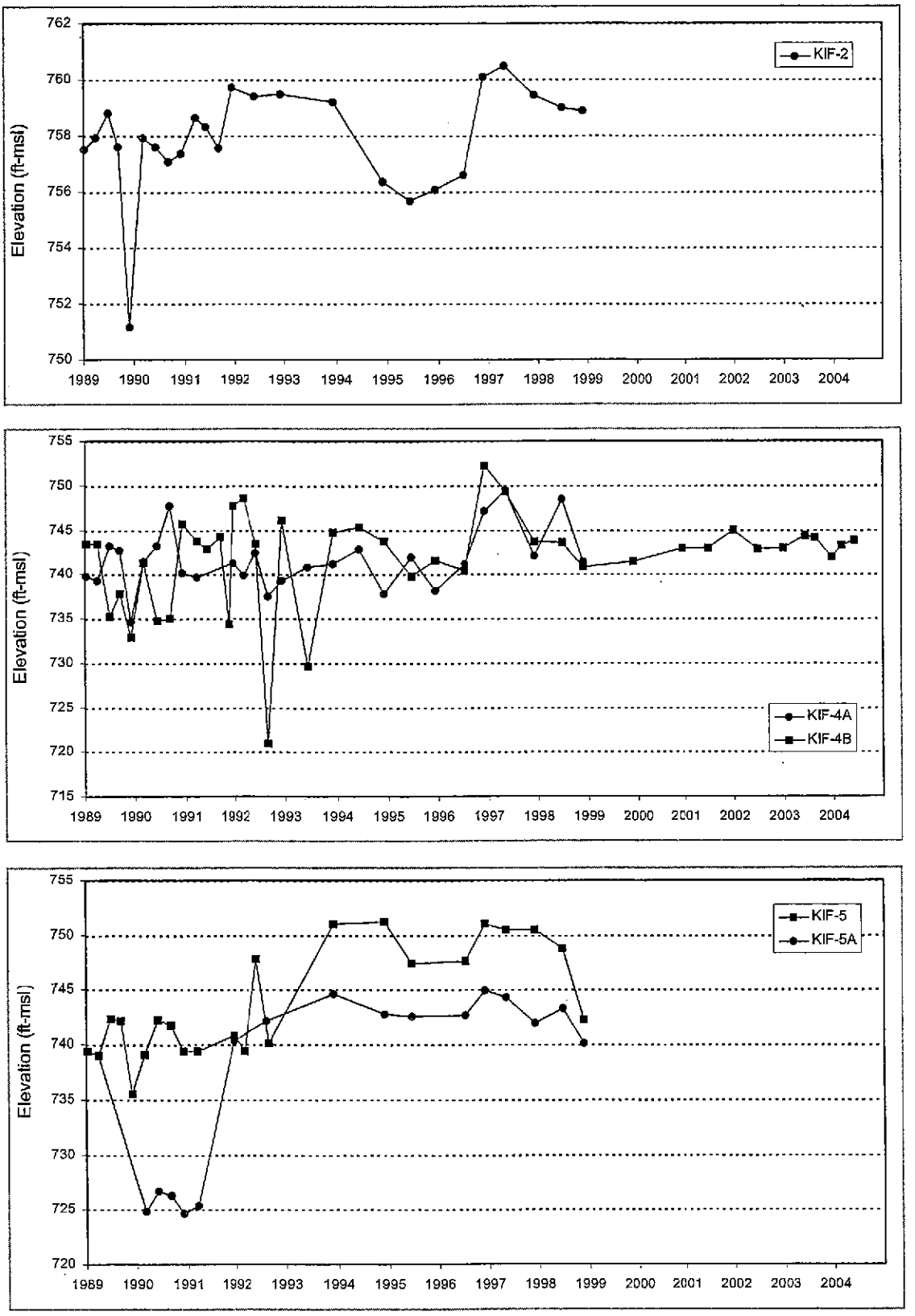

Figure 2-8(a). Long-Term Groundwater Hydrographs for Selected Monitoring Wells

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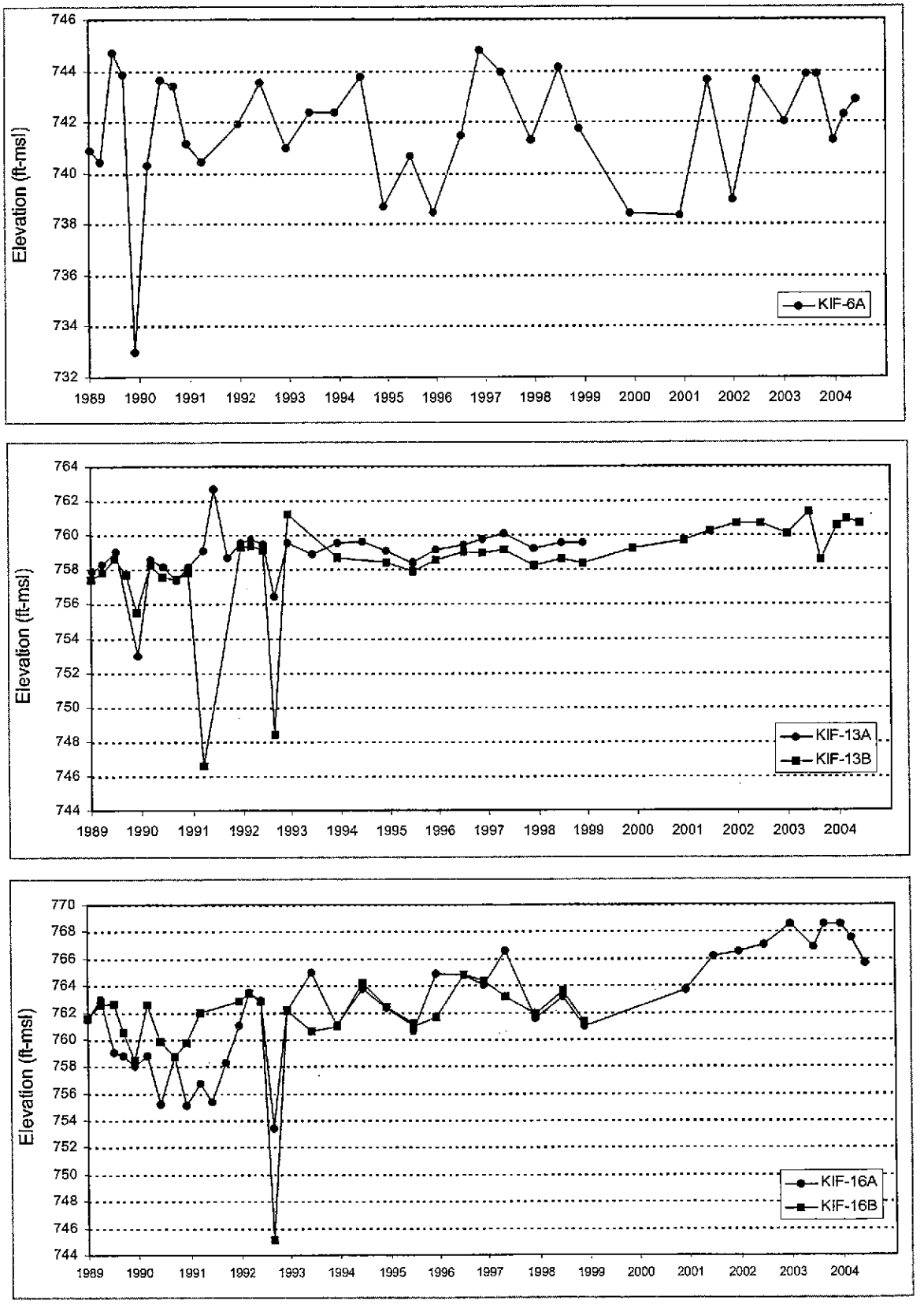

Figure 2-8(b). Long-Term Groundwater Hydrographs for Selected Monitoring Wells

TVA-00018576

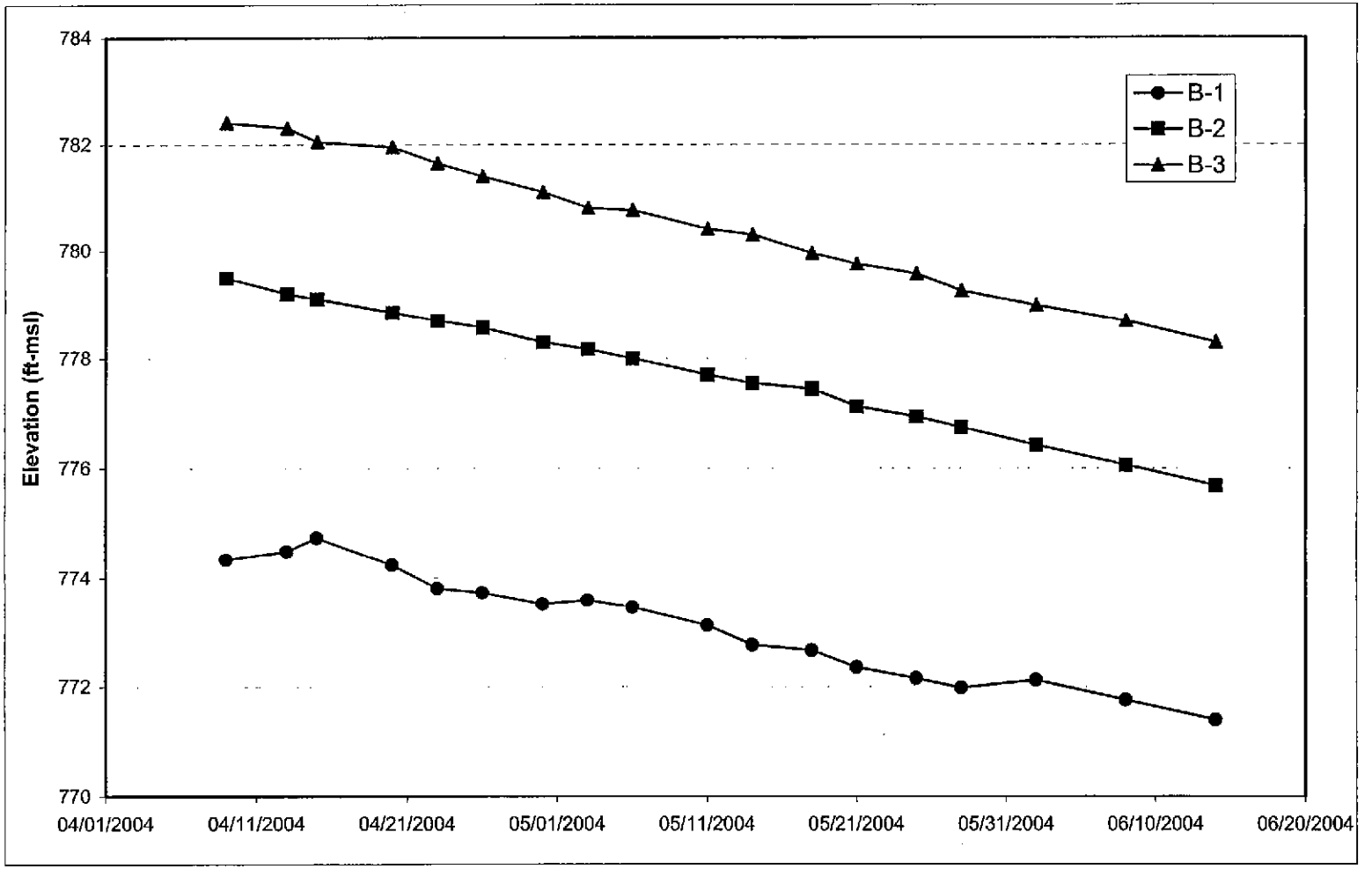

Figure 2-9. Short-Term Groundwater Hydrographs for Piezometers B1 – B3

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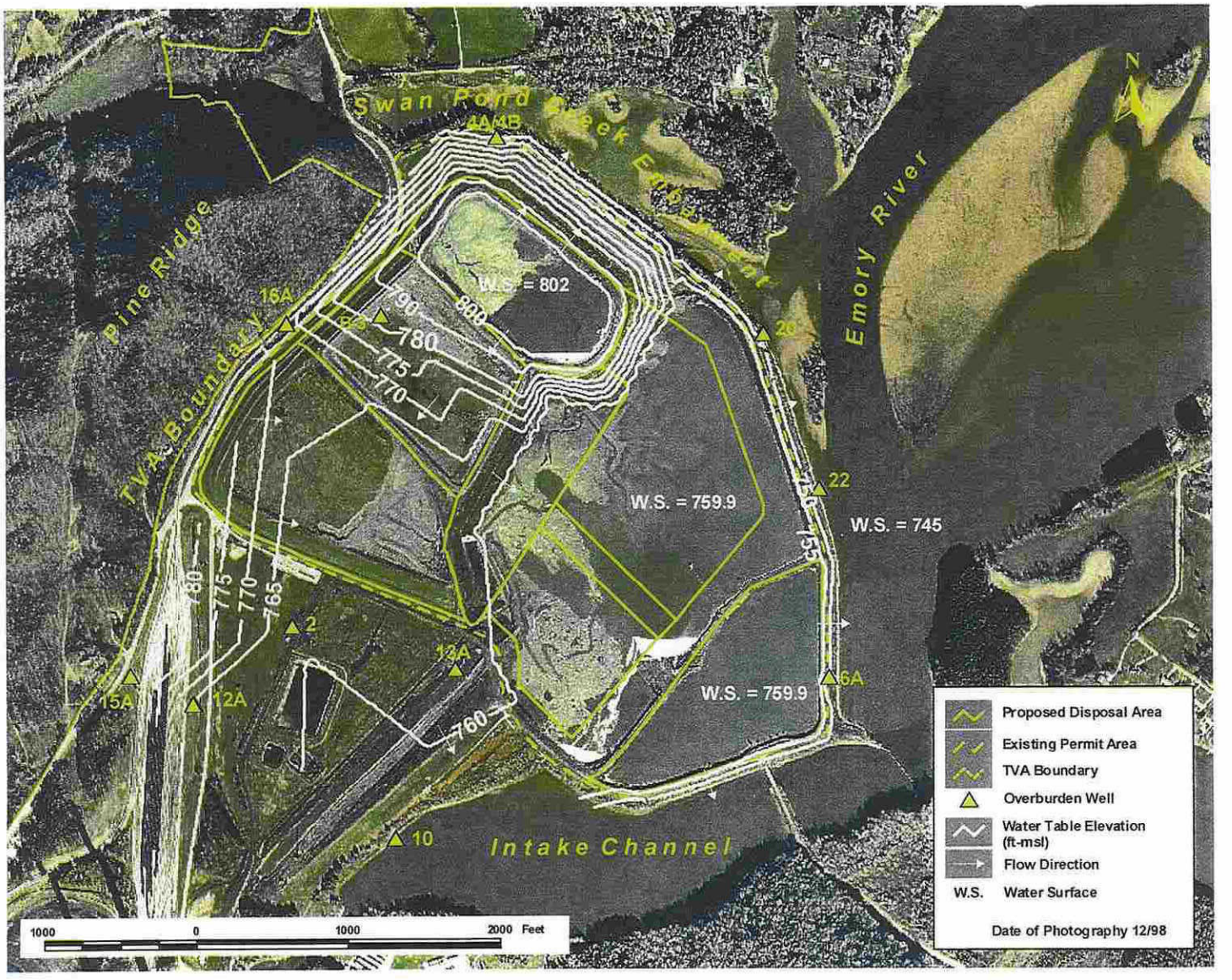

Figure 2-10. Estimated Seasonal High Water Table Map

TVA-00018578

2.3 Hydraulic Properties

A summary of field and laboratory measurements of hydraulic conductivity for ash, alluvial soils, and shallow bedrock derived from previous site investigations is presented in Table 2-1. References for the laboratory or field methods are also given in the table. Vertical hydraulic conductivities (K_v) for nine fly ash samples range from 3.6×10^{-6} to 8.3×10^{-5} cm/s and exhibit a median value of 2.0×10^{-5} cm/s. The two field measurements of fly ash horizontal conductivity (K_h) generally fall within the range of data reported for K_v. Laboratory-derived K_h and K_v data for alluvial clay-silt samples show little difference and average about 5×10^{-7} cm/s. Field measures of K_h for this unit are about an order of magnitude higher, averaging approximately 7×10^{-6} cm/s. The difference reflects the larger measurement scale associated with field tests as well as the tendency for higher K values in the horizontal direction. Field testing performed in three wells completed in the upper Conasauga shale yielded K_h values averaging 2×10^{-5} cm/s.

The "natural" geologic buffer material below the proposed CCB disposal area would largely consist of fly ash (see hydrogeologic sections on Figures 2-3 and 2-4). As indicated in Table 2-1, hydraulic conductivity measurements of fly ash are limited to laboratory analysis of seven samples and two Boutwell field tests. Although the number of hydraulic conductivity measurements is below the recommended requirements of the DSWM Hydrogeologic Guidance Document, these data are considered sufficient in view of the high-degree of homogeneity of fly ash.

The hydraulic conductivity data presented in Table 2-1 do not include data for remolded samples of landfill cap and geologic buffer materials. The source of the cap and buffer materials has not been identified. Prior to construction of either the cap or buffer, TVA will solicit bids for cap/buffer materials having specified geotechnical properties. These specifications will include a requirement that the cap/buffer materials are compacted in accordance with ASTM D-698 or D-1557, and that hydraulic conductivity be measured according to ASTM D-5084. Hydraulic conductivities equal to or less than 10^{-6} cm/s (at design compaction) will be required of buffer materials.

Clay cap material will require hydraulic conductivities equal to or less than 10^{-7} cm/s. Test results will be presented to the State for approval prior to construction of the cap or buffer.

TVA-00018579

Table 2-1. Summary of Site Hydraulic Conductivity Data

Media	Location	K_h (cm/s)	K_v (cm/s)	Test Method	Reference
Fly Ash	Ash Dredge Cell 1	--	8.3E-05	ASTM D-5084	Law, 1995
Fly Ash	Ash Dredge Cell 3	--	3.4E-05	ASTM D-5084	Law, 1995
Fly Ash	B-1	1.4E-05	5.1E-06	ASTM D-6391	Mactec, 2004
Fly Ash	B-2	3.7E-06	3.6E-06	ASTM D-6391	Mactec, 2004
Fly Ash	B-2A	--	1.67E-05	ASTM D-5084	Mactec, 2004
Fly Ash	B-1A, 1B	--	1.87E-05	ASTM D-5084	Mactec, 2004
Fly Ash	--	--	2.0E-05	ASTM D-2434-68	EPRI, 1993
Fly Ash	--	--	2.1E-05	ASTM D-2434-68	EPRI, 1993
Fly Ash	--	--	2.2E-05	ASTM D-2434-68	EPRI, 1993
Bottom Ash	(?)	--	9.3E-03	ASTM D-5084	Law, 1995
Alluvial Clay-Silt	Well 2	7.4E-08	6.3E-08	(note 1)	Milligan & Ruane, 1980
Alluvial Clay-Silt	Well 4	6.6E-08	2.8E-07	(note 1)	Milligan & Ruane, 1980
Alluvial Clay-Silt	Well 5	2.8E-07	4.0E-07	(note 1)	Milligan & Ruane, 1980
Alluvial Clay-Silt	Well 6	2.5E-06	4.4E-07	(note 2)	Milligan & Ruane, 1980
Alluvial Clay-Silt	Well 2	9.1E-06	--	(note 2)	Velasco&Bohac, 1991
Alluvial Clay-Silt	Well 4B	6.1E-06	--	(note 2)	Velasco&Bohac, 1991
Alluvial Clay-Silt	Well 5	9.1E-06	--	(note 2)	Velasco&Bohac, 1991
Alluvial Clay-Silt	Well 13A	3.0E-06	--	(note 2)	Velasco&Bohac, 1991
Conasauga Shale	Well 9B	6.1E-06	--	(note 2)	Velasco&Bohac, 1991
Conasauga Shale	Well 13B	2.1E-05	--	(note 2)	Velasco&Bohac, 1991
Conasauga Shale	Well 15A	3.0E-05	--	(note 2)	Velasco&Bohac, 1991

Notes:

1. *Laboratory constant-head test of undisturbed sample in triaxial cell; exact method unknown.*
2. *Field constant-rate pumping test in single well.*

TVA-00018580

2.4 Precipitation

In the absence of long-term precipitation records for the KIF site, precipitation data were obtained for the National Oceanic and Atmospheric Administration (NOAA) station in Oak Ridge, Tennessee, located some 20 miles northwest of the site. A continuous 20-year period (1968-87) of daily precipitation data was selected. Annual precipitation for the period ranged from 38.8 to 76.3 inches and averaged approximately 52.9 inches.

3. LOCAL GROUNDWATER USE

A survey of local groundwater use within an approximate two-mile radius of the center of the ash pond area was conducted in March 1995 (Boggs et al., 1995). The survey included interviews with local residents and utility district managers. Water well records maintained by the State of Tennessee were also examined for wells within the survey region. This survey identified a total of 22 residential wells. A listing of these wells and their coordinate locations is given in Table 3-1. Note that wells were numbered 1 through 23 with no well 15. One spring (Spring 1) was identified which provides untreated water for 10 to 12 residences along Swan Pond Road and for several residents of the Kingston Heights subdivision. The spring emanates from aquifers of the Knox Group. This spring appeared to be the only spring in the survey region used for water supply. Other residents within the survey region were served by one of the four local water utilities listed in Table 3-1. These utilities provide treated water from intakes on Watts Bar Lake or the Emory River.

This area was re-surveyed in May 2004 to determine whether changes in local water use had occurred. The survey relied on interviews with local utility district managers, a drive-by inspection to identify new residences, and examination of current State well records. Six new residential wells identified, i.e., wells 24 through 29 (Figure 3-1) located east of the proposed disposal area on the opposite side of the Emory River. There was no change in public water supplies in the site vicinity.

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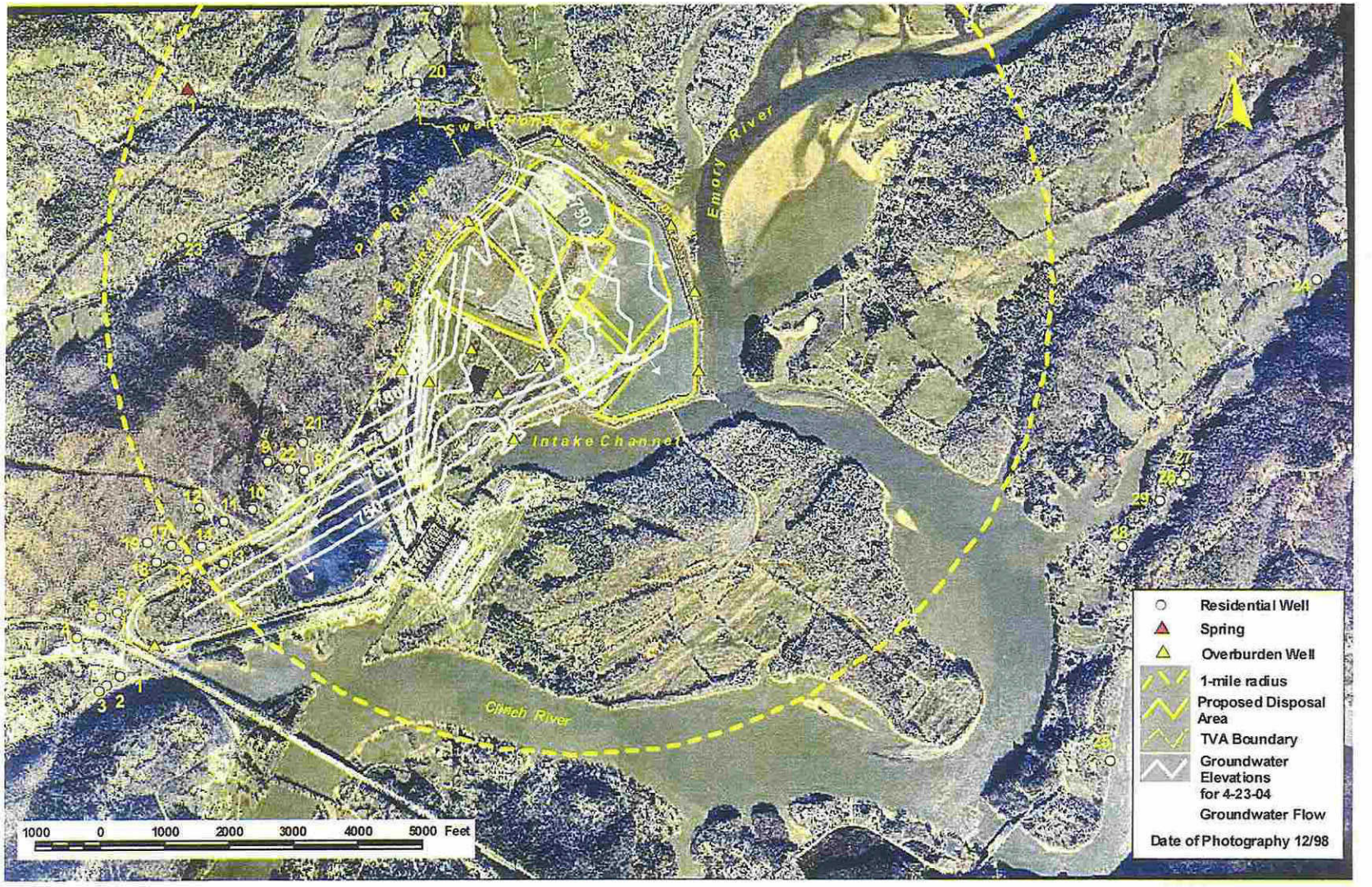

Figure 3-1. Private Water Wells and Springs in Site Vicinity

TVA-00018582

Table 3-1. Off-Site Wells, Springs, and Public Water Supplies

Location Identifier	Location Description	Longitude (dg-mn-sc) est	Latitude (dg-mn-sc) est	Inside 1 mile radius	Outside 1 mile radius	Comment
Well 1	Swan Pond Rd south of Hwy 70	35-53-35 N	84-32-05.5 W		X	
Well 2	Swan Pond Rd south of Hwy 70	35-53-34 N	84-32-09 W		X	
Well 3	Swan Pond Rd south of Hwy 70	35-53-33 N	84-32-10.5 W		X	
Well 4	North of Hwy 70, South of I-40	35-53-41.5 N	84-32-14 W		X	
Well 5	Swan Pond Rd north of Hwy 70	35-53-44.5 N	84-32-09.5 W		X	
Well 6	Swan Pond Rd north of Hwy 70	35-53-45 N	84-32-06 W		X	
Well 7	Swan Pond Circle north of Swan Pond Rd	35-55-18 N	84-31-04.5 W	X		
Well 8	Swan Pond Rd north of Hwy 70	35-54-06 N	84-31-31 W	X		
Well 9	Swan Pond Rd north of Hwy 70	35-54-07 N	84-31-37 W	X		
Well 10	Swan Pond Rd north of Hwy 70	35-54-00.5 N	84-31-41 W	X		
Well 11	Swan Pond Rd north of Hwy 70	35-53-58.5 N	84-31-46 W	X		
Well 12	Swan Pond Rd north of Hwy 70	35-54-00.5 N	84-31-50.5 W	X		
Well 13	Swan Pond Rd north of Hwy 70	35-53-52 N	84-31-47 W	X		
Well 14	Swan Pond Rd north of Hwy 70	35-53-55 N	84-31-50 W	X		
Well 16	Swan Pond Rd north of Hwy 70	35-53-53 N	84-31-53 W		X	
Well 17	Swan Pond Rd north of Hwy 70	35-53-55 N	84-31-56 W		X	
Well 18	Swan Pond Rd north of Hwy 70	35-53-52 N	84-31-58.5 W		X	
Well 19	Swan Pond Rd north of Hwy 70	35-53-56 N	84-32-00 W		X	
Well 20	Swan Pond Rd west of Swan Pond circle	35-55-06.5 N	84-31-09 W	X		
Well 21	Swan Pond Rd north of Hwy 70	35-54-11 N	84-31-31.5 W	X		
Well 22	Swan Pond Rd north of Hwy 70	35-54-05 N	84-31-05 W	X		
Well 23	Hassler Mill Rd west of Swan Pond Rd	35-54-43 N	84-31-54 W	X		
Well 24	Sugar Grove Valley Road	35-54-34N	84-28-19W		X	
Well 25	Sugar Grove Valley Road	35-54-20N	84-28-59W		X	
Well 26	Sugar Grove Valley Road	35-54-03N	84-28-45W		X	
Well 27	Sugar Grove Valley Road	35-54-04N	84-28-44W		X	
Well 28	Sugar Grove Valley Road	35-54-53N	84-28-56W		X	
Well 29	Sugar Grove Valley Road	35-54-00N	84-28-49W		X	
Spring 1	Near intersection of Swan Pond Rd and Frost Hollow Rd (used for portion of municipal supply by City of Kingston)	35-55-07 N	84-31-54 W	X		
City of Kingston	Intake off Hwy 58 south of Kingston on Watts Bar Lake	n/a	n/a			Outside 2-mile radius
Swan Pond U. D.	Purchase water from City of Harriman	n/a	n/a			Outside 2-mile radius
Midtown Utilities	Purchase water from City of Rockwood	n/a	n/a			Outside 2-mile radius
Town of Harriman	Intake on Emory River Near Mile 13	n/a	n/a			Outside 2-mile radius
City of Rockwood	Intake on Watts Bar Lake near Post Oak Creek	n/a	n/a			Outside 2-mile radius

TVA-00018583

4. EVALUATION OF POTENTIAL WATER QUALITY IMPACTS

The potential impacts of proposed future coal-combustion byproduct (CCB) disposal on local groundwater and surface water resources are examined in this section. The focus of the evaluation is on the potential effect of disposal activities on stream water quality since all shallow groundwater originating on, or flowing beneath, the site ultimately discharges to streams without traversing private property. Separate evaluations are performed for future codisposal of ash and gypsum (Option A) and disposal of ash only (Option B). Comparisons of water quality impacts for facility designs with and without a constructed 3-ft geologic buffer are provided for each disposal option.

4.1 Contaminants of Concern

Representative chemical data for fly ash and flue-gas desulfurization (FGD)-derived gypsum leachate are presented in Table 4-1. The gypsum data represent average constituent concentrations for five leachate samples collected from the gypsum pond and slurry tank at Cumberland Fossil Plant (CUF) (Appendix E). Fly ash data were obtained from a single leachate sample collected from WP21 located in the KIF active ash pond on June 7, 2004.

Eight contaminants of concern (COC) were selected for evaluation including ammonia, arsenic, cadmium, copper, mercury, nickel, selenium, and zinc. These constituents exhibit mean concentrations that are significantly above primary drinking water MCL (e.g., As, Cd, Hg, Ni, and Se) or have potential aquatic toxicity (e.g., Cd, Cu, Ni, and Zn). Ash produced after May 2004 may contain a maximum of 226 mg/kg ammonia as a result of the recently installed NOx reduction system. Ammonia forms a residue on ash particle surfaces which is expected to be highly soluble. Residual ammonia dissolved by either sluice water or infiltrating precipitation would likely be in the form of the ammonium ion (NH_4^-). Interstitial water remaining in sluiced ash after mixing of ammoniated-ash with sluice water is estimated to contain 2.64 mg/L NH_3-N (TVA, 2002). The same ammonia content is conservatively assumed to apply to dry "dipped" ash (i.e., ash dredged from the ash pond and hauled by truck to the disposal site). Incident precipitation infiltrating through dry stacked fly ash would form leachate-containing ammonia as well as other ash-related constituents. The NH_3-N concentration of the dry ash leachate is estimated to be approximately 733 mg/L assuming complete leaching of ammonia from a unit volume of ash by one pore volume of infiltrating water. On entering the groundwater system beneath the disposal area, ammonia may be transformed by biological nitrification to nitrate and/or nitrite.

TVA-00018584

Table 4-1. Fly Ash and Gypsum Leachate Data

	Units	MCL	CCC	KIF Ash Leachate[1]	CUF Gypsum Leachate[2]
Aluminum	µg/L	200	150	<50	280.0
Antimony	µg/L	6		<3	9.3
Arsenic	µg/L	50		750	1.0
Barium	µg/L	2000		40	77.5
Beryllium	µg/L	4		<1	1.0
Boron	µg/L			730	42,500.0
Cadmium	µg/L	5	0.25	2	11.9
Chloride	mg/L	250		7.9	1,300.0
Chromium	µg/L	100	100	<1	2.3
Cobalt	µg/L			<1	9.5
Copper	µg/L	1300	9	<10	5.5
Fluoride	mg/L	4		0.57	13.1
Iron	µg/L	300		16000	205.0
Lead	µg/L	15	2.5	<1	1.0
Magnesium	µg/L			11	535.0
Manganese	µg/L	50		580	1,490.0
Mercury	µg/L	2	0.77	0.1	3.4
Nickel	µg/L	100	52	3	106.5
Selenium	µg/L	50	5	<1	137.0
Silver	µg/L	100	3.2	<10	5.2
Sodium	mg/L			5.7	19.5
TDS (180 deg)	mg/L	500		400	6,800.0
Strontium	µg/L			460	4,500.0
Sulfate	µg/L	250		130	3,020.0
Thallium	µg/L	2		<2	<2
Vanadium	µg/L			<10	<10
Zinc	µg/L	5000	120	<10	715.0

[1]*Data for filtered water sample from wellpoint WP-21 completed in Ash Pond.*
[2]*Average concentrations for 4 gypsum leachate samples given in Appendix E.*

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4.2 Methods

4.2.1 Leachate Seepage Estimation

The potential impacts associated with each of the proposed CCB disposal areas during the period of active disposal operations were assessed individually since these facilities generally involve different wastes, spatially distinct areas, and will operate over different timeframes. The HELP landfill hydrologic water budget model (Schroeder et al., 1989 and 1994) was used to estimate CCB leachate seepage rates from landfill-type facilities not involving waste impoundments (e.g., dry ash stacks, inactive ash dredge cells, and inactive gypsum rim-ditch disposal operations). Typically, individual landfills were divided for purposes of HELP simulations into subregions based on waste thickness, surface cover, and surface slope. For example, Figure 4-1 shows the subregion and stratigraphic profile associated with the proposed Phase 1 addition of sluiced ash to existing Ash Dredge Cells 1-3. Subsequent stages of Phase 1 development of Cells 1-3 (e.g., capping with dipped ash and final closure) involved additional modeling steps. Subregion and profile diagrams for these models are given on Figures F-2 and F-3 of Appendix F.

Seepage estimates for CCB impoundment facilities (e.g., active ash dredge cells and gypsum sedimentation ponds) were performed by modeling a typical section through the disposal area using the USGS MODFLOW-2000 groundwater flow model (Harbaugh et al., 2000) in conjunction with the Visual MODFLOW modeling interface (Waterloo Hydrogeologic, Inc., 2004). The average steady-state seepage rate from the base of the facility along the section was then integrated over the full area of the facility to estimate total leachate seepage.

The various CCB disposal areas associated with Option A involved modeling of 25 separate landfill and impoundment subregions. Diagrams similar to Figure 4-1 describing the individual facility models for Option A are provided in Appendix F. Likewise, Appendix G contains diagrams of facility subregions associated with Option B. Note that proposed Phase 1 disposal facilities are the same for both Options A and B.

HELP Simulations – Hydraulic properties used in the HELP simulations are presented in Table 4-2. Fly ash data represent average characteristics derived from laboratory testing of three Kingston fly ash samples (Young et al., 1993). The bottom ash hydraulic conductivity given in Table 4-2 is based on test results for a KIF bottom ash sample reported by MACTEC (2004). All other bottom ash parameters are based on lab testing of a sample of CUF bottom ash (D.B. Stephens, 1991). Since no gypsum has yet been produced at KIF, average properties for two gypsum samples from Shawnee Fossil Plant (SHF) were used (D.B. Stephens, 1991). The values for top soil were those presented by Schroeder et al. [1989] for a soil loam. The field capacity, wilting point, and porosity for the clay cap and clay buffer were those given by Schroeder et al. [1989] for a soil liner.

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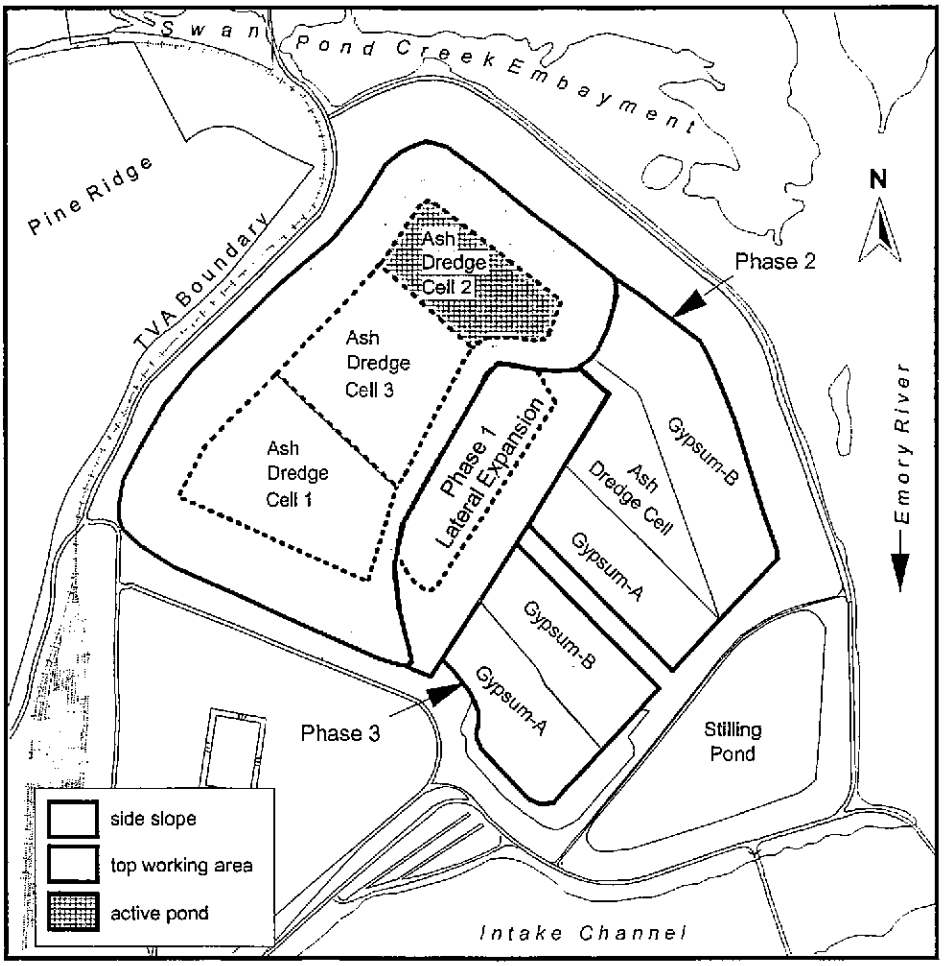

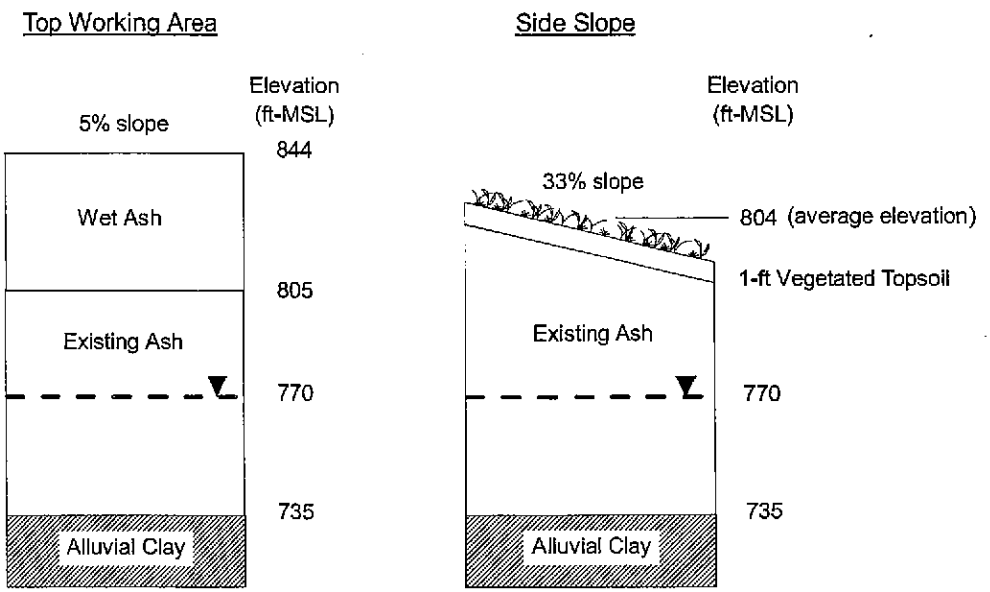

Figure 4-1. Conceptual Model of Ash Dredge Cells 1-3

Table 4-2. Hydraulic Properties Applied in HELP Simulations

Media Type	Total Porosity	Field Capacity[1]	Wilting Point[2]	Initial Volumetric Moisture Content (%)	Hydraulic Conductivity (cm/s)
Top Soil	0.46	0.23	0.12	0.23	3.7×10^{-4}
Clay Cap	0.43	0.37	0.28	0.37	1.0×10^{-7}
Fly Ash	0.47	0.40	0.12	0.22 - 0.32	2.0×10^{-5}
Gypsum	0.68	0.54	0.28	0.50	5.1×10^{-5}
Bottom Ash	0.53	0.15	0.06	0.10	9.3×10^{-3}
Geologic Buffer	0.43	0.37	0.28	0.37	1.0×10^{-6}

[1]Moisture content at pressure head of -0.33 bar.

[2]Moisture content at pressure head of -15 bars.

The design maximum hydraulic conductivity of the clay cap is 10^{-7} cm/s while that of the clay buffer is 10^{-6} cm/s. Initial volumetric moisture contents for the top soil, clay buffer, and clay cap were arbitrarily set at field capacity for all simulations involving these materials. The design moisture content of dry-stacked fly ash at the time of emplacement will be 0.22, whereas an initial moisture content of 0.26 was applied to existing fly ash. Initial moisture contents for gypsum and bottom ash were estimated from in situ data measured at SHF and CUF.

Soil Conservation Service curve numbers (CN), used by HELP to estimate surface runoff, were determined on the basis of vegetative cover and soil texture relationships provided by Schroeder et al. (1994, Figure 7, p. 39). CN values of 90 were used for bare fly ash and gypsum surfaces. Temporary cover consisting of top soil and a fair grass cover was assigned a CN of 80 and a leaf area index (LAI) of 2.2. Final cover applied at facility closure and consisting of top soil with a good grass cover was assigned a CN of 80 and an LAI of 3.3.

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Evaporation parameters required by HELP include the evaporation coefficient and the evaporation depth. Foust and Young (1993) demonstrated by laboratory experiments and numerical simulations using fly ash from TVA's Kingston and Colbert Plants that the evaporation depth can approach several feet. For HELP simulations involving bare fly ash surfaces, a conservative evaporation depth of 30 inches was used. The measured evaporation coefficient of 14.6 mm/day$^{0.5}$ for KIF fly ash reported by Foust and Young (1993) was used for bare fly ash surfaces. For bare gypsum surfaces, an evaporation depth of 18 inches was assumed in conjunction with an evaporation coefficient of 8 mm/day$^{0.5}$ derived from a 15-month field lysimeter study involving SHF gypsum (Boggs et al., 1990). All cases involving top soil cover assumed 12-inch evaporation depths and an evaporation coefficient of 5.1 mm/day$^{0.5}$ in accordance with guidance provided by Schroeder et al. (1994).

Meteorological data was compiled from a NOAA station located in Oak Ridge, Tennessee. This station was selected because of its close proximity to KIF and because high quality data was available for a continuous 20-year period. The data include daily rainfalls and mean daily temperatures from 1968 to 1987. In order to provide 30 years of rainfall/temperature data for the water budget simulation, data for years 1968-77 were added to the end of the 1968-87 record. Daily solar radiation values were generated using a HELP subroutine that incorporates several factors including latitude and daily rainfall.

MODFLOW Simulations-- Steady-state leachate seepage from the gypsum and ash ponds were obtained from two-dimensional profile models oriented normal to the river as shown in the example on Figure 4-2. The figure depicts the finite difference model grid, subsurface hydrogeologic units, and constructed waste layers associated with the initial Phase 2 gypsum/ash impoundments. The upper model shown in Figure 4-2 represents an impoundment design without a geologic (clay) buffer, while the lower model represents an impoundment which incorporates a geologic buffer. In this example, constant-head boundary conditions of 765 ft and 740 ft are applied at the left and right model boundaries, respectively, to represent the approximate pre-impoundment ambient hydraulic gradient toward the river. The lower boundary represents approximate top of bedrock elevation and is assigned zero flux. Constant heads of 784 ft are assigned to model cells representing the upper surface of the impoundment to represent an assumed 4-ft water depth. Perimeter drains indicated in the bottom ash drainage layers were assigned fixed heads equal to the average elevation of the layer. Stratigraphic units, including the existing fly ash, alluvial clay, and alluvial sand, were assigned uniform average thicknesses based on available boring data. Table 4-3 provides the media hydraulic properties assigned to the models. In order to estimate the total steady rate of seepage through the base of the entire impoundment, the computed average flux rate across the lower side of the lowest drainage blanket for the 2D model was multiplied by the total surface area of the impoundment.

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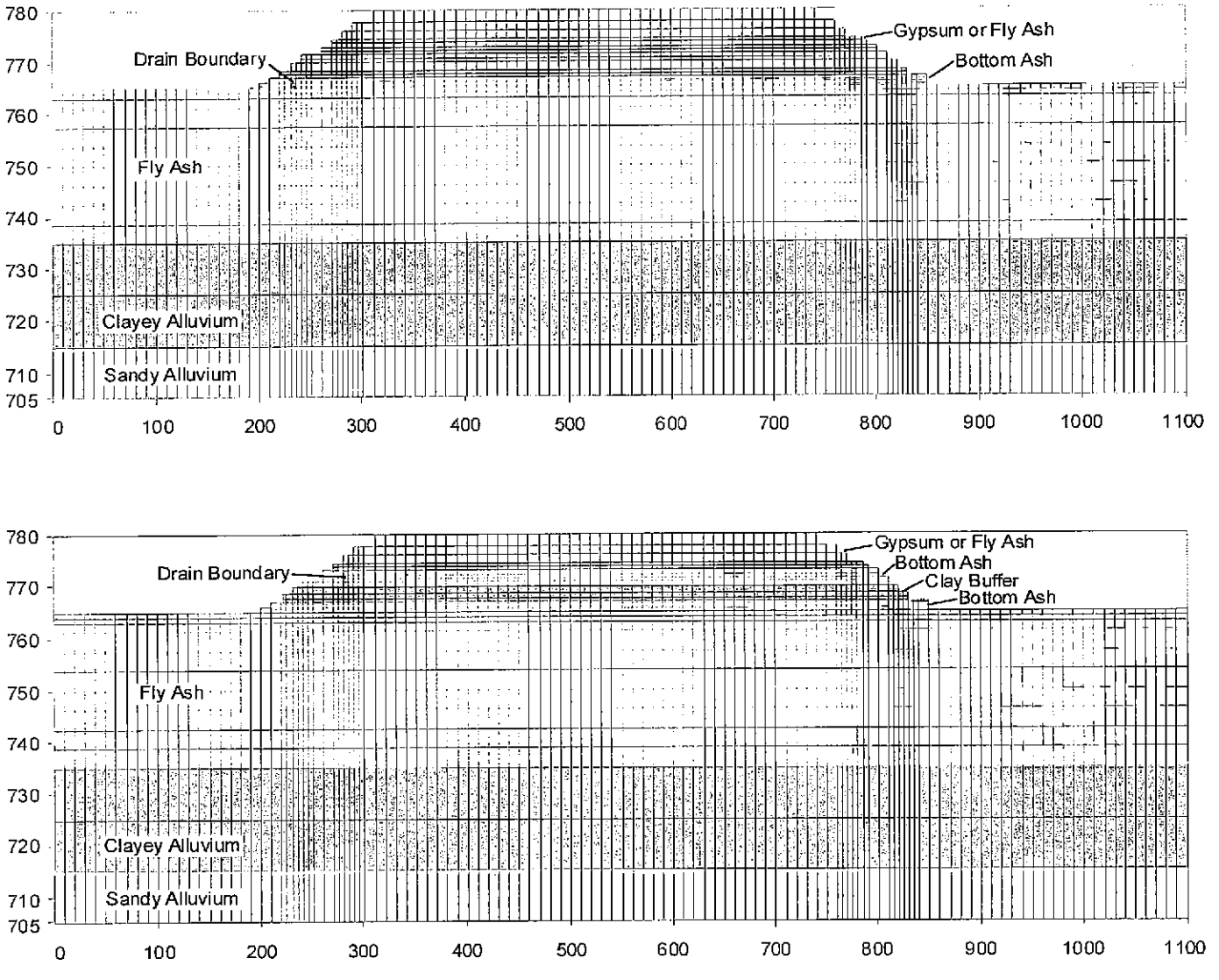

Figure 4-2. Profile View of MODFLOW Models Used for Pond Seepage Estimation

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Table 4-3. Hydraulic Properties Applied in MODFLOW Simulations

Media Type	Thickness (ft)	Vertical Hydraulic Conductivity (cm/s)	Horizontal Hydraulic Conductivity (cm/s)
New Fly Ash	(varies)	2.0×10^{-5}	1.0×10^{-4}
New Gypsum	(varies)	5.1×10^{-5}	5.1×10^{-4}
Bottom Ash	2.0[a], 3.0[b]	9.3×10^{-3}	1.0×10^{-2}
Geologic (Clay) Buffer	3.0	1.0×10^{-6}	1.0×10^{-5}
Existing Fly Ash	30.0	2.0×10^{-5}	1.0×10^{-4}
Alluvial Clay	20.0	4.0×10^{-7}	9.0×10^{-6}
Alluvial Sand	10.0	1.0×10^{-4}	1.0×10^{-3}

[a]Thickness of bottom ash drainage layer above fly ash base

[b]Thickness of bottom ash drainage layer above geologic (clay) buffer

4.2.2 Stream Loading Estimation

Depending on their location and mode of disposal (i.e., either landfill or impoundment), leachate seepage from the CCB disposal areas will be transported by shallow groundwater to SPC embayment, Emory River, or the plant intake channel. Groundwater flow patterns based on water levels measured in shallow monitoring wells shown on Figure 2-6 indicate that, in the absence of sluicing to Ash Dredge Cells 1-3, leachate emerging from the base of Cells 2, 3, and most of Cell 1 would be transported by ambient groundwater flow to SPC. Leachate seepage from Phase 1 Lateral Expansion Area and from the Phase 2 and 3 Areas would ultimately discharge in the Emory River or the intake channel. The presence of impoundment disposal facilities during different phases of disposal operations would to some extent alter groundwater flow patterns and ultimate leachate discharge points. For example, incorporating the potentiometric heads associated with active Cell 2, ash pond, and stilling pond (Figure 2-7) indicates leachate seepage to SPC would be limited to Cell 2, while leachate from the remaining cells would discharge to the river and intake channel. For conservatism, all leachate seepage produced from Ash Dredge Cells 1-3 is assumed to ultimately discharge to SPC, whereas leachate from all other areas discharges to the Emory River.

In estimating worst-case in-stream COC concentrations, no credit was taken for mixing and dilution of leachate by ambient groundwater during transport or for geochemical attenuation. The mean leachate seepage rate estimated using HELP or MODFLOW for each facility during the active disposal period, along with the initial COC concentrations given in Table 4-1, were used to compute the mass loading (in kg/day) to the stream for each COC. To estimate COC concentrations in the stream, complete mixing of predicted mass loadings with the appropriate low stream flow was assumed. The 7Q10 stream flow was applied to in-stream concentration estimates for ammonia,

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whereas the 1Q10 was used for other COC constituents in accordance with TDEC guidance. Note that estimates of the maximum COC in-stream concentrations for the Emory River account for the cumulative contributions of COC mass loadings from multiple CCB disposal areas and from tributary SPC. On the other hand, the existing Ash Dredge Cells 1-3 represent the only area contributing COC mass to SPC. In this case the maximum concentrations for SPC were estimated using the highest stream load predicted for any future operational phase at Cells 1-3, including the post-closure phase.

Because no historical stream flow data are available for SPC, 1Q10 and 7Q10 low flows were estimated on the basis of continuous flow data (1935-70) for Whites Creek near Sharps Chapel, Tennessee. Whites Creek watershed (above the gauging station) is approximately 2.7 mi^2 and is closest in size of any of the gauged streams in the region to the 4.1 mi^2 watershed area of SPC. The 1Q10 and 7Q10 for Whites Creek are reported to be 0.216 and 0.240 cfsm (cubic feet per second per square mile). Applying the Whites Creek unit flows to the SPC watershed yields 1Q10 and 7Q10 estimates of 0.89 and 0.96 cfs.

Emory River 1Q10 and 7Q10 flows of 0.40 and 0.68 cfs are reported for the USGS gauging station at Oakdale located approximately 16 miles upstream of KIF (Flohr et al., 1993). However, flow of the Emory River in the immediate vicinity of KIF is controlled by upstream releases from Melton Hill Dam and plant intake withdrawals which average approximately 2200 cfs. Numerical flow-temperature simulations indicate that under worst-case low flow conditions (i.e., low natural inflow from the Emory River upstream and no releases from Melton Hill Dam) the flow toward the plant intake from the upstream reach of the Emory adjacent to the ash pond is approximately 84 cfs (personal communication, 5/6/02, Ming Shiao of the TVA Hydrothermal Team). The plant-controlled low flow of 84 cfs was used in stream loading analyses instead of the traditional 1Q10 and 7Q10 flows.

4.3 Option A - Future Codisposal of Coal Ash and FGD-Derived Gypsum

4.3.1 Facility Description

Figure 4-3 provides the schedule of CCB disposal operations proposed under Option A. Phase 1 operations will involve sluiced fly ash disposal in the existing Ash Dredge Cells 1-3 and in the Phase 1 Dredge Cell Lateral Expansion Area between 2004 and 2015. Approximately 4.034 million CY will be deposited in these areas bringing the grade elevation to approximately 844 ft in Cells 1-3 and to elevation 810 ft in the Lateral Expansion Area. Between 2015 and 2017 approximately 951,200 CY of dipped ash will be placed atop Cells 1-3 raising the final grade to a maximum elevation of 858 ft.

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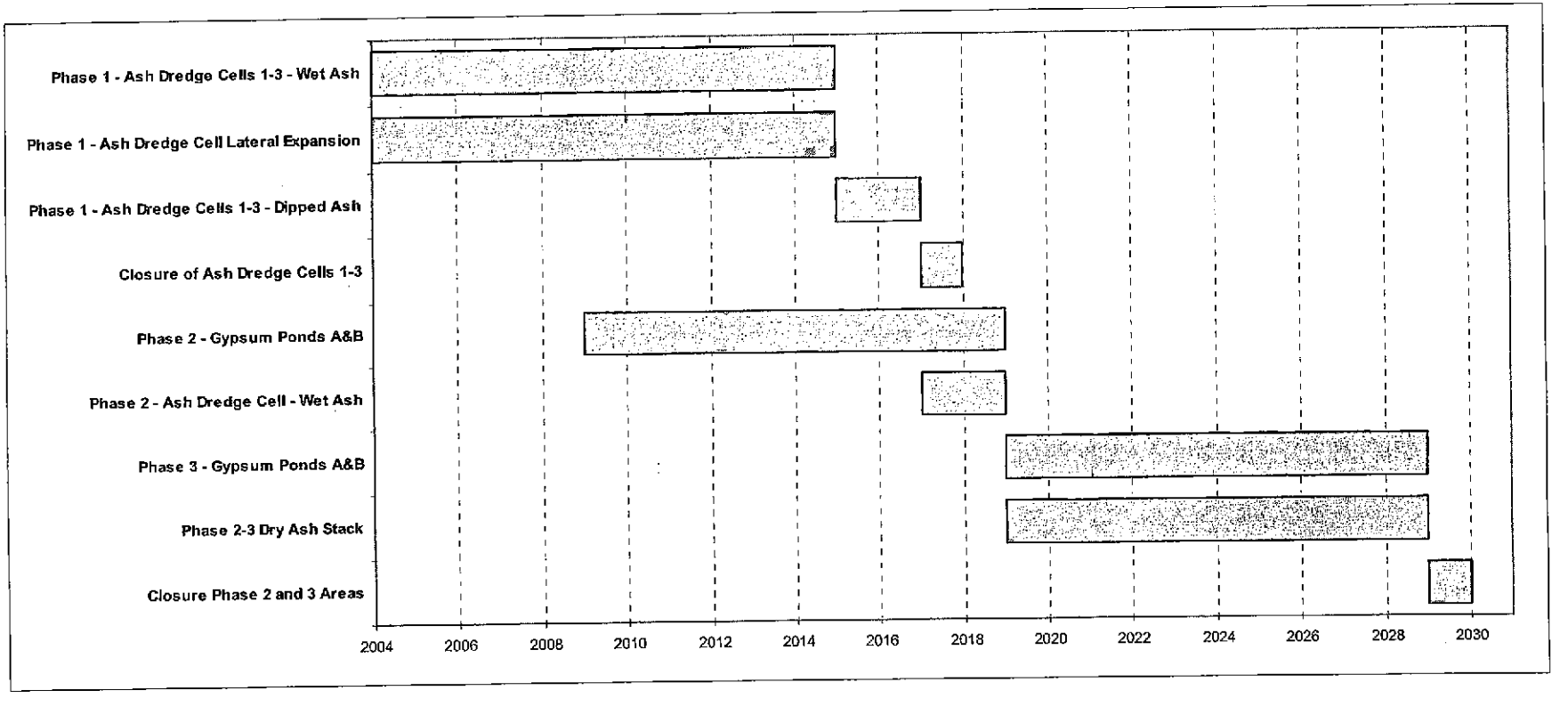

Figure 4-3. Option A – Schedule of Facility Operations

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Dredge Cells 1-3 will be partially closed in 2017 by construction of a 1-ft thick clay cap having maximum hydraulic conductivity of 10^{-6} cm/s followed by 1 ft of vegetated top soil. The cap will extend over the entire Cells 1-3 area with the exception of the southeast-facing side slopes which will be left uncovered to allow for subsequent contiguous Phase 2 and 3 disposal operations. Maximum surface elevation of the closed facility will be approximately 860 ft.

Gypsum byproduct disposal in the Phase 2 area is expected to begin in 2009 when flue-gas scrubbers are scheduled for operation. Wet gypsum will be alternately sluiced to rim-ditch systems in Ponds A and B until 2019 when the stack reaches elevation 870 ft. At that point, gypsum byproduct will be directed to rim-ditch systems in the Phase 3 area. Stacking of dry fly ash in the region between the Phase 2 and 3 areas will also begin in 2019. Gypsum disposal in the Phase 3 area is expected to continue until 2029 when the stack reaches elevation 870 ft. Total volumes of gypsum deposited in the Phase 2 and 3 areas are estimated at approximately 3.27 million CY and 3.60 million CY, respectively.

Dry fly ash stacking will continue above the gypsum stacks until approximately 2029. The total volume of dry ash deposited in the Phase 2 and 3 areas will be approximately 5.7 million CY. Closure of the Phase 2 and 3 areas will involve placement of a clay cap and vegetated top soil over the entire area. Design of the cap and cover will be the same as that applied to the Phase 1 area.

4.3.2 Leachate Seepage Results

Average leachate seepage estimates for each of the proposed disposal facilities considered under Option A are presented in Table 4-4. Detailed seepage data for all disposal facility subregions are given in Appendix H, along with information regarding estimation methods.

The mean leachate seepage rate during the period (2004-14) of wet sluicing of ash to Dredge Cells 1-3 is estimated at approximately 425,000 liters per day (Lpd) (Table 4-5). This estimate conservatively assumes active ash sluicing to Cell 2 (closest to SPC embayment) and exposure of working surfaces of inactive Cells 1 and 3 to incident precipitation. Approximately 37% of the total seepage is derived from seepage below the assumed impoundment in Cell 2 as estimated with MODFLOW (Appendix H). Seepage from the remaining area was estimated using the HELP model. The average seepage rate outside of Cell 2 represents approximately 22% of average precipitation, and reflects the relatively high infiltration rates associated with exposed ash surfaces and the interim topsoil on side slope areas. Capping and closure of Dredge Cells 1-3 in 2018 is predicted to reduce the average seepage rate by 32 % to approximately 287,400 Lpd.

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Table 4-4. Option A – Facility Leachate Seepage Estimates

Facility	Start Date	End Date	Waste	Mean Leachate Seepage (Lpd)	Seepage Difference Buffer vs. No Buffer
Phase 1 - Ash Dredge Cells 1-3	2004	2014	wet ash	425,135	NA
Phase 1 - Ash Dredge Cells 1-3	2015	2016	dipped ash	243,499	NA
Closure of Ash Dredge Cells 1-3	2017	2046	mixed ash	287,409	NA
Phase 1 - Dredge Cell Lateral Expansion Area	2004	2014	wet ash	56,936	NA
Phase 2 - Gypsum Ponds A&B - NO BUFFER	2009	2018	gypsum	62,287	
Phase 2 - Gypsum Ponds A&B - BUFFER	2009	2018	gypsum	41,506	33%
Phase 2 - Ash Dredge Cell - NO BUFFER	2009	2018	wet ash	21,844	
Phase 2 - Ash Dredge Cell - BUFFER	2009	2018	wet ash	17,370	20%
Phase 3 - Gypsum Ponds A&B - NO BUFFER	2019	2028	gypsum	60,733	
Phase 3 - Gypsum Ponds A&B - BUFFER	2019	2028	gypsum	37,798	38%
Phase 2&3 Dry Ash Stack - NO BUFFER	2019	2028	dry ash	10,268	
Phase 2&3 Dry Ash Stack - BUFFER	2019	2028	dry ash	8,243	20%
Closure of Phase 2&3 Areas - NO BUFFER	2029	2058	ash/gypsum	179,456	
Closure of Phase 2&3 Areas - BUFFER	2029	2058	ash/gypsum	177,878	1%

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Table 4-5. Option A - Predicted Worst-Case Stream Loadings and In-Stream Concentrations

Constituent	MCL	CCC	Swan Pond CreekEmbayment		Emory River - No Buffer Case		Emory River - Buffer Case	
			Maximum Loading (kg/day)	Maximum Concentration (mg/L)	Maximum Loading (kg/day)	Maximum Concentration (mg/L)	Maximum Loading (kg/day)	Maximum Concentration (mg/L)
Ammonia-N	10/1	(**)	4.24E-01	0.15221	5.14E+01	0.25018	5.10E+01	0.24800
Arsenic	0.05	0.15	1.57E-03	0.00061	6.38E-02	0.00031	6.32E-02	0.00031
Cadmium	0.005	0.00021	4.25E-04	0.00016	1.88E-03	0.00001	1.59E-03	0.00001
Copper	1.3	0.0072	1.08E-02	0.00414	9.55E-03	0.00005	9.28E-03	0.00005
Mercury	0.002	0.00077	2.55E-04	0.00010	6.28E-04	0.00000	5.04E-04	0.00000
Nickel	0.1	0.0422	1.98E-02	0.00763	2.92E-02	0.00014	2.46E-02	0.00012
Selenium	0.05	0.005	4.25E-04	0.00016	1.72E-02	0.00008	1.33E-02	0.00006
Zinc	5	0.0957	8.89E-02	0.03424	1.60E-01	0.00078	1.29E-01	0.00063

***See Table 4-6*

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Leachate seepage rates from the Phase 2 and 3 Gypsum and Ash Disposal Areas were conservatively estimated for the maximum sedimentation pond surface areas which occur during the early stage of disposal operations. A working surface elevation of 780 ft was assumed for the gypsum and ash disposal areas. Net seepage from Phase 2 Gypsum Ponds A and B is estimated to be approximately 62,300 Lpd for the no-buffer case and 41,500 Lpd for the buffer design, indicating a 33% overall reduction in seepage provided by the clay buffer. The Phase 3 Gypsum Disposal Area showed similar results with the buffer providing a 38% reduction in seepage generation. Incorporating artificial clay buffers below the Phase 2 Ash Dredge Cell and the dry ash stack situated between the Phase 2 and 3 areas decreased seepage by approximately 20% in both cases.

Average leachate seepage rates predicted during 30-year post-closure simulations of the combined Phase 2 and 3 areas were approximately 179,500 Lpd for the no-buffer design and 177,900 Lpd with a clay buffer (Table 4-4). The 1-ft, 10^{-6} cm/s clay cap constructed over the disposal area at closure would largely control net infiltration through the CCB materials. Since the hydraulic conductivity of the clay cap and buffer would be the same, the buffer would provide essentially no (i.e., less than 1%) additional containment of leachate seepage. Overall, results indicate that while modest seepage reductions of 20 to 38% could be expected by the addition of a clay buffer during active disposal operations, the long-term benefit of a buffer would be negligible.

4.3.3 Predicted COC Concentrations in Swan Pond Creek Embayment

The only disposal area that would contribute COC-containing leachate to SPC would be Ash Dredge Cells 1-3, as discussed in Section 4.2.2. Except for ammonia, future ash leachate generated from this area is expected to be chemically similar to current leachate. Therefore, future loadings of COC other than ammonia would not be expected to differ significantly from current loadings to SPC.

Estimates of the mass loading of each COC produced by leachate seepage from future disposal operations are presented in Table H2 (Appendix H). These estimates are subsequently used in estimating the cumulative COC loadings to SPC and the Emory River shown on Figures 4-4 and 4-5, and worst-case in-stream COC concentrations presented in Table 4-5. To illustrate the method of computing the facility mass loadings, consider the following example calculation for ammonia. From Table 4-4 the mean leachate seepage rate during the period (2004-14) of wet sluicing to Ash Dredge Cells 1-3 is 425,135 Lpd. The volume-weighted average NH_3-N concentration of 1.00 mg/L for leachate generated from Cells 1-3 shown in Table H2 is based on 4.034 million CY of new sluiced ash (above elevation 805 ft) having a pore water NH_3-N concentration of 2.64 mg/L and 6.652million CY of existing ash (between elevations 760 and 805 ft) having a zero NH_3-N concentration. Applying the weighted-average pore water NH_3-N

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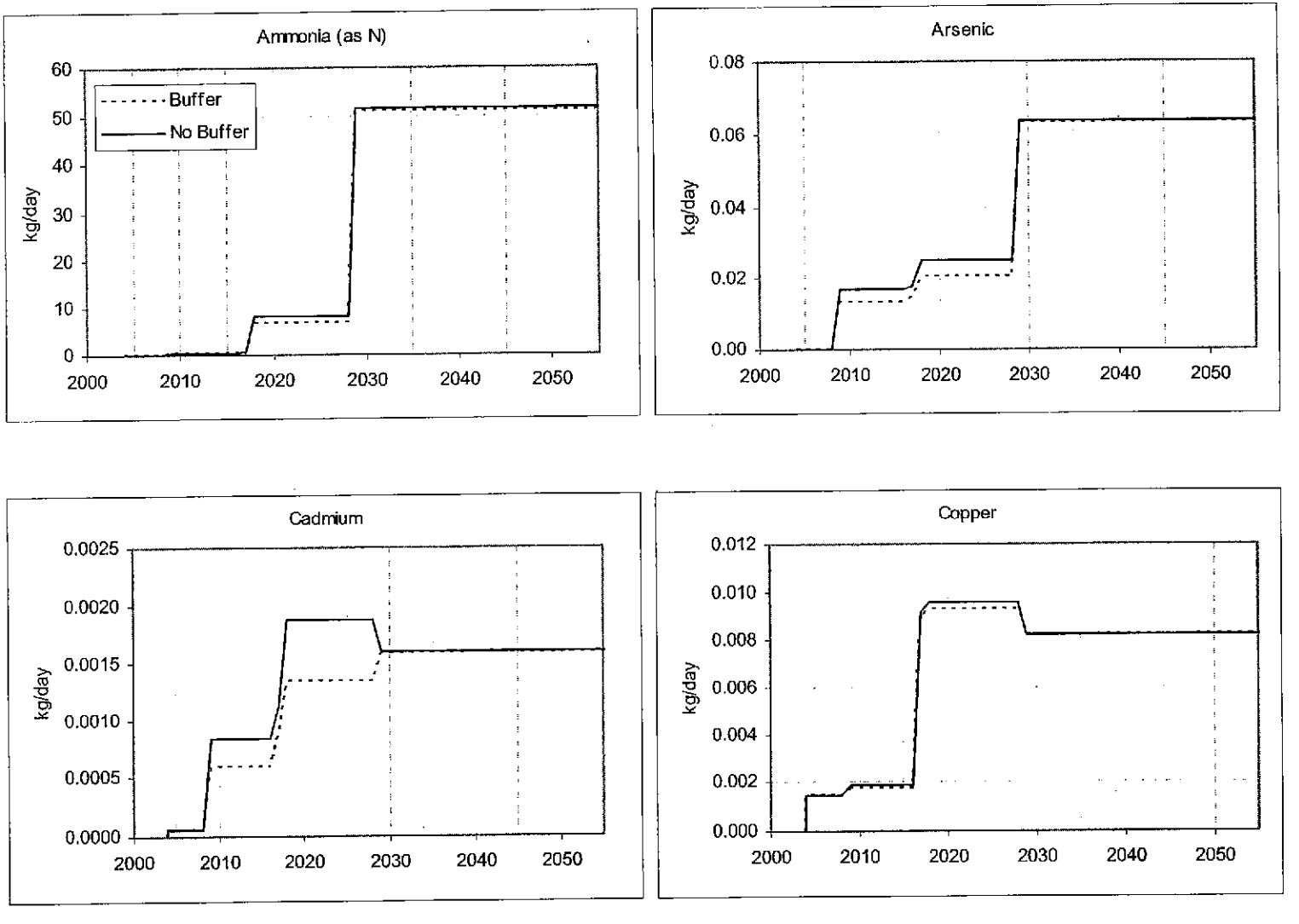

Figure 4-4. Option A – Cumulative COC Mass Loading for Emory River (Ammonia, Arsenic, Cadmium, and Copper)

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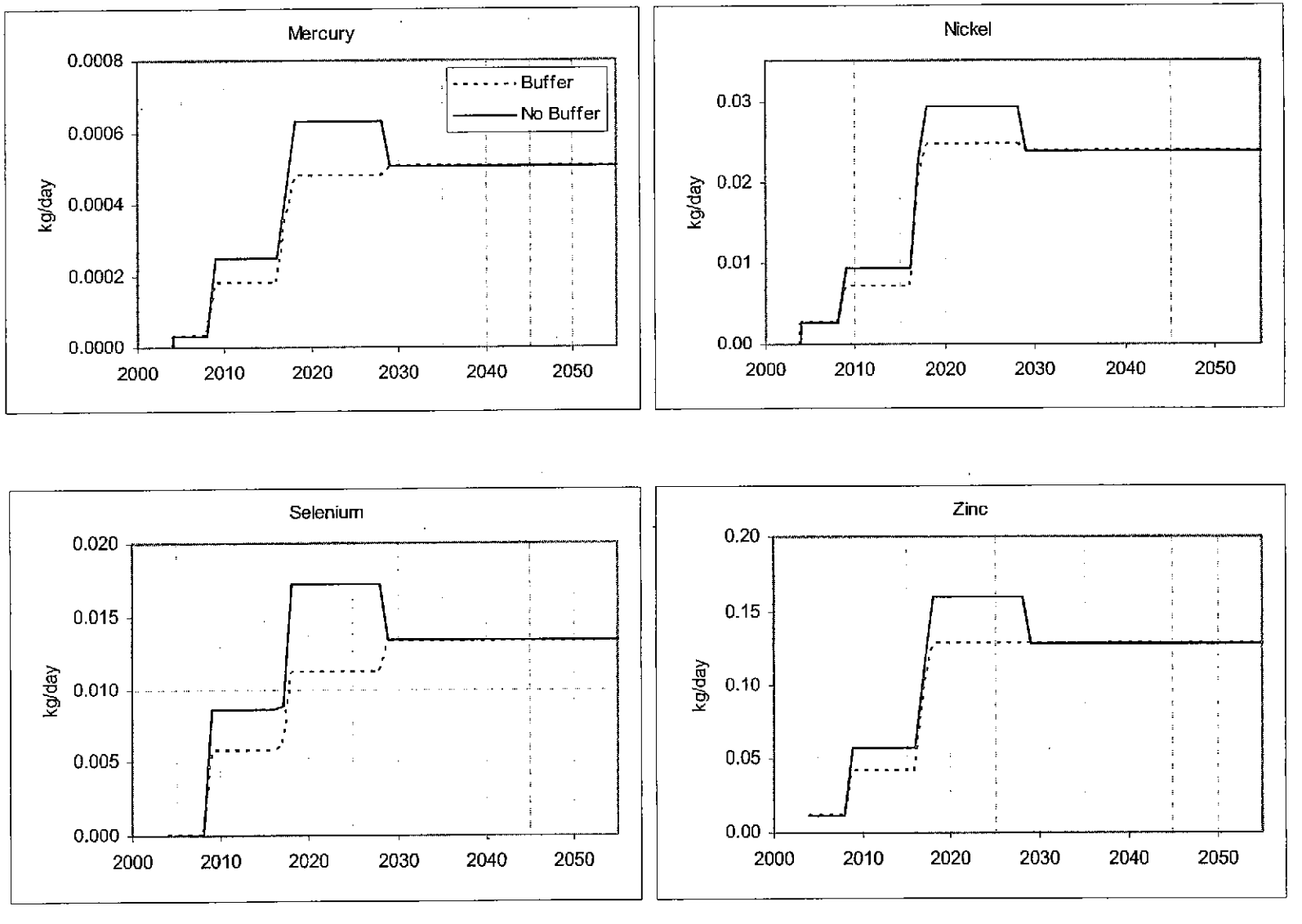

Figure 4-5. Option A – Cumulative COC Mass Loading for Emory River (Mercury, Nickel, Selenium, and Zinc)

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concentration to the predicted seepage rate yields a mass loading of 0.424 kg/day. Since SPC discharges into the Emory River a short distance downstream, the NH_3-N loading to the Emory River is also 0.424 kg/day. Loadings of other ash-related COC to SPC were computed using historical mean groundwater quality data for monitoring wells 4A, 4B, 5, 5A, and 5B (Appendix I). As shown on Figure 2-6, these wells are situated downgradient of existing ash disposal areas, and provide representative COC concentrations of ash leachate currently entering SPC.

The period of wet sluicing of ash to Ash Dredge Cells 1-3 produces the largest ammonia loading to SPC of any of the future disposal activities in this area. Consequently, the worst-case NH_3-N concentration in SPC after full mixing of the predicted maximum loading (0.424 kg/day) with the 7Q10 low flow would be approximately 0.15 mg/L (Table 4-5). While there is no drinking water MCL for ammonia, conversion of ammonia to nitrate or nitrite is possible during groundwater transport, and these constituents have MCLs of 10 mg/L and 1 mg/L, respectively. Resulting NO_3-N or NO_2-N concentrations in SPC would be <0.15 mg/L for either constituent and would be below MCLs. Maximum allowable levels of ammonia for protection of aquatic life presented in Table 4-6 are dependent on stream pH and temperature. Although no historical pH data are available for SPC embayment, three measurements performed on July 21, 2004, indicated pH of approximately 8.0 to 8.1. The estimated NH_3-N level is below the aquatic life CCC for the expected range of stream pH and temperature conditions. Further examination of Table 4-5 indicates that the predicted maximum stream loadings for the remaining COC produce in-stream concentrations meeting applicable MCL and CCC standards.

Table 4-6. Maximum Allowable Ammonia Concentrations to Protect Aquatic Life[a]

	CMC (mg N/L)[b]				CCC (mg N/L)			
Temp[c] (°C)	**pH=7.0**	**pH=7.5**	**pH=8.0**	**pH=8.5**	**pH=7.0**	**pH=7.5**	**pH=8.0**	**pH=8.5**
15					5.73	4.23	2.36	1.06
20					4.15	3.07	1.71	0.77
25	36.09	19.89	8.41	3.20	3.01	2.22	1.24	0.55
30					2.18	1.61	0.90	0.40

[a]*Assumes Salmonids absent and fish early life stages present.*

[b]*CMC is not temperature dependent.*

[c]*Chronic values do not change with temperature below 14.6°C.*

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4.3.4 Predicted COC Concentrations in Emory River

The summary of maximum COC stream loadings and concentrations for the Emory River presented in Table 4-5 account for the cumulative contributions of COC mass loadings from multiple CCB disposal areas and from SPC. The graphs shown on Figures 4-4 and 4-5 provide cumulative mass loading time-series for each COC based on the facility operational schedules and loading data derived from Table H2. These graphs provide a general indication of the temporal variation of stream loadings in response to proposed disposal activities.

Figure 4-4 shows that the cumulative ammonia loading to the Emory River is low for both the buffer and no-buffer cases until 2019, when disposal of dry ash, with its relatively high ammonia content, begins in the region between the Phase 2 and 3 areas. The cumulative loads peak at closure (2029) after the maximum quantity of dry ash has been placed between and over the Phase 2 and 3 gypsum stacks. The worst-case NH_3-N loading estimated for the no-buffer design is 51.4 kg/day, resulting in an in-stream concentration of approximately 0.250 mg/L under low-flow conditions (Table 4-5). The clay buffer design slightly reduces the predicted in-stream concentration to 0.248 mg/L. These results suggest a negligible environmental advantage to the clay buffer, particularly since the in-stream NH_3-N concentration in both cases is below MCL and CCC.

Predicted worst-case in-stream concentrations for the remaining COC are also well below human health and aquatic life criteria in all cases. Differences between the estimated COC concentrations for the no-buffer and buffer design cases are directly related to predicted seepage differences and are generally 22% or less. As expected, constituents strongly associated with gypsum (e.g., cadmium, mercury, nickel, selenium and zinc) show substantial increases in cumulative load during the Phase 2 and 3 gypsum disposal periods from 2009 to 2029 (Figures 4-4 and 4-5). Loadings decrease substantially in 2029 after closure of the Phase 2 and 3 areas in response to decreased surface infiltration provided by the low-permeability clay cap.

4.4 Option B - Future Disposal of Coal Ash Only

4.4.1 Facility Description

Figure 4-6 provides the schedule of CCB disposal operations proposed for the ash-only disposal option. Phase 1 ash disposal operations would be the same as those described in Section 4.3.1 including closure of Ash Dredge Cells 1-3 in 2018. Sluiced ash disposal in the Phase 2 area is expected to begin in 2017. Ash would be alternately sluiced to two or three dredge cells until 2029 when the stack reaches elevation 870 ft. At that point, dry ash disposal operations would begin in the Phase 3 area.

TVA-00018601

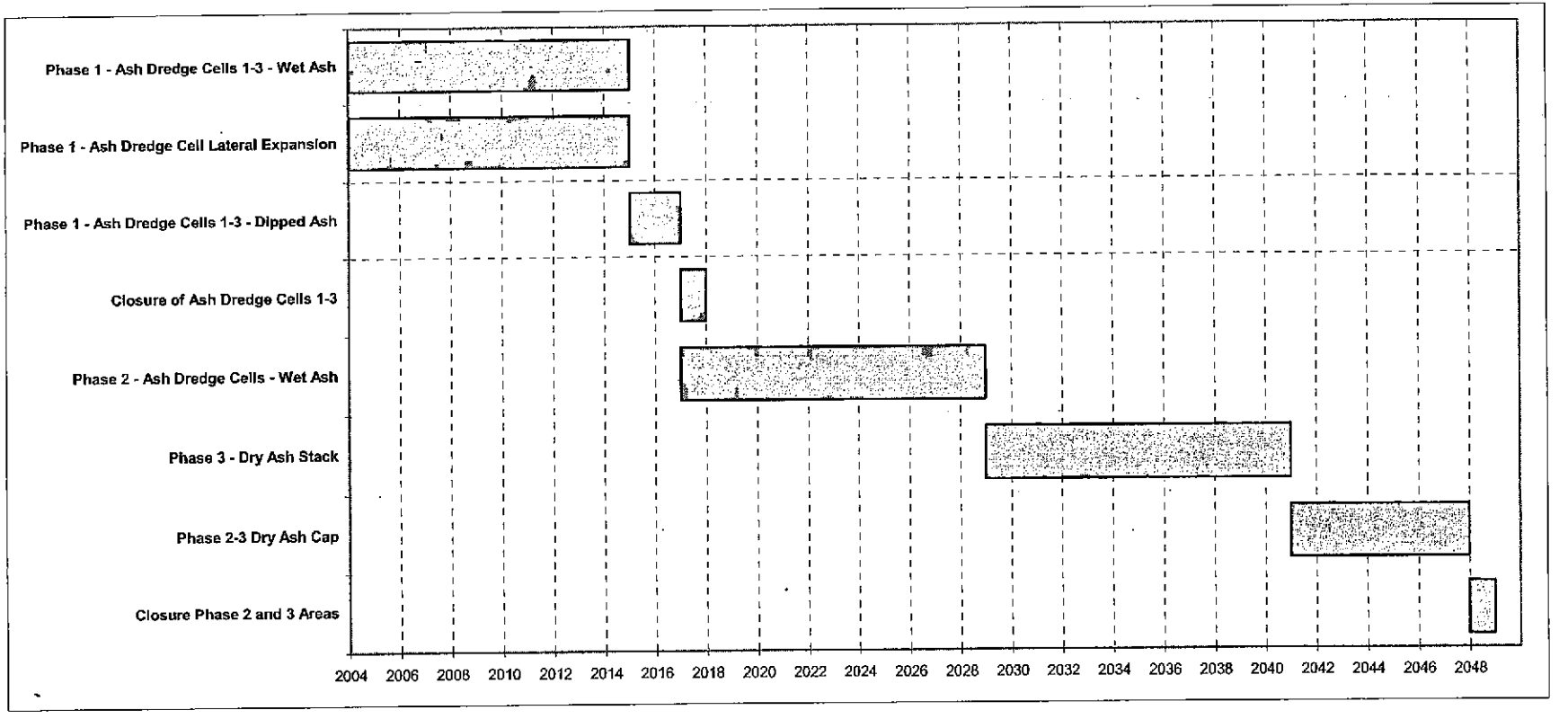


Figure 4-6. Option B – Schedule of Facility Operations

TVA-00018602

Dry ash stacking is expected to continue in the Phase 2 and 3 areas until 2048 when the stack attains a maximum elevation of 930 ft. Closure of the Phase 2 and 3 areas and the Phase 1 Lateral Expansion Area would occur in 2048 in the same manner described in Section 4.3.1 for Option A.

4.4.2 Leachate Seepage Results

Average leachate seepage estimates for each of the proposed disposal facilities considered under Option B are presented in Table 4-7. Detailed seepage data for all disposal facility subregions are given in Table J1 (Appendix J) along with information regarding estimation methods.

Leachate seepage estimates for Ash Dredge Cells 1-3 and the Lateral Expansion Area given in Table 4-7 are identical to those presented in Table 4-4 for Option A, since proposed disposal operations in these areas would be the same under both options. Results indicate that construction of an artificial clay buffer beneath the Phase 2 and 3 areas would reduce seepage during the active disposal period by 22 to 28%. As with Option A, 30-year post-closure simulations of the combined Phase 2 and 3 areas indicate essentially no difference between leachate production rates with or without a clay buffer.

4.4.3 Predicted COC Concentrations in Swan Pond Creek Embayment

Maximum COC stream loadings and concentrations for SPC embayment for Option B presented in Table J2 are identical to those presented for Option A (Table H2) , since future disposal operations affecting SPC are the same for both disposal options. Refer to Section 4.2.3 for discussion of potential water quality impacts to SPC.

4.4.4 Predicted COC Concentrations in Emory River

Except for ammonia, future ash leachate generated from existing ash disposal areas is expected to be chemically similar to current ash leachate. Therefore, future loadings of COC other than ammonia would not be expected to differ significantly from current loadings to the Emory River. Nevertheless, worst-case in-stream concentrations for the remaining COC are included in the analysis for consistency.

TVA-00018603

Table 4-7. Option B – Facility Leachate Seepage Estimates

Facility	Start Date	End Date	Waste	Mean Leachate Seepage (Lpd)	Seepage Difference Buffer vs. No Buffer
Phase 1 - Ash Dredge Cells 1-3	2004	2014	wet ash	425,135	NA
Phase 1 - Ash Dredge Cells 1-3	2015	2016	dipped ash	243,499	NA
Closure of Ash Dredge Cells 1-3	2017	2046	mixed ash	287,409	NA
Phase 1 - Dredge Cell Lateral Expansion Area	2004	2014	wet ash	56,936	NA
Phase 2 - Ash Dredge Cells - NO BUFFER	2017	2028	wet ash	125,956	
Phase 2 - Ash Dredge Cells - BUFFER	2017	2028	wet ash	92,002	27%
Phase 3 - Dry Ash Stack - NO BUFFER	2029	2040	dry ash	111,158	
Phase 3 - Dry Ash Stack - BUFFER	2029	2040	dry ash	80,042	28%
Phase 2&3 - Dry Ash Cap - NO BUFFER	2041	2047	dry ash	88,160	
Phase 2&3 - Dry Ash Cap - BUFFER	2041	2047	dry ash	68,837	22%
Closure of Phase 2&3 Areas - NO BUFFER	2048	2077	ash	230,944	
Closure of Phase 2&3 Areas - BUFFER	2048	2077	ash	229,223	1%

TVA-00018604

Facility COC mass loadings for Option B are provided in Table J2, while Figures 4-7 and 4-8 show predicted cumulative COC mass loading time series for the Emory River. The ammonia loading to the Emory River is low for both buffer and no-buffer cases until 2029, when dry ash disposal, with its relatively high ammonia content, begins in the Phase 3 Area. The ammonia load decreases following facility closure (2048) in response to reduced infiltration through the clay cap. Table 4-8 indicates the worst-case cumulative NH_3-N loading estimated for the no-buffer design is approximately 119 kg/day, resulting in an in-stream concentration of approximately 0.58 mg/L for the Emory River low-flow condition (Section 4.2.2). The clay buffer reduces the predicted in-stream concentration by 19% to approximately 0.47 mg/L. For both buffer and no-buffer cases, potential ammonia-derived nitrate or nitrite byproduct concentrations would be well below drinking water limits during low flow conditions. Predicted ammonia levels would also be below the CCC under typical pH conditions for the Emory River (Figure 4-9). Potential adverse aquatic impacts could occur under coincident conditions of extreme pH, temperature, and low flow in the Emory River (i.e., pH>8.0 and temperature ≥30°C). Historical data for Oakdale (RM 18.3) show that river pH exceeds 8.0 less than 8% of the time, whereas temperatures of 30°C or more occur less than 3% of the time. Disregarding the probability of the Emory River low flow condition at the plant for which data are unavailable, the joint probability of the extreme pH and temperature conditions would be less than 0.3%.

Worst-case in-stream concentrations for the remaining COC are also well below human health and aquatic life criteria in all cases. Differences between the estimated COC concentrations for the no-buffer and buffer design cases are directly related to predicted seepage differences and are generally less than 13%.

4.5 Potential Impacts to Groundwater Users

There are currently 13 residential wells and one public water supply spring located within approximately one mile of the proposed disposal area (Figure 3-1). Wells 7 and 20 lie north of Swan Creek embayment and are hydrologically isolated from the disposal site. Similarly, the public water supply spring (Spring 1) and well 23 are hydrologically isolated from the site by Pine Ridge. The ten remaining wells, located to the southwest along Swan Pond Road, are situated indirectly upgradient of the site. There is no indication of groundwater movement from the proposed disposal site toward any off-site wells or springs. No adverse off-site groundwater impacts associated with the proposed CCB disposal facilities are anticipated under present or future conditions.

TVA-00018605

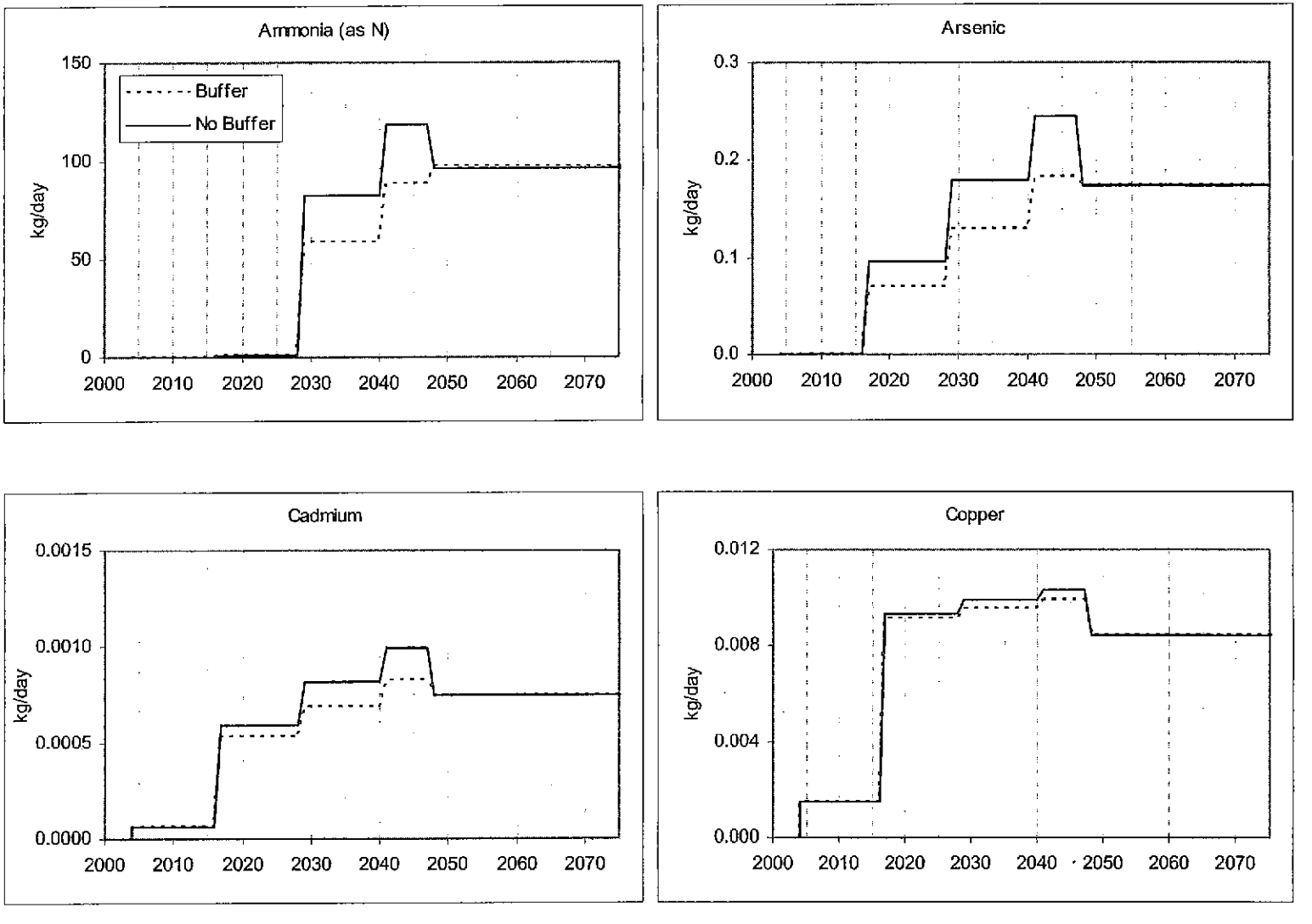


Figure 4-7. Option B – Cumulative COC Mass Loading for Emory River (Ammonia, Arsenic, Cadmium, and Copper)

TVA-00018606

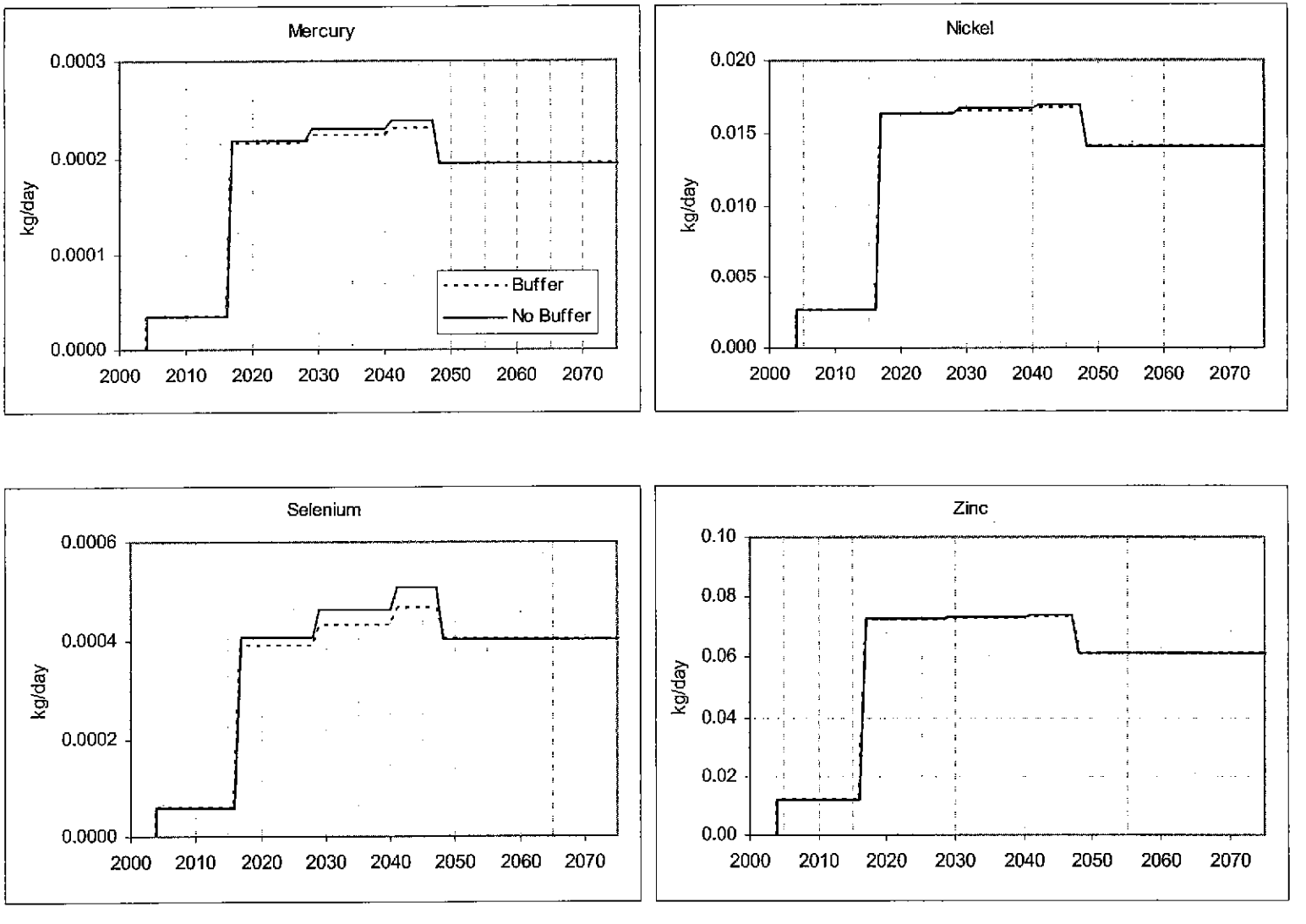
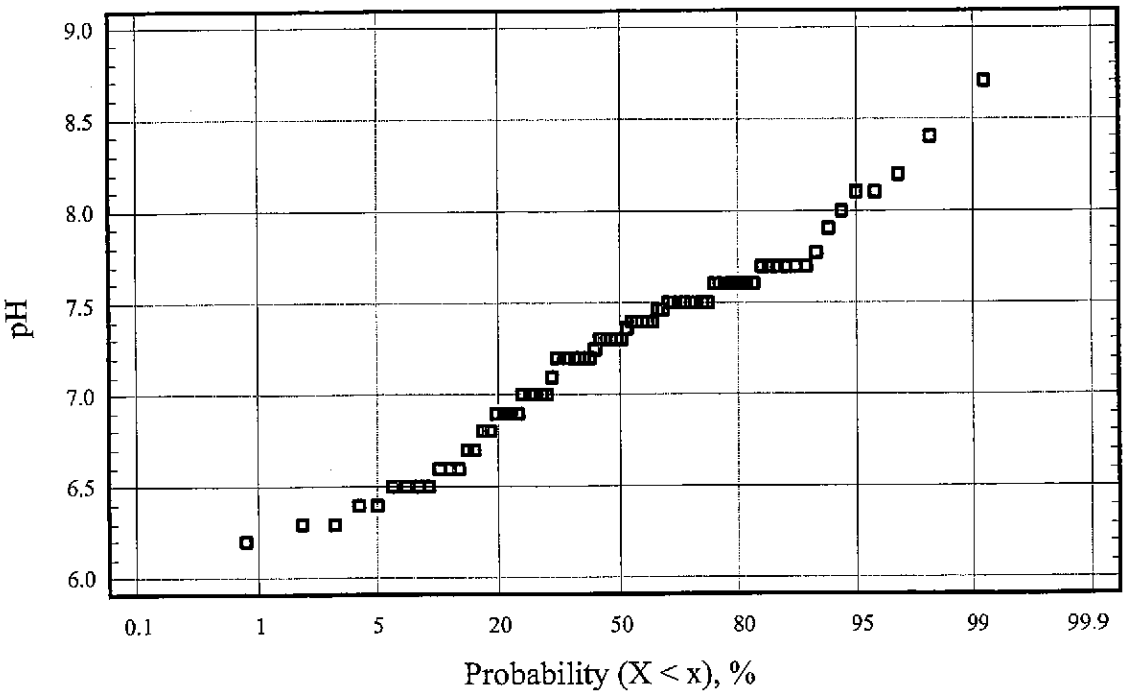


Figure 4-8. Option B – Cumulative COC Mass Loading for Emory River (Mercury, Nickel, Selenium, and Zinc)

TVA-00018607



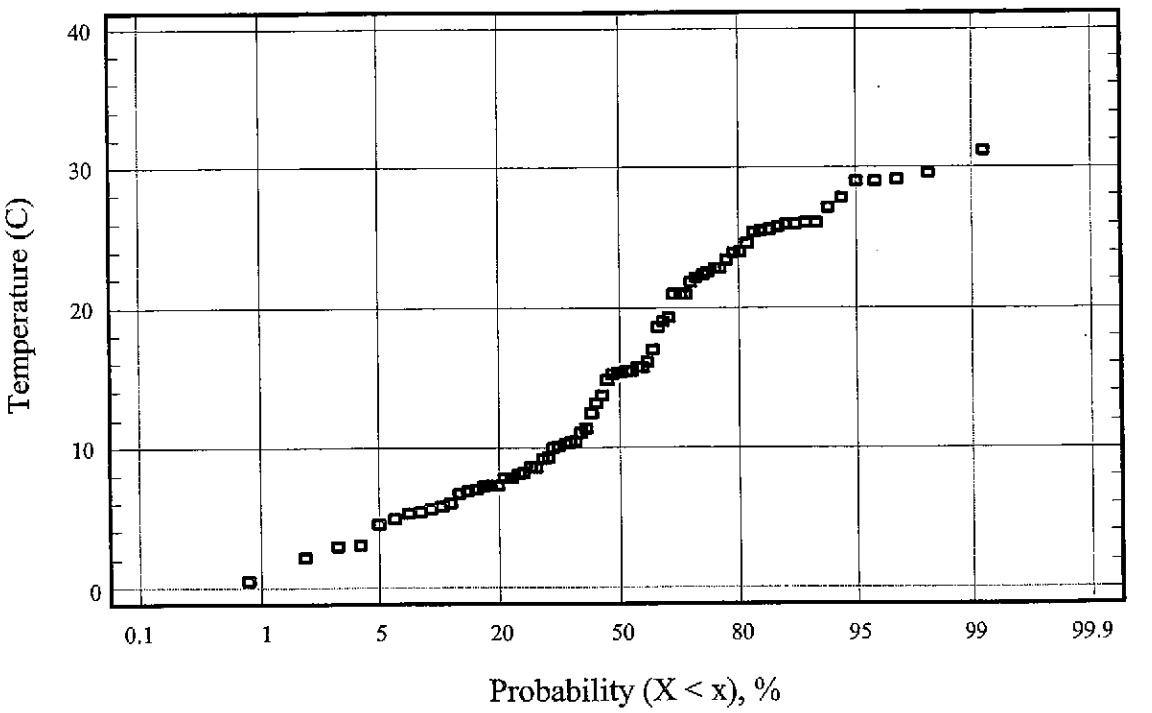


Figure 4-9. Emory River (RM 18.3) pH and Temperature Duration Data (1986-2001)

TVA-00018608

Table 4-8. Option B - Predicted Maximum Stream Loadings and In-Stream Concentrations

Constituent	MCL	CCC	Swan Pond Creek Embayment		Emory River – No Buffer Case		Emory River – Buffer Case	
			Maximum Loading (kg/day)	Maximum Concentration (mg/L)	Maximum Loading (kg/day)	Maximum Concentration (mg/L)	Maximum Loading (kg/day)	Maximum Concentration (mg/L)
Ammonia-N	10/1	(**)	4.24E-01	0.15221	1.19E+02	0.57939	9.67E+01	0.47043
Arsenic	0.05	0.15000	1.57E-03	0.00061	2.45E-01	0.00119	1.82E-01	0.00089
Cadmium	0.005	0.00021	4.25E-04	0.00016	9.95E-04	0.00000	8.26E-04	0.00000
Copper	1.3	0.00720	1.08E-02	0.00414	1.03E-02	0.00005	9.92E-03	0.00005
Mercury	0.002	0.00077	2.55E-04	0.00010	2.39E-04	0.00000	2.31E-04	0.00000
Nickel	0.1	0.04220	1.98E-02	0.00763	1.70E-02	0.00008	1.68E-02	0.00008
Selenium	0.05	0.00500	4.25E-04	0.00016	5.07E-04	0.00000	4.65E-04	0.00000
Zinc	5	0.09570	8.89E-02	0.03424	7.36E-02	0.00036	7.32E-02	0.00036

** *See Table 4-6*

TVA-00018609

4.6 Discussion and Conclusions

Modeling of leachate seepage from proposed CCB disposal facilities indicates that construction of an artificial 3-ft clay buffer having a hydraulic conductivity of 10^{-6} cm/s or less beneath the Phase 2 and 3 disposal areas would not provide a significant environmental benefit. During the operational phase, predicted leachate seepage rates for the no-buffer and buffer designs for Option A differed by 38% or less. Similar comparisons for Option B showed differences of 28% or less. In general, differences in seepage rates with and without the buffer are relatively small because hydraulic conductivity of the clay buffer is only an order of magnitude lower than that of CCB materials. Following facility closure, differences in seepage rates were 1% or less for both disposal options indicating essentially no long-term environmental benefit of an artificial clay buffer.

A conservative evaluation of leachate seepage effects on local stream water quality further supports the suitability of the site for the proposed disposal options without an artificial geologic buffer. Under Option A, maximum cumulative COC stream loadings predicted for the Emory River during low flow conditions would not produce in-stream concentrations exceeding the drinking water MCL or aquatic life criteria for either the buffer or no-buffer cases. Predicted COC concentrations for the Emory River low-flow condition under disposal Option B were below drinking water and aquatic life standards for all COC except ammonia. Worst-case NH_3-N concentrations of 0.58 and 0.47 mg/L estimated for the no-buffer and buffer designs pose no threat to human health, but could exceed the CCC under coincident conditions of extreme pH, temperature, and low flow in the Emory River. Historical data suggest the joint probability of such an occurrence would be less than 0.3%. The potential risk associated with ammonia under Option B can be addressed by future monitoring. Periodic sampling of ash ammonia content and groundwater downgradient of the facility could be performed to assure ammonia levels remain within the limits assumed in this evaluation.

The facility poses no risk to existing or future groundwater users. There are no existing groundwater wells downgradient of the proposed facility, and there is no potential for future development of such wells. All downgradient property between the disposal site and surface water boundaries lies within plant reservation boundaries.

TVA-00018610

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TVA-00018612

APPENDIX A

SOIL BORING LOGS

TVA-00018613

This information taken from "Report of Geotechnical Exploration – Ash Disposal Area – Kingston Fossil Plant, Kingston, Tennessee," MACTEC Engineering and Consulting, Inc., May 4, 2004.

TVA-00018614

FIELD EXPLORATORY PROCEDURES

Soil Test Boring (Hollow Stem)

All boring and sampling operations were conducted in general accordance with ASTM D 1586. The borings were advanced by mechanically turning continuous steel hollow-stem auger flights into the ground. At regular intervals, soil samples were obtained with a standard 1.4-inch I.D., 2-inch O.D., split-tube sampler. The sampler was first seated 6 inches to penetrate any loose cuttings and then driven an additional foot with blows of a 140-pound hammer falling 30 inches. The number of hammer blows required to drive the sampler the final foot of penetration was recorded and is designated the "standard penetration test (SPT) resistance." Proper evaluation of the penetration resistance provides an index to the soil's strength, density, and ability to support foundations.

Representative portions of the soil samples obtained from the split-tube sampler were sealed in glass jars and transported to our laboratory for testing and further examination. Test Boring Records are attached, graphically showing the soil descriptions and penetration resistances.

Plugging and Abandonment of Boreholes

Upon completion of drilling and sampling, the geotechnical boreholes were plugged with a Type I Portland cement-bentonite grout mixture using a tremie pipe method. The borings were plugged in general accordance with the requirements specified by TVA. The borings were plugged immediately after drilling and sampling of the boreholes.

Bulk Samples

Bulk samples of several ash types obtained at various elevations were collected for testing.

Undisturbed Sampling

The relatively undisturbed soil samples were obtained by pushing a section of 3-inch O.D., 16-gauge steel tubing into the soil at the desired sampling level. The sampling procedure is described by ASTM D-1587. The tube, together with the encased soils, was carefully removed from the ground, made airtight, and transported to our laboratory.

To obtain relatively undisturbed samples of ash a 3-1/2-inch OD, 3-inch ID split spoon with liner was used. The spoon was pushed into the bottoms of the boreholes at the desired sampling depths. The ash samples, enclosed in the liners, were then sealed with a wax / motor oil mixture at both ends and then capped to minimize changes in the structure and moisture content of the samples.

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LEGEND	ELEV (ft)	SAMPLES: IDENT	TYPE	N-COUNT 1st 6" 2nd 6" 3rd 6"	PL (%) NM (%) LL (%) ▲ FINES (%) ● SPT (bpf)
0	NOTE: MONITORING WELL 1 (PIEZOMETER) WAS INSTALLED APPROXIMATELY 11.0' NORTH EAST OF B-1. AUGER BORING FROM 0.0' TO 20.0'. 1" PIEZOMETER PIPE INSTALLED FROM GROUND SURFACE TO A DEPTH OF 20.0'.		781.8				
5			776.8				
10			771.8				
15			766.8				
20	BORING TERMINATED AT 20.0'		761.8				
25			756.8				
30			751.8				
35			746.8				
40			741.8				
45			736.8				

SOIL 3043041009_01.GPJ LAW_GIBB.GDT 4/23/04

REMARKS:

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 BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

Driller : Akins
Prepared By: Justice
Checked By:

SOIL TEST BORING RECORD

PROJECT: Kingston Fossil Plant - Ash Diposal Area

DRILLED: March 25, 2004 **BORING NO.:** MW-1

PROJ. NO.: 3043041009/0001 **PAGE 1 OF 1**

MACTEC

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS	LEGEND	ELEV (ft)	SAMPLES IDENT	TYPE	N-COUNT 1st 6" 2nd 6" 3rd 6"	PL (%) NM (%) LL (%) ▲ FINES (%) ● SPT (bpf)
0	SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.		795.3				
	NOTE: MONITORING WELL 2 (PIEZOMETER) WAS INSTALLED APPROXIMATELY 15.0' NORTH EAST OF B-2.						
	AUGER BORING FROM 0.0' TO 35.0'.						
	1" PIEZOMETER PIPE INSTALLED FROM GROUND SURFACE TO A DEPTH OF 35.0'.						
5			790.3				
10			785.3				
15		▼	780.3				
20			775.3				
25			770.3				
30			765.3				
35	BORING TERMINATED AT 35.0'		760.3				
40			755.3				
45			750.3				

SOIL 3043041009_01.GPJ LAW_GIBR.GDT 4/23/04

REMARKS:

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 BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

Driller : Akins
Prepared By: Justice
Checked By:

SOIL TEST BORING RECORD

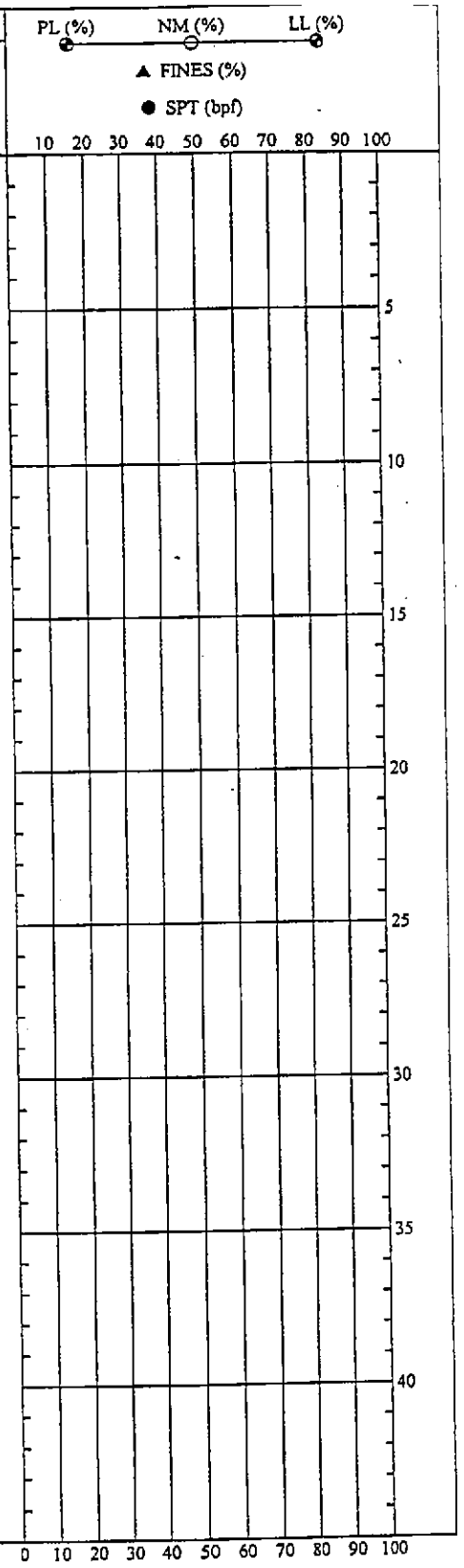
PROJECT: Kingston Fossil Plant - Ash Diposal Area

DRILLED: March 25, 2004 **BORING NO.:** MW-2

PROJ. NO.: 3043041009/0001 **PAGE 1 OF 1**

MACTEC

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS	LEGEND	ELEV (ft)	SAMPLES IDENT	TYPE	N-COUNT 1st 6" 2nd 6" 3rd 6"	PL (%) NM (%) LL (%) ▲ FINES (%) ● SPT (bpf)
0	SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.		810.8				
	NOTE: MONITORING WELL 3 (PIEZOMETER) WAS INSTALLED APPROXIMATELY 16.0' SOUTH WEST OF B-3.						
	AUGER BORING FROM 0.0' TO 40.0'.						
	1" PIEZOMETER PIPE INSTALLED FROM GROUND SURFACE TO A DEPTH OF 40.0'.						
5			805.8				
10			800.8				
15			795.8				
20			790.8				
25			785.8				
30			780.8				
35			775.8				
40	BORING TERMINATED AT 40.0'		770.8				
45			765.8				



SOIL 3043041009 D1.GPJ LAW_GIBB.GDT 4/23/04

REMARKS:

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Driller : Akins
Prepared By: Justice
Checked By:

SOIL TEST BORING RECORD

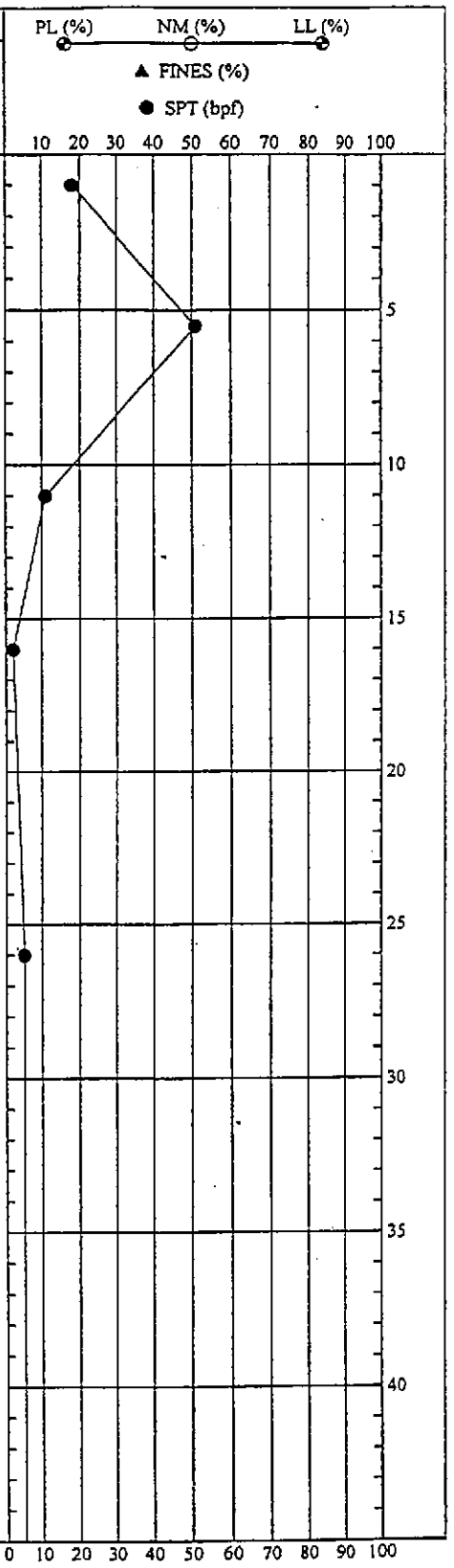
PROJECT: Kingston Fossil Plant - Ash Diposal Area

DRILLED: March 25, 2004 **BORING NO.:** MW-3

PROJ. NO.: 3043041009/0001 **PAGE 1 OF 1**

MACTEC

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LEGEND	ELEV (ft)	SAMPLES IDENT	TYPE	N-COUNT 1st 6" 2nd 6" 3rd 6"
0	FIRM TO STIFF, ORANGE-BROWN, SLIGHTLY MOIST, SILTY CLAY WITH CHERT FRAGMENTS - FILL		781.8	SPT-1		3-7-11
	VERY STIFF, GRAY, DRY TO SLIGHTLY MOIST, SANDY CLAYEY SILT - ASH					
	VERY DENSE TO VERY LOOSE, GRAY, SLIGHTLY MOIST TO WET, SILTY SAND - ASH			UD-1		0.5-0.5
5			776.8	SPT-2		15-25-26
10			771.8	SPT-3		4-5-6
15	NOTE: AT ABOUT 15.0' STARTED INTRODUCING WATER INTO THE BOREHOLE TO REDUCE PIPING OF SUBSURFACE MATERIALS INTO AUGERS.		766.8	SPT-4		2-1-1
20			761.8	SPT-5		woh-woh-1
25			756.8	SPT-6		1-2-3
30			751.8	SPT-7		woh-woh-1
35			746.8	SPT-8		woh-woh-1
40			741.8	SPT-9		woh-woh-1
	FIRM TO VERY SOFT, GRAY, WET, SANDY CLAYEY SILT / SILTY CLAY - ASH					
45			736.8			



SOIL 3043041009 01.GPJ LAW GIBB.GDT 4/6/04

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 BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

Driller : Akins
Prepared By: Justice
Checked By:

SOIL TEST BORING RECORD

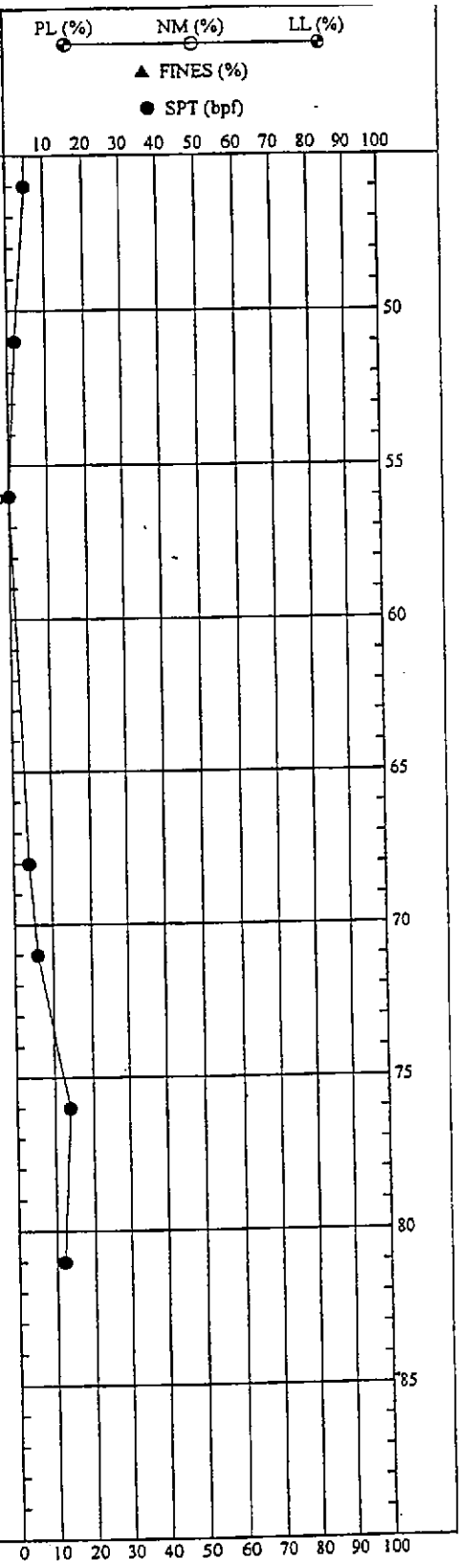
PROJECT: TVA Kingston Ash

DRILLED: March 8, 2004 **BORING NO.:** B-1

PROJ. NO.: 3043041009/0001 **PAGE 1 OF 2**

MACTEC

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LEGEND	ELEV (ft)	SAMPLES IDENT	TYPE	N-COUNT 1st 6" 2nd 6" 3rd 6"
45	FIRM TO VERY SOFT, GRAY, WET, SANDY CLAYEY SILT / SILTY CLAY - ASH		736.8	SPT-10		1-2-3
50			731.8	SPT-11		woh-1-1
	VERY SOFT TO SOFT, GRAY, MOIST, SANDY SILTY CLAY - ALLUVIUM					
55			726.8	SPT-12		woh-woh-woh
60			721.8	SPT-13		woh-woh-3
	VERY LOOSE TO FIRM, GRAY, WET CLAYEY / SILTY SAND - ALLUVIUM					
65			716.8	UD-2		2.0-2.0
				SPT-14		2-2-2
70			711.8	SPT-15		woh-3-3
75			706.8	SPT-16		5-6-8
80	NOTE: GRAVEL OBSERVED IN SAMPLE INTERVAL FROM 80.0' TO 81.5'		701.8	SPT-17		5-6-6
	AUGER REFUSAL AT 82.2'. BORING TERMINATED AT 82.2'.					
85			696.8			
90			691.8			



SOIL 3043041009 01.GPJ LAW GIBB.GDT 4/6/04

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 BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

Driller : Akins
Prepared By: Justice
Checked By:

SOIL TEST BORING RECORD

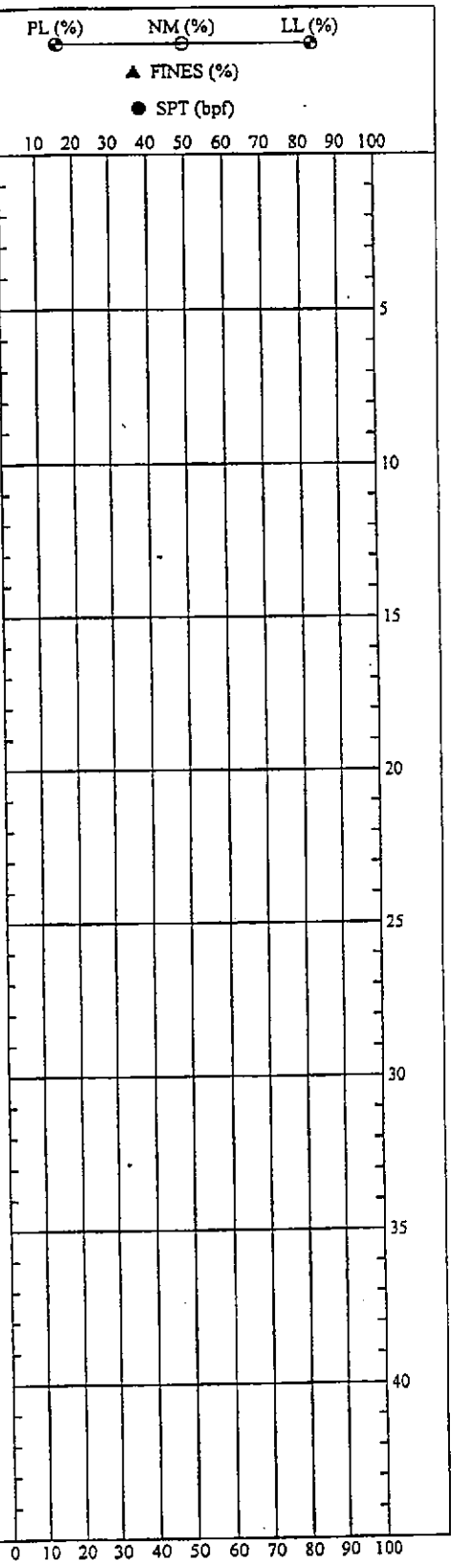
PROJECT: TVA Kingston Ash

DRILLED: March 8, 2004 **BORING NO.:** B-1

PROJ. NO.: 3043041009/0001 **PAGE 2 OF 2**

MACTEC

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS	LEGEND	ELEV (ft)	SAMPLES IDENT	TYPE	N-COUNT 1st 6" 2nd 6" 3rd 6"	PL (%) NM (%) LL (%) ▲ FINES (%) ● SPT (bpf)
0	SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.		781.8				
	NOTE: B-1A WAS OFFSET APPROXIMATELY 22.0' SOUTH WEST OF B-1.						
	AUGER BORING FROM 0.0' TO 5.0' USED FOR IN-SITU HYDRAULIC CONDUCTIVITY TESTING.						
5	BORING TERMINATED AT 5.0'		776.8				
10			771.8				
15			766.8				
20			761.8				
25			756.8				
30			751.8				
35			746.8				
40			741.8				
45			736.8				



SOIL 3043041009_01.GPJ LAW_GIBB.GDT 4/7/04

REMARKS:

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Driller : Akins
Prepared By: Justice
Checked By:

SOIL TEST BORING RECORD

PROJECT: TVA Kingston Ash

DRILLED: March 15, 2004 **BORING NO.:** B-1A

PROJ. NO.: 3043041009/0001 **PAGE 1 OF 1**

MACTEC

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS	LEGEND	ELEV (ft)	SAMPLES IDENT	TYPE	N-COUNT 1st 6" 2nd 6" 3rd 6"	PL (%) NM (%) LL (%) ▲ FINES (%) ● SPT (bpf) 10 20 30 40 50 60 70 80 90 100
0	SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.		781.8				
	NOTE: B-1B WAS OFFSET APPROXIMATELY 47.0' SOUTH WEST OF B-1.						
	AUGER BORING FROM 0.0' TO 5.0' USED FOR IN-SITU HYDRAULIC CONDUCTIVITY TESTING.						
5	BORING TERMINATED AT 5.0'		776.8				
10			771.8				
15			766.8				
20			761.8				
25			756.8				
30			751.8				
35			746.8				
40			741.8				
45			736.8				

SOIL 3043041009_01.GPJ LAW_GIBB.GDT 4/7/04

REMARKS:

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Driller : Akins
Prepared By:Justice
Checked By:

SOIL TEST BORING RECORD

PROJECT: TVA Kingston Ash

DRILLED: March 15, 2004 **BORING NO.:** B-1B

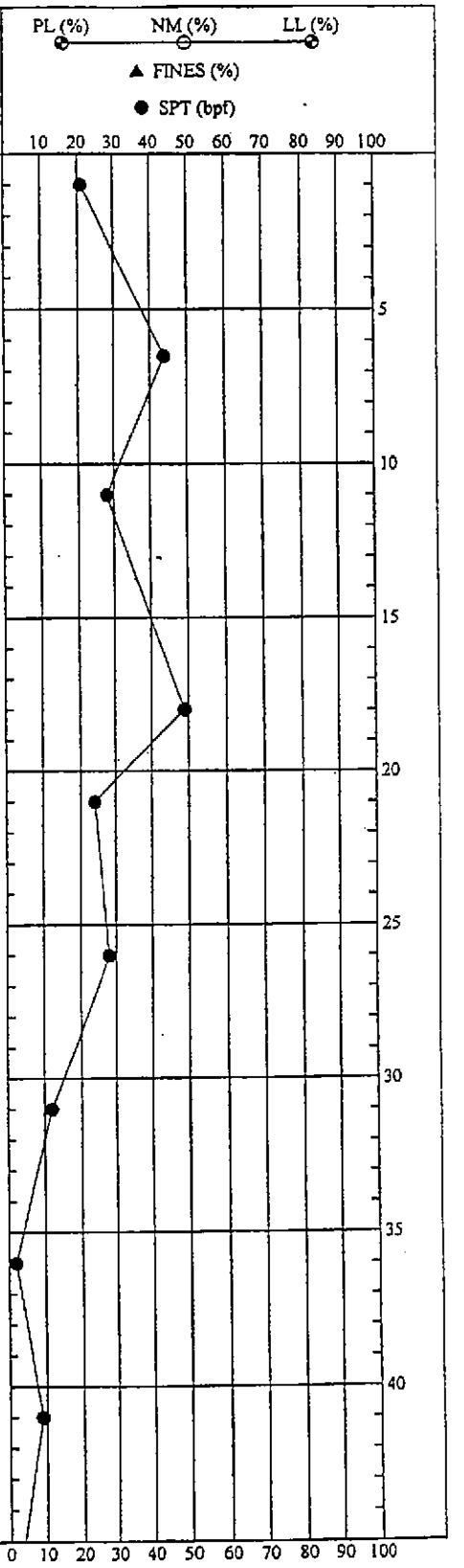
PROJ. NO.: 3043041009/0001 **PAGE 1 OF 1**

MACTEC

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS	ELEV (ft)	SAMPLE IDENT	TYPE	N-COUNT 1st 6" 2nd 6" 3rd 6"
0	STIFF, RED-BROWN, SLIGHTLY MOIST, SILTY CLAY WITH CHERT FRAGMENTS - FILL	795.3			
	DENSE TO FIRM, GRAY, SLIGHTLY MOIST TO WET, CLAYEY / SILTY SAND - ASH		SPT-1		5-5-16
5		790.3	UD-1		0-1.5
			SPT-2		18-30-14
10		785.3	SPT-3		10-11-17
15		780.3	UD-2		0-2.0
			SPT-4		13-23-26
20		775.3	SPT-5		10-8-16
25		770.3	SPT-6		8-14-14
30	NOTE: AT ABOUT 30.0' STARTED INTRODUCING WATER INTO THE HOLE TO REDUCE PIPING OF SUBSURFACE MATERIALS INTO AUGERS.	765.3	SPT-7		4-4-8
	VERY SOFT, GRAY, WET, SANDY SILTY CLAY - ASH				
35		760.3	SPT-8		woh-1-1
	STIFF TO VERY SOFT, BROWN, RED-BROWN, AND OLIVE BROWN, MOIST TO WET, SILTY CLAY WITH COAL FRAGMENTS, CHERT FRAGMENTS, AND SOME ASH - FILL				
40		755.3	SPT-9		2-4-5
45		750.3			

SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.

LEGEND



SOIL 3043041009 01.GPJ LAW GIHB.GDT 4/6/04

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

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Driller : Akins
Prepared By: Justice
Checked By:

SOIL TEST BORING RECORD

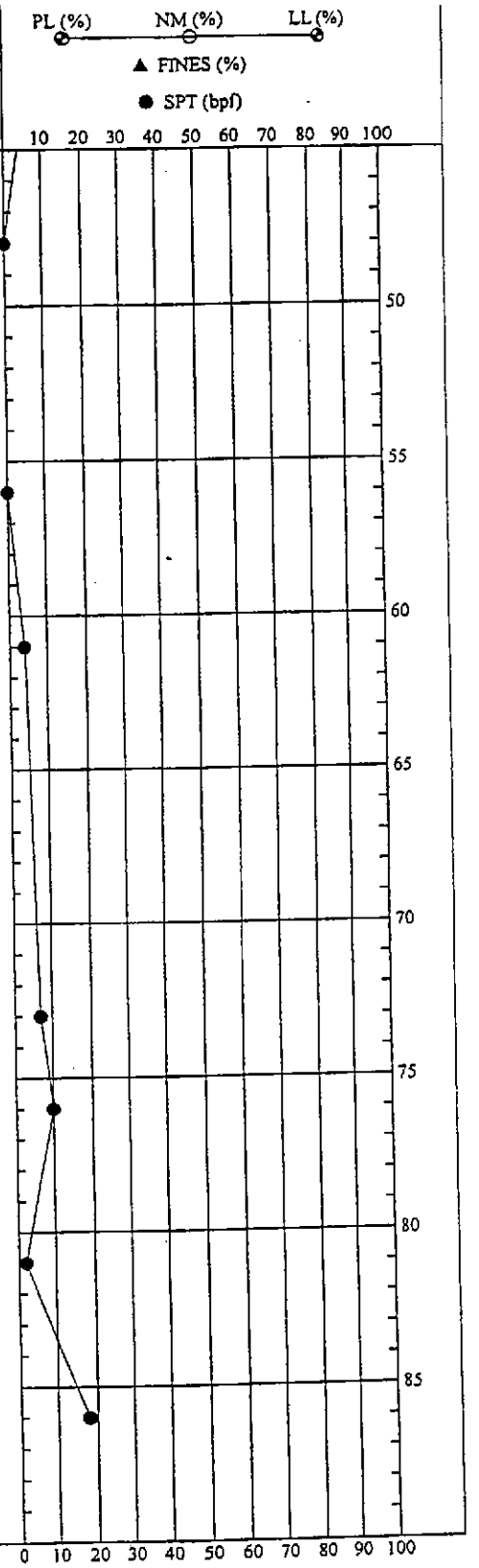
PROJECT: TVA Kingston Ash

DRILLED: March 4, 2004 **BORING NO.:** B-2

PROJ. NO.: 3043041009/0001 **PAGE 1 OF 2**

MACTEC

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LEGEND	ELEV (ft)	SAMPLES IDENT	TYPE	N-COUNT 1st 6" 2nd 6" 3rd 6"
45	STIFF TO VERY SOFT, BROWN, RED-BROWN, AND OLIVE BROWN, MOIST TO WET, SILTY CLAY WITH COAL FRAGMENTS, CHERT FRAGMENTS, AND SOME ASH - FILL		750.3	UD-3		0-2.0
				SPT-10		woh-woh-woh
50			745.3	SPT-11		woh-woh-1
55	VERY LOOSE, GRAY, WET, SILTY CLAYEY SAND - ASH		740.3	SPT-12		woh-1-woh
60			735.3	SPT-13		6-3-1
	VERY SOFT TO STIFF, ORANGE BROWN AND OLIVE GRAY, WET TO MOIST, SILTY / SANDY CLAY WITH A FEW ROOTS - ALLUVIUM		730.3	SPT-14		1-woh-1
65						
70			725.3	UD-4		2.0-2.0
				SPT-15		4-2-5
75			720.3	SPT-16		1-4-6
	VERY LOOSE TO FIRM, OLIVE GRAY, WET, SILTY / CLAYEY SAND - ALLUVIUM		715.3	SPT-17		woh-1-1
80						
85			710.3	SPT-18		5-10-8
	AUGER REFUSAL AT 87.5'. BORING TERMINATED AT 87.5'.					
90			705.3			



SOIL_3043041009_01.GPJ LAW_GIBB.GDT 4/6/04

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

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Driller : Akins
Prepared By: Justice
Checked By:

SOIL TEST BORING RECORD

PROJECT: TVA Kingston Ash

DRILLED: March 4, 2004 **BORING NO.:** B-2

PROJ. NO.: 3043041009/0001 **PAGE 2 OF 2**

MACTEC

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS	LEGEND	ELEV (ft)	SAMPLES IDENT	TYPE	N-COUNT 1st 6" 2nd 6" 3rd 6"	PL (%) NM (%) LL (%) ▲ FINES (%) ● SPT (bpf) 10 20 30 40 50 60 70 80 90 100
0	SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.		795.3				
	NOTE: B-2A WAS OFFSET APPROXIMATELY 15.0' SOUTH WEST OF B-2.						
	AUGER BORING FROM 0.0' TO 5.0' USED FOR IN-SITU HYDRAULIC CONDUCTIVITY TESTING.						
5	BORING TERMINATED AT 5.0'		790.3				
10			785.3				
15			780.3				
20			775.3				
25			770.3				
30			765.3				
35			760.3				
40			755.3				
45			750.3				

SOIL 3043041009 01.GPJ LAW GIBB.GDT 4/7/04

REMARKS:

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Driller : Akins
Prepared By:Justice
Checked By:

SOIL TEST BORING RECORD

PROJECT: TVA Kingston Ash

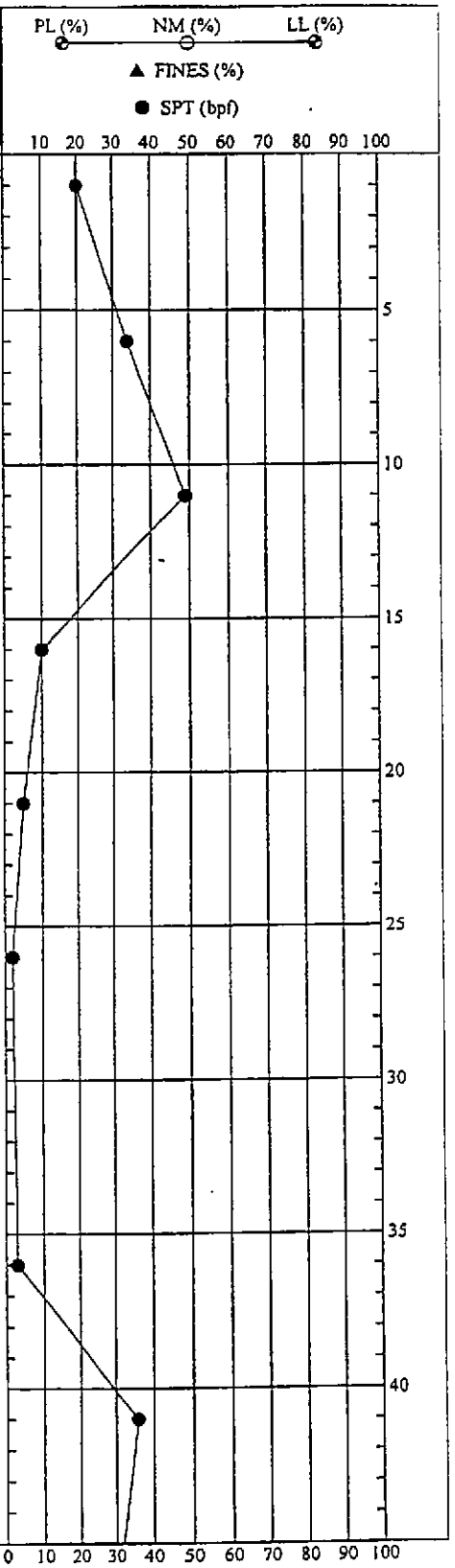
DRILLED: March 15, 2004 **BORING NO.:** B-2A

PROJ. NO.: 3043041009/0001 **PAGE** 1 **OF** 1

MACTEC

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS	LEGEND	ELEV (ft)	SAMPLES IDENT	TYPE	N-COUNT 1st 6" 2nd 6" 3rd 6"
0	VERY STIFF, GRAY, SLIGHTLY MOIST, SANDY CLAYEY SILT - ASH		810.8	SPT-1		3-8-12
	DENSE TO VERY LOOSE, GRAY, SLIGHTLY MOIST TO WET, SILTY / CLAYEY SAND - ASH					
5			805.8	SPT-2		7-16-18
10			800.8	SPT-3		12-22-27
15			795.8	SPT-4		2-5-5
20			790.8	SPT-5		2-3-2
25		▽	785.8	SPT-6		woh-1-1
30			780.8	SPT-7		woh-woh-1
35			775.8	SPT-8		1-1-2
40			770.8	SPT-9		10-18-18
45			765.8			

SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.



SOIL 3043041009 01.GPJ LAW GIBB.GDT 4/6/04

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

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Driller : Akins
Prepared By: Justice
Checked By:

SOIL TEST BORING RECORD

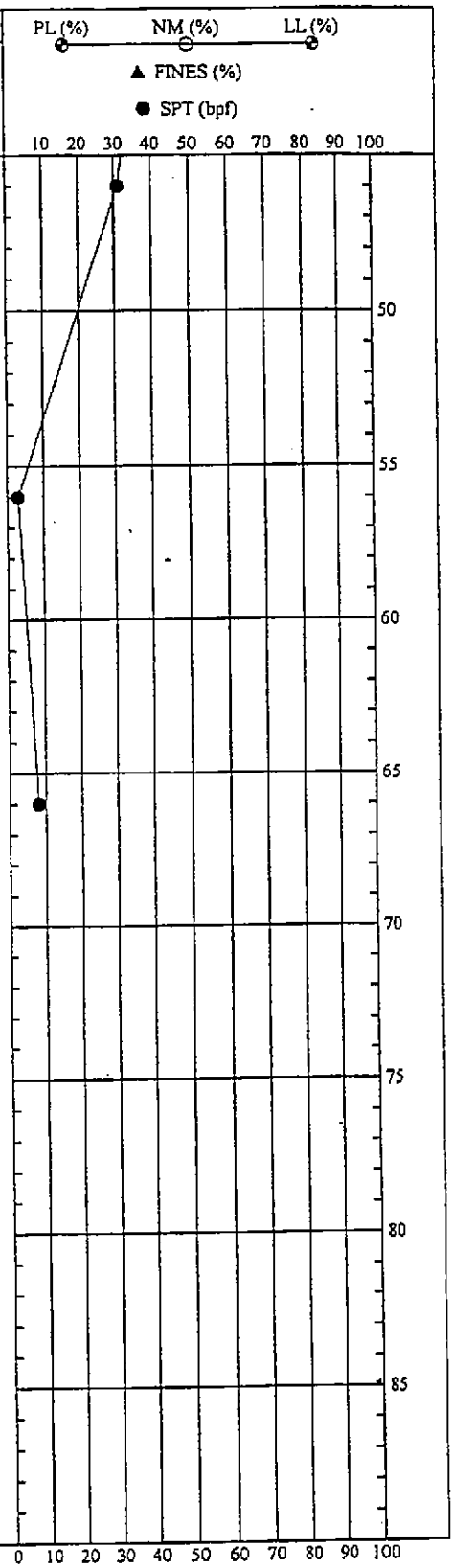
PROJECT: TVA Kingston Ash

DRILLED: March 3, 2004 **BORING NO.:** B-3

PROJ. NO.: 3043041009/0001 **PAGE 1 OF 2**

MACTEC

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LEGEND	ELEV (ft)	SAMPLES IDENT	TYPE	N-COUNT 1st 6" 2nd 6" 3rd 6"
45	DENSE TO VERY LOOSE, GRAY, SLIGHTLY MOIST TO WET, SILTY / CLAYEY SAND - ASH		765.8	SPT-10		7-17-14
	VERY SOFT, GRAY, WET, SANDY SILTY CLAY - ASH					
50			760.8	SPT-11		woh-woh-1
	VERY LOOSE, GRAY, WET, SAND - ASH					
55			755.8	SPT-12		1-2-1
	VERY SOFT, BROWN, WET, SILTY CLAY WITH COAL AND CHERT FRAGMENTS - FILL					
60			750.8	SPT-13		woh-woh-1
	LOOSE GRAY, WET, CLAYEY SILTY SAND WITH GRAVEL - ASH					
65			745.8	SPT-14		4-4-4
	NOTE: AT A DEPTH OF 70.0' ATTEMPTED TO SEAT SPLIT-SPOON BUT REFUSED AT 50.0'. SUBSURFACE MATERIAL SUSPECTED TO HAVE PIPED IN AUGERS. FLUSHING OF BOREHOLE WITH WATER WAS UNSUCCESSFUL.					
70	BORING TERMINATED AT 70.0'		740.8			
75			735.8			
80			730.8			
85			725.8			
90			720.8			



SOIL_3043041009_01.GPJ LAW_GIBB.GDT 4/7/04

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

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Driller : Akins
Prepared By: Justice
Checked By:

SOIL TEST BORING RECORD

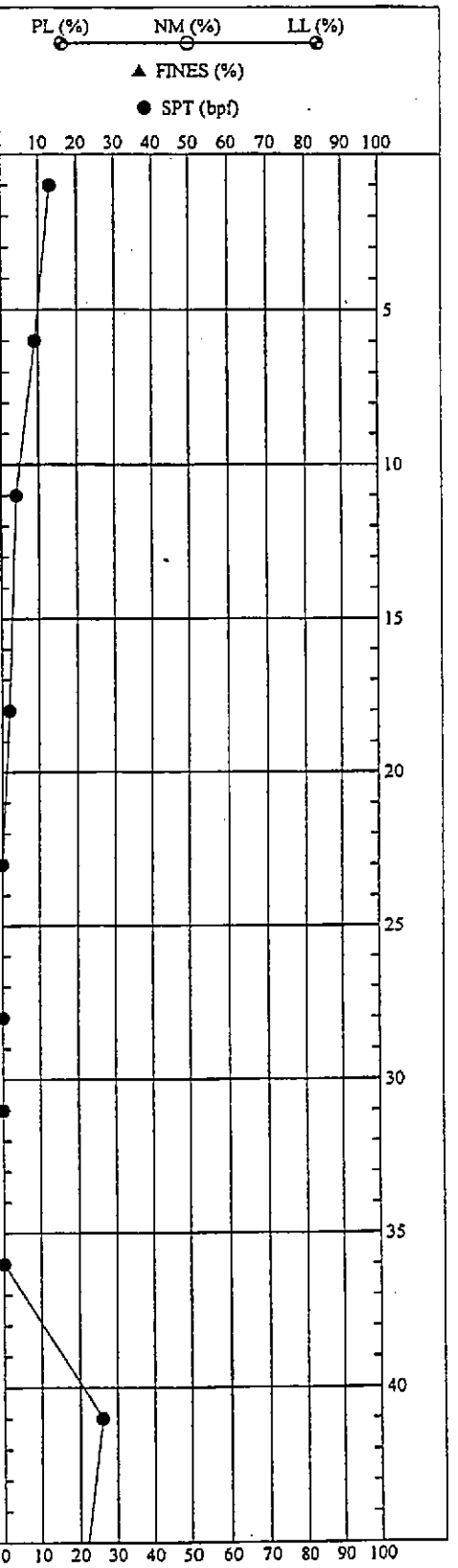
PROJECT: TVA Kingston Ash

DRILLED: March 3, 2004 **BORING NO.:** B-3

PROJ. NO.: 3043041009/0001 **PAGE 2 OF 2**

MACTEC

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LEGEND	ELEV (ft)	SAMPLES IDENT	TYPE	N-COUNT 1st 6" 2nd 6" 3rd 6"
0	STIFF TO VERY SOFT, GRAY, SLIGHTLY MOIST TO WET, CLAYEY / SANDY SILT - ASH		810.6	SPT-1		3-6-7
5			805.6	SPT-2		2-3-6
10			800.6	SPT-3		3-2-2
15			795.6	UD-1		0-2.0
				SPT-4		woh-1-1
20			790.6	UD-2		0-2.0
				SPT-5		woh-woh-woh
25			785.6			
		▽		SPT-6		woh-woh-woh
30			780.6	SPT-7		woh-woh-woh
35			775.6	SPT-8		woh-1-woh
40	VERY FIRM TO FIRM, GRAY, VERY MOIST TO WET, SILTY / CLAYEY SAND - ASH NOTE: DRILLER REPORTED "STIFF" DRILLING AT ABOUT 38.0'.		770.6	SPT-9		4-12-14
45			765.6			



SOIL_3043041009_01.GPJ LAW_GIBB.GDT 4/23/04

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

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Driller : Akins
Prepared By:Justice
Checked By:

SOIL TEST BORING RECORD

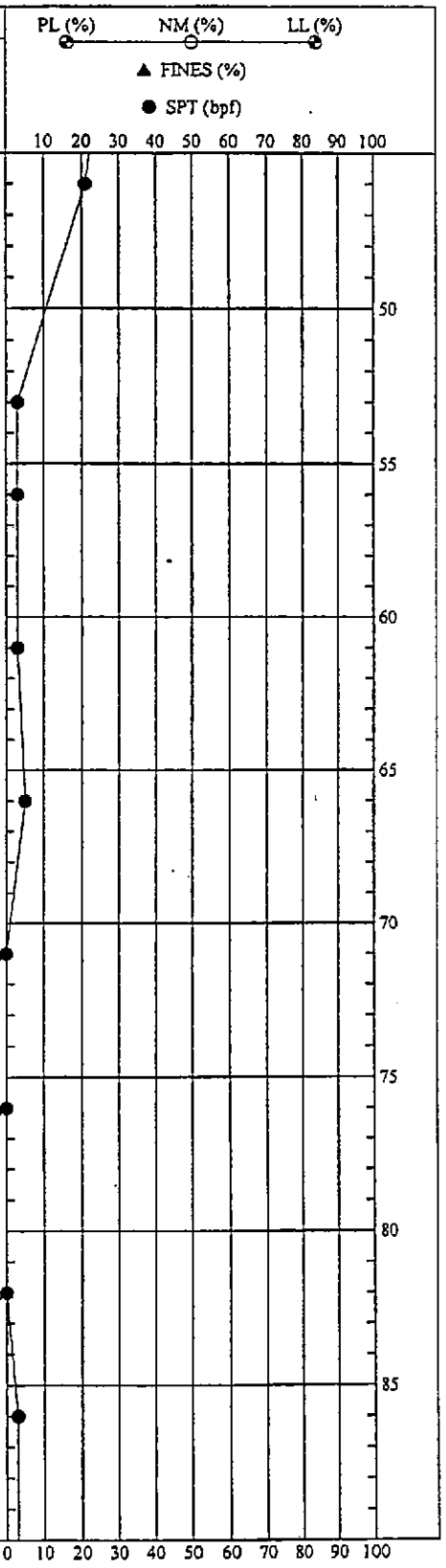
PROJECT: Kingston Fossil Plant - Ash Diposal Area

DRILLED: March 23, 2004 **BORING NO.:** B-4

PROJ. NO.: 3043041009/0001 **PAGE 1 OF 3**

MACTEC

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LEGEND	ELEV (ft)	SAMPLES IDENT	TYPE	N-COUNT 1st 6" 2nd 6" 3rd 6"
45	FIRM, GRAY, VERY MOIST TO WET, SILTY / CLAYEY SAND - ASH		765.6	SPT-10		8-11-10
	SOFT, GRAY, WET, CLAYEY SANDY SILT - ASH					
50			760.6	UD-3		0-2.0
				SPT-11		2-2-1
55	VERY LOOSE TO LOOSE, GRAY, WET, CLAYEY SILTY SAND - ASH		755.6	SPT-12		1-2-1
60			750.6	SPT-13		1-1-2
65			745.6	SPT-14		1-3-2
70			740.6	SPT-15		woh-woh-woh
	VERY SOFT, GRAY, WET, CLAYEY SILT - ASH NOTE: AT SAMPLE INTERVAL FROM 75.0' TO 76.5' SPLIT-SPOON DROPPED UNDER THE WEIGHT OF THE TOOLS.					
75			735.6	SPT-16		woh-woh-woh
80			730.6	SPT-17		woh-woh-woh
	NOTE: DRILLER REPORTED CLAYEY ALLUVIAL SAND AT ABOUT 83.0'.					
85	VERY LOOSE TO LOOSE, GRAY, YELLOW-BROWN, AND OLIVE GRAY, WET, CLAYEY SAND WITH A FEW ROOTS - ALLUVIUM		725.6	SPT-18		1-2-1
90			720.6			



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

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Driller : Akins
Prepared By: Justice
Checked By:

SOIL TEST BORING RECORD

PROJECT: TVA Kingston Ash

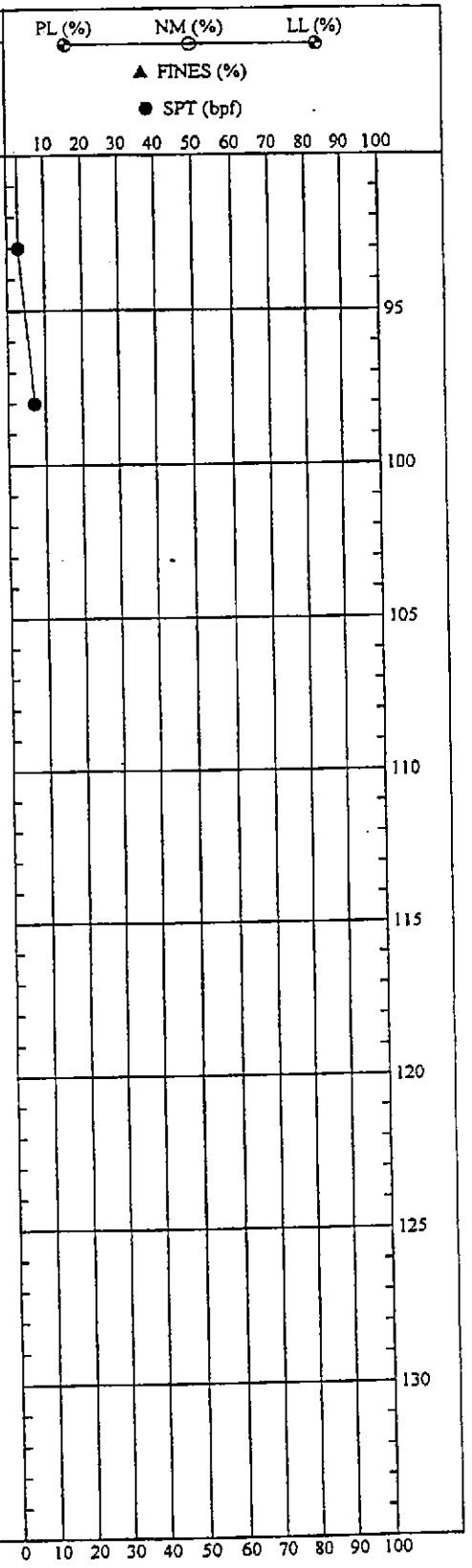
DRILLED: March 23, 2004 **BORING NO.:** B-4

PROJ. NO.: 3043041009/0001 **PAGE 2 OF 3**

MACTEC

SOIL 3043041009 01.GPJ LAW GIBB.GDT 4/6/04

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LEGEND	ELEV (ft)	SAMPLES IDENT	TYPE	N-COUNT 1st 6" 2nd 6" 3rd 6"	PL (%) NM (%) LL (%) ▲ FINES (%) ● SPT (bpf)
90	VERY LOOSE TO LOOSE, GRAY, YELLOW-BROWN, AND OLIVE GRAY, WET, CLAYEY SAND WITH A FEW ROOTS - ALLUVIUM		720.6	UD-4		0-2.0	
				SPT-19		1-2-1	
95			715.6	UD-5		0-2.0	
				SPT-20		4-4-3	
	BORING TERMINATED AT 98.5'						
100			710.6				
105			705.6				
110			700.6				
115			695.6				
120			690.6				
125			685.6				
130			680.6				
135			675.6				



SOIL 3043041009_01.GPJ LAW_GIBB.GDT 4/6/04

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

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Driller : Akins
Prepared By: Justice
Checked By:

SOIL TEST BORING RECORD

PROJECT: TVA Kingston Ash

DRILLED: March 23, 2004 **BORING NO.:** B-4

PROJ. NO.: 3043041009/0001 **PAGE 3 OF 3**

MACTEC

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LEGEND	ELEV (ft)	SAMPLES IDENT	TYPE	N-COUNT 1st 6" 2nd 6" 3rd 6"	PL (%) NM (%) LL (%) ▲ FINES (%) ● SPT (bpf)
0	AUGER BORING NOTE: BORING B-4A WAS OFFSET ABOUT 3 FEET EAST OF B-4.		810.6				
5			805.6				
10			800.6				
15			795.6	UD-1		1.1-2.0	
	VERY LOOSE, GRAY, VERY MOIST TO WET, CLAYEY SILTY SAND - ASH			SPT-1		woh-woh-1	
20			790.6	UD-2		0-2.0	
25			785.6	UD-3		1.2-2.0	
				SPT-2		woh-woh-woh	
	BORING TERMINATED AT 28.5'						
30			780.6				
35			775.6				
40			770.6				
45			765.6				

SOIL 3043041009_01.GPJ LAW_GIRB.GDT 4/6/04

REMARKS: STANDARD PENETRATION RESISTANCE TESTING PERFORMED USING AN AUTOMATIC HAMMER. NO GROUND WATER ENCOUNTERED AT TIME OF EXPLORATION.

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Driller : Akins
Prepared By: Justice
Checked By:

SOIL TEST BORING RECORD

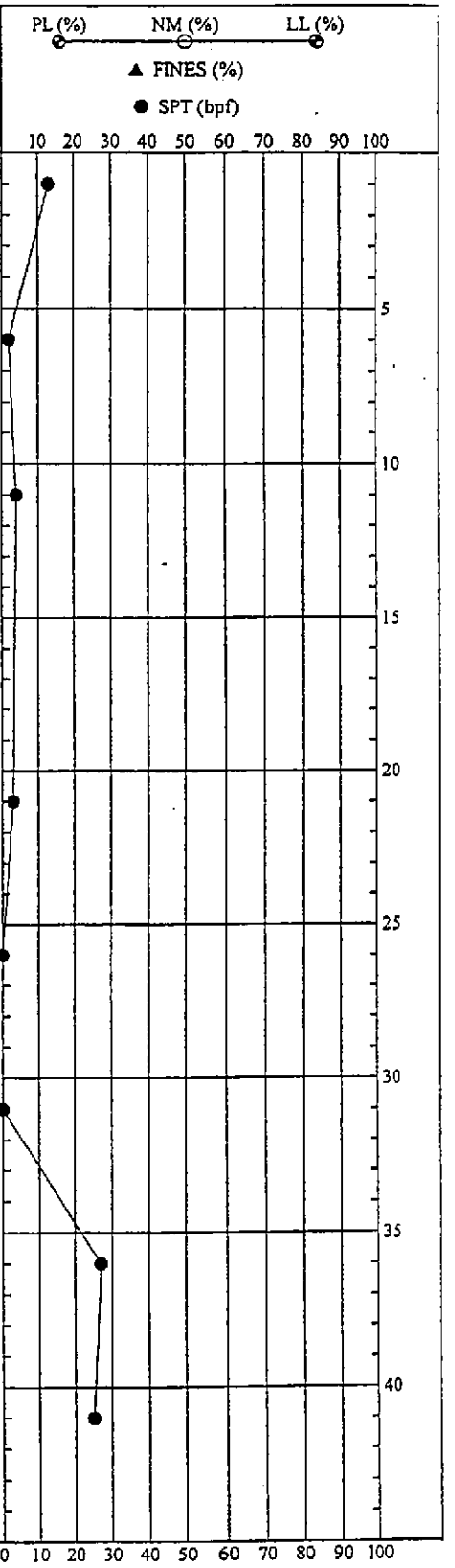
PROJECT: TVA Kingston Ash

DRILLED: March 24, 2004 **BORING NO.:** B-4A

PROJ. NO.: 3043041009/0001 **PAGE 1 OF 1**

MACTEC

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LEGEND	ELEV (ft)	SAMPLES IDENT	TYPE	N-COUNT 1st 6" 2nd 6" 3rd 6"
0	FIRM TO VERY LOOSE, GRAY, SLIGHTLY MOIST TO WET, CLAYEY SILTY SAND - ASH		810.2	SPT-1		3-6-7
5			805.2	SPT-2		1-1-1
10			800.2	SPT-3		2-2-2
15			795.2	SPT-4		1-woh-1
20			790.2	SPT-5		woh-2-1
25			785.2	SPT-6		woh-woh-woh
30			780.2	SPT-7		woh-woh-woh
35	VERY STIFF, GRAY, SLIGHTLY MOIST, CLAYEY SILT - ASH VERY FIRM, GRAY, SLIGHTLY MOIST, SILTY SAND - ASH		775.2	SPT-8		8-12-15
40	NOTE: BORING TERMINATED DUE TO DIFFICULT DRILLING. BORING TERMINATED AT 41.5'		770.2	SPT-9		5-11-14
45			765.2			



SOIL 3043041009_01.GPJ LAW_GIBB.GDT 4/23/04

REMARKS: STANDARD PENETRATION RESISTANCE TESTING PERFORMED USING AN AUTOMATIC HAMMER. NO GROUND WATER ENCOUNTERED AT TIME OF EXPLORATION.

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 BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

Driller : Akins
Prepared By: Justice
Checked By:

SOIL TEST BORING RECORD

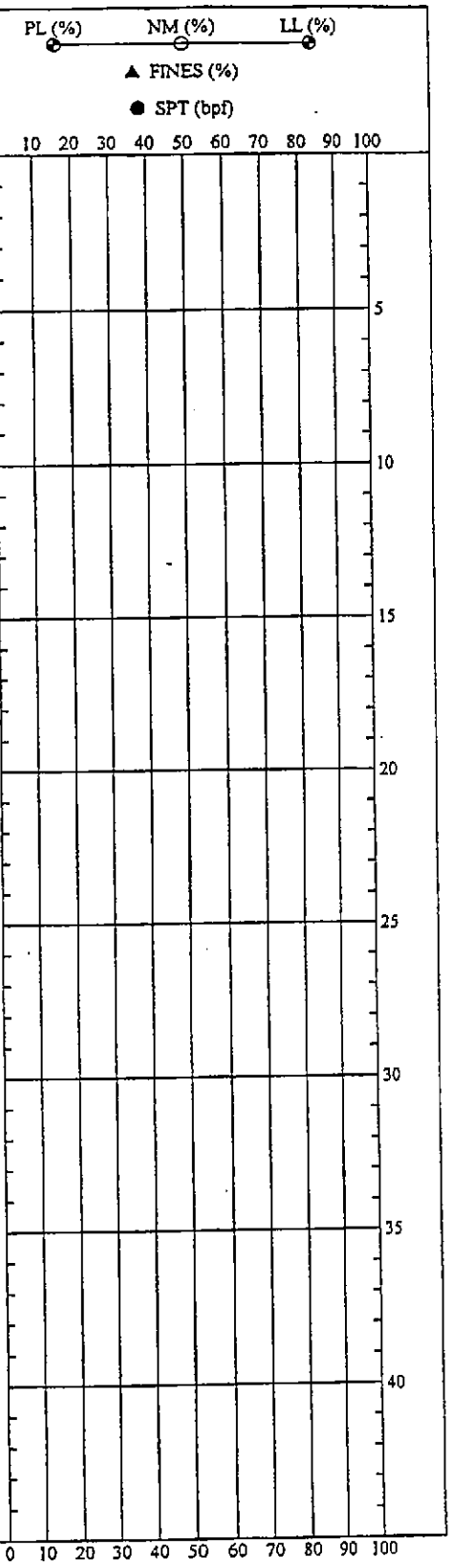
PROJECT: Kingston Fossil Plant - Ash Diposal Area

DRILLED: March 1, 2004 **BORING NO.:** B-5

PROJ. NO.: 3043041009/0001 **PAGE 1 OF 1**

MACTEC

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS	LEGEND	ELEV (ft)	SAMPLES IDENT	TYPE	N-COUNT 1st 6" 2nd 6" 3rd 6"	PL (%) NM (%) LL (%) ▲ FINES (%) ● SPT (bpf)
0	SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.		810.2				
	AUGER BORING FROM 0.0' TO 45.0' - ASH						
	NOTE: BORING B-5A WAS OFFSET ABOUT 3 FEET NORTH OF B-5.						
5			805.2				
10			800.2				
15			795.2				
20			790.2				
25			785.2				
30			780.2				
35			775.2				
40		▽	770.2				
45			765.2				



SOIL_3043041009_01.GPJ LAW_GIBB.GDT 4/7/04

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

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Driller : Akins
Prepared By: Justice
Checked By:

SOIL TEST BORING RECORD

PROJECT: TVA Kingston Ash

DRILLED: March 2, 2004 **BORING NO.:** B-5A

PROJ. NO.: 3043041009/0001 **PAGE 1 OF 3**

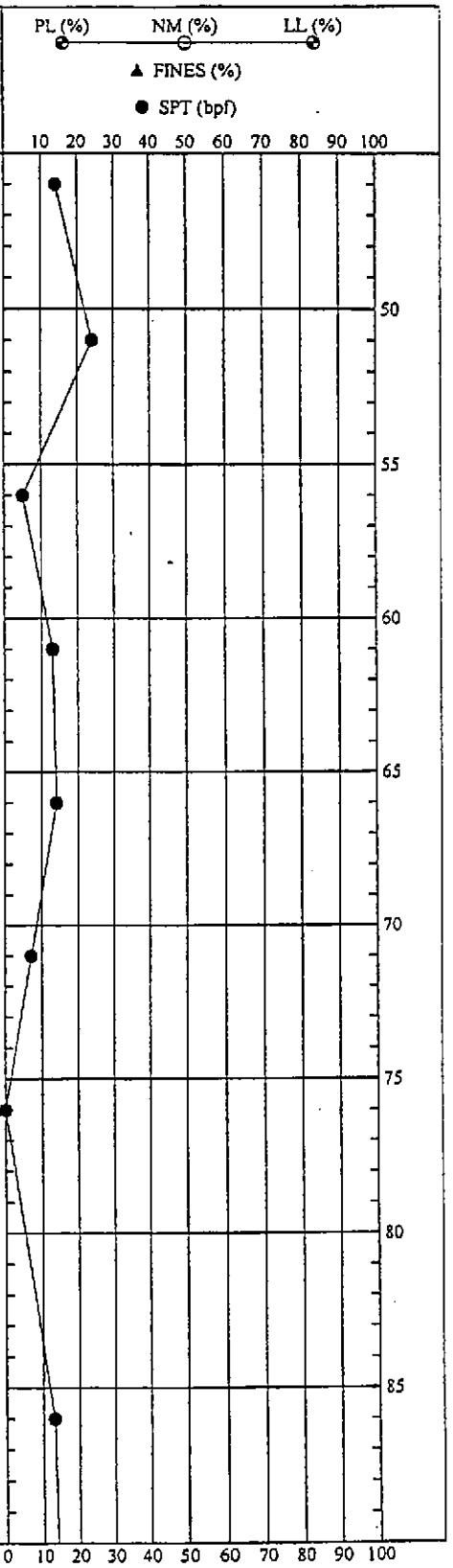
MACTEC

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS	ELEV (ft)	SAMPLE IDENT	TYPE	N-COUNT (1st 6" 2nd 6" 3rd 6")
45	STIFF, GRAY, MOIST TO VERY MOIST, SANDY CLAYEY SILT - ASH	765.2	SPT-1		3-4-10
	VERY FIRM TO FIRM TO VERY LOOSE, GRAY, MOIST TO WET, CLAYEY SILTY SAND - ASH				
50		760.2	SPT-2		7-11-13
55		755.2	SPT-3		1-1-4
60		750.2	SPT-4		2-7-6
65		745.2	SPT-5		1-6-8
70		740.2	SPT-6		2-3-4
75		735.2	SPT-7		woh-woh-woh
80		730.2	SPT-8		woh-woh-2
	VERY SOFT TO STIFF, OLIVE GRAY, ORANGE BROWN, AND OLIVE BROWN, VERY MOIST TO SLIGHTLY MOIST, SANDY SILTY CLAY - ALLUVIUM				
85		725.2	SPT-9		1-6-7
90		720.2			

SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.

LEGEND

SAMPLES



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

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Driller : Akins
Prepared By: Justice
Checked By:

SOIL TEST BORING RECORD

PROJECT: Kingston Fossil Plant - Ash Diposal Area

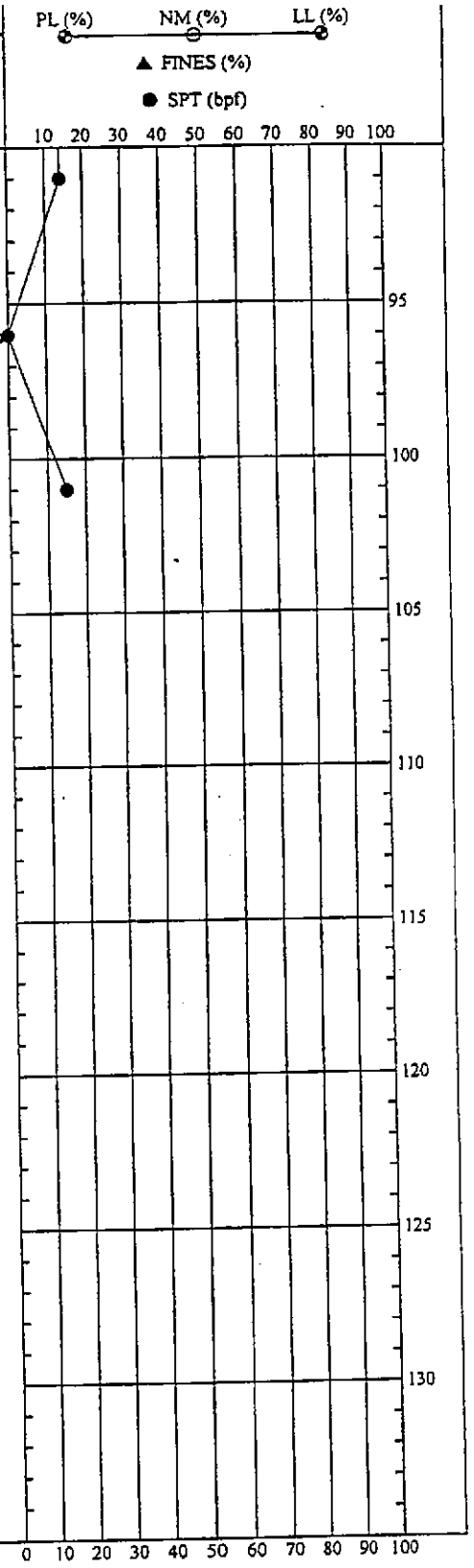
DRILLED: March 2, 2004 **BORING NO.:** B-5A

PROJ. NO.: 3043041009/0001 **PAGE 2 OF 3**

MACTEC

SOIL 3043041009_01.GPJ LAW_GIBB.GDT 4/23/04

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LEGEND	ELEV (ft)	SAMPLES IDENT	TYPE	N-COUNT 1st 6" 2nd 6" 3rd 6"	PL (%) NM (%) LL (%) ▲ FINES (%) ● SPT (bpf)
90	VERY SOFT TO STIFF, OLIVE GRAY, ORANGE BROWN, AND OLIVE BROWN, VERY MOIST TO SLIGHTLY MOIST, SANDY SILTY CLAY - ALLUVIUM		720.2	SPT-10		5-7-7	
	VERY LOOSE TO FIRM, GRAY, WEY, SILTY CLAYEY SAND - ALLUVIUM		715.2	SPT-11		woh-woh-woh	
100			710.2	SPT-12		3-7-8	
	BORING TERMINATED A 101.5'						
105			705.2				
110			700.2				
115			695.2				
120			690.2				
125			685.2				
130			680.2				
135			675.2				



SOIL 3043041009 01.GPJ LAW GIBB.GDT 4/7/04

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

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Driller : Akins
Prepared By:Justice
Checked By:

SOIL TEST BORING RECORD

PROJECT: TVA Kingston Ash

DRILLED: March 2, 2004 **BORING NO.:** B-5A

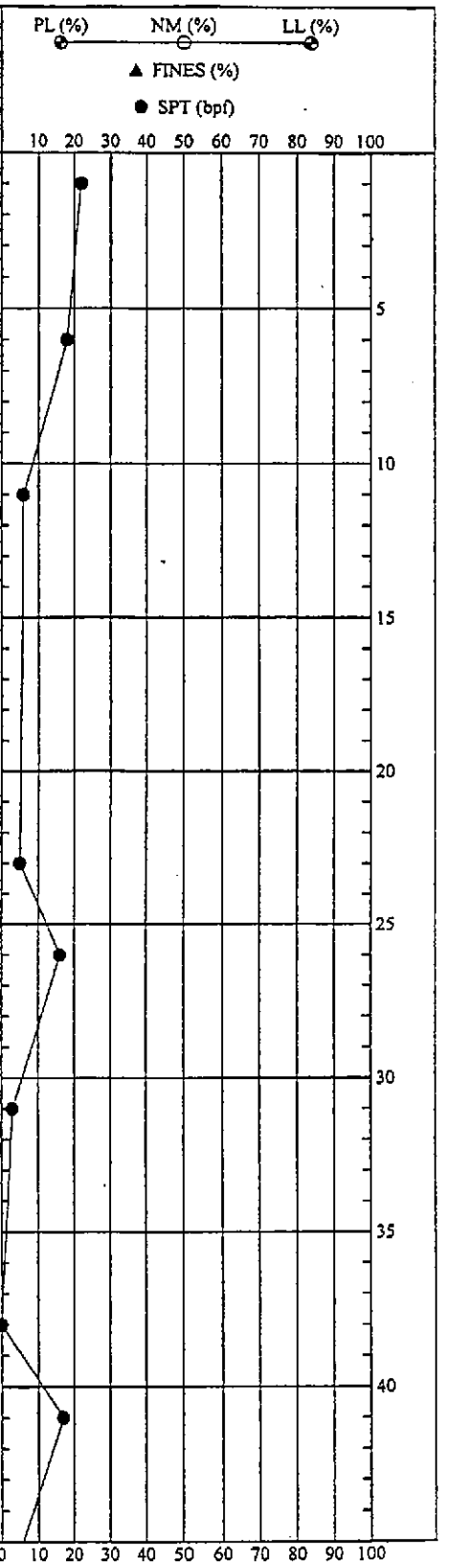
PROJ. NO.: 3043041009/0001 **PAGE 3 OF 3**

MACTEC

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS	ELEV (ft)	SAMPLE IDENT	TYPE	N-COUNT 1st 6" 2nd 6" 3rd 6"
0	VERY STIFF TO VERY SOFT, GRAY, DRY TO WET, SANDY CLAYEY SILT - ASH	809.5	SPT-1		6-10-12
5		804.5	SPT-2		2-7-11
10		799.5	SPT-3		3-3-3
15		794.5	SPT-4		woh-woh-1
20		789.5	UD-1		0-2.0
			SPT-5		1-2-3
25		784.5	SPT-6		5-6-10
30	VERY LOOSE, GRAY, SLIGHTLY MOIST, SILTY SAND - ASH	779.5	SPT-7		2-1-2
	VERY SOFT, GRAY, WET, SANDY SILTY CLAY - ASH				
35		774.5	UD-2		0-2.0
			SPT-8		woh-woh-woh
40	VERY STIFF TO SOFT, GRAY, SLIGHTLY MOIST TO WET, SANDY / CLAYEY SILT - ASH	769.5	SPT-9		5-8-9
45		764.5			

LEGEND

SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.



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Driller : Akins
Prepared By:Justice
Checked By:

SOIL TEST BORING RECORD

PROJECT: TVA Kingston Ash

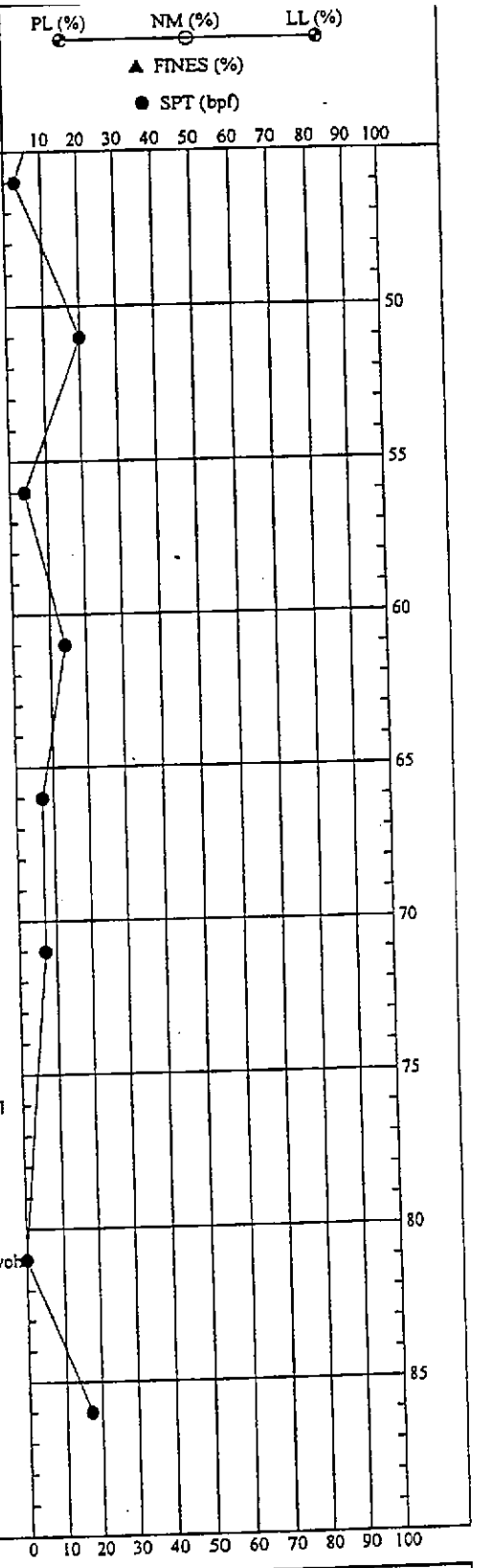
DRILLED: March 10, 2004 **BORING NO.:** B-6

PROJ. NO.: 3043041009/0001 **PAGE** 1 **OF** 2

MACTEC

SOIL 3043041009 01.GPJ LAW GIBB.GDT 4/6/04

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS	ELEV (ft)	SAMPLE IDENT	TYPE	N-COUNT (1st 6" 2nd 6" 3rd 6")
45	VERY STIFF TO SOFT, GRAY, SLIGHTLY MOIST TO WET, SANDY / CLAYEY SILT - ASH	764.5	SPT-10		3-2-1
50		759.5	SPT-11		8-10-10
55		754.5	SPT-12		2-1-3
60		749.5	SPT-13		2-4-10
	LOOSE, GRAY, WET, SILTY SAND - ASH				
65	NOTE: AT ABOUT 65.0' STARTED INTRODUCING WATER INTO THE BOREHOLE TO REDUCE PIPING OF SUBSURFACE MATERIALS INTO AUGERS.	744.5	SPT-14		1-3-4
	FIRM TO VERY SOFT, GRAY, WET, SANDY CLAYEY SILT - ASH				
70		739.5	SPT-15		1-4-3
75		734.5	SPT-16		woh-woh-1
80	VERY SOFT TO VERY STIFF, OLIVE GRAY TO OLIVE BROWN, VERY MOIST TO SLIGHTLY MOIST, SILTY / SANDY CLAY WITH A FEW ROOTS - ALLUVIUM	729.5	SPT-17		woh-woh-woh
85	NOTE: BORING TERMINATED DUE TO DIFFICULT DRILLING. BORING TERMINATED AT 86.5'	724.5	SPT-18		1-8-9
90		719.5			



SOIL 3043041009_01.GPJ LAW_GINR.GDT 4/6/04

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

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Driller : Akins
Prepared By: Justice
Checked By:

SOIL TEST BORING RECORD

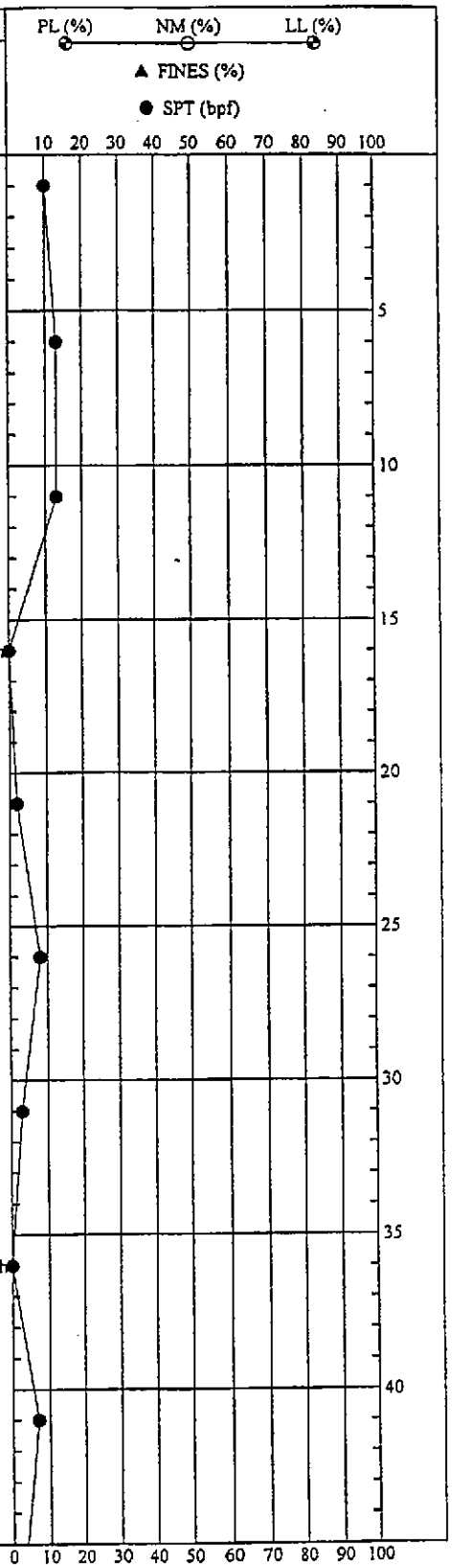
PROJECT: TVA Kingston Ash

DRILLED: March 10, 2004 **BORING NO.:** B-6

PROJ. NO.: 3043041009/0001 **PAGE 2 OF 2**

MACTEC

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS (SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.)	ELEV (ft)	SAMPLE IDENT	TYPE	N-COUNT 1st 6" 2nd 6" 3rd 6"
0	STIFF, GRAY, SLIGHTLY MOIST, SANDY CLAYEY SILT - ASH	767.0	SPT-1		3-5-5
5	FIRM, GRAY, SLIGHTY MOIST, SILTY SAND AND STIFF, RED-BROWN , SILTY CLAY - FILL	762.0	SPT-2		4-6-7
	FIRM TO VERY LOOSE, GRAY, WET, CLAYEY / SILTY SAND - ASH				
10		757.0	SPT-3		6-7-6
15		752.0	SPT-4		woh-woh-woh
20	NOTE: AT ABOUT 20.0' STARTED INTRODUCING WATER INTO THE BOREHOLE TO REDUCE PIPING OF SUBSURFACE MATERIALS INTO AUGERS.	747.0	SPT-5		woh-1-1
25		742.0	SPT-6		1-4-4
	SOFT, GRAY, WET, SANDY SILTY CLAY - ASH				
30		737.0	SPT-7		1-2-1
35	VERY SOFT TO FIRM, GRAY, OLIVE BROWN, AND LIGHT ORANGE BROWN, WET TO SLIGHTLY MOIST SANDY / SILTY CLAY WITH A TRACE OF COAL FRAGMENTS - ALLUVIUM	732.0	SPT-8		woh-woh-woh
40		727.0	SPT-9		woh-4-3
45		722.0			



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Driller : Akins
Prepared By:Justice
Checked By:

SOIL TEST BORING RECORD

PROJECT: TVA Kingston Ash

DRILLED: March 11, 2004 **BORING NO.:** B-7

PROJ. NO.: 3043041009/0001 **PAGE 1 OF 2**

MACTEC

SOIL 3043041009_01.GPJ LAW_GIBB.GDT 4/7/04

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS	LEGEND	ELEV (ft)	SAMPLES IDENT	TYPE	N-COUNT 1st 6" 2nd 6" 3rd 6"	PL (%) NM (%) LL (%) ▲ FINES (%) ● SPT (bpf)
45	SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.		722.0	SPT-10		woh-1-2	
	BORING TERMINATED AT 46.5'						
50			717.0				
55			712.0				
60			707.0				
65			702.0				
70			697.0				
75			692.0				
80			687.0				
85			682.0				
90			677.0				

SOIL 3043041009_01.GPJ LAW_GIBB.GDT 4/7/04

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

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Driller : Akins
Prepared By:Justice
Checked By:

SOIL TEST BORING RECORD

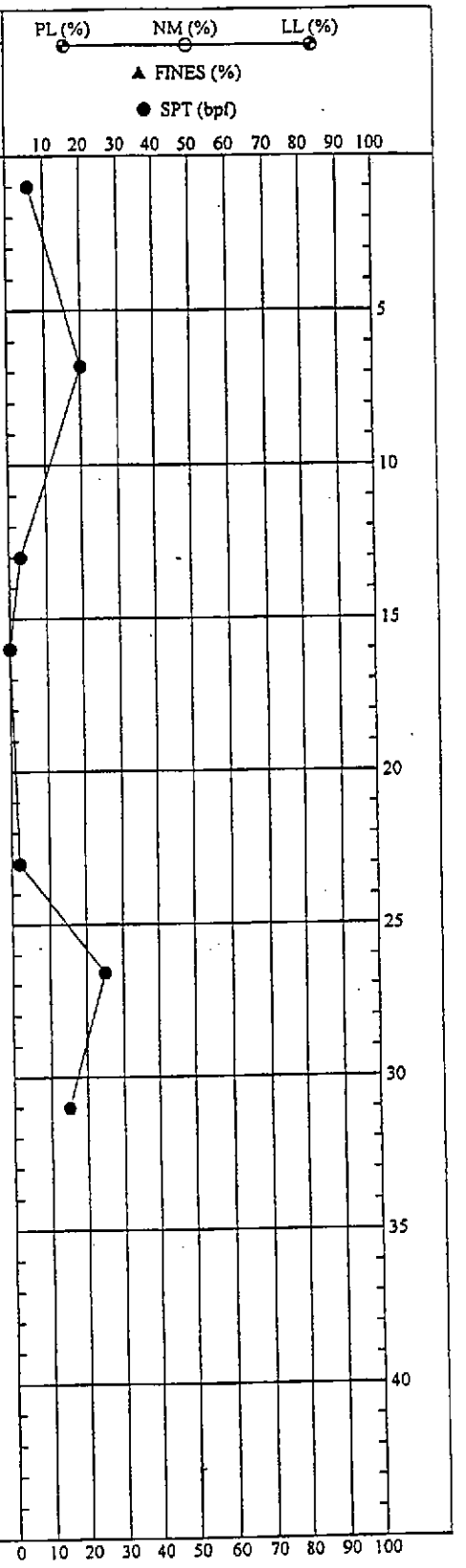
PROJECT: TVA Kingston Ash

DRILLED: March 11, 2004 **BORING NO.:** B-7

PROJ. NO.: 3043041009/0001 **PAGE 2 OF 2**

MACTEC

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LEGEND	ELEV (ft)	SAMPLES IDENT	TYPE	N-COUNT 1st 6" 2nd 6" 3rd 6"
0	FIRM, GRAY, SLIGHTLY MOIST, SANDY CLAYEY SILT - ASH		773.6	SPT-1		2-3-3
	FIRM TO VERY LOOSE, GRAY, SLIGHTLY MOIST TO MOIST, SILTY / CLAYEY SAND - ASH		768.6	UD-1		0-0.8
5				SPT-2		9-10-10
10			763.6	UD-2		1.0-2.0
	NOTE: RED-BROWN, SILTY CLAY WAS OBSERVED IN THE SAMPLE OBTAINED FROM 12.0' TO 13.5'.			SPT-3		2-2-1
	VERY SOFT, GRAY WET SANDY CLAYEY SILT - ASH		758.6			
15	NOTE: AT ABOUT 15.0' STARTED INTRODUCING WATER INTO THE BOREHOLE TO REDUCE PIPING OF SUBSURFACE MATERIALS INTO AUGERS.			SPT-4		1-woh-woh
	VERY LOOSE TO VERY FIRM, GRAY, WET TO MOIST, CLAYEY SILTY SAND - ASH					
20			753.6	UD-3		1.7-2.0
				SPT-5		1-1-1
25			748.6	UD-4		0-0.6
				SPT-6		2-11-14
	FIRM, GRAY, WET, GRAVELLY SAND - ASH		743.6			
30				SPT-7		2-7-8
35	BORING TERMINATED AT 35.0'		738.6			
40			733.6			
45			728.6			



SOIL_3043041009_01.GPJ LAW_GIBB.GDT 4/23/04

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Driller : Akins
Prepared By: Justice
Checked By:

SOIL TEST BORING RECORD

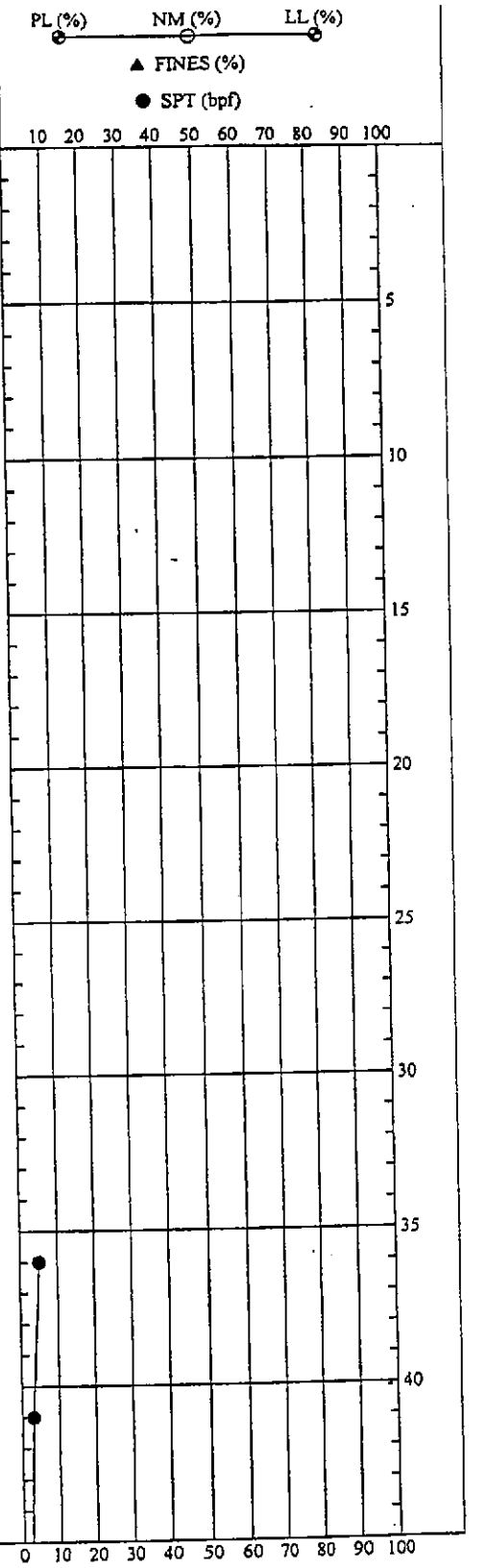
PROJECT: Kingston Fossil Plant - Ash Diposal Area

DRILLED: March 19, 2004 **BORING NO.:** B-8

PROJ. NO.: 3043041009/0001 **PAGE 1 OF 1**

MACTEC

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LEGEND	ELEV (ft)	SAMPLES IDENT	SAMPLES TYPE	SAMPLES N-COUNT (1st 6" 2nd 6" 3rd 6")	PL (%) NM (%) LL (%) ▲ FINES (%) ● SPT (bpf)
0	AUGER BORING FROM 0.0' TO 35.0' - ASH NOTE: BORING B-8A WAS OFFSET ABOUT 3.0 FEET SOUTH EAST OF B-8.		773.6				
5			768.6				
10		▽	763.6				
15			758.6				
20			753.6				
25			748.6				
30			743.6				
35	NOTE: AT ABOUT 35.0' STARTED INTRODUCING WATER INTO THE BOREHOLE TO REDUCE PIPING OF SUBSURFACE MATERIALS INTO AUGERS. LOOSE TO VERY LOOSE, WET, CLAYEY SILTY SAND - ASH		738.6	SPT-1		2-2-3	
40			733.6	SPT-2		1-2-1	
45			728.6				



SOIL_3043041009_01.GPJ LAW_GIBB.GDT 4/9/04

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

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Driller : Akins
Prepared By:Justice
Checked By:

SOIL TEST BORING RECORD

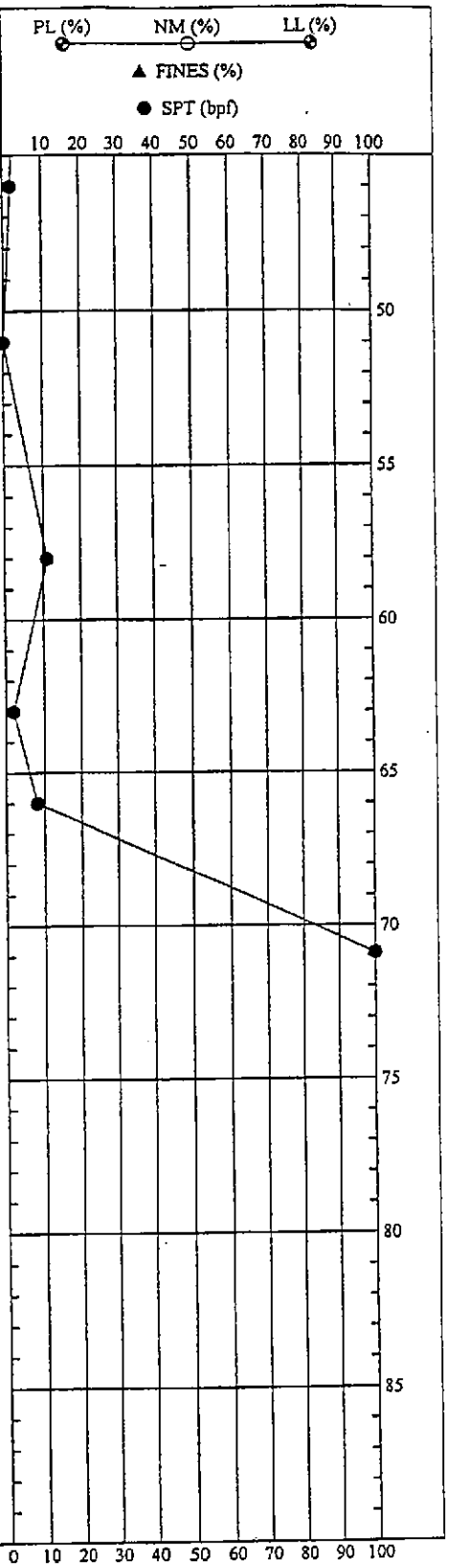
PROJECT: TVA Kingston Ash

DRILLED: March 22, 2004 **BORING NO.:** B-8A

PROJ. NO.: 3043041009/0001 **PAGE 1 OF 2**

MACTEC

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LEGEND	ELEV (ft)	SAMPLES IDENT	TYPE	N-COUNT 1st 6" 2nd 6" 3rd 6"
45	LOOSE TO VERY LOOSE, WET, CLAYEY SILTY SAND - ASH		728.6	SPT-3		woh-1-1
	VERY SOFT, GRAY, WET, CLAYEY SANDY SILT - ASH					
50			723.6	SPT-4		woh-1-woh
	STIFF, GRAY TO OLIVE BROWN, SLIGHTLY MOIST TO MOIST, SILTY / SANDY CLAY WITH A FEW ROOTS - ALLUVIUM					
55			718.6	UD-1		0-2.0
				SPT-5		woh-5-6
60			713.6	UD-2		2.0-2.0
	VERY LOOSE, OLIVE BROWN, WET, CLAYEY SAND - ALLUVIUM			SPT-6		1-1-1
	LOOSE TO FIRM, OLIVE BROWN, MOIST, SAND - ALLUVIUM					
65			708.6	SPT-7		woh-3-5
70			703.6	SPT-8		5-50/0.4
	VERY HARD, GREENISH GRAY, SHALE - RESIDUUM AUGER REFUSAL AT 70.7'. BORING TERMINATED AT 70.9'					
75			698.6			
80			693.6			
85			688.6			
90			683.6			



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Driller : Akins
Prepared By: Justice
Checked By:

SOIL TEST BORING RECORD

PROJECT: TVA Kingston Ash

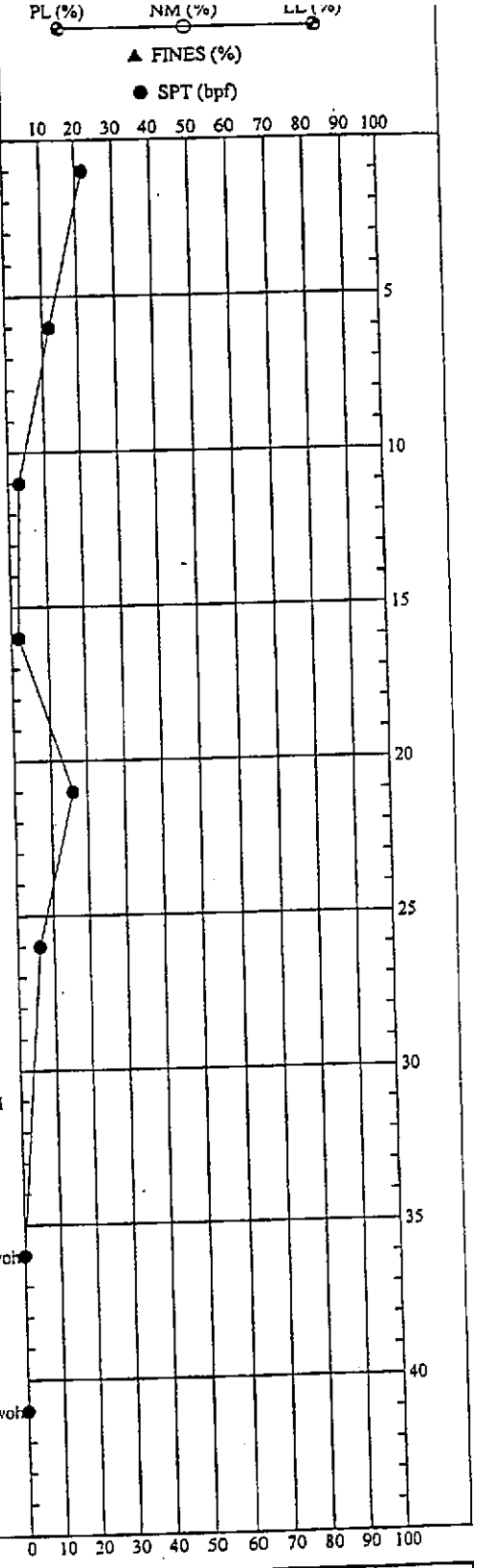
DRILLED: March 22, 2004 **BORING NO.:** B-8A

PROJ. NO.: 3043041009/0001 **PAGE 2 OF 2**

MACTEC

SOIL 3043041009_01.GPJ LAW_GINB.GDT 4/13/04

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LEGEND	ELEV (ft)	SAMPLES IDENT	TYPE	N-COUNT 1st 6" 2nd 6" 3rd 6"
0	FIRM GRAYISH-BROWN TO BROWN, DRY TO SLIGHTLY MOIST, SILTY SAND WITH COAL FRAGMENTS AND RED-BROWN SILTY CLAY - FILL		764.4	SPT-1		6-10-12
	FIRM, GRAY, SLIGHTLY MOIST TO MOIST, CLAYEY SILTY SAND - ASH		759.4	SPT-2		3-7-5
	VERY LOOSE, GRAY, WET, CLAYEY GRAVELLY SAND WITH COAL FRAGMENTS - ASH		754.4	SPT-3		1-2-1
15	NOTE: AT ABOUT 15.0' STARTED INTRODUCING WATER INTO THE BOREHOLE TO REDUCE PIPING OF SUBSURFACE MATERIALS INTO AUGERS.		749.4	SPT-4		1-1-1
	VERY STIFF TO VERY SOFT, GRAY, WET, SANDY CLAYEY SILT - ASH		744.4	SPT-5		4-7-9
25			739.4	SPT-6		2-4-2
30			734.4	SPT-7		woh-woh-1
35	VERY SOFT TO SOFT, GRAY AND LIGHT ORANGE BROWN, WET TO SLIGHTLY MOIST, SILTY / SANDY CLAY WITH A TRACE OF ROOT HAIRS AND ROUNDED GRAVEL - ALLUVIUM		729.4	SPT-8		woh-woh-woh
40			724.4	SPT-9		woh-woh-woh
45			719.4			



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

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Driller : Akins
Prepared By:Justice
Checked By:

SOIL TEST BORING RECORD

PROJECT: TVA Kingston Ash

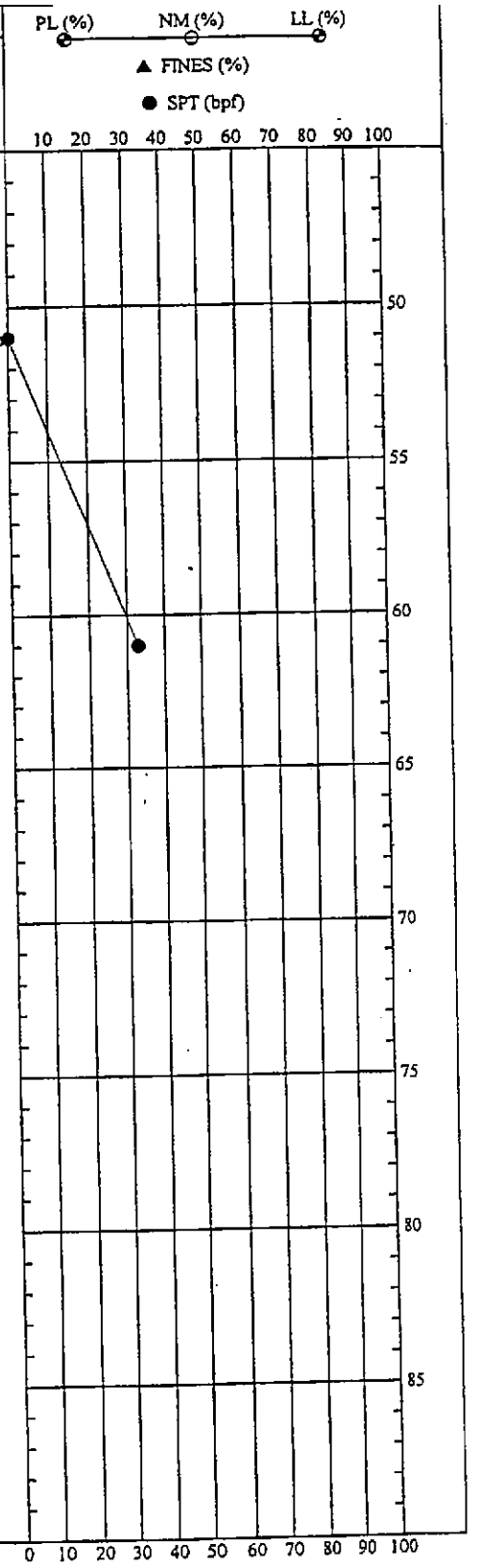
DRILLED: March 12, 2004 **BORING NO.:** B-9

PROJ. NO.: 3043041009/0001 **PAGE 1 OF 2**

MACTEC

SOIL 3043041009_01.GPJ LAW_GIBB.GDT 4/7/04

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS	LEGEND	ELEV (ft)	SAMPLES IDENT	TYPE	N-COUNT 1st 6" 2nd 6" 3rd 6"
45	VERY SOFT TO SOFT, GRAY AND LIGHT ORANGE BROWN, WET TO SLIGHTLY MOIST, SILTY / SANDY CLAY WITH A TRACE OF ROOT HAIRS AND ROUNDED GRAVEL - ALLUVIUM		719.4	SPT-10		woh-woh-4
50			714.4	SPT-11		woh-woh-woh
55			709.4	SPT-12		woh-woh-1
	DENSE, GRAY, VERY MOIST, CLAYEY SAND WITH SOME LEAVES - ALLUVIUM					
60			704.4	SPT-13		2-12-21
	HARD, GREENISH-GRAY, SHALE WITH SOME LIMESTONE FRAGMENTS - RESIDUUM					
	AUGER REFUSAL AT 61.9'. BORING TERMINATED AT 61.9'.					
65			699.4			
70			694.4			
75			689.4			
80			684.4			
85			679.4			
90			674.4			



SOIL 3043041009 01.GPJ LAW_GIBB.GDT 4/7/04

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Driller : Akins
Prepared By: Justice
Checked By:

SOIL TEST BORING RECORD

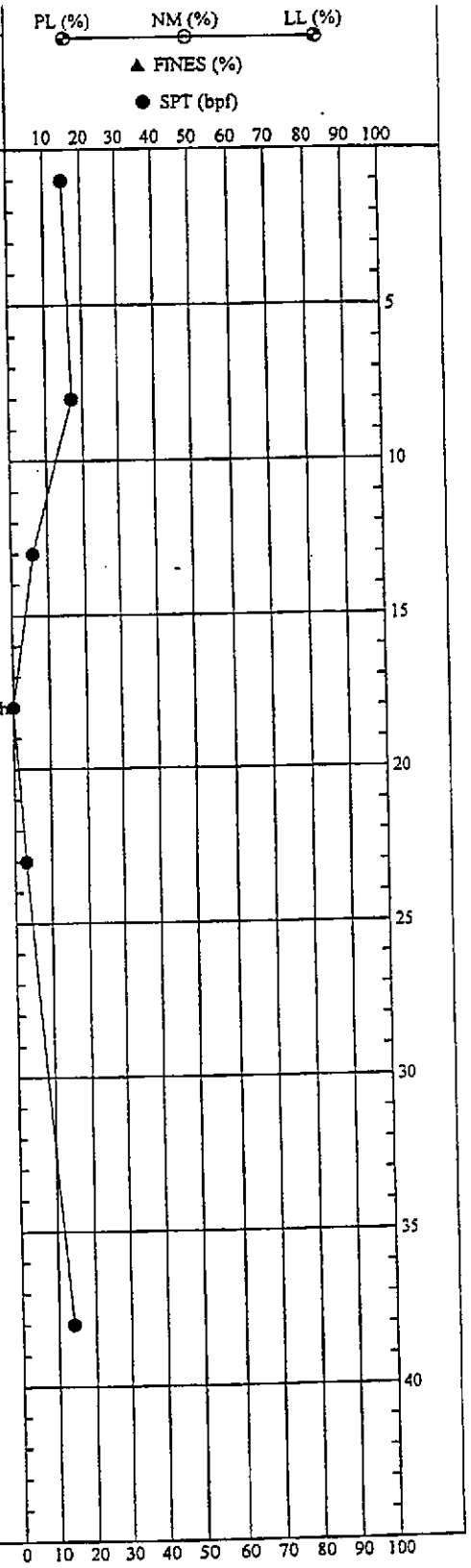
PROJECT: TVA Kingston Ash

DRILLED: March 12, 2004 **BORING NO.:** B-9

PROJ. NO.: 3043041009/0001 **PAGE 2 OF 2**

MACTEC

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LEGEND	ELEV (ft)	SAMPLES IDENT	TYPE	N-COUNT 1st 6" 2nd 6" 3rd 6"
0	FIRM, GRAY, SLIGHTLY MOIST, SILTY SAND WITH COAL FRAGMENTS - ASH		762.6	SPT-1		3-6-9
	FIRM, GRAY, WET, SILTY SAND - ASH					
5			757.6	UD-1		2.0-2.0
	NOTE: AT ABOUT 7.0' STARTED INTRODUCING WATER INTO THE BOREHOLE TO REDUCE PIPING OF SUBSURFACE MATERIALS INTO AUGERS.			SPT-2		5-7-10
10	FIRM. GRAY, WET, SANDY CLAYEY SILT - ASH		752.6	UD-2		0.9-2.0
				SPT-3		2-2-4
15	VERY LOOSE, GRAY, WET, SAND - ASH		747.6	UD-3		0.4-2.0
				SPT-4		woh-woh-woh
20	VERY LOOSE, GRAY, WET, CLAYEY SILTY SAND - ASH		742.6	UD-4		1.7-2.0
				SPT-5		1-1-2
25			737.6	SPT-6		1-woh-1
	VERY LOOSE, GRAY, WET, CLAYEY SAND - ALLUVIUM					
30			732.6	SPT-7		woh-woh-1
35			727.6	UD-5		2.0-2.0
				SPT-8		4-5-9
	STIFF TO HARD, OLIVE BROWN TO BROWN, WEATHERED SHALE - RESIDUUM					
40	AUGER REFUSAL AT 39.2'. BORING TERMINATED AT 39.2'		722.6			
45			717.6			



SOIL 3043041009_01.GPJ LAW_GINR.GDT 4/7/04

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Driller : Akins
Prepared By: Justice
Checked By:

SOIL TEST BORING RECORD

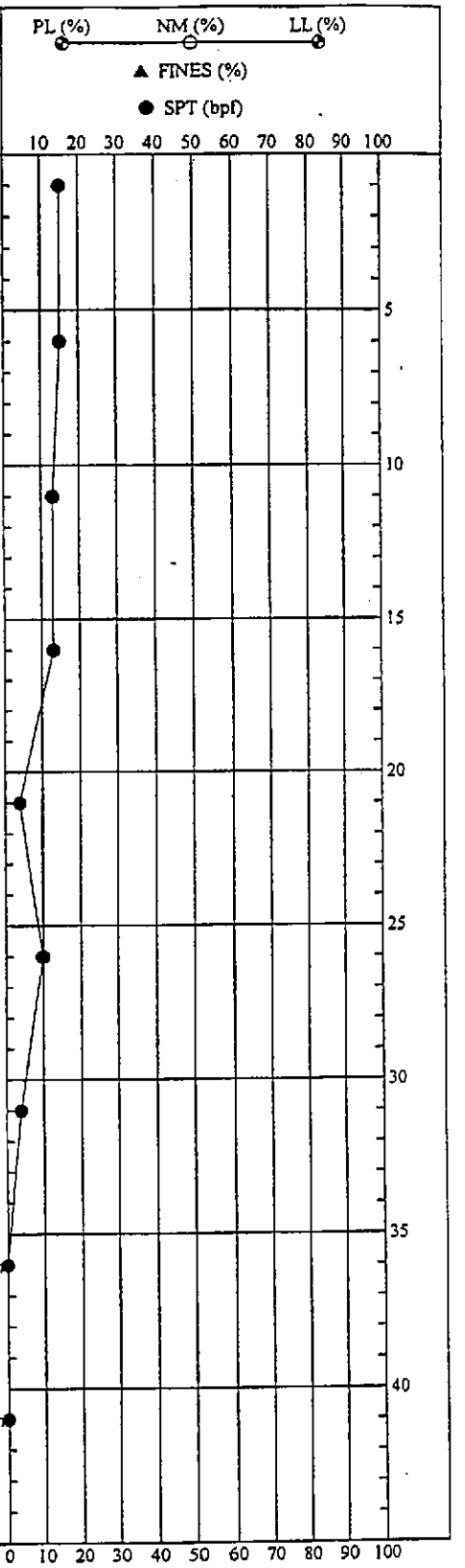
PROJECT: TVA Kingston Ash

DRILLED: March 18, 2004 **BORING NO.:** B-10

PROJ. NO.: 3043041009/0001 **PAGE 1 OF 1**

MACTEC

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	ELEV (ft)	SAMPLE IDENT	TYPE	N-COUNT 1st 6" 2nd 6" 3rd 6"
0	CRUSHED STONE BASE (0.3')	765.0			
	STIFF, ORANGE-BROWN, DRY TO SLIGHTLY MOIST, SILTY CLAY WITH CHERT FRAGMENTS - FILL		SPT-1		8-7-8
5		760.0	SPT-2		2-6-9
10		755.0	SPT-3		2-5-8
15		750.0	SPT-4		3-6-7
20	VERY LOOSE, GRAY, MOIST TO WET, SILTY SAND WITH COAL FRAGMENTS - ASH	745.0	SPT-5		2-2-2
	STIFF, LIGHT GRAY, WET, SANDY SILTY CLAY - ASH				
25	LOOSE TO VERY LOOSE, ORANGE-BROWN TO GRAYISH-BROWN, WET, SILTY SAND - ALLUVIUM	740.0	SPT-6		6-7-3
30		735.0	SPT-7		2-2-2
	VERY SOFT, OLIVE BROWN, WET, SILTY SANDY CLAY - ALLUVIUM				
35		730.0	SPT-8		woh-woh-woh
40		725.0	SPT-9		woh-woh-woh
45		720.0			



SOIL 3043041009 01.GPJ LAW GIBB.GDT 4/7/04

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Driller : Akins
Prepared By: Justice
Checked By:

SOIL TEST BORING RECORD

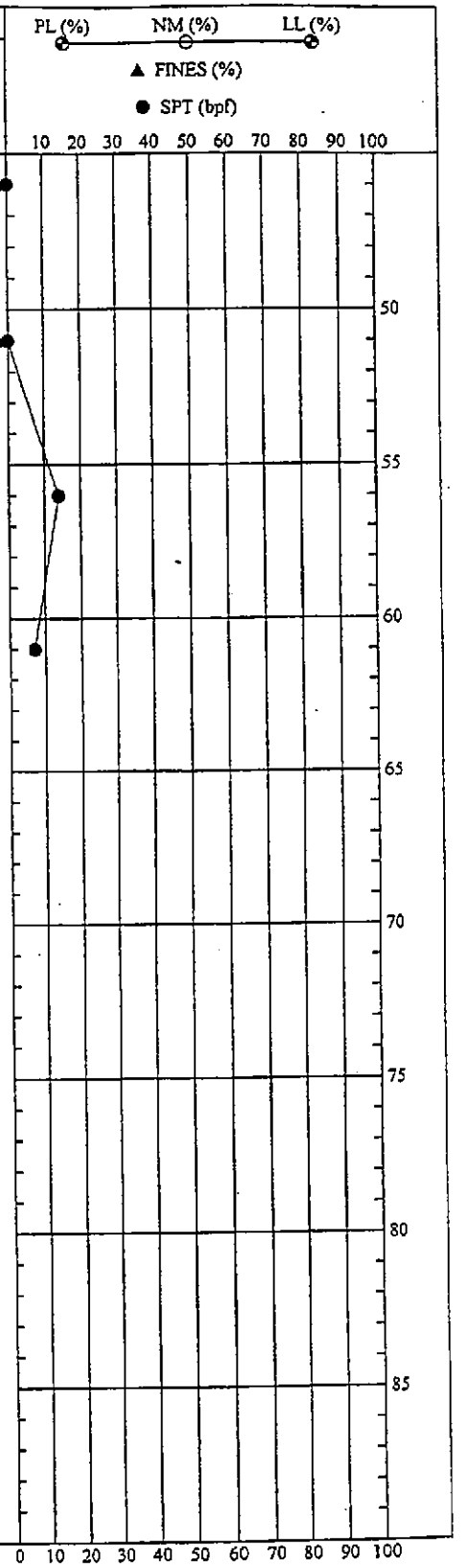
PROJECT: TVA Kingston Ash

DRILLED: March 15, 2004 **BORING NO.:** B-11

PROJ. NO.: 3043041009/0001 **PAGE** 1 **OF** 2

MACTEC

SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LEGEND	ELEV (ft)	SAMPLES IDENT	TYPE	N-COUNT 1st 6" 2nd 6" 3rd 6"
VERY SOFT, OLIVE BROWN, WET, SILTY SANDY CLAY - ALLUVIUM		720.0	SPT-10		woh-woh-woh
VERY LOOSE TO FIRM, GRAY, WET, CLAYEY SAND - ALLUVIUM		715.0	SPT-11		woh-woh-woh
		710.0	SPT-12		2-3-11
LOOSE, GRAY, WET, SAND WITH A FEW ROOTS - ALLUVIUM		705.0	SPT-13		1-1-6
AUGER REFUSAL AT 62.5'. BORING TERMINATED AT 62.5'		700.0			
		695.0			
		690.0			
		685.0			
		680.0			
		675.0			



SOIL 3043041009 01.GPJ LAW_GIBB.GDT 4/7/04

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Driller : Akins
Prepared By: Justice
Checked By:

SOIL TEST BORING RECORD

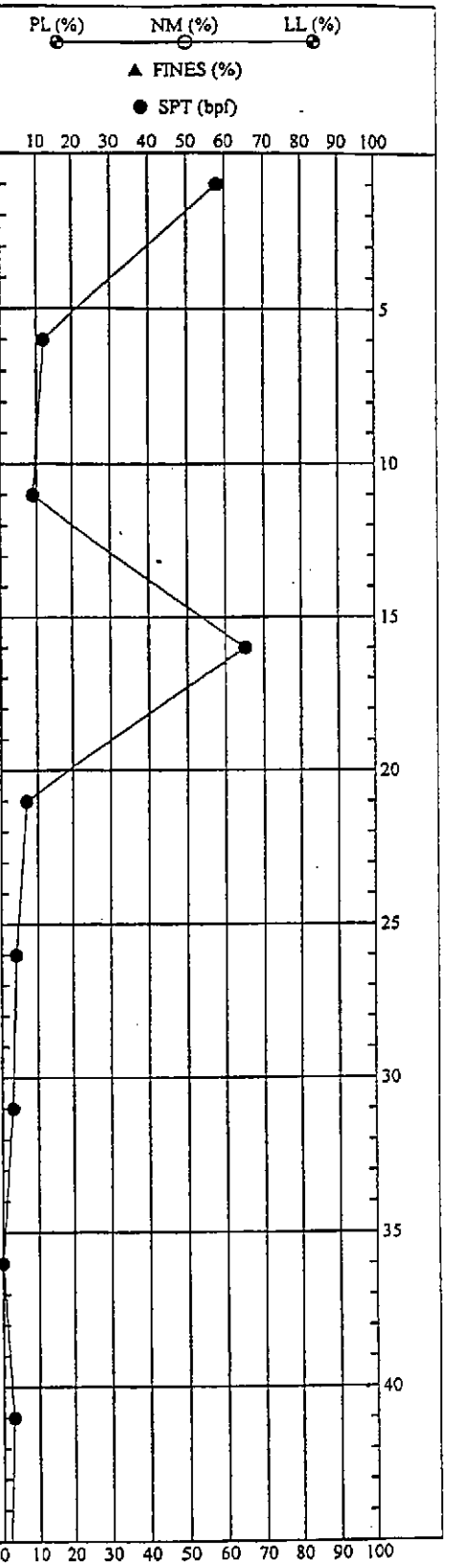
PROJECT: TVA Kingston Ash

DRILLED: March 15, 2004 **BORING NO.:** B-11

PROJ. NO.: 3043041009/0001 **PAGE 2 OF 2**

MACTEC

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS	ELEV (ft)	SAMPLES IDENT	TYPE	N-COUNT 1st 6" 2nd 6" 3rd 6"
0	VERY STIFF TO VERY HARD, RED-BROWN, DRY SILTY CLAY WITH CHERT FRAGMENTS - FILL	763.9	SPT-1		4-20-38
	VERY DENSE, GRAY, SLIGHTLY MOIST, SILTY SAND WITH COAL FRAGMENTS - ASH				
	STIFF TO VERY HARD, RED-BROWN, SLIGHTLY MOIST, SILTY CLAY WITH CHERT FRAGMENTS, LIMESTONE FRAGMENTS, AND A FEW ROOTS - FILL				
5		758.9	SPT-2		4-6-6
10		753.9	SPT-3		1-4-5
15	NOTE: BLOW COUNTS WERE MORE THAN LIKELY INFLATED DUE TO THE PRESENCE OF LARGE ROCK FRAGMENTS IN SPT-1 AND SPT-4.	748.9	SPT-4		10-26-39
	LOOSE TO VERY LOOSE, GRAY, WET, SILTY SAND WITH COAL FRAGMENTS - ASH				
20		743.9	SPT-5		2-4-3
25		738.9	SPT-6		2-2-2
	VERY LOOSE, YELLOW-BROWN, WET, CLAYEY SILTY SAND - ALLUVIUM				
	SOFT, YELLOW-BROWN, MOIST TO VERY MOIST, SANDY CLAY - ALLUVIUM				
30		733.9	SPT-7		woh-1-2
	VERY LOOSE TO LOOSE, YELLOW-BROWN, WET, CLAYEY SAND - ALLUVIUM				
35		728.9	SPT-8		woh-woh-woh
40		723.9	SPT-9		1-2-1
45		718.9			



SOIL 3043041009 01.GPJ LAW_GIBB.GDT 4/7/04

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Driller : Akins
Prepared By: Justice
Checked By:

SOIL TEST BORING RECORD

PROJECT: TVA Kingston Ash

DRILLED: March 16, 2004 **BORING NO.:** B-12

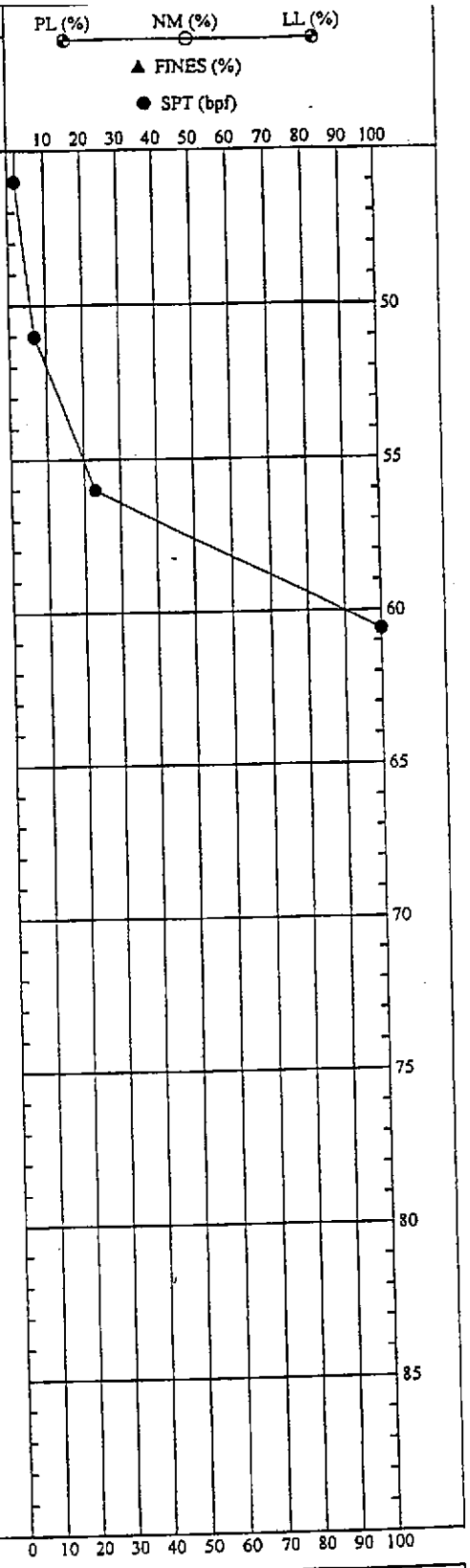
PROJ. NO.: 3043041009/0001 **PAGE 1 OF 2**

MACTEC

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS	LEGEND	ELEV (ft)	SAMPLE IDENT	TYPE	N-COUNT 1st 6" 2nd 6" 3rd 6"
45	VERY LOOSE TO LOOSE, YELLOW-BROWN, WET, CLAYEY SAND - ALLUVIUM		718.9	SPT-10		1-1-1
50			713.9	SPT-11		woh-3-4
	VERY FIRM, LIGHT BROWN, WET, SAND - ALLUVIUM					
55			708.9	SPT-12		4-10-13
60	AUGER REFUSAL AT 59.7'		703.9	SPT-13		20-50/0.4
	VERY HARD, MAROON AND BLUISH GRAY WEATHERED SHALE - RESIDUUM					
	BORING TERMINATED AT 60.6'					
65			698.9			
70			693.9			
75			688.9			
80			683.9			
85			678.9			
90			673.9			

SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.

SAMPLES



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Driller : Akins
Prepared By: Justice
Checked By:

SOIL TEST BORING RECORD

PROJECT: Kingston Fossil Plant - Ash Diposal Area

DRILLED: March 16, 2004 **BORING NO.:** B-12

PROJ. NO.: 3043041009/0001 **PAGE 2 OF 2**

MACTEC

SOIL 3043041009_01.GPJ LAW_GIBB.GDT 4/23/04

This information taken from "Kingston Fossil Plant – Dredge Cells/Closure Soil Investigation," Singleton Laboratories Report 015-672-142A, September 29, 1994.

TVA-00018651

SINGLETON LABORATORIES

SOIL PROFILE LEGEND AND SYMBOLS

Depth 1"=5'	El	SPT (N)	Log*	W	LL	PI	Gr	Description or Test Results
Boring Depth and Scale	Elevation	Blows Per Foot (SS Boring)	Lab Soil Type	Moisture Content	Liquid Limit	Plasticity Index	Soil Group Number	

Legend

El, etc	Soil Type (Unified Classification)
Mat'l	Notation of Soil Not Sampled (SS, PAH, HAH Logs)
(Core) Type	Bedrock (Note core if cored)
▽	Initial Water Table Reading
▼	24 h Water Table Reading
	Explanation of US Sampling Limits if Applicable

Boring Symbols

SS - 2-in. od Split Spoon Boring

SPT - Standard Penetration Test Blows Per Foot With 2-in. Split Spoon

CPT - Cone Penetration Test

US - Undisturbed Sample Boring

PAH - Power Auger Hole

HAH - Hand Auger Hole

TP - Test Pit or Trench

V - Vane Shear

P - Piezometer

Under Description or Test Results		
Test	Engineering Test Results	
Q, R, $\bar{R}$, S	Friction Angle (degrees)	Cohesion (tsf)
UC	Unconfined Compressive Strength (tsf)	Sensitivity Ratio
C	Compression Index	Preconsolidation Pressure (tsf)
k	Coefficient of Permeability (cm/sec)	

Example:

Q 12.0 0.62 R 19.6 0.21 S 34.0 0
UC 4.0 2.6 C 0.72 2.0 k 5.6

Soil Test Symbols

Q - Unconsolidated-Undrained Triaxial Compression

R - Consolidated-Undrained Triaxial Compression (Saturated)

$\bar{R}$ - Effective Consolidated-Undrained Triaxial Compression

R nat - Consolidated-Undrained Triaxial Compression (Natural Moisture)

S - Consolidated-Drained Direct Shear

UC - Unconfined Compression

C - Consolidation

k - Permeability

FLA

SINGLETON LABORATORIES

FIELD LOG ABBREVIATIONS

Typical Name	Abbreviation
Sandy gravel	sd gv
Silty gravel	si gv
Clayey gravel	cl gv
Sand	sd
Silty sand	si sd
Clayey sand	cl sd
Sandy silt	sd si
Clayey silt	cl si
Fat silt	ft si
Sandy clay	sd cl
Silty clay	si cl
Medium clay	md cl
Fat clay	ft cl
Cobble	cob
Blouder	bldr
Riprap	rr
Topsoil	ts

Name Modifiers

Clean	cln
Coarse	crs
Dirty	dty
Fine	fn
Organic	org
Poorly graded	pgd
Well graded	wgd
Degraded	degd

Gravel Shape

Angular	ang
Platy	plty
Round/Rounded	rd
Subangular	sb ang
Subrounded	sb rd

Lithology and Mineralogy	Abbreviation
Bedrock	br
Chert	cht
Dolomite	dol
Limestone	ls
Manganese	mn
Micaceous	mic
Pyrite	py
Quartz	qtz
Sandstone	ss
Shale	sh
Bentonite	bent
Hematite	hem

Color

Black	blk
Blue	blu
Brown	brn
Cream	crm
Dark	dk
Gray	gy
Green	grn
Light	lt
Maroon	mrn
Mottled	mott
Olive	olv
Pink	pk
Purple	pur
Red	r
Rust	rst
Tan	tn
White	wht
Yellow	yel

Structure	Abbreviation	Consistency	Abbreviation
Blocky	blky	Dense	dns
Fissured	fis	Firm	f
Homogeneous	homo	Hard	hd
Laminated	lam	Loose	lse
Saprolitic	sapr	Soft	s
Shaly	shly	Stiff	stf
Slickensided	slsid	Very Stiff	v stf
Stratified	strat		

Origin		Moisture	
Alluvial	all	Dry	d
Colluvial	coll	Moist	mst
Loess	lss	V Moist	v mst
Residual	resd	Wet	w

General Modifiers

Alternate/Alternating	alt	Layers	lyrs
Angle	∡	Low	l
Augering	augg	Material	mtl
Bottom Ash	ba	Medium	md
Coal	col	Mud	mud
Contaminated	cont	Original	orig
Dip	dp	Partings	prtgs
Disturbed	dstrb	Plastic	plstc
Debris	dbr	River	rvr
Discontinued	disc	Roots	rts
Drive	dr	Rough	rou
Dust	dst	Slow	sl
Elevation	el	Small	sm
Feet	ft	Spoil	sp
Fill	fl	Terraced	ter
Fiber	fbr	Thick	thk
Fly Ash	fa	Thin	thn
High/highly	h	Trace	tr
Horizontal	hor	Variable	var
Hydraulic	hyd	Vegetation	veg
Inch	in	Vertical	vert
Inclusion	inc	Weathered	wth
Incomplete Recovery	IR	With	w/
Interface	infa	Wood	wd

SINGLETON LABORATORIES

SOIL PROFILE: SPLIT-SPOON

PROJECT: KINGSTON FP
BORING: SS-1 STATION:
DATE DRILLED: 7/28/94

FEATURE: DREDGE CELLS
RANGE:
PREPARED BY: mhd

SURFACE EL: 752.0
CHECKED BY: TAL

DEPTH ft.	EL	SPT (N)	* LOG	W	LL	PI	GR	FIELD DESCRIPTION
	750							
5			CL	12.4	31	12	5	TN & GY SI CL, D
	745							
10			CL	19.2	26	8	9	LT BRN SI CL W/TR GY TS, MST
	740							
15			CL	17.0	26	8	6	BRN SI CL, D
	735							
20			CL	27.1	26	8	9	BRN & GY SI CL, V MST
	730							
25			CL	24.1	26	8	9	BRN & GY SI CL, V MST
	725							
30			SM	19.5	NP	NP	10	GY SI SC TR GV, MST (FA)
	720							
35								

1''=5'

* LAB CLASSIF.

SINGLETON LABORATORIES

SOIL PROFILE: SPLIT-SPOON

PROJECT: KINGSTON FP
BORING: SS-1 STATION:
DATE DRILLED: 7/28/94

FEATURE: DREDGE CELLS
RANGE:
PREPARED BY: mhd

SURFACE EL: 752.0
CHECKED BY: TAL

DEPTH ft.	EL	SPT (N)	* LOG	W	LL	PI	GR	FIELD DESCRIPTION
			SM	27.6	NP	NP	10	GY SI SD, V MST (FA)
	715							
40								REFUSAL GROUND WATER LEVEL = 8'9"
	710							
45								
	705							
50								
	700							
55								
	695							
60								
	690							
65								
	685							
70								

1''=5'

* LAB CLASSIF.

SINGLETON LABORATORIES

SOIL PROFILE: SPLIT-SPOON

PROJECT: KINGSTON FP
FEATURE: DREDGE CELLS
BORING: SS-2 STATION:
RANGE:
SURFACE EL: 764.0
DATE DRILLED: 7/27/94
PREPARED BY: mhd
CHECKED BY: TAL

DEPTH ft.	EL	SPT (N)	* LOG	W	LL	PI	GR	FIELD DESCRIPTION
	760							
5		14	MH-CH	21.9	59	28	2	BRN SI CL W/GV, TR TS, D
	755							
10		10	MH-CH	22.8	59	28	2	R-BRN SI CL, TR GV, D
	750							
15		8	MH-CH	28.0	59	28	2	R-BRN SI CL, TR GV, MST
	745							
20		13	SM	25.6	NP	NP	10	GY SI SD W/TR GV (FA), V MST
	740							
25		-	SM	19.0	NP	NP	10	GY SI SD W/GV (FA), W
	735							
30		-	SM	28.1	NP	NP	3	BRN SD WI CL (FA), W
	730							
35								

1''=5'

* LAB CLASSIF.

SINGLETON LABORATORIES

SOIL PROFILE: SPLIT-SPOON

PROJECT: KINGSTON FP FEATURE: DREDGE CELLS
BORING: SS-2 STATION: RANGE: SURFACE EL: 764.0
DATE DRILLED: 7/27/94 PREPARED BY: mhd CHECKED BY: TAL

DEPTH ft.	EL	SPT (N)	* LOG	W	LL	PI	GR	FIELD DESCRIPTION
		-	CL	33.6	26	8	9	BRN SI CL W/GY SI (FA), V MST
	725							
40		3	CL	20.1	26	8	9	ORNG & GY SI CL, V MST
	720							
45		28	ML	14.0	NP	NP	8	GY SD mix W/PKTS GY CL, MST
	715							
50		50+	ML	15.8	NP	NP	8	GY SD mix W/PKTS GY CL, MST
								REFUSAL
	710							GROUND WATER LEVEL = 5'8"
55								
	705							
60								
	700							
65								
	695							
70								

1"=5'

* LAB CLASSIF.

SINGLETON LABORATORIES

SOIL PROFILE: SPLIT-SPOON

PROJECT: KINGSTON FP FEATURE: DREDGE CELLS
BORING: SS-3 STATION: RANGE: SURFACE EL: 773.0
DATE DRILLED: 7/28/94 PREPARED BY: mhd CHECKED BY: TAL

DEPTH ft.	EL	SPT (N)	* LOG	W	LL	PI	GR	FIELD DESCRIPTION
	770							
5		25	ML	23.3	NP	NP	12	GY CL SI (FA), MST
	765							
10		5	SM	23.0	NP	NP	10	GY SD CL, TR GV (FA), V MST
	760							
15		4	SM	28.6	NP	NP	10	GY SD CL, TR GV (FA), V MST
	755							
20		1	SM	28.6	NP	NP	10	GY SD SI CL, TR GV (FA), W
	750							
25		2	SM	27.1	NP	NP	10	GY SD SI CL, TR GV (FA), W
	745							
30		1	SM	27.0	NP	NP	10	GY SD SI CL, TR GV (FA), W
	740							
35								

1''=5'

* LAB CLASSIF.

SINGLETON LABORATORIES

SOIL PROFILE: SPLIT-SPOON

PROJECT: KINGSTON FP
FEATURE: DREDGE CELLS
BORING: SS-3 STATION:
RANGE:
SURFACE EL: 773.0
DATE DRILLED: 7/28/94
PREPARED BY: mhd
CHECKED BY: JAL

DEPTH ft.	EL	SPT (N)	* LOG	W	LL	PI	GR	FIELD DESCRIPTION
		2	ML	28.8	NP	NP	12	GY SD SI CL, TR GV (FA), W
	735							
40		2	SM	22.0	NP	NP	10	GY SD SI CL, TR GV (FA), W
	730							
45		-	ML	33.9	NP	NP	12	GY CL SI, TR GV (FA), W
	725							
50		-	ML	15.7	NP	NP	8	GY CL SI W/GV (FA), V MST
	720							
55		50+	ML	5.8	NP	NP	12	GY CL SI, TR GV
	715							REFUSAL
60								GROUND WATER LEVEL = 9'8"
	710							
65								
	705							
70								

1''=5'

* LAB CLASSIF.

SINGLETON LABORATORIES

SOIL PROFILE: SPLIT-SPOON

PROJECT: KINGSTON FP FEATURE: DREDGE CELLS
BORING: SS-4 STATION: RANGE: SURFACE EL: 752.0
DATE DRILLED: 7/26/94 PREPARED BY: mhd CHECKED BY: TAL

DEPTH ft.	EL	SPT (N)	* LOG	W	LL	PI	GR	FIELD DESCRIPTION
	750							
5		10	CL	14.2	26	8	6	LT BRN SI CL w/TS, D
	745							
10		3	CL-ML	23.8	26	4	1	BRN & GY SI CL w/TS, MST
	740							
15		8	CL	22.3	31	12	5	TN & GY SI CL (FA), V MST
	735							
20		4	SM	20.9	NP	NP	3	TN SI SD, MST
	730							
25		-	SM	34.8	NP	NP	3	TN SI SD, MST
	725							
30		7	SM	21.4	NP	NP	3	TN SI SD, MST
	720							
35								

1''=5'

* LAB CLASSIF.

SINGLETON LABORATORIES

SOIL PROFILE: SPLIT-SPOON

PROJECT: KINGSTON FP
BORING: SS-4 STATION:
DATE DRILLED: 7/26/94

FEATURE: DREDGE CELLS
RANGE:
PREPARED BY: mhd

SURFACE EL: 752.0
CHECKED BY: TAL

DEPTH ft.	EL	SPT (N)	* LOG	W	LL	PI	GR	FIELD DESCRIPTION
	715	36	SM	20.4	NP	NP	3	TN SI SD, MST
40								REFUSAL GROUND WATER LEVEL = 9'0"
	710							
45								
	705							
50								
	700							
55								
	695							
60								
	690							
65								
	685							
70								

1''=5'

*LAB CLASSIF.

SINGLETON LABORATORIES

SOIL PROFILE: SPLIT-SPOON

PROJECT: KINGSTON FP
BORING: SS-5 STATION:
DATE DRILLED: 7/27/94

FEATURE: DREDGE CELLS
RANGE:
PREPARED BY: mhd

SURFACE EL: 764.0
CHECKED BY: TAL

DEPTH ft.	EL	SPT (N)	* LOG	W	LL	PI	GR	FIELD DESCRIPTION
	760							
5		18	MH-CH	19.6	59	28	2	R-BRN SI CL w/TR CTH, D
	755							
10		14	MH-CH	24.2	59	28	2	BRN SI CL w/GV, D
	750							
15		54	CL-ML	23.5	26	4	1	BRN SI CL w/PKTS GY CL SI, TR CHT, MST
	745							
20		20	SM	24.3	NP	NP	10	GY SI SD, TR GV (FA), MST
	740							
25		3	CL	20.9	26	8	6	LT BRN SD SI CL, TR GV, V MST
	735							
30		14	CL	23.6	31	12	5	TN & GY SI CL, V MST
	730							
35								

1''=5'

* LAB CLASSIF.

SINGLETON LABORATORIES

SOIL PROFILE: SPLIT-SPOON

PROJECT: KINGSTON FP
BORING: SS-5 STATION:
DATE DRILLED: 7/27/94

FEATURE: DREDGE CELLS
RANGE:
PREPARED BY: mhd

SURFACE EL: 764.0
CHECKED BY: TAC

DEPTH ft.	EL	SPT (N)	* LOG	W	LL	PI	GR	FIELD DESCRIPTION
		16	ML	21.5	NP	NP	7	BRN SI CL W/GY FA, V MST
	725							
40		2	SM	24.2	NP	NP	3	ORNG CL SD, V MST
	720							
45		2	CL	21.9	26	8	9	TN CL SI W/PKTS GY FA, V MST
	715							
50		30	SC/SM	10.8	NP	NP	4	LT BRN SI SD W/GY, V MST
	710							
55		50+	ML	13.9	NP	NP	12	BRN & GY CL SI, FA, MST
								REFUSAL
								GROUND WATER LEVEL = 20'
	705							
60								
	700							
65								
	695							
70								

1''=5'

* LAB CLASSIF.

SINGLETON LABORATORIES

SOIL PROFILE: SPLIT-SPOON

PROJECT: KINGSTON FP FEATURE: DREDGE CELLS
BORING: SS-5 STATION: RANGE: SURFACE EL: 773.0
DATE DRILLED: 8/1/94 PREPARED BY: mhd CHECKED BY: TAL

DEPTH ft.	EL	SPT (N)	* LOG	W	LL	PI	GR	FIELD DESCRIPTION
	770							
5		24	ML	25.2	NP	NP	12	GY SI (FA), MST
	765							
10		5	SM	19.7	NP	NP	10	GY SI (FA), MST
	760							
15		2	SM	28.8	NP	NP	11	GY SI SD (FA), MST
	755							
20		-	ML	25.8	NP	NP	12	GY SI (FA), MST
	750							
25		3	ML	23.3	NP	NP	8	BRN SI CL w/GY FA, TR GV, V MST
	745							
30		1	ML	32.7	NP	NP	12	GY SI (FA), W
	740							
35								

1''=5'

* LAB CLASSIF.

SINGLETON LABORATORIES

SOIL PROFILE: SPLIT-SPOON

PROJECT: KINGSTON FP
BORING: SS-6 STATION:
DATE DRILLED: 8/1/94

FEATURE: DREDGE CELLS
RANGE:
PREPARED BY: mhd

SURFACE EL: 773.0
CHECKED BY: TAL

DEPTH ft.	EL	SPT (N)	* LOG	W	LL	PI	GR	FIELD DESCRIPTION
		9	CL	19.6	26	8	9	BRN CL SI mix W/FA
	735							
40		12	SM	19.4	NP	NP	3	BRN SI SD, V MST
	730							
45		1	SM	29.3	NP	NP	3	BRN SI SD, V MST
	725							
50		3	SM	21.8	NP	NP	3	BRN SD CL, V MST
	720							
55		6	ML	22.3	NP	NP	8	GY SI SD W/FA, MST
	715							
60		50+	ML	9.9	NP	NP	12	GY SI, FA, MST
	710							REFUSAL
65								GROUND WATER LEVEL = 16' 7"
	705							
70								

1''=5'

* LAB CLASSIF.

SINGLETON LABORATORIES

SOIL PROFILE: SPLIT-SPOON

PROJECT: KINGSTON FP FEATURE: DREDGE CELLS
BORING: SS-8 STATION: RANGE: SURFACE EL: 782.0
DATE DRILLED: 8/2/94 PREPARED BY: mhd CHECKED BY: TAL

DEPTH ft.	EL	SPT (N)	* LOG	W	LL	PI	GR	FIELD DESCRIPTION
	780							
5		50+	SM	17.6	NP	NP	10	GY SI (FA), TR GY, D
	775							
10		50+	SM	18.4	NP	NP	10	GY SI (FA), TR GV, D
	770							
15		50+	SM	21.9	NP	NP	10	GY SI (FA), TR GV, D
	765							
20		8	SM	43.9	NP	NP	11	GY SI SD (FA), MST
	760							
25		15	SM	17.9	NP	NP	10	GY SI SD W/GV (FA), MST
	755							
30		-	ML	31.7	NP	NP	12	GY SI (FA), W
	750							
35								

1''=5'

* LAB CLASSIF.

SINGLETON LABORATORIES

SOIL PROFILE: SPLIT-SPOON

PROJECT: KINGSTON FP
BORING: SS-8 STATION:
DATE DRILLED: 8/2/94

FEATURE: DREDGE CELLS
RANGE:
PREPARED BY: mhd

SURFACE EL: 782.0
CHECKED BY: TAL

DEPTH ft.	EL	SPT (N)	* LOG	W	LL	PI	GR	FIELD DESCRIPTION
		-	ML	24.4	NP	NP	12	GY SI (FA), MST
	745							
40		3	ML	23.8	NP	NP	12	GY SI (FA), MST
	740							
45		9	ML	31.2	NP	NP	12	GY SI (FA), MST
	735							
50		4	ML	22.3	NP	NP	8	GY CL SI w/LUMPS TN SI CL, MST
	730							
55		13	ML	18.2	NP	NP	7	MOTT BRN/TN/GY SI CL, MST
	725							
60		13	ML	18.6	NP	NP	7	MOTT BRN/TN/GY SI CL, MST
	720							
65		4	SC/SM	27.7	NP	NP	4	TN SI SD, W
	715							
70								

1''=5'

* LAB CLASSIF.

SINGLETON LABORATORIES

SOIL PROFILE: SPLIT-SPOON

PROJECT: KINGSTON FP
FEATURE: DREDGE CELLS
BORING: SS-8
STATION:
RANGE:
SURFACE EL: 782.0
DATE DRILLED: 8/2/94
PREPARED BY: mhd
CHECKED BY: 7AL

DEPTH ft.	EL	SPT (N)	* LOG	W	LL	PI	GR	FIELD DESCRIPTION
		5	SM	24.9	NP	NP	10	GY SD SI (FA), W
	710							
75		7	SC/SM	22.7	NP	NP	4	TN SI SD, V MST
	705							
								REFUSAL
80								GROUND WATER LEVEL = 11' 3"
	700							
85								
	695							
90								
	690							
95								
	685							
100								
	680							
105								

1''=5'

* LAB CLASSIF.

SINGLETON LABORATORIES

SOIL PROFILE: SPLIT-SPOON

PROJECT: KINGSTON FP
FEATURE: DREDGE CELLS
BORING: SS-9
STATION:
RANGE:
SURFACE EL: 795.0
DATE DRILLED: 8/2/94
PREPARED BY: mhd
CHECKED BY: TAL

DEPTH ft.	EL 795	SPT (N)	* LOG	W	LL	PI	GR	FIELD DESCRIPTION
5	790	20	ML	17.8	NP	NP	12	GY SI (FA), MST
10	785	50+	ML	19.5	NP	NP	12	GY SI (FA), MST
15	780	44	ML	20.1	NP	NP	12	GY SI (FA), MST
20	775	46	ML	18.3	NP	NP	12	GY SI (FA), MST
25	770	6	ML	30.2	NP	NP	12	GY SI (FA), MST
30	765	5	ML	35.2	NP	NP	12	GY SI (FA), W
35	760							

1''=5'

* LAB CLASSIF.

SINGLETON LABORATORIES

SOIL PROFILE: SPLIT-SPOON

PROJECT: KINGSTON FP FEATURE: DREDGE CELLS
BORING: SS-9 STATION: RANGE: SURFACE EL: 795.0
DATE DRILLED: 8/2/94 PREPARED BY: mhd CHECKED BY: TAL

DEPTH ft.	EL	SPT (N)	* LOG	W	LL	PI	GR	FIELD DESCRIPTION
	760	2	ML	17.3	NP	NP	12	GY SI (FA), W
40	755	1	ML	31.0	NP	NP	12	GY SI (FA), W
45	750	-	ML	23.0	NP	NP	12	GY SI (FA), D
50	745	-	ML	31.7	NP	NP	12	GY SI (FA), TR GV, W
55	740	5	ML	30.0	NP	NP	12	GY SI (FA), TR GV, W
60	735	6	ML	32.6	NP	NP	12	GY SI (FA), TR GV, W
65	730	-	ML	26.9	NP	NP	8	BRN SI CL W/GY SI (FA), MST
70	725							

1''=5'

* LAB CLASSIF.

SINGLETON LABORATORIES

SOIL PROFILE: SPLIT-SPOON

PROJECT: KINGSTON FP FEATURE: DREDGE CELLS
BORING: SS-9 STATION: RANGE: SURFACE EL: 795.0
DATE DRILLED: 8/2/94 PREPARED BY: mhd CHECKED BY: TAL

DEPTH ft.	EL	SPT (N)	* LOG	W	LL	PI	GR	FIELD DESCRIPTION
	725	13	CL	19.2	26	8	9	BRN, TN & GY SI CL, TR CL, MST
75	720	19	CL	19.5	26	8	6	ORNG-BRN SI CL, MST
80	715	4	SM	20.5	NP	NP	10	GY SD SI, W
85	710	19	SC/SM	23.1	NP	NP	4	TN SI SD
90	705	8	SC/SM	23.1	NP	NP	4	GY SI SD
95	700							REFUSAL GROUND WATER LEVEL = 29'
100	695							
105	690							

1''=5'

* LAB CLASSIF.

SINGLETON LABORATORIES

SOIL PROFILE: SPLIT-SPOON

PROJECT: KINGSTON FP
FEATURE: DREDGE CELLS
BORING: SS-10 STATION:
RANGE:
SURFACE EL: 797.5
DATE DRILLED: 8/8/94
PREPARED BY: mhd
CHECKED BY: TA

DEPTH ft.	EL	SPT (N)	* LOG	W	LL	PI	GR	FIELD DESCRIPTION
	795							
5		50+	ML	17.3	NP	NP	12	GY SI (FA), MST
	790							
10		26	ML	24.7	NP	NP	12	GY SI (FA), MST
	785							
15		25	ML	15.0	NP	NP	12	GY SD SI, TR GV, MST
	780							
20		5	ML	22.1	NP	NP	12	GY SI (FA), MST
	775							
25		4	ML	27.4	NP	NP	12	GY SI (FA), MST
	770							
30		14	ML	29.1	NP	NP	12	GY SI (FA), MST
	765							
35								

1''=5'

*LAB CLASSIF.

SINGLETON LABORATORIES

SOIL PROFILE: SPLIT-SPOON

PROJECT: KINGSTON FP
FEATURE: DREDGE CELLS
BORING: SS-10 STATION:
RANGE:
SURFACE EL: 797.5
DATE DRILLED: 8/8/94
PREPARED BY: mhd
CHECKED BY: 7A

DEPTH ft.	EL	SPT (N)	* LOG	W	LL	PI	GR	FIELD DESCRIPTION
		18	SM	31.2	NP	NP	11	GY SD SI (FA) w/GV, W
	760							
40		9	ML	31.4	NP	NP	12	GY SI (FA), V MST
	755							
45		-	ML	27.0	NP	NP	12	GY SD SI w/GV (FA), V MST
	750							
50		-	ML	27.2	NP	NP	12	GY SD SI w/GV (FA), V MST
	745							
55		6	SM	30.7	NP	NP	11	GY PGD SI SD (FA), V MST
	740							
60		9	SM	16.4	NP	NP	11	GY PGD SI SD (FA), V MST
	735							
65		25	SM	19.4	NP	NP	11	CRS PGD SI SD w/GV (FA)
	730							
70								

1''=5'

* LAB CLASSIF.

SINGLETON LABORATORIES

SOIL PROFILE: SPLIT-SPOON

PROJECT: KINGSTON FP FEATURE: DREDGE CELLS
BORING: SS-10 STATION: RANGE: SURFACE EL: 797.5
DATE DRILLED: 8/8/94 PREPARED BY: mhd CHECKED BY: TAL

DEPTH ft.	EL	SPT (N)	* LOG	W	LL	PI	GR	FIELD DESCRIPTION
		39	ML	19.0	NP	NP	8	BRN SI CL W/PKTS GY SI (FA), V MST
	725							
75		17	CL	19.2	26	8	9	BRN & GY SI CL, V MST
	720							
80		18	CL	16.9	26	8	6	ORNG-BRN SD SI CL, MST
	715							
85		16	ML	18.9	NP	NP	8	GY SI SD, MST
	710							
90		50+	ML	3.7	NP	NP	8	GY SI SD w/GV
	705							
95								
	700							REFUSAL GROUND WATER LEVEL =
100								
	695							
105								
1''=5'		* LAB CLASSIF.						

This information taken from "Report of Soil Borings, Monitoring Well Installation and Soil Laboratory Testing – Tennessee Valley Authority – Watts Bar and Kingston Facilities," Law Engineering, November 30, 1988.

TVA-00018676

FIELD EXPLORATORY PROCEDURES

SOIL TEST BORING (HOLLOW STEM)

All boring and sampling operations were conducted in general accordance with ASTM Designation D 1586-67. The borings were advanced by mechanically twisting continuous steel hollow-stem auger flights into the ground. At regular intervals, soil samples were obtained with a standard 1.4-inch I.D., 2-inch O.D., split-tube sampler. The sampler was first seated 6 inches to penetrate any loose cuttings and then driven an additional foot with blows of a 140-pound hammer falling 30 inches. The number of hammer blows required to drive the sampler the final foot of penetration was recorded and is designated the "standard penetration resistance". The penetration resistance, when properly evaluated, is an index to the soil strength, density and ability to support foundations.

Representative portions of the soil samples, obtained from the split-tube sampler, were sealed in glass jars and transported to our laboratory. In the laboratory, the samples were examined by our engineer to verify the driller's field classifications. Test Boring Records are attached, graphically showing the soil descriptions and penetration resistances.

Law Engineering

Boring Record

BORING NUMBER J-9A
DATE DRILLED 10-3-88
JOB NUMBER K-88195
PAGE 1 OF 2

DEPTH (FT.)	DESCRIPTION		ELEV. *	PENETRATION-BLOWS PER FOOT 5 10 20 30 40 50 60 80 100 "N"
0.0	GRAY FLY ASH WHICH CONTAINS COAL FRAGMENTS AND CINDERS. MOISTURE CONTENT INCREASED IN SAMPLES TO A DEPTH OF 13 FEET AT WHICH TIME THE SAMPLES BECAME SATURATED.	13.0		
40.0				

REMARKS: * ELEVATION TO BE PROVIDED BY TVA

Law Engineering

Boring Record

BORING NUMBER J - 9A
DATE DRILLED 10-3-88
JOB NUMBER K-88195
PAGE 2 OF 2

DEPTH (FT.)	DESCRIPTION	ELEV. *	PENETRATION-BLOWS PER FOOT 5 10 20 30 40 50 60 80 100 "N"
40.0	GRAY FLY ASH WHICH CONTAINS COAL FRAGMENTS AND CINDERS. MOISTURE CONTENT INCREASED IN SAMPLES TO A DEPTH OF 13 FEET AT WHICH TIME THE SAMPLES BECAME SATURATED.		
67.7	REFUSAL		

REMARKS: * ELEVATION TO BE PROVIDED BY TVA

Law Engineering

Boring Record

BORING NUMBER J-9B
DATE DRILLED 10-3-88
JOB NUMBER K-88195
PAGE 1 OF 3

DEPTH (FT.)	DESCRIPTION	ELEV. *	PENETRATION-BLOWS PER FOOT 5 10 20 30 40 50 60 80 100 "N"
0.0	DRY GRAY ASH		
35.0	ALLUVIAL CLAY, SAND AND GRAVEL WITH WEATHERED SHALE FRAGMENTS		
40.0			

REMARKS: BORING DRILLED USING AIR ROTARY EQUIPMENT
* ELEVATION TO BE PROVIDED BY TVA

Law Engineering

Boring Record

BORING NUMBER J-9B
DATE DRILLED 10-3-88
JOB NUMBER K-88195
PAGE 2 OF 3

DEPTH (FT.)	DESCRIPTION	ELEV.	PENETRATION-BLOWS PER FOOT 5 10 20 30 40 50 60 80 100 "N"
40.0	ALLUVIAL CLAY, SAND AND GRAVEL WITH WEATHERED SHALE FRAGMENTS		
67.5	BLUE GRAY SHALE WITH CALCITE JOINTS		
80.0			

REMARKS:

Law Engineering

Boring Record

BORING NUMBER J-9B
DATE DRILLED 10-3-88
JOB NUMBER K-88195
PAGE 3 OF 3

DEPTH (FT.)	DESCRIPTION	ELEV.	PENETRATION-BLOWS PER FOOT 5 10 20 30 40 50 60 80 100 "N"
80.0	BLUE GRAY SHALE WITH CALCITE JOINTS		
82.4	BORING TERMINATED		

REMARKS:

Law Engineering

Boring Record

BORING NUMBER J-10
DATE DRILLED 9-27-88
JOB NUMBER K-88195
PAGE 1 OF 1

DEPTH (FT.)	DESCRIPTION	ELEV. *	PENETRATION-BLOWS PER FOOT 5 10 20 30 40 50 60 80 100 "N"
0.0	WASH BORING TO A PREDETERMINED DEPTH		
		12.0	
15.0	BORING TERMINATED		

REMARKS: * ELEVATION TO BE PROVIDED BY TVA

Law Engineering

Boring Record

BORING NUMBER J-10A
DATE DRILLED 9-27-88
JOB NUMBER K-88195
PAGE 1 OF 1

DEPTH (FT.)	DESCRIPTION	ELEV. *	PENETRATION-BLOWS PER FOOT 5 10 20 30 40 50 60 80 100 "N"
0.0	WASH BORING TO A PREDETERMINED DEPTH		
29.9	BORING TERMINATED		

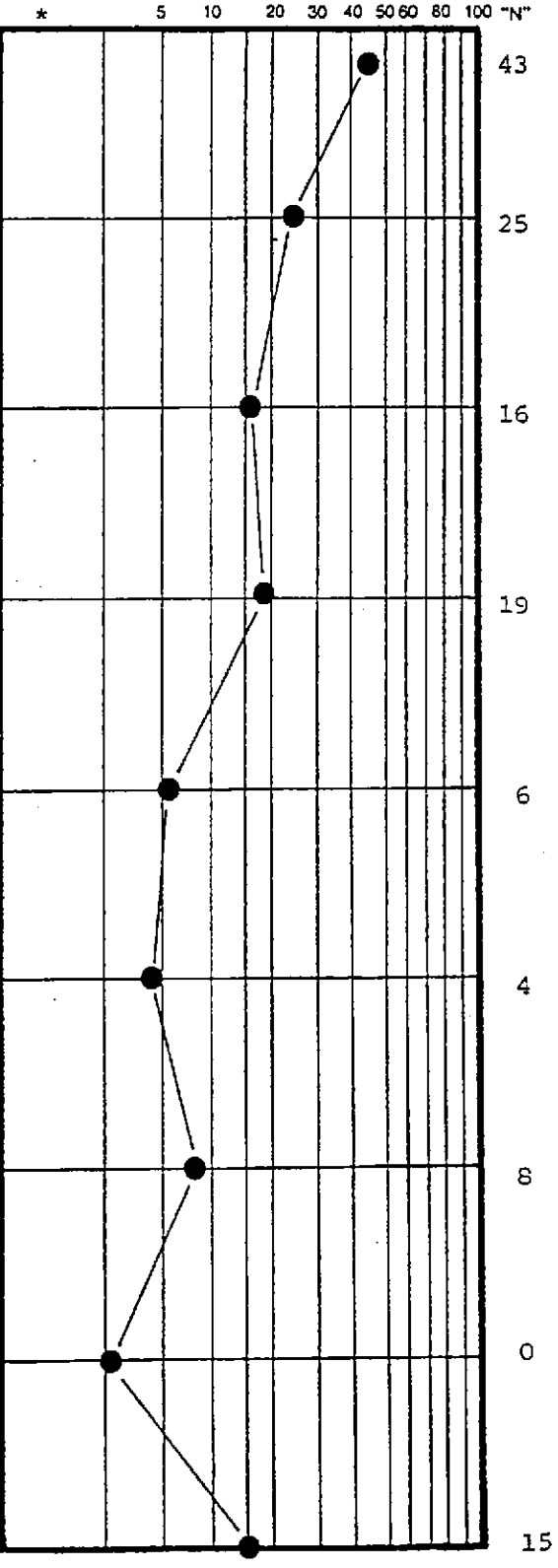
REMARKS: * ELEVATION TO BE PROVIDED BY TVA

Law Engineering

Soil Test Boring Record

BORING NUMBER J-10B
DATE DRILLED 9-27-88
JOB NUMBER K-88195
PAGE 1 OF 2

DEPTH (FT.)	DESCRIPTION	ELEV. *
0.0	HARD TO VERY STIFF DARK GRAY, BROWN AND BLACK SILTY CLAY - FILL	
12.5	VERY STIFF WEATHERED GRAY SHALE WITH ASH - FILL	13.0
17.5	FIRM TO SOFT LIGHT BROWN AND GRAY WEATHERED SHALE (WET) - FILL	
27.5	LIGHT GRAY AND BROWN SILTY CLAY RANGING FROM STIFF TO VERY SOFT - FILL	
40.0		



REMARKS: * ELEVATION TO BE PROVIDED BY TVA

Law Engineering

Soil Test Boring Record

BORING NUMBER J-10 B
DATE DRILLED 9-27-88
JOB NUMBER K-88195
PAGE 2 OF 2

DEPTH (FT.)	DESCRIPTION	ELEV. *	PENETRATION-BLOWS PER FOOT 5 10 20 30 40 50 60 80 100	"N"
40.0	LIGHT GRAY AND BROWN SILTY CLAY RANGING FROM STIFF TO VERY SOFT - FILL			15
				0
				50/0.2
49.4	REFUSAL			

REMARKS: * ELEVATION TO BE PROVIDED BY TVA

Law Engineering

Boring Record

BORING NUMBER J-11B
DATE DRILLED 9-19-88
JOB NUMBER K-88195
PAGE 1 OF 1

DEPTH (FT.)	DESCRIPTION	ELEV.	PENETRATION-BLOWS PER FOOT 5 10 20 30 40 50 60 80 100 "N"
0.0			
1.0	RED SILTY CLAY-POSSIBLE FILL		
	TANNISH-BROWN SHALEY SILTY CLAY - RESIDUUM		
5.0	DARK BROWN AND GRAYISH GREEN SHALE		
31.5	BORING TERMINATED		

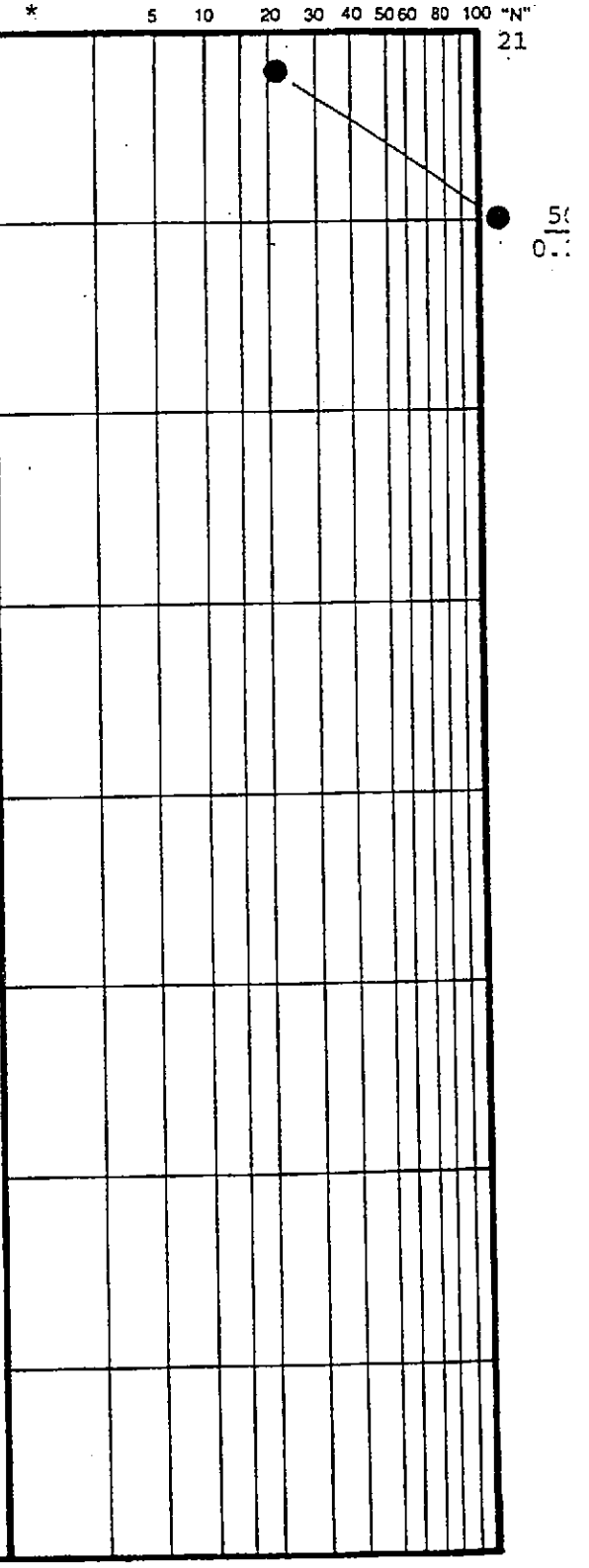
REMARKS: BORING ADVANCED USING AIR ROTARY EQUIPMENT

Law Engineering

Soil Test Boring Record

BORING NUMBER J-11B
DATE DRILLED 9-23-88
JOB NUMBER K-88195
PAGE 1 OF 1

DEPTH (FT.)	DESCRIPTION	ELEV. *	PENETRATION-BLOWS PER FOOT 5 10 20 30 40 50 60 80 100 "N"
0.0			
0.2	TOPSOIL		
2.5	VERY STIFF BROWN CLAYEY DESICATED SHALE - RESIDUUM		
5.2	VERY HARD GRAY VERY WEATHERED SHALE - RESIDUUM		
	REFUSAL		



REMARKS: *ELEVATION TO BE PROVIDED BY TVA

Law Engineering

Soil Test Boring Record

BORING NUMBER J-12A
DATE DRILLED 9-22-88
JOB NUMBER K-88195
PAGE 1 OF 1

DEPTH (FT.)	DESCRIPTION	ELEV. *	PENETRATION-BLOWS PER FOOT (5 10 20 30 40 50 60 80 100 "N")
0.0	STIFF MOTTLED BROWN SILTY CLAY WITH TRACE OF CHERT- FILL		14
2.5	FIRM GRAY FLY ASH WITH TRACE ORGANICS - FILL		7
		8.0	
9.0	VERY SOFT MOTTLED BROWN SILTY CLAY WITH ORGANICS - RESIDUUM		1
12.5	SOFT TO VERY SOFT SATURATED GRAYISH BROWN SILTY CLAY WITH WEATHERED SHALE FRAGMENTS - RESIDUUM		5
			2
24.8	REFUSAL		50/0.3

REMARKS: * ELEVATION TO BE PROVIDED BY TVA

Law Engineering

Boring Record

BORING NUMBER J-12B
DATE DRILLED 9-26-88
JOB NUMBER K-88195
PAGE 1 OF 2

DEPTH (FT.)	DESCRIPTION	ELEV. *	PENETRATION-BLOWS PER FOOT 5 10 20 30 40 50 60 80 100 "N"
0.0	RED-BROWN SILTY CLAY WITH CHERT FRAGMENTS		
3.0	DARK GRAY ASH AND ASH AND ASH CLAY MIXTURE		
20.0	GREENISH GRAY SHALE SLURRY WITH LIMESTONE FRAGMENTS		
28.0	DUE TO A CAVE-IN AT 28.0 FEET THE BORING WAS OFFSET AND RE-DRILLED GRAY SHALE		
40.0			

REMARKS: BORING ADVANCED USING AIR ROTARY EQUIPMENT
* ELEVATION TO BE PROVIDED BY TVA

Law Engineering

Boring Record

BORING NUMBER J-12B
DATE DRILLED 9-26-88
JOB NUMBER K-88195
PAGE 2 OF 2

DEPTH (FT.)	DESCRIPTION	ELEV.	PENETRATION-BLOWS PER FOOT 5 10 20 30 40 50 60 80 100 "N"
40.0	GRAY SHALE		
54.2	BORING TERMINATED		

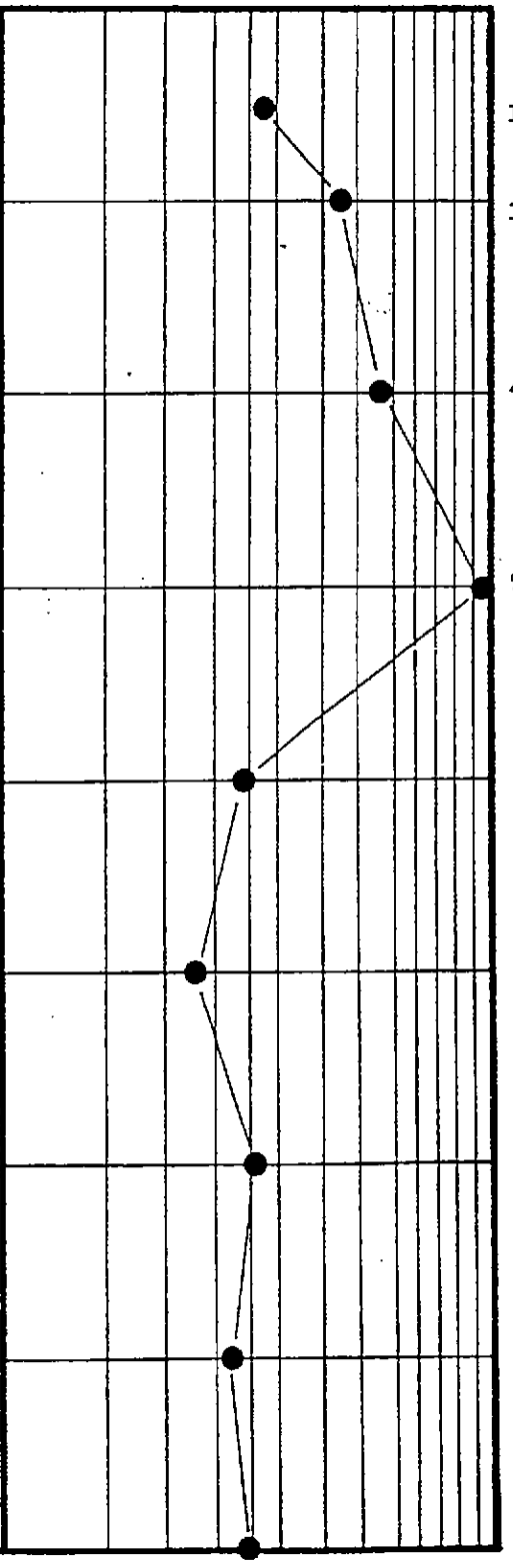
REMARKS:

Law Engineering

Soil Test Boring Record

BORING NUMBER J-13A
DATE DRILLED 9-28-88
JOB NUMBER K-88195
PAGE 1 OF 2

DEPTH (FT.)	DESCRIPTION	ELEV. *	PENETRATION-BLOWS PER FOOT (5 10 20 30 40 50 60 80 100) "N"
1.5	VERY STIFF MOTTLED BROWN SILTY CLAY - FILL		
	BLACK FLY ASH	14.0	17, 35, 47, 93, 14, 8, 11, 12, 14
40.0			



REMARKS: * ELEVATION TO BE PROVIDED BY TVA

Law Engineering

Soil Test Boring Record

BORING NUMBER J-13 A
DATE DRILLED 9-28-88
JOB NUMBER K-88195
PAGE 2 OF 2

DEPTH (FT.)	DESCRIPTION	ELEV. *	PENETRATION-BLOWS PER FOOT (5 10 20 30 40 50 60 80 100 "N")
40.0			14
	BLACK FLY ASH		12
47.5	DENSE SAND AND GRAVEL -ALLUVIUM		41
52.5	FIRM VERY SILTY CLAY - ALLUVIUM		25
64.0	REFUSAL		

REMARKS: * ELEVATION TO BE PROVIDED BY TVA

Law Engineering

Boring Record

BORING NUMBER J-13B
DATE DRILLED 9/29 - 30/88
JOB NUMBER K-88195
PAGE 1 OF 3

DEPTH (FT.)	DESCRIPTION	ELEV. *	PENETRATION-BLOWS PER FOOT 5 10 20 30 40 50 60 80 100 "N"
0.0			
0.5	TOPSOIL		
	BROWN SILTY CLAY AND WEATHERED SHALE		
4.0			
	GRAY ASH		
40.0			

REMARKS: BORING ADVANCED USING AIR ROTARY EQUIPMENT
* ELEVATION TO BE PROVIDED BY TVA

Law Engineering

Boring Record

BORING NUMBER J-13B
DATE DRILLED 9/29-30/88
JOB NUMBER K-88195
PAGE 2 OF 3

DEPTH (FT.)	DESCRIPTION	ELEV.	PENETRATION-BLOWS PER FOOT 5 10 20 30 40 50 60 80 100 "N"
40.0			
	GRAY ASH		
45.0	ASH AND SAND (VERY WET)		
65.0	GRAY SHALE WITH ZONES OF LIMESTONE AND SANDSTONE		
80.0			

REMARKS:

Law Engineering

Boring Record

BORING NUMBER J-13B
DATE DRILLED 9/29 -30/88
JOB NUMBER K-88195
PAGE 3 OF 3

DEPTH (FT.)	DESCRIPTION	ELEV.	PENETRATION-BLOWS PER FOOT 5 10 20 30 40 50 60 80 100 "N"
80.0	GRAY SHALE WITH ZONES OF LIMESTONE AND SANDSTONE		
82.0	BORING TERMINATED		

REMARKS:

Law Engineering

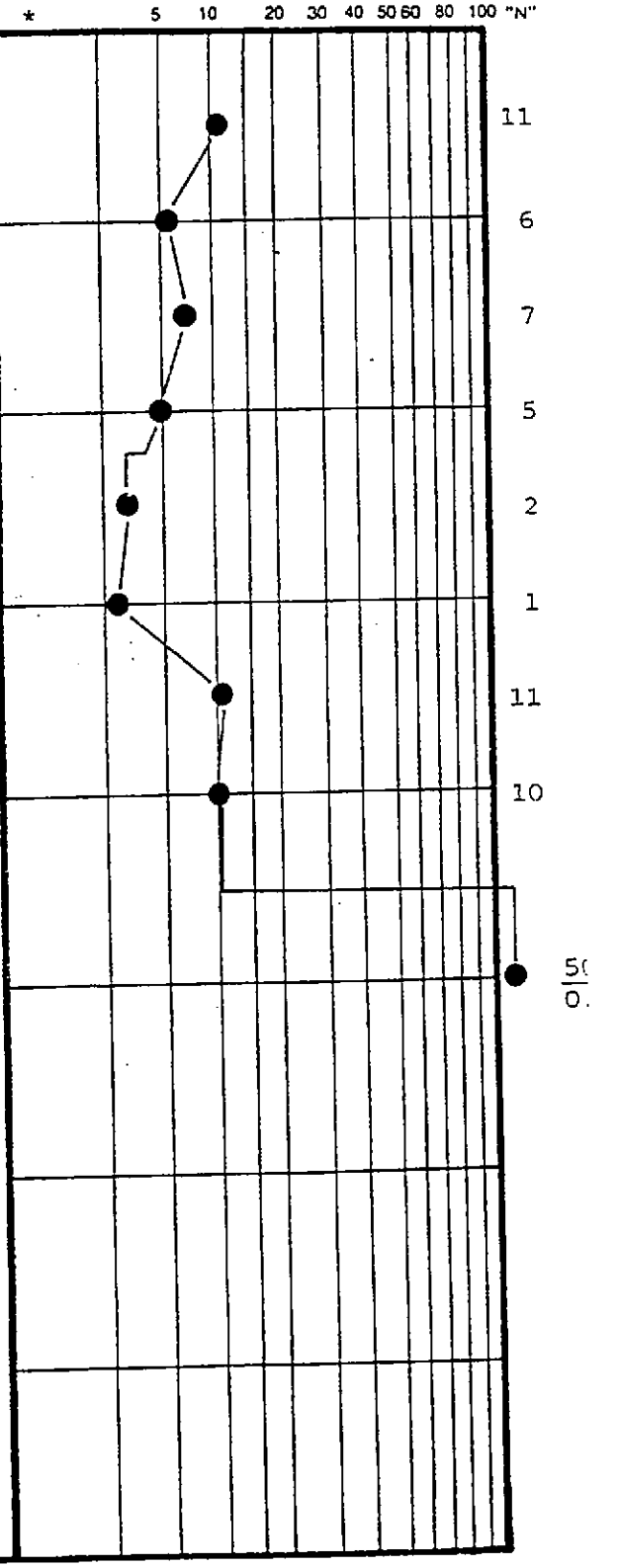
Soil Test Boring Record

BORING NUMBER J-14
DATE DRILLED 9-23-88
JOB NUMBER K-88195
PAGE 1 OF 1

DEPTH (FT.)	DESCRIPTION
0.0	GRAVEL
1.0	STIFF RED-BROWN SILTY CLAY- FILL
3.5	FIRM MOTTLED DARK BROWN SILTY CLAY FILL
6.0	FIRM RED-BROWN SILTY CLAY WITH TRACE ORGANICS - FILL
8.5	FIRM MOTTLED DARK BROWN SILTY CLAY - FILL
11.0	VERY LOOSE BLACK SILTY SAND AND GRAVEL - ALLUVIUM
14.0	
16.0	LOOSE BROWN AND GRAY SILTY CLAY WITH BLACK STAINING - ALLUVIUM
22.5	VERY HARD GRAY WEATHERED SHALE
25.3	BORING TERMINATED

ELEV. *

PENETRATION-BLOWS PER FOOT 5 10 20 30 40 50 60 80 100 "N"



REMARKS: *ELEVATION TO BE PROVIDED BY TVA

Law Engineering

Boring Record

BORING NUMBER J-14A
DATE DRILLED 9-22-88
JOB NUMBER K-88195
PAGE 1 OF 1

DEPTH (FT.)	DESCRIPTION	ELEV. *	PENETRATION-BLOWS PER FOOT 5 10 20 30 40 50 60 80 100 "N"
0.0	RED-BROWN AND DARK BROWN SILTY CLAY WITH ROCK FRAGMENTS-FILL (FILL USED FOR CONSTRUCTING THE RAILROAD)		
17.0	TANISH GRAY SILT WITH TRACE OF ASH - FILL		
19.0	WEATHERED BROWN AND TAN SHALE		
25.0	BORING TERMINATED		

REMARKS: BORING ADVANCED USING AIR ROTARY EQUIPMENT
* ELEVATION TO BE PROVIDED BY TVA

Law Engineering

Boring Record

BORING NUMBER J-14B
DATE DRILLED 9-22-88
JOB NUMBER K-88195
PAGE 1 OF 1

DEPTH (FT.)	DESCRIPTION	ELEV. *	PENETRATION-BLOWS PER FOOT 5 10 20 30 40 50 60 80 100 "N"
0.0	RED BROWN SILTY CLAY -FILL (FILL USED FOR CONSTRUCTING THE RAILROAD)		
18.0	GRAY BROWN SILTY CLAY WITH A TRACE OF ASH		
	REFUSAL		
24.5	BROWN AND GRAY TO GRAY SHALE WITH CALCITE SEAMS		
40.0	BORING TERMINATED		

REMARKS: BORING ADVANCED USING AIR ROTARY EQUIPMENT
* ELEVATION TO BE PROVIDED BY TVA

Law Engineering

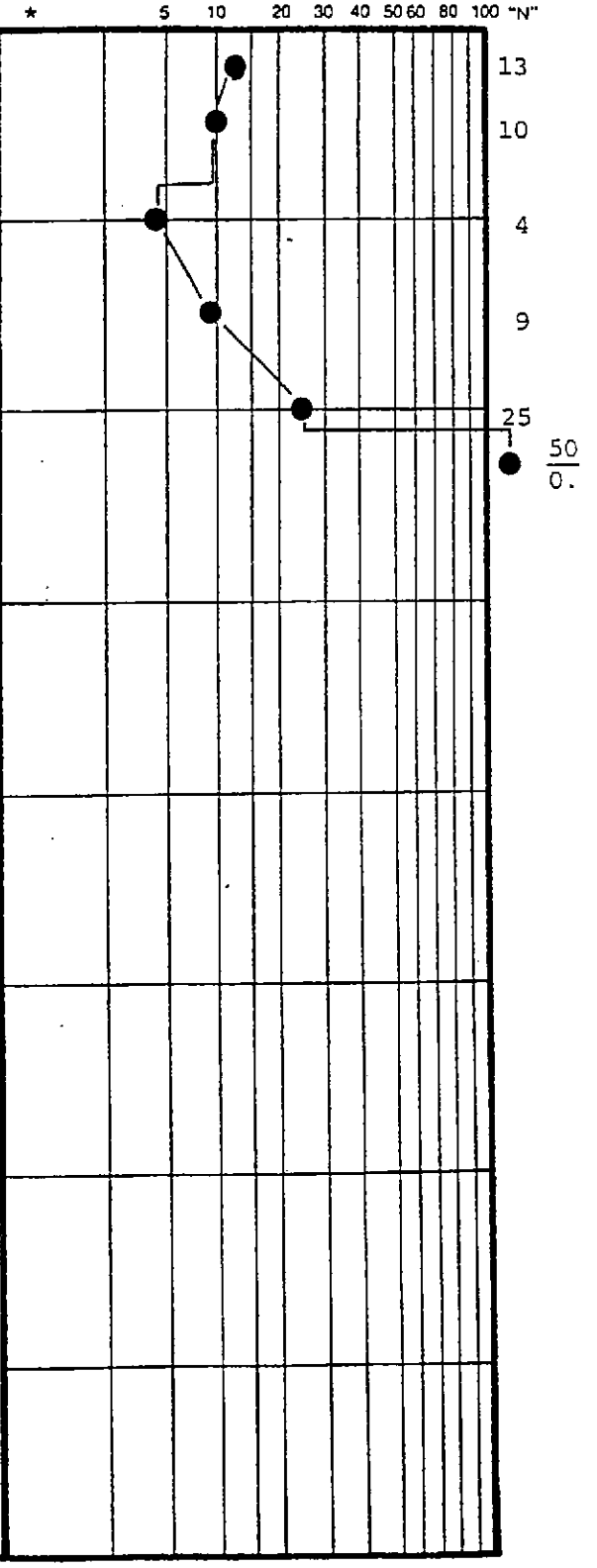
Soil Test Boring Record

BORING NUMBER J-15
DATE DRILLED 9-23-88
JOB NUMBER K-88195
PAGE 1 OF 1

DEPTH (FT.)	DESCRIPTION
0.0	STIFF MOTTLED REDDISH-BROWN SILTY CLAY - FILL
2.0	STIFF MOTTLED BROWN SILTY CLAY WITH ROCK FRAGMENT - FILL
4.0	SOFT TO FIRM REDDISH BROWN SILTY CLAY - RESIDUUM
10.5	LIGHT BROWN VERY WEATHERED SHALE-RESIDUUM
12.0	REFUSAL

ELEV. *

PENETRATION-BLOWS PER FOOT



REMARKS: * ELEVATION TO BE PROVIDED BY TVA

Law Engineering

Boring Record

BORING NUMBER J-15A
DATE DRILLED 9-21-88
JOB NUMBER K-88195
PAGE 1 OF 1

DEPTH (FT.)	DESCRIPTION	ELEV. *	PENETRATION-BLOWS PER FOOT 5 10 20 30 40 50 60 80 100 "N"
0.0	TANISH-BROWN TO BROWN SILTY CLAY		
8.0	GRAY-BROWN SILT WITH SHALE FRAGMENTS		
13.5	REFUSAL GRAY SHALE		
25.2	BORING TERMINATED		
40.0			

REMARKS: BORING ADVANCED USING AIR ROTARY EQUIPMENT
* ELEVATION TO BE PROVIDED BY TVA

Law Engineering

Boring Record

BORING NUMBER J-15B
DATE DRILLED 9-21-88
JOB NUMBER K-88195
PAGE 1 OF 2

DEPTH (FT.)	DESCRIPTION	ELEV. *	PENETRATION-BLOWS PER FOOT 5 10 20 30 40 50 60 80 100 "N"
0.0	WEATHERED SHALE		
3.0	BROWN AND GRAY-BROWN SILTY CLAY WITH TRACE SHALE FRAGMENTS		
14.0	GRAY SHALE		
40.0			

REMARKS: BORING ADVANCED USING AIR ROTARY EQUIPMENT

* ELEVATION TO BE PROVIDED BY TVA

Law Engineering

Boring Record

BORING NUMBER J-15B
DATE DRILLED 9-21-88
JOB NUMBER K-88195
PAGE 2 OF 2

DEPTH (FT.)	DESCRIPTION	ELEV.	PENETRATION-BLOWS PER FOOT 5 10 20 30 40 50 60 80 100 "N"
40.0			
	GRAY SHALE		
44.2	BORING TERMINATED		

REMARKS:

Law Engineering

Boring Record

BORING NUMBER J-16A
DATE DRILLED 10-5-88
JOB NUMBER K-88195
PAGE 1 OF 2

DEPTH (FT.)	DESCRIPTION	ELEV. *	PENETRATION-BLOWS PER FOOT 5 10 20 30 40 50 60 80 100 "N"
0.0			
0.2	TOPSOIL		
	RED-BROWN AND BROWN SILTY CLAY - FILL		
13.0		14.0	
	GRAY BROWN SILTY CLAY - FILL (SOME OF THE SOILS APPEAR TO BE ASSOICIATED WITH AN OLD ROAD SURFACE)		
18.0			
	RED BROWN SANDY CLAY (SLURRY) - POSSIBLE RESIDUUM		
40.0			

REMARKS: * ELEVATION TO BE PROVIDED BY TVA

Law Engineering

Boring Record

BORING NUMBER J-16A
DATE DRILLED 10-5-88
JOB NUMBER K-88195
PAGE 2 OF 2

DEPTH (FT.)	DESCRIPTION	ELEV. *	PENETRATION-BLOWS PER FOOT 5 10 20 30 40 50 60 80 100 "N"
40.0	GRAY BROWN SANDY CLAYEY SILT WHICH GRADES TO GRAY CLAY-SAND -RESIDUUM		
61.0	GRAY SANDY CLAY CONTAINING WEATHERED SHALE FRAGMENTS -RESIDUUM		
64.7	REFUSAL		

REMARKS: * ELEVATION TO BE PROVIDED BY TVA

Law Engineering

Boring Record

BORING NUMBER J-16B
DATE DRILLED 9-23-88
JOB NUMBER K-88195
PAGE 1 OF 2

DEPTH (FT.)	DESCRIPTION	ELEV. *	PENETRATION-BLOWS PER FOOT 5 10 20 30 40 50 60 80 100 "N"
0.0	RED-BROWN SILTY CLAY WITH SMALL ROCK FRAGMENTS - FILL		
10.0	RED TO RED-BROWN TO BROWN SILTY CLAY - FILL		
20.5	BROWN SILTY CLAY - POSSIBLE TOPSOIL		
22.0	GRAY AND BROWN SLURRY WITH ROCK FRAGMENTS		
40.0			

REMARKS: BORING ADVANCED USING AIR ROTARY EQUIPMENT

* ELEVATION TO BE PROVIDED BY TVA

Law Engineering

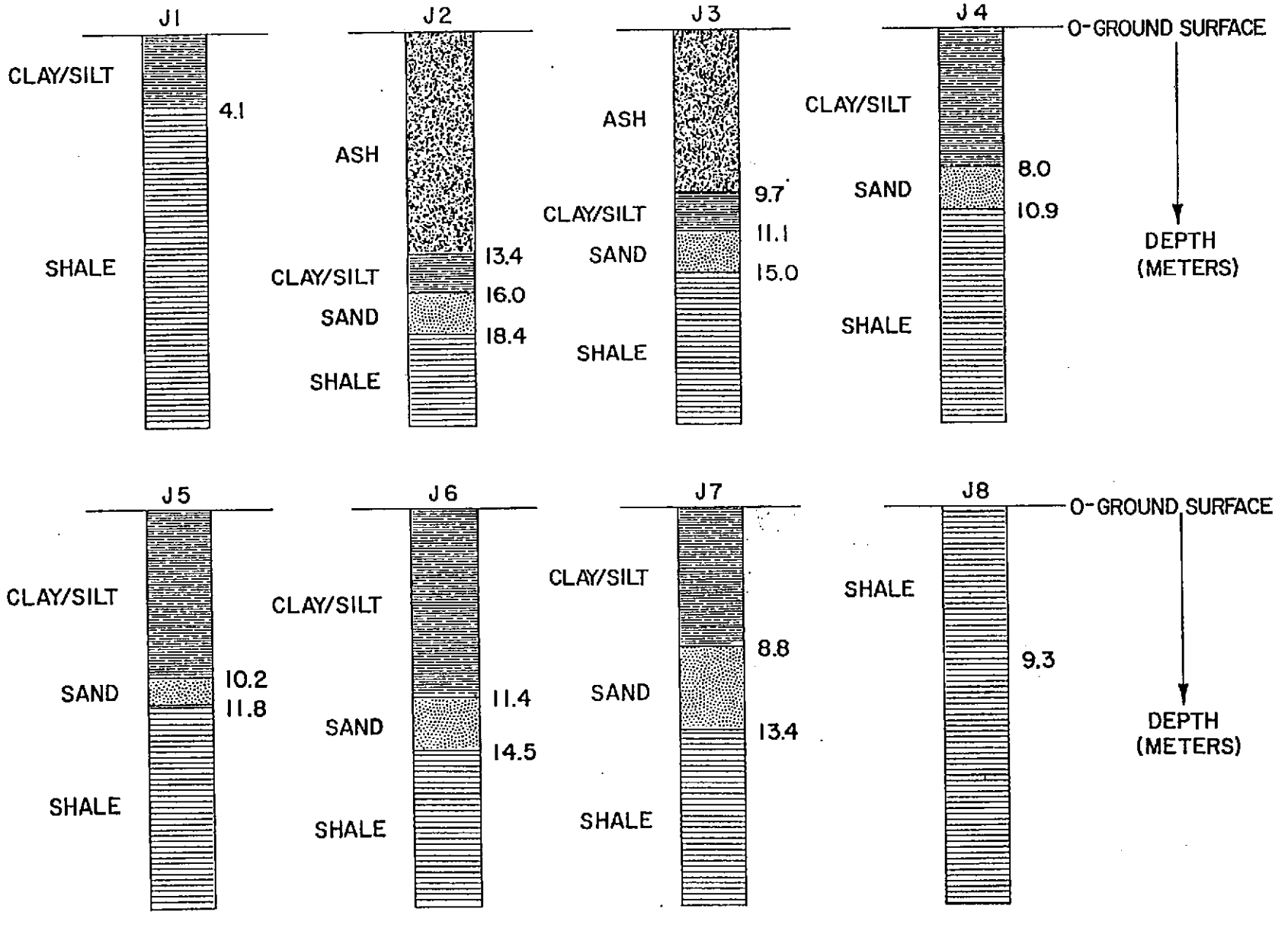
Boring Record

BORING NUMBER J-16B
DATE DRILLED 9-23-88
JOB NUMBER K-88195
PAGE 2 OF 2

DEPTH (FT.)	DESCRIPTION	ELEV.	PENETRATION-BLOWS PER FOOT 5 10 20 30 40 50 60 80 100 "N"
40.0			
41.0	CASING "BLEW-OUT" AROUND 41 FEET. THE BORING WAS OFFSET AND REDRILLED RED-BROWN, BROWN AND GRAY SILTY CLAY WITH SHALE FRAGMENTS		
56.0	BROWN AND GRAY SHALE		
73.0	BORING TERMINATED		

REMARKS:

VERTICAL PROFILE OF THE SUBSTRATUM AT PLANT J's MONITORING WELL LOCATIONS



TVA-00018708

APPENDIX B

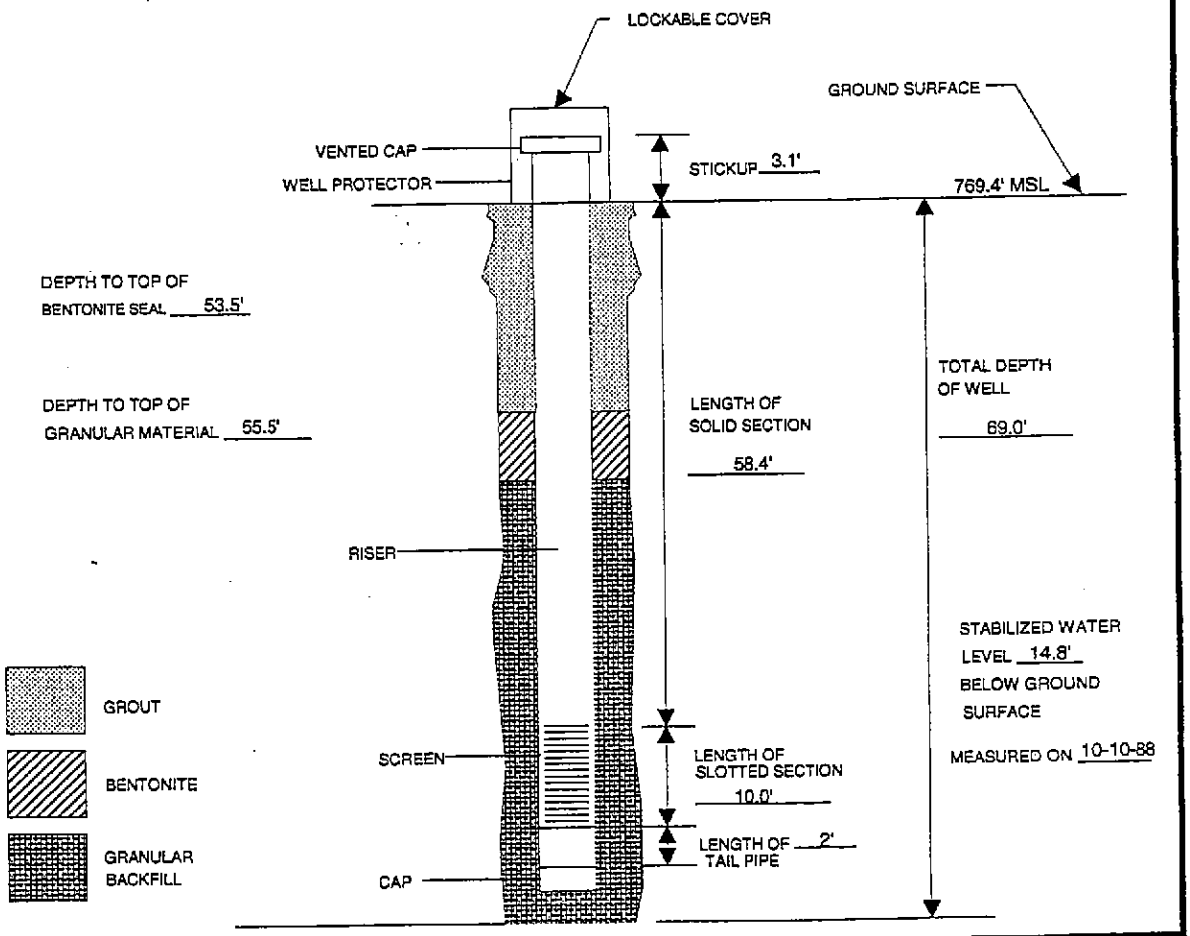
MONITORING WELL DIAGRAMS

TVA-00018709

TYPE II MONITORING WELL INSTALLATION RECORD

PROJECT: KINGSTON STEAM PLANT
JOB NUMBER: K-88195
WELL NUMBER: J-9 A
INSTALLATION DATE: 10-3 TO 10-4-88
LOCATION: PLANT COORDINATES W 9+44 N 19+07 Tennessee Lambert NAD83 Easting 2408204.75 Northing 575458
GROUND SURFACE ELEVATION: 769.4' MSL
TOP OF INNER CASING: 772.5' MSL
GRANULAR BACKFILL MATERIAL: QUARTZ SAND, COARSE
SLOT SIZE: .010 INCHES
CASING MATERIAL: PVC
CASING DIAMETER: 2 INCHES
DRILLING TECHNIQUE: POWER AUGER
DRILLING CONTRACTOR: LAW ENGINEERING
BOREHOLE DIAMETER: 11 INCHES
FIELD REPRESENTATIVE: H. W. ROBINSON
LOCKABLE COVER ?: YES
KEY CODE/COMBINATION: 2043
RISER MATERIAL: PVC
SCREEN MATERIAL: PVC
COMMENTS:

(NOT TO SCALE)



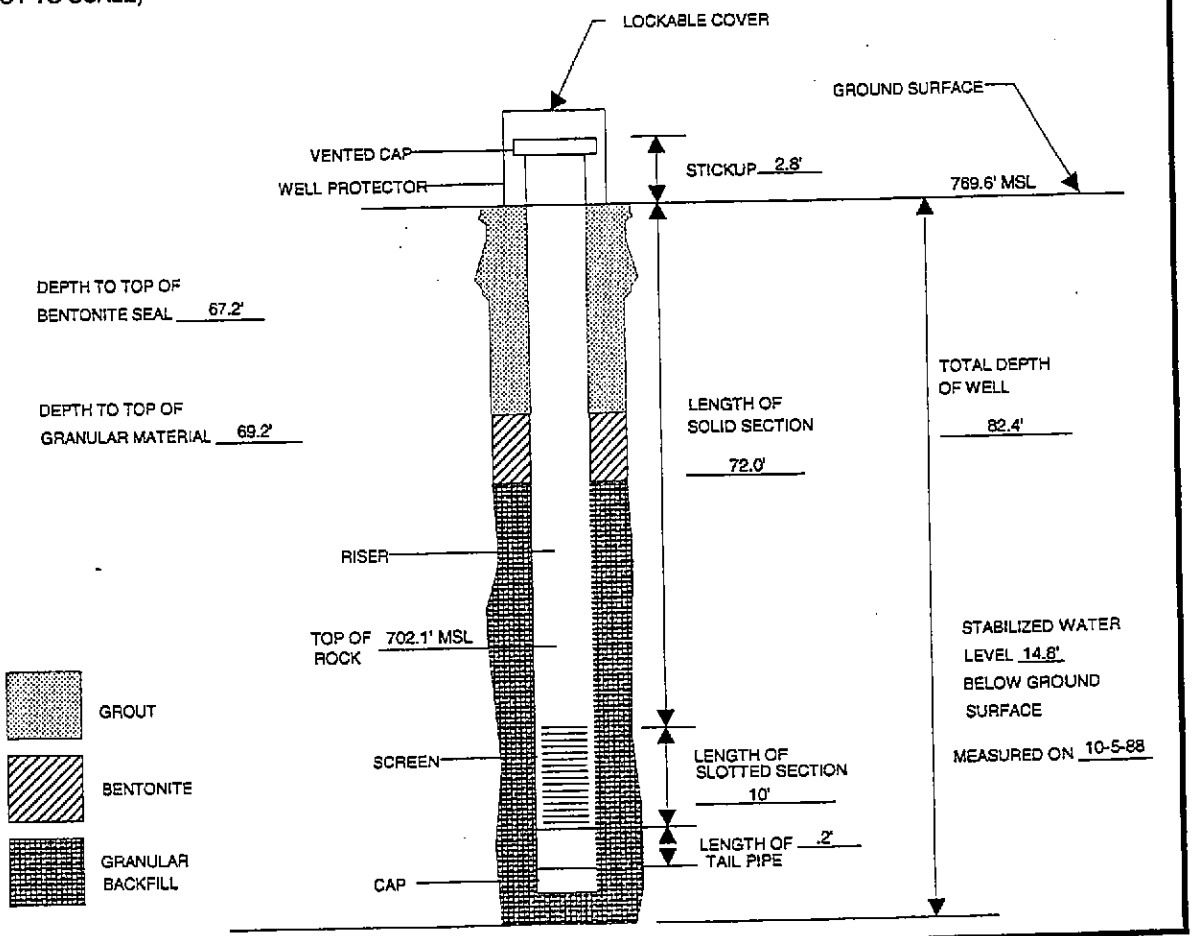
ENG LAB 10/2/90

TVA-00018710

TYPE II MONITORING WELL INSTALLATION RECORD

PROJECT: KINGSTON STEAM PLANT
JOB NUMBER: K-88195
WELL NUMBER: J-9B
INSTALLATION DATE: 9-28 TO 9-29-88
LOCATION: PLANT COORDINATES W 9+42 , N 19+22 Tennessee Lambert NAD83 Easting 2408204.25 Northing 575457.5
GROUND SURFACE ELEVATION: 769.6' MSL
TOP OF INNER CASING: 772.4' MSL
GRANULAR BACKFILL MATERIAL: QUARTZ SAND,COURSE
SLOT SIZE: .010 INCHES
CASING MATERIAL: PVC
CASING DIAMETER: 2 INCHES
DRILLING TECHNIQUE: AIR ROTARY
DRILLING CONTRACTOR: HIGHLAND DRILLING
BOREHOLE DIAMETER: 5 7/8 (ROLLER CONE)
FIELD REPRESENTATIVE: H. W. ROBINSON
LOCKABLE COVER ?: YES
KEY CODE/COMBINATION: 2043
RISER MATERIAL: PVC
SCREEN MATERIAL: PVC
COMMENTS:

(NOT TO SCALE)



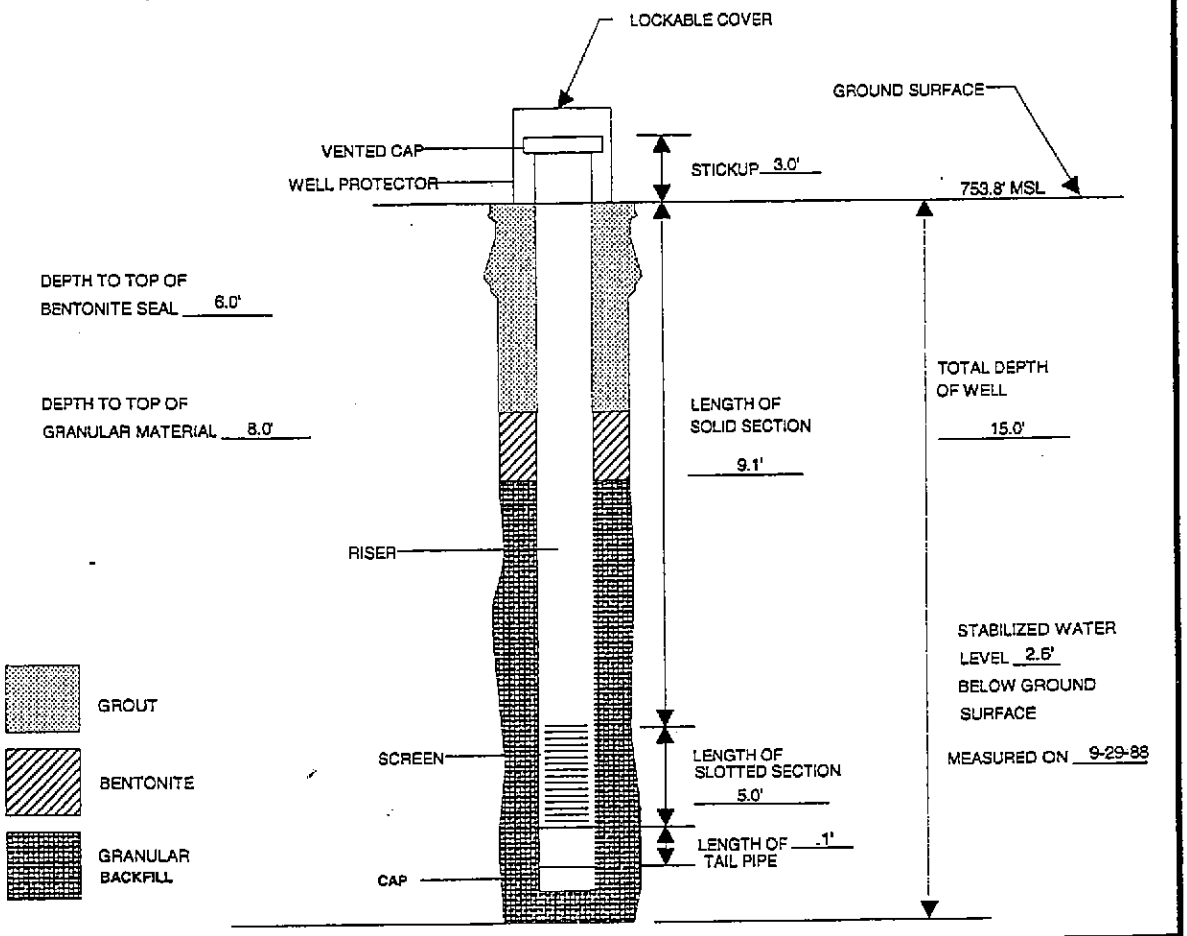
ENG LAB 10/2/90

TVA-00018711

TYPE II MONITORING WELL INSTALLATION RECORD

PROJECT: KINGSTON STEAM PLANT
JOB NUMBER: K-88195
WELL NUMBER: J-10
INSTALLATION DATE: 9-27-88
LOCATION: PLANT COORDINATES W 4+79, N 16+36 Tennessee Lambert NAD83 Easting 2408462.25 Northing 574754.063
GROUND SURFACE ELEVATION: 753.8' MSL
TOP OF INNER CASING: 756.8' MSL
GRANULAR BACKFILL MATERIAL: QUARTZ SAND,COURSE
SLOT SIZE: .010 INCHES
CASING MATERIAL: PVC
CASING DIAMETER: 2 INCHES
DRILLING TECHNIQUE: POWER AUGER
DRILLING CONTRACTOR: LAW ENGINEERING
BOREHOLE DIAMETER: 11 INCHES
FIELD REPRESENTATIVE: H. W. ROBINSON
LOCKABLE COVER ?: YES
KEY CODE/COMBINATION: 2043
RISER MATERIAL: PVC
SCREEN MATERIAL: PVC
COMMENTS:

(NOT TO SCALE)



ENG LAB 10/2/90

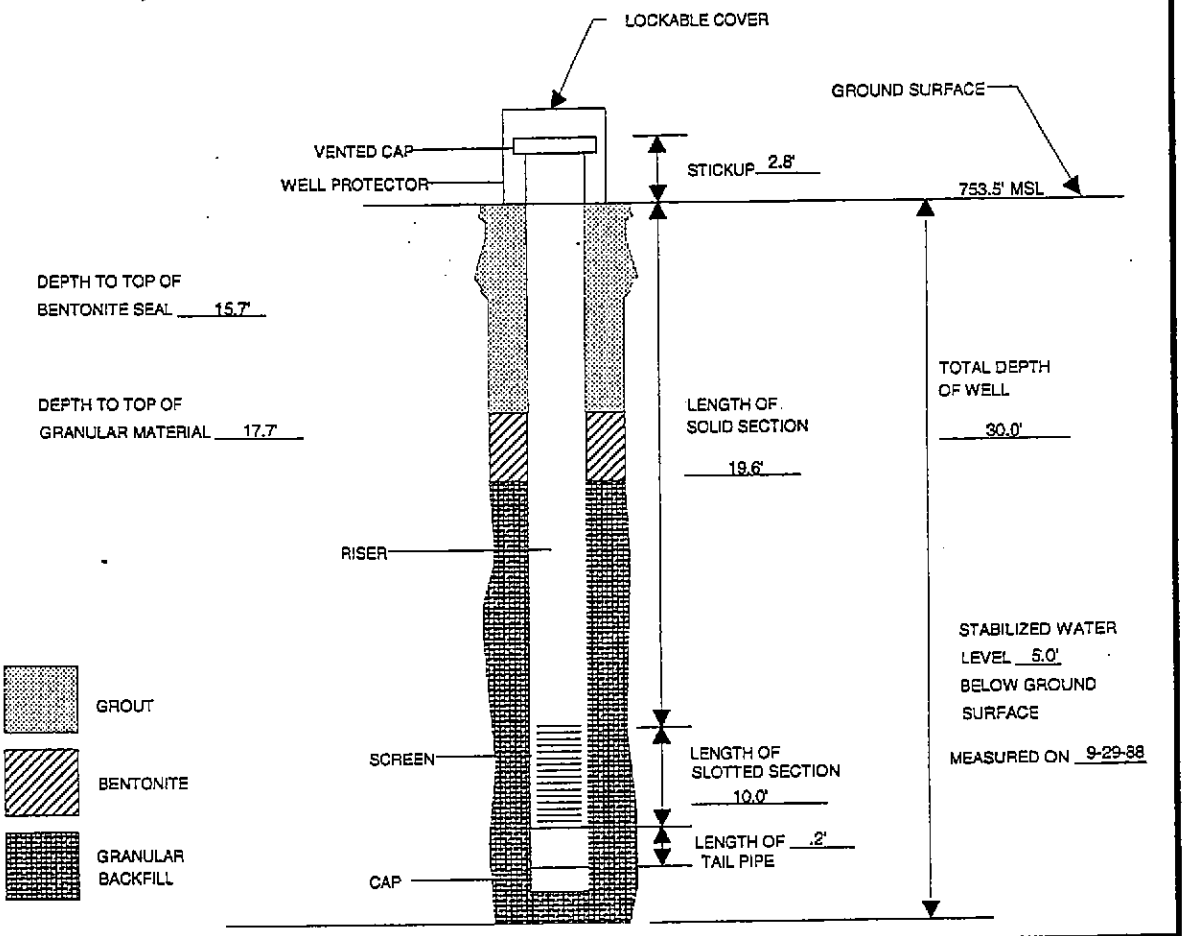
TVA-00018712

TYPE II MONITORING WELL INSTALLATION RECORD

PROJECT	KINGSTON STEAM PLANT	JOB NUMBER	K-88195
WELL NUMBER	J - 10A	INSTALLATION DATE	9-19 TO 9-27-88
LOCATION	PLANT COORDINATES W 4+68, N 16+51	Tennessee Lambert NAD83 Easting 2408462.25 Northing 574754.063	
GROUND SURFACE ELEVATION	753.5' MSL	TOP OF INNER CASING	756.3' MSL
GRANULAR BACKFILL MATERIAL	QUARTZ SAND, COURSE	SLOT SIZE	.010 INCHES
CASING MATERIAL	PVC	CASING DIAMETER	2 INCHES
DRILLING TECHNIQUE	AIR ROTARY & POWER AUGER	DRILLING CONTRACTOR	HIGHLAND DRILLING & LAW ENGINEERING
BOREHOLE DIAMETER	11 INCHES	FIELD REPRESENTATIVE	H. W. ROBINSON
LOCKABLE COVER ?	YES	KEY CODE/COMBINATION	2043
RISER MATERIAL	PVC	SCREEN MATERIAL	PVC

COMMENTS

(NOT TO SCALE)

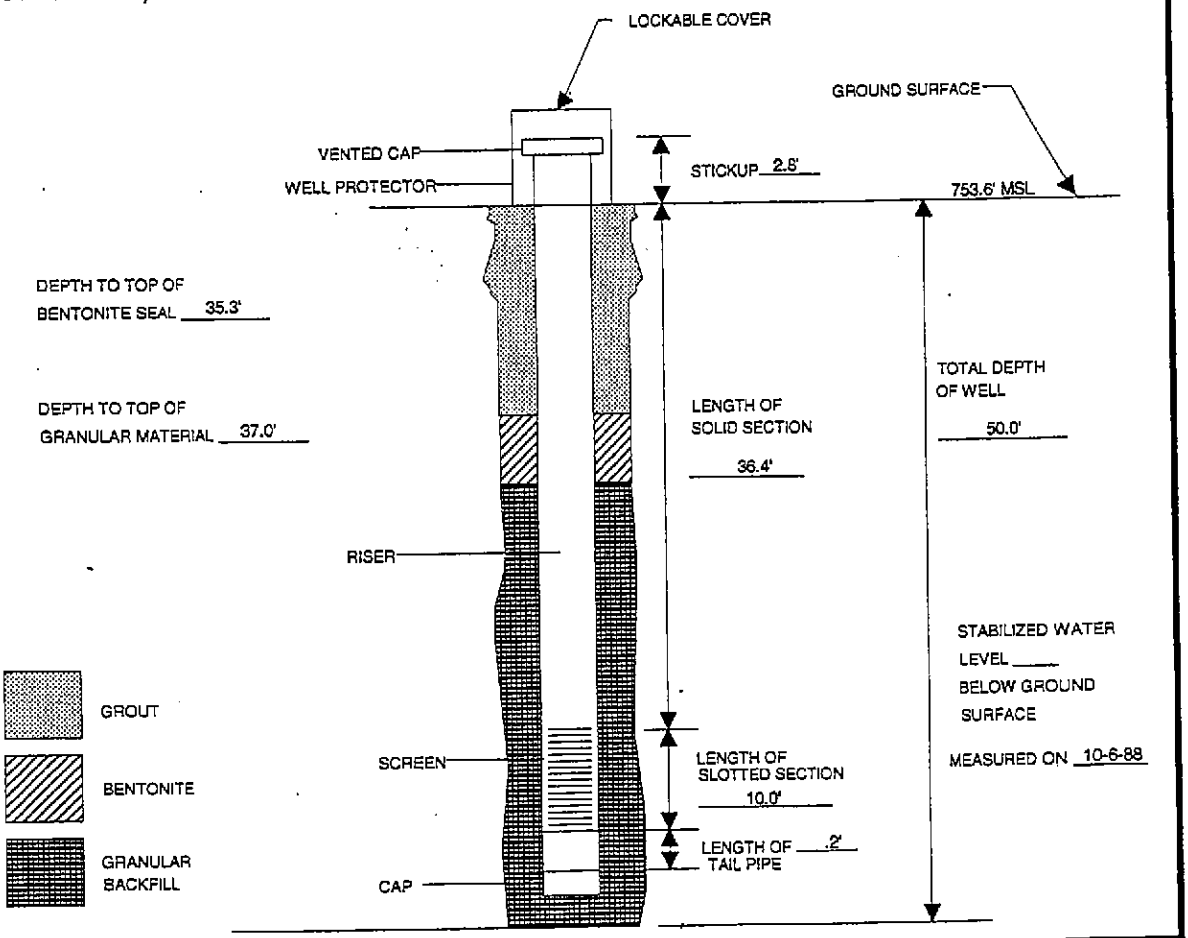


EHQ LAB 10/2/90

TYPE II MONITORING WELL INSTALLATION RECORD

PROJECT: KINGSTON STEAM PLANT
JOB NUMBER: K-88195
WELL NUMBER: J-10 B
INSTALLATION DATE: 9-23-88
LOCATION: PLANT COORDINATES W 4+73, N 16+51 Tennessee Lambert NAD83 Easting 2408462.25 Northing 574754.063
GROUND SURFACE ELEVATION: 753.6' MSL
TOP OF INNER CASING: 756.4' MSL
GRANULAR BACKFILL MATERIAL: QUARTZ SAND,COURSE
SLOT SIZE: .010 INCHES
CASING MATERIAL: PVC
CASING DIAMETER: 2 INCHES
DRILLING TECHNIQUE: POWER AUGER
DRILLING CONTRACTOR: LAW ENGINEERING
BOREHOLE DIAMETER: 11 INCHES
FIELD REPRESENTATIVE: H. W. ROBINSON
LOCKABLE COVER ?: YES
KEY CODE/COMBINATION: 2043
RISER MATERIAL: PVC
SCREEN MATERIAL: PVC
COMMENTS:

(NOT TO SCALE)



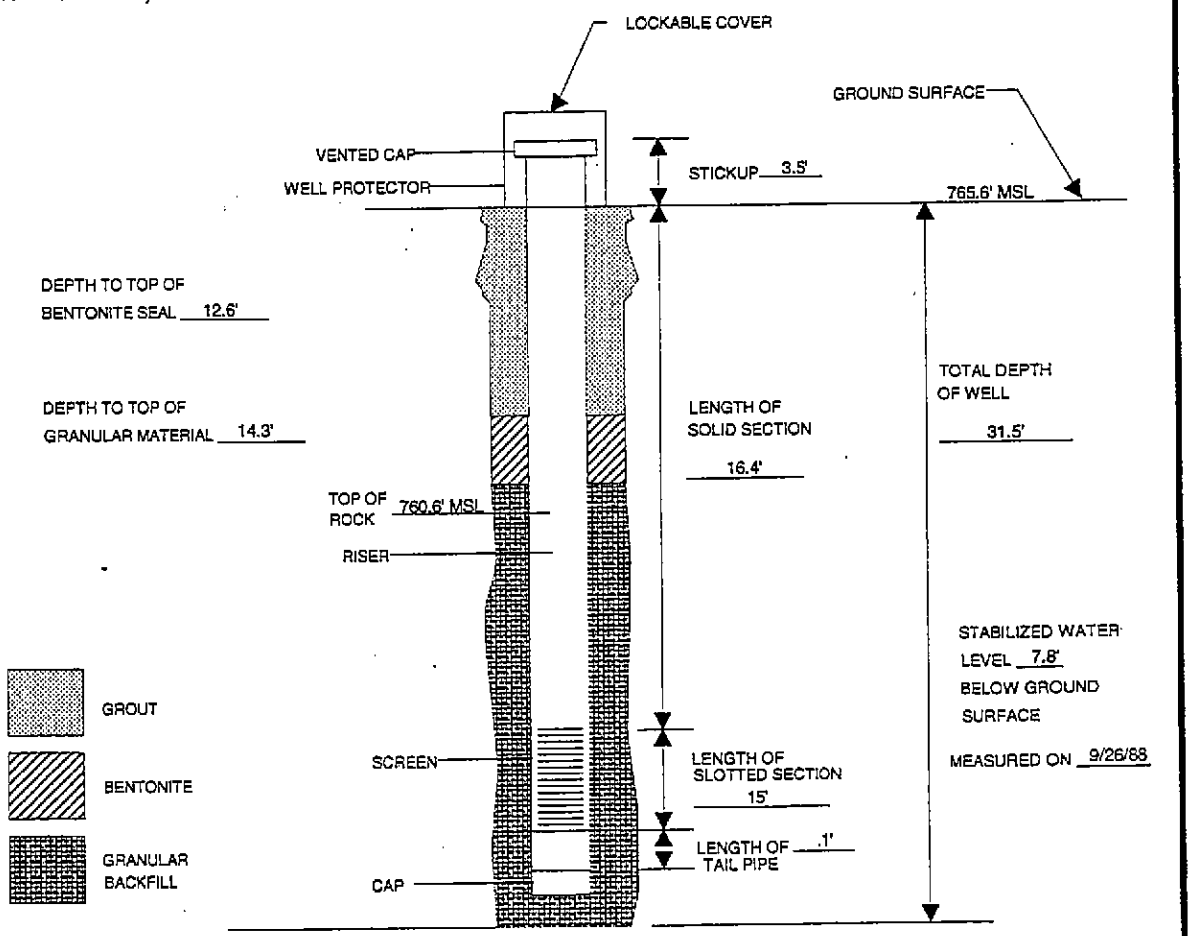
ENG LAB 10/2/90

TVA-00018714

TYPE II MONITORING WELL INSTALLATION RECORD

PROJECT: KINGSTON STEAM PLANT
JOB NUMBER: K-88195
WELL NUMBER: J-11 B
INSTALLATION DATE: 9-19-88
LOCATION: PLANT COORDINATES W 7+84, N 7+97
GROUND SURFACE ELEVATION: 765.6' MSL
TOP OF INNER CASING: 769.1' MSL
GRANULAR BACKFILL MATERIAL: QUARTZ SAND,COURSE
SLOT SIZE: 0.10 INCHES
CASING MATERIAL: PVC
CASING DIAMETER: 2 INCHES
DRILLING TECHNIQUE: AIR/WATER ROTARY
DRILLING CONTRACTOR: HIGHLAND DRILLING
BOREHOLE DIAMETER: 8 INCHES
FIELD REPRESENTATIVE: H. W. ROBINSON
LOCKABLE COVER ?: YES
KEY CODE/COMBINATION: 2043
RISER MATERIAL: PVC
SCREEN MATERIAL: PVC
COMMENTS:

(NOT TO SCALE)



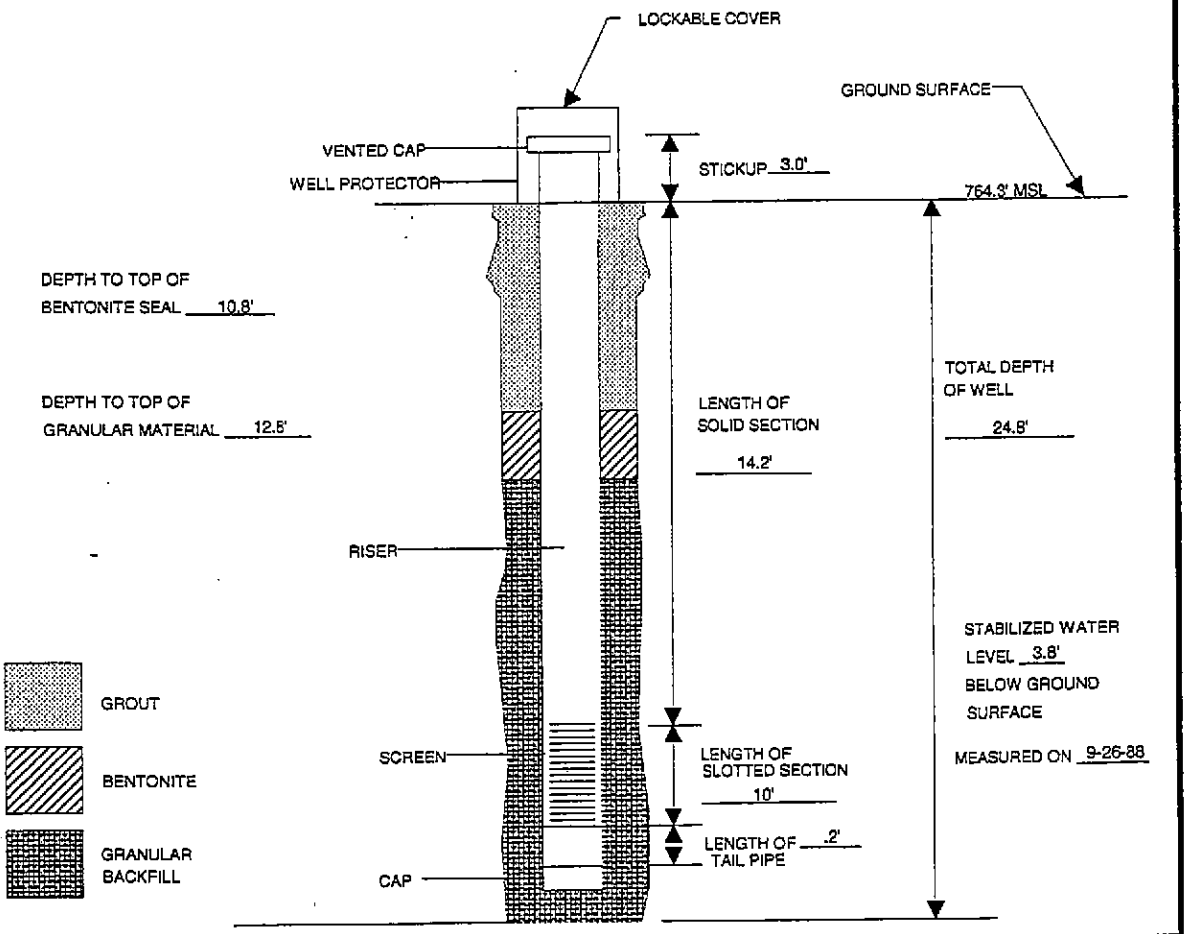
ENG LAB 10/2/90

TYPE II MONITORING WELL INSTALLATION RECORD

PROJECT	KINGSTON STEAM PLANT	JOB NUMBER	K-88195
WELL NUMBER	J-12 A	INSTALLATION DATE	9-22-88
LOCATION	PLANT COORDINATES W 17+40, N 15+57	Tennessee Lambert NAD83 Easting 2407132.25 Northing 575644	
GROUND SURFACE ELEVATION	764.3' MLS	TOP OF INNER CASING	767.3' MLS
GRANULAR BACKFILL MATERIAL	QUARTZ SAND,COURSE	SLOT SIZE	.010 INCHES
CASING MATERIAL	PVC	CASING DIAMETER	2 INCHES
DRILLING TECHNIQUE	POWER AUGER	DRILLING CONTRACTOR	LAW ENGINEERING
BOREHOLE DIAMETER	10 1/4 INCHES	FIELD REPRESENTATIVE	H. W. ROBINSON
LOCKABLE COVER ?	YES	KEY CODE/COMBINATION	2043
RISER MATERIAL	PVC	SCREEN MATERIAL	PVC

COMMENTS

(NOT TO SCALE)



ENG LAB 10/2/90

TYPE II MONITORING WELL INSTALLATION RECORD

PROJECT KINGSTON STEAM PLANT

JOB NUMBER K-88195

WELL NUMBER J-13 A

INSTALLATION DATE 9-28 TO 9-30-88

LOCATION PLANT COORDINATES W 7+13, N 31+23 Tennessee Lambert NAD83 Easting 2408856.75 Northing 575872.44

GROUND SURFACE ELEVATION 766.5' MSL

TOP OF INNER CASING 769.2' MSL

GRANULAR BACKFILL MATERIAL QUARTZ SAND,COARSE

SLOT SIZE .010 INCH

CASING MATERIAL PVC

CASING DIAMETER 2 INCHES

DRILLING TECHNIQUE POWER AUGER

DRILLING CONTRACTOR LAW ENGINEERING

BOREHOLE DIAMETER APPROXIMATELY 11 INCHES

FIELD REPRESENTATIVE H. W. ROBINSON

LOCKABLE COVER ? YES

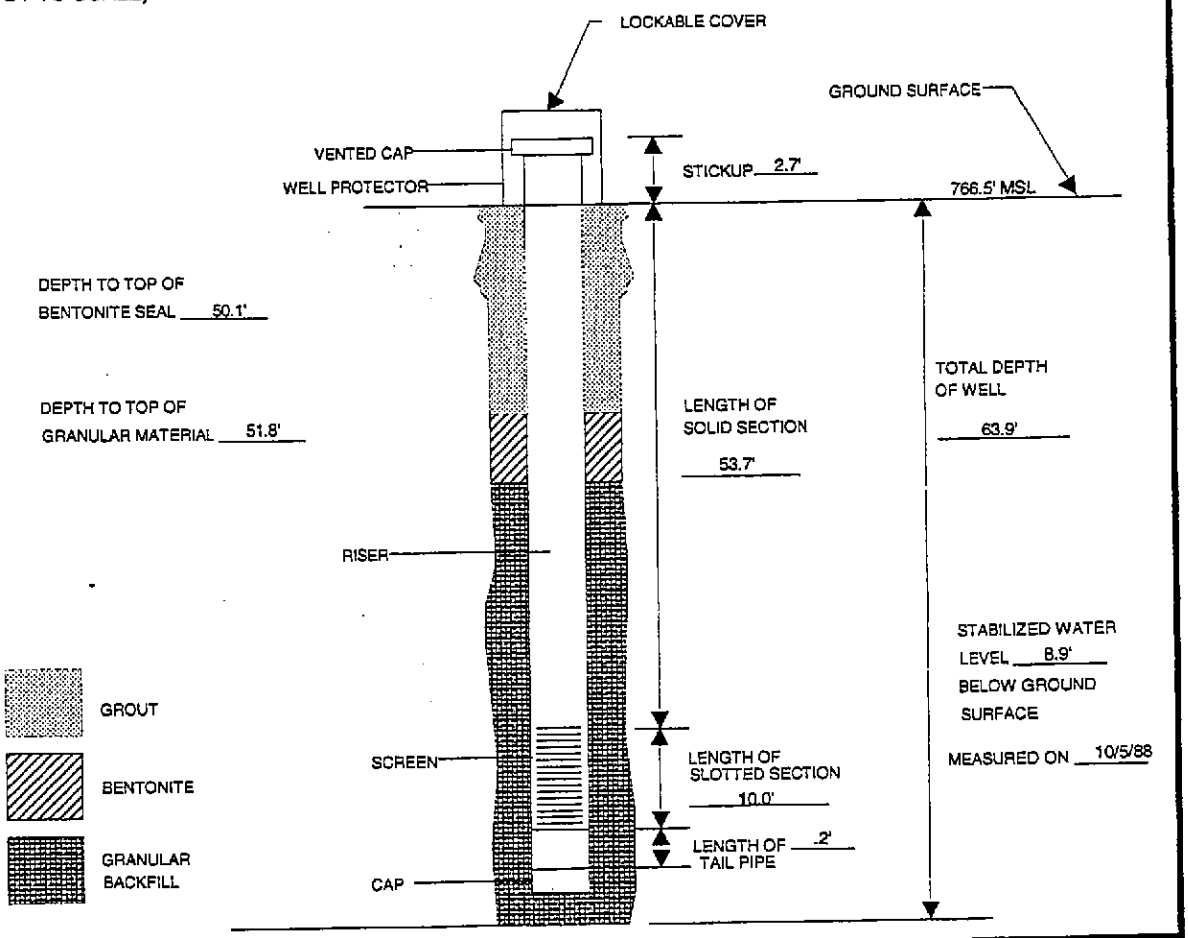
KEY CODE/COMBINATION 2043

RISER MATERIAL PVC

SCREEN MATERIAL PVC

COMMENTS

(NOT TO SCALE)



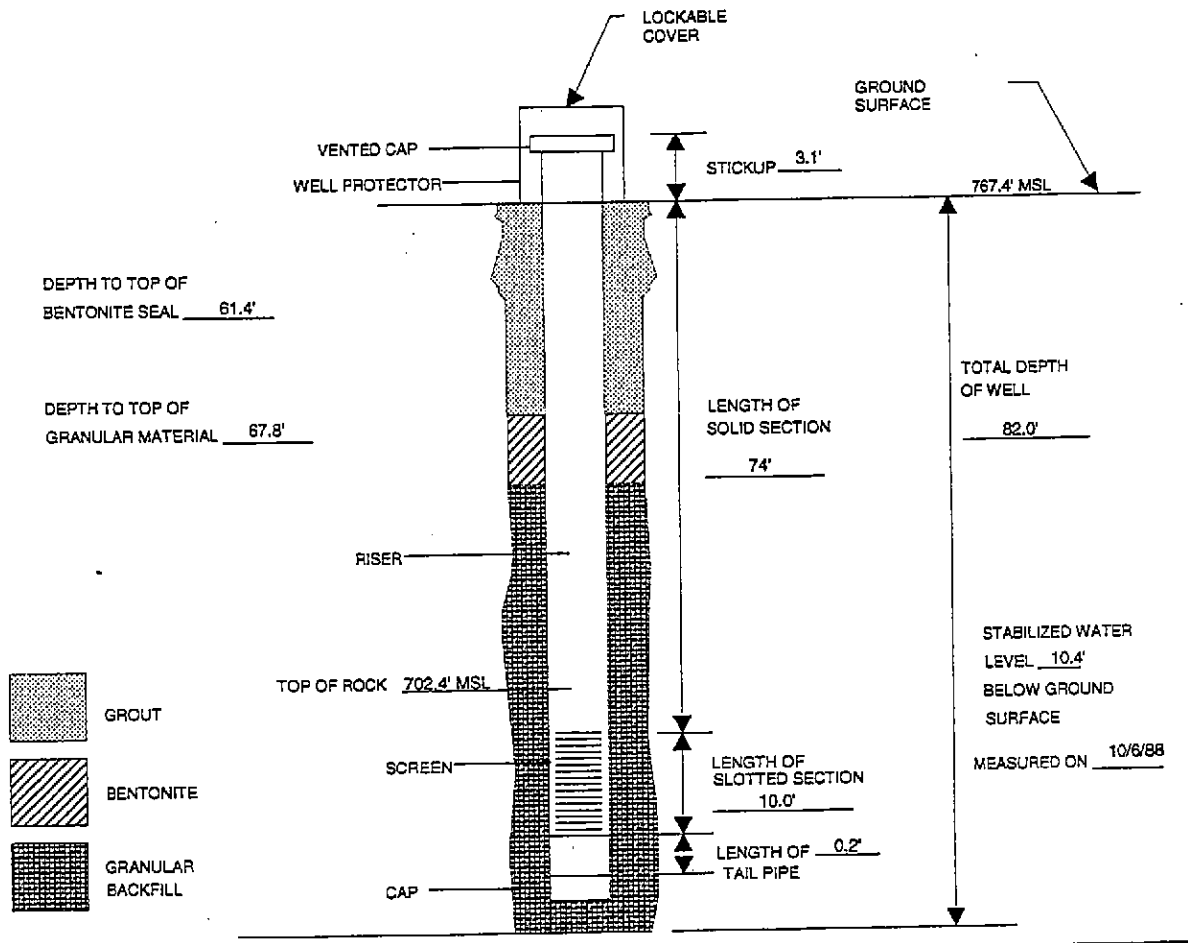
ENG LAB 10/2/90

TVA-00018717

TYPE II MONITORING WELL INSTALLATION RECORD

PROJECT: KINGSTON STEAM PLANT
JOB NUMBER: K-88195
WELL NUMBER: J-13 B
INSTALLATION DATE: 9-29 TO 9-30-88
LOCATION: PLANT COORDINATES W 7+34, N 31+04 Tennessee Lambert NAD83 Easting 2408856.25 Northing 575872.43
GROUND SURFACE ELEVATION: 767.4' MSL
TOP OF INNER CASING: 770.5' MSL
GRANULAR BACKFILL MATERIAL: QUARTZ SAND
SLOT SIZE: .010 INCH
CASING MATERIAL: PVC
CASING DIAMETER: 2 INCHES
DRILLING TECHNIQUE: AUGER AND AIR ROTARY
DRILLING CONTRACTOR: HIGHLAND DRILLING
BOREHOLE DIAMETER: 8" AUGER, 5 7/8" (ROLLER CONE)
FIELD REPRESENTATIVE: H.W. ROBINSON
LOCKABLE COVER ?: YES
KEY CODE/COMBINATION: 2043
RISER MATERIAL: PVC
SCREEN MATERIAL: PVC
COMMENTS:

(NOT TO SCALE)

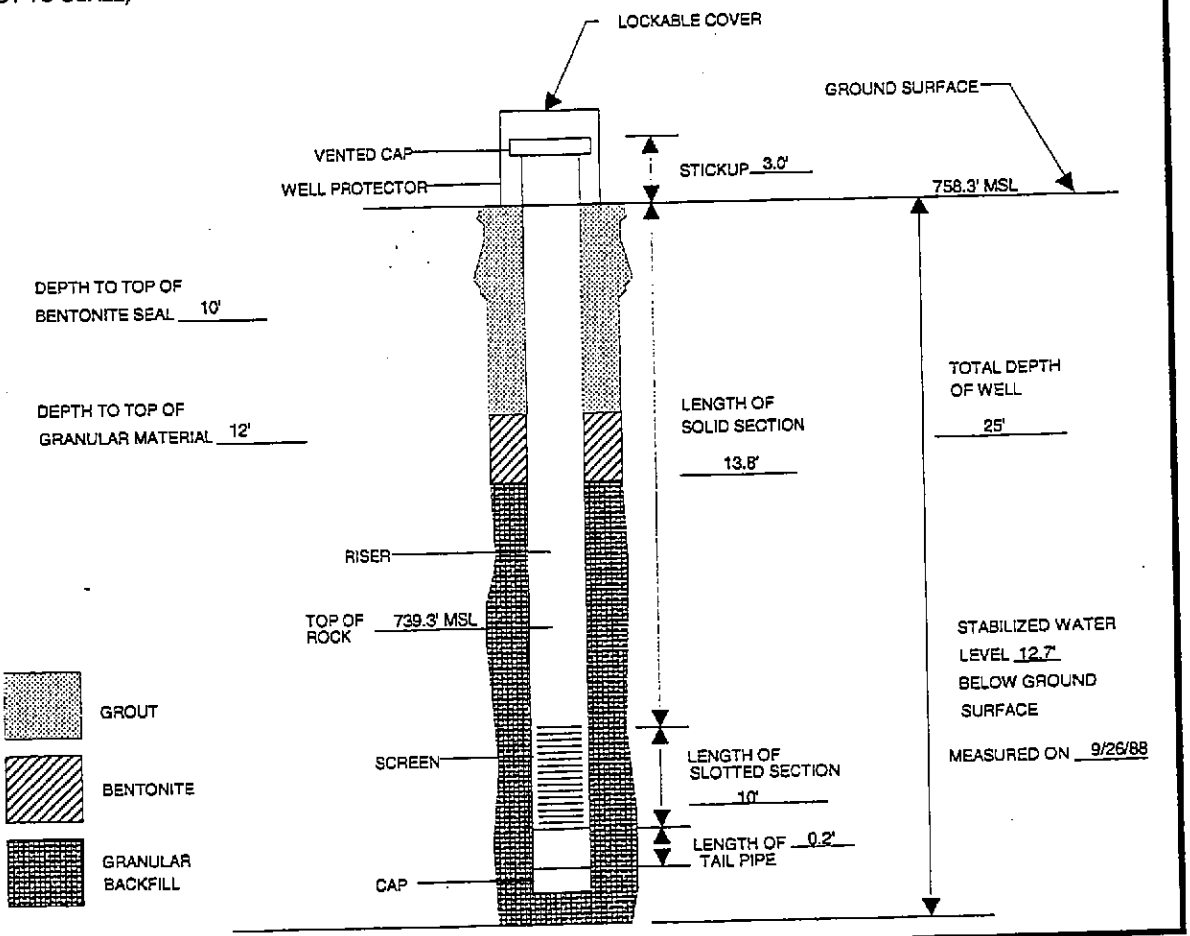


ENG LAB
10/2/90

TYPE II MONITORING WELL INSTALLATION RECORD

PROJECT: KINGSTON STEAM PLANT
JOB NUMBER: K-88195
WELL NUMBER: J-14 A
INSTALLATION DATE: 9-22-88
LOCATION: PLANT COORDINATES W 30+46, N 37+49 Tennessee Lambert NAD83 Easting 2402915.5 Northing 571535.31
GROUND SURFACE ELEVATION: 758.3' MSL
TOP OF INNER CASING: 761.3' MSL
GRANULAR BACKFILL MATERIAL: QUARTZ SAND, COARSE
SLOT SIZE: .010 INCH
CASING MATERIAL: PVC
CASING DIAMETER: 2 INCHES
DRILLING TECHNIQUE: AIR/WATER ROTARY
DRILLING CONTRACTOR: HIGHLAND DRILLLING
BOREHOLE DIAMETER: 8 INCHES
FIELD REPRESENTATIVE: H.W. ROBINSON
LOCKABLE COVER ?: YES
KEY CODE/COMBINATION: 2043
RISER MATERIAL: PVC
SCREEN MATERIAL: PVC
COMMENTS:

(NOT TO SCALE)

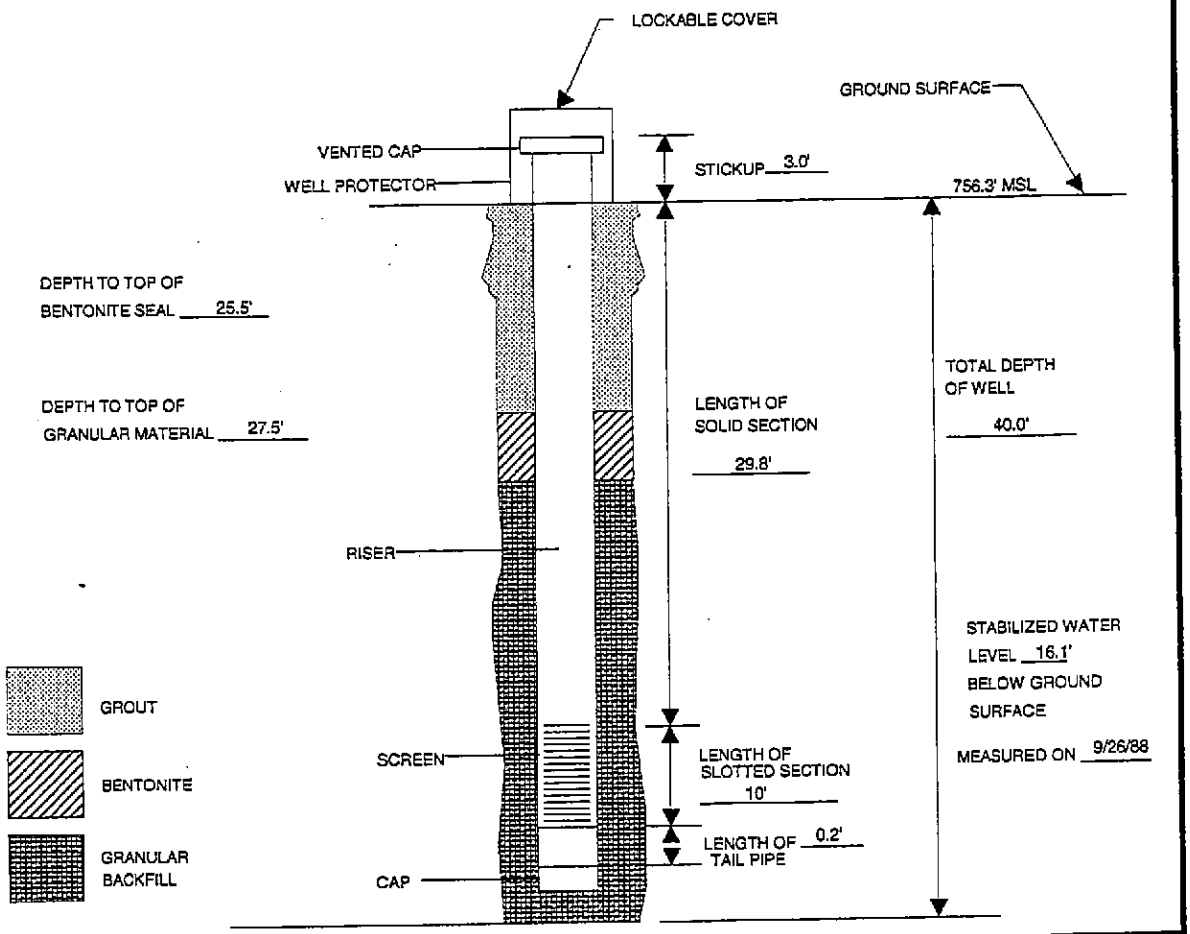


ENG LAB 10/2/90

TYPE II MONITORING WELL INSTALLATION RECORD

PROJECT: KINGSTON STEAM PLANT
JOB NUMBER: K-88195
WELL NUMBER: J-14 B
INSTALLATION DATE: 9-22-88
LOCATION: PLANT COORDINATES W 30+56, S 37+60 Tennessee Lambert NAD83 Easting 2402915.5 Northing 571535.31
GROUND SURFACE ELEVATION: 758.3' MSL
TOP OF INNER CASING: 761.3' MSL
GRANULAR BACKFILL MATERIAL: QUARTZ,SAND,COARSE
SLOT SIZE: .010 INCH
CASING MATERIAL: PVC
CASING DIAMETER: 2 INCHES
DRILLING TECHNIQUE: AIR/WATER ROTARY
DRILLING CONTRACTOR: HIGHLAND DRILLING
BOREHOLE DIAMETER: 8 INCHES
FIELD REPRESENTATIVE: H.W. ROBINSON
LOCKABLE COVER ?: YES
KEY CODE/COMBINATION: 2043
RISER MATERIAL: PVC
SCREEN MATERIAL: PVC
COMMENTS:

(NOT TO SCALE)



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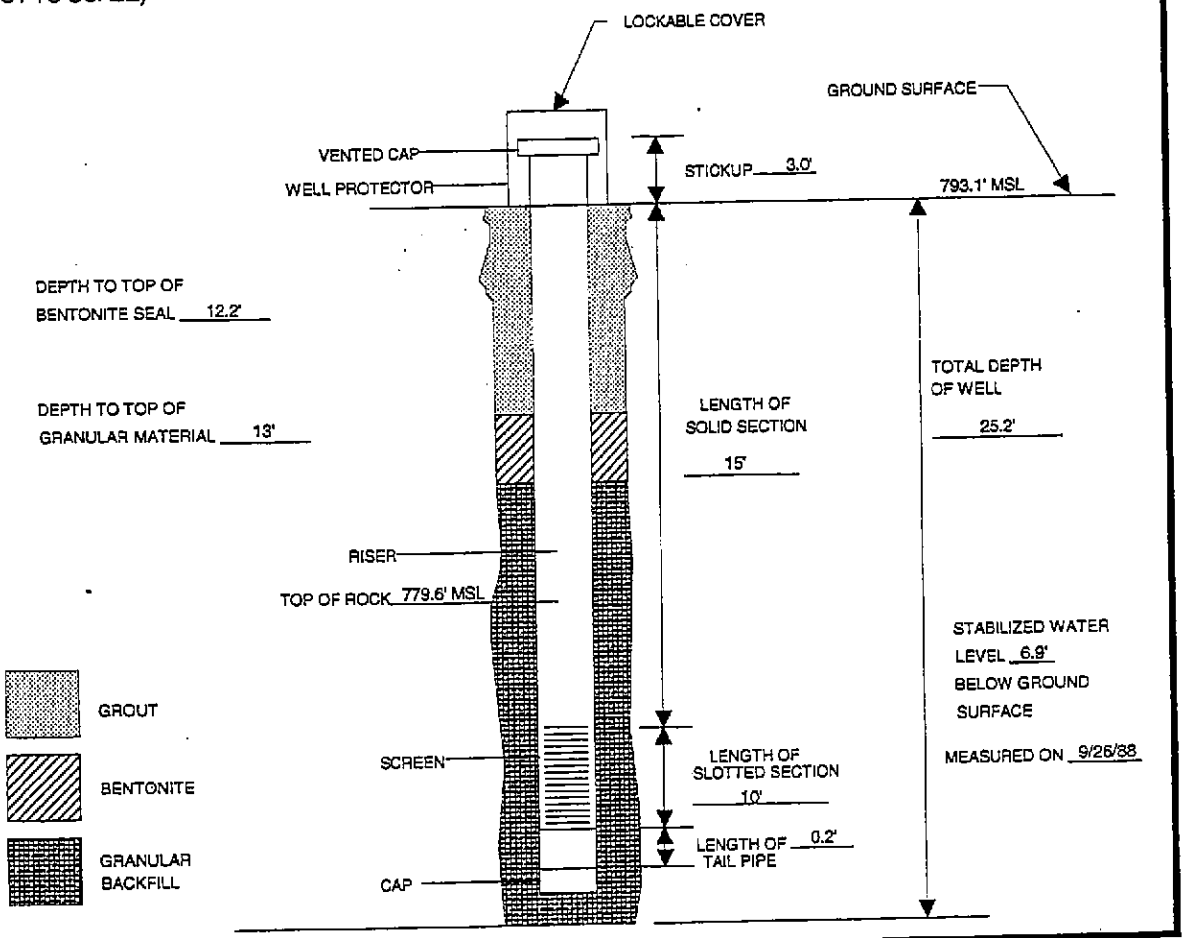
TVA-00018720

TYPE II MONITORING WELL INSTALLATION RECORD

PROJECT	KINGSTON STEAM PLANT	JOB NUMBER	K-88195
WELL NUMBER	J-15 A	INSTALLATION DATE	9-21-88
LOCATION	PLANT COORDINATES W 24+39,N 6+35	Tennessee Lambert NAD83 Easting 2406718 Northing 575840	
GROUND SURFACE ELEVATION	793.1' MSL	TOP OF INNER CASING	796.1' MSL
GRANULAR BACKFILL MATERIAL	QUARTZ SAND, COURSE	SLOT SIZE	.010 INCH
CASING MATERIAL	PVC	CASING DIAMETER	2 INCHES
DRILLING TECHNIQUE	AIR/WATER ROTARY	DRILLING CONTRACTOR	HIGHLAND DRILLING
BOREHOLE DIAMETER	8 INCHES	FIELD REPRESENTATIVE	H.W. ROBINSON
LOCKABLE COVER ?	YES	KEY CODE/COMBINATION	2043
RISER MATERIAL	PVC	SCREEN MATERIAL	PVC

COMMENTS

(NOT TO SCALE)



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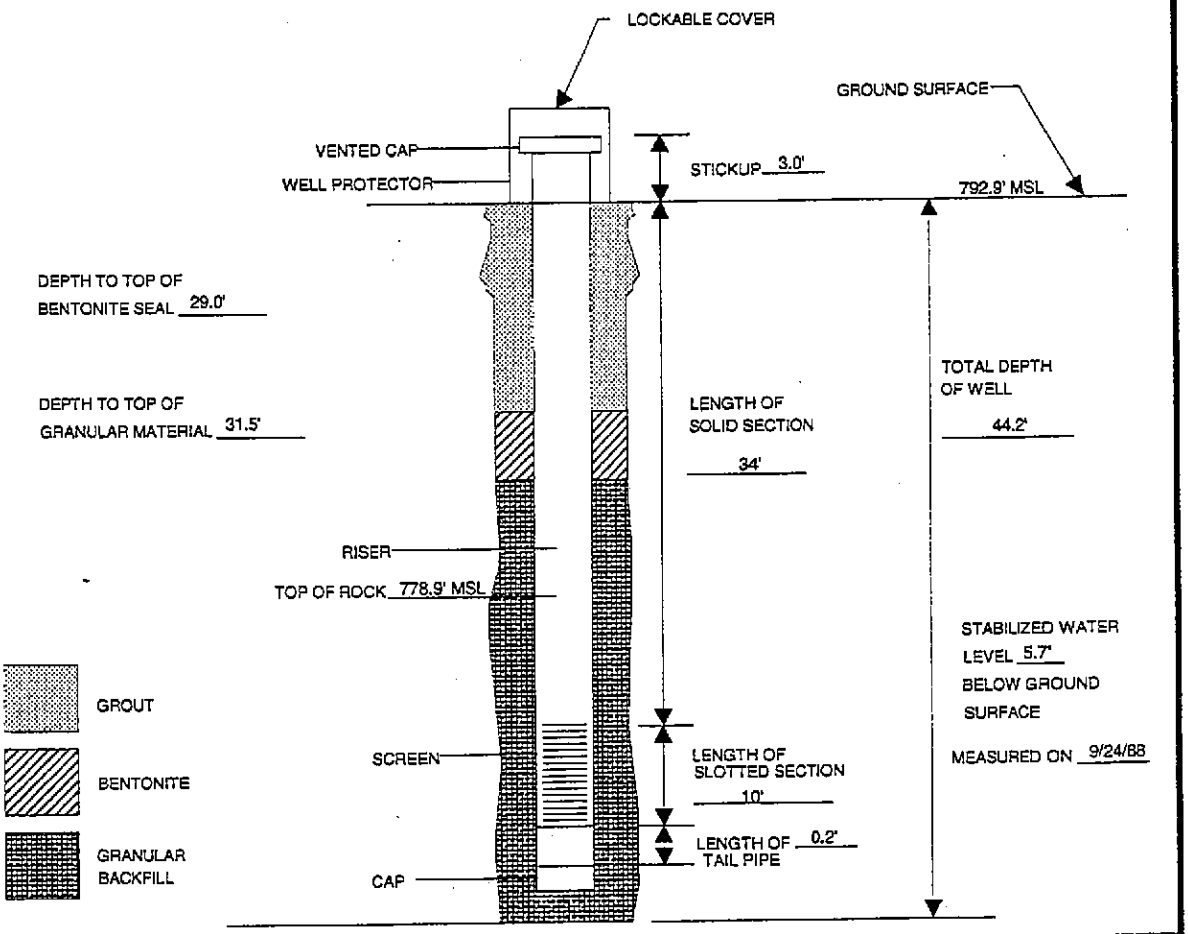
TYPE II MONITORING WELL INSTALLATION RECORD

PROJECT	KINGSTON STEAM PLANT	JOB NUMBER	K-88195
WELL NUMBER	J-15 B	INSTALLATION DATE	9-21-88
LOCATION	PLANT COORDINATES W 24+38,N 6+50	Tennessee Lambert NAD83	Easting 2406718 Northing 575840
GROUND SURFACE ELEVATION	792.9' MSL	TOP OF INNER CASING	795.9' MSL
GRANULAR BACKFILL MATERIAL	QUARTZ SAND, COARSE	SLOT SIZE	.010 INCH
CASING MATERIAL	PVC	CASING DIAMETER	2 INCHES
DRILLING TECHNIQUE	AIR/WATER ROTARY	DRILLING CONTRACTOR	HIGHLAND DRILLING
BOREHOLE DIAMETER	8 INCHES	FIELD REPRESENTATIVE	H.W. ROBINSON
LOCKABLE COVER ?	YES	KEY CODE/COMBINATION	2043
RISER MATERIAL	PVC	SCREEN MATERIAL	PVC

COMMENTS

(NOT TO SCALE)



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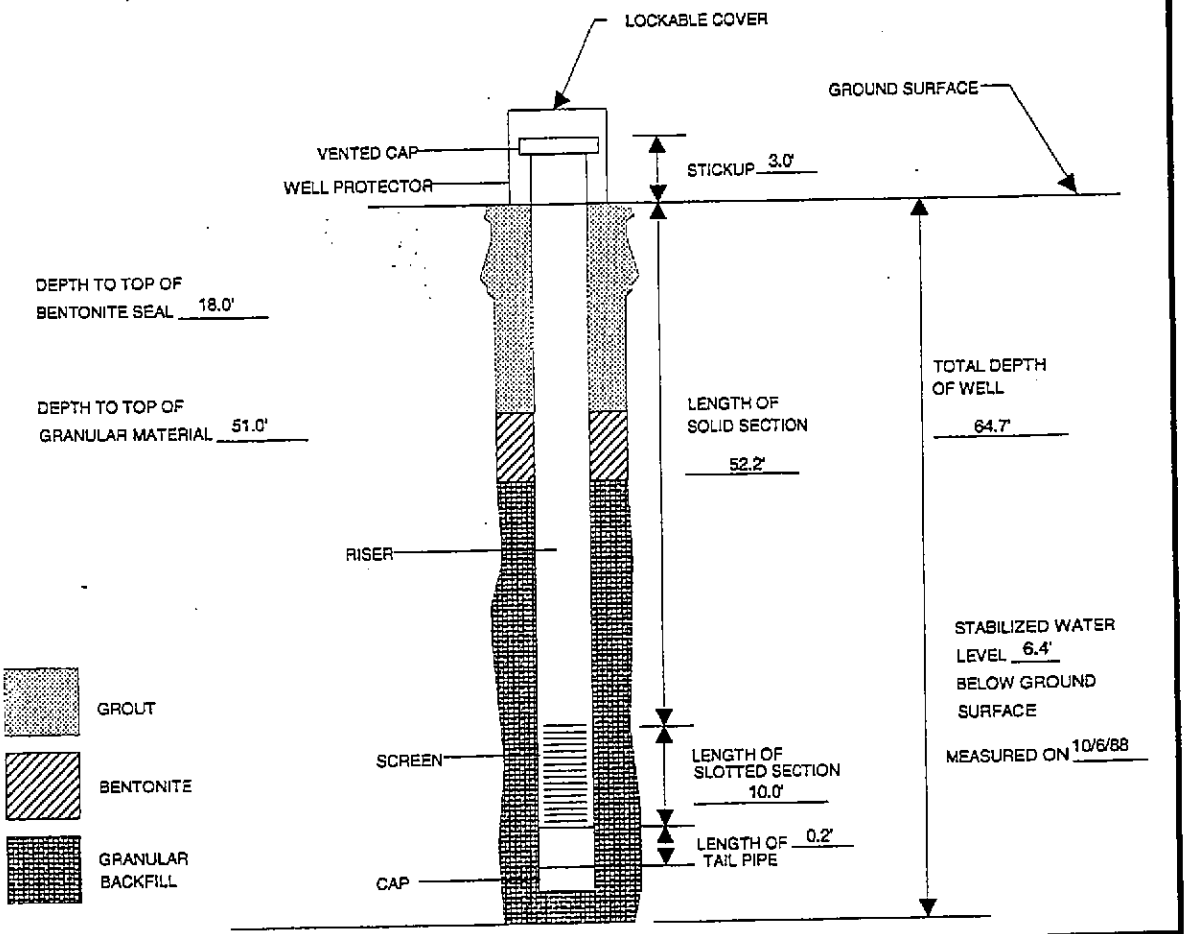
TYPE II MONITORING WELL INSTALLATION RECORD

PROJECT	KINGSTON STEAM PLANT	JOB NUMBER	K-88195
WELL NUMBER	J-16 A	INSTALLATION DATE	10-5-88
LOCATION	PLANT COORDINATES W 27+87,N 40+08	Tennessee Lambert NAD83 Easting 2407752 Northing 578181.56	
GROUND SURFACE ELEVATION	756.6' MSL	TOP OF INNER CASING	768.6' MSL
GRANULAR BACKFILL MATERIAL	QUARTZ SAND, COARSE	SLOT SIZE	.010 INCH
CASING MATERIAL	PVC	CASING DIAMETER	2 INCHES
DRILLING TECHNIQUE	POWER AUGER	DRILLING CONTRACTOR	HIGHLAND DRILLING
BOREHOLE DIAMETER	11 INCHES	FIELD REPRESENTATIVE	H.W. ROBINSON
LOCKABLE COVER ?	YES	KEY CODE/COMBINATION	2043
RISER MATERIAL	PVC	SCREEN MATERIAL	PVC

COMMENTS

(NOT TO SCALE)



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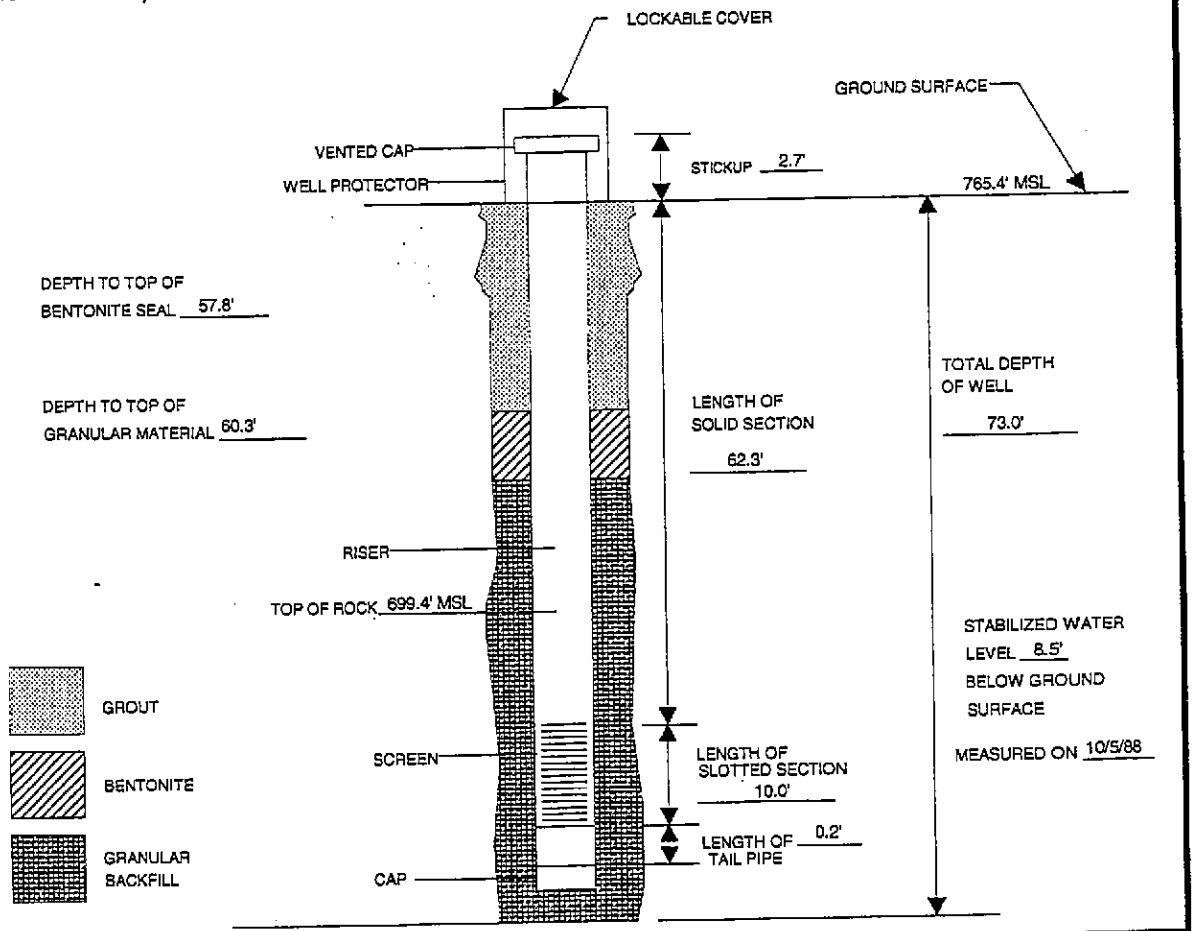
TYPE II MONITORING WELL INSTALLATION RECORD

PROJECT: KINGSTON STEAM PLANT
JOB NUMBER: K-88195
WELL NUMBER: J-16 B
INSTALLATION DATE: 9-23-88
LOCATION: PLANT COORDINATES W 27+80,N 40+34 Tennessee Lambert NAD83 Easting 2407751 Northing 578181.05
GROUND SURFACE ELEVATION: 765.4' MSL
TOP OF INNER CASING: 768.1' MSL
GRANULAR BACKFILL MATERIAL: QUARTZ SAND,COARSE
SLOT SIZE: .010 INCHES
CASING MATERIAL: PVC
CASING DIAMETER: 2 INCHES
DRILLING TECHNIQUE: AUGER AND AIR ROTARY
DRILLING CONTRACTOR: HIGHLAND DRILLING
BOREHOLE DIAMETER: 8" AUGER,5 7/8" AIR ROTARY
FIELD REPRESENTATIVE: H.W. ROBINSON
LOCKABLE COVER ?: YES
KEY CODE/COMBINATION: 2043
RISER MATERIAL: PVC
SCREEN MATERIAL: PVC
COMMENTS:

(NOT TO SCALE)



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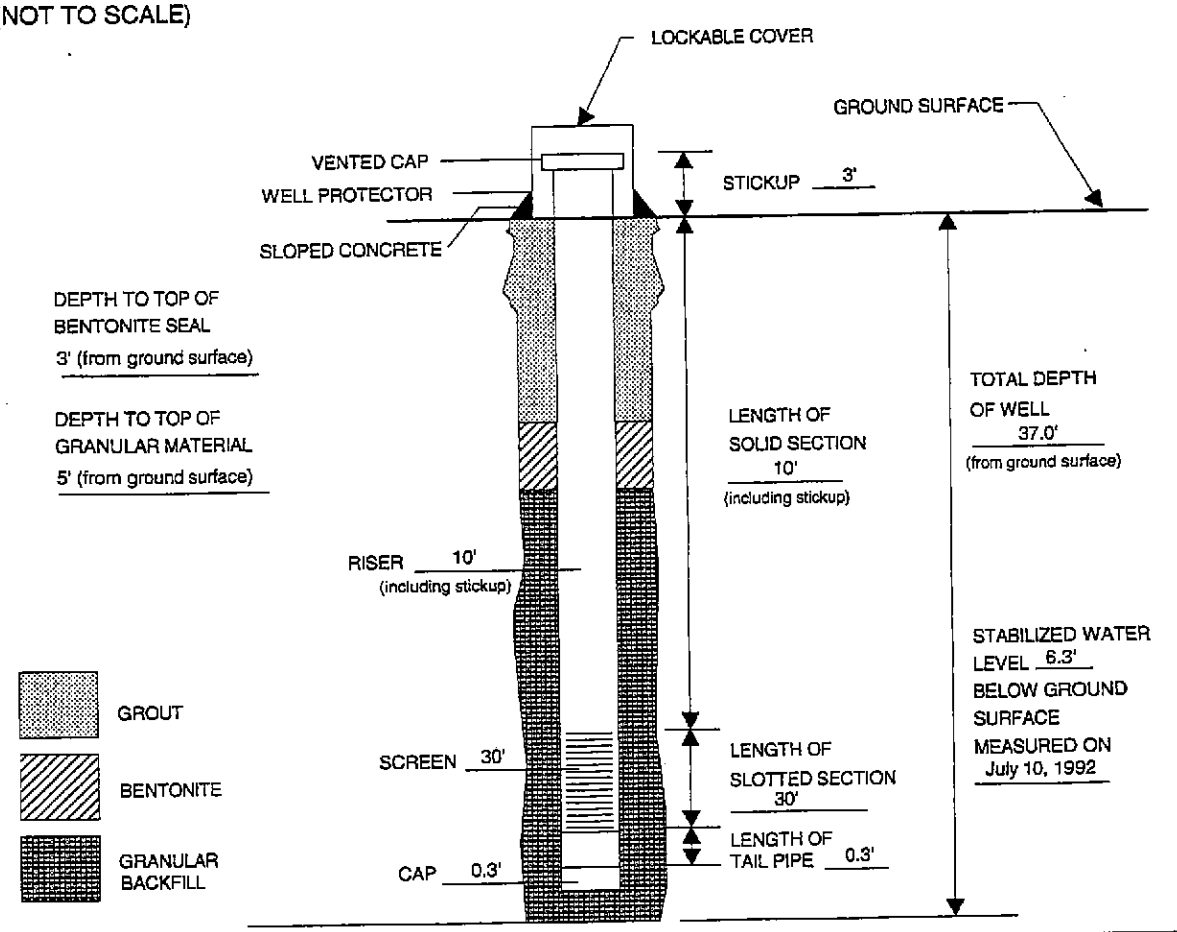
TYPE II MONITORING WELL INSTALLATION RECORD

PROJECT	Kingston Fossil Plant		
WELL NUMBER	17	INSTALLATION DATE	July 8, 1992
LOCATION	Tennessee Lambert NAD83	Easting 2410795.25	Northing 578066.65
GROUND SURFACE ELEVATION	762.42' MSL	TOP OF INNER CASING	765.42' MSL
GRANULAR BACKFILL MATERIAL	Sand	SLOT SIZE	0.010 "
CASING MATERIAL	4" SCH 40 PVC	CASING DIAMETER	4" SCH 40 PVC
DRILLING TECHNIQUE	HSA	DRILLING CONTRACTOR	John Voekel, Law Engr.
BOREHOLE DIAMETER	4.25" HSA (ID)	FIELD REPRESENTATIVE	Mel Wagner
LOCKABLE COVER ?	Yes	FILTER CLOTH AROUND SCREEN?	No

COMMENTS The 4.25" HSA was used first with the continuous sampling barrel.
Next, the 6.25" (ID) auger was used to provide room for the sand pack around the screen.

(NOT TO SCALE)



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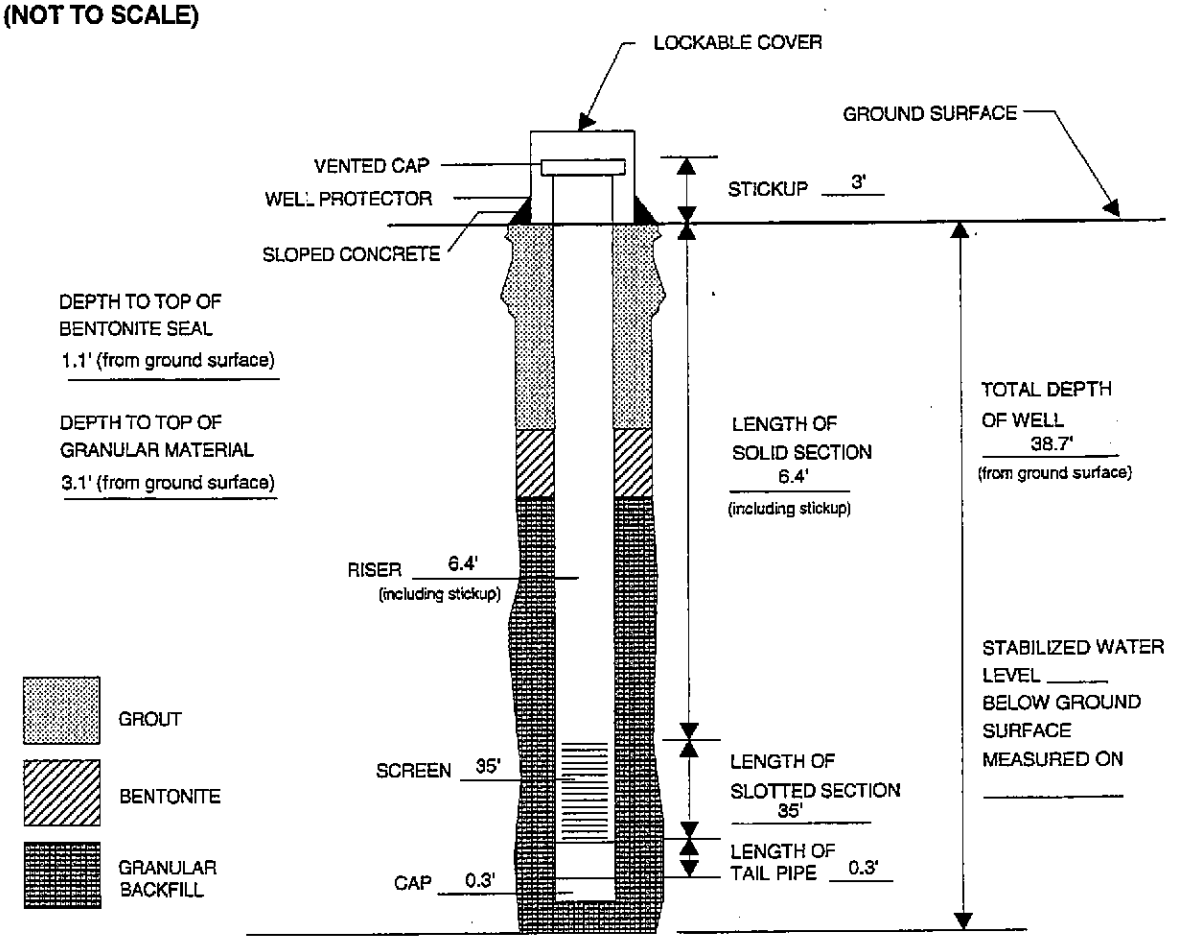
TYPE II MONITORING WELL INSTALLATION RECORD

PROJECT	Kingston Fossil Plant		
WELL NUMBER	18	INSTALLATION DATE	July 10, 1992
LOCATION	Tennessee Lambert NAD83	Easting 2410814.93	Northing 578075.63
GROUND SURFACE ELEVATION	764.32' MSL	TOP OF INNER CASING	767.32' MSL
GRANULAR BACKFILL MATERIAL	Sand	SLOT SIZE	0.010 "
CASING MATERIAL	4" SCH 40 PVC	CASING DIAMETER	4" SCH 40 PVC
DRILLING TECHNIQUE	HSA	DRILLING CONTRACTOR	John Voekel, Law Engr.
BOREHOLE DIAMETER	4.25" HSA (ID)	FIELD REPRESENTATIVE	Mel Wagner
LOCKABLE COVER ?	Yes	FILTER CLOTH AROUND SCREEN?	No

COMMENTS The 4.25" HSA was used first with the continuous sampling barrel.
Next, the 6.25" (ID) auger was used to provide room for the sand pack around the screen.

(NOT TO SCALE)



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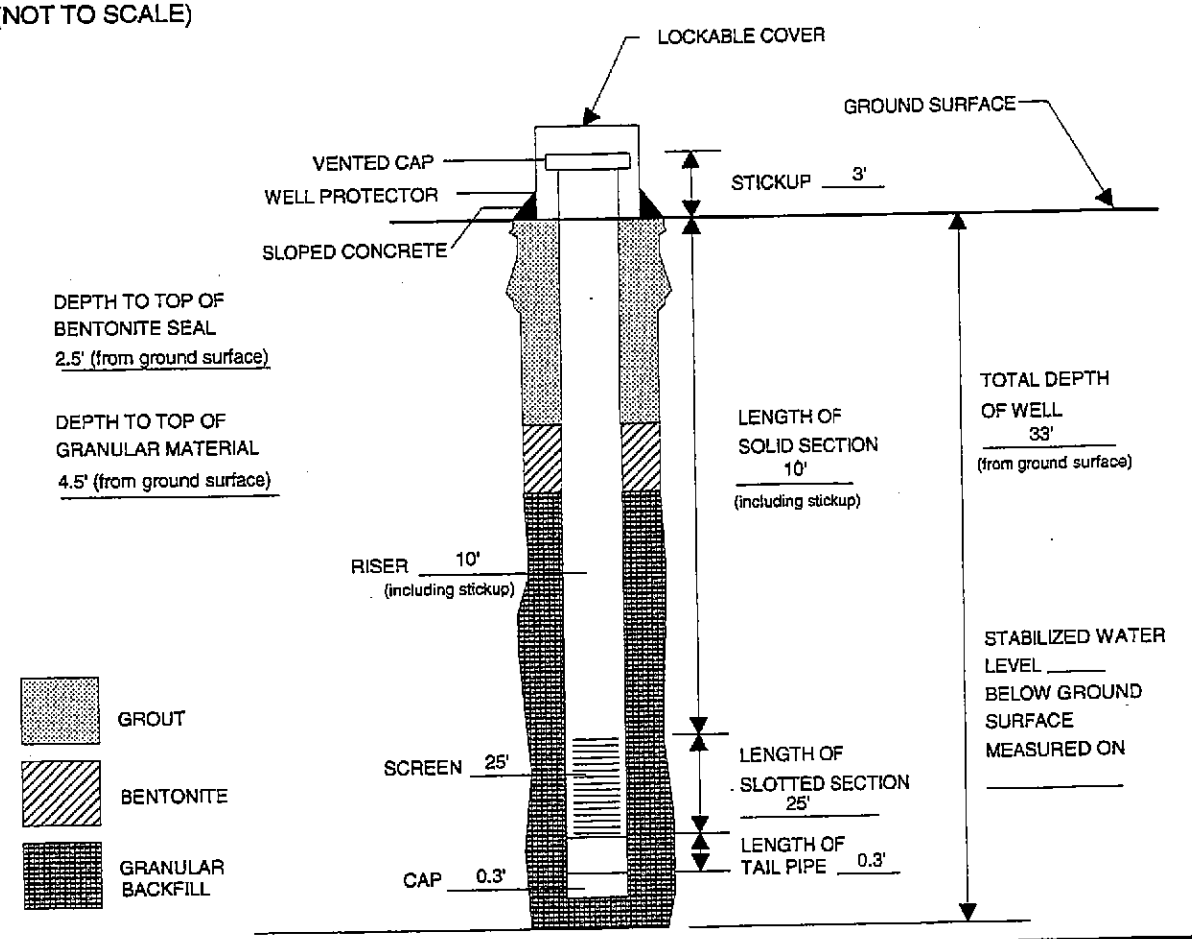
TYPE II MONITORING WELL INSTALLATION RECORD

PROJECT	Kingston Fossil Plant		
WELL NUMBER	19	INSTALLATION DATE	July 13, 1992
LOCATION	Tennessee Lambert NAD83	Easting 2410840.11	Northing 578086.78
GROUND SURFACE ELEVATION	763.90' MSL	TOP OF INNER CASING	766.90' MSL
GRANULAR BACKFILL MATERIAL	Sand	SLOT SIZE	0.010 "
CASING MATERIAL	4" SCH 40 PVC	CASING DIAMETER	4" SCH 40 PVC
DRILLING TECHNIQUE	HSA	DRILLING CONTRACTOR	John Voekel, Law Engr.
BOREHOLE DIAMETER	4.25" HSA (ID)	FIELD REPRESENTATIVE	Mel Wagner
LOCKABLE COVER ?	Yes	FILTER CLOTH AROUND SCREEN?	No

COMMENTS The 4.25" HSA was used first with the continuous sampling barrel.
Next, the 6.25" (ID) auger was used to provide room for the sand pack around the screen.

(NOT TO SCALE)



ENG LAB 6/19/95

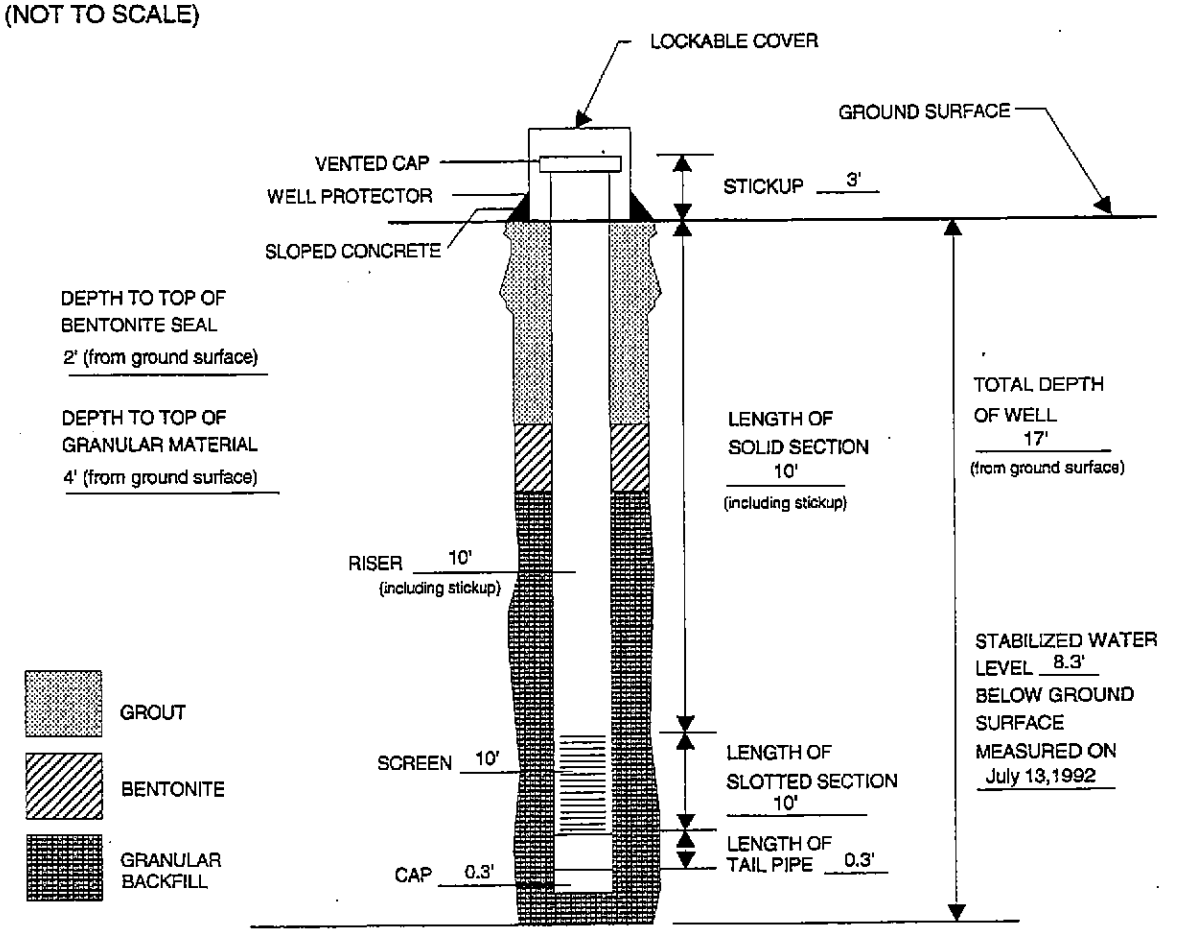
TYPE II MONITORING WELL INSTALLATION RECORD

PROJECT	Kingston Fossil Plant		
WELL NUMBER	20	INSTALLATION DATE	July 10, 1992
LOCATION	Tennessee Lambert NAD 83	Easting 2410890.94	Northing 578108.22
GROUND SURFACE ELEVATION	750.06' MSL	TOP OF INNER CASING	753.06' MSL
GRANULAR BACKFILL MATERIAL	Sand	SLOT SIZE	0.010 "
CASING MATERIAL	4" SCH 40 PVC	CASING DIAMETER	4" SCH 40 PVC
DRILLING TECHNIQUE	HSA	DRILLING CONTRACTOR	John Voekel, Law Engr.
BOREHOLE DIAMETER	4.25" HSA (ID)	FIELD REPRESENTATIVE	Mel Wagner
LOCKABLE COVER ?	Yes	FILTER CLOTH AROUND SCREEN?	No

COMMENTS The 4.25" HSA was used first with the continuous sampling barrel.

The 6.25" HSA was not used because the well was drilled in a clay-filled berm.

(NOT TO SCALE)



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MONITORING WELL INSTALLATION RECORD

PROJECT: Kingston Fossil Plant

WELL NUMBER: KIF-22

INSTALLATION DATE: July 10, 2002

TOP OF INNER CASING: 756.2 ft-msl

CASING MATERIAL: PVC Sch 80

DRILLING TECHNIQUE: Hollow-Stem Auger

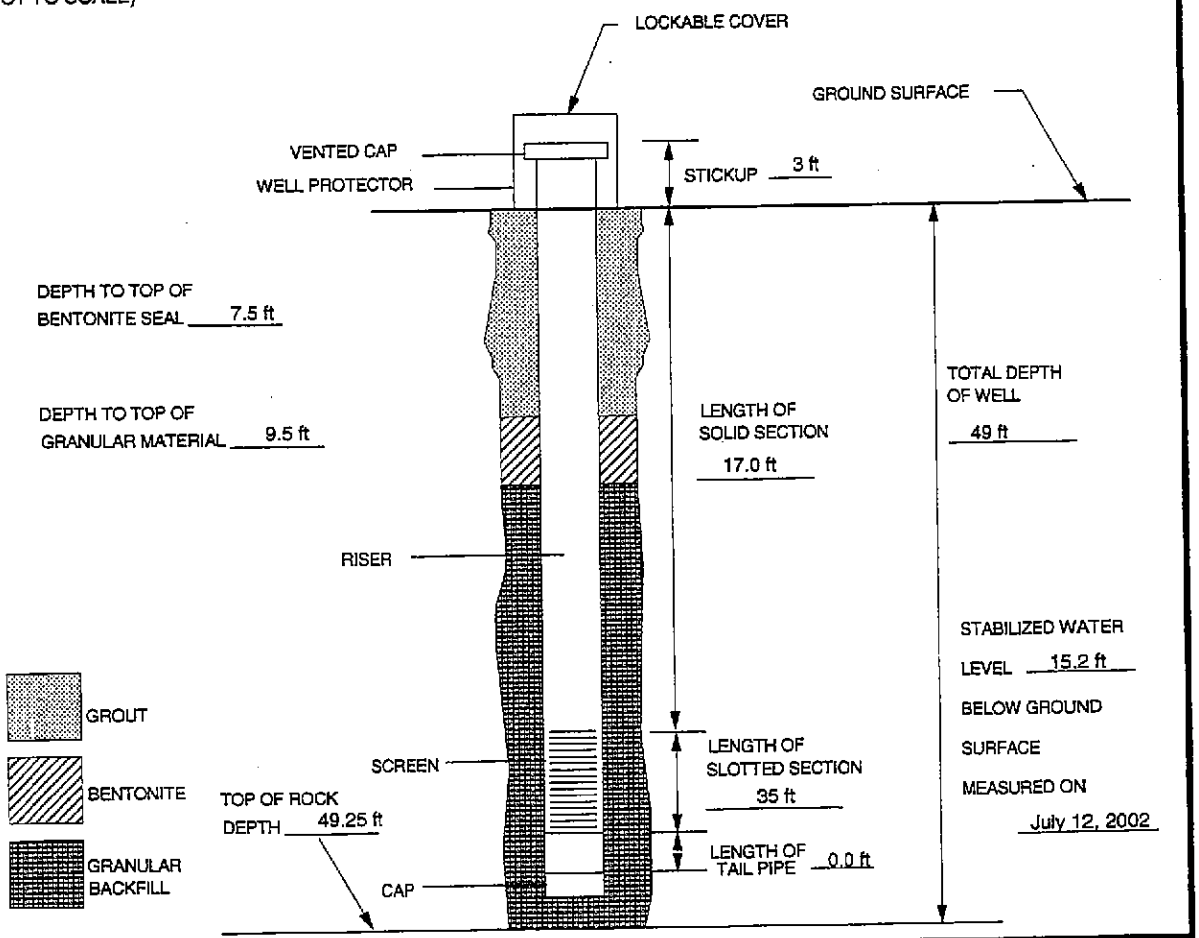
BOREHOLE DIAMETER: 8 1/4 in.

DRILLED BY: Lynn England

LOGGED BY: Jim Overton

COMMENTS: Filter sand was placed into the annulus from the bottom up with a sand injector.
Soil descriptions were taken from split spoon sampler.
Well completed with 4 inch by 4 inch by 5 foot lockable steel well protector and a 4 foot diameter concrete pad.
Four steel bollards were placed around the concrete pad.

(NOT TO SCALE)



APPENDIX C

SOIL GRAIN SIZE, MOISTURE CONTENT, AND ATTERBERG LIMITS DATA

TVA-00018730

This information taken from "Report of Geotechnical Exploration – Ash Disposal Area – Kingston Fossil Plant, Kingston, Tennessee," MACTEC Engineering and Consulting, Inc., May 4, 2004.

TVA-00018731

LABORATORY TEST PROCEDURES

Moisture Content

The moisture content in a given mass of soil is the ratio, expressed as a percentage, of the weight of the water to the weight of the solid particles. This test was conducted in accordance with ASTM D 2216.

Unit Weights

The moist or dry unit weight of a given soil mass is obtained by dividing the weight of the soil mass by the volume. Selected portions of the 3-inch split spoon and Shelby tube samples obtained during the exploration were measured and weighed in our laboratory to determine sample unit weights.

Specific Gravity of Soil Solids

The specific gravity of soil solids is the ratio of the mass of a unit volume of a soil solid to the mass of the same volume of gas-free distilled water at 20C. The test method for determining the specific gravity of soil solids that passes the 4.75-mm (No. 4) sieve using a water pycnometer is described in ASTM D 854, Method B, and "Test Methods for Specific Gravity of Soil Solids by Water Pycnometer".

Atterberg Limits

Originally, the Atterberg Limits consisted of seven "limits of consistency" of fine-grained soils. In current engineering usage, the term usually refers only to the liquid limit (LL) and plastic limit (PL). The LL (between the liquid and plastic states) is the water content at which a trapezoidal groove of specified shape, cut in moist soil held in a special cup, is closed after 25 taps on a hard rubber plate. The PL (between plastic and semi-solid states) is the water content at which the soil crumbles when rolled into threads of 1/8 inch in diameter.

The LL has been found to be proportional to the compressibility of the normally consolidated soil. The PI is the calculated difference in water contents between the LL and the PL. Together the LL and PI are used to classify silts and clays according to the Unified Soil Classification System

(ASTM D 2487). The PI is used to predict the potential for volume changes in confined soils beneath foundations or grade slabs. The LL, PL, and PI are determined in accordance with ASTM D 4318.

Grain Size Distribution

Grain Size Tests are performed to aid in determining the soil classification and the grain size distribution. The soil samples are prepared for testing according to ASTM D 421 (dry preparation) or ASTM D 2217 (wet preparation). If only the grain size distribution of soils coarser than a number 200 sieve (0.074-mm opening) is desired, the grain size distribution is determined by washing the sample over a number 200 sieve and, after drying, passing the samples through a standard set of nested sieves. If the grain size distribution of the soils finer than the number 200 sieve is also desired, the grain size distribution of the soils coarser than the number 10 sieve is determined by passing the sample through a set of nested sieves. Materials passing the number 10 sieve are dispersed with a dispersing agent and suspended in water, and the grain size distribution calculated from the measured settlement rate of the particles. These tests are conducted in accordance with ASTM D 422.

Triaxial Shear Tests

Triaxial shear tests are used to determine the strength characteristics and friction angle of a given soil sample. Triaxial tests are also used to determine the elastic properties of the soil specimen.

Triaxial shear tests are performed on several sections of a relatively undisturbed sample extruded from the sampling tube. The samples are trimmed into cylinders 1.4 to 2.8 inches in diameter and encased in rubber membranes. Each is then placed in a compression chamber and confined by all-around air pressure. The test results are presented in the form of stress-strain curves and Mohr envelopes, or p-q plots on the accompanying Triaxial Shear Test Sheets.

One of three types of triaxial tests is normally performed, the most suitable type being determined by the loading conditions imposed on the soil in the field and the soil characteristics.

1. Consolidated-Undrained (Designated as a CU or R Test)
2. Consolidated-Drained (designated as a CD or S Test)
3. Unconsolidated-Undrained (designated as a UU or Q Test)

Consolidation Test

Consolidation tests are conducted on representative soil samples to determine the change in height of the sample with increasing load. The results of these tests are used to estimate the amount and rate of settlement of structures constructed on similar soils.

A consolidation test is conducted according to ASTM D-2435 on a single section of an undisturbed sample extruded from a sample tube. The sample is trimmed into a disc 2.0 or 2.5 inches in diameter and 1 inch thick. The disc is confined in a steel ring and sandwiched between porous plates. Depending on the conditions in the field, the test may be conducted with a sample either at its natural moisture content or saturated. It is then subjected to incrementally increasing vertical loads, and the resulting deformations are measured with a micrometer dial gauge. Void ratios are then calculated from these deformation readings. The test results are presented in the form of pressure-versus-void-ratio curves on the accompanying Consolidation Test Sheet.

Falling Head Permeability Test

The test sample was taken from the bottom of the undisturbed sample. The physical dimensions and weight were obtained and the sample was encased in a rubber membrane and placed in a triaxial chamber. The sample was then back-pressure saturated until a B value of 0.95 or greater was reached. After saturation was obtained, the sample was consolidated under 10-psi confining stress. Upon completion of consolidation, a falling head permeability test was performed. The test was conducted in accordance with ASTM D 5084.

TABLE 3
NATURAL MOISTURE CONTENT AND ATTERBERG LIMITS LABORATORY TEST RESULTS

Boring Number	Sample Number	Sample Type	Sample Description/ Origin	Sample Depth (Feet)	Moisture Content (%)	Atterberg Limits		
						Liquid Limit (LL)	Plastic Limit (PL)	Plasticity Index (PI)
B-1	UD-1	UD	ASH	4-4.5	19	NT	NT	NT
B-1	UD-2	UD	Alluvium	65-67	20	NV	NP	NP
B-2	UD-4	UD	Alluvium	70-72	17	NV	NP	NP
B-3	1	SPT	ASH	0-1.5	24	NT	NT	NT
B-3	2	SPT	ASH	5-6.5	20	NT	NT	NT
B-3	3	SPT	ASH	10-11.5	16	NT	NT	NT
B-3	4	SPT	ASH	15-16.5	17	NT	NT	NT
B-3	5	SPT	ASH	20-21.5	39	NT	NT	NT
B-3	6	SPT	ASH	25-26.5	40	NT	NT	NT
B-3	7	SPT	ASH	30-31.5	34	NT	NT	NT
B-3	8	SPT	ASH	35-36.5	22	NT	NT	NT
B-3	9	SPT	ASH	40-41.5	22	NT	NT	NT
B-3	10	SPT	ASH	45-46.5	31	NT	NT	NT
B-3	11	SPT	ASH	50-51.5	39	NT	NT	NT
B-3	12	SPT	ASH	55-56.5	43	NT	NT	NT
B-3	13	SPT	FILL/ASH	60-61.5	30	NT	NT	NT
B-3	14	SPT	ASH	65-66.5	16	NT	NT	NT
B-4A	UD-1	UD	ASH	15-17	37	NT	NT	NT
B-4A	UD-3	UD	ASH	25-27	38	NT	NT	NT
B-5	1	SPT	ASH	0-1.5	22	NT	NT	NT
B-5	2	SPT	ASH	5-6.5	39	NT	NT	NT
B-5	3	SPT	ASH	10-11.5	25	NT	NT	NT
B-5	4	SPT	ASH	15-16.5	32	NT	NT	NT
B-5	5	SPT	ASH	20-21.5	30	NT	NT	NT
B-5	6	SPT	ASH	25-26.5	39	NT	NT	NT
B-5	7	SPT	ASH	30-31.5	41	NT	NT	NT
B-5	8	SPT	ASH	35-36.5	29	NT	NT	NT
B-5	9	SPT	ASH	40-41.5	34	NT	NT	NT
B-8	1	SPT	ASH	0-1.5	25	NT	NT	NT
B-8	2	SPT	ASH	5.8-7.3	20	NT	NT	NT
B-8	UD-2	UD	ASH	10-12	19	NT	NT	NT
B-8	3	SPT	ASH	12-13.5	22	NT	NT	NT
B-8	4	SPT	ASH	15-16.5	45	NT	NT	NT
B-8	UD-3	UD	ASH	20-22	32	NT	NT	NT

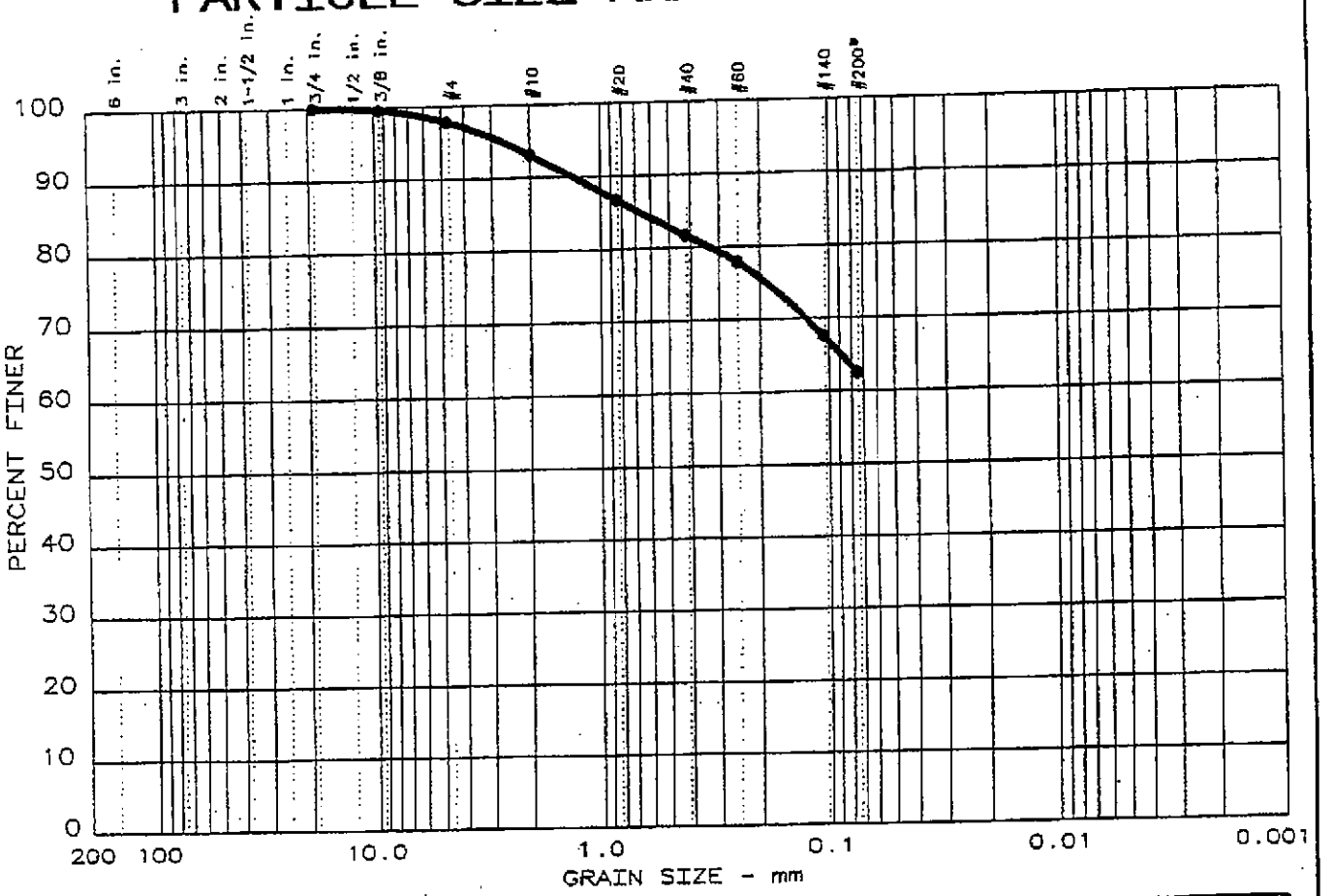
TABLE 3
NATURAL MOISTURE CONTENT AND ATTERBERG LIMITS LABORATORY TEST RESULTS

Boring Number	Sample Number	Sample Type	Sample Description/ Origin	Sample Depth (Feet)	Moisture Content (%)	Atterberg Limits		
						Liquid Limit (LL)	Plastic Limit (PL)	Plasticity Index (PI)
B-8	5	SPT	ASH	22-23.5	43	NT	NT	NT
B-8	6	SPT	ASH	25.6-27.1	27	NT	NT	NT
B-8	7	SPT	ASH	30-31.5	25	NT	NT	NT
B-8A	1	SPT	ASH	35-36.5	37	NT	NT	NT
B-8A	2	SPT	ASH	40-41.5	47	NT	NT	NT
B-8A	3	SPT	ASH	45-46.5	37	NT	NT	NT
B-8A	4	SPT	ASH	50-51.5	36	NT	NT	NT
B-8A	5	SPT	Alluvium	57-58.5	24	26	15	11
B-8A	6	SPT	Alluvium	62-63.5	24			
B-8A	UD-2	UD	Alluvium	60-62	22	26	16	10
B-8A	7	SPT	Alluvium	65-66.5	27	NV	NP	NP
B-8A	8	SPT	Alluvium	70-70.9	17			
B-10	1	SPT	ASH	0-1.5	18	NT	NT	NT
B-10	UD-1	UD	ASH	5-7	25	NT	NT	NT
B-10	2	SPT	ASH	7-8.5	28	NT	NT	NT
B-10	UD-2	UD	ASH	10-12	25	NT	NT	NT
B-10	3	SPT	ASH	12-13.5	30	NT	NT	NT
B-10	UD-3	UD	ASH	15-17	38	NT	NT	NT
B-10	4	SPT	ASH	17-18.5	45	NT	NT	NT
B-10	UD-4	UD	ASH	20-22	37	NT	NT	NT
B-10	5	SPT	ASH	22-23.5	32	NT	NT	NT
B-10	6	SPT	ASH	25-26.5	48	NT	NT	NT
B-10	7	SPT	Alluvium	30-31.5	25	NT	NT	NT
B-10	UD-5	UD	Alluvium	35-37	22	NV	NP	NP
B-10	8	SPT	Alluvium	37-38.5	20	NT	NT	NT

NT - Not Tested
NV – Non-Viscous
NP - Non-Plastic
SPT - Standard Penetration Test

Prepared By CTJ Date 5/4/04 Checked By MBH Date 5/4/04

PARTICLE SIZE ANALYSIS REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	15	0.0	2.2	35.3	62.5	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	NV	NP	0.668							

MATERIAL DESCRIPTION	USCS	AASHTO
● Grey Bottom Ash with Fly Ash		

Project No.: 3043-04-1009.0001
Project: TVA Kingston Ash Disposal Area
● Location: B-1A & B Bulk @ 0'-5'

Date: 04-19-04

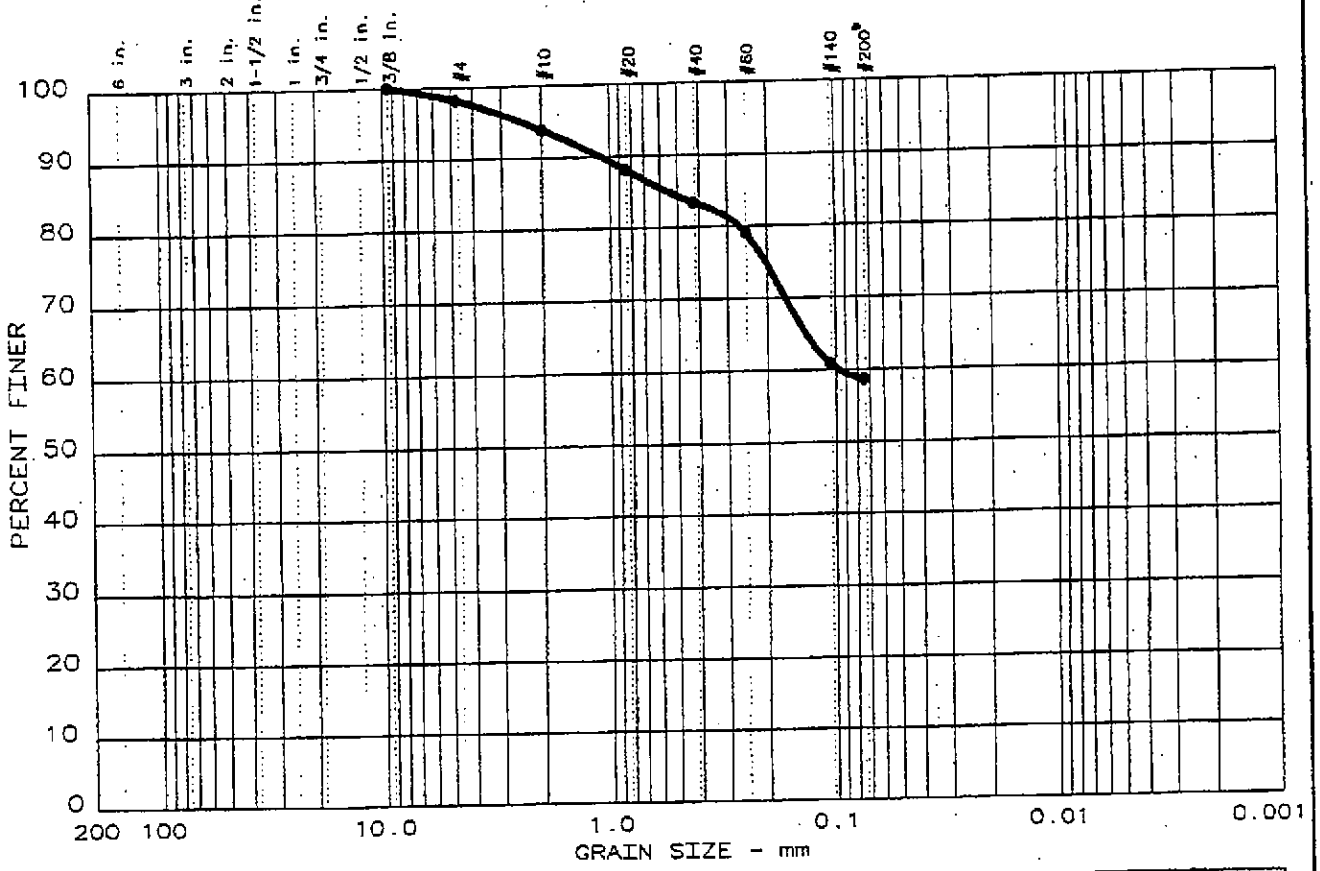
Remarks:
Specific Gravity: 2.35

PARTICLE SIZE ANALYSIS REPORT

LAW ENGINEERING AND ENVIRONMENTAL SERVICES

Fig. No.: ———

PARTICLE SIZE ANALYSIS REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	6	0.0	1.8	39.4	58.8	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	NV	NP	0.550	0.0966						

MATERIAL DESCRIPTION	USCS	AASHTO
● Grey Fly Ash with Bottom Ash		

Project No.: 3043-04-1009.0001
Project: TVA Kingston Ash Disposal Area
● Location: B-1 UD @ 4'-4.5'

Date: 04-19-04

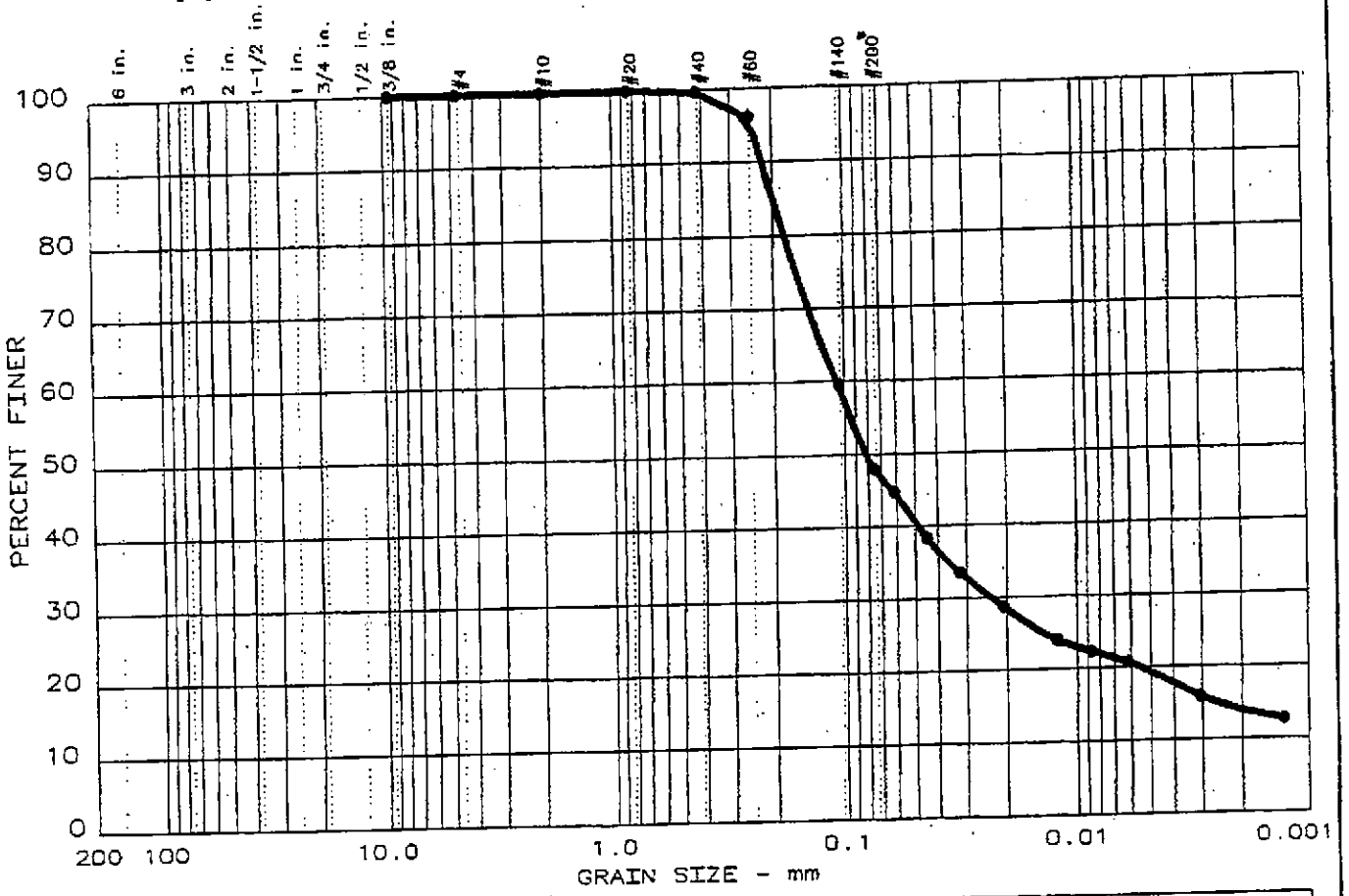
Remarks:
Moisture Content: 19.0%

PARTICLE SIZE ANALYSIS REPORT

LAW ENGINEERING AND ENVIRONMENTAL SERVICES

Fig. No.: ———

PARTICLE SIZE ANALYSIS REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	5	0.0	0.0	52.1	28.6	19.3

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	NV	NP	0.198	0.107	0.0814	0.0235	0.0026			

MATERIAL DESCRIPTION	USCS	AASHTO
● Orange-Grey Silty Fine Sand	SM	

Project No.: 3043-04-1009.0001
Project: TVA Kingston Ash Disposal Area
● Location: B-1 UD @ 65'-67'

Date: 04-19-04

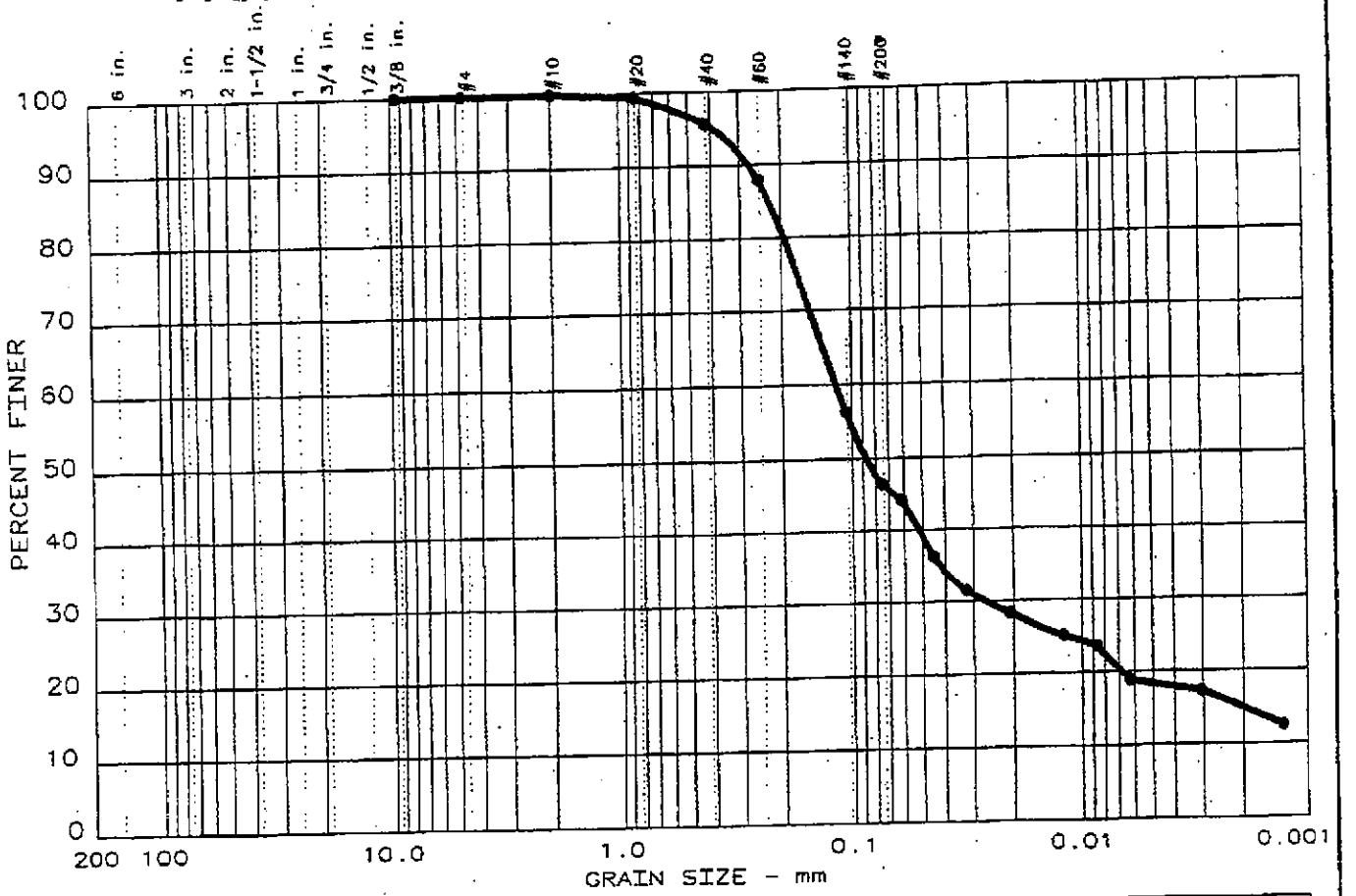
Remarks:
Moisture Content: 20.0%

PARTICLE SIZE ANALYSIS REPORT

LAW ENGINEERING AND ENVIRONMENTAL SERVICES

Fig. No.: ———

PARTICLE SIZE ANALYSIS REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	2	0.0	0.0	53.5	28.1	18.4

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	NV	NP	0.224	0.116	0.0878	0.0265	0.0020			

MATERIAL DESCRIPTION	USCS	AASHTO
● Orange-Brown Silty Fine Sand	SM	

Project No.: 3043-04-1009.0001
Project: TVA Kingston Ash Disposal Area
● Location: B-2 UD @ 70'-72'

Date: 04-19-04

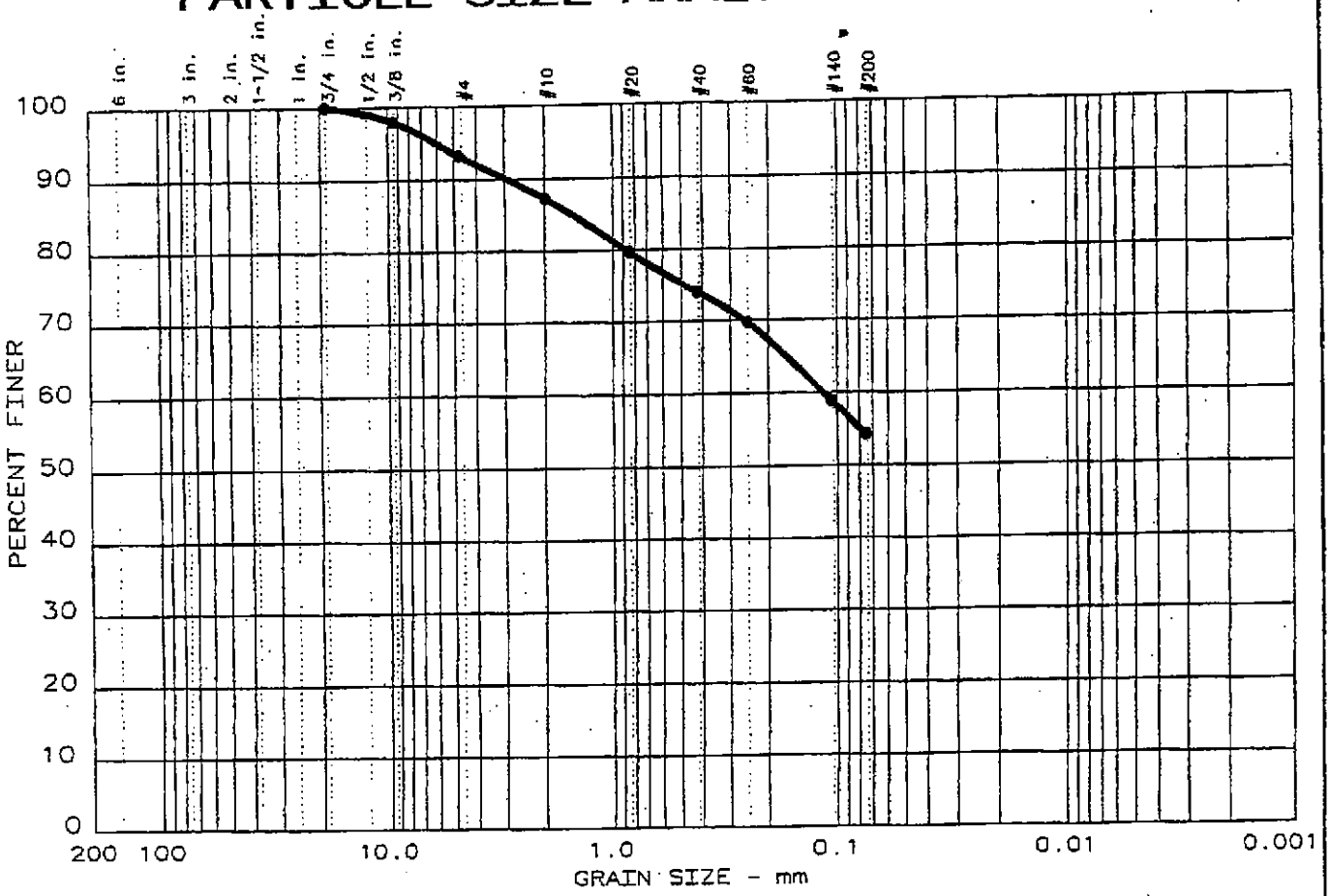
Remarks:
Moisture Content: 16.8%

PARTICLE SIZE ANALYSIS REPORT

LAW ENGINEERING AND ENVIRONMENTAL SERVICES

Fig. No.: ———

PARTICLE SIZE ANALYSIS REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	16	0.0	6.8	38.9	54.3	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	NV	NP	1.51	0.114						

MATERIAL DESCRIPTION	USCS	AASHTO
● Grey Bottom Ash with Fly Ash		

Project No.: 3043-04-1009.0001
Project: TVA Kingston Ash Disposal Area
● Location: B-2A Bulk @ 0'-5'

Date: 04-19-04

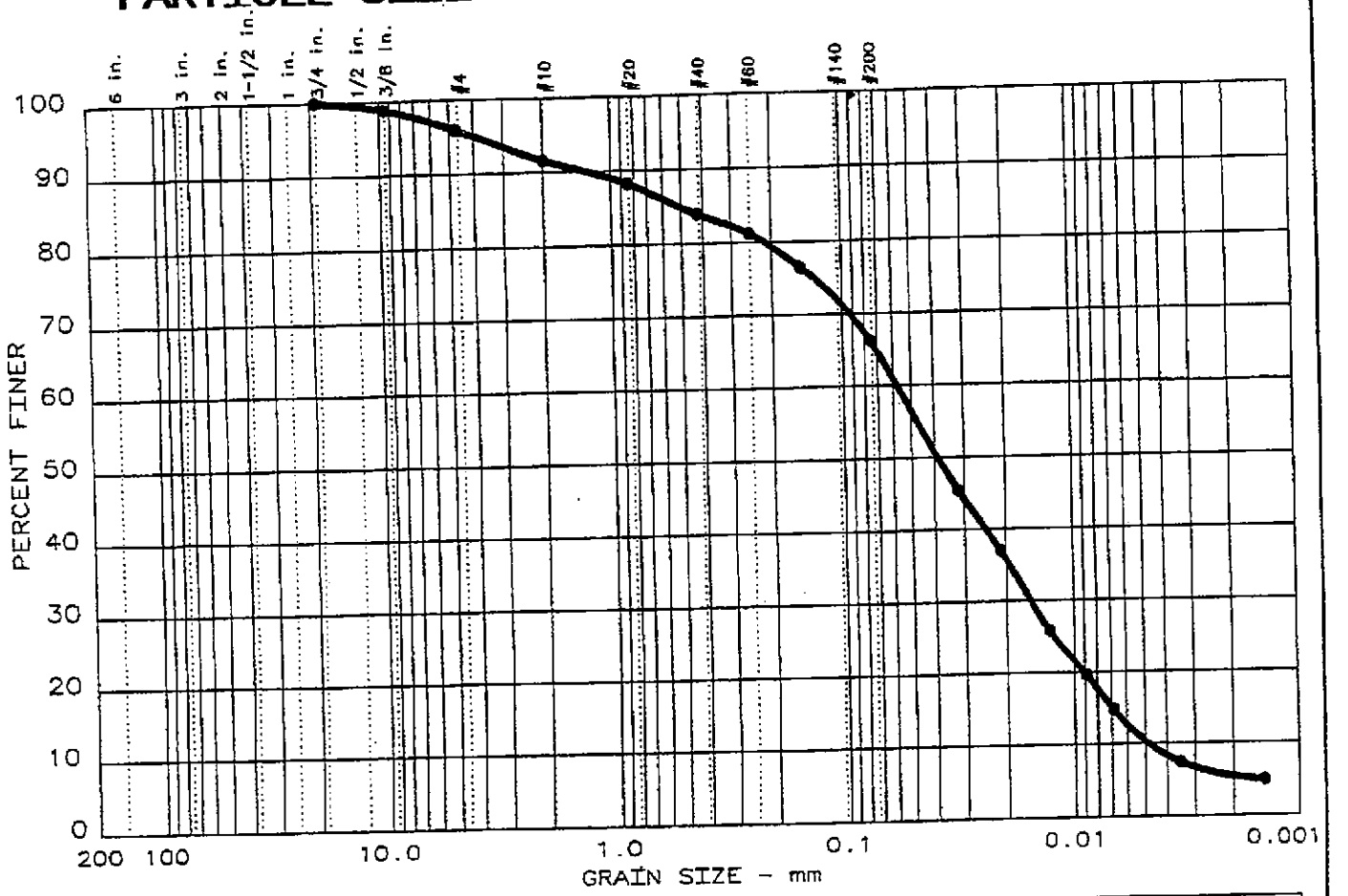
Remarks:
Specific Gravity: 2.40

PARTICLE SIZE ANALYSIS REPORT

LAW ENGINEERING AND ENVIRONMENTAL SERVICES

Fig. No.: _____

PARTICLE SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	LL	PI
●	4	0.0	4.0	29.7	56.0	10.3	NT	NT	NT

SIEVE inches size	PERCENT FINER ●		
0.75	100.0		
0.375	98.8		
	GRAIN SIZE		
D_{60}	0.0569		
D_{30}			
D_{10}	0.0048		
	COEFFICIENTS		
C_c	0.89		
C_u	11.8		

SIEVE number size	PERCENT FINER ●		
4	96.0		
10	91.6		
20	88.3		
40	84.0		
60	81.3		
100	76.5		
200	66.3		

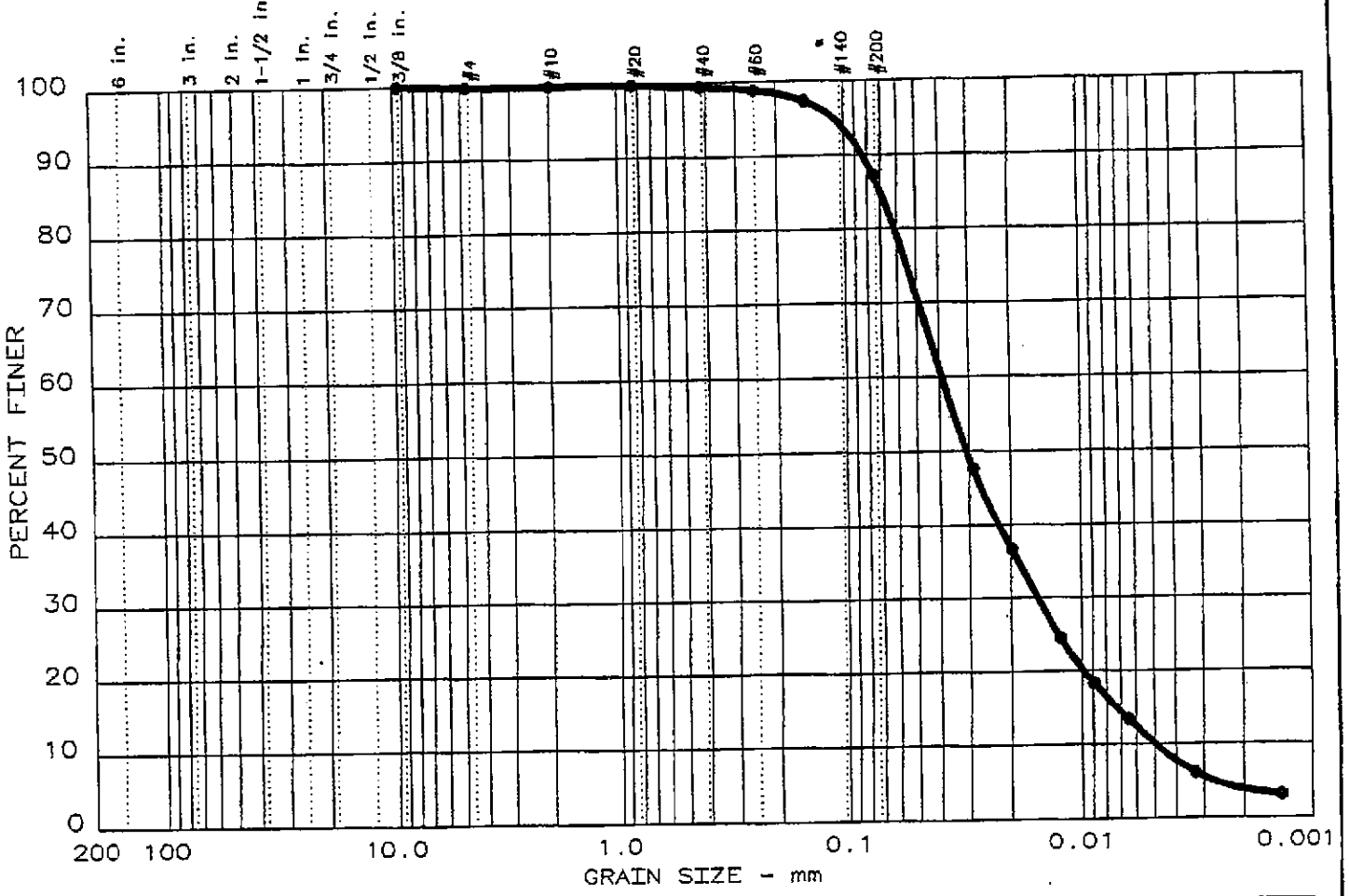
Sample information:
● B-3, 5-6.5' & 10-11.5'
Gray ash
SPT Samples

Remarks:
Methods: Particle Size: ASTM D 422-63(2002); Specific Gravity of Portion < No. 10: 2.40

LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.

Project No.: 3043041009.0001
Project: TVA Kingston Ash
Date: April 21, 2004
Fig. No.: B3

PARTICLE SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	LL	PI
●	5	0.0	0.2	12.6	77.1	10.1	NT	NT	NT

SIEVE inches size	PERCENT FINER ●		
0.375	100.0		
	GRAIN SIZE		
D_{60}	0.0391		
D_{30}			
D_{10}	0.0049		
	COEFFICIENTS		
C_c	1.23		
C_u	8.0		

SIEVE number size	PERCENT FINER ●		
4	99.8		
10	99.7		
20	99.7		
40	99.4		
60	98.9		
100	97.3		
200	87.2		

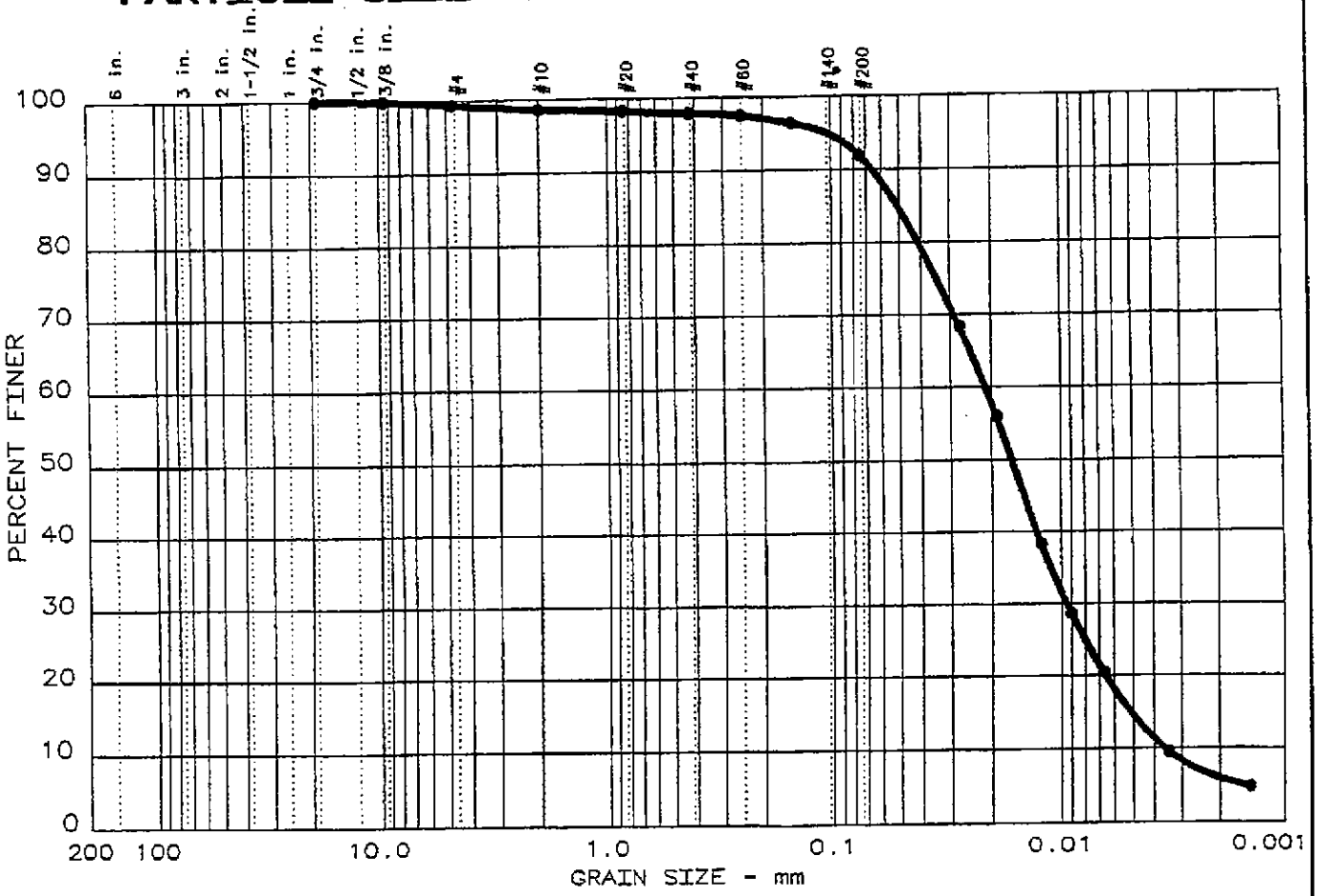
Sample information:
● B-3,15-16.5' & 20-21.5'
Gray ash
SPT Samples

Remarks:
Methods: Particle Size: ASTM D 422-63(2002): Specific Gravity of Portion < No. 10: 2.58

LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.

Project No.: 3043041009.0001
Project: TVA Kingston Ash
Date: April 21, 2004
Fig. No.: B3

PARTICLE SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	LL	PI
●	6	0.0	0.7	7.3	77.4	14.6	NT	NT	NT

SIEVE inches size	PERCENT FINER ●		
0.75	100.0		
0.375	99.9		
	GRAIN SIZE		
D_{60}	0.0211		
D_{30}			
D_{10}	0.0036		
	COEFFICIENTS		
C_c	1.20		
C_u	5.9		

SIEVE number size	PERCENT FINER ●		
4	99.3		
10	98.6		
20	98.3		
40	97.9		
60	97.5		
100	96.4		
200	92.0		

Sample information:
● B-3,25-26.5' & 30-31.5'
Gray ash
SPT Samples

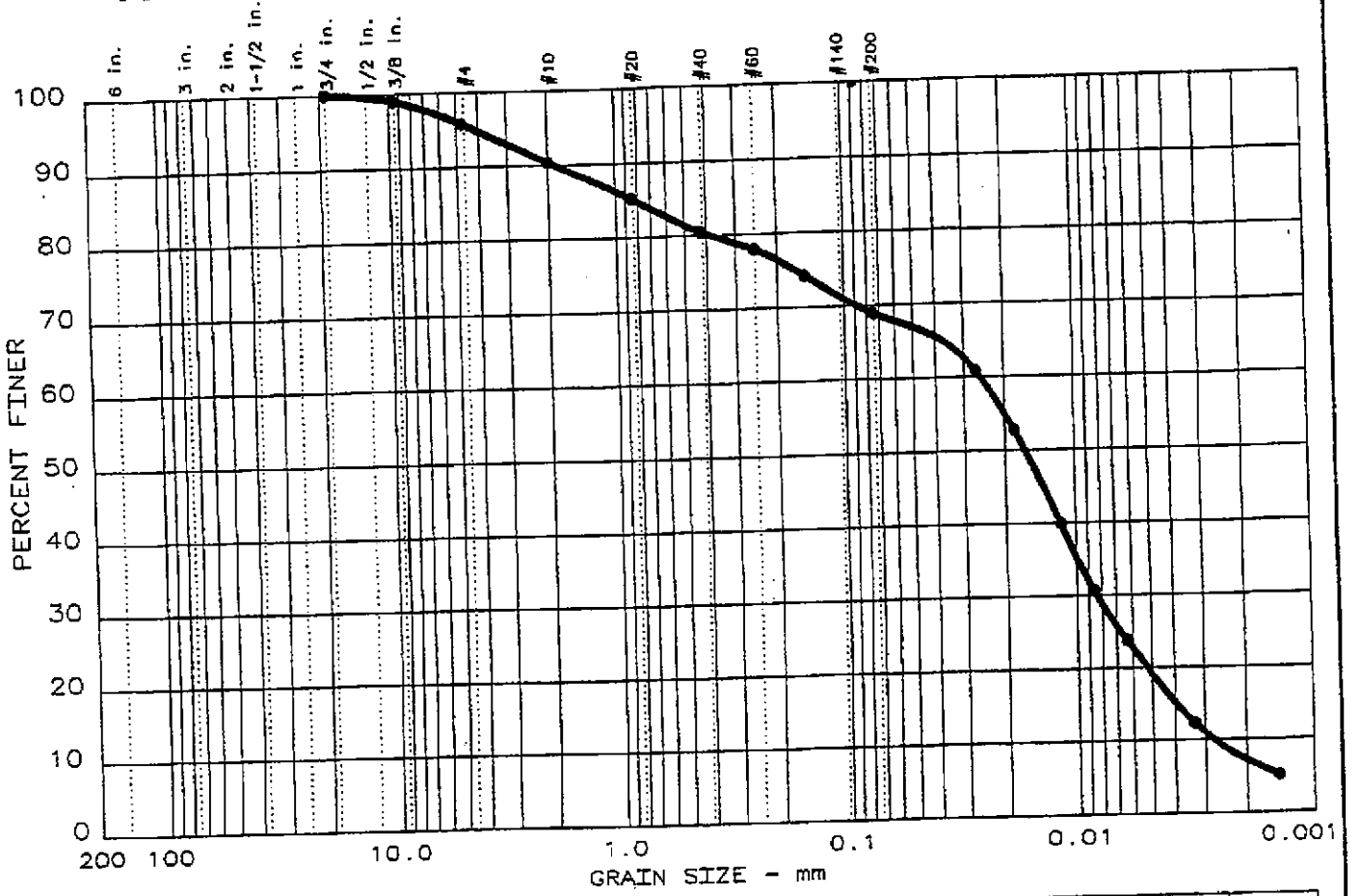
Remarks:
Methods: Particle Size: ASTM D 422-63(2002); Specific Gravity of Portion < No. 10: 2.42

LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.

Project No.: 3043041009.0001
Project: TVA Kingston Ash

Date: April 21, 2004 Fig. No.: B3

PARTICLE SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	LL	PI
●	7	0.0	4.2	26.8	49.7	19.3	NT	NT	NT

SIEVE inches size	PERCENT FINER ●		
0.75	100.0		
0.375	99.0		
	GRAIN SIZE		
D_{60}	0.0251		
D_{30}			
D_{10}	0.0027		
	COEFFICIENTS		
C_c	1.01		
C_u	9.2		

SIEVE number size	PERCENT FINER ●		
4	95.8		
10	90.4		
20	85.2		
40	80.5		
60	78.0		
100	74.3		
200	69.0		

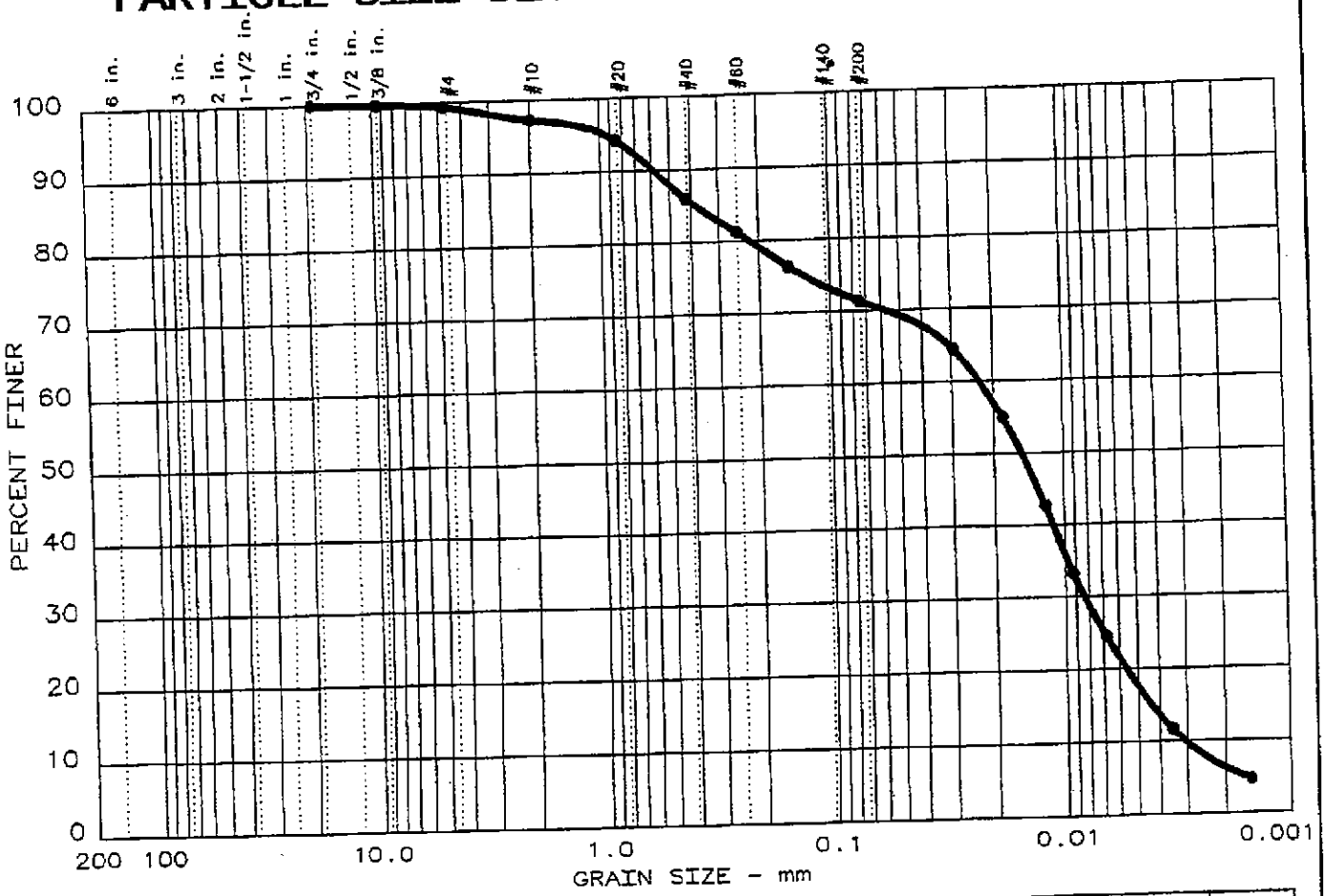
Sample information:
● B-3,40-41.5' & 45-46.5'
Gray ash
SPT Samples

Remarks:
Methods: Particle Size: ASTM D 422-63(2002): Specific Gravity of Portion < No. 10: 2.40

LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.

Project No.: 3043041009.0001
Project: TVA Kingston Ash
Date: April 21, 2004
Fig. No.: B3

PARTICLE SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	LL	PI
●	11	0.0	0.7	27.9	53.6	17.8	NT	NT	NT

SIEVE inches size	PERCENT FINER ●		
0.75	100.0		
0.375	99.8		
GRAIN SIZE			
D_{60}	0.0226		
D_{30}			
D_{10}	0.0031		
COEFFICIENTS			
C_c	1.01		
C_u	7.4		

SIEVE number size	PERCENT FINER ●		
4	99.3		
10	97.3		
20	94.3		
40	86.0		
60	81.3		
100	76.4		
200	71.4		

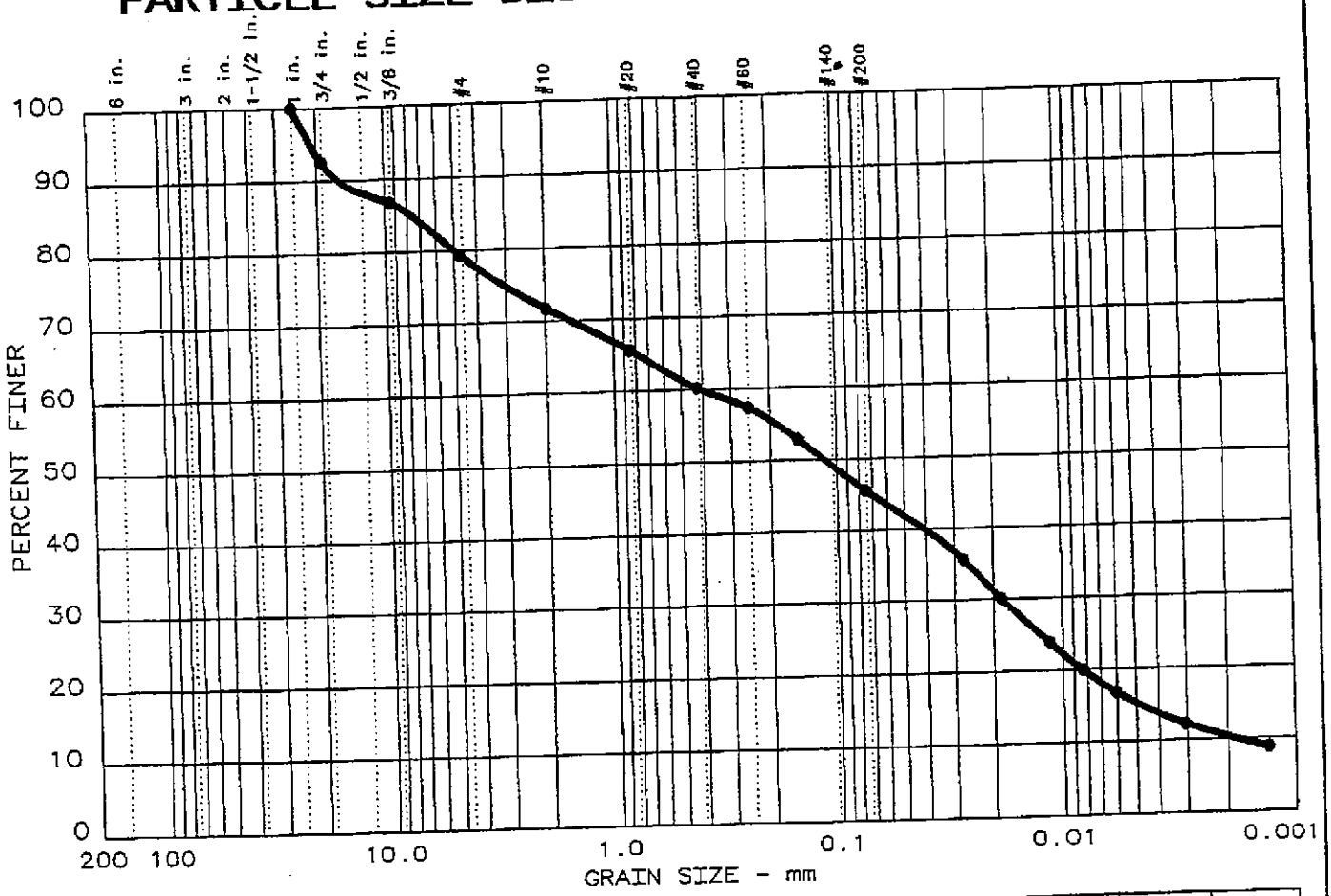
Sample information:
● B-3,50-51.5. & 55-56.5'
Gray ash
SPT Samples

Remarks:
Methods: Particle Size: ASTM D 422-63(2002); Specific Gravity of Portion < No. 10: 2.27

LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.

Project No.: 3043041009.0001
Project: TVA Kingston Ash
Date: April 15, 2004
Fig. No.: B3

PARTICLE SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	LL	PI
●	8	0.0	20.6	33.8	30.3	15.3	NT	NT	NT

SIEVE inches size	PERCENT FINER ●		
1	100.0		
0.75	92.5		
0.375	86.8		
	GRAIN SIZE		
D_{60}	0.403		
D_{30}			
D_{10}	0.0017		
	COEFFICIENTS		
C_c	0.48		
C_u	234.4		

SIEVE number size	PERCENT FINER ●		
4	79.4		
10	71.8		
20	65.7		
40	60.3		
60	57.4		
100	52.8		
200	45.6		

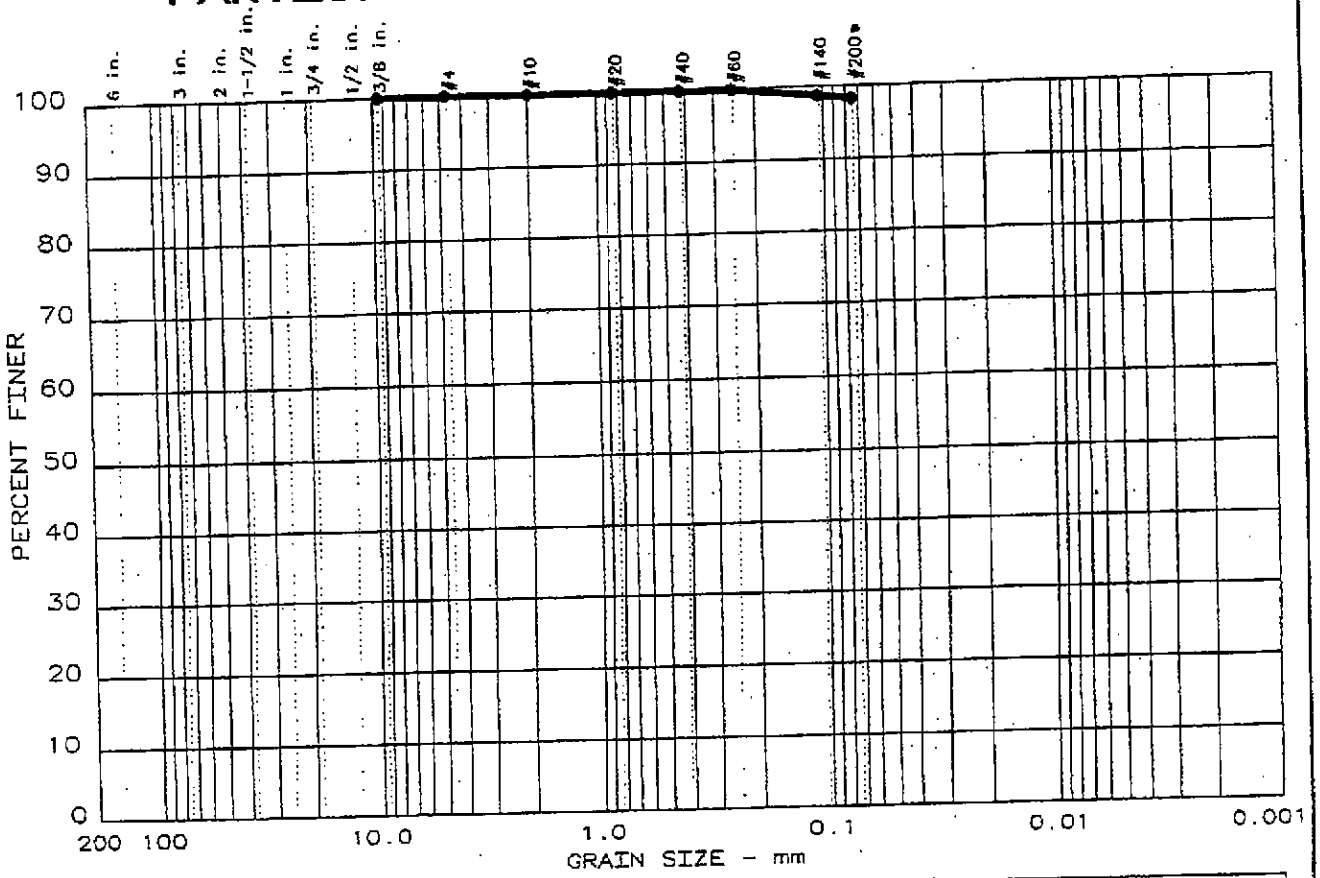
Sample information:
● B-3, 60-61.5' & 65-66.5'
Gray and brown ash
SPT Samples

Remarks:
Methods: Particle Size: ASTM D 422-63(2002); Specific Gravity of Portion < No. 10: 2.54

LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.

Project No.: 3043041009.0001
Project: TVA Kingston Ash
Date: April 21, 2004
Fig. No.: B3

PARTICLE SIZE ANALYSIS REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	7	0.0	0.0	1.8	98.2	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	NV	NP								

MATERIAL DESCRIPTION	USCS	AASHTO
● Grey Fly Ash		

Project No.: 3043-04-1009.0001
Project: TVA Kingston Ash Disposal Area
● Location: B-4A UD @ 15'-17'

Date: 04-19-04

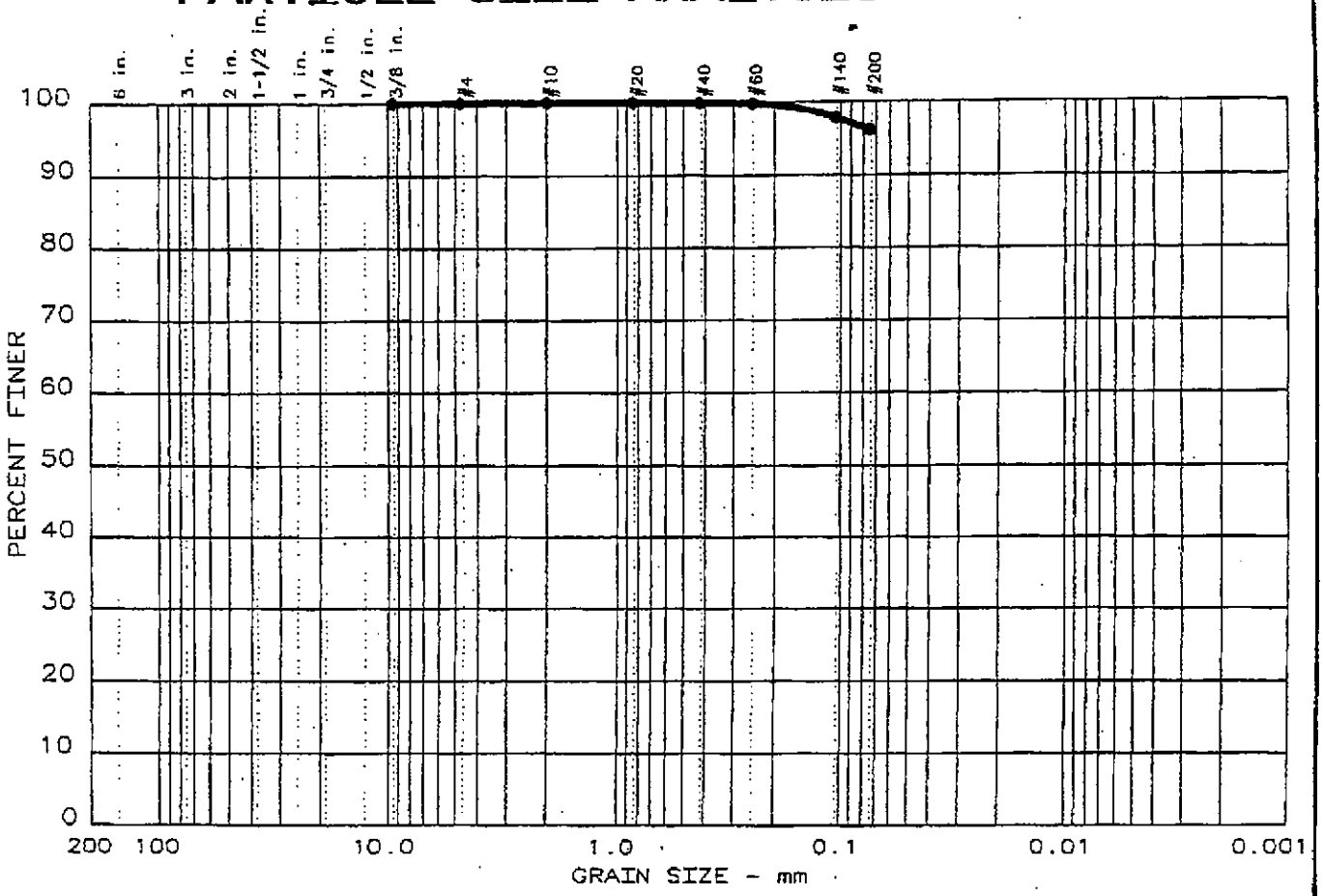
Remarks:
Moisture Content: 37.2%

PARTICLE SIZE ANALYSIS REPORT

LAW ENGINEERING AND ENVIRONMENTAL SERVICES

Fig. No.: ———

PARTICLE SIZE ANALYSIS REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	8	0.0	0.0	3.8	96.2	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	NV	NP								

MATERIAL DESCRIPTION	USCS	AASHTO
● Grey Fly Ash		

Project No.: 3043-04-1009.0001
Project: TVA Kingston Ash Disposal Area
● Location: B-4A UD @ 25'-27'

Date: 04-19-04

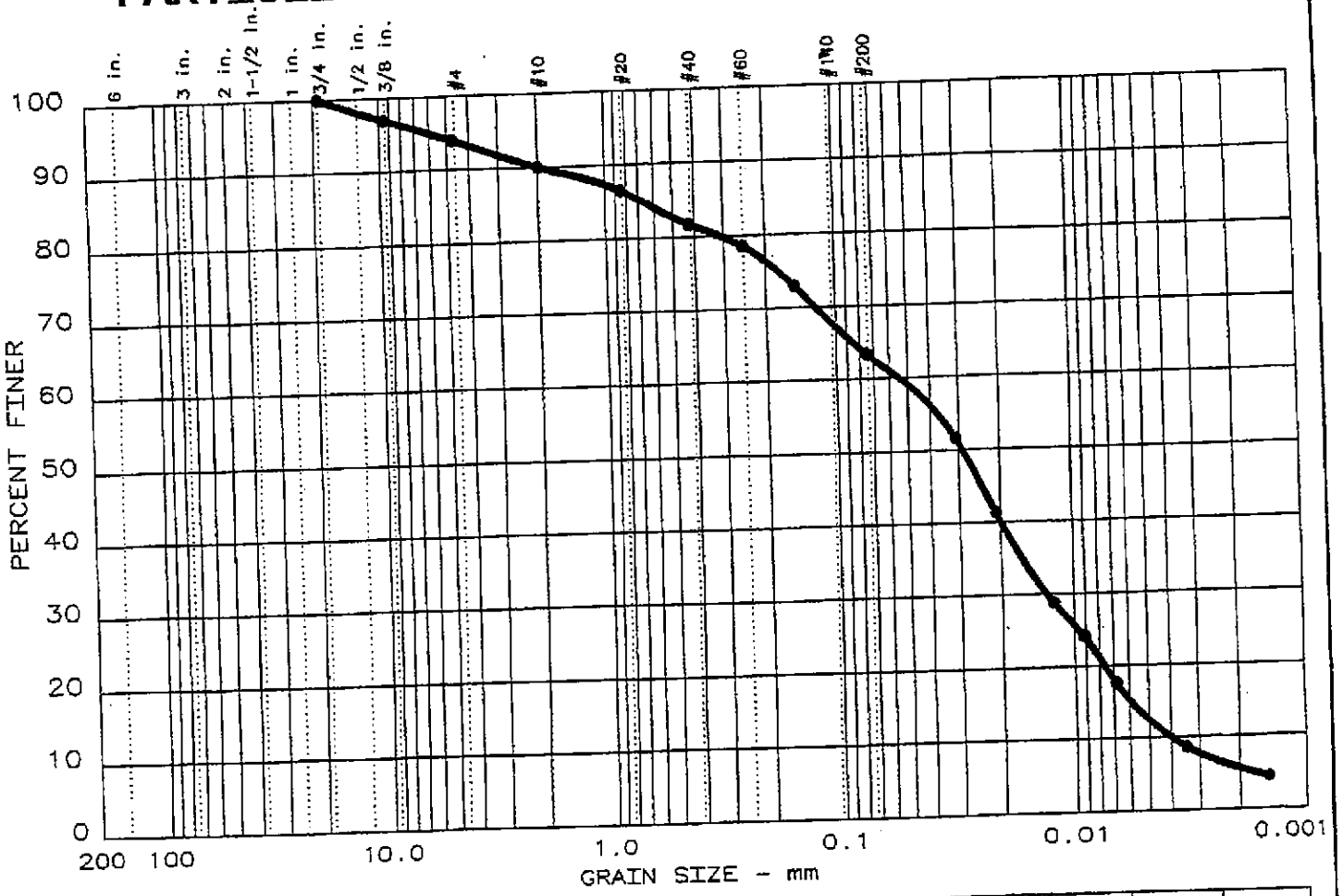
Remarks:
Moisture Content: 32.0%
Specific Gravity: 2.32

PARTICLE SIZE ANALYSIS REPORT

LAW ENGINEERING AND ENVIRONMENTAL SERVICES

Fig. No.: _____

PARTICLE SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	LL	PI
●	9	0.0	6.0	30.6	51.0	12.4	NT	NT	NT

SIEVE inches size	PERCENT FINER ●		
0.75	100.0		
0.375	97.0		
	GRAIN SIZE		
D_{60}	0.0543		
D_{30}			
D_{10}	0.0040		
	COEFFICIENTS		
C_c	0.77		
C_u	13.6		

SIEVE number size	PERCENT FINER ●		
4	94.0		
10	90.0		
20	86.5		
40	81.7		
60	78.6		
100	73.0		
200	63.4		

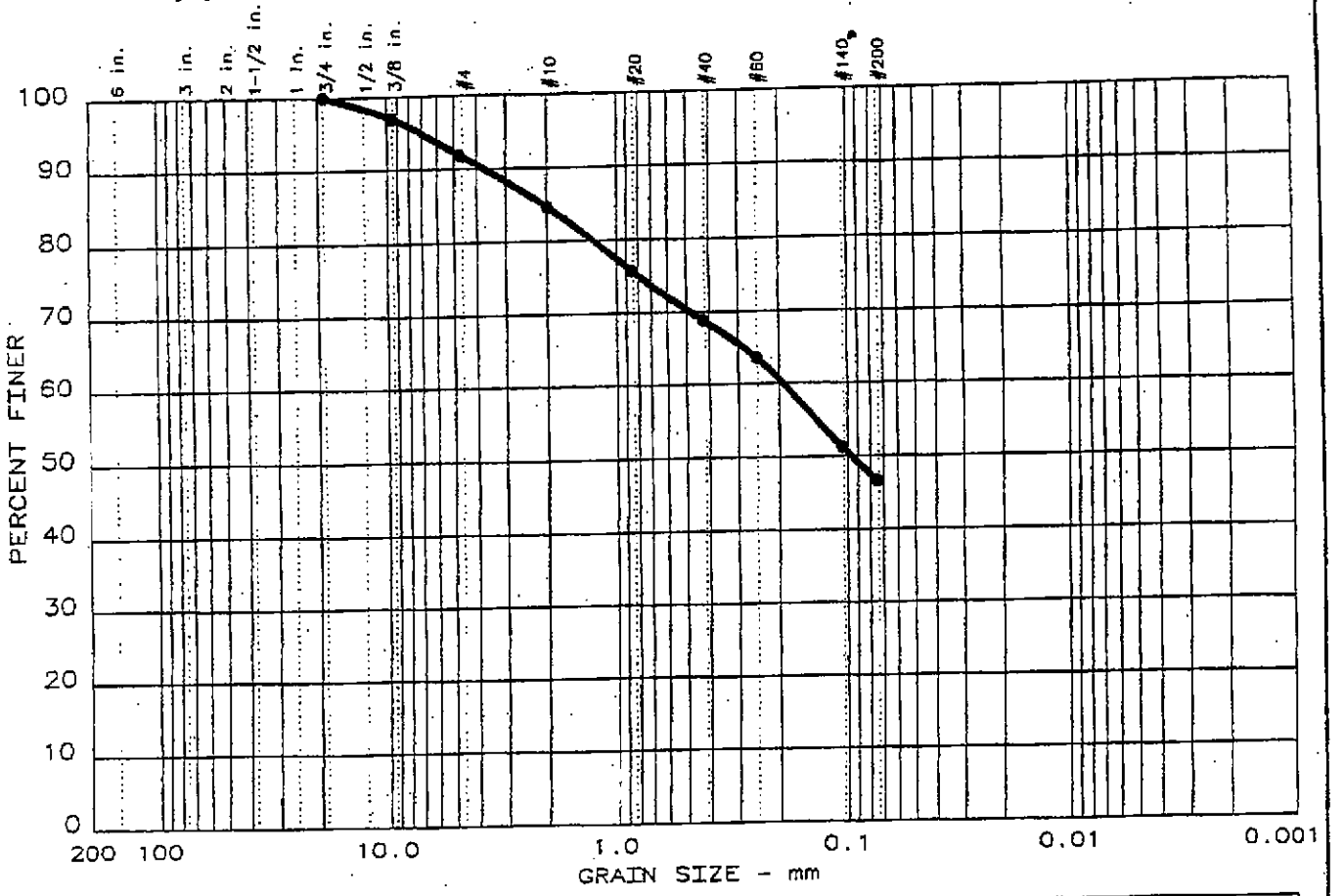
Sample information:
● B-8, 0-1.5' & 5.8-7.3'
Gray ash
SPT Samples

Remarks:
Methods: Particle Size: ASTM D 422-63(2002); Specific Gravity of Portion < No. 10: 2.35

LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.

Project No.: 3043041009.0001
Project: TVA Kingston Ash
Date: April 21, 2004
Fig. No.: B8

PARTICLE SIZE ANALYSIS REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	9	0.0	8.1	45.3	46.6	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	NV	NP	2.07	0.188	0.0966					

MATERIAL DESCRIPTION	USCS	AASHTO
● Grey Bottom Ash with Fly Ash		

Project No.: 3043-04-1009.0001
Project: TVA Kingston Ash Disposal Area
● Location: B-8 UD @ 10'-12'

Date: 04-19-04

Remarks:

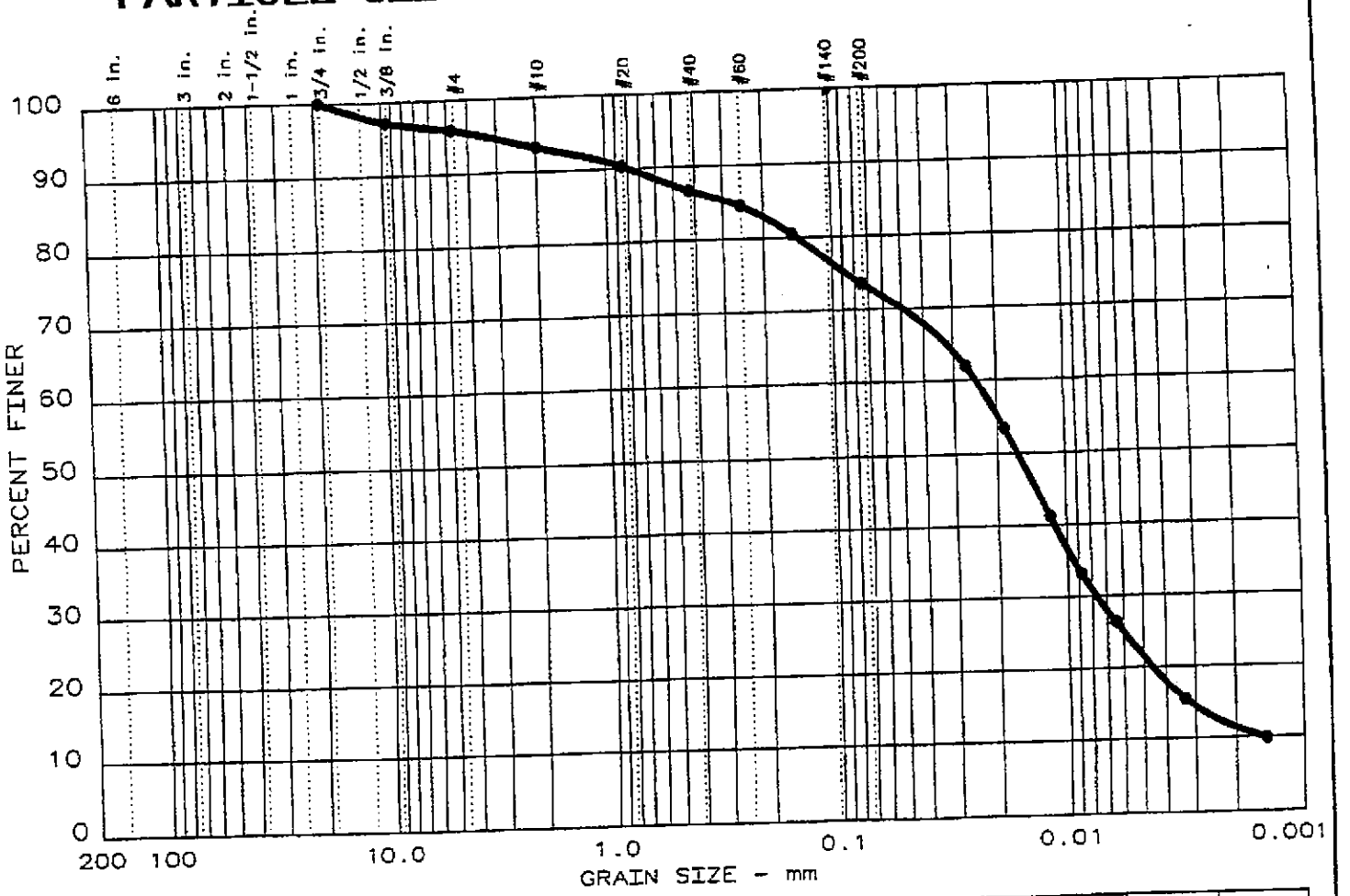
Moisture Content: 19.4%

PARTICLE SIZE ANALYSIS REPORT

LAW ENGINEERING AND ENVIRONMENTAL SERVICES

Fig. No.: ———

PARTICLE SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	LL	PI
●	12	0.0	4.1	22.3	52.0	21.6	NT	NT	NT

SIEVE inches size	PERCENT FINER ●		
0.75	100.0		
0.375	97.2		
	GRAIN SIZE		
D_{60}	0.0243		
D_{30}			
D_{10}	0.0015		
	COEFFICIENTS		
C_c	1.62		
C_u	16.2		

SIEVE number size	PERCENT FINER ●		
4	95.9		
10	93.2		
20	90.3		
40	86.7		
60	84.5		
100	80.5		
200	73.6		

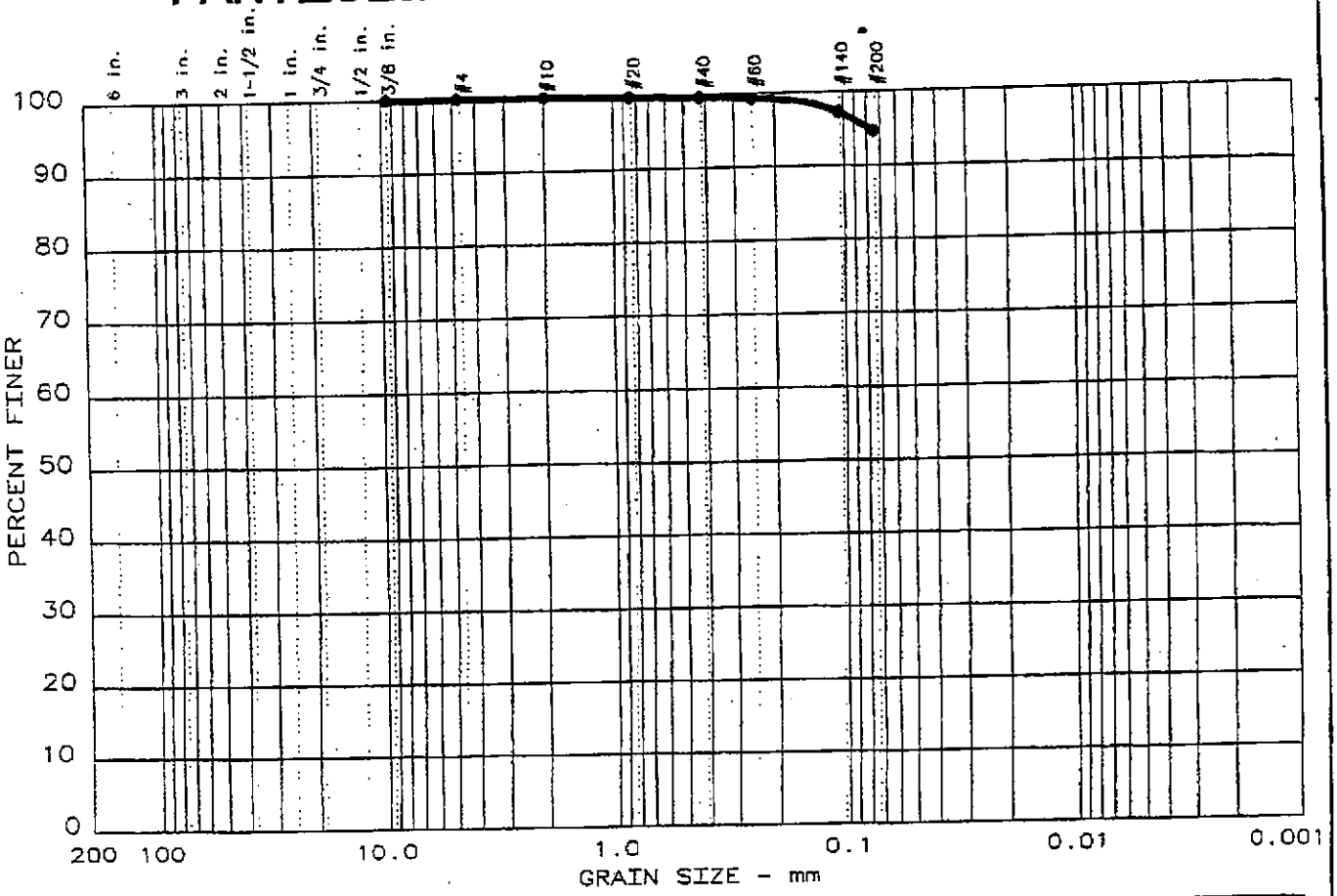
Sample information:
● B-8, 12-13.5' & 15-16.5'
Gray brown ash
SPT Samples

Remarks:
Methods: Particle Size: ASTM D 422-63(2002); Specific Gravity of Portion < No. 10: 2.38.

LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.

Project No.: 3043041009.0001
Project: TVA Kingston Ash
Date: April 21, 2004
Fig. No.: B8

PARTICLE SIZE ANALYSIS REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	10	0.0	0.0	5.3	94.7	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	NV	NP								

MATERIAL DESCRIPTION	USCS	AASHTO
● Grey Fly Ash		

Project No.: 3043-04-1009.0001
Project: TVA Kingston Ash Disposal Area
● Location: B-8 UD @ 20'-22'

Date: 04-19-04

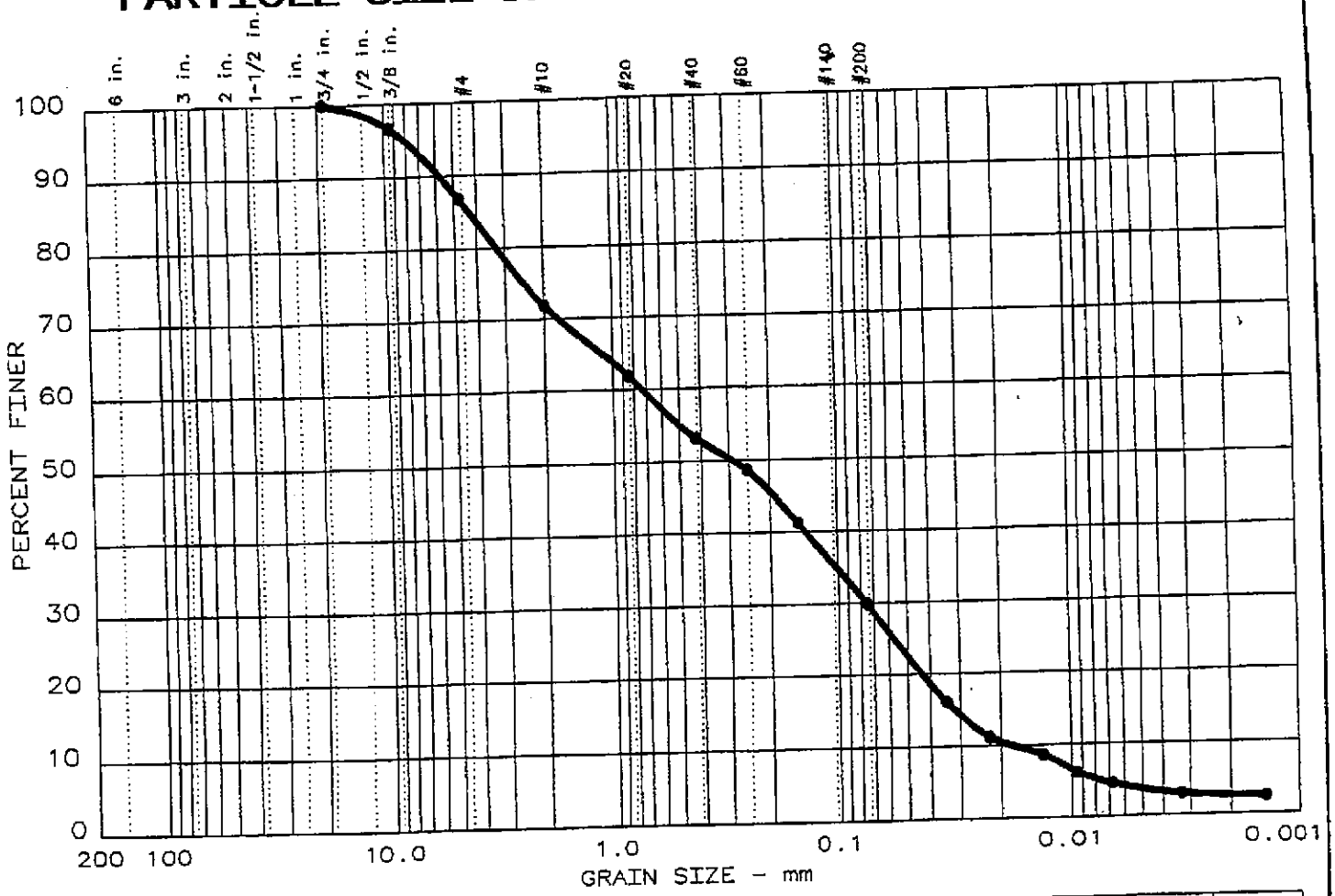
Remarks:
Moisture Content: 32.2%

PARTICLE SIZE ANALYSIS REPORT

LAW ENGINEERING AND ENVIRONMENTAL SERVICES

Fig. No.: ———

PARTICLE SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	LL	PI
●	10	0.0	13.2	56.9	26.2	3.7	NT	NT	NT

SIEVE inches size	PERCENT FINER ●		
0.75	100.0		
0.375	96.7		
	GRAIN SIZE		
D_{60}	0.733		
D_{30}			
D_{10}	0.0178		
	COEFFICIENTS		
C_c	0.43		
C_u	41.2		

SIEVE number size	PERCENT FINER ●		
4	86.8		
10	71.9		
20	61.9		
40	53.2		
60	48.7		
100	41.2		
200	29.9		

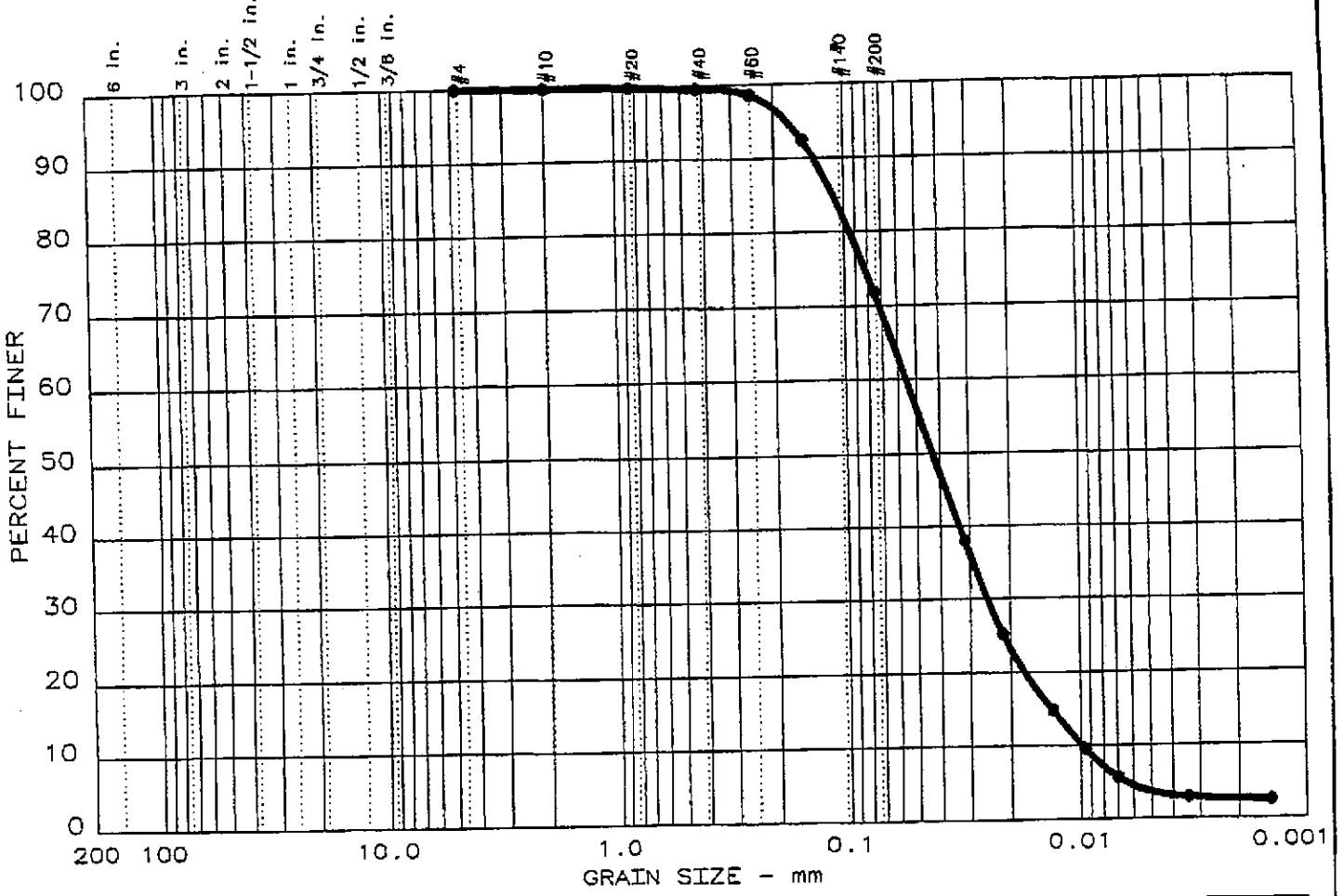
Sample information:
● B-8, 25.6-27.1' & 30-31.5'
Gray ash
SPT Samples

Remarks:
Methods: Particle Size: ASTM D 422-63(2002); Specific Gravity of Portion < No. 10: 2.49

LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.

Project No.: 3043041009.0001
Project: TVA Kingston Ash
Date: April 21, 2004
Fig. No.: B8

PARTICLE SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	LL	PI
●	13	0.0	0.0	28.2	68.2	3.6	NT	NT	NT

SIEVE inches size	PERCENT FINER ●		
	GRAIN SIZE		
D_{60}	0.0550		
D_{30}			
D_{10}	0.0098		
	COEFFICIENTS		
C_c	1.18		
C_u	5.6		

SIEVE number size	PERCENT FINER ●		
4	100.0		
10	99.9		
20	99.8		
40	99.5		
60	98.6		
100	92.4		
200	71.8		

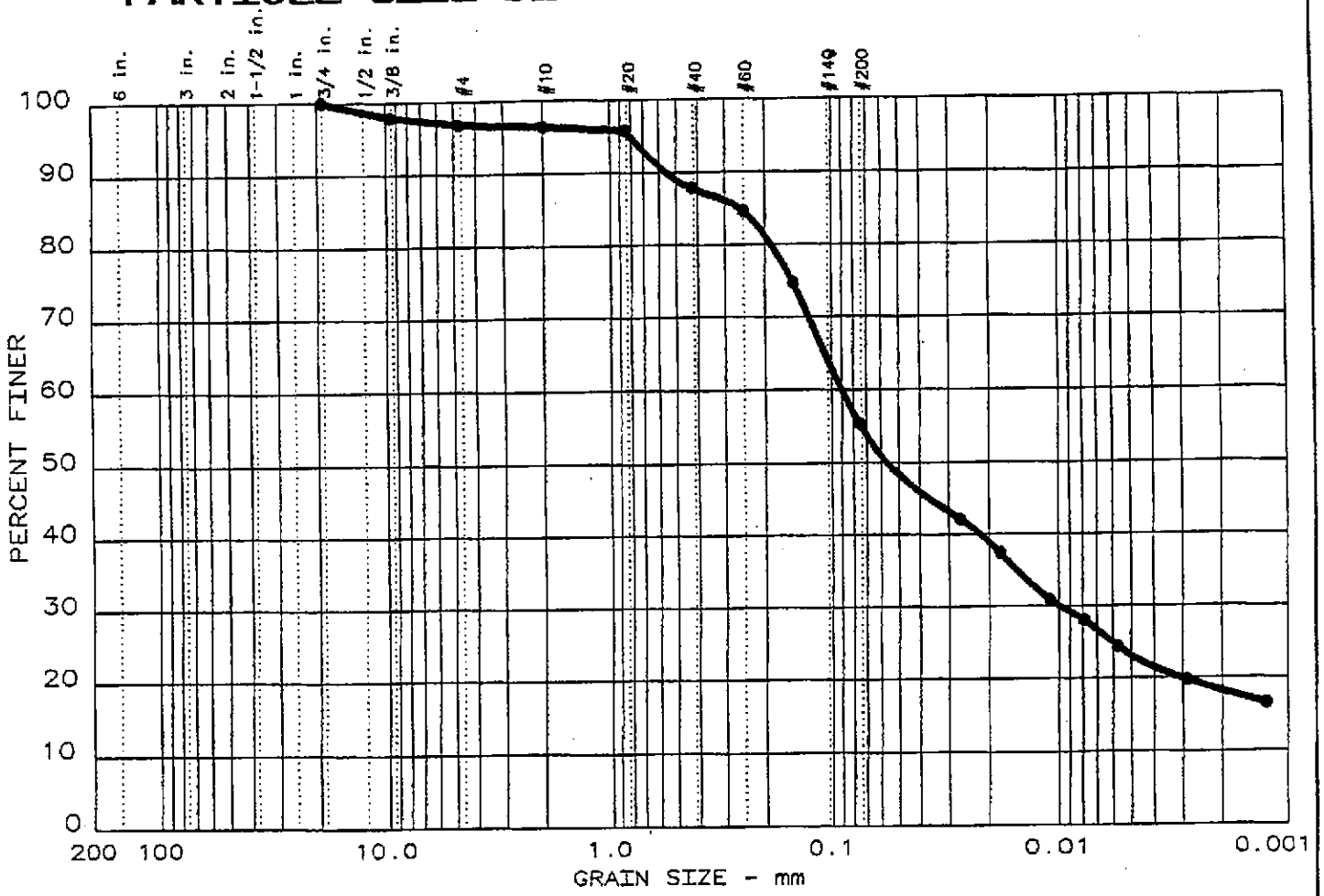
Sample information:
● B-8A, 40-41.5' & 45-46.5'
Dark gray ash
SPT Samples

Remarks:
Methods: Particle Size: ASTM D 422-63(2002): Specific Gravity of Portion < No. 10: 2.52

LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.

Project No.: 3043041009.0001
Project: TVA Kingston Ash
Date: April 21, 2004
Fig. No.: B8A

PARTICLE SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	LL	PI
●	15	0.0	3.2	41.4	32.4	23.0	CL	25	11

SIEVE inches size	PERCENT FINER ●		
0.75	100.0		
0.375	97.9		
GRAIN SIZE			
D_{60}	0.0901		
D_{30}			
D_{10}			
COEFFICIENTS			
C_c			
C_u			

SIEVE number size	PERCENT FINER ●		
4	96.8		
10	96.4		
20	95.8		
40	87.9		
60	84.7		
100	74.7		
200	55.4		

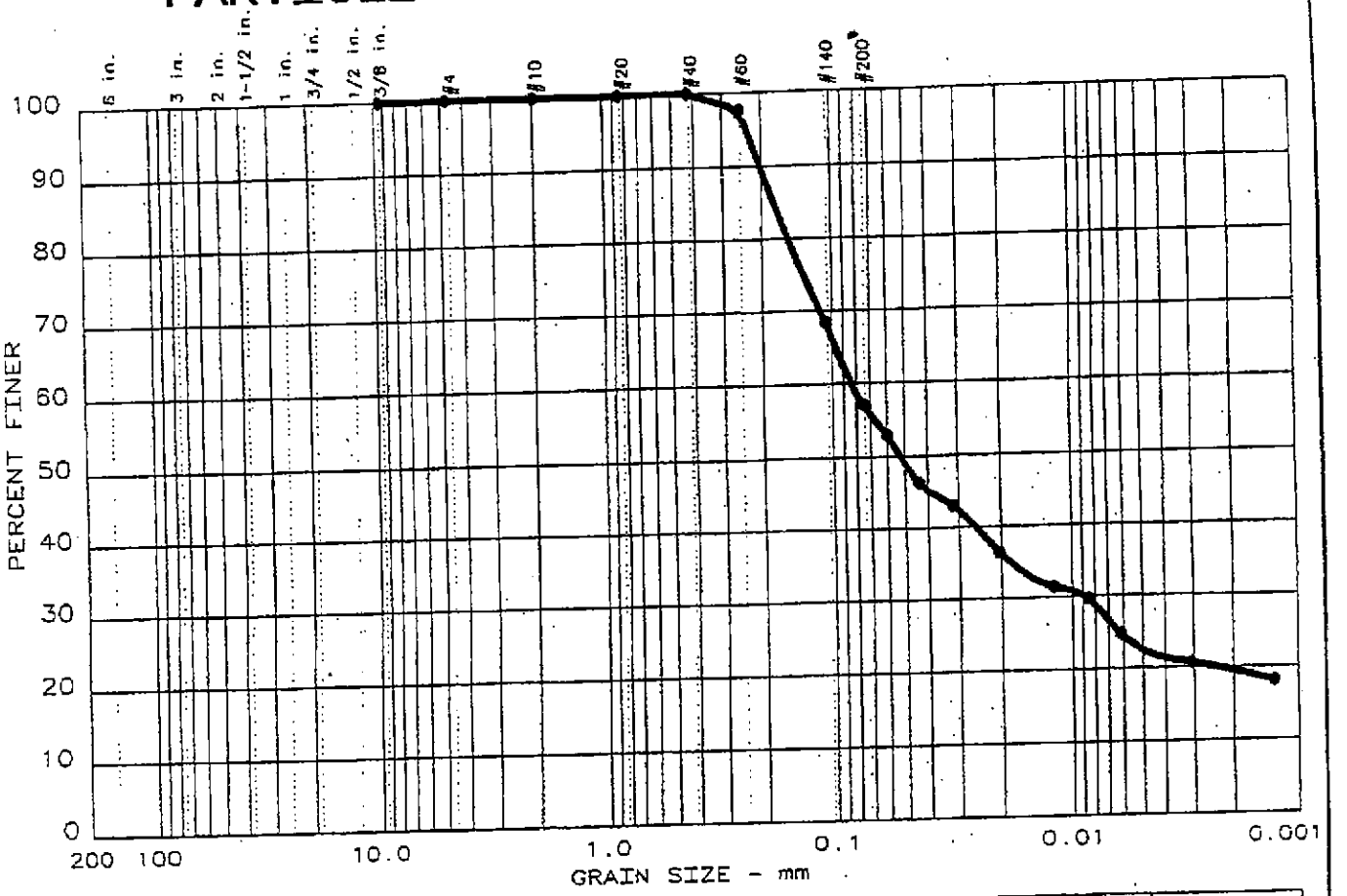
Sample information:
●B-8A,57-58.5' & 62-63.5'
Tan sandy lean clay
SPT Samples

Remarks:
Methods: Particle Size: ASTM D 422-63(2002); Specific Gravity of Portion < No. 40: 2.68

LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.

Project No.: 3043041009.0001
Project: TVA Kingston Ash
Date: April 21, 2004
Fig. No.: B8A

PARTICLE SIZE ANALYSIS REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	4	0.0	0.0	42.8	34.7	22.5

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	26	10	0.176	0.0832	0.0524	0.0088				

MATERIAL DESCRIPTION	USCS	AASHTO
● Grey-Brown Sandy Lean Clay	CL	

Project No.: 3043-04-1009.0001
Project: TVA Kingston Ash Disposal Area
● Location: B-8A UD @ 60'-62'

Date: 04-19-04

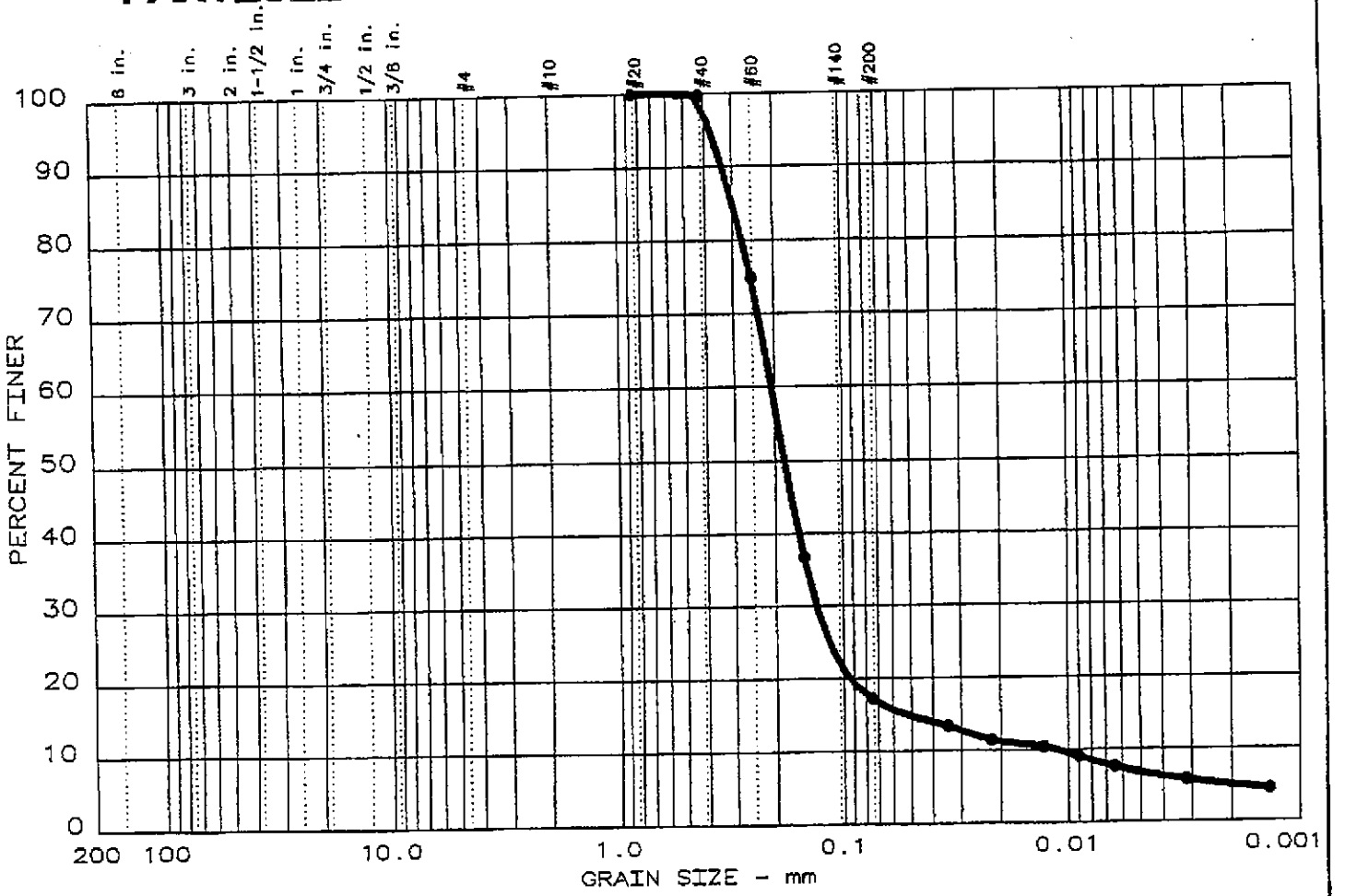
Remarks:
Moisture Content: 21.9%
Specific Gravity: 2.67

PARTICLE SIZE ANALYSIS REPORT

LAW ENGINEERING AND ENVIRONMENTAL SERVICES

Fig. No.: ———

PARTICLE SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	LL	PI
●	14	0.0	0.0	82.7	10.5	6.8	SM	NP	NP

SIEVE inches size	PERCENT FINER ●		
	GRAIN SIZE		
D_{60}	0.206		
D_{30}			
D_{10}	0.0111		
	COEFFICIENTS		
C_c	7.62		
C_u	18.5		

SIEVE number size	PERCENT FINER ●		
20	100.0		
40	99.7		
60	75.0		
100	36.7		
200	17.3		

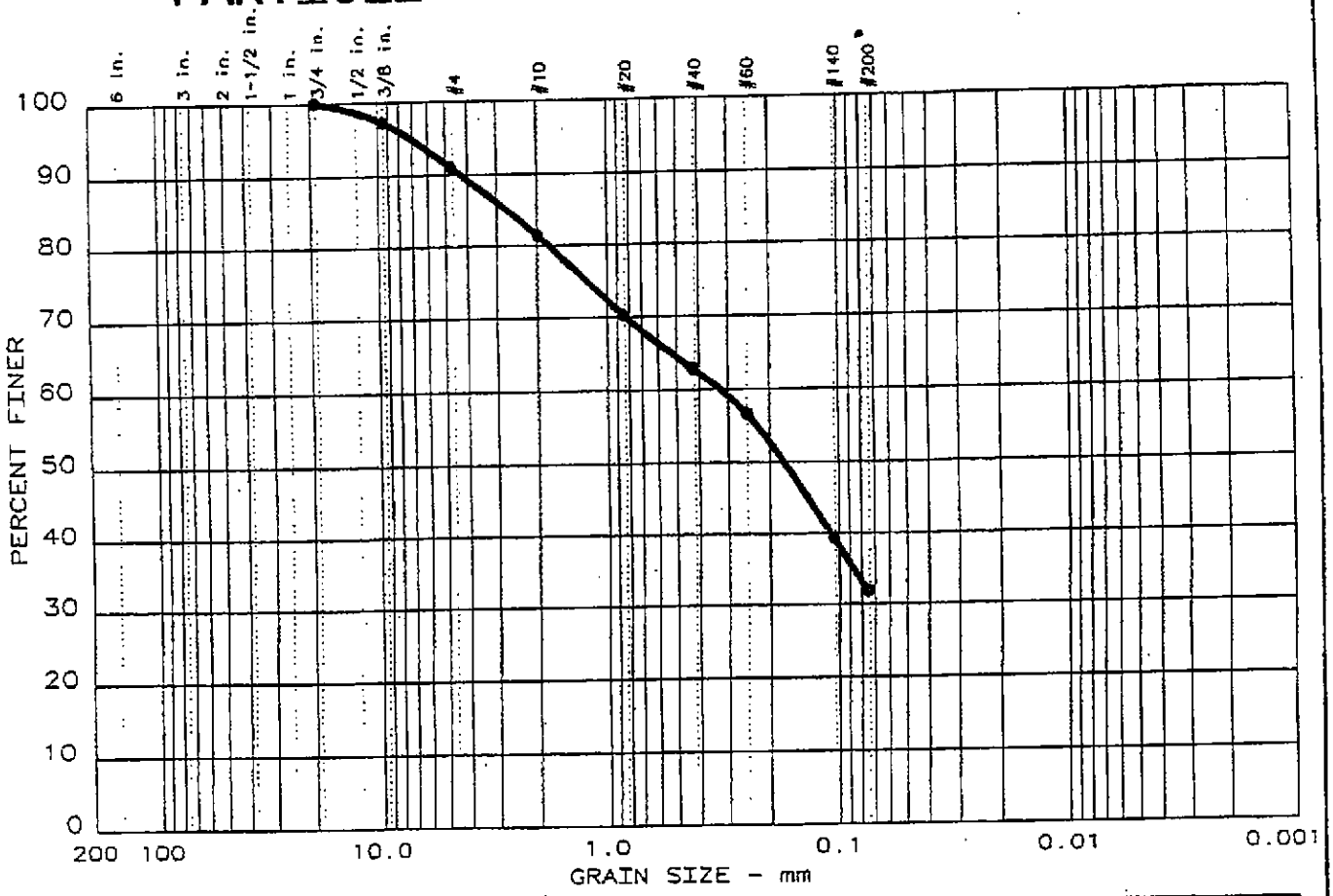
Sample information:
● B-8A, 65-66.5' & 70-70.9'
Gray brown silty sand
SPT Samples

Remarks:
Methods: Particle Size: ASTM D 422-63(2002); Specific Gravity of Portion < No. 40: 2.67

LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.

Project No.: 3043041009.0001
Project: TVA Kingston Ash
Date: April 21, 2004
Fig. No.: B8A

PARTICLE SIZE ANALYSIS REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	11	0.0	9.0	59.1	31.9	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	NV	NP	2.66	0.320	0.172					

MATERIAL DESCRIPTION	USCS	AASHTO
● Grey Fly Ash with Bottom Ash		

Project No.: 3043-04-1009.0001
Project: TVA Kingston Ash Disposal Area
● Location: B-10 UD @ 5'-7'

Date: 04-19-04

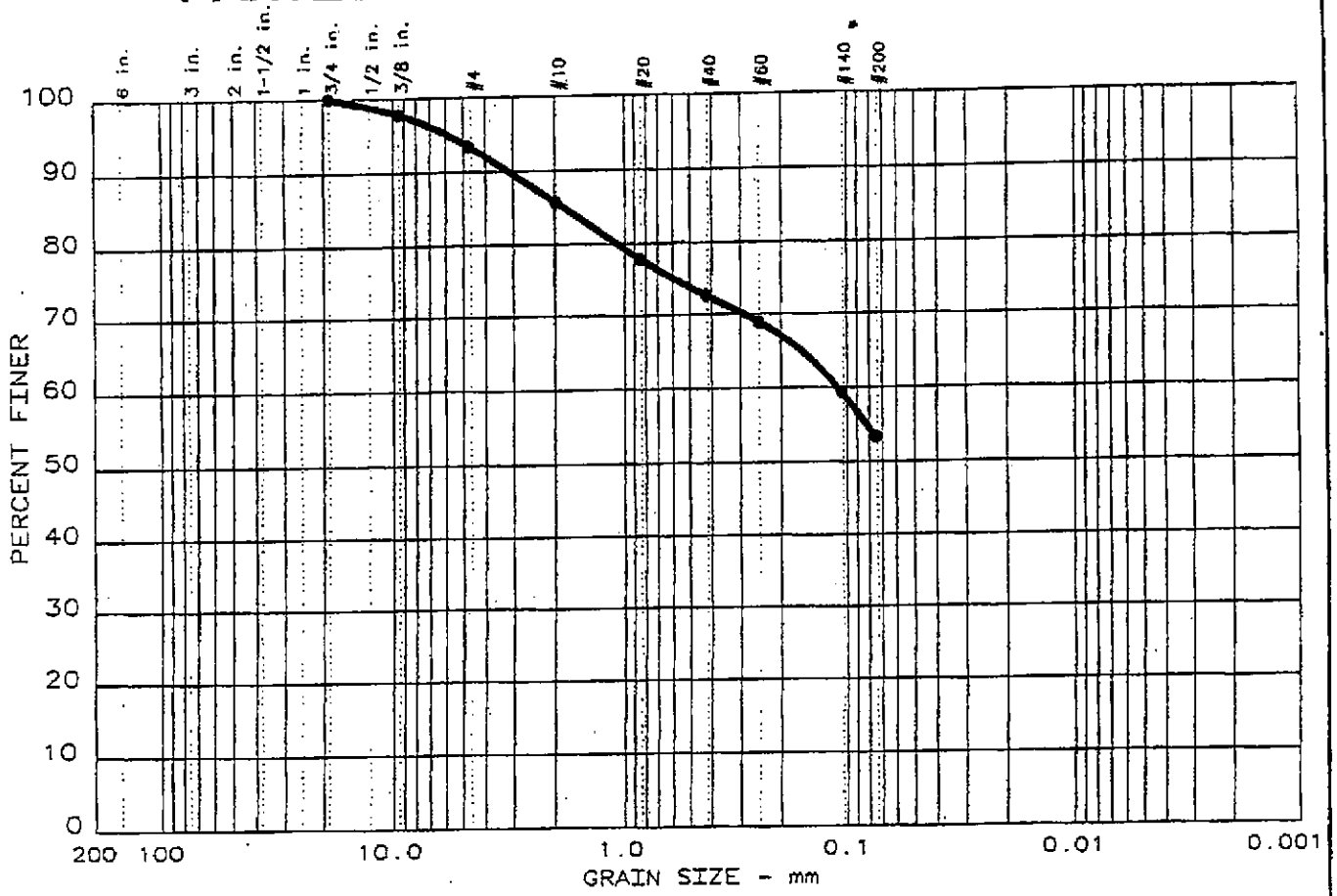
Remarks:
Moisture Content: 24.7%
Specific Gravity: 2.29

PARTICLE SIZE ANALYSIS REPORT

LAW ENGINEERING AND ENVIRONMENTAL SERVICES

Fig. No.: _____

PARTICLE SIZE ANALYSIS REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	12	0.0	6.6	40.0	53.4	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	NV	NP	1.82	0.110						

MATERIAL DESCRIPTION	USCS	AASHTO
● Grey Fly Ash with Bottom Ash		

Project No.: 3043-04-1009.0001
Project: TVA Kingston Ash Disposal Area
● Location: B-10 UD @ 10'-12'

Date: 04-19-04

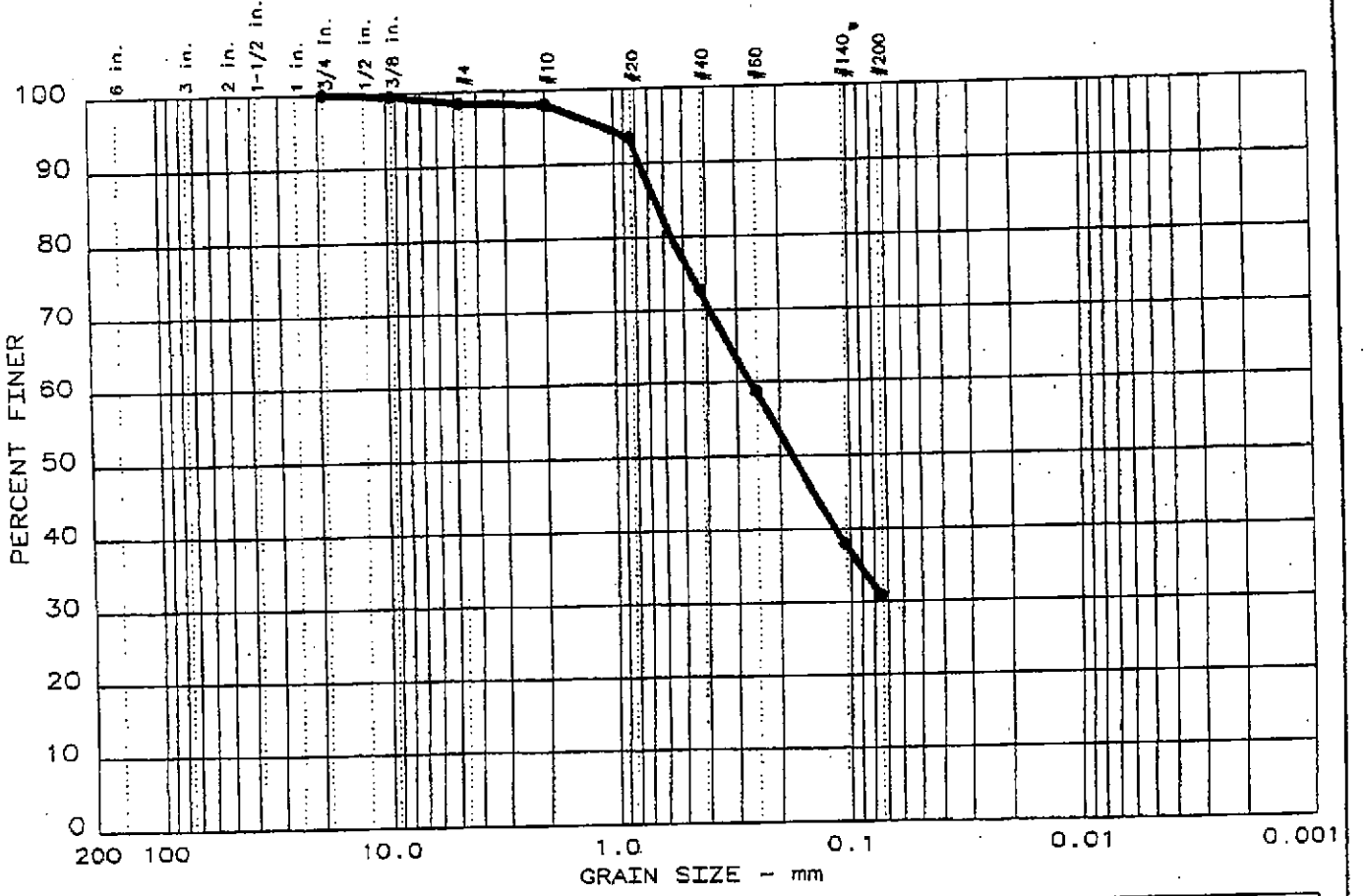
Remarks:
Moisture Content: 24.5%

PARTICLE SIZE ANALYSIS REPORT

LAW ENGINEERING AND ENVIRONMENTAL SERVICES

Fig. No.: ———

PARTICLE SIZE ANALYSIS REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	13	0.0	1.5	67.6	30.9	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	NV	NP	0.653	0.263	0.176					

MATERIAL DESCRIPTION	USCS	AASHTO
● Grey Fly Ash with Bottom Ash		

Project No.: 3043-04-1009.0001
Project: TVA Kingston Ash Disposal Area
● Location: B-10 UD @ 15'-17'

Date: 04-19-04

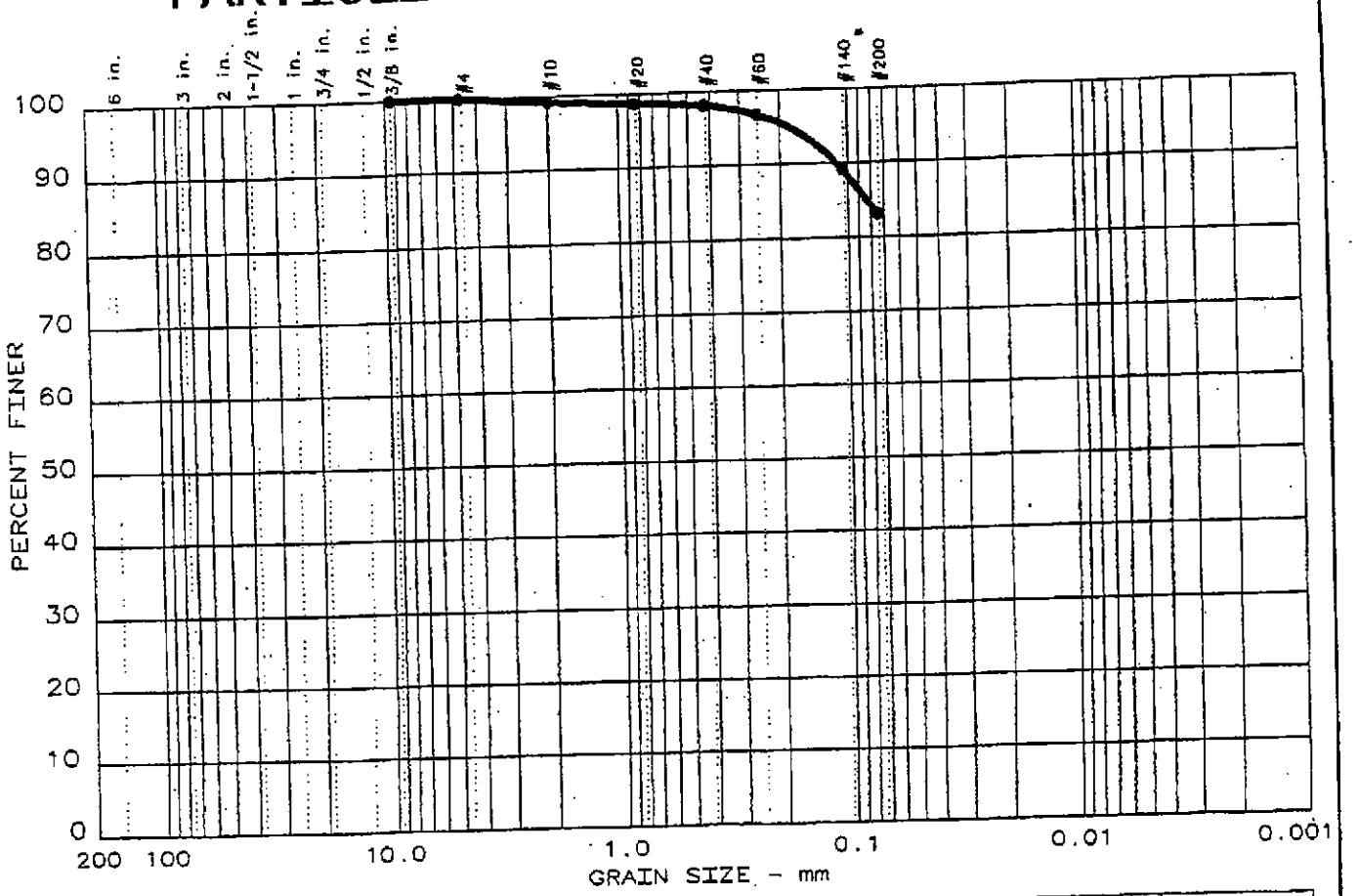
Remarks:
Moisture Content: 38.1%

PARTICLE SIZE ANALYSIS REPORT

LAW ENGINEERING AND ENVIRONMENTAL SERVICES

Fig. No.: ———

PARTICLE SIZE ANALYSIS REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	14	0.0	0.0	16.9	83.1	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	NV	NP	0.0832							

MATERIAL DESCRIPTION	USCS	AASHTO
● Grey Fly Ash		

Project No.: 3043-04-1009.0001
Project: TVA Kingston Ash Disposal Area
● Location: B-10 UD @ 20'-22'

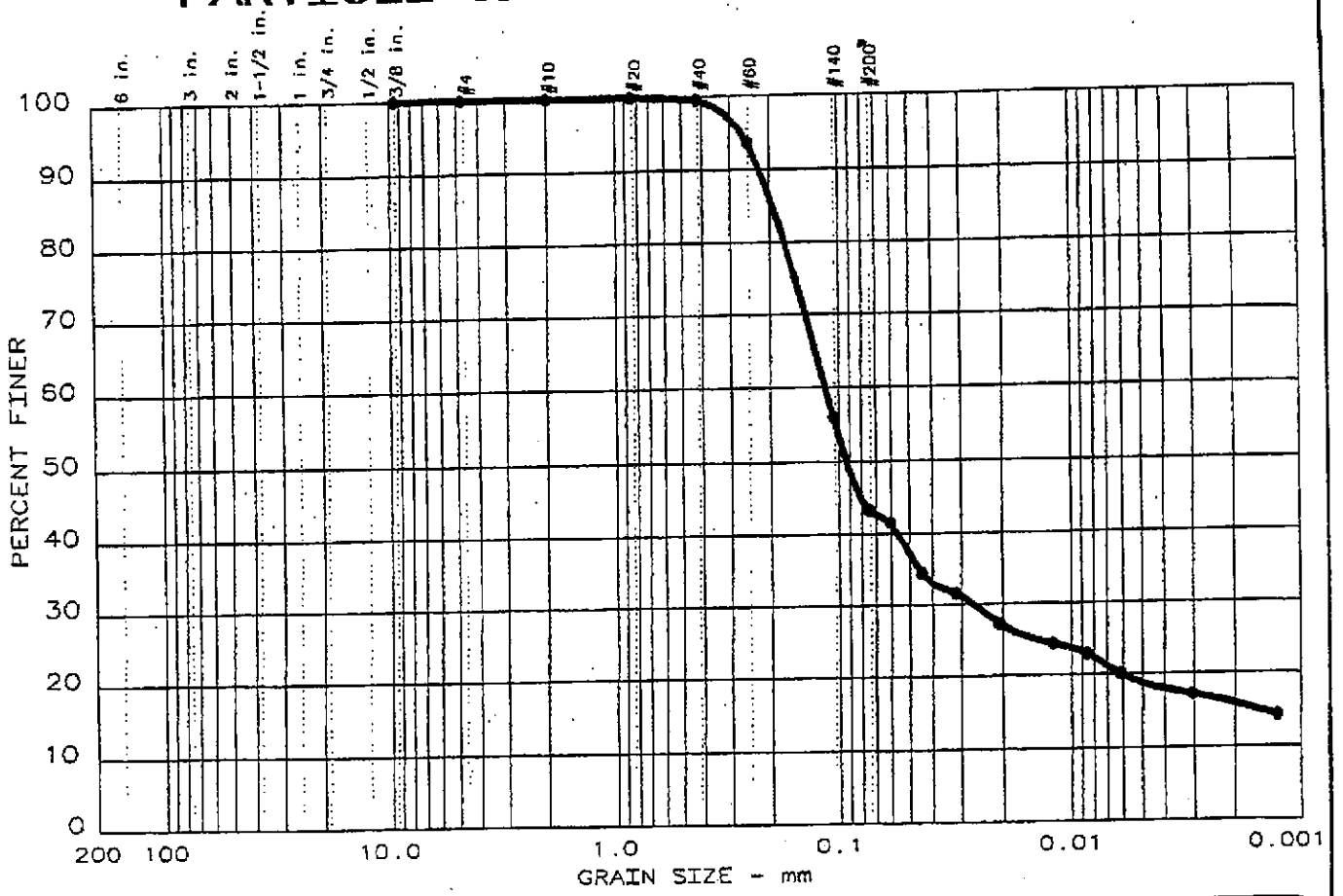
Date: 04-19-04

Remarks:
Moisture Content: 36.5%
Specific Gravity: 2.28

PARTICLE SIZE ANALYSIS REPORT
LAW ENGINEERING AND ENVIRONMENTAL SERVICES

Fig. No.: ———

PARTICLE SIZE ANALYSIS REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	3	0.0	0.0	56.7	24.6	18.7

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	NV	NP	0.193	0.115	0.0931	0.0265	0.0015			

MATERIAL DESCRIPTION	USCS	AASHTO
● Tan-Brown Silty Fine Sand	SM	

Project No.: 3043-04-1009.0001
Project: TVA Kingston Ash Disposal Area
● Location: B-10 UD @ 35'-37'

Date: 04-19-04

Remarks:
Moisture Content: 21.9%

PARTICLE SIZE ANALYSIS REPORT

LAW ENGINEERING AND ENVIRONMENTAL SERVICES

Fig. No.: ———

This information taken from "Kingston Fossil Plant – Dredge Cells/Closure Soil Investigation," Singleton Laboratories Report 015-672-142A, September 29, 1994.

TVA-00018764

LABORATORY TESTING

All split-spoon samples obtained were visually classified and tested for moisture content in accordance with ASTM D 2216, while Atterberg limits, grain-size analysis, and specific gravity tests were performed on representative SPT soil samples in accordance with ASTM D 4318, and D 422, and D 854, respectively. Test results are shown in the field logs. Individual test data sheets are enclosed in Appendix C.

All twenty-five (25) undisturbed soil samples obtained from the dike areas were tested for moisture content, classification, grain-size, Atterberg limits, specific gravity, and unit weight in accordance with ASTM D 2216, D 2488, D 422, D 4318, D 854, and SLP-2, respectively. Unconsolidated-undrained triaxial (Q) and consolidated-undrained triaxial (R) with pore water pressure measurements were performed on five (5) selected undisturbed soil samples in accordance with ASTM D 4767 and D 5084, respectively. Test results are also summarized in Table 1. Individual test data sheets are enclosed in Appendix D. Under Q test conditions, angles of internal friction ranged from zero (with 1.85 tsf cohesion) to 37.4 degrees, and cohesions varied from zero to 1.85 tsf. Under R test conditions, apparent angles of internal friction and cohesions ranged from 4.4 to 35.8 degrees and from 0.32 to 3.65 tsf, respectively, and effective angles of internal friction and cohesions varied from 9.2 to 37.5 degrees and from zero to 2.91 tsf, respectively.

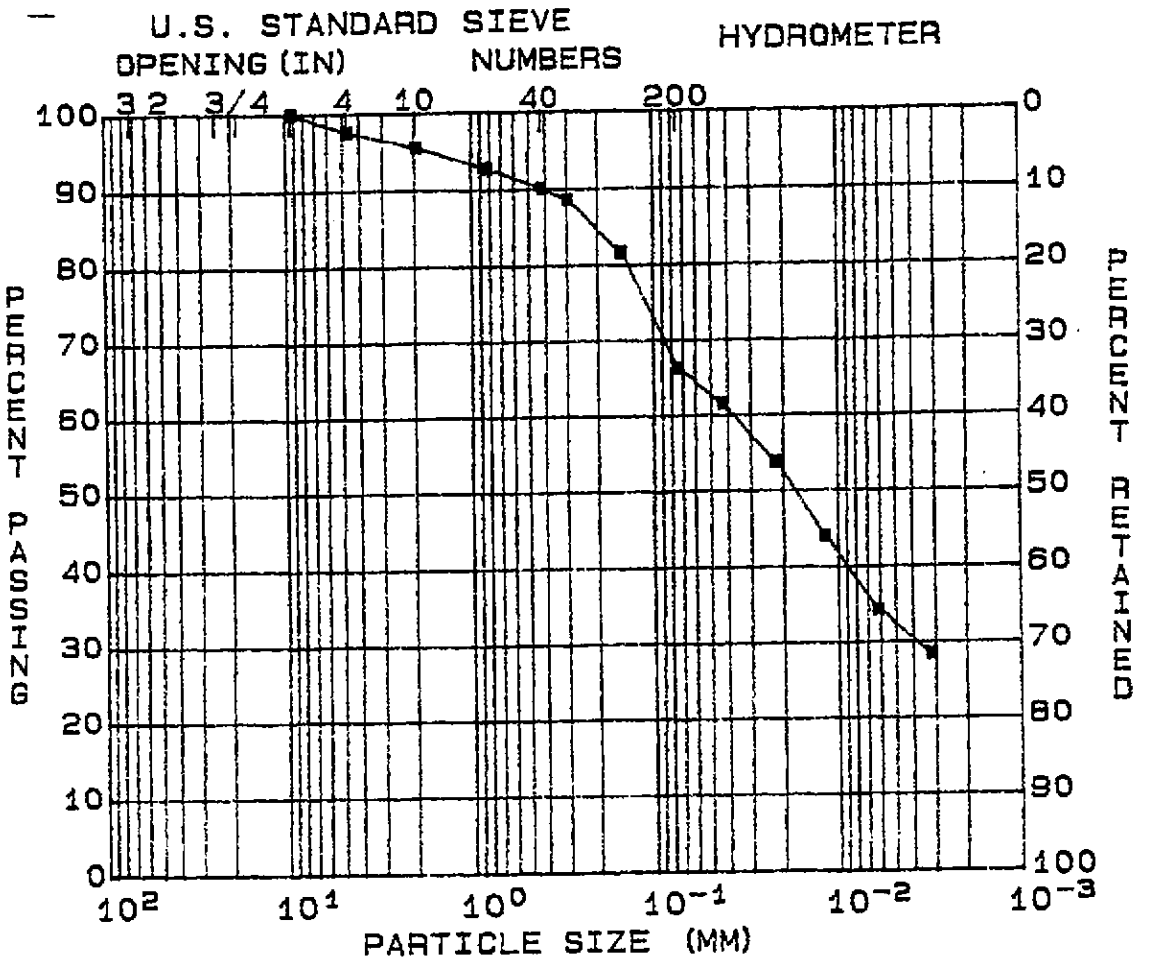
All bulk soil samples obtained from the Dredge Cell 2 were visually classified as a gray silty sand (fly ash) and tested for moisture content on representative samples. Natural moisture contents ranged from 34.5 to 39.9 percent with an average of 37.6 percent. Two (2) soil classes were identified from all the bulk samples. Compaction tests were performed in accordance with ASTM D 698 Method A. Optimum moisture contents and maximum dry densities were determined to be 25.4 percent and 79.8 pcf, respectively for soil Class I, and 24.5 percent and 79.9 pcf, respectively for soil Class II. As indicated from the test results, Soil Classes I and II are very similar. A family of compaction curves was established for each soil class and the compaction curves are enclosed. For each soil class, classification tests including grain-size analysis, specific gravity, and Atterberg Limits were performed. Test results are summarized in Table 2 and also shown in the attached compaction curves. Individual test data sheets and compaction curves are enclosed in Appendix E.

Unconsolidated-undrained triaxial (Q) and consolidated-undrained triaxial (R) with pore water pressure measurements tests were performed on the soil samples remolded to the optimum moisture content with 95 and 100 percent maximum dry density. Test results are also summarized in Table 2. Individual test data sheets are also enclosed in Appendix E. Under Q test conditions, angles of internal friction ranged from 23.7 to 24.0 degrees and cohesions varied from 1.04 to 1.10 tsf. Under R test conditions, apparent angles of internal friction and cohesions ranged from 17.9 to 17.9 degrees and from 0.19 to 0.21 tsf, respectively, and effective angles of internal friction and cohesions varied from 28.3 to 38.3 degrees and from 0.06 to 0.27 tsf, respectively.

SINGLETON LABORATORIES
PARTICLE SIZE ANALYSIS

PROJECT: TVA/KINGSTON FP
FEATURE: DREDGE CELLS/CLOSURE
STATION:
RANGE :
PART :

BORING: SS-1 thru SS-10
EL. :
SAMPLE: Gr 1
DATE : 09-29-94



GRAVEL (%) =	2	D10 (MM)	= --
SAND (%) =	32	D30 (MM)	= --
SILT (%) =	34	D60 (MM)	= --
CLAY (%) =	32	COEF UNIF	= --

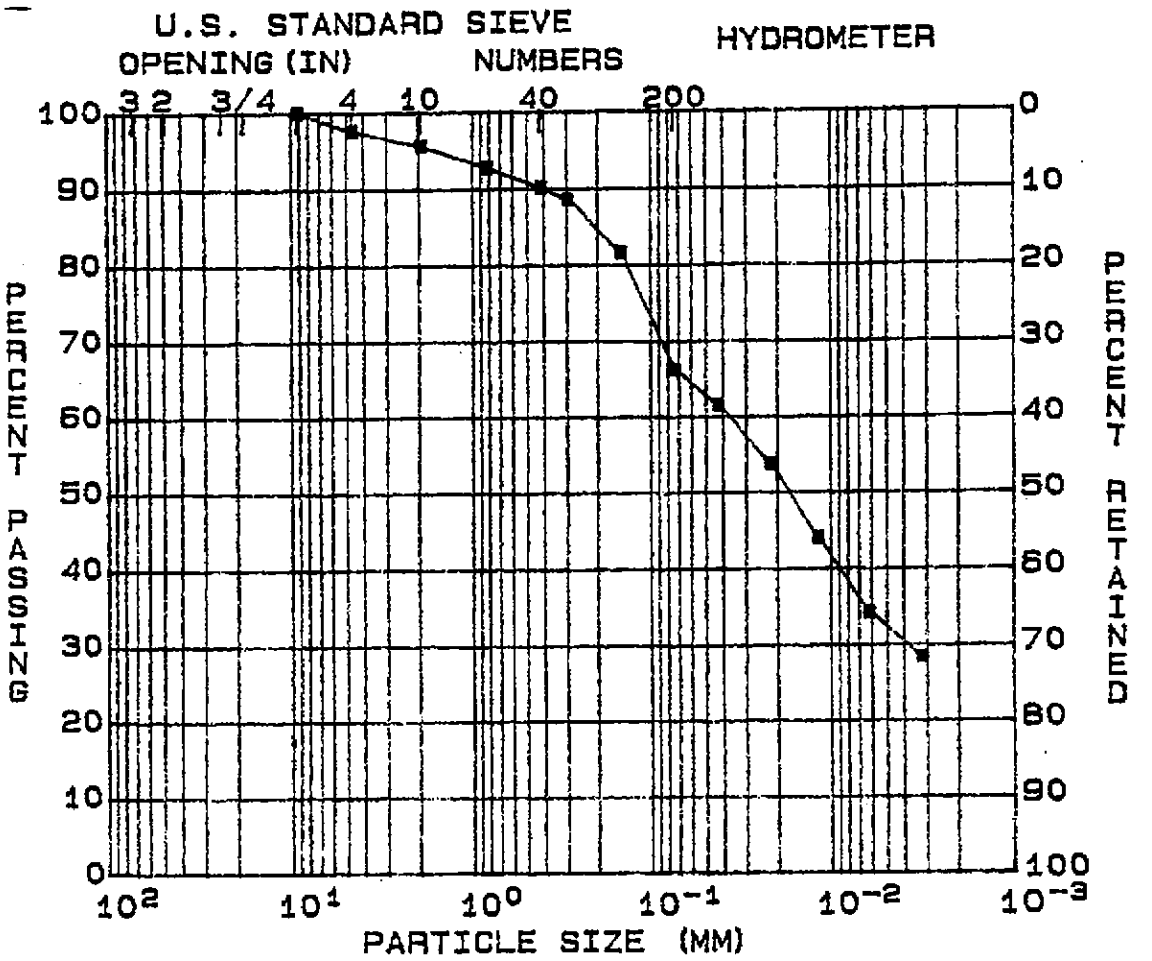
SOIL SYMBOL= CL-ML	L.L. (%) = 26	DENSITY (pcf) = --
MOISTURE (%) =	P.I. (%) = 4	SATURATION (%) = --
SP. GR. = 2.65		VOID RATIO = --

REMARKS:

SINGLETON LABORATORIES
PARTICLE SIZE ANALYSIS

PROJECT: TVA/KINGSTON FP
FEATURE: DREDGE CELLS/CLOSURE
STATION:
RANGE :
PART :

BORING: SS-1 thru SS-10
EL. :
SAMPLE: Gr 1
DATE : 09-29-94



GRAVEL (%) =	2	D10 (MM) =	--
SAND (%) =	32	D30 (MM) =	--
SILT (%) =	34	D60 (MM) =	--
CLAY (%) =	32	COEF UNIF =	--

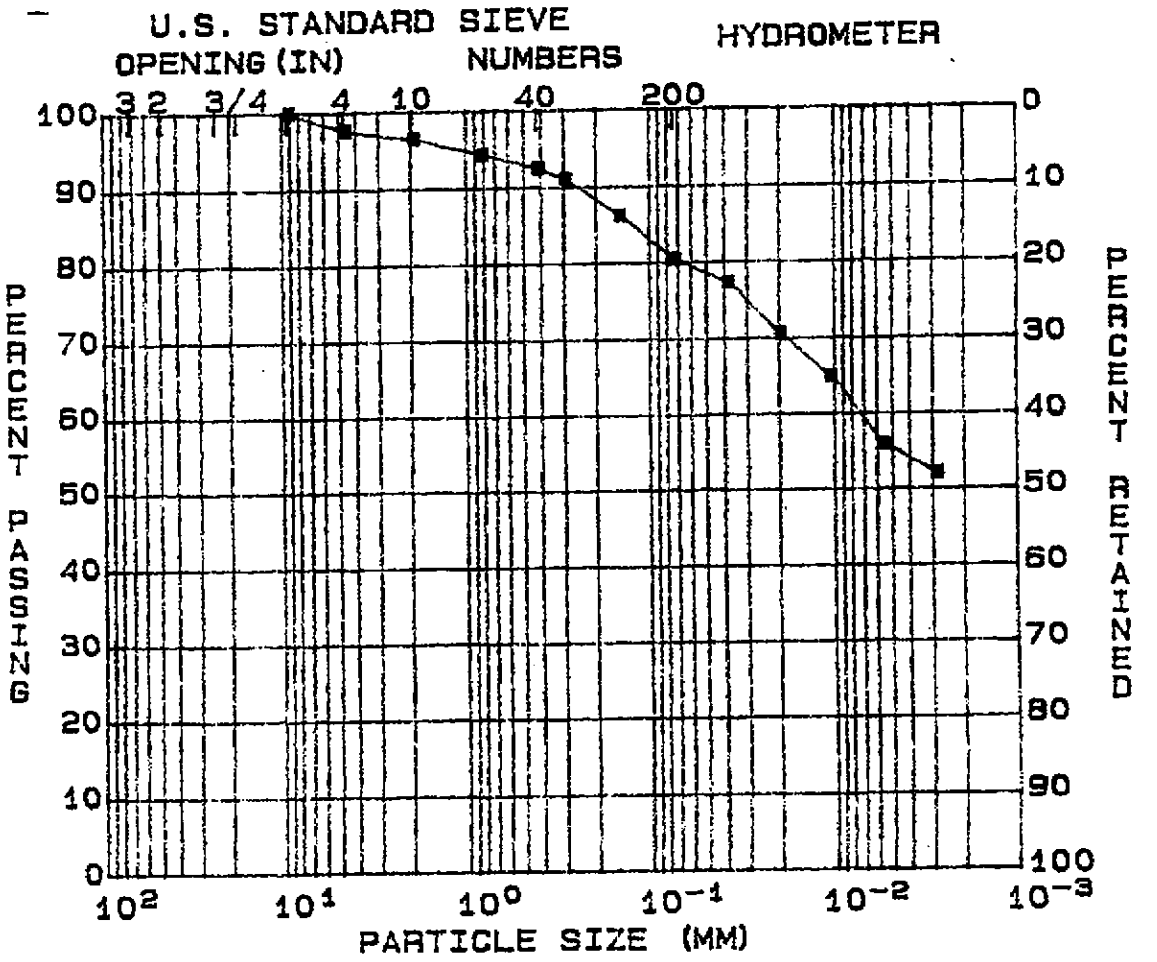
SOIL SYMBOL =	CL-ML	L.L. (%) =	25	DENSITY (pcf) =	--
MOISTURE (%) =		P.I. (%) =	4	SATURATION (%) =	--
SP. GR. =	2.65			VOID RATIO =	--

REMARKS:

SINGLETON LABORATORIES
PARTICLE SIZE ANALYSIS

PROJECT: TVA/KINGSTON FP
FEATURE: DREDGE CELLS/CLOSURE
STATION:
RANGE :
PART :

BORING: SS-1 thru SS-10
EL. :
SAMPLE: Gr 2
DATE : 09-29-94



GRAVEL (%) =	1	D10 (MM) =	--
SAND (%) =	18	D30 (MM) =	--
SILT (%) =	25	D60 (MM) =	--
CLAY (%) =	56	COEF UNIF =	--

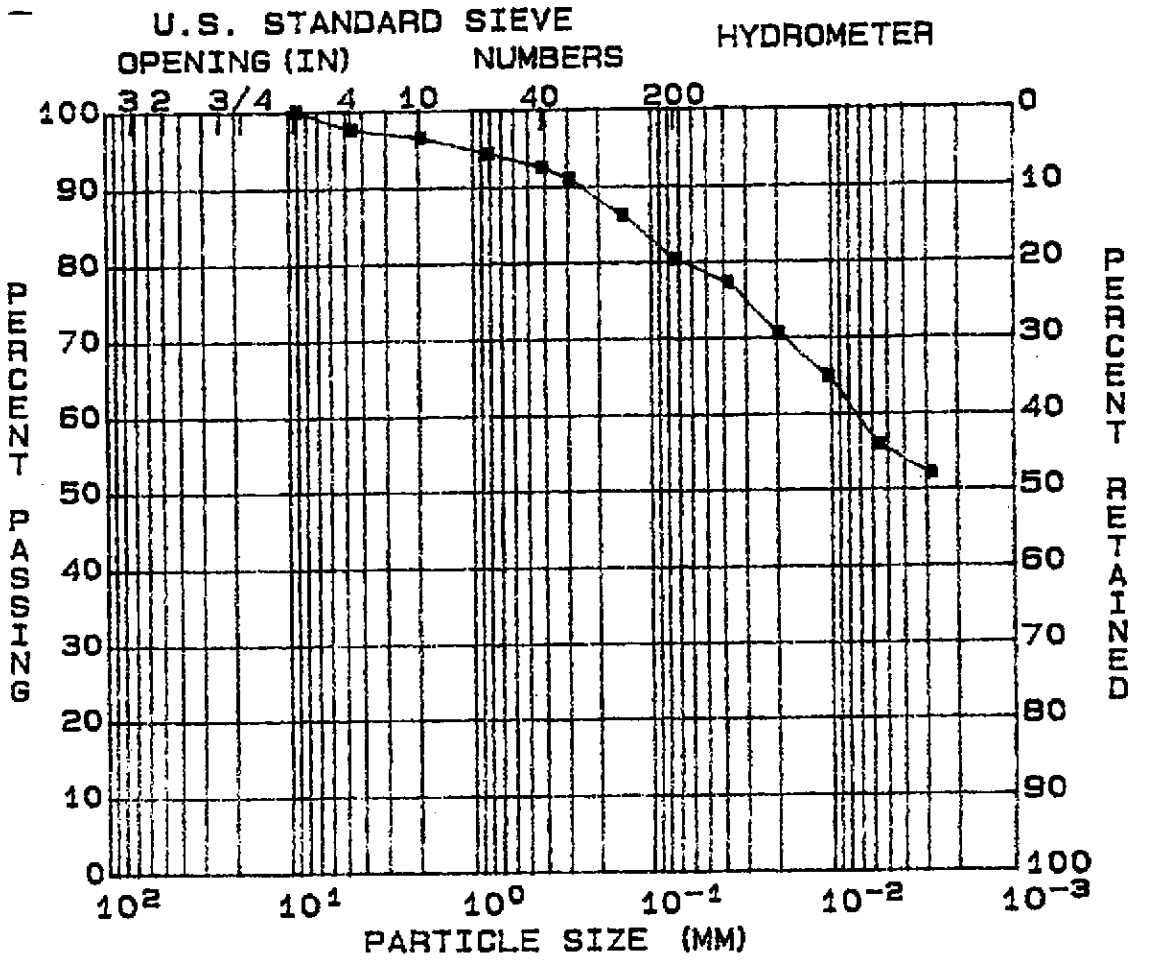
SOIL SYMBOL =	MH/CH	L.L. (%) =	59	DENSITY (pcf) =	--
MOISTURE (%) =		P.I. (%) =	28	SATURATION (%) =	--
SP. GR. =	2.73			VOID RATIO =	--

REMARKS:

SINGLETON LABORATORIES
PARTICLE SIZE ANALYSIS

PROJECT: TVA/KINGSTON FP
FEATURE: DREDGE CELLS/CLOSURE
STATION:
RANGE :
PART :

BORING: SS-1 thru SS-10
EL. :
SAMPLE: Gr 2
DATE : 09-29-94



GRAVEL (%) =	1	D10 (MM)	= --
SAND (%) =	18	D30 (MM)	= --
SILT (%) =	25	D60 (MM)	= --
CLAY (%) =	56	COEF UNIF	= --

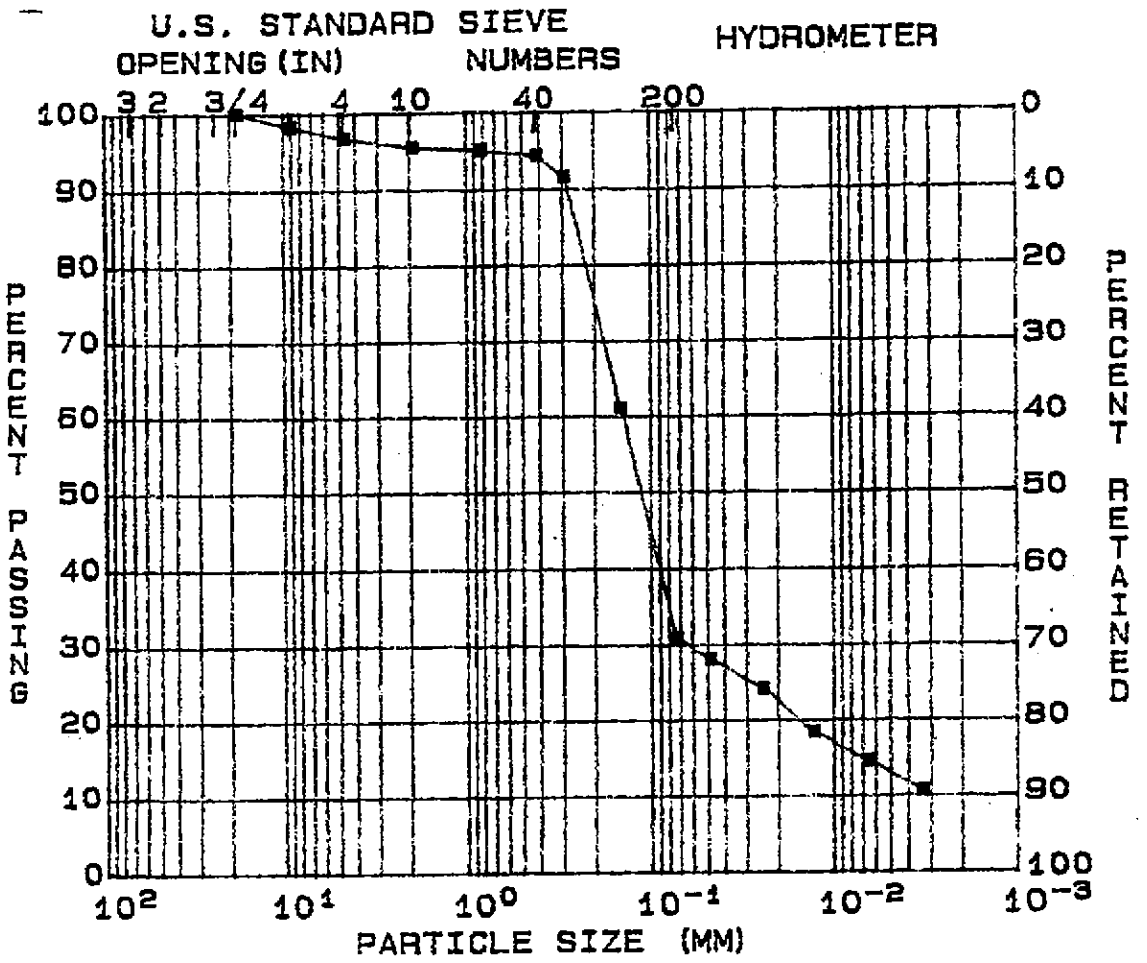
SOIL SYMBOL =	MH/CH	L.L. (%)	= 59	DENSITY (pcf)	= --
MOISTURE (%) =		P.I. (%)	= 27	SATURATION (%)	= --
SP. GR.	= 2.73			VOID RATIO	= --

REMARKS:

SINGLETON LABORATORIES
PARTICLE SIZE ANALYSIS

PROJECT: TVA/KINGSTON FP
FEATURE: DREDGE CELLS/CLOSURE
STATION:
RANGE :
PART :

BORING: SS-1 thru SS-10
EL. :
SAMPLE: Gr 3
DATE : 09-29-94



GRAVEL (%) =	3	D10 (MM)	= 0.0029
SAND (%) =	66	D30 (MM)	= 0.0648
SILT (%) =	18	D60 (MM)	= 0.1456
CLAY (%) =	13	COEF UNIF	=49.4

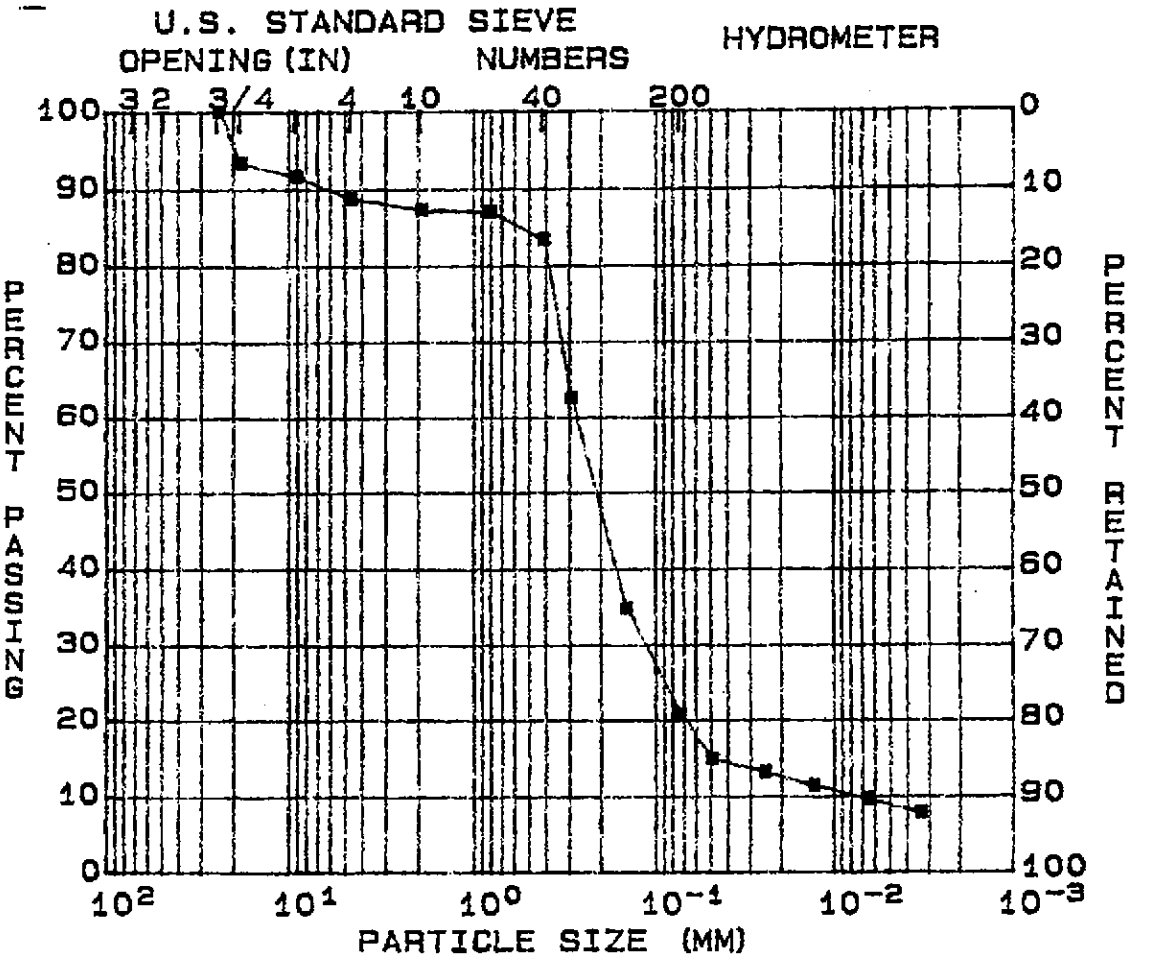
SOIL SYMBOL= SM	L.L. (%) = NP	DENSITY (pcf) = --
MOISTURE (%) =	P.I. (%) = NP	SATURATION (%) = --
SP. GR. = 2.64		VOID RATIO = --

REMARKS:

SINGLETON LABORATORIES
PARTICLE SIZE ANALYSIS

PROJECT: TVA/KINGSTON FP
FEATURE: DREDGE CELLS/CLOSURE
STATION:
RANGE :
PART :

BORING: SS-1 thru SS-10
EL. :
SAMPLE: Gr 4
DATE : 09-29-94



GRAVEL (%)	= 11	D10 (MM)	= 0.0076
SAND (%)	= 68	D30 (MM)	= 0.1176
SILT (%)	= 12	D60 (MM)	= 0.2804
CLAY (%)	= 9	COEF UNIF	=37.1

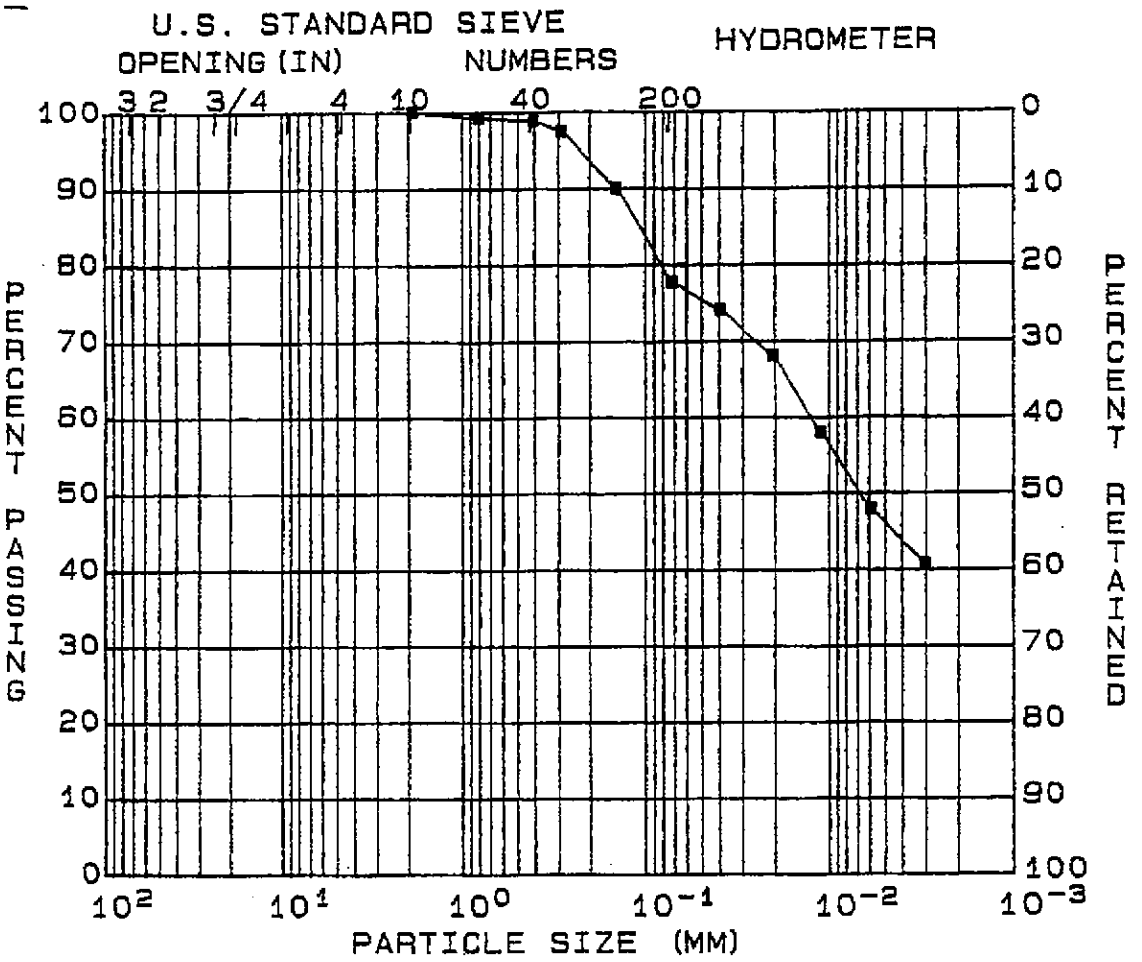
SOIL SYMBOL	= SC/SM	L.L. (%)	= NP	DENSITY (pcf)	= --
MOISTURE (%)	=	P.I. (%)	= NP	SATURATION (%)	= --
SP. GR.	= 2.66			VOID RATIO	= --

REMARKS:

SINGLETON LABORATORIES
PARTICLE SIZE ANALYSIS

PROJECT: TVA/KINGSTON FP
FEATURE: DREDGE CELLS/CLOSURE
STATION:
RANGE :
PART :

BORING: SS-1 thru SS-10
EL. :
SAMPLE: Gr 5
DATE : 09-29-94



GRAVEL (%)	= 0	D10 (MM)	= --
SAND (%)	= 22	D30 (MM)	= --
SILT (%)	= 32	D60 (MM)	= --
CLAY (%)	= 46	COEF UNIF	= --

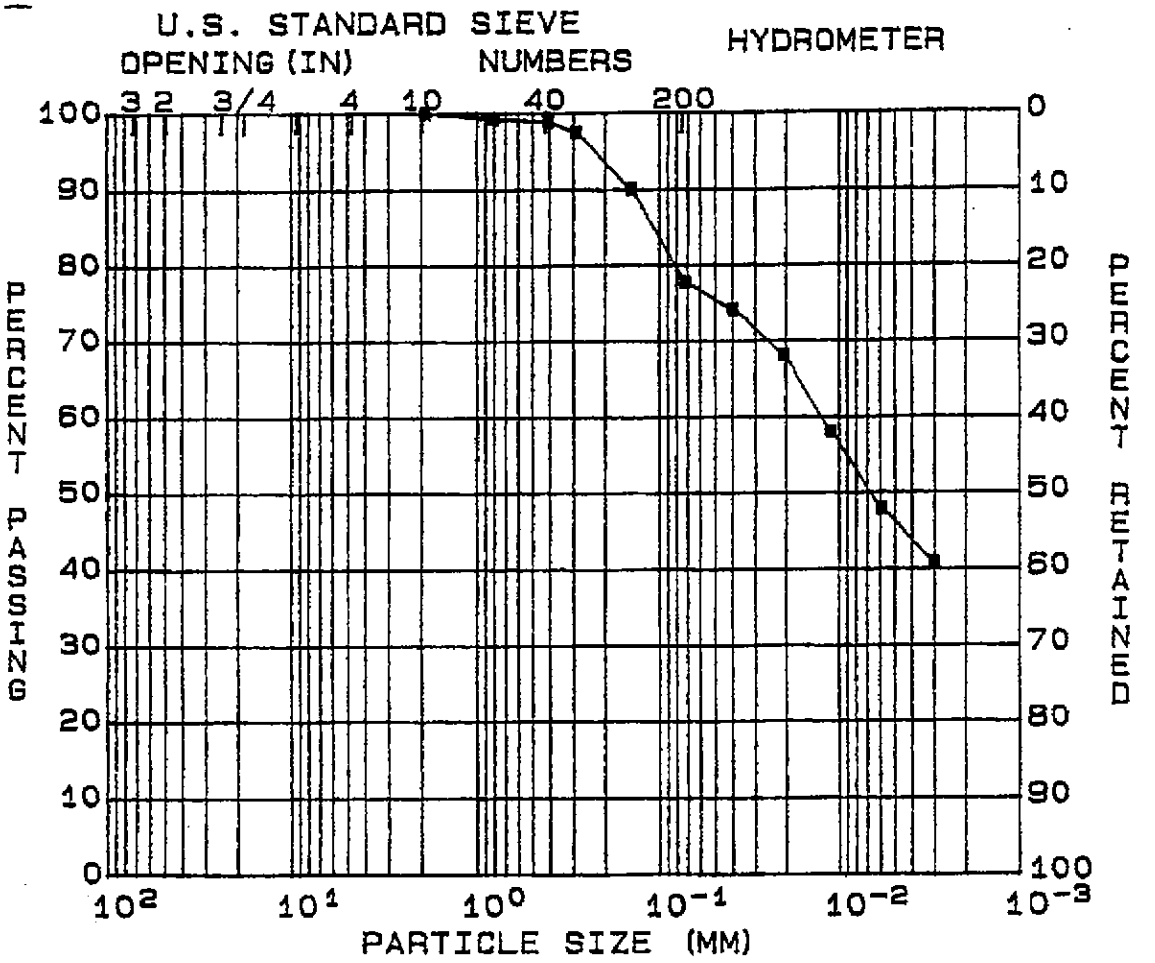
SOIL SYMBOL = CL	L.L. (%) = 31	DENSITY (pcf) = --
MOISTURE (%) =	P.I. (%) = 12	SATURATION (%) = --
SP. GR. = 2.66		VOID RATIO = --

REMARKS:

SINGLETON LABORATORIES
PARTICLE SIZE ANALYSIS

PROJECT: TVA/KINGSTON FP
FEATURE: DREDGE CELLS/CLOSURE
STATION:
RANGE :
PART :

BORING: SS-1 thru SS-10
EL. :
SAMPLE: Gr 5
DATE : 09-29-94



GRAVEL (%)	= 0	D10 (MM)	= --
SAND (%)	= 22	D30 (MM)	= --
SILT (%)	= 32	D60 (MM)	= --
CLAY (%)	= 46	COEF UNIF	= --

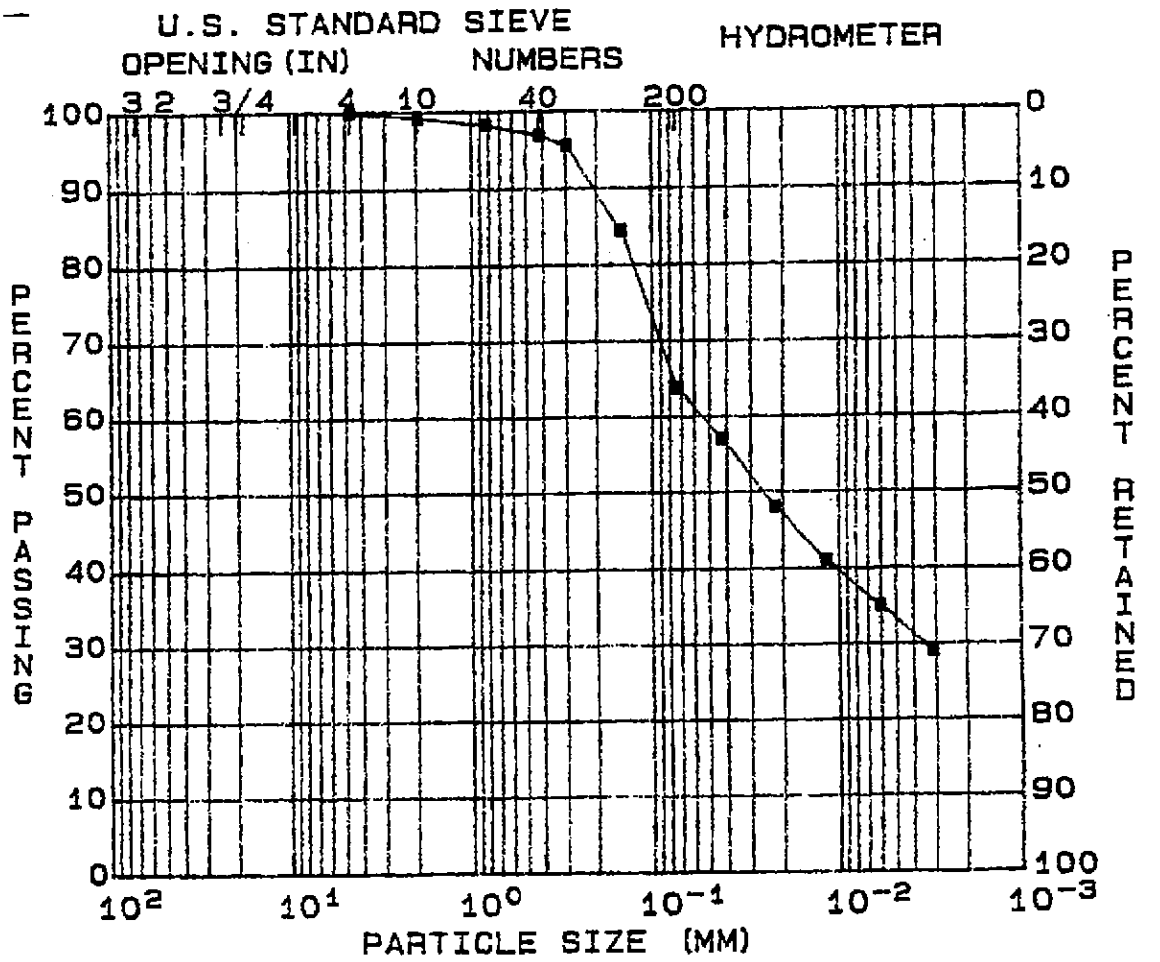
SOIL SYMBOL	= CL	L.L. (%)	= 30	DENSITY (pcf)	= --
MOISTURE (%)	=	P.I. (%)	= 11	SATURATION (%)	= --
SP. GR.	= 2.66			VOID RATIO	= --

REMARKS:

SINGLETON LABORATORIES
PARTICLE SIZE ANALYSIS

PROJECT: TVA/KINGSTON FP
FEATURE: DREDGE CELLS/CLOSURE
STATION:
RANGE :
PART :

BORING: SS-1 thru SS-10
EL. :
SAMPLE: Gr 6
DATE : 09-29-94



GRAVEL (%) =	0	D10 (MM)	= --
SAND (%) =	36	D30 (MM)	= --
SILT (%) =	30	D60 (MM)	= --
CLAY (%) =	34	COEF UNIF	= --

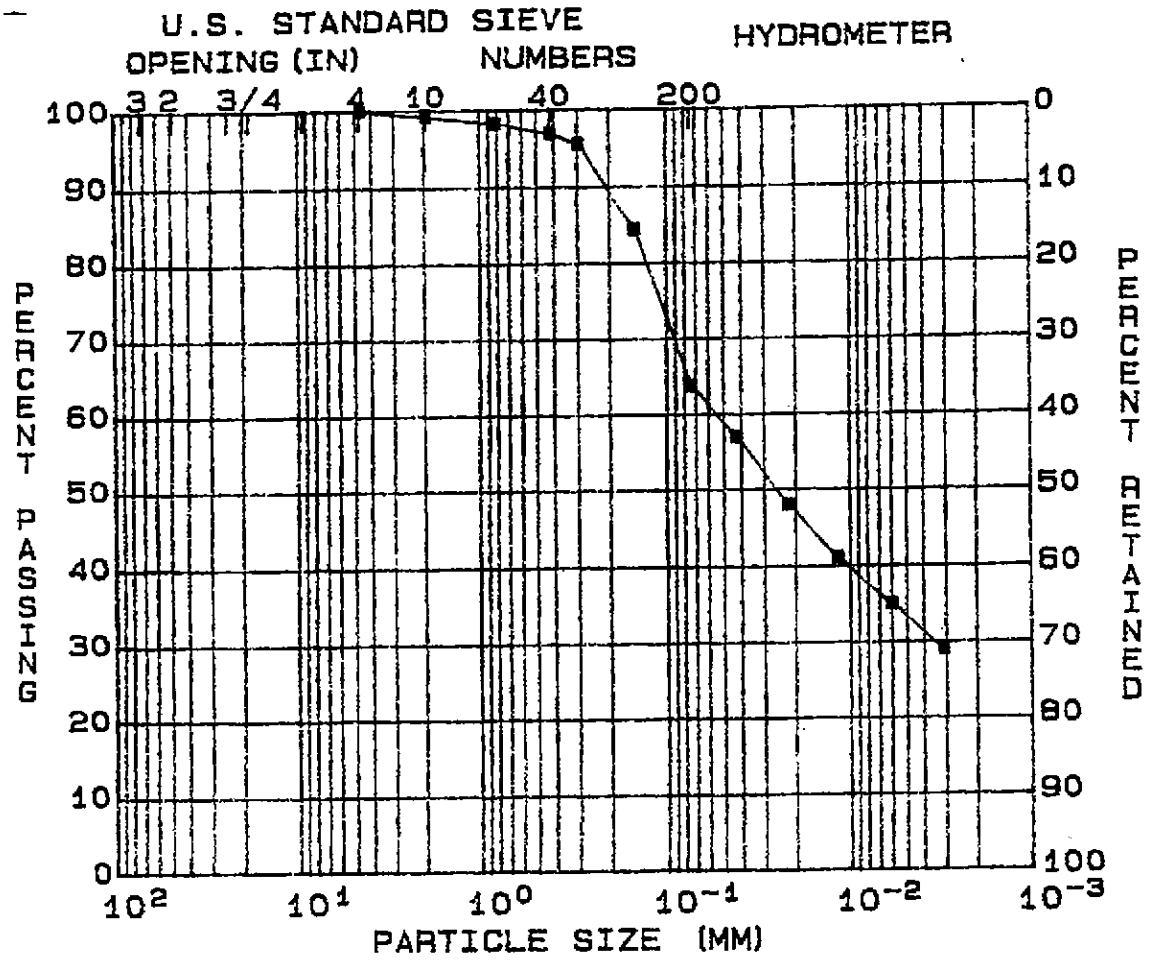
SOIL SYMBOL= CL	L.L. (%) = 26	DENSITY (pcf) = --
MOISTURE (%) =	P.I. (%) = 8	SATURATION (%) = --
SP. GR. = 2.71		VOID RATIO = --

REMARKS:

SINGLETON LABORATORIES
PARTICLE SIZE ANALYSIS

PROJECT: TVA/KINGSTON FP
FEATURE: DREDGE CELLS/CLOSURE
STATION:
RANGE :
PART :

BORING: SS-1 thru SS-10
EL. :
SAMPLE: Gr 6
DATE : 09-29-94



GRAVEL (%)	= 0	D10 (MM)	= --
SAND (%)	= 36	D30 (MM)	= --
SILT (%)	= 30	D60 (MM)	= --
CLAY (%)	= 34	COEF UNIF	= --

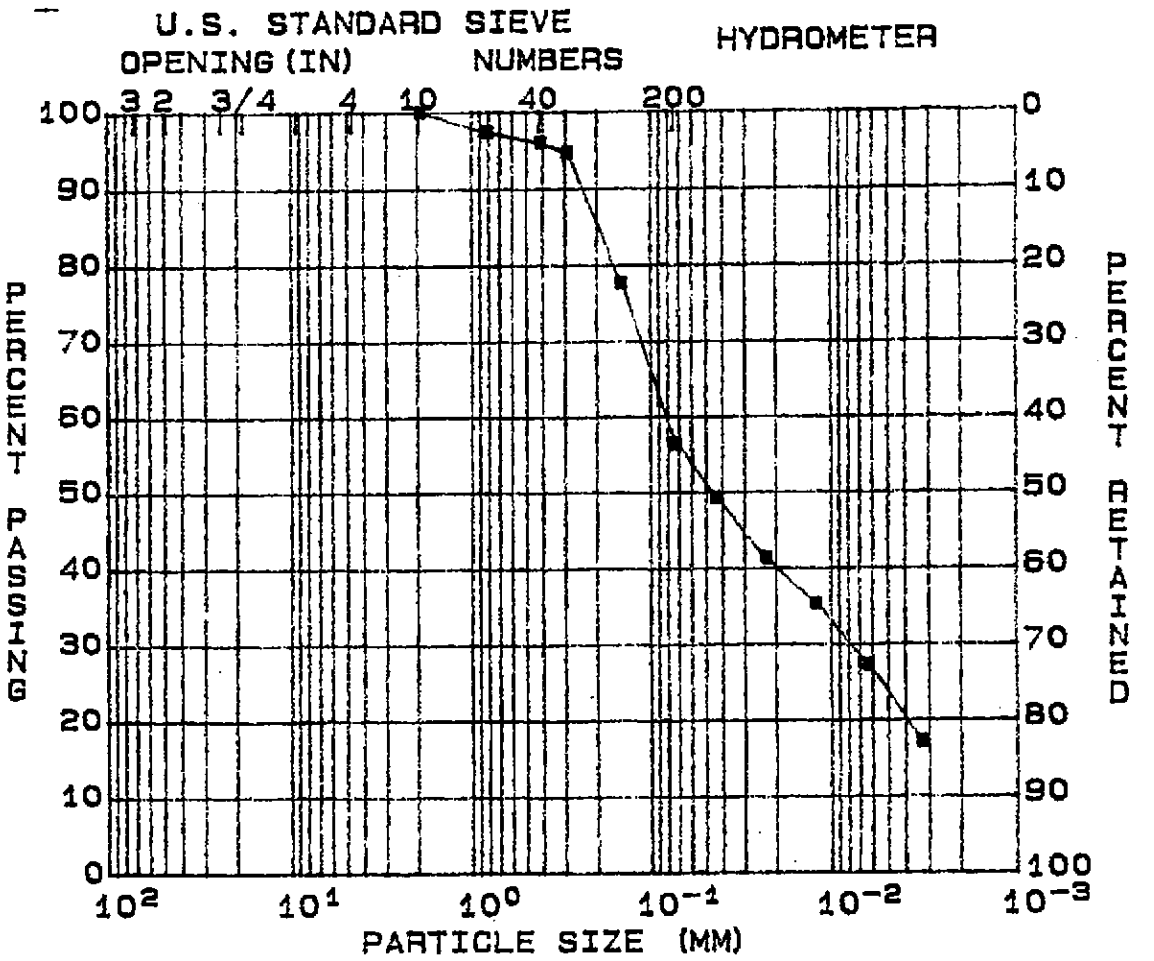
SOIL SYMBOL = CL	L.L. (%) = 26	DENSITY (pcf) = --
MOISTURE (%) =	P.I. (%) = 8	SATURATION (%) = --
SP. GR. = 2.71		VOID RATIO = --

REMARKS:

SINGLETON LABORATORIES
PARTICLE SIZE ANALYSIS

PROJECT: TVA/KINGSTON FP
FEATURE: DREDGE CELLS/CLOSURE
STATION:
RANGE :
PART :

BORING: SS-1 thru SS-10
EL. :
SAMPLE: Gr 7
DATE : 09-29-94



GRAVEL (%) =	0	D10 (MM) =	--
SAND (%) =	43	D30 (MM) =	--
SILT (%) =	33	D60 (MM) =	--
CLAY (%) =	24	COEF UNIF =	--

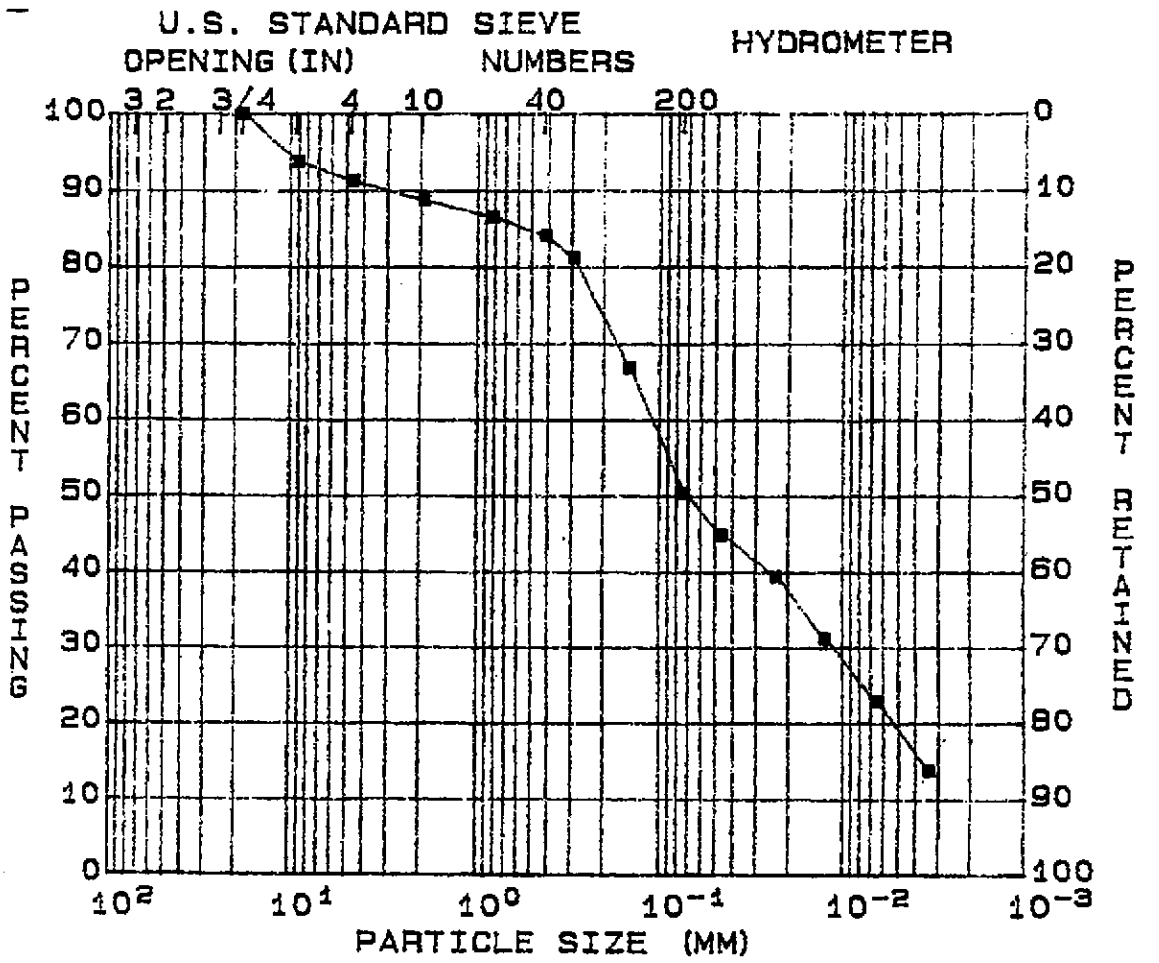
SOIL SYMBOL =	ML	L.L. (%) =	NP	DENSITY (pcf) =	--
MOISTURE (%) =		P.I. (%) =	NP	SATURATION (%) =	--
SP. GR. =	2.65			VOID RATIO =	--

REMARKS:

SINGLETON LABORATORIES
PARTICLE SIZE ANALYSIS

PROJECT: TVA/KINGSTON FP
FEATURE: DREDGE CELLS/CLOSURE
STATION:
RANGE :
PART :

BORING: SS-1 thru SS-10
EL. :
SAMPLE: Gr 8
DATE : 09-29-94



GRAVEL (%)	= 8	D10 (MM)	= --
SAND (%)	= 41	D30 (MM)	= --
SILT (%)	= 31	D60 (MM)	= --
CLAY (%)	= 20	COEF UNIF	= --

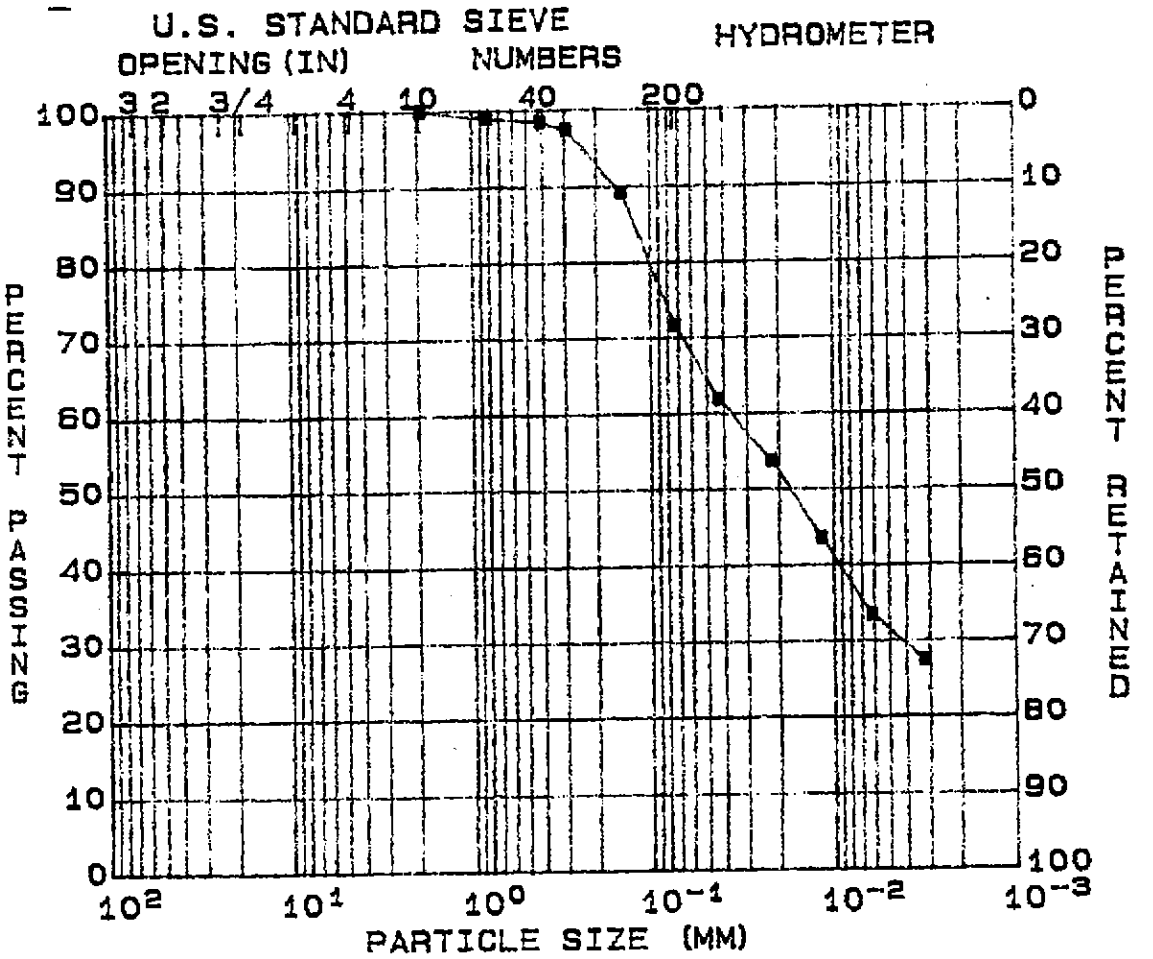
SOIL SYMBOL = ML	L.L. (%) = NP	DENSITY (pcf) = --
MOISTURE (%) =	P.I. (%) = NP	SATURATION (%) = --
SP. GR. = 2.56		VOID RATIO = --

REMARKS:

SINGLETON LABORATORIES
PARTICLE SIZE ANALYSIS

PROJECT: TVA/KINGSTON FP
FEATURE: DREDGE CELLS/CLOSURE
STATION:
RANGE :
PART :

BORING: SS-1 thru SS-10
EL. :
SAMPLE: Gr 9
DATE : 09-29-94



GRAVEL (%)	= 0	D10 (MM)	= --
SAND (%)	= 28	D30 (MM)	= --
SILT (%)	= 40	D60 (MM)	= --
CLAY (%)	= 32	COEF UNIF	= --

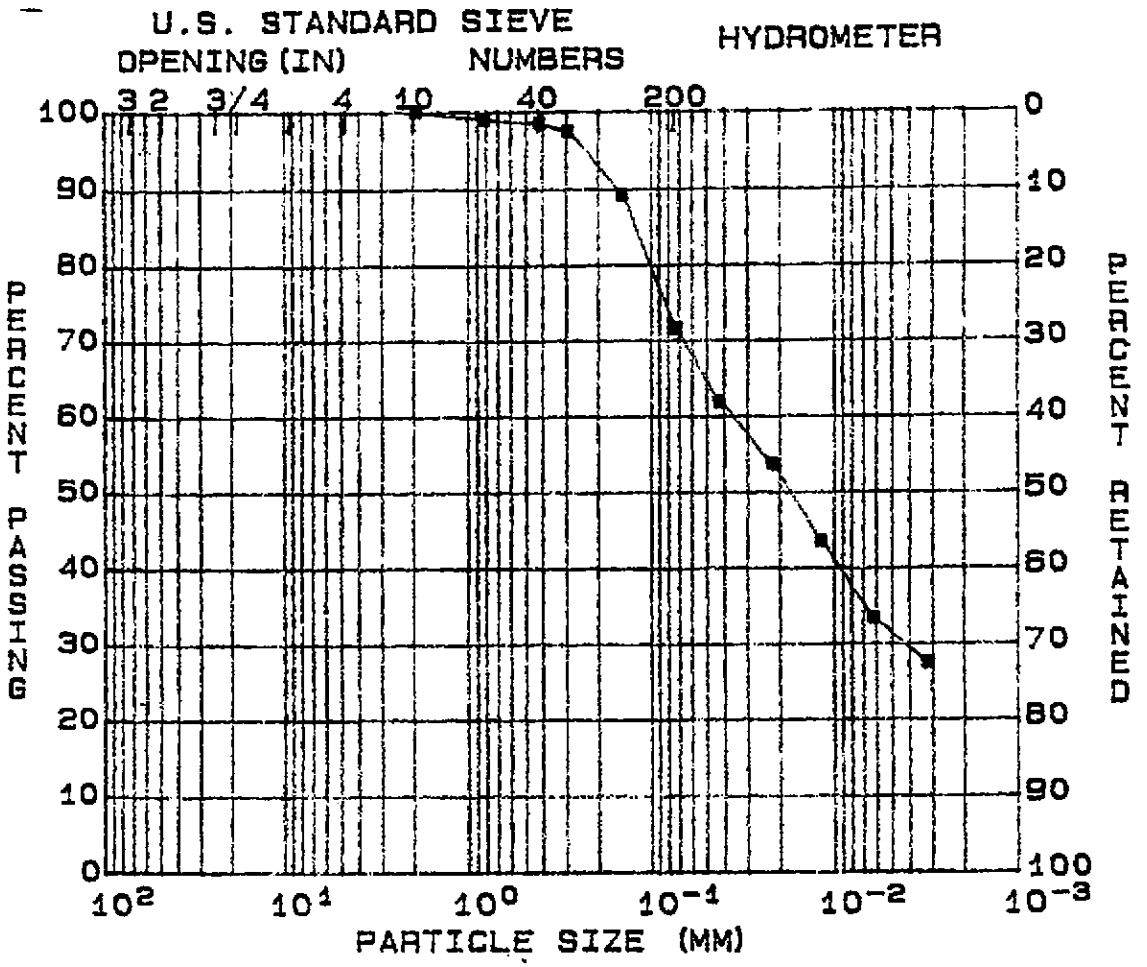
SOIL SYMBOL = CL	L.L. (%) = 26	DENSITY (pcf) = --
MOISTURE (%) =	P.I. (%) = 8	SATURATION (%) = --
SP. GR. = 2.64		VOID RATIO = --

REMARKS:

SINGLETON LABORATORIES
PARTICLE SIZE ANALYSIS

PROJECT: TVA/KINGSTON FP
FEATURE: DREDGE CELLS/CLOSURE
STATION:
RANGE :
PART :

BORING: SS-1 thru SS-10
EL. :
SAMPLE: Gr 9
DATE : 09-29-94



GRAVEL (%)	= 0	D10 (MM)	= ---
SAND (%)	= 28	D30 (MM)	= ---
SILT (%)	= 40	D60 (MM)	= ---
CLAY (%)	= 32	COEF UNIF	= ---

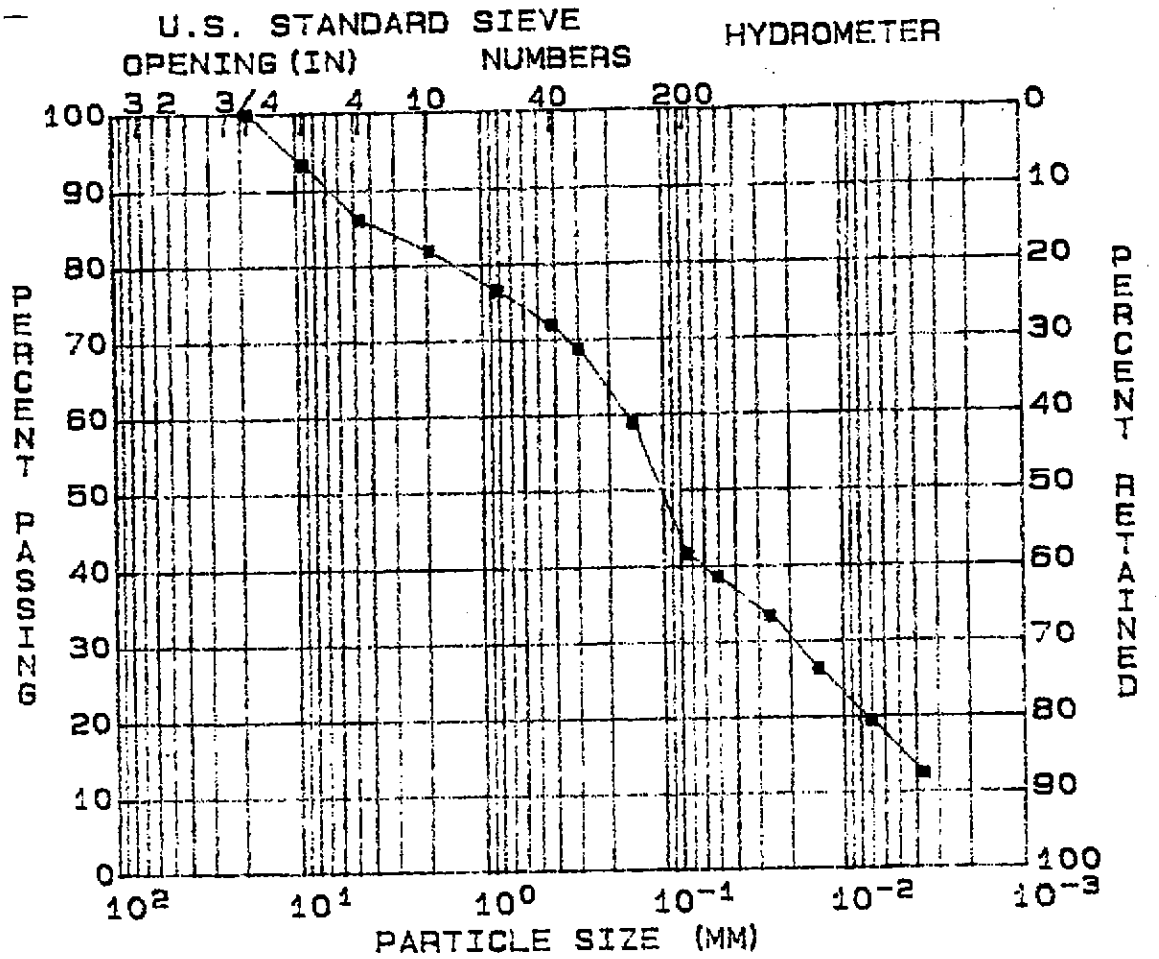
SOIL SYMBOL = CL	L.L. (%) = 26	DENSITY (pcf) = --
MOISTURE (%) =	P.I. (%) = 8	SATURATION (%) = --
SP. GR. = 2.64		VOID RATIO = --

REMARKS:

SINGLETON LABORATORIES
PARTICLE SIZE ANALYSIS

PROJECT: TVA/KINGSTON FP
FEATURE: DREDGE CELLS/CLOSURE
STATION:
RANGE :
PART :

BORING: SS-1 thru SS-10
EL. :
SAMPLE: Gr 10
DATE : 09-29-94



GRAVEL (%)	= 13	D10 (MM)	= 0.0029
SAND (%)	= 45	D30 (MM)	= 0.0185
SILT (%)	= 26	D60 (MM)	= 0.1552
CLAY (%)	= 16	COEF UNIF	=54.2

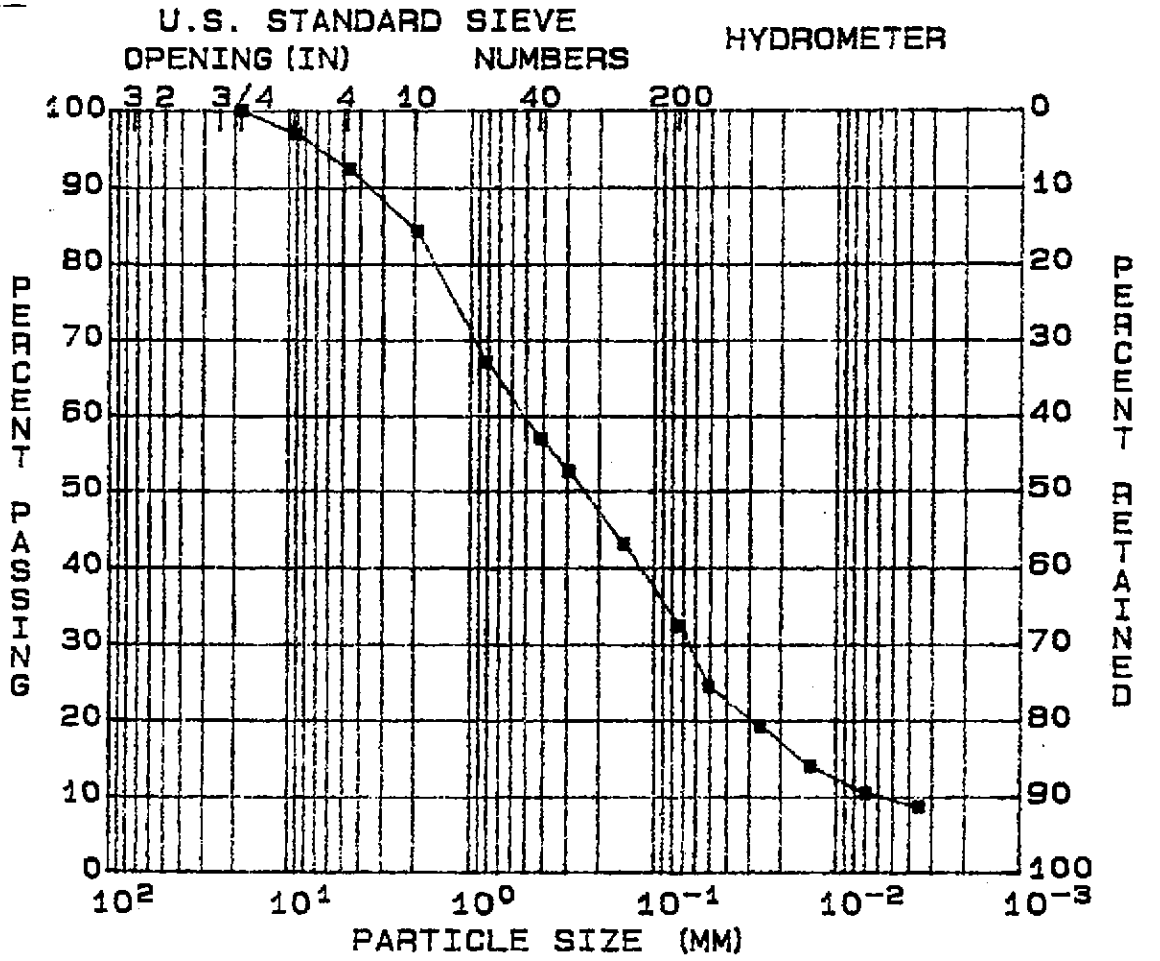
SOIL SYMBOL= SM	L.L. (%) = NP	DENSITY (pcf) = --
MOISTURE (%) =	P.I. (%) = NP	SATURATION (%) = --
SP. GR. = 2.40		VOID RATIO = --

REMARKS:

SINGLETON LABORATORIES
PARTICLE SIZE ANALYSIS

PROJECT: TVA/KINGSTON FP
FEATURE: DREDGE CELLS/CLOSURE
STATION:
RANGE :
PART :

BORING: SS-1 thru SS-10
EL. :
SAMPLE: Gr 11
DATE : 09-29-94



GRAVEL (%) =	7	D10 (MM)	= 0.0056
SAND (%) =	61	D30 (MM)	= 0.0662
SILT (%) =	23	D60 (MM)	= 0.5022
CLAY (%) =	9	COEF UNIF=	90.5

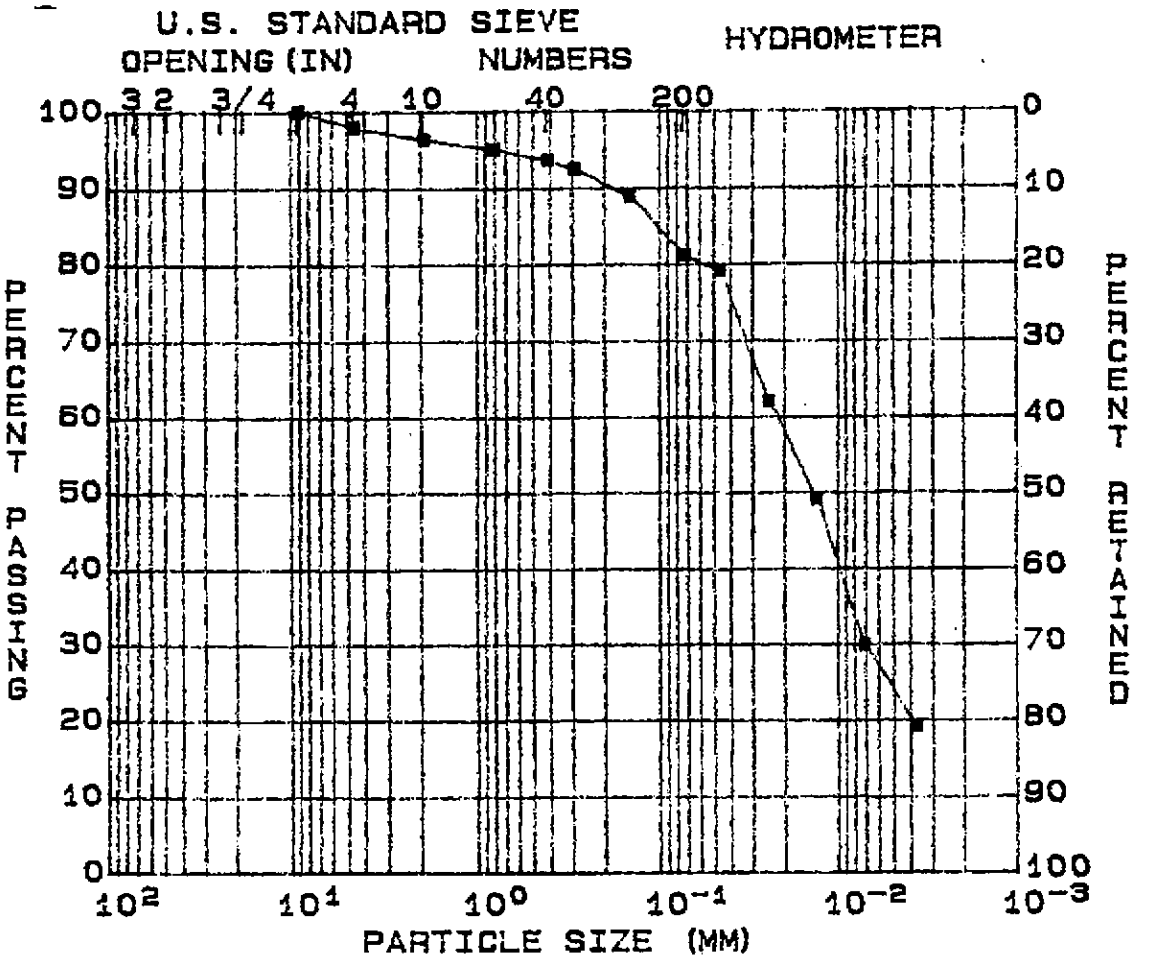
SOIL SYMBOL= SM	L.L. (%) = NP	DENSITY (pcf) = --
MOISTURE (%) =	P.I. (%) = NP	SATURATION (%) = --
SP. GR. = 2.51		VOID RATIO = --

REMARKS:

SINGLETON LABORATORIES
PARTICLE SIZE ANALYSIS

PROJECT: TVA/KINGSTON FP
FEATURE: DREDGE CELLS/CLOSURE
STATION:
RANGE :
PART :

BORING: SS-1 thru SS-10
EL. :
SAMPLE: Gr 12
DATE : 09-29-94



GRAVEL (%)	= 1	D10 (MM)	= --
SAND (%)	= 17	D30 (MM)	= --
SILT (%)	= 57	D60 (MM)	= --
CLAY (%)	= 25	COEF UNIF	= --

SOIL SYMBOL = ML	L.L. (%) = NP	DENSITY (pcf) = --
MOISTURE (%) =	P.I. (%) = NP	SATURATION (%) = --
SP. GR. = 2.31		VOID RATIO = --

REMARKS:

This information taken from "Report of Soil Borings, Monitoring Well Installation and Soil Laboratory Testing – Tennessee Valley Authority – Watts Bar and Kingston Facilities," Law Engineering, November 30, 1988.

TVA-00018783

LABORATORY TESTING PROCEDURES

ATTERBERG LIMITS

The Atterberg Limits consist of moisture contents of soils which produce specified consistencies. The Atterberg Limits consist of the Liquid Limit (LL), Plastic Limit (PL) and Shrinkage Limit (SL). The LL (between the liquid and plastic states) is the water content at which a trapazoidal groove of specified shape, cut in moist soil held in a special cup, is closed after 25 taps on a hard rubber plate. The PL (between the semi-solid and solid states) is the maximum water content at which a reduction in water content will not cause a decrease in the volume of the soil mass.

The LL has been found to be proportional to the compressibility of the normally consolidated soil. The Plasticity Index (PI) is the calculated difference in water contents between the LL and PL. Together the LL and PI are used to classify silts at clays according to the Unified System Classification of Soils (ASTM D-2487). The PI is used to predict the potential for volume changes in confined soils beneath foundations or grade slabs. Should the PI indicate the potential for soil volume change, Shrinkage Limit (SL) testing can be performed to estimate the amount of volume changes in confined soils beneath foundations or grade slabs.

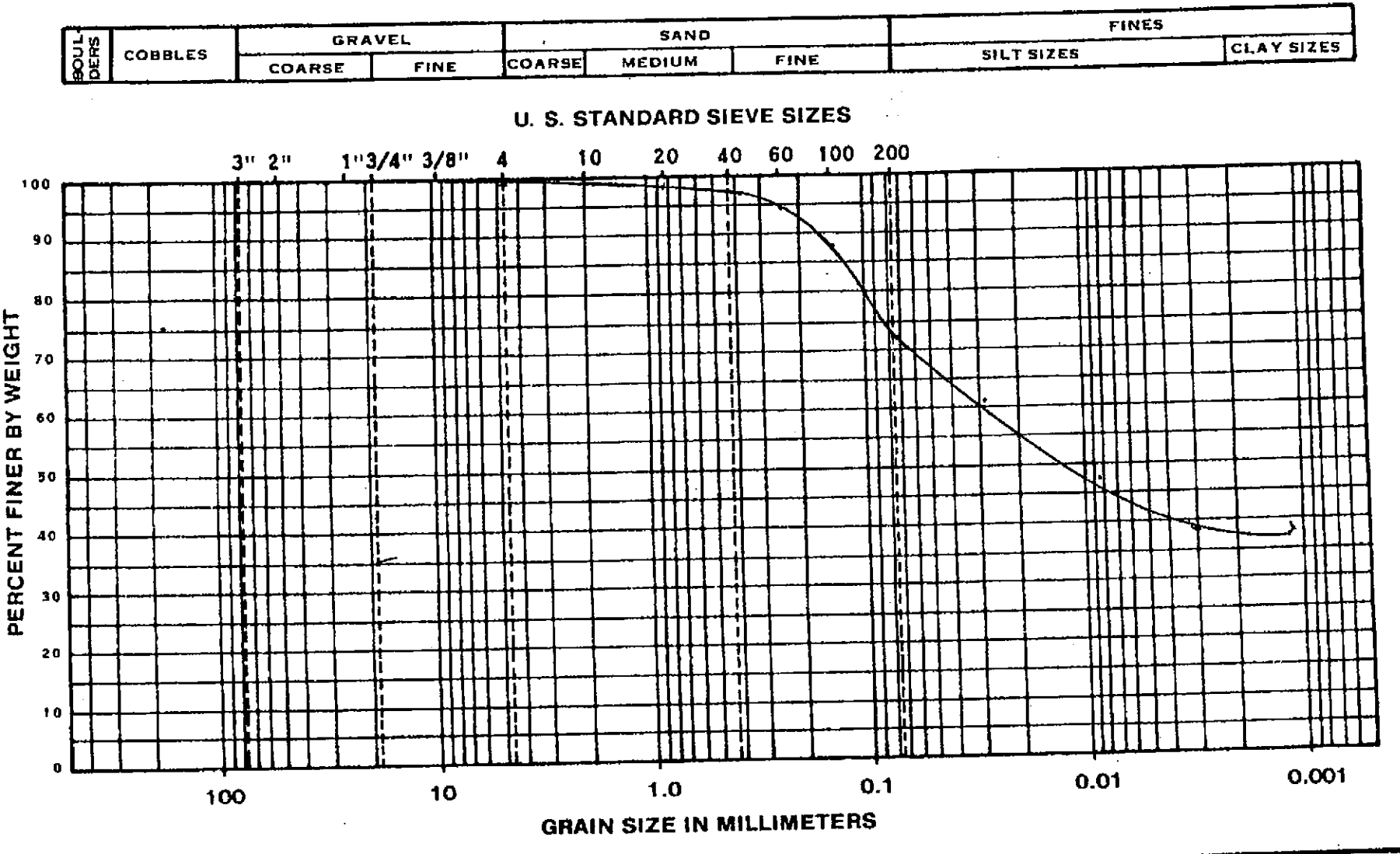
The LL, (PL and PI) and SL are determined in accordance with ASTM's D-423, D-424 and D-427, respectively.

GRAIN SIZE DISTRIBUTION

Grain Size Tests are performed to aid in determining the soil classification and the grain size distribution. The soil samples are prepared for testing according to ASTM D-421 (dry preparation) or ASTM D-2217 (wet preparation). If only the grain size distribution of soils coarser than a number 200 sieve (o.074 mm opening) is desired, the grain size distribution is determined by washing the sample over a #200 sieve and after drying passing the samples through a standard set of nested sieves. If the

grain size distribution of the soils finer than the #200 sieve is also desired, the grain size distribution of the soils coarser than the #10 sieve is determined by passing the sample through a set of nested sieves. Materials passing the number 10 sieve are dispersed with a dispersing agent and suspended in water and the grain size distribution calculated from the measured settlement rate of the particles. These tests are conducted in accordance with ASTM D-422.

AF



Law Engineering Testing Company

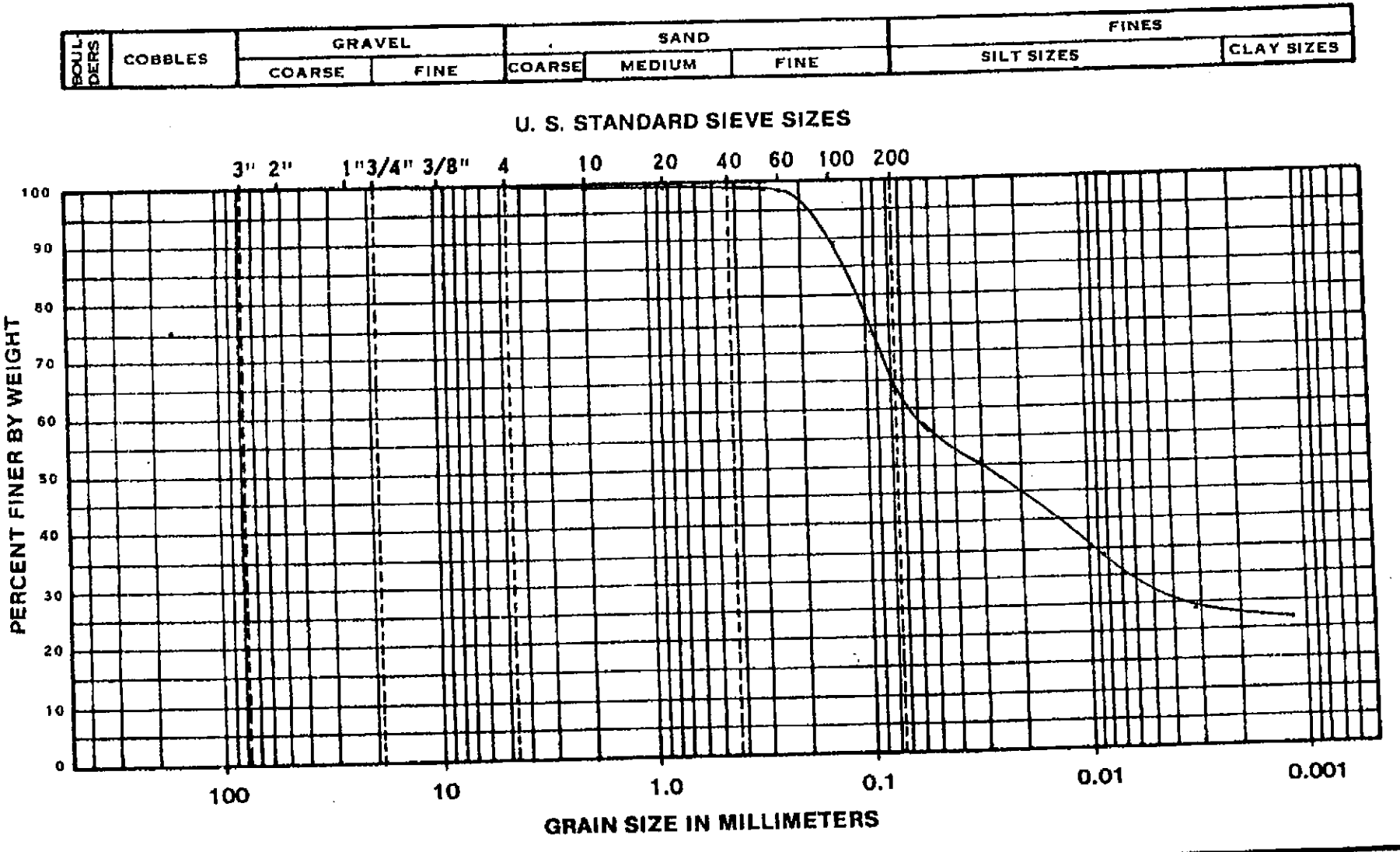
Grain Size Distribution

BORING NO.	DEPTH	NAT WC	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
WB-1	4 TO 5.5 FEET	16.6%	41	20	21	CL - INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY

JOB NO. K-88195

TVA-00018786

AF 3L



Law Engineering Testing Company

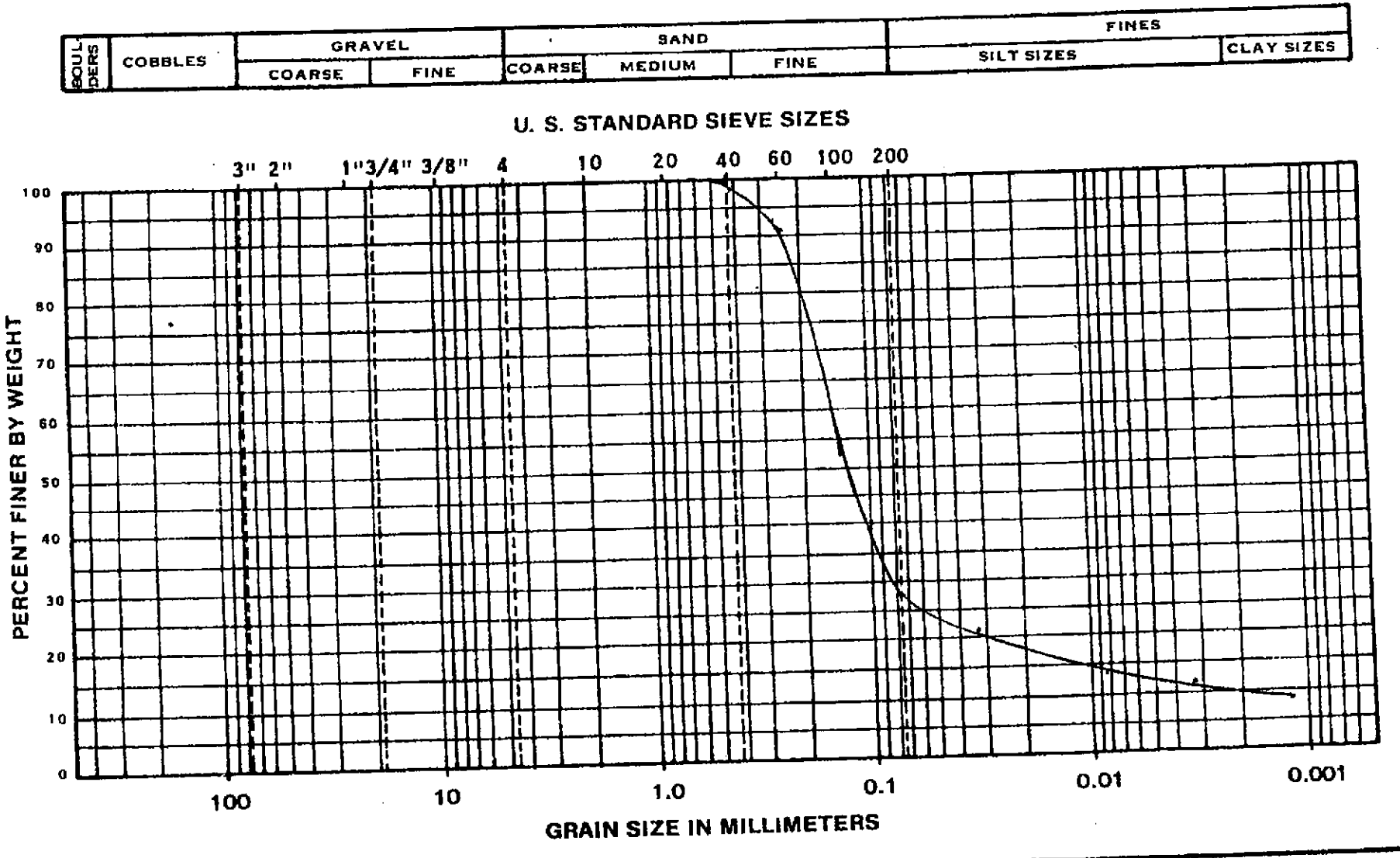
Grain Size Distribution

BORING NO.	DEPTH	NAT WC	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
WB-1	19 TO 20.5 FEET	19.1%	27	17	10	CL - INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY

JOB NO. K-88195

TVA-00018787

AF 36



Law Engineering Testing Company

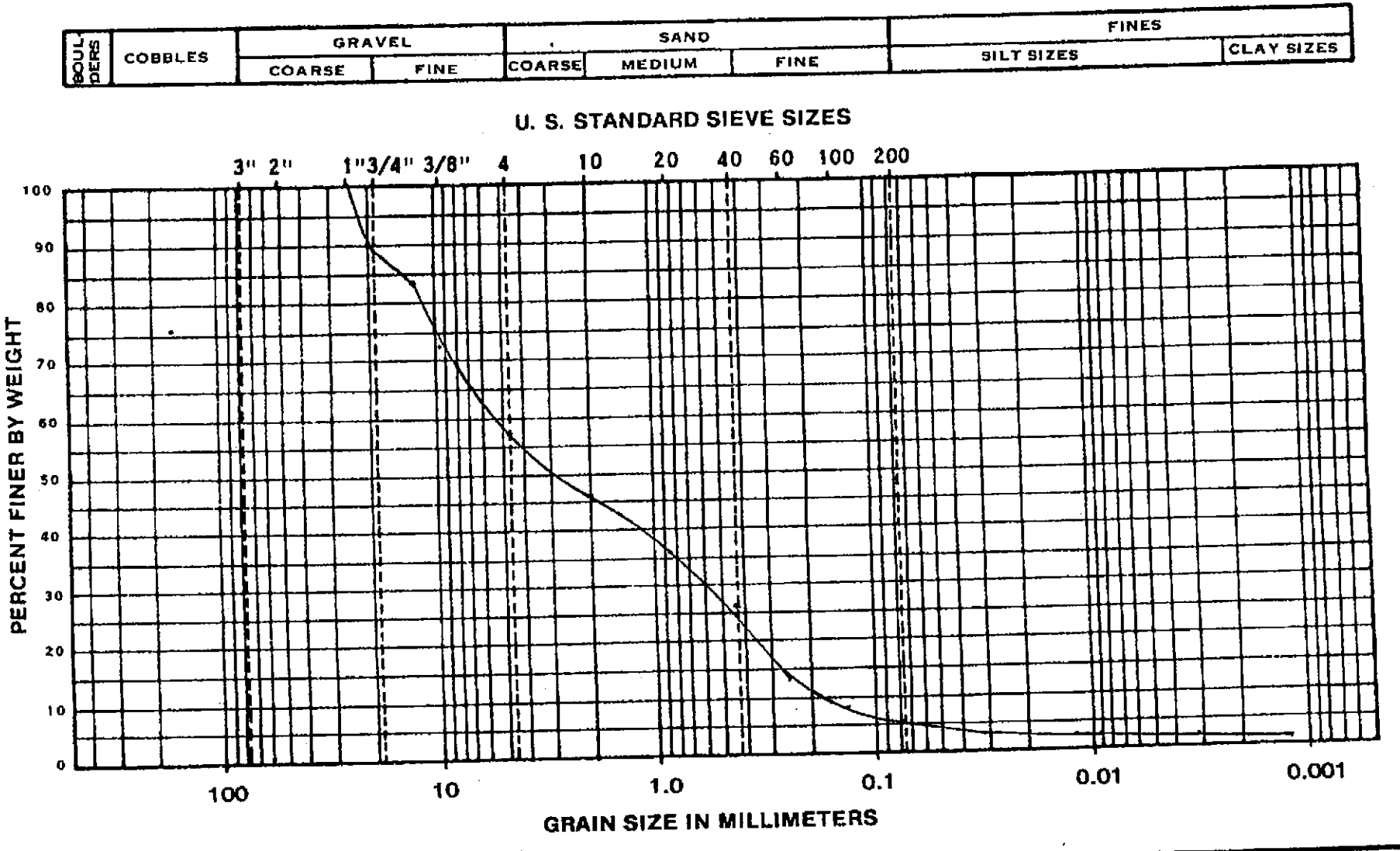
Grain Size Distribution

BORING NO.	DEPTH	NAT WC	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
WB-1	34 TO 35.5 FEET	26.3%	23	20	3	SM - SILTY SANDS, SANDY-SILT MIXTURE

JOB NO. K-88195

TVA-00018788

AF 3



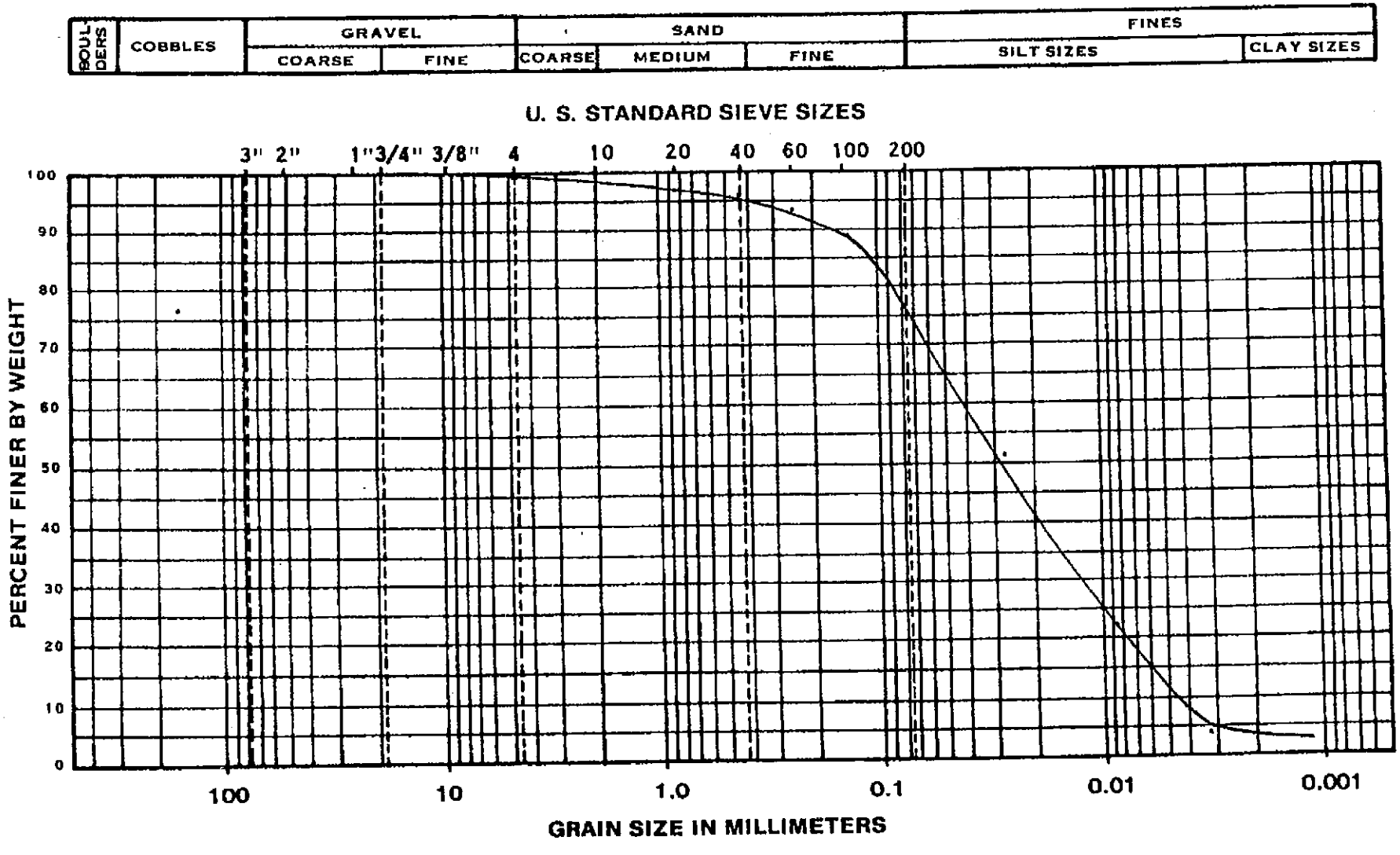
Law Engineering Testing Company

Grain Size Distribution

BORING NO.	DEPTH	NAT WC	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
WB-1	44 TO 45.5 FEET	10.3%	NON-PLASTIC			SP-SM - POORLY GRADED SANDS TO SILTY SANDS
JOB NO. K-88195						

TVA-00018789

AF 36



Law Engineering Testing Company

Grain Size Distribution

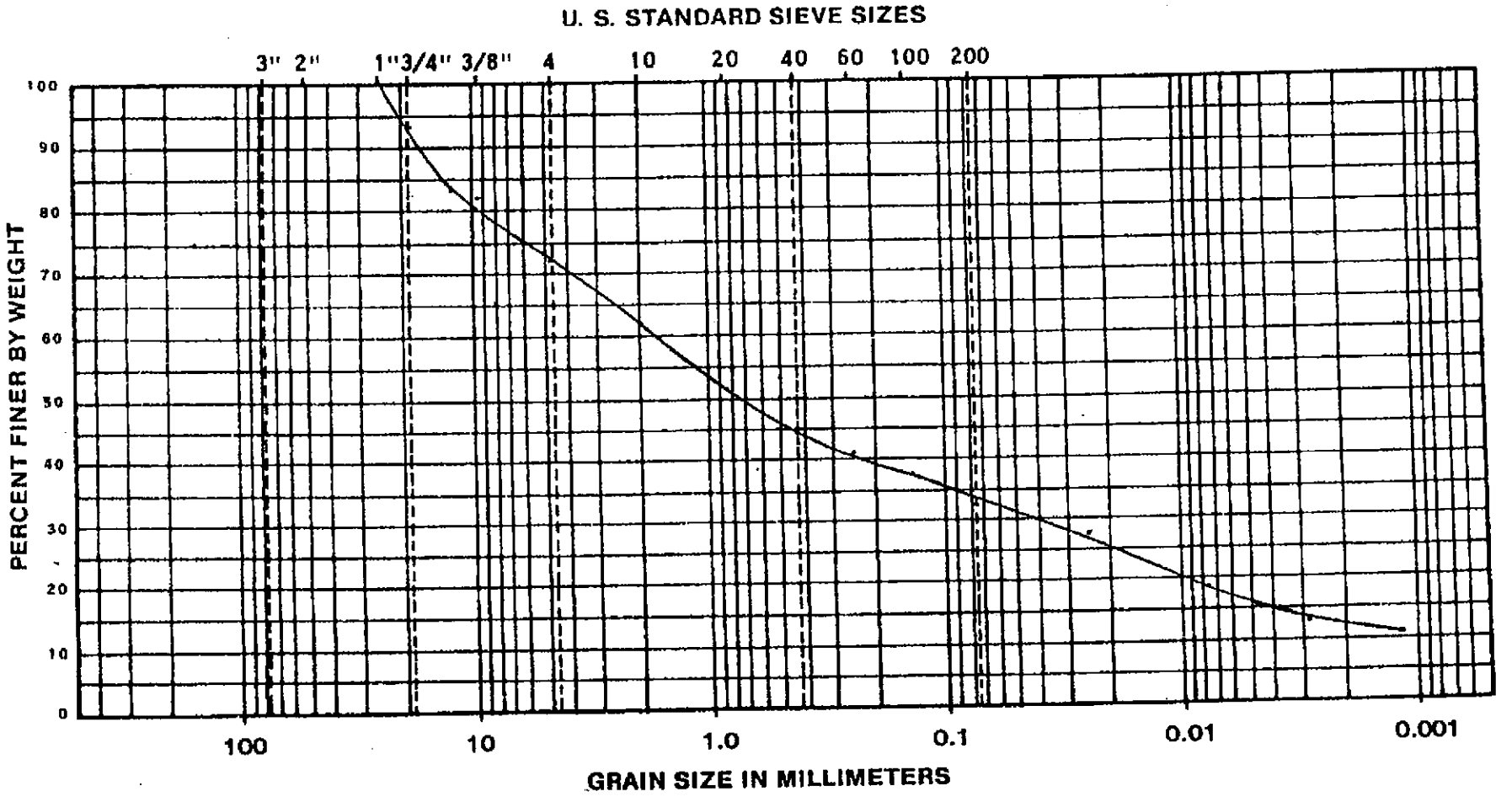
BORING NO.	DEPTH	NAT WC	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
J-9A	9 TO 10.5 FEET	23.5%	NON-PLASTIC SOIL			ML - INORGANIC SILTS AND FINE SANDS

JOB NO. K-88195

TVA-00018790

AF 36

BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES



Law Engineering Testing Company

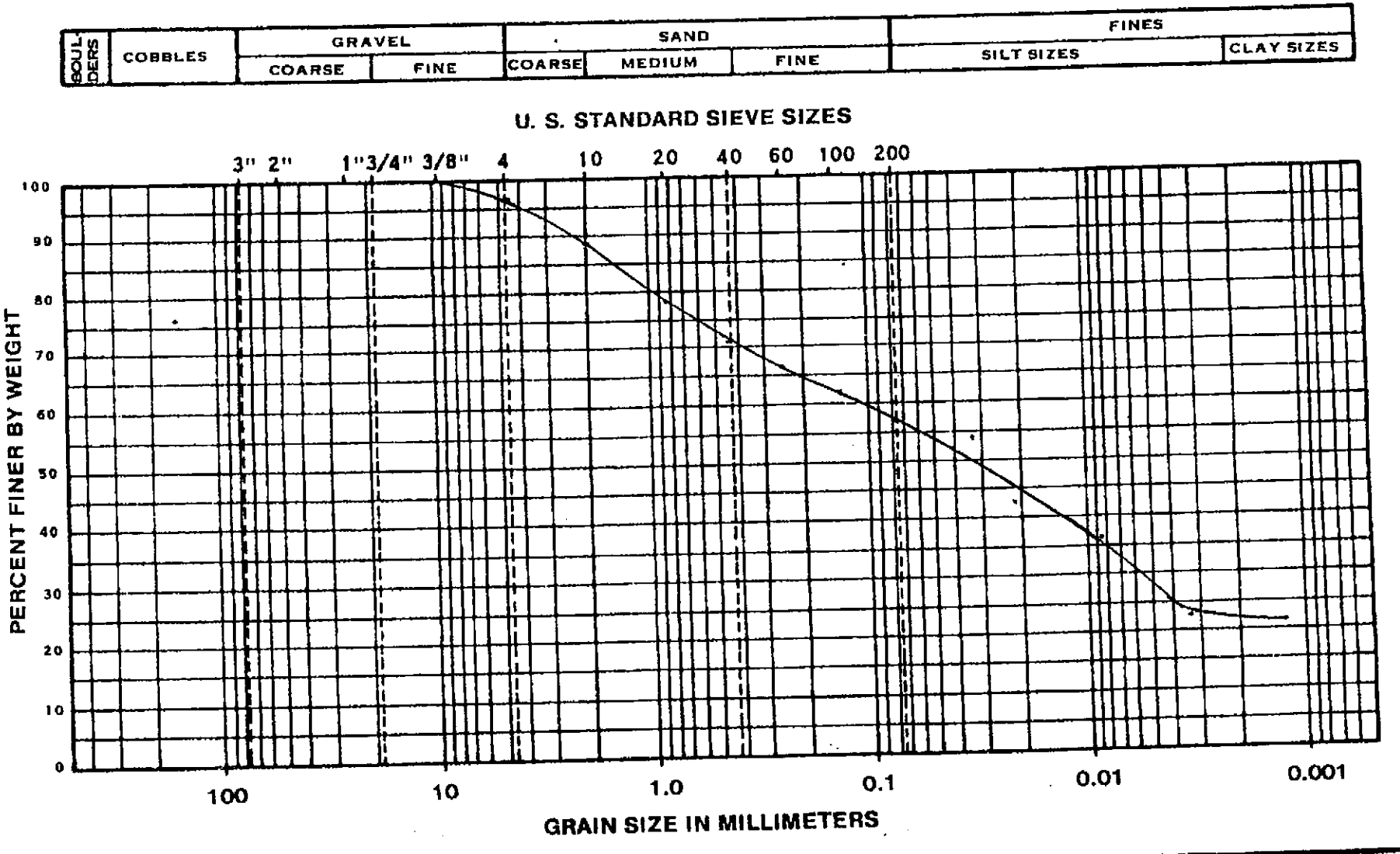
Grain Size Distribution

BORING NO.	DEPTH	NAT WC	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
J-10B	4.0 TO 5.5 FEET	11.4%				SAMPLE NOT LARGE ENOUGH TO PERFORM PLASTICITY TESTS

JOB NO. K-88195

TVA-00018791

AF 36



Law Engineering Testing Company

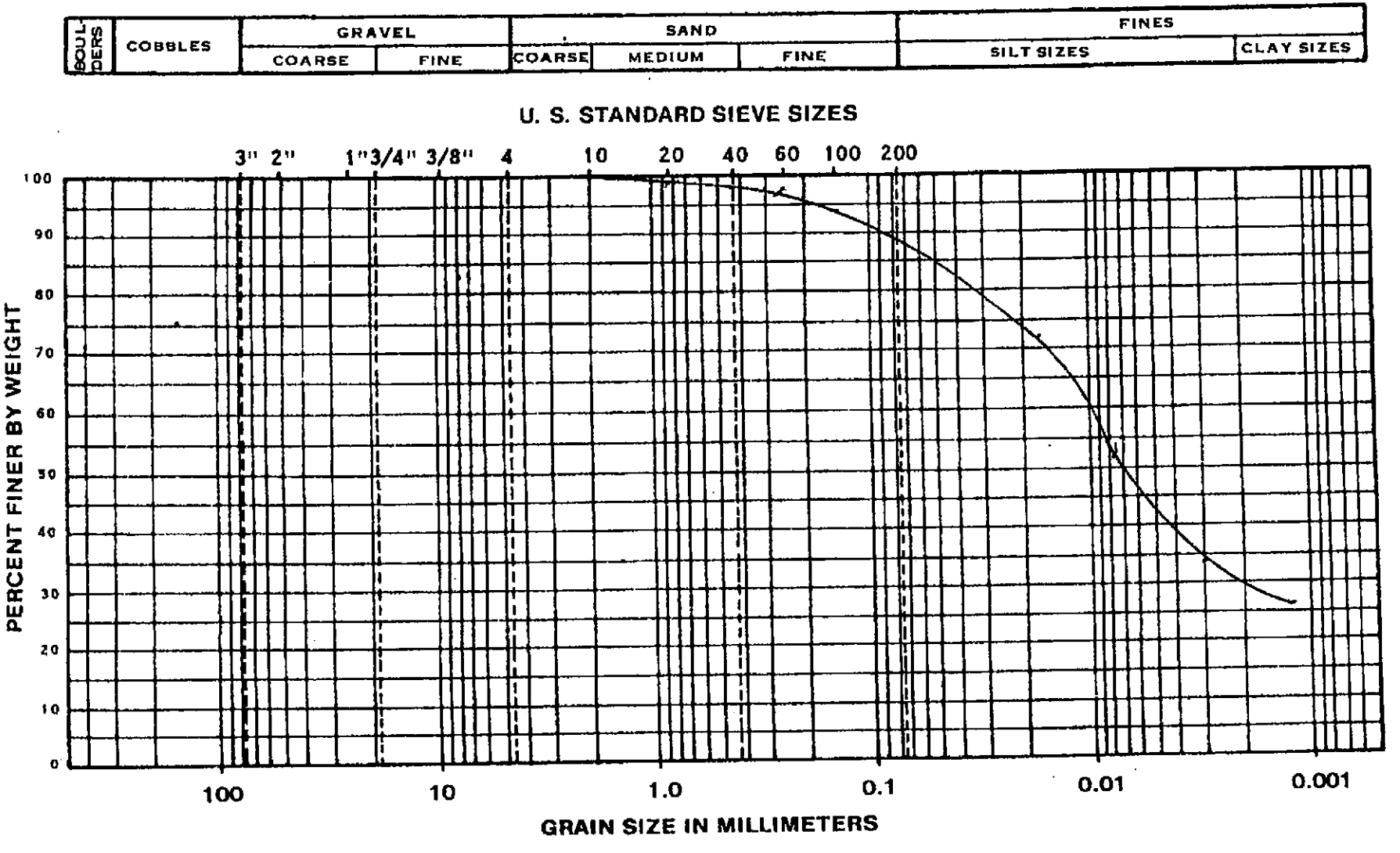
Grain Size Distribution

BORING NO.	DEPTH	NAT WC	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
J-10B	14 TO 15.5 FEET	24.8%	38	24	14	CL - INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY

JOB NO. K-88195

TVA-00018792

AF 3(



Law Engineering Testing Company

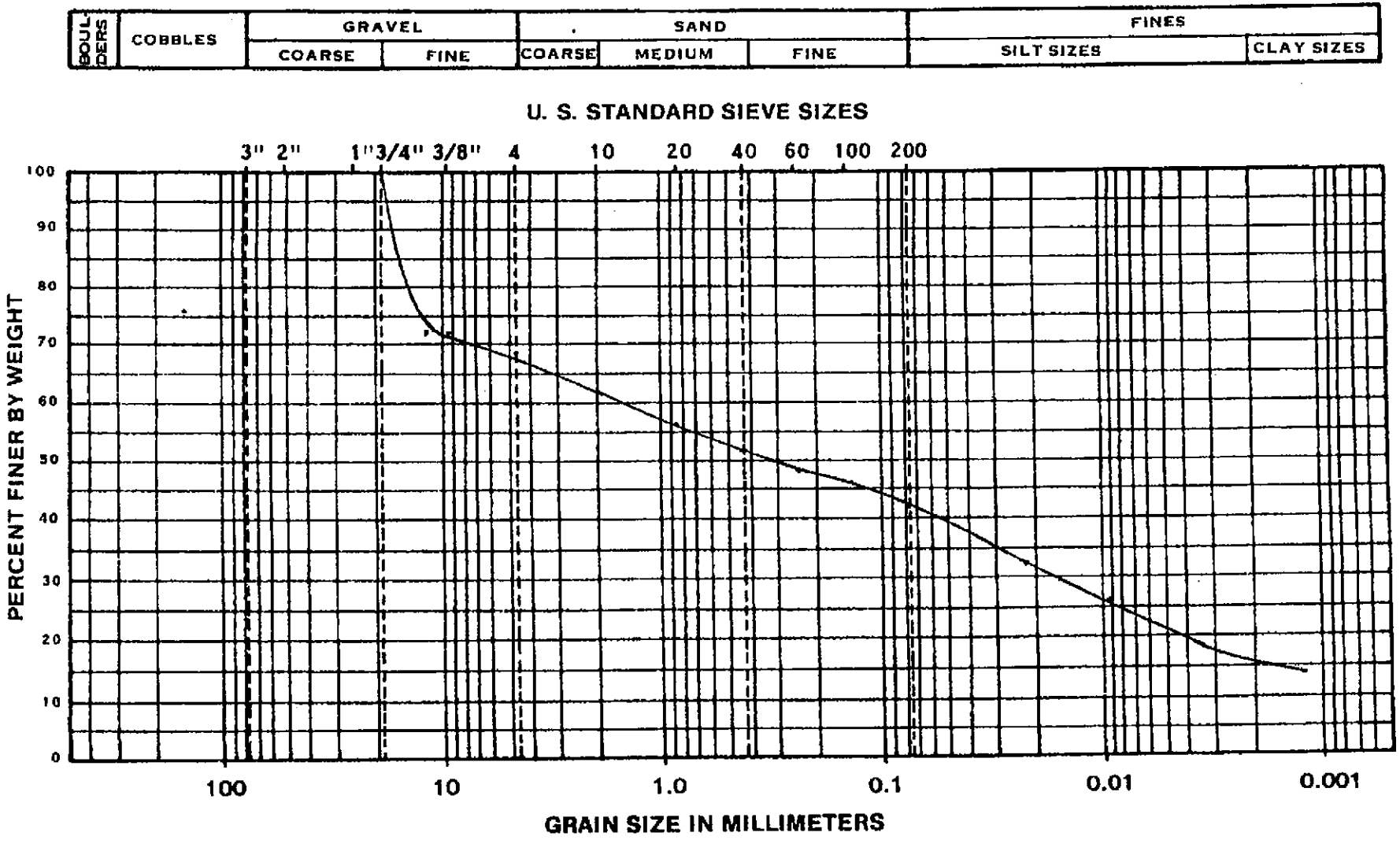
Grain Size Distribution

BORING NO.	DEPTH	NAT WC	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
J-11B	4 TO 5.5 FEET	12.5%	37	23	14	CL - INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY

JOB NO. K-88195

TVA-00018793

AF 36



Law Engineering Testing Company

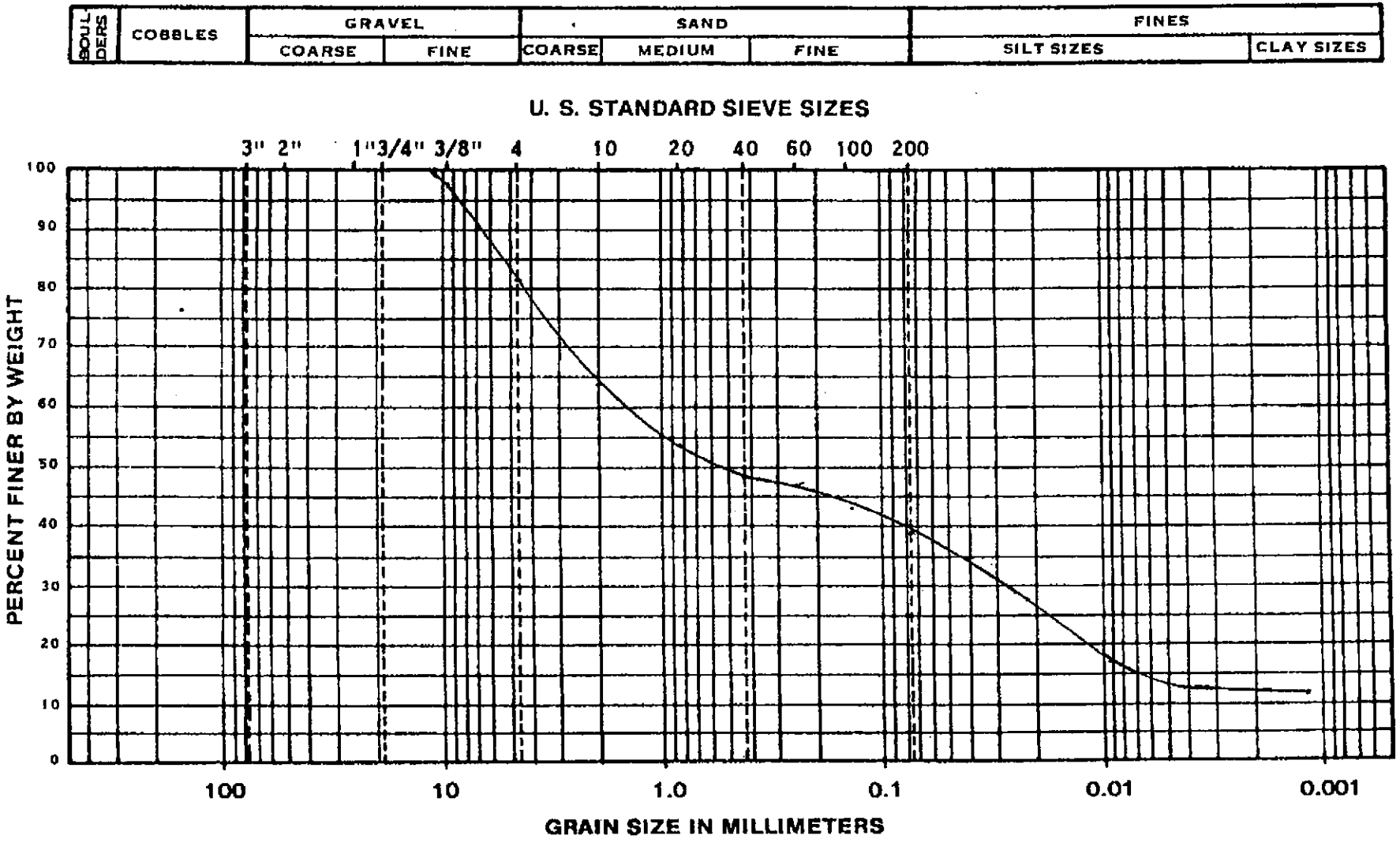
Grain Size Distribution

BORING NO.	DEPTH	NAT WC	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
J-12A	14 TO 15.5 FEET	21.3%	36	21	15	GC - CLAYEY GRAVELS, GRAVEL - SAND-CLAY MIXTURE

JOB NO. K-88195

TVA-00018794

AF 36



Law Engineering Testing Company

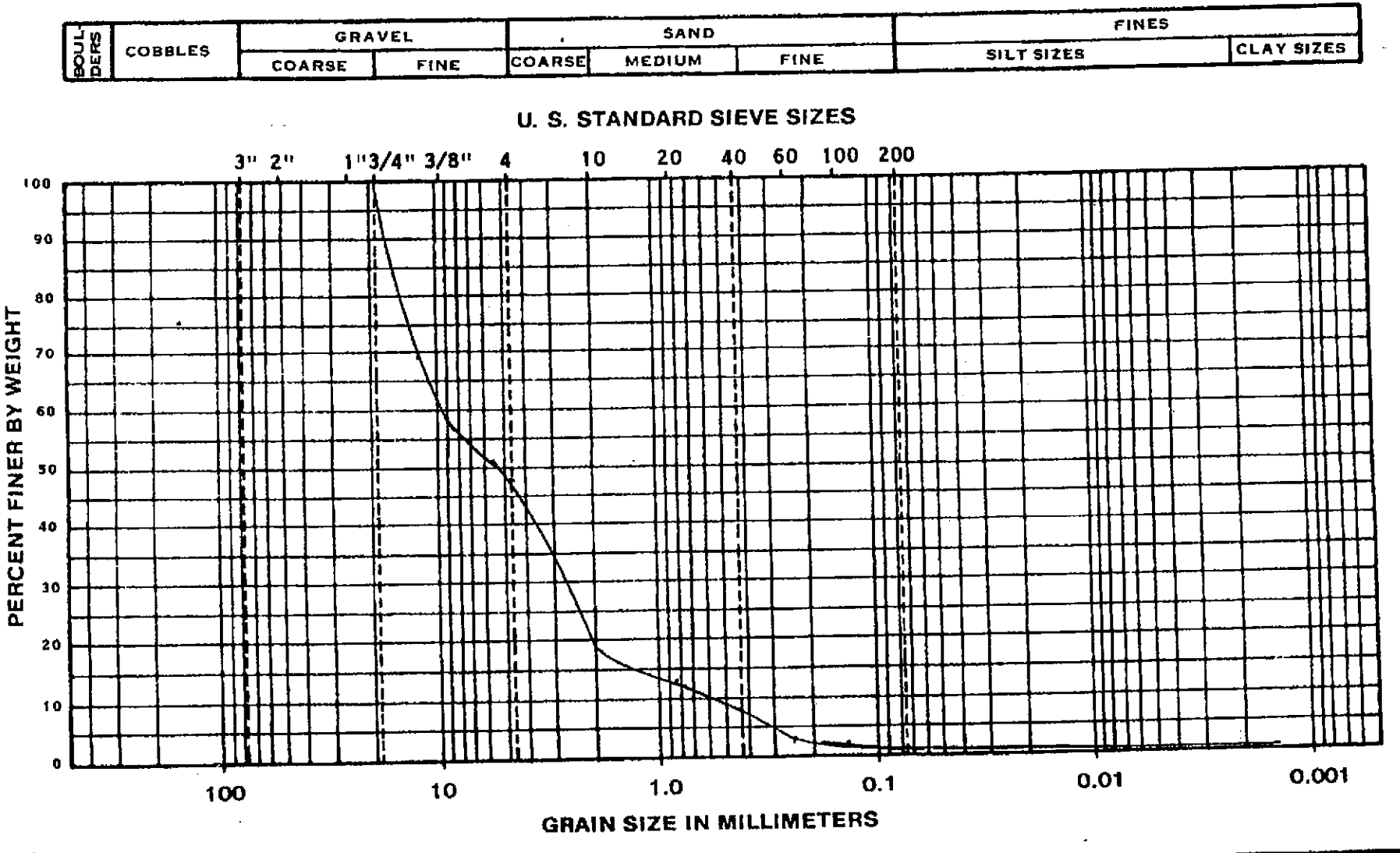
Grain Size Distribution

BORING NO.	DEPTH	NAT WC	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
J-12A	24 TO 25.5 FEET	13.4%	30	20	10	SC - CLAYEY SANDS, SANDY-CLAY MIXTURE

JOB NO. K-88195

TVA-00018795

AF 36



Law Engineering Testing Company

Grain Size Distribution

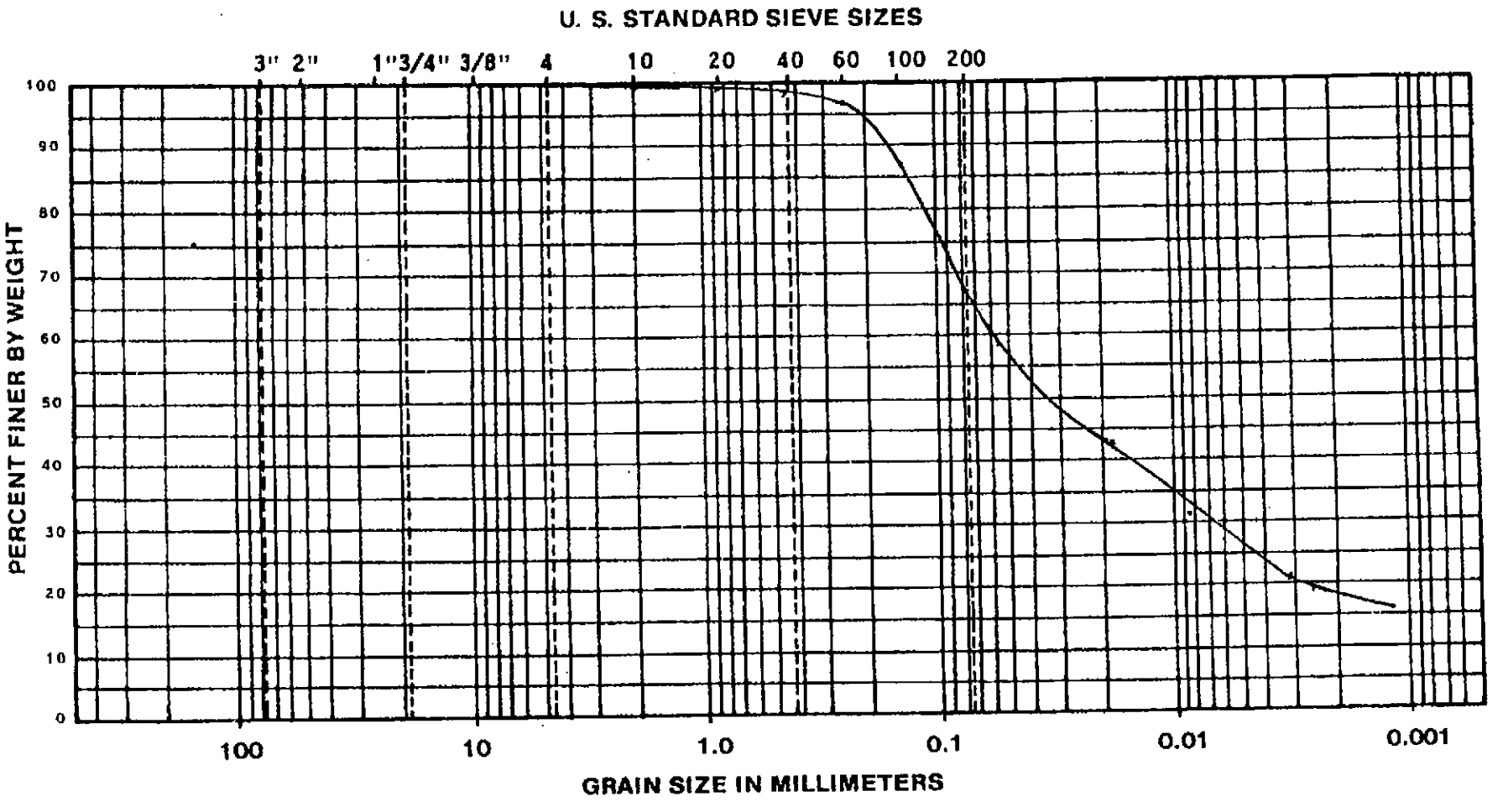
BORING NO.	DEPTH	NAT WC	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
J-13 A	49 TO 50.5 FEET	17.2%	NON-PLASTIC			GW - WELL GRADED GRAVEL, GRAVEL SAND MIXTURES, LITTLE TO NO FINES

JOB NO. K-88195

TVA-00018796

AF 3

BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES



Law Engineering Testing Company

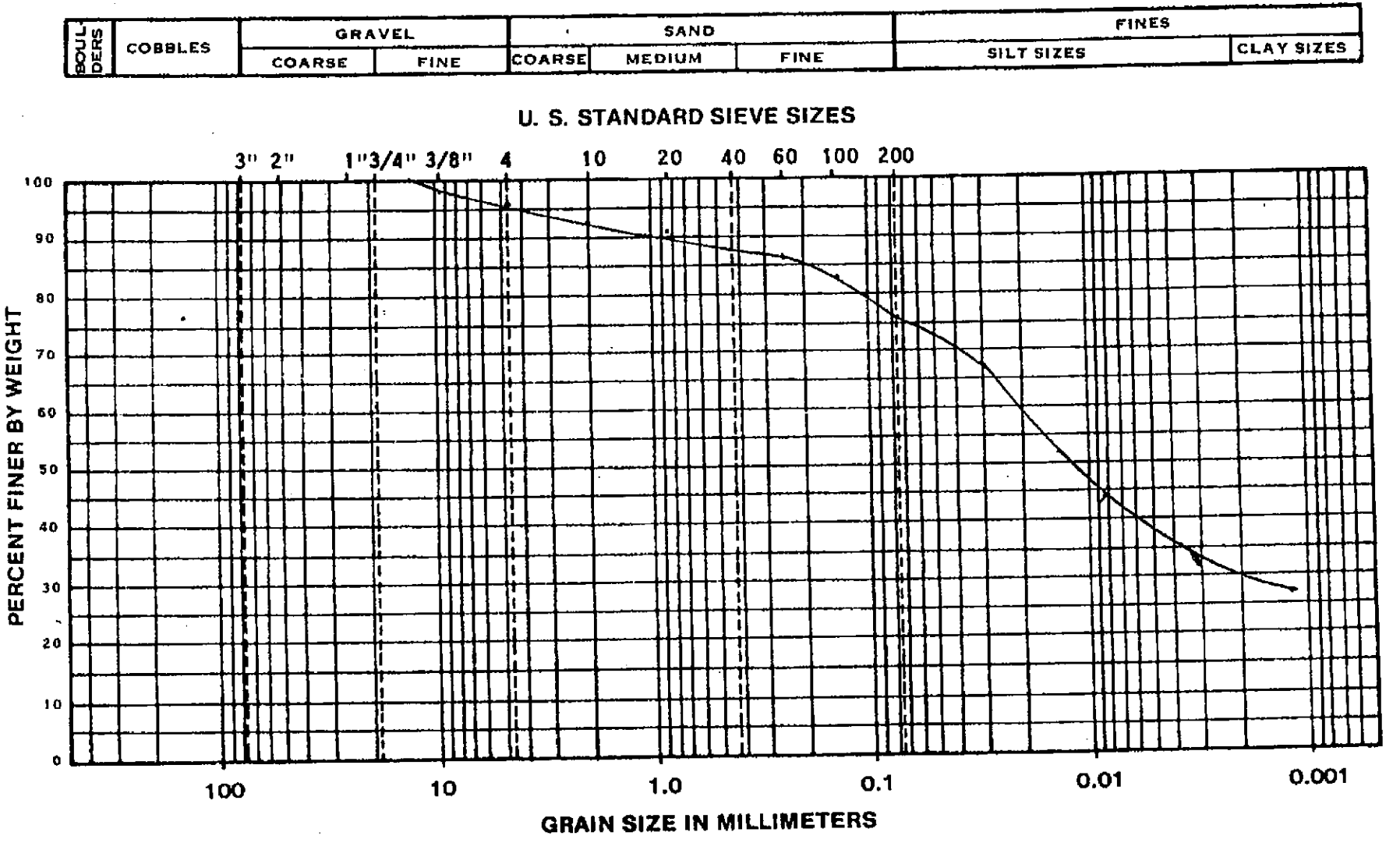
Grain Size Distribution

BORING NO.	DEPTH	NAT WC	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
J-13 A	54 TO 55.5 FEET	29.3%	27	17	10	CL - INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY

JOB NO. K-88195

TVA-00018797

AF 36



Law Engineering Testing Company

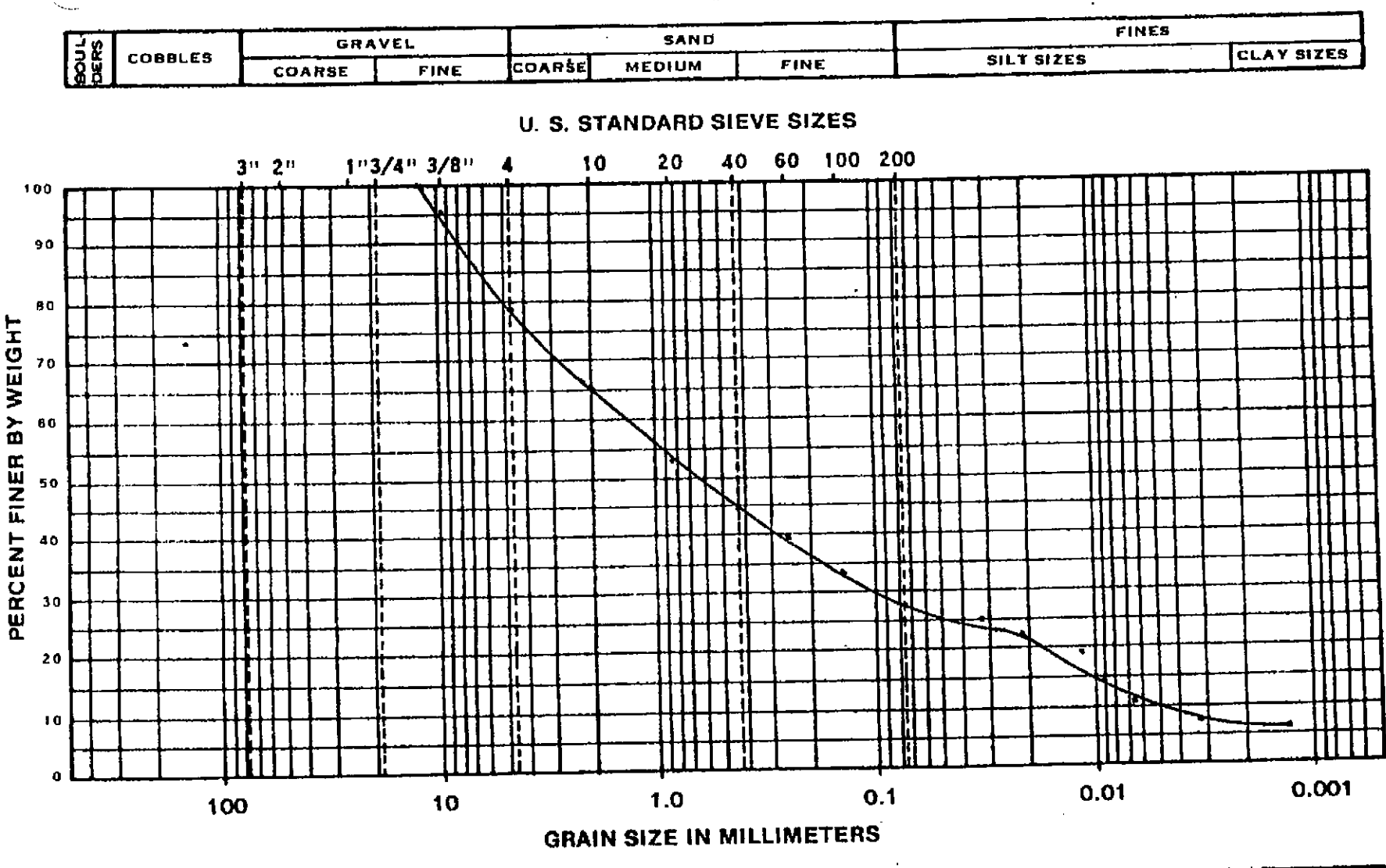
Grain Size Distribution

BORING NO.	DEPTH	NAT WC	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
J-14	9 TO 10.5 FEET	17.8%	28	14	14	CL - INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY

JOB NO. K-88195

TVA-00018798

AF 3



Law Engineering Testing Company

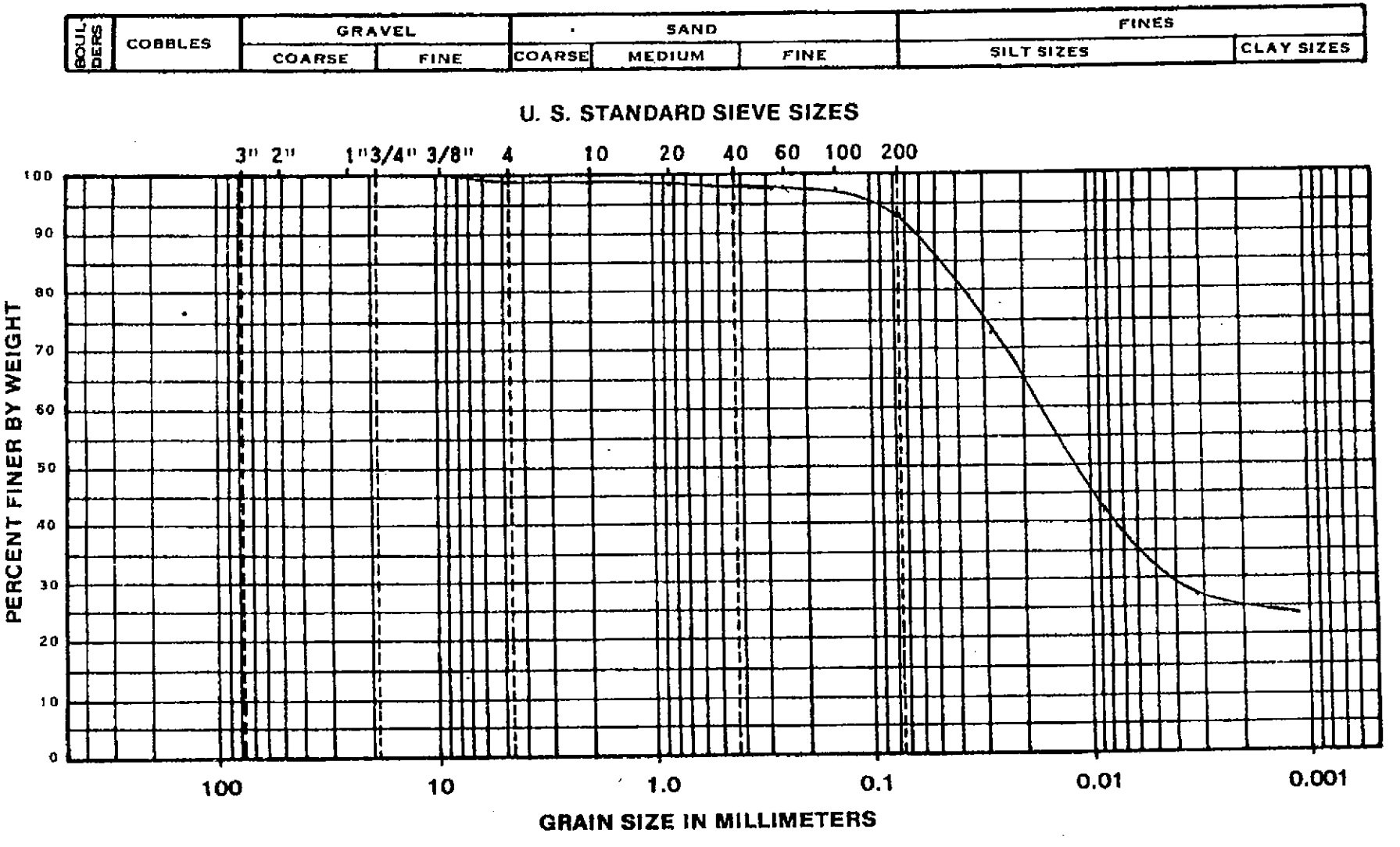
Grain Size Distribution

BORING NO.	DEPTH	NAT WC	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
J-14	11.5 TO 13.0 FEET	25.1%	NON-PLASTIC			SM - SILTY SANDS, SAND-SILT MIXTURE

JOB NO. K-88195

TVA-00018799

AF 36



Law Engineering Testing Company

Grain Size Distribution

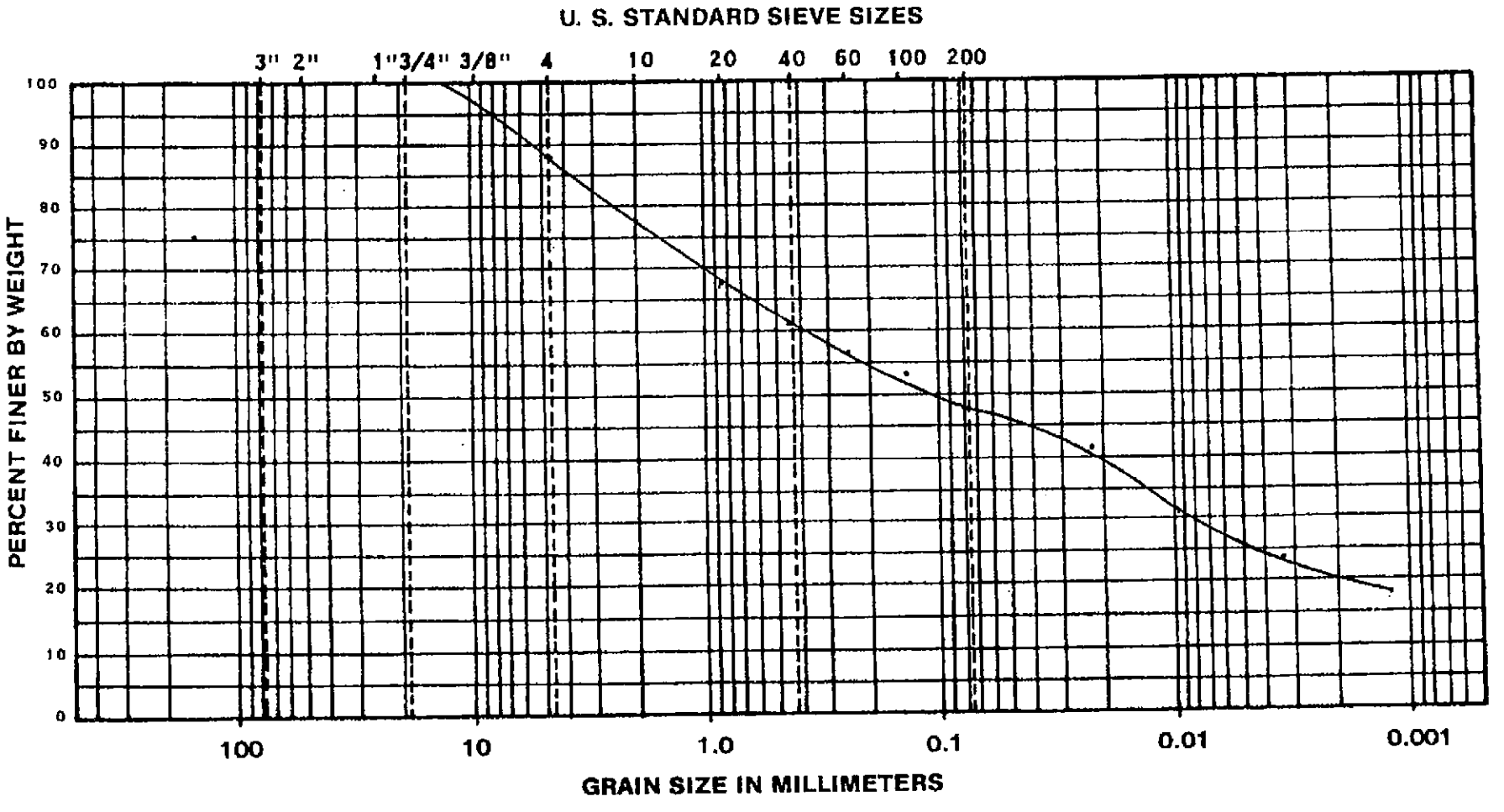
BORING NO.	DEPTH	NAT WC	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
J-14	29 TO 30.5 FEET	22.8%	30	19	11	CL - INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY

JOB NO. K-88195

TVA-00018800

AF 3

BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES



Law Engineering Testing Company

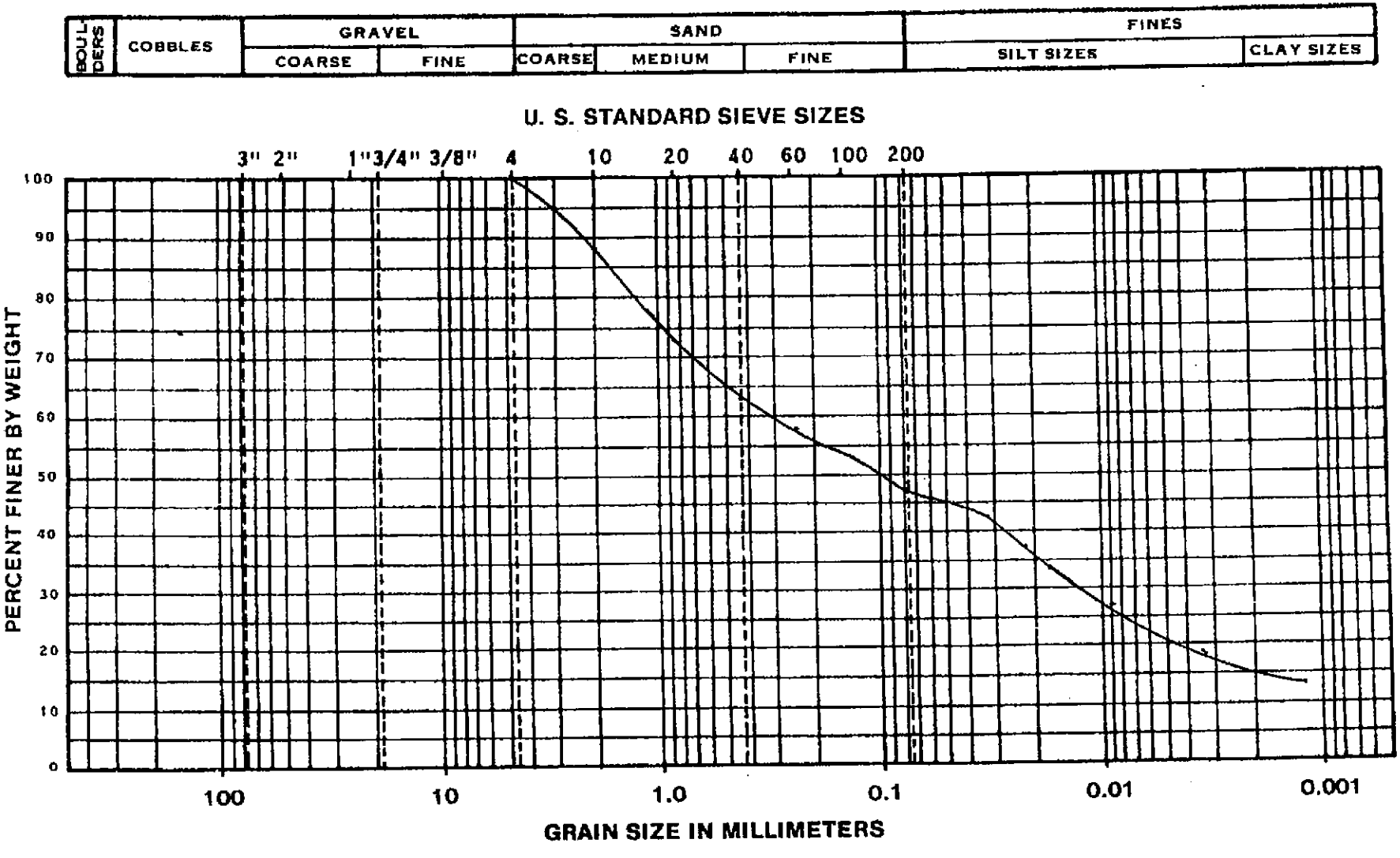
Grain Size Distribution

BORING NO.	DEPTH	NAT WC	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
J-15	4.0 TO 5.5 FEET	16.2%	29	17	12	SC - CLAYEY SANDS, SANDY-CLAY MIXTURE

JOB NO. K-88195

TVA-00018801

AF 3(



Law Engineering Testing Company

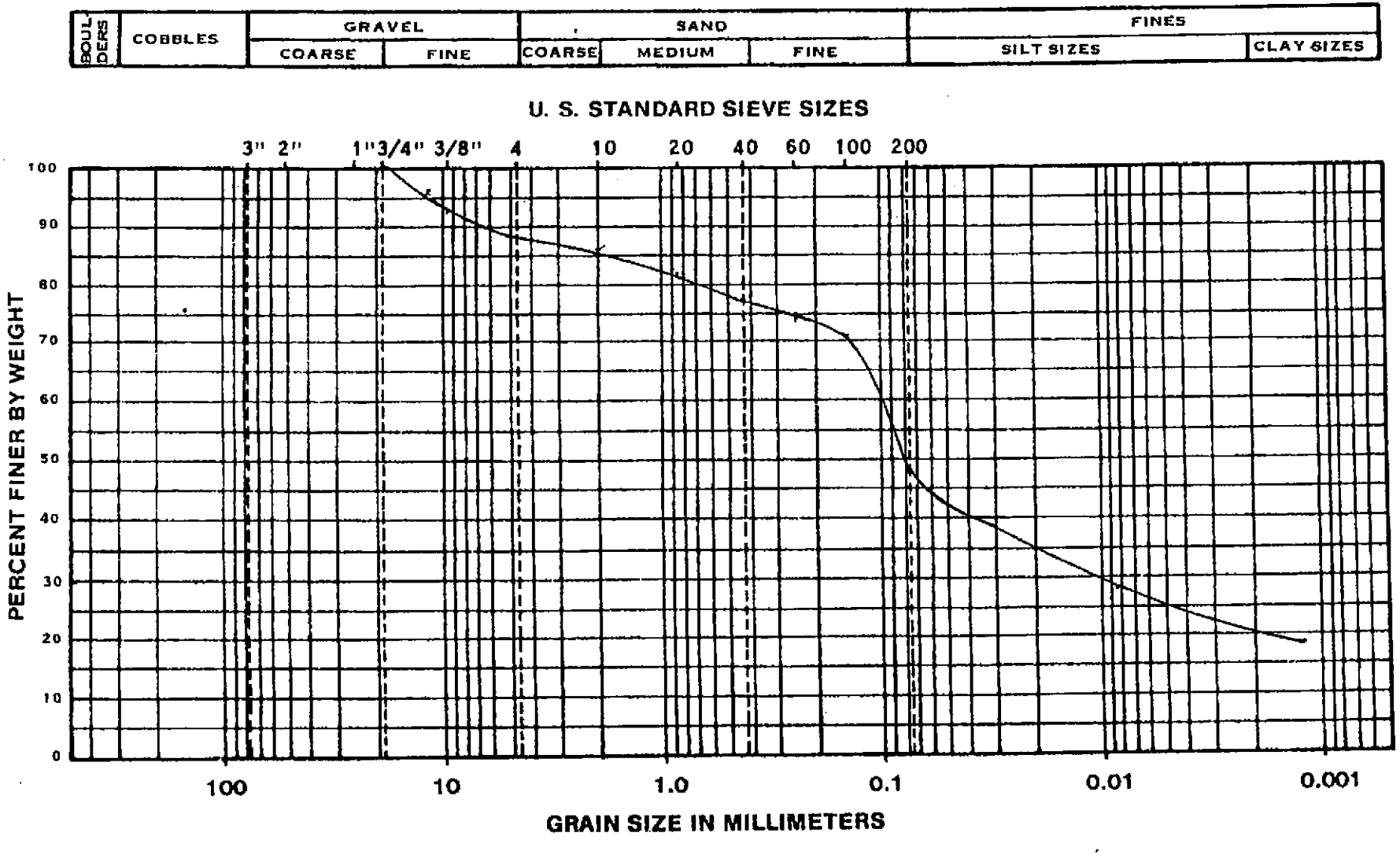
Grain Size Distribution

BORING NO.	DEPTH	NAT WC	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
J-15	9 TO 10.5 FEET	12.3%	33	22	11	SC - CLAYEY SANDS, SANDY-CLAY MIXTURE

JOB NO. K-88195

TVA-00018802

AF 3t



Law Engineering Testing Company

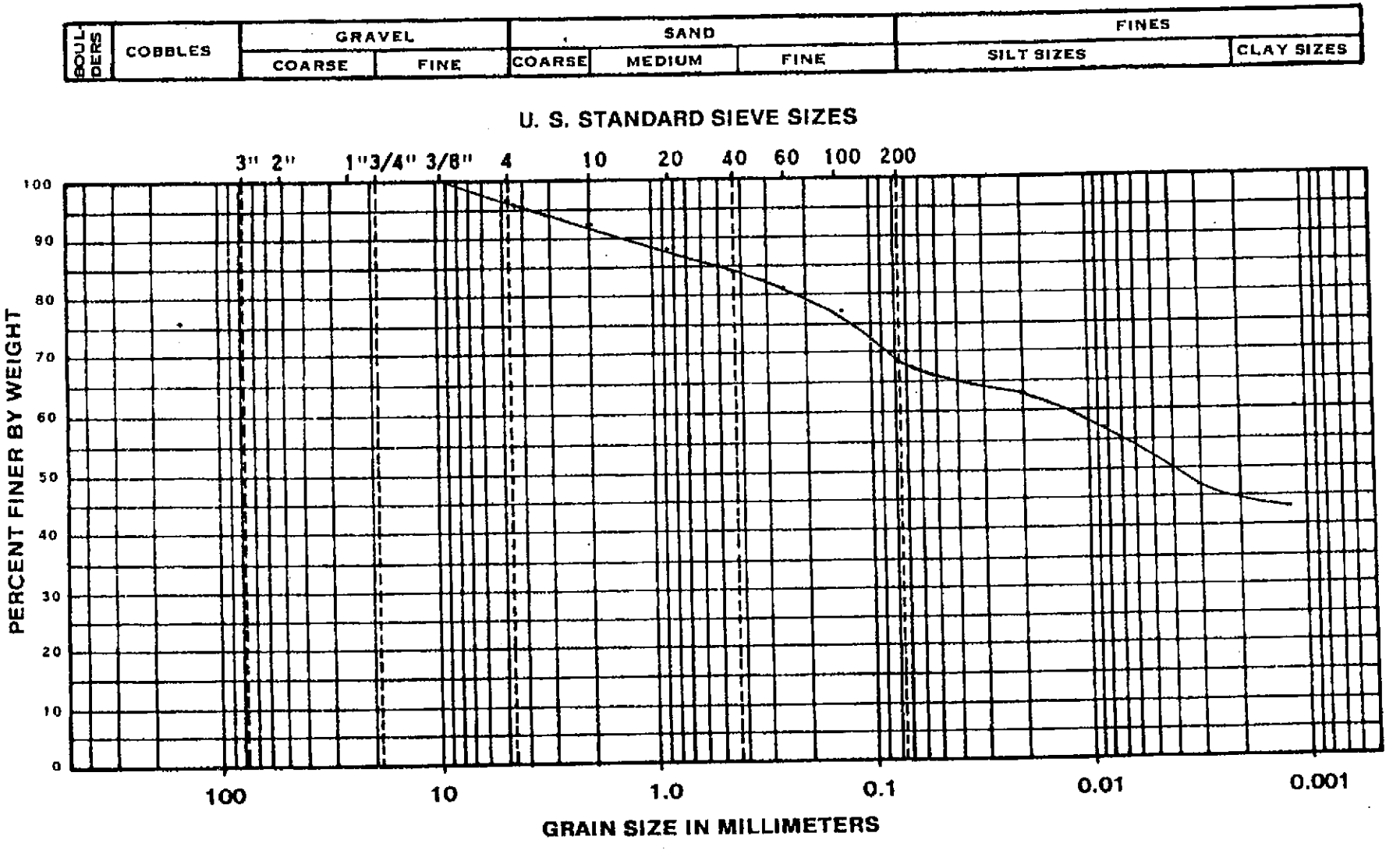
Grain Size Distribution

BORING NO.	DEPTH	NAT WC	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
J-16A	19 TO 20.5 FEET	29.6%	28	17	11	SC - CLAYEY SAND, SANDY CLAY MIXTURE

JOB NO. K-88195

TVA-00018803

AF 36



Law Engineering Testing Company

Grain Size Distribution

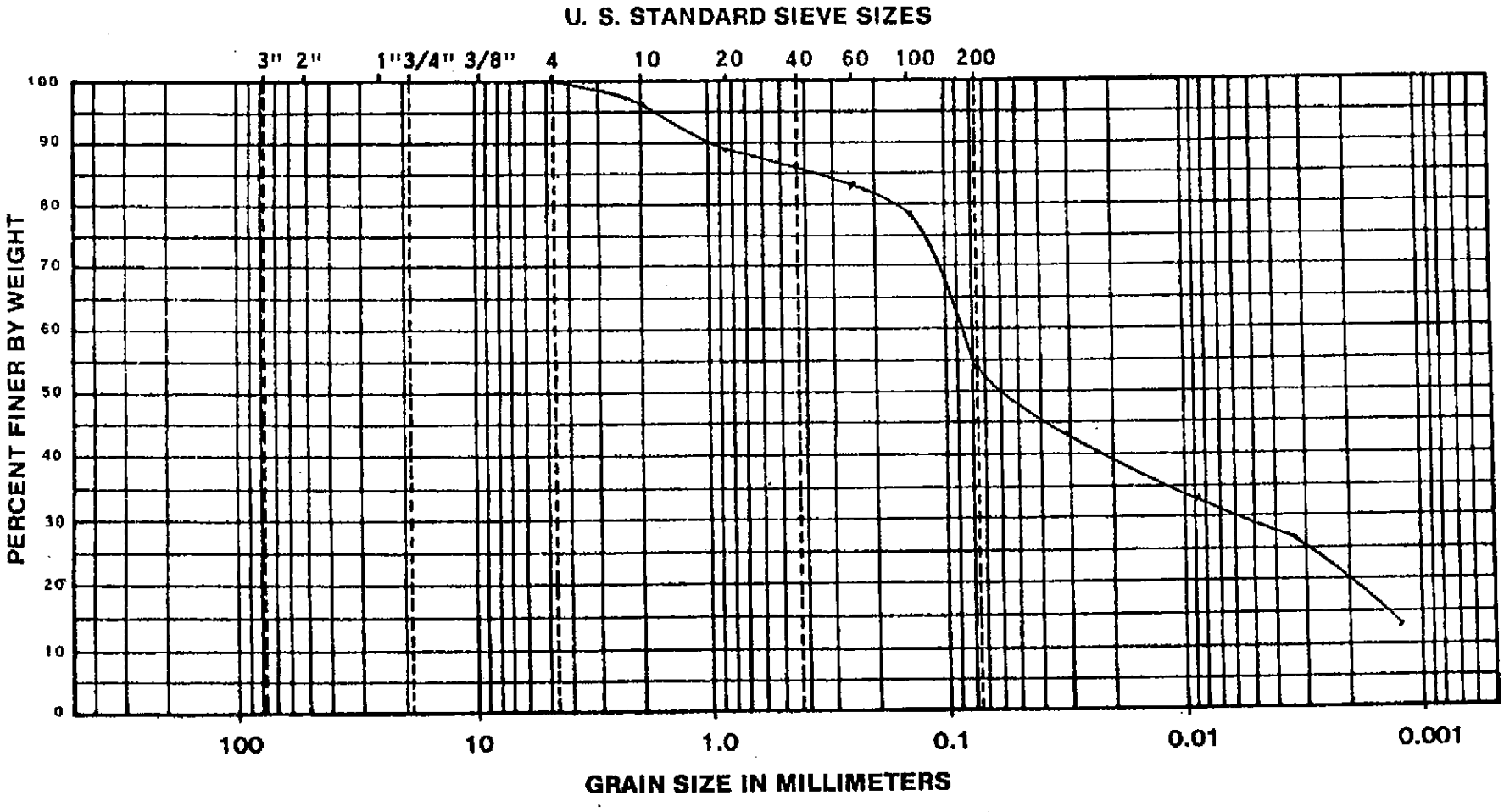
BORING NO.	DEPTH	NAT WC	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
J-16A	9 TO 10.5 FEET	21.8%	45	20	25	CL - INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY

JOB NO. K-88195

TVA-00018804

AF 3(

BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES



Law Engineering Testing Company

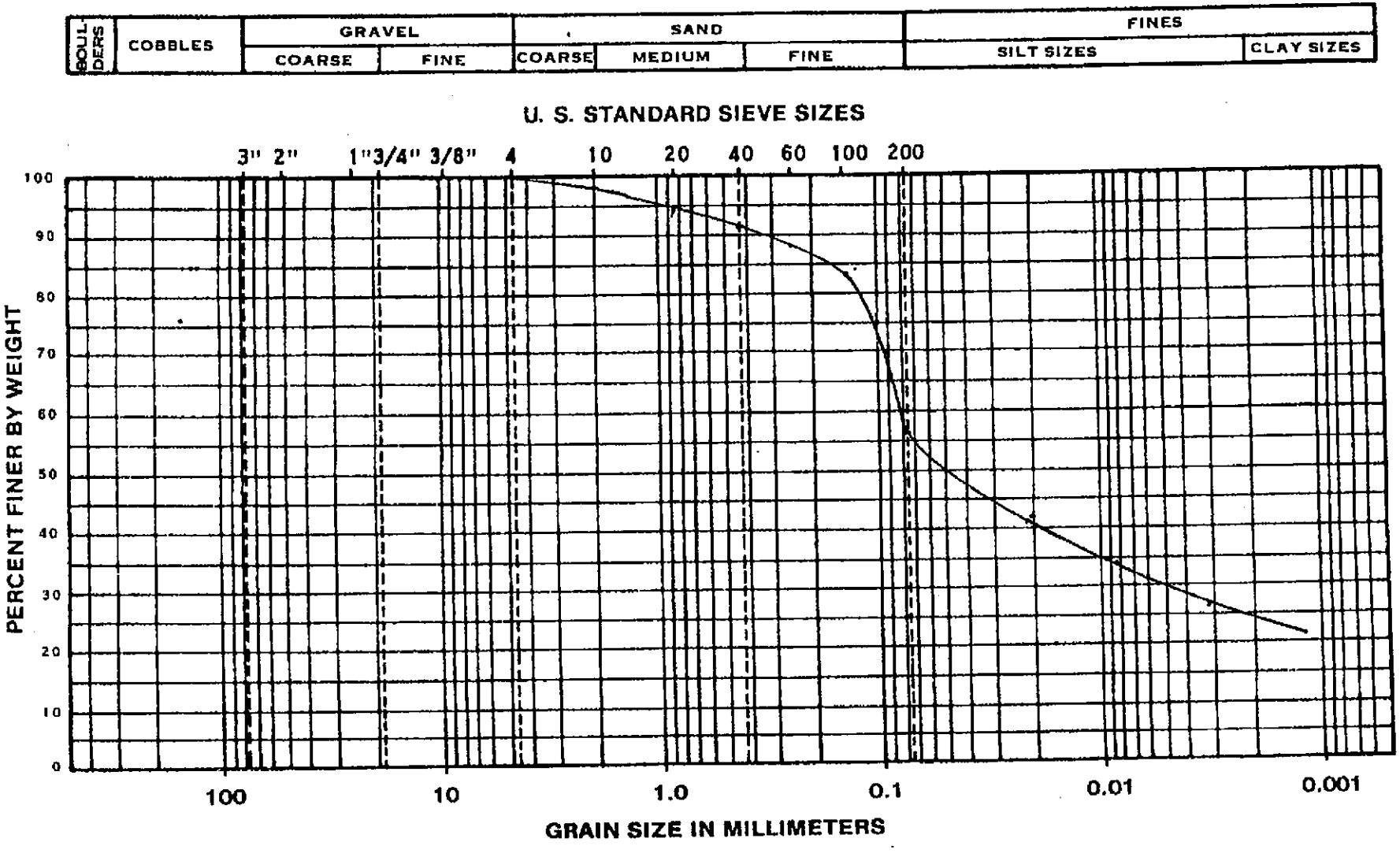
Grain Size Distribution

BORING NO.	DEPTH	NAT WC	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
J-16A	39 TO 40.5 FEET	47.8%	29	13	16	CL - INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY

JOB NO. K-88195

TVA-00018805

AF 3



Law Engineering Testing Company

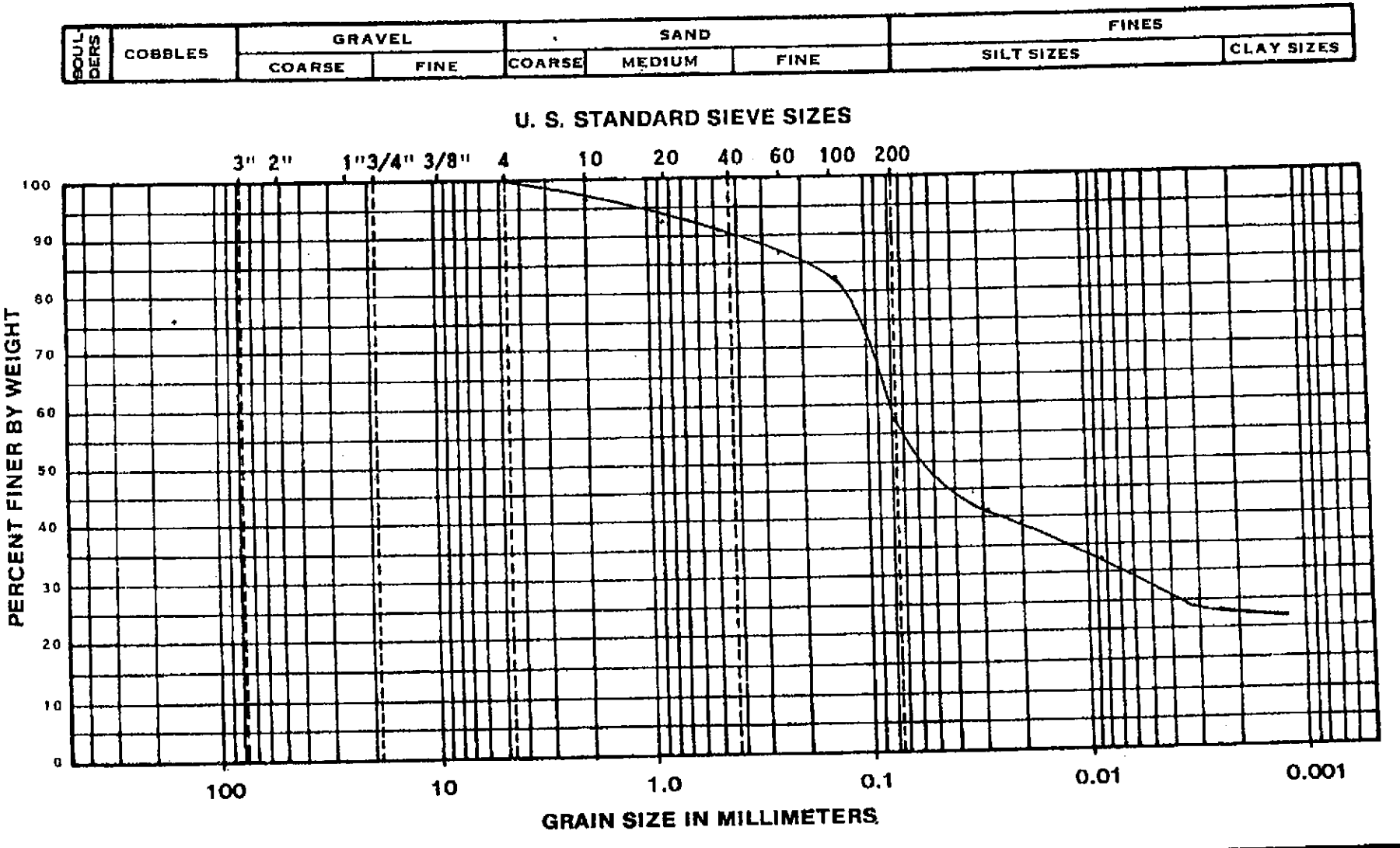
Grain Size Distribution

BORING NO.	DEPTH	NAT WC	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
J-16A	44.0 TO 45.5 FEET	60.0%	26	16	10	CL - INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY

JOB NO. K-88195

TVA-00018806

AF 364.



Law Engineering Testing Company

Grain Size Distribution

BORING NO.	DEPTH	NAT WC	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
J-16A	54.0 TO 55.5 FEET	50.5%	26	16	10	CL - INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY

JOB NO. J-88195

TVA-00018807

APPENDIX D

TABULATED GROUNDWATER LEVEL DATA FOR SELECTED MONITORING WELLS

TVA-00018808

Kingston Fossil Plant - Groundwater Level Data for Selected Monitoring Wells

Date	KIF-10	KIF-10A	KIF-10B	KIF-11B	KIF-12A	KIF-12B	KIF-13A	KIF-13B	KIF-16A	KIF-16B	KIF-2	KIF-4A	KIF-4B	KIF-5	KIF-5A	KIF-5B	KIF-6A
	(ft-msl)	(ft-msl)	(ft-msl)	(ft-msl)	(ft-msl)	(ft-msl)	(ft-msl)	(ft-msl)	(ft-msl)	(ft-msl)	(ft-msl)	(ft-msl)	(ft-msl)	(ft-msl)	(ft-msl)	(ft-msl)	(ft-msl)
01/04/1989	750.72	747.01	749.70	761.32	761.45	760.76			761.42	761.55							
01/05/1989								757.45									
01/11/1989							757.91				757.51	739.83	743.37	739.40		741.01	740.88
03/28/1989	750.98	747.15	749.31	761.84											739.01		
03/29/1989					762.11	760.79	758.27	757.84	762.99	762.53		739.30	743.41	738.98		740.62	740.45
03/30/1989											757.94						
06/28/1989				762.50	761.06	761.45						743.21	735.20	742.36		744.26	744.72
06/29/1989								758.60			758.79						
07/05/1989	751.21	748.92	751.90				759.02										
07/06/1989									759.06	762.63							
09/13/1989												742.68	737.80	742.19		743.70	743.86
09/14/1989	751.18	749.18	751.90	757.38				757.68	758.76	760.53	757.61						
11/29/1989											751.15	734.68	732.87	735.50		733.83	733.01
11/30/1989	751.15	744.00	748.62	755.18													
12/04/1989									758.01	758.43							
12/05/1989						755.12		755.51									
12/06/1989							752.99										
03/06/1990												741.44	741.27	739.14		740.72	
03/07/1990				761.68							757.94				724.84		740.32
03/08/1990									758.76	762.57							
03/12/1990						761.09		758.20									
03/13/1990	751.21	747.38	749.93														
03/14/1990					761.68		758.53										
06/05/1990											757.61	743.21	734.78	742.22		744.72	743.64
06/06/1990	751.35	748.56	751.12	757.64		760.17		757.55									
06/07/1990									755.22	759.84					726.64		
06/11/1990																	
06/14/1990					760.93		758.17										
09/05/1990											757.09	747.74	735.01	741.77		743.31	743.41
09/06/1990															726.25		
09/10/1990					760.11	759.71	757.35	757.45									
09/11/1990	751.48	749.70	750.89	757.09					758.73	758.73							
12/04/1990											757.35	740.16	745.70	739.44		741.08	741.17
12/05/1990									755.12	759.74					724.61		

TVA-00018809

Kingston Fossil Plant - Groundwater Level Data for Selected Monitoring Wells

Date	KIF-10	KIF-10A	KIF-10B	KIF-11B	KIF-12A	KIF-12B	KIF-13A	KIF-13B	KIF-16A	KIF-16B	KIF-2	KIF-4A	KIF-4B	KIF-5	KIF-5A	KIF-5B	KIF-6A
	(ft-msl)	(ft-msl)	(ft-msl)	(ft-msl)	(ft-msl)	(ft-msl)	(ft-msl)	(ft-msl)	(ft-msl)	(ft-msl)	(ft-msl)	(ft-msl)	(ft-msl)	(ft-msl)	(ft-msl)	(ft-msl)	(ft-msl)
12/06/1990					761.68	760.99	758.14	757.81									
12/10/1990	752.26	747.57	750.10	759.78													
03/15/1991									756.73	761.98							
03/20/1991	752.33	748.23	750.49	762.43							758.63	739.67	743.67	739.37		740.98	740.45
03/21/1991					762.01	761.29	759.09	746.59							725.36		
06/03/1991									755.41								
06/04/1991	752.49	749.34									758.33		742.75				
06/06/1991							762.70										
09/09/1991													744.13				
09/10/1991	755.91	752.00									757.58						
09/11/1991							758.66		758.30								
11/12/1991													734.42				
12/17/1991											759.71	741.24	747.67	740.85	740.32	742.59	741.93
12/18/1991	756.59	751.80															
12/19/1991					762.11	761.35	759.55	759.25	761.06	762.80							
12/23/1991			751.28	760.99													
03/03/1992	756.33	750.98										739.90	748.56	739.37		741.27	
03/04/1992							759.74	759.35	763.48	763.39							
06/02/1992											759.42	742.39	743.44				743.54
06/03/1992	756.43	752.30			761.15	760.43	759.51	759.12						747.83		742.42	
06/04/1992									762.86	762.83							
08/20/1992															742.13		
09/01/1992	755.91	742.29					756.43	748.39				737.47	720.90	740.09		740.16	
09/02/1992									753.38	745.11							
12/07/1992											759.48	739.24	746.03				740.98
12/08/1992	756.46	750.46	751.41	759.55			759.55	761.19									
12/10/1992									762.11	762.11							
06/07/1993					761.78	760.86											
06/08/1993	755.81	752.03					758.89					740.75	729.63				742.36
06/09/1993									764.99	760.56							
12/06/1993	756.79	752.23	752.85	761.78	762.96	761.98	759.55	758.66	761.02	760.93	759.22	741.21	744.65	750.95	744.62	747.61	742.36
05/20/1994																	
06/13/1994	756.43	752.30										742.78	745.37				743.77
06/14/1994							759.65		763.75	764.17							

TVA-00018810

Kingston Fossil Plant - Groundwater Level Data for Selected Monitoring Wells

Date	KIF-10	KIF-10A	KIF-10B	KIF-11B	KIF-12A	KIF-12B	KIF-13A	KIF-13B	KIF-16A	KIF-16B	KIF-2	KIF-4A	KIF-4B	KIF-5	KIF-5A	KIF-5B	KIF-6A
	(ft-msl)	(ft-msl)	(ft-msl)	(ft-msl)	(ft-msl)	(ft-msl)	(ft-msl)	(ft-msl)	(ft-msl)	(ft-msl)	(ft-msl)	(ft-msl)	(ft-msl)	(ft-msl)	(ft-msl)	(ft-msl)	(ft-msl)
11/29/1994																	
12/05/1994	755.77	750.43	754.40	758.99	762.50	761.35	759.06	758.43	762.34	762.40	756.36	737.76	743.64	751.25	742.75	741.50	738.68
06/19/1995	755.64	751.38		759.48	761.48	760.47	758.37	757.91	761.02	761.15	755.68	741.86	739.76	747.44	742.62	741.96	740.65
06/21/1995	755.71	751.64					758.43					741.86	739.80				740.65
06/22/1995			752.17						760.60	760.96							
12/11/1995				761.02							756.07	738.19	741.57				738.45
12/12/1995	755.97	749.65	751.08					758.53									
12/13/1995					762.53	761.19	759.12										
12/14/1995									764.83	761.65							
07/08/1996	756.00	751.87	752.72	760.73	761.61	760.56	759.38	758.99	764.80	764.76	756.59	741.21	740.39	747.57	742.72	743.08	741.47
12/02/1996	756.86	753.08	753.54	764.60	763.68	762.24	759.74	758.92	764.04	764.37	760.07	747.11	752.20	750.98	744.98	745.18	744.78
05/06/1997	756.86	752.69	753.28	762.76	763.45	761.94	760.07	759.15	766.57	763.16	760.47	749.44	749.31	750.49	744.32	743.80	743.93
12/08/1997	756.86	754.69	754.92	761.88	763.22	761.65	759.19	758.23	761.52	761.84	759.45	742.06	743.67	750.52	741.93	740.55	741.27
06/29/1998	756.10	752.23	752.85	759.97	762.60	761.12	759.55	758.60	763.19	763.55	758.99	748.46	743.57	748.75	743.31	743.14	744.09
12/01/1998	756.33	751.28	751.67	758.27	761.32	760.37	759.55	758.37	760.93	761.32	758.89	741.40	740.78	742.22	740.09	740.03	741.73
12/06/1999								759.22					741.37				738.42
12/14/2000								759.68	763.68				742.91				738.32
06/27/2001								760.24	766.17				742.88				743.60
12/31/2001								760.66	766.50				744.98				738.94
06/28/2002								760.70	766.99				742.81				743.64
01/08/2003								760.11	768.57				742.88				741.99
06/16/2003								761.32	766.83				744.36				743.86
09/02/2003								758.53	768.57				744.06				743.83
12/29/2003								760.56	768.57				741.86				741.27
03/10/2004								760.96	767.49				743.21				742.29
06/07/2004								760.70	765.63				743.76				742.87
Maximum =	**756.86**	**754.69**	**754.92**	**764.60**	**763.68**	**762.24**	**762.70**	**761.32**	**768.57**	**764.76**	**760.47**	**749.44**	**752.20**	**751.25**	**744.98**	**747.61**	**744.78**

TVA-00018811

Kingston Fossil Plant - Groundwater Level Data for Selected Monitoring Wells (Continued)

	B-1		B-2		B-3		RAINFALL (IN.)
Well Elevations		782.1		795.3		811.4	24:00 - 24:00
	Depth	Elevation	Depth	Elevation	Depth	Elevation	
04/09/2004	7.75	774.35	15.80	779.50	29.00	782.40	0.00
04/10/2004		782.10		795.30		811.40	0.00
04/11/2004		782.10		795.30		811.40	0.70
04/12/2004		782.10		795.30		811.40	0.80
04/13/2004	7.60	774.50	16.10	779.20	29.10	782.30	1.00
04/14/2004		782.10		795.30		811.40	0.10
04/15/2004	7.35	774.75	16.20	779.10	29.35	782.05	0.00
04/16/2004		782.10		795.30		811.40	0.00
04/17/2004		782.10		795.30		811.40	0.00
04/18/2004		782.10		795.30		811.40	0.00
04/19/2004		782.10		795.30		811.40	0.00
04/20/2004	7.85	774.25	16.45	778.85	29.45	781.95	0.00
04/21/2004		782.10		795.30		811.40	0.10
04/22/2004		782.10		795.30		811.40	0.18
04/23/2004	8.30	773.80	16.60	778.70	29.75	781.65	0.18
04/24/2004		782.10		795.30		811.40	0.00
04/25/2004		782.10		795.30		811.40	0.01
04/26/2004	8.38	773.72	16.73	778.57	30.00	781.40	0.03
04/27/2004		782.10		795.30		811.40	0.00
04/28/2004		782.10		795.30		811.40	0.00
04/29/2004		782.10		795.30		811.40	0.00
04/30/2004	8.60	773.50	17.00	778.30	30.30	781.10	0.00
05/01/2004		782.10		795.30		811.40	0.00
05/02/2004		782.10		795.30		811.40	0.00
05/03/2004	8.53	773.57	17.13	778.17	30.60	780.80	0.00
05/04/2004		782.10		795.30		811.40	0.00
05/05/2004		782.10		795.30		811.40	0.00
05/06/2004	8.66	773.44	17.30	778.00	30.64	780.76	0.00
05/07/2004		782.10		795.30		811.40	0.00
05/08/2004		782.10		795.30		811.40	0.00
05/09/2004		782.10		795.30		811.40	0.00
05/10/2004		782.10		795.30		811.40	0.10
05/11/2004	9.00	773.10	17.60	777.70	31.00	780.40	0.30
05/12/2004		782.10		795.30		811.40	0.00
05/13/2004		782.10		795.30		811.40	0.25
05/14/2004	9.35	772.75	17.75	777.55	31.10	780.30	0.00
05/15/2004		782.10		795.30		811.40	0.00
05/16/2004		782.10		795.30		811.40	0.00
05/17/2004		782.10		795.30		811.40	0.00
05/18/2004	9.45	772.65	17.85	777.45	31.45	779.95	0.00
05/19/2004		782.10		795.30		811.40	0.00
05/20/2004		782.10		795.30		811.40	0.00
05/21/2004	9.75	772.35	18.17	777.13	31.65	779.75	0.00
05/22/2004		782.10		795.30		811.40	0.00

TVA-00018812

	B-1		B-2		B-3		RAINFALL (IN.)
Well Elevations		782.1		795.3		811.4	24:00 - 24:00
	Depth	Elevation	Depth	Elevation	Depth	Elevation	
05/23/2004		782.10		795.30		811.40	0.00
05/24/2004		782.10		795.30		811.40	0.00
05/25/2004	9.95	772.15	18.35	776.95	31.83	779.57	0.00
05/26/2004		782.10		795.30		811.40	0.90
05/27/2004		782.10		795.30		811.40	0.00
05/28/2004	10.12	771.98	18.55	776.75	32.15	779.25	0.30
05/29/2004		782.10		795.30		811.40	0.00
05/30/2004		782.10		795.30		811.40	0.10
05/31/2004		782.10		795.30		811.40	0.80
06/01/2004		782.10		795.30		811.40	0.00
06/02/2004	9.98	772.12	18.87	776.43	32.42	778.98	0.2
06/03/2004		782.10		795.30		811.40	0
06/04/2004		782.10		795.30		811.40	0.35
06/05/2004		782.10		795.30		811.40	0
06/06/2004		782.10		795.30		811.40	0
06/07/2004	.	782.10		795.30		811.40	0
06/08/2004	10.34	771.76	19.24	776.06	32.71	778.69	0
06/09/2004		782.10		795.30		811.40	0
06/10/2004		782.10		795.30		811.40	0
06/11/2004		782.10		795.30		811.40	0
06/12/2004		782.10		795.30		811.40	0.5
06/13/2004		782.10		795.30		811.40	0
06/14/2004	10.7	771.40	19.61	775.69	33.1	778.30	0

TVA-00018813

APPENDIX E

CHEMICAL ANALYSIS OF GYPSUM LEACHATE SAMPLES FROM CUMBERLAND FOSSIL PLANT

TVA-00018814

Chemical Analysis of Gypsum Leachate Samples from Cumberland Fossil Plant

Constituent	Units	MCL		Sample 1		Sample 2		Sample 3		Sample 4		Sample 5
Aluminum, total	ug/L	200		580				140		350	<	50
Antimony, total	ug/L	6		12				13	<	6	<	6
Arsenic, total	ug/L	50	<	1			<	1	<	1	<	1
Barium, total	ug/L	2000		130				120		30		30
Beryllium, total	ug/L	4	<	1			<	1				
Boron, total	ug/L	--		54000				54000		25000		37000
Cadmium, total	ug/L	5		9.2				3.5		22		13
Calcium, total	mg/L	--		870				880		760		790
Chloride, total	mg/L	250		1000		1200		1000		1400		1900
Chromium, total	ug/L	100		5			<	1			<	1
Cobalt, total	ug/L	--		10				9				
Copper, total	ug/L	1300	<	10			<	10	<	1	<	1
Fluoride, total	mg/L	4		18		1.2		20				
Iron, total	ug/L	300		790				10	<	10	<	10
Lead, total	ug/L	15	<	1			<	1	<	1	<	1
Magnesium, total	mg/L	--		350				350		650		790
Manganese, total	ug/L	50		2600				2500		110		750
Mercury, total	ug/L	2	<	0.2			<	0.2		13		0.2
Nickel, total	ug/L	100		97				85		167		77
pH (field)	pH	6.5-8.5		6.99		7.19		7.48				
Selenium, total	ug/L	50		25				28		396		99
Silver, total	ug/L	100	<	10			<	10		0.4		0.3
Sodium, total	mg/L	--		18				21				
TDS (180)	mg/L	500		6300		8100		6000				
Strontium, total	ug/L	--		4500				4500				
Sulfate, total	mg/L	250		3700		2100		3800		2700		2800
Thallium, total	ug/L	2	<	2			<	2				
Vanadium, total	ug/L	--	<	10			<	10				
Zinc, total	ug/L	5000		880				1000		840		140

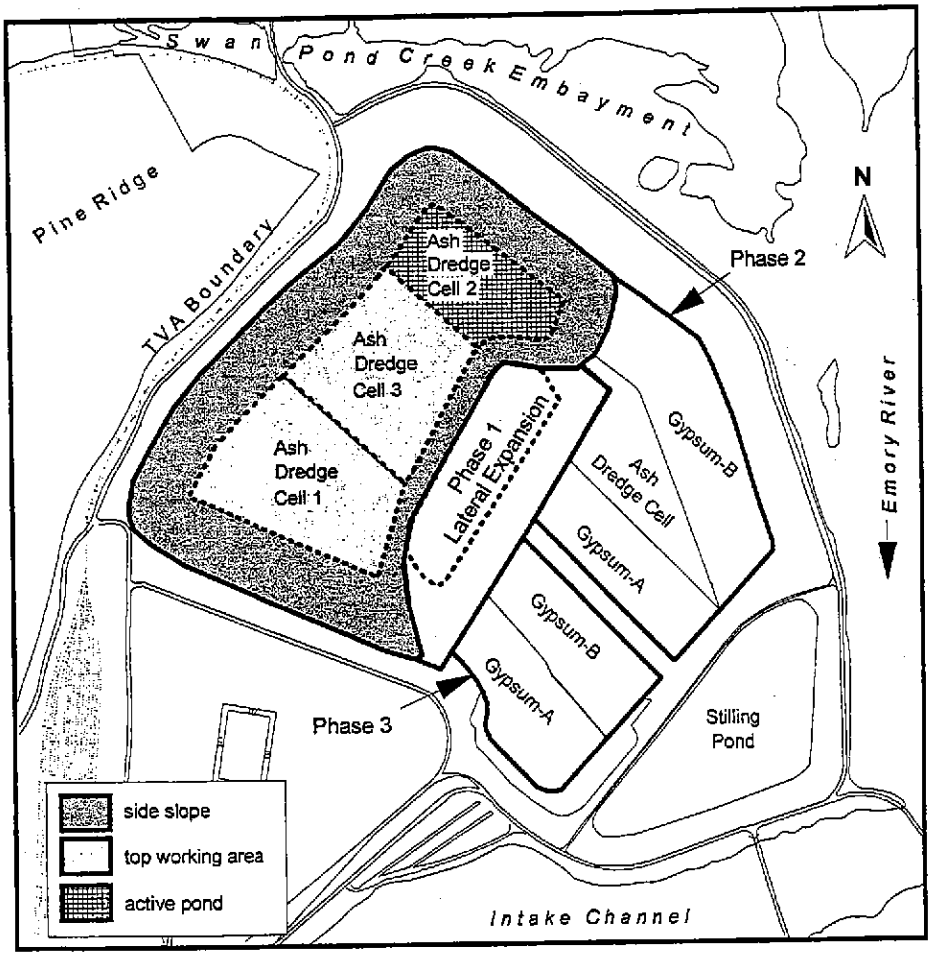
1. *Sample collected on 2/25/99 before effluent entered gypsum pond overflow weir.*
2. *Sample collected on 7/21/99 before effluent entered gypsum pond overflow weir.*
3. *Sample collected on 2/25/99 at RP-4.*
4. *Filtered sample collected on 9/23/03 at RP-3.*
5. *Filtered sample collected on 9/23/03 from end of gypsum effluent pipe.*

TVA-00018815

APPENDIX F

OPTION A – FACILITY SUBREGIONS AND PROFILES FOR SEEPAGE MODEL SIMULATIONS

TVA-00018816



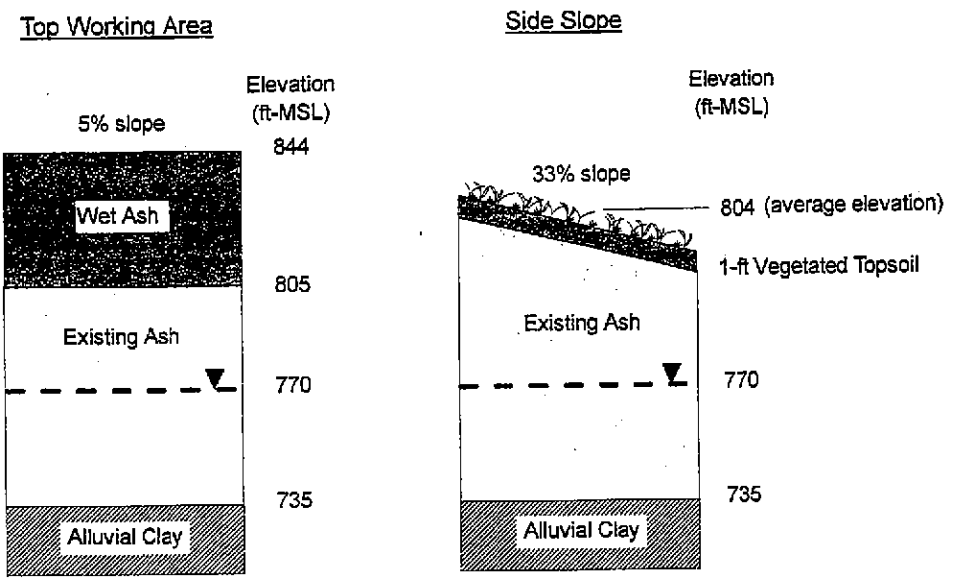
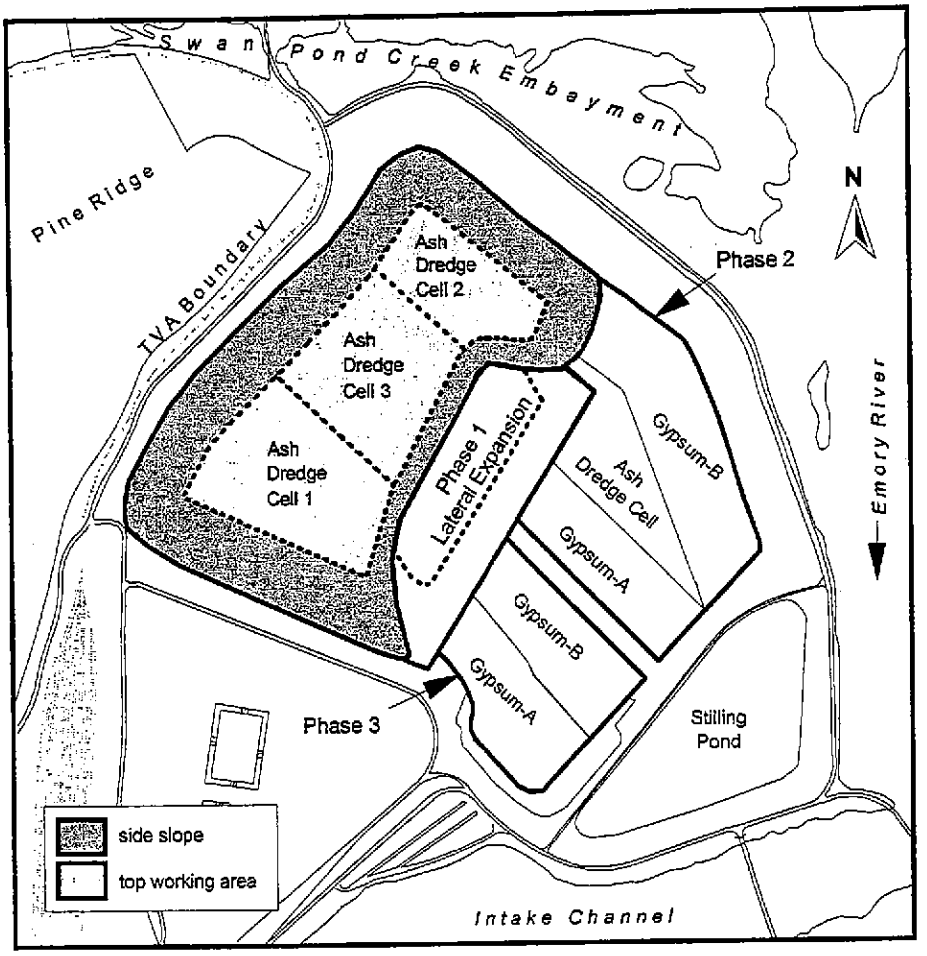


Figure F-1

TVA-00018817



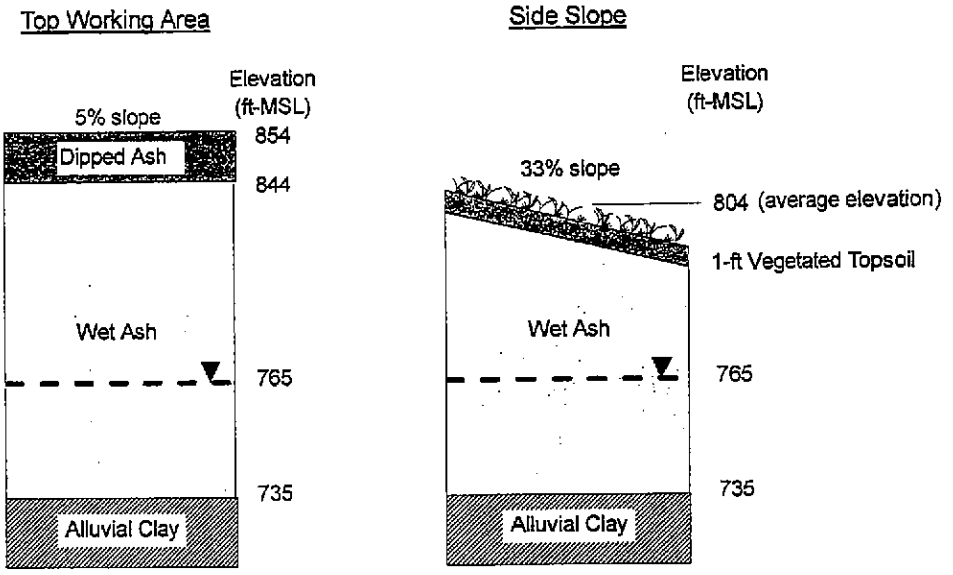
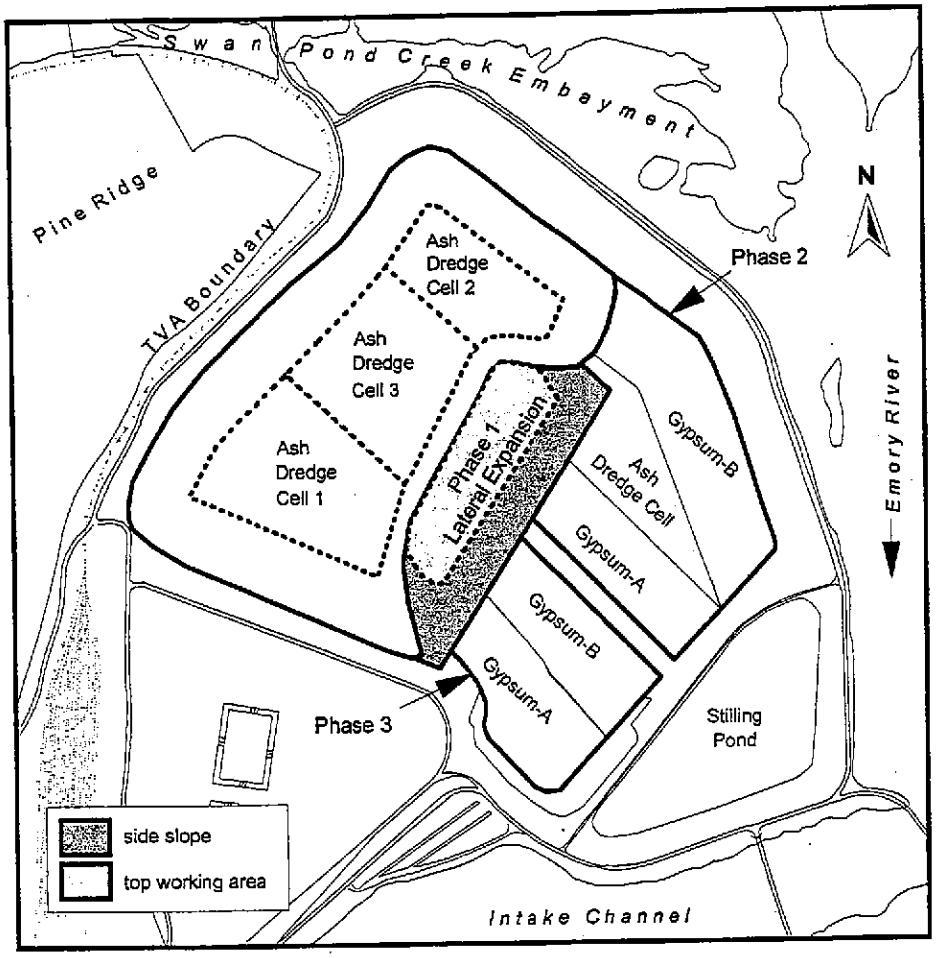


Figure F-2

TVA-00018818



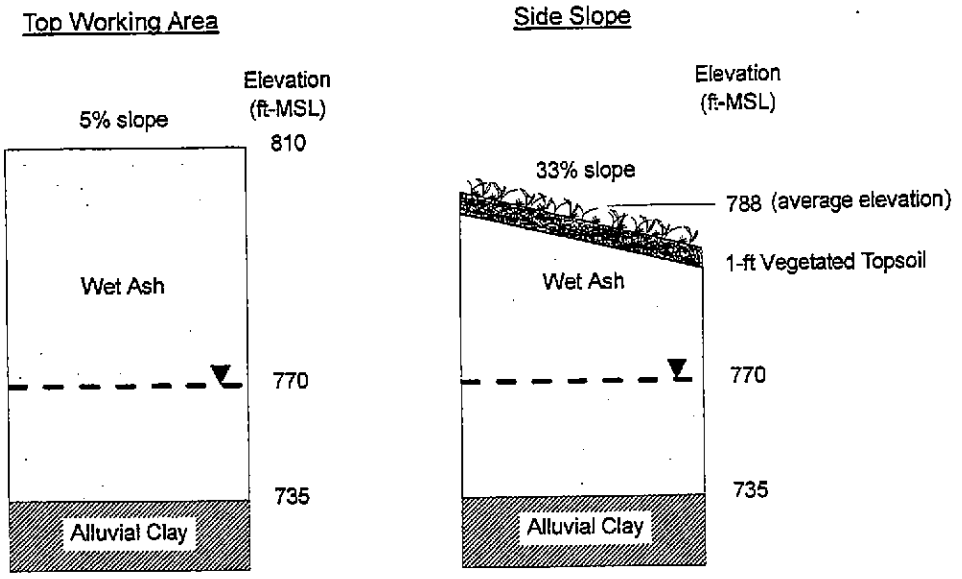
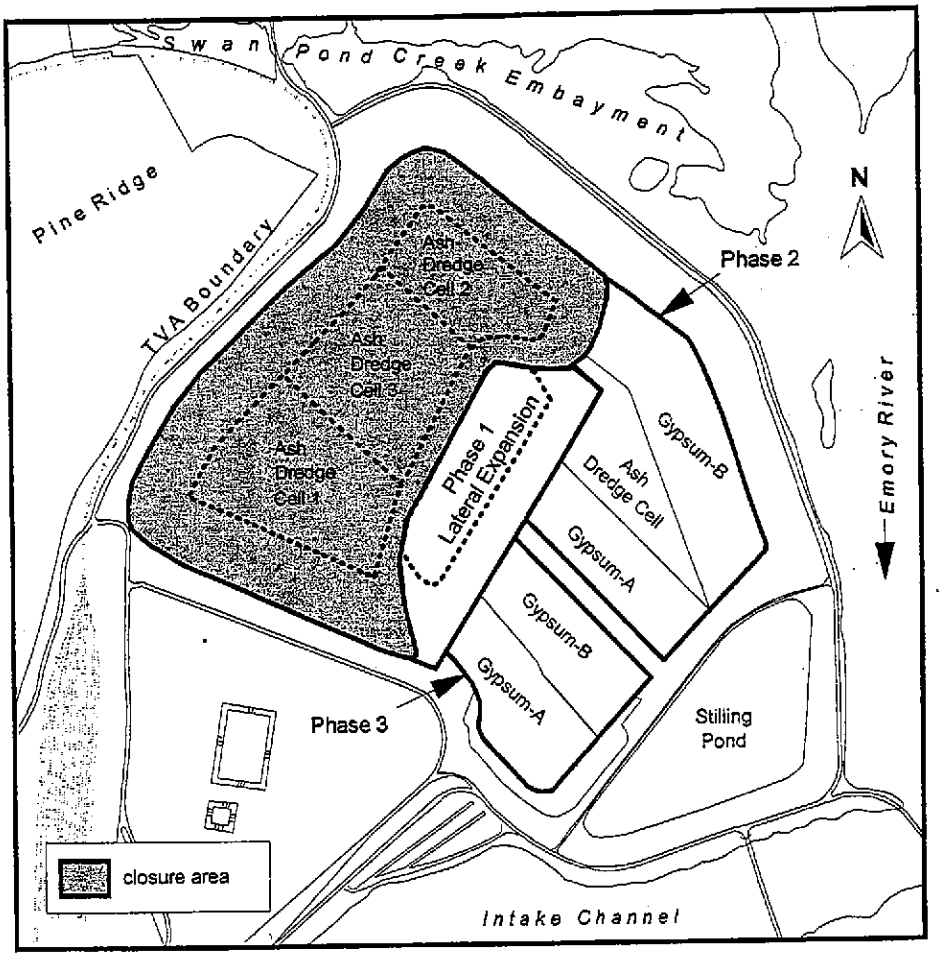


Figure F-3

TVA-00018819


Swan Pond Creek Embayment
Pine Ridge
TVA Boundary
N
Phase 2
Ash Dredge Cell 2
Ash Dredge Cell 3
Ash Dredge Cell 1
Phase 1 Lateral Expansion
Gypsum-B
Ash Dredge Cell
Gypsum-A
Gypsum-B
Gypsum-A
Emory River
Phase 3
Stilling Pond
closure area
Intake Channel

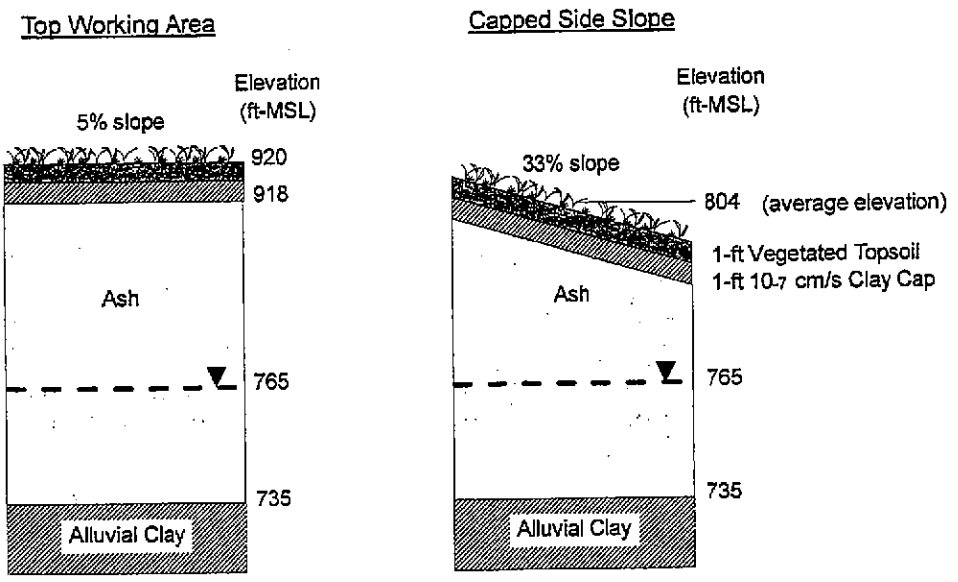
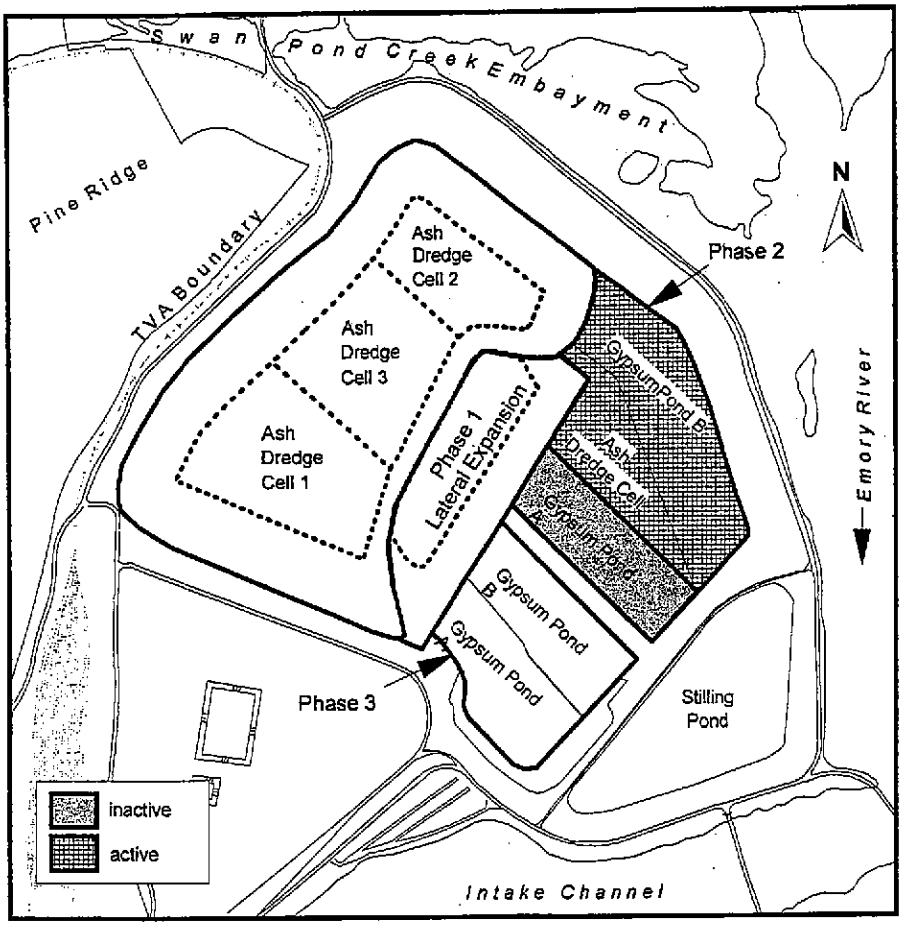

Top Working Area
Elevation (ft-MSL)
5% slope
920
918
Ash
765
735
Alluvial Clay
Capped Side Slope
Elevation (ft-MSL)
33% slope
804 (average elevation)
1-ft Vegetated Topsoil
1-ft 10-7 cm/s Clay Cap
Ash
765
735
Alluvial Clay

Figure F-4



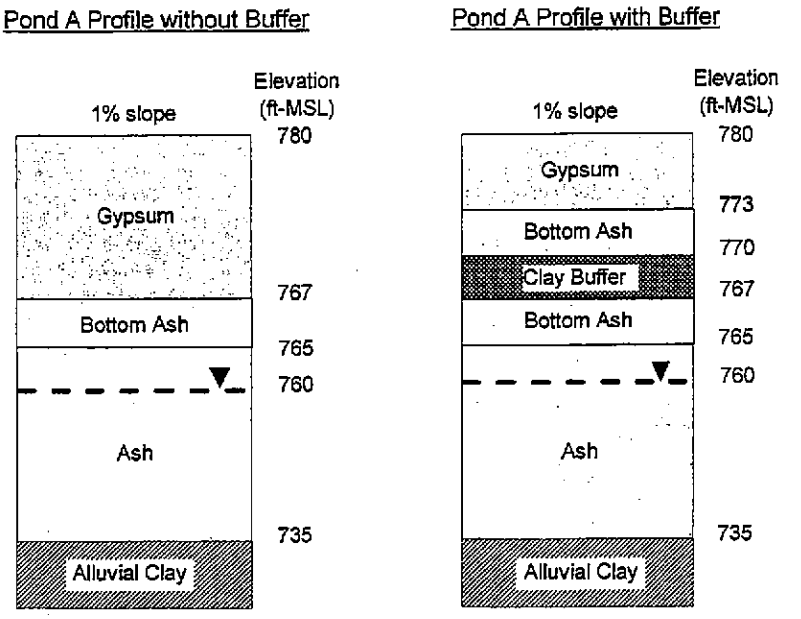
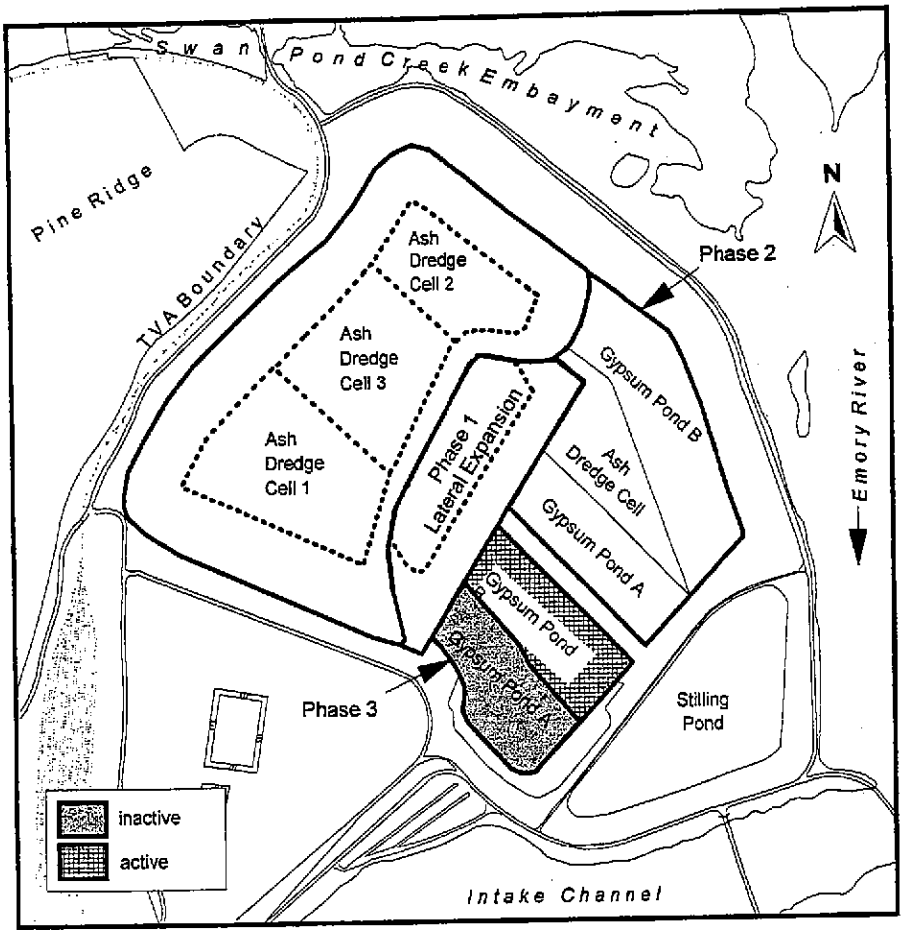


Figure F-5

TVA-00018821



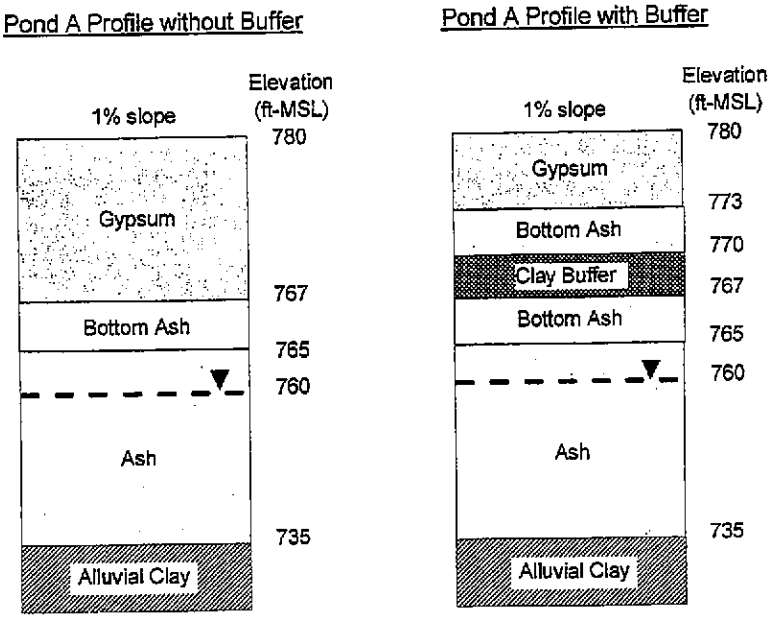
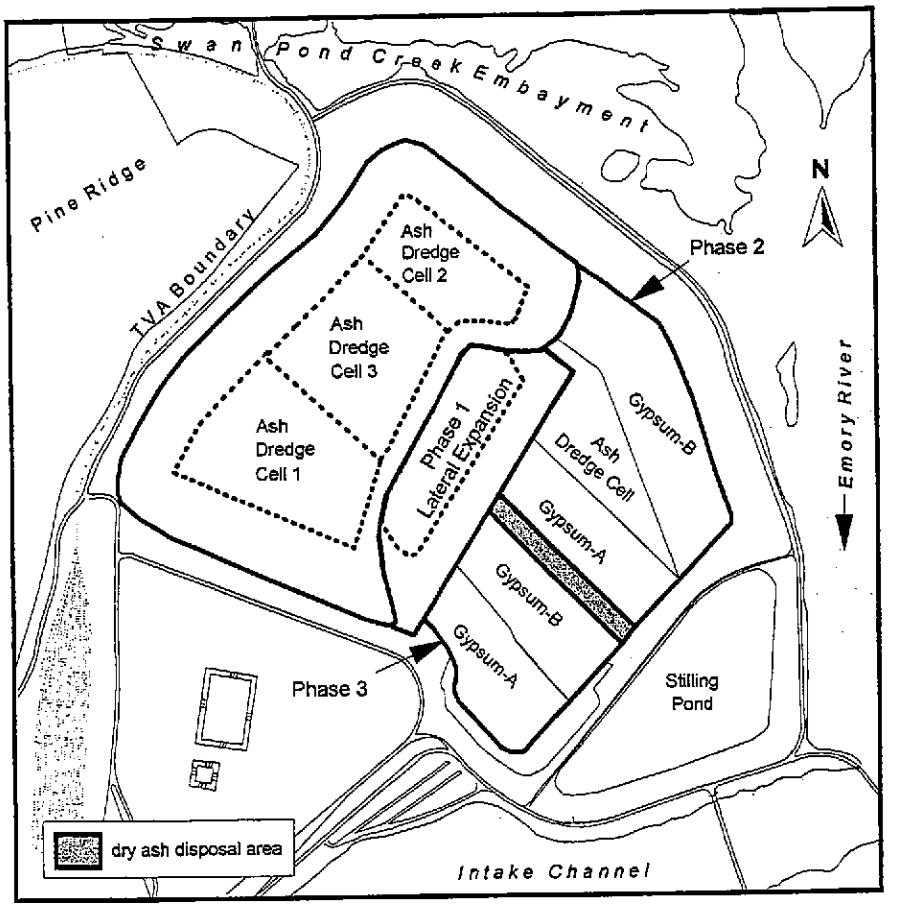


Figure F-6

TVA-00018822



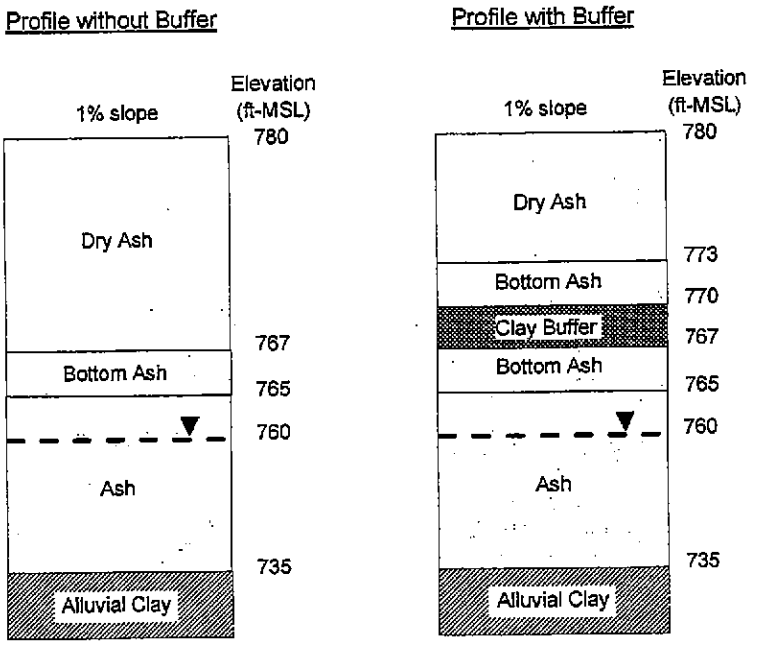
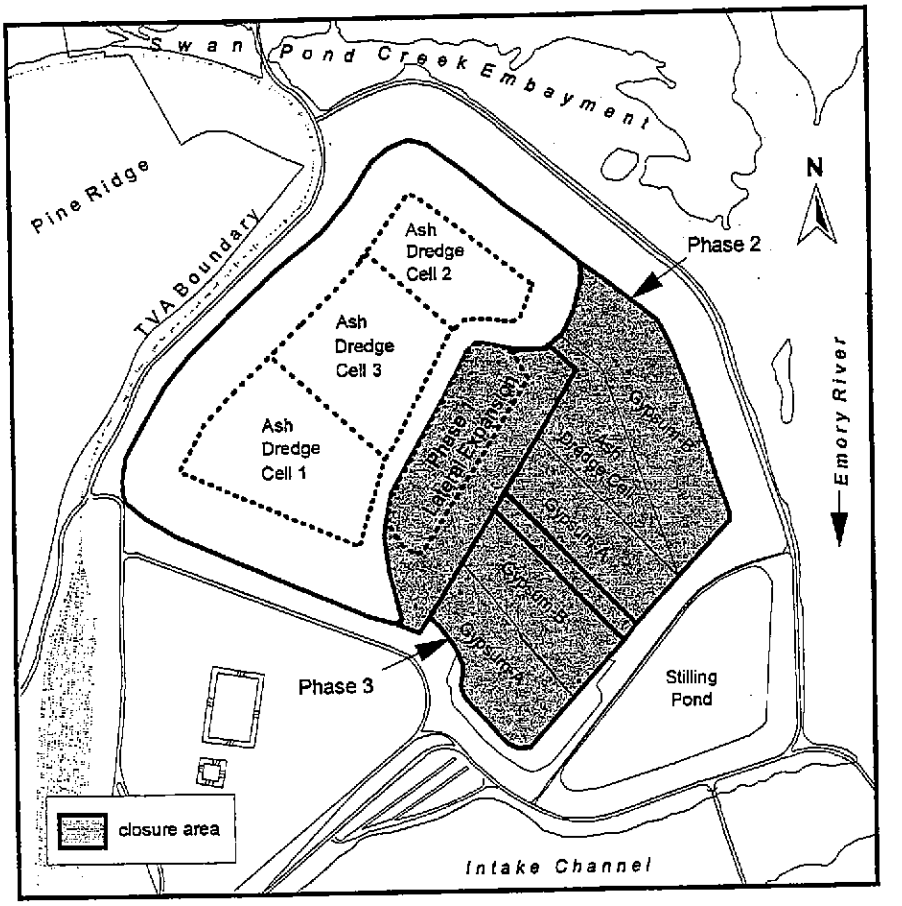


Figure F-7

TVA-00018823



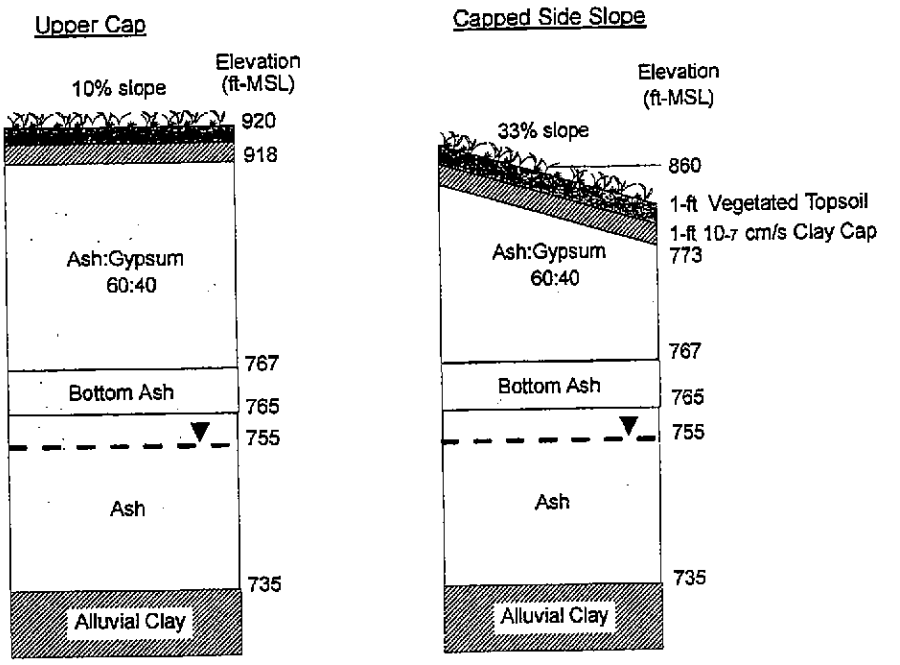
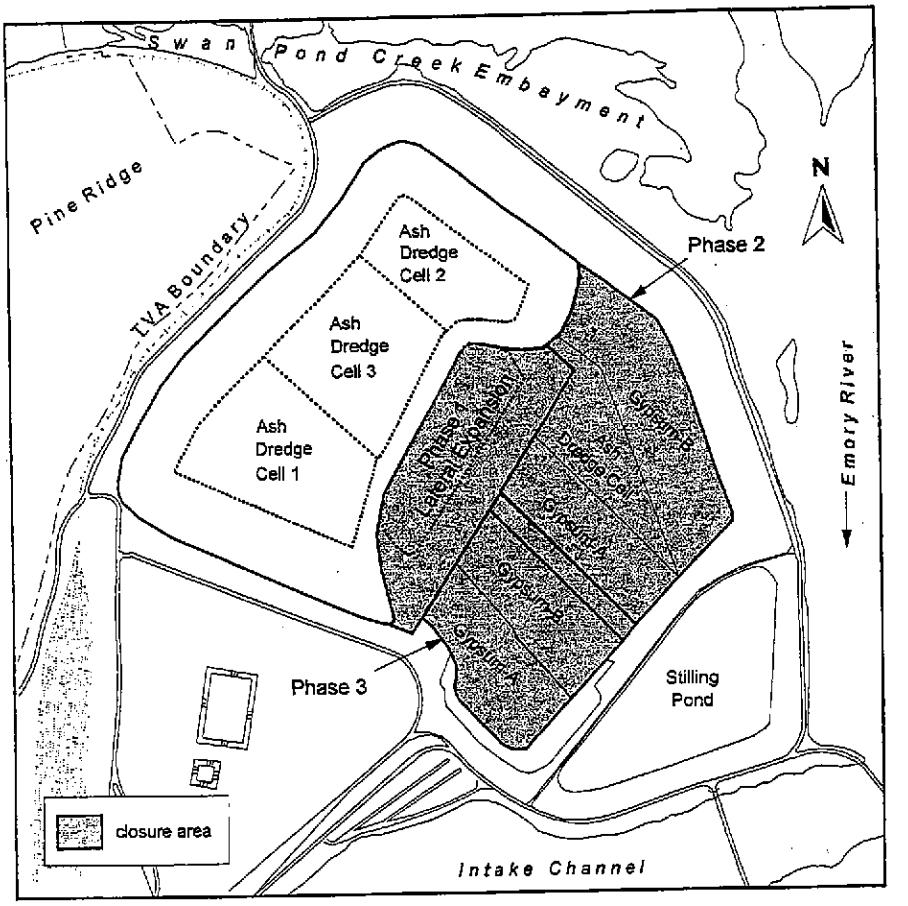


Figure F-8

TVA-00018824



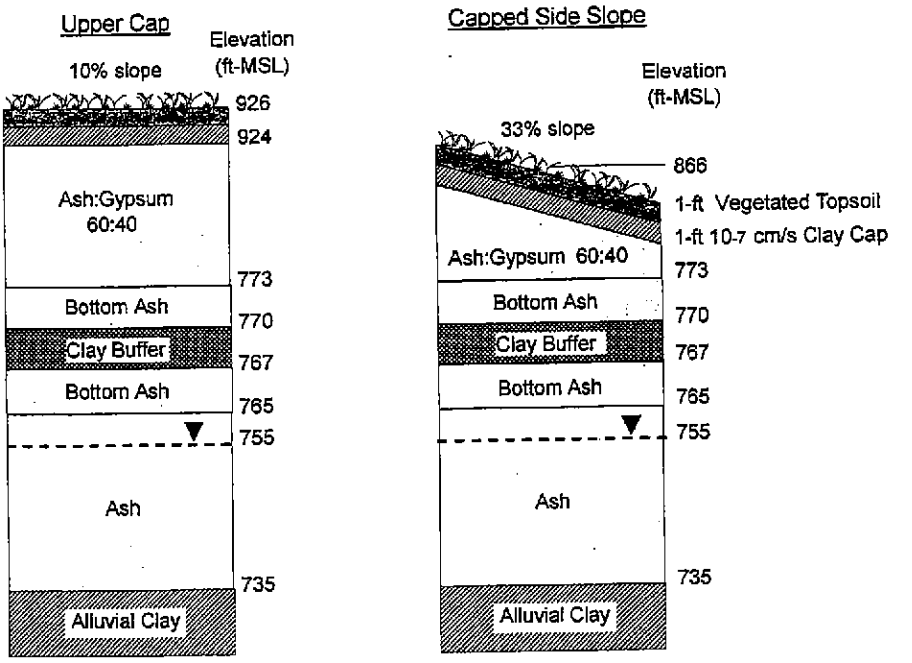


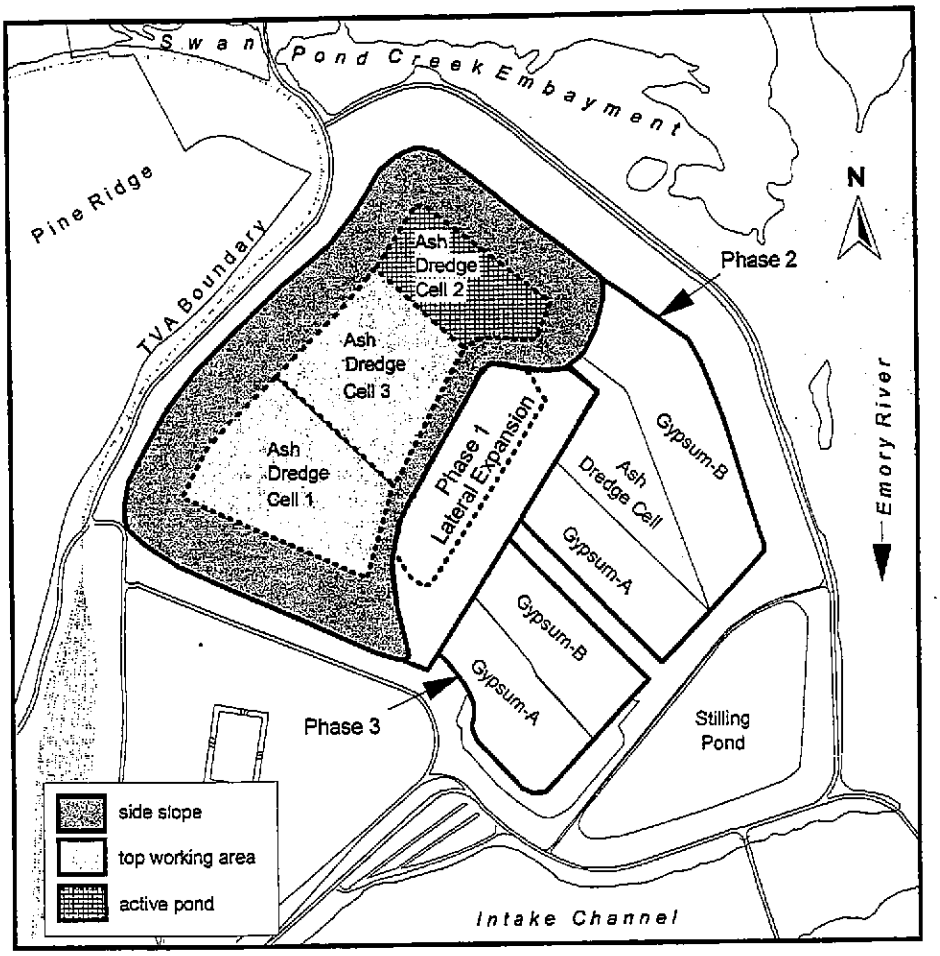
Figure F-9

TVA-00018825

APPENDIX G

OPTION B – FACILITY SUBREGIONS AND PROFILES FOR SEEPAGE MODEL SIMULATIONS

TVA-00018826


Swan Pond Creek Embayment
Pine Ridge
TVA Boundary
N
Ash Dredge Cell 2
Ash Dredge Cell 3
Ash Dredge Cell 1
Phase 1 Lateral Expansion
Phase 2
Phase 3
Gypsum-B
Ash Dredge Cell
Gypsum-A
Gypsum-B
Gypsum-A
Emory River
Stilling Pond
Intake Channel
side slope
top working area
active pond

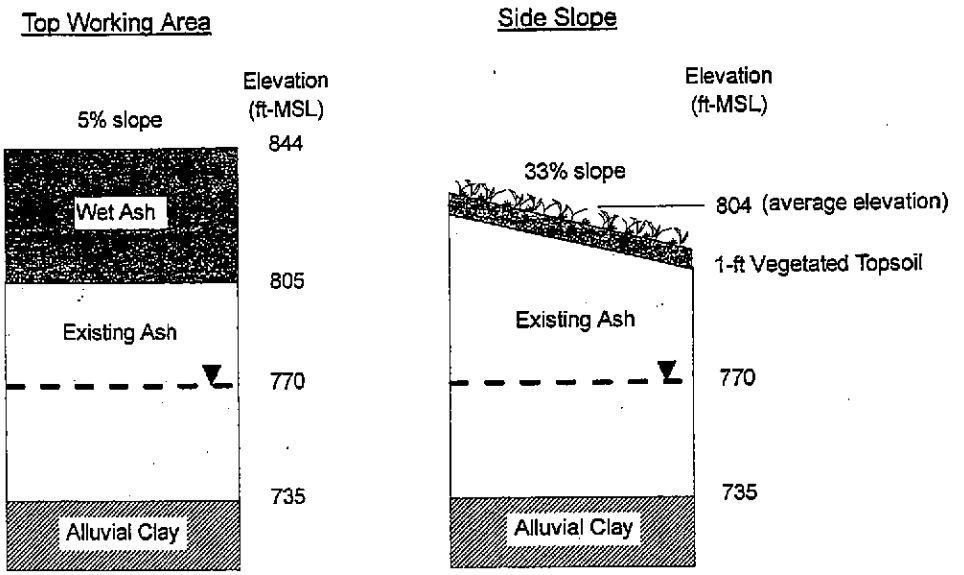
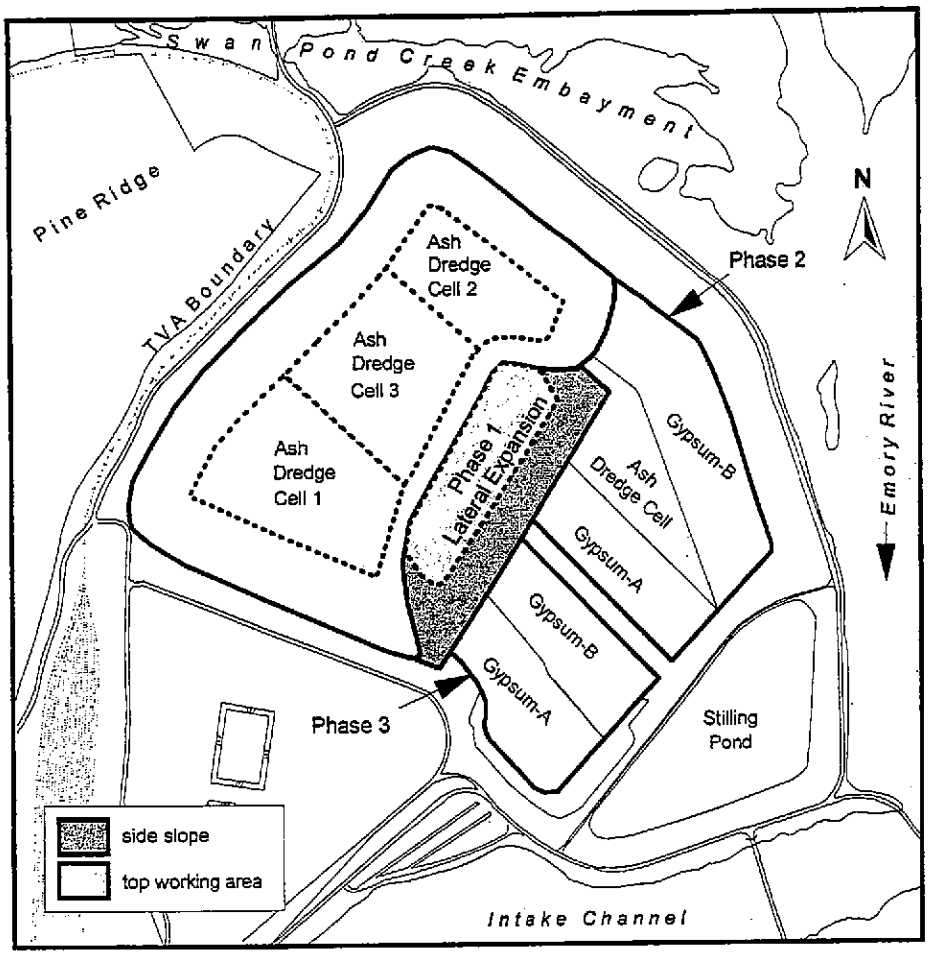

Top Working Area
5% slope
Elevation (ft-MSL)
844
Wet Ash
805
Existing Ash
770
735
Alluvial Clay
Side Slope
Elevation (ft-MSL)
33% slope
804 (average elevation)
1-ft Vegetated Topsoil
Existing Ash
770
735
Alluvial Clay

Figure G-1



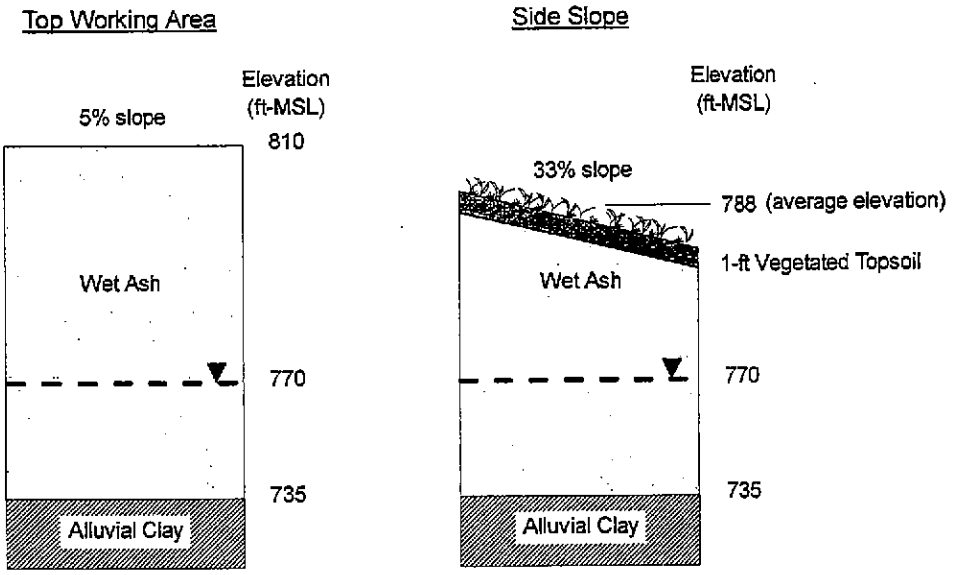
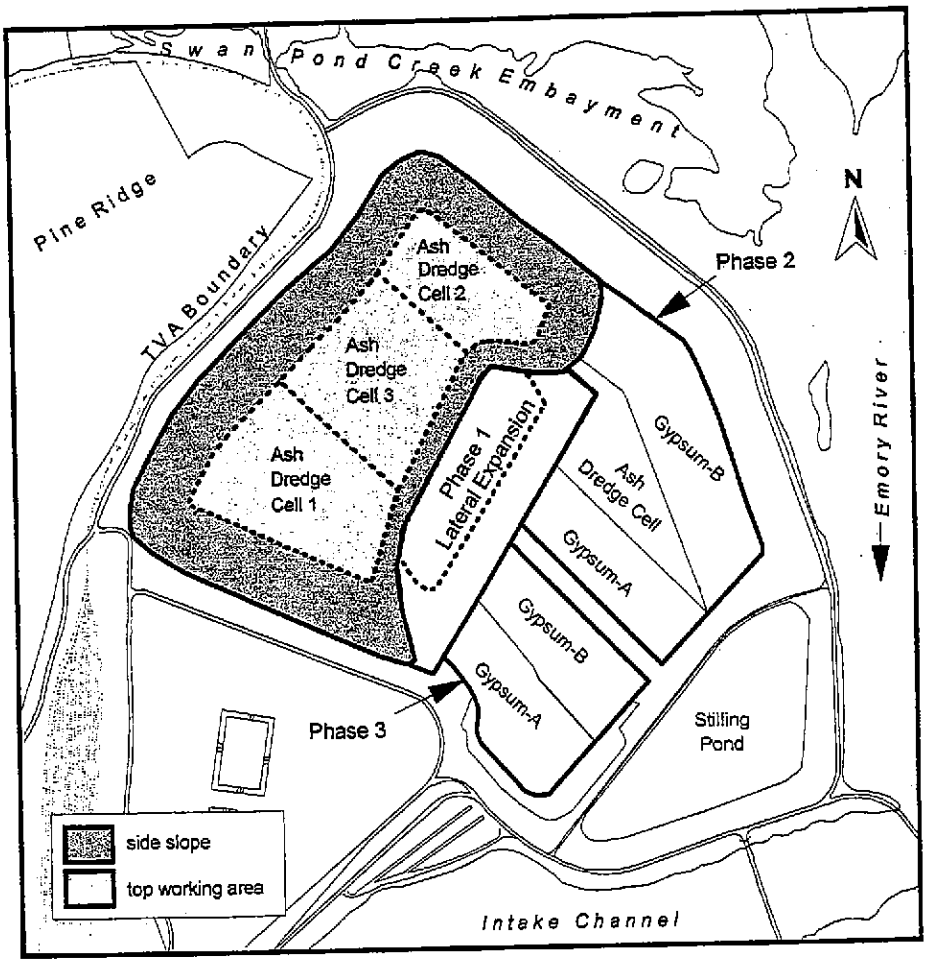


Figure G-2

TVA-00018828



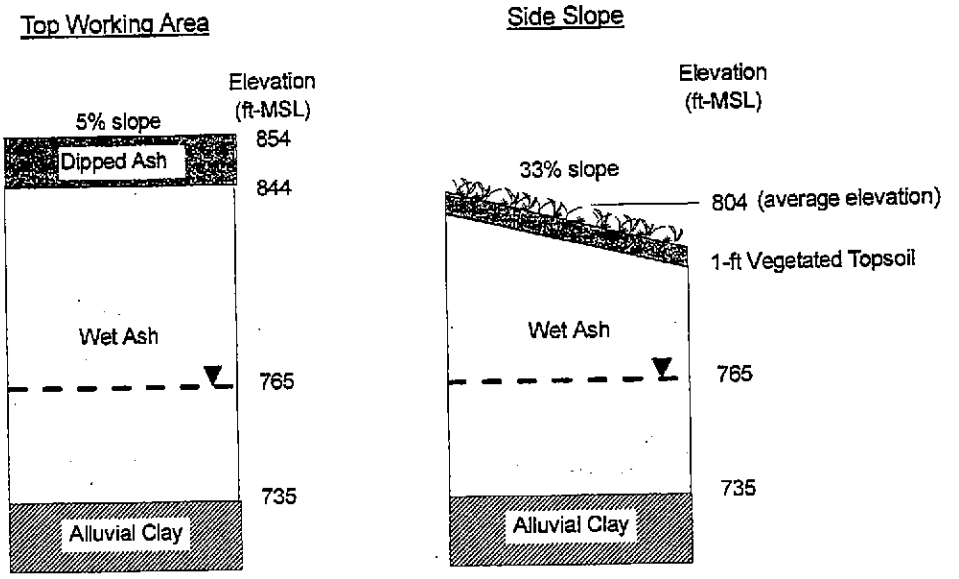
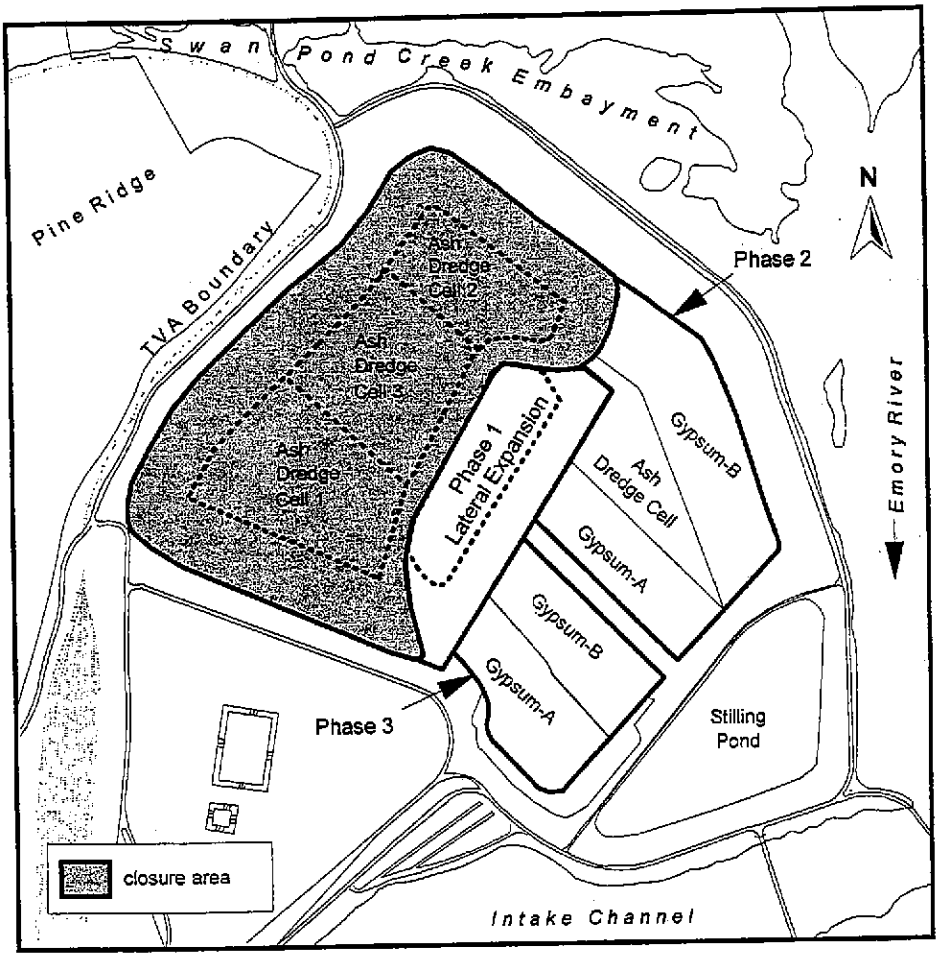


Figure G-3

TVA-00018829


Swan Pond Creek Embayment
Pine Ridge
TVA Boundary
N
Phase 2
Ash Dredge Cell 2
Ash Dredge Cell 3
Ash Dredge Cell 1
Phase 1 Lateral Expansion
Gypsum-B
Ash Dredge Cell
Gypsum-A
Gypsum-B
Gypsum-A
Emory River
Phase 3
Stilling Pond
closure area
Intake Channel

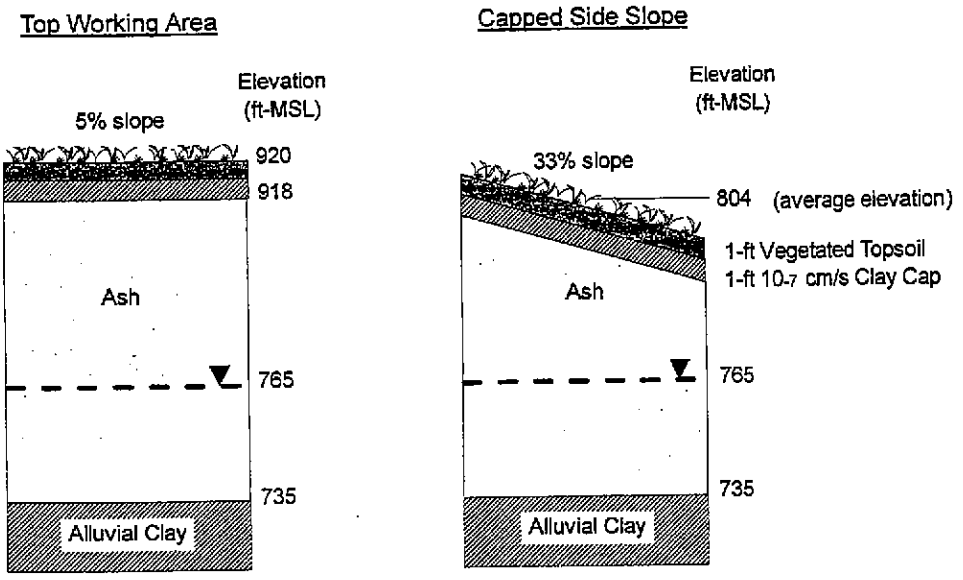
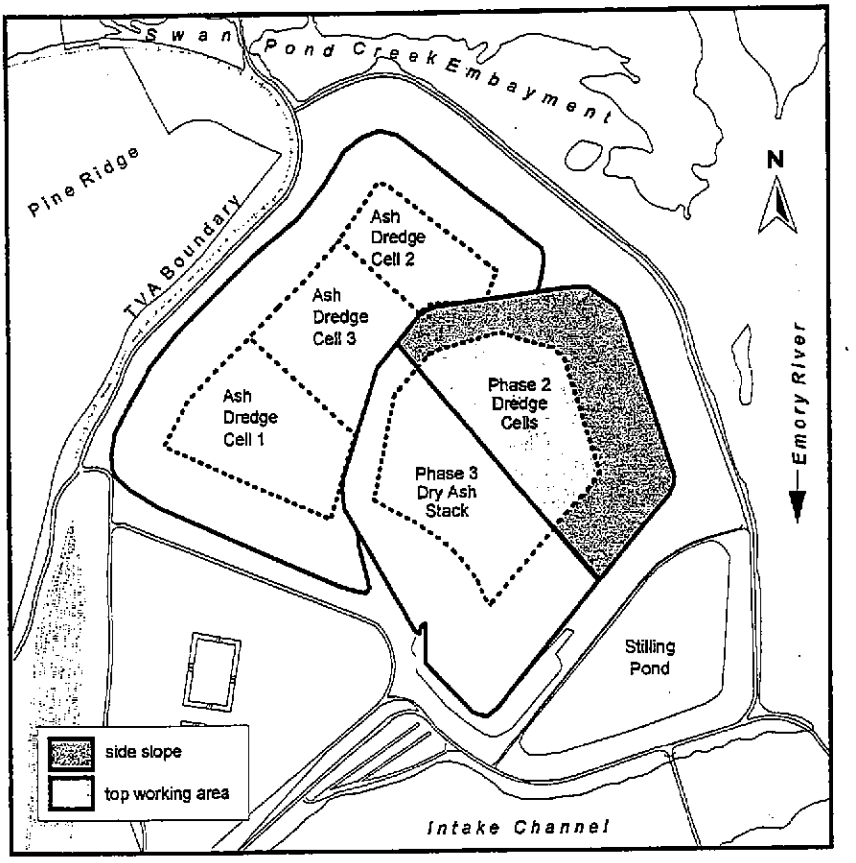

Top Working Area
Elevation (ft-MSL)
5% slope
920
918
Ash
765
735
Alluvial Clay
Capped Side Slope
Elevation (ft-MSL)
33% slope
804 (average elevation)
1-ft Vegetated Topsoil
1-ft 10-7 cm/s Clay Cap
Ash
765
735
Alluvial Clay

Figure G-4



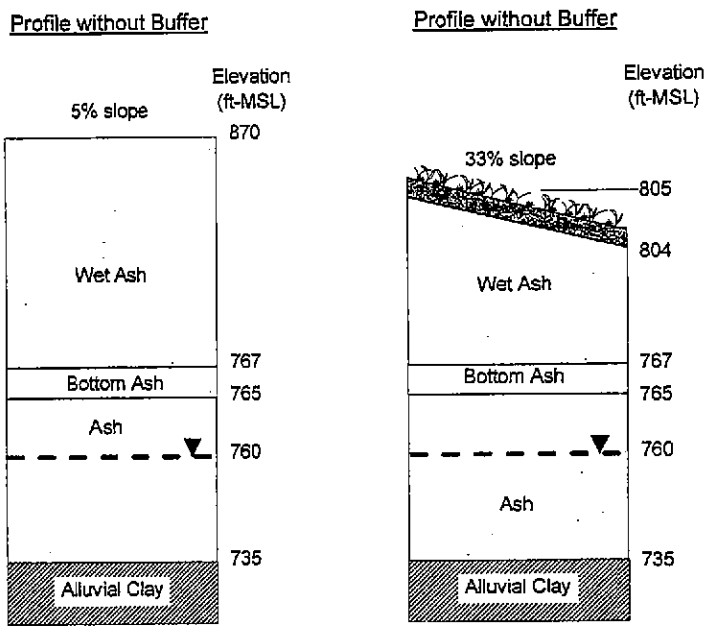
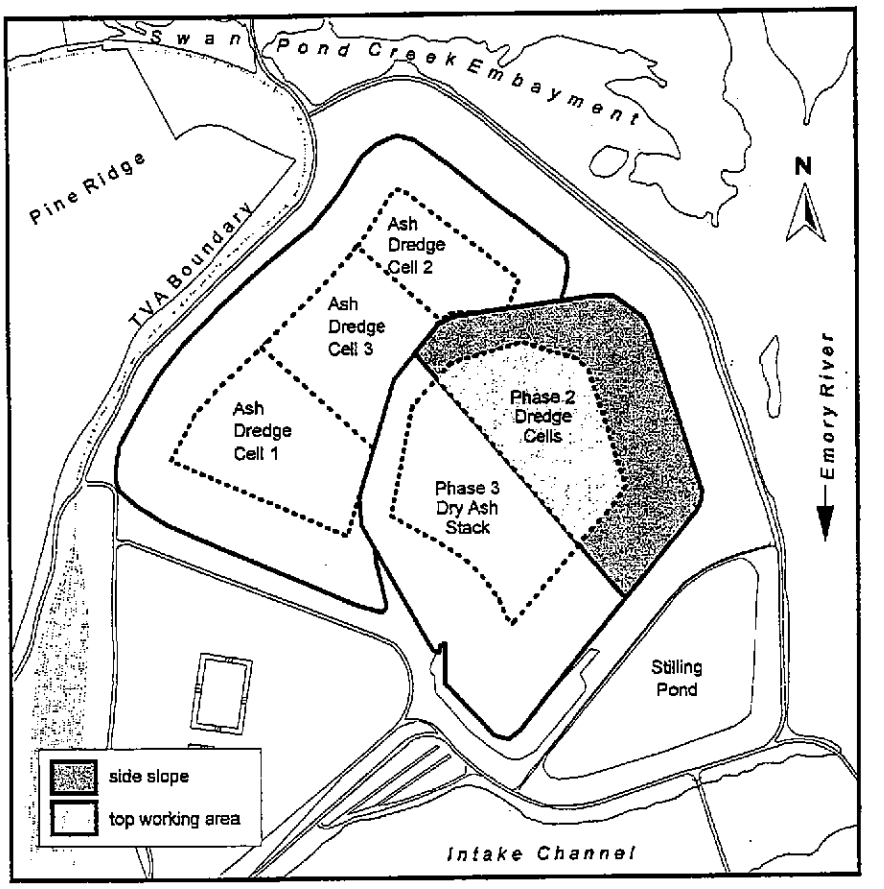


Figure G-5

TVA-00018831


Swan Pond Creek Embayment
Pine Ridge
TVA Boundary
N
Ash Dredge Cell 2
Ash Dredge Cell 3
Ash Dredge Cell 1
Phase 2 Dredge Cells
Phase 3 Dry Ash Stack
Emory River
Stilling Pond
side slope
top working area
Intake Channel

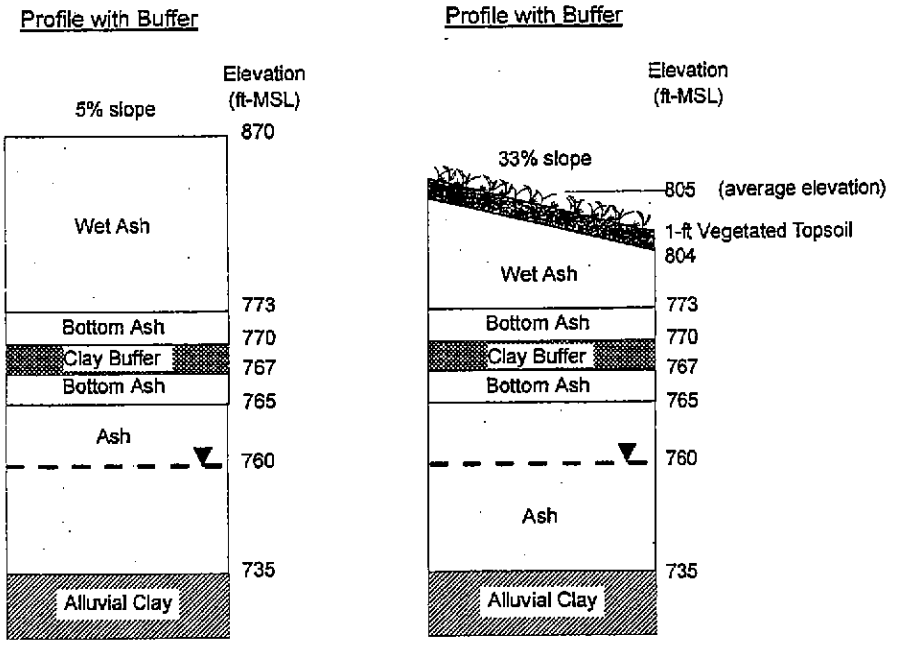
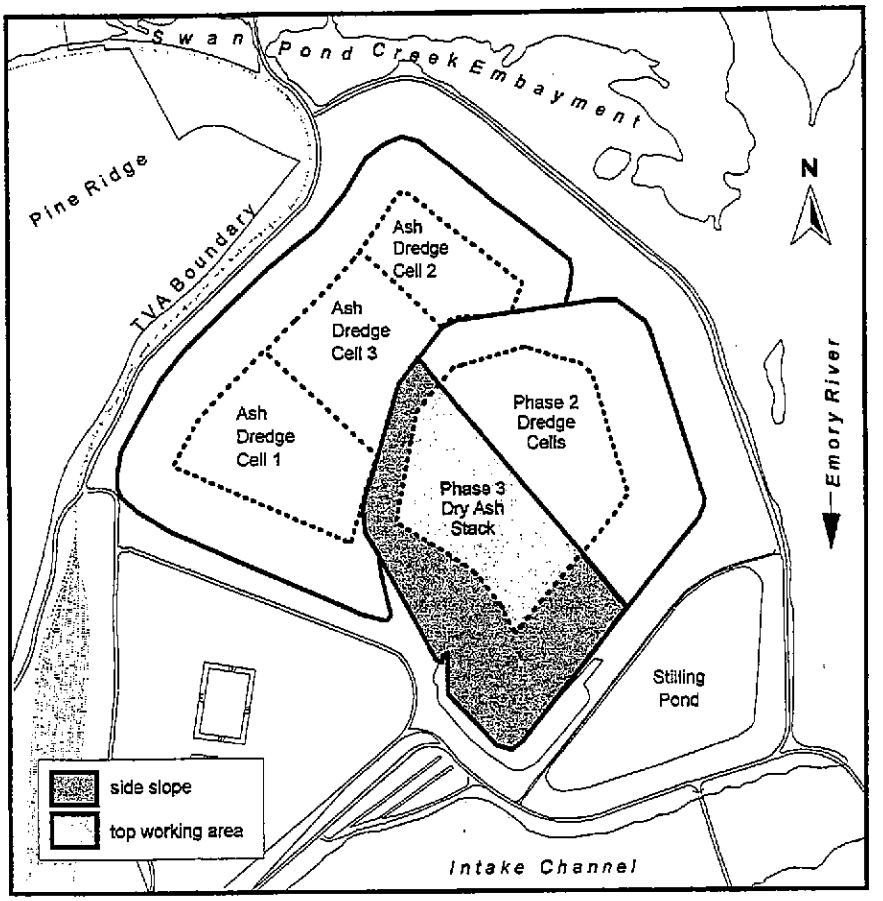

Profile with Buffer
5% slope
Elevation (ft-MSL)
870
Wet Ash
773
Bottom Ash
770
Clay Buffer
767
Bottom Ash
765
Ash
760
735
Alluvial Clay
Profile with Buffer
Elevation (ft-MSL)
33% slope
805 (average elevation)
1-ft Vegetated Topsoil
804
Wet Ash
773
Bottom Ash
770
Clay Buffer
767
Bottom Ash
765
760
Ash
735
Alluvial Clay

Figure G-6



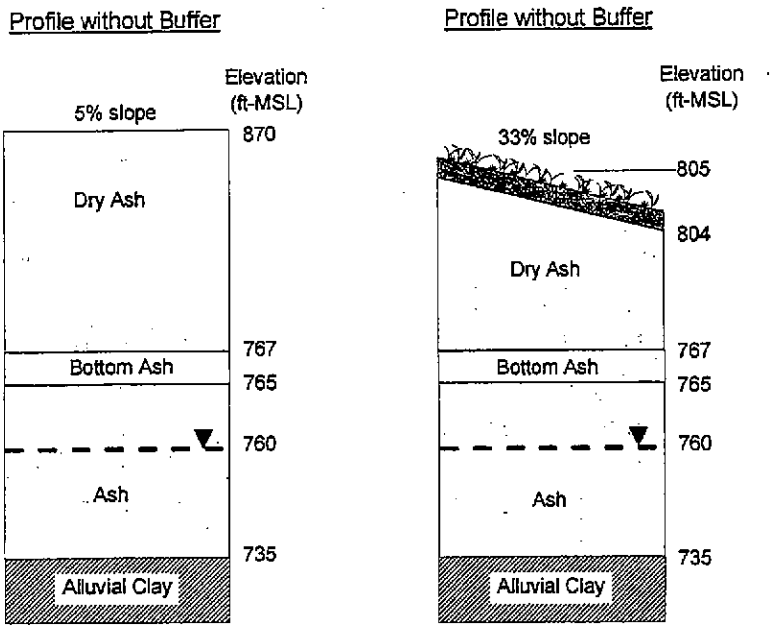
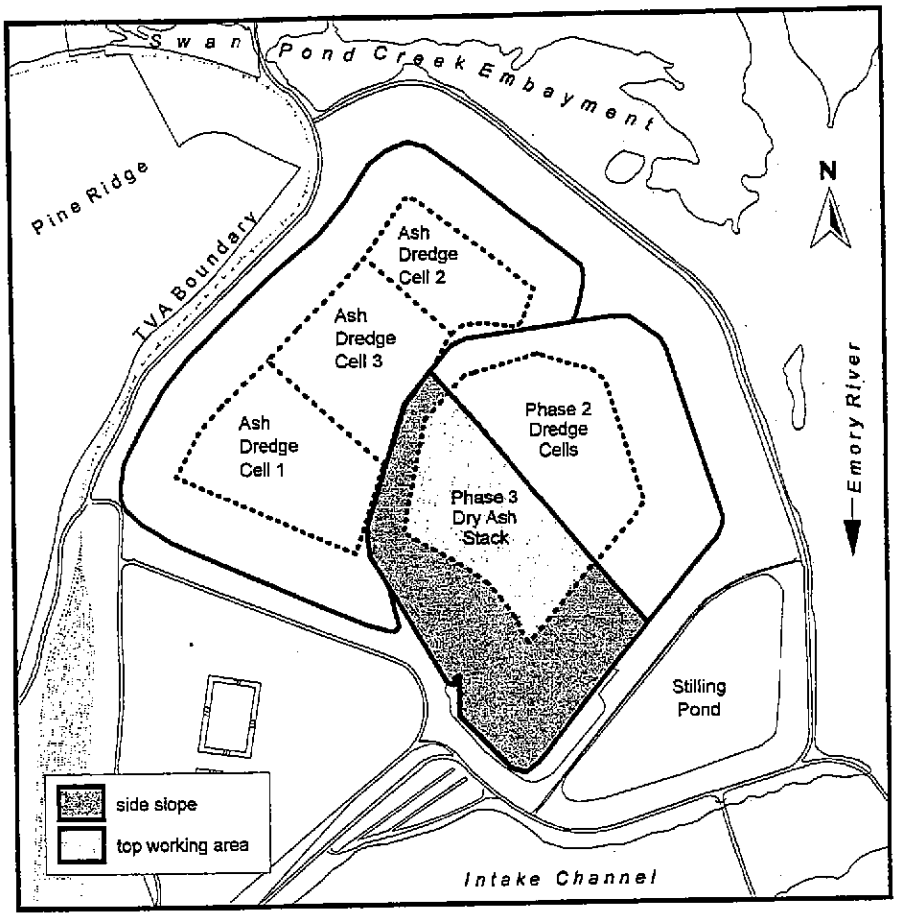


Figure G-7

TVA-00018833


Swan Pond Creek Embayment
Pine Ridge
TVA Boundary
N
Ash Dredge Cell 2
Ash Dredge Cell 3
Ash Dredge Cell 1
Phase 2 Dredge Cells
Phase 3 Dry Ash Stack
Emory River
Stilling Pond
side slope
top working area
Intake Channel

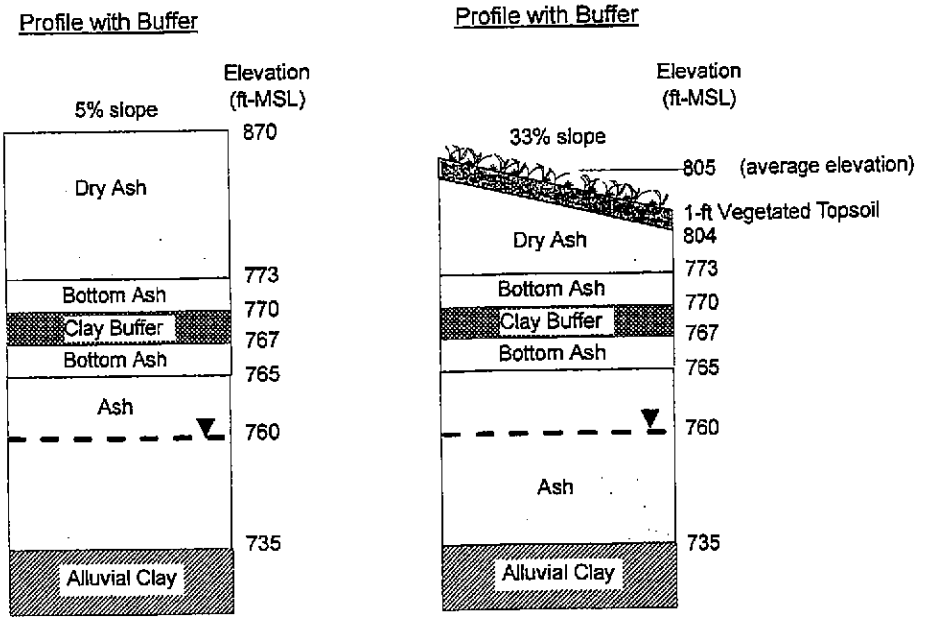
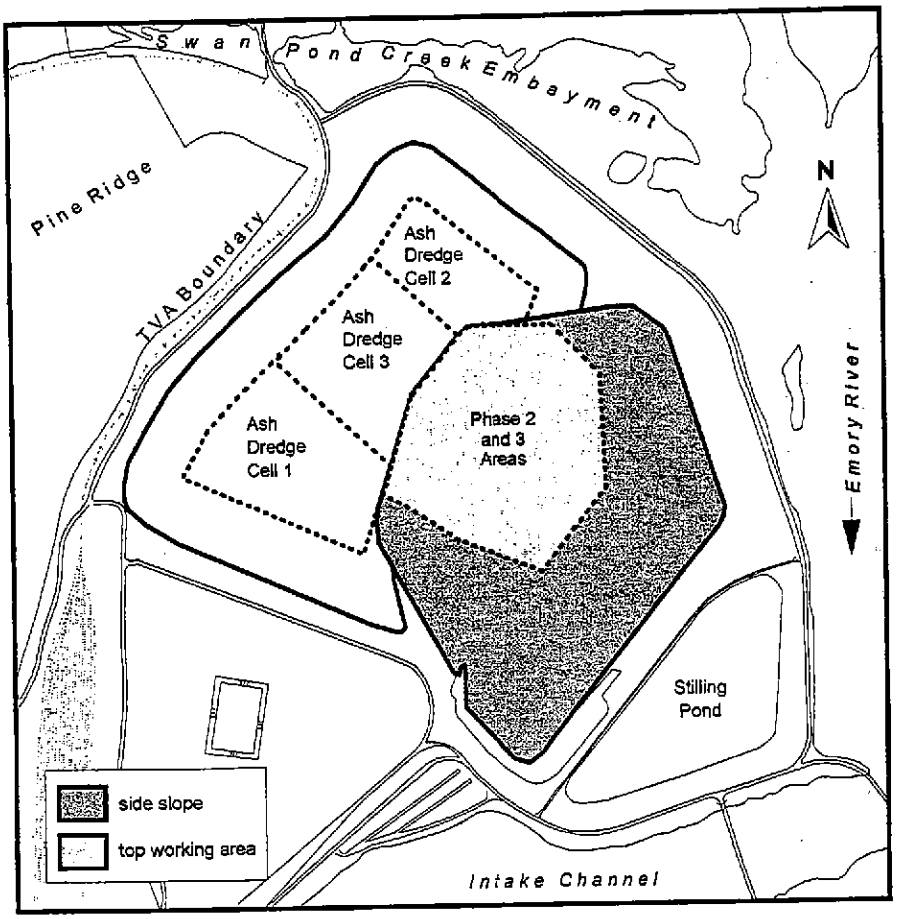

Profile with Buffer
5% slope
Elevation (ft-MSL)
870
Dry Ash
773
Bottom Ash
770
Clay Buffer
767
Bottom Ash
765
Ash
760
735
Alluvial Clay
Profile with Buffer
33% slope
Elevation (ft-MSL)
805 (average elevation)
1-ft Vegetated Topsoil
804
Dry Ash
773
Bottom Ash
770
Clay Buffer
767
Bottom Ash
765
760
Ash
735
Alluvial Clay

Figure G-8



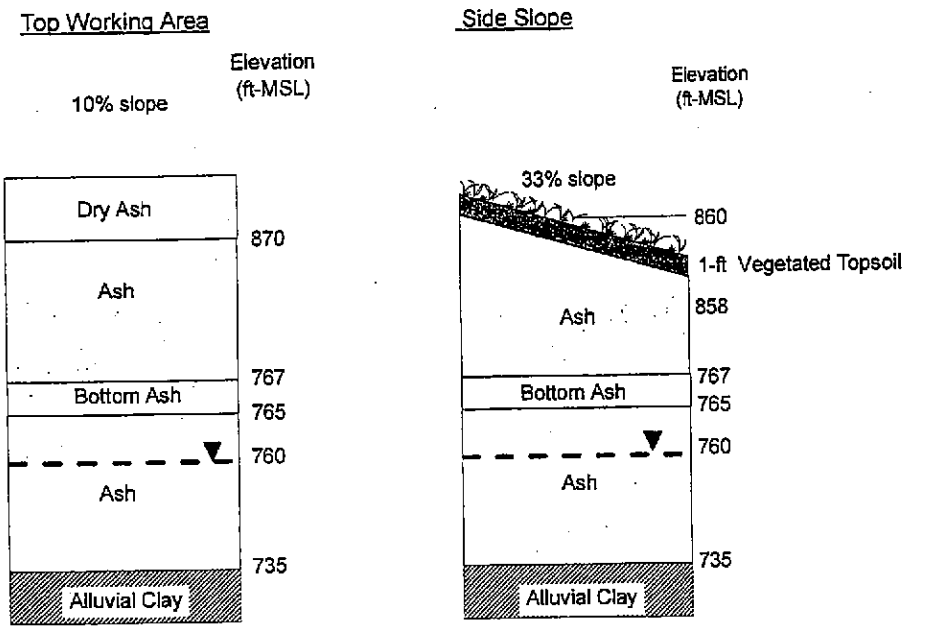
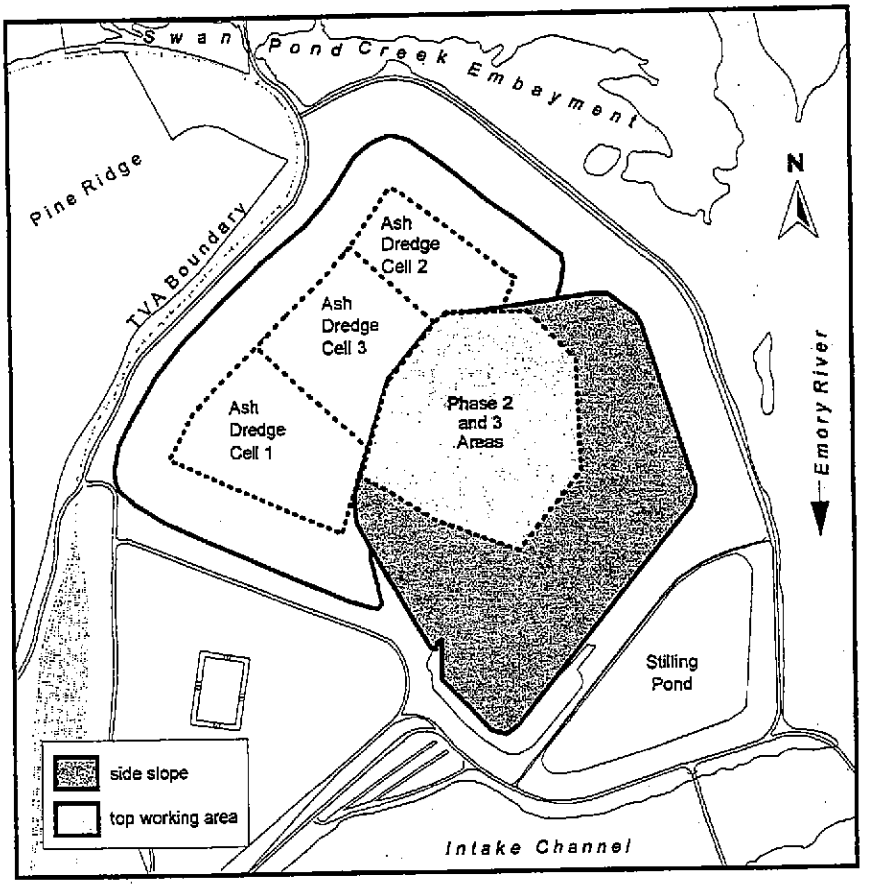


Figure G-9

TVA-00018835



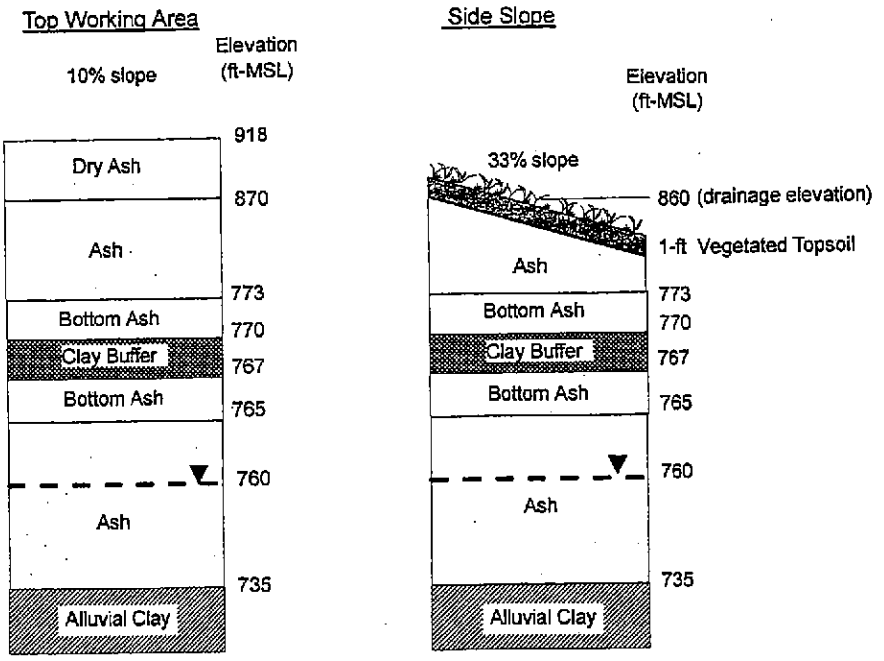
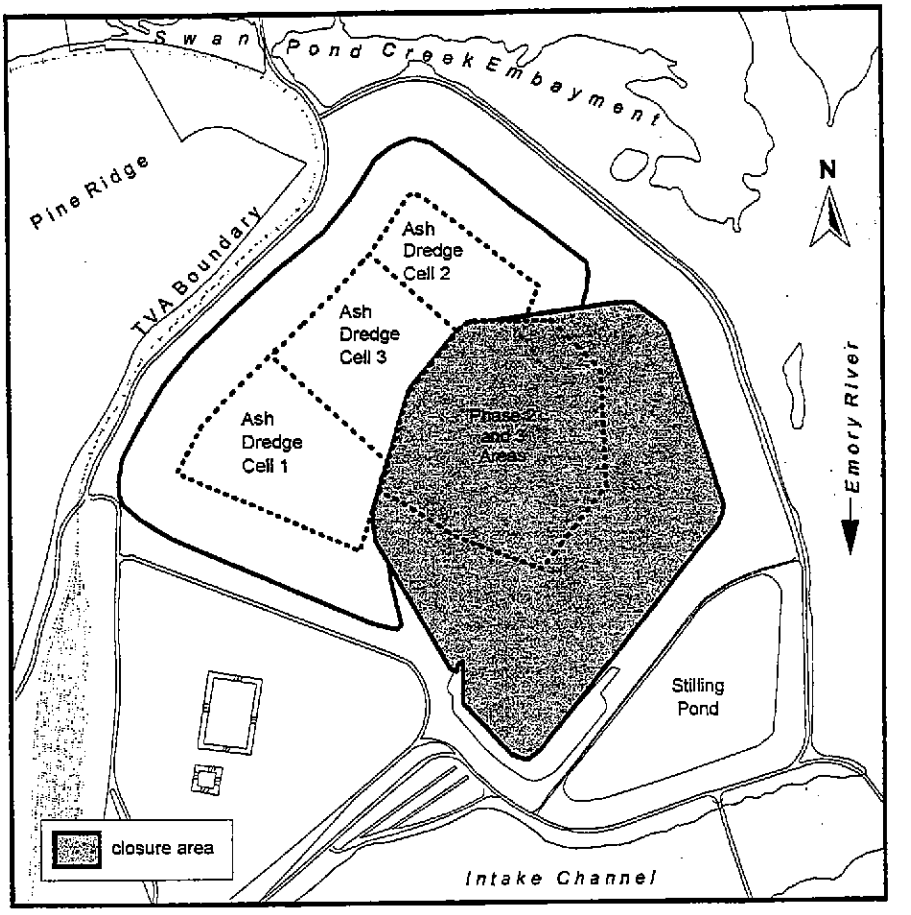


Figure G-10

TVA-00018836



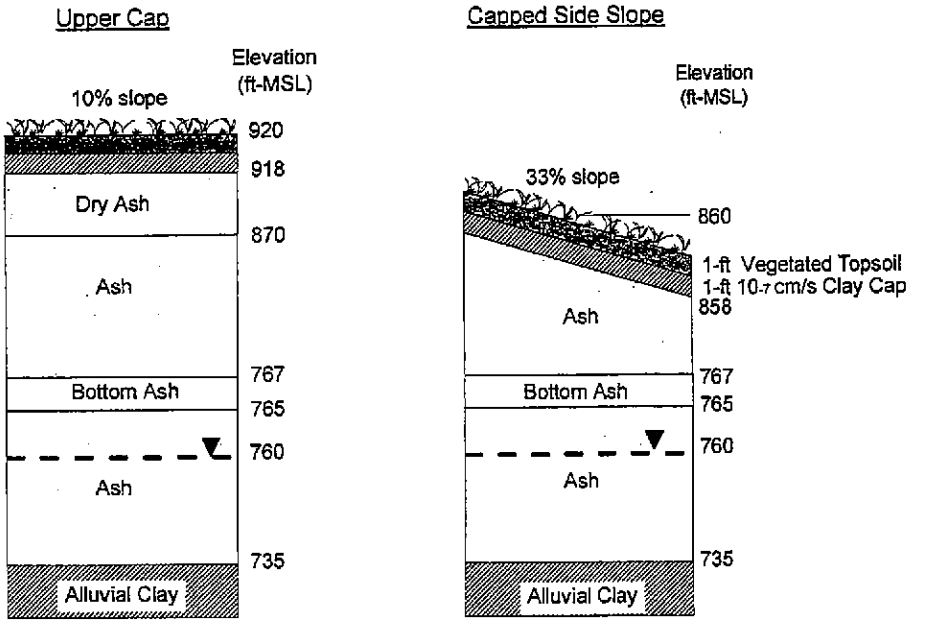
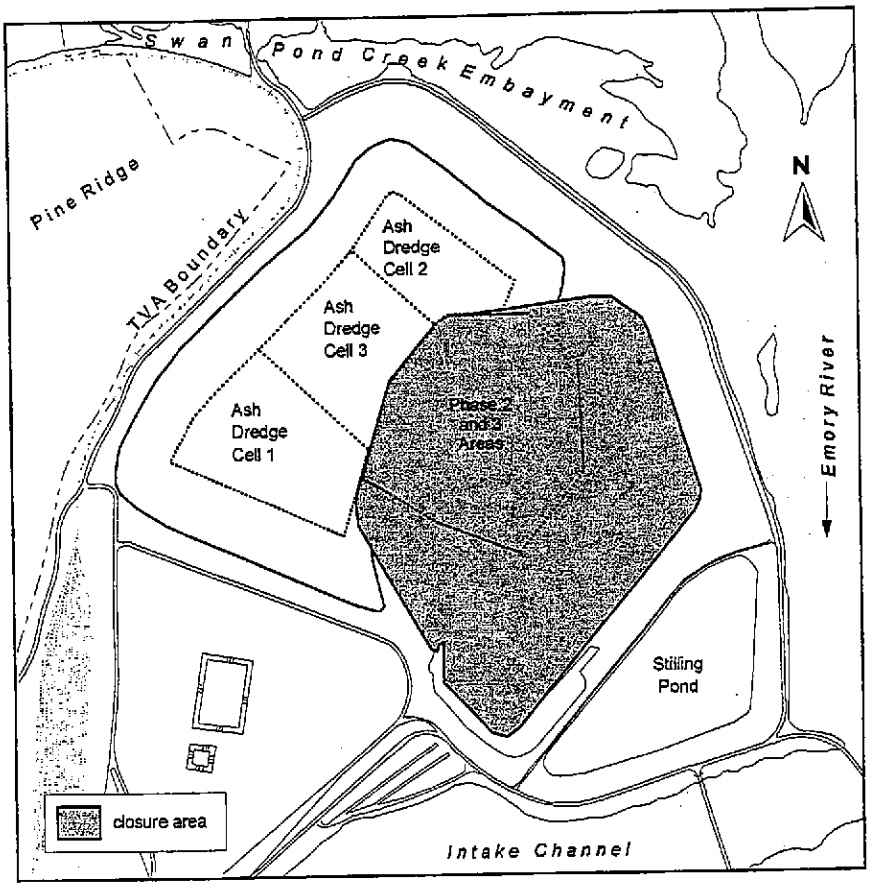


Figure G-11

TVA-00018837



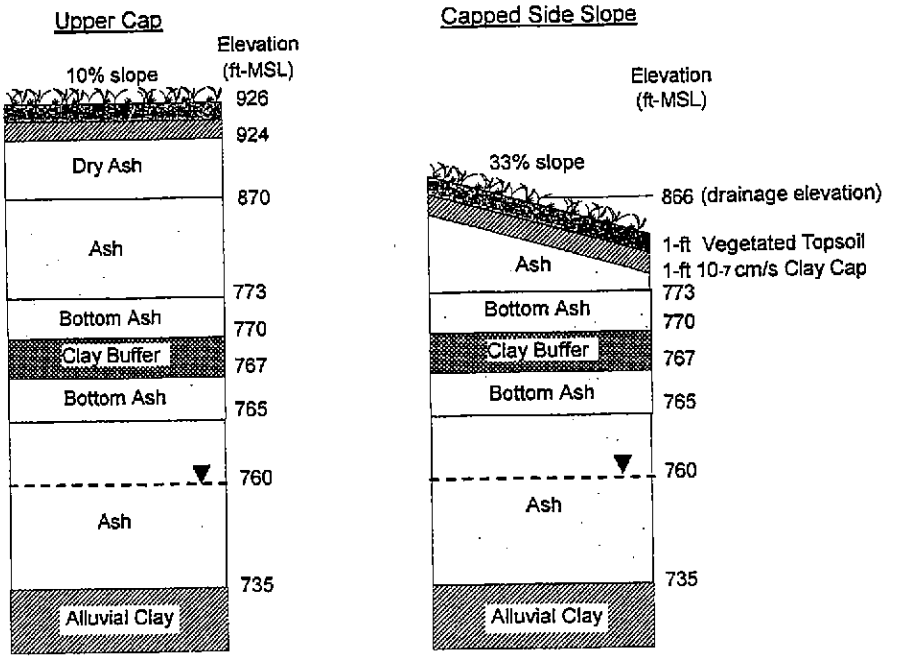


Figure G-12

TVA-00018838

APPENDIX H

OPTION A – LEACHATE SEEPAGE AND COC MASS LOADING ESTIMATES

TVA-00018839

Table H1. Option A – Leachate Seepage Estimates for Disposal Facility Subregions

Facility Subregion	Start Date	End Date	Waste	Surface Area (sq ft)	Mean Seepage (%P)1	Mean Seepage (Lpd)	Model Applied for Seepage Estimate	Subregion Figure No. (Appendix F)
Phase 1 - Ash Dredge Cells 1& 3 - Top Working Area	2004	2014	wet ash	1,596,662	11.6	67,618	HELP	F-1
Phase 1 - Ash Dredge Cells 1& 3 - Side Slopes	2004	2014	wet ash	1,799,163	30.7	200,760	HELP	F-1
Phase 1 - Ash Dredge Cell 2 (active pond)	2004	2014	wet ash	798,350	--	156,757	MODFLOW	F-1
Phase 1 - Ash Dredge Cells 1-3 - Top Working Area	2015	2016	dipped ash	1,965,662	13.5	90,215	HELP	F-2
Phase 1 - Ash Dredge Cells 1-3 - Side Slopes	2015	2016	dipped ash	2,581,418	17.4	153,283	HELP	F-2
Closure of Ash Dredge Cells 1-3 - Upper Cap	2017	2046	mixed ash	1,965,662	19.2	132,247	HELP	F-3
Closure of Ash Dredge Cells 1-3 - Side Slopes	2017	2046	mixed ash	2,581,418	17.2	155,163	HELP	F-3
Phase 1 - Dredge Cell Lateral Expansion Area - Top	2004	2014	wet ash	496,898	16.9	12,454	HELP	F-4
Phase 1 - Dredge Cell Lateral Expansion Area - Slope	2004	2014	wet ash	502,432	24.4	44,483	HELP	F-4
Phase 2 - Gypsum Pond A (inactive) - NO BUFFER	2009	2018	gypsum	417,835	24.6	37,940	HELP	F-5
Phase 2 - Gypsum Pond A (inactive) - BUFFER	2009	2018	gypsum	417,835	16.2	24,962	HELP	F-5
Phase 2 - Gypsum Pond B (active) - NO BUFFER	2009	2018	wet gypsum	405,015	--	24,347	MODFLOW	F-5
Phase 2 - Gypsum Pond B (active) - BUFFER	2009	2018	wet gypsum	405,015	--	16,545	MODFLOW	F-5
Phase 2 - Ash Pond (active) - NO BUFFER	2009	2018	wet ash	449,658	--	21,844	MODFLOW	F-5
Phase 2 - Ash Pond (active) - BUFFER	2009	2018	wet ash	449,658	--	17,370	MODFLOW	F-5
Phase 3 - Gypsum Pond A (inactive) - NO BUFFER	2019	2028	gypsum	384,240	27.5	38,890	HELP	F-6
Phase 3 - Gypsum Pond A (inactive) - BUFFER	2019	2028	gypsum	384,240	16.2	22,955	HELP	F-6
Phase 3 - Gypsum Pond B (active) - NO BUFFER	2019	2028	wet gypsum	363,363	--	21,844	MODFLOW	F-6
Phase 3 - Gypsum Pond B (active) - BUFFER	2019	2028	wet gypsum	363,363	--	14,843	MODFLOW	F-6
Dry Ash Stack between Phase 2&3 - NO BUFFER	2019	2028	dry ash	249,655	11.2	10,268	HELP	F-7
Dry Ash Stack between Phase 2&3 - BUFFER	2019	2028	dry ash	249,655	9.0	8,243	HELP	F-7
Closure of Phase 2&3 Areas - Upper Cap - NO BUFFER	2029	2058	60:40 ash/gypsum	1,538,324	12.0	65,409	HELP	F-8
Closure of Phase 2&3 Areas - Upper Cap - BUFFER	2029	2058	60:40 ash/gypsum	1,538,324	12.2	66,629	HELP	F-9
Closure of Phase 2&3 Areas - Side Slopes - NO BUFFER	2029	2058	60:40 ash/gypsum	2,709,399	11.9	114,047	HELP	F-8
Closure of Phase 2&3 Areas - Side Slopes - BUFFER	2029	2058	60:40 ash / gypsum	2,709,399	12.1	115,311	HELP	F-9

1Percent of mean annual precipitation

TVA-00018840

Table H2. Option A – COC Mass Loading Estimates

Facility	Start Date	End Date	Waste	Ammonia			Arsenic			Cadmium		
				Weighted Average Leachate Conc. (mg/L)	Mass Loading SPC (kg/day)	Mass Loading Emory River (kg/day)	Weighted Average Leachate Conc. (mg/L)	Mass Loading SPC (kg/day)	Mass Loading Emory River (kg/day)	Weighted Average Leachate Conc. (mg/L)	Mass Loading SPC (kg/day)	Mass Loading Emory River (kg/day)
Phase 1 - Ash Dredge Cells 1-3	2004	2014	wet ash	1.00	0.4237	0.4237	0.004	0.0016	0.3189	0.001	0.0004	0.0004
Phase 1 - Ash Dredge Cells 1-3	2015	2016	dipped ash	1.13	0.2754	0.2754	0.004	0.0009	0.1826	0.001	0.0002	0.0002
Closure of Ash Dredge Cells 1-3	2017	2046	mixed ash	1.13	0.3250	0.3250	0.004	0.0011	0.0503	0.001	0.0003	0.0003
Phase 1 - Dredge Cell Lateral Expansion Area	2004	2014	wet ash	2.64	--	0.1503	0.0037	0.0002	0.0427	0.001	--	0.0001
Phase 2 - Gypsum Ponds A&B - NO BUFFER	2009	2018	gypsum	0.000	--	0.000	0.001	0.000	0.000	0.012	--	0.0007
Phase 2 - Gypsum Ponds A&B - BUFFER	2009	2018	gypsum	0.000	--	0.000	0.001	0.000	0.000	0.012	--	0.0005
Phase 2 - Ash Dredge Cell - NO BUFFER	2009	2018	wet ash	2.64	--	0.0577	0.7500	0.0164	0.0164	0.002	--	4.37E-05
Phase 2 - Ash Dredge Cell - BUFFER	2009	2018	wet ash	2.64	--	0.0459	0.7500	0.0130	0.0130	0.002	--	3.47E-05
Phase 3 - Gypsum Ponds A&B - NO BUFFER	2019	2028	gypsum	0.00	--	0.0000	0.0005	0.0000	0.0000	0.012	--	0.0007
Phase 3 - Gypsum Ponds A&B - BUFFER	2019	2028	gypsum	0.00	--	0.0000	0.0005	0.0000	0.0000	0.012	--	0.0005
Phase 2&3 Dry Ash Stack - NO BUFFER	2019	2028	dry ash	733.00	--	7.5263	0.7500	0.0077	0.0077	0.002	--	2.05E-05
Phase 2&3 Dry Ash Stack - BUFFER	2019	2028	dry ash	733.00	--	6.0425	0.7500	0.0062	0.0062	0.002	--	1.65E-05
Closure of Phase 2&3 Areas - NO BUFFER	2029	2058	60:40 ash/gyp	284.69	--	50.6395	0.3496	0.0627	0.0113	0.007	--	0.0013
Closure of Phase 2&3 Areas - BUFFER	2029	2058	60:40 ash/gyp	284.69	--	51.0886	0.3496	0.0622	0.0105	0.007	--	0.0013

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Table H2. Option A – COC Mass Loading Estimates (cont.)

Facility	Start Date	End Date	Waste	Copper			Mercury			Nickel		
				Weighted Average Leachate Conc. (mg/L)	Mass Loading SPC (kg/day)	Mass Loading Emory River (kg/day)	Weighted Average Leachate Conc. (mg/L)	Mass Loading SPC (kg/day)	Mass Loading Emory River (kg/day)	Weighted Average Leachate Conc. (mg/L)	Mass Loading SPC (kg/day)	Mass Loading Emory River (kg/day)
Phase 1 - Ash Dredge Cells 1-3	2004	2014	wet ash	0.025	0.0108	0.0108	0.0006	2.55E-04	2.55E-04	0.0466	1.98E-02	1.98E-02
Phase 1 - Ash Dredge Cells 1-3	2015	2016	dipped ash	0.025	0.0062	0.0062	0.0006	1.46E-04	1.46E-04	0.0466	1.13E-02	1.13E-02
Closure of Ash Dredge Cells 1-3	2017	2046	mixed ash	0.025	0.0073	0.0073	0.0006	1.72E-04	1.72E-04	0.0466	1.34E-02	1.34E-02
Phase 1 - Dredge Cell Lateral Expansion Area	2004	2014	wet ash	0.025	--	0.0014	0.0006	--	3.42E-05	0.0466	--	0.0027
Phase 2 - Gypsum Ponds A&B - NO BUFFER	2009	2018	gypsum	0.006	--	0.0003	0.0034	--	2.12E-04	0.107	--	0.0066
Phase 2 - Gypsum Ponds A&B - BUFFER	2009	2018	gypsum	0.006	--	0.0002	0.0034	--	1.41E-04	0.107	--	0.0044
Phase 2 - Ash Dredge Cell - NO BUFFER	2009	2018	wet ash	0.005	--	1.09E-04	0.0001	--	2.18E-06	0.003	--	6.55E-05
Phase 2 - Ash Dredge Cell - BUFFER	2009	2018	wet ash	0.005	--	8.69E-05	0.0001	--	1.74E-06	0.003	--	5.21E-05
Phase 3 - Gypsum Ponds A&B - NO BUFFER	2019	2028	gypsum	0.006	--	0.0003	0.0034	--	2.06E-04	0.107	--	0.0065
Phase 3 - Gypsum Ponds A&B - BUFFER	2019	2028	gypsum	0.006	--	0.0002	0.0034	--	1.29E-04	0.107	--	0.0040
Phase 2&3 Dry Ash Stack - NO BUFFER	2019	2028	dry ash	0.005	--	0.0001	0.0001	--	1.03E-06	0.003	--	3.08E-05
Phase 2&3 Dry Ash Stack - BUFFER	2019	2028	dry ash	0.005	--	0.0000	0.0001	--	8.24E-07	0.003	--	2.47E-05
Closure of Phase 2&3 Areas - NO BUFFER	2029	2058	60:40 ash/gyp	0.005	--	0.0009	0.0019	--	3.34E-04	0.058	--	0.0105
Closure of Phase 2&3 Areas - BUFFER	2029	2058	60:40 ash/gyp	0.005	--	0.0009	0.0019	--	3.31E-04	0.058	--	0.0104

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Table H2. Option A – COC Mass Loading Estimates (cont.)

Facility	Start Date	End Date	Waste	Selenium			Zinc		
				Weighted Average Leachate Conc. (mg/L)	Mass Loading SPC (kg/day)	Mass Loading Emory River (kg/day)	Weighted Average Leachate Conc. (mg/L)	Mass Loading SPC (kg/day)	Mass Loading Emory River (kg/day)
Phase 1 - Ash Dredge Cells 1-3	2004	2014	wet ash	0.001	0.0004	4.25E-04	0.209	0.0889	0.0889
Phase 1 - Ash Dredge Cells 1-3	2015	2016	dipped ash	0.001	0.0002	2.43E-04	0.209	0.0509	0.0509
Closure of Ash Dredge Cells 1-3	2017	2046	mixed ash	0.001	0.0003	2.87E-04	0.209	0.0601	0.0601
Phase 1 - Dredge Cell Lateral Expansion Area	2004	2014	wet ash	0.001	--	5.69E-05	0.209	--	0.0119
Phase 2 - Gypsum Ponds A&B - NO BUFFER	2009	2018	gypsum	0.137	--	8.53E-03	0.715	--	0.0445
Phase 2 - Gypsum Ponds A&B - BUFFER	2009	2018	gypsum	0.137	--	5.69E-03	0.715	--	0.0297
Phase 2 - Ash Dredge Cell - NO BUFFER	2009	2018	wet ash	0.001	--	1.09E-05	0.005	--	1.09E-04
Phase 2 - Ash Dredge Cell - BUFFER	2009	2018	wet ash	0.001	--	8.69E-06	0.005	--	8.69E-05
Phase 3 - Gypsum Ponds A&B - NO BUFFER	2019	2028	gypsum	0.137	--	8.32E-03	0.715	--	0.0434
Phase 3 - Gypsum Ponds A&B - BUFFER	2019	2028	gypsum	0.137	--	5.18E-03	0.715	--	0.0270
Phase 2&3 Dry Ash Stack - NO BUFFER	2019	2028	dry ash	0.001	--	5.13E-06	0.005	--	0.0001
Phase 2&3 Dry Ash Stack - BUFFER	2019	2028	dry ash	0.001	--	4.12E-06	0.005	--	0.0000
Closure of Phase 2&3 Areas - NO BUFFER	2029	2058	60:40 ash/gyp	0.073	--	1.32E-02	0.3843	--	0.0690
Closure of Phase 2&3 Areas - BUFFER	2029	2058	60:40 ash/gyp	0.073	--	1.31E-02	0.3843	--	0.0684

TVA-00018843

APPENDIX I

OPTION B – LEACHATE SEEPAGE AND COC MASS LOADING ESTIMATES

TVA-00018844

Table I1. Option B – Leachate Seepage Estimates for Disposal Facility Subregions

Facility Subregion	Start Date	End Date	Waste	Surface Area (sq ft)	Mean Seepage (%P)[1]	Mean Seepage (Lpd)	Model Applied for Seepage Estimate	Appendix VII Subregion Figure No.
Phase 1 - Ash Dredge Cells 1& 3 - Top Working Area	2004	2014	wet ash	1,596,662	11.6	67,618	HELP	1
Phase 1 - Ash Dredge Cells 1& 3 - Side Slope	2004	2014	wet ash	1,799,163	30.7	200,760	HELP	1
Phase 1 - Ash Dredge Cell 2 (active pond)	2004	2014	wet ash	798,350	--	156,757	MODFLOW	1
Phase 1 - Ash Dredge Cells 1-3 - Top Working Area	2015	2016	dipped ash	1,965,662	13.5	90,215	HELP	2
Phase 1 - Ash Dredge Cells 1-3 - Side Slope	2015	2016	dipped ash	2,581,418	17.4	153,283	HELP	2
Closure of Ash Dredge Cells 1-3 - Upper Cap	2017	2046	mixed ash	1,965,662	19.2	132,247	HELP	3
Closure of Ash Dredge Cells 1-3 - Side Slope	2017	2046	mixed ash	2,581,418	17.2	155,163	HELP	3
Phase 1 - Dredge Cell Lateral Expansion Area - Top	2004	2014	wet ash	496,898	16.9	12,454	HELP	4
Phase 1 - Dredge Cell Lateral Expansion Area - Slope	2004	2014	wet ash	502,432	24.4	44,483	HELP	4
Phase 2 - Ash Dredge Cell - Top - NO BUFFER	2009	2009	wet ash	900,003	7.1	23,559	HELP	5
Phase 2 - Ash Dredge Cell - Top - BUFFER	2017	2017	wet ash	900,003	5.4	17,950	HELP	6
Phase 2 - Ash Dredge Cell - Slope - NO BUFFER	2009	2009	wet ash	1,175,800	23.6	102,398	HELP	5
Phase 2 - Ash Dredge Cell - Slope - BUFFER	2009	2009	wet ash	1,175,800	17.1	74,052	HELP	6
Phase 3 - Dry Ash Stack - Top - NO BUFFER	2019	2019	dry ash	897,897	2.9	9,747	HELP	6
Phase 3 - Dry Ash Stack - Top - BUFFER	2019	2019	dry ash	897,897	1.8	6,013	HELP	7
Phase 3 - Dry Ash Stack - Slope - NO BUFFER	2019	2019	dry ash	1,307,901	21.0	101,410	HELP	6
Phase 3 - Dry Ash Stack - Slope - BUFFER	2019	2019	dry ash	1,307,901	15.3	74,029	HELP	7
Phase2-3 - Dry Ash Cap - Top - NO BUFFER	2029	2029	mixed ash	2,709,399	2.0	10,880	HELP	8
Phase2-3 - Dry Ash Cap - Top - BUFFER	2029	2029	mixed ash	1,538,324	1.9	10,583	HELP	9
Phase2-3 - Dry Ash Cap - Slope - NO BUFFER	2029	2029	mixed ash	2,709,399	7.8	77,280	HELP	8
Phase2-3 - Dry Ash Cap - Slope - BUFFER	2029	2029	mixed ash	1,538,324	5.9	58,254	HELP	9
Closure of Phase 2&3 Areas - Upper Cap - NO BUFFER	2029	2058	60:40 ash/gypsum	1,538,324	14.5	78,822	HELP	10
Closure of Phase 2&3 Areas - Upper Cap - BUFFER	2029	2058	60:40 ash/gypsum	1,538,324	14.2	77,024	HELP	11
Closure of Phase 2&3 Areas - Side Slope - NO BUFFER	2029	2058	60:40 ash/gypsum	2,709,399	16.0	152,122	HELP	10
Closure of Phase 2&3 Areas - Side Slope - BUFFER	2029	2058	60:40 ash/gypsum	2,709,399	16.0	152,199	HELP	11

[1]*Percent of mean annual precipitation*

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Table I2. Options B – COC Mass Loading Estimates

Facility	Start Date	End Date	Waste	Ammonia			Arsenic			Cadmium		
				Weighted Average Leachate Conc. (mg/L)	Mass Loading SPC (kg/day)	Mass Loading Emory River (kg/day)	Weighted Average Leachate Conc. (mg/L)	Mass Loading SPC (kg/day)	Mass Loading Emory River (kg/day)	Weighted Average Leachate Conc. (mg/L)	Mass Loading SPC (kg/day)	Mass Loading Emory River (kg/day)
Phase 1 - Ash Dredge Cells 1-3	2004	2014	wet ash	1.00	0.4237	0.4237	0.0037	0.0016	0.0016	0.001	0.0004	0.0004
Phase 1 - Ash Dredge Cells 1-3	2015	2016	dipped ash	1.13	0.2754	0.2754	0.0037	0.0009	0.0009	0.001	0.0002	0.0002
Closure of Ash Dredge Cells 1-3	2017	2046	mixed ash	1.13	0.3250	0.3250	0.0037	0.0011	0.0011	0.001	0.0003	0.0003
Phase 1 - Dredge Cell Lateral Expansion Area	2004	2014	wet ash	2.64	--	0.1503	0.0037	--	0.0002	0.001	--	0.0001
Phase 2 - Ash Dredge Cells - NO BUFFER	2017	2028	wet ash	2.64	--	0.2429	0.75	--	0.0690	0.002	--	0.0002
Phase 2 - Ash Dredge Cells - BUFFER	2017	2028	wet ash	2.64	--	0.3325	0.75	--	0.0945	0.002	--	0.0003
Phase 3 - Dry Ash Stack - NO BUFFER	2029	2040	dry ash	733.00	--	58.6711	0.75	--	0.0600	0.002	--	0.0002
Phase 3 - Dry Ash Stack - BUFFER	2029	2040	dry ash	733.00	--	81.4785	0.75	--	0.0834	0.002	--	0.0002
Phase 2&3 - Dry Ash Cap - NO BUFFER	2041	2047	dry ash	417.21	--	28.7193	0.75	--	0.0516	0.002	--	0.0001
Phase 2&3 - Dry Ash Cap - BUFFER	2041	2047	dry ash	417.21	--	36.7811	0.75	--	0.0661	0.002	--	0.0002
Closure of Phase 2&3 Areas - NO BUFFER	2048	2077	ash	417.21	--	96.3518	0.75	--	0.1732	0.002	--	0.0005
Closure of Phase 2&3 Areas - BUFFER	2048	2077	ash	417.21	--	95.6339	0.75	--	0.1719	0.002	--	0.0005

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Table I2. Options B – COC Mass Loading Estimates (cont.)

Facility	Start Date	End Date	Waste	Copper			Mercury			Nickel		
				Weighted Average Leachate Conc. (mg/L)	Mass Loading SPC (kg/day)	Mass Loading Emory River (kg/day)	Weighted Average Leachate Conc. (mg/L)	Mass Loading SPC (kg/day)	Mass Loading Emory River (kg/day)	Weighted Average Leachate Conc. (mg/L)	Mass Loading SPC (kg/day)	Mass Loading Emory River (kg/day)
Phase 1 - Ash Dredge Cells 1-3	2004	2014	wet ash	0.0253	0.0108	0.0108	0.0006	0.00026	0.00026	0.0466	0.0198	0.0198
Phase 1 - Ash Dredge Cells 1-3	2015	2016	dipped ash	0.0253	0.0062	0.0062	0.0006	0.00015	0.00015	0.0466	0.0113	0.0113
Closure of Ash Dredge Cells 1-3	2017	2046	mixed ash	0.0253	0.0073	0.0073	0.0006	0.00017	0.00017	0.0466	0.0134	0.0134
Phase 1 - Dredge Cell Lateral Expansion Area	2004	2014	wet ash	0.0253	--	0.0014	0.0006	--	0.00003	0.0466	--	0.0027
Phase 2 - Ash Dredge Cells - NO BUFFER	2017	2028	wet ash	0.005	--	0.0005	0.0001	--	0.00001	0.003	--	0.0003
Phase 2 - Ash Dredge Cells - BUFFER	2017	2028	wet ash	0.005	--	0.0006	0.0001	--	0.00001	0.003	--	0.0004
Phase 3 - Dry Ash Stack - NO BUFFER	2029	2040	dry ash	0.005	--	0.0004	0.0001	--	0.00001	0.003	--	0.0002
Phase 3 - Dry Ash Stack - BUFFER	2029	2040	dry ash	0.005	--	0.0006	0.0001	--	0.00001	0.003	--	0.0003
Phase 2&3 - Dry Ash Cap - NO BUFFER	2041	2047	dry ash	0.005	--	0.0003	0.0001	--	0.00001	0.003	--	0.0002
Phase 2&3 - Dry Ash Cap - BUFFER	2041	2047	dry ash	0.005	--	0.0004	0.0001	--	0.00001	0.003	--	0.0003
Closure of Phase 2&3 Areas - NO BUFFER	2048	2077	ash	0.005	--	0.0012	0.0001	--	0.00002	0.003	--	0.0007
Closure of Phase 2&3 Areas - BUFFER	2048	2077	ash	0.005	--	0.0011	0.0001	--	0.00002	0.003	--	0.0007

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Table I2. Options B – COC Mass Loading Estimates (cont.)

Facility	Start Date	End Date	Waste	Selenium			Zinc		
				Weighted Average Leachate Conc. (mg/L)	Mass Loading SPC (kg/day)	Mass Loading Emory River (kg/day)	Weighted Average Leachate Conc. (mg/L)	Mass Loading SPC (kg/day)	Mass Loading Emory River (kg/day)
Phase 1 - Ash Dredge Cells 1-3	2004	2014	wet ash	0.001	0.0004	0.0004	0.209	0.0889	0.0889
Phase 1 - Ash Dredge Cells 1-3	2015	2016	dipped ash	0.001	0.0002	0.0002	0.209	0.0509	0.0509
Closure of Ash Dredge Cells 1-3	2017	2046	mixed ash	0.001	0.0003	0.0003	0.209	0.0601	0.0601
Phase 1 - Dredge Cell Lateral Expansion Area	2004	2014	wet ash	0.001	--	0.0001	0.209	--	0.0119
Phase 2 - Ash Dredge Cells - NO BUFFER	2017	2028	wet ash	0.001	--	0.0000	0.005	--	0.0005
Phase 2 - Ash Dredge Cells - BUFFER	2017	2028	wet ash	0.001	--	0.0001	0.005	--	0.0006
Phase 3 - Dry Ash Stack - NO BUFFER	2029	2040	dry ash	0.001	--	0.0000	0.005	--	0.0004
Phase 3 - Dry Ash Stack - BUFFER	2029	2040	dry ash	0.001	--	0.0001	0.005	--	0.0006
Phase 2&3 - Dry Ash Cap - NO BUFFER	2041	2047	dry ash	0.001	--	0.0000	0.005	--	0.0003
Phase 2&3 - Dry Ash Cap - BUFFER	2041	2047	dry ash	0.001	--	0.0000	0.005	--	0.0004
Closure of Phase 2&3 Areas - NO BUFFER	2048	2077	ash	0.001	--	0.0001	0.005	--	0.0012
Closure of Phase 2&3 Areas - BUFFER	2048	2077	ash	0.001	--	0.0001	0.005	--	0.0011

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APPENDIX J

SELECTED GROUNDWATER QUALITY DATA FOR MONITORING WELLS 4A, 4B, 5, 5A, AND 5B

TVA-00018849

Groundwater Quality Data for Selected Wells

Well	Sample Date	Arsenic	Cadmium	Copper	Mercury	Nickel	Selenium	Zinc
KIF-4A	07/02/76		1	60	0.2	50	1	200
KIF-4A	03/09/77	4	1	10	2	50	1	10
KIF-4A	01/11/89	1	3	20			1	620
KIF-4A	03/29/89	1	2	10			1	440
KIF-4A	06/28/89	2	2	20			1	480
KIF-4A	09/13/89	2	5	10		140	1	690
KIF-4A	11/29/89	1	4	40			1	1200
KIF-4A	03/06/90	3	5	90			1	820
KIF-4A	06/05/90	6	4	10			1	870
KIF-4A	09/05/90	4	5	40			1	830
KIF-4A	12/04/90	1	3	30			1	790
KIF-4A	03/20/91	3	4	10			1	860
KIF-4A	12/17/91	13	3	50				670
KIF-4A	03/03/92	1	5	160				830
KIF-4A	06/02/92	2	3	170				810
KIF-4A	09/01/92	3	4	10				790
KIF-4A	12/07/92	2	3	10		120		670
KIF-4A	06/08/93	1	2	10		100		660
KIF-4A	12/09/93	9	2	10		180		650
KIF-4A	06/13/94	1	3	10		98		580
KIF-4A	12/06/94	3	5	10		110		560
KIF-4A	06/21/95	2		10		92		450
KIF-4A	12/11/95	1		10		99		400
KIF-4B	07/02/76		1	180	0.6	310	1	2
KIF-4B	03/09/77	4	1	10	2	80	1	10
KIF-4B	01/11/89	2	0.1	10			1	10
KIF-4B	03/29/89	2	0.1	10			1	40
KIF-4B	06/28/89	6	0.4	30			1	70
KIF-4B	09/13/89	4	0.5	20		20	1	80
KIF-4B	11/29/89	6	0.4	20			1	110
KIF-4B	03/06/90	2	0.6	10			1	100
KIF-4B	06/05/90	2	0.3	10			1	60
KIF-4B	09/05/90	3	0.8	40			1	30
KIF-4B	12/04/90	6	0.3	10			1	70
KIF-4B	03/20/91	2	0.3	10			1	10
KIF-4B	06/04/91	10	0.4	10			1	30
KIF-4B	09/10/91	11	0.5	10			1	40
KIF-4B	12/17/91	7	0.3	30				20
KIF-4B	03/03/92	1	0.1	10				10
KIF-4B	06/02/92	1	0.5	60				100
KIF-4B	09/01/92	1	0.3	10				40
KIF-4B	12/07/92	5	0.4	10		9		60
KIF-4B	06/08/93	1	0.1	10		3		40
KIF-4B	12/09/93	1	0.1	10		16		10
KIF-4B	06/13/94	1	0.5	10		23		40
KIF-4B	12/06/94	1		10		15		10
KIF-4B	06/21/95	1		10		13		10
KIF-4B	12/11/95	6		10		84		90
KIF-4B	12/03/96	2	0.1	10		5		10
KIF-4B	12/04/96	1	0.2	10		7		100
KIF-4B	05/07/97	1	0.3	10		19		10
KIF-4B	05/08/97	1	0.2	10		1		10

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Groundwater Quality Data for Selected Wells (continued)

Well	Sample Date	Arsenic	Cadmium	Copper	Mercury	Nickel	Selenium	Zinc
KIF-4B	12/09/97	3	0.3	10		16		50
KIF-4B	12/10/97	3	0.9	10		2		10
KIF-4B	06/30/98	1	0.5	10		32		40
KIF-4B	12/02/98	1	0.3	10		14		20
KIF-4B	12/03/98	3	2	10		39		50
KIF-4B	12/06/99	1	0.1	10		6		10
KIF-4B	12/07/99	1	0.4	10		11		13
KIF-4B	12/14/00	2	0.1	10	0.2	27	1	28
KIF-4B	06/28/01	1	0.18	12	0.2	2	1	11
KIF-4B	12/31/01	4.2	1	10	0.1	3.3	1	17
KIF-4B	06/28/02	1	0.1	10	0.1	7	1	10
KIF-4B	01/08/03	4	0.1	10	0.1	7.9	2.2	10
KIF-4B	06/16/03	1	0.5	10	0.1	16	1	40
KIF-4B	09/02/03	1.2	0.32	10	0.1	8.4	0.9	20
KIF-4B	12/29/03	0.4	0.29	10	0.1	7.9	0.3	10
KIF-4B	03/10/04	2	0.33	10	0.1	1.1	0.5	10
KIF-4B	06/07/04	4	0.4	10	0.1	4	1	30
KIF-4B	09/14/04	1	0.1	10	0.1	1	1	10
KIF-5	07/02/76		1	40	0.2	50	1	80
KIF-5	03/09/77	4	1	10	2	50	1	10
KIF-5	01/11/89	2	0.1	20			1	130
KIF-5	03/29/89	2	0.3	80			1	150
KIF-5	06/28/89	2	1	60			1	100
KIF-5	09/13/89	3	0.5	30		33	1	230
KIF-5	11/29/89	3	0.1	30			1	310
KIF-5	03/06/90	5	1	70			1	210
KIF-5	06/05/90	3	0.3	30			1	190
KIF-5	09/05/90	7	0.5	30			1	170
KIF-5	12/04/90	16	0.1	50			1	140
KIF-5	03/20/91	4	0.2	10			1	120
KIF-5	12/17/91	12	0.5	50				220
KIF-5	03/03/92	4	0.2	40				140
KIF-5	06/03/92	17	1	20				60
KIF-5	06/30/92			10				40
KIF-5	09/01/92	17	0.1	10				30
KIF-5A	07/02/76		1	90	0.2	180	1	410
KIF-5A	03/09/77	6	1	10	2	60	1	50
KIF-5A	03/28/89	1	0.3	10			1	10
KIF-5A	09/13/89	3	0.5	30		33	1	230
KIF-5A	11/29/89	3	0.1	30			1	310
KIF-5A	03/06/90	5	1	70			1	210
KIF-5A	03/07/90	2	1	100			1	80
KIF-5A	06/07/90	8	0.6	10			1	40
KIF-5A	09/06/90	2	0.9	10			1	10
KIF-5A	12/05/90	1	0.3	10			1	1300
KIF-5A	03/21/91	1	0.5	20			1	220
KIF-5A	12/17/91	5	0.5	10				90
KIF-5A	12/17/91	12	0.5	50				220
KIF-5A	06/30/92			10				250
KIF-5A	08/20/92			190				1200

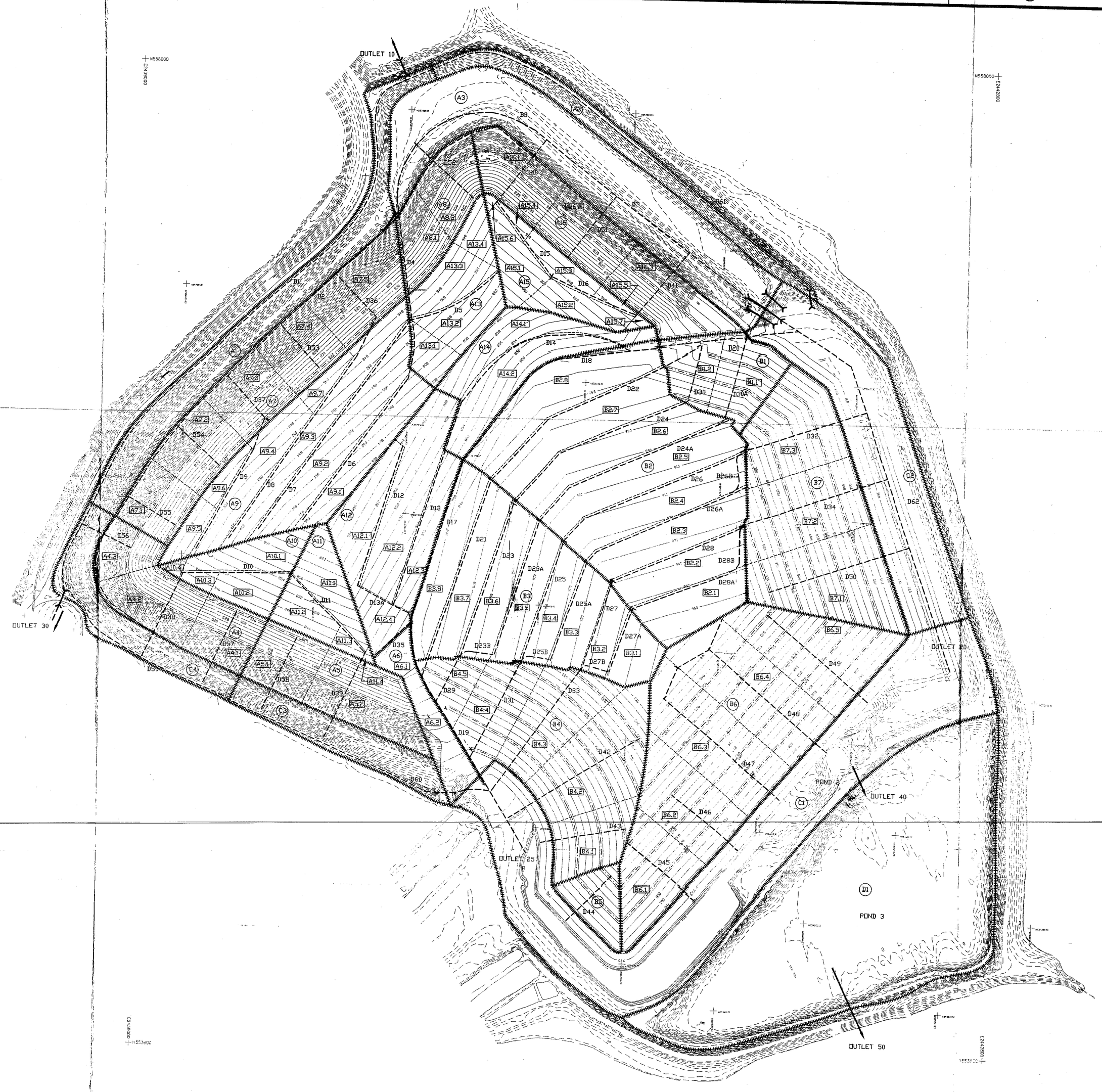
TVA-00018851

Groundwater Quality Data for Selected Wells (continued)

Well	Sample Date	Arsenic	Cadmium	Copper	Mercury	Nickel	Selenium	Zinc
KIF-5B	03/09/77	4	1	20	2	50	1	200
KIF-5B	01/11/89	1	0.1	10			1	10
KIF-5B	03/29/89	1	1	10			1	10
KIF-5B	06/28/89	2	0.1	10			1	20
KIF-5B	09/13/89	1	0.1	10		12	1	60
KIF-5B	11/29/89	1	0.2	10			1	190
KIF-5B	03/06/90	1	0.4	20			1	50
KIF-5B	06/05/90	1	0.1	10			1	40
KIF-5B	09/05/90	1	0.5	30			1	20
KIF-5B	12/04/90	4	0.3	10			1	10
KIF-5B	03/20/91	1	0.1	20			1	10
KIF-5B	12/17/91	7	0.2	20				110
KIF-5B	03/03/92	1	0.2	10				20
KIF-5B	06/03/92	47	1	(1000)*				250
KIF-5B	06/30/92			10				260
KIF-5B	09/01/92	3	0.2	10				110
Average Concentration =		**3.8**	**1.0**	**26**	**0.6**	**46**	**1.0**	**210**

** outlier*

TVA-00018852



SUB-AREAS

NO.	AREAS (SF)	AC
A4.1	84,375	1.9
A4.2	107,555	2.5
A4.3	60,542	1.4
A5.1	85,038	2.0
A5.2	138,142	3.2
A6.1	23,684	0.5
A6.2	74,177	1.7
A7.1	79,766	1.8
A7.2	97,418	2.2
A7.3	92,792	2.1
A7.4	86,910	2.0
A7.5	129,126	3.0
A8.1	65,893	1.5
A8.2	82,706	1.9
A9.1	106,643	2.4
A9.2	140,016	3.2
A9.3	110,806	2.5
A9.4	96,090	2.2
A9.5	32,058	0.7
A9.6	21,012	0.5
A9.7	20,920	0.5
A10.1	69,131	1.6
A10.2	51,399	1.2
A10.3	11,970	0.3
A10.4	6,219	0.1
A11.1	75,735	1.7
A11.2	52,523	1.2
A11.3	11,533	0.3
A11.4	2,484	0.1
A12.1	91,907	2.1
A12.2	157,784	3.6
A12.3	69,554	1.6
A12.4	46,032	1.1
A13.1	36,502	0.8
A13.2	67,883	1.6
A13.3	66,299	1.5
A13.4	32,385	0.7
A14.1	101,632	2.3
A14.2	123,896	2.8
A15.1	63,342	1.5
A15.2	54,514	1.3
A15.3	40,303	0.9
A15.4	9,999	0.2
A15.5	9,742	0.2
A15.6	3,175	0.1
A15.7	4,981	0.1
A16.1	107,714	2.5
A16.2	101,051	2.3
A16.3	125,133	2.9
B1.1	66,070	1.5
B1.2	94,477	2.2
B2.1	95,717	2.2
B2.2	94,923	2.2
B2.3	113,134	2.6
B2.4	128,156	2.9
B2.5	150,280	3.4
B2.6	135,587	3.1
B2.7	144,918	3.3
B2.8	173,418	4.0
B3.1	53,066	1.2
B3.2	43,319	1.0
B3.3	67,394	1.5
B3.4	70,138	1.6
B3.5	83,287	1.9
B3.6	96,378	2.2
B3.7	108,630	2.5
B3.8	112,166	2.6
B4.1	95,512	2.2
B4.2	196,259	4.5
B4.3	142,619	3.3
B4.4	112,301	2.6
B4.5	55,989	1.3
B5	65,343	1.5
B6.1	127,724	2.9
B6.2	143,141	3.3
B6.3	202,805	4.7
B6.4	212,215	4.9
B6.5	208,162	4.8
B7.1	216,193	5.0
B7.2	172,119	4.0
B7.3	163,600	3.8

AREAS

NO.	AREAS (SF)	AC
A1	347,930	8.0
A2	157,754	3.6
A3	550,828	12.6
A4	240,898	5.5
A5	220,865	5.1
A6	98,259	2.3
A7	454,416	10.4
A8	133,907	3.1
A9	543,559	12.5
A10	138,675	3.2
A11	144,237	3.3
A12	369,448	8.5
A13	217,076	5.0
A14	226,510	5.2
A15	178,705	4.1
A16	331,937	7.6
B1	159,054	3.7
B2	1,027,381	23.6
B3	630,447	14.5
B4	604,832	13.9
B5	59,822	1.4
B6	887,345	20.4
B7	553,854	12.7
C1	966,057	22.2
C2	469,700	10.8
C3	146,519	3.4
C4	169,142	3.9
D1	1,227,994	28.2

LEGEND

- AREA BOUNDARY
- SUB AREA BOUNDARY
- DITCHES
- TERRACE DITCHES
- (B6) AREA DESIGNATION
- [B6.1] SUB-AREA DESIGNATION
- D32 DITCH DESIGNATION

REV NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST	REV CD
R											
R 0											D
REVISED FOR DREDGE CELL EXPANSION PH2											

DISCIPLINE INTERFACE

SCALE: 1"=200'

EXCEPT AS NOTED

YARD

DREDGE CELL
LATERAL EXPANSION STAGE 6
DRAINAGE AREAS

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

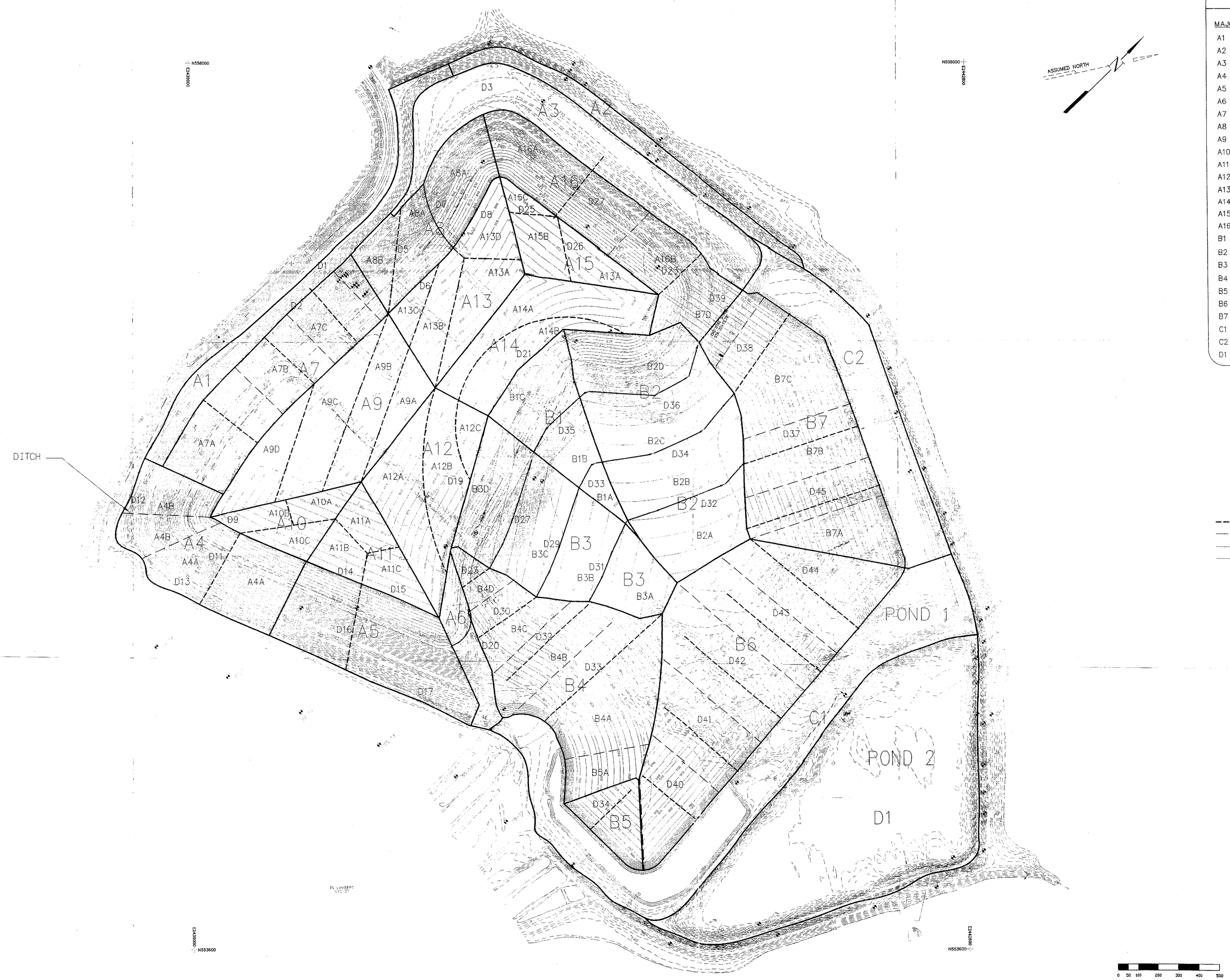
AUTOCAD R14 | DATE | 36 | C | 10W425-34E | R 0

PLOT FACTOR:200
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

PARSONS	0
TASK COMPLETED BY:	REV NO.

TVA-00018853



MAJOR AREAS (SF)		AC
A1	226,602	5.21
A2	161,220	3.71
A3	464,532	10.66
A4	412,970	9.50
A5	402,252	9.23
A6	90,388	2.07
A7	423,951	9.75
A8	297,557	6.83
A9	475,534	10.92
A10	127,333	2.92
A11	166,168	3.81
A12	349,867	8.03
A13	301,344	6.92
A14	303,988	7.00
A15	158,297	3.63
A16	441,313	10.13
B1	254,835	5.85
B2	766,010	17.56
B3	558,846	12.83
B4	664.000	15.24
B5	93,126	2.13
B6	1,004,646	23.06
B7	746,594	17.04
C1	702,594	16.16
C2	390,814	9.00
D1	1,228,142	28.19

MINOR AREAS (SF)		AC
A4A	251,531	5.79
A4B	160,267	3.69
A6A	32,691	.75
A6B	64,225	1.48
A7A	178,925	4.12
A7B	121,271	2.79
A7C	105,217	2.42
A8A	229,940	5.29
A8B	59,261	1.36
A9A	66,777	1.54
A9B	132,768	3.05
A9C	167,973	3.86
A9D	85,609	1.97
A10A	43,633	1.00
A10B	39,029	.90
A10C	44,230	1.02
A11A	54,545	1.25
A11B	51,146	1.18
A11C	61,619	1.42
A12A	189,025	4.35
A12B	126,377	2.91
A12C	33,234	.76
A13A	110,079	2.53
A13B	83,494	1.92
A13C	35,421	.81
A13D	77,576	1.78
A14A	112,796	2.59
A14B	207,650	4.78
A15A	59,999	1.38
A15B	70,062	1.61
A15C	21,898	.50
A16A	235,823	5.42
A16B	91,152	2.10
B1A	28,474	.65
B1B	63,864	1.47
B1C	138,513	3.19
B2A	183,388	4.22
B2B	211,157	4.86
B2C	207,293	4.77
B2D	173,921	4.00
B3A	111,178	2.56
B3B	132,129	3.04
B3C	163,370	3.76
B3D	154,470	3.55
B4A	309,105	7.11
B4B	146,467	3.37
B4C	107,608	2.47
B4D	44,035	1.01
B5A	155,388	3.57
B6A	131,830	3.03
B6B	219,570	5.05
B6C	226,003	5.20
B6D	185,685	4.27
B6E	249,126	5.73
B7A	267,697	6.16
B7B	168,214	3.87
B7C	251,571	5.79
B7D	147,932	3.40

REV. NO.	DATE	DSGN	DRWN	CHKD	SURV	RVWD	APPD	ISSD	PROJECT ID	AS CONST	REV. CD
R 0	REVISED FOR DREDGE CELL EXPANSION PH2										D

DISCIPLINE INTERFACE

SCALE: 1"=200' EXCEPT AS NOTED

YARD

DREDGE CELL
LATERAL EXPANSION STAGE 6
DRAINAGE AREAS

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R14 | DATE | 36 | C | 10W425-34F | R 0

PLOT FACTOR:200
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

PARSONS	0
TASK COMPLETED BY:	REV NO.

TVA-00018854