

Figure 2.4-30 thru Figure 2.4-40 Are Not Used

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Figure 2.4-40a Main Plant Site Grading And Drainage System For Flood Studies Sheet 1

Figure 2.4-40a Deleted by Amendment 101

Figure 2.4-40a Deleted by Amendment 101

Figure 2.4-40b Main Plant General Plan

Figure 2.4-40c Yard Site Grading and Drainage System For Flood Studies

Figure 2.4-40d-1 Main Plant Plant Perimeter Roads Plan and Profile Sheet 1

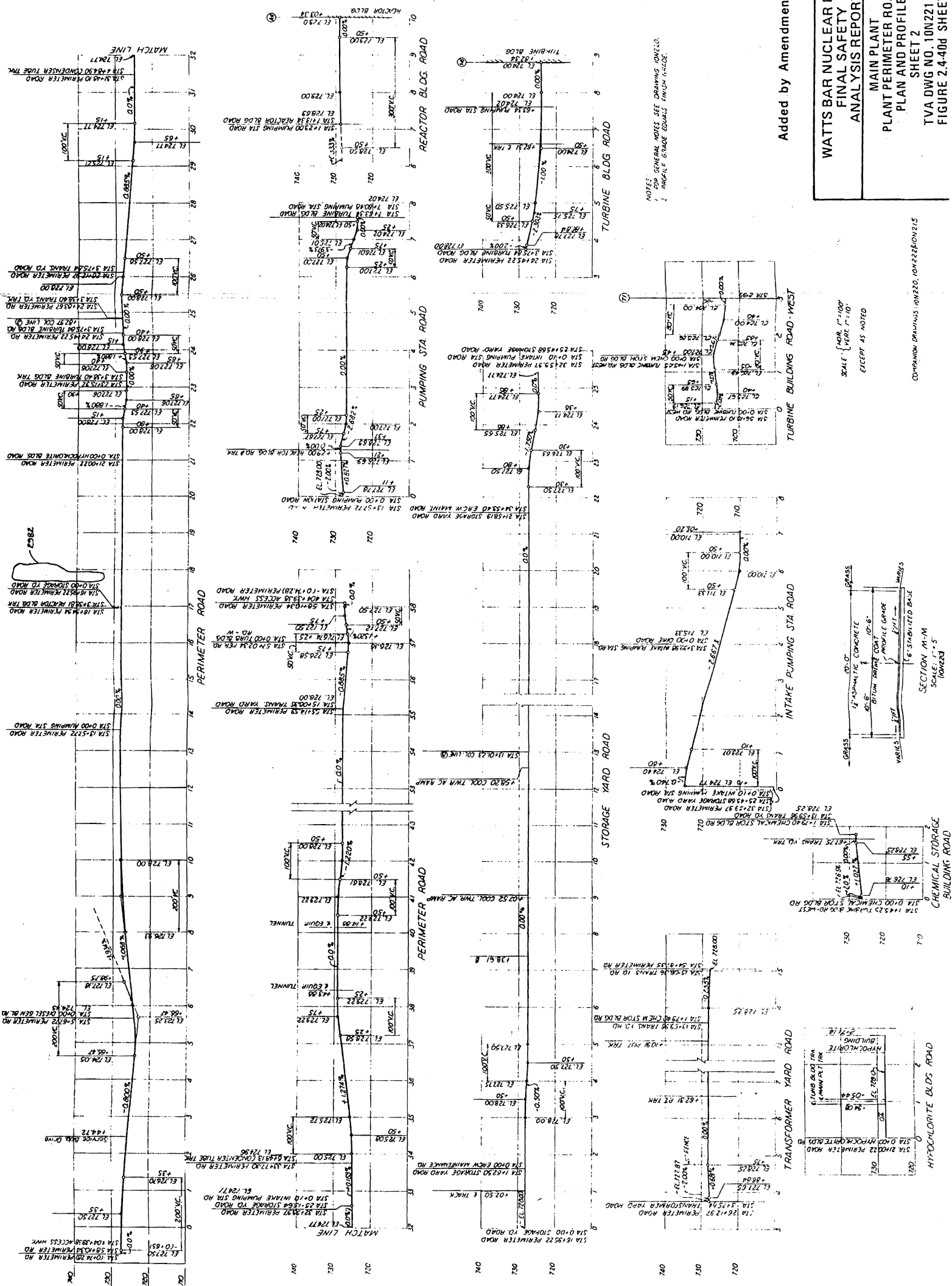


Figure 2.4-40d Main Plant Perimeter Roads Plan and Profile - Sheet 2

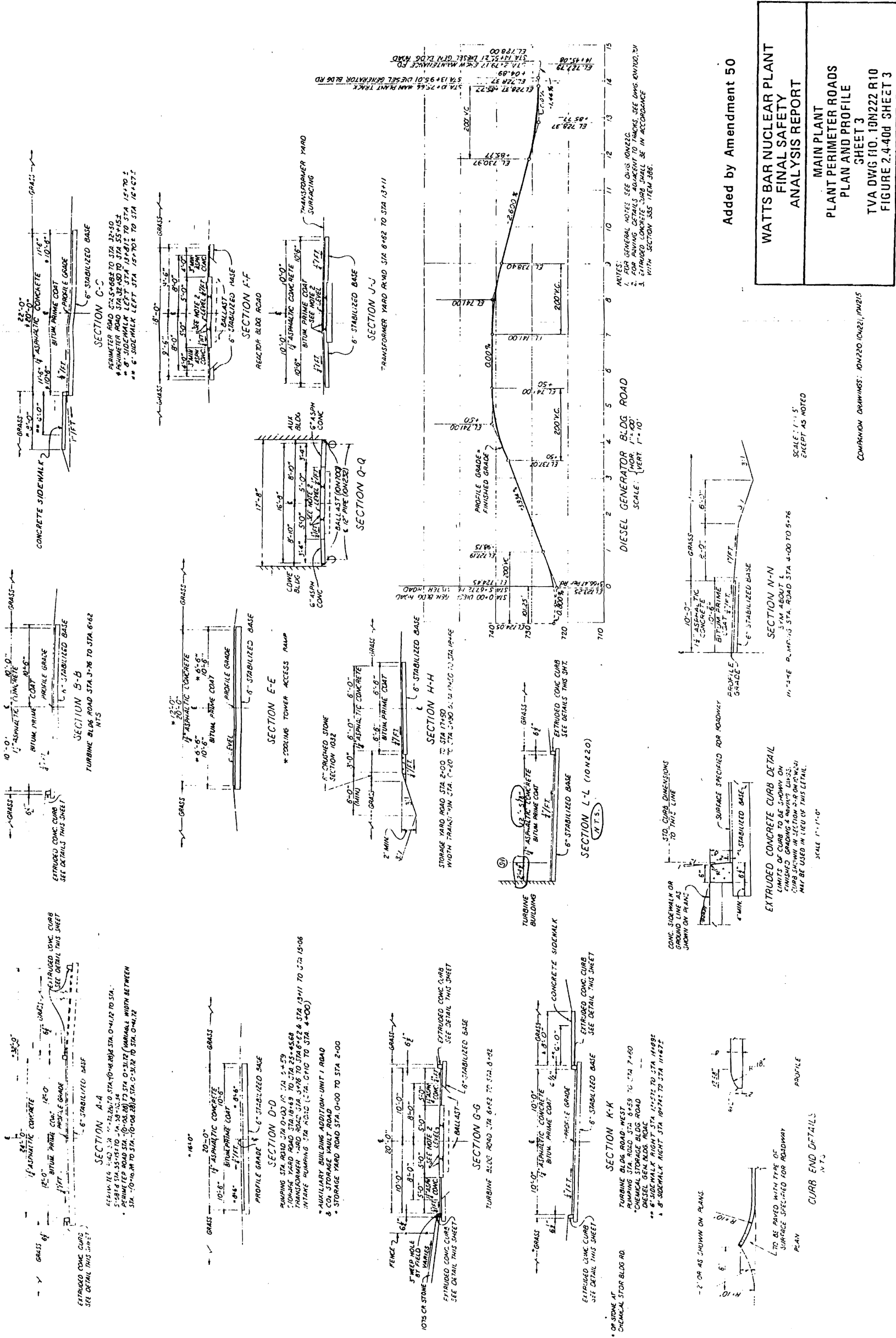
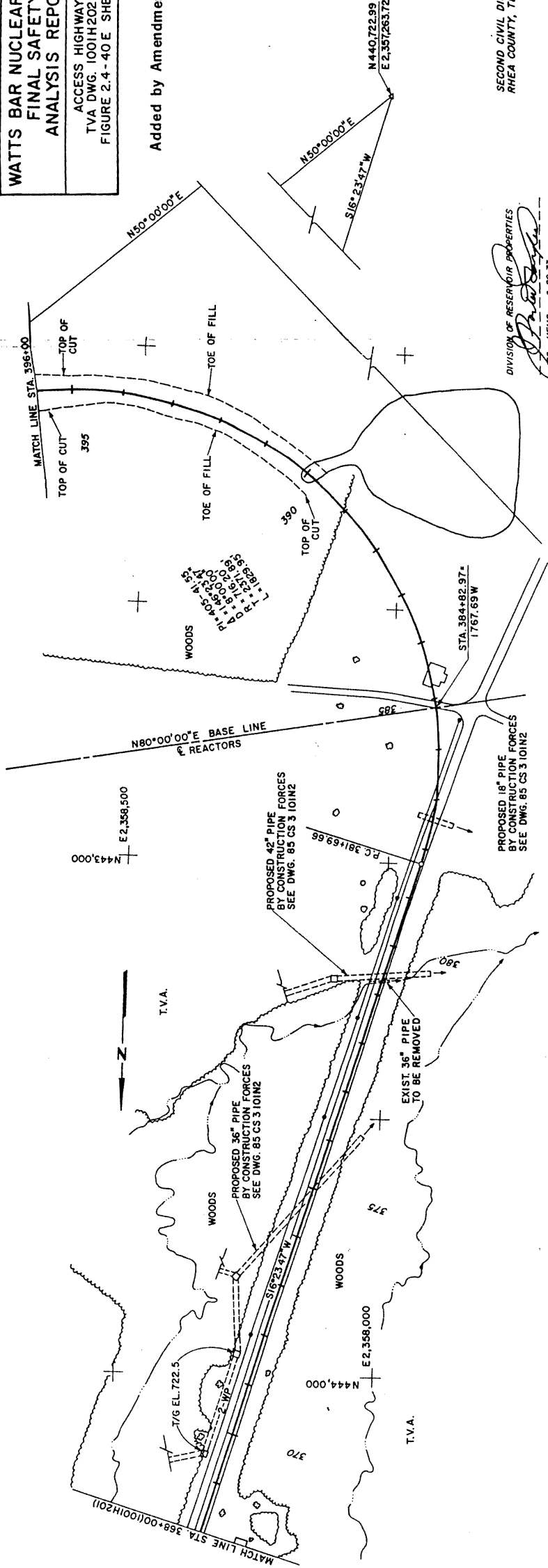


Figure 2.4-40d Main Plant Perimeter Roads Plan and Profile - Sheet 3

WATTS BAR NUCLEAR PLANT
FINAL SAFETY
ANALYSIS REPORT
ACCESS HIGHWAY
TVA DWG. 1001H202 R4
FIGURE 2.4-40 E SHEET 1

Added by Amendment 50



SECOND CIVIL DISTRICT
AREA COUNTY, TENNESSEE

DIVISION OF RESERVOIR PROPERTIES
MEMO 9-20-73

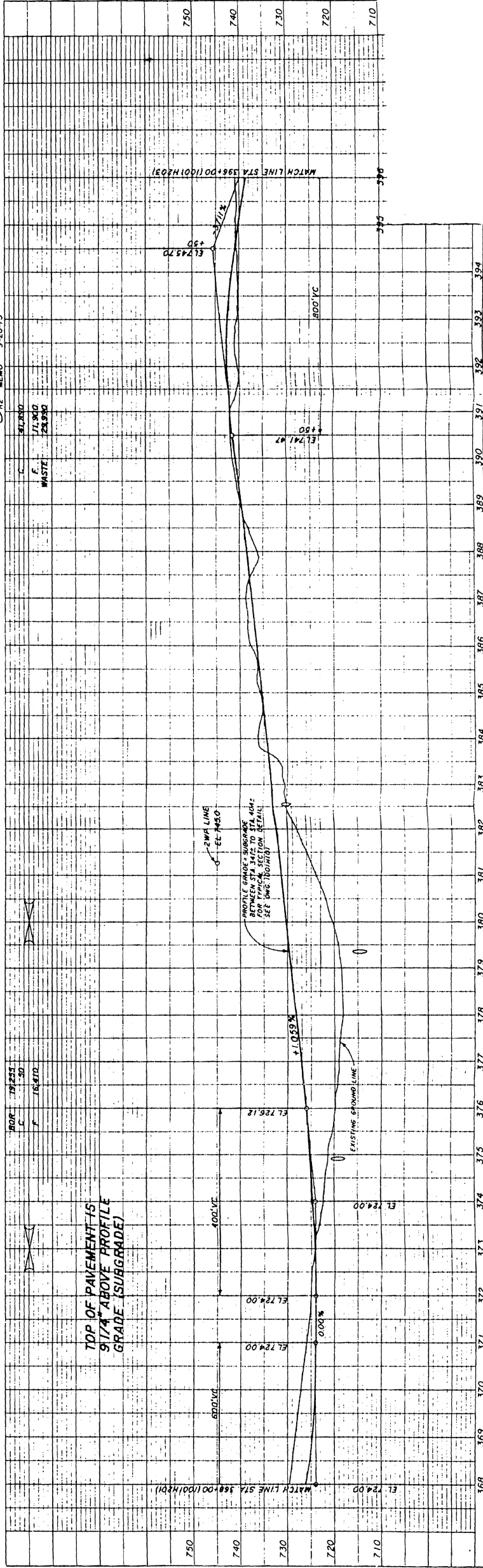


Figure 2.4-40e Access Highway TVA DWG 1001H202 R4 - Sheet 1

WATTS BAR NUCLEAR PLANT
FINAL SAFETY
ANALYSIS REPORT
ACCESS HIGHWAY
TVA DWG. 1001H201 R4
FIGURE 2.4-40E SHEET 2

Added by Amendment 50

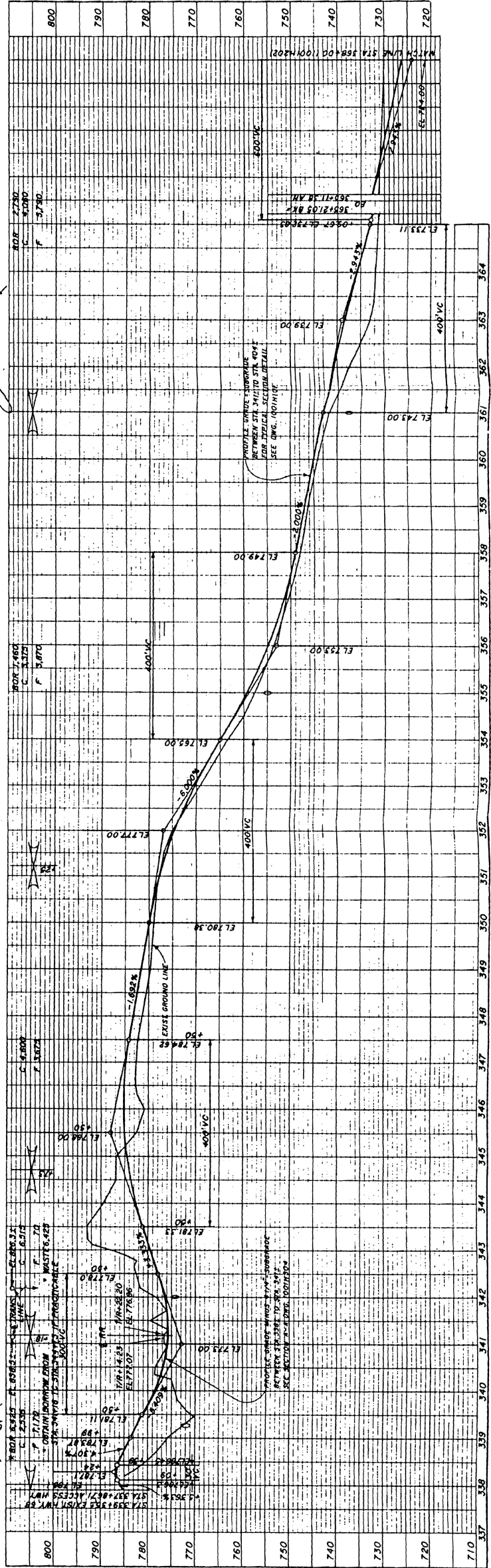
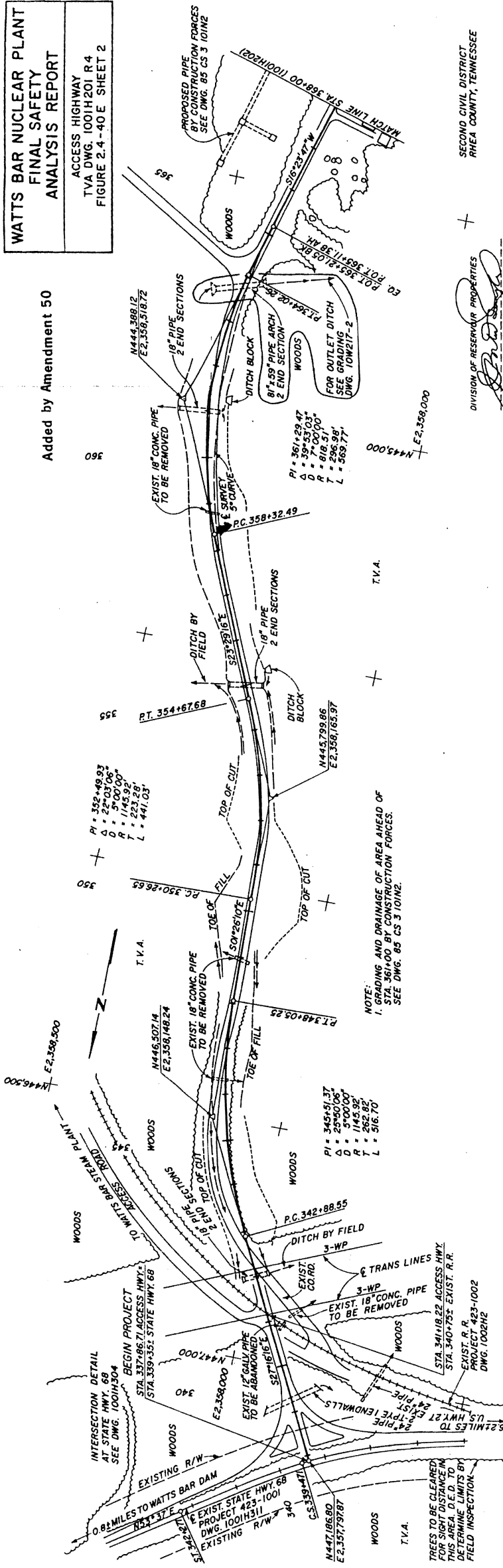
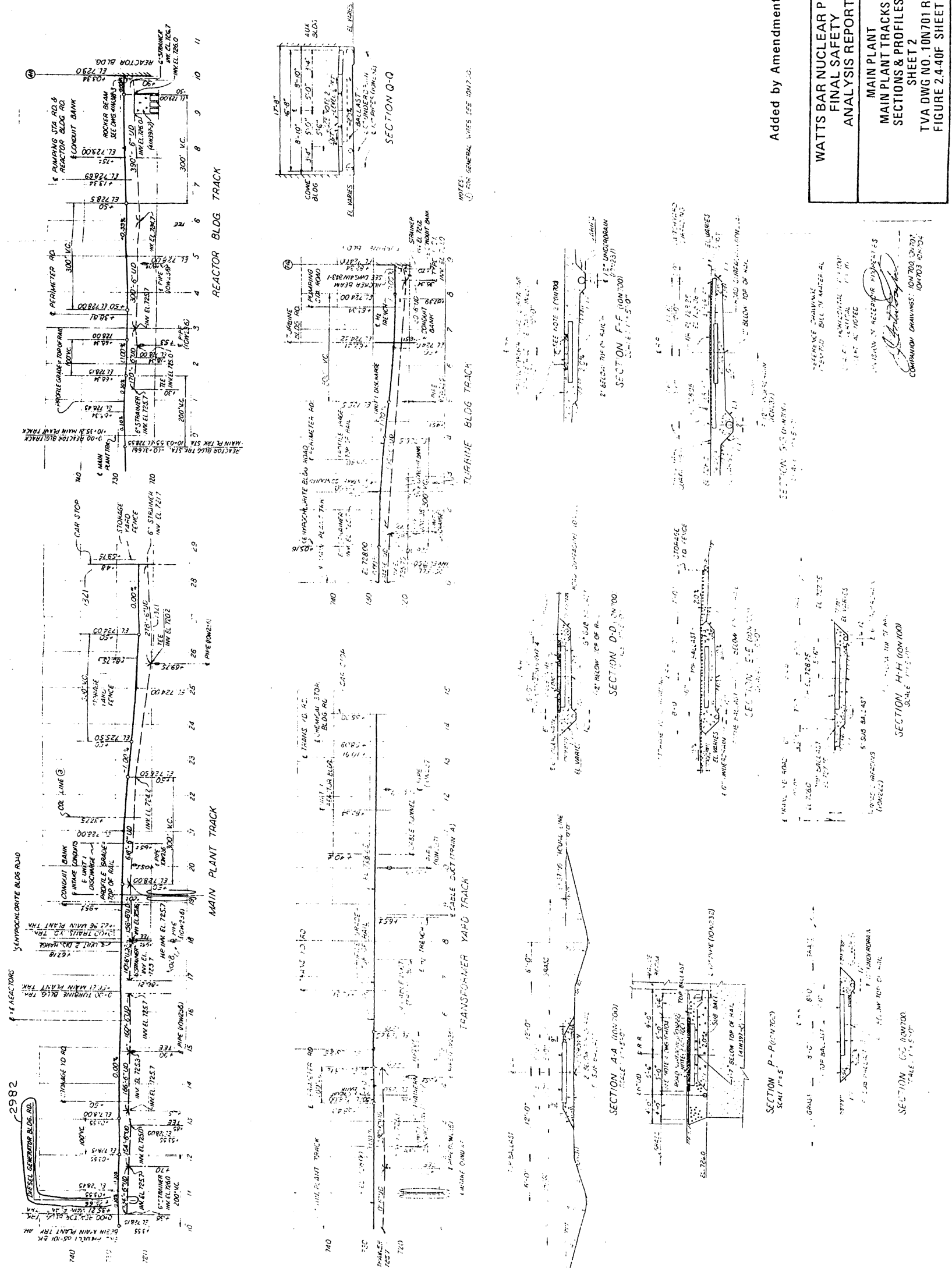


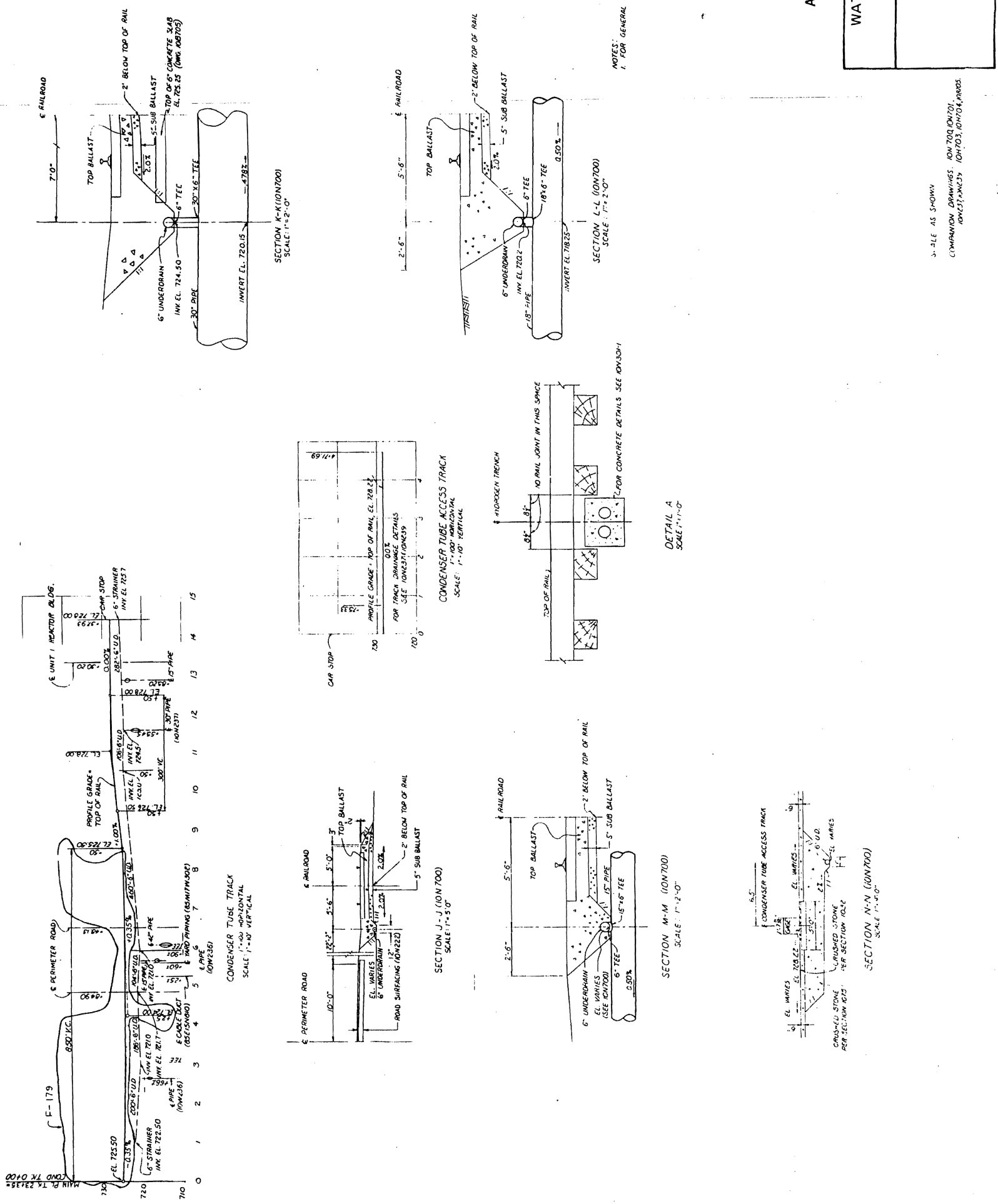
Figure 2.4-40e Access Highway TVA DWG. 1001H201 R4 - Sheet 2

Figure 2.4-40f Main Plant Main Plant Tracks Plan - Sheet 1



Added by Amendment 50

Figure 2.4-40f Main Plant Main Plant Tracks Sections & Profiles - Sheet 2



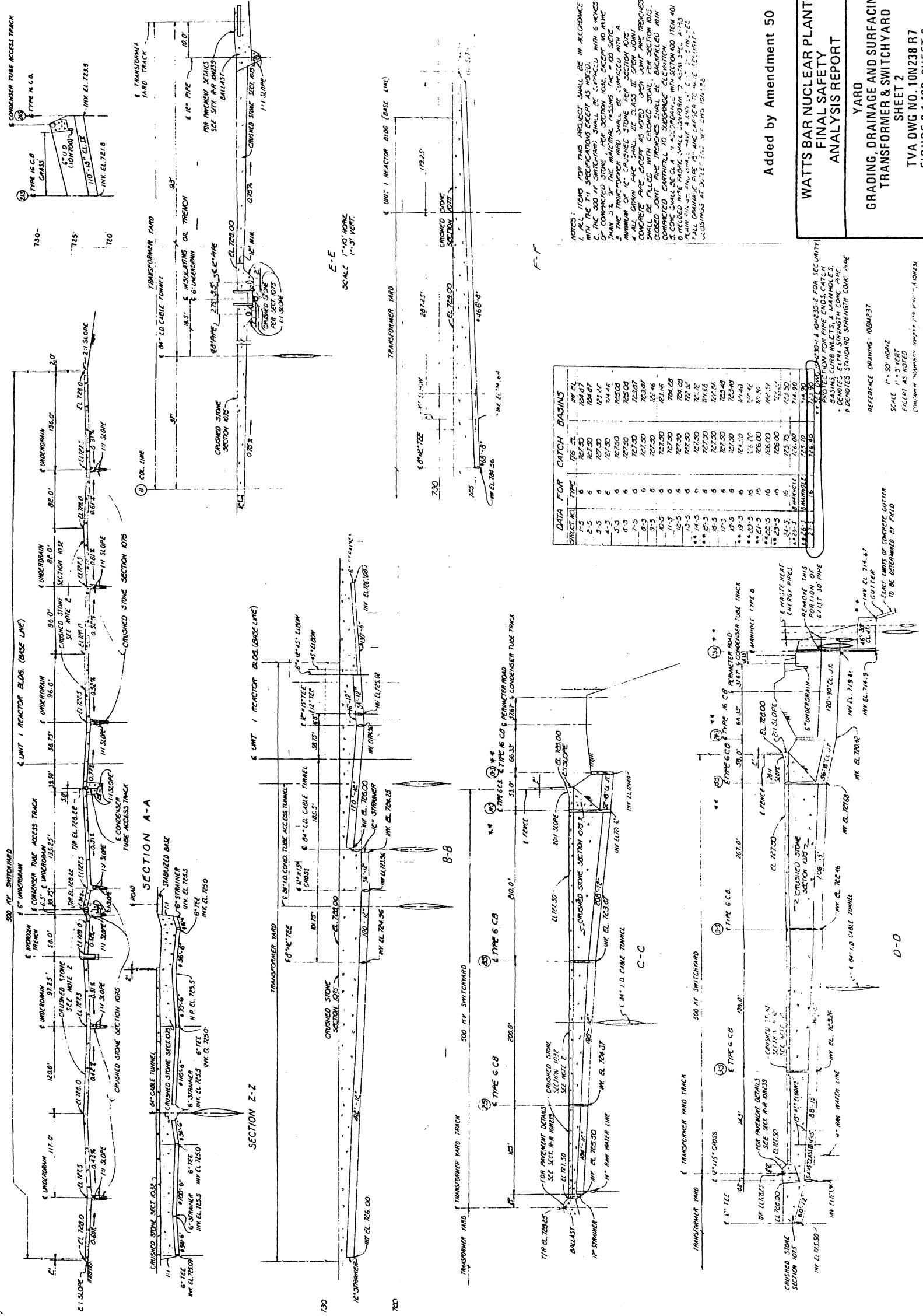
Added by Amendment 50

WATTS BAR NUCLEAR PLANT FINAL SAFETY ANALYSIS REPORT
MAIN PLANT MAIN PLANT TRACKS SECTIONS & PROFILES SHEET 3 TVA DWG NO. 10N702 R3 FIGURE 2.4-40F SHEET 3

3-FILE AS SHOWN
 (COMPARISON DRAWINGS: 10N700, 10N701,
 10N702, 10N703, 10N704, 10N705)

Figure 2.4-40f Main Plant Main Plant Tracks Sections & Profiles - Sheet 3

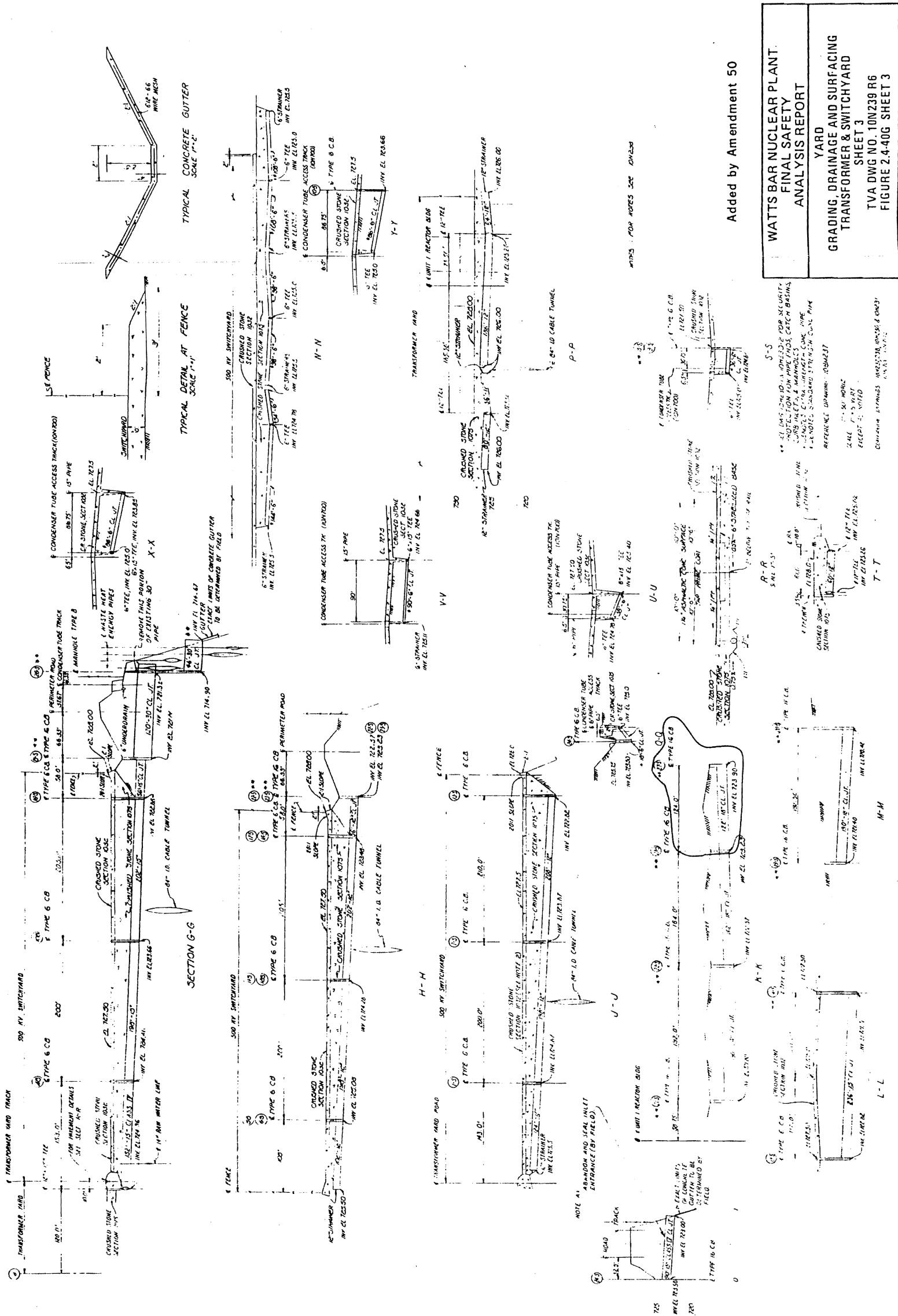
Figure 2.4-40g Yard, Grading Drainage and Surfacing Transformer & Switchyard - Sheet 1



Added by Amendment 50

WATTS BAR NUCLEAR PLANT
FINAL SAFETY
ANALYSIS REPORT
YARD
GRADING, DRAINAGE AND SURFACING
TRANSFORMER & SWITCHYARD
SHEET 2
TVA DWG NO. 10N238 R7
FIGURE 2.4-40G SHEET 2

Figure 2.4-40g Yard, Grading Drainage and Surfacing Transformer & Switchyard - Sheet 2



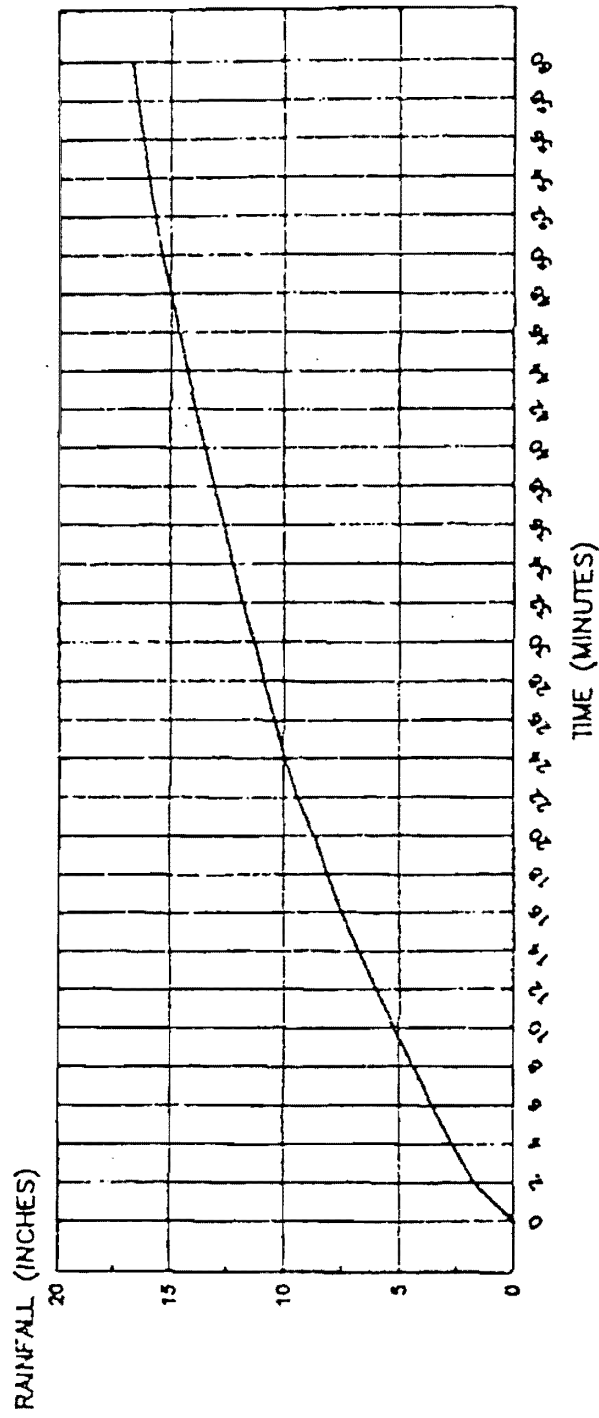
Added by Amendment 50

<p>WATTS BAR NUCLEAR PLANT FINAL SAFETY ANALYSIS REPORT</p>
<p>YARD GRADING, DRAINAGE AND SURFACING TRANSFORMER & SWITCHYARD SHEET 3 TVA DWG NO. 10N239 R6 FIGURE 2.4-40G SHEET 3</p>

** EL ELEVATIONS ARE TO BE CHECKED FOR SECURITY
 PROTECTION FOR PIPE FITTINGS, CATCH BASINS,
 CURB INLETS, MANHOLES,
 1. UNLESS OTHERWISE NOTED, ALL
 2. UNLESS OTHERWISE NOTED, ALL
 REFERENCE DRAWINGS: 20M237
 SCALE: 1" = 20' HORIZ.
 EXCEPT AS NOTED
 CONSTRUCTION STANDARDS: 20M238, 20M239, 20M240

Figure 2.4-40g Yard, Grading Drainage and Surfacing Transformer & Switchyard - Sheet 3

PROBABLE MAXIMUM PRECIPITATION
BASED ON HYDROMETEOROLOGICAL REPORT NO. 56



AMENDMENT 83

WATTS BAR NUCLEAR PLANT
FINAL SAFETY
ANALYSIS REPORT

PROBABLE MAXIMUM PRECIPITATION
• POINT RAINFALL
FIGURE 2.4-40h

SCANNED DOCUMENT
THIS IS A SCANNED DOCUMENT MAINTAINED ON
THE WBNP OPTIGRAPHICS SCANNER DATABASE

Figure 2.4-40h Probable Maximum Precipitation Point Rainfall

Figure 2.4-40i Deleted by Amendment 83

Figure 2.4-40j Deleted by Amendment 83

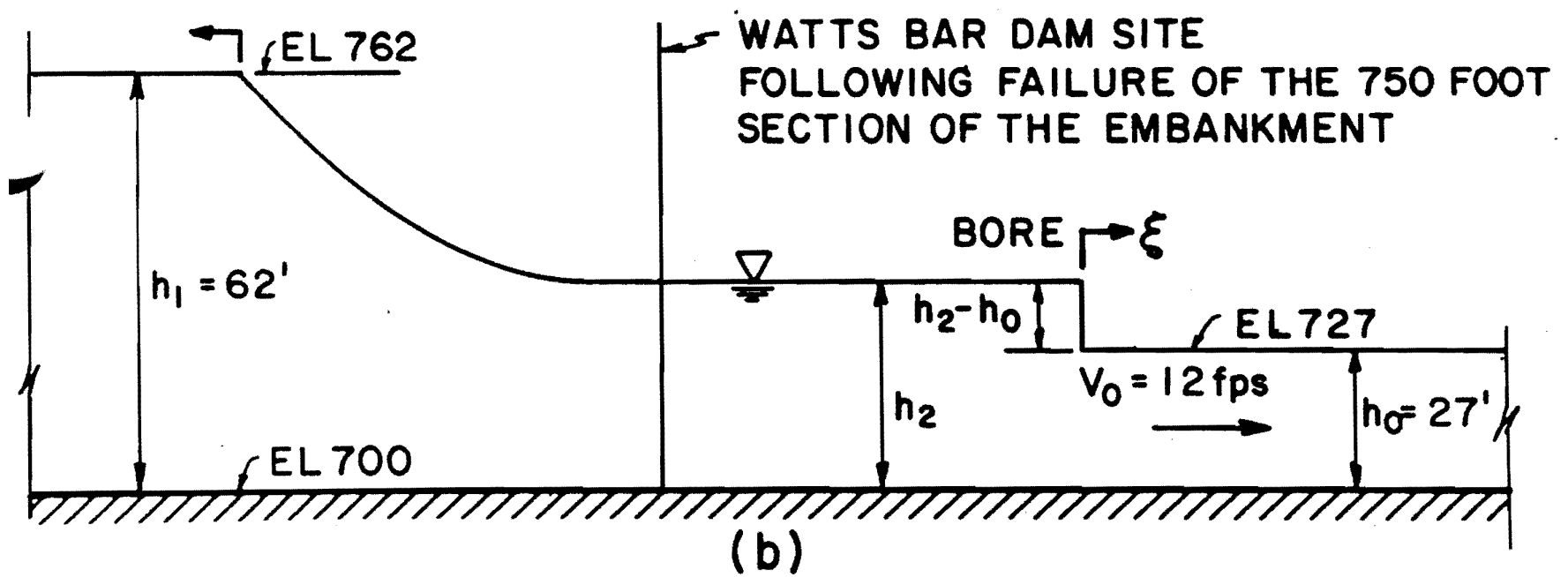
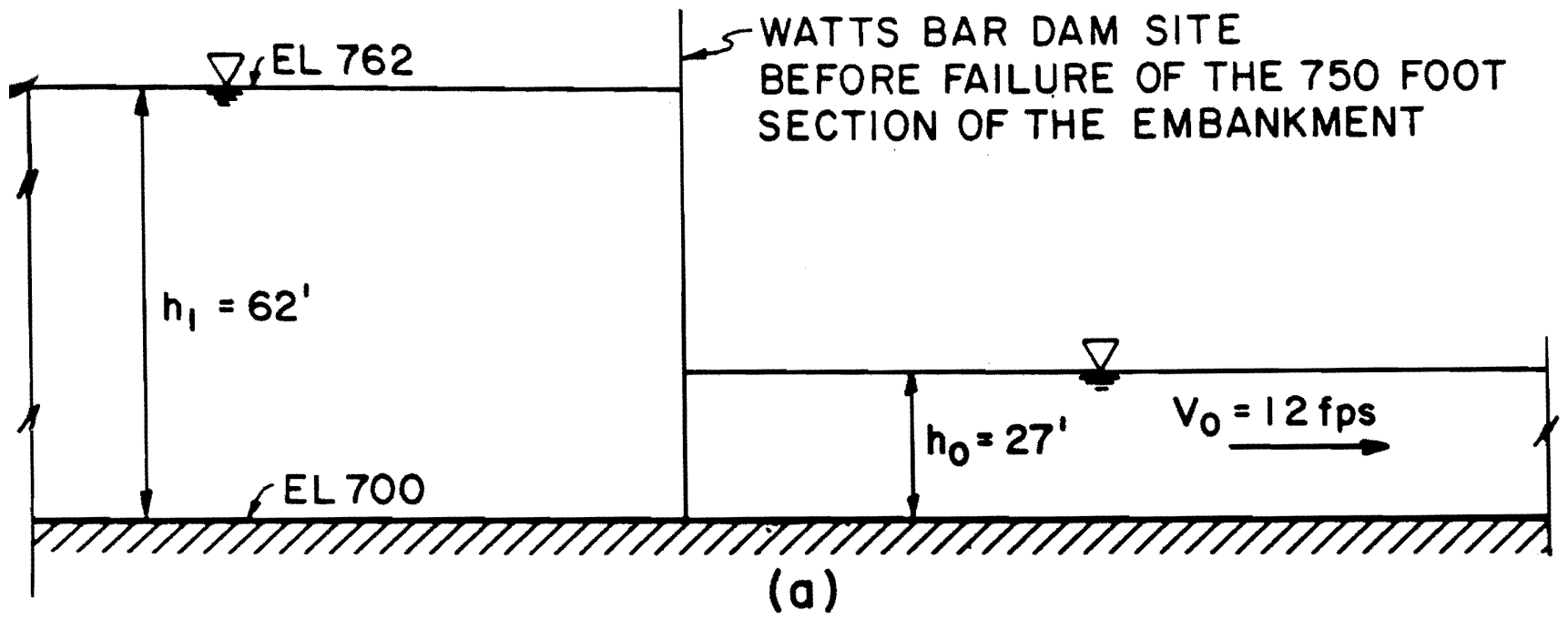
Figure 2.4-40k Deleted by Amendment 83

Figure 2.4-40L Deleted by Amendment 83

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Figure 2.4-41 thru Figure 2.4-60 Are Not Used

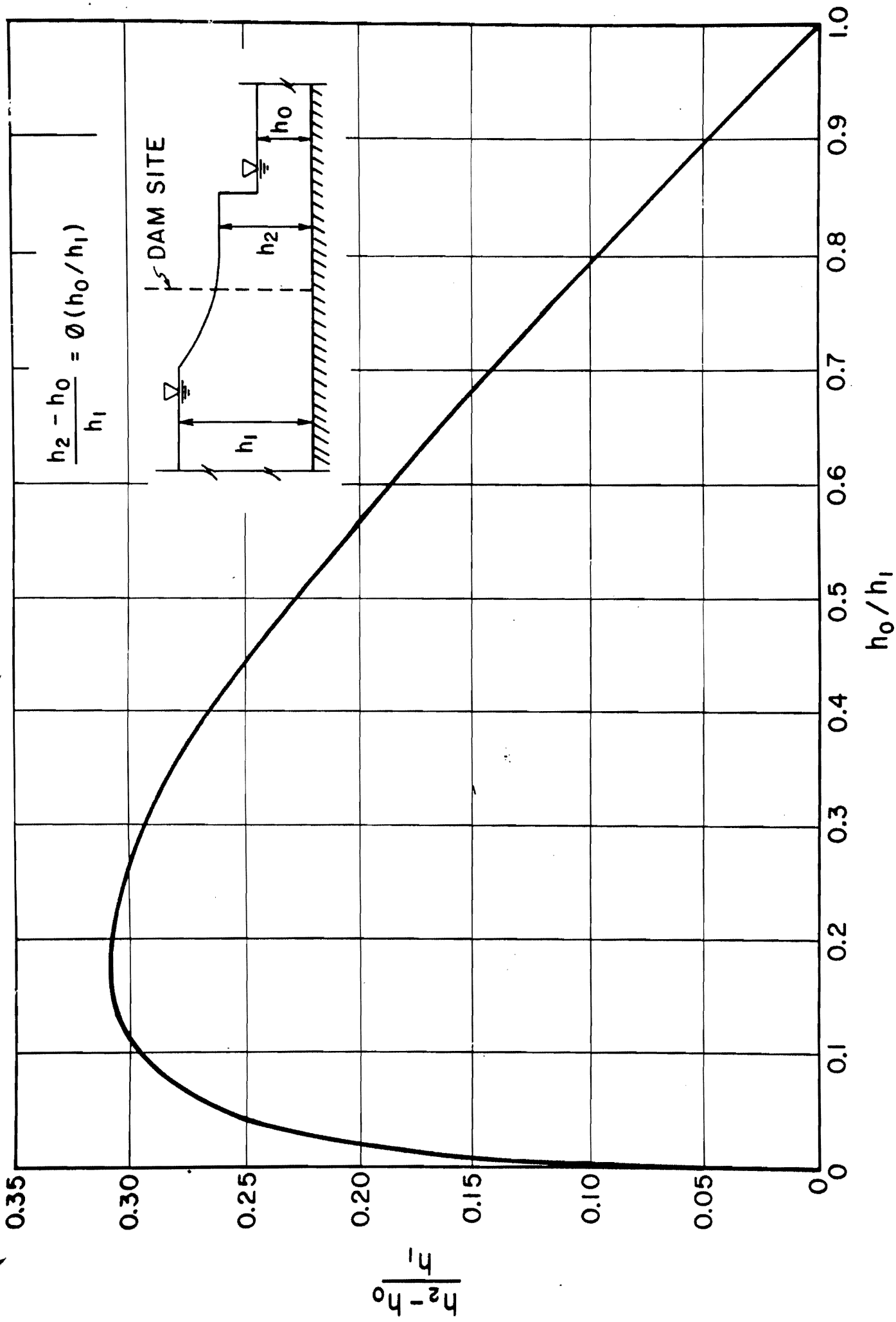
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WATTS BAR PROBABLE MAXIMUM FLOOD
WATER LEVELS BEFORE & AFTER EMBANKMENT FAILURE
FIGURE 2.4-61

Revised by Amendment 39

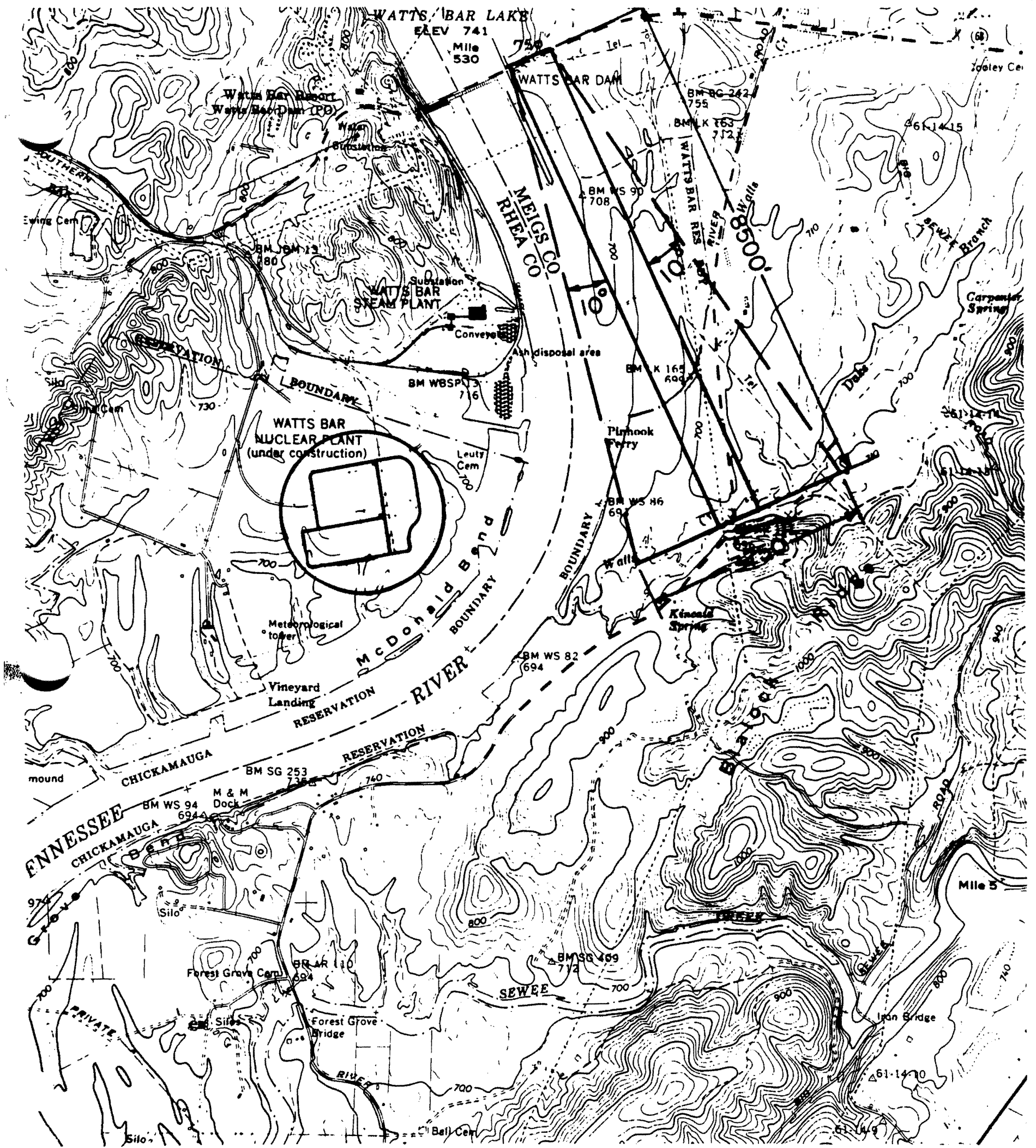
Figure 2.4-61 Watts Bar Probable Maximum Flood Water Levels Before and After Embankment Failure



RELATIVE BORE HEIGHT (AFTER J. J. STROKER, REF. 31)
 FIGURE 2.4-62

Revised by Amendment 39

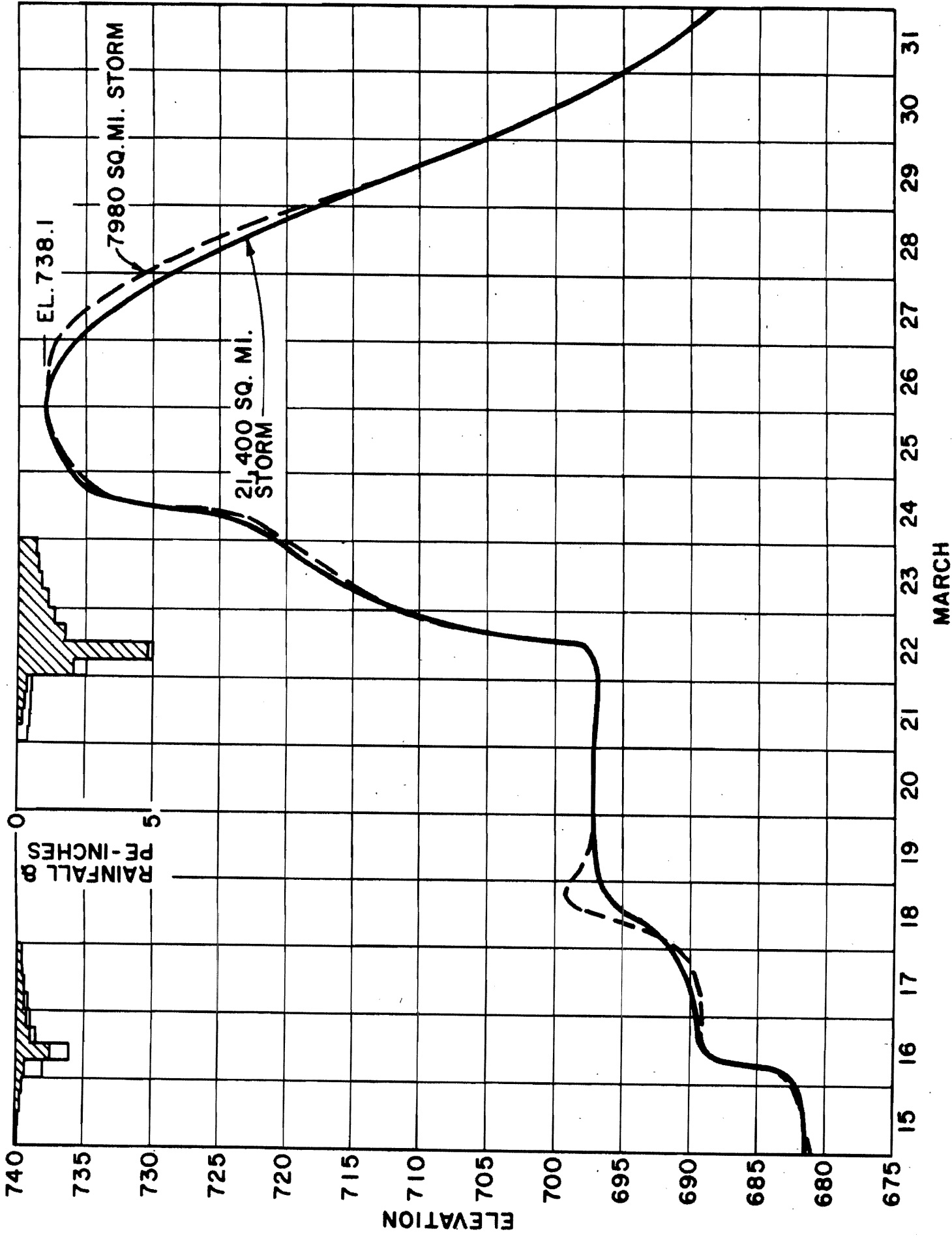
Figure 2.4-62 Relative Bore Height (After J. J. Stroker, REF. 31)



**ASSUMED LIMITS OF EMBANKMENT FAILURE
WAVE EXPANSION
FIGURE 2.4-63**

Revised by Amendment 39

Figure 2.4-63 Assumed Limits of Embankment Failure Wave Expansion



WATTS BAR NUCLEAR PLANT PROBABLE MAXIMUM FLOOD ELEVATION

FIGURE 2.4 - 64

Revised by Amendment 32

Figure 2.4-64 Watts Bar Nuclear Plant Probable Maximum Flood Elevation

Figure 2.4-65 thru Figure 2.4-67 Are Not Used

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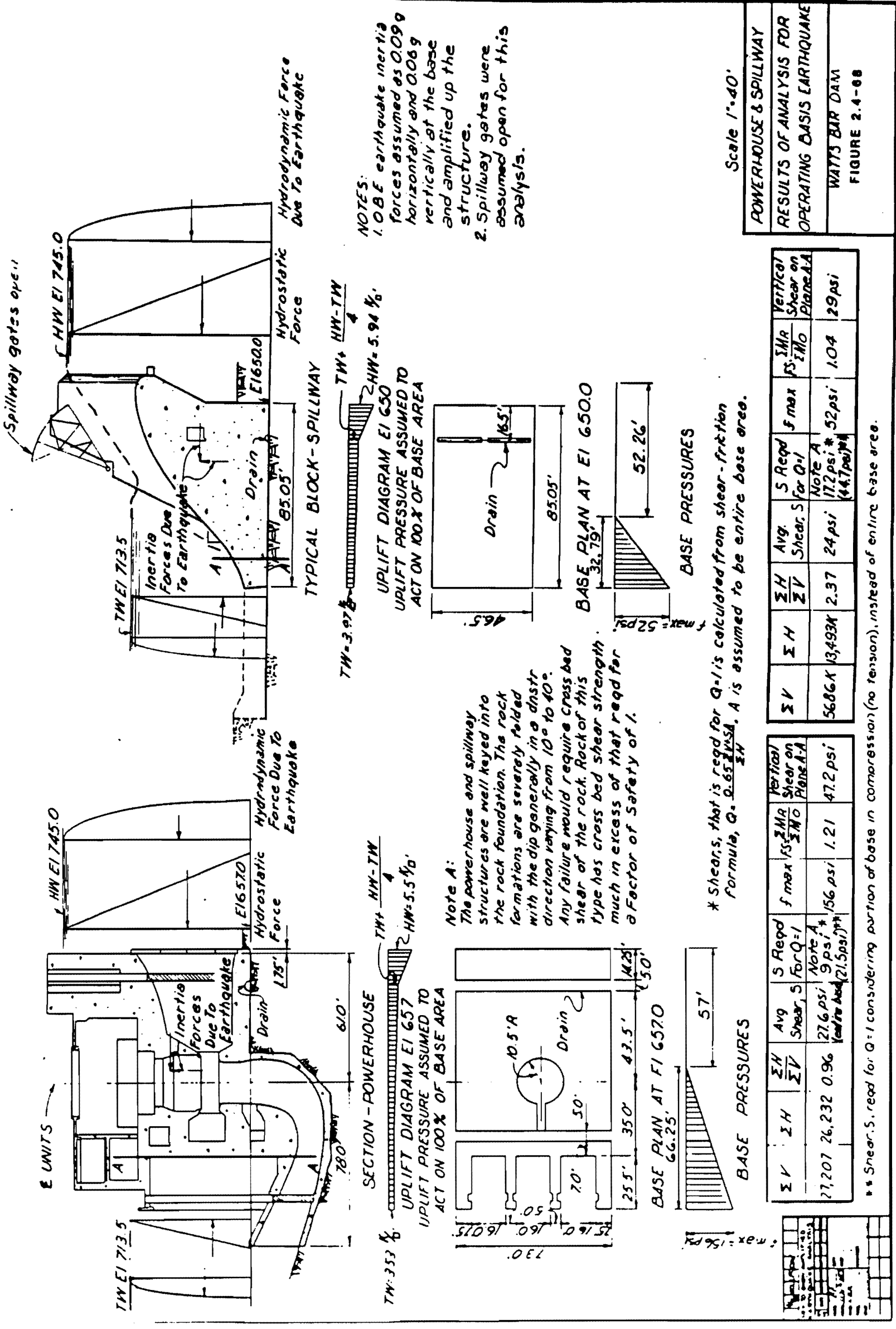


Figure 2.4-68 Powerhouse & Spillway Results of Analysis For Operating Basis Earthquake - Watts Bar Dam

Amendment 63

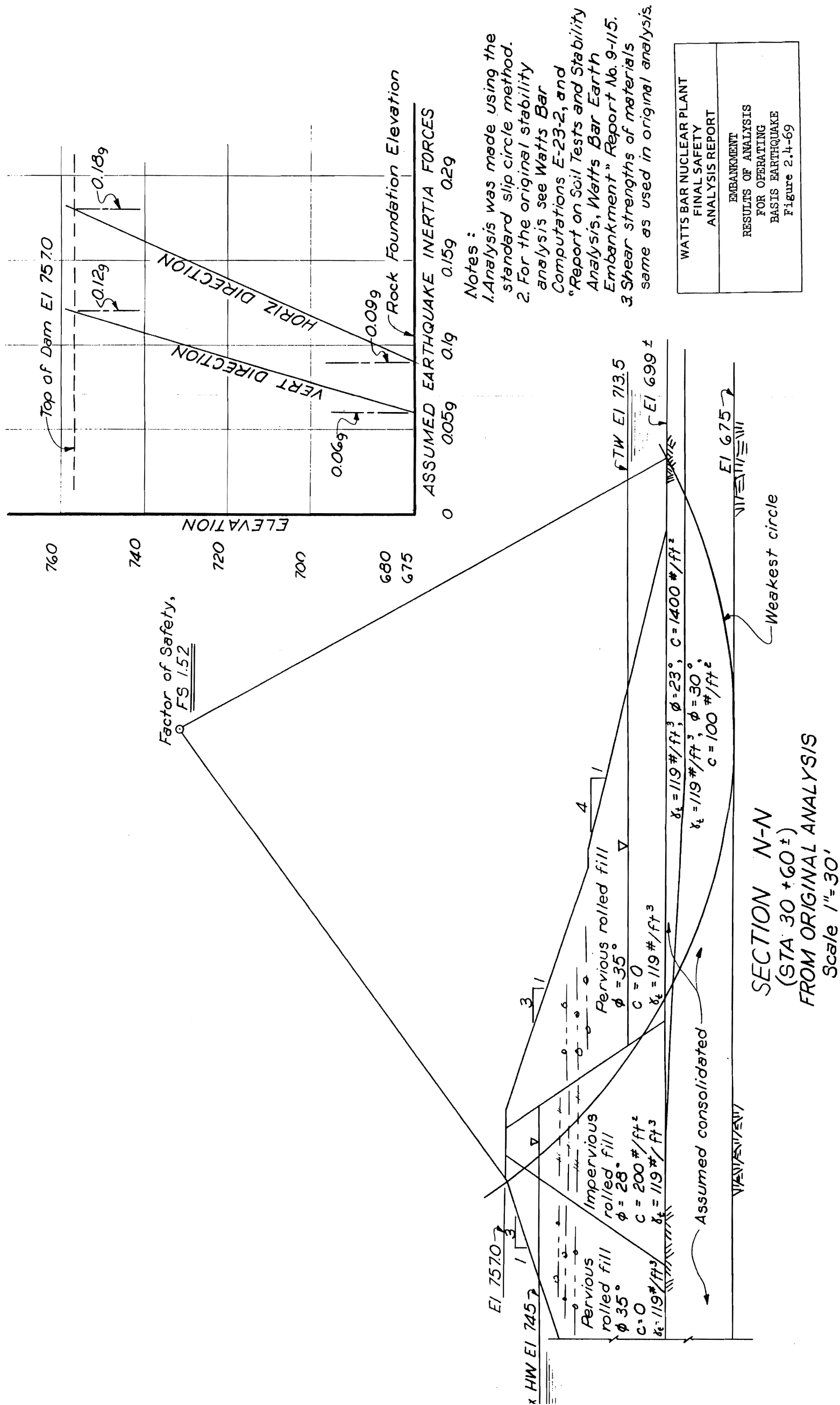


Figure 2.4-69 Embankment Results of Analysis For Operating Basis Earthquake

Figure 2.4-70 Deleted by Amendment 83

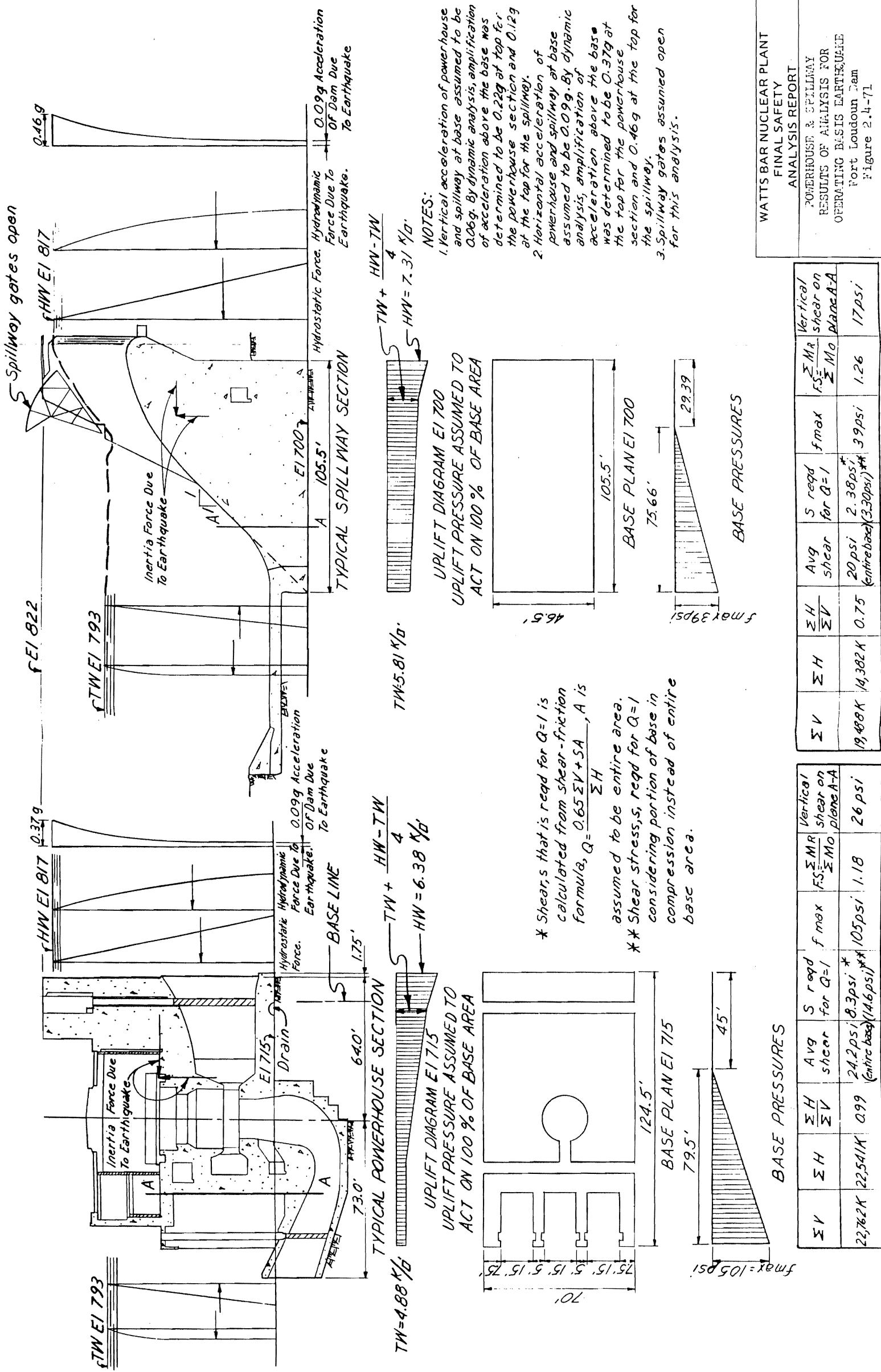
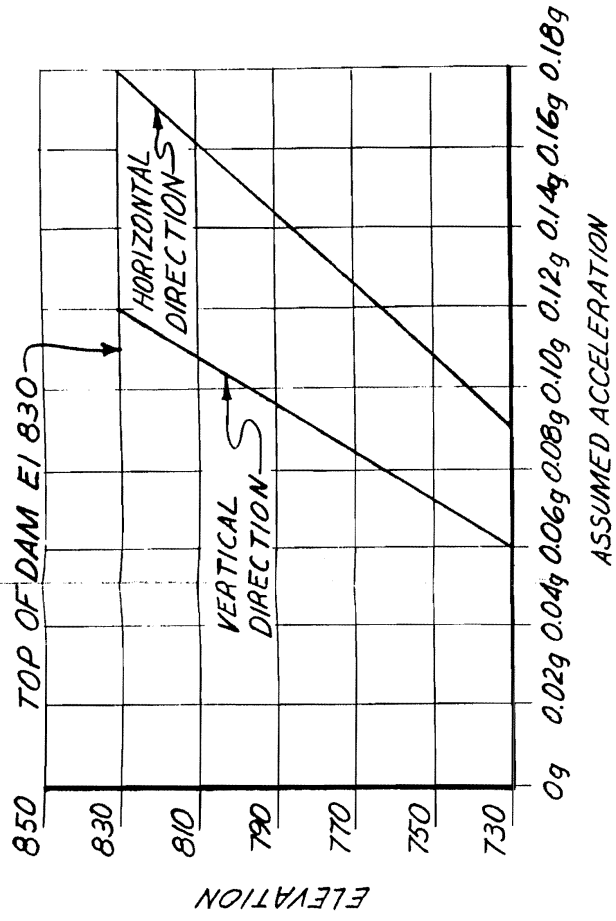
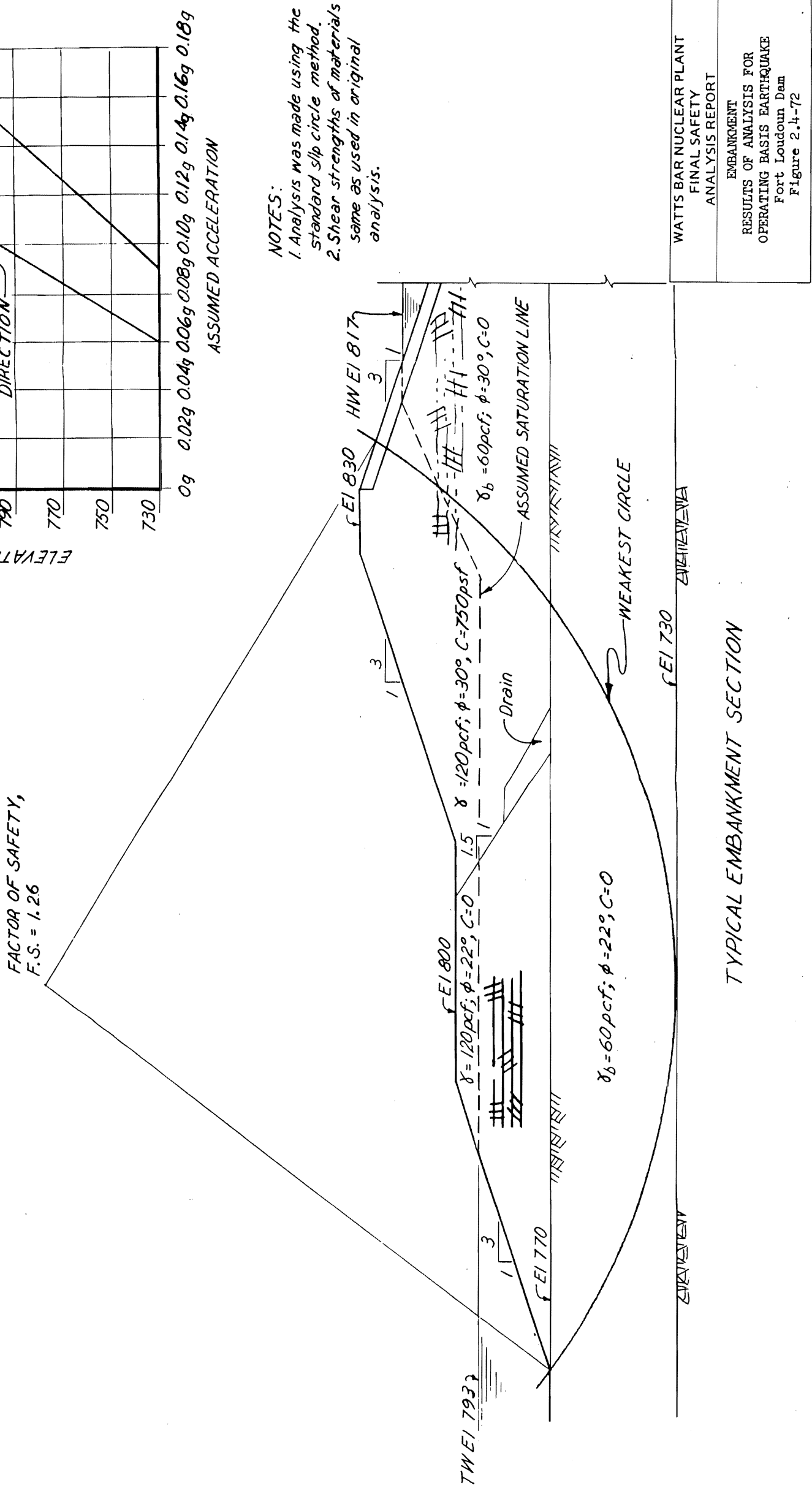


Figure 2.4-71 Powerhouse & Spillway Results of Analysis For Operating Basis Earthquake - Fort Loudoun Dam



NOTES:
1. Analysis was made using the standard slip circle method.
2. Shear strengths of materials same as used in original analysis.

FACTOR OF SAFETY,
F.S. = 1.26



WATTS BAR NUCLEAR PLANT FINAL SAFETY ANALYSIS REPORT
EMBANKMENT RESULTS OF ANALYSIS FOR OPERATING BASIS EARTHQUAKE Fort Loudoun Dam Figure 2.4-72

Figure 2.4-72 Embankment Results Of Analysis For Operating Basis Earthquake - Fort Loudoun Dam

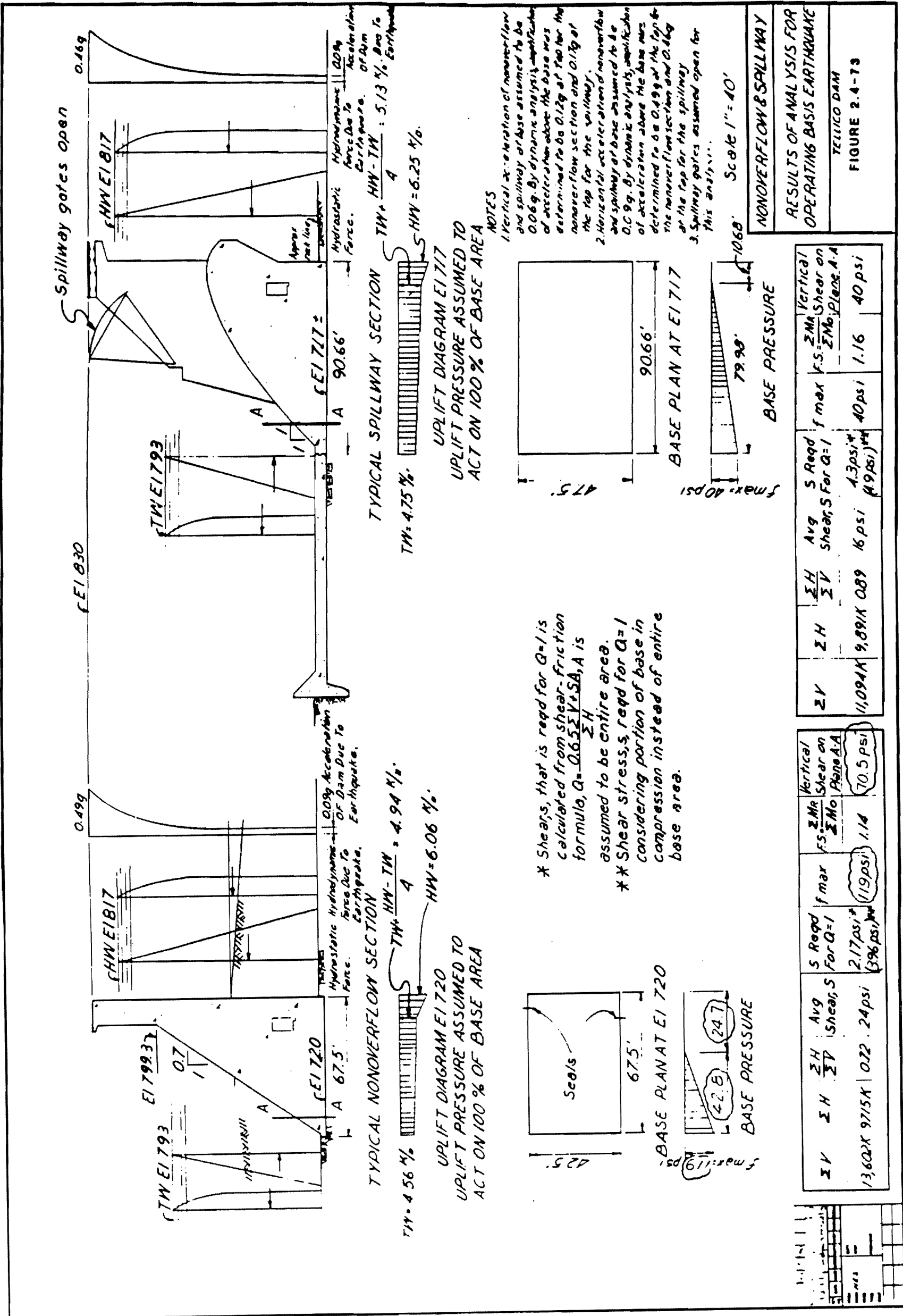
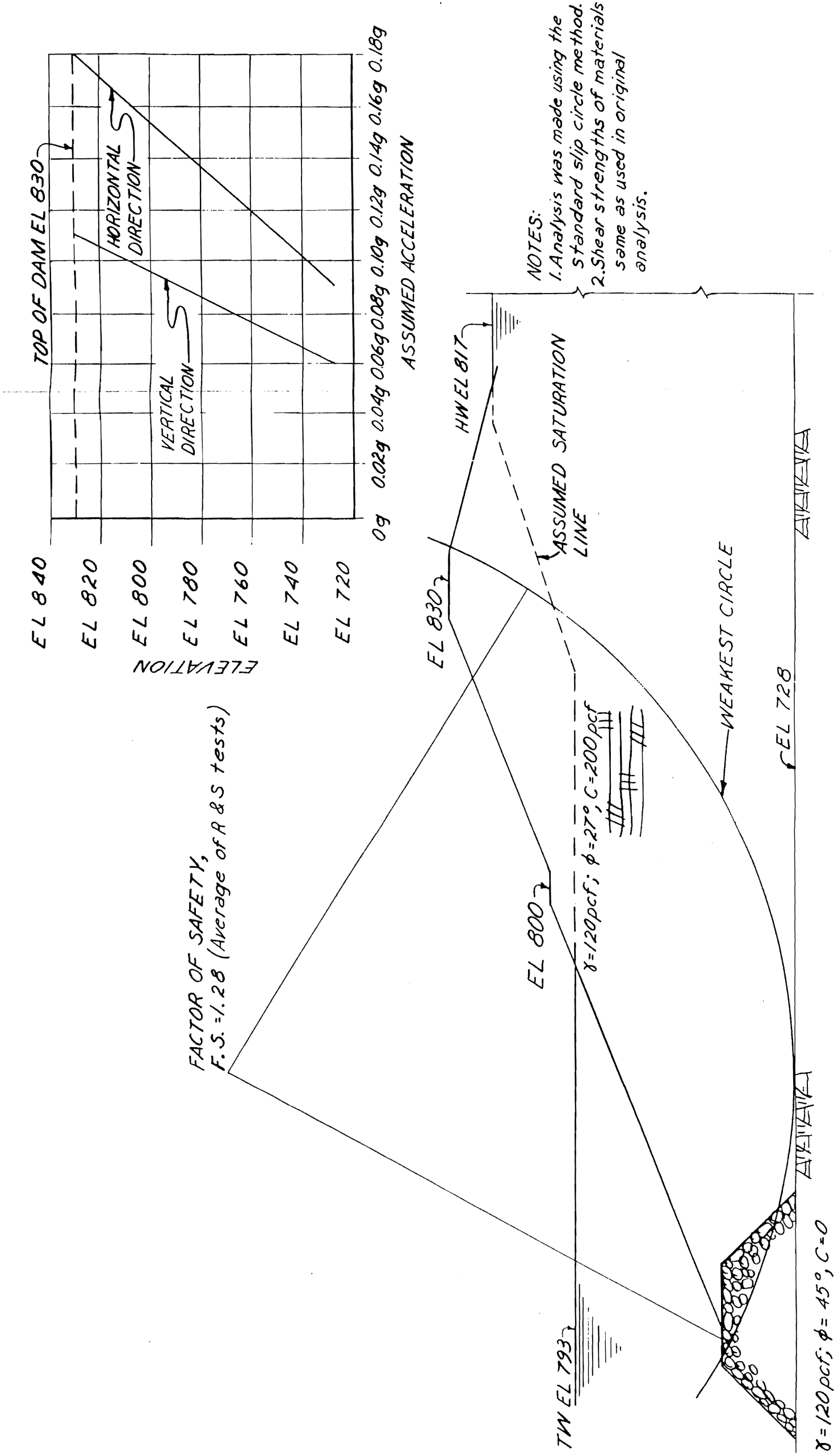
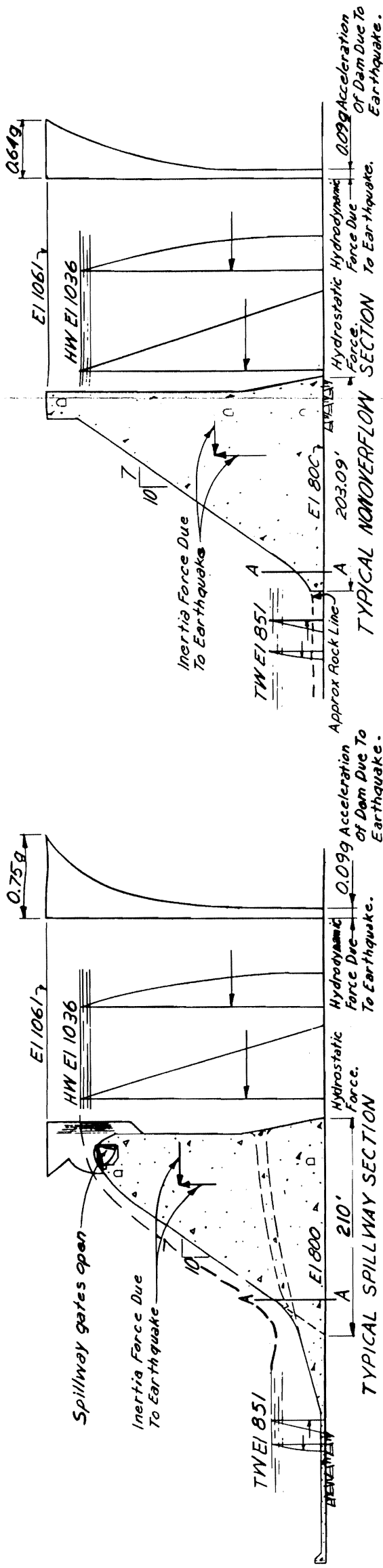


Figure 2.4-73 Nonoverflow & Spillway Results of Analysis For Operating Basis Earthquake - Tellico Dam



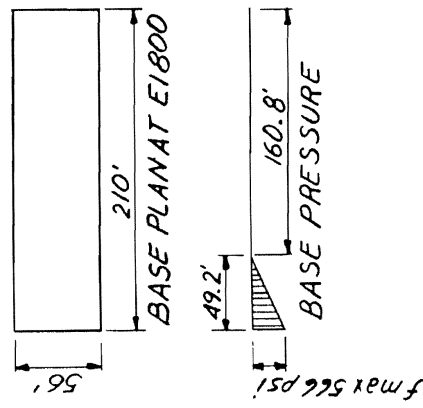
WATTS BAR NUCLEAR PLANT FINAL SAFETY ANALYSIS REPORT
EMBANKMENT RESULTS FOR ANALYSIS FOR OPERATING BASIS EARTHQUAKE Tellico Dam Figure 2.4-74

Figure 2.4-74 Embankment Results For Analysis For Operating Basis Earthquake - Tellico Dam



TW=3.19 Ksf HW=14.75 Ksf

UPLIFT DIAGRAM EI 800
UPLIFT PRESSURE ASSUMED
TO ACT ON 100% OF BASE AREA

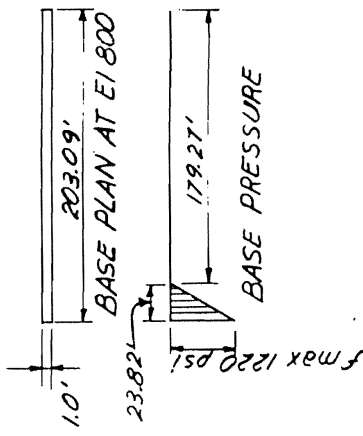


* Shears, that is reqd for $Q=1$ is calculated from shear-friction formula, $Q = 0.65 \Sigma V + SA$, A is assumed to be entire area.

** Shears, reqd for $Q=1$ considering portion of base in compression (no tension), instead of entire base area.

TW=3.19 Ksf HW=14.75 Ksf

UPLIFT DIAGRAM EI 800
UPLIFT PRESSURE ASSUMED
TO ACT ON 100% OF BASE AREA



NOTES:
1. Vertical acceleration of nonoverflow and spillway at base assumed to be 0.06g. By dynamic analysis, amplification of acceleration above the base was determined to be 0.14g at the top for the nonoverflow section and 0.14g at the top for the spillway.
2. Horizontal acceleration of nonoverflow and spillway at base assumed to be 0.09g. By dynamic analysis, amplification of acceleration above the base was determined to be 0.64g at the top for the nonoverflow section and 0.75g at the top for the spillway.
3. Spillway gates assumed open for this analysis.

WATTS BAR NUCLEAR PLANT
FINAL SAFETY
ANALYSIS REPORT
SPILLWAY & NONOVERFLOW
RESULTS OF ANALYSIS FOR
OBE + 1/2 P.F.
Morris Dam
Figure 2.4-75

ΣV	ΣH	$\frac{\Sigma H}{\Sigma V}$	Avg Shears	S Reqd For $Q=1$	f max	$FS = \frac{\Sigma MR}{\Sigma Mo}$	$\frac{\Sigma MR}{\Sigma Mo}$ Vertical Shear on Plane A-A
112,666 K	143,587 K	1.28	85 psi (entire base)	42 psi* (17 psi)**	566 psi	1.25	247 psi
2101 K	2786 K	1.33	95 psi (entire base) (415 psi)**	49 psi* (1220 psi)**	1220 psi	1.03	535 psi

Figure 2.4-75 Spillway & Nonoverflow Results of Analysis For OBE & 1/2 PMF-Norris Dam

Figure 2.4-76 Analysis For OBE & 1/2 PMF Assumed Condition of Dam After Failure Norris Dam

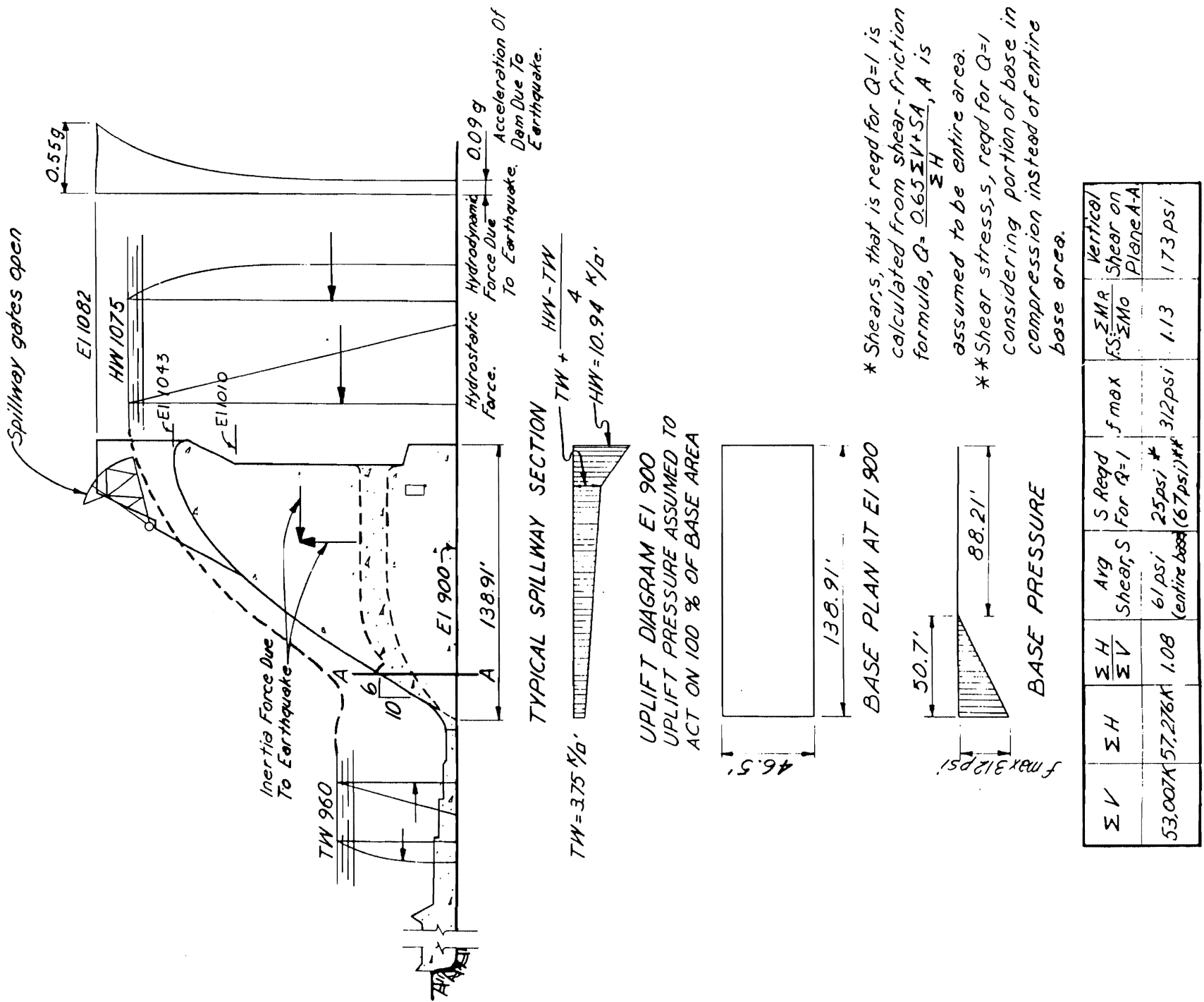


Figure 2.4-77 Spillway & Nonoverflow Results of Analysis For Operating Basis Earthquake -Cherokee Dam

WATTS BAR NUCLEAR PLANT FINAL SAFETY ANALYSIS REPORT
REVISION: NO. 1
DATE: 10/1/77
BY: J. R. HARRIS
FOR: W. B. BROWN
CHEROKEE DAM
FIGURE 2.4-77

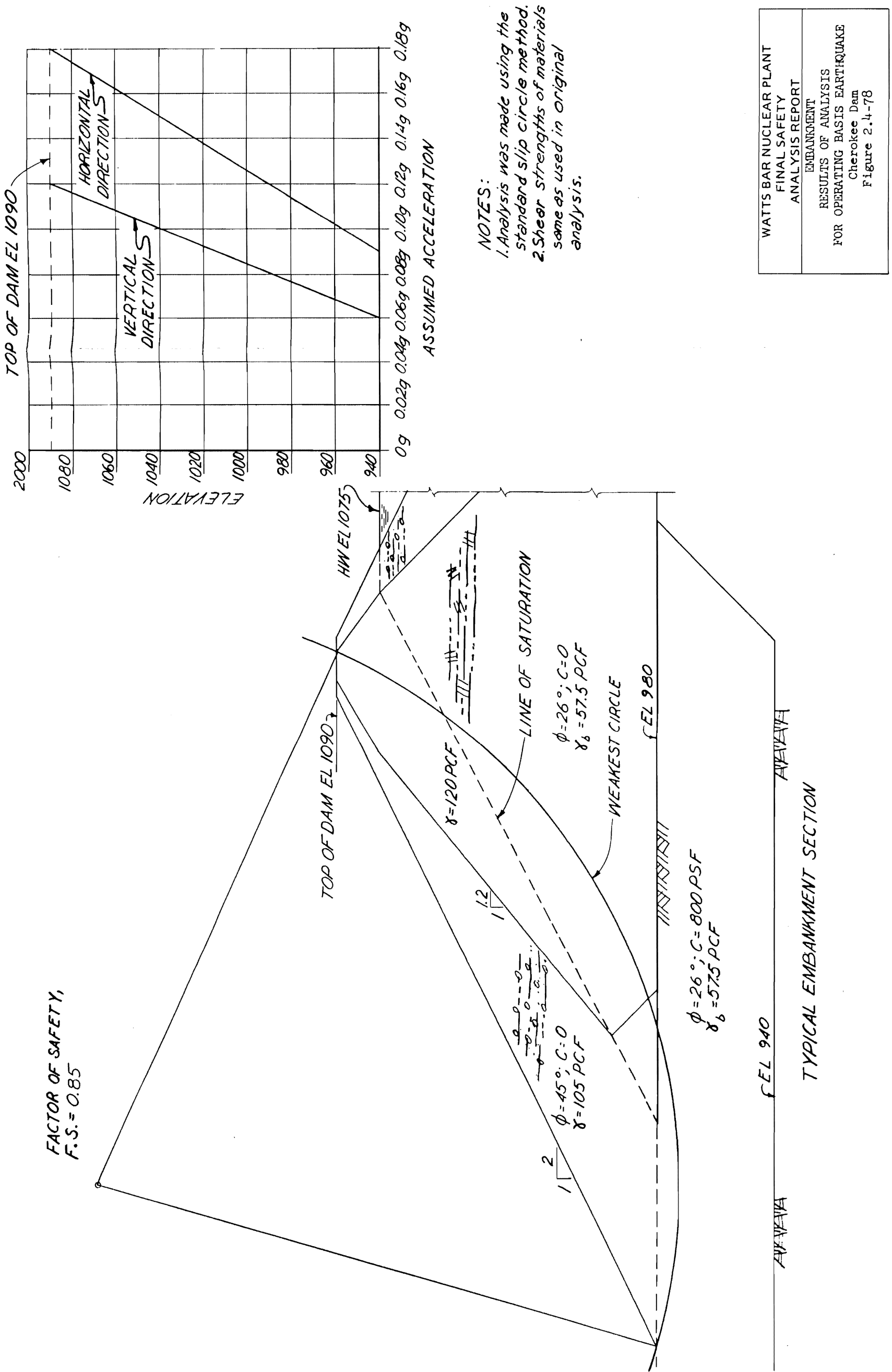
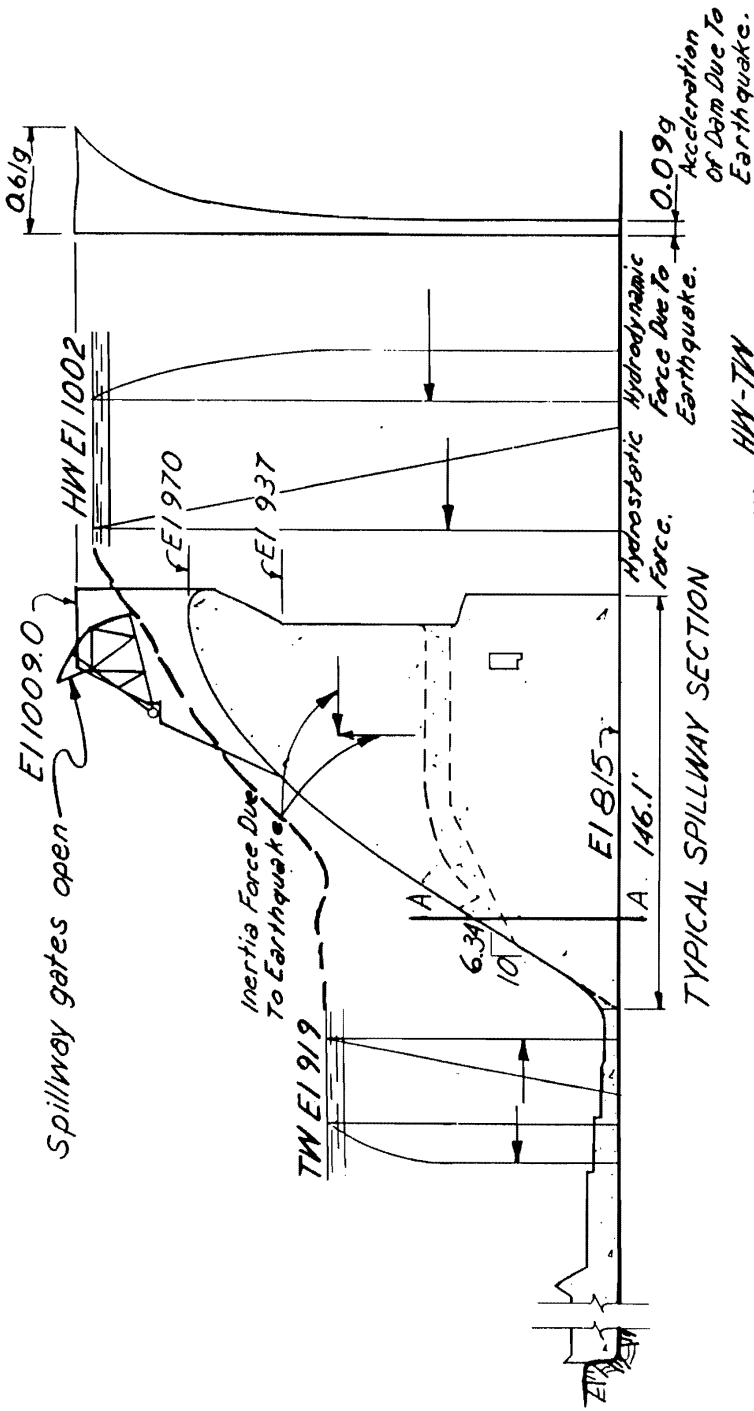


Figure 2.4-78 Embankment Results of Analysis For Operating Basis Earthquake - Cherokee Dam

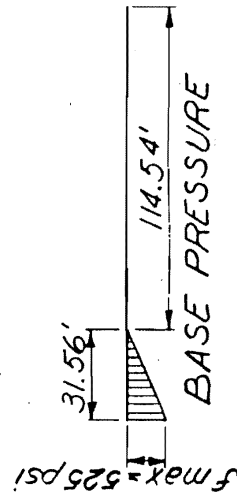
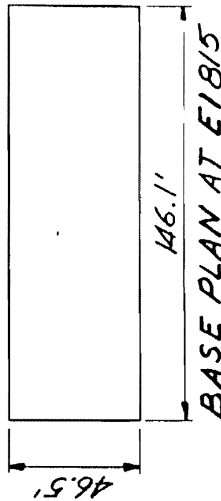
Figure 2.4-79 Assumed Condition of Dam After Failure PBE And 1/2 Probable Max Flood - Cherokee Dam



NOTES:
 1. Vertical acceleration of the spillway at the base assumed to be 0.06 g. By dynamic analysis, amplification of acceleration above the base was determined to be 0.13 g at the top.
 2. Horizontal acceleration of the spillway at the base assumed to be 0.09 g. By dynamic analysis amplification of acceleration above the base was determined to be 0.61 g at the top.
 3. Spillway gates assumed open for this analysis.

$TW = 6.5 \frac{K}{ft}$
 $HW - TW = 4$
 $HW = 11.7 \frac{K}{ft}$

UPLIFT DIAGRAM EI 815
 UPLIFT PRESSURES ASSUMED TO ACT ON 100% OF BASE AREA



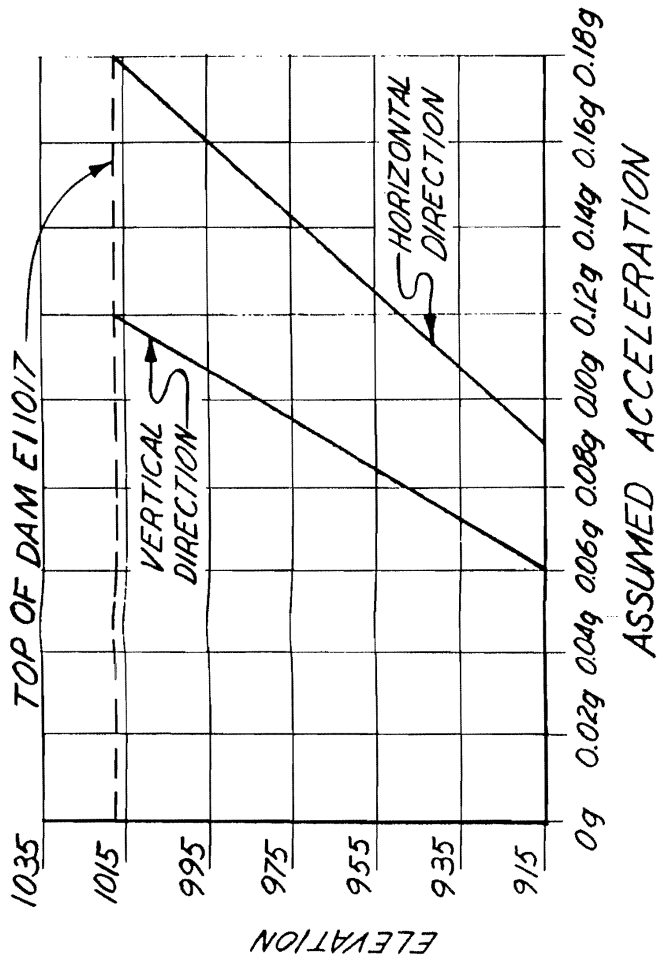
* Shear, s , that is reqd for $Q=1$ is calculated from shear-friction formula, $Q = \frac{0.65 \Sigma V + SA}{\Sigma H}$, A is assumed to be entire area.

** Shear stress, s , reqd for $Q=1$ considering portion of base in compression instead of entire base area.

ΣV	ΣH	$\frac{\Sigma H}{\Sigma V}$	Avg Shear, s	S Reqd For $Q=1$	f max	$\frac{\Sigma MR}{FS \cdot \Sigma MO}$	Vertical Shear on Plane AA
55,483K	60,245K	1.09	61.6 psi (entire base)	25 psi*	525 psi**	1.06	156 psi

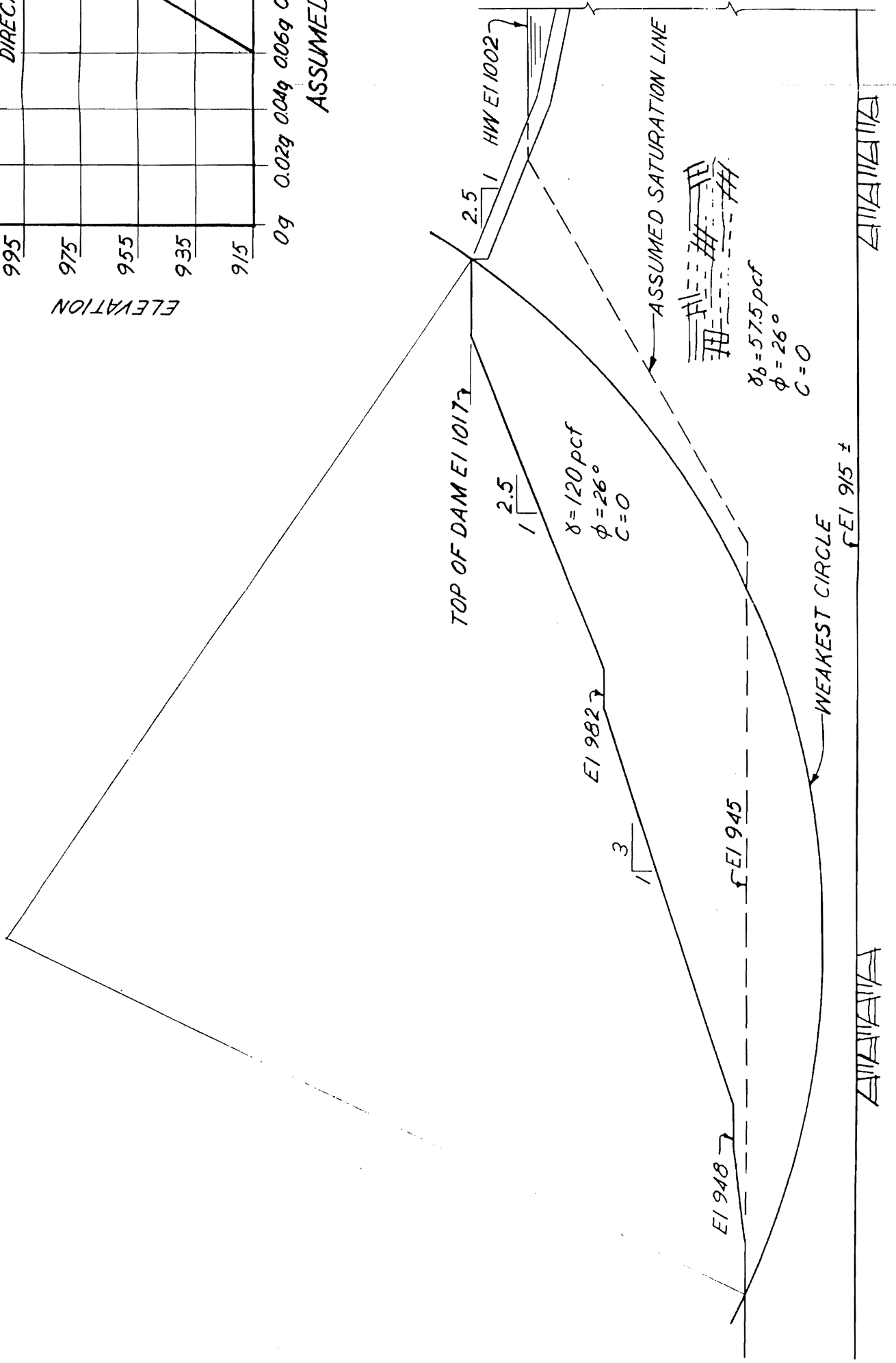
WATTS BAR NUCLEAR PLANT FINAL SAFETY ANALYSIS REPORT
SPILLWAY & NONOVERFLOW RESULTS OF ANALYSIS FOR OPERATING BASIS EARTHQUAKE Douglas Dam Figure 2.4-80

Figure 2.4-80 Spillway & Nonoverflow Results of Analysis For Operating Basis Earthquake - Douglas Dam



NOTES:
 1. Analysis was made using the standard slip circle method.
 2. Shear strengths of materials same as used in original analysis.

FACTOR OF SAFETY
 F.S. = 1.0



SADDLE DAM No. 1

WATTS BAR NUCLEAR PLANT FINAL SAFETY ANALYSIS REPORT
SADDLE DAM NO. 1 RESULTS OF ANALYSIS FOR OPERATING BASIS EARTHQUAKE Douglas Dam Figure 2.4-81

Figure 2.4-81 Saddle Dam No. 1 Results of Analysis For Operating Basis Earthquake - Douglas Dam

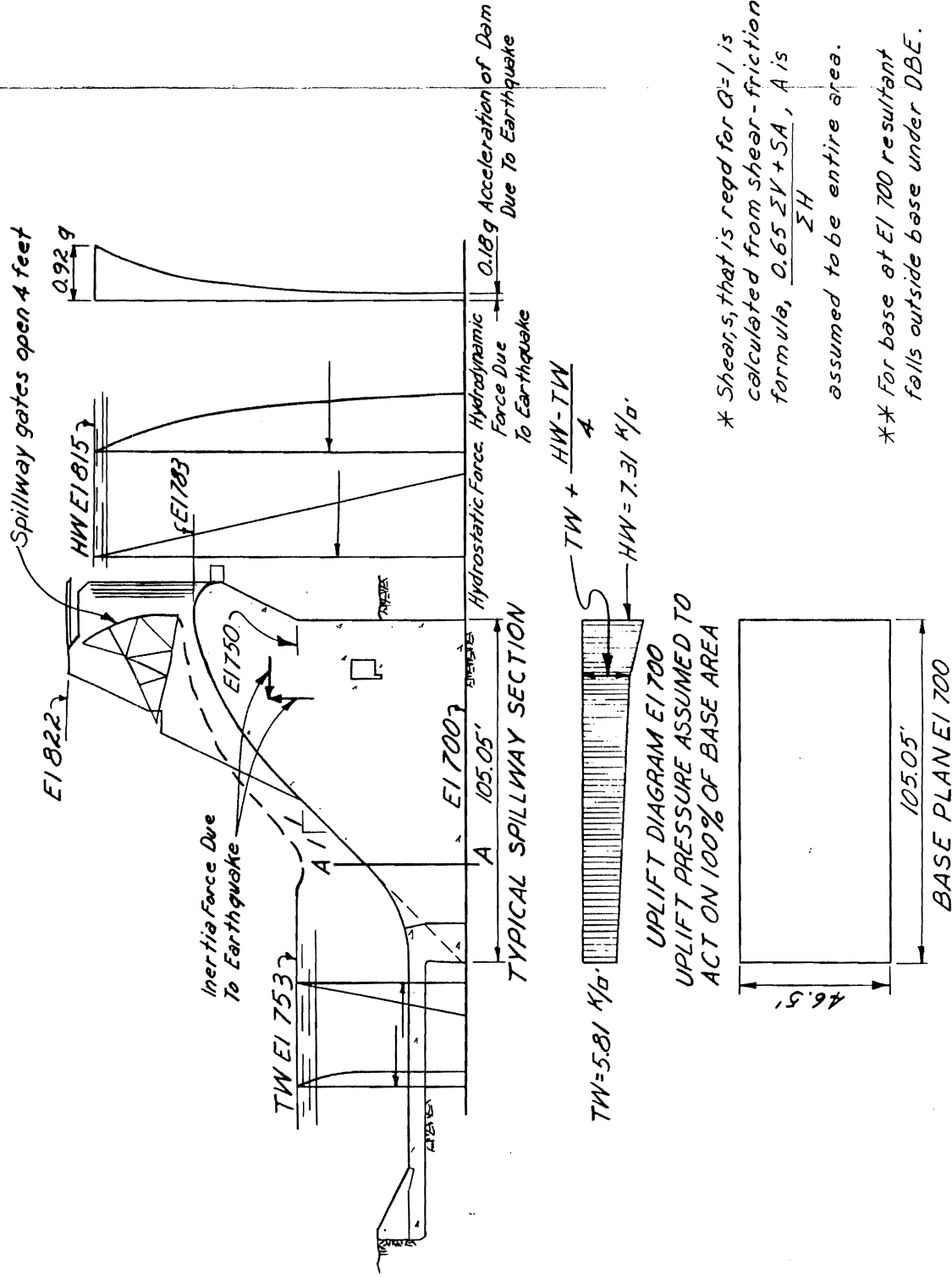
Figure 2.4-82 Douglas Dam Assumed Condition of Dam After Failure aBE And 1/2 Probable Maximum Flood - Douglas Project

Figure 2.4-83 Fontana Dam Assumed Condition of Dam after Failure aBE And 1/2 Probable Maximum Flood - Fontana Dam

Figure 2.4-84 Deleted by Amendment 63

Figure 2.4-85 Deleted by Amendment 63

NOTES:
 1. Vertical acceleration of spillway at base assumed to be 0.12g. By dynamic analysis, amplification of acceleration above the base was determined to be 0.24g at the spillway at base assumed to be 0.18g. By dynamic analysis, amplification of acceleration above the base was determined to be 0.92g at the spillway gates assumed open 4 feet for this analysis.



* Shear, s, that is reqd for $Q=1$ is calculated from shear-friction formula, $\frac{0.65 \sum V + SA}{\sum H}$, A is assumed to be entire area.

** For base at EI 700 resultant falls outside base under DBE.

$\sum V$	$\sum H$	$\frac{\sum H}{\sum V}$	Avg shear	S reqd for $Q=1$	f max	$\frac{FS \sum MR}{\sum MO}$
19,254K	29,534K	1.62	42 psi (entire base)	25 psi*	*	0.9

WATTS BAR NUCLEAR PLANT FINAL SAFETY ANALYSIS REPORT SPILLWAY
RESULTS OF ANALYSIS FOR SSE EARTHQUAKE Fort Loudoun Dam Figure 2.4-86

Figure 2.4-86 Spillway Results of Analysis For SSE Earthquake Fort Loudoun Dam

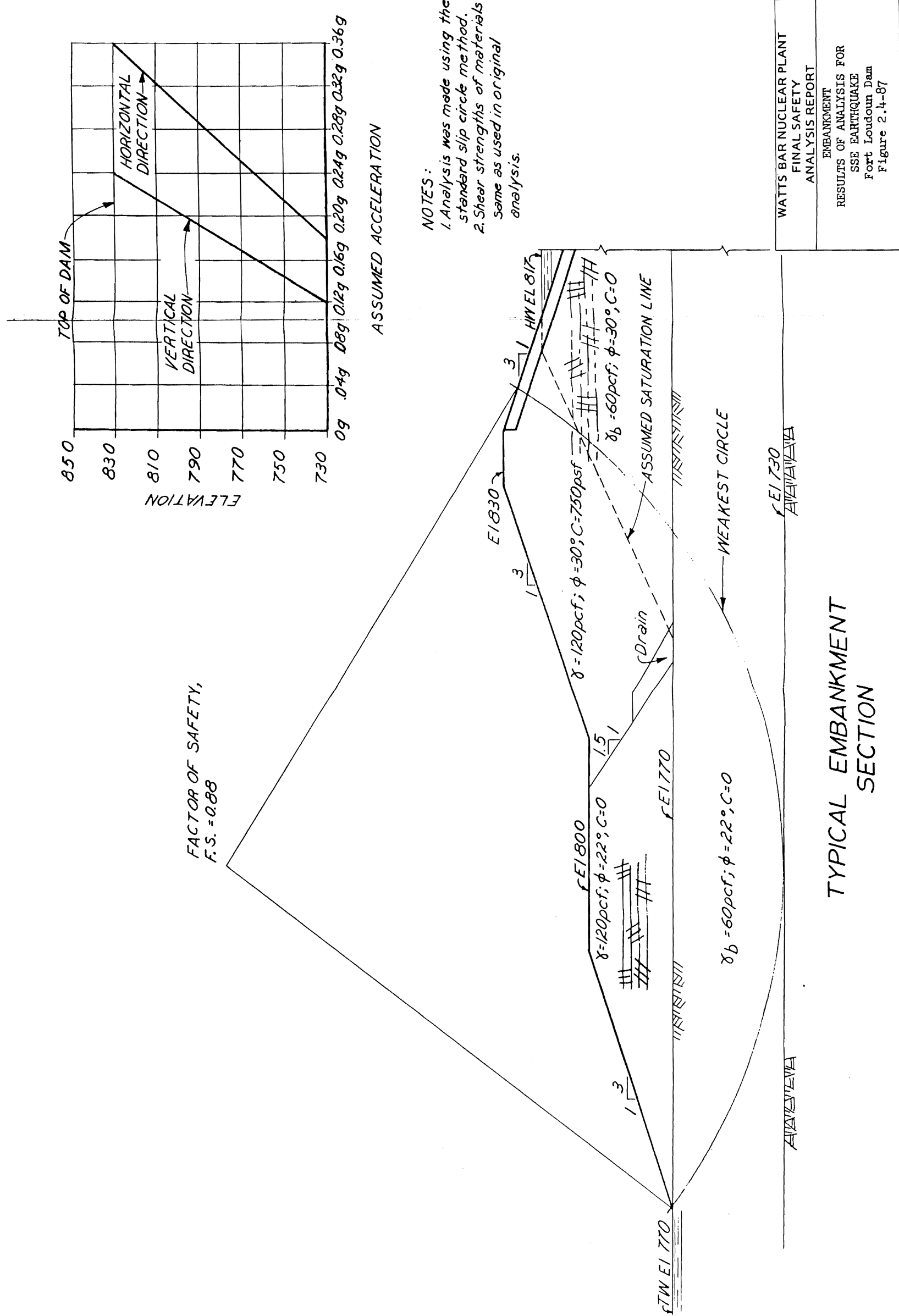


Figure 2.4-87 Embankment Results of Analysis For SSE Earthquake Fort Loudoun Dam

Figure 2.4-88 Fort Loudoun Dam Assumed Condition of Dam After Failure SSE Combined With a 25 Year Flood - Fort Loudoun Dam

Figure 2.4-89 Tellico Dam Assumed Condition of Dam After Failure SSE Combined With a 25 Year Flood Tellico Project

Figure 2.4-90 Norris Dam SSE + 25 Year Flood Judged Condition of Dam After Failure - Norris Dam

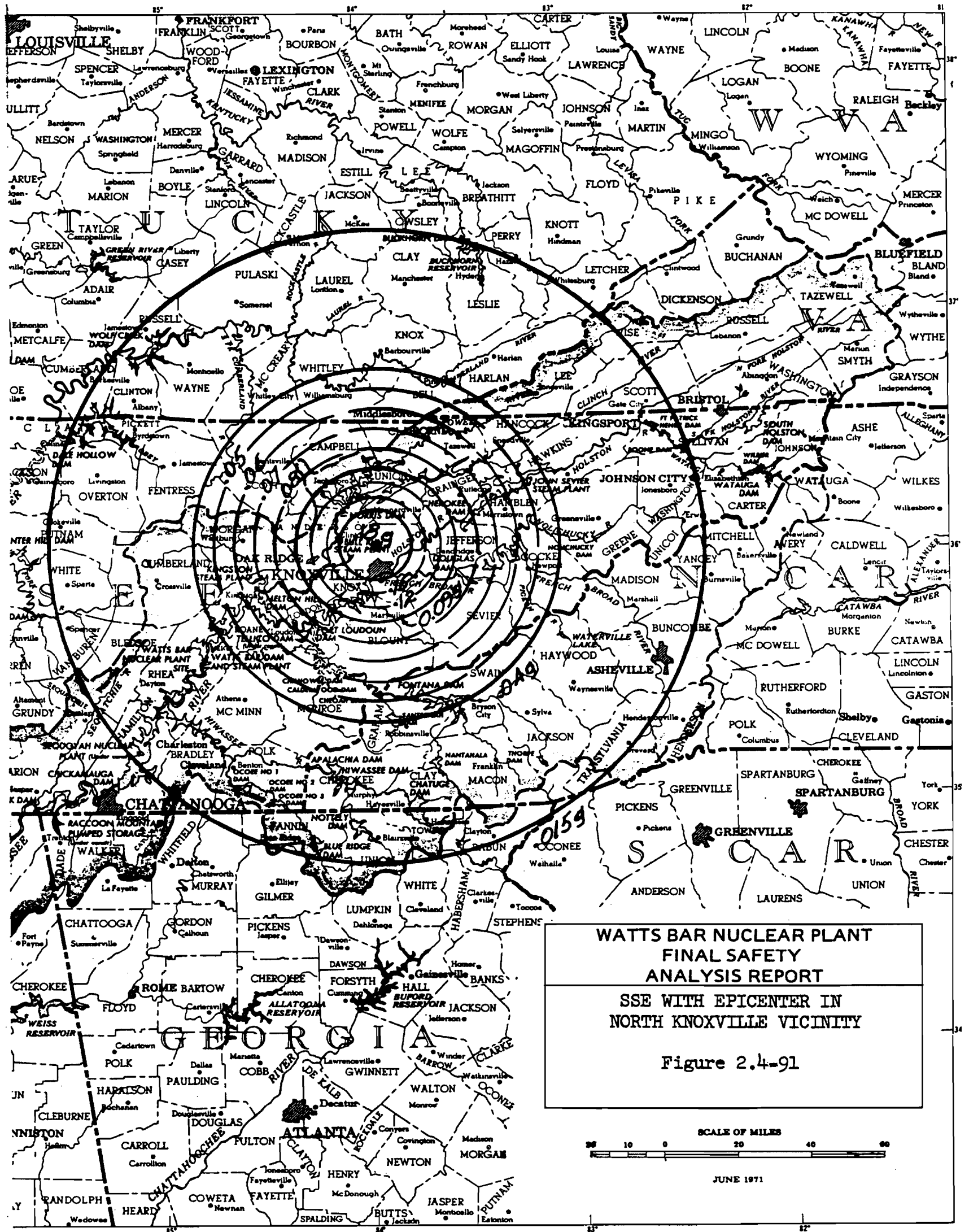


Figure 2.4-91 SSE With Epicenter In North Knoxville Vicinity

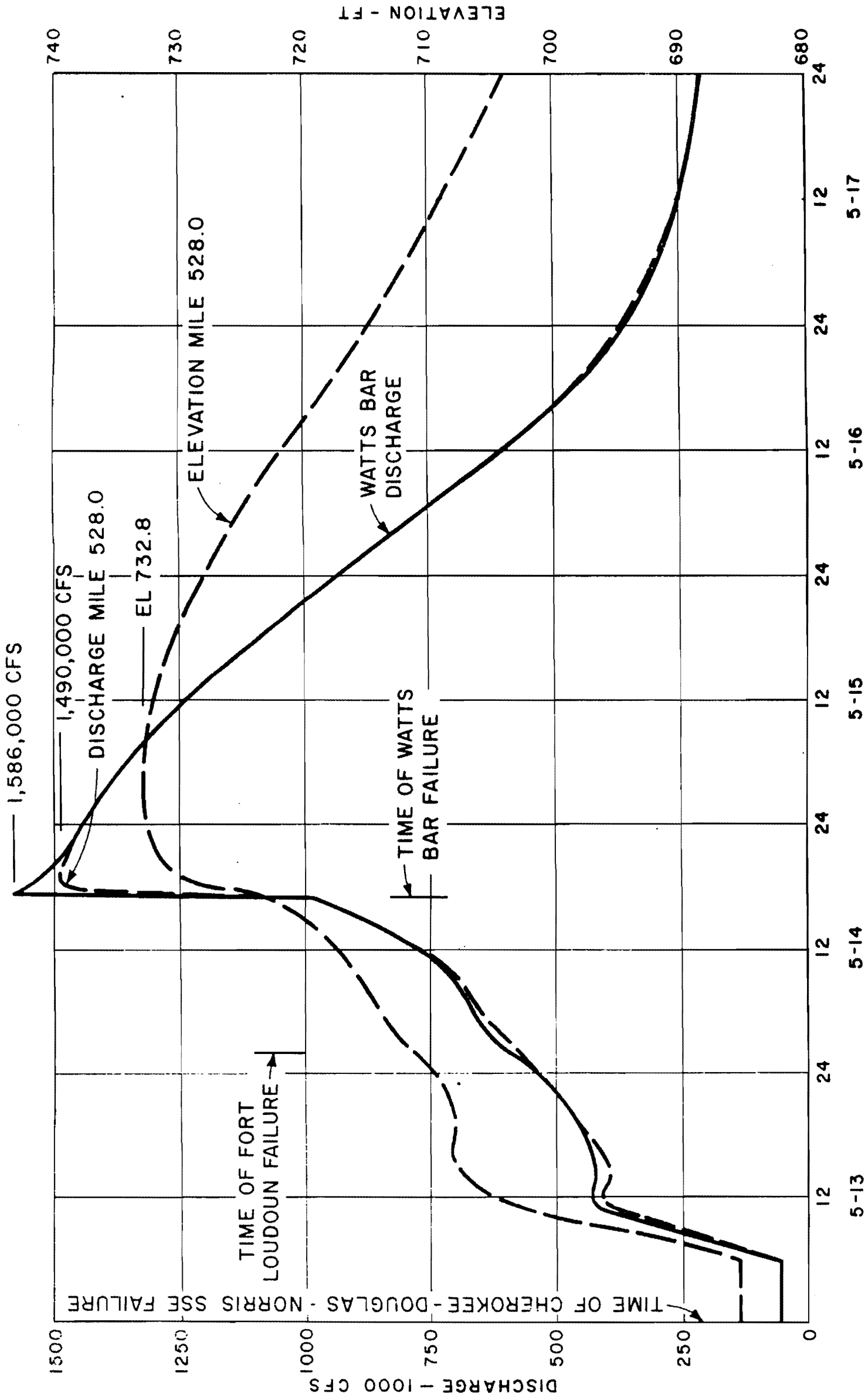


Figure 2.4-92 Time and Date Flood Hydrographs

Revised by Amendment 35

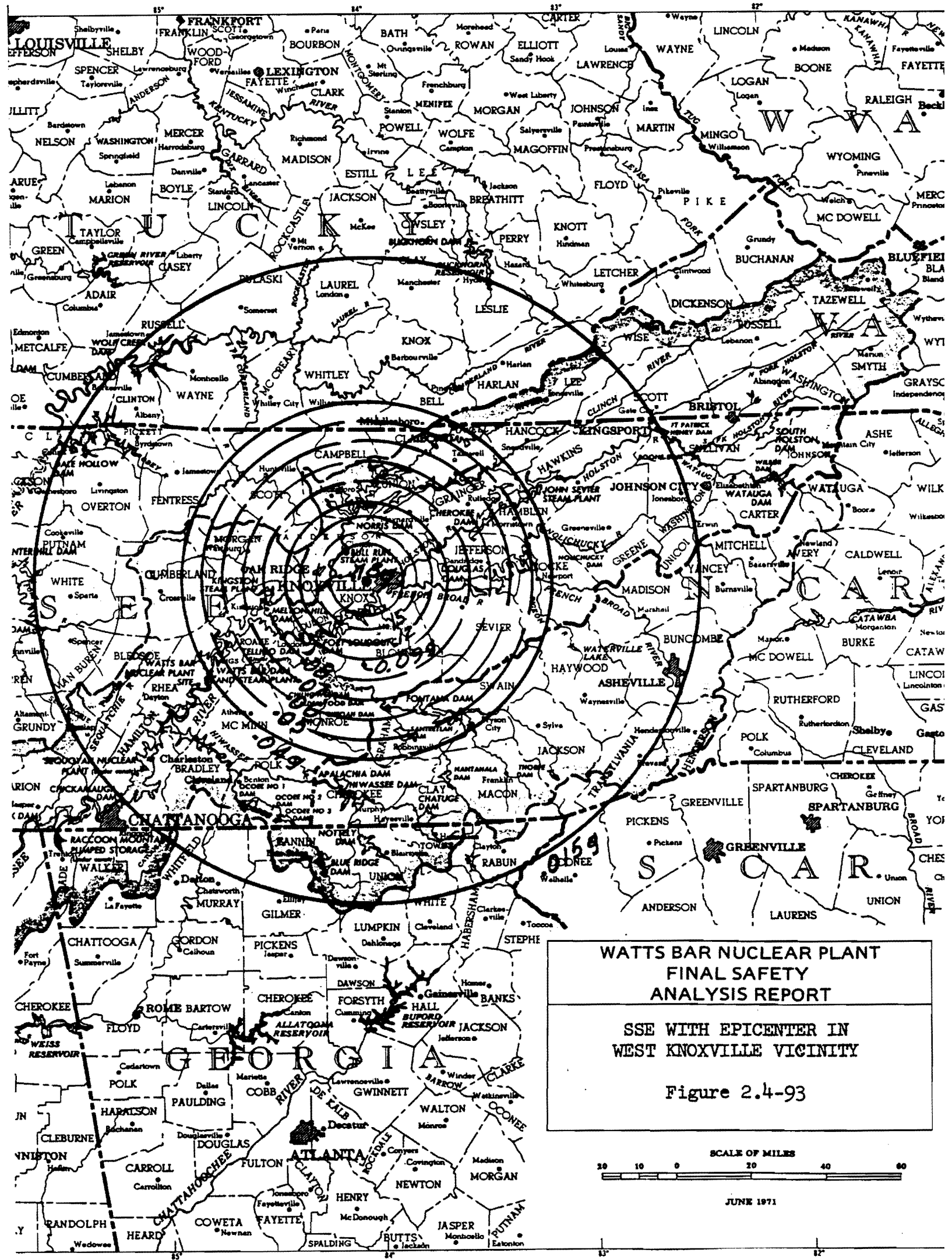


Figure 2.4-93 SSE With Epicenter In West Knoxville Vicinity

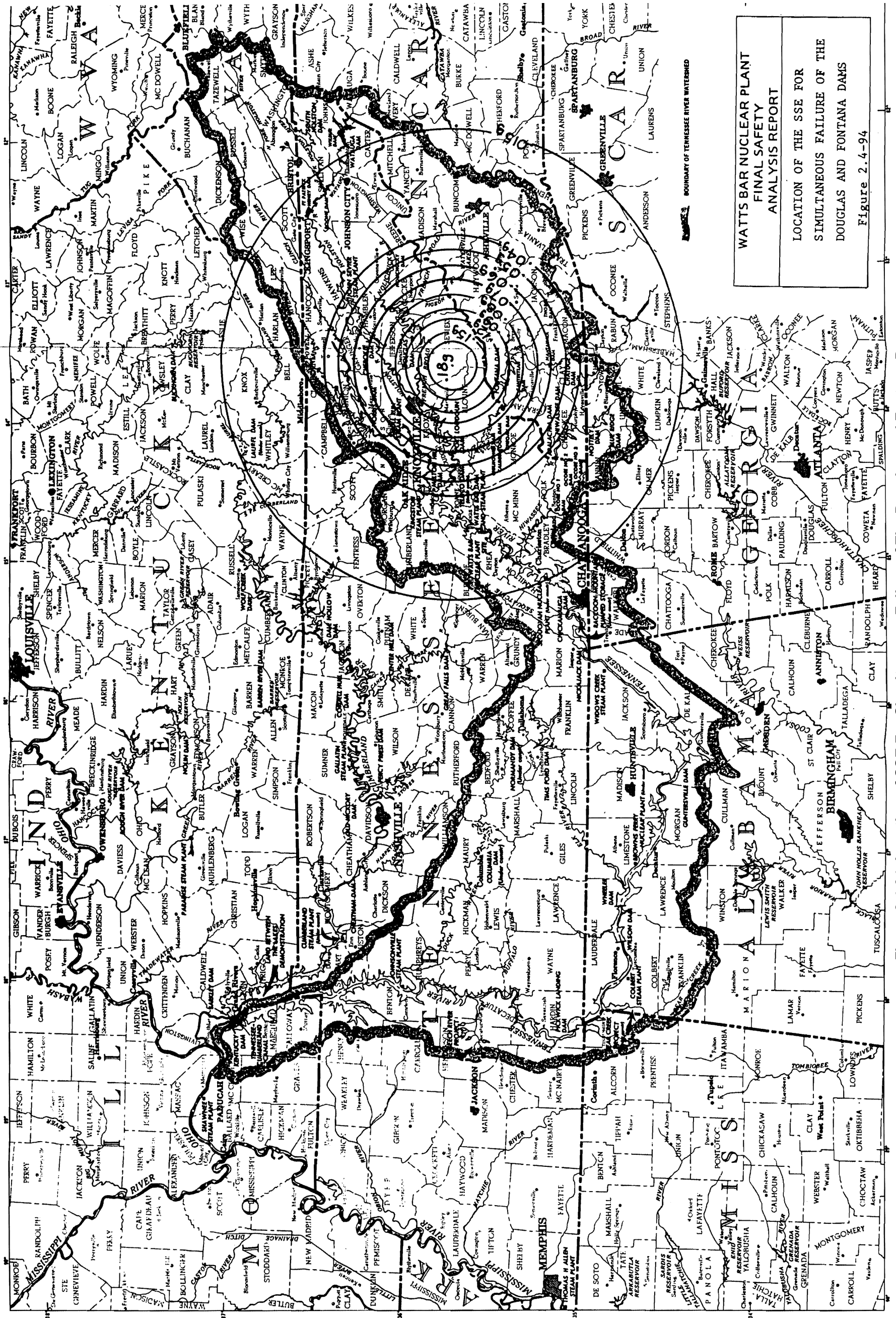
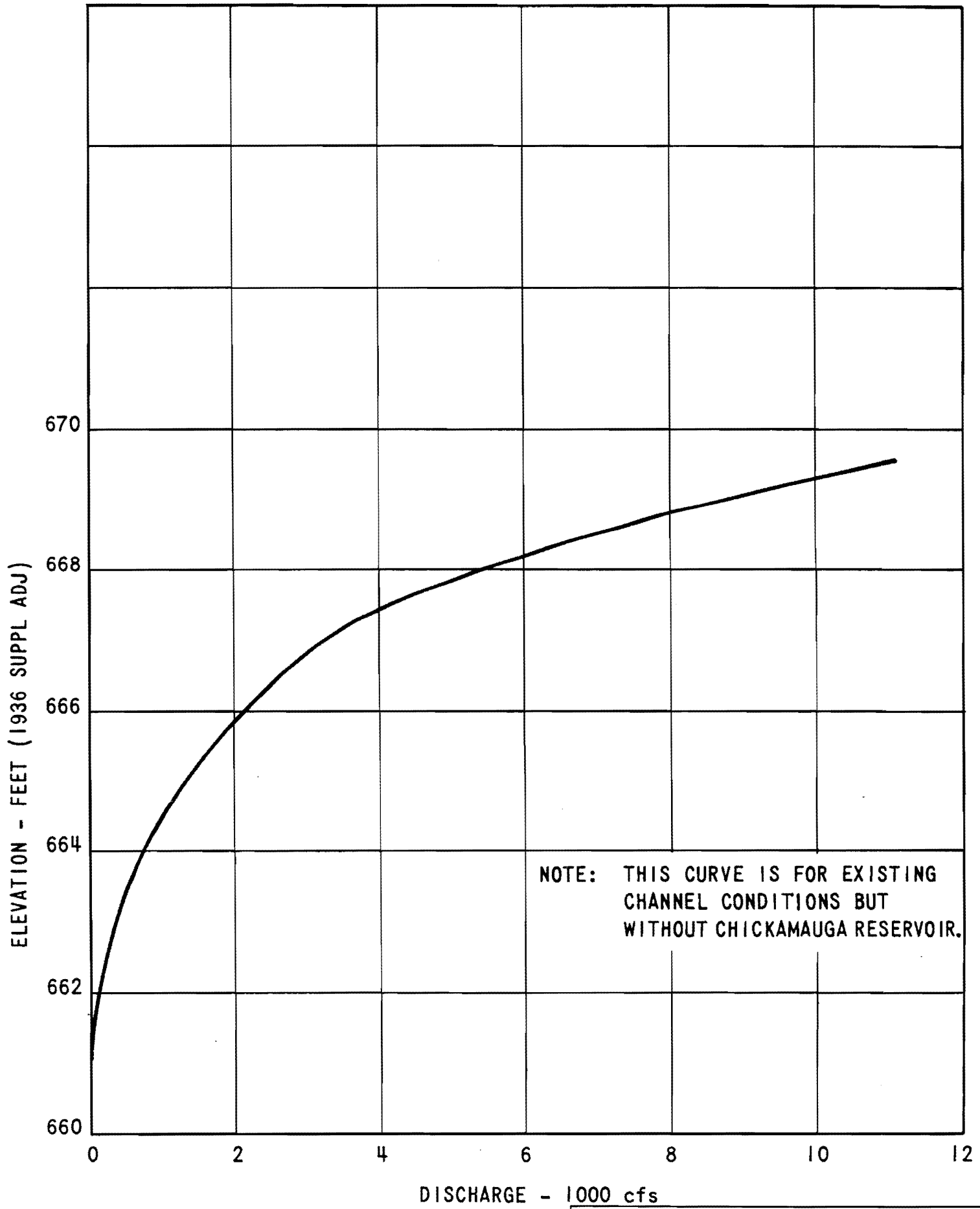


Figure 2.4-94 Location of SSE For Simultaneous Failure of The Douglas and Fontana Dams



WATTS BAR NUCLEAR PLANT
FINAL SAFETY
ANALYSIS REPORT

TENNESSEE RIVER MILE 523.2
WATTS BAR NUCLEAR PLANT
RATING CURVE
Figure 2.4-95

Figure 2.4-95 Tennessee River Mile 523.2 Watts Bar Nuclear Plant Rating Curve

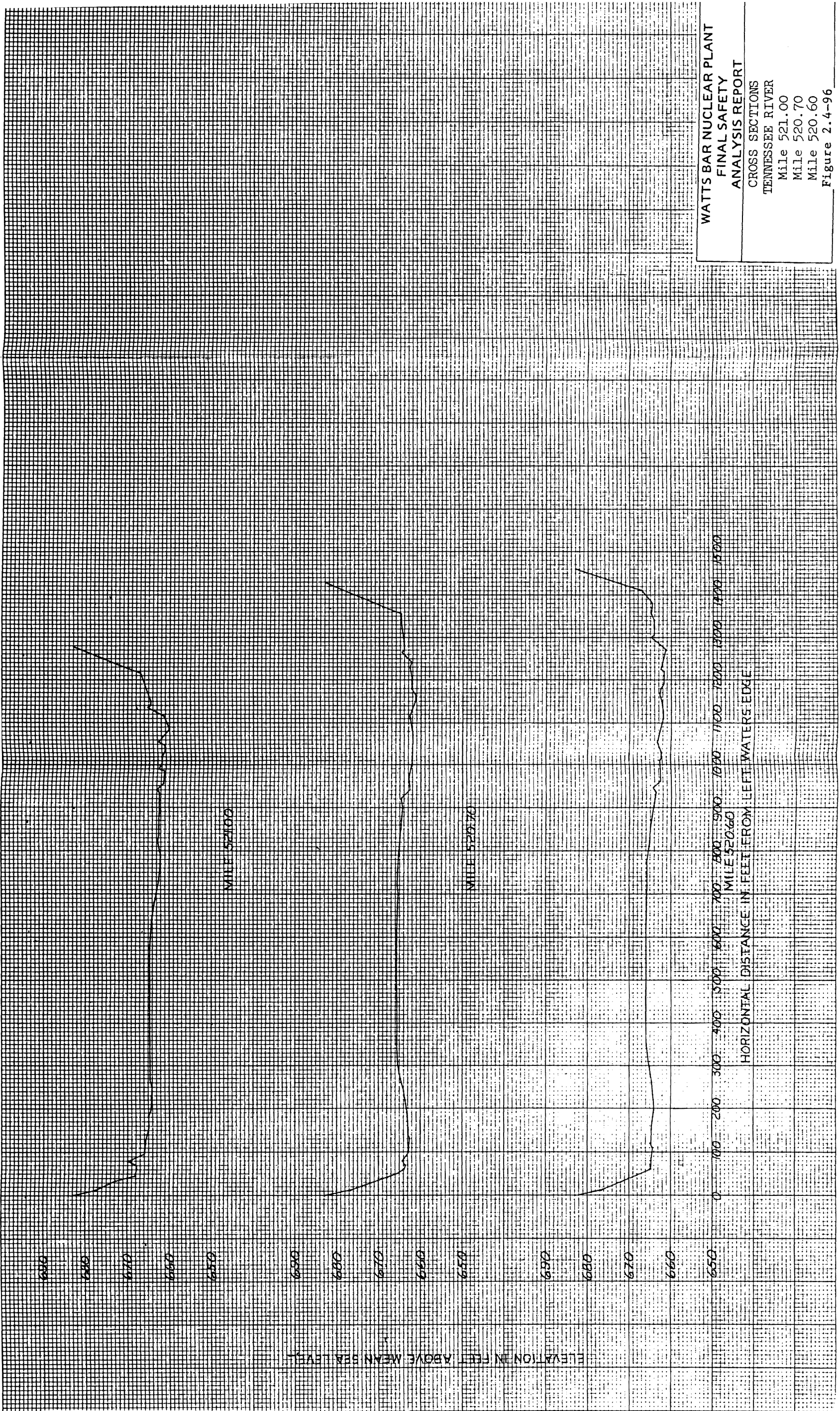


Figure 2.4-96 Cross Sections Tennessee River (mile 521.00) (mile 520.70) (mile 520.60)

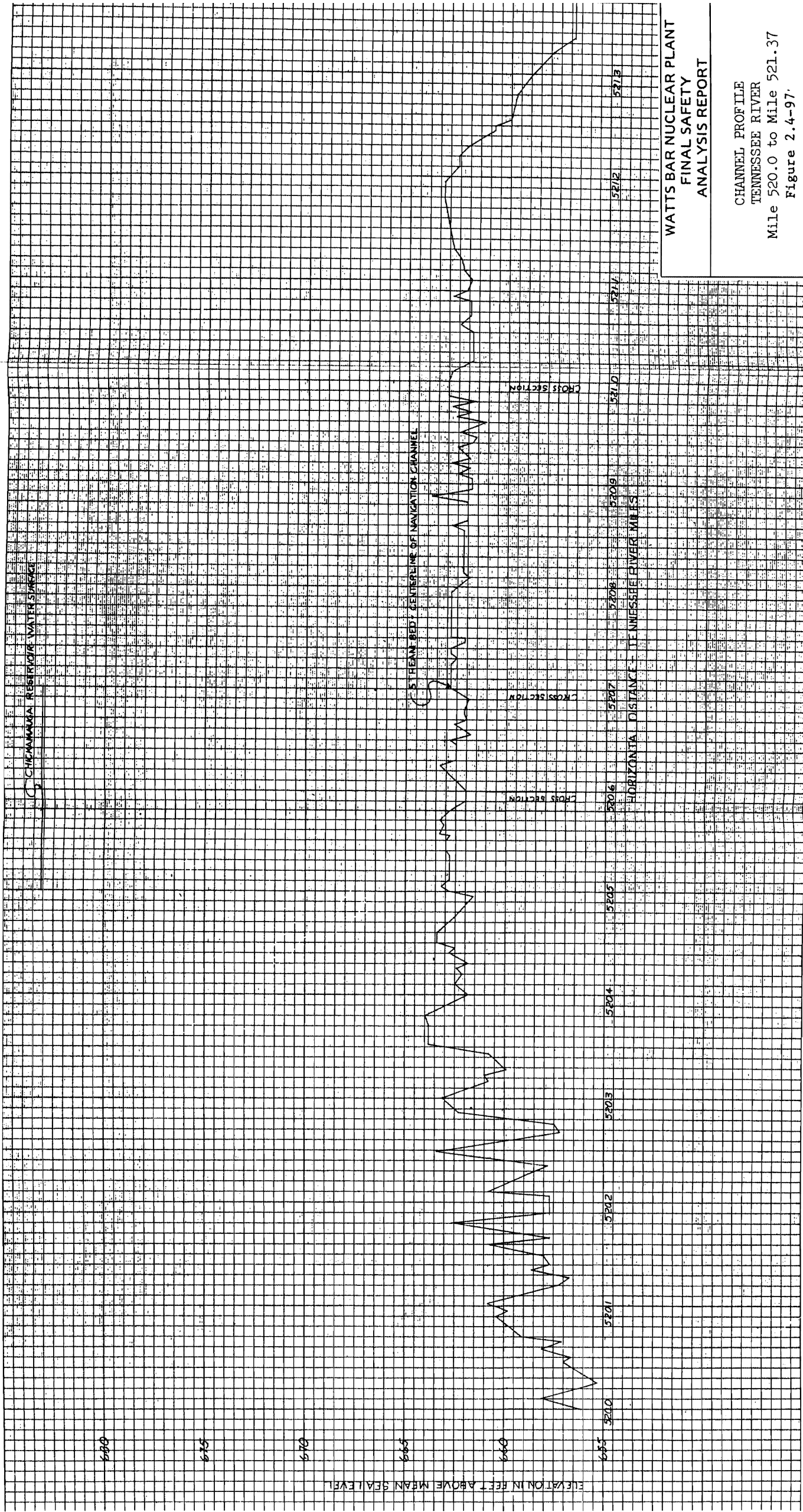
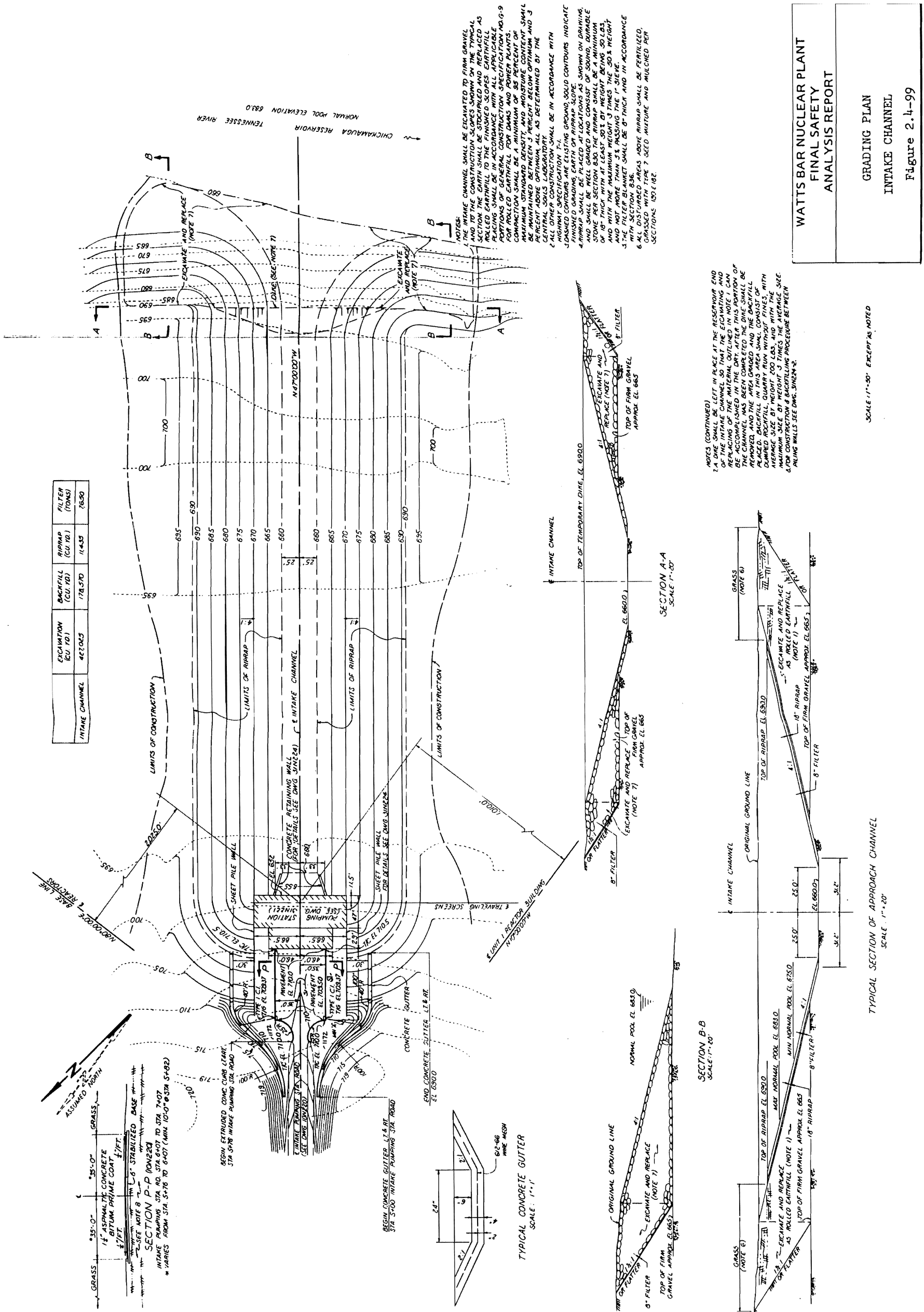


Figure 2.4-97 Channel Profile Tennessee River (mile 520.0 to mile 521.37)

Figure 2.4-98 Not Used



WATTS BAR NUCLEAR PLANT
FINAL SAFETY
ANALYSIS REPORT

GRADING PLAN
INTAKE CHANNEL
Figure 2.4-99

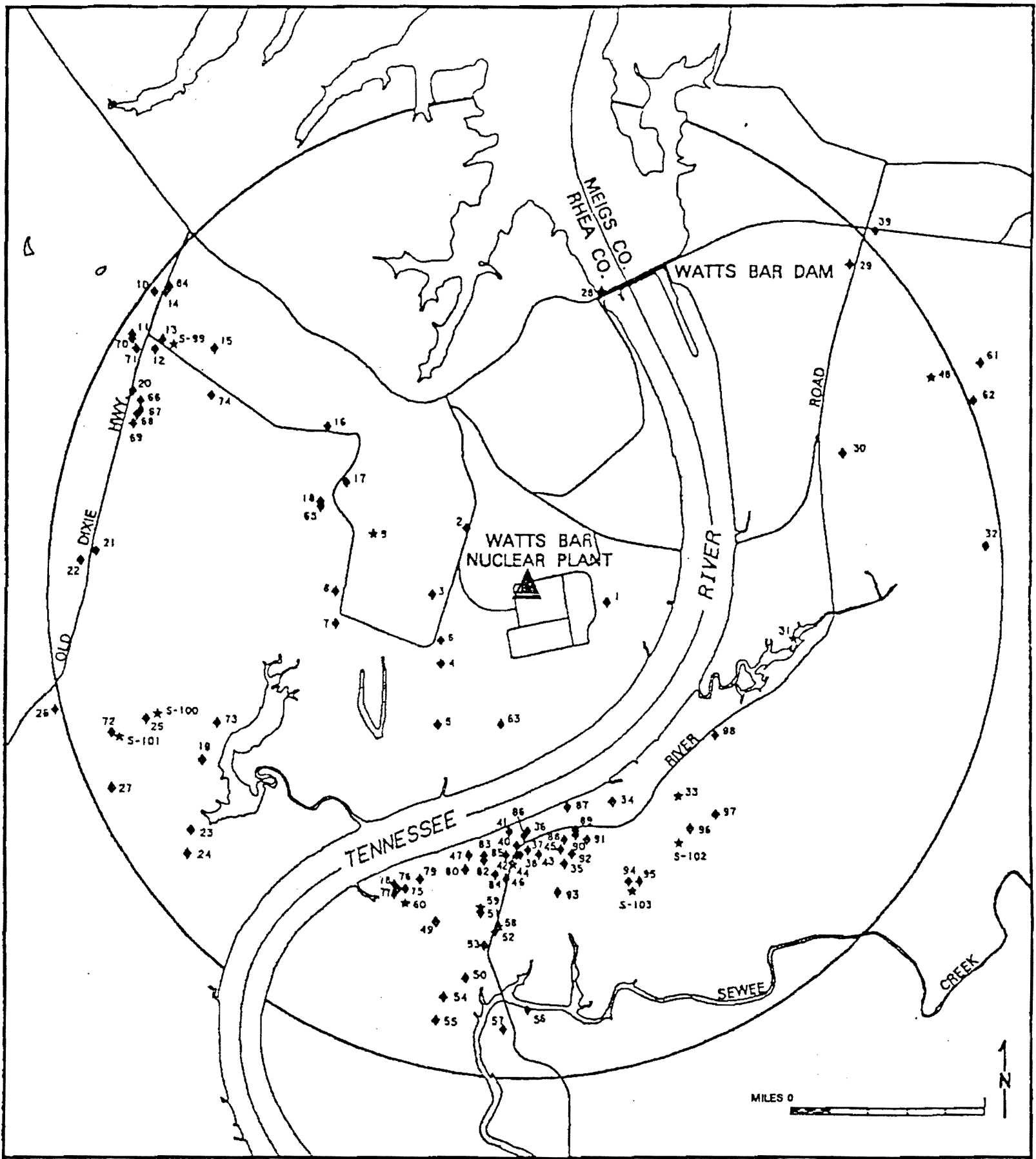
SCALE: 1" = 50' EXCEPT AS NOTED

SCALE: 1" = 20'

Figure 2.4-99 Grading Plan Intake Channel

Figure 2.4-100 Deleted by Amendment 83

Figure 2.4-101 Deleted by Amendment 33



LEGEND

- ◆ WELL
- ★ SPRING
- ROADS
- 2 MILE RADIUS OF PLANT SITE

AMENDMENT 83

WATTS BAR NUCLEAR PLANT
FINAL SAFETY
ANALYSIS REPORT

WELL AND SPRING INVENTORY
WITHIN 2 MILE RADIUS OF WATTS BAR
NUCLEAR PLANT SITE
FSAR FIG 2.4-102

SCANNED DOCUMENT
THIS IS A SCANNED DOCUMENT MAINTAINED ON
THE WBNP OPTICRAPHICS SCANNER DATABASE

Figure 2.4-102 Wells And Spring Inventory Within 2-Mile Radius of Watts Bar Nuclear Plant Site

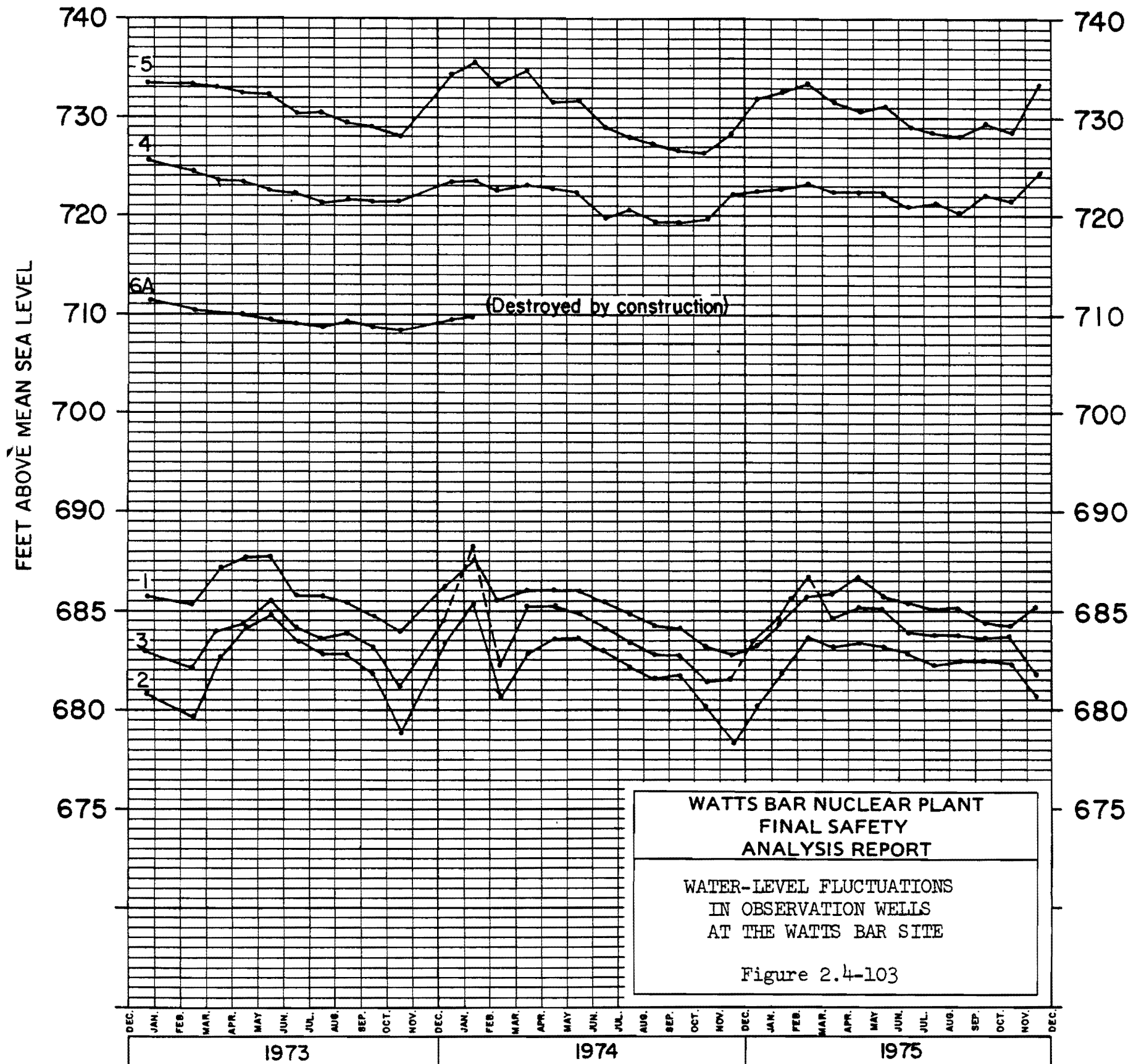
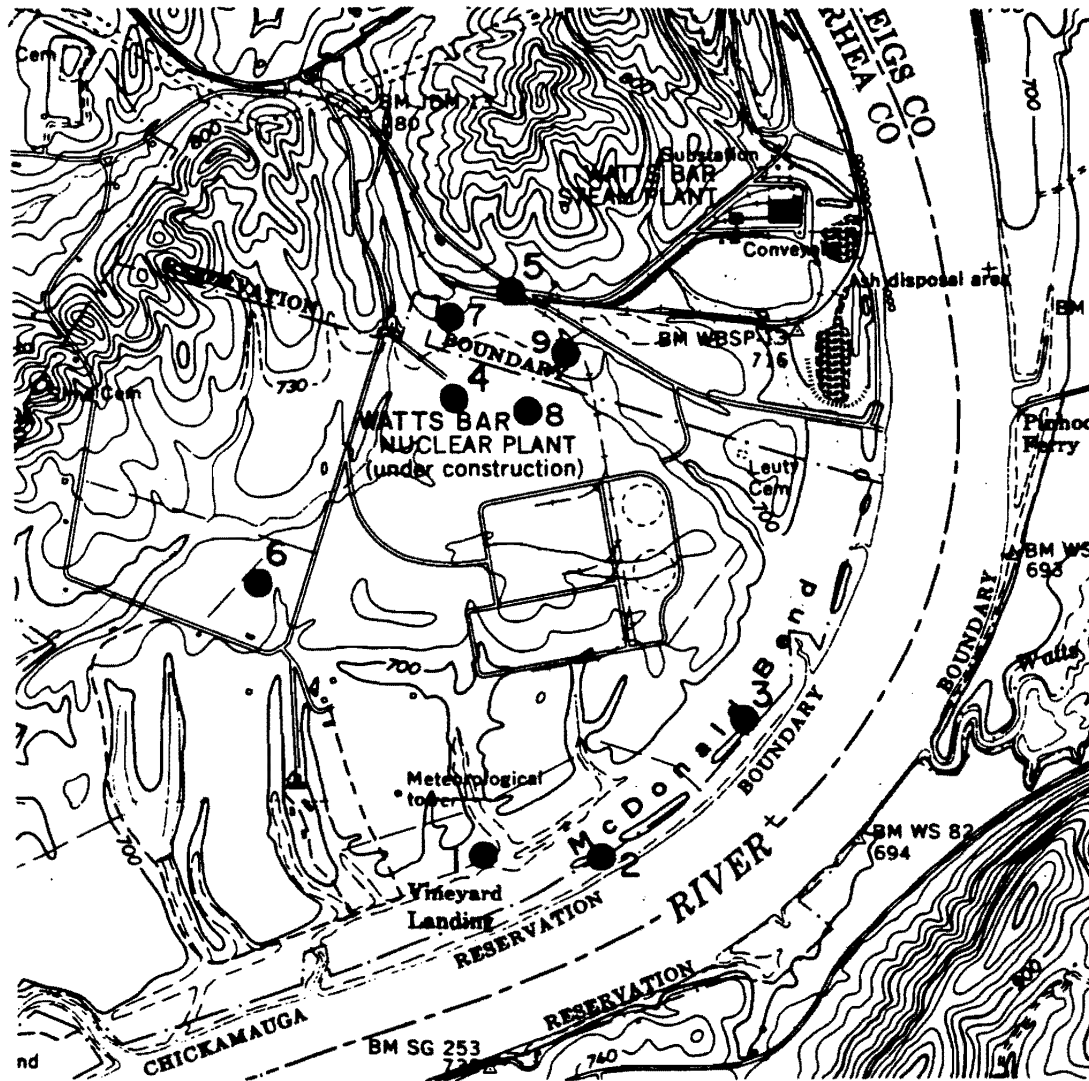


Figure 2.4-103 Water-Level Fluctuations In Observation Wells at The Watts Bar Site



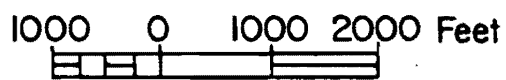
NOTE:

Topographic base from U.S.G.S - T.V.A. 7.5 minute quadrangle, Decatur, Tenn., 118-SE, Contour interval 20 feet.

LEGEND:

●² - Ground-water observation well showing number.

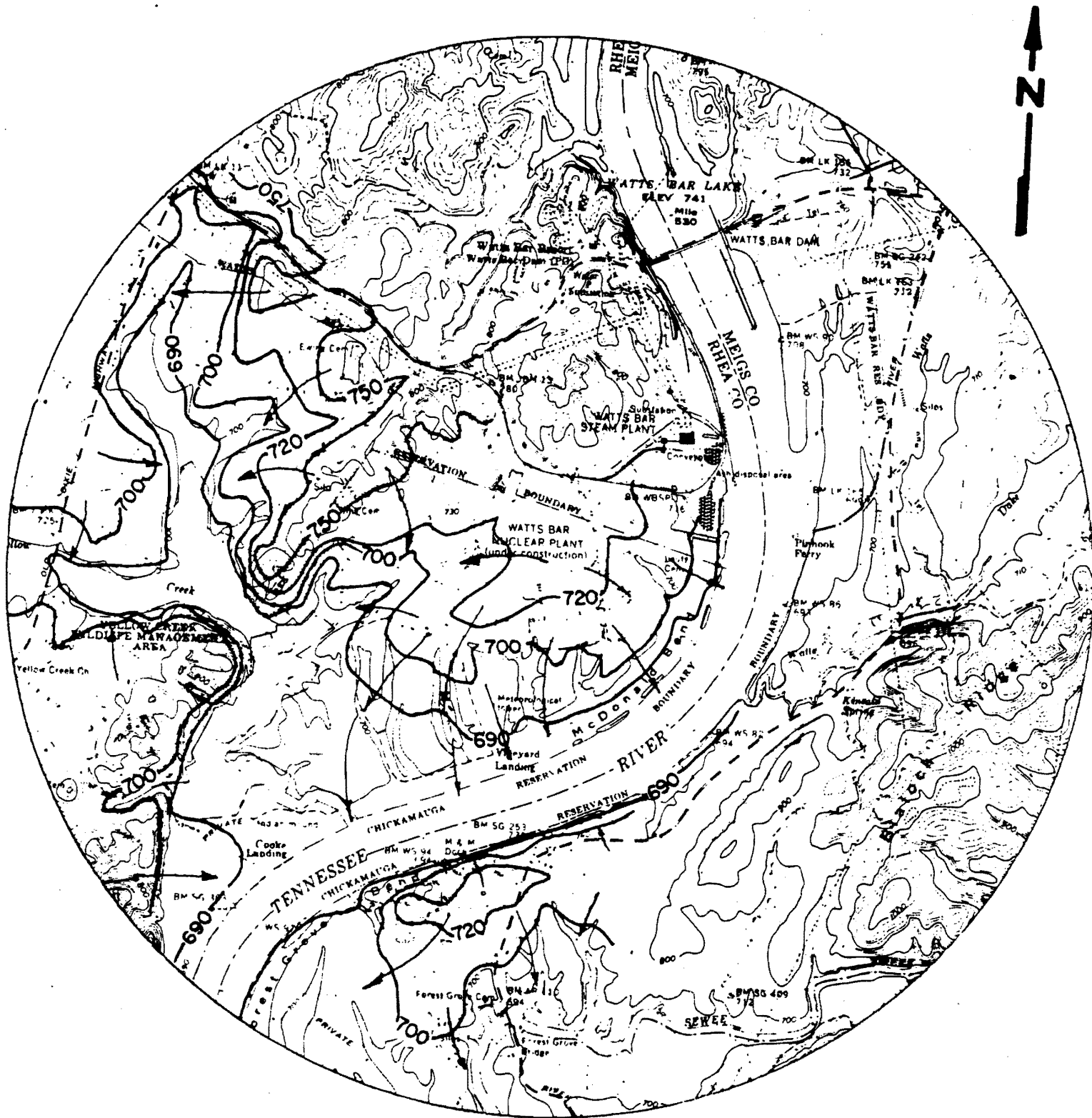
SCALE:



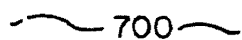

Revised by Amendment 50

<p>WATTS BAR NUCLEAR PLANT FINAL SAFETY ANALYSIS REPORT</p>
<p>LOCATIONS OF GROUND-WATER OBSERVATION WELLS FIGURE 2.4-104</p>

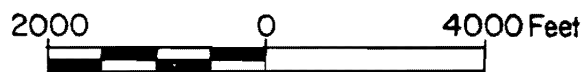
Figure 2.4-104 Locations of Ground - Water Observation Wells



EXPLANATION:

-  700 — Water table contour, in feet above mean sea level.
-  — General direction of ground-water movement.

SCALE:



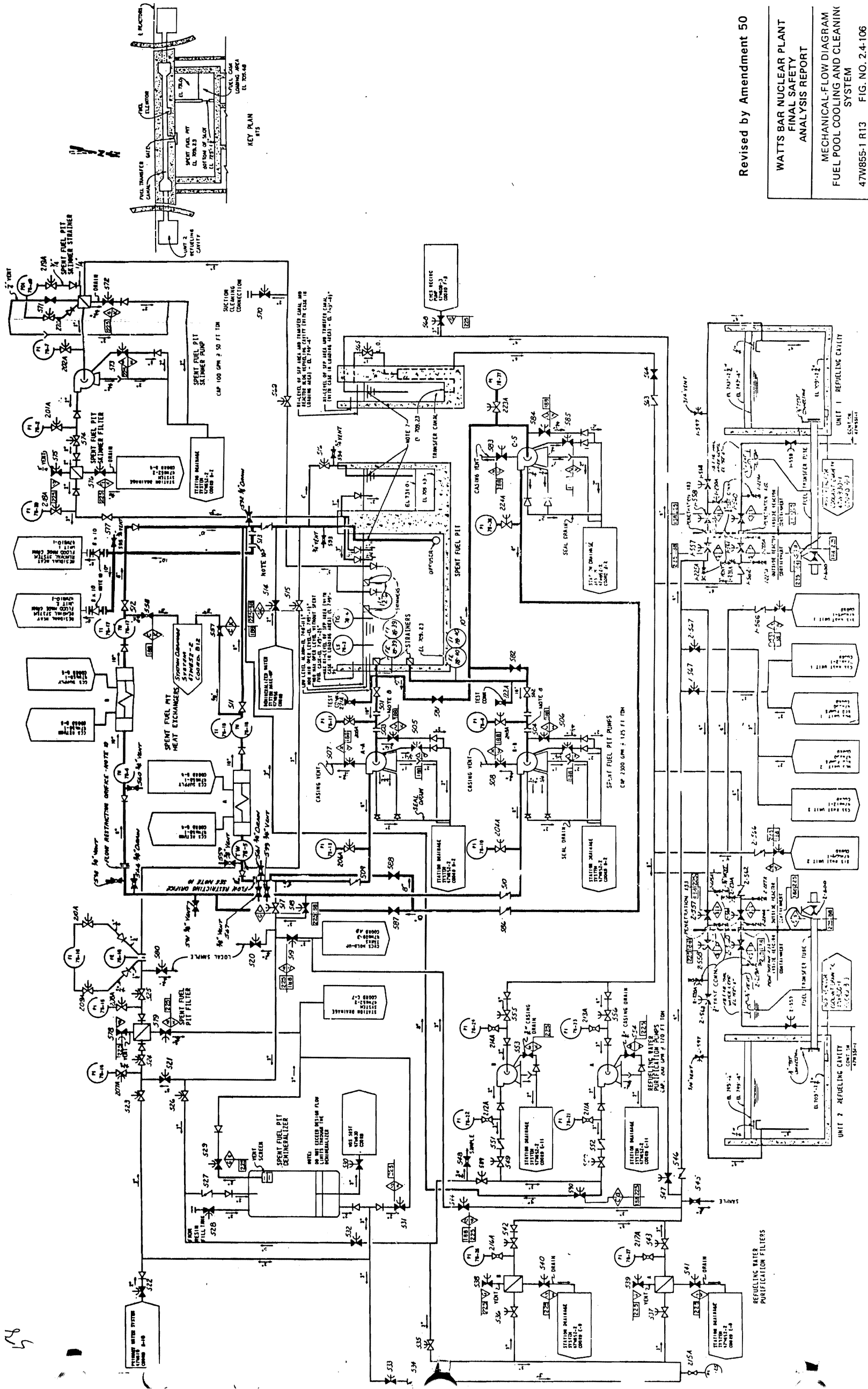
Revised by Amendment 50

WATTS BAR NUCLEAR PLANT
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GENERALIZED WATER-TABLE
CONTOUR MAP

Figure 2.4-105

Figure 2.4-105 Generalized Water-Table Contour Map January 1972



Revised by Amendment 50

WATTS BAR NUCLEAR PLANT
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MECHANICAL-FLOW DIAGRAM
FUEL POOL COOLING AND CLEANING
SYSTEM

47WB55-1 R13 FIG. NO. 2.4-106

Figure 2.4-106 Mechanical - Flow Diagram Fuel Pool Cooling and Cleaning System

DESIGN PRESSURE & TEMPERATURE DATA		
Line Design No.	Pressure (PSI)	Design Temperature (°F)
1	100	450
2	100	400
3	100	100

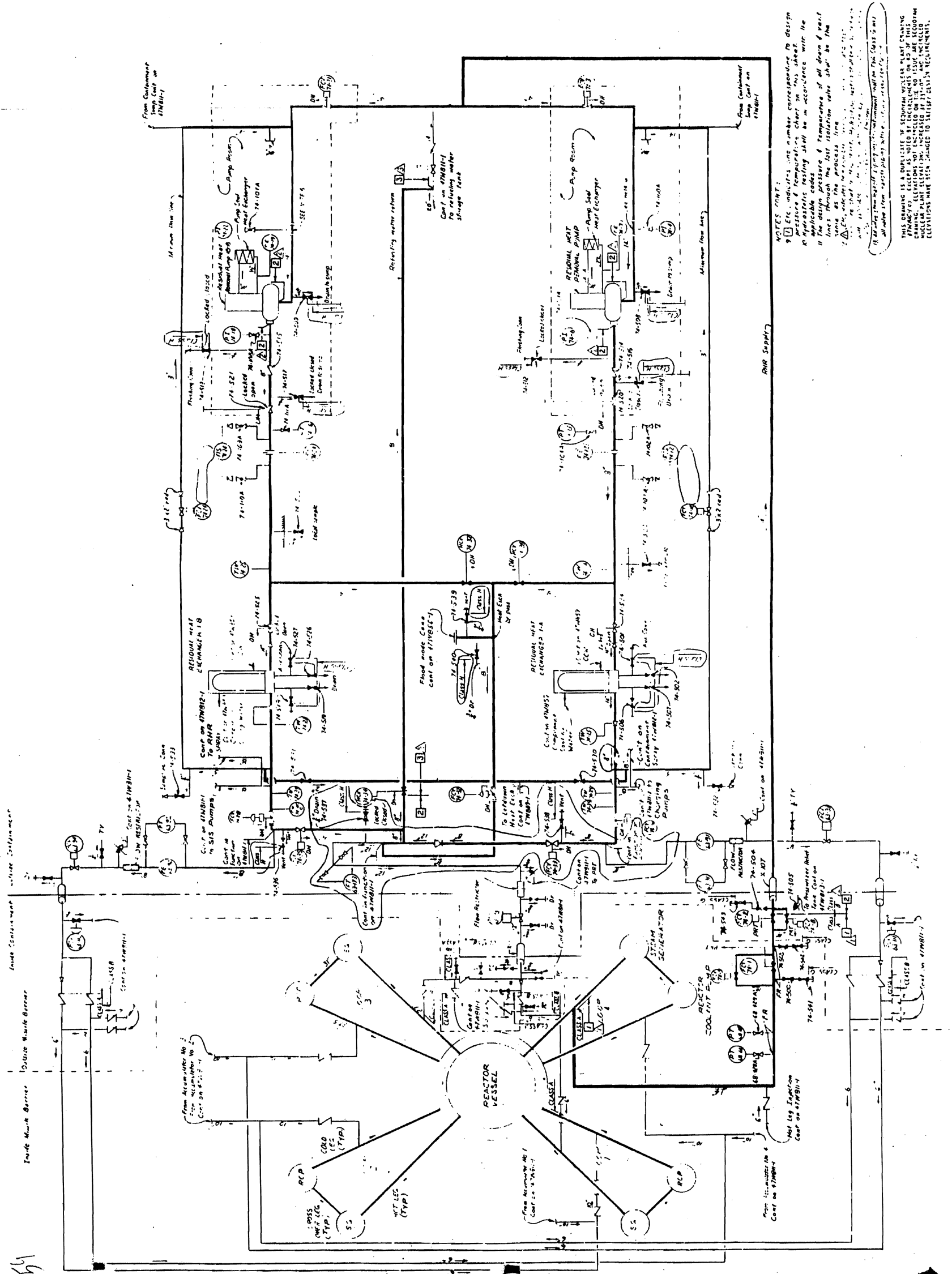
THIS DRAWING IS A DUAL COPY OF THE ORIGINAL DRAWING. THE ORIGINAL DRAWING IS FILED IN THE PROJECT FILES. THE DUAL COPY IS FILED IN THE PROJECT FILES.

- NOTES:
1. ALL SYSTEMS ARE TO BE DESIGNED TO WITHSTAND THE DESIGN PRESSURE AND TEMPERATURE DATA SHOWN IN THE TABLE ABOVE.
 2. ALL SYSTEMS ARE TO BE DESIGNED TO WITHSTAND THE DESIGN PRESSURE AND TEMPERATURE DATA SHOWN IN THE TABLE ABOVE.
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 9. ALL SYSTEMS ARE TO BE DESIGNED TO WITHSTAND THE DESIGN PRESSURE AND TEMPERATURE DATA SHOWN IN THE TABLE ABOVE.

REFERENCE DRAWING:
 1. WATTS BAR NUCLEAR PLANT SAFETY ANALYSIS REPORT
 2. WATTS BAR NUCLEAR PLANT SAFETY ANALYSIS REPORT
 3. WATTS BAR NUCLEAR PLANT SAFETY ANALYSIS REPORT
 4. WATTS BAR NUCLEAR PLANT SAFETY ANALYSIS REPORT
 5. WATTS BAR NUCLEAR PLANT SAFETY ANALYSIS REPORT
 6. WATTS BAR NUCLEAR PLANT SAFETY ANALYSIS REPORT
 7. WATTS BAR NUCLEAR PLANT SAFETY ANALYSIS REPORT
 8. WATTS BAR NUCLEAR PLANT SAFETY ANALYSIS REPORT
 9. WATTS BAR NUCLEAR PLANT SAFETY ANALYSIS REPORT

Revised by Amendment

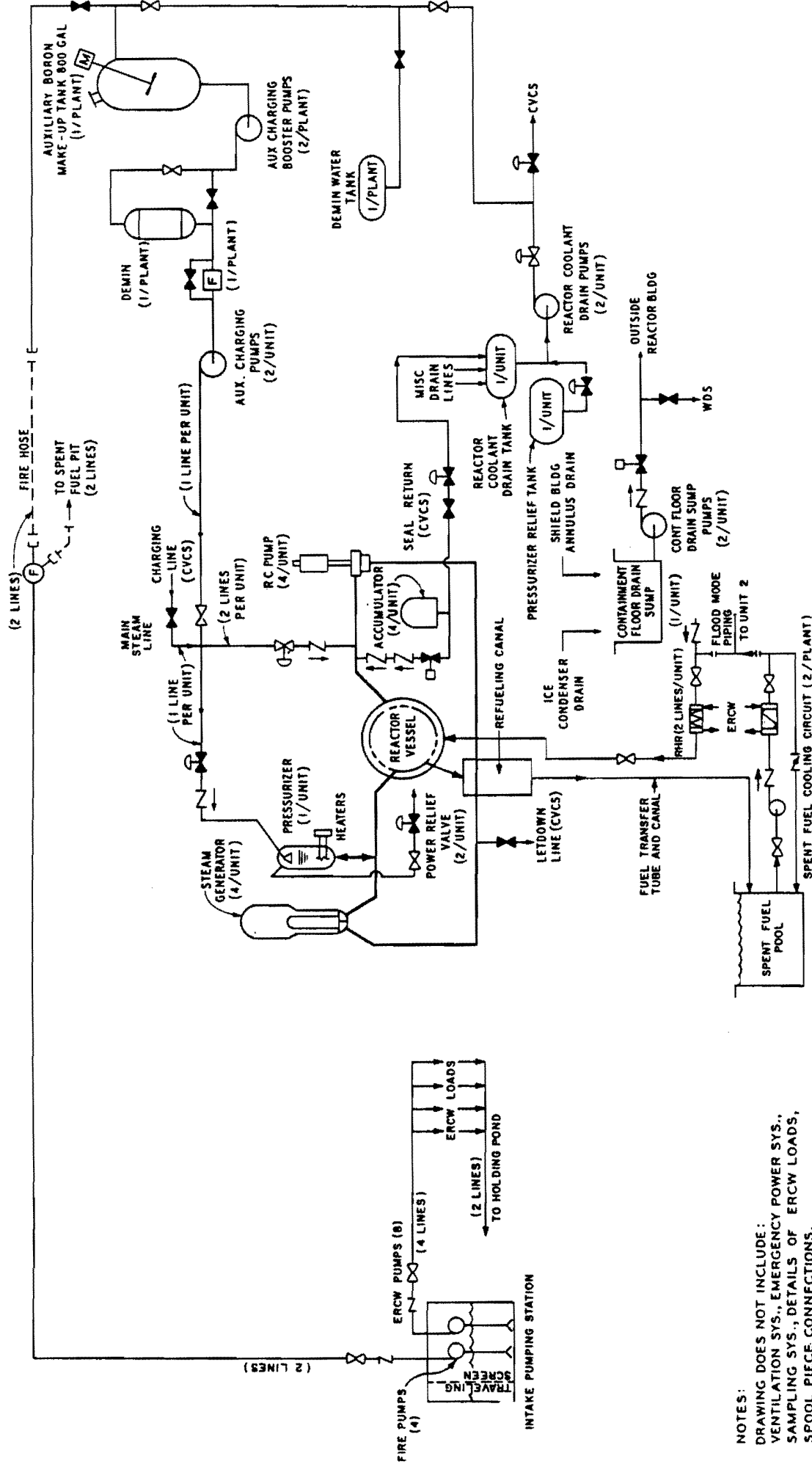
WATTS BAR NUCLEAR PLANT SAFETY ANALYSIS REPORT
 POWERHOUSE UNITS 1 & 2
 RESIDUAL HEAT REMOVAL SYSTEM
 TVA DWG NO. 47W610-1 R16
 FIGURE 2.4-107



NOTES CONT:

1. ALL SYSTEMS ARE TO BE DESIGNED TO WITHSTAND THE DESIGN PRESSURE AND TEMPERATURE DATA SHOWN IN THE TABLE ABOVE.
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9. ALL SYSTEMS ARE TO BE DESIGNED TO WITHSTAND THE DESIGN PRESSURE AND TEMPERATURE DATA SHOWN IN THE TABLE ABOVE.

Figure 2.4-107 Powerhouse Units 1 & 2 Flow Diagram - Residual Heat Removal System

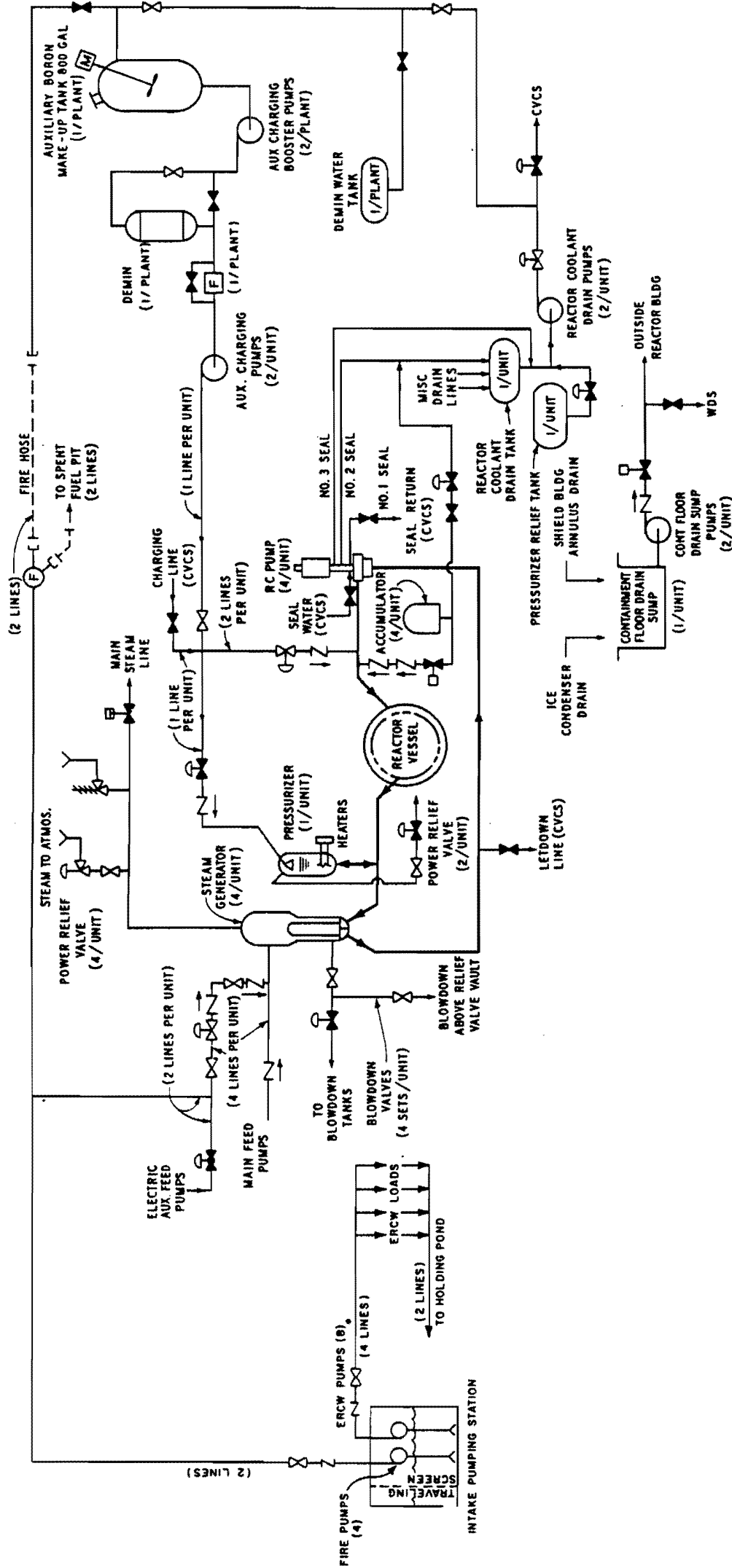


NOTES:
 DRAWING DOES NOT INCLUDE:
 VENTILATION SYS., EMERGENCY POWER SYS.,
 SAMPLING SYS., DETAILS OF ERCW LOADS,
 SPOOL PIECE CONNECTIONS.

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SCHEMATIC FLOW DIAGRAM
 FLOOD PROTECTION PROVISIONS
 OPEN REACTOR COOLING
 (unit 1 shown, unit 2 similar)
 Figure 2.4-108

Figure 2.4-108 Schematic Flow Diagram Flood Protection Provisions Open Reactor Cooling (Unit 1 Shown, Unit 2 Similar)

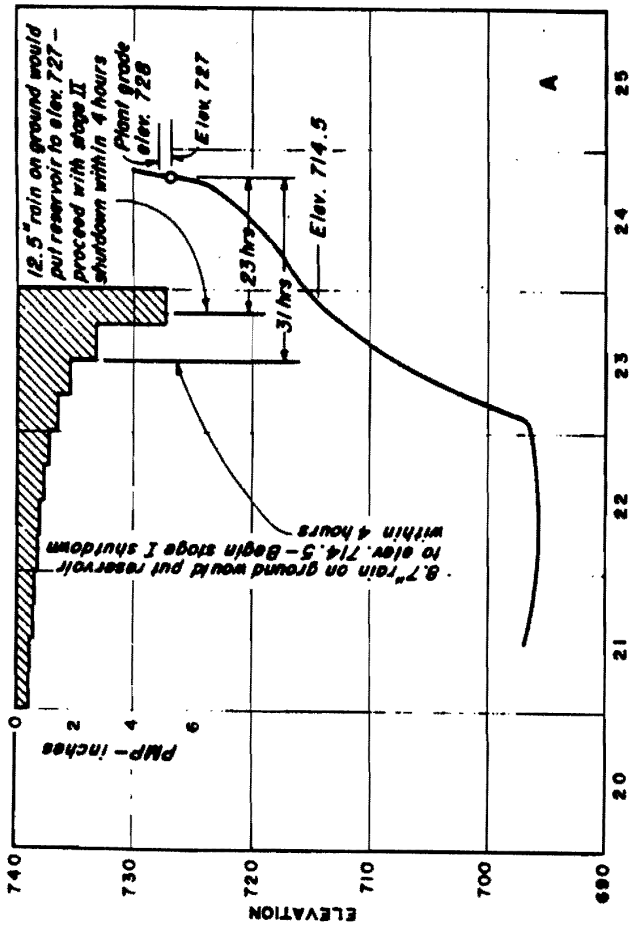
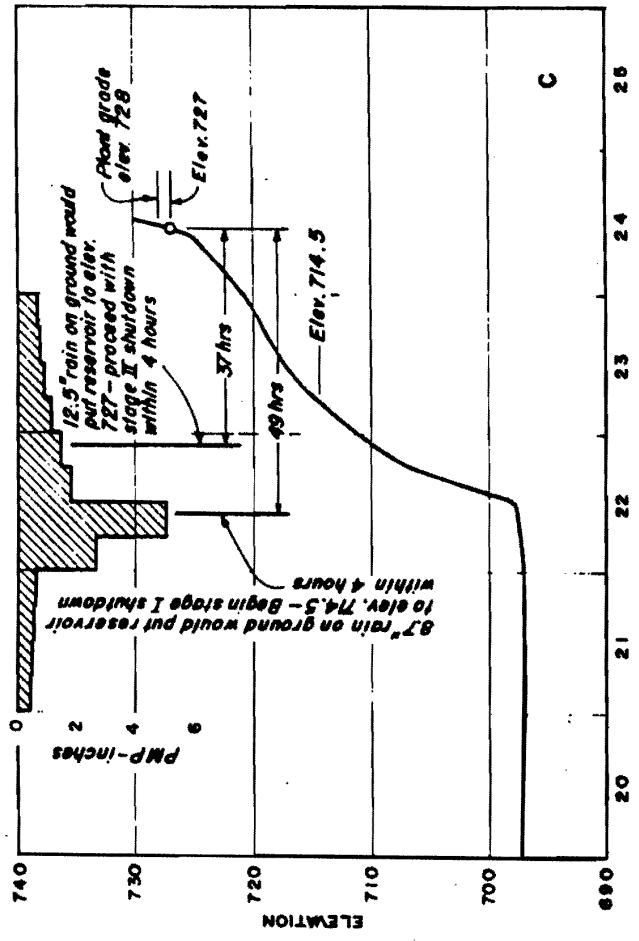


NOTES:
 DRAWING DOES NOT INCLUDE:
 VENTILATION SYS., EMERGENCY POWER SYS.,
 SAMPLING SYS., DETAILS OF ERCW LOADS,
 SPOOL PIECE CONNECTIONS.

WATTS BAR NUCLEAR PLANT
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SCHEMATIC FLOW DIAGRAM
 FLOOD PROTECTION PROVISIONS
 NATURAL CONVECTION COOLING
 (unit 1 shown, unit 2 similar)
 Figure 2.4-109

Figure 2.4-109 Schematic Flow Diagram Flood Protection Provisions Natural Convection Cooling (Unit 1 Shown, Unit 2 Similar)



NOTE: Times shown allow 4 hours for communications and forecast computation.

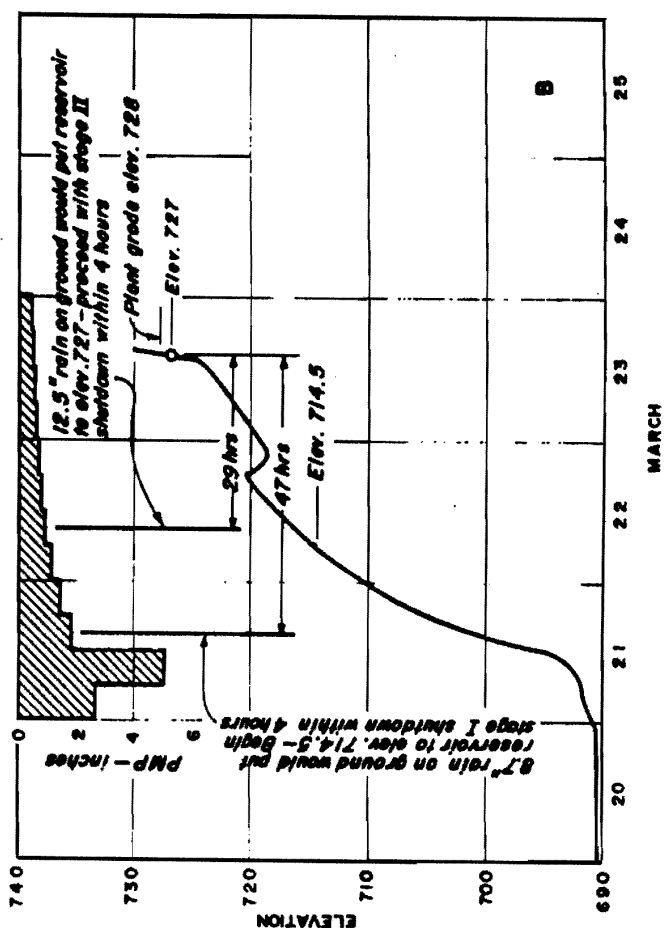
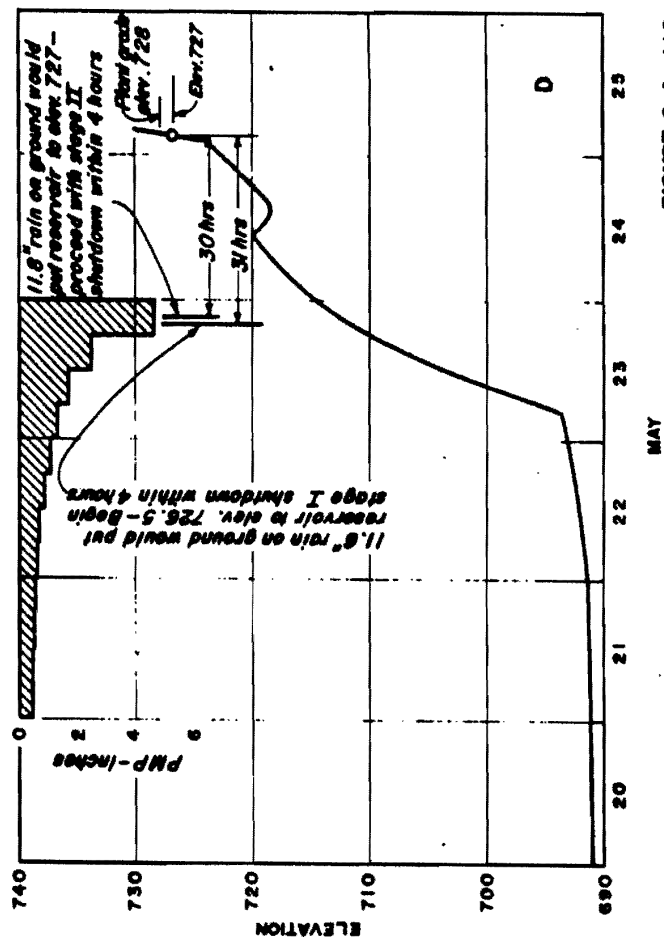
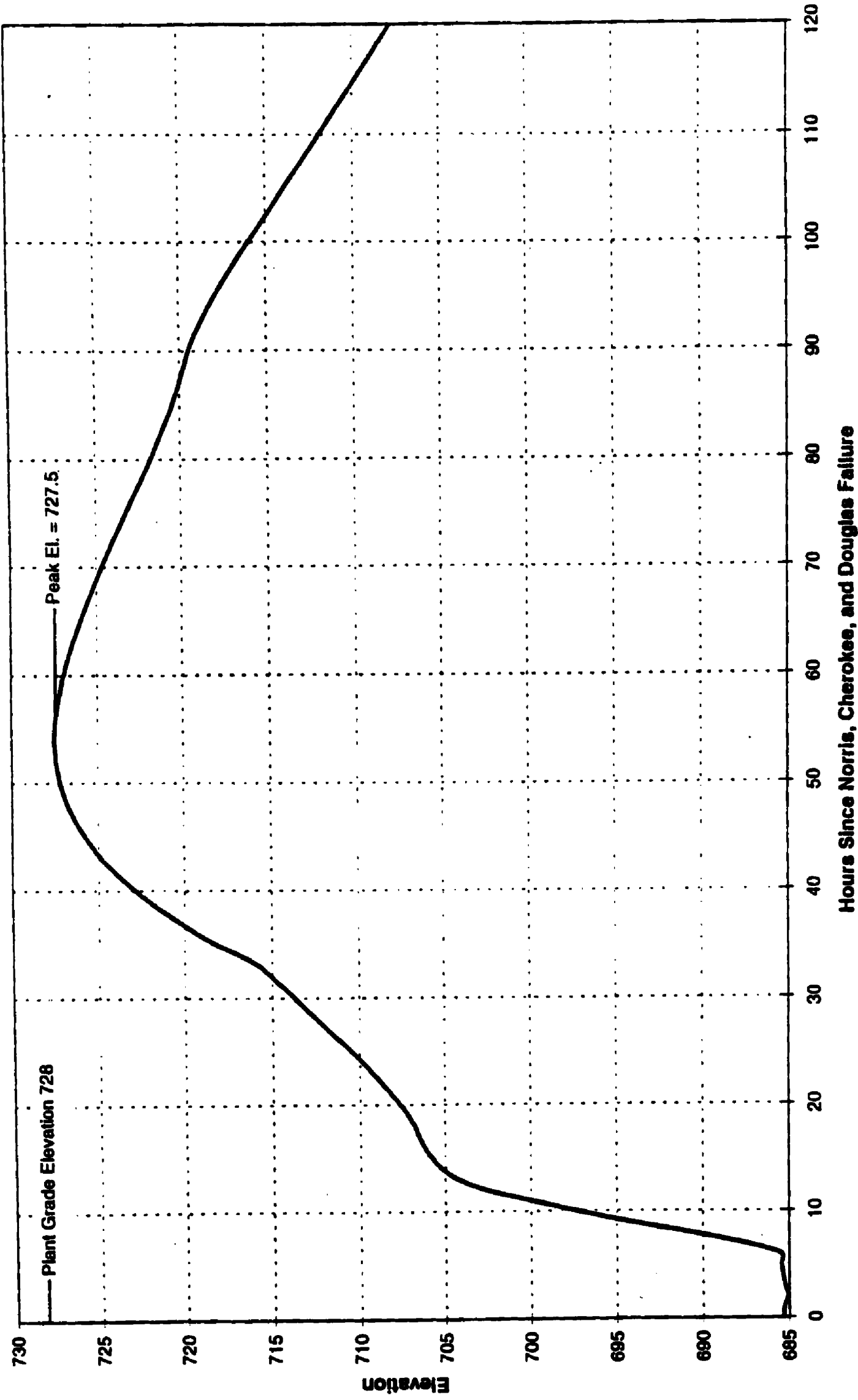


FIGURE 2.4-110

WATTS BAR NUCLEAR PLANT RAINFALL FLOOD PROTECTION PLAN Added by Amendment 32
BASIS FOR SAFE SHUTDOWN FOR PLANT FLOODING

Figure 2.4-110 Watts Bar Nuclear Plant Rainfall Flood Protection Plan Basis For Safe Shutdown For Plant Flooding



**Seismic Flood Analysis - Norris, Cherokee and Douglas SSE with 25-year Flood
Watts Bar Plant
Figure 2.4 - 111**

FSAR - Amendment 92

Figure 2.4-111 Douglas PMF Failure Wave at Watts Bar Plant