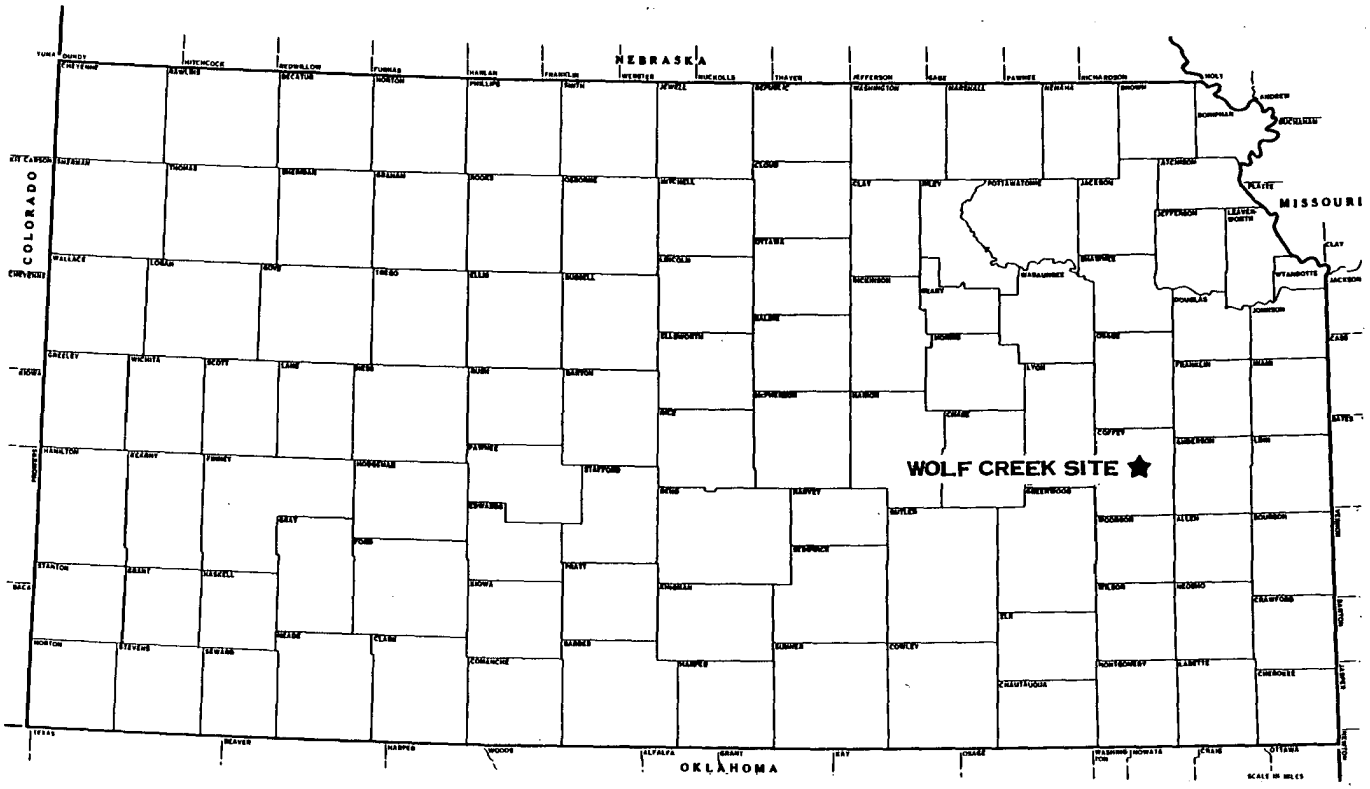
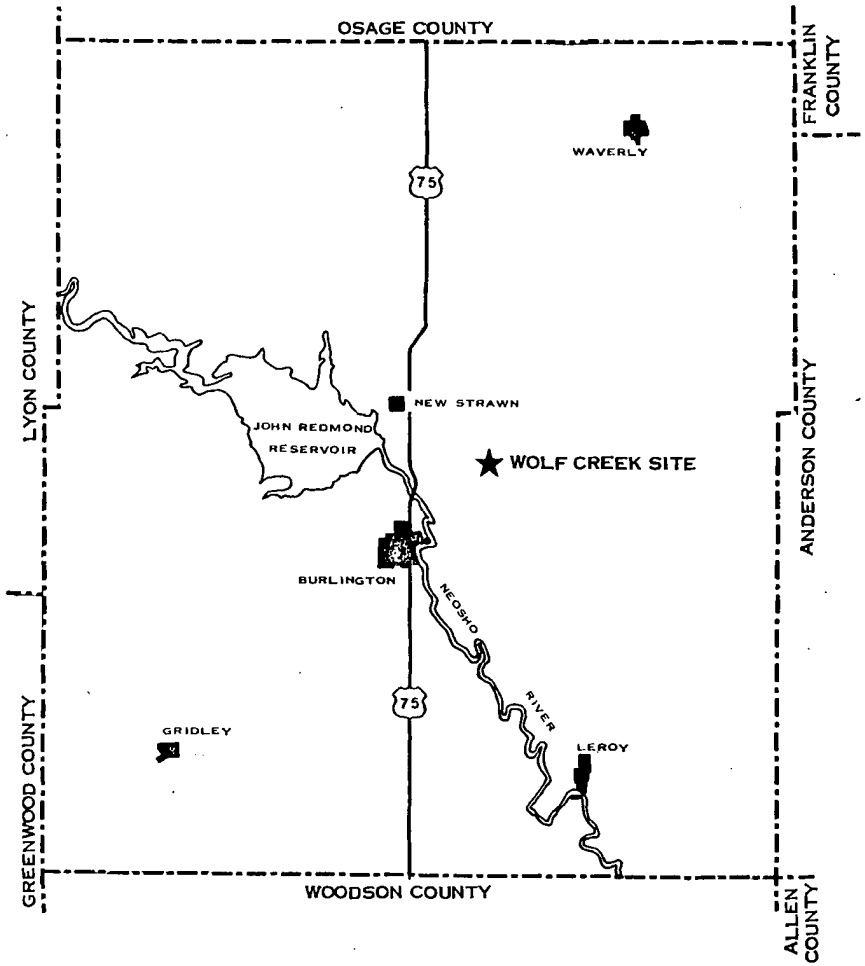


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.1-1

Location of Site within the State of Kansas



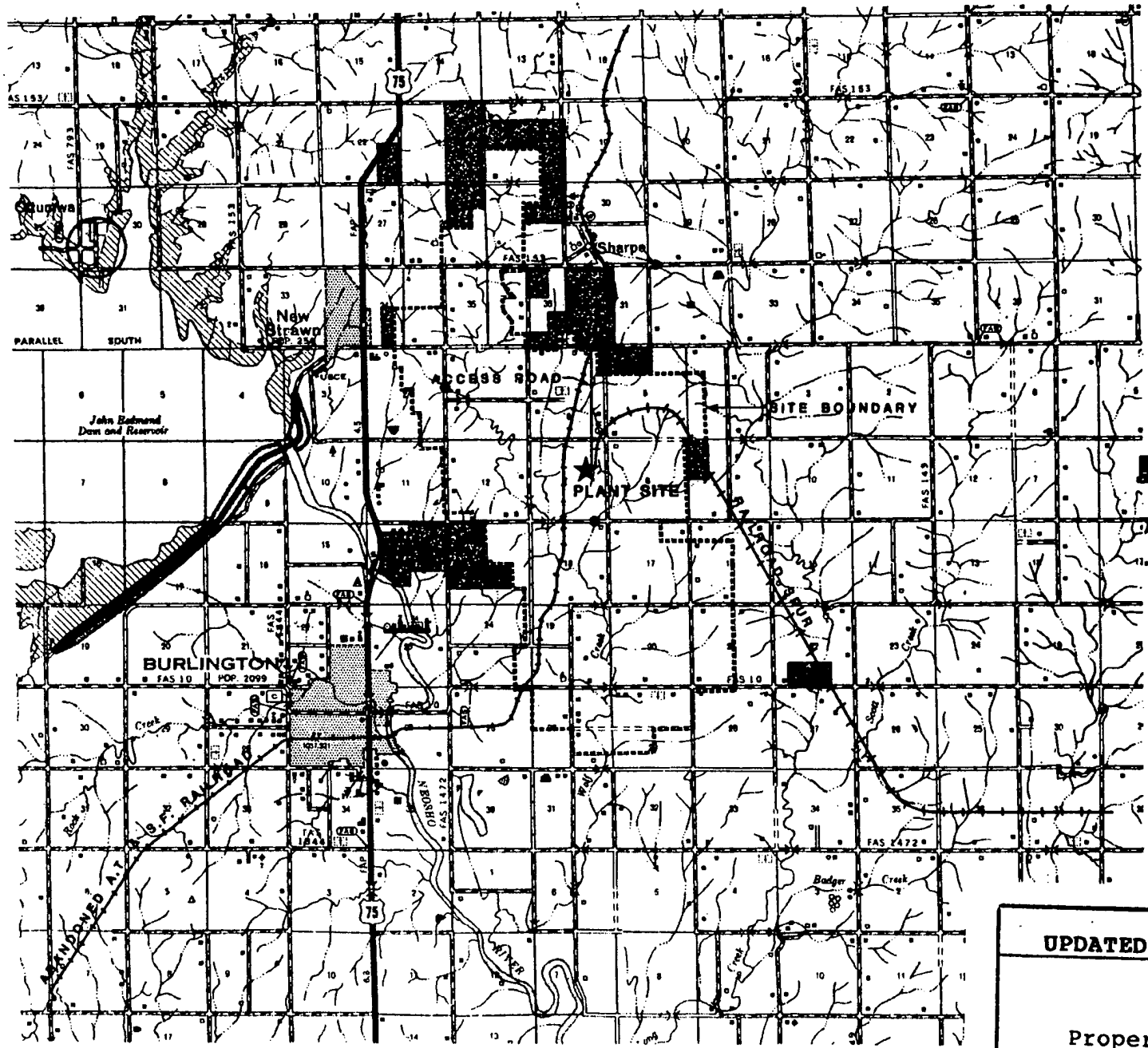


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.1-2

Location of Site within Coffey County

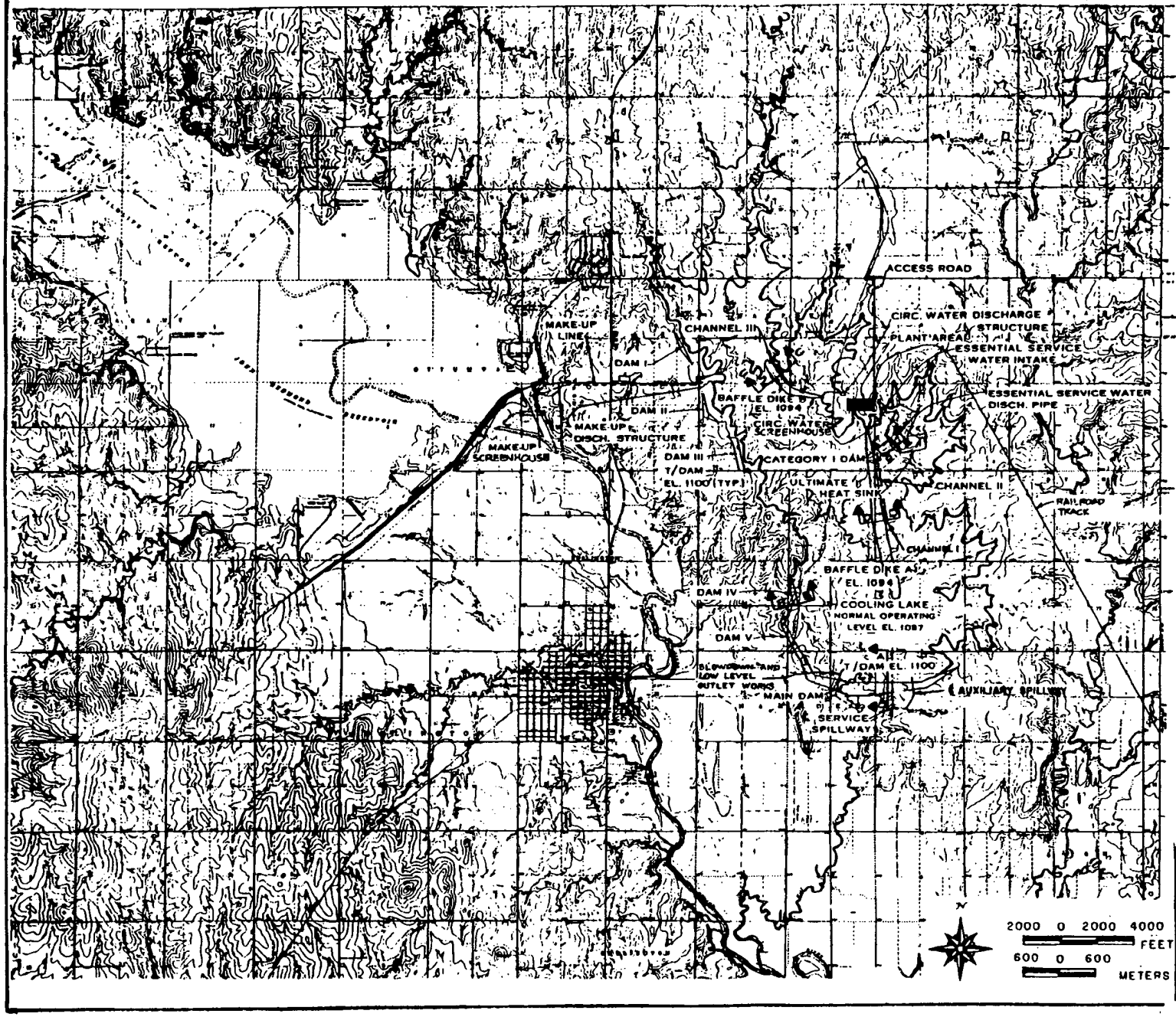


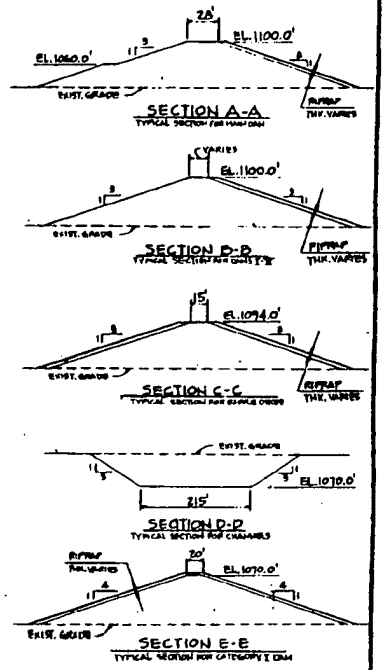
Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.1-3

Property Owned By Applicant





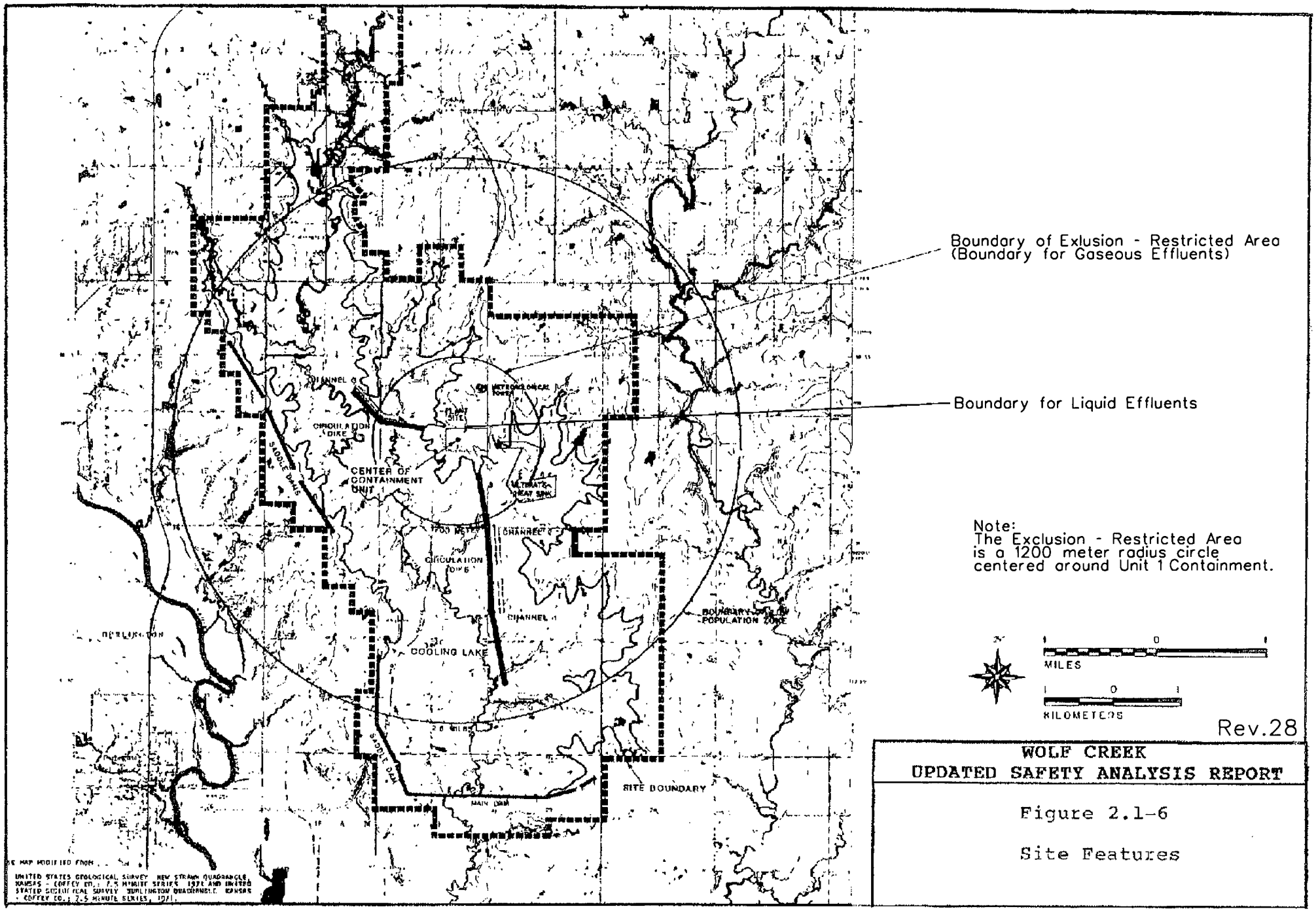
ITEM	APPROX. LENGTH	WIDTH	SIDE SLOPE
MAIN DAM	12260'	28'	3:1
DAM I	1740'	12'	3:1
DAM II	3020'	12'	3:1
DAM III	2450'	12'	3:1
DAM IV	2470'	20'	3:1
DAM V	445'	12'	3:1
BAFFLE DIKE 'A'	10410'	15'	3:1
BAFFLE DIKE 'B'	4570'	15'	3:1
CHANNEL #1	4800'	215'	3:1
CHANNEL #2	3230'	215'	3:1
CHANNEL #3	4700'	215'	3:1
CATEGORY I DAM	1500'	20'	4:1

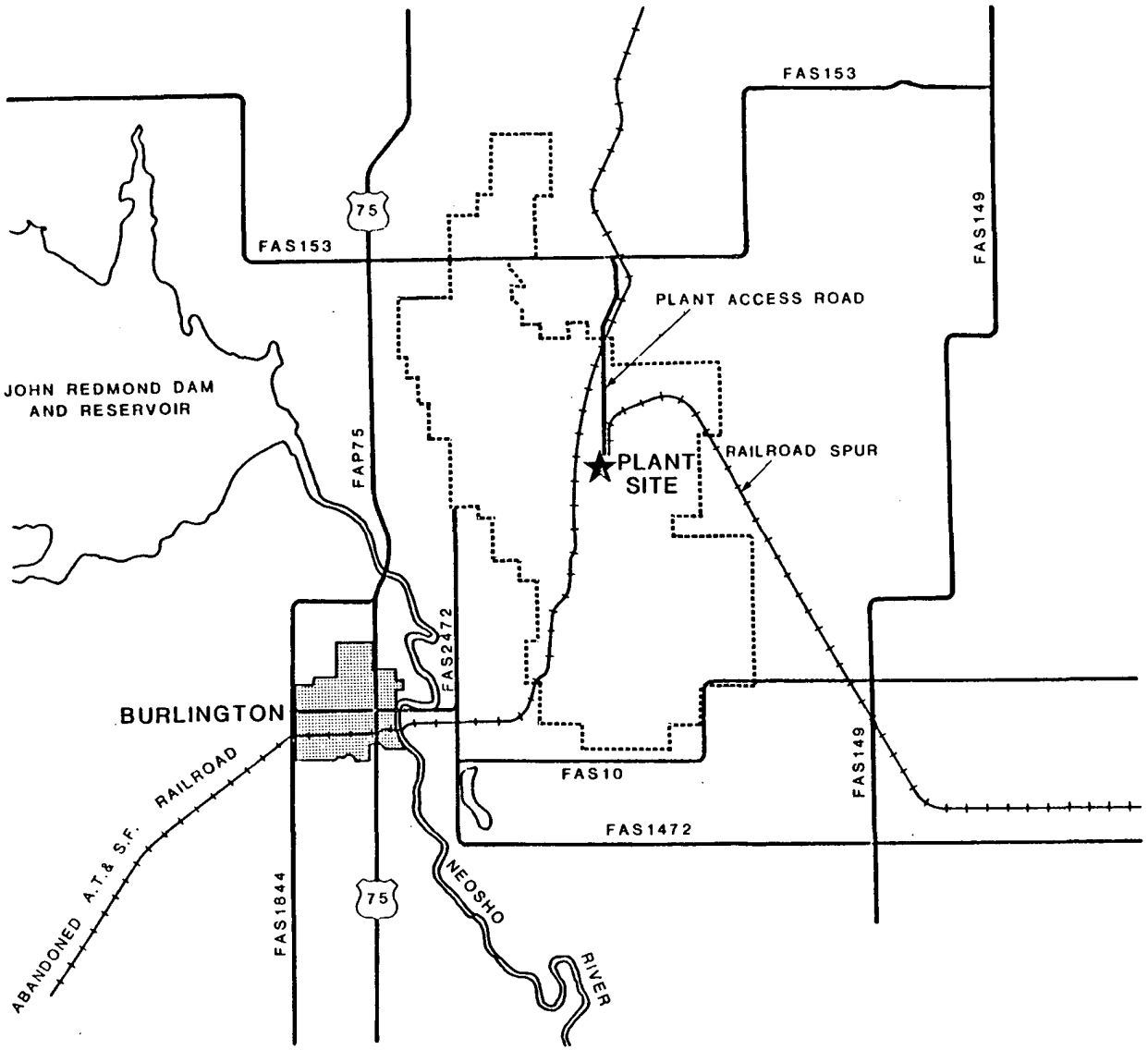
Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.1-5

Layout of Dams, Dikes, Spillways, and Outlet Work


Boundary of Exlusion - Restricted Area
(Boundary for Gaseous Effluents)
Boundary for Liquid Effluents
Note:
The Exclusion - Restricted Area
is a 1200 meter radius circle
centered around Unit 1 Containment.
CENTER OF CONTAINMENT UNIT
CIRCULATION DIKE
SADDLE DAMS
CHANNEL C
CHANNEL D
COOLING LAKE
SITE BOUNDARY
MAIN DAM
MILES
KILOMETERS
Rev.28
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT
Figure 2.1-6
Site Features



1 0 1 2 3
MILES

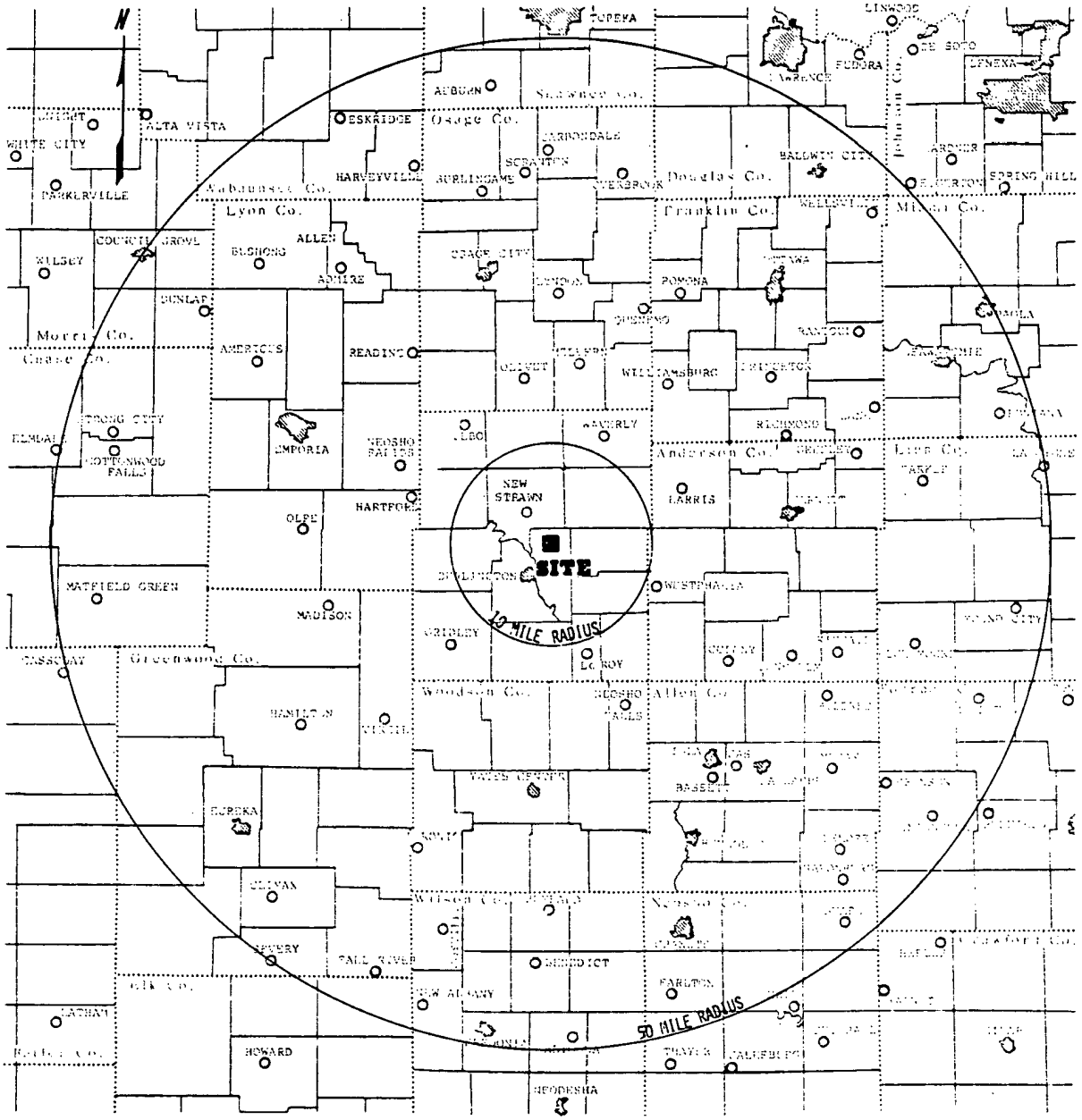
1 0 1 2 3
KILOMETERS

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.1-7

Transportation Network near the Site



STATUTE MILES

10 0 10 20

Rev. 0

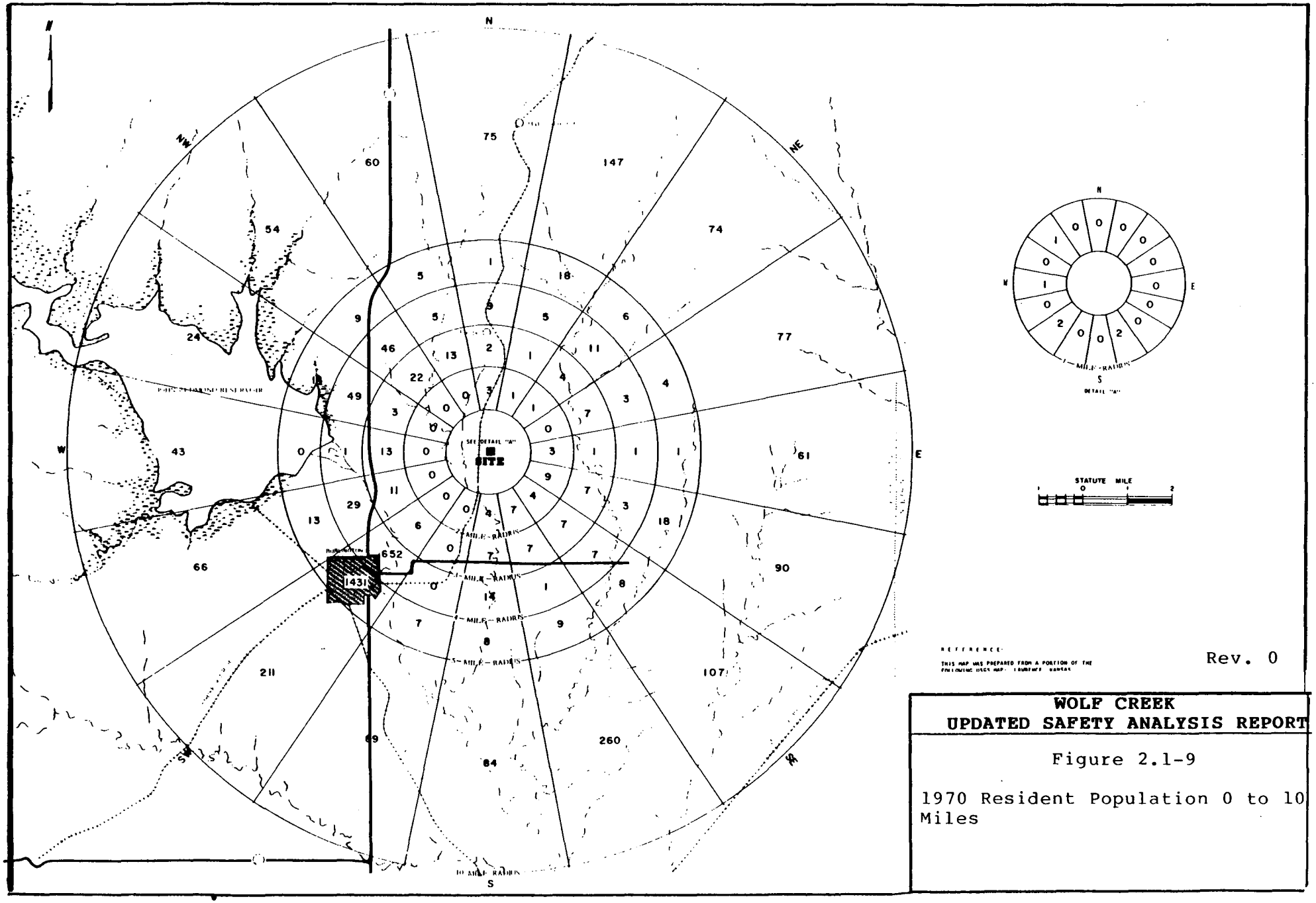
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.1-8

Cities and Towns within 50 Miles of the Site

REFERENCE:

BUREAU OF CENSUS, CIVIL DIVISION
MAP OF KANSAS, 1970

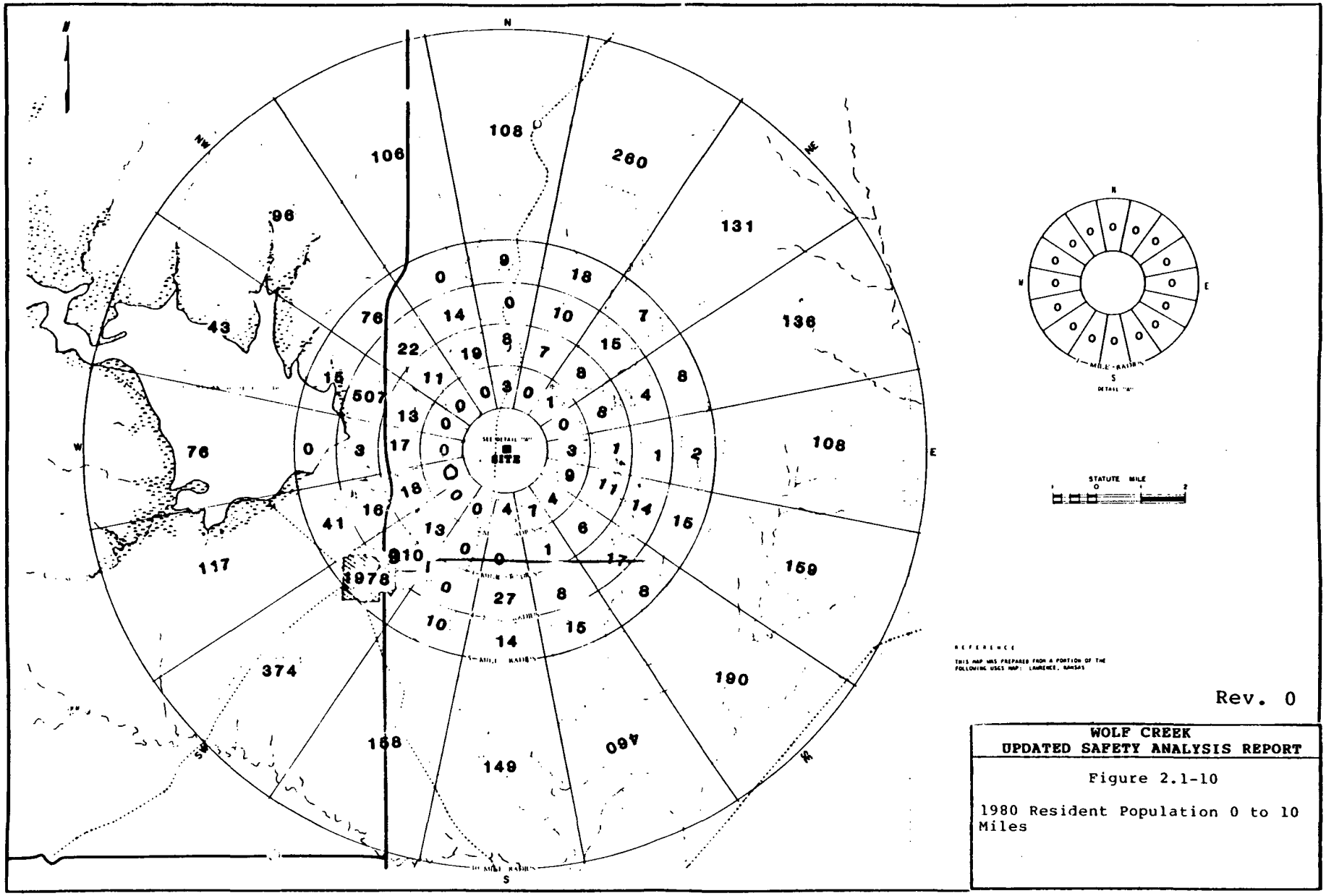


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.1-9

1970 Resident Population 0 to 10 Miles

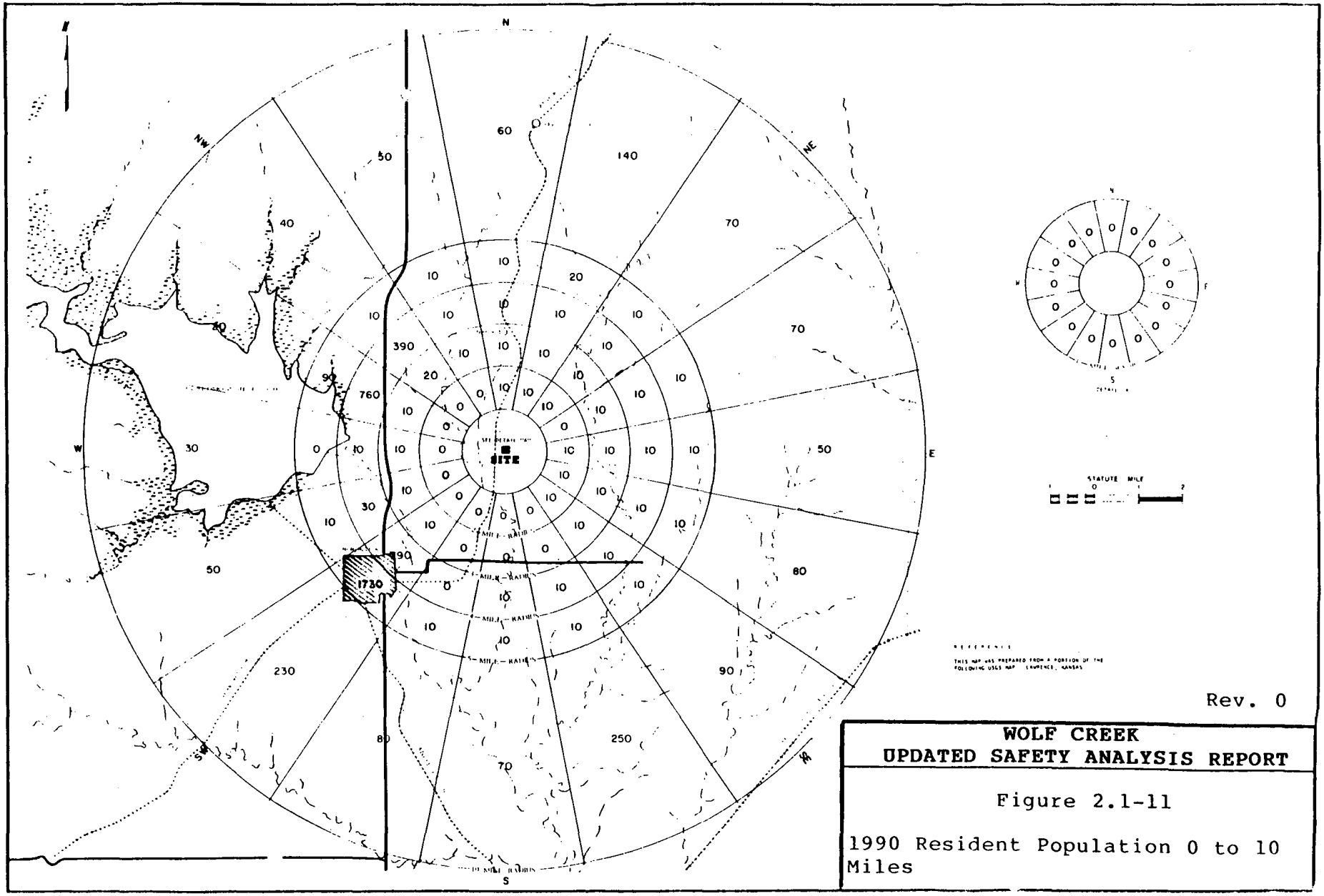


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.1-10

1980 Resident Population 0 to 10 Miles

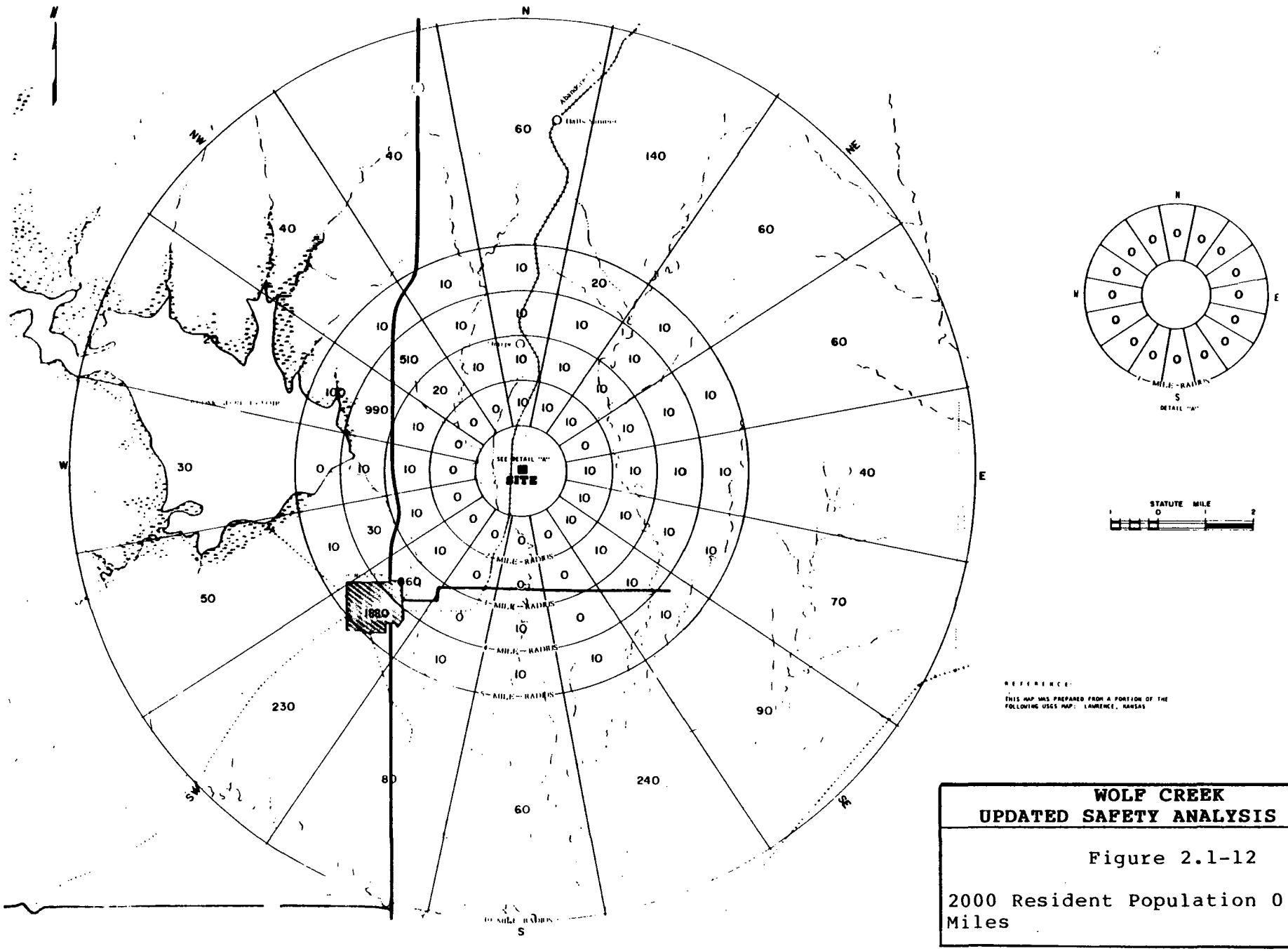


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.1-11

1990 Resident Population 0 to 10 Miles

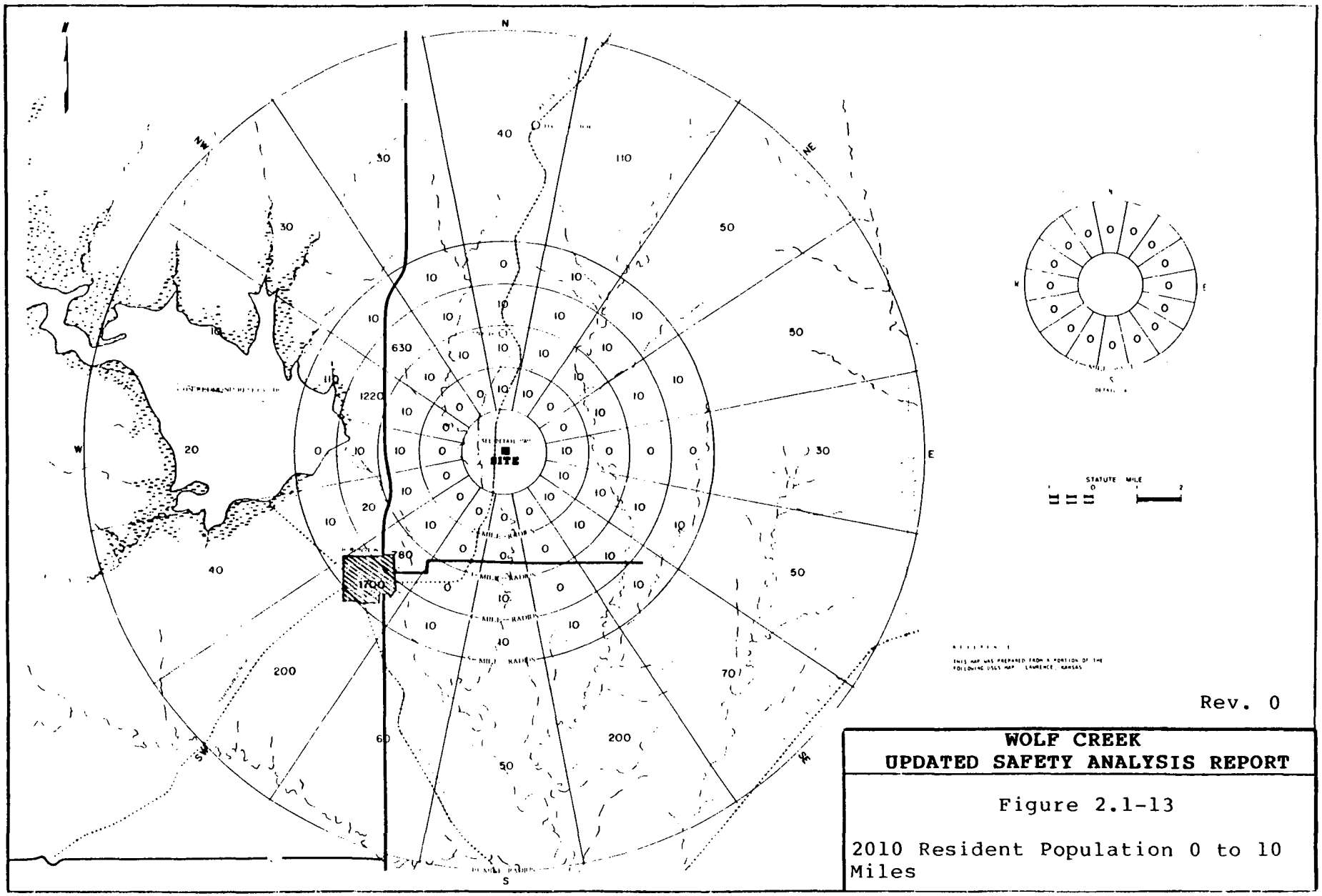


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.1-12

2000 Resident Population 0 to 10 Miles

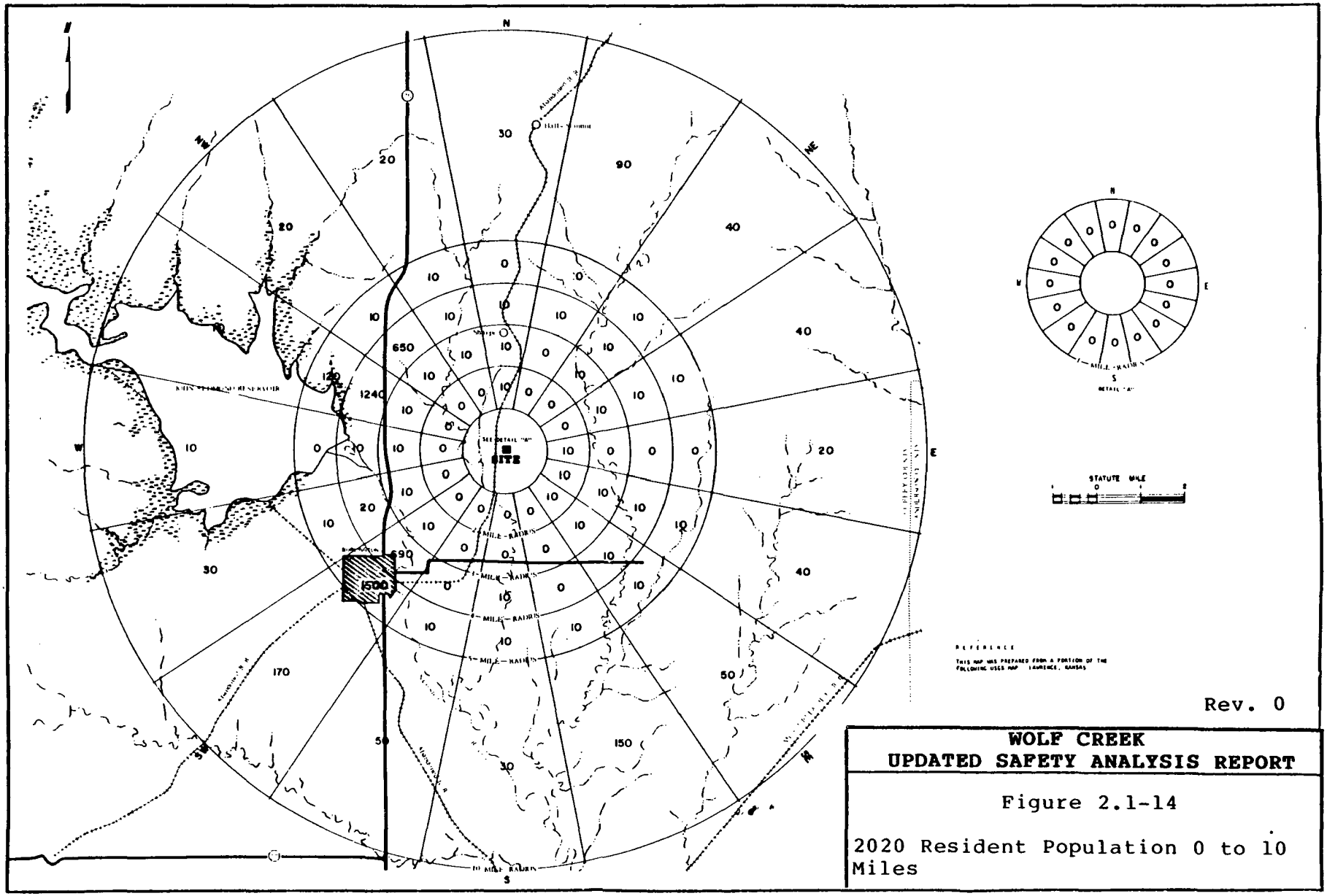


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.1-13

2010 Resident Population 0 to 10 Miles

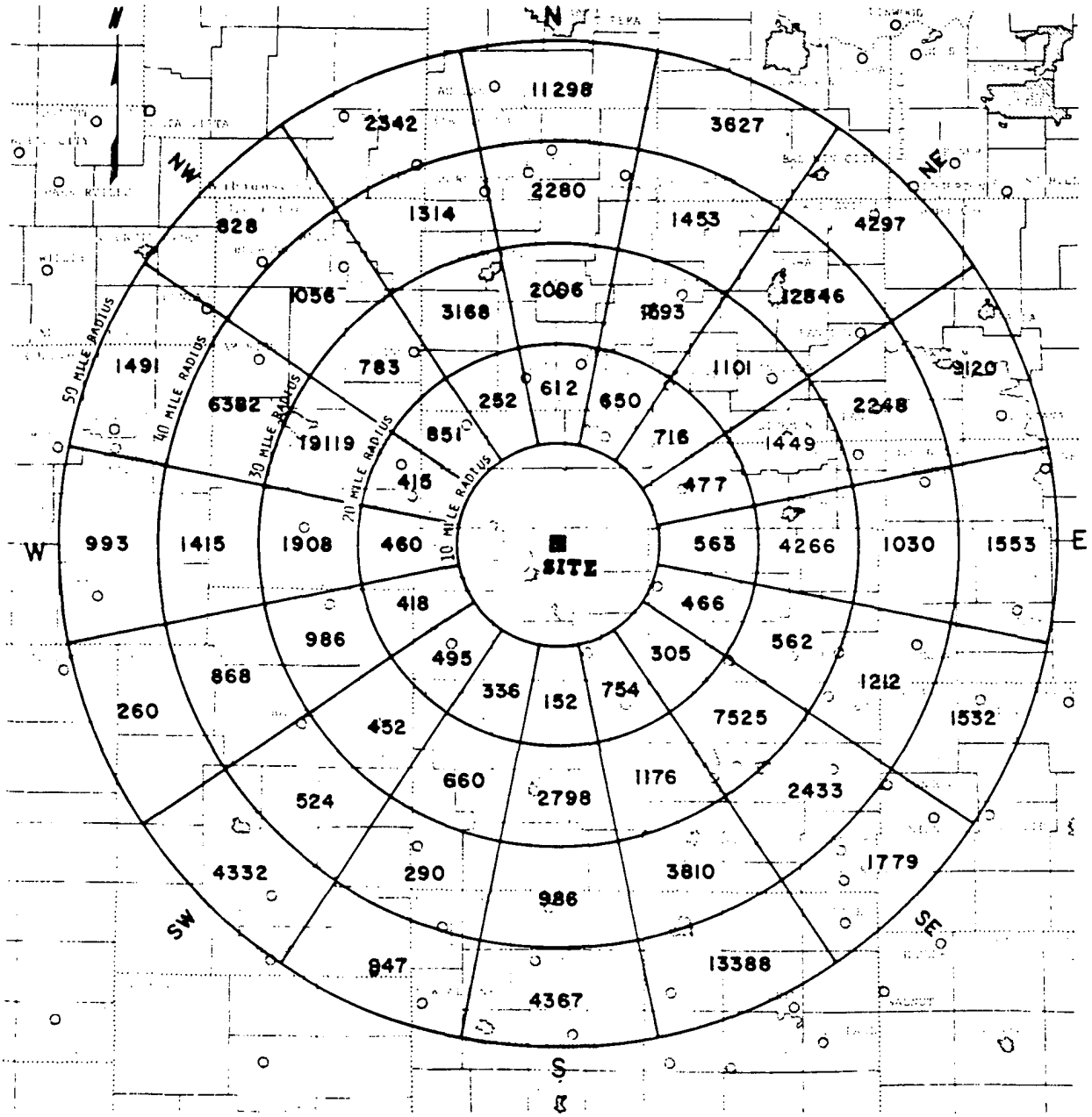


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.1-14

2020 Resident Population 0 to 10 Miles



STATUTE MILES

10 0 10 20

REFERENCE

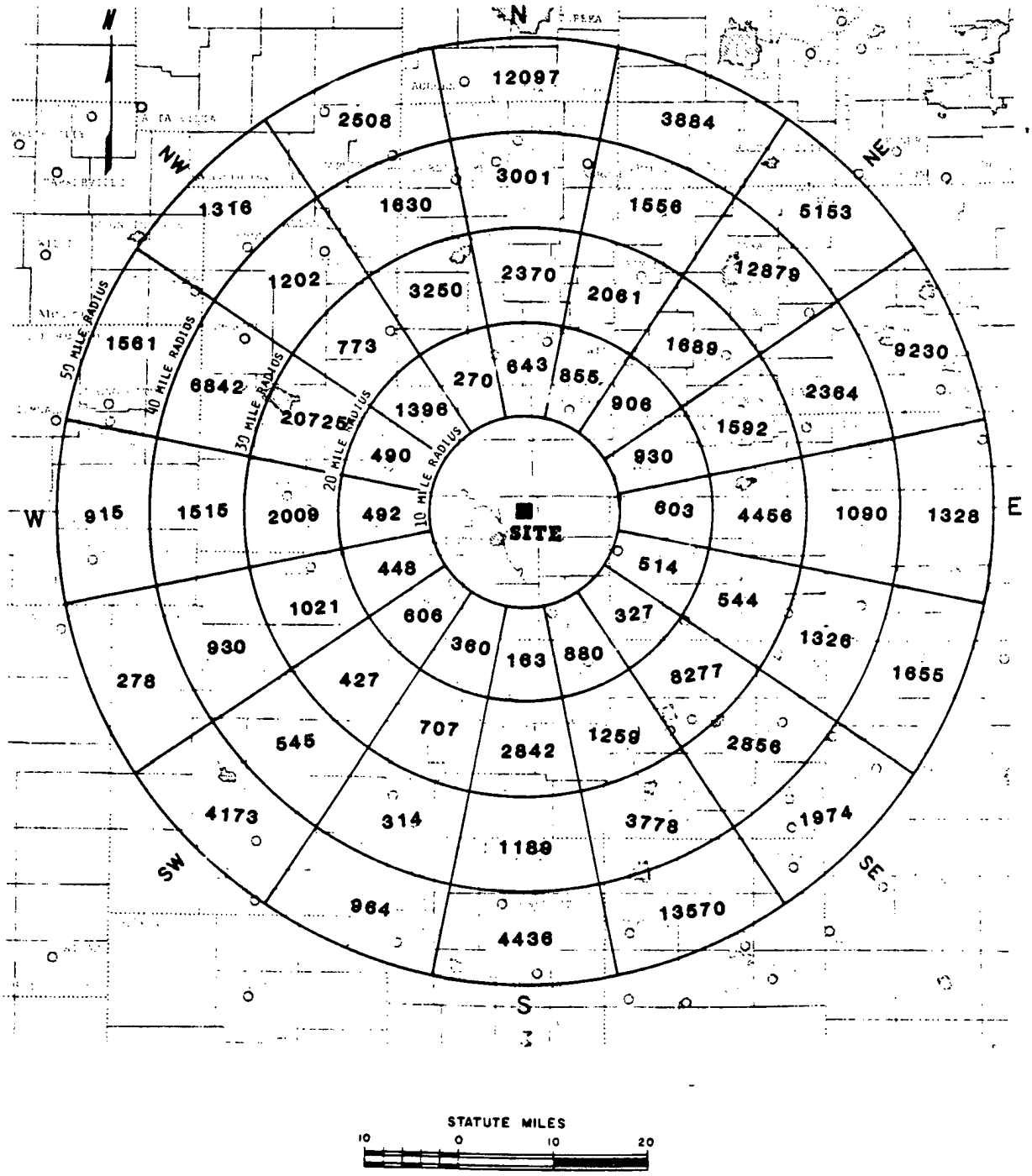
BUREAU OF CENSUS, CIVIL DIVISION
MAP OF KANSAS, 1970

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.1-15

1970 Resident Population 10 to 50 Miles



Rev. 0

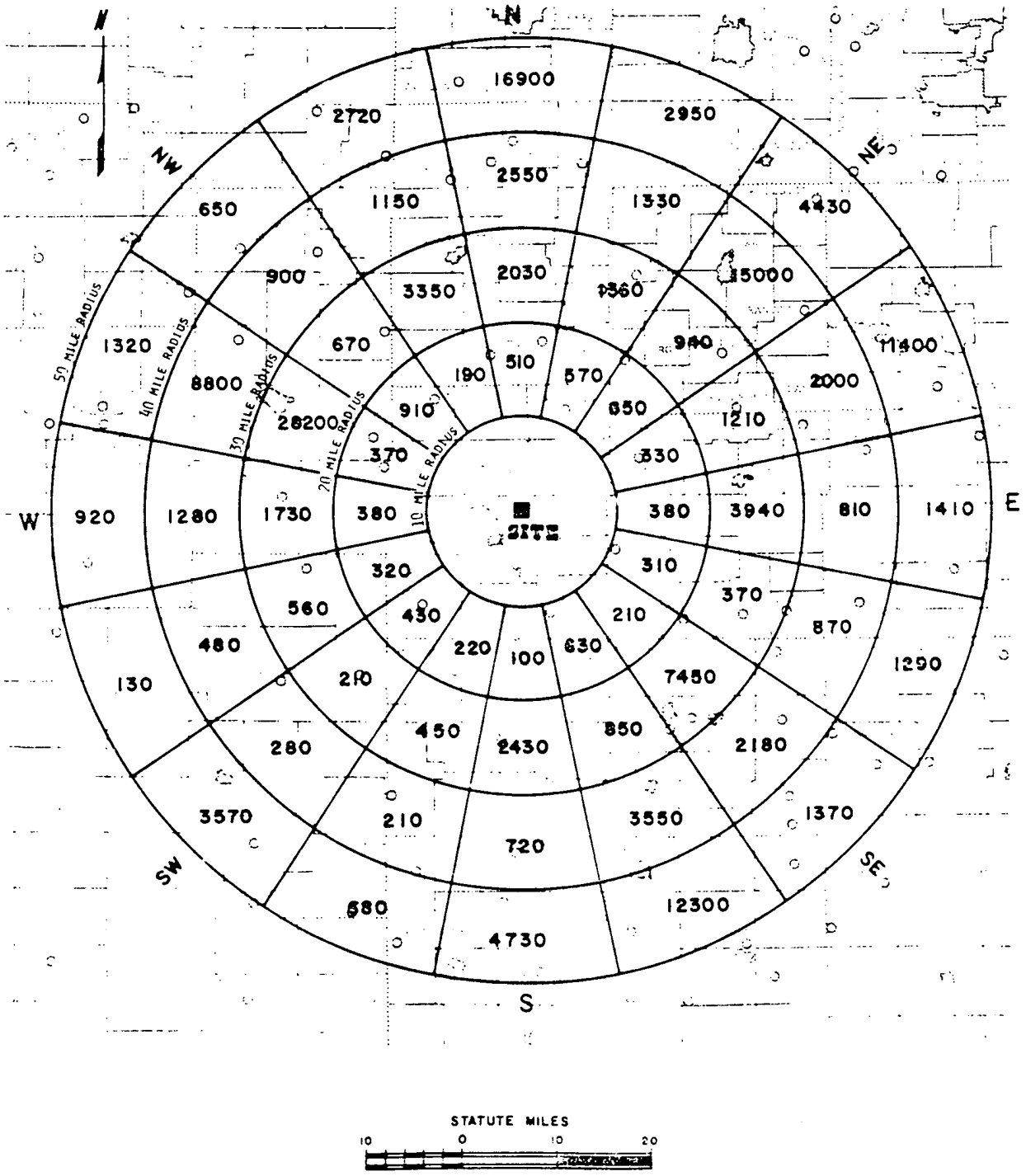
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.1-16

1980 Resident Population 10 to 50 Miles

REFERENCE:

BUREAU OF CENSUS, CIVIL DIVISION
MAP OF KANSAS, 1970



Rev. 0

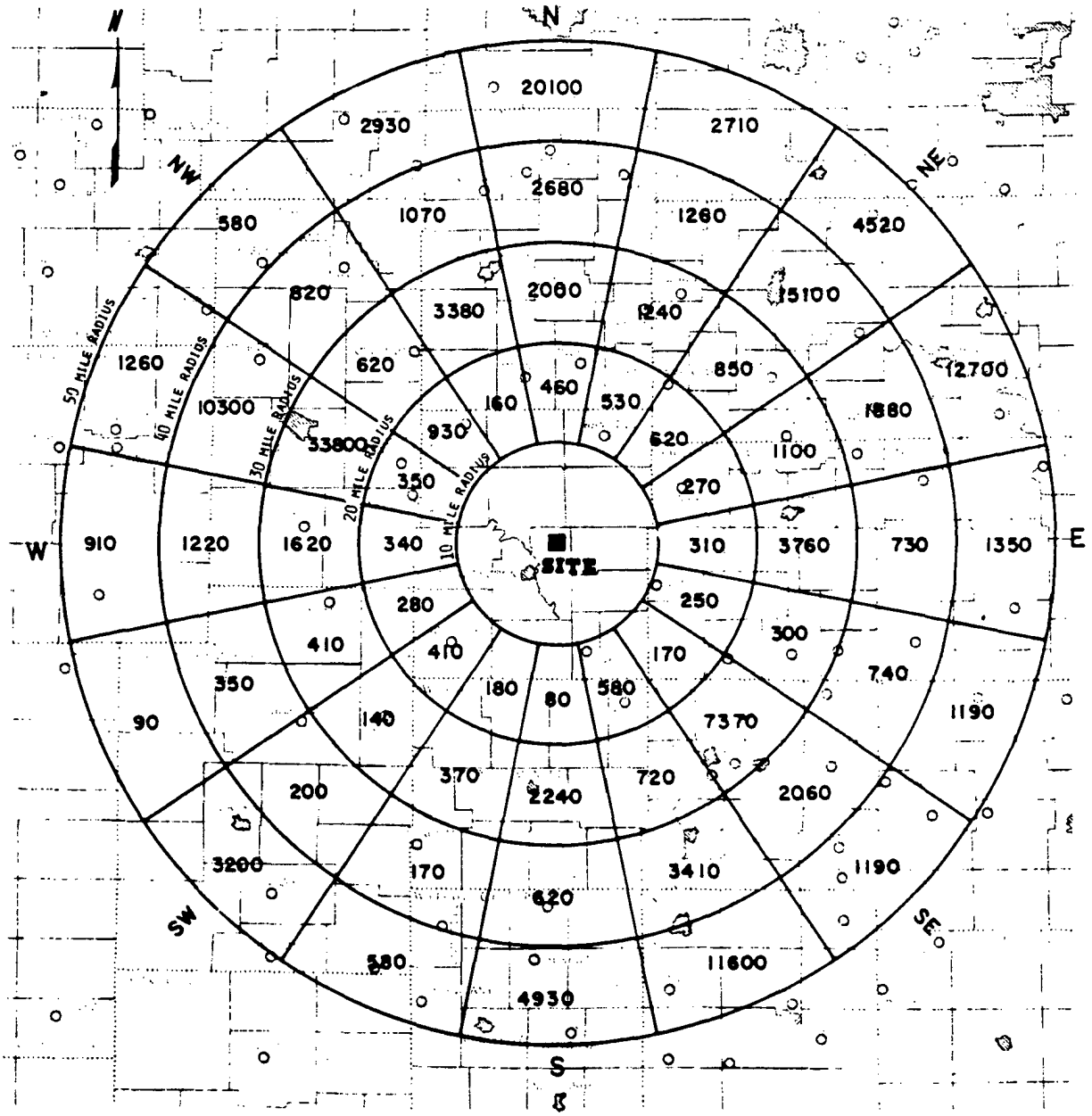
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.1-17

1990 Resident Population 10 to 50 Miles

REFERENCE

BUREAU OF CENSUS, CIVIL DIVISION
MAP OF KANSAS, 1970



Rev. 0

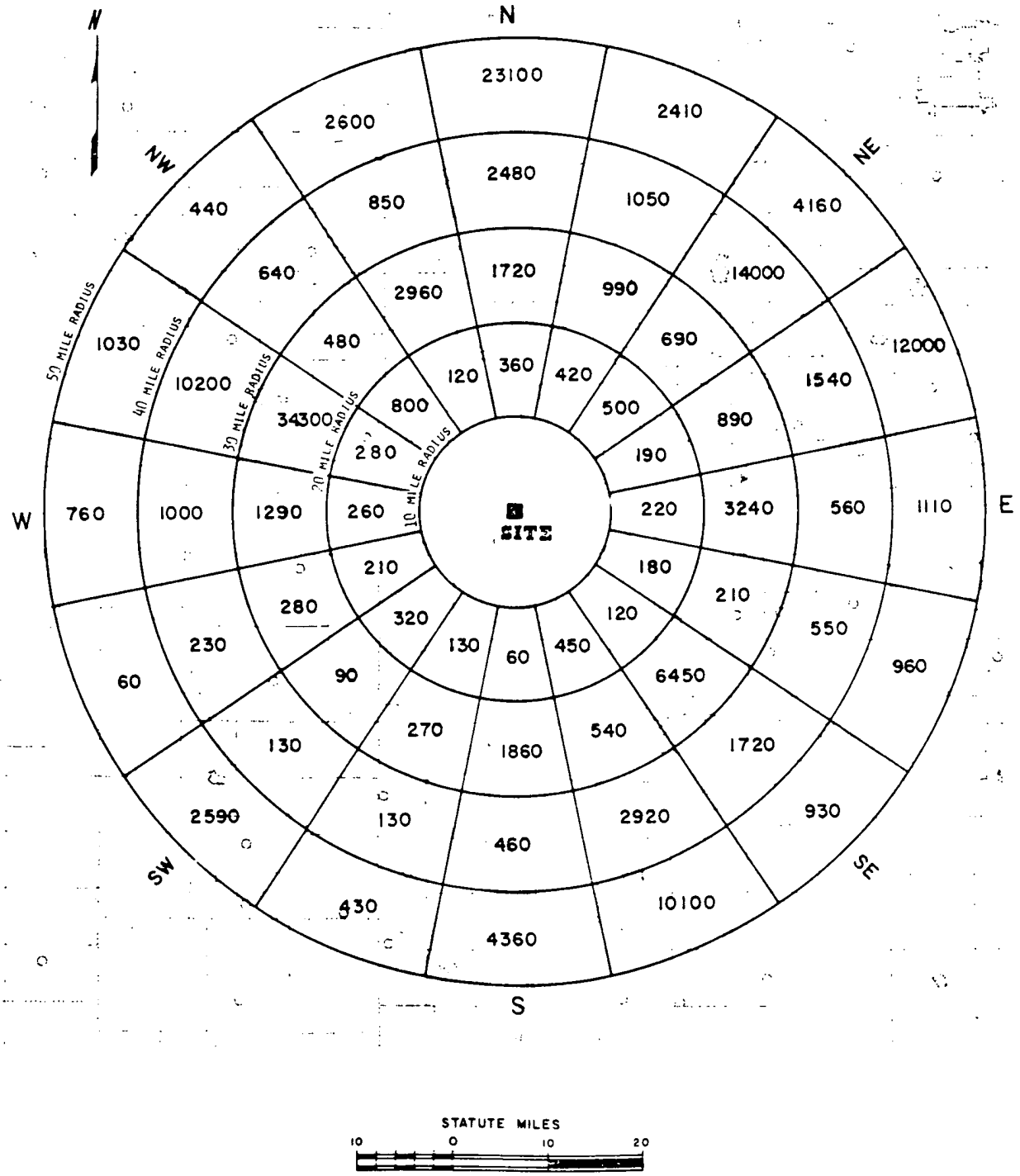
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.1-18

2000 Resident Population 10 to 50 Miles

REFERENCE:

BUREAU OF CENSUS, CIVIL DIVISION
MAP OF KANSAS, 1970



Rev. 0

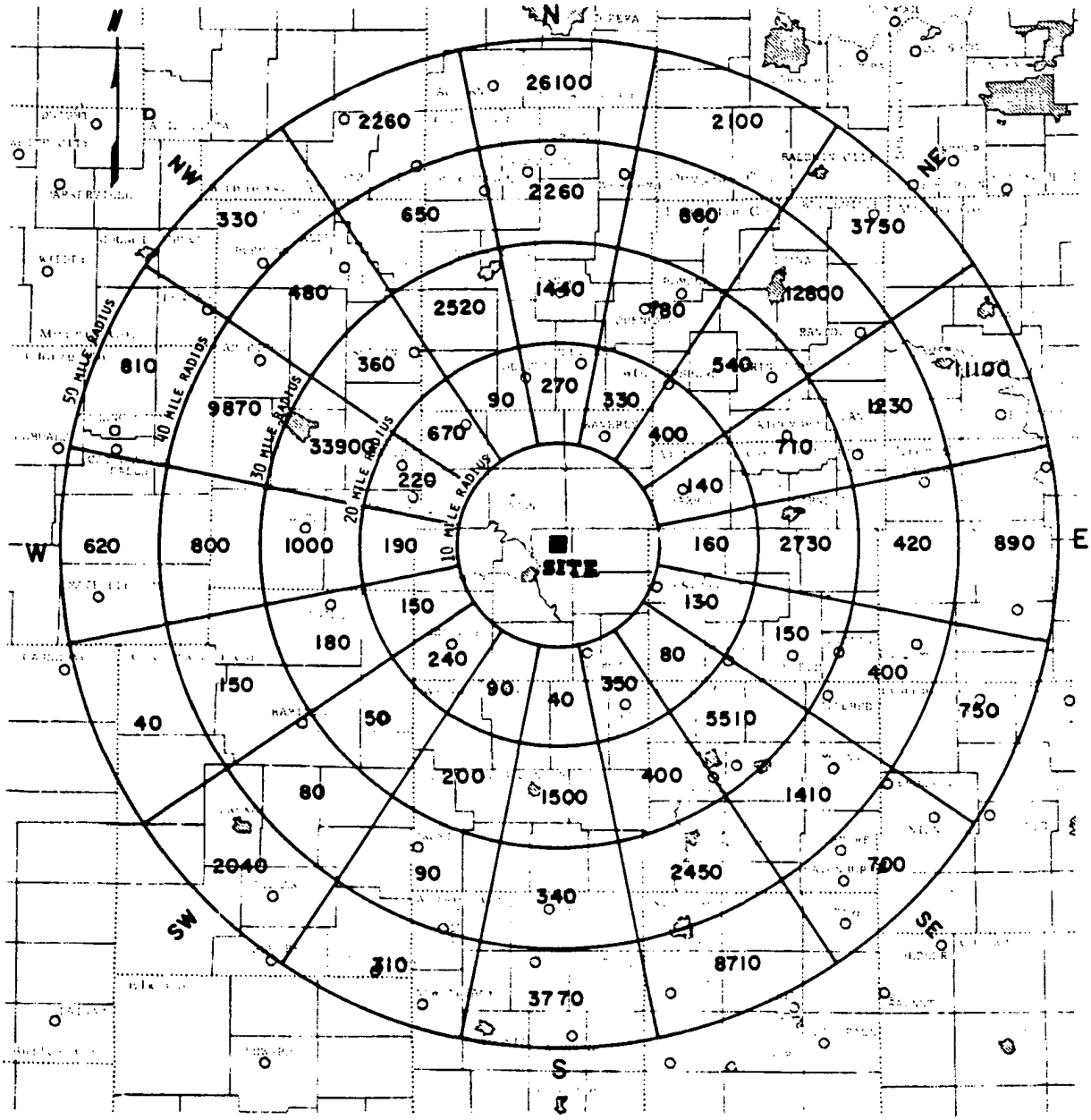
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.1-19

2010 Resident Population 10 to 50 Miles

REFERENCE

BUREAU OF CENSUS, CIVIL DIVISION
MAP OF KANSAS, 1970



Rev. 0

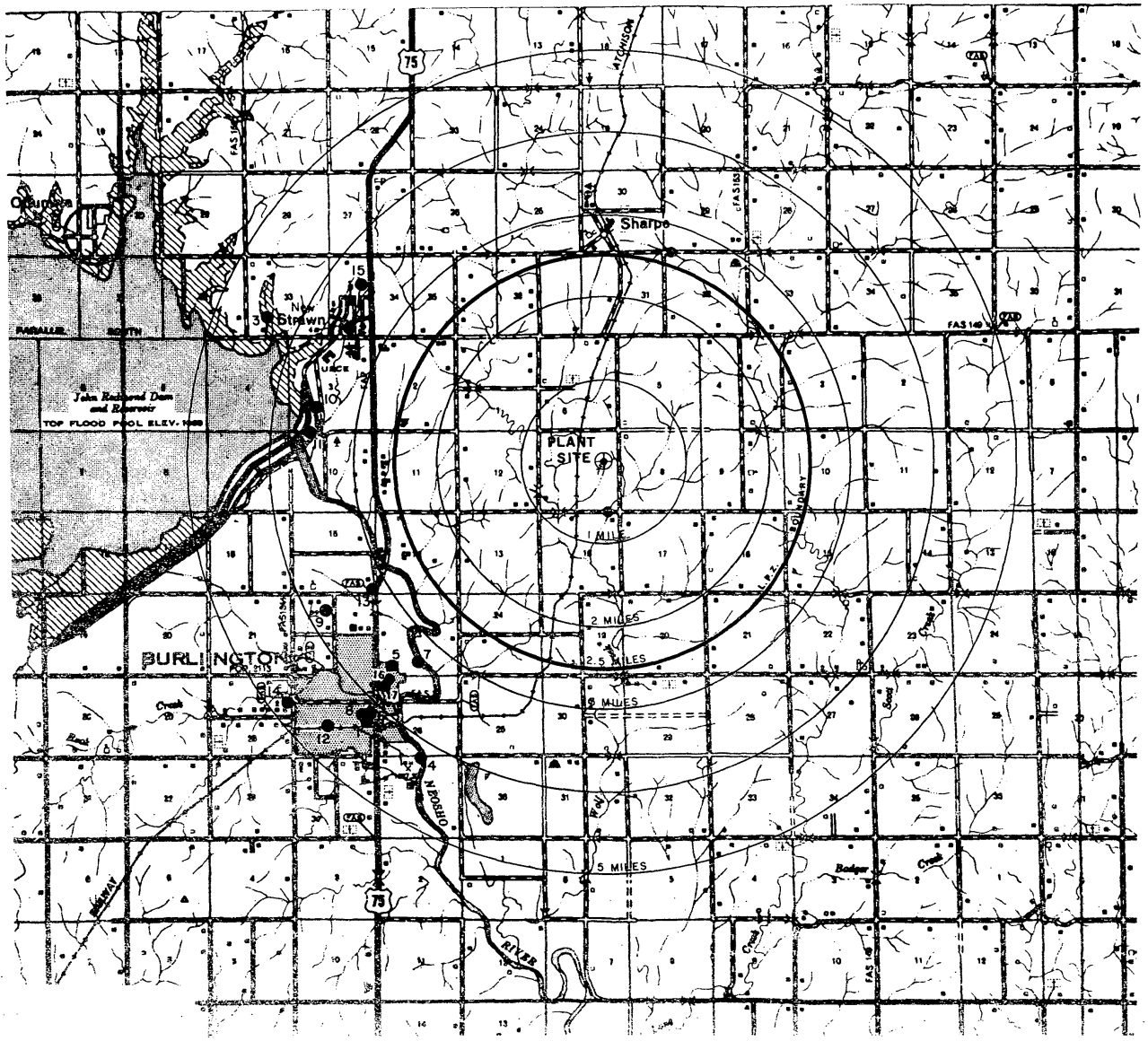
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.1-20

2020 Resident Population 10 to 50 Miles

REFERENCE:

BUREAU OF CENSUS, CIVIL DIVISION
MAP OF KANSAS, 1970

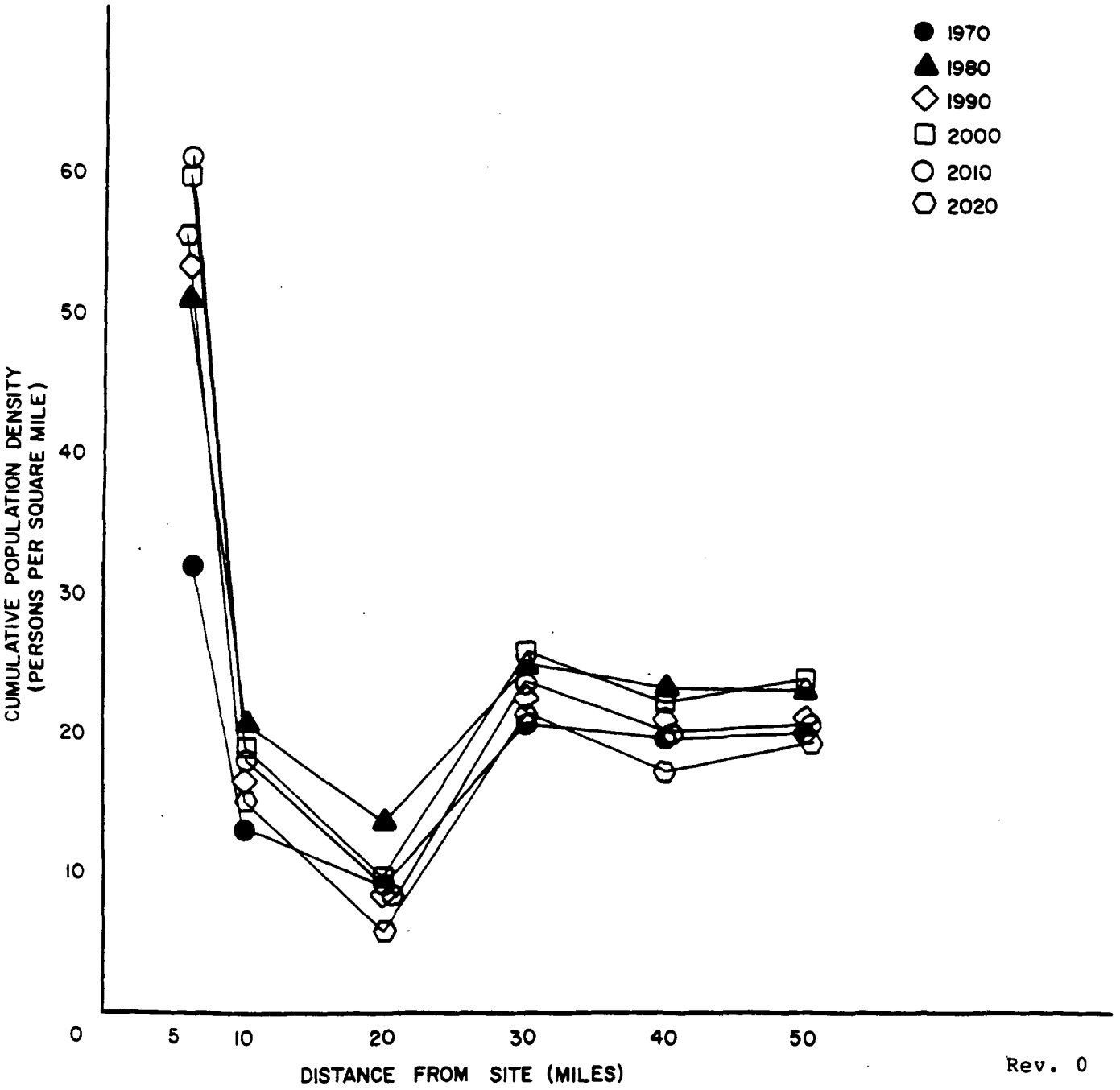


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

FIGURE 2.1-21

PUBLIC FACILITIES AND INSTITUTIONS WITHIN 5 MILES OF THE SITE

Rev. 0

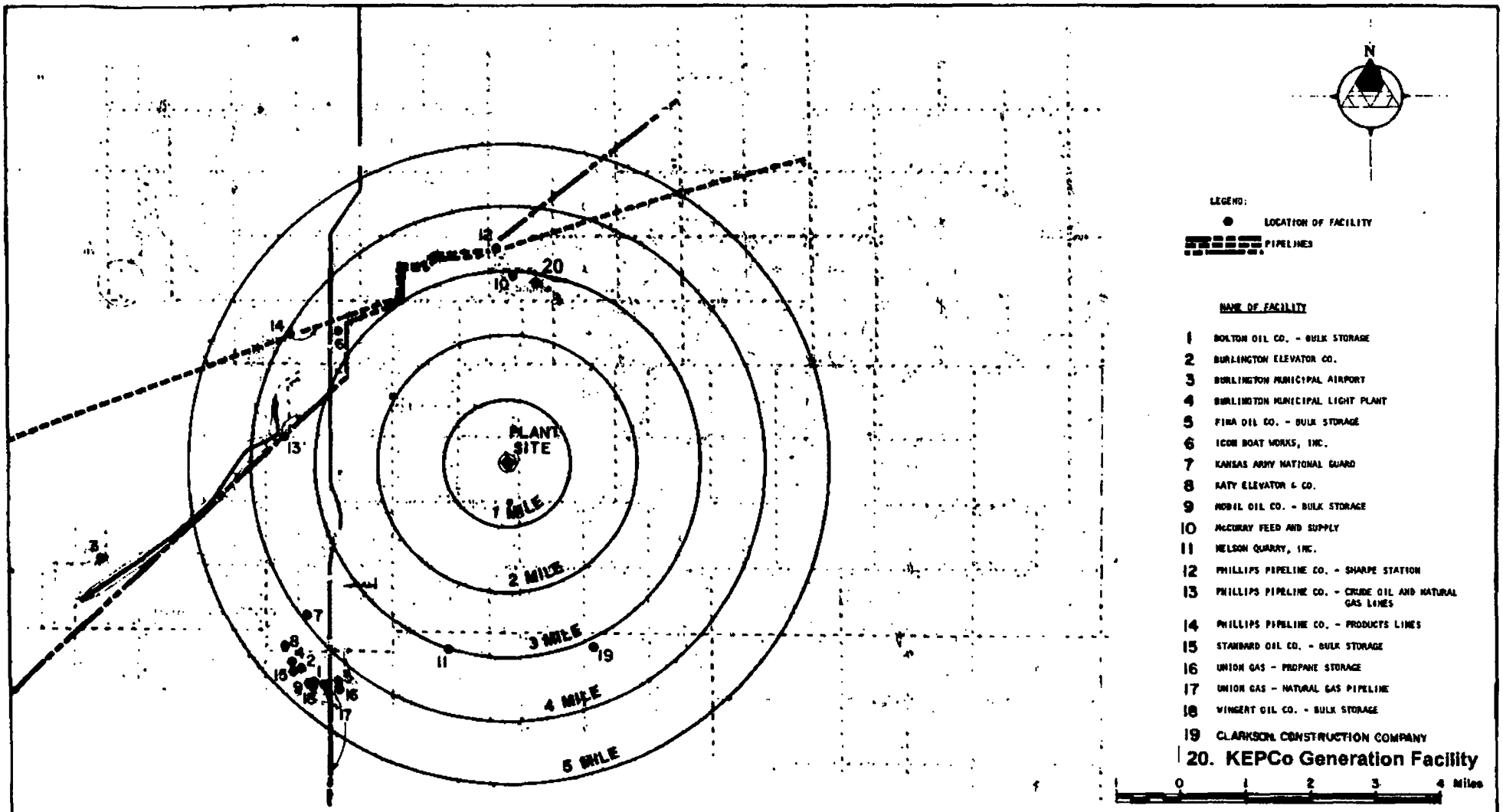


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.1-22

Cumulative Population Density, 1970 to 2020 within 50 Miles of the Site

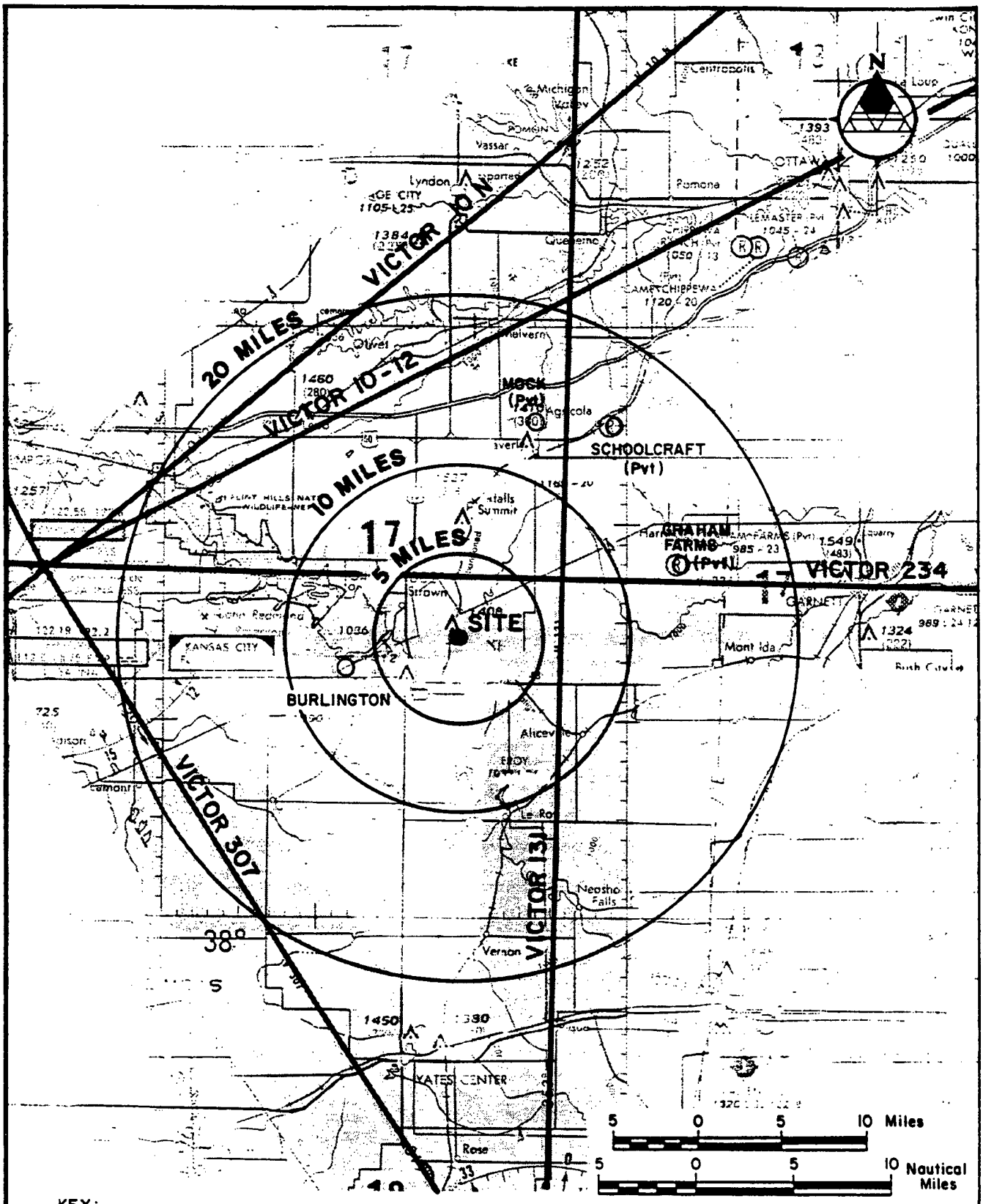


BASE MAP REFERENCE:
BASE MAP MODIFIED FROM GENERAL HIGHWAY MAP, COFFEY COUNTY, KANSAS, STATE HIGHWAY COMMISSION OF KANSAS, 1974.

Rev. 16

WOLF CREEK GENERATING STATION
UNIT NO. 1
FINAL SAFETY ANALYSIS REPORT

FIGURE 2.2-1
INDUSTRIAL, TRANSPORTATION, AND MILITARY FACILITIES, 0 TO 5 MILES



KEY:

AIRPORTS

AIR ROUTE

NOTE:

LOCATION OF MOCK AIRPORT PROVIDED BY R. MOCK (1979).

AIR INFORMATION SOURCE AND BASE MAP REFERENCE:

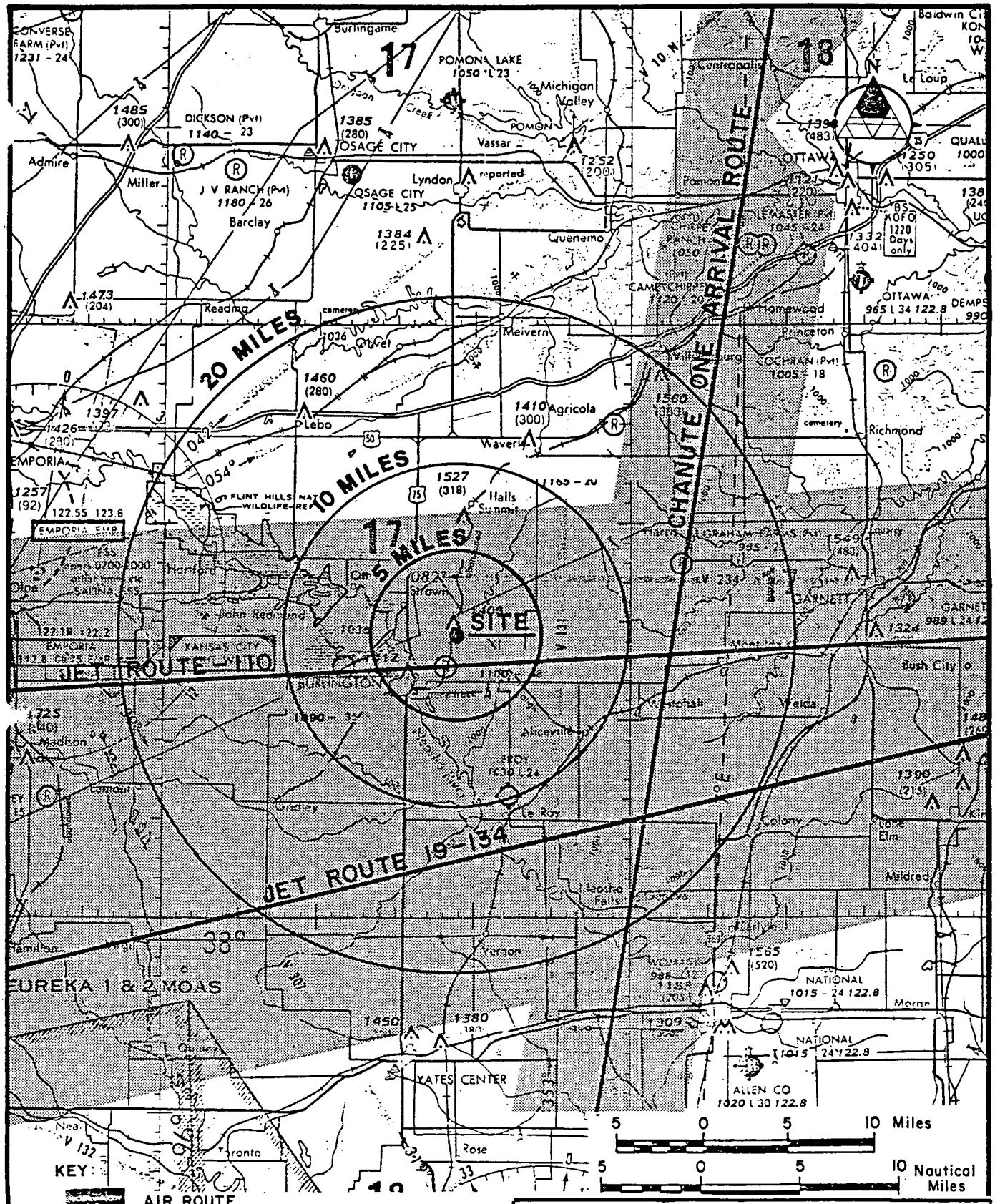
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, 1978, KANSAS CITY SECTIONAL AERONAUTICAL CHART, SCALE 1:500,000, 21st EDITION (DECEMBER 28) WASHINGTON, D.C..

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.2-2

Low Altitude Air Routes and Airports within 20 Miles



AIR INFORMATION SOURCE:

McQUEEN, R.W., 1979, CHIEF, KANSAS CITY AIR ROUTE TRAFFIC CONTROL CENTER, FEDERAL AVIATION ADMINISTRATION, OLATHE, KANSAS, WRITTEN COMMUNICATION (SEPT. 19, 1979).

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, 1979, NORTHEAST, ENROUTE HIGH ALTITUDE-U.S. MAP, JUNE 14th EDITION, WASHINGTON, D.C..

BASE MAP REFERENCE:

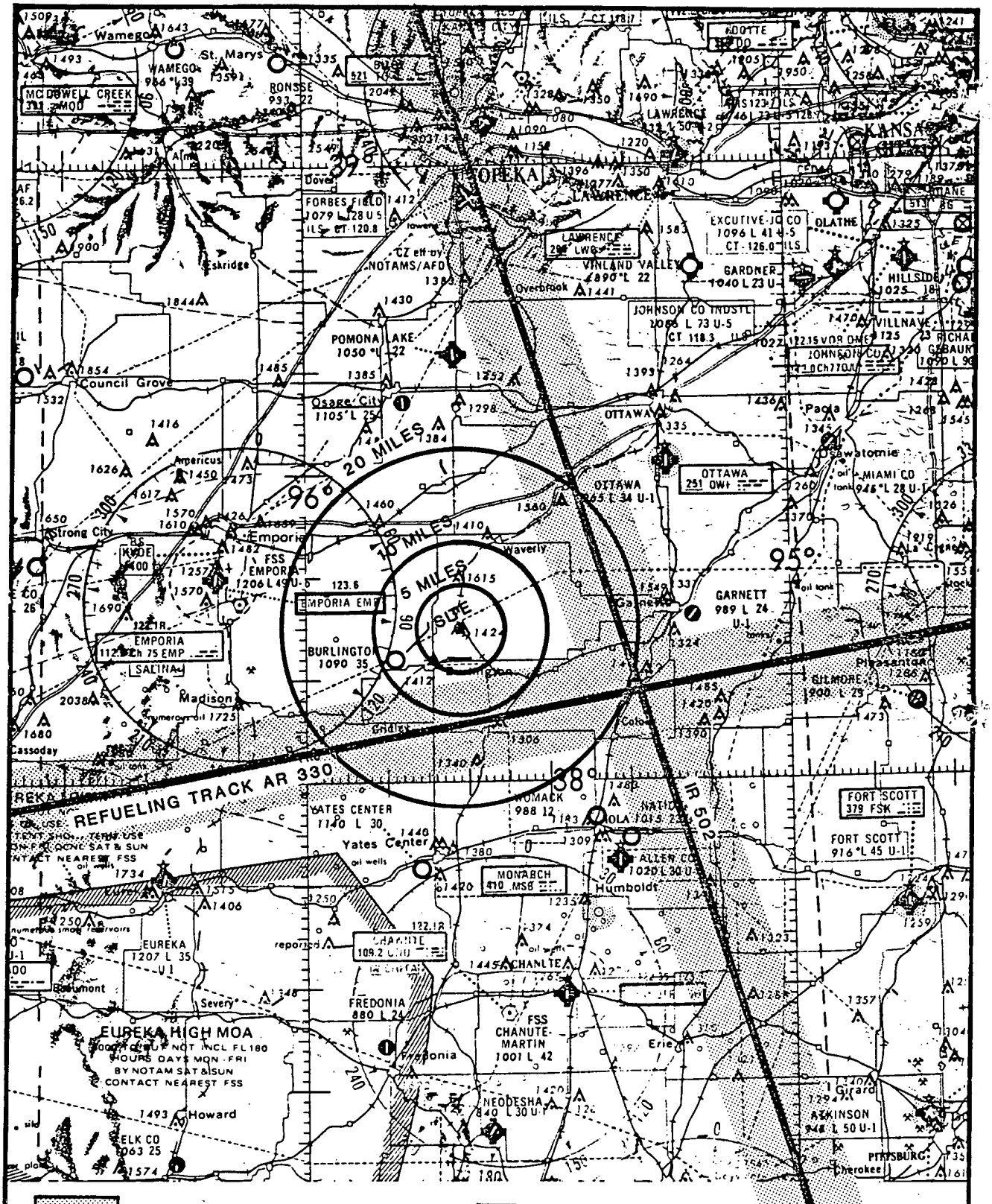
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, 1978, KANSAS CITY SECTIONAL AERONAUTICAL CHART, SCALE 1:500,000, 21st EDITION (DECEMBER 28) WASHINGTON, D.C..

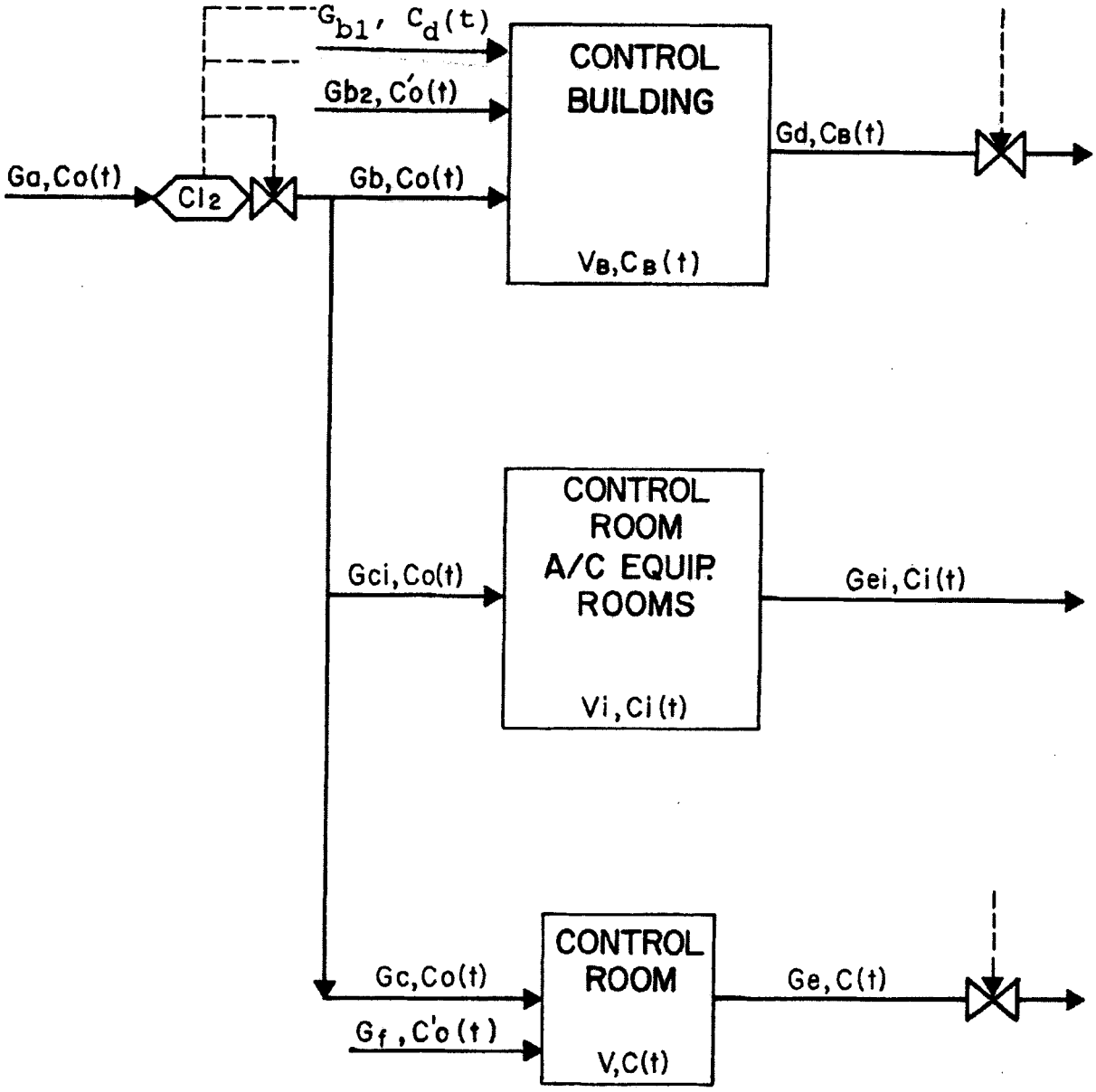
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.2-3

High Altitude Jet Routes within 20 Miles

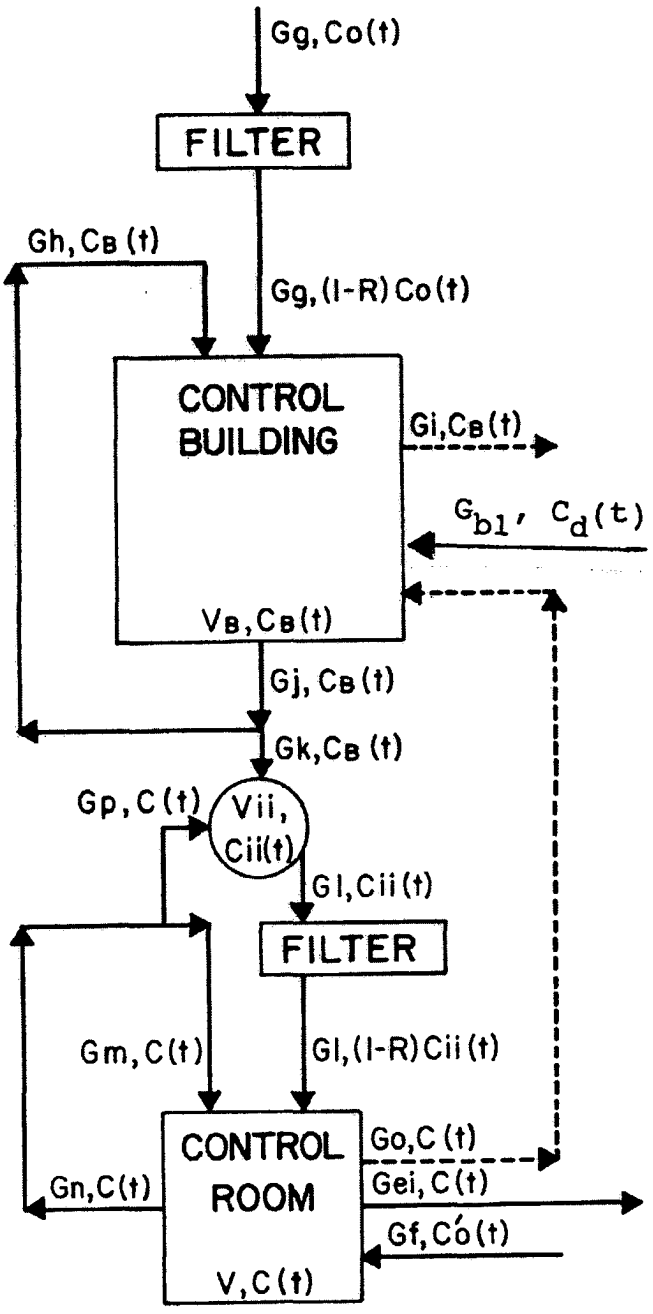
Rev. 0


20 MILES
10 MILES
5 MILES
SITE
REFUELING TRACK AR 330
IR 502
EUREKA HIGH MOA
FL180
HOURS DAYS MON-FRI
BY NOTAM SAT&SUN
CONTACT NEAREST FSS
FSS EMPORIA
FSS CHANUTE-MARTIN
EMPORIA
SALINA
TOPEKA
LAWRENCE
OTTAWA
BURLINGTON
GARNETT
Yates Center
Humboldt
Chanute
Fredonia
Eureka
Madison
Council Grove
Osage City
Strong City
Americus
Waverly
Ottawa
Pomona Lake
Wamego
St. Marys
Howard
Cassoday
Cedar
Colony
Girard
Pittsburg
Fort Scott
Gilmore
Pleasanton
Olathe
Gardner
Johnson Co
Miami Co
Osawatomie
Paola
Villnave
Hillside
Kansas
Lawrence
Forbes Field
Monarch
Neodesha
Atkinson
Severy
Elk Co
Allen Co
Fort Scott
Yates Center
Overbrook
Vinland Valley
Excutive-Jo Co
Johnson Co Indstl
Johnson Co
Ottawa
Miami Co
Garnett
Gilmore
Pleasanton
Fort Scott
Allen Co
Monarch
Chanute
Fredonia
Neodesha
Atkinson
Pittsburg
Girard
Erie
Parsons
Oswego
Cherokee
Howard
Elk Co
Severy
Fredonia
Eureka
Madison
Cassoday
Strong City
Americus
Council Grove
Osage City
Pomona Lake
Waverly
Emporia
Burlington
Yates Center
Humboldt



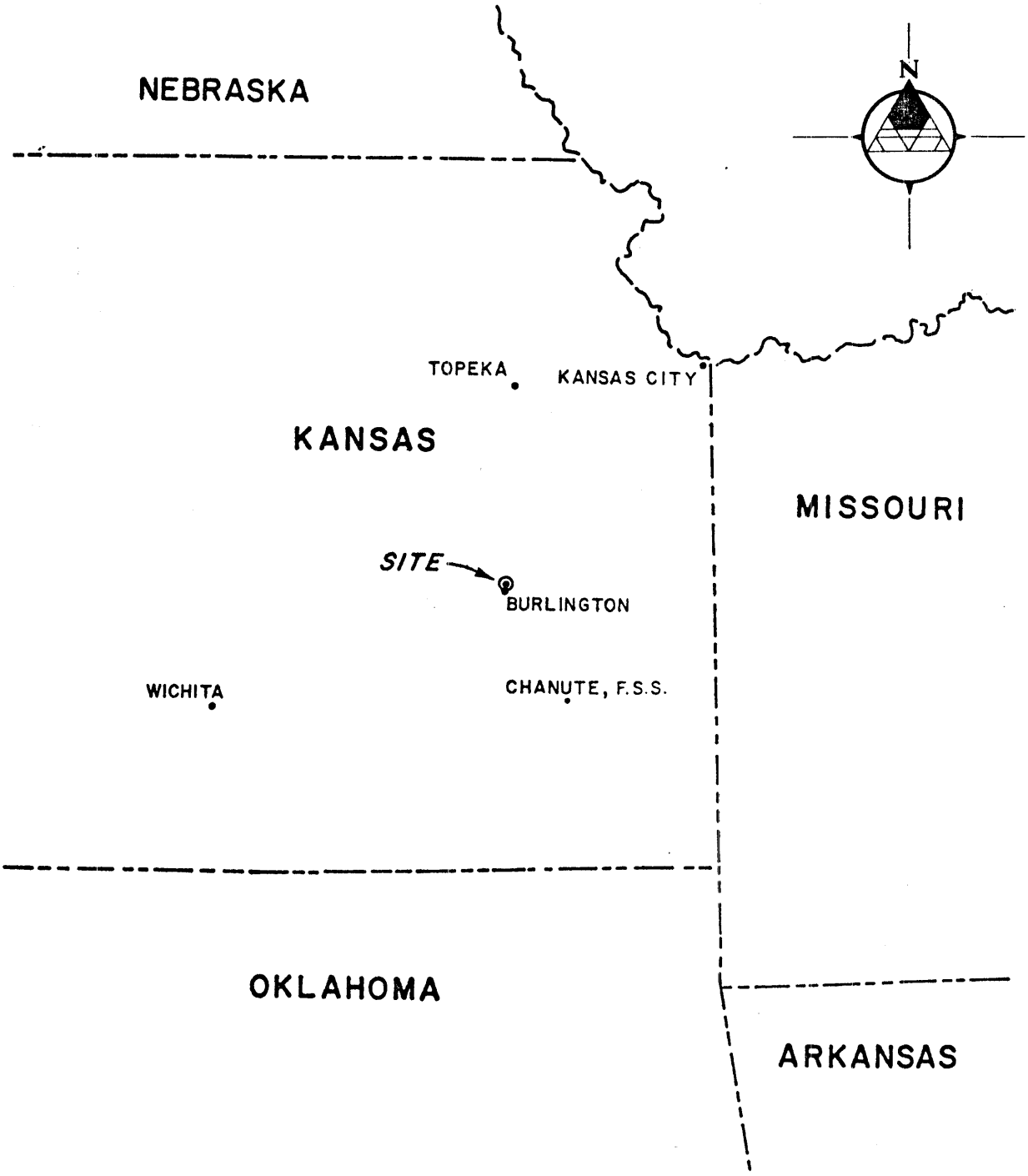
REV. 2

WOLF CREEK UPDATED SAFETY ANALYSIS REPORT
Figure 2.2-6 (sheet 1 of 2) Mathematical Model for the Control Room Chlorine Analysis Pre-Isolation Mode



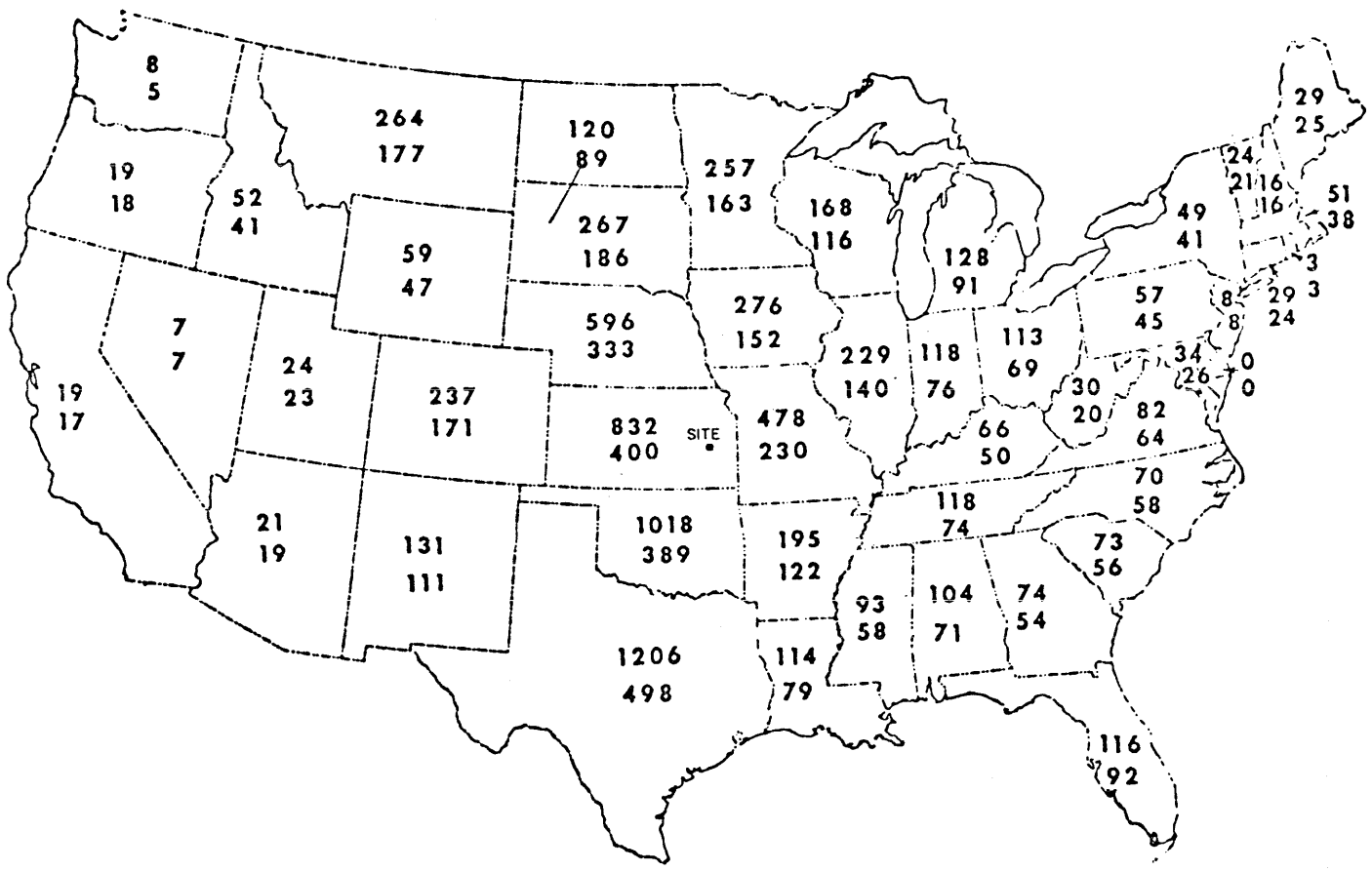
REV. 2

WOLF CREEK UPDATED SAFETY ANALYSIS REPORT
Figure 2.2-6 (sheet 2 of 2) Mathematical Model for the Control Room Chlorine Analysis Post-Isolation Mode



Rev. 0

WOLF CREEK UPDATED SAFETY ANALYSIS REPORT
Figure 2.3-1 Regional Climatological Stations



REFERENCE:
PAUTZ, M.E., 1969: SEVERE LOCAL STORM OCCURRENCES 1955-1967. ESSA TECH. MEMO WBTM FCST 12, OFFICES OF METEOROLOGICAL OPERATIONS, SILVER SPRING, MD.

NOTES

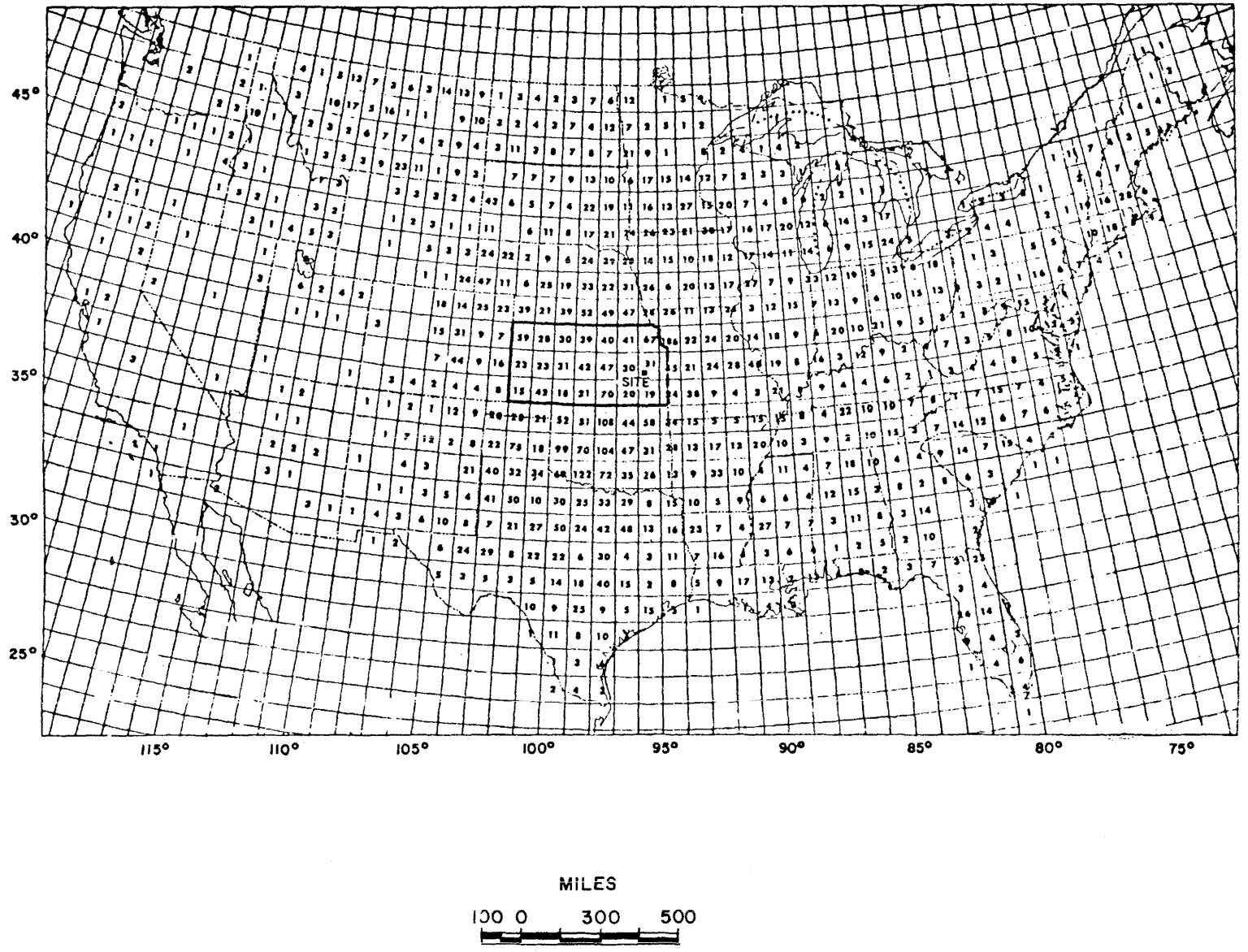
Upper figure is number of hail reports 0.75 inch and greater; lower figure, total days this size reported, 1955-1967.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Rev. 0

Figure 2.3-2

Hail Reports, 1955-1967



REFERENCE:
PAUTZ, M.E., 1969: SEVERE LOCAL STORM OCCURRENCES 1955-1967. ESSA TECH. MEMO WBTM FCST 12, OFFICE OF METEOROLOGICAL OPERATIONS, SILVER SPRING, MD.

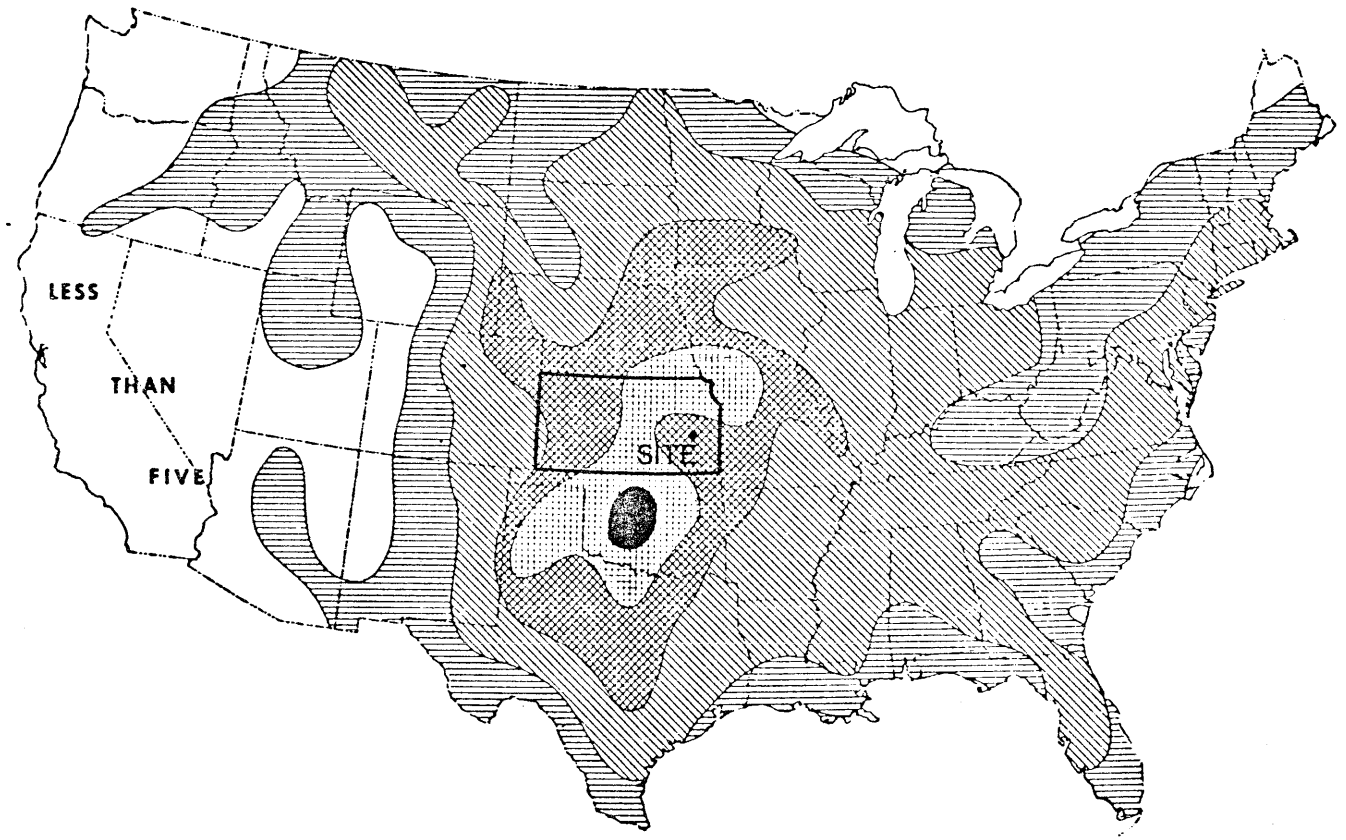
NOTE: DATA SHOWS TOTAL NUMBER OF REPORTS OF HAIL 3/4 INCH IN DIAMETER OR GREATER FROM 1955 TO 1967.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.3-3

Hail Reports by One-Degree Squares, 1955-1967

Rev. 0



EXPLANATION

- 300 +
- 150 - 300
- 75 - 150
- 25 - 75
- 5 - 25

MILES

250 0 250 500 750

NOTE: MAP ZONATION SHOWS TOTAL NUMBER OF REPORTS OF HAIL 3/4 INCH IN DIAMETER OR GREATER FROM 1955 TO 1967. DATA FOR 2-DEGREE LATITUDE AND LONGITUDE SQUARES.

REFERENCE:
PAUTZ, M.E., 1969: SEVERE LOCAL STORM OCCURRENCES 1955-1967. ESSA TECH. MEMO WBTM FCST 12, OFFICE OF METEOROLOGICAL OPERATIONS, SILVER SPRING, MD.

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.3-4

Hail Reports by Two-Degree Squares, 1955-1967

NOTE: DATA SHOWS TOTAL NUMBER OF TORNADO REPORTS FROM 1955 TO 1967.

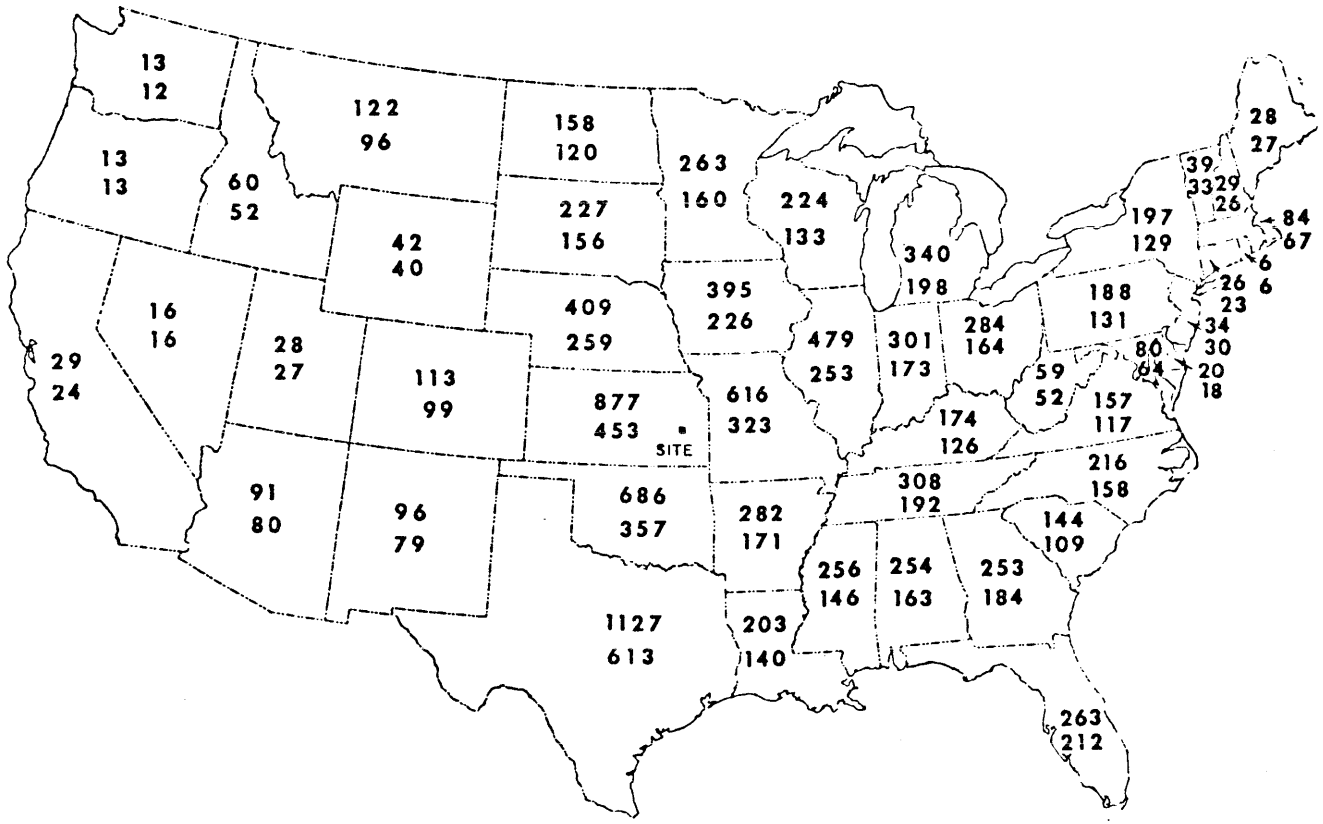
REFERENCE:
PAUTZ, M. E., 1969: SEVERE LOCAL STORM OCCURRENCES 1955-1967. ESSA TECH. MEMO WBTM FCST 12, OFFICE OF METEOROLOGICAL OPERATIONS, SILVER SPRING, MD.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.3-5

Tornado Reports by One-Degree Squares, 1955-1967

Rev. 0



NOTES

Upper figure is number of wind gusts 50 knots and greater; lower figure, total days on which wind gusts occurred, 1955-1967.

REFERENCE:
PAUTZ, M.E., 1969: SEVERE LOCAL STORM OCCURRENCES 1955-1967. ESSA TECH. MEMO WBTM FCST 12, OFFICE OF METEOROLOGICAL OPERATIONS, SILVER SPRING, MD.

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.3-6

Wind Gusts, 1955-1967

NOTE: DATA SHOWS TOTAL NUMBER OF REPORTS OF WIND GUSTS 50 KNOTS OR GREATER FROM 1955 TO 1967.

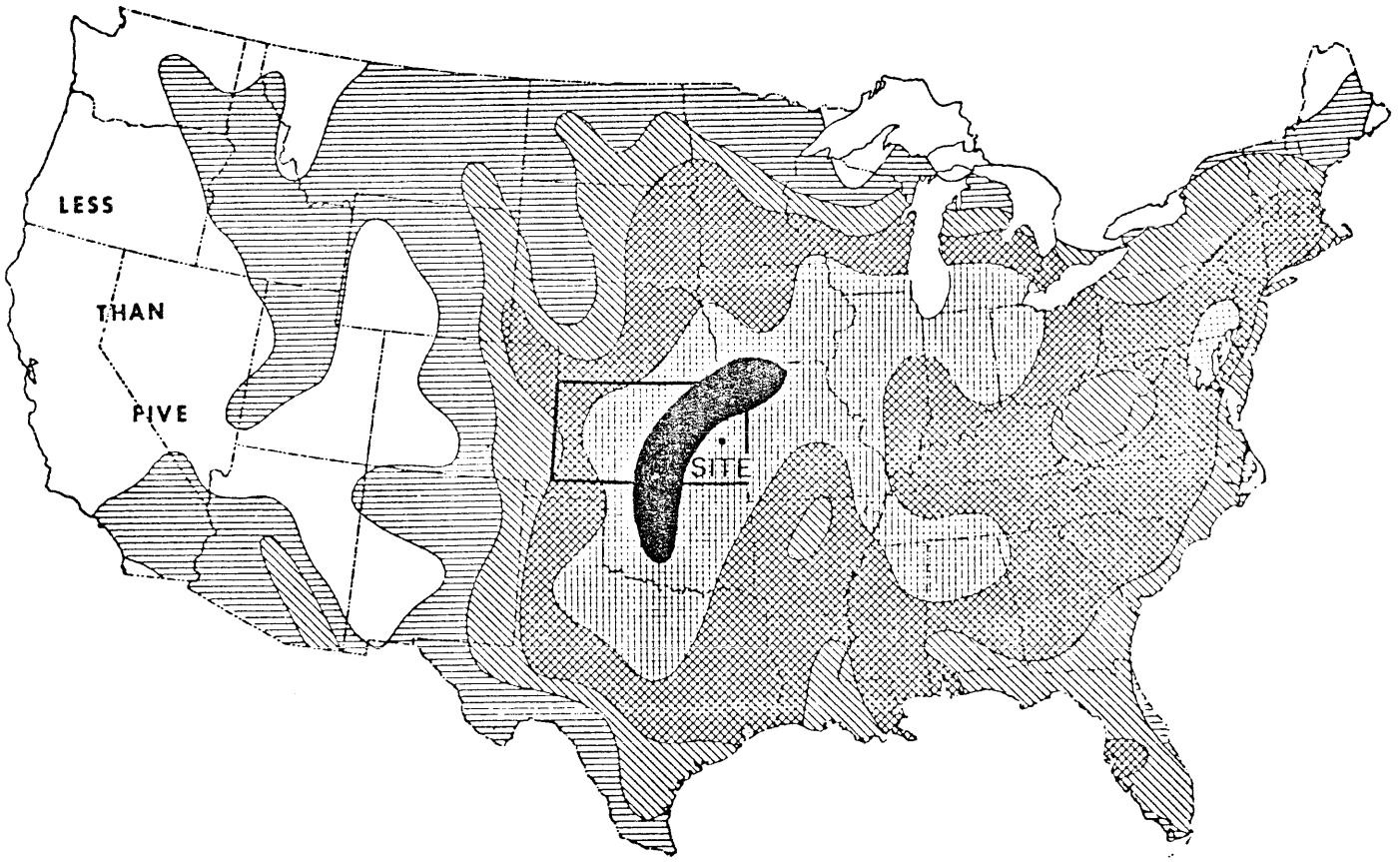
REFERENCE:
PAUTZ, M.E., 1969: SEVERE LOCAL STORM OCCURRENCES 1955-1967. ESSA TECH. MEMO WBTM FCST 12, OFFICE OF METEOROLOGICAL OPERATIONS, SILVER SPRING, MD.

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.3-7

Wind Storms by One-Degree Squares, 1955-1967



NOTE: MAP ZONATION SHOWS TOTAL NUMBER OF WIND STORMS WITH 50 KNOT GUSTS OR GREATER FROM 1955 TO 1967. DATA FOR 2-DEGREE LATITUDE AND LONGITUDE SQUARES.

REFERENCE:
PAUTZ, M.E., 1969: SEVERE LOCAL STORM OCCURRENCES 1955-1967. ESSA TECH. MEMO WBTM FCST 12. OFFICE OF METEOROLOGICAL OPERATIONS, SILVER SPRING, MD.

MILES
250 0 250 500 750

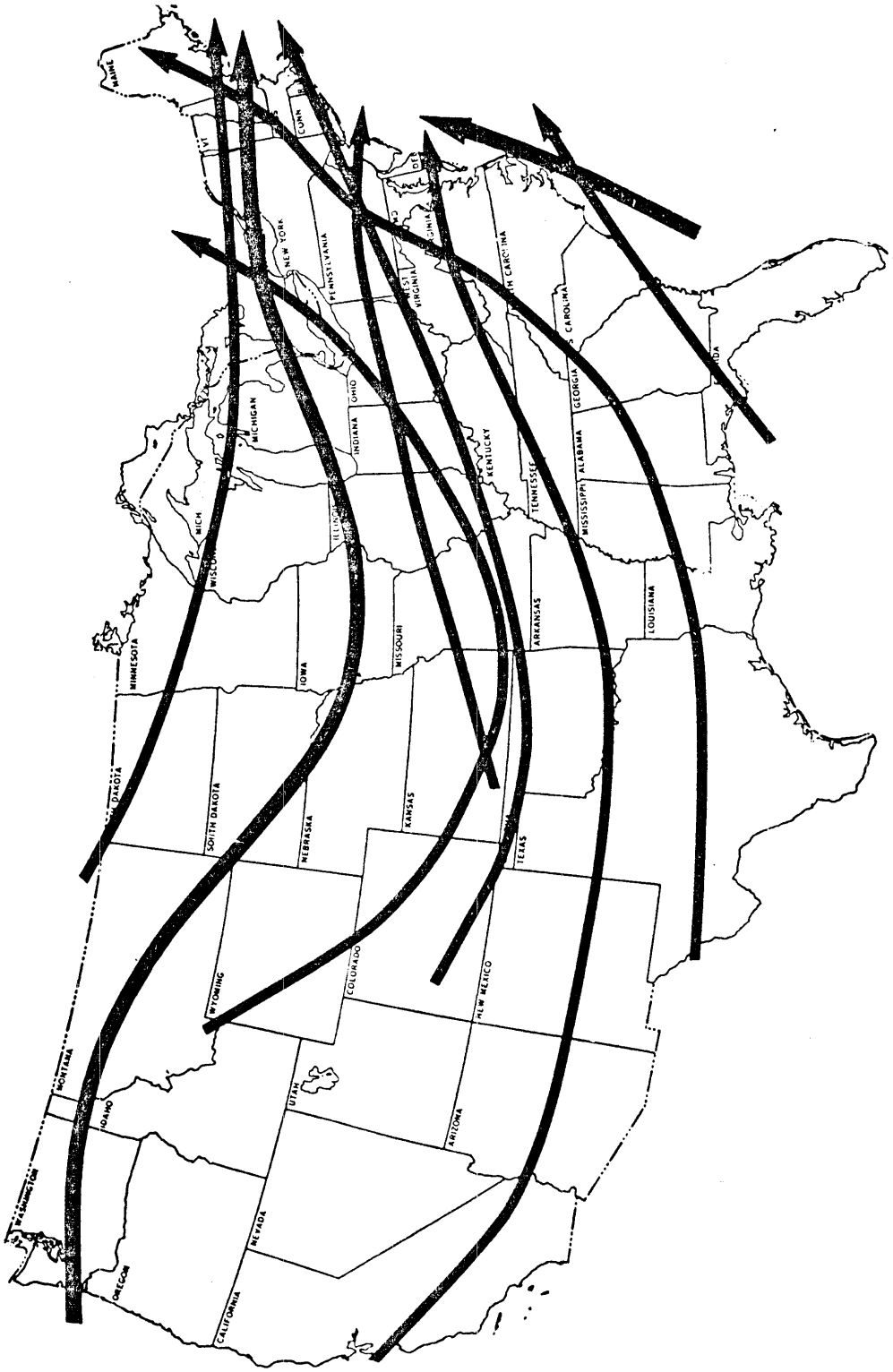
EXPLANATION
- 200 +
- 100 - 200
- 50 - 100
- 25 - 50
- 5 - 25

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Rev. 0

Figure 2.3-8

Wind Storms by Two-Degree Squares, 1955-1967



REFERENCE:

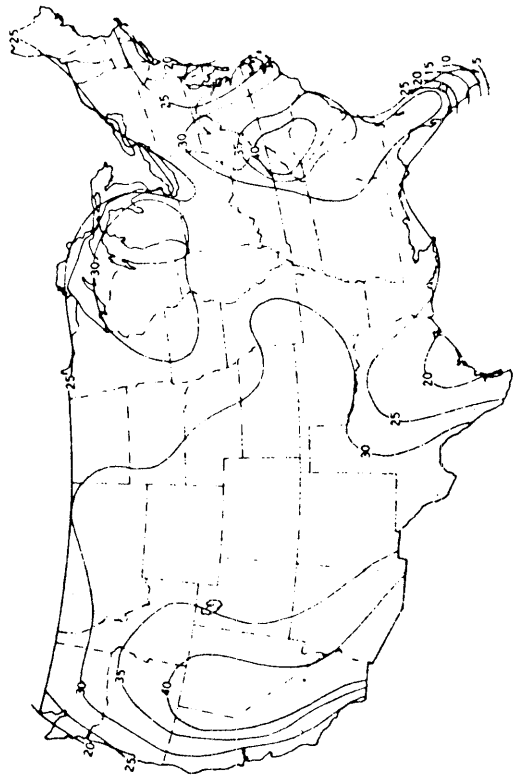
KLEIN, W.H., 1957: PRINCIPAL TRACKS AND MEAN FREQUENCIES OF CYCLONES AND ANTICYCLONES IN THE NORTHERN HEMISPHERE. U.S. WEATHER BUREAU RES. PAPER, NO. 40.

Rev. 0

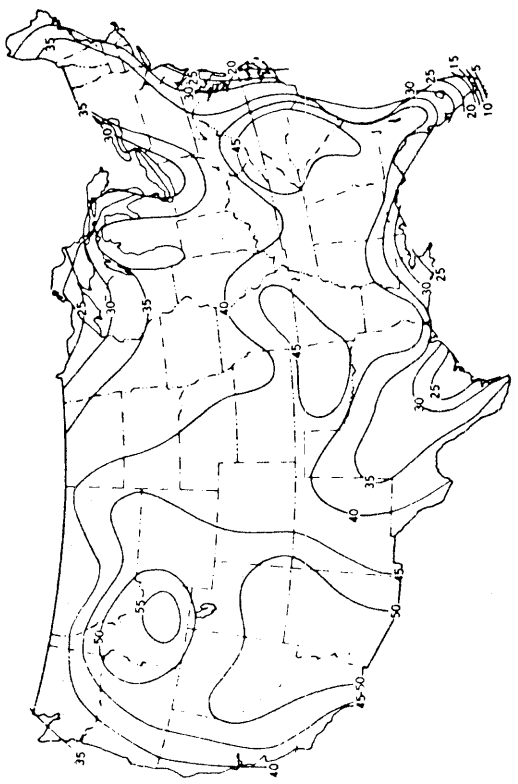
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.3-9

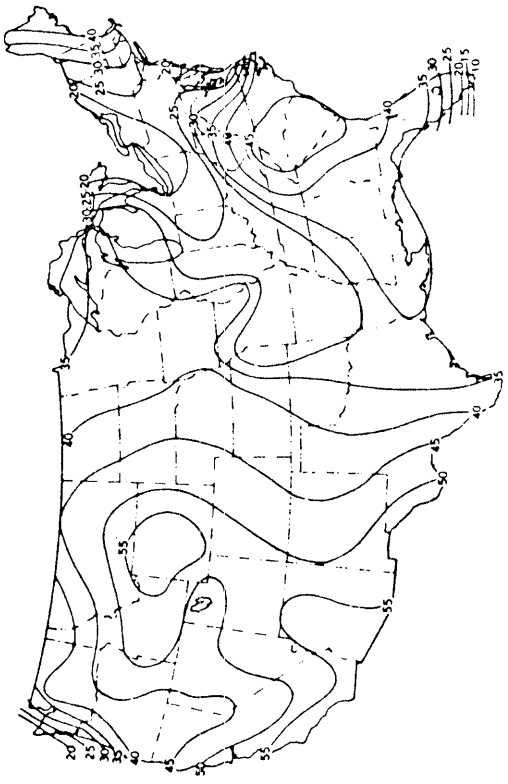
Average Tracks by Cyclones



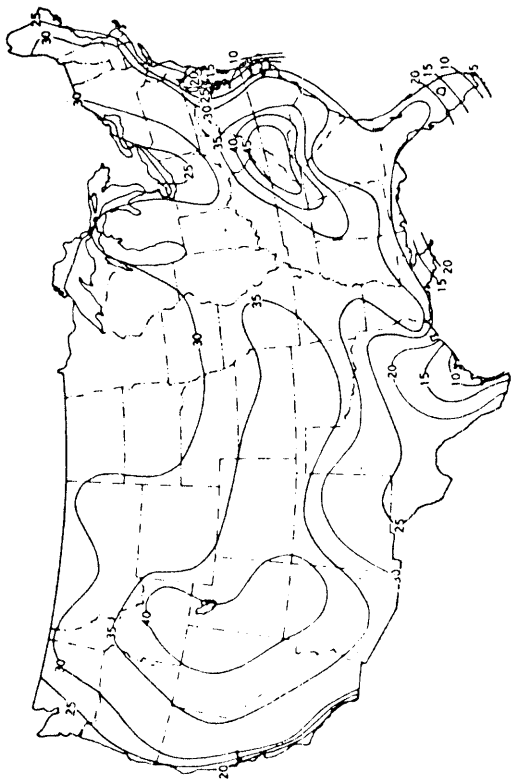
SPRING



FALL



WINTER



SUMMER

Rev. 0

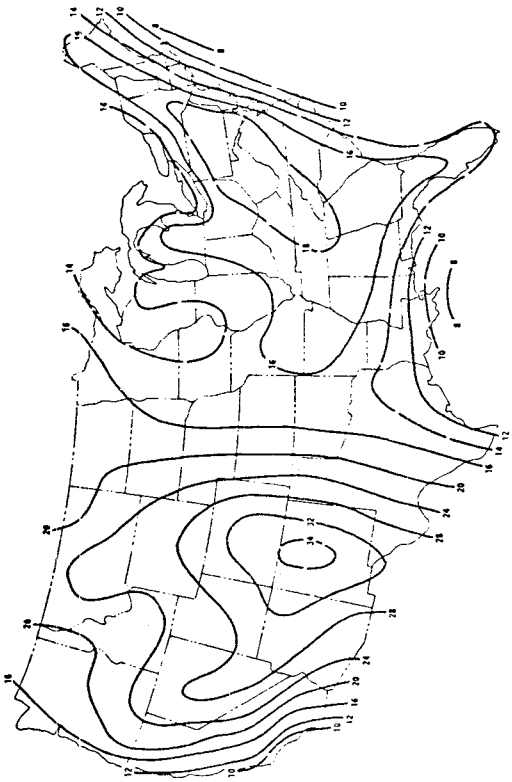
NOTE: CONTOURS REPRESENT PERCENT FREQUENCY OF INVERSIONS AND ISOTHERMAL CONDITIONS.

REFERENCE:
HOSLER, C.R., 1961: LOW LEVEL INVERSION FREQUENCY IN THE CONTIGUOUS UNITED STATES. MON. WEA. REV., 89, 379-339.

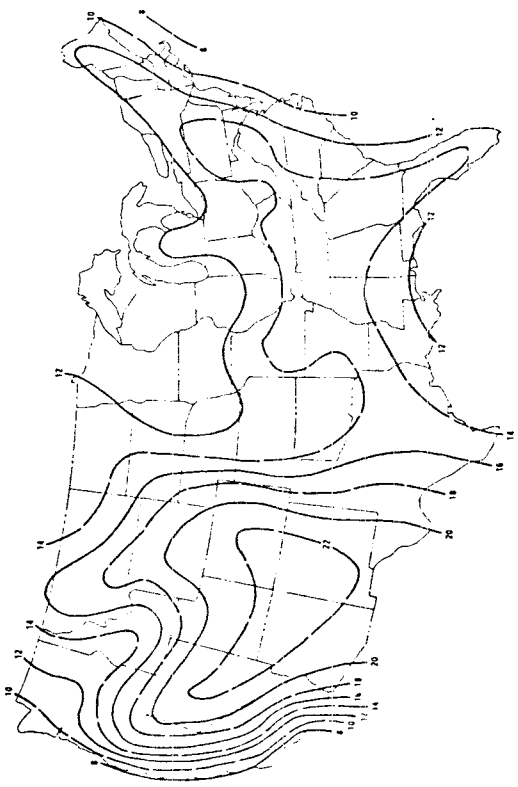
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.3-10

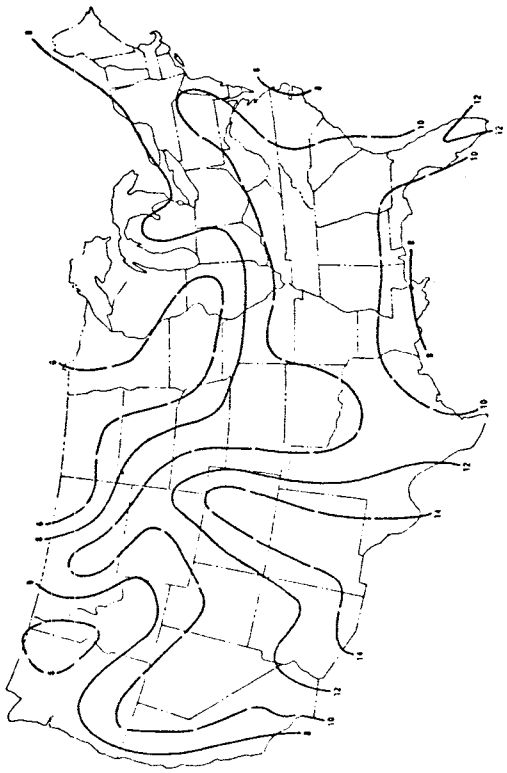
Seassonal Inversions and Isothermal Maps



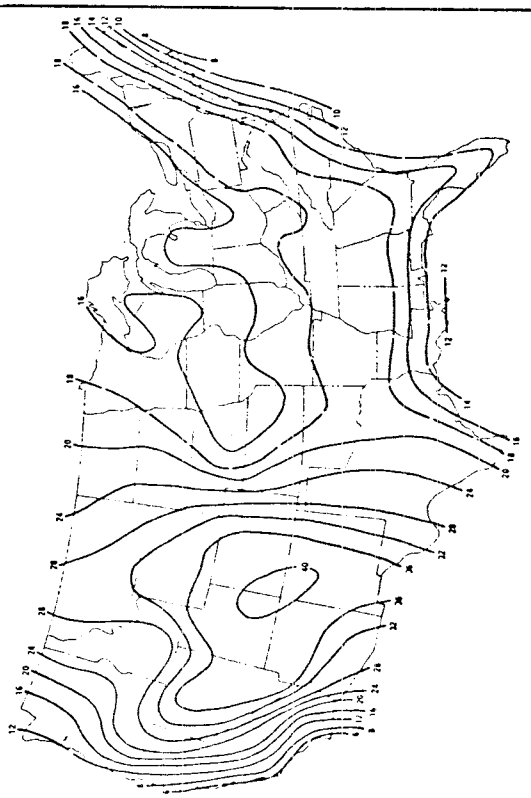
SPRING



FALL



WINTER



SUMMER

Rev. 0

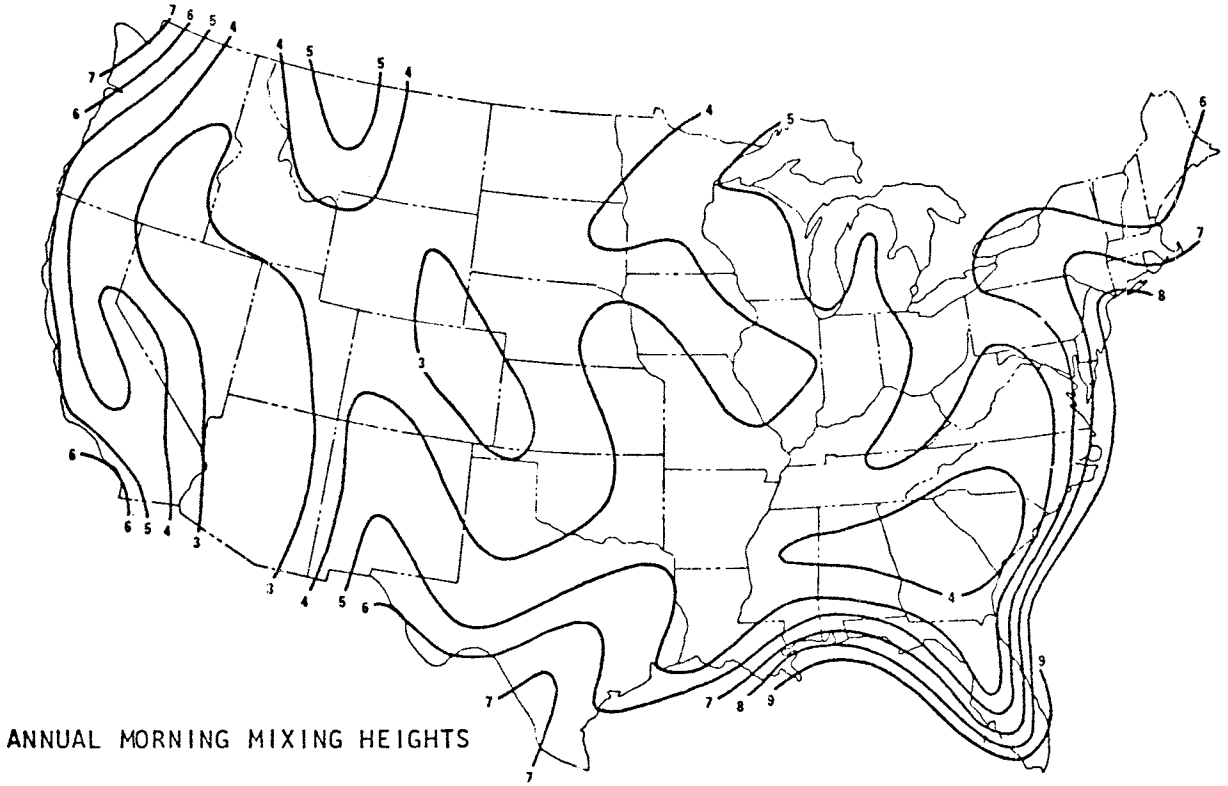
NOTE:
ISOPLETH LINES DESIGNATE DEPTHS IN HUNDREDS OF METERS.

REFERENCE:
HOLZWORTH, G.C., 1972: MIXING HEIGHTS, WIND SPEEDS, AND POTENTIAL FOR URBAN AIR POLLUTION THROUGHOUT THE CONTIGUOUS UNITED STATES. U.S. ENVIRONMENTAL PROTECTION AGENCY NO. AP-101, p. 32-35.

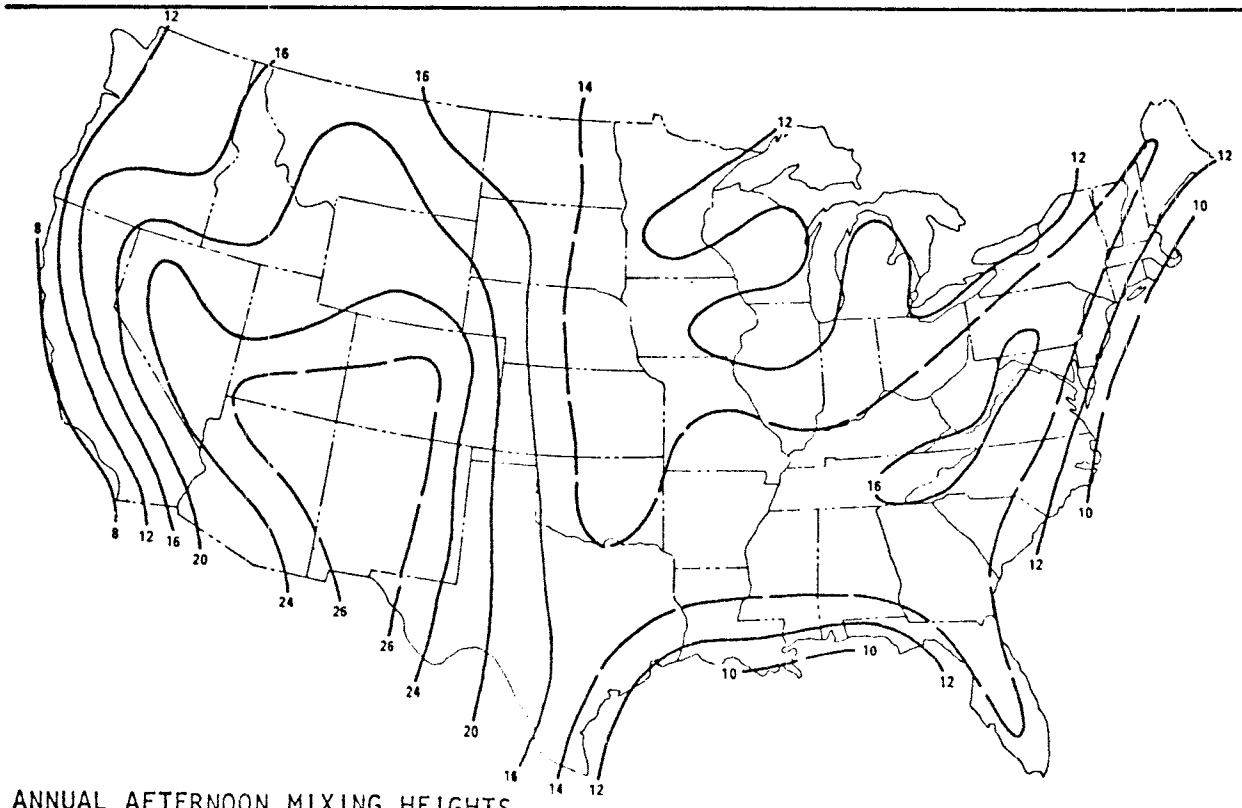
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.3-11

Isopleths of Seasonal Mean Afternoon Mixing Depths



ANNUAL MORNING MIXING HEIGHTS



ANNUAL AFTERNOON MIXING HEIGHTS

Rev. 0

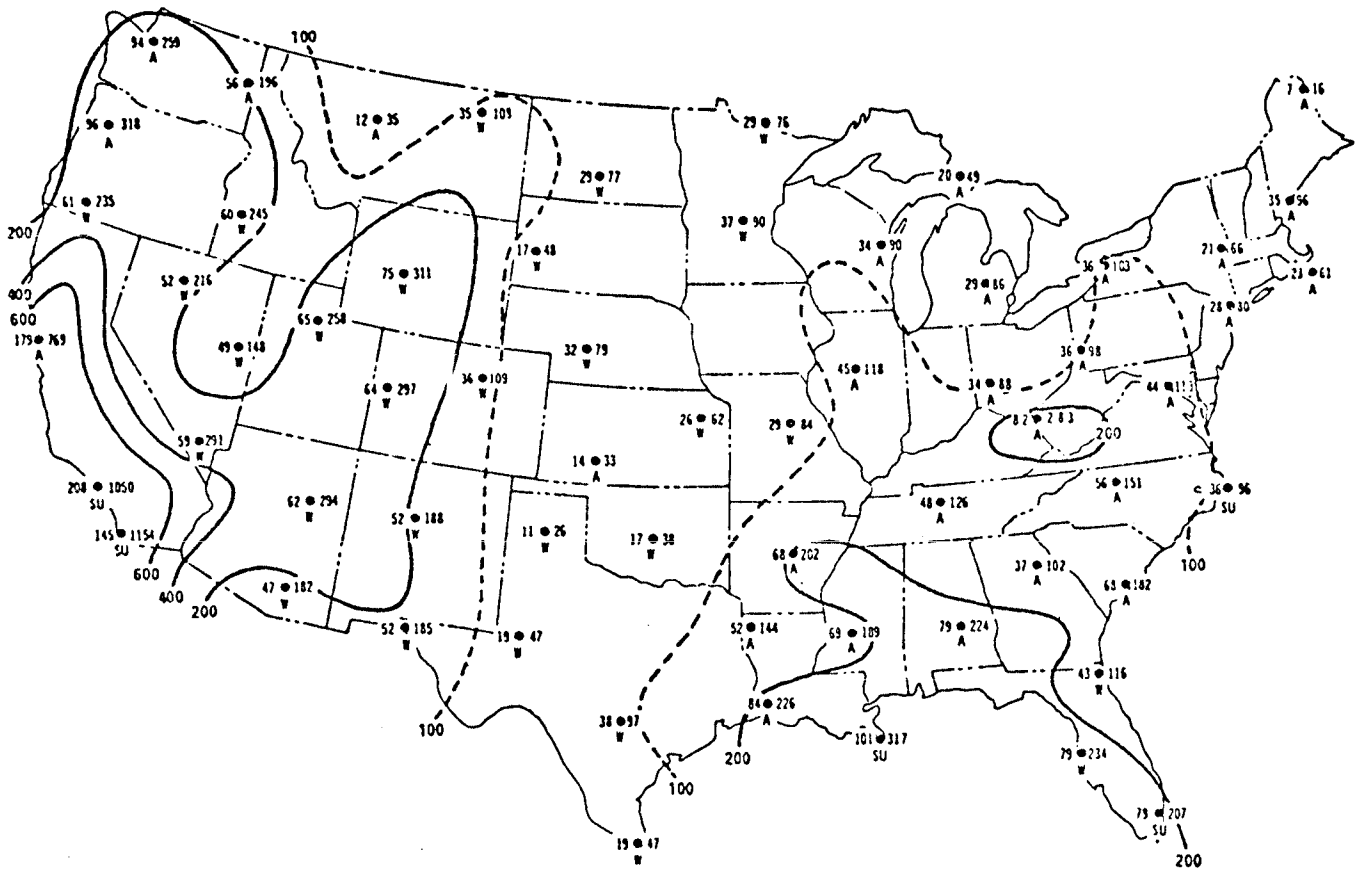
NOTE: ISOPLETH LINES DESIGNATE DEPTHS IN HUNDREDS OF METERS.

REFERENCE:
HOLZWORTH, G.C., 1972: MIXING HEIGHTS, WIND SPEEDS, AND POTENTIAL FOR URBAN AIR POLLUTION THROUGHOUT THE CONTIGUOUS UNITED STATES. U.S. ENVIRONMENTAL PROTECTION AGENCY. NO. AP-101, p. 26 AND 31.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.3-12

Isopleths of Annual Mean Mixing Depths



EXPLANATION

EPISODES — EPISODE-DAYS

62 • 294
W

SEASON

W=WINTER
A=AUTUMN
SU=SUMMER

NOTES:
ISOPLETH LINES DESIGNATE TOTAL NUMBER OF EPISODE DAYS IN 5 YEARS WITH MIXING DEPTHS 1500 METERS OR LESS AND WIND SPEEDS ≤ 6.0 MPS. ISOPLETHS FOR DATA AT SAN DIEGO AND SANTA MONICA, CALIFORNIA WERE LEFT INCOMPLETE FOR CLARITY.

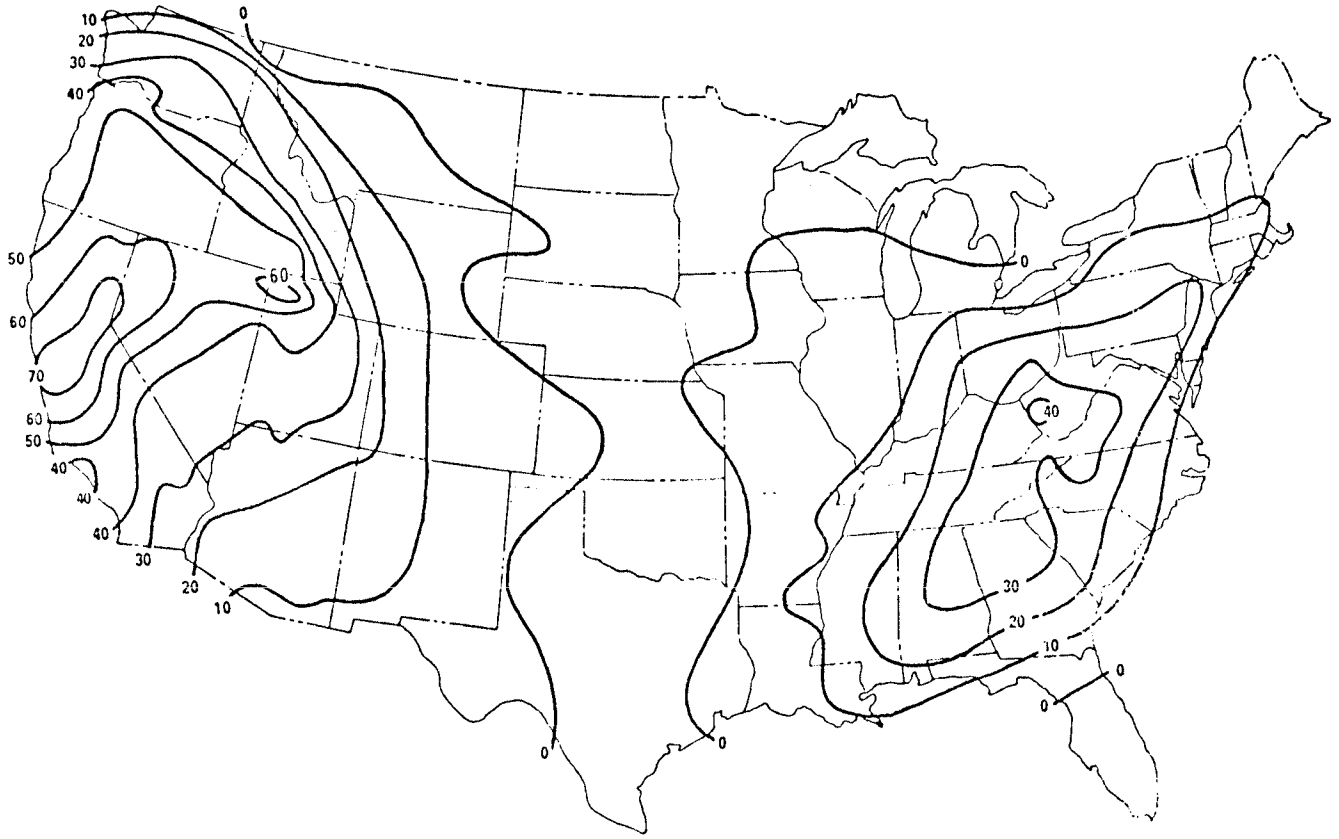
REFERENCE:
HOLZWORTH, G.C., 1972: MIXING HEIGHTS, WIND SPEEDS, AND POTENTIAL FOR URBAN AIR POLLUTION THROUGHOUT THE CONTIGUOUS UNITED STATES. U.S. ENVIRONMENTAL PROTECTION AGENCY. NO. AP-101, p 84.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Rev. 0

Figure 2.3-13

Mixing Depth Episode Days



NOTE: ISOPLETH LINES DESIGNATE TOTAL NUMBER OF FORECAST DAYS OF HIGH AIR POLLUTION POTENTIAL. DATA IS BASED ON FORECASTS ISSUED FROM AUGUST 1, 1960 AND OCTOBER 1, 1963 FOR EASTERN AND WESTERN PARTS OF THE UNITED STATES, RESPECTIVELY, THROUGH APRIL 3, 1970.

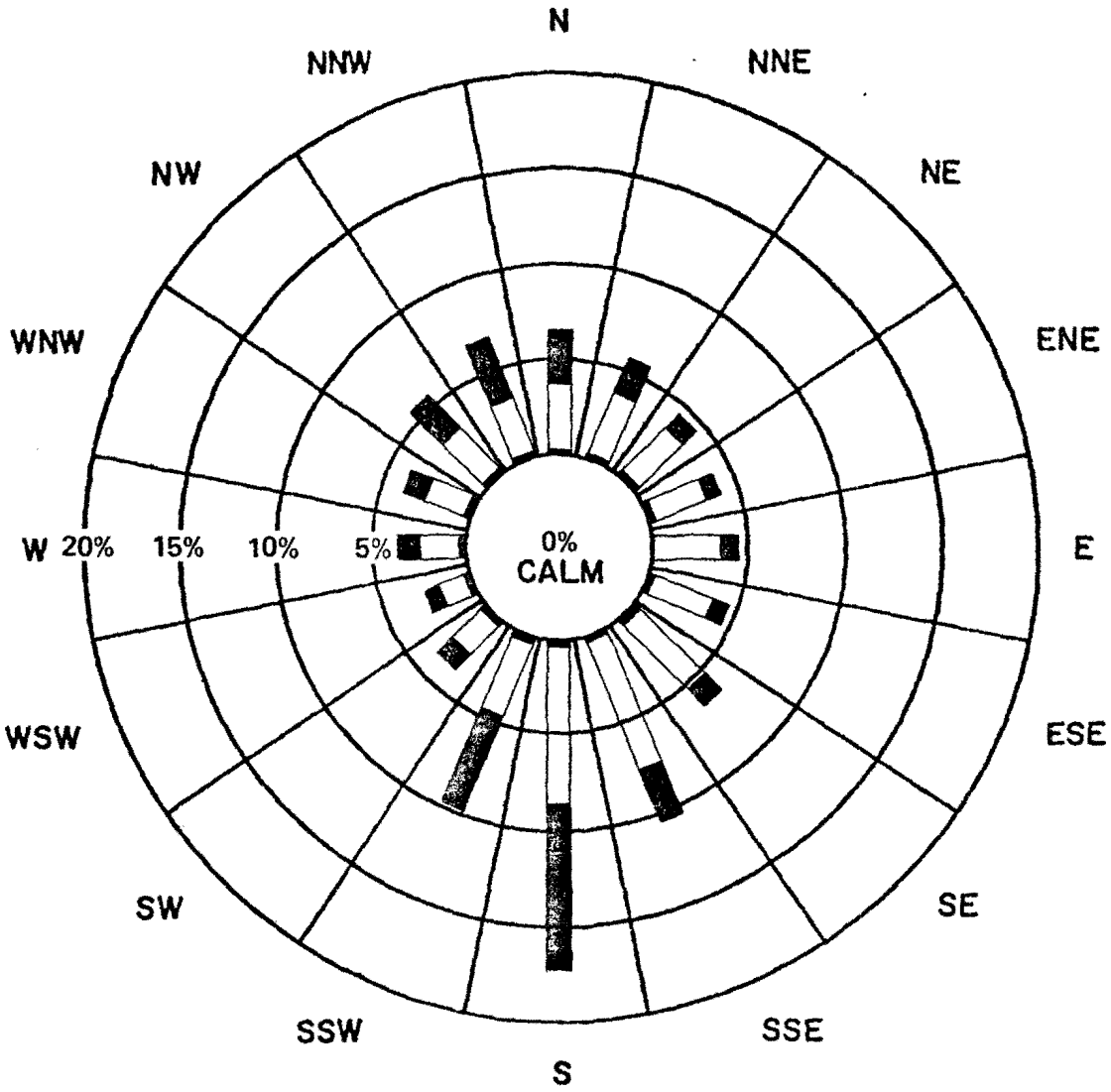
REFERENCE:
HOLZWORTH, G.C., 1972: MIXING HEIGHTS, WIND SPEEDS, AND POTENTIAL FOR URBAN AIR POLLUTION THROUGHOUT THE CONTIGUOUS UNITED STATES. U.S. ENVIRONMENTAL PROTECTION AGENCY. NO. AP-101 p. 96.

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.3-14

Forecast Days of High Air Pollution Potential



Rev. 0

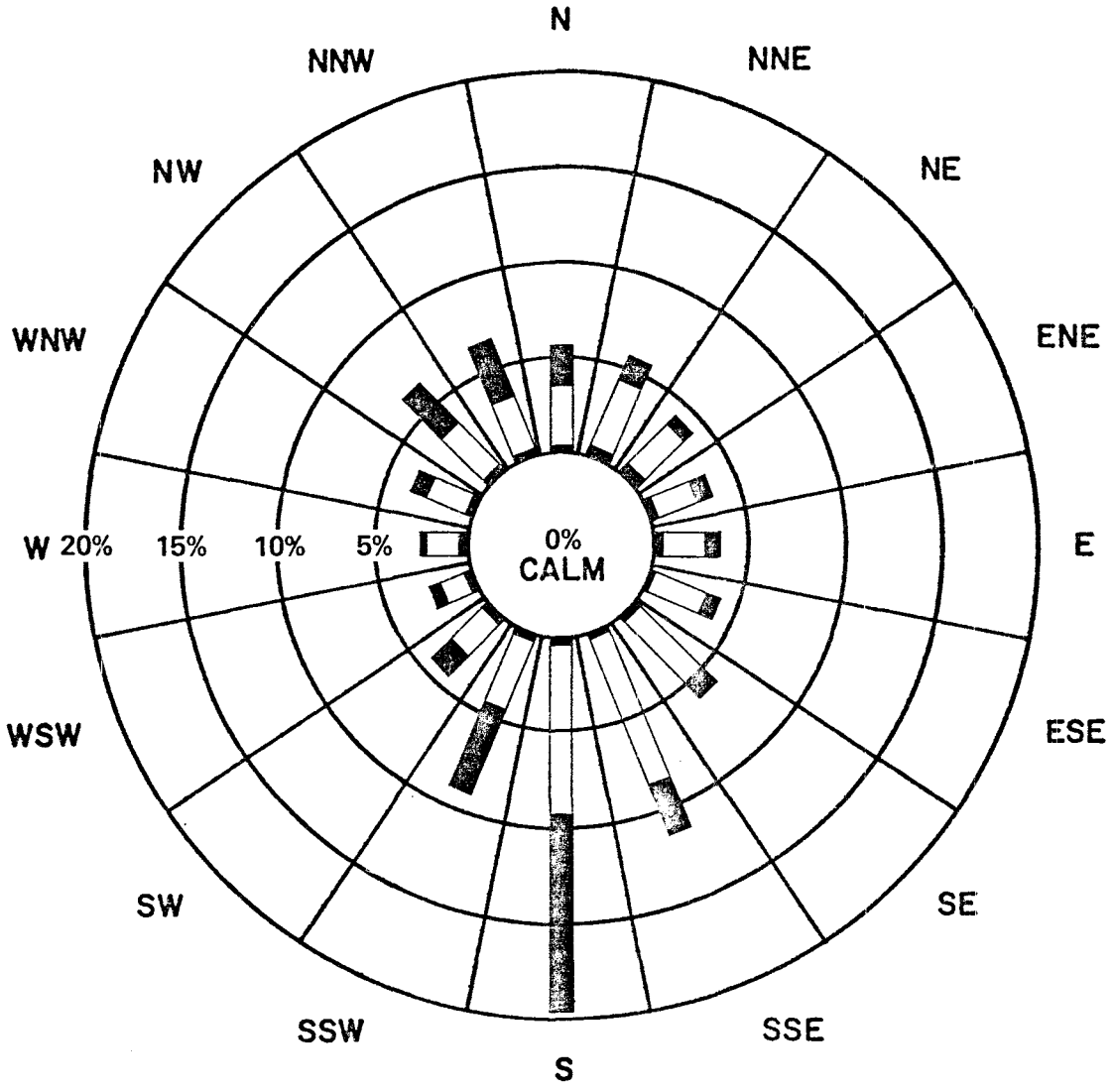
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.3-15

Wind Frequency Distribution in Percent - 3 Years Combined

LEGEND:

0-1.5 1.5-5.0 >5 Meters Per Second

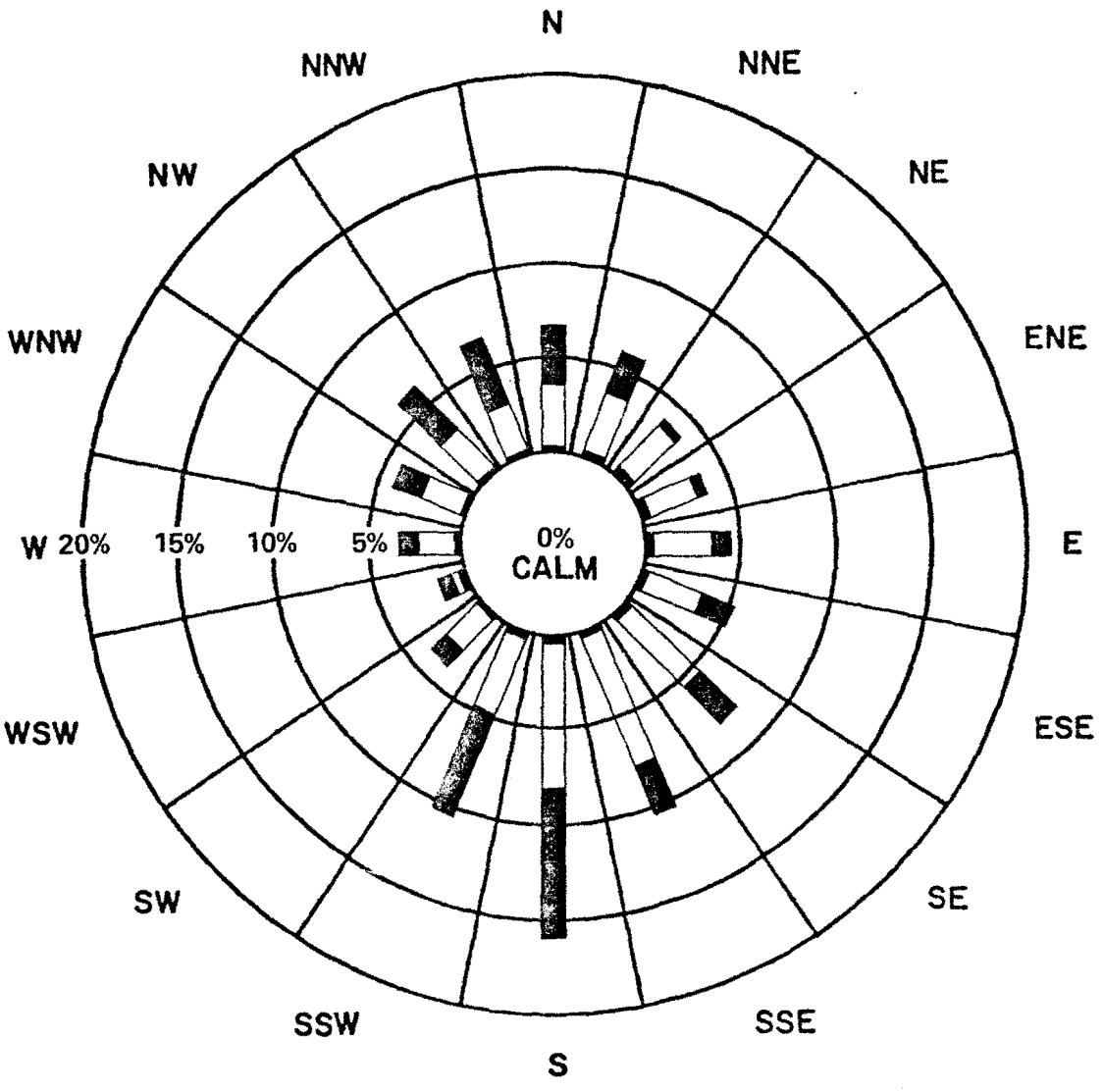


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.3-16

Wind Frequency Distribution in Percent - 6/1/73 - 5/31/74



Rev. 0

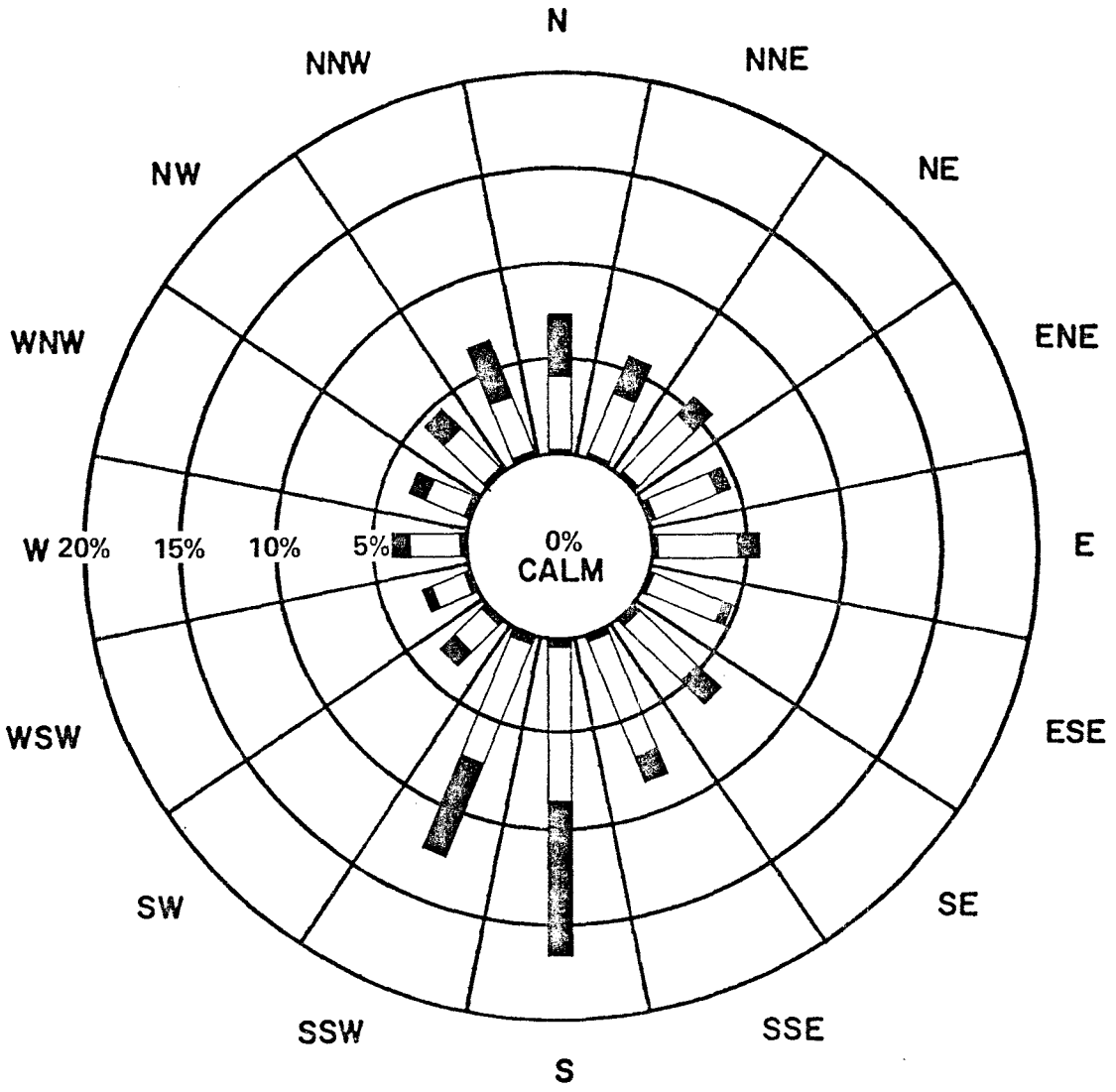
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.3-17

Wind Frequency Distribution in Percent - 6/1/74 - 5/31/75

LEGEND:

0-1.5 1.5-5.0 >5 Meters Per Second



LEGEND:

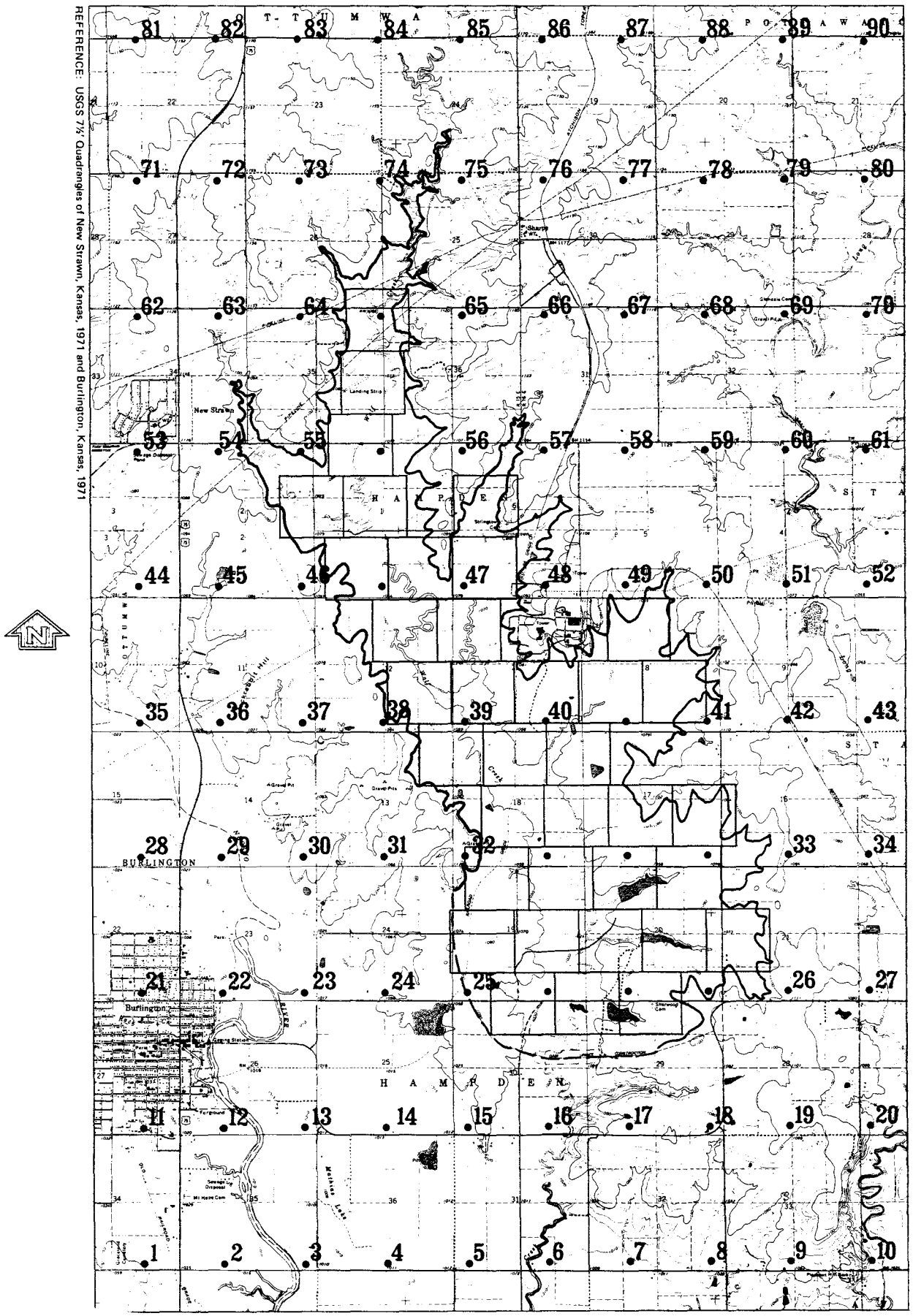
0-1.5 1.5-5.0 >5 Meters Per Second

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.3-18

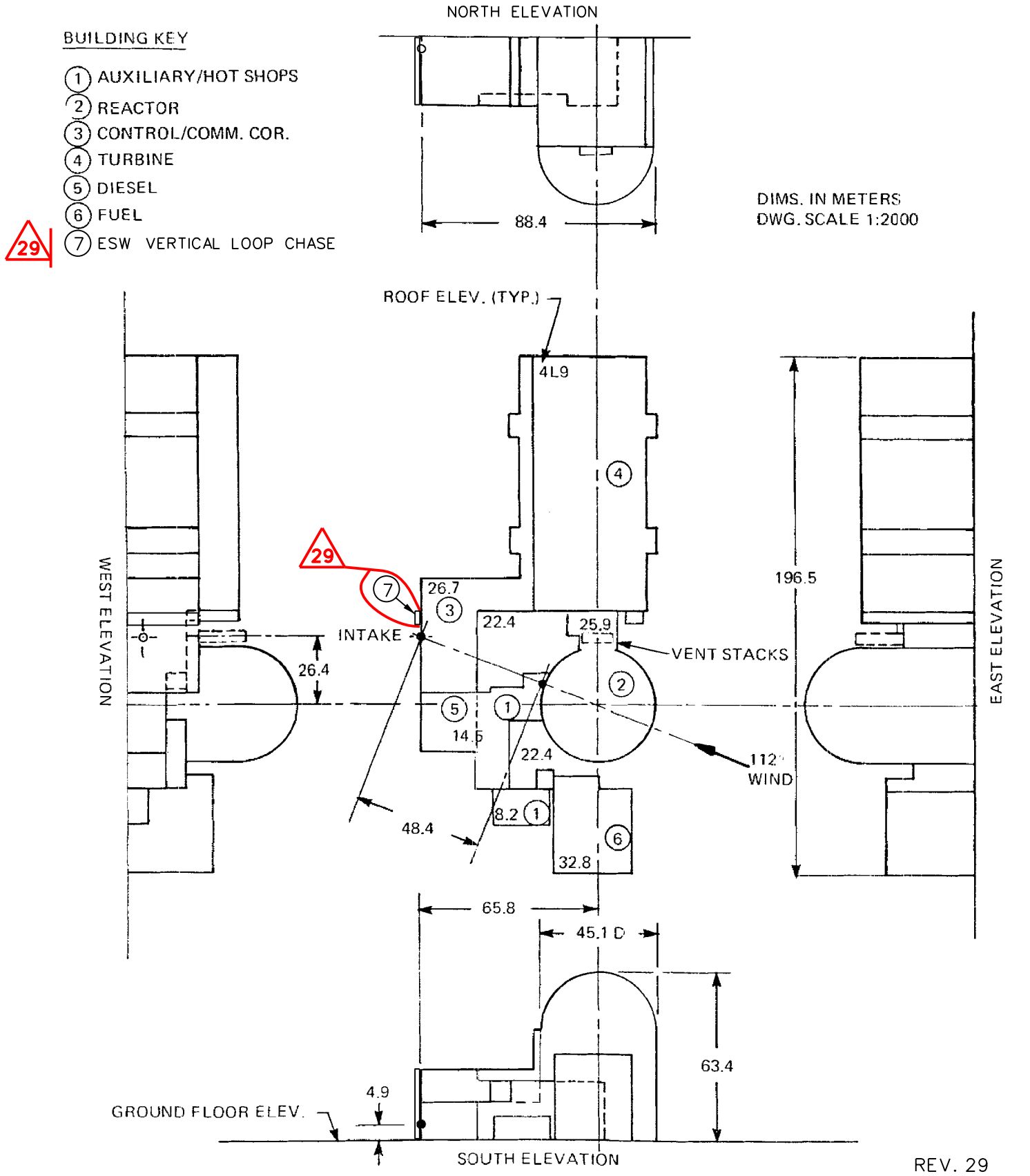
Wind Frequency Distribution in Percent - 3/5/79 - 3/4/80



WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.3-19

Fogging and Icing Analysis Grid

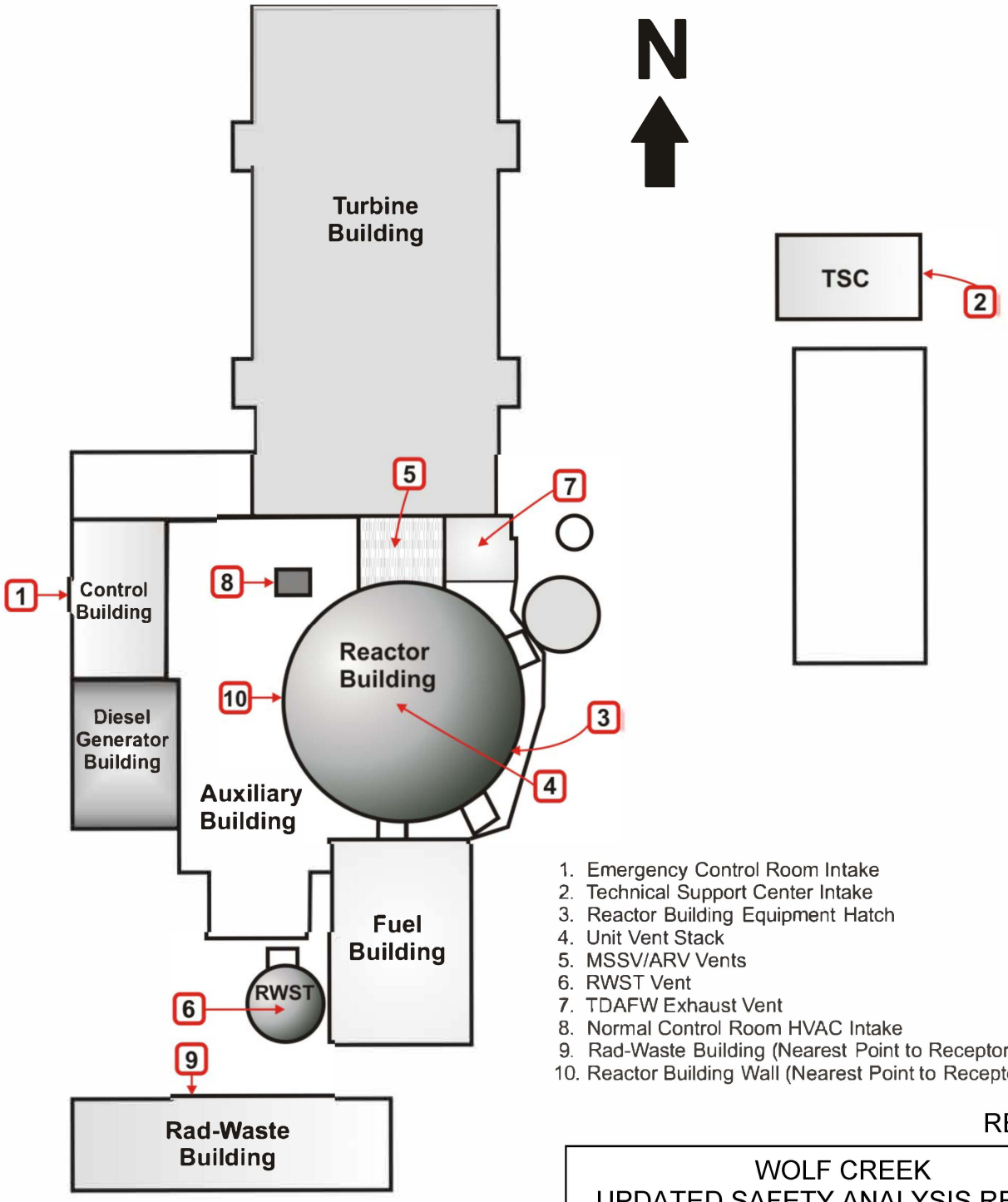


REV. 29

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.3-20

Contiguous Building Arrangement
One-Unit Plant

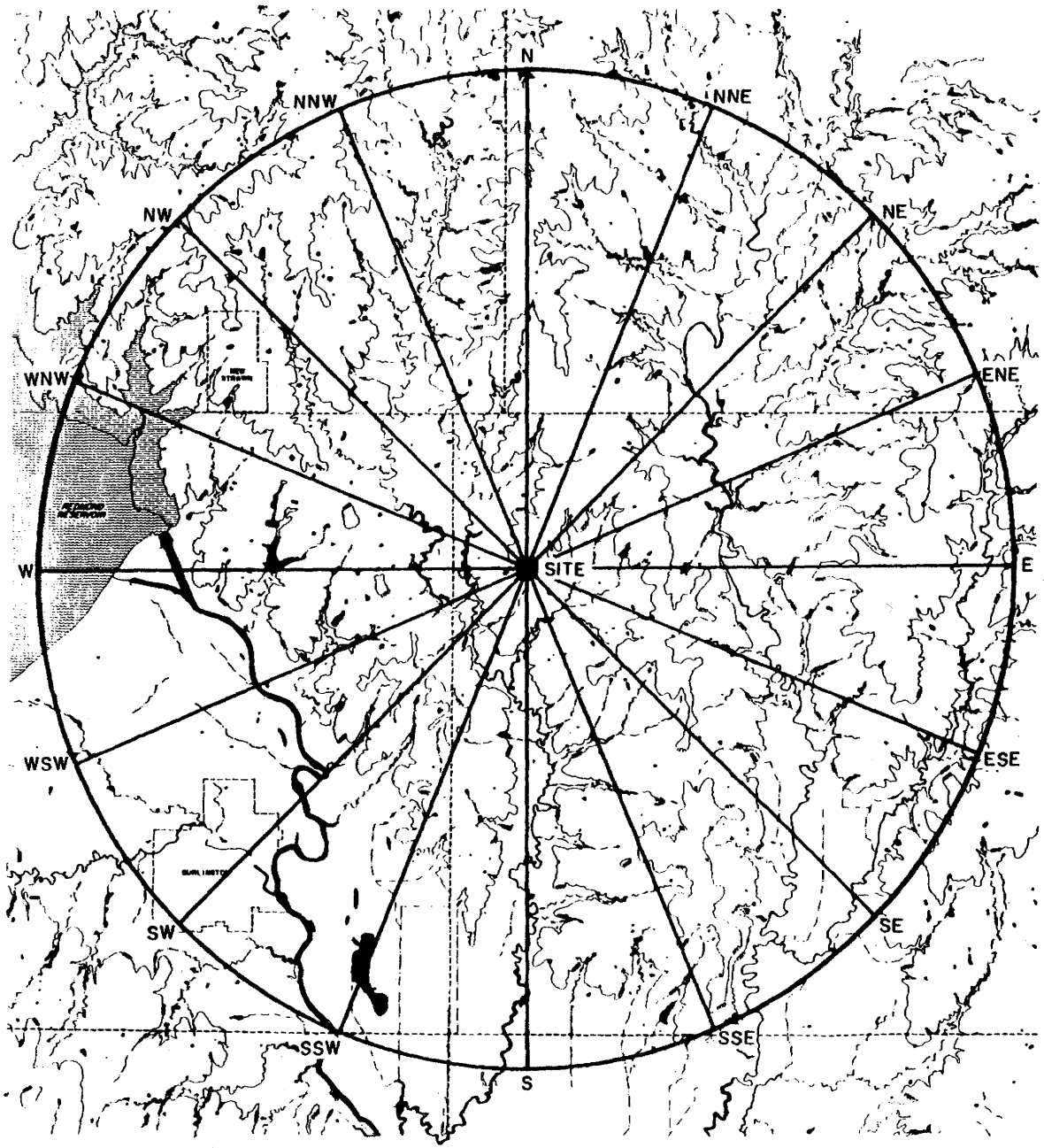


1. Emergency Control Room Intake
2. Technical Support Center Intake
3. Reactor Building Equipment Hatch
4. Unit Vent Stack
5. MSSV/ARV Vents
6. RWST Vent
7. TDAFW Exhaust Vent
8. Normal Control Room HVAC Intake
9. Rad-Waste Building (Nearest Point to Receptor)
10. Reactor Building Wall (Nearest Point to Receptor)

REV. 34

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

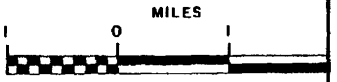
FIGURE 2.3-20a
DIAGRAM OF SOURCE AND
RECEPTOR LOCATIONS





REFERENCE:

FIFTY-FOOT TOPOGRAPHIC CONTOURS FROM U.S. GEOLOGICAL SURVEY QUADRANGLES FOR NEW STRAWN (1971), OTTUMWA (1970), WAVERLY SE (1971), ALICEVILLE (1971), AND JOHN REDMOND DAM (1966); 7.5 MINUTE SERIES.



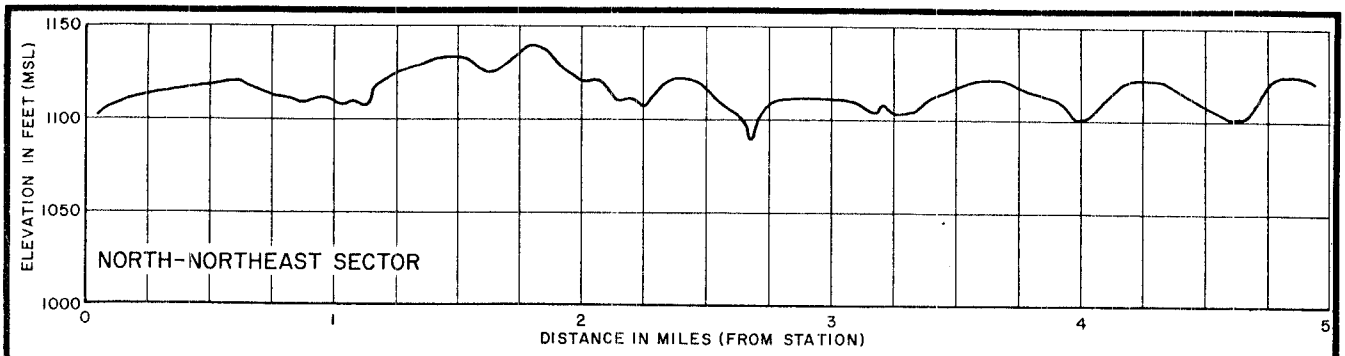
CONTOUR INTERVAL 50 FEET
DATUM IS MEAN SEA LEVEL

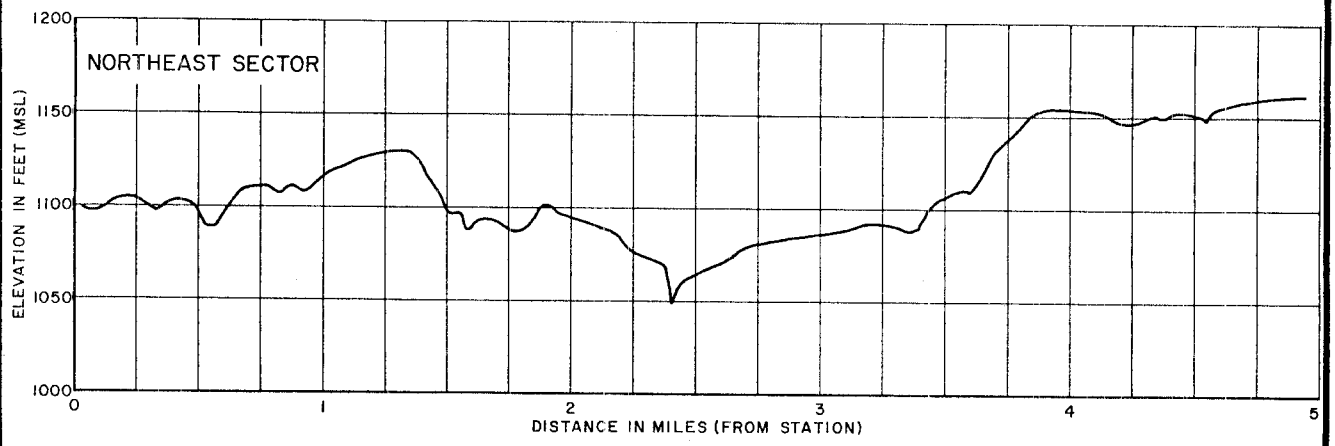
Rev. 0

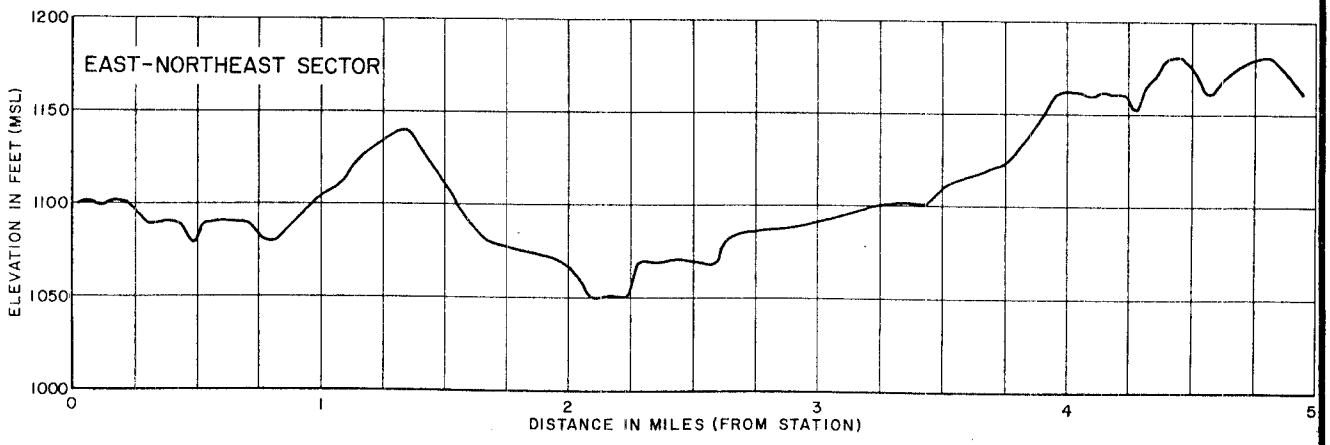
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

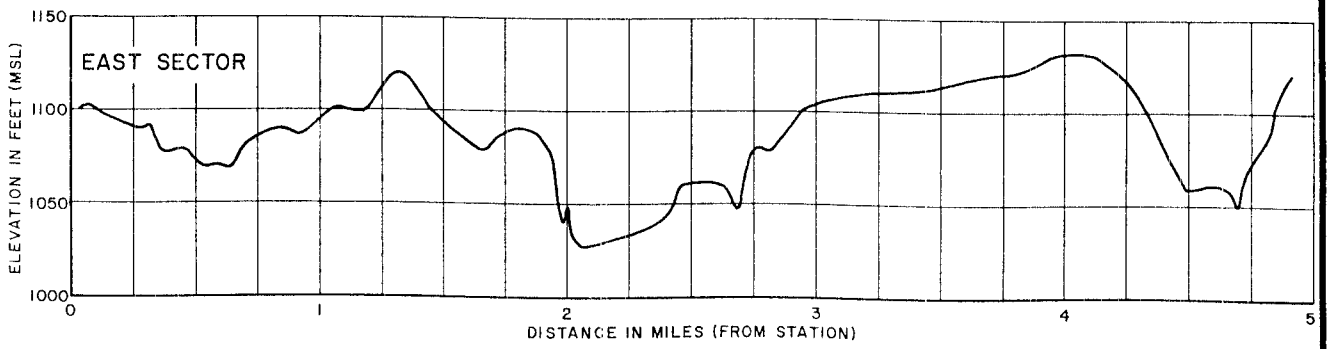
Figure 2.3-21

Topographic Features within 5 Miles of the Plant Site









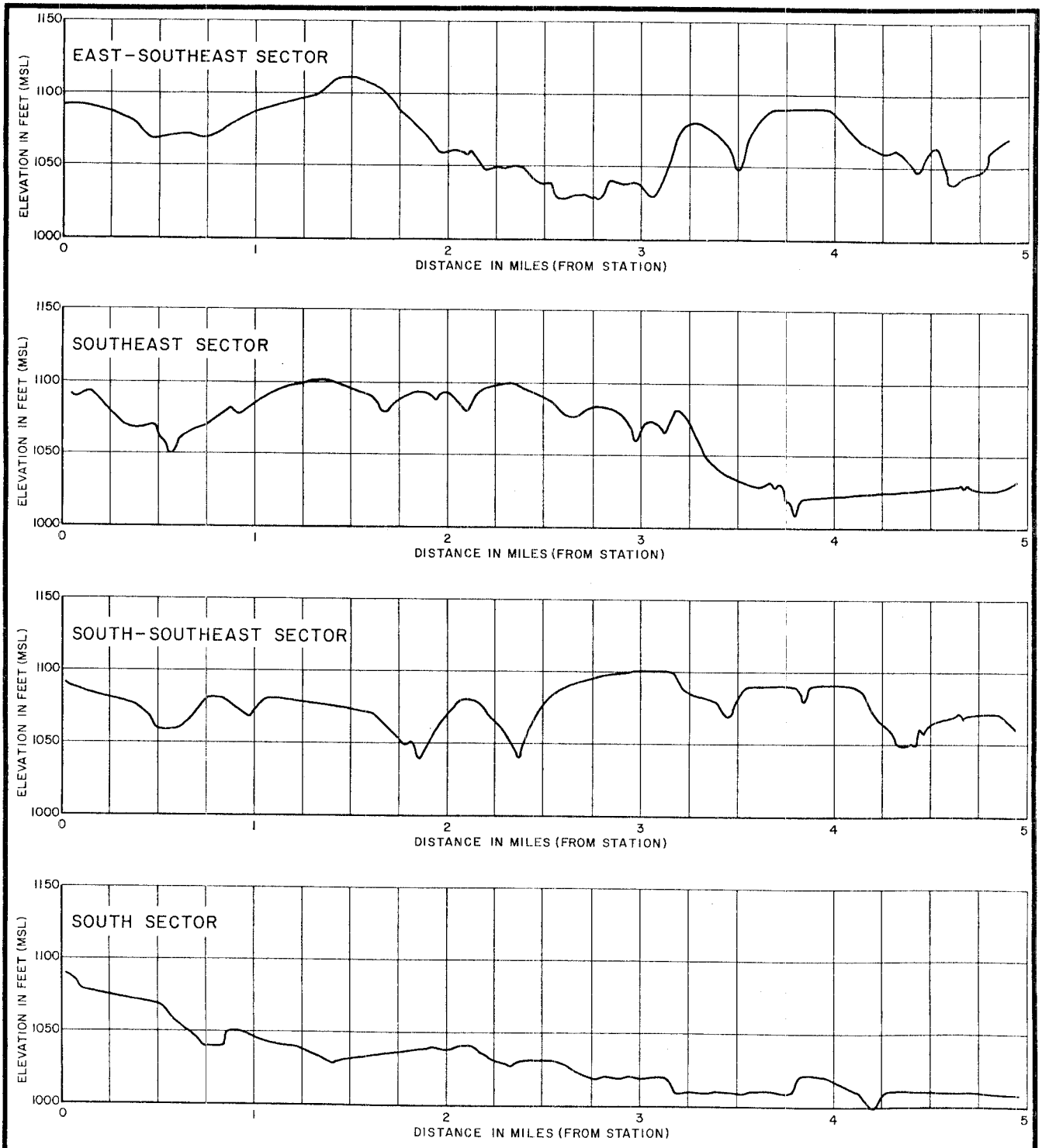
Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.3-22 (Sheet 1 of 4)

Topographic Cross-Sections within 5 Mile Radius of the Site

NOTES: CROSS SECTIONS CORRESPOND TO RADIALS SHOWN IN FIGURE 2.3-21. VERTICAL EXAGGERATION EQUALS 40.



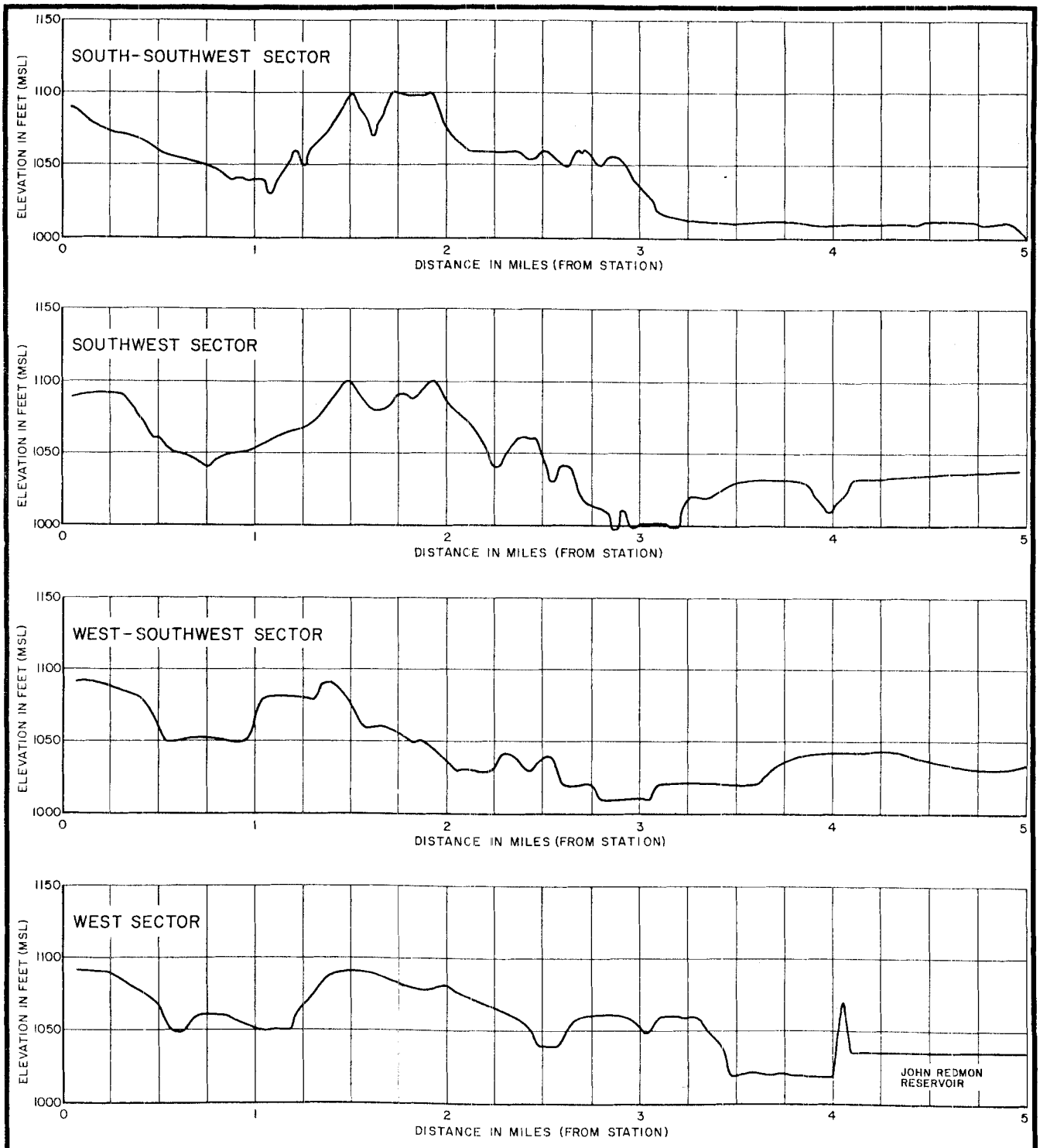
NOTES: CROSS SECTIONS CORRESPOND TO RADIALS SHOWN IN FIGURE 2.3-21. VERTICAL EXAGGERATION EQUALS 40.

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.3-22 (Sheet 2 of 4)

Topographic Cross-Sections within 5 Mile Radius of the Site



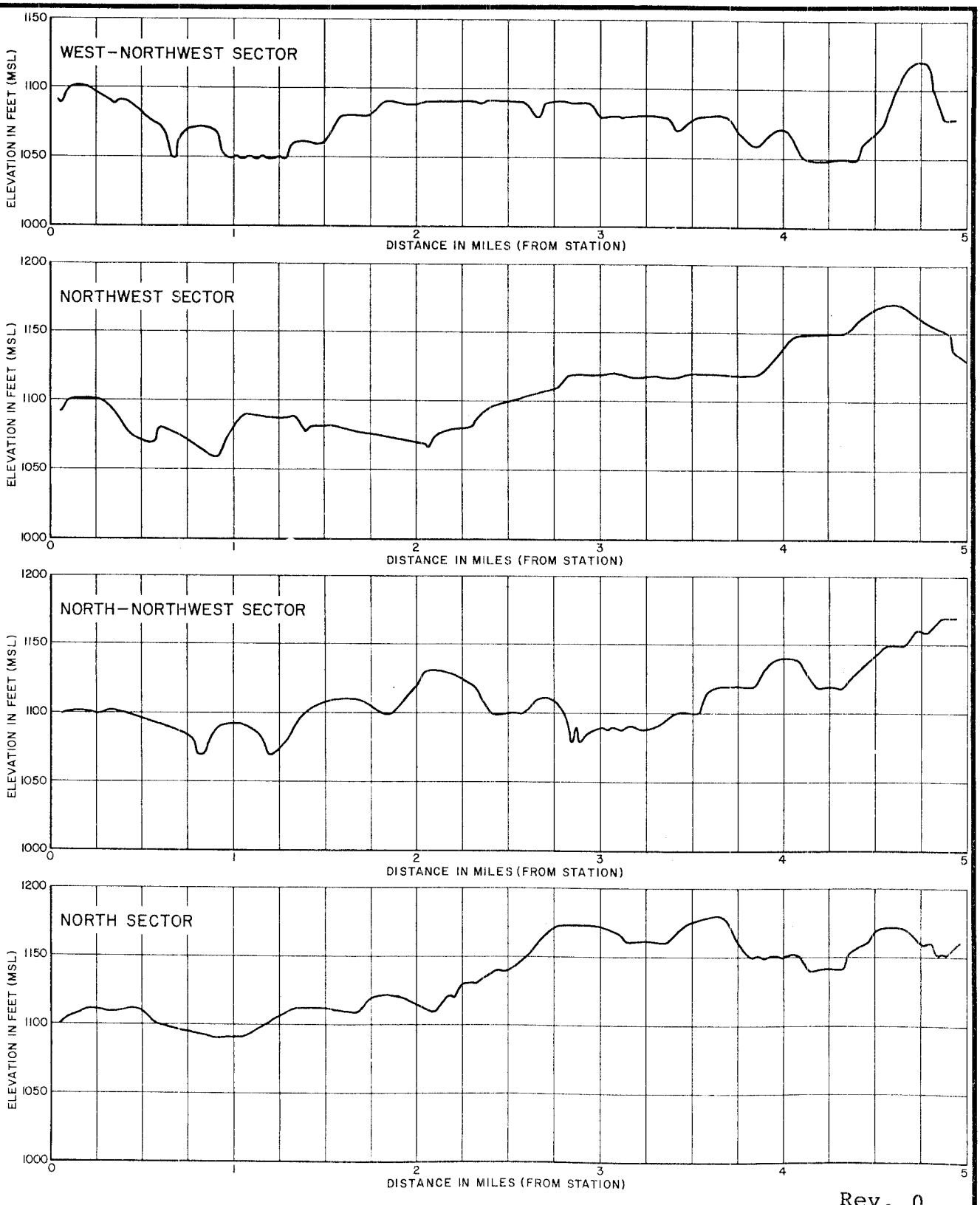
Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.3-22 (Sheet 3 of 4)

Topographic Cross-Sections within 5 Mile Radius of the Site

NOTES: CROSS SECTIONS CORRESPOND TO RADIALS SHOWN IN FIGURE 2.3-21. VERTICAL EXAGGERATION EQUALS 40.



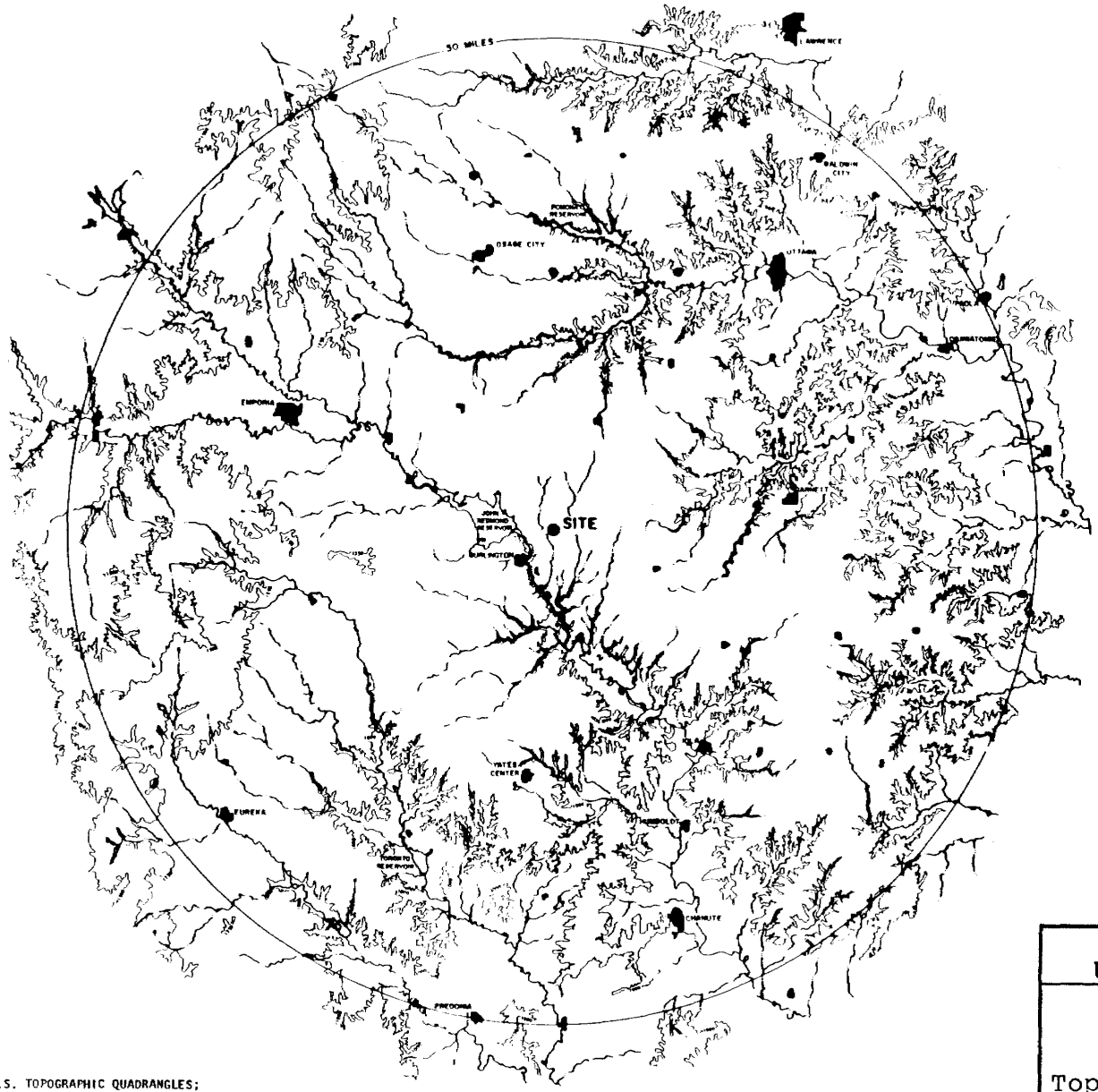
Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.3-22 (Sheet 4 of 4)

Topographic Cross-Sections within 5 Mile Radius of the Site

NOTES: CROSS SECTIONS CORRESPOND TO RADIALS SHOWN IN FIGURE 2.3-21. VERTICAL EXAGGERATION EQUALS 40.



REFERENCE:

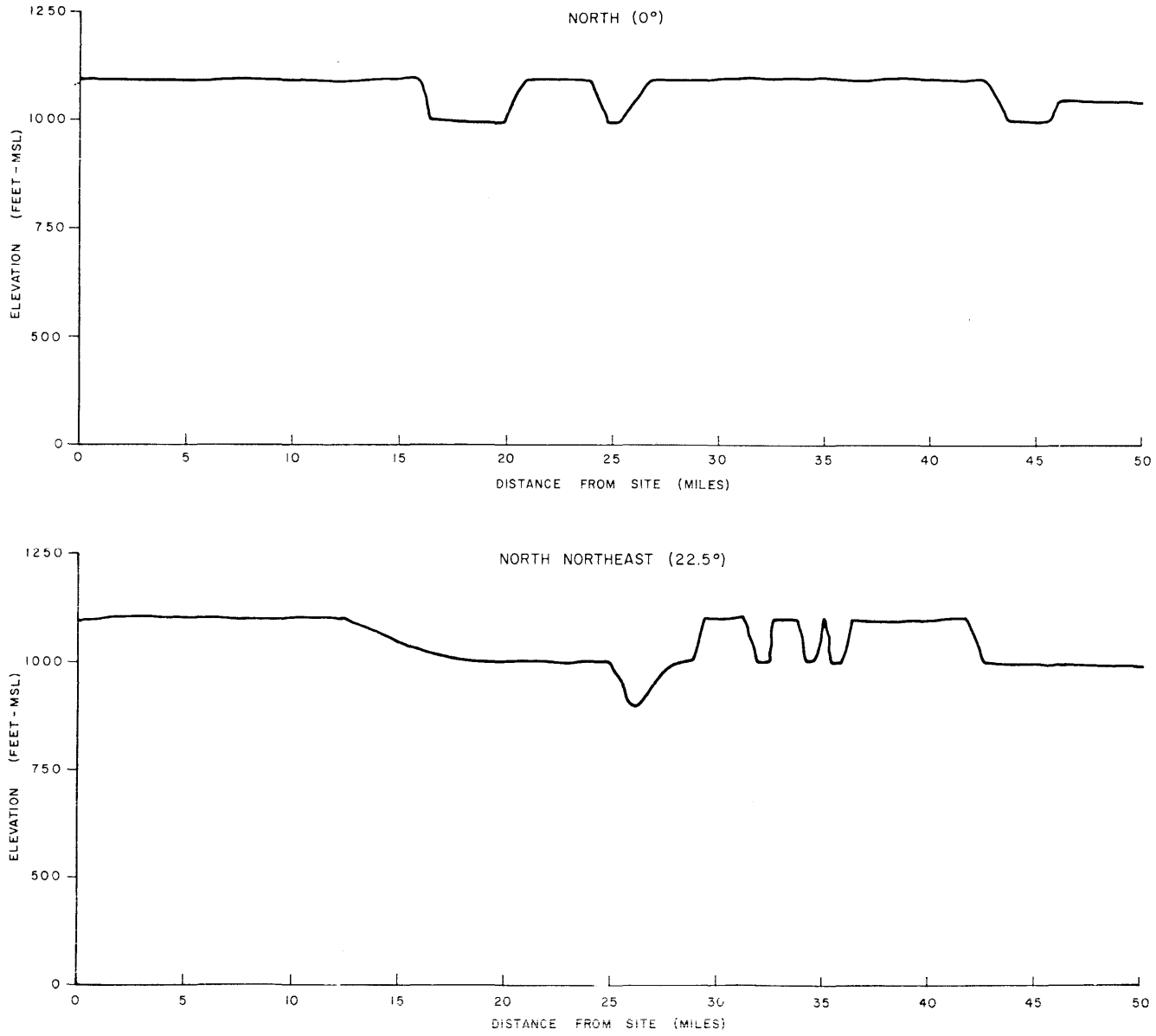
BASED ON U.S.G.S. TOPOGRAPHIC QUADRANGLES;
HUTCHINSON, KANSAS - 1955
JOPLIN, MISSOURI; KANSAS - 1954
LAWRENCE, KANSAS; MISSOURI - 1956
WICHITA, KANSAS - 1955

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.3-23

Topographic Features within 50 Miles of the Plant Site

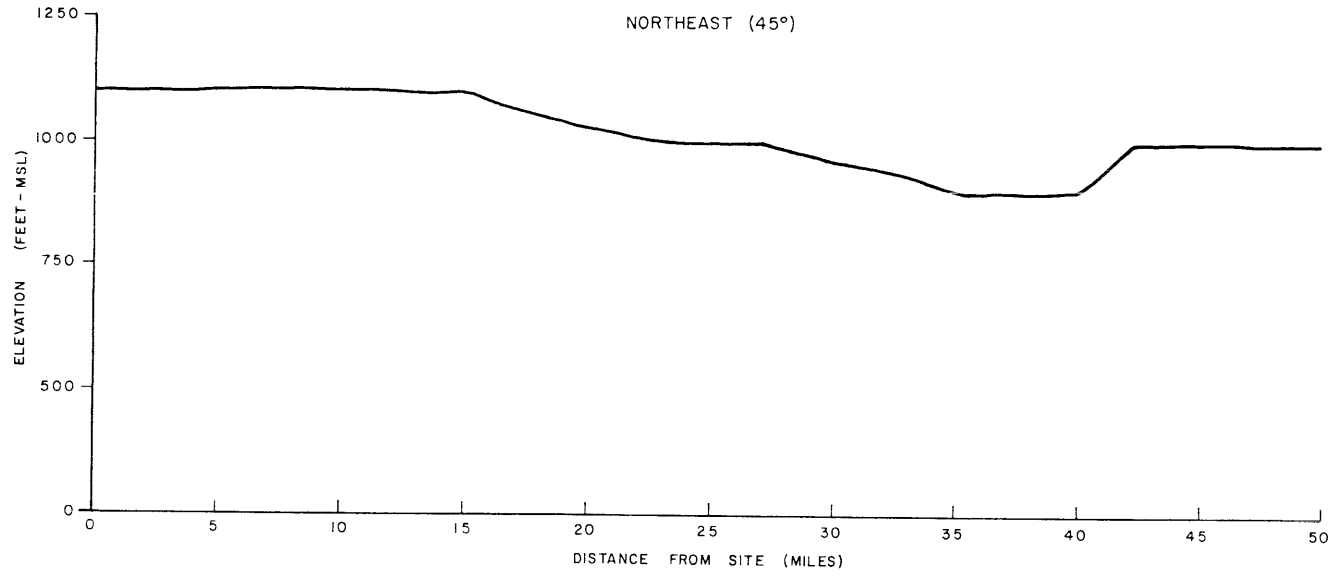


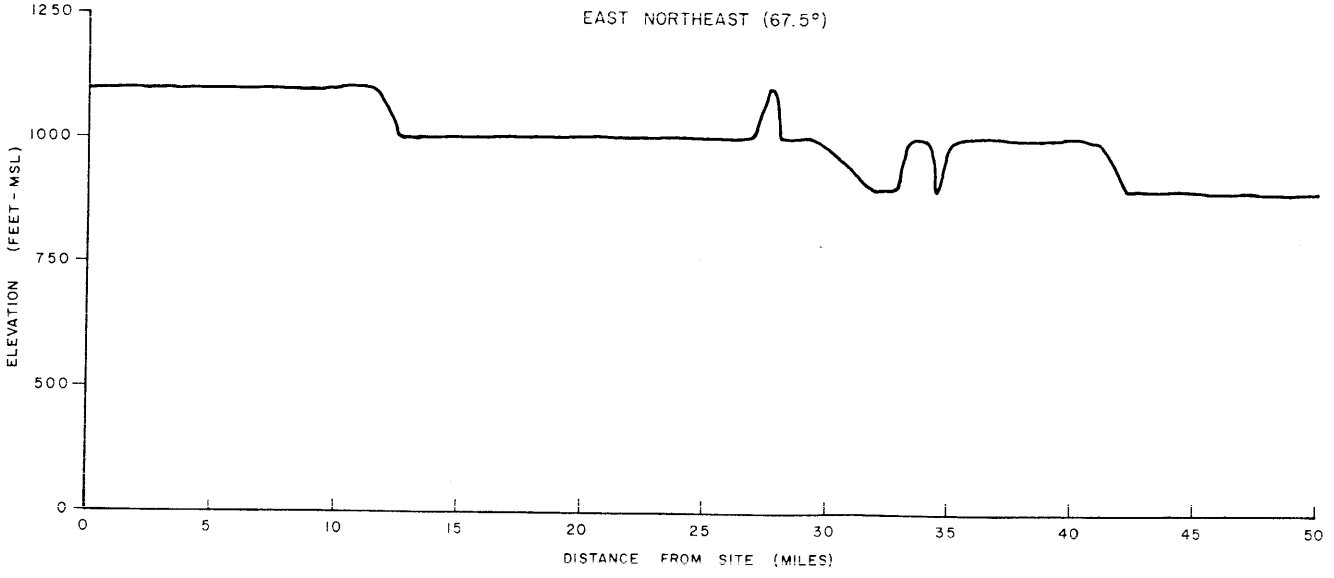
Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.3-24 (Sheet 1 of 8)

Topographic Cross-Sections within a 50 Mile Radius of the Site



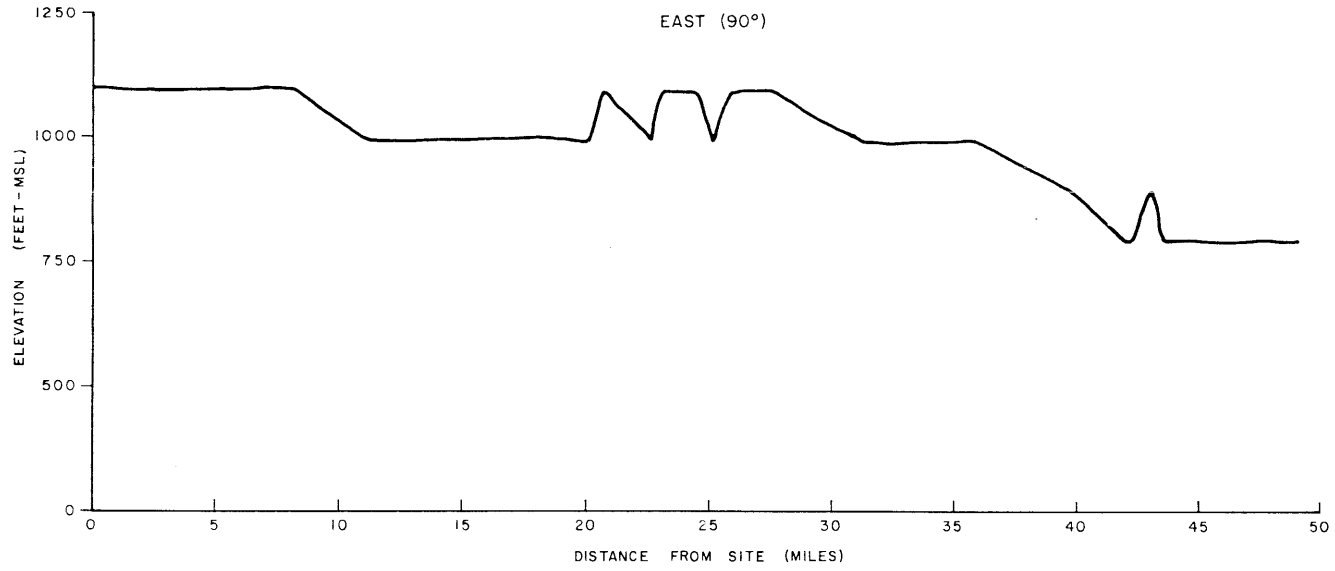


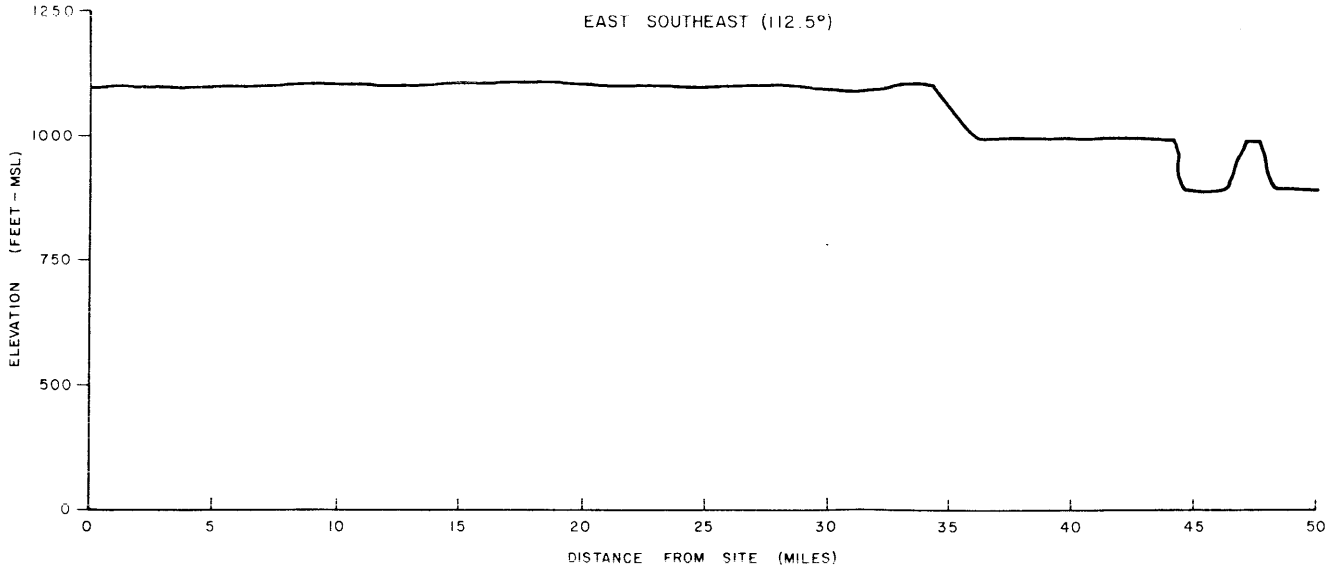
Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.3-24 (Sheet 2 of 8)

Topographic Cross-Sections within a 50 Mile Radius of the Site



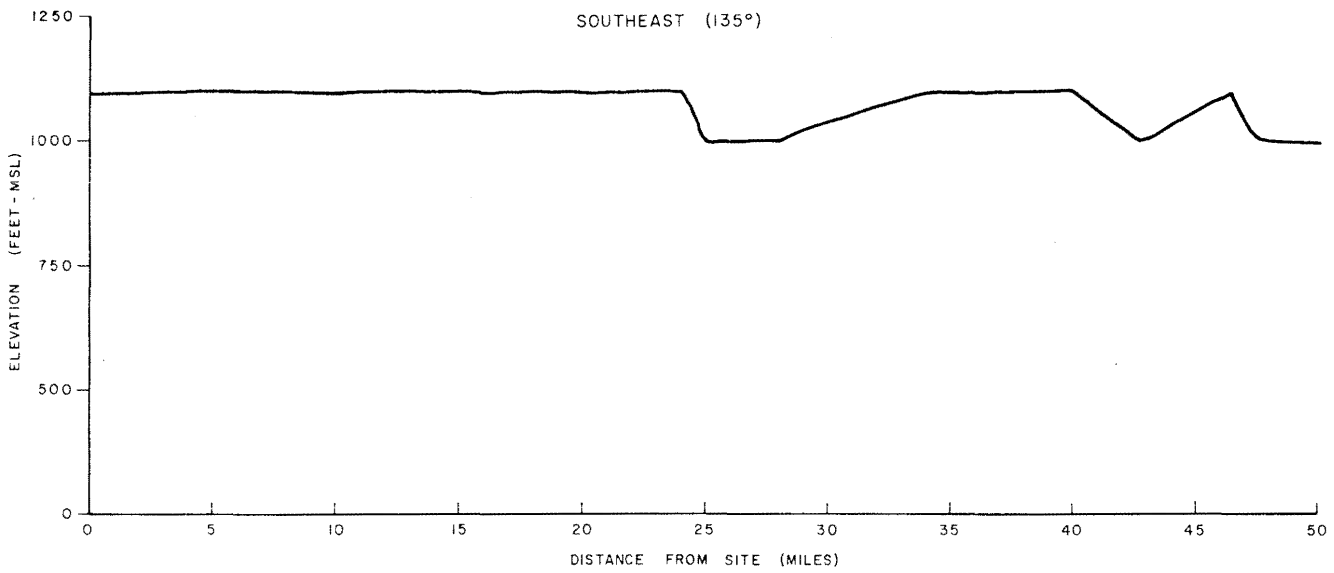


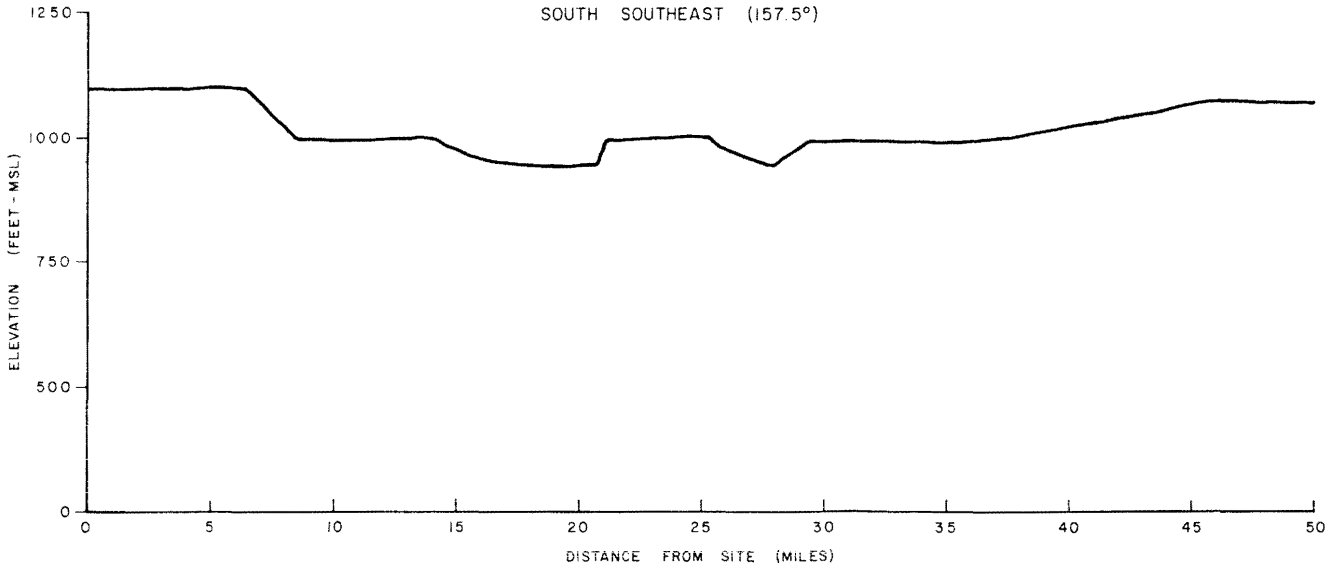
Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.3-24 (Sheet 3 of 8)

Topographic Cross-Sections within a 50 Mile Radius of the Site



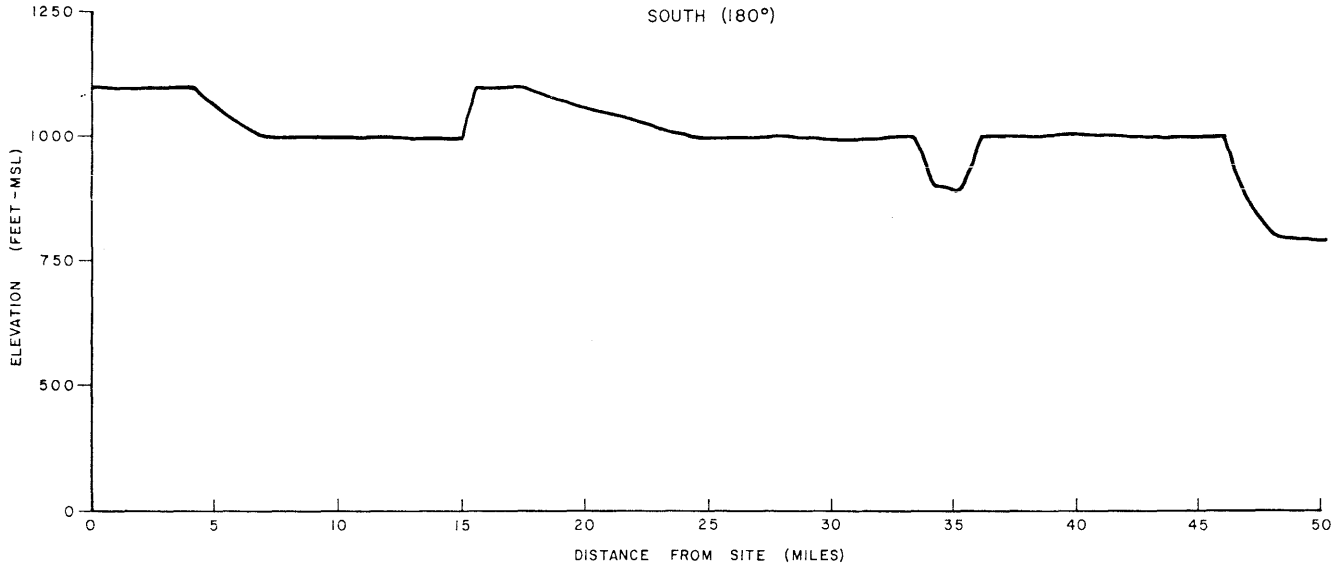


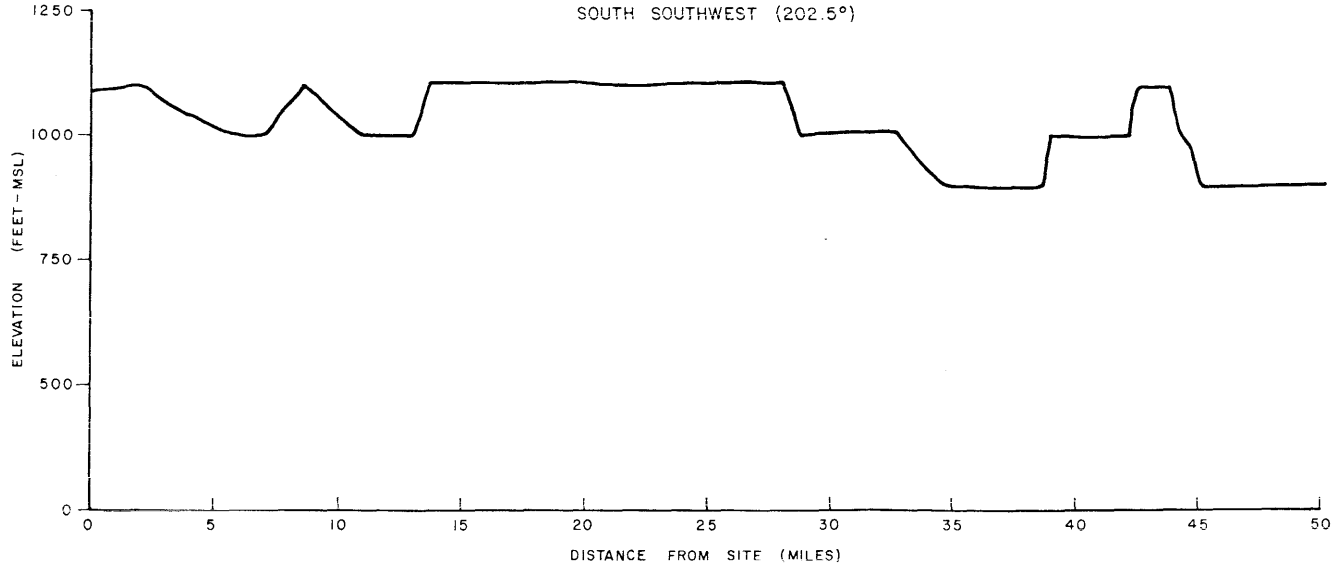
Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.3-24 (Sheet 4 of 8)

Topographic Cross-Sections within a 50 Mile Radius of the Site



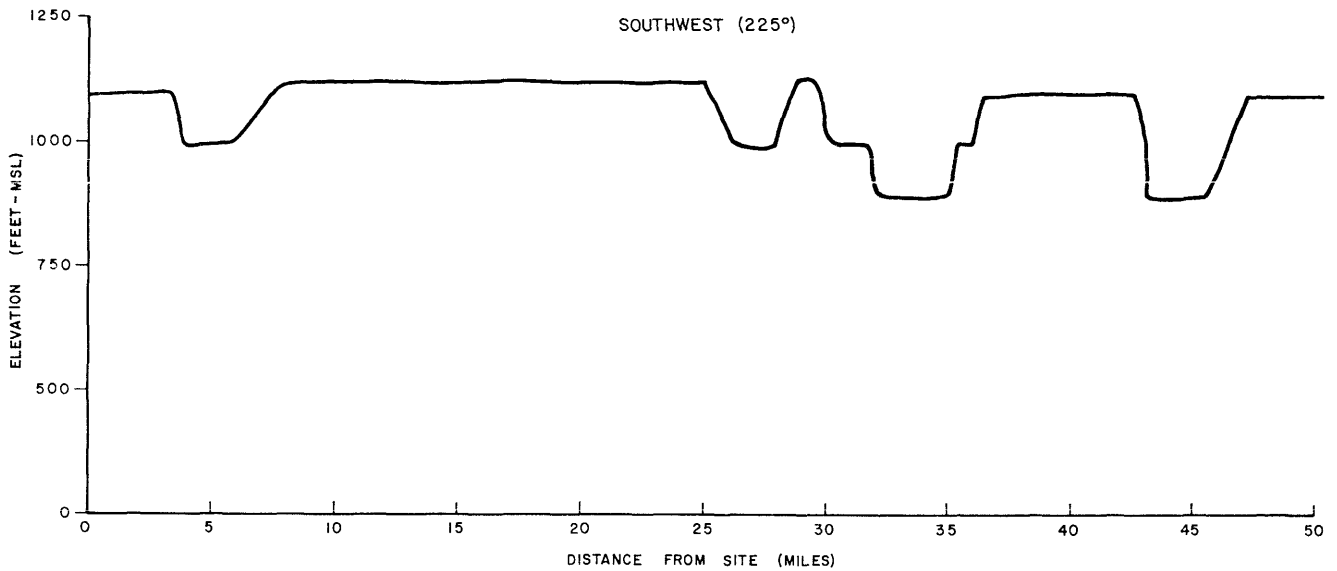


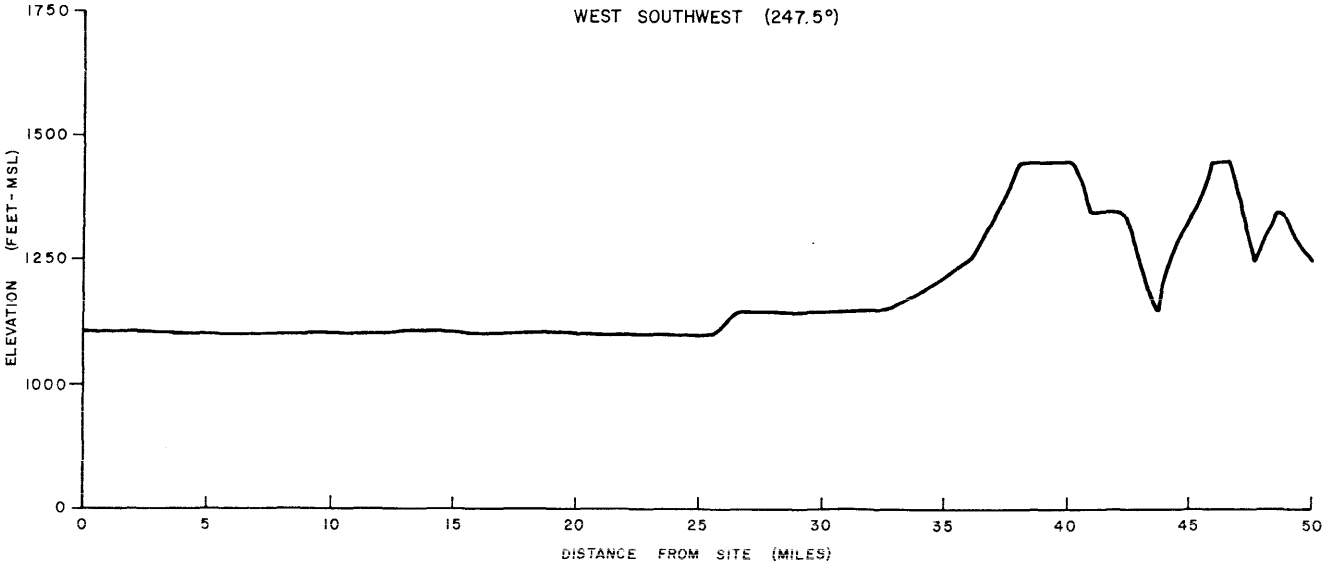
Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.3-24 (Sheet 5 of 8)

Topographic Cross-Sections within a 50 Mile Radius of the Site



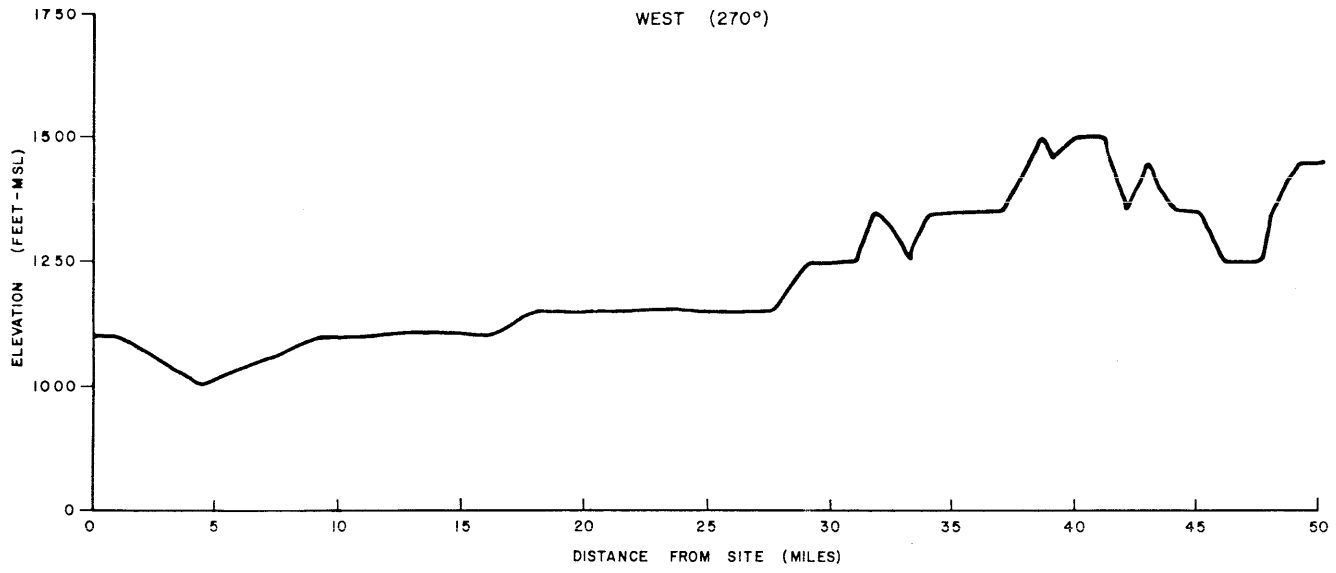


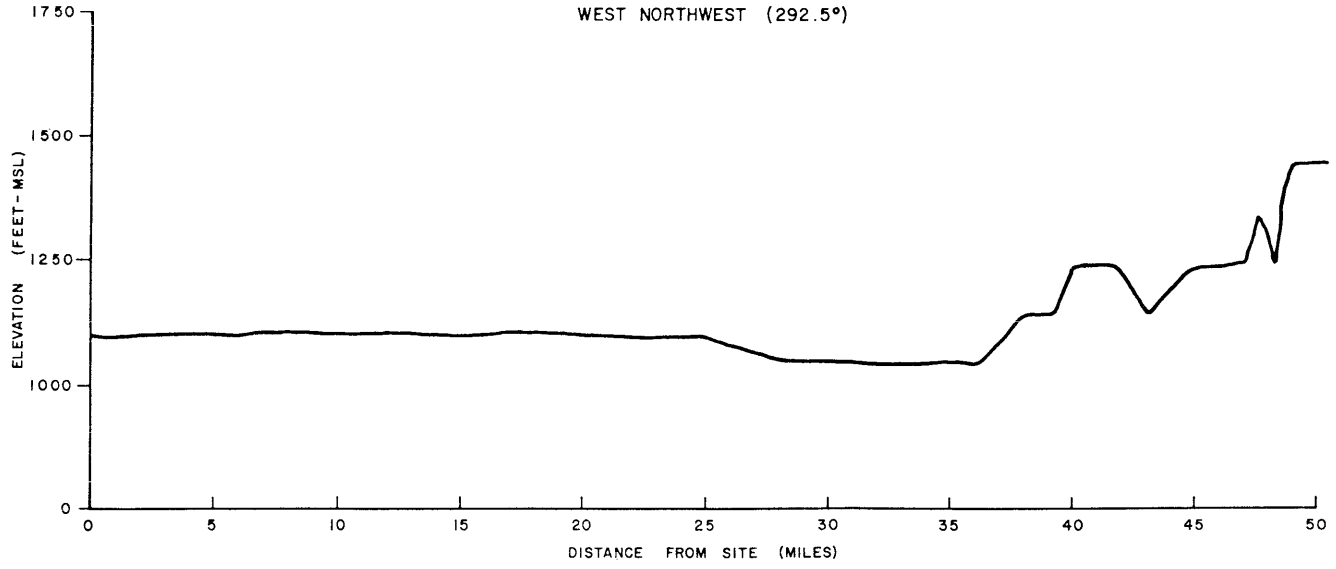
Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.3-24 (Sheet 6 of 8)

Topographic Cross-Sections within a 50 Mile Radius of the Site



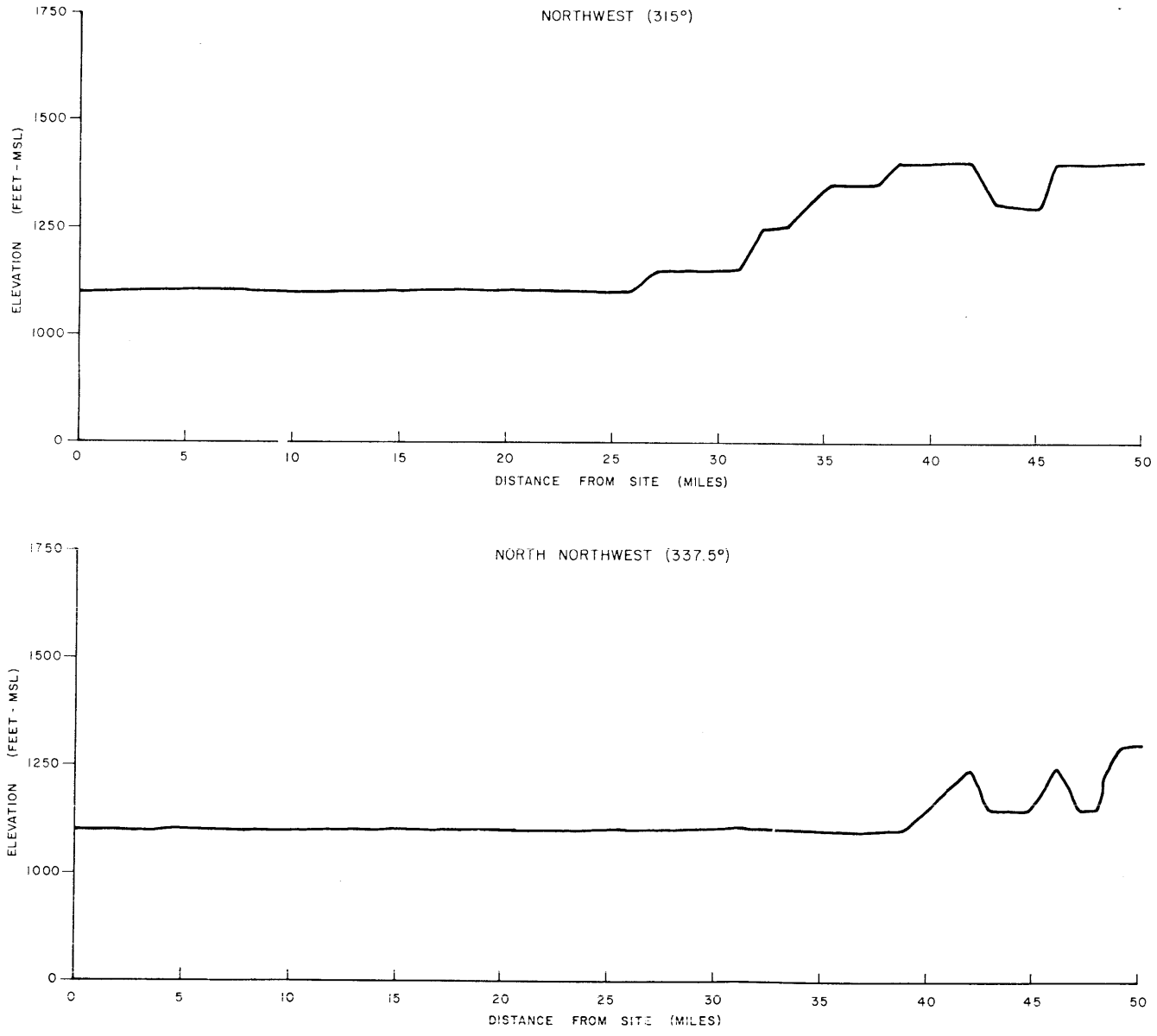


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.3-24 (Sheet 7 of 8)

Topographic Cross-Sections within a 50 Mile Radius of the Site

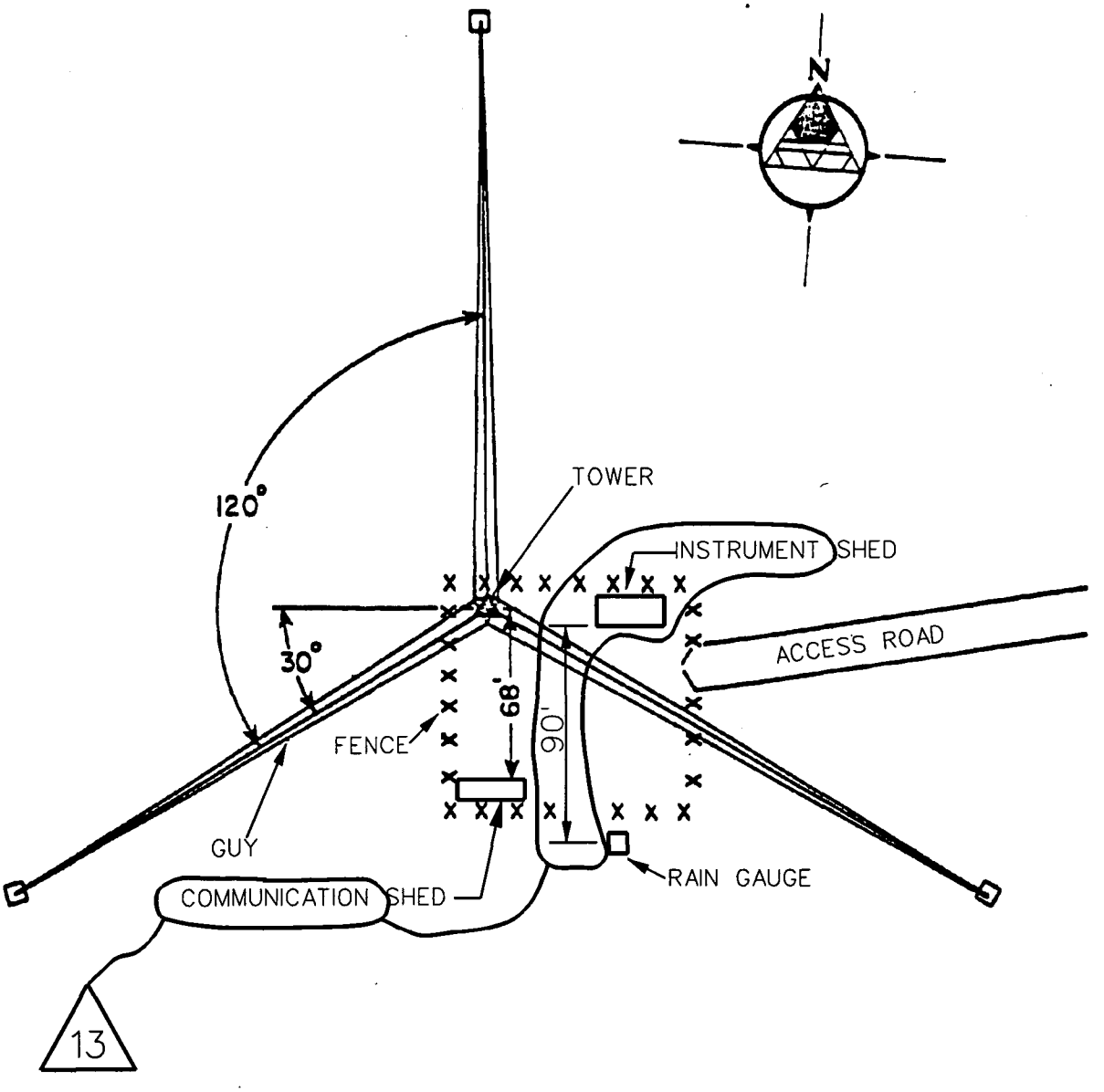


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.3-24 (Sheet 8 of 8)

Topographic Cross-Sections within a 50 Mile Radius of the Site





NOTE:

FIGURE 2.1-6 SHOWS THE RELATIONSHIP OF THE METEOROLOGICAL TOWER TO PLANT STRUCTURES AND FEATURES.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.3-25, REV. 13

Meteorological Tower Plot Plan

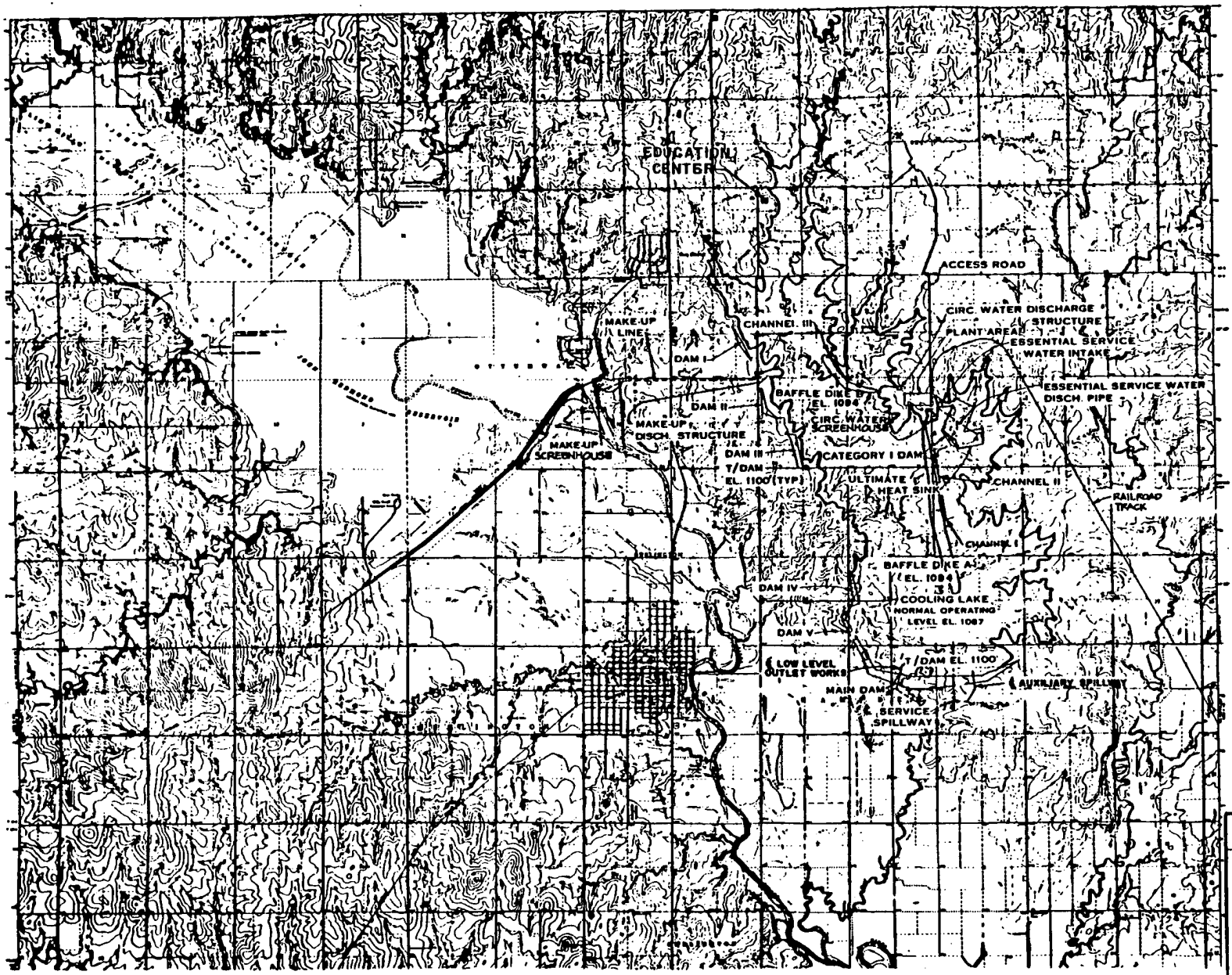
FIGURE 2.3-26 HAS BEEN DELETED

REV. 34

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

FIGURE 2.3-26

VARIATION OF INTAKE K_C WITH
WIND DIRECTION

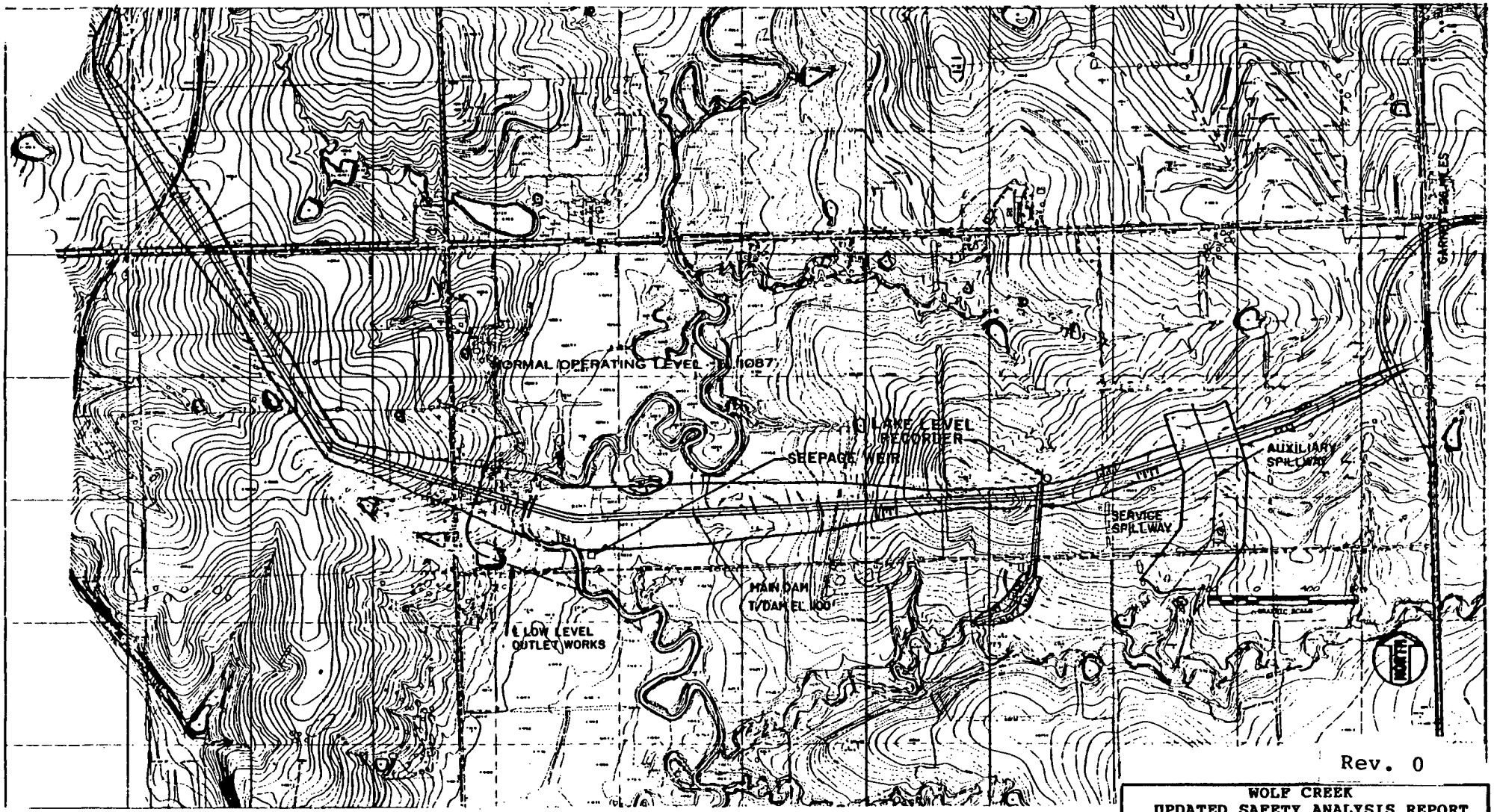


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

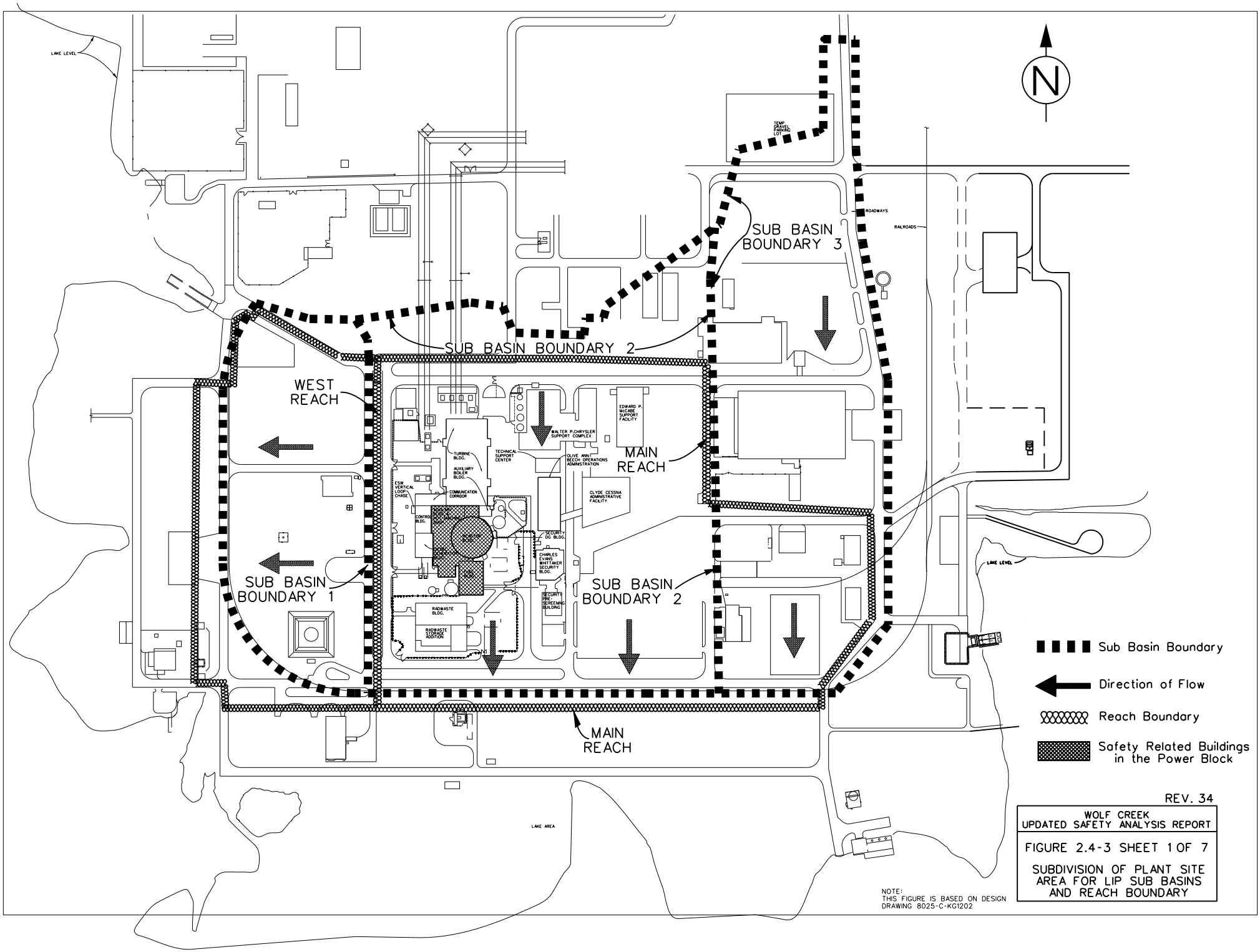
Figure 2.4-1

General Arrangement



Rev. 0

WOLF CREEK UPDATED SAFETY ANALYSIS REPORT
Figure 2.4-2 Main Dam and Appurtenant Structures



NOTE:
THIS FIGURE IS BASED ON DESIGN DRAWING 8025-C-KG1202

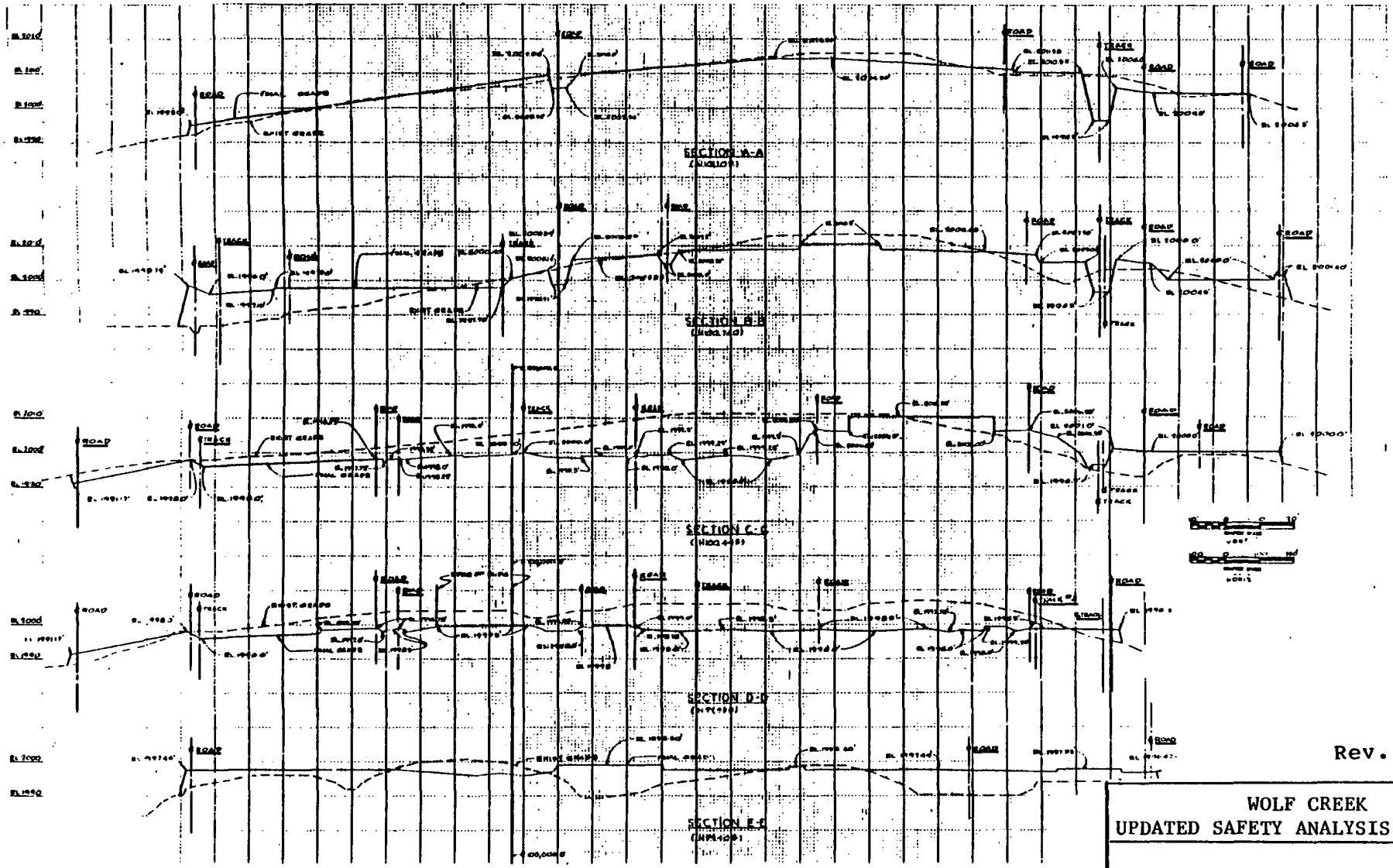
REV. 34

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

FIGURE 2.4-3 SHEET 1 OF 7

SUBDIVISION OF PLANT SITE AREA FOR LIP SUB BASINS AND REACH BOUNDARY

THIS PAGE INTENTIONALLY LEFT BLANK

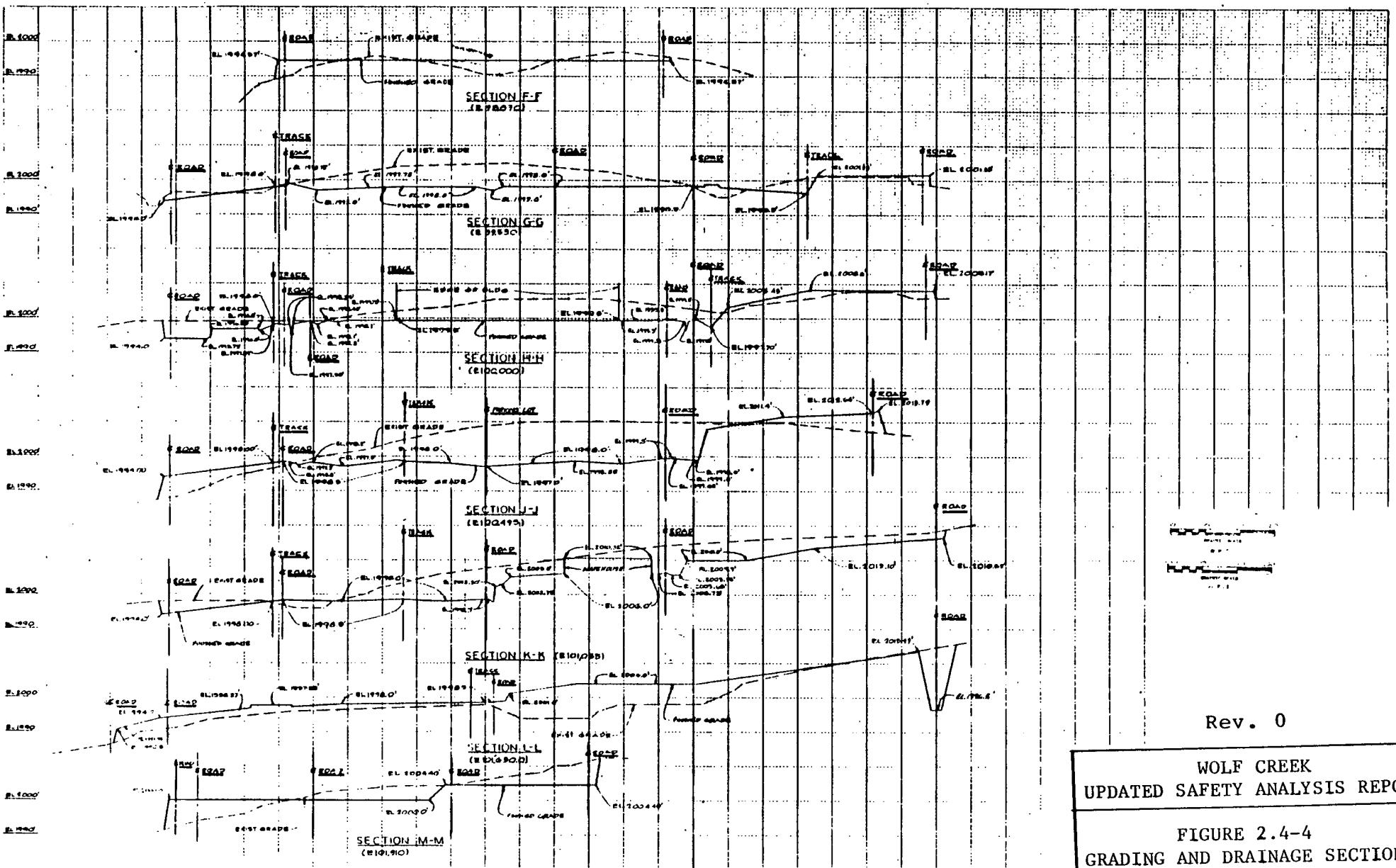


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

FIGURE 2.4-4
GRADING AND DRAINAGE SECTIONS

(SHEET 1 OF 3)



Rev. 0

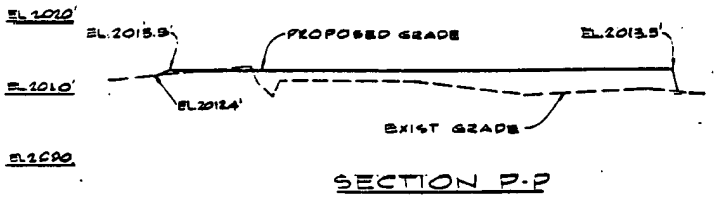
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

FIGURE 2.4-4
GRADING AND DRAINAGE SECTIONS

(SHEET 2 OF 3)



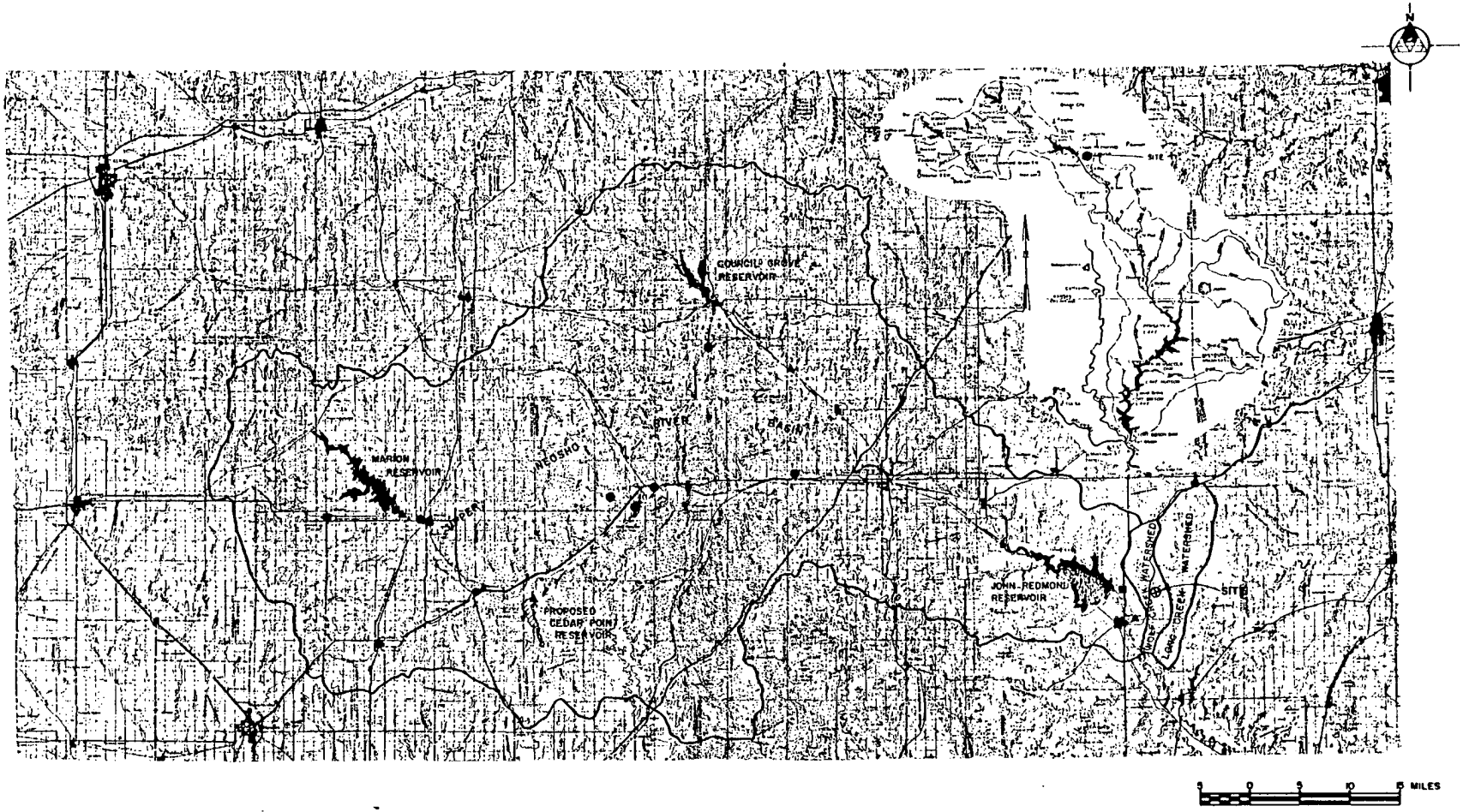
SECTION N-N



SECTION P-P

Rev. 0

WOLF CREEK UPDATED SAFETY ANALYSIS REPORT
Figure 2.4-4 (Sheet 3 of 3) Grading and Drainage Sections



Rev. 0

LEGEND

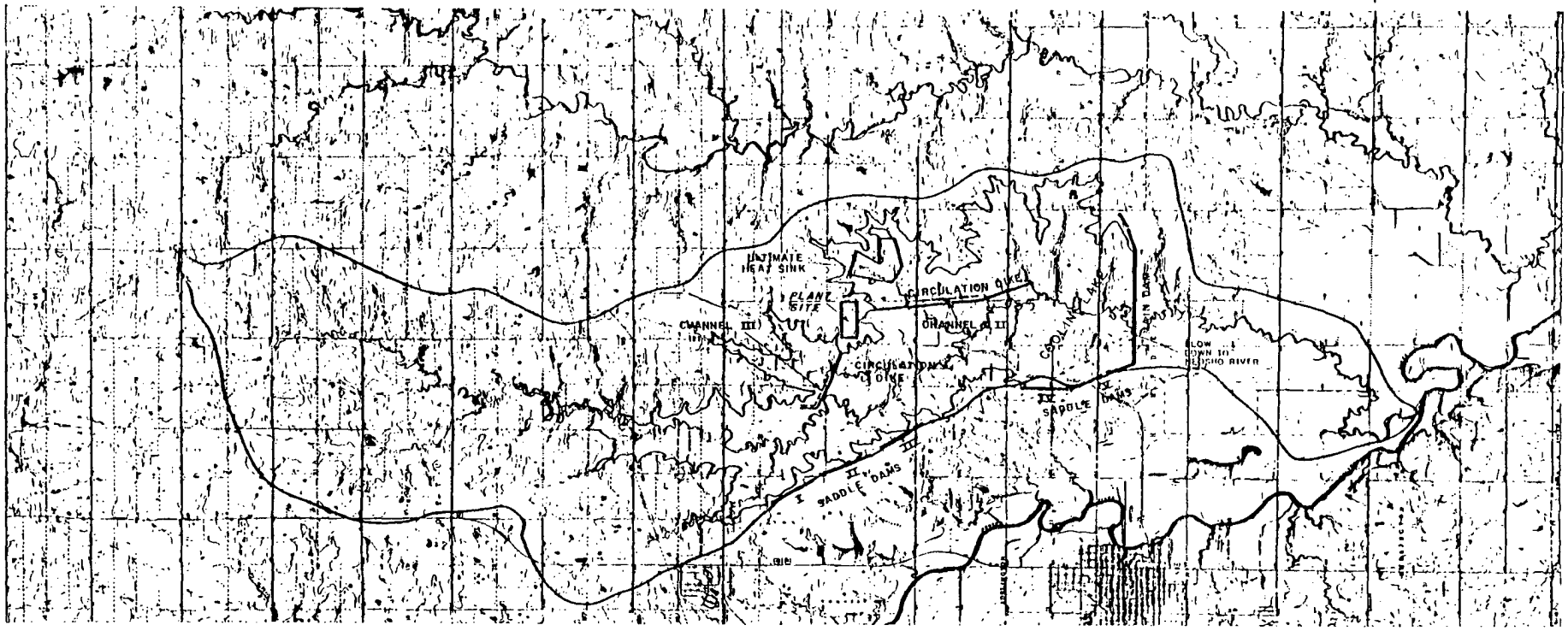
- ▲ EXISTING U.S.G.S. STREAM-GAGING STATIONS
- ● DISCONTINUED U.S.G.S. STREAM-GAGING STATIONS
- ■ U.S.G.S. RESERVOIR WATER-STAGE RECORDERS

REFERENCE:
BASED ON U.S.G.S. MAPS:
HUTCHINSON, KANSAS, 1971
LAWRENCE, KANSAS, 1971

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-5

Neosho River Basin in Kansas



MAP REFERENCE

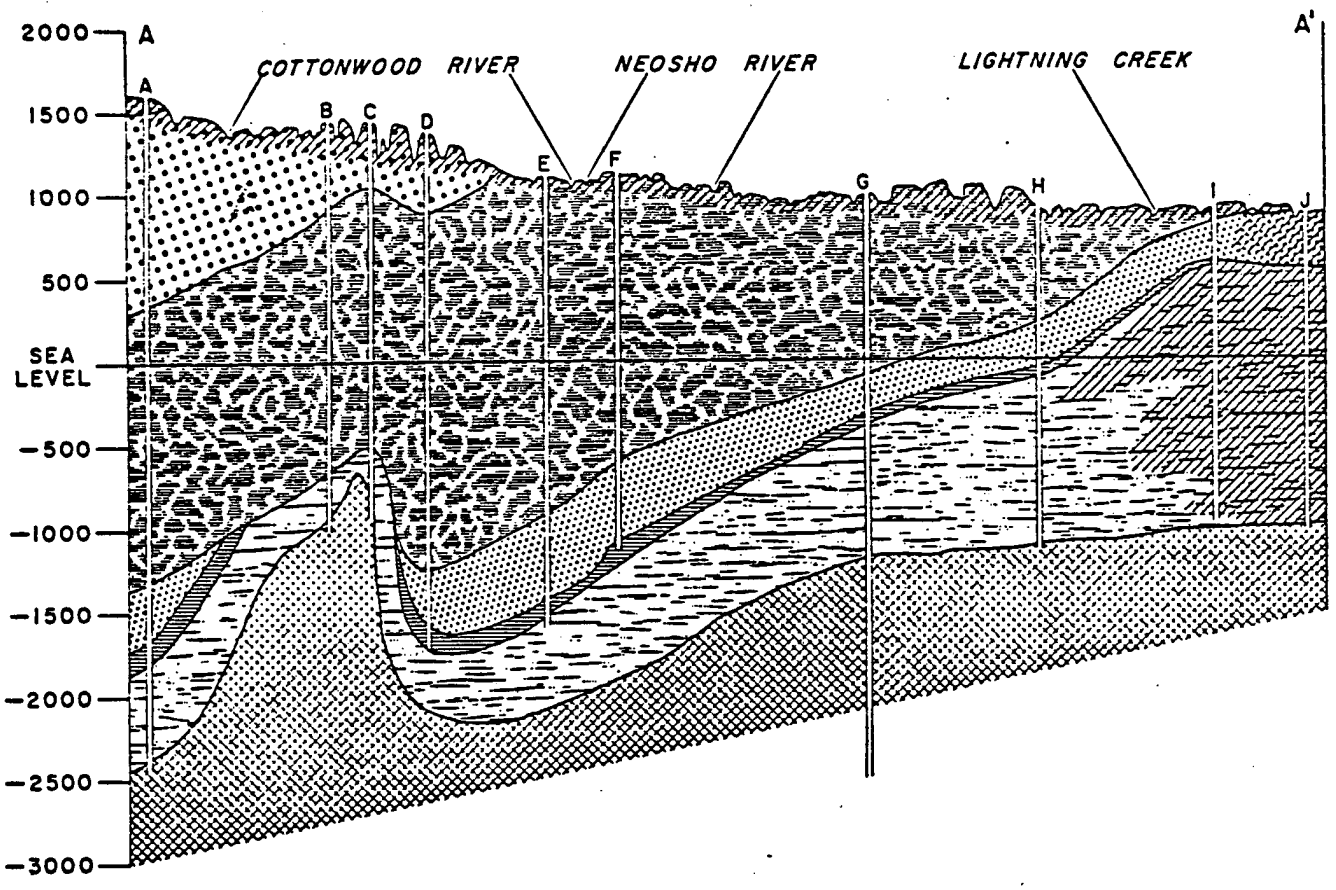
THIS MAP TAKEN FROM U.S.G.S. QUADRANGLES: BURLINGTON, KANSAS AND NEW STRAWN, KANSAS DATED 1971

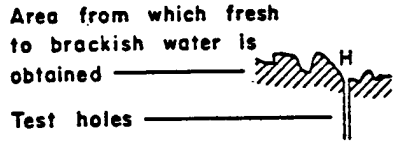
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-6

Wolf Creek Watershed

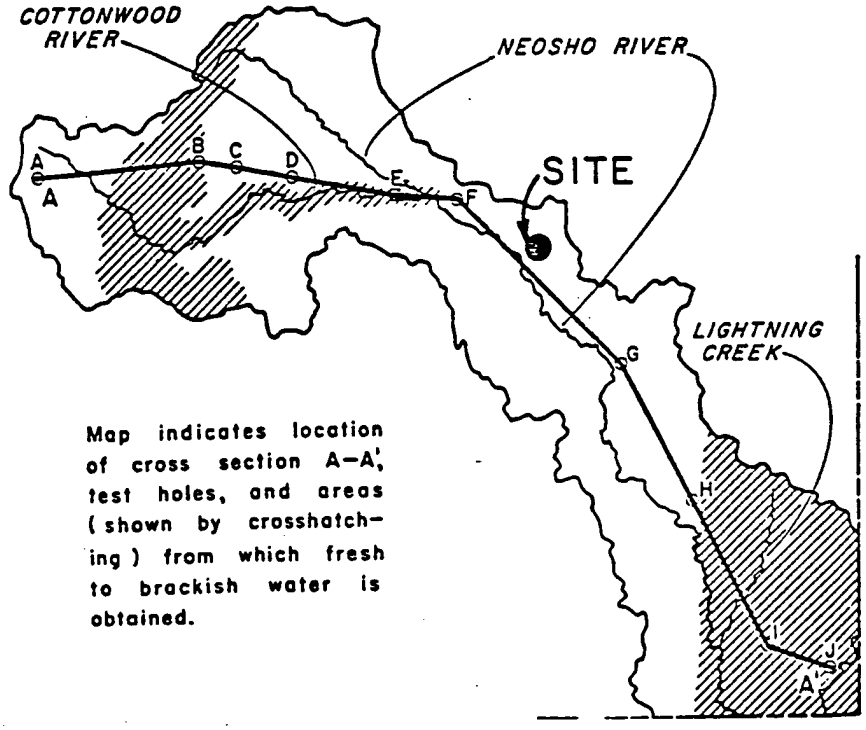
Rev. 0





SYSTEMS

- Cretaceous
- Permian
- Pennsylvanian
- Mississippian
- Mississippian or Devonian
- Cambrian and Ordovician
- Precambrian



Map indicates location of cross section A–A', test holes, and areas (shown by crosshatching) from which fresh to brackish water is obtained.

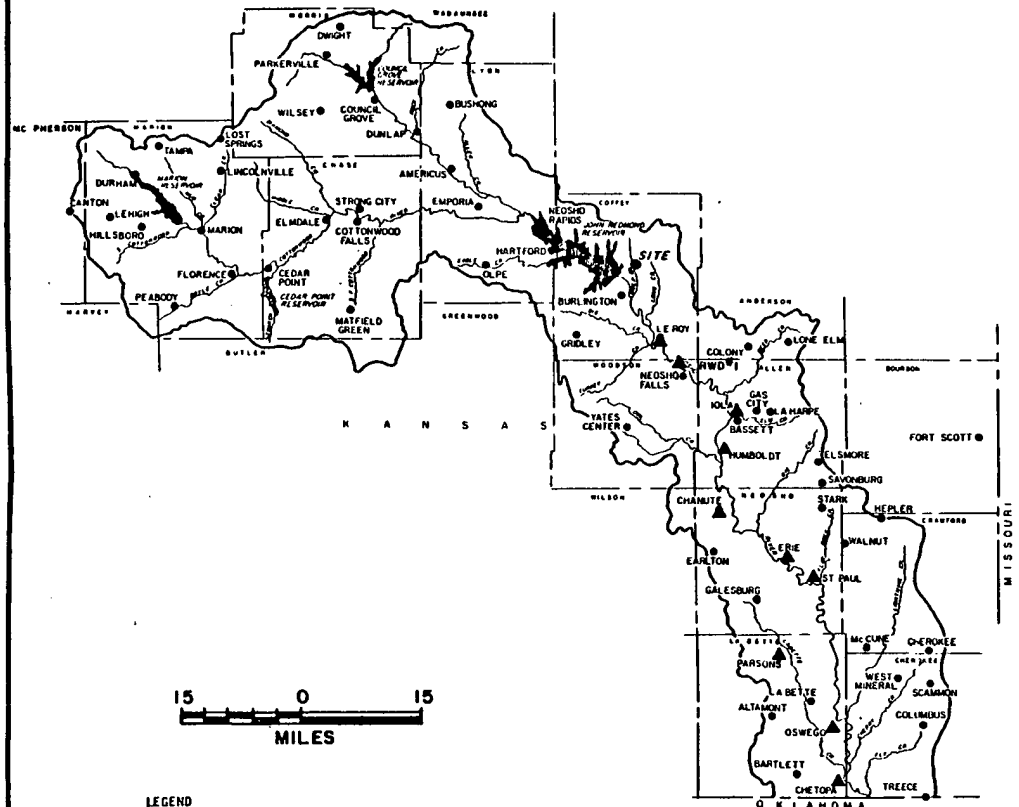
REPRODUCED FROM KANSAS WATER RESOURCES BOARD, 1961, P. 58.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-7

Generalized Geologic Cross-Section, Neosho River Basin in Kansas

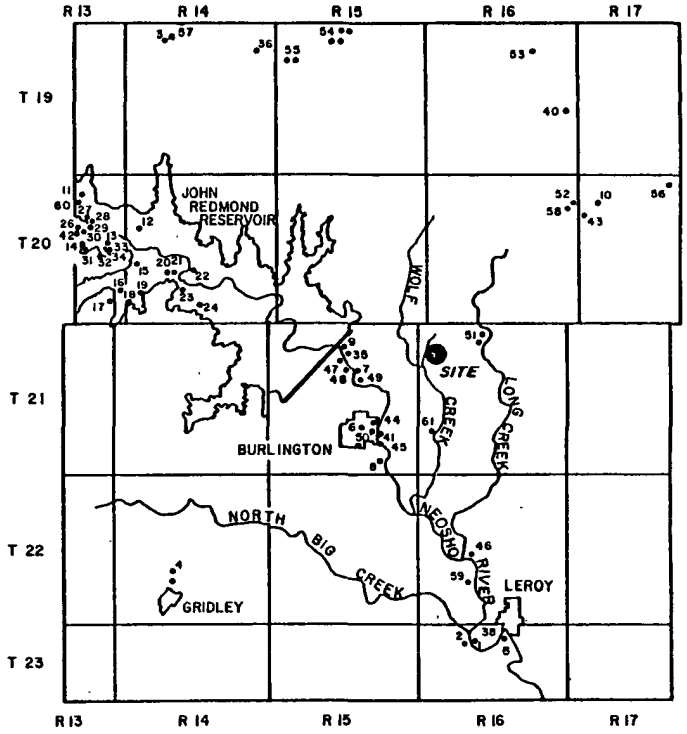
Rev. 0



LEGEND

▲ MUNICIPALITIES AND RURAL WATER DISTRICTS UTILIZING THE NEOSHO RIVER DOWN-STREAM OF THE SITE. REFER TO TABLE 2.4-5 FOR USAGE INFORMATION.

15● COFFEY COUNTY WATER USER; SYMBOL INDICATES POINT OF INTAKE OR POINT OF DIVERSION. REFER TO TABLE 2.4-4 FOR OWNER, SOURCE AND USAGE INFORMATION.



ENLARGEMENT OF COFFEY COUNTY, KANSAS

5 0 5
MILES

Rev. 0

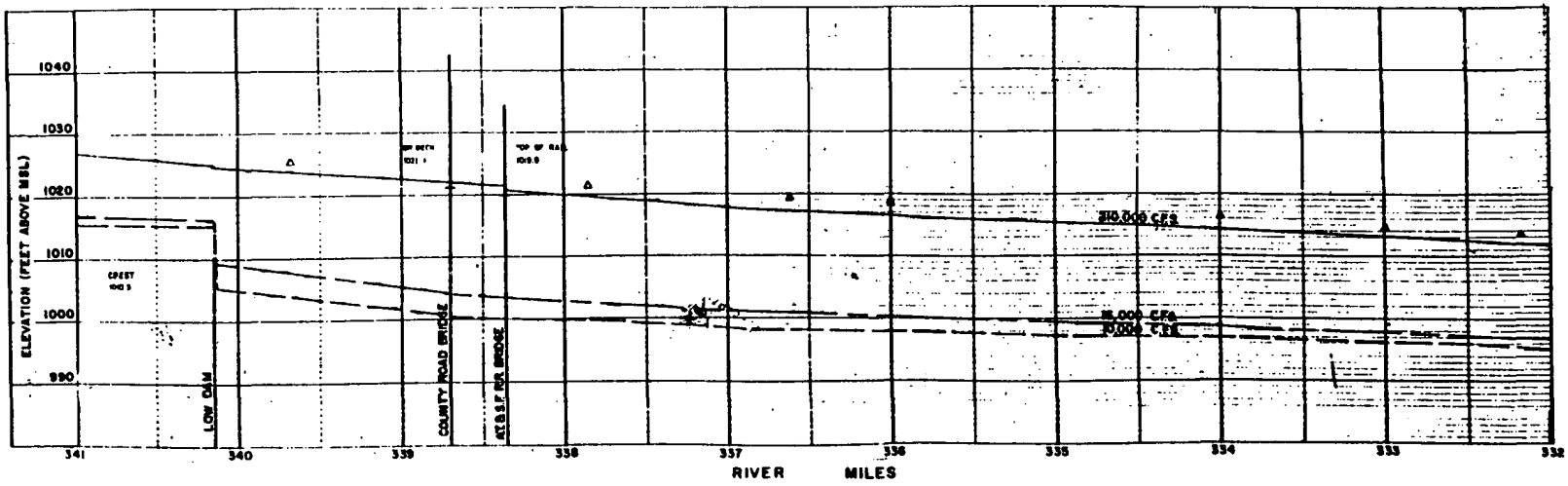
REFERENCE:

KANSAS BOARD OF AGRICULTURE, 1979: OPEN FILE MATERIAL: DIVISION OF WATER RESOURCES, TOPEKA, KANSAS (MARCH)
FLICKENGER, G., 1979, ASSOCIATE ENGINEER, WATER RESOURCES BOARD, TOPEKA, KANSAS WRITTEN COMMUNICATION (MARCH 9)

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-8

Water Users in Coffey County and Municipal Users Downstream of Site





LEGEND

HIGH WATER EXPERIENCED IN JULY 1951

FLOODS MODIFIED BY COUNCIL GROVE, MARION, GEDAR POINT AND JOHN REDMOND RESERVOIRS

JULY 1951 FLOOD

JULY 1948 FLOOD

MAY 1957 FLOOD

REFERENCE:
REPRODUCED FROM U.S. ARMY CORPS OF ENGINEERS, 1965. PLATE A-16.

4000 0 4000

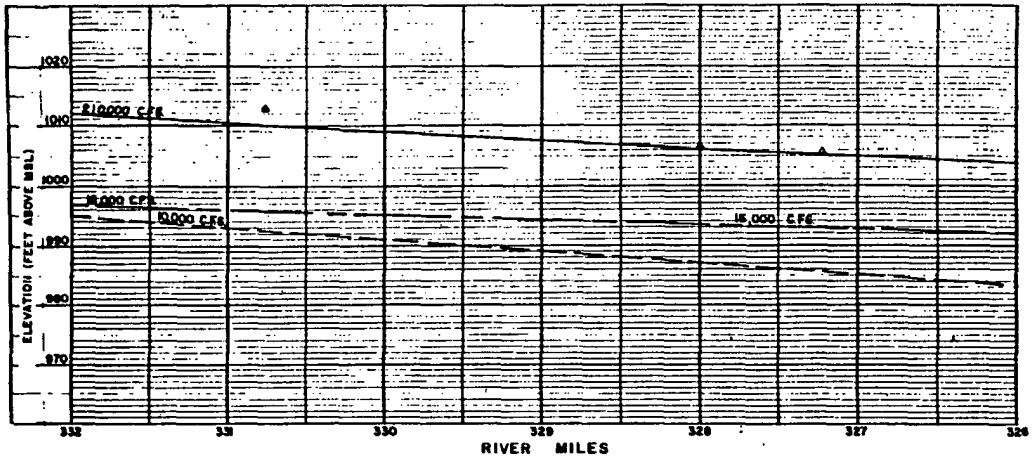
FEET

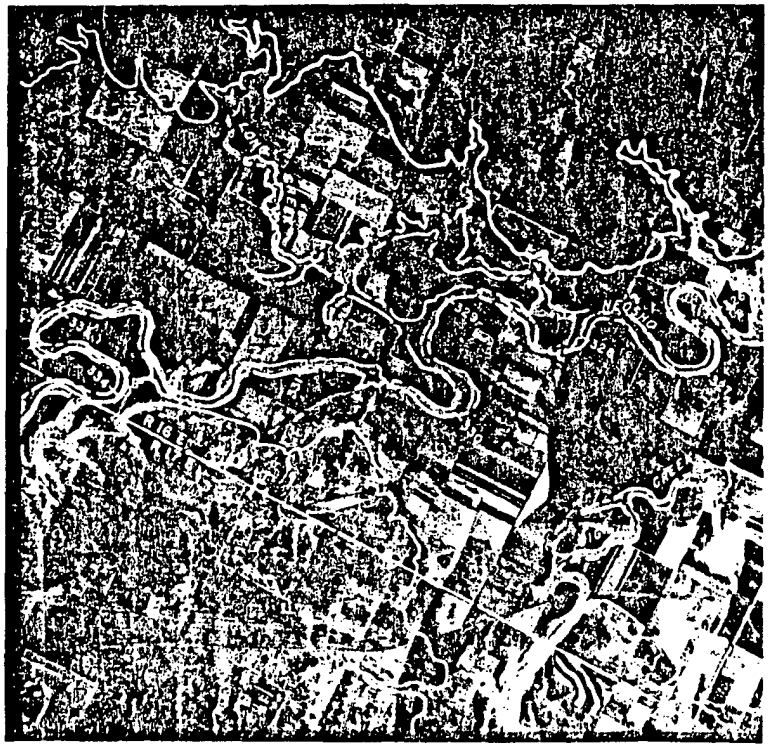
Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-9

Flood Areas and Profiles, Neosho River Mile 332 to Mile 341





LEGEND

HIGH WATER EXPERIENCED IN JULY 1951

FLOODS MODIFIED BY COUNCIL GROVE, MARION, CEDAR POINT AND JOHN REDMOND RESERVOIRS

JULY 1951 FLOOD

JULY 1948 FLOOD

MAY 1957 FLOOD

4000 0 4000

FEET

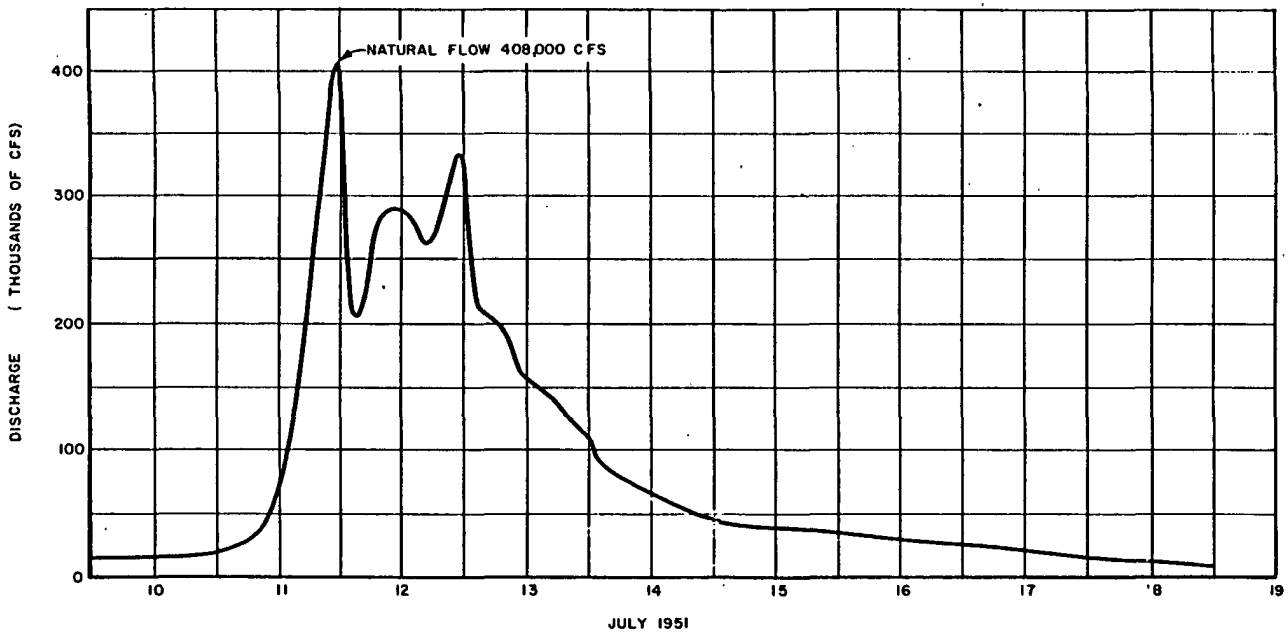
Rev. 0

REFERENCE:
REPRODUCED FROM U.S. ARMY CORPS OF ENGINEERS, 1965, PLATE A-15.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-10

Flood Areas and Profiles, Neosho River Mile 326 to Mile 332



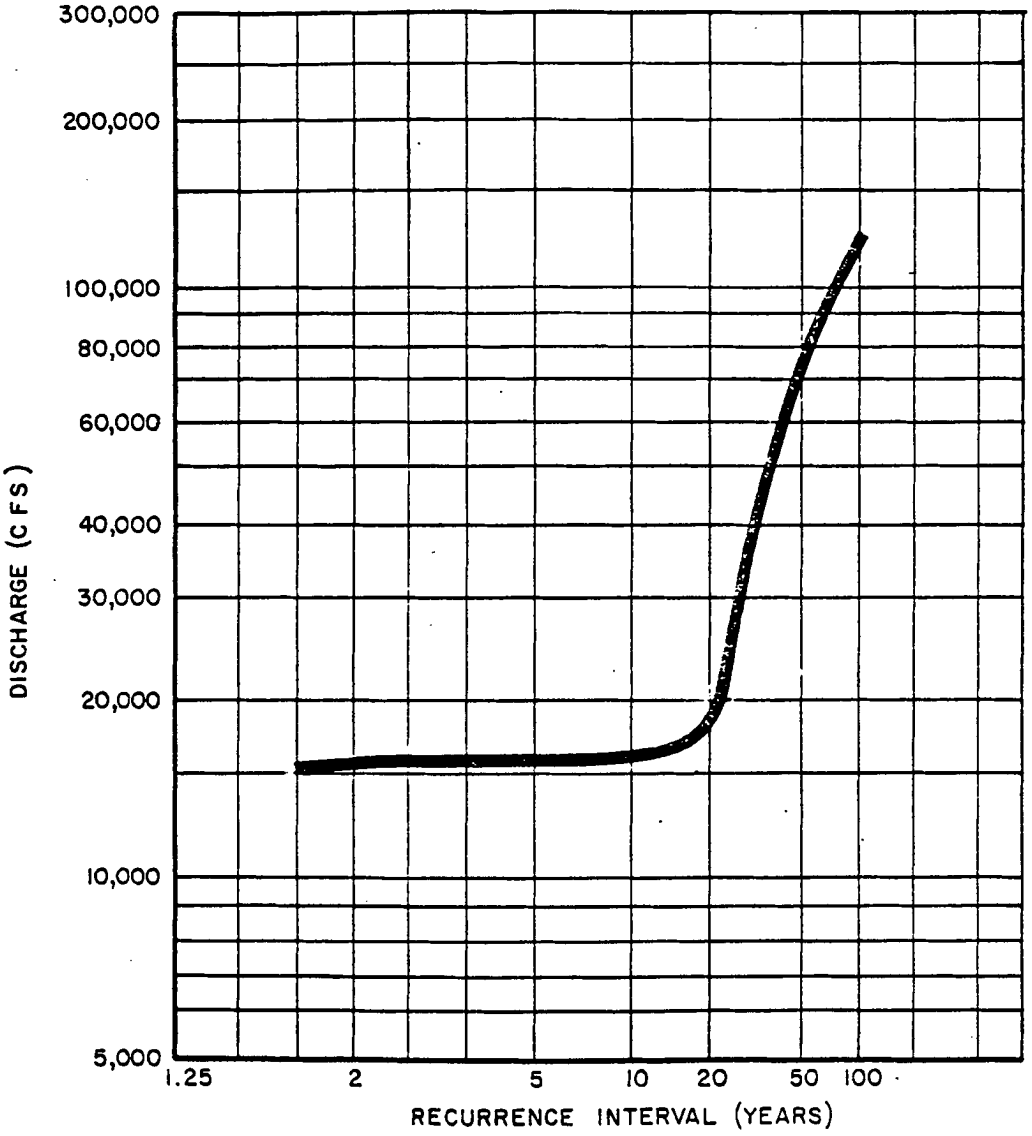
Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-11

July 1951 Flood Hydrograph, John Redmond Dam

REFERENCE:
REPRODUCED FROM U.S. ARMY CORPS OF ENGINEERS, 1958, PLATE 18.



NOTE: THE CURVE INCLUDES THE REGULATING EFFECTS OF COUNCIL GROVE, MARION, CEDAR POINT AND JOHN REDMOND RESERVOIRS.

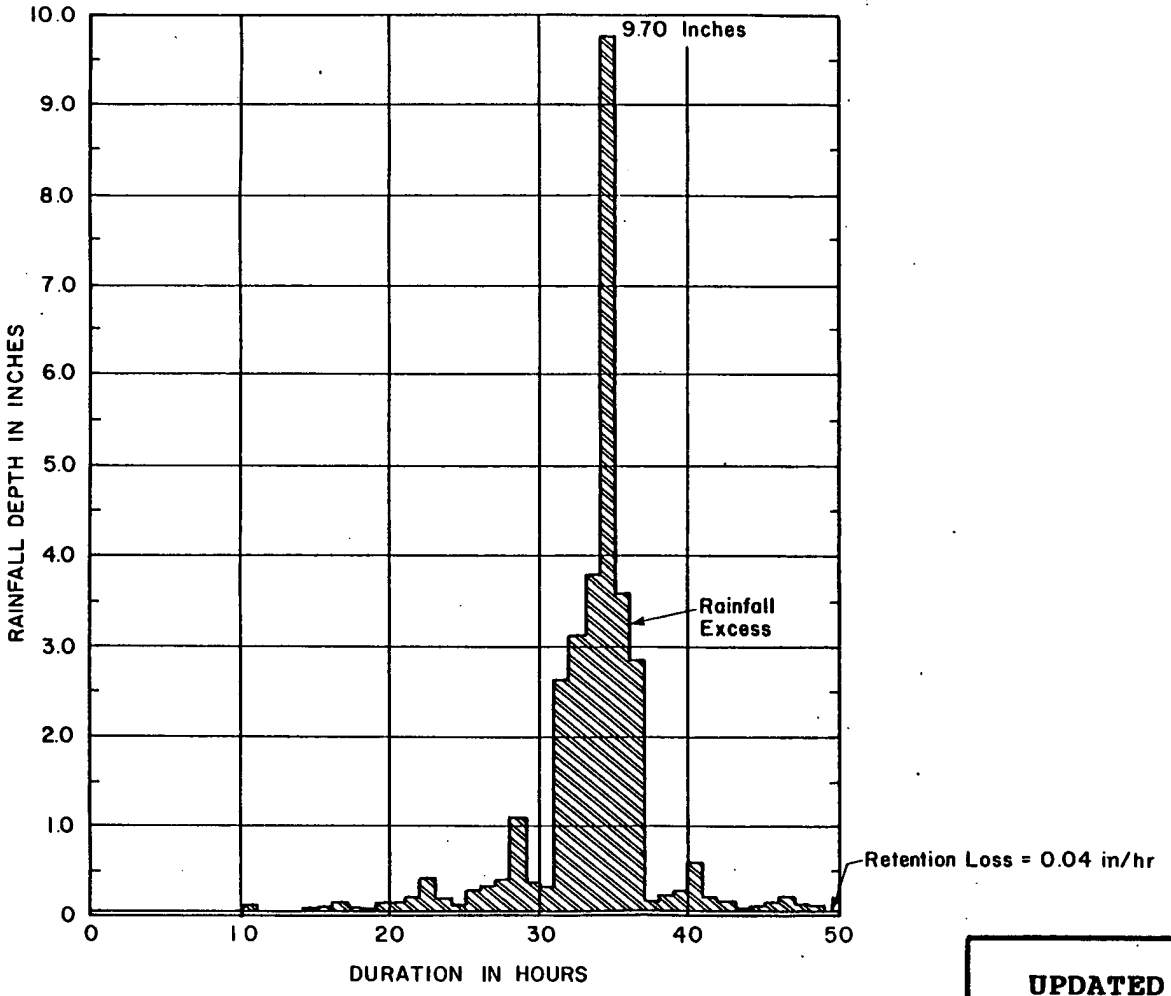
Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-12

Discharge Frequency Curve for John Redmond Dam

REFERENCE:
REPRODUCED FROM U.S. ARMY CORPS OF ENGINEERS, 1965, PLATE A-47.

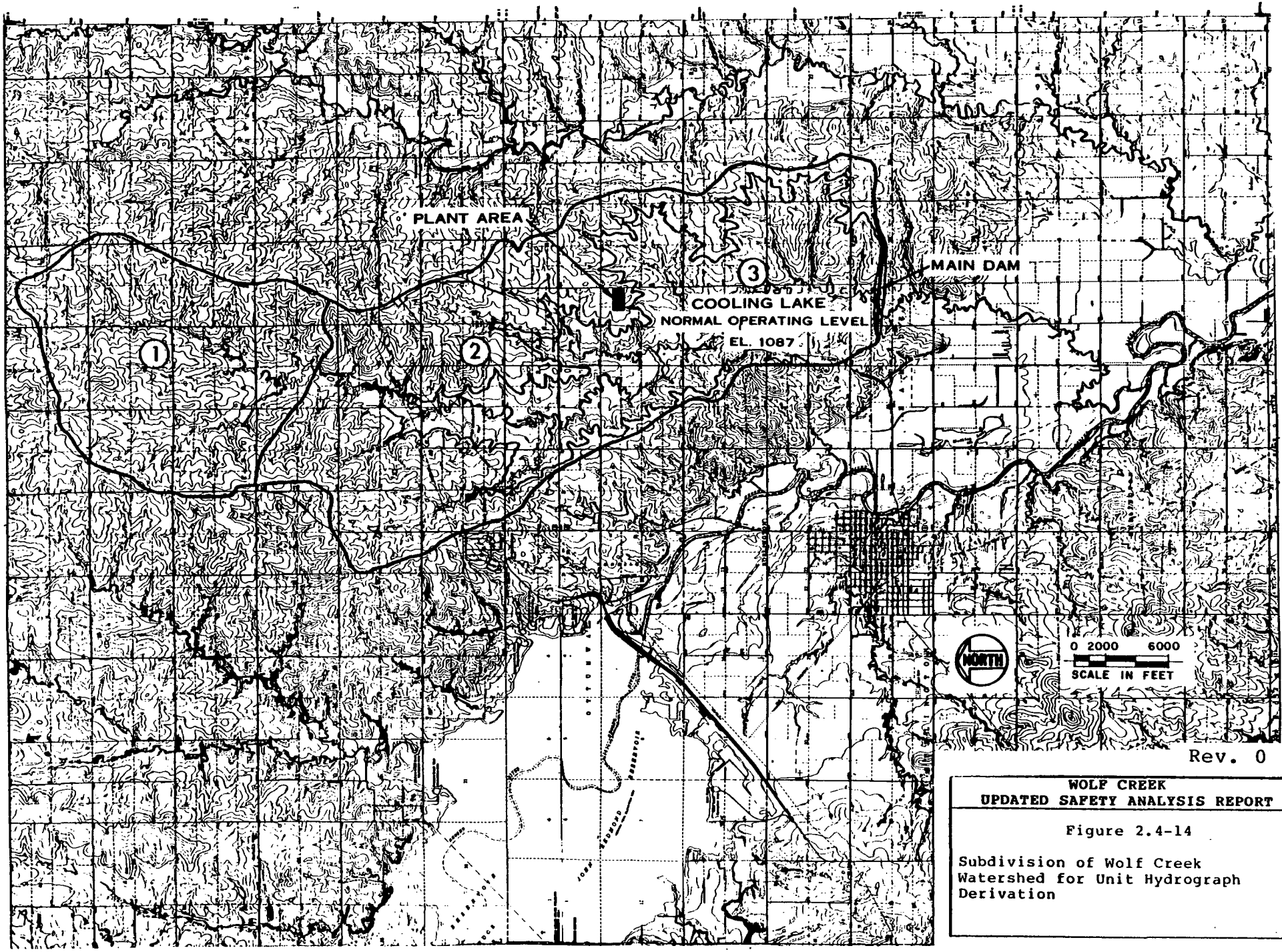


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-13

PMP Storm Distribution

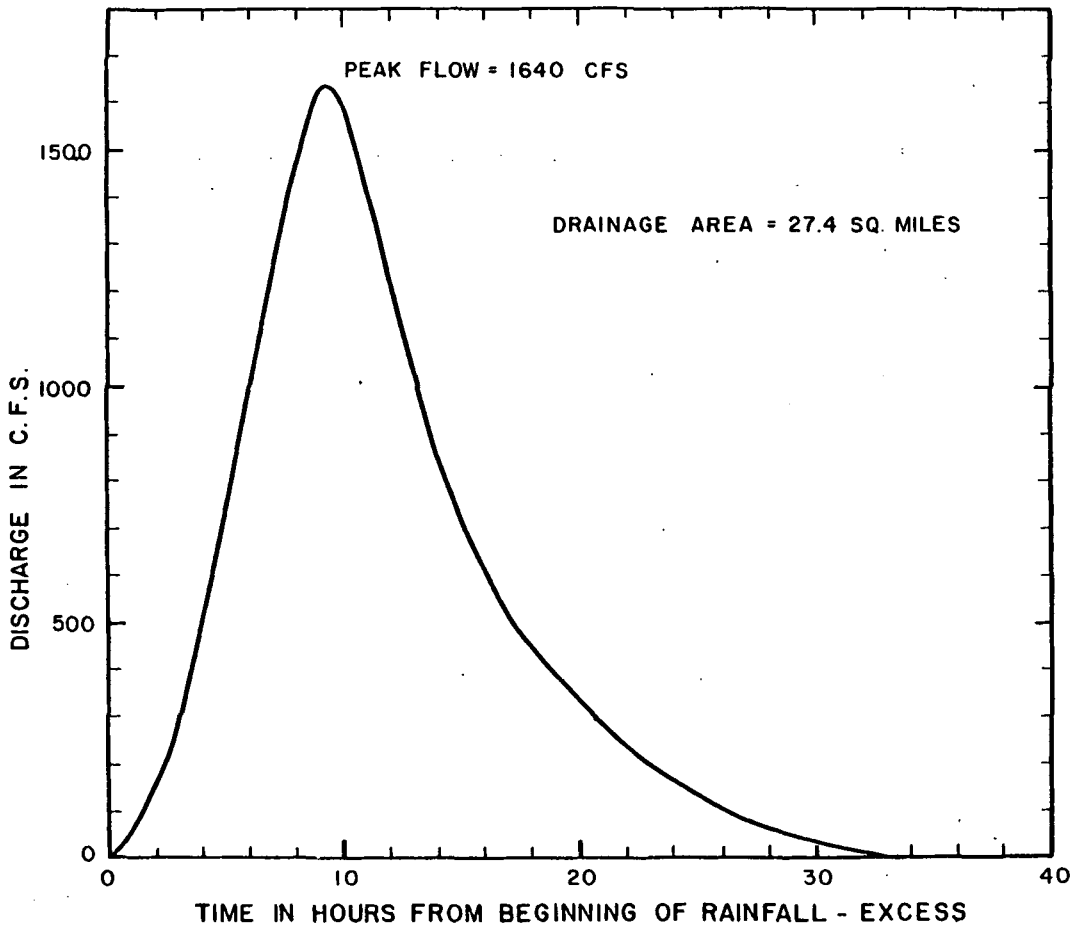


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-14

Subdivision of Wolf Creek Watershed for Unit Hydrograph Derivation

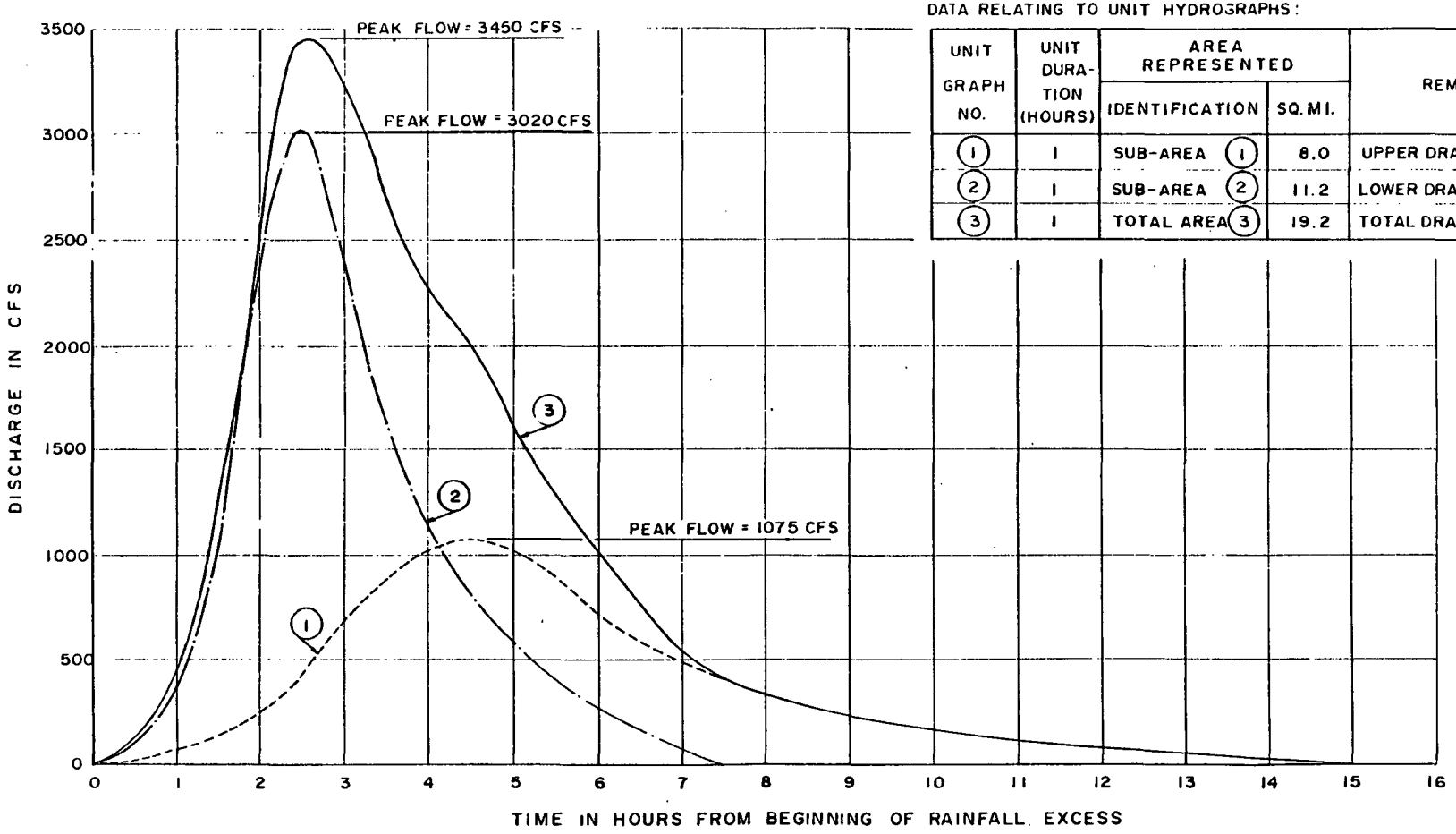


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-15

1-Hour Unit Hydrograph Under Natural Conditions



DATA RELATING TO UNIT HYDROGRAPHS:

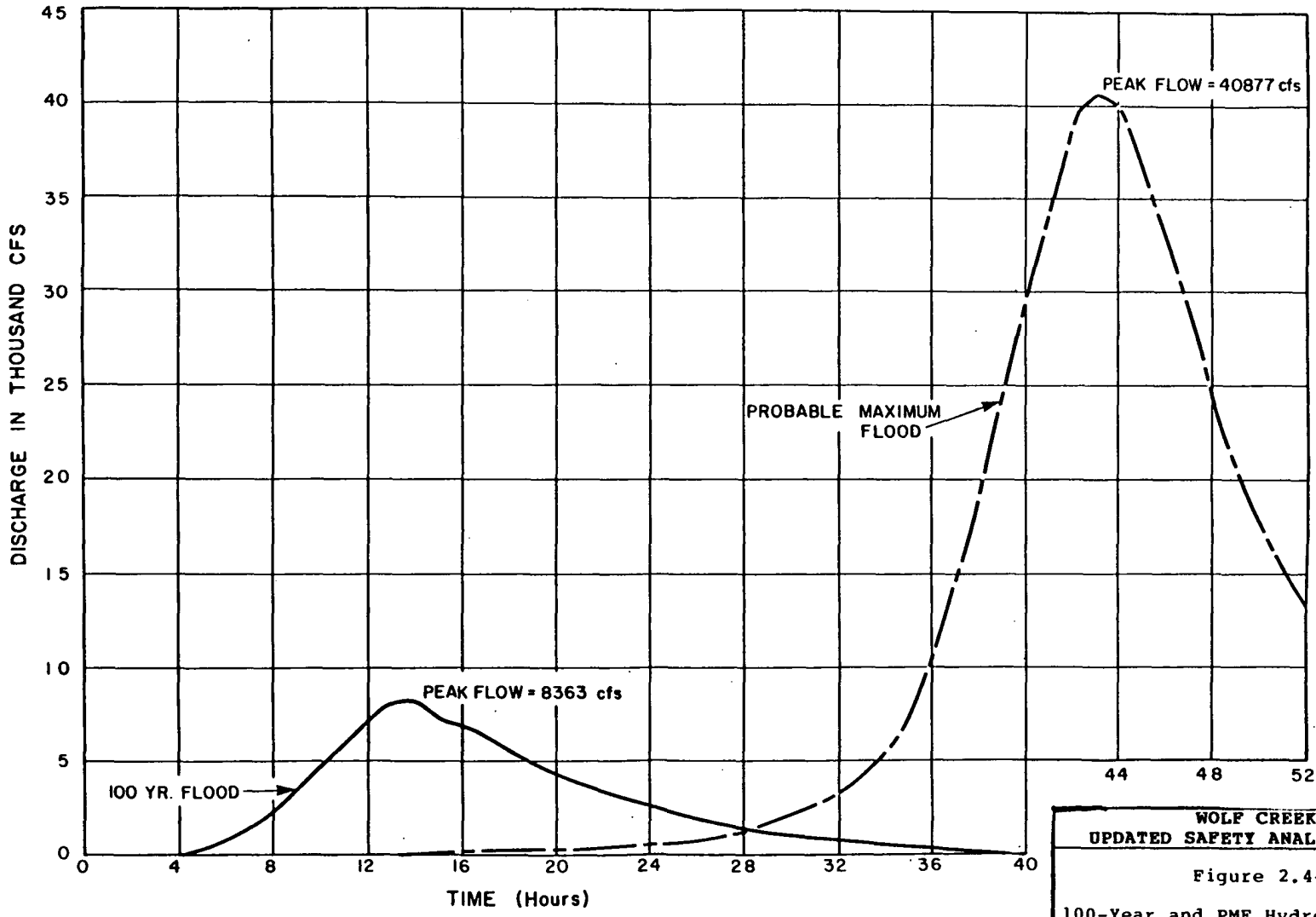
UNIT GRAPH NO.	UNIT DURATION (HOURS)	AREA REPRESENTED		REMARKS
		IDENTIFICATION	SQ. MI.	
(1)	1	SUB-AREA (1)	8.0	UPPER DRAINAGE AREA
(2)	1	SUB-AREA (2)	11.2	LOWER DRAINAGE AREA
(3)	1	TOTAL AREA (3)	19.2	TOTAL DRAINAGE AREA

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-16

1-Hour Unit Hydrograph for Sub-Basin Drainage Areas

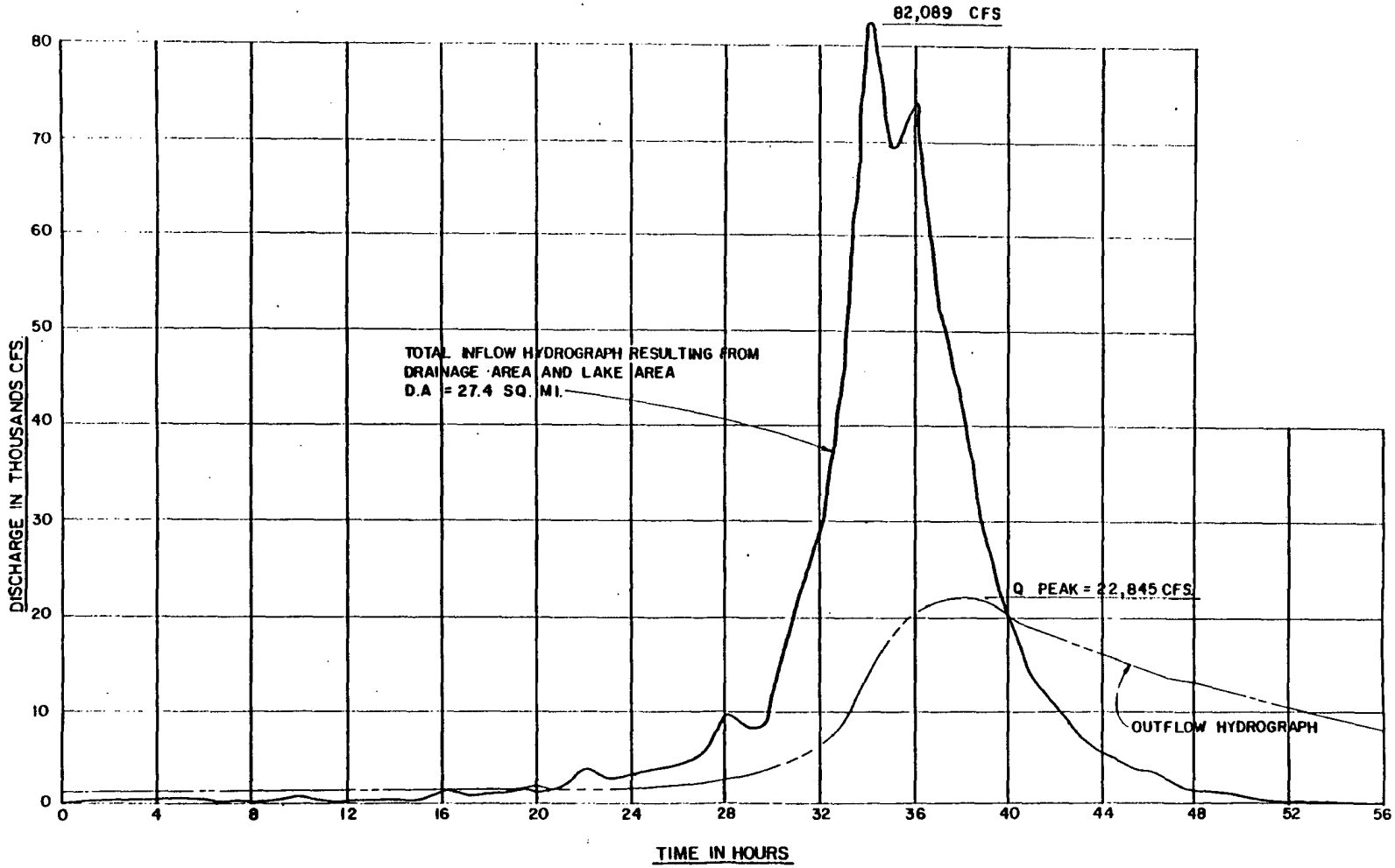


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-17

100-Year and PMF Hydrograph Under Natural Conditions

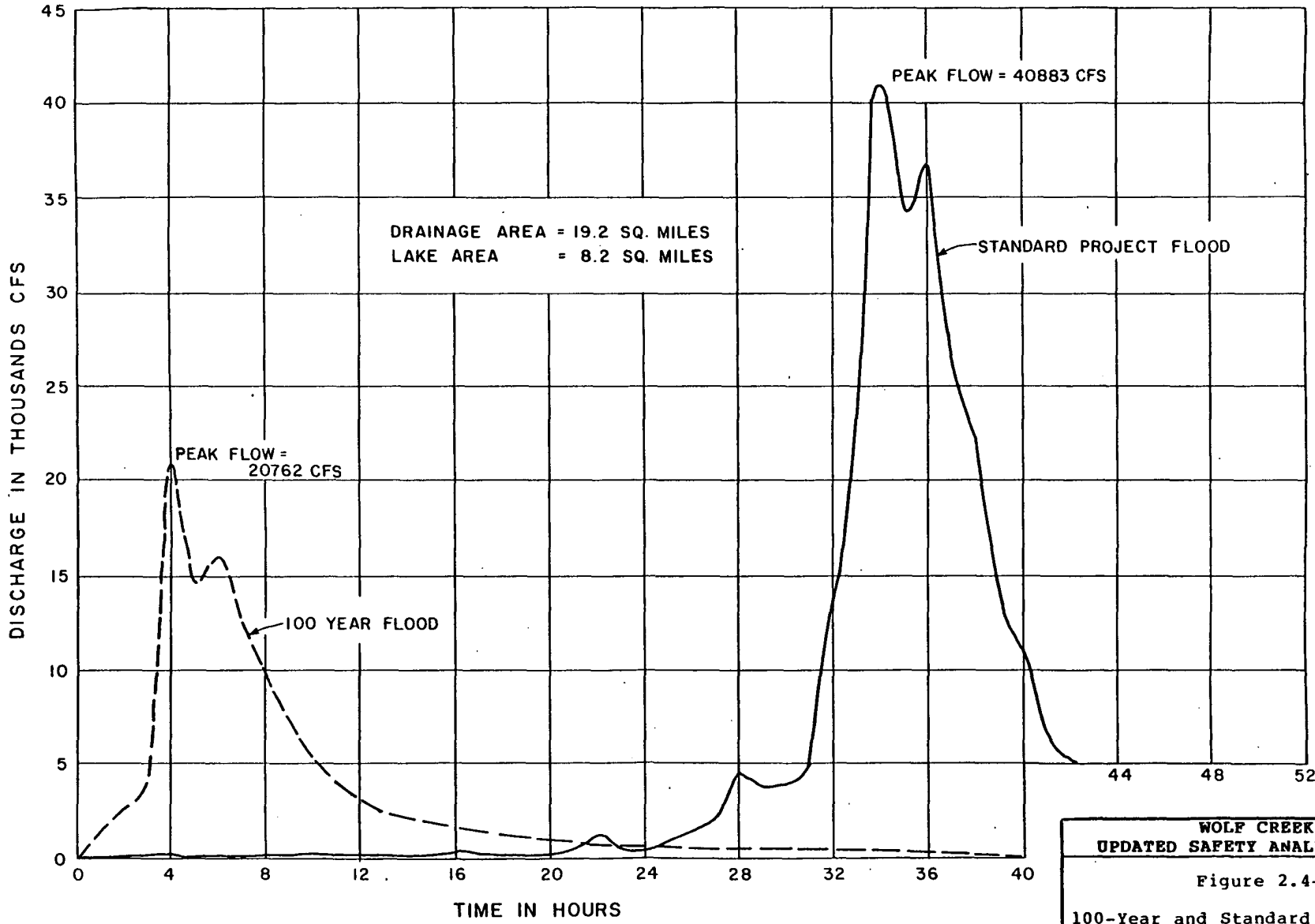


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-18

PMF Hydrographs (Modified Conditions)

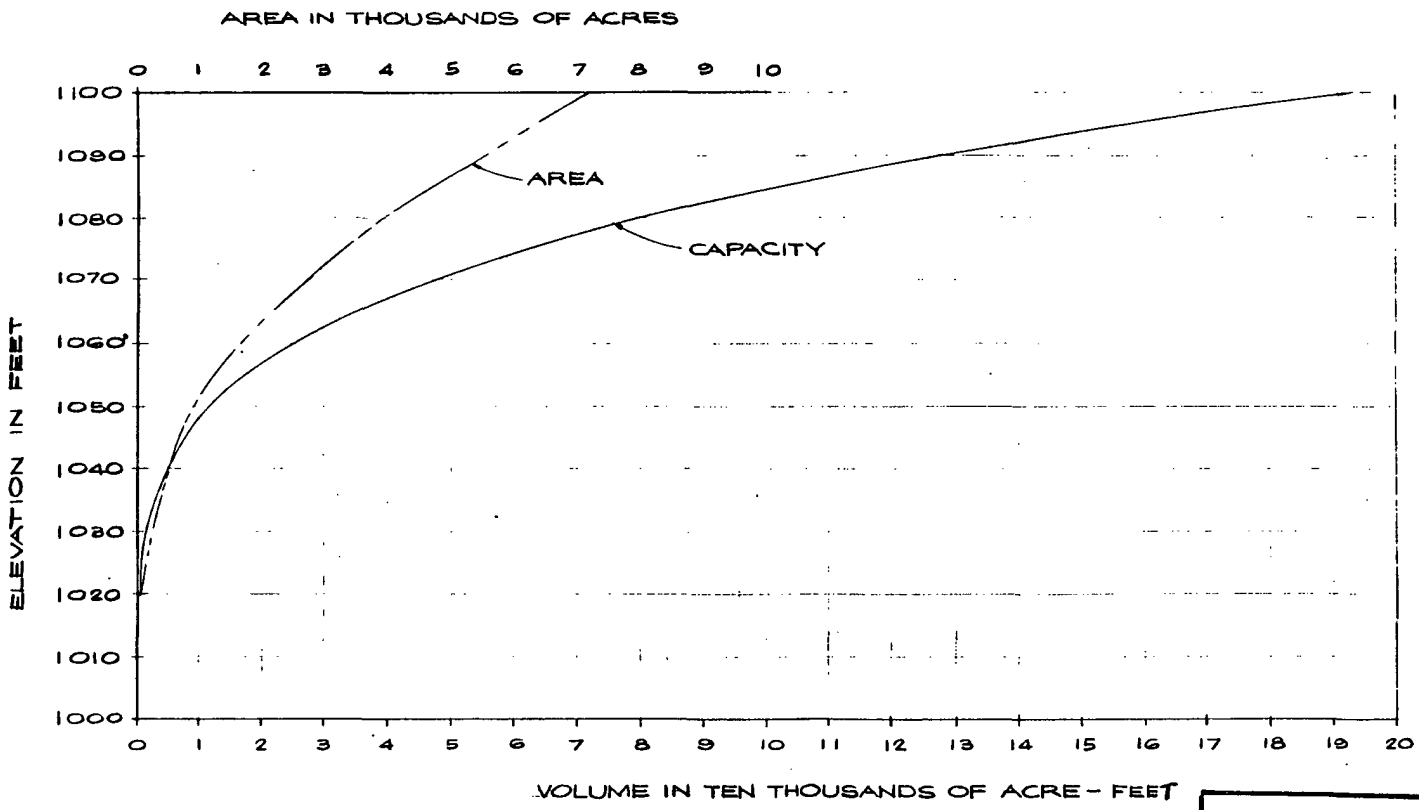


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-19

100-Year and Standard Flood Hydrographs (Modified Conditions)



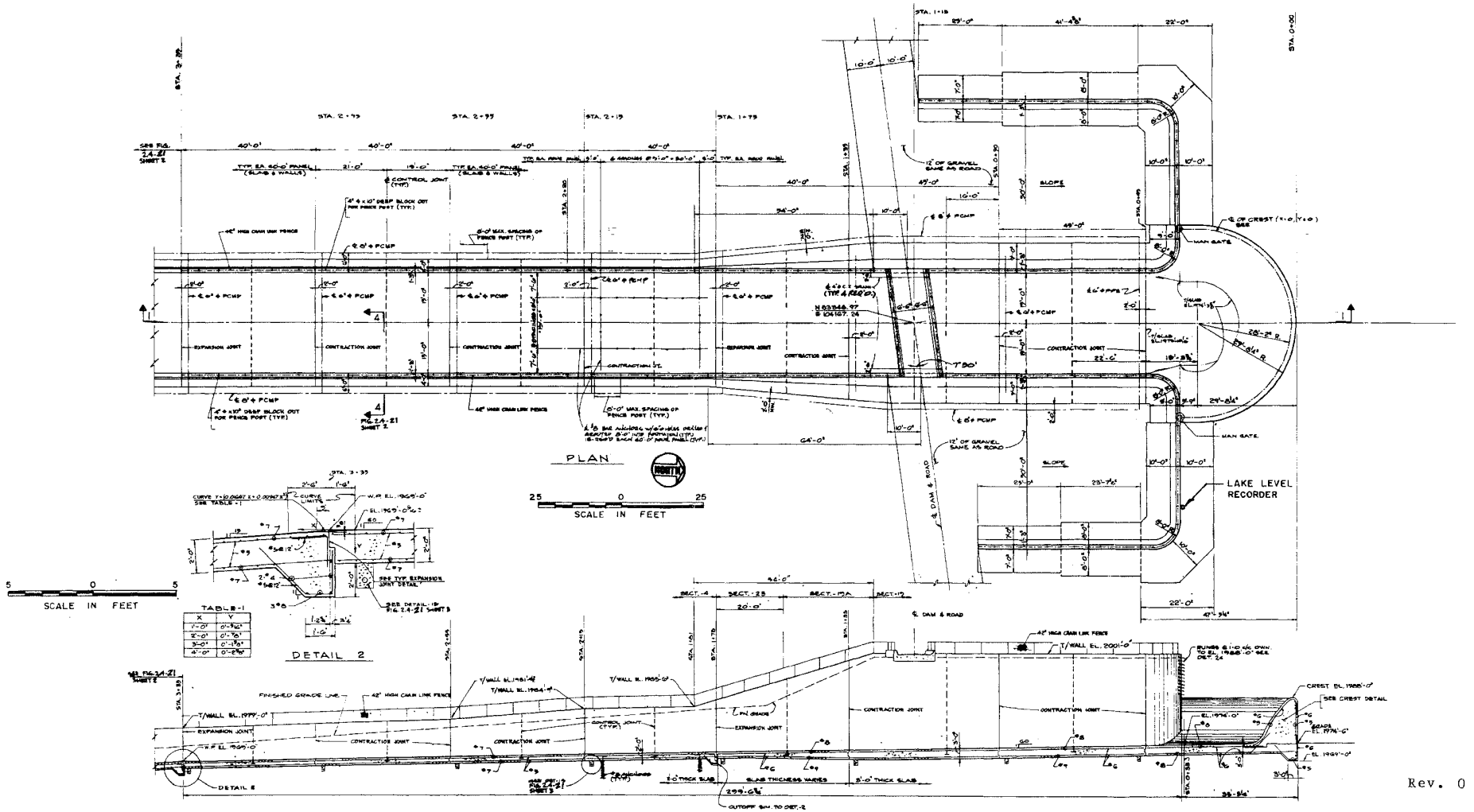
ELEVATION IN FEET	AREA IN ACRES	CAPACITY IN ACRE-FEET
1020.0	31	118
1030.0	245	1205
1040.0	507	4797
1050.0	891	11720
1060.0	1623	25181
1070.0	2643	46520
1080.0	3981	79300
1088.0	5247	116370
1090.0	5510	127120
1100.0	7155	190633

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-20

Cooling Lake Area - Capacity Curves



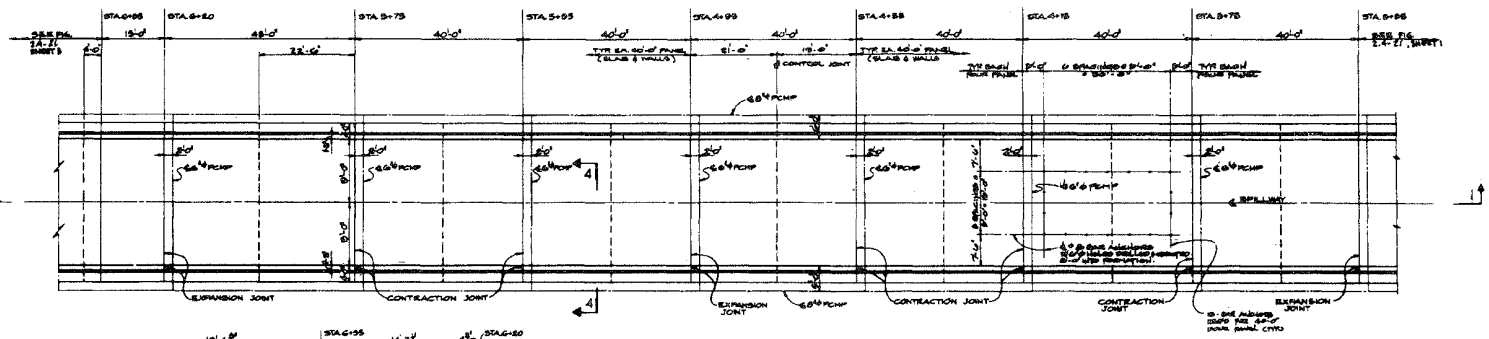
NOTE:
ELEVATIONS SHOWN ARE SHUPPS ELEVATIONS.
SUBTRACT 900 FEET TO OBTAIN U.S.G.S. MSL ELEVATIONS.

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

FIGURE 2.4-21 (Sheet 1 of 3)

SERVICE SPILLWAY PLANS



PLAN

SCALE IN FEET

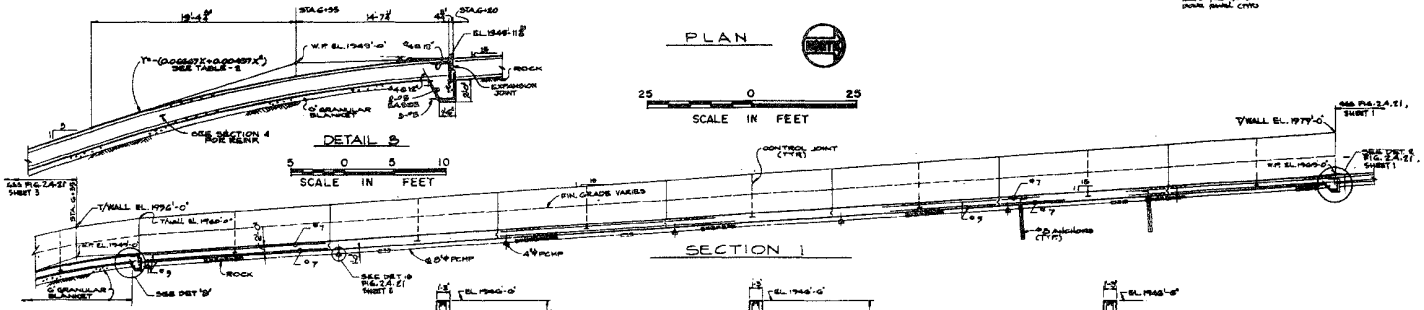
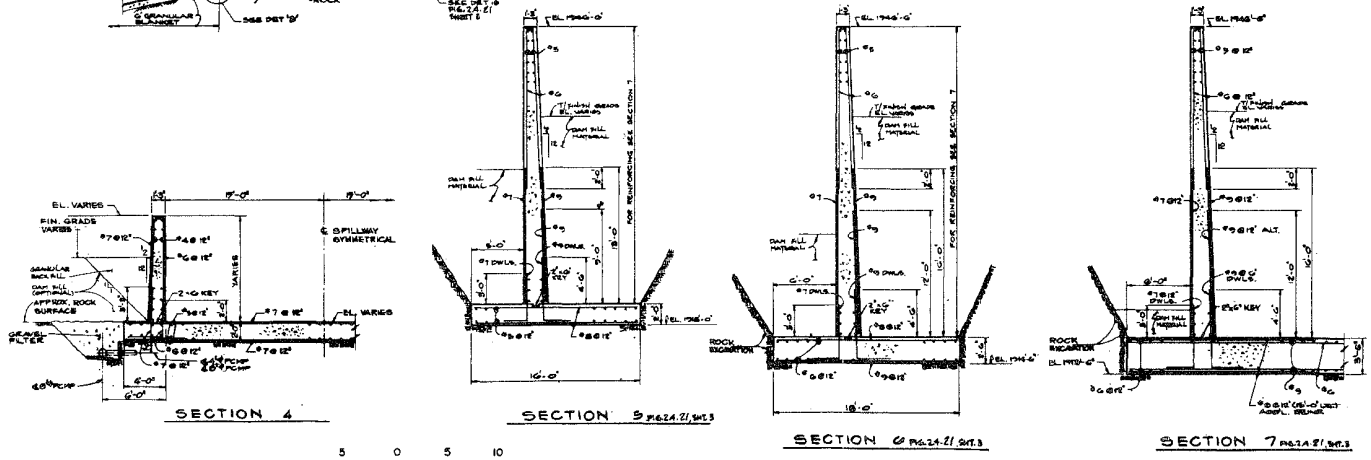


TABLE-2

X	Y
2'-0"	0'-1"±
4'-0"	0'-4"±
6'-0"	0'-9"±
8'-0"	0'-13"±
10'-0"	1'-1"±
12'-0"	1'-5"±
14'-0"	1'-9"±
16'-0"	2'-2"±
18'-0"	2'-6"±
20'-0"	2'-11"±
22'-0"	3'-5"±
24'-0"	4'-2"±
26'-0"	4'-9"±
28'-0"	5'-3"±
30'-0"	6'-1"±
32'-0"	6'-9"±
34'-0"	7'-6"±

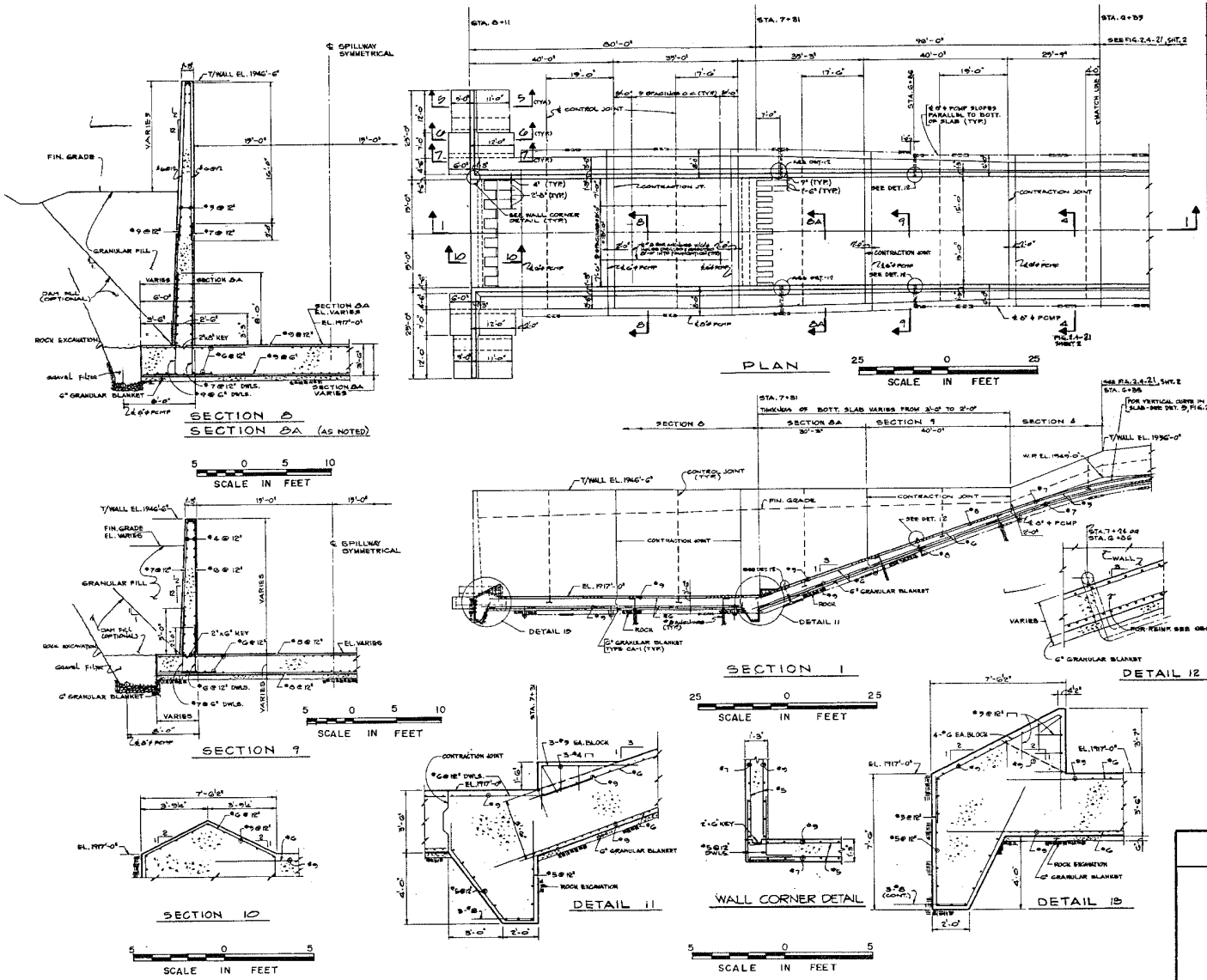


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

FIGURE 2.4-21 (Sheet 2 of 3)

SERVICE SPILLWAY PLANS



REINFORCING LAP LENGTH & ANCHOR SCHEDULE

BAR SIZE	LAP SPLICE LENGTH		ANCHOR LENGTH	
	TOP BARS	OTHER BARS	TOP BARS	OTHER BARS
#4	18"	13"	14"	10"
#5	22"	16"	17"	12"
#6	27"	20"	21"	15"
#7	36"	25"	27"	19"
#8	44"	32"	34"	24"
#9	56"	40"	44"	31"
#10	71"	51"	55"	39"
#11	87"	62"	67"	48"

NOTES

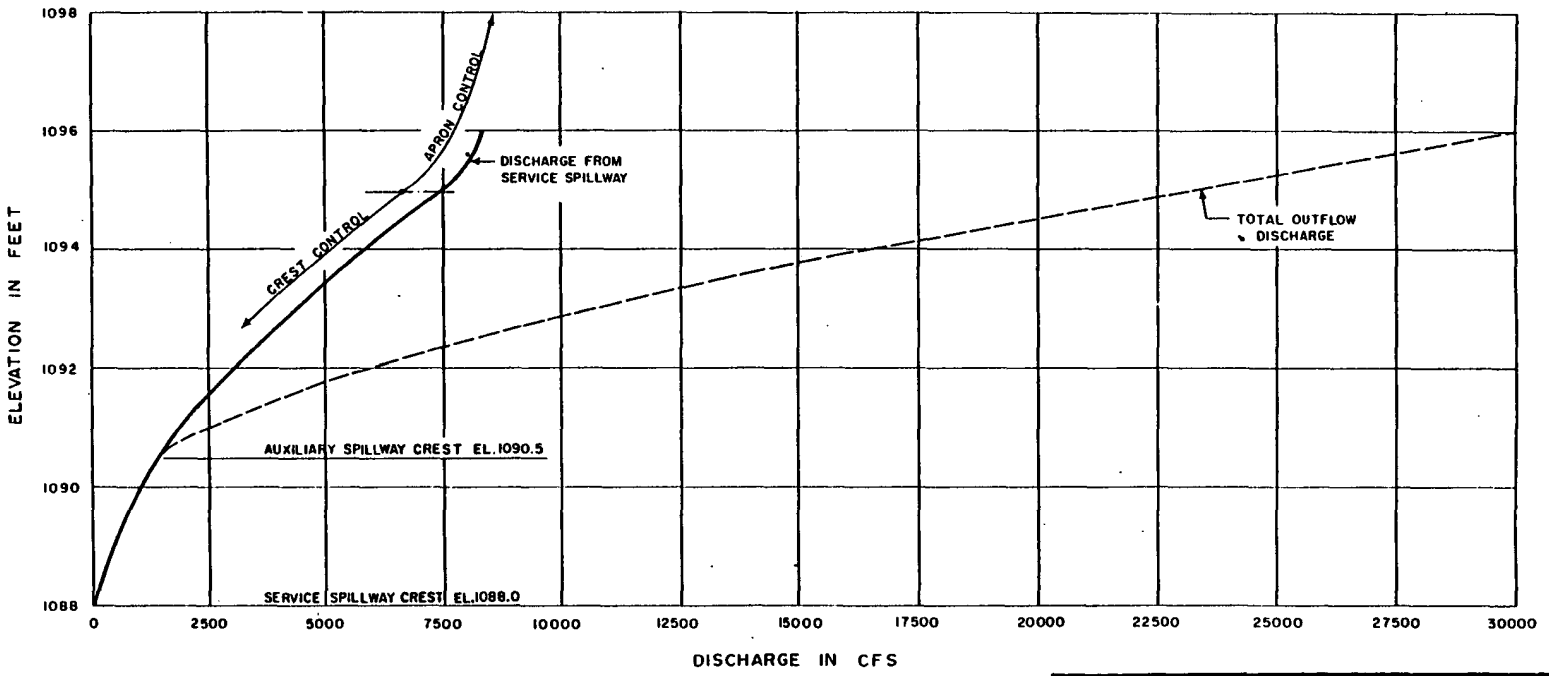
1. LAP SPLICES SHALL BE USED ONLY WHERE IT IS NOT POSSIBLE TO USE CONTINUOUS BAR.
2. LAP AND ANCHORAGE LENGTHS ARE NOT TO BE SCALED FROM DRAWINGS.
3. WHENEVER BARS OF DIFFERENCE SIZES ARE SPLICED, THE LAP SPLICE LENGTH OF THE SMALLER BAR SHALL BE USED UNLESS NOTED.
4. LAP SPLICES SHALL BE LOCATED AS SHOWN ON DRAWINGS. HOWEVER THE CONTRACTOR MAY USE OTHER CONVENIENT LOCATION WITH APPROVAL OF THE CONSULTING ENGINEER.
5. TOP REINFORCEMENT IS HORIZONTAL REINFORCEMENT SO PLACED THAT MORE THAN 12" OF CONCRETE IS CAST IN THE MEMBER BELOW THE BAR. FOLLOWING SHALL BE CONSIDERED AS TOP BARS.
   A. ALL HORIZONTAL REINFORCEMENT IN WALLS.
   B. TOP BARS IN FOOTINGS AND SLABS.
6. LAP SPLICES LENGTH SHOWN ABOVE ARE FOR STAGGERED SPLICES (CLASS-B TYPE). FOR NON STAGGERED SPLICES USE CLASS-C TYPE SPLICES (1.7x ANCHOR LENGTH)

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

FIGURE 2.4-21 (Sheet 3 of 3)

SERVICE SPILLWAY PLANS

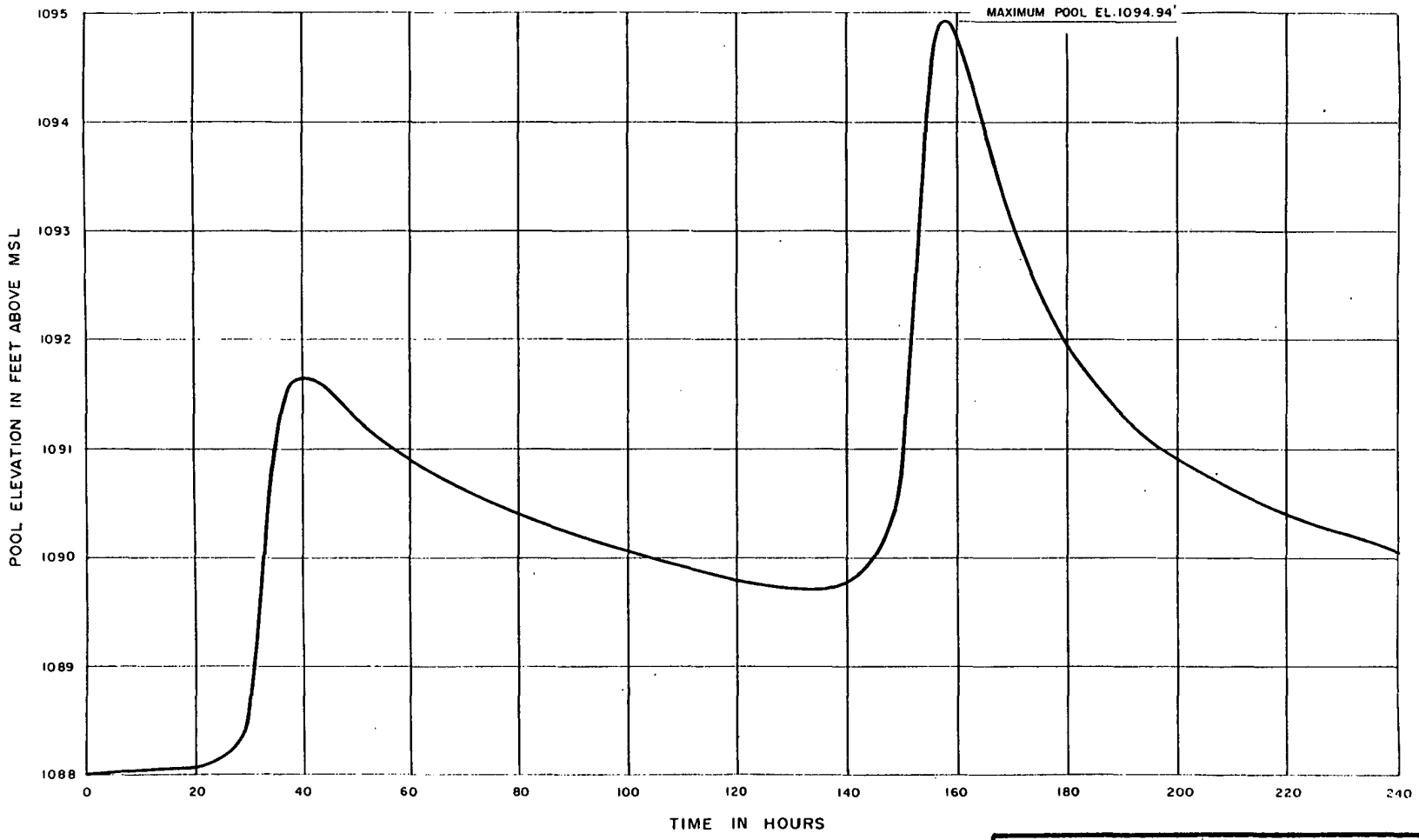


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-22

Spillway Rating Curve



Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-23

Lake Water Level Variation with Time from Flood Routing Analysis

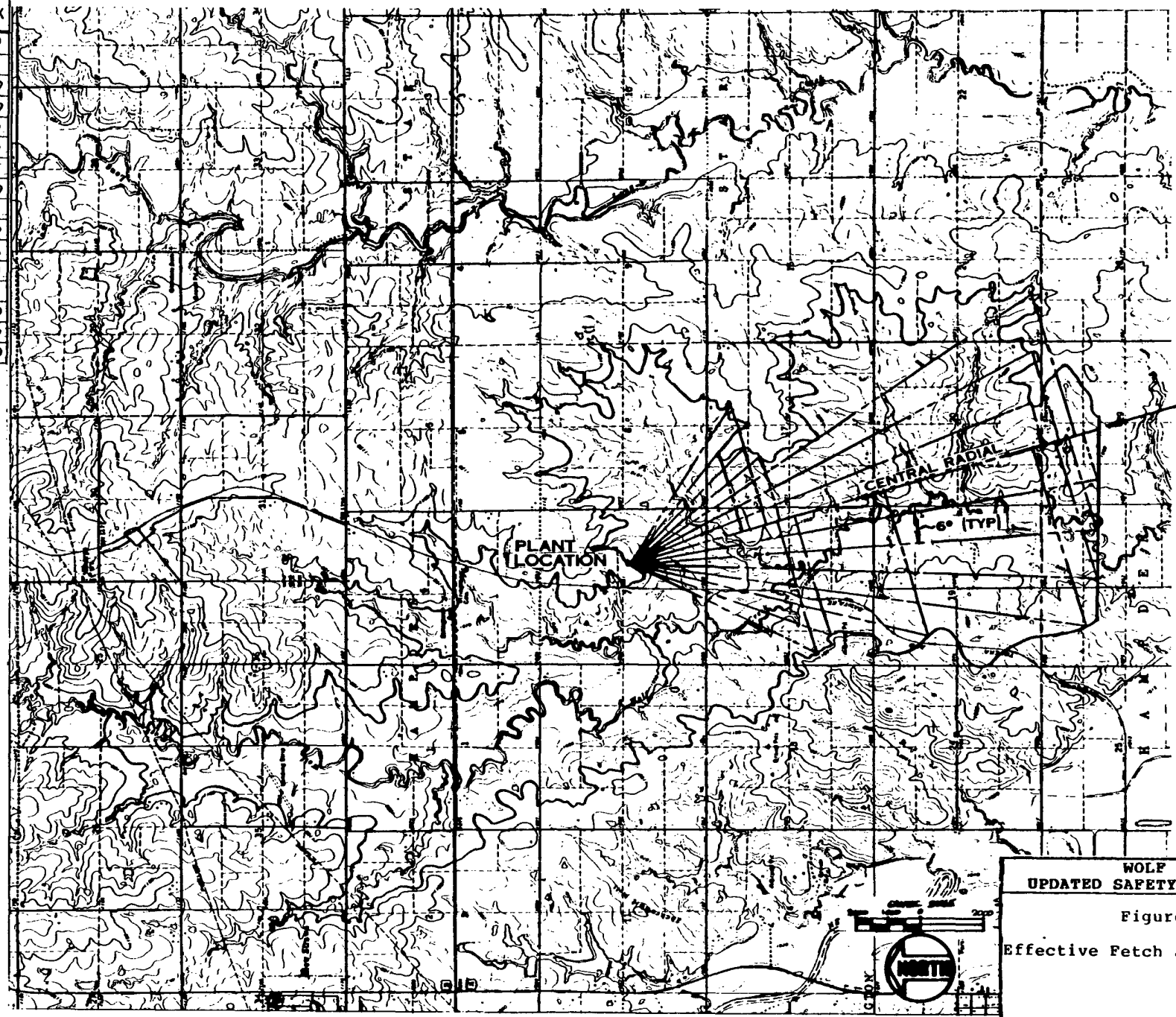
α	$\cos\alpha$	X_i	$X_i \cos\alpha$
42	.743	4,700	3,500
36	.809	5,460	4,410
30	.866	8,500	7,350
24	.914	13,300	12,350
18	.951	14,300	13,600
12	.978	14,900	14,600
6	.995	15,350	15,200
0	1.000	15,800	15,800
6	.995	15,300	15,200
12	.978	14,300	14,000
18	.951	14,650	13,906
24	.914	4,700	4,300
30	.866	4,360	3,720
36	.809	4,360	3,520
42	.743	4,300	3,200
TOTAL	13.512		144,650

$$F_{eff} = \frac{\Sigma X_i \cos\alpha}{\Sigma \cos\alpha}$$

$$= \frac{144,650}{13.512}$$

= 10,700 FT.

= 2.03 MILES



Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-24

Effective Fetch at Plant Location

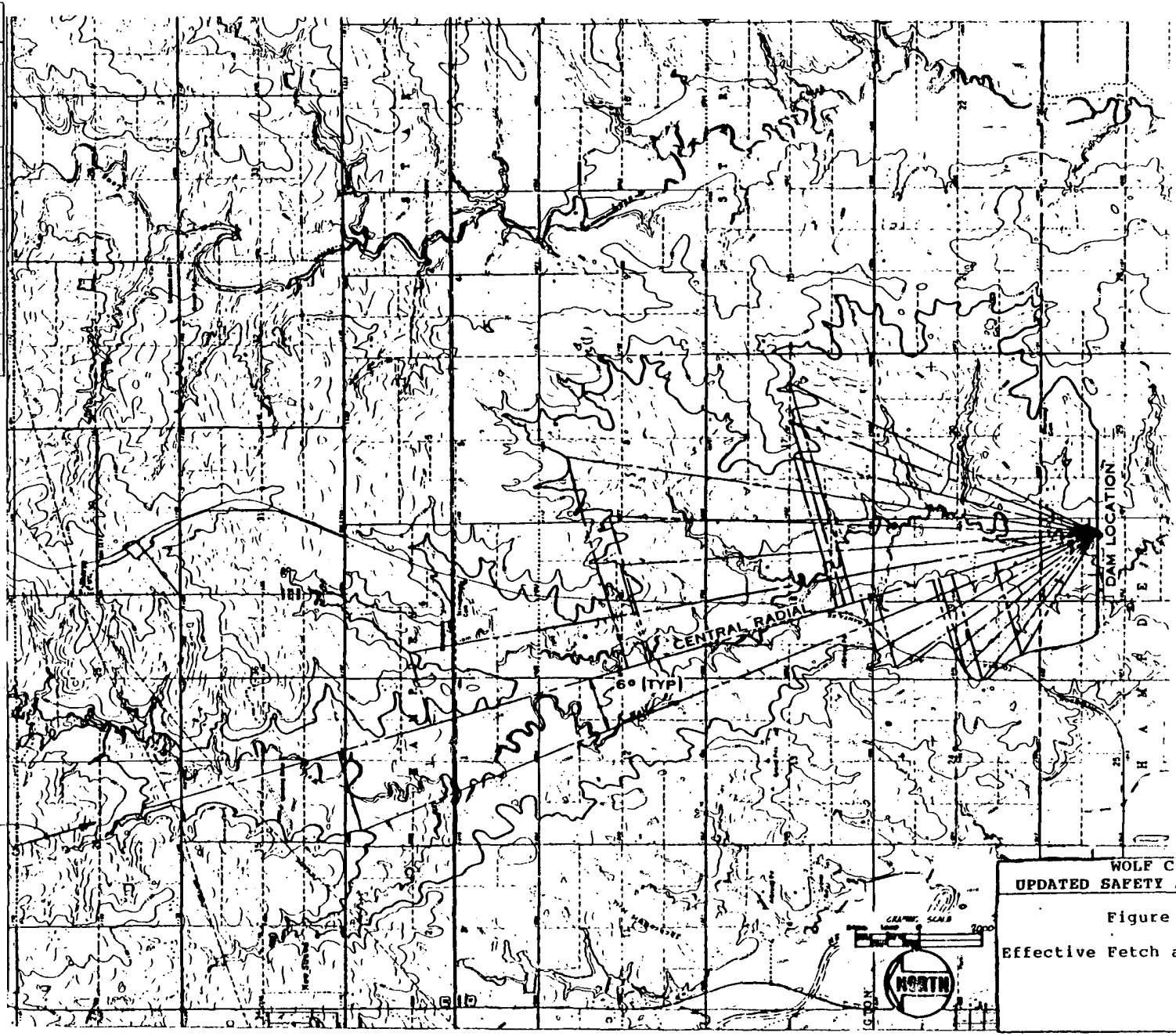
α	$\cos\alpha$	X_i	$X_i\cos\alpha$
42	.743	7,600	5650
36	.809	8,250	6,670
30	.846	9,190	7,920
24	.914	15800	14,440
18	.951	15,500	14,740
12	.978	14,550	14,200
6	.995	21,250	21,100
0	1.000	31,850	31,850
6	.995	26,450	26,300
12	.975	7,950	7,700
18	.951	5,600	5,320
24	.914	5,550	5070
30	.866	5,300	4,590
36	.809	4,900	3,960
42	.743	3,250	2,420
TOTAL	13.512		172,000

$$F_{eff} = \frac{\Sigma X_i \cos\alpha}{\Sigma \cos\alpha}$$

$$= \frac{172,000}{13.512}$$

= 12,700 FT.

= 2.40 MILES

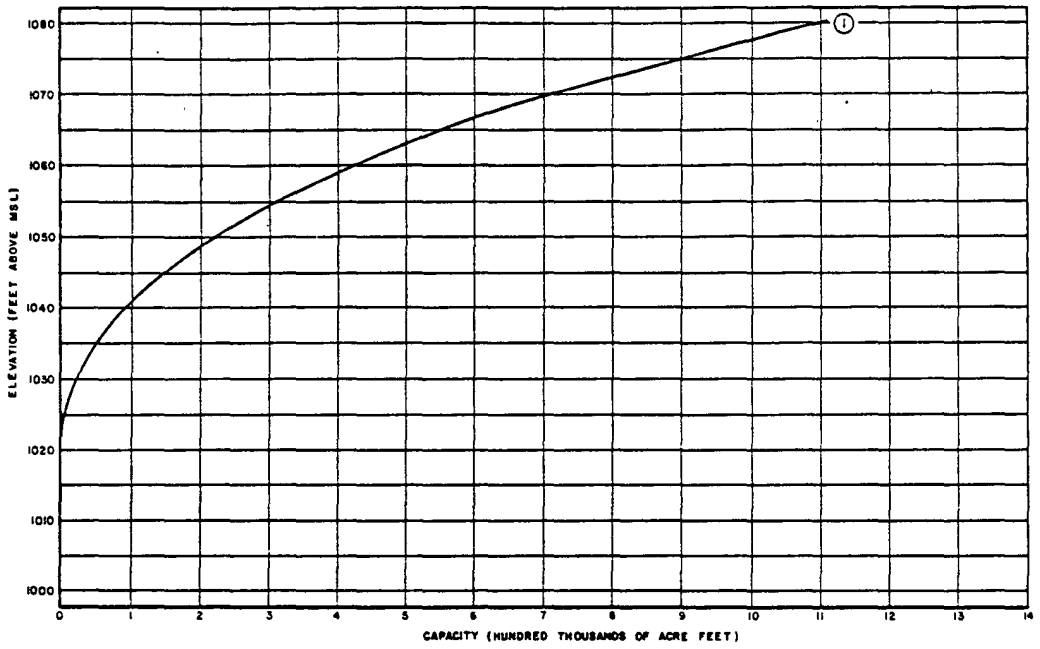


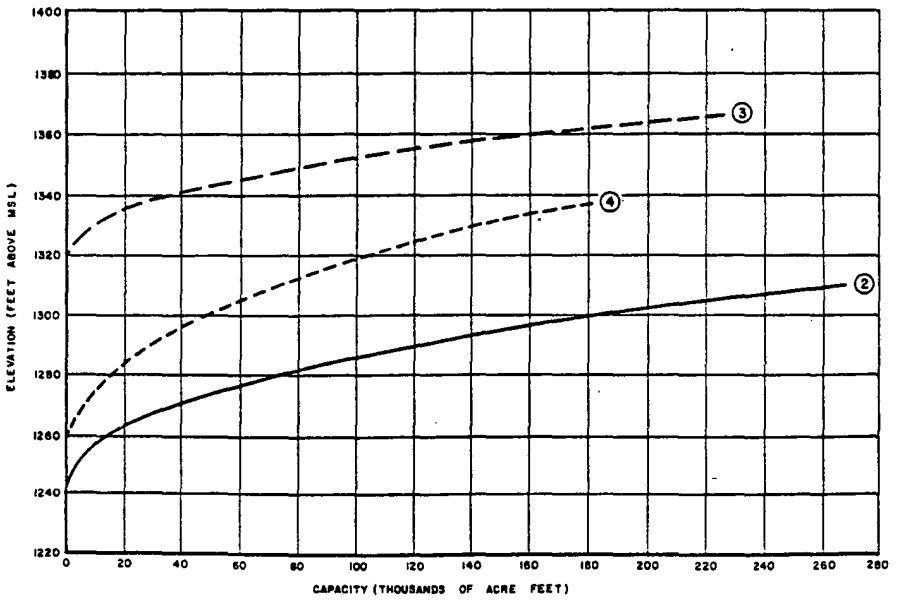
Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-25

Effective Fetch at Dam Location





Rev. 0

NOTE:

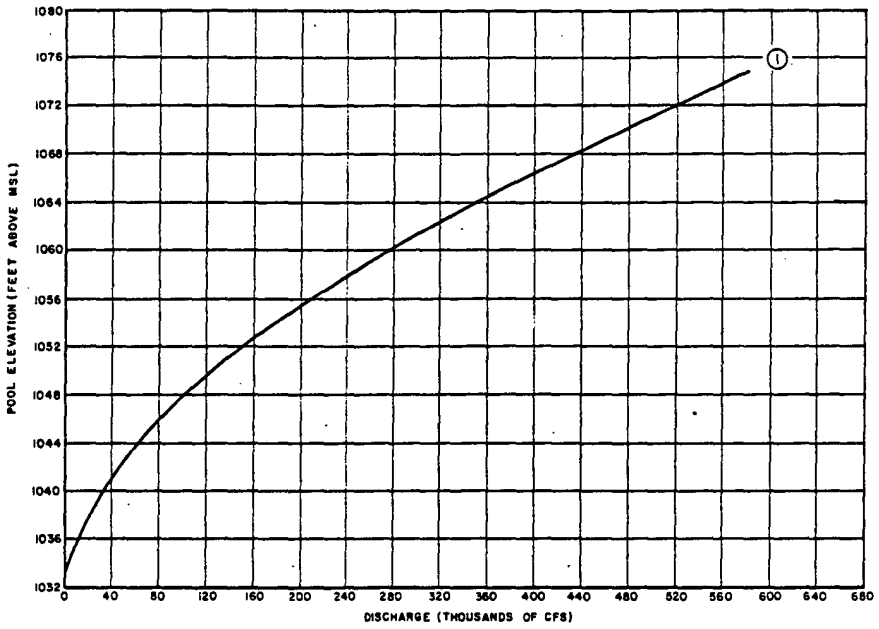
① JOHN REDMOND RESERVOIR
② COUNCIL GROVE RESERVOIR
③ MARION RESERVOIR
④ PROPOSED CEDAR POINT RESERVOIR

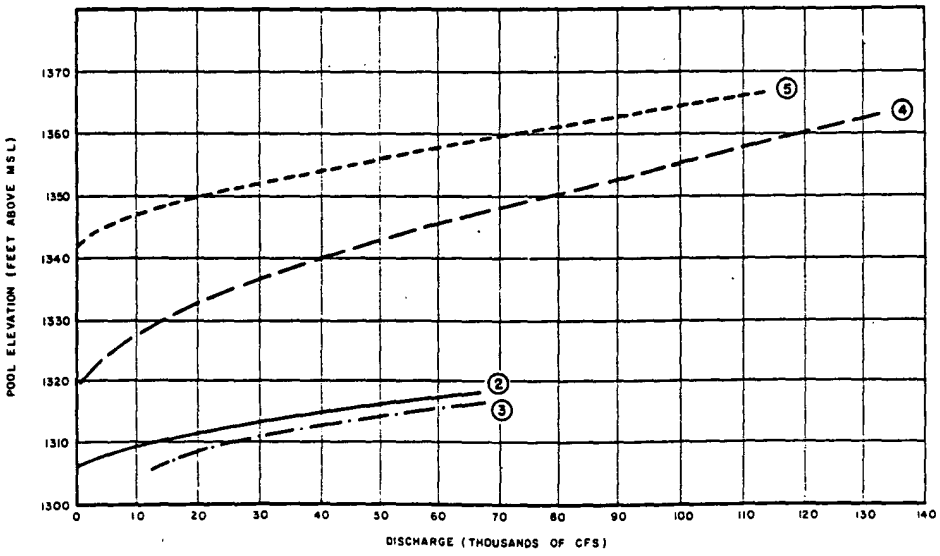
REFERENCES:
U.S. ARMY CORPS OF ENGINEERS, 1958; 1959; 1961; 1973.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-26

Reservoir Capacity Curves in Upper Neosho River Basin





Rev. 0

1 JOHN REDMOND RESERVOIR

2 COUNCIL GROVE RESERVOIR, WITH 500' UNCONTROLLED SPILLWAY

3 COUNCIL GROVE RESERVOIR, 1-17' CONDUIT AND 500' UNCONTROLLED SPILLWAY

4 MARION RESERVOIR

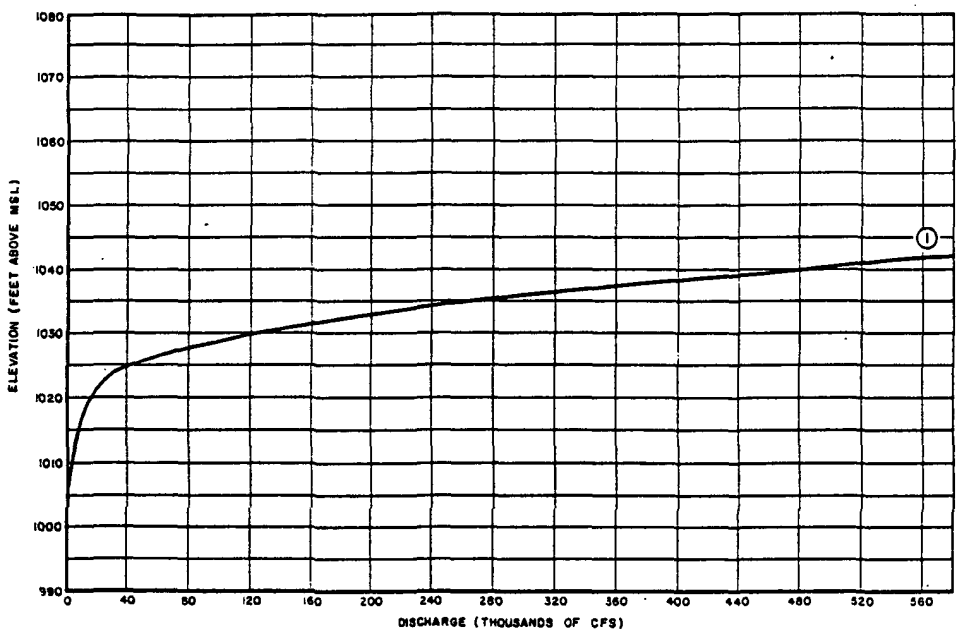
5 PROPOSED CEDAR POINT RESERVOIR

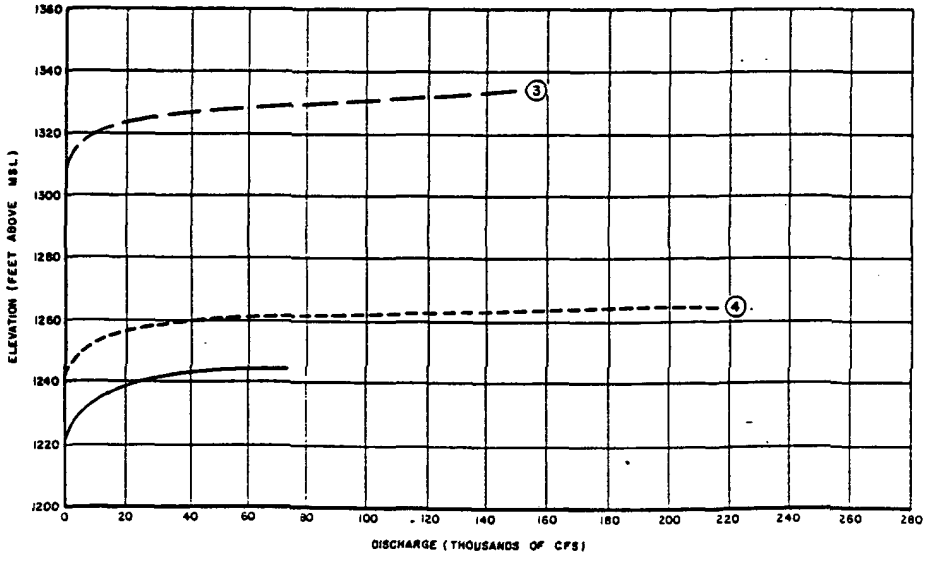
REFERENCES:
U.S. ARMY CORPS OF ENGINEERS, 1962; 1967; 1968; 1973.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-27

Spillway Rating Curves in Upper Neosho River Basin





Rev. 0

NOTE:

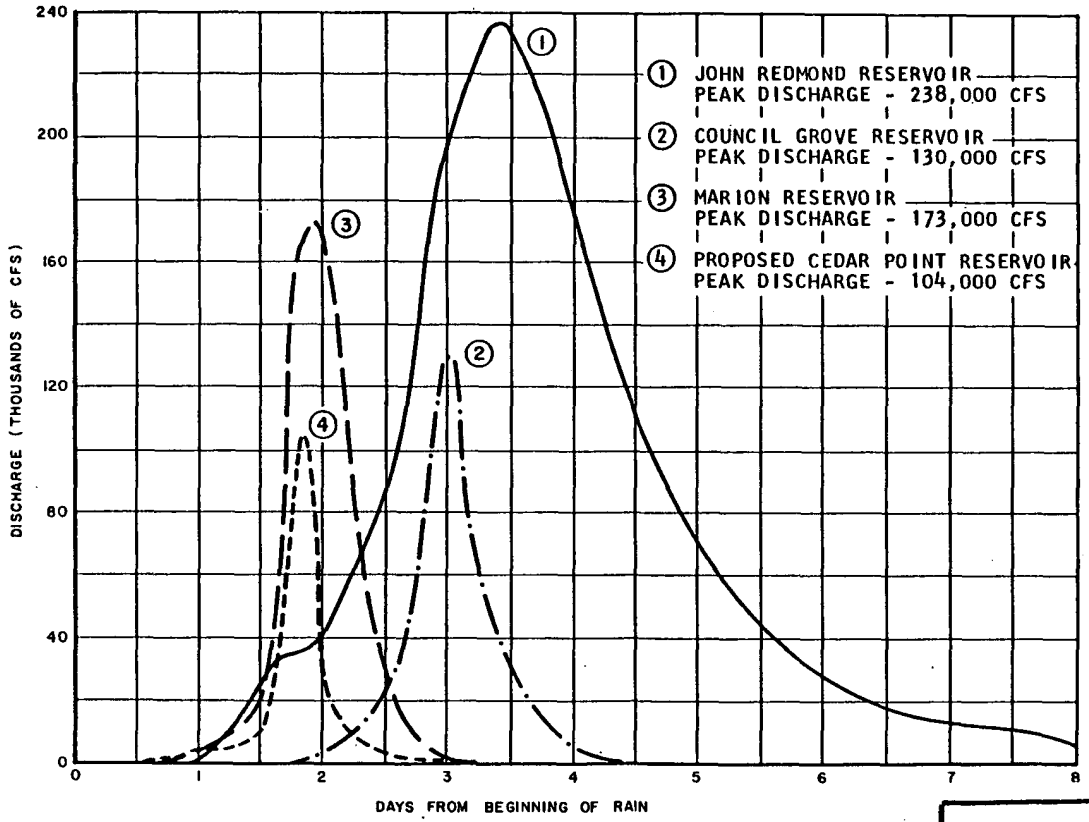
1 JOHN REDMOND RESERVOIR
2 COUNCIL GROVE RESERVOIR
3 MARION RESERVOIR
4 PROPOSED CEDAR POINT RESERVOIR

REFERENCES:
U.S. ARMY CORPS OF ENGINEERS, 1962; 1967; 1973.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-28

Tailwater Rating Curves in Upper Neosho River Basin



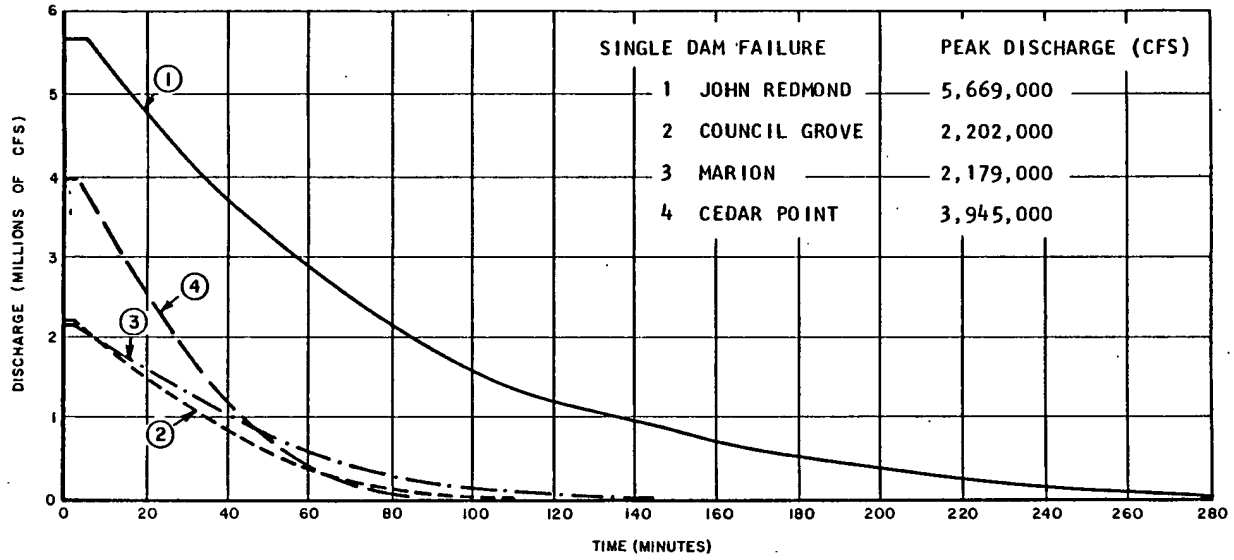
Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-29

Standard Project Flood Hydrographs

REFERENCES:
U.S. ARMY CORPS. OF ENGINEERS, 1958; 1959; 1981; 1971.

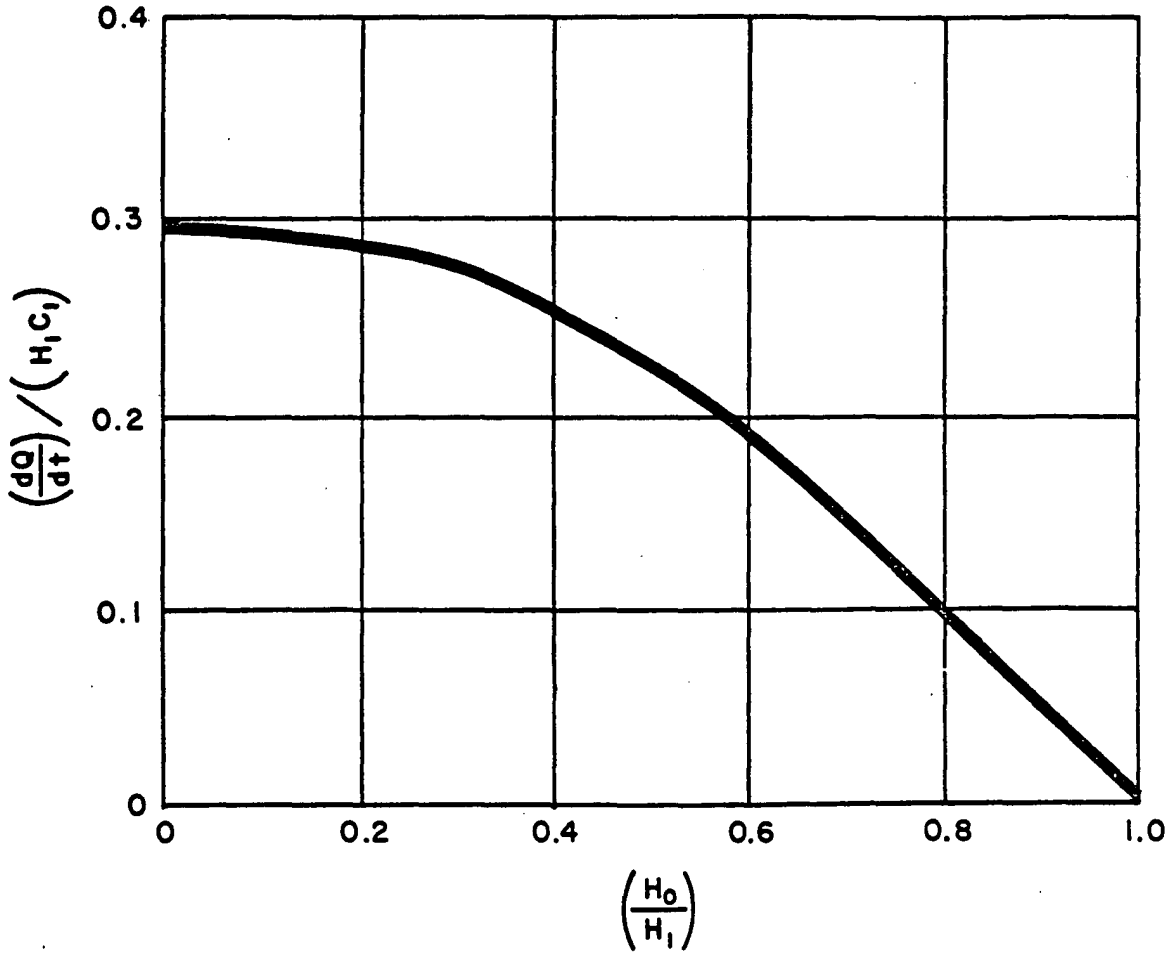


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-30

Computed Dambreak Water Release Rates



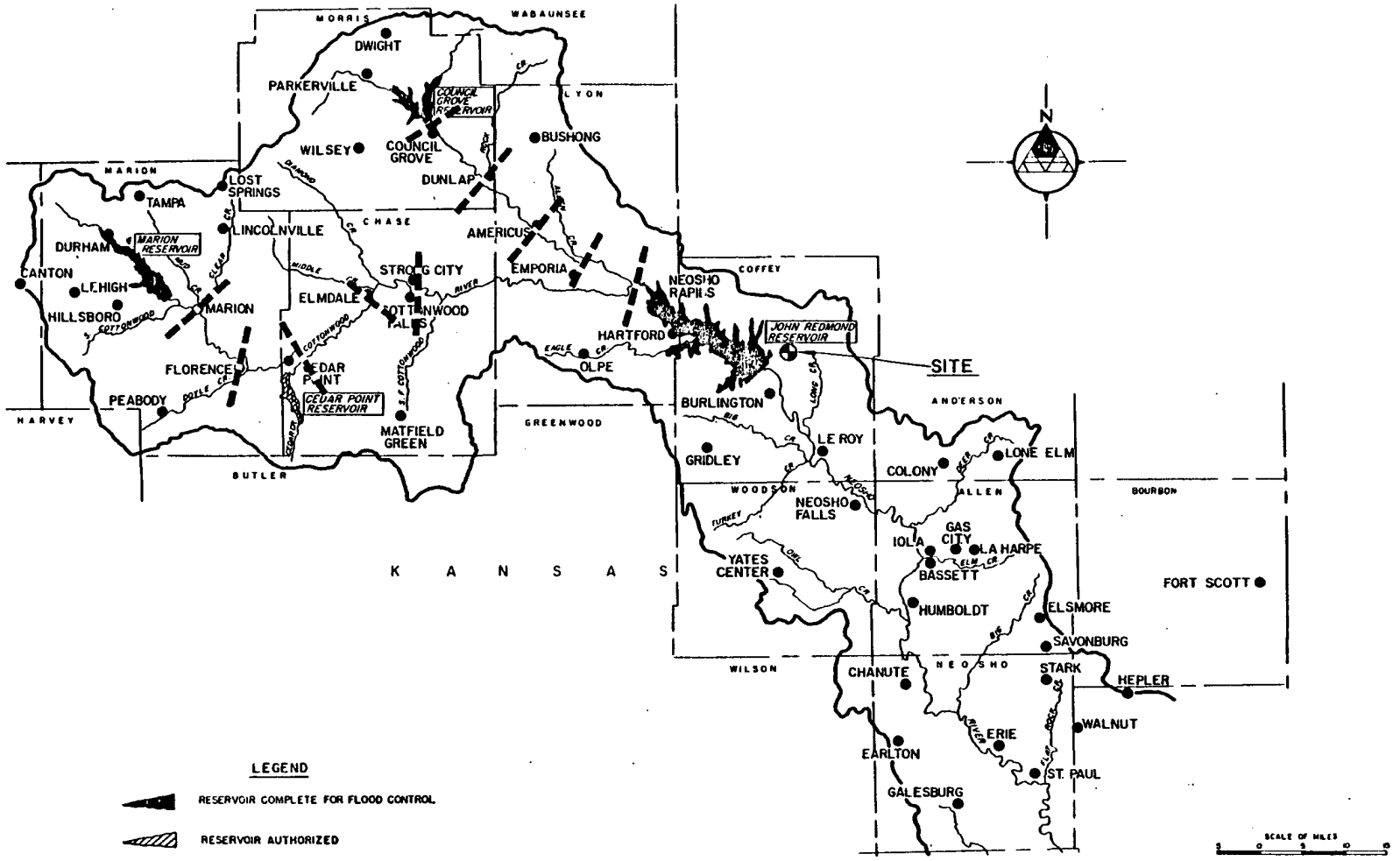
Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-31

Discharge Rate at the Damsite

REFERENCE:
REPRODUCED FROM STOKER, 1957,
P. 339, FIG. 10.8-4.



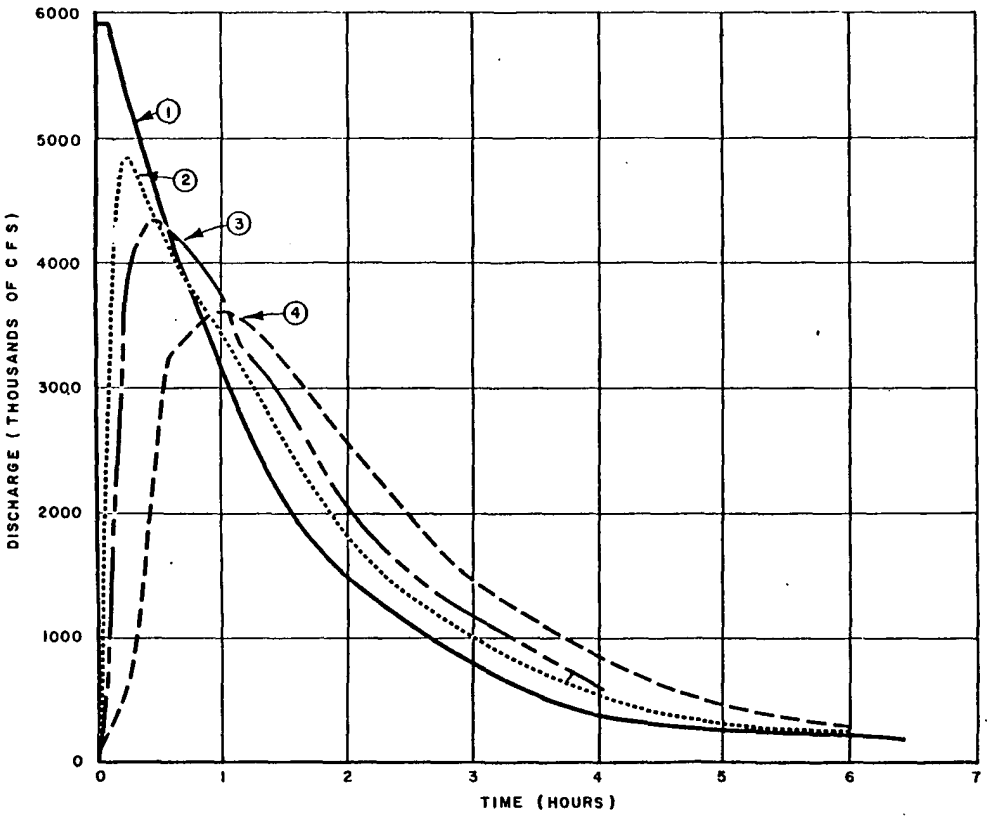
REFERENCE:
REPRODUCED FROM U.S. ARMY CORPS OF ENGINEERS, 1965, PLATE 1.

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-32

Control Stations along the Neosho and Cottonwood Rivers



STANDARD PROJECT FLOOD AND DAM FAILURE
AT JOHN REDMOND

1 JOHN REDMOND DAMSITE

2 TWO MILES DOWNSTREAM FROM DAMSITE

3. THREE MILES DOWNSTREAM FROM DAMSITE

4 SIX MILES DOWNSTREAM FROM DAMSITE

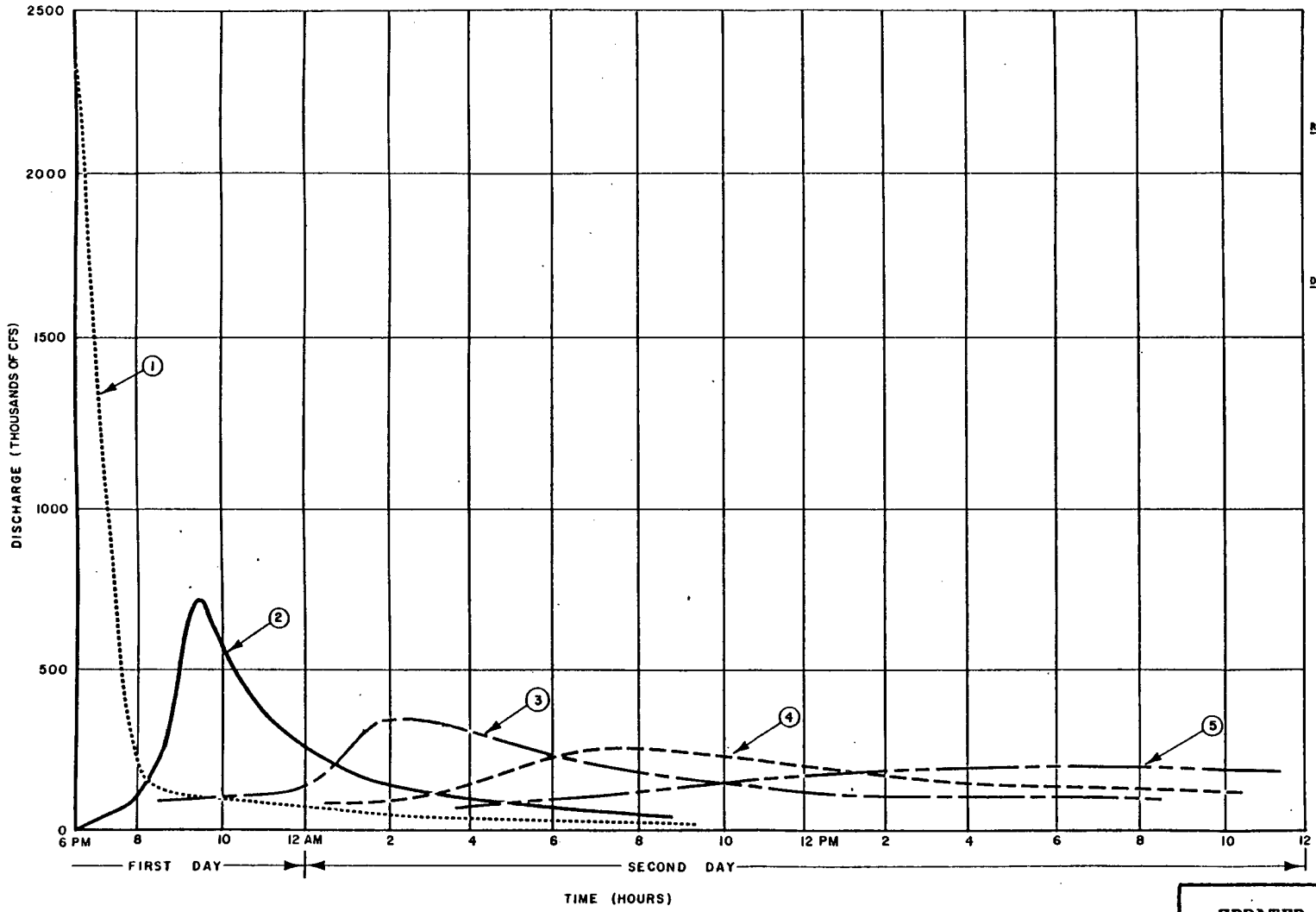
NOTE: PLANT SITE GRADE FAR ABOVE MAXIMUM FLOOD STAGES ON NEOSHO RIVER.

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-33

John Redmond Dam Failure Flood Translation



RIVER MILE		
449.9	1	COUNCIL GROVE DAM SITE
430.5	2	DUNLAP
413.0	3	AMERICUS
398.1	4	EMPORIA
382.8	5	JUNCTION OF NEOSHO RIVER AND COTTONWOOD RIVER

DAMBREAK TIME

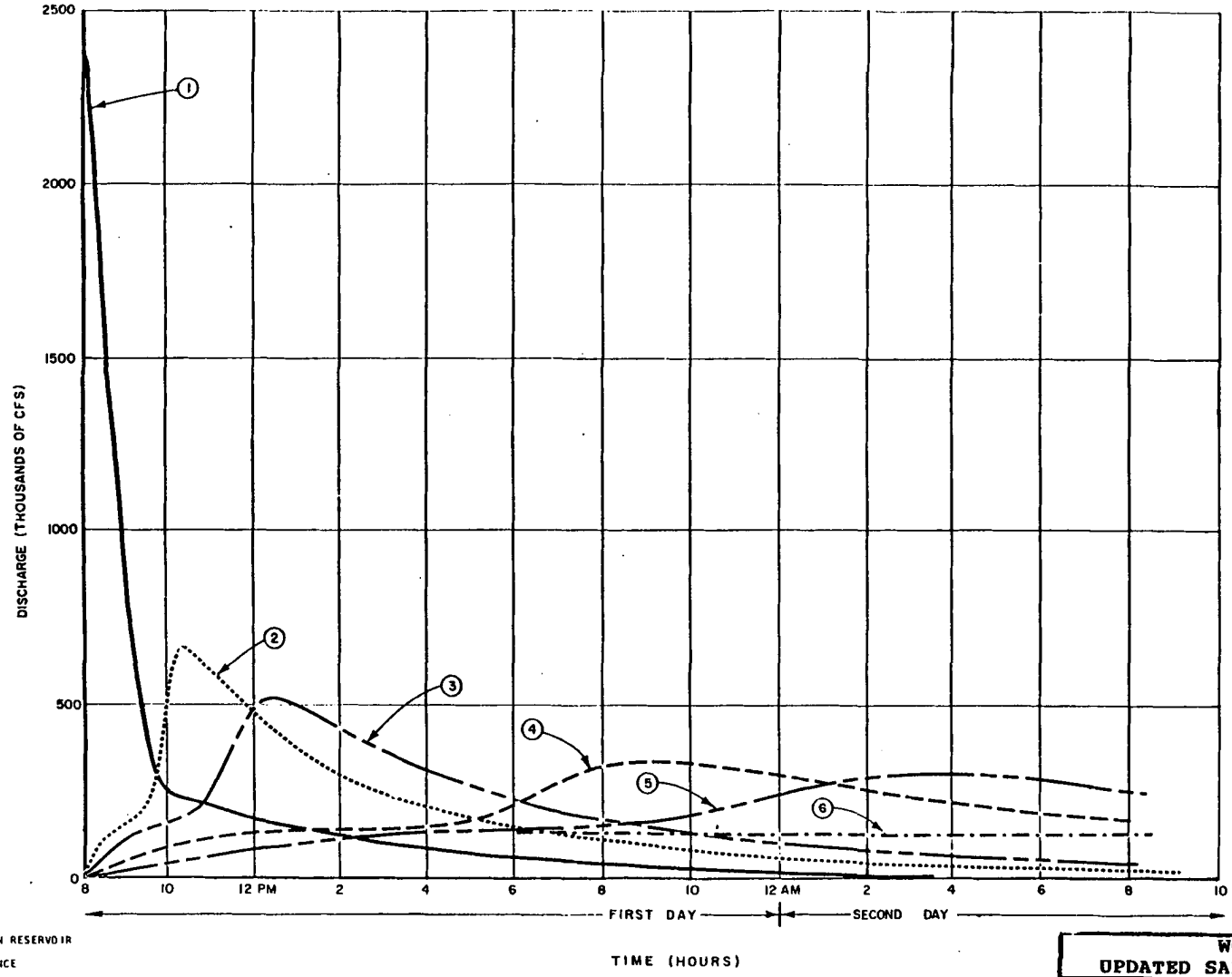
COUNCIL GROVE DAM: 6:25 PM, FIRST DAY

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-34

Council Grove Dam Failure Flood Translation



RIVER MILE		
126.7	1	MARION RESERVOIR
108.2	2	FLORENCE
98.1	3	CEDAR POINT
70.9	4	ELMDALE
55.0	5	STRONG CITY
0	6	JUNCTION OF NEOSHO RIVER AND COTTONWOOD RIVER

DAMBREAK TIME

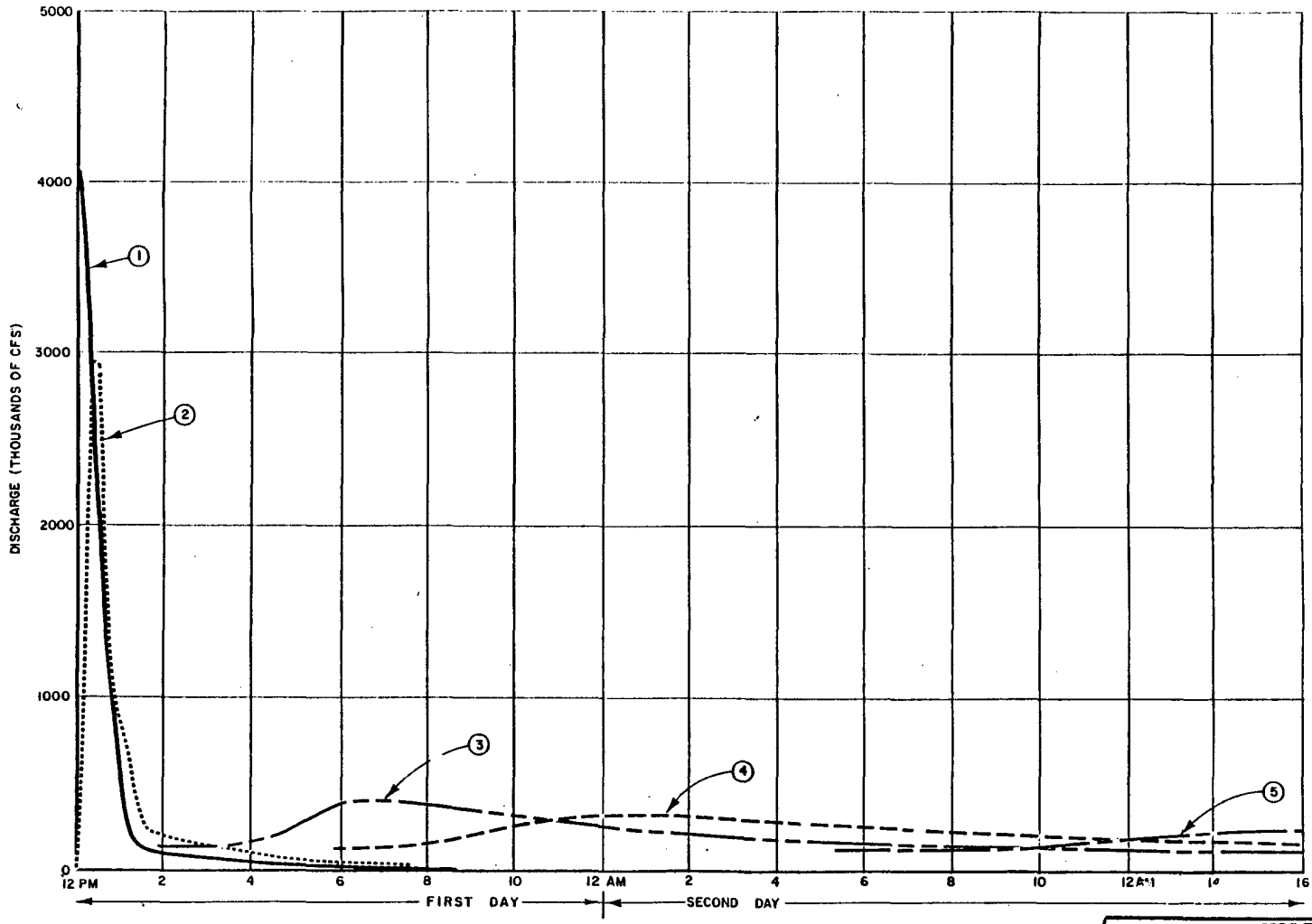
MARION DAM: 8:17 AM, FIRST DAY

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-35

Marion Dam Failure Flood Translation



RIVER MILE		
102.3	1	CEDAR POINT DAMSITE
98.1	2	CEDAR POINT
70.9	3	ELMDALE
55.0	4	STRONG CITY
0	5	JUNCTION OF NEOSHO AND COTTONWOOD RIVERS

DAMBREAK TIME

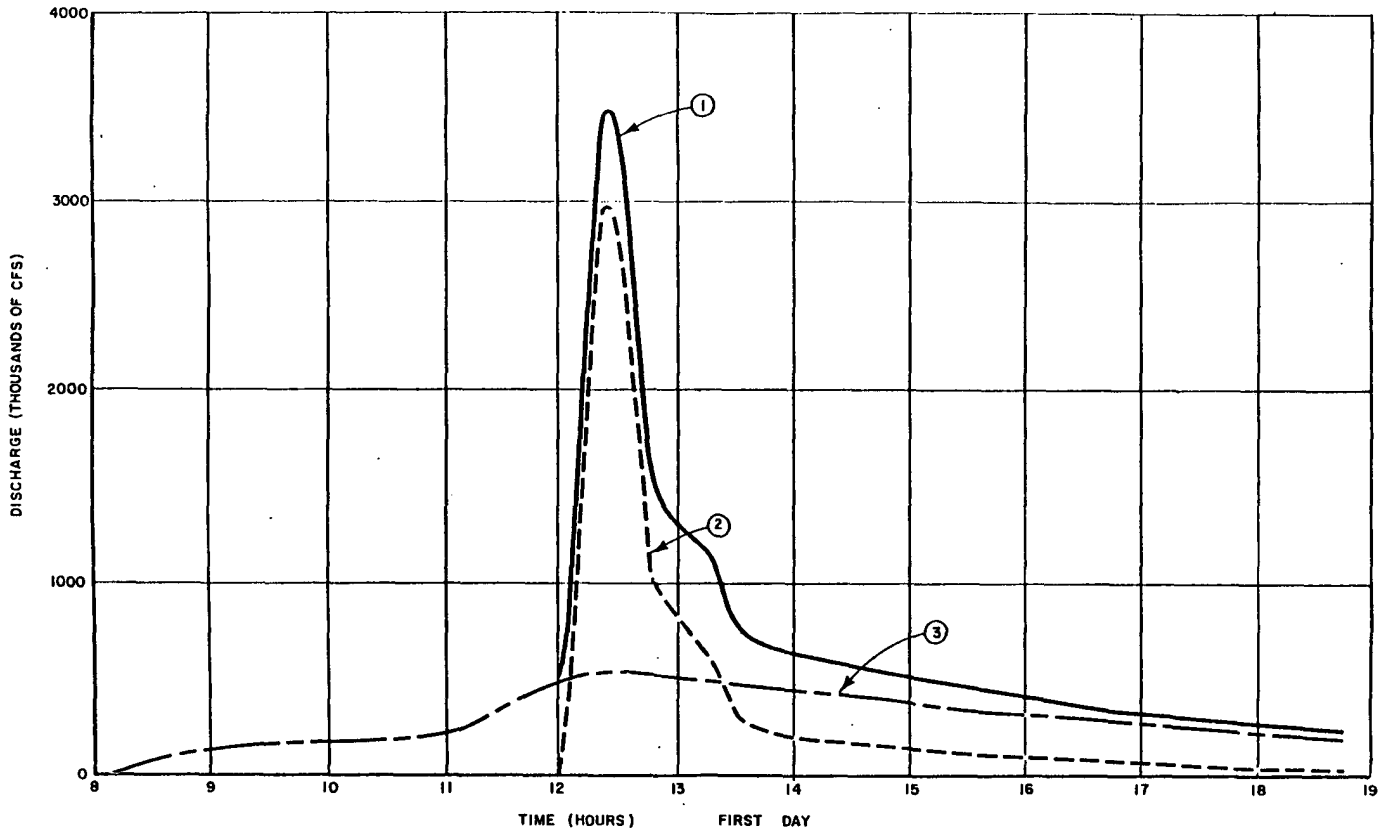
CEDAR POINT DAM: 12:00 PM, FIRST DAY

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-36

Cedar Point Dam Failure Flood Translation



1 FLOOD AT JUNCTION OF CEDAR CREEK AND COTTONWOOD RIVER

2 CEDAR POINT DAM FAILURE FLOOD

3 MARION DAM FAILURE FLOOD

DAMBREAK TIME

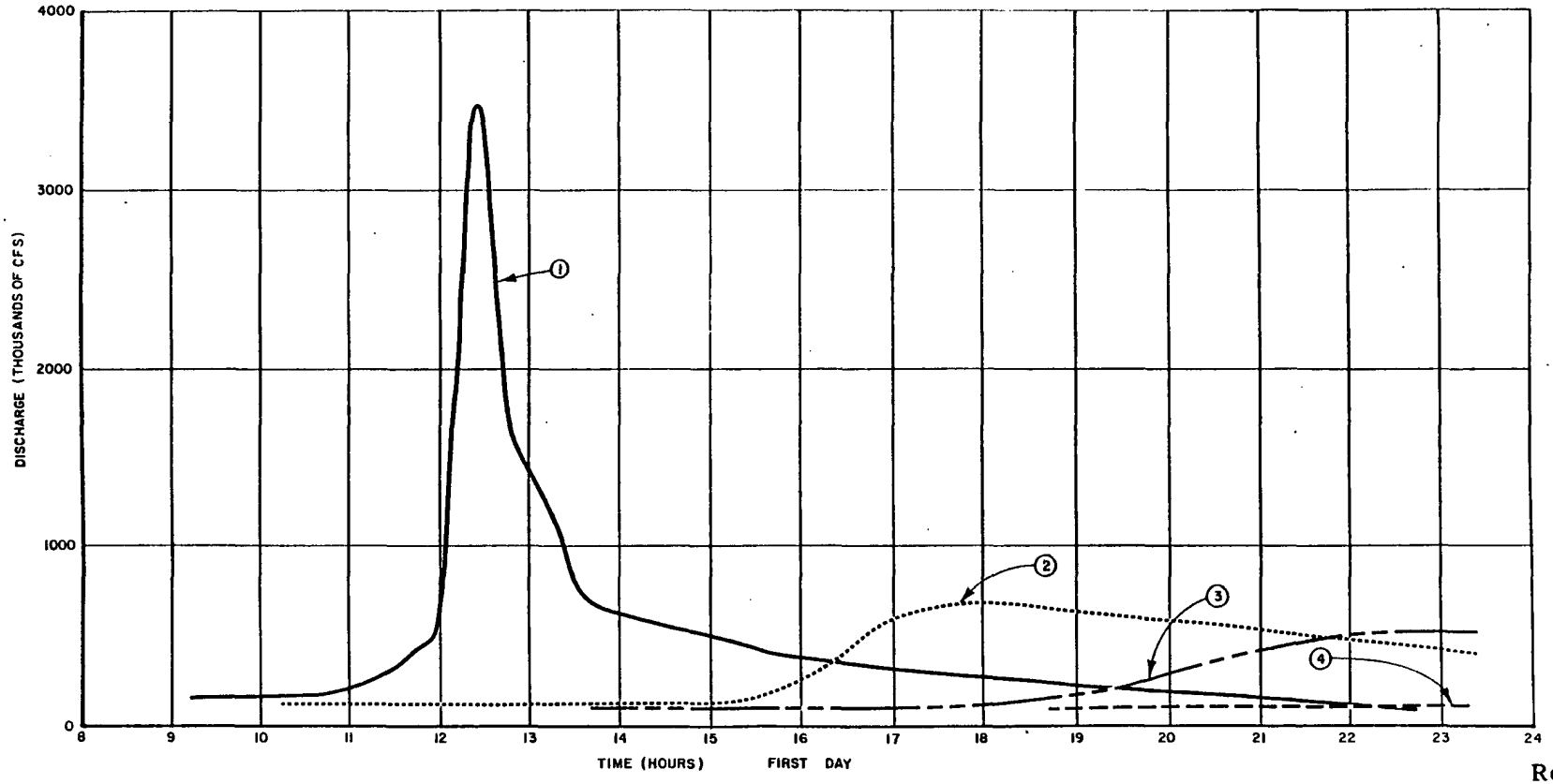
MARION RESERVOIR 8:17 AM
CEDAR POINT RESERVOIR: 12:00 PM

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-37

Flood at Junction of Cedar Creek and Cottonwood River



Rev. 0

RIVER MILE

98.1	1	CEDAR POINT
70.9	2	ELMDALE
55.0	3	STRONG CITY
0	4	JUNCTION OF NEOSHO RIVER AND COTTONWOOD RIVER

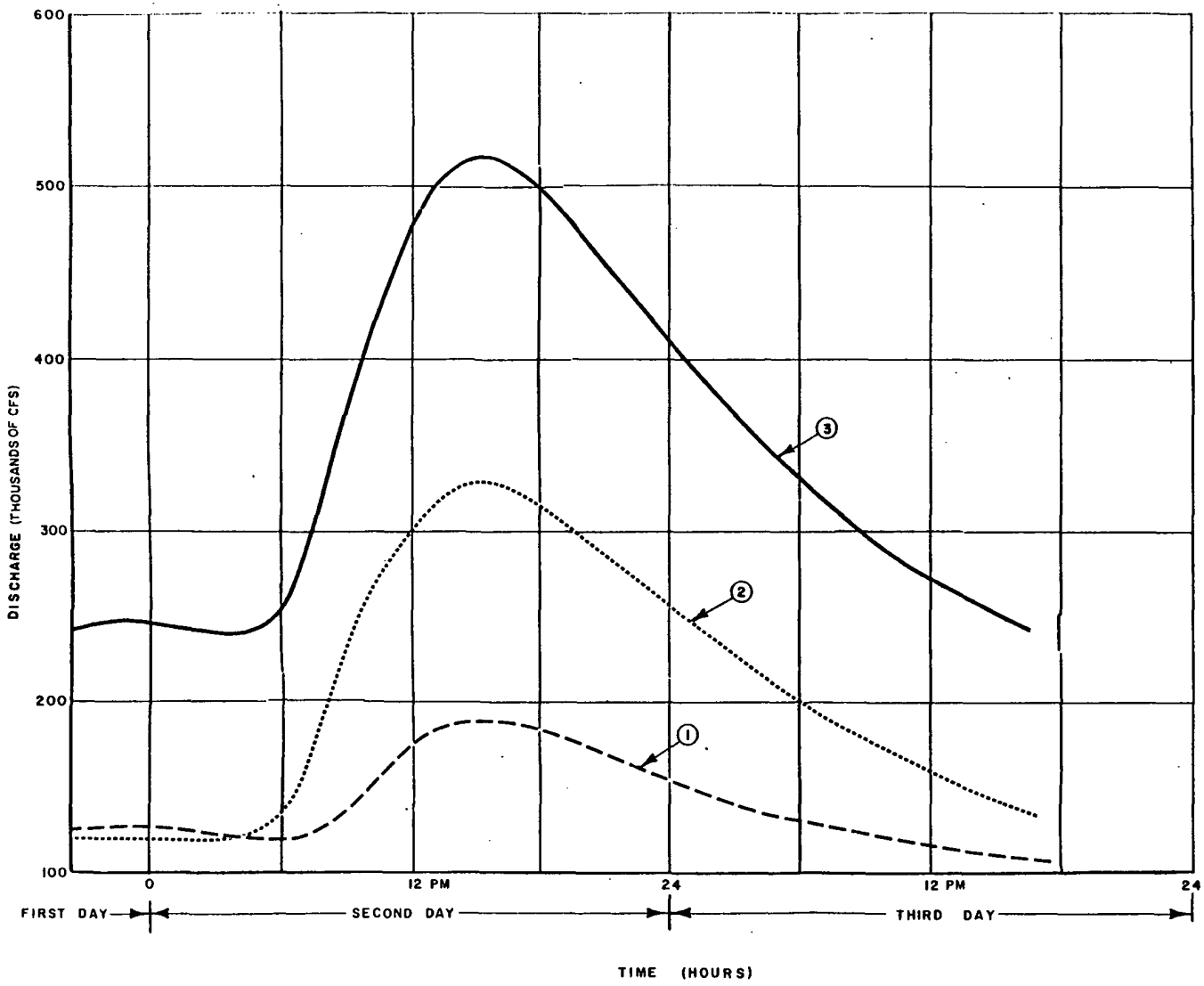
DAMBREAK TIME

MARION DAM 8:17 AM
CEDAR POINT DAM: 12:00 PM

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-38

Combination of Marion and Cedar Point Dams Failures Flood Translation



1 FLOOD FROM COUNCIL GROVE DAM FAILURE

2 FLOOD FROM MARION AND CEDAR POINT DAM FAILURE

3 FLOOD AT JUNCTION OF NEOSHO RIVER AND COTTONWOOD RIVER

DAMBREAK TIME

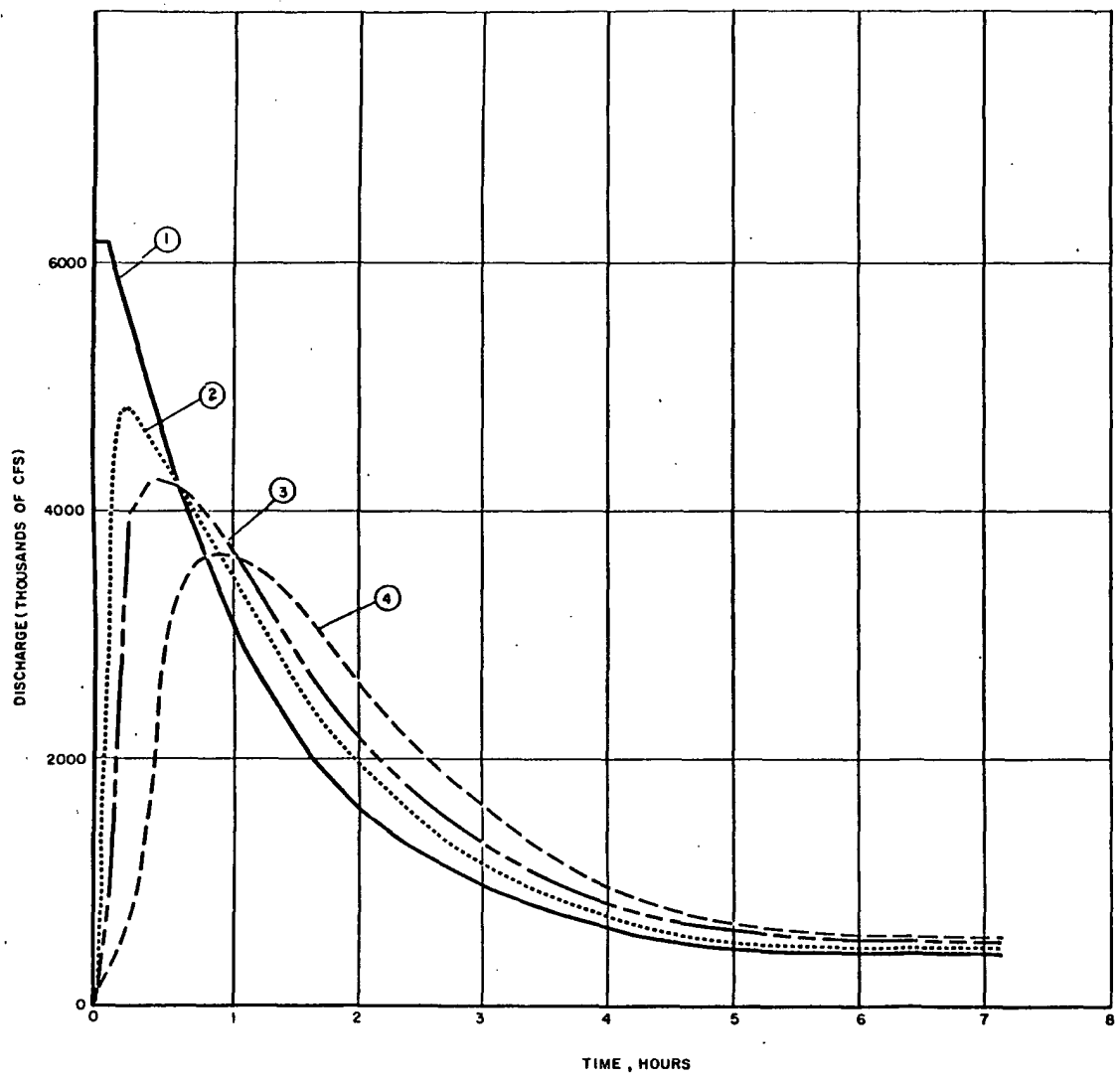
MARION DAM: 8:17 AM, FIRST DAY
CEDAR POINT DAM: 12:00 PM, FIRST DAY
COUNCIL GROVE DAM: 6:25 PM, FIRST DAY

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-39

Flood at Junction of Neosho and Cottonwood Rivers



DAM FAILURES AT JOHN REDMOND, COUNCIL GROVE, MARION AND CEDAR POINT DAM

STANDARD PROJECT FLOODS WERE INCLUDED AT COUNCIL GROVE, MARION AND CEDAR POINT.

1 JOHN REDMOND DAM

2 TWO MILES DOWNSTREAM FROM DAMSITE

3 THREE MILES DOWN STREAM FROM DAMSITE

4 SIX MILES DOWNSTREAM FROM DAMSITE

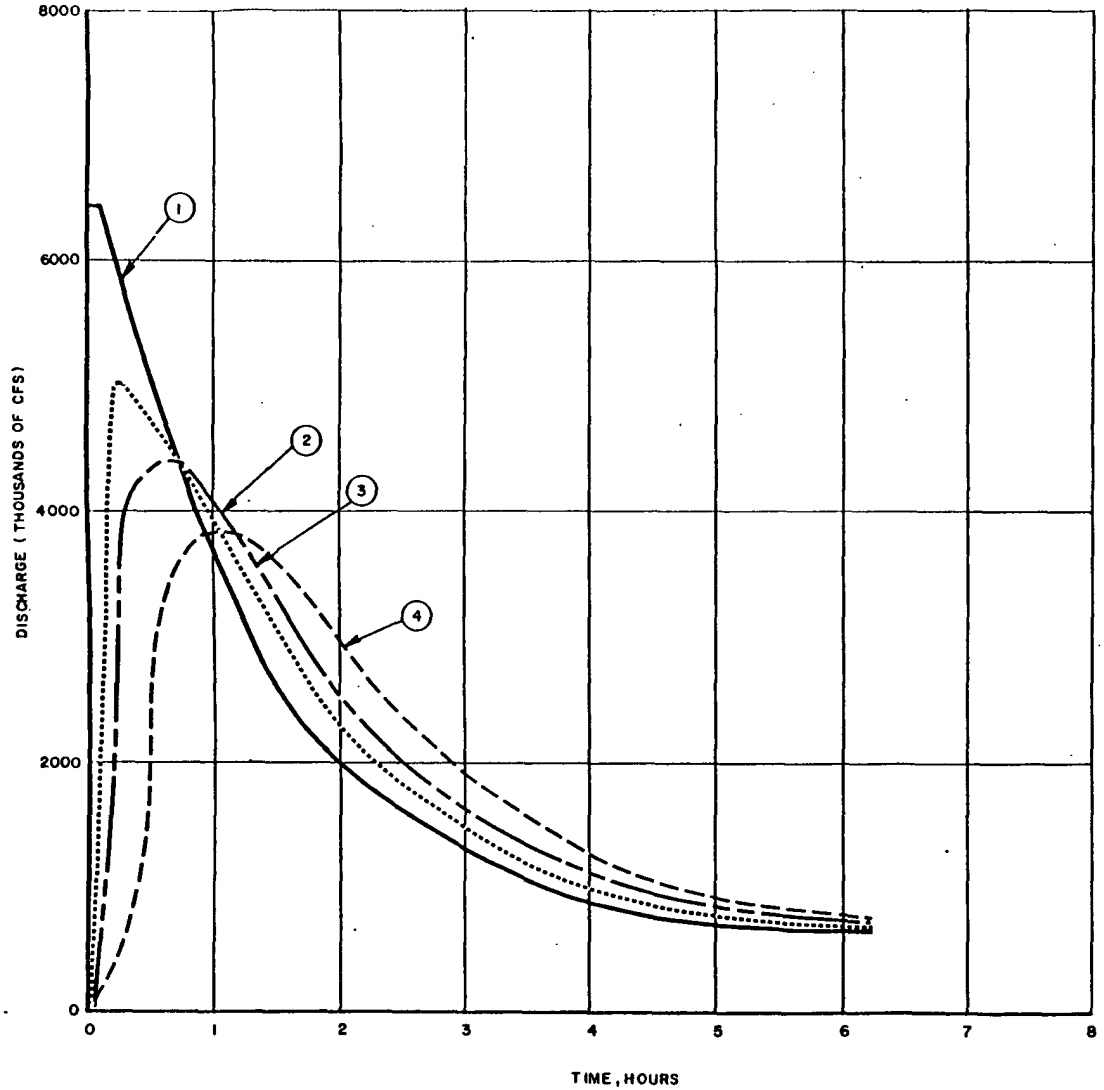
NOTE: PLANT SITE GRADE FAR ABOVE MAXIMUM FLOOD STAGES ON NEOSHO RIVER.

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-40

Multiple Dam Failures Flood Translation



STANDARD PROJECT FLOOD AND DAM FAILURE AT JOHN REDMOND DAM, COUNCIL GROVE, MARION, AND CEDAR POINT DAMS.

1 JOHN REDMOND DAMSITE

2 TWO MILES DOWNSTREAM FROM DAMSITE

3 THREE MILES DOWNSTREAM FROM DAMSITE

4 SIX MILES DOWNSTREAM FROM DAMSITE

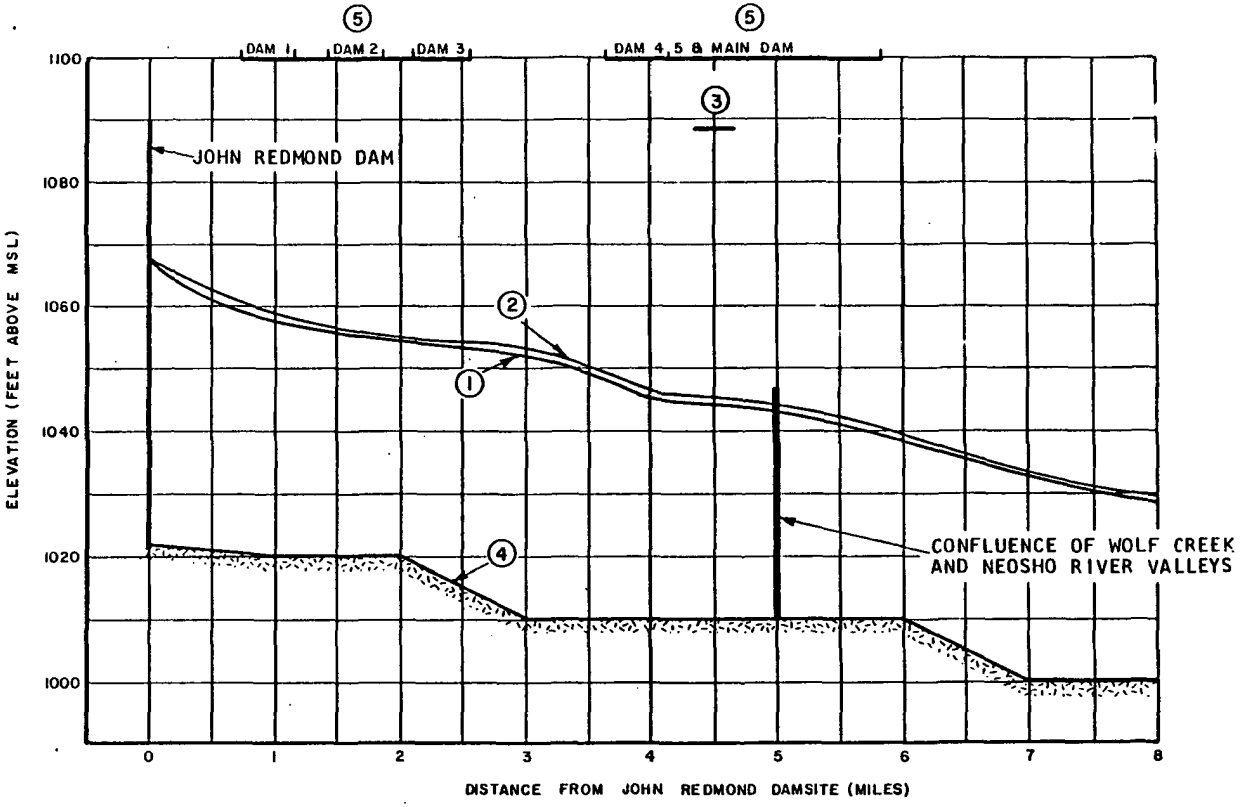
NOTE: PLANT SITE GRADE FAR ABOVE MAXIMUM FLOOD STAGES ON NEOSHO RIVER.

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-41

Multiple Dam Failures with Standard Project Flood Translation



Rev. 0

1 RESULTED FROM DAM FAILURE OF JOHN REDMOND DAM RESERVOIR COINCIDENT WITH THE SPF.

2 RESULTED FROM DAM FAILURES OF JOHN REDMOND, COUNCIL GROVE, MARION AND CEDAR POINT RESERVOIRS COINCIDENT WITH THE SPF.

3 WOLF CREEK DAM SPILLWAY CREST = 1088 FEET

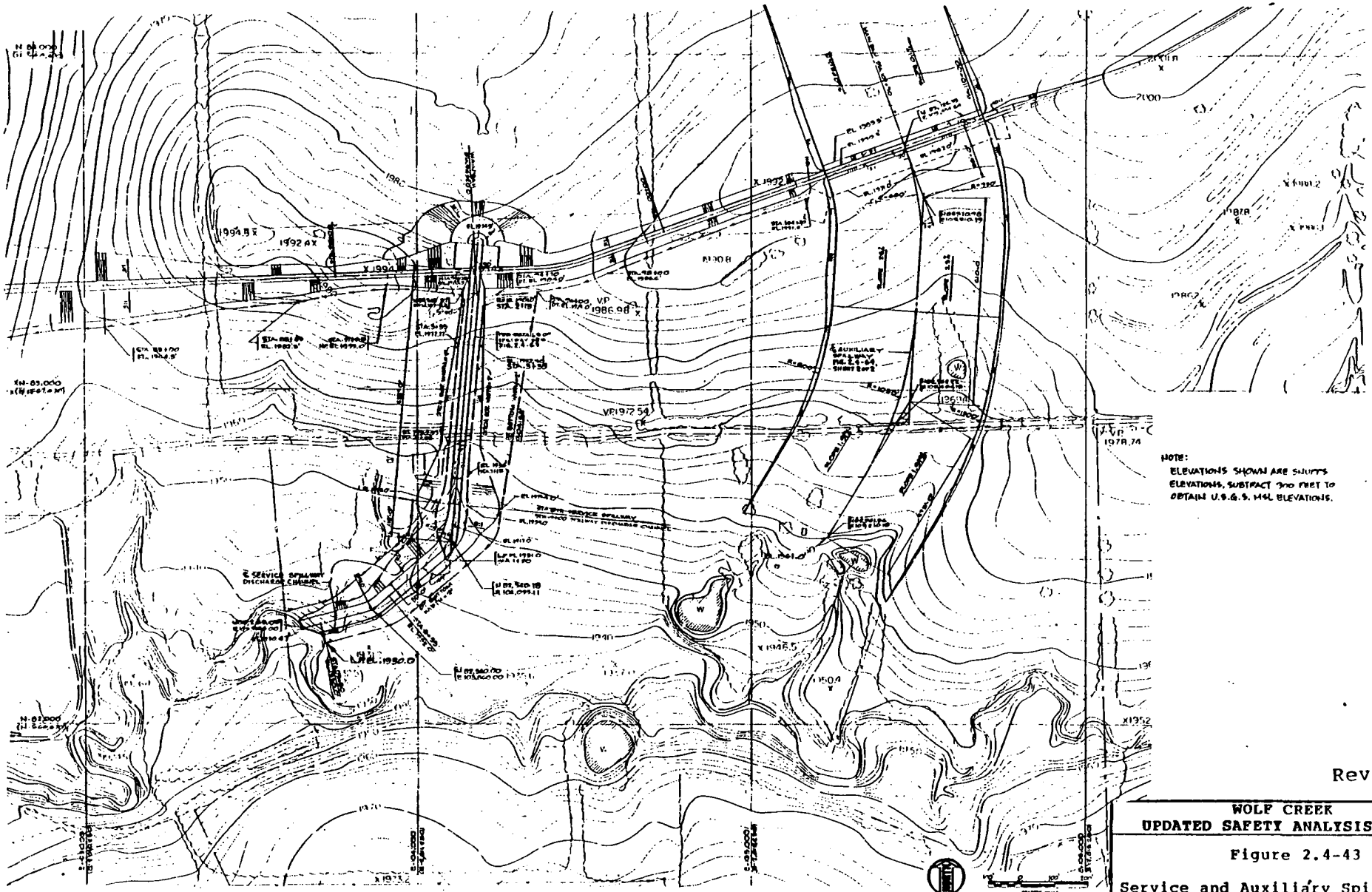
4 NEOSHO RIVER DAM

5 ELEVATIONS AND LOCATIONS FOR WOLF CREEK COOLING LAKE DAMS; ALSO SEE FIGURE 2.4-1.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-42

Maximum Flood Stages of Neosho River near the Wolf Creek Dam

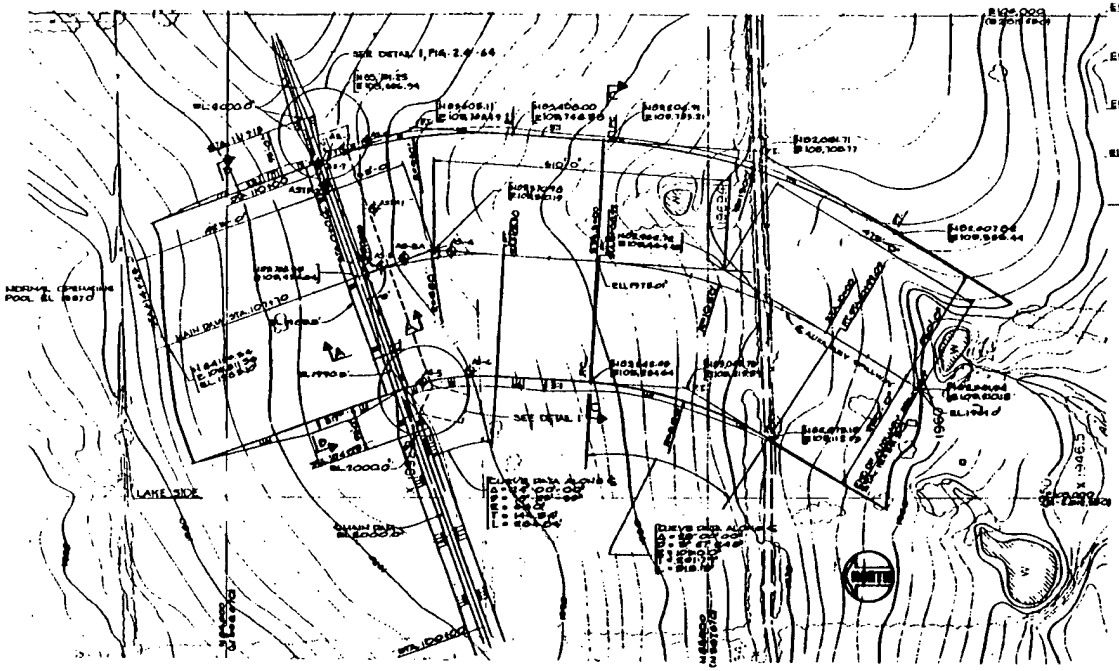


Rev. 0

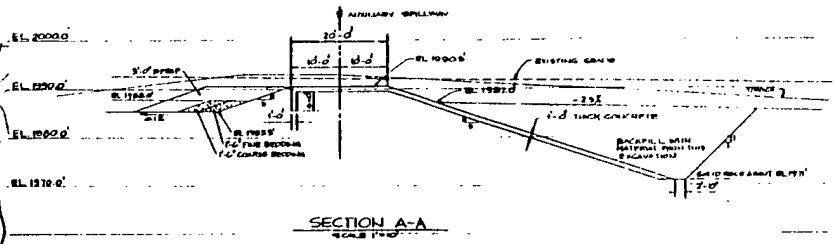
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-43

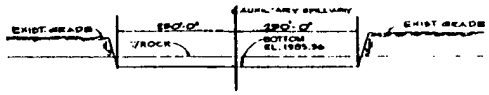
Service and Auxiliary Spillways Location



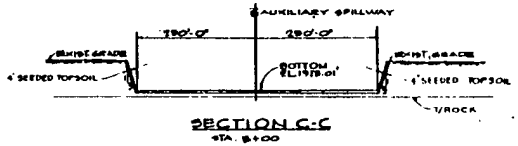
PLAN



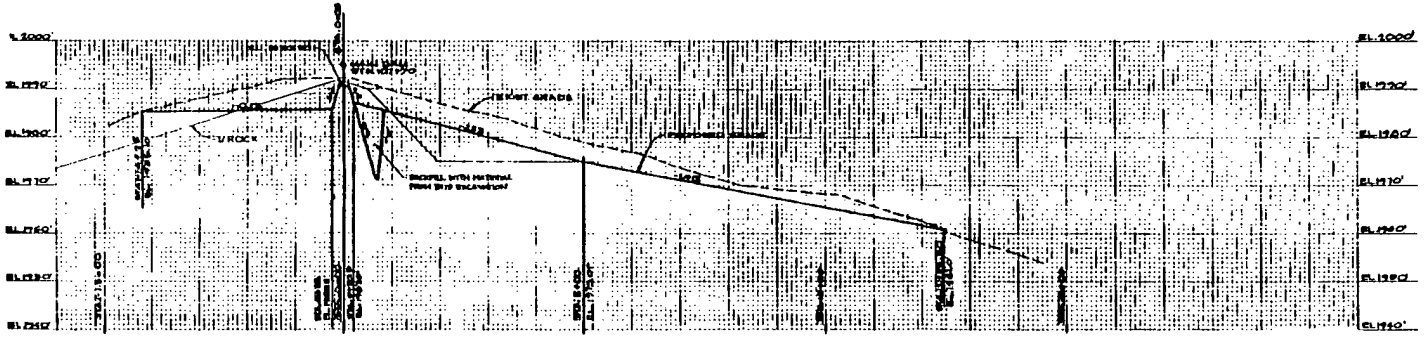
SECTION A-A



SECTION B-B



SECTION C-C



LONGITUDINAL PROFILE ALONG ℄

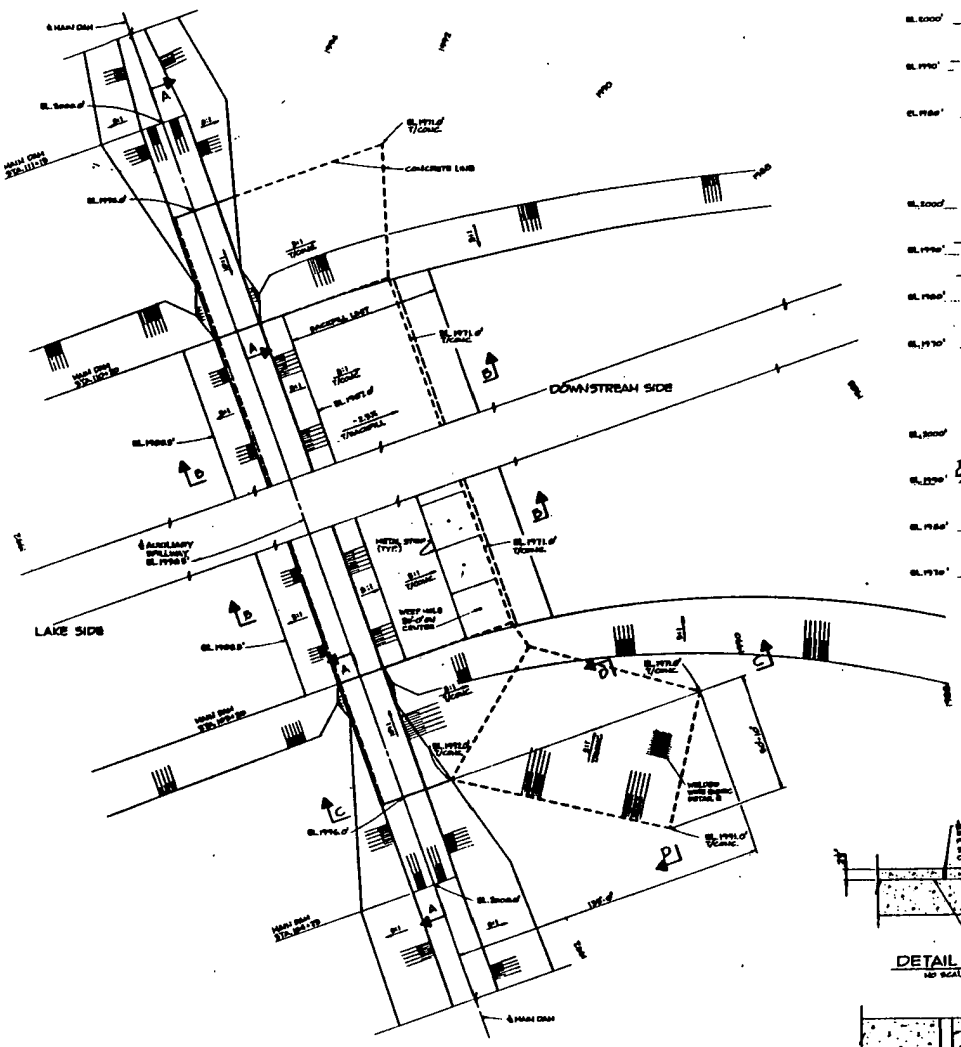
NOTE:
ELEVATIONS SHOWN ARE SHUPP'S ELEVATIONS.
SUBTRACT 900 FEET TO OBTAIN U.S.G.S. MSL ELEVATIONS.

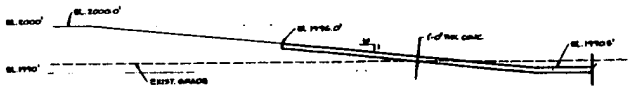
Rev. 0

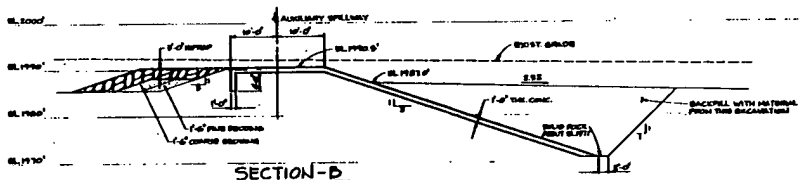
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

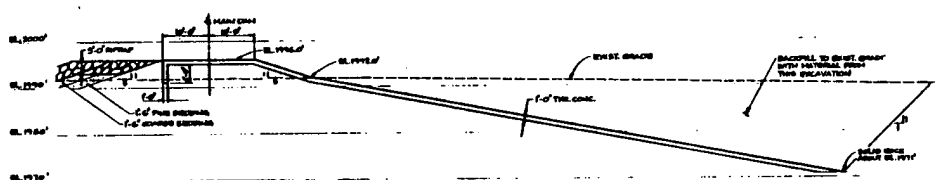
Figure 2.4-44 (Sheet 1 of 2)

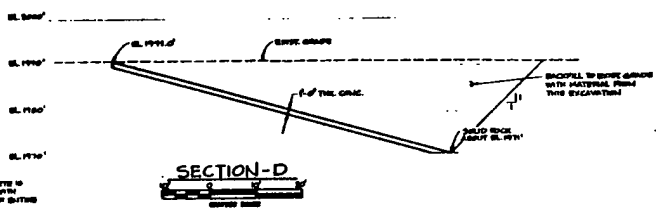
Auxiliary Spillway Plans

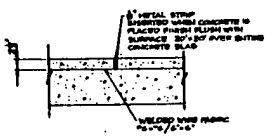


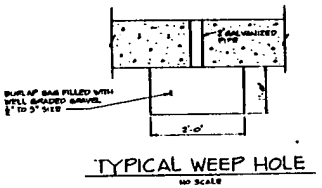










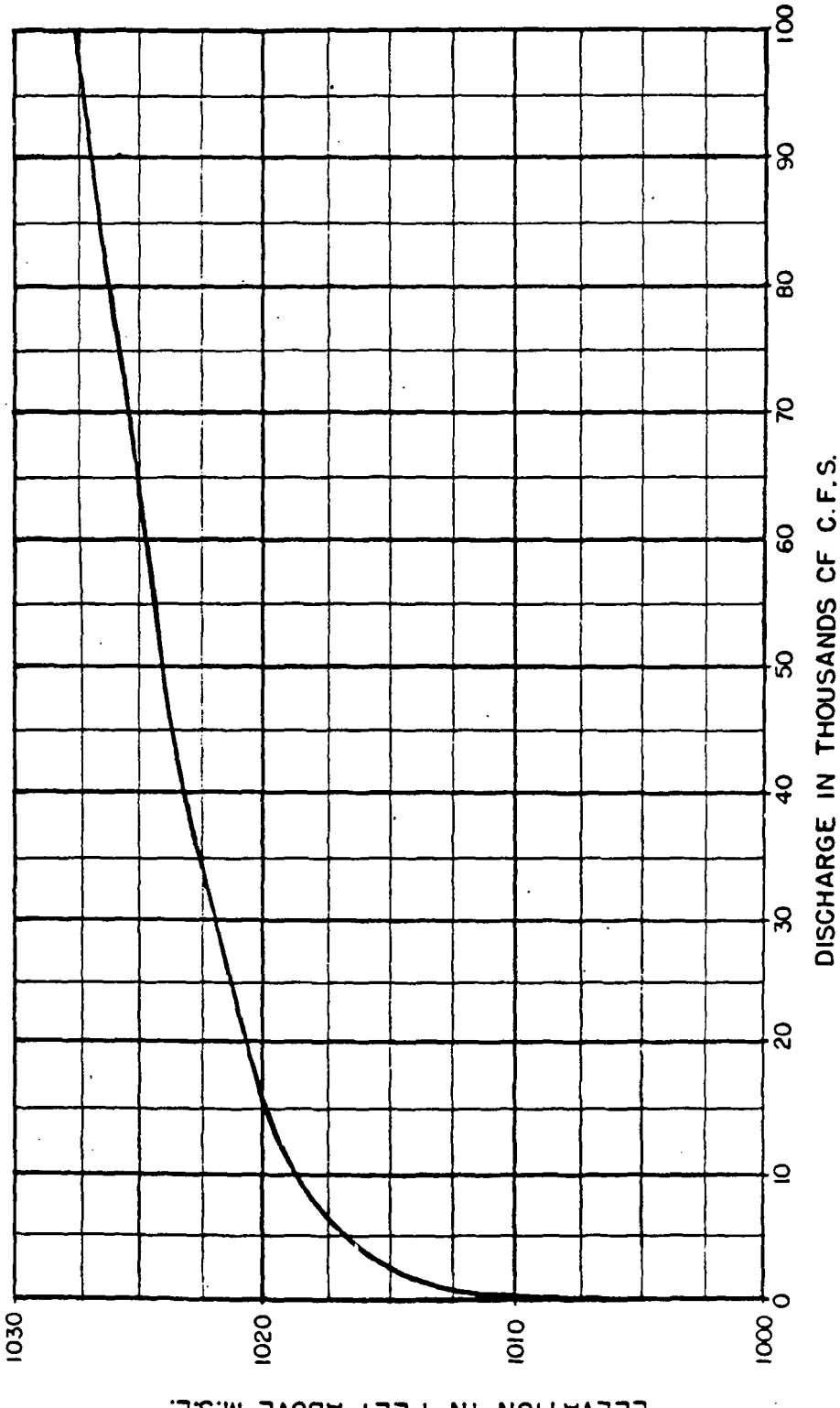


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-44 (Sheet 2 of 2)

Auxiliary Spillway Plans

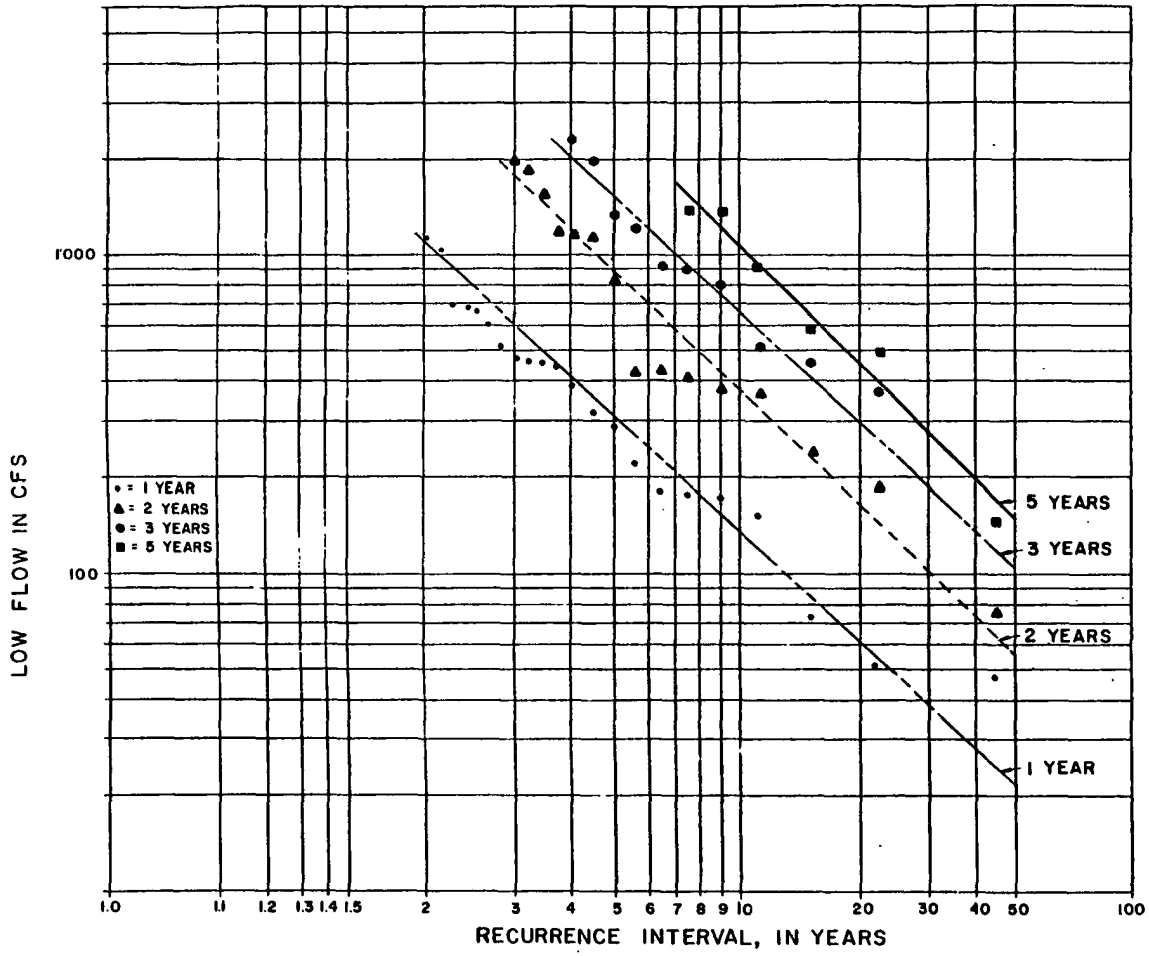


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-45

Tailwater Rating Curve, Wolf Creek Dam

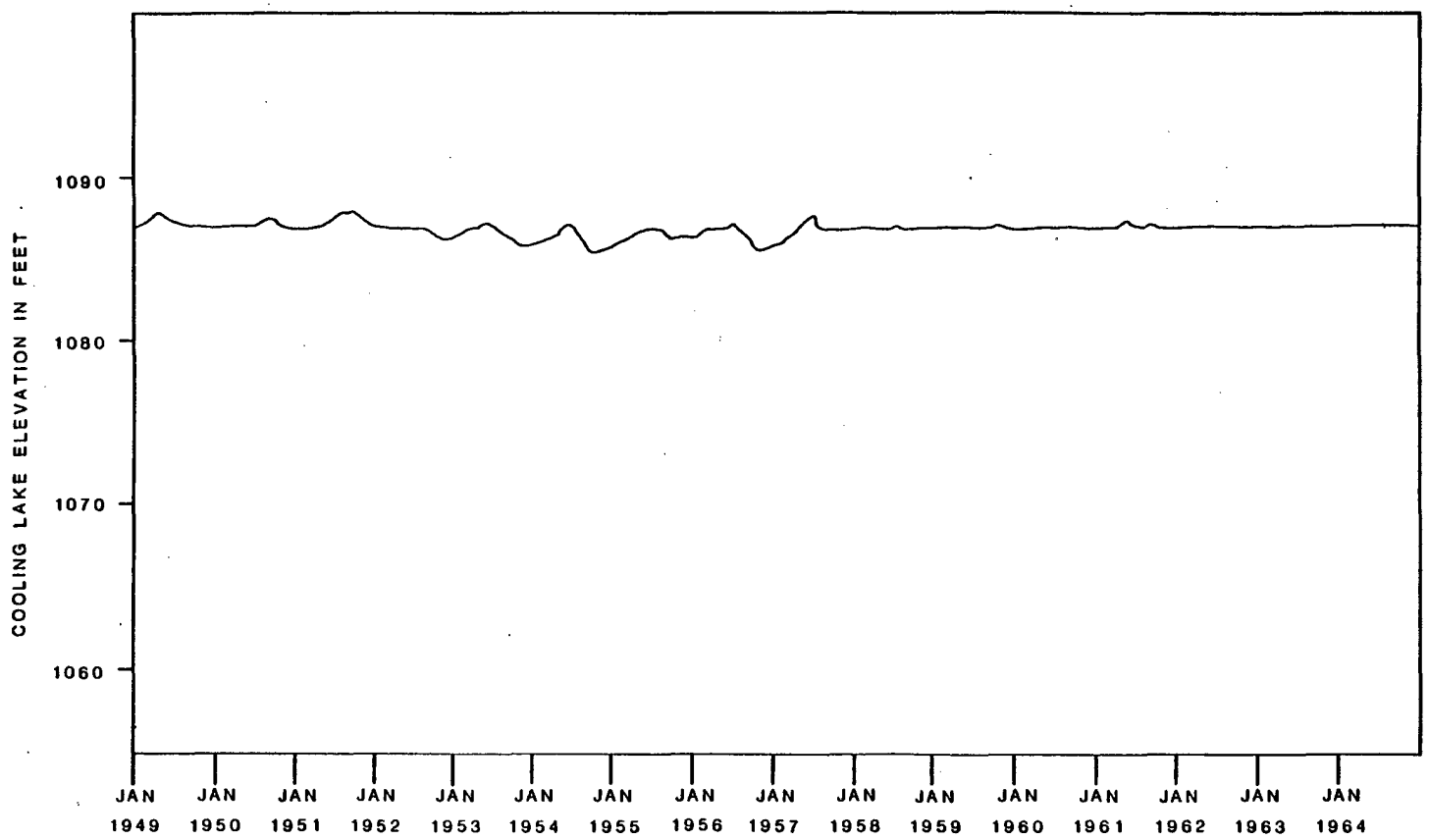


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-46

Low Flow Frequency Duration Curves for Neosho River at John Redmond Damsite



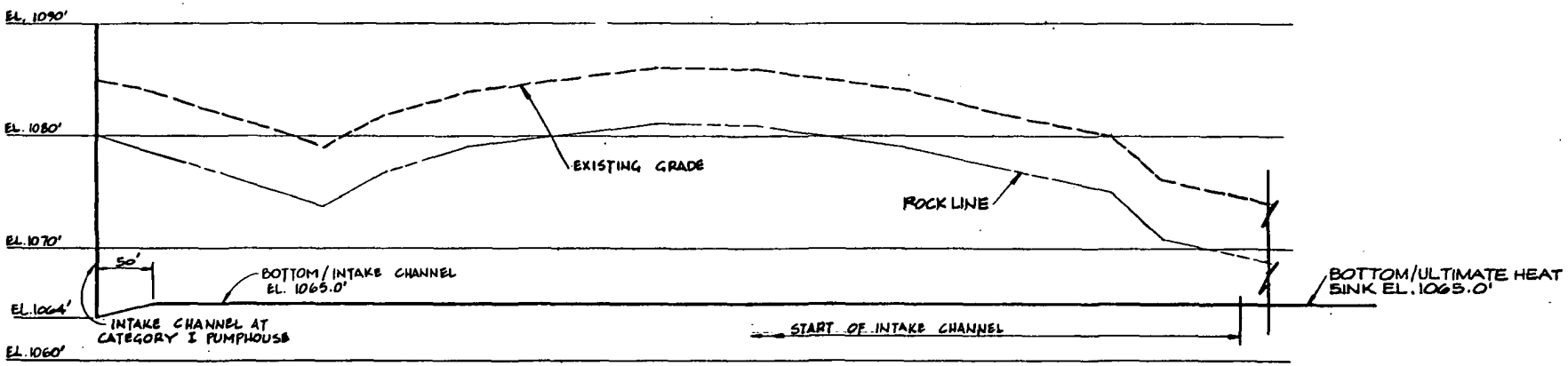
NOTE: ONE UNIT AT 100% AVERAGE ANNUAL LOAD FACTOR.

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

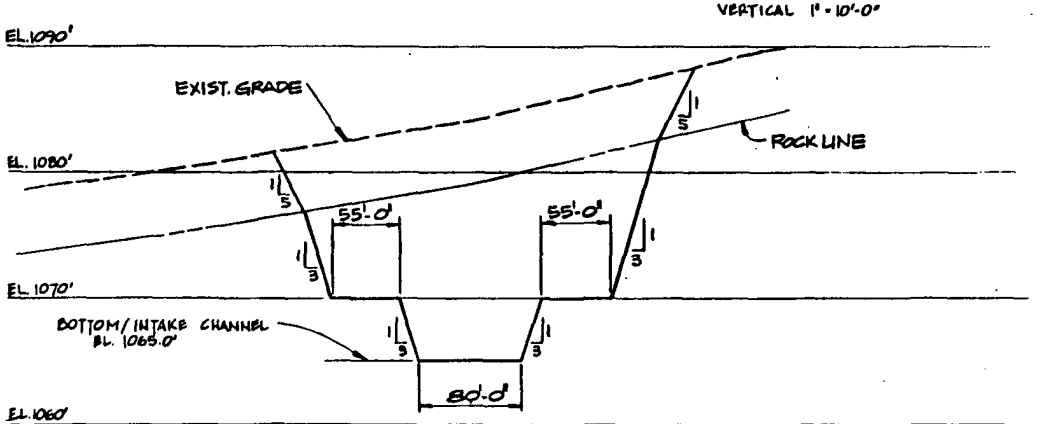
Figure 2.4-47

Simulated Cooling Lake Drawdown Analysis - 1951-1959



LONGITUDINAL SECTION

SCALE: HORIZONTAL 1" = 100'-0"
VERTICAL 1" = 10'-0"



TRANSVERSE SECTION

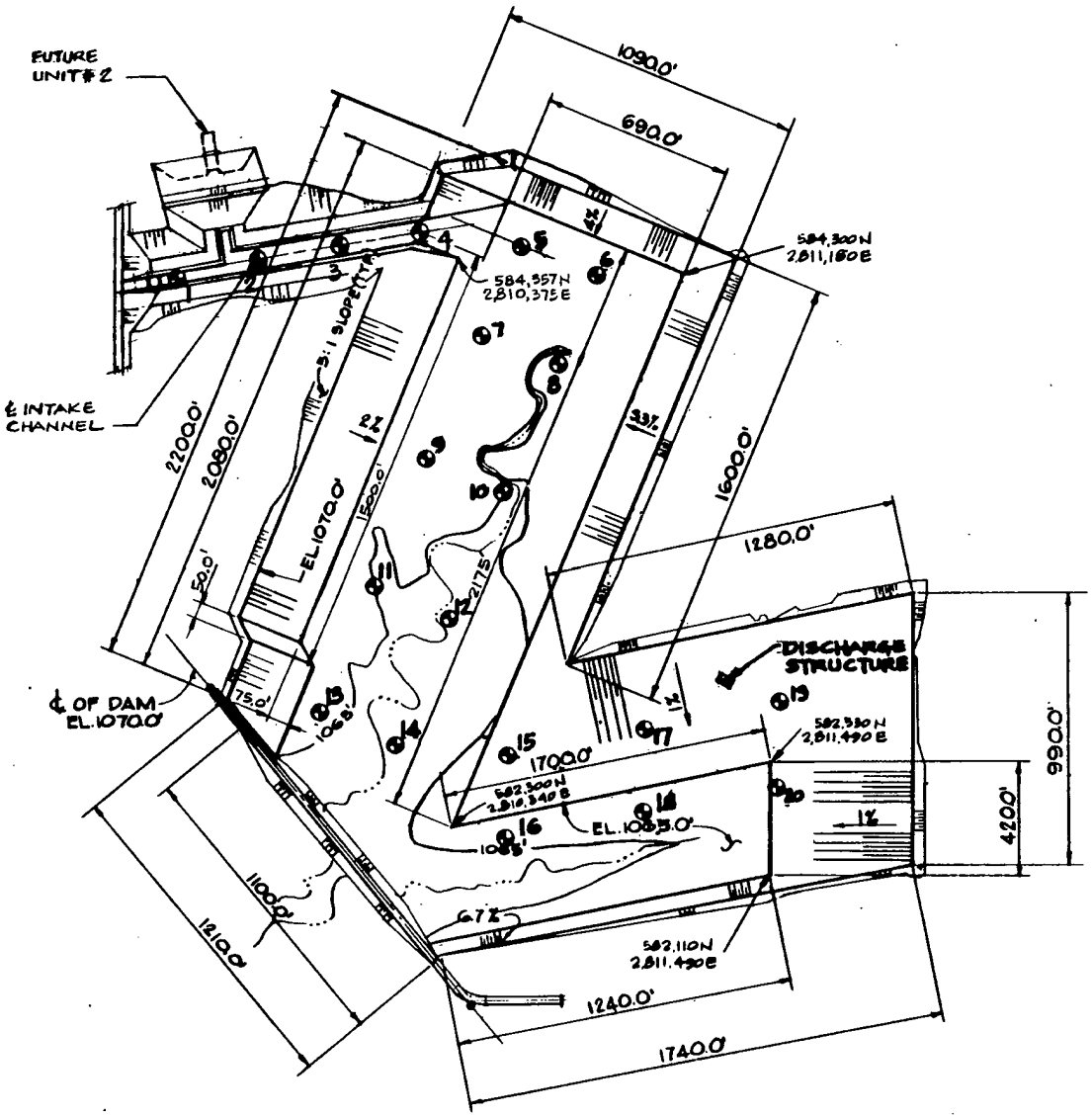
SCALE: HORIZONTAL 1" = 100'-0"
VERTICAL 1" = 10'-0"

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-48

Ultimate Heat Sink, Intake Channel Sections



STATION	LOCATION	
	NORTH	EAST
1	584,298	2,809,338
2	584,361	2,809,632
3	584,405	2,809,929
4	584,448	2,810,226
5	584,415	2,810,580
6	584,300	2,810,860
7	584,060	2,810,430
8	583,950	2,810,695
9	583,610	2,810,230
10	583,490	2,810,510
11	583,150	2,810,045
12	583,030	2,810,320
13	582,685	2,809,850
14	582,565	2,810,120
15	582,530	2,810,530
16	582,225	2,810,520
17	582,630	2,811,017
18	582,320	2,811,015
19	582,730	2,811,510
20	582,420	2,811,500

● — SOUNDING STATION

400' 0' 400' 800'

GRAPHIC SCALE

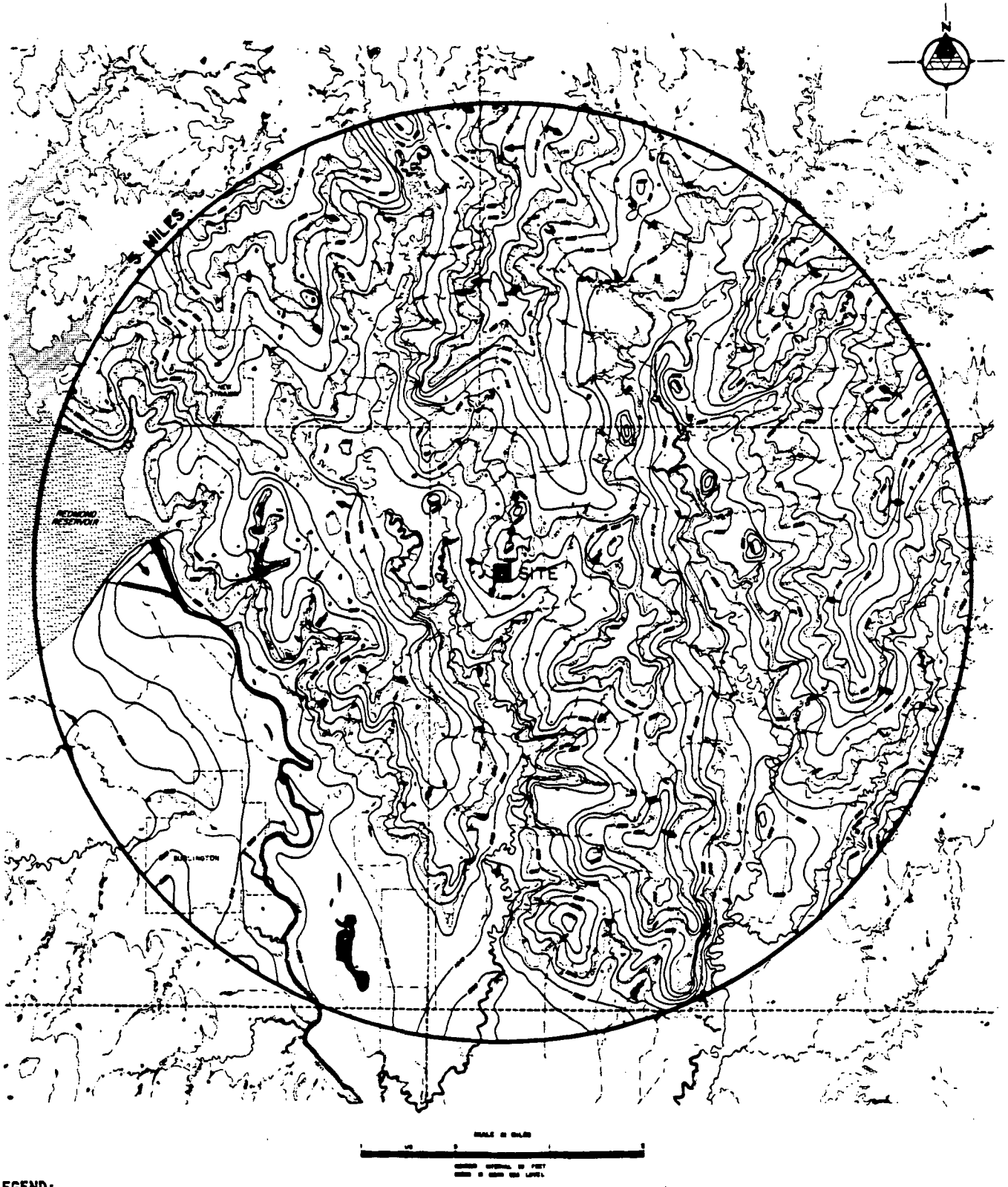
NORTH

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-49

Location of Sounding Stations in Ultimate Heat Sink



LEGEND:

-1100- TOPOGRAPHIC CONTOURS (50 FOOT INTERVALS)

-1000- WATER TABLE ELEVATION CONTOURS (10 FOOT INTERVAL FROM DATA GATHERED DURING WELL INVENTORY. (SEE TABLE 2.4-29).

ARROWS SHOW DIRECTION OF GROUND-WATER FLOW.

REFERENCE:

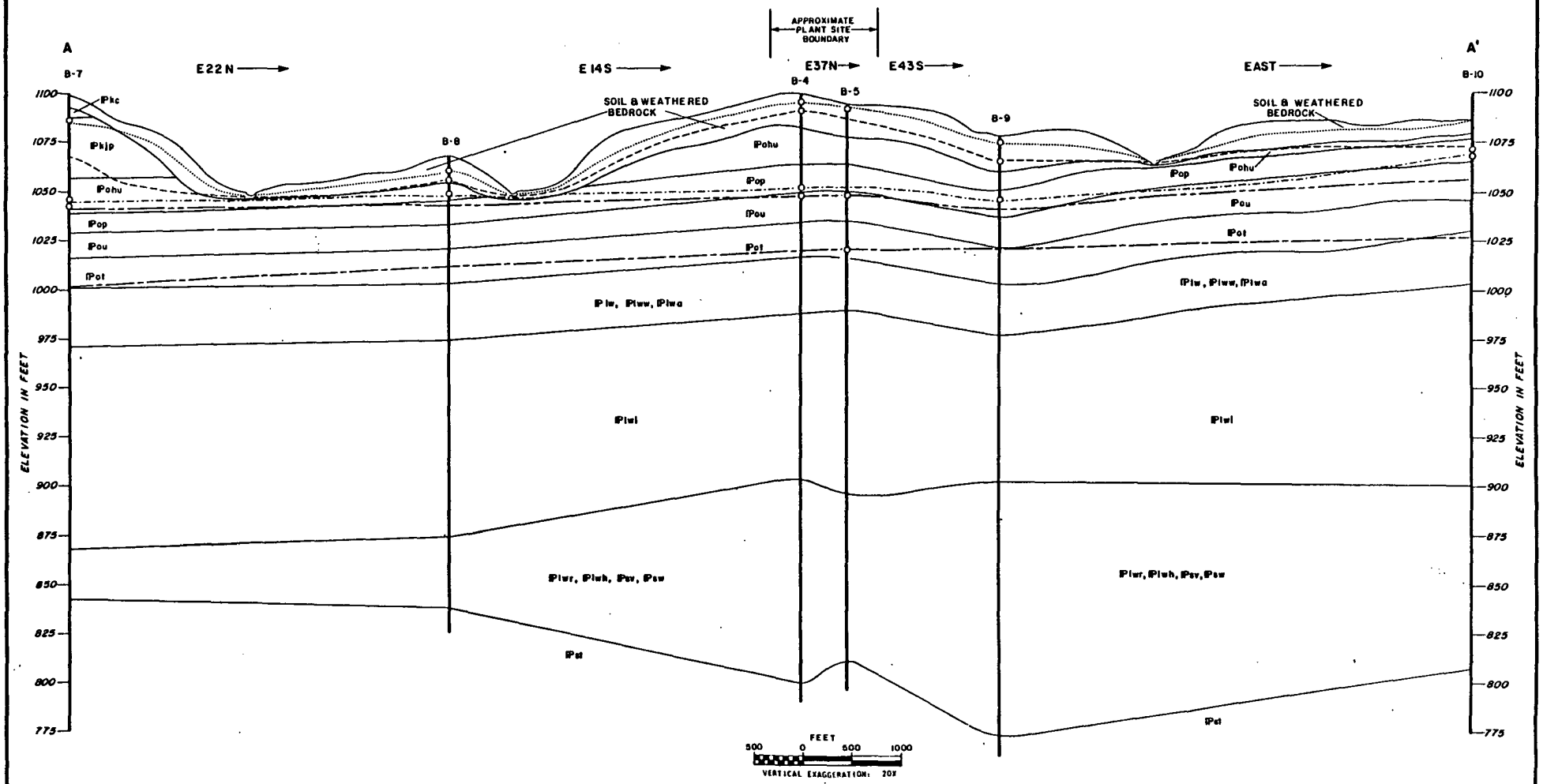
FIFTY-FOOT TOPOGRAPHIC CONTOURS FROM U.S. GEOLOGICAL SURVEY QUADRANGLES FOR NEW STRAWN (1971); OTTUMWA (1970), WAVERLY SE (1971), ALICEVILLE (1971), BURLINGTON (1971) AND JOHN REDMOND DAM (1966); 7.5 MINUTE SERIES.

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-50

Water Table Contour Map within 5 Miles of the Site



Rev. 0

NOTES:

1. FIGURE 2.4-54 SHOWS LOCATION OF CROSS-SECTION A-A'
2. FIGURE 2.5-41 SHOWS DETAILED SITE STRATIGRAPHIC COLUMN.
3. TABLE 2.4-32 LISTS PIEZOMETER WATER LEVEL READINGS.
4. ELEVATIONS REFER TO USGS DATUM.
5. THE CROSS-SECTION AND WATER LEVELS SHOWN REPRESENT OUR EVALUATION OF THE MOST PROBABLE CONDITIONS BASED UPON INTERPRETATION OF PRESENTLY AVAILABLE DATA AND REVIEW OF INFORMATION PRESENTED IN FIGURES 2.4-57, 2.4-58, 2.4-59, 2.5-14a, 2.5-14b, 2.5-22, AND 2.5-23. HOWEVER, SOME VARIATION OF SUBSURFACE CONDITIONS BETWEEN BOREHOLES MUST BE EXPECTED.

EXPLANATION:

- o — AVERAGE WATER LEVEL ELEVATION IN FEET (ALL AVERAGES FOR JUNE, 1974, EXCEPT B-7 AVERAGED FOR OCTOBER, 1973. B-7 NOT MONITORED AFTER OCTOBER, 1973.)
- ..... WATER TABLE
- - - - - - PLATTSMOUTH POTENTIOMETRIC SURFACE
- -·-·- TORONTO POTENTIOMETRIC SURFACE
- ——— IRELAND POTENTIOMETRIC SURFACE
- ——— TONGANOXIE POTENTIOMETRIC SURFACE

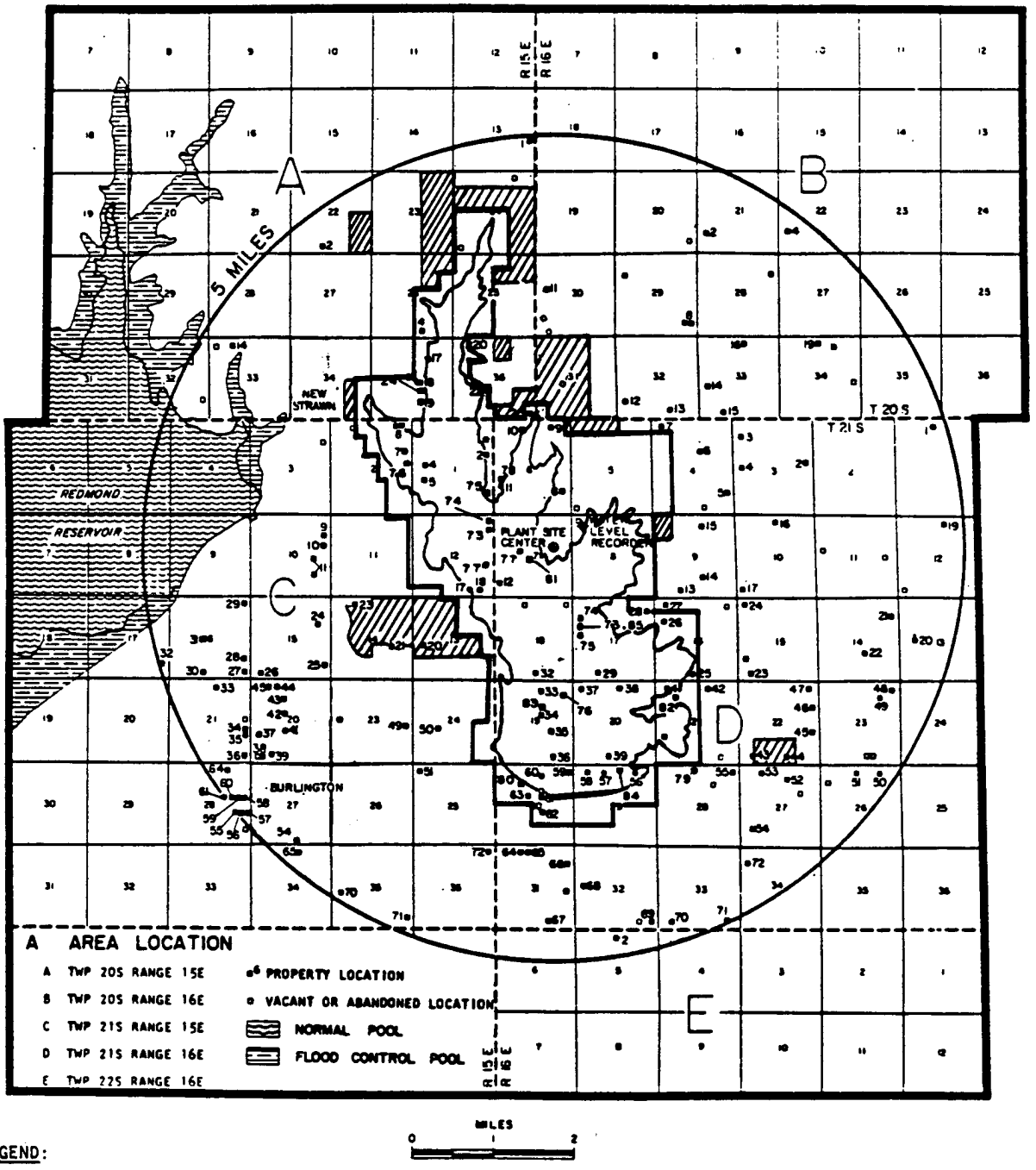
STRATIGRAPHIC COLUMN:

SYMBOL	STRATIGRAPHIC MEMBER	SYMBOL	STRATIGRAPHIC MEMBER
IPkc	CLAY CREEK LIMESTONE MEMBER	IPlww	WILLIAMSBURG COAL BED
IPkjp	JACKSON PARK SHALE MEMBER	IPlwa	AMAZONIA LIMESTONE MEMBER
IPohu	HEUMADER SHALE MEMBER	IPlwl	IRELAND SANDSTONE MEMBER
IPop	PLATTSMOUTH LIMESTONE MEMBER	IPlwr	ROBBINS SHALE MEMBER
IPou	UNDIFFERENTIATED HEEBNER SHALE LEAVENWORTH LIMESTONE AND SHYDERVILLE SHALE MEMBERS	IPlwh	HASKELL LIMESTONE MEMBER
		IPsv	VINLAND SHALE MEMBER
IPot	TORONTO LIMESTONE MEMBER	IPsw	WESTPHALIA LIMESTONE MEMBER
IPlw	UNNAMED LAWRENCE SHALE MEMBER	IPst	TONGANOXIE SANDSTONE MEMBER

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-51

Generalized East-West Cross-Section through Plant Site Showing Potentiometric Water Levels



LEGEND:

- SITE BOUNDARY
- COOLING LAKE AT NORMAL OPERATING LEVEL (1087 FEET)
- AREA OUTSIDE SITE BOUNDARY OWNED BY APPLICANTS

REFERENCE:

GENERAL HIGHWAY MAP OF COFFEY COUNTY, KANSAS; PREPARED BY THE KANSAS STATE HIGHWAY DEPARTMENT.

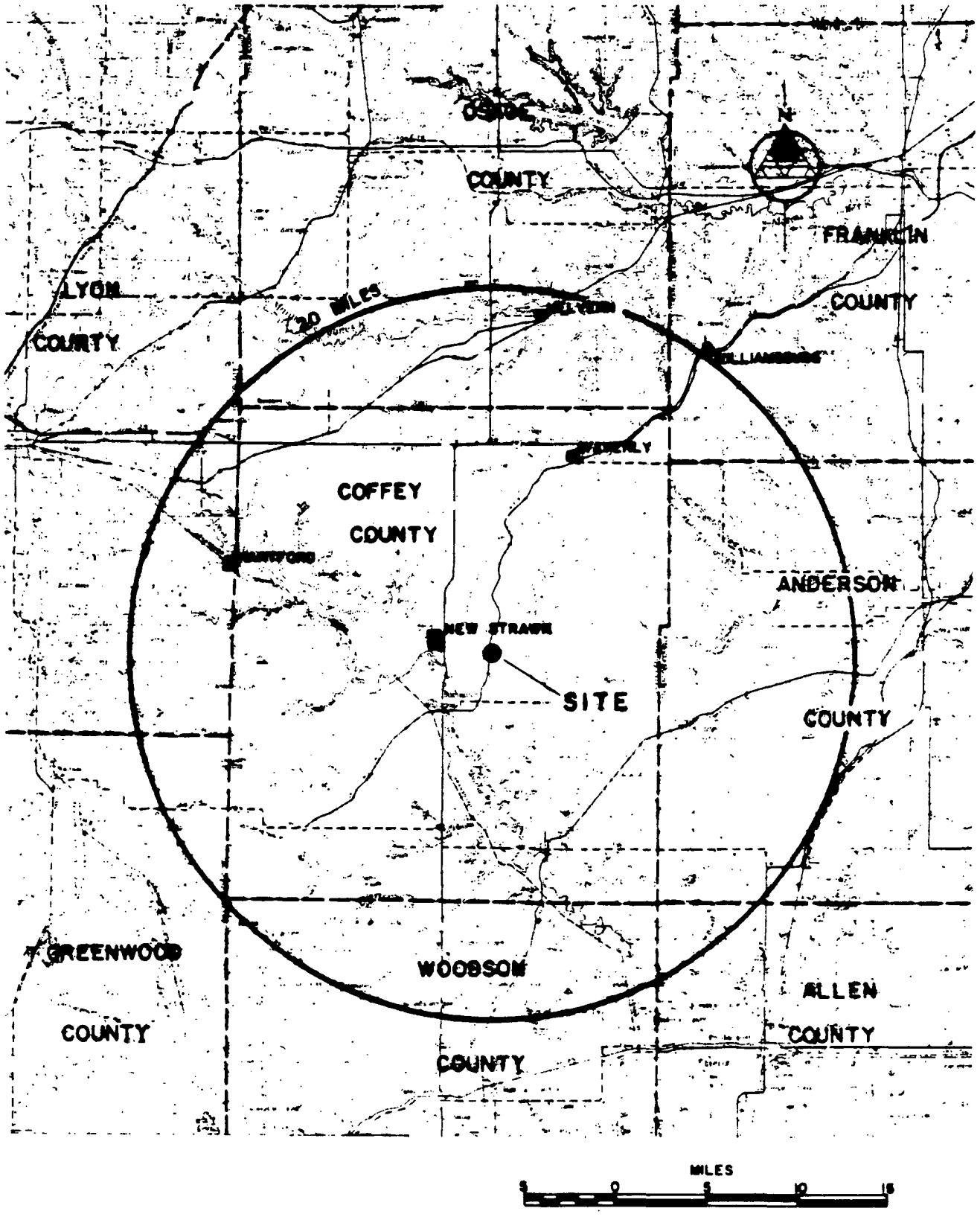
FIGURES 2.1-3, 2.4-52, 2.5-2 (FSAR).

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-52

Well Inventory within 5 Miles Relative to Cooling Lake and Property Boundary



REFERENCE:

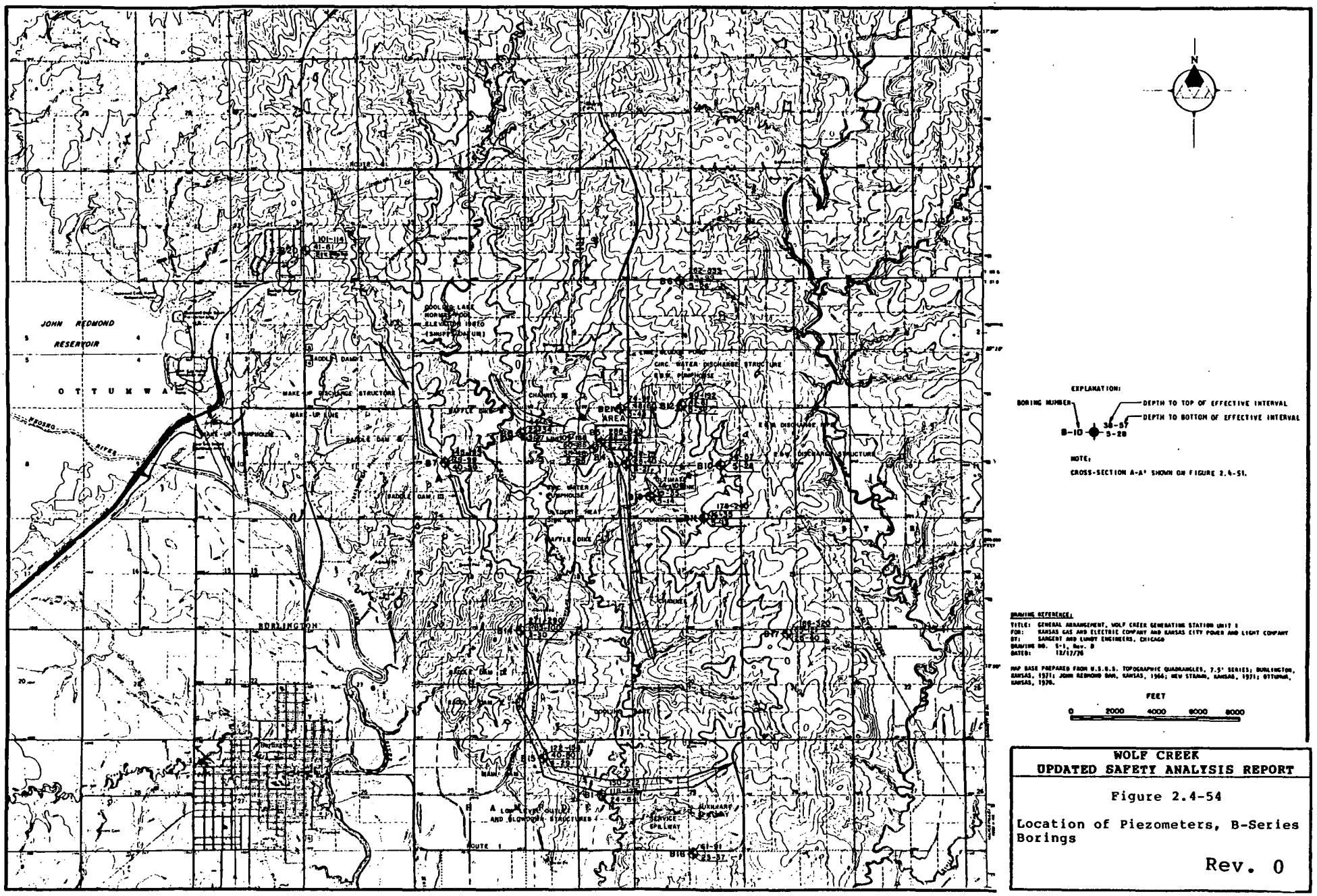
BASED ON U.S.G.S. TOPOGRAPHIC QUADRANGLES;
HUTCHINSON, KANSAS - 1955
JOPLIN, MISSOURI; KANSAS - 1954
LAWRENCE, KANSAS; MISSOURI - 1956
WICHITA, KANSAS - 1955

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-53

Municipal Ground-Water Supplies within 20 Miles of the Site

Rev. 0

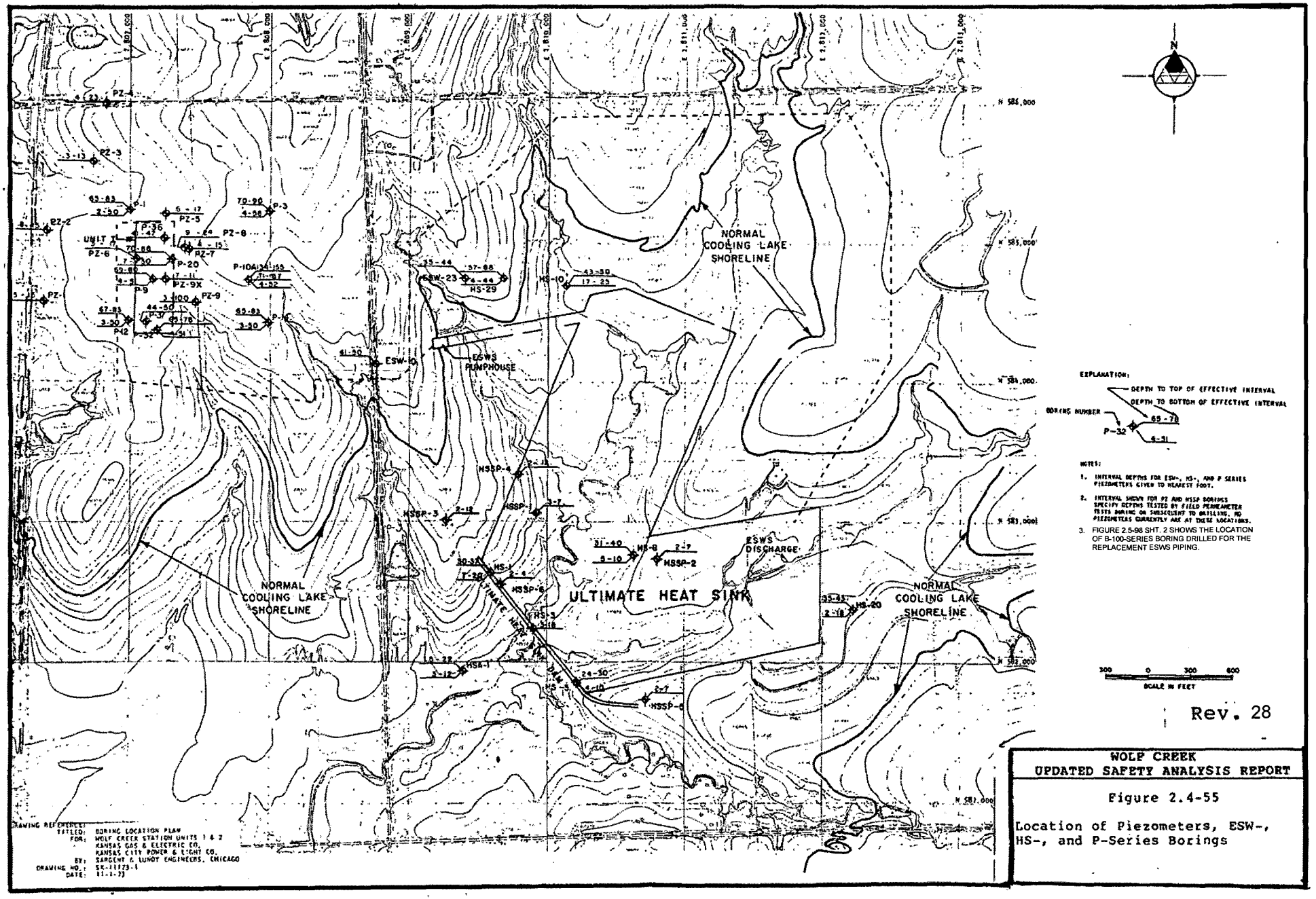


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-54

Location of Piezometers, B-Series Borings

Rev. 0

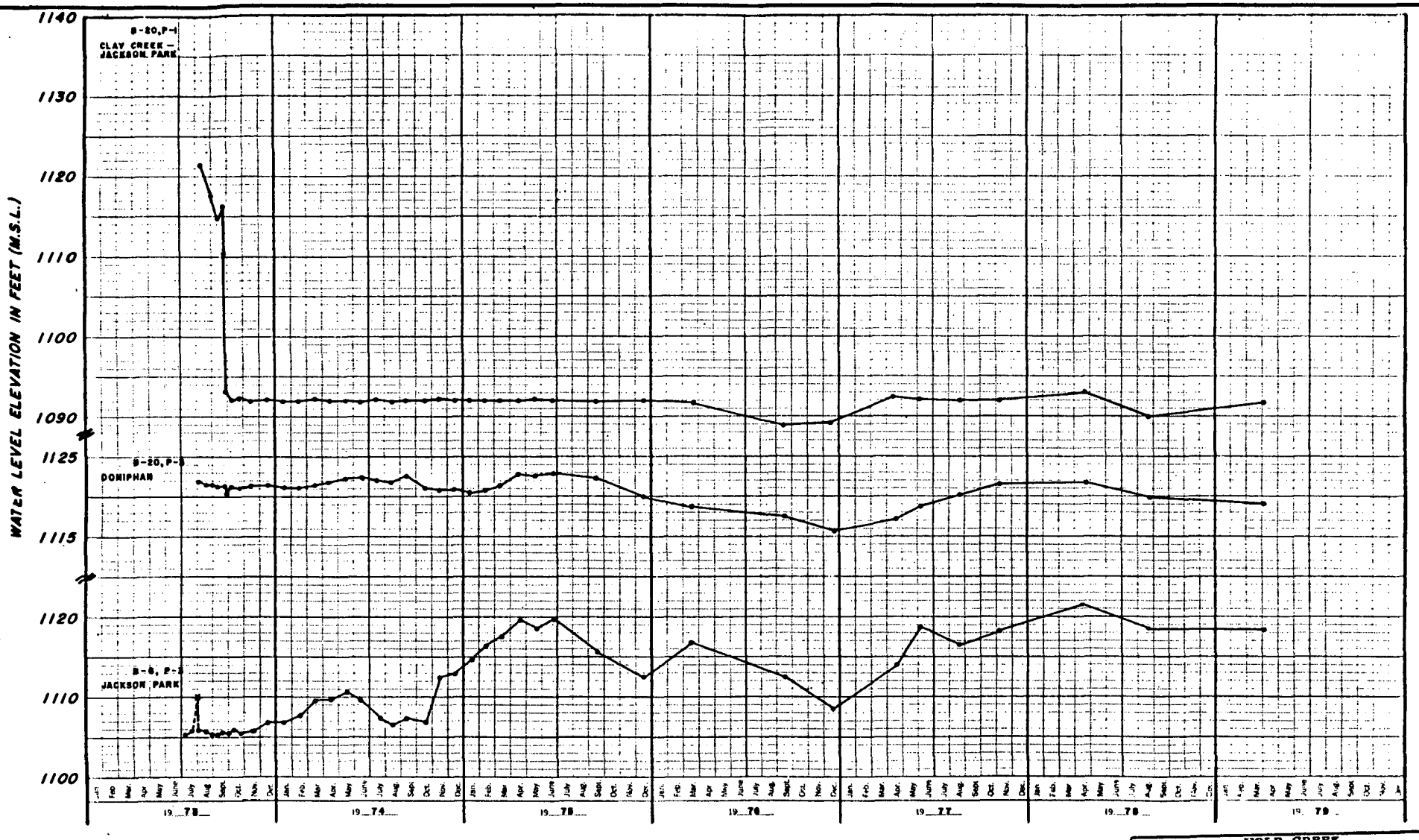


Rev. 28

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-55

Location of Piezometers, ESW-, HS-, and P-Series Borings



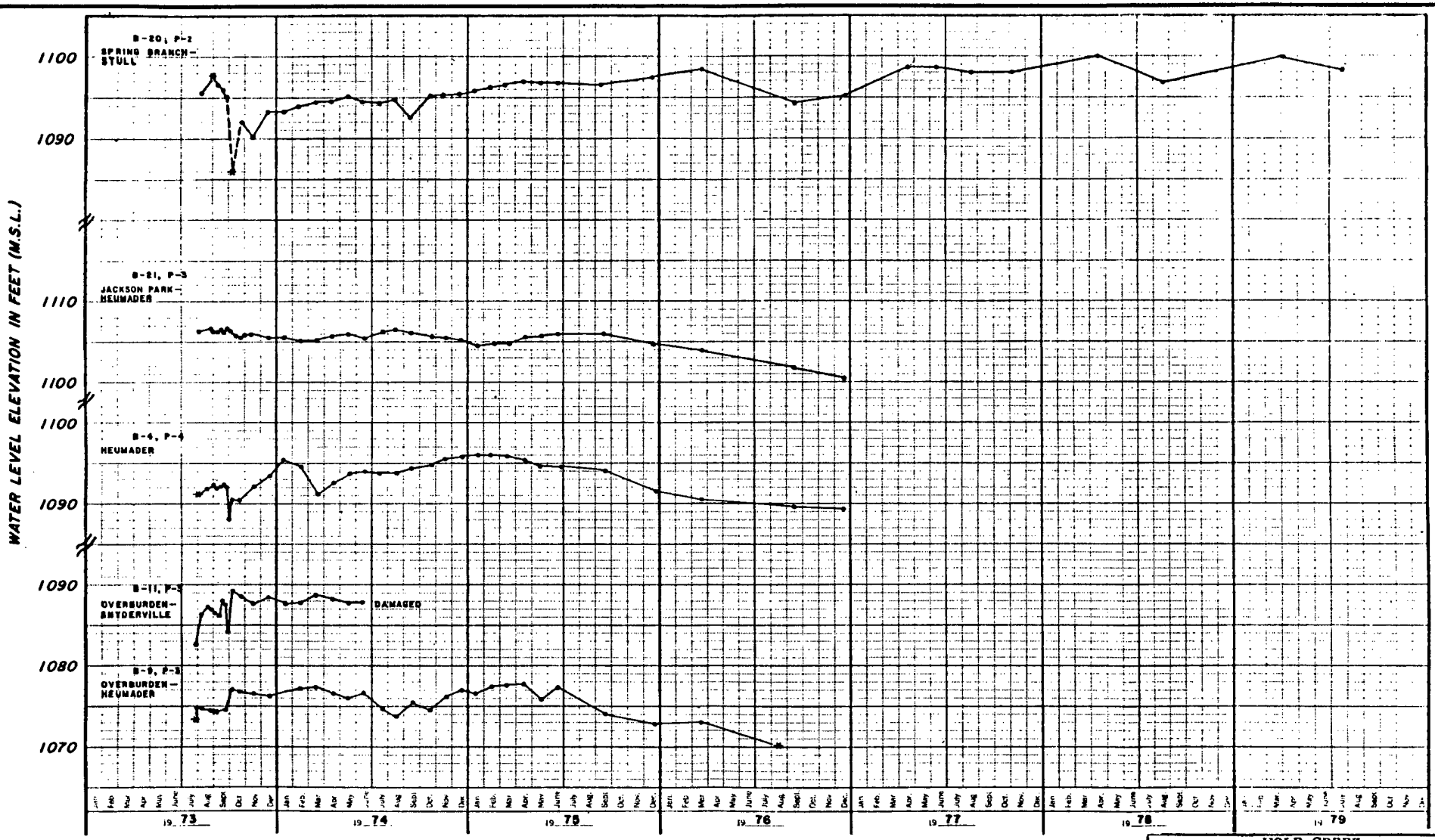
* THIS PORTION OF HYDROGRAPH NOT SHOWN.
SEE TABLES 2.4-32 AND 2.4-33.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-56 (Sheet 1 of 18)

Variations of Water Levels in Piezometers

Rev. 0

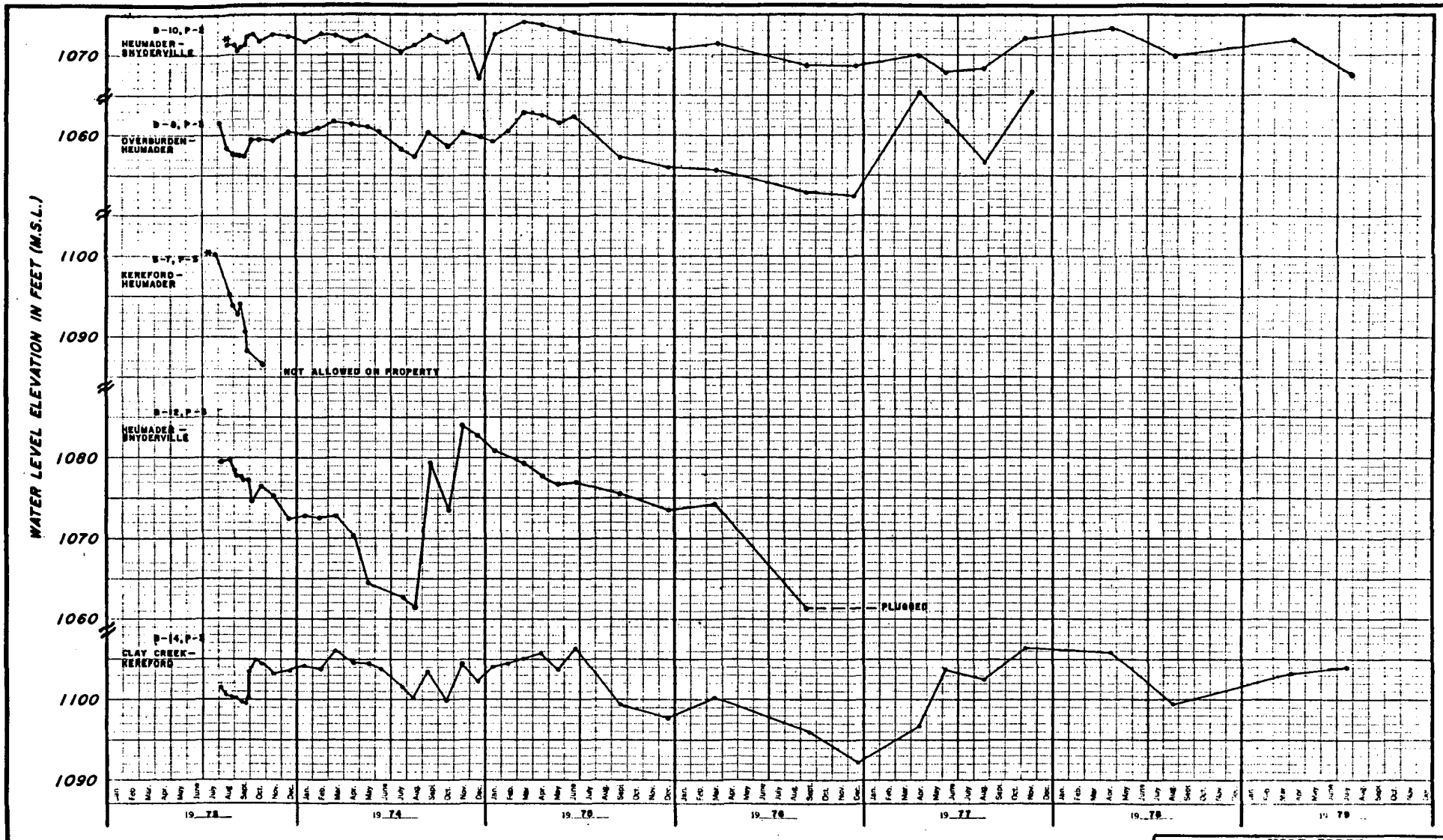


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-56 (Sheet 2 of 18)

Variations of Water Levels in Piezometers

Rev. 0

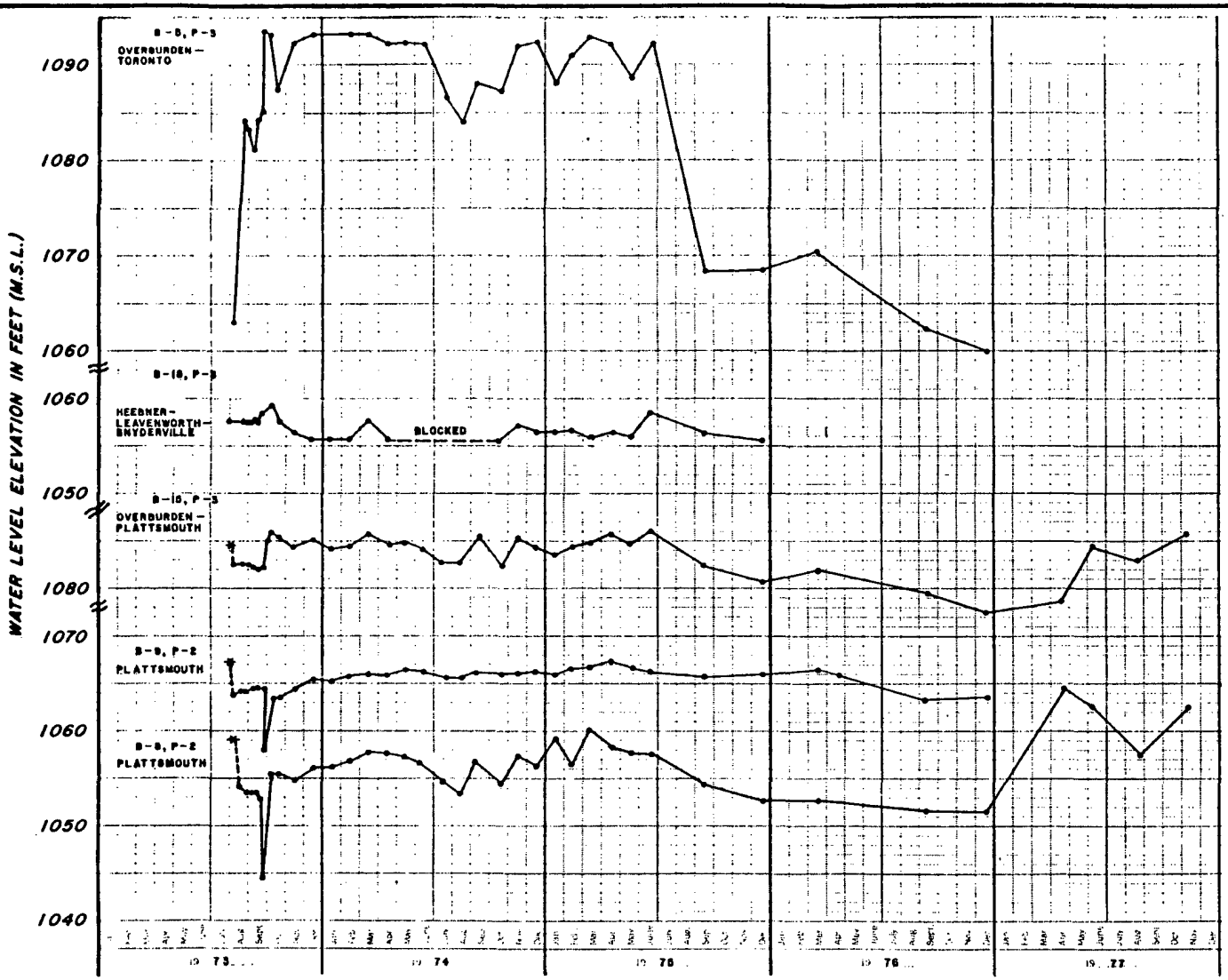


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-56 (Sheet 3 of 18)

Variations of Water Levels in Piezometers

Rev. 0

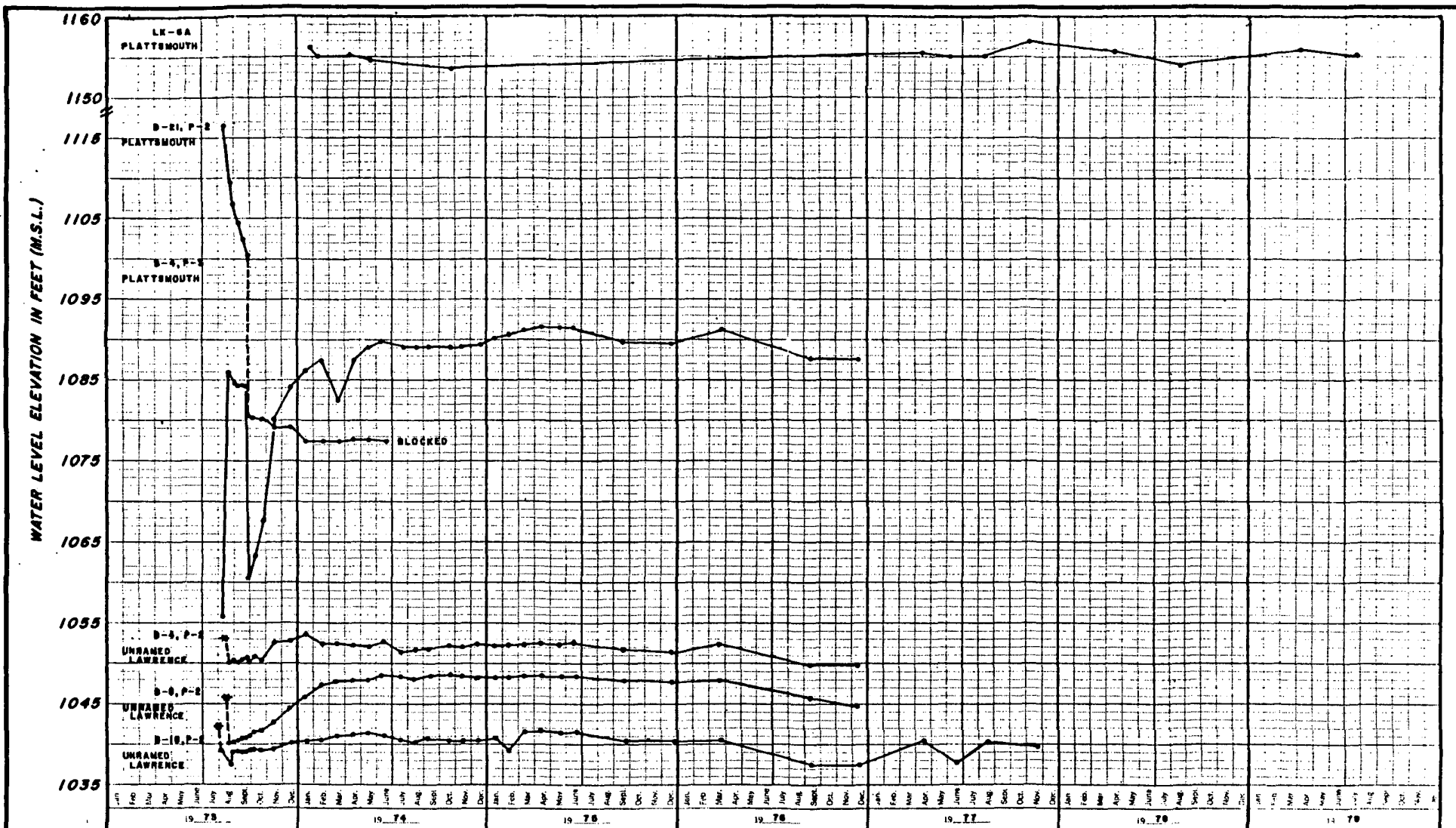


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-56 (Sheet 4 of 18)

Variations of Water Levels in Piezometers

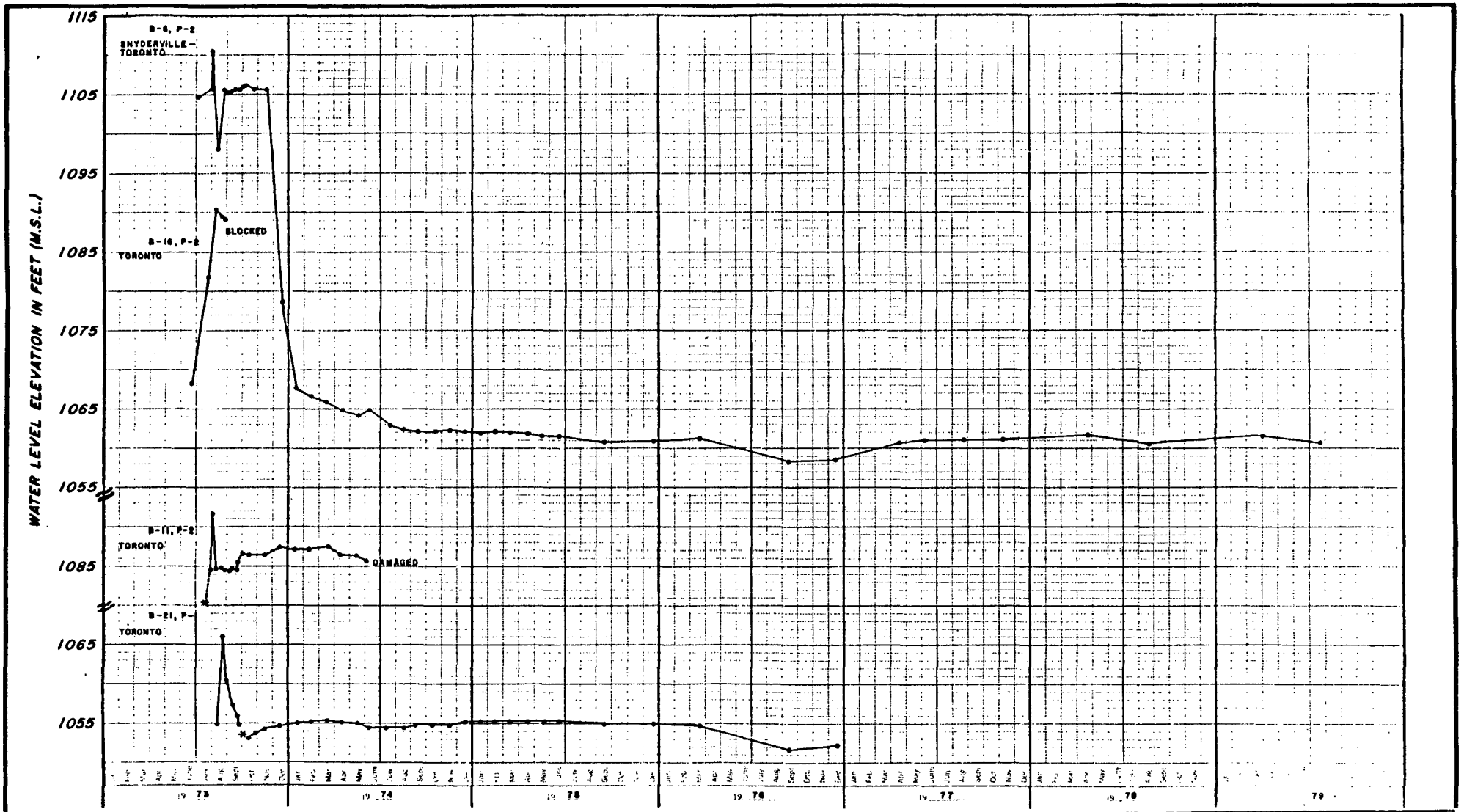


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-56 (Sheet 5 of 18)

Variations of Water Levels in Piezometers

Rev. 0

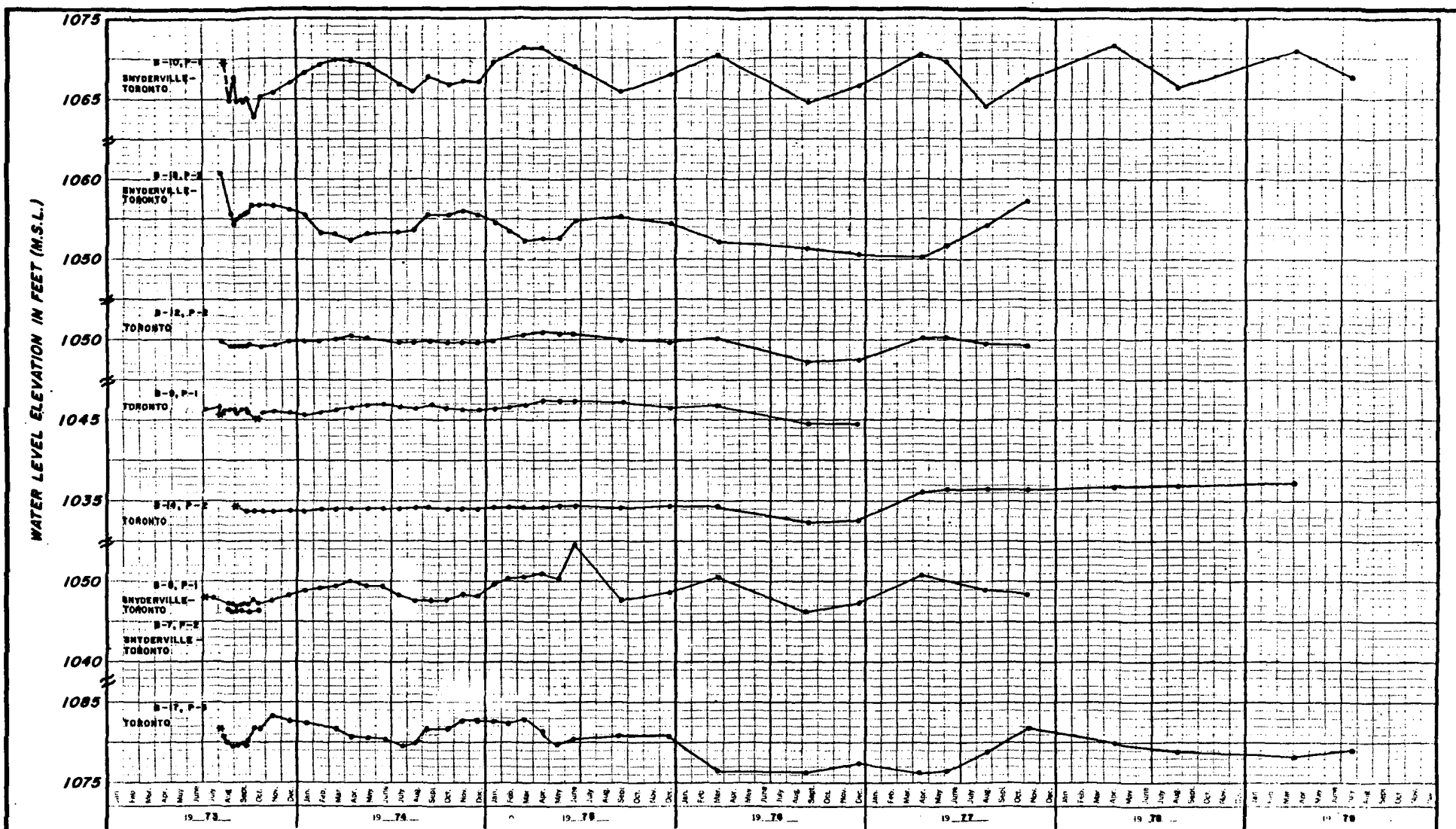


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-56 (Sheet 6 of 18)

Variations of Water Levels in Piezometers

Rev. 0

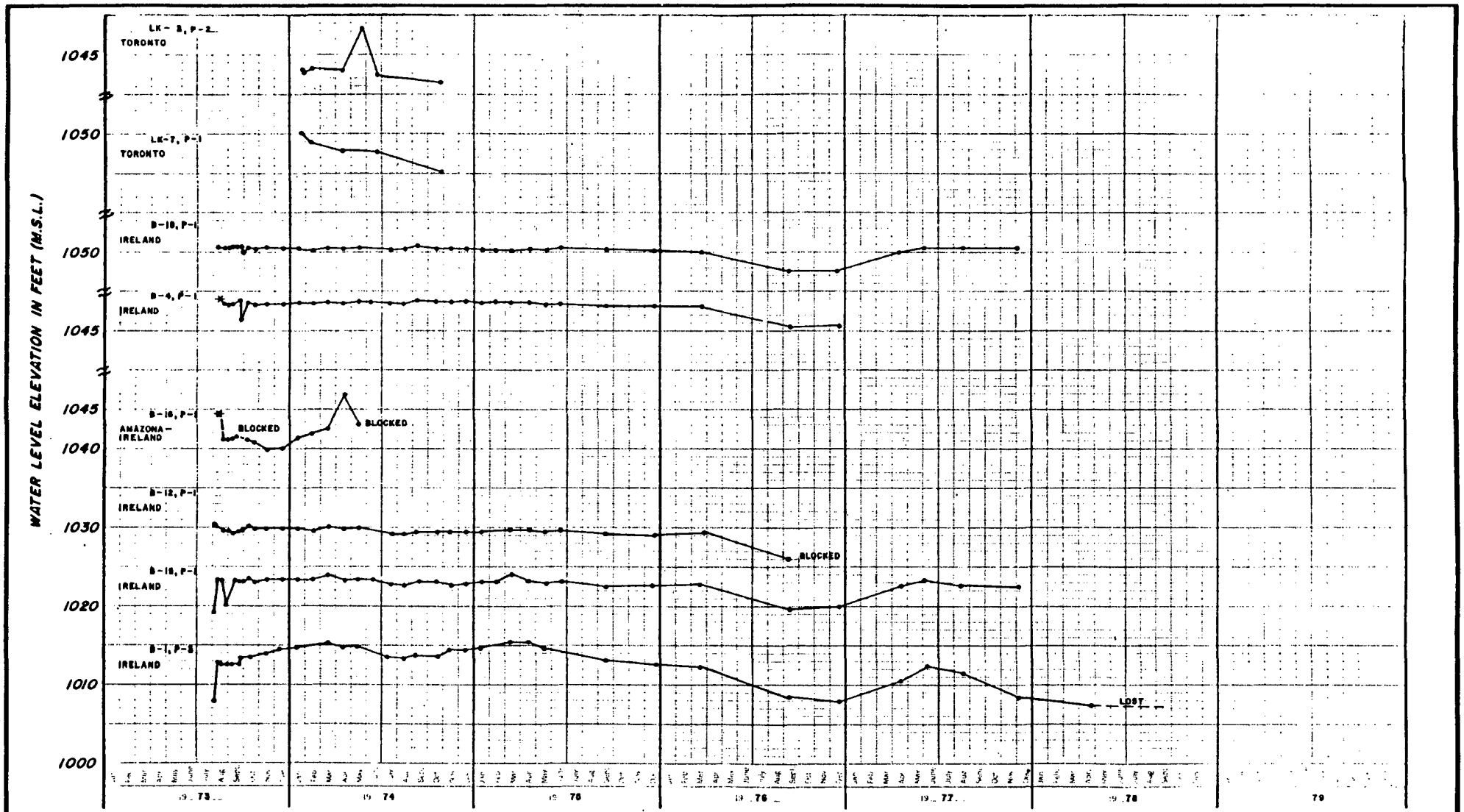


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-56 (Sheet 7 of 18)

Variations of Water Levels in Piezometers

Rev. 0

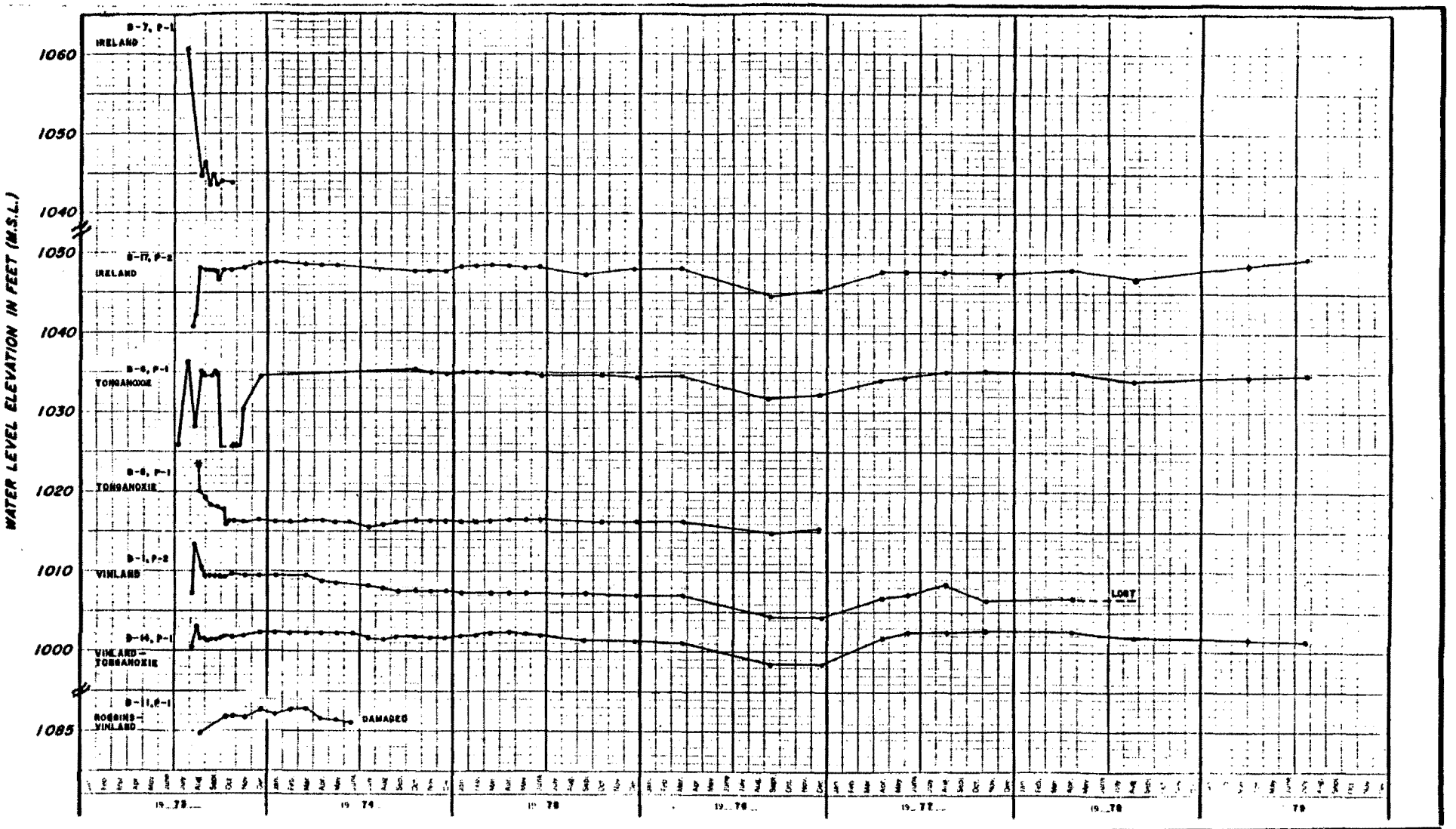


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-56 (Sheet 8 of 18)

Variations of Water Levels in Piezometers

Rev. 0

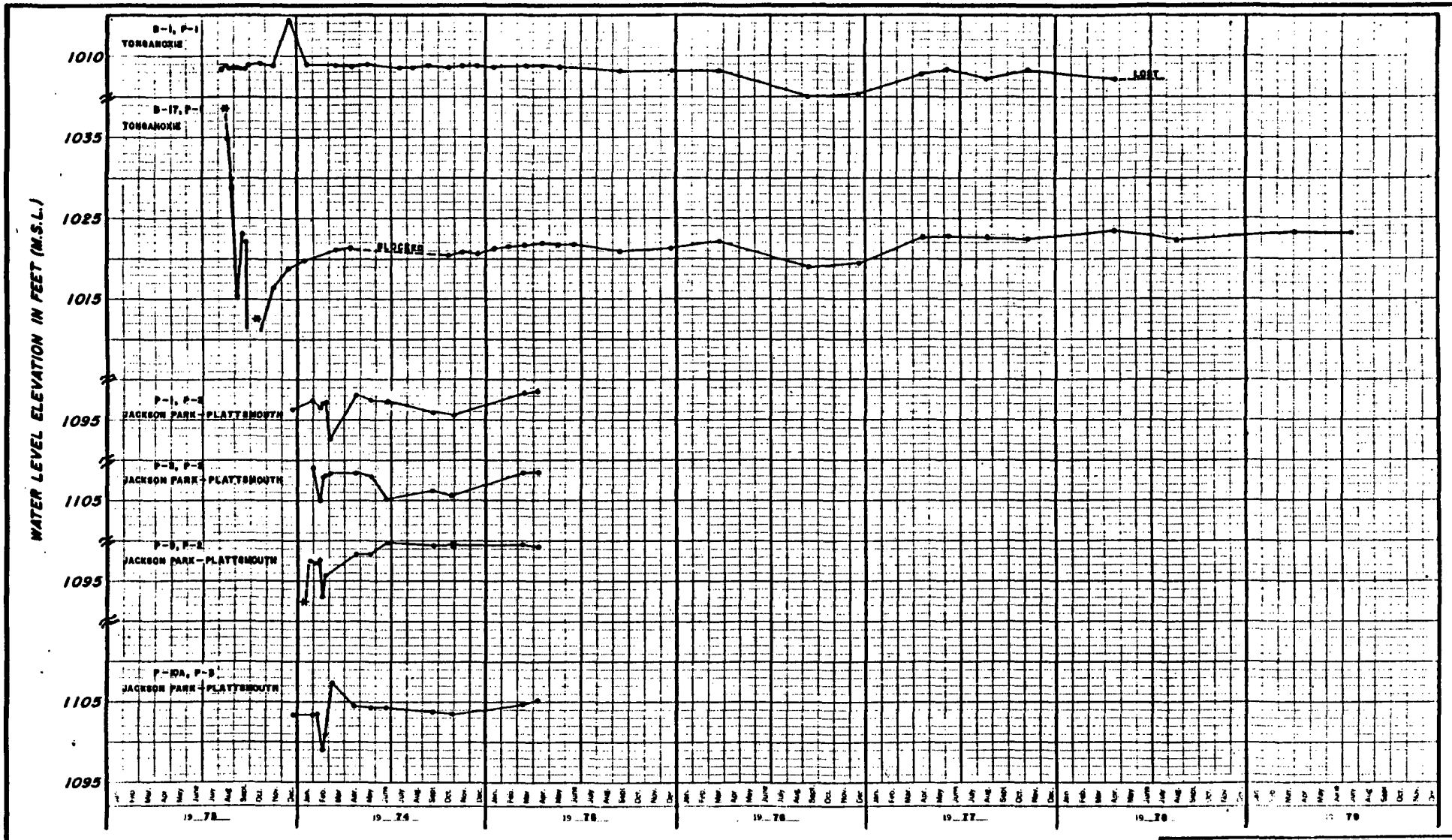


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-56 (Sheet 9 of 18)

Variations of Water Levels in Piezometers

Rev. 0

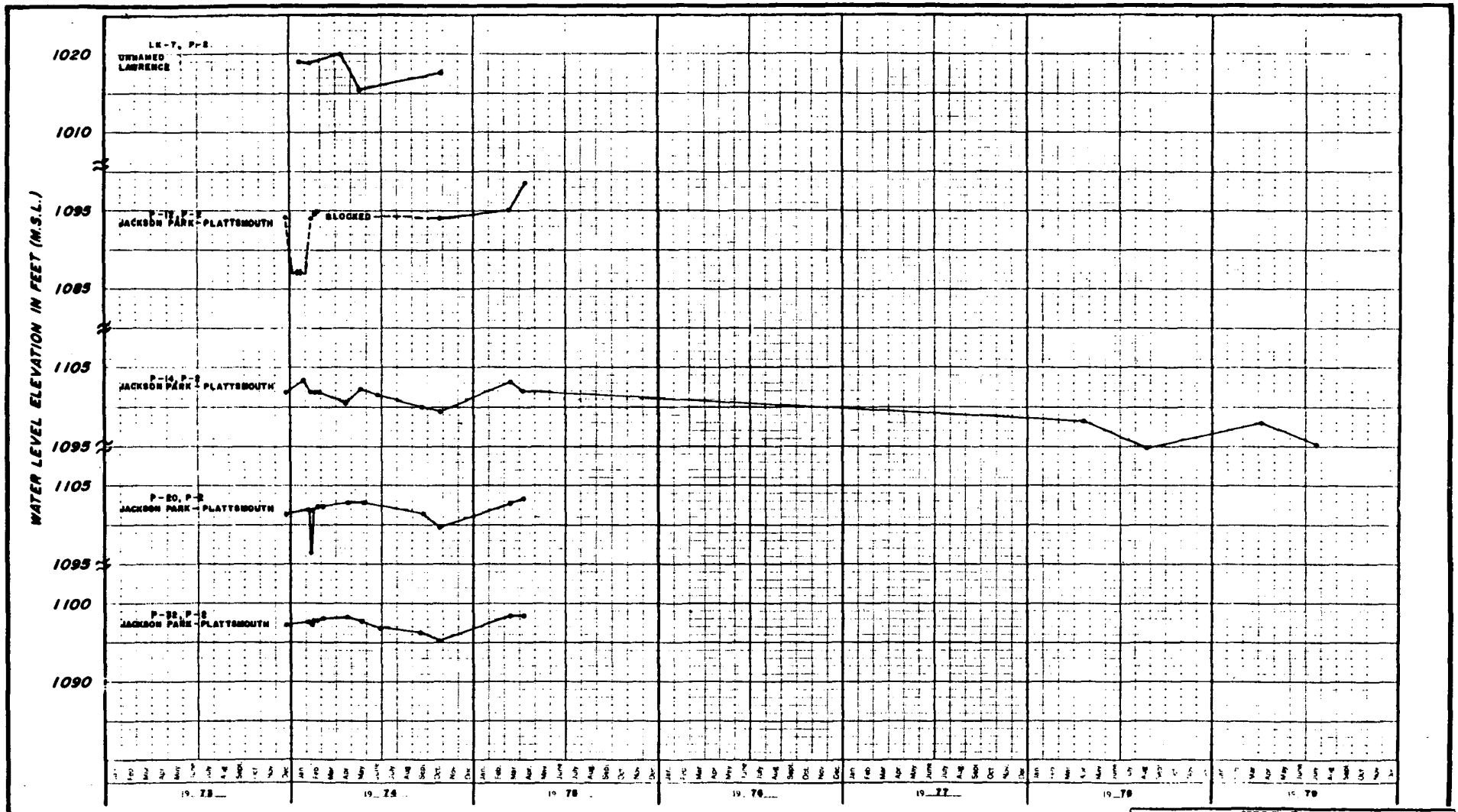


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-56 (Sheet 10 of 18)

Variations of Water Levels in Piezometers

Rev. 0

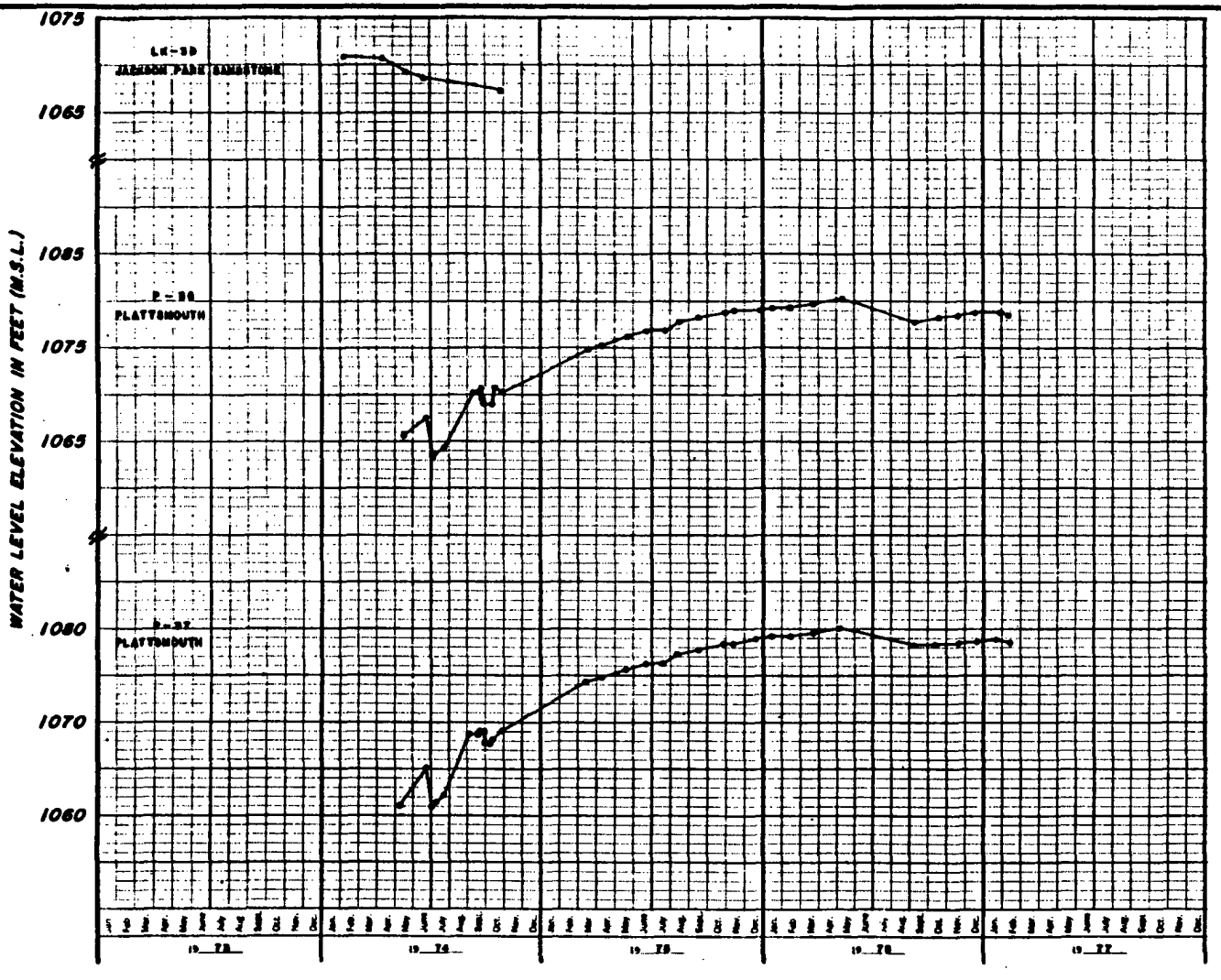


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-56 (Sheet 11 of 18)

Variations of Water Levels in Piezometers

Rev. 0

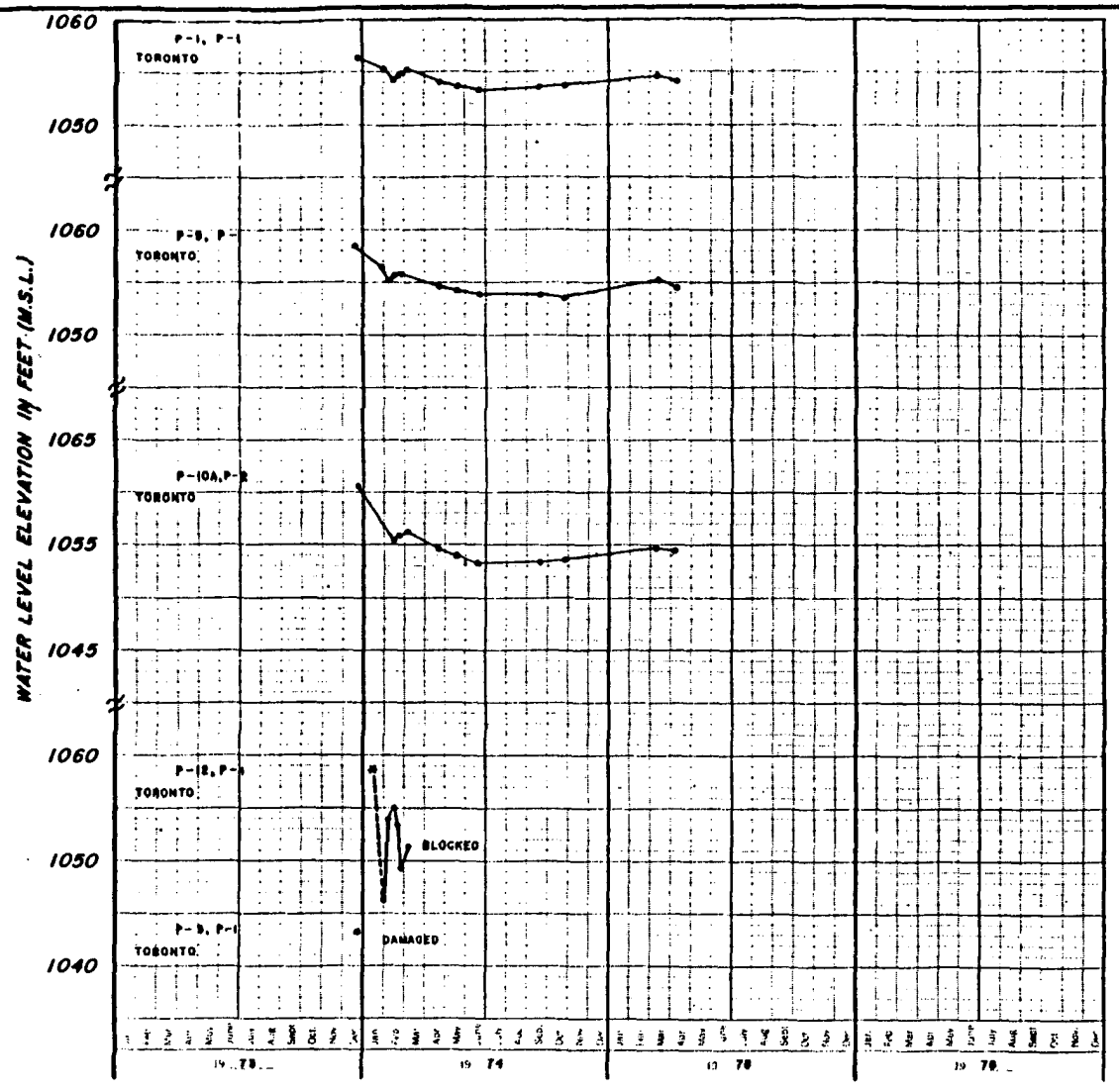


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-56 (Sheet 12 of 18)

Variations of Water Levels in Piezometers

Rev. 0

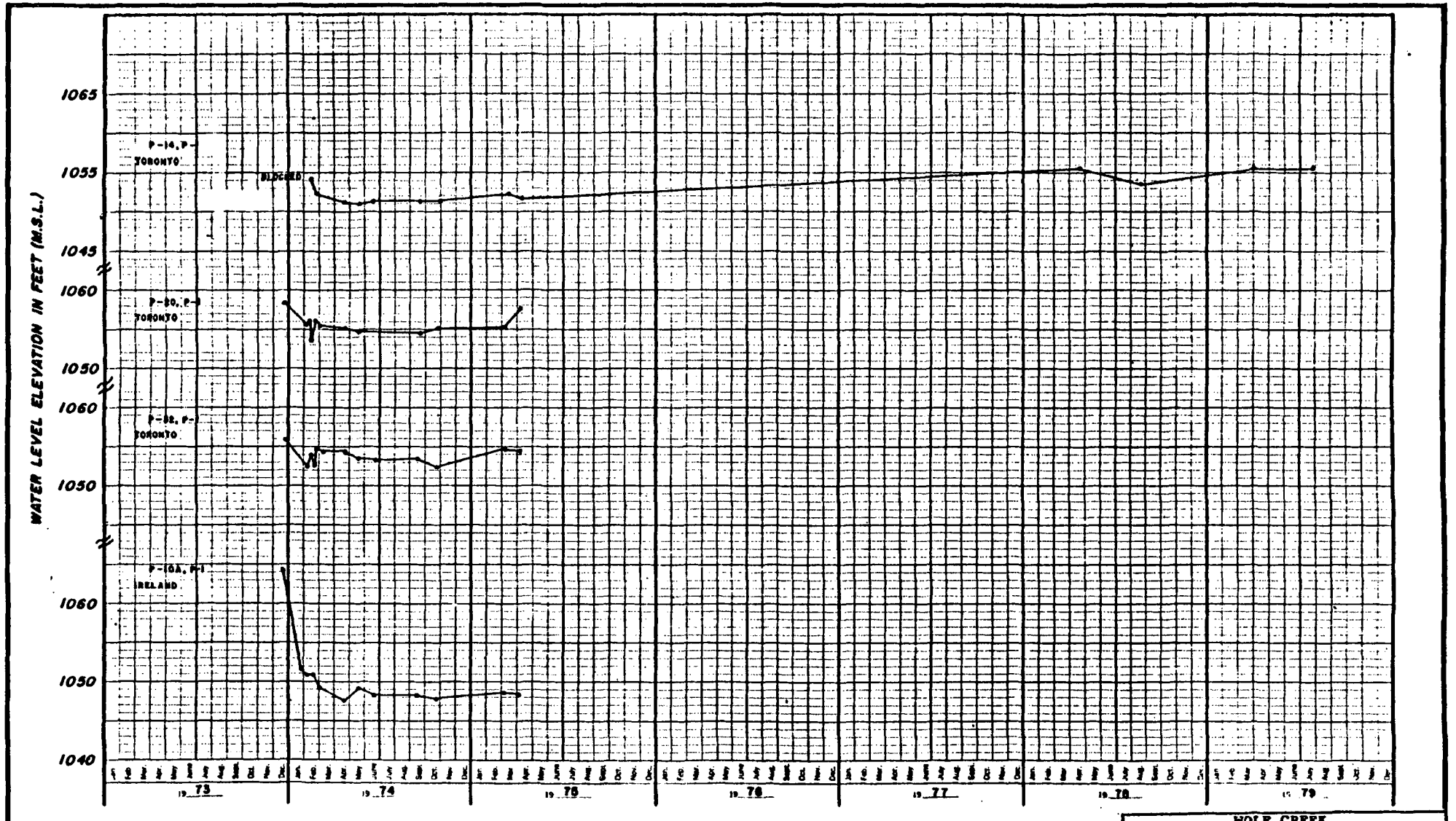


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-56 (Sheet 13 of 18)

Variations of Water Levels in Piezometers

Rev. 0

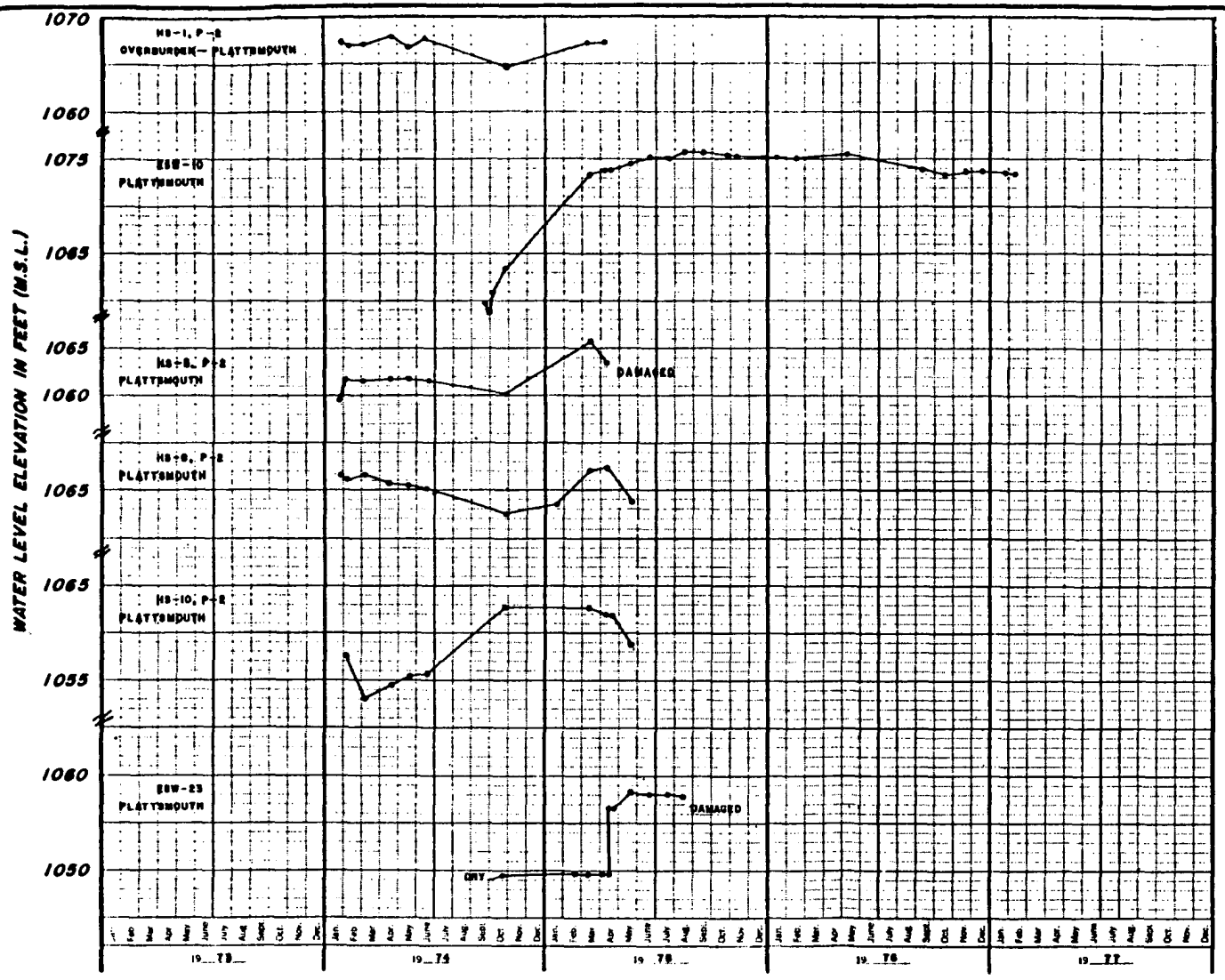


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-56 (Sheet 14 of 18)

Variations of Water Levels in Piezometers

Rev. 0

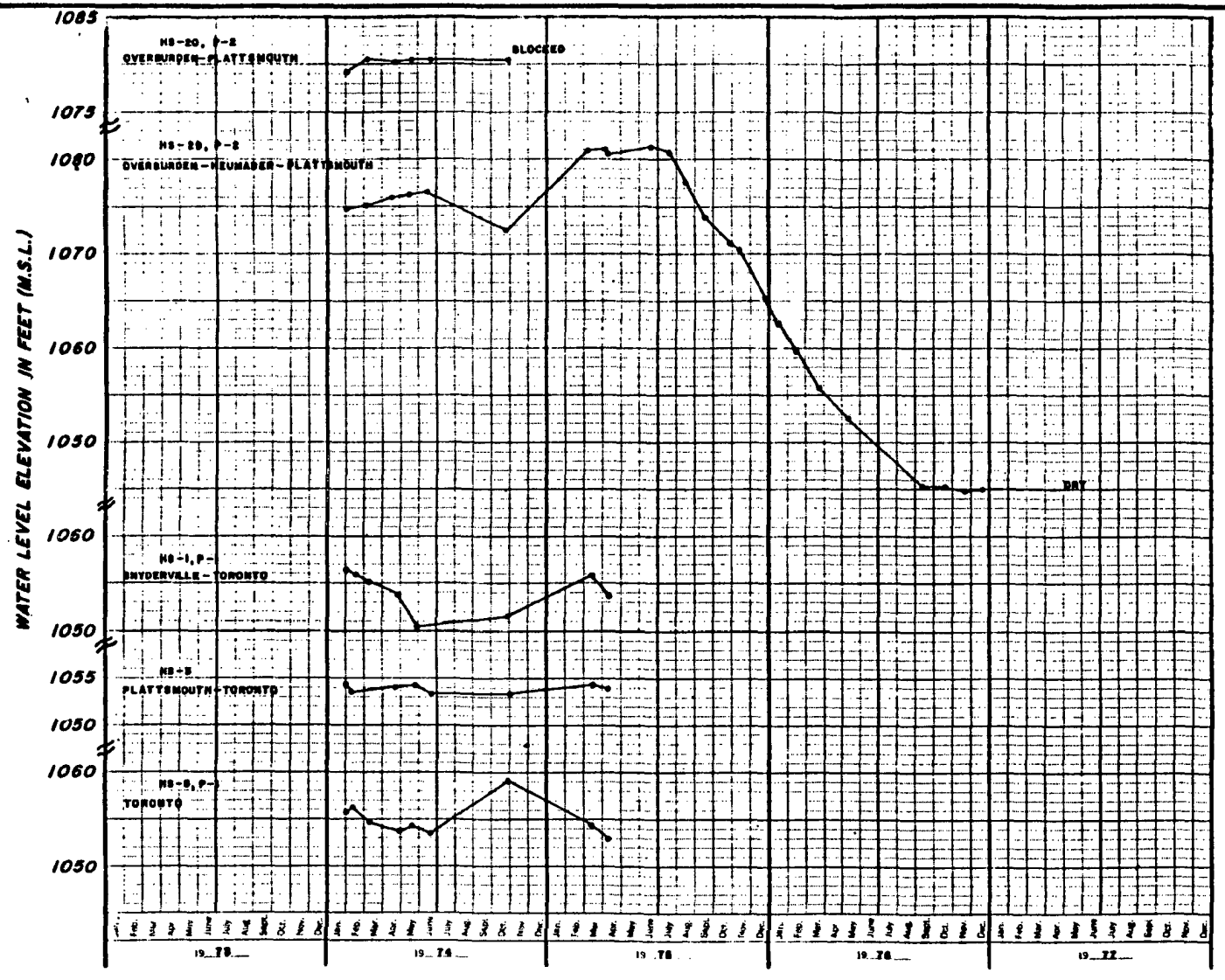


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-56 (Sheet 15 of 18)

Variations of Water Levels in Piezometers

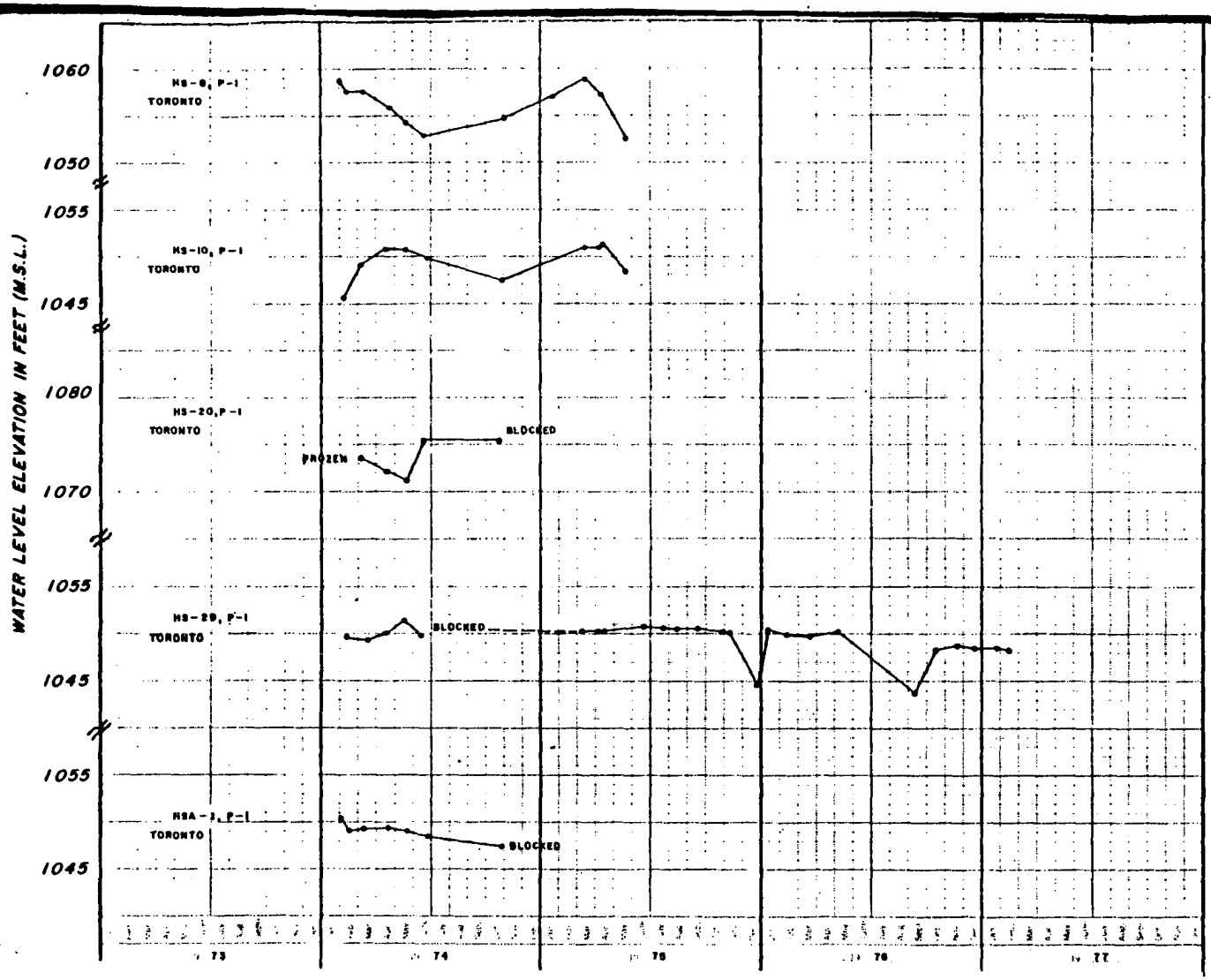


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-56 (Sheet 16 of 18)

Variations of Water Levels in Piezometers

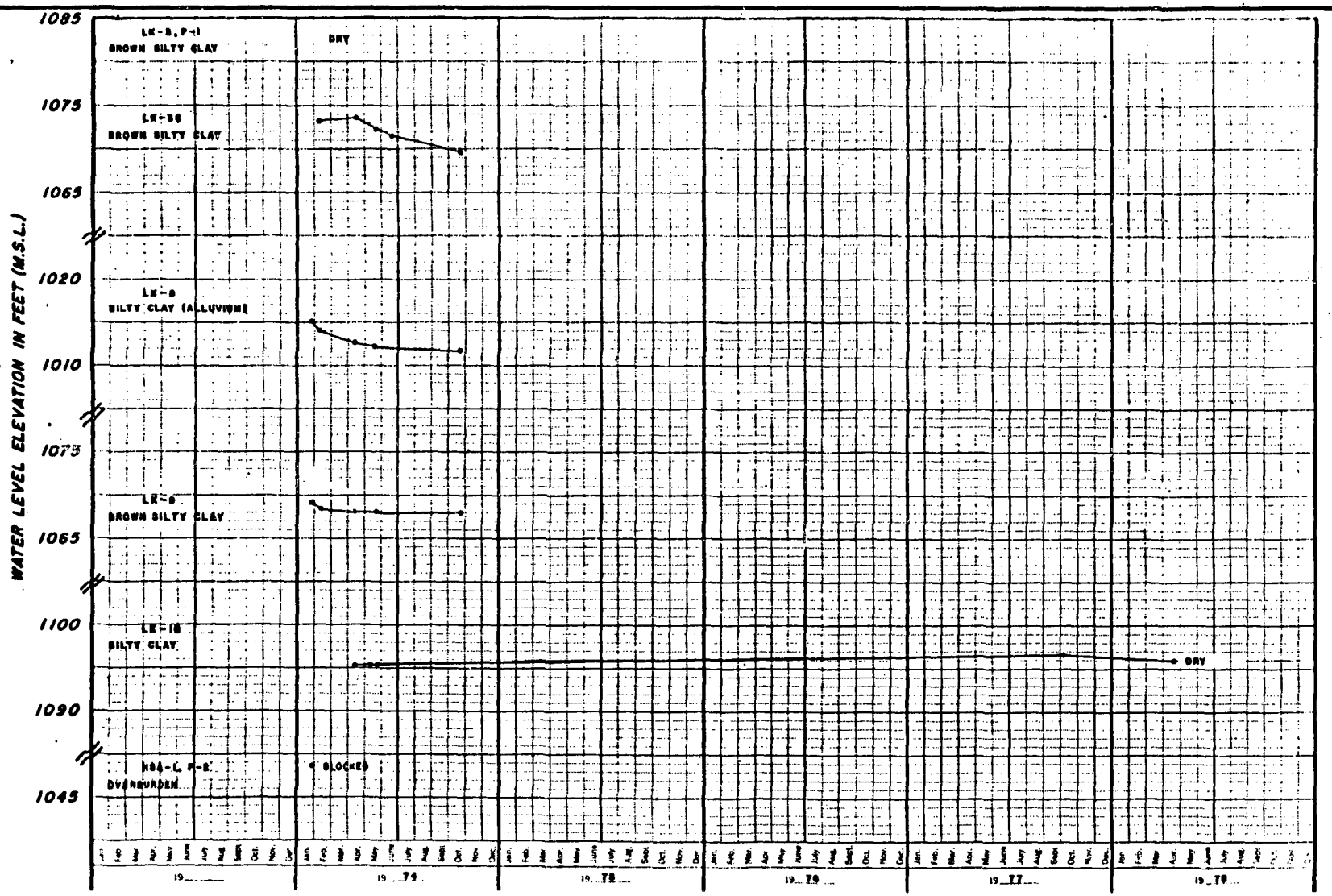


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-56 (Sheet 17 of 18)

Variations of Water Levels in Piezometers

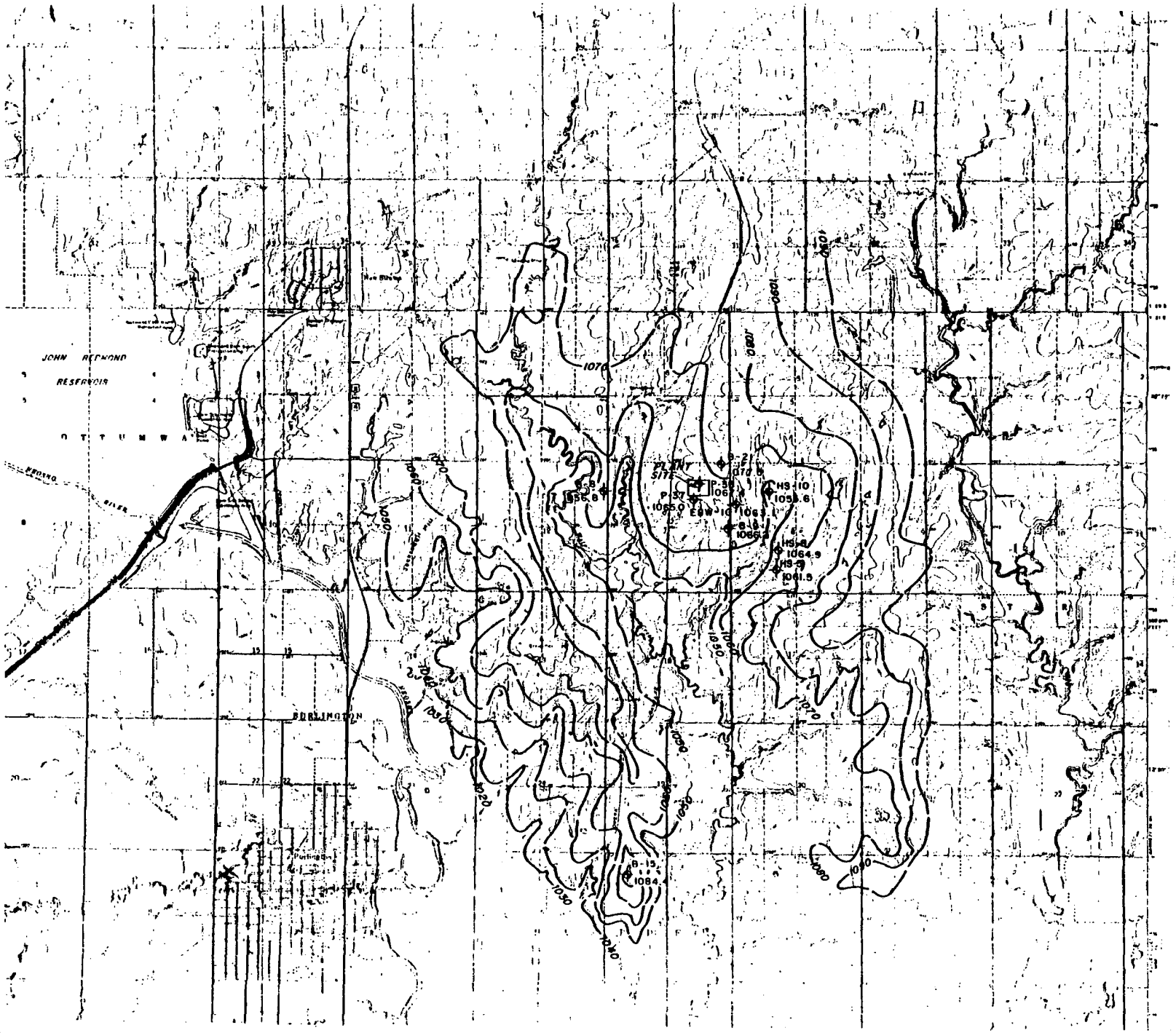


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-56 (Sheet 18 of 18)

Variations of Water Levels in Piezometers



LEGEND:

B-8 PIEZOMETER NUMBER AND LOCATION

1056.0 AVERAGE WATER LEVEL ELEVATION IN FEET (ALL AVERAGES FOR JUNE, 1974 EXCEPT ESW-10 INSTALLED SEPTEMBER, 1974, ESW-10 READINGS AVERAGED FOR OCTOBER, 1974.)

1080 POTENTIOMETRIC CONTOURS

1080 INTERPOLATED POTENTIOMETRIC CONTOURS

ELEVATIONS REFER TO USGS DATUM

DRAWING REFERENCE:
TITLE: GENERAL ARRANGEMENT, WOLF CREEK GENERATING STATION UNIT 1
FOR: KANSAS GAS AND ELECTRIC COMPANY AND KANSAS CITY POWER AND LIGHT COMPANY
BY: SARGENT AND LUNDY ENGINEERS, CHICAGO
DRAWING NO. G-1; Rev. 8
DATED: 12/17/76

MAP BASE PREPARED FROM U.S.G.S. TOPOGRAPHIC QUADRANGLES, 7.5' SERIES; BURLINGTON, KANSAS, 1971; JOHN REDMOND DAM, KANSAS, 1966; NEW STRAWN, KANSAS, 1971; OTTUMWA, KANSAS, 1970.

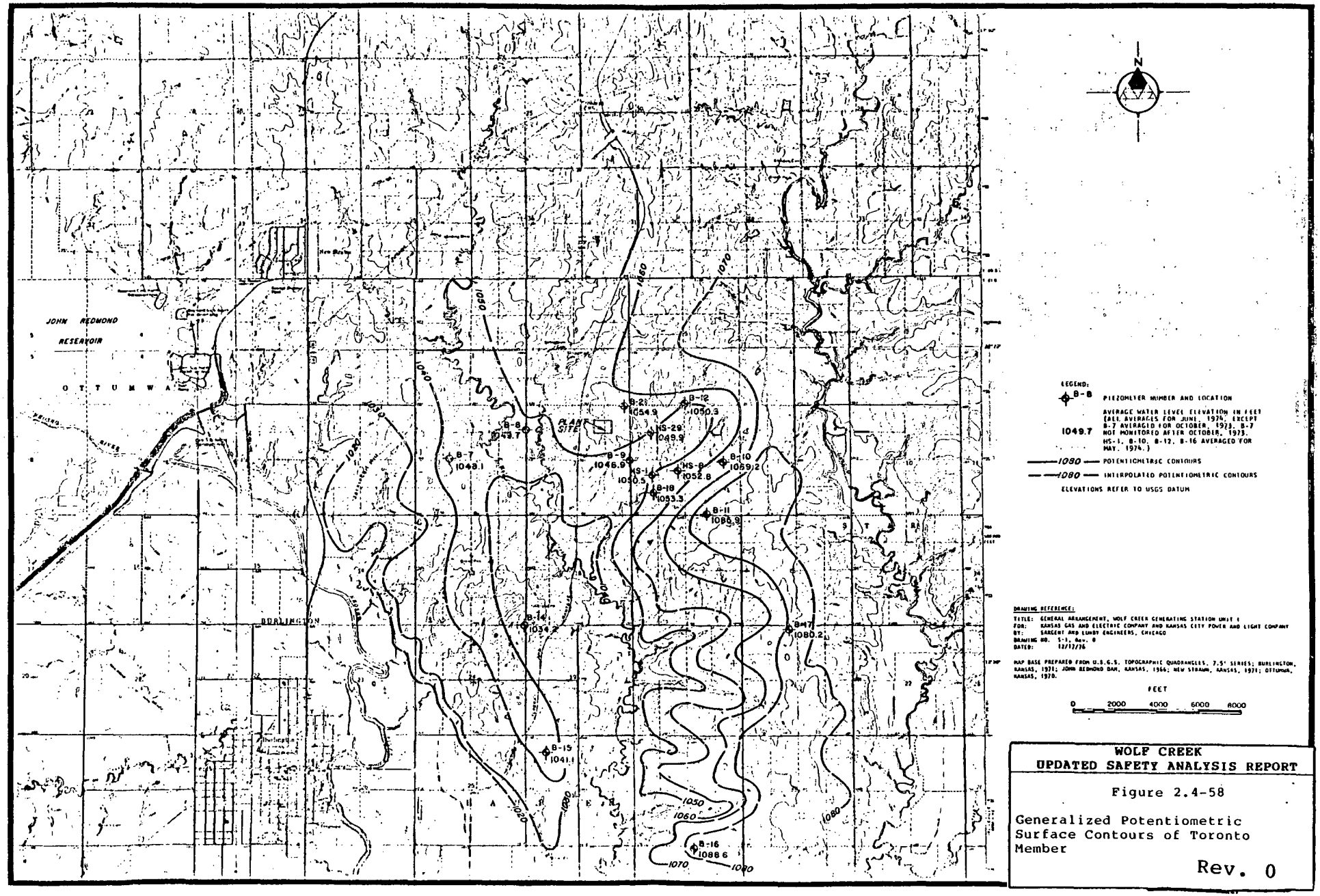
FEET
0 2000 4000 6000 8000

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-57

Generalized Potentiometric Surface Contours of Plattsmouth Member

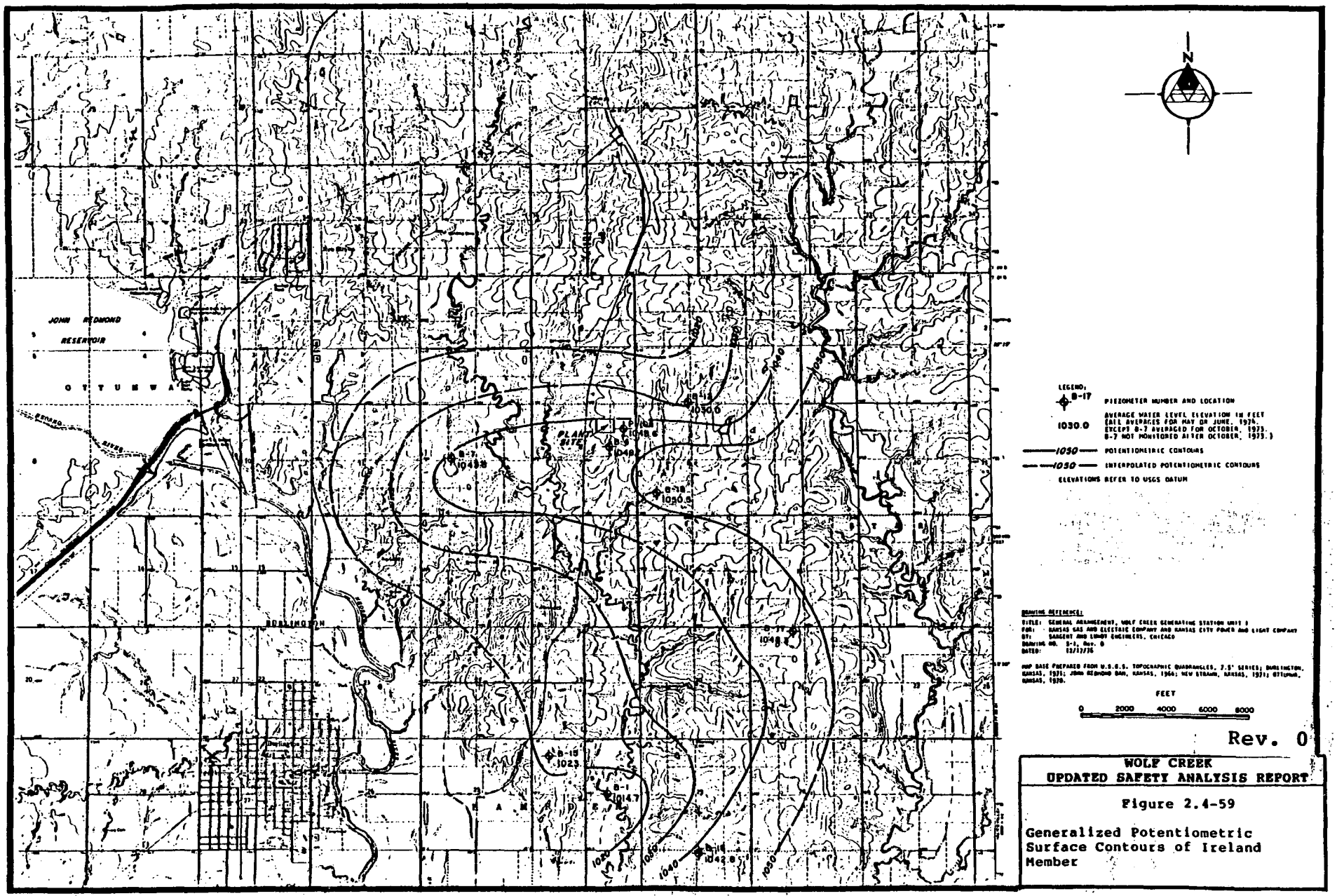


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-58

Generalized Potentiometric Surface Contours of Toronto Member

Rev. 0

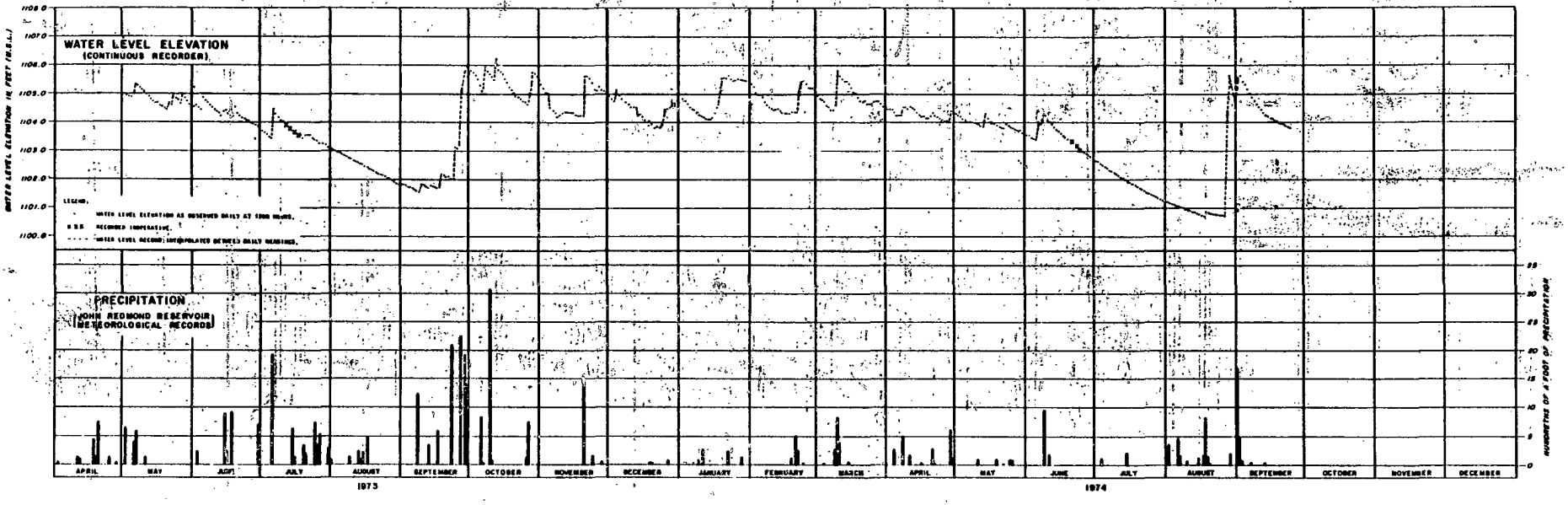


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-59

Generalized Potentiometric Surface Contours of Ireland Member

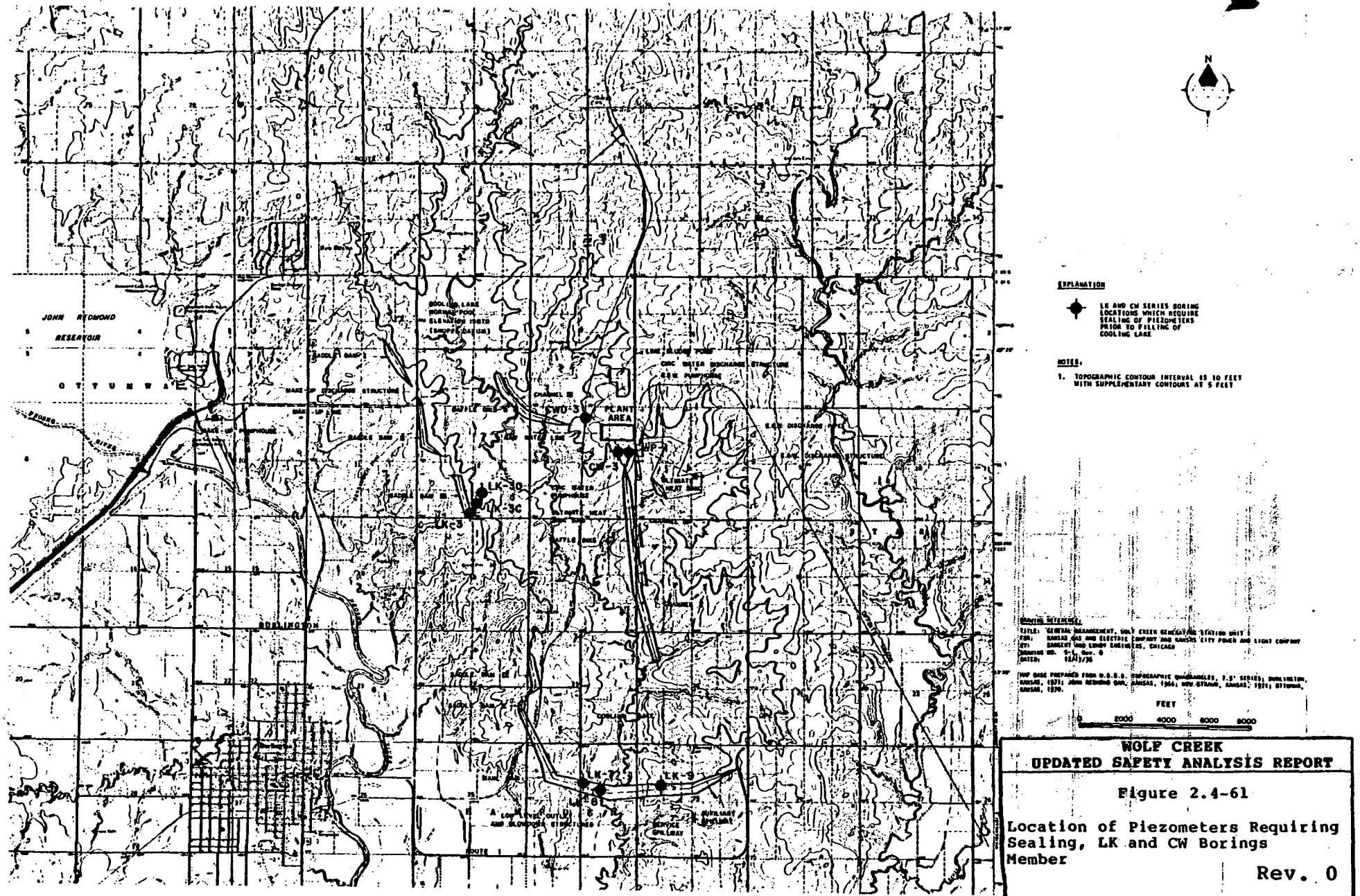


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-60

Water Level Recorder Chart and Precipitation Record at Site



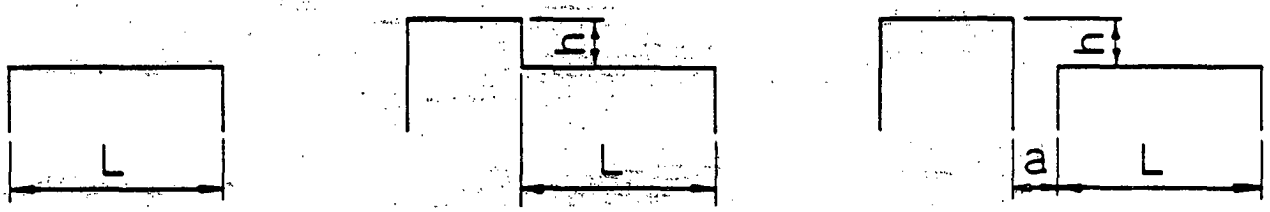
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-61

Location of Piezometers Requiring Sealing, LK and CW Borings Member

Rev. 0

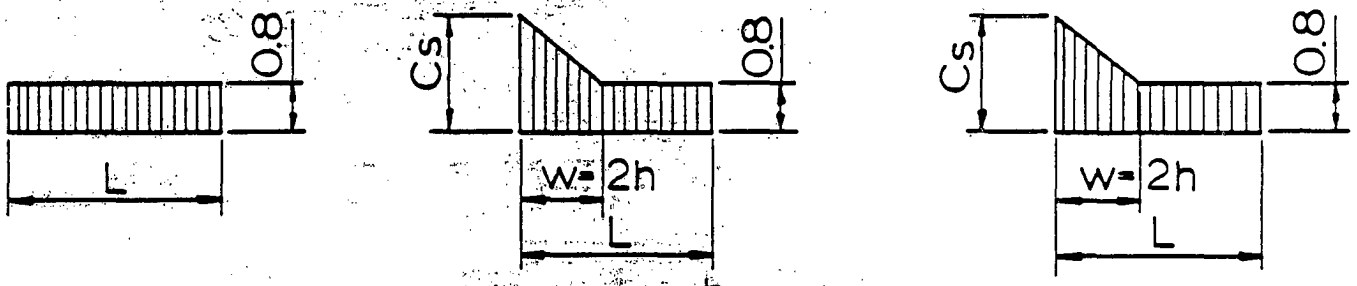
ROOF GEOMETRY



FLAT EXPOSED ROOF, UPPER LEVEL OF MULTI-LEVEL ROOFS, AND DOMES.

LOWER LEVEL OF MULTI-LEVEL ROOFS WHEN UPPER ROOF IS PART OF THE SAME BUILDING OR AN ADJACENT BUILDING NOT MORE THAN 15FT. AWAY.

DISTRIBUTION COEFFICIENTS



$C_s = 0.8$ FOR ALL EXPOSED UNSHELTERED ROOFS.

$C_s = 15\frac{h}{g}$

WHEN $15\frac{h}{g} < 0.8$ USE $C_s = 0.8$

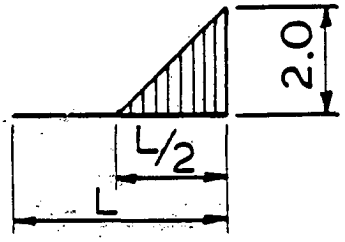
WHEN $15\frac{h}{g} > 3.0$ USE $C_s = 3.0$

$w = 2h$

WHEN $h < 5$ FT. USE $w = 10$ FT.

WHEN $h > 15$ FT. USE $w = 30$ FT.

IN ADDITION FOR SPHERICAL DOMES:



WHERE

h = DIFFERENCE IN ROOF HT. IN FT.
g = GROUND SNOW LOAD IN PSF
w = WIDTH OF DRIFT IN FT.
a = DISTANCE BETWEEN BUILDINGS < 15 FT.

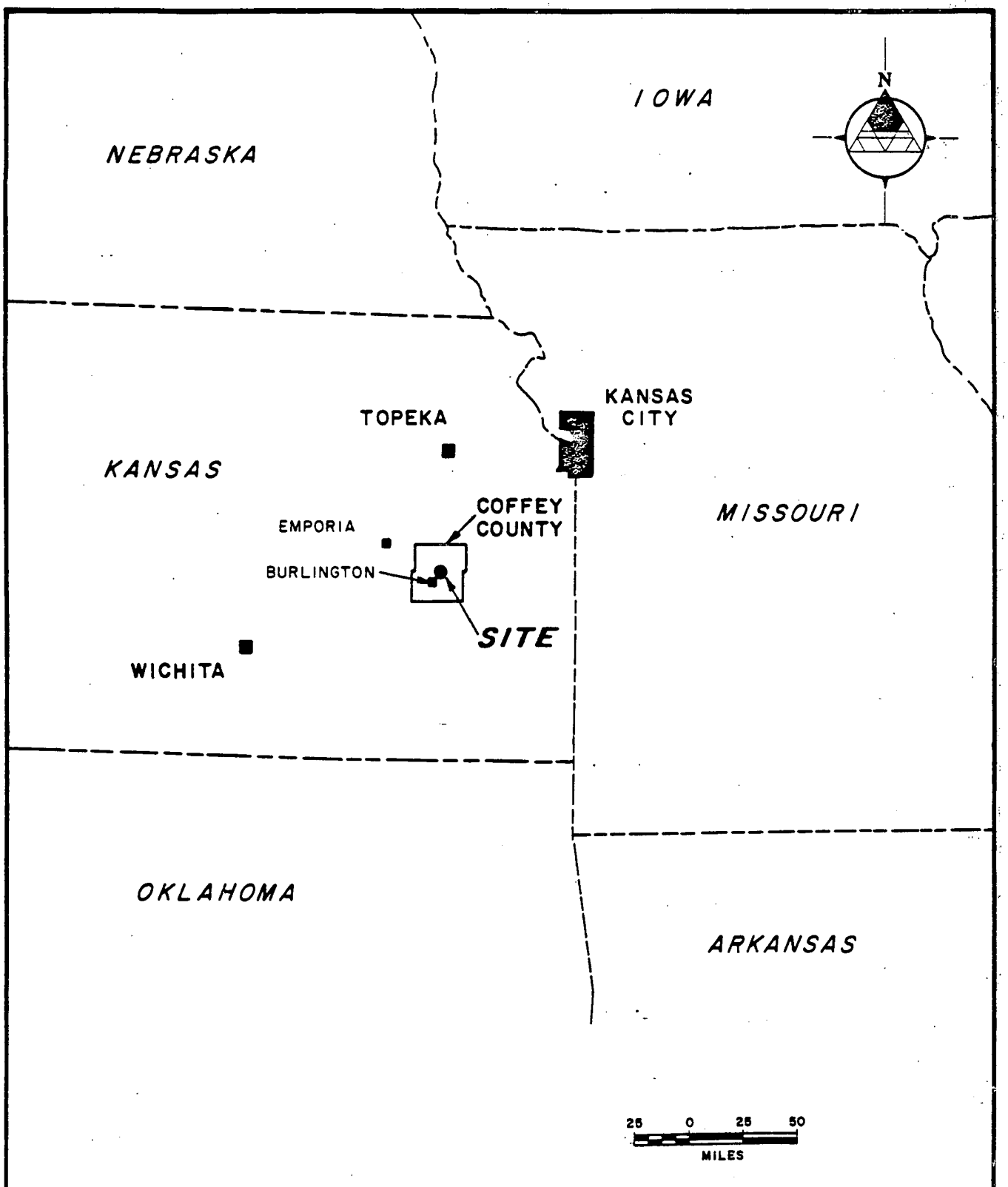
REFERENCE: AMERICAN NATIONAL STANDARD A58.1-1972, SECTION 7.1, FIGURES 5 AND 6.

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.4-62

Snowload Distributions and Coefficients



Rev. 0

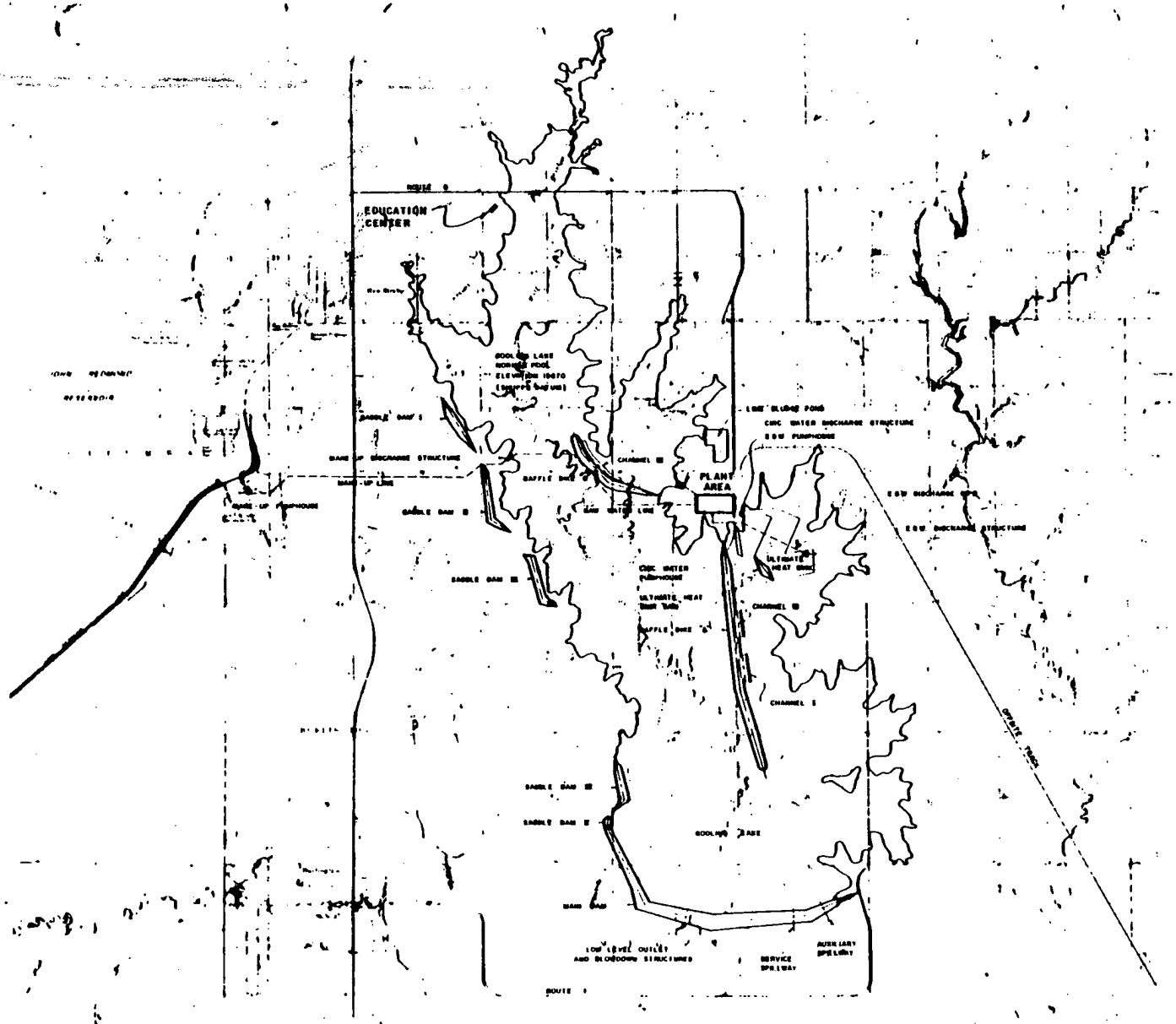
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-1

Site Location Map

REFERENCE:

BASE MAP COMPILED FROM UNITED STATES GEOLOGICAL SURVEY, UNITED STATES, WASHINGTON, D.C.: 1961.





DRAWING REFERENCE:

TITLE: WOLF CREEK GENERATING STATION, PROPERTY & FACILITIES SITE PLAN

FOR: KANSAS GAS & ELECTRIC COMPANY AND KANSAS CITY POWER & LIGHT COMPANY

BY: KANSAS GAS & ELECTRIC COMPANY

DRAWING NO: 6025-C-KG1201, REV. 0

DATE: 8/30/82

MAP BASE PREPARED FROM U.S.G.S. TOPOGRAPHIC QUADRANGLES, 7.5' SERIES; BURLINGTON, KANSAS, 1971: JOHN REDMOND DAM, KANSAS, 1966: NEW STRAWN, KANSAS, 1971: OTTUMWA, KANSAS, 1970

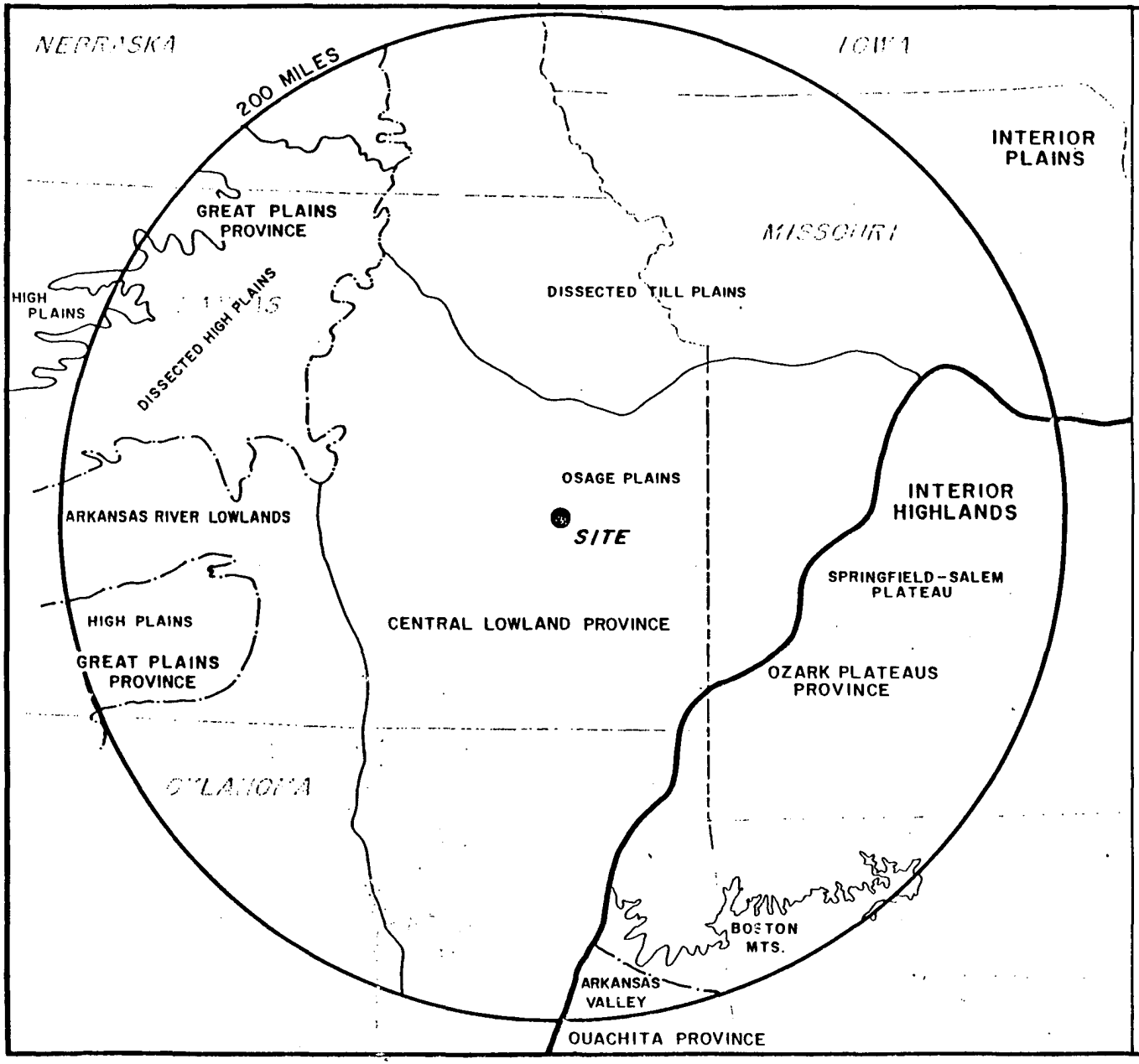


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-2

Site Plot Plan



EXPLANATION:

- MAJOR DIVISION FOOTHILLS
- PROVINCE BOUNDARY
- SECTION BOUNDARY
- STATE BOUNDARY

NOTE:

1. BASE MAP MODIFIED FROM UNITED STATES GEOLOGICAL SURVEY, UNITED STATES, WASHINGTON, D.C., 1943

REFERENCES:

MODIFIED FROM:

1. CROMELIS, C., 1930, GEOLOGY OF ARKANSAS PALEOZOIC AREA: ARKANSAS GEOLOGICAL SURVEY, BULL. 3, PT III.

2. CURTIS, JR., N.M., AND HAN, W.E., 1972, GEOMORPHIC PROVINCES OF OKLAHOMA: GEOLOGY AND EARTH RESOURCES OF OKLAHOMA: OKLAHOMA GEOLOGICAL SURVEY, EDUCATION PUBLICATION 1, P.3.

3. ELDER, J.A., 1969, SOILS OF NEBRASKA: NEBRASKA GEOLOGICAL SURVEY, RESOURCE REPORT NO. 2, P.7.

4. FENNEMAN, N.M., 1957, PHYSICAL DIVISION OF THE UNITED STATES, EDITION OF 1946: WASHINGTON D.C. UNITED STATES GEOLOGICAL SURVEY.

5. FRYE, J.C., AND SWINEFORD, A., 1949, THE PLAINS BORDER PHYSIOGRAPHIC SECTION: TRANSACTION OF THE KANSAS ACADEMY OF SCIENCE, VOLUME 52, NO. 1, PP. 71-80.

6. SCHOEWE, W.H., 1949, THE GEOGRAPHY OF KANSAS, PART II, PHYSICAL GEOGRAPHY: TRANSACTION OF THE KANSAS ACADEMY OF SCIENCE, VOLUME 52, NO. 3, PP. 275-277.

25 0 25 50

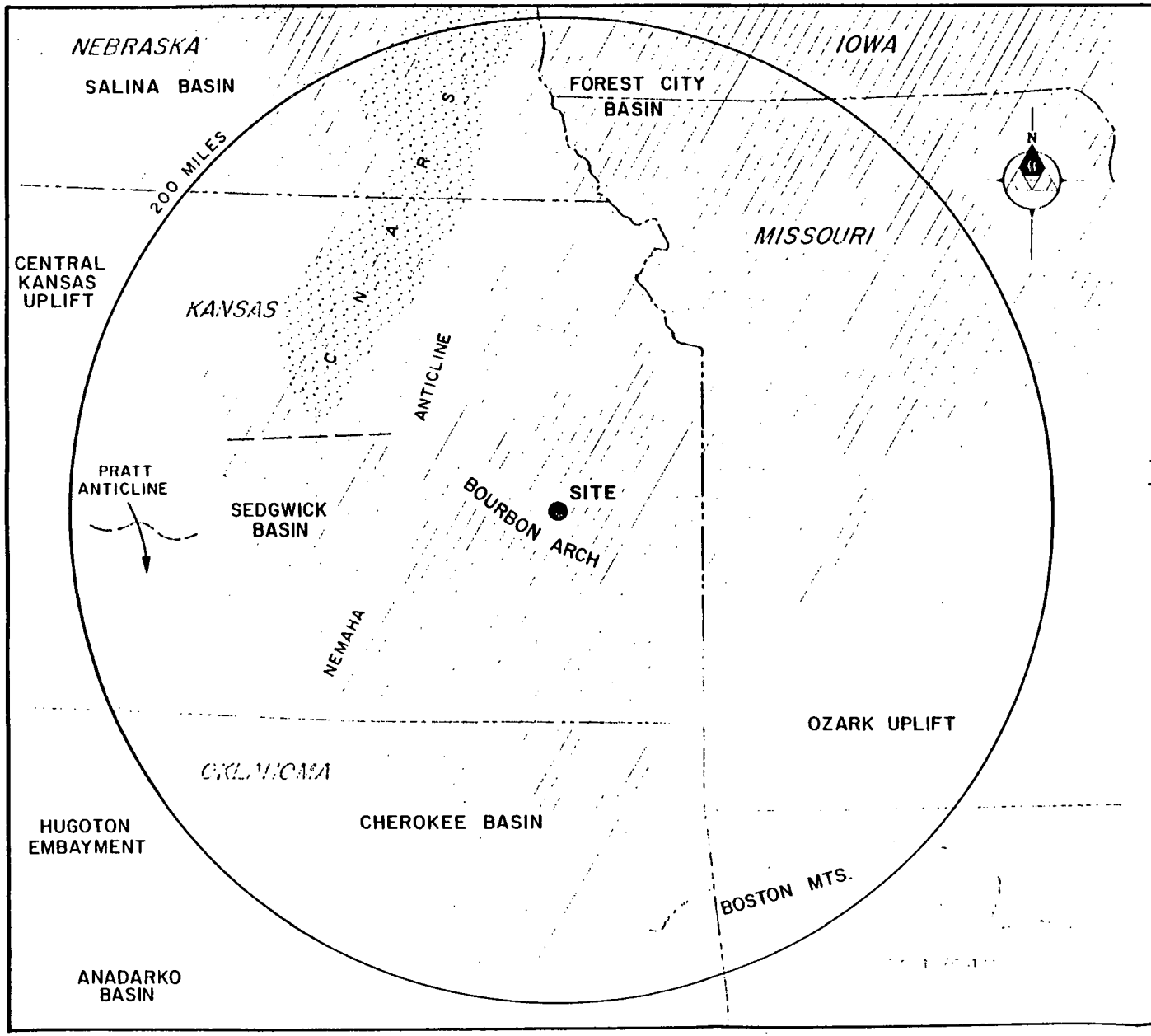
MILES

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-3

Regional Physiographic Map





INDEX MAP SHOWING
CENTRAL STABLE REGION

EXPLANATION:

— — — STATE BOUNDARY

— — — APPROXIMATE BOUNDARY OF STRUCTURE

NOTES:

1. BASE MAP COMPILED FROM UNITED STATES GEOLOGICAL SURVEY, UNITED STATES, WASHINGTON, D.C.: 1961.
2. TABLES 2.5-1 THROUGH 2.5-6 DETAIL THE CHARACTERISTICS OF THESE STRUCTURES.
3. FIGURE 2.5-11 SUMMARIZES THE STRUCTURAL EVOLUTION OF THESE FEATURES.
4. FIGURES 2.5-15, 2.5-16 AND 2.5-17 SHOW THE VARIOUS MINOR FOLDS AND FAULTS ASSOCIATED WITH THESE STRUCTURES.

REFERENCES:

MODIFIED FROM:

1. LANDES, K.K., 1959, PETROLEUM GEOLOGY: 2ND ED., NEW YORK, JOHN WILEY & SONS, INC.
2. MERRIAM, D.F., 1963, THE GEOLOGIC HISTORY OF KANSAS KANSAS GEOLOGICAL SURVEY, BULL. 162, PP. [illegible], FIG. 26.
3. RIGGS, E.A., 1960, MAJOR BASINS AND STRUCTURAL FEATURES OF THE UNITED STATES, MAPLEWOOD, N.J. [illegible]

25 0 25 50

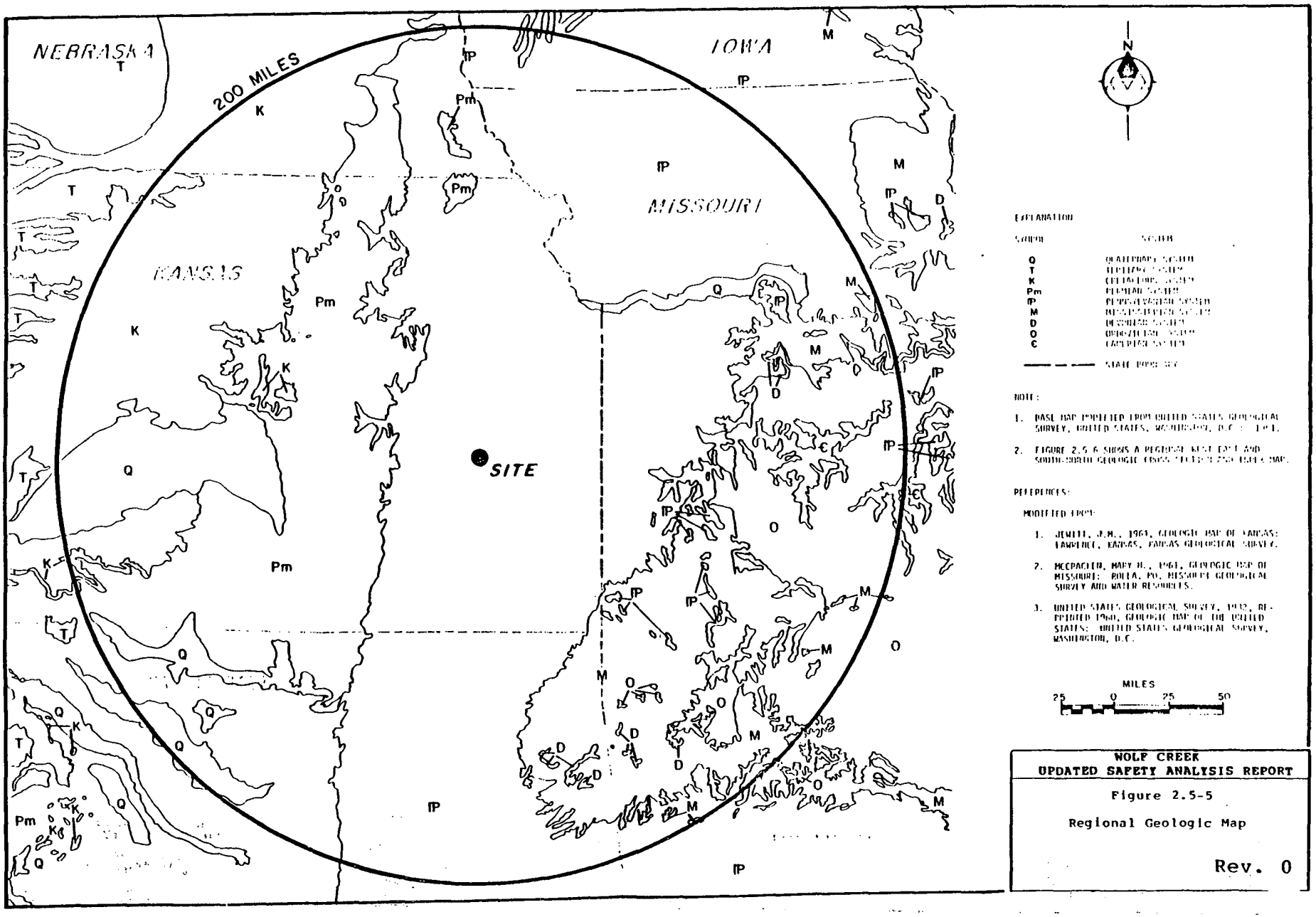
MILES

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-4

Regional Tectonic Map

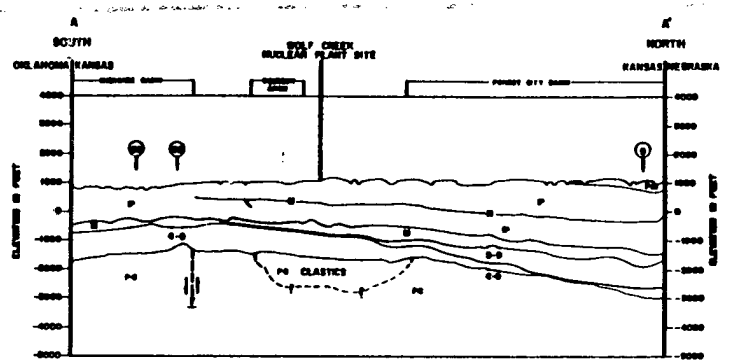


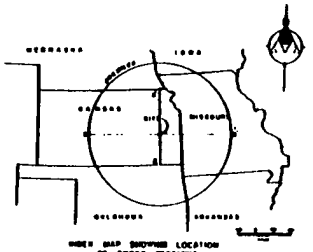
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

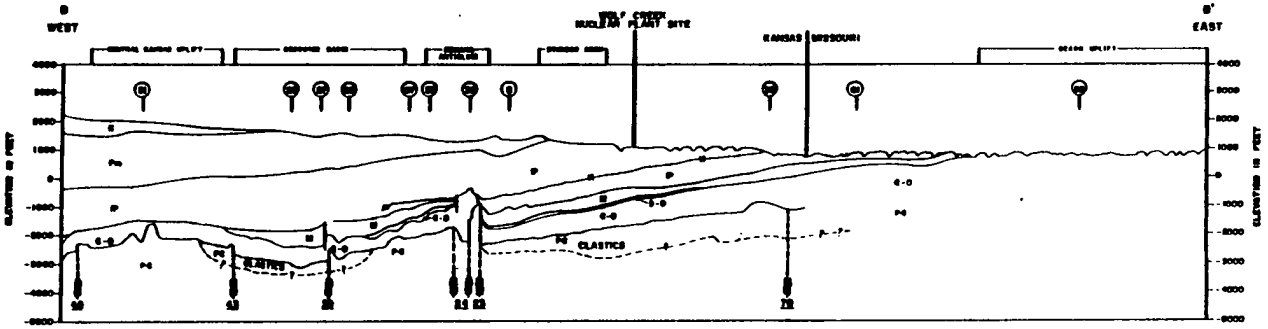
Figure 2.5-5

Regional Geologic Map

Rev. 0









EXPLANATION

K - CRETACEOUS
Pe - PERMIAN
P - PENNSYLVANIAN
M - MISSISSIPPIAN
S-D - SILURIAN AND DEVONIAN
C-O - CAMBRIAN AND ORDOVICIAN
P-C - PRECAMBRIAN

EXPLANATION:

(9) NUMBER CORRESPONDS TO FOLD NUMBERS ON FIGURE 2.5-15 AND TABLES 2.5-1 THROUGH 2.5-6.

40 NUMBER CORRESPONDS TO FAULT NUMBERS ON FIGURE 2.5-16 AND TABLES 2.5-8 THROUGH 2.5-13.

NOTE:
K-CRETACEOUS OF THE KANSAS CITY GROUP BEYOND LIMITS SHOWN WAS NOT PRESENTED IN REFERENCE 17.

REFERENCES

MODIFIED FROM-

1 BRANSON, CARL C., AND OTHERS, 1965, GEOLOGY AND OIL AND GAS RESOURCES OF CANEY COUNTY, OKLAHOMA: OKLAHOMA GEOLOGICAL SURVEY, BULLETIN 94, PP 67-90, PL 1

2 COLE, VINGIL B., 1976, CONFIGURATION OF THE TOP OF PRECAMBRIAN ROCKS IN KANSAS: KANSAS GEOLOGICAL SURVEY, MAP M-1, SCALE 1:500,000.

3 _____, 1976, SUBSURFACE ORDOVICIAN-CAMBRIAN ROCKS IN KANSAS: KANSAS GEOLOGICAL SURVEY, SUBSURFACE GEOLOGIC SERIES 2, 19P.

4 FAHRLEY, A.J., 1967, STRUCTURAL GEOLOGY OF NORTH AMERICA, HARPER AND ROW, 2ND ED., PP 11, 272.

5 JEWETT, J.M., 1960, GEOLOGIC MAP OF KANSAS: KANSAS GEOLOGICAL SURVEY, MAP M-1, SCALE 1:500,000

6 KANSAS GEOLOGICAL SOCIETY, 1954, NORTH-SOUTH ELECTRIC LOG CROSS SECTION FROM NEBRASKA TO OKLAHOMA ALONG SIXTH PRINCIPLE MERIDIAN: KANSAS GEOLOGICAL SOCIETY, PLATE

7 _____, 1956, EAST-WEST-SOUTH ELECTRIC LOG CROSS SECTION FROM TOWNSHIP 34-RW to 34-4W: KANSAS GEOLOGICAL SOCIETY, PLATE

8 LEE, WALLACE, 1940, STRUCTURAL DEVELOPMENT OF THE FORNEY CITY BASIN OF MISSOURI, KANSAS, IOWA, AND NEBRASKA, OIL AND GAS INVESTIGATIONS: U.S. GEOLOGICAL SURVEY, PRELIMINARY MAP NO. SHEET 5, 6

9 _____, 1956, STRATIGRAPHY AND STRUCTURAL DEVELOPMENT OF THE SALINA BASIN AREA: KANSAS GEOLOGICAL SURVEY, BULL 121.

10 MCCRACKEN, MARY H., 1961, GEOLOGIC MAP OF MISSOURI, MISSOURI GEOLOGICAL SURVEY AND WATER RESOURCES

11 _____, 1971, STRUCTURAL FEATURES OF MISSOURI, REPORT OF INVESTIGATIONS 49: MISSOURI GEOLOGICAL SURVEY AND WATER RESOURCES, PL. 1.

12 MERRIAM, DANIEL F., BUNCHELL, RICHARD E., AND ATKINSON, W.R., 1959, PRELIMINARY REGIONAL STRUCTURAL CONTOUR MAP ON TOP OF THE LANSING GROUP (PENNSYLVANIAN) IN KANSAS, OIL AND GAS INVESTIGATION: KANSAS GEOLOGICAL SURVEY, NO. 19, MAP

13 MERRIAM, DANIEL F., 1960, PRELIMINARY REGIONAL STRUCTURAL CONTOUR MAP ON TOP OF MISSISSIPPIAN ROCKS IN KANSAS, OIL AND GAS INVESTIGATION: KANSAS GEOLOGICAL SURVEY, NO 27, MAP

14 _____, AND KELLY, T.S., 1980, PRELIMINARY REGIONAL STRUCTURE CONTOUR MAP ON TOP OF "VIOLA" (SILURIAN DEVONIAN) ROCKS IN KANSAS, OIL AND GAS INVESTIGATION: KANSAS GEOLOGICAL SURVEY, NO 23, MAP

15 _____, AND SMITH, PHILIP, 1981, PRELIMINARY REGIONAL STRUCTURAL CONTOUR MAP ON TOP OF JURASSIC ROCKS (CAMBRIAN-ORDOVICIAN) IN KANSAS, OIL AND GAS INVESTIGATION: KANSAS GEOLOGICAL SURVEY, NO 25, MAP

16 SAYRE, FRANK B., 1960, TECTONIC HISTORY OF MID-CONTINENTAL UNITED STATES IN AND ADJACENT: U.D. MERIT COLLOQUIUM, UNIVERSITY OF MISSOURI AREA, SERIES 1, NO 1, P 75

17 WATNEY, W. LYNN, 1978, STRUCTURAL CONTOUR MAP - BASE OF KANSAS CITY GROUP (UPPER PENNSYLVANIAN) - EASTERN KANSAS: KANSAS GEOLOGICAL SURVEY, MAP M-10.

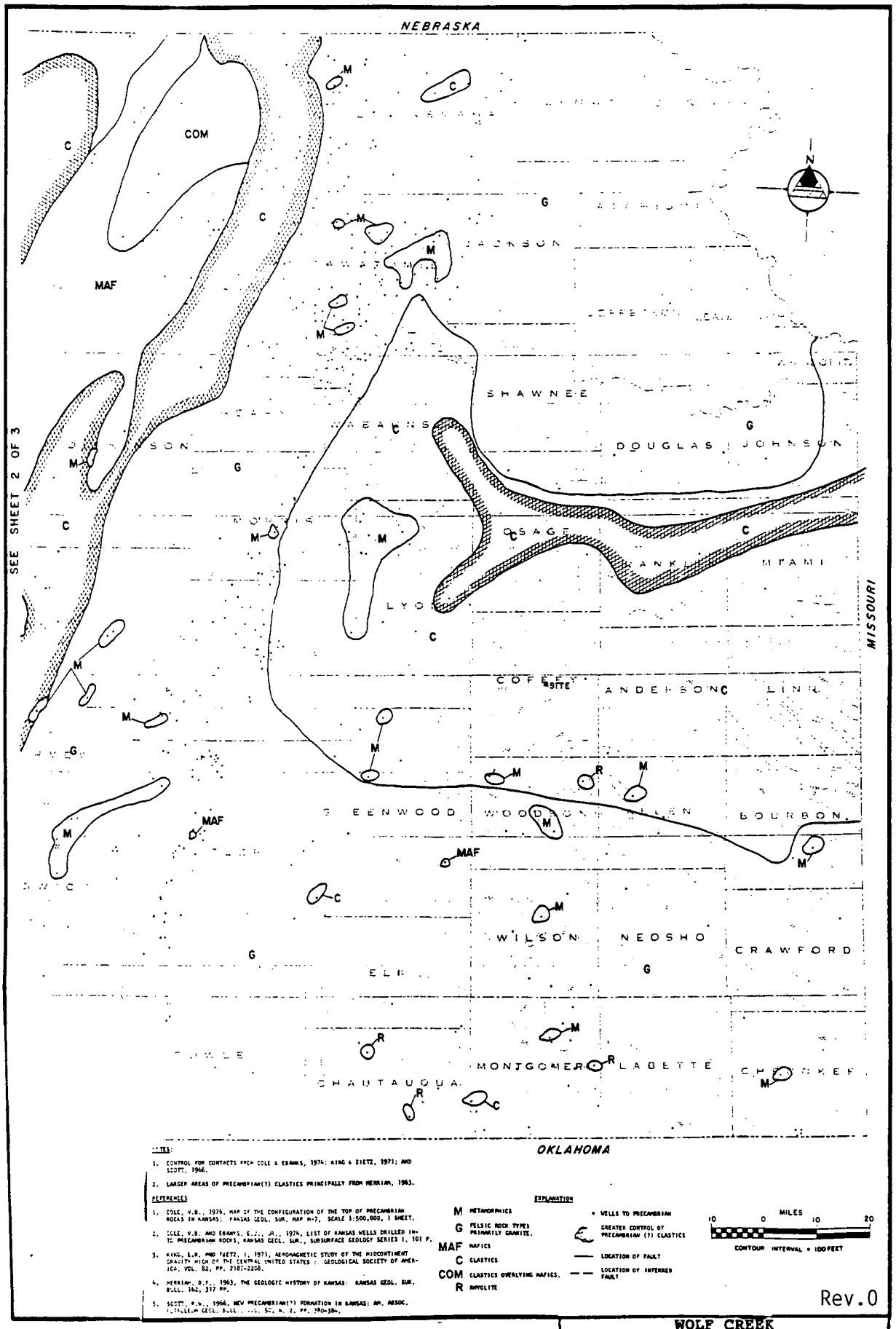
18 ZEISER, DORIS C., (ED.), 1980, THE STRATIGRAPHIC SUCCESSION IN KANSAS: KANSAS GEOLOGICAL SURVEY, BULLETIN 189, PP 1

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

FIGURE 2.5-6

REGIONAL GEOLOGIC CROSS SECTION

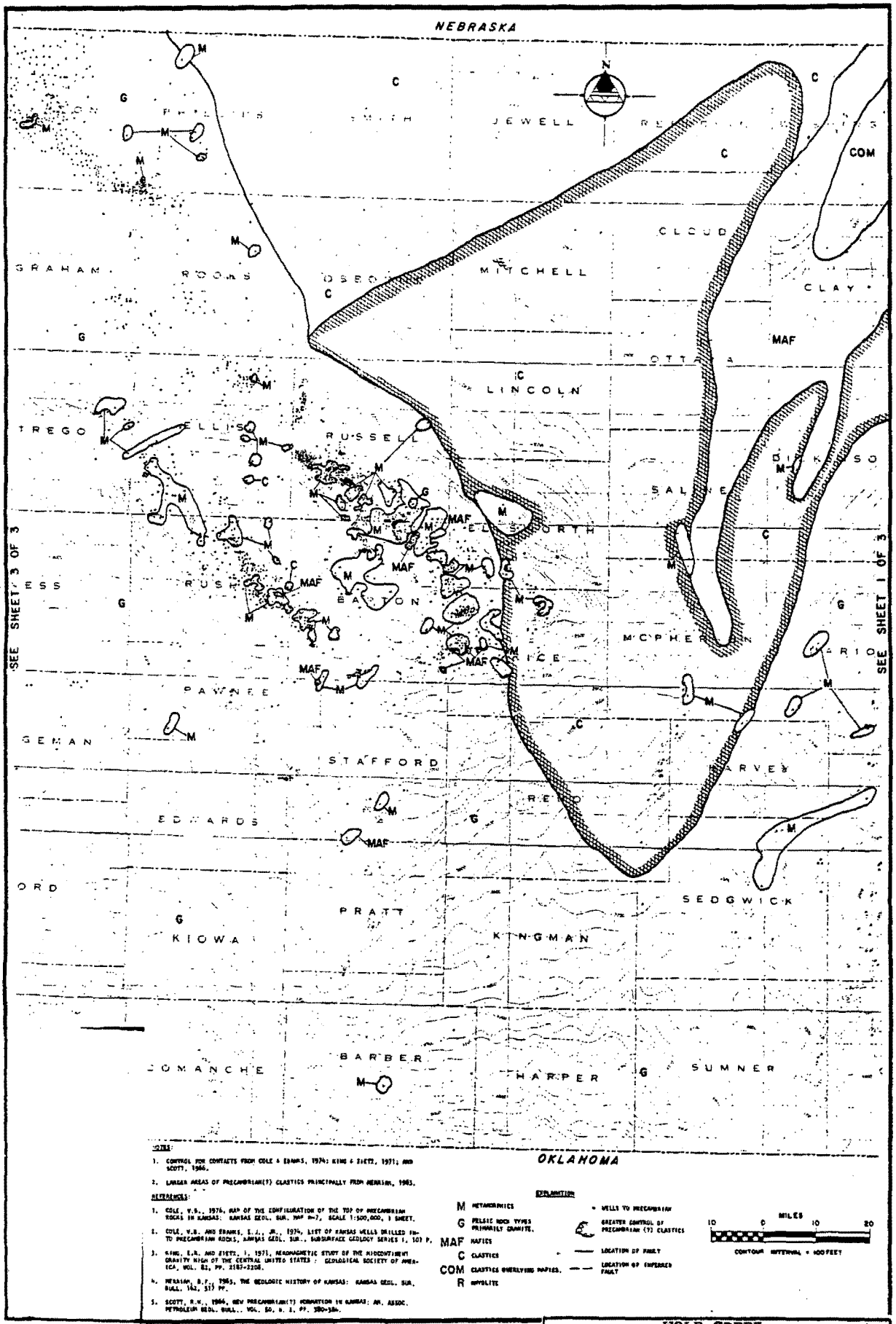


Rev.0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-7 (Sheet 1 of 3)

Structure Contour and Lithologic Map of Precambrian Surface in Kansas

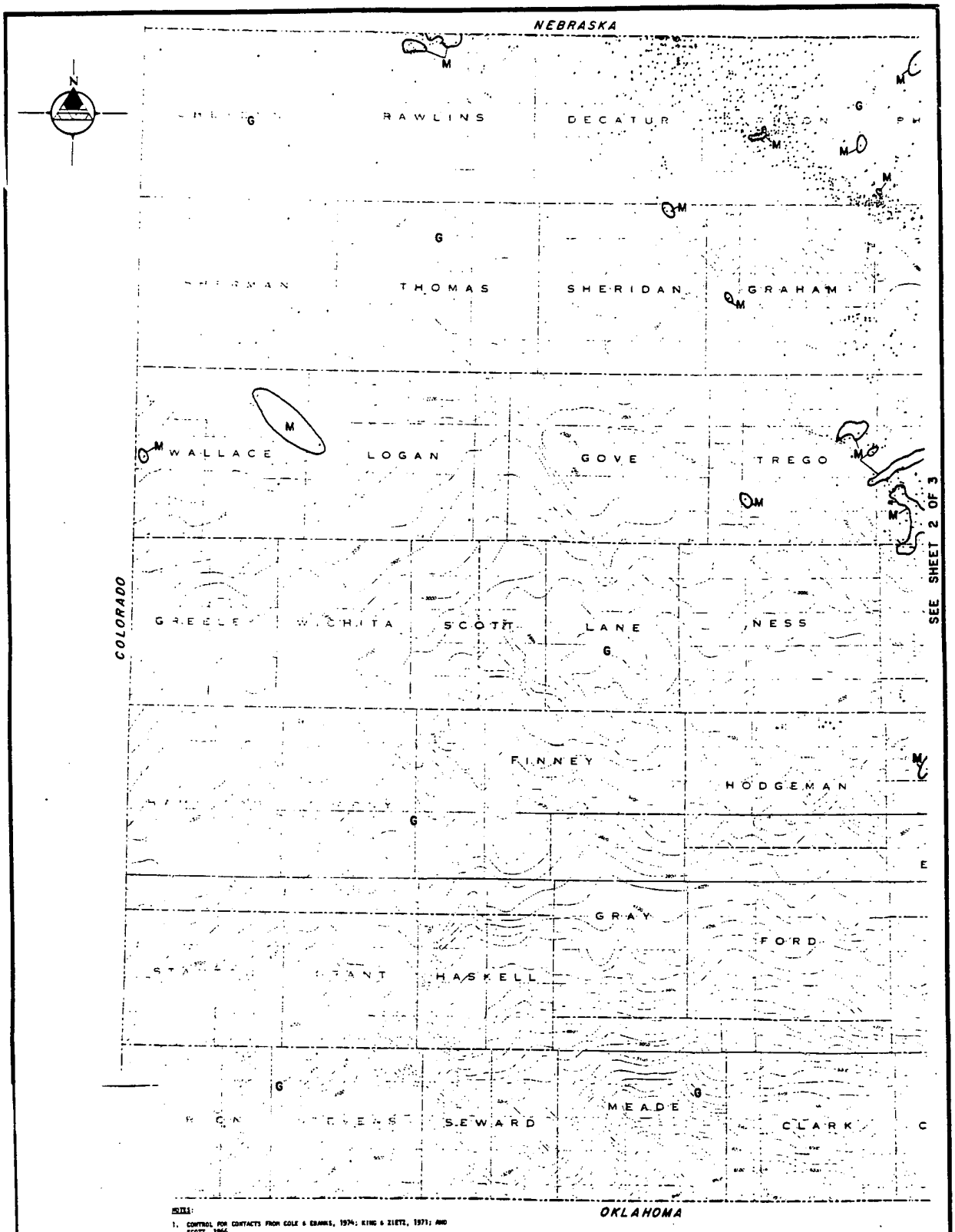


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-7 (Sheet 2 of 3)

Structure Contour and Lithologic Map of Precambrian Surface in Kansas

Rev. 0

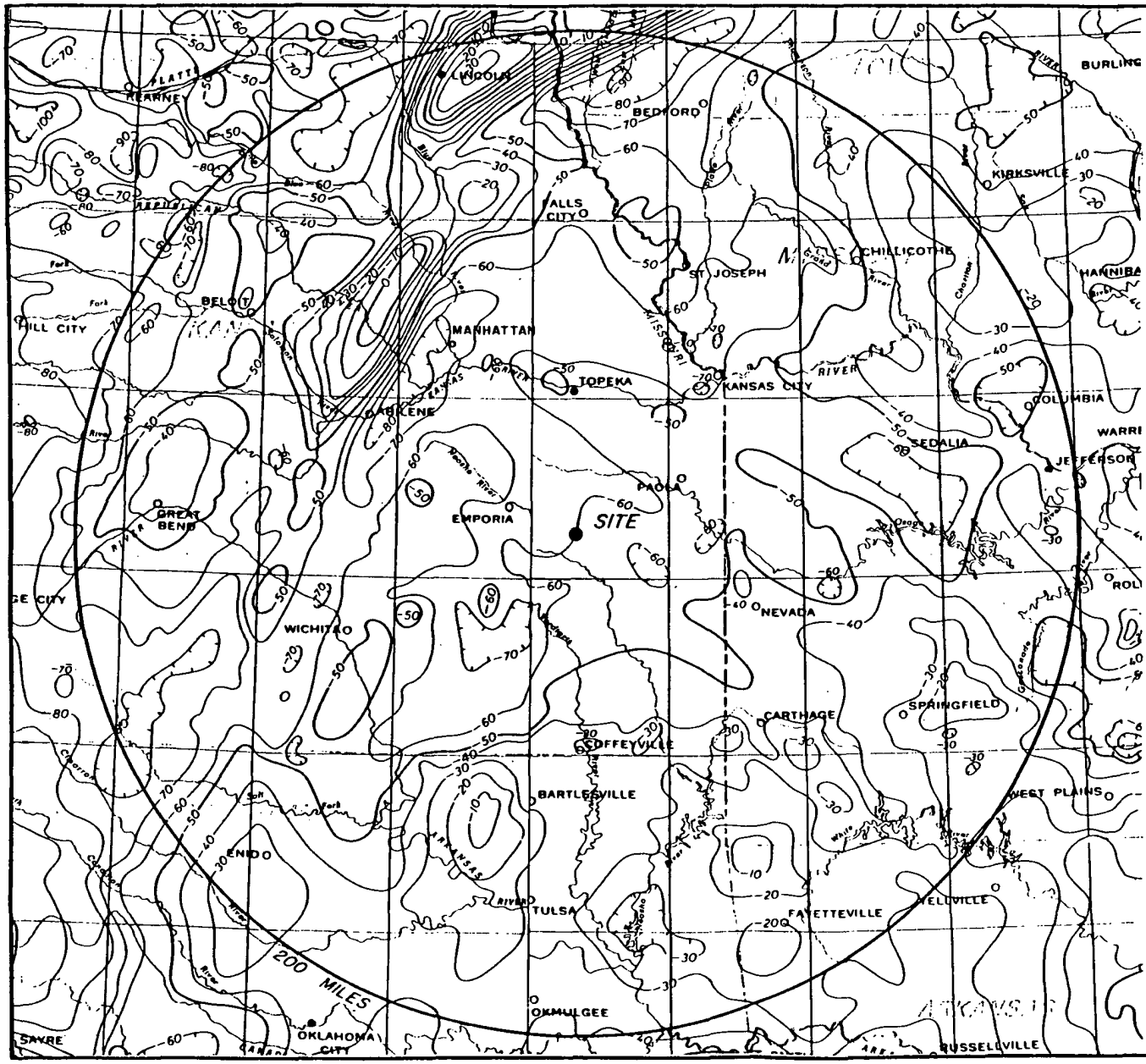


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-7 (Sheet 3 of 3)

Structure Contour and Lithologic Map of Precambrian Surface in Kansas

Rev. 0



N

EXPLANATION

STATE BOUNDARY

REFERENCE:

AMERICAN GEOPHYSICAL UNION AND UNITED STATES GEOLOGICAL SURVEY, 1964, BOUGUER GRAVITY ANOMALY MAP OF THE UNITED STATES.

CONTOUR INTERVAL 10 MILLIGALS

MILES

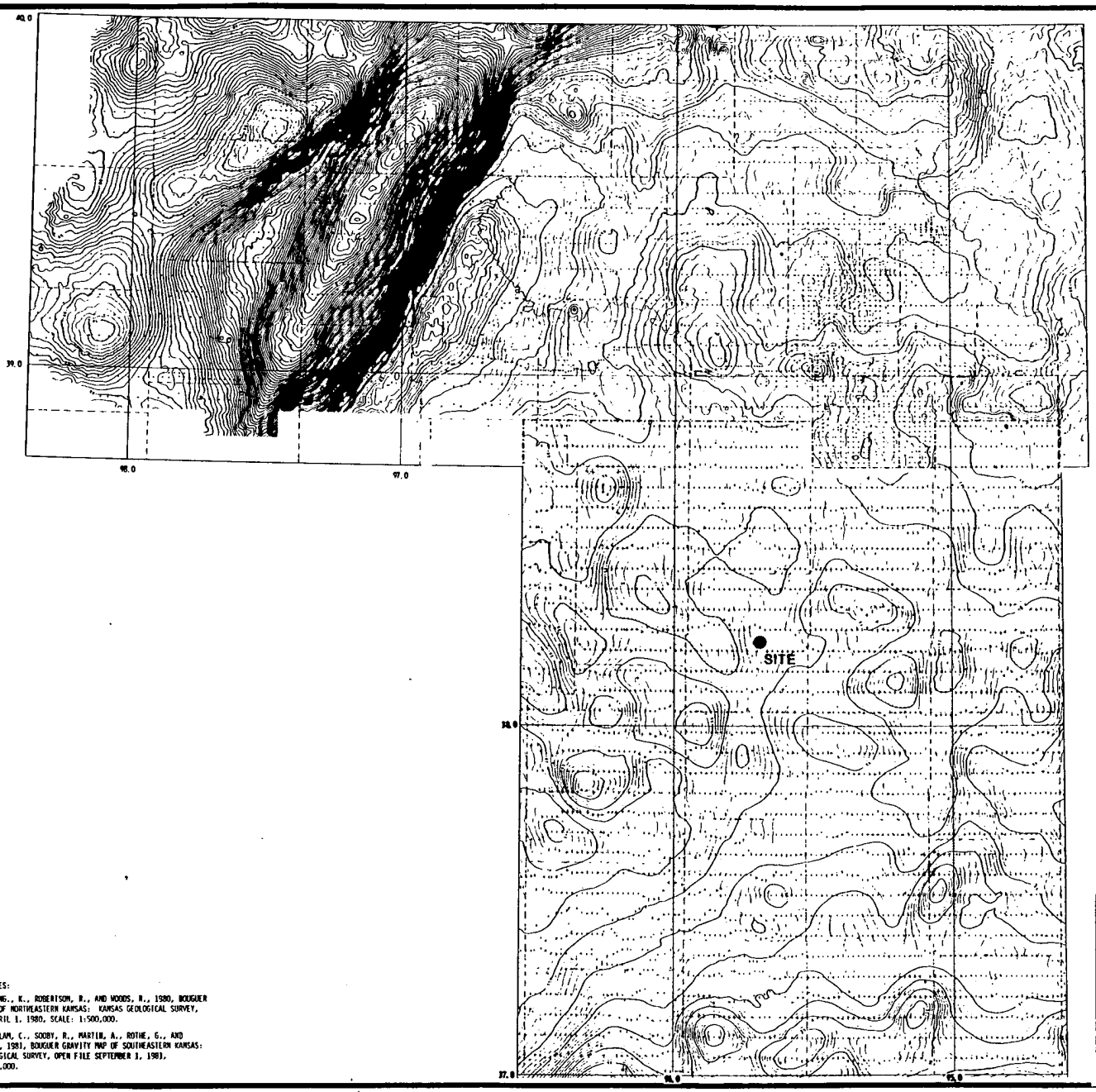
25 0 25 50

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-8

Regional Bouguer Gravity Anomaly Map

Rev. 0



MAP REFERENCES:

YARGER, H., MG., K., ROBERTSON, B., AND WOODS, B., 1980, BOUGUER GRAVITY MAP OF NORTHEASTERN KANSAS: KANSAS GEOLOGICAL SURVEY, OPEN FILE APRIL 1, 1980, SCALE: 1:500,000.

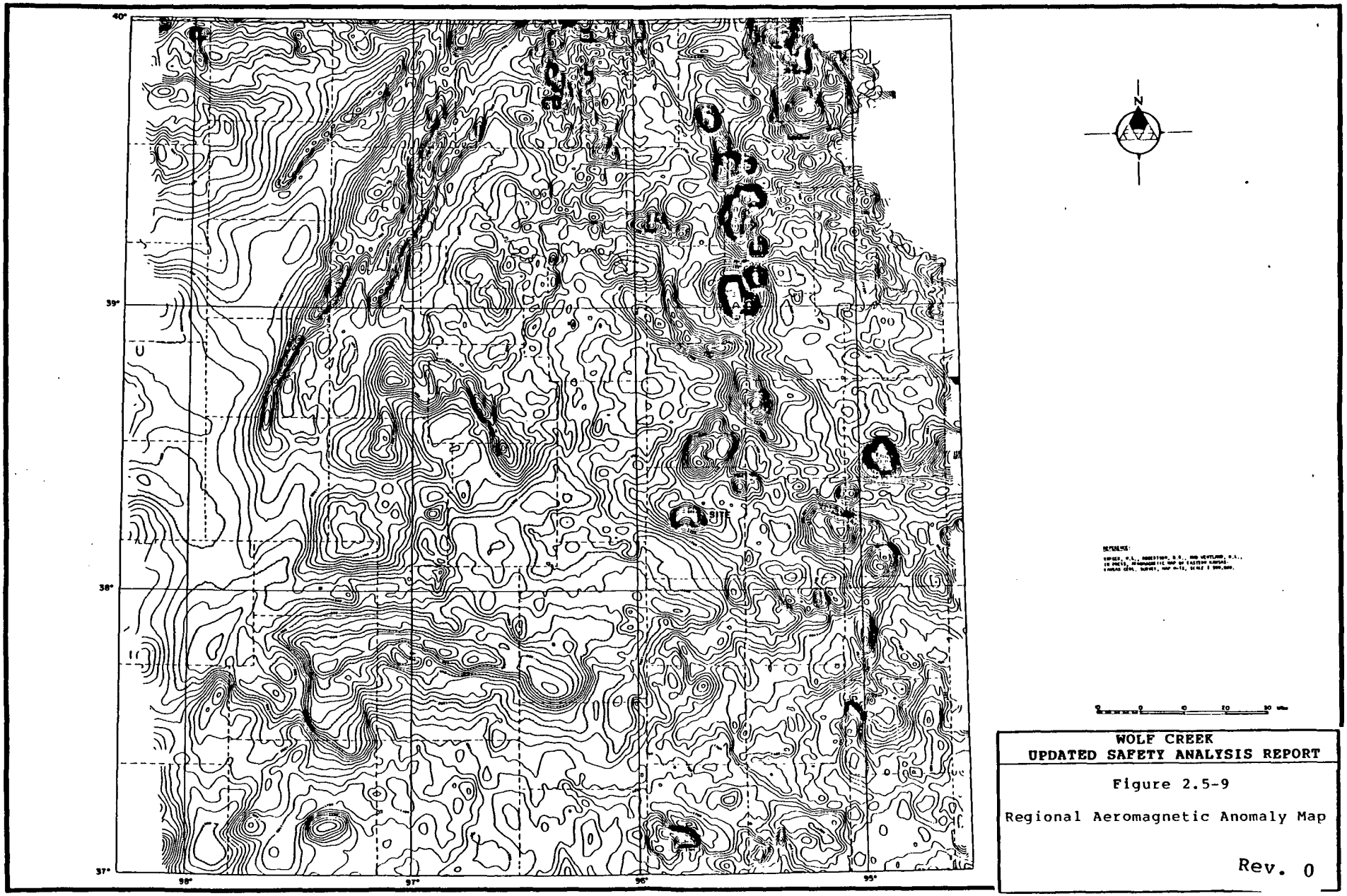
YARGER, H., LAM, C., SOOBY, R., MARTIN, A., ROTHE, G., AND STEEPLES, D., 1981, BOUGUER GRAVITY MAP OF SOUTHEASTERN KANSAS: KANSAS GEOLOGICAL SURVEY, OPEN FILE SEPTEMBER 1, 1981, SCALE: 1:500,000.

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-8a

Bouguer Gravity Map of Eastern Kansas

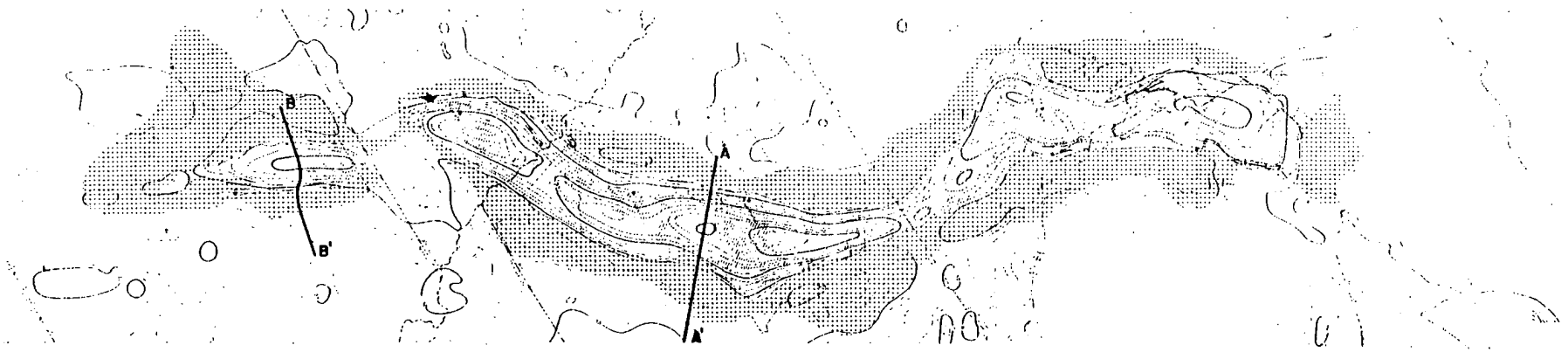


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-9

Regional Aeromagnetic Anomaly Map

Rev. 0



25 0 25 50 75
MILES

EXPLANATION

KEWEENAWAN
- CLASTIC ROCKS
- CLASTIC ROCKS UNDERLAIN BY MAFIC ROCK
- MAFIC ROCK

PRE-KEWEENAWAN
- BASEMENT ROCKS

Rev. 0

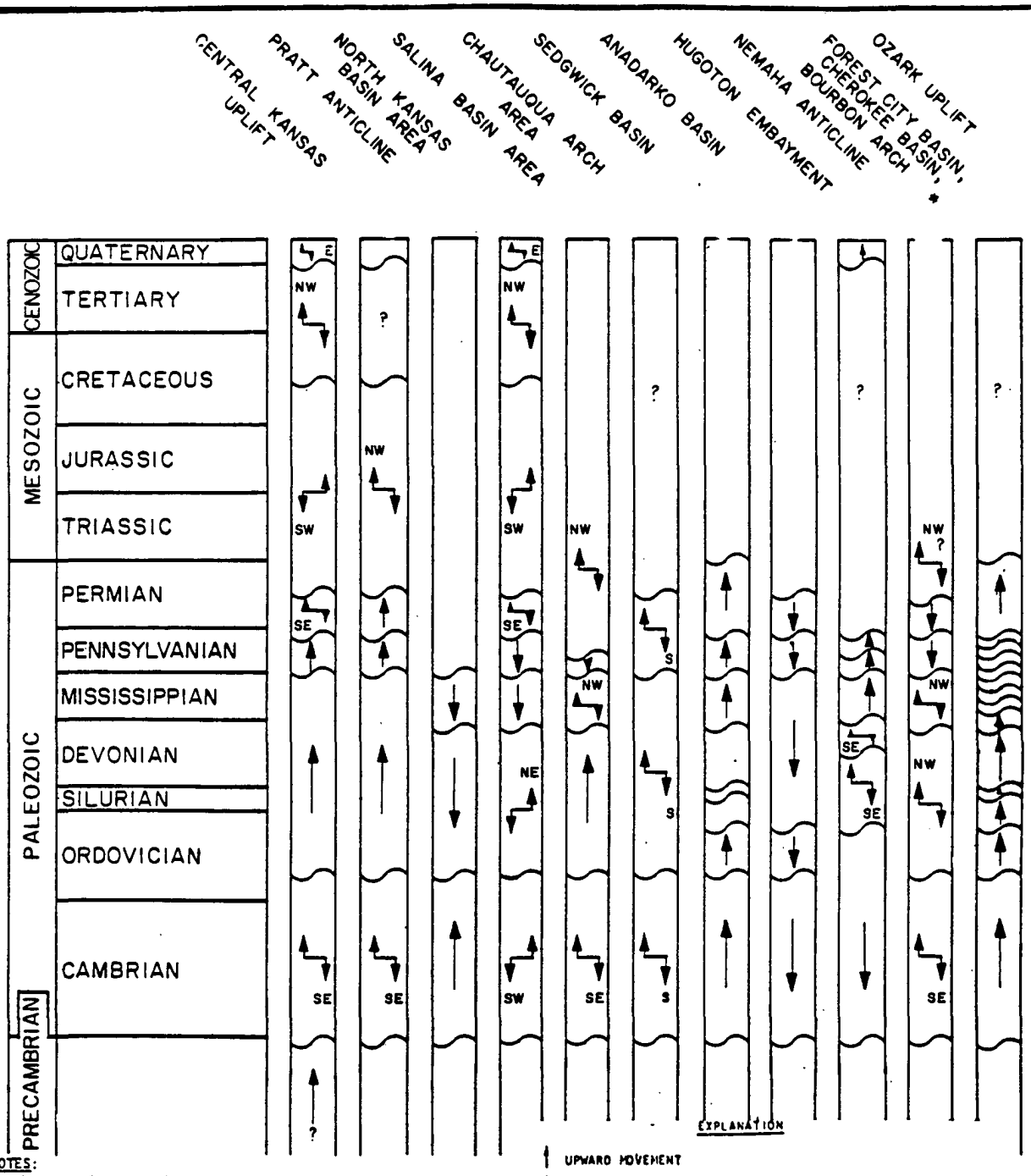
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-10

Extent of Midcontinent Gravity High

REFERENCES:

KING, E.R., AND ZIETZ, I, 1971, AEROMAGNETIC STUDY OF THE MIDCONTINENT GRAVITY HIGH OF THE CENTRAL UNITED STATES: GEOLOGIC SOCIETY OF AMERICA BULLETIN, VOL. 82, PP. 2187-2208.



NOTES:

1. LOCATIONS OF THE VARIOUS STRUCTURES ARE SHOWN ON FIGURE 2.5-4.
2. TABLES 2.5-1 THROUGH 2.5-6 DETAIL THE CHARACTERISTICS OF THESE STRUCTURES.
3. FIGURES 2.5-15, 2.5-16 AND 2.5-17 SHOW THE VARIOUS MINOR FOLDS AND FAULTS ASSOCIATED WITH THESE STRUCTURES.

* FOR A SHORT PERIOD OF TIME DURING THE MISSISSIPPIAN-PENNSYLVANIAN, THE BOURBON ARCH MOVED UPWARD RELATIVE TO THE FOREST CITY AND CHEROKEE BASINS. (SECTION 2.5 1.1.5.1.11).

Rev. 0

REFERENCES:

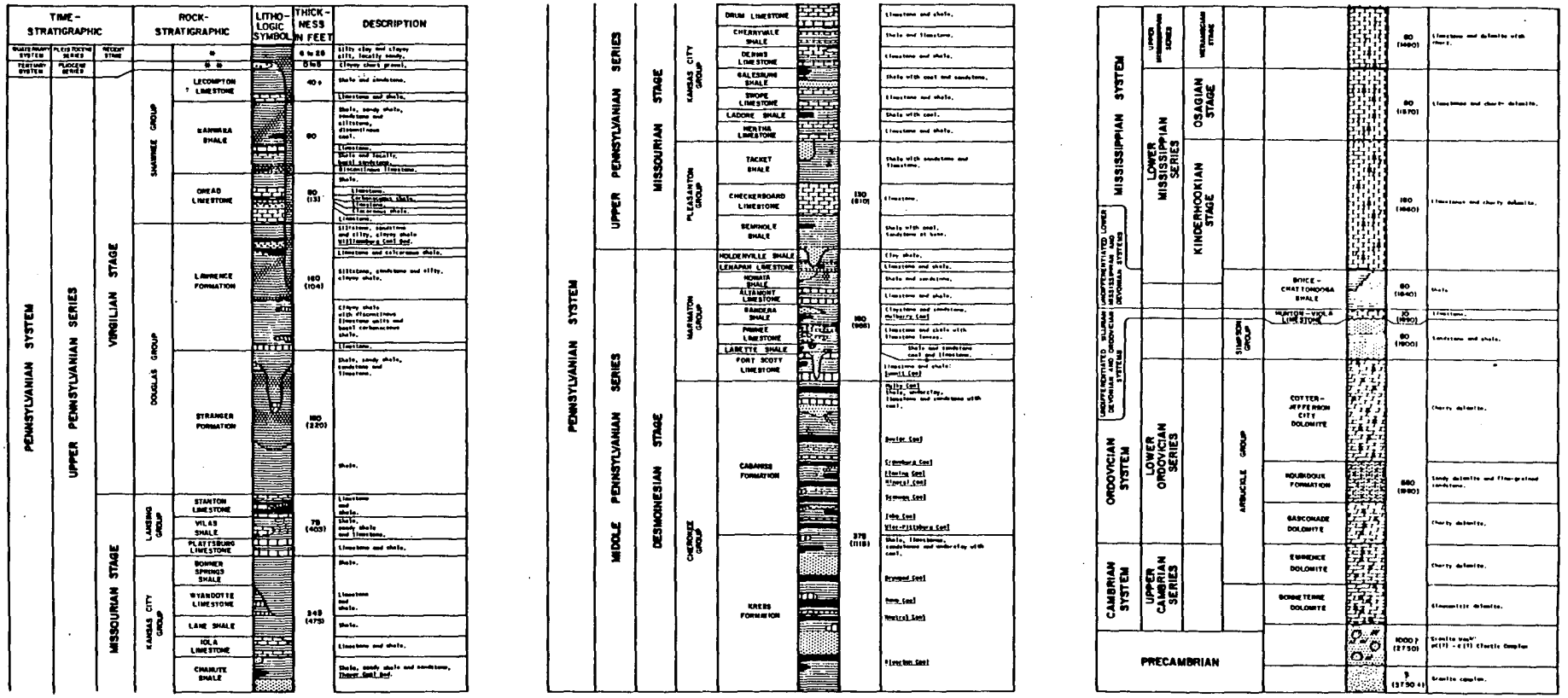
MODIFIED FROM:

1. ARBENZ, J.K., 1956, TECTONIC MAP OF OKLAHOMA SHOWING SURFACE STRUCTURAL FEATURES: OKLAHOMA GEOLOGICAL SURVEY, MAP.
2. McCRAKEN, M.H., 1971, STRUCTURAL FEATURES OF MISSOURI: MISSOURI GEOL. SURVEY AND WATER RESOURCES, R.I. NO. 49, PP. 8-67, PL. 1.
3. MERRIAM, D.F., 1963, THE GEOLOGIC HISTORY OF KANSAS: KANSAS GEOL. SURVEY, BULL. 162, PP. 179-253, FIG. 124.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-11

Structural Evolution of Regional Tectonic Features



Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-12

Generalized Site - Stratigraphic Column

REFERENCES:

MODIFIED FROM:

1. COLE, V.B., 1976, CONFIGURATION OF THE TOP OF PRECAMBRIAN ROCKS IN KANSAS: KANSAS GEOLOGICAL SURVEY, MAP M-7, SCALE 1:500,000.
2. _____, 1979, PRIVATE COMMUNICATION.
3. JEWETT, J.M., 1963, OIL AND GAS IN EASTERN KANSAS: KANSAS GEOLOGICAL SURVEY, BULL. 104, PP. 80-290.
4. MERRIAM, D.F., 1963, THE GEOLOGIC HISTORY OF KANSAS: KANSAS GEOLOGICAL SURVEY, BULL. 162, PP. 80-290.
5. THOMPSON, T.L. AND COEBEL, E.D., 1968, CONODONTS AND STRATIGRAPHY OF THE MERAMECIAN STAGE (UPPER MISSISSIPPIAN) IN KANSAS: KANSAS GEOLOGICAL SURVEY, BULL. 192, PP. 1-7.
6. WHITNEY, S.L., 1978, STRUCTURAL CONTOUR MAP: BASE OF KANSAS CITY GROUP (UPPER PENNSYLVANIAN)-EASTERN KANSAS: KANSAS GEOLOGICAL SURVEY, MAP M-10, SCALE 1:500,000.
7. ZELLER, D.E. (ED.), 1968, THE STRATIGRAPHIC SUCCESSION IN KANSAS: KANSAS GEOLOGICAL SURVEY, BULL. 189, 81PP., 3 PL.

EXPLANATION:

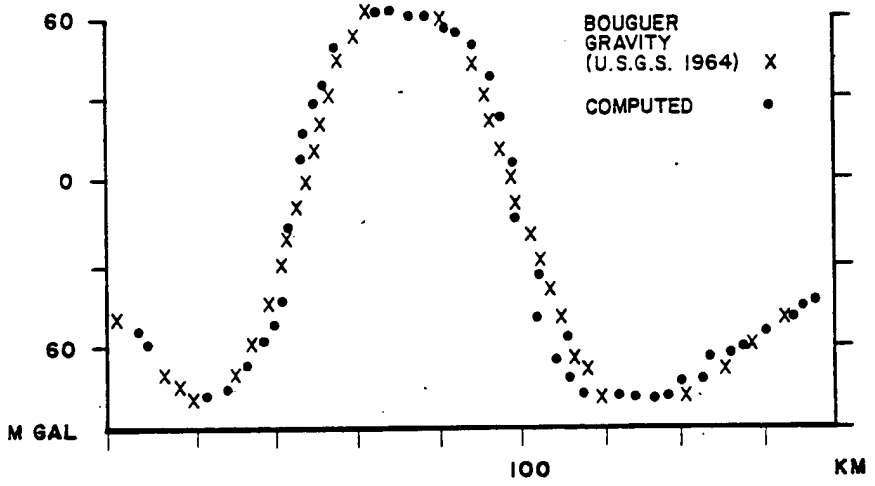
- GRANITE
- SHALE
- SANDSTONE
- METAMORPHICS
- LIMESTONE
- DOLOMITE
- CHERT
- COAL
- CALCAREOUS SHALE

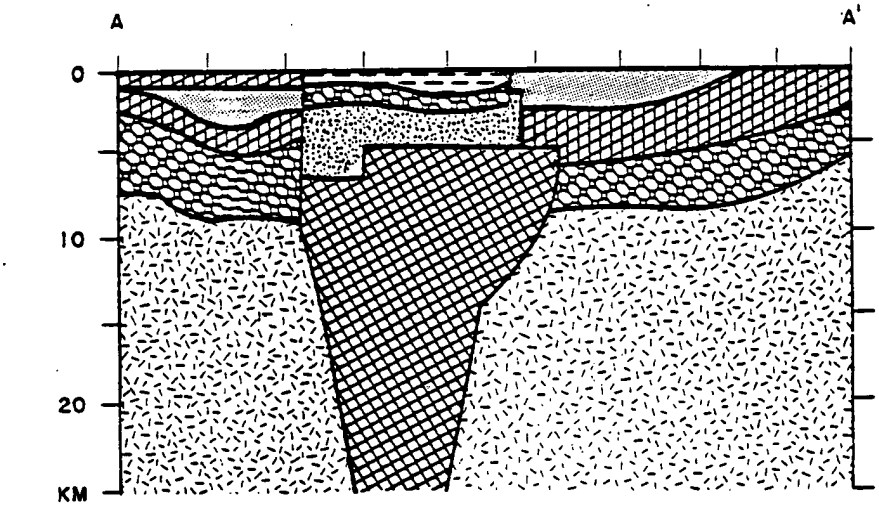
NOTES

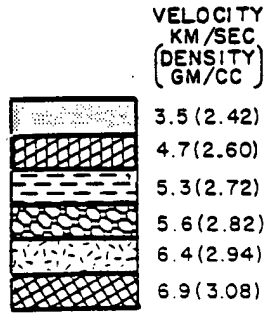
* PLEISTOCENE MATERIALS MAY OR MAY NOT BE PRESENT AT ANY ONE AREA OF THE SITE AND MAY OVERLIE ANY MEMBER DOWN TO THE IRELAND SANDSTONE MEMBER.

** PLIOCENE MATERIALS OCCUR AS HIGH LEVEL TERRACE DEPOSITS AND MAY OR MAY NOT BE PRESENT AT ANY ONE AREA OF THE SITE. THEY MAY OVERLIE ANY MEMBER DOWN TO THE TORONTO LIMESTONE MEMBER.

1. THICKNESSES OF THE FORMATIONS DOWN THROUGH THE STRANGER FORMATION ARE FROM BOREHOLES IN THE SITE AREA. ALL OTHER THICKNESSES ARE ESTIMATES.
2. NUMBERS IN PARENTHESES REPRESENT ESTIMATED DEPTHS TO THE TOP OF THE FORMATIONS BENEATH THE PROPOSED PLANT SITE.
3. A DETAILED STRATIGRAPHIC COLUMN OF THE DOUGLAS AND SHAWNEE GROUPS IS PRESENTED ON FIGURE 2.5-41.









Rev. 0

REFERENCE:

OCOLA, L.C., AND MEYER, R.P., 1973, CENTRAL NORTH AMERICAN RIFT SYSTEM, STRUCTURE AT THE AXIAL ZONE FROM SEISMIC AND GRAVIMETRIC DATA: JOUR. OF GEOPHYSICAL RESEARCH, VOL. 78, NO. 23, PP. 5173-5194, FIG. 10.

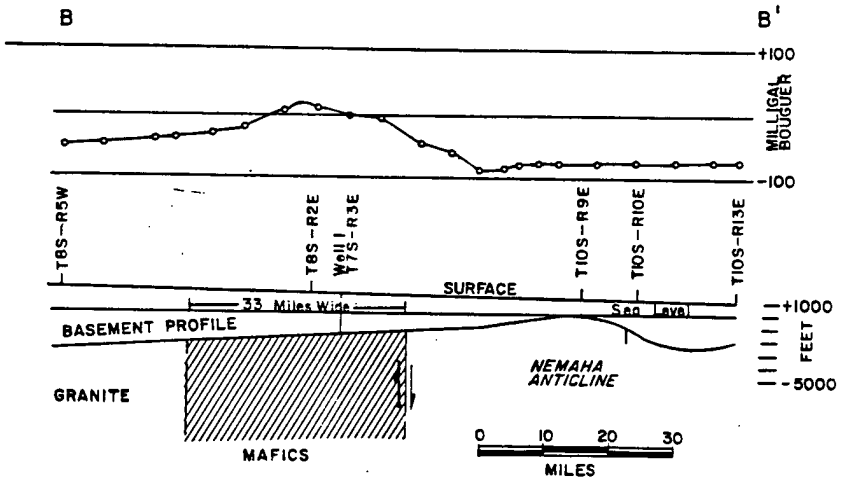
NOTE:

LOCATION OF PROFILE IS SHOWN ON FIGURE 2.5-10.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-13

Model of Iowa-Nebraska Segment of Midcontinent Gravity High



Rev. 0

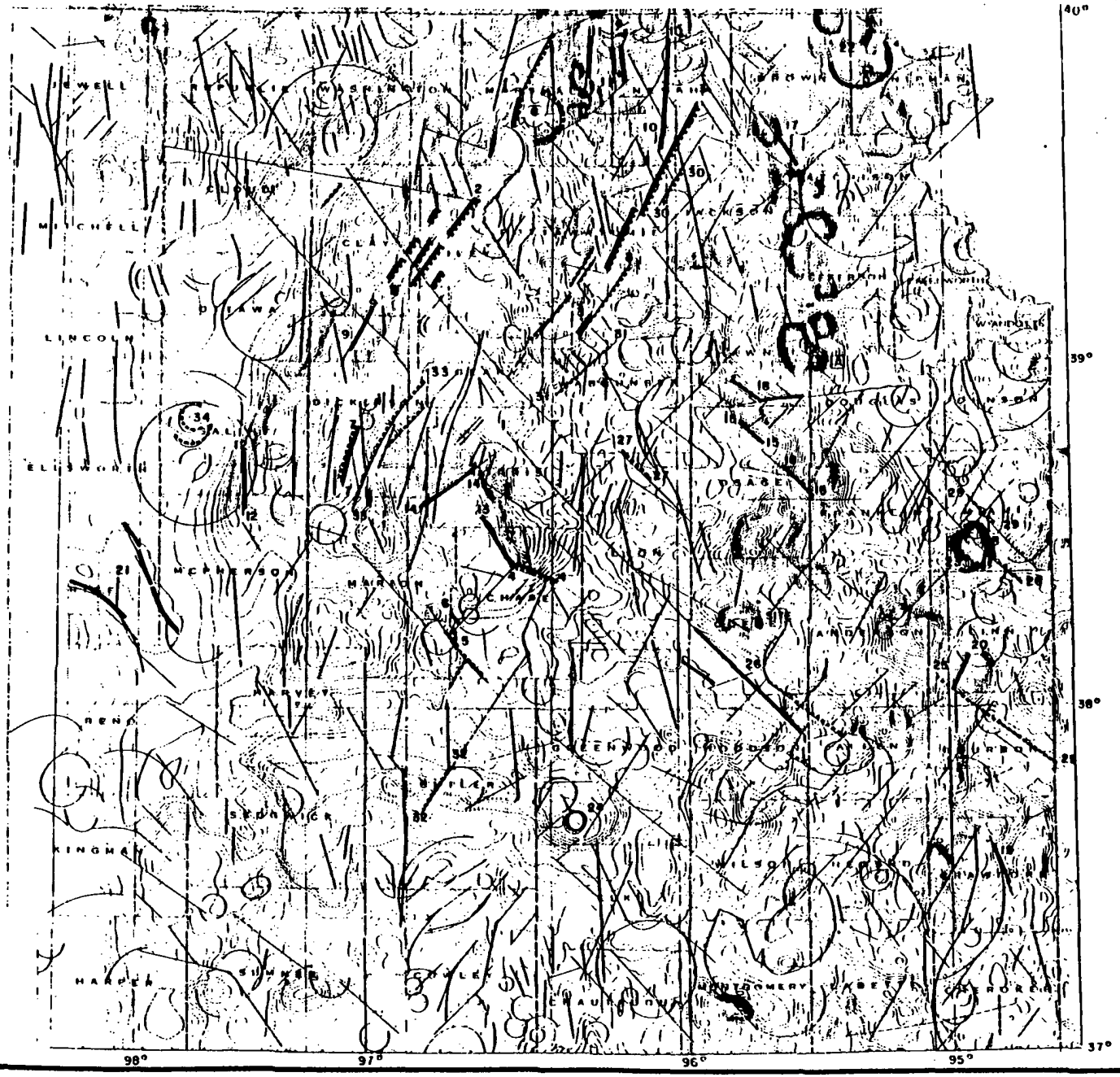
NOTES:

1. DRAWING MODIFIED FROM LYONS, P.L., 1959, THE GREENLEAF ANOMALY, A SIGNIFICANT GRAVITY FEATURE, IN HAMBLETON, W.W., (ED.), SYMPOSIUM ON GEOPHYSICS IN KANSAS: KANSAS GEOL. SUR., BULL. 137, PP. 105-120, FIG. 5. DIRECTION OF RELATIVE MOVEMENT ALONG FAULT IS AS INTERPRETED BY LYONS.
2. LOCATION OF PROFILE IS SHOWN ON FIGURE 2.5-10.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-14

Model of Kansas Segment of Midcontinent Gravity High

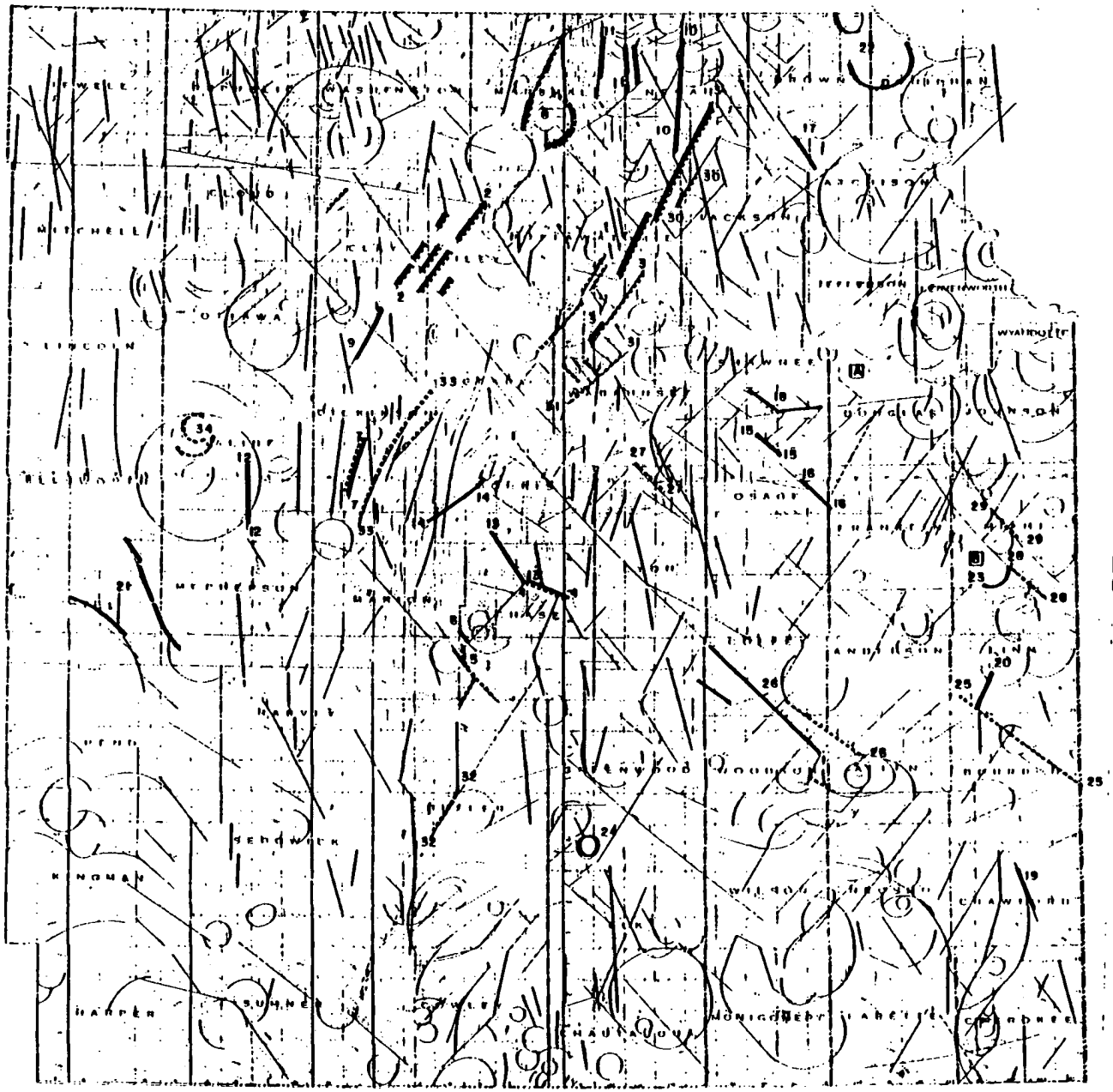


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-14a

Composite Map - Aeromagnetic Intensity and LANDSAT Lineaments

Rev. 0



N

KEY:

[A] LOCATION OF BORINGS INTO CIRCULAR GEOPHYSICAL ANOMALIES

LANDSAT LINEMENTS CORRELATING WITH TRENDS OR STRUCTURES ON THE PRECAMBRIAN SURFACE MAP.

LANDSAT LINEAMENTS CORRELATING WITH TRENDS ON THE AEROMAGNETIC MAP.

MAP REFERENCE:

COLE, V. B., 1976, CONFIGURATION ON THE TOP OF PRECAMBRIAN ROCKS IN KANSAS: KANSAS GEOLOGIC SURVEY, MAP M-1, SCALE 1:500,000.

McCAULEY, J.R., DELLWIG, L. F., AND DAVISON, E. C., 1978, LANDSAT LINEAMENTS OF EASTERN KANSAS: KANSAS GEOLOGICAL SURVEY, MAP M-11, SCALE: 1:500,000.

FEET
10 0 10 20 30

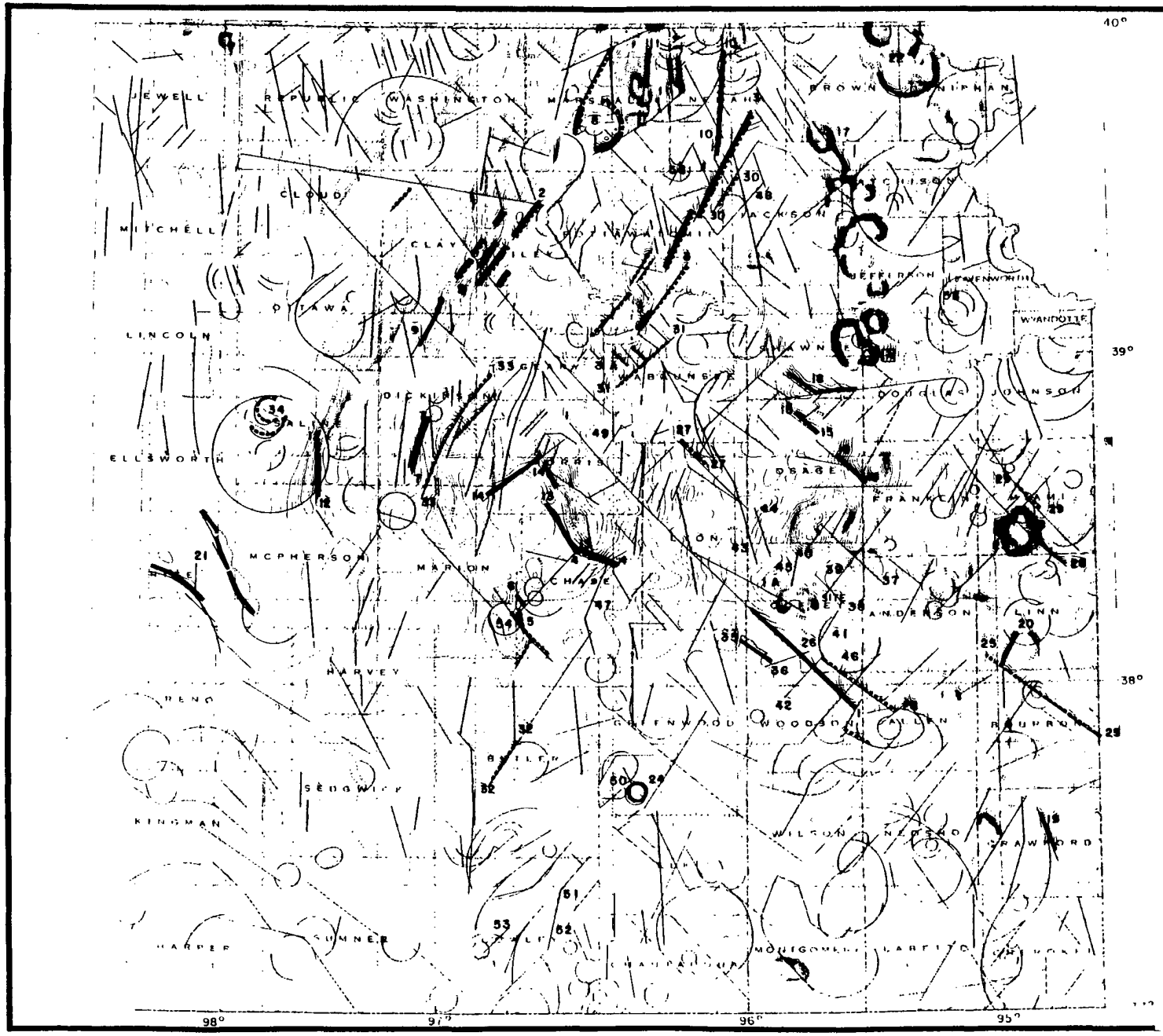
REV. 4, 7/81

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-14b

Composite Map - Precambrian Surface and LANDSAT Lineaments

Rev. 0



KEY:

- LOCATION OF BORINGS INTO CIRCULAR GEOPHYSICAL ANOMALIES
- LANDSAT LINEMENTS CORRELATING WITH TRENDS OR STRUCTURES ON THE PRECAMBRIAN SURFACE MAP.
- LANDSAT LINEAMENTS CORRELATING WITH TRENDS ON THE AEROMAGNETIC MAP.

MAP REFERENCE:

YARGER, H. L., ROBERTSON, R.R., AND WENTLAND, R. L., IN PRESS, AEROMAGNETIC MAP OF EASTERN KANSAS: KANSAS GEOLOGIC SURVEY, MAP M-12, SCALE 1:500,000.

McCAULEY, J.R., DELLWIG, L.F. AND DAVISON, E. C., 1978, LANDSAT LINEAMENTS OF EASTERN KANSAS: KANSAS GEOLOGIC SURVEY, MAP M-11, SCALE 1:500,000.

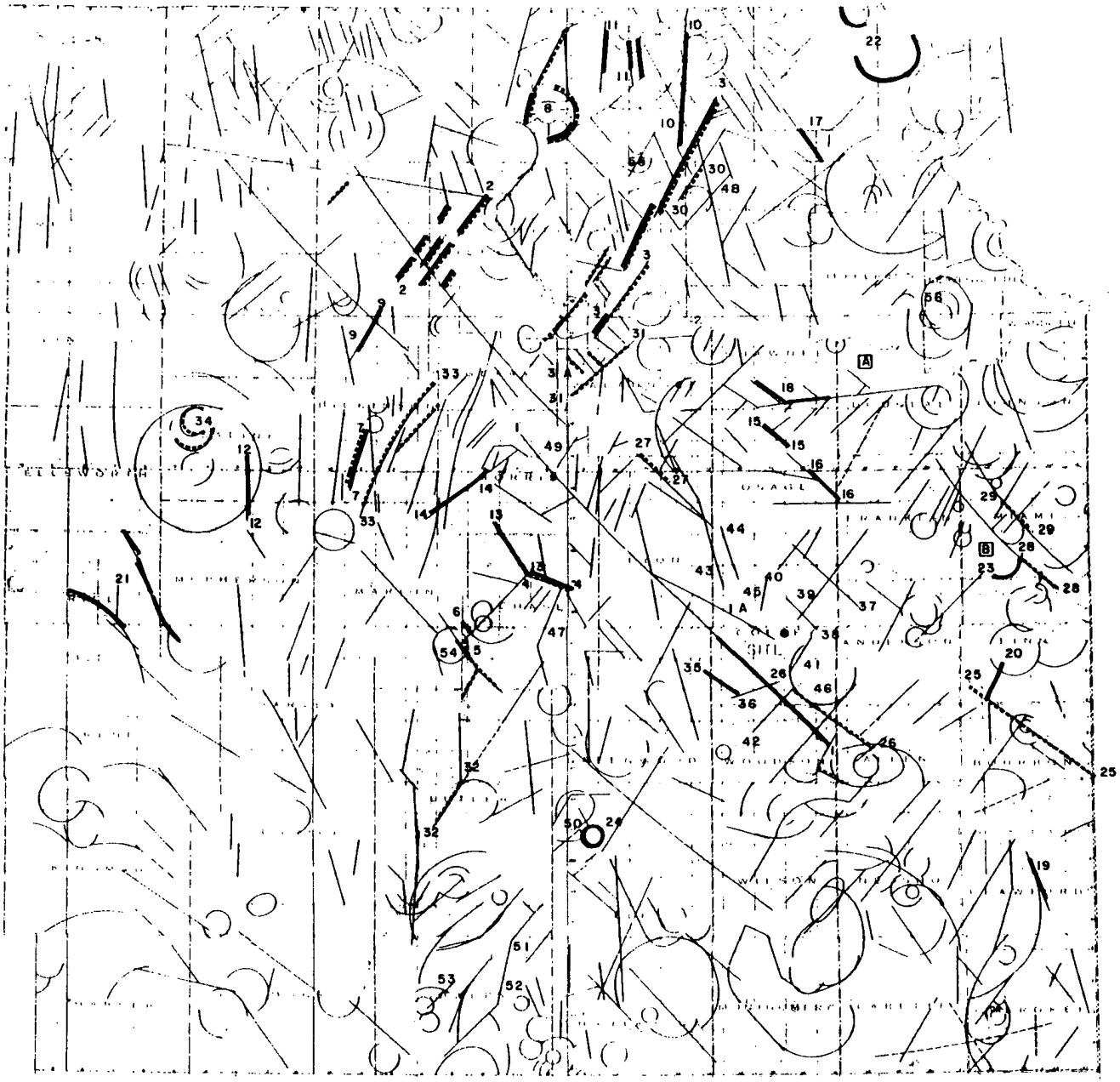
FEET
10 0 10 20 30

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-14c

Composite Map - Aeromagnetic Intensity and LANDSAT Lineaments

Rev. 0



KEY:

- [A] LOCATION OF BORINGS INTO CIRCULAR GEOPHYSICAL ANOMALIES
- LANDSAT LINEMENTS CORRELATING WITH TRENDS OR STRUCTURES ON THE PRECAMBRIAN SURFACE MAP.
- LANDSAT LINEAMENTS CORRELATING WITH TRENDS ON THE AEROMAGNETIC MAP.

MAP REFERENCE:

COLE, V. B., 1976, CONFIGURATION ON THE TOP OF PRECAMBRIAN ROCKS IN KANSAS: KANSAS GEOLOGIC SURVEY, MAP M-7, SCALE 1:500,000.

McCAULEY, J.R., DELLWIG, L. F., AND DAVISON, E. C., 1978, LANDSAT LINEAMENTS OF EASTERN KANSAS: KANSAS GEOLOGICAL SURVEY, MAP M-11, SCALE: 1:500,000.

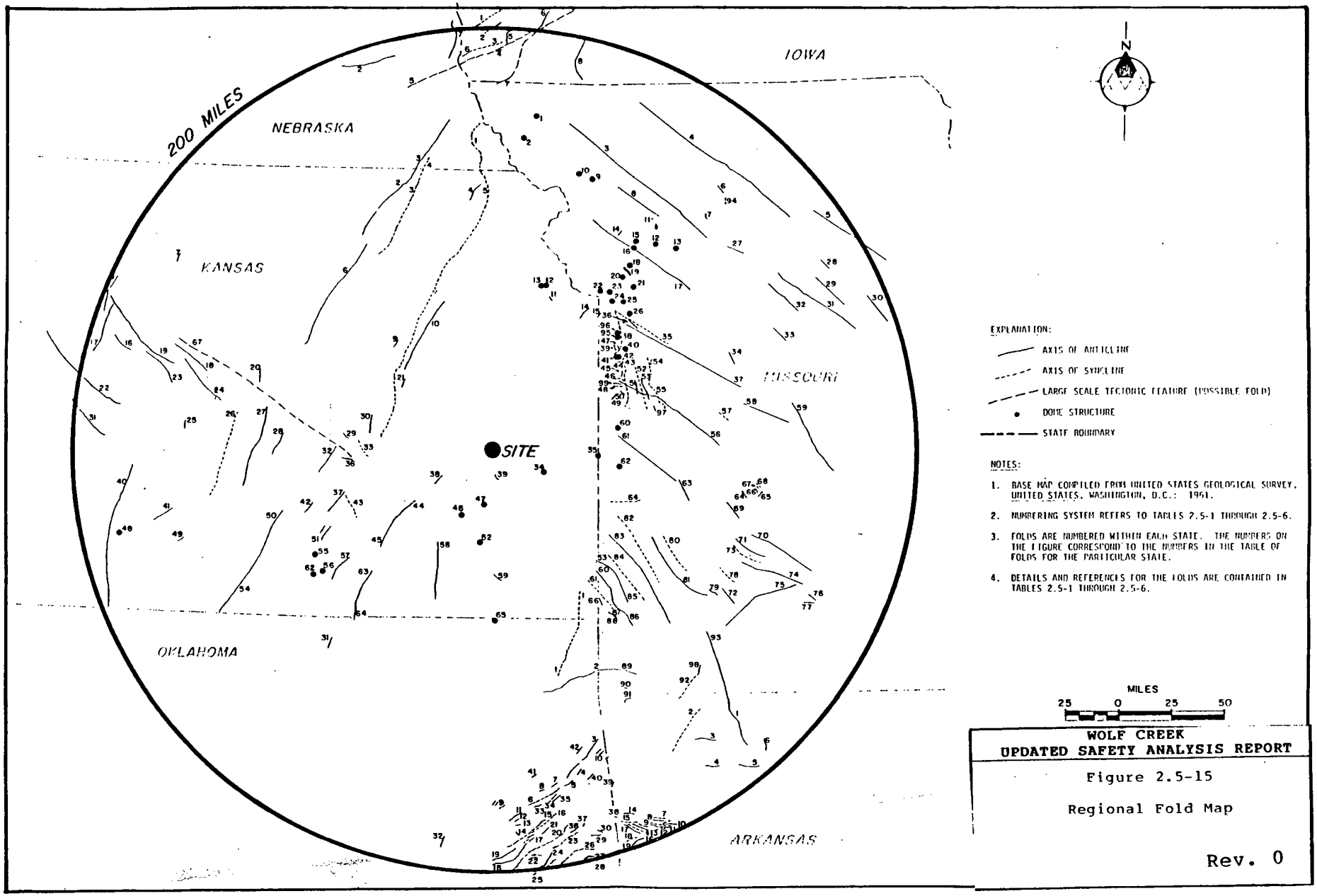
FEET
10 0 10 20 30

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-14d

Composite Map - Precambrian Surface and LANDSAT Lineaments

Rev. 0

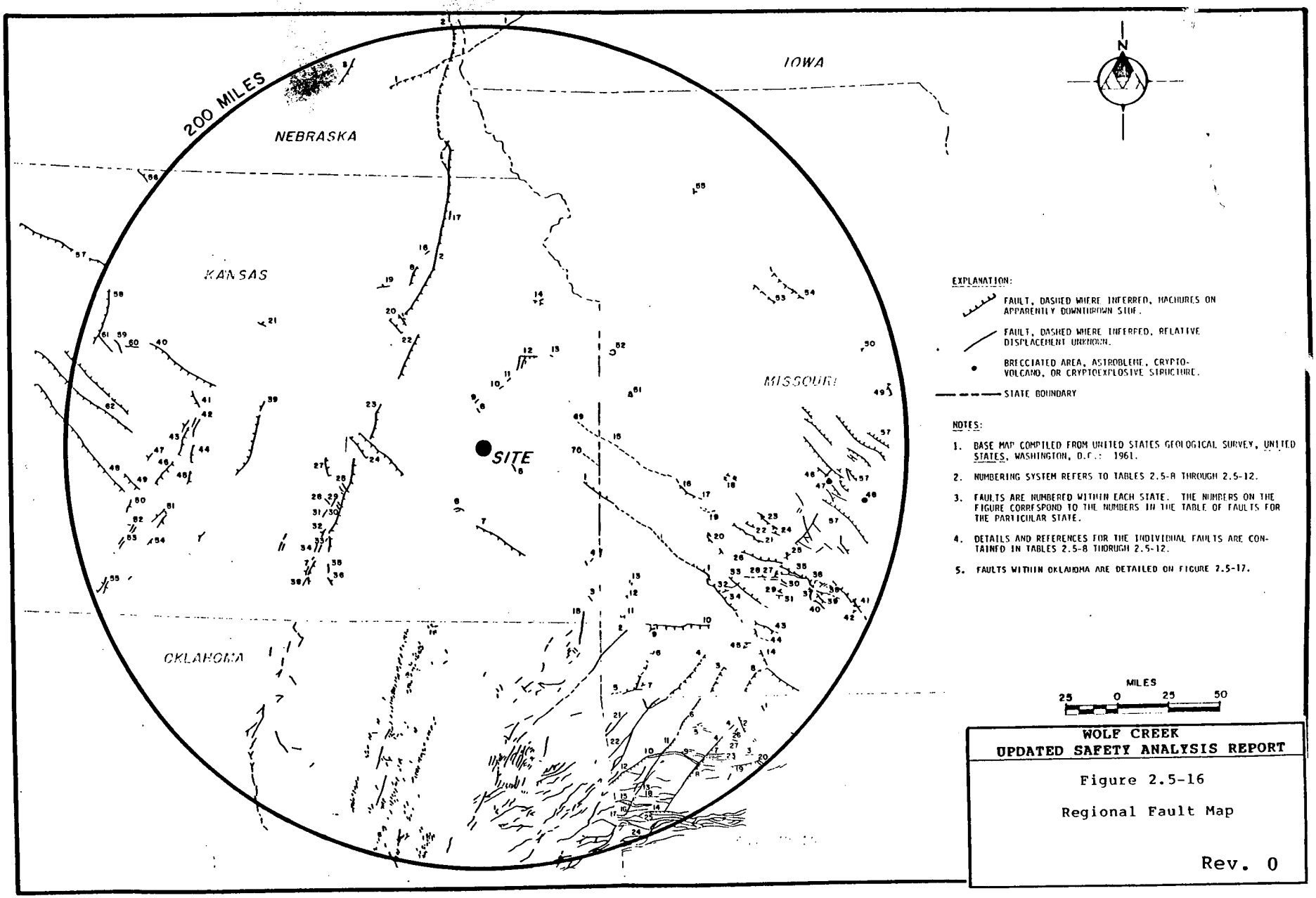


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-15

Regional Fold Map

Rev. 0

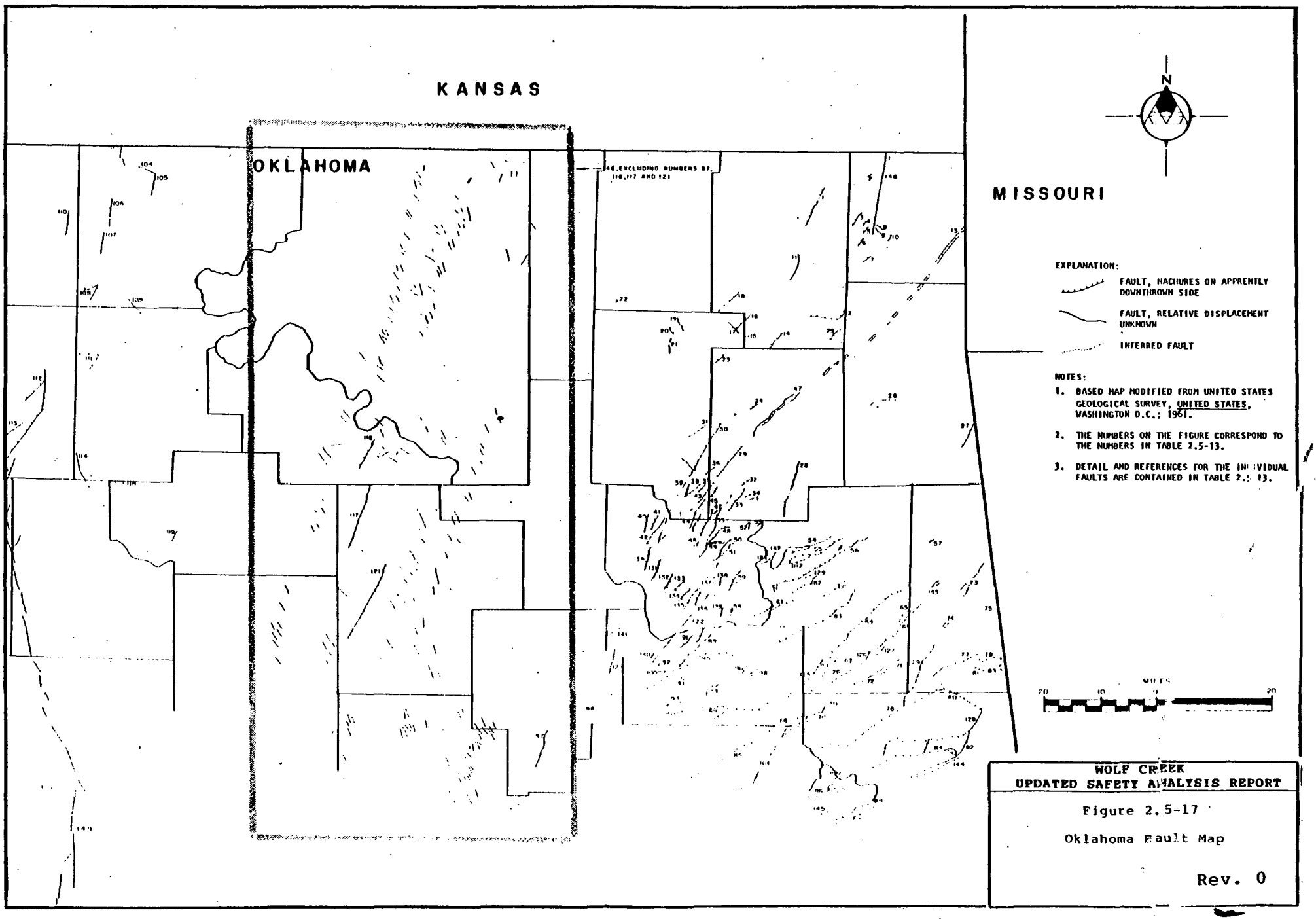


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-16

Regional Fault Map

Rev. 0

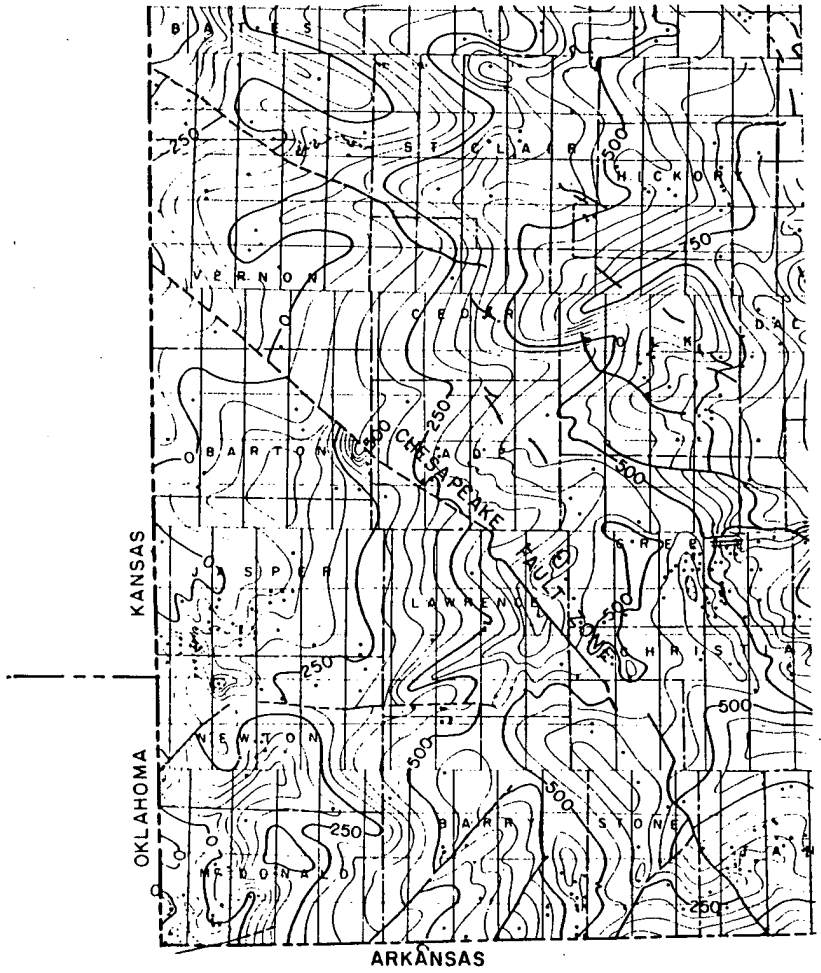


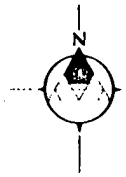
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-17

Oklahoma Fault Map

Rev. 0





EXPLANATION:

- CONTROL POINT
- MAPPED FAULT
- PROBABLE FAULT
- STATE BOUNDARY
- COUNTY BOUNDARY

NOTES:

1. MODIFIED FROM McCRACKEN AND McCRACKEN, 1965
2. MAP IS CONTOURED ON BASE OF ROUBIDOUX FORMATION.

SCALE

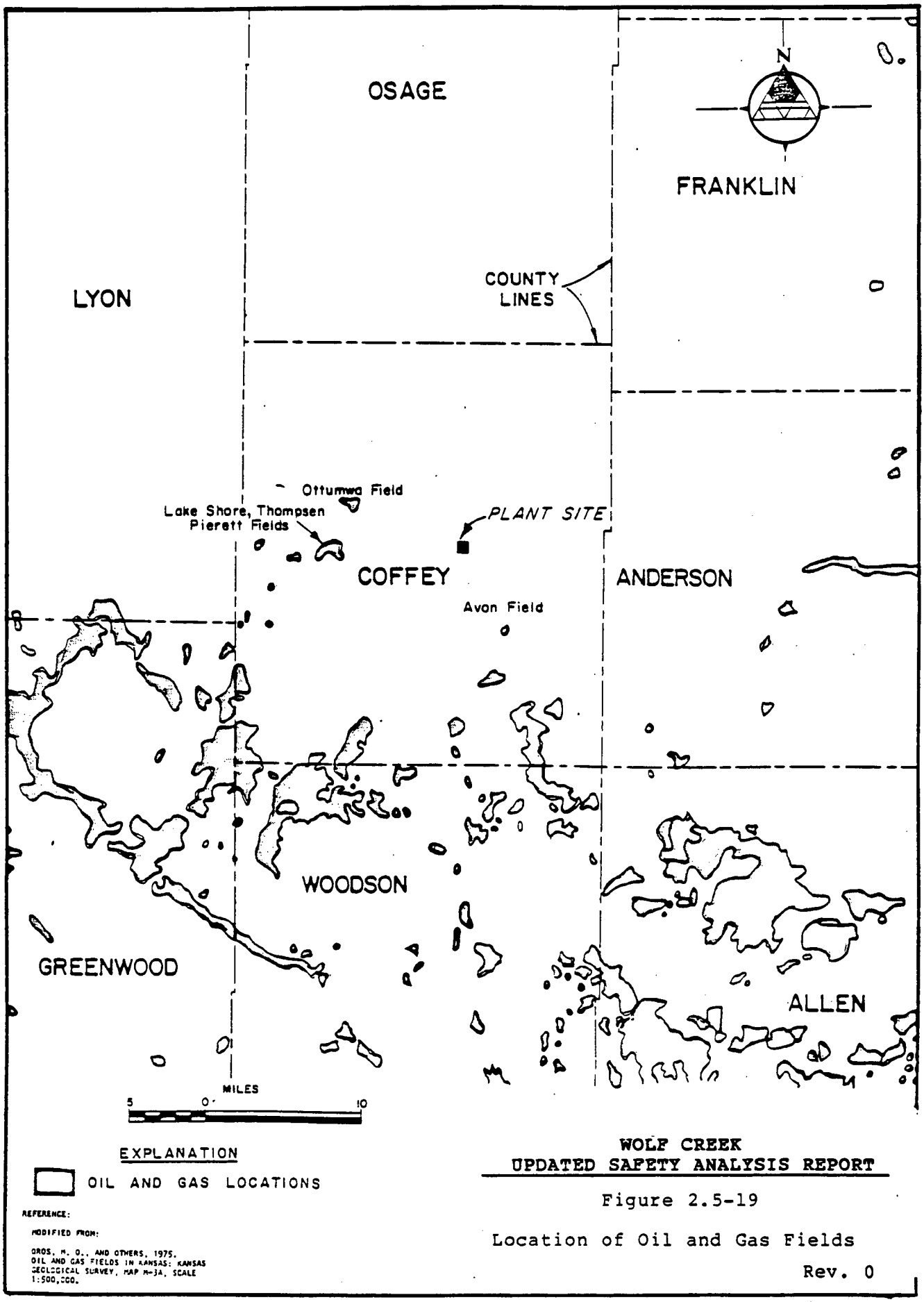
CONTOUR INTERVAL IS 50 FEET

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-18

Location of Control Points for Chesapeake Fault Zone for Missouri

Rev. 0

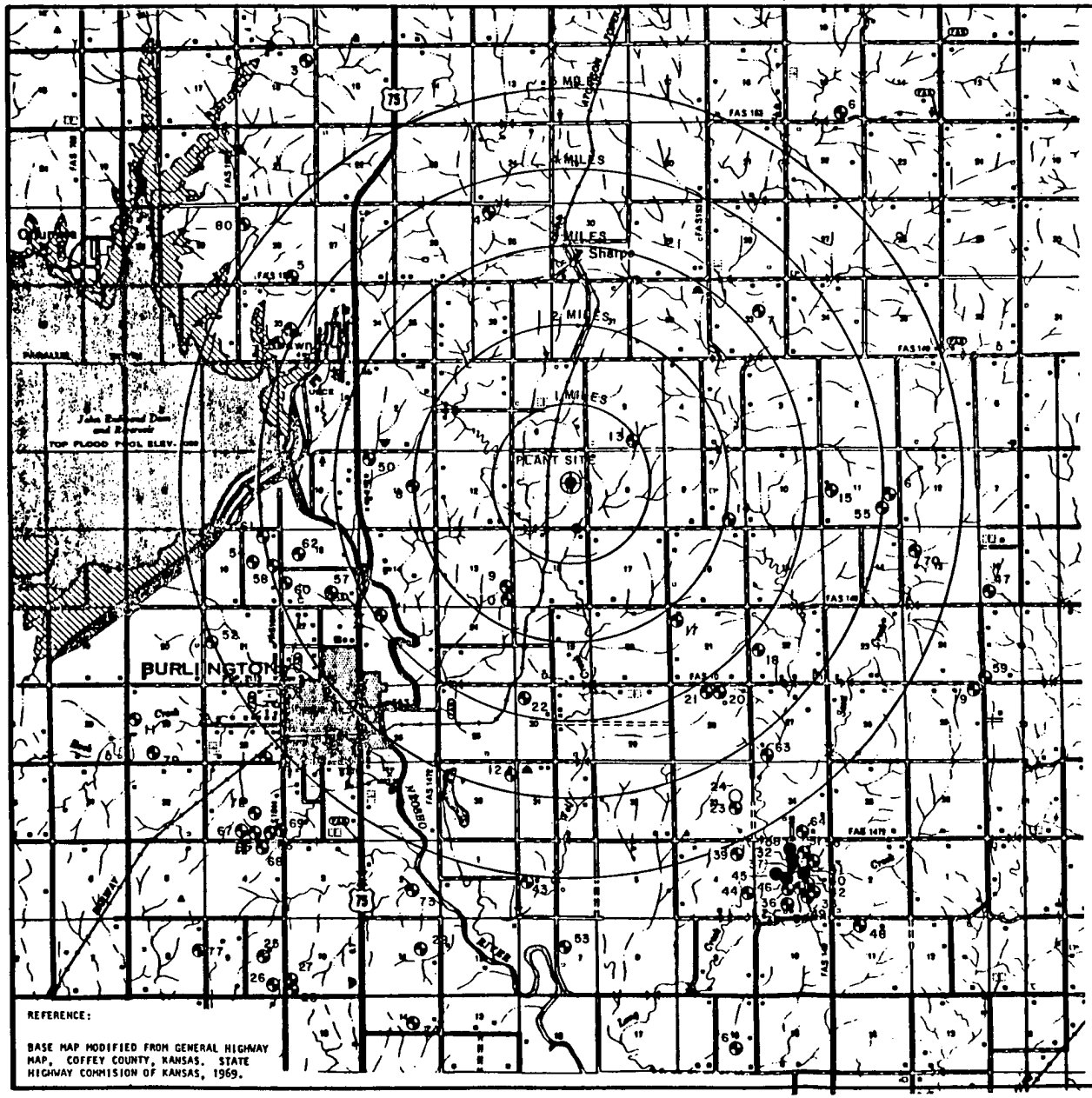


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-19

Location of Oil and Gas Fields

Rev. 0



N

EXPLANATION:

- DRY HOLE
- PRODUCING WELL
- ABANDONED LOCATION

NOTES:

1. INFORMATION COMPLETE THROUGH MAY 11, 1981
2. NUMBERING SYSTEM REFERS TO TABLE 2.5-16.

MILES

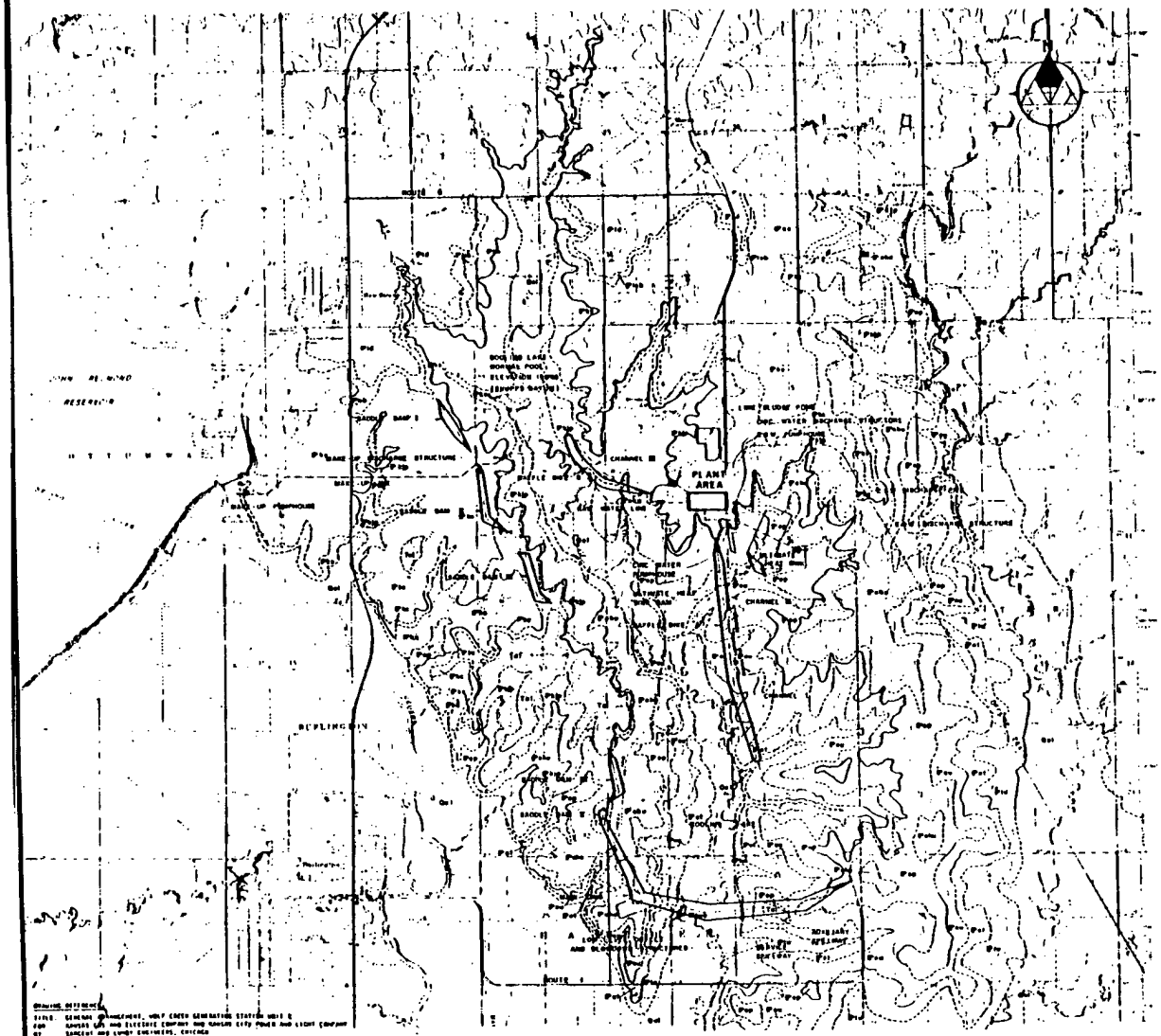
1 0 1 2 3

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-20

Location of Oil Wells



EXPLANATION

CONTACT VERIFIED BY FIELD OBSERVATION

CONTACT FROM AERIAL PHOTOGRAPHIC INTERPRETATION OR INFERRED

STRATIGRAPHIC SYMBOLS

SYMBOL	STRATIGRAPHIC NOMENCLATURE
Qal	QUATERNARY ALLUVIUM
Tal	TERTIARY GRAVELS
	LECOMPTON FORMATION
Pld	DONIPHAN SHALE MEMBER
Plsb	SPRING BRANCH LIMESTONE MEMBER
	KANWAKA FORMATION
Pks	STULL SHALE MEMBER
Pkc	CLAY CREEK LIMESTONE MEMBER
Pkjp	JACKSON PARK SHALE MEMBER
	OREAD FORMATION
Poha	HEUMADER SHALE MEMBER
Phe	UNDIFFERENTIATED JACKSON PARK SHALE, KEREFORD LIMESTONE AND HEUMADER SHALE MEMBERS
Pop	PLATTSMOUTH LIMESTONE MEMBER
Poh	HEEBNER SHALE MEMBER
Pol	LEAVENORTH LIMESTONE MEMBER
Pos	SNYDERVILLE SHALE MEMBER
Pou	UNDIFFERENTIATED HEEBNER SHALE, LEAVENORTH LIMESTONE AND SNYDERVILLE SHALE MEMBERS
Pot	TORONTO LIMESTONE MEMBER
Plw	LAWRENCE FORMATION

NOTE:
FIGURE 2.5-41 IS A DETAILED STRATIGRAPHIC SECTION OF THE UNITS ENCOUNTERED AT THE SURFACE AND IN THE BORING PROGRAM IN THE SITE AREA.

TOPOGRAPHIC CONTOUR INTERVAL IS 10 FEET WITH SUPPLEMENTARY CONTOURS AT 5 FEET

FEET

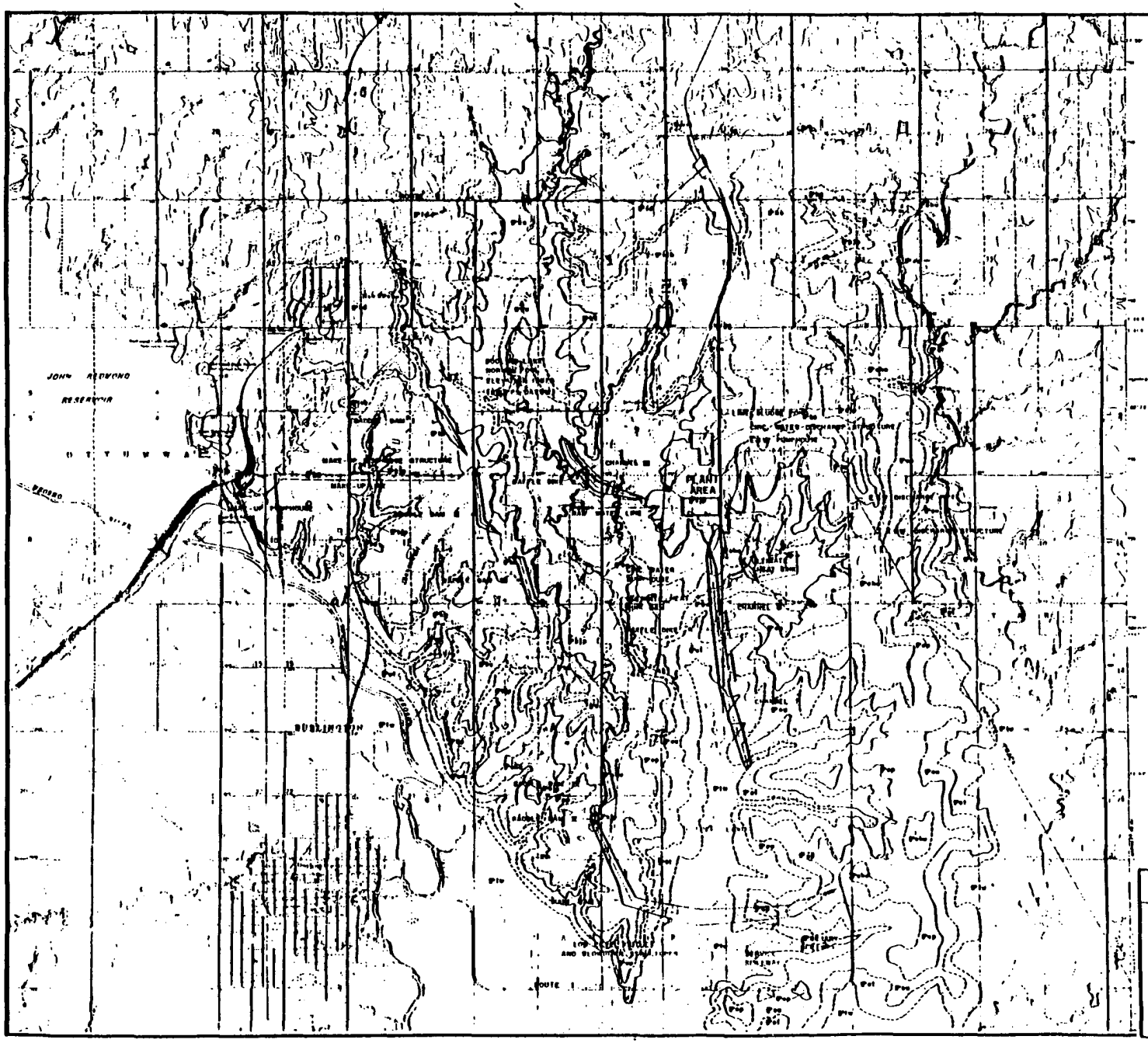
0 2000 4000 6000 8000

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-21

Surficial Geologic Map - Site

Rev. 0



N

EXPLANATION

CONTACT VERIFIED BY FIELD OBSERVATION

CONTACT FROM AERIAL PHOTOGRAPHIC INTERPRETATION OR INFERRED

STRATIGRAPHIC SYMBOLS

SYMBOL	STRATIGRAPHIC NOMENCLATURE
	LECOMPTON FORMATION
Pld	Doniphan Shale Member
Plsb	Spring Branch Limestone Member
	KANWAKA FORMATION
Pks	Stull Shale Member
Pkc	Clay Creek Limestone Member
Pkjp	Jackson Park Shale Member
	ORTAD FORMATION
Pohu	Heumader Shale Member
Pbu	Undifferentiated Jackson Park Shale, Bergford Limestone and Heumader Shale Members
Pmp	Plattsmouth Limestone Member
Pmh	Heebner Shale Member
Pml	Leavenworth Limestone Member
Pms	Snyderville Shale Member
Pmu	Undifferentiated Heebner Shale, Leavenworth Limestone and Snyderville Shale Members
Pmt	Toronto Limestone Member
Plw	LAWRENCE FORMATION

NOTES

1. FIGURE 2.5-41 IS A DETAILED STRATIGRAPHIC COLUMN OF THE UNITS PRESENT AT THE SURFACE IN THE SITE AREA.
2. FIGURE 2.5-21 SHOWS THE SURFICIAL GEOLOGY OF THE SITE AREA.
3. FIGURE 2.5-23 SHOWS DETAILS OF BEDROCK GEOLOGY IN THE CATEGORY I AREA.

TOPOGRAPHIC CONTOUR INTERVAL IS 10 FEET WITH SUPPLEMENTARY CONTOURS AT 5 FEET

DRAWING REFERENCE:

TITLE: GENERAL ARRANGEMENT, WOLF CREEK GENERATING STATION UNIT 1
FOR: KANSAS GAS AND ELECTRIC COMPANY AND KANSAS CITY POWER AND LIGHT COMPANY
BY: SARGENT AND LUNDY ENGINEERS, CHICAGO
DRAWING NO. S-1, Rev. 0
DATED: 11/17/76

MAP DATE PREPARED FROM U.S.G.S. TOPOGRAPHIC QUADRANGLES, 7.5' SERIES; BURLINGTON, KANSAS, 1971; JOHN REDMOND DAM, KANSAS, 1966; NEW STRAWN, KANSAS, 1971; OTTUMWA, KANSAS, 1970. MILES

FEET

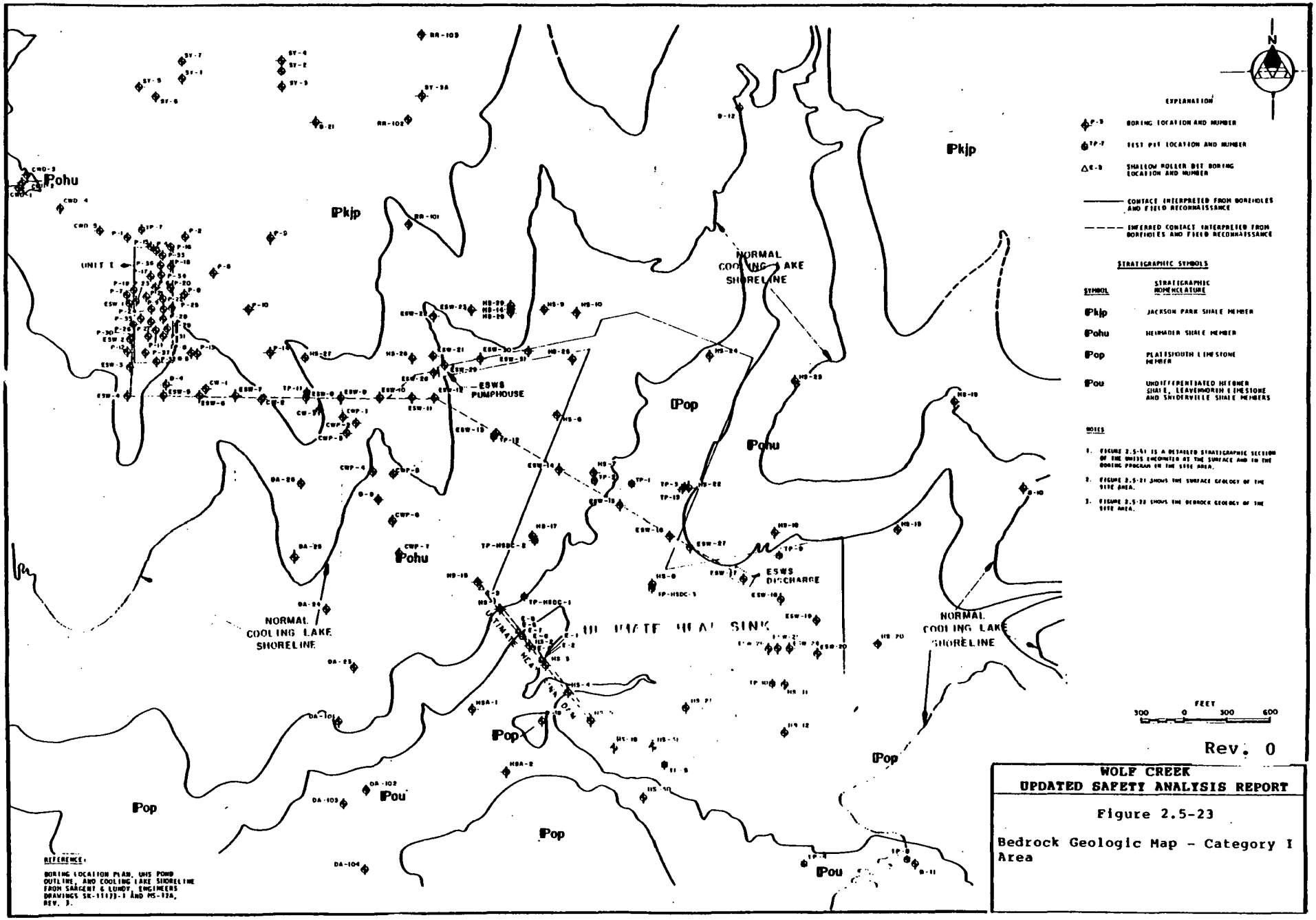
0 2000 4000 6000 8000

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-22

Bedrock Geologic Map - Site

Rev. 0

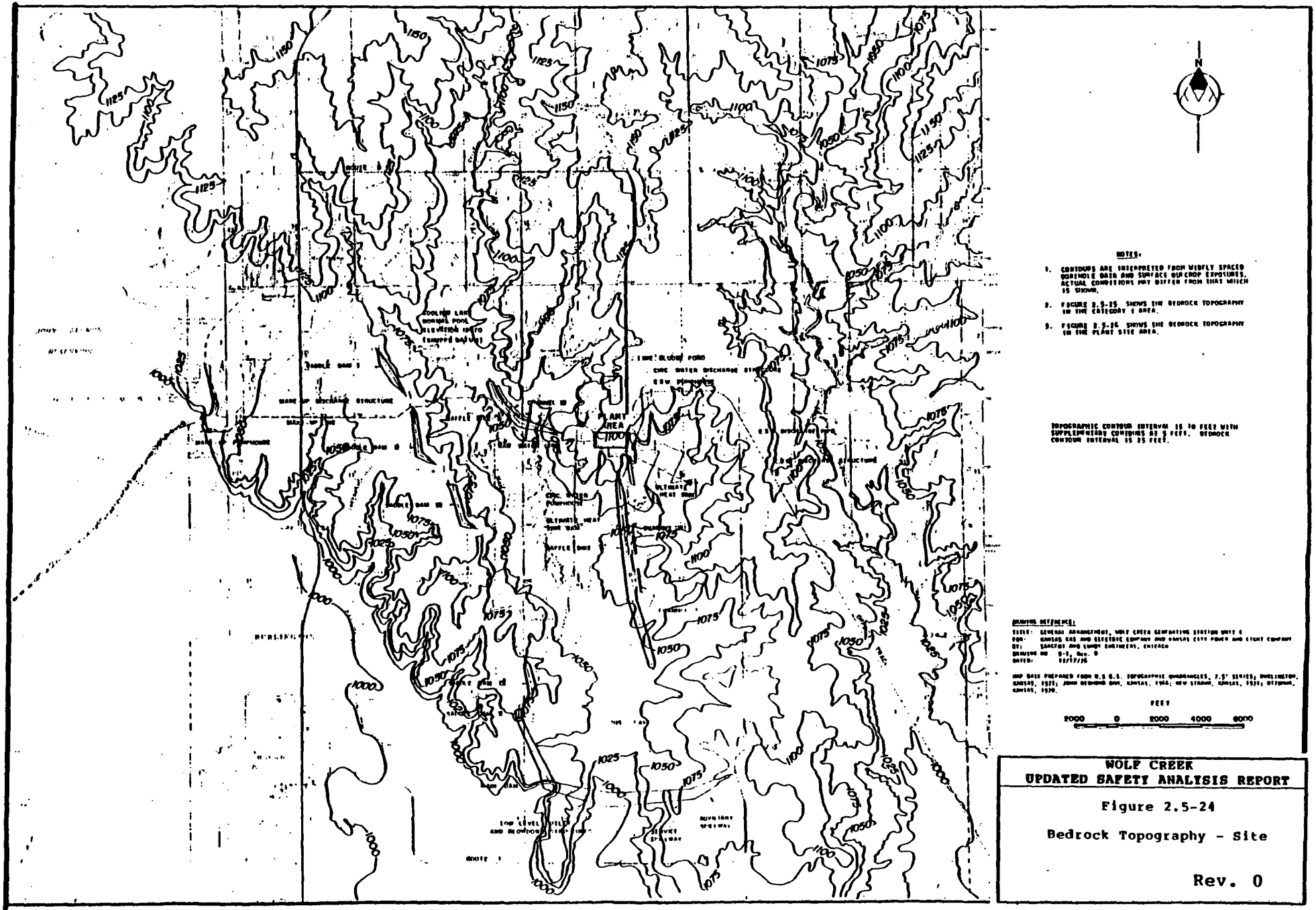


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-23

Bedrock Geologic Map - Category I Area

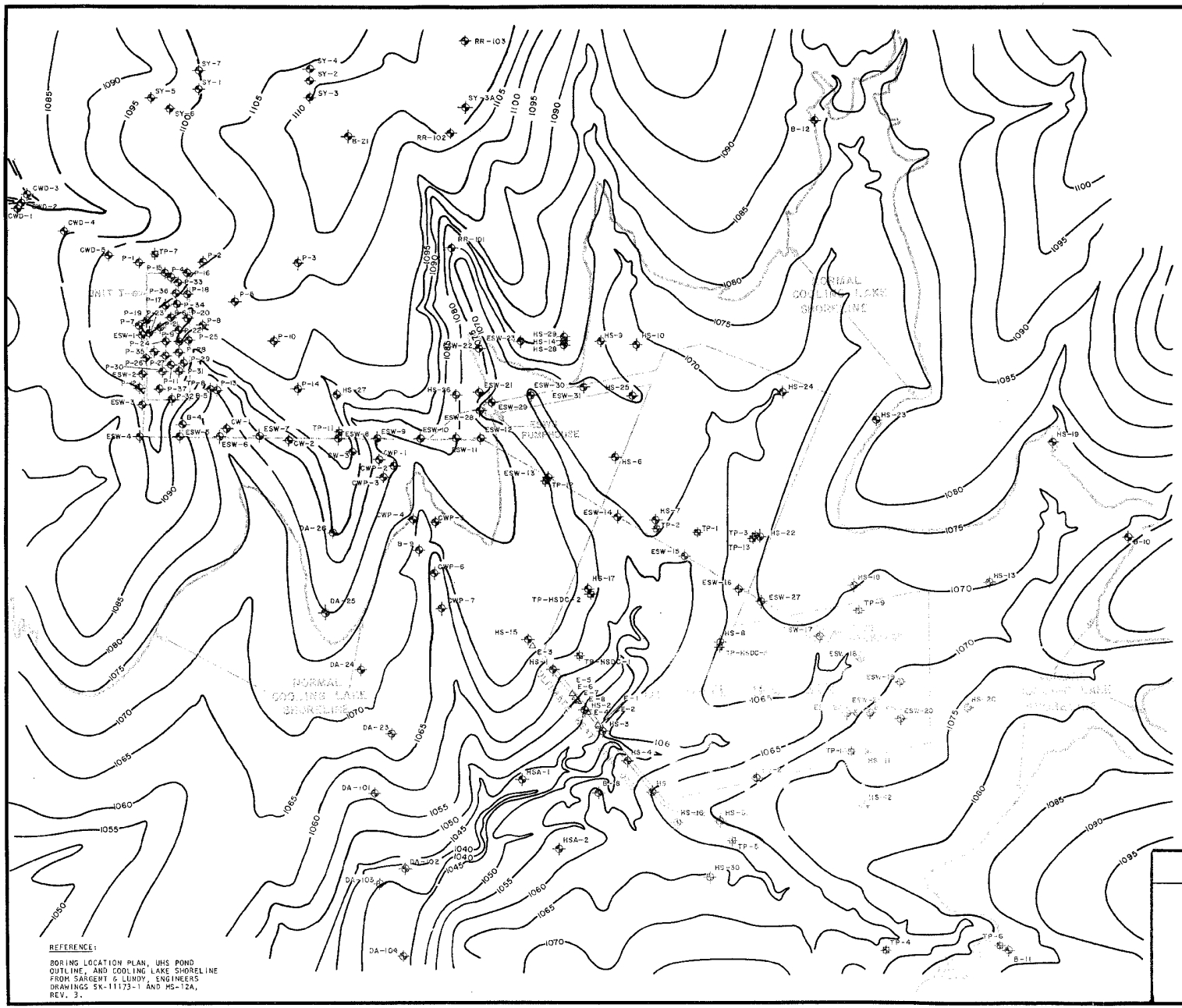


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-24

Bedrock Topography - Site

Rev. 0



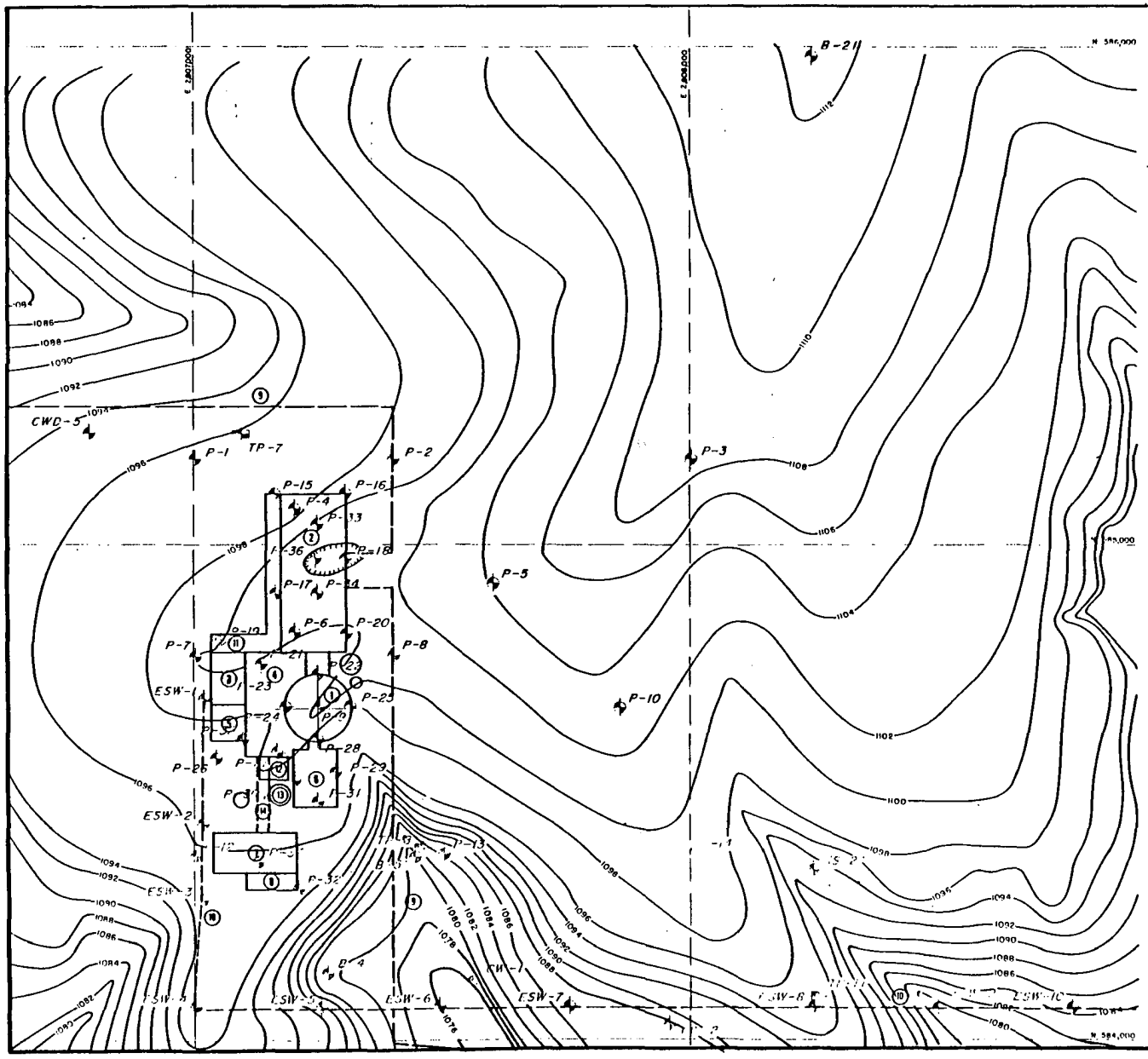
BORING NUMBER	ELEVATION OF UNIT	BORING NUMBER	ELEVATION OF UNIT	BORING NUMBER	ELEVATION OF UNIT
B-4	1082.5	HS-6	1069.9	ESW-17	1069.0
B-5	1078.4	HS-7	1062.5	ESW-18	1068.5
B-9	1060.5	HS-8	1065.0	ESW-19	1071.3
B-10	1079.3	HS-9	1070.2	ESW-20	1072.0
B-11	1083.0	HS-10	1071.1	ESW-21	1077.6
B-12	1082.2	HS-11	1072.3	ESW-22	1075.9
B-18	1060.3	HS-12	1077.7	ESW-23	1081.5
B-21	1113.3	HS-13	1071.7	ESW-24	1070.2
P-1	1096.8	HS-14	1076.7	ESW-25	1070.4
P-2	1098.6	HS-15	1071.9	ESW-26	1068.2
P-3	1109.0	HS-16	1066.6	ESW-27	1070.4
P-4	1097.6	HS-17	1067.0	ESW-28	1067.0
P-5	1104.1	HS-18	1070.5	ESW-29	1068.2
P-6	1100.1	HS-19	1073.2	ESW-30	1063.3
P-7	1100.0	HS-20	1076.4	ESW-31	1058.1
P-8	1100.6	HS-21	1069.5	CW-1	1076.0
P-9	1109.2	HS-22	1068.5	CW-2	1087.7
P-10	1103.7	HS-23	1076.4	CW-3	1093.0
P-11	1097.2	HS-24	1067.1	CWD-1	1085.8
P-12	1095.7	HS-25	1072.8	CWD-2	1078.3
P-13	1083.3	HS-26	1080.5	CWD-3	1082.7
P-14	1099.3	HS-27	1092.7	CWD-4	1089.6
P-15	1096.7	HS-28	1075.8	CWD-5	1095.4
P-16	1099.6	HS-29	1081.1	CWP-1	1082.3
P-17	1100.6	HS-30	1056.3	CWP-2	1080.6
P-18	1096.6	HS-31	1070.9	CWP-3	1080.0
P-19	1099.7	HSA-1	1060.5	CWP-4	1074.2
P-20	1099.5	HSA-2	1058.8	CWP-5	1073.5
P-21	1099.9	TP-1	1067.7	CWP-6	1060.2
P-22	1099.6	TP-2	1073.3	CWP-7	1060.5
P-23	1099.4	TP-3	1073.7	DA-23	1066.4
P-24	1098.1	TP-4	1075.6	DA-24	1073.0
P-25	1097.9	TP-5	1073.7	DA-25	1082.0
P-26	1097.5	TP-6	1090.3	DA-26	1091.2
P-27	1098.3	ESW-1	1095.3	DA-101	1036.9
P-28	1097.6	ESW-2	1096.4	DA-102	1038.6
P-29	1097.0	ESW-3	1095.1	DA-103	1037.1
P-30	1097.3	ESW-4	1094.5	DA-104	1044.6
P-31	1097.5	ESW-5	1087.5	RR-101	1078.0
P-32	1095.2	ESW-6	1076.8	RR-102	1111.9
P-33	1100.1	ESW-7	1086.9	RR-103	1111.1
P-34	1101.2	ESW-8	1095.2	SY-1	1100.1
P-35	1097.7	ESW-9	1079.0	SY-2	1109.0
P-36	1098.6	ESW-10	1084.6	SY-3	1110.1
P-37	1095.7	ESW-11	1079.5	SY-3A	1111.7
HS-1	1062.5	ESW-12	1073.1	SY-4	1105.0
HS 2	1053.7	ESW-13	1067.5	SY-5	1096.0
HS-3	1059.7	ESW-14	1064.3	SY-6	1098.2
HS-4	1057.4	ESW-15	1063.2	SY-7	1100.6
HS-5	1065.1	ESW-16	1068.8		

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

FIGURE 2.5-25

BEDROCK TOPOGRAPHY
CATEGORY 1 AREA



N

EXPLANATION:

1. CONTAINMENT*
2. TURBINE BLDG.
3. CONTROL BLDG.*
4. AUXILIARY BLDG.*
5. EMER. DIESEL GEN. BLDG.*
6. FUEL POST BLDG.*
7. RADWASTE BLDG.
8. FROM STORAGE (SOLID WASTE)
9. COOLING WATER PIPELINES
10. ESWS PIPELINES*
11. CONTROL BLDG. COMMUNICATIONS CORRIDOR
12. HOT MACHINE SHOP
13. REFUELING WATER STORAGE TANK
14. RADWASTE PIPE TUNNEL*

* CATEGORY I

P-3 BORING LOCATION AND NUMBER

TP-7 TEST PIT LOCATION AND NUMBER

NOTES:

1. CONTOURS ARE INTERPRETED FROM BOREHOLE DATA AND SURFACE OUTCROP EXPOSURES. ACTUAL CONDITION MAY DIFFER FROM THAT WHICH IS SHOWN.
2. FIGURE 2.5-24 SHOWS BEDROCK TOPOGRAPHY IN THE SITE.
3. FIGURE 2.5-25 SHOWS BEDROCK TOPOGRAPHY IN THE CATEGORY I AREA.
4. ELEVATION USED TO PREPARE MAP ARE AS FOLLOWS:

BORING NUMBER	ELEVATION OF UNIT	BORING NUMBER	ELEVATION OF UNIT
B-4	1082.5	P-26	1092.5
B-5	1078.4	P-27	1099.3
B-21	1113.3	P-28	1092.6
P-1	1096.8	P-29	1092.0
P-2	1098.6	P-30	1092.1
P-3	1103.0	P-31	1092.5
P-4	1092.6	P-32	1095.2
P-5	1104.1	P-33	1100.1
P-6	1100.1	P-34	1101.2
P-7	1100.0	P-35	1092.2
P-8	1100.6	P-36	1098.6
P-9	1100.2	P-37	1092.2
P-10	1103.7	MS-22	1092.7
P-11	1092.2	TP-7	1102.3
P-12	1095.7	TP-8	1096.2
P-13	1083.3	ESW-1	1099.3
P-14	1099.3	ESW-2	1096.4
P-15	1096.7	ESW-3	1095.1
P-16	1099.6	ESW-4	1096.9
P-17	1100.6	ESW-5	1092.5
P-18	1096.6	ESW-6	1076.8
P-19	1099.7	ESW-7	1081.9
P-20	1099.5	ESW-8	1095.2
P-21	1099.9	ESW-9	1079.0
P-22	1099.6	ESW-10	1084.6
P-23	1099.4	CW-1	1076.0
P-24	1098.1	CW-2	1082.7
P-25	1097.9	CWD-5	1095.4

BEDROCK CONTOUR INTERVAL IS 2 FEET.

100 0 100 200 300

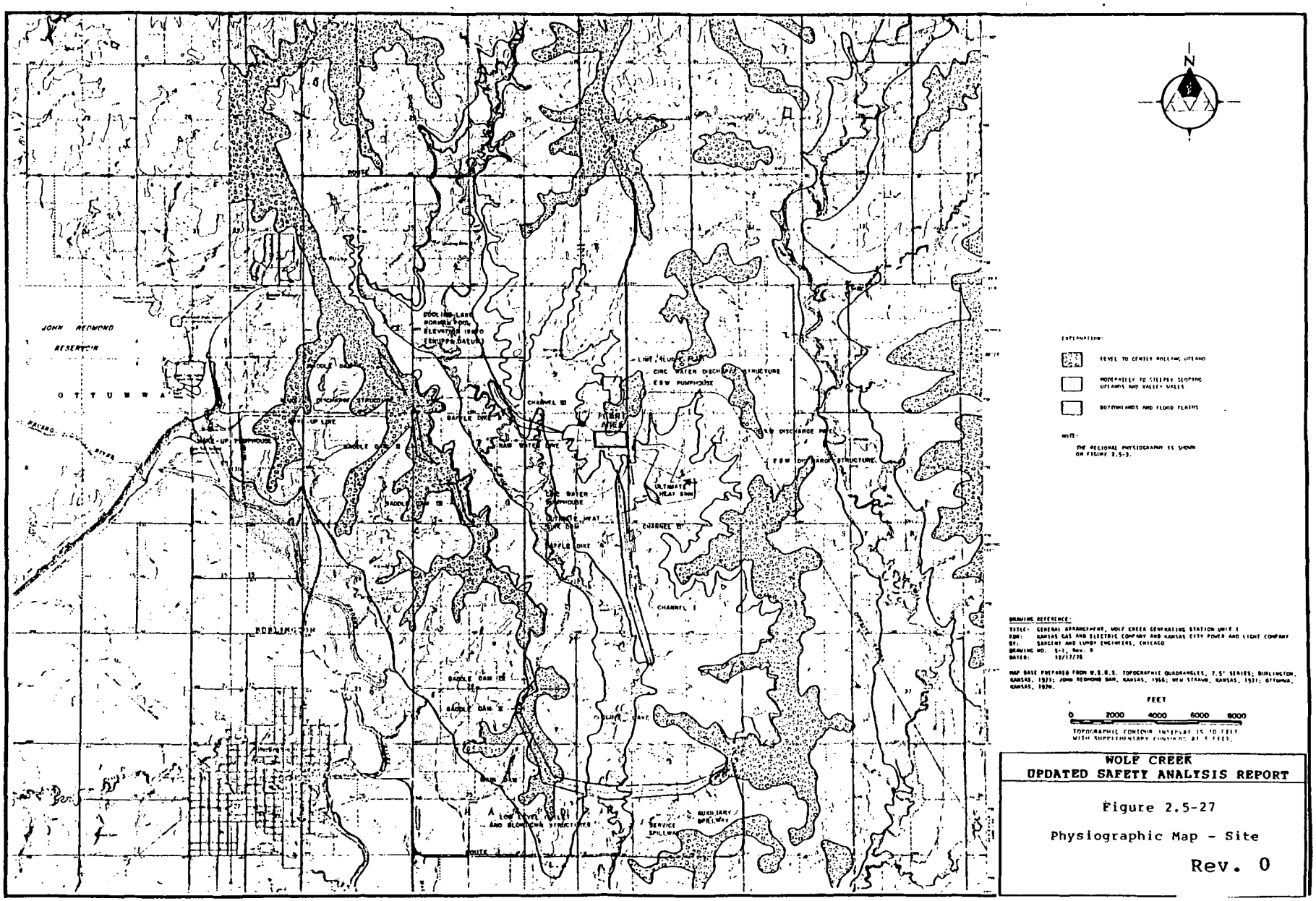
SCALE IN FEET

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-26

Bedrock Topography - Plant Site

Rev. 0

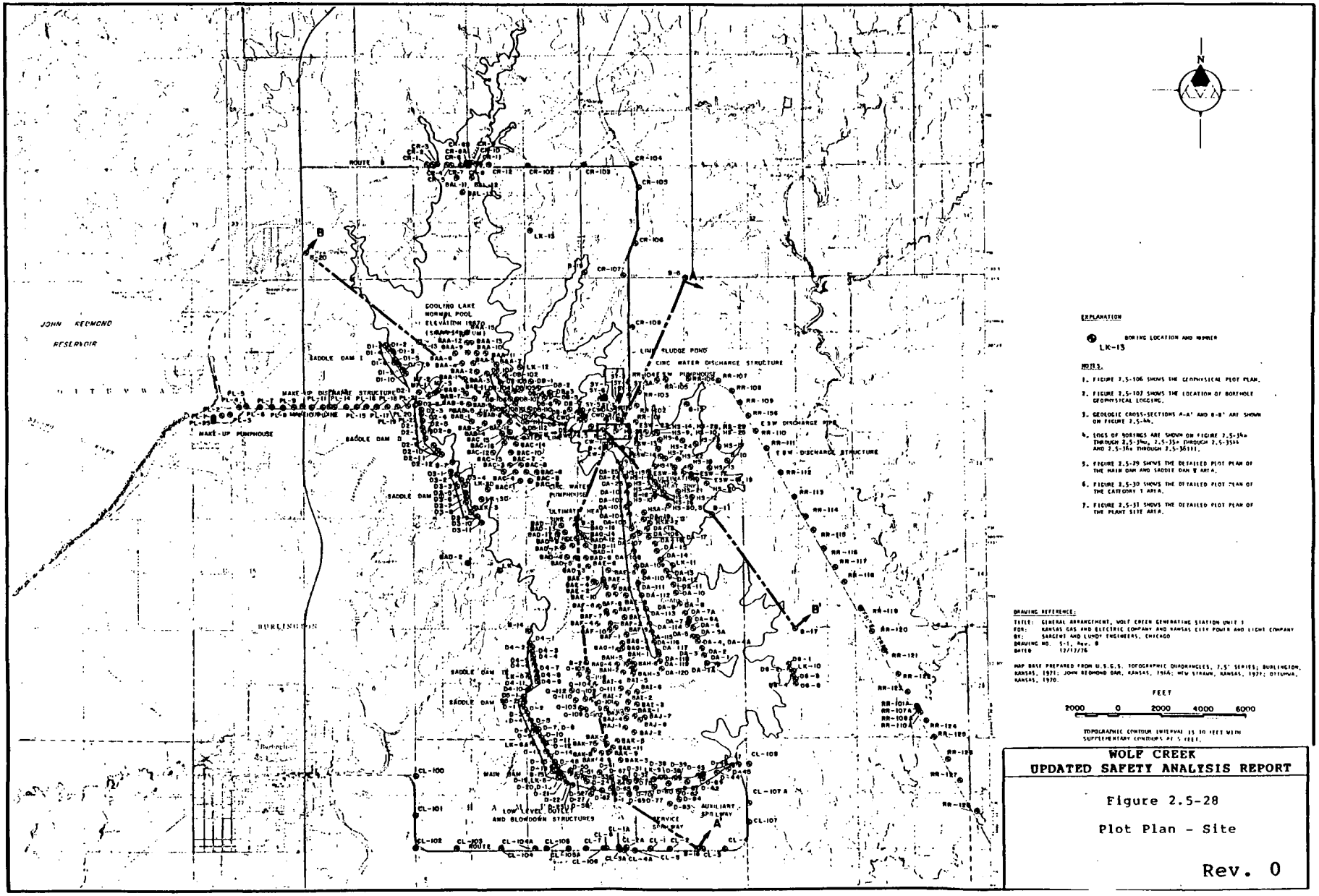


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-27

Physiographic Map - Site

Rev. 0



EXPLANATION

LR-13 BORING LOCATION AND NUMBER

NOTES:

1. FIGURE 2.5-106 SHOWS THE GEOPHYSICAL PLOT PLAN.
2. FIGURE 2.5-107 SHOWS THE LOCATION OF BOREHOLE GEOPHYSICAL LOGGING.
3. GEOLOGIC CROSS-SECTIONS A-A' AND B-B' ARE SHOWN ON FIGURE 2.5-44.
4. LOGS OF BORINGS ARE SHOWN ON FIGURE 2.5-34a THROUGH 2.5-34q, 2.5-35a THROUGH 2.5-35bb AND 2.5-36a THROUGH 2.5-36111.
5. FIGURE 2.5-29 SHOWS THE DETAILED PLOT PLAN OF THE MAIN DAM AND SADDLE DAM 1 AREA.
6. FIGURE 2.5-30 SHOWS THE DETAILED PLOT PLAN OF THE CATEGORY 1 AREA.
7. FIGURE 2.5-31 SHOWS THE DETAILED PLOT PLAN OF THE PLANT SITE AREA.

DRAWING REFERENCE:

TITLE: GENERAL ARRANGEMENT, WOLF CREEK GENERATING STATION UNIT 1
FOR: KANSAS GAS AND ELECTRIC COMPANY AND KANSAS CITY POWER AND LIGHT COMPANY
BY: SARGENT AND LUNDY ENGINEERS, CHICAGO
DRAWING NO. 5-1, Rev. 8
DATED 12/17/76

MAP BASE PREPARED FROM U.S.G.S. TOPOGRAPHIC QUADRANGLES, 7.5' SERIES; BURLINGTON, KANSAS, 1971; JOHN REDMOND DAM, KANSAS, 1968; NEW STRAUN, KANSAS, 1971; OTTUMWA, KANSAS, 1970.

FEET
2000 0 2000 4000 6000

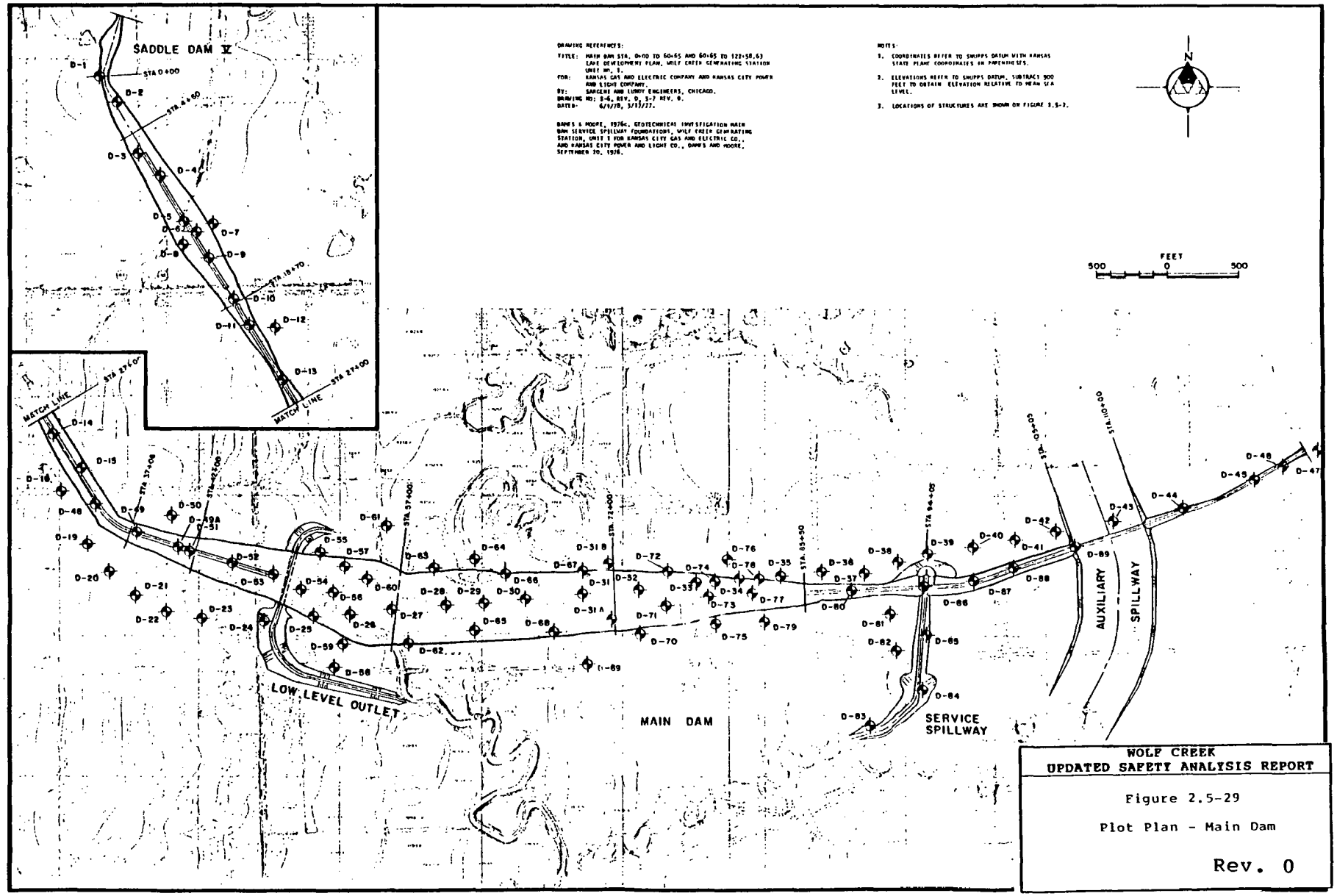
TOPOGRAPHIC CONTOUR INTERVAL IS 10 FEET WITH SUPPLEMENTARY CONTOURS AT 5 FEET.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-28

Plot Plan - Site

Rev. 0

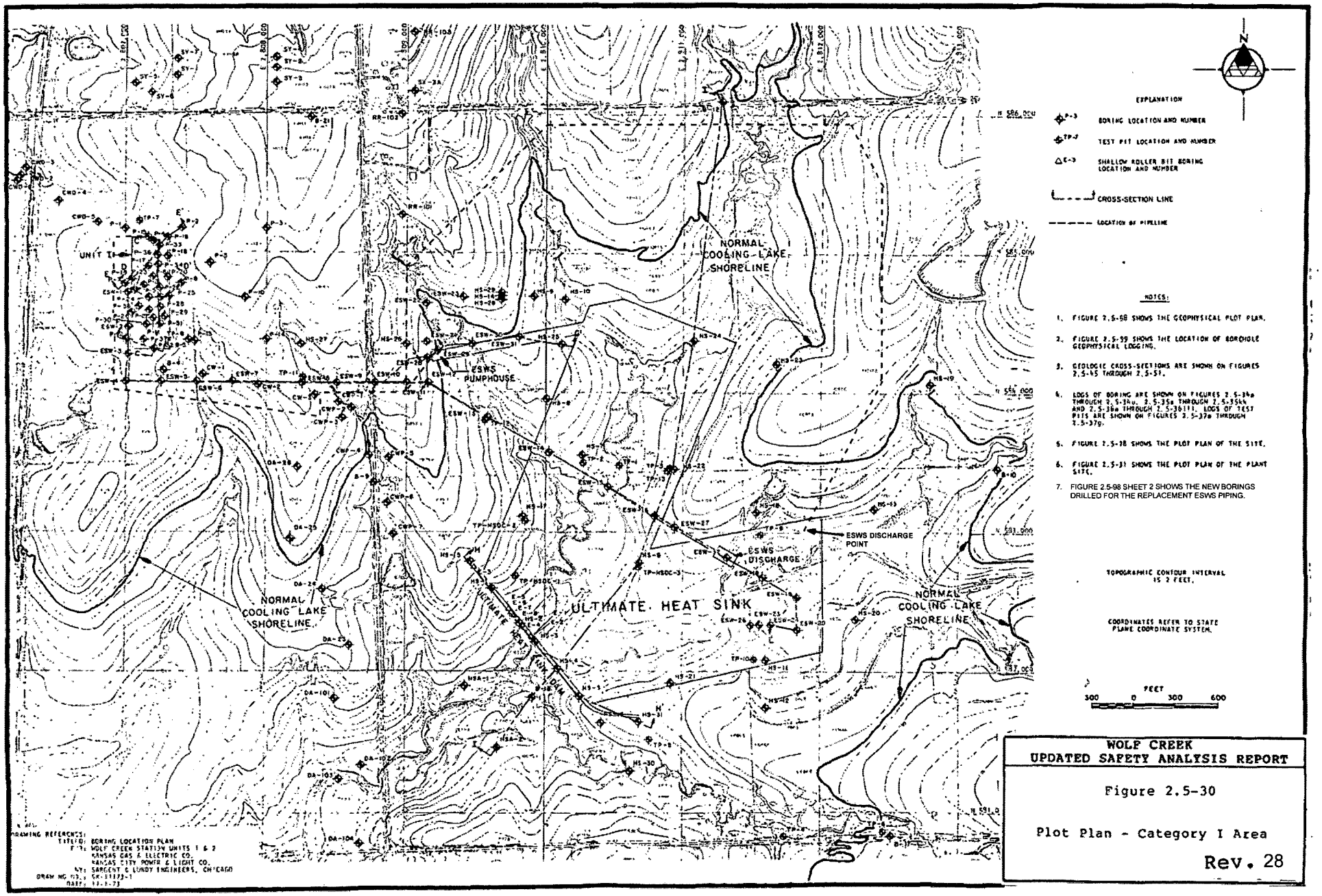


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-29

Plot Plan - Main Dam

Rev. 0

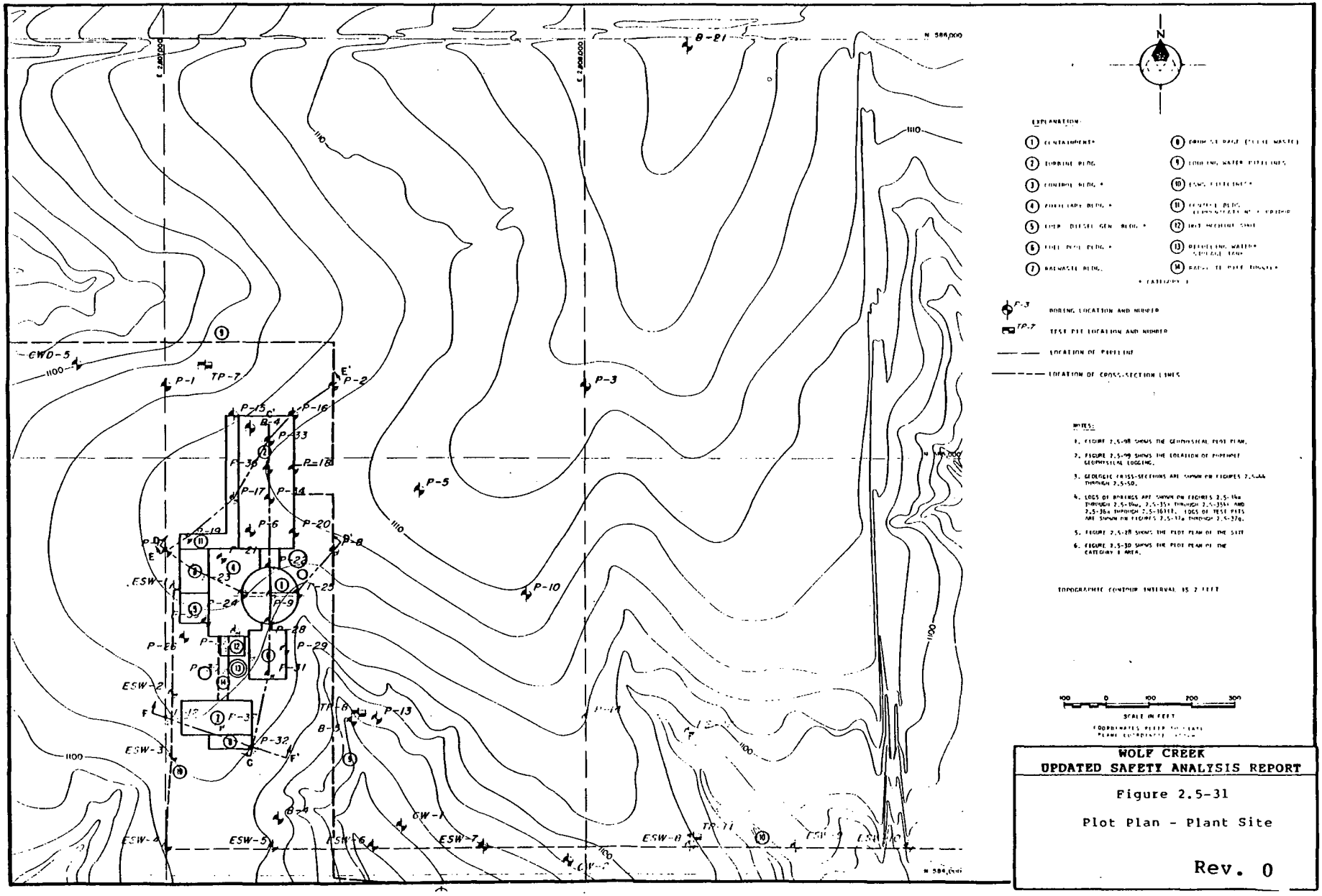


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-30

Plot Plan - Category I Area

Rev. 28



WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-31

Plot Plan - Plant Site

Rev. 0

EXPLANATION OF TEST DATA SYMBOLS

LL	LIQUID LIMIT
PL	PLASTIC LIMIT
PI	PLASTICITY INDEX
D	DRY DENSITY (POUNDS PER CUBIC FOOT)
Dm	MAXIMUM DRY DENSITY (POUNDS PER CUBIC FOOT)
W	MOISTURE CONTENT (PERCENT)
Wo	OPTIMUM MOISTURE CONTENT (PERCENT)
S	SHEAR STRENGTH (POUNDS PER SQUARE FOOT)
Sp	PEAK SHEAR STRENGTH (POUNDS PER SQUARE FOOT)
Sy	YIELD SHEAR STRENGTH (POUNDS PER SQUARE FOOT)
P	CONFINING PRESSURE (POUNDS PER SQUARE INCH)
Q	UNCONFINED COMPRESSIVE STRENGTH (POUNDS PER SQUARE FOOT)
E	MODULUS OF ELASTICITY (POUNDS PER SQUARE INCH)
Id	SLAKE DURABILITY INDEX (TWO CYCLE TEST)
Kr	RECOMPACTED PERMEABILITY (CENTIMETERS PER SECOND)
Ku	PERMEABILITY OBTAINED FROM UNDISTURBED SAMPLE (CENTIMETERS PER SECOND)

1* RESULTS OF PARTICLE SIZE ANALYSES ARE SHOWN ON FIGURE 2.5-90

2* CONSOLIDATION CURVES ARE SHOWN ON FIGURES 2.5-88a THROUGH 2.5-88j.

3* CLAY MINERALOGY IS SHOWN IN TABLE 2.5-43

4* SWELLING POTENTIALS ARE AVAILABLE IN TABLE 2.5-44

5* RESULTS OF RESONANT COLUMN TESTS ARE PRESENTED IN TABLES 2.5-40.

6* RESULTS OF DYNAMIC TRIAXIAL TESTS ARE PRESENTED IN TABLE 2.5-42 AND ON FIGURE 2.5-92.



PERMEABILITY OBTAINED FROM BOREHOLE PRESSURE TESTS.

HORIZONTAL SOLID LINES SEPARATE TESTED INTERVAL.

ZERO (0) VALUES INDICATE NO WATER WAS LOST DURING PRESSURE TESTING.

90% PERCENT RECOVERED INDICATES TOTAL AMOUNT OF CORE RECOVERED FOR EACH RUN, EXPRESSED AS A PERCENTAGE OF THE TOTAL LENGTH OF THE CORE RUN.

RQD ROCK QUALITY DESIGNATION
A MODIFIED CORE RECOVERY PERCENTAGE IN WHICH ALL THE PIECES OF SOUND CORE OVER 4 INCHES LONG ARE COUNTED AS RECOVERY. THE MODIFIED SUM OF CORE RECOVERED IS THEN EXPRESSED AS A PERCENTAGE OF THE TOTAL LENGTH OF THE CORE RUN.

EXPLANATION OF SYMBOLS FOR SAMPLES

INDICATES THE NUMBER OF BLOWS REQUIRED TO DRIVE A STANDARD PENETRATION TEST SAMPLER 1 FOOT WITH A 140 POUND HAMMER FALLING 30 INCHES

13 ◪ INDICATES DEPTH OF STANDARD PENETRATION TEST (2" O.D. SPLIT SPOON SAMPLER)

INDICATES THE NUMBER OF BLOWS REQUIRED TO DRIVE A DAMES & MOORE TYPE U SAMPLER 1 FOOT WITH A 340 POUND HAMMER FALLING 24 INCHES

13 ■ INDICATES DEPTH OF SAMPLE OBTAINED WITH DAMES & MOORE TYPE U SAMPLER (3.25" O.D. 2.42" I.D. SPLIT SPOON SAMPLER)

P INDICATES SAMPLER PUSHED TO OBTAIN SAMPLE

□ INDICATES DEPTH OF SAMPLING ATTEMPT WITH NO RECOVERY

▩ INDICATES DISTURBED SAMPLE; ON TEST PIT LOGS INDICATES ZONE OF GRAB SAMPLE

C INDICATES SAMPLE OBTAINED BY CORING WITH A 2-3/8 INCH INSIDE DIAMETER DENNISON SAMPLER

P INDICATES SAMPLE OBTAINED BY PUSHING A 3 INCH INSIDE DIAMETER SHELBY TUBE

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-32 (Sheet 1 of 2)

Explanation and General Notes for Boring and Test Pit Logs

NOTES

ELEVATIONS REFER TO U.S.G.S. DATUM.

5% VUGS INDICATES THE ESTIMATED RATIO OF VUGGED CORE SURFACE AREA TO TOTAL CORE SURFACE AREA.

SANDSTONE 70% INDICATES THE VISUALLY ESTIMATED PERCENTAGE OF SANDSTONE BY VOLUME TO THE TOTAL VOLUME OF THE CORE OVER THE INTERVAL INDICATED.

60° REPRESENTS 60 DEGREES MEASURED FROM A PLANE PERPENDICULAR TO THE LONGITUDINAL AXIS OF THE CORE.

OCCASIONAL REPRESENTS 0 TO 10 PERCENT BY VOLUME

NUMEROUS REPRESENTS 10 TO 50 PERCENT BY VOLUME

CLAYEY REFERS TO SHALES WHICH HAVE BEEN ALTERED BY WEATHERING OR GROUNDWATER ACTION, USUALLY ALONG THIN, HORIZONTAL BEDDING PLANES. THE ALTERATION HAS DEGRADED THE SHALE INTO CLAY PARTICLES, THEREBY SIGNIFICANTLY REDUCING THE STRENGTH IN THE CLAYEY AREAS.

BEDDING TERMINOLOGY

THINLY LAMINATED	- LESS THAN 0.001 FOOT
LAMINATED	- 0.001 FOOT TO 0.01 FOOT
THIN BEDDED	- 0.01 FOOT TO 0.1 FOOT
MEDIUM BEDDED	- 0.1 FOOT TO 1.0 FOOT
THICK BEDDED	- GREATER THAN 1.0 FOOT

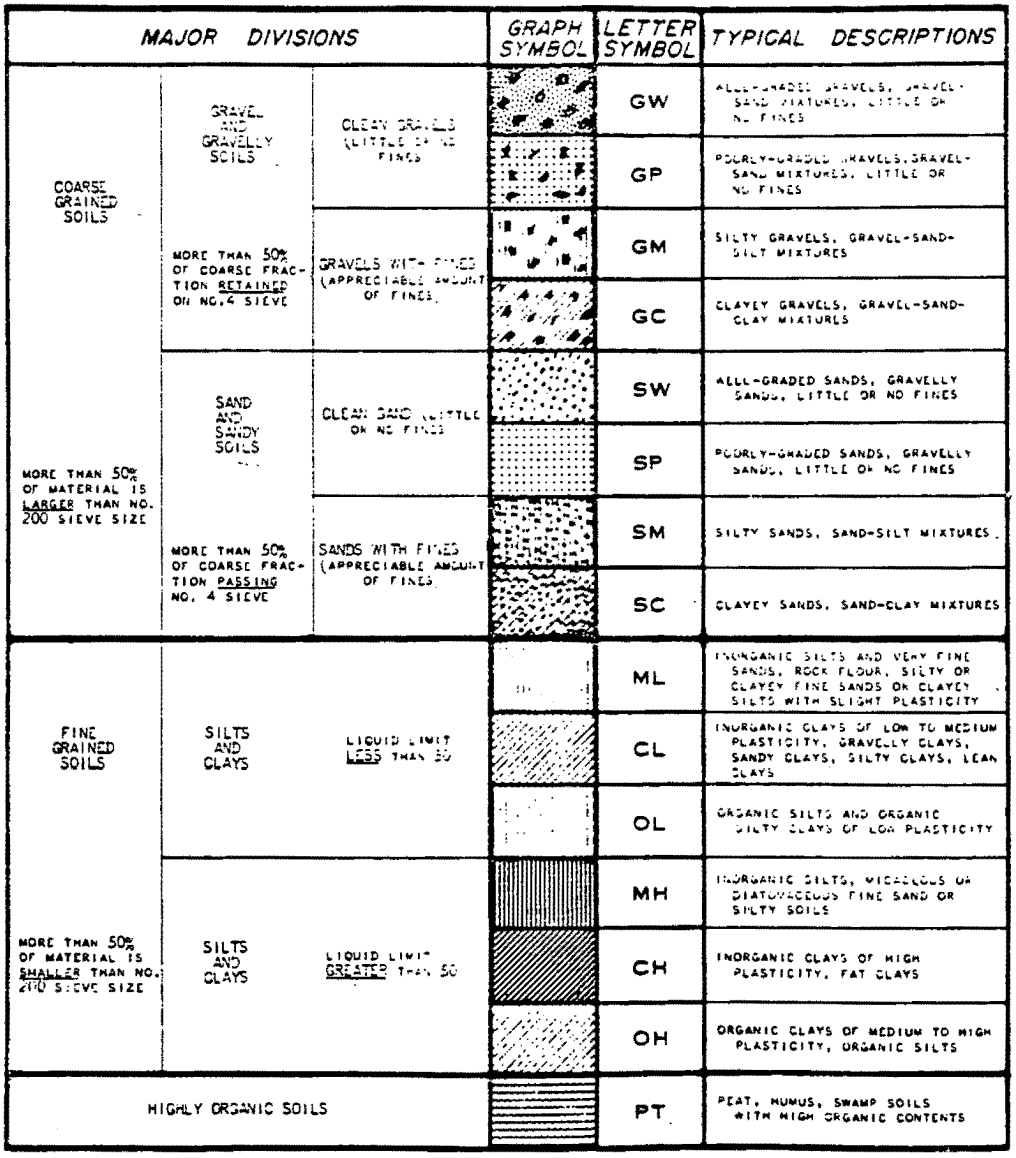
WEATHERING TERMINOLOGY

SLIGHTLY WEATHERED	ROCK IS SLIGHTLY DISCOLORED WITH A SLIGHTLY LOWER STRENGTH THAN UNWEATHERED ROCK.
MODERATELY WEATHERED	ROCK IS CONSIDERABLY DISCOLORED WITH A SIGNIFICANTLY LOWER STRENGTH THAN UNWEATHERED ROCK.
HIGHLY WEATHERED	ROCK IS DISCOLORED AND WEAKENED SO INTENSELY THAT 2-INCH DIAMETER ROCK CORES CAN BE BROKEN READILY BY HAND. WET STRENGTH IS USUALLY MUCH LOWER THAN DRY STRENGTH.

Rev. 0

Figure 2.5-32 (Sheet 2 of 2)

Explanation and General Notes for Boring and Test Pit Logs



NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS.

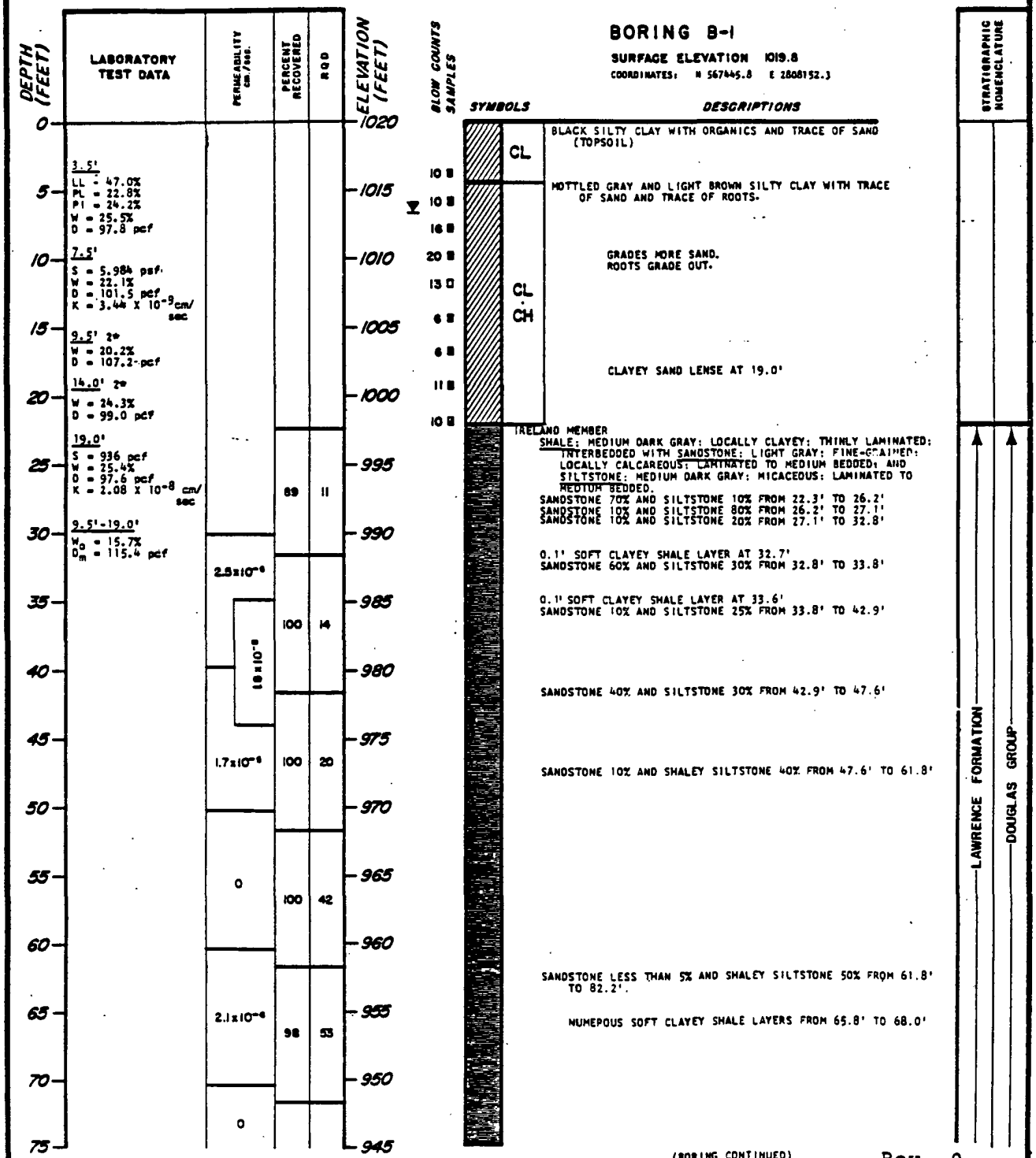
SOIL CLASSIFICATION CHART

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-33

Unified Soil Classification System

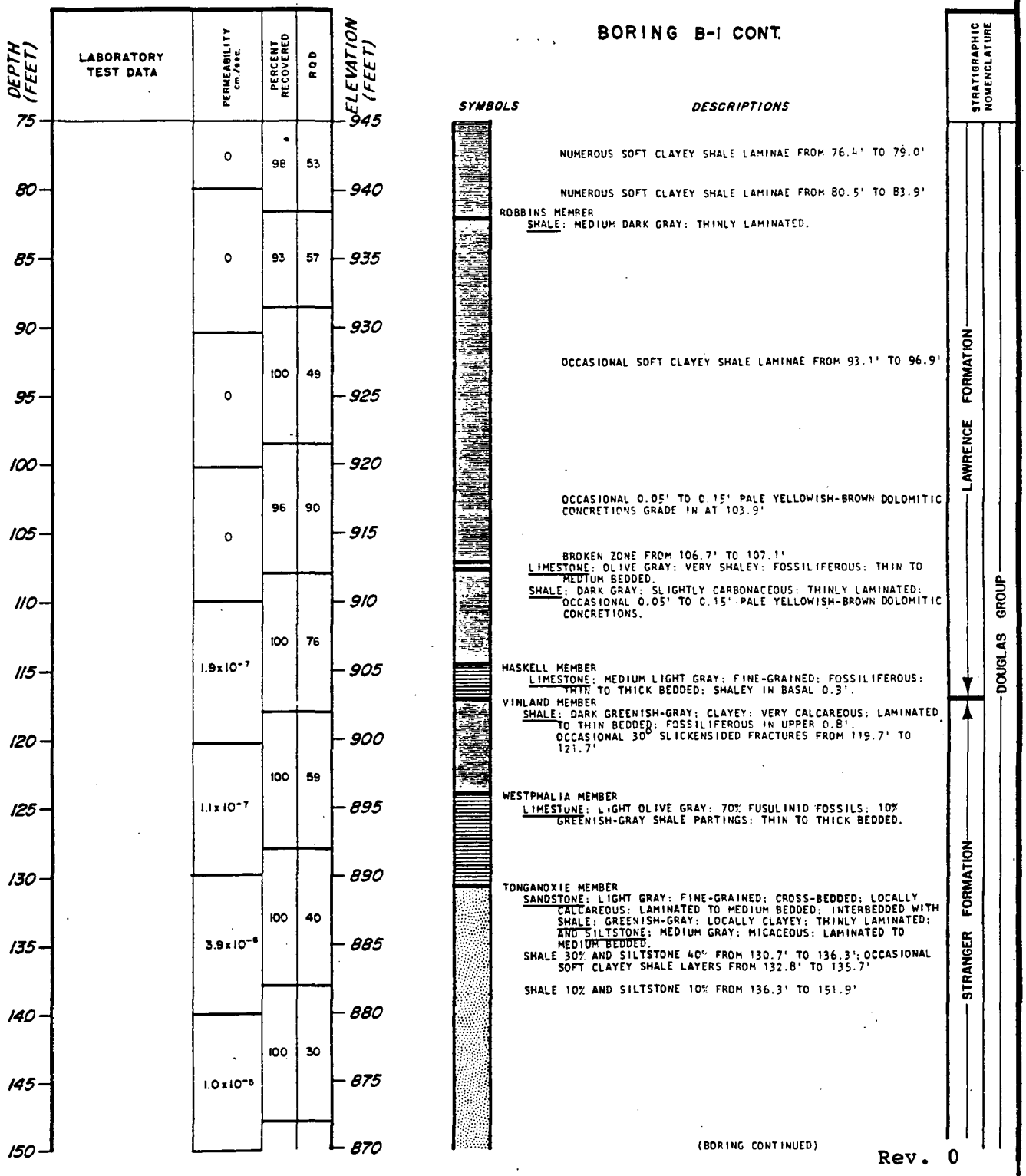


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34a (Sheet 1 of 4)

Log of Boring B-1

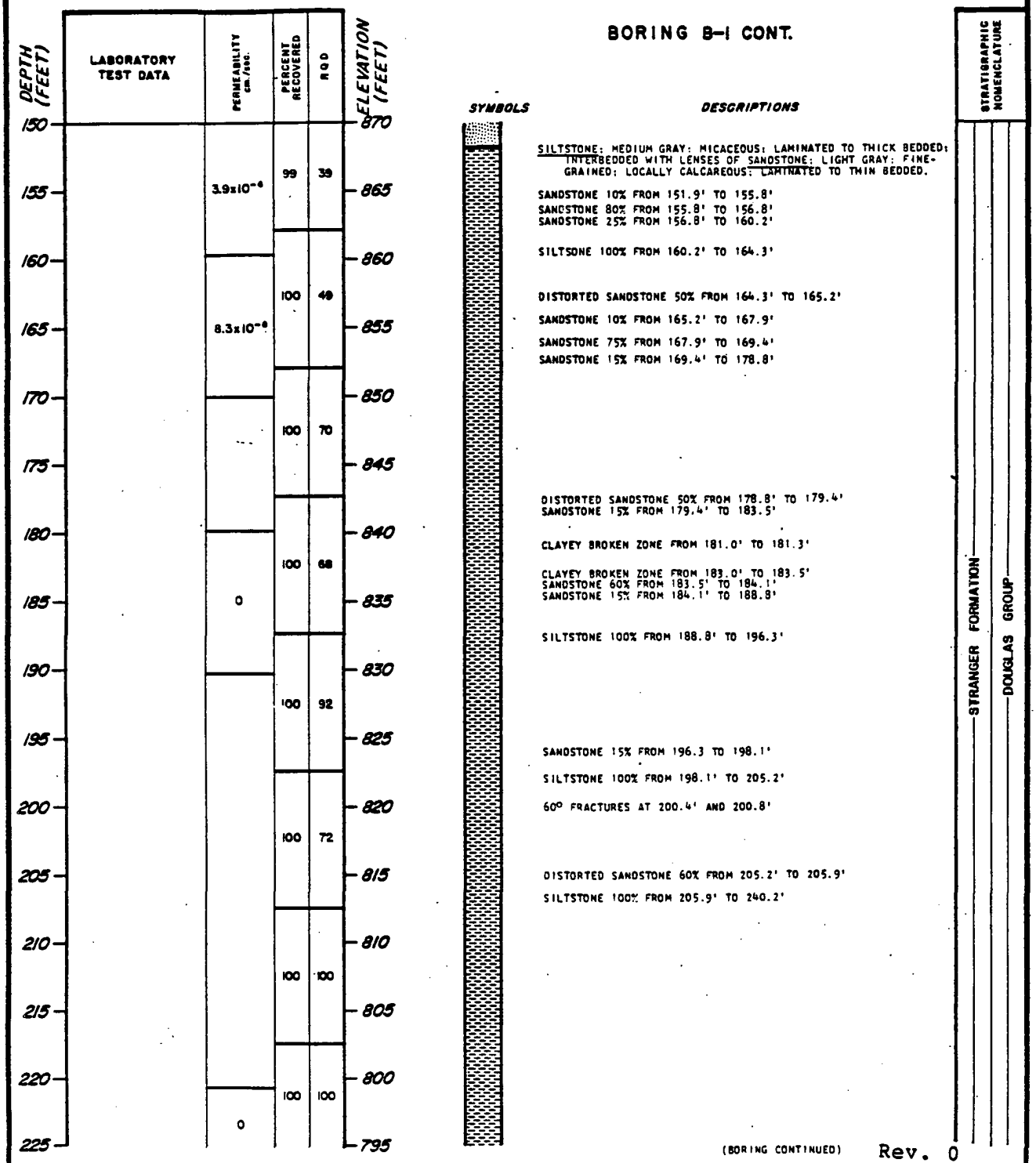


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34a (Sheet 2 of 4)

Log of Boring B-1

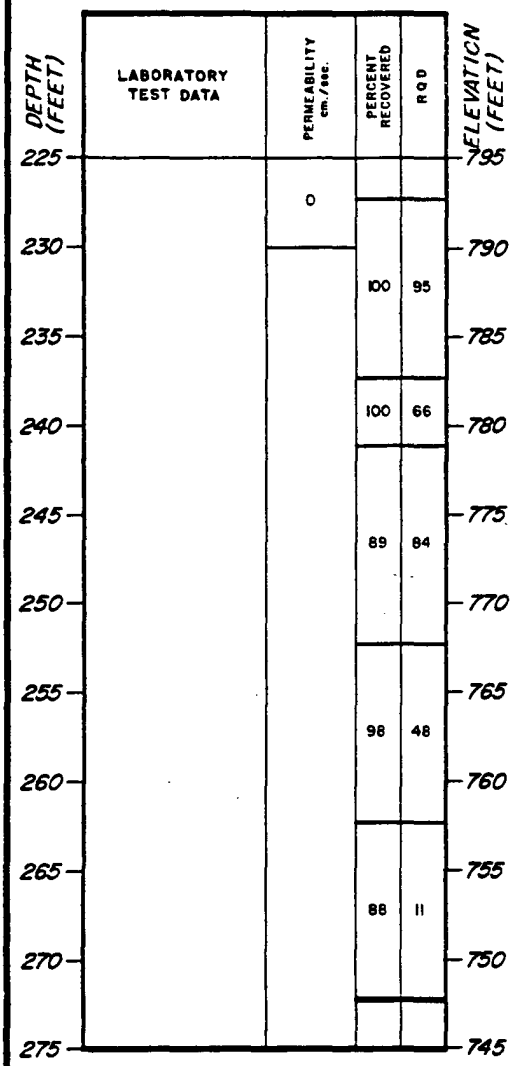


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34a (Sheet 3 of 4)

Log of Boring B-1

BORING B-1 CONT.



SYMBOLS

DESCRIPTIONS

70° FRACTURE AT 230.9'

SANDSTONE 25% FROM 240.2' TO 241.0'
SILTSTONE 100% FROM 241.0' TO 248.3'

30° FRACTURE AT 243.0'

SILTSTONE AND SANDSTONE BECOME INTERBEDDED WITH SHALE; MEDIUM DARK GRAY; THINLY LAMINATED.
SANDSTONE 10% AND SHALE 10% FROM 248.3' TO 270.0'

0.06' CLAYEY BROKEN LAYERS AT 251.0' AND 251.9'
60° SLICKENSIDED FRACTURE AT 252..4'
30° SLICKENSIDED FRACTURE AT 252.9'

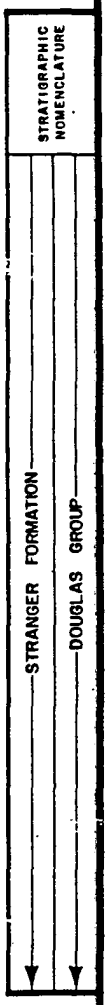
60° FRACTURE AT 255.2'
NUMEROUS 20° TO 45° SLICKENSIDED FRACTURES FROM 256.0' TO 260.2'

30° FRACTURE AT 261.4'
60° FRACTURES AT 261.6' AND 262.0'

NUMEROUS SOFT CLAYEY SHALE LAYERS FROM 263.3' TO 272.3'

SHALEY SILTSTONE 50% AND SHALE 50% FROM 270.0' TO 272.3'

BORING COMPLETED AT 272.3 FEET ON 7-4-73.
CASING USED TO A DEPTH OF 22.3 FEET.
GROUNDWATER LEVEL RECORDED AT 7.0 FEET ON 7-5-73.
THIRD PIEZOMETER INSTALLED AT AN INTERVAL FROM 24.0 FEET TO 84.0 FEET ON 7-18-73.
SECOND PIEZOMETER INSTALLED AT AN INTERVAL FROM 118.0 FEET TO 125.0 FEET ON 7-18-73.
FIRST PIEZOMETER INSTALLED AT AN INTERVAL FROM 130.0 FEET TO 272.0 FEET ON 7-18-73.
PIEZOMETER READINGS ARE PRESENTED ON TABLE 2.4-29.



Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34a (Sheet 4 of 4)

Log of Boring B-1

BORING B-2

SURFACE ELEVATION 1067.0

COORDINATES: N 573886.5 E 2805178.4

DEPTH (FEET)	LABORATORY TEST DATA	PERMEABILITY cm./sec.	PERCENT RECOVERED	RQD	ELEVATION (FEET)	BLOW COUNTS SAMPLES	SYMBOLS	DESCRIPTIONS	STRATIGRAPHIC NOMENCLATURE
0					1065	19 26 11/9"	CL CL	DARK BROWN CLAYEY SILT WITH TRACE OF ORGANIC MATERIAL (TOPSOIL). MOTTLED GRAY AND ORANGE BROWN SILTY CLAY WITH TRACE OF SAND AND GRAVEL.	
5					1060			PLATTSMOUTH MEMBER LIMESTONE; LIGHT GRAY AND LOCALLY WEATHERED TO YELLOWISH-BROWN; FINE-GRAINED; FOSSILIFEROUS; SLIGHTLY WEATHERED; THIN TO MEDIUM BEDDED.	OREAD FORMATION — SHAWNEE GROUP
10			24	0	1055			HEEBNER MEMBER SHALE; GRAYISH-BLACK; CARBONACEOUS; CLAYEY; MODERATE TO HIGHLY WEATHERED; THINLY LAMINATED. LEAVENWORTH MEMBER LIMESTONE; MEDIUM GRAY; FINE-GRAINED; FOSSILIFEROUS; THIN TO MEDIUM BEDDED.	
15			83	23	1050			SNYDERVILLE MEMBER SHALE; MEDIUM GRAY AND LIGHT OLIVE GRAY; CLAYEY; VERY CALCAREOUS; LOCALLY FOSSILIFEROUS; THIN TO MEDIUM BEDDED. 70° FRACTURE AT 16.3' 45° FRACTURE AT 16.8' .1' LIMESTONE LENSE AT 20.2'	
20					1045			TORONTO MEMBER LIMESTONE; LIGHT GRAY TO VERY LIGHT GRAY; LOCALLY WEATHERED TO GRAYISH-ORANGE ALONG SHALE PARTINGS; FINE-GRAINED; FOSSILIFEROUS WITH FOSSIL FRAGMENT BEDS; THIN TO THICK BEDDED. MODERATELY WEATHERED TO DARK YELLOWISH-BROWN WITH 15% PINPOINT VUGS FROM 24.3' TO 25.7'	
25			100	55	1040			SHALEY FROM 28.9' TO 31.5'	
30					1035			.07' GREENISH-GRAY CLAY LAYER AT 30.6' .1' SOFT CLAYEY SHALE LAYER AT 31.4' SLIGHTLY WEATHERED FROM 31.5' TO 32.8'	
35			97	55	1030			SHALE; GREENISH-GRAY TO MEDIUM DARK GRAY; LOCALLY VERY CLAYEY; THINLY LAMINATED. SOFT CLAYEY SHALE LAYERS FROM 36.5' TO 37.4' AND FROM 38.2' TO 38.4'	LAWRENCE FORMATION — DOUGLAS GROUP
40					1025			SHALE; MEDIUM GRAY; CLAYEY; THINLY LAMINATED; INTERBEDDED WITH SANDSTONE; LIGHT GRAY; FINE-GRAINED; SILTY; LOCALLY CALCAREOUS; LAMINATED TO THIN BEDDED. SANDSTONE 10% FROM 39.1' TO 42.0' SANDSTONE 40% FROM 42.0' TO 48.5'	
45			100	0	1020			BROKEN ZONE FROM 46.6' TO 46.9'	
50					1015			SANDSTONE 10% FROM 48.5' TO 54.1' SOFT CLAYEY SHALE ZONE FROM 53.0' TO 54.1' SANDSTONE GRADES OUT AT 54.1' CARBONACEOUS SHALE FROM 54.1' TO 55.0'	
55			92	0	1010			WILLIAMSBURG COAL BED COAL; BLACK; SHALEY; THIN BEDDED. SHALE; GREENISH-GRAY; CLAYEY; VERY CALCAREOUS; LAMINATED TO THIN BEDDED. 70° FRACTURE AT 55.6'	
60			100	44	1005			AMAZONIA MEMBER LIMESTONE; LIGHT GREENISH-GRAY; SHALEY; FINE-GRAINED; FOSSILIFEROUS; INTERBEDDED WITH LAYERS OF SHALE; GREENISH-GRAY; CALCAREOUS; CLAYEY; THINLY LAMINATED. SHALE LAYER FROM 61.7' TO 63.6'	
65					1000			IRELAND MEMBER SHALE; MEDIUM GRAY TO MEDIUM DARK GRAY; CLAYEY; THINLY LAMINATED; INTERBEDDED WITH SANDSTONE; LIGHT GRAY; VERY FINE-GRAINED; LOCALLY CALCAREOUS; LAMINATED TO THIN BEDDED. VERY CLAYEY WITH 10% SANDSTONE FROM 67.0' TO 70.1' SANDSTONE 10% FROM 70.1' TO 76.0' NUMEROUS SOFT CLAYEY SHALE LAYERS FROM 71.2' TO 72.5'	
70			100	25	995				
75									

(BORING CONTINUED)

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

FIGURE 2.5-34b (Sheet 1 of 5)

LOG OF BORING B-2

Rev. 0

BORING B-2 CONT'D

DEPTH (FEET)	ELEVATION (FEET)	PERCENT RECOVERED	RQD	PERMEABILITY cm/sec.	LABORATORY TEST DATA
75	990				
80	985	100	34		
85	980				
90	975	97	24		
95	970				
100	965	99	17		
105	960				
110	955	100	27		
115	950				
120	945	100	22		
125	940				
130	935	99	34		
135	930				
140	925	100	5		
145	920				
150					

SYMBOLS

DESCRIPTIONS

SANDSTONE 30% FROM 76.0' TO 79.2'

SANDSTONE 10% FROM 79.2' TO 80.3'

COAL; BLACK; SHALEY; LAMINATED TO THIN BEDDED.
SHALE; MEDIUM GRAY TO MEDIUM DARK GRAY; THINLY LAMINATED; INTERBEDDED WITH SANDSTONE; LIGHT GRAY; FINE-GRAINED; LAMINATED TO MEDIUM BEDDED; AND SILTSTONE; MEDIUM GRAY; MICACEOUS; LAMINATED TO MEDIUM BEDDED.
SHALE 100% FROM 81.0' TO 82.4'
SANDSTONE 85% AND SILTSTONE 10% FROM 82.4' TO 89.2'

SANDSTONE 30% AND SILTSTONE 65% FROM 89.2' TO 91.3'

SANDSTONE 10% AND SILTSTONE 40% FROM 91.3' TO 98.7'
NUMEROUS SOFT CLAYEY SHALE LAYERS FROM 89.2' TO 94.6'

NUMEROUS SOFT CLAYEY SHALE LAYERS FROM 96.8' TO 98.3'

SANDSTONE 20% AND SILTSTONE 75% FROM 98.7' TO 99.2'
SANDSTONE 90% AND SILTSTONE 5% FROM 99.2' TO 99.6'
SANDSTONE 10% AND SILTY SHALE 85% FROM 99.6' TO 99.9'
SANDSTONE 10% AND SILTSTONE 85% FROM 99.9' TO 112.7'
NUMEROUS SOFT SILTY CLAYEY SHALE LAYERS FROM 102.5' TO 104.3'
70° FRACTURE AT 104.2'

BROKEN ZONE FROM 105.5' TO 105.7'
40° FRACTURE AT 105.7'

NUMEROUS SOFT SILTY CLAYEY SHALE LAYERS FROM 106.5' TO 107.0'

CLAYEY ZONE FROM 108.5' TO 109.7'

SANDSTONE 60% AND SILTSTONE 35% FROM 112.7' TO 112.9'
SANDSTONE 10% AND SILTSTONE 85% FROM 112.9' TO 113.1'
SANDSTONE 95% FROM 113.1' TO 113.8'
50° SLICKENSIDED FRACTURE AT 113.5'
SANDSTONE 10% AND SILTSTONE 85% FROM 113.8' TO 117.7'
60° SLICKENSIDED CLAY FILLED FRACTURE AT 115.2'
1.2' CALCAREOUS SANDSTONE LAYER WITH INTERBEDDED, DISTORTED NON-CALCAREOUS, CARBONACEOUS, SHALEY SILTSTONE AT 117.7'
SANDSTONE 10% AND SILTSTONE 85% FROM 118.9' TO 128.0'
NUMEROUS SOFT CLAYEY LAYERS FROM 118.9' TO 120.1'

0.4' CROSSBEDDED SANDSTONE LAYER WITH INTERBEDDED CARBONACEOUS SILTSTONE PARTINGS AT 121.7'
BROKEN ZONE WITH IRREGULAR VERTICAL FRACTURE FROM 121.9' TO 122.2'
NUMEROUS SOFT CLAYEY LAYERS FROM 124.2' TO 124.5'

0.5' SOFT CLAYEY LAYER AT 126.0'

SANDSTONE 30% AND SILTSTONE 65% FROM 128.0' TO 133.4'

SANDSTONE 60% AND SILTSTONE 35% FROM 133.4' TO 148.2'

OCCASIONAL SOFT CLAYEY LAYERS FROM 139.0' TO 140.0'

0.35' CALCAREOUS SANDSTONE LAYER AT 141.7'
NUMEROUS SOFT CLAYEY LAYERS FROM 142.1' TO 148.3'

SANDSTONE 50% AND SILTY SHALE 50% FROM 148.2' TO 149.7'
SANDSTONE 20% AND SILTY SHALE 75% FROM 149.7' TO 156.5'

STRATIGRAPHIC NOMENCLATURE

DOUGLAS GROUP — LAWRENCE FORMATION

(BORING CONTINUED)

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

FIGURE 2.5-34b (Sheet 2 of 5)

LOG OF BORING B-2

Rev. 0

BORING B-2 CONT'D

DEPTH (FEET)	LABORATORY TEST DATA	PERMEABILITY cm./sec.	PERCENT RECOVERED	RQD	ELEVATION (FEET)
150					915
155			100	4	910
160			96	74	905
165					900
170			100	100	895
175			100	37	890
180					885
185			100	84	880
190					875
195			99	57	870
200					865
205			100	33	860
210					855
215			100	0	850
220					845
225					

SYMBOLS

DESCRIPTIONS

ROBBINS MEMBER
SHALE; MEDIUM DARK GRAY; MICACEOUS; THINLY LAMINATED; SLIGHTLY CALCAREOUS AND SLIGHTLY CARBONACEOUS BELOW 179.4'.

LIMESTONE; LIGHT OLIVE GRAY; VERY SHALEY; FOSSILIFEROUS; MEDIUM BEDDED.
SHALE; MEDIUM GRAY; CARBONACEOUS; PLANT FOSSILIFEROUS; SLIGHTLY CALCAREOUS; THINLY LAMINATED; OCCASIONAL PALE YELLOWISH-BROWN CONCRETIONS.
0.6' BROKEN ZONE WITH IRREGULAR VERTICAL FRACTURE AT 181.5'

HASKELL MEMBER
LIMESTONE; LIGHT GRAY; FINE-GRAINED; FOSSILIFEROUS; MEDIUM BEDDED.
VINLAND MEMBER
SHALE; MEDIUM DARK GRAY; VERY CALCAREOUS; MICACEOUS; PLANT FOSSILIFEROUS; THINLY LAMINATED; INTERBEDDED WITH SANDSTONE; LIGHT GRAY; FINE TO VERY FINE GRAINED; LOCALLY SLIGHTLY CALCAREOUS; MICACEOUS; SLIGHTLY CARBONACEOUS; LAMINATED TO THINLY LAMINATED.
0.2' SOFT, CLAYEY BROKEN ZONE AT 189.5'
SANDSTONE 10% AND SILTY SHALE 90% FROM 190.0' TO 191.1'
SHALE 100% FROM 191.1' TO 192.4'
0.1' PALE YELLOWISH-BROKEN CONCRETION AT 193.1'
SANDSTONE 10% AND SHALE 90% FROM 192.4' TO 195.8'
SANDSTONE; LIGHT GRAY; FINE-GRAINED; SLIGHTLY CALCAREOUS; MICACEOUS; SLIGHTLY CARBONACEOUS; LAMINATED; INTERBEDDED WITH SHALE; MEDIUM DARK GRAY; SLIGHTLY CALCAREOUS; MICACEOUS; SLIGHTLY CARBONACEOUS; THINLY LAMINATED.
SANDSTONE 75% AND SHALE 25% FROM 195.8' TO 201.7'
LIMESTONE; MEDIUM LIGHT GRAY; 60% FUSULINID FOSSILS; SHALEY; THIN BEDDED.
TONGANOXIE MEMBER
SANDSTONE; LIGHT GRAY TO LIGHT OLIVE GRAY; FINE-GRAINED; MICACEOUS; LOCALLY SLIGHTLY CALCAREOUS; CROSS-BEDDED; LAMINATED; INTERBEDDED WITH SHALE; MEDIUM DARK GRAY; CARBONACEOUS; THINLY LAMINATED; AND SILTSTONE; MEDIUM DARK GRAY; MICACEOUS; CARBONACEOUS; MEDIUM BEDDED TO THINLY LAMINATED.
0.3' SOFT GREENISH-GRAY CLAYEY ZONE AT 202.1'
SANDSTONE 5% AND SHALE 95% FROM 202.4' TO 204.9'
NUMEROUS SOFT CLAYEY LAMINAE FROM 202.4' TO 204.7'
0.15' GRAYISH-ORANGE CALCAREOUS ZONE AT 203.0'
SANDSTONE 30% AND SILTSTONE 20% FROM 204.9' TO 208.9'
SANDSTONE 85% AND SILTSTONE 10% FROM 208.9' TO 210.4'
SANDSTONE 45% AND SILTSTONE 45% FROM 210.4' TO 214.8'
SANDSTONE 80% AND SILTY SHALE 20% FROM 214.8' TO 216.8'
NUMEROUS SOFT SANDY CLAYEY LAYERS FROM 215.5' TO 216.8'
0.15' MEDIUM GRAY CONCRETION AT 216.8'
SANDSTONE 20% (LOCALLY GRADES TO 40%); SILTSTONE 70% AND SHALE 10% FROM 216.8' TO 228.4'
0.5' SOFT SANDY CLAYEY BROKEN ZONE AT 219.4'

NUMEROUS SOFT CLAYEY LAYERS FROM 222.1' TO 225.7'

STRATIGRAPHIC NOMENCLATURE

DOUGLAS GROUP
LAWRENCE FORMATION
STRANGER FORMATION

(BORING CONTINUED)

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

FIGURE 2.5-34b (Sheet 3 of 5)

LOG OF BORING B-2

Rev. 0

BORING B-2 CONT'D

DEPTH (FEET)	LABORATORY TEST DATA	PERMEABILITY cm./sec.	PERCENT RECOVERED	RQD	ELEVATION (FEET)	SYMBOLS	DESCRIPTIONS	STRATIGRAPHIC NOMENCLATURE
225								STRANGER FORMATION — DOUGLAS GROUP
			100	29	840		SANDSTONE 5% AND SILTSTONE 90% FROM 228.4' TO 284.9'	
230							0.1' BROKEN SOFT CLAYEY ZONE AT 231.2'	
					835			
235			100	65			0.7' CONVOLUTED SANDSTONE BEDDING AT 235.7'	
					830			
240							70° SLICKENSIDED FRACTURE AT 240.4' 0.3' BROKEN ZONE WITH 70° SLICKENSIDED FRACTURED AT 240.5' 0.6' CONVOLUTED SANDSTONE BEDDING AT 240.9'	
					825			
245			100	68			OCCASIONAL SOFT CLAYEY LAMINAE FROM 245.7' TO 247.7'	
					820		OPEN VERTICAL FRACTURE FROM 248.4' TO 249.1'	
250							0.1' BROKEN ZONE AT 151.1'	
					815			
255			100	97				
					810		OCCASIONAL 60° SLICKENSIDED FRACTURES ALONG CROSS-BEDDING PLANES FROM 259.6' TO 262.1'	
260								
					805			
265			96	71				
					800			
270							NUMEROUS SOFT CLAYEY LAMINAE FROM 270.1' TO 276.3'	
					795			
275			99	24			0.1' BROKEN SOFT CLAYEY ZONE AT 278.0'	
					790		OCCASIONAL SOFT CLAYEY LAYERS FROM 279.0' TO 280.2'	
280							SANDSTONE 20% AND SILTSTONE 70% FROM 281.0' TO 286.7' 0.1' BROKEN ZONE AT 281.8' OCCASIONAL SOFT CLAYEY LAMINAE FROM 283.3' TO 284.7'	
					785			
285			98	60			SANDSTONE 5% AND SILTSTONE 85% FROM 286.7' TO 292.0'	
					780		NUMEROUS SOFT CLAYEY LAYERS FROM 287.3' TO 288.1'	
290							SANDSTONE 10% AND SILTSTONE 70% FROM 292.0' TO 296.3' NUMEROUS SOFT CLAYEY LAMINAE FROM 293.1' TO 295.3'	
					775			
295			93	39			SANDSTONE 10% AND SILTSTONE 50% FROM 296.3' TO 309.0'	
					770		OCCASIONAL SOFT CLAYEY LAMINAE FROM 299.0' TO 302.7'	
300								

(BORING CONTINUED)

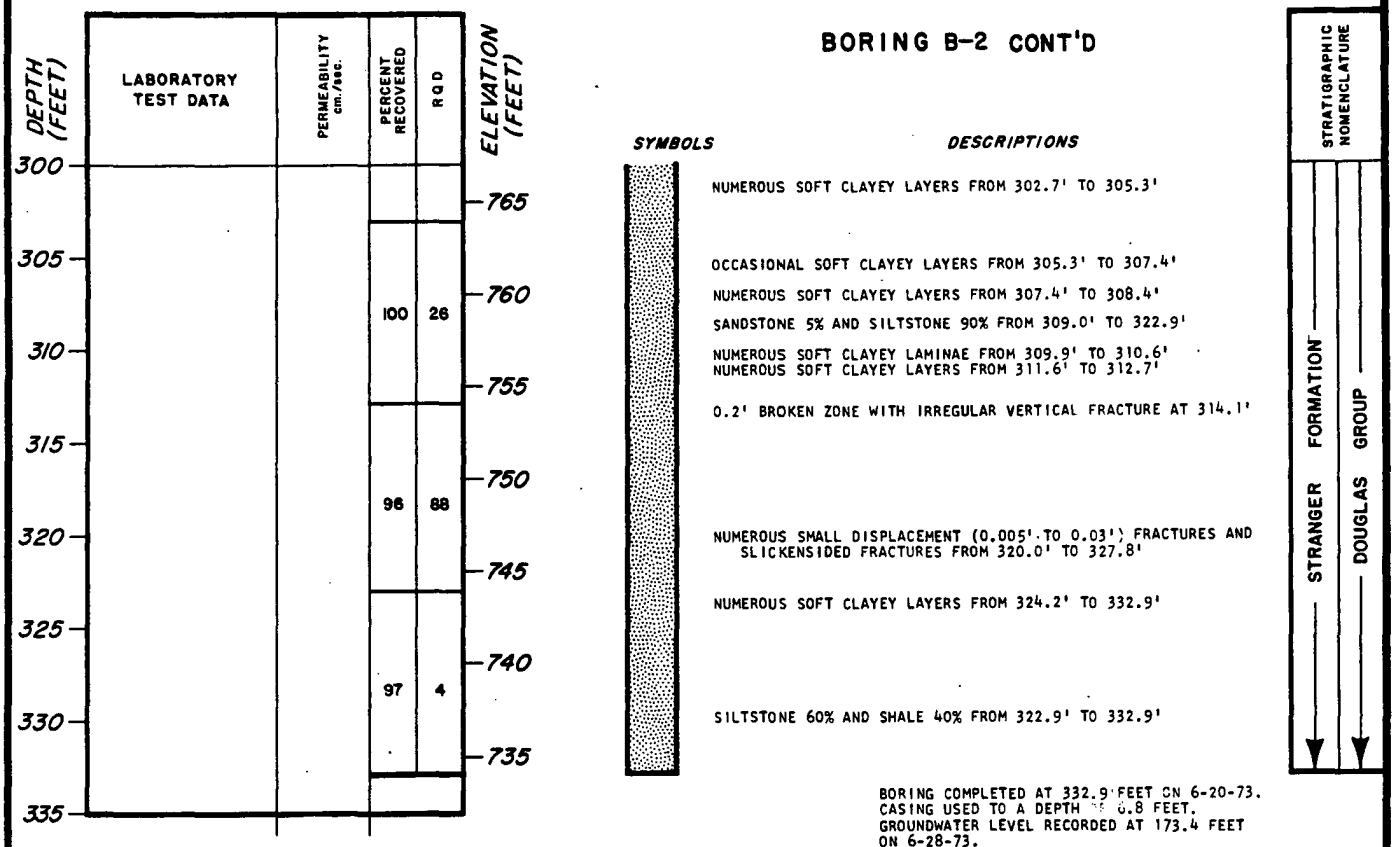
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

FIGURE 2.5-34b (Sheet 4 of 5)

LOG OF BORING B-2

Rev. 0

BORING B-2 CONT'D



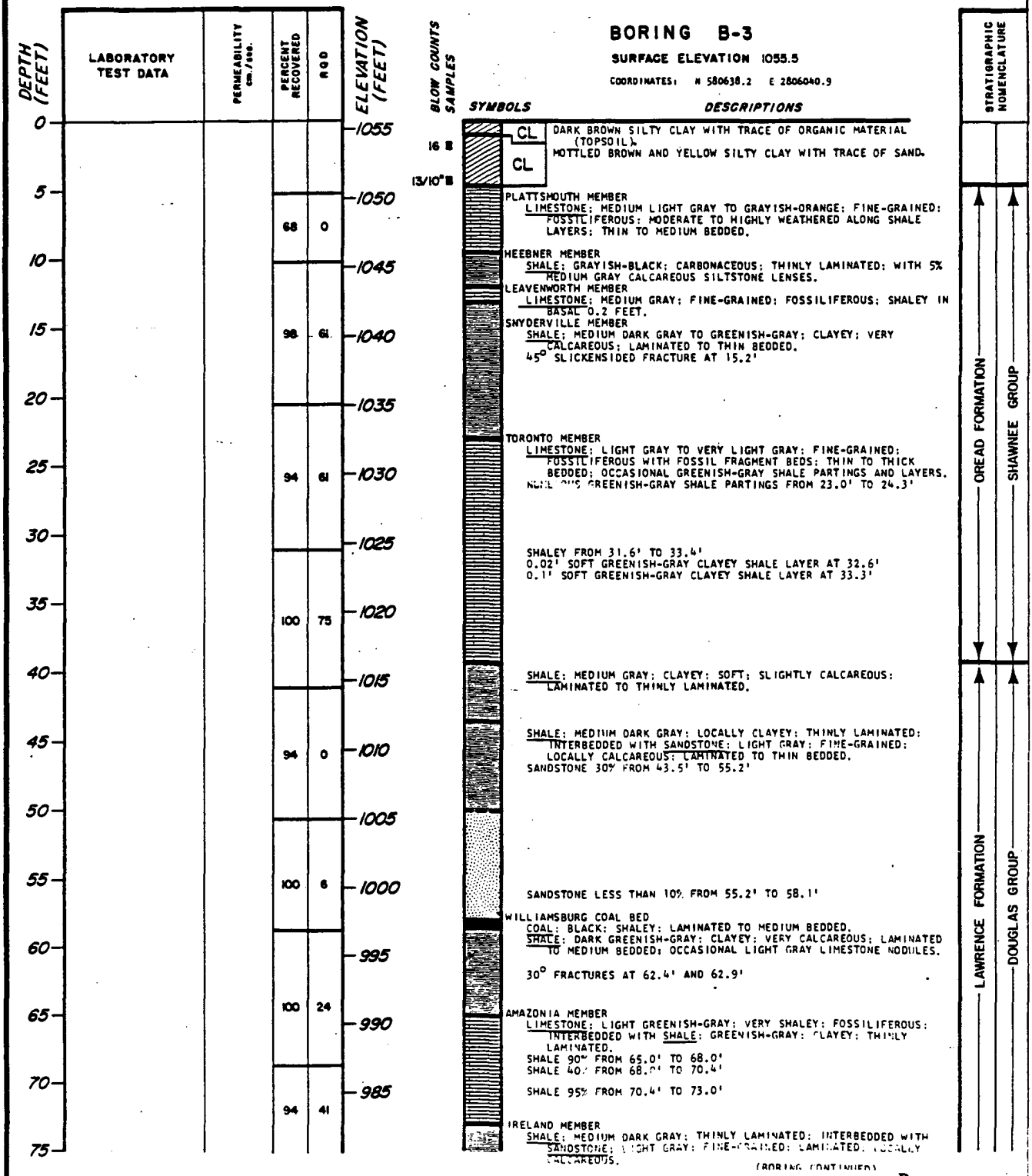
BORING COMPLETED AT 332.9 FEET ON 6-20-73.
CASING USED TO A DEPTH OF 6.8 FEET.
GROUNDWATER LEVEL RECORDED AT 173.4 FEET ON 6-28-73.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

FIGURE 2.5-34b (Sheet 5 of 5)

LOG OF BORING B-2

Rev. 0



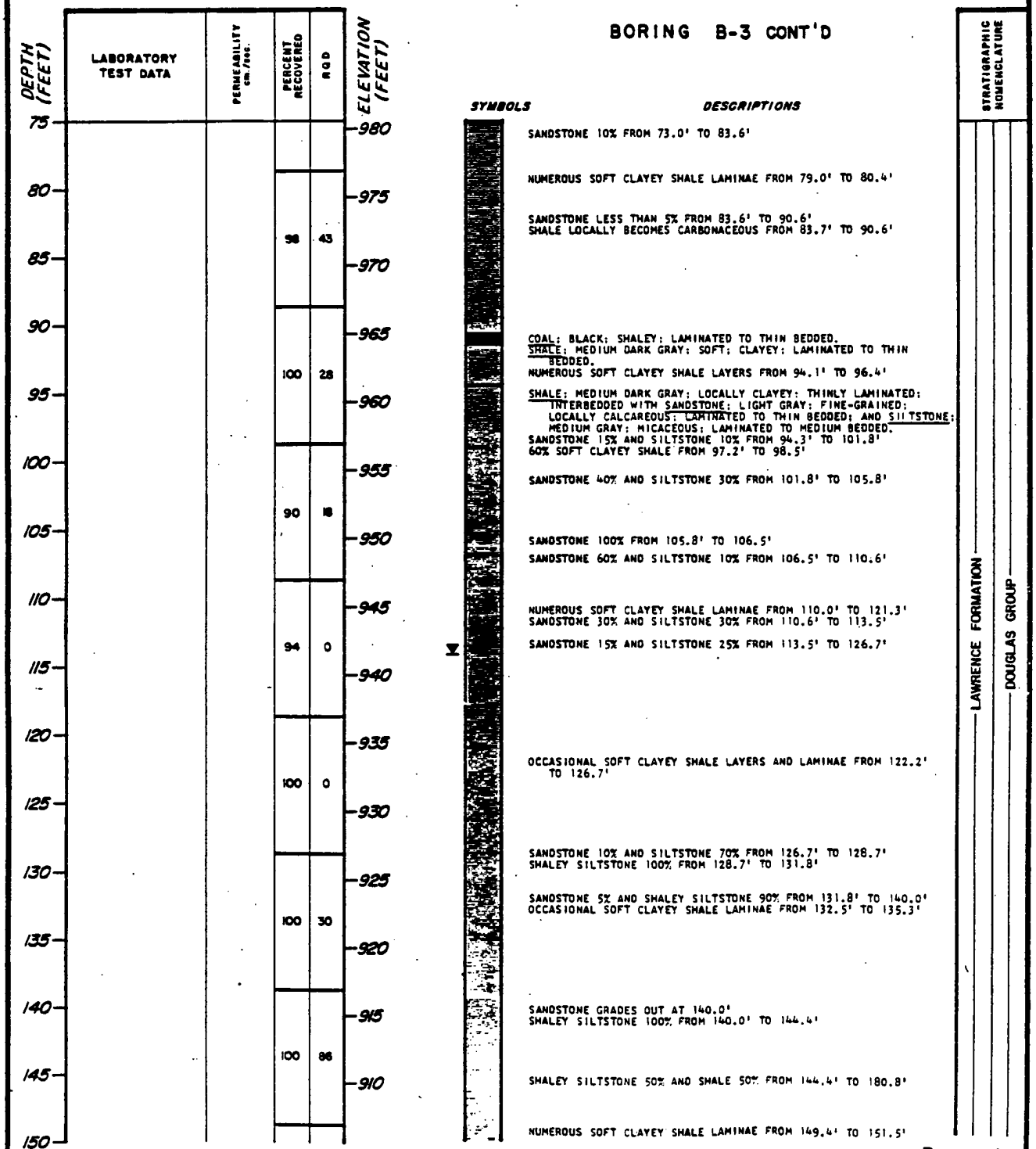
Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34c (Sheet 1 of 5)

Log of Boring B-3

BORING B-3 CONT'D

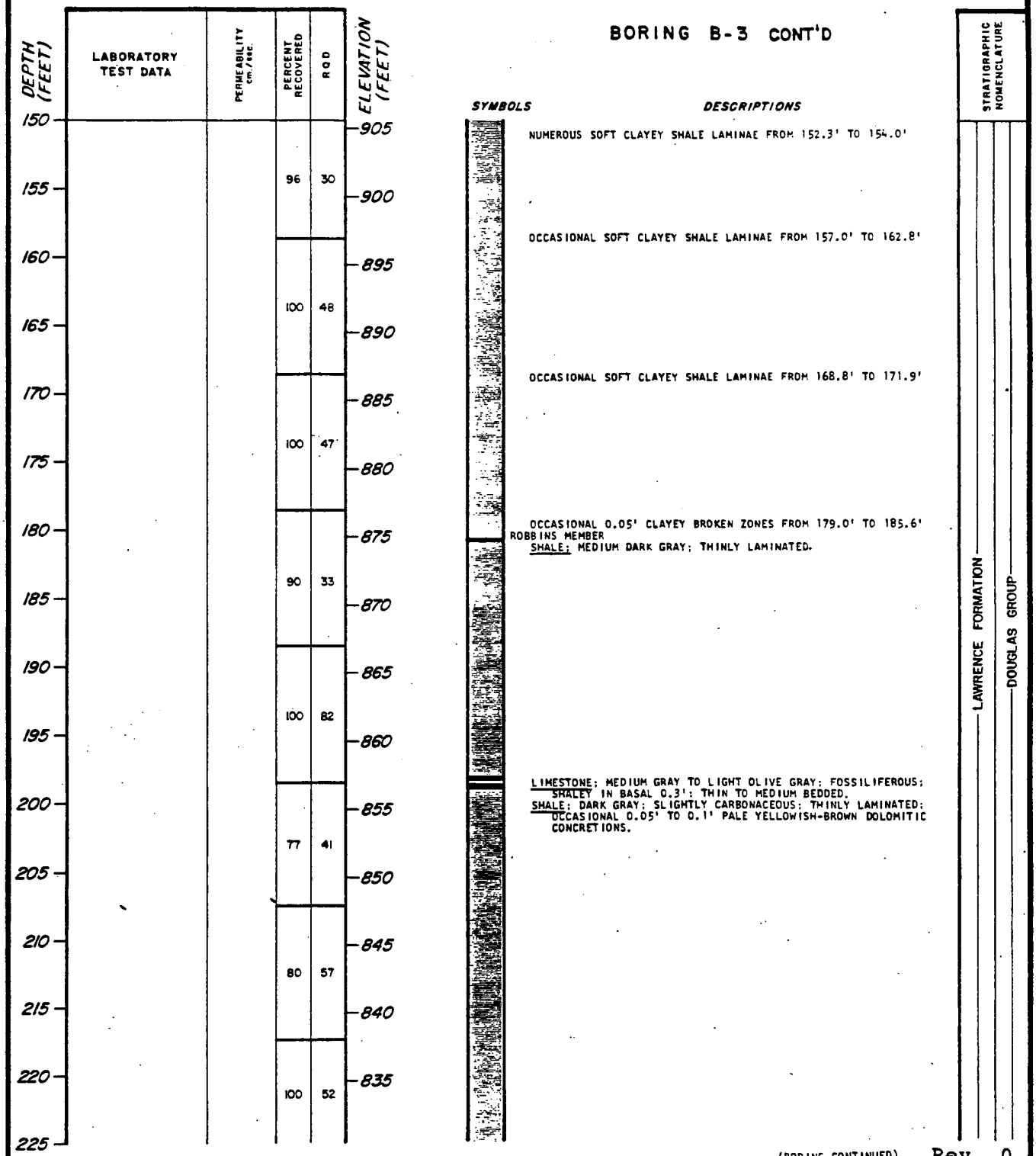


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34c (Sheet 2 of 5)

Log of Boring B-3

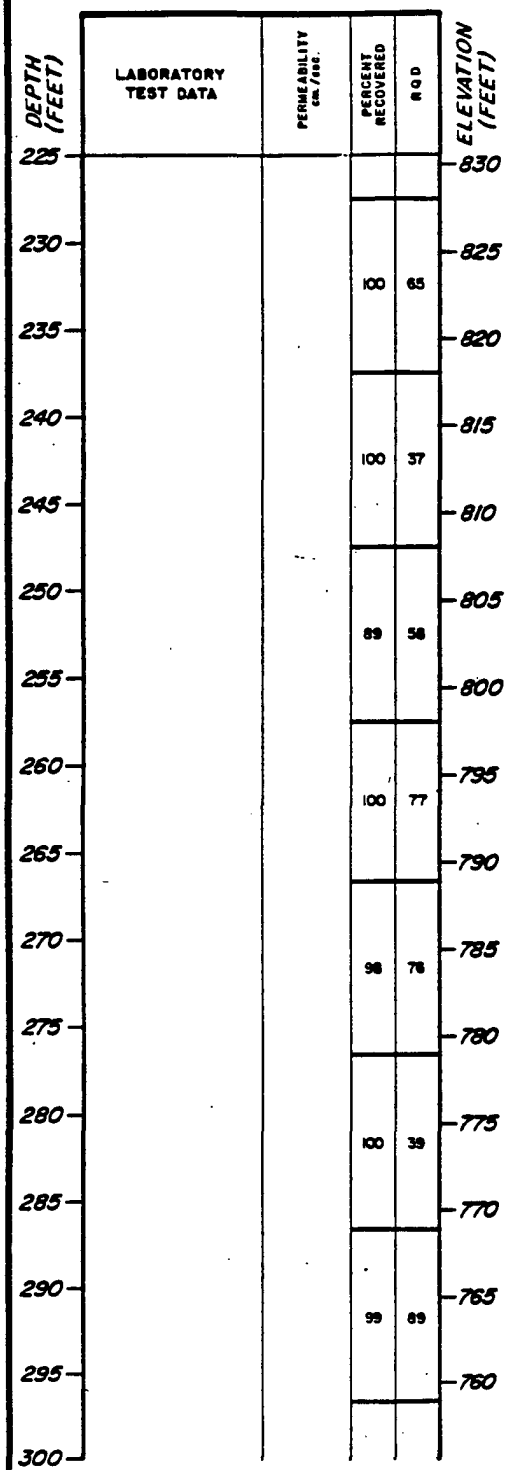


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34c (Sheet 3 of 5)

Log of Boring B-3



BORING B-3 CONT'D

SYMBOLS

DESCRIPTIONS

SHALE; MEDIUM DARK GRAY; VERY CALCAREOUS; FOSSILIFEROUS; THIN BEDDED.
SHALE; GRAYISH-BLACK; CARBONACEOUS; SLIGHTLY CALCAREOUS; THINLY LAMINATED.

HASKELL MEMBER
LIMESTONE; MEDIUM LIGHT GRAY; FINE-GRAINED; FOSSILIFEROUS; THIN TO MEDIUM BEDDED; SHALEY IN UPPER AND BASAL 0.15'.
VINLAND MEMBER
SHALE; MEDIUM GRAY; VERY CALCAREOUS; FOSSILIFEROUS; LAMINATED TO THIN BEDDED.
COAL; BLACK; SHALEY; LAMINATED TO THIN BEDDED.
SILTSTONE; LIGHT GREENISH-GRAY; SHALEY; SANDY; LAMINATED TO THIN BEDDED; INTERBEDDED WITH SANDSTONE; LIGHT GRAY; FINE-GRAINED; SILTY; CALCAREOUS; LAMINATED TO THIN BEDDED; AND SHALE; DARK GREENISH-GRAY; THINLY LAMINATED.
SHALE 80% AND SILTSTONE 20% FROM 236.6' TO 238.6'
SILTSTONE 60% AND SHALE 10% FROM 238.6' TO 243.2'
SILTSTONE 50% AND SANDSTONE 50% FROM 243.2' TO 245.0'

SILTSTONE 50% AND SHALE 40% FROM 245.0' TO 249.7'
NUMEROUS CLAYEY SHALE LAYERS FROM 245.1' TO 246.8'

SILTSTONE 40% AND SANDSTONE 50% FROM 249.7' TO 257.5'

SILTY SANDSTONE 90% AND SILTSTONE 10% FROM 257.5' TO 266.0'

0.15' SILTY FUSULINID LIMESTONE LAYER AT 265.3'

LIMESTONE; LIGHT OLIVE GRAY; 60% FUSULINID FOSSILS; 10% ROUNDED LIMESTONE PEBBLES; SHALEY; THIN TO THICK BEDDED.

TONGANOXIE MEMBER
SHALE; MEDIUM DARK GRAY; THINLY LAMINATED; INTERBEDDED WITH SANDSTONE; LIGHT GRAY; FINE-GRAINED; LOCALLY CALCAREOUS; LAMINATED TO THIN BEDDED; AND SILTSTONE; MEDIUM GRAY; MICACEOUS; LAMINATED TO MEDIUM BEDDED.
SANDSTONE 25% AND SILTSTONE 35% FROM 269.3' TO 279.5'

SANDSTONE 10% AND SILTSTONE 20% FROM 279.5' TO 291.4'

NEAR VERTICAL FRACTURE FROM 285.4' TO 285.7'

SANDSTONE 30% AND SILTSTONE 30% FROM 291.4' TO 295.0'

SANDSTONE LESS THAN 5% AND SHALEY SILTSTONE 50% FROM 295.0' TO 316.0'

STRATIGRAPHIC NOMENCLATURE
LAWRENCE FORMATION
STRANGER FORMATION
DOUGLAS GROUP

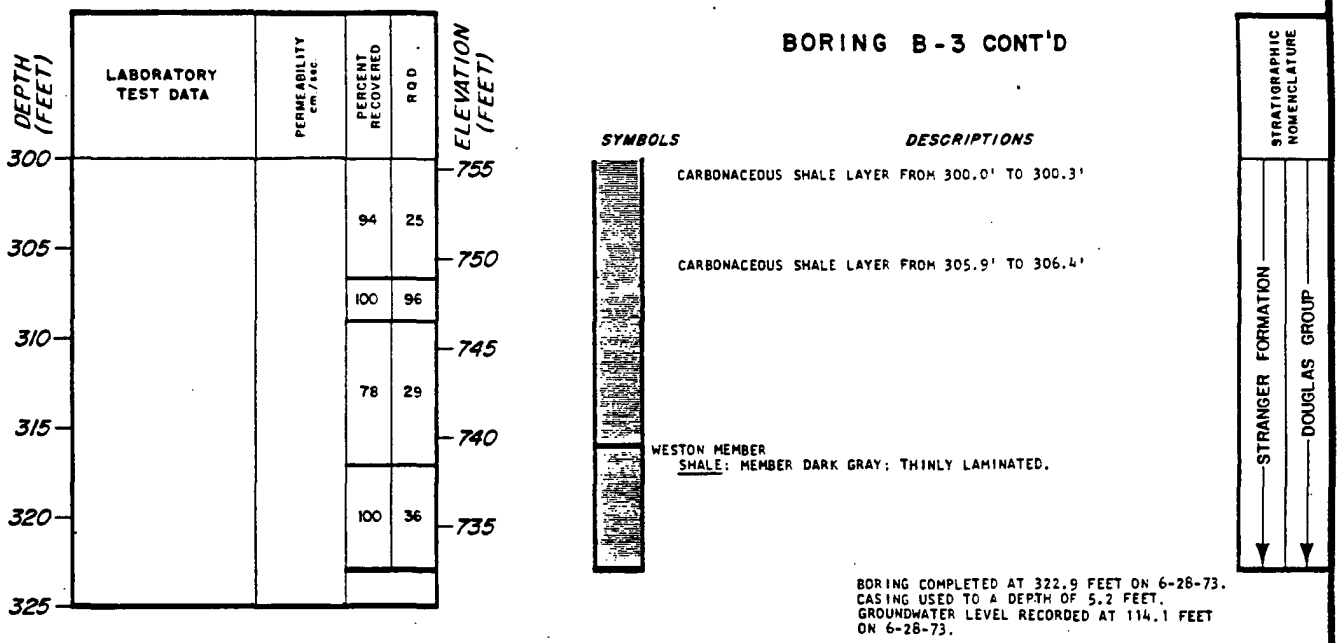
(BORING CONTINUED)

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34c (Sheet 4 of 5)

Log of Boring B-3

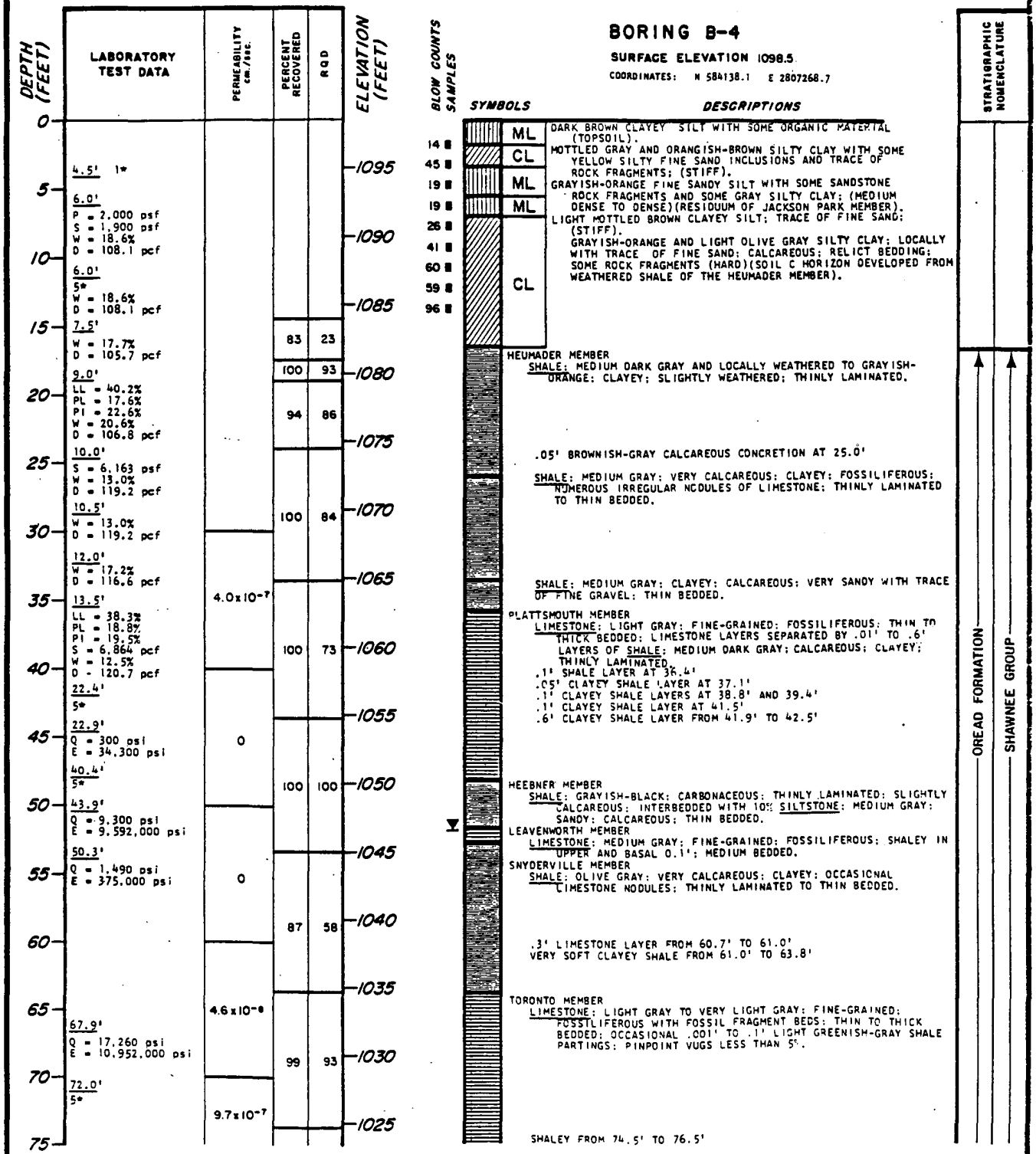


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34c (Sheet 5 of 5)

Log of Boring B-3

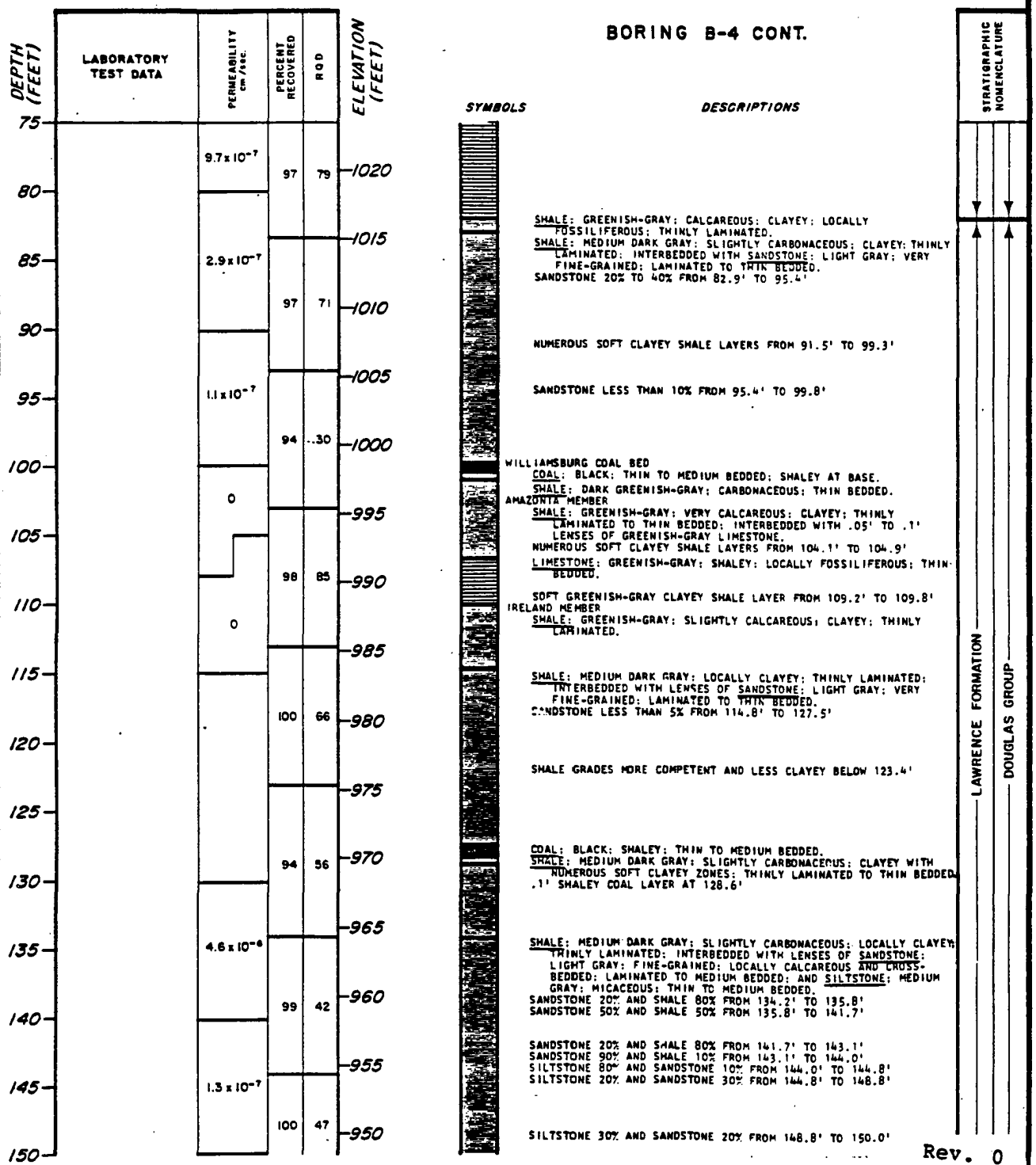


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34d (Sheet 1 of 6)

Log of Boring B-4

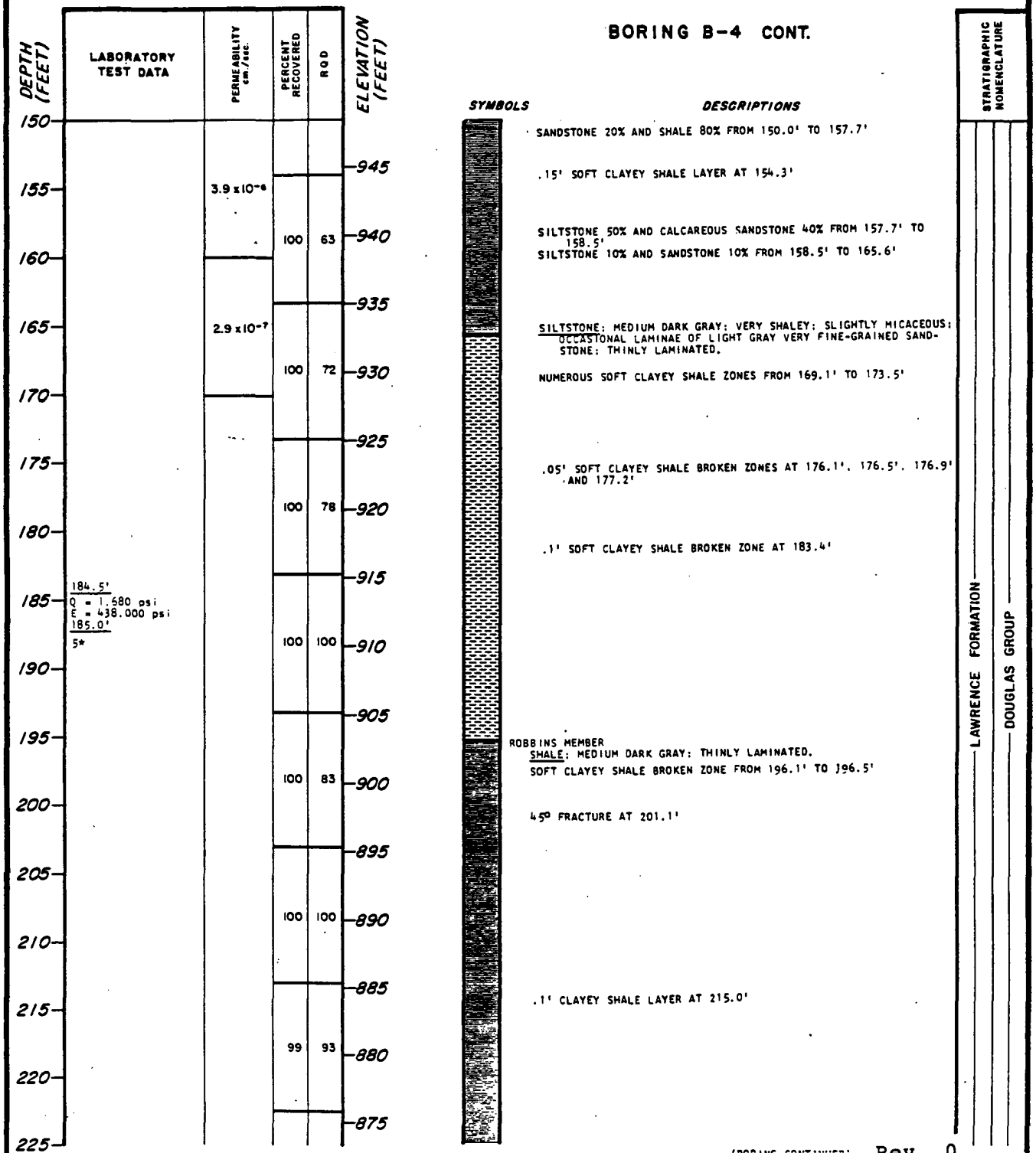


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34d (Sheet 2 of 6)

Log of Boring B-4

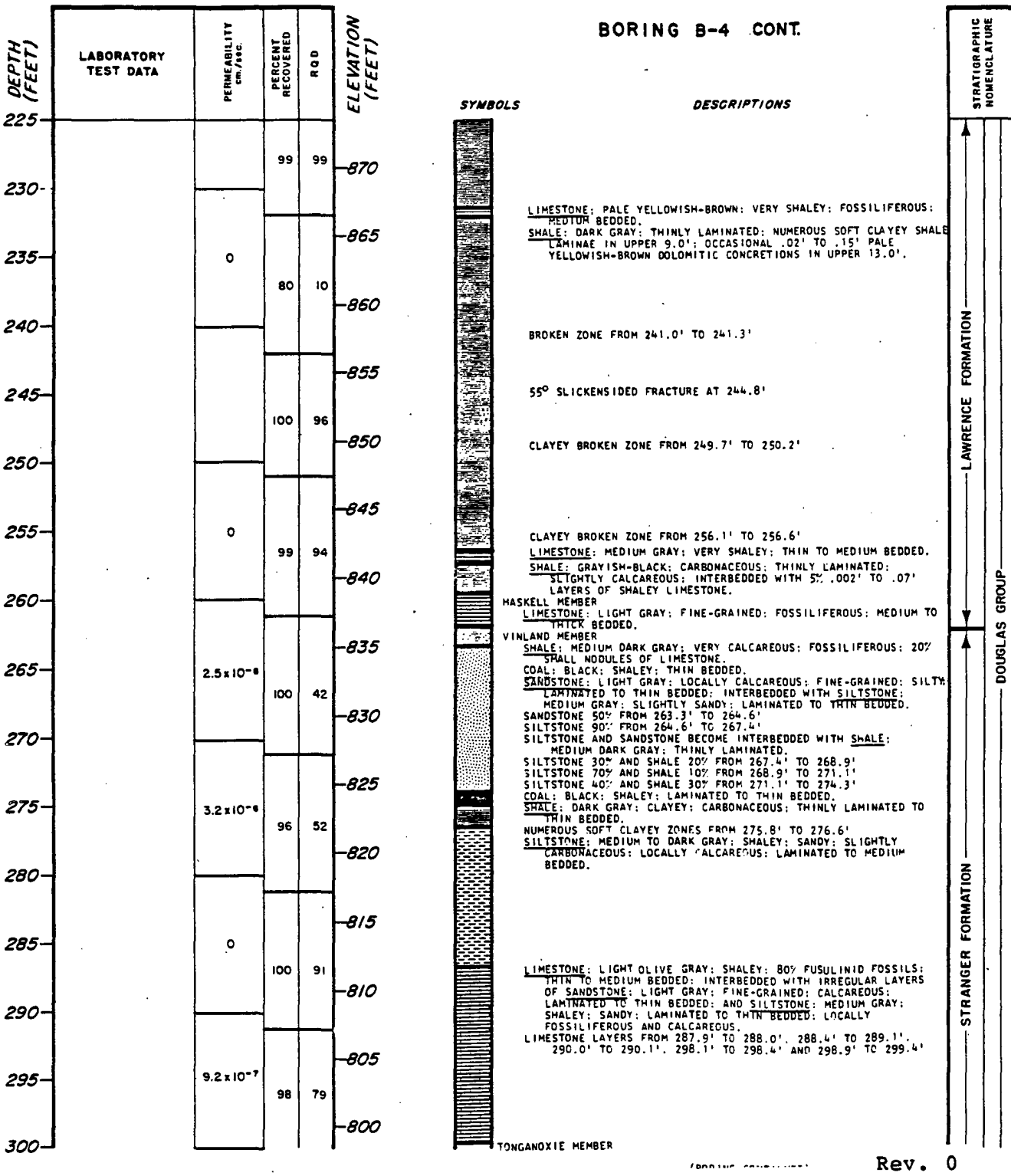


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34d (Sheet 3 of 6)

Log of Boring B-4

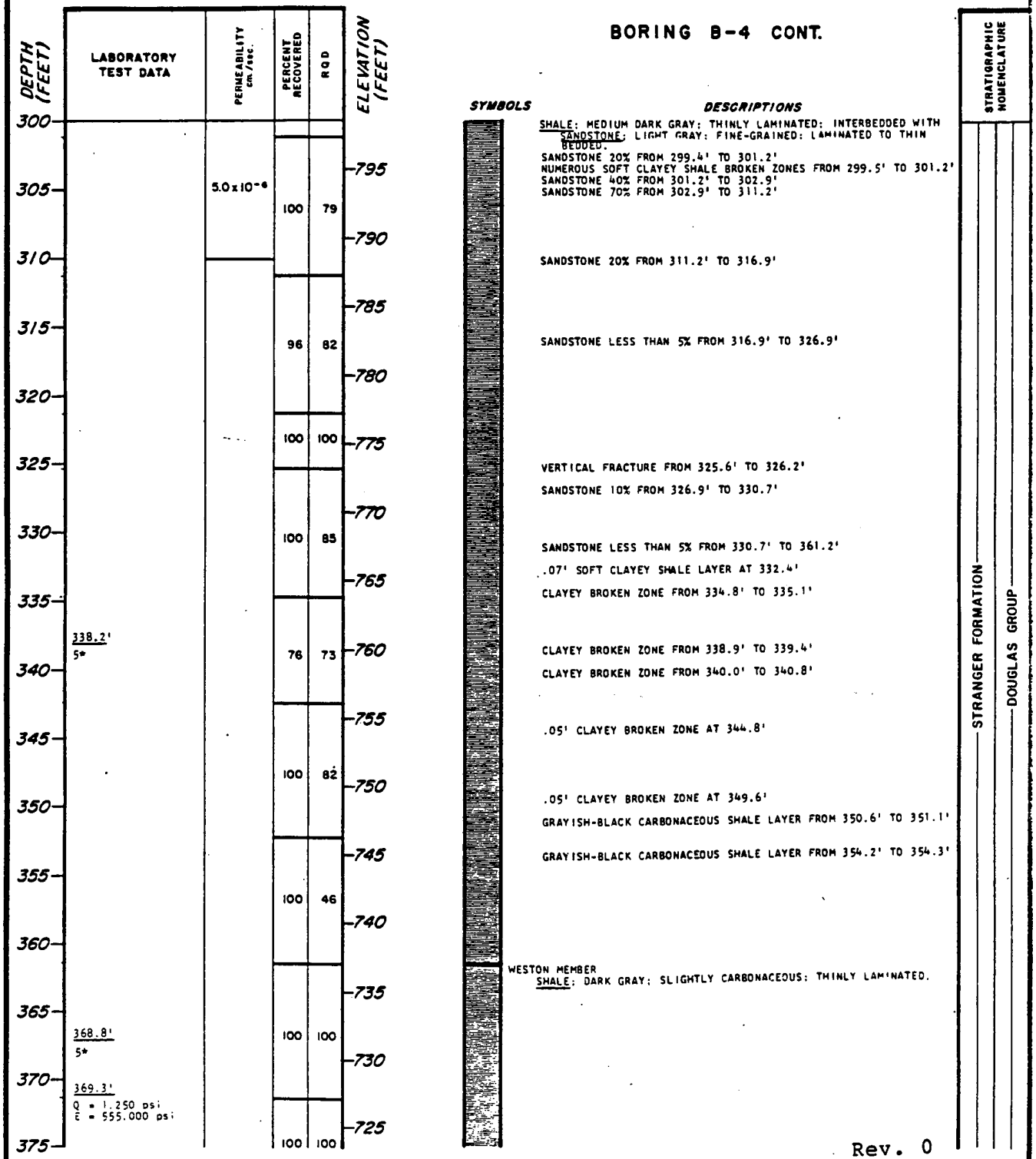


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34d (Sheet 4 of 6)

Log of Boring B-4

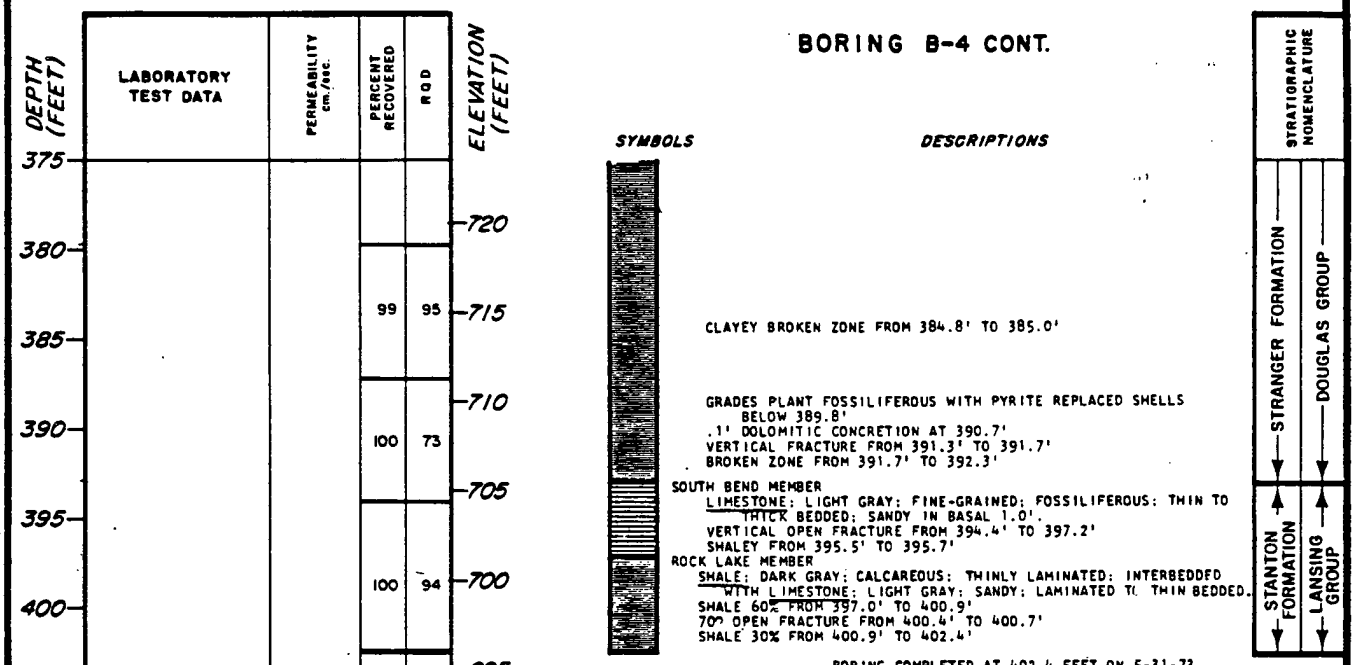


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34d (Sheet 5 of 6)

Log of Boring B-4

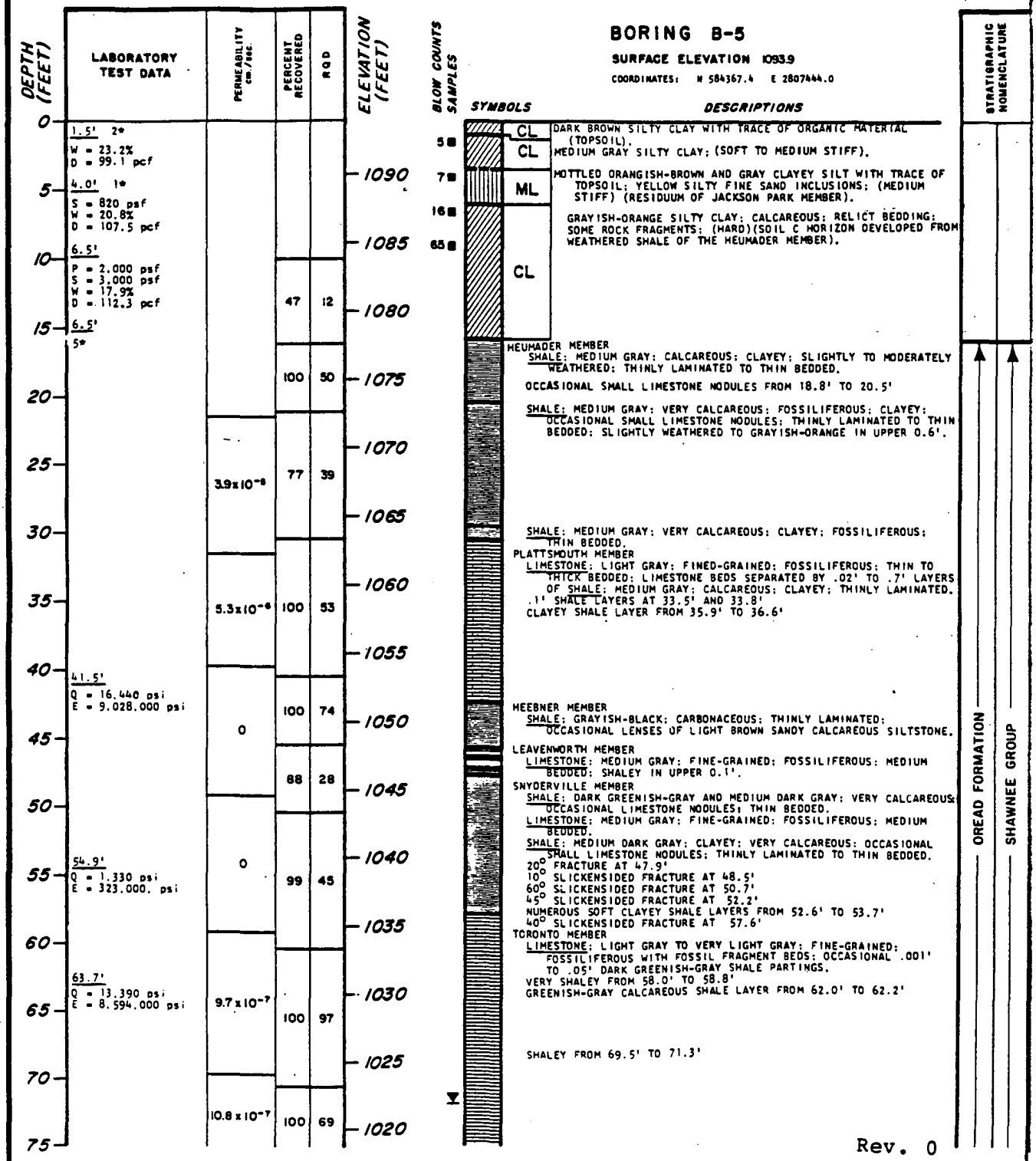


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34d (Sheet 6 of 6)

Log of Boring B-4

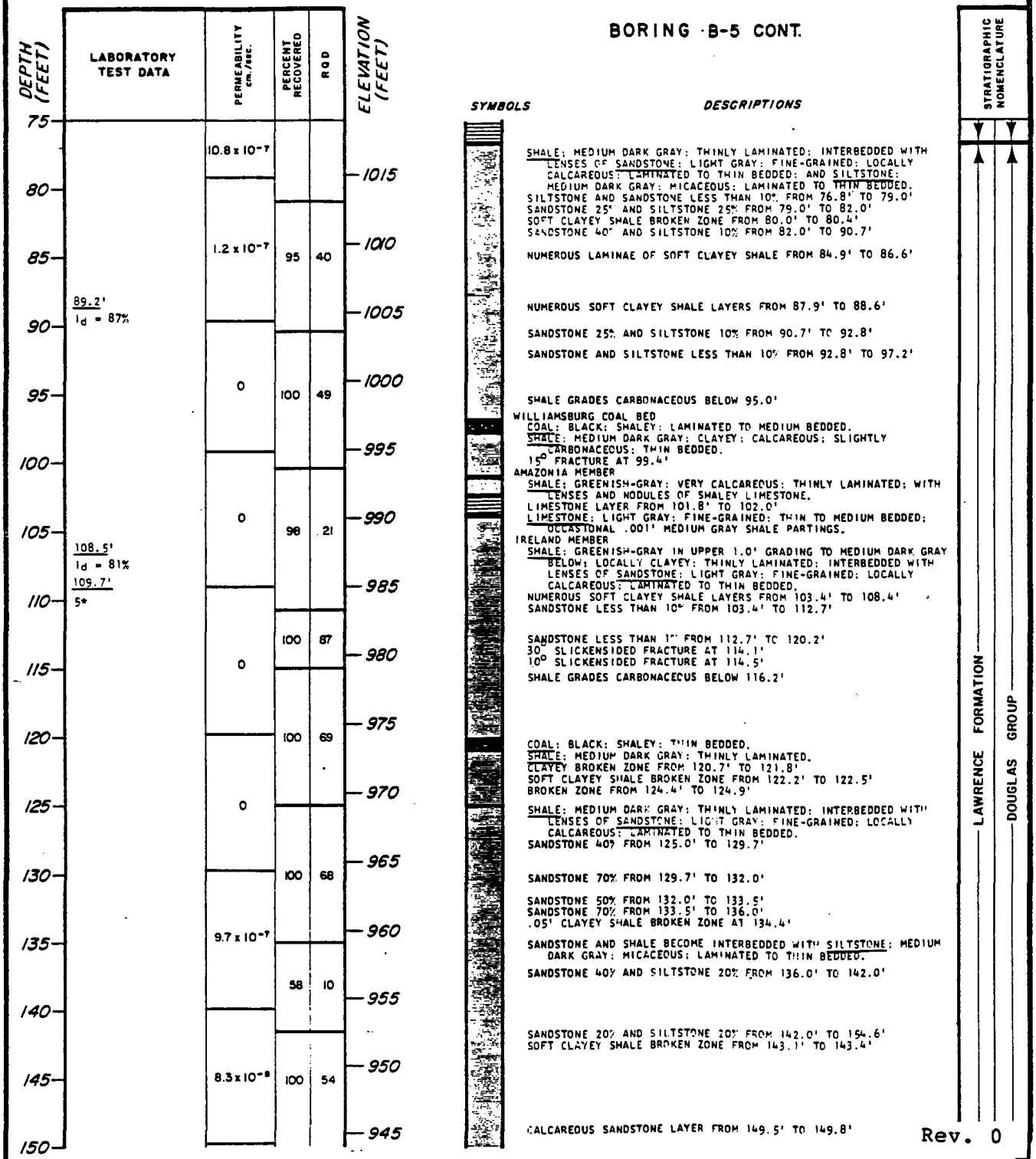


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34e (Sheet 1 of 6)

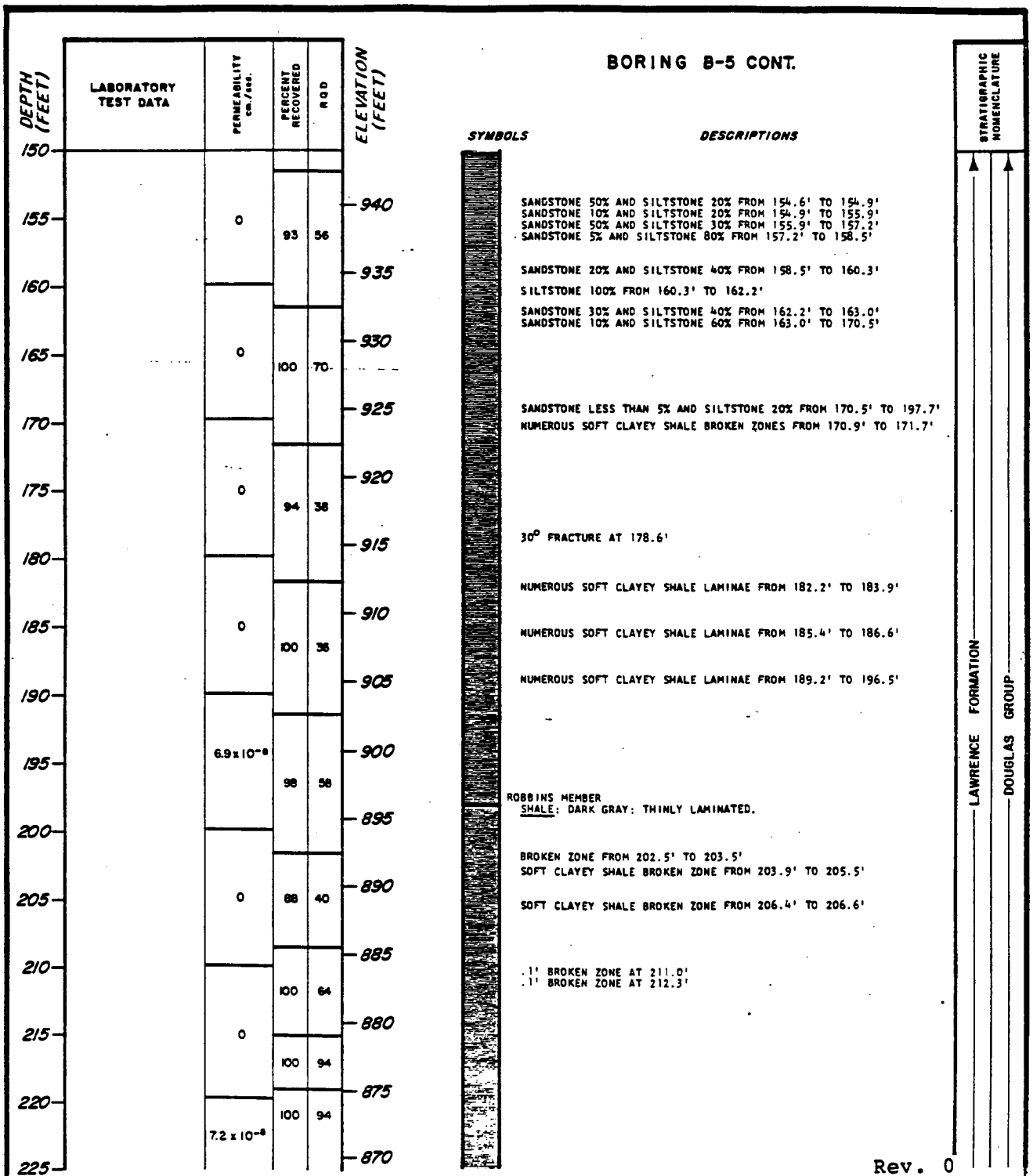
Log of Boring B-5



WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34e (Sheet 2 of 6)

Log of Boring B-5



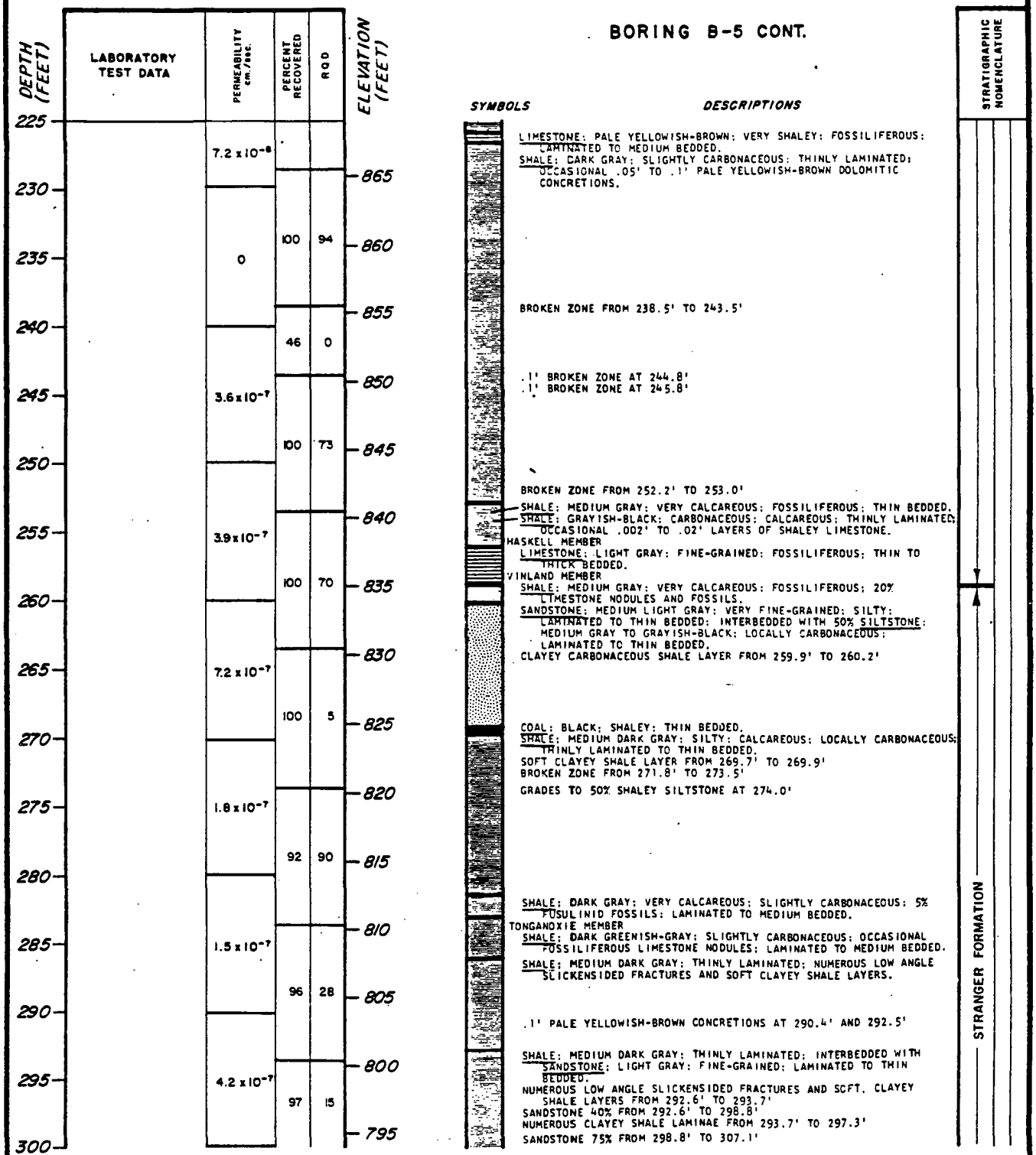
Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34e (Sheet 3 of 6)

Log of Boring B-5

BORING B-5 CONT.

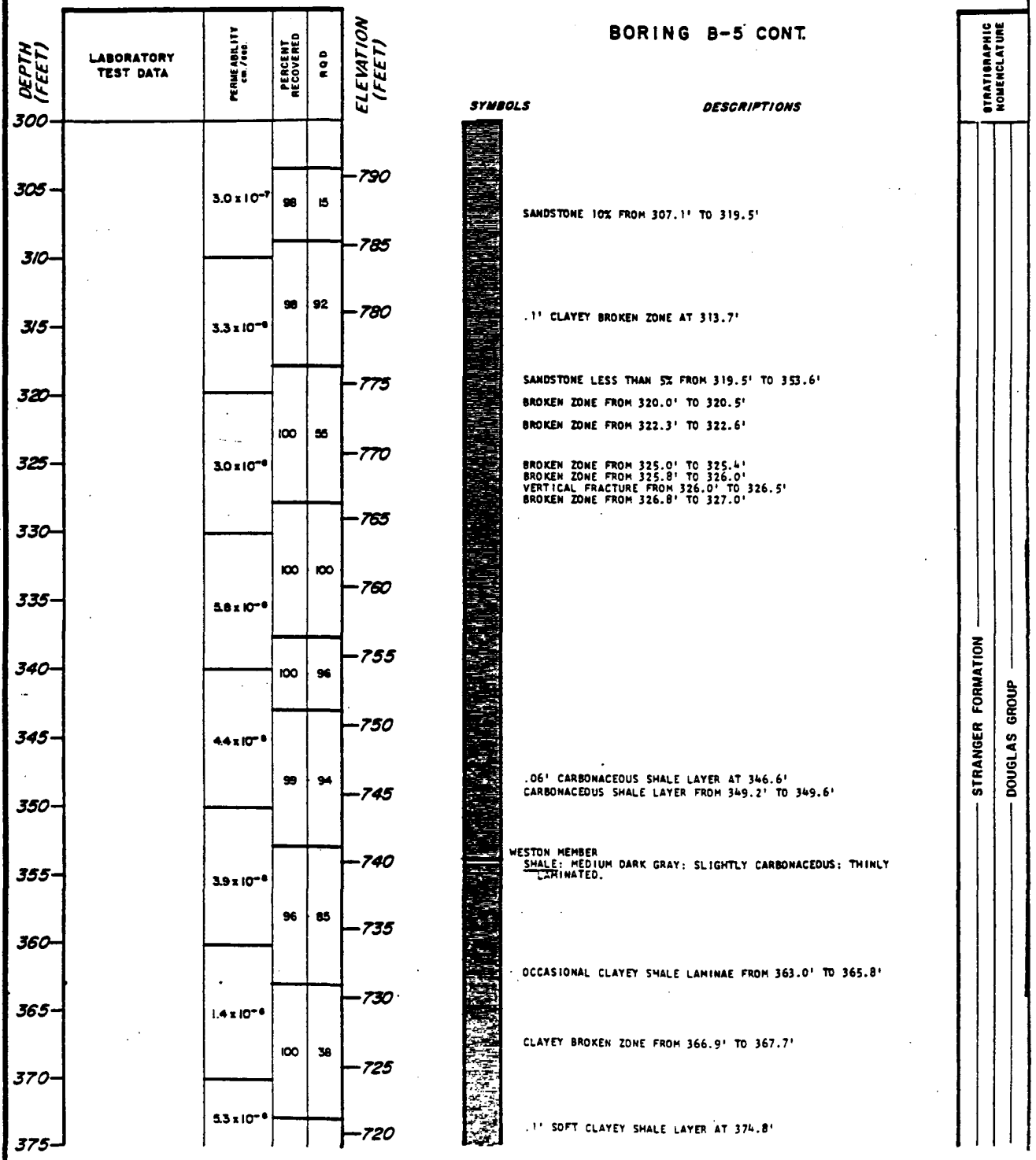


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34e (Sheet 4 of 6)

Log of Boring B-5

Rev. 0

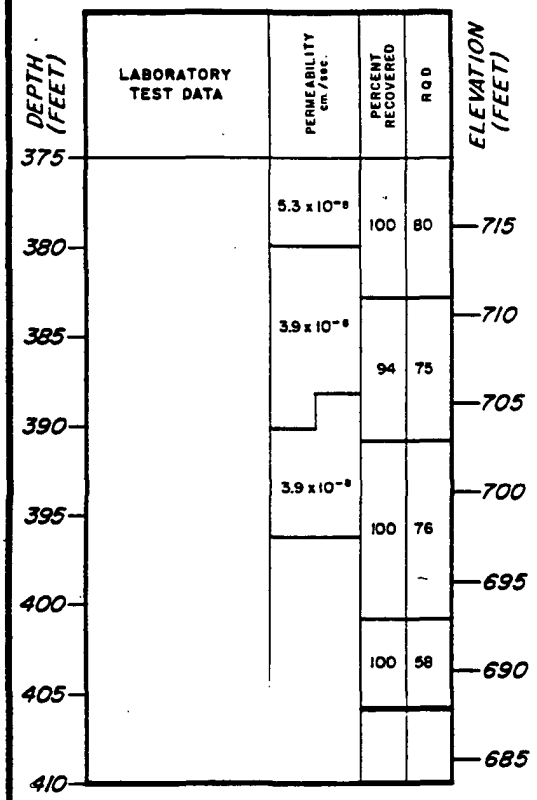


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34e (Sheet 5 of 6)

Log of Boring B-5

Rev. 0



BORING B-5 CONT.

SYMBOLS

DESCRIPTIONS

.05' SOFT CLAYEY SHALE LAYER AT 377.1'

BROKEN ZONE FROM 384.6' TO 385.1'

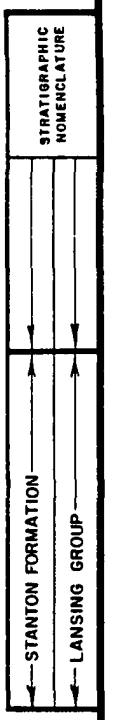
SOUTH BEND MEMBER
LIMESTONE: MEDIUM LIGHT GRAY; FINE-GRAINED; FOSSILIFEROUS; OCCASIONAL BROWNISH-GRAY SHALE PARTINGS; THIN TO THICK BEDDED; SANDY IN BASAL 1.2 FEET.

ROCK LAKE MEMBER
SHALE: MEDIUM DARK GRAY; CALCAREOUS; THINLY LAMINATED; INTERBEDDED WITH IRREGULAR LAYERS AND LENSES OF LIMESTONE; MEDIUM LIGHT GRAY; FINE-GRAINED; LOCALLY VERY SANDY; LAMINATED TO MEDIUM BEDDED.
SHALE 60% FROM 391.0' TO 395.1'
SHALE 20% FROM 395.1' TO 396.6'
10% SHALE AND 90% SANDY LIMESTONE FROM 396.6' TO 398.1'

SANDSTONE: LIGHT OLIVE GRAY; FINE- TO MEDIUM-GRAINED; SLIGHTLY CALCAREOUS; OCCASIONAL MEDIUM DARK GRAY SHALE PARTINGS; THIN TO THICK BEDDED.
VERTICAL OPEN FRACTURE FROM 400.3' TO 401.5'

VERTICAL OPEN FRACTURE FROM 404.2' TO 405.8', CALCITE-LINED FROM 405.1' TO 405.8'

BORING COMPLETED AT 405.8 FEET ON 6-5-73.
CASING USED TO A DEPTH OF 16.2 FEET.
GROUNDWATER LEVEL RECORDED AT 71.8 FEET ON 6-7-73.
THIRD PIEZOMETER INSTALLED AT AN INTERVAL FROM 5.0 FEET TO 72.0 FEET ON 8-7-73.
SECOND PIEZOMETER INSTALLED AT AN INTERVAL FROM 86.0 FEET TO 98.0 FEET ON 8-7-73.
FIRST PIEZOMETER INSTALLED AT AN INTERVAL FROM 288.0 FEET TO 348.0 FEET ON 8-7-73.
PIEZOMETER READINGS ARE PRESENTED ON TABLE 2.4-29.

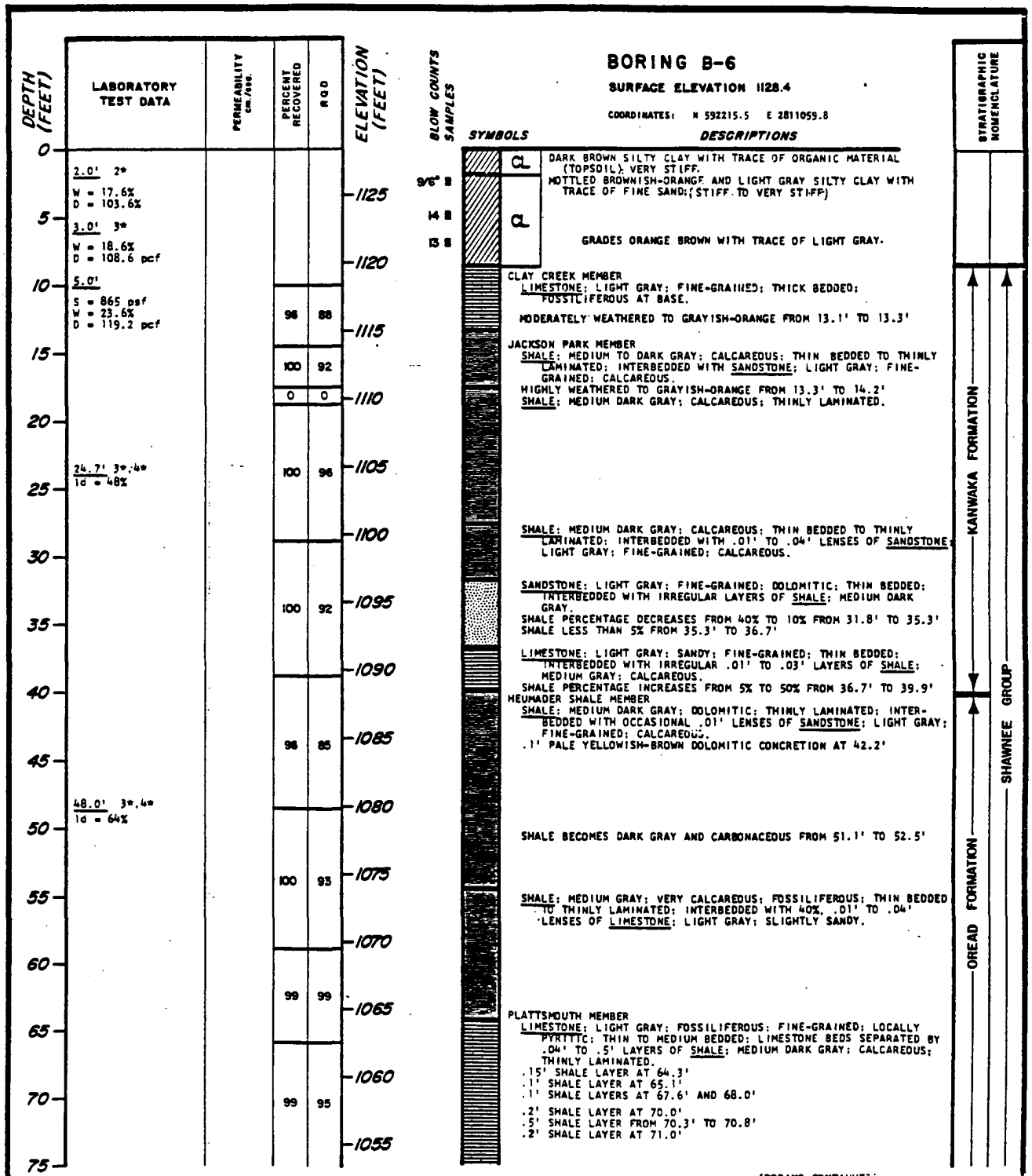


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34e (Sheet 6 of 6)

Log of Boring B-5

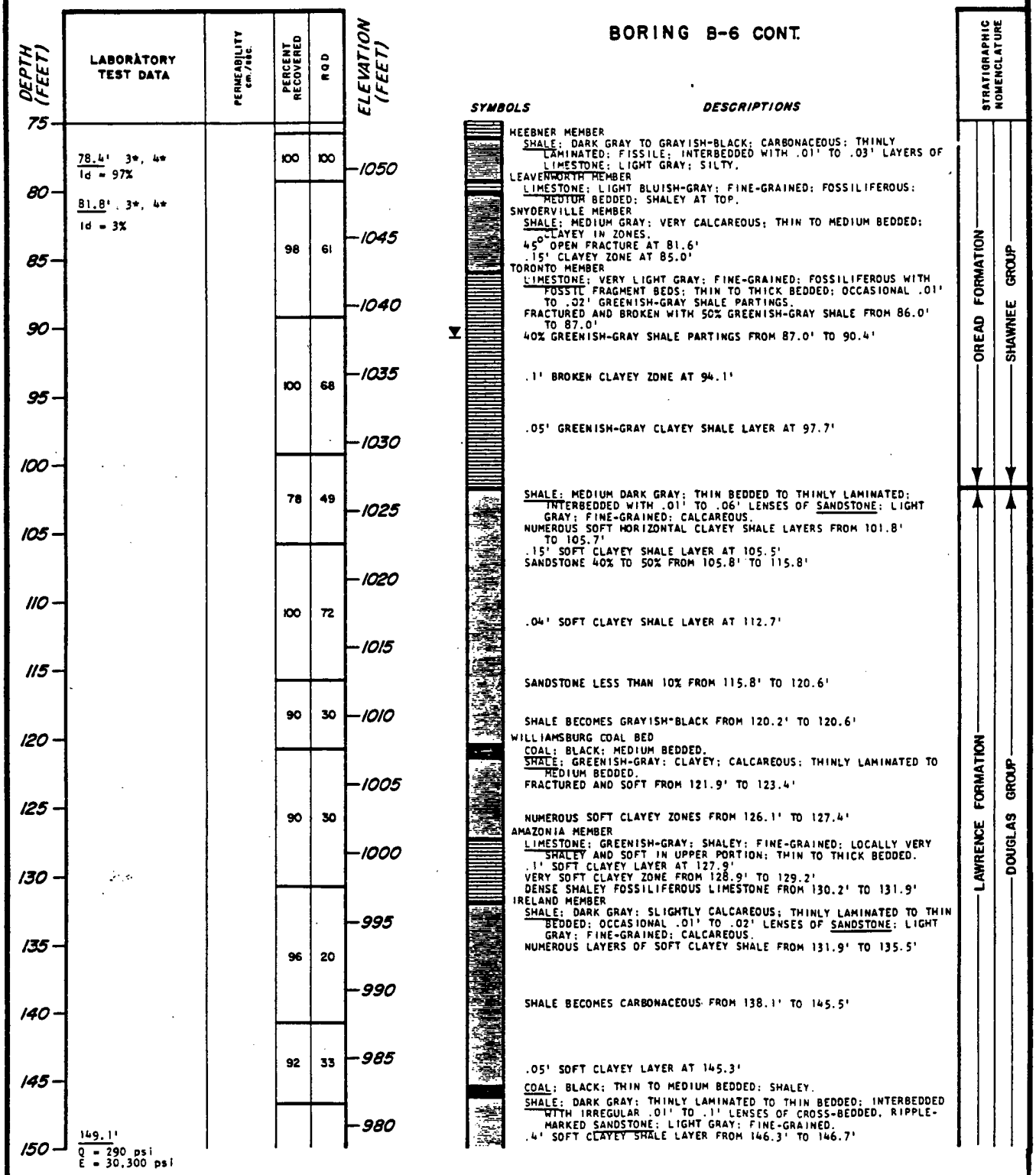


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34f (Sheet 1 of 6)

Log of Boring B-6

Rev. 0

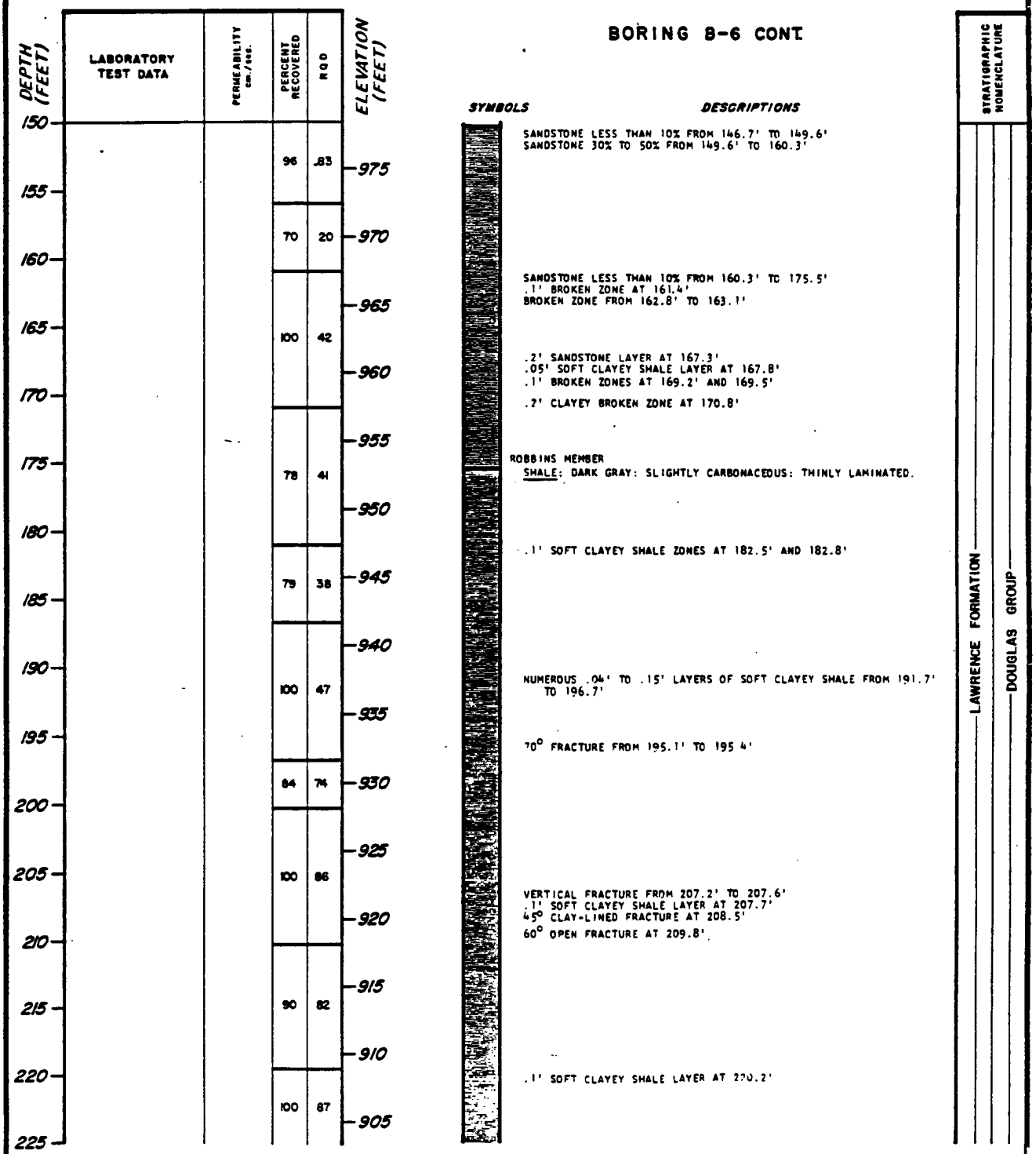


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34f (Sheet 2 of 6)

Log of Boring B-6

Rev. 0



WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34f (Sheet 3 of 6)

Log of Boring B-6

Rev. 0

BORING B-6 CONT.

DEPTH (FEET)	LABORATORY TEST DATA	PERMEABILITY cm/sec	PERCENT RECOVERED	RQD	ELEVATION (FEET)
225	226.0' 3*, 4* Id = 76%				
230			87	9	900
			100	100	
235			100	99	895
240			100	88	890
245					885
250			99	88	880
255					875
260			100	99	870
265			95	72	865
270					860
275			100	88	855
280					850
285			100	89	845
290					840
295			100	90	835
300					830

SYMBOLS

DESCRIPTIONS

SHALE BECOMES DARK GRAY AND SLIGHTLY CARBONACEOUS FROM 232.8' TO 236.3'

SHALE: DARK GRAY: VERY CALCAREOUS: FOSSILIFEROUS: MEDIUM BEDDED.
SHALE: DARK GRAY: SLIGHTLY CARBONACEOUS: THINLY LAMINATED: OCCASIONAL .05' TO .15' PALE YELLOWISH-BROWN IRONSTONE CONCRETIONS.
VERTICAL CLAY-LINED FRACTURE ZONE FROM 238.4' TO 238.9'
VERTICAL OPEN FRACTURE FROM 232.2' TO 232.8'

HASKELL MEMBER
LIMESTONE: LIGHT GRAY: FINE-GRAINED: 10% FUSULINID FOSSILS: MEDIUM TO THICK BEDDED.

VINLAND MEMBER
LIMESTONE: LIGHT GRAY: FOSSILIFEROUS: SANDY: THIN BEDDED; INTERBEDDED WITH 40% DARK GRAY SHALE.
SANDSTONE: LIGHT GRAY: FINE-GRAINED: MICACEOUS: SLIGHTLY CALCAREOUS: THIN TO THICK BEDDED: OCCASIONAL .01' DARK GRAY SHALE PARTINGS.

SHALE: GREENISH-GRAY: SLIGHTLY CALCAREOUS: THIN TO MEDIUM BEDDED: NUMEROUS 20° TO 40° SLICKENSIDED FRACTURES.
SHALE BECOMES LIGHT GREENISH-GRAY AND VERY DOLOMITIC FROM 254.1' TO 254.7'

WESTPHALIA MEMBER
LIMESTONE: LIGHT GRAY: FINE-GRAINED: 60% FUSULINID FOSSILS: THIN TO THICK BEDDED: INTERBEDDED WITH GREENISH-GRAY SHALE.
SHALE LESS THAN 5% FROM 254.7' TO 256.4'
SHALE 10% FROM 256.4' TO 260.4'

SHALE INCREASES FROM 20% TO 80% FROM 260.4' TO 261.5'

TONGANOXIE MEMBER
SANDSTONE: GREENISH-GRAY: VERY FINE-GRAINED: SILTY: MEDIUM BEDDED.
SILTSTONE: LIGHT TO MEDIUM GRAY: SLIGHTLY SANDY: MICACEOUS: THIN TO THICK BEDDED: INTERBEDDED WITH SHALE: DARK GRAY: THINLY LAMINATED: AND SANDSTONE: LIGHT GRAY: VERY FINE-GRAINED: THIN BEDDED.
SANDSTONE 10% AND SHALE 5% FROM 262.6' TO 267.4'
VERTICAL CLAY-LINED FRACTURE FROM 263.5' TO 264.5'
SILTSTONE 100% FROM 267.4' TO 275.6'

CURVING NEAR VERTICAL SLICKENSIDED FRACTURE AT 270.8'
45° SLICKENSIDED FRACTURES AT 271.1' AND 271.2'

SANDSTONE 30% AND SHALE 10% FROM 275.6' TO 286.2'

HIGHLY FRACTURED ZONE FROM 280.8' TO 281.3'
NEAR VERTICAL FRACTURE FROM 281.4' TO 281.9'

SANDSTONE 5% AND SHALE 25% FROM 286.2' TO 312.1'

STRATIGRAPHIC NOMENCLATURE

LAWRENCE FORMATION

STRANGER FORMATION

DOUGLAS GROUP

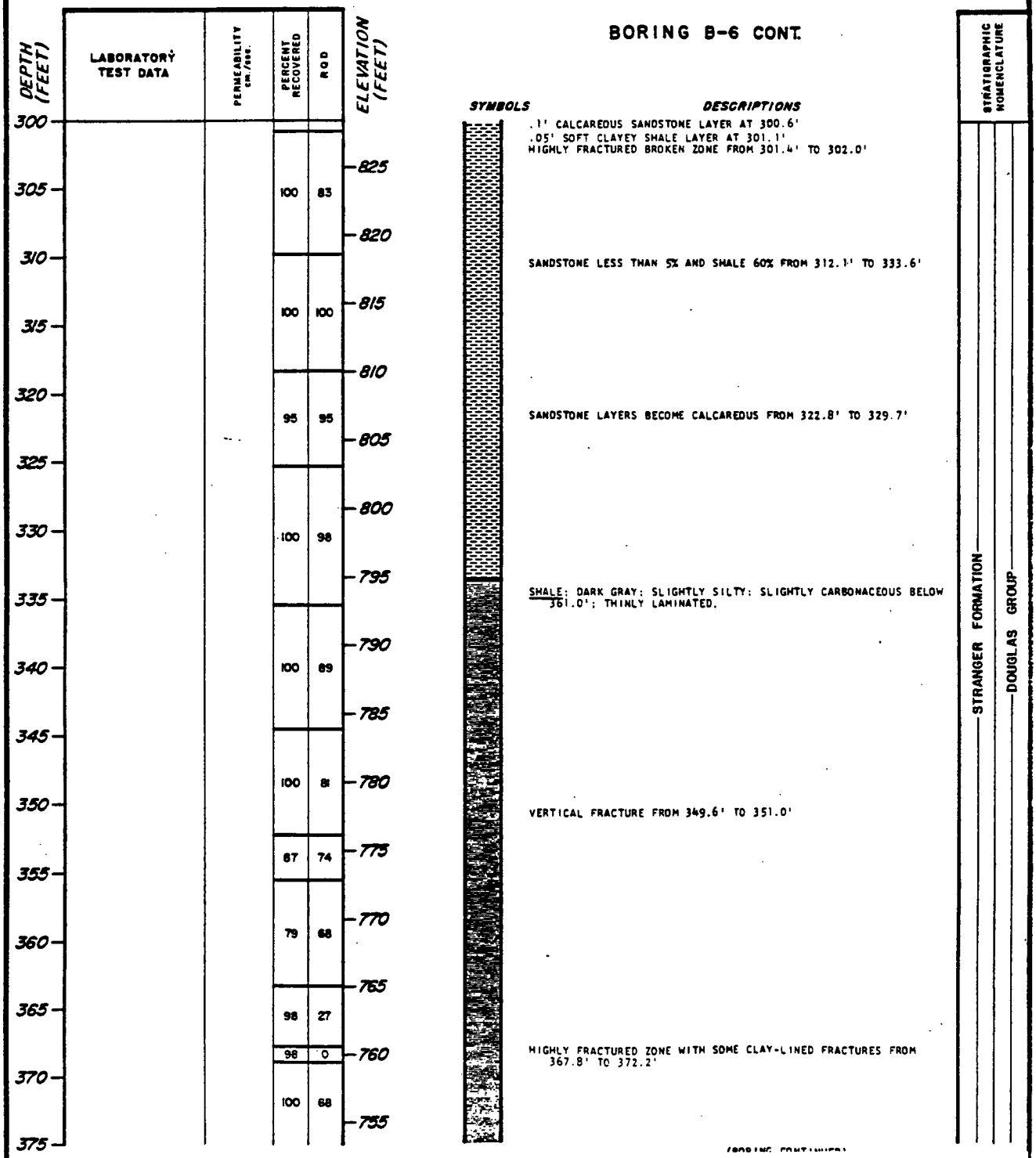
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34f (Sheet 4 of 6)

Log of Boring B-6

Rev. 0

BORING B-6 CONT.

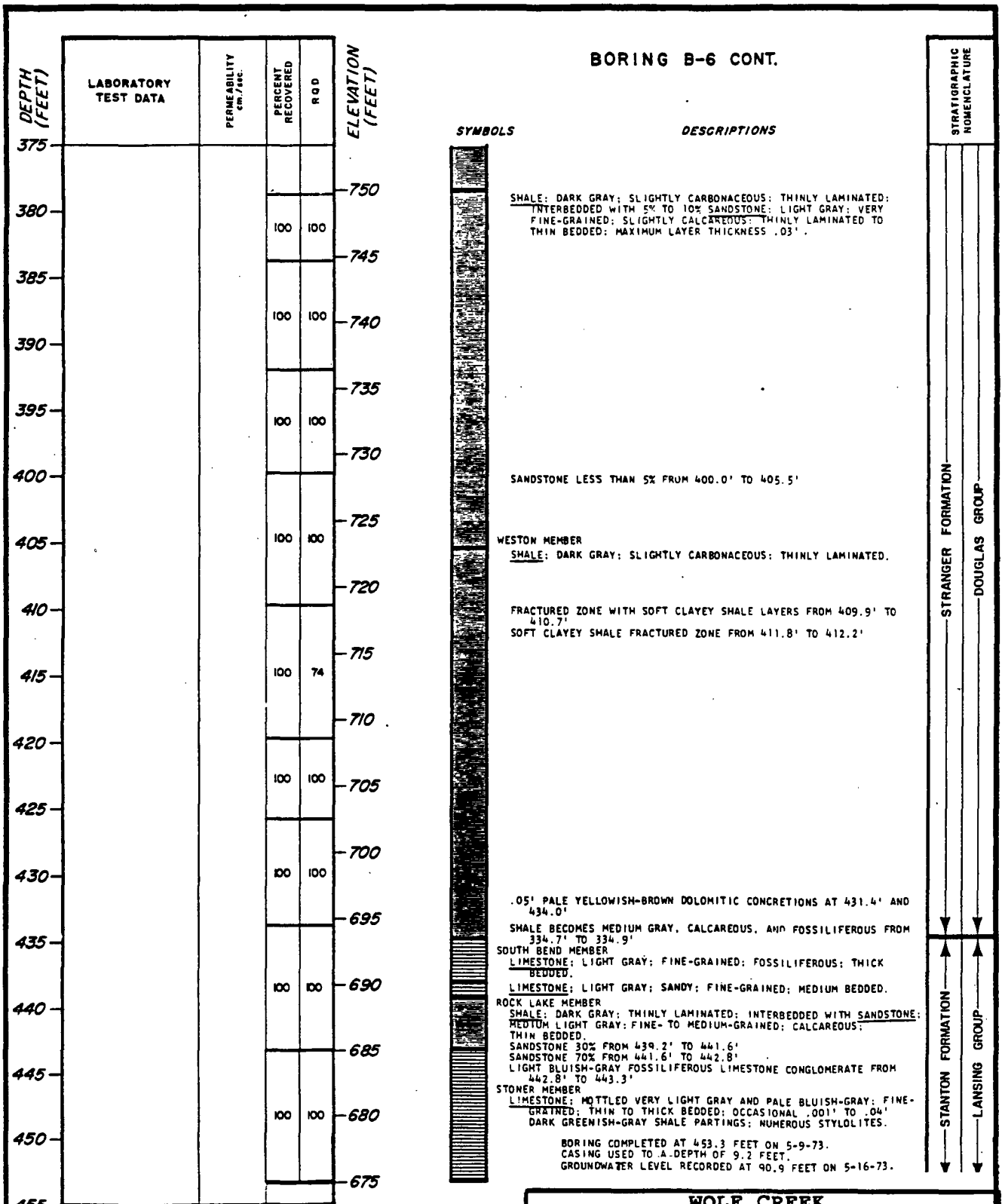


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34f (Sheet 5 of 6)

Log of Boring B-6

Rev. 0



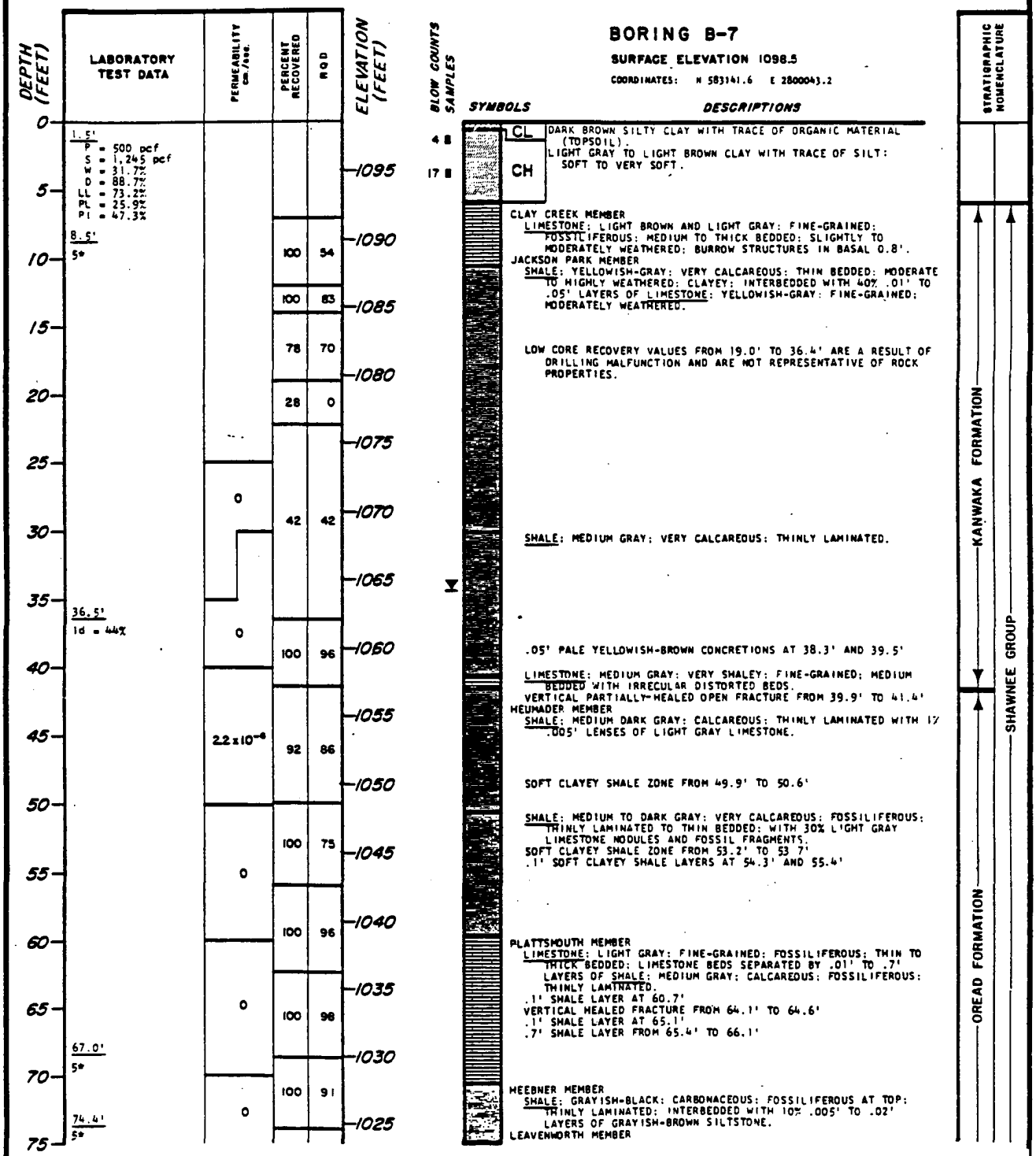
THIRD PIEZOMETER INSTALLED AT AN INTERVAL OF 5.0 FEET TO 26.0 FEET ON 7-3-73.
SECOND PIEZOMETER INSTALLED AT AN INTERVAL FROM 83.0 FEET TO 89.0 FEET ON 7-3-73.
FIRST PIEZOMETER INSTALLED AT AN INTERVAL FROM 262.0 FEET TO 333.0 FEET ON 7-3-73.
PIEZOMETER READINGS ARE PRESENTED ON TABLE 2.4-29.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34f (Sheet 6 of 6)

Log of Boring B-6

Rev. 0

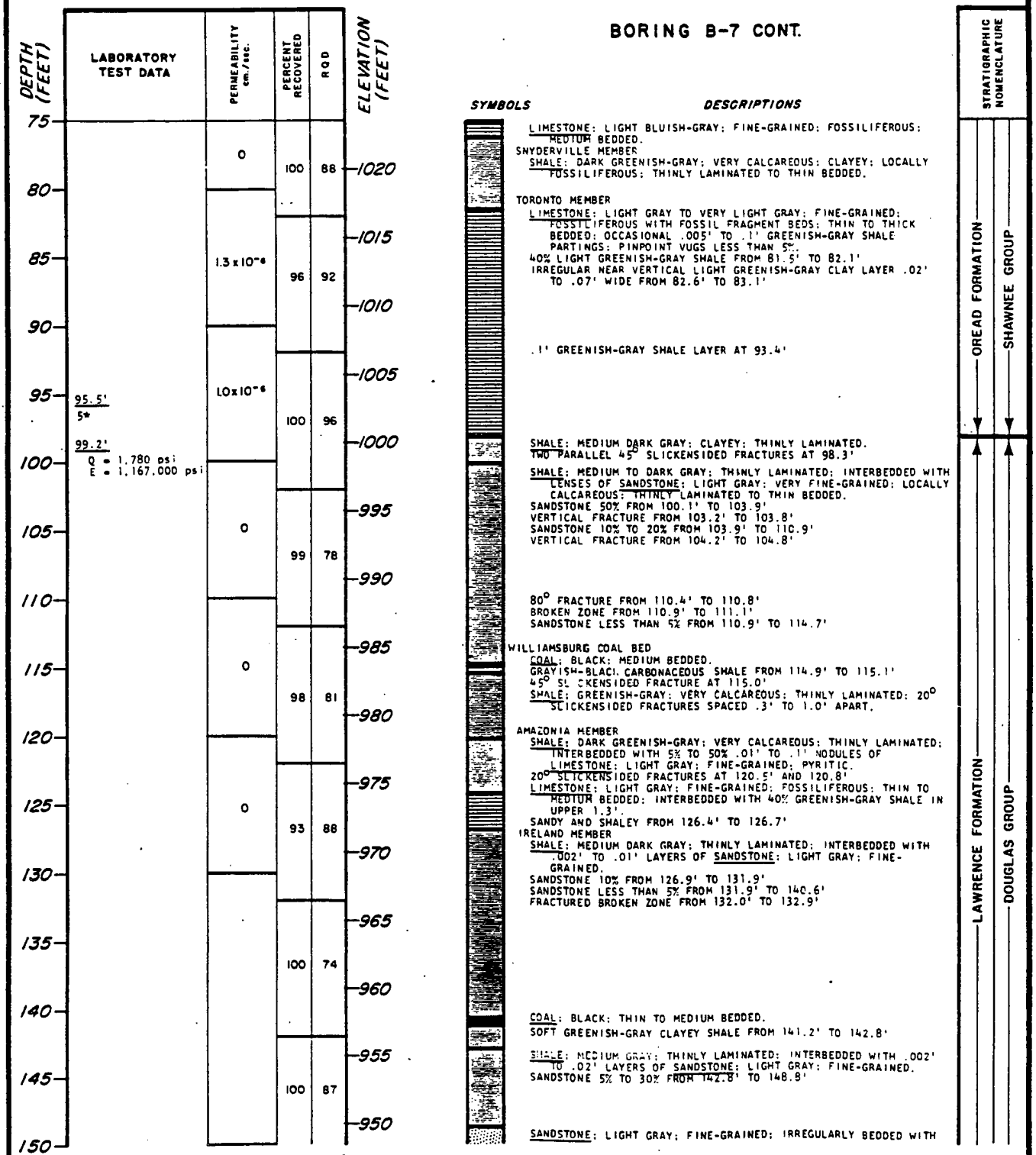


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34g (Sheet 1 of 6)

Log of Boring B-7

Rev. 0

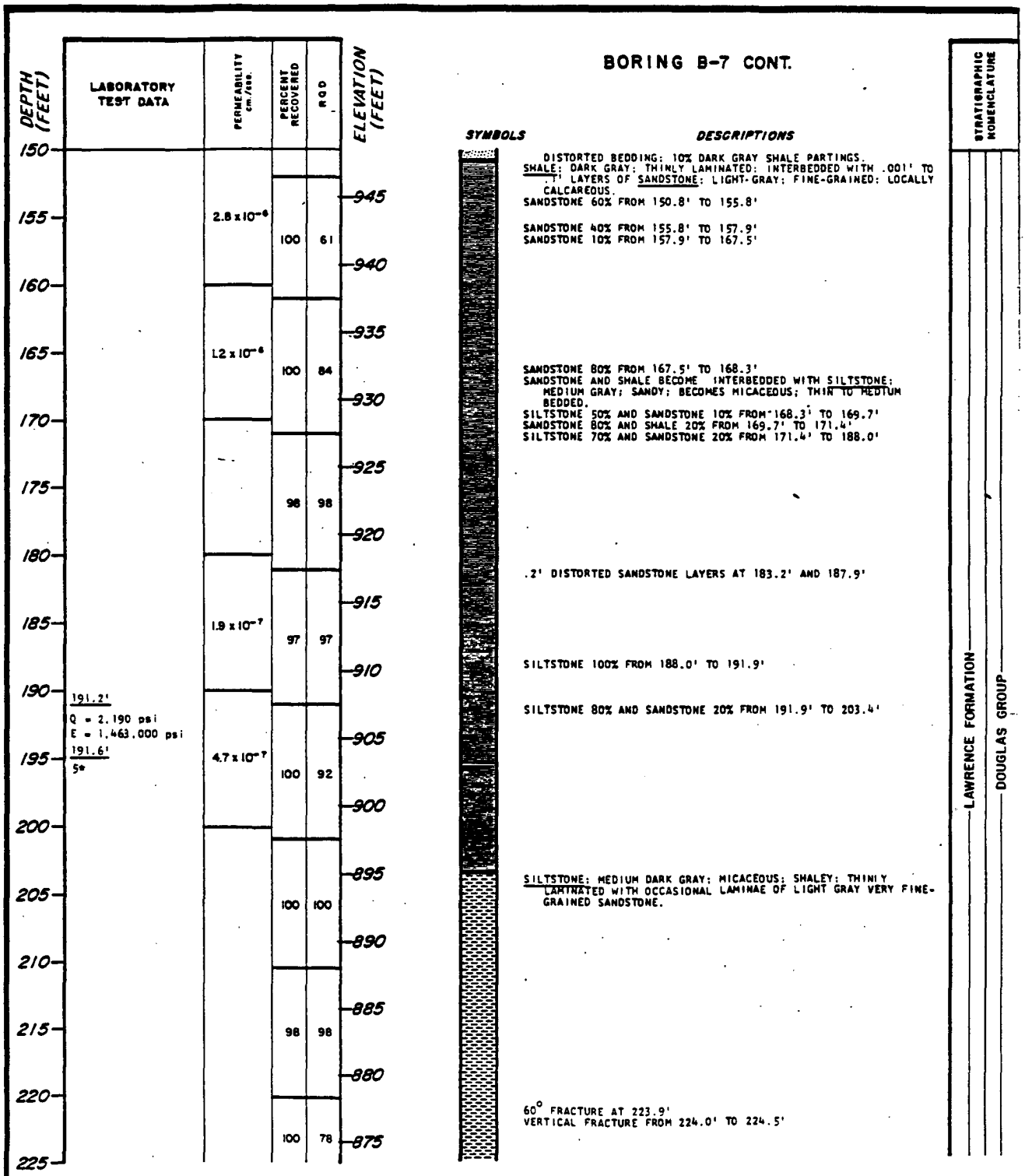


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34g (Sheet 2 of 6)

Log of Boring B-7

Rev. 0

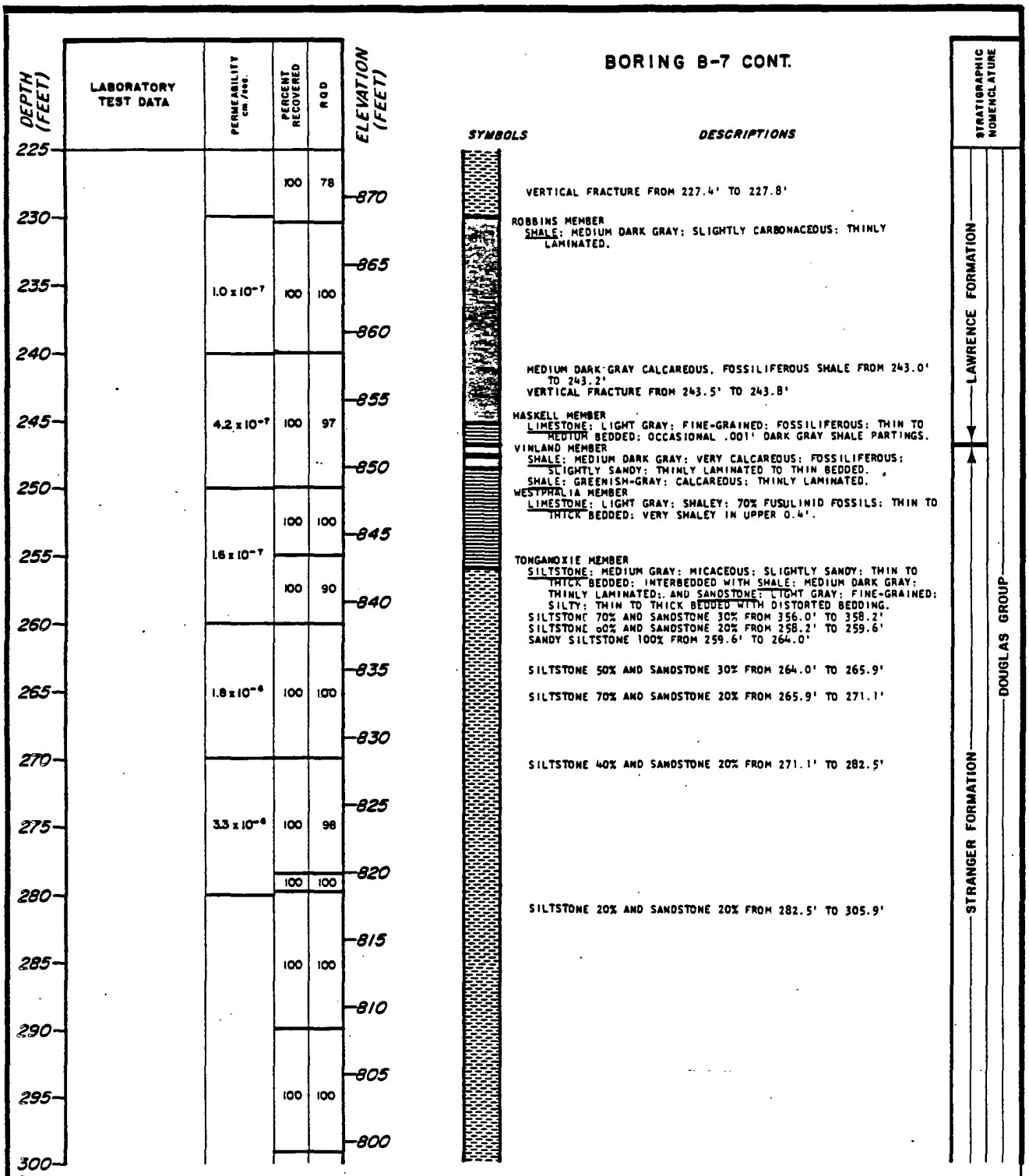


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34g (Sheet 3 of 6)

Log of Boring B-7

Rev. 0

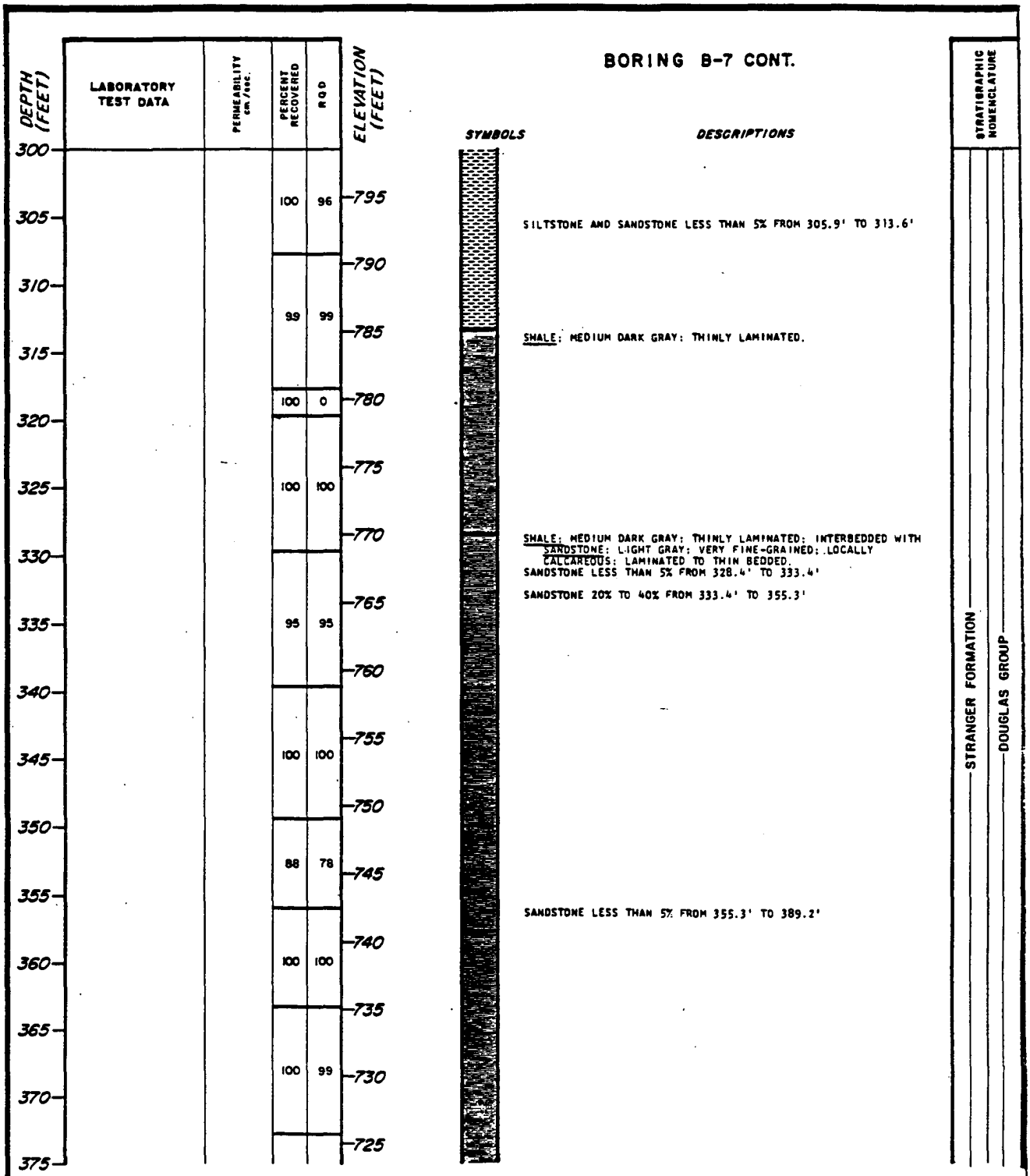


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34g (Sheet 4 of 6)

Log of Boring B-7

Rev. 0

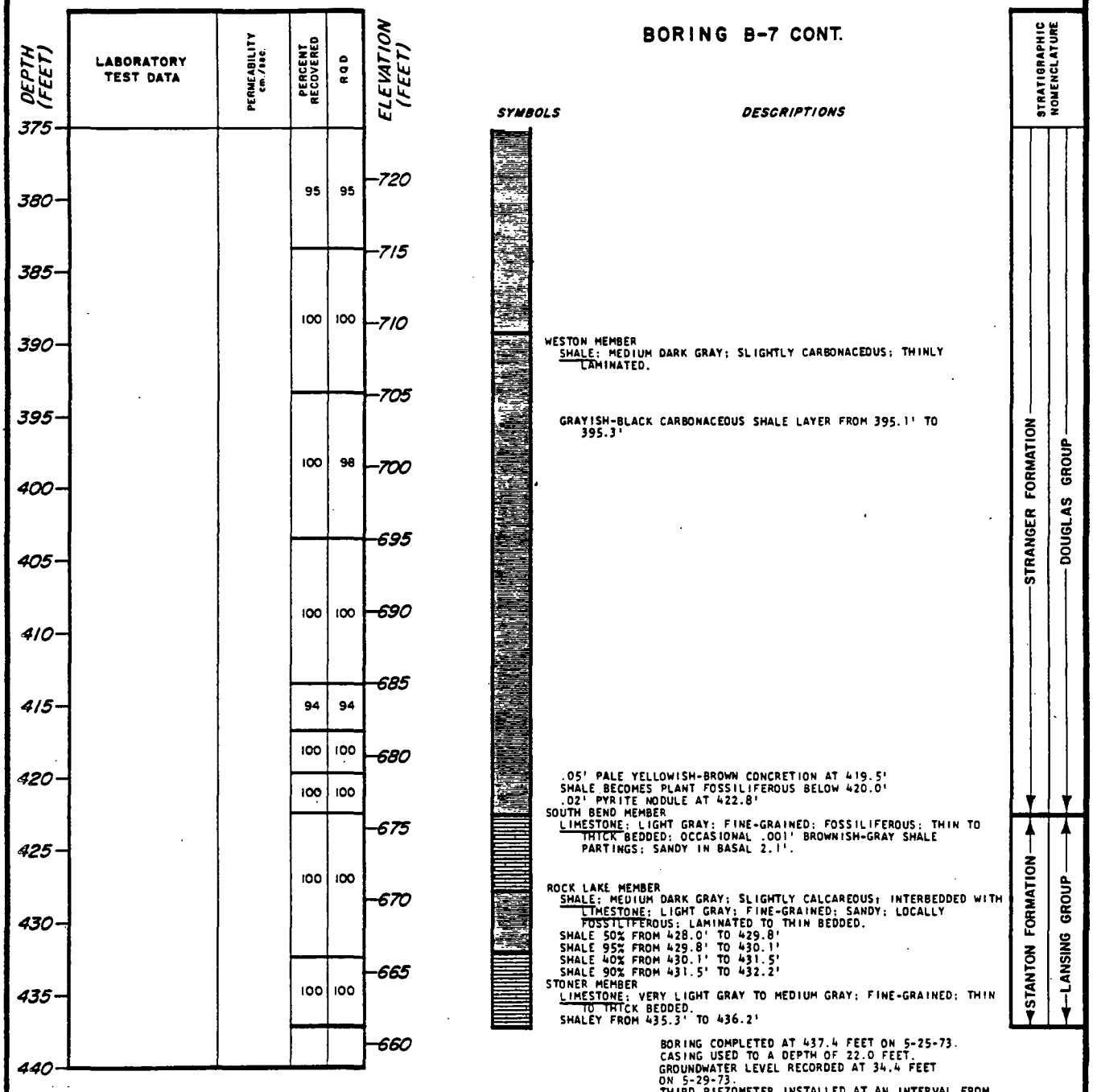


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34g (Sheet 5 of 6)

Log of Boring B-7

Rev. 0

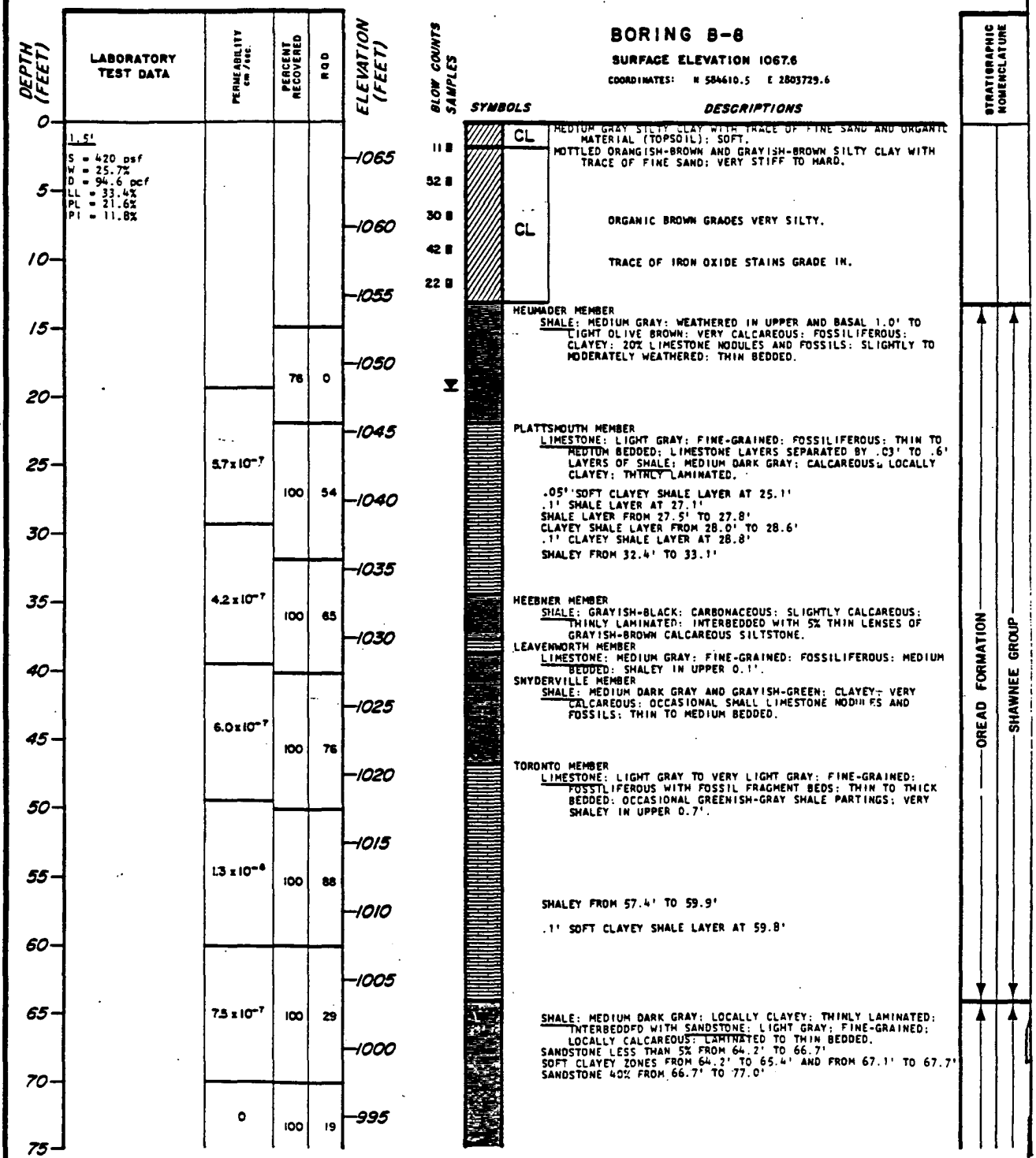


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34g (Sheet 6 of 6)

Log of Boring B-7

Rev. 0

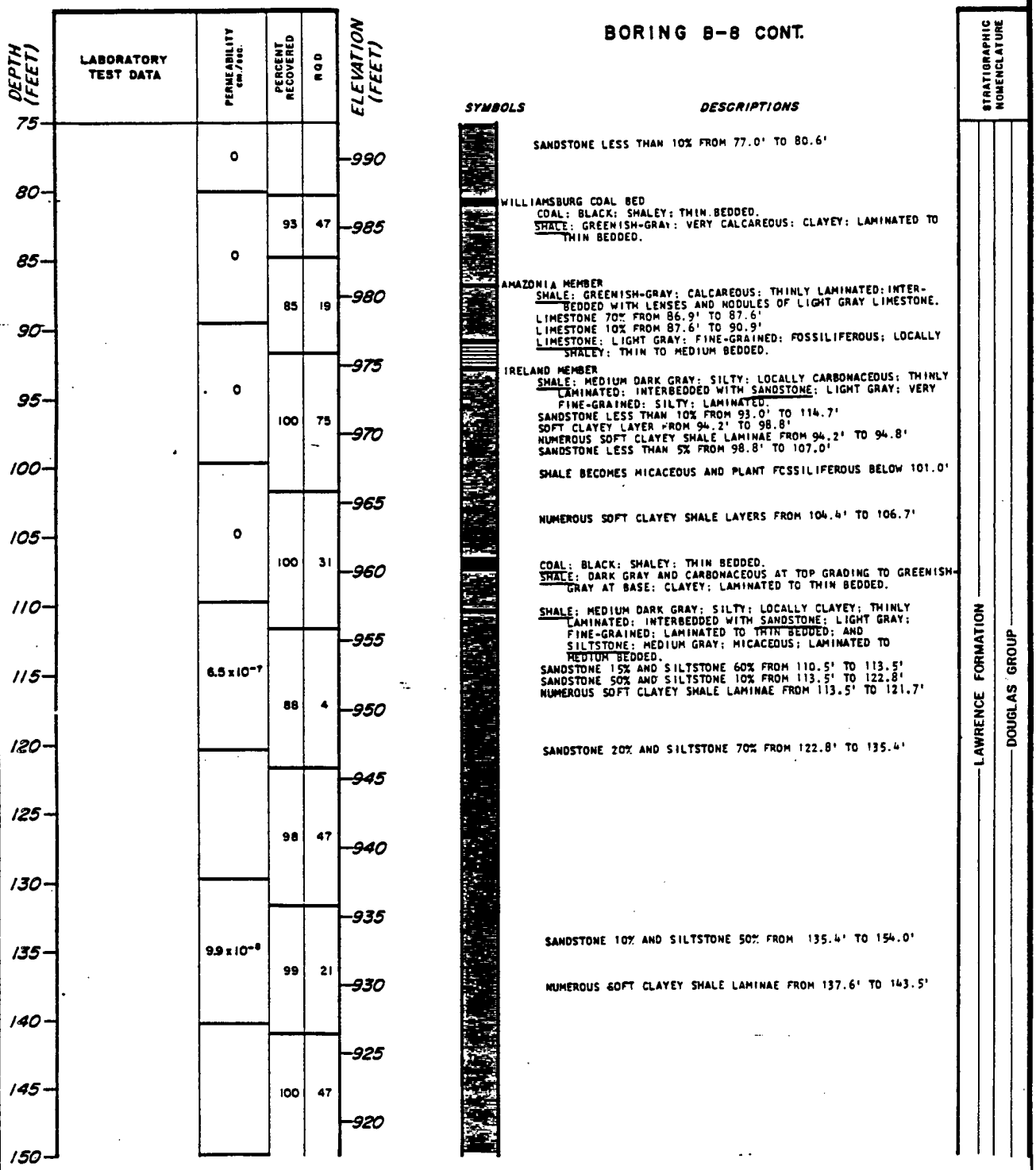


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34h (Sheet 1 of 6)

Log of Boring B-8

Rev. 0

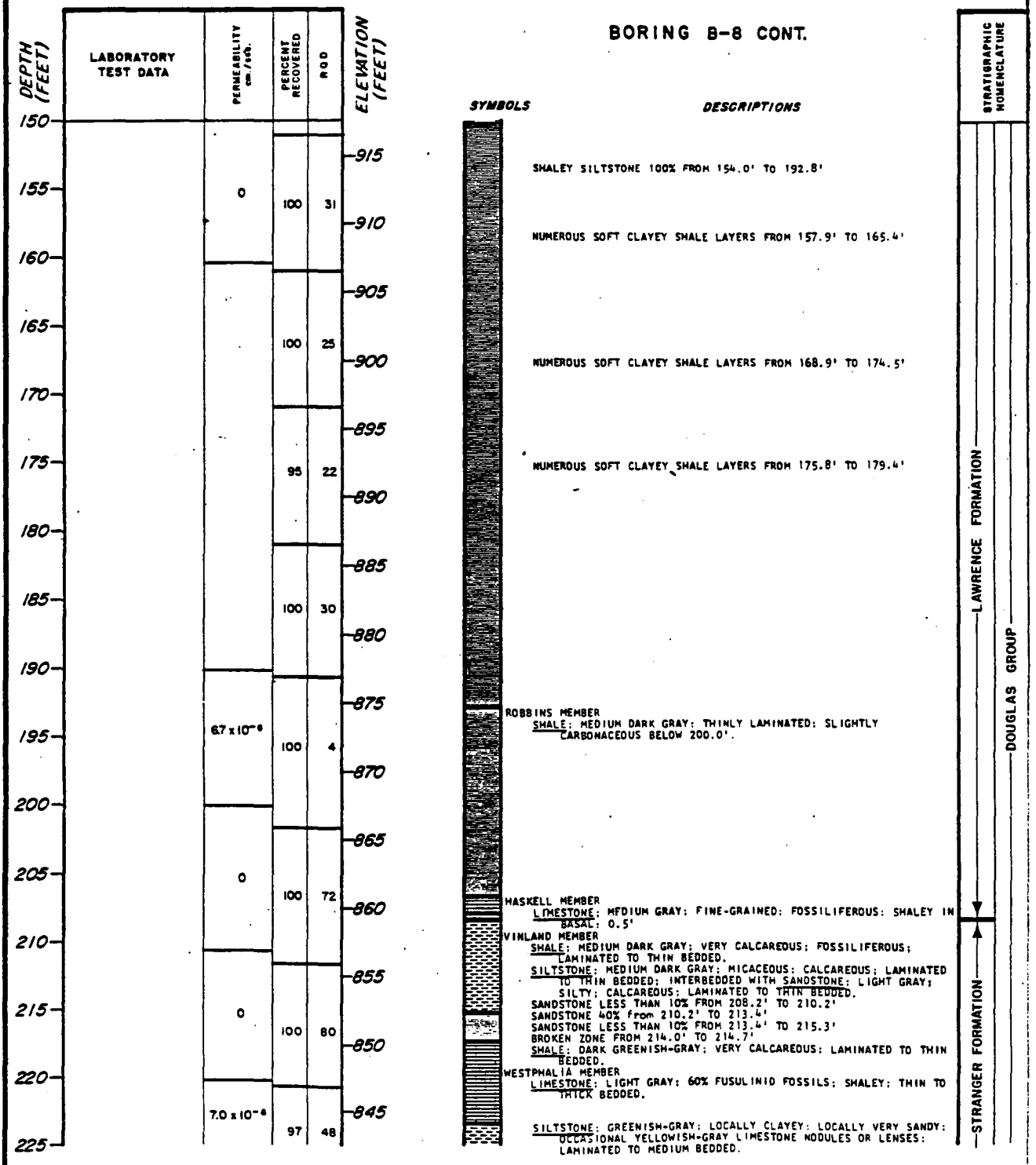


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34h (Sheet 2 of 6)

Log of Boring B-8

Rev. 0



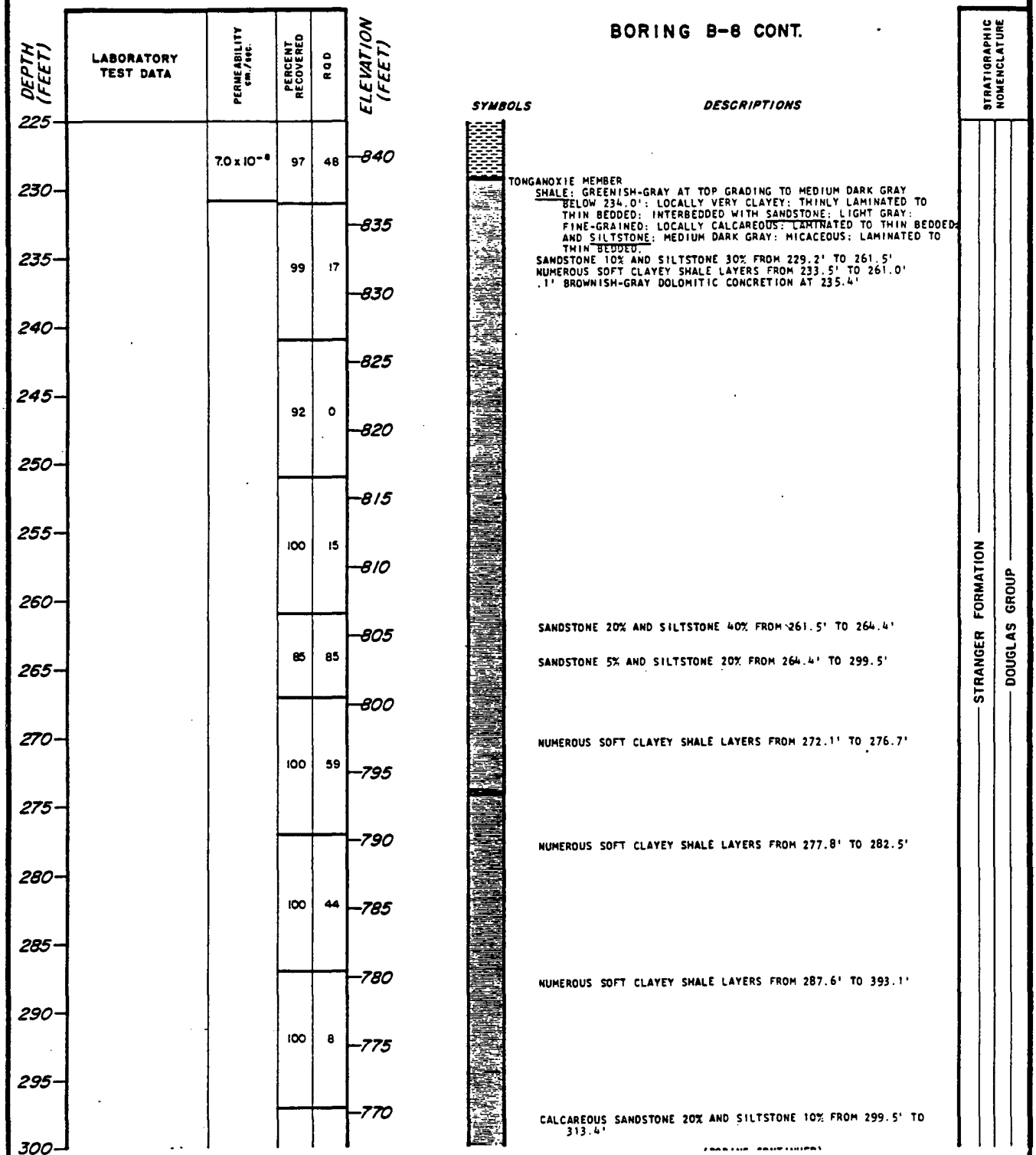
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34h (Sheet 3 of 6)

Log of Boring B-8

Rev. 0

BORING B-8 CONT.

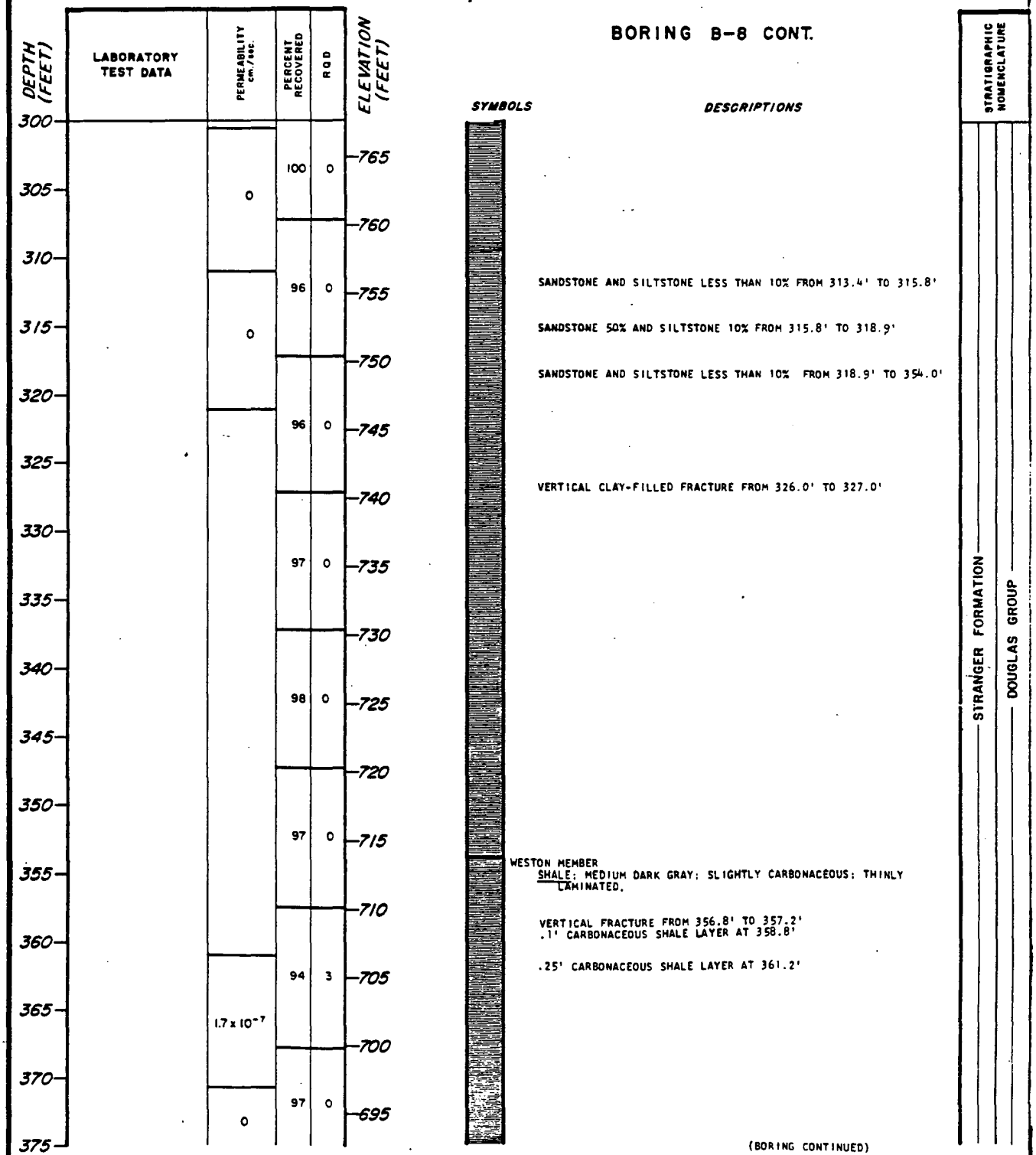


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34h (Sheet 4 of 6)

Log of Boring B-8

Rev. 0

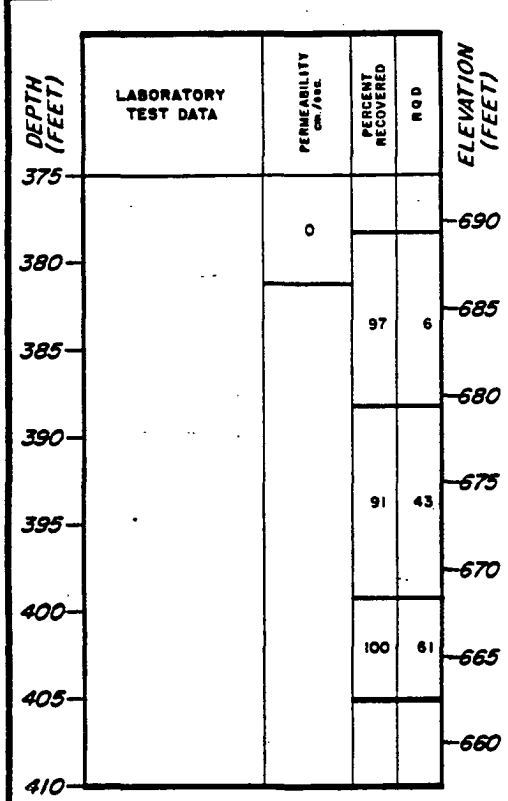


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34h (Sheet 5 of 6)

Log of Boring B-8

Rev. 0



BORING B-8 CONT.



.15' BROKEN ZONE AT 376.5'
.2' BROKEN ZONE AT 377.6'

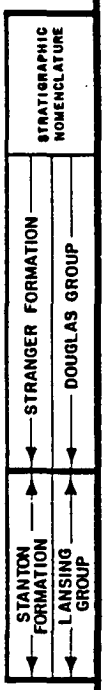
BROKEN AND CLAYEY FROM 389.5' TO 393.1'

SOUTH BEND MEMBER
LIMESTONE: LIGHT GRAY; FINE-GRAINED; FOSSILIFEROUS; THIN TO THICK BEDDED; SANDY IN BASAL 1.4'.
VERTICAL CALCITE-HEALED FRACTURES FROM 393.5' TO 394.7' AND FROM 395.2' TO 396.8'

ROCK LAKE MEMBER
SHALE: MEDIUM DARK GRAY; CALCAREOUS; THINLY LAMINATED; INTERBEDDED WITH LIMESTONE; LIGHT GRAY; FINE-GRAINED; LOCALLY VERY SANDY; LAMINATED TO MEDIUM BEDDED.
SHALE 70% FROM 397.9' TO 401.5'
LIMESTONE 70% FROM 401.5' TO 403.1'
VERY SANDY FROM 402.3' TO 403.1'

STONER MEMBER
LIMESTONE: LIGHT GRAY TO VERY LIGHT GRAY; FINE-GRAINED; OCCASIONAL GREENISH-GRAY SHALE PARTINGS; THIN TO THICK BEDDED.

BORING COMPLETED AT 405.1 FEET ON 6-11-73.
CASING USED TO A DEPTH OF 15.0 FEET.
GROUNDWATER LEVEL RECORDED AT 20.0 FEET ON 6-25-73.
THIRD PIEZOMETER INSTALLED AT AN INTERVAL FROM 5.0 FEET TO 17.0 FEET ON 7-31-73.
SECOND PIEZOMETER INSTALLED AT AN INTERVAL FROM 22.0 FEET TO 34.0 FEET ON 7-31-73.
FIRST PIEZOMETER INSTALLED AT AN INTERVAL FROM 44.0 FEET TO 64.0 FEET ON 7-31-73.
PIEZOMETER READINGS ARE PRESENTED ON TABLE 2.4-29.

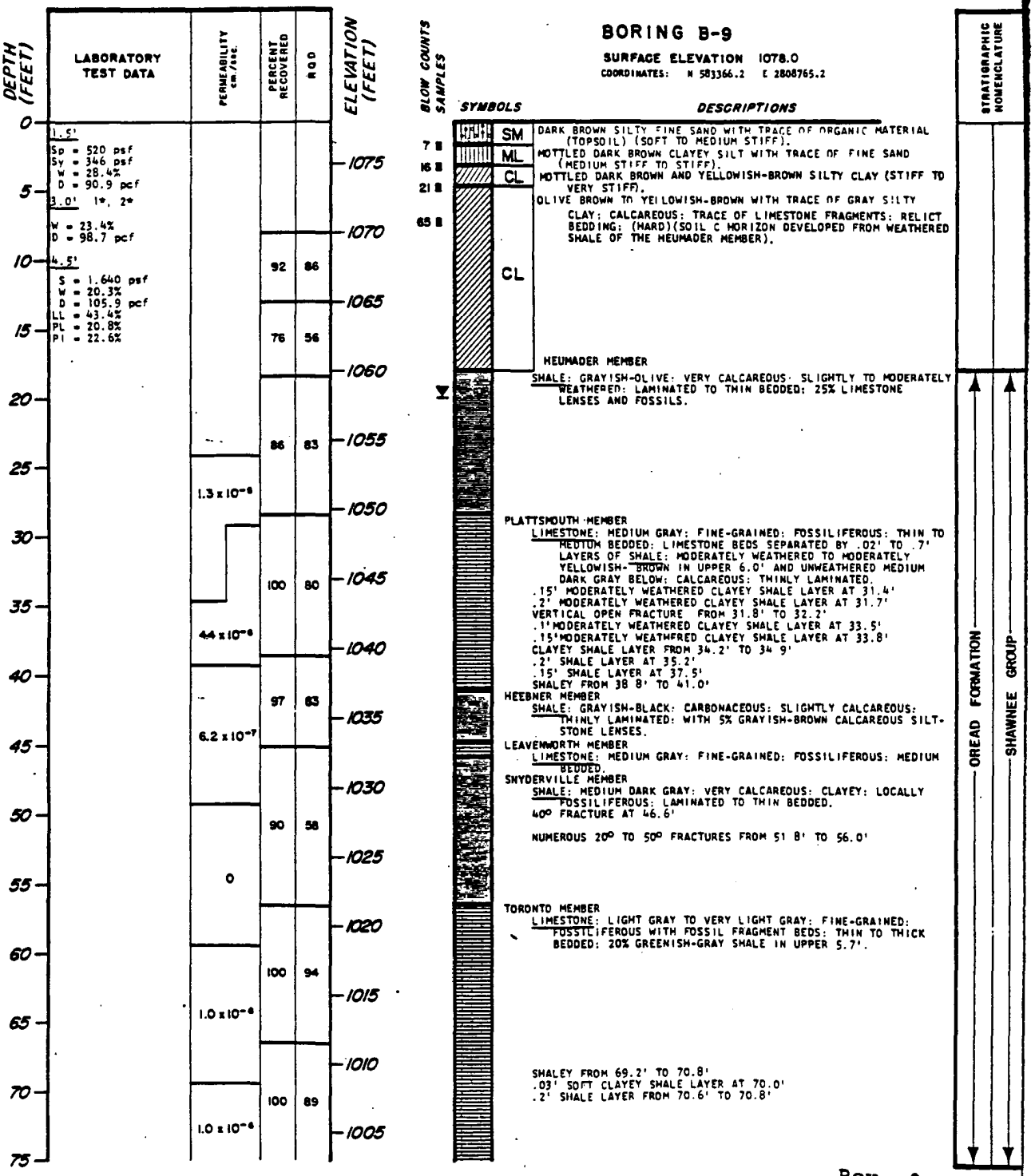


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34h (Sheet 6 of 6)

Log of Boring B-8

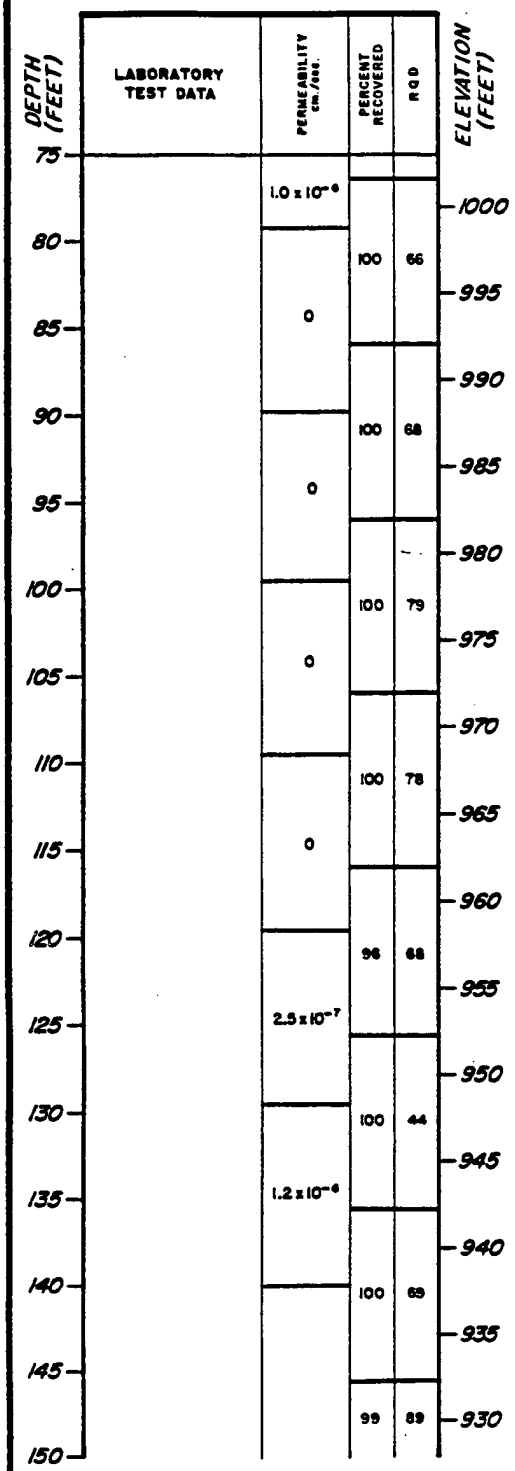


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34i (Sheet 1 of 6)

Log of Boring B-9



BORING B-9 CONT.

SYMBOLS

DESCRIPTIONS

SHALE: MEDIUM TO DARK GRAY; LOCALLY SOFT AND CLAYEY; THINLY LAMINATED; INTERBEDDED WITH SANDSTONE; LIGHT GRAY; FINE-GRAINED; LOCALLY CALCAREOUS; LAMINATED TO THIN BEDDED.
100% SOFT CLAYEY SHALE FROM 75.6' TO 79.0'
SANDSTONE 20% TO 40% FROM 79.0' TO 94.1'
NUMEROUS SOFT CLAYEY SHALE LAYERS FROM 80.4' TO 85.9'

BROKEN ZONE FROM 86.5' TO 86.7'

SANDSTONE LESS THAN 10% FROM 94.1' TO 96.3'

WILLIAMSBURG COAL BED
COAL: BLACK; SHALEY; THINLY LAMINATED TO THIN BEDDED.
SHALE: GREENISH-GRAY; CLAYEY; CALCAREOUS; LAMINATED TO THIN BEDDED; NUMEROUS LOW ANGLE FRACTURES.
AMAZONIA MEMBER
LIMESTONE: GREENISH-GRAY; VERY SHALEY; FOSSILIFEROUS; THIN BEDDED.
IRELAND MEMBER
SHALE: GREENISH-GRAY; CLAYEY; OCCASIONAL LIMESTONE NODULES; CALCAREOUS IN UPPER 1.0'; THINLY LAMINATED TO THIN BEDDED.
SHALE: MEDIUM DARK GRAY; LOCALLY CLAYEY; THINLY LAMINATED; INTERBEDDED WITH SANDSTONE; LIGHT GRAY; FINE-GRAINED; LOCALLY CALCAREOUS; LAMINATED TO THIN BEDDED; AND SILTSTONE; MEDIUM GRAY; MICACEOUS; LAMINATED TO THIN BEDDED.
NUMEROUS SOFT CLAYEY SHALE LAYERS FROM 104.2' TO 106.2'
SANDSTONE 5% AND SILTSTONE 20% FROM 104.2' TO 107.7'
SANDSTONE 40% AND SILTSTONE 30% FROM 107.7' TO 109.0'
FRACTURED CLAYEY ZONE FROM 108.0' TO 108.4'
SANDSTONE 10% AND SILTSTONE 30% FROM 109.0' TO 121.0'
CLAYEY BROKEN ZONE FROM 109.0' TO 109.4'

SOFT CLAYEY ZONE FROM 114.9' TO 115.5'

COAL: BLACK; SHALEY; LAMINATED TO MEDIUM BEDDED.
SHALE: MEDIUM GRAY; CLAYEY; THINLY LAMINATED; CARBONACEOUS IN UPPER 0.3'.
CLAYEY BROKEN ZONE FROM 122.2' TO 122.6'

SHALE: MEDIUM DARK GRAY; THINLY LAMINATED; INTERBEDDED WITH SANDSTONE; LIGHT GRAY; FINE-GRAINED; LAMINATED TO MEDIUM BEDDED; AND SILTSTONE; MEDIUM GRAY; MICACEOUS; LAMINATED TO MEDIUM BEDDED.
SANDSTONE 20% AND SILTSTONE 40% FROM 125.2' TO 128.2'
SANDSTONE 75% AND SILTSTONE 15% FROM 128.2' TO 132.6'

BROKEN ZONE FROM 131.5' TO 131.8'

VERTICAL FRACTURE FROM 132.2' TO 132.4'
SANDSTONE 50% AND SILTSTONE 30% FROM 132.6' TO 142.2'

60° FRACTURE AT 132.7'
45° FRACTURE AT 135.0'

SANDSTONE 20% AND SILTSTONE 50% FROM 142.2' TO 146.4'

SANDSTONE 10% AND SILTSTONE 30% FROM 146.4' TO 157.8'

.05' CARBONACEOUS SHALE LAYER AT 147.9'

STRATIGRAPHIC NOMENCLATURE

LAWRENCE FORMATION

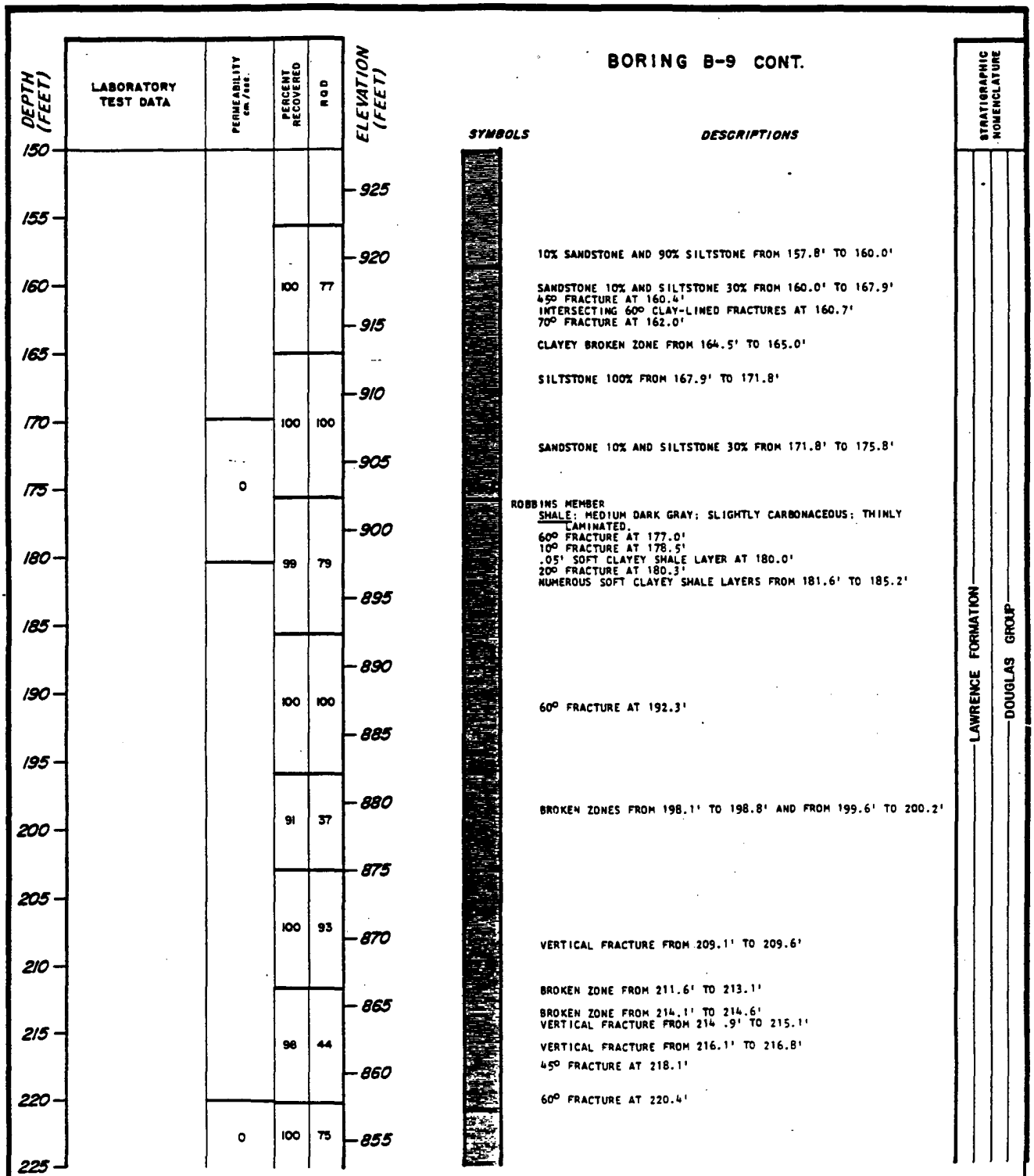
DOUGLAS GROUP

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34i (Sheet 2 of 6)

Log of Boring B-9

Rev. 0

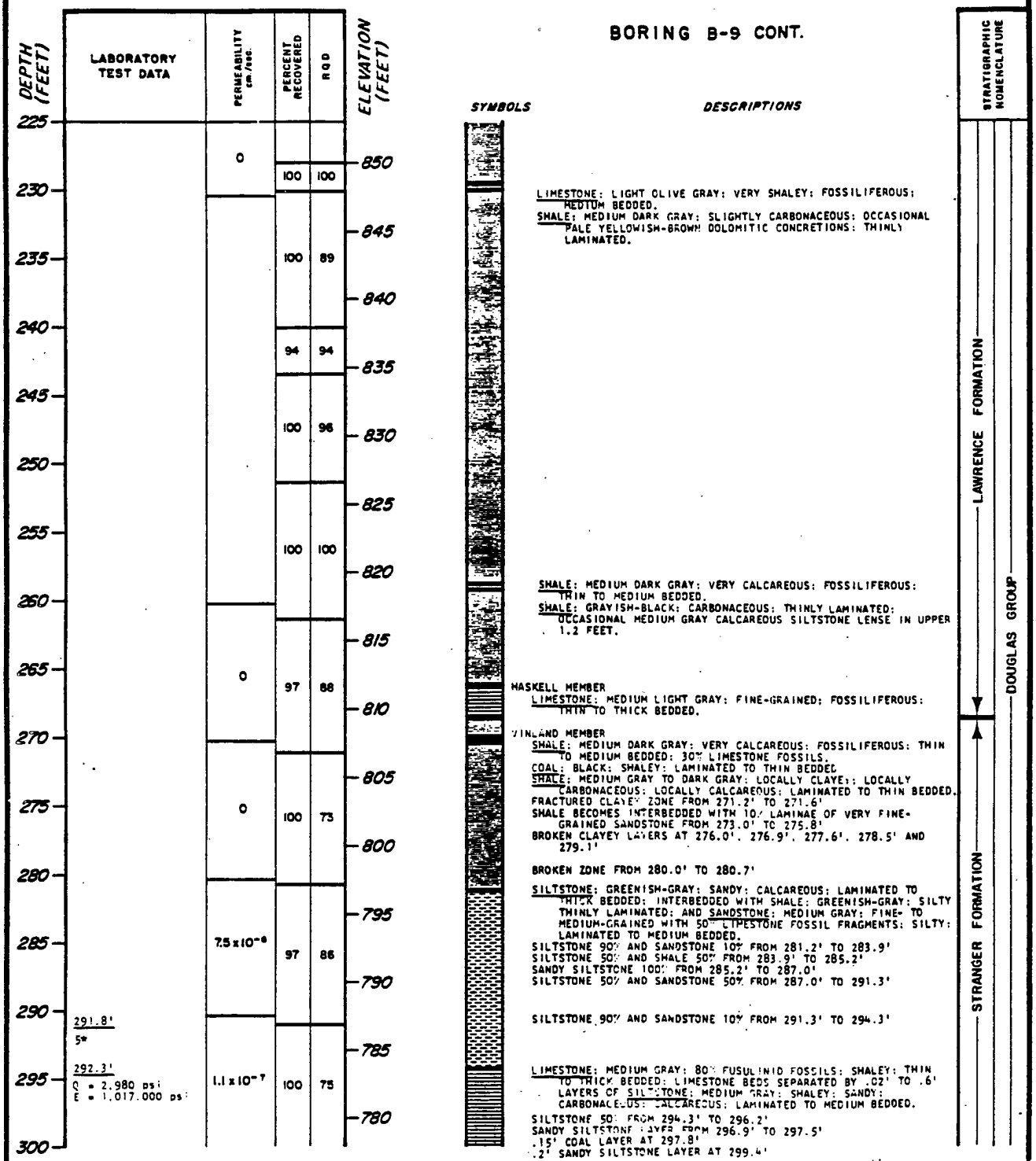


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34i (Sheet 3 of 6)

Log of Boring B-9

Rev. 0

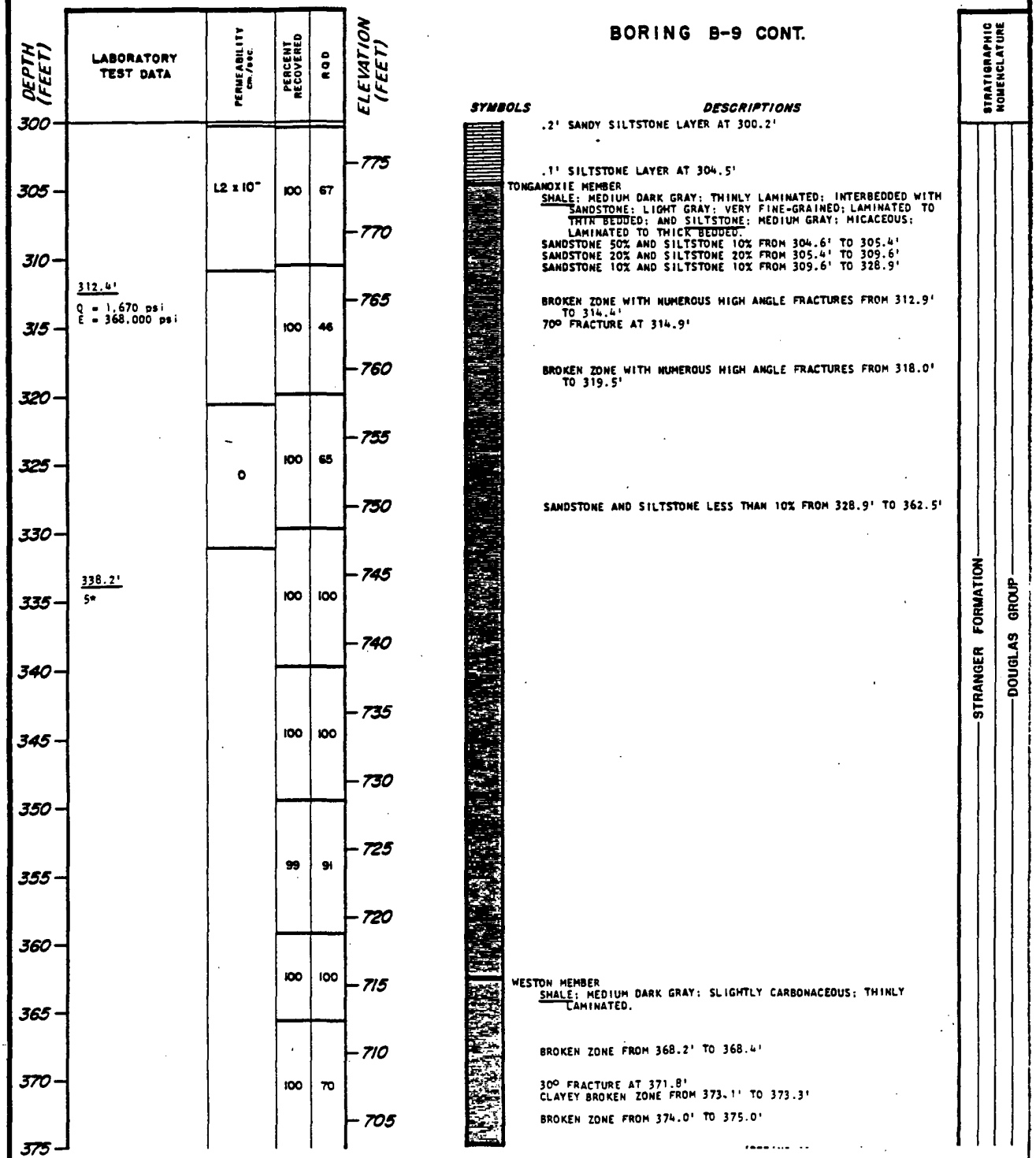


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34i (Sheet 4 of 6)

Log of Boring B-9

Rev. 0

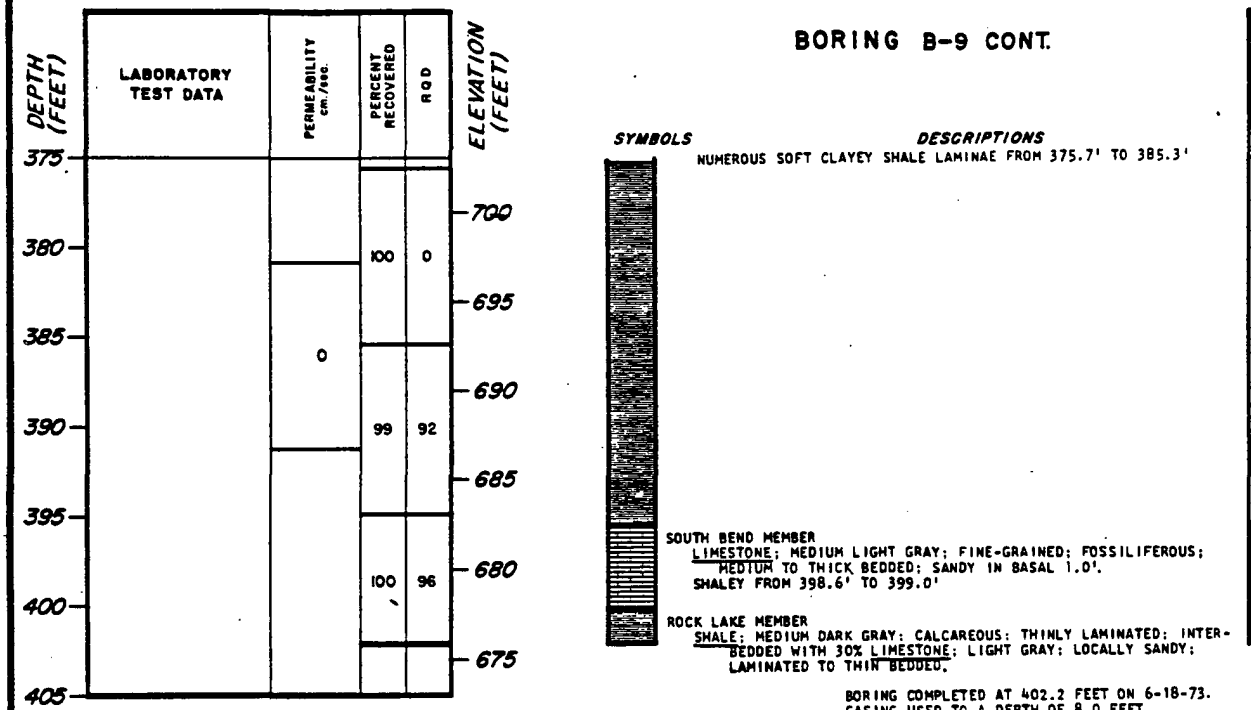


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34i (Sheet 5 of 6)

Log of Boring B-9

Rev. 0

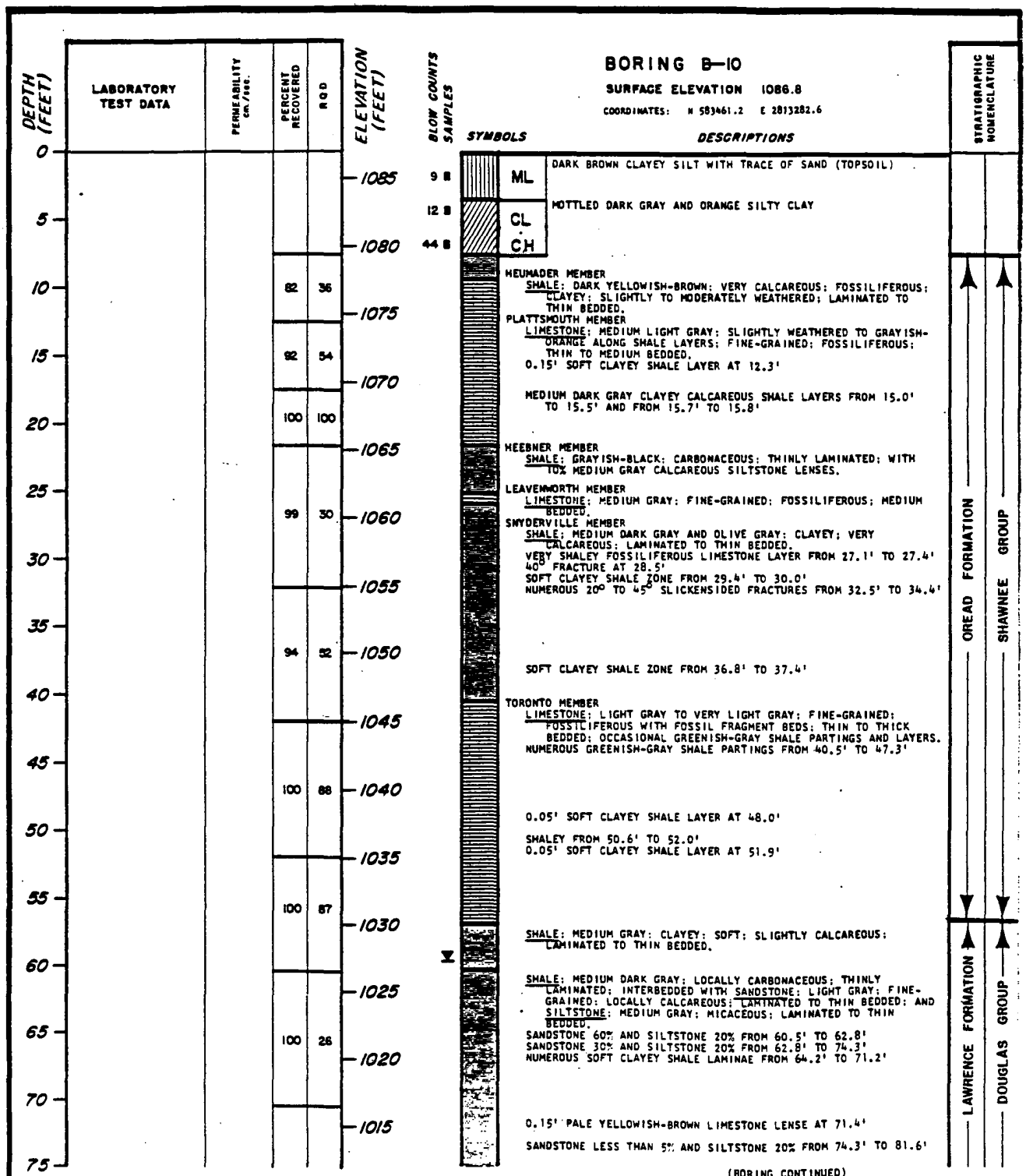


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34i (Sheet 6 of 6)

Log of Boring B-9

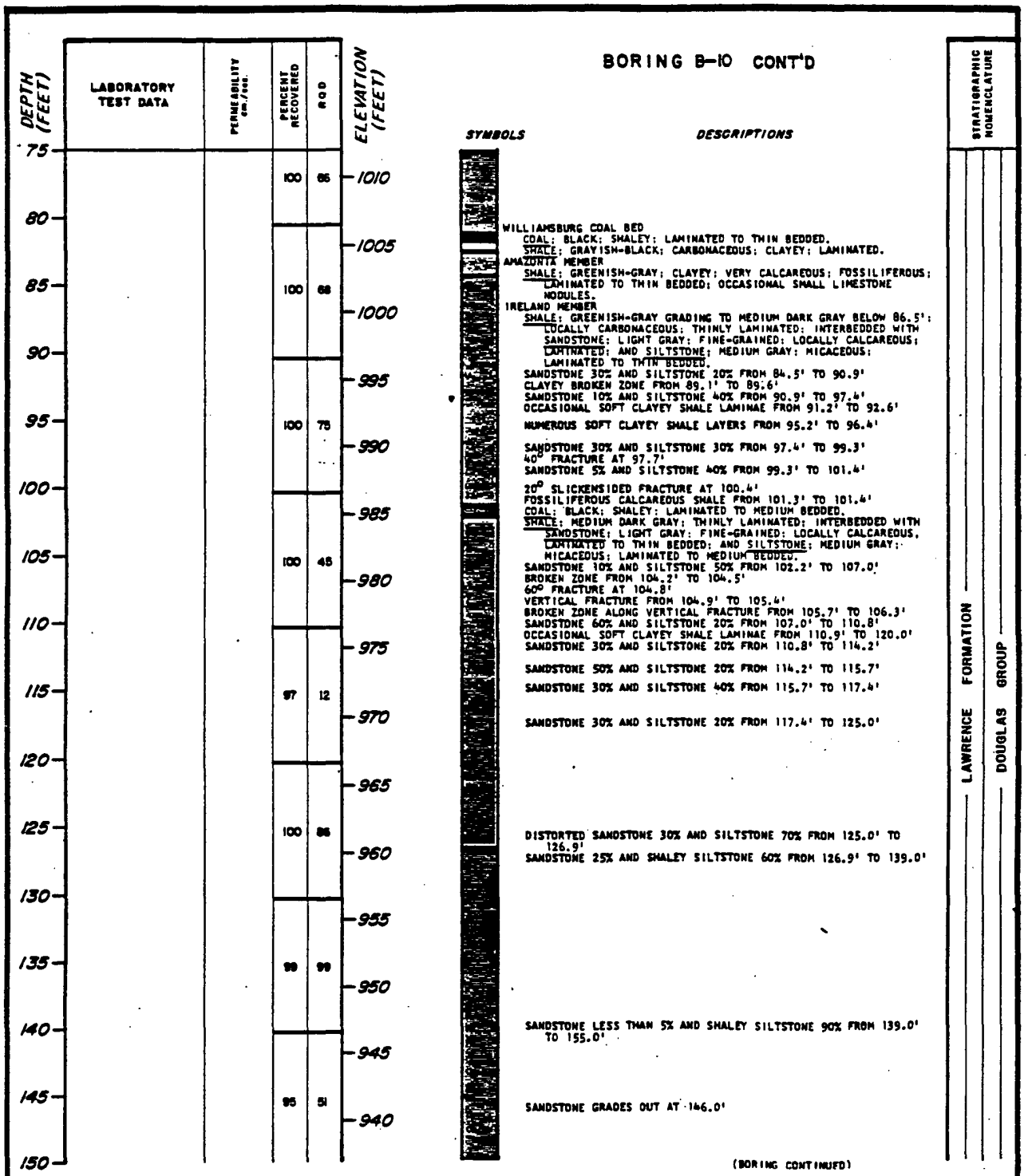


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34j (Sheet 1 of 5)

Log of Boring B-10

Rev. 0

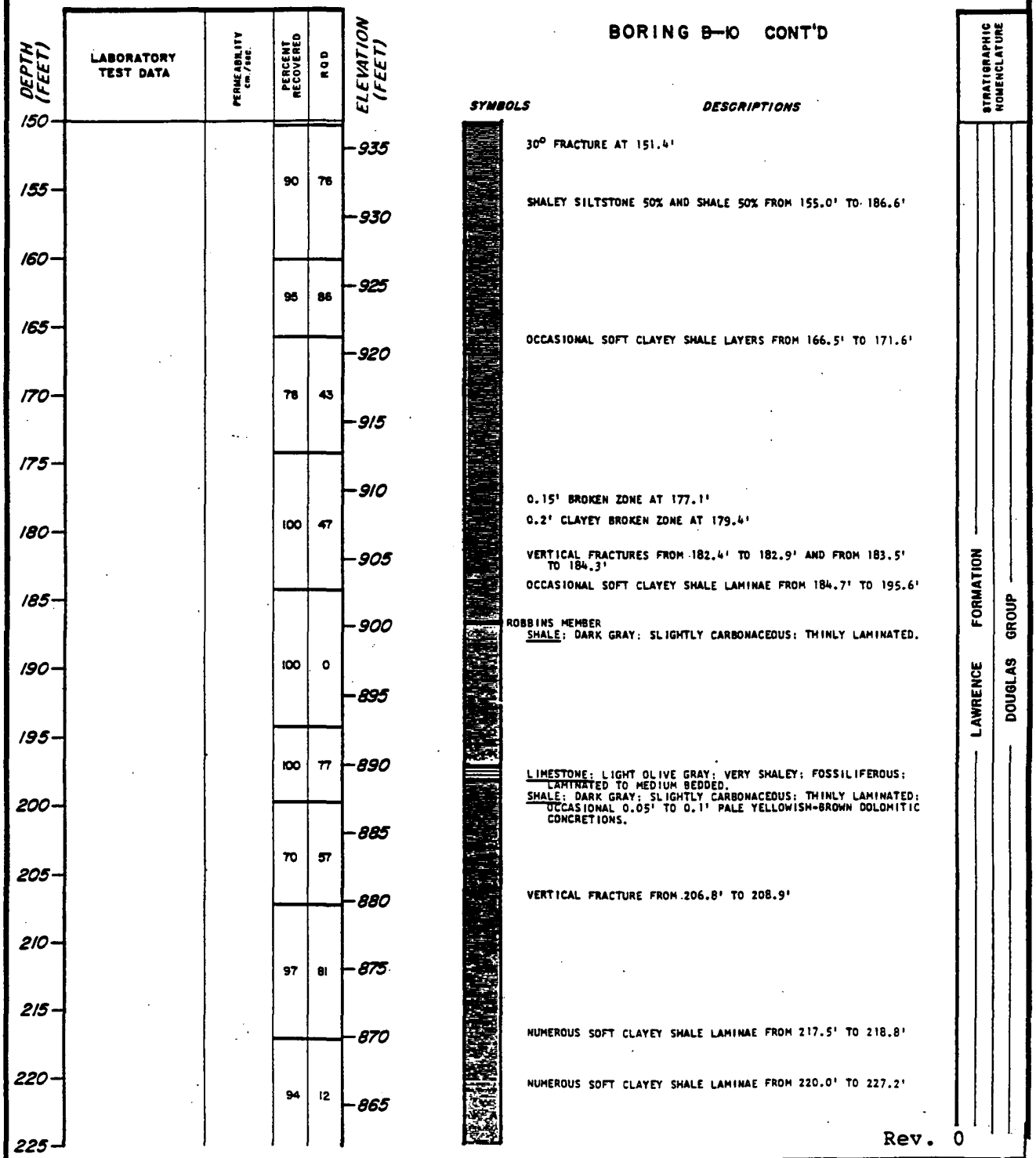


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34j (Sheet 2 of 5)

Log of Boring B-10

Rev. 0

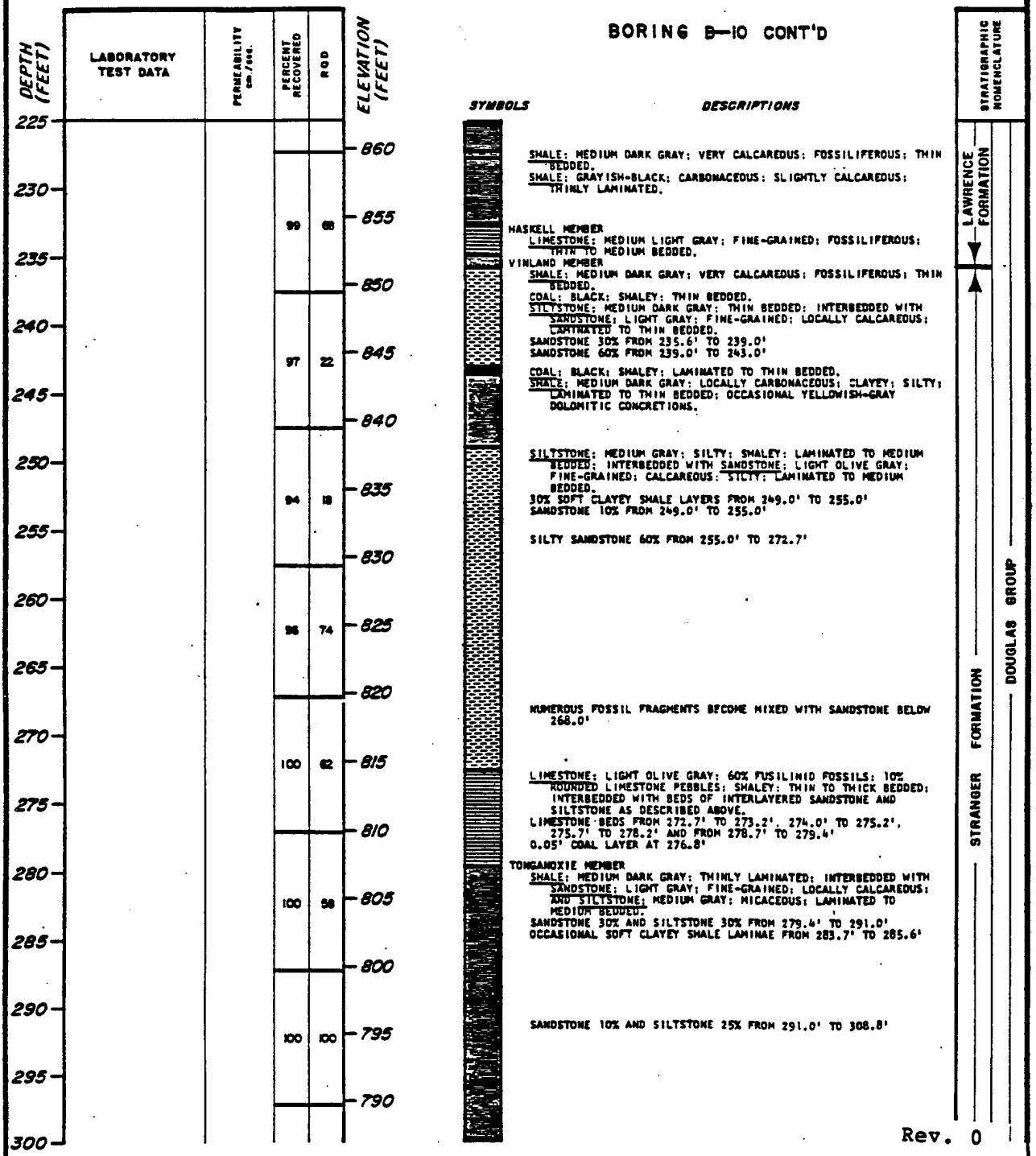


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34j (Sheet 3 of 5)

Log of Boring B-10

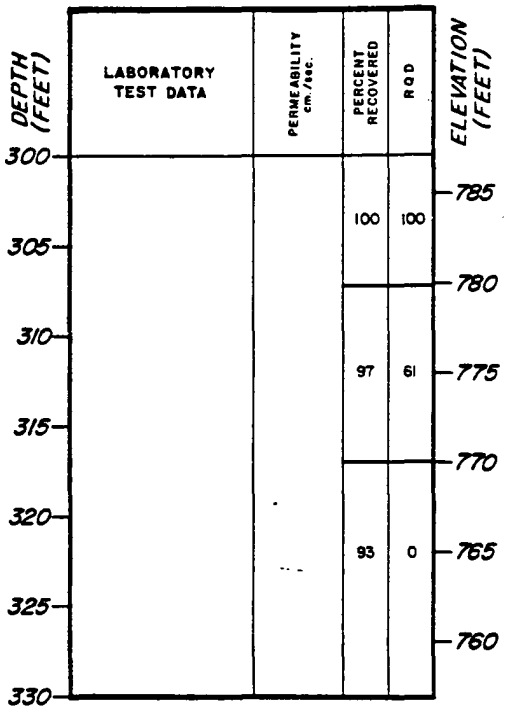


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34j (Sheet 4 of 5)

Log of Boring B-10



BORING B-10 CONT'D

SYMBOLS

DESCRIPTIONS

0.15' CLAYEY BROKEN ZONE AT 302.3'

SANDSTONE 5% AND SILTSTONE 15% FROM 308.8' TO 321.3'

VERTICAL FRACTURE FROM 314.0' TO 315.0'

CARBONACEOUS SHALE LAYER FROM 316.5' TO 316.8'

NUMEROUS SOFT CLAYEY SHALE LAMINAE FROM 317.9' TO 326.9'

WESTON MEMBER
SHALE: MEDIUM DARK GRAY; THINLY LAMINATED.

STRATIGRAPHIC NOMENCLATURE

STRANGER FORMATION

DOUGLAS GROUP

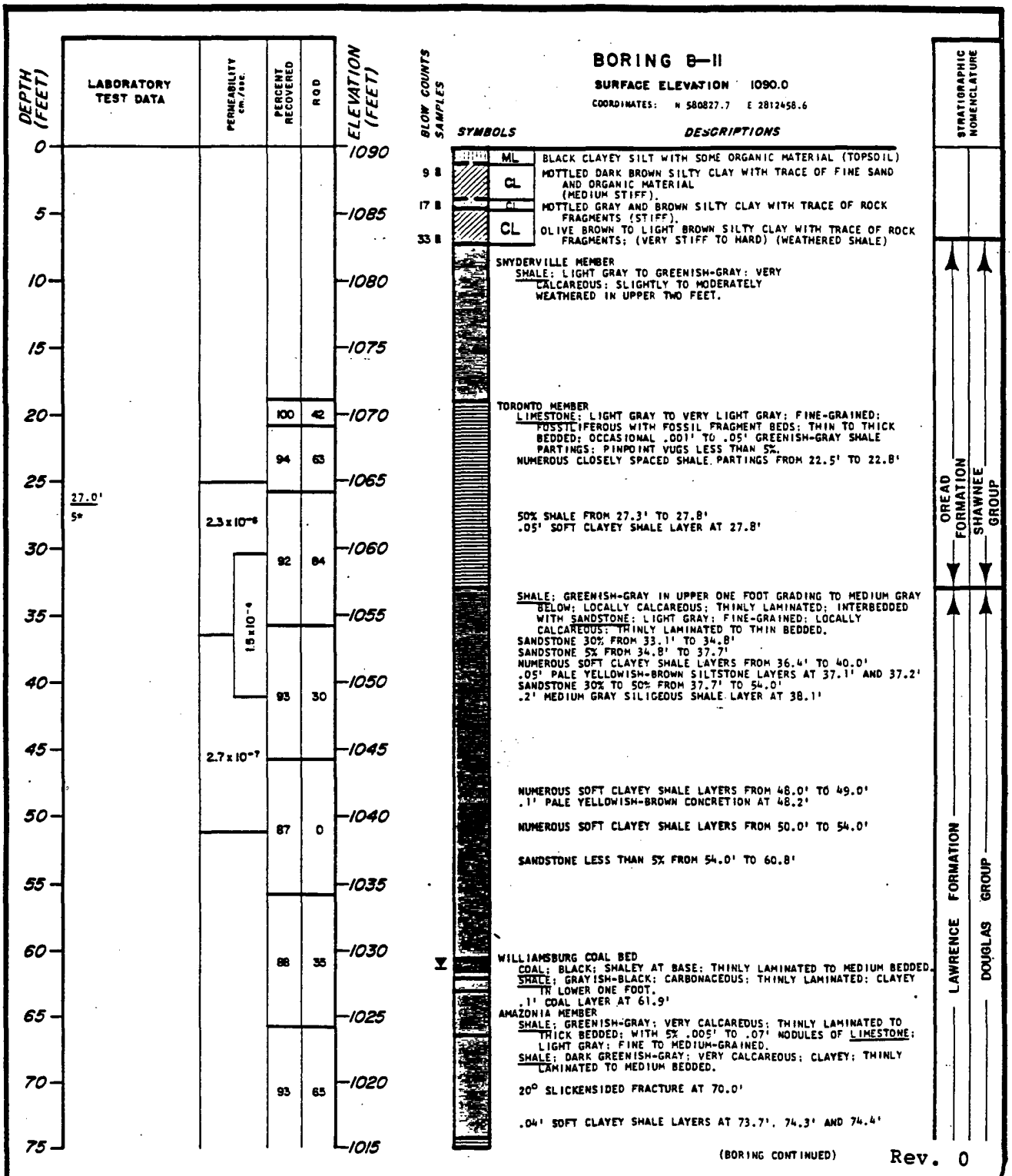
BORING COMPLETED AT 326.9 FEET ON 7-3-73.
CASING USED TO A DEPTH OF 10.0 FEET.
GROUNDWATER LEVEL RECORDED AT 59.6 FEET ON 6-27-73.
SECOND PIEZOMETER INSTALLED AT AN INTERVAL FROM 5.0 FEET TO 28.0 FEET ON 7-26-73.
FIRST PIEZOMETER INSTALLED AT AN INTERVAL FROM 38.0 FEET TO 57.0 FEET ON 7-26-73.
PIEZOMETER READINGS ARE PRESENTED ON TABLE 2.4-29.

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34j (Sheet 5 of 5)

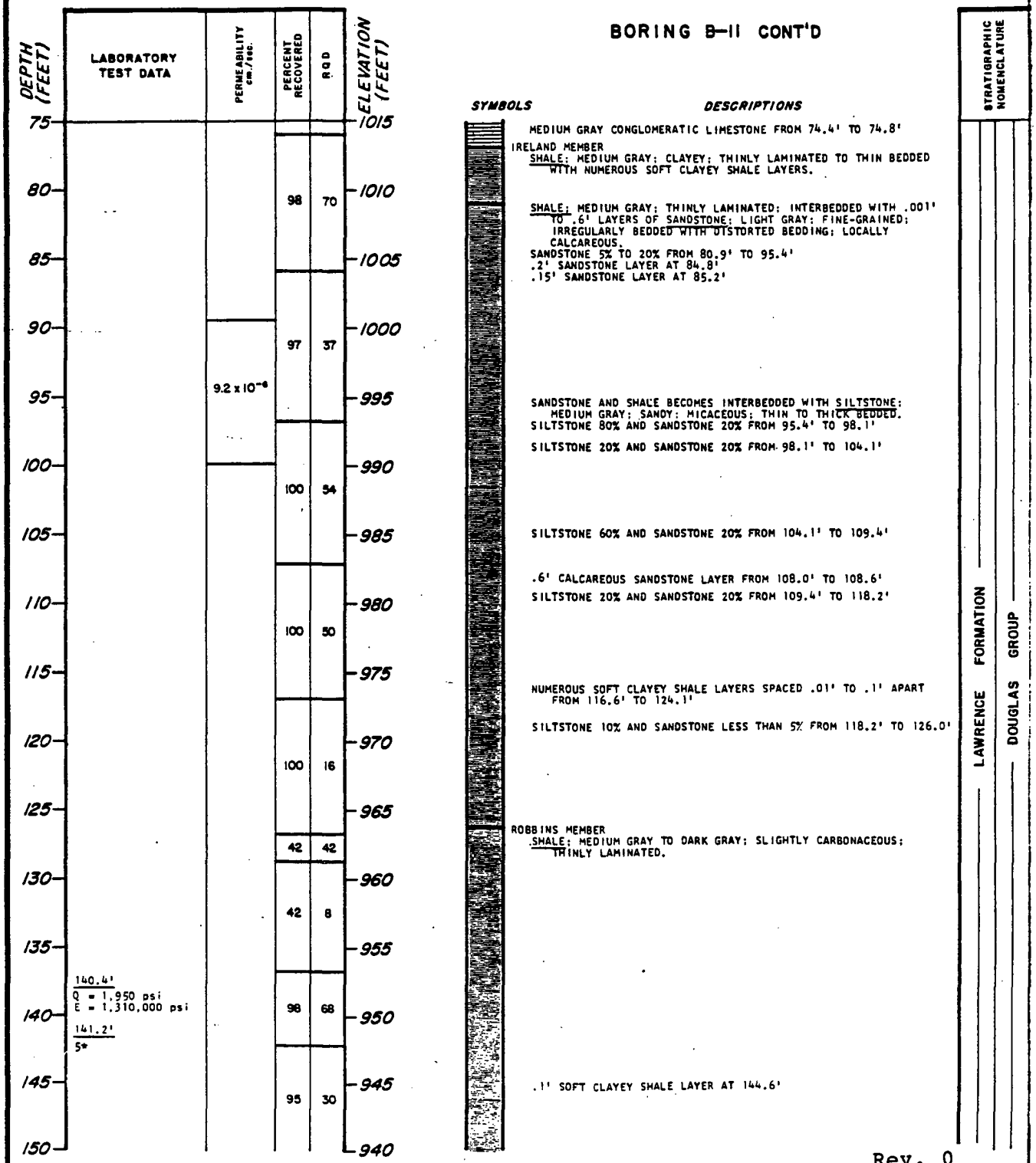
Log of Boring B-10



WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34k (Sheet 1 of 5)

Log of Boring B-11

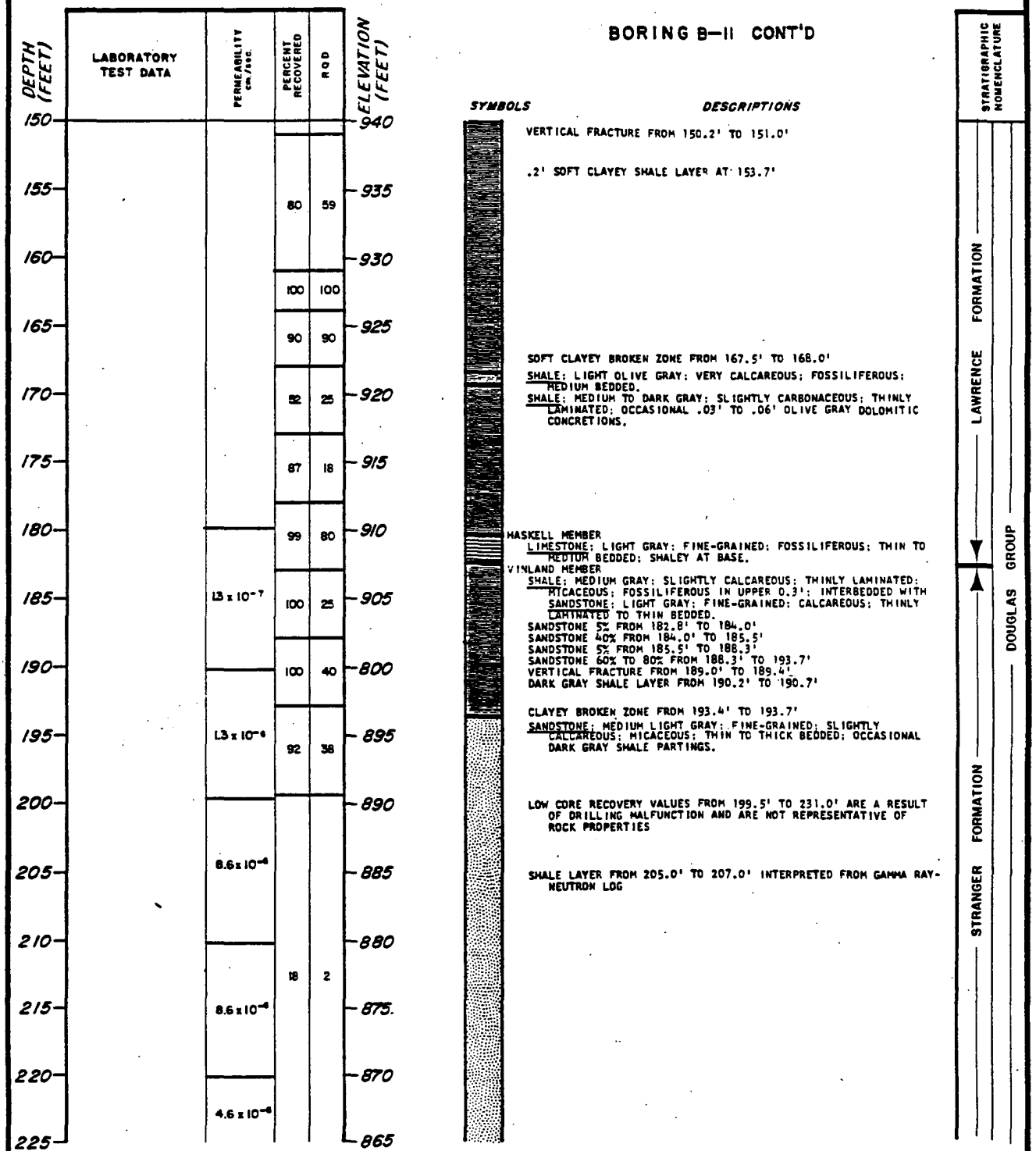


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34k (Sheet 2 of 5)

Log of Boring B-11

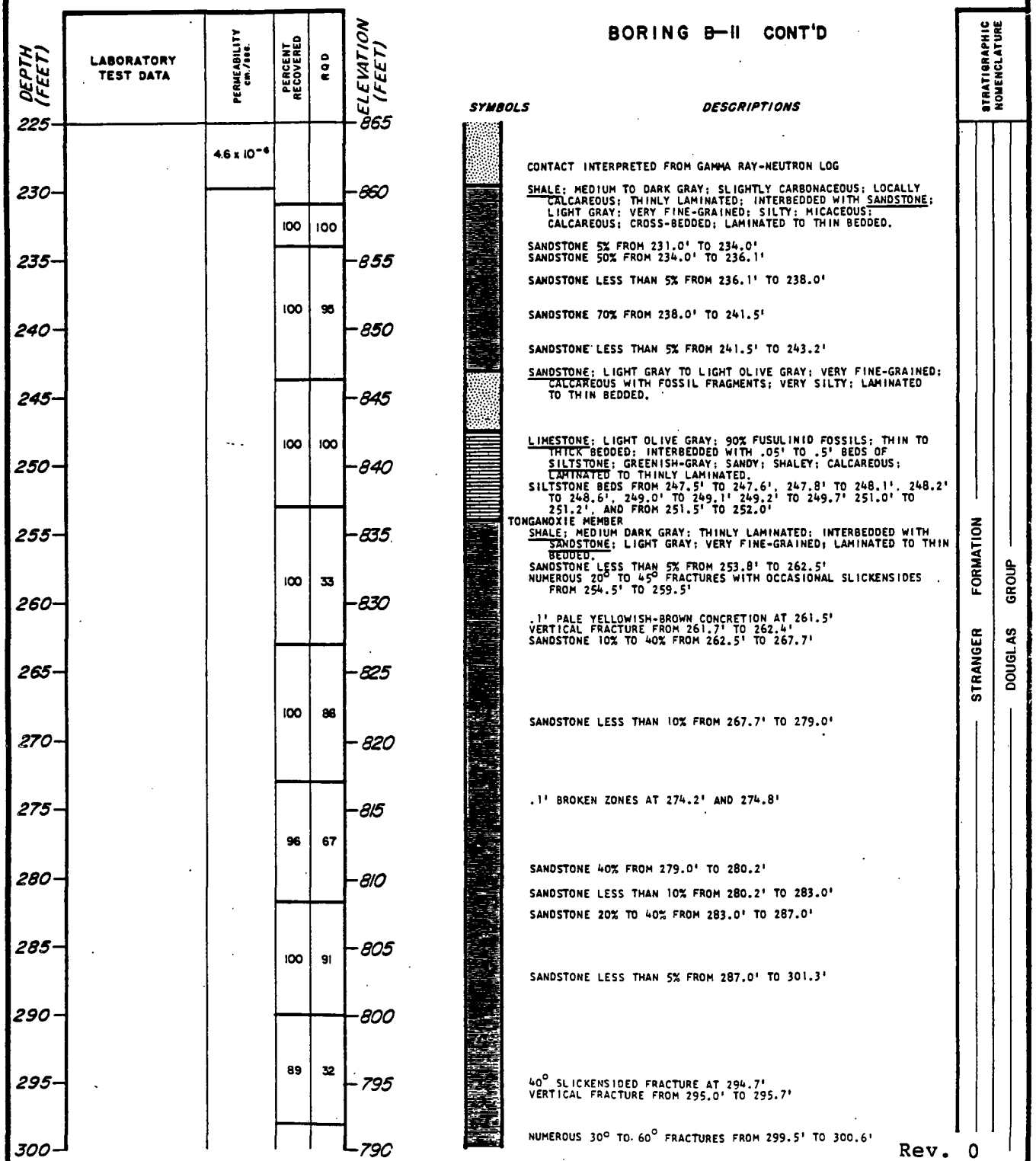


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34k (Sheet 3 of 5)

Log of Boring B-11

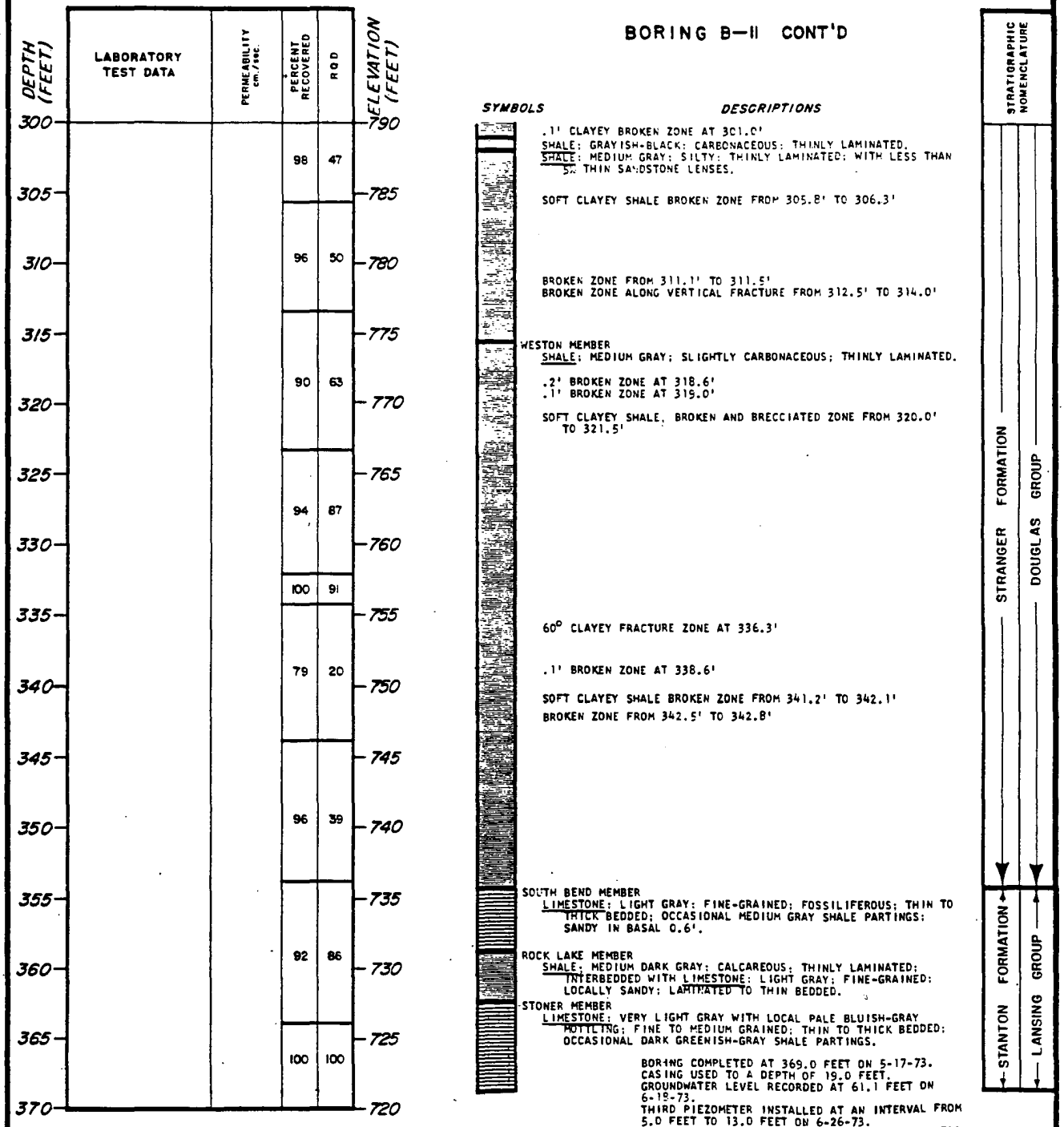


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34k (Sheet 4 of 5)

Log of Boring B-11

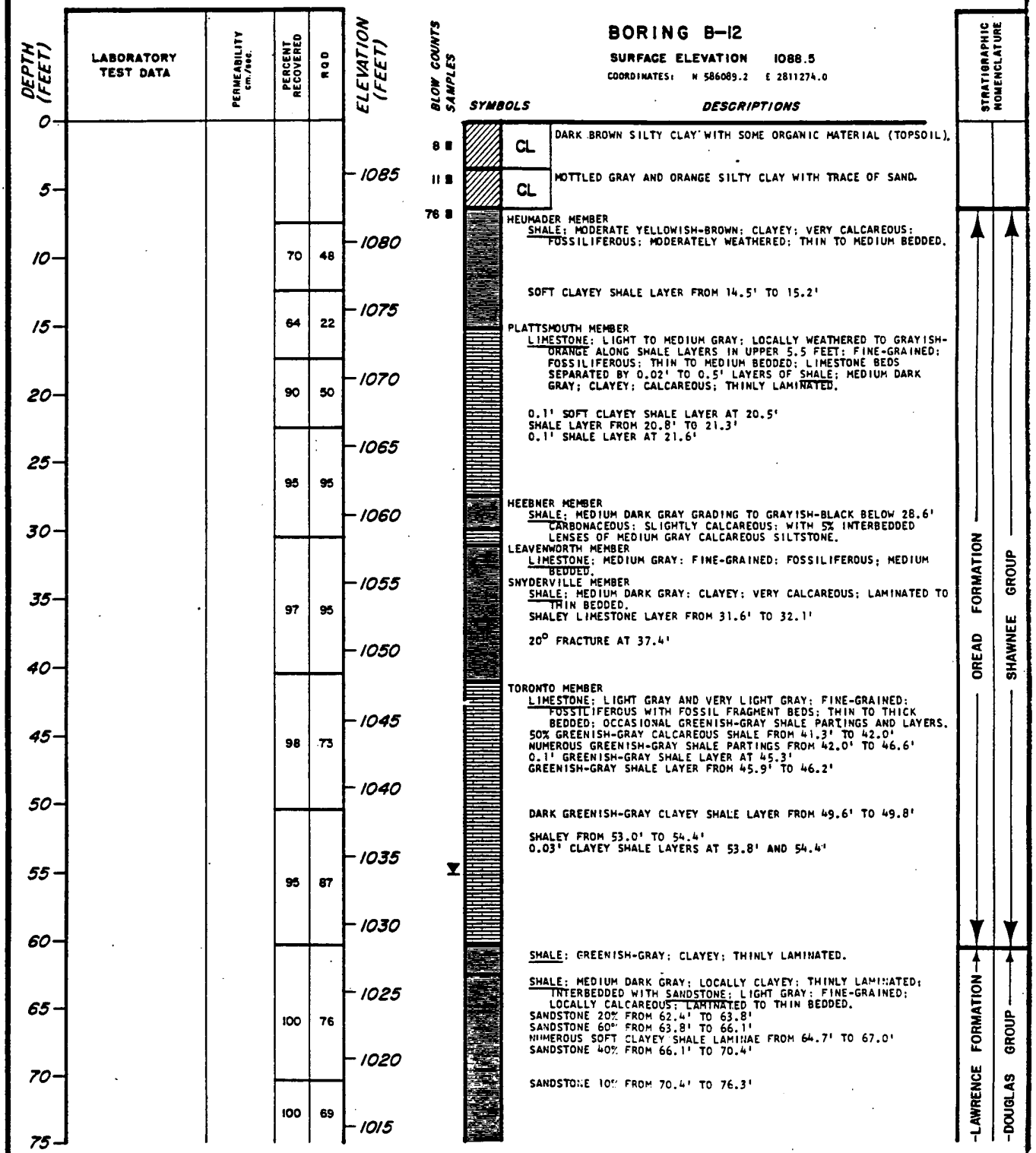


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34k (Sheet 5 of 5)

Log of Boring B-11

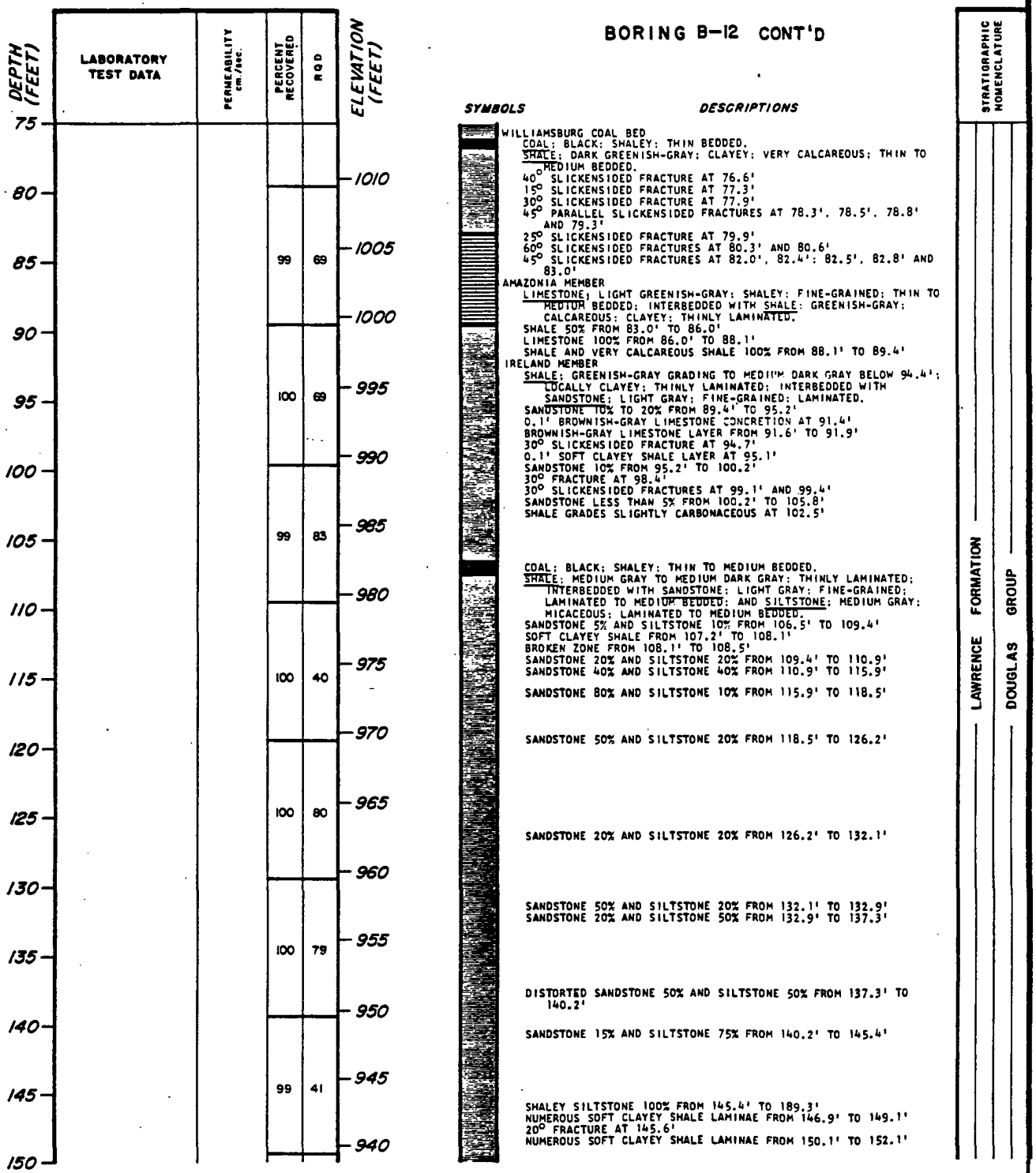


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-341 (Sheet 1 of 5)

Log of Boring B-12

Rev. 0

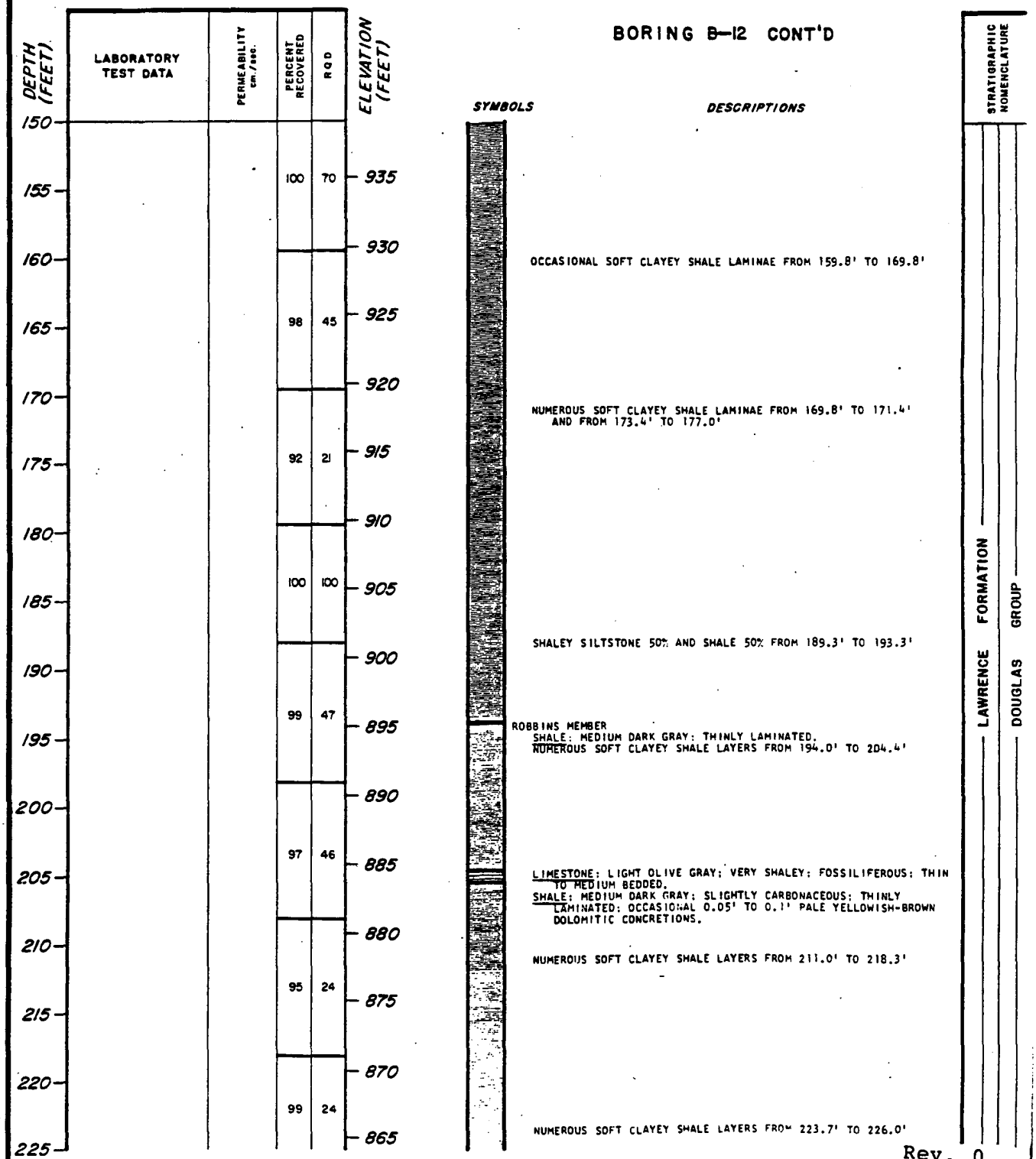


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-341 (Sheet 2 of 5)

Log of Boring B-12

Rev. 0

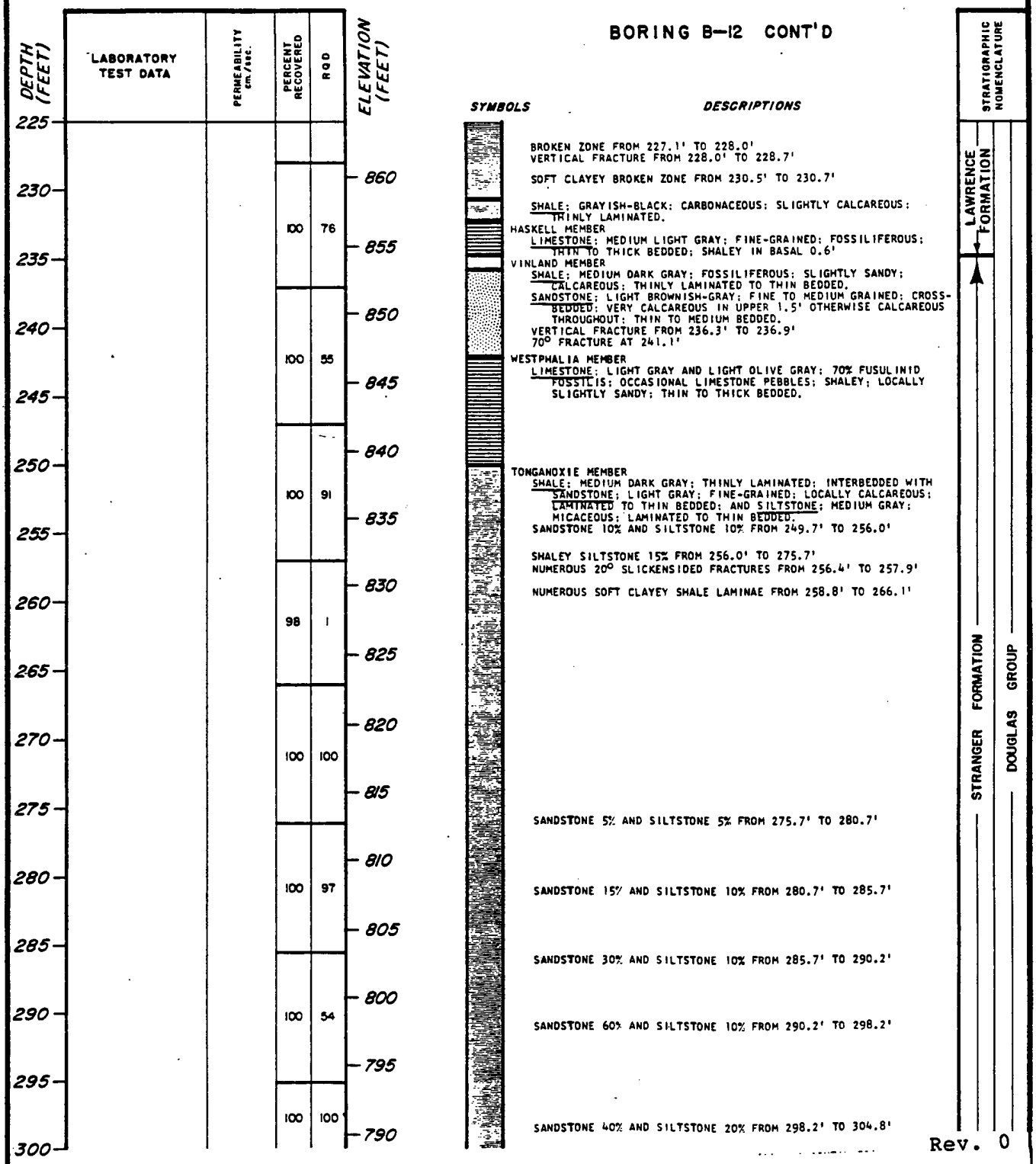


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-341 (Sheet 3 of 5)

Log of Boring B-12

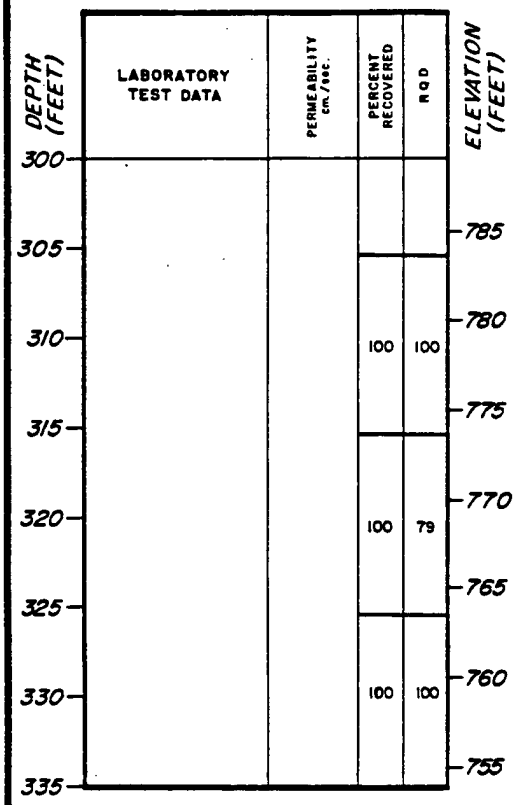


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-341 (Sheet 4 of 5)

Log of Boring B-12



BORING B-12 CONT'D

SYMBOLS

DESCRIPTIONS

SANDSTONE 20% AND SILTSTONE 20% FROM 304.8' TO 309.7'

SANDSTONE 30% AND SILTSTONE 20% FROM 309.7' TO 314.6'

SANDSTONE LESS THAN 5% AND SHALEY SILTSTONE 5% FROM 314.6' TO 334.6'

STRATIGRAPHIC NOMENCLATURE

STRANGER FORMATION

DOUGLAS GROUP

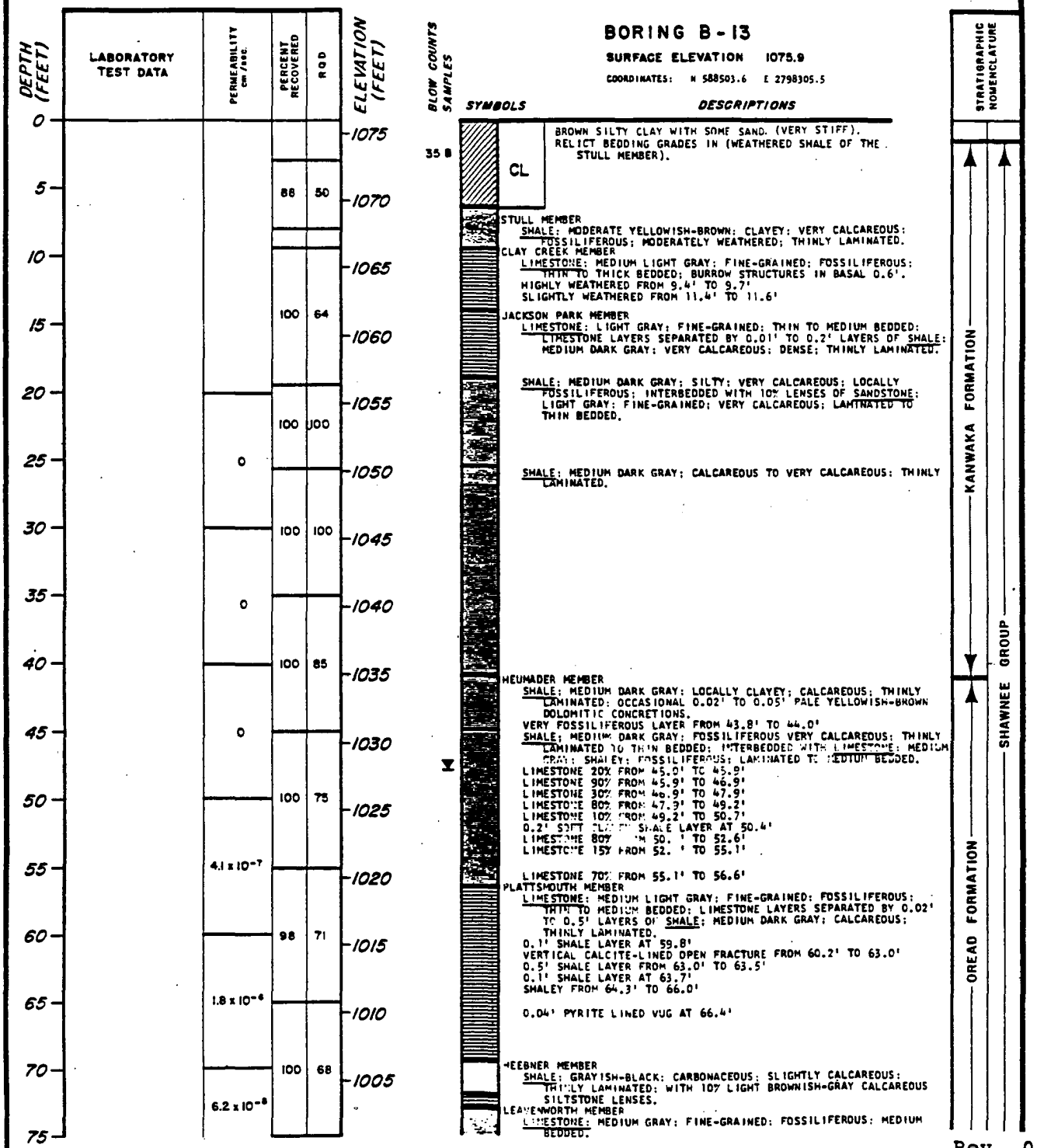
BORING COMPLETED AT 334.6 FEET ON 6-25-73.
CASING USED TO A DEPTH OF 16.0 FEET.
GROUNDWATER LEVEL RECORDED AT 55.0 FEET ON 7-12-73.
THIRD PIEZOMETER INSTALLED AT AN INTERVAL FROM 5.0 FEET TO 32.0 FEET ON 7-17-73.
SECOND PIEZOMETER INSTALLED AT AN INTERVAL FROM 41.0 FEET TO 61.0 FEET ON 7-17-73.
FIRST PIEZOMETER INSTALLED AT AN INTERVAL FROM 90.0 FEET TO 192.0 FEET ON 7-17-73.
PIEZOMETER READINGS ARE PRESENTED ON TABLE 2.4-29.

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-341 (Sheet 5 of 5)

Log of Boring B-12

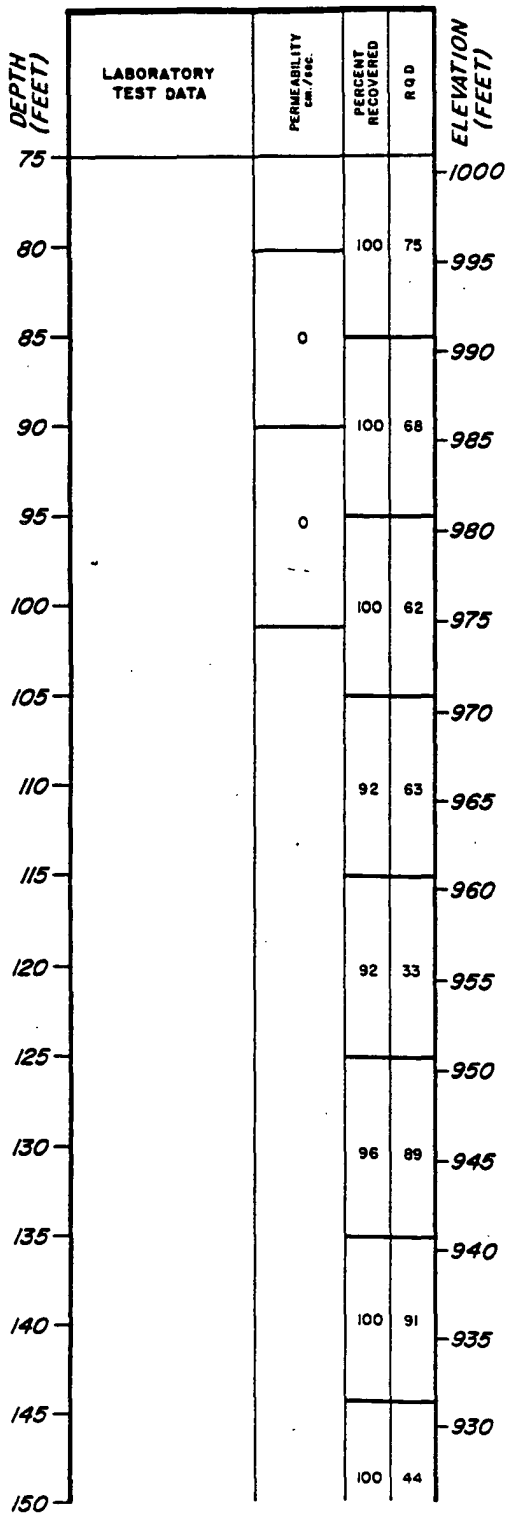


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34m (Sheet 1 of 5)

Log of Boring B-13



BORING B-13 CONT'D

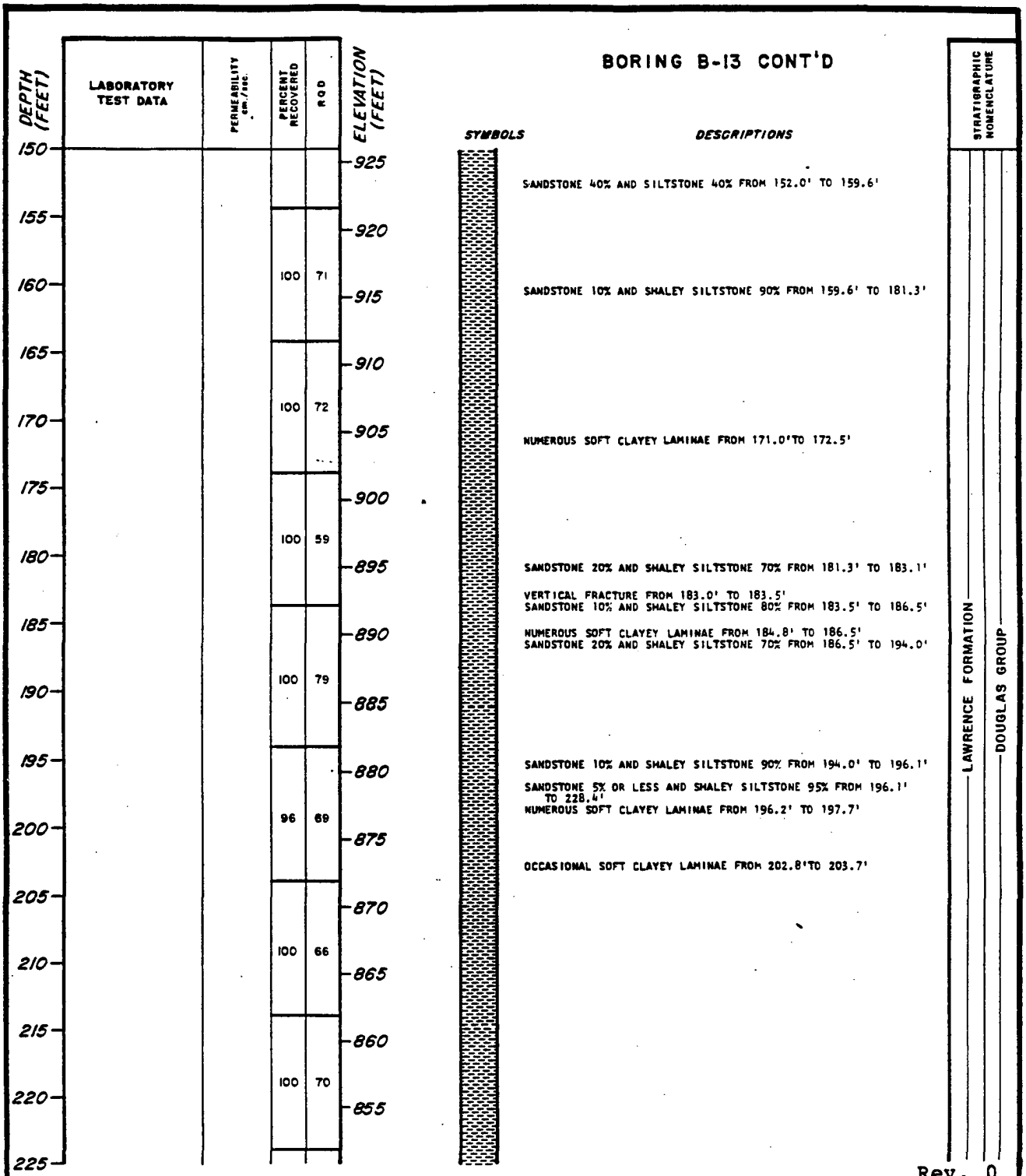
SYMBOLS	DESCRIPTIONS
	SNYDERVILLE MEMBER SHALE: OLIVE GRAY; VERY CALCAREOUS; CLAYEY; LOCALLY FOSSILIFEROUS; LAMINATED TO THIN BEDDED; OCCASIONAL LIGHT GRAY LIMESTONE NODULES. 45° PARALLEL FRACTURES AT 77.9' AND 78.1' 0.1' SOFT CLAYEY SHALE LAYER AT 78.9'
	TORONTO MEMBER LIMESTONE: LIGHT GRAY TO VERY LIGHT GRAY; FINE-GRAINED; FOSSILIFEROUS WITH FOSSIL FRAGMENT BEDS; THIN TO THICK BEDDED; OCCASIONAL GREENISH-GRAY SHALE PARTINGS AND LAYERS.
	SHALEY FROM 89.9' TO 91.6' 0.1' GREENISH-GRAY SHALE LAYER AT 90.4'
	SHALE: MEDIUM DARK GRAY; LOCALLY CLAYEY; THINLY LAMINATED; INTERBEDDED WITH LENSES OF SANDSTONE: LIGHT GRAY; FINE-GRAINED; LOCALLY CALCAREOUS; LAMINATED TO THIN BEDDED. CLAYEY SHALE 100% FROM 96.1' TO 97.6' SANDSTONE 5% FROM 97.6' TO 100.0' SANDSTONE 20% FROM 100.0' TO 101.5' SANDSTONE 50% FROM 101.5' TO 105.4'
	SANDSTONE 80% FROM 105.4' TO 106.4' SANDSTONE 20% FROM 106.4' TO 112.8'
	SANDSTONE 5% FROM 112.8' TO 115.4'
	WILLIAMSBURG COAL BED COAL: BLACK; SHALEY; THIN BEDDED. SHALE: LIGHT OLIVE GRAY; CLAYEY; VERY CALCAREOUS; OCCASIONAL 20° TO 60° SLICKENSIDED FRACTURES; LAMINATED TO THIN BEDDED.
	AMAZONIA MEMBER SHALE: GREENISH-GRAY; CLAYEY; CALCAREOUS; THINLY LAMINATED; INTERBEDDED WITH LIMESTONE: LIGHT GREENISH-GRAY; SHALEY; FOSSILIFEROUS; THIN TO MEDIUM BEDDED. LIMESTONE 20% FROM 121.3' TO 124.5' LIMESTONE 100% FROM 124.5' TO 125.7' LIMESTONE 70% FROM 125.7' TO 127.0'
	IRELAND SHALE: MEDIUM DARK GRAY; THINLY LAMINATED; INTERBEDDED WITH SANDSTONE: LIGHT GRAY; FINE-GRAINED; LOCALLY CALCAREOUS; LAMINATED TO THIN BEDDED; AND SILTSTONE: MEDIUM GRAY; MICACEOUS; LAMINATED TO MEDIUM BEDDED. SANDSTONE 15% AND SILTSTONE 25% FROM 127.0' TO 131.0' SANDSTONE 35% AND SILTSTONE 25% FROM 131.0' TO 132.6' SANDSTONE 5% AND SHALEY SILTSTONE 45% FROM 132.6' TO 142.5'
	COAL: BLACK; SHALEY; THIN BEDDED. SILTSTONE: MEDIUM GRAY; MICACEOUS; LAMINATED TO THICK BEDDED. INTERBEDDED WITH SANDSTONE: LIGHT GRAY; FINE-GRAINED; LAMINATED TO THIN BEDDED; AND SHALE: MEDIUM DARK GRAY; THINLY LAMINATED. CLAYEY SHALE 100% FROM 143.1' TO 144.0' SANDSTONE 5% AND SHALE 80% FROM 144.0' TO 148.1' SANDSTONE 25% AND SILTSTONE 40% FROM 148.1' TO 152.0'

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34m (Sheet 2 of 5)

Log of Boring B-13

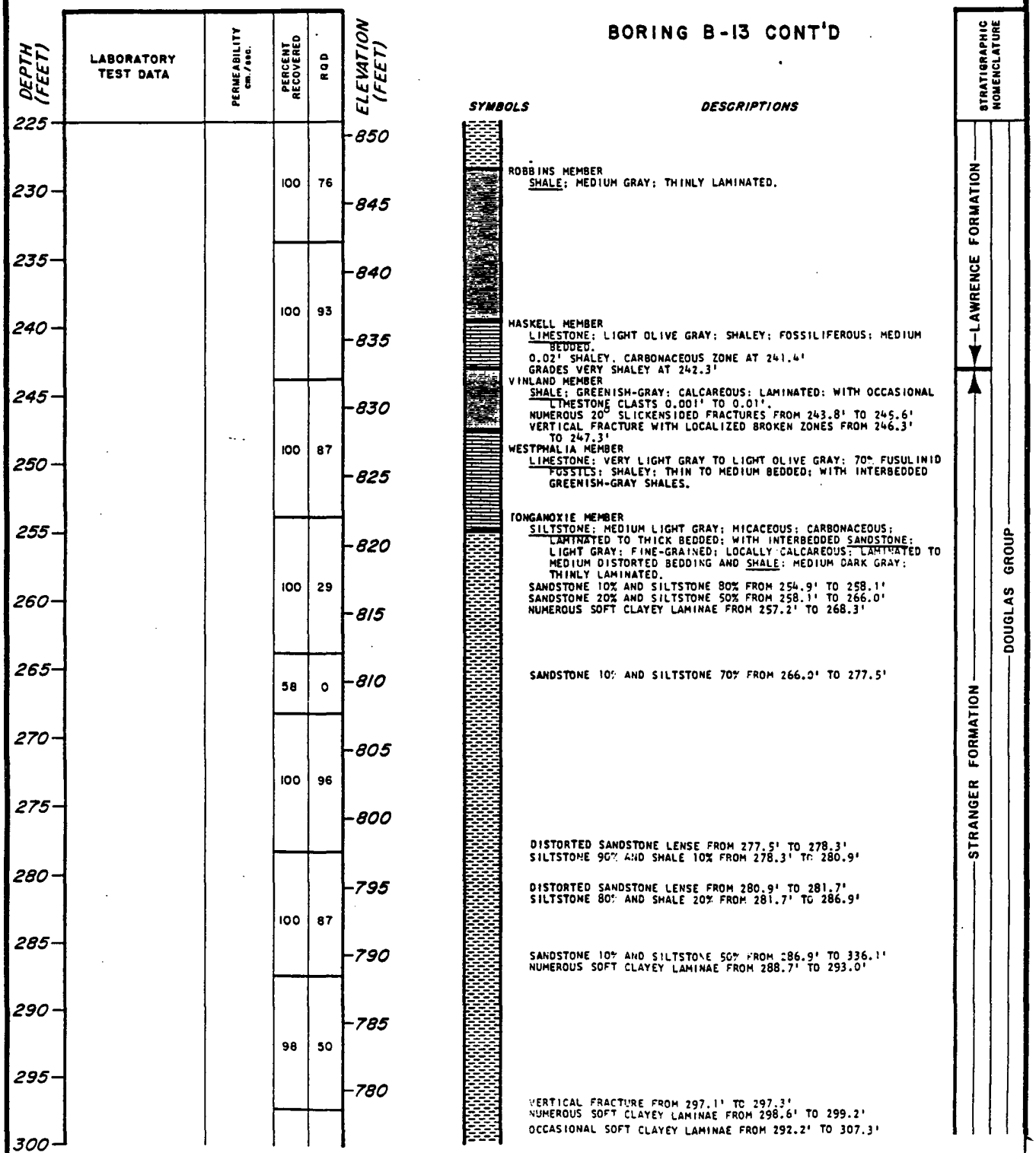


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34m (Sheet 3 of 5)

Log of Boring B-13

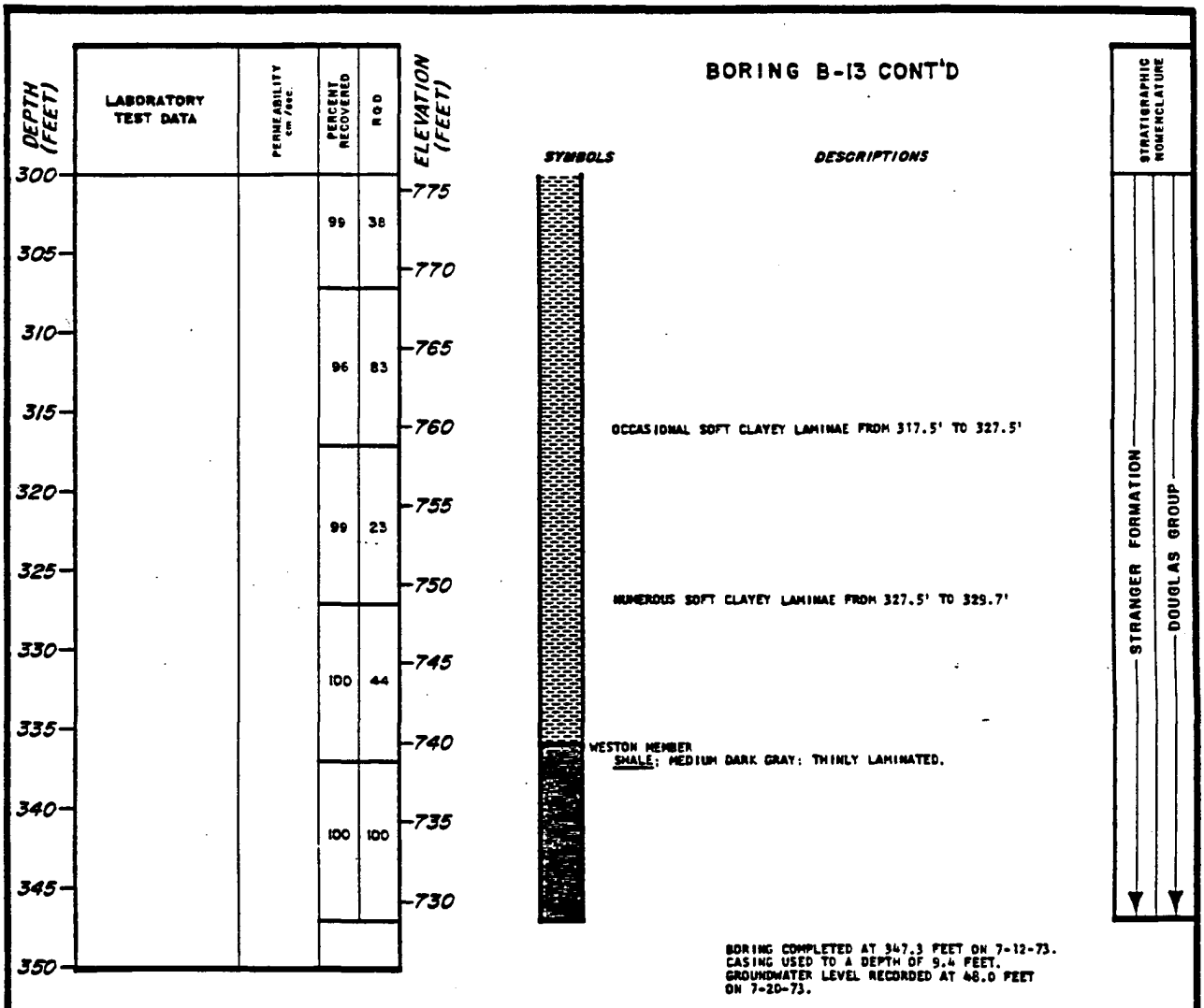


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34m (Sheet 4 of 5)

Log of Boring B-13

Rev. 0

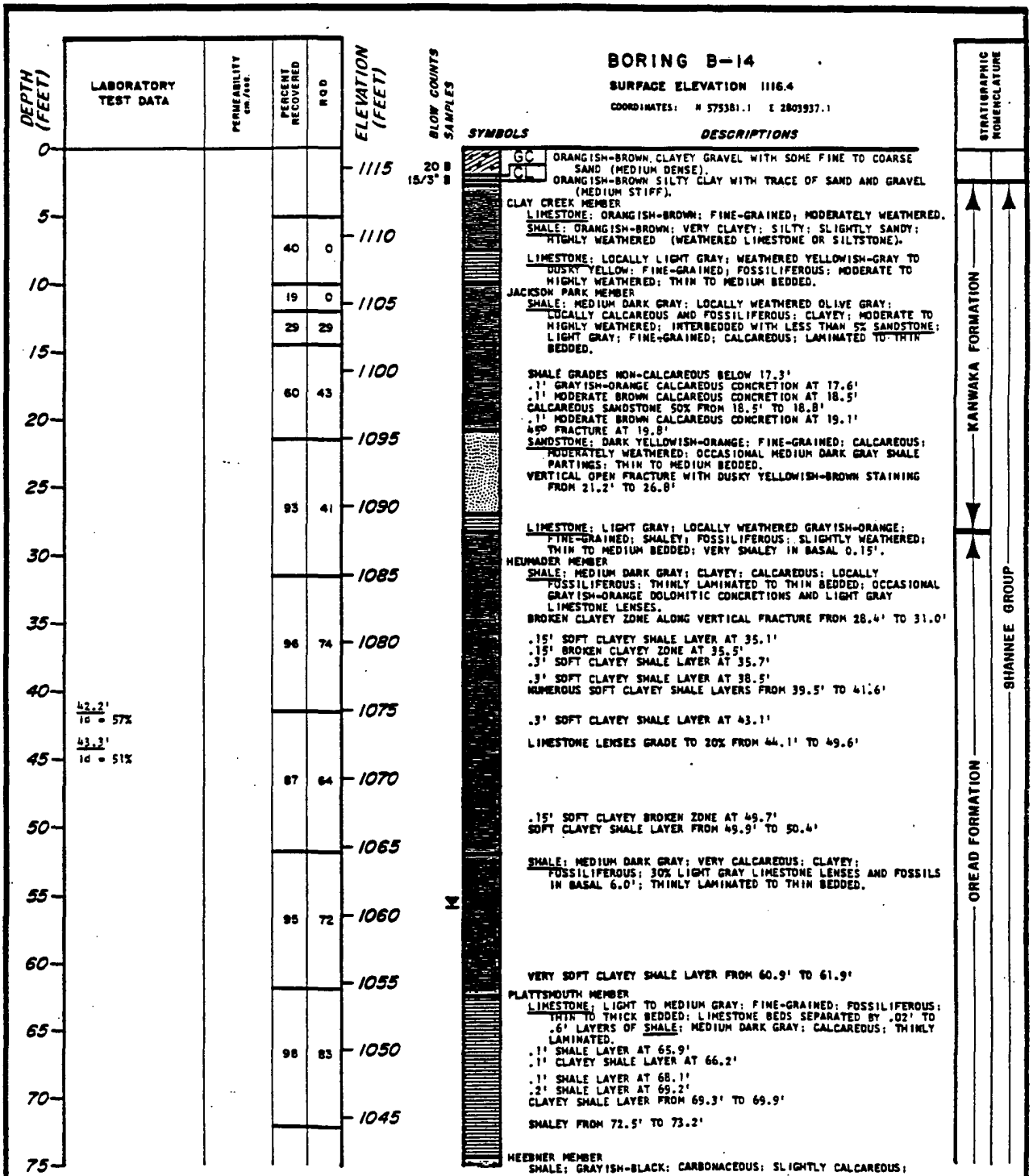


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34m (Sheet 5 of 5)

Log of Boring B-13

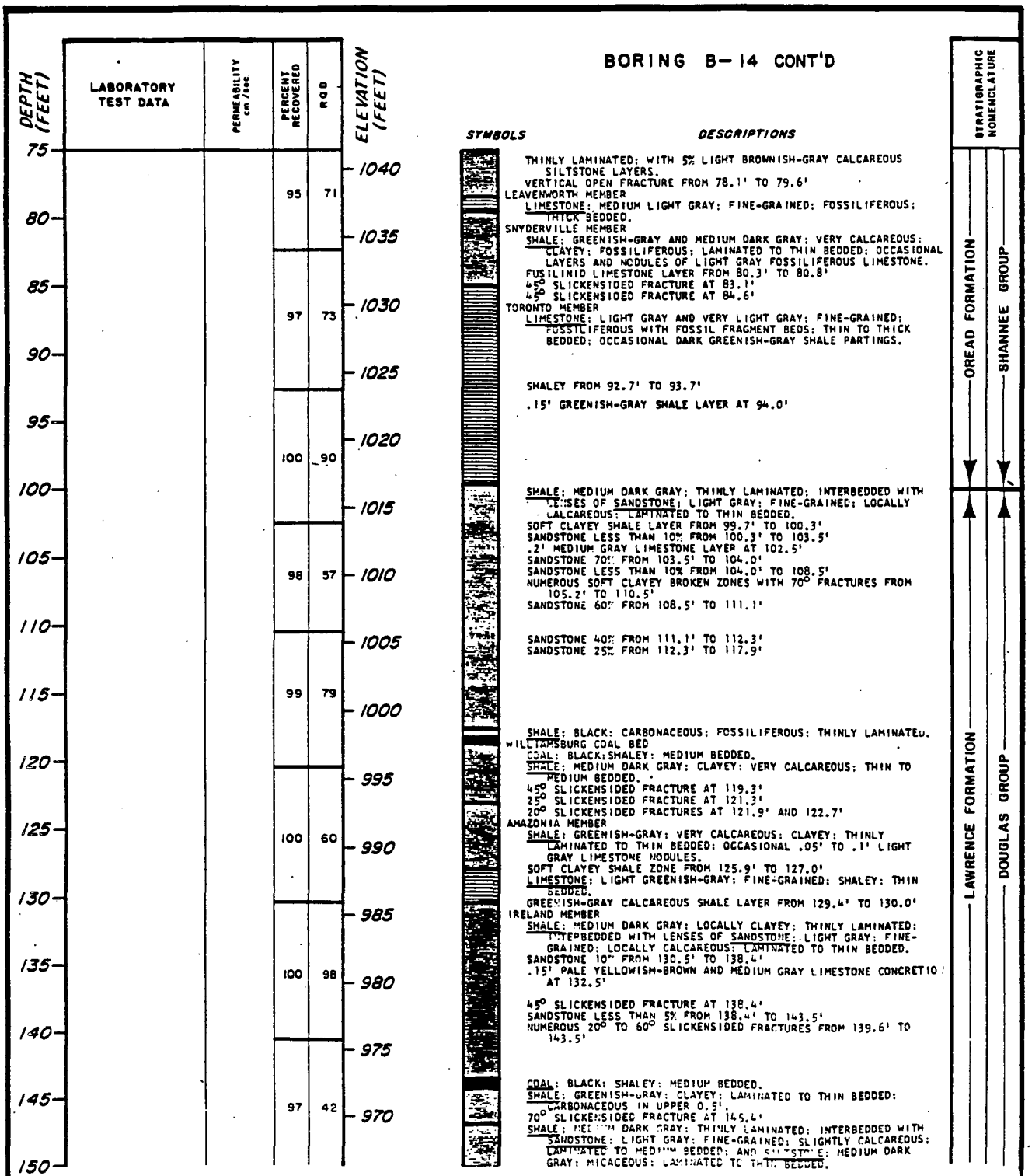


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34n (Sheet 1 of 6)

Log of Boring B-14

Rev. 0



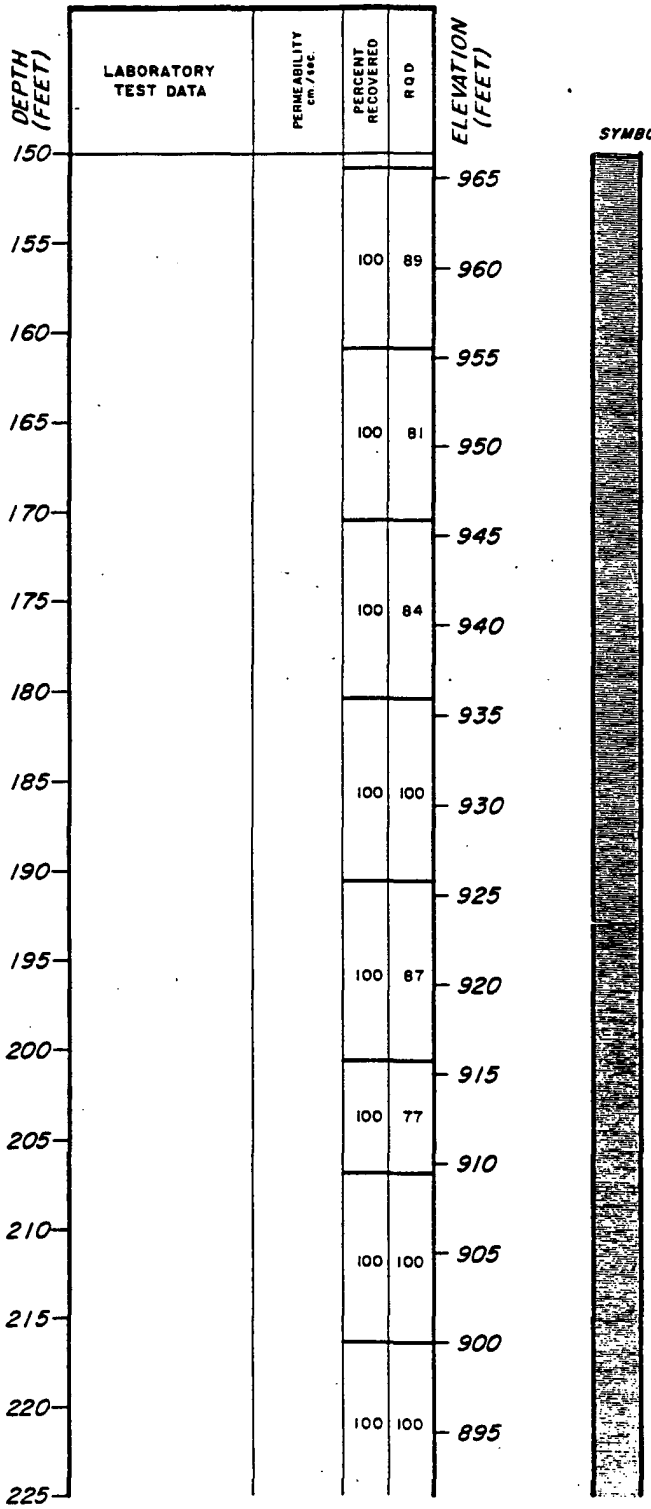
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34n (Sheet 2 of 6)

Log of Boring B-14

Rev. 0

BORING B-14 CONT'D



SYMBOLS

DESCRIPTIONS

SANDSTONE 30% AND SILTSTONE 30% FROM 146.9' TO 150.0'
SANDSTONE 40% AND SILTSTONE 10% FROM 150.0' TO 153.4'

SANDSTONE 70% AND SILTSTONE 5% FROM 153.4' TO 155.6'

SANDSTONE 90% AND SILTSTONE 5% FROM 155.6' TO 158.6'

SANDSTONE 30% AND SILTSTONE 10% FROM 158.6' TO 161.6'

SANDSTONE 50% AND SILTSTONE 50% FROM 161.6' TO 162.5'
SANDSTONE 20% AND SILTSTONE 10% FROM 162.5' TO 168.5'

SANDSTONE 50% AND SILTSTONE 40% FROM 168.5' TO 170.1'

SANDSTONE 20% AND SILTSTONE 20% FROM 170.1' TO 172.5'

SANDSTONE 20% AND SILTSTONE 80% FROM 172.5' TO 177.1'

BROKEN ZONE ALONG VERTICAL FRACTURE FROM 173.9' TO 174.8'

SANDSTONE 30% AND SILTSTONE 60% FROM 177.1' TO 179.3'

SANDSTONE 10% AND SILTSTONE 90% FROM 179.3' TO 192.7'

SANDSTONE 40% AND SILTSTONE 50% FROM 192.7' TO 193.4'
SANDSTONE 5% AND SILTSTONE 95% FROM 193.4' TO 195.8'
45° FRACTURES AT 193.6' AND 193.8'
60° FRACTURE AT 194.2'

DISTORTED CALCAREOUS SANDSTONE 50% AND SILTSTONE 50% FROM 195.8' TO 196.9'
SHALEY SILTSTONE 100% FROM 196.9' TO 214.7'
.1' BROKEN ZONE AT 196.9'
.1' BROKEN ZONE AT 198.0'

60° FRACTURE AT 203.3'

30° FRACTURE AT 205.2'

VERTICAL FRACTURE FROM 210.0' TO 210.7'

SANDSTONE 5% AND SHALEY SILTSTONE 60% FROM 214.7' TO 233.8'

STRATIGRAPHIC NOMENCLATURE

LAWRENCE FORMATION

DOUGLAS GROUP

(BORING CONTINUED)

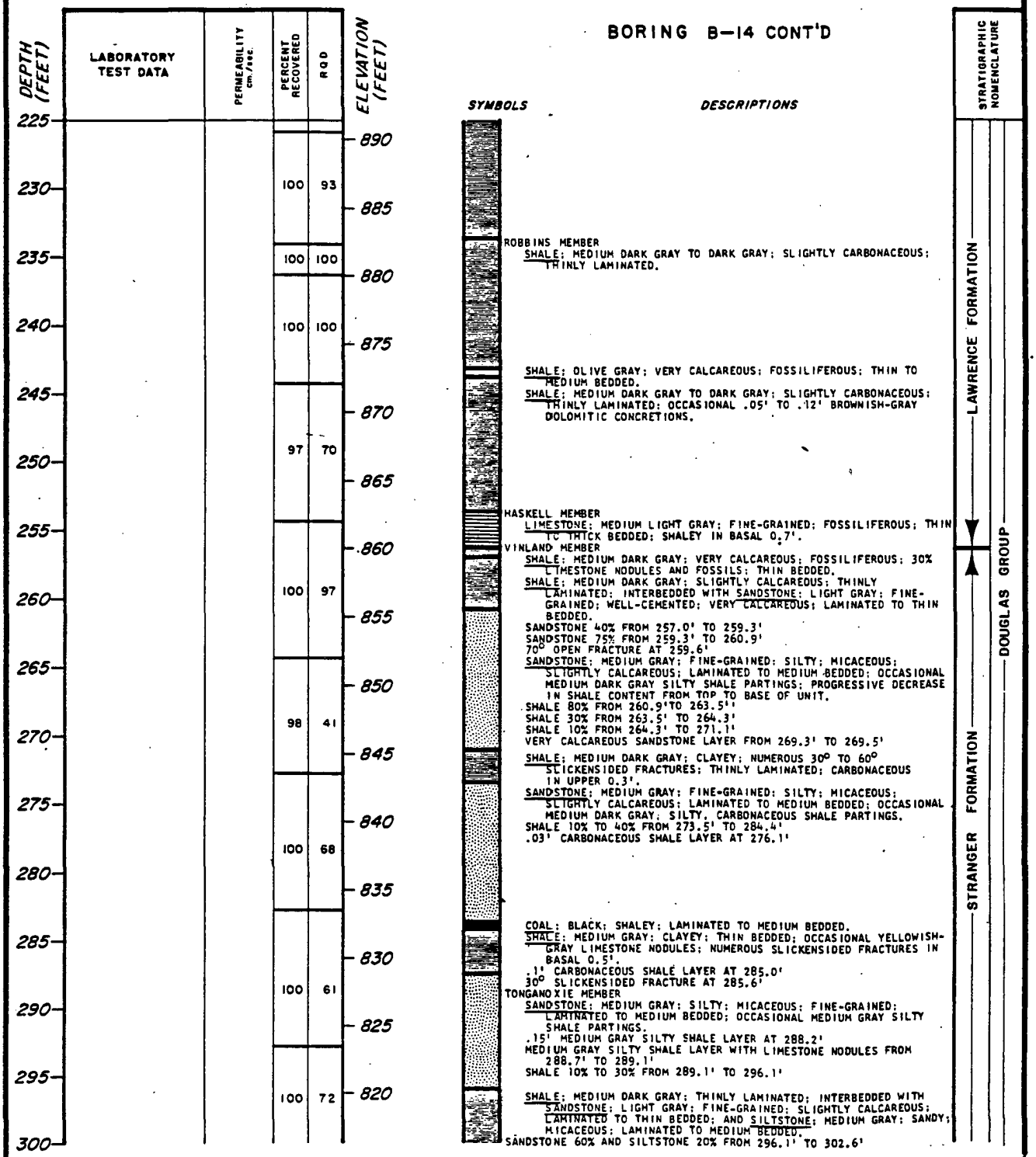
Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34n (Sheet 3 of 6)

Log of Boring B-14

BORING B-14 CONT'D

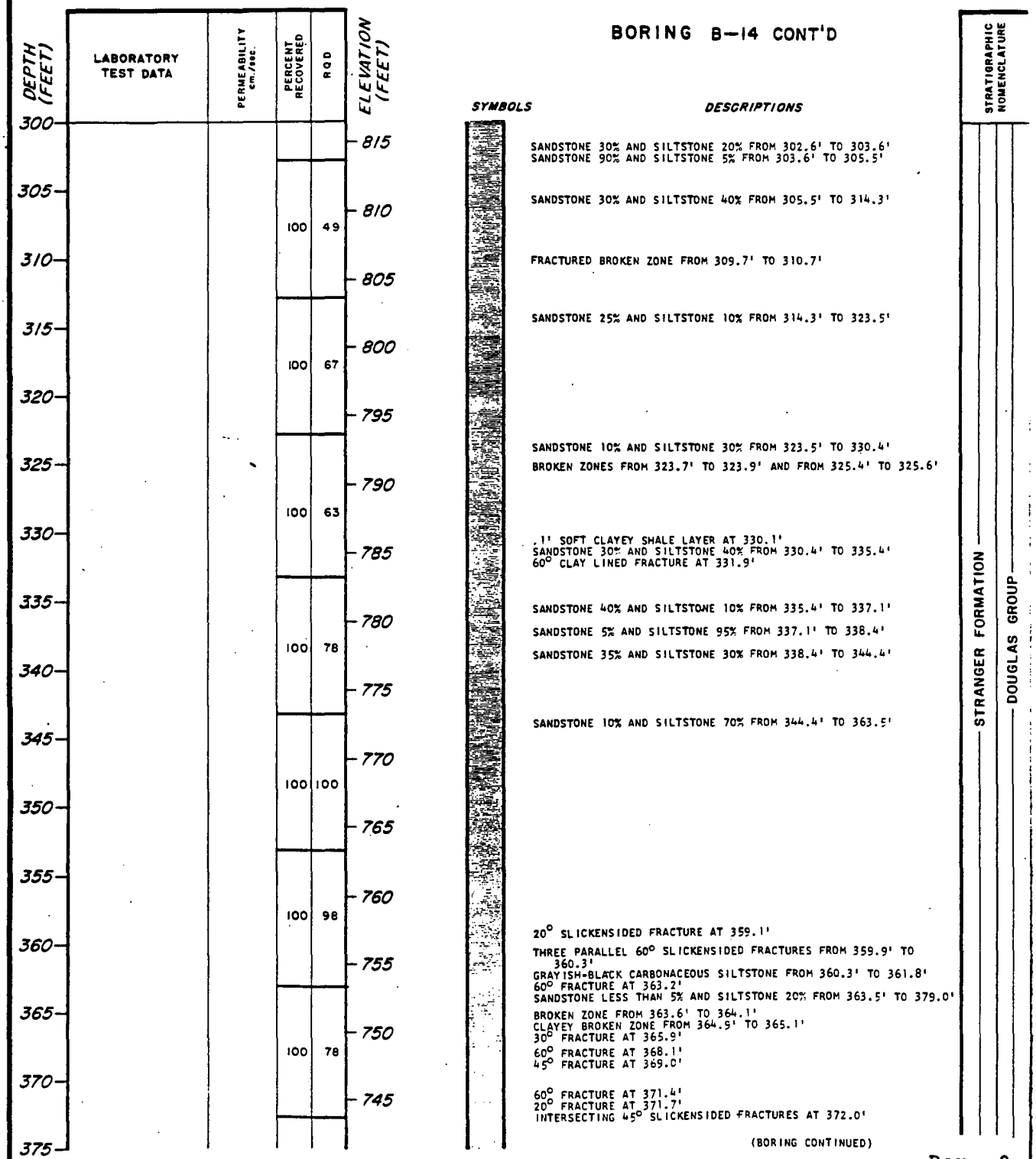


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34n (Sheet 4 of 6)

Log of Boring B-14

Rev. 0

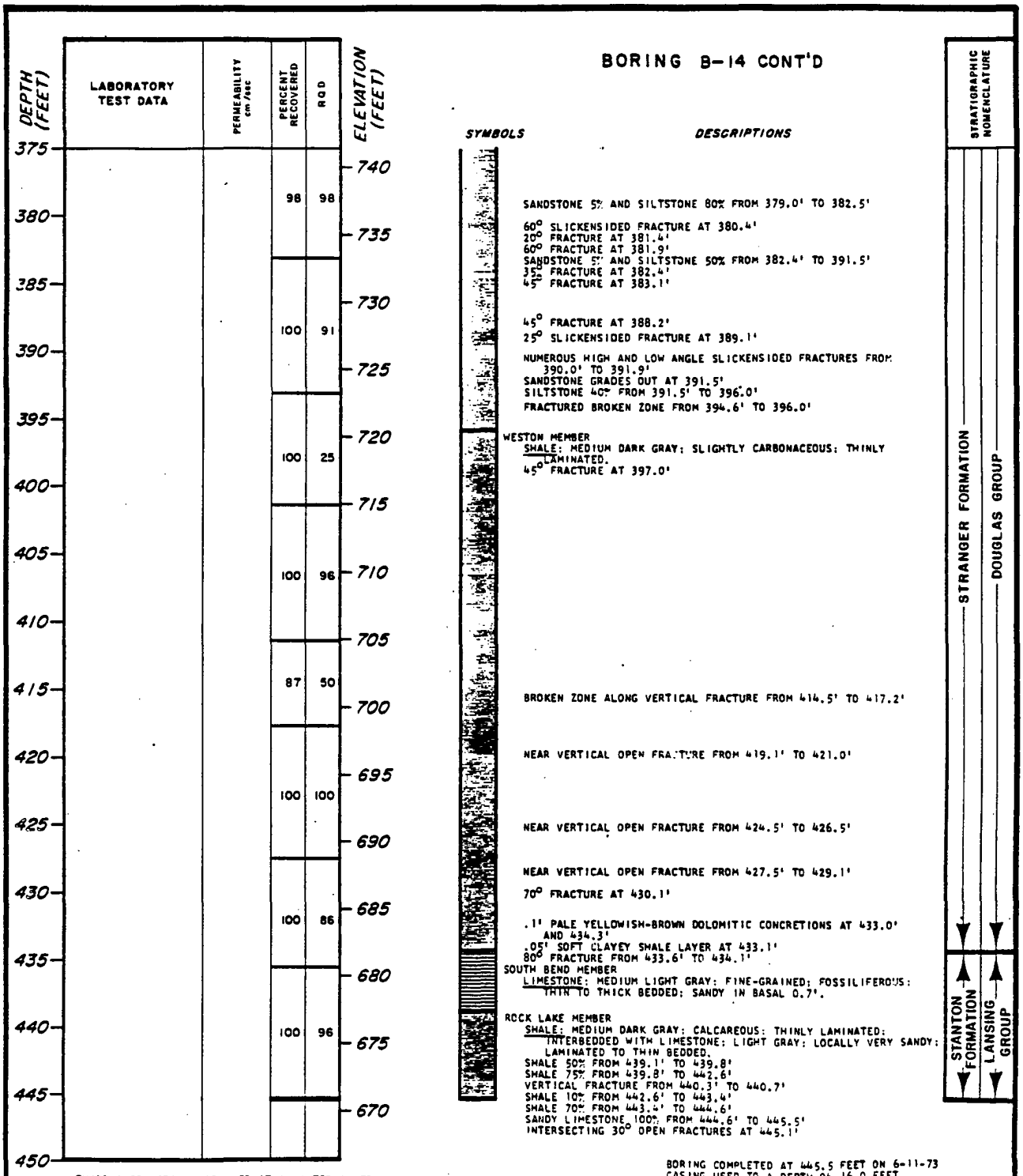


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34n (Sheet 5 of 6)

Log of Boring B-14



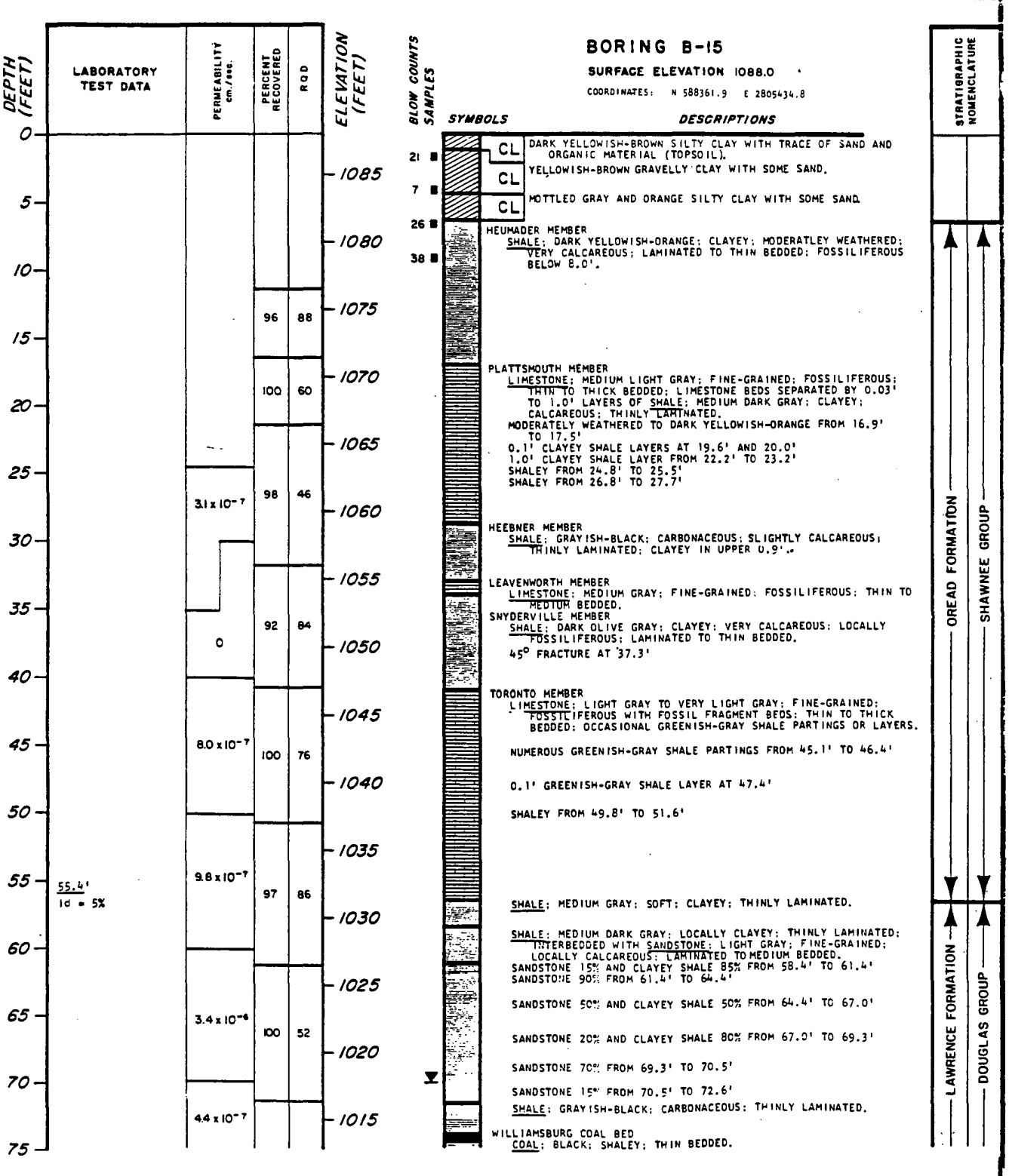
THIRD PIEZOMETER INSTALLED AT AN INTERVAL FROM 7.0 FEET TO 30.0 FEET ON 9-5-73.
SECOND PIEZOMETER INSTALLED AT AN INTERVAL FROM 85.0 FEET TO 100.0 FEET ON 8-6-73.
FIRST PIEZOMETER INSTALLED AT AN INTERVAL FROM 271.0 FEET TO 290.0 FEET.
PIEZOMETER READINGS ARE PRESENTED ON TABLE 2.4-29.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34n (Sheet 6 of 6)

Log of Boring B-14

Rev. 0

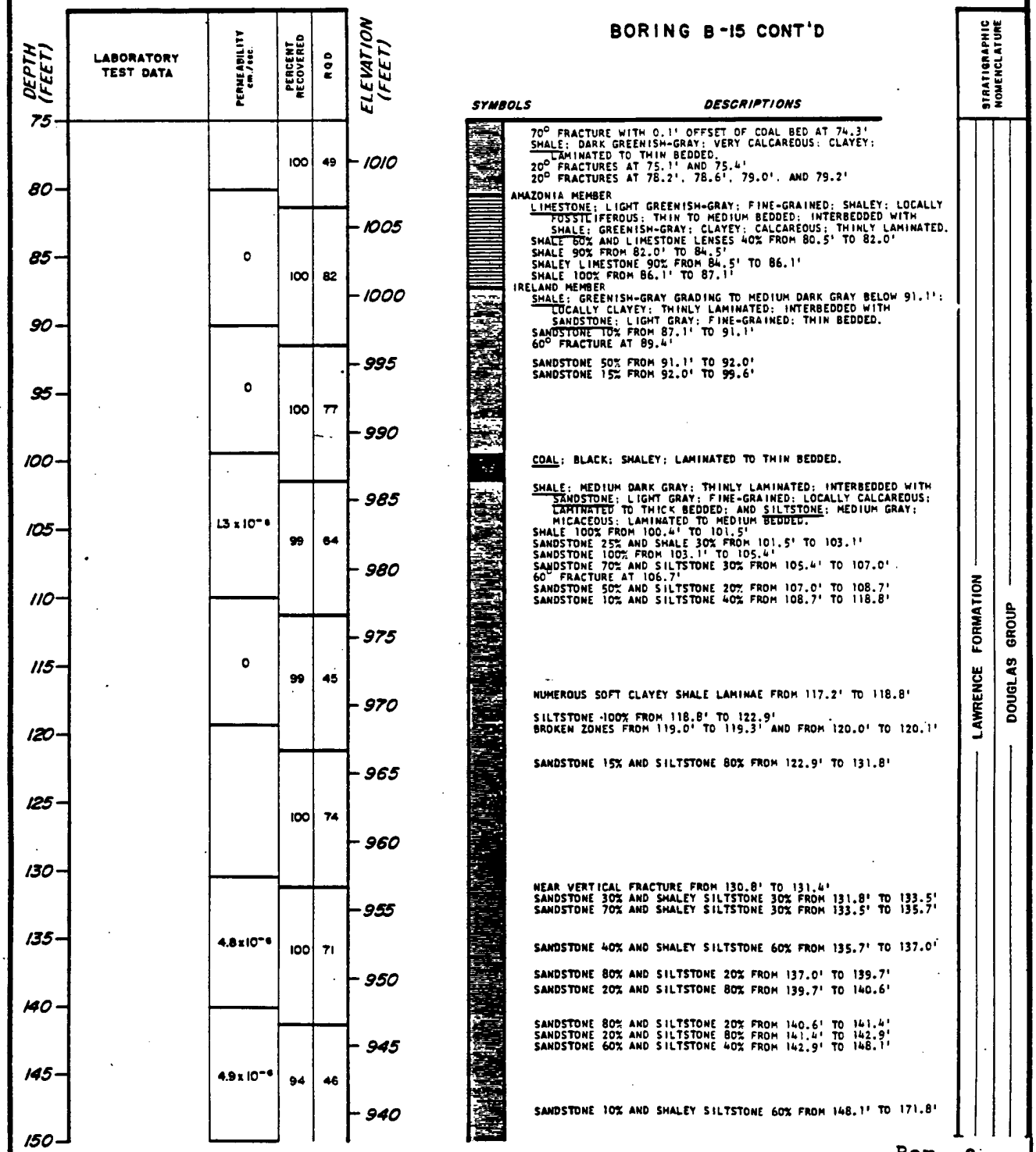


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34o (Sheet 1 of 5)

Log of Boring B-15

Rev. 0

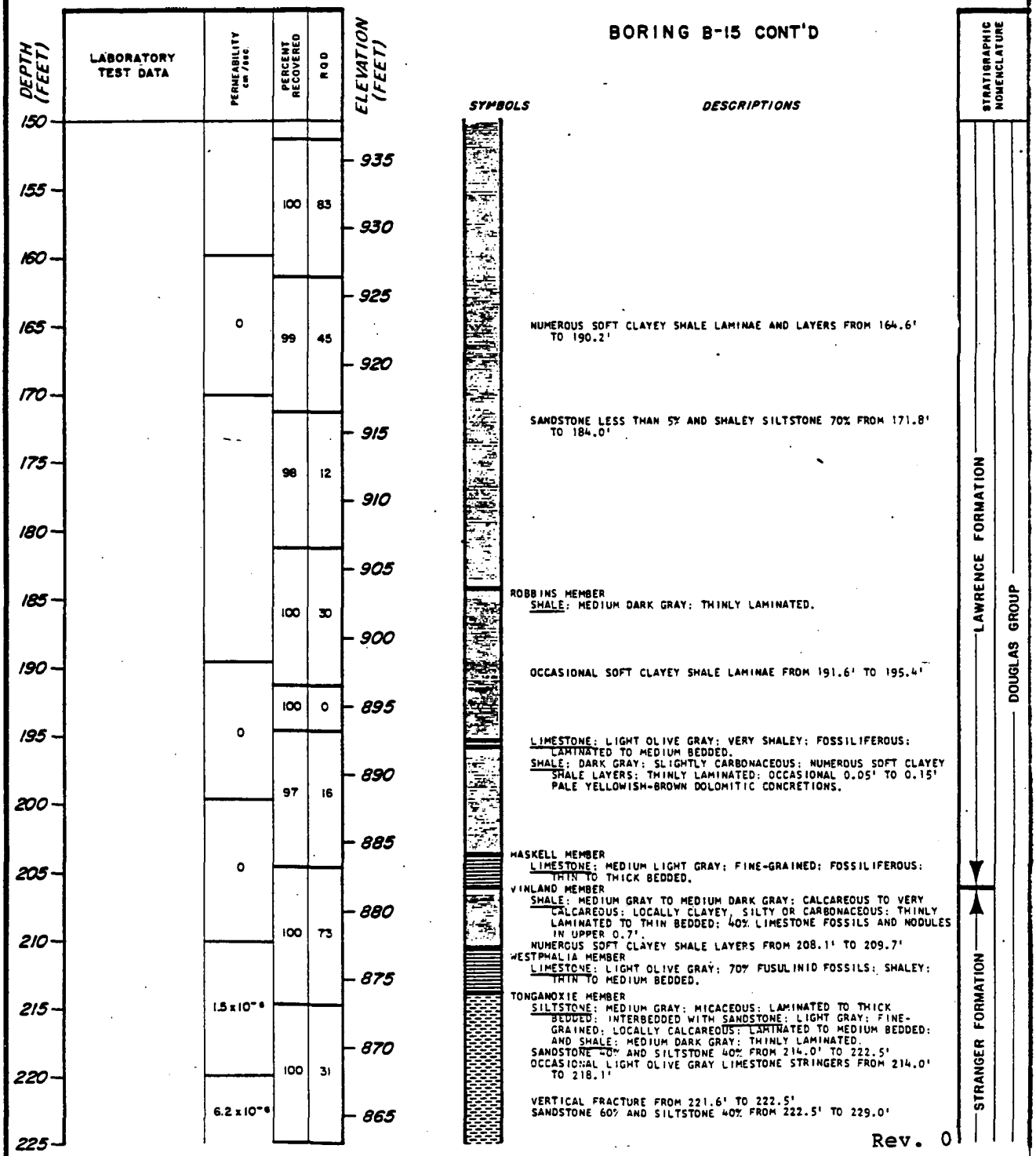


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34o (Sheet 2 of 5)

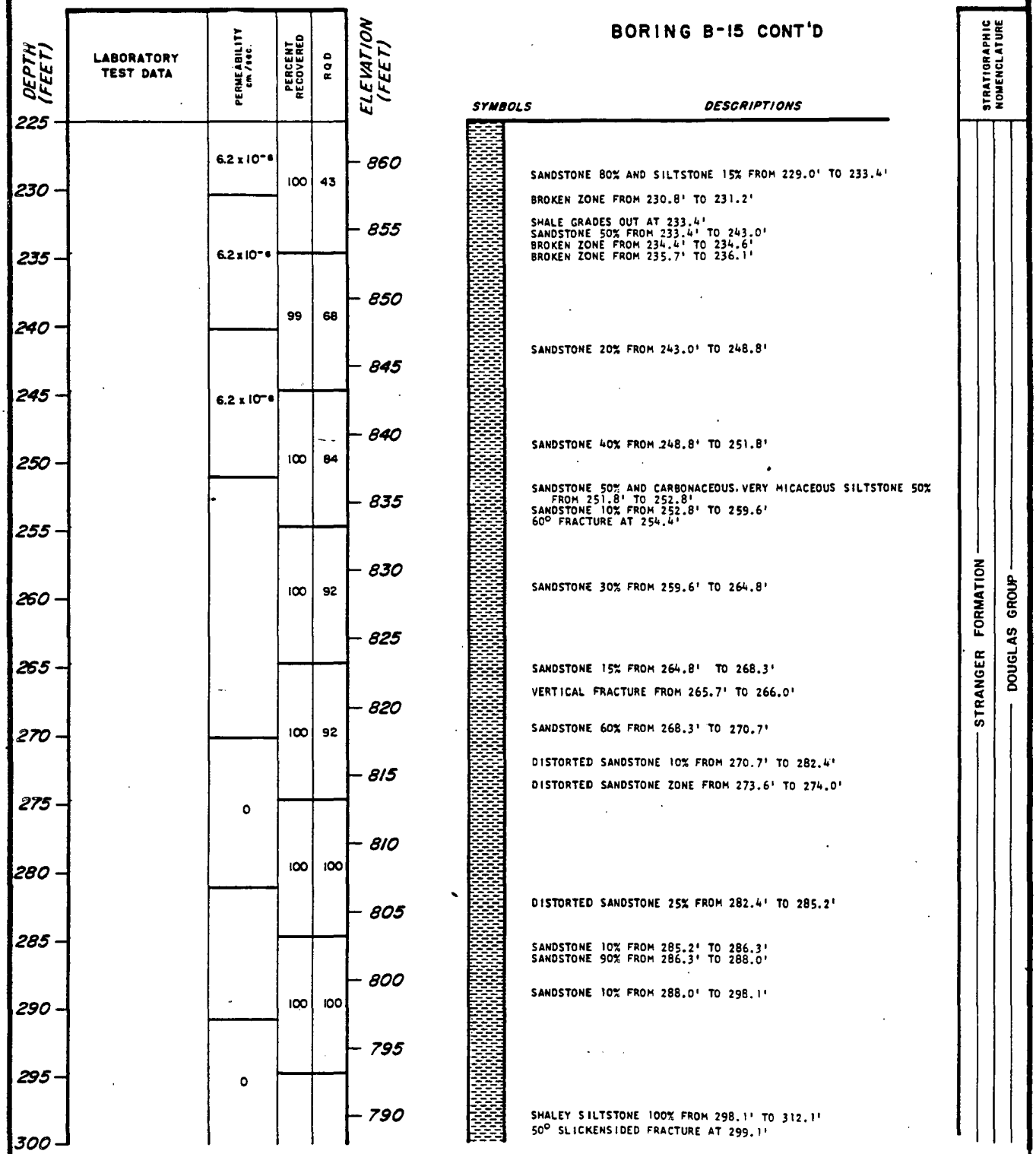
Log of Boring B-15



WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34o (Sheet 3 of 5)

Log of Boring B-15

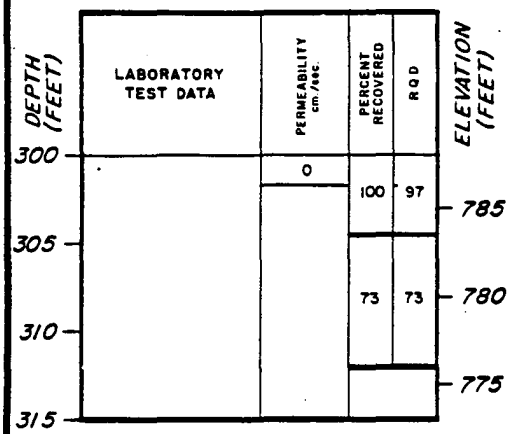


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34o (Sheet 4 of 5)

Log of Boring B-15



BORING B-15 CONT'D

SYMBOLS

DESCRIPTIONS

BROKEN ZONE FROM 301.6' TO 301.8'

STRATIGRAPHIC NOMENCLATURE

STRANGER FORMATION

DOUGLAS GROUP

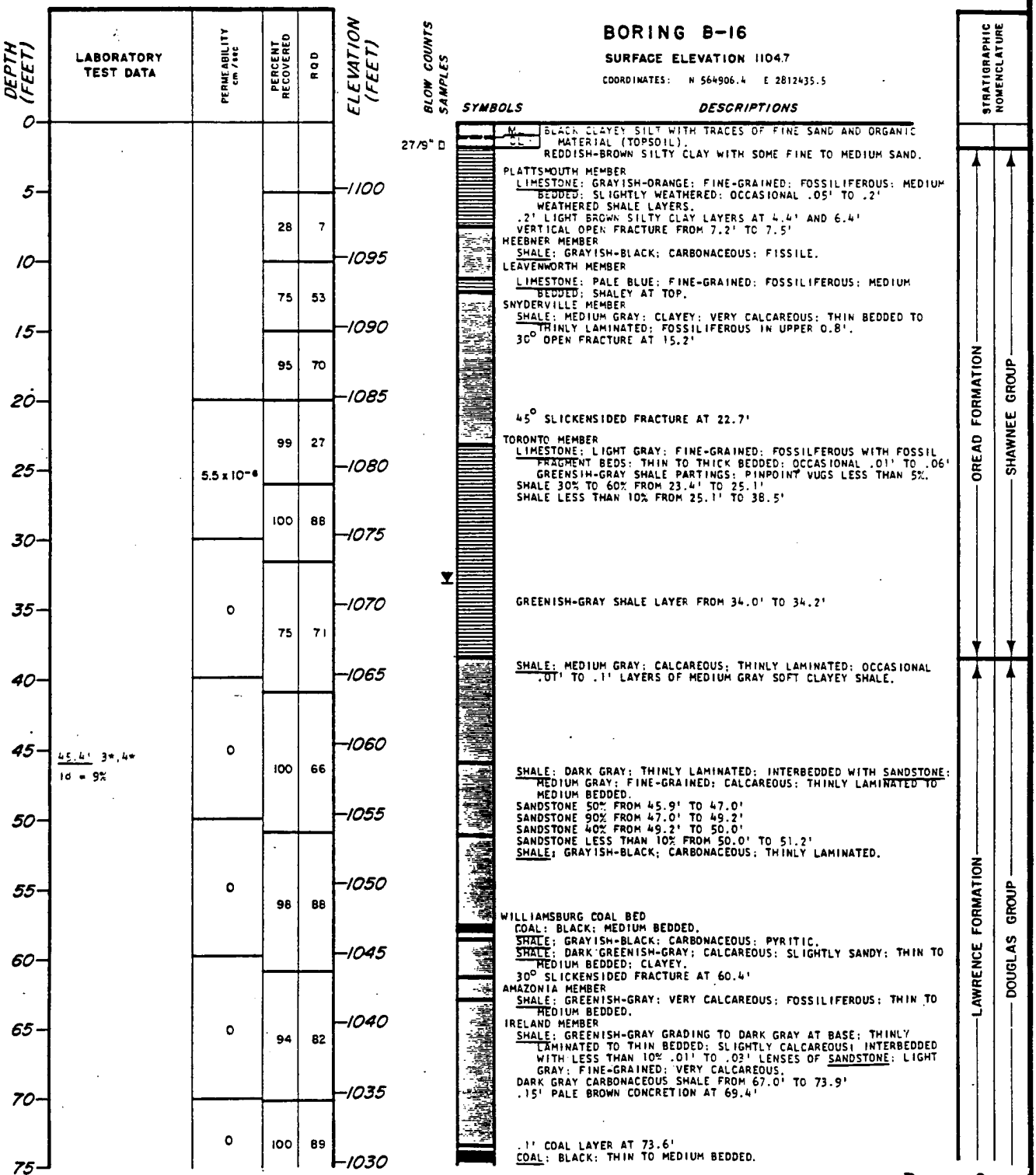
BORING COMPLETED AT 312.1 FEET ON 7-6-73.
CASING USED TO A DEPTH OF 14.5 FEET.
GROUND WATER LEVEL RECORDED AT 70.4 FEET FEET ON 7-9-73.
THIRD PIEZOMETER INSTALLED AT AN INTERVAL FROM 5.0 FEET TO 29.0 FEET ON 7-13-73.
SECOND PIEZOMETER INSTALLED AT AN INTERVAL FROM 40.0 FEET TO 80.0 FEET ON 7-13-73.
FIRST PIEZOMETER INSTALLED AT AN INTERVAL FROM 122.0 FEET TO 154.0 FEET ON 7-13-73.
PIEZOMETER READINGS ARE PRESENTED ON TABLE 2.4-29.

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34o (Sheet 5 of 5)

Log of Boring B-15

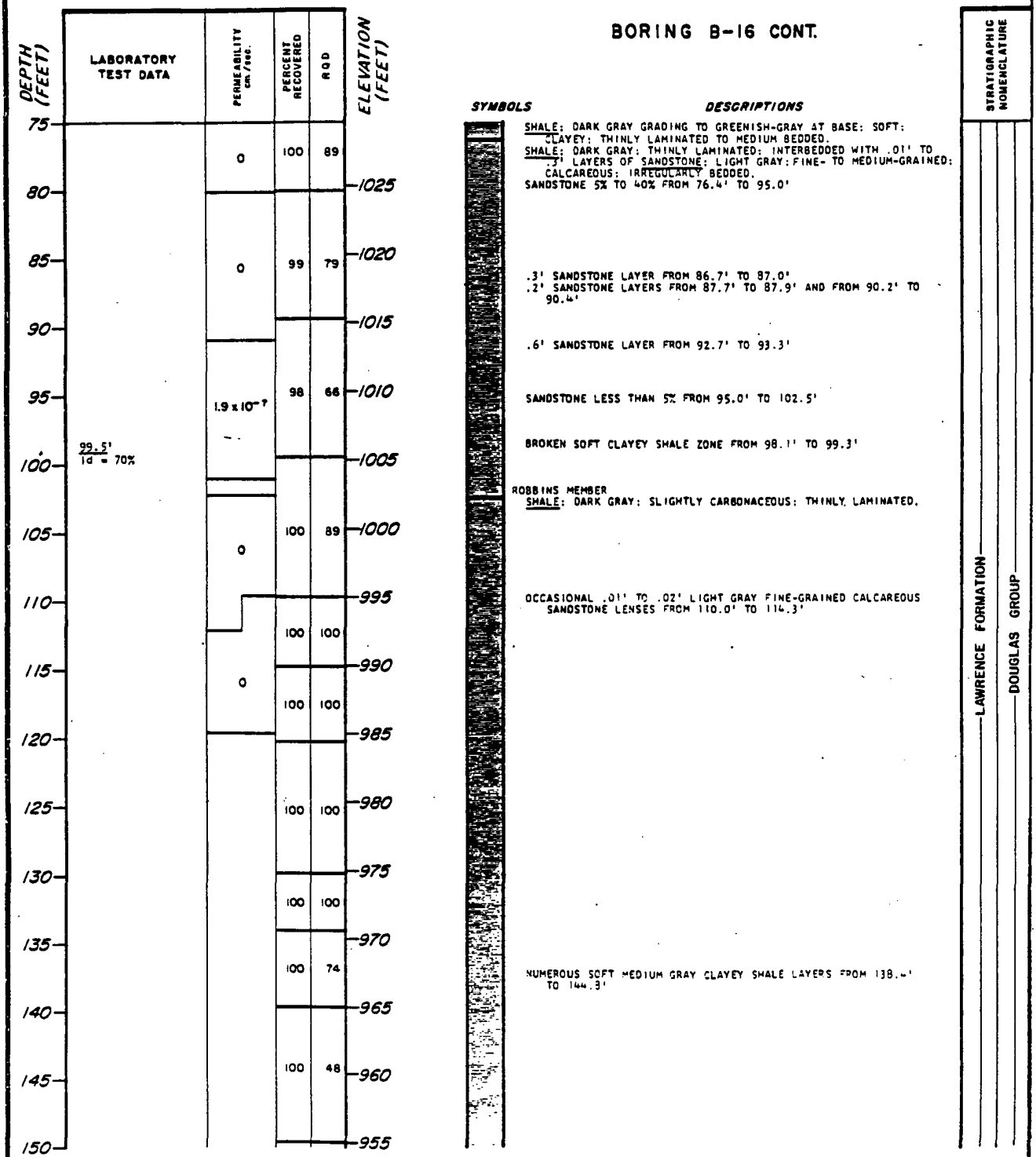


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34p (Sheet 1 of 6)

Log of Boring B-16

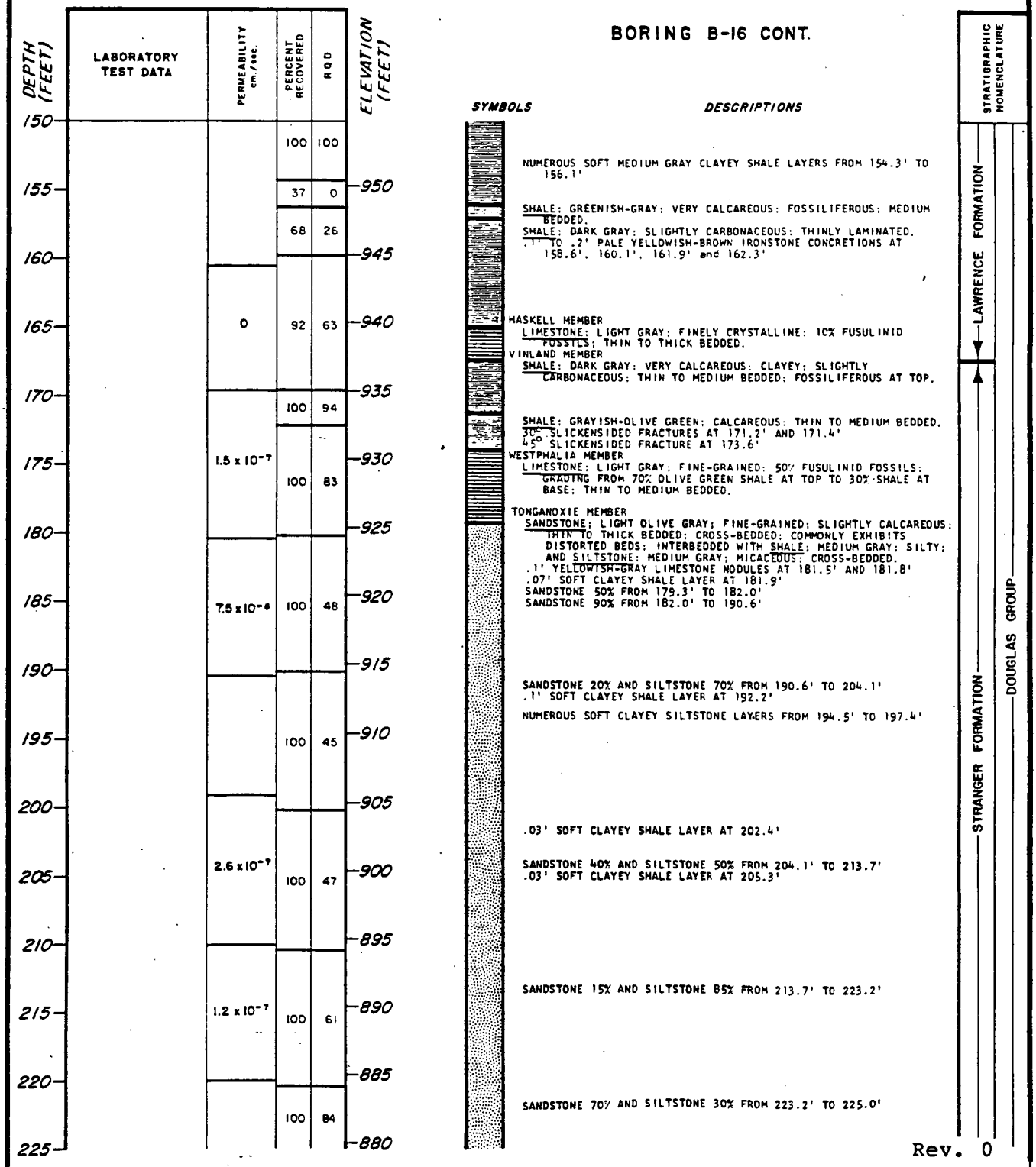


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34p (Sheet 2 of 6)

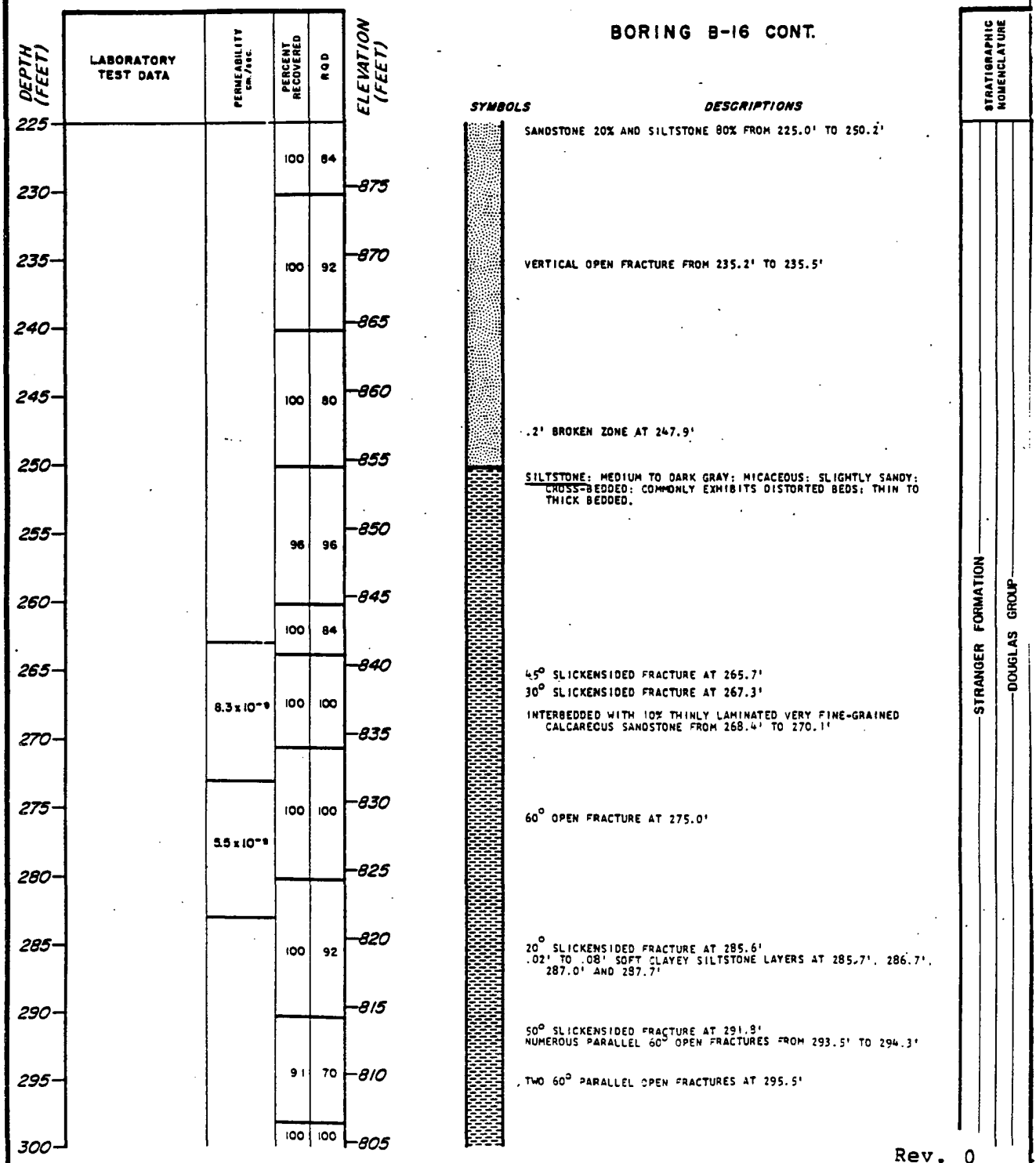
Log of Boring B-16



WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34p (Sheet 3 of 6)

Log of Boring B-16

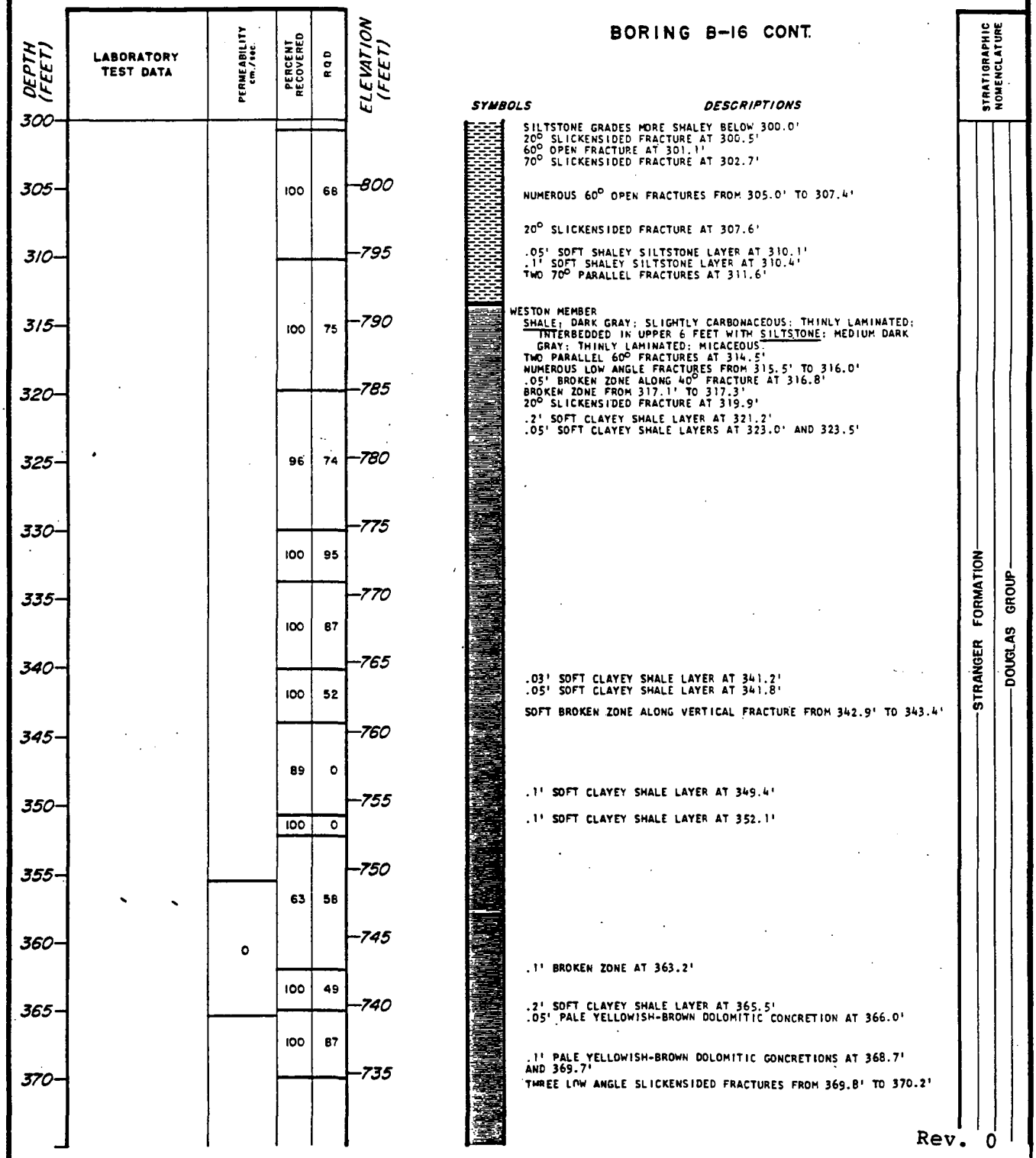


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34p (Sheet 4 of 6)

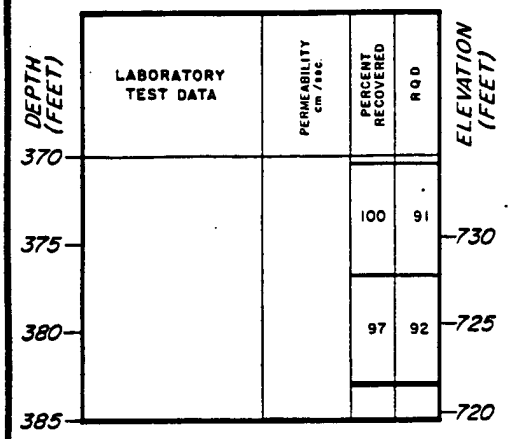
Log of Boring B-16



WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34p (Sheet 5 of 6)

Log of Boring B-16



BORING B-16 CONT.

SYMBOLS	DESCRIPTIONS
	SOUTH BEND MEMBER LIMESTONE: LIGHT GRAY: FINE-GRAINED: FOSSILIFEROUS: THIN TO THICK BEDDED: OCCASIONAL DARK GRAY SHALE PARTINGS BELOW 374.4'. LIMESTONE: LIGHT GRAY: SANDY: THIN TO MEDIUM BEDDED: INTERBEDDED WITH 10% SHALE: DARK GRAY: SANDY. ROCK LAKE MEMBER SHALE: DARK GRAY: CALCAREOUS: SANDY: THINLY LAMINATED: INTERBEDDED WITH 40% LIMESTONE: LIGHT GRAY: SLIGHTLY SANDY: THIN BEDDED. STONER MEMBER LIMESTONE: VERY LIGHT GRAY: FINE-GRAINED: OCCASIONAL FUSULINID FOSSILS: THICK BEDDED.

STRATIGRAPHIC NOMENCLATURE: STANTON FORMATION / LANSING GROUP

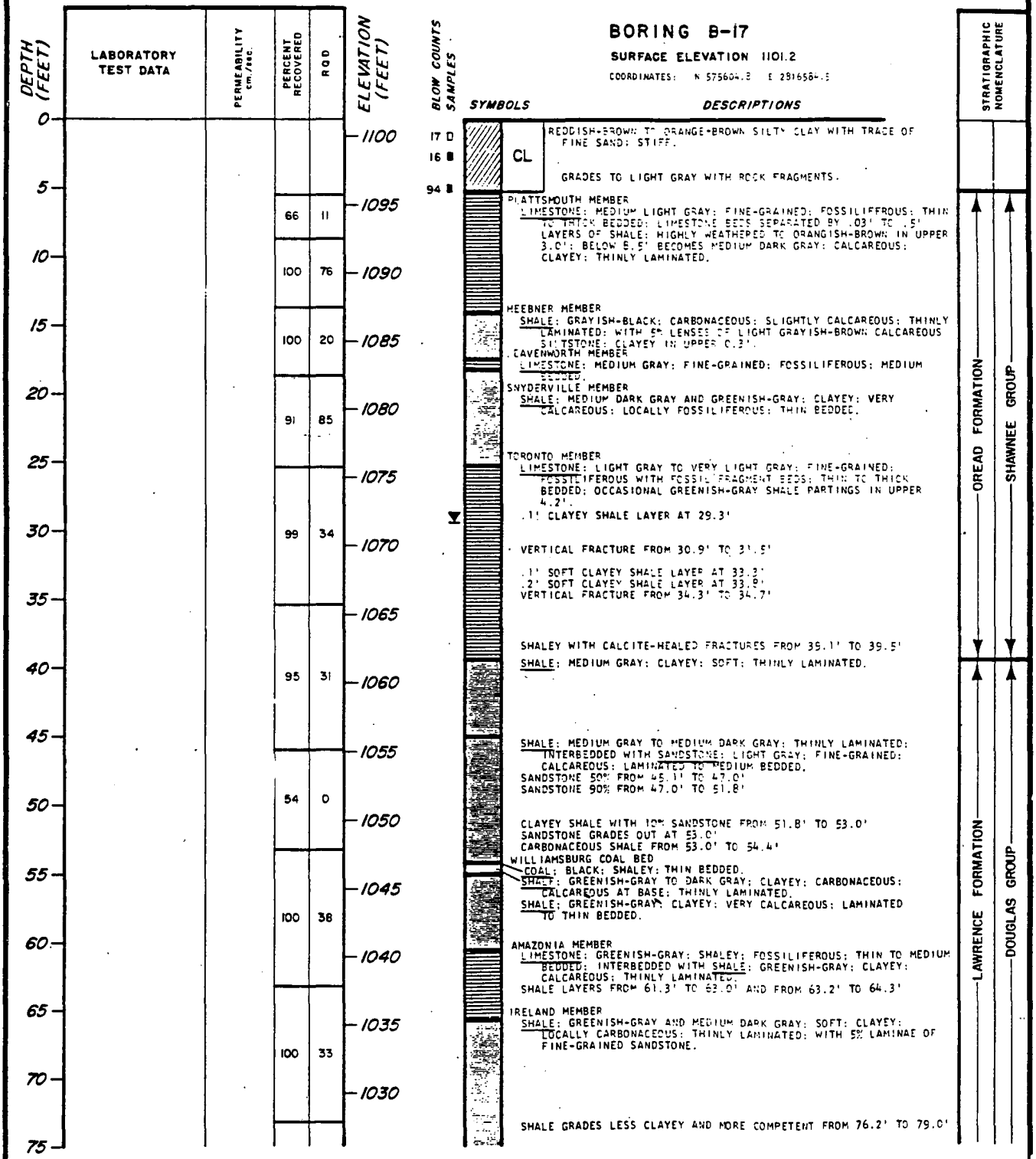
BORING COMPLETED ON 5-4-73 AT 383.0 FEET.
CASING USED TO A DEPTH OF 5.0 FEET.
GROUNDWATER LEVEL RECORDED AT 32.9 FEET ON 5-7-73.
SECOND PIEZOMETER INSTALLED AT AN INTERVAL FROM 23.0 FEET TO 37.0 FEET ON 7-27-73.
FIRST PIEZOMETER INSTALLED AT AN INTERVAL FROM 61.0 FEET TO 91.0 FEET ON 7-27-73.
PIEZOMETER READINGS PRE PRESENTED ON TABLE 2.4-29.

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34p (Sheet 6 of 6)

Log of Boring B-16

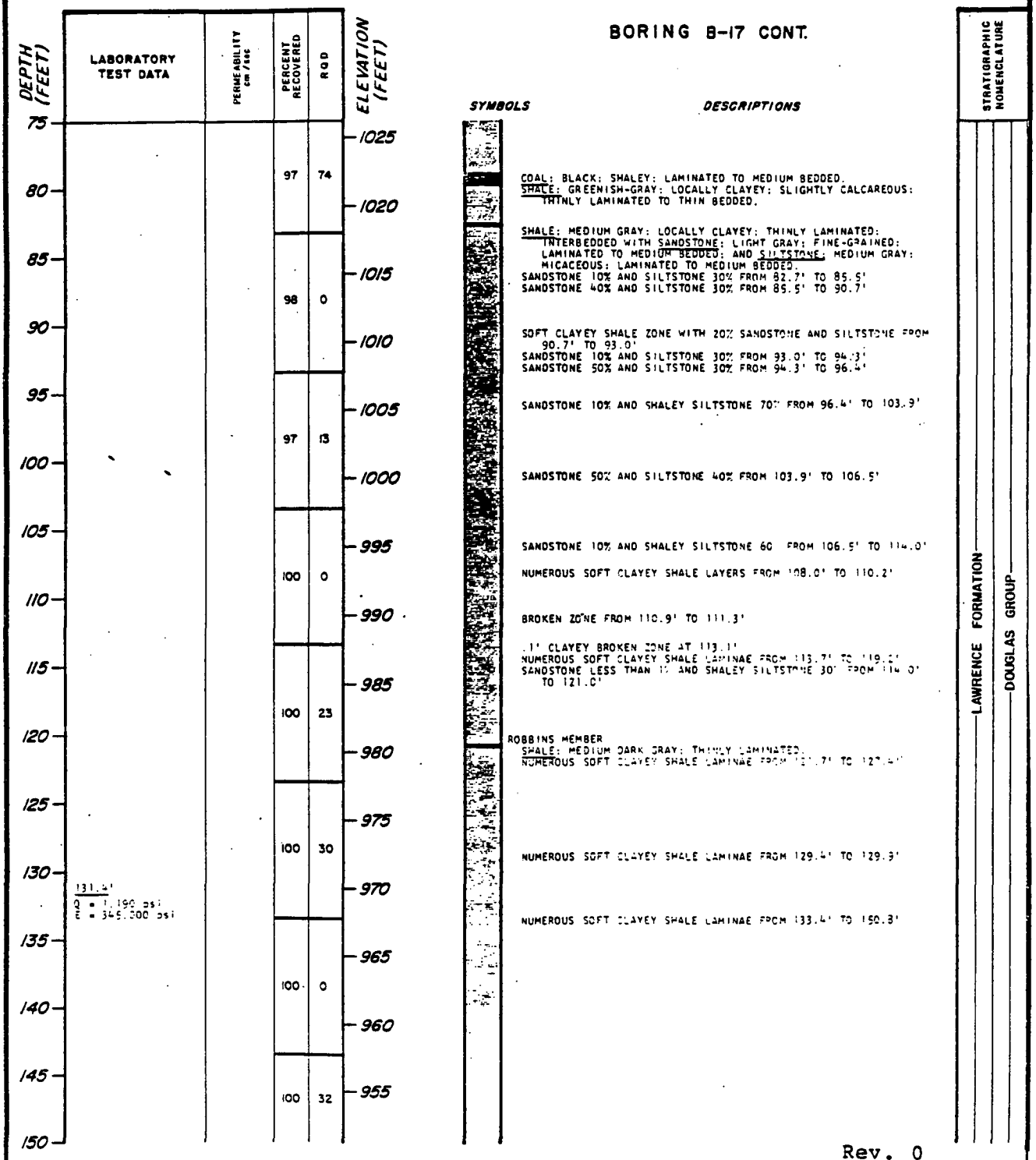


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34q (Sheet 1 of 5)

Log of Boring B-17

Rev. 0

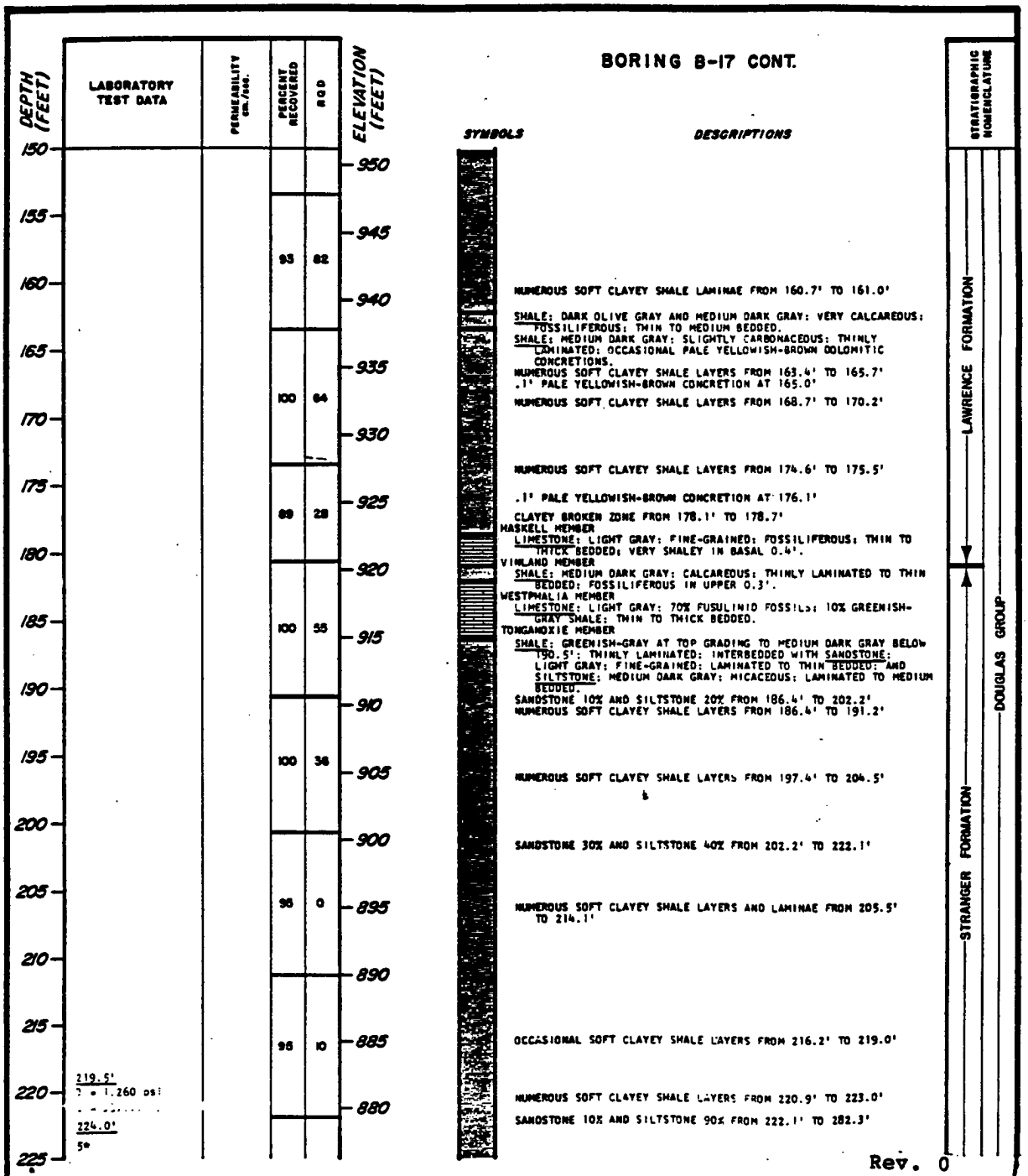


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34q (Sheet 2 of 5)

Log of Boring B-17

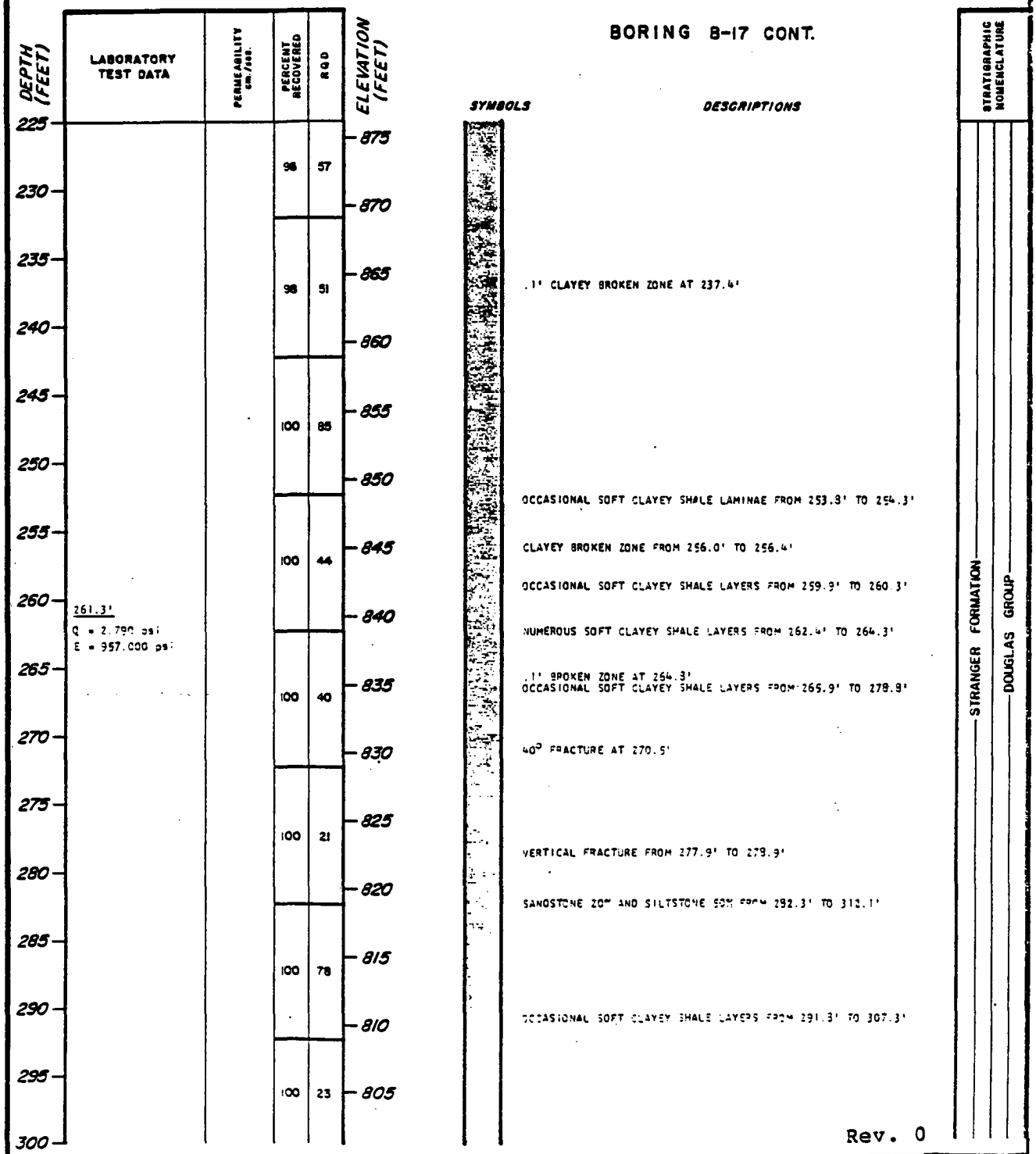


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34q (Sheet 3 of 5)

Log of Boring B-17

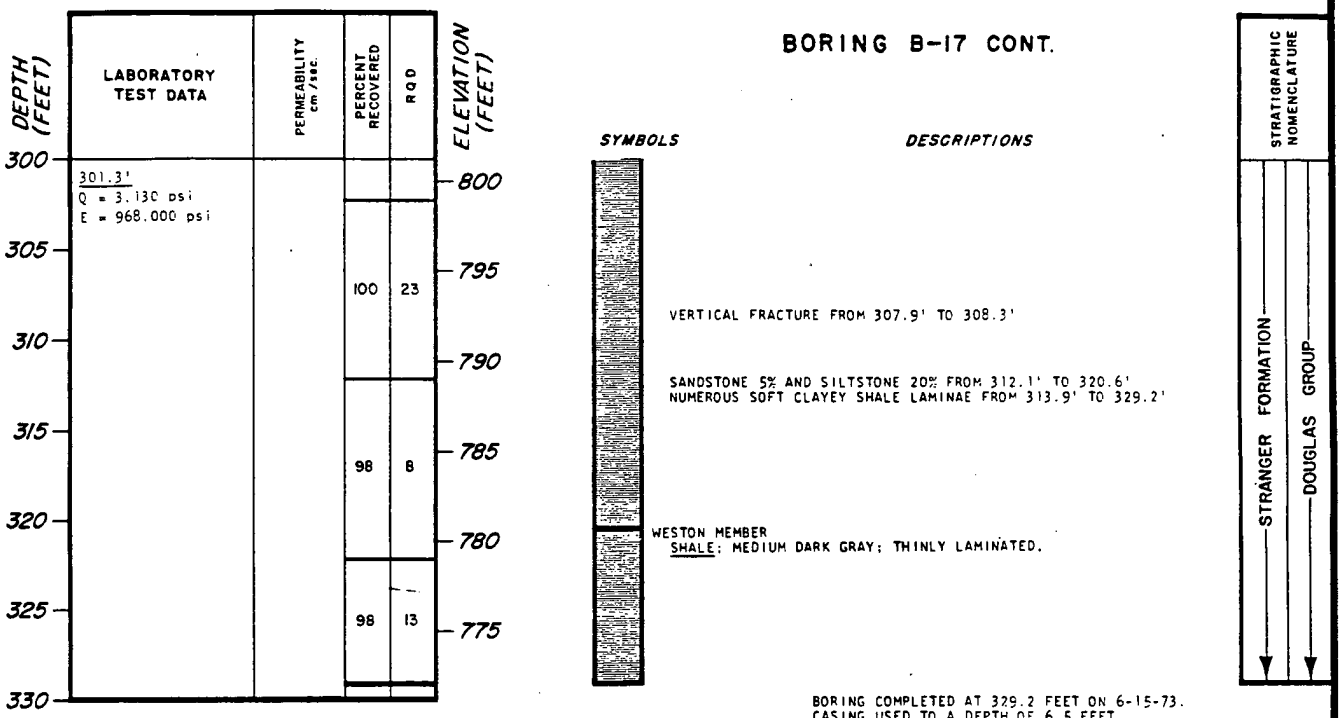


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34q (Sheet 4 of 5)

Log of Boring B-17



BORING COMPLETED AT 329.2 FEET ON 6-15-73.
CASING USED TO A DEPTH OF 6.5 FEET.
GROUNDWATER LEVEL RECORDED AT 29.6 FEET ON 8-6-73.

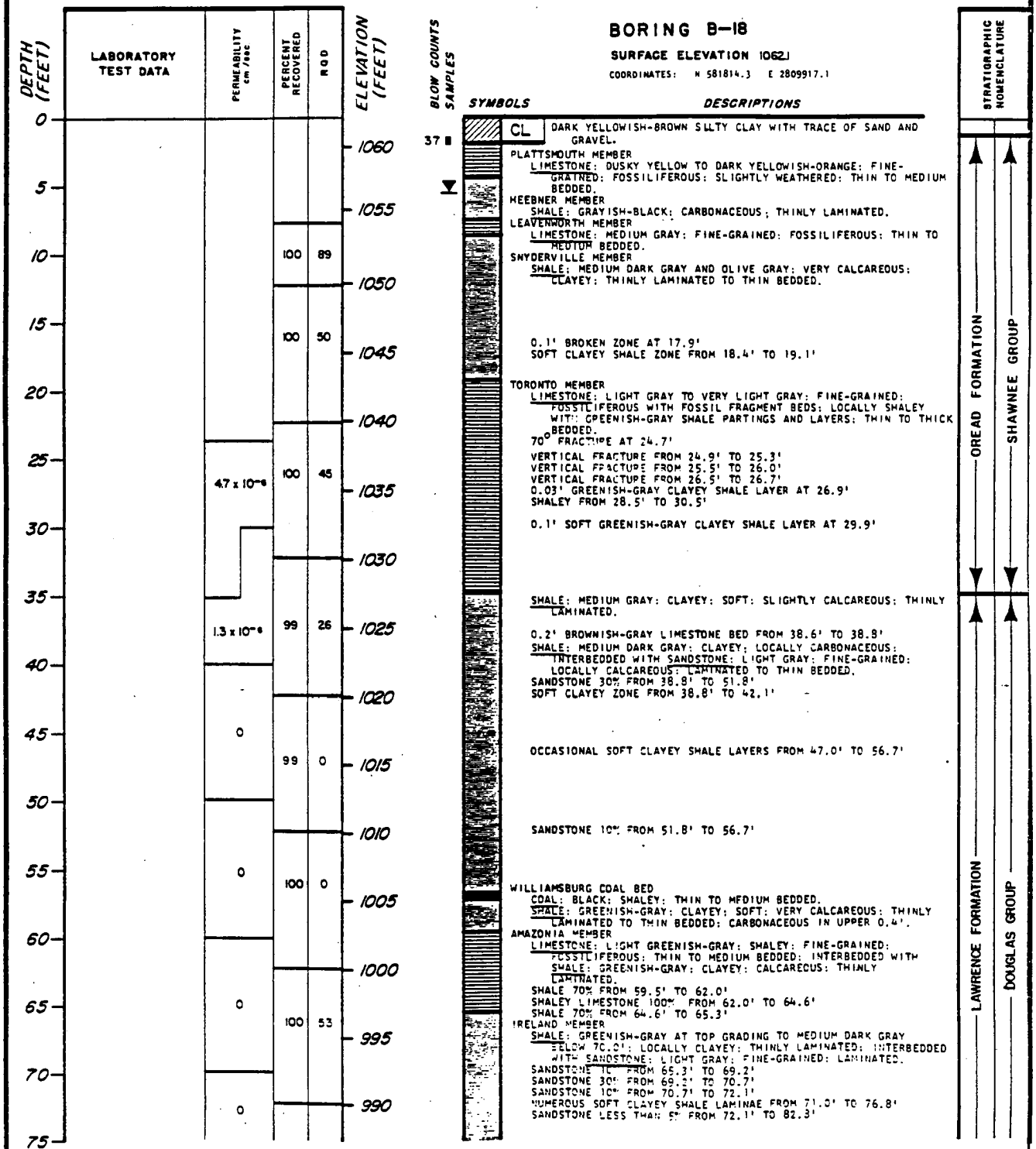
THIRD PIEZOMETER INSTALLED AT AN INTERVAL FROM 25.0 FEET TO 40.0 FEET ON 7-20-73.
SECOND PIEZOMETER INSTALLED AT AN INTERVAL FROM 65.0 FEET TO 121.0 FEET ON 7-20-73.
FIRST PIEZOMETER INSTALLED AT AN INTERVAL FROM 186.0 FEET TO 320.0 FEET ON 7-20-73.
PIEZOMETER READINGS ARE PRESENTED ON TABLE 2.4-29.

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34q (Sheet 5 of 5)

Log of Boring B-17

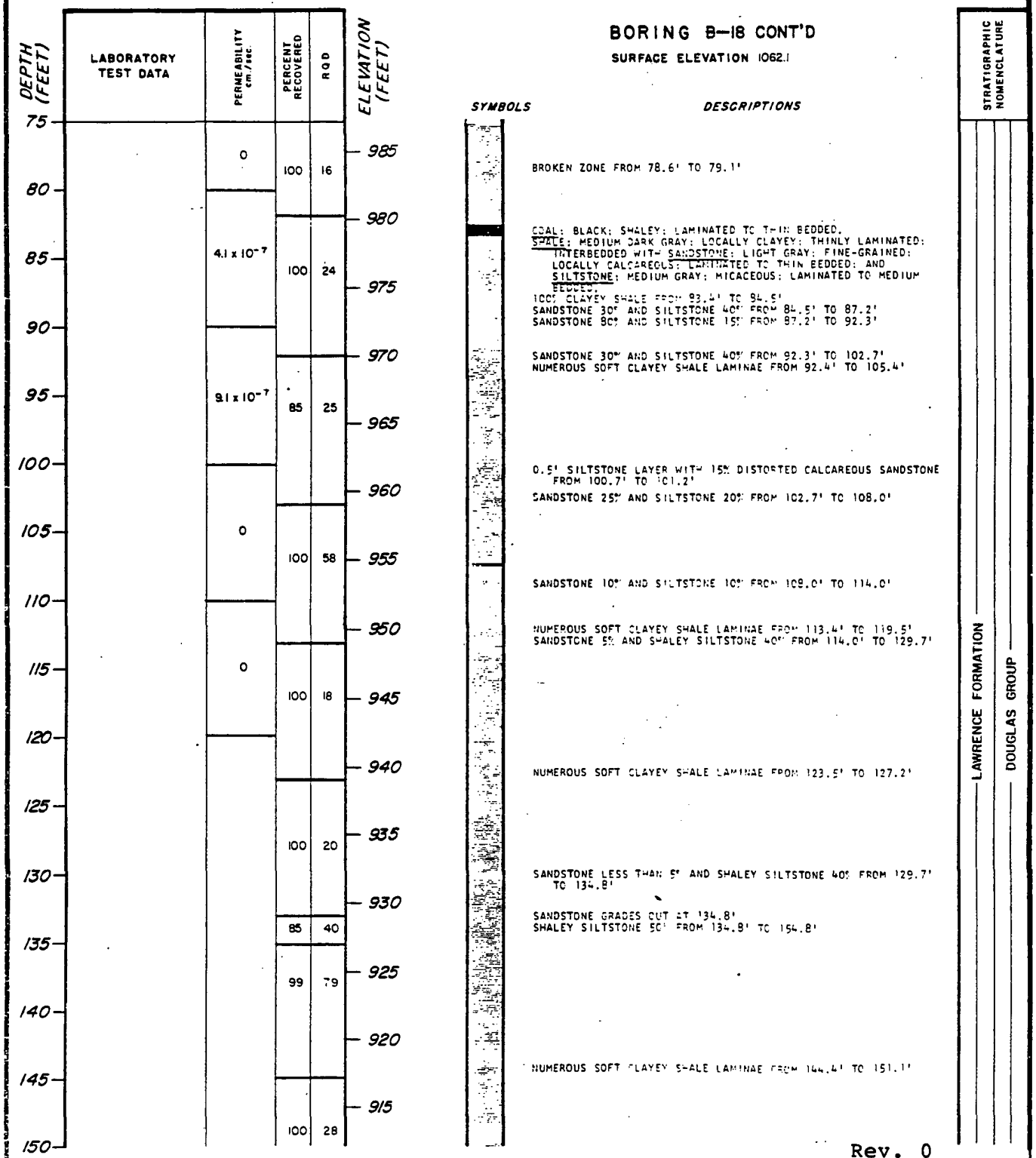


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34r (Sheet 1 of 5)

Log of Boring B-18

Rev. 0



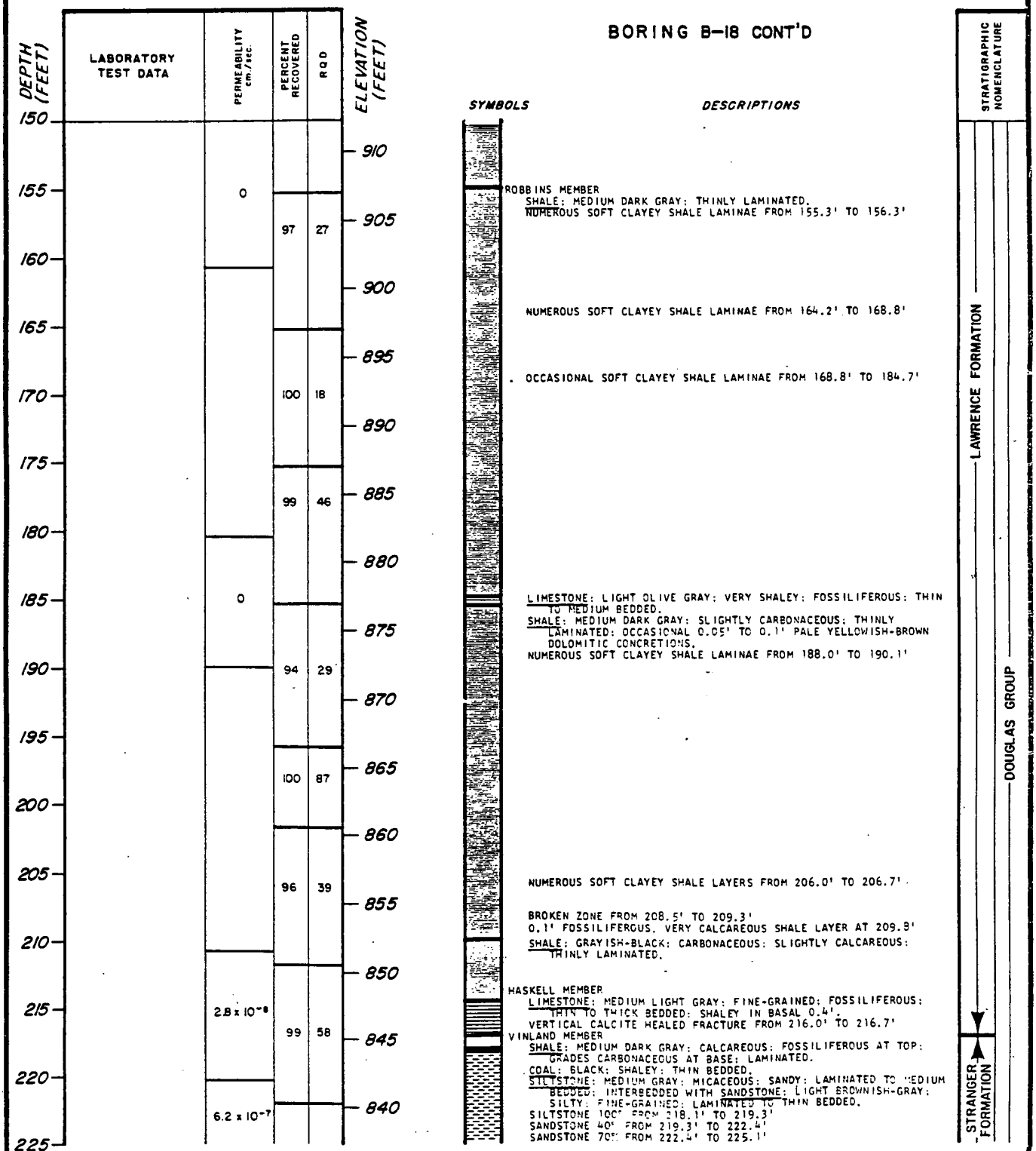
Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34r (Sheet 2 of 5)

Log of Boring B-18

BORING B-18 CONT'D



WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34r (Sheet 3 of 5)

Log of Boring B-18

Rev. 0

BORING B—18 CONT'D

DEPTH (FEET)	LABORATORY TEST DATA	PERMEABILITY cm/sec.	PERCENT RECOVERED	RQD	ELEVATION (FEET)
225			83	11	835
230		0	100	9	830
235					825
240		3.1×10^{-8}	100	88	820
245					815
250		4.4×10^{-8}	93	77	810
255					805
260		2.0×10^{-8}	99	92	800
265					795
270			100	42	790
275					785
280			99	91	780
285					775
290		0	99	99	770
295					765
300					

SYMBOLS

DESCRIPTIONS

SANDSTONE 20% FROM 225.1' TO 226.5'
COAL: BLACK; SHALEY; LAMINATED TO THIN BEDDED.
SILTSTONE: MEDIUM GRAY; SHALEY; SANDY; LAMINATED TO MEDIUM BEDDED; INTERBEDDED WITH SANDSTONE: LIGHT BROWNISH-GRAY; FINE-GRAINED; SILTY; CALCAREOUS; LAMINATED TO THIN BEDDED; AND SHALE: MEDIUM GRAY; LOCALLY SLIGHTLY CARBONACEOUS; CLAYEY; THINLY LAMINATED TO THIN BEDDED.
SILTSTONE 75% AND SHALE 25% FROM 226.9' TO 231.0'
SANDSTONE 10% AND SHALE 30% FROM 231.0' TO 240.0'
NUMEROUS SOFT CLAYEY SHALE LAMINAE FROM 231.5' TO 240.0'

SHALE GRADES OUT AT 240.0'
SANDSTONE 60% AND SANDY SILTSTONE 40% FROM 240.0' TO 257.5'

60° SLICKENSIDED FRACTURE AT 257.0'

LIMESTONE: LIGHT OLIVE GRAY; 70% FUSULINID FRAGMENTS; CONGLOMERATIC ROUNDED LIMESTONE PEBBLES; SHALEY; THIN TO MEDIUM BEDDED; INTERBEDDED WITH SILTSTONE: MEDIUM DARK GRAY; SHALEY; SANDY; CALCAREOUS; LAMINATED TO THIN BEDDED.
LIMESTONE LAYERS FROM 257.3' TO 257.7', FROM 258.0' TO 258.2' AND FROM 258.8' TO 259.1'
TONGANOXIE MEMBER
SHALE: MEDIUM DARK GRAY; THINLY LAMINATED; INTERBEDDED WITH SANDSTONE: LIGHT GRAY; FINE-GRAINED; LOCALLY CALCAREOUS; LAMINATED TO THIN BEDDED; AND SILTSTONE: MEDIUM GRAY; MICACEOUS; LAMINATED TO MEDIUM BEDDED.
SANDSTONE 20% AND SILTSTONE 20% FROM 259.1' TO 271.8'
20° FRACTURE AT 260.5'
30° FRACTURE AT 261.7'
20° FRACTURE AT 262.6'
45° SLICKENSIDED FRACTURE AT 263.2'
0.1' BROKEN ZONE AT 263.4'
SANDSTONE 10% AND SILTSTONE 20% FROM 271.8' TO 282.9'

OCCASIONAL SOFT CLAYEY SHALE LAMINAE FROM 275.2' TO 281.0'

0.05' BROKEN ZONE AT 282.6'
SANDSTONE 25% AND SILTSTONE 20% FROM 282.9' TO 290.4'

VERTICAL FRACTURE FROM 288.4' TO 288.7'

SANDSTONE 30% AND SILTSTONE 10% FROM 290.4' TO 296.6'

SANDSTONE LESS THAN 5% AND SHALEY SILTSTONE 10% FROM 296.6' TO 305.0'

Rev. 0

STRATIGRAPHIC NOMENCLATURE

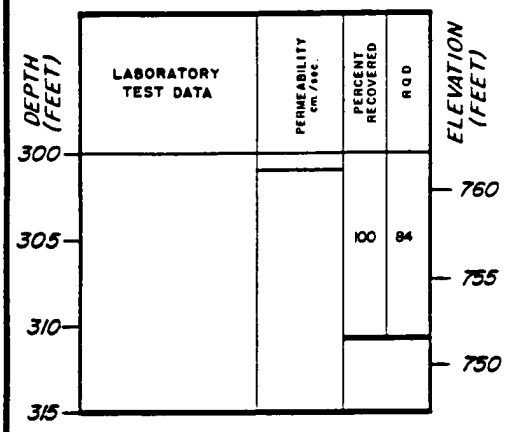
STRANGER FORMATION

DOUGLAS GROUP

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34r (Sheet 4 of 5)

Log of Boring B-18



BORING B-18 CONT'D

SYMBOLS	DESCRIPTIONS
	CARBONACEOUS SHALE LAYER FROM 301.7' TO 302.0'
	WESTON MEMBER SHALE: MEDIUM DARK GRAY; SLIGHTLY CARBONACEOUS: THINLY LAMINATED.

STRATIGRAPHIC NOMENCLATURE: STRANGER FORMATION — DOUGLAS GROUP

BORING COMPLETED AT 310.5 FEET ON 6-25-73.
CASING USED TO A DEPTH OF 7.7 FEET.
GROUNDWATER LEVEL RECORDED AT 5.7 FEET ON 6-29-73.

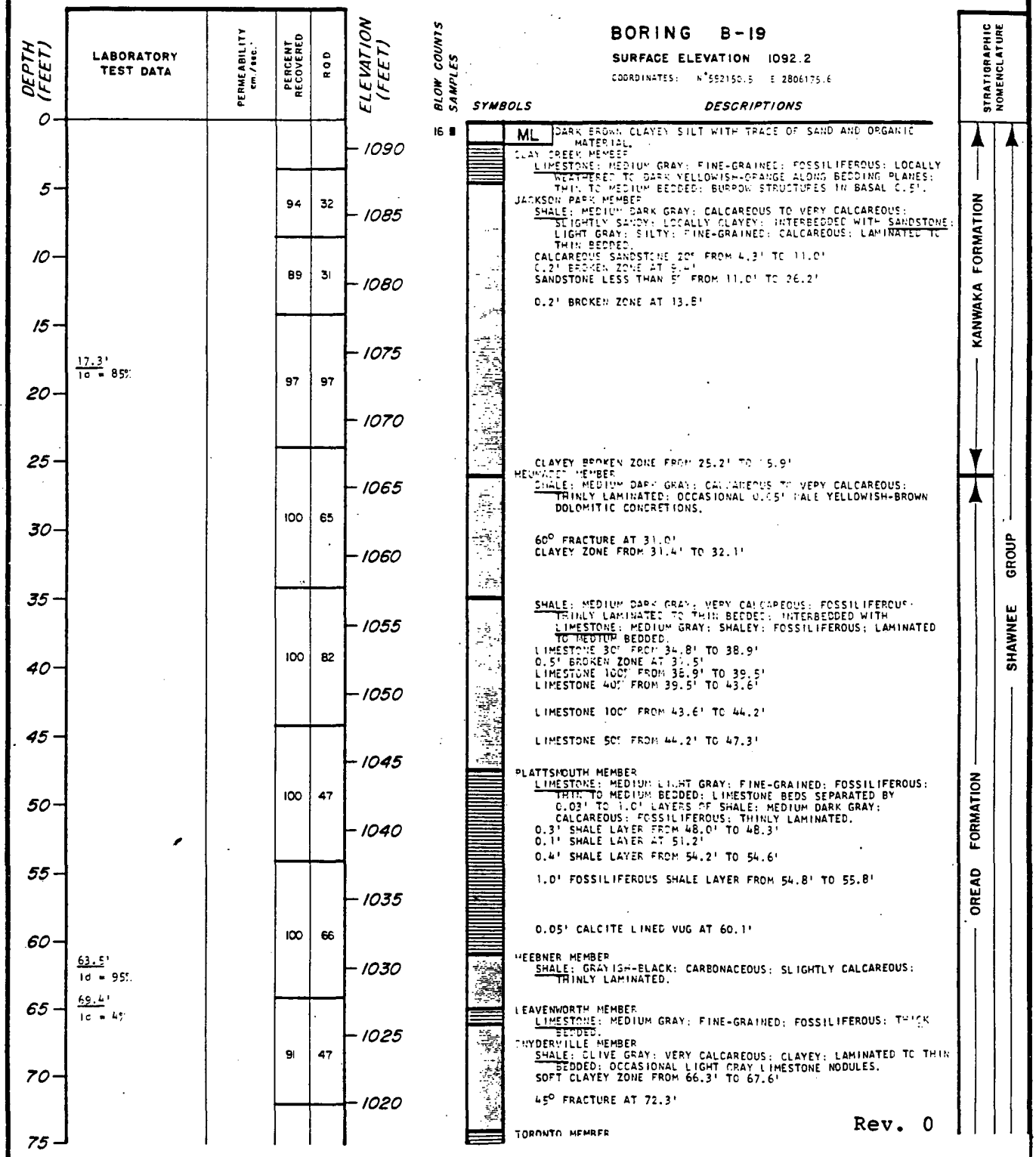
THIRD PIEZOMETER INSTALLED AT AN INTERVAL FROM 5.0 FEET TO 10.0 FEET ON 7/19/74.
SECOND PIEZOMETER INSTALLED AT AN INTERVAL FROM 19.0 FEET TO 35.0 FEET ON 7/19/74.
FIRST PIEZOMETER INSTALLED AT AN INTERVAL FROM 74.0 FEET TO 105.0 FEET ON 7/19/74.
PIEZOMETER READINGS ARE PRESENTED ON TABLE 2.4-29.

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34r (Sheet 5 of 5)

Log of Boring B-18

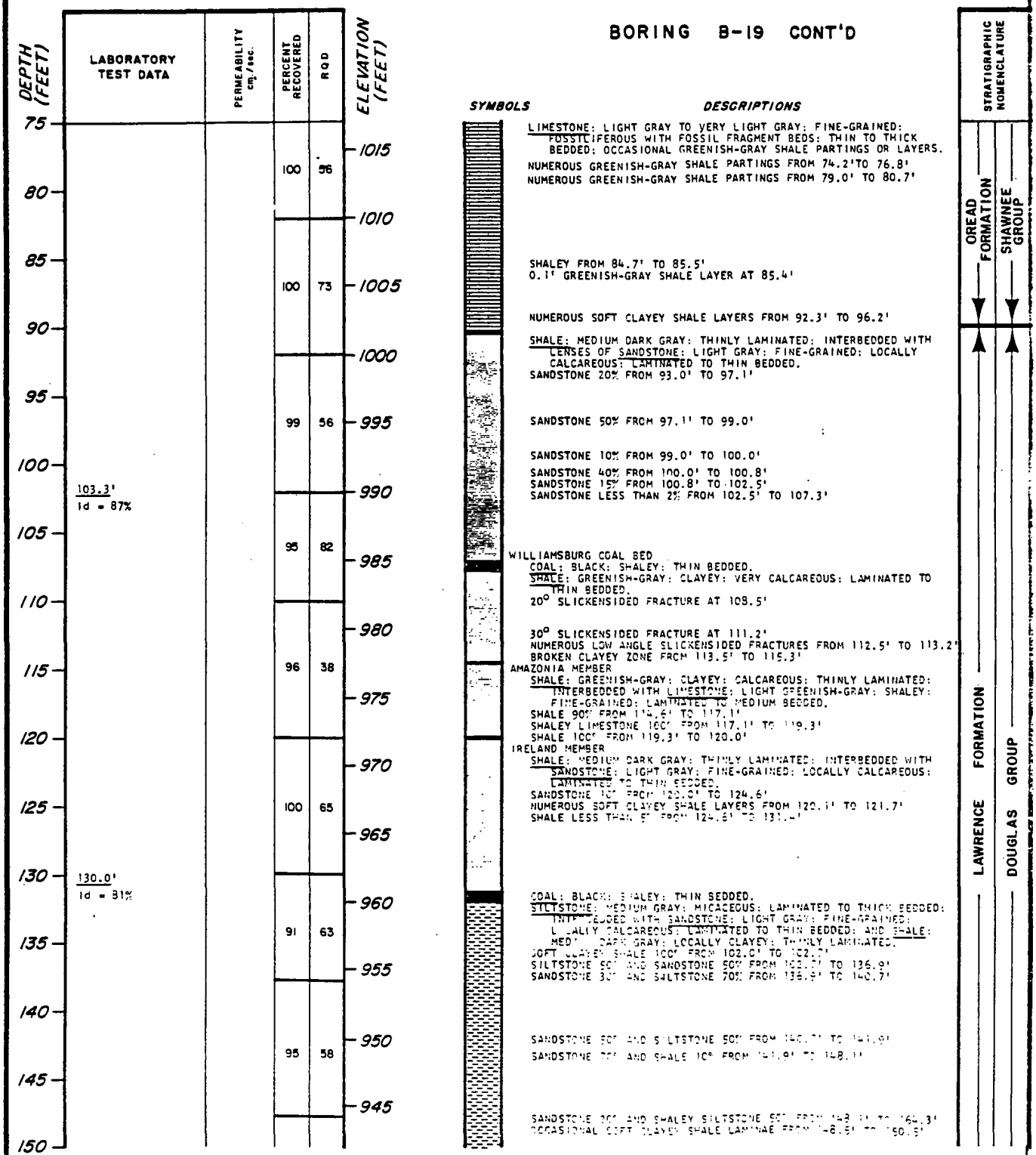


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34s (Sheet 1 of 5)

Log of Boring B-19

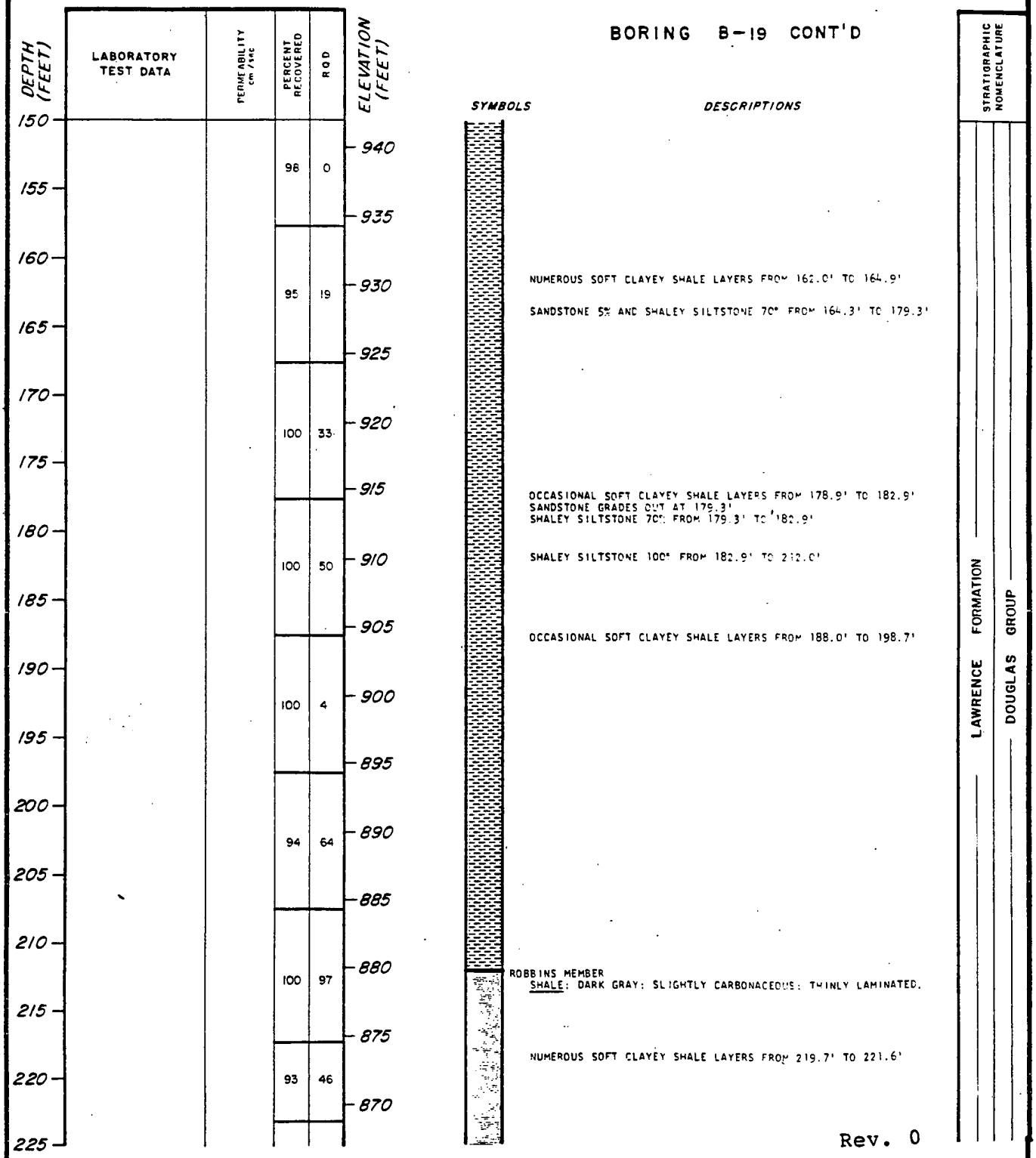


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34s (Sheet 2 of 5)

Log of Boring B-19

Rev. 0

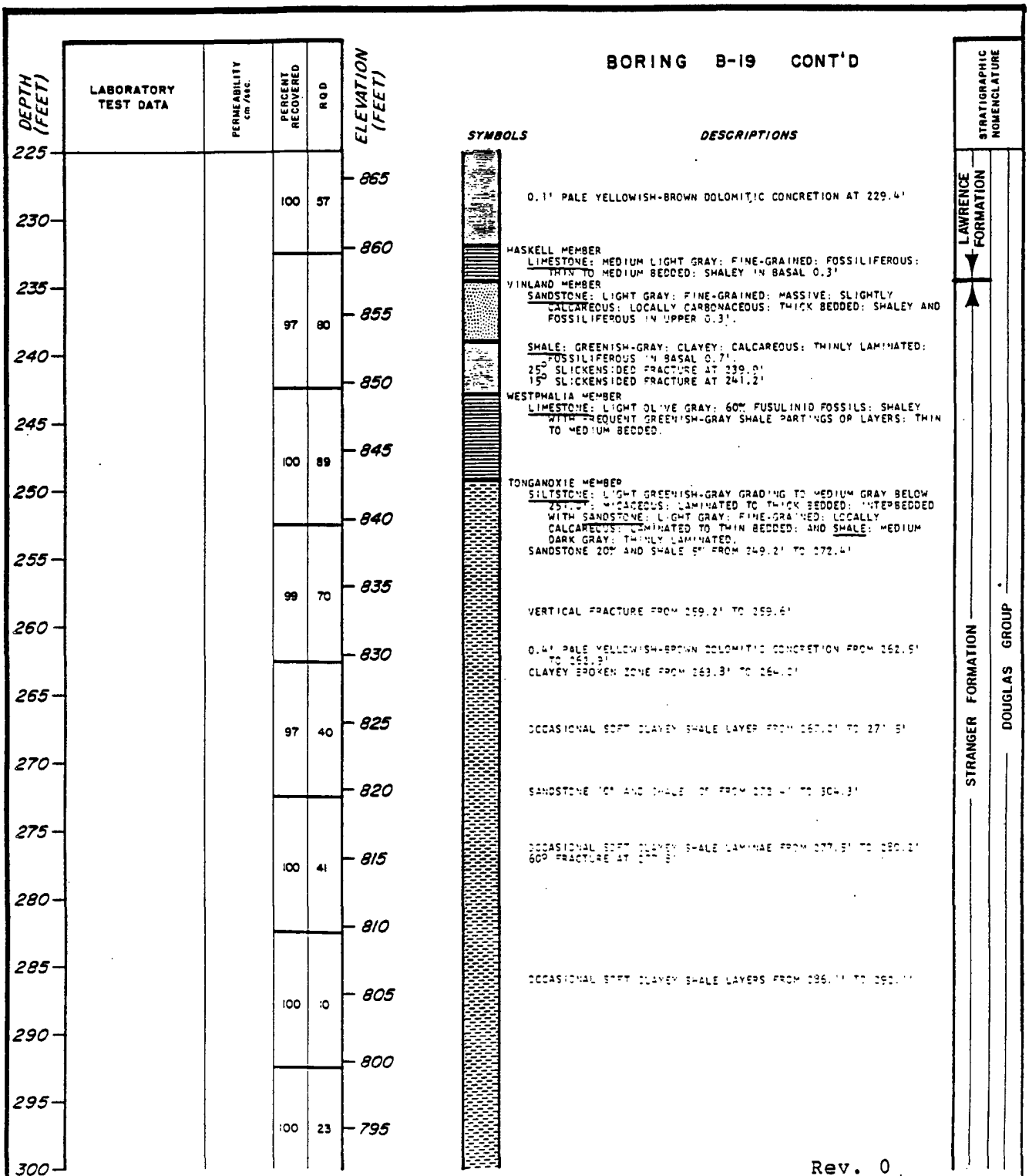


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34s (Sheet 3 of 5)

Log of Boring B-19

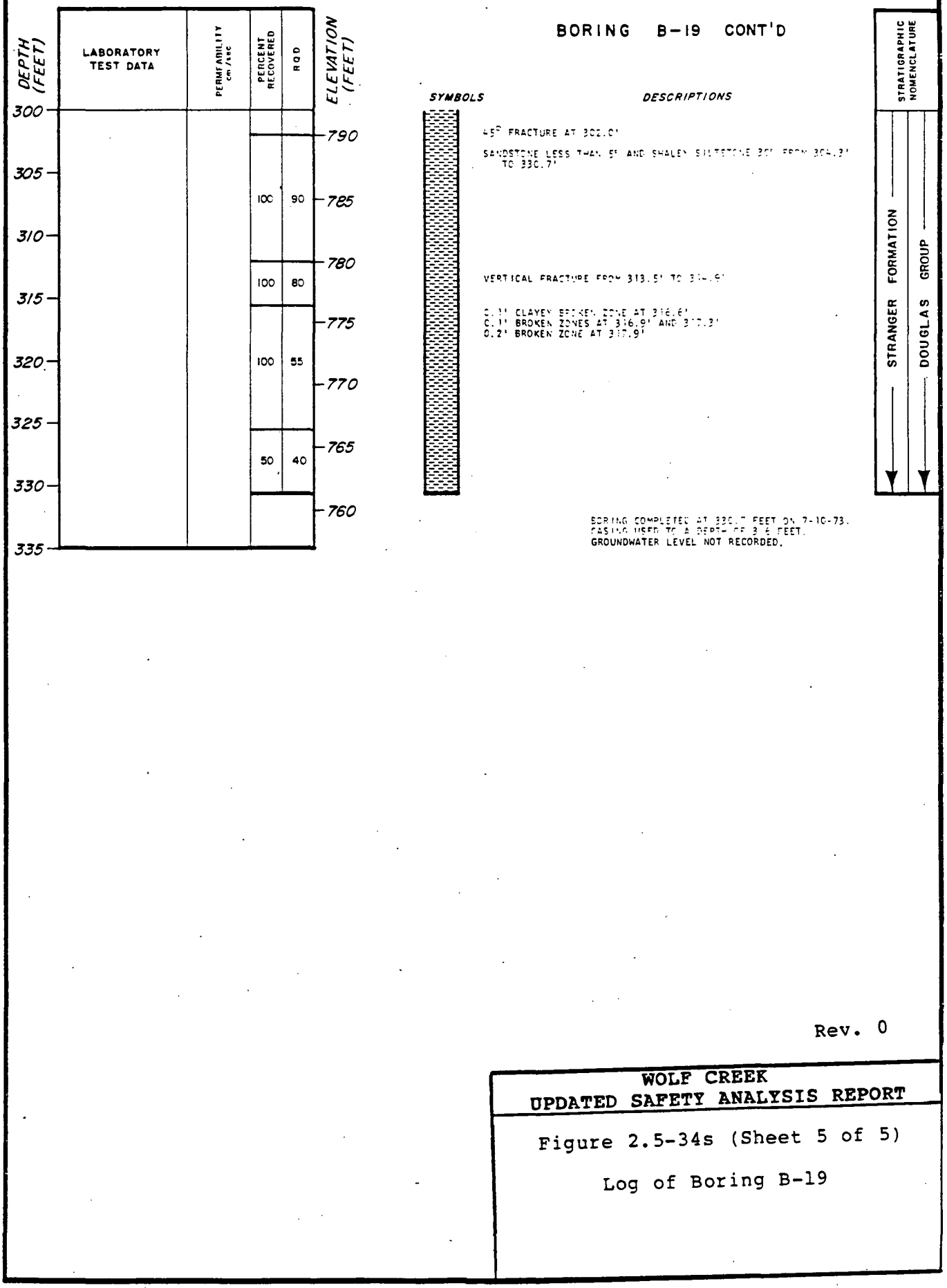


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34s (Sheet 4 of 5)

Log of Boring B-19

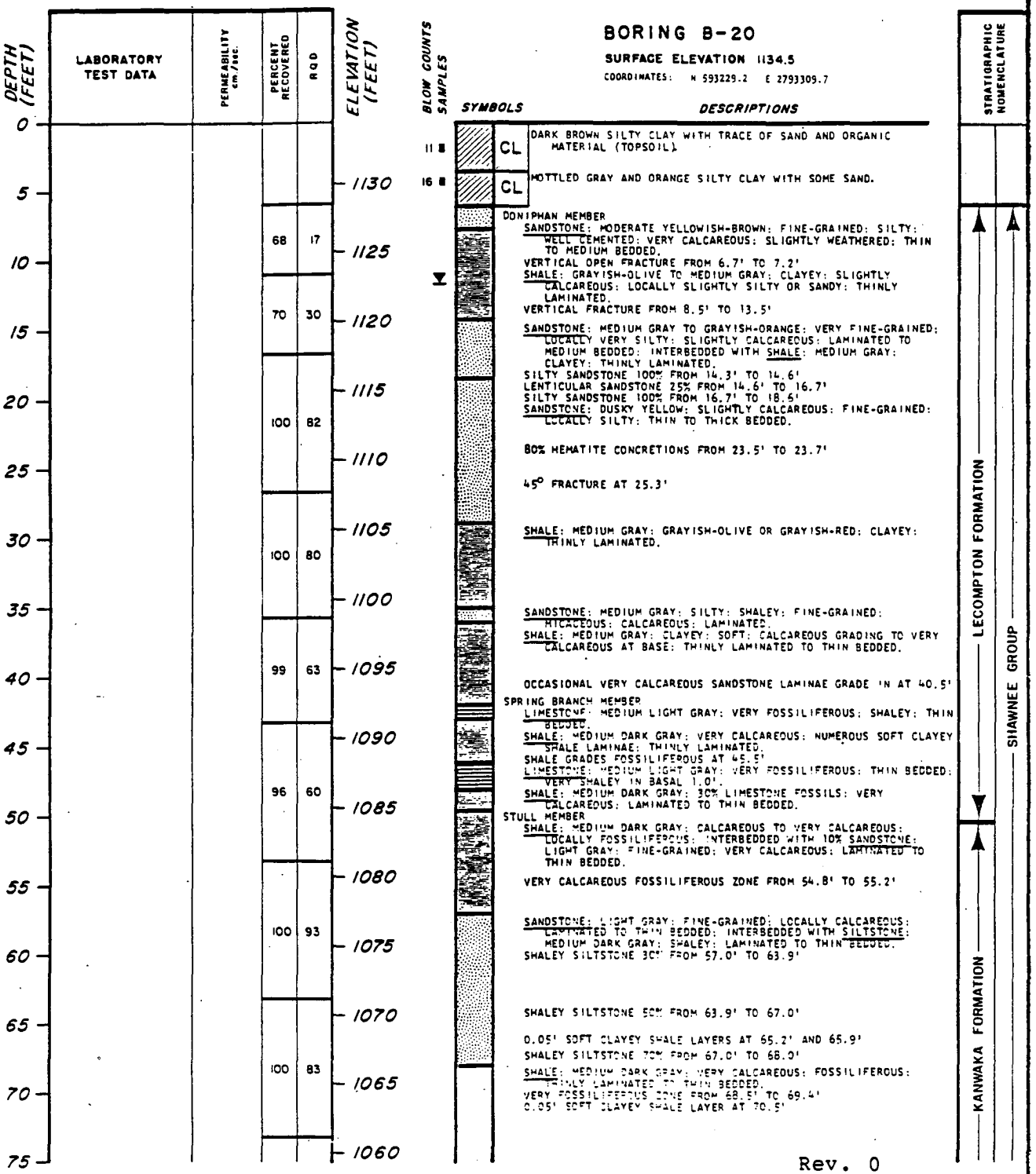


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34s (Sheet 5 of 5)

Log of Boring B-19

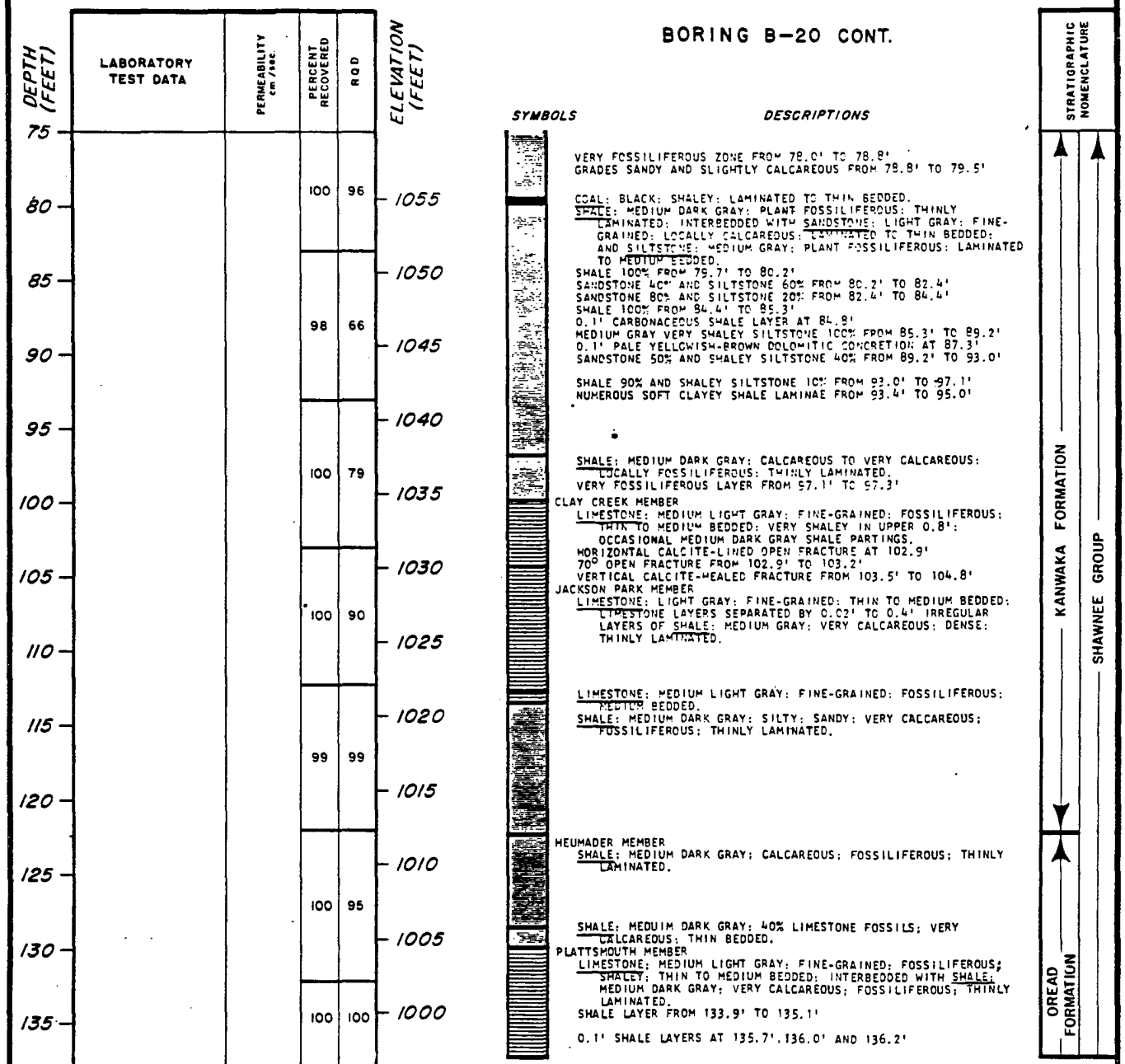


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34t (Sheet 1 of 2)

Log of Boring B-20



BORING COMPLETED AT 137.6 FEET ON 7-10-73.
CASING USED TO A DEPTH OF 7.0 FEET.
GROUNDWATER LEVEL RECORDED AT 11.6 FEET ON 8-11-73.
THIRD PIEZOMETER INSTALLED AT AN INTERVAL FROM 21.0 FEET TO 29.0 FEET ON 7-26-73.
SECOND PIEZOMETER INSTALLED AT AN INTERVAL FROM 41.0 FEET TO 81.0 FEET ON 7-26-73.
FIRST PIEZOMETER INSTALLED AT AN INTERVAL FROM 101.0 FEET TO 114.0 FEET ON 7-26-73.
PIEZOMETER READINGS ARE PRESENTED ON TABLE 2.4-29.

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34t (Sheet 2 of 2)

Log of Boring B-20

BORING B-21

SURFACE ELEVATION 1117.8

COORDINATES: N 585976.0 E 2808242.2

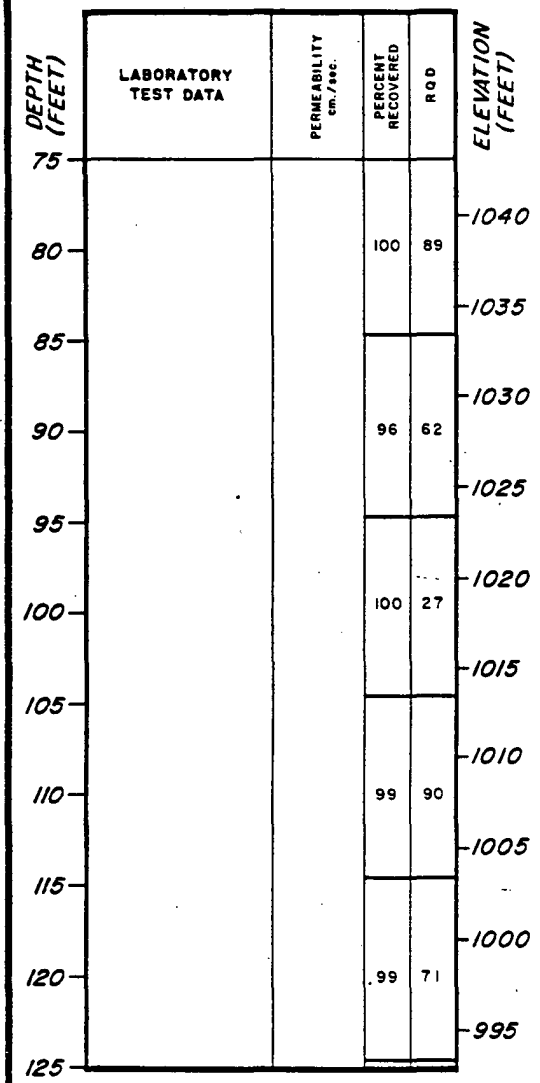
DEPTH (FEET)	ELEVATION (FEET)	LABORATORY TEST DATA	PERMEABILITY cm/sec	PERCENT RECOVERED	RQD	BLOW COUNTS SAMPLES	SYMBOLS	DESCRIPTIONS	STRATIGRAPHIC NOMENCLATURE
0	1115					30	CL	DARK BROWN SILTY CLAY WITH TRACE OF SAND AND ORGANIC MATERIAL (TOPSOIL).	
						33	CL	MOTTLED GRAY AND ORANGE SILTY CLAY WITH TRACE OF SAND.	
5				100	18			JACKSON PARK MEMBER SANDSTONE: WEATHERS GRAYISH-ORANGE; FINE TO VERY FINE-GRAINED; SLIGHTLY CALCAREOUS; LIMONITIC; SLIGHTLY WEATHERED; THIN TO THICK BEDDED.	KANAWAKA FORMATION
10	1110			100	38			0.05' SOFT CLAYEY ZONE AT 6.3' VERTICAL HEMATITE STAINED FRACTURE FROM 6.3' TO 9.8'; LOCALLY CALCITE HEALED FROM 7.3' TO 9.2' LIMESTONE: MEDIUM LIGHT GRAY; CALCARENITIC; THIN BEDDED; WITH INTERBEDDED DISTORTED SANDSTONE LAMINAE. SANDSTONE: WEATHERS GRAYISH-ORANGE; FINE TO VERY FINE GRAINED; LIMONITIC; SLIGHTLY CALCAREOUS; THIN TO MEDIUM BEDDED; WITH OCCASIONAL 0.02' TO 0.15' LIMESTONE CONCRETIONS; GRADES VERY SILTY IN BASAL 2.4'	
15	1105							0.5' BROKEN ZONE WITH VERTICAL FRACTURE AT 14.5'	
20	1100			93	61			0.05' HEMATITE STAINED NODULE AT 18.5' DISTORTED THIN LAMINAE OF VERY LIGHT GRAY CALCARENITIC LIMESTONE AND MEDIUM LIGHT GRAY SHALE GRADE IN AT 19.7'	
25	1095							HEUMADER MEMBER SHALE: MEDIUM LIGHT GRAY; WEATHERS YELLOWISH-GRAY; CALCAREOUS; CLAYEY; THINLY LAMINATED; FOSSILIFEROUS WITH OCCASIONAL LIMESTONE LENSES IN BASAL 9.8'. SOFT CLAYEY SHALE FROM 20.8' TO 25.8'	
30	1090			100	54			OCCASIONAL 0.03' TO 0.1' LIGHT OLIVE-GRAY DOLOMITIC CONCRETIONS GRADE IN AT 25.4' OCCASIONAL LAMINAE OF LIMESTONE; MEDIUM LIGHT GRAY WEATHERS GRAYISH-ORANGE; CALCARENITIC; LAMINATED; GRADE IN AT 25.9'. NUMEROUS SOFT CLAYEY LAYERS FROM 28.5' TO 35.8' 0.05' BROKEN ZONE AT 29.9'	
35	1085							0.25' SOFT CLAYEY SHALE LAYER AT 34.4' 0.1' SOFT CLAYEY SHALE LAYER AT 35.5' NUMEROUS SOFT CLAYEY LAYERS FROM 36.4' TO 39.8'	
40	1080			100	70			0.1' SOFT CLAYEY SHALE LAYER AT 38.6' GRADES HIGHLY CALCAREOUS FROM 39.8' SOFT CLAYEY SHALE LAYER FROM 40.5' TO 40.8' 0.1' CLAYEY BROKEN ZONE AT 41.4'	
45	1075							SOFT CLAYEY SHALE FROM 43.4' TO 44.5' VERY SHALEY LIMESTONE FROM 44.4' TO 45.2'	
50	1070			100	55			SOFT, CLAYEY, CALCAREOUS SHALE FROM 45.2' TO 48.9' PLATTSMOUTH MEMBER LIMESTONE: MEDIUM GRAY; FINE-GRAINED; FOSSILIFEROUS; THIN TO MEDIUM BEDDED; WITH INTERBEDDED SHALE; MEDIUM DARK GRAY; CLAYEY; CALCAREOUS; THINLY LAMINATED.	OREAD FORMATION
55	1065							0.1' CLAYEY SHALE LAYERS AT 52.0' AND 52.3' 0.1' CLAYEY SHALE LAYERS AT 53.8' AND 54.1'	
60	1060			100	82			HEEBNER MEMBER SHALE: MEDIUM DARK GRAY; CARBONACEOUS; FISSILE; THINLY LAMINATED WITH INTERBEDDED LENSES OF SANDSTONE; LIGHT GRAY; CALCAREOUS; VERY FINE-GRAINED; LAMINATED. CALCAREOUS ZONE WITH 10% FOSSILS FROM 60.2' TO 60.6' LEAVENWORTH MEMBER LIMESTONE: LIGHT OLIVE-GRAY; FINE-GRAINED; FOSSILIFEROUS; MEDIUM BEDDED.	
65	1055							SNYDERVILLE MEMBER SHALE: MEDIUM GRAY TO GREENISH-GRAY; VERY CALCAREOUS; CLAYEY; LOCALLY FOSSILIFEROUS; LAMINATED TO THIN BEDDED. 25% FOSSILIFEROUS FROM 64.6' TO 65.0' NUMEROUS CALCITE HEALED VERTICAL FRACTURES FROM 65.2' TO 65.4' 60° CALCITE HEALED FRACTURE FROM 65.4' TO 65.5' NUMEROUS 10° TO 20° SLICKENSIDED FRACTURES FROM 65.9' TO 69.9'	
70	1050			90	68			0.15' SOFT CLAYEY LAYER AT 73.0'	SHAWNEE GROUP
75	1045								

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34u (Sheet 1 of 2)

Log of Boring B-21



BORING B-21 CONT'D



SYMBOLS

DESCRIPTIONS

TORONTO MEMBER
LIMESTONE: LIGHT GRAY TO VERY LIGHT GRAY: FINE-GRAINED: FOSSILIFEROUS: LOCALLY VERY SHALEY: MEDIUM TO THICK BEDDED: WITH INTERBEDDED GREENISH-GRAY TO LIGHT OLIVE GRAY SHALE LAMINAE.
30% SHALE FROM 74.6' TO 75.0'
BROKEN ZONE WITH VERTICAL FRACTURE FROM 75.8' TO 76.2'
VERTICAL FRACTURE FROM 77.1' TO 77.7'
60° FRACTURE FROM 78.0' TO 78.2'
FOSSIL FRAGMENT BED WITH 90% FOSSILS FROM 78.8' TO 79.3'

0.1' SOFT CLAYEY SHALE LAYER AT 86.1'

SHALE: MEDIUM GRAY TO DARK GRAY: MICACEOUS: CARBONACEOUS: LAMINATED: WITH INTERBEDDED SANDSTONE: LIGHT GRAY: FINE TO VERY FINE-GRAINED: MICACEOUS: LOCALLY CALCAREOUS: LAMINATED.
100% SOFT CLAYEY SHALE FROM 90.8' TO 92.4'
10% SANDSTONE FROM 92.4' TO 93.1'
40% SANDSTONE FROM 93.1' TO 96.5'
20% SANDSTONE FROM 96.5' TO 104.4'

NUMEROUS SOFT CLAYEY LAYERS FROM 101.2' TO 104.4'

10% SANDSTONE FROM 104.4' TO 106.4'

WILLIAMSBURG COAL BED
COAL: BLACK: CALCAREOUS: THINLY LAMINATED TO THIN BEDDED.
SHALE: GREENISH-GRAY: VERY CALCAREOUS: LAMINATED TO THIN BEDDED.
NUMEROUS LOW ANGLE SLICKENSIDED FRACTURES FROM 107.8' TO 115.1'

NUMEROUS SOFT CLAYEY LAYERS FROM 115.4' TO 118.3'

AMAZONIA MEMBER
SHALE: GREENISH-GRAY: VERY CALCAREOUS: CLAYEY: LAMINATED: WITH LENSES AND NODULES OF SHALEY LIMESTONE.

LIMESTONE: GREENISH-GRAY: FINE-GRAINED: SHALEY: FOSSILIFEROUS: THIN TO MEDIUM BEDDED: WITH INTERBEDDED SHALE: GREENISH-GRAY: CALCAREOUS: THINLY LAMINATED.

IRELAND MEMBER
SHALE: MEDIUM GRAY: MICACEOUS: SLIGHTLY CARBONACEOUS: THINLY LAMINATED: WITH INTERBEDDED SANDSTONE: LIGHT GRAY: FINE-GRAINED: DISTORTED LAMINATIONS.
SANDSTONE 90% FROM 121.6' TO 123.0'
SANDSTONE 15% FROM 123.0' TO 124.8'

STRATIGRAPHIC NOMENCLATURE
OREAD FORMATION
SHAWNEE GROUP
LAWRENCE FORMATION
DOUGLAS GROUP

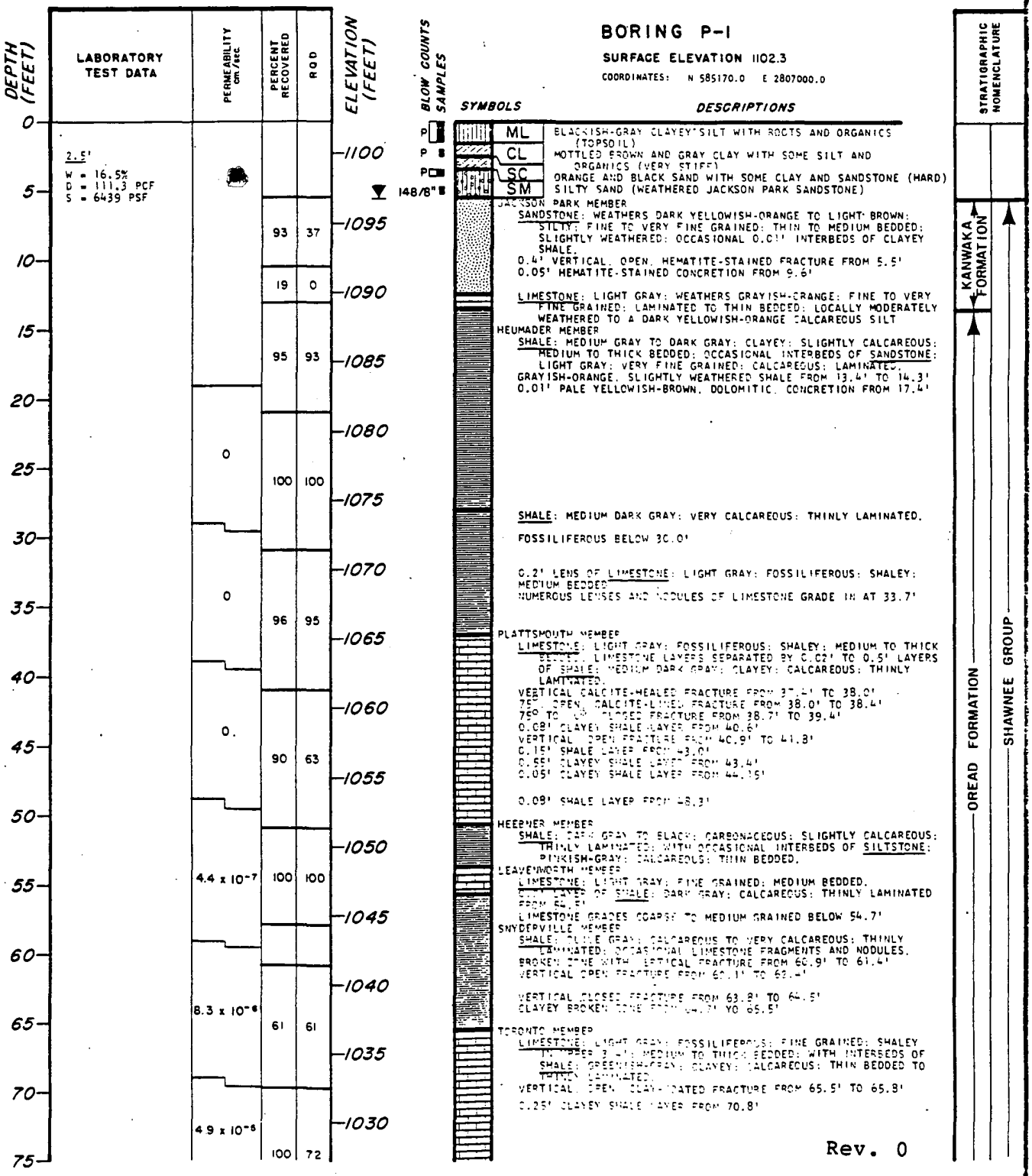
BORING COMPLETED AT 124.8 FEET ON 7-12-73.
CASING USED TO A DEPTH OF 15.0 FEET.
GROUNDWATER LEVEL RECORDED AT 11.4 FEET ON 8-10-73
THIRD PIEZOMETER INSTALLED AT AN INTERVAL FROM 5.0 FEET TO 43.0 FEET ON 7-30-73.
SECOND PIEZOMETER INSTALLED AT AN INTERVAL FROM 48.0 FEET TO 60.0 FEET ON 7-30-73.
FIRST PIEZOMETER INSTALLED AT AN INTERVAL FROM 74.0 FEET TO 91.0 FEET ON 7-30-73.
PIEZOMETER READINGS ARE PRESENTED ON TABLE 2.4-29.

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-34u (Sheet 2 of 2)

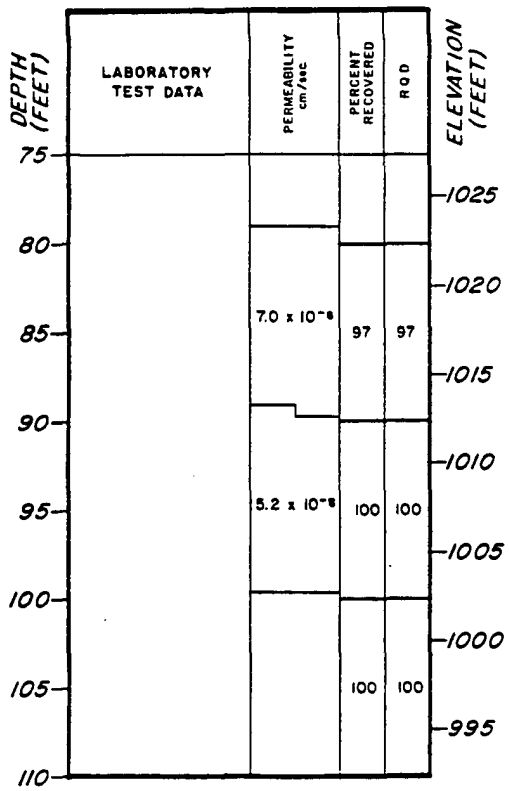
Log of Boring B-21



WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-35a (Sheet 1 of 2)

Log of Boring P-1



BORING P-1 CONT'D.

SYMBOLS

DESCRIPTIONS

0.05' CLAYEY SHALE LAYER FROM 76.5'

0.1' CLAYEY SHALE LAYER FROM 77.0'

0.01' CLAYEY SHALE LAYER FROM 79.9'

SHALE: GREENISH-GRAY GRADING TO MEDIUM GRAY BELOW 84.1': CLAYEY: SLIGHTLY CALCAREOUS: THINLY LAMINATED: WITH INTERBEDS OF SANDSTONE: LIGHT GRAY: CALCAREOUS: SLIGHTLY CARBONACEOUS: FINE TO VERY FINE GRAINED: LAMINATED.
SANDSTONE LESS THAN 10% FROM 82.5' TO 85.6'
SANDSTONE 30% FROM 85.6' TO 87.2'
SANDSTONE 50% FROM 87.2' TO 88.2'
SANDSTONE 30% FROM 88.2' TO 89.9'

SOFT CLAYEY ZONE FROM 90.9' TO 92.3'
SANDSTONE 10% FROM 89.9' TO 92.3'
SANDSTONE 30% FROM 92.3' TO 97.5'

SANDSTONE 10% FROM 97.5' TO 101.1'

SHALE 100% FROM 101.1' TO 102.1'

WILLIAMSBURG COAL BED
COAL: BLACK: SHALEY: MEDIUM BEDDED.
SHALE: DARK GRAY GRADING TO GREENISH-GRAY: CARBONACEOUS: CLAYEY: CALCAREOUS: THIN BEDDED.

AMAZONIA MEMBER
SHALE: GREENISH-GRAY: CALCAREOUS TO VERY CALCAREOUS: CLAYEY: THINLY LAMINATED TO THIN BEDDED: WITH OCCASIONAL LIGHT GRAY LIMESTONE NODULES.
LIMESTONE: LIGHT GRAY: SHALEY: FINE GRAINED: LOCALLY FOSSILIFEROUS: MEDIUM BEDDED: WITH INTERBEDS OF SHALE: GREENISH-GRAY: CALCAREOUS: THINLY LAMINATED.

IRELAND MEMBER
SHALE: GREENISH-GRAY: CALCAREOUS: THINLY LAMINATED.

STRATIGRAPHIC NOMENCLATURE

LAWRENCE FORMATION

DOUGLASS GROUP

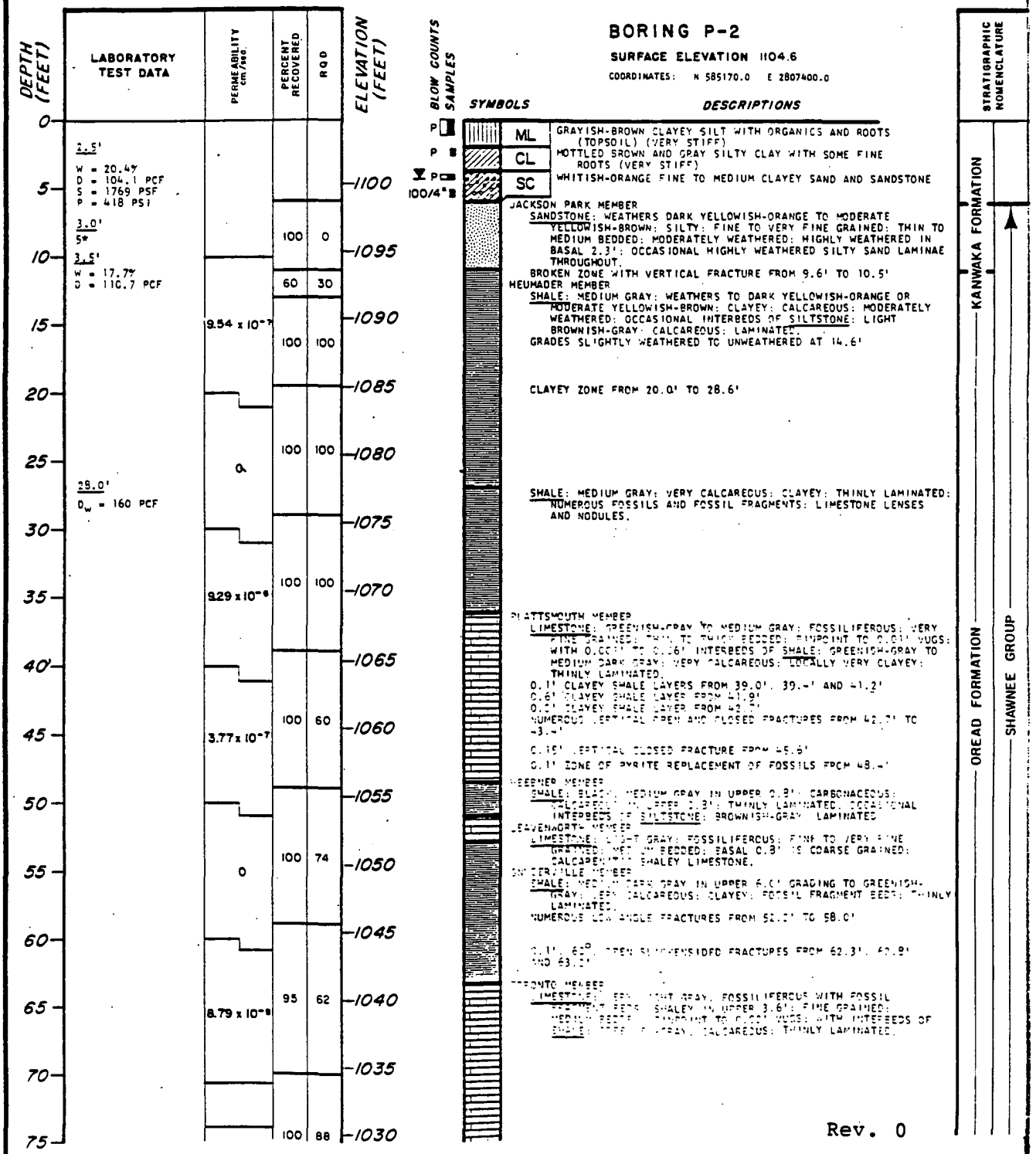
BORING COMPLETED AT 109.9 FEET ON 10-24-73.
CASING USED TO A DEPTH OF 10.5 FEET.
GROUNDWATER LEVEL RECORDED AT 5.5 FEET ON 10-29-73.
SECOND PIEZOMETER INSTALLED AT AN INTERVAL FROM 2.5 FEET TO 50.0 FEET ON 11-13-73.
FIRST PIEZOMETER INSTALLED AT AN INTERVAL FROM 64.5 FEET TO 93.0 FEET ON 11-13-73.
PIEZOMETER READINGS ARE PRESENTED ON TABLE 2.4-3i.

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-35a (Sheet 2 of 2)

Log of Boring P-1

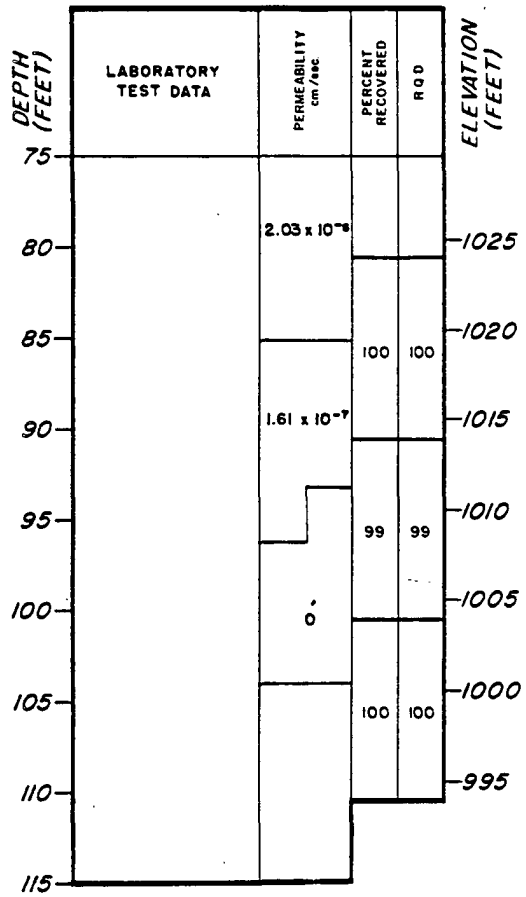


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-35b (Sheet 1 of 2)

Log of Boring P-2



BORING P-2 CONT'D.

SYMBOLS

DESCRIPTIONS

0.05' CLAYEY SHALE LAYER AT 78.0'
0.08' CLAYEY SHALE LAYER AT 78.6'

SHALE: GREENISH-GRAY IN UPPER 2.0' GRADING TO MEDIUM DARK GRAY; LOCALLY CALCAREOUS; CLAYEY; SLIGHTLY CARBONACEOUS; THINLY LAMINATED; WITH INTERBEDDED SANDSTONE; LIGHT GRAY; CALCAREOUS; SILTY; MICACEOUS; SLIGHTLY CARBONACEOUS; FINE-GRAINED; LAMINATED WITH DISTORTED STRUCTURE; AND SILTSTONE; MEDIUM DARK GRAY; SHALEY; SLIGHTLY CARBONACEOUS; MICACEOUS; LAMINATED TO THIN BEDDED.
80% CALCAREOUS SANDSTONE AND 20% SHALE FROM 83.4' TO 83.9'
100% SHALE FROM 83.9' TO 85.4'
0.1', 45°, OPEN FRACTURE FROM 84.9'
SANDSTONE 40% AND SILTSTONE 40% FROM 95.4' TO 97.5'

SANDSTONE 10% AND SILTSTONE 50% FROM 97.5' TO 100.5'

SHALE 100% FROM 100.5' TO 103.5'

SHALE GRADES VERY CARBONACEOUS FROM 102.0'
0.1' COAL SEAM FROM 103.0'
WILLIAMSBURG COAL BED
COAL: BLACK; VERY SHALEY; LAMINATED.
SHALE: DARK GRAY GRADING TO GREENISH-GRAY; CLAYEY; CARBONACEOUS IN UPPER 0.6'; VERY CALCAREOUS; THINLY LAMINATED.
AMAZONIA MEMBER
SHALE: GREENISH-GRAY; VERY CALCAREOUS; THINLY LAMINATED; LENSES AND NODULES OF LIMESTONE.
LIMESTONE: GREENISH-GRAY; VERY SHALEY; FOSSILIFEROUS; FINE GRAINED; MEDIUM BEDDED.
0.3' VERTICAL OPEN FRACTURE FROM 109.0'

BORING COMPLETED AT 110.5 FEET ON 10-29-73.
CASING USED TO A DEPTH OF 6.0 FEET.
GROUNDWATER LEVEL RECORDED AT 4.4 FEET ON 11-4-73.

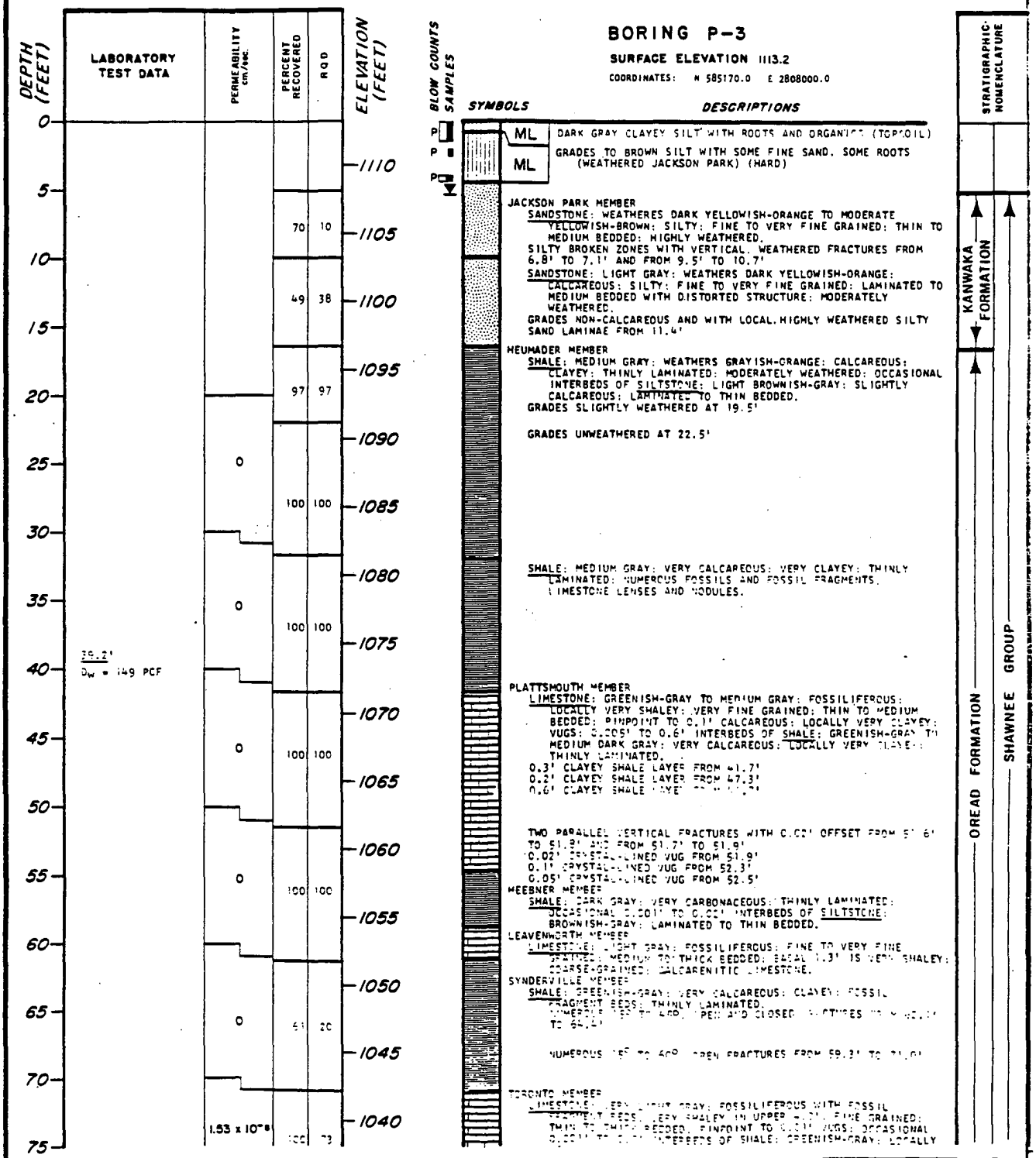
STRATIGRAPHIC NOMENCLATURE
LAWRENCE FORMATION
DOUGLASS GROUP

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-35b (Sheet 2 of 2)

Log of Boring P-2

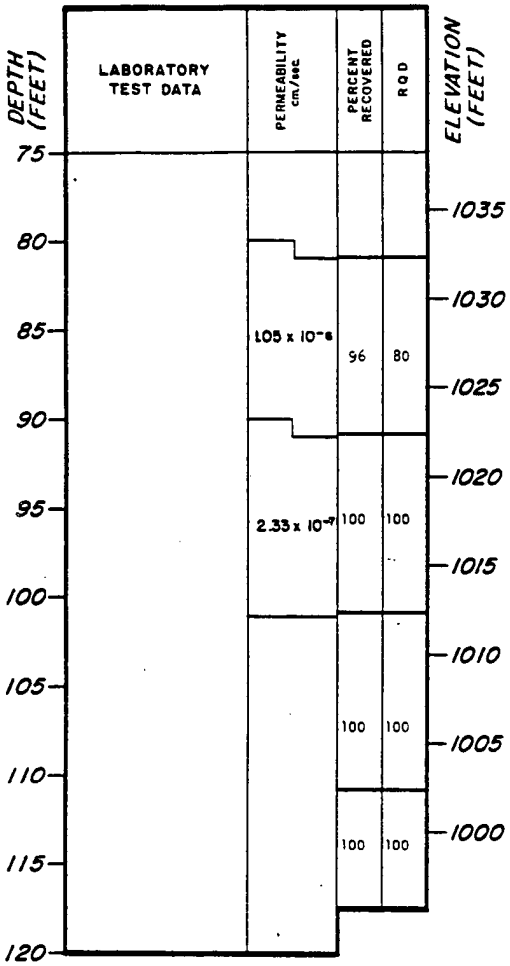


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-35c (Sheet 1 of 2)

Log of Boring P-3

Rev. 0



BORING P-3 CONT'D



SYMBOLS **DESCRIPTIONS**

0.7' CLAYEY SHALE LAYER FROM 71.5'
VERTICAL: CLAY-HEALED FRACTURE FROM 72.6' TO 73.3'

VERTICAL OPEN FRACTURE FROM 78.1' TO 79.2'

0.05' CLAYEY SHALE LAYER FROM 82.1'
0.15' CLAYEY SHALE LAYER FROM 82.7'

0.2' VERTICAL HEALED FRACTURE FROM 87.4'

SHALE: GREENISH-GRAY IN UPPER 2.4' GRADING TO MEDIUM DARK GRAY: LOCALLY CALCAREOUS: CLAYEY SLIGHTLY CARBONACEOUS: THINLY LAMINATED WITH INTERBEDDED SANDSTONE: LIGHT GRAY: CALCAREOUS: SILTY: MICACEOUS: SLIGHTLY CARBONACEOUS: FINE GRAINED: LAMINATED TO THIN BEDDED WITH DISTORTED STRUCTURE: AND SILTSTONE: MEDIUM DARK GRAY: SHALEY: SLIGHTLY CARBONACEOUS: MICACEOUS: LAMINATED TO THIN BEDDED.
SHALE 100% FROM 88.5' TO 90.6'
SANDSTONE 10% AND SILTSTONE 50% FROM 90.6' TO 91.9'
SANDSTONE 40% AND SILTSTONE 40% FROM 91.9' TO 101.8'
NUMEROUS CLAYEY SHALE LAMINAE AND THIN BEDS FROM 94.9' TO 104.0'

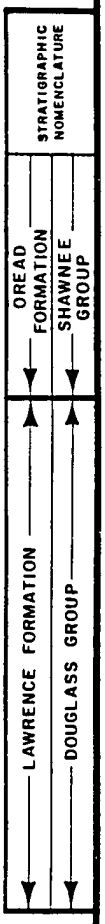
SANDSTONE 10% GRADING TO LESS THAN 5% AND SILTSTONE 40% FROM 101.8' TO 105.3'

GRADES CARBONACEOUS FROM 105.1'
WILLIAMSBURG COAL BED
COAL: BLACK: SHALEY: THIN BEDDED.
SHALE: MEDIUM DARK GRAY IN UPPER 0.2' GRADING TO GREENISH-GRAY: CALCAREOUS TO VERY CALCAREOUS: THINLY LAMINATED.
45° OPEN SLICKENSIDED FRACTURES FROM 107.6' AND 107.7'
AMAZONIA MEMBER
SHALE: GREENISH-GRAY: VERY CALCAREOUS: THINLY LAMINATED: NODULES AND LENSES OF LIMESTONE.

GRADES WITH INTERBEDDED LIGHT GRAY LIMESTONE FROM 114.7'

LIMESTONE: LIGHT GRAY: OCCASIONAL FOSSIL FRAGMENTS: SHALEY: FINE GRAINED: THIN TO MEDIUM BEDDED: WITH INTERBEDDED SHALE: GREENISH-GRAY: CLAYEY: CALCAREOUS: LAMINATED TO THIN BEDDED.

BORING COMPLETED AT 117.5' FEET ON 11-2-73.
CASING USED TO A DEPTH OF 5.0 FEET.
GROUNDWATER LEVEL RECORDED AT 5.5 FEET ON 11-4-73.
SECOND PIEZOMETER INSTALLED AT AN INTERVAL FROM 4.0 FEET TO 56.0 FEET ON 11-14-73.
FIRST PIEZOMETER INSTALLED AT AN INTERVAL FROM 70.0 FEET TO 90.0 FEET ON 11-14-73.
PIEZOMETER READINGS ARE PRESENTED ON TABLE 2.4-31.

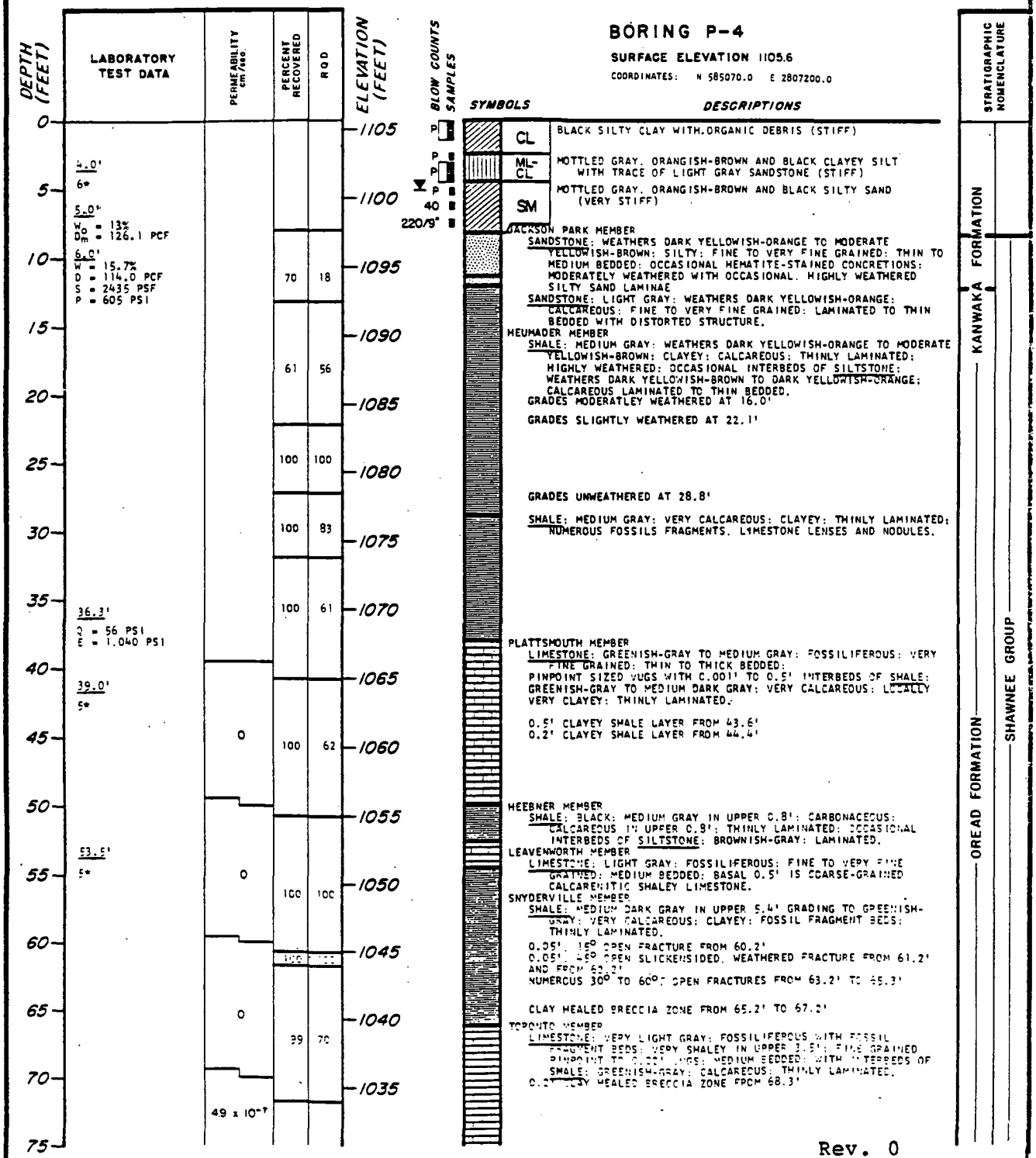


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-35c (Sheet 2 of 2)

Log of Boring P-3

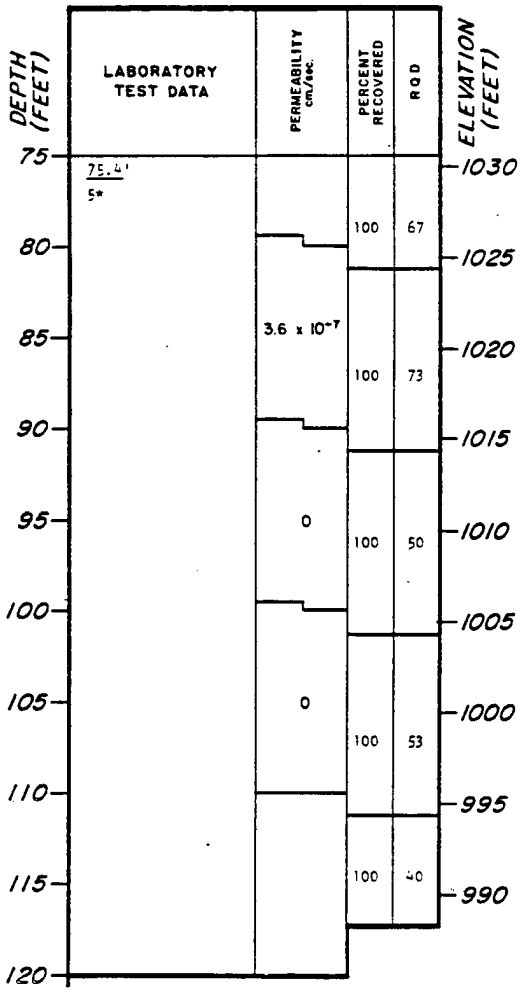


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-35d (Sheet 1 of 2)

Log of Boring P-4



BORING P-4 CONT'D



SYMBOLS

DESCRIPTIONS

0.05' CLAYEY SHALE LAYER FROM 77.9'
0.25' CLAYEY SHALE LAYER FROM 78.3'

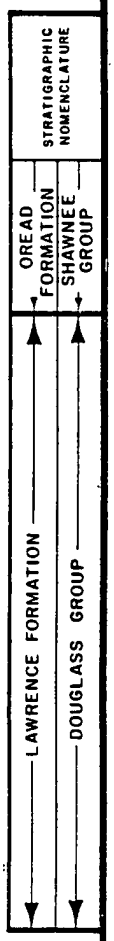
SHALE: GREENISH-GRAY GRADING TO MEDIUM DARK GRAY; LOCALLY CALCAREOUS; CLAYEY; MICACEOUS; SLIGHTLY CARBONACEOUS; THINLY LAMINATED; WITH INTERBEDDED SANDSTONE; LIGHT GRAY; CALCAREOUS; SILTY; MICACEOUS; SLIGHTLY CARBONACEOUS; FINE GRAINED; LAMINATED WITH DISTORTED STRUCTURE.

CALCAREOUS SANDSTONE 70% FROM 83.4' TO 83.9'
SHALE 100% FROM 83.9' TO 86.3'
SANDSTONE 40% AND 40% SILTSTONE; MEDIUM DARK GRAY; SLIGHTLY CARBONACEOUS; SHALEY; MICACEOUS; LAMINATED TO THIN BEDDED; FROM 86.3' TO 95.3'
NUMEROUS CLAYEY ZONES FROM 91.0' TO 98.7'
SANDSTONE 10% AND SILTSTONE 40% FROM 95.3' TO 101.7'

OCCASIONAL 0.05' TO 0.3' VERTICAL OPEN FRACTURES FROM 96.6' TO 99.0'

WILLIAMSBURG COAL BED
COAL: BLACK; SHALEY; PYRITIFEROUS; LAMINATED TO THIN BEDDED; WITH INTERBEDDED SHALE: GREENISH-GRAY; VERY CLAYEY; THINLY LAMINATED.
SHALE: GREENISH-GRAY; VERY CALCAREOUS; CARBONACEOUS IN UPPER 0.4'; THINLY LAMINATED.
AMAZONIA MEMBER
SHALE: GREENISH-GRAY; VERY CALCAREOUS; THINLY LAMINATED; OCCASIONAL NODULES AND LAYERS OF LIMESTONE.
LIMESTONE: LIGHT GRAY; LOCALLY FOSSILIFEROUS; FINE GRAINED; MEDIUM BEDDED; WITH INTERBEDDED SHALE: GREENISH-GRAY; VERY CALCAREOUS; THINLY LAMINATED.
0.2' VERTICAL OPEN FRACTURE FROM 109.7'
SHALE: GREENISH-GRAY IN UPPER 1.0' GRADING TO MEDIUM DARK GRAY; SLIGHTLY CALCAREOUS; THINLY LAMINATED; WITH INTERBEDDED SANDSTONE: LIGHT GRAY; CALCAREOUS; FINE GRAINED; LAMINATED.

BORING COMPLETED AT 117.2 FEET ON 10-30-73.
CASING USED TO A DEPTH OF 8.0 FEET.
GROUNDWATER LEVEL RECORDED AT 5.- FEET ON 11-4-73.

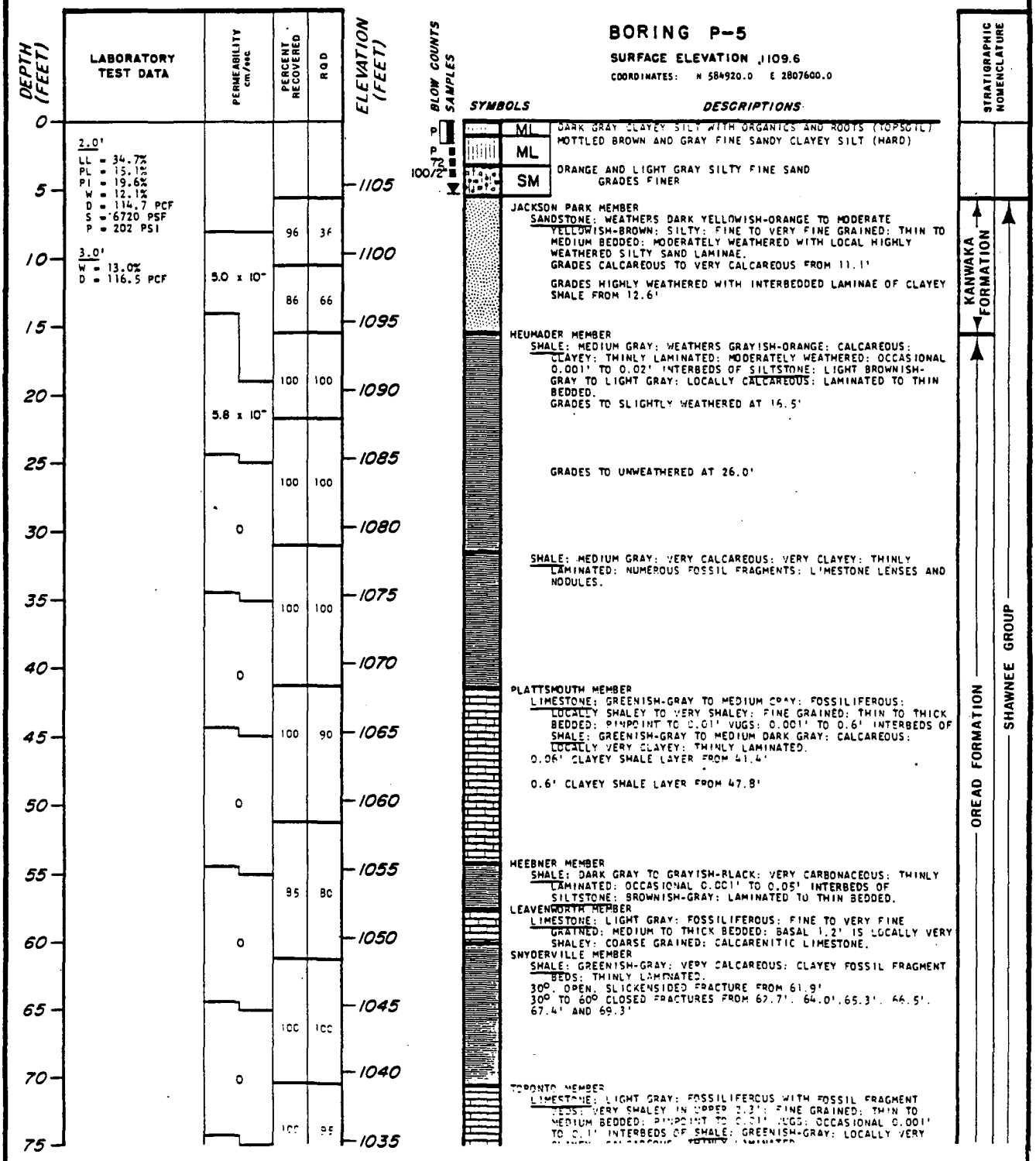


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-35d (Sheet 2 of 2)

Log of Boring P-4

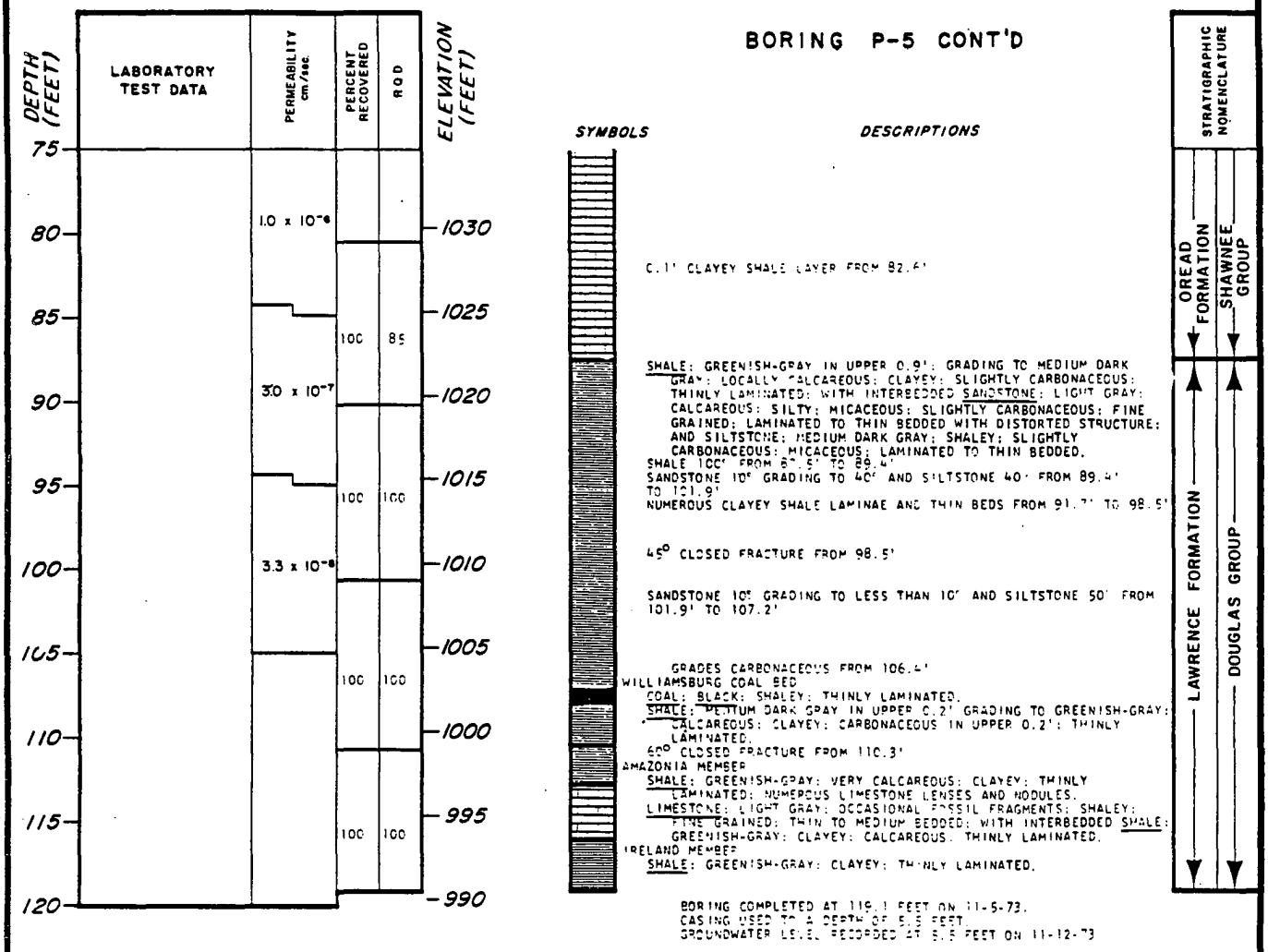


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-35e (Sheet 1 of 2)

Log of Boring P-5

Rev. 0

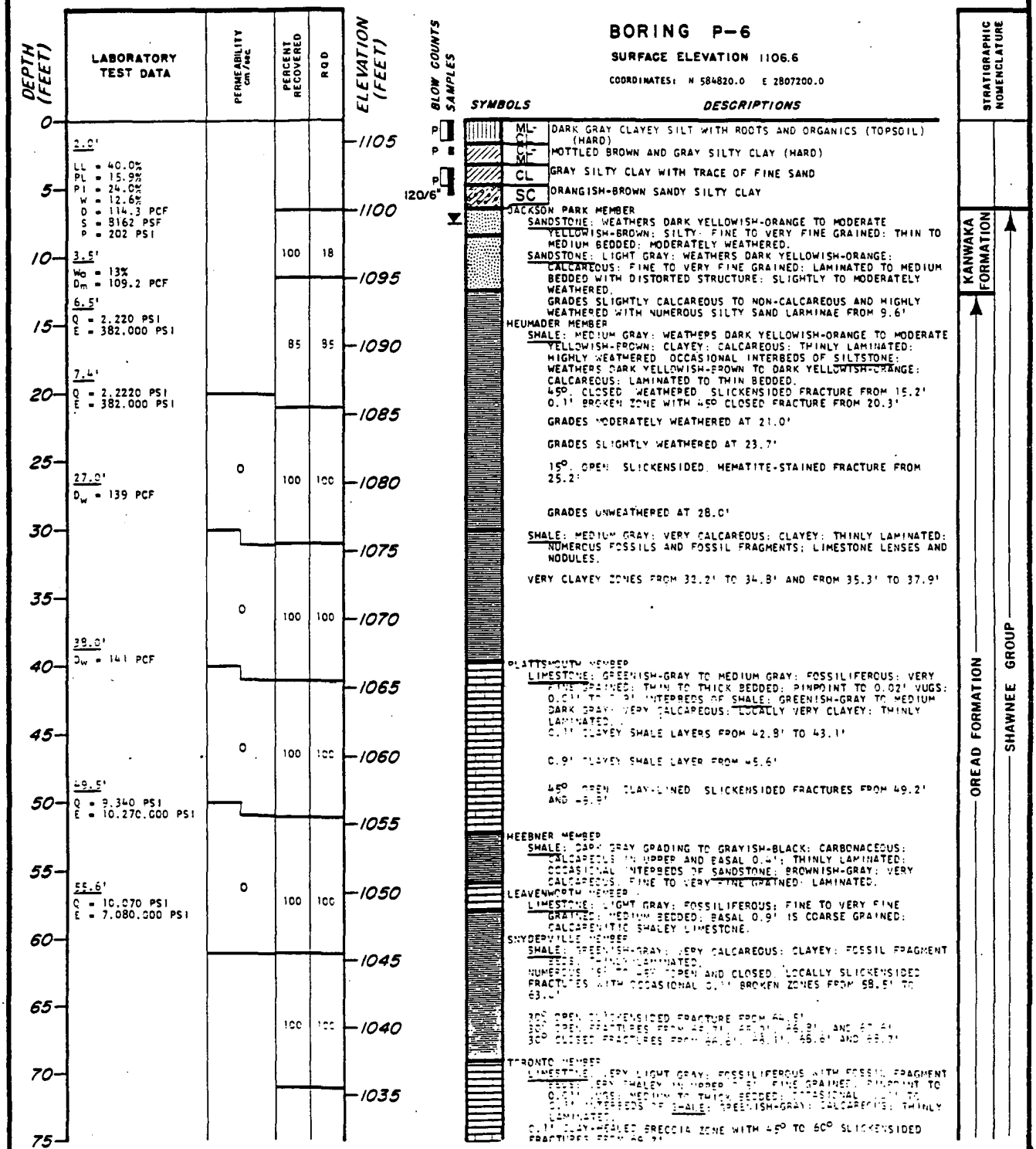


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-35e (Sheet 2 of 2)

Log of Boring P-5

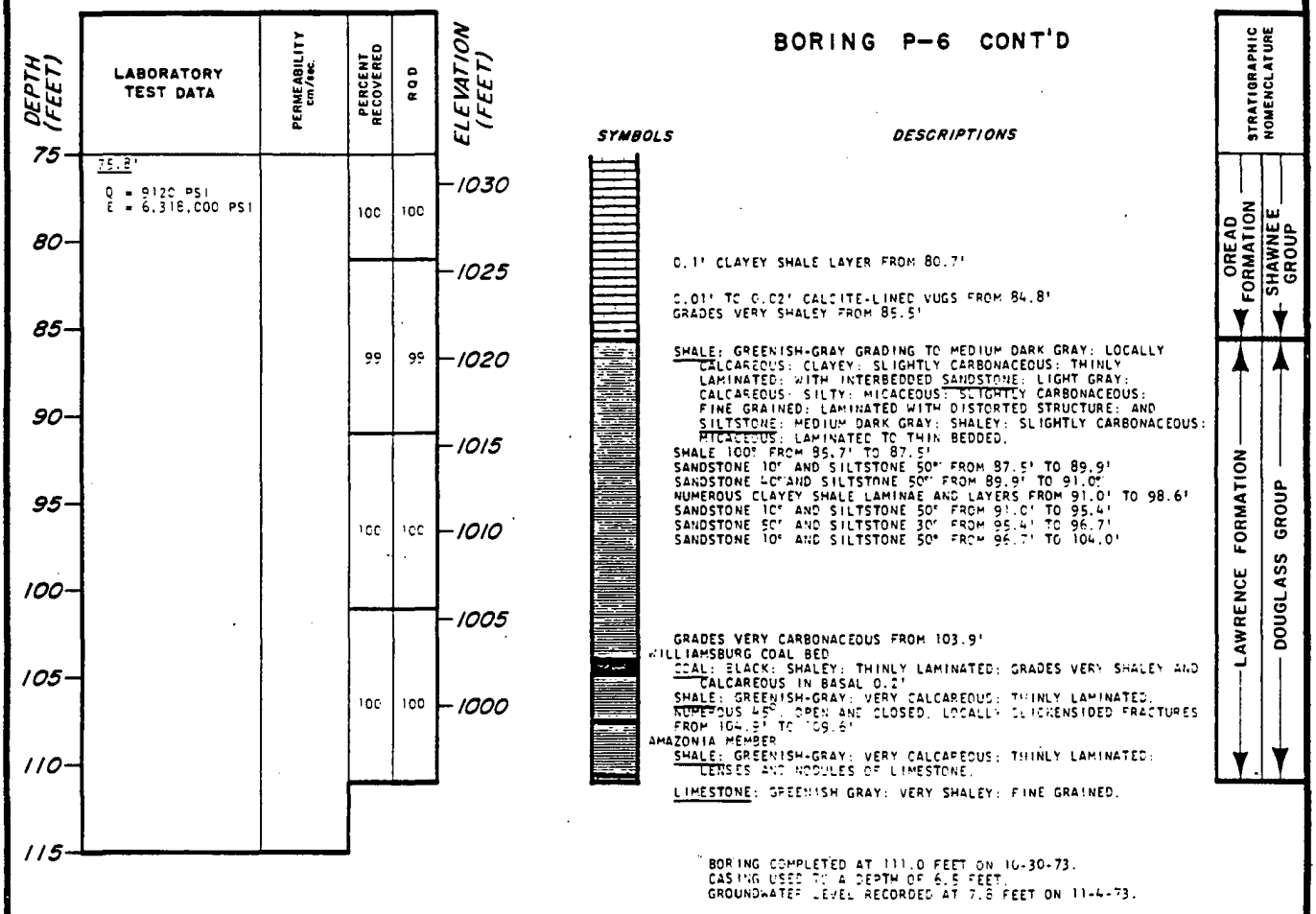


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-35f (Sheet 1 of 2)

Log of Boring P-6

Rev. 0

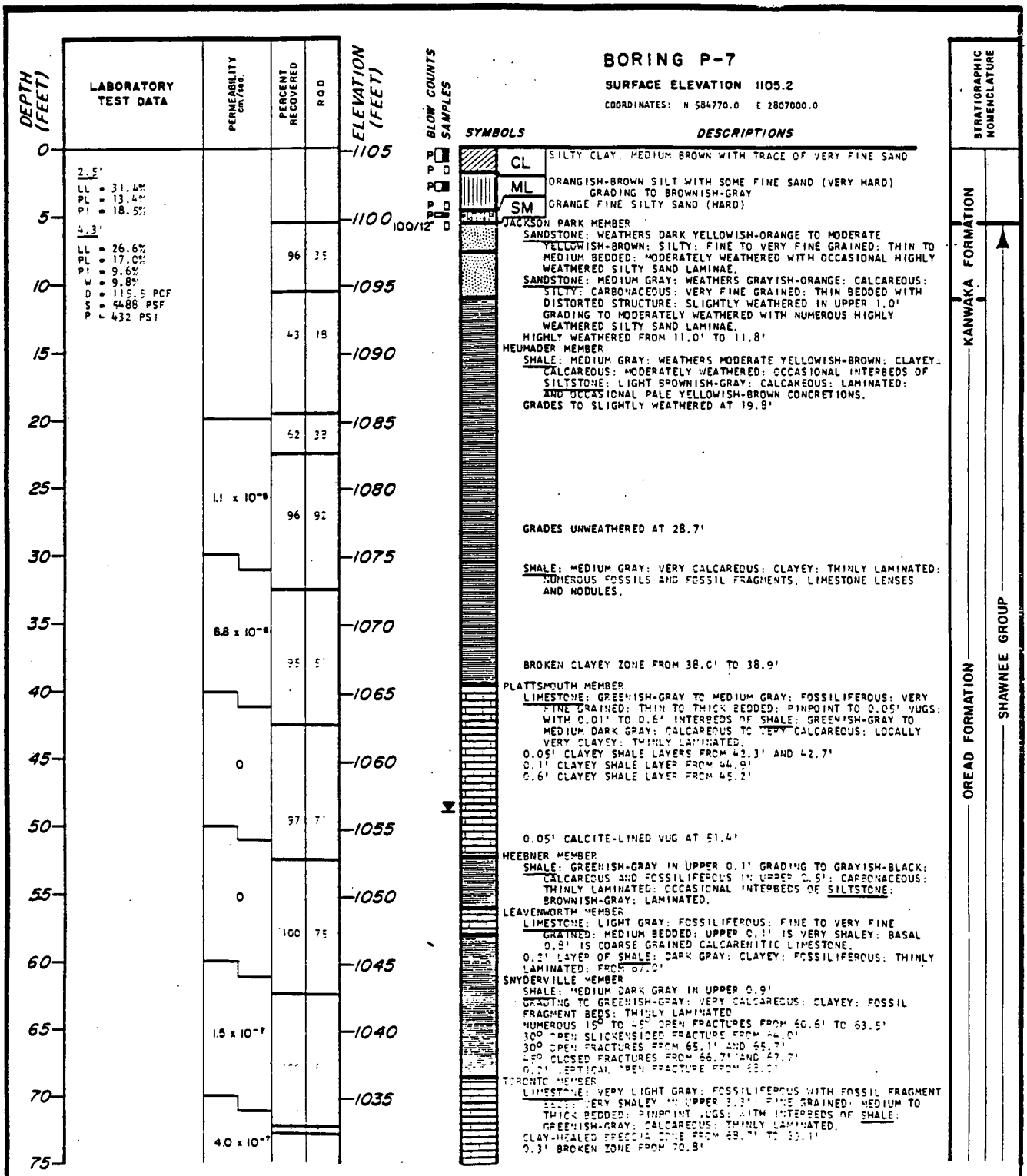


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-35f (Sheet 2 of 2)

Log of Boring P-6

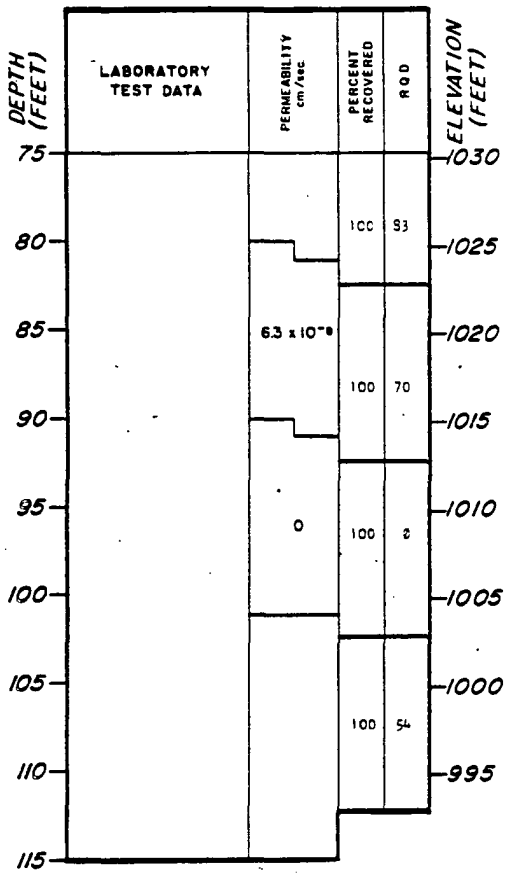


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-35g (Sheet 1 of 2)

Log of Boring P-7

Rev. 0



BORING P-7 CONT'D.

SYMBOLS

DESCRIPTIONS

0.15' CLAYEY SHALE LAYER FROM 76.0'

GRADES VERY SHALEY FROM 86.0'

SHALE: GREENISH-GRAY WITH UPPER 1.4' GRADING TO MEDIUM DARK GRAY; LOCALLY CALCAREOUS; CLAYEY; SILGHTLY CARBONACEOUS; THINLY LAMINATED WITH INTERBEDDED SANDSTONE; LIGHT GRAY; CALCAREOUS; SILTY; MICACEOUS; SLIGHTLY CARBONACEOUS; FINE GRAINED; LAMINATED WITH DISTORTED STRUCTURE; AND SILTSTONE; MEDIUM DARK GRAY; SHALEY; SLIGHTLY CARBONACEOUS; MICACEOUS; LAMINATED TO THIN BEDDED.
SHALE 100% FROM 86.3' TO 87.7'
SANDSTONE 10% AND SILTSTONE 50% FROM 87.7' TO 88.5'
SANDSTONE 40% AND SILTSTONE 40% FROM 88.5' TO 99.3'
NUMEROUS CLAYEY LAMINAE AND THIN BEDS FROM 92.4' TO 103.6'

SANDSTONE 10% AND SILTSTONE 50% FROM 99.3' TO 104.0'

0.4' BROKEN ZONE WITH 45° TO VERTICAL FRACTURES FROM 101.9'

GRADES VERY CARBONACEOUS AT 103.9'

WILLIAMSBURG COAL BED
COAL: BLACK; SHALEY; LAMINATED.
SHALE: DARK GRAY GRADING TO GREENISH-GRAY; VERY CALCAREOUS; THINLY LAMINATED.
OCCASIONAL 30° TO 60° OPEN FRACTURES FROM 104.5' TO 108.0'

AMAZONIA MEMBER
SHALE: GREENISH-GRAY; VERY CALCAREOUS; THINLY LAMINATED; OCCASIONAL NODULES AND LAYERS OF LIMESTONE.

LIMESTONE: LIGHT GRAY; FINE GRAINED; MEDIUM BEDDED.

BORING COMPLETED AT 112.3 FEET ON 10-31-73.
CASING USED TO A DEPTH OF 5.5 FEET.
GROUNDWATER LEVEL RECORDED AT -9.0 FEET ON 11-4-73.

STRATIGRAPHIC NOMENCLATURE

LAWRENCE FORMATION

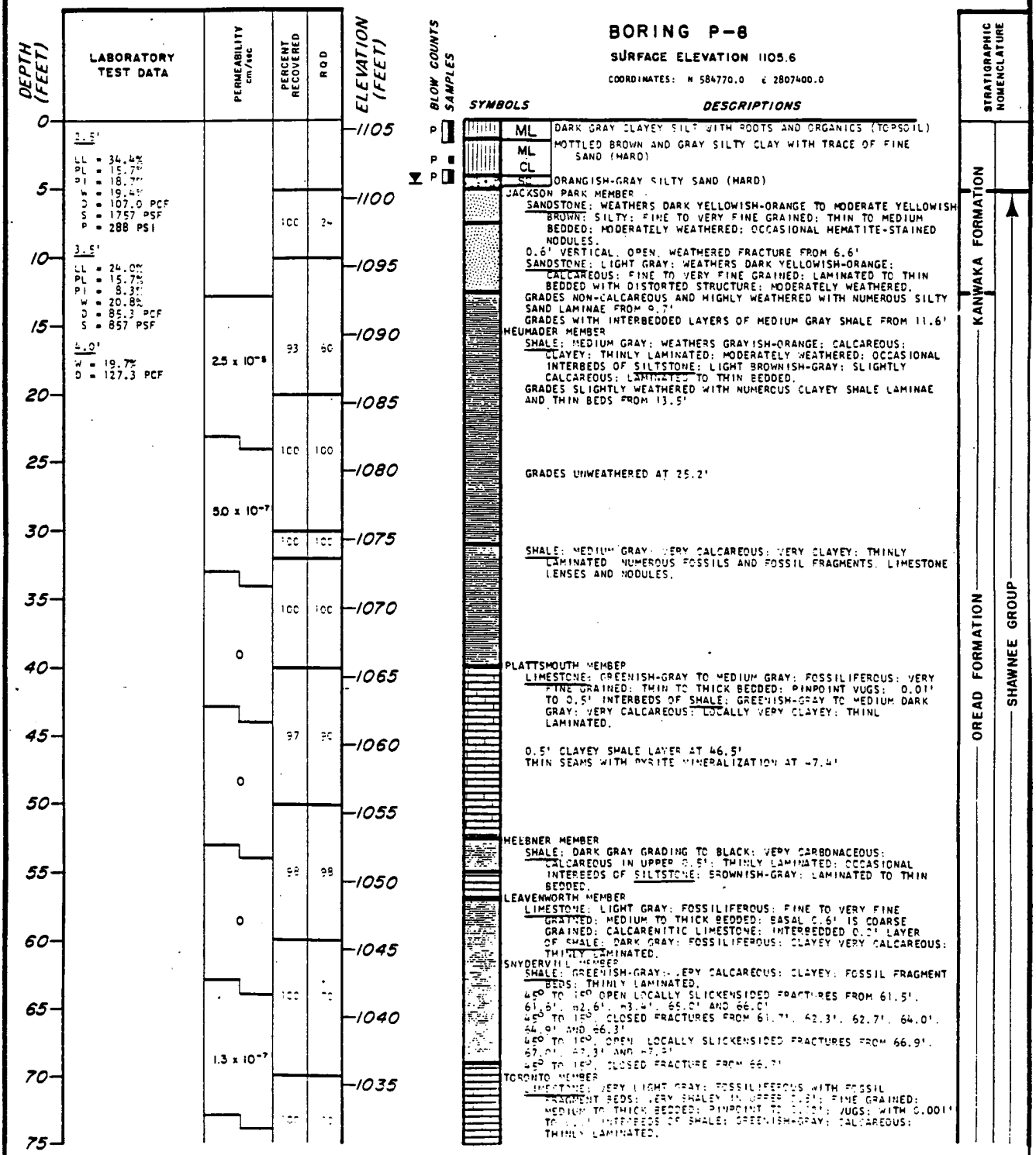
DOUGLASS GROUP

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-35g (Sheet 2 of 2)

Log of Boring P-7

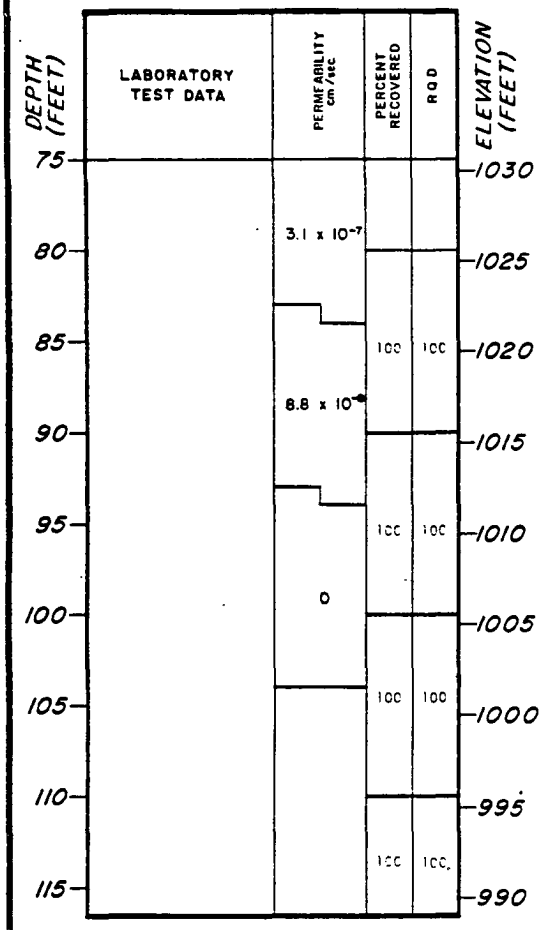


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-35h (Sheet 1 of 2)

Log of Boring P-8

Rev. 0



BORING P-8 CONT'D.

SYMBOLS

DESCRIPTIONS

0.1' CLAYEY SHALE LAYER FROM 80.7'

GRADES VERY SHALEY FROM 85.6'

SHALE: GREENISH-GRAY IN UPPER 1.3' GRADING TO MEDIUM GRAY AND MEDIUM DARK GRAY; LOCALLY CALCAREOUS; CLAYEY; SLIGHTLY CARBONACEOUS; THINLY LAMINATED; WITH INTERBEDDED SANDSTONE; LIGHT GRAY; CALCAREOUS; SILTY; MICACEOUS; SLIGHTLY CARBONACEOUS; FINE GRAINED; LAMINATED TO THIN BEDDED WITH DISTORTED STRUCTURE; AND SILTSTONE; MEDIUM DARK GRAY; SHALEY; SLIGHTLY CARBONACEOUS; MICACEOUS; LAMINATED TO THIN BEDDED.
SHALE 100% FROM 85.8' TO 87.9'
SANDSTONE 10% GRADING TO 40% AND SILTSTONE 40% FROM 87.9' TO 100.5'
45° CLOSED FRACTURE FROM 89.6'
NUMEROUS CLAYEY LAMINAE AND THIN BEDS FROM 90.0' TO 96.2'

VERTICAL OPEN AND CLOSED FRACTURE FROM 98.5' TO 100.2'

SANDSTONE 10% AND SILTSTONE 40% FROM 100.5' TO 106.1'

GRADES VERY CARBONACEOUS FROM 105.0'

WILLIAMSBURG COAL BED
COAL: BLACK; SHALEY; THINLY LAMINATED.
SHALE: MEDIUM DARK GRAY; CALCAREOUS; THINLY LAMINATED.
45° OPEN SLICKENSIDED FRACTURES FROM 108.2', 108.5', 109.3' AND 109.8'

AMAZONIA MEMBER
SHALE: GREENISH-GRAY; CALCAREOUS TO VERY CALCAREOUS; THINLY LAMINATED; NUMEROUS NODULES AND LAYERS OF LIMESTONE.
LIMESTONE: LIGHT GRAY; OCCASIONAL FOSSIL FRAGMENTS; FINE GRAINED; THIN TO THICK BEDDED; WITH INTERBEDDED SHALE; GREENISH-GRAY; CLAYEY; CALCAREOUS; THIN BEDDED.

IRELAND MEMBER
SHALE: GREENISH-GRAY GRADING TO MEDIUM GRAY; SANDY IN UPPER 0.6'; GRADES SILTY BELOW 116.3'; MICACEOUS; THINLY LAMINATED TO THIN BEDDED.

BORING COMPLETED AT 116.5 FEET ON 10-31-73.
CASING USED TO A DEPTH OF 5.0 FEET.
GROUNDWATER [illegible] RECORDED AT 4.7 FEET ON 11-4-73.

STRATIGRAPHIC NOMENCLATURE

LAWRENCE FORMATION

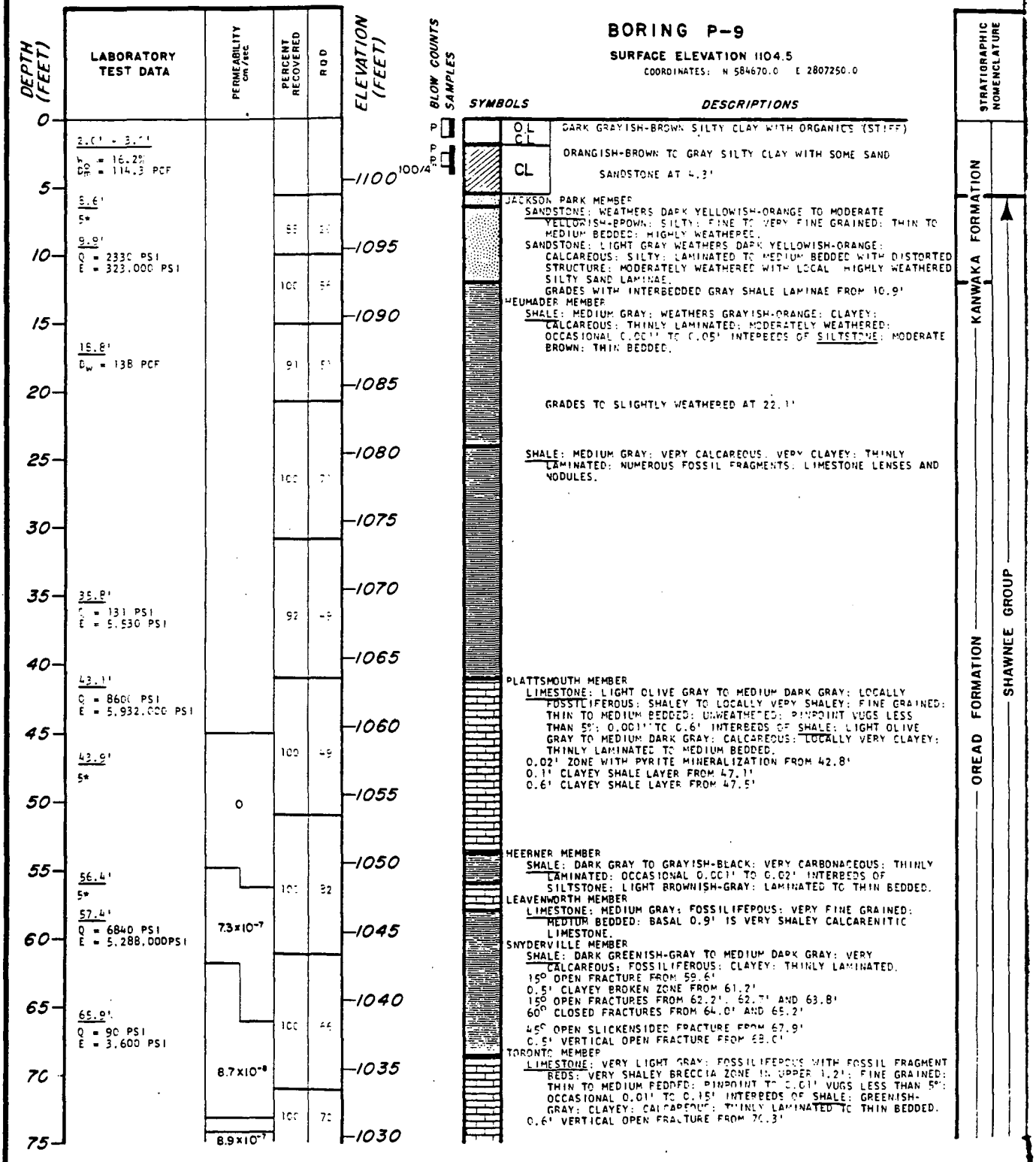
DOUGLASS GROUP

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-35h (Sheet 2 of 2)

Log of Boring P-8

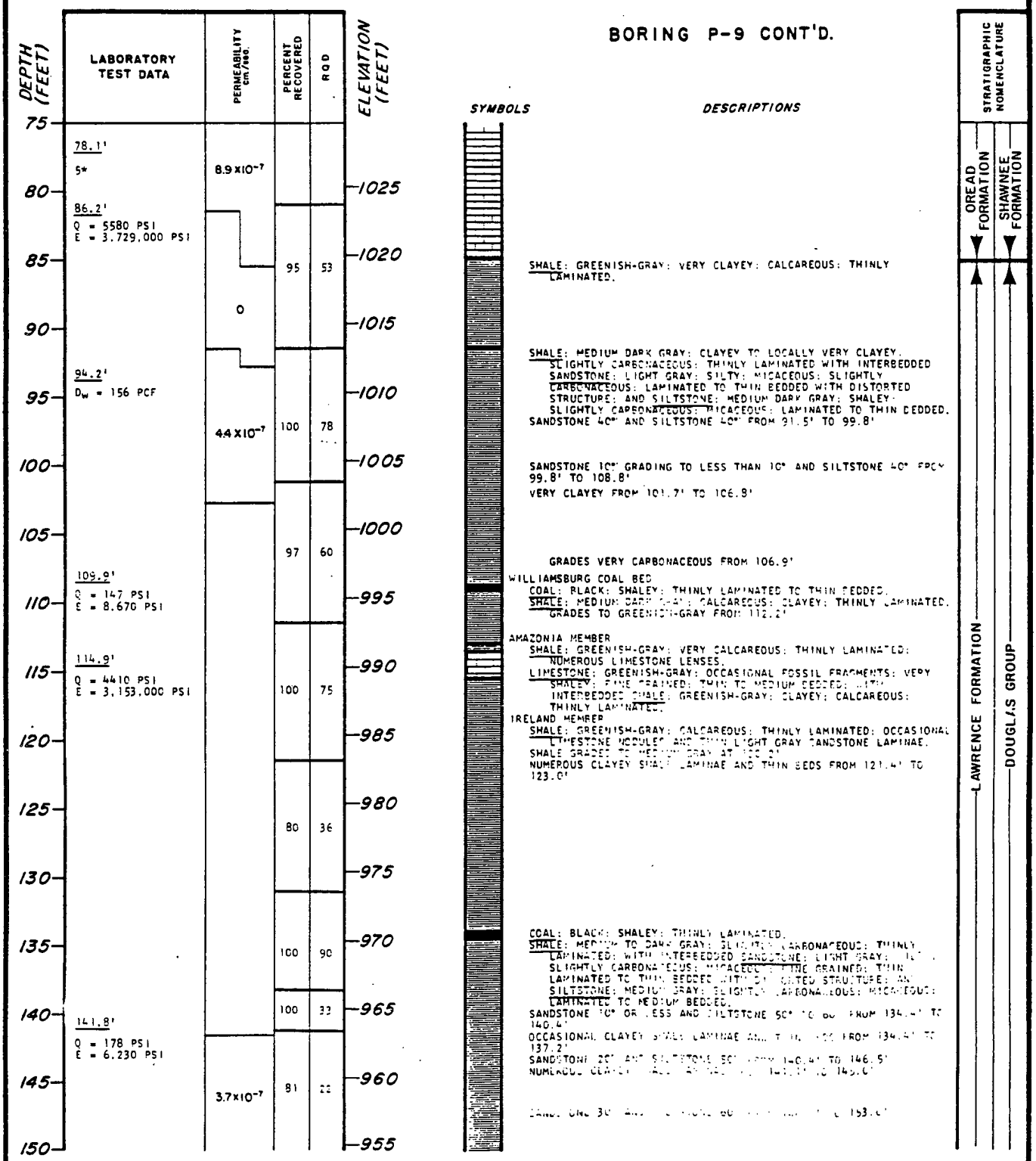


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-35i (Sheet 1 of 6)

Log of Boring P-9

Rev. 0

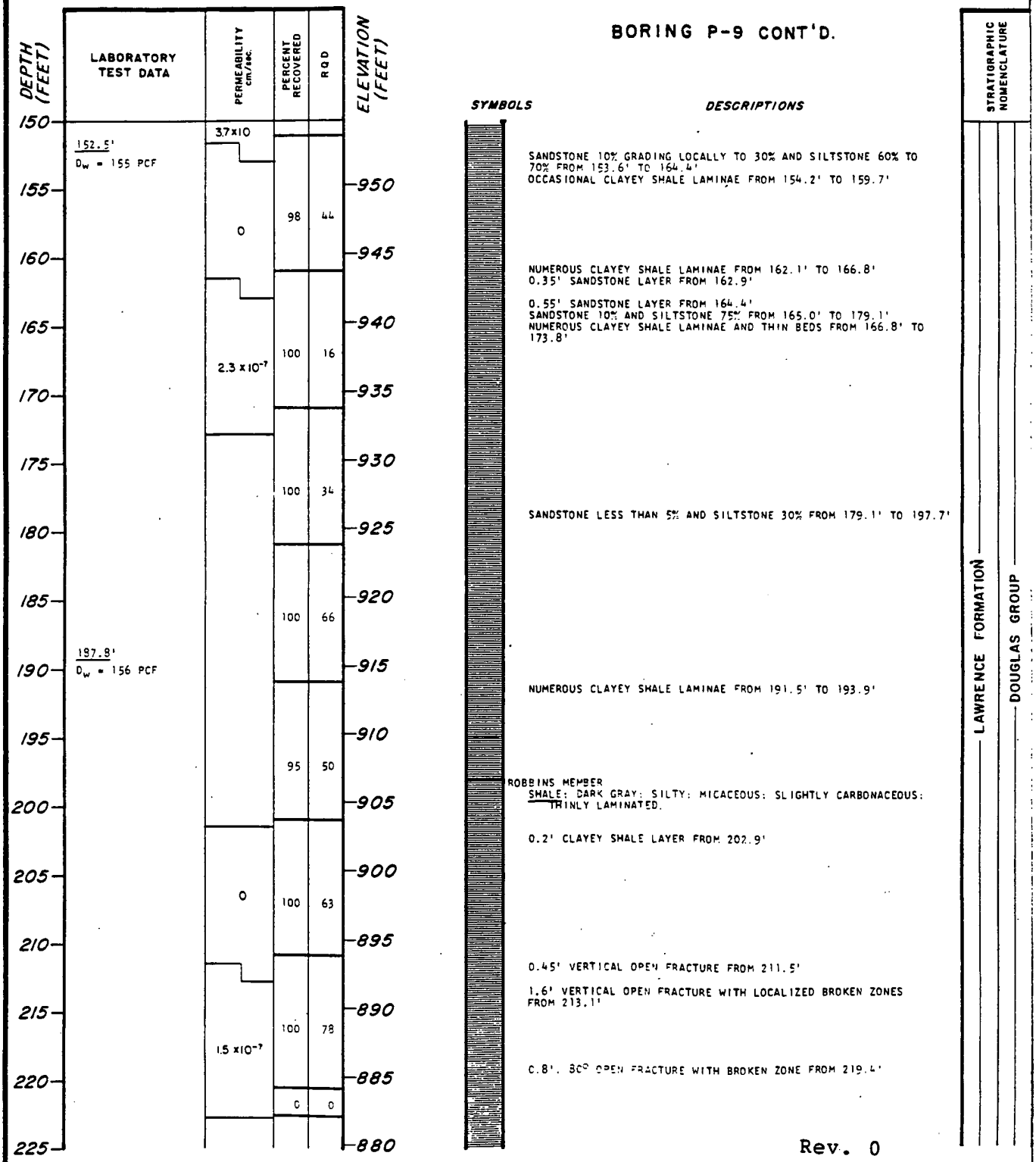


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-35i (Sheet 2 of 6)

Log of Boring P-9

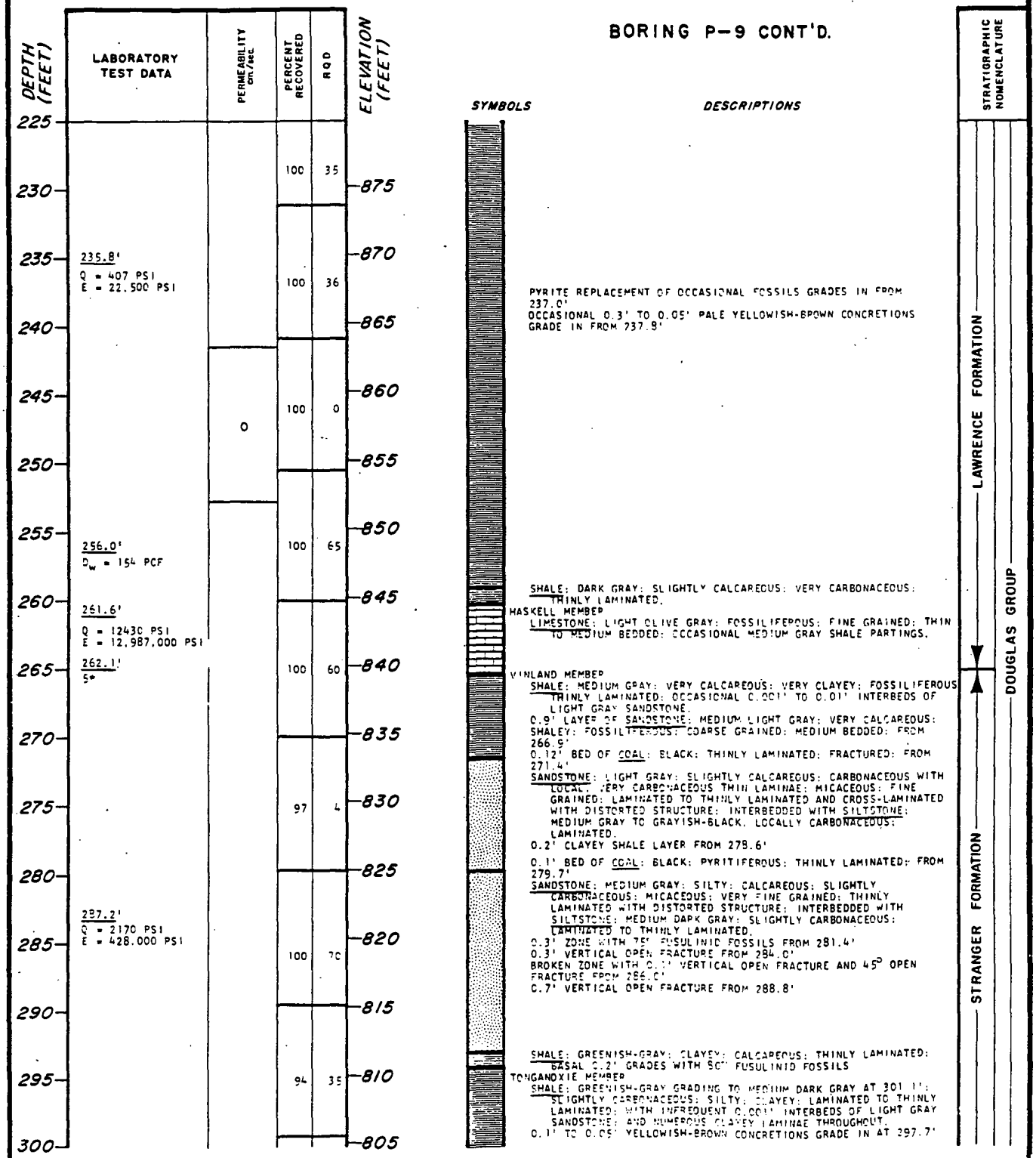


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-35i (Sheet 3 of 6)

Log of Boring P-9

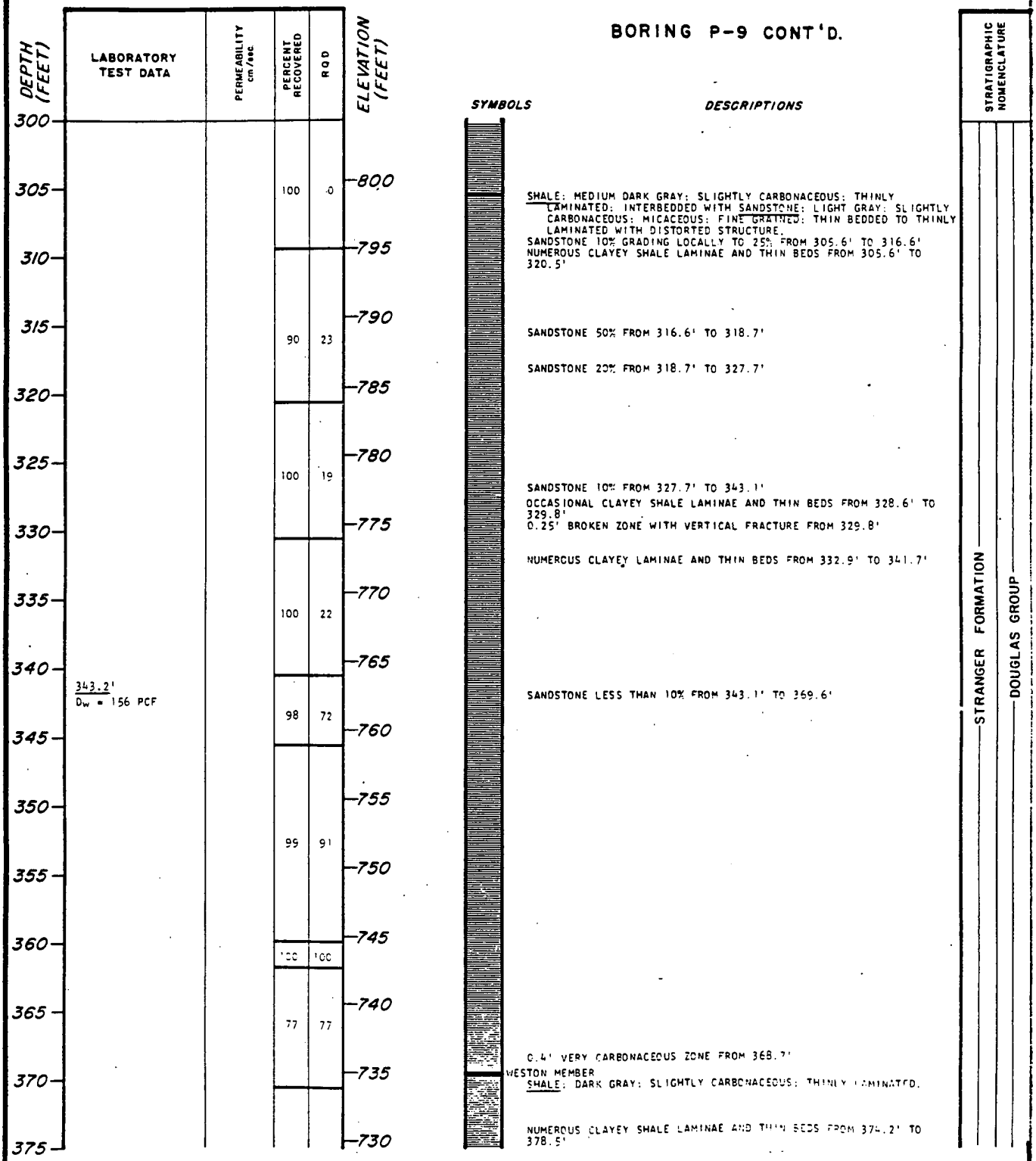


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-35i (Sheet 4 of 6)

Log of Boring P-9

Rev. 0

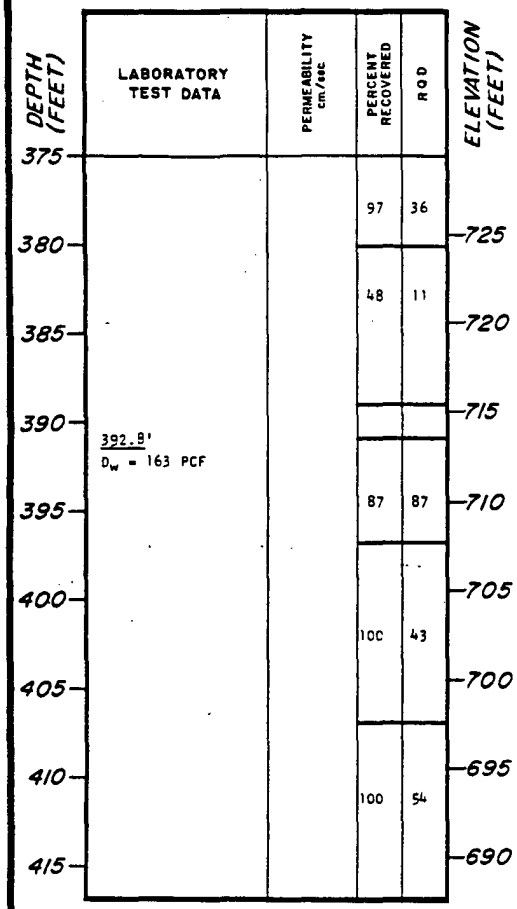


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-35i (Sheet 5 of 6)

Log of Boring P-9

Rev. 0



BORING P-9 CONT'D.



SYMBOLS

DESCRIPTIONS

1.4' BROKEN ZONE. LOCALLY CLAY-HEALED WITH VERTICAL AND 60° OPEN AND CLAY-HEALED FRACTURES FROM 378.5'

NUMEROUS CLAYEY SHALE LAMINAE FROM 381.3' TO 382.2'

INTERVAL FROM 389.0' TO 390.8' NOT CORED DUE TO EQUIPMENT MALFUNCTION

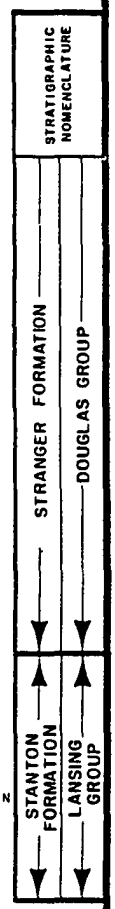
NUMEROUS DARK GRAY TO MEDIUM GRAY CLAYEY SHALE LAMINAE AND THIN BEDS FROM 397.5' TO 403.0'

SOUTH BEND MEMBER
LIMESTONE: LIGHT GRAY; SANDY; SHALEY; LOCALLY FOSSILIFEROUS; FINE GRAINED; THIN TO MEDIUM BEDDED; OCCASIONAL DARK GRAY SHALE PARTINGS.

ROCK LAKE MEMBER
SHALE: MEDIUM GRAY; SILTY; CALCAREOUS; VERY CLAYEY; THINLY LAMINATED; INTERBEDDED WITH SANDSTONE; LIGHT GRAY; CALCAREOUS; SILTY; FINE TO MEDIUM GRAINED; LAMINATED TO THIN BEDDED WITH DISTORTED STRUCTURE.
GRADES COARSE GRAINED FROM 312.7'
BASAL 0.2' CONTAINS 0.05' ANGULAR NODULES OF LIMESTONE

STONER MEMBER
LIMESTONE: LIGHT GRAY; SHALEY; SANDY; VERY FINE GRAINED; MEDIUM BEDDED.
GRADES LESS SANDY FROM 314.6'
0.4' VERTICAL OPEN FRACTURE FROM 316.5'

BORING COMPLETED AT 416.9 FEET ON 11-13-73.
CASING USED TO A DEPTH OF 19.0 FEET.
GROUNDWATER LEVEL RECORDED AT 25.0 FEET ON 11-16-73.
SECOND PIEZOMETER INSTALLED AT AN INTERVAL FROM 3.5 FEET TO 50.8 FEET ON 12-13-73.
FIRST PIEZOMETER INSTALLED AT AN INTERVAL FROM 69.0 FEET TO 80.4 FEET ON 12-11-73.
PIEZOMETER READINGS ARE PRESENTED ON TABLE 2.4-31.

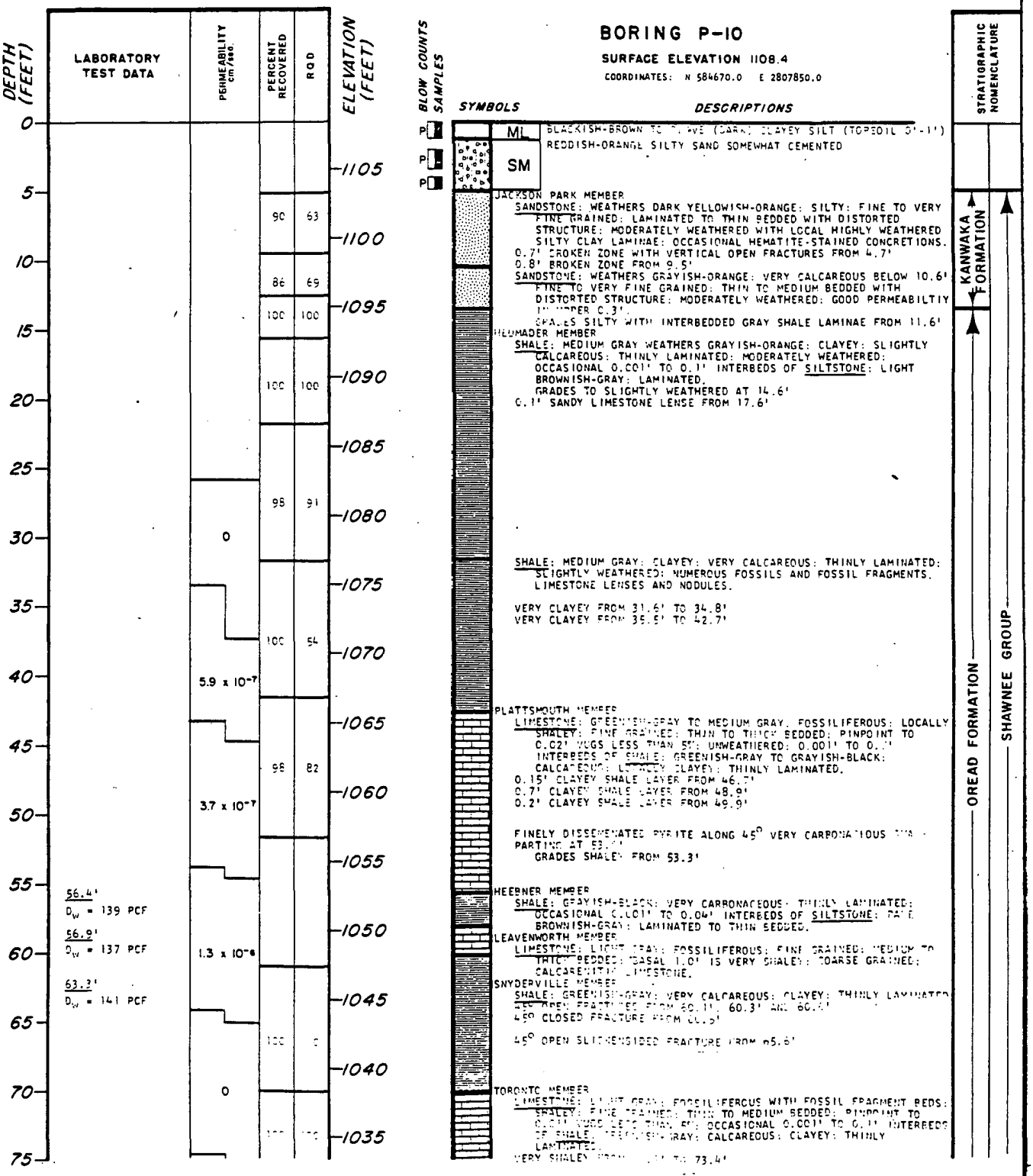


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-35i (Sheet 6 of 6)

Log of Boring P-9

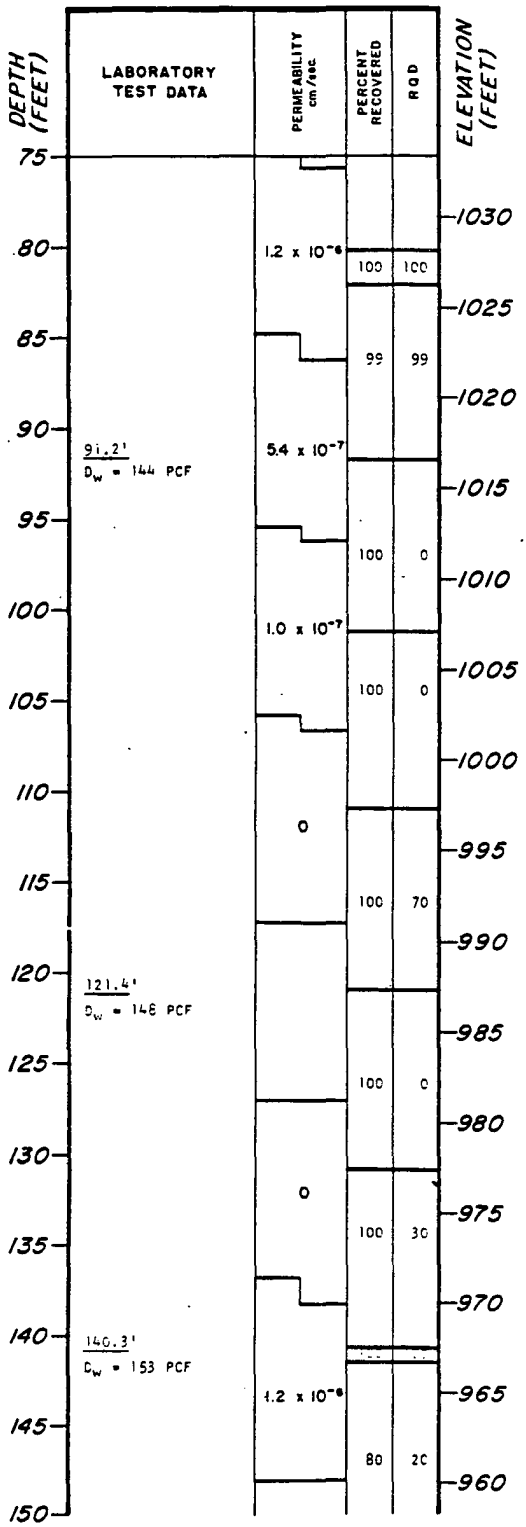


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-35j (Sheet 1 of 6)

Log of Boring P-10

Rev. 0



BORING P-10 CONT'D.

SYMBOLS

DESCRIPTIONS

TWO 0.4' INTERSECTING VERTICAL FRACTURES FROM 70.5'

0.7', 80° OPEN FRACTURE FROM 78.4' AND 0.5' VERTICAL OPEN FRACTURE FROM 79.7'
GRADES TO VERY SHALEY FROM 80.5' TO 82.2'
0.6' VERTICAL CLOSED FRACTURE FROM 80.6'
0.1' CLAYEY SHALE LAYER FROM 82.1'

SHALE: GREENISH-GRAY; CLAYEY; SLIGHTLY CALCAREOUS; THINLY LAMINATED.

SHALE: MEDIUM DARK GRAY; CLAYEY TO LOCALLY VERY CLAYEY; SLIGHTLY CARBONACEOUS; THINLY LAMINATED WITH INTERBEDDED SANDSTONE: LIGHT GRAY; SILTY; MICACEOUS; SLIGHTLY CARBONACEOUS; LAMINATED TO THIN BEDDED; AND SILTSTONE: MEDIUM DARK GRAY; SHALEY; SLIGHTLY CARBONACEOUS; MICACEOUS; LAMINATED TO THIN BEDDED.
SANDSTONE 10% AND SILTSTONE 80% FROM 90.0' TO 91.8'
SANDSTONE 40% AND SILTSTONE 50% FROM 91.8' TO 101.9'
NUMEROUS CLAYEY SHALE LAMINAE AND THIN BEDS FROM 92.9' TO 101.3'

SANDSTONE 10% GRADING TO LESS THAN 5% AND SILTSTONE 40% FROM 101.9' TO 103.6'

SHALE: GRAYISH-BLACK; VERY CLAYEY; CALCAREOUS; VERY CARBONACEOUS; THIN BEDDED.
COAL: BLACK; SHALEY; THINLY LAMINATED.
SHALE: DARK GREENISH-GRAY; VERY CALCAREOUS; CLAYEY; THINLY LAMINATED.
30° OPEN SLICKENSIDED FRACTURES FROM 106.0', 106.5' AND 107.9'
30° OPEN SLICKENSIDED FRACTURE FROM 108.4'
50° OPEN SLICKENSIDED FRACTURE FROM 108.5'
AMAZONIA MEMBER
SHALE: GREENISH-GRAY; CLAYEY; VERY CALCAREOUS; THINLY LAMINATED; OCCASIONAL LIMESTONE LENSES AND NODULES.
5° OPEN SLICKENSIDED FRACTURE FROM 108.5'
LIMESTONE: GREENISH-GRAY; VERY SHALEY; FINE GRAINED; THIN TO THICK BEDDED.
0.15' CLAYEY SHALE LAYER FROM 113.5'
GRADES WITH LESS SHALE FROM 113.7'
IRELAND MEMBER
SHALE: GREENISH-GRAY; VERY CLAYEY; SLIGHTLY CALCAREOUS TO CALCAREOUS; THINLY LAMINATED; WITH OCCASIONAL LAMINAE OF SANDSTONE.
GRADES WITH MEDIUM GRAY MOTTLING FROM 120.9'

0.001' TO 0.01' VERY CARBONACEOUS INTERLAMINATIONS GRADE IN FROM 123.6'

CLAYEY FACTION GRADES OUT AT 132.2'
COAL: BLACK WITH MODERATE BROWN INTERLAMINATIONS; THINLY LAMINATED.
NUMEROUS 0.02' TO 0.1' VERTICAL CLOSED CALCITE-LINED FRACTURES FROM 132.6' TO 133.3'
SHALE: MEDIUM GRAY TO DARK GRAY WITH GREENISH-GRAY MOTTLING: VERY CLAYEY; LOCALLY CALCAREOUS; THINLY LAMINATED WITH INTERBEDDED SANDSTONE: LIGHT GRAY; SLIGHTLY CALCAREOUS; SLIGHTLY CARBONACEOUS; MICACEOUS; VERY FINE GRAINED; THINLY LAMINATED WITH DISTORTED STRUCTURE; AND SILTSTONE: MEDIUM GRAY; SLIGHTLY CARBONACEOUS; MICACEOUS; THINLY LAMINATED.
VERY CLAYEY FROM 133.3' TO 142.2'
SANDSTONE 10% AND SILTSTONE 30% FROM 133.3' TO 140.2'
GREENISH-GRAY MOTTLING GRADES OUT AT 140.0'
0.3' SANDSTONE LAYER FROM 140.2'
SANDSTONE 50% AND SILTY SHALE 50% FROM 140.5' TO 150.5'

1.0' SANDSTONE LAYER WITH DISTORTED STRUCTURE FROM 145.2'

1.1' CALCAREOUS SANDSTONE LAYER WITH DISTORTED STRUCTURE FROM 149.0'

STRATIGRAPHIC NOMENCLATURE

OREAD FORMATION

SHAWNEE GROUP

LAWRENCE FORMATION

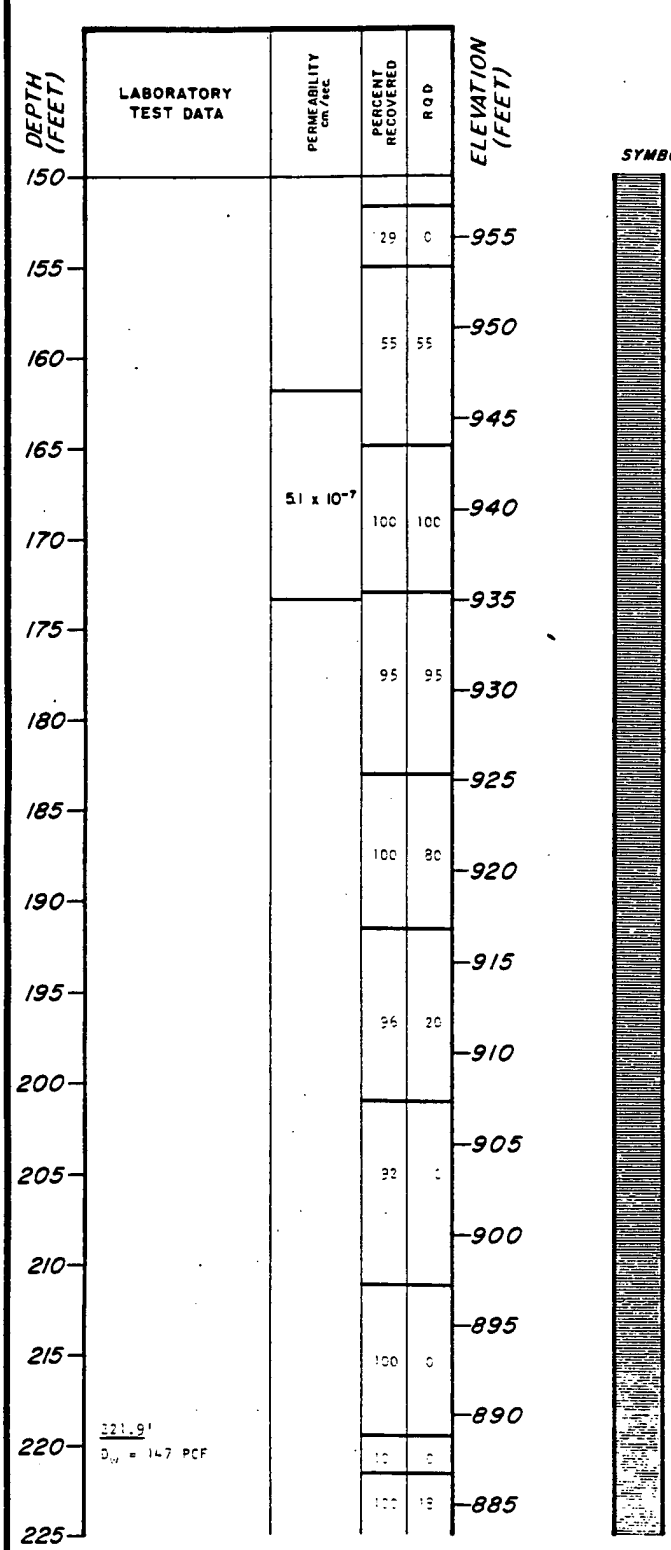
DOUGLAS GROUP

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-35j (Sheet 2 of 6)

Log of Boring P-10



BORING P-10 CONT'D.

SYMBOLS

DESCRIPTIONS

SANDSTONE 10% AND SHALEY SILTSTONE 90% FROM 150.5' TO 163.0'

NUMEROUS CLAYEY SHALE LAMINAE FROM 155.7' TO 159.1'

0.7' ZONE OF NUMEROUS HIGHLY DISTORTED SANDSTONE LAMINAE AND THIN BEDS FROM 159.6'

SHALEY SILTSTONE 100% WITH OCCASIONAL CALCAREOUS SANDSTONE LENSES FROM 163.0' TO 165.6'

SANDSTONE 30% AND SHALEY SILTSTONE 70% FROM 165.6' TO 175.3'

INTERSECTING 0.4' VERTICAL OPEN FRACTURE; 0.2', 80° OPEN FRACTURE AND 45° OPEN SLICKENSIDED FRACTURE FROM 175.5'
SANDSTONE 10% GRADING LOCALLY TO 50% AND SHALEY SILTSTONE 90% FROM 175.3' TO 183.0'
1.5' VERTICAL OPEN FRACTURE FROM 176.6'

0.3' VERTICAL OPEN FRACTURE FROM 181.2'

0.6' VERTICAL OPEN FRACTURE FROM 182.8'
SHALEY SILTSTONE 100% FROM 183.0' TO 232.3'
0.7' CLAYEY ZONE FROM 183.7'
45° OPEN FRACTURES FROM 185.2' AND 185.4'

NUMEROUS 45° OPEN AND CLOSED FRACTURES FROM 187.7' TO 188.1'

45° OPEN FRACTURES AT 190.0' AND 191.0'

NUMEROUS CLAYEY SHALE LAMINAE FROM 194.2' TO 201.1'

0.6' BROKEN ZONE FROM 200.5'

NUMEROUS CLAYEY SHALE LAMINAE FROM 213.3' TO 219.4'

GRADES VERY CLAYEY FROM 221.[illegible]'

(BORING CONTINUED)

STRATIGRAPHIC NOMENCLATURE

LAWRENCE FORMATION

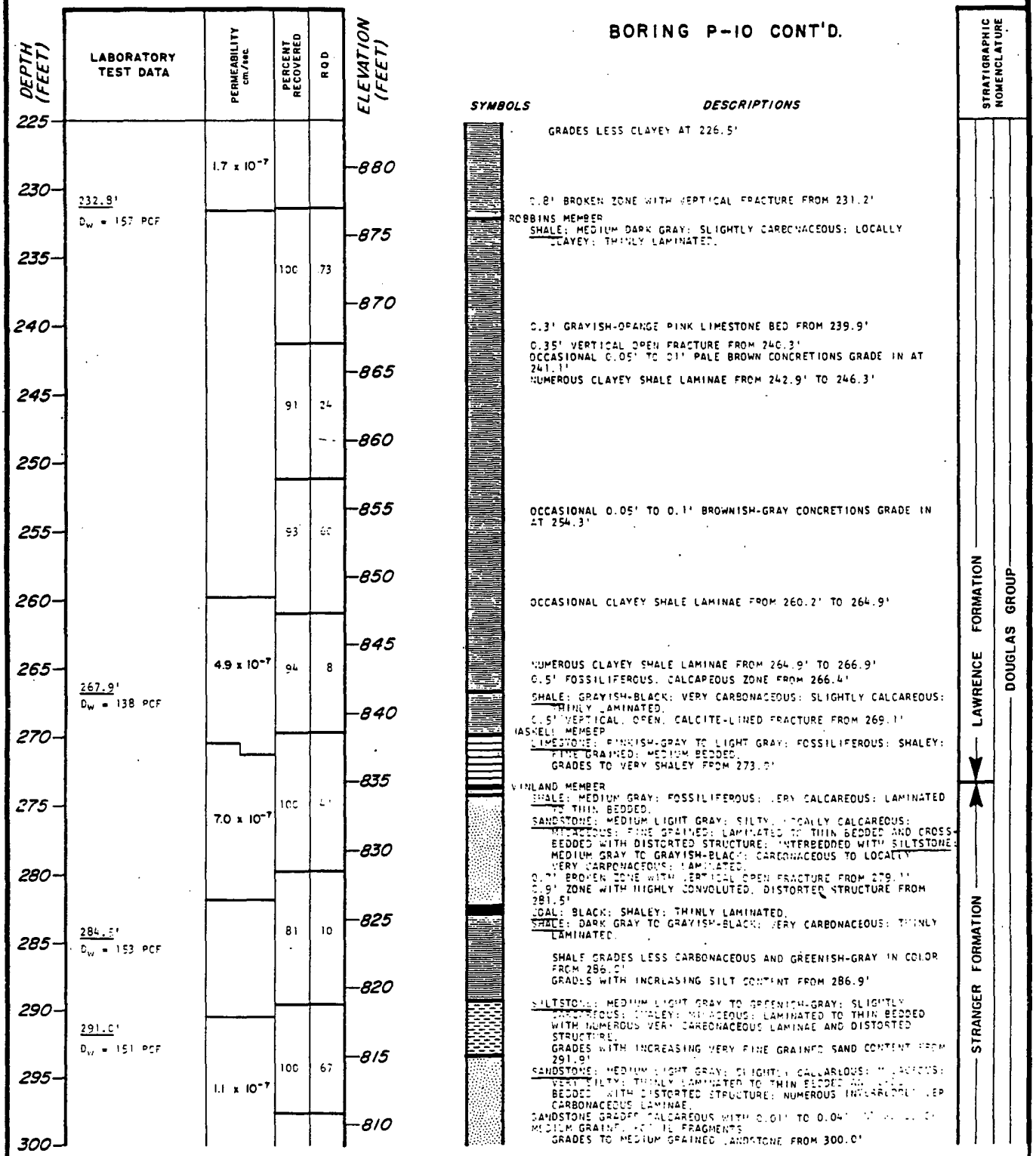
DOUGLAS GROUP

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-35j (Sheet 3 of 6)

Log of Boring P-10

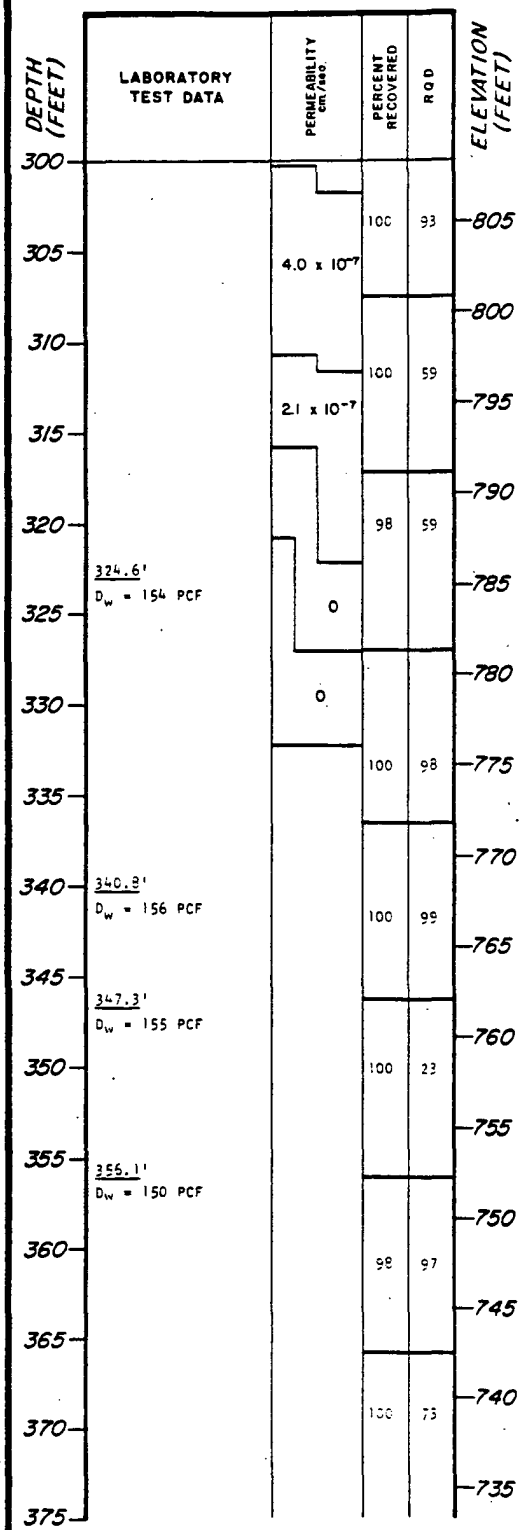


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-35j (Sheet 4 of 6)

Log of Boring P-10

Rev. 0



BORING P-10 CONT'D

SYMBOLS

DESCRIPTIONS

LIMESTONE: MEDIUM LIGHT GRAY; 90% FUSULINID FOSSILS; SHALEY; THIN TO MEDIUM BEDDED; NUMEROUS LIMESTONE NODULES; OCCASIONAL 0.01' TO 0.9' INTERBEDS OF SANDSTONE: MEDIUM GRAY; MICACEOUS; CARBONACEOUS; SLIGHTLY CALCAREOUS; FINE GRAINED; LAMINATED TO THIN BEDDED.

0.4' SANDSTONE BED FROM 306.3'
0.9' SANDSTONE BED FROM 306.9'

0.5' SANDSTONE BED FROM 311.3'
0.9' SANDSTONE BED FROM 312.0'

TONGANOXIE MEMBER

SHALE: MEDIUM DARK GRAY; MICACEOUS; SILTY; SLIGHTLY CARBONACEOUS; THINLY LAMINATED; OCCASIONAL 0.001' TO 0.01' INTERBEDS OF SANDSTONE: LIGHT GRAY; MICACEOUS; FINE GRAINED; THINLY LAMINATED AND CROSS-LAMINATED, WITH DISTORTED STRUCTURE.

7.6' HIGHLY FRACTURED ZONE FROM 313.6' WITH NUMEROUS VERTICAL TO 30° OPEN, SLICKENSIDED AND POLISHED FRACTURES. BEDDING IN UPPER PORTION DIPS APPROXIMATELY 60° GRADING TO 45° AT 315.0', 30° AT 318.9' AND TO NEARLY HORIZONTAL AT 320.8'.
SILTY SHALE 95% AND SANDSTONE 5% GROM 313.6' TO 318.7'
0.01' TO 0.05' YELLOWISH-BROWN CONCRETIONS GRADE IN AT 314.2'
SILTY SHALE 80% AND SANDSTONE 20% FROM 318.7' TO 321.6'
SANDSTONE 80% FROM 321.6' TO 322.2'
SANDSTONE 10% FROM 322.2' TO 336.3'

SANDSTONE LESS THAN 5% FROM 336.3' TO 367.2'

OCCASIONAL CLAYEY SHALE LAMINAE FROM 346.8' TO 356.0'

0.35' VERY CARBONACEOUS ZONE FROM 364.3'

WESTON MEMBER

SHALE: MEDIUM DARK GRAY; CARBONACEOUS; THINLY LAMINATED. NUMEROUS CLAYEY SHALE LAMINAE FROM 370.0' TO 375.9'

0.25' 75° OPEN FRACTURE FROM 372.1'
0.15' VERTICAL OPEN FRACTURE FROM 375.9'

STRATIGRAPHIC NOMENCLATURE

STRANGER FORMATION

DOUGLAS GROUP

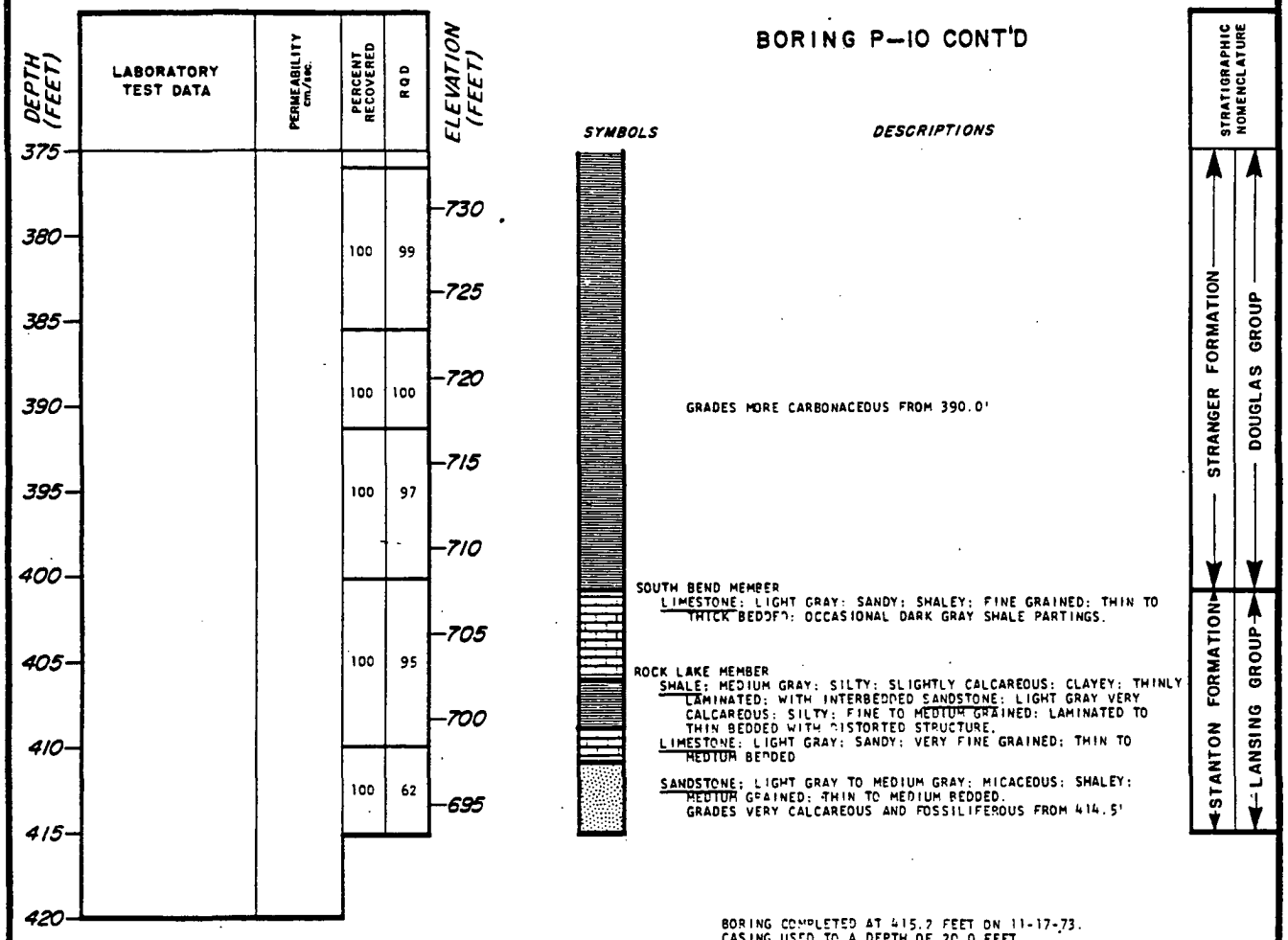
Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-35j (Sheet 5 of 6)

Log of Boring P-10

BORING P-10 CONT'D



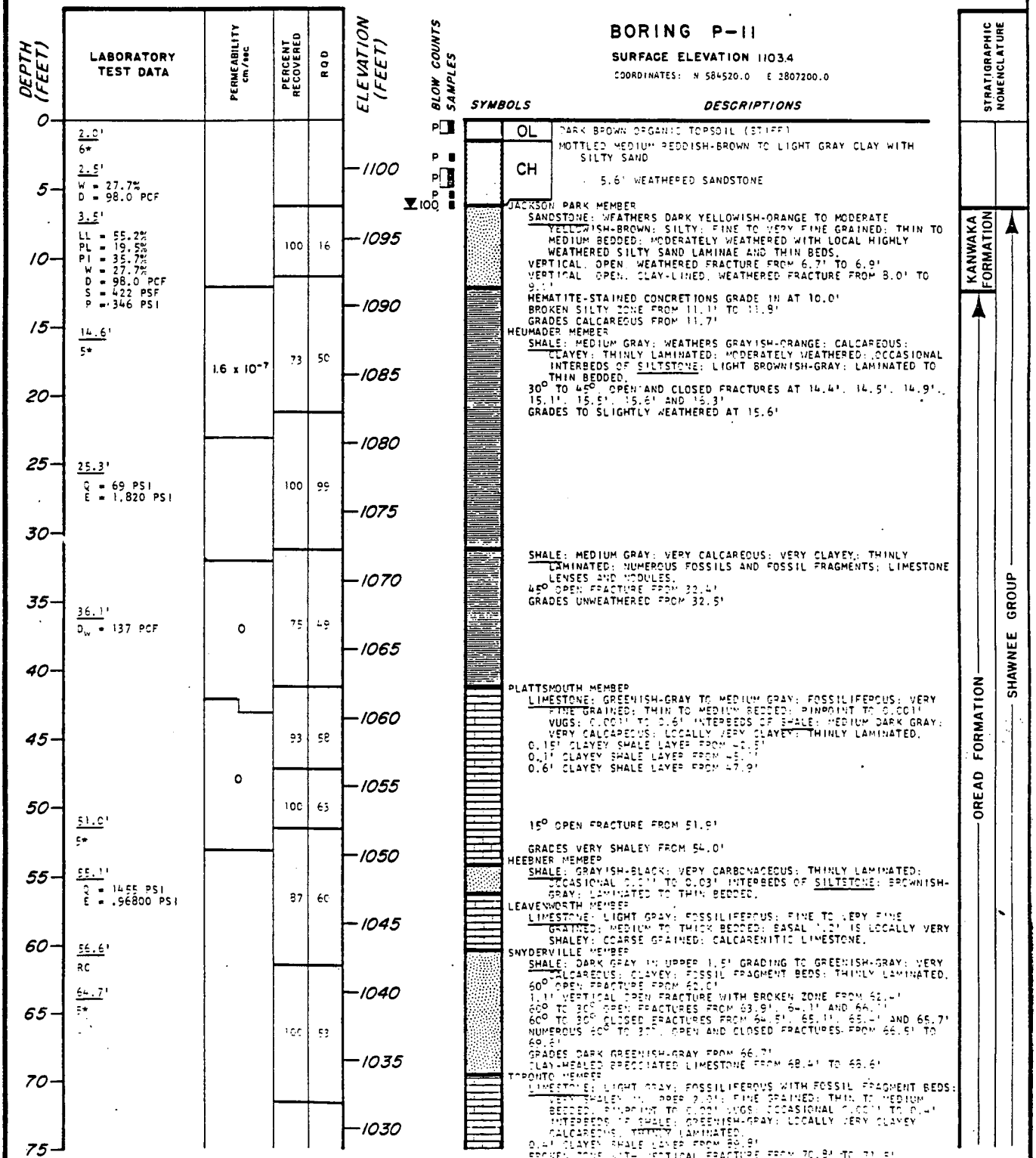
BORING COMPLETED AT 415.2 FEET ON 11-17-73.
CASING USED TO A DEPTH OF 20.0 FEET.
GROUNDWATER LEVEL RECORDED AT 33.5 FEET ON 11-18-73.
THIRD PIEZOMETER INSTALLED AT AN INTERVAL FROM 134.0 FEET TO 155.0 FEET ON 12-11-73.
SECOND PIEZOMETER INSTALLED AT AN INTERVAL FROM 70.8 FEET TO 86.6 FEET ON 12-11-73.
FIRST PIEZOMETER INSTALLED AT AN INTERVAL FROM 4.0 FEET TO 52.0 FEET ON 12-10-73.
PIEZOMETER READINGS ARE PRESENTED ON TABLE 2.4-31.

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-35j (Sheet 6 of 6)

Log of Boring P-10

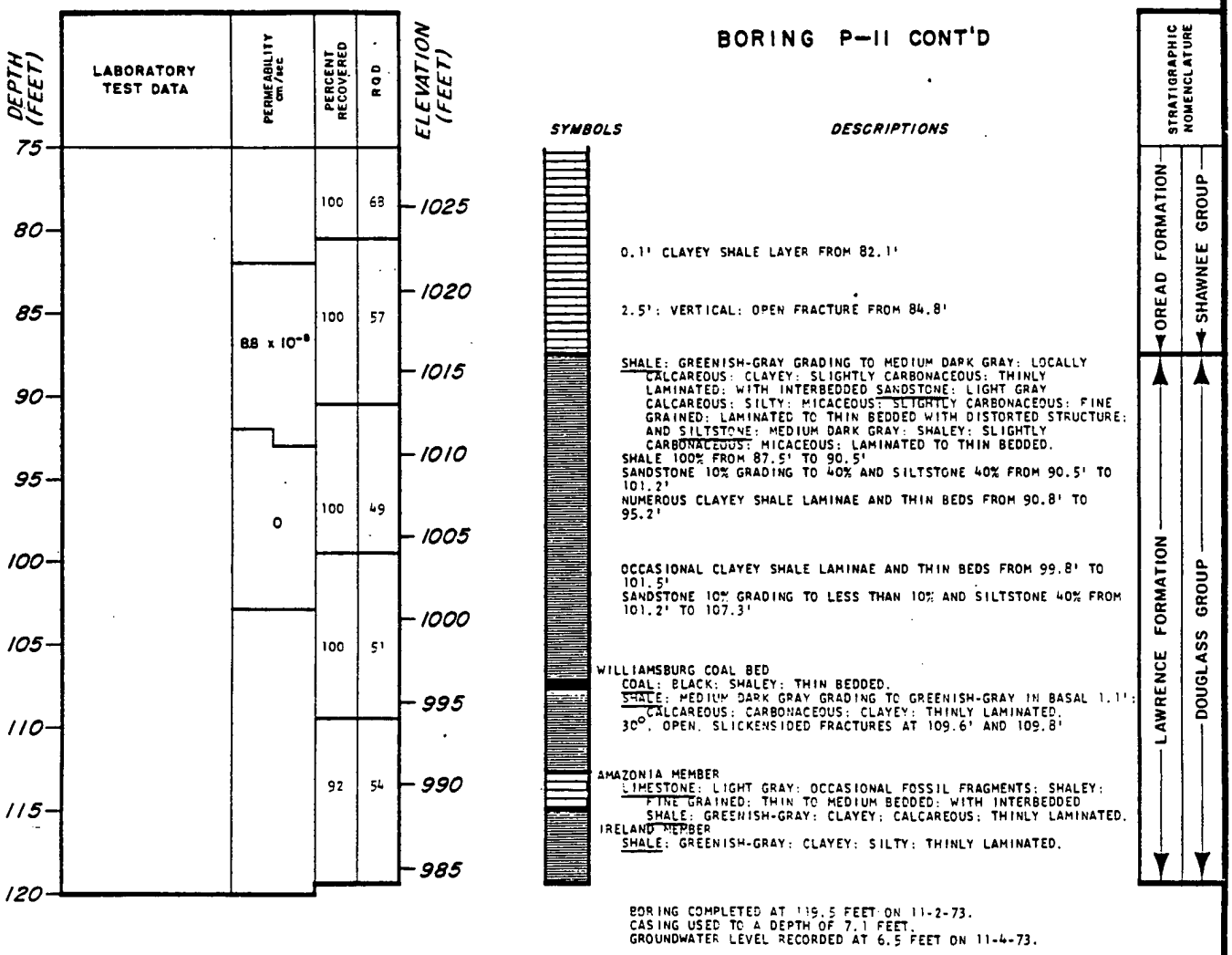


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-35k (Sheet 1 of 2)

Log of Boring P-11

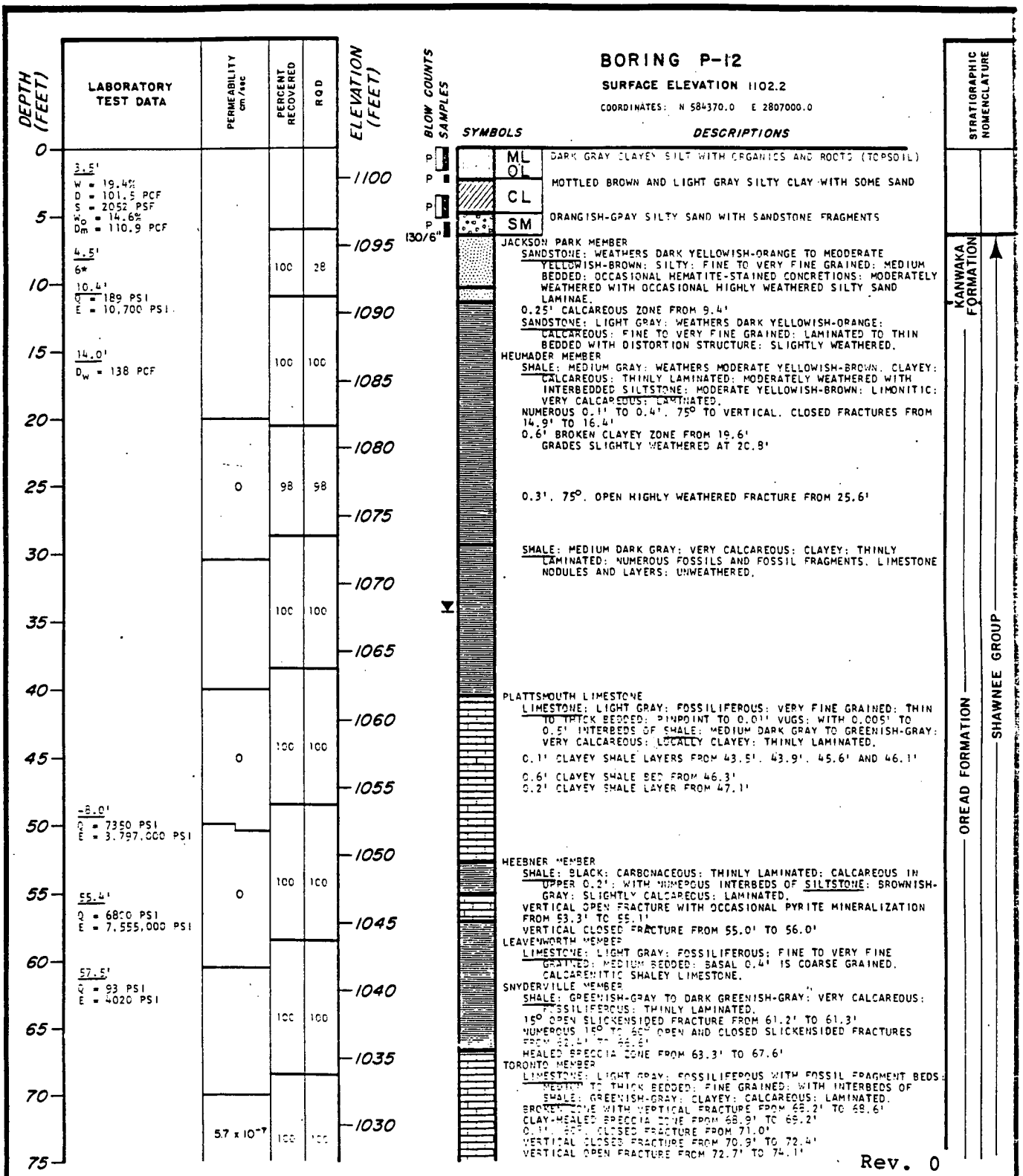


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-35k (Sheet 2 of 2)

Log of Boring P-11



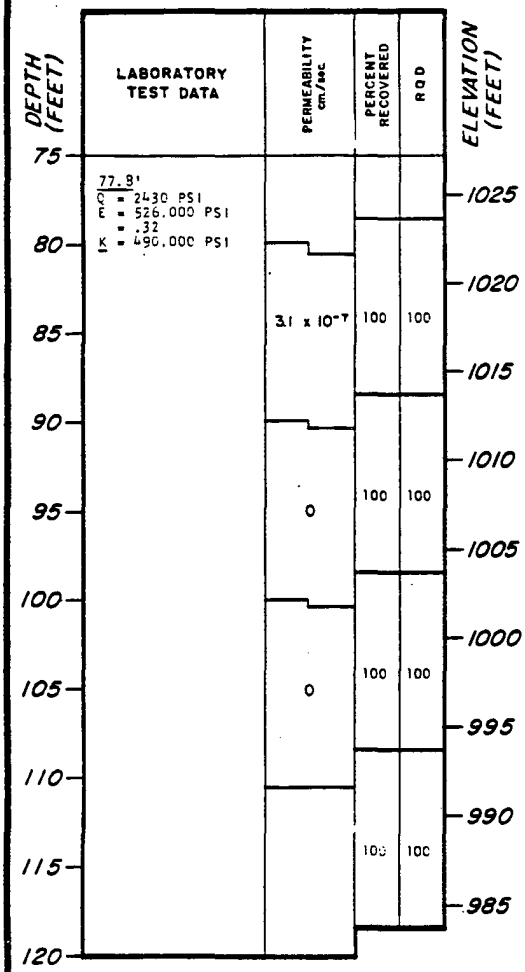
Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-351 (Sheet 1 of 2)

Log of Boring P-12

BORING P-12 CONT'D





SYMBOLS

DESCRIPTIONS

SHALE: MEDIUM GRAY TO DARK GRAY: LOCALLY SLIGHTLY CALCAREOUS: CLAYEY: MICACEOUS SLIGHTLY CARBONACEOUS: THINLY LAMINATED: WITH INTERBEDDED SANDSTONE: LIGHT GRAY: CALCAREOUS: MICACEOUS: SLIGHTLY CARBONACEOUS: FINE GRAINED: LAMINATED WITH DISTORTED STRUCTURE.
SHALE 100% FROM 84.6' TO 86.4'
SANDSTONE 10% FROM 86.4' TO 87.8'
SANDSTONE 40% - 50% FROM 87.8' TO 98.5'
VERTICAL OPEN FRACTURE FROM 90.9' TO 91.3'

SANDSTONE 10% FROM 98.5' TO 101.3'
OCCASIONAL CLAYEY SHALE LAYERS FROM 98.5' TO 103.6'
SHALE 100% FROM 101.3' TO 103.6'

WILLIAMSBURG COAL BED
COAL: BLACK: SHALEY: LAMINATED TO THIN BEDDED: WITH INTERBEDDED SHALE: GREENISH-GRAY TO MEDIUM GRAY: CALCAREOUS: THINLY LAMINATED.
SHALE: GREENISH-GRAY: CALCAREOUS: CARBONACEOUS IN UPPER 0.1': THINLY LAMINATED
OCCASIONAL 45° OPEN FRACTURES FROM 104.8' TO 106.7'
AMAZONIA MEMBER
SHALE: GREENISH-GRAY: VERY CALCAREOUS: THINLY LAMINATED: OCCASIONAL NODULES AND LAYERS OF LIMESTONE.
LIMESTONE: LIGHT GRAY: LOCALLY FOSSILIFEROUS: MEDIUM BEDDED: WITH INTERBEDDED SHALE: GREENISH-GRAY: VERY CALCAREOUS: THINLY LAMINATED.
IRELAND MEMBER
SHALE: GREENISH-GRAY IN UPPER 5.0' GRADING TO MEDIUM DARK GRAY: LOCALLY CALCAREOUS: THINLY LAMINATED: WITH INTERBEDDED SANDSTONE: LIGHT GRAY: CALCAREOUS: FINE GRAINED: LAMINATED.

BORING COMPLETED AT 118.5 FEET ON 10-25-73.
CASING USED TO A DEPTH OF 6.5 FEET.
GROUNDWATER RECORDED AT 34.5 FEET ON 10-29-73.
SECOND PIEZOMETER INSTALLED AT AN INTERVAL FROM 3.0 FEET TO 50.4 FEET ON 12-3-73.
FIRST PIEZOMETER INSTALLED AT AN INTERVAL FROM 67.0 FEET TO 83.3 FEET ON 12-3-73.
PIEZOMETER READINGS ARE PRESENTED ON TABLE 2.4-31.

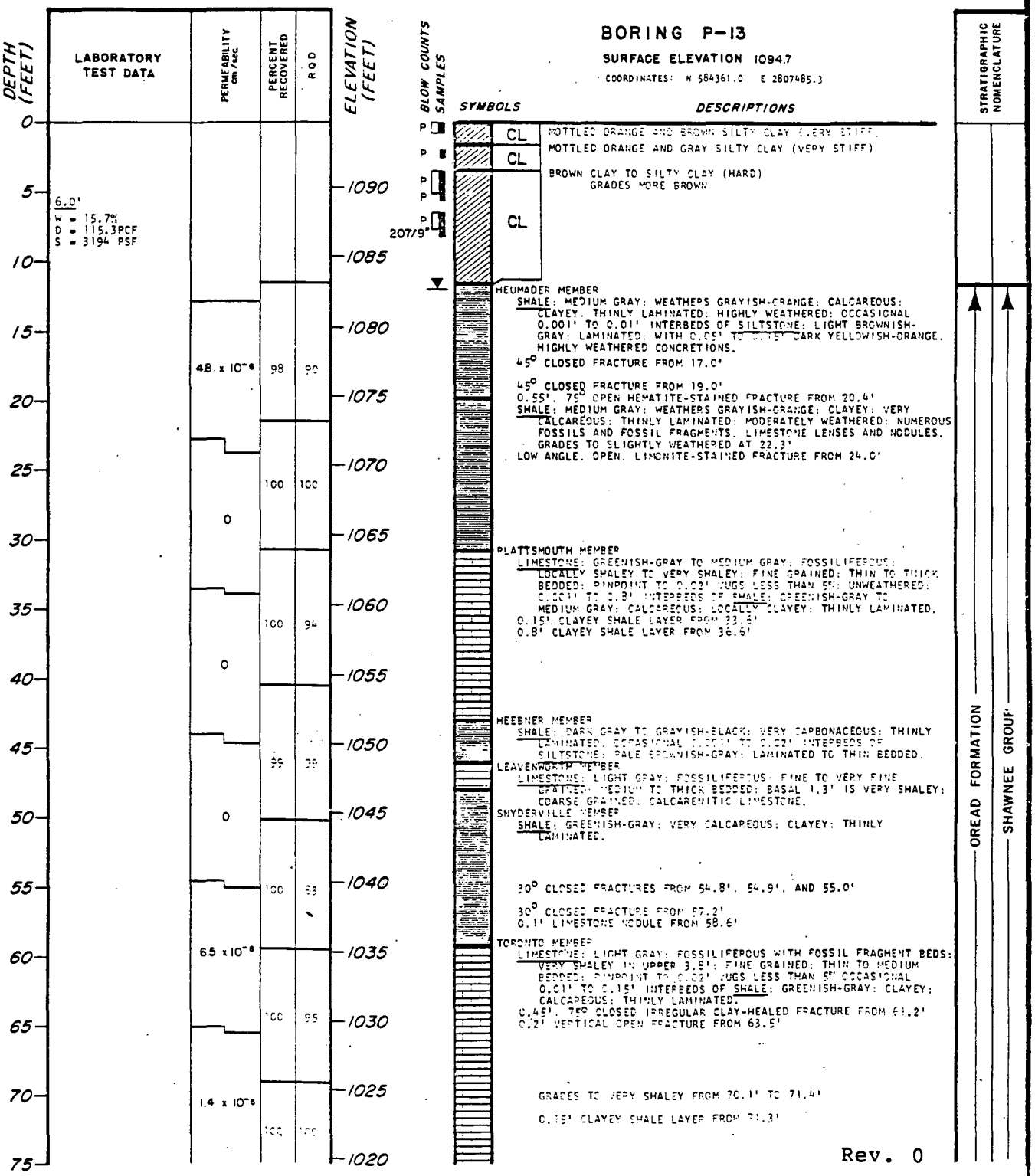


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-351 (Sheet 2 of 2)

Log of Boring P-12

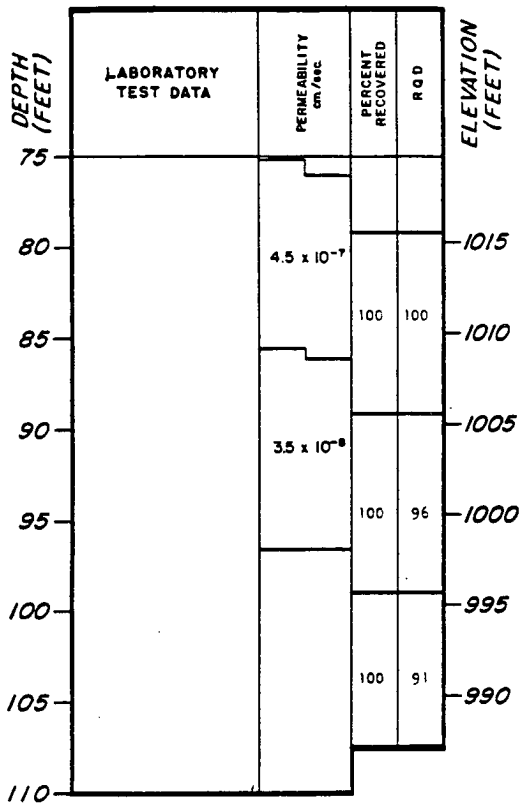


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-35m (Sheet 1 of 2)

Log of Boring P-13



BORING P-13 CONT'D

SYMBOLS

DESCRIPTIONS

SHALE: GREENISH-GRAY AND MOTTLED MEDIUM GRAY; SILTY; MICACEOUS; THINLY LAMINATED.
0.5' BROKEN ZONE WITH 30° TO 45° OPEN SLICKENSIDED FRACTURES FROM 79.0'
SHALE: MEDIUM GRAY; SLIGHTLY CARBONACEOUS; THINLY LAMINATED; INTERBEDDED WITH SANDSTONE: LIGHT GRAY; SILTY; MICACEOUS; SLIGHTLY CARBONACEOUS; FINE GRAINED; LAMINATED TO THIN BEDDED WITH DISTORTED STRUCTURE; AND SILTSTONE: MEDIUM DARK GRAY; SLIGHTLY CARBONACEOUS; MICACEOUS; LAMINATED TO THIN BEDDED.
SANDSTONE 10% AND SILTSTONE 70% FROM 79.2' TO 81.0'
SANDSTONE 40% AND SILTSTONE 40% FROM 81.0' TO 91.9'

0.5' VERTICAL FRACTURE FROM 89.9'

SANDSTONE LESS THAN 10% AND SILTSTONE 30% FROM 91.9' TO 97.4'

GRADES VERY CARBONACEOUS FROM 96.6'
WILLIAMSBURG COAL BED
COAL: BLACK; SHALEY; THINLY LAMINATED.
SHALE: MEDIUM DARK GRAY; CARBONACEOUS; CLAYEY; CALCAREOUS; THINLY LAMINATED.
BROKEN ZONE WITH 30° OPEN SLICKENSIDED FRACTURES FROM 99.0' TO 99.2'
AMAZONIA MEMBER
LIMESTONE: LIGHT GRAY; OCCASIONAL FOSSIL FRAGMENTS; SHALEY TO VERY SHALEY; FINE GRAINED; THIN TO MEDIUM BEDDED WITH INTERBEDDED SHALE: GREENISH-GRAY; CALCAREOUS; THINLY LAMINATED.
GRADES TO VERY SHALEY AT 104.0'
IRELAND MEMBER
SHALE: GREENISH-GRAY; CALCAREOUS; CLAYEY; THINLY LAMINATED.

BORING COMPLETED AT 107.5 FEET ON 11-6-73.
CASING USED TO A DEPTH OF 10.0 FEET.
GROUNDWATER LEVEL RECORDED AT 12.0 FEET ON 11-16-73.

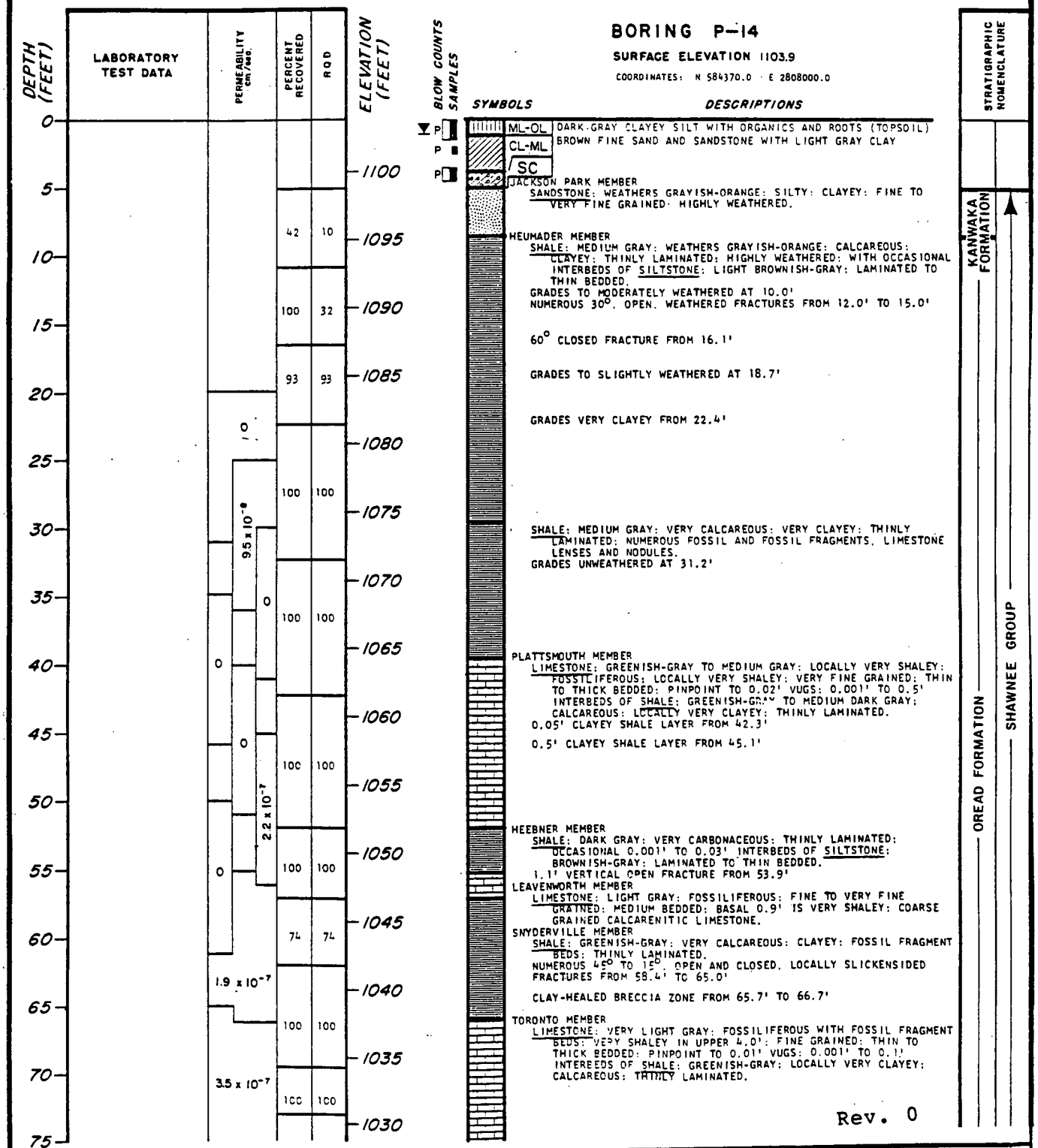
STRATIGRAPHIC NOMENCLATURE
LAWRENCE FORMATION
DOUGLAS GROUP

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-35m (Sheet 2 of 2)

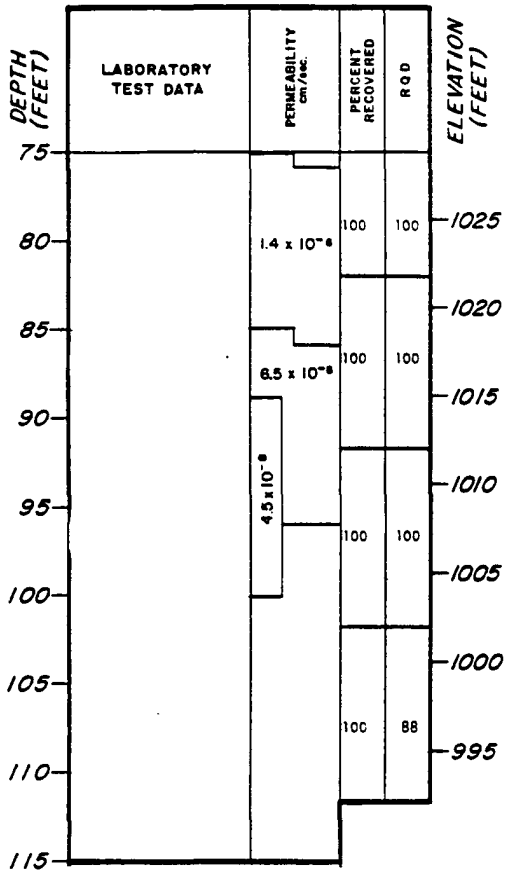
Log of Boring P-13



WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-35n (Sheet 1 of 2)

Log of Boring P-14



BORING P-14 CONT'D

SYMBOLS

DESCRIPTIONS

SHALE: GREENISH-GRAY IN UPPER 2.4' GRADING TO MEDIUM DARK GRAY; LOCALLY CALCAREOUS; CLAYEY; SLIGHTLY CARBONACEOUS; THINLY LAMINATED; WITH INTERBEDDED SANDSTONE; LIGHT GRAY; CALCAREOUS; SILTY; MICACEOUS; SLIGHTLY CARBONACEOUS; FINE GRAINED; LAMINATED TO THIN BEDDED WITH DISTORTED STRUCTURE; AND SILTSTONE; MEDIUM DARK GRAY; SHALEY; SLIGHTLY CARBONACEOUS; MICACEOUS; LAMINATED TO THIN BEDDED.
SHALE 100% FROM 83.7' TO 86.0'
SANDSTONE 10% GRADING TO 40% AND SILTSTONE 40% FROM 86.0' TO 97.1'

SANDSTONE 10% GRADING TO LESS THAN 10% FROM 97.1' TO 102.1'

GRADES LOCALLY VERY CARBONACEOUS FROM 99.5'

WILLIAMSBURG COAL BED
COAL: BLACK; SHALEY; THIN BEDDED.
SHALE: GREENISH-GRAY; CLAYEY; THINLY LAMINATED
0.1' CLAYEY SHALE LAYER FROM 102.3'
GRADES VERY CALCAREOUS FROM 102.4'
45° TO 30° OPEN AND CLOSED, LOCALLY SLICKENSIDED FRACTURES AT 103.2', 103.4', 104.0', 104.1', 104.2', 104.4', 104.8' AND 105.3'
AMAZONIA MEMBER
SHALE: GREENISH-GRAY; CLAYEY; VERY CALCAREOUS; THINLY LAMINATED; LENSES AND NODULES OF LIMESTONE.
LIMESTONE: LIGHT GRAY; SHALEY; FINE GRAINED; THIN TO MEDIUM BEDDED; WITH INTERBEDDED SHALE: GREENISH-GRAY; CLAYEY; CALCAREOUS; LAMINATED.

BORING COMPLETED AT 111.8 FEET ON 11-1-73.
CASING USED TO A DEPTH OF 5.0 FEET.
GROUNDWATER LEVEL RECORDED AT 1.0 FEET ON 11-4-73.
SECOND PIEZOMETER INSTALLED AT AN INTERVAL FROM 3.0 FEET TO 50.4 FEET ON 11-13-73.
FIRST PIEZOMETER INSTALLED AT AN INTERVAL FROM 65.2 FEET TO 93.2 FEET ON 11-13-73.
PIEZOMETER READINGS ARE PRESENTED ON TABLE 2.4-31.

STRATIGRAPHIC NOMENCLATURE

ORE AD FORMATION

SHAWNEE GROUP

LAWRENCE FORMATION

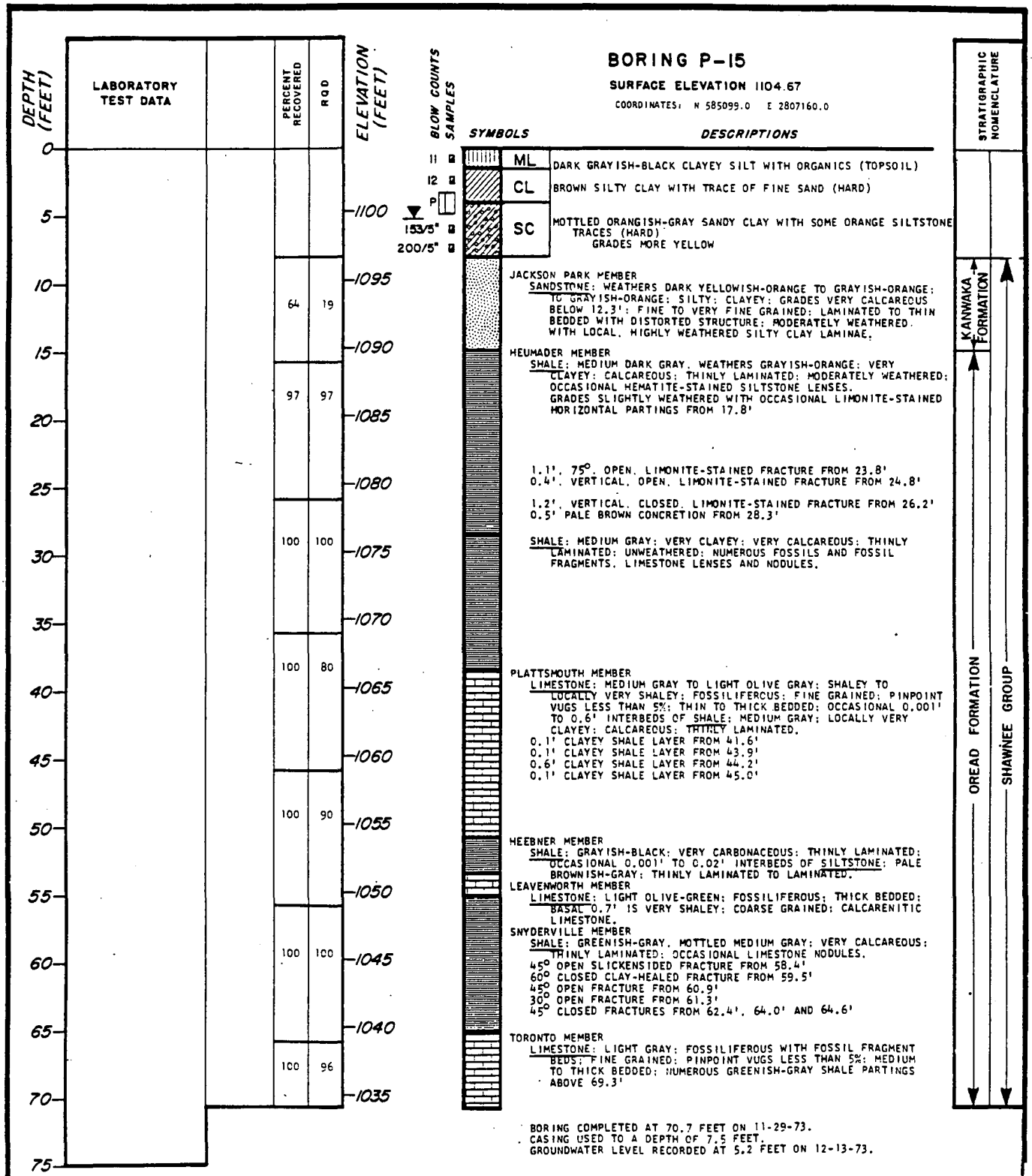
DOUGLASS GROUP

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-35n (Sheet 2 of 2)

Log of Boring P-14

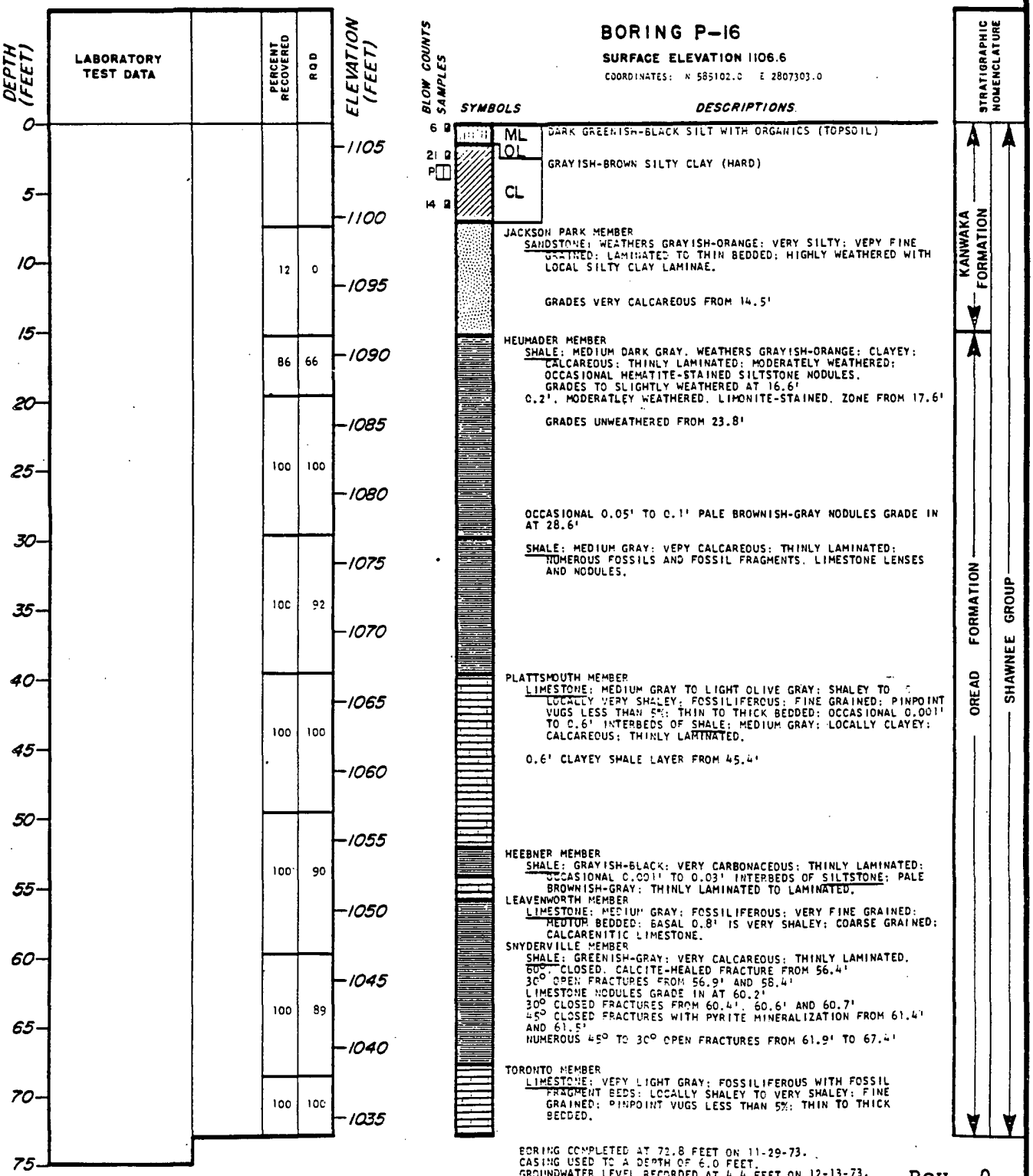


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-35o

Log of Boring P-15

Rev. 0

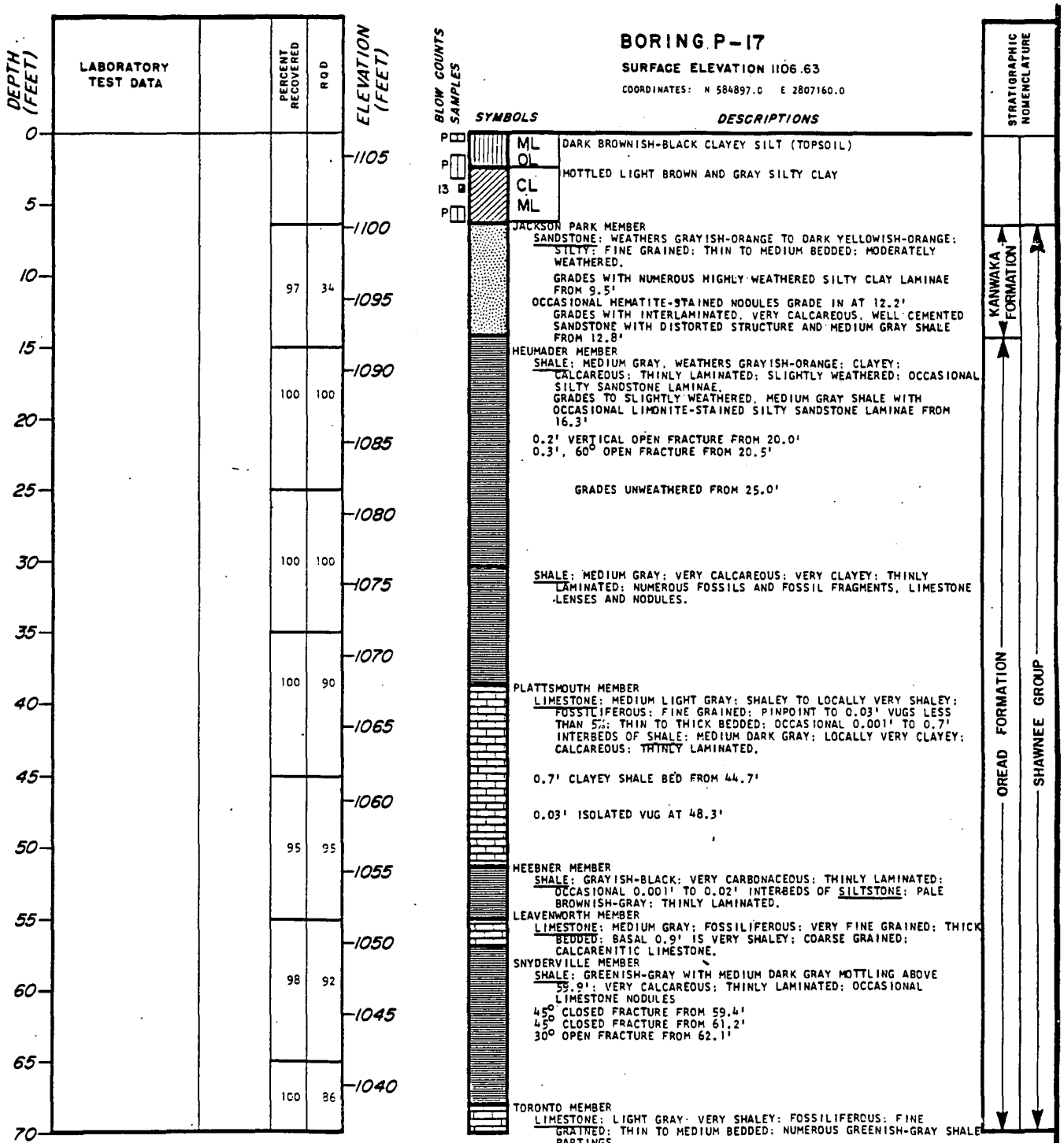


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-35p

Log of Boring P-16

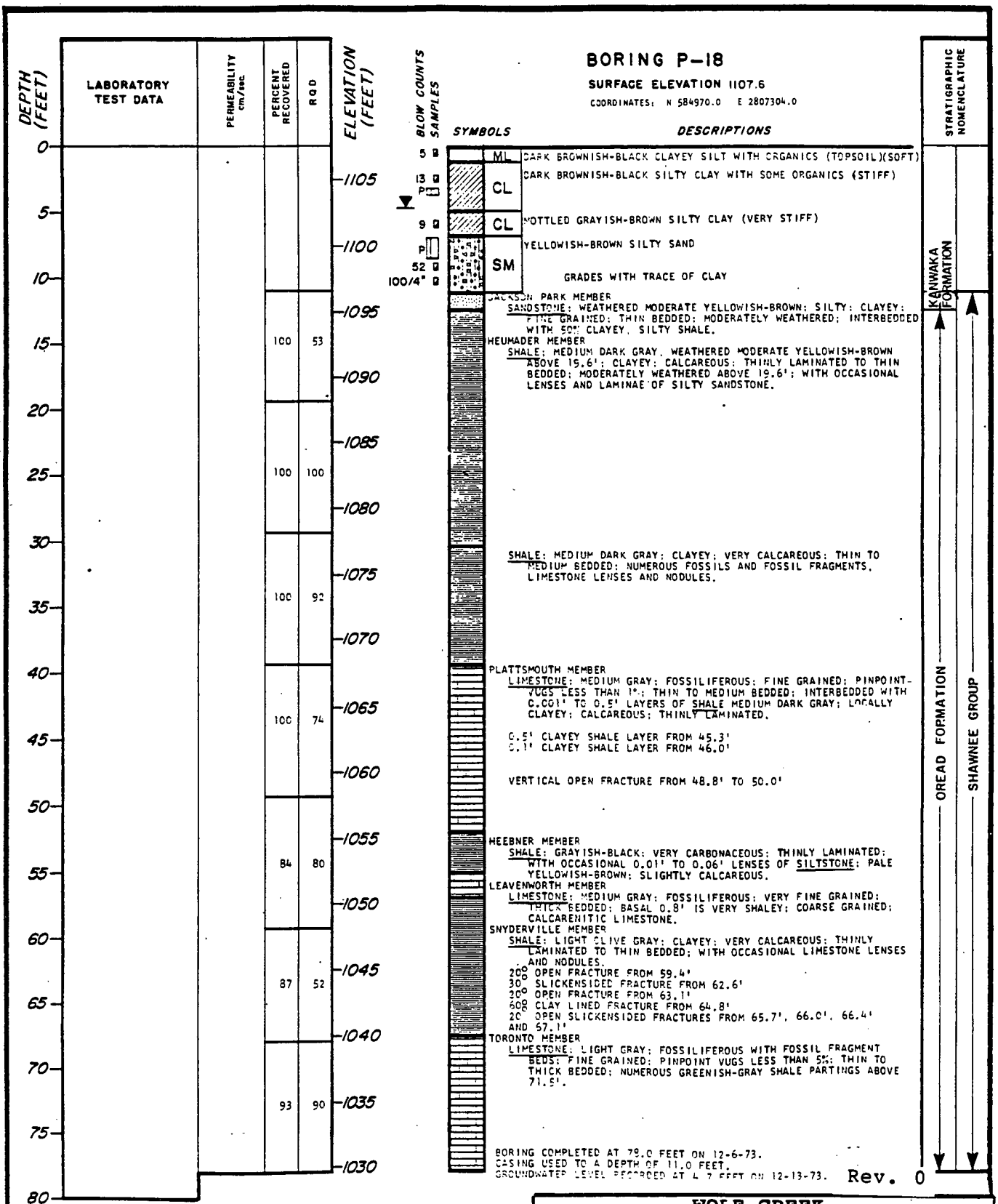


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-35q

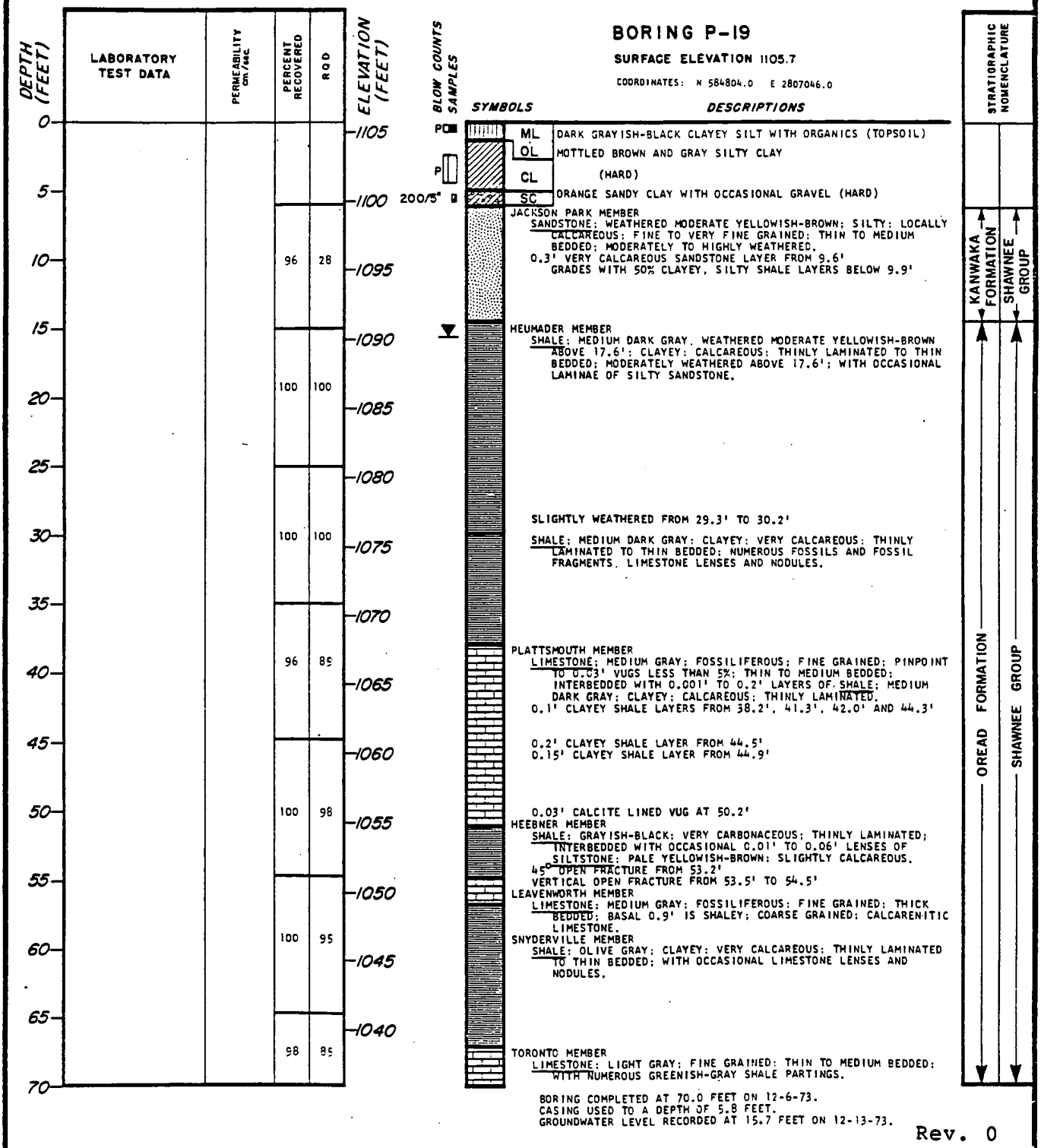
Log of Boring P-17



WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-35r

Log of Boring P-18

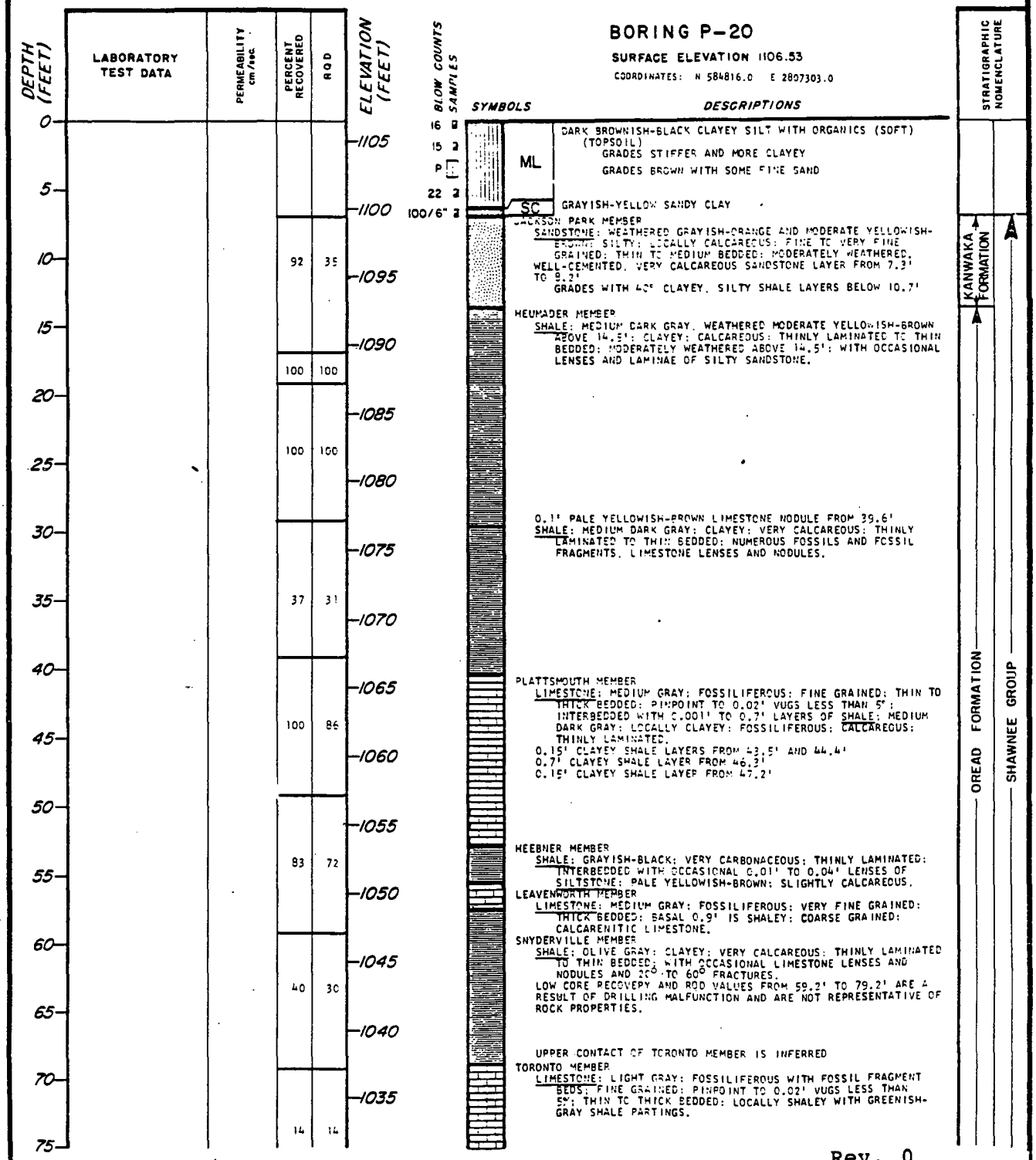


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-35s

Log of Boring P-19

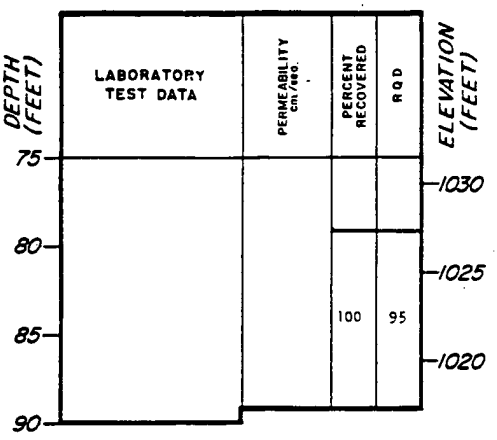


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-35t (Sheet 1 of 2)

Log of Boring P-20



BLOW COUNTS SAMPLES

SYMBOLS

BORING P-20 CONT'D

SURFACE ELEVATION

DESCRIPTIONS

SHALEY FROM 79.8' TO 81.4'

SHALE; OLIVE GRAY; SILTY; LOCALLY CARBONACEOUS; THINLY LAMINATED; WITH 5% LAMINAE OF VERY FINE GRAINED SANDSTONE. 30° OPEN FRACTURE FROM 87.2'

BORING COMPLETED AT 89.2 FEET ON 12-6-73.
CASING USED TO A DEPTH OF 7.0 FEET.
GROUNDWATER LEVEL RECORDED AT 10.0 FEET ON 12-7-73.
SECOND PIEZOMETER INSTALLED AT AN INTERVAL FROM 7.0 FEET TO 50.0 FEET ON 12-7-73.
FIRST PIEZOMETER INSTALLED AT AN INTERVAL FROM 69.5 FEET TO 86.0 FEET ON 12-7-73.
PIEZOMETER READINGS ARE PRESENTED ON TABLE 2.4-31.

STRATIGRAPHIC NOMENCLATURE

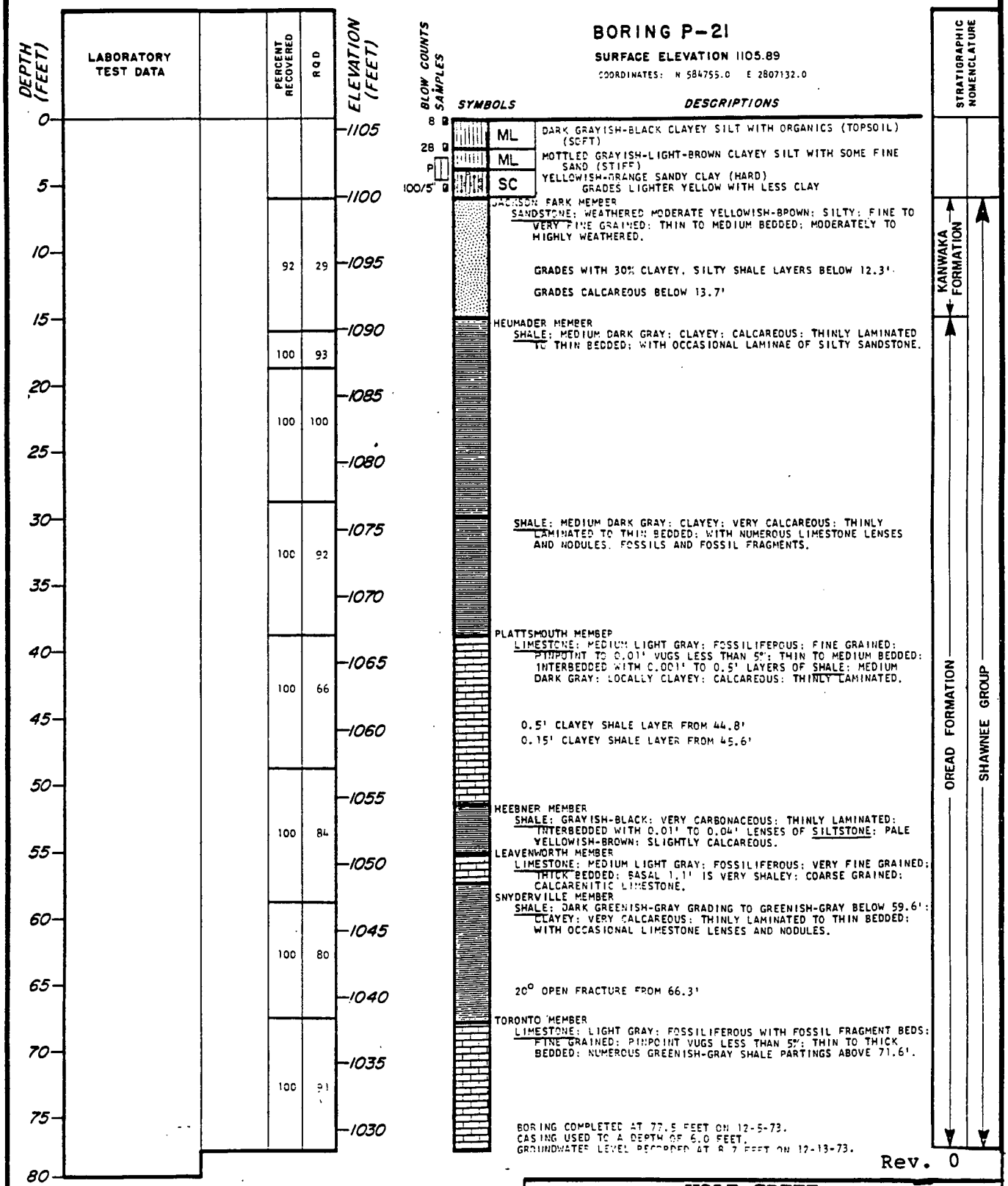
LAWRENCE FORMATION	OREAD FORMATION
DOUGLAS GROUP	SHAWNEE GROUP

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-35t (Sheet 2 of 2)

Log of Boring P-20

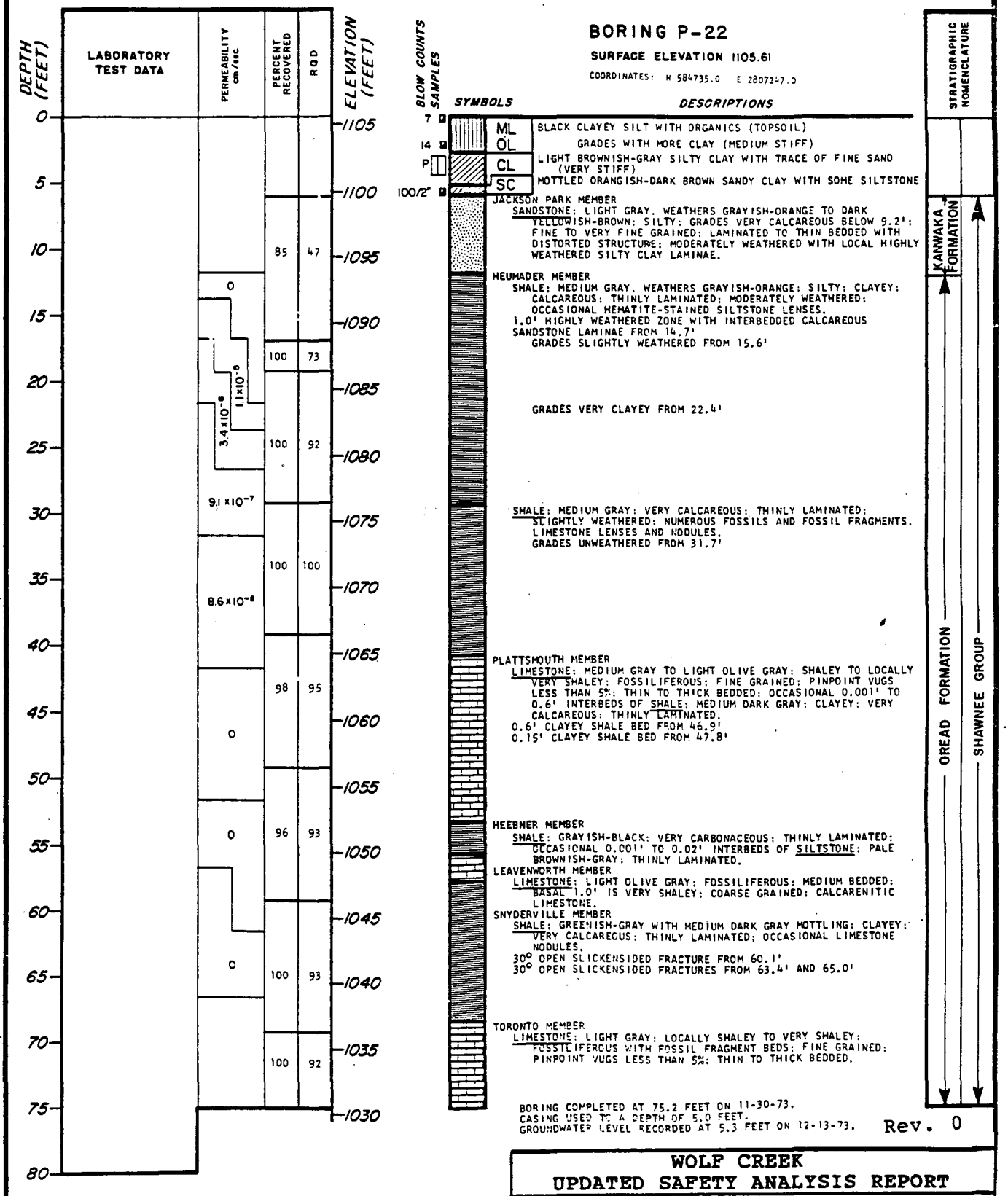


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-35u

Log of Boring P-21

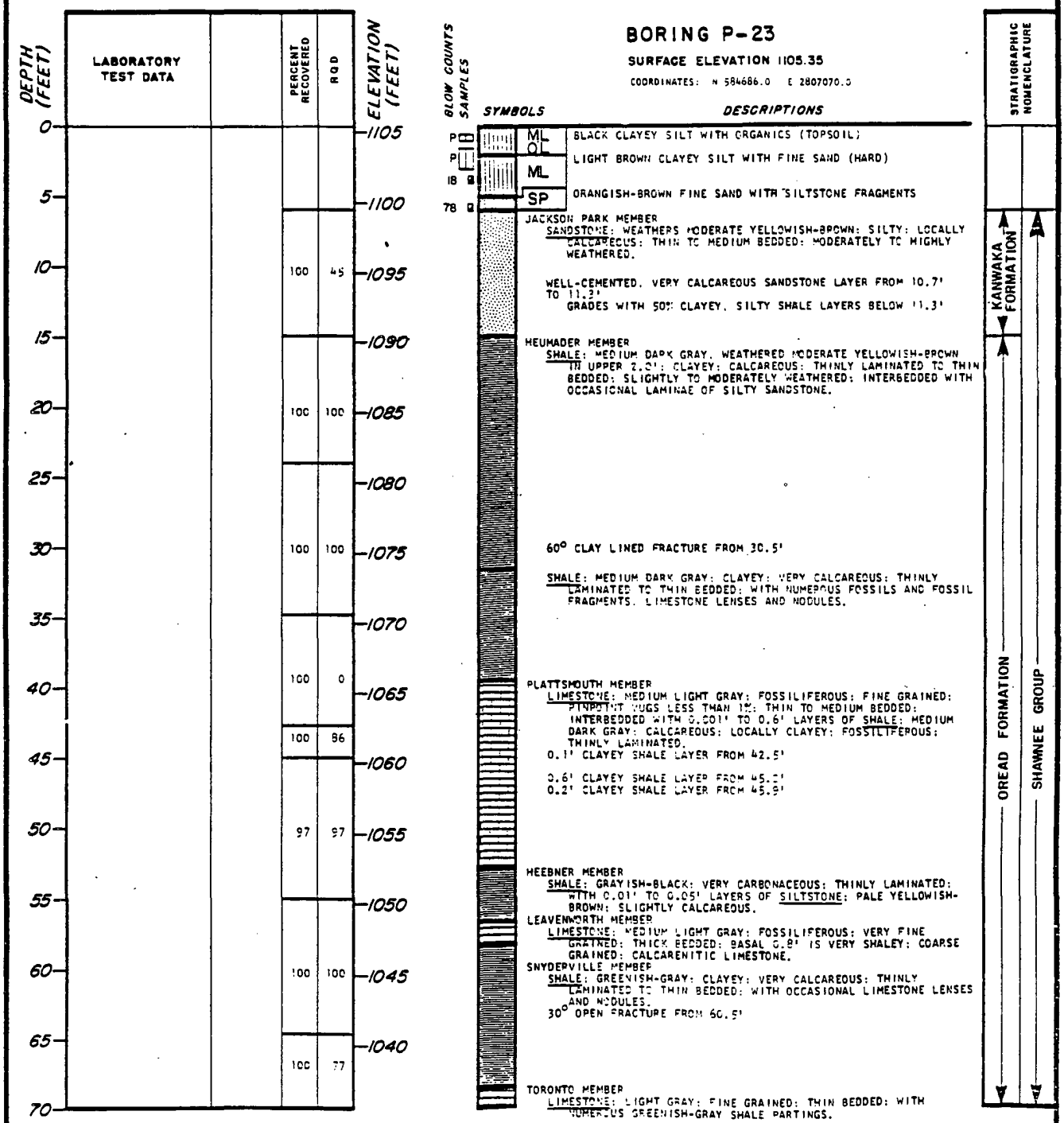


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-35v

Log of Boring P-22

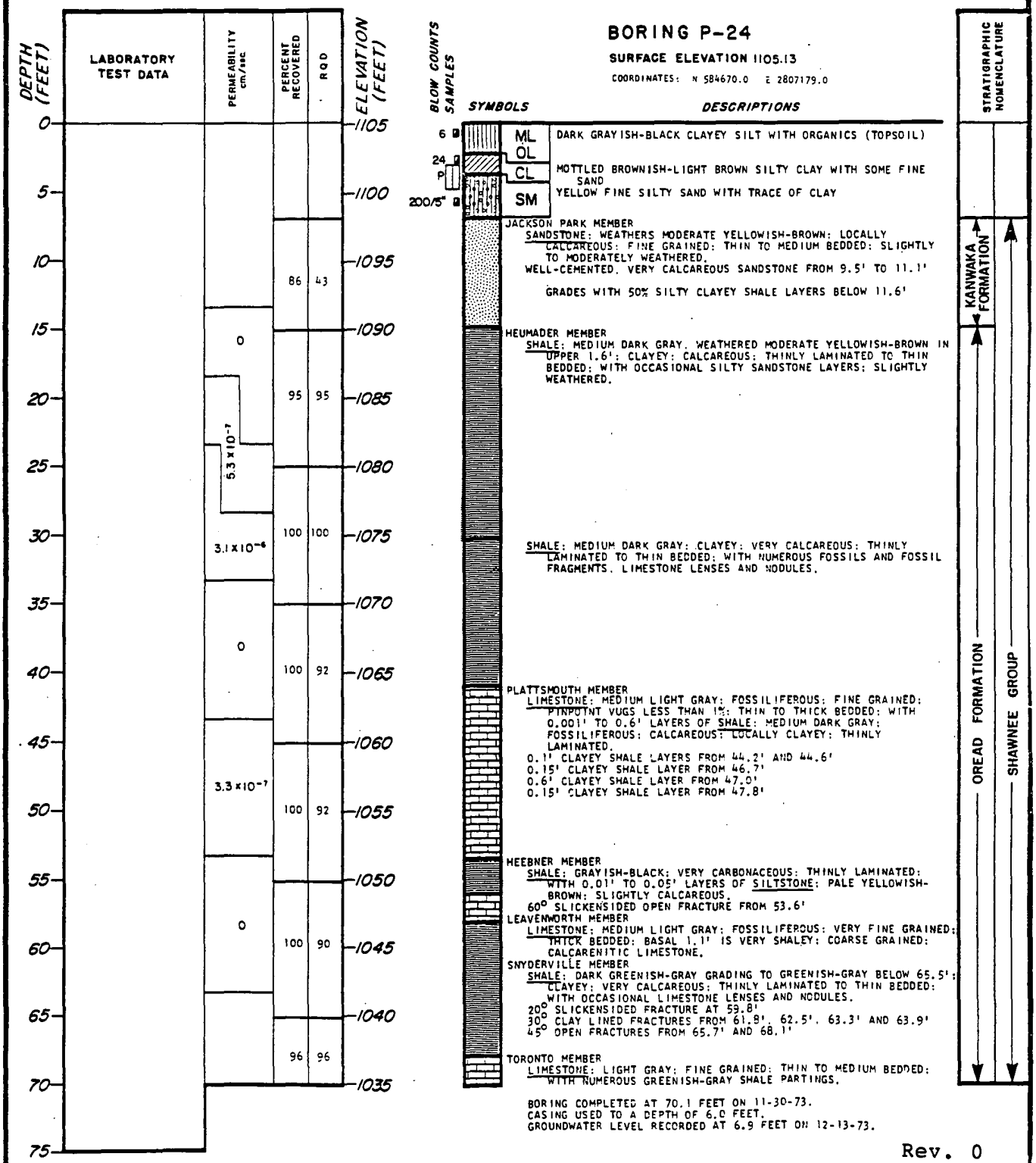


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-35w

Log of Boring P-23

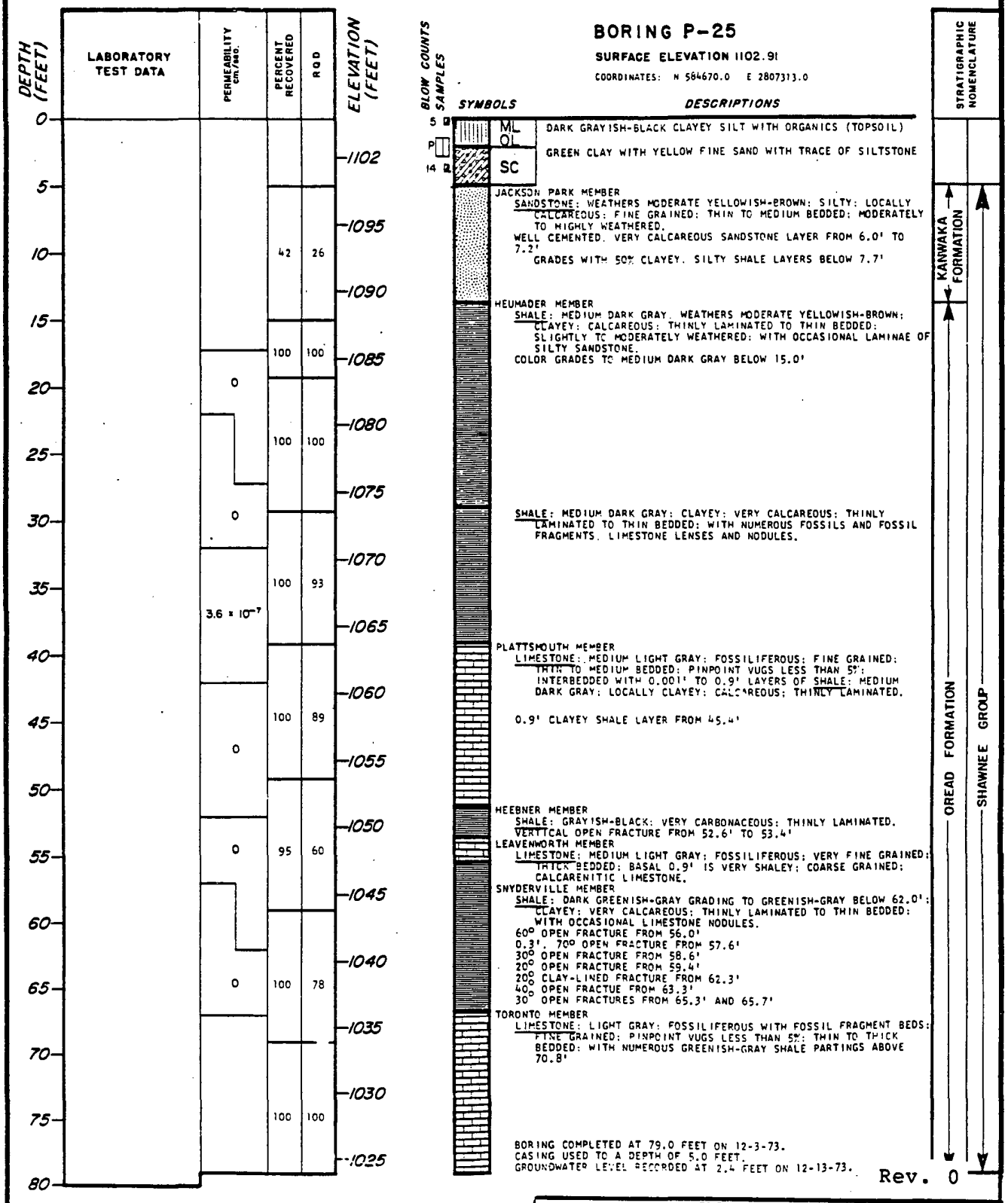


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-35x

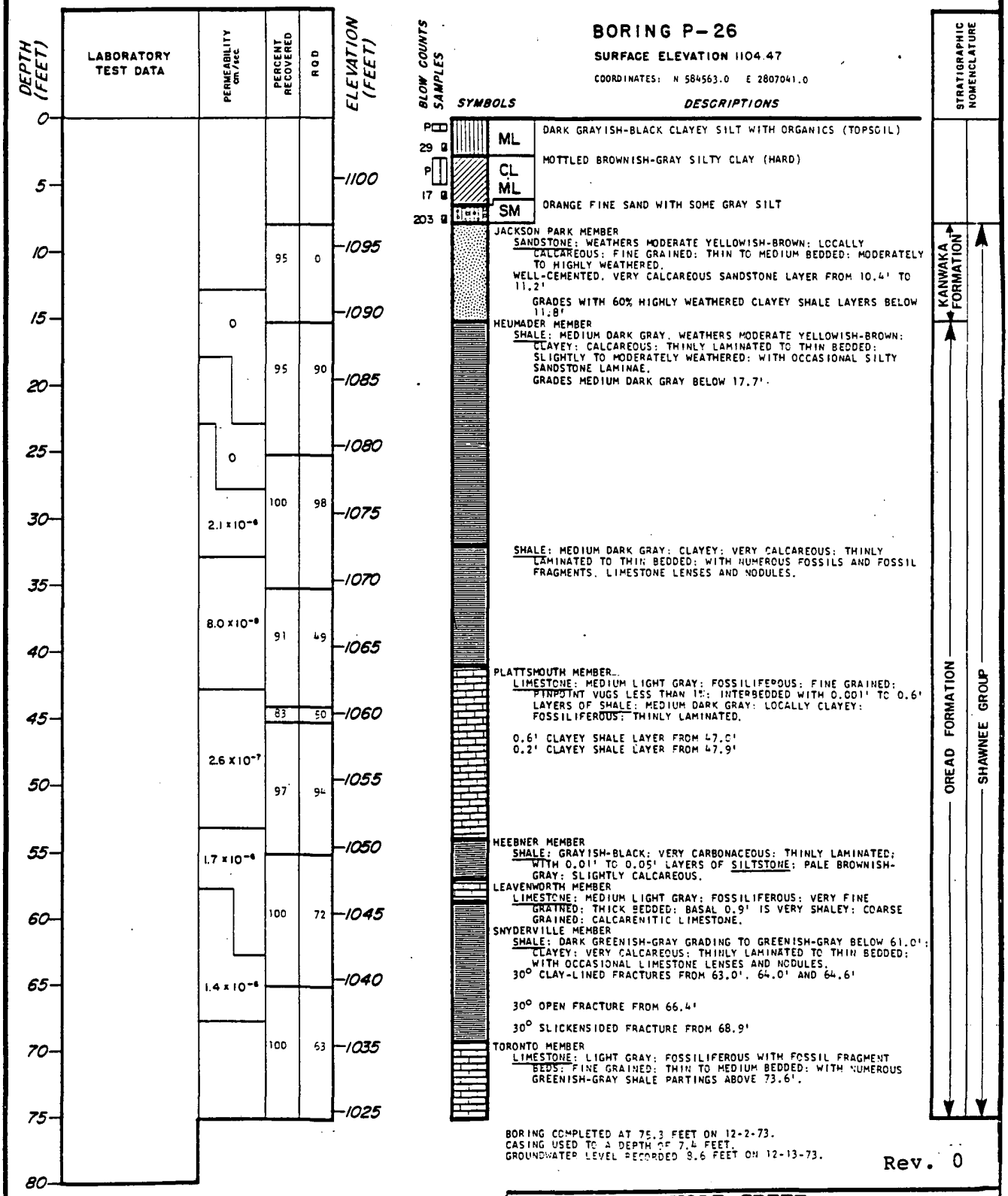
Log of Boring P-24



WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-35y

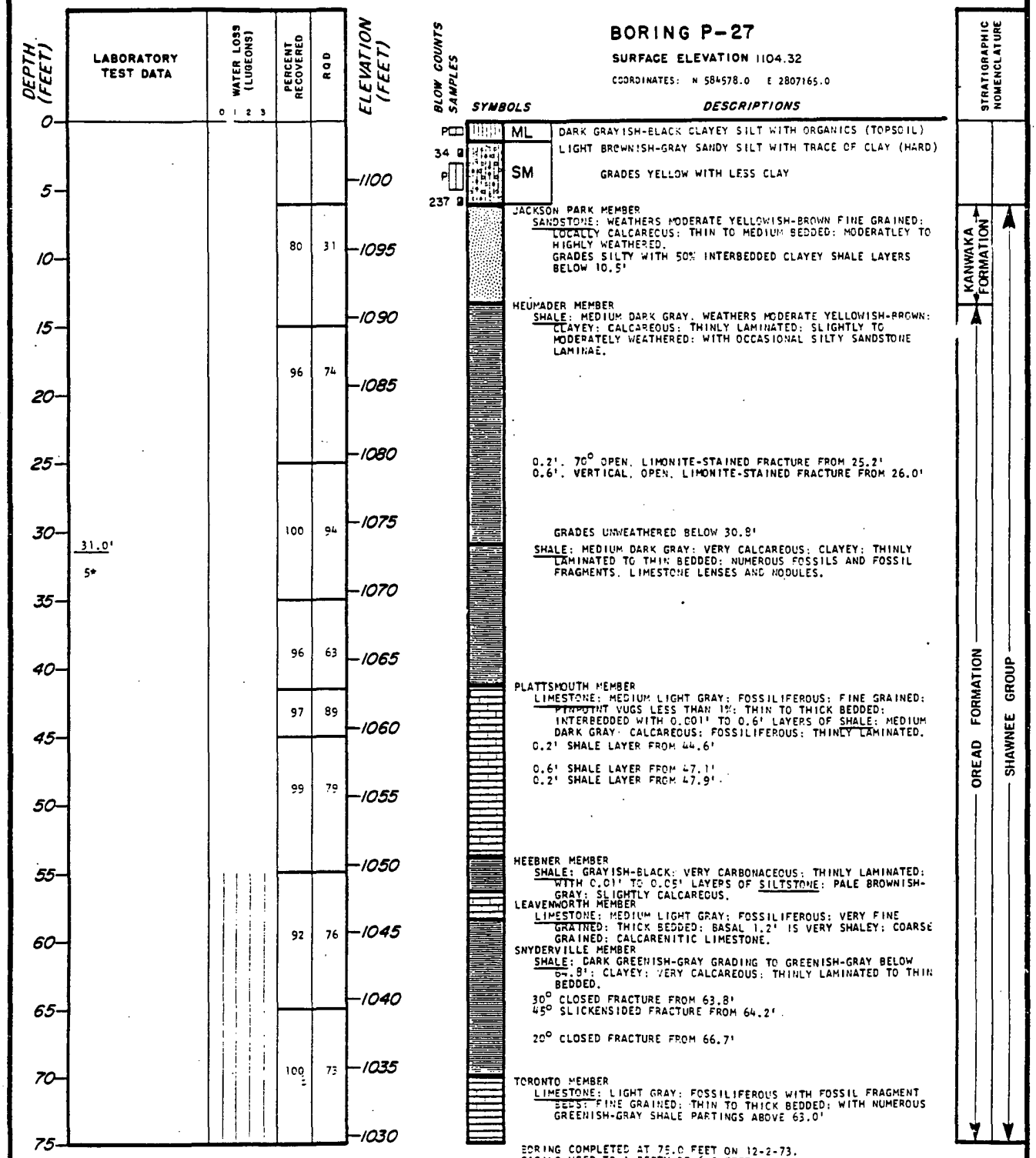
Log of Boring P-25



WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-35z

Log of Boring P-26

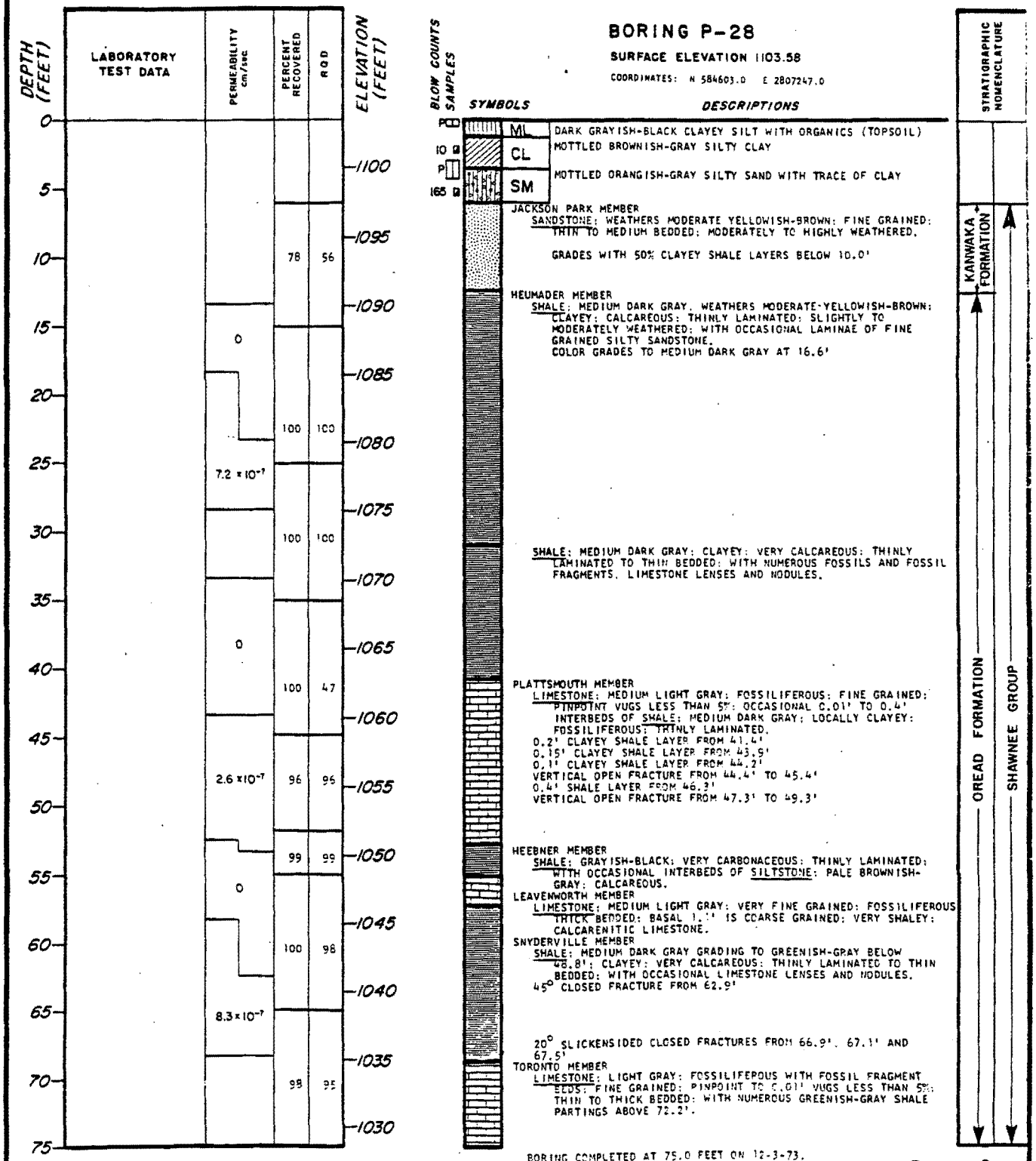


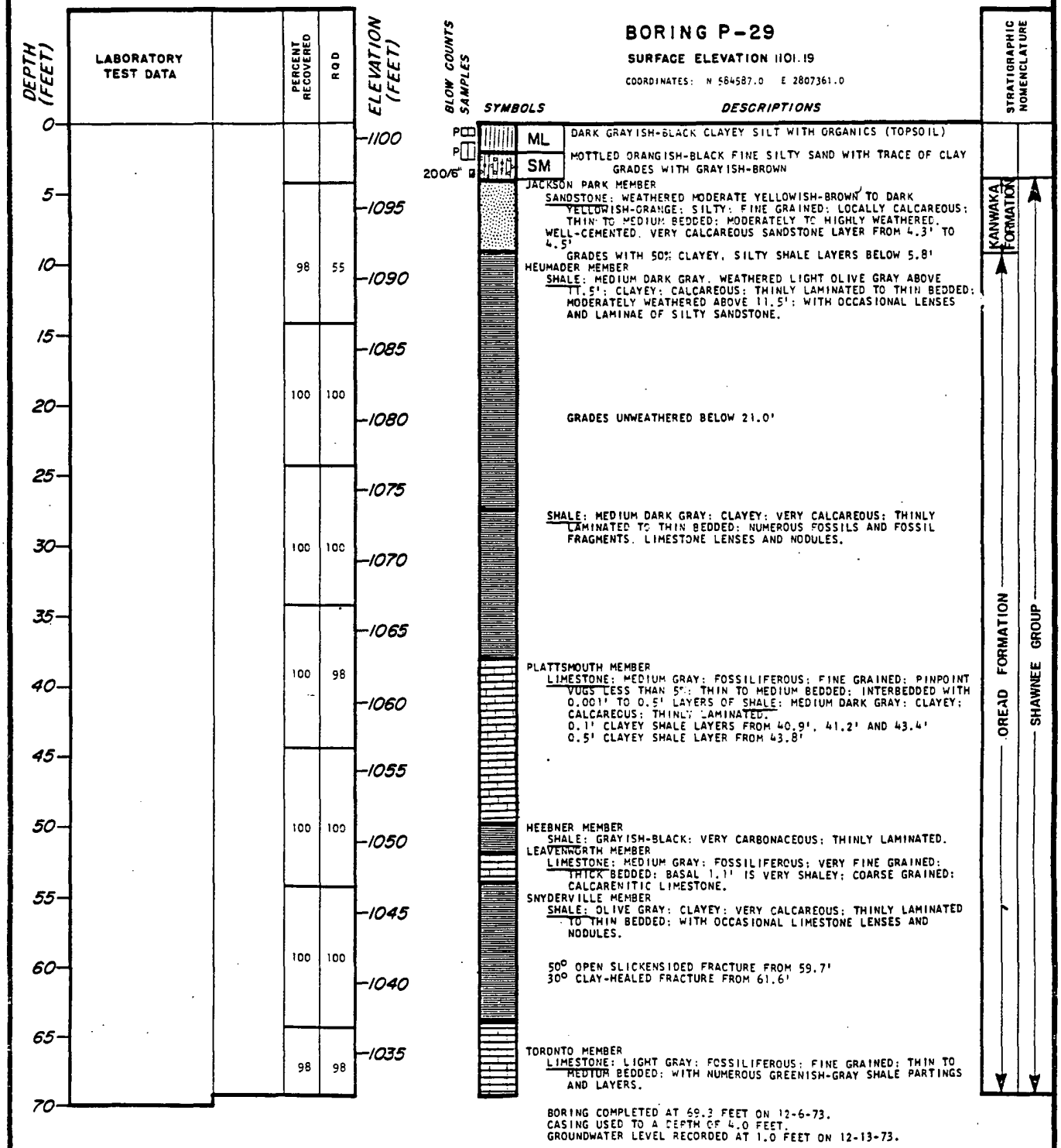
Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-35aa

Log of Boring P-27


BORING P-28
SURFACE ELEVATION 1103.58
COORDINATES: N 584603.0 E 2807247.0
DEPTH (FEET)
LABORATORY TEST DATA
PERMEABILITY cm/sec
PERCENT RECOVERED
RQD
ELEVATION (FEET)
BLOW COUNTS
SAMPLES
SYMBOLS
DESCRIPTIONS
STRATIGRAPHIC NOMENCLATURE
ML
CL
SM
DARK GRAYISH-BLACK CLAYEY SILT WITH ORGANICS (TOPSOIL)
MOTTLED BROWNISH-GRAY SILTY CLAY
MOTTLED ORANGISH-GRAY SILTY SAND WITH TRACE OF CLAY
JACKSON PARK MEMBER
SANDSTONE: WEATHERS MODERATE YELLOWISH-BROWN; FINE GRAINED; THIN TO MEDIUM BEDDED; MODERATELY TO HIGHLY WEATHERED.
GRADES WITH 50% CLAYEY SHALE LAYERS BELOW 10.0'
HEUMADER MEMBER
SHALE: MEDIUM DARK GRAY, WEATHERS MODERATE-YELLOWISH-BROWN; CLAYEY; CALCAREOUS; THINLY LAMINATED; SLIGHTLY TO MODERATELY WEATHERED; WITH OCCASIONAL LAMINAE OF FINE GRAINED SILTY SANDSTONE.
COLOR GRADES TO MEDIUM DARK GRAY AT 16.6'
SHALE: MEDIUM DARK GRAY; CLAYEY; VERY CALCAREOUS; THINLY LAMINATED TO THIN BEDDED; WITH NUMEROUS FOSSILS AND FOSSIL FRAGMENTS, LIMESTONE LENSES AND NODULES.
PLATTSMOUTH MEMBER
LIMESTONE: MEDIUM LIGHT GRAY; FOSSILIFEROUS; FINE GRAINED; PINPOINT VUGS LESS THAN 5%; OCCASIONAL 0.01' TO 0.4' INTERBEDS OF SHALE; MEDIUM DARK GRAY; LOCALLY CLAYEY; FOSSILIFEROUS; THINLY LAMINATED.
0.2' CLAYEY SHALE LAYER FROM 41.4'
0.15' CLAYEY SHALE LAYER FROM 43.9'
0.1' CLAYEY SHALE LAYER FROM 44.2'
VERTICAL OPEN FRACTURE FROM 44.4' TO 45.4'
0.4' SHALE LAYER FROM 46.3'
VERTICAL OPEN FRACTURE FROM 47.3' TO 49.3'
HEEBNER MEMBER
SHALE: GRAYISH-BLACK; VERY CARBONACEOUS; THINLY LAMINATED; WITH OCCASIONAL INTERBEDS OF SILTSTONE; PALE BROWNISH-GRAY; CALCAREOUS.
LEAVENWORTH MEMBER
LIMESTONE: MEDIUM LIGHT GRAY; VERY FINE GRAINED; FOSSILIFEROUS; THICK BEDDED; BASAL 1.1' IS COARSE GRAINED; VERY SHALEY; CALCARENITIC LIMESTONE.
SNYDERVILLE MEMBER
SHALE: MEDIUM DARK GRAY GRADING TO GREENISH-GRAY BELOW 68.8'; CLAYEY; VERY CALCAREOUS; THINLY LAMINATED TO THIN BEDDED; WITH OCCASIONAL LIMESTONE LENSES AND NODULES.
45° CLOSED FRACTURE FROM 62.9'
20° SLICKENSIDED CLOSED FRACTURES FROM 66.9', 67.1' AND 67.5'
TORONTO MEMBER
LIMESTONE: LIGHT GRAY; FOSSILIFEROUS WITH FOSSIL FRAGMENT MOLDS; FINE GRAINED; PINPOINT TO 0.01' VUGS LESS THAN 5%; THIN TO THICK BEDDED; WITH NUMEROUS GREENISH-GRAY SHALE PARTINGS ABOVE 72.2'.
KANWAKA FORMATION
OREAD FORMATION
SHAWNEE GROUP
BORING COMPLETED AT 75.0 FEET ON 12-3-73.
CASING USED TO A DEPTH OF 5.6 FEET.
GROUNDWATER LEVEL RECORDED AT 4.6 FEET ON 12-13-73
Rev. 0
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT
Figure 2.5-35bb
Log of Boring P-28



Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-35cc

Log of Boring P-29

BORING P-30

SURFACE ELEVATION 1103.4

COORDINATES: N 584479.0 E 2807146.0

DEPTH (FEET)	LABORATORY TEST DATA	PERMEABILITY cm/sec	PERCENT RECOVERED	RQD	ELEVATION (FEET)
0					1103
5					
10	12.1' 5*		70	37	1095
15					1090
			97	78	1085
20			100	88	
25					1080
30					1075
			100	93	1070
35					
40					1065
			100	74	1060
45					
50					1055
			100	91	1050
55					
60					1045
			100	71	1040
65					
70					1035
			100	90	1030
75					
80					1025

BLOW COUNTS SAMPLES

PC
10
P
70

SYMBOLS

DESCRIPTIONS

ML OL — DARK GRAYISH-BLACK CLAYEY SILT WITH ORGANICS (TOPSOIL)

ML — DARK BROWNISH-GRAY SILT WITH SILTSTONE CLAY

SM — YELLOW SILTY SAND WITH SOME SILTSTONE FRAGMENTS

JACKSON PARK MEMBER
SANDSTONE: WEATHERS GRAYISH-ORANGE: VERY SILTY; VERY CALCAREOUS; FINE TO VERY FINE GRAINED; LAMINATED TO THIN BEDDED WITH DISTORTED STRUCTURE; MODERATLEY WEATHERED WITH HIGHLY WEATHERED SILTY CLAY LAMINAE.

HEUMADER MEMBER
SHALE: MEDIUM GRAY, WEATHERS MODERATE YELLOWISH-BROWN; CLAYEY; CALCAREOUS; THINLY LAMINATED; MODERATELY WEATHERED; OCCASIONAL MODERATE BROWN SILTSTONE INTERBEDS, AND HEMATITE-STAINED CONCRETIONS.
GRADES TO SLIGHTLY WEATHERED AT 17.5'

30° OPEN FRACTURE FROM 18.5'

GRADES UNWEATHERED WITH OCCASIONAL LIMONITE STAINED HORIZONTAL PARTINGS FROM 28.5'

SHALE: MEDIUM GRAY; VERY CALCAREOUS; VERY CLAYEY; THINLY LAMINATED; FOSSILS AND FOSSIL FRAGMENTS, LIMESTONE LENSES AND NODULES.

PLATTSMOUTH MEMBER
LIMESTONE: MEDIUM GRAY TO LIGHT OLIVE GRAY; SHALEY TO LOCALLY VERY SHALEY; FOSSILIFEROUS; FINE GRAINED; PINPOINT VUGS LESS THAN 5%; THIN TO THICK BEDDED; OCCASIONAL 0.001' TO 0.5' INTERBEDS OF SHALE: MEDIUM GRAY; LOCALLY CLAYEY; CALCAREOUS; THINLY LAMINATED.

0.5' CLAYEY SHALE BED FROM 48.4'
0.1' CLAYEY SHALE LAYER FROM 49.3'

HEEBNER MEMBER
SHALE; GRAYISH-BLACK; VERY CARBONACEOUS; THINLY LAMINATED; OCCASIONAL 0.001' TO 0.05' INTERBEDS OF SILTSTONE; PALE BROWNISH-GRAY; THINLY LAMINATED TO THIN BEDDED.

LEAVENWORTH MEMBER
LIMESTONE: MEDIUM GRAY; FOSSILIFEROUS; VERY FINE GRAINED; MEDIUM BEDDED; BASAL 1.0' IS VERY SHALEY; COARSE GRAINED; CALCARENITIC LIMESTONE.

SNYDERVILLE MEMBER
SHALE; GREENISH-GRAY WITH MEDIUM DARK GRAY MOTTLING; VERY CALCAREOUS; THINLY LAMINATED; OCCASIONAL LIMESTONE NODULES.
30° OPEN FRACTURES FROM 62.2', 63.7', 64.0', 64.3', 65.3' AND 65.9'

45° OPEN SLICKENSIDED FRACTURES FROM 66.3', 67.1' AND 68.1'
0.5' BROKEN ZONE WITH VERTICAL OPEN FRACTURE FROM 67.4'
0.9' CLAYEY BROKEN ZONE WITH NUMEROUS 45° TO VERTICAL OPEN FRACTURES FROM 68.2'

TORONTO MEMBER
LIMESTONE: LIGHT GRAY; FOSSILIFEROUS WITH FOSSIL FRAGMENT BEDS; LOCALLY SHALEY TO VERY SHALEY; FINE GRAINED; PINPOINT VUGS LESS THAN 5%; THIN TO THICK BEDDED.

BORING COMPLETED AT 79.0 FEET ON 12-2-73.
CASING USED TO A DEPTH OF 5.5 FEET.
GROUNDWATER LEVEL RECORDED AT 7.0 FEET ON 12-13-73.

STRATIGRAPHIC NOMENCLATURE

KANWAKA FORMATION

OREAD FORMATION

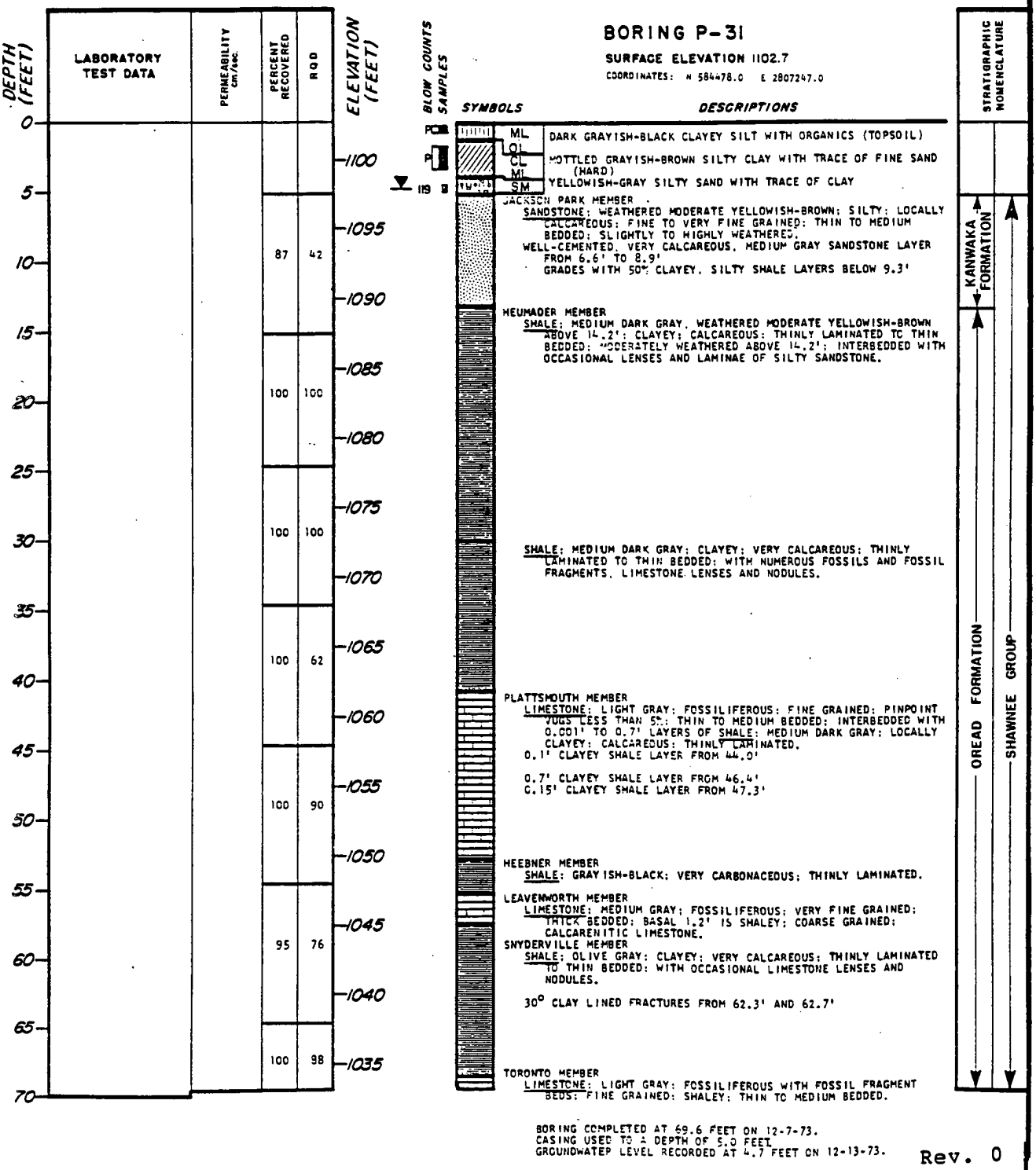
SHAWNEE GROUP

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-35dd

Log of Boring P-30

Rev. 0



JACKSON PARK MEMBER
SANDSTONE: WEATHERED MODERATE YELLOWISH-BROWN; SILTY; LOCALLY CALCAREOUS; FINE TO VERY FINE GRAINED; THIN TO MEDIUM BEDDED; SLIGHTLY TO HIGHLY WEATHERED.
WELL-CEMENTED, VERY CALCAREOUS, MEDIUM GRAY SANDSTONE LAYER FROM 6.6' TO 8.9'
GRADES WITH 50% CLAYEY, SILTY SHALE LAYERS BELOW 9.3'

HEUMADER MEMBER
SHALE: MEDIUM DARK GRAY, WEATHERED MODERATE YELLOWISH-BROWN ABOVE 14.2'; CLAYEY; CALCAREOUS; THINLY LAMINATED TO THIN BEDDED; MODERATELY WEATHERED ABOVE 14.2'; INTERBEDDED WITH OCCASIONAL LENSES AND LAMINAE OF SILTY SANDSTONE.

SHALE: MEDIUM DARK GRAY; CLAYEY; VERY CALCAREOUS; THINLY LAMINATED TO THIN BEDDED; WITH NUMEROUS FOSSILS AND FOSSIL FRAGMENTS, LIMESTONE LENSES AND NODULES.

PLATTSMOUTH MEMBER
LIMESTONE: LIGHT GRAY; FOSSILIFEROUS; FINE GRAINED; PINPOINT VUGS LESS THAN 5%; THIN TO MEDIUM BEDDED; INTERBEDDED WITH 0.001' TO 0.7' LAYERS OF SHALE; MEDIUM DARK GRAY; LOCALLY CLAYEY; CALCAREOUS; THINLY LAMINATED.
0.1' CLAYEY SHALE LAYER FROM 44.0'

0.7' CLAYEY SHALE LAYER FROM 46.4'
0.15' CLAYEY SHALE LAYER FROM 47.3'

HEEBNER MEMBER
SHALE: GRAYISH-BLACK; VERY CARBONACEOUS; THINLY LAMINATED.

LEAVENWORTH MEMBER
LIMESTONE: MEDIUM GRAY; FOSSILIFEROUS; VERY FINE GRAINED; THICK BEDDED; BASAL 1.2' IS SHALEY; COARSE GRAINED; CALCARENITIC LIMESTONE.
SNYDERVILLE MEMBER
SHALE: OLIVE GRAY; CLAYEY; VERY CALCAREOUS; THINLY LAMINATED TO THIN BEDDED; WITH OCCASIONAL LIMESTONE LENSES AND NODULES.

30° CLAY LINED FRACTURES FROM 62.3' AND 62.7'

TORONTO MEMBER
LIMESTONE: LIGHT GRAY; FOSSILIFEROUS WITH FOSSIL FRAGMENT BEDS; FINE GRAINED; SHALEY; THIN TO MEDIUM BEDDED.

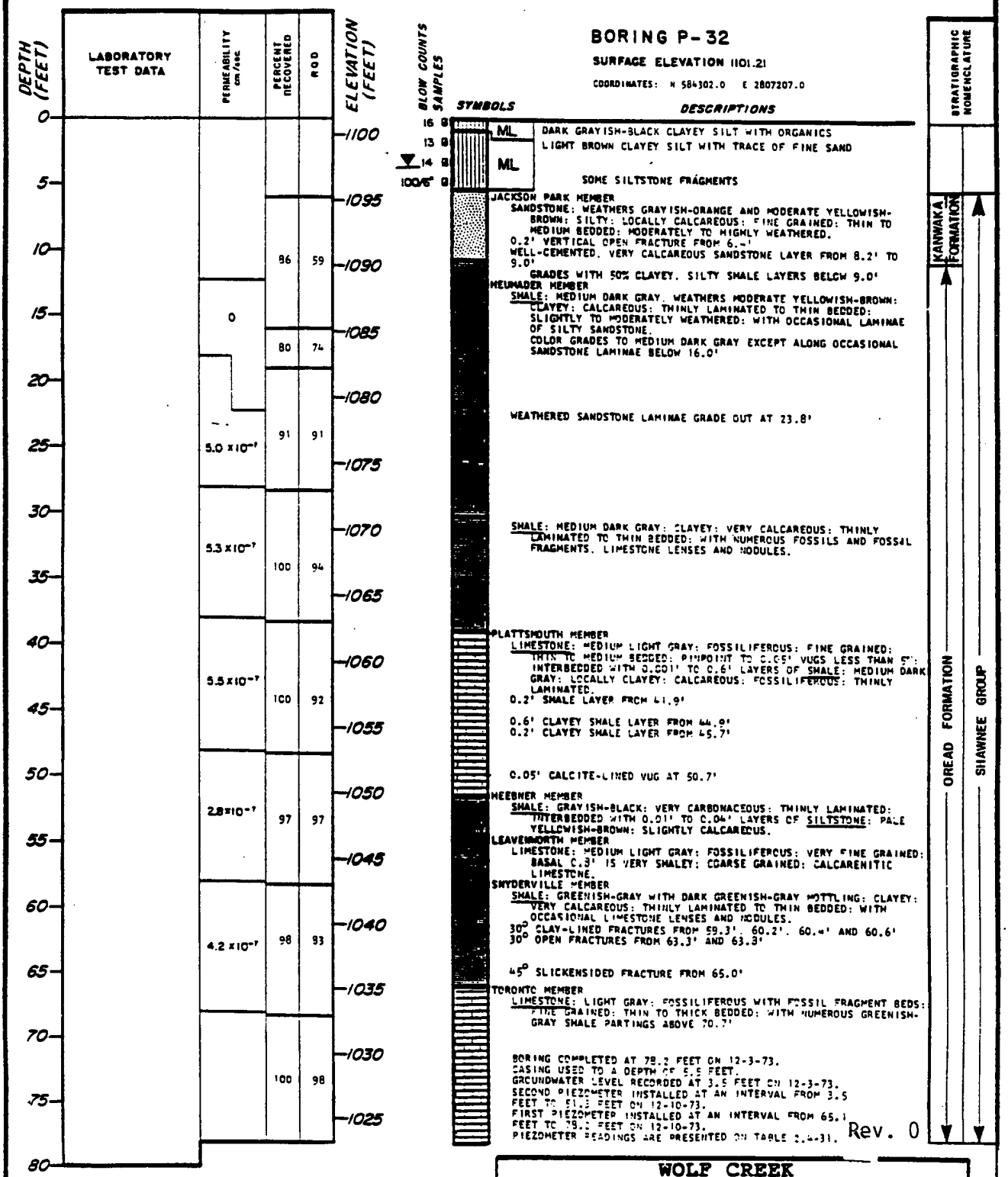
BORING COMPLETED AT 69.6 FEET ON 12-7-73.
CASING USED TO A DEPTH OF 5.0 FEET.
GROUNDWATER LEVEL RECORDED AT 4.7 FEET ON 12-13-73.

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-35ee

Log of Boring P-31

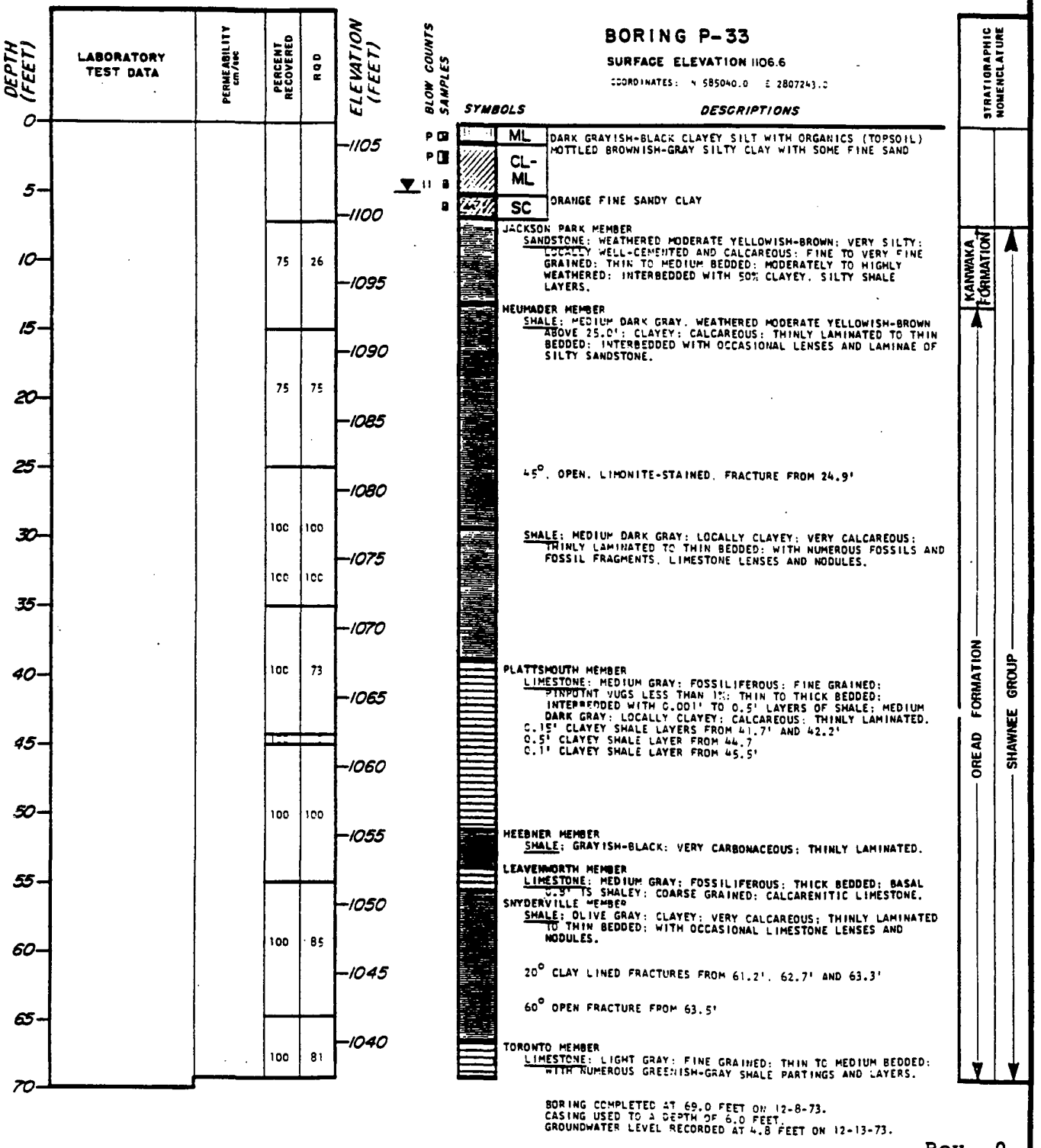


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-35ff

Log of Boring P-32

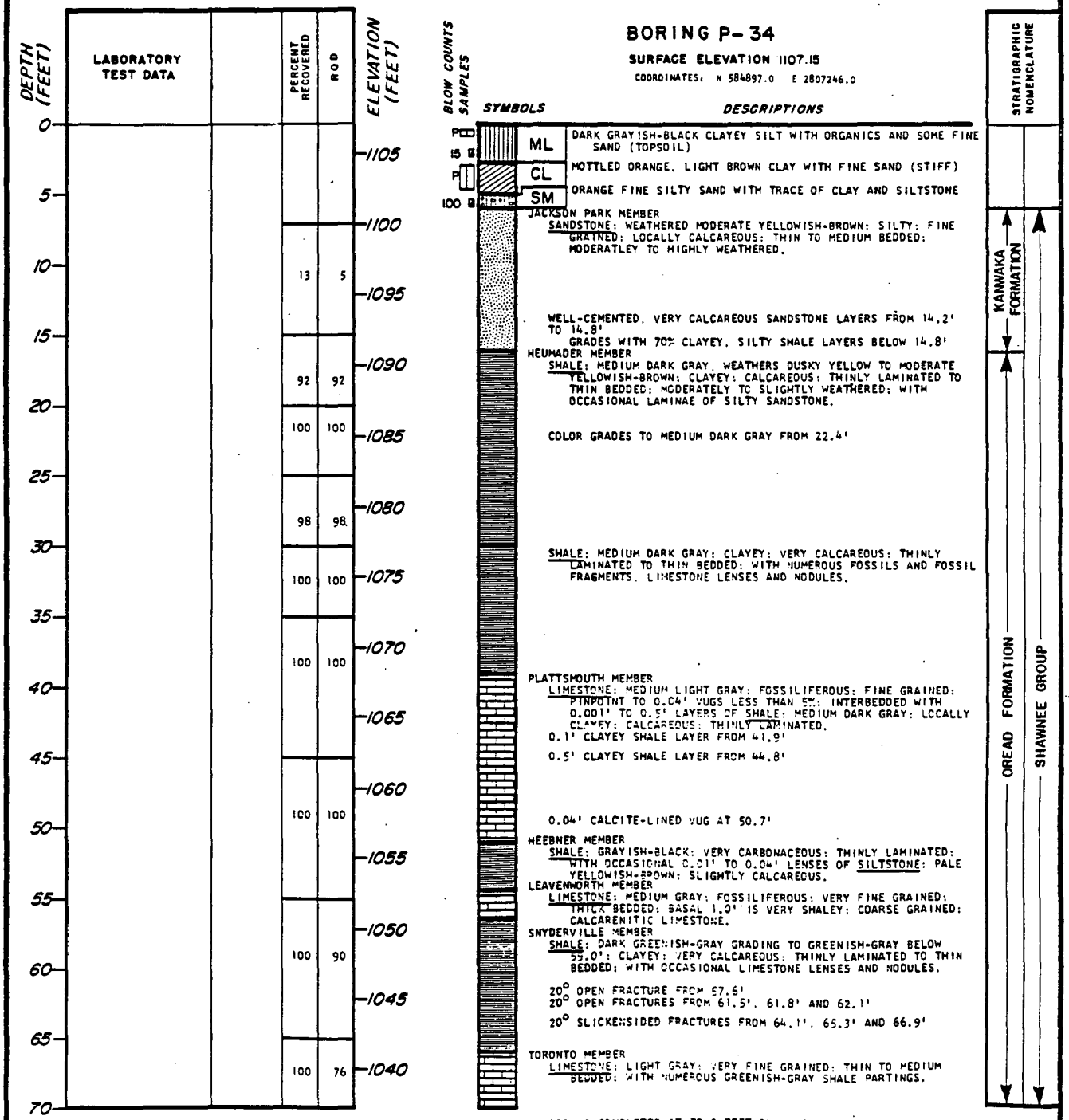


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-35gg

Log of Boring P-33

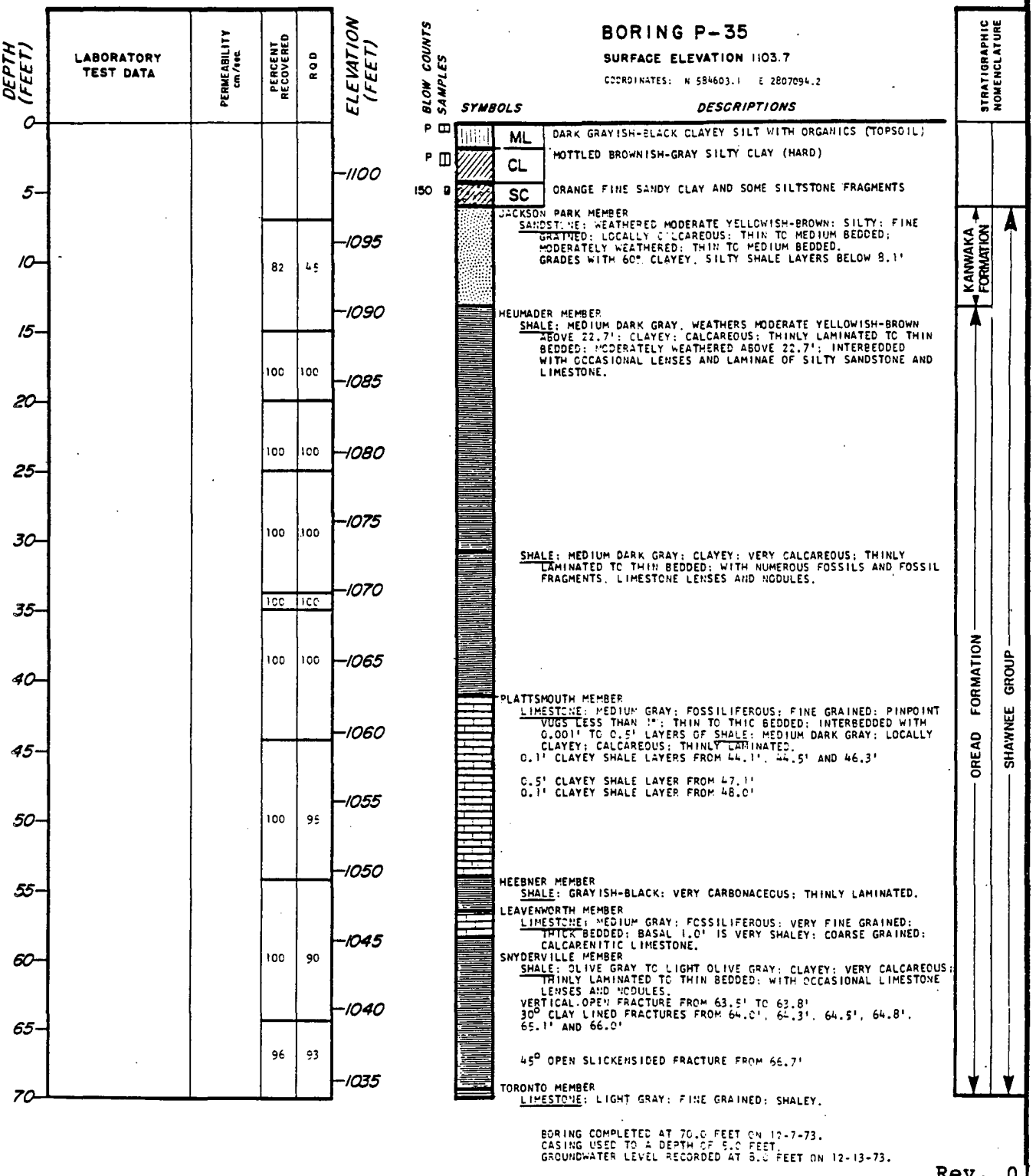


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-35hh

Log of Boring P-34

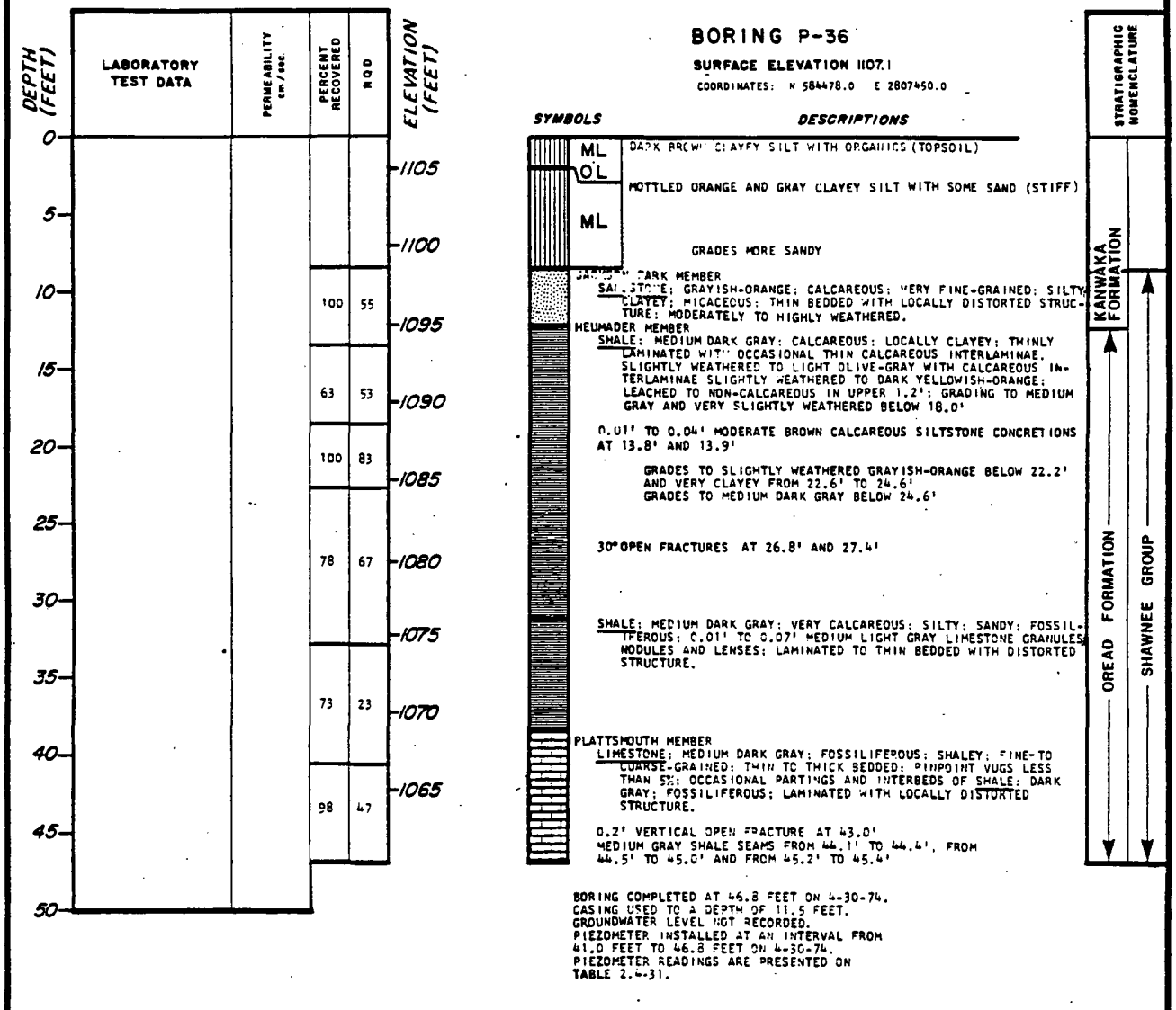


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-35ii

Log of Boring P-35



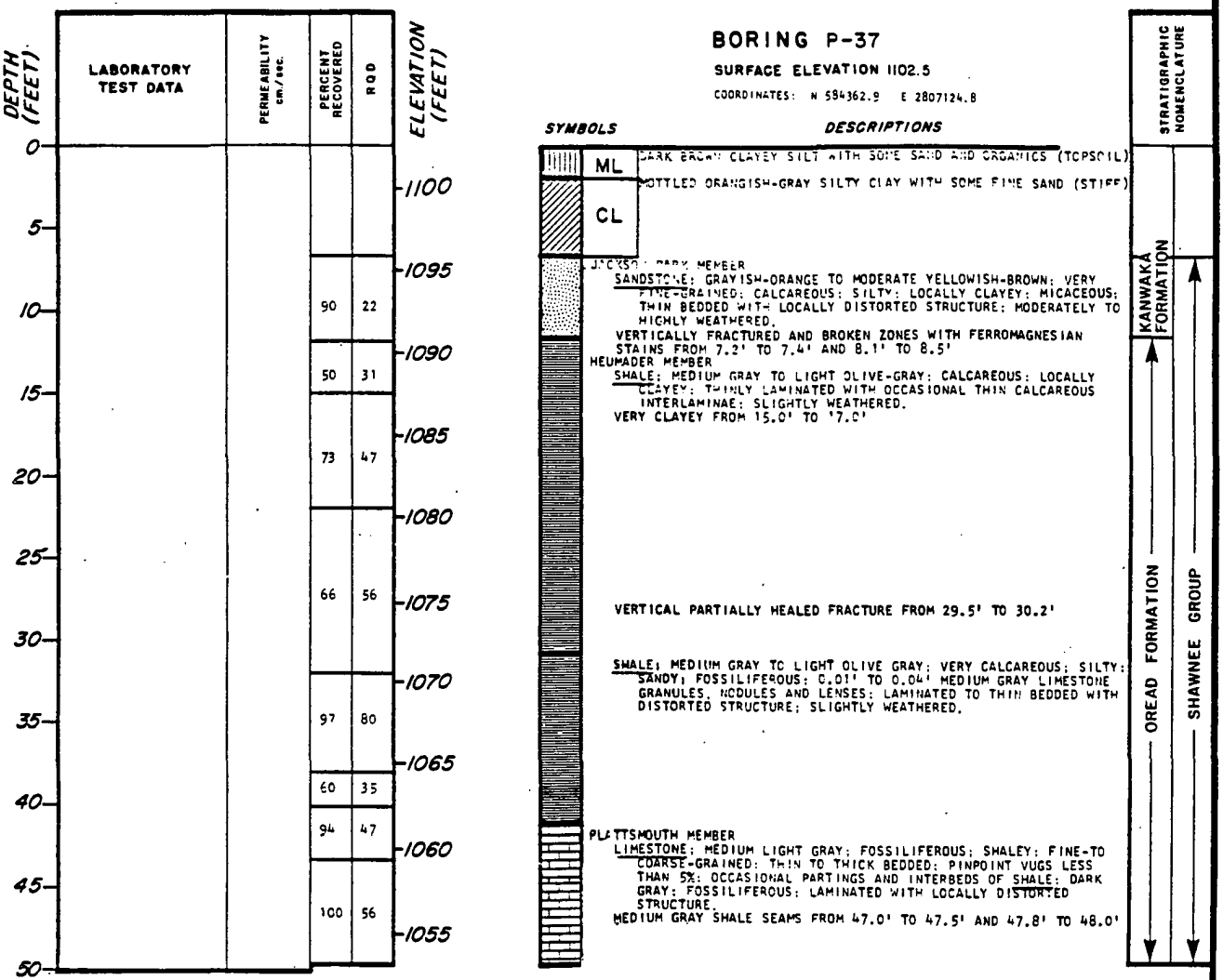
BORING COMPLETED AT 46.8 FEET ON 4-30-74.
CASING USED TO A DEPTH OF 11.5 FEET.
GROUNDWATER LEVEL NOT RECORDED.
PIEZOMETER INSTALLED AT AN INTERVAL FROM 41.0 FEET TO 46.8 FEET ON 4-30-74.
PIEZOMETER READINGS ARE PRESENTED ON TABLE 2.4-31.

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-35jj

Log of Boring P-36



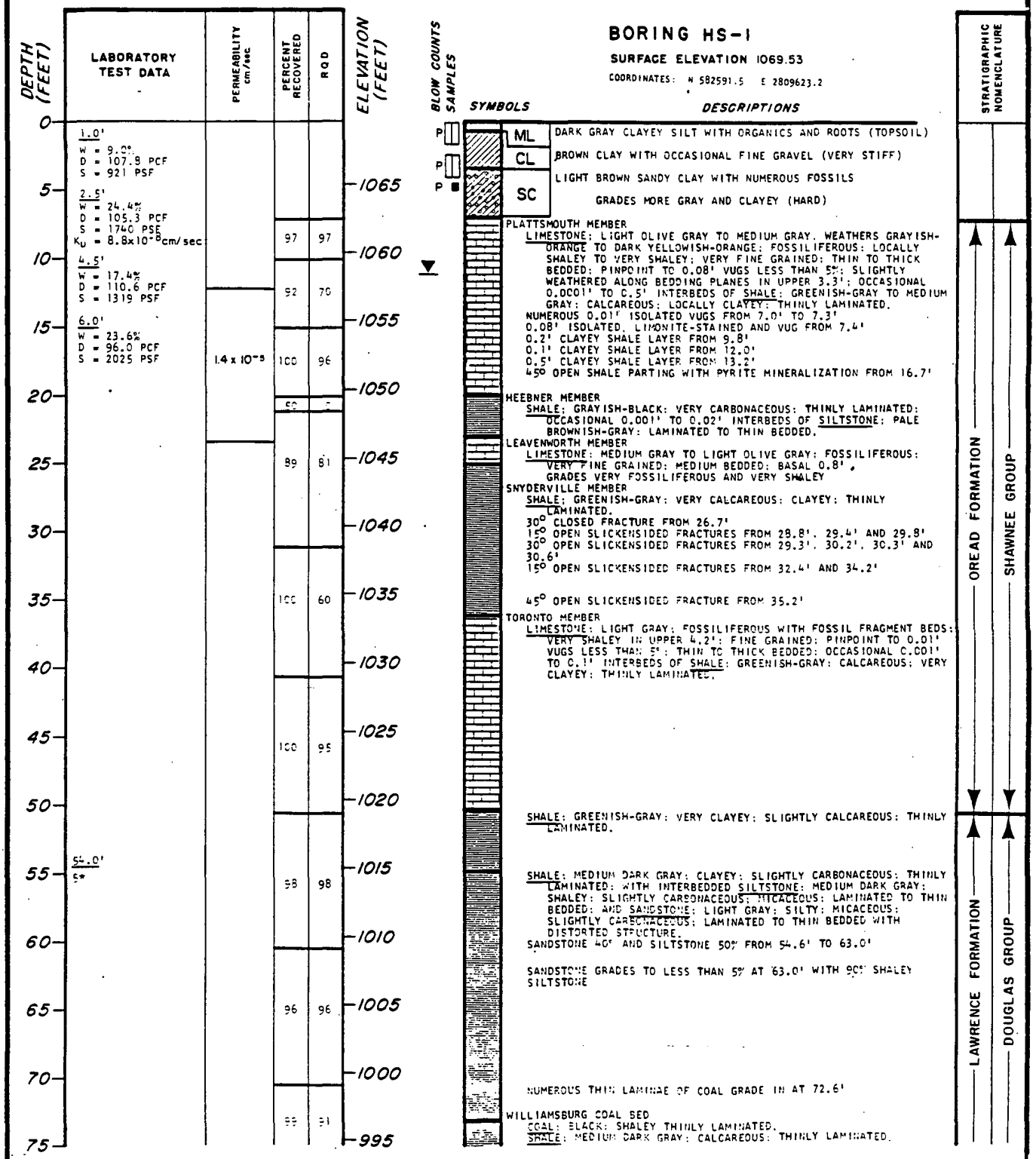
BORING COMPLETED AT 49.7 FEET ON 5-1-74.
CASING USED TO A DEPTH OF 15.0 FEET.
GROUNDWATER LEVEL NOT RECORDED
PIEZOMETER INSTALLED AT AN INTERVAL FROM 44.0 FEET TO 49.7 FEET ON 5-1-74.
PIEZOMETER READINGS ARE PRESENTED ON TABLE 2.4-31.

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-35kk

Log of Boring P-37

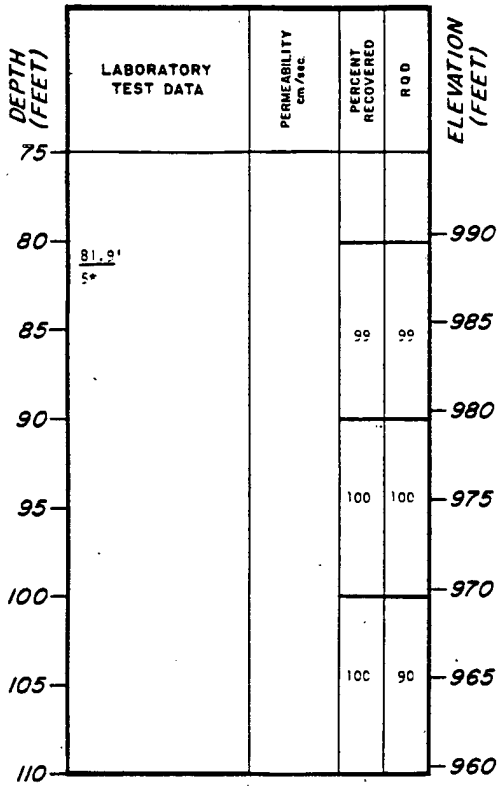


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36a (Sheet 1 of 2)

Log of Boring HS-1

Rev. 0



BLOW COUNTS SAMPLES

BORING HS-1 CONT'D.

SYMBOLS

DESCRIPTIONS

15° OPEN SLICKENSIDED FRACTURES FROM 73.9', 74.2' AND 74.5'
30° CLOSED FRACTURES FROM 74.7', 75.0', 75.2' AND 75.6'
45° OPEN SLICKENSIDED FRACTURE FROM 75.7'

AMAZONIA MEMBER

SHALE: GREENISH-GRAY; VERY CALCAREOUS; LOCALLY CLAYEY; THINLY LAMINATED WITH OCCASIONAL LIMESTONE LENSES AND NODULES. NUMEROUS 30° TO 45° OPEN AND CLOSED FRACTURES FROM 79.2' TO 80.5'

LIMESTONE: GREENISH-GRAY; SILTY; SHALEY; FINE GRAINED; THIN TO MEDIUM BEDDED.

IRELAND MEMBER

SHALE: GREENISH-GRAY; CALCAREOUS; THINLY LAMINATED WITH OCCASIONAL LIMESTONE NODULES AND THIN LIGHT GRAY SANDSTONE LAMINAE.

60° OPEN FRACTURE FROM 84.2'
SHALE GRADES TO MEDIUM GRAY AT 84.5'
0.1' VERTICAL OPEN FRACTURE FROM 86.0'
PALE BROWN CONCRETIONS GRADE IN AT 97.1'
SANDSTONE GRADES TO 20% FROM 87.3' WITH 80% SILTY SHALE
SANDSTONE 10% AND SILTY SHALE 90% FROM 90.0' TO 95.7'
30° OPEN FRACTURE FROM 93.9'

30° OPEN FRACTURES FROM 95.2', 95.3' AND 96.0'
NUMEROUS HIGH-ANGLE OPEN FRACTURES FROM 96.0' TO 97.9'
SANDSTONE LESS THAN 5% AND SILTY SHALE 95% FROM 95.7' TO 101.0'

0.5' VERTICAL OPEN FRACTURE FROM 98.4'

0.5' BROKEN ZONE WITH 30° TO 60° OPEN FRACTURES FROM 99.5'

COAL: BLACK WITH MODERATE BROWN INTERLAMINATIONS; SHALEY; THINLY LAMINATED.
0.01' TO 0.05' VERTICAL CALCITE-HEALED FRACTURE FROM 101.0' TO 101.2'

SHALE: MEDIUM GRAY TO DARK GRAY; SLIGHTLY CARBONACEOUS; THINLY LAMINATED; WITH INTERBEDDED SANDSTONE: LIGHT GRAY; SILTY; SLIGHTLY CARBONACEOUS; MICACEOUS; FINE GRAINED; THINLY LAMINATED TO THIN BEDDED WITH DISTORTED STRUCTURE; AND SILTSTONE: MEDIUM GRAY; SLIGHTLY CARBONACEOUS; MICACEOUS; LAMINATED TO MEDIUM BEDDED.

NUMEROUS THIN LAMINAE OF COAL FROM 101.4' TO 102.1'
SHALE 100% FROM 101.4' TO 103.7'
0.5' GREENISH-GRAY BROKEN ZONE FROM 102.1'
SANDSTONE 10% AND SHALEY SILTSTONE 90% FROM 103.7' TO 105.7'
SANDSTONE GRADES TO 70% AND SHALEY SILTSTONE 30% FROM 105.7'

BORING COMPLETED AT 110.0 FEET ON 11-17-73.
CASING USED TO A DEPTH OF 7.0 FEET.
GROUNDWATER LEVEL RECORDED AT 11.2 FEET ON 12-13-73.
SECOND PIEZOMETER INSTALLED AT AN INTERVAL FROM 7.0 FEET TO 20.0 FEET ON 12-21-73.
FIRST PIEZOMETER INSTALLED AT AN INTERVAL FROM 30.0 FEET TO 37.0 FEET ON 12-21-73.
PIEZOMETER READINGS ARE PRESENTED ON TABLE 2.4-31.

STRATIGRAPHIC NOMENCLATURE

LAWRENCE FORMATION

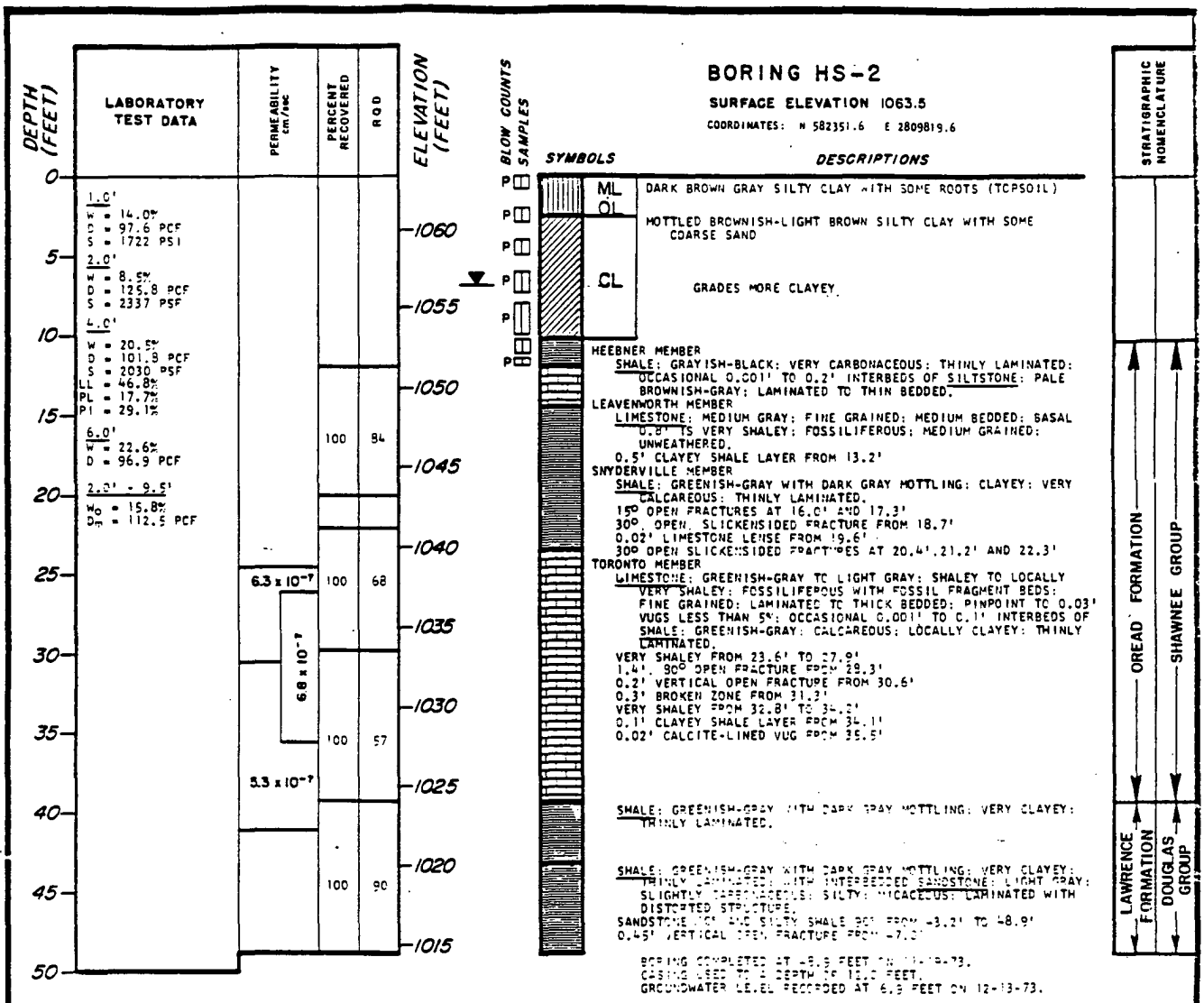
DOUGLAS GROUP

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36a (Sheet 2 of 2)

Log of Boring HS-1

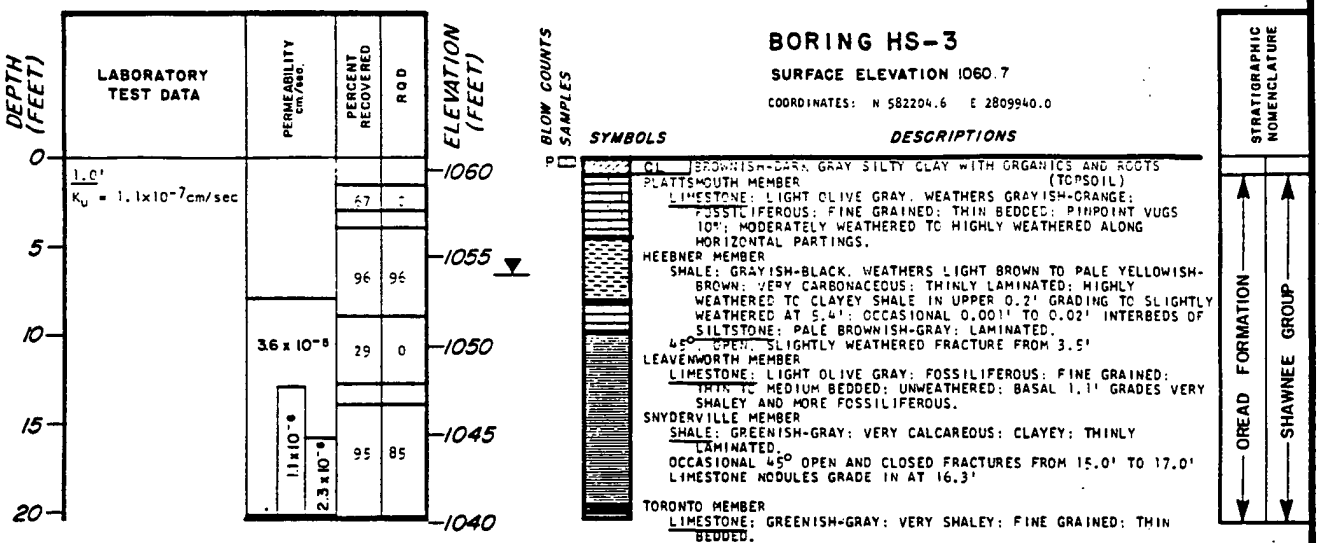


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36b

Log of Boring HS-2

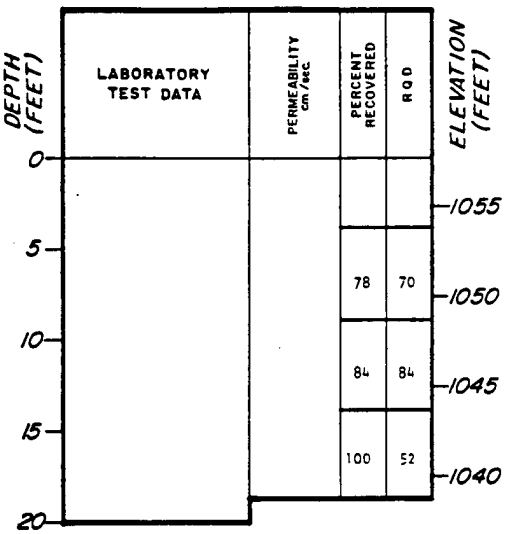


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36c

Log of Boring HS-3



BLOW COUNTS SAMPLES

BORING HS-4

SURFACE ELEVATION 1057.7

COORDINATES: N 582011.2 E 2810098.4

SYMBOLS	DESCRIPTIONS
ML	DARK GRAY CLAYEY SILT WITH ORGANICS AND ROOTS (TOPSOIL)
	PLATTSMOUTH MEMBER
	LIMESTONE: LIGHT BROWNISH-GRAY; FOSSILIFEROUS; MEDIUM BEDDED; MODERATELY WEATHERED.
	HEEBNER MEMBER
	SHALE: MEDIUM DARK GRAY; CARBONACEOUS; THINLY LAMINATED. SLIGHTLY WEATHERED.
	LEAVENWORTH MEMBER
	LIMESTONE: MEDIUM GRAY; FOSSILIFEROUS; VERY FINE GRAINED; MEDIUM BEDDED; UNWEATHERED; BASAL 0.5' IS MODERATELY WEATHERED. VERY SHALEY AND FOSSILIFEROUS.
	SNYDERVILLE MEMBER
	SHALE: GREENISH-GRAY; MOTTLED MEDIUM DARK GRAY; VERY CALCAREOUS; CLAYEY; THINLY LAMINATED.
	30° OPEN SLICKENSIDED FRACTURES FROM 6.5', 9.9' AND 10.3'
	30° CLOSED FRACTURES FROM 12.1', 12.4' AND 12.5'
	LIMESTONE NODULES GRADE IN AT 13.5'.
	30° OPEN FRACTURE FROM 13.6'
	45° OPEN FRACTURE FROM 14.6'
	TORONTO MEMBER
	LIMESTONE: LIGHT GRAY; FOSSILIFEROUS WITH FOSSIL FRAGMENT BEDS; SHALEY; FINE GRAINED; THIN TO MEDIUM BEDDED; PINPOINT TO 0.01' VUGS LESS THAN 5%; OCCASIONAL 0.01' INTERBEDS OF SHALE: GREENISH-GRAY; VERY CLAYEY; CALCAREOUS; THINLY LAMINATED.

BORING COMPLETED AT 18.8 FEET ON 11-21-73.
CASING USED TO A DEPTH OF 3.8 FEET.
GROUNDWATER LEVEL RECORDED AT 1.5 FEET ON 12-13-73.

STRATIGRAPHIC NOMENCLATURE

OREAD FORMATION

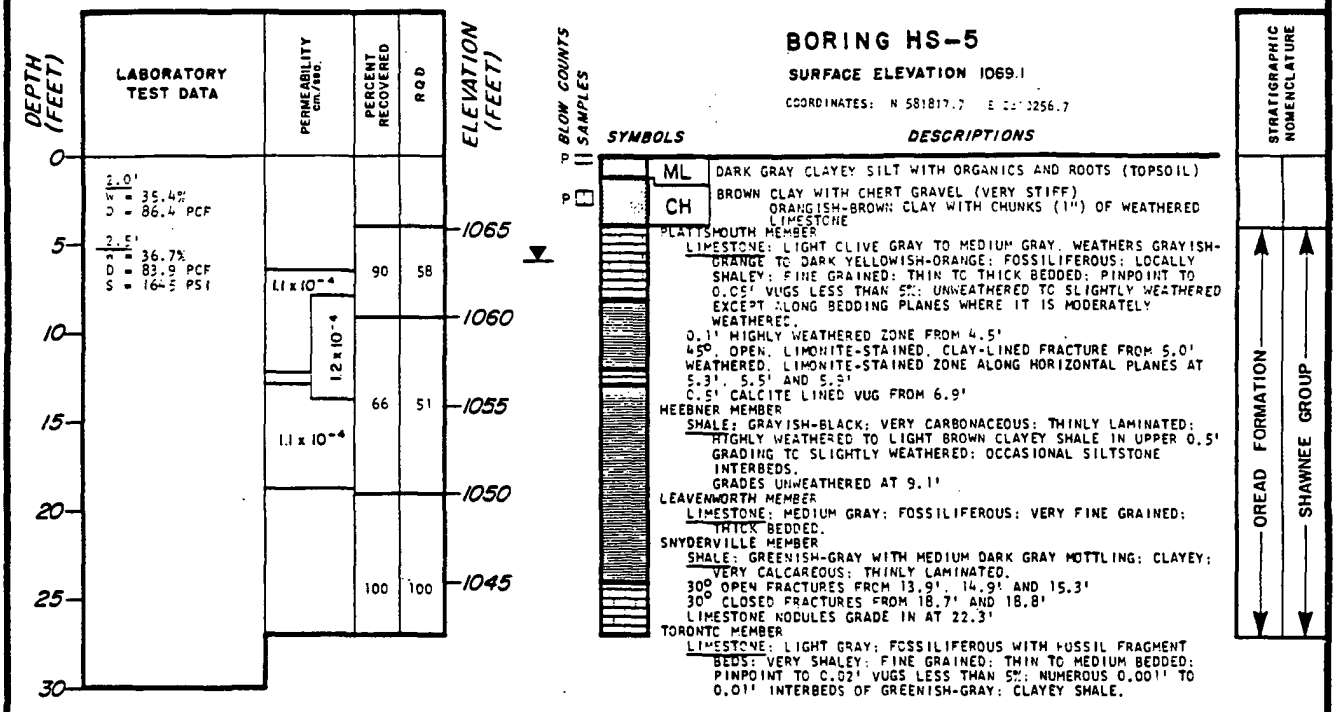
SHAWNEE GROUP

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36d

Log of Boring HS-4

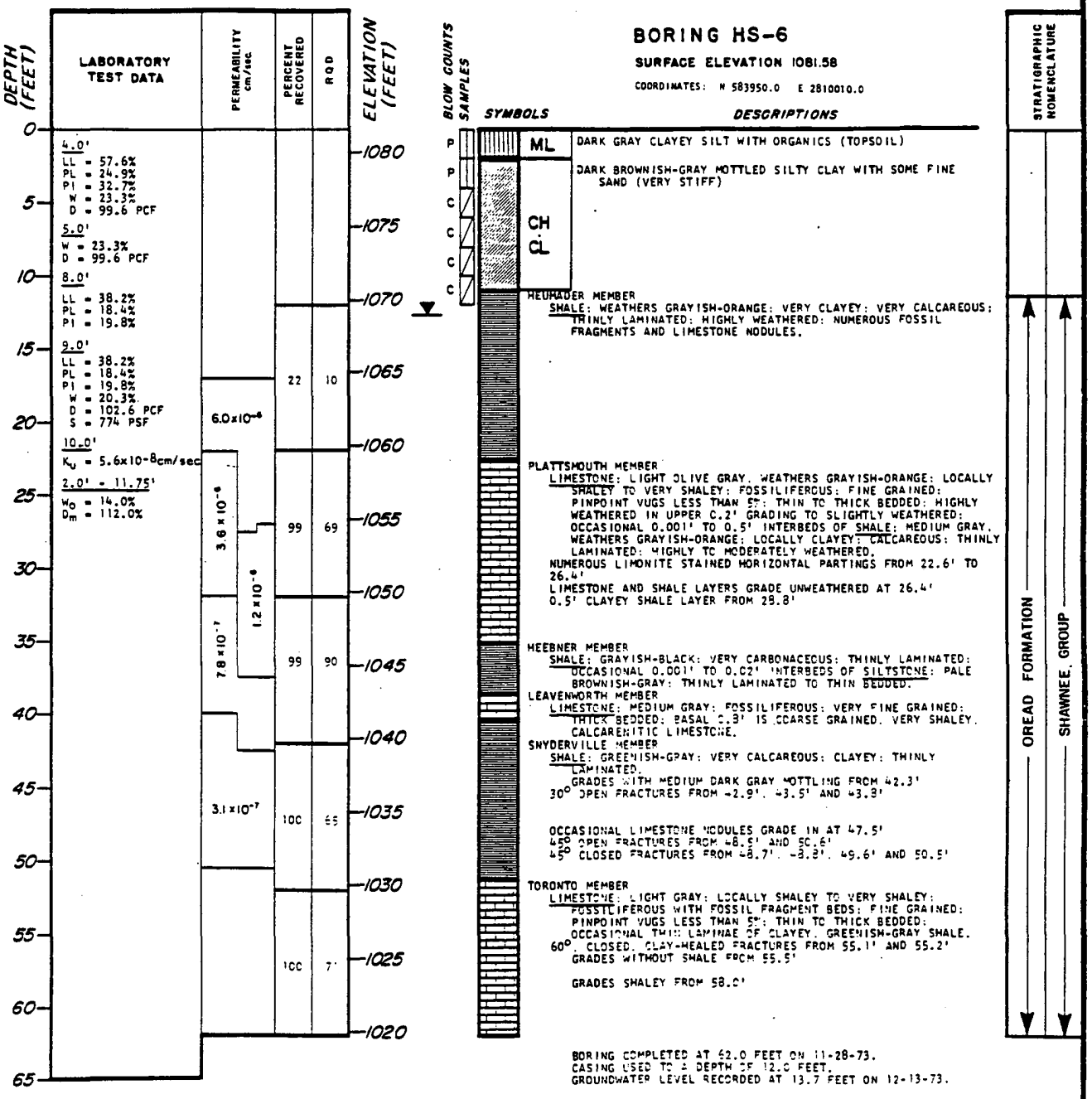


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36e

Log of Boring HS-5

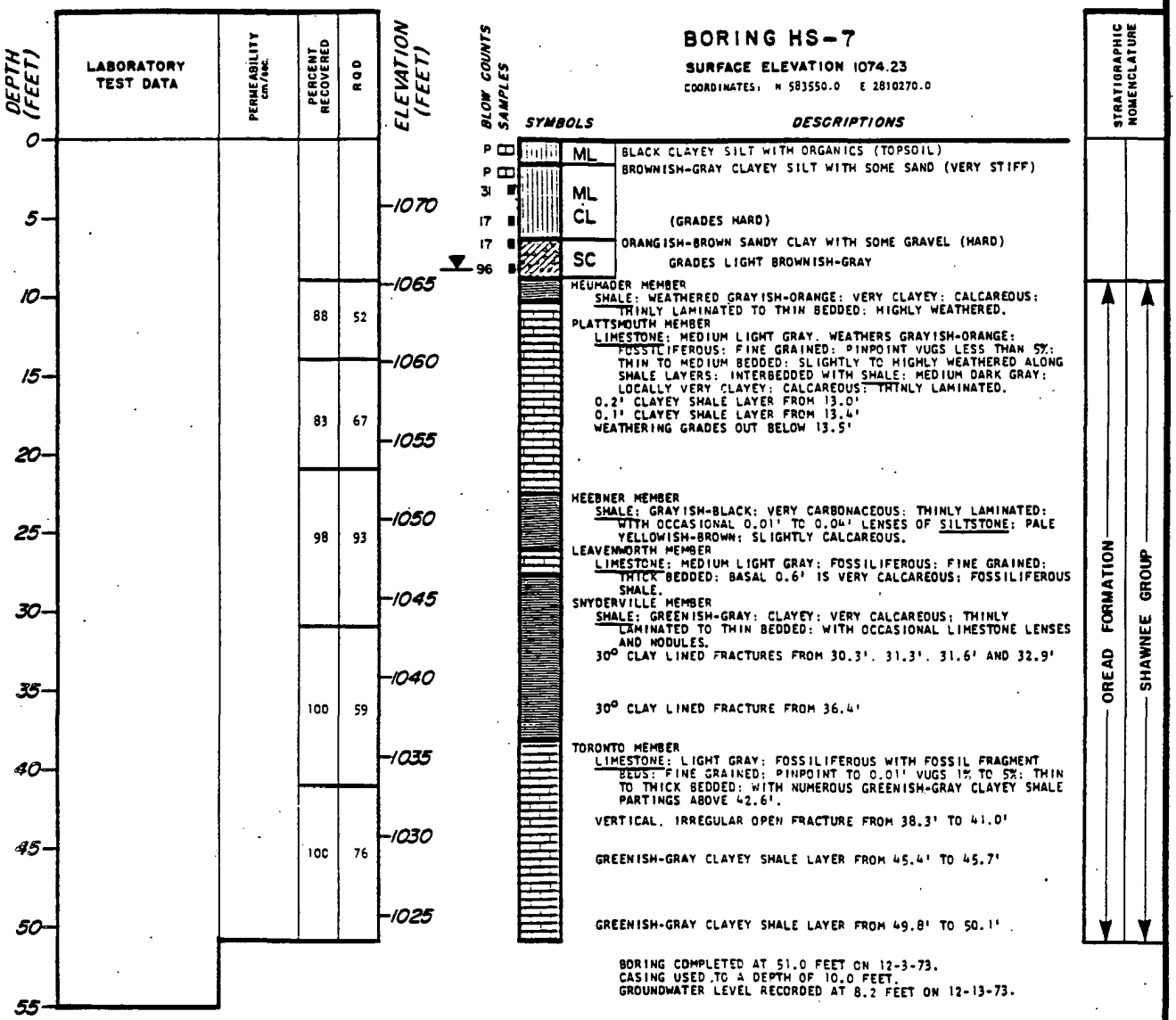


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36f

Log of Boring HS-6

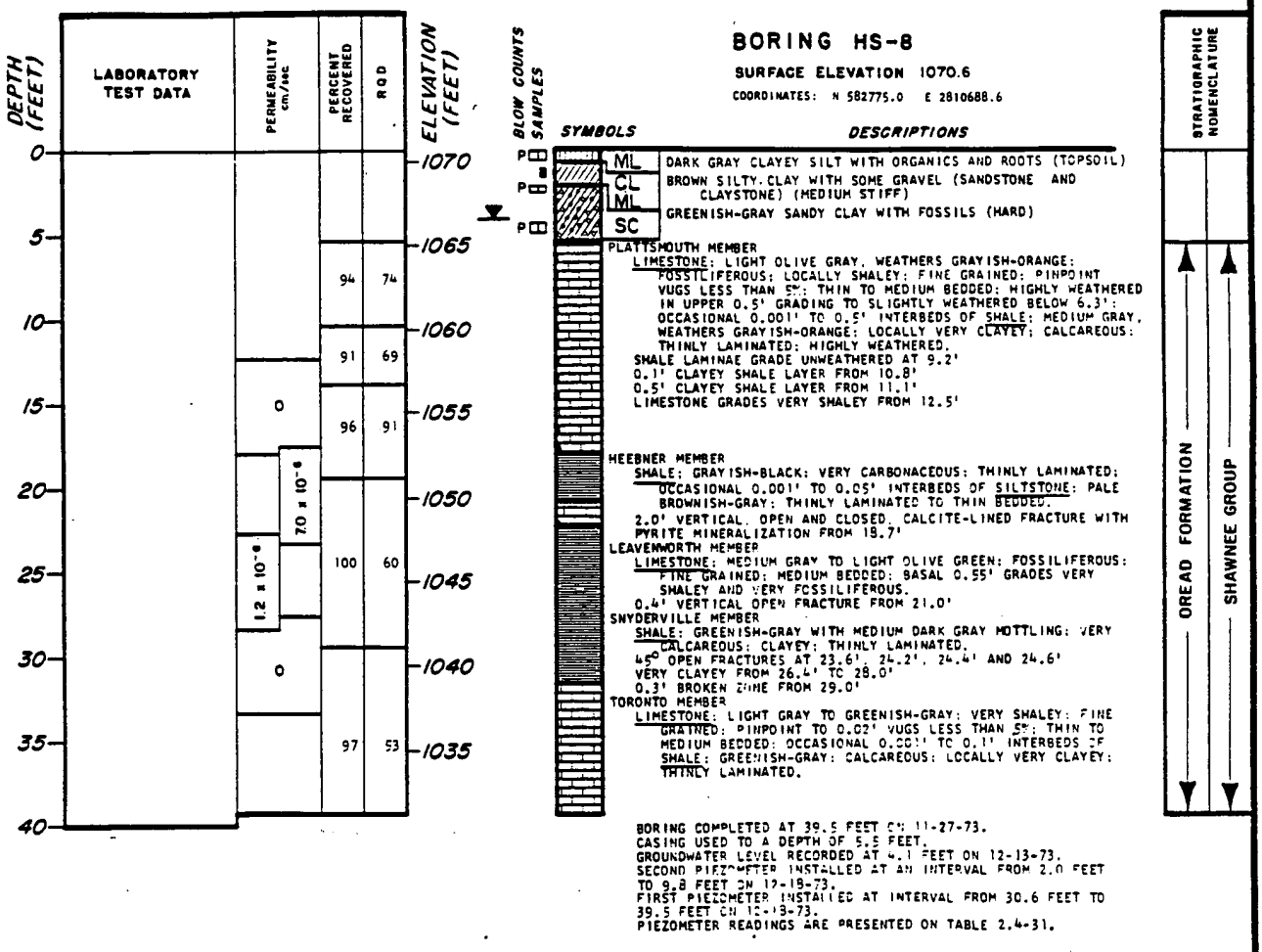


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36g

Log of Boring HS-7

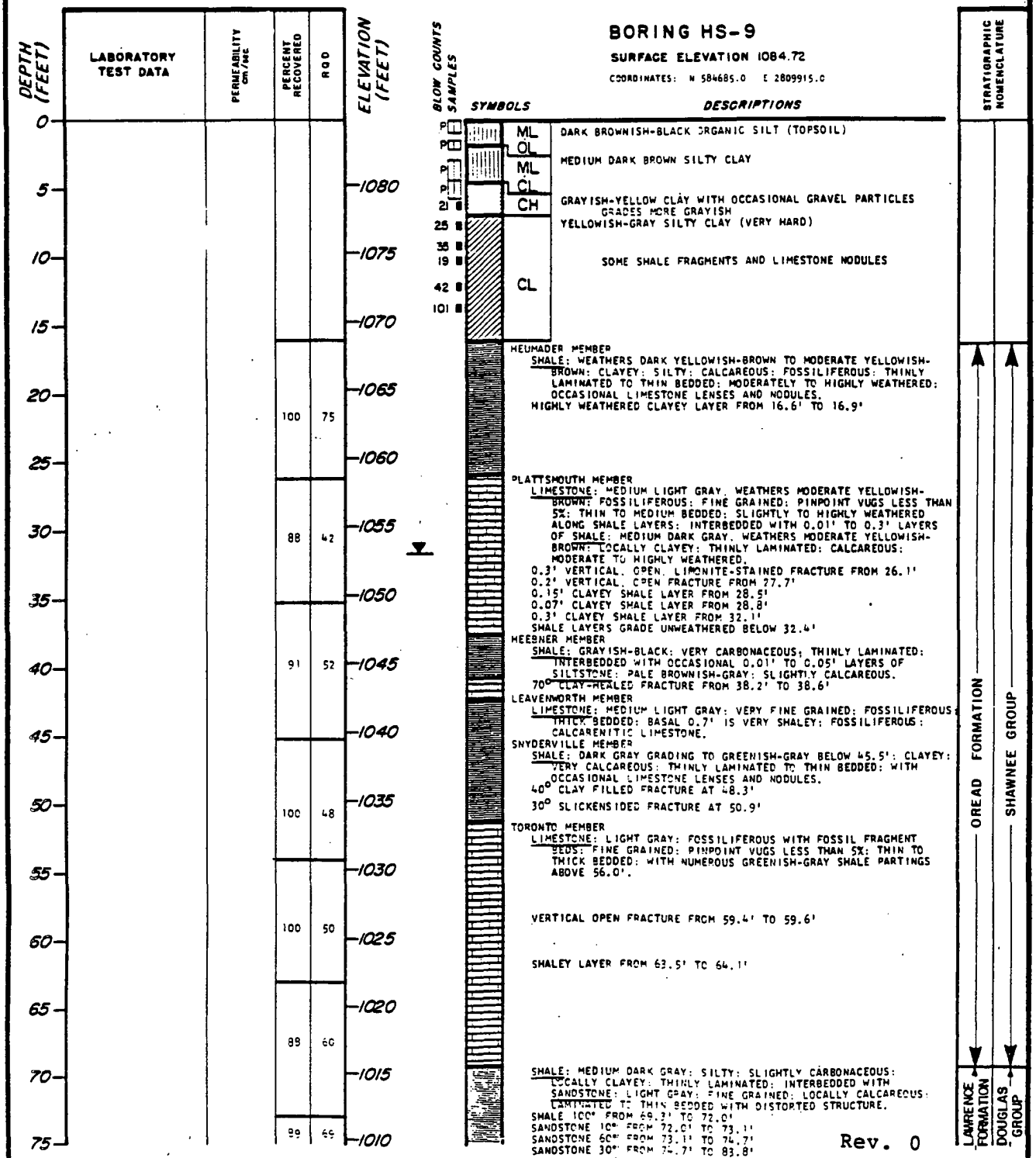


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36h

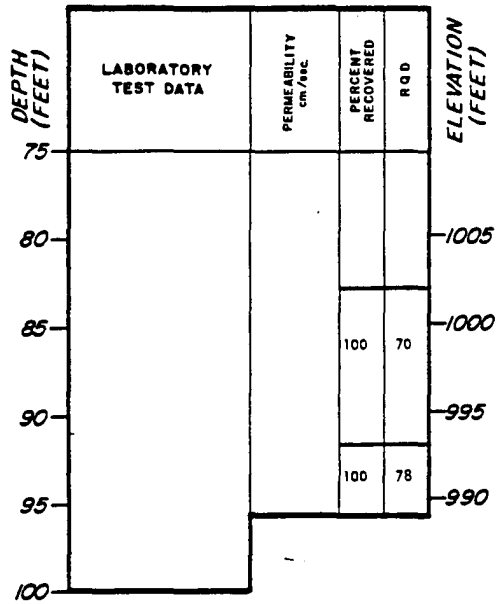
Log of Boring HS-8



WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36i (Sheet 1 of 2)

Log of Boring HS-9



BLOW COUNTS SAMPLES

SYMBOLS

BORING HS-9 CONT'D

SURFACE ELEVATION

DESCRIPTIONS

SANDSTONE LESS THAN 10% FROM 83.8' TO 87.8'

NUMEROUS CLAYEY SHALE LAYERS FROM 84.0' TO 84.7'

GRADES CARBONACEOUS BELOW 87.3'

WILLIAMSBURG COAL BED
COAL: BLACK: SHALEY: THINLY LAMINATED TO THIN BEDDED.
SHALE: DARK GREENISH-GRAY: VERY CALCAREOUS: LOCALLY CLAYEY: LAMINATED TO THIN BEDDED.
20° SLICKENSIDED CLOSED FRACTURES AT 89.6', 89.9', 90.7' AND 91.5'
AMAZONIA MEMBER
SHALE: DARK GREENISH-GRAY: VERY CALCAREOUS: LAMINATED TO THIN BEDDED: WITH OCCASIONAL LENSES AND NODULES OF LIMESTONE.

BORING COMPLETED AT 95.5 FEET ON 12-3-73.
CASING USED TO A DEPTH OF 26.0 FEET.
GROUNDWATER LEVEL RECORDED AT 30.9 FEET ON 12-13-73.

STRATIGRAPHIC NOMENCLATURE

LAWENCE FORMATION

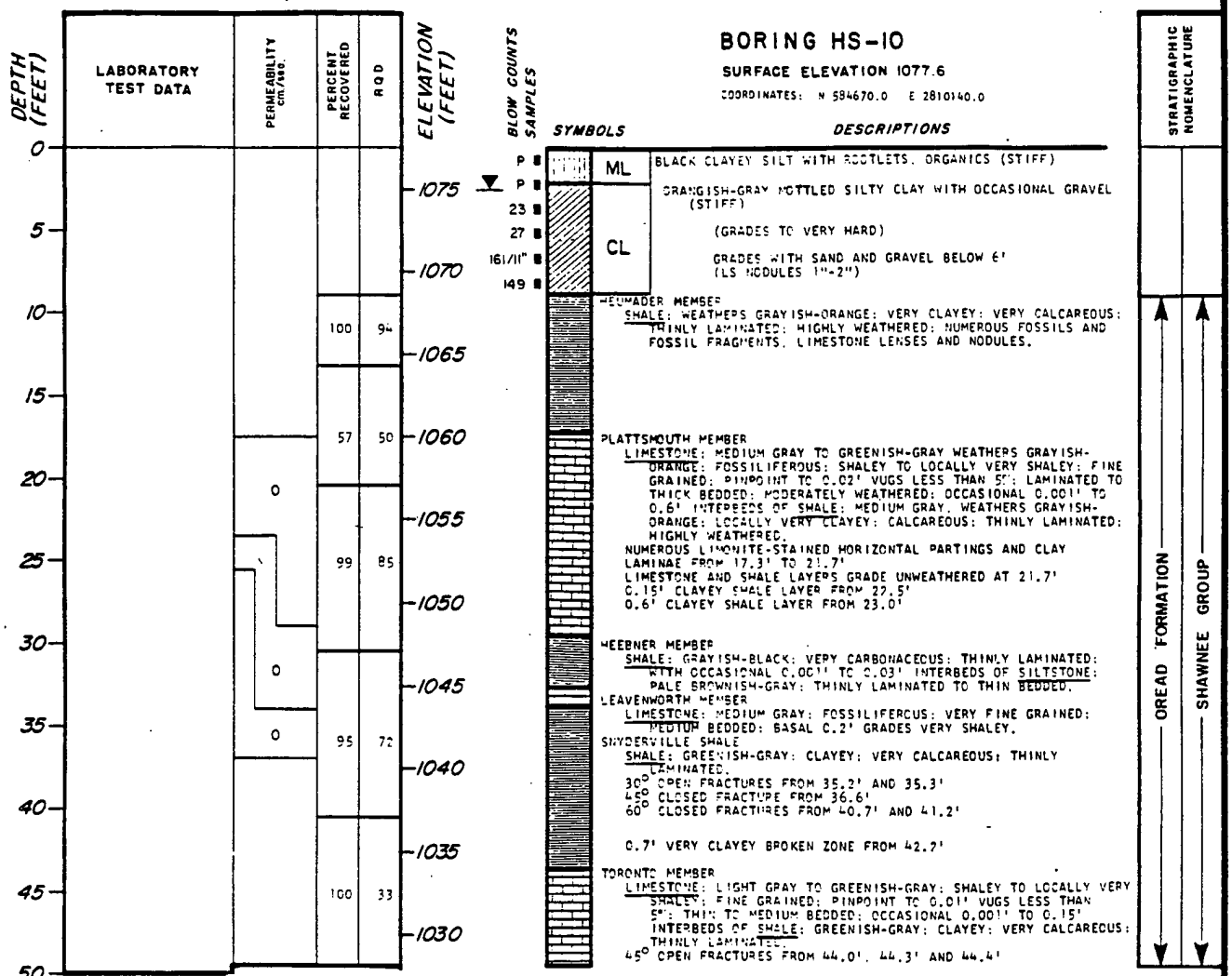
DOUGLAS GROUP

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36i (Sheet 2 of 2)

Log of Boring HS-9



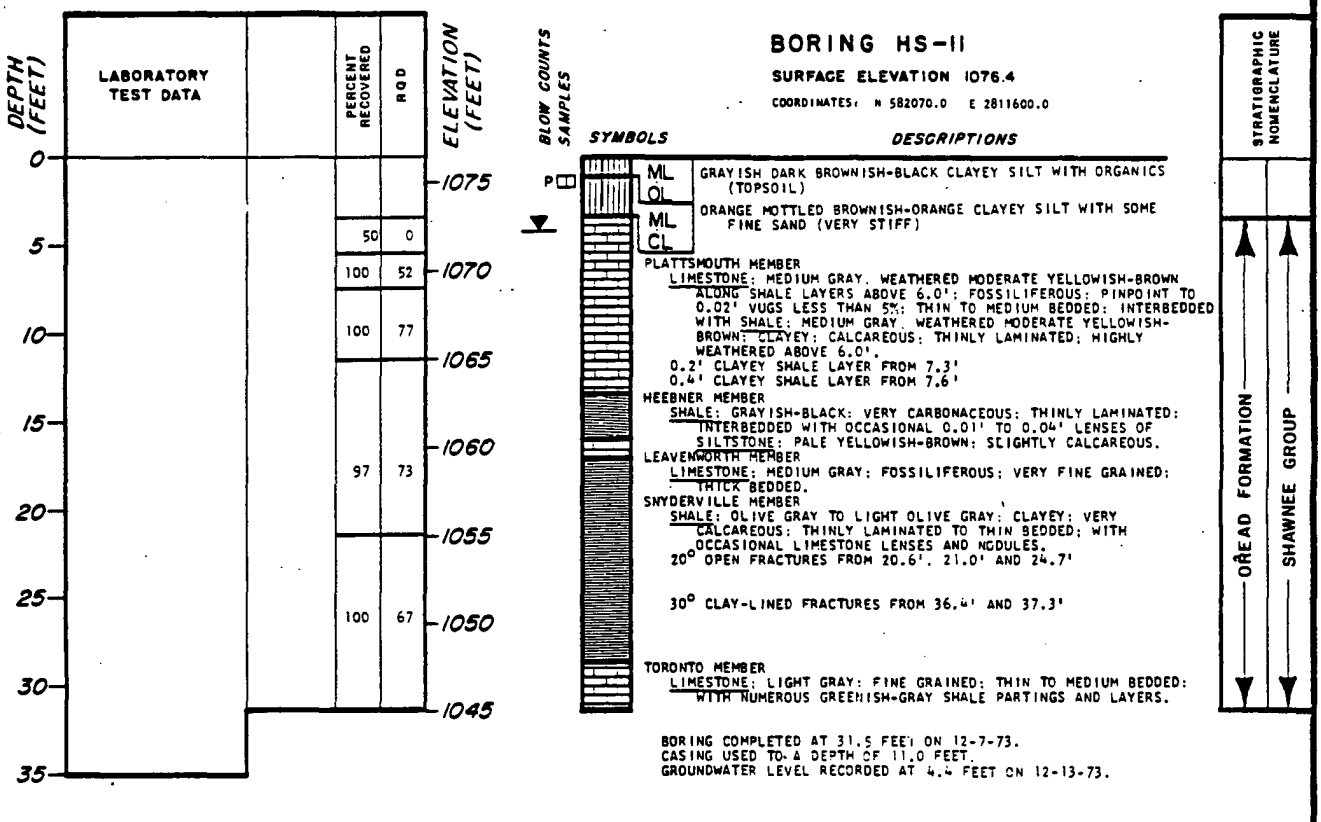
BORING COMPLETED AT 49.5 FEET ON 11-30-73.
CASING USED TO A DEPTH OF 13.3 FEET.
GROUNDWATER LEVEL RECORDED AT 2.- FEET ON 12-13-73.
SECOND PIEZOMETER INSTALLED AT AN INTERVALL FROM 17.2 FEET TO 24.9 FEET ON 1-25-74.
FIRST PIEZOMETER INSTALLED AT AN INTERVAL FROM 42.5 FEET TO 49.5 FEET ON 1-25-74.
PIEZOMETER READINGS ARE PRESENTED ON TABLE 2.4-31.

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36j

Log of Boring HS-10

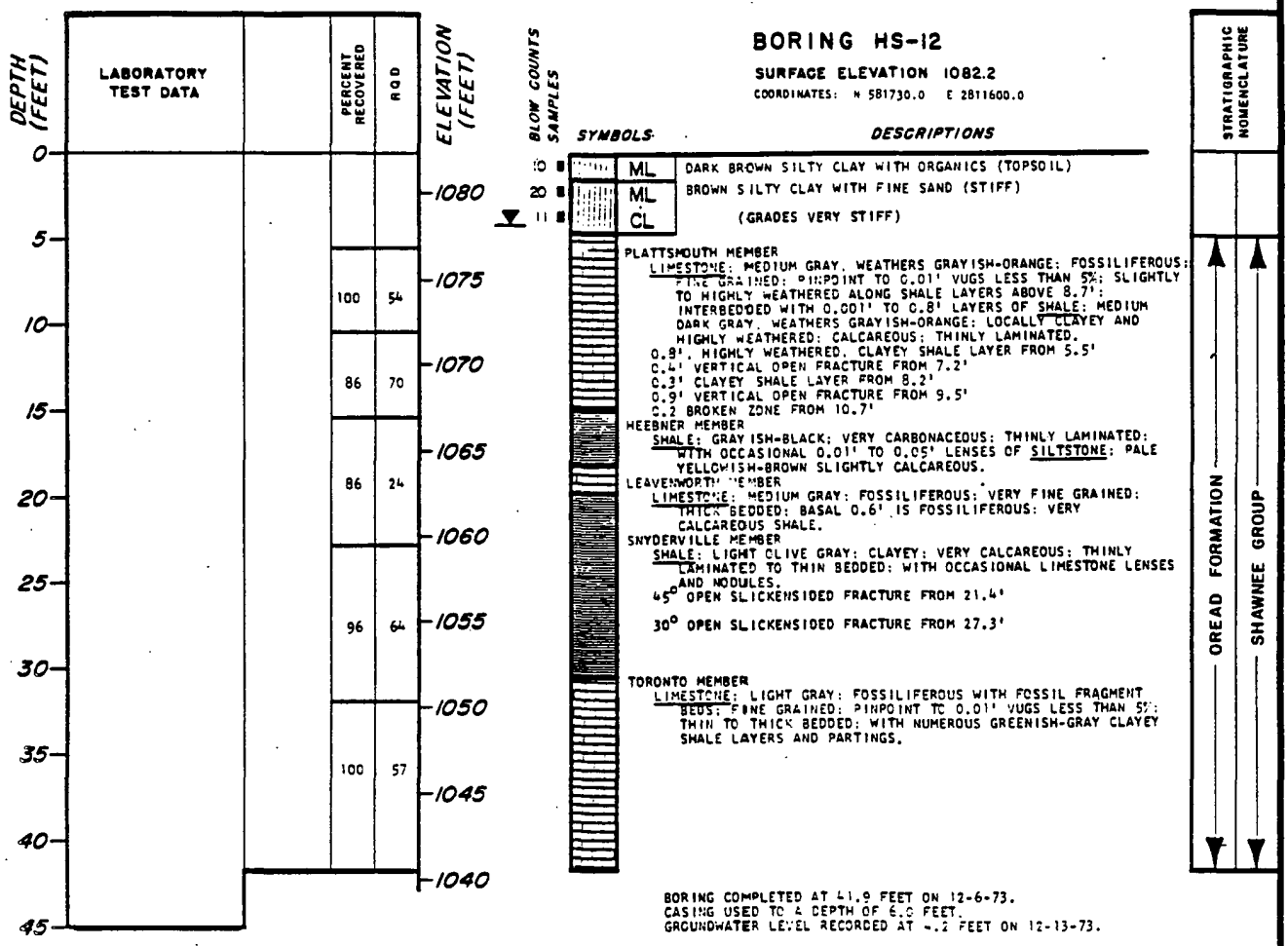


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36k

Log of Boring HS-11

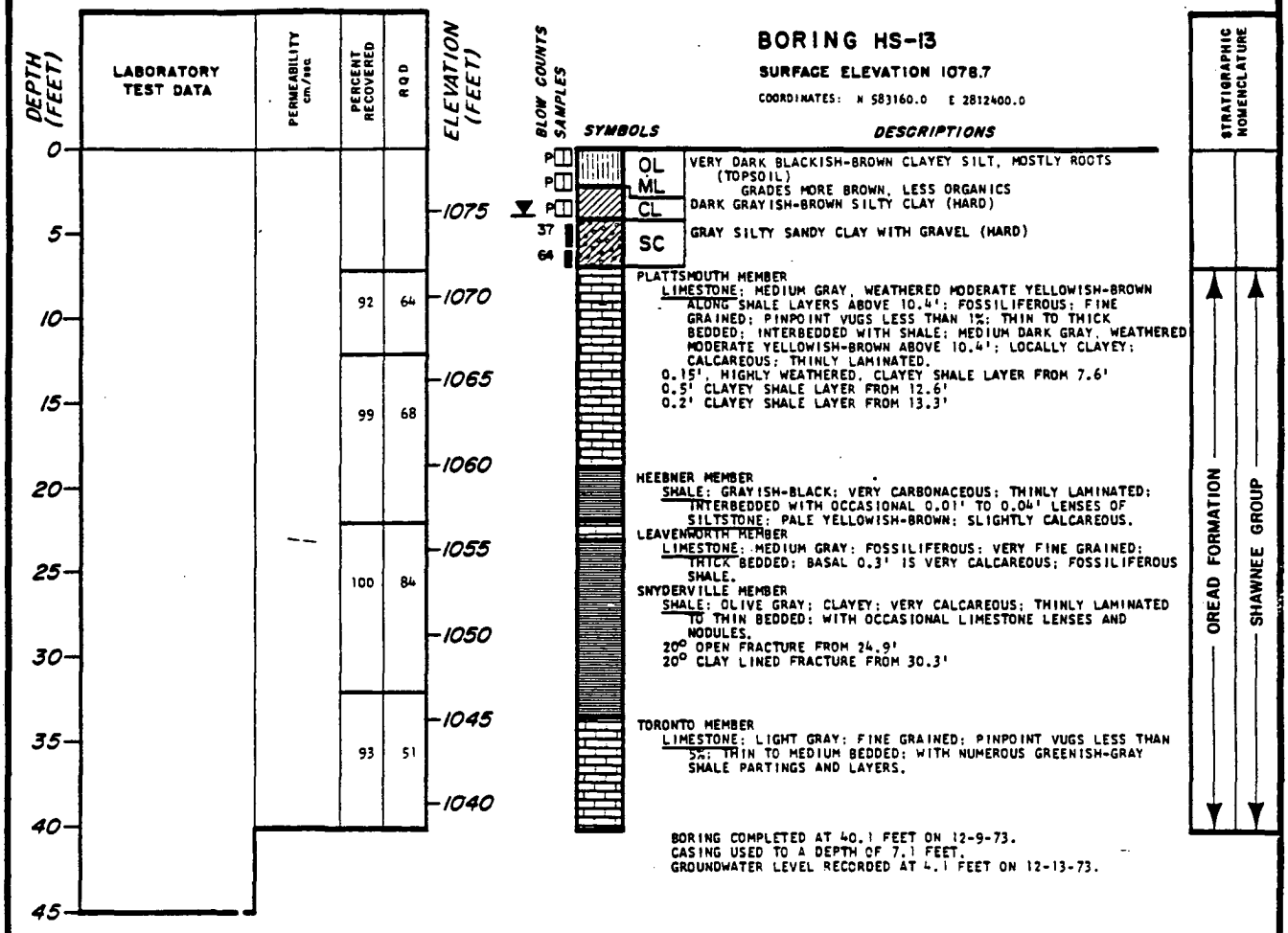


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-361

Log of Boring HS-12

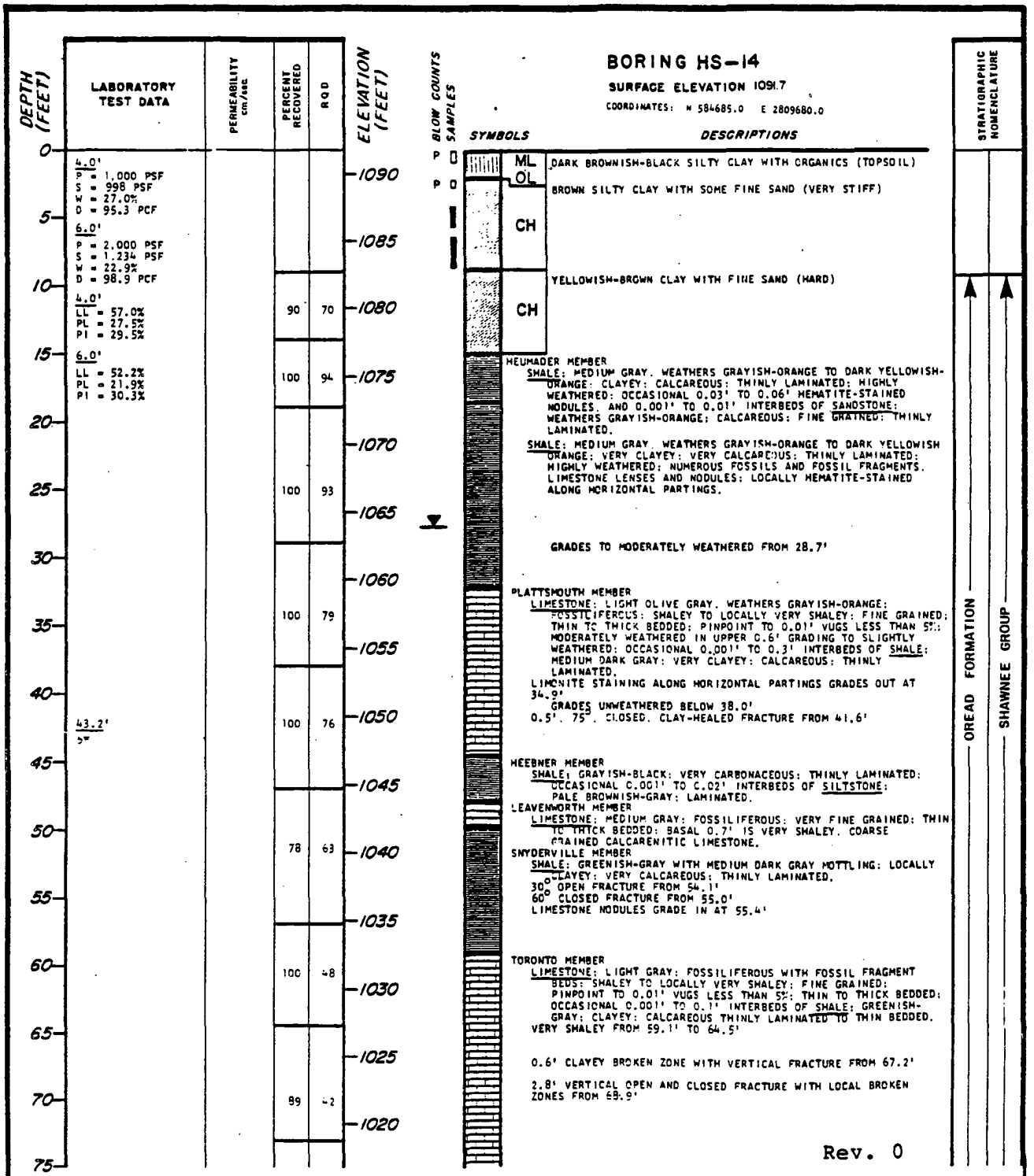


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36m

Log of Boring HS-13

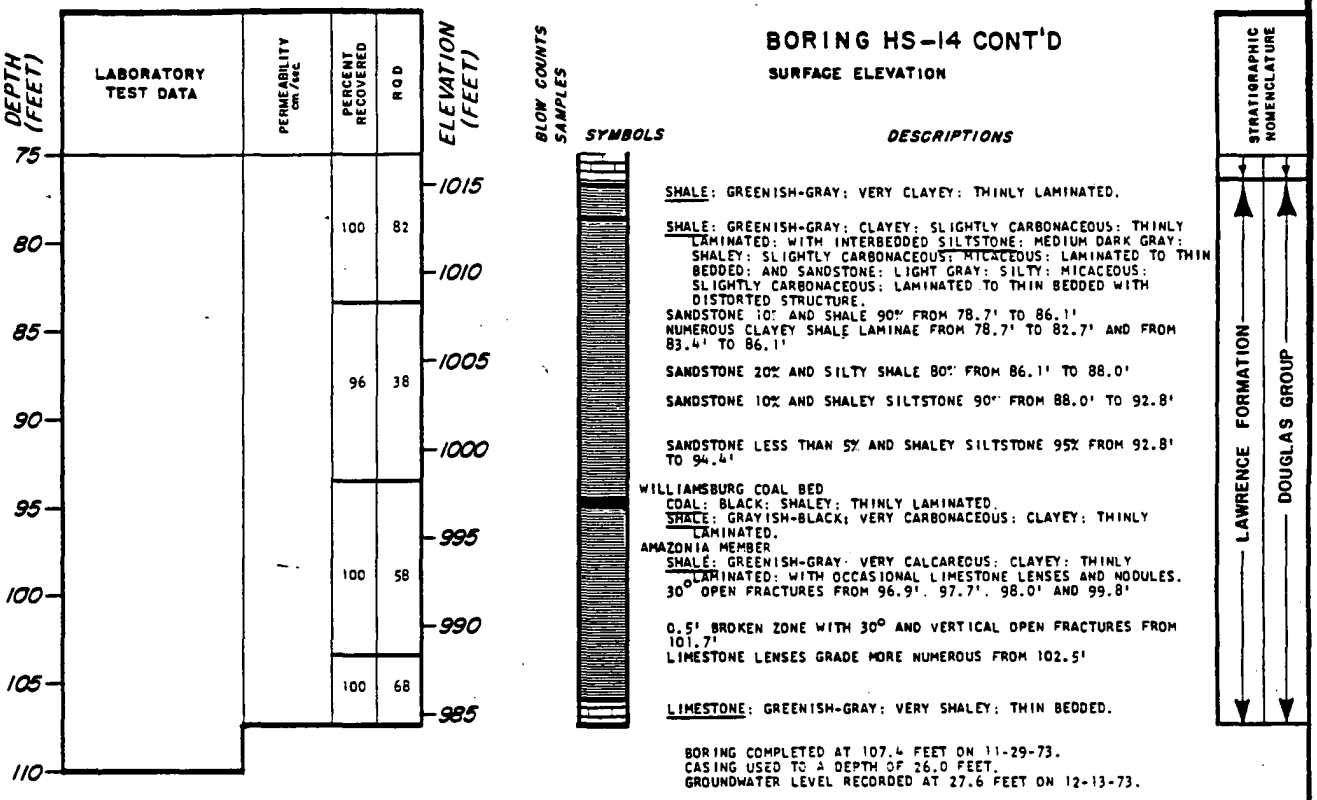


0				1090
5				1085
10		90	70	1080
15		100	94	1075
20				1070
25		100	93	1065
30				1060
35		100	79	1055
40		100	76	1050
45				1045
50		78	63	1040
55				1035
60		100	48	1030
65				1025
70		89	42	1020
75				

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36n (Sheet 1 of 2)

Log of Boring HS-14



Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36n (Sheet 2 of 2)

Log of Boring HS-14

BORING HS-15

SURFACE ELEVATION 1077.38

COORDINATES: N 582784.9 E 2809464.9

DEPTH (FEET)	LABORATORY TEST DATA	PERMEABILITY CM/SEC	PERCENT RECOVERED	RQD	ELEVATION (FEET)	BLOW COUNTS SAMPLES	SYMBOLS	DESCRIPTIONS	STRATIGRAPHIC NOMENCLATURE
0	1.0' LL = 50.1% PL = 28.1% PI = 22.0% S = 977 PSF P = 1000 PSI W = 30.2% D = 86.6%				1075	P	MH OH CH	DARK GRAY CLAYEY SILT WITH ORGANICS AND ROOTS (TOPSOIL) BROWN CLAY WITH OCCASIONAL FINE GRAVEL AND OCCASIONAL FOSSILS (VERY STIFF)	
5						P			
	4.0' 5*		64	32	1070	P		HEUMADER MEMBER SHALE: WEATHERS GRAYISH-ORANGE TO DARK YELLOWISH-ORANGE: VERY CALCAREOUS: CLAYEY: NUMEROUS FOSSILS AND FOSSIL FRAGMENTS: HIGHLY WEATHERED.	
10	LL = 51.1% PL = 20.4% PI = 30.7% S = 3077 PSF P = 1000 PSI W = 21.1% D = 18.7 PCF							LIGHT BROWN LIMONITE-STAINED SILTSTONE LENSES GRADE IN BELOW 10.5'	
			25	12	1065			PLATTSMOUTH MEMBER LIMESTONE: LIGHT GRAY TO MEDIUM GRAY, WEATHERS GRAYISH-ORANGE: FOSSILIFEROUS: SHALEY TO LOCALLY VERY SHALEY: VERY FINE GRAINED: THIN TO THICK BEDDED: PINPOINT TO 0.03' VUGS LESS THAN 5%: SLIGHTLY WEATHERED: 0.001' TO 0.5' INTERBEDS OF SHALE: LIGHT OLIVE GRAY TO MEDIUM DARK GRAY, WEATHERS GRAYISH-ORANGE: CLAYEY: CALCAREOUS; THINLY LAMINATED; MODERATELY WEATHERED.	
15	9.0' 5*				1060			0.07' MODERATELY WEATHERED CLAYEY SHALE LAYER FROM 20.6' 0.17' MODERATELY WEATHERED CLAYEY SHALE LAYER FROM 20.9'	
20								0.5' SLIGHTLY WEATHERED CLAYEY SHALE LAYER FROM 23.5' LIMESTONE AND SHALE GRADE UNWEATHERED AT 24.5'	
25			98	92	1055			0.03' CALCITE-LINED VUG FROM 27.9'	
30					1050			HEEBNER MEMBER SHALE: DARK GRAY TO GRAYISH-BLACK: VERY CARBONACEOUS: THINLY LAMINATED: OCCASIONAL 0.001' TO 0.03' INTERBEDS OF SILTSTONE: LIGHT BROWNISH-GRAY: CALCAREOUS; LAMINATED TO THIN BEDDED.	OREAD FORMATION
	32.3' 5*				1045			LEAVENWORTH MEMBER LIMESTONE: MEDIUM GRAY: FINE GRAINED: THICK BEDDED.	SHAWNEE GROUP
35			100	100	1040			SNYDERVILLE MEMBER SHALE: GREENISH-GRAY: VERY CALCAREOUS: CLAYEY: THINLY LAMINATED. 45° CLOSED FRACTURES AT 38.6', 38.8' AND 39.8'	
40								15° OPEN SLICKENSIDED FRACTURE FROM 41.3' LIMESTONE NODULES GRADE IN AT 41.8' 15° OPEN SLICKENSIDED FRACTURE FROM 42.5'	
45			100	100	1035			30° CLOSED FRACTURE FROM 45.2' 30° OPEN SLICKENSIDED FRACTURE FROM 46.2'	
50					1030			TORONTO MEMBER LIMESTONE: LIGHT GRAY: FOSSILIFEROUS WITH FOSSIL FRAGMENT BEDS: SHALEY TO LOCALLY VERY SHALEY: VERY FINE GRAINED: THIN TO THICK BEDDED: PINPOINT TO 0.02' VUGS LESS THAN 5%: OCCASIONAL 0.001' TO 0.2' INTERBEDS OF SHALE: GREENISH-GRAY: CALCAREOUS: CLAYEY: THINLY LAMINATED. EXTREMELY SHALEY FROM 46.4' TO 47.2' SHALEY FROM 47.2' TO 51.6'	
55			100	88	1025				
60					1020			0.05' CLAYEY SHALE LAYER FROM 58.5' 0.15' CLAYEY SHALE LAYER FROM 59.0'	
65			95	95	1015			OCCASIONAL 0.02' CALCITE-LINED VUGS GRADE IN AT 64.1'	
70					1010			SHALE: GREENISH-GRAY: CLAYEY: CALCAREOUS: THINLY LAMINATED: WITH NUMEROUS VERY CARBONACEOUS LAMINAE.	LAWRENCE FORMATION
			100	100	1005			SHALE: MEDIUM GRAY: SILTY: CLAYEY: SLIGHTLY CARBONACEOUS: THINLY LAMINATED: WITH INTERBEDDED SILTSTONE: MEDIUM DARK GRAY: SHALEY: SLIGHTLY CARBONACEOUS: MICACEOUS: LAMINATED TO THIN BEDDED: AND SANDSTONE: LIGHT GRAY: CALCAREOUS: SILTY: MICACEOUS: LAMINATED TO THIN BEDDED WITH DISTORTED STRUCTURE. VERY CLAYEY FROM 67.2' TO 80.5' SANDSTONE 30% AND SILTSTONE 60% FROM 67.2' TO 81.7'	DOUGLAS GROUP
75									

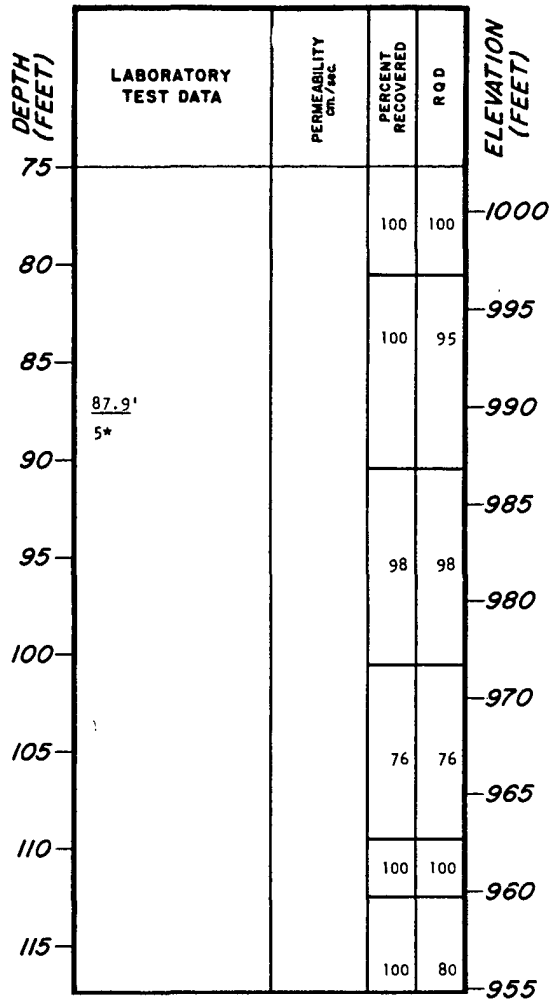
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36o (Sheet 1 of 2)

Log of Boring HS-15

Rev. 0

BORING HS-15 CONT'D.



BLOW COUNTS SAMPLES

SYMBOLS

DESCRIPTIONS

SANDSTONE LESS THAN 5% AND SHALEY SILTSTONE 95% FROM 81.7' TO 84.5'
GRADES VERY CARBONACEOUS FROM 83.5'

WILLIAMSBURG COAL BED
COAL; BLACK; SHALEY; THINLY LAMINATED.
SHALE; MEDIUM GRAY; VERY CALCAREOUS; CLAYEY; THINLY LAMINATED.
15° OPEN FRACTURE FROM 85.9'
30° OPEN SLICKENSIDED FRACTURES FROM 86.5', 86.6' AND 87.0'
0.4' BROKEN ZONE WITH 15° TO 45° OPEN SLICKENSIDED FRACTURES FROM 87.3'
AMAZONIA MEMBER
SHALE; GREENISH-GRAY; CALCAREOUS; THINLY LAMINATED; WITH NUMEROUS LIMESTONE NODULES.

LIMESTONE; GREENISH-GRAY; VERY SHALEY; VERY FINE GRAINED; MEDIUM TO THICK BEDDED.
IRELAND MEMBER
SHALE; GREENISH-GRAY; SLIGHTLY CALCAREOUS; MICACEOUS; SILTY; THINLY LAMINATED.
GRADES FROM 94.4' WITH INTERBEDDED SANDSTONE; LIGHT GRAY; MICACEOUS; FINE GRAINED; THINLY LAMINATED TO THIN BEDDED WITH DISTORTED STRUCTURE
SANDSTONE 10% FROM 94.4' TO 102.0'
SHALE GRADES TO MEDIUM GRAY AT 96.5'

SANDSTONE LESS THAN 5% FROM 102.0' TO 111.3'

VERY CARBONACEOUS LAMINAE GRADE IN AT 107.8'

2.1' CLAYEY BROKEN ZONE FROM 109.5'

COAL; BLACK; SHALEY; THINLY LAMINATED.

SHALE; MEDIUM GRAY; SILTY; CLAYEY; THINLY LAMINATED; WITH INTERBEDDED SANDSTONE; LIGHT GRAY; LOCALLY CALCAREOUS; MICACEOUS; FINE GRAINED; THINLY LAMINATED TO THINLY LAMINATED TO THIN BEDDED WITH DISTORTED STRUCTURE.
SILTY SHALE 100% FROM 112.5' TO 114.1'
SANDSTONE 30% AND SILTY SHALE 70% FROM 114.1' TO 117.5'

BORING COMPLETED AT 117.5 FEET ON 11-19-73.
CASING USED TO A DEPTH OF 5.5 FEET.
GROUNDWATER LEVEL RECORDED AT 17.8 FEET ON 12-13-73.

STRATIGRAPHIC NOMENCLATURE

LAWRENCE FORMATION

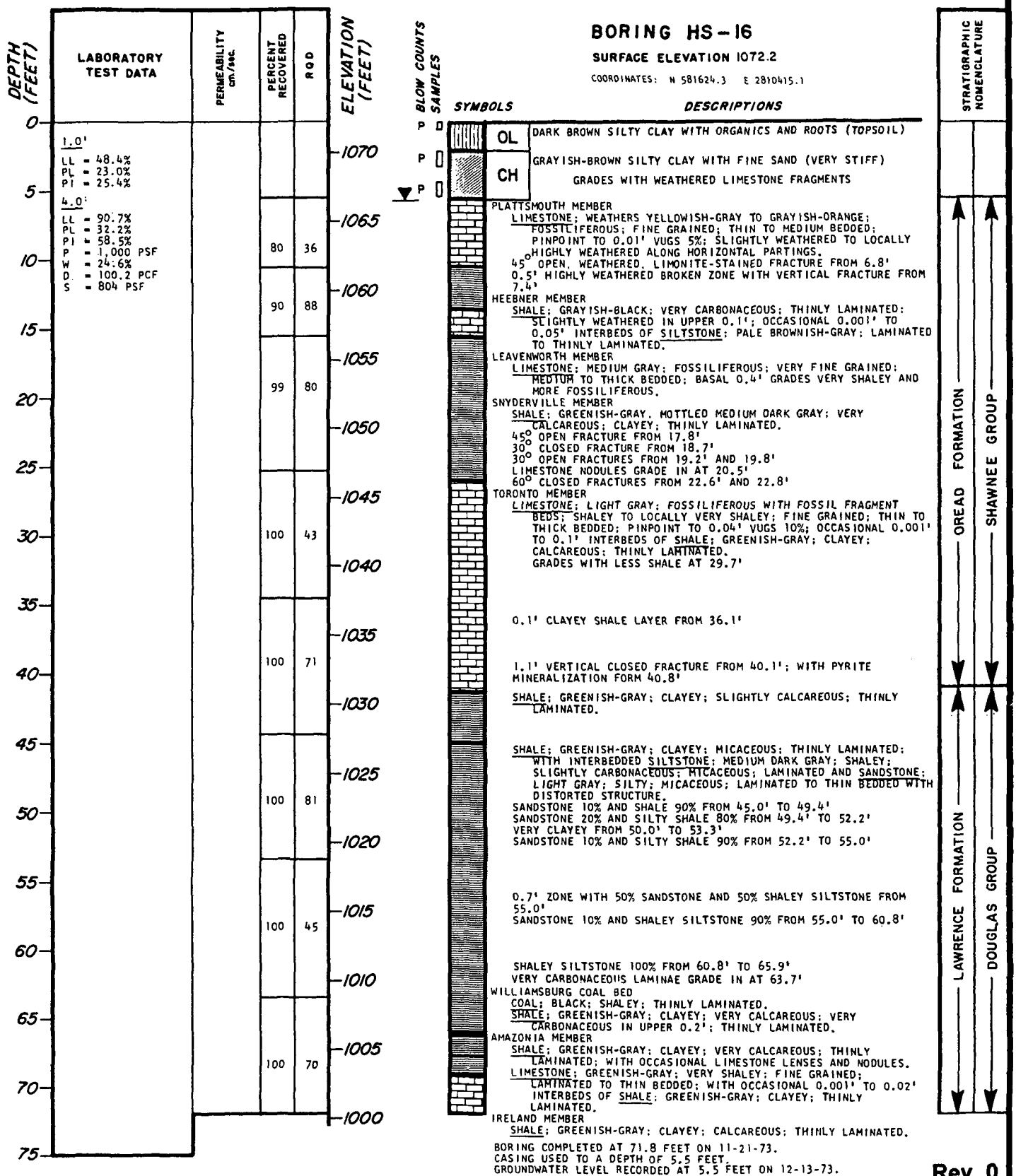
DOUGLAS GROUP

Rev. 12

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36o (Sheet 2 of 2)

Log of Boring HS-15

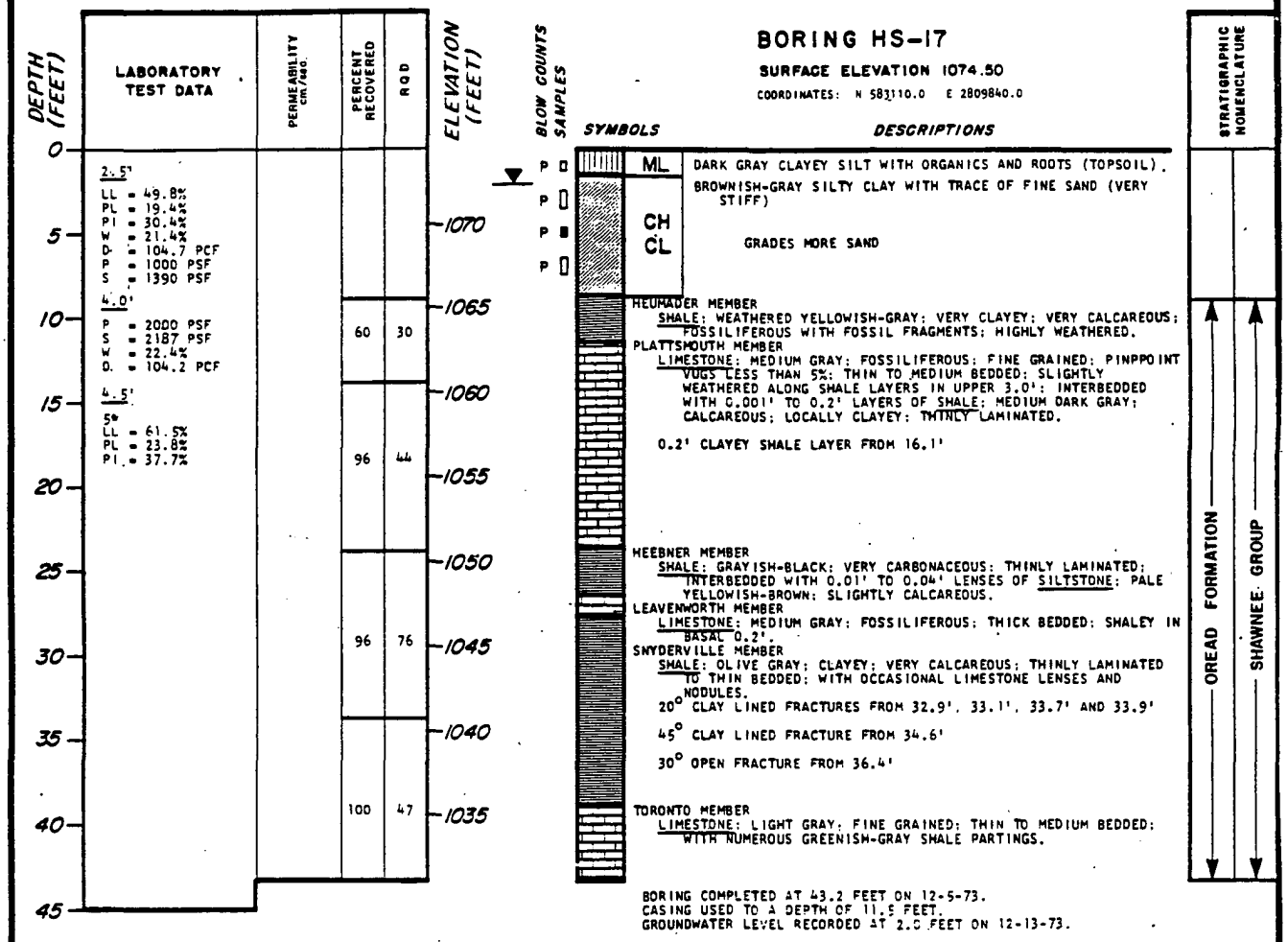


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36p

Log of Boring HS-16

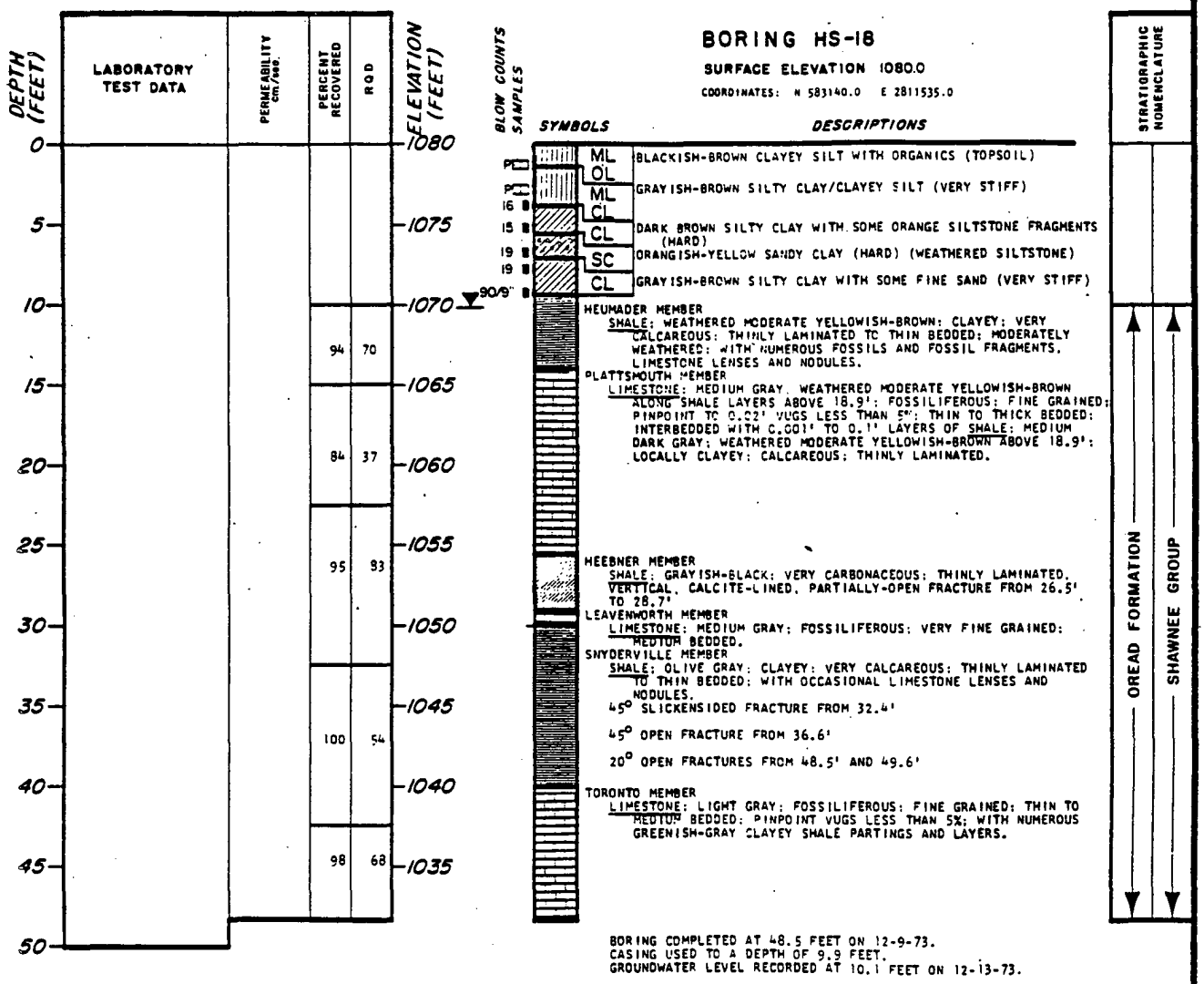


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36q

Log of Boring HS-17

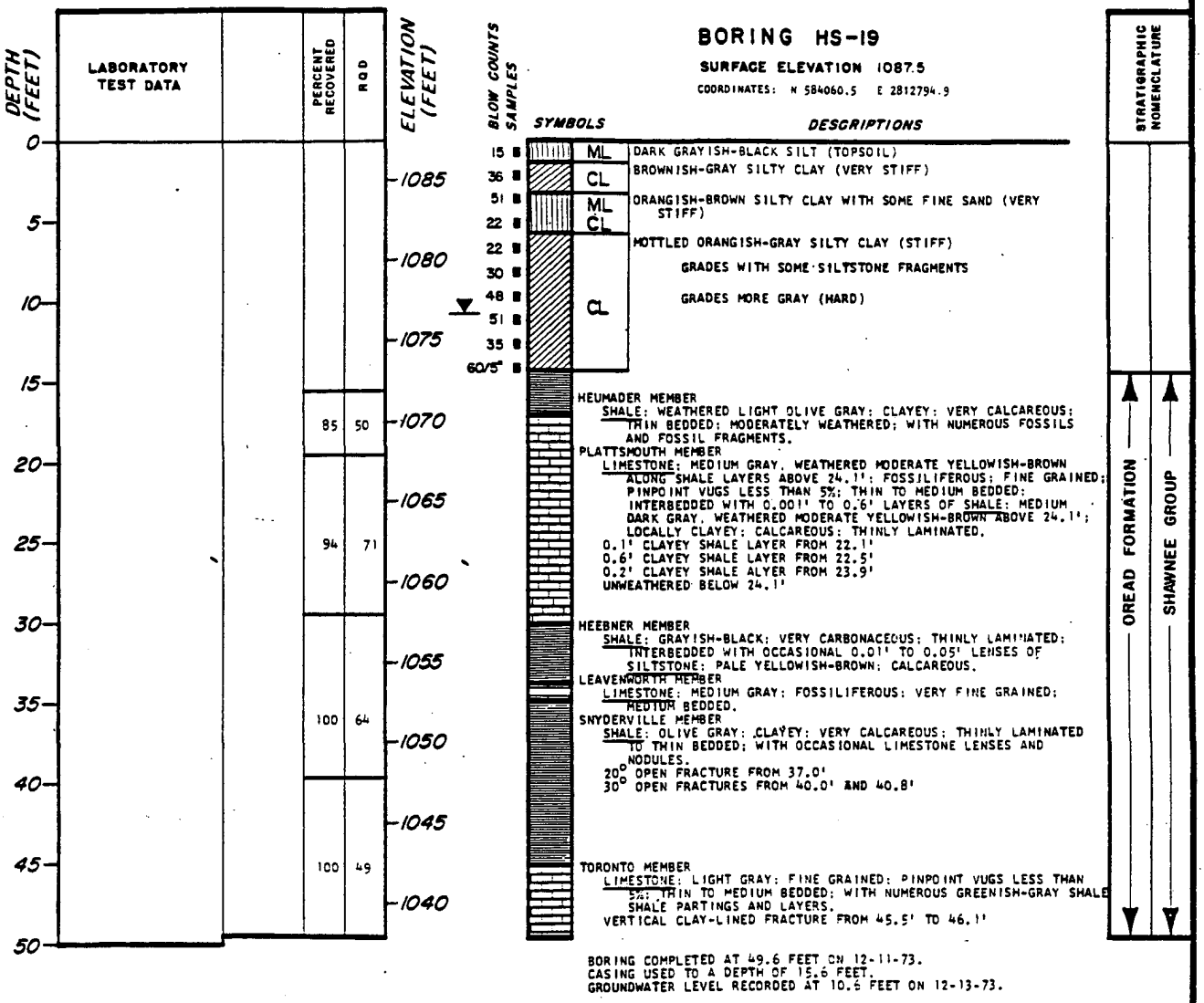


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36r

Log of Boring HS-18

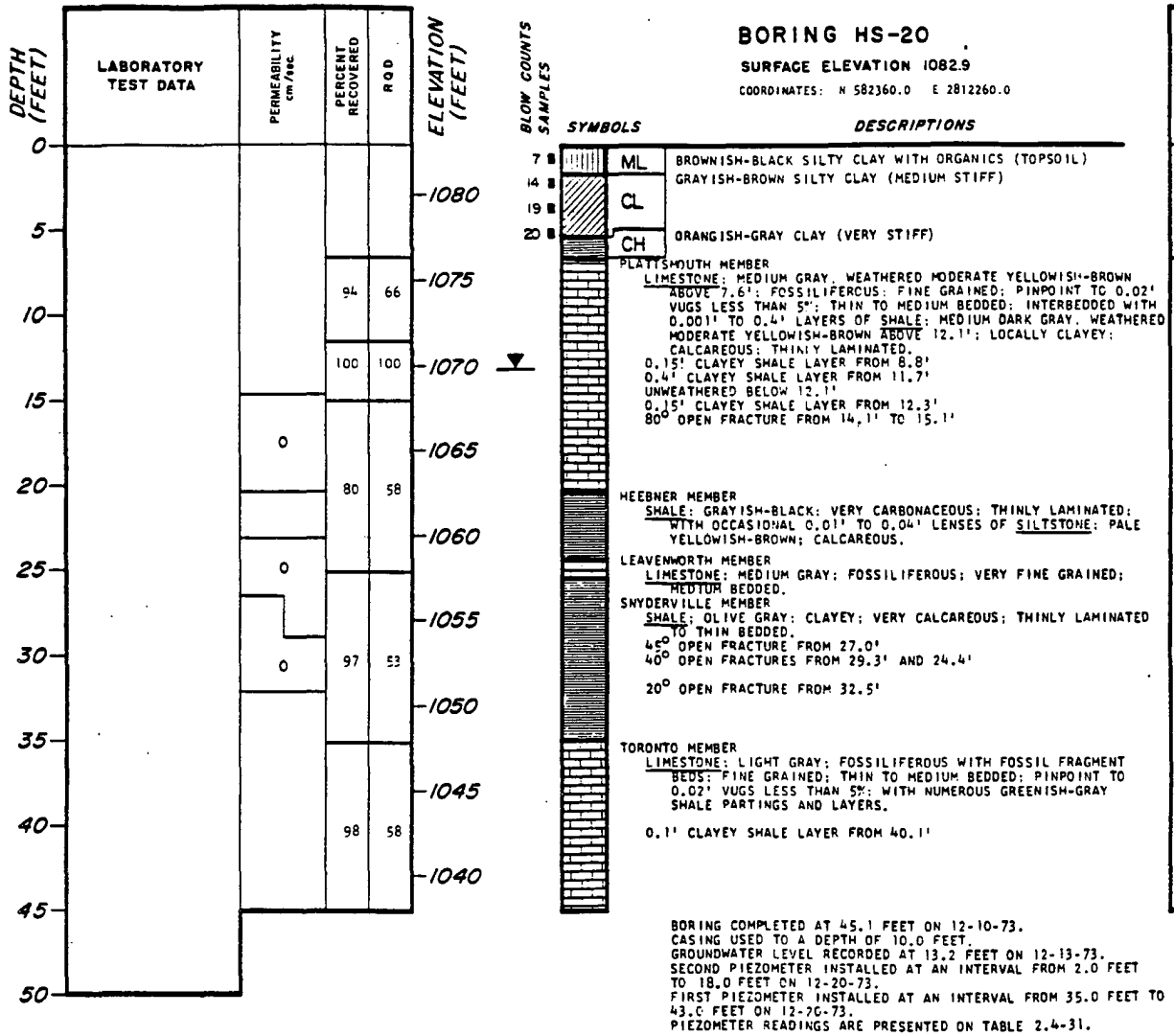


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36s

Log of Boring HS-19

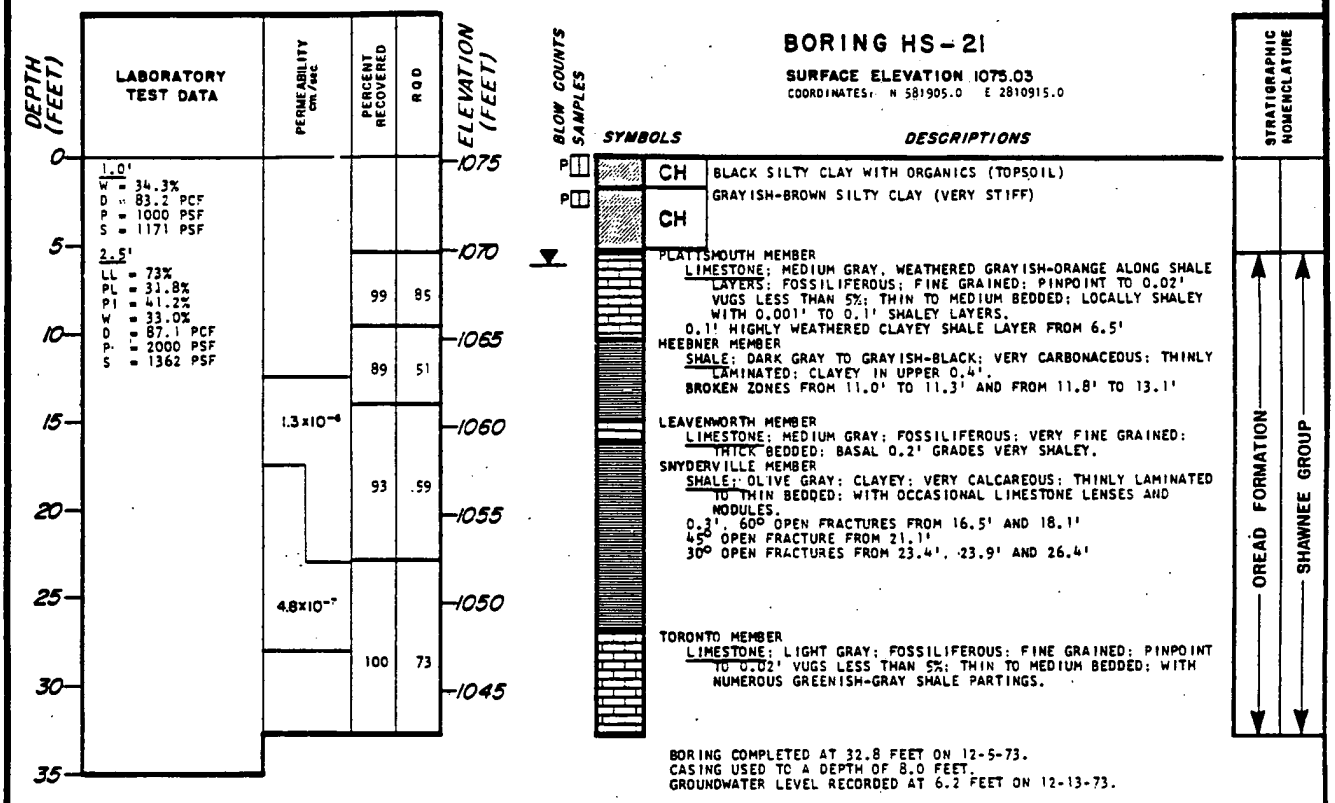


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36t

Log of Boring HS-20



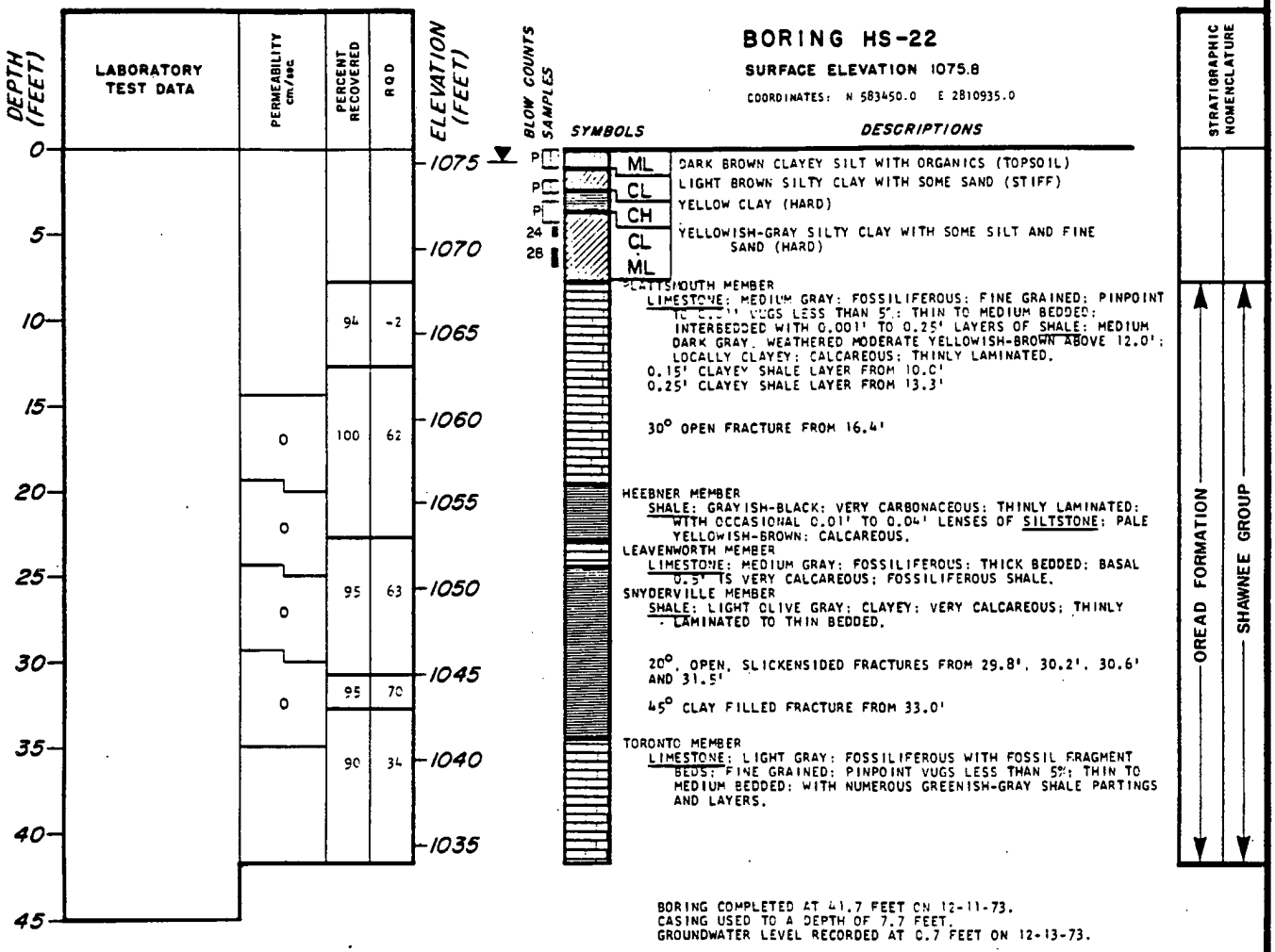
BORING COMPLETED AT 32.8 FEET ON 12-5-73.
CASING USED TO A DEPTH OF 8.0 FEET.
GROUNDWATER LEVEL RECORDED AT 6.2 FEET ON 12-13-73.

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36u

Log of Boring HS-21

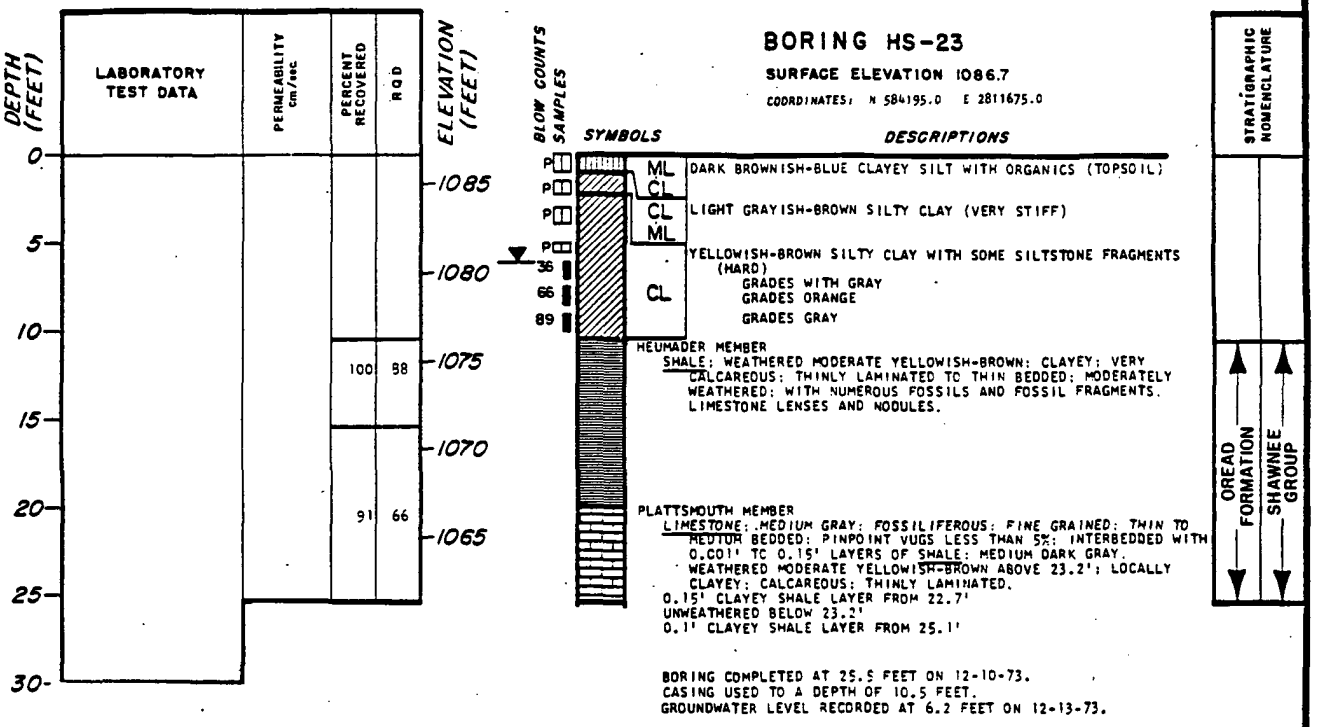


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36v

Log of Boring HS-22

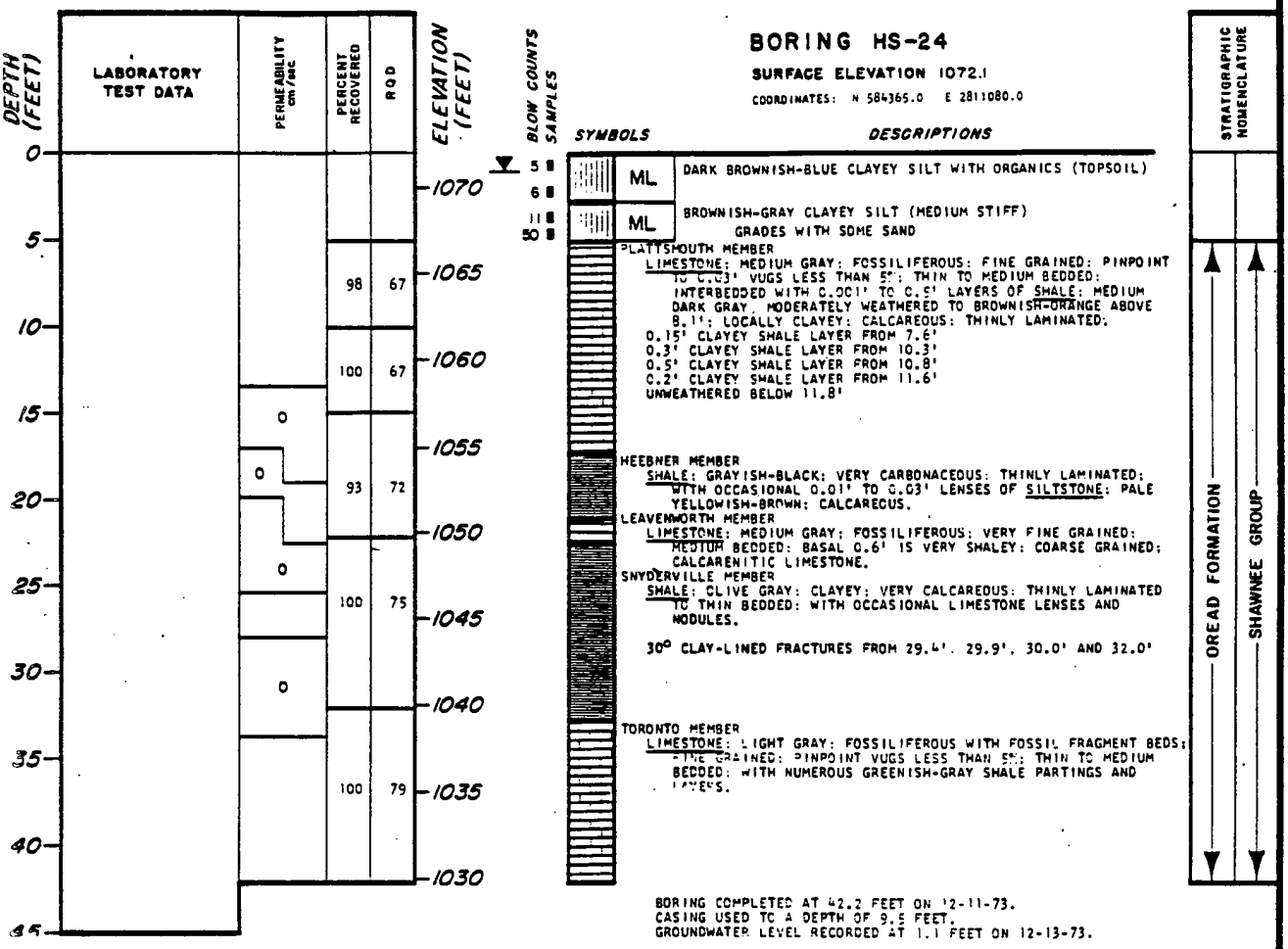


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36w

Log of Boring HS-23



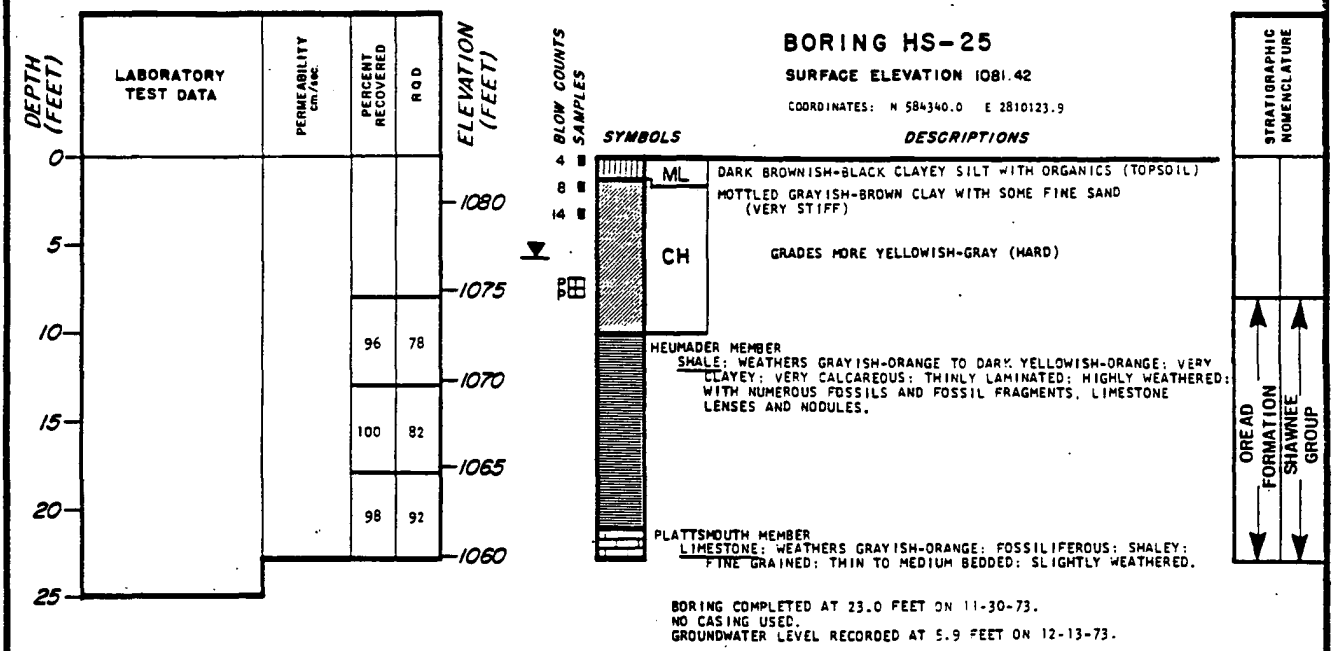
BORING COMPLETED AT 42.2 FEET ON 12-11-73.
CASING USED TO A DEPTH OF 9.5 FEET.
GROUNDWATER LEVEL RECORDED AT 1.1 FEET ON 12-13-73.

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36x

Log of Boring HS-24



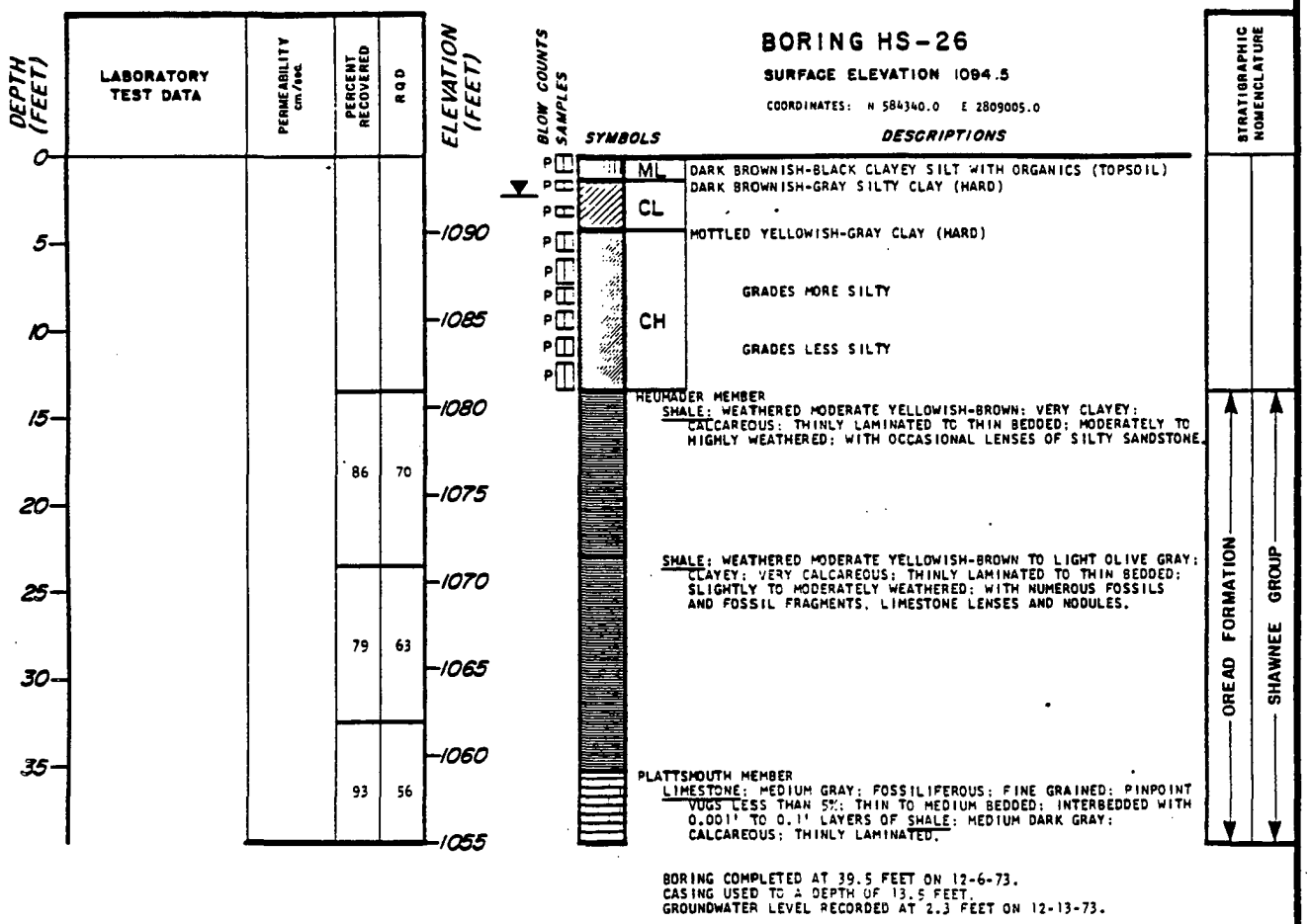
BORING COMPLETED AT 23.0 FEET ON 11-30-73.
NO CASING USED.
GROUNDWATER LEVEL RECORDED AT 5.9 FEET ON 12-13-73.

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36y

Log of Boring HS-25



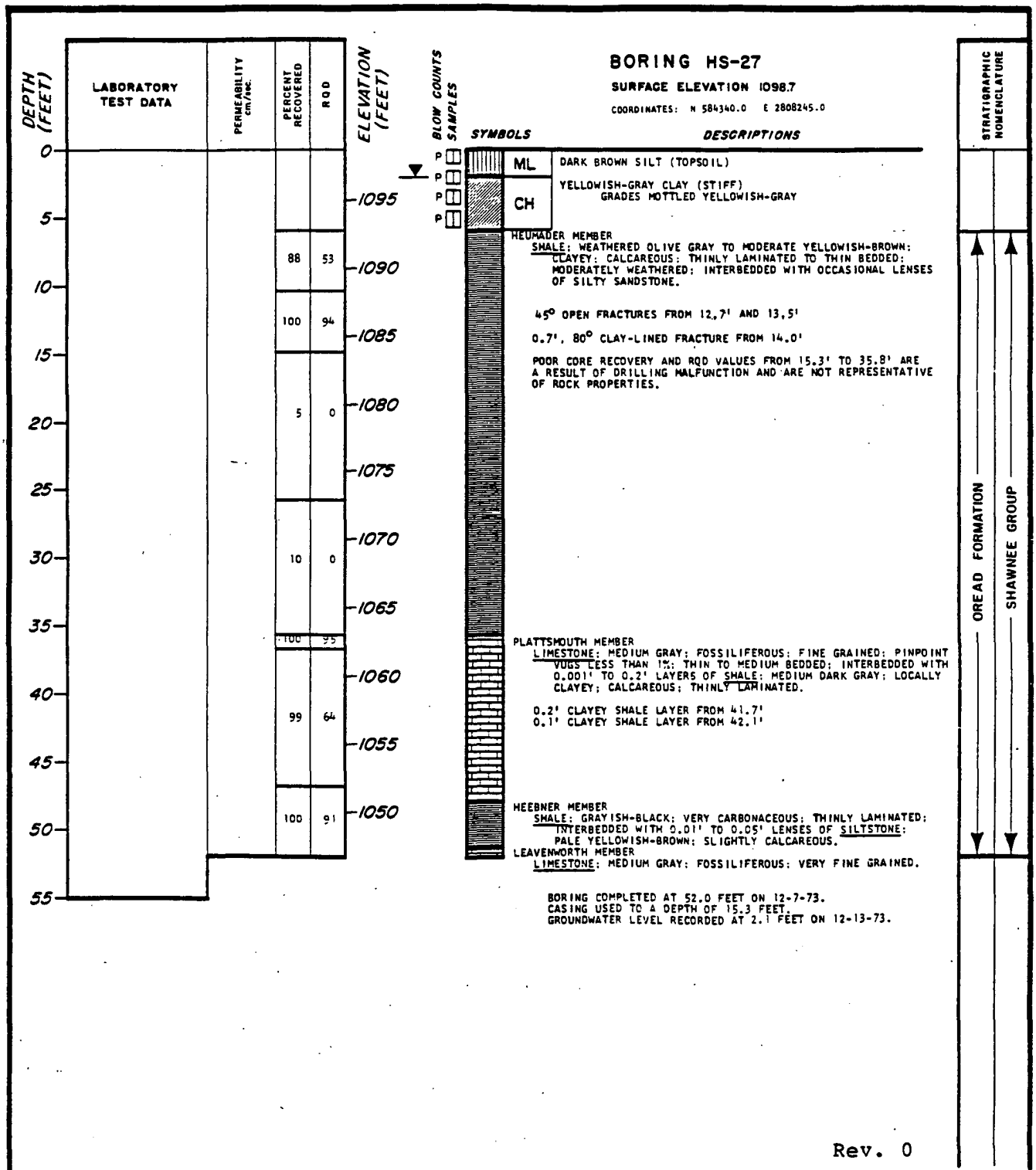
BORING COMPLETED AT 39.5 FEET ON 12-6-73.
CASING USED TO A DEPTH OF 13.5 FEET.
GROUNDWATER LEVEL RECORDED AT 2.3 FEET ON 12-13-73.

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36z

Log of Boring HS-26

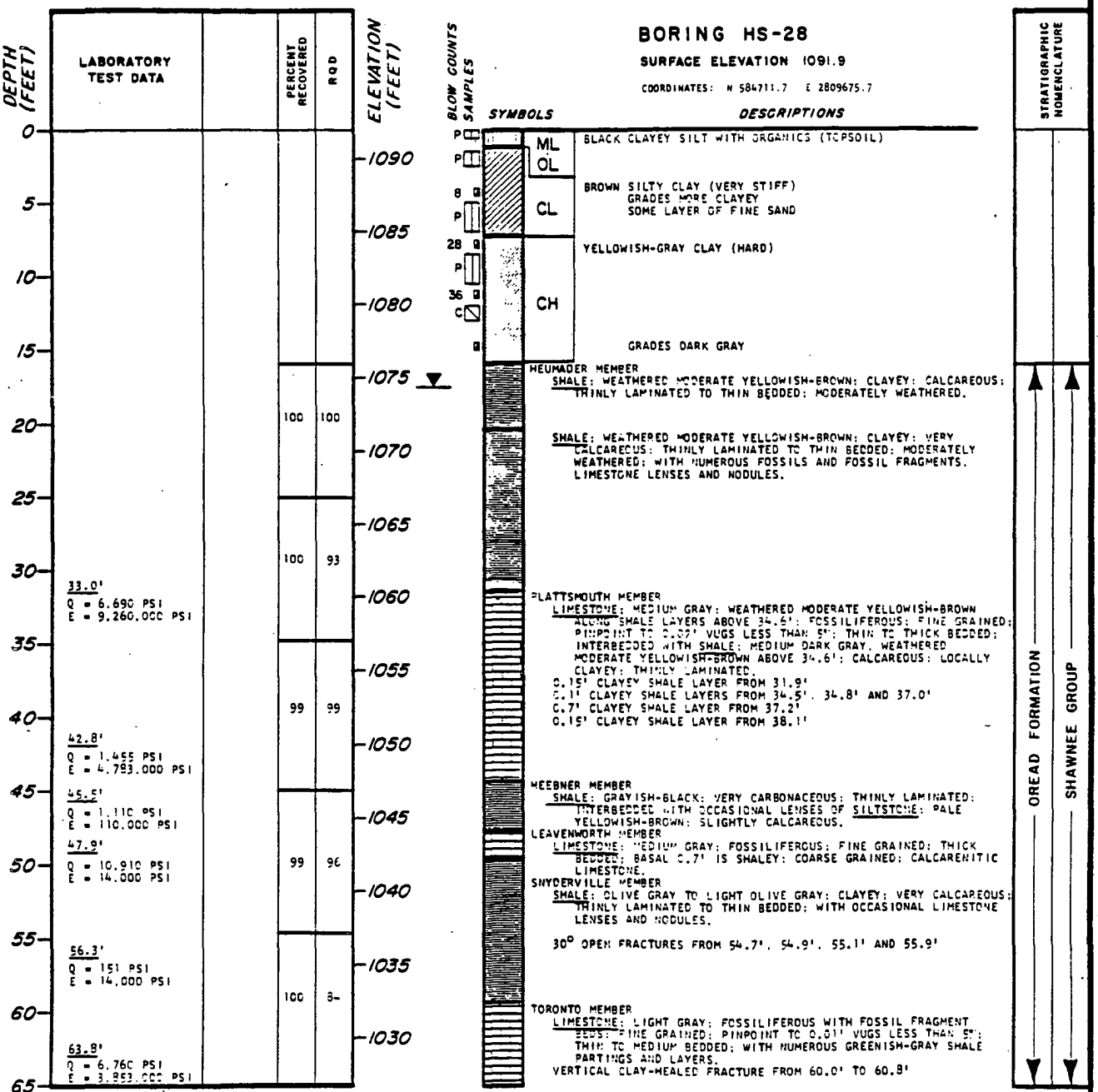


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36aa

Log of Boring HS-27

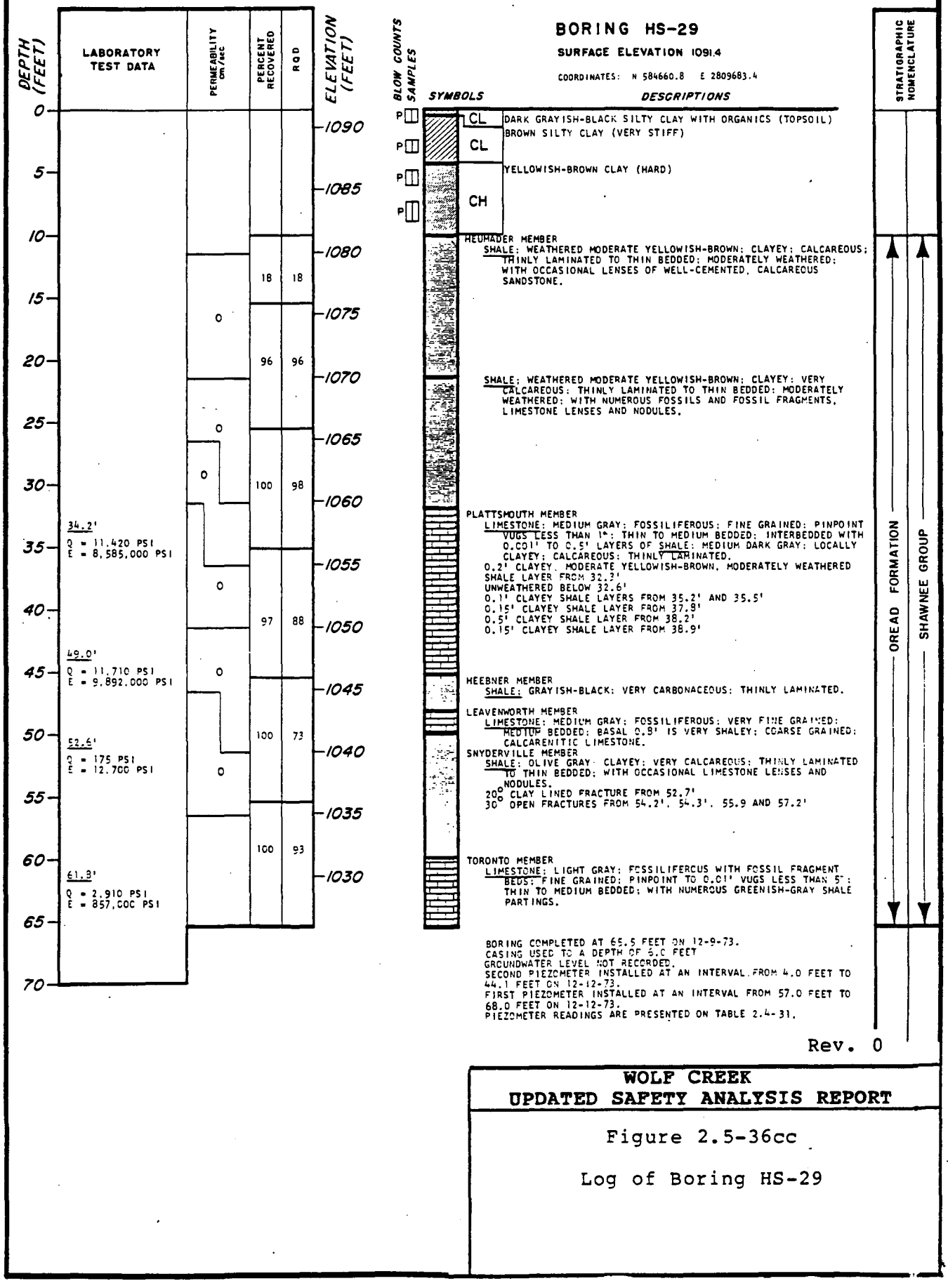


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36bb

Log of Boring HS-28

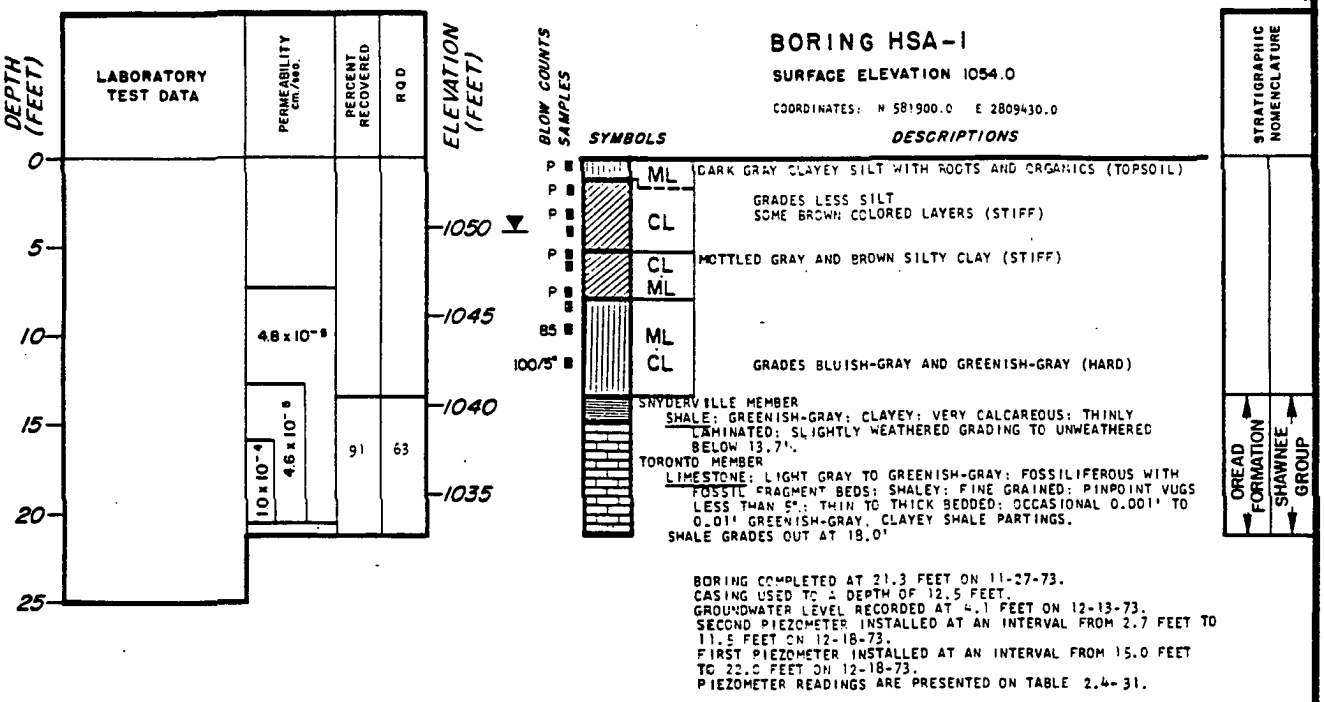


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36cc

Log of Boring HS-29



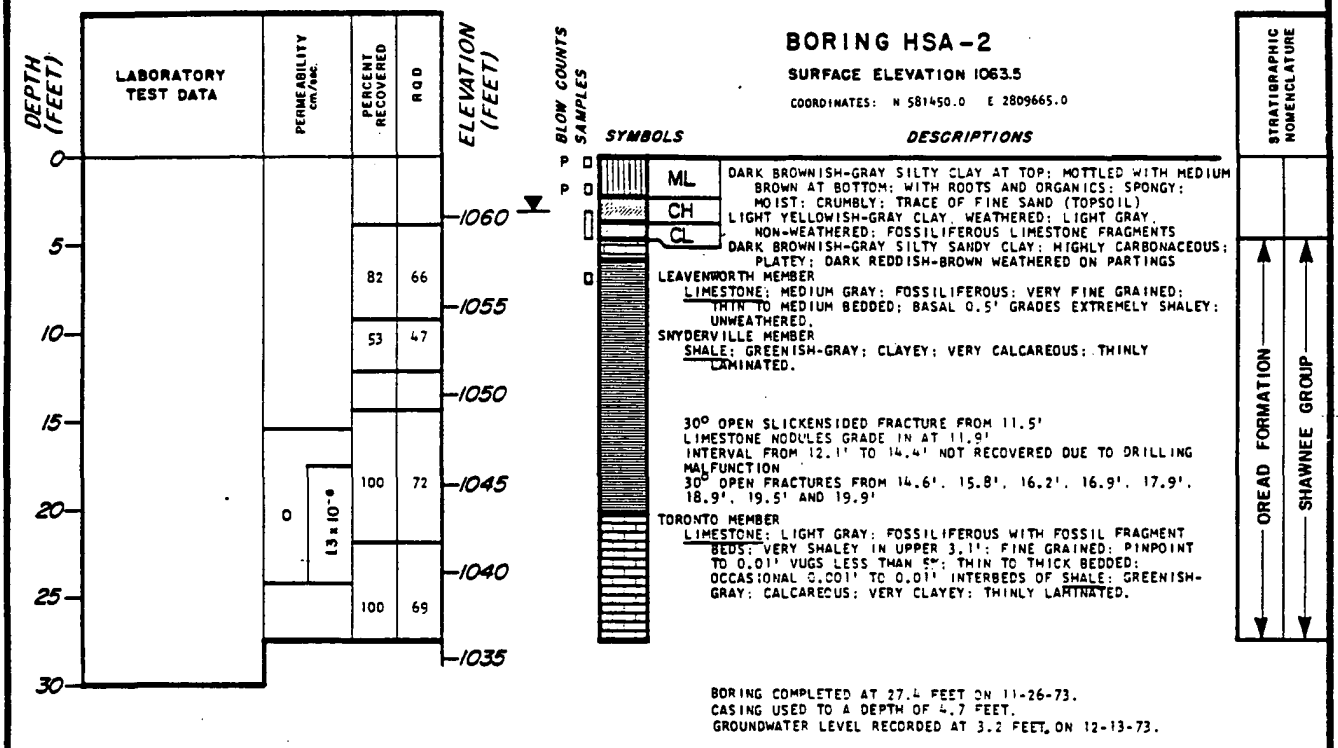
BORING COMPLETED AT 21.3 FEET ON 11-27-73.
CASING USED TO A DEPTH OF 12.5 FEET.
GROUNDWATER LEVEL RECORDED AT 4.1 FEET ON 12-13-73.
SECOND PIEZOMETER INSTALLED AT AN INTERVAL FROM 2.7 FEET TO 11.5 FEET ON 12-18-73.
FIRST PIEZOMETER INSTALLED AT AN INTERVAL FROM 15.0 FEET TO 22.0 FEET ON 12-18-73.
PIEZOMETER READINGS ARE PRESENTED ON TABLE 2.4-31.

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36dd

Log of Boring HSA-1



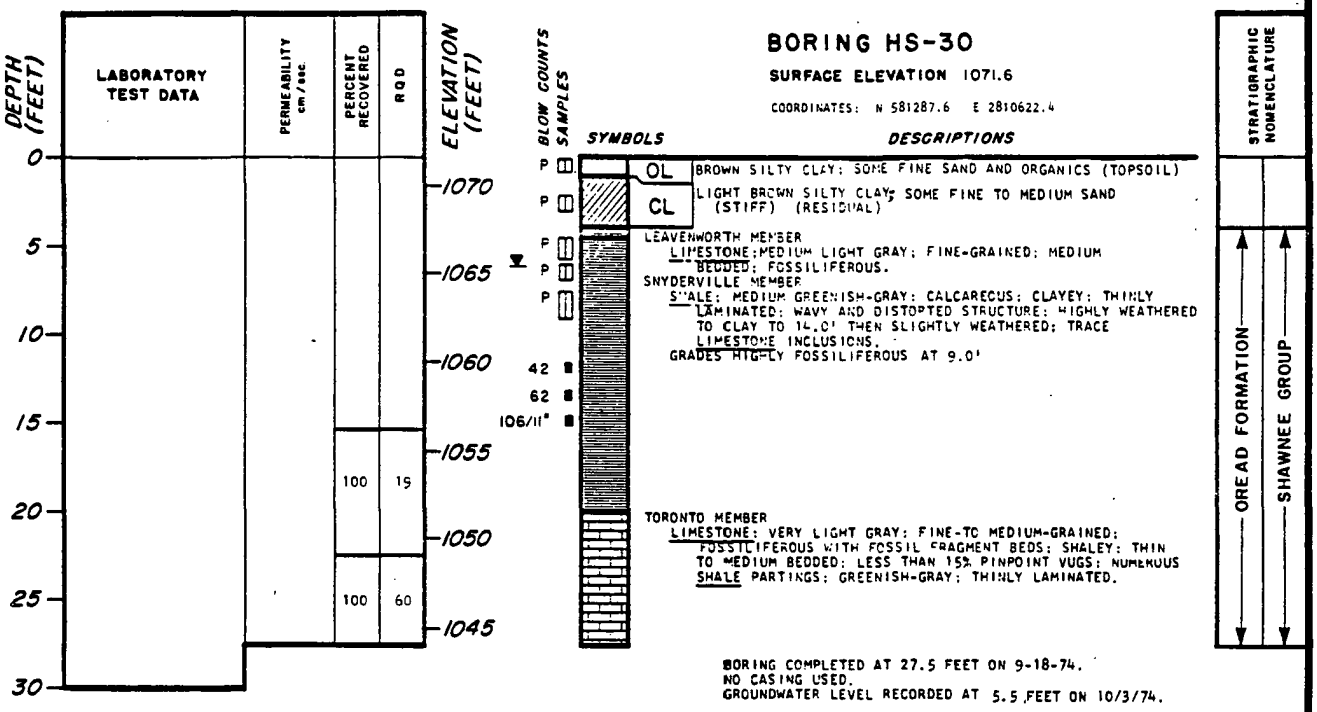
BORING COMPLETED AT 27.4 FEET ON 11-26-73.
CASING USED TO A DEPTH OF 4.7 FEET.
GROUNDWATER LEVEL RECORDED AT 3.2 FEET, ON 12-13-73.

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36ee

Log of Boring HSA-2



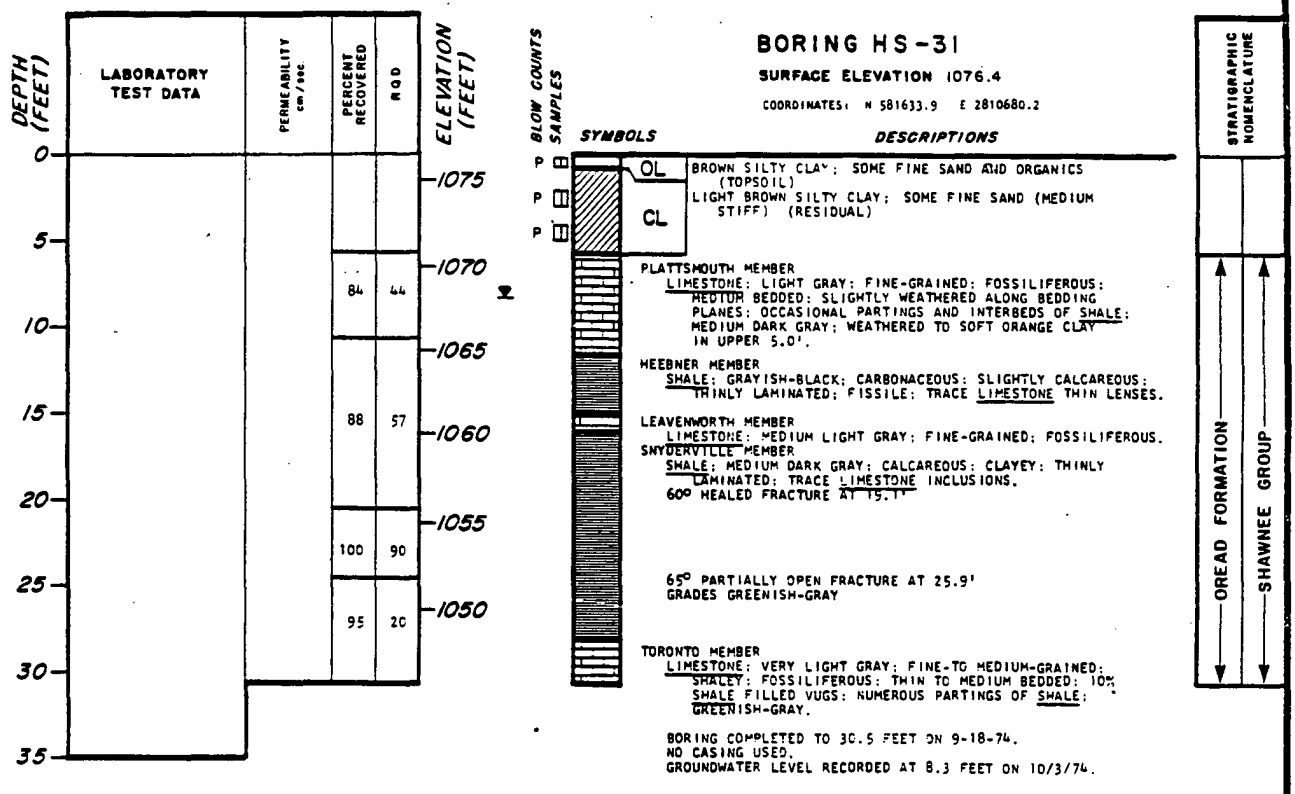
BORING COMPLETED AT 27.5 FEET ON 9-18-74.
NO CASING USED.
GROUNDWATER LEVEL RECORDED AT 5.5 FEET ON 10/3/74.

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36ff

Log of Boring HS-30

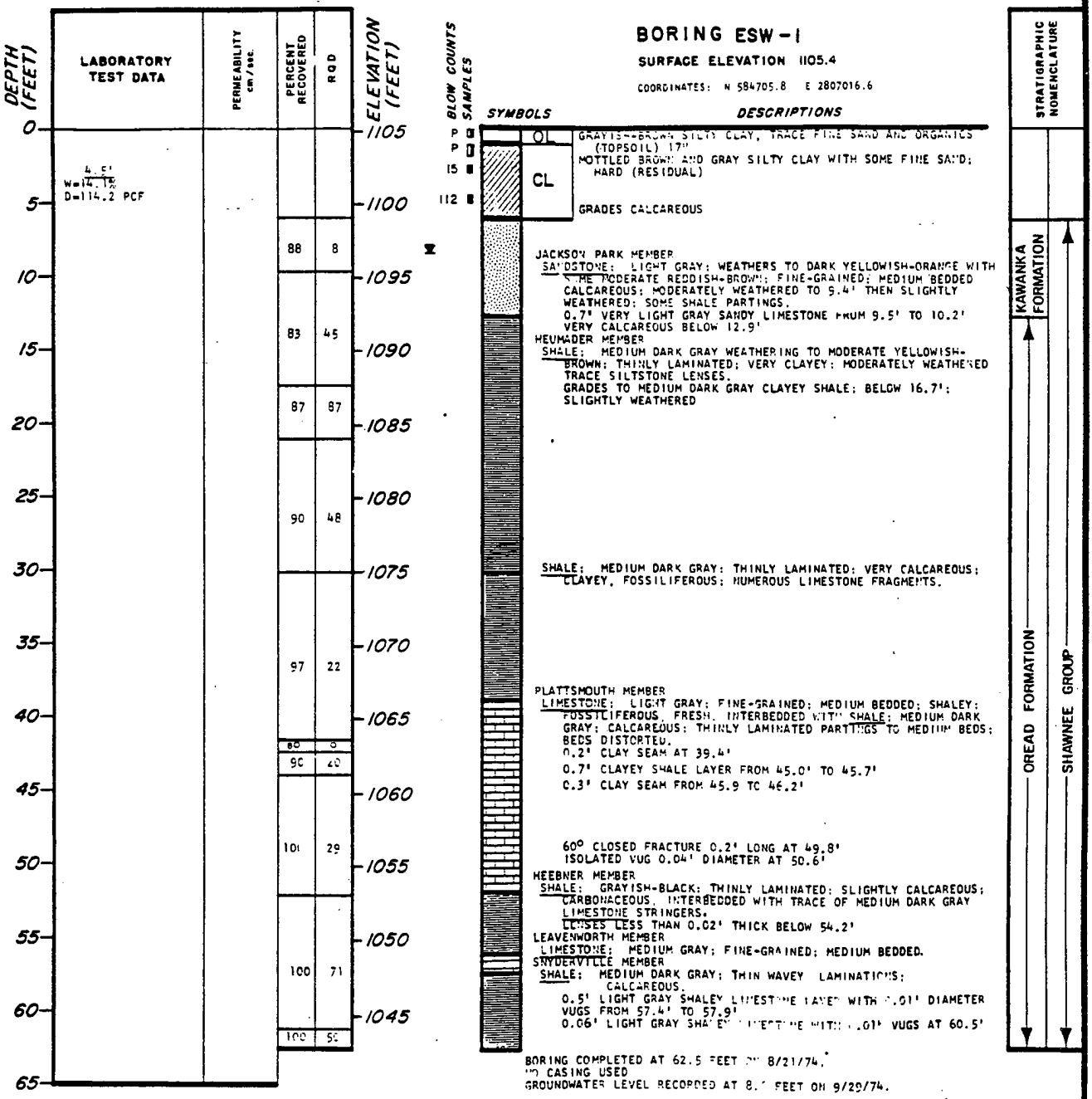


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36gg

Log of Boring HS-31



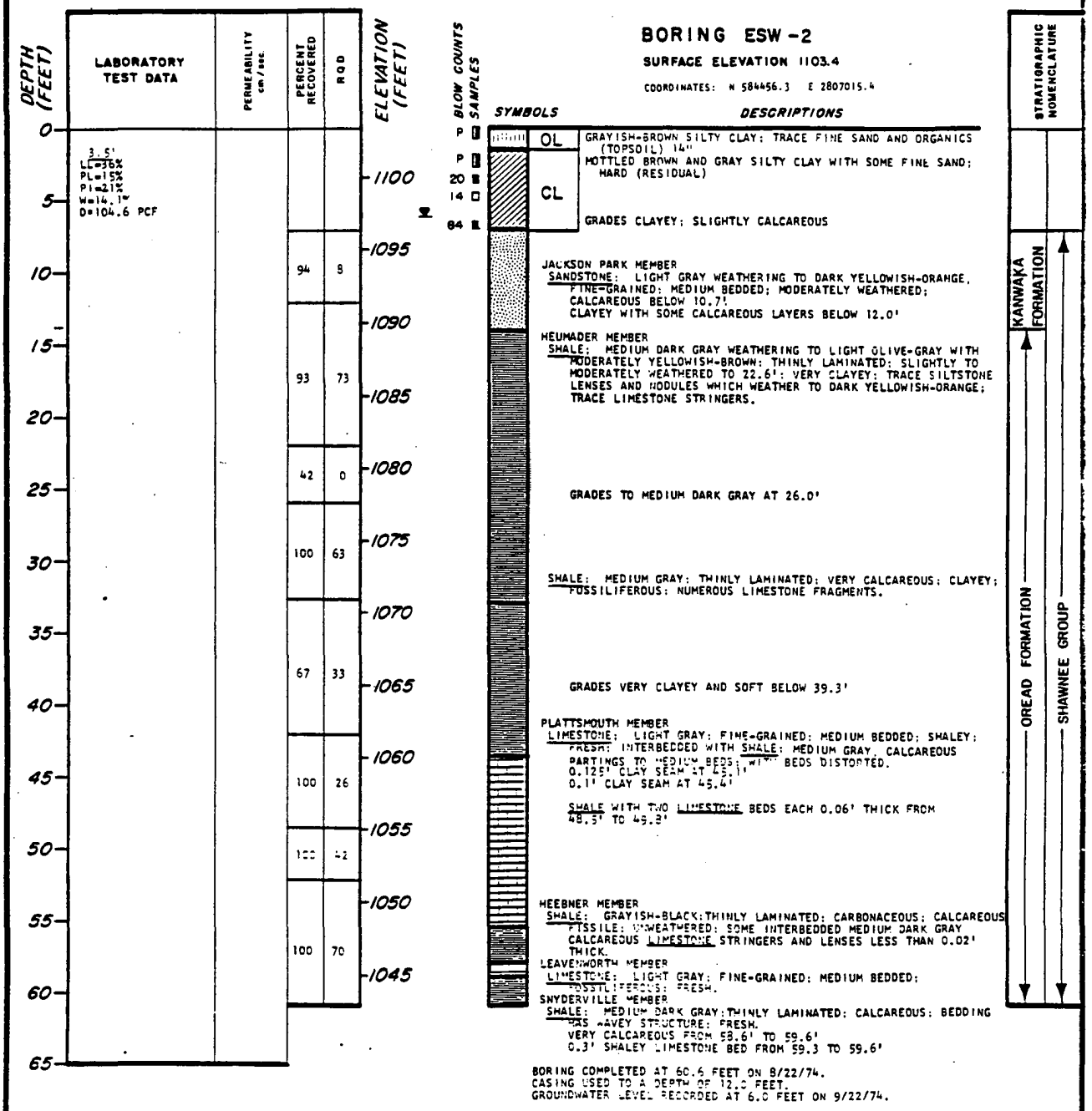
BORING COMPLETED AT 62.5 FEET ON 8/21/74.
NO CASING USED
GROUNDWATER LEVEL RECORDED AT 8.[illegible] FEET ON 9/20/74.

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36hh

Log of Boring ESW-1

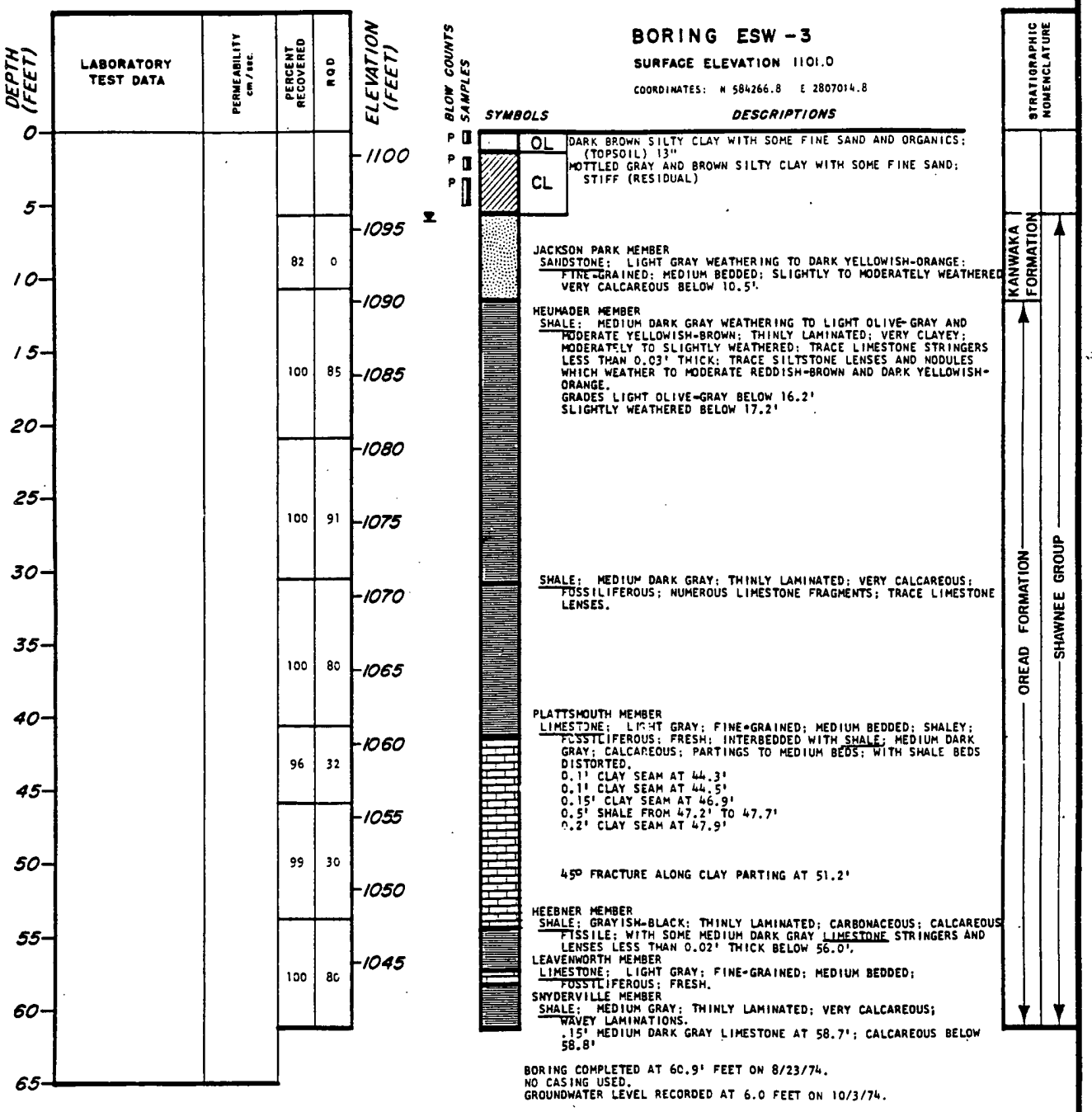


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36ii

Log of Boring ESW-2

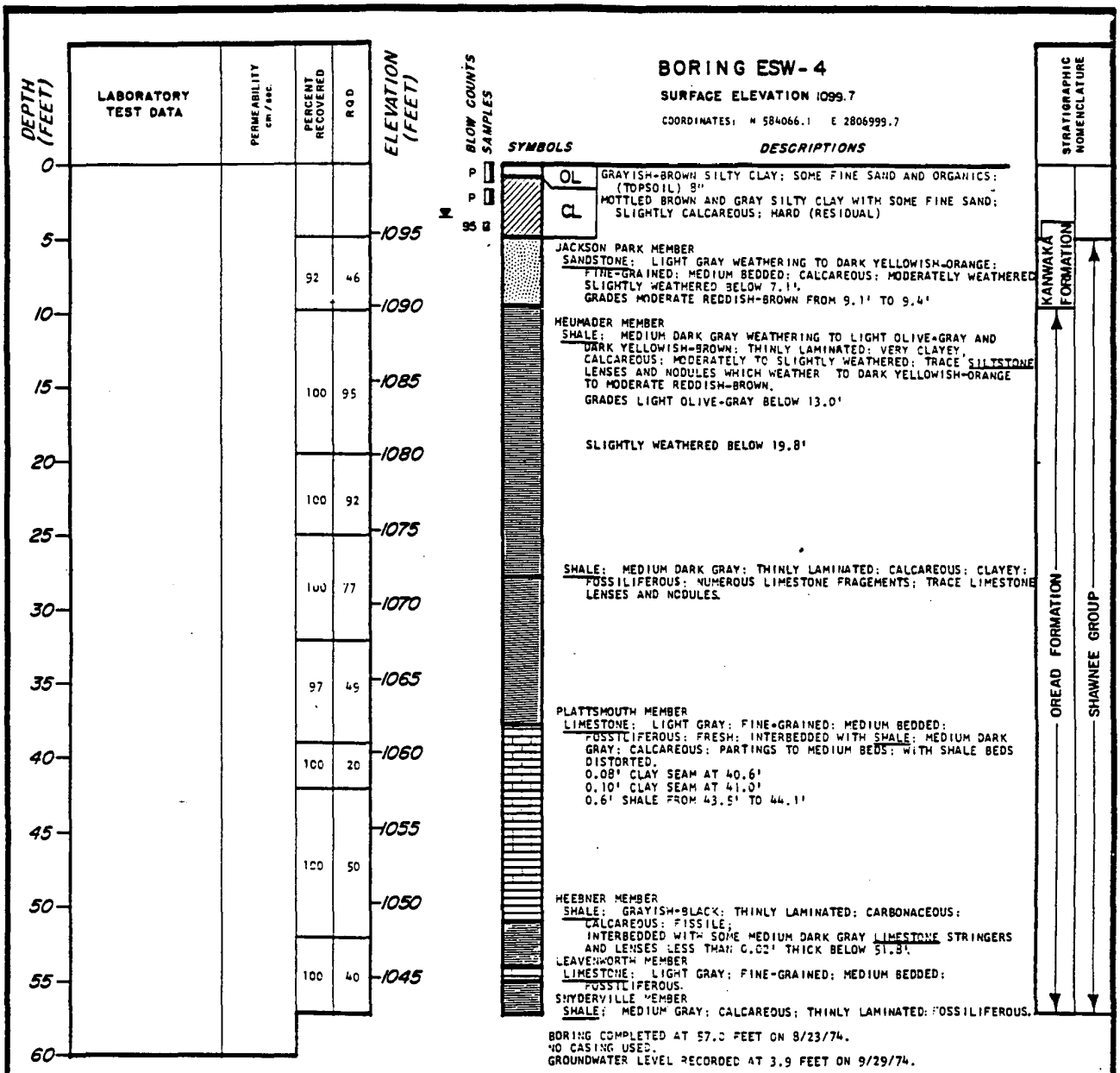


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36jj

Log of Boring ESW-3

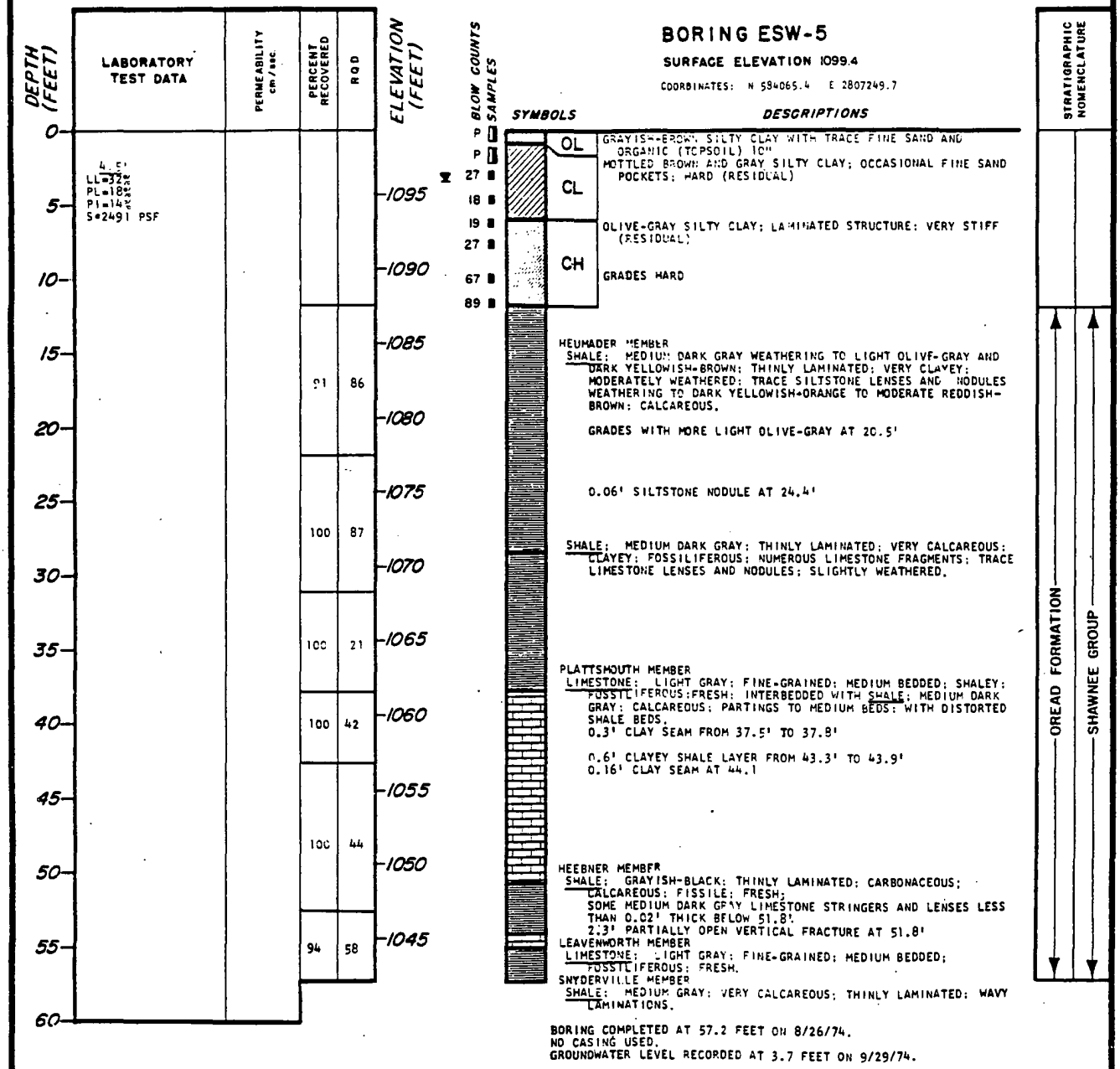


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36kk

Log of Boring ESW-4

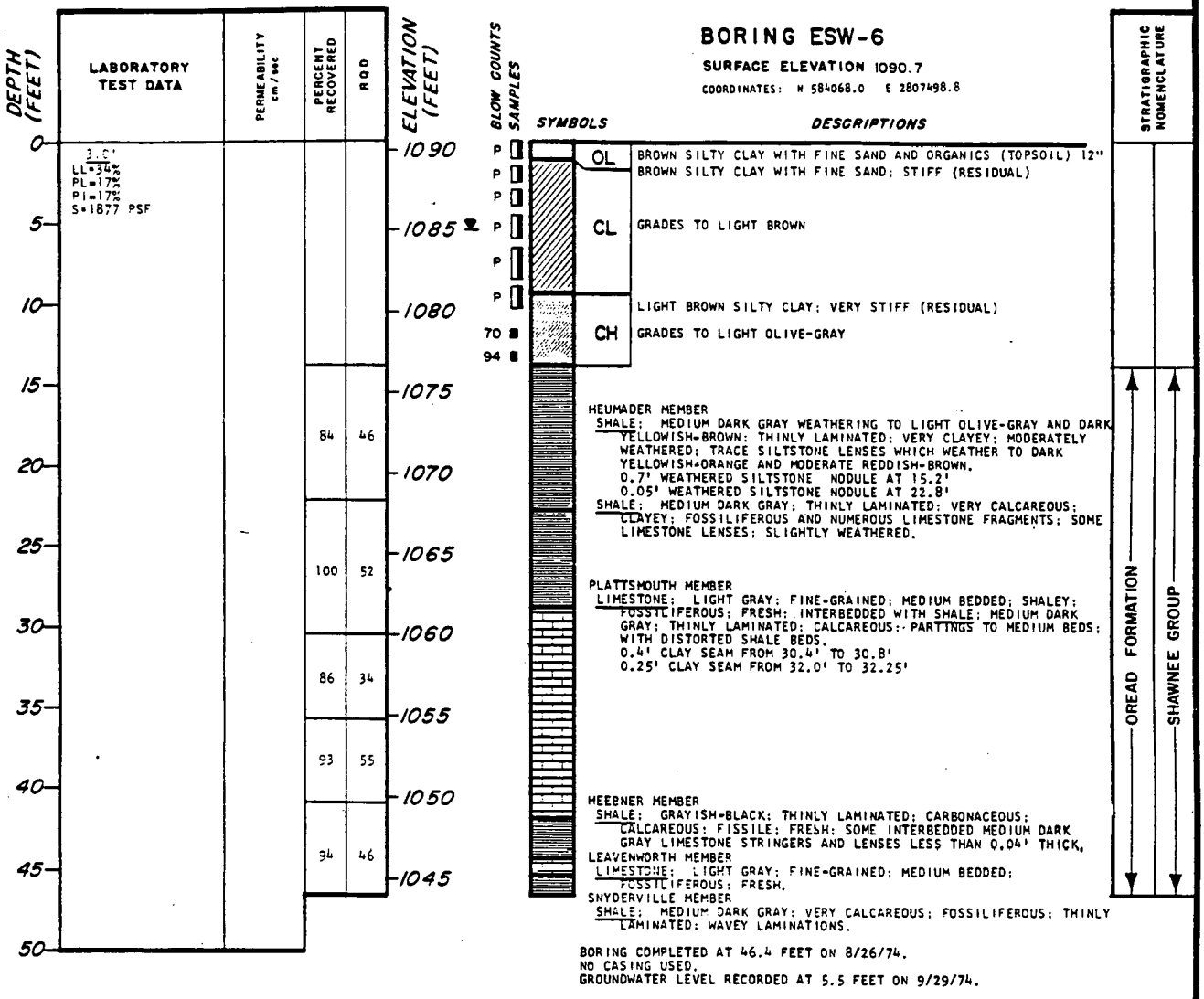


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-3611

Log of Boring ESW-5

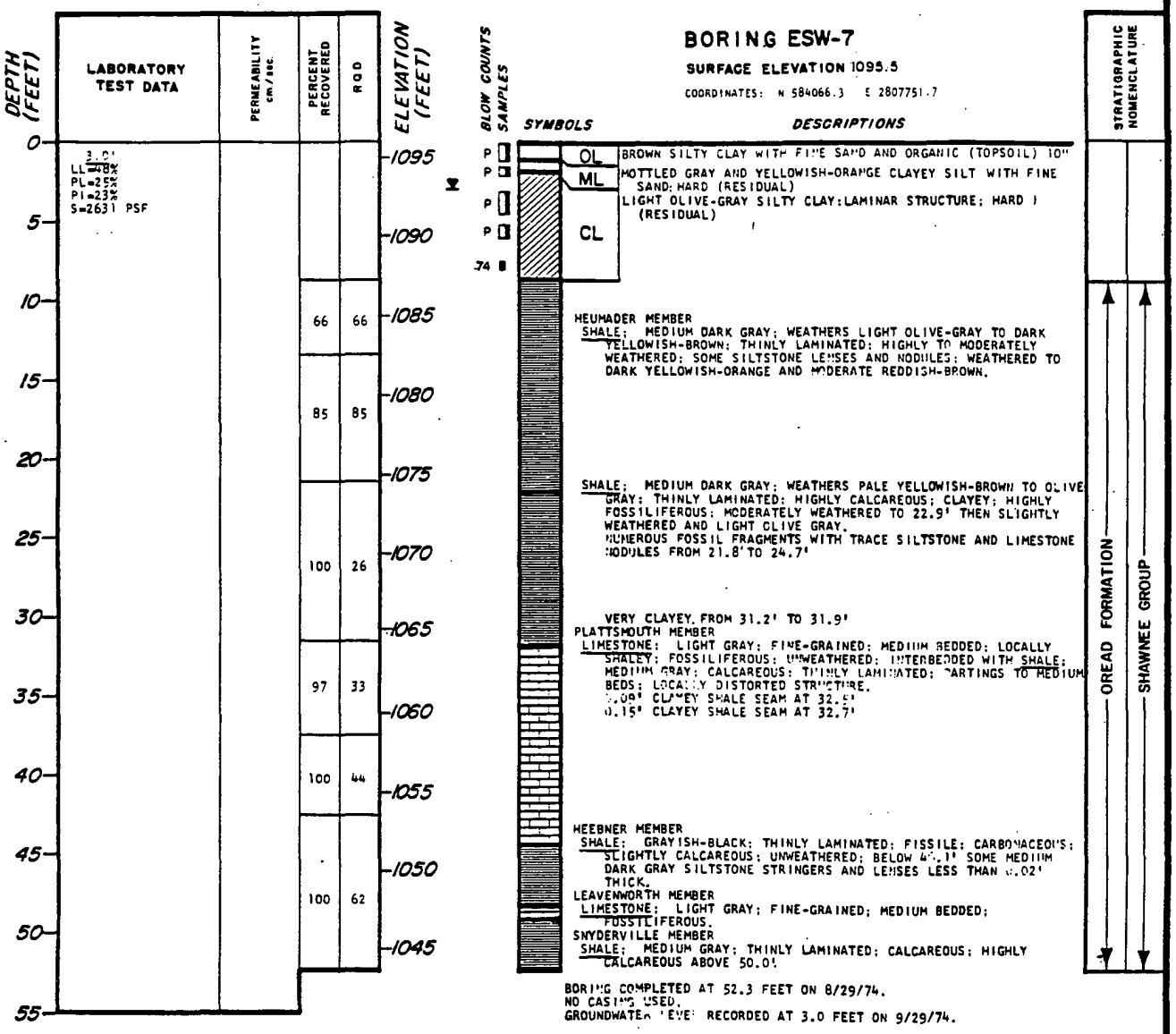


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36mm

Log of Boring ESW-6

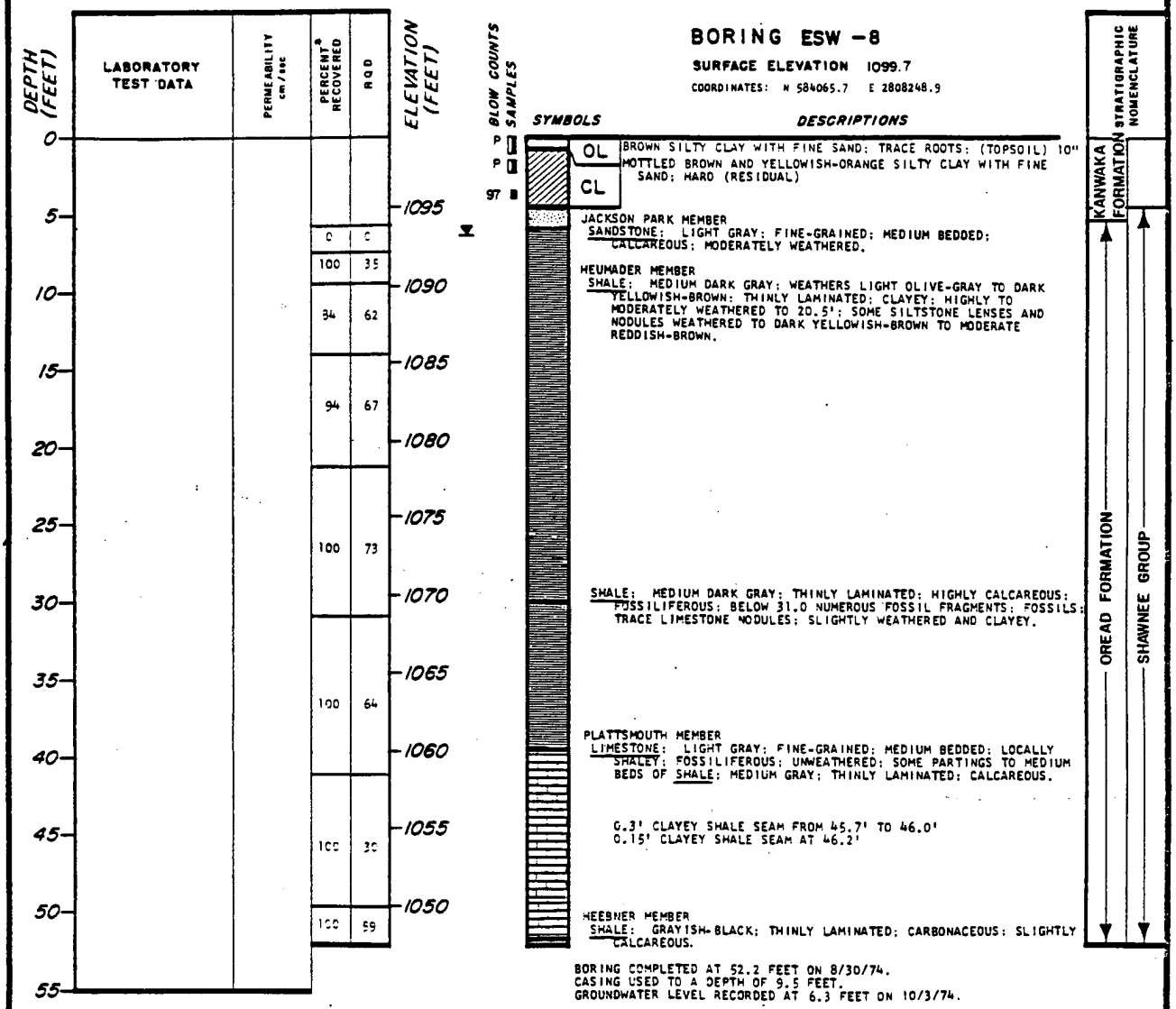


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36nn

Log of Boring ESW-7

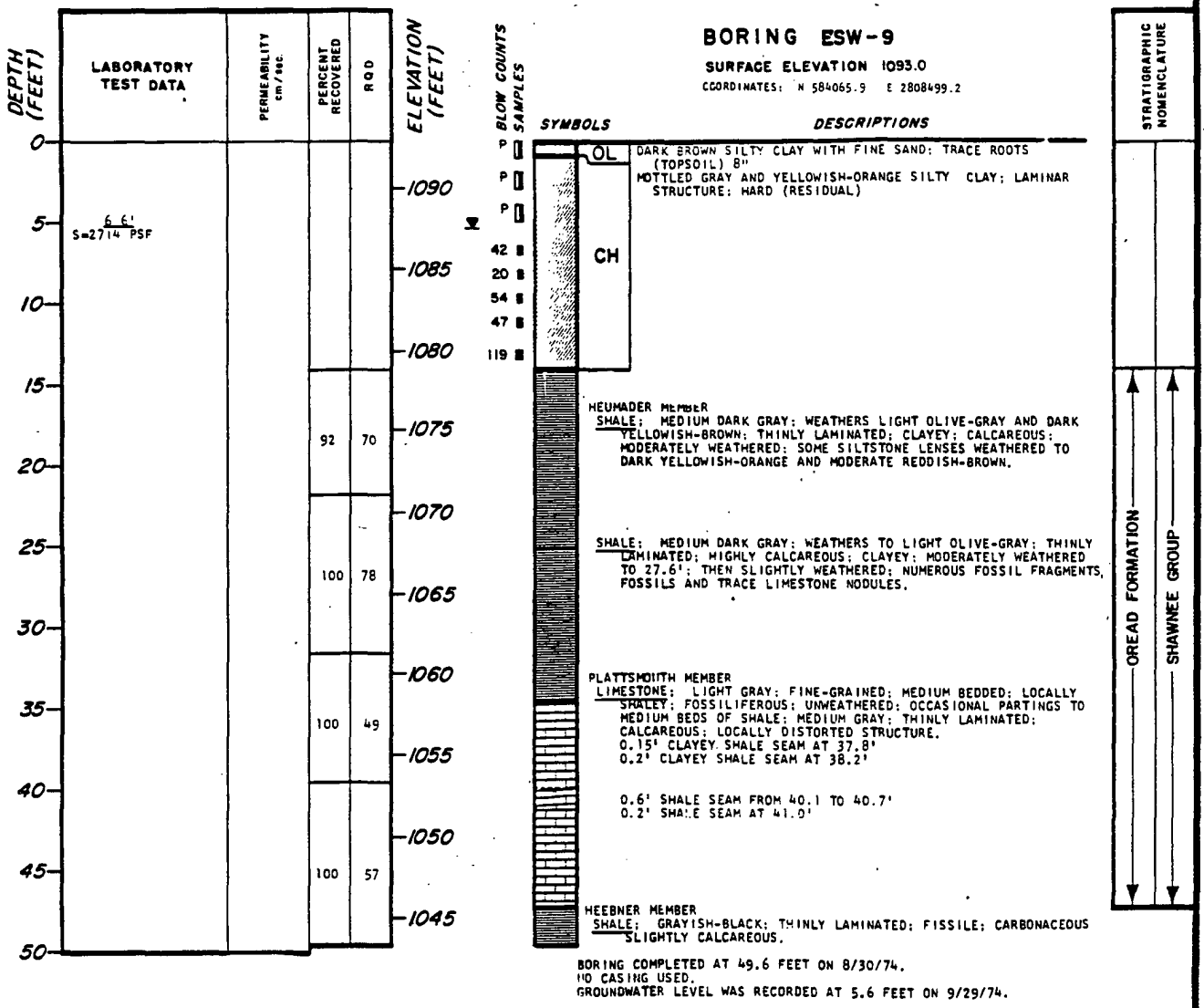


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-3600

Log of Boring ESW-8

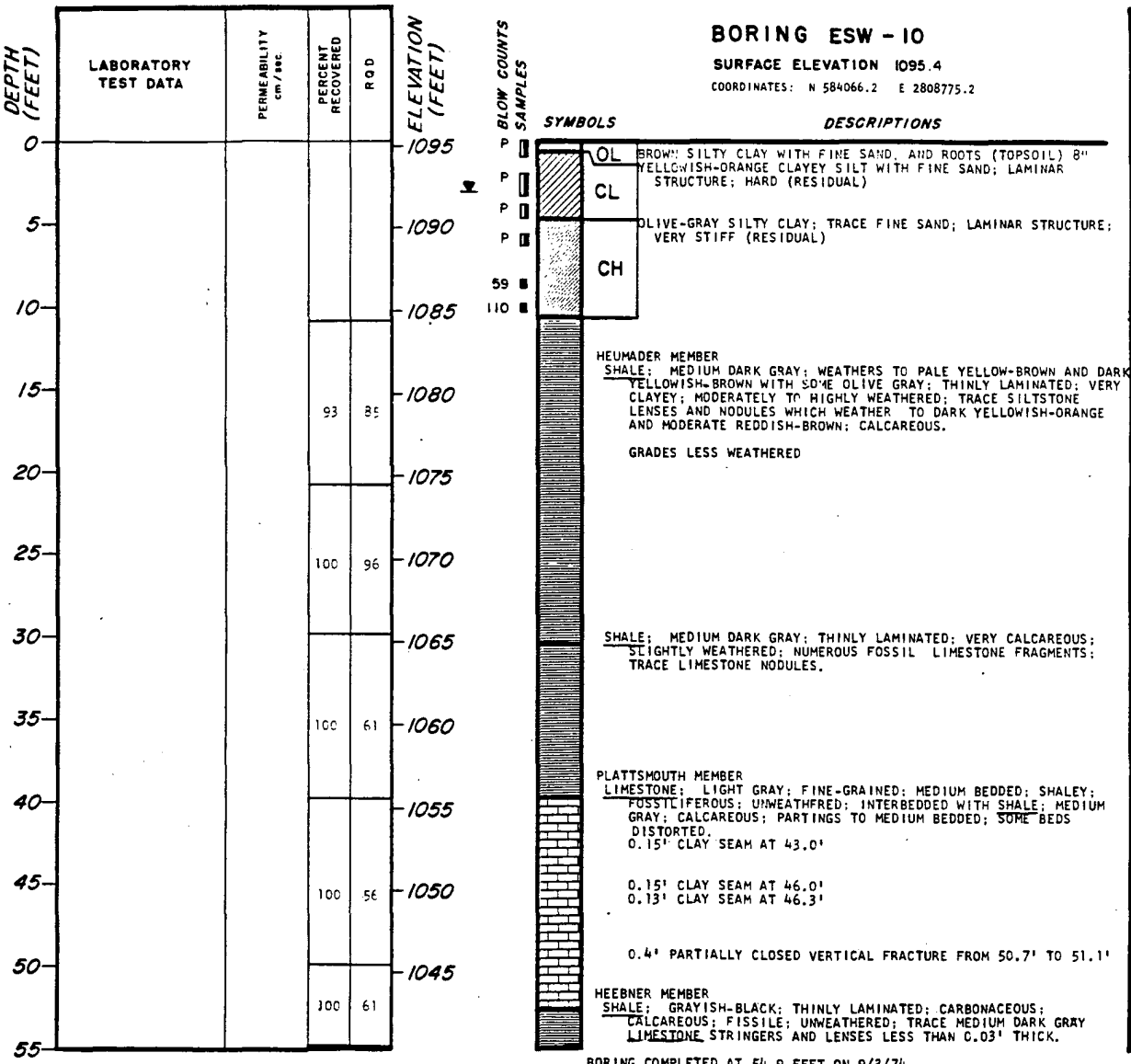


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36pp

Log of Boring ESW-9

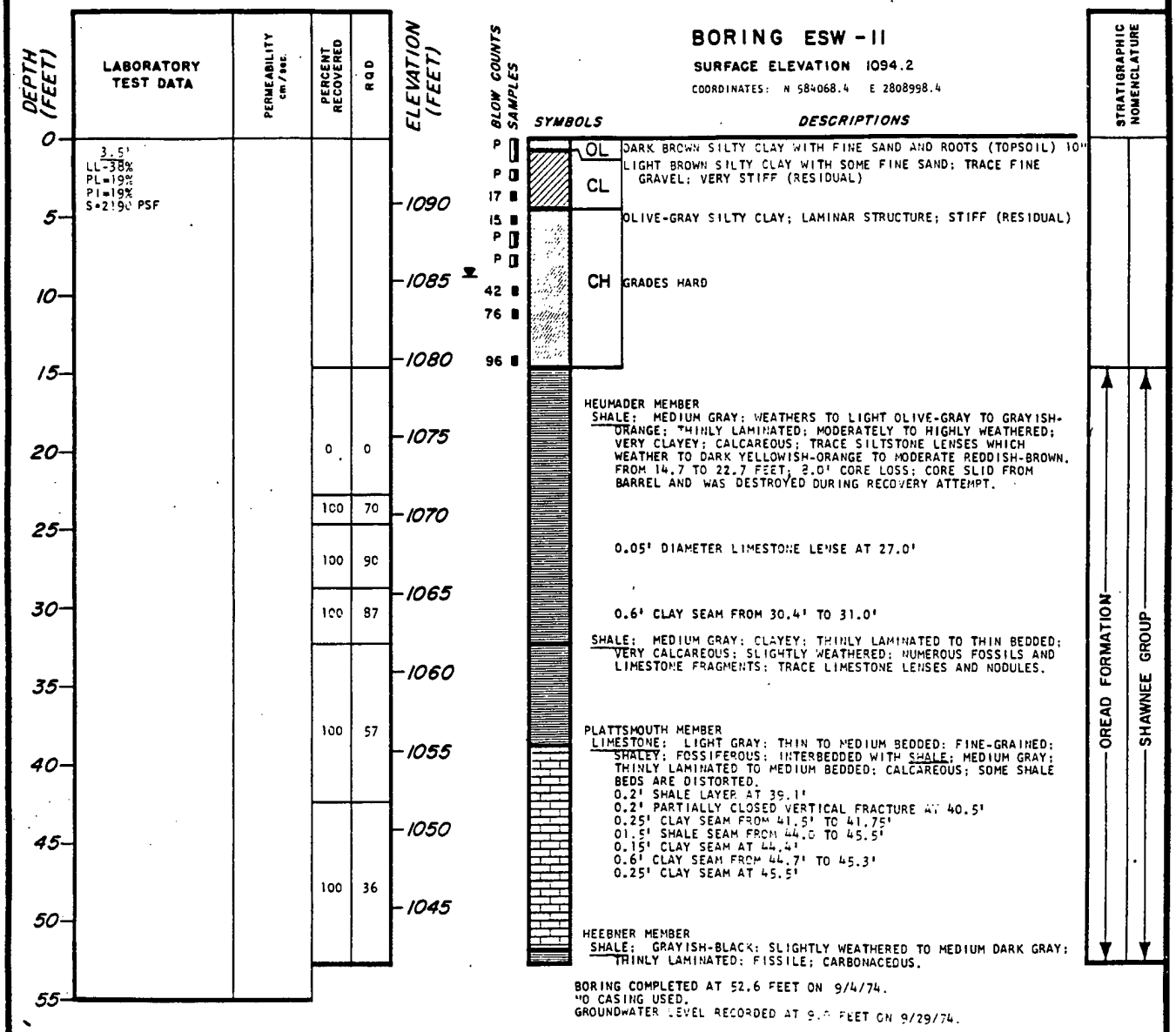


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36qq

Log of Boring ESW-10

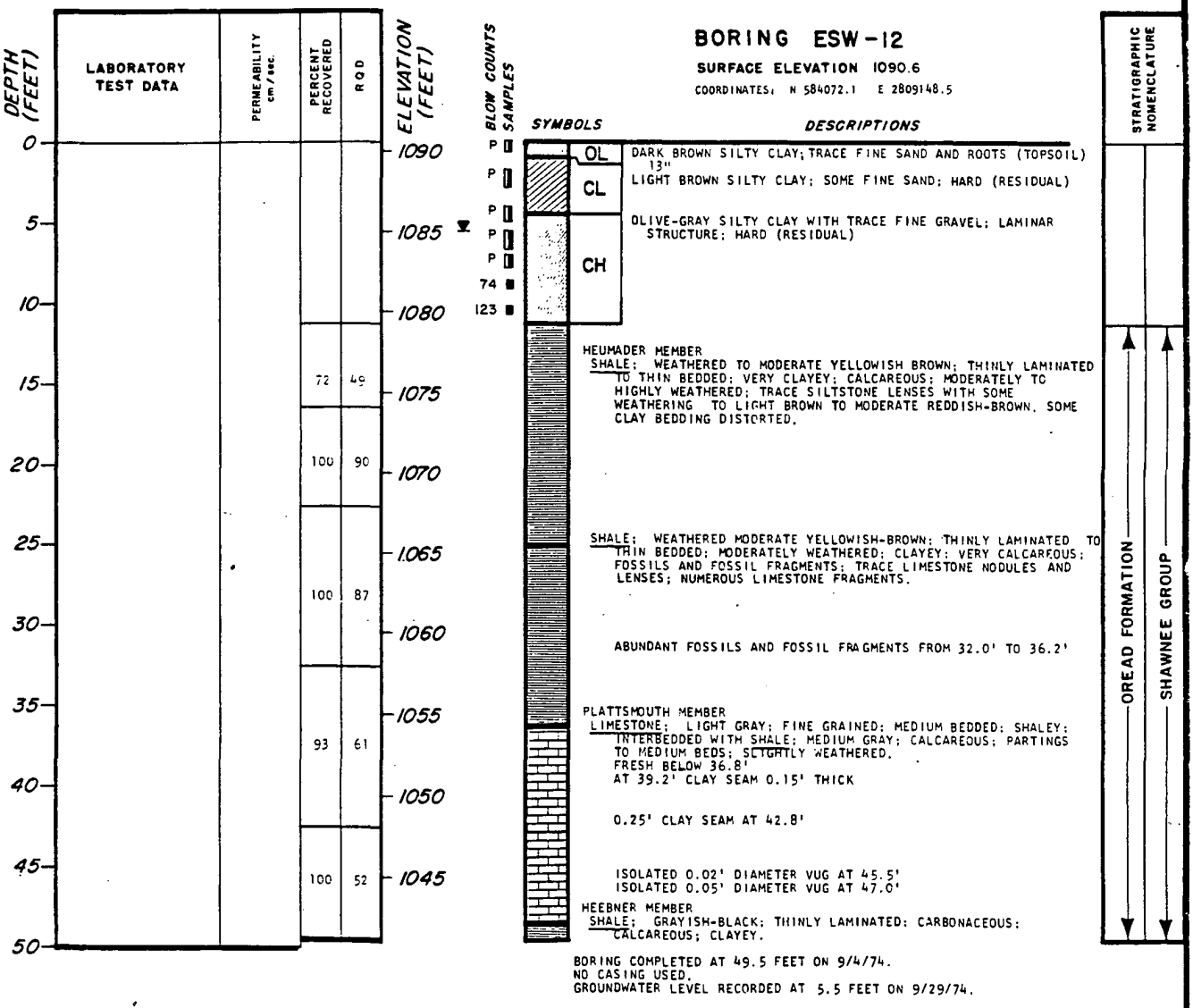


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36rr

Log of Boring ESW-11

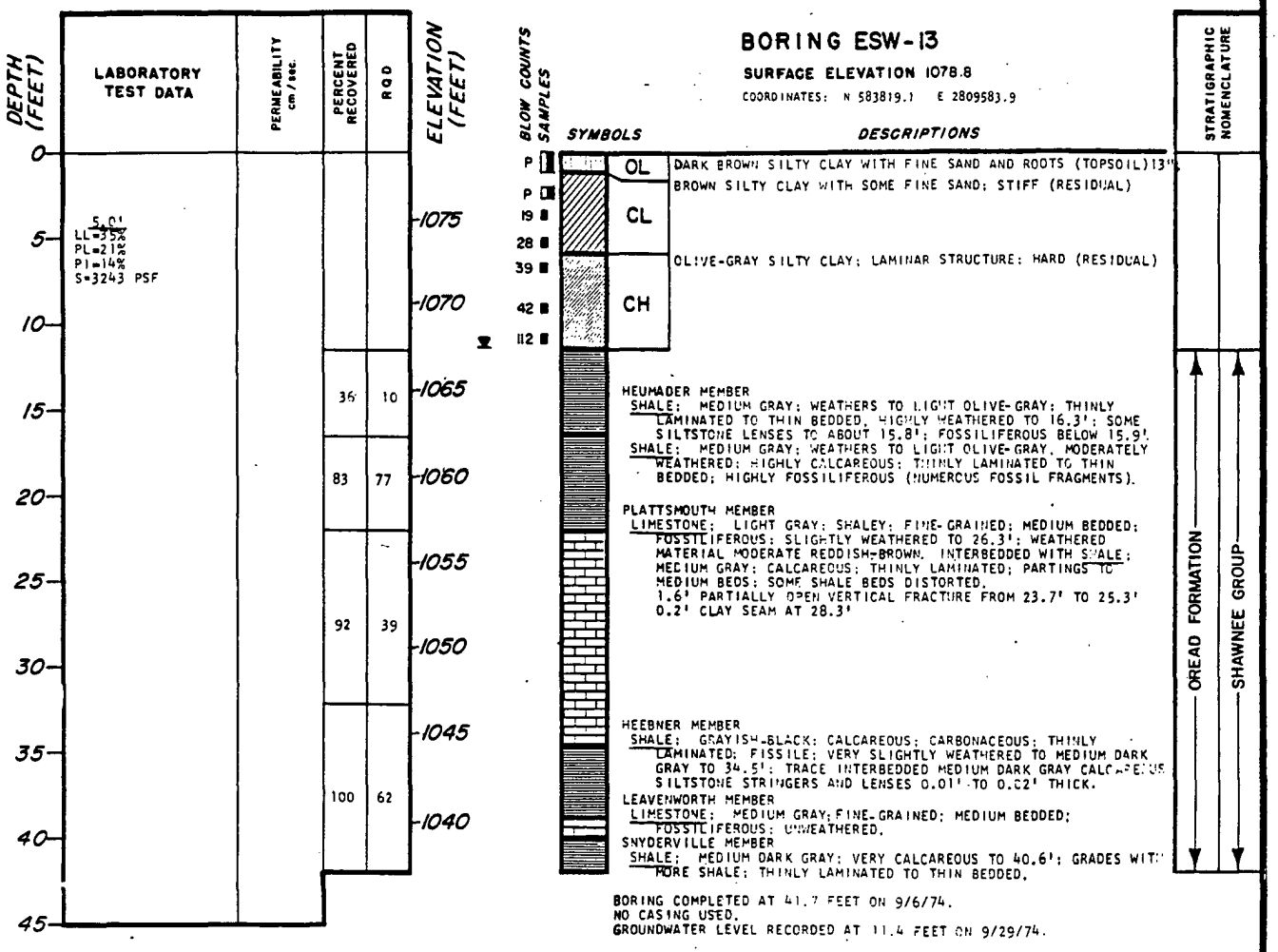


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36ss

Log of Boring ESW-12

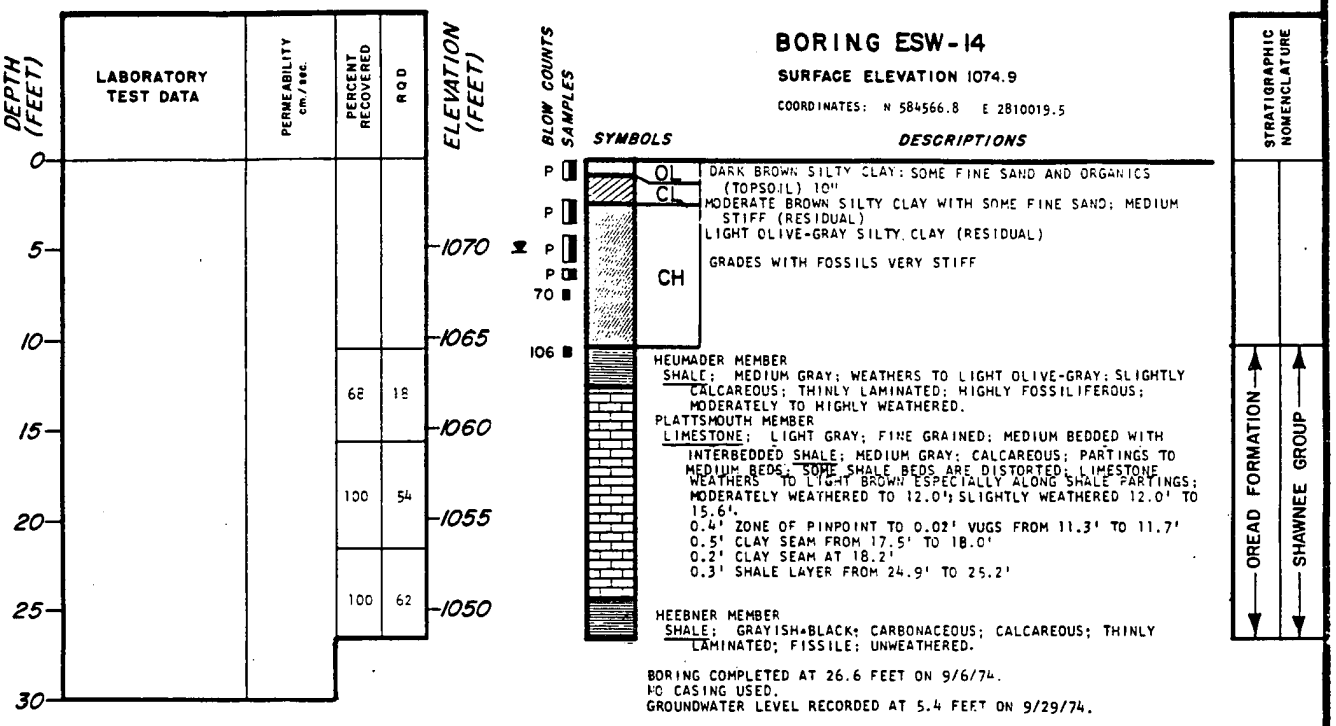


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36tt

Log of Boring ESW-13

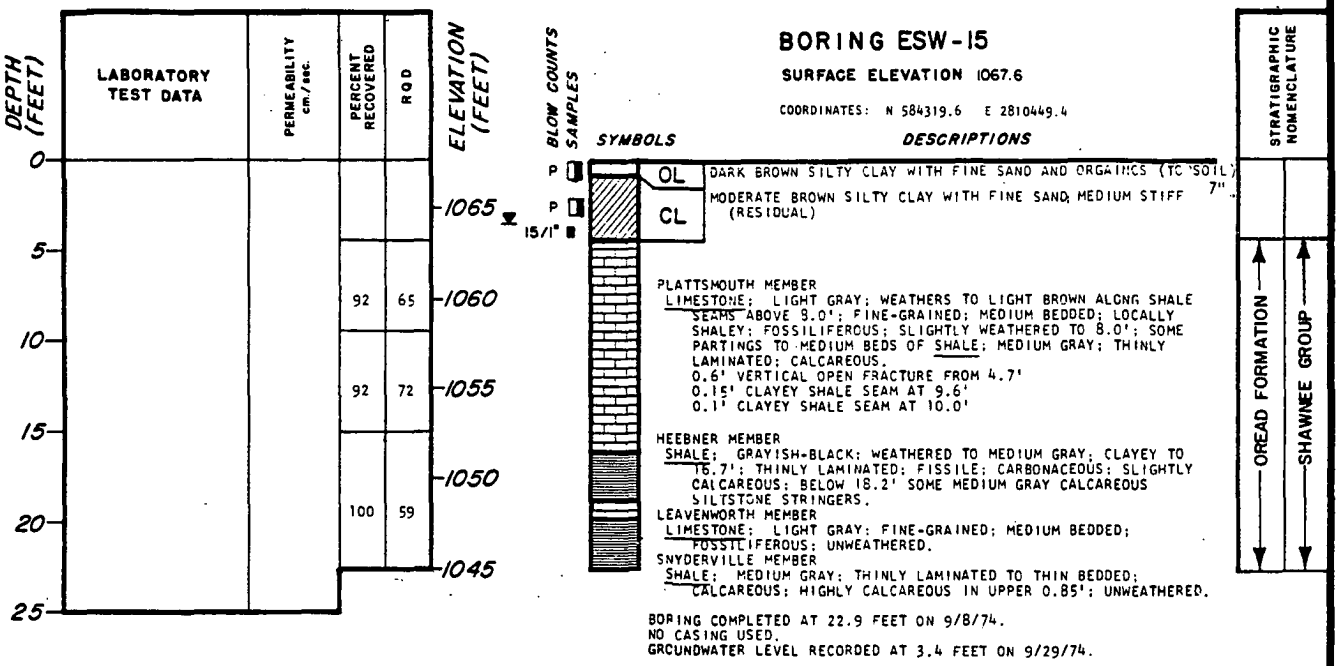


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36uu

Log of Boring ESW-14

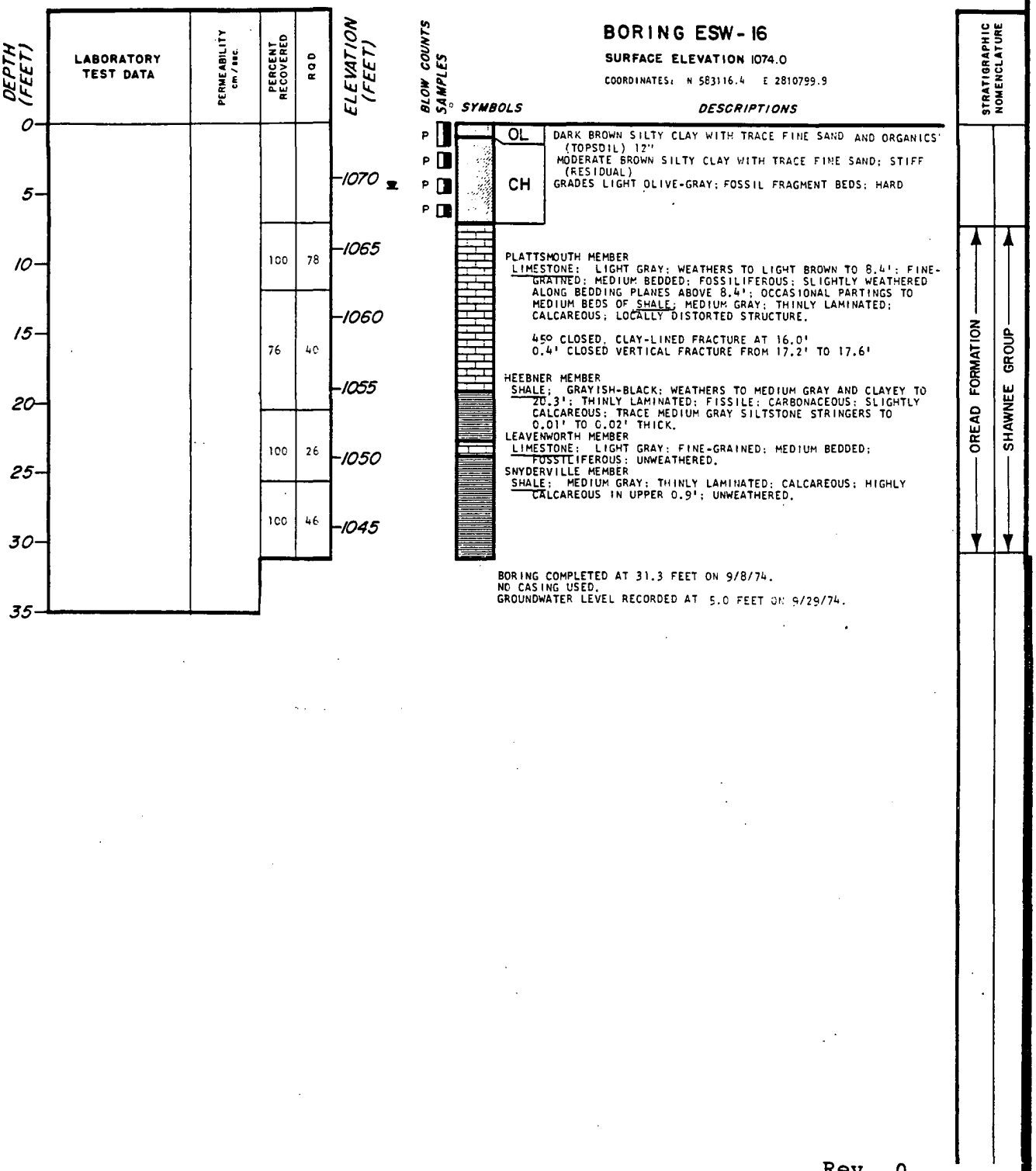


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36vv

Log of Boring ESW-15



Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

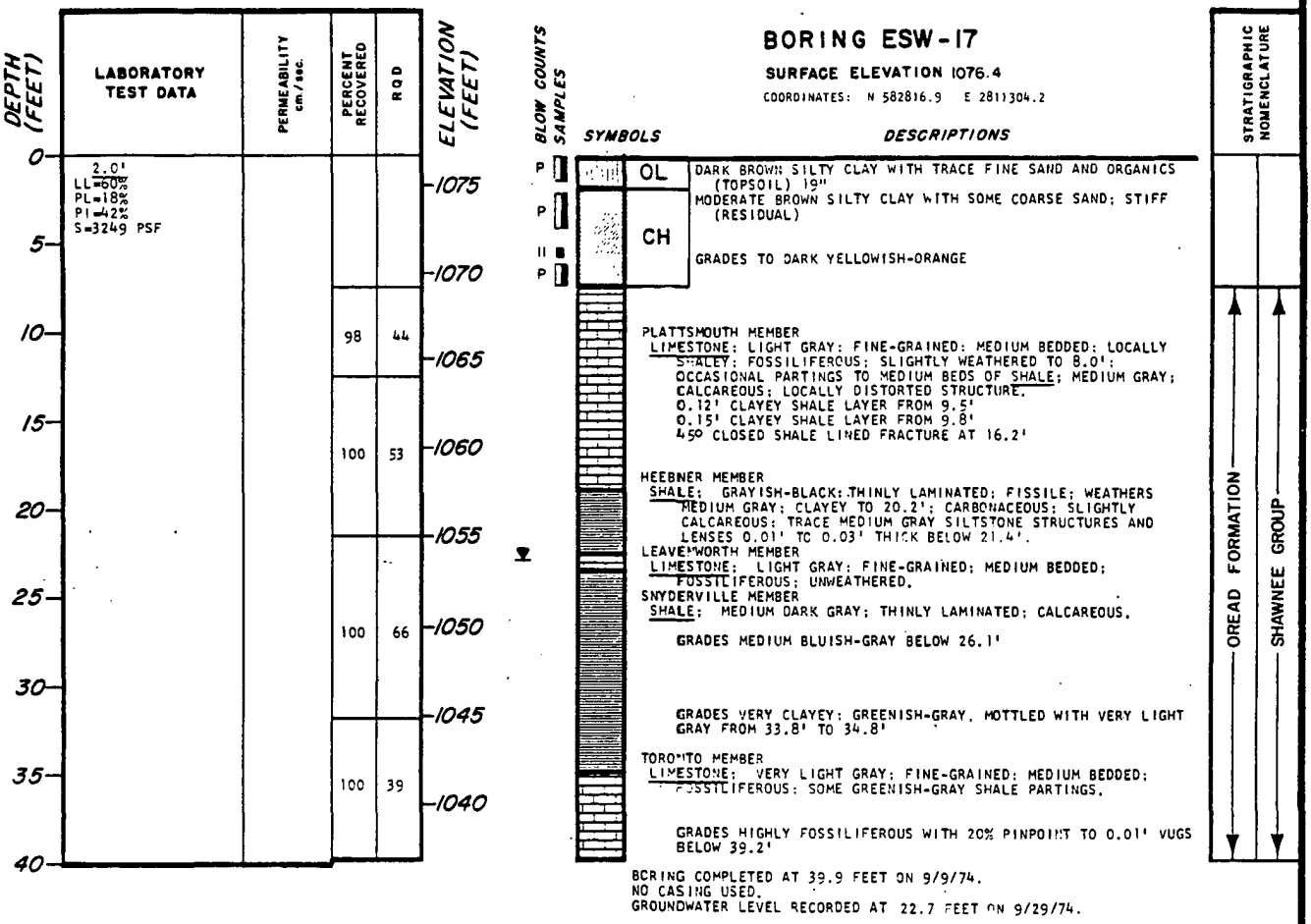
Figure 2.5-36ww

Log of Boring ESW-16

BORING ESW-17

SURFACE ELEVATION 1076.4

COORDINATES: N 582816.9 E 2811304.2



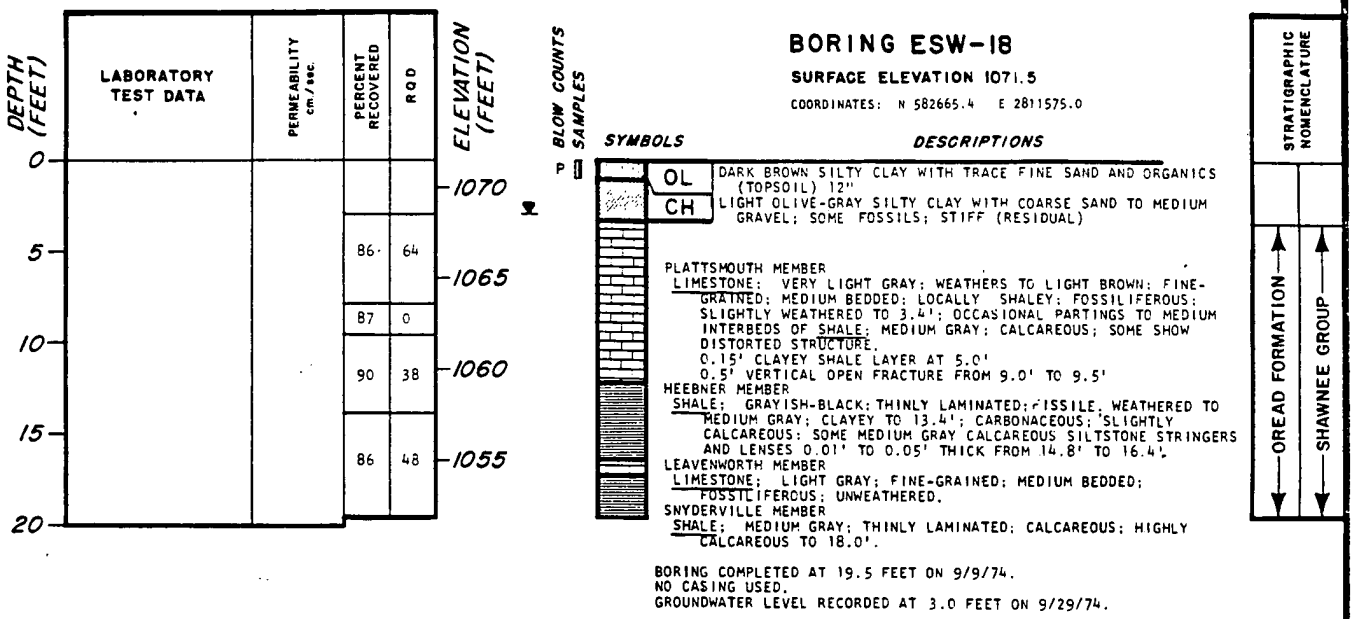
BORING COMPLETED AT 39.9 FEET ON 9/9/74.
NO CASING USED.
GROUNDWATER LEVEL RECORDED AT 22.7 FEET ON 9/29/74.

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36xx

Log of Boring ESW-17



BORING ESW-18

SURFACE ELEVATION 1071.5

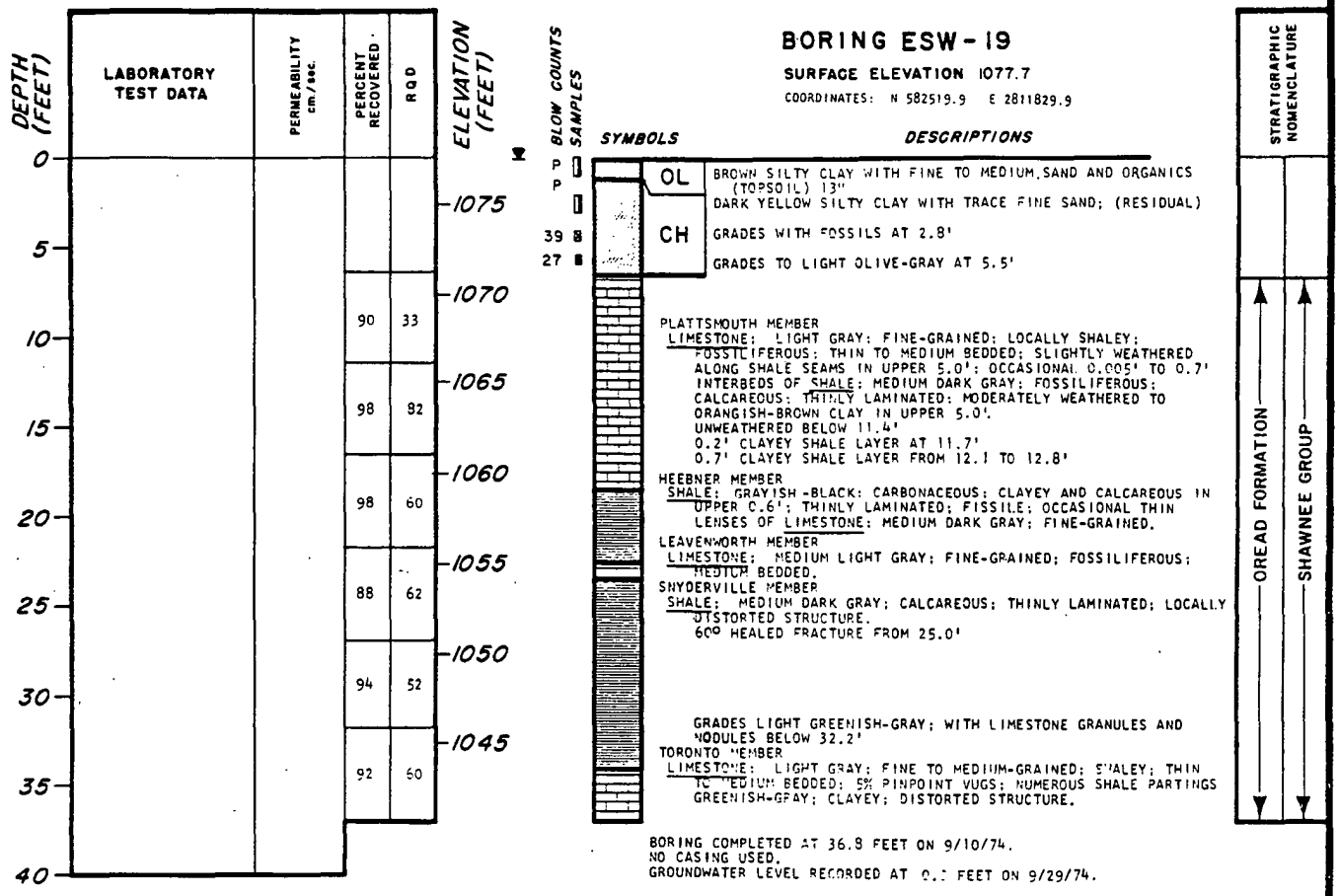
COORDINATES: N 582665.4 E 2811575.0

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36yy

Log of Boring ESW-18

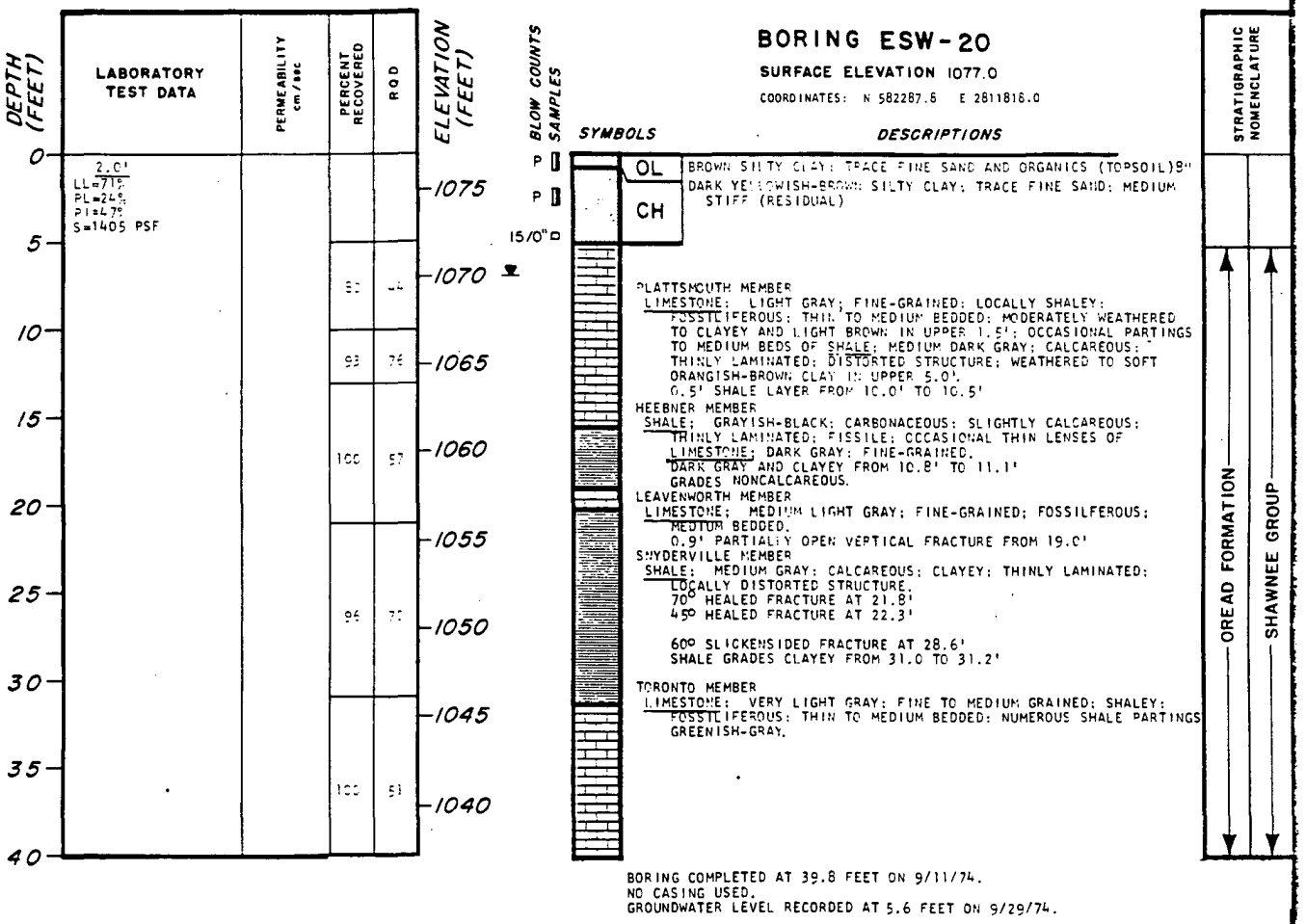


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36zz

Log of Boring ESW-19

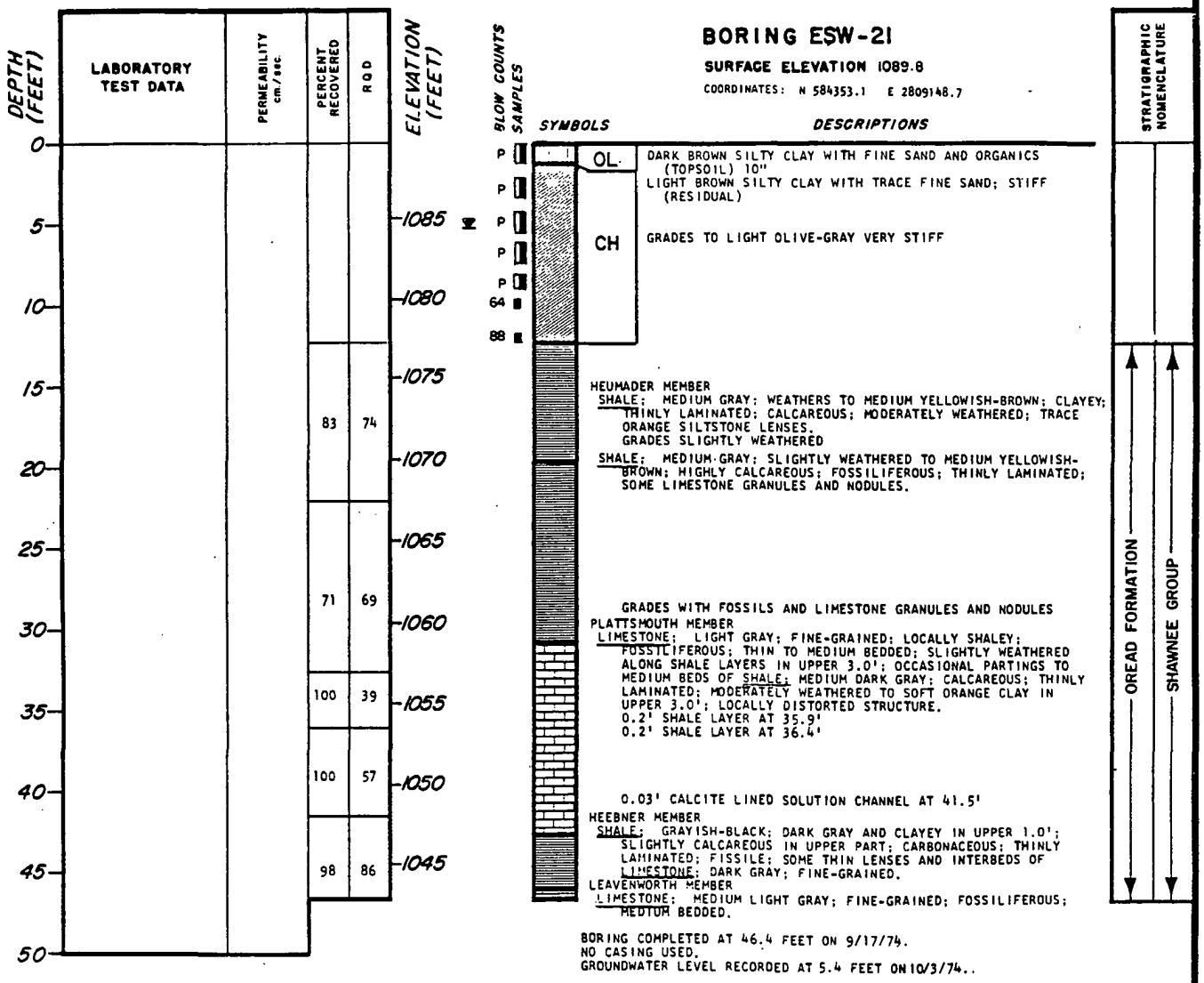


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36aaa

Log of Boring ESW-20

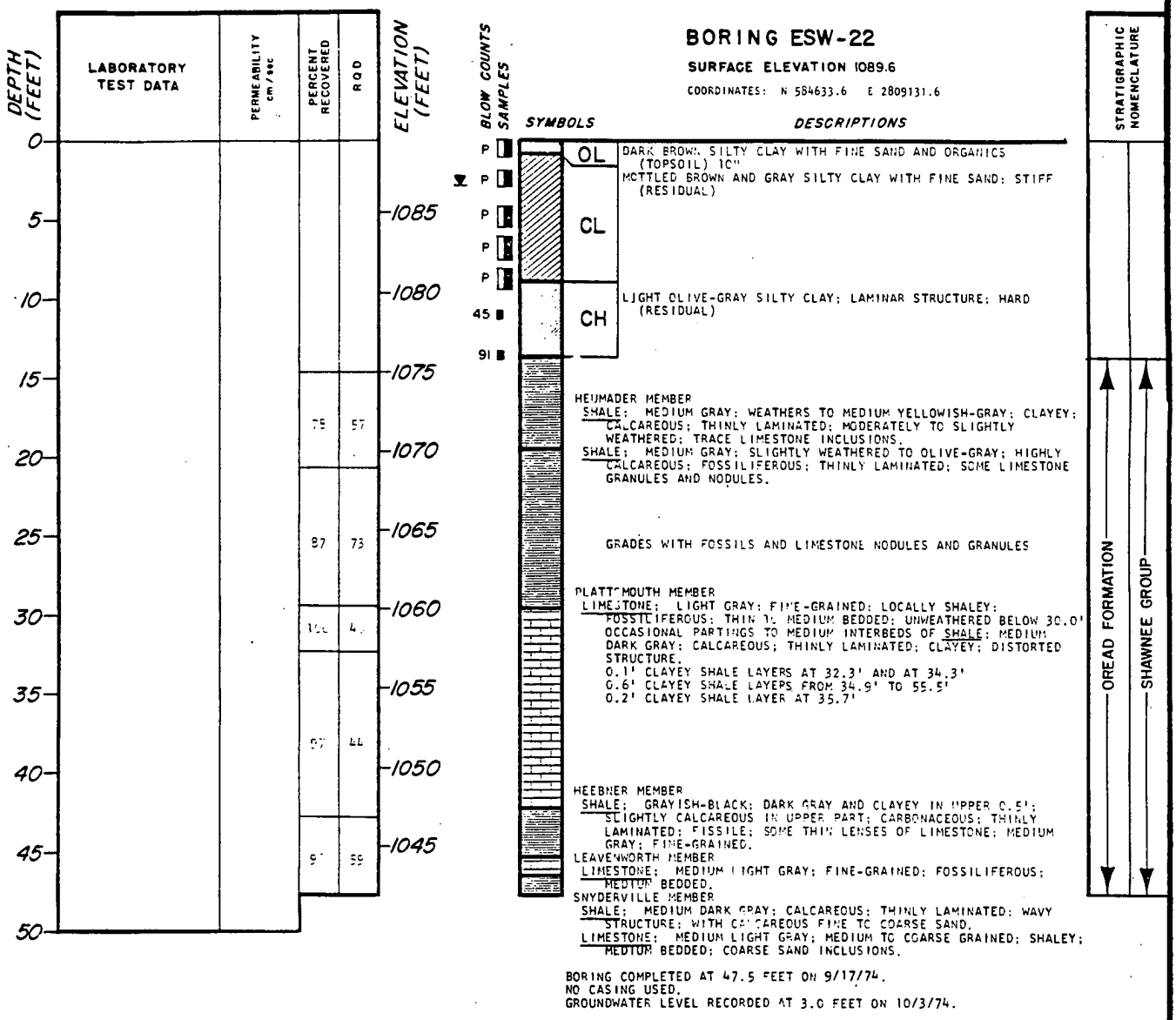


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36bbb

Log of Boring ESW-21

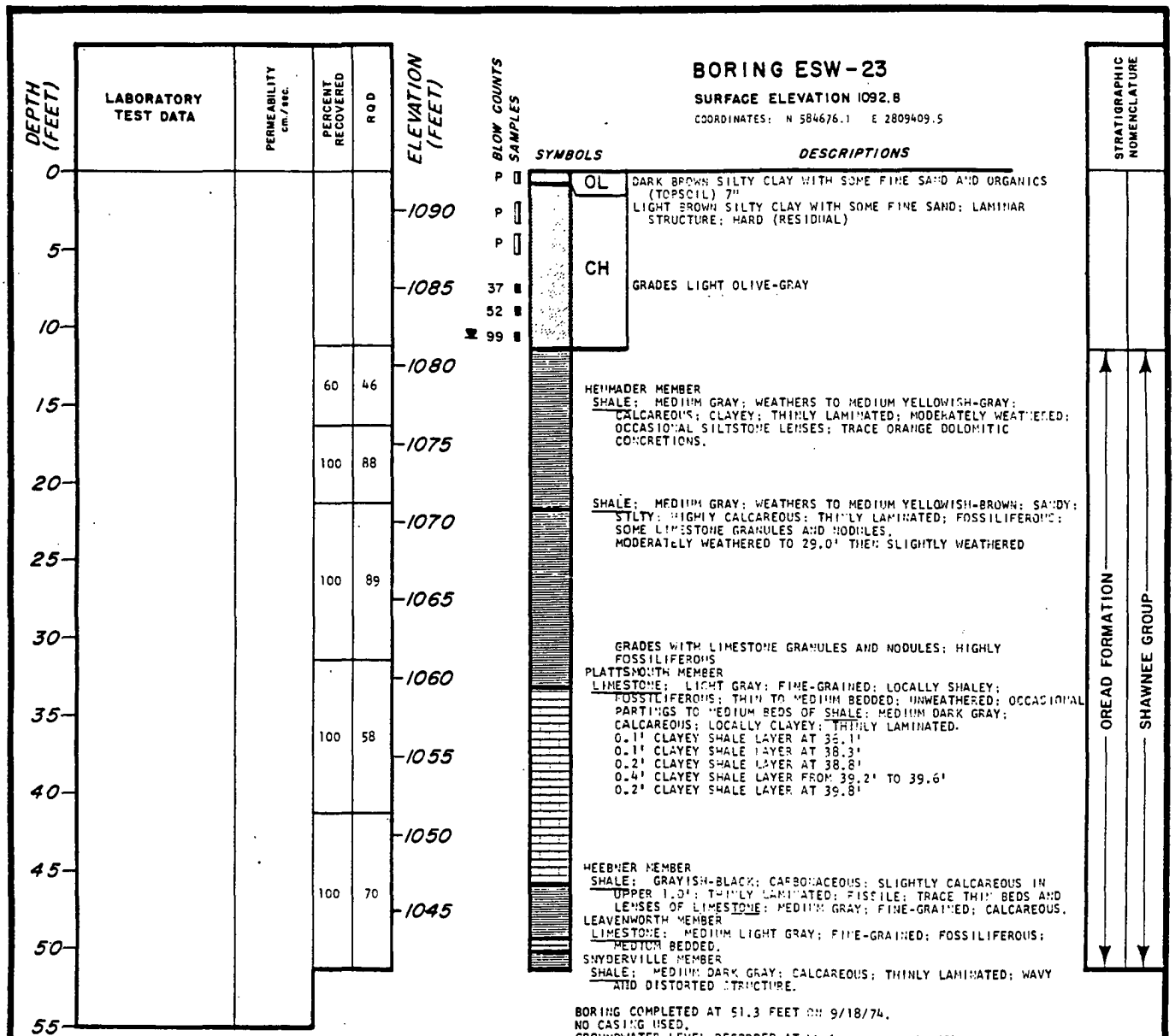


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36ccc

Log of Boring ESW-22

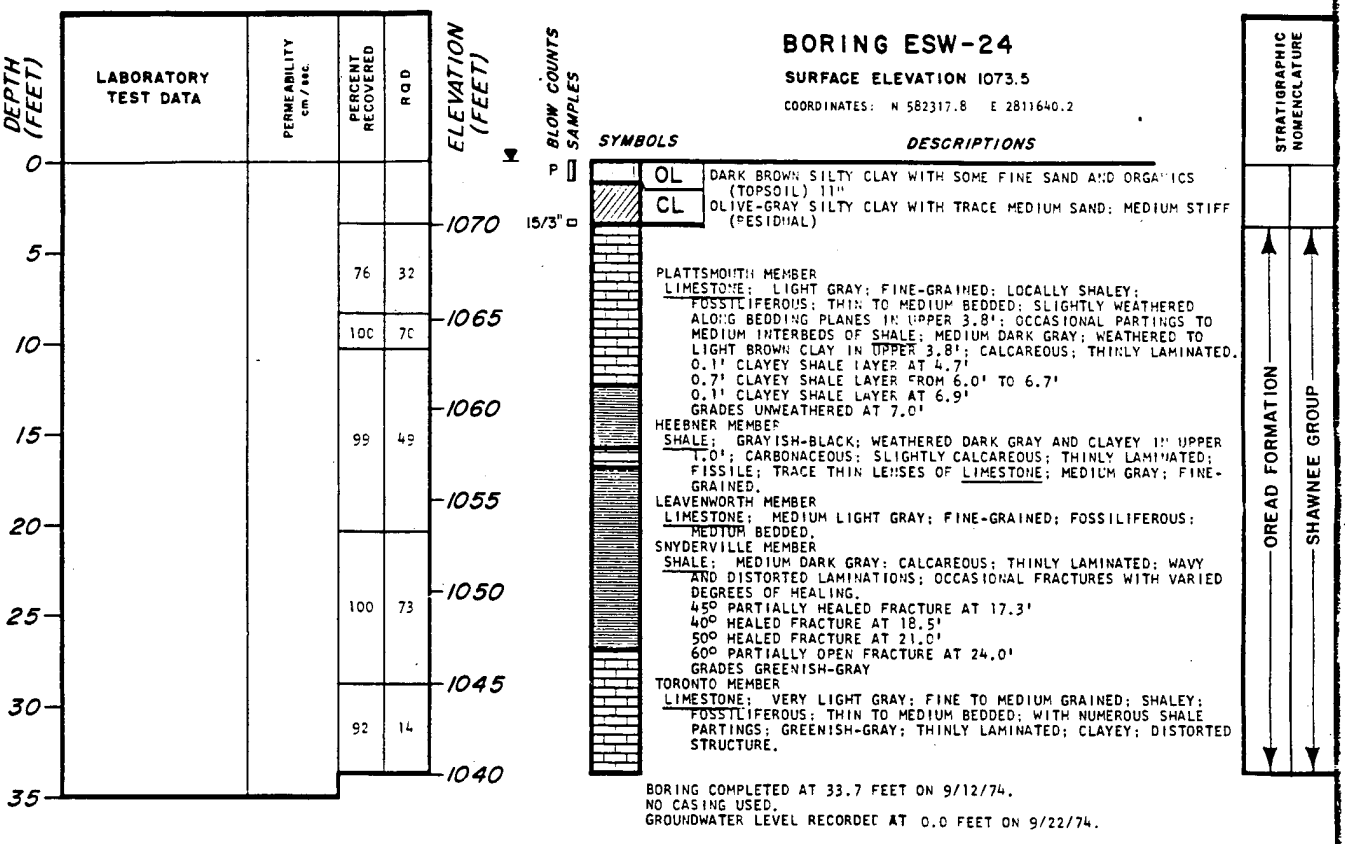


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36ddd

Log of Boring ESW-23

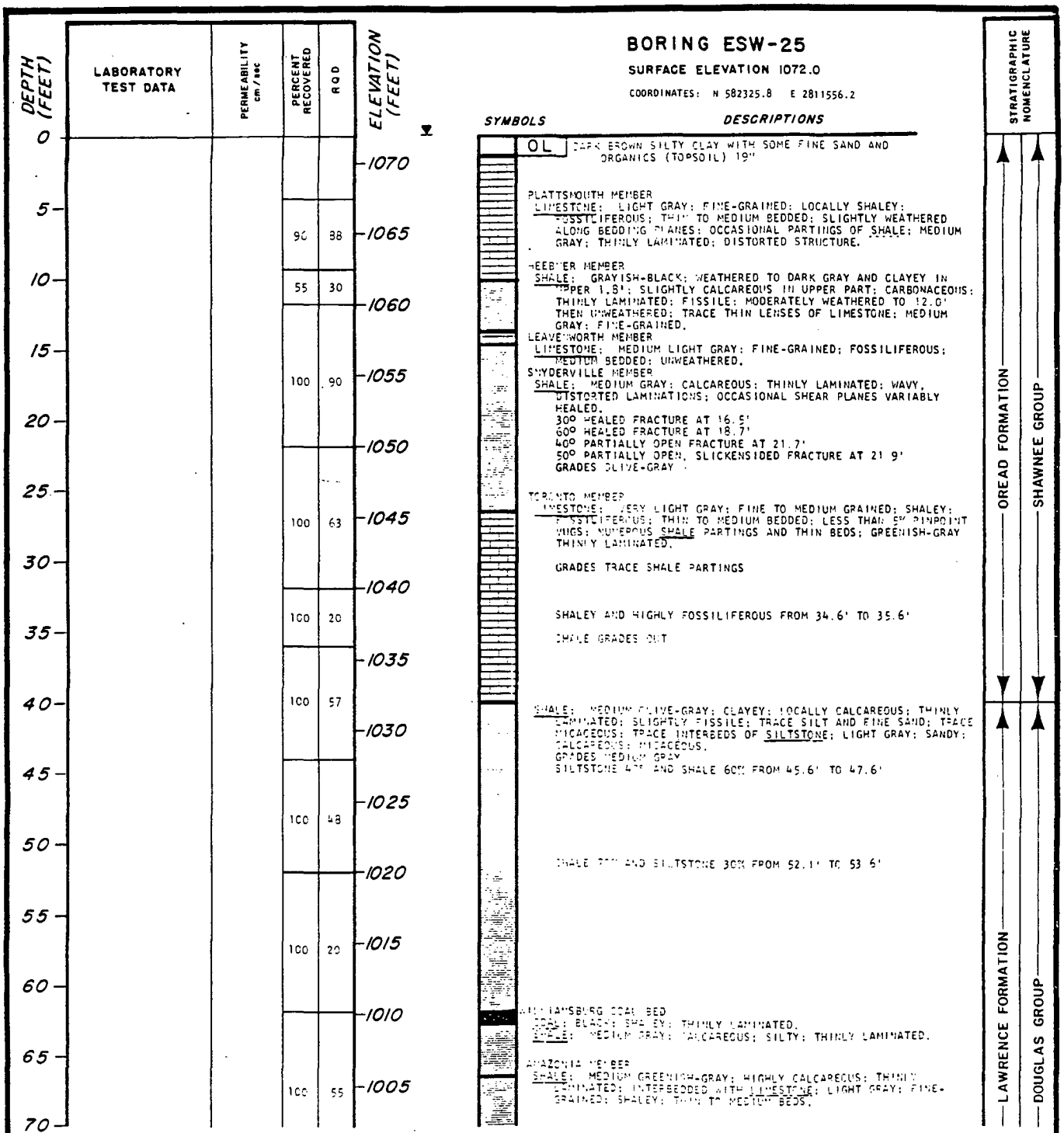


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36eee

Log of Boring ESW-24



(BORING CONTINUED)

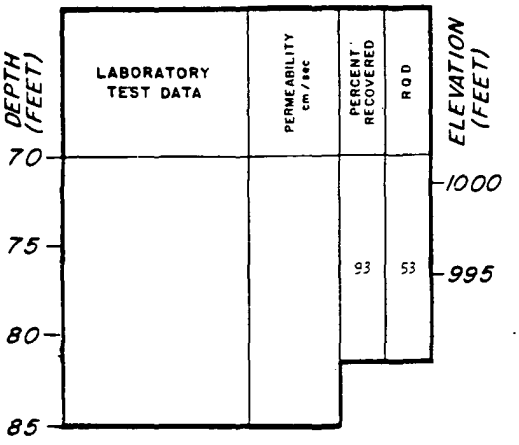
Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36fff (Sheet 1 of 2)

Log of Boring ESW-25

BORING ESW-25 CONT'D



SYMBOLS	DESCRIPTIONS	STRATIGRAPHIC NOMENCLATURE
	0.6' LIMESTONE FROM 71.7' TO 72.3'	LAWRENCE FORMATION — DOUGLAS GROUP
	IRELAND MEMBER SHALE: MEDIUM DARK GRAY; SLIGHTLY CALCAREOUS; THINLY LAMINATED; SILTY; SOME SILTSTONE THIN LENSES; MEDIUM GRAY; CALCAREOUS.	

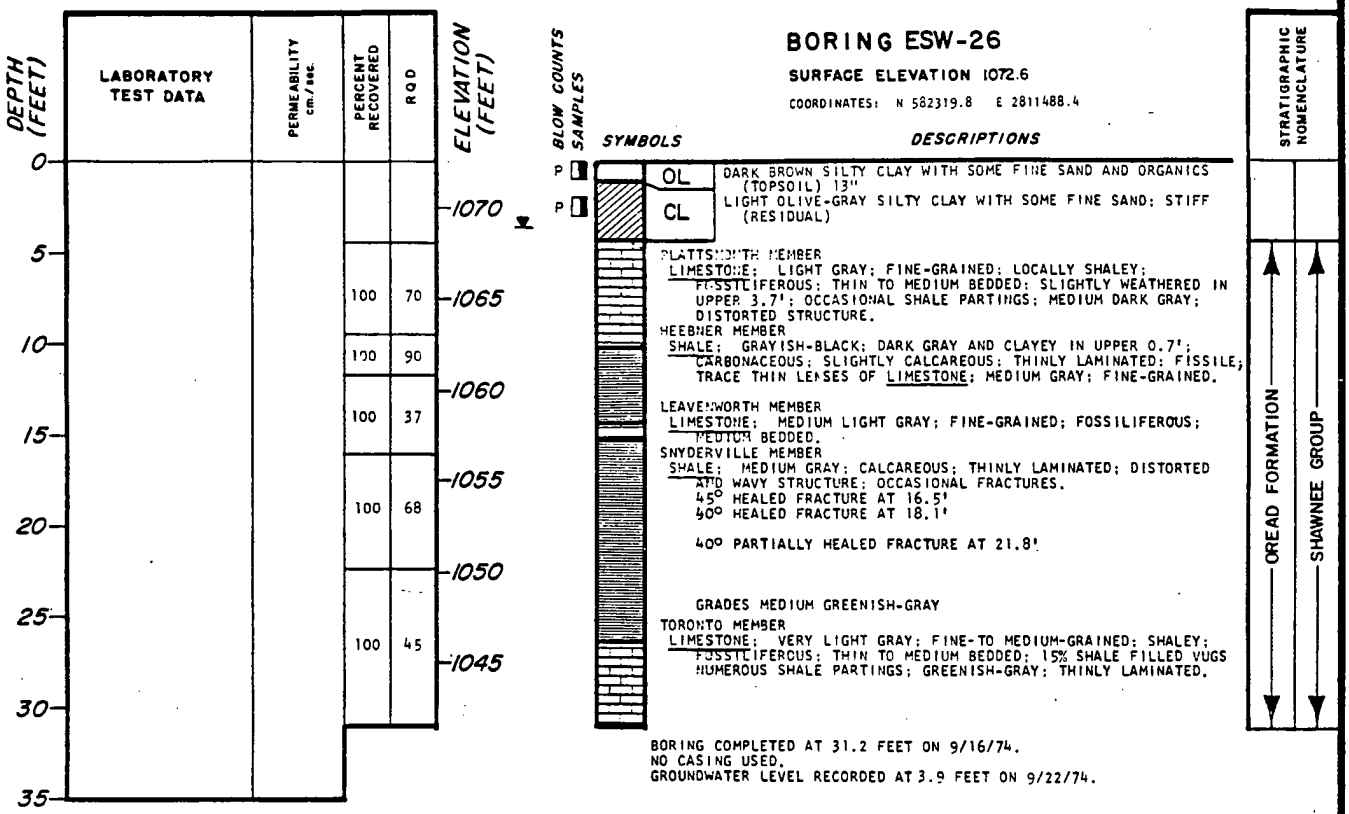
BORING COMPLETED AT 81.8 FEET ON 9/16/74.
CASING USED TO A DEPTH OF 4.6 FEET.
GROUNDWATER LEVEL RECORDED AT 1.6 FEET ON 9/22/74.

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36fff (Sheet 2 of 2)

Log of Boring ESW-25

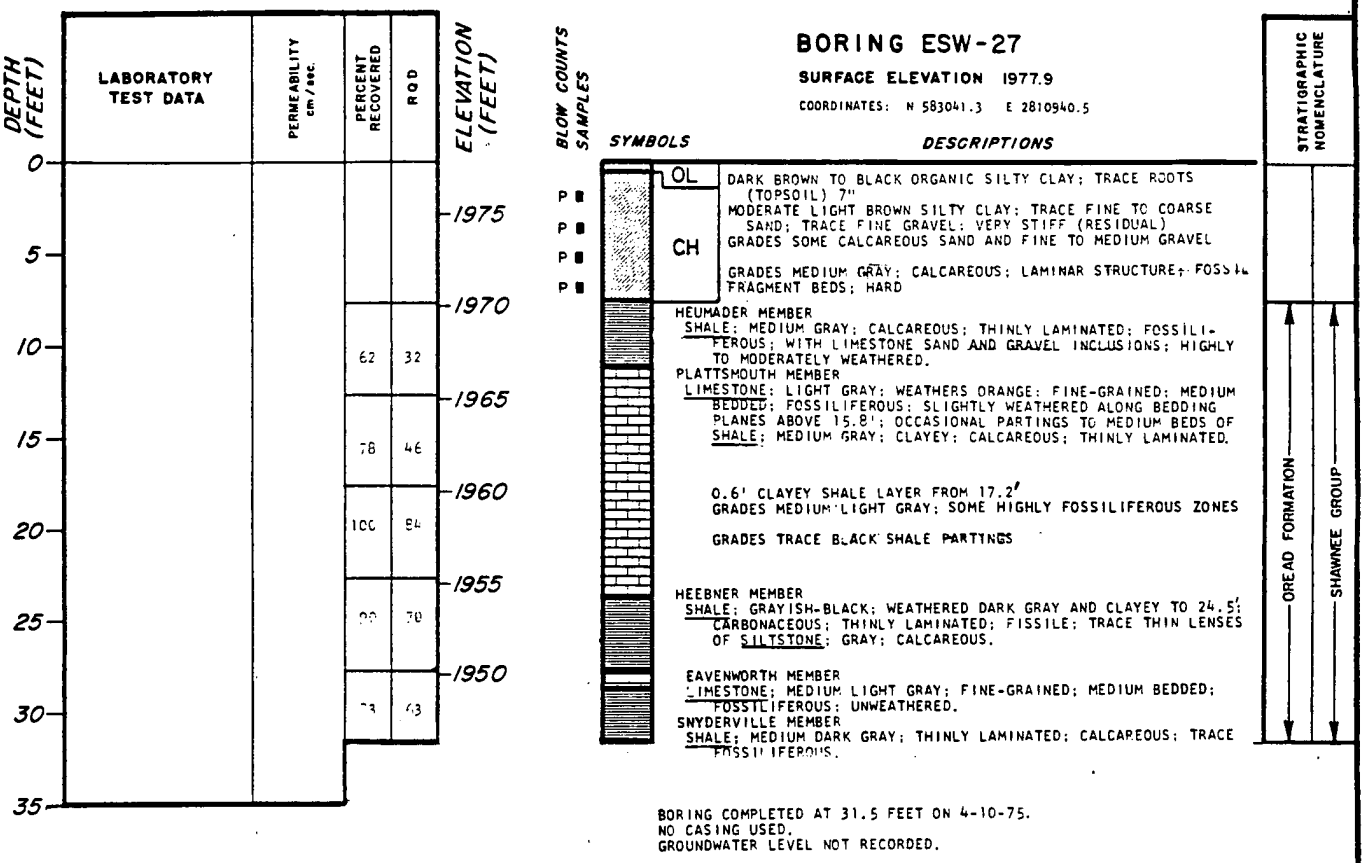


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36ggg

Log of Boring ESW-26



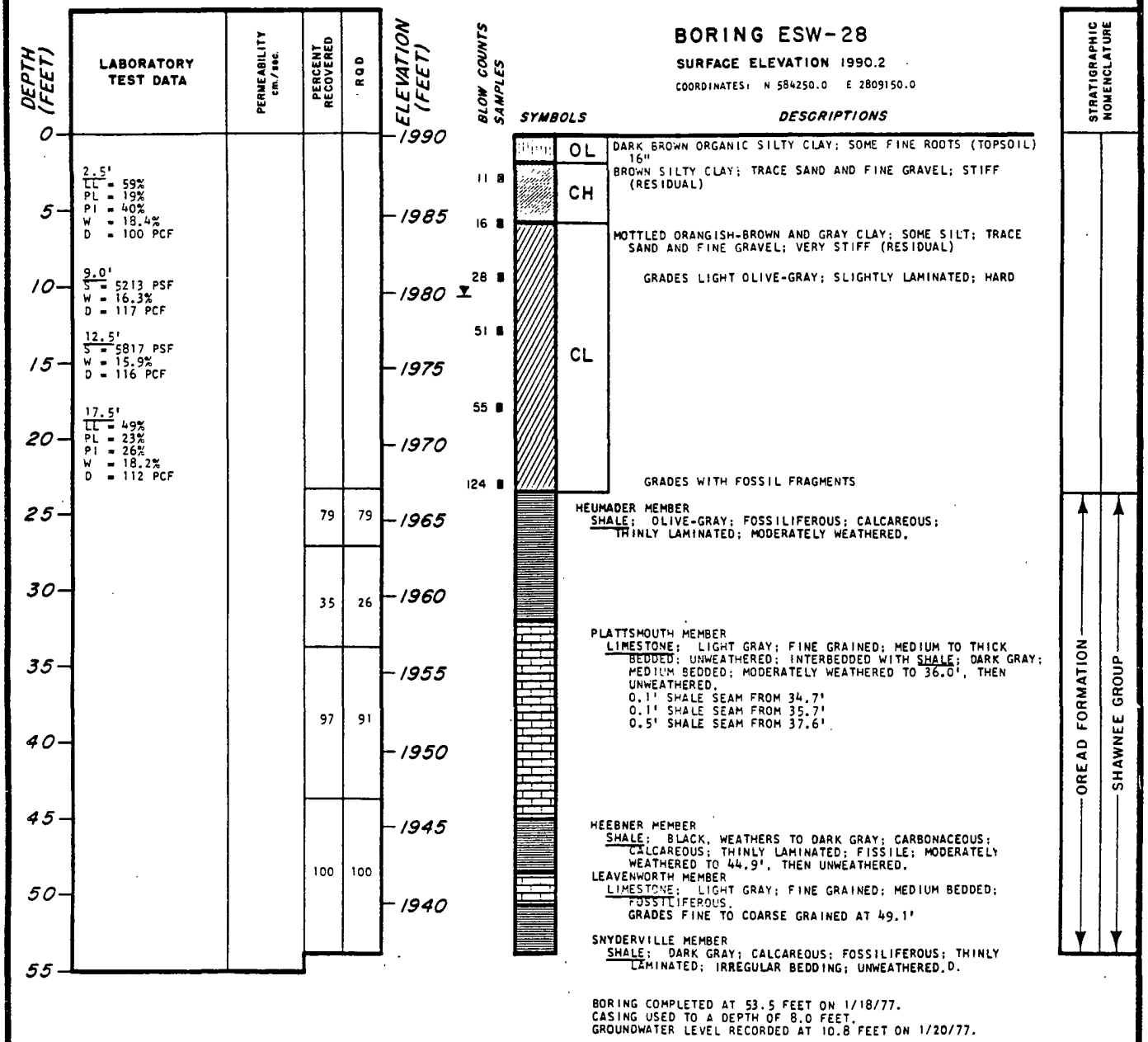
BORING COMPLETED AT 31.5 FEET ON 4-10-75.
NO CASING USED.
GROUNDWATER LEVEL NOT RECORDED.

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36hhh

Log of Boring ESW-27

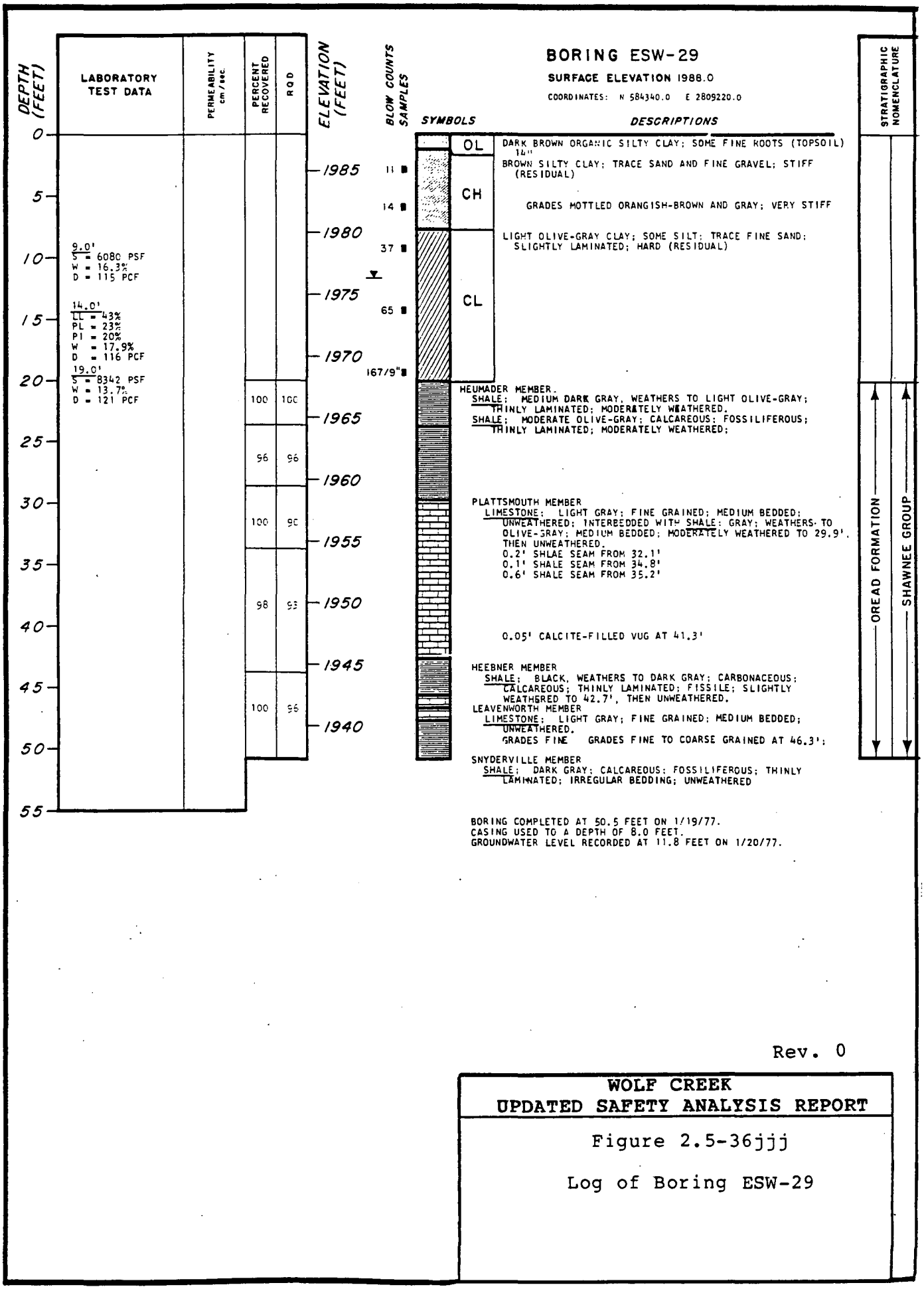


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36iii

Log of Boring ESW-28



Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

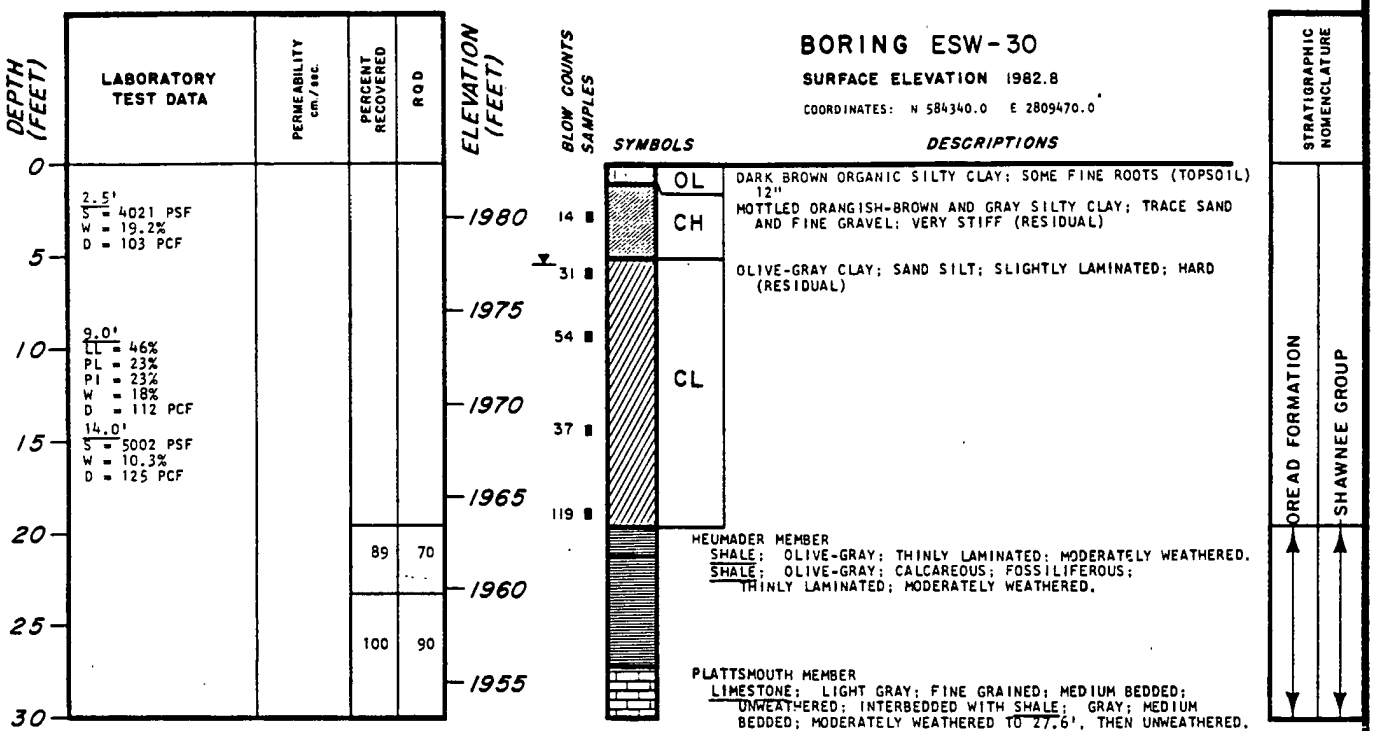
Figure 2.5-36jjj

Log of Boring ESW-29

BORING ESW-30

SURFACE ELEVATION 1982.8

COORDINATES: N 584340.0 E 2809470.0



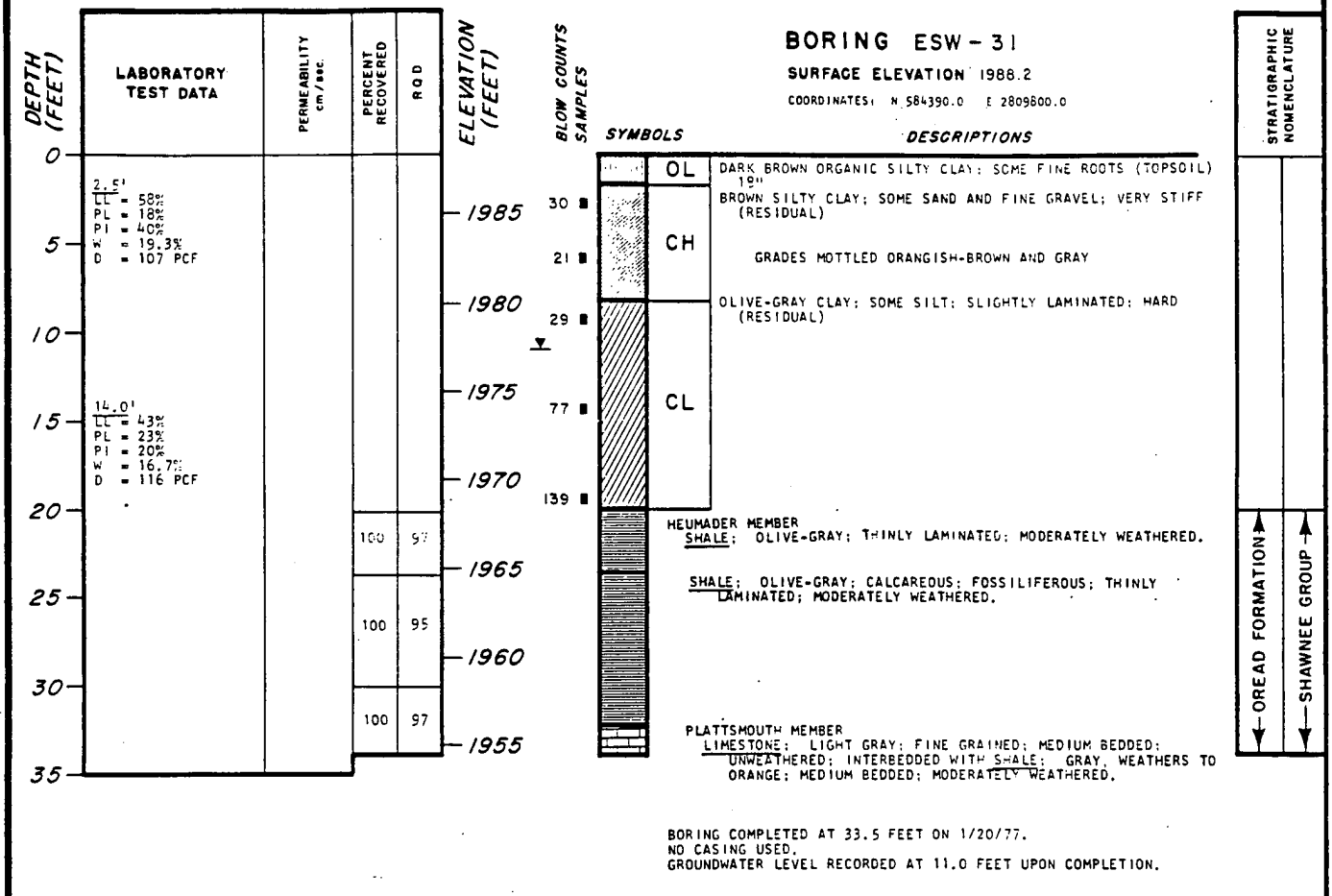
BORING COMPLETED AT 30.0 FEET ON 1/19/77.
NO CASING USED.
GROUNDWATER LEVEL RECORDED AT 5.7 FEET ON 1/20/77.

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36kkk

Log of Boring ESW-30



BORING COMPLETED AT 33.5 FEET ON 1/20/77.
NO CASING USED.
GROUNDWATER LEVEL RECORDED AT 11.0 FEET UPON COMPLETION.

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36111

Log of Boring ESW-31

Surface Level (ft): **1998.672** Easting (ft): **99542.819017**

Total Drill Depth (ft): **19** Northing (ft): **100004.940569**

Inclination/Bearing: **90** Datum: **Wolf Creek Plant Datum**

Hole Id:

B-101

Sheet: 1 of 2

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
									SILT, with sand and clay (ML); dark reddish brown (5YR 2.5/2); dry; medium stiff to stiff; trace roots (FILL).		1998.2						
2					SPT-1	0.7/1.5		20 10 6	SILT, gravelly with sand and clay (ML); dark reddish brown (5YR 2.5/2); dry; medium stiff to stiff; trace roots; large amounts of concrete and construction debris (FILL).								
											1995.7						
4					SPT-2	1/0.9		21 50/5.5	SAND, silty (SM); strong brown (7.5YR 5/6), mottled black (7.5 YR 2.5/1) and light gray (7.5YR 7/1), grading to light yellowish brown (10 YR 6/4); dry; hard to very stiff; 65-75% very fine grained sand; 25%-35% silt; well cemented zones; little weathered sandstone clasts; no HCl reaction.				41	12		
											1994.2						
6									SANDSTONE; very pale brown (10YR 7/3); dry; extremely weak (R0) to very weak (R1); moderately weathered; strong reaction to HCl; with limestone interbeds, weathered to gravel and friable. Hard sandstone nodules in auger cuttings between 5.0 and 6.5 ft.								
					SPT-3	0.9/0.9		22 50/4	SHALE; sandy, extremely weak to very weak (R1), moderately weathered, weak HCl reaction.				71	9			
8																	
											1989.7						
10					SPT-4			50/5	SANDSTONE; very pale brown (10YR 7/3); dry; extremely weak (R0) to very weak (R1); moderately weathered; strong reaction to HCl; with limestone interbeds, weathered to gravel and friable. SPT refusal criteria met. Bechtel requests augering additional 10 feet with no sampling.								
12																	
14											1984.7						
									SHALE; dark bluish gray (5PB 4/1); dry; extremely weak (R0); completely weathered; friable; strong HCl reaction.								

Notes:

1. Terms and symbols defined on Plate 1.
2. As-Built coordinates and elevation surveyed by Kaw Valley Engineering (KS-licensed).
3. The SPT blow count is defined as the number of blows required for a 140 lb. auto trip safety hammer falling 30 inches to drive the split-barrel sampler 6 inches in a possible 18 inch sample interval.
4. Shelby tubes used for cohesive soil sampling of dimensions 36 inches long, 3 inch outside diameter.
5. HQ3 carbide Diamond bit used for rock coring.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36mmm Rev. 28
Log of Boring B-101
Sheet 1 of 2

Surface Level (ft): **1998.672** Easting (ft): **99542.819017**

Total Drill Depth (ft): **19** Northing (ft): **100004.940569**

Inclination/Bearing: **90** Datum: **Wolf Creek Plant Datum**

Hole Id:

B-101

Sheet: 2 of 2

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
16									SHALE; dark bluish gray (5PB 4/1); dry; extremely weak (R0); completely weathered; friable; strong HCl reaction. Grab samples from auger Easy augering - Hard digging								
18											1979.7						
20																	
22																	
24																	
26																	
28																	

Notes:

1. Terms and symbols defined on Plate 1.
2. As-Built coordinates and elevation surveyed by Kaw Valley Engineering (KS-licensed).
3. The SPT blow count is defined as the number of blows required for a 140 lb. auto trip safety hammer falling 30 inches to drive the split-barrel sampler 6 inches in a possible 18 inch sample interval.
4. Shelby tubes used for cohesive soil sampling of dimensions 36 inches long, 3 inch outside diameter.
5. HQ3 carbide Diamond bit used for rock coring.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36mmm Rev. 28
Log of Boring B-101
Sheet 2 of 2

Surface Level (ft): **1998.63** Easting (ft): **99578.98**

Total Drill Depth (ft): **29.5** Northing (ft): **99633.86**

Inclination/Bearing: **90** Datum: **Wolf Creek Plant Datum**

Hole Id:

B-102

Sheet: 1 of 2

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
									SILT with clay and sand (ML); dark reddish brown (10R 3/2); dry; stiff to very stiff; some roots.		1998.1						
					SPT-1	1.4/1.5		5 13 16	SILT (ML); very pale brown (10YR 7/3) to light brownish gray (10YR 6/2); dry; very stiff; very fine grained, no HCl reaction.								
2																	
4					SPT-2	0.9/0.9		41 50/4	SANDSTONE; very pale brown (10YR 7/3); dry; very fine grained; extremely weak (R0); moderately weathered; sand is well-rounded; few cemented nodules but generally easily friable; no HCl reaction.		1994.1			12			
6									Bechtel representative recommends one sample at 8.5 ft, then at 15 ft based on B-101 log.								
									SHALE, sandy; dark bluish gray (5B 5/1), very fine grained; extremely weak (R0); highly weathered; weak HCl reaction; weak bedrock structure, indistinct fine horizontal to subhorizontal laminae, very friable.		1991.6						
8																	
					SPT-3	1.4/1.5		50 50/4					83	11			
10									Downforce 500 lb.								
12									Auger speed 12 to 13 ft is 55 sec.								
									Change in cuttings at 13.0 ft Auger speed 13 to 14 ft is 60 sec.								
14					SPT-4	1.5/1.5		9 16 25	Auger speed 14 to 15 ft is 60 sec.				84	12			

Notes:

1. Terms and symbols defined on Plate 1.
2. As-Built coordinates and elevation surveyed by Kaw Valley Engineering (KS-licensed).
3. The SPT blow count is defined as the number of blows required for a 140 lb. auto trip safety hammer falling 30 inches to drive the split-barrel sampler 6 inches in a possible 18 inch sample interval.
4. Shelby tubes used for cohesive soil sampling of dimensions 36 inches long, 3 inch outside diameter.
5. HQ3 carbide Diamond bit used for rock coring.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36nnn Rev. 28
Log of Boring B-102
Sheet 1 of 2

Surface Level (ft): **1998.63** Easting (ft): **99578.98**

Total Drill Depth (ft): **29.5** Northing (ft): **99633.86**

Inclination/Bearing: **90** Datum: **Wolf Creek Plant Datum**

Hole Id:

B-102

Sheet: 2 of 2

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
16									SHALE, sandy; dark bluish gray (5B 5/1), very fine grained; extremely weak (R0); highly weathered; weak HCl reaction; weak bedrock structure, indistinct fine horizontal to subhorizontal laminae, very friable. Attempt shelby tube at 15 ft; refusal at 15.7 ft, discard tube. Begin wet rotary at 15.7 ft							
18					SPT-5	1.2/1.5		29 50 21/3	SPT refusal (100 total blows)					13			
20		0:35							MB, 25° at 20.2'								
									MB, 0° at 20.5'								
									MB, 0° at 20.9'								
		1:00							MB, 25° at 21.3'								
22					CR-1	4.9/5			MB, 0°, additional breaks while transferring to core box between 21.9' and 23.5 ' Downpressure 250 psi								
		0:32															
24		0:35															
		0:54							MB, 0°, shoe between 24.4' and 24.7'								
									Very weak (R1), increasingly clay sized, becoming harder								
26		0:36			SC-1					31		163		11			
		0:42			CR-2	5/5	0.9/5		MB, 0° at 26.7' Sample B-102-SC-2-27.9-28.9 broken before wrapping								
28		0:38							MB, 0° at 27.4' MB, 0° at 27.5' MB, 0° at 27.8'								
		0:42							SHALE; medium bluish gray (5B 5/1), very fine grained; very weak (R1); slightly to moderately weathered; strong HCl reaction. MB, 0° at 29.0'		1969.9 1969.1						

Notes:

1. Terms and symbols defined on Plate 1.
2. As-Built coordinates and elevation surveyed by Kaw Valley Engineering (KS-licensed).
3. The SPT blow count is defined as the number of blows required for a 140 lb. auto trip safety hammer falling 30 inches to drive the split-barrel sampler 6 inches in a possible 18 inch sample interval.
4. Shelby tubes used for cohesive soil sampling of dimensions 36 inches long, 3 inch outside diameter.
5. HQ3 carbide Diamond bit used for rock coring.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36nnn Rev. 28
Log of Boring B-102
Sheet 2 of 2

Surface Level (ft): **1995.031** Easting (ft): **99592.732388**

Total Drill Depth (ft): **29.4** Northing (ft): **99170.217696**

Inclination/Bearing: **90** Datum: **Wolf Creek Plant Datum**

Hole Id:

B-103

Sheet: 1 of 2

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
									SAND, silty (SM-ML); very dark gray (5YR 3/1); dry; loose; fine grained; with grass and roots; fill.		1994.6						
2					SPT-1	1.1/1.5		5 6 5	SILT, with clay (ML); gray (7.5YR 6/1) to brown (7.5YR 5/2); dry; medium stiff; very fine; weak HCl reaction								
4					SPT-2	1.5/1.5		5 8 16	SILT, sandy (ML); light yellowish brown (10YR 6/4) to yellowish brown (10YR 5/6) and trace brown (7.5YR 4/2); dry; stiff; very fine grained; trace very fine sand; sand content decreasing with depth; no to weak HCl reaction.		1991.2		83	13			
6					SPT-3	1.3/1.5		5 5 8	CLAY, with silt (CL); light olive brown (2.5Y 5/3) to light yellowish brown (2.5Y 6/4) and trace red (10R 4/6); dry; medium stiff; plastic; no HCl reaction.		1988.5			12			
8					ST-1	2.1/2				2.66		127	95	18	47	18	29
10																	
12					SPT-4	1.5/1.5		8 14 20	Increasing strength to very stiff; red absent, weak HCl reaction; trace FeO staining on weathered zones.								
14	▽				SPT-5	1.5/1.5											

Notes:

1. Terms and symbols defined on Plate 1.
2. As-Built coordinates and elevation surveyed by Kaw Valley Engineering (KS-licensed).
3. The SPT blow count is defined as the number of blows required for a 140 lb. auto trip safety hammer falling 30 inches to drive the split-barrel sampler 6 inches in a possible 18 inch sample interval.
4. Shelby tubes used for cohesive soil sampling of dimensions 36 inches long, 3 inch outside diameter.
5. HQ3 carbide Diamond bit used for rock coring.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36ooo Rev. 28
Log of Boring B-103
Sheet 1 of 2

Surface Level (ft): **1995.031** Easting (ft): **99592.732388**

Total Drill Depth (ft): **29.4** Northing (ft): **99170.217696**

Inclination/Bearing: **90** Datum: **Wolf Creek Plant Datum**

Hole Id:

B-103

Sheet: 2 of 2

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
								6	Wet at 15 ft		1979.8						
16								9 13	CLAY, with silt (CL); brown (10YR 4/3) to dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/6); moist; standing water in SPT sampler; weak HCl reaction.								
											1978.0						
18									SHALE, silty; dark grayish brown (10YR 4/2) to sparse yellowish brown (10YR 5/6) and grayish brown (10YR 5/2); moist; extremely weak (R0); friable; no HCl reaction on gray, weak HCl reaction on yellowish brown.								
20					SPT-6	1.4/1.5		5 30 48									
22																	
											1971.4						
24					SPT-7	1.4/1.5		17 22 24	SHALE; dark grayish brown (10YR 4/2) to sparse yellowish brown (10YR 5/6) and grayish brown (10YR 5/2); dry; extremely weak (R0); moderately to highly weathered (MW-HW); FeO staining in weathered zones; indistinct horizontal to sub-horizontal laminae; few hard cemented nodules similar to limestone but weak HCl reaction; breaks in angular fragments; no grains visible; weak HCl reaction.								
26																	
28																	
					SPT-8			27 50/3	Dry, friable, easy to break with hands. SPT-8, completed 28.6-29.4								
									No water in hole before grouting		1965.6						

Notes:

1. Terms and symbols defined on Plate 1.
2. As-Built coordinates and elevation surveyed by Kaw Valley Engineering (KS-licensed).
3. The SPT blow count is defined as the number of blows required for a 140 lb. auto trip safety hammer falling 30 inches to drive the split-barrel sampler 6 inches in a possible 18 inch sample interval.
4. Shelby tubes used for cohesive soil sampling of dimensions 36 inches long, 3 inch outside diameter.
5. HQ3 carbide Diamond bit used for rock coring.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36ooo Rev. 28
Log of Boring B-103
Sheet 2 of 2

Surface Level (ft):	**1995.51**	Easting (ft):	**100852.08**
Total Drill Depth (ft):	**38.9**	Northing (ft):	**99195.74**
Inclination/Bearing:	**90**	Datum:	**Wolf Creek Plant Datum**

Hole Id:

B-104

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
					SPT-1	1 / 1.5		7 16 11	SAND, clayey (SC); with construction gravel and roots; fill.								
									SILT with clay and gravel (ML); very pale brown (10YR 7/4) to yellowish brown (10YR 5/6); dry; very stiff; difficult to break with hands; compacted soil/fill.		1994.2						
2																	
											1991.8						
4					SPT-2	0.9 / 1.5		5 8 8	SILT with clay (ML); light yellowish brown (10YR 6/4) to yellowish brown (10YR 6/4); dry; stiff; trace very fine sand; no HCl reaction.								
6																	
					SPT-3	1.3 / 1.5		8 13 14	CLAY, silty (CL); brown (10YR 5/3) to yellowish brown (10YR 5/6); dry; stiff to very stiff; high dry strength; weak HCl reaction, little sand.		1988.9		86	15	49	18	31
8					ST-1				Drilling wet rotary at 7.7 ft because cuttings are not returning on augers.								
10																	
12					SPT-4	1.5 / 1.5		13 19 28					93				
									SILT with clay (ML); light yellowish brown (10YR 6/4) to yellowish brown (10YR 5/4); dry; very stiff; trace fine sand; sample breaks on indistinct horizontal partings; strong HCl reaction.		1983.1						
14					SPT-5			13 22 27	Driller notes color change to gray at 13 ft				99				

Notes:

1. Terms and symbols defined on Plate 1.
2. As-Built coordinates and elevation surveyed by Kaw Valley Engineering (KS-licensed).
3. The SPT blow count is defined as the number of blows required for a 140 lb. auto trip safety hammer falling 30 inches to drive the split-barrel sampler 6 inches in a possible 18 inch sample interval.
4. Shelby tubes used for cohesive soil sampling of dimensions 36 inches long, 3 inch outside diameter.
5. HQ3 carbide Diamond bit used for rock coring.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36ppp Rev. 28
Log of Boring B-104
Sheet 1 of 3

Surface Level (ft): **1995.51** Easting (ft): **100852.08**

Total Drill Depth (ft): **38.9** Northing (ft): **99195.74**

Inclination/Bearing: **90** Datum: **Wolf Creek Plant Datum**

Hole Id:

B-104

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
									SHALE; mottled light yellowish brown (10YR 6/4) to brown (10YR 4/3); extremely weak (R0); highly weathered (HW); high dry strength; few indistinct horizontal to sub-horizontal laminae, increasing with depth; trace FeO staining on horizontal partings; no to weak HCl reaction.		1980.5						
16																	
18																	
					SPT-6	1.5 1.5		15 25 39	Mottled dark gray (7.5YR 4/1).					17	50	19	31
20																	
22																	
											1972.0						
24					SPT-7			13 13 20	SHALE; gray (10YR 5/1) to dark gray (10YR 4/1) with trace light yellowish brown (10YR 4/3); moist; extremely weak (R0); trace FeO staining on thin partings; moisture likely introduced during drilling.								
26																	
28											1967.5						
					SPT-8	0.5 0.5		50/5	SHALE; dark gray (2.5YR 4/1) with trace zones of white (10YR 8/1); dry; extremely weak (R0); friable; abundant horizontal to sub-horizontal laminae with common breaks on very thin lenses along laminae; strong HCl reaction.		1966.6						
		0:57							Downpressure 175 lb. No loss of water								

Notes:

1. Terms and symbols defined on Plate 1.
2. As-Built coordinates and elevation surveyed by Kaw Valley Engineering (KS-licensed).
3. The SPT blow count is defined as the number of blows required for a 140 lb. auto trip safety hammer falling 30 inches to drive the split-barrel sampler 6 inches in a possible 18 inch sample interval.
4. Shelby tubes used for cohesive soil sampling of dimensions 36 inches long, 3 inch outside diameter.
5. HQ3 carbide Diamond bit used for rock coring.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36ppp Rev. 28
Log of Boring B-104
Sheet 2 of 3

Surface Level (ft):	**1995.51**	Easting (ft):	**100852.08**
Total Drill Depth (ft):	**38.9**	Northing (ft):	**99195.74**
Inclination/Bearing:	**90**	Datum:	**Wolf Creek Plant Datum**

Hole Id:

B-104

Sheet: 3 of 3

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
		NM							SHALE; argillaceous; medium gray (N5) to medium dark gray (N4) and white (N9); very weak to weak (R1-R2); fresh to slightly weathered; trace indistinct thin laminae but much less common than in other boreholes; sparse bivalve and oyster shells; trace white calcium carbonate nodules; strong HCl reaction.								
		0:39			CR-1	5 in	5 in		MB, 0° at 30.7'								
32		0:35							Soft sediment deformation with higher energy, increased sand, shell hash and calcium carbonate.								
		NM							MB, 0° at 33.7'								
34		0:43							Shale is very muddy, argillaceous with common shell hash and clay balls; generally horizontal to sub-horizontal bedding; rough core surface.								
		1:35									1960.2						
		2:00			CR-2	5 in	5 in		LIMESTONE; light olive gray (5Y 6/1) to light gray (N7); weak (R2); fresh; slightly muddy but generally cleaner with depth; few shale partings, horizontal to sub-horizontal; strong HCl reaction.								
36									MB, 0° at 35.67'								
									Trace shell fragments below 36 ft								
		3:45							MB, 0° at 36.1'								
					SC-1				MB, 0° at 36.8'	•1214		167		1			
38		4:02									1956.6						
40																	
42																	
44																	

Notes:

1. Terms and symbols defined on Plate 1.
2. As-Built coordinates and elevation surveyed by Kaw Valley Engineering (KS-licensed).
3. The SPT blow count is defined as the number of blows required for a 140 lb. auto trip safety hammer falling 30 inches to drive the split-barrel sampler 6 inches in a possible 18 inch sample interval.
4. Shelby tubes used for cohesive soil sampling of dimensions 36 inches long, 3 inch outside diameter.
5. HQ3 carbide Diamond bit used for rock coring.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36ppp Rev. 28
Log of Boring B-104
Sheet 3 of 3

Surface Level (ft): **1996.74** Easting (ft): **101374.029934**

Total Drill Depth (ft): **35.1** Northing (ft): **99305.885193**

Inclination/Bearing: **90** Datum: **Wolf Creek Plant Datum**

Hole Id:

B-105

Sheet: 1 of 3

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
0					GRAB-1				CLAY, silty with sand (CL-ML); light olive brown (2.5Y 5/3) to dark gray (2.5Y 4/1); moist; stiff; well-graded; little small gravel; gravel and sand are sub-angular, up to 0.5 in in diameter (Fill).		1996.2						
					SPT-1	0.9/1.5		19 14 7	GRAVEL (GP); construction gravel, (fill). Shelby tube at surface - refusal at 0.6 ft. Grab sample at 0 to 0.5 ft; dry fill.		1995.5						
2									CLAY, silty (CL-ML); olive brown (2.5Y 4/4) to black (2.5Y 2.5/1); dry to moist; stiff; very fine grained; no HCl reaction (fill).		1993.7						
					GRAB-2				GRAVEL (GP); sandstone, limey concrete; stiff to very stiff (fill). - Grab sample at 3 to 4.5 ft., dry fill. From 3.0 ft, rig grinding on rock.								
4																	
					SPT-2	1.1/1.5		4 10 18						14			
6																	
8																	
									CLAY (CH); olive gray (5Y 4/2) to dark gray (5Y 4/1); moist; soft; trace sand (less than 5%); moderately plastic; no HCl reaction.		1988.2						
					SPT-3	1.3/1.5		3 3 4						23			
10																	
					ST-1	1.9/2				2.72		130	93	23	52	16	36
12																	
									SHALE; olive gray (5Y 5/2) and olive gray (5Y 5/3); extremely weak (R0); completely weathered; indistinct horizontal to sub-horizontal laminations; slightly to moderately silty; weak HCl reaction.		1983.9						
14					SPT-4	1.4/1.5		8 12 18									

Notes:

1. Terms and symbols defined on Plate 1.
2. As-Built coordinates and elevation surveyed by Kaw Valley Engineering (KS-licensed).
3. The SPT blow count is defined as the number of blows required for a 140 lb. auto trip safety hammer falling 30 inches to drive the split-barrel sampler 6 inches in a possible 18 inch sample interval.
4. Shelby tubes used for cohesive soil sampling of dimensions 36 inches long, 3 inch outside diameter.
5. HQ3 carbide Diamond bit used for rock coring.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36qqq Rev. 28
Log of Boring B-105
Sheet 1 of 3

Surface Level (ft): **1996.74** Easting (ft): **101374.029934**

Total Drill Depth (ft): **35.1** Northing (ft): **99305.885193**

Inclination/Bearing: **90** Datum: **Wolf Creek Plant Datum**

Hole Id:

B-105

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log / Sample Type	Sample Number	Recovery	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
16								SHALE; olive gray (5Y 5/2) and olive gray (5Y 5/3); extremely weak (R0); highly to completely weathered; indistinct horizontal to sub-horizontal laminations; slightly to moderately silty; weak HCl reaction.		1981.7						
18																
20				SPT-5	1.5/1.5		13 24 37	With occasional brownish yellow (10YR 6/6) discoloration between laminae. Color change to dark gray (5Y 4/1) with occasional brownish yellow (10YR 6/6) discoloration between laminae; less silty.								
22																
24				SPT-6	1.5/1.5		16 24 42									
26																
28				SPT-7	1.5/1.5			Moderately weathered; very silty; trace very fine sand with grayish brown (10YR 5/2); strong HCl reaction.								

Notes:

1. Terms and symbols defined on Plate 1.
2. As-Built coordinates and elevation surveyed by Kaw Valley Engineering (KS-licensed).
3. The SPT blow count is defined as the number of blows required for a 140 lb. auto trip safety hammer falling 30 inches to drive the split-barrel sampler 6 inches in a possible 18 inch sample interval.
4. Shelby tubes used for cohesive soil sampling of dimensions 36 inches long, 3 inch outside diameter.
5. HQ3 carbide Diamond bit used for rock coring.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36qqq Rev. 28
Log of Boring B-105
Sheet 2 of 3

Surface Level (ft): **1996.74**
Easting (ft): **101374.029934**
Total Drill Depth (ft): **35.1**
Northing (ft): **99305.885193**
Inclination/Bearing: **90**
Datum: **Wolf Creek Plant Datum**

Hole Id:

B-105

Sheet: 3 of 3

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
								19 29 48	SHALE; dark gray (5Y 4/1) and grayish brown (10YR 5/2); extremely weak (R0); moderately weathered; indistinct horizontal to sub-horizontal laminae; moderately to very silty; strong HCl reaction.		1966.7						
32																	
34					SPT-8	1.4 1.4		19 39 50/3	No sand, less silt; occasional calcite coating between laminae and in small crystals.		1961.6						
36																	
38																	
40																	
42																	
44																	

Notes:
1. Terms and symbols defined on Plate 1.
2. As-Built coordinates and elevation surveyed by Kaw Valley Engineering (KS-licensed).
3. The SPT blow count is defined as the number of blows required for a 140 lb. auto trip safety hammer falling 30 inches to drive the split-barrel sampler 6 inches in a possible 18 inch sample interval.
4. Shelby tubes used for cohesive soil sampling of dimensions 36 inches long, 3 inch outside diameter.
5. HQ3 carbide Diamond bit used for rock coring.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36qqq Rev. 28
Log of Boring B-105
Sheet 3 of 3

Surface Level (ft): **1995.458** Easting (ft): **101791.596732**

Total Drill Depth (ft): **35.2** Northing (ft): **99276.55072**

Inclination/Bearing: **90** Datum: **Wolf Creek Plant Datum**

Hole Id:

B-106

Sheet: 1 of 3

Depth, feet	Sample Number	Recovery	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
					SILT, clayey (ML); very dark grayish brown (10YR 3/2); dry; stiff; 90% silt and clay; trace roots and organics; no odor; no HCl reaction.		1994.5						
2	SPT-1	6 / 1.5		10 11 12	SILT with clay (ML); mottled brownish yellow (10YR 6/6) to very dark gray (10YR 3/1) and weak red (10YR 4/4); dry; stiff to medium stiff; 65-75% fines, 10-20% sand, 10-20% granules; no HCl reaction.								
4	SPT-2	1.2 / 1.5		3 5 5	Lens of SAND (SP); olive (5Y 5/4); damp; fine grained; poorly graded.		1991.4		67	15			
					CLAY, sandy (CL); very dark gray (2.5Y 3/1); moist; medium stiff; moderately plastic; trace silt; no HCl reaction.								
6	ST-1	1.85 / 2			CLAY (CL); light olive brown (2.5Y 5/3) to very pale brown (10YR 7/4); dry; very fine grained, trace silt and fine mica; stiff to medium stiff; moderately plastic, includes indistinct horizontal to sub-horizontal laminae (<1/32"); grading to a completely weathered shale.	1.58	1989.5	126	23	42	14	28
8													
10	SPT-3	1.4 / 1.5		3 4 6									
12	SPT-4	1.5 / 1.5		5 12 18	SHALE; dark yellowish orange (10YR 6/6) to grayish orange (10YR 7/4); fine grained; extremely weak (RO); indistinct very thin horizontal to sub-horizontal laminae; strong HCl reaction.		1983.5						
14	SPT-5			11 15 27						13	49	16	33

Notes:

1. Terms and symbols defined on Plate 1.
2. As-Built coordinates and elevation surveyed by Kaw Valley Engineering (KS-licensed).
3. The SPT blow count is defined as the number of blows required for a 140 lb. auto trip safety hammer falling 30 inches to drive the split-barrel sampler 6 inches in a possible 18 inch sample interval.
4. Shelby tubes used for cohesive soil sampling of dimensions 36 inches long, 3 inch outside diameter.
5. HQ3 carbide Diamond bit used for rock coring.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36rrr Rev. 28
Log of Boring B-106
Sheet 1 of 3

Surface Level (ft): **1995.458** Easting (ft): **101791.596732**

Total Drill Depth (ft): **35.2** Northing (ft): **99276.55072**

Inclination/Bearing: **90** Datum: **Wolf Creek Plant Datum**

Hole Id:

B-106

Sheet: 2 of 3

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
16	▽								SHALE; dark yellowish orange (10YR 6/6) to grayish orange (10YR 7/4); fine grained; extremely weak (RO); indistinct very thin horizontal to sub-horizontal laminae; strong HCl reaction. SPT Intervals: 2 per 5 ft; 0-15 ft then 1 per 5 ft 15-refusal								
18																	
20					SPT-6	1.5/1.5		12 19 31	Moisture on spoon at SPT-6								
22																	
24					SPT-7	1.3/1.5		9 14 19	Moisture absent at SPT-7 and below								
26																	
28																	
					SPT-8	1.4/1.5											

Notes:

1. Terms and symbols defined on Plate 1.
2. As-Built coordinates and elevation surveyed by Kaw Valley Engineering (KS-licensed).
3. The SPT blow count is defined as the number of blows required for a 140 lb. auto trip safety hammer falling 30 inches to drive the split-barrel sampler 6 inches in a possible 18 inch sample interval.
4. Shelby tubes used for cohesive soil sampling of dimensions 36 inches long, 3 inch outside diameter.
5. HQ3 carbide Diamond bit used for rock coring.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36rrr Rev. 28
Log of Boring B-106
Sheet 2 of 3

Surface Level (ft): **1995.458** Easting (ft): **101791.596732**

Total Drill Depth (ft): **35.2** Northing (ft): **99276.55072**

Inclination/Bearing: **90** Datum: **Wolf Creek Plant Datum**

Hole Id:

B-106

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
32								12 18 33	SHALE; dark yellowish orange (10YR 6/6) to grayish orange (10YR 7/4) and trace yellowish gray (5Y 8/1); very fine grained; extremely weak (RO); very thin horizontal to sub-horizontal laminae; yellowish gray is sandy, in <1/8" sparse cemented vertical band Driller reports change at 32 ft based on return of cuttings		1965.2						
34					SPT-9			19 31 50/5			1960.3						
36																	
38																	
40																	
42																	
44																	

Notes:

1. Terms and symbols defined on Plate 1.
2. As-Built coordinates and elevation surveyed by Kaw Valley Engineering (KS-licensed).
3. The SPT blow count is defined as the number of blows required for a 140 lb. auto trip safety hammer falling 30 inches to drive the split-barrel sampler 6 inches in a possible 18 inch sample interval.
4. Shelby tubes used for cohesive soil sampling of dimensions 36 inches long, 3 inch outside diameter.
5. HQ3 carbide Diamond bit used for rock coring.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36rrr Rev. 28
Log of Boring B-106
Sheet 3 of 3

Surface Level (ft): **1996.49** Easting (ft): **101786.81**

Total Drill Depth (ft): **44.8** Northing (ft): **99452.04**

Inclination/Bearing: **90** Datum: **Wolf Creek Plant Datum**

Hole Id:

B-107

Sheet: 1 of 3

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
									SILT with sand; brown (7.5YR 4/3); dry; common roots; topsoil; fill?.		1996.3						
									- 6" flight augers 0 to 12 ft								
					SPT-1	0.8/1.5		4 4 7	SILT; brownish yellow (10YR 6/6) to yellowish brown (10YR 5/6); dry; medium stiff; traces fine sand and clay; friable; fill.								
2																	
									Sample SPT-2 jabs; SPT-2A 3.5 to 4.0 ft; SPT-2B 4.0 to 5.0 ft		1992.8						
4											1992.5						
					SPT-2	1.3/1.5		3 5 5	SAND (SP); pink (7.5YR 7/3); dry; loose; fine to medium grained; sub-angular to sub-rounded; fill.				6			
									CLAY (CL); black (10YR 2/1) to dark reddish brown (5YR 3/3); dry to slightly moist; medium stiff; trace silt; no HCl reaction.		1991.0						
6					ST-1				CLAY, silty (CL); dark grayish brown (10YR 4/2); very soft; moist; plastic; easy to mold with fingers; no HCl reaction.	•3.46		129	90	21	39	14	25
8											1988.5						
					SPT-3	1.4/1.5		3 5 7	CLAY, sandy (CH); mottled light yellowish brown (10YR 6/4) to very dark grayish brown (10YR 3/2) and yellowish brown (10YR 5/6); dry to slightly moist; medium stiff; medium plasticity; trace silt; no HCl reaction.								
10					ST-2					•2.52		130	77	21	53	19	34
12									At 12 ft, switch to mud drilling; install casing.								
									Very dark grayish brown is absent								
14					SPT-4	1.4/1.5		8 13 16									

Notes:

1. Terms and symbols defined on Plate 1.
2. As-Built coordinates and elevation surveyed by Kaw Valley Engineering (KS-licensed).
3. The SPT blow count is defined as the number of blows required for a 140 lb. auto trip safety hammer falling 30 inches to drive the split-barrel sampler 6 inches in a possible 18 inch sample interval.
4. Shelby tubes used for cohesive soil sampling of dimensions 36 inches long, 3 inch outside diameter.
5. HQ3 carbide Diamond bit used for rock coring.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36sss Rev. 28
Log of Boring B-107
Sheet 1 of 3

Surface Level (ft): **1996.49** Easting (ft): **101786.81**

Total Drill Depth (ft): **44.8** Northing (ft): **99452.04**

Inclination/Bearing: **90** Datum: **Wolf Creek Plant Datum**

Hole Id:

B-107

Sheet: 2 of 3

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
16									CLAY, sandy (CH); mottled light yellowish brown (10YR 6/4) to very dark grayish brown (10YR 3/2) and yellowish brown (10YR 5/6); dry to slightly moist; medium stiff; medium plasticity; trace silt; no HCl reaction.								
											1979.5						
18									CLAY (CL); mottled yellowish brown (10YR 5/6 to 10YR 5/4) and dark gray (10YR 4/1); dry to slightly moist; very stiff; medium dry strength, low plasticity; trace very thin horizontal laminae but generally massive; weak HCl reaction.								
					SPT-5	1.2/1.5		8 11 12									
20																	
22																	
24					SPT-6	1.3/1.5		12 18 28	Grading to dark gray (10YR 4/1); increasing very thin horizontal laminae; grading to highly weathered shale.								
26																	
28											1968.5						
					SPT-7	1.4/1.5		19 30 40	SHALE; brown (10YR 5/3) to yellowish brown (10YR 5/6) and grayish brown (10YR 5/1); extremely weak (R0); completely weathered; common indistinct horizontal to sub-horizontal thin laminae; weak HCl reaction.								

Notes:

1. Terms and symbols defined on Plate 1.
2. As-Built coordinates and elevation surveyed by Kaw Valley Engineering (KS-licensed).
3. The SPT blow count is defined as the number of blows required for a 140 lb. auto trip safety hammer falling 30 inches to drive the split-barrel sampler 6 inches in a possible 18 inch sample interval.
4. Shelby tubes used for cohesive soil sampling of dimensions 36 inches long, 3 inch outside diameter.
5. HQ3 carbide Diamond bit used for rock coring.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36sss Rev. 28
Log of Boring B-107
Sheet 2 of 3

Surface Level (ft): **1996.49** Easting (ft): **101786.81**

Total Drill Depth (ft): **44.8** Northing (ft): **99452.04**

Inclination/Bearing: **90** Datum: **Wolf Creek Plant Datum**

Hole Id:

B-107

Sheet: 3 of 3

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log / Sample Type	Sample Number	Recovery	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
32								SHALE; brown (10YR 5/3) to yellowish brown (10YR 5/6) and grayish brown (10YR 5/1); extremely weak (R0); completely weathered; common indistinct horizontal to sub-horizontal thin laminae; weak HCl reaction.								
										1963.0						
34				SPT-8	1.3 1.3		40 34 26/3	SHALE; dark gray (2.5Y 4/1) and trace (yellowish brown (10YR 5/6); dry to slightly moist; extremely weak (R0); completely weathered; sparse thin, horizontal laminae; trace calcium carbonate grains; strong HCl reaction. - SPT-8; Refusal, 100 blows total. Sample last interval 3" so 33.5 to 34.8 ft.		1961.7						
36		3:24 2:56		CR-1	4.9 5	4.9 5		SHALE; argillaceous; mottled light olive gray (5Y 6/1) and medium gray (N5) to yellowish gray (5Y 8/1); extremely weak (R0) to very weak (R1); highly weathered to completely weathered; muddy; abundant shell fragments, calcium carbonate nodules and rip-up - At 34.8 ft, coring HQ3 Downpressure 300 psi MB, 0° at 35.0' MB, 0° at 35.85' Too soft to preserve a special care sample. MB, 0° at 37.3'								
38		3:38 2:23														
40		2:39 3:00						MB, 0° at 39.8'		1956.4						
42		2:30 2:35		CR-2	4.8 5	4.8 5		LIMESTONE; argillaceous; light olive gray (5Y 6/1) to medium light gray (N6) and brownish gray (5YR 4/1) to dark gray (N3); very weak (R1) to extremely weak (R0) at partings; fresh (F) to slightly weathered (SW); common calcium carbonate grains and shell MB, 0° at 40.7' MB, 0°, incipient at 41.4' 1/2" vug with black crystals and several well-formed calcite crystals can be seen with hand lens. MB, 0°, spin zone at 43.0' MB, 0° at 43.4'								
44		3:00 2:41						MB, 0° at 44.8'		1951.7						

Notes:

1. Terms and symbols defined on Plate 1.
2. As-Built coordinates and elevation surveyed by Kaw Valley Engineering (KS-licensed).
3. The SPT blow count is defined as the number of blows required for a 140 lb. auto trip safety hammer falling 30 inches to drive the split-barrel sampler 6 inches in a possible 18 inch sample interval.
4. Shelby tubes used for cohesive soil sampling of dimensions 36 inches long, 3 inch outside diameter.
5. HQ3 carbide Diamond bit used for rock coring.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36sss Rev. 28
Log of Boring B-107
Sheet 3 of 3

Surface Level (ft): **1996.67** Easting (ft): **100130.72**

Total Drill Depth (ft): **36.95** Northing (ft): **99274.436**

Inclination/Bearing: **90** Datum: **Wolf Creek Plant Datum**

Hole Id:

B-108

Sheet: 1 of 3

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
									GRAVEL (GP), silty; fine to coarse gravel, up to 1.5" diameter; poorly graded; loose to medium dense (FILL).								
											1995.0						
2					SPT-1	0.9/1.5		8 15 10	SILT (ML), with gravel; brownish yellow (10YR 6/8); stiff to medium stiff; damp; non-plastic; high dry strength; gravel is fine-grained sandstone and other non-natives, fine, subangular to subangular; clay and fine-grained sand increasing with depth; well graded (FILL).		1993.5						
4					SPT-2	1.3/1.5		3 8 12	CLAY (CL), with silt, sand and gravel; light olive brown (2.5Y 5/3); stiff; highly plastic matrix; pea gravel, yellowish brown (10YR 5/4); well graded (FILL).		1992.5						
6	▽								CLAY (CL), sandy with silt and gravel; brownish yellow (10YR 6/8); stiff; damp; low to non plastic; high dry strength; subangular pea gravel of non natives; well graded (FILL).								
					ST-3	1/2			More silty, becoming CL-ML, less sand content; damp to moist; moderate dilatancy								
8											1988.4						
									CLAY (CL), with gravel; light olive brown (2.5Y 5/3); hard to very stiff; damp; high dry strength; fine gravel of sandstone and other non-natives; poorly graded; well consolidated; breaks along subhorizontal partings (FILL).								
10					SPT-4	1.3/1.5		13 22 35									
12					SPT-5	1.5/1.5		11 25 42									
14									Locally more silty in places.								
					SPT-6												

Notes:

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36ttt Rev. 28
Log of Boring B-108
Sheet 1 of 3

Surface Level (ft):	**1996.67**	Easting (ft):	**100130.72**
Total Drill Depth (ft):	**36.95**	Northing (ft):	**99274.436**
Inclination/Bearing:	**90**	Datum:	**Wolf Creek Plant Datum**

Hole Id:

B-108

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
						1.5 1.5		14 31 44	Large reddish brown clast. CLAY (CL), with gravel; light olive brown (2.5Y 5/3); hard to very stiff; damp; high dry strength; fine gravel of sandstone and other non-natives; poorly graded; well consolidated; breaks along subhorizontal partings (FILL).								
16					SPT-7	1.5 1.5		14 25 43									
18																	
					SPT-8	1.5 1.5		12 24 35	Mottled gray clay stringers (GLEY1 6N); minor iron oxide staining; flecks of manganese.								
20																	
22					SPT-9	1.5 1.5		13 21 34	Large orangish brown claystone clast								
									CLAY (CL), with sand and gravel; light olive brown (2.5Y 5/3); mottled reddish brown (5YR 4/4) and yellowish brown (10YR 5/6); hard; damp; well compacted; fine gravel, subangular, non-native composition; fine to coarse grained sand; well graded (FILL).		1973.2						
24					SPT-10	1.4 1.4		17 20 50/5.0"									
26									SHALE; light gray (N7); extremely weak (R0); slightly weathered; indistinct laminations; undulating, subhorizontal laminae; argillaceous; CaCO3 nodules. (Heumader Shale)		1970.8						
					SPT-11	0.9 0.9		31 50/4.5"	Carbide drill bit. Down pressure 200 psi.								
28		1:56							MB, 0° at 28.1'								
		1:20									1967.9						
		0:56			CR-1												

Notes:

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36ttt Rev. 28
Log of Boring B-108
Sheet 2 of 3

Surface Level (ft):	**1996.67**	Easting (ft):	**100130.72**
Total Drill Depth (ft):	**36.95**	Northing (ft):	**99274.436**
Inclination/Bearing:	**90**	Datum:	**Wolf Creek Plant Datum**

Hole Id:

B-108

Sheet: 3 of 3

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
32		0:59 1:39 2:05 7:57 21:24			CR-2	2.8/3	2.4/3		SHALE; medium gray (N5); very weak (R1); fresh to slightly weathered; distinct laminations; rough core surface; undulating, subhorizontal laminae; gravel embedded in in shale, high energy deposition; argillaceous; CaCO3 nodules; soft soil deformation, clay balls. (Heumader Shale) Bedding joint, clay bed (R0), slightly washed out in drilling. Bit plugging up, down pressure 50 psi. Harder drilling, down pressure 350 psi. Fracture zone, infilled with gravel and coarser material; fresh		1962.5						
34									LIMESTONE; light gray (N7); weak (R2); fresh; slightly dipping bedding with some thin shale interbeds; clear, sharp upper contact with Heumader Shale; slightly muddy with soft sediment deformation (Plattsmouth Limestone). Bedding joint at contact, fresh, subhorizontal Hard drilling, down pressure 500 psi. Shale interbed, 0.1 ft thickness. Fine grained angular clast at 15 degree inclination		1961.3						
36																	
38																	
40																	
42																	
44																	

Notes:

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36ttt Rev. 28
Log of Boring B-108
Sheet 3 of 3

Surface Level (ft):	**1996.8**	Easting (ft):	**100145.05**
Total Drill Depth (ft):	**36.95**	Northing (ft):	**99272.93**
Inclination/Bearing:	**90**	Datum:	**Wolf Creek Plant Datum**

Hole Id:

B-109

Sheet: 1 of 3

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
0									GRAVEL (GP), silty; fine to coarse gravel, up to 1.5" diameter; poorly graded; loose to medium dense (FILL).								
2					SPT-1	1.5/1.5		15 13 13	CLAY (CL), with silt and gravel; light olive brown (2.5Y 5/3); stiff; dry to damp; high dry strength; fine gravel, subangular, non-native (FILL).		1995.1 1994.4						
4									SILT (ML), sandy, with gravel; brownish yellow (10YR 6/8); stiff to medium stiff; damp; non-plastic; high dry strength; fine grained sand increasing with depth; fine-grained sandstone gravel, up to 0.6" diameter; well graded (FILL).								
					ST-2	2/2											
6	▽																
8					ST-3	1.2/2					1988.6						
10									CLAY (CL), with gravel; light olive brown (2.5Y 5/3); hard to very stiff; damp; high dry strength; fine gravel of sandstone and other non-natives, subangular, up to 0.5 inch diameter, with weathering rhinds; poorly graded; well consolidated; breaks along subhorizontal partings.								
					ST-4	1.3/1.3											
12									Intermittent reddish brown claystone clasts, with large weathering rhinds around clasts.								
					SPT-5	1.5/1.5		16 27 38	Intermittent thin clay seams at random inclinations.								
14																	

Notes:

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36uuu Rev. 28
Log of Boring B-109
Sheet 1 of 3

Surface Level (ft): **1996.8** Easting (ft): **100145.05**

Total Drill Depth (ft): **36.95** Northing (ft): **99272.93**

Inclination/Bearing: **90** Datum: **Wolf Creek Plant Datum**

Hole Id:

B-109

Sheet: 2 of 3

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
16					SPT-6	1.3/1.5		14 28 42	CLAY (CL), with gravel; light olive brown (2.5Y 5/3); hard to very stiff; damp; high dry strength; fine gravel of sandstone and other non-natives, subangular, up to 0.5 inch diameter, with weathering rhinds; poorly graded; well consolidated; breaks along subhorizontal partings.							
18					SPT-7	1.5/1.5		18 27 38									
20					SPT-8	1.5/1.5		11 16 25									
22					SPT-9	1.5/1.5		14 21 38									
24					SPT-10	1/1		18 50/5.5"									
26					SPT-11	0.5/0.5		50/5.5"	SHALE; medium gray (N5) to light gray (N7); extremely weak (R0) to very weak (R1); slightly weathered to fresh; indistinct laminations; undulating, subhorizontal laminae; argillaceous; $CaCO_3$ nodules. (Heumader Shale)		1970.4						
28		4:47 5:01 5:07			CR-1	4.9/5	4.9/5		Diamond drill bit. Down pressure 200 psi. Higher energy deposition with soft sediment deformation and pervasive clay balls.								

Notes:

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36uuu Rev. 28
Log of Boring B-109
Sheet 2 of 3

Surface Level (ft): **1996.8** Easting (ft): **100145.05**

Total Drill Depth (ft): **36.95** Northing (ft): **99272.93**

Inclination/Bearing: **90** Datum: **Wolf Creek Plant Datum**

Hole Id:

B-109

Sheet: 3 of 3

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
32		5:04 5:21 3:27							SHALE; medium gray (N5) to light gray (N7); extremely weak (R0) to very weak (R1); slightly weathered to fresh; indistinct laminations; undulating, subhorizontal laminae; argillaceous; CaCO3 nodules. (Heumader Shale) Becoming harder (R1-R2)								
34		5:21 4:11			CR-2	5/5	4.7/5		LIMESTONE; light gray (N7); weak (R2); fresh to slightly weathered; undulatory bedding appears 5 to 10 degree inclination; slightly muddy with soft sediment deformation; high energy transitional upper contact with Heumader Shale, interbedded over upper 0.4 ft.		1963.5						
36		3:20 4:27							Subhorizontal shale interbed at 33.6', 0.4 inch thickness. Joint pair (5°), closed, FeO staining Bedding joint along shale interbed Pervasive thin shale interbeds, subhorizontal and undulatory bedding, 0.2 to 0.5 inch thickness. Interbeds at 35.0, 35.3, 35.5, 35.9,36.2, 36.5, 36.7, 36.8, 34.0, 34.2 ft.		1959.9						
38																	
40																	
42																	
44																	

Notes:

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36uuu Rev. 28
Log of Boring B-109
Sheet 3 of 3

Surface Level (ft):	**1996.23**	Easting (ft):	**100130.72**
Total Drill Depth (ft):	**33.4**	Northing (ft):	**99238.741**
Inclination/Bearing:	**90**	Datum:	**Wolf Creek Plant Datum**

Hole Id:

B-110

Sheet: 1 of 3

Depth, feet	Sample Number	Recovery	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
					GRAVEL (GP), silty; fine to coarse gravel, up to 1.5" diameter; poorly graded; loose to medium dense (FILL).								
							1994.8						
2	SPT-1	0.7/1.5		7 9 11	CLAY (CL), sandy to SAND, clayey; strong brown (7.5YR 5/8) and light olive brown (2.5Y 5/3); medium stiff; damp; non plastic; high dry strength; fine grained sand; intermixed in discrete chunks of clayey sand and sandy clay; trace fine gravel; well graded (FILL).								
4	ST-2	1.9/2											
6													
							1989.5						
					CLAY (CL), sandy; strong brown (7.5YR 5/8); very soft to soft; wet; crumbles; slow dilatancy; low dry strength (FILL).								
8	ST-3	0.4/2											
							1986.4						
10	ST-4	1/2			GRAVEL (GP), clayey; wet; loose; subangular, fine gravel, non-natives, range in size from 0.5" diameter down to pea size, predominantly 0.5" size (FILL). Hard to recover sample, stuck in middle of tube. Possibly lost bottom 0.3'								
12													
	SPT-5	1.2/1.5		4 9 10			1982.3						
14	SPT-6												

Notes:

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36vvv Rev. 28
Log of Boring B-110
Sheet 1 of 3

Surface Level (ft):	**1996.23**	Easting (ft):	**100130.72**
Total Drill Depth (ft):	**33.4**	Northing (ft):	**99238.741**
Inclination/Bearing:	**90**	Datum:	**Wolf Creek Plant Datum**

Hole Id:

B-110

Sheet: 2 of 3

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log / Sample Type	Sample Number	Recovery	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
					1.5/1.5		5 6 18	CLAY (CL), with gravel; light olive brown (2.5Y 5/3); very stiff; damp; little fine gravel of non-natives; poorly graded; well compacted (FILL).								
16				SPT-7	1.5/1.5		17 24 34									
18																
				SPT-8	1.4/1.5		12 15 22									
20								CLAY (CL); grayish brown (10Y 5/2) to light olive brown (2.5Y 5/3), mottled orangish brown in places; hard to very stiff; poorly graded; low plasticity; no dilatancy (FILL).		1976.2						
22				SPT-9	1.5/1.5		11 22 40									
										1972.6						
24				SPT-10	1.4/1.4		21 50/5.0"	CLAY (CL), gravelly, with silt; brown (10YR 5/3); hard to very stiff; damp to moist; clay matrix is moderate to low plasticity; fine gravel of non-natives; well graded (FILL).								
										1970.6						
26								CLAY (CL); grayish brown (10Y 5/2) to light olive brown (2.5Y 5/3), mottled orangish brown in places; hard to very stiff; poorly graded; low plasticity; no dilatancy (FILL).		1969.7						
				SPT-11	0.9/0.9		20 50/5.0"	SHALE; light gray (N7); extremely weak (R0) to very weak (R1); slightly weathered to fresh; distinct laminations, broken in sample along subhorizontal laminations; undulating, subhorizontal laminae; argillaceous; CaCO3 nodules; upper few inches at contact is softer; rough core surface; high energy deposition with some soft sediment deformation (Heumader Shale)								
28		4:20 6:10						MB, 0° at 28.1' Diamond drill bit. Down pressure 200 psi.								

Notes:

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36vvv Rev. 28
Log of Boring B-110
Sheet 2 of 3

Surface Level (ft):	**1996.23**	Easting (ft):	**100130.72**
Total Drill Depth (ft):	**33.4**	Northing (ft):	**99238.741**
Inclination/Bearing:	**90**	Datum:	**Wolf Creek Plant Datum**

Hole Id:

B-110

Sheet: 3 of 3

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
32		5:02 5:27			CR-1	5	5		SHALE; light gray (N7); extremely weak (R0) to very weak (R1); slightly weathered to fresh; distinct laminations, broken in sample along subhorizontal laminations; undulating, subhorizontal laminae; argillaceous; $CaCO_3$ nodules; upper few inches at contact is softer; rough core surface; high energy deposition with some soft sediment deformation (Heumader Shale)								
									Becomes softer to extremely weak (R0), lower energy, less clay balls, rough core surface, no shells		1963.4						
34									Becoming harder to very weak (R1), more shells and clay balls Bedding joint (0°), clay bed (R0), slightly washed out in drilling.		1962.8						
									LIMESTONE; light gray (N7); weak (R2); fresh to slightly weathered; subhorizontal bedding with some thin shale interbeds; clear, abrupt upper contact with Heumader Shale; slightly muddy with soft sediment deformation, bivalve shells (Plattsmouth Limestone).								
36									Fracture zone (10°), infilled with gravel and coarser material; fresh Bedding joint (0°) at contact, fresh, subhorizontal								
38																	
40																	
42																	
44																	

Notes:

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36vvv Rev. 28
Log of Boring B-110
Sheet 3 of 3

Surface Level (ft):	**1996.43**	Easting (ft):	**100145.05**
Total Drill Depth (ft):	**36**	Northing (ft):	**99237.235**
Inclination/Bearing:	**90**	Datum:	**Wolf Creek Plant Datum**

Hole Id:

B-111

Sheet: 1 of 3

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
									GRAVEL (GP), silty; fine to coarse gravel, up to 1.5 diameter; poorly graded; loose to medium dense (Parking lot road base).		1995.5						
2					SPT-1	1.3/1.5		7 9 16	CLAY (CL), with gravel and sand; light olive brown (2.5Y 5/3); high dry strength; fine gravel, subangular, non-native; well graded and well compacted (FILL).		1994.4						
4					SPT-2	0.6/1.5		7 7 7	CLAY (CL), sandy to SAND, clayey with gravel; strong brown (7.5YR 5/8) and light olive brown (2.5Y 5/3); medium stiff; damp; intermixed in discrete chunks of CL and SW; sandstone clasts, subangular; non plastic; fine grained sand; well graded; medium dry strength (FILL).								
6					SPT-3	1.5/1.5		4 5 6			1990.6						
8					ST-4	1.3/1.3			CLAY (CL), with gravel; grayish brown (10Y 5/2) to light olive brown (2.5Y 5/3), mottled orangish brown in places; very stiff to hard; damp; trace fine gravel of sandstone and reddish brown claystone, subangular; poorly graded; well compacted (FILL).								
10					SPT-5	1.5/1.5		10 20 28									
12					SPT-6	1.5/1.5		11 23 37									
14																	

Notes:
1. Borehole dry at sampling time.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36www Rev. 28
Log of Boring B-111
Sheet 1 of 3

Surface Level (ft):	**1996.43**	Easting (ft):	**100145.05**
Total Drill Depth (ft):	**36**	Northing (ft):	**99237.235**
Inclination/Bearing:	**90**	Datum:	**Wolf Creek Plant Datum**

Hole Id:

B-111

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log / Sample Type	Sample Number	Recovery	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
16				SPT-7	1.5/1.5		14 24 36	CLAY (CL), with gravel; grayish brown (10Y 5/2) to light olive brown (2.5Y 5/3), mottled orangish brown in places; very stiff to hard; damp; trace fine gravel of sandstone and reddish brown claystone, subangular; poorly graded; well compacted (FILL).								
18				SPT-8	1.5/1.5		18 30 38									
20				SPT-9	1.1/1.5		15 20 36									
22				SPT-10	1.5/1.5		14 26 41									
24				SPT-11	0.5/0.5		50/5.9"									
26		4:12						SHALE; medium gray (N5); extremely weak (R0) to very weak (R1); slightly weathered to fresh; distinct laminations, transitions over 1ft intervals from medium gray (N5) to moderately yellowish brown (10YR 5/4) with no composition change (Heumader Shale)		1970.5						
28		5:10						Refusal at 6" mark, shale in very tip of SPT sample B111-S11								
		4:55		CR-1	5/5	4.6/5		Diamond drill bit. Down pressure 150 psi.		1967.7						
		4:40														

Notes:
1. Borehole dry at sampling time.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36www Rev. 28
Log of Boring B-111
Sheet 2 of 3

Surface Level (ft):	**1996.43**	Easting (ft):	**100145.05**
Total Drill Depth (ft):	**36**	Northing (ft):	**99237.235**
Inclination/Bearing:	**90**	Datum:	**Wolf Creek Plant Datum**

Hole Id:

B-111

Sheet: 3 of 3

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
32		5:39							SHALE; medium gray (N5); very weak (R1); fresh to slightly weathered; high energy deposition, soft sediment deformation, pervasive clay balls; upper contact is gradual over 0.3 ft; abundant bivalves and oyster shells, shell hash layers throughout; non fractured (Heumader Shale)								
		4:29							Random fracture, open, soft infill, fresh, 10 and 15 degree dip at acute angles								
		4:19							MB, 0° at 30.8'								
34		6:05			CR-2	5	5		Bedding joint (0°), subhorizontal, soft infill, clay to coarse grained, fresh								
		3:35							MB, 0° at 34.0' along shale interbed								
36		4:11									1960.4						
38																	
40																	
42																	
44																	

Notes:
1. Borehole dry at sampling time.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36www Rev. 28
Log of Boring B-111
Sheet 3 of 3

Surface Level (ft): **1963.49** Easting (ft): **103172.87**

Total Drill Depth (ft): **12.7** Northing (ft): **98371.84**

Inclination/Bearing: **90** Datum: **Wolf Creek Plant Datum**

Hole Id:

B-112

Sheet: 1 of 1

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
					SPT-1	1.2/1.5		1 2 4	CLAY, sandy (CL); olive black (5Y 2/1); moist to wet; medium stiff; very clayey; 2" of well graded, fine-coarse sand in bottom of spoon (did not bag). - 26.2 ft to mud line from deck NWJ rod check to be 10 ft, 5 ft, 2 ft. Spoon dropped to 26.5 ft when lowered to mud line.				80	24	39	14	25
2					SPT-2	0 0.1		2 50/1	LIMESTONE; pale blue (5PB 7/2); weak (R2); moderately weathered (MW); medium bedded; heavy staining and some clay fill in sub-horizontal discs to 4.8 ft; fossiliferous; very close- to closely spaced, wavy laminations; strong HCl reaction.		1961.0						
		3:31			CR-1	1/2	0/2		BJ, MB - Vertical, 0° between 2.8' and 3.0'								
4		1:49							BJ, 0° at 3.3'								
		2:52							MB, FZ, 0° between 3.5' and 3.7'								
									4.2 ft to water from deck								
		3:23							MB, FZ, 0° between 4.6' and 4.8'								
6									Fresh (F)								
									Circulation water is light gray								
					SC-1				BJ, 10° at 5.7'	•1170		161		2			
		3:02			CR-2	5/5	4.6/5		HW casing with drive shoe = 10.5 ft								
									Casing alone 10.0 ft, 5.0 ft, 2.0 ft, 1.0 ft								
8		2:27							BJ, 0° at 7.5'								
									Bedding joints are rough and undulating								
									Bottom of lake relatively flat								
		3:26							BJ, 0° at 8.6'								
									BJ, 0° at 9.3'								
10		2:44															
		3:30			CR-3	3.3/3.2	2.4/3.2		MB, FZ, 0° between 11.1' and 11.3'		1952.2						
12									SHALE; grayish black (5YR N2); very weak (R0); moderately weathered (MW); very thin to thin bedded; clayey; slight HCl reaction.								
		3:48							Circulation water color change to dark gray at 11.5 ft		1950.8						
									BJ at 12.0'								
									BJ at 12.6'								
14																	

Notes:

1. Terms and symbols defined on Plate 1.
2. As-Built coordinates and elevation surveyed by Kaw Valley Engineering (KS-licensed).
3. The SPT blow count is defined as the number of blows required for a 140 lb. auto trip safety hammer falling 30 inches to drive the split-barrel sampler 6 inches in a possible 18 inch sample interval.
4. Shelby tubes used for cohesive soil sampling of dimensions 36 inches long, 3 inch outside diameter.
5. HQ3 carbide Diamond bit used for rock coring.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36xxx Rev. 28
Log of Boring B-112
Sheet 1 of 1

Surface Level (ft): **1996.59** Easting (ft): **100837.75**

Total Drill Depth (ft): **43.05** Northing (ft): **99262.758**

Inclination/Bearing: **90** Datum: **Wolf Creek Plant Datum**

Hole Id:

B-112L

Sheet: 1 of 3

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
0					ST-1	1.9/2			CLAY (CL), silty, with gravel; yellowish brown; medium stiff to stiff; damp; gravel is angular to subangular, pea size; well graded (FILL).								
2																	
					ST-2	2/2											
4											1992.0						
									CLAY (CL), with silt; dark gray (10YR 4/1); medium stiff; damp; medium to high plasticity; poorly graded; medium dry strength (FILL).								
6					ST-3	1.8/2									43	16	27
8	▼				SPT-4	0.3/1.5		5 10 7									
											1987.2						
10					SPT-5	0.5/1.5		2 2 4	CLAY (CL), with silt; dark gray (10YR 4/1), mottled yellowish brown (10YR 5/6); soft to medium stiff; moist to damp; high to medium plasticity; poorly graded; high dry strength; fragments of intact shale with faint laminae; trace FeO staining (FILL). Gravel trailings in auger cuttings						46	17	29
12																	
					ST-6								87		46	17	29
14																	

Notes:

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36yyy Rev. 28
Log of Boring B-112L
Sheet 1 of 3

Surface Level (ft): **1996.59** Easting (ft): **100837.75**

Total Drill Depth (ft): **43.05** Northing (ft): **99262.758**

Inclination/Bearing: **90** Datum: **Wolf Creek Plant Datum**

Hole Id:

B-112L

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
16					ST-7	0.8/2			CLAY (CL), with silt; dark gray (10YR 4/1), mottled yellowish brown (10YR 5/6); soft to medium stiff; moist to damp; high to medium plasticity; poorly graded; high dry strength; fragments of intact shale with faint laminae; trace FeO staining (FILL).				89		47	18	29
18					SPT-8	0.8/1.5		2 2 7					79				
									GRAVEL, with sand (GP); loose to medium dense; wet; poorly graded; 5-10% fines content; subangular clasts up to 0.6" diameter; poorly graded (FILL)		1977.6						
20					ST-9	0/0.5			Dented tube in B112-9, no recovery								
22																	
24																	
					SPT-10	1.5/0.3		4 2 2									
26									SHALE; medium dark gray (N4); extremely weak (R0); fresh to slightly weathered; trace CaCO3 nodules; trace indistinct laminations (Heumader Shale)		1970.4						
28									Driller reports harder drilling								

Notes:

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36yyy Rev. 28
Log of Boring B-112L
Sheet 2 of 3

Surface Level (ft):	**1996.59**	Easting (ft):	**100837.75**
Total Drill Depth (ft):	**43.05**	Northing (ft):	**99262.758**
Inclination/Bearing:	**90**	Datum:	**Wolf Creek Plant Datum**

Hole Id:

B-112L

Sheet: 3 of 3

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
					SPT-11	0.8/0.8		15 50/4.0"	SHALE; medium dark gray (N4); extremely weak (R0); fresh to slightly weathered; trace CaCO3 nodules; trace indistinct laminations (Heumader Shale) Driller reports harder drilling								
32																	
34																	
36					SPT-12	0.3/1.5		3 16 23									
38					SPT-13	0/0.1		50/1.0"	Refusal with auger, confirmed with SPT refusal		1958.5						
		4:29							LIMESTONE; very light gray (N8) to light gray (N7); weak (R2); fresh to slightly weathered; slightly fractured along bedding breaks; bedding is subhorizontal and undulating up to 0.8 inch amplitude; argillaceous with random coarser clasts up to 0.5" diameter; pervasive bivalves and oyster shells; generally low energy deposition, with intermittent high energy zones up to 1.2 inch thickness; bedding material is dark gray (N8), argillaceous, very weak (Plattsmouth Limestone) Bedding joint (0°), subhorizontal, open, fresh Bedding joint (0°), subhorizontal, open within soft material Bedding (10°), closed, undulatory Bedding (5°), closed, undulatory Bedding (2°), closed, undulatory, subhorizontal Bedding (0°), closed, softer material MB, 0° at 42.7'							
40		4:03			CR-1	5/5	4.6/5			1471.7							
		4:50															
42		3:56															
		5:31									1953.5						
44																	

Notes:

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36yyy Rev. 28
Log of Boring B-112L
Sheet 3 of 3

Surface Level (ft): **1967.02** Easting (ft): **103470.77**

Total Drill Depth (ft): **2.35** Northing (ft): **98152.29**

Inclination/Bearing: **90** Datum: **Wolf Creek Plant Datum**

Hole Id:

B-113

Sheet: 1 of 1

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
0					SPT-1	0.8/1.5		0 0 0	CLAY (CL); pale yellowish brown (10YR 6/2); moist to wet; very soft; contains limestone fragments, or residuum; Organic debris and detritus, 0 to 0.2 ft. Depth to Mudline is 24.8 ft.								
2					SPT-2	0/0.15		21 50/2			1964.7						
4																	
6																	
8																	
10																	
12																	
14																	

Notes:

1. Terms and symbols defined on Plate 1.
2. As-Built coordinates and elevation surveyed by Kaw Valley Engineering (KS-licensed).
3. The SPT blow count is defined as the number of blows required for a 140 lb. auto trip safety hammer falling 30 inches to drive the split-barrel sampler 6 inches in a possible 18 inch sample interval.
4. Shelby tubes used for cohesive soil sampling of dimensions 36 inches long, 3 inch outside diameter.
5. HQ3 carbide Diamond bit used for rock coring.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36zzz Rev. 28
Log of Boring B-113
Sheet 1 of 1

Surface Level (ft): **1996.54** Easting (ft): **100873.25**

Total Drill Depth (ft): **40.8** Northing (ft): **99259.028**

Inclination/Bearing: **90** Datum: **Wolf Creek Plant Datum**

Hole Id:

B-113L

Sheet: 1 of 3

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
					ST-1	1.2/2			CLAY, silty, with sand and trace gravel (CL); dark grey (10YR 4/1) with sand and sandstone of brownish yellow (10YR 6/6); medium stiff to stiff; damp; clay matrix is low to moderate plasticity; subangular, sandstone clasts of fine grained sand; well graded (FILL).								
2																	
					SPT-2	1/1.5		5 8 9									
4																	
											1990.9						
6					ST-3	1.9/2			CLAY, with gravel and silt (CL); very dark gray (10YR 3/1); medium stiff; damp; clay matrix is high to moderately plastic; shale clasts, yellowish brown fine grained sandstone (R0) and reddish siltstone clasts (R0-R1); well graded; high dry strength (FILL).						48	18	30
8					SPT-4	0.9/1.5		3 3 4									
10					ST-5	1.2/1.5				6.14					47	17	30
12									CLAY, silty (CL); very dark gray (10YR 3/1), mottled yellowish brown (10YR 5/4) and dark brown (7.5 YR 3/3); little fine gravel and sand; soft to medium stiff; high to moderately plastic; moderately well graded (FILL).		1984.3						
					SPT-6	1.5/1.5		3 3 5					86		45	15	30
14																	

Notes:

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36aaaa Rev. 28
Log of Boring B-113L
Sheet 1 of 3

Surface Level (ft): **1996.54** Easting (ft): **100873.25**

Total Drill Depth (ft): **40.8** Northing (ft): **99259.028**

Inclination/Bearing: **90** Datum: **Wolf Creek Plant Datum**

Hole Id:

B-113L

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log / Sample Type	Sample Number	Recovery	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
16				ST-7	1.3/2			CLAY, silty (CL); very dark gray (10YR 3/1), mottled yellowish brown (10YR 5/4) and dark brown (7.5 YR 3/3); little fine gravel and sand; soft to medium stiff; high to moderately plastic; moderately well graded (FILL).								
								Large clast of siltstone, up to 2" diameter, possibly limestone								
18	▽			SPT-8	1.2/1.5		2 3 5	up to 20% fine gravel content, generally non-native, increasing matrix plasticity to high to moderate. Hydrostatic pressure up to 15 ft depth minimum.				85				
								GRAVEL, with sand (GP); loose to medium dense; wet; poorly graded; 5-10% fines content; subangular clasts up to 0.6" diameter; poorly graded (FILL)		1977.0						
20				SPT-9	0.9/1.5		8 8 9					7				
22																
				SPT-10	0.8/1.5		6 9 10									
24								Increasing fines content to 15%.								
26				SPT-11	1.1/1.5		6 11 14	SHALE; dark gray (N3); extremely weak (R0) to very weak (R1); fresh to slightly weathered; indistinct, subhorizontal laminations (Heumader Shale)		1970.3						
28																

Notes:

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36aaaa Rev. 28
Log of Boring B-113L
Sheet 2 of 3

Surface Level (ft):	**1996.54**	Easting (ft):	**100873.25**
Total Drill Depth (ft):	**40.8**	Northing (ft):	**99259.028**
Inclination/Bearing:	**90**	Datum:	**Wolf Creek Plant Datum**

Hole Id:

B-113L

Sheet: 3 of 3

Depth, feet	Drill Rate (mins)	Sample Number	Recovery	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf)	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
32	4:45	SPT-12	0.8/0.8		17 50/4.0"	SHALE; dark gray (N3); extremely weak (R0) to very weak (R1); fresh to slightly weathered; indistinct, subhorizontal laminations (Heumader Shale) Diamond bit. Down pressure 200 psi Bedding breaks (0°), subhorizontal, undulatory								
	4:57					Bedding breaks (0°), subhorizontal, undulatory		1964.1						
34	5:11	CR-1	5/5	4.6/5		SHALE; medium dark gray to light gray (N4-N3); very weak (R1); fresh to slightly weathered; high energy deposition with soft sediment deformation; light gray clay balls; CaCO3 nodules; rough core surface; argillaceous (Heumader Shale) Soft gravel zones at 32.8-33.0, 33.5-33.7 ft. Extremely weak, clay-like, high plasticity. Down pressure 350 psi	69.7							
	6:45													
36	6:50													
	4:34													
	4:54					Increasing strength towards limestone contact to R1-R2 Bedding breaks (0°), subhorizontal, undulatory		1958.8						
38	5:01	CR-2	5/5	5/5		LIMESTONE; very light gray (N8) to light gray (N7); weak (R2); fresh to slightly weathered; argillaceous with very thin shale interbeds; contact is clear and sharp with shale; minor incipient fractures; bedding is subhorizontal and undulating up to 0.4 inch amplitude (Plattsmouth Limestone) SHALE interbed, 0.1 ft thickness, R1-R2; clear contacts along undulatory bed, 0.4"amplitude.								
	3:18													
40	3:35							1955.7						
42														
44														

Notes:

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36aaaa Rev. 28
Log of Boring B-113L
Sheet 3 of 3

Surface Level (ft): **1996.32** Easting (ft): **100837.75**

Total Drill Depth (ft): **36.3** Northing (ft): **99242.648**

Inclination/Bearing: **90** Datum: **Wolf Creek Plant Datum**

Hole Id:

B-114L

Sheet: 1 of 3

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
					ST-1				CLAY (CL); dark grey (10 YR 3/1); damp; soft to medium strong; high plasticity (FILL)								
									GRAVEL, with sand (GP); loose; fine to coarse gravel, subangular to angular, with medium grained sand; well graded (FILL)		1995.6						
2									CLAY, silty, with sand (CL); dark gray (10YR 4/1); medium stiff; damp; medium grained sand, brownish yellow (10YR 4/1); high dry strength; low plasticity; trace clasts, angular, broken in sampler; well graded (FILL).		1994.7						
					SPT-2	1 1.5		5 7 7									
4																	
					ST-3	1.9 2											
6																	
											1988.9						
8					SPT-4	0.4 1.5		2 5 6	CLAY, with gravel and silt (CL); dark gray (10YR 4/1); medium stiff; damp; high dry strength; moderate plasticity; gravel is fine, mostly shale composition (FILL).						44	17	27
	▽																
	▼																
10					ST-5	1.4 2											
12																	
					SPT-6	1.2 1.5		2 3 4									
14																	

Notes:

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36bbbb Rev. 28
Log of Boring B-114L
Sheet 1 of 3

Surface Level (ft): **1996.32** Easting (ft): **100837.75**

Total Drill Depth (ft): **36.3** Northing (ft): **99242.648**

Inclination/Bearing: **90** Datum: **Wolf Creek Plant Datum**

Hole Id:

B-114L

Sheet: 2 of 3

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
									CLAY, with silt (CL); dark gray (10YR 4/1); stiff; damp; high dry strength; moderate plasticity; some fine gravel, mostly shale composition; poorly graded (FILL).	3.59	1981.1						
16					ST-7	1.4/2									44	17	27
18																	
20									GRAVEL, sandy (GP); medium dense to dense; moderately sorted; poorly graded; gravel is fine with some coarse gravel; subrounded to subangular; sand is coarse grained (FILL). Hydrostatic pressure up to 15 ft depth minimum.		1976.5						
					SPT-8	0.9/1.5		6 9 12					10				
22									Cuttings don't appear to reflect gravel unit								
24																	
26					SPT-9	1/1.5		4 22 43	SHALE; dark gray (N3-N4); extremely weak (R0) to very weak (R1); fresh to slightly weathered; distinct, subhorizontal laminations (Heumader Shale)		1970.8						
28																	

Notes:

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36bbbb Rev. 28
Log of Boring B-114L
Sheet 2 of 3

Surface Level (ft):	**1996.32**	Easting (ft):	**100837.75**
Total Drill Depth (ft):	**36.3**	Northing (ft):	**99242.648**
Inclination/Bearing:	**90**	Datum:	**Wolf Creek Plant Datum**

Hole Id:

B-114L

Sheet: 3 of 3

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log / Sample Type	Sample Number	Recovery	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
				SPT-10	1.3/1.5		3 30 50/4"	SHALE; dark gray (N3-N4); extremely weak (R0) to very weak (R1); fresh to slightly weathered; distinct, subhorizontal laminations (Heumader Shale) Diamond bit. Down pressure 160 psi								
32		3:34														
		5:59								1963.5						
34		5:44		CR-1	4.4/5	4.4/5		SHALE; medium gray (N5); very weak (R1) to weak (R2); fresh to slightly weathered; distinct laminations; high energy deposition with soft sediment deformation with shell hash in places; subhorizontal, undulating bedding; sparse bivalve shells; CaCO3 nodules (Heumader Shale) Bedding breaks (0°), subhorizontal, undulatory Diamond bit cutting poorly in shale	•178.4							
		6:10														
36		5:50						MB, 0° at 35.9'		1960.0						
38																
40																
42																
44																

Notes:

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36bbbb Rev. 28
Log of Boring B-114L
Sheet 3 of 3

Surface Level (ft): **1965.47** Easting (ft): **104039.14**

Total Drill Depth (ft): **11.1** Northing (ft): **97706.88**

Inclination/Bearing: **90** Datum: **Wolf Creek Plant Datum**

Hole Id:

B-115

Sheet: 1 of 1

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
					SPT-1	0.8/0.9		0 38 50/1	SILT (ML); dark gray (N3) and black (N1); wet; very soft; with clay and organics. Depth to Mudline is 26.5 ft.		1964.6						
2		1:49							LIMESTONE; pale blue (5PB 7/2); medium strong (R3); moderately weathered (MW) to 2 ft, fresh (F) below 2 ft; thin to medium bedded; heavy staining to 2 ft; fossiliferous; moderately argillaceous with shale partings; strong HCl reaction. FZ, 0° between 1.1' and 2.0' BJ, 0°, rough, undulating at 2.8'							
		2:45			SC-1												
		3:10			CR-1	5/5	3.5/5			•1800		163		1			
4									BJ, 0°, rough, undulating at 3.9'								
		3:35									1961.0						
		2:33							SHALE; grayish black (5YR N/2); very weak (R1); moderately weathered (MW) to highly weathered (HW); very thin to thinly bedded; clayey in HW zone, 4.5 to 5.0 ft; no reaction to HCl. - FZ, 0°, due to weathering between 4.5' and 5.1' BJ, 0° at 5.9' Light olive gray (5Y 6/1) nodules and very thin bands; very close to closely spaced, horizontal bedding joints. - BJ, 0°, very close to closely spaced between 6.1' and 8.4'								
6		6:12															
		5:58															
8																	
		4:24			CR-2	5/5	2.8/5		LIMESTONE; pale blue (5B/J/6); medium strong (R3); fresh (F); medium bedded; strong HCl reaction. BJ, 0° at 8.7'		1957.1						
		3:41							BJ, 0° at 8.8' BJ, 0° at 8.9'		1955.9						
10		5:58							SHALE; dark gray (N3); extremely weak (R0); highly weathered (HW); thin bedded; fossiliferous; moderate HCl reaction. BJ, 0° at 10.4' BJ, 0° at 10.6' BJ, 0° at 10.8'		1954.4						
12																	
14																	

Notes:

1. Terms and symbols defined on Plate 1.
2. As-Built coordinates and elevation surveyed by Kaw Valley Engineering (KS-licensed).
3. The SPT blow count is defined as the number of blows required for a 140 lb. auto trip safety hammer falling 30 inches to drive the split-barrel sampler 6 inches in a possible 18 inch sample interval.
4. Shelby tubes used for cohesive soil sampling of dimensions 36 inches long, 3 inch outside diameter.
5. HQ3 carbide Diamond bit used for rock coring.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36cccc Rev. 28
Log of Boring B-115
Sheet 1 of 1

Surface Level (ft):	**1996.31**	Easting (ft):	**100873.25**
Total Drill Depth (ft):	**37.8**	Northing (ft):	**99238.918**
Inclination/Bearing:	**90**	Datum:	**Wolf Creek Plant Datum**

Hole Id:

B-115L

Sheet: 1 of 3

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
0					ST-1	1.2/2			CLAY, sandy with silt, trace gravel (CL); very dark gray (10YR 3/1) with sand nodules and sandstone of brownish yellow (10YR 6/6); medium stiff to stiff; damp; low to moderate plasticity; trace fine grained sandstone clasts, subangular; nodules of fine grained sand; well graded (FILL).								
2					SPT-2	0.9/1.5		4 7 5									
4																	
6					ST-3	1.4/2			CLAY, silty (CL); brown (10YR 4/3); stiff; damp; loss of sand and gravel; low dry strength; low to moderate plasticity; higher dilatancy; poorly graded (FILL).		1990.8						
8	▼				SPT-4	0.6/1.5		2 3 4	CLAY, with gravel and silt (CL); dark gray (10YR 4/1); medium stiff; damp; moderate plasticity; poorly graded (FILL).		1989.1						
10					ST-5	1/2			CLAY, silty (CL); brown (10YR 4/3), mottled dark gray (10YR4/1); medium stiff; moderate to high plasticity; poorly graded; trace fine gravel; trace fine grained sand; high dry strength (FILL)		1986.1						
12					SPT-6	0.5/1.5		2 3 3									
14																	

Notes:

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36dddd Rev. 28
Log of Boring B-115L
Sheet 1 of 3

Surface Level (ft):	**1996.31**	Easting (ft):	**100873.25**
Total Drill Depth (ft):	**37.8**	Northing (ft):	**99238.918**
Inclination/Bearing:	**90**	Datum:	**Wolf Creek Plant Datum**

Hole Id:

B-115L

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
16					ST-7	1.1/2			CLAY, silty (CL); brown (10YR 4/3), mottled dark gray (10YR4/1); medium stiff; moderate to high plasticity; poorly graded; trace fine gravel; trace fine grained sand; high dry strength (FILL)	•3.2			92		44	16	28
18											1977.8							
									GRAVEL, sandy (GP); medium dense ; wet; well sorted; poorly graded; gravel is fine, subangular; sand is coarse grained (FILL).									
20					SPT-8	0.9/1.5		6 6 9					5				
22																		
24									SHALE; dark gray (N3), mottled yellow brown (10YR 6/6) in places; extremely weak (R0) to very weak (R1); fresh to slightly weathered; intermixed little fine to coarse grained sand and angular, coarse quartz sand (Heumader Shale)		1972.3						
26					SPT-9	0.9/1.5		5 10 32									
28					SPT-10	0.7/0.7		33 50/2"	Becoming stronger								
		2:20									1966.6						

Notes:

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36dddd Rev. 28
Log of Boring B-115L
Sheet 2 of 3

Surface Level (ft): **1996.31** Easting (ft): **100873.25**

Total Drill Depth (ft): **37.8** Northing (ft): **99238.918**

Inclination/Bearing: **90** Datum: **Wolf Creek Plant Datum**

Hole Id:

B-115L

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
		3:56							SHALE; dark gray (N3); very weak (R1); fresh to slightly weathered; distinct subhorizontal laminae; rough core surface (Heumader Shale)		1965.8						
		2:57			CR-1	5/5	4.8/5		SHALE; dark gray (N3); extremely weak (R0) to very weak (R1); fresh to slightly weathered; indistinct subhorizontal laminae, more distinct in 2-3" zones (Heumader Shale)	•78.7	1964.8						
32		1:27															
		1:59							SHALE; medium gray (N4); very weak (R1) to weak (R2); fresh to slightly weathered; high energy deposition with soft sediment deformation; light gray clay balls; CaCO3 nodules; rough core surface; argillaceous (Heumader Shale)								
34		2:27															
		3:09															
		3:03			CR-2	4/4.1	4/4.1										
36																	
		2:17 11:25							LIMESTONE; light gray (N7); weak (R2); fresh to slightly weathered; bedding appears subhorizontal; contact with Heumader shale above is sharp, slightly muddy at contact; argillaceous (Plattsmouth Limestone)		1958.8 1958.5						
38																	
40																	
42																	
44																	

Notes:

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36dddd Rev. 28
Log of Boring B-115L
Sheet 3 of 3

Surface Level (ft): **1998.97** Easting (ft): **99761.47**

Total Drill Depth (ft): **34** Northing (ft): **100077**

Inclination/Bearing: **90** Datum: **Wolf Creek Plant Datum**

Hole Id:

B-118

Sheet: 1 of 3

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log / Sample Type	Sample Number	Recovery, feet	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
0								CLAY, sandy (CL) - Fill								
2																
4																
										1994.0						
6								GRAVEL (GP - Fill								
8																
10										1989.0						
				SPT-1			9 13 11	GRAVEL, sandy (GP); damp; light gray (10YR 7/1); medium dense to loose; gravel is subangular, fine, average 0.5 inch diameter, up to coarse 0.8 inch diameter, generally limestone composition with non-natives; very fine to medium grained sand; no cohesion; poorly graded (FILL).								
12																
				SPT-2	1.3 1.5		11 14 12	Becomes wet in sample								
14	▽							Groundwater measured at 14.1 ft morning 5/11. Hollow stem auger in place to bedrock depth left overnight.								

Notes:

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36eeee Rev. 28
Log of Boring B-118
Sheet 1 of 3

Surface Level (ft): **1998.97** Easting (ft): **99761.47**

Total Drill Depth (ft): **34** Northing (ft): **100077**

Inclination/Bearing: **90** Datum: **Wolf Creek Plant Datum**

Hole Id:

B-118

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery, feet	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
16					SPT-3	0.8/1.5		9 10 12	GRAVEL, sandy (GP); damp; light gray (10YR 7/1); medium dense to loose; gravel is subangular, fine, average 0.5 inch diameter, up to coarse 0.8 inch diameter, generally limestone composition with non-natives; very fine to medium grained sand; no cohesion; poorly graded (FILL).								
18					SPT-4	0.8/1.5		10 12 15									
									GRAVEL, with sand and clay (GP-GC); wet; light gray (10YR 7/1); medium dense to loose; gravel is subangular, fine, average 0.5 inch diameter, up to coarse 0.8 inch diameter, generally limestone composition with non-natives; very fine to medium grained sand; 10-15% clay; little cohesion; poorly graded (FILL).		1980.5						
20					SPT-5	0.9/1.5		10 13 14									
									CLAY (Residual Soil); damp; very dark gray (GLEY 1 3N); stiff to very stiff; indistinct to faint laminations; minor FeO staining along lamination breaks; very weak bedrock fabric; nonplastic moldable with strong finger pressure; poorly graded (Weathered Heumader Shale)		1977.8						
22					SPT-6	1.2/1.3		21 37 50/3									
									SHALE; dark gray (N3); extremely weak (R0); slightly weathered; indistinct to faint laminations; undulating, subhorizontal laminae; slightly fractured; intermittent fine gravel; lower energy deposition; rough core surface (Heumader Shale)		1975.2						
24		4:06							Surface diamond bit. Downpressure 200 psi								
		4:57							Subhorizontal bedding ,0°, washed out, soft interbed at 24.6'								
26		4:01			CR-1	4.9/5	4.8/5		Pebble layer at 24.8 ft, 2.5 inch thickness BJ, 0°, bedding infill, soft clay at 25.7' Increasing strength, extremely weak (R0) to very weak (R1)								
		4:57							SHALE; light gray (N7) to medium gray (N5); very weak (R1); slightly weathered to fresh; CaCO3 nodules; pervasive clay balls; high energy deposition; intermittent thin soft clay beds along bedding; distinct laminations; bivalve shells up to 0.3 inch diame		1971.4						
28		5:31															
		5:12							BJ, 0°, bedding infill, soft clay and fine gravel at 27.6'								

Notes:

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36eeee Rev. 28
Log of Boring B-118
Sheet 2 of 3

Surface Level (ft): **1998.97** Easting (ft): **99761.47**

Total Drill Depth (ft): **34** Northing (ft): **100077**

Inclination/Bearing: **90** Datum: **Wolf Creek Plant Datum**

Hole Id:

B-118

Sheet: 3 of 3

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery, feet	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
32		6:25 5:11 5:40 3:26			CR-2	5 5	4.8 5		BJ, 0°, bedding infill, soft clay at 28.4' MB, 0°, along bedding at 28.8' MB, 0° at 29.1' MB, 0° at 29.3' SHALE; light gray (N7) to medium gray (N5); very weak (R1); slightly weathered to fresh; CaCO3 nodules; pervasive clay balls; high energy deposition; intermittent thin soft clay beds along bedding; distinct laminations; bivalve shells up to 0.3 inch diame BJ, 0°, bedding infill, soft clay and fine gravel at 31.4' Limestone bed, 0.8 inch thickness Soft clay bed, 0.7 inch thickness		1966.9						
34									LIMESTONE; very light gray (N8); weak (R2); fresh to slightly weathered; subhorizontal bedding with some thin shaley interbeds; clear upper contact with Heumader Shale; slightly fractured with minor incipient fracturing; argillaceous with thin soft shale (R1-R0) interbeds; bivalve shells (Plattsmouth Limestone). BJ, 0°, bedding infill, soft clay and fine gravel at 32.1' BJ, 15°, undulatory argillaceous dark gray bed at 33.4' End of boring at 34 ft below ground surface		1965.0						
36																	
38																	
40																	
42																	
44																	

Notes:

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36eeee Rev. 28
Log of Boring B-118
Sheet 3 of 3

Surface Level (ft):	**1999.1**	Easting (ft):	**99768.24**
Total Drill Depth (ft):	**34**	Northing (ft):	**100027.41**
Inclination/Bearing:	**90**	Datum:	**Wolf Creek Plant Datum**

Hole Id:

B-119

Sheet: 1 of 3

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log / Sample Type	Sample Number	Recovery, feet	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
								CLAY, sandy (CL) - Fill								
2																
4																
6																
								GRAVEL (GP) - Fill		1992.1						
8																
10								GRAVEL, sandy (GP); damp; light gray (10YR 7/1); medium dense to loose; gravel is subangular, fine, average 0.5 inch diameter, up to coarse 0.8 inch diameter, generally limestone composition with non-natives; very fine to medium grained sand; no cohesion; poorly graded (FILL).		1989.1						
				SPT-1	0.83/1.5		12 16 16									
12																
				SPT-2	0.75/1.5		8 7 9	Becomes moist to wet in sample								
14	▽															

Notes:

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36ffff Rev. 28
Log of Boring B-119
Sheet 1 of 3

Surface Level (ft):	**1999.1**	Easting (ft):	**99768.24**
Total Drill Depth (ft):	**34**	Northing (ft):	**100027.41**
Inclination/Bearing:	**90**	Datum:	**Wolf Creek Plant Datum**

Hole Id:

B-119

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log / Sample Type	Sample Number	Recovery, feet	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
								Groundwater measured at 14.4 ft morning 5/11. Hole completed and casing left in hole overnight.								
16				SPT-3	0.83/1.5		10 9 7	GRAVEL, sandy (GP); damp; light gray (10YR 7/1); medium dense to loose; gravel is subangular, fine, average 0.5 inch diameter, up to coarse 0.8 inch diameter, generally limestone composition with non-natives; very fine to medium grained sand; no cohesion; poorly graded (FILL).								
18				SPT-4	0.83/1.5		13 13 11	Well sorted, medium to fine grained sand top of sample, called slough. Brought into sample from water table hydrostatic pressure.		1980.6						
20				SPT-5	0.83/1.5		6 10 10	GRAVEL, with sand and clay (GP-GC); wet; light gray (10YR 7/1); medium dense to loose; gravel is subangular, fine, average 0.5 inch diameter, up to coarse 0.8 inch diameter, generally limestone composition with non-natives; very fine to medium grained sand; 10-15% clay; some cohesion; moderately graded (FILL).								
22										1977.3						
				SPT-6	1/1.3		8 46 50/3	CLAY (Residual Soil); damp; very dark gray (GLEY 1 3N); stiff to very stiff; indistinct to faint laminations; minor FeO staining along lamination breaks; very weak bedrock fabric; nonplastic moldable with strong finger pressure; poorly graded; contact to Shale is gradual over 1 foot (Weathered Heumader Shale)		1975.6						
24		5:20						SHALE; dark gray (N3) to medium dark gray (N4); extremely weak (R0); slightly weathered; faint, subhorizontal laminations; argillaceous; minor FeO staining; slightly fractured; rough core surface (Heumader Shale)								
		5:20						Surface diamond bit. Downpressure 300 psi								
26		5:00		CR-1	4.9/5	4.6/5		BJ, 0°, bedding infill, soft clay, subhorizontal, undulatory at 25.0'								
								BJ, 0°, bedding infill, soft clay, subhorizontal, undulatory at 26.4'								
		4:05						BJ, 0°, bedding infill, soft clay, subhorizontal, undulatory at 27.3'								
28		4:49						SHALE; light gray (N7) to medium gray (N5); very weak (R1); slightly weathered to fresh; CaCO3 nodules; pervasive clay balls; high energy deposition; intermittent thin soft clay beds along bedding; distinct laminations; bivalve shells up to 0.3 inch diameter (Heumader Shale)		1971.3						
		2:54														

Notes:

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36ffff Ref. 28
Log of Boring B-119
Sheet 2 of 3

Surface Level (ft):	**1999.1**	Easting (ft):	**99768.24**
Total Drill Depth (ft):	**34**	Northing (ft):	**100027.41**
Inclination/Bearing:	**90**	Datum:	**Wolf Creek Plant Datum**

Hole Id:

B-119

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery, feet	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
32		3:32 3:49 5:11 3:38			CR-2	5 5	5 5		RF, 20°, across bedding at 27.8' BJ, 0°, bedding infill, soft clay, subhorizontal, undulatory at 30.1' SHALE; medium gray (N5); very weak (R1) to extremely weak (R0); slightly weathered to fresh; CaCO3 nodules; fine gravel clasts average 0.3 inch diameter, up to 0.7 inch diameter; swelling clay beds in core (Heumader Shale) MB, 0°, along bedding at 30.4' LIMESTONE; very light gray (N8) to light gray (N7); weak (R2); fresh; argillaceous with very thin soft shale (R1-R0) interbeds; bivalve shells; slightly fractured, minor incipient fracturing; subhorizontal, undulatory bedding, 0.2 inch amplitude; clear, sharp upper contact with shale; subhorizontal bedding with some thin shaley interbeds; clear upper contact with Heumader Shale; upper 7 inches is more argillaceous and shaley at contact; (Plattsmouth Limestone). BJ, 0°, bedding infill, soft clay at contact at 31.7' End of boring at 34 ft below ground surface		1968.9 1967.4 1965.1					
34																	
36																	
38																	
40																	
42																	
44																	

Notes:

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36ffff Rev. 28
Log of Boring B-119
Sheet 3 of 3

Mudline Level (ft): **1975.03** Easting (ft): **101964.08**

Total Drill Depth (ft): **37.8** Northing (ft): **99646.05**

Inclination/Bearing: **90** Datum: **Wolf Creek Plant Datum**

Hole Id:

B-120

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery, feet	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
									Depth to Mudline below platform deck surface is 16.2 ft.								
2																	
4																	
6																	
8																	
10																	
12																	
14																	

Notes:

Mudline Level (ft): **1975.03** Easting (ft): **101964.08**

Total Drill Depth (ft): **37.8** Northing (ft): **99646.05**

Inclination/Bearing: **90** Datum: **Wolf Creek Plant Datum**

Hole Id:

B-120

Sheet: 2 of 3

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery, feet	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
									Depth to Mudline below platform deck surface is 16.2 ft.								
16									Limestone Riprap - Fill		1975.0						
18																	
20																	
											1970.2						
22					SPT-1	0.6/1.5		0 0 0	CLAY (CL), with gravel; olive (5Y 4/4); very soft; matrix moderate plasticity; gravel is 10-20%, fine up to 0.3 inch diameter; moist to damp; moderate dry strength; poorly graded (FILL) SPT = Weight of Hammer at 21.0'								
24					ST-2	1.5/2			Increasing gravel content and diameter up to 0.7 inches								
26					ST-3	1/2			PP = 3.1 tsf								
28									PP = 1.7 tsf			127		23			
					ST-4	1.3/2					1962.2						

Notes:

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36 gggg Rev. 28
Log of Boring B-120
Sheet 2 of 3

Mudline Level (ft): **1975.03** Easting (ft): **101964.08**

Total Drill Depth (ft): **37.8** Northing (ft): **99646.05**

Inclination/Bearing: **90** Datum: **Wolf Creek Plant Datum**

Hole Id:

B-120

Sheet: 3 of 3

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery, feet	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
32					SPT-5	1.2/1.5		6 8 15	CLAY (CL), with gravel and sand (Residual Soil); damp to moist; olive gray (5Y 4/2); stiff; CaCO3 nodules; very weak bedrock fabric; indistinct laminations; medium grained sand; fine, angular to subangular gravel, limestone composition, up to 0.2 inch diameter; minor FeO staining along lamination breaks; moderately graded (Weathered Heumader Shale) PP = 1.5 tsf Unable to advance past 32.75' w/casing advancer, switch to coring		1958.4						
34		2:07 2:14							LIMESTONE; light gray (N7); weak (R2); fresh; dark gray shaley interbeds (R1-R2), undulatory bedding with 0.5 inch amplitude argillaceous with very thin soft shale (R1-R0) interbeds; pervasive bivalve and mollusk shells; moderately to slightly fractured, minor incipient fracturing at subvertical inclination; bedding is subhorizontal and undulatory; soft interbeds of brown shale in upper 2.8 ft and dark gray shale in lower 2.2 ft; generally low energy deposition with intermittent high energy zones; argillaceous with random fine clasts (Plattsmouth Limestone). Surface diamond Downpressure 300 psi								
36		2:22 2:48			CR-1	5/5	4.5/5										
38		3:15							BJ, soft brown shale (R0) interbed, between 33.1' to 33.3' RF, 10°, stepped, open at 33.7' BJ, 0°, open, fresh, subhorizontal at 33.9' BJ, BJ, in shaley (R1) interbed BJ, soft brown shale (R0) interbed, between 35.4' and 35.5' BJ, soft dark gray shale (R0) interbed, between 35.8' and 36.0' BJ, soft dark gray shale (R0) interbed, between 36.3' and 36.4' BJ, 0°, in shaley (R1) interbed, subhorizontal at 36.8'		1953.4						
40									End of boring at 37.8 ft below deck surface and 21.6 ft below mudline								
42																	
44																	

Notes:

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36gggg Rev. 28
Log of Boring B-120
Sheet 3 of 3

Mudline Level (ft):	**1975.1**	Easting (ft):	**101973.43**
Total Drill Depth (ft):	**39**	Northing (ft):	**99672.5**
Inclination/Bearing:	**90**	Datum:	**Wolf Creek Plant Datum**

Hole Id:

B-121

Sheet: 1 of 3

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log / Sample Type	Sample Number	Recovery, feet	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
								Depth to Mudline below platform deck surface is 16.2 ft.								
2																
4																
6																
8																
10																
12																
14																

Notes:

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36hhhh Rev. 28
Log of Boring B-121
Sheet 1 of 3

Mudline Level (ft): **1975.1** Easting (ft): **101973.43**

Total Drill Depth (ft): **39** Northing (ft): **99672.5**

Inclination/Bearing: **90** Datum: **Wolf Creek Plant Datum**

Hole Id:

B-121

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery, feet	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
									Depth to Mudline below platform deck surface is 16.2 ft.								
16									Limestone Riprap - Fill		1975.1						
18																	
20																	
									CLAY (CL), with sand; damp; olive (5Y 4/3), mottled gray (Gley 1 6N); stiff to very stiff; faint undulating laminations; sand is very fine grained; moderate plasticity; poorly graded (Lacustrine Clay)		1970.3						
22					SPT-1	0.9/1.5		3 12 14	PP > 4.5 tsf								
									Intermittent gravel clast, up to 0.6 diameter								
24					SPT-2	1.2/1.5		8 11 12	3-inch interbed of dark yellowish brown (10YR 4/4) CLAY, medium stiff to stiff								
26									Interbeds of medium stiff CLAY and stiff CLAY								
					SPT-3	1.3/1.5		7 15 19									
28											1962.7						
					SPT-4	1.3/1.3			PP > 4.5 tsf								

Notes:

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36hhhh Rev. 28
Log of Boring B-121
Sheet 2 of 3

Mudline Level (ft): **1975.1** Easting (ft): **101973.43**

Total Drill Depth (ft): **39** Northing (ft): **99672.5**

Inclination/Bearing: **90** Datum: **Wolf Creek Plant Datum**

Hole Id:

B-121

Sheet: 3 of 3

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery, feet	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
								16 47 50/4	CLAY (CL), sandy (Residual Soil); damp; olive gray (5Y 5/2); very stiff to hard; CaCO3 nodules; very weak bedrock fabric; indistinct to faint laminations; fine grained sand; fine, 5-10% fine gravel; matrix is low to moderate plasticity with strong finger pressure (Weathered Heumader Shale)								
32					SPT-5	1.3 1.5		16 16 18	Comparable composition with increased gravel content up to 20%, mostly fine with few angular gravel up to 0.7 inch diameter; becoming stiff to very stiff								
									Driller reports hard drilling at 33.3'								
34					SPT-6	0 0.2		50/2			1957.3						
		2:32							LIMESTONE; very light gray (N8) to light gray (N7); weak (R2); slightly weathered to fresh; bivalve and mollusk shells throughout with discrete beds of increased content; slightly fractured, minor incipient fracturing; bedding is subhorizontal and undulatory; soft interbeds of brown shale in upper 1 ft and dark gray shale in lower 4 ft; generally low energy deposition with intermittent thin high energy zones; intermittent 0.2-0.5 inch dark gray shaley interbeds (R1-R2) imply subhorizontal to 15 degree undulating bedding; argillaceous (Plattsmouth Limestone).								
		2:48															
36		2:27			CR-1	4.7 5	4.3 5										
		3:09															
38		3:01							Surface diamond bit, downpressure 300 psi MB, 0° at 34.6' BJ, 10°, soft brown shale (R0) interbed at 34.8' BJ, 0°, open, fresh, top of shale interbed at 37.1' BJ, 0°, soft dark gray shale (R0) interbed at 37.2' BJ, 0°, soft dark gray shale (R0) interbed at 37.8' BJ, 0°, base of dark gray shaley interbed (R1) at 38.4'		1952.3						
40									End of boring at 39 ft below deck surface and 22.8 ft below mudline								
42																	
44																	

Notes:

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36hhhh Rev. 28
Log of Boring B-121
Sheet 3 of 3

Mudline Level (ft):	**1981.76**	Easting (ft):	**101968.77**
Total Drill Depth (ft):	**38.3**	Northing (ft):	**99642.7**
Inclination/Bearing:	**90**	Datum:	**Wolf Creek Plant Datum**

Hole Id:

B-122

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery, feet	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
									Depth to Mudline below platform deck surface is 17.0 ft.								
2																	
4																	
6																	
8																	
10																	
12																	
14																	

Notes:

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36iii Rev. 28
Log of Boring B-122
Sheet 1 of 3

Mudline Level (ft):	**1981.76**	Easting (ft):	**101968.77**
Total Drill Depth (ft):	**38.3**	Northing (ft):	**99642.7**
Inclination/Bearing:	**90**	Datum:	**Wolf Creek Plant Datum**

Hole Id:

B-122

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log / Sample Type	Sample Number	Recovery, feet	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
								Depth to Mudline below platform deck surface is 17.0 ft.								
16																
								Limestone Riprap - Fill		1981.8						
18								Advancing thru rip rap. Casing advanced with roller bit								
20								Driller able to push casing without rotation about 6 inches. Sounding from deck is 20.6'								
				SPT-1	0.5/1.5		4 5 1	SAND, gravelly; loose; moist; graded medium grained sand to fine gravel from top to bottom of sampler; subangular grains; limestone and non-natives composition; poorly consolidated; no fines; nonplastic; gravel is angular to subangular, mostly limestone; well graded (FILL)		1978.2						
22								2" gravel lodged in SPT shoe. Possibly blocked more recovery		1976.9						
				SPT-2	0.3/1.5		0 1 2	CLAY (CL); damp; olive (5Y 4/4), mottled grey (GLEY 1 5N); very soft to soft; moderately plastic; 5-10% fine gravel of non-natives; 5-10% sand; poorly graded; high dry strength (FILL)								
24								SPT sample recovered with weight of hammer at 23'								
				ST-3	1.3/2			No sample collected in S3 Shelby. 2 ft penetration. 4" collected by pushing SPT sampler								
26																
28								Refusal with Shelby at 11 inches								
				ST-4	0/2			PP = 3.25 tsf								
										1969.2						

Notes:

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36iiii Rev. 28
Log of Boring B-122
Sheet 2 of 3

Mudline Level (ft): **1981.76** Easting (ft): **101968.77**

Total Drill Depth (ft): **38.3** Northing (ft): **99642.7**

Inclination/Bearing: **90** Datum: **Wolf Creek Plant Datum**

Hole Id:

B-122

Sheet: 3 of 3

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery, feet	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
32					SPT-5	0.6/1.5		2 3 3	CLAY (CL), with gravel (Residual Soil); damp to moist; olive gray (5Y 4/2); stiff; CaCO3 nodules; very weak bedrock fabric; indistinct to faint laminations; fine, subangular to angular gravel of limestone composition; trace medium grained sand; some FeO staining (Weathered Heumader Shale) Comparable composition with increased gravel content up to 20%, mostly fine with few angular gravel up to 0.7 inch diameter; becoming stiff to very stiff								
					SPT-6	0.3/0.3		50/3	Very slow advance thru clay w/ roller bit. Driller reports much harder at 32.5' No penetration, high ping w/ SPT, jumping. Switch to coring. Surface diamond bit. Downpressure 300 psi. Milky white water return		1965.5						
34		2:09															
		2:15															
36		2:02			CR-1	4.7/5	4.2/5		LIMESTONE; light gray (N7); weak (R2); slightly weathered to fresh; pervasive bivalve and mollusk shells; intermittent 0.2-0.5 inch dark gray shaley interbeds (R1-R2), dark gray undulatory, subhorizontal to up to 20 degree inclination; slightly to moderately fractured, minor incipient fracturing; bedding is subhorizontal and undulatory with up to 0.3 inch amplitude; soft interbeds of dark gray shale (R0) up to 1.5 inch thick; argillaceous with random fine clasts; generally low energy deposition with intermittent thin high energy zones and soft sediment deformation (Plattsmouth Limestone). RF, closed at 33.7' RF, 15°, stepped, partial bedding, F at 33.8' RF, 0°, stepped, partially along bedding at 34.4' BJ, open, F at 34.6' BJ, open, F, along shaly interbed at 34.7' Shale interbed R0, between 35.6' and 35.8' Shale interbed R0, between 36.2' and 36.3' BJ, undulating, shaley interbed (R1 - R2) at 37.2' BJ, open, F, undulatory at 37.7' MB, at 38.2'		1960.5						
		3:23															
38		4:30							End of boring at 38.3 ft below deck surface and 21.3 ft below mudline								
40																	
42																	
44																	

Notes:

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36iii Rev. 28
Log of Boring B-122
Sheet 3 of 3

Mudline Level (ft):	**1972.67**	Easting (ft):	**101976.24**
Total Drill Depth (ft):	**38.2**	Northing (ft):	**99648.7**
Inclination/Bearing:	**90**	Datum:	**Wolf Creek Plant Datum**

Hole Id:

B-123

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery, feet	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
									Depth to Mudline below platform deck surface is 18.8 ft.								
2																	
4																	
6																	
8																	
10																	
12																	
14																	

Notes:

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36jjj Rev. 28
Log of Boring B-123
Sheet 1 of 3

Mudline Level (ft):	**1972.67**	Easting (ft):	**101976.24**
Total Drill Depth (ft):	**38.2**	Northing (ft):	**99648.7**
Inclination/Bearing:	**90**	Datum:	**Wolf Creek Plant Datum**

Hole Id:

B-123

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery, feet	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
									Depth to Mudline below platform deck surface is 18.8 ft.								
16																	
18									Advancing thru rip rap. Casing advanced with roller bit		1972.7						
									Limestone Riprap - Fill								
20									Driller able to push casing without rotation about 6 inches. Sounding from deck is 20.6'		1971.0						
					SPT-1	0.6/1.5		4 7 4	GRAVEL (GP); sandy, clayey; light yellowish brown (10YR 6/4), mottled gray (GLEY 1 5N) and strong brown (75 YR 5/6); loose; moist to wet; gravel is subrounded to subangular, up to 2 diameter in sampler, predominantly limestone composition, mostly fine, approx. 0.5 diameter; sand is very fine to fine grained; matrix is low plasticity; well graded (FILL)		1968.9						
22									2" gravel lodged in SPT shoe. Possibly blocked more recovery								
					SPT-2	0.3/1.5		0 0 0	CLAY (CL); lt olive gray (5Y 6/2); mottled dark gray (GLEY 1 4N); strong brown (7.5YR 5/6); very soft; moderate plasticity; low dilatancy; 5-10% fine gravel, subrounded; moist; poorly graded (FILL)								
24									SPT sample recovered with weight of hammer								
									No sample collected in S3 Shelby. 2 ft penetration. 4" collected by pushing SPT sampler								
26					ST-3	0.3/1.5											
28									Increasing consistency to stiff								
					ST-4	0.9/0.9			Refusal with Shelby at 11 inches		1963.3						
									PP = 3.25 tsf								

Notes:

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36jjjj Rev. 28
Log of Boring B-123
Sheet 2 of 3

Mudline Level (ft):	**1972.67**	Easting (ft):	**101976.24**
Total Drill Depth (ft):	**38.2**	Northing (ft):	**99648.7**
Inclination/Bearing:	**90**	Datum:	**Wolf Creek Plant Datum**

Hole Id:

B-123

Sheet: 3 of 3

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery, feet	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
32					SPT-5	1.5/1.5		14 19 29	CLAY (CL) with gravel (Residual Soil); lt olive gray (5Y 6/2); damp to moist; very stiff to stiff; low dilatancy; moderate plasticity; 15-20% fine gravel; subangular, up to 0.3 ft diameter; poorly graded; faint laminations in clay (Weathered Heumader Shale)								
									Very slow advance thru clay w/ roller bit. Driller reports much harder at 32.5'								
					SPT-6	0/0.1		50/1	No penetration, high ping w/ SPT, jumping. Switch to coring.		1958.3						
34		3:17							LIMESTONE; lt gray (N7); weak (R2); sl weathered to fresh; sl fractured; pervasive bivalves and mollusk shells; intermittent shaly R1 - R2 interbeds, subhorizontal to 20 degree inclination; soft interbeds of brown shale in upper 1 ft and dk gray shale in lower 4 ft; argillaceous w/ fine clasts; bedding is subhorizontal and undulatory with 1.0-inch peak to peak amplitude; generally low energy deposition w/ few thin high energy beds (Plattsmouth Limestone)								
		2:24															
		2:30			CR-1	4.9/5	4.5/5			881.5							
36		3:30															
		3:10							Surface diamond bit. Downpressure 300 psi. Milky white water return BJ, open, washed out at 33.3' Bed of claystone, between 33.5' and 33.6' BJ, open, fresh, w/in shaly interbed at 35.2'								
38									Shale interbed, BJ at top, between 36.2' and 36.3' Shale interbed, between 36.5' and 36.6'		1953.3						
									End of boring at 38.2 ft below deck surface and 19.4 ft below mudline								
40																	
42																	
44																	

Notes:

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36jjjj Rev. 28
Log of Boring B-123
Sheet 3 of 3

Mudline Level (ft):	**1975**	Easting (ft):	**101976.67**
Total Drill Depth (ft):	**38.7**	Northing (ft):	**99582.73**
Inclination/Bearing:	**90**	Datum:	**Wolf Creek Plant Datum**

Hole Id:

B-124

Sheet: 1 of 3

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery, feet	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
									Depth to Mudline below platform deck surface is 16.1 ft.								
2																	
4																	
6																	
8																	
10																	
12																	
14																	

Notes:

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36kkkk Rev. 28
Log of Boring B-124
Sheet 1 of 3

Mudline Level (ft):	**1975**	Easting (ft):	**101976.67**
Total Drill Depth (ft):	**38.7**	Northing (ft):	**99582.73**
Inclination/Bearing:	**90**	Datum:	**Wolf Creek Plant Datum**

Hole Id:

B-124

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery, feet	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
									Depth to Mudline below platform deck surface is 16.1 ft.								
16									Limestone Riprap - Fill		1975.0						
18																	
20																	
									SAND; loose; poorly consolidated; poorly graded (FILL)		1970.1						
22					SPT-1	0/1.5		3 2 3	Trace sand grains coating SPT sampler								
									CLAY (CL); damp to moist; very soft to soft; olive (5Y 5/3); mottled dark gray (GLEY 1 4N); moderate to high plasticity; 10-15% fine gravel, subangular to subrounded; sandstone and other non natives composition, up to 0.7 diameter, mostly 0.3; poorly graded moderate to high dry strength; trace sand (FILL)		1968.6						
24					SPT-2	0.6/1.5		0 0 2									
26					SPT-3	0.4/1.5		2 2 3									
28					ST-4	1.5/2											

Notes:

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36kkkk Rev. 28
Log of Boring B-124
Sheet 2 of 3

Mudline Level (ft): **1975** Easting (ft): **101976.67**

Total Drill Depth (ft): **38.7** Northing (ft): **99582.73**

Inclination/Bearing: **90** Datum: **Wolf Creek Plant Datum**

Hole Id:

B-124

Sheet: 3 of 3

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery, feet	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
32					SPT-5	0.8/1.5		3 4 4	CLAY (CL); damp to moist; very soft to soft; olive (5Y 5/3); mottled dark gray (GLEY 1 4N); moderate to high plasticity; 10-15% fine gravel, subangular to subrounded; sandstone and other non natives composition, up to 0.7 diameter, mostly 0.3; poorly graded moderate to high dry strength; trace sand (FILL) PP = 3.2 tsf Increasing gravel content to CLAY with w/ gravel, fine, subangular to subrounded; sandstone, red claystone, other non-natives composition		1958.4						
34		1:50			SPT-6	0.3/0.3		50/3	CLAY (CL) (Residual Soil); olive gray; limestone gravel, fine, subrounded to subangular; CaCO3 nodules; hard soil to extremely weak (R0) rock (Weathered Heumader Shale)		1957.4						
36		2:27 2:13			CR-1	4.9/5	2.5/5		LIMESTONE; lt gray (N7); weak (R2); SW-F; moderately fractured; interbeds of brown shale in upper 3 ft, dark gray shale in lower 2 ft, up to 2 thickness; pervasive bivalve and mollusk shells; intermittent dark shaley R2 - R1 interbeds, generally subhorizontal, few up to 25 degree dip; argillaceous; generally low energy deposition with intermittent thin high energy beds; minor random clasts up to 0.6 (Plattsmouth Limestone) Core start. Depth sound at 33.7' Shale, brown 2", R0, between 34.0' and 34.2' JT, 65°, F at 34.5'								
38		2:31 3:20							BJ,undulatory, subhorizontal at 34.6' JT, 70°-75°, clear mineralization, F at 35.2' BJ, 0°, subhorizontal at 35.6' BJ, thin brown SHALE at 36.7' Gray brown SHALE, R0, subhorizontal laminations, between 36.8' and 37.0' SHALE, dark gray, faint laminations, subhorizontal, between 37.2' and 37.4' BJ, in dark shaly ls bed at 38.0' BJ, 0°, undulatory, subhorizontal at 38.4' End of boring at 38.7 ft below deck surface and 22.6 ft below mudline		1952.4						
40																	
42																	
44																	

Notes:

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36kkkk Rev. 28
Log of Boring B-124
Sheet 3 of 3

Mudline Level (ft): **1973.65** Easting (ft): **101983.16**

Total Drill Depth (ft): **39.5** Northing (ft): **99583.29**

Inclination/Bearing: **90** Datum: **Wolf Creek Plant Datum**

Hole Id:

B-125

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery, feet	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
									Depth to Mudline below platform deck surface is 17.5 ft.								
2																	
4																	
6																	
8																	
10																	
12																	
14																	

Notes:

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36IIII Rev. 28
Log of Boring B-125
Sheet 1 of 3

Mudline Level (ft): **1973.65** Easting (ft): **101983.16**

Total Drill Depth (ft): **39.5** Northing (ft): **99583.29**

Inclination/Bearing: **90** Datum: **Wolf Creek Plant Datum**

Hole Id:

B-125

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery, feet	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
									Depth to Mudline below platform deck surface is 17.5 ft.								
16																	
									Limestone Riprap - Fill		1973.7						
18																	
20																	
									CLAY (CL); damp to moist; olive (5Y 4/3) mottled dark gray (GLEY 1 4N); soft to v. soft; highly plastic; 5-15% fine gravel, subangular, limestone composition; poorly graded ; trace sand, fine grained; no structure; moderate dry strength (FILL)		1969.7						
22					SPT-1	0/1.5		6 4 1									
24					SPT-2	0.5/1.5		0 0 1									
26																	
					ST-3	1.3/2			CLAY (CL); damp to moist; light yellowish brown (2.5Y 6/4) mottled gray (GLEY 4N); medium stiff; moderately plastic; 5-15% silt; 5-15% fine gravel, subangular, limestone composition (FILL) PP = 3.2 tsf		1963.9						
28																	

Notes:

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36IIII Rev. 28
Log of Boring B-125
Sheet 2 of 3

Mudline Level (ft): **1973.65** Easting (ft): **101983.16**

Total Drill Depth (ft): **39.5** Northing (ft): **99583.29**

Inclination/Bearing: **90** Datum: **Wolf Creek Plant Datum**

Hole Id:

B-125

Sheet: 3 of 3

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery, feet	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
					ST-4	1.7/2			CLAY (CL); damp to moist; light yellowish brown (2.5Y 6/4) mottled gray (GLEY 4N); medium stiff; moderately plastic; 5-15% silt; 5-15% fine gravel, subangular, limestone composition (FILL) PP = 3.1 tsf								
32					SPT-5			1 9 15	CLAY (CL) (Residual Soil); damp; olive gray (5Y 5/2); stiff to v. stiff; faint bedrock fabric; CaCO3 stringers; little FeO staining; non plastic; high dry strength; barely moldable w/ strong finger pressure; trace fine gravel, up to 0.5 diameter, angular (Weathered Heumader Shale) PP > 4.5 tsf		1959.2						
34					SPT-6	0.4/0.4		50/5			1956.7						
36		2:14 3:39							LIMESTONE; light gray (N7); weak (R2); sl weathered to fresh; sl fractured; pervasive bivalves and mollusk shells; intermittent shaly interbeds, R1 - R2, subhorizontal to 20 degree inclination; soft interbeds of brown shale in upper 2 ft, dark gray in lower 2 ft, up to 2 thickness; bedding is subhorizontal and undulatory/ up to 1.1 peak to peak amplitude, argillaceous; gradual to clear upper contact; random clasts up to 0.5; generally low energy deposition with intermittent thin high energy beds (Plattsmouth Limestone) SHALE, brown, 1" bed, R0, between 35.2' and 35.3' BJ, incipient, closed, shaley at 36.2' SHALE, dark gray, faint laminations, subhorizontal at 38.0'								
38		2:33 2:55 3:38			CR-1	4.8/5	4/5			•1734.6							
40									End of boring at 39.5 ft below deck surface and 22.0 ft below mudline		1951.7						
42																	
44																	

Notes:

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36IIII Rev. 28
Log of Boring B-125
Sheet 3 of 3

Mudline Level (ft): **1975**
Total Drill Depth (ft): **40.9**
Inclination/Bearing: **90**

Easting (ft): **101977.42**
Northing (ft): **99569.19**
Datum: **Wolf Creek Plant Datum**

Hole Id:

B-126

Sheet: 1 of 4

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery, feet	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
									Depth to Mudline below platform deck surface is 16.6 ft.								
2																	
4																	
6																	
8																	
10																	
12																	
14																	

Notes:

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36mmmm Rev. 28
Log of Boring B-126
Sheet 1 of 4

Mudline Level (ft):	**1975**	Easting (ft):	**101977.42**
Total Drill Depth (ft):	**40.9**	Northing (ft):	**99569.19**
Inclination/Bearing:	**90**	Datum:	**Wolf Creek Plant Datum**

Hole Id:

B-126

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery, feet	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
									Depth to Mudline below platform deck surface is 16.6 ft.								
16									Limestone Riprap - Fill		1975.0						
18																	
20																	
									GRAVEL; (GP) sandy; brownish yellow (10YR 6/6); dense; moist to wet; subangular gravel, fine up to 0.8 diameter; coarse grained sand; FeO staining; moderately graded (FILL)		1970.6						
22					SPT-1	0.6 / 1.5		36 39 36									
									CLAY (CL) (Residual Soil); hard soil to extremely weak (R0) rock; yellowish brown (10YR 5/6) to olive gray (5Y 4/2), mottled dark gray; faint laminations; FeO staining along subhorizontal partings; 5-15% limestone gravel, fine, subangular; discrete interbeds of (1) yellowish brown with fine gravel and little fine grained sand and (2) olive gray, more distinct laminations; CaCO3, FeO staining, harder consistency to R0 (Weathered Heumader Shale)		1968.8						
24					SPT-2	0.6 / 1.5		6 14 16									
26									PP > 4.5 tsf								
					SPT-3	1.3 / 1.5		13 19 27	PP > 4.5 tsf								
28																	
					SPT-4	1.5 / 1.5		12 18 28									

Notes:

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36mmmm Rev. 28
Log of Boring B-126
Sheet 2 of 4

Mudline Level (ft):	**1975**	Easting (ft):	**101977.42**
Total Drill Depth (ft):	**40.9**	Northing (ft):	**99569.19**
Inclination/Bearing:	**90**	Datum:	**Wolf Creek Plant Datum**

Hole Id:

B-126

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log / Sample Type	Sample Number	Recovery, feet	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
32		2:20						SHALE; light olive gray (5Y 5/2); extremely weak to very weak (R0 - R1); slightly weathered; pervasive bivalve shells; faint to indistinct laminations; rough core surface; 10-15% limestone gravel; (Heumader Shale)		1960.7						
		2:42						Advance casing to 30.9 and begin coring								
		2:32		CR-1	4.9/5	4.6/5		BJ, 0°, infilled with clay and fine gravel MW, subhorizontal at 31.9'								
34		3:32						BJ, 0°, infilled with clay MW subhorizontal at 32.2'	•2.84	1957.9						
		3:05						SHALE; pale olive (10Y 6/2) to dusky yellow (5Y 6/4); very weak (R1); sl. weathered; faint laminations; few gravel, subangular (Heumader Shale)		1956.8						
36		1:54						LIMESTONE; light gray (N7); weak (R2); sl. weathered to fresh; sl. to moderately fractured; intermittent dark shaley R1 - R2 interbeds, subhorizontal to 20 degree incline with 1 peak to peak amplitude; bivalves and mollusk shells are pervasive; upper contact with shale is clear with soft brown shale interbeds in upper 1.5 ft, and dark gray shale interbeds in lower 4 ft; argillaceous; poc marked w/ incipient fractures; bedding is subhorizontal and undulatory; random fine clasts; generally low energy deposition with intermittent high energy beds (Plattsmouth Limestone)								
		2:22														
38		2:54		CR-2	4.9/5	4.9/5			•1588.4							
		2:36						BJ, 0°, undulatory 0.2" wavelength, subhorizontal at 34.9'								
								SHALE, brown, 1", R0, between 35.1' and 35.2'								
40		4:35						Mineralized vug at 35.7', 0.4 cm wide, 0.3 cm deep								
								BJ, 20°, stepped, in high energy bed at 36.3'								
								BJ, 20°, undulatory to stepped in shaley R1 bed at 36.9'		1951.1						
								dark gray SHALE, 2", R0, between 37.6' and 37.8'		1950.7						
42								dark gray SHALE, 1", R0, between 38.1' and 38.2'								
								dark gray SHALE, 1", R1, between 40.2' and 40.3'								
								FZ, clay infilled 3" zone top of SHALE contact, between 40.3' and 40.5'								
44								SHALE; medium dark to dark gray (3N to 4N); extremely weak to weak; faint laminations; fresh; unfractured; minor gravel fine (Heebner Shale)								

Notes:

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36mmmm Rev. 28
Log of Boring B-126
Sheet 3 of 4

Mudline Level (ft): **1975** Easting (ft): **101977.42**

Total Drill Depth (ft): **40.9** Northing (ft): **99569.19**

Inclination/Bearing: **90** Datum: **Wolf Creek Plant Datum**

Hole Id:

B-126

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery, feet	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
									End of boring at 40.9 ft delow deck surface and 24.3 ft below mudline								
46																	
48																	
50																	
52																	
54																	
56																	
58																	

Notes:

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36mmmm Rev. 28
Log of Boring B-126
Sheet 4 of 4

Mudline Level (ft):	**1973.05**	Easting (ft):	**101984**
Total Drill Depth (ft):	**38.4**	Northing (ft):	**99580**
Inclination/Bearing:	**90**	Datum:	**Wolf Creek Plant Datum**

Hole Id:

B-127

Sheet: 1 of 3

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery, feet	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
									Depth to Mudline below platform deck surface is 18.2 ft.								
2																	
4																	
6																	
8																	
10																	
12																	
14																	

Notes:

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36nnnn Rev.28
Log of Boring B-127
Sheet 1 of 3

Mudline Level (ft):	**1973.05**	Easting (ft):	**101984**
Total Drill Depth (ft):	**38.4**	Northing (ft):	**99580**
Inclination/Bearing:	**90**	Datum:	**Wolf Creek Plant Datum**

Hole Id:

B-127

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery, feet	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
									Depth to Mudline below platform deck surface is 18.2 ft.								
16																	
18									Limestone Riprap - Fill		1973.1						
20																	
22																	
24					SPT-1	0.4/1.5		0 0 0	CLAY (CL); damp to moist; olive (5Y 5/4); highly plastic; mottled dark gray (GLEY 1 4N) very soft to soft; no structure; moderate dry strength; trace sand; 5-10% gravel, subangular, limestone composition; poorly graded (FILL)		1967.7						
26					SPT-2	0.6/1.5		0 2 3	Intermittent beds with increased consistency								
28					SPT-3	0.5/1.5		2 2 7	CLAY (CL); damp to moist; olive (5Y 5/4) to light yellowish brown (10YR 6/4), mottled dark gray (GLEY 1 4N); medium stiff; 5-10% silt; 10-15% fine gravel; moderately plastic; poorly graded (FILL)		1963.6						

Notes:

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36nnnn Rev. 28
Log of Boring B-127
Sheet 2 of 3

Mudline Level (ft): **1973.05** Easting (ft): **101984**

Total Drill Depth (ft): **38.4** Northing (ft): **99580**

Inclination/Bearing: **90** Datum: **Wolf Creek Plant Datum**

Hole Id:

B-127

Sheet: 3 of 3

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery, feet	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
									CLAY (CL) (Residual Soil); olive gray (5Y 5/2); very stiff; faint bedrock fabric; CaCO3 stringers; minor FeO staining along faint laminations; barely moldable w/ strong finger pressure; damp to moist; (Weathered Heumader Shale)		1960.4						
32					SPT-4	1.3/1.5		18 22 26									
					SPT-5	0/0.1		50/1			1957.9						
34		2:40							LIMESTONE; light gray (N7); weak (R2); slightly weathered; slightly fractured; argillaceous; pervasive bivalves and oyster shells; random subangular clasts up to 0.5; generally low energy deposition with few thin high energy beds; intermittent shaley interbeds (R1 - R2), up to 1.3 thickness, subhorizontal to 15 degrees inclination; soft interbeds of brown shale in upper 3 ft, dark gray in lower 2 ft, up to 2 thickness, extremely weak (R0); bedding is subhorizontal and undulatory w/ up to 1 peak to peak amplitude (Plattsmouth Limestone) Shale, brown, 1" bed, R0, between 33.7' and 33.8' 2 cm wide 4 cm deep vug at 34.0, coated in FeO BJ open, F at 34.0'							
		2:41															
36		2:50			CR-1	5/5	4.5/5				2298.5						
		3:05															
38		2:17							BJ, base of brown shale bed, undulatory, tight, R1 at 35.9' BJ, top of shale bed at 36.2' SHALE, dark gray, R0, 1.5", between 36.2' and 36.3' BJ, top of shale bed, open, F at 36.7' SHALE, dark gray, R0 - R1 at 36.7' BJ, shaley LS, undulatory over 0.3" at 37.3' End of boring at 38.4 ft below deck surface and 20.2 ft below mudline		1952.9						
40																	
42																	
44																	

Notes:

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36nnnn Rev. 28
Log of Boring B-127
Sheet 3 of 3

Surface Level (ft): **1968.99** Easting (ft): **104340.83**

Total Drill Depth (ft): **11.1** Northing (ft): **98295.47**

Inclination/Bearing: **90** Datum: **Wolf Creek Plant Datum**

Hole Id:

B-130

Sheet: 1 of 1

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
0		3:40			SPT-1	0.1/0.1		50/1	LIMESTONE; light gray (N7); medium strong (R3); slightly weathered (SW); medium bedded; moderately argillaceous; fossiliferous; undulating dark gray (N3), close to medium spaced laminations (limey shale); strong HCl reaction.								
		4:01			SC-1					▶2100		167		1			
2		3:39			CR-1	5/5	3.9/5		BH, 0°, stained, rough, sub-horizontal at 0.2' MB, 90° between 0.4' and 0.5' BJ, 0°, stained, rough, sub-horizontal at 0.5' Fresh (F) at 0.7 ft BJ, 0°, rough, sub-horizontal at 2.6'								
		3:18							Moderate yellowish brown shale seam at 2.7 to 2.75 ft BJ, 0°, rough, sub-horizontal at 2.8'								
4		3:29							Medium dark gray (N4), clayey shale seams at 3.0-3.1 ft, 3.2-3.3 ft. BJ, 0°, rough, sub-horizontal at 4.0'								
		3:01							BJ, 0 at 5.3'								
6		4:17															
		3:28			CR-2	5/5	4.1/5										
8		2:41							Medium dark gray (N4) clayey shale seams at 8.15-8.25 ft, 8.6-9.3 ft, and 9.55-9.70 ft. - Weak (R2) at 8.15 ft Clayey shale seams have no HCl reaction. BJ, 0°, rough, sub-horizontal at 9.4'								
		2:15							BJ, 0°, rough, sub-horizontal at 9.8' BJ, 0°, rough, sub-horizontal at 9.9' BJ, 0°, rough, sub-horizontal at 10.0'		1958.9						
10																	
12																	
14																	

Notes:

1. Terms and symbols defined on Plate 1.
2. As-Built coordinates and elevation surveyed by Kaw Valley Engineering (KS-licensed).
3. The SPT blow count is defined as the number of blows required for a 140 lb. auto trip safety hammer falling 30 inches to drive the split-barrel sampler 6 inches in a possible 18 inch sample interval.
4. Shelby tubes used for cohesive soil sampling of dimensions 36 inches long, 3 inch outside diameter.
5. HQ3 carbide Diamond bit used for rock coring.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36oooo Rev. 28
Log of Boring B-130
Sheet 1 of 1

Surface Level (ft): **1981.31** Easting (ft): **104551.59**

Total Drill Depth (ft): **24.8** Northing (ft): **98559.49**

Inclination/Bearing: **90** Datum: **Wolf Creek Plant Datum**

Hole Id:

B-131

Sheet: 1 of 2

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
					SPT-1	0.8/1.5		0 1 1	CLAY (CH); dark olive brown (2.5Y 3/3); wet; soft; some silt, decreasing with depth; highly plastic - 9.7 ft to mud line; 4.4 ft to water from deck								
2											1979.2						
					ST-1	1.3/2			CLAY (CH); brownish yellow (10YR 6/6); moist; soft; trace sand.	0.61		116		33	69	21	48
4																	
											1976.5						
					SPT-2	1.3/1.5		1 2 2	CLAY, with sand (CH); brownish yellow (10YR 6/6); moist to wet; soft; some silt; trace to little subrounded gravel; mottled light grey (10YR 7/1) and dark grey (10YR 4/1).					30	69	19	50
6																	
8					SPT-3	1.5/1.5		6 8 11	more silty, stiff				81	19	53	18	35
											1971.7						
10					SPT-4	1.2/1.5		14 19 31	CLAY, silty (CL); light brownish grey (2.5Y 6/2); moist to wet; very stiff; some sand and gravel; moderately plastic.				77	14			
12																	
					SPT-5	1.1/1.5		10 9 10	trace gravel, stiff				77	19	70	53	17
14																	
											1966.5						

Notes:

1. Terms and symbols defined on Plate 1.
2. As-Built coordinates and elevation surveyed by Kaw Valley Engineering (KS-licensed).
3. The SPT blow count is defined as the number of blows required for a 140 lb. auto trip safety hammer falling 30 inches to drive the split-barrel sampler 6 inches in a possible 18 inch sample interval.
4. Shelby tubes used for cohesive soil sampling of dimensions 36 inches long, 3 inch outside diameter.
5. HQ3 carbide Diamond bit used for rock coring.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36pppp Rev. 28
Log of Boring B-131
Sheet 1 of 2

Surface Level (ft): **1981.31** Easting (ft): **104551.59**

Total Drill Depth (ft): **24.8** Northing (ft): **98559.49**

Inclination/Bearing: **90** Datum: **Wolf Creek Plant Datum**

Hole Id:

B-131

Sheet: 2 of 2

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
16		3:07							LIMESTONE; light gray (N7); medium strong (R3); slightly weathered, moderately stained to 19.6'; medium bedded; thin to medium spaced wavy laminations of dark gray (N3) limey shale interbeds; fossiliferous; moderately argillaceous; fossiliferous; strong HCl reaction.								
		3:22			SC-1 CR-1	2.9/3	2/3		- 10 blows for no penetration (refusal). Begin coring		2530	168		1			
18		3:30							HW casing set to 20.0 ft from deck with 0.5 ft stick up above deck								
		2:35							Clay seam between discontinuities up to 0.25 ft thick at 15.1, 17.1, 17.5, 19.6 and 19.85 ft								
		3:30							BJ, 0°, rough at 15.2'								
									Special care sample 15.3-16.9 ft								
									BJ, 0°, rough at 15.4'								
									BJ, 0°, rough at 16.8'								
20		3:44			CR-2	5/5	3.3/5		Down feed pressure is 400 psi								
									BJ, 0°, rough at 17.4'								
									BJ, 0°, rough at 17.5'								
									BJ, 0°, rough at 17.6'								
		4:47							Core spun off between 17.8 and 18.0 ft. Sideways in box								
									BJ, 0°, rough at 18.7'								
22									BJ, 0°, rough at 18.8'								
									BJ, 0°, rough at 19.9'								
		3:44							medium grey (N5) clayey shale interbed up to 0.8 ft thick at 20.4 and 21.2 ft								
									thinly spaced, subhorizontal, dark grey (N3), shaly limestone laminations between 21.7 and 22.7 ft								
		2:22			CR-3	2/2	1.8/2		MB, 0° at 22.8'								
24									MB, 0° at 22.9'								
		2:11							Core separates at shale and clay seam in run 2 when placing in box.		1956.5						
									BJ, 15°, rough, FeO stained between 23.1' and 23.2'								
26									BJ, 25°, rough, FeO stained between 24.0' and 24.2'								
									BJ, 0°, rough, slightly open at 24.4'								
28																	

Notes:

1. Terms and symbols defined on Plate 1.
2. As-Built coordinates and elevation surveyed by Kaw Valley Engineering (KS-licensed).
3. The SPT blow count is defined as the number of blows required for a 140 lb. auto trip safety hammer falling 30 inches to drive the split-barrel sampler 6 inches in a possible 18 inch sample interval.
4. Shelby tubes used for cohesive soil sampling of dimensions 36 inches long, 3 inch outside diameter.
5. HQ3 carbide Diamond bit used for rock coring.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36pppp Rev. 28
Log of Boring B-131
Sheet 2 of 2

Surface Level (ft): **1998.211** Easting (ft): **101788.076122**

Total Drill Depth (ft): **29.9** Northing (ft): **99819.136255**

Inclination/Bearing: **90** Datum: **Wolf Creek Plant Datum**

Hole Id:

B-140

Sheet: 1 of 2

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
					SPT-1	1.3/1.5		6 23 20	SILT, gravelly (ML); very stiff; dark grayish brown (10YR 4/2) and light gray (10YR 7/2); dry; with cement and roots (fill). 4 in casing drilled with mud (temporary0; hole cleaned out with flight augers to sample.								
2																	
					SPT-2	0.9/0.9		6 50/5	Fill, CLAY and concrete mix; hard; roots absent at 3.5 ft. SPT-2 interval is 3.6 to 4.5 ft. Rig grinding from 4.5 to 5 ft; concrete. Drilling with mud		1994.7						
4																	
6					SPT-3	1.3/1.5		3 3 6	CLAY (CH); very dark brown (10YR 2/2) to black (10YR 2/1); dry to moist; soft to medium stiff; trace fine to coarse sand; no HCl reaction.		1992.2			18	69	20	49
8					ST-1	0/2			ST-1 and ST-2, no recovery; rig pulled forward to drill B-140a in order to re-attempt ST sample collection.								
10					ST-2	0/2			Push 50 psi								
12																	
14					SPT-4	1.4/1.5		5 7 11	CLAY (CL); brown (10YR 5/3) to yellowish brown (10YR 5/6); dry to slightly moist; medium stiff to stiff; trace silt; no to weak HCL reaction.		1984.7						

Notes:

1. Terms and symbols defined on Plate 1.
2. As-Built coordinates and elevation surveyed by Kaw Valley Engineering (KS-licensed).
3. The SPT blow count is defined as the number of blows required for a 140 lb. auto trip safety hammer falling 30 inches to drive the split-barrel sampler 6 inches in a possible 18 inch sample interval.
4. Shelby tubes used for cohesive soil sampling of dimensions 36 inches long, 3 inch outside diameter.
5. HQ3 carbide Diamond bit used for rock coring.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36qqqq Rev. 28
Log of Boring B-140
Sheet 1 of 2

Surface Level (ft): **1998.211** Easting (ft): **101788.076122**

Total Drill Depth (ft): **29.9** Northing (ft): **99819.136255**

Inclination/Bearing: **90** Datum: **Wolf Creek Plant Datum**

Hole Id:

B-140

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
16									CLAY (CL); brown (10YR 5/3) to yellowish brown (10YR 5/6); dry to slightly moist; medium stiff to stiff; trace silt; no to weak HCL reaction.								
18											1979.7						
					SPT-5	1.4/1.5		12 16 31	CLAY (CL); brownish yellow (10YR 6/6) to grayish yellow (10YR 5/2); moist; very stiff to hard; trace silt; medium to low plasticity; strong HCl reaction.					17	46	15	31
20																	
22																	
									Weak HCl reaction; massive below 23.0								
24					SPT-6	1.3/1.5		15 26 37									
26																	
28																	
					SPT-7	1.4/1.4		19 30 50/5.5	CLAY (CL); brownish yellow (10YR 6/6) to brown (10YR 5/3); moist; hard; trace calcium carbonate grains, medium sized, sub-rounded to rounded; single small crinoid stem; massive texture; strong HCl reaction.		1969.7 1968.3						

Notes:

1. Terms and symbols defined on Plate 1.
2. As-Built coordinates and elevation surveyed by Kaw Valley Engineering (KS-licensed).
3. The SPT blow count is defined as the number of blows required for a 140 lb. auto trip safety hammer falling 30 inches to drive the split-barrel sampler 6 inches in a possible 18 inch sample interval.
4. Shelby tubes used for cohesive soil sampling of dimensions 36 inches long, 3 inch outside diameter.
5. HQ3 carbide Diamond bit used for rock coring.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36qqqq Rev. 28
Log of Boring B-140
Sheet 2 of 2

Surface Level (ft): **1998.211** Easting (ft): **101788.076122**

Total Drill Depth (ft): **14.1** Northing (ft): **99819.136255**

Inclination/Bearing: **90** Datum: **Wolf Creek Plant Datum**

Hole Id:

B-140a

Sheet: 1 of 1

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
2									No recovery in attempted shelby tubes in B-140; rig pulled forward to drill B-140a in order to re-attempt ST sample collection.								
4																	
6									Lithology of B-140a logged only for ST-2 where sample was recovered. See B-140 for soil description above ST-1								
8																	
10					ST-1	0/2											
12					ST-2	1.6/2			CLAY (CL); brown (10YR 5/3) to yellowish brown (10YR 5/6); dry to slightly moist; medium stiff; sparse silt; no to weak HCL reaction.		2010.3						
14											2012.3						

Notes:

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36rrrr Rev. 28
Log of Boring B-140a
Sheet 1 of 1

Surface Level (ft): **2005.578** Easting (ft): **101787.031361**

Total Drill Depth (ft): **19.7** Northing (ft): **100779.997862**

Inclination/Bearing: **90** Datum: **Wolf Creek Plant Datum**

Hole Id:

B-141

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
									SAND (SP); construction concrete; roots (fill).								
					SPT-1	1.3/1.5		6 23 20	SILT (ML); mottled yellow (10YR 7/6) to brown (10YR 5/3); dry; medium stiff; difficult to break with hands; sparse fine sand; trace roots; fill.		2005.3						
2																	
4					SPT-2	1.2/1.5		6 50/5	SAND, silty (SM); brownish yellow (10YR 6/6) to yellowish brown (10YR 5/6); dry; stiff to very stiff; very fine grained; grains rounded; partially consolidated; mostly hard but friable; some zones well-cemented; porous; no HCl reaction.		2001.7						
									CLAY (CL); brownish yellow (10YR 6/6) and very pale brown (10YR 8/2); dry to slightly moist; stiff to very stiff; little very fine grained sand; unconsolidated.		2000.2						
6					SPT-3	1.3/1.5		3 3 6					90	13			
									CLAY (CL); brownish yellow (10YR 6/6) to yellowish brown (10YR 5/6) and grayish brown (10YR 3/2); dry to slightly moist; stiff to very stiff; trace very fine sand laminae; trace grayish brown magnesium oxide staining; no HCl reaction.		1998.4						
8					SPT-4	1.4/1.5		5 7 11	Set 6 ft casing; begin drilling wet rotary below SPT-3.				99	20	48	18	30
10									CLAY (CL); light olive brown (2.5Y 5/3) to dark grayish brown (2.5Y 4/2); dry to slightly moist; stiff to very stiff; weak HCl reaction.		1995.6						
					ST-1	0/2			- Attempt ST-1, pushed 1.5 ft but shelby tube lost in hole; will pull up and start second hole.								
12					SPT-5	1.4/1.5		12 16 31	Attempt ST-2, only 7 in pushed until refusal; no recovery.								
					ST-2	0/2					1992.1						
14					SPT-6	1.3/1.5		15 26 37									

Notes:

1. Terms and symbols defined on Plate 1.
2. As-Built coordinates and elevation surveyed by Kaw Valley Engineering (KS-licensed).
3. The SPT blow count is defined as the number of blows required for a 140 lb. auto trip safety hammer falling 30 inches to drive the split-barrel sampler 6 inches in a possible 18 inch sample interval.
4. Shelby tubes used for cohesive soil sampling of dimensions 36 inches long, 3 inch outside diameter.
5. HQ3 carbide Diamond bit used for rock coring.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36ssss Rev. 28
Log of Boring B-141
Sheet 1 of 2

Surface Level (ft): **2005.578** Easting (ft): **101787.031361**

Total Drill Depth (ft): **19.7** Northing (ft): **100779.997862**

Inclination/Bearing: **90** Datum: **Wolf Creek Plant Datum**

Hole Id:

B-141

Sheet: 2 of 2

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
16									CLAY (CL); gray (7.5YR 5/1) and gray (7.5YR 6/1); very stiff; difficult to break; grading to highly weathered shale; breaks along indistinct horizontal laminae, very thin; trace to sparse iron oxide staining; strong HCl reaction.								
18											1987.1						
					SPT-7	1.4 / 1.4		19 / 30 / 50/5.5	CLAY (CH); dark gray (7.5YR 4/1); dry to slightly moist; hard; highly plastic at 18.5 ft, becoming less plastic; grading to shale; massive; horizontal laminae not present; weak HCl reaction.		1986.1						
20									SHALE; dark gray (7.5YR 4/1); dry; very weak (R1); some solid zones; trace horizontal laminae; strong HCl reaction.		1985.9						
22																	
24																	
26																	
28																	

Notes:

1. Terms and symbols defined on Plate 1.
2. As-Built coordinates and elevation surveyed by Kaw Valley Engineering (KS-licensed).
3. The SPT blow count is defined as the number of blows required for a 140 lb. auto trip safety hammer falling 30 inches to drive the split-barrel sampler 6 inches in a possible 18 inch sample interval.
4. Shelby tubes used for cohesive soil sampling of dimensions 36 inches long, 3 inch outside diameter.
5. HQ3 carbide Diamond bit used for rock coring.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36ssss Rev. 28
Log of Boring B-141
Sheet 2 of 2

Surface Level (ft): **2005.967** Easting (ft): **101913.543012**

Total Drill Depth (ft): **29.8** Northing (ft): **101287.495955**

Inclination/Bearing: **90** Datum: **Wolf Creek Plant Datum**

Hole Id:

B-142

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
									SILT, sandy (ML); dark brown (10YR 3/3); dry; very stiff; with roots (fill).								
					SPT-1	1.5/1.5		6 17 28	SAND, silty (SM); very pale brown (10YR 7/4); dry; very stiff; partially cemented; trace magnesium oxide staining; fill.		2005.3						
									SILT (ML); mottled brownish yellow (10YR 6/6) to dark yellowish brown (10YR 4/4); dry; stiff; few thin, horizontal laminae; sparse fine sand; trace magnesium oxide staining; no HCl reaction.		2004.5						
2																	
4					SPT-2	1.5/1.5		6 8 9									
									CLAY (CL); mottled brownish yellow (10YR 6/6) to dark yellowish brown (10YR 4/4); dry to slightly moist; stiff; breaks on horizontal lines but texture generally massive; sandy at top of ST sample.		2001.1						
6					ST-1	1.6/1.6				6.5		134		19	46	16	30
8																	
									CLAY (CL); mottled light yellowish brown (2.5Y 6/4) to olive brown (2.5YR 4/3) and white (2.5Y 8/1); slightly moist; stiff; sparse iron oxide staining; trace white calcium carbonate grains; strong HCl reaction.		1997.5						
					SPT-3	1.5/1.5		8 13 14									
10									CLAY (CL); grayish brown (2.5Y 5/2) to dark grayish brown (2.5Y 4/2) and brownish yellow (10YR 6/6); moist; stiff to very stiff; difficult to break with hands; slightly silty with silt content decreasing with depth; brownish yellow decreasing with depth.		1996.0						
					SPT-4			8 14 20									
12																	
									Grading to completely weathered shale with few indistinct horizontal to sub-horizontal laminae.								
14					SPT-5			14 22 27									

Notes:

1. Terms and symbols defined on Plate 1.
2. As-Built coordinates and elevation surveyed by Kaw Valley Engineering (KS-licensed).
3. The SPT blow count is defined as the number of blows required for a 140 lb. auto trip safety hammer falling 30 inches to drive the split-barrel sampler 6 inches in a possible 18 inch sample interval.
4. Shelby tubes used for cohesive soil sampling of dimensions 36 inches long, 3 inch outside diameter.
5. HQ3 carbide Diamond bit used for rock coring.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36tttt Rev. 28
Log of Boring B-142
Sheet 1 of 3

Surface Level (ft): **2005.967** Easting (ft): **101913.543012**

Total Drill Depth (ft): **29.8** Northing (ft): **101287.495955**

Inclination/Bearing: **90** Datum: **Wolf Creek Plant Datum**

Hole Id:

B-142

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
16									CLAY (CL); grayish brown (2.5Y 5/2) to dark grayish brown (2.5Y 4/2) and brownish yellow (10YR 6/6); moist; stiff to very stiff; difficult to break with hands; slightly silty with silt content decreasing with depth; brownish yellow decreasing with depth.								
18																	
					SPT-6	1.3/1.3		20 49 42/4	SHALE; dark gray (2.5Y 4/1); dry; extremely weak (R0); moderately to highly weathered; common clay at 18.5 ft decreasing with depth; abundant indistinct horizontal to subhorizontal laminae; weak HCl reaction.		1987.5			14	44	18	26
20		0:39							SHALE; medium dark gray (N4); very weak (R1) to extremely weak (R0); fresh (F) to slightly weathered (SW); very thin horizontal laminae throughout; trace iron oxide staining; trace calcium carbonate grains; strong HCl reaction.		1986.2						
		NM							extremely weak (R0), with common thin zones of completely weathered, no HCL reaction.								
22		0:45			CR-1	4.9/5	4.7/5		- MB, 0° at 20.3' MB, 0° at 20.7' MB, 0° at 22.6' MB, 0° at 23.0'								
		0:52							Return to very weak (R1) to extremely weak (R0) below 23.8								
24		0:44							MB, 0° at 24.6'								
		0:26							Extremely weak (R0); medium dark gray (N4); no rock structure; no HCl reaction below 25.0.								
26		0:26							- MB, 0° at 25.0' MB, 0° at 25.1' MB, 0° at 25.2'		1979.4						
		0:34			CR-2	5/5	4.6/5		MB, 0° at 25.3' MB, 0° at 25.4' Returns to very weak (R1) to extremely weak (R0); thin horizontal distinct laminae; trace siltstone lenses; no to weak HCl reaction below 25.7.								
28		0:28			SC-1				- MB, 0° at 25.7'	•295		159		3			
		0:36							MB, 0° at 25.9' MB, 0° at 26.0' MB, 0° at 26.1'		1976.2						

Notes:

1. Terms and symbols defined on Plate 1.
2. As-Built coordinates and elevation surveyed by Kaw Valley Engineering (KS-licensed).
3. The SPT blow count is defined as the number of blows required for a 140 lb. auto trip safety hammer falling 30 inches to drive the split-barrel sampler 6 inches in a possible 18 inch sample interval.
4. Shelby tubes used for cohesive soil sampling of dimensions 36 inches long, 3 inch outside diameter.
5. HQ3 carbide Diamond bit used for rock coring.

Surface Level (ft): **2005.967** Easting (ft): **101913.543012**

Total Drill Depth (ft): **29.8** Northing (ft): **101287.495955**

Inclination/Bearing: **90** Datum: **Wolf Creek Plant Datum**

Hole Id:

B-142

Sheet: 3 of 3

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
32									SHALE; medium dark gray (N4); very weak (R1) to weak (R2); fresh (F); muddy; argillaceous with common calcium carbonate lenses and shell fragments; generally horizontal to sub-horizontal with soft sediment deformation; strong HCl reaction. MB, 0° at 26.8'								
34																	
36																	
38																	
40																	
42																	
44																	

Notes:

1. Terms and symbols defined on Plate 1.
2. As-Built coordinates and elevation surveyed by Kaw Valley Engineering (KS-licensed).
3. The SPT blow count is defined as the number of blows required for a 140 lb. auto trip safety hammer falling 30 inches to drive the split-barrel sampler 6 inches in a possible 18 inch sample interval.
4. Shelby tubes used for cohesive soil sampling of dimensions 36 inches long, 3 inch outside diameter.
5. HQ3 carbide Diamond bit used for rock coring.

Surface Level (ft): **1992.349** Easting (ft): **102521.512769**

Total Drill Depth (ft): **25.8** Northing (ft): **101317.409776**

Inclination/Bearing: **90** Datum: **Wolf Creek Plant Datum**

Hole Id:

B-143

Sheet: 1 of 2

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log / Sample Type	Sample Number	Recovery	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
0				SPT-1	1.5/1.5		12 16 12	CLAY, sandy (CL); with construction concrete; dry (Fill)								
4				SPT-2	1.4/1.5		3 3 4	CLAY, silty (CL); dark gray (2.5Y 4/1); moist; soft to medium stiff; moderately plastic; trace fine sand; no HCl reaction.		1988.7			23	60	15	45
6				ST-1	1.85/1.85			CLAY, with silt (CH); light olive brown (2.5Y 5/4), grayish brown (2.5Y 5/2) and dark yellowish brown (10YR 4/6); moist; medium stiff; plastic; no HCl reaction.	2.5	1987.8	129		22			
10				SPT-3	1.5/1.5		3 5 7	CLAY, silty (CL); grayish brown (10YR 5/2) to yellowish brown (10YR 5/6); medium stiff; plastic; strong HCl reaction.		1983.8						
12				SPT-4	1.3/1.5		5 8 10									
14				SPT-5	1.4/1.5		7 14 17	CLAY, silty (CL); olive gray (5Y 5/2) to brown (7.5YR 5/3); dry to slightly moist; stiff to very stiff; trace sand partings with iron oxide staining; strong HCl reaction.		1979.3			13			

Notes:

1. Terms and symbols defined on Plate 1.
2. As-Built coordinates and elevation surveyed by Kaw Valley Engineering (KS-licensed).
3. The SPT blow count is defined as the number of blows required for a 140 lb. auto trip safety hammer falling 30 inches to drive the split-barrel sampler 6 inches in a possible 18 inch sample interval.
4. Shelby tubes used for cohesive soil sampling of dimensions 36 inches long, 3 inch outside diameter.
5. HQ3 carbide Diamond bit used for rock coring.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36uuuu Rev. 28
Log of Boring B-143
Sheet 1 of 2

Surface Level (ft): **1992.349** Easting (ft): **102521.512769**

Total Drill Depth (ft): **25.8** Northing (ft): **101317.409776**

Inclination/Bearing: **90** Datum: **Wolf Creek Plant Datum**

Hole Id:

B-143

Sheet: 2 of 2

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
16									CLAY, silty (CL); olive gray (5Y 5/2) to brown (7.5YR 5/3); dry to slightly moist; stiff to very stiff; trace sand partings with iron oxide staining; strong HCl reaction.								
18											1973.9						
20					SPT-6	1.4/1.5		18 20 27	CLAY (CL); olive gray (5Y 5/2) to brown (7.5YR 5/4); dry; very stiff; grading to completely weathered shale; high dry strength; trace fine to medium grained sand; trace rounded sandstone nodules; trace indistinct horizontal to sub-horizontal laminae but generally massive texture; strong HCl reaction.								
22																	
24					SPT-7	1.4/1.5		21 24 40	Well cemented sand lens, cemented with CaCO3; strong HCl reaction. CLAY, silty (CL); grayish brown (10YR 5/2) to dark grayish brown (10YR 4/2); dry; very stiff to hard; grading to completely weathered shale; little sand; sparse horizontal to sub-horizontal laminae; sparse calcium carbonate grains; strong HCL reaction.		1968.6						
26					~~SPT-8~~	~~0/0~~		~~10/0~~	Auger refused at 26 ft; verify with SPT-8.		1966.5						
28																	

Notes:

1. Terms and symbols defined on Plate 1.
2. As-Built coordinates and elevation surveyed by Kaw Valley Engineering (KS-licensed).
3. The SPT blow count is defined as the number of blows required for a 140 lb. auto trip safety hammer falling 30 inches to drive the split-barrel sampler 6 inches in a possible 18 inch sample interval.
4. Shelby tubes used for cohesive soil sampling of dimensions 36 inches long, 3 inch outside diameter.
5. HQ3 carbide Diamond bit used for rock coring.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36uuuu Rev. 28
Log of Boring B-143
Sheet 2 of 2

Surface Level (ft): **1992.29** Easting (ft): **103840.302382**

Total Drill Depth (ft): **25** Northing (ft): **101353.519769**

Inclination/Bearing: **90** Datum: **Wolf Creek Plant Datum**

Hole Id:

B-144

Sheet: 1 of 2

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
					SPT-1	1.5/1.5		4 4 5	SILT, with clay (ML); dark gray (7.5YR 4/1); medium stiff; dry; grass at surface; trace fine sand; with roots.								
2																	
											1988.9						
4					SPT-2	1.4/1.5		5 5 4	SILT (ML); very dark gray (7.5YR 3/2) and mottled strong brown (7.5YR 5/6) and pinkish gray (7.5YR 7/2); dry; stiff; trace sandy; blocky texture with few angular cemented sand and siltstone clasts; few clay zones; common iron and magnesium oxide staining; no HCl reaction.				92	21			
6					SPT-3	1.2/1.5		5 5 8						17			
					ST-1	0/0.5			ST-1 push until refusal; tube bent, no sample. Drilling mud rotary below 8 ft.								
8											1983.8						
					SPT-4	1.4/1.5		11 14 11	CLAY, silty (CL); olive gray (5Y 5/2); dry; very stiff; trace indistinct horizontal laminae; weak HCl reaction.		1983.1						
									CLAY, silty, gravelly (CL); olive gray (5Y 5/2); dry; very stiff; gravel comprises angular sandstone; trace indistinct horizontal laminae; weak HCl reaction in clay; strong HCl reaction in limestone gravel.		1982.8						
10											1981.5						
					SPT-5	1.4/1.5		9 16 28	CLAY, with silt (CL); brown (10YR 5/3) to grayish brown (10YR 5/2); dry; very stiff; trace indistinct horizontal laminae; weak HCl reaction.								
12									CLAY, with silt (CL); grayish brown (2.5Y 5/2) and light brown (7.5YR 6/4); hard; few sandy zones and CaCO3 nodules with strong HCl reaction; clay shows weak HCl reaction; SPT-6 refusal at 15 ft on 100 blows								
14					SPT-6	1.5/1.5		19 36 46									

Notes:

1. Terms and symbols defined on Plate 1.
2. As-Built coordinates and elevation surveyed by Kaw Valley Engineering (KS-licensed).
3. The SPT blow count is defined as the number of blows required for a 140 lb. auto trip safety hammer falling 30 inches to drive the split-barrel sampler 6 inches in a possible 18 inch sample interval.
4. Shelby tubes used for cohesive soil sampling of dimensions 36 inches long, 3 inch outside diameter.
5. HQ3 carbide Diamond bit used for rock coring.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36vvvv Rev. 28
Log of Boring B-144
Sheet 1 of 2

Surface Level (ft): **1992.29** Easting (ft): **103840.302382**

Total Drill Depth (ft): **25** Northing (ft): **101353.519769**

Inclination/Bearing: **90** Datum: **Wolf Creek Plant Datum**

Hole Id:

B-144

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
16		0:36							Grading to dark gray (5Y 4/1) completely weathered shale.		1977.3						
		0:31							SHALE; olive gray (5Y 4/1), light olive gray (5Y 6/1) and light brown (5YR 5/6); extremely weak (R0) to very weak (R1); moderately to highly weathered; includes calcium carbonate inclusions and fine to medium sand; stronger shale zones have distinct horizontal laminae with weak HCl reaction; weaker argillaceous zones have rough core surface with strong HCl reaction.								
18		0:30			CR-1	5/5	5/5		Too soft to collect special care sample								
		0:17															
		0:16															
20		0:23							MB, 0° at 20.2'								
		0:22															
22		0:00			CR-2	5/5	4.9/5		Shale becoming more argillaceous with depth.								
		4:45							MB, 0° at 23.1'		1969.1						
24									LIMESTONE; pale brown (5YR 5/2); weak (R2); fresh (F); generally massive but with few shaly sub-horizontal partings; trace shell fragments and crinoid stem inclusions; strong HCl reaction.								
		6:51							- Change in drilling rate at 23.2 ft; 350 psi.		1967.3						
26									Limestone broken - no special care sample collected.								
									Completely weathered shale interbed at 23.6 to 23.7 ft								
									- MB, 0° at 23.6'								
									MB, 0° at 23.7'								
									Trace pyrite 24.4 to 24.7 ft								
28									- MB; 0° at 24.4'								

Notes:

1. Terms and symbols defined on Plate 1.
2. As-Built coordinates and elevation surveyed by Kaw Valley Engineering (KS-licensed).
3. The SPT blow count is defined as the number of blows required for a 140 lb. auto trip safety hammer falling 30 inches to drive the split-barrel sampler 6 inches in a possible 18 inch sample interval.
4. Shelby tubes used for cohesive soil sampling of dimensions 36 inches long, 3 inch outside diameter.
5. HQ3 carbide Diamond bit used for rock coring.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36vvvv Rev. 28
Log of Boring B-144
Sheet 2 of 2

Surface Level (ft): **1992.48** Easting (ft): **104940.96**

Total Drill Depth (ft): **29.9** Northing (ft): **101320.18**

Inclination/Bearing: **90** Datum: **Wolf Creek Plant Datum**

Hole Id:

B-145

Sheet: 1 of 3

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
0					SPT-1	1.2/1.5		4 5 8	TILL ZONE; SILT (ML); brown (7.5YR 4/2), medium stiff, dry, with common roots and fine sand, grass at surface.								
									CLAY (CL); silty, brown (7.5YR 4/2), common roots, dry, difficult to break with hands.		1991.3						
2									CLAY, with sand (CL); light gray (7.5YR 6/1), light brown (7.5YR 6/4), and light grey (7.5YR 8/1) with common FeO-staining, dry, stiff, few cemented silt lenses, cemented with CaCO3 stained FeO, strong HCl reaction.		1990.5						
4					SPT-2	1.3/1.4		6 6 7	Cemented silt absent 4.5 - 8 ft.								
6					ST-1	1.7/2.0				1.35							
8					SPT-3	1.5/1.5		7 12 18	Common cemented silt lenses, hard, strong brown (7.5YR 4/4), grading to gray (5Y 5/1), dry, cemented silt lenses shows no to weak HCl reaction, clay shows strong reaction.								
10									Begin wash rotary at 10 ft bgs.								
12					SPT-4	1.5/1.5		8 9 14	CLAY (CL); gray (5Y 5/1) with strong brown (7.5YR 4/4) FeO staining, dry, very stiff, sparse silt, trace fine sand, strong HCl reaction.		1980.7						
									CLAY, silty (CL); light yellowish brown (10YR 6/4) to yellowish brown (10YR 5/4), very stiff, high dry strength, strong HCl reaction.		1979.1						
14					SPT-5	1.5/1.5		6 10 17	SHALE; dark gray (10YR 4/1), extremely weak (R0), highly weathered to residual soil		1978.2						

Notes:

1. Terms and symbols defined on Plate 1.
2. As-Built coordinates and elevation surveyed by Kaw Valley Engineering (KS-licensed).
3. The SPT blow count is defined as the number of blows required for a 140 lb. auto trip safety hammer falling 30 inches to drive the split-barrel sampler 6 inches in a possible 18 inch sample interval.
4. Shelby tubes used for cohesive soil sampling of dimensions 36 inches long, 3 inch outside diameter.
5. HQ3 carbide Diamond bit used for rock coring.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36wwww Rev. 28
Log of Boring B-145
Sheet 1 of 3

Surface Level (ft): **1992.48** Easting (ft): **104940.96**

Total Drill Depth (ft): **29.9** Northing (ft): **101320.18**

Inclination/Bearing: **90** Datum: **Wolf Creek Plant Datum**

Hole Id:

B-145

Sheet: 2 of 3

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
16									SHALE; dark gray (10YR 4/1), extremely weak (R0), highly weathered to residual soil, few indistinct horizontal to subhorizontal laminae but generally massive texture, dry, weak HCl reaction.								
18					SPT-6	1.3/1.3		20 50 30/2	SHALE: dark grayish brown (10YR 4/2) to yellowish brown (10YR 5/4), muddy, extremely weak (R0), common quartz granules and shell fragments, strong HCl reaction.		1974.5						
20		2:03							Refusal on 100 total blows at 19.7 ft.		1972.6						
22		1:24 1:46			CR-1	4.9/5	4.8/5		SHALE: light olive gray (5Y 5/2) to olive gray (5Y 3/2), extremely weak (R0), moderately weathered, common shell fragments and crinoid stems, trace limestone rip-up clasts, outer edge of core has rough texture, easily breakable, some horizontal laminae, strong HCl reaction. HQ3 drilling with diamond bit starting at 19.9 ft. MB, 0° at 20.7' Downpressure 300 psi, 20.9-27 ft.		1969.7						
24		2:09 2:15							LIMESTONE: medium light gray (N6) to medium dark gray (N4), with few shale interbeds, very weak (R1) to weak (R2), fresh, trace calcareous inclusions, especially in shaly zones, trace pyrite, strong HCl reaction. Lens of extremely weak (R0), completely weathered, dark yellowish orange (10YR 6/6) coarser material, 0.1 ft thick. - MB, 0° at 23.2' MB, 0° at 23.3' MB, 0° at 25.7'								
26		2:25 2:19			SC-1				MB, 0° at 25.8' MB, 0° at 26.0'		1970	166	1				
28		2:17 2:41			CR-2	5.1/5	3.8/5		Downpressure 400 psi 27-29.9 ft. No water gain or loss for hole. Driller reports significantly harder drilling east of lake than within Wolf Creek proper. MB, 0° at 28.4'								
		2:18									1962.6						

Notes:

1. Terms and symbols defined on Plate 1.
2. As-Built coordinates and elevation surveyed by Kaw Valley Engineering (KS-licensed).
3. The SPT blow count is defined as the number of blows required for a 140 lb. auto trip safety hammer falling 30 inches to drive the split-barrel sampler 6 inches in a possible 18 inch sample interval.
4. Shelby tubes used for cohesive soil sampling of dimensions 36 inches long, 3 inch outside diameter.
5. HQ3 carbide Diamond bit used for rock coring.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36wwww Rev. 28
Log of Boring B-145
Sheet 2 of 3

Surface Level (ft): **1992.48** Easting (ft): **104940.96**

Total Drill Depth (ft): **29.9** Northing (ft): **101320.18**

Inclination/Bearing: **90** Datum: **Wolf Creek Plant Datum**

Hole Id:

B-145

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
32									0.7 ft interbed of SHALE between 28.6 and 29.3 ft, dark gray (N3), extremely weak (R0), develops strong horizontal fractures on laminae when dry, fresh, strong reaction to HCl, Shale bands increasing with depth and show soft sediment deformation. - MB, 0° at 28.6' MB, 0° at 29.5' MB, 0° at 29.6'								
34																	
36																	
38																	
40																	
42																	
44																	

Notes:

1. Terms and symbols defined on Plate 1.
2. As-Built coordinates and elevation surveyed by Kaw Valley Engineering (KS-licensed).
3. The SPT blow count is defined as the number of blows required for a 140 lb. auto trip safety hammer falling 30 inches to drive the split-barrel sampler 6 inches in a possible 18 inch sample interval.
4. Shelby tubes used for cohesive soil sampling of dimensions 36 inches long, 3 inch outside diameter.
5. HQ3 carbide Diamond bit used for rock coring.

Surface Level (ft): **1992.91** Easting (ft): **104922.86**

Total Drill Depth (ft): **25** Northing (ft): **100148.99**

Inclination/Bearing: **90** Datum: **Wolf Creek Plant Datum**

Hole Id:

B-146

Sheet: 1 of 2

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
0					SPT-1	1.5/4.5		3 3 3	TILL ZONE; SILT (ML); brown (7.5YR 4/2), loose, dry, with common roots, sparse sand, grass at surface.								
									CLAY, silty (CL); brown (7.5YR 4/2), dry, high dry strength, no HCl reaction.		1991.9						
2																	
									CLAY, with silt (CL); gray (5YR 5/1) to yellowish red (5YR 5/6), stiff, high dry strength, no HCl reaction.		1989.9						
4					SPT-2	1.5/1.5		6 7 8						22			
6																	
8																	
					ST-1	1.9/1.9				3.04		136	98	18			
10																	
									CLAY (CL); gray (5YR 6/1) to light olive gray (5Y 6/2), very stiff, dry, with FeO-stained, cemented silt lenses, weak HCl reaction throughout, FeO staining is yellowish brown (10YR 5/6).		1982.4						
					SPT-3	1.4/1.5		8 14 16									
12																	
14					SPT-4	1.4/1.5		14 17 28	Cemented silt lenses decreasing with depth.								
											1978.1						

Notes:

1. Terms and symbols defined on Plate 1.
2. As-Built coordinates and elevation surveyed by Kaw Valley Engineering (KS-licensed).
3. The SPT blow count is defined as the number of blows required for a 140 lb. auto trip safety hammer falling 30 inches to drive the split-barrel sampler 6 inches in a possible 18 inch sample interval.
4. Shelby tubes used for cohesive soil sampling of dimensions 36 inches long, 3 inch outside diameter.
5. HQ3 carbide Diamond bit used for rock coring.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36xxxx Rev. 28
Log of Boring B-146
Sheet 1 of 2

Surface Level (ft): **1992.91** Easting (ft): **104922.86**

Total Drill Depth (ft): **25** Northing (ft): **100148.99**

Inclination/Bearing: **90** Datum: **Wolf Creek Plant Datum**

Hole Id:

B-146

Sheet: 2 of 2

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
16									SAND, with silt (SP); dry, gray (10YR 6/1) to grayish brown (10YR 5/2) and light gray (10YR 7/2), well cemented, calcareous, hard, strong HCl reaction, quartz grains fine to medium, subrounded.								
											1975.9						
18									CLAY (CL), grading to completely weathered shale; gray (5Y 6/1) to light olive gray (5Y 6/2), hard, high dry strength, absence of cemented sand and FeO staining, indistinct horizontal to subhorizontal laminae, weak HCl reaction.								
					SPT-5	1.4/1.5		11 29 34									
20									Start at 20.0 ft on 10/26/11. No water in hole at start of drilling.								
22									SHALE; gray (5Y 5/1) to olive gray (5Y 5/2), very dark gray (5Y 3/1) in places, extremely weak (R0), dry, with common shell fragments and CaCO3 nodules, highly weathered, indistinct horizontal to subhorizontal laminae, strong HCl reaction.		1970.9						
24					SPT-6	1.5/1.5		13 50/5			1967.9						
26																	
28																	

Notes:

1. Terms and symbols defined on Plate 1.
2. As-Built coordinates and elevation surveyed by Kaw Valley Engineering (KS-licensed).
3. The SPT blow count is defined as the number of blows required for a 140 lb. auto trip safety hammer falling 30 inches to drive the split-barrel sampler 6 inches in a possible 18 inch sample interval.
4. Shelby tubes used for cohesive soil sampling of dimensions 36 inches long, 3 inch outside diameter.
5. HQ3 carbide Diamond bit used for rock coring.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36xxxx Rev. 28
Log of Boring B-146
Sheet 2 of 2

Surface Level (ft): **1993.62** Easting (ft): **104924.57**

Total Drill Depth (ft): **19.8** Northing (ft): **99302.88**

Inclination/Bearing: **90** Datum: **Wolf Creek Plant Datum**

Hole Id:

B-147

Sheet: 1 of 2

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
0					SPT-1	1.5/1.5		3 4 4	TILL ZONE; SILT (ML); brown (7.5YR 4/2), loose, dry, with common roots and clay, sparse sand, grass at surface.		1993.0						
2									SILT (ML); very dark grayish brown (10YR 3/2), dry, stiff, with fine sand, trace clay, and roots, no HCl reaction.								
4					SPT-2	1.1/1.5		4 4 5	CLAY (CL); silty, mottled yellowish brown (10YR 5/3) to dark grayish brown (10YR 4/2), with brownish yellow (10YR 6/6), stiff, trace fine sand and roots, MnO staining, weak HCl reaction.		1990.6			28			
6					SPT-3	1.2/1.5		5 6 8	SILT (ML); with clay, brownish yellow (10YR 6/6) to pale brown (10YR 6/3), with very pale brown (10YR 8/2), $CaCO_3$ nodules, stiff, trace fine sand lenses and cemented silt lenses, silt is FeO stained with high dry strength, strong HCl reaction except no reaction on siltstone zones.		1987.2			16			
8					SPT-4	1.5/1.5		11 13 16	CLAY (CL); silty, mottled gray (5Y 5/1), olive gray (5Y 5/2), and light yellowish brown (10YR 6/4), hard, dry, with common silt lenses,some lenses are cemented with gray (5Y 6/1) $CaCO_3$, with some strong brown (7.5YR 4/6) FeO staining; HCl reaction is strong on $CaCO_3$ cemented zones and weak on clay, none on FeO cemented zones.		1985.8						
10					SPT-5	1.4/1.5		9 19 25	Below 10.6 ft, common very fine sand, cemented zones decreasing with depth, dry, few horizontal laminae, grading to completely weathered shale.								
12																	
14					SPT-6	1.5/1.5		16 23 32					94	12			

Notes:

1. Terms and symbols defined on Plate 1.
2. As-Built coordinates and elevation surveyed by Kaw Valley Engineering (KS-licensed).
3. The SPT blow count is defined as the number of blows required for a 140 lb. auto trip safety hammer falling 30 inches to drive the split-barrel sampler 6 inches in a possible 18 inch sample interval.
4. Shelby tubes used for cohesive soil sampling of dimensions 36 inches long, 3 inch outside diameter.
5. HQ3 carbide Diamond bit used for rock coring.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36yyyy Rev. 28
Log of Boring B-147
Sheet 1 of 2

Surface Level (ft): **1993.62** Easting (ft): **104924.57**

Total Drill Depth (ft): **19.8** Northing (ft): **99302.88**

Inclination/Bearing: **90** Datum: **Wolf Creek Plant Datum**

Hole Id:

B-147

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
16									CLAY (CL); silty, mottled gray (5Y 5/1), olive gray (5Y 5/2), and light yellowish brown (10YR 6/4), hard, dry, with common silt lenses,some lenses are cemented with gray (5Y 6/1) CaCO3, with some strong brown (7.5YR 4/6) FeO staining; HCl reaction is strong on CaCO3 cemented zones and weak on clay, none on FeO cemented zones.		1977.6					
18					SPT-7	1.5/1.5		26 50/4	SHALE; mottled grayish brown (2.5Y 5/2), dark gra (2.5Y 4/1) and light brown (7.5YR6/4), dry, hard, abundant shell fragments, highly weathered, indistinct horizontal laminae, strong HCl reaction, few FeO-stained zones, generally horizontal bedding.		1973.8					
20																	
22																	
24																	
26																	
28																	

Notes:

1. Terms and symbols defined on Plate 1.
2. As-Built coordinates and elevation surveyed by Kaw Valley Engineering (KS-licensed).
3. The SPT blow count is defined as the number of blows required for a 140 lb. auto trip safety hammer falling 30 inches to drive the split-barrel sampler 6 inches in a possible 18 inch sample interval.
4. Shelby tubes used for cohesive soil sampling of dimensions 36 inches long, 3 inch outside diameter.
5. HQ3 carbide Diamond bit used for rock coring.

Surface Level (ft): **1988.31** Easting (ft): **104706.94**

Total Drill Depth (ft): **32.3** Northing (ft): **98880.82**

Inclination/Bearing: **90** Datum: **Wolf Creek Plant Datum**

Hole Id:

B-148

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
									TILL ZONE; SILT (ML); brown (7.5YR 4/2), loose, dry, with common roots and clay, sparse sand, grass at surface.		1987.7						
					SPT-1	1.2/1.5		2 4 3	SILT, with clay (ML); black (7.5YR 2.5/1), dry, high dry strength, no HCl reaction.								
2											1985.8						
									CLAY (CL); silty, medium stiff, mottled dark grayish brown (10YR 4/2), dark yellowish brown (10YR 4/4), and very dark brown (10YR 2/2), dry to slightly moist, trace roots, no HCl reaction, blocky texture, moderately plastic.								
4					SPT-2	1.3/1.5		4 5 5						20	49	14	35
6					ST-1	2/2				0.7		126		24			
8											1979.8						
					SPT-3	1.5/1.5		4 6 9	CLAY, silty (CL); medium stiff, yellowish brown (10YR 5/6) to brownish yellow (10YR 6/6), dry to slightly moist, with common cemented silt layers, FeO staining, no HCl reaction, blocky texture absent.								
10																	
					SPT-4	1.5/1.5		9 15 15	Below 11.5, includes quartz sand, fine to medium grained, CaCO3 nodules and common crinoid stems and shell fragments, strong HCl reaction.								
12											1975.3						
					SPT-5	1.5/1.5		13 17 24	CLAY, with silt (CL); yellowish brown (10YR 5/4) to dark yellowish brown (10YR 4/6) and very pale brown (10YR 7/3), dry, few horizontal FeO stained zones, shell fragments common, trace cemented sand, strong HCl reaction.								
14																	

Notes:

1. Terms and symbols defined on Plate 1.
2. As-Built coordinates and elevation surveyed by Kaw Valley Engineering (KS-licensed).
3. The SPT blow count is defined as the number of blows required for a 140 lb. auto trip safety hammer falling 30 inches to drive the split-barrel sampler 6 inches in a possible 18 inch sample interval.
4. Shelby tubes used for cohesive soil sampling of dimensions 36 inches long, 3 inch outside diameter.
5. HQ3 carbide Diamond bit used for rock coring.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36zzzz Rev. 28
Log of Boring B-148
Sheet 1 of 3

Surface Level (ft): **1988.31** Easting (ft): **104706.94**

Total Drill Depth (ft): **32.3** Northing (ft): **98880.82**

Inclination/Bearing: **90** Datum: **Wolf Creek Plant Datum**

Hole Id:

B-148

Sheet: 2 of 3

Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
16									CLAY, with silt (CL); yellowish brown (10YR 5/4) to dark yellowish brown (10YR 4/6) and very pale brown (10YR 7/3), dry, few horizontal FeO stained zones, shell fragments common, trace cemented sand, strong HCl reaction.		1972.3						
18									SHALE; highly to completely weathered, yellowish brown (10YR 5/6) to gray (10YR 5/1), extremely weak (R0) to very weak (R1), dry, high dry strength, common shell fragments and crinoid stems, horizontal laminae not evident on fresh sample. - Rig chattering.							
20					SPT-6	1.5/1.5		18 31 36	Start drilling at 20 ft, 10/27/11, no fluid in hole at start of drilling. Driller reports hard drilling at 21.2 ft. Switch from auger to wash rotary.							
22											1966.0						
24		1:56 2:17			CR-1	4.9/5	3.7/5		LIMESTONE; medium gray (N5) to light olive gray (5Y 5/2), very weak to (R1) to weak (R2), fresh to slightly weathered, trace shell fragments and pyrite, with common shale lenses; shale is light gray (N7) to medium dark gray (N4), subhorizontal, showing soft sediment deformation, strong HCl reaction throughout. - SPT refusal at 22.3 ft bgs. Begin HQ3 coring at 22.3 ft bgs. Coring with diamond bit. Zones of extremely weak, completely weathered dark yellowish orange (10YR 6/6) material, with no rock structure or HCl reaction, up to 0.4 ft thick, at 22.6-22.8, 23.4, 23.8, 24.4, 24.8-25.2, 25.8, 27.3, and 27.6-27.8 ft. MB, 0° at 22.7' MB, 0° at 22.8'							
26		1:46 2:11 2:05															
28		2:11 2:25 2:10			CR-2				MB, 0° at 23.4' MB, 0° at 23.8' Limestone soft and broken. Mechanical breaks do not allow collection of special care sample on Run 1. MB, 0° at 24.4' MB Zone, 0° between 24.8' and 25.2'		1960.5						

Notes:

1. Terms and symbols defined on Plate 1.
2. As-Built coordinates and elevation surveyed by Kaw Valley Engineering (KS-licensed).
3. The SPT blow count is defined as the number of blows required for a 140 lb. auto trip safety hammer falling 30 inches to drive the split-barrel sampler 6 inches in a possible 18 inch sample interval.
4. Shelby tubes used for cohesive soil sampling of dimensions 36 inches long, 3 inch outside diameter.
5. HQ3 carbide Diamond bit used for rock coring.

Surface Level (ft): **1988.31** Easting (ft): **104706.94**

Total Drill Depth (ft): **32.3** Northing (ft): **98880.82**

Inclination/Bearing: **90** Datum: **Wolf Creek Plant Datum**

Hole Id:

B-148

Sheet: 3 of 3

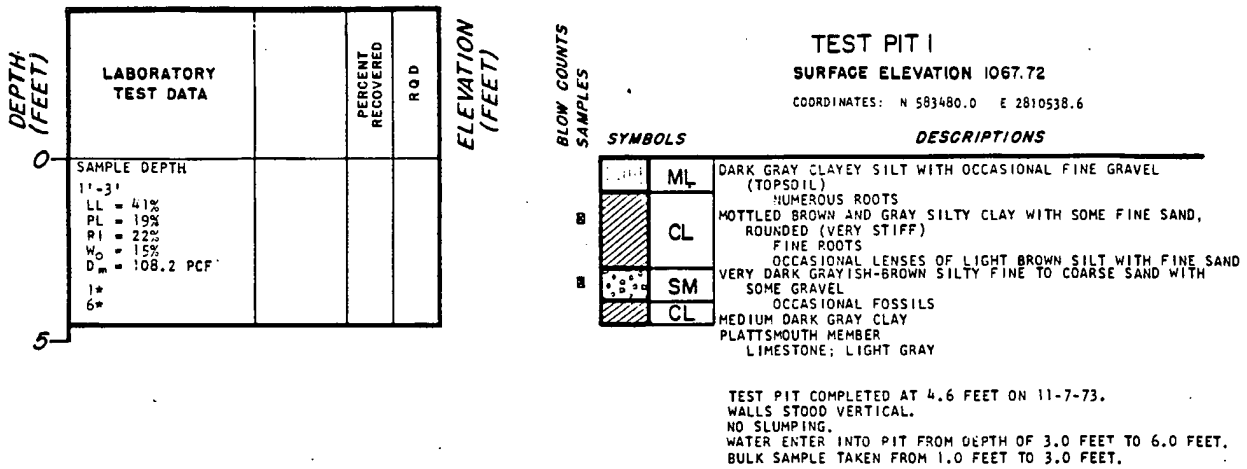
Depth, feet	Water Level	Drill Rate (mins)	Graphic Log	Sample Type	Sample Number	Recovery	RQD	SPT Blows per 6-inches	STRATUM DESCRIPTION	Estimated Strength (ksf) 500 1000 1500 2000	Stratum Elev. (feet)	CLASSIFICATION: Total Unit Wt., pcf	Passing No. 200 Sieve, %	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index (PI)
32		2:09 2:11			SC-1	5/5 1.7/1.7	3.7/5		MB Zone, 0° between 25.4' and 25.7' MB, 0° at 26.3' No water loss or gain. Downpressure 400 psi. MB Zone, 0° between 27.6' and 27.7' MB, 0° at 27.9' LIMESTONE, medium gray (N5), weak (R2), fresh, clay zones absent, increased occurrence of soft sediment deformation, with abundant shell fragments and calcareous nodules, strong HCl reaction throughout, shale lenses at 28.0-28.6 and 28.9-29.0 ft. MB, 0° at 27.8' MB, 0° at 32.0' MB, 0° at 32.8' MB, 0° at 32.9'	1780	1956.0	165		2			
34																	
36																	
38																	
40																	
42																	
44																	

Notes:

1. Terms and symbols defined on Plate 1.
2. As-Built coordinates and elevation surveyed by Kaw Valley Engineering (KS-licensed).
3. The SPT blow count is defined as the number of blows required for a 140 lb. auto trip safety hammer falling 30 inches to drive the split-barrel sampler 6 inches in a possible 18 inch sample interval.
4. Shelby tubes used for cohesive soil sampling of dimensions 36 inches long, 3 inch outside diameter.
5. HQ3 carbide Diamond bit used for rock coring.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-36zzzz Rev. 28
Log of Boring B-148
Sheet 3 of 3

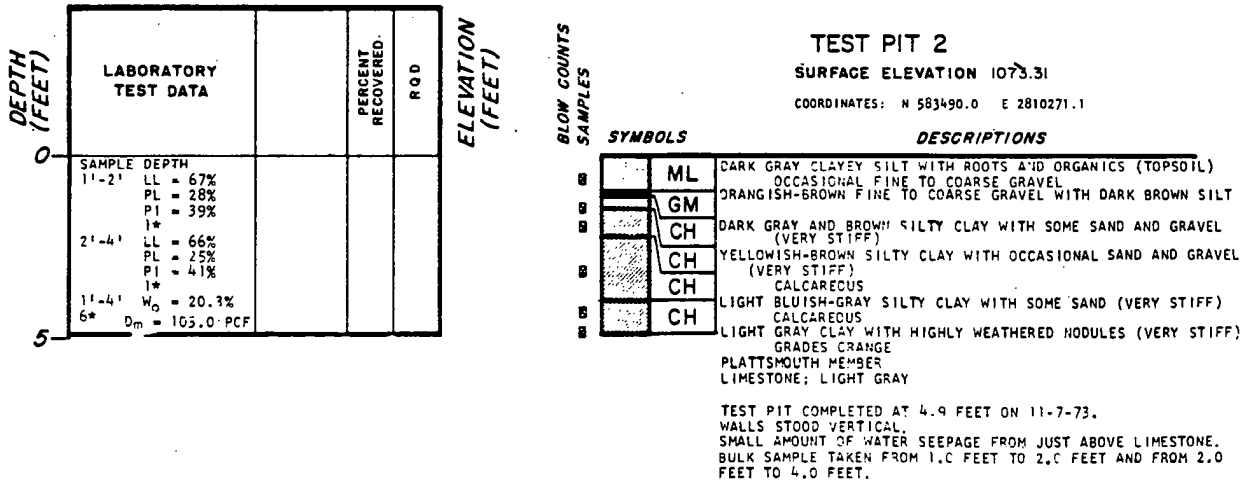


TEST PIT 1

SURFACE ELEVATION 1067.72

COORDINATES: N 583480.0 E 2810538.6

TEST PIT COMPLETED AT 4.6 FEET ON 11-7-73.
WALLS STOOD VERTICAL.
NO SLUMPING.
WATER ENTER INTO PIT FROM DEPTH OF 3.0 FEET TO 6.0 FEET.
BULK SAMPLE TAKEN FROM 1.0 FEET TO 3.0 FEET.

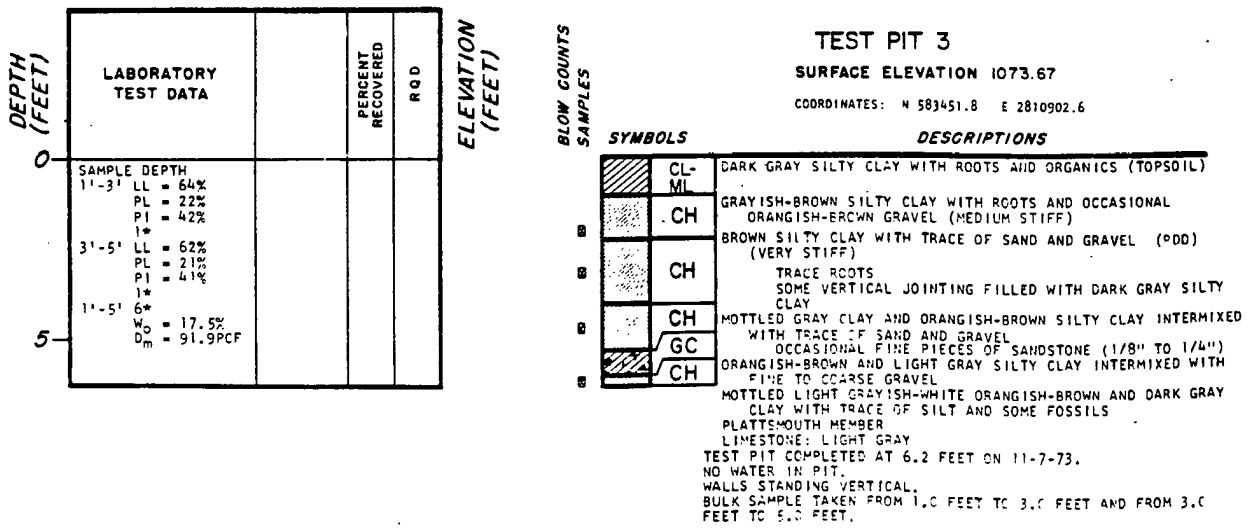


TEST PIT 2

SURFACE ELEVATION 1073.31

COORDINATES: N 583490.0 E 2810271.1

TEST PIT COMPLETED AT 4.9 FEET ON 11-7-73.
WALLS STOOD VERTICAL.
SMALL AMOUNT OF WATER SEEPAGE FROM JUST ABOVE LIMESTONE.
BULK SAMPLE TAKEN FROM 1.0 FEET TO 2.0 FEET AND FROM 2.0 FEET TO 4.0 FEET.



TEST PIT 3

SURFACE ELEVATION 1073.67

COORDINATES: N 583451.8 E 2810902.6

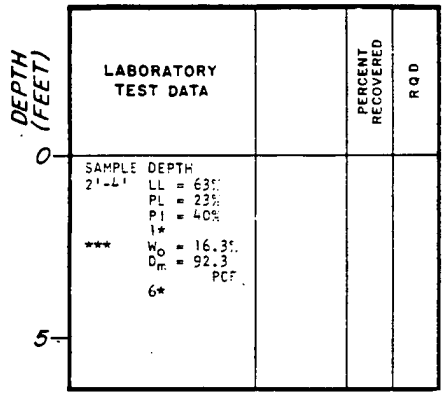
TEST PIT COMPLETED AT 6.2 FEET ON 11-7-73.
NO WATER IN PIT.
WALLS STANDING VERTICAL.
BULK SAMPLE TAKEN FROM 1.0 FEET TO 3.0 FEET AND FROM 3.0 FEET TO 5.0 FEET.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-37a

Log of Test Pits TP-1, TP-2 & TP-3

Rev. 0



*** RESULT OF MIXTURE OF SAMPLE FROM 2.0 FEET TO 4.0 FEET IN TP 4 AND FROM 1.5 FEET TO 4.5 FEET IN TP 6.

TEST PIT 4

SURFACE ELEVATION 1079.55

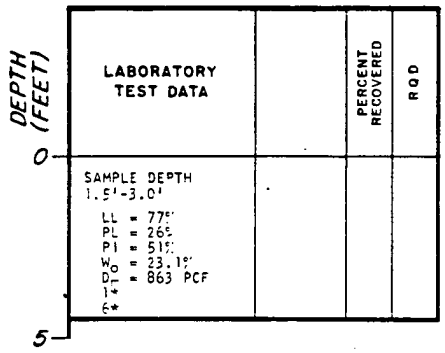
COORDINATES: N 580827.8 E 2811731.7

BLOW COUNTS SAMPLES

SYMBOLS	DESCRIPTIONS
ML-CL	BLACK CLAYEY SILT WITH ROOTS AND ORGANICS (TOPSOIL)
CH	DARK GRAYISH-BROWN CLAY WITH SOME SILT (VERY STIFF) OCCASIONAL SMALL NODULES OF HIGHLY WEATHERED LIGHT GRAY LIMESTONE
CH	MOTTLED GRAY, BROWN AND ORANGE SILTY CLAY (VERY STIFF) SOME FINE ROOTS AND TRACE OF SAND OCCASIONAL SMALL HIGHLY WEATHERED LIMESTONE NODULES
CH	LIGHT BROWNISH-GRAY CLAY WITH INTERMIXED HIGHLY WEATHERED LIGHT GRAY LIMESTONE NODULES (VERY STIFF) NUMEROUS GYPSUM CRYSTALS IN CLAY SOME FINE ROOTS
CH	
CL	MOTTLED GRAY, BROWN AND ORANGE CLAY (VERY STIFF) NUMEROUS GYPSUM CRYSTALS GRADES BROWN WITH TRACE OF FINE SAND

HEEBNER MEMBER
SHALE: BLACK: THINLY LAMINATED: CARBONACEOUS: FISSILE (HARD)

TEST PIT COMPLETED AT 6.4 FEET ON 11-7-73.
HOLE REFILLED.
TOPSOIL PLACED AT SURFACE.
WALLS STOOD VERTICAL.
SOME VERY SLOW WATER SEEPAGE FROM 4.8 FEET TO BASE OF PIT.
BULK SAMPLE TAKEN FROM 2.0 FEET TO 4.0 FEET AND FROM 5.0 FEET TO 6.4 FEET.



TEST PIT 5

SURFACE ELEVATION 1073.72

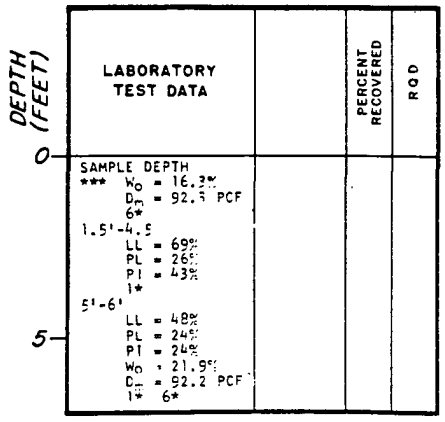
COORDINATES: N 581516.6 E 2810765.1

BLOW COUNTS SAMPLES

SYMBOLS	DESCRIPTIONS
ML-CL	BROWNISH-BLACK SILTY CLAY WITH ROOTS AND ORGANICS (TOPSOIL)
CL-CH	GRAYISH-BROWN CLAY WITH TRACE OF SILT (VERY STIFF) SOME ROOTS OCCASIONAL SAND, ROUNDED
CH	MOTTLED GRAYISH-BROWN AND GRAYISH-BLACK SILTY CLAY WITH OCCASIONAL SAND
CH	ORANGE CLAY WITH TRACE OF SAND (VERY STIFF) OCCASIONAL BLACK MANGANESE STAINING LARGE 6" - 12" CHUNKS OF MODERATELY WEATHERED LIMESTONE (3.6')

PLATTSMOUTH MEMBER
LIMESTONE: LIGHT GRAY; SLIGHT TO MODERATE WEATHERED; VERTICAL JOINTING WITH CLAY FILL

TEST PIT COMPLETED AT 4.5 FEET ON 11-8-73.
REFILLED - TOPSOIL ON TOP.
WALL STOOD VERTICAL.
NO WATER SEEPAGE
BULK SAMPLE TAKEN FROM 1.5 FEET TO 3.0 FEET.



*** RESULT OF MIXTURE OF SAMPLE FROM 2.0 FEET TO 4.0 FEET IN PT 4 AND 1.5 FEET TO 4.5 FEET IN TP 6.

TEST PIT 6

SURFACE ELEVATION 1090.27

COORDINATES: N 580846.7 E 2812458.4

BLOW COUNTS SAMPLES

SYMBOLS	DESCRIPTIONS
ML-CL	BLACK SILT WITH SOME CLAY, ROOTS AND ORGANICS (TOPSOIL)
CL	BLACK SILTY CLAY WITH SOME FINE ROOTS (VERY STIFF)
CH	VERY DARK GRAYISH-BROWN CLAY (VERY STIFF) FINE VERTICAL ANGULAR JOINTS FILLED WITH BLACK SILTY CLAY FILL
CH	MOTTLED GRAYISH-BROWN, YELLOWISH-BROWN AND DARK GRAY CLAY WITH SOME SILT AND TRACE OF SAND OCCASIONAL FINE ROUNDED GRAVEL SOME FINE ROOTS SOME VERTICAL JOINTING
CH	
CL	ORANGE SILTY CLAY GRADING TO DARK GRAY CLAY OCCASIONAL VERY LIGHT GRAY STREAKS OF HIGHLY WEATHERED LIMESTONE SOME BOULDERS OF SLIGHT TO MODERATE WEATHERED LIMESTONE VERTICAL JOINTS IN GRAY CLAY WITH BLACK CLAY FILL CONTAINING NUMEROUS FINE ROOTS

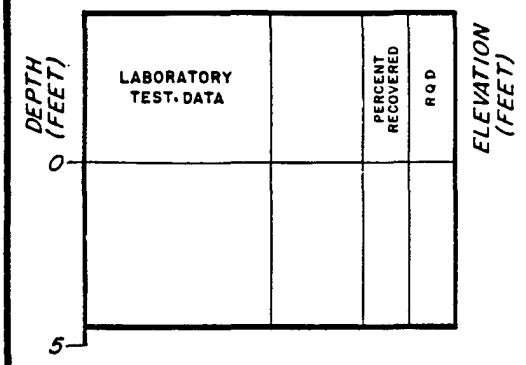
LIGHT OLIVE GRAY SILTY CLAY WITH TRACE OF SAND (HARD) (WEATHERED SNYDERVILLE MEMBER)
TEST PIT COMPLETED AT 7.5 FEET ON 11-8-73.
WALLS STOOD VERTICAL.
WATER SLOWLY RISING FROM SEEPAGE FROM 5.0 FEET TO 6.0 FEET.
BULK SAMPLE FROM 1.5 FEET TO 4.5 FEET AND FROM 5.0 TO 6.0 FEET.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-37b

Log of Test Pits TP-4, TP-5 & TP-6

Rev. 0



BLOW COUNTS SAMPLES

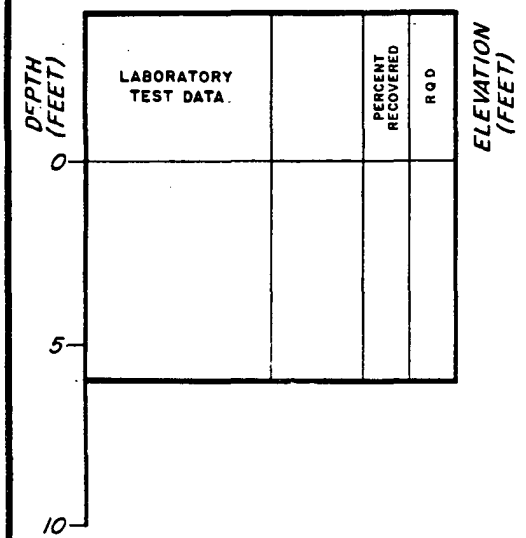
TEST PIT 7

SURFACE ELEVATION 1102.3

COORDINATES: N 585220.6 E 2807093.5

SYMBOLS	DESCRIPTIONS
ML	DARK BROWN CLAYEY SILT WITH ORGANICS AND ROOTS (TOPSOIL)
CL	GRAYISH-BLACK SILTY CLAY WITH FINE ROOTS (HARD)
CL	DARK BROWN SILTY CLAY (VERY STIFF) GRADES MORE BROWN
SC	MOTTLED ORANGISH-GRAY SAND AND SANDSTONE HIGHLY WEATHERED: CLAY SEAMS

TEST PIT COMPLETED AT 4.5 FEET ON 12-4-73.
WALLS STOOD VERTICAL.
NO WATER SEEPAGE.
BULK SAMPLE TAKEN FROM 3.0 FEET TO 4.5 FEET.



BLOW COUNTS SAMPLES

TEST PIT 8

SURFACE ELEVATION 1096.15

COORDINATES: N 584382.3 E 2807456.0

SYMBOLS	DESCRIPTIONS
ML	DARK BROWN CLAYEY SILT WITH ORGANICS AND FINE ROOTS (TOPSOIL)
CL	YELLOWISH-BROWN SILTY CLAY WITH OCCASIONAL GRAVEL OCCASIONAL LIMESTONE CONCRETIONS
CL ML	MOTTLED YELLOWISH-BROWN SILTY CLAY WITH FINE SAND PIECES OF HIGHLY WEATHERED SANDSTONE (VERY STIFF)
CL	MOTTLED YELLOWISH-BROWN CLAY WITH BLACK MANGANESE STAINING (STIFF)

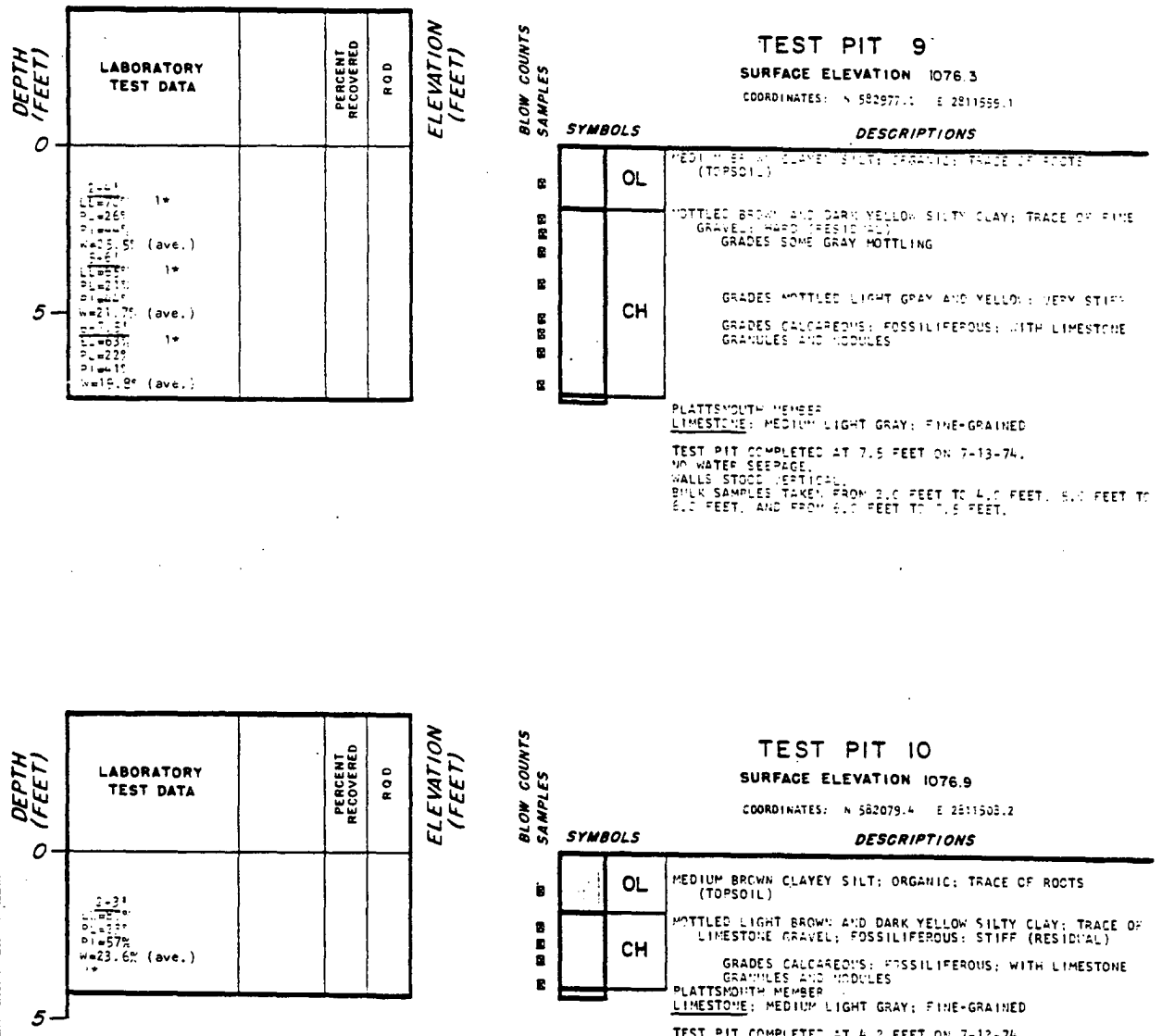
TEST PIT COMPLETED AT 6.0 FEET ON 12-2-73.
WALL STOOD VERTICAL.
NO WATER SEEPAGE
BULK SAMPLE TAKEN FROM 5.0 TO 6.0 FEET.

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-37c

Log of Test Pits TP-7 & TP-8



TEST PIT 9

SURFACE ELEVATION 1076.3

COORDINATES: N 582977.1 E 2811595.1

TEST PIT COMPLETED AT 7.5 FEET ON 7-13-74.
NO WATER SEEPAGE.
WALLS STOOD VERTICAL.
BULK SAMPLES TAKEN FROM 2.0 FEET TO 4.0 FEET, 5.0 FEET TO 6.0 FEET, AND FROM 6.0 FEET TO 7.5 FEET.

TEST PIT 10

SURFACE ELEVATION 1076.9

COORDINATES: N 582079.4 E 2811503.2

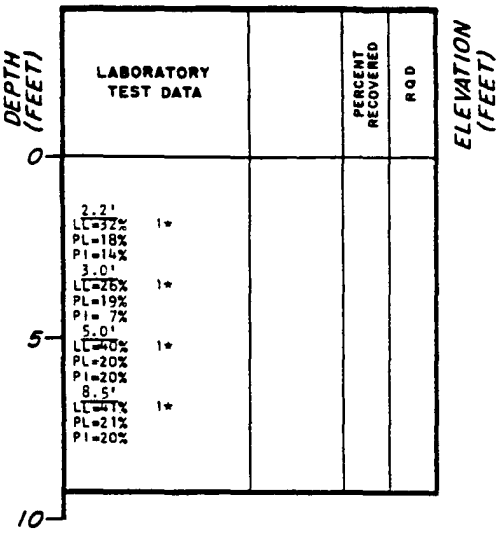
TEST PIT COMPLETED AT 4.2 FEET ON 7-13-74.
SLIGHT WATER SEEPAGE FROM TOP OF LIMSTONE.
WALLS STOOD VERTICAL.
BULK SAMPLE TAKEN FROM 2.0 TO 3.0 FEET.

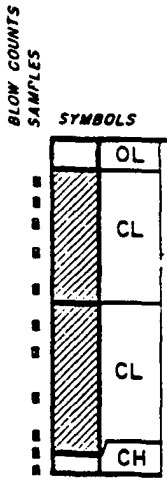
Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-37d

Log Of Test Pits TP-9 & TP-10





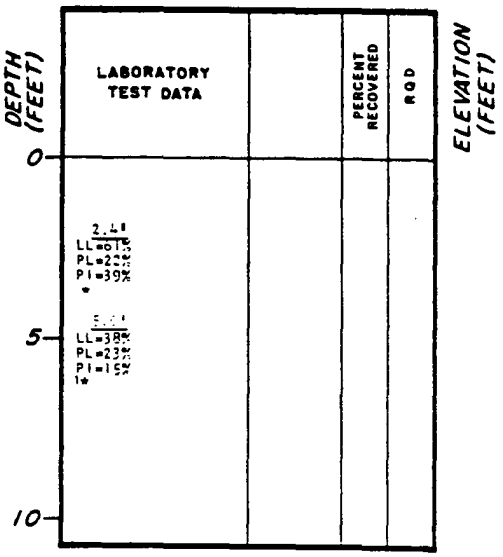
TEST PIT 11

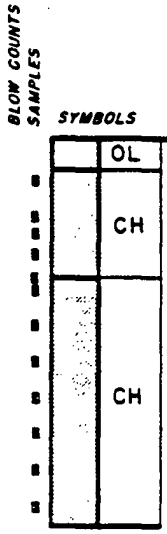
SURFACE ELEVATION 1099.6
COORDINATES: N 584080.7 E 2308248.9

DESCRIPTIONS

DARK BROWN CLAYEY SILT; WITH FINE SAND; TRACE ROOTS (MEDIUM STIFF) (TOPSOIL)
LIGHT BROWN CLAYEY SILT; TRACE ROOTS; SOME RED SANDSTONE LENSES (VERY STIFF TO HARD) (RESIDUAL)
ROOTS GRADE OUT AT 1.4'
GRADES TO DARK YELLOWISH-ORANGE; HARD AT 2.7'
SOME MODERATE RED SILTSTONE LENSES 0.1' TO 0.2' THICK FROM 3.1'
LIGHT OLIVE-GRAY SILTY CLAY; WITH FINE SAND; LAMINAR STRUCTURE; TRACE RED SILTSTONE LENSES (VERY STIFF) (RESIDUAL)
FINE SAND GRADES OUT FROM 6.1'
LIGHT BROWN SILTSTONE LENSES
LIGHT OLIVE-GRAY CLAY; LAMINAR STRUCTURE (VERY STIFF) (RESIDUAL)

TEST PIT COMPLETED AT 9.2 FEET ON 10/1/74.
VERY SLIGHT GROUNDWATER SEEPAGE.
WALLS STOOD VERTICAL, NO SLUMPING.





TEST PIT 12

SURFACE ELEVATION 1078.8
COORDINATES: N 583807.1 E 2803571.9

DESCRIPTIONS

DARK BROWN SILTY CLAY; SOME FINE SAND; TRACE ROOTS (MEDIUM STIFF) (TOPSOIL)
BROWN SILTY CLAY TRACE FINE SAND AND MEDIUM ROUNDED GRAVEL; TRACE ROOTS; (VERY STIFF) (RESIDUAL)
ROOTS GRADE OUT AT 3.4'
LIGHT BROWN SILTSTONE NODULES; ELONGATED, ROUNDED, DISCONTINUOUS AT 5.4'
LIGHT OLIVE-GRAY SILTY CLAY; SOME SILTSTONE LENSES; SOME SILTY ZONES; LAMINAR STRUCTURE; (VERY STIFF) (RESIDUAL)
GRADES SOME FOSSILS FROM 6.3' TO 8.8'
LIGHT BROWN SILTSTONE NODULES, DISCONTINUOUS

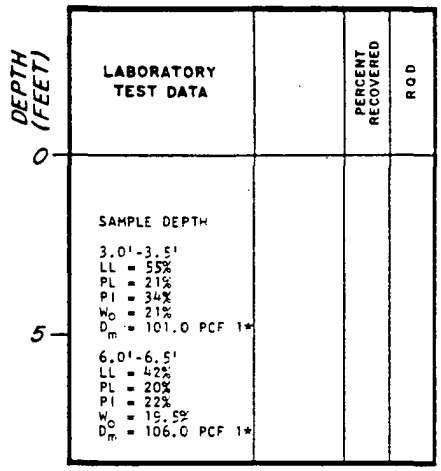
TEST PIT COMPLETED AT 10.6 FEET ON 10/1/74.
WALLS STOOD VERTICAL, NO SLUMPING.
NO APPARENT SEEPAGE.

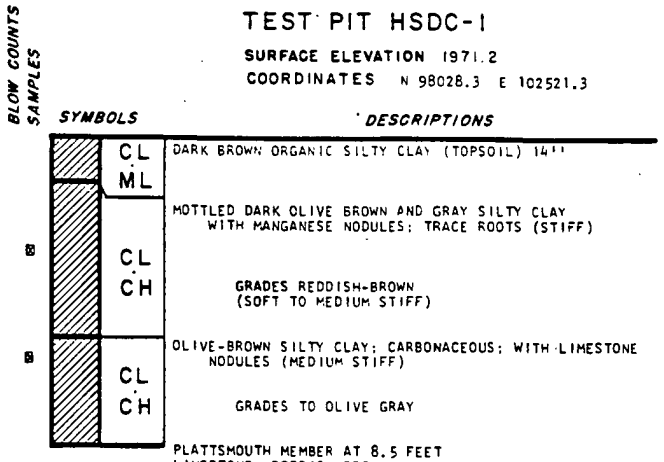
Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-37e

Log Of Test Pits TP-11 & TP-12



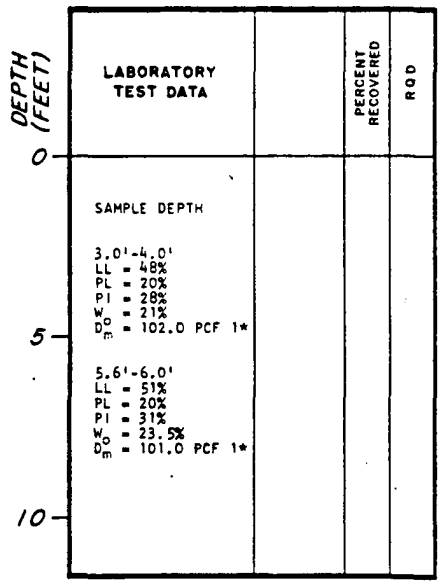


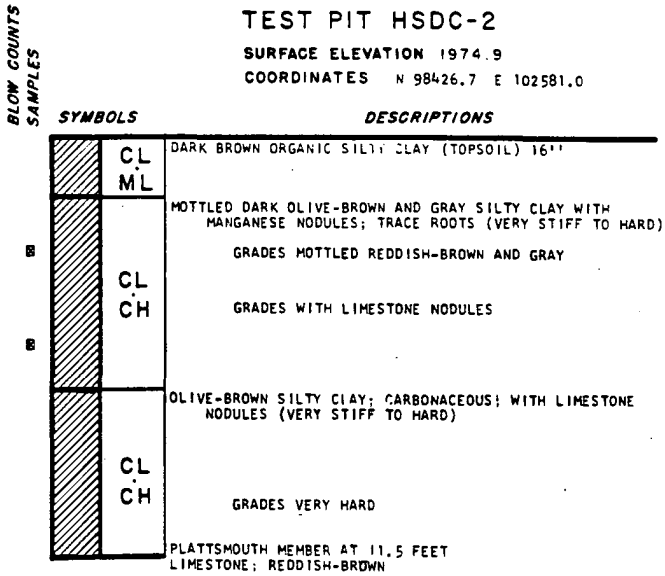
TEST PIT HSDC-1

SURFACE ELEVATION 1971.2

COORDINATES N 98028.3 E 102521.3

TEST PIT COMPLETED AT 8.5 FEET ON 8-13-76.
NO WATER IN PIT. NO SEEPAGE NOTICED.





TEST PIT HSDC-2

SURFACE ELEVATION 1974.9

COORDINATES N 98426.7 E 102581.0

TEST PIT COMPLETED AT 11.5 FEET ON 8-13-76.
NO WATER IN PIT. NO SEEPAGE NOTICED.

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-37f

Log Of Test Pits HSDC-1 & HSDC-2

TEST PIT HSDC-3

SURFACE ELEVATION 1970.7

COORDINATES N 98088.0 E 103425.8

DEPTH (FEET)	LABORATORY TEST DATA		PERCENT RECOVERED	RQD	BLOW COUNTS SAMPLES	SYMBOLS	DESCRIPTIONS
0	SAMPLE DEPTH 2.5'-3.0' LL = 64% PL = 22% PI = 42% W_o = 24.1% D_m = 95.2 PCF, 1*					CL ML	DARK BROWN SILTY CLAY WITH ORGANIC AND FINE ROOTS (TOPSOIL) 16''
						CL CH	MOTTLED DARK OLIVE-BROWN AND GRAY SILTY CLAY; WITH MANGANESE NODULES AND LIMESTONE NODULES (STIFF)
5	4.5'-5.0' LL = 77% PL = 29% PI = 48% W_o = 27.5% D_m = 93.7 PCF, 1*					CH	OLIVE-BROWN SILTY CLAY; CARBONACEOUS; WITH LIMESTONE NODULES (MEDIUM STIFF)
						CH	REDDISH-BROWN SILTY CLAY WITH LIMESTONE FRAGMENTS AND 2'' - 3'' LIMESTONE SLABS(MEDIUM STIFF) PLATTSMOUTH MEMBER AT 6.0 FEET LIMESTONE; REDDISH-BROWN

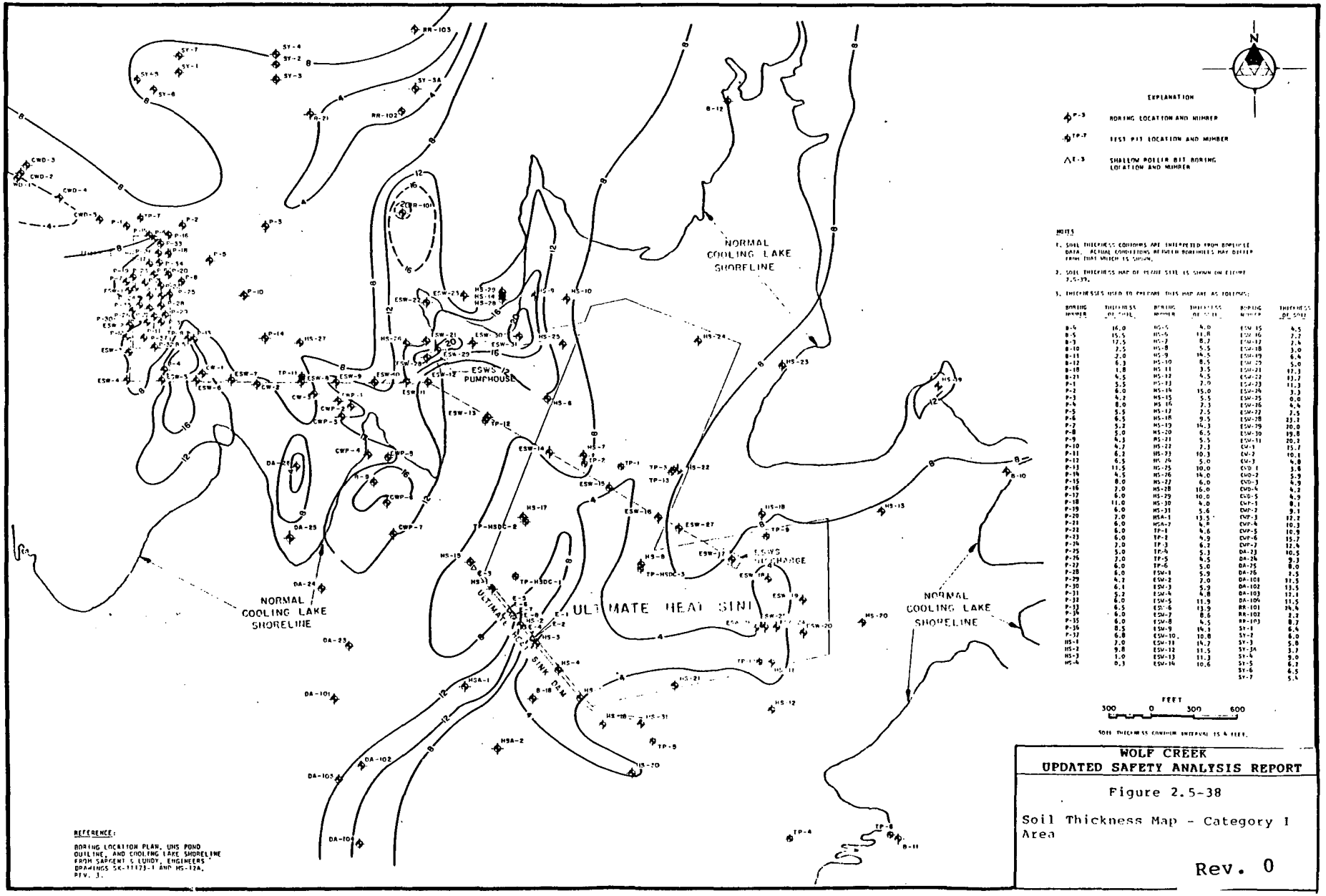
TEST PIT COMPLETED AT 6.0 FEET ON 8-13-76.
NO WATER IN PIT. NO SEEPAGE NOTICED.

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-37g

Log Of Test Pit HSDC-3

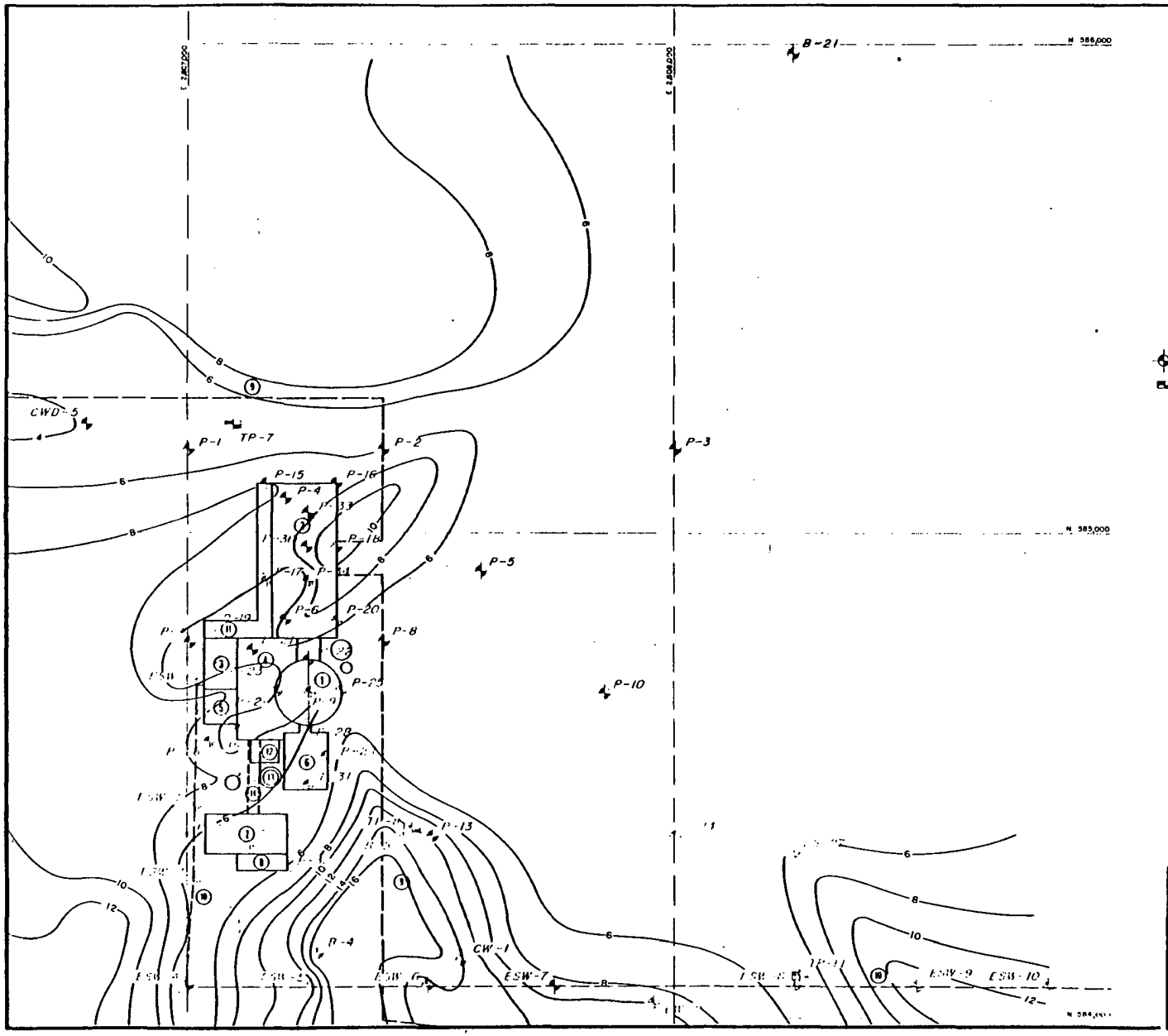


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-38

Soil Thickness Map - Category I Area

Rev. 0



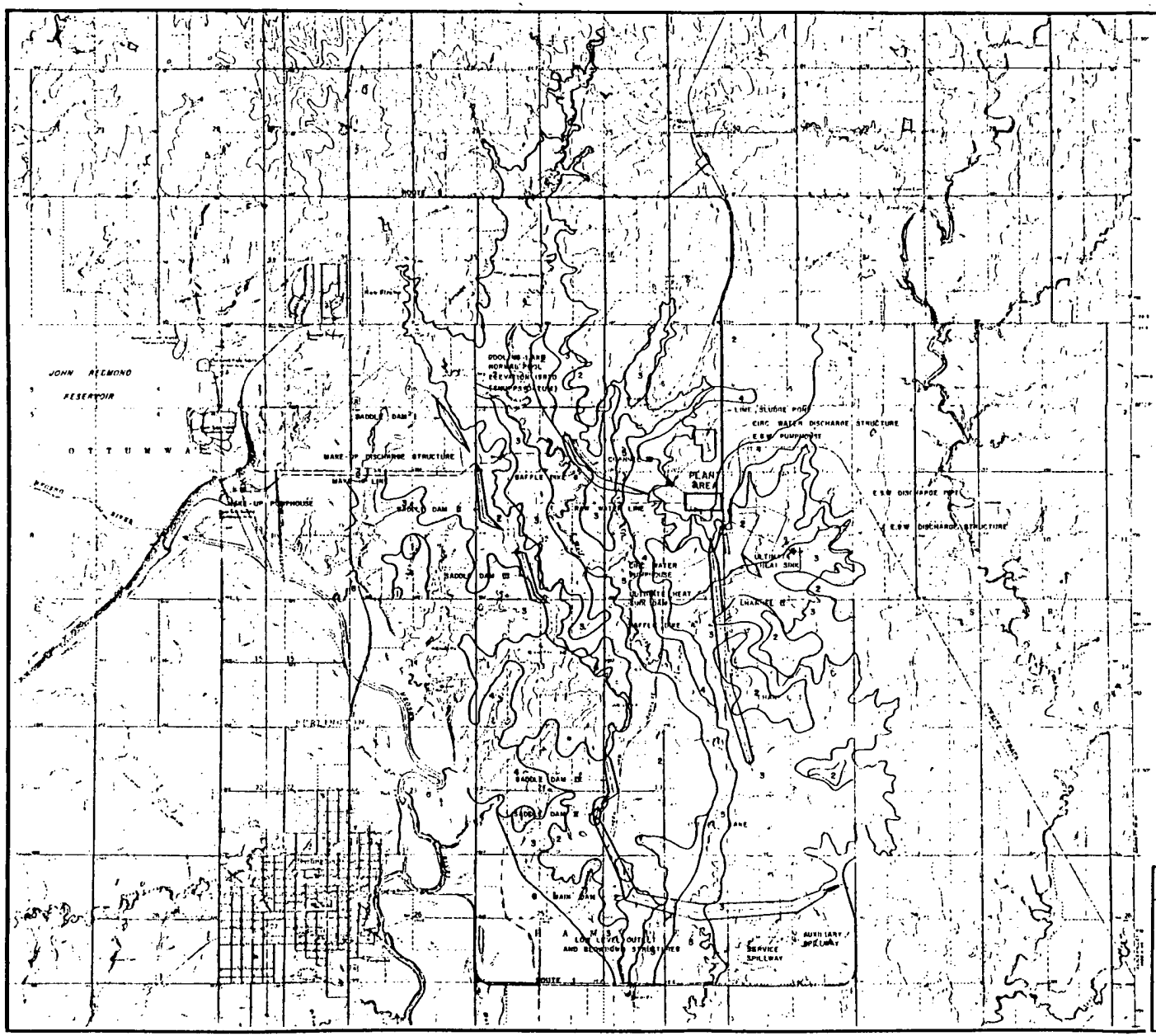
BORING NUMBER	THICKNESS OF SOIL	BORING NUMBER	THICKNESS OF SOIL
B-4	16.0	P-24	7.0
B-5	15.5	P-25	5.0
B-21	4.5	P-26	7.0
P-1	5.5	P-27	6.0
P-2	6.0	P-28	6.0
P-3	4.2	P-29	4.7
P-4	8.0	P-30	6.1
P-5	5.5	P-31	5.2
P-6	6.5	P-32	6.0
P-7	5.2	P-33	6.5
P-8	5.0	P-34	6.0
P-9	6.3	P-35	6.0
P-10	4.7	P-36	8.5
P-11	6.2	P-37	6.8
P-12	6.5	TP-77	6.0
P-13	11.5	ESW-1	5.9
P-14	4.5	ESW-2	7.0
P-15	8.0	ESW-3	5.9
P-16	7.0	ESW-4	6.9
P-17	6.0	ESW-5	11.9
P-18	11.0	ESW-6	13.9
P-19	6.0	ESW-7	8.6
P-20	7.0	ESW-8	6.5
P-21	6.0	ESW-9	16.1
P-22	6.0	ESW-10	11.8
P-23	6.0	CW-1	11.7
		CW-2	10.1
		CWD-5	4.9

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-39

Soil Thickness Map - Plant Site



N

EXPLANATION

MAP NO.	ASSOCIATION NAME	COMPONENT SOIL SERIES
1	REMIRA-OLPE	50% REMIRA SERIES SOILS 30% OLPE SERIES SOILS 20% IRRATIONALLY DECIPHERING DENNIS AND ERAM SERIES SOILS
2	REMIRA-WOODSON	50% REMIRA SERIES SOILS 40% WOODSON SERIES SOILS 10% DENNIS AND SUMMIT SERIES SOILS
3	SUMMIT-ERAM	60% SUMMIT SERIES SOILS 30% ERAM SERIES SOILS 10% LEHA SERIES SOILS 20% CLAYEY SOILS DEVELOPED ON LIMESTONE
4	DENNIS-BATES-ERAM	35% DENNIS SERIES SOILS 30% BATES SERIES SOILS 25% ERAM SERIES SOILS 10% REMIRA AND COLLINSVILLE SERIES SOILS
5	MASON-OAKWOOD	50% MASON SERIES SOILS 40% OAKWOOD SERIES SOILS 10% VERDIGRIS SERIES SOILS
6	OSAGE-VERDIGRIS	50% OSAGE SERIES SOILS 40% VERDIGRIS SERIES SOILS 10% MASON SERIES SOILS

NOTES:

SUBSECTION 2.5.1.2.1.4 CONTAINS A BRIEF DESCRIPTION OF THE PROPERTIES OF THESE SOIL SERIES.

REFERENCE:

HAGER, ROBERT, 3 AUGUST 1973 PRIVATE COMMUNICATION.

DRAWING REFERENCE:

TITLE: GENERAL ARRANGEMENT, WOLF CREEK GENERATING STATION UNIT 1
FOR: KANSAS GAS AND ELECTRIC COMPANY AND KANSAS CITY POWER AND LIGHT COMPANY
BY: SARGENT AND LUNDY ENGINEERS, CHICAGO
DRAWING NO. S-1, Rev. 8
DATED: 12/17/76

MAP BASE PREPARED FROM U.S.G.S. TOPOGRAPHIC QUADRANGLES, 7.5' SERIES; BURLINGTON, KANSAS, 1971; JOHN REDMOND DAM, KANSAS, 1966; NEW STRAWN, KANSAS, 1971; OTTUMWA, KANSAS, 1970.

FEET

0 2000 4000 6000 8000

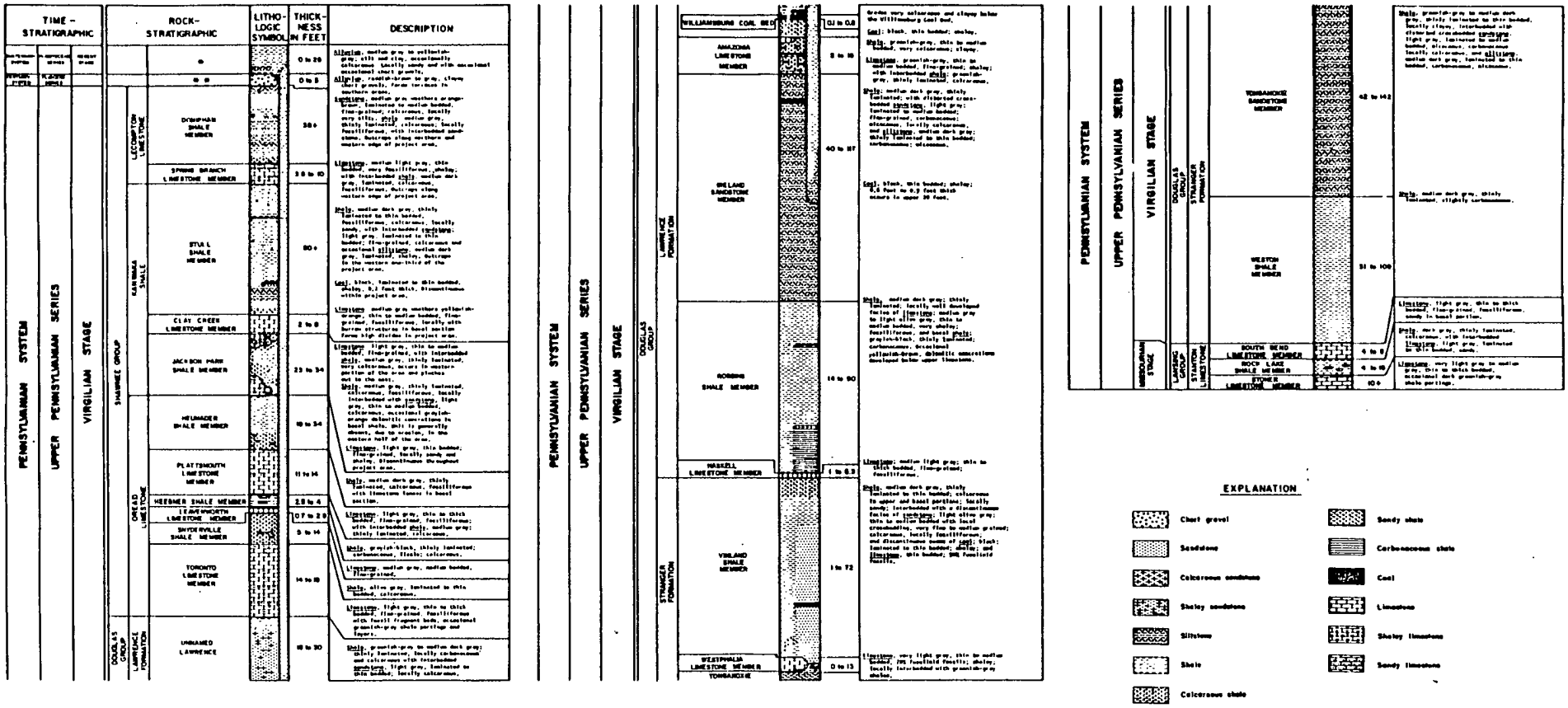
TOPOGRAPHIC CONTOUR INTERVAL IS 10 FEET WITH SUPPLEMENTARY CONTOURS AT 5 FEET.

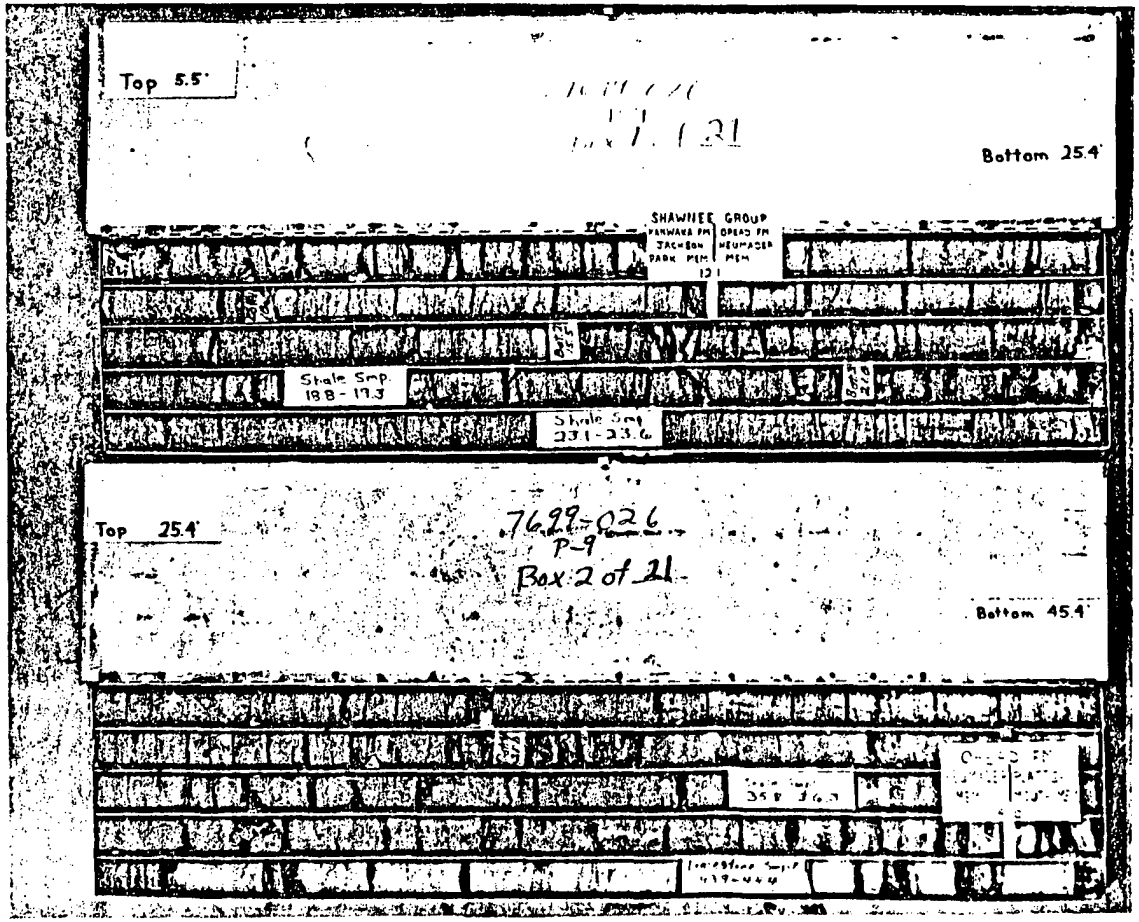
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-40

Soil Conservation Service Soils Map - Site

Rev. 0


TIME - STRATIGRAPHIC
ROCK-STRATIGRAPHIC
LITHO-LOGIC SYMBOL
THICK-NESS IN FEET
DESCRIPTION
PENNSYLVANIAN SYSTEM
UPPER PENNSYLVANIAN SERIES
VIRGILLIAN STAGE
SHAWNEE GROUP
DOUGLAS GROUP
LECOMPTON LIMESTONE
KANWAKA SHALE
OREAD LIMESTONE
LAWRENCE FORMATION
DOUGLAS GROUP
STRANGER FORMATION
TONGANOXIE
DOUBTFUL
0 to 20
0 to 8
DOUBTFUL
DOUBTFUL
DOUBTFUL



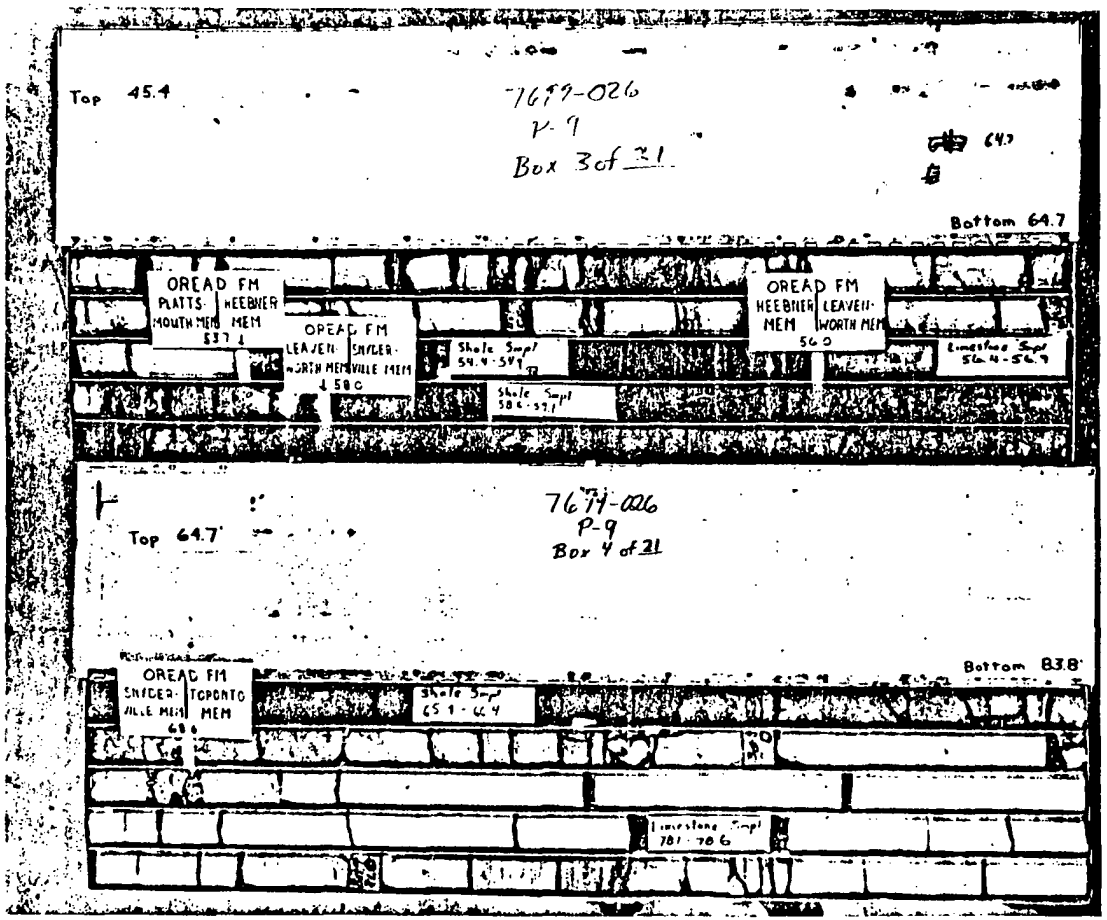
NOTE:
LOG OF BORING P-9 IS SHOWN ON FIGURE 2.5-351.

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-42a

Photographs of Rock Core 5.5 - 45.4 ft.



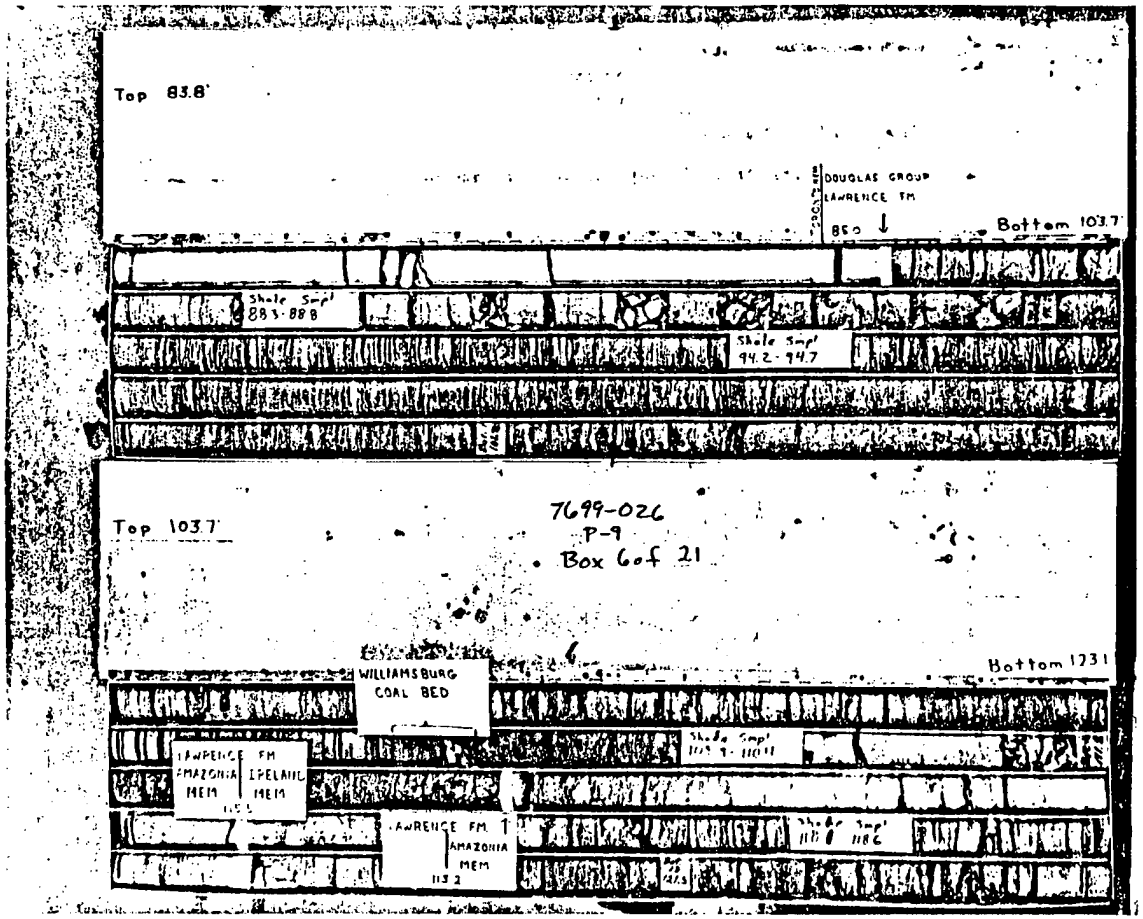
NOTE:
LOG OF BORING P-9 IS SHOWN ON FIGURE 2.5-351.

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-42b

Photographs Of Rock Core
45.4-83.8 Feet



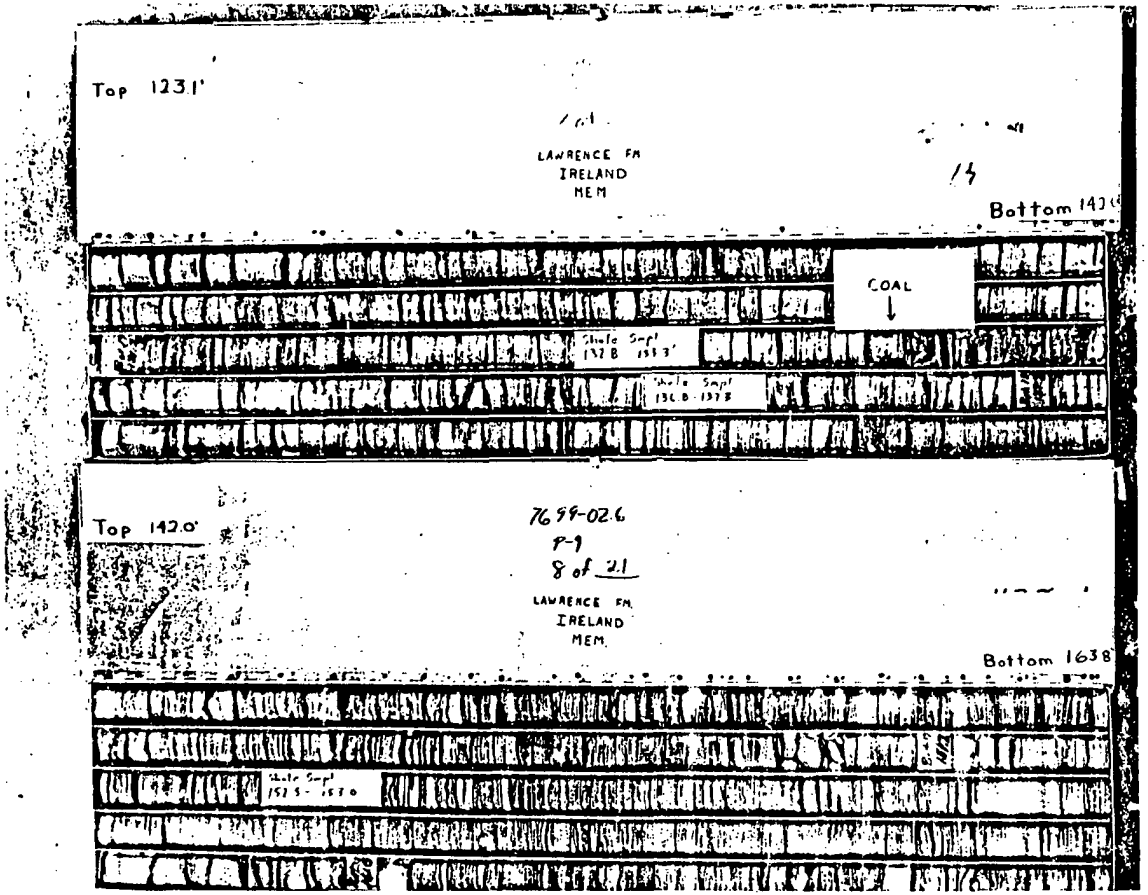
NOTE:
LOG OF BORING P-9 IS SHOWN ON FIGURE 2.5-351.

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-42c

Photographs Of Rock Core
83.8-123.1 Feet



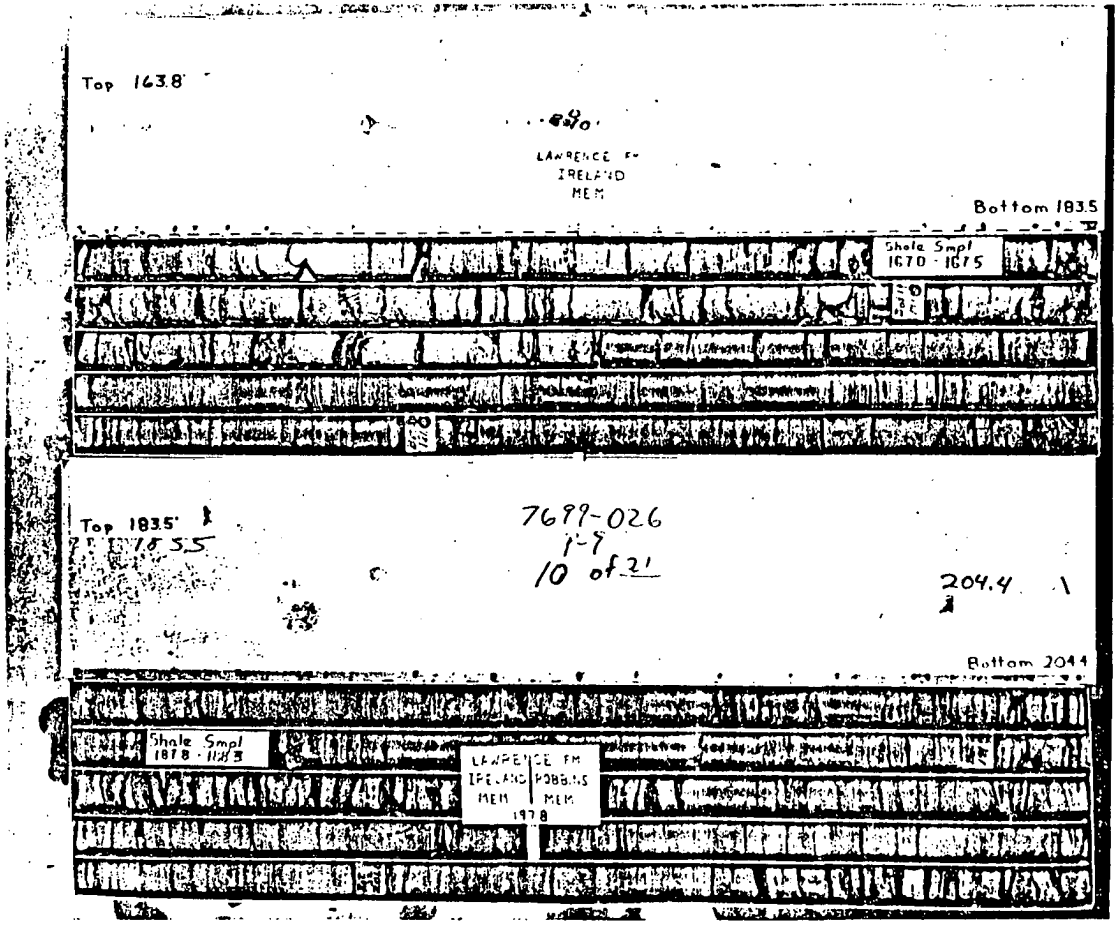
NOTE:
LOG OF BORING P-9 IS SHOWN ON FIGURE 2.5-35i.

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-42d

Photographs Of Rock Core
123.1-163.8 Feet



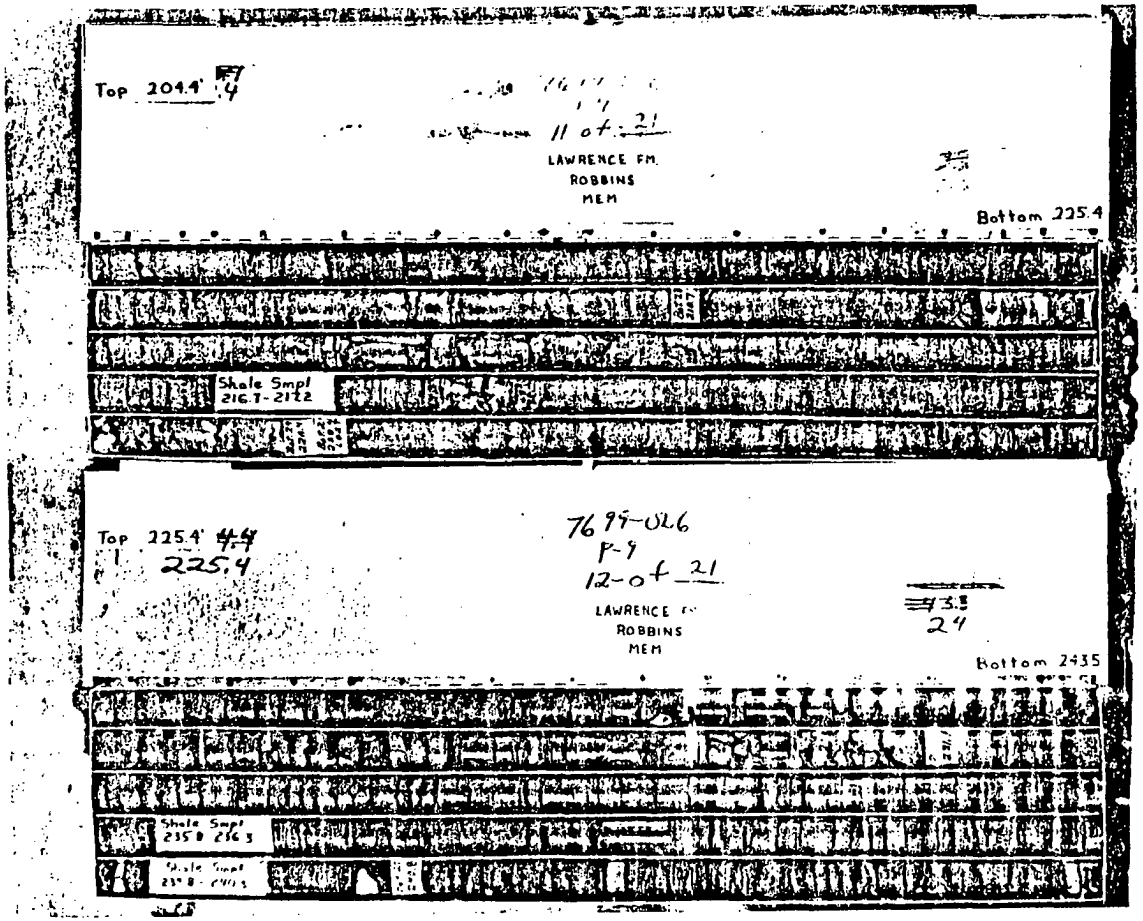
NOTE:
LOG OF BORING P-9 IS SHOWN ON FIGURE 2.5-351.

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-42e

Photographs Of Rock Core
163.8-204.4 Feet



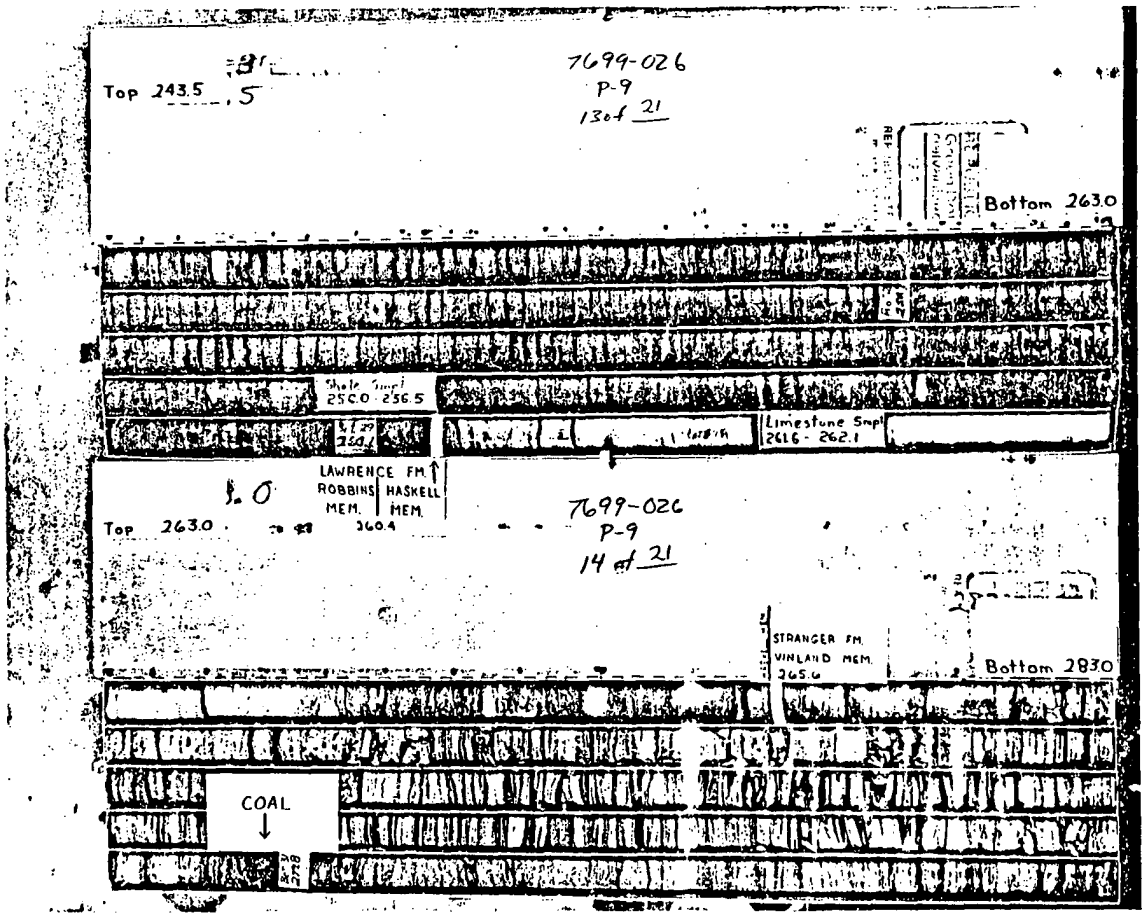
NOTE:
LOG OF BORING P-9 IS SHOWN ON FIGURE 2.5-35f.

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-42f

Photographs Of Rock Core
204.4-243.5 Feet



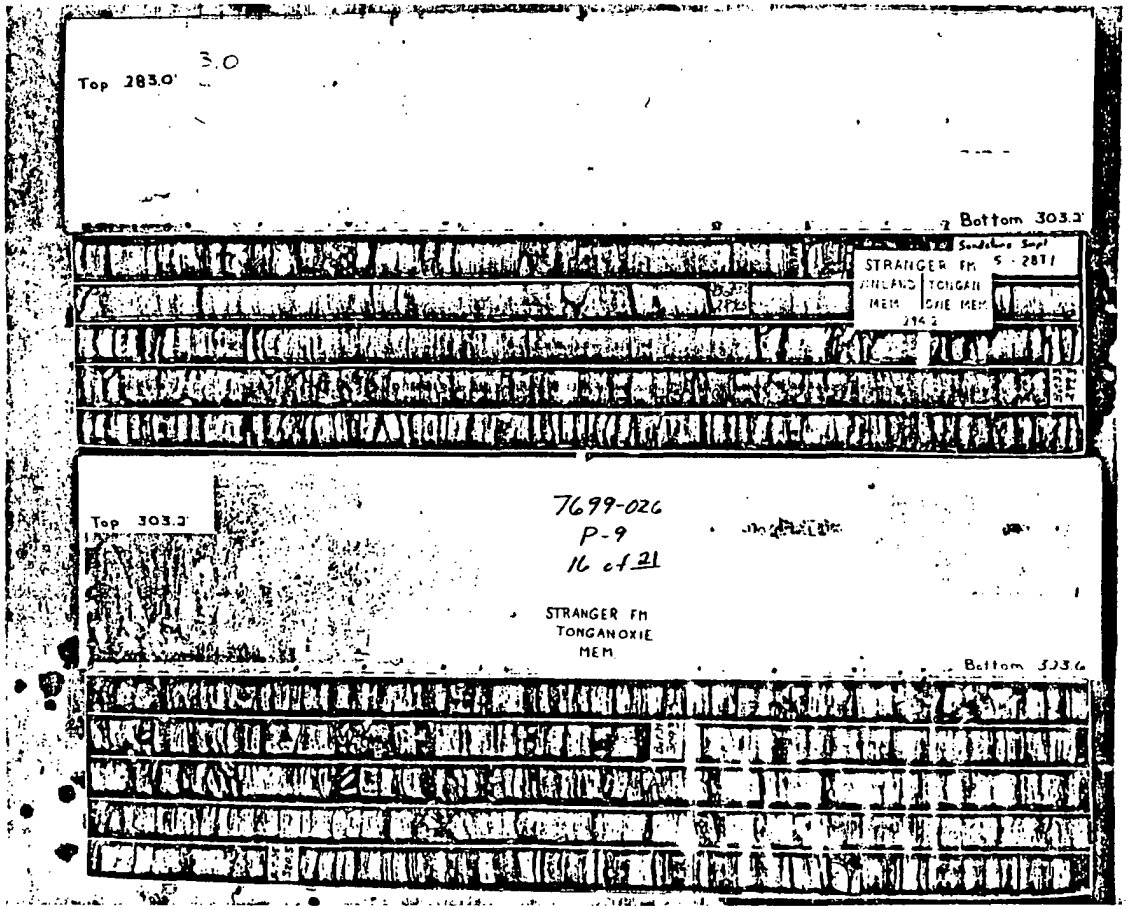
NOTE:
LOG OF BORING P-9 IS SHOWN ON FIGURE 2.5-35f.

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-42g

Photographs of Rock Core
243.5-283.0 feet



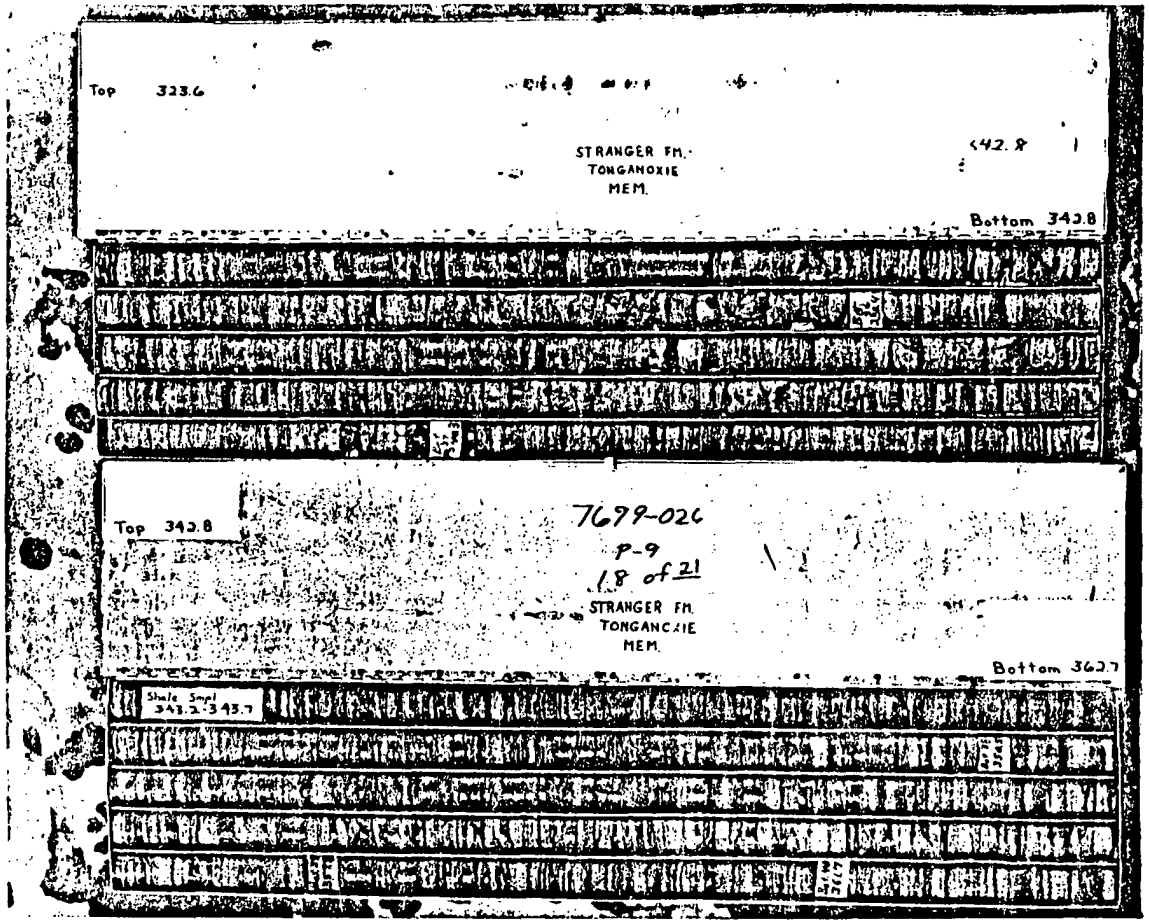
NOTE:
LOG OF BORING P-9 IS SHOWN ON FIGURE 2.5-351.

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-42h

Photographs of Rock Core
283.0-323.6 Feet



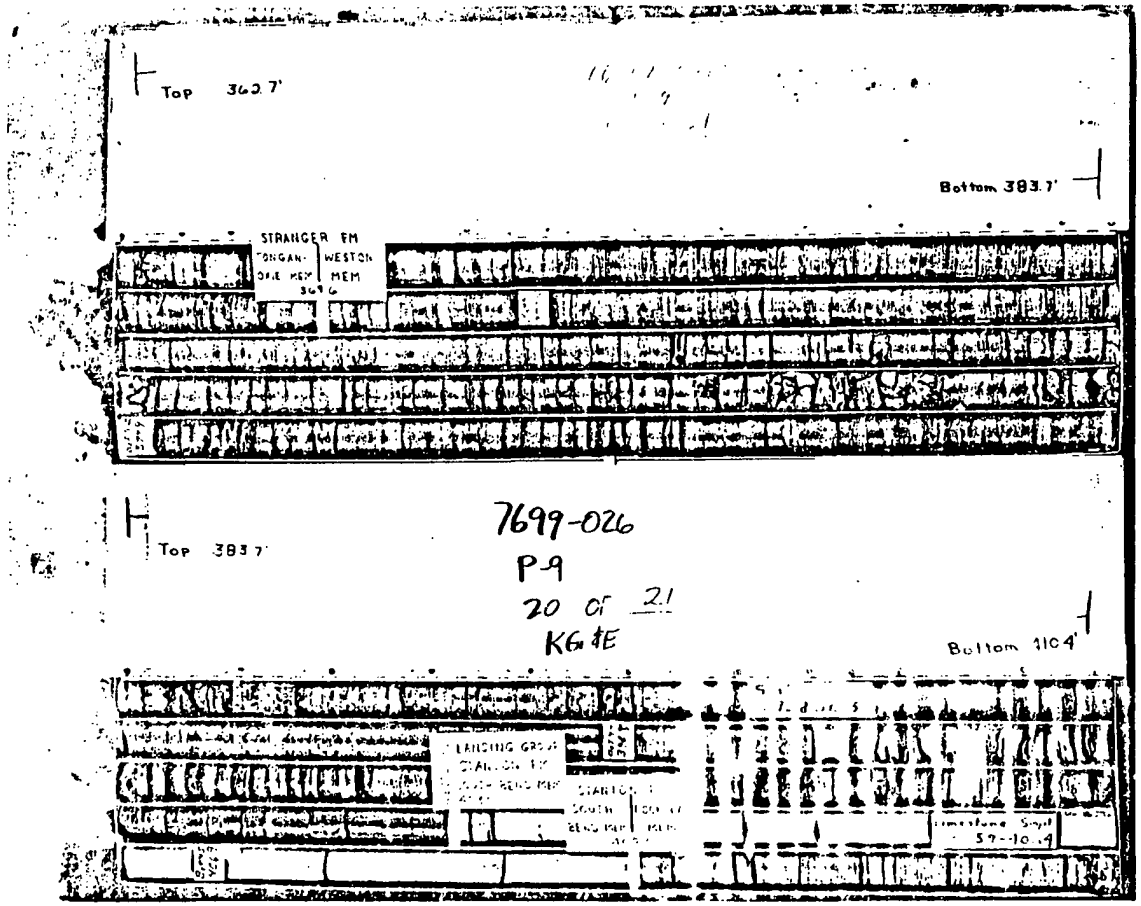
NOTE:
LOG OF BORING P-9 IS SHOWN ON FIGURE 2.5-35i.

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-42i

Photographs Of Rock Core
323.6-362.7 Feet



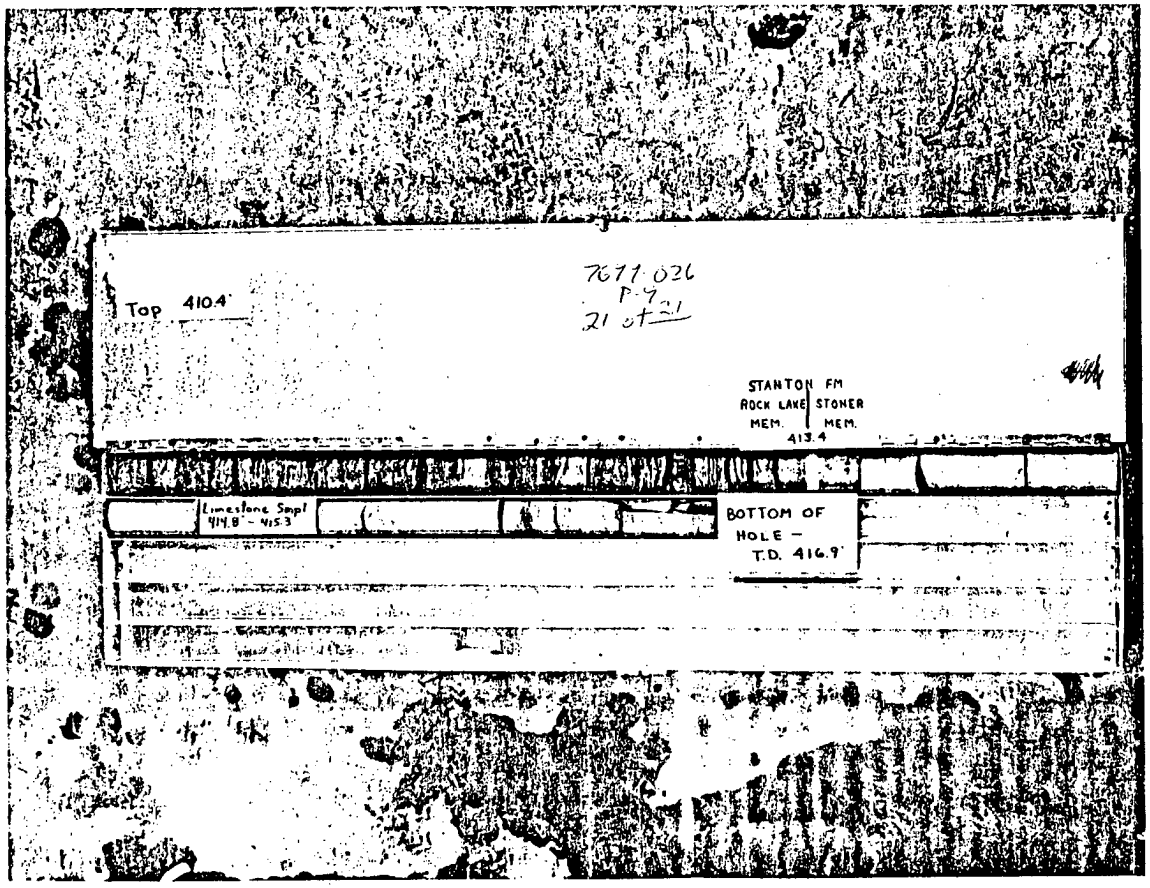
NOTE:
LOG OF BORING P-9 IS SHOWN ON FIGURE 2.5-35i.

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-42j

Photographs Of Rock Core
362.7-410.4 Feet



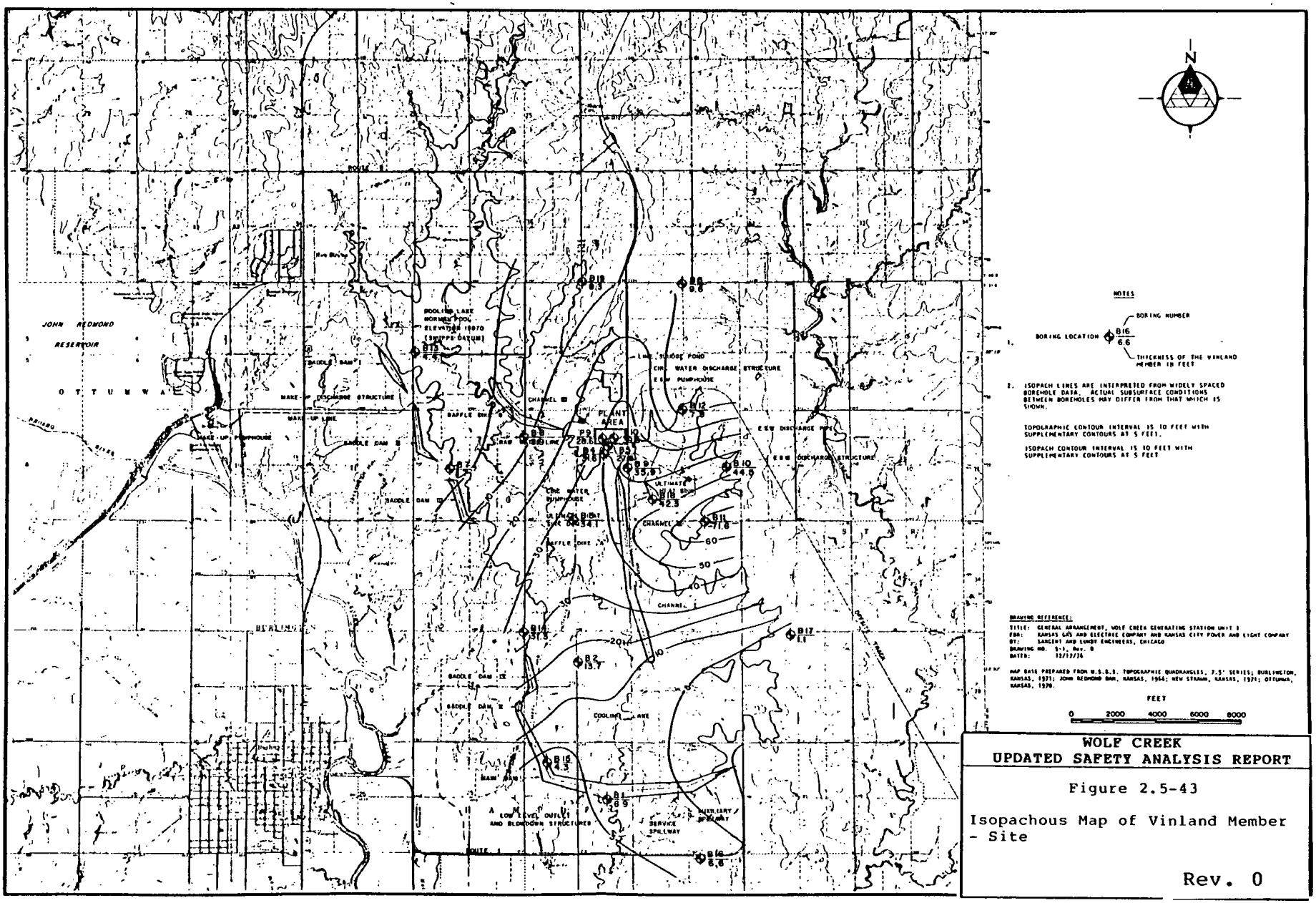
NOTE:
LOG OF BORING P-9 IS SHOWN ON FIGURE 2.5-351.

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5 42k

Photographs Of Rock Core
410.4-416.9 Feet

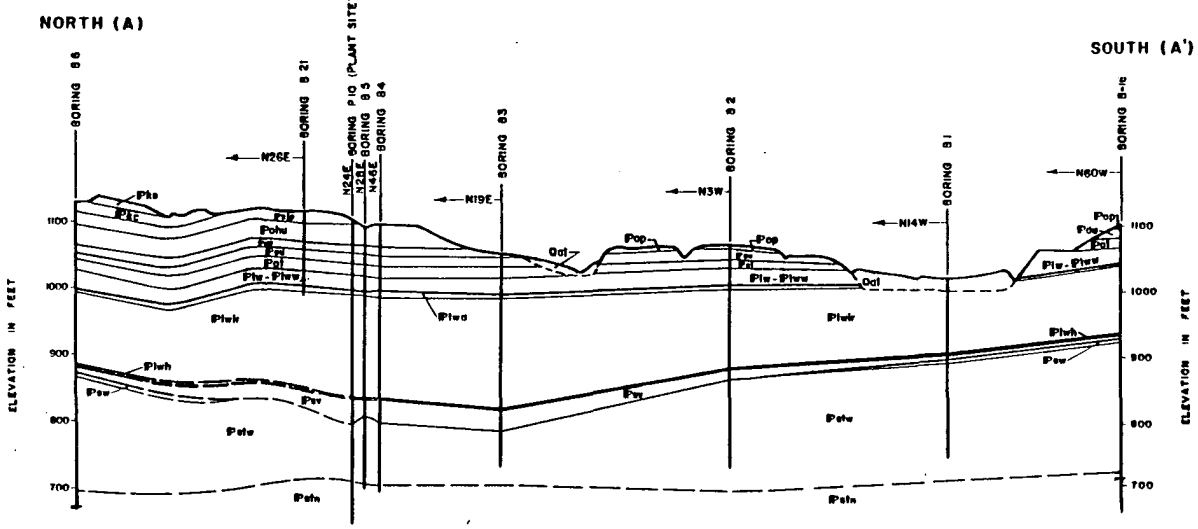


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

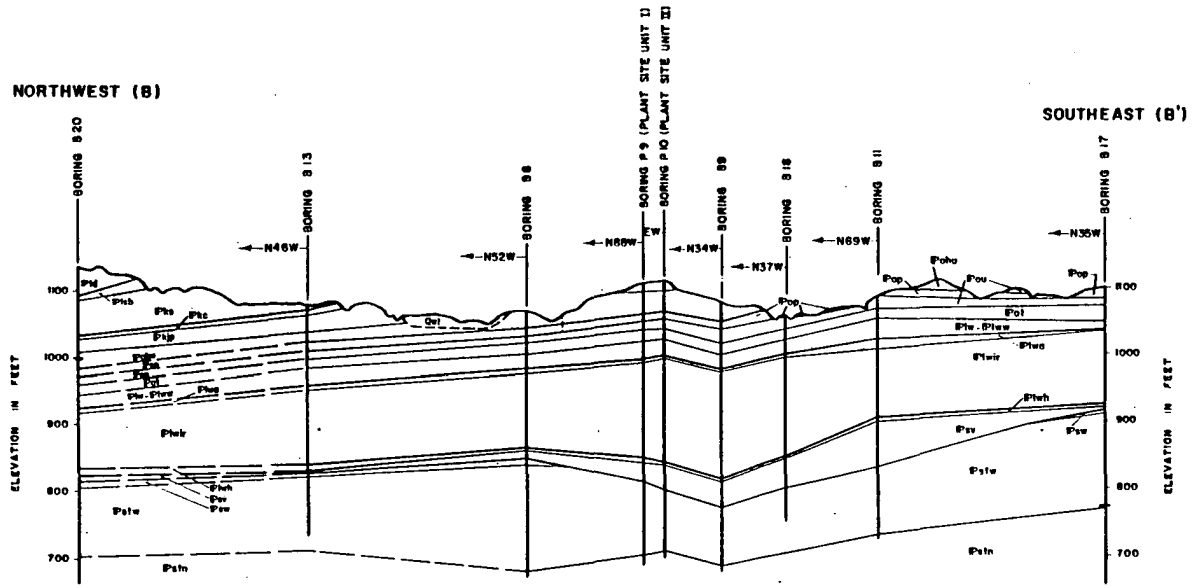
Figure 2.5-43

Isopachous Map of Vinland Member - Site

Rev. 0



SECTION A - A'



SECTION B - B'

VERTICAL EXAGGERATION· 20X

EXPLANATION

CONTACT BETWEEN UNITS

INFERRED CONTACT BETWEEN UNITS

N35W AZIMUTH OF CROSS-SECTION

STRATIGRAPHIC COLUMN

SYMBOL	STRATIGRAPHIC MEMBER
Qal	Quaternary Alluvium
Ptd	Doniphan Shale Member
Ptsb	Spring Branch Limestone Member
Pts	Stull Shale Member
Ptc	Clay Creek Limestone Member
Ptjp	Jackson Park Shale Member
Poho	Heumader Shale Member
Pop	Plattsmouth Limestone Member
Pou	Undifferentiated Heebner Shale, Leavenworth Limestone and Snyderville Shale Members
Pot	Toronto Limestone Member
Ptw	Unnamed Lawrence Shale
Ptwu	Williamsburg Coal Bed
Ptwa	Amazonia Limestone Member
Ptwir	Undifferentiated Ireland Sandstone and Robbins Shale Members
Ptwh	Haskell Limestone Member
Psv	Vinland Shale Member
Psw	Westphalia Limestone Member
Pstw	Undifferentiated Tonganoxie Sandstone and Weston Shale Members
Pstn	Stanton Limestone Member

NOTES

1. LOCATION OF THE SECTIONS ARE SHOWN ON FIGURE 2.5-28.
2. SECTIONS ARE INTERPRETED FROM WIDELY SPACED BOREHOLES IN THE AREA. ACTUAL SUBSURFACE CONDITIONS BETWEEN BOREHOLES MAY DIFFER FROM THAT SHOWN.
3. GROUND-WATER LEVEL GENERALLY PARALLELS TOPOGRAPHY AND IS 6 TO 10 FEET BELOW GROUND SURFACE.
4. A DETAILED SITE STRATIGRAPHIC SECTION IS SHOWN ON FIGURE 2.5-41.
5. FIGURE 2.5-27 IS A SURFICIAL GEOLOGIC MAP.
6. RESIDUAL SOIL IS NOT SHOWN. IT IS MOST DEEPLY DEVELOPED IN SHALE UNITS WHERE THE THICKNESS RANGES FROM 5 TO ABOUT 20 FEET. IN LIMESTONE, IT RANGES FROM 0 TO A MAXIMUM ABOUT 8.5 FEET. REFER TO THE BORING LOGS FIGURES 2.5-34a THROUGH 2.5-34u; 2.5-35a THROUGH 2.5-35kk; 2.5-36a THROUGH 2.5-36111 AND THE TEST PITS LOGS FIGURES 2.5-37a THROUGH 2.5-37g.
7. ELEVATIONS ARE BASED ON MEAN SEA LEVEL.

1000 0 1000 2000

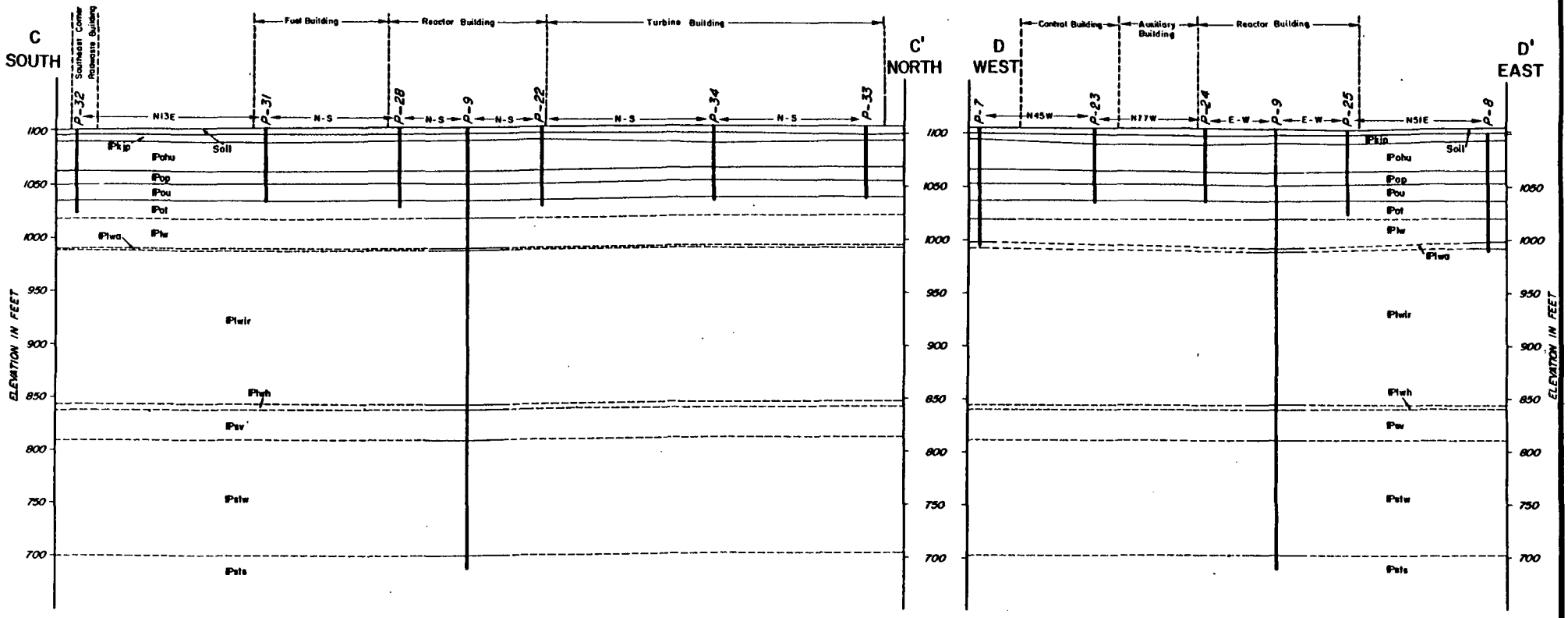
HORIZONAL SCALE IN FEET

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-44

Geologic Cross-Sections A-A' and B-B' - Site

Rev. 0



EXPLANATION:

- IPkjp – JACKSON PARK SANDSTONE MEMBER
- IPohu – HEUMADER SHALE MEMBER
- IPop – PLATTSMOUTH LIMESTONE MEMBER
- IPou – UNDIFFERENTIATED HEEBNER SHALE, LEAVENWORTH LIMESTONE AND SNYDERVILLE SHALE MEMBERS
- IPot – TORONTO LIMESTONE MEMBER
- IPlw – UNNAMED LAWRENCE SHALE MEMBER
- IPwa – AMAZONIA LIMESTONE MEMBER
- IPwir – UNDIFFERENTIATED IRELAND SANDSTONE AND ROBBINS SHALE MEMBERS
- IPwh – HASKELL LIMESTONE MEMBER
- IPsv – VINLAND SHALE MEMBER, UNDIFFERENTIATED TONGANOXIE
- IPstw – SANDSTONE AND WESTON SHALE MEMBER
- IPsts – STANTON LIMESTONE FORMATION

———— CONTACT BETWEEN UNITS

- - - - - - - - INFERRED CONTACT BETWEEN UNITS

←N51E→ AZIMUTH OF CROSS-SECTION

FEET

100 50 0 50 100

NOTES:

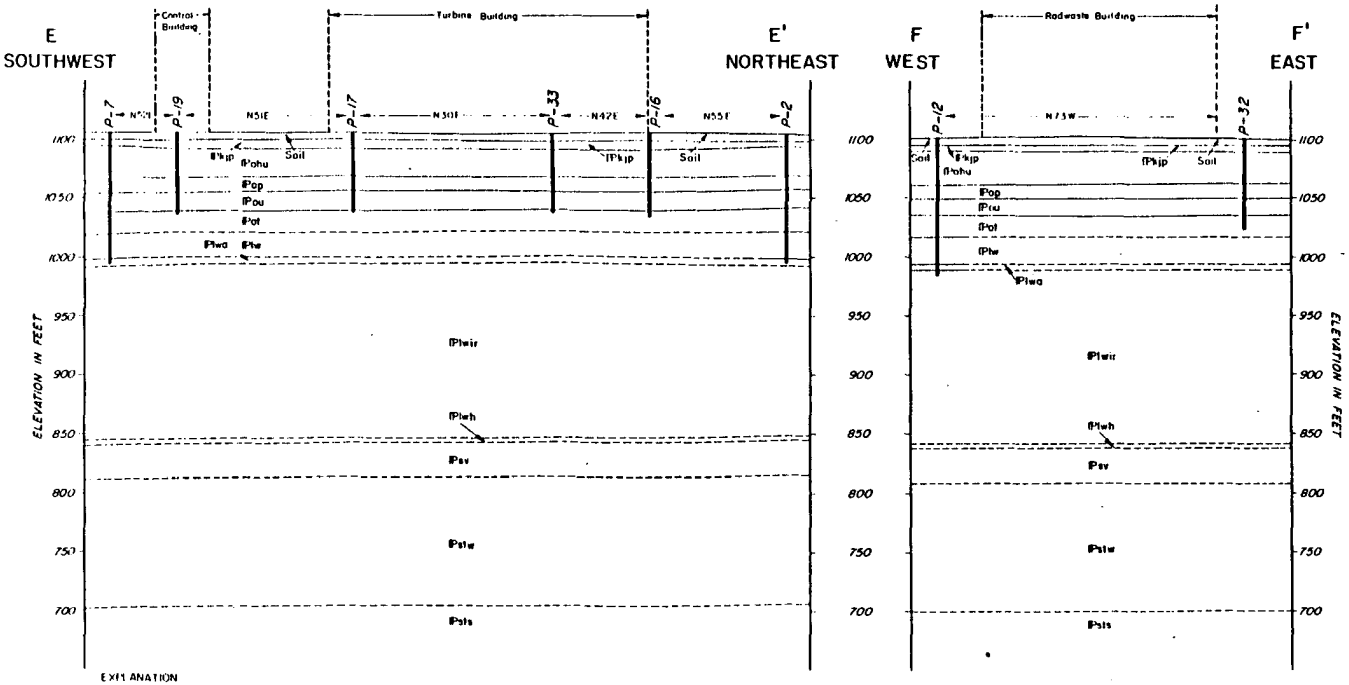
1. SUBSURFACE INFORMATION BELOW THE BASE OF THE AMAZONIA LIMESTONE MEMBER IS BASED ON STRATIGRAPHIC THICKNESSES OBTAINED FROM BORING P-9.
2. ELEVATIONS REFER TO MEAN SEA LEVEL.
3. LOCATIONS OF BOREHOLES AND CROSS-SECTION LINES ARE SHOWN ON FIGURES 2.5-30 AND 2.5-31.
4. SECTIONS ARE INTERPRETED FROM BOREHOLE DATA AND GEOLOGIC EXCAVATION MAPPING. ACTUAL SUBSURFACE CONDITIONS BETWEEN BOREHOLES AND BELOW EXCAVATION GRADE MAY DIFFER FROM THAT WHICH IS SHOWN.
5. A DETAILED SITE STRATIGRAPHIC SECTION IS SHOWN ON FIGURE 2.5-41.
6. PLANT STRUCTURE BOUNDARIES ARE SHOWN WHERE THEY INTERSECT CROSS-SECTION LINES.
7. FINAL EXCAVATION GRADE IS SHOWN ON FIGURE 2.5-10A.

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-45

Geologic Cross-Sections C-C' and D-D' - Plant Site



EXPLANATION

IPkjp – KANSAS CITY GROUP, JOHNSON SHALE MEMBER, PLATTE WOODS LIMESTONE MEMBER, AND UNDIFFERENTIATED INTERVENING SHALE

IPohu – HOUSER CREEK MEMBER

IPop – PLATTE WOODS LIMESTONE MEMBER, UNDIFFERENTIATED INTERVENING SHALE

IPou – ELWOOD AND IATAN LIMESTONE AND UNDIFFERENTIATED SHALE MEMBERS

IPot – IATAN LIMESTONE MEMBER

IPw – UNDIVIDED LAWRENCE SHALE MEMBER

IPwa – ANNAMOSA LIMESTONE MEMBER

IPwir – UNDIFFERENTIATED IRELAND SANDSTONE AND NORDEN SHALE MEMBERS

IPwh – HASKELL LIMESTONE MEMBER

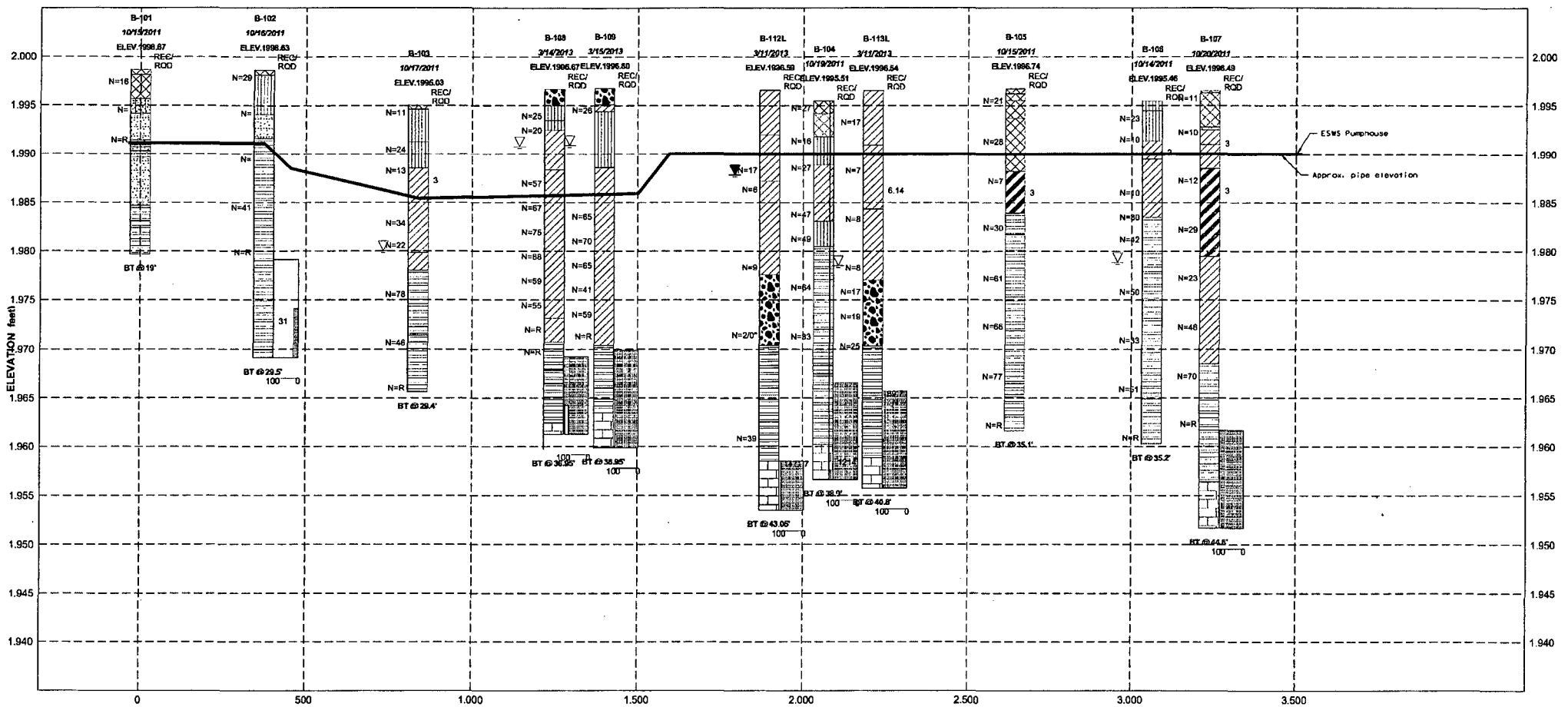
IPsv – VINLAND SHALE MEMBER

IPsw – UNDIFFERENTIATED DOUGLAS SANDSTONE AND WESTON SHALE MEMBERS

IPss – STANTON LIMESTONE FORMATION

——— – CONTACT REVISED UNITS

– – – –



LITHOLOGY GRAPHICS

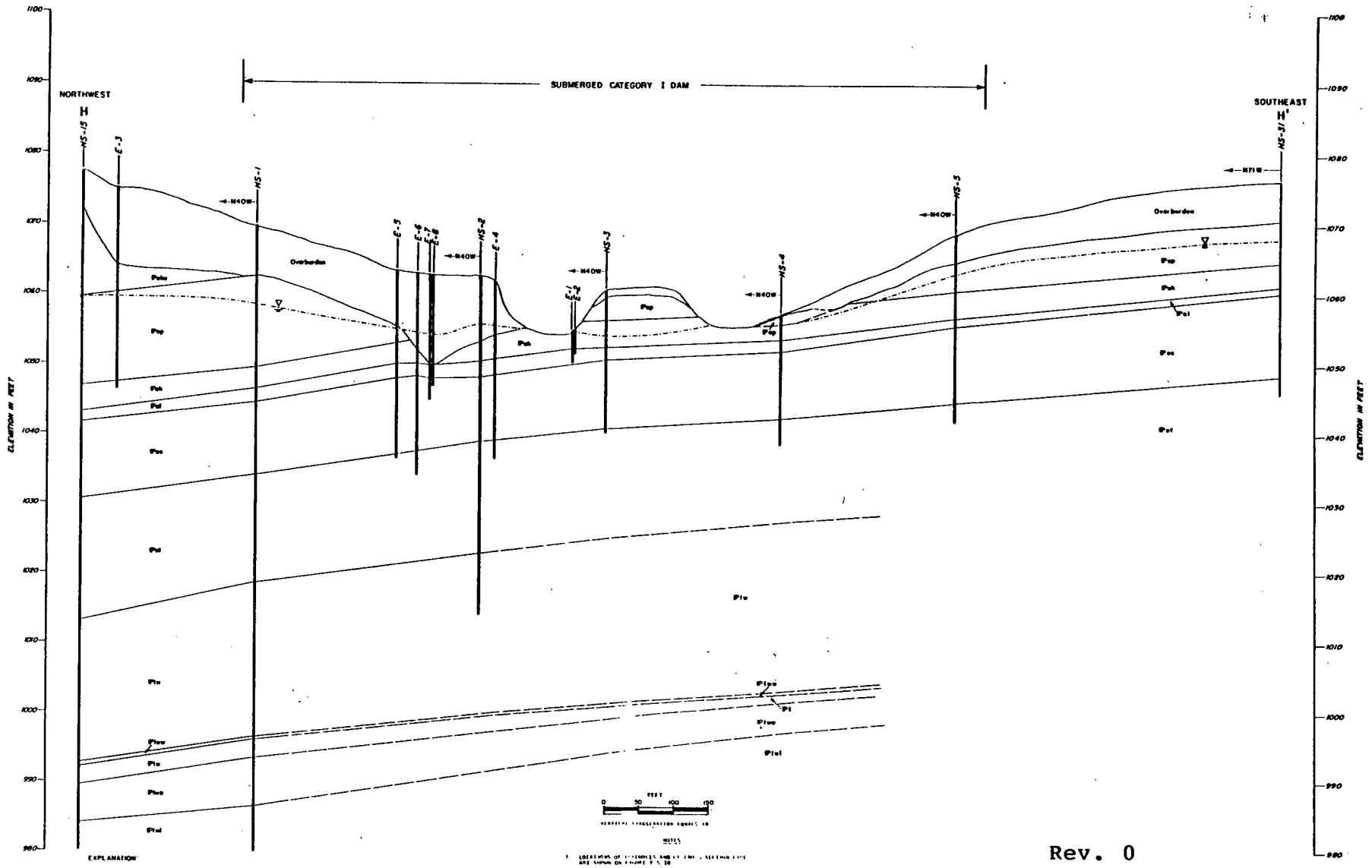
- Fat clay, high plasticity
- Lean clay, low to moderate plasticity
- CLAY AND CLAYEY SAND (CH/SC)
- Fill (made ground)
- % Recovery (Unshaded) & % RQD (Shaded) per run
- Clean gravel
- Limestone
- Low to moderate plasticity silt
- Shale
- ESWS Discharge and Intake Pipe Invert
- Silty Sand
- Sandstone

REFERENCE:

25707-000-V14-CY05-00015-003

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-47 Rev. 28
Geologic Cross Section
ESWS Pipeline - Powerblock to Pumphouse
Sheet 1 of 1

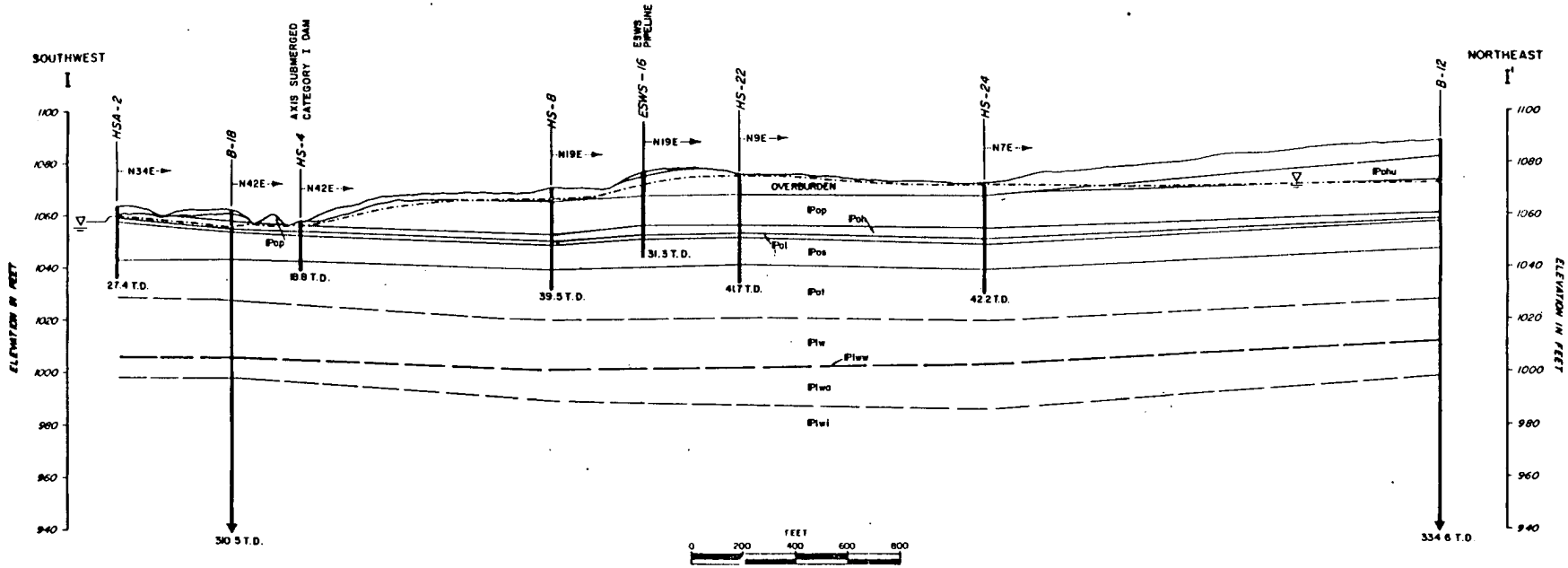


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-48

Geologic Cross-Section H-H' - Ultimate Heat Sink



EXPLANATION

(Pohu - HEINBAUER SHALE MEMBER
(Pop - PLATTSMOUTH LIMESTONE MEMBER
(Poh - HEEBNER SHALE MEMBER
(Pol - LEAVENWORTH LIMESTONE MEMBER
(Pos - SNYDERVILLE SHALE MEMBER
(Pot - TOPEKA LIMESTONE MEMBER
(Plw - UNNAMED LAWRENCE SHALE MEMBER
(Plww - WILLIAMSBURG COAL BED
(Plwa - AMAZONIA LIMESTONE MEMBER
(Plwi - IRELAND SANDSTONE MEMBER

CONTACT BETWEEN UNITS

INFERRED CONTACT BETWEEN UNITS

N19E AZIMUTH OF CROSS-SECTION

FEET
0 200 400 600 800
VERTICAL EXAGGERATION APPROXIMATELY 10x

NOTES

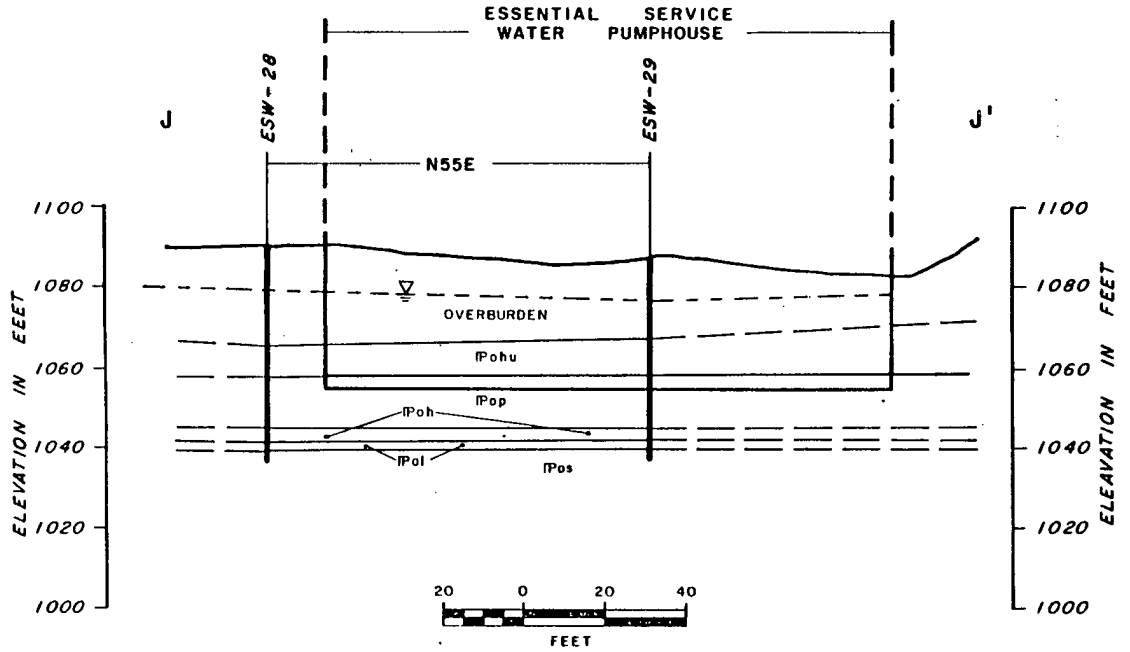
1. LOCATIONS OF BOREHOLES AND OF CROSS-SECTION LINE ARE SHOWN ON FIGURE 2.5-30.
2. ELEVATIONS REFER TO MEAN SEA LEVEL.
3. SECTIONS ARE INTERPRETED FROM BOREHOLE DATA. LOCAL SUBSURFACE CONDITIONS BETWEEN BOREHOLES MAY DIFFER FROM THAT WHICH IS SHOWN.
4. A DETAILED SITE STRATIGRAPHIC SECTION IS SHOWN ON FIGURE 2.5-48.
5. ESWS-ESSENTIAL SERVICE WATER SYSTEM.

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-49

Geologic Cross-Section I-I' - Ultimate Heat Sink



EXPLANATION

- Pjp - JACKSON PARK SHALE MEMBER
- Pohu - HUMMADER SHALE MEMBER
- Pop - PLATTSMOUTH LIMESTONE
- Poh - HEEBNER SHALE MEMBER
- Pol - LEAVENWORTH LIMESTONE MEMBER
- ▽ - PIEZOMETRIC SURFACE
- Pos - SNYDERVILLE SHALE MEMBER
- Pot - TOPONTO LIMESTONE MEMBER
- ——— CONTACT BETWEEN UNITS
- — — — INFERRED CONTACT BETWEEN UNITS
- —N55E→ AZIMUTH OF CROSS-SECTION

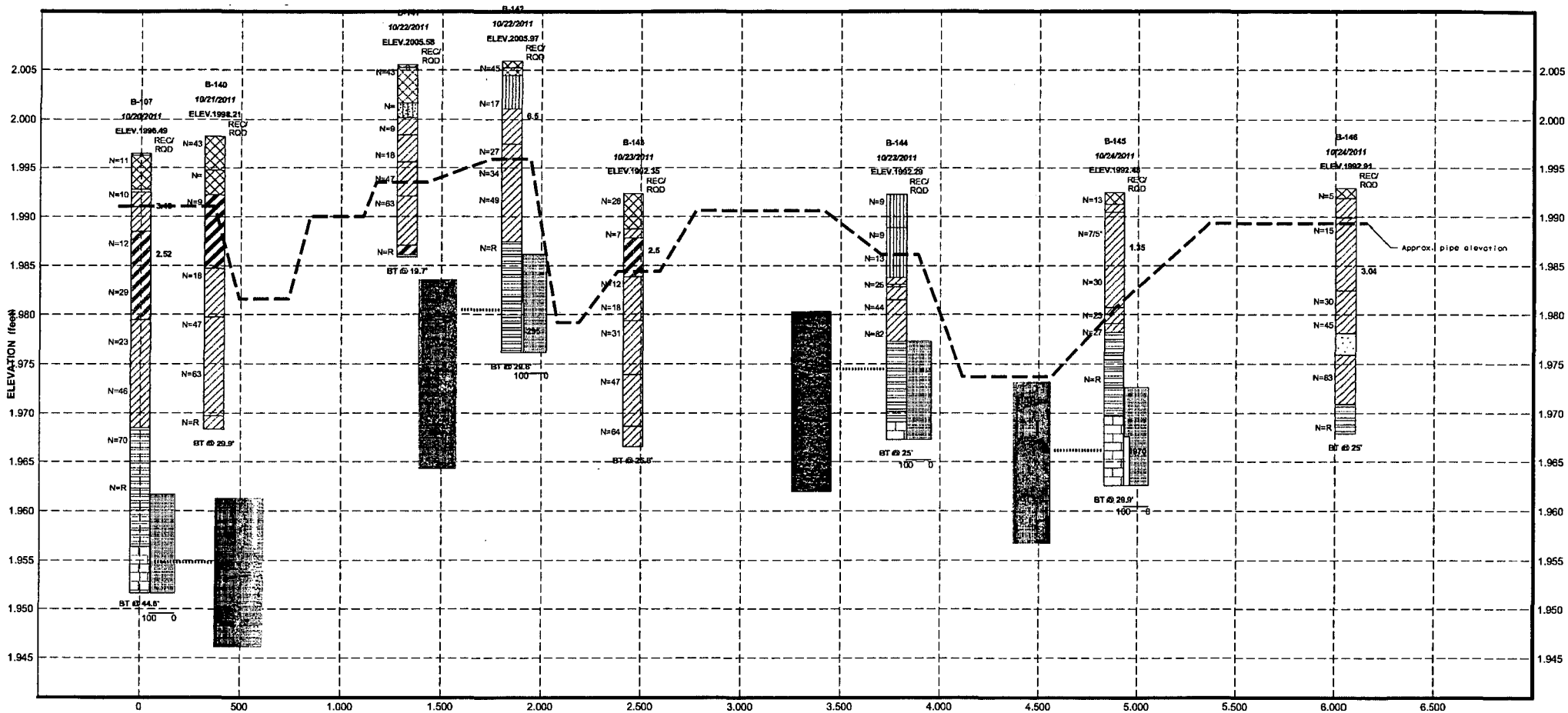
NOTES:
1. LOCATIONS OF BOREHOLES AND OF CROSS-SECTION LINE ARE SHOWN ON FIGURE 2.5-30.
2. ELEVATIONS REFER TO MEAN SEA LEVEL.
3. SECTIONS ARE INTERPRETED FROM BOREHOLE DATA. ACTUAL SUBSURFACE CONDITIONS BETWEEN BOREHOLES MAY DIFFER FROM THAT WHICH IS SHOWN.
4. A DETAILED SITE STRATIGRAPHIC SECTION IS SHOWN ON FIGURE 2.5-41.
5. ESWS-ESSENTIAL SERVICE WATER SYSTEM.

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-50

Geologic Cross-Section J-J' - ESWS Pumphouse



LITHOLOGY GRAPHICS

- Fat clay, high plasticity
- Lean clay, low to moderate plasticity
- Fill (made ground)
- Limestone
- Low to moderate plasticity silt
- Shale
- Silty Clay
- Silty Sand
- Clean sand, poorly graded
- Sandstone

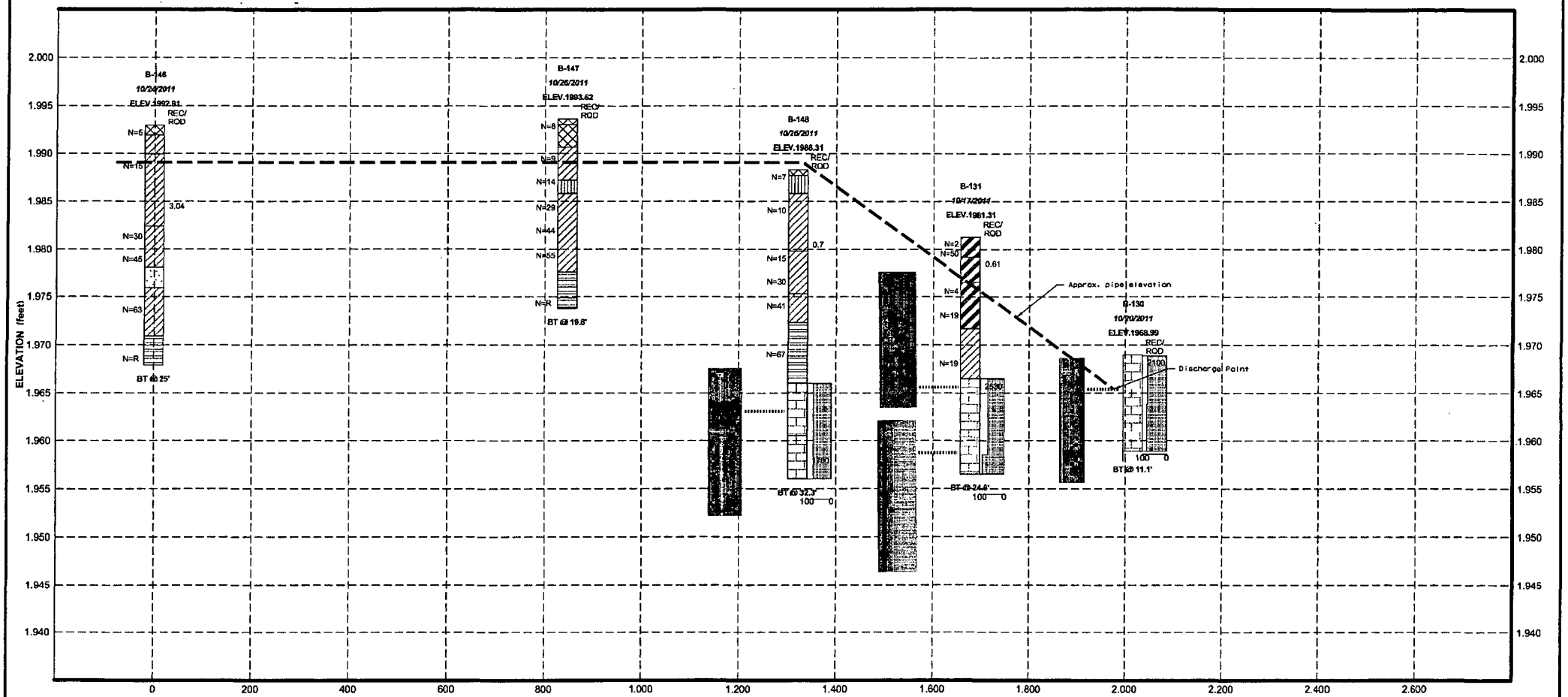
- % Recovery (Unshaded) & % RQD (Shaded) per run
- N=70 SPT N-value
- N=R SPT Refusal
- 3.46 UCS Failure Stress (ksf)
- ESWS Discharge Piping Invert

REFERENCE:

25707-000-V14-CY05-00015-003

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-51 Rev. 28
Geologic Cross-Section
ESWS Pipeline
Sheet 1 of 2



LITHOLOGY GRAPHICS

- Fat clay, high plasticity
- Lean clay, low to moderate plasticity
- Fill (made ground)
- Limestone
- Low to moderate plasticity silt
- Shale
- Silty Clay
- Silty Sand
- Clean sand, poorly graded
- Sandstone

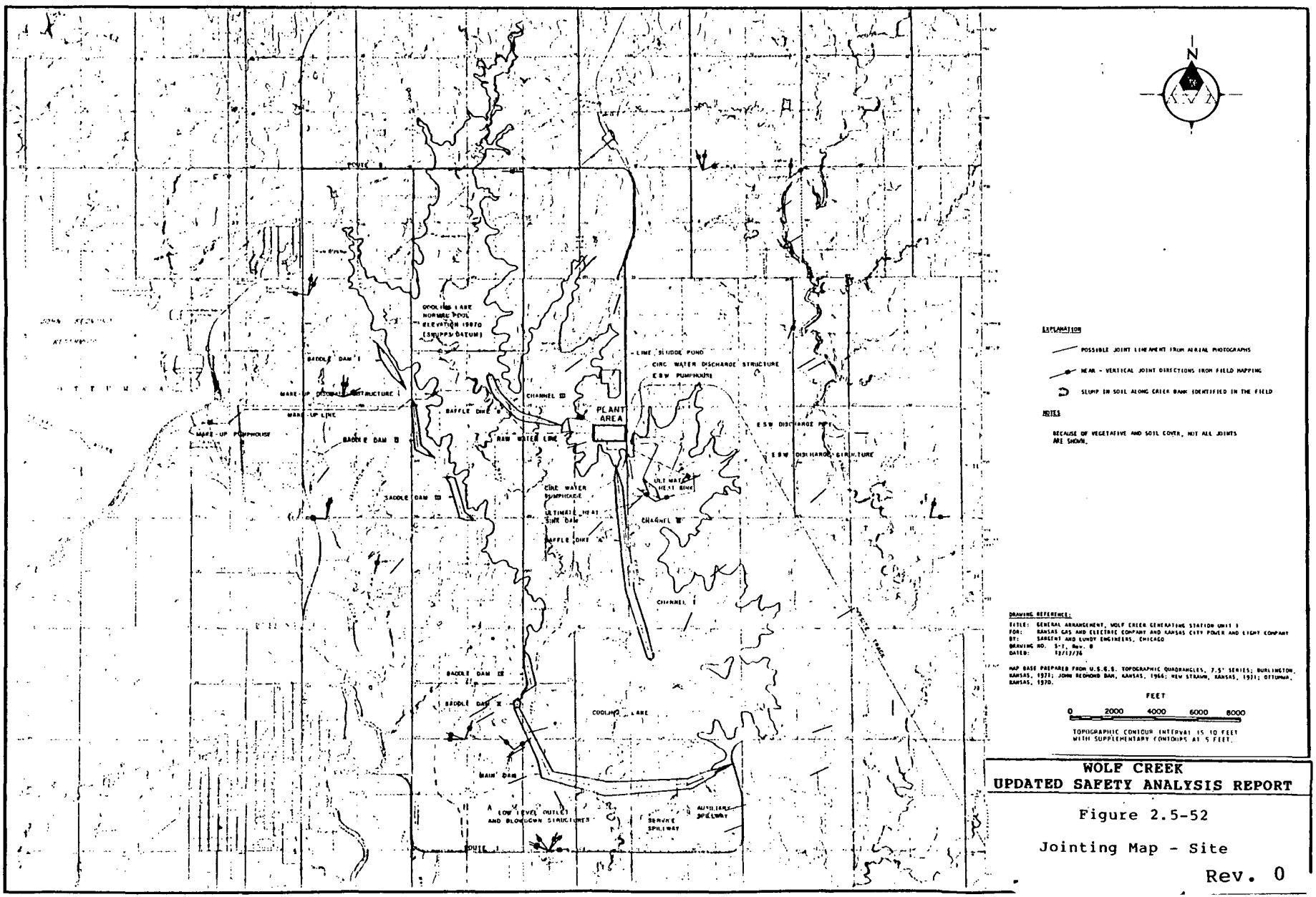
- % Recovery (Unshaded) & % RQD (Shaded) per run
- N=70 SPT N-value
- N=R SPT Refusal
- 3.46 UCS Failure Stress (ksf)
- ESWS Discharge Piping Invert

REFERENCE:

25707-000-V14-CY05-00015-003

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-51 Rev. 28
Geologic Cross-Section
ESWS Discharge Piping
Sheet 2 of 2

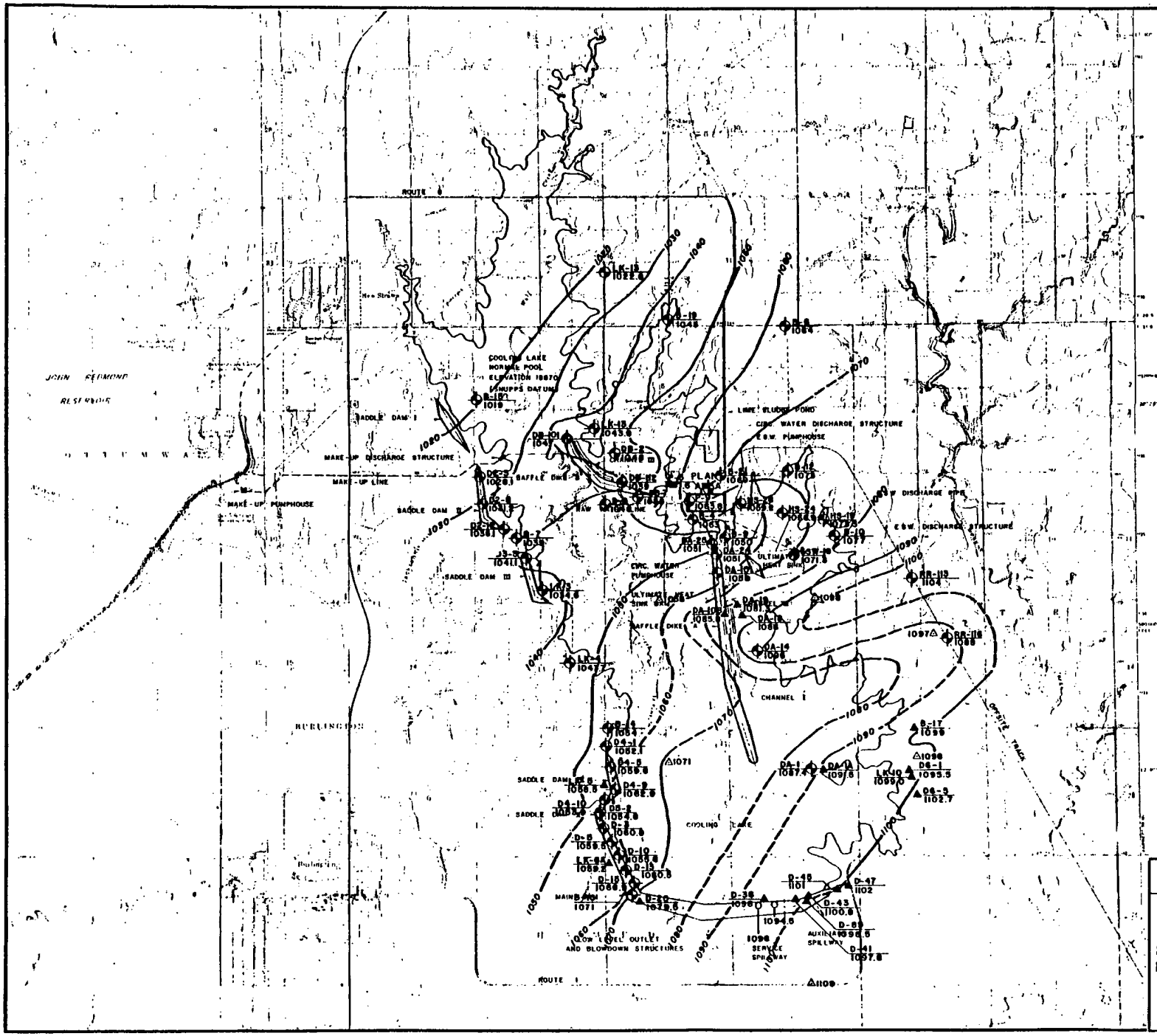


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-52

Jointing Map - Site

Rev. 0



NOTES:

1. BORING LOCATION ◆ B-16 / 733.5 — BORING NUMBER; TOP ELEVATION OF PLATTSMOUTH LIMESTONE MEMBER
3. BORING LOCATION ▲ LK-10 / 1099 — BORING NUMBER; PROJECTED TOP ELEVATION OF PLATTSMOUTH LIMESTONE MEMBER FROM THE BASE OF THE PLATTSMOUTH LIMESTONE MEMBER
3. PROJECTED ELEVATION POINT △ 1071 — PROJECTED TOP ELEVATION OF PLATTSMOUTH LIMESTONE MEMBER FROM THE BASE OF THE PLATTSMOUTH LIMESTONE MEMBER (OUTCROP)
4. O_{1096} ELEVATION FROM GEOLOGICAL EXCAVATION MAPPING
5. STRUCTURAL CONTOUR LINES INTERPRETED FROM WIDELY SPACED BOREHOLE DATA. ACTUAL SUBSURFACE CONDITIONS BETWEEN BOREHOLES MAY DIFFER FROM THAT SHOWN.
6. DASHED CONTOURS REPRESENT PROJECTION OF THE TOP OF THE PLATTSMOUTH LIMESTONE MEMBER WHERE IT HAS BEEN REMOVED BY EROSION.
7. A DETAILED STRUCTURE CONTOUR MAP OF PLATTSMOUTH LIMESTONE IN THE THE CATEGORY I AREA IS SHOWN ON FIGURE 2.5-58.
8. A DETAILED STRUCTURAL CONTOUR MAP OF PLATTSMOUTH LIMESTONE IN THE PLANT SITE IS SHOWN ON FIGURE 2.5-59.

TOPOGRAPHIC CONTOUR INTERVAL IS 10 FEET WITH SUPPLEMENTARY CONTOURS AT 5 FEET.

STRUCTURAL CONTOUR INTERVAL IS 10 FEET.

DRAWING REFERENCE:
TITLE: GENERAL ARRANGEMENT, WOLF CREEK GENERATING STATION UNIT 1
FOR: KANSAS GAS AND ELECTRIC COMPANY AND KANSAS CITY POWER AND LIGHT COMPANY
BY: SARGENT AND LUNDY ENGINEERS, CHICAGO
DRAWING NO. S-1, Rev. 8
DATED: 12/17/76

MAP BASE PREPARED FROM U.S.G.S. TOPOGRAPHIC QUADRANGLES, 7.5' SERIES; BURLINGTON, KANSAS, 1971; JOHN REDMOND DAM, KANSAS, 1966; NEW STRAWN, KANSAS, 1971; OTTUMWA, KANSAS, 1970.

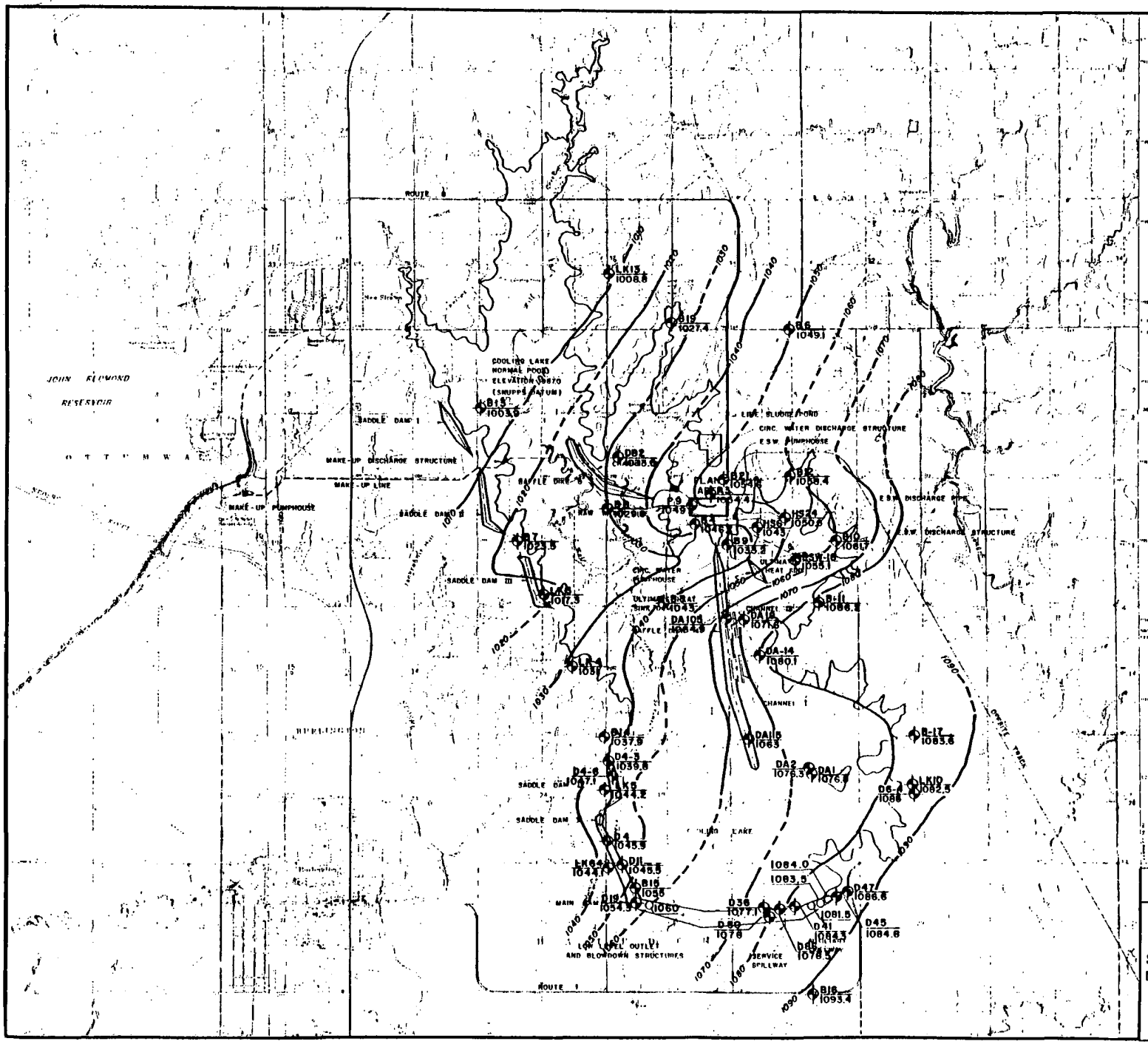
FEET
2000 0 2000 4000 6000

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-53

Structure Contours of Plattsmouth Member ~ Site

Rev. 0



NOTES:

1. BORING LOCATION ◈ B-10 / 1061.7 (BORING NUMBER; TOP ELEVATION OF LEAVENWORTH LIMESTONE MEMBER)
2. ○1084.0 ELEVATION FROM GEOLOGICAL EXCAVATION MAPPING
3. STRUCTURAL CONTOUR LINES INTERPRETED FROM WIDELY SPACED BOREHOLE DATA. ACTUAL SUBSURFACE CONDITIONS BETWEEN BOREHOLES MAY DIFFER FROM THAT SHOWN.
4. CONTOURS DASHED WHERE LOCATION IS APPROXIMATE.
5. DETAILED STRUCTURE CONTOUR MAP OF LEAVENWORTH LIMESTONE IN THE CATEGORY I AREA IS SHOWN ON FIGURE 2.5-60.

TOPOGRAPHIC CONTOUR INTERVAL IS 10 FEET WITH SUPPLEMENTARY CONTOURS AT 5 FEET.

STRUCTURAL CONTOUR INTERVAL IS 10 FEET.

DRAWING REFERENCE:
TITLE: GENERAL ARRANGEMENT, WOLF CREEK GENERATING STATION UNIT 1
FOR: KANSAS GAS AND ELECTRIC COMPANY AND KANSAS CITY POWER AND LIGHT COMPANY
BY: SARGENT AND LUNDY ENGINEERS, CHICAGO
DRAWING NO. G-1, Rev. 8
DATED: 12/17/76

MAP BASE PREPARED FROM U.S.G.S. TOPOGRAPHIC QUADRANGLES, 7.5' SERIES; BURLINGTON, KANSAS, 1971; JOHN REDMOND DAM, KANSAS, 1966; NEW STRAWN, KANSAS, 1971; OTTUMWA, KANSAS, 1970.

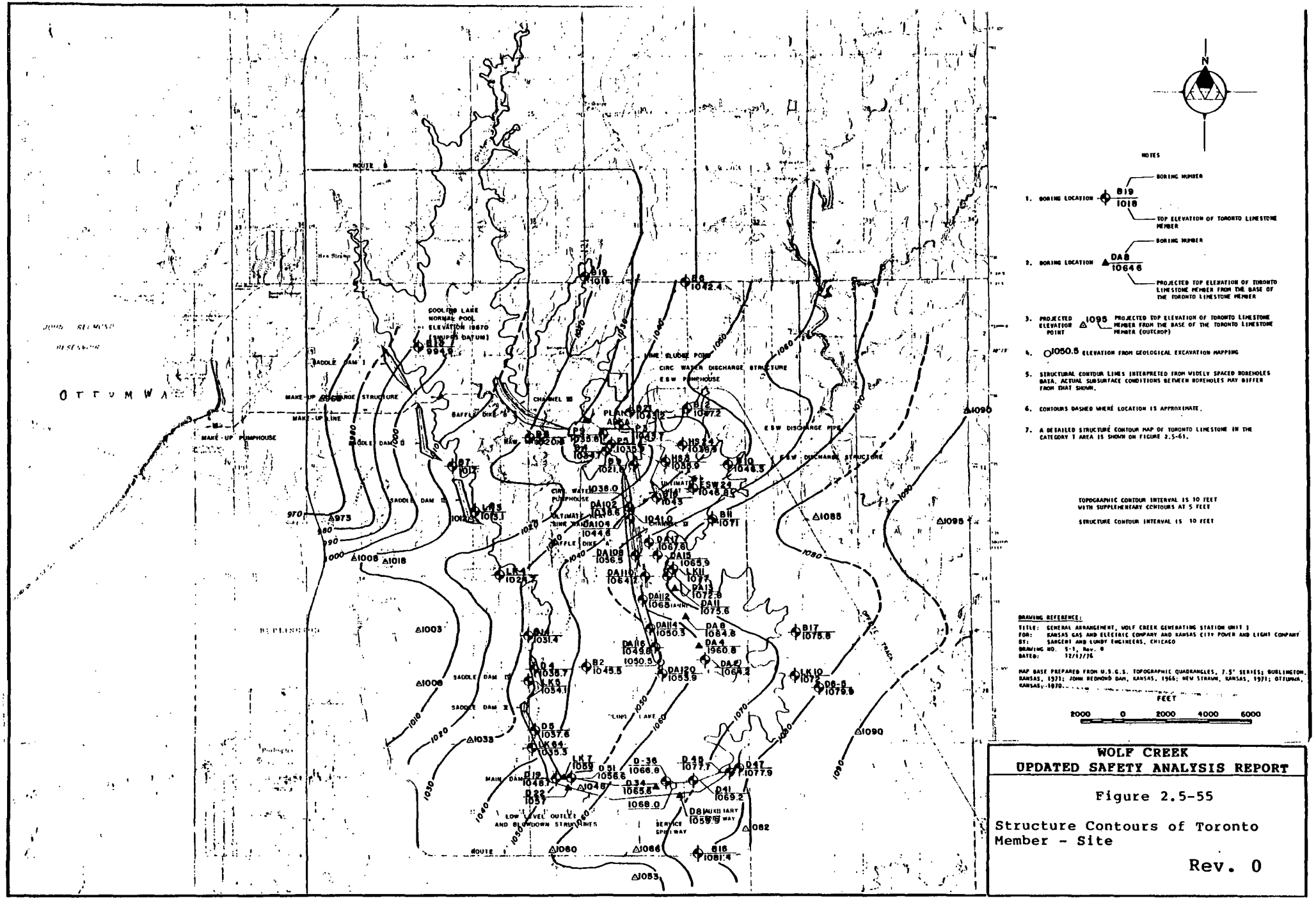
FEET
2000 0 2000 4000 6000

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-54

Structure Contours of Leavenworth Member - Site

Rev. 0

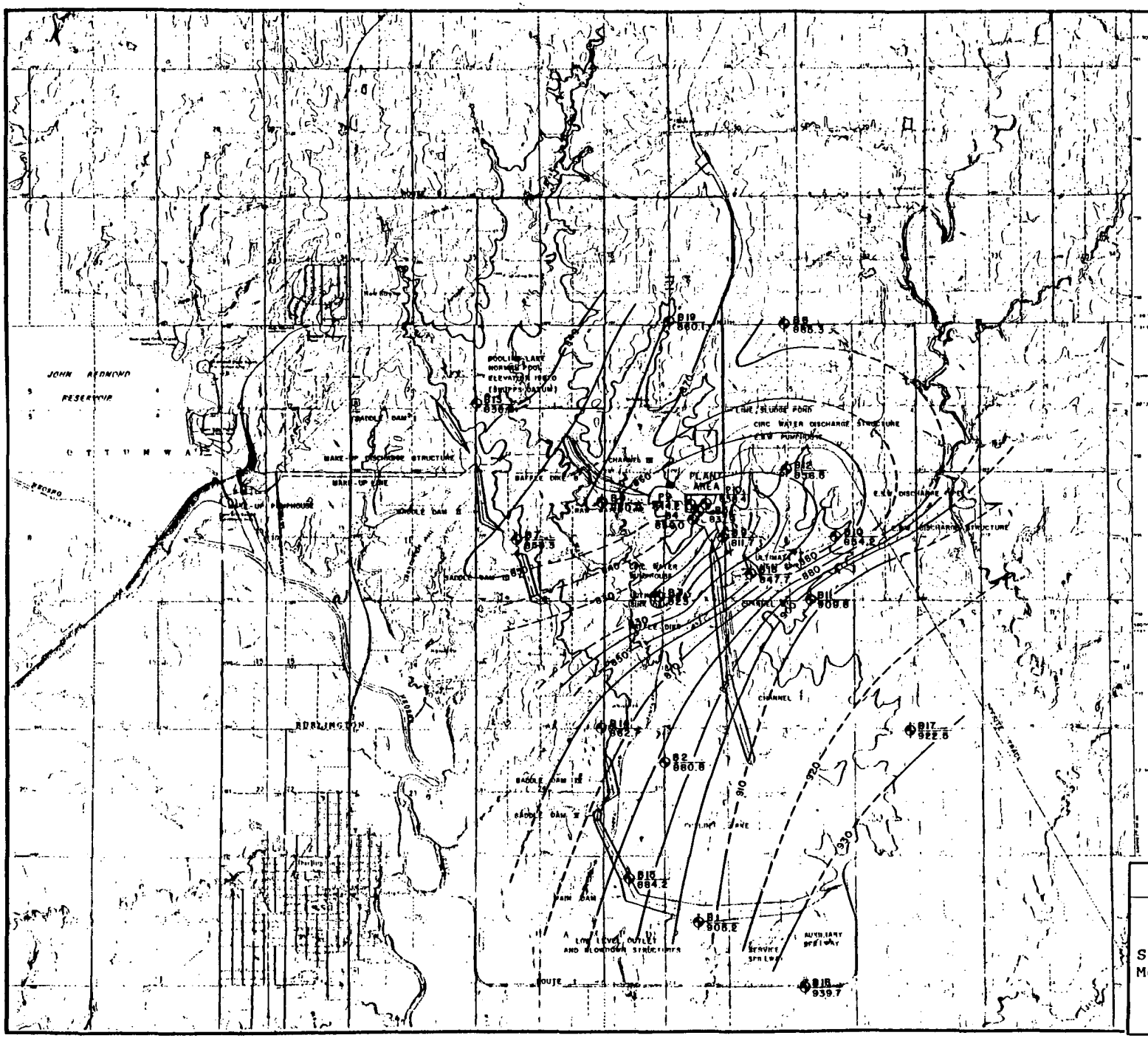


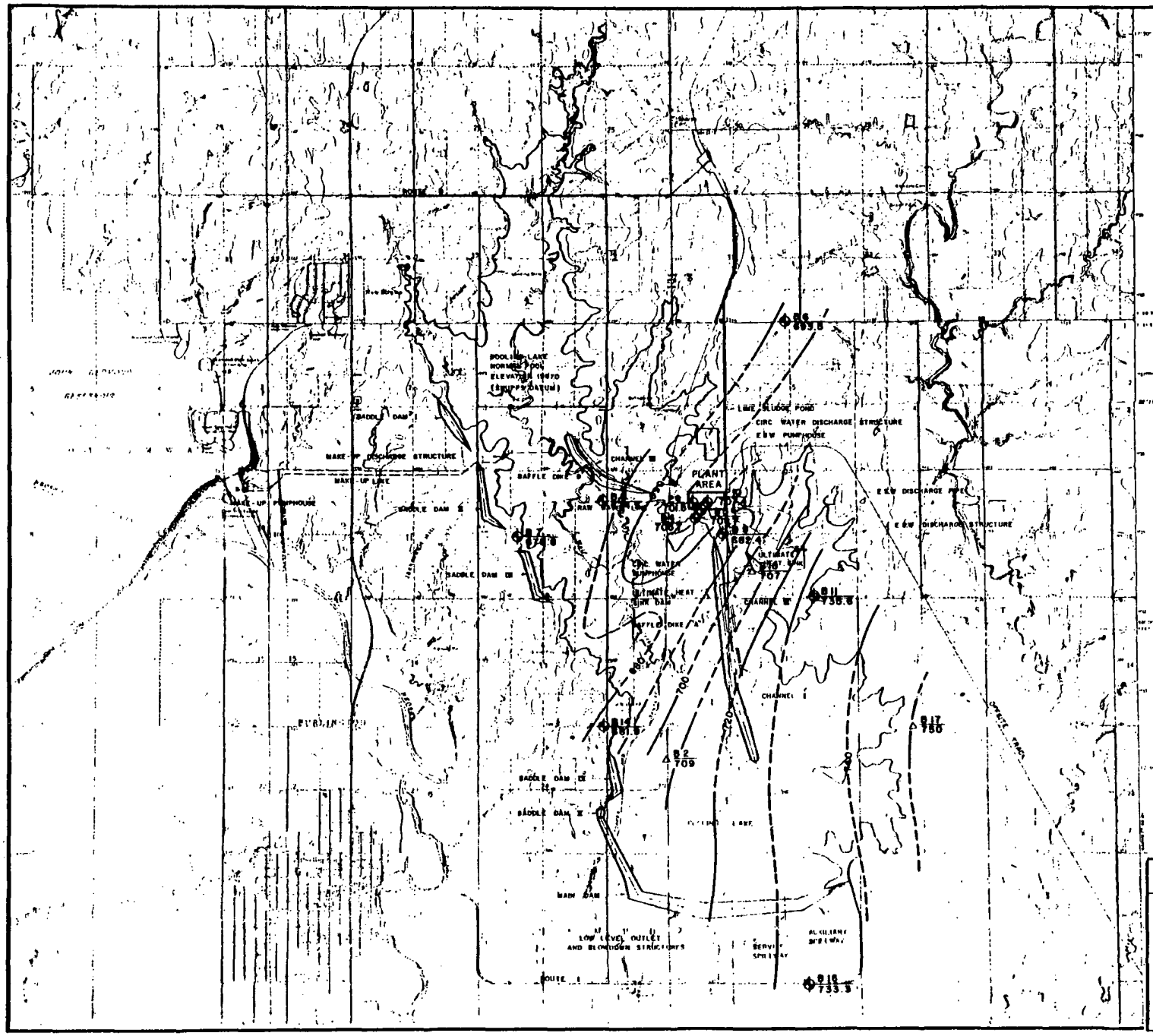
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-55

Structure Contours of Toronto Member - Site

Rev. 0


N
JOHN REDMOND RESERVOIR
OTTUMWA
BURLINGTON
PLANT AREA
MAIN DAM
SADDLE DAM 1
SADDLE DAM 2
SADDLE DAM 3
DIKE 1
DIKE 2
DIKE 3
DIKE 4
DIKE 5
DIKE 6
DIKE 7
DIKE 8
DIKE 9
DIKE 10
DIKE 11
DIKE 12
DIKE 13
DIKE 14
DIKE 15
DIKE 16
DIKE 17
DIKE 18
DIKE 19
DIKE 20
DIKE 21
DIKE 22
DIKE 23
DIKE 24
DIKE 25
DIKE 26
DIKE 27
DIKE 28
DIKE 29
DIKE 30
DIKE 31
DIKE 32
DIKE 33
DIKE 34
DIKE 35
DIKE 36
DIKE 37
DIKE 38
DIKE 39
DIKE 40
DIKE 41
DIKE 42
DIKE 43
DIKE 44
DIKE 45
DIKE 46
DIKE 47
DIKE 48
DIKE 49
DIKE 50
DIKE 51
DIKE 52
DIKE 53
DIKE 54
DIKE 55
DIKE 56
DIKE 57
DIKE 58
DIKE 59
DIKE 60
DIKE 61
DIKE 62
DIKE 63
DIKE 64
DIKE 65
DIKE 66
DIKE 67
DIKE 68
DIKE 69
DIKE 70
DIKE 71
DIKE 72
DIKE 73
DIKE 74
DIKE 75
DIKE 76
DIKE 77
DIKE 78
DIKE 79
DIKE 80
DIKE 81
DIKE 82
DIKE 83
DIKE 84
DIKE 85
DIKE 86
DIKE 87
DIKE 88
DIKE 89
DIKE 90
DIKE 91
DIKE 92
DIKE 93
DIKE 94
DIKE 95
DIKE 96
DIKE 97
DIKE 98
DIKE 99
DIKE 100
DIKE 101
DIKE 102
DIKE 103
DIKE 104
DIKE 105
DIKE 106
DIKE 107
DIKE 108
DIKE 109
DIKE 110
DIKE 111
DIKE 112
DIKE 113
DIKE 114
DIKE 115
DIKE 116
DIKE 117
DIKE 118
DIKE 119
DIKE 120
DIKE 121
DIKE 122
DIKE 123
DIKE 124
DIKE 125
DIKE 126
DIKE 127
DIKE 128
DIKE 129
DIKE 130
DIKE 131
DIKE 132
DIKE 133
DIKE 134
DIKE 135
DIKE 136
DIKE 137
DIKE 138
DIKE 139
DIKE 140
DIKE 141
DIKE 142
DIKE 143
DIKE 144
DIKE 145
DIKE 146
DIKE 147
DIKE 148
DIKE 149
DIKE 150
DIKE 151
DIKE 152
DIKE 153
DIKE 154
DIKE 155
DIKE 156
DIKE 157
DIKE 158
DIKE 159
DIKE 160
DIKE 161
DIKE 162
DIKE 163
DIKE 164
DIKE 165
DIKE 166
DIKE 167
DIKE 168
DIKE 169
DIKE 170
DIKE 171
DIKE 172
DIKE 173
DIKE 174
DIKE 175
DIKE 176
DIKE 177
DIKE 178
DIKE 179
DIKE 180
DIKE 181
DIKE 182
DIKE 183
DIKE 184
DIKE 185
DIKE 186
DIKE 187
DIKE 188
DIKE 189
DIKE 190
DIKE 191
DIKE 192
DIKE 193
DIKE 194
DIKE 195
DIKE 196
DIKE 197
DIKE 198
DIKE 199
DIKE 200
DIKE 201
DIKE 202
DIKE 203
DIKE 204
DIKE 205
DIKE 206
DIKE 207
DIKE 208
DIKE 209
DIKE 210
DIKE 211
DIKE 212
DIKE 213
DIKE 214
DIKE 215
DIKE 216
DIKE 217
DIKE 218
DIKE 219
DIKE 220
DIKE 221
DIKE 222
DIKE 223
DIKE 224
DIKE 225
DIKE 226
DIKE 227
DIKE 228
DIKE 229
DIKE 230
DIKE 231
DIKE 232
DIKE 233
DIKE 234
DIKE 235
DIKE 236
DIKE 237
DIKE 238
DIKE 239
DIKE 240
DIKE 241
DIKE 242
DIKE 243
DIKE 244
DIKE 245
DIKE 246
DIKE 247
DIKE 248
DIKE 249
DIKE 250
DIKE 251
DIKE 252
DIKE 253
DIKE 254
DIKE 255
DIKE 256
DIKE 257
DIKE 258
DIKE 259
DIKE 260
DIKE 261
DIKE 262
DIKE 263
DIKE 264
DIKE 265
DIKE 266
DIKE 267
DIKE 268
DIKE 269
DIKE 270
DIKE 271
DIKE 272
DIKE 273
DIKE 274
DIKE 275
DIKE 276
DIKE 277
DIKE 278
DIKE 279
DIKE 280
DIKE 281
DIKE 282
DIKE 283
DIKE 284
DIKE 285
DIKE 286
DIKE 287
DIKE 288
DIKE 289
DIKE 290
DIKE 291
DIKE 292
DIKE 293
DIKE 294
DIKE 295
DIKE 296
DIKE 297
DIKE 298
DIKE 299
DIKE 300
DIKE 301
DIKE 302
DIKE 303
DIKE 304
DIKE 305
DIKE 306
DIKE 307
DIKE 308
DIKE 309
DIKE 310
DIKE 311
DIKE 312
DIKE 313
DIKE 314
DIKE 315
DIKE 316
DIKE 317
DIKE 318
DIKE 319
DIKE 320
DIKE 321
DIKE 322
DIKE 323
DIKE 324
DIKE 325
DIKE 326
DIKE 327
DIKE 328
DIKE 329
DIKE 330
DIKE 331
DIKE 332
DIKE 333
DIKE 334
DIKE 335
DIKE 336
DIKE 337
DIKE 338
DIKE 339
DIKE 340
DIKE 341
DIKE 342
DIKE 343
DIKE 344
DIKE 345
DIKE 346
DIKE 347
DIKE 348
DIKE 349
DIKE 350
DIKE 351
DIKE 352
DIKE 353
DIKE 354
DIKE 355
DIKE 356
DIKE 357
DIKE 358
DIKE 359
DIKE 360
DIKE 361
DIKE 362
DIKE 363
DIKE 364
DIKE 365
DIKE 366
DIKE 367
DIKE 368
DIKE 369
DIKE 370
DIKE 371
DIKE 372
DIKE 373
DIKE 374
DIKE 375
DIKE 376
DIKE 377
DIKE 378
DIKE 379
DIKE 380
DIKE 381
DIKE 382
DIKE 383
DIKE 384
DIKE 385
DIKE 386
DIKE 387
DIKE 388
DIKE 389
DIKE 390
DIKE 391
DIKE 392
DIKE 393
DIKE 394
DIKE 395
DIKE 396
DIKE 397
DIKE 398
DIKE 399
DIKE 400
DIKE 401
DIKE 402
DIKE 403
DIKE 404
DIKE 405
DIKE 406
DIKE 407
DIKE 408
DIKE 409
DIKE 410
DIKE 411
DIKE 412
DIKE 413
DIKE 414
DIKE 415
DIKE 416
DIKE 417
DIKE 418
DIKE 419
DIKE 420
DIKE 421
DIKE 422
DIKE 423
DIKE 424
DIKE 425
DIKE 426
DIKE 427
DIKE 428
DIKE 429
DIKE 430
DIKE 431
DIKE 432
DIKE 433
DIKE 434
DIKE 435
DIKE 436
DIKE 437
DIKE 438
DIKE 439
DIKE 440
DIKE 441
DIKE 442
DIKE 443
DIKE 444
DIKE 445
DIKE 446
DIKE 447
DIKE 448
DIKE 449
DIKE 450
DIKE 451
DIKE 452
DIKE 453
DIKE 454
DIKE 455
DIKE 456
DIKE 457
DIKE 458
DIKE 459
DIKE 460
DIKE 461
DIKE 462
DIKE 463
DIKE 464
DIKE 465
DIKE 466
DIKE 467
DIKE 468
DIKE 469
DIKE 470
DIKE 471
DIKE 472
DIKE 473
DIKE 474
DIKE 475
DIKE 476
DIKE 477
DIKE 478
DIKE 479
DIKE 480
DIKE 481
DIKE 482
DIKE 483
DIKE 484
DIKE 485
DIKE 486
DIKE 487
DIKE 488
DIKE 489
DIKE 490
DIKE 491
DIKE 492
DIKE 493
DIKE 494
DIKE 495
DIKE 496
DIKE 497
DIKE 498
DIKE 499
DIKE 500
DIKE 501
DIKE 502
DIKE 503
DIKE 504
DIKE 505
DIKE 506
DIKE 507
DIKE 508
DIKE 509
DIKE 510
DIKE 511
DIKE 512
DIKE 513
DIKE 514
DIKE 515
DIKE 516
DIKE 517
DIKE 518
DIKE 519
DIKE 520
DIKE 521
DIKE 522
DIKE 523
DIKE 524
DIKE 525
DIKE 526
DIKE 527
DIKE 528
DIKE 529
DIKE 530
DIKE 531
DIKE 532
DIKE 533
DIKE 534
DIKE 535
DIKE 536
DIKE 537
DIKE 538
DIKE 539
DIKE 540
DIKE 541
DIKE 542
DIKE 543
DIKE 544
DIKE 545
DIKE 546
DIKE 547
DIKE 548
DIKE 549
DIKE 550
DIKE 551
DIKE 552
DIKE 553
DIKE 554
DIKE 555
DIKE 556
DIKE 557
DIKE 558
DIKE 559
DIKE 560
DIKE 561
DIKE 562
DIKE 563
DIKE 564
DIKE 565
DIKE 566
DIKE 567
DIKE 568
DIKE 569
DIKE 570
DIKE 571
DIKE 572
DIKE 573
DIKE 574
DIKE 575
DIKE 576
DIKE 577
DIKE 578
DIKE 579
DIKE 580
DIKE 581
DIKE 582
DIKE 583
DIKE 584
DIKE 585
DIKE 586
DIKE 587
DIKE 588
DIKE 589
DIKE 590
DIKE 591
DIKE 592
DIKE 593
DIKE 594
DIKE 595
DIKE 596
DIKE 597
DIKE 598
DIKE 599
DIKE 600
DIKE 601
DIKE 602
DIKE 603
DIKE 604
DIKE 605
DIKE 606
DIKE 607
DIKE 608
DIKE 609
DIKE 610
DIKE 611
DIKE 612
DIKE 613
DIKE 614
DIKE 615
DIKE 616
DIKE 617
DIKE 618
DIKE 619
DIKE 620
DIKE 621
DIKE 622
DIKE 623
DIKE 624
DIKE 625
DIKE 626
DIKE 627
DIKE 628
DIKE 629
DIKE 630
DIKE 631
DIKE 632
DIKE 633
DIKE 634
DIKE 635
DIKE 636
DIKE 637
DIKE 638
DIKE 639
DIKE 640
DIKE 641
DIKE 642
DIKE 643
DIKE 644
DIKE 645
DIKE 646
DIKE 647
DIKE 648
DIKE 649
DIKE 650
DIKE 651
DIKE 652
DIKE 653
DIKE 654
DIKE 655
DIKE 656
DIKE 657
DIKE 658
DIKE 659
DIKE 660
DIKE 661
DIKE 662
DIKE 663
DIKE 664
DIKE 665
DIKE 666
DIKE 667
DIKE 668
DIKE 669
DIKE 670
DIKE 671
DIKE 672
DIKE 673
DIKE 674
DIKE 675
DIKE 676
DIKE 677
DIKE 678
DIKE 679
DIKE 680
DIKE 681
DIKE 682
DIKE 683
DIKE 684
DIKE 685
DIKE 686
DIKE 687
DIKE 688
DIKE 689
DIKE 690
DIKE 691
DIKE 692
DIKE 693
DIKE 694
DIKE 695
DIKE 696
DIKE 697
DIKE 698
DIKE 699
DIKE 700
DIKE 701
DIKE 702
DIKE 703
DIKE 704
DIKE 705
DIKE 706
DIKE 707
DIKE 708
DIKE 709
DIKE 710
DIKE 711
DIKE 712
DIKE 713
DIKE 714
DIKE 715
DIKE 716
DIKE 717
DIKE 718
DIKE 719
DIKE 720
DIKE 721
DIKE 722
DIKE 723
DIKE 724
DIKE 725
DIKE 726
DIKE 727
DIKE 728
DIKE 729
DIKE 730
DIKE 731
DIKE 732
DIKE 733
DIKE 734
DIKE 735
DIKE 736
DIKE 737
DIKE 738
DIKE 739
DIKE 740
DIKE 741
DIKE 742
DIKE 743
DIKE 744
DIKE 745
DIKE 746
DIKE 747
DIKE 748
DIKE 749
DIKE 750
DIKE 751
DIKE 752
DIKE 753
DIKE 754
DIKE 755
DIKE 756
DIKE 757
DIKE 758
DIKE 759
DIKE 760
DIKE 761
DIKE 762
DIKE 763
DIKE 764
DIKE 765
DIKE 766
DIKE 767
DIKE 768
DIKE 769
DIKE 770
DIKE 771
DIKE 772
DIKE 773
DIKE 774
DIKE 775
DIKE 776
DIKE 777
DIKE 778
DIKE 779
DIKE 780
DIKE 781
DIKE 782
DIKE 783
DIKE 784
DIKE 785
DIKE 786
DIKE 787
DIKE 788
DIKE 789
DIKE 790
DIKE 791
DIKE 792
DIKE 793
DIKE 794
DIKE 795
DIKE 796
DIKE 797
DIKE 798
DIKE 799
DIKE 800
DIKE 801
DIKE 802
DIKE 803
DIKE 804
DIKE 805
DIKE 806
DIKE 807
DIKE 808
DIKE 809
DIKE 810
DIKE 811
DIKE 812
DIKE 813
DIKE 814
DIKE 815
DIKE 816
DIKE 817
DIKE 818
DIKE 819
DIKE 820
DIKE 821
DIKE 822
DIKE 823
DIKE 824
DIKE 825
DIKE 826
DIKE 827
DIKE 828
DIKE 829
DIKE 830
DIKE 831
DIKE 832
DIKE 833
DIKE 834
DIKE 835
DIKE 836
DIKE 837
DIKE 838
DIKE 839
DIKE 840
DIKE 841
DIKE 842
DIKE 843
DIKE 844
DIKE 845
DIKE 846
DIKE 847
DIKE 848
DIKE 849
DIKE 850
DIKE 851
DIKE 852
DIKE 853
DIKE 854
DIKE 855
DIKE 856
DIKE 857
DIKE 858
DIKE 859
DIKE 860
DIKE 861
DIKE 862
DIKE 863
DIKE 864
DIKE 865
DIKE 866
DIKE 867
DIKE 868
DIKE 869
DIKE 870
DIKE 871
DIKE 872
DIKE 873
DIKE 874
DIKE 875
DIKE 876
DIKE 877
DIKE 878
DIKE 879
DIKE 880
DIKE 881
DIKE 882
DIKE 883
DIKE 884
DIKE 885
DIKE 886
DIKE 887
DIKE 888
DIKE 889
DIKE 890
DIKE 891
DIKE 892
DIKE 893
DIKE 894
DIKE 895
DIKE 896
DIKE 897
DIKE 898
DIKE 899
DIKE 900
DIKE 901
DIKE 902
DIKE 903
DIKE 904
DIKE 905
DIKE 906
DIKE 907
DIKE 908
DIKE 909
DIKE 910
DIKE 911
DIKE 912
DIKE 913
DIKE 914
DIKE 915
DIKE 916
DIKE 917
DIKE 918
DIKE 919
DIKE 920
DIKE 921
DIKE 922
DIKE 923
DIKE 924
DIKE 925
DIKE 926
DIKE 927
DIKE 928
DIKE 929
DIKE 930
DIKE 931
DIKE 932
DIKE 933
DIKE 934
DIKE 935
DIKE 936
DIKE 937
DIKE 938
DIKE 939
DIKE 940
DIKE 941
DIKE 942
DIKE 943
DIKE 944
DIKE 945
DIKE 946
DIKE 947
DIKE 948
DIKE 949
DIKE 950
DIKE 951
DIKE 952
DIKE 953
DIKE 954
DIKE 955
DIKE 956
DIKE 957
DIKE 958
DIKE 959
DIKE 960
DIKE 961
DIKE 962
DIKE 963
DIKE 964
DIKE 965
DIKE 966
DIKE 967
DIKE 968
DIKE 969
DIKE 970
DIKE 971
DIKE 972
DIKE 973
DIKE 974
DIKE 975
DIKE 976
DIKE 977
DIKE 978
DIKE 979
DIKE 980
DIKE 981
DIKE 982
DIKE 983
DIKE 984
DIKE 985
DIKE 986
DIKE 987
DIKE 988
DIKE 989
DIKE 990
DIKE 991
DIKE 992
DIKE 993
DIKE 994
DIKE 995
DIKE 996
DIKE 997
DIKE 998
DIKE 999
DIKE 1000
B19 860.1
B5 885.3
B13 856.7
B12 838.8
B10 864.2
B9 811.3
B8 847.7
B11 809.8
B17 922.8
B16 902.7
B2 860.8
B15 884.2
B1 908.8
B18 939.7
B7 859.3
B6 840
860
880
900
910
920
930
940
950
960
970
980
990
1000
1010
1020
1030
1040
1050
1060
1070
1080
1090
1100
1110
1120
1130
1140
1150
1160
1170
1180
1190
1200
1210
1220
1230
1240
1250
1260
1270
1280
1290

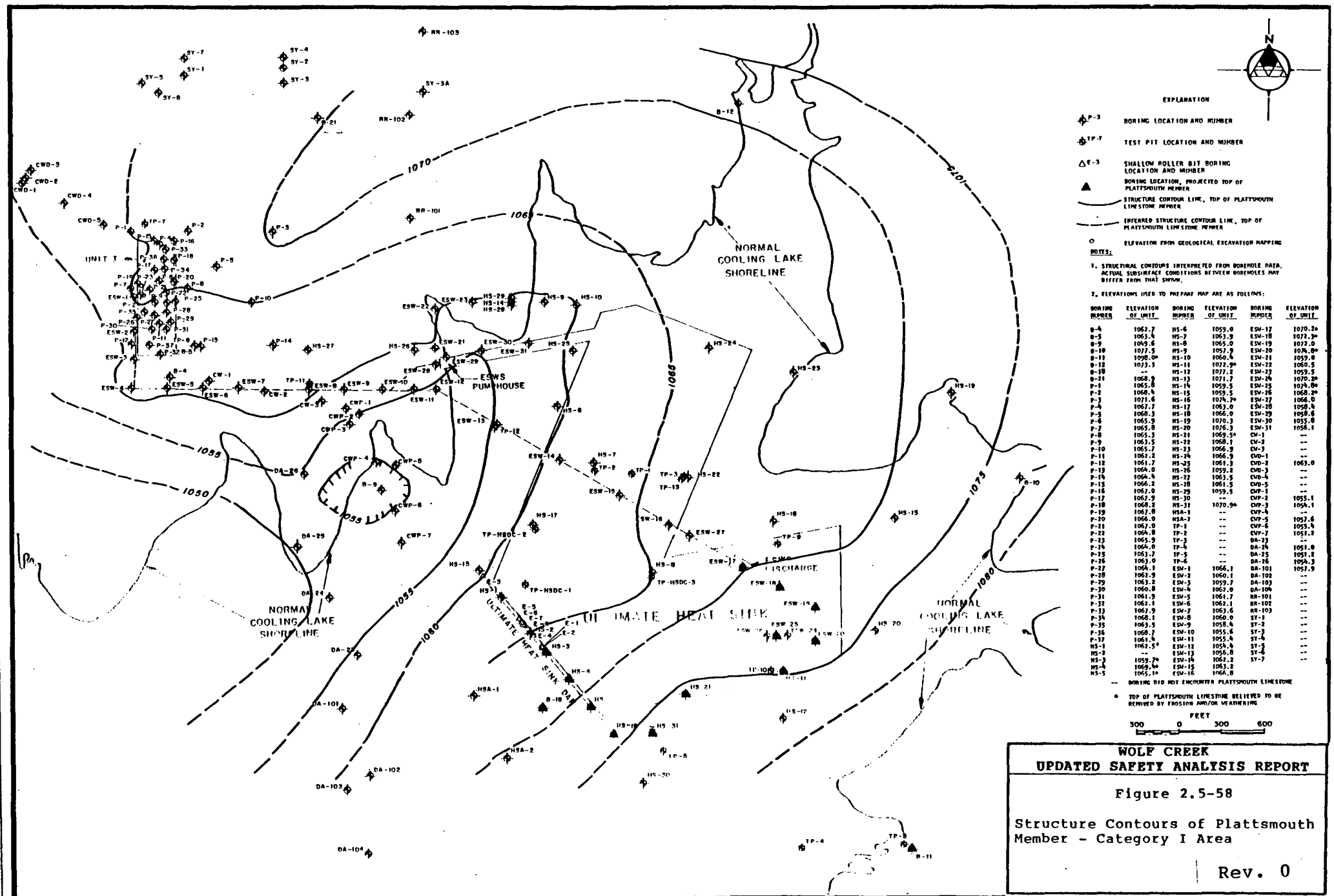


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-57

Structure Contours of Stanton Formation - Site

Rev. 0

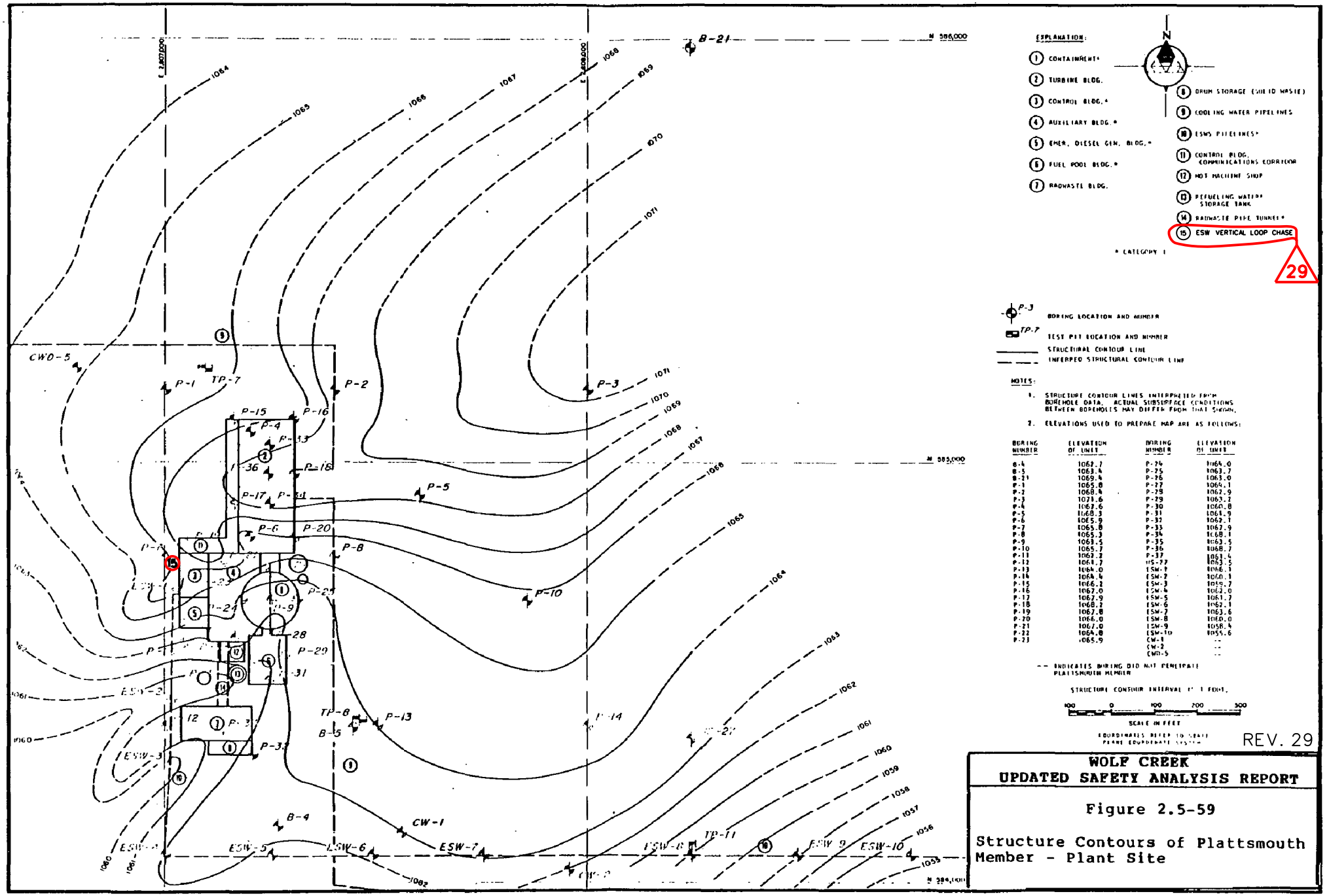


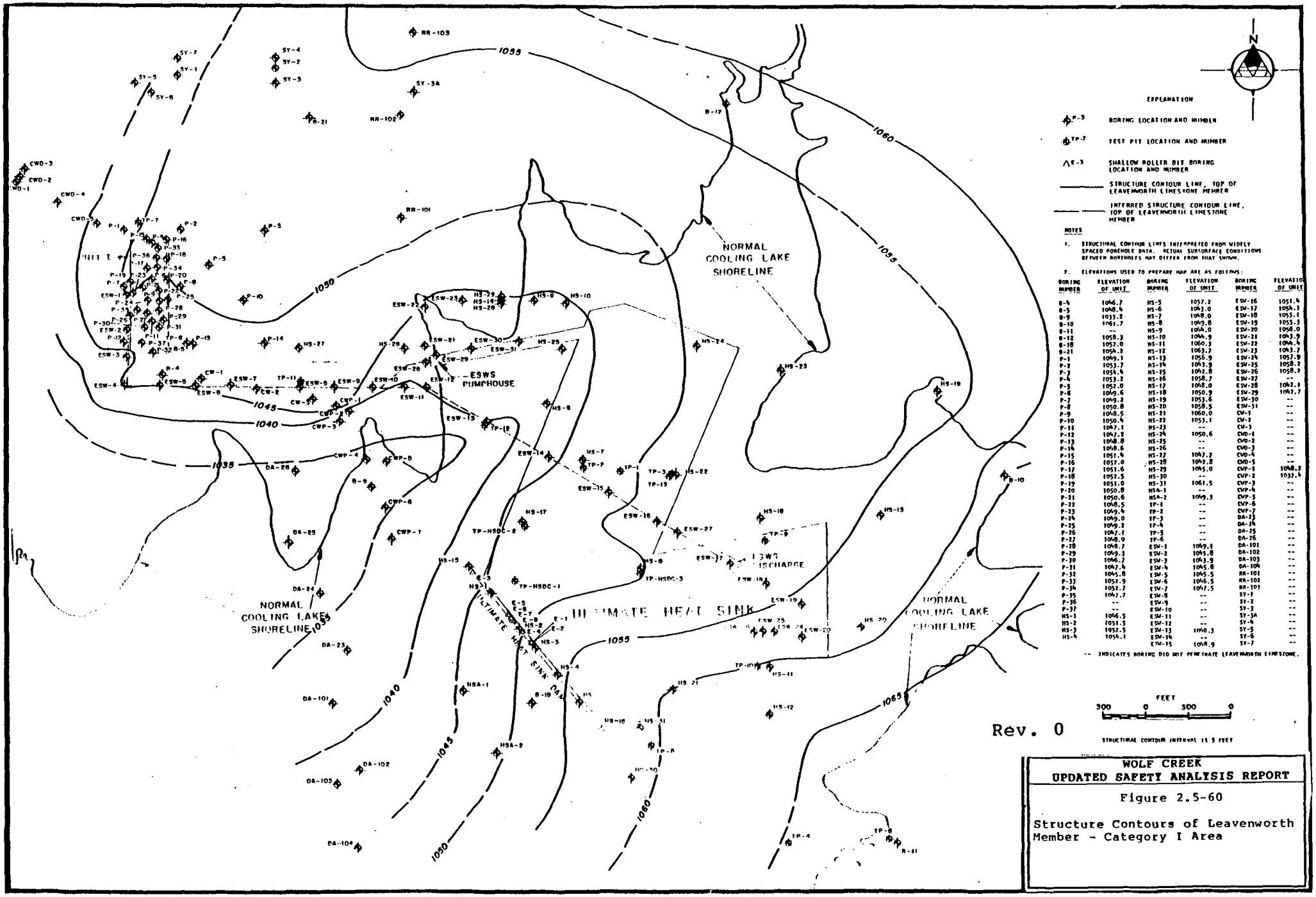
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

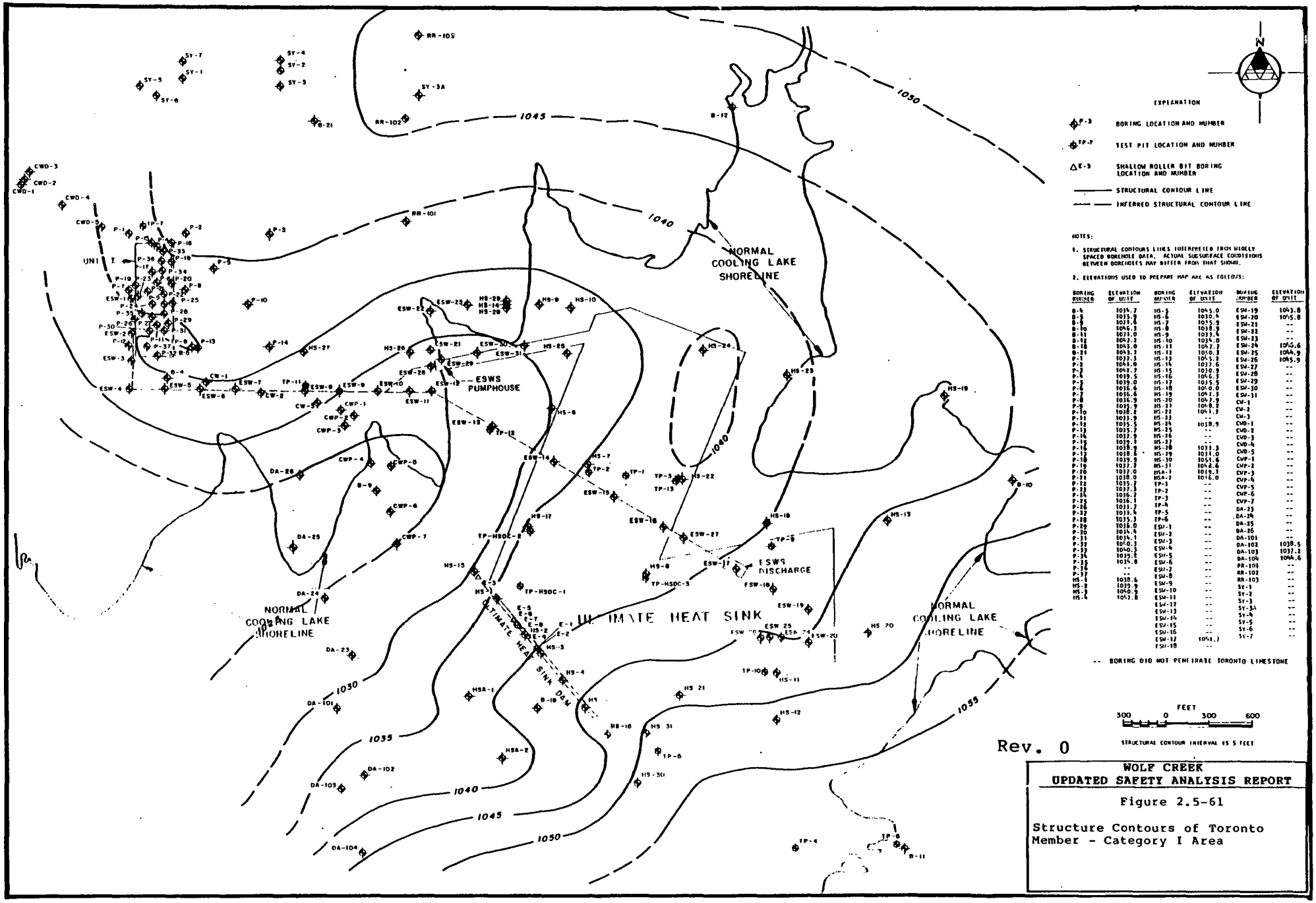
Figure 2.5-58

Structure Contours of Plattsmouth Member - Category I Area

Rev. 0


EXPLANATION:
1 CONTAINMENT*
2 TURBINE BLDG.
3 CONTROL BLDG.*
4 AUXILIARY BLDG.*
5 EMER. DIESEL GEN. BLDG.*
6 FUEL POOL BLDG.*
7 RADWASTE BLDG.
8 DRUM STORAGE (SOLID WASTE)
9 COOLING WATER PIPELINES
10 ESWS PIPELINES*
11 CONTROL BLDG. COMMUNICATIONS CORRIDOR
12 HOT MACHINE SHOP
13 REFUELING WATER* STORAGE TANK
14 RADWASTE PIPE TUNNEL*
15 ESW VERTICAL LOOP CHASE
* CATEGORY I
29
P-3 BORING LOCATION AND NUMBER
TP-7 TEST PIT LOCATION AND NUMBER
STRUCTURAL CONTOUR LINE
INFERRED STRUCTURAL CONTOUR LINE
NOTES:
1. STRUCTURE CONTOUR LINES INTERPRETED FROM BOREHOLE DATA. ACTUAL SUBSURFACE CONDITIONS BETWEEN BOREHOLES MAY DIFFER FROM THAT SHOWN.
2. ELEVATIONS USED TO PREPARE MAP ARE AS FOLLOWS:
BORING NUMBER | ELEVATION OF LINER | BORING NUMBER | ELEVATION OF LINER
B-4 1062.7 P-24 1064.0
B-5 1063.4 P-25 1063.7
B-21 1069.4 P-26 1063.0
P-1 1065.0 P-27 1064.1
P-2 1068.4 P-28 1062.9
P-3 1071.6 P-29 1063.7
P-4 1063.6 P-30 1060.8
P-5 1068.3 P-31 1061.9
P-6 1065.9 P-32 1062.1
P-7 1065.8 P-33 1067.9
P-8 1065.3 P-34 1068.1
P-9 1063.5 P-35 1063.5
P-10 1065.7 P-36 1068.7
P-11 1063.2 P-37 1061.4
P-12 1061.7 HS-77 1063.5
P-13 1064.0 ESW-1 1066.1
P-14 1064.4 ESW-2 1060.1
P-15 1066.2 ESW-3 1059.7
P-16 1067.0 ESW-4 1062.0
P-17 1062.9 ESW-5 1061.7
P-18 1068.2 ESW-6 1062.1
P-19 1067.8 ESW-7 1063.6
P-20 1066.0 ESW-8 1060.0
P-21 1067.0 ESW-9 1058.4
P-22 1064.8 ESW-10 1055.6
P-23 1065.9 CW-1 --
CW-2 --
CWO-5 --
-- INDICATES BORING DID NOT PENETRATE PLATTSMOUTH MEMBER
STRUCTURE CONTOUR INTERVAL 1' 1 FOOT.
100 0 100 200 300
SCALE IN FEET
COORDINATES REFER TO STATE PLANE COORDINATE SYSTEM
REV. 29
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT
Figure 2.5-59
Structure Contours of Plattsmouth Member - Plant Site


NORMAL COOLING LAKE SHORELINE
ESWS PUMPHOUSE
ESWS DISCHARGE
ULTIMATE HEAT SINK
NORMAL COOLING LAKE SHORELINE
NORMAL COOLING LAKE SHORELINE
UNIT E
1055
1060
1050
1045
1040
1035
1065
EXPLANATION
BORING LOCATION AND NUMBER
TEST PIT LOCATION AND NUMBER
SHALLOW ROLLER BIT BORING LOCATION AND NUMBER
STRUCTURE CONTOUR LINE, TOP OF LEAVENWORTH LIMESTONE MEMBER
INFERRED STRUCTURE CONTOUR LINE, TOP OF LEAVENWORTH LIMESTONE MEMBER
NOTES
1. STRUCTURAL CONTOUR LINES INTERPRETED FROM WIDELY SPACED BOREHOLE DATA. ACTUAL SUBSURFACE CONDITIONS BETWEEN BOREHOLES MAY DIFFER FROM THAT SHOWN.
2. ELEVATIONS USED TO PREPARE MAP ARE AS FOLLOWS:
BORING NUMBER | ELEVATION OF UNIT | BORING NUMBER | ELEVATION OF UNIT | BORING NUMBER | ELEVATION OF UNIT
B-5 1046.7 HS-5 1057.2 ESW-16 1051.4
B-8 1048.4 HS-6 1061.0 ESW-17 1054.1
B-9 1033.2 HS-7 1048.0 ESW-18 1055.1
B-10 1061.7 HS-8 1049.8 ESW-19 1055.3
B-11 -- HS-9 1044.0 ESW-20 1058.0
B-12 1058.3 HS-10 1044.9 ESW-21 1043.9
B-18 1052.0 HS-11 1060.3 ESW-22 1044.4
B-21 1054.9 HS-12 1063.7 ESW-23 1043.7
P-1 1049.1 HS-13 1058.9 ESW-24 1057.9
P-2 1053.7 HS-14 1061.3 ESW-25 1058.2
P-3 1054.4 HS-15 1062.8 ESW-26 1058.9
P-4 1053.2 HS-16 1058.7 ESW-27 --
P-5 1052.0 HS-17 1068.0 ESW-28 1062.1
P-6 1049.6 HS-18 1050.9 ESW-29 1062.7
P-7 1049.2 HS-19 1053.6 ESW-30 --
P-8 1050.8 HS-20 1058.5 ESW-31 --
P-9 1048.5 HS-21 1060.0 CW-1 --
P-10 1050.4 HS-22 1053.1 CW-2 --
P-11 1047.1 HS-23 -- CW-3 --
P-12 1047.1 HS-24 1050.6 CWP-1 --
P-13 1048.8 HS-25 -- CWP-2 --
P-14 1048.6 HS-26 -- CWP-3 --
P-15 1051.4 HS-27 1062.7 CWP-4 --
P-16 1052.0 HS-28 1062.8 CWP-5 --
P-17 1051.6 HS-29 1045.0 CWP-1 1048.2
P-18 1052.5 HS-30 -- CWP-2 1037.4
P-19 1051.0 HS-31 1061.5 CWP-3 --
P-20 1050.8 HSA-1 -- CWP-4 --
P-21 1050.6 HSA-2 1049.3 CWP-5 --
P-22 1048.5 TP-1 -- CWP-6 --
P-23 1049.4 TP-2 -- CWP-7 --
P-24 1049.0 TP-3 -- DA-23 --
P-25 1049.2 TP-4 -- DA-24 --
P-26 1047.1 TP-5 -- DA-25 --
P-27 1048.9 TP-6 -- DA-26 --
P-28 1048.7 ESW-1 1049.1 DA-101 --
P-29 1049.1 ESW-2 1049.8 DA-102 --
P-30 1046.7 ESW-3 1043.9 DA-103 --
P-31 1047.4 ESW-4 1045.8 DA-104 --
P-32 1045.8 ESW-5 1045.5 RR-101 --
P-33 1052.9 ESW-6 1046.5 RR-102 --
P-34 1052.7 ESW-7 1047.5 RR-103 --
P-35 1047.7 ESW-8 -- SY-1 --
P-36 -- ESW-9 -- SY-2 --
P-37 -- ESW-10 -- SY-3 --
HS-1 1046.5 ESW-11 -- SY-3A --
HS-2 1051.5 ESW-12 -- SY-4 --
HS-3 1052.5 ESW-13 1040.3 SY-5 --
HS-4 1054.1 ESW-14 -- SY-6 --
ESW-15 1044.9 SY-7 --
-- INDICATES BORING DID NOT PENETRATE LEAVENWORTH LIMESTONE.
FEET
300 0 300 0
STRUCTURAL CONTOUR INTERVAL IS 5 FEET
Rev. 0
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT
Figure 2.5-60
Structure Contours of Leavenworth Member - Category I Area

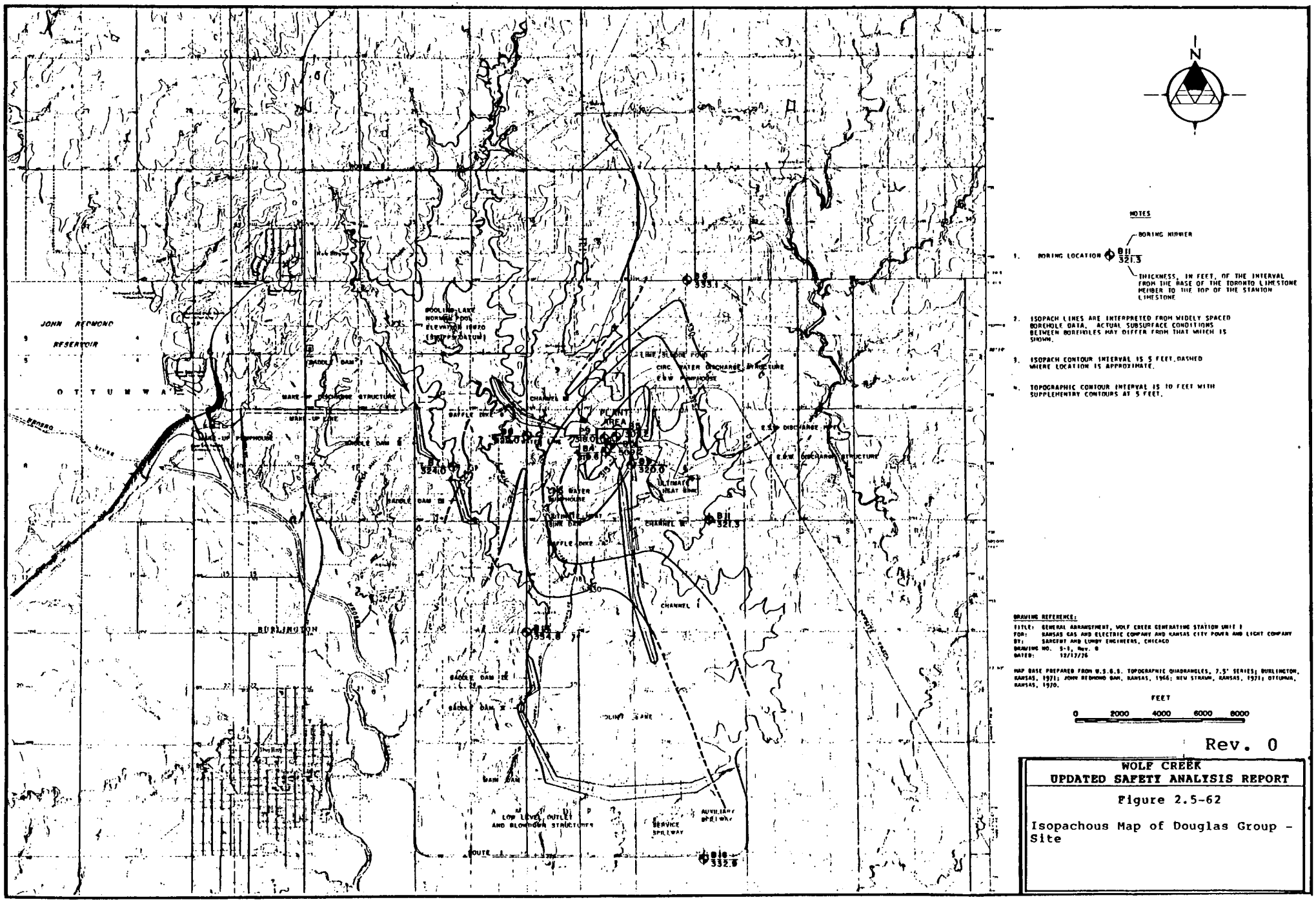


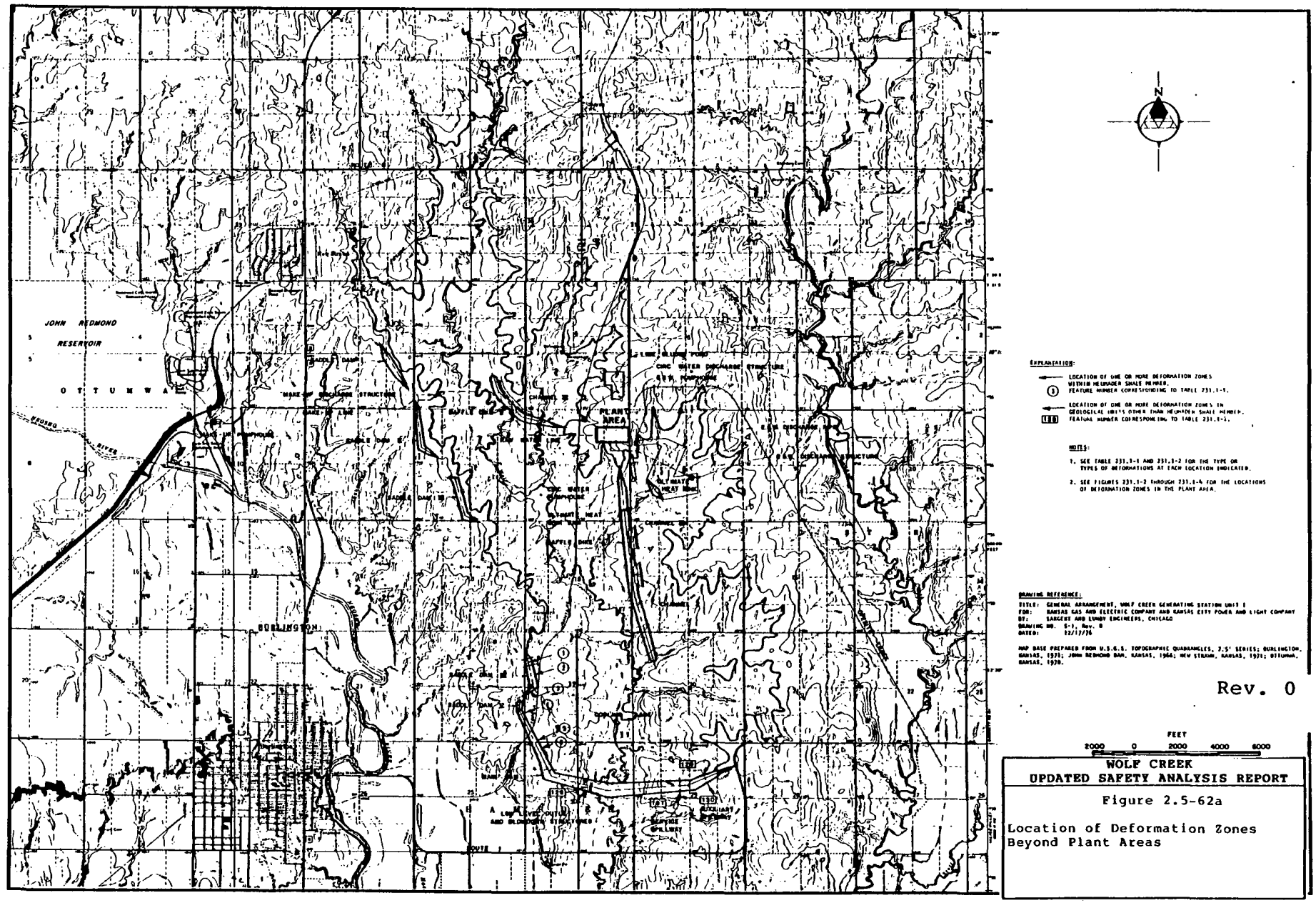
Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-61

Structure Contours of Toronto Member - Category I Area

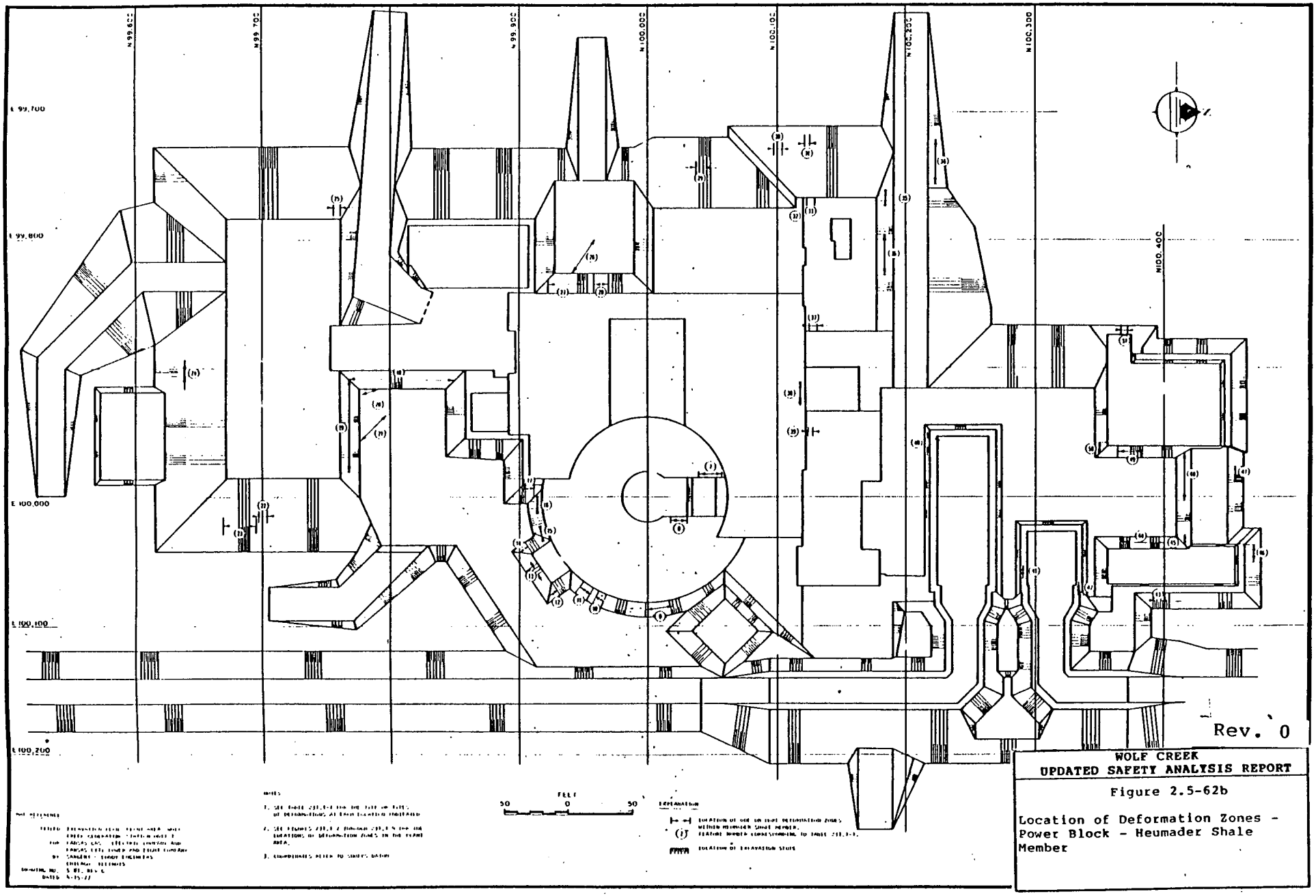

N
JOHN REDMOND RESERVOIR
OTTUMWA
BURLINGTON
PLANT AREA
BOILING LAKE
NORMAL POOL ELEVATION 1070 (MSL DATUM)
SADDLE DAM 1
SADDLE DAM 2
SADDLE DAM 3
SADDLE DAM 4
SADDLE DAM 5
SADDLE DAM 6
BAFFLE DIKE 1
BAFFLE DIKE 2
MAKE-UP DISCHARGE STRUCTURE
MAKE-UP LINE
MAKE-UP PUMPHOUSE
CIRC. WATER DISCHARGE STRUCTURE
E.S.W. PUMPHOUSE
E.S.W. DISCHARGE PIPE
E.S.W. DISCHARGE STRUCTURE
CIRC. WATER PUMPHOUSE
ULTIMATE HEAT SINK
CHANNEL 1
CHANNEL 2
CHANNEL 3
CHANNEL 4
LOW LEVEL OUTLET AND BLOWDOWN STRUCTURE
SERVICE SPILLWAY
AUXILIARY SPILLWAY
DAM
ROUTE
B6 333.1
B11 321.3
B10 332.8
B12 324.0
B13 320.0
B14 354.8
B15 318.0
B16 318.6
B17 338.0
B18 322.2
B19 318.0
B20 318.0
B21 318.0
B22 318.0
B23 318.0
B24 318.0
B25 318.0
B26 318.0
B27 318.0
B28 318.0
B29 318.0
B30 318.0
B31 318.0
B32 318.0
B33 318.0
B34 318.0
B35 318.0
B36 318.0
B37 318.0
B38 318.0



WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-62a

Location of Deformation Zones Beyond Plant Areas

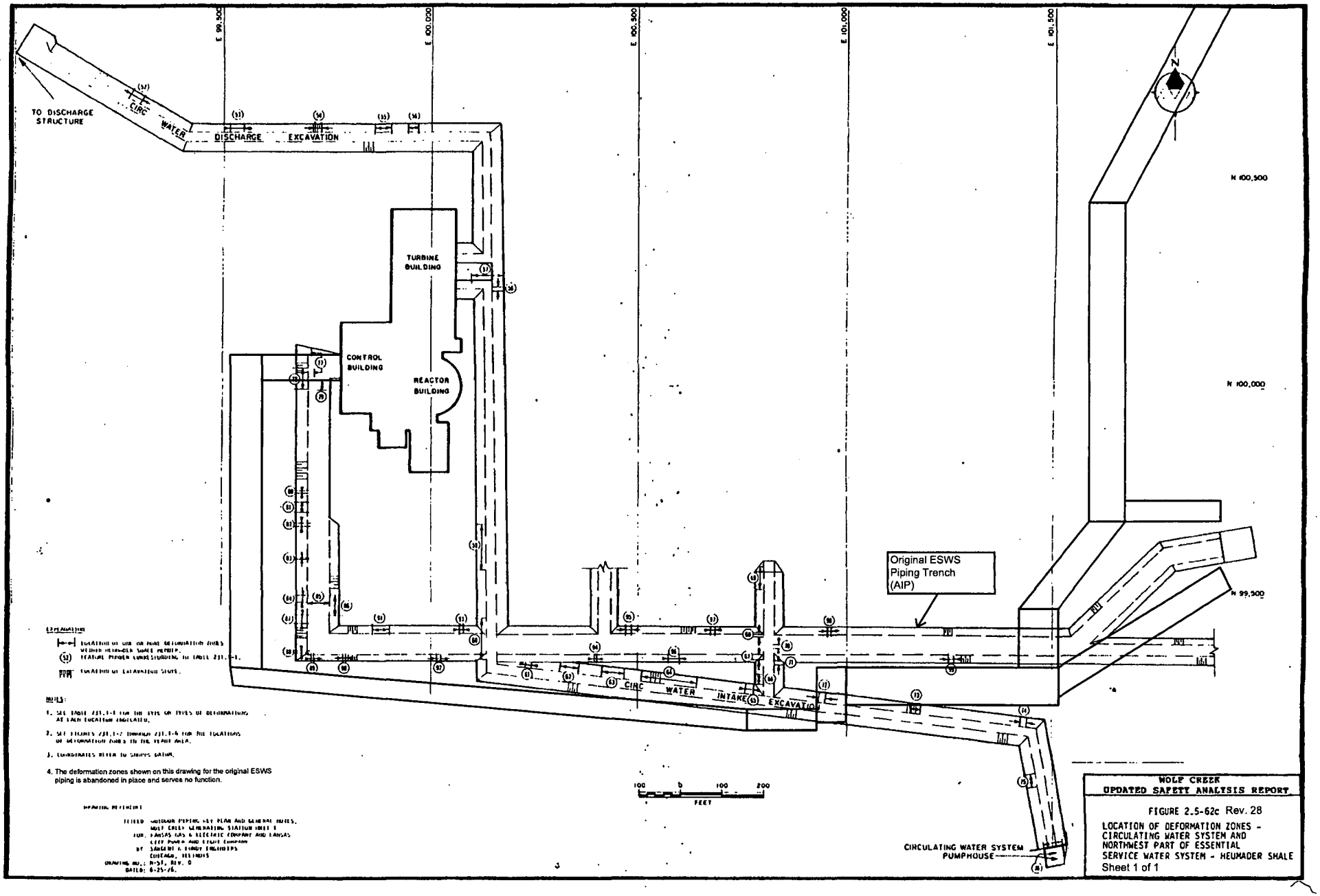


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-62b

Location of Deformation Zones - Power Block - Heumader Shale Member

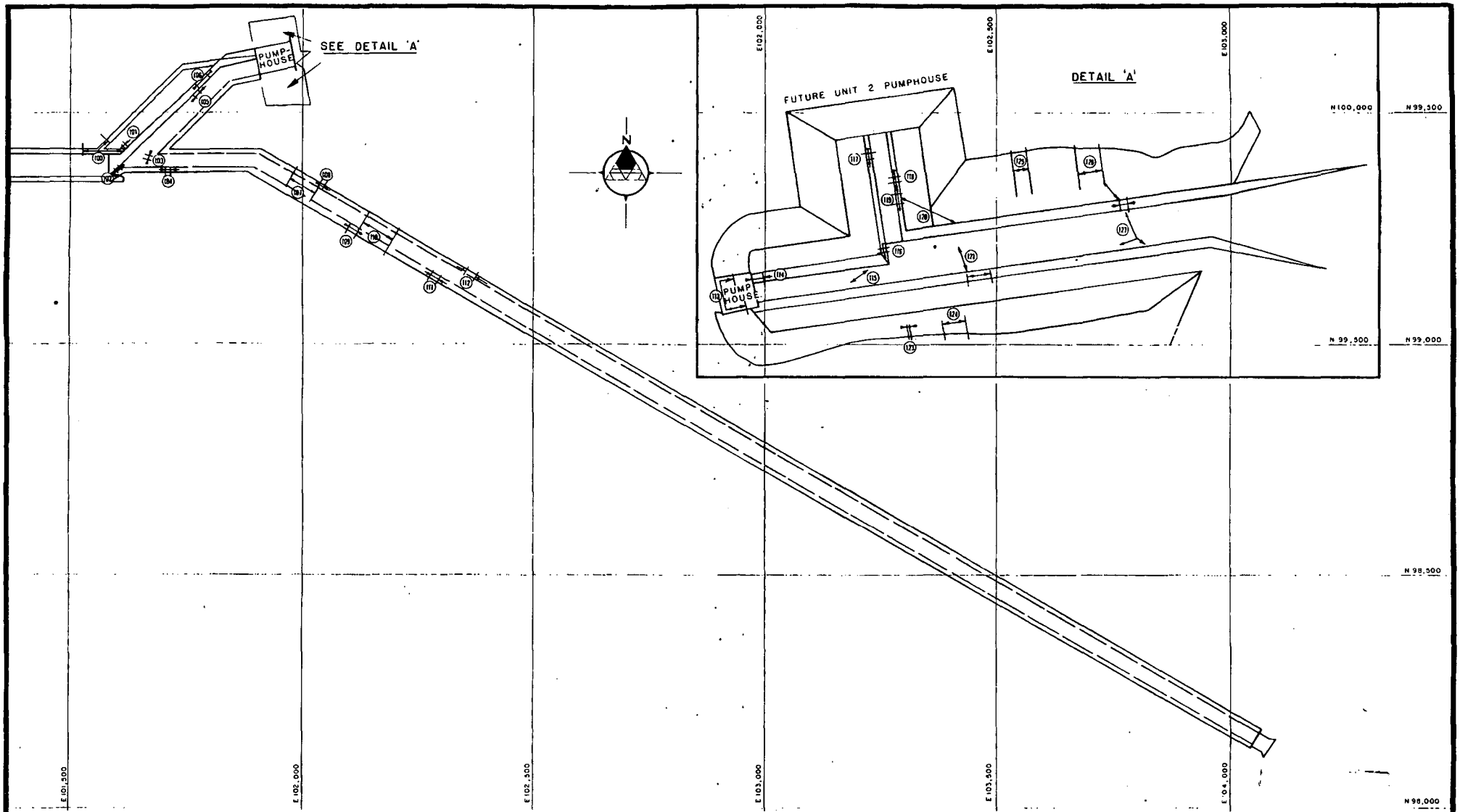


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

FIGURE 2.5-62c Rev. 28

LOCATION OF DEFORMATION ZONES - CIRCULATING WATER SYSTEM AND NORTHWEST PART OF ESSENTIAL SERVICE WATER SYSTEM - HEUMADER SHALE

Sheet 1 of 1



DRAWING REFERENCE:

TITLED: YARD PIPELINES & ELECTRIC DUCT BANKS PLAN, SECTIONS & SCHEDULES, SHEET 2
FOR: K G & E / K E P C L
BY: BECHTEL - SMUPPS
DRAWING NO.: S-81, REV. F
DATED: 1-28-81

NOTES:

1. SEE TABLE 231.1-1 FOR THE TYPE OR TYPES OF DEFORMATIONS AT EACH LOCATION INDICATED.
2. SEE FIGURES 231.1-2 THROUGH 231.1-4 FOR THE LOCATIONS OF DEFORMATION ZONES IN THE PLANT AREA.
3. COORDINATES REFER TO SMUPPS DATUM.

: he defo _ ation one ho n on thi d a. in e e fo. the old ESWS pipin hich i abandoned in place and e.ve no f nction.

FEET
100 0 100 200

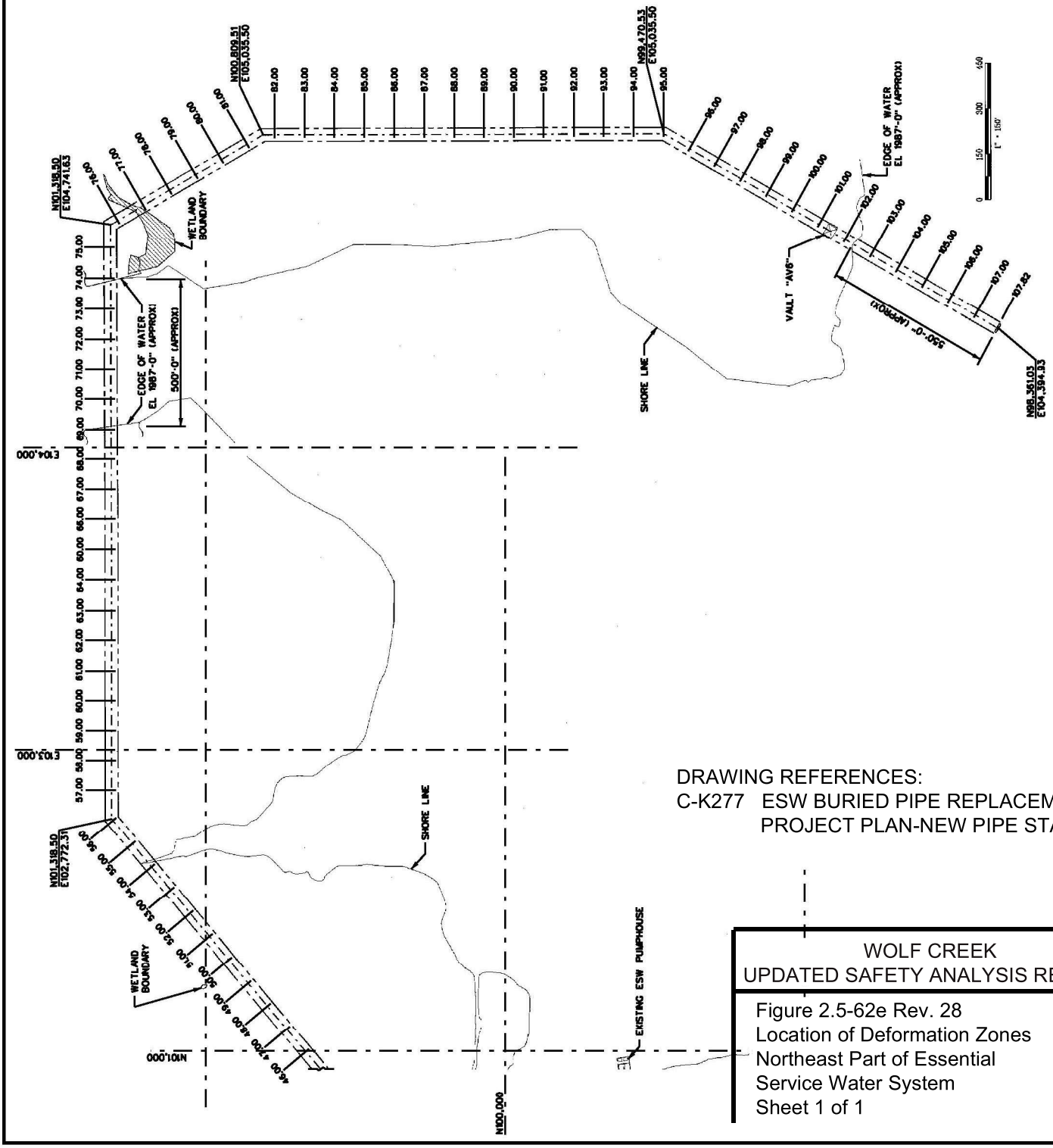
EXPLANATION:

LOCATION OF ONE OR MORE DEFORMATION ZONES WITHIN HEUMADER SHALE MEMBER.
(101) FEATURE NUMBER CORRESPONDING TO TABLE 231.1-1.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-62d Rev. 28

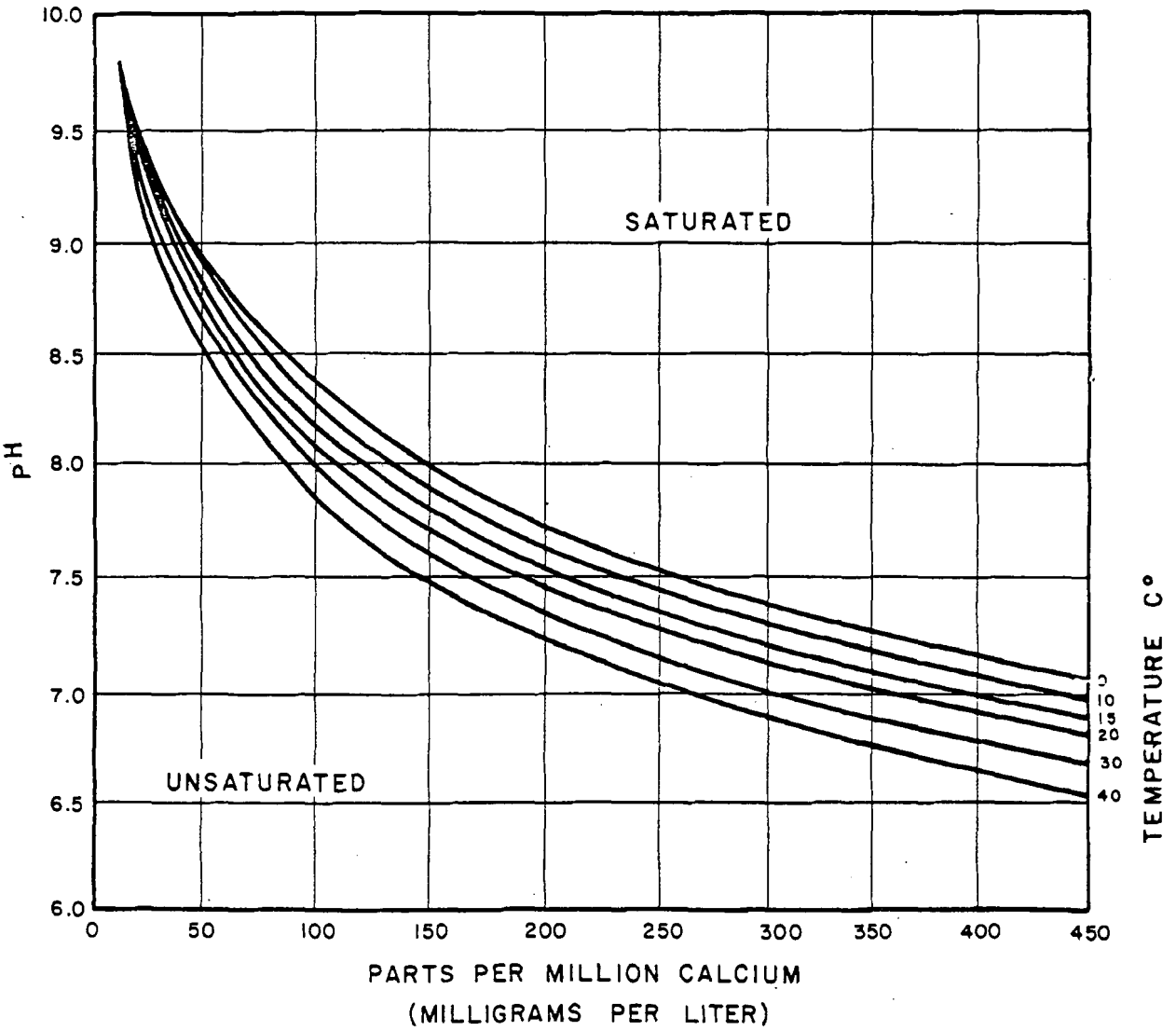
Location of Deformation Zones - Southeast Part of Essential Service Water System - Heumader Shale Member
Sheet 1 of 1



DRAWING REFERENCES:
C-K277 ESW BURIED PIPE REPLACEMENT PROJECT PLAN-NEW PIPE STATION

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-62e Rev. 28
Location of Deformation Zones
Northeast Part of Essential
Service Water System
Sheet 1 of 1



Rev. 0

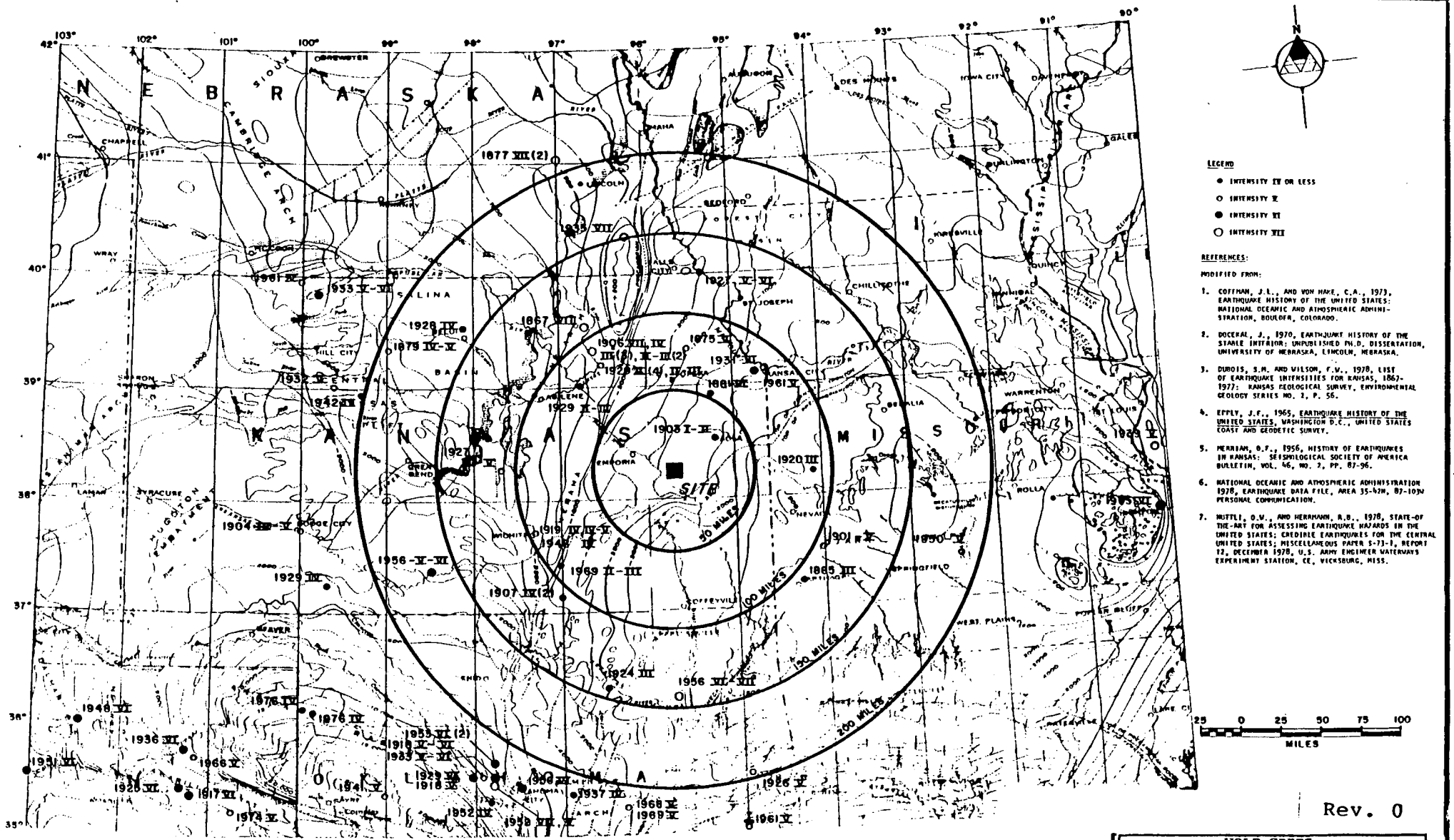
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-63

Calcium Solubility Curves

REFERENCE:

MODIFIED FROM SWEETING, M.M., 1966, "THE WEATHERING OF LIMESTONE, WITH PARTICULAR REFERENCE TO THE CARBONIFEROUS LIMESTONES OF NORTHERN ENGLAND IN DURY, G.H., ED., ESSAYS IN GEOMORPHOLOGY: AMERICAN ELSEVIER CO. INC., NEW YORK, P. 177-209.



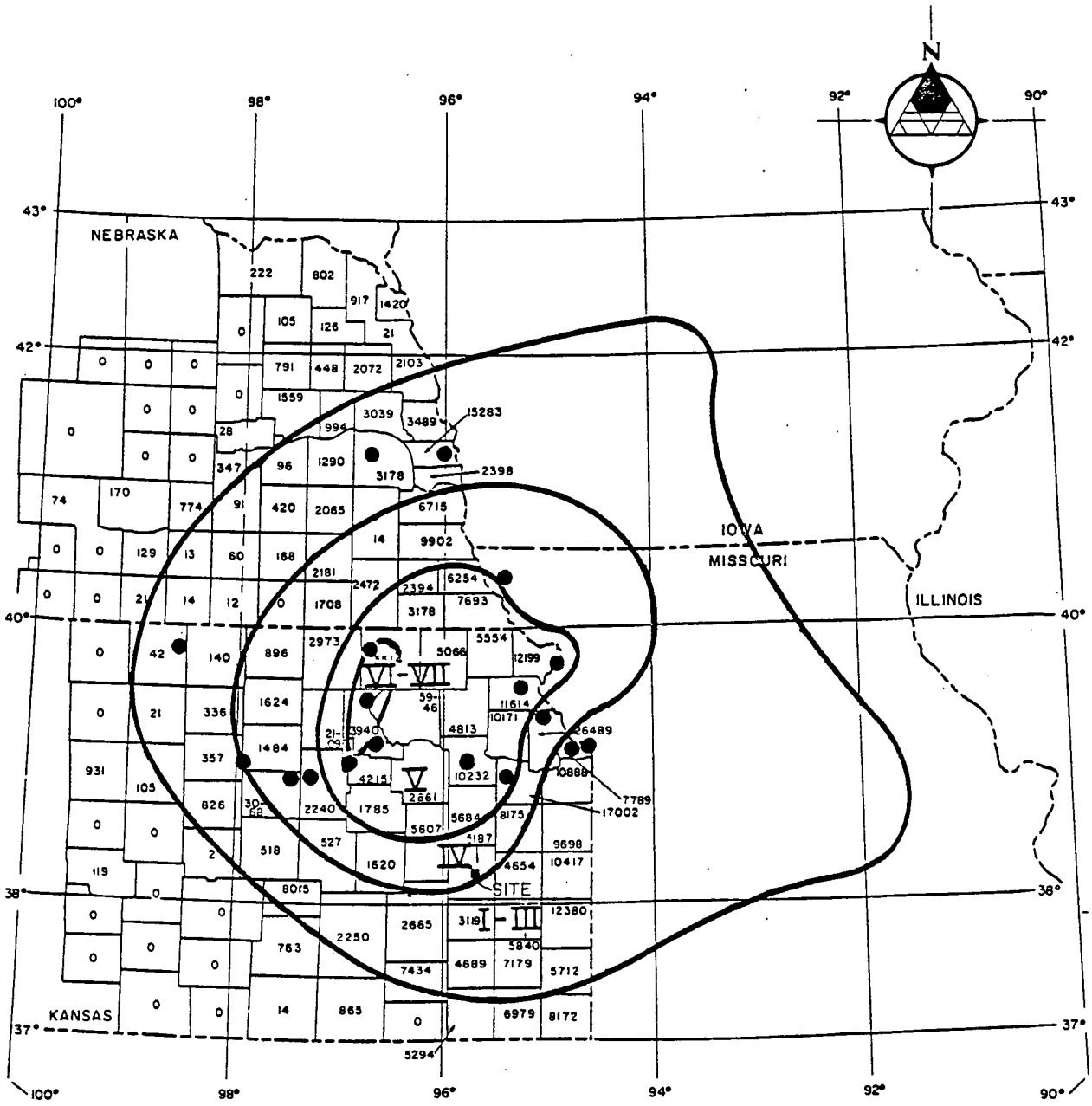
REFERENCE:
TECTONIC MAP OF THE UNITED STATES, USGS AND AAPG, 1962.

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-64

Earthquake Intensity and Epicenter Map



EXPLANATION:

● DATA POINT

0 50 100 200 Miles

Rev. 0

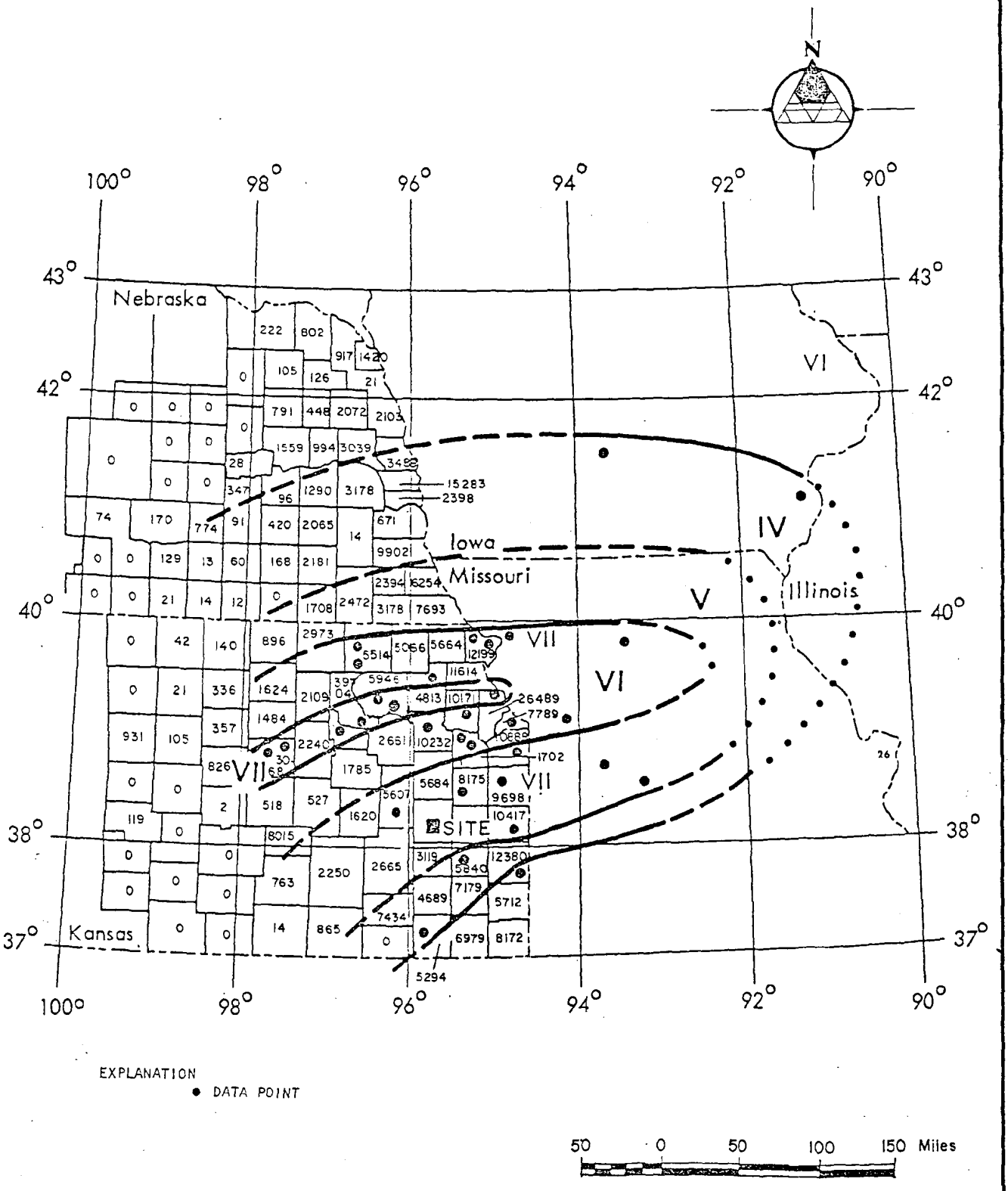
NOTES:

1. MODIFIED MERICALLI INTENSITIES ASSIGNED BY J. DOCEKAL.
2. SOURCE OF COUNTY POPULATION DATA-U.S. CENSUS OF 1860 AND 1870.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-65

Docekal Isoseismal Map for 1867 Manhattan, Kansas Earthquake



NOTES:

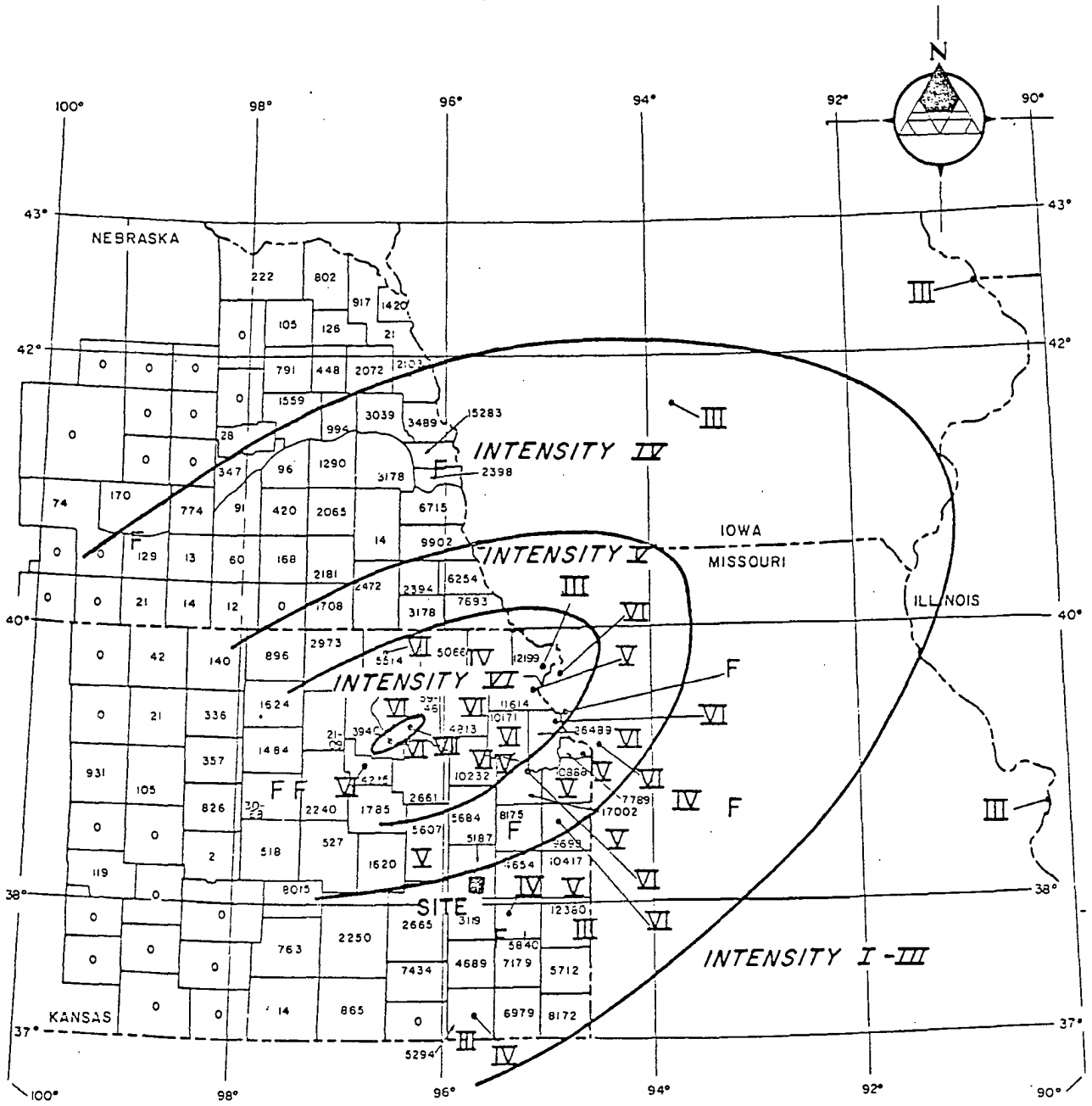
1. MODIFIED MERCALLI INTENSITY ASSIGNED BY DUBOIS & WILSON; 1978.
2. SOURCE OF COUNTY POPULATION DATA - US CENSUS OF 1860 AND 1870.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-66

Dubois & Wilson Isoseismal Map for 1867 Manhattan (Wamego), Kansas Earthquake

Rev. 0



EXPLANATION:

F EARTHQUAKE FELT-INTENSITY UNKNOWN

NOTES:

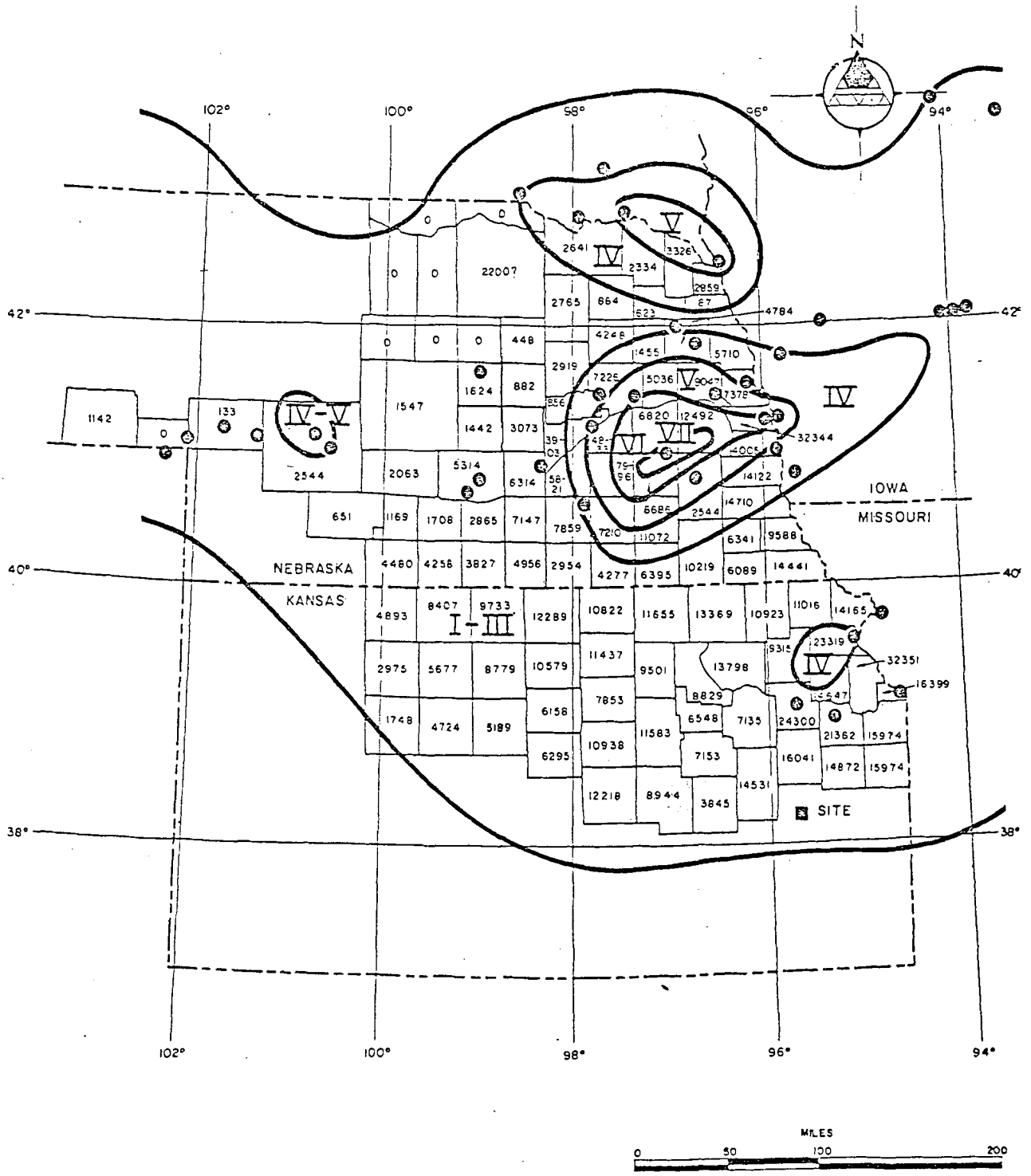
1. MODIFIED MERCALLI INTENSITIES ASSIGNED BY DAMES AND MOORE.
2. DATA LISTED IN TABLE 2.5-21.
3. SOURCE OF COUNTY POPULATION DATA- U.S. CENSUS OF 1860 AND 1870.

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-67

Dames & Moore Isoseismal Map for 1867 Manhattan, Kansas Earthquake



Rev. 0

EXPLANATION:

DATA POINT

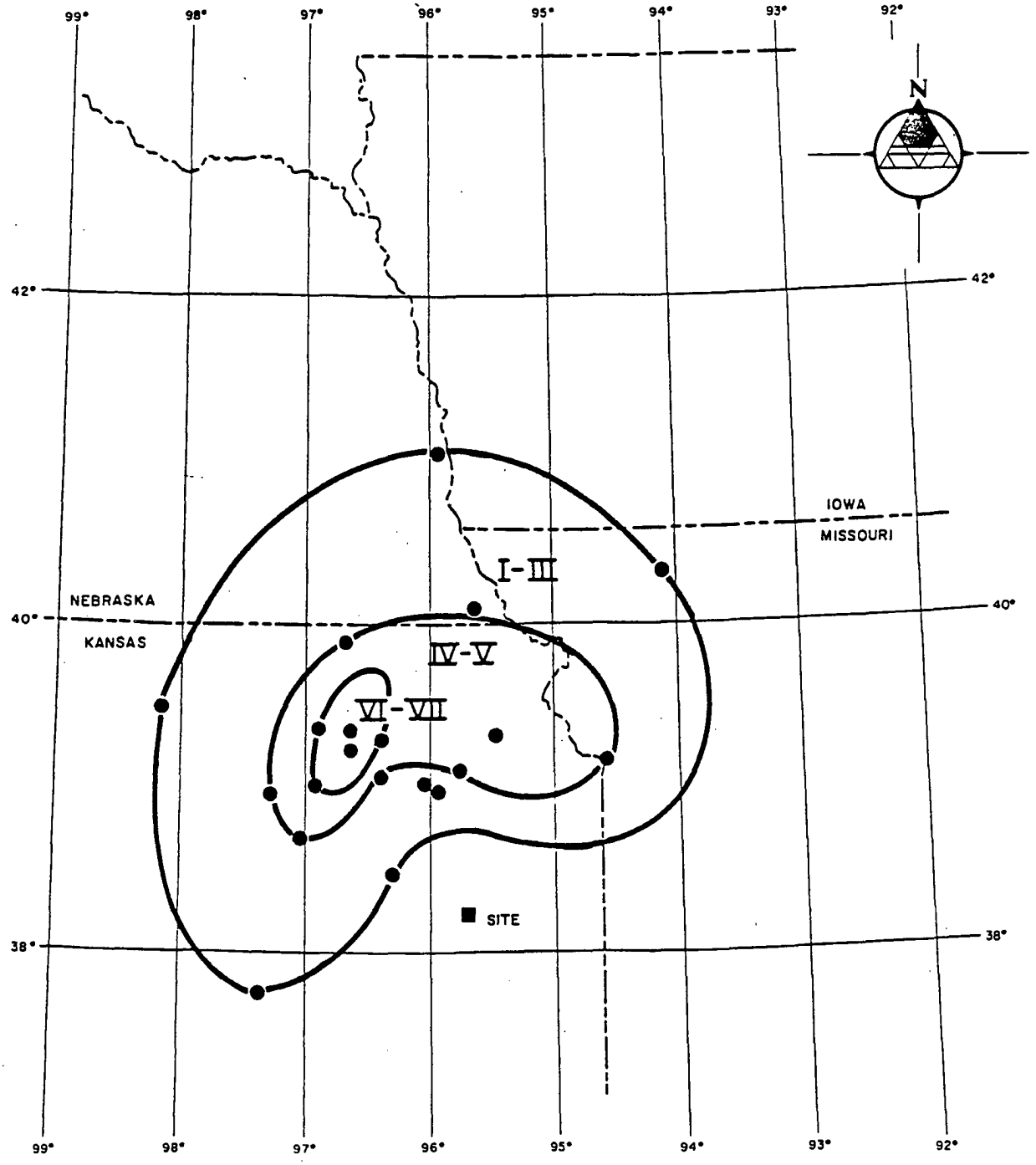
NOTES:

1. MODIFIED MERICALLI INTENSITIES ASSIGNED BY J. DOCEKAL.
2. SOURCE OF COUNTY POPULATION DATA-U.S. CENSUS OF 1870 AND 1880.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-68

Isoseismal Map for 1877 Eastern Nebraska Earthquake



EXPLANATION

● DATA POINT

20 0 20 40 60 80 Miles

Rev. 0

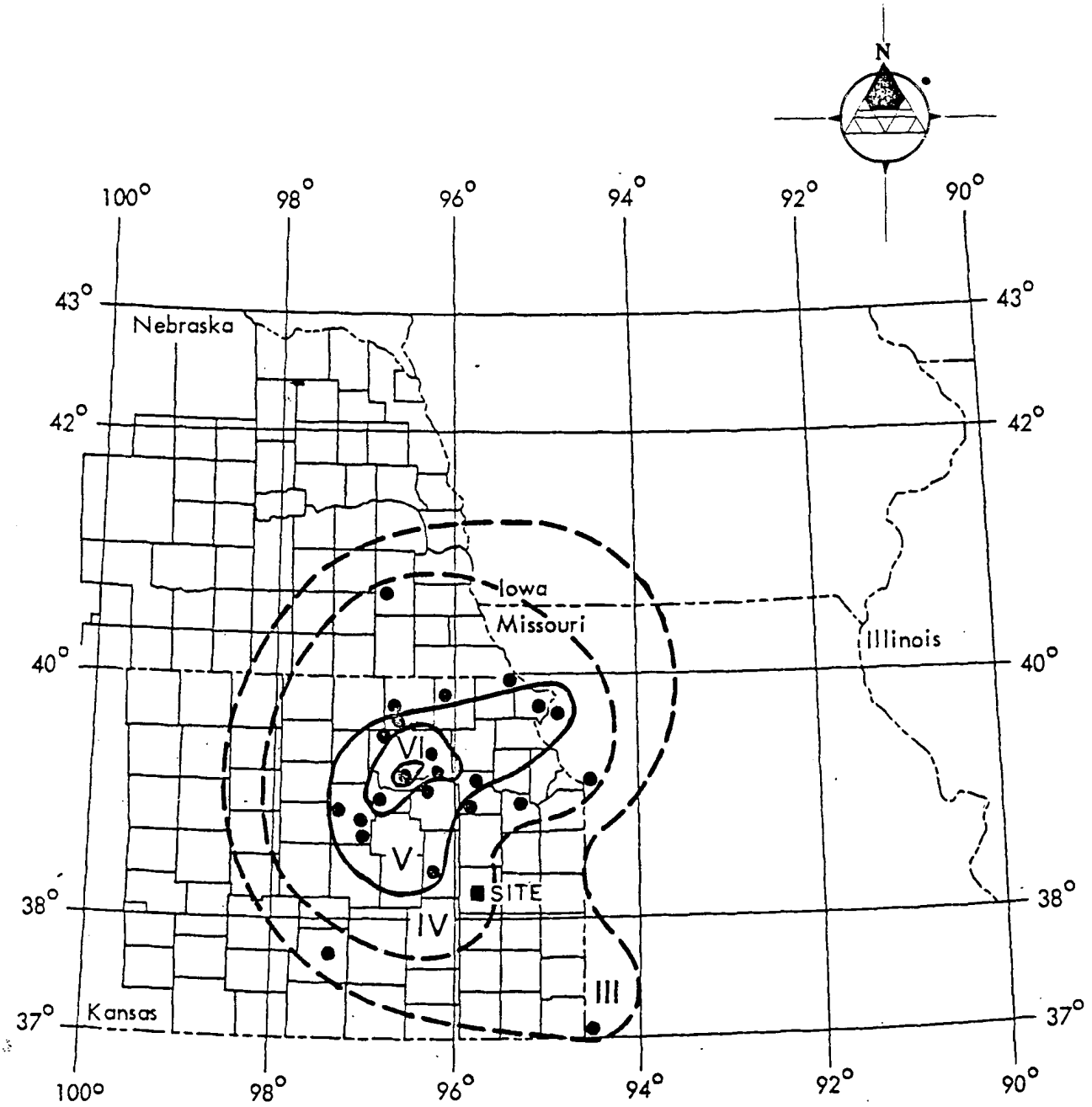
NOTES:

1. MODIFIED MERCALLI INTENSITY ASSIGNED BY J. DOCEKAL.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-69

Docekal Isoseismal Map for 1906 Manhattan, Kansas Earthquake



EXPLANATION

● DATA POINT

50 0 50 100 150 Miles

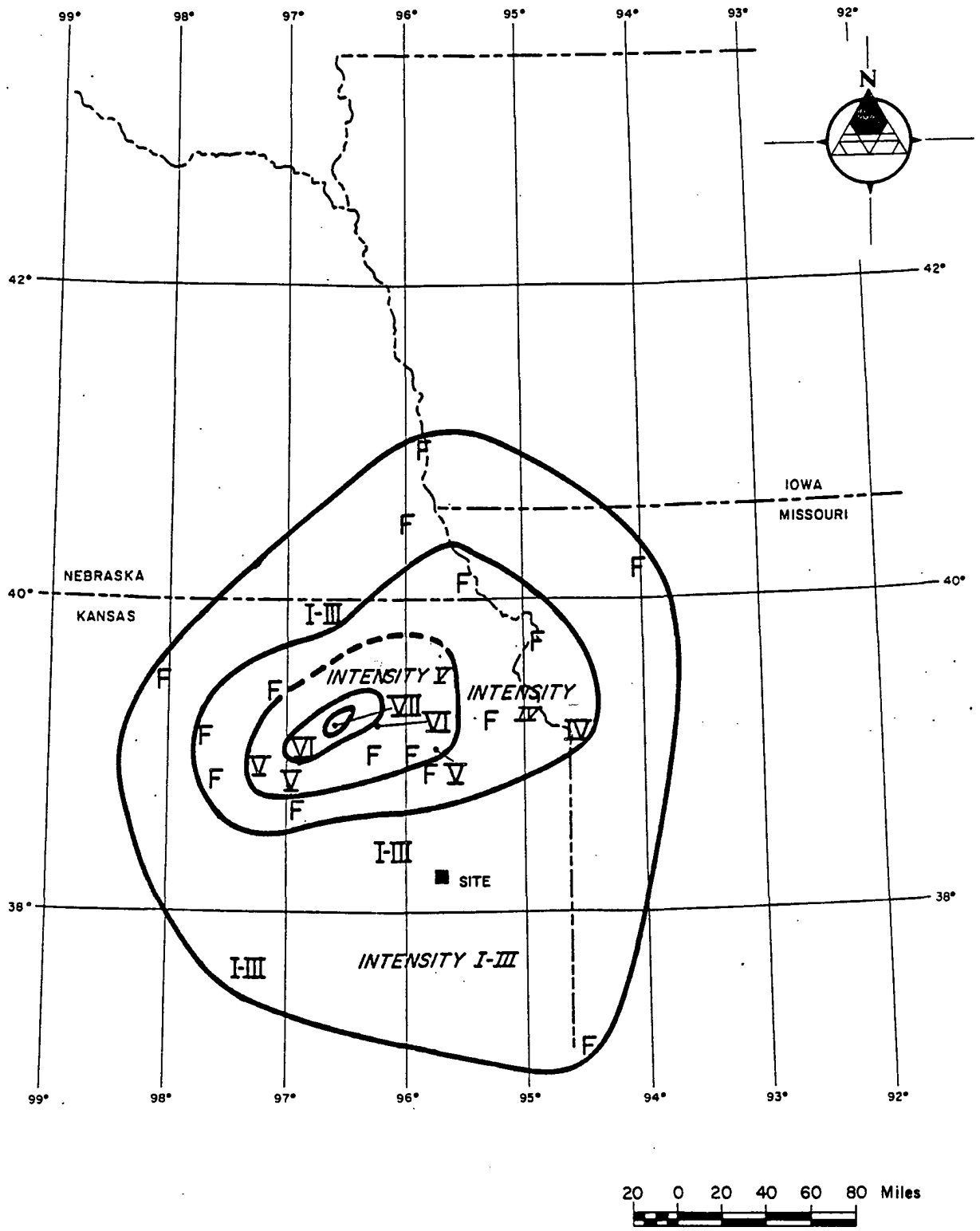
Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-70

Dubois & Wilson Isoseismal Map for 1906 Manhattan, Kansas Earthquake

NOTES:
1. MODIFIED MERCALLI INTENSITY ASSIGNED BY DUBOIS & WILSON; 1978.



EXPLANATION:

F EARTHQUAKE FELT-INTENSITY UNKNOWN

NOTES:

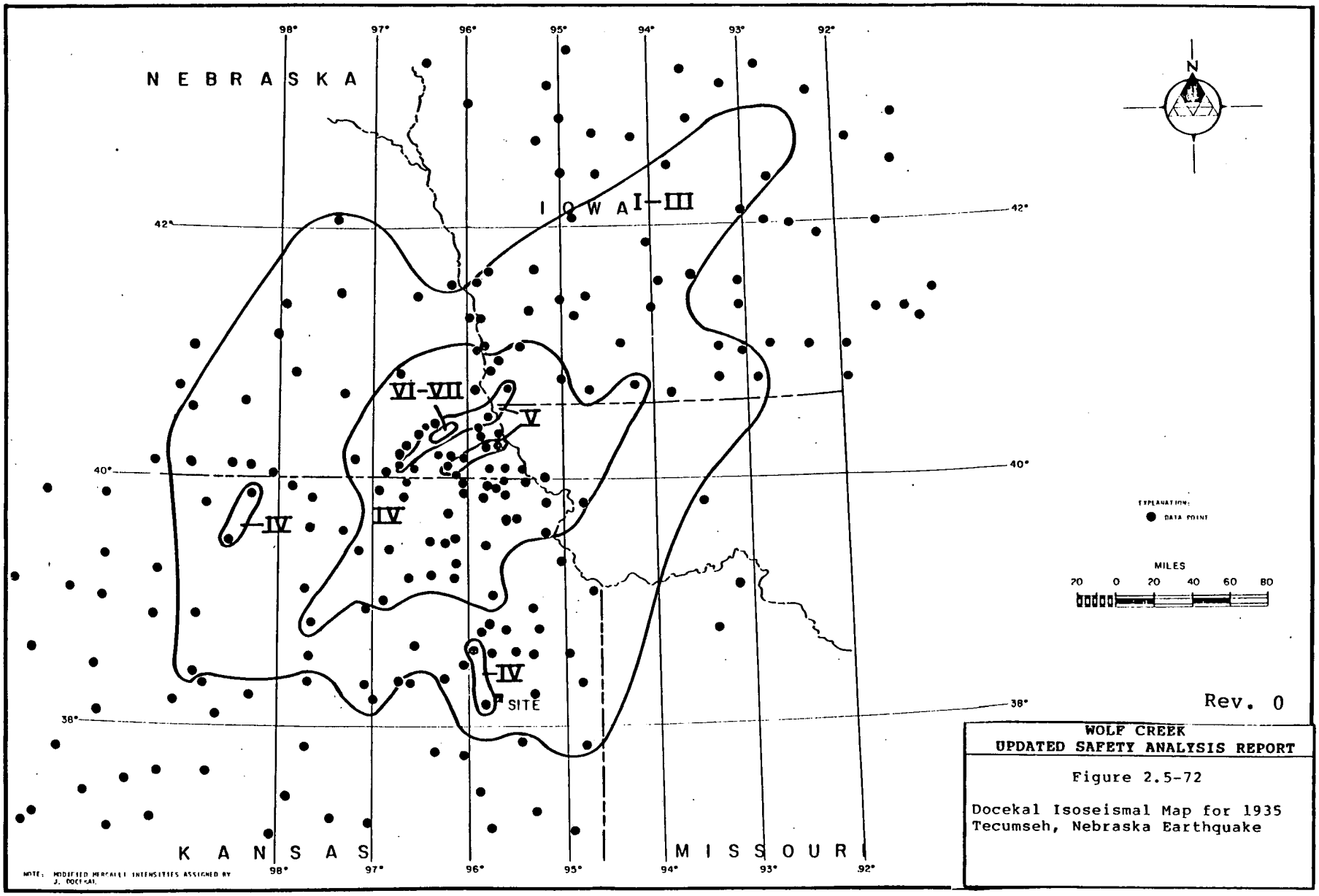
1. MODIFIED MERCALLI INTENSITIES ASSIGNED BY DAMES AND MOORE.
2. DATA LISTED IN TABLE 2.5-23.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

FIGURE 2.5-71

DAMES & MOORE ISOSEISMAL MAP FOR 1906 MANHATTAN, KANSAS EARTHQUAKE

Rev. 0

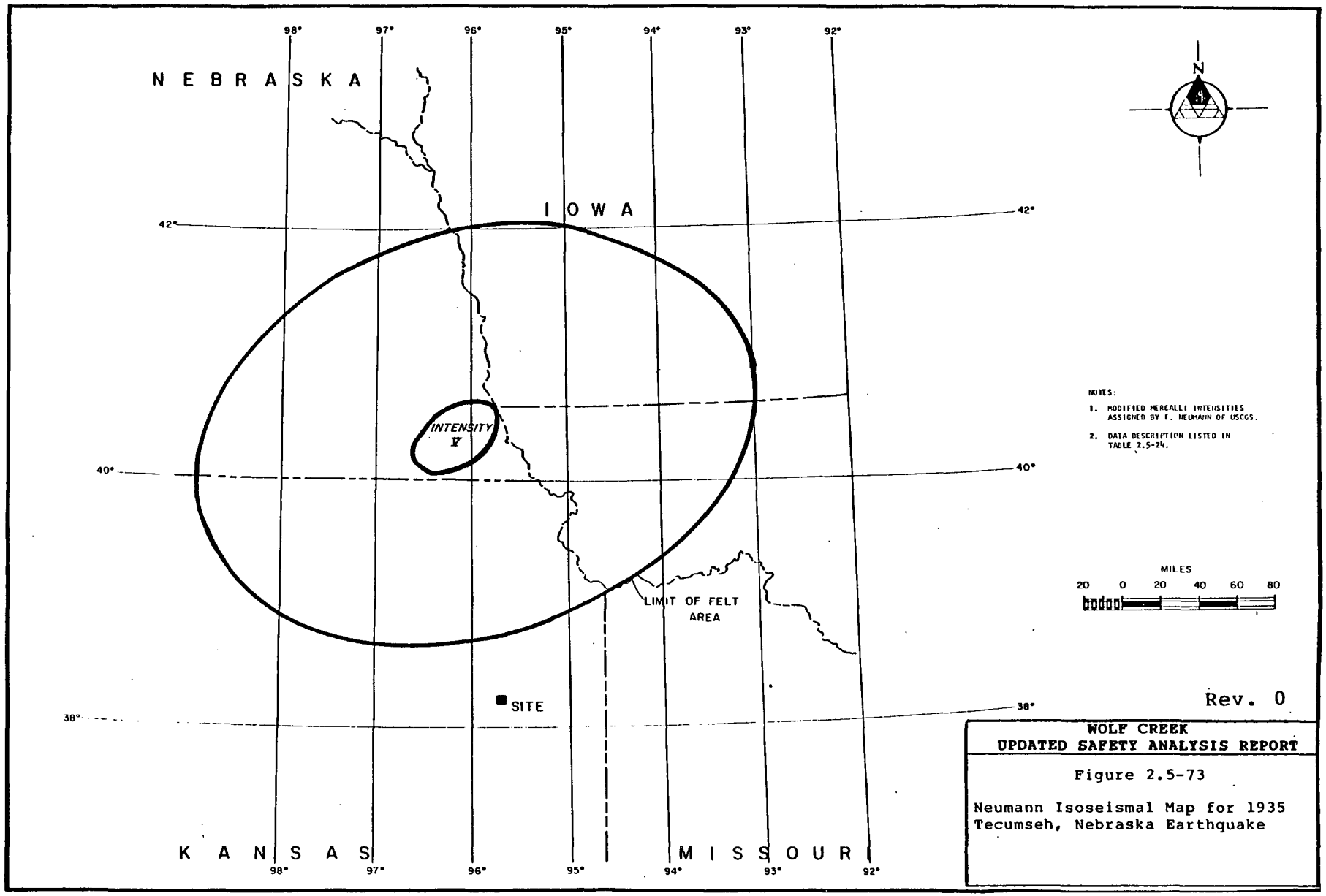


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-72

Docekal Isoseismal Map for 1935
Tecumseh, Nebraska Earthquake

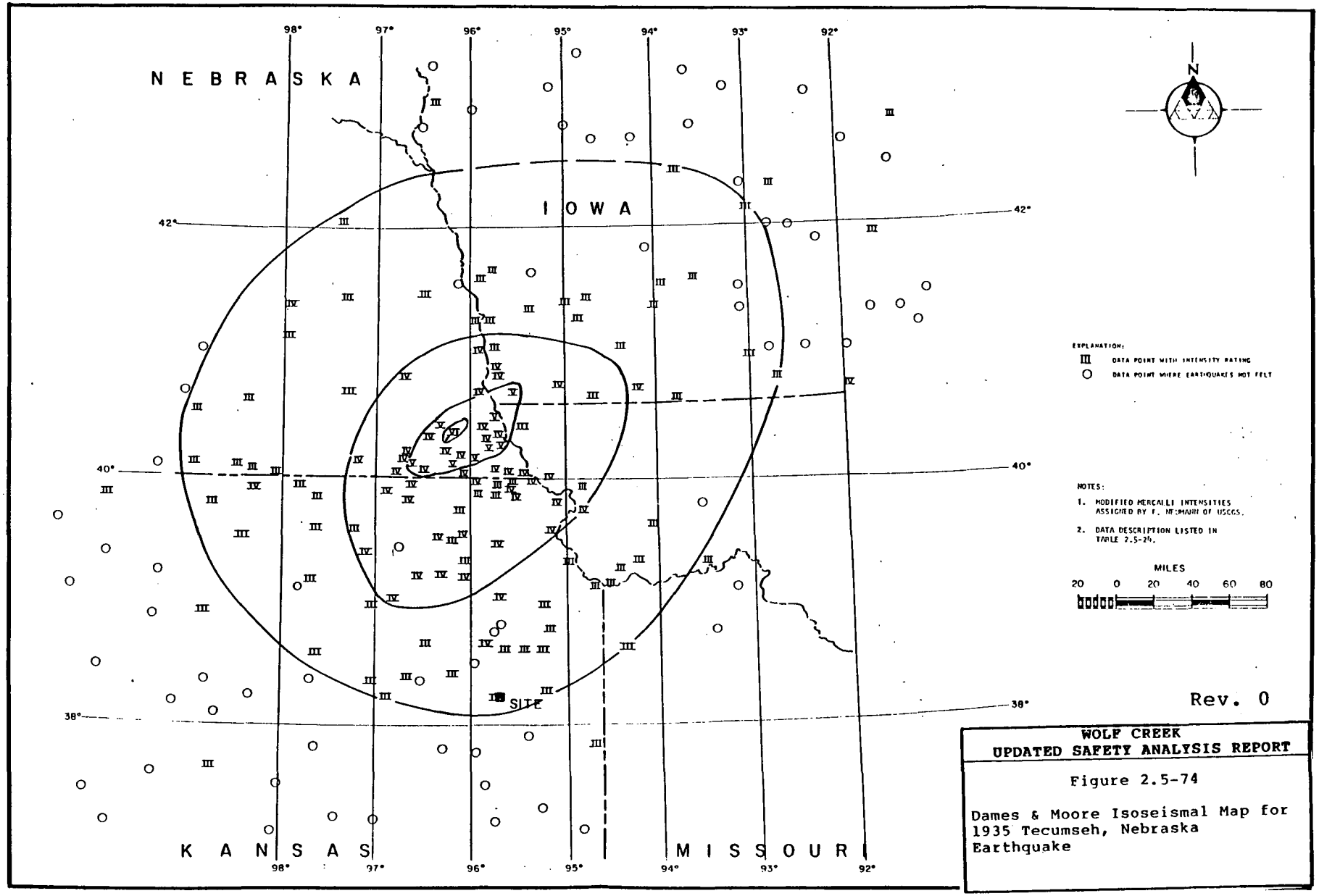


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-73

Neumann Isoseismal Map for 1935
Tecumseh, Nebraska Earthquake

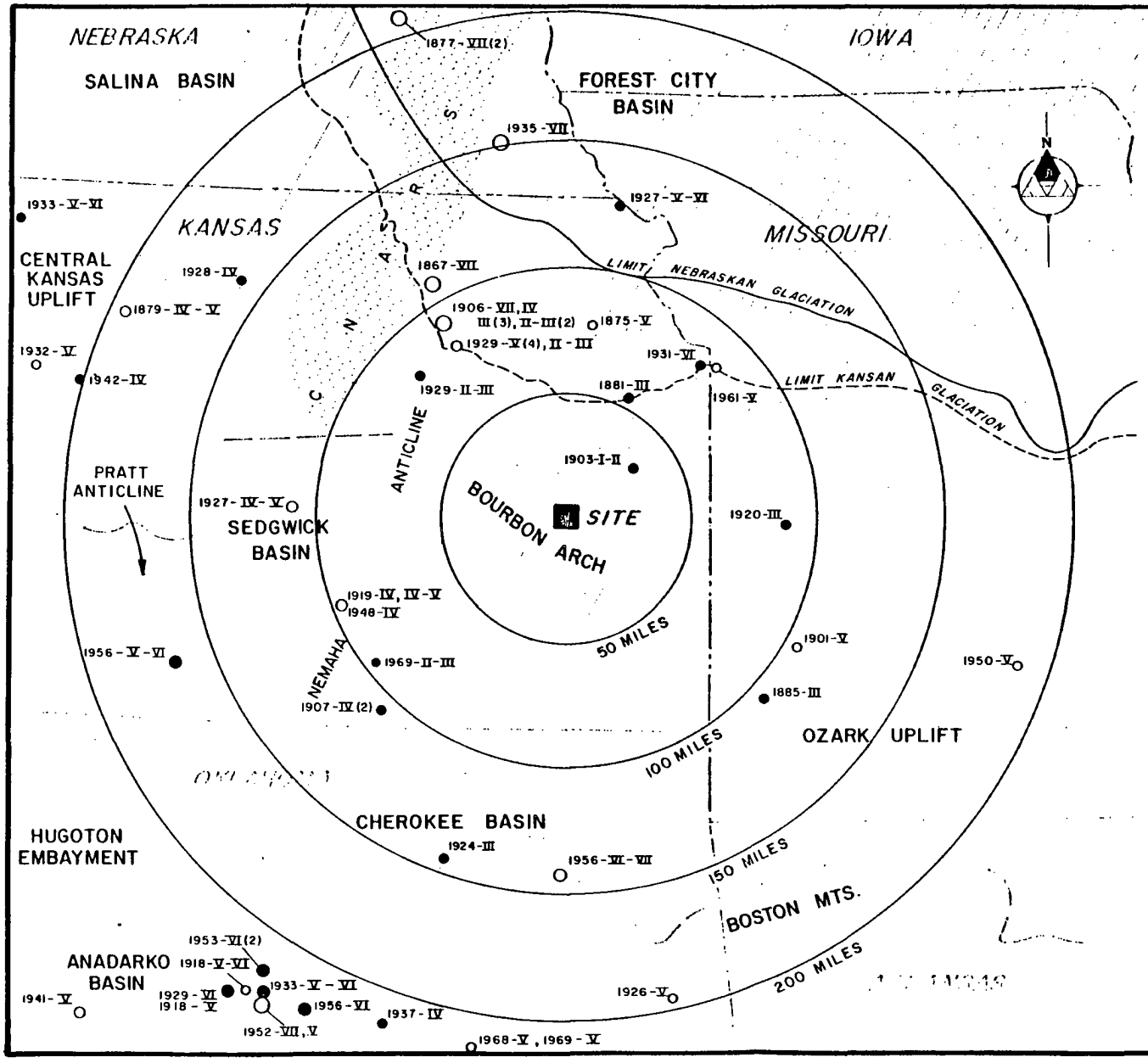


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-74

Dames & Moore Isoseismal Map for 1935 Tecumseh, Nebraska Earthquake



LEGEND

- ● INTENSITY IV OR LESS
- ○ INTENSITY V
- ● INTENSITY VI
- ○ INTENSITY VII
- ——— STATE BOUNDARY
- ---- APPROXIMATE BOUNDARY OF STRUCTURE

REFERENCES:

MODIFIED FROM:

1. COFFMAN, J.L., AND VON HAKE, C.A., 1973, EARTHQUAKE HISTORY OF THE UNITED STATES? NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, BOULDER, COLORADO.
2. DIVISION OF EARTH SCIENCES, NATIONAL RESEARCH COUNCIL (COMPILED AND EDITED), 1959, GLACIAL MAP OF THE UNITED STATES EAST OF THE ROCKY MOUNTAINS: THE GEOLOGICAL SOCIETY OF AMERICA, NEW YORK.
3. DOCEKAL, J., 1970, EARTHQUAKE HISTORY OF THE STABLE INTERIOR, UNPUBLISHED PH.D. DISSERTATION, UNIVERSITY OF NEBRASKA, LINCOLN, NEBRASKA.
4. DUBOIS, S.M., AND WILSON, F.W., 1978, LIST OF EARTHQUAKE INTENSITIES FOR KANSAS, 1867-1977: KANSAS GEOLOGICAL SURVEY, ENVIRONMENTAL GEOLOGY SERIES NO. 2, P. 56.
5. EPPLY, J.F., 1965, EARTHQUAKE HISTORY OF THE UNITED STATES, WASHINGTON D.C., UNITED STATES COAST AND GEODETIC SURVEY.
6. LANDES, K.K., 1959, PETROLEUM GEOLOGY: 2ND ED., NEW YORK, JOHN WILEY & SONS, INC.
7. MERRIAM, D.F., 1956, HISTORY OF EARTHQUAKES IN KANSAS: SEISMOLOGICAL SOCIETY OF AMERICA BULL., VOL. 46, NO. 2, PP. 87-96.
8. _____, 1963, THE GEOLOGIC HISTORY OF KANSAS: KANSAS GEOL. SUR., BULL. 162, PP. 179-253.
9. NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION 1978, EARTHQUAKE DATA FILE, AREA 35-42N, 87-103W PERSONAL COMMUNICATION.
10. NUTTLI, O.W., AND HERRMANN, R.B., 1978, STATE-OF-THE-ART FOR ASSESSING EARTHQUAKE HAZARDS IN THE UNITED STATES; CREDIBLE EARTHQUAKES FOR THE CENTRAL UNITED STATES; MISCELLANEOUS PAPER S-73-1, REPORT 12, DECEMBER 1978, U.S. ARMY ENGINEER WATERWAYS EXPERIMENT STATION, CE, VICKSBURG, MISS.
11. RIGGS, E.A., 1960, MAJOR BASINS AND STRUCTURAL FEATURES OF THE UNITED STATES: HALLEWOOD, N.J., C.S. HAMMOND & CO.

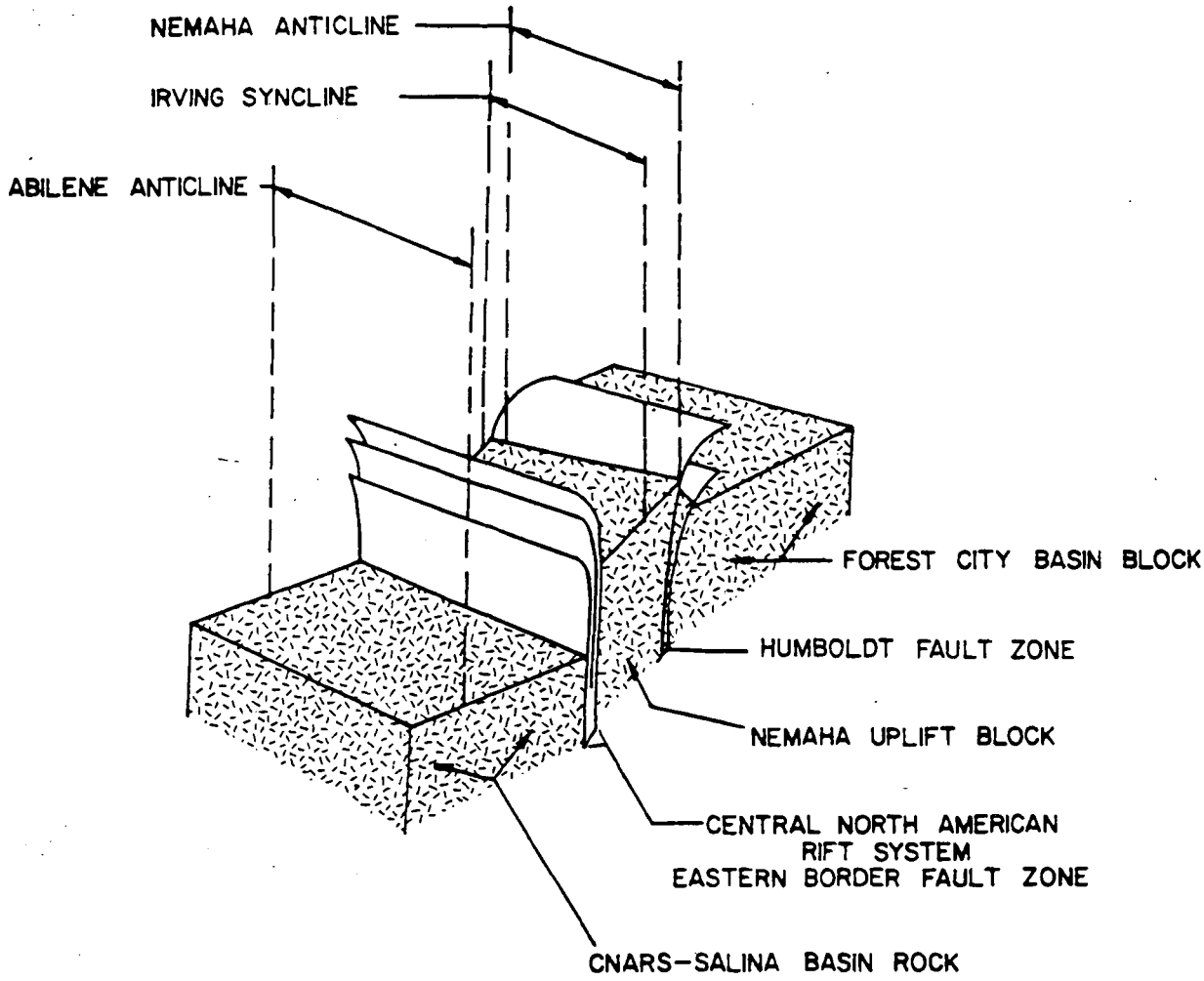
MILES
25 0 25 50

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-75

Regional Tectonic Structures, Earthquake Epicenters, and Limits of Glaciation

Rev. 0



NOTE:
THE NEMAHA AND ABILINE ANTICLINES AND THE IRVING SYNCLINE ARE EXPRESSED ON THE CONFIGRATION OF THE PRECAMBRIAN SURFACE AND IN THE OVERLYING SEDIMENTS (SECTION 2.5.1.1.5.1.15)

MODIFIED FROM:

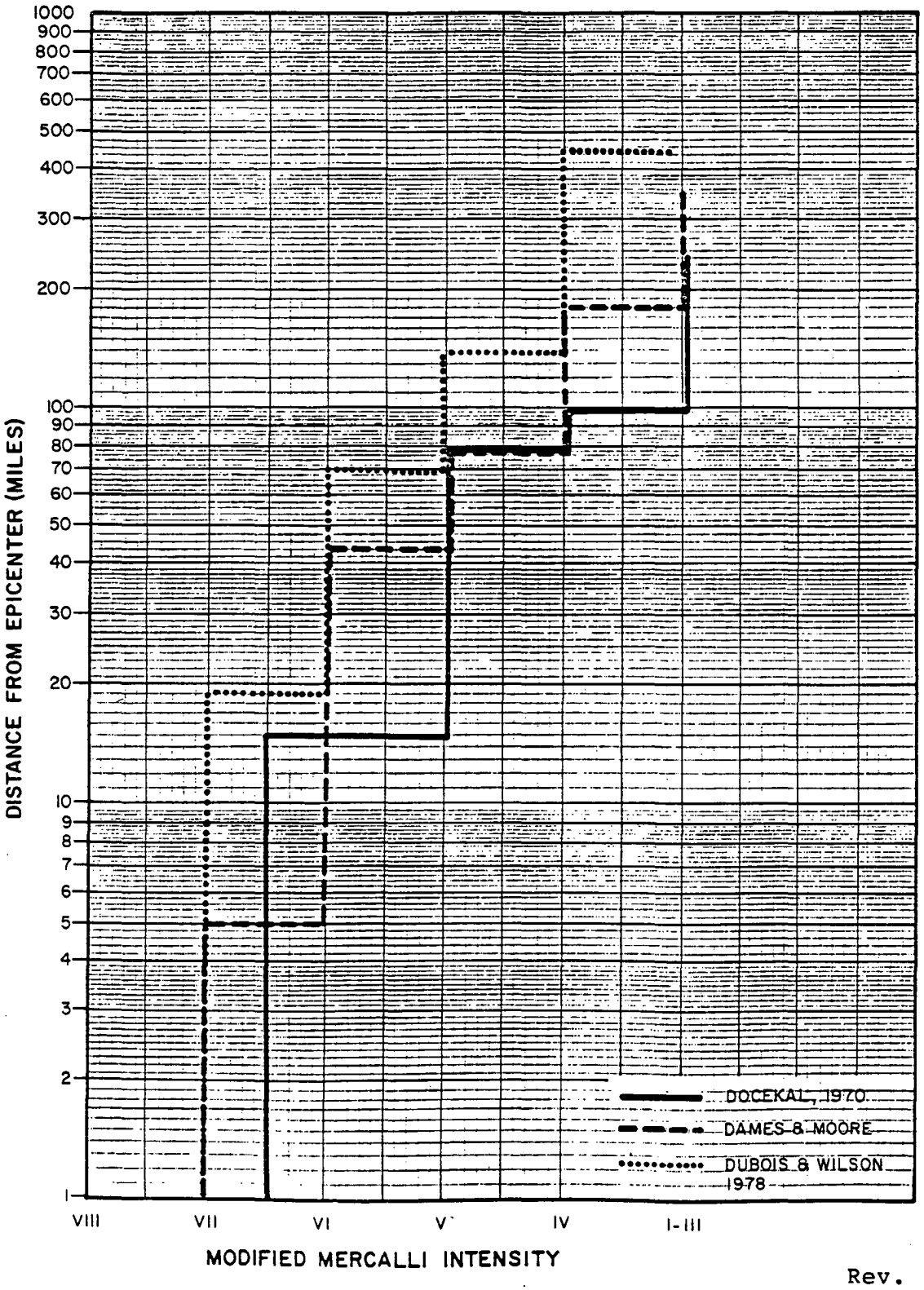
SYLVESTER, A.G., AND SMITH, R.R., 1976, TECTONIC TRANSPRESSION AND BASEMENT-CONTROLLED DEFORMATION IN SAN ANDREAS FAULT ZONE, SALTON TROUGH, CALIF.: AMERICAN ASSOC. PETROLEUM GEOL. BULL., VOL. 60, NO. 12, PP. 2081-2102, FIG. 6.

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-76

Idealized Block Diagram of Basement and Principal Faults in Central Kansas

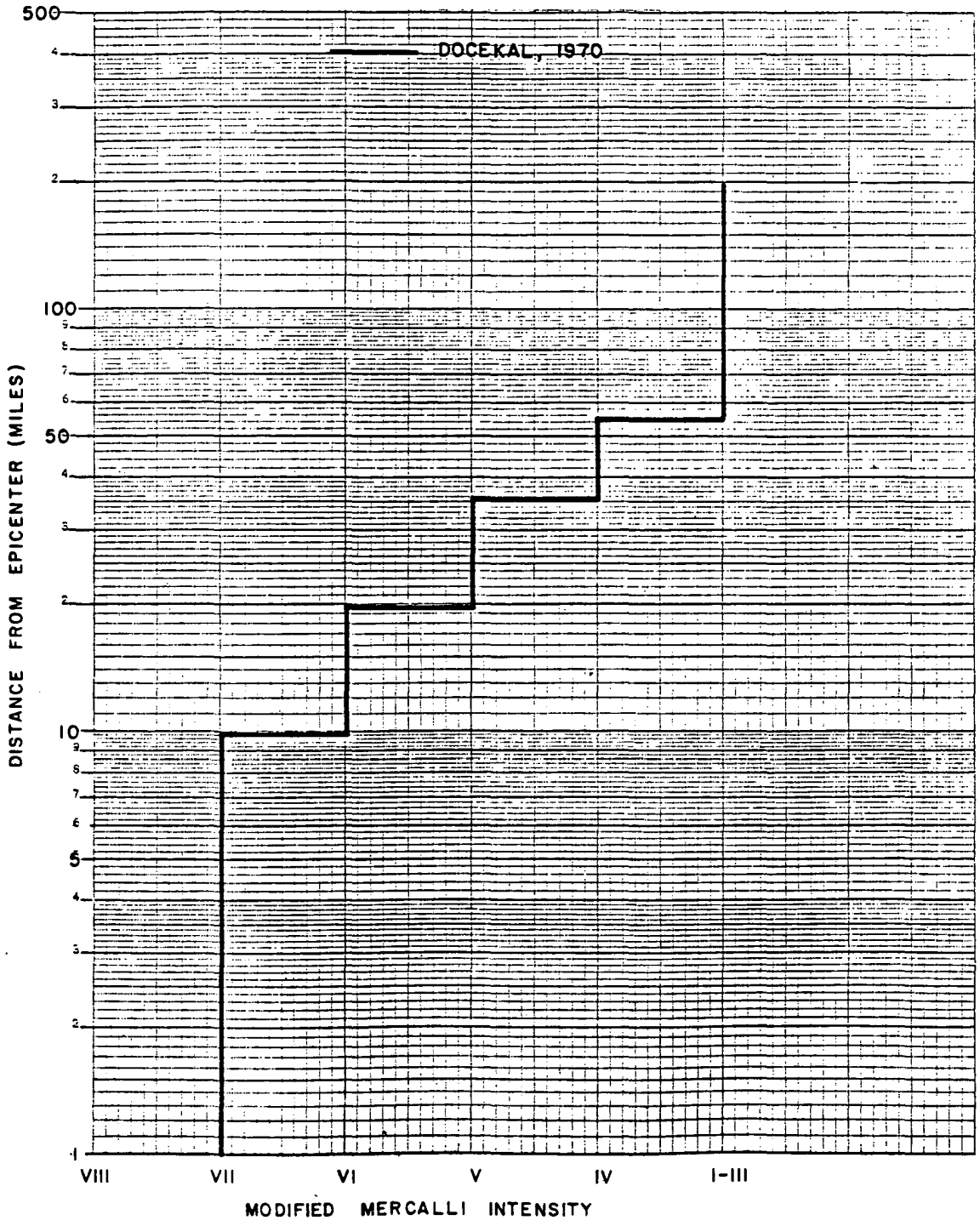


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-77

Attenuation Curves for 1867
Manhattan, Kansas Earthquake

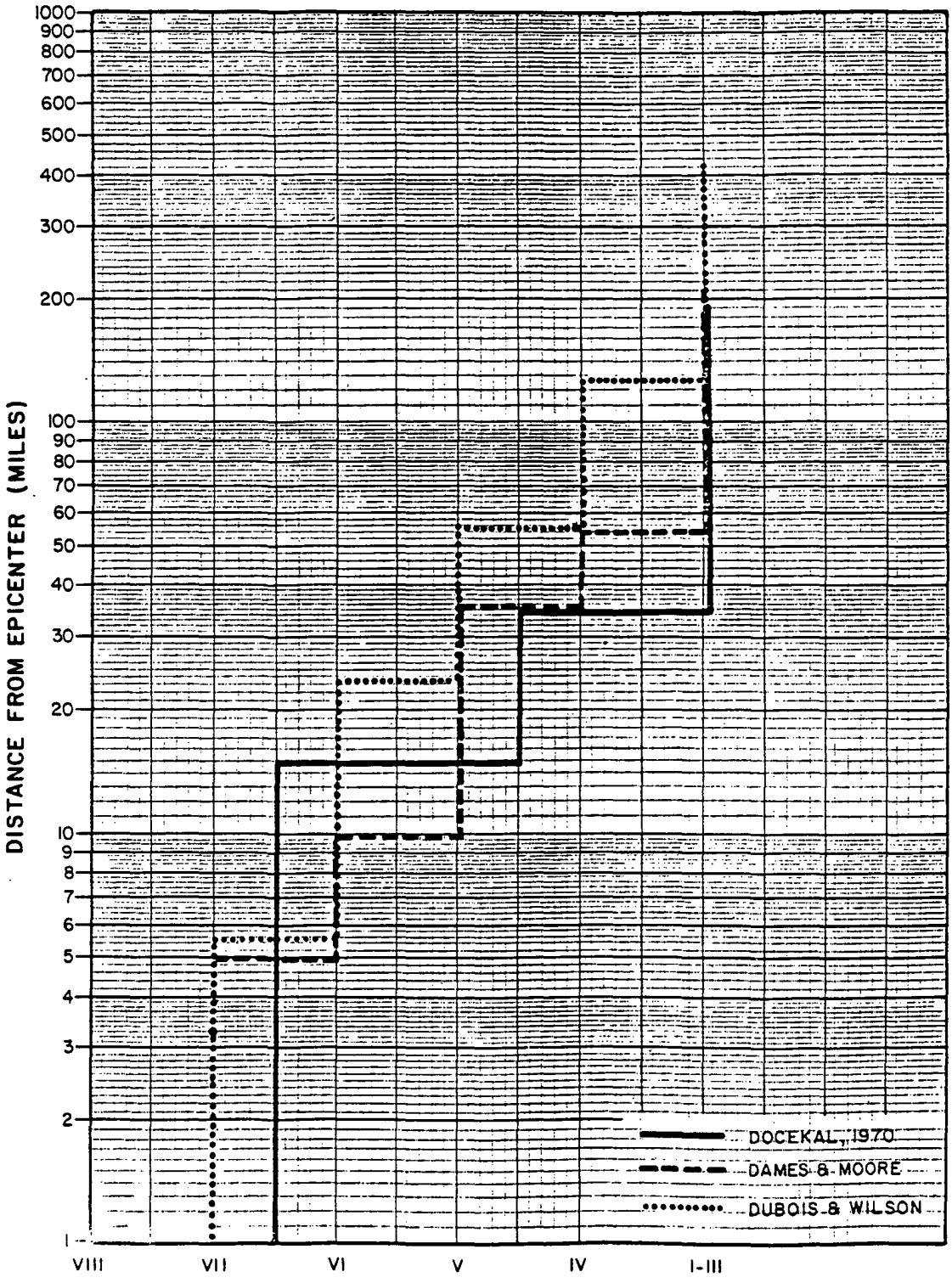


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-78

Attenuation Curve for 1877
Eastern Nebraska Earthquake

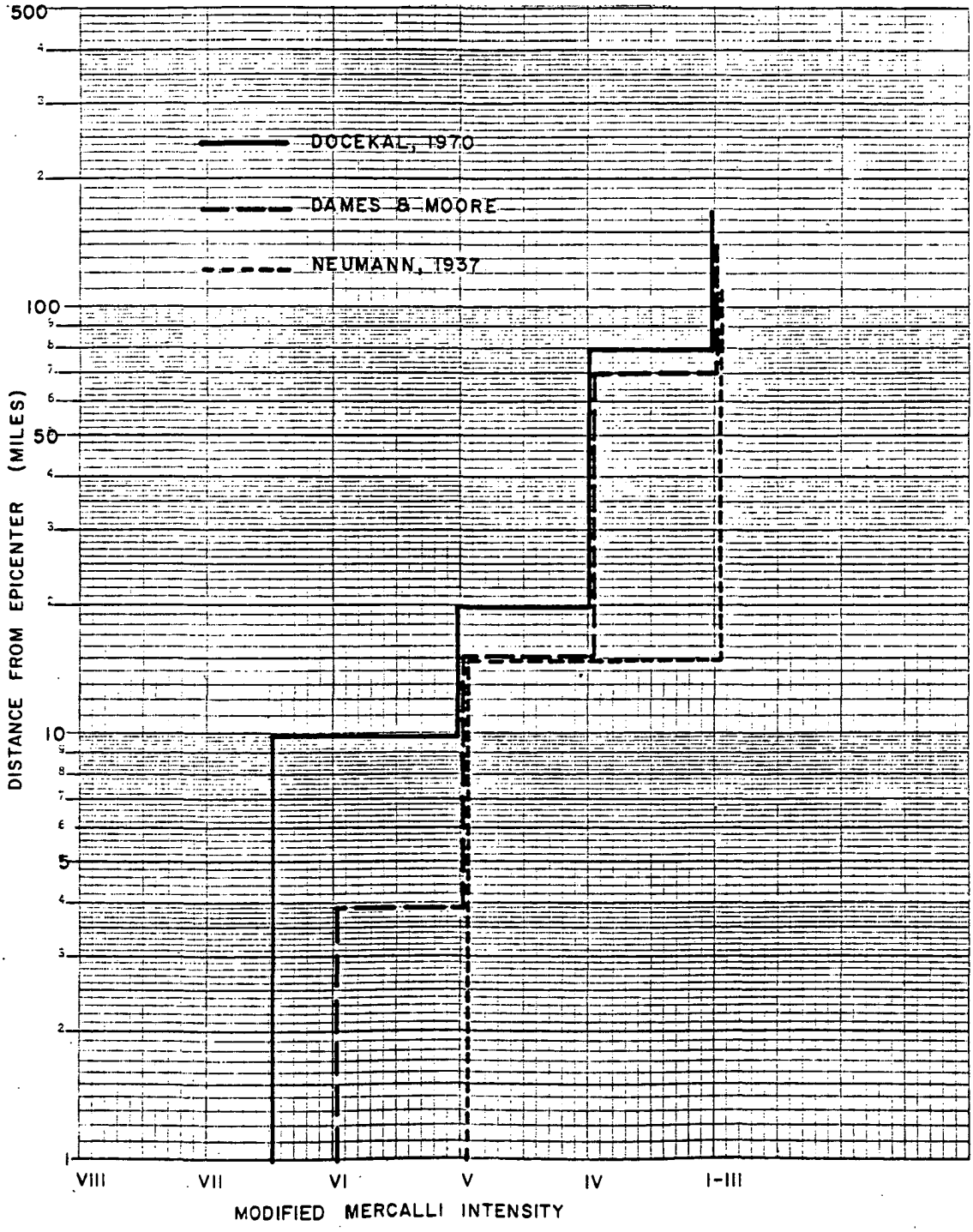


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-79

Attenuation Curves for 1906
Manhattan, Kansas Earthquake

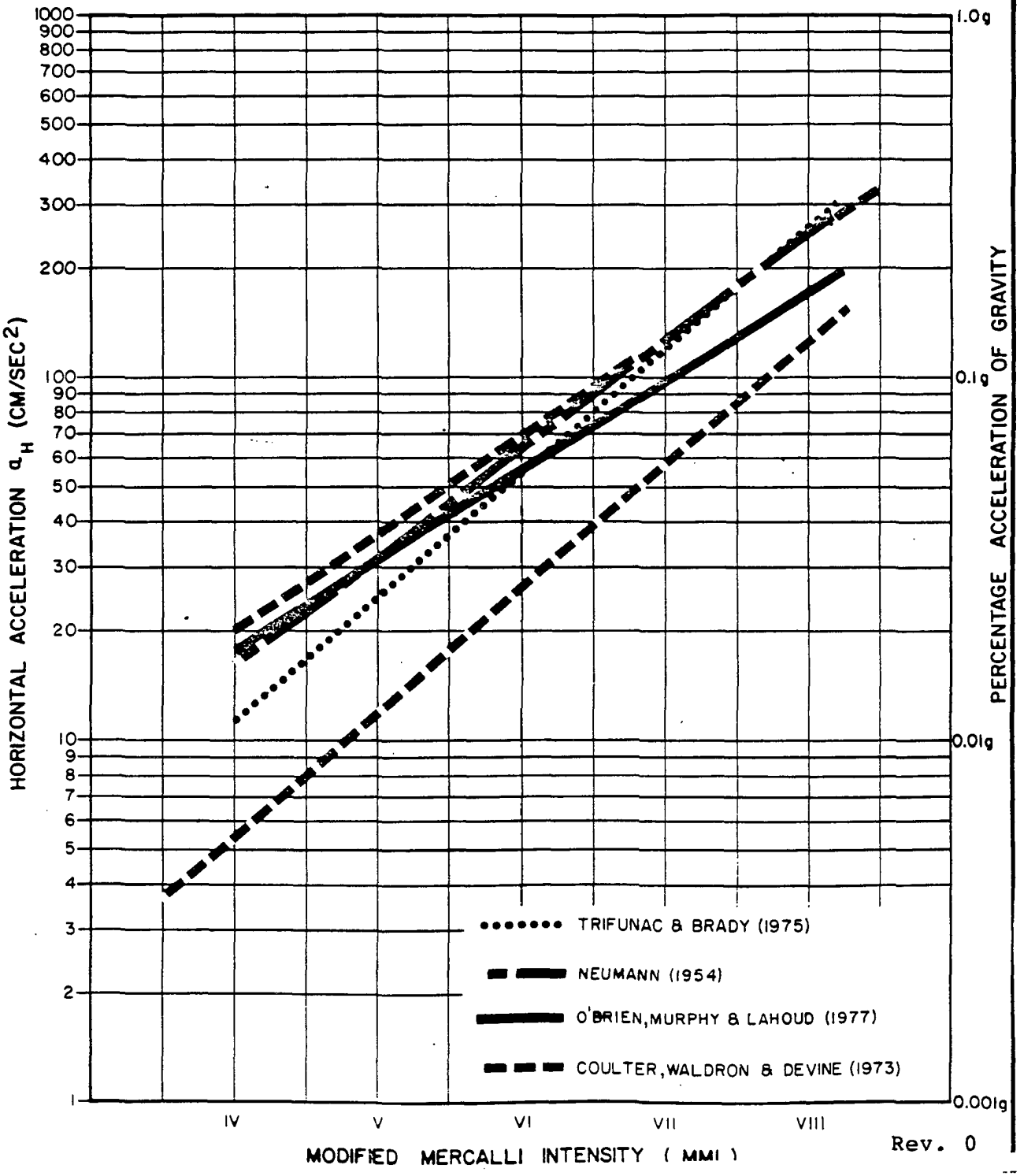


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-80

Attenuation Curves for 1935
Tecumseh, Nebraska Earthquake



Rev. 0

REFERENCES:

Coulter, H.W. Waldron, H.H. and Devine, J.F., 1973, Seismic and design considerations for nuclear facilities in Proceedings of the fifth world conference on earthquake engineering: Rome, Italy, Paper no. 302.

Neumann, F., 1954, Earthquake intensity and related ground motion: University of Washington Press, Seattle, Washington.

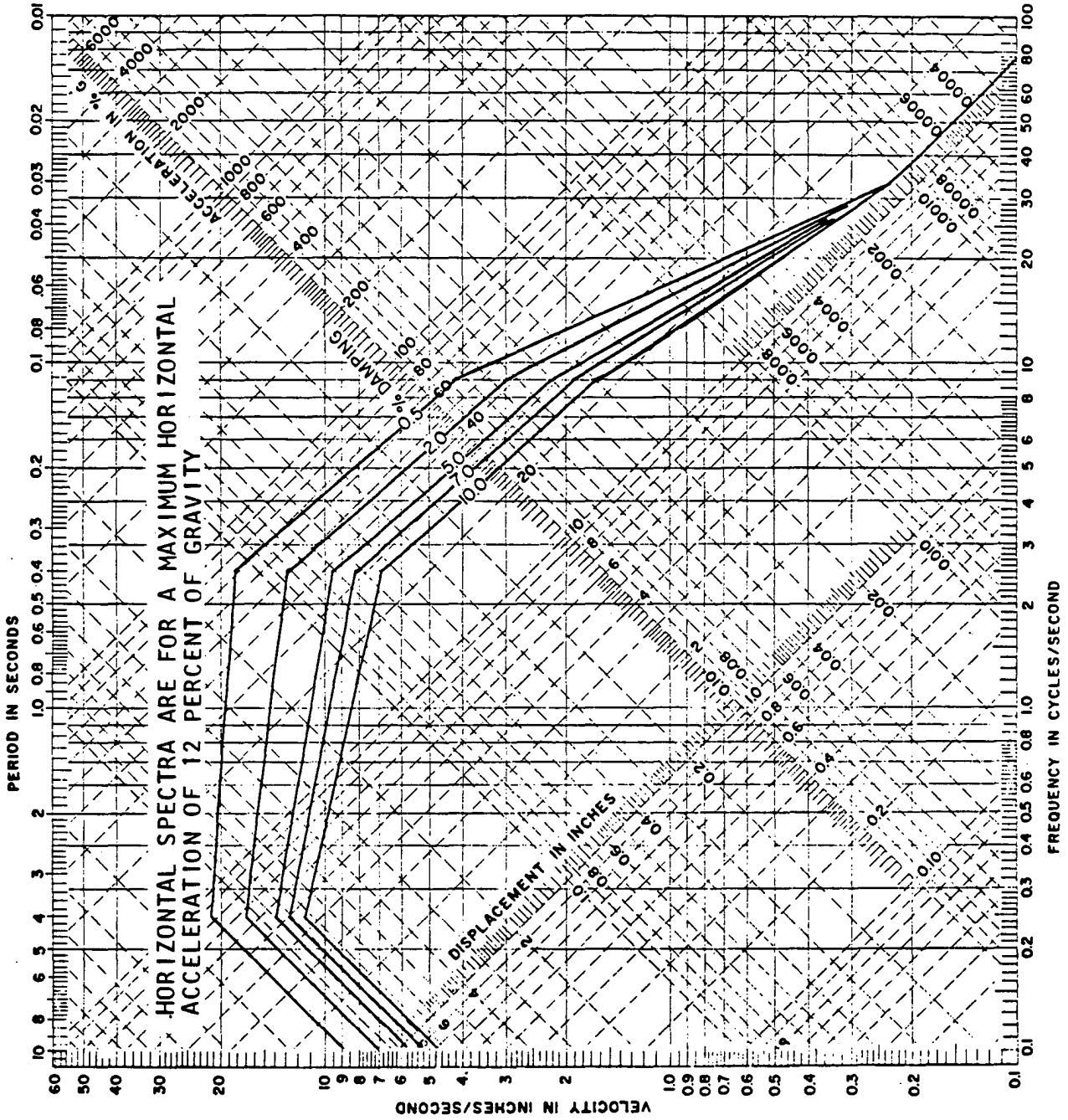
O'Brien L.J., Murphy, J.R. and Lahoud, J.A., 1977, The correlation of peak ground acceleration amplitude with seismic intensity and other physical parameters, Computer Sciences Corporation, Falls Church, Virginia.

Trifunac, M.A. and Brady, A.G., 1975, On the correlation of seismic intensity scales with peaks of recorded strong ground motion: Bulletin of the Seismological Society of America, Vol. 66, p. 139-162.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-81

Epicentral Earthquake Intensity vs Horizontal Acceleration

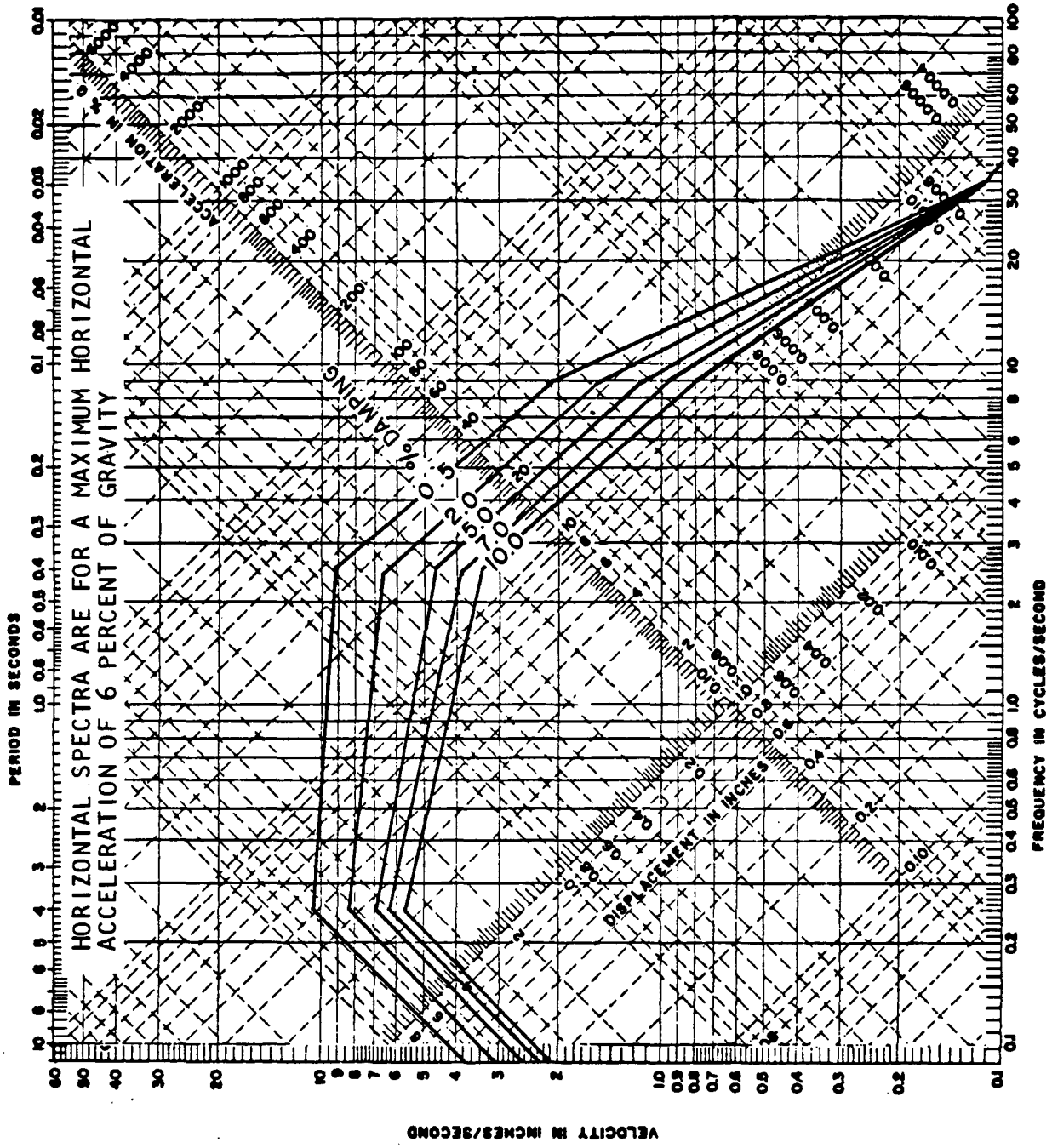


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-82

Horizontal Response Spectra Safe Shutdown Earthquake

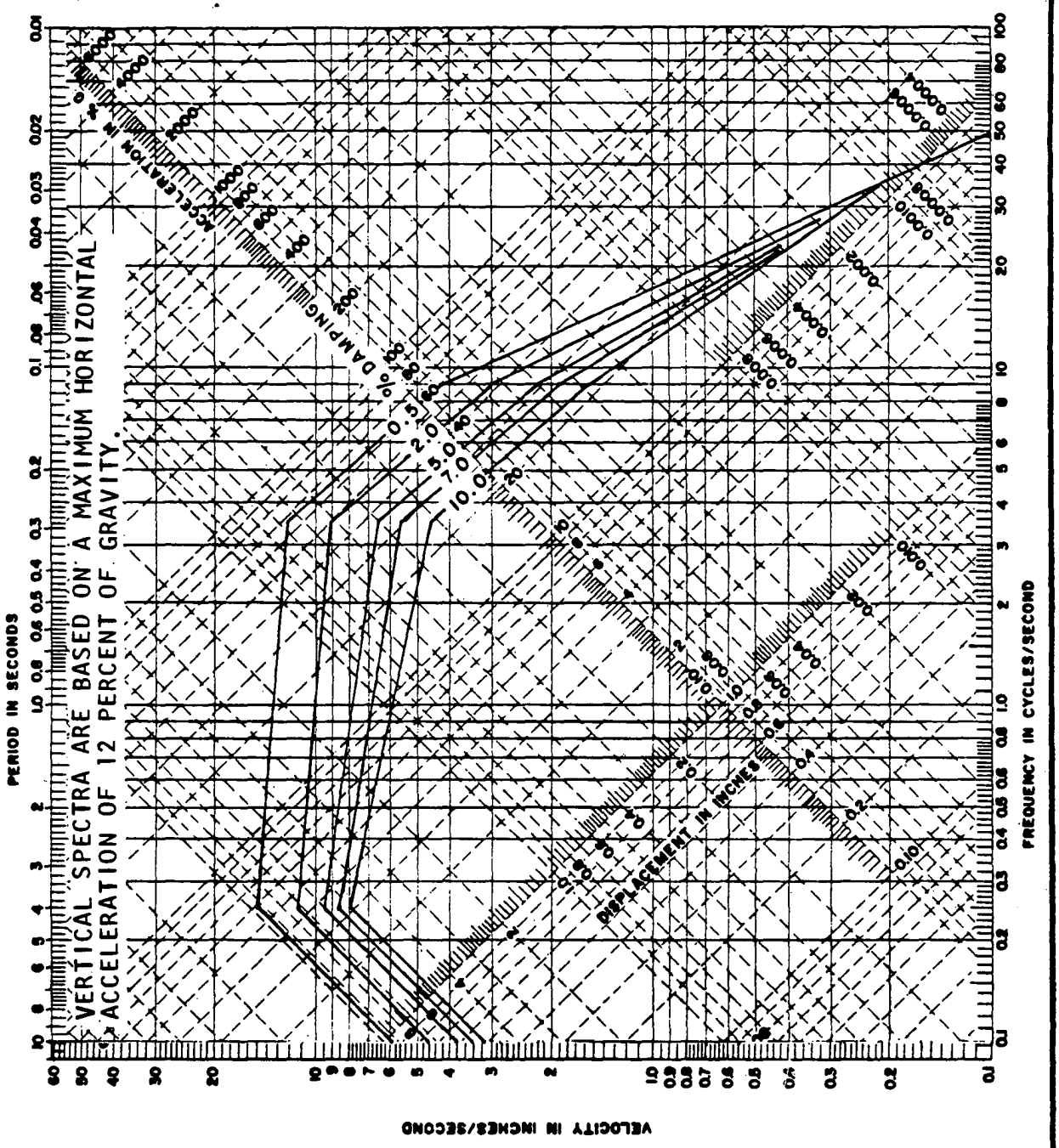


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-83

Horizontal Response Spectra
Operating Basis Earthquake

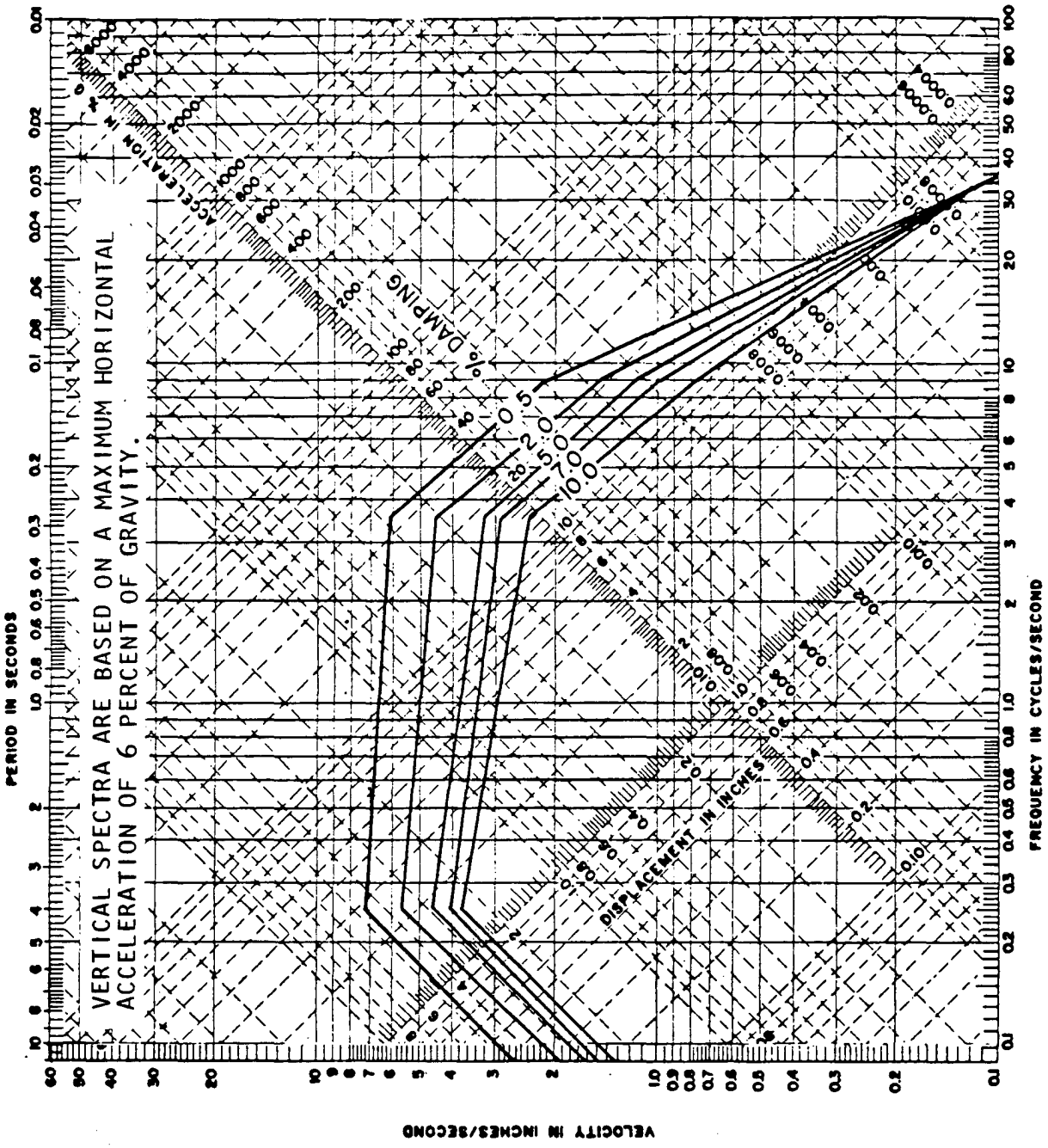


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-84

Vertical Response Spectra, Safe Shutdown Earthquake

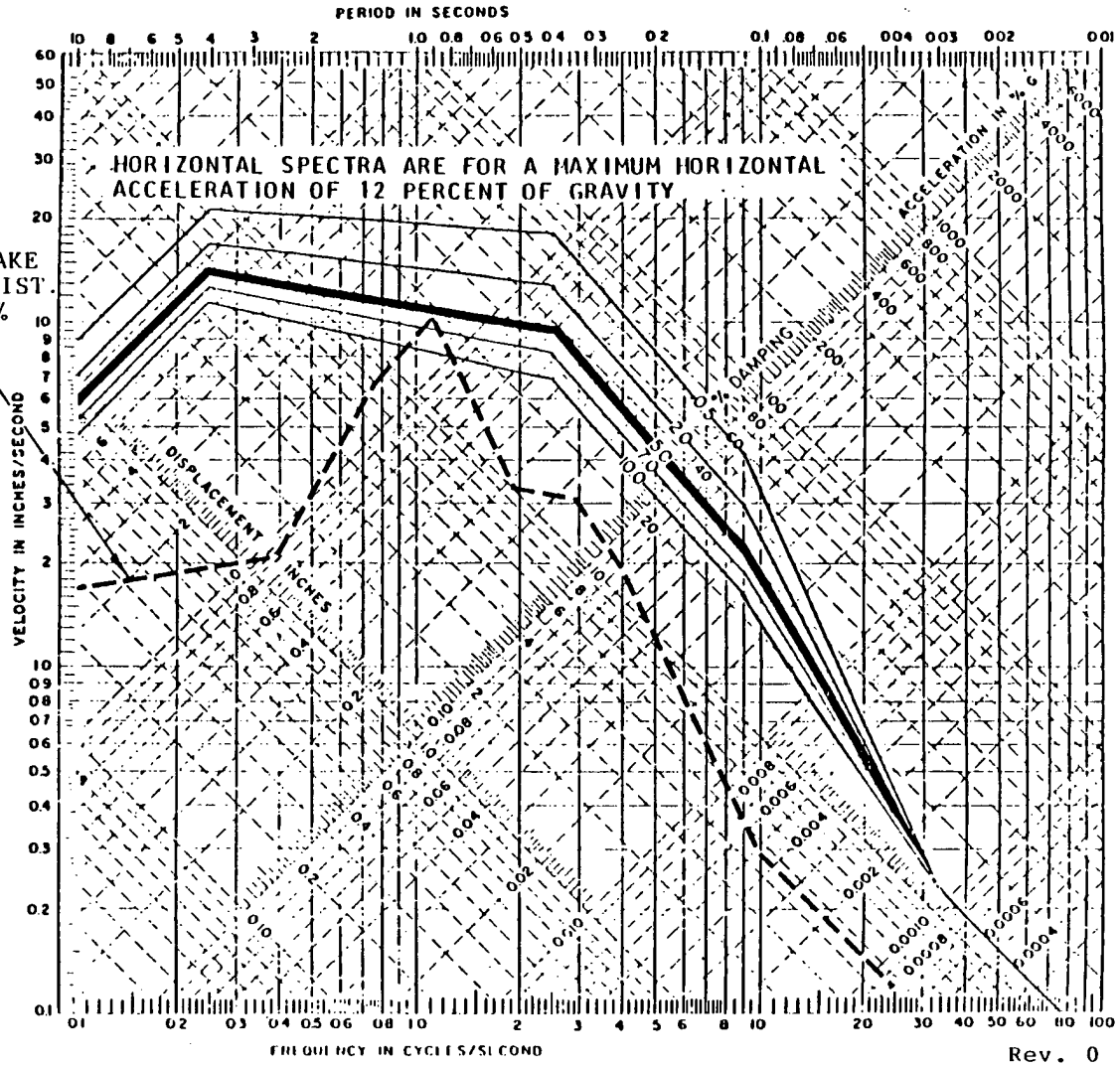


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

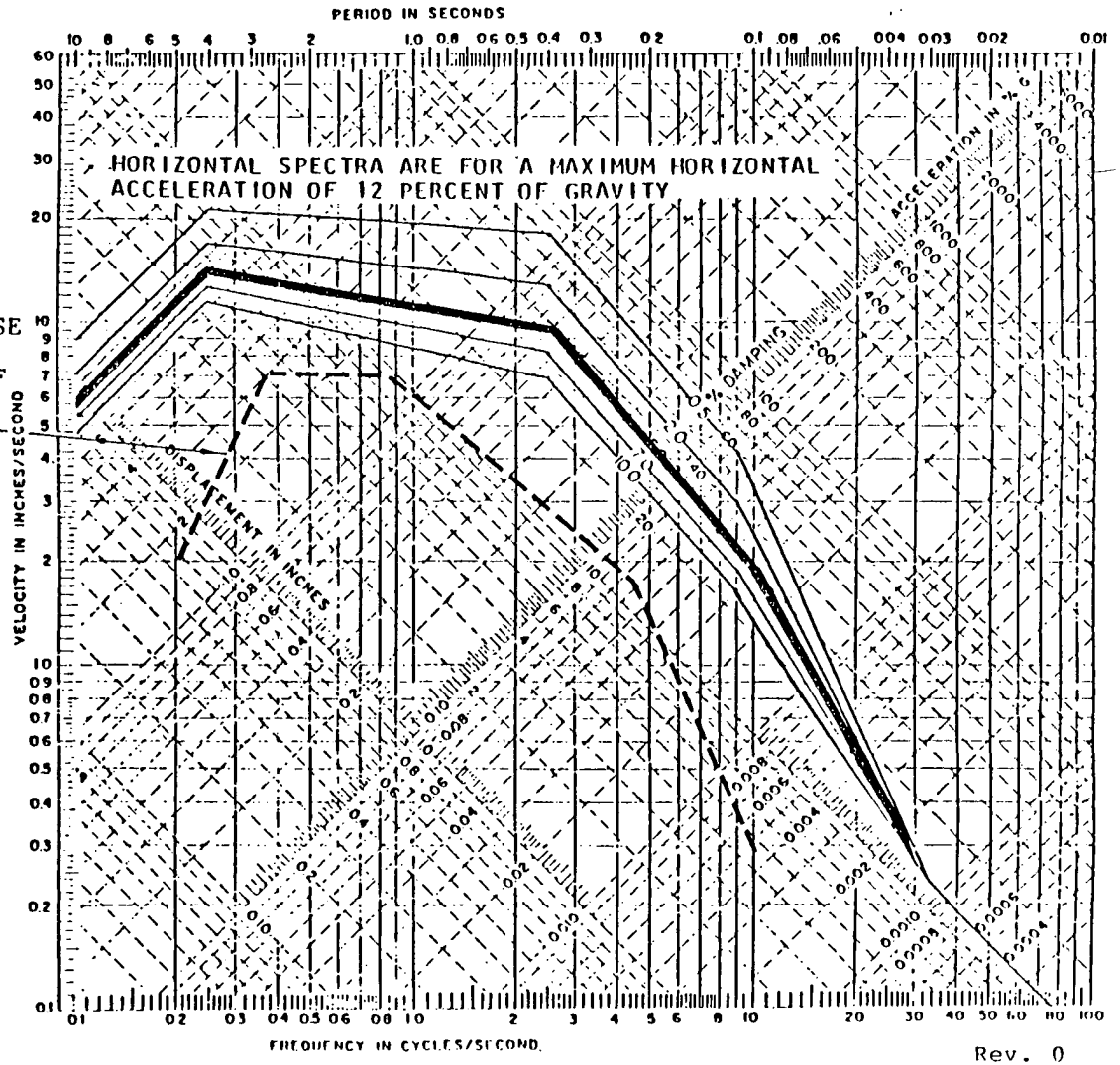
Figure 2.5-85

Vertical Response Spectra,
Operating Basis Earthquake



Rev. 0

WOLF CREEK UPDATED SAFETY ANALYSIS REPORT
Figure 2.5-85a
Horizontal Response Spectra, Safe Shutdown Earthquake, Compared with the Western Washington Earthquake Response Spectra



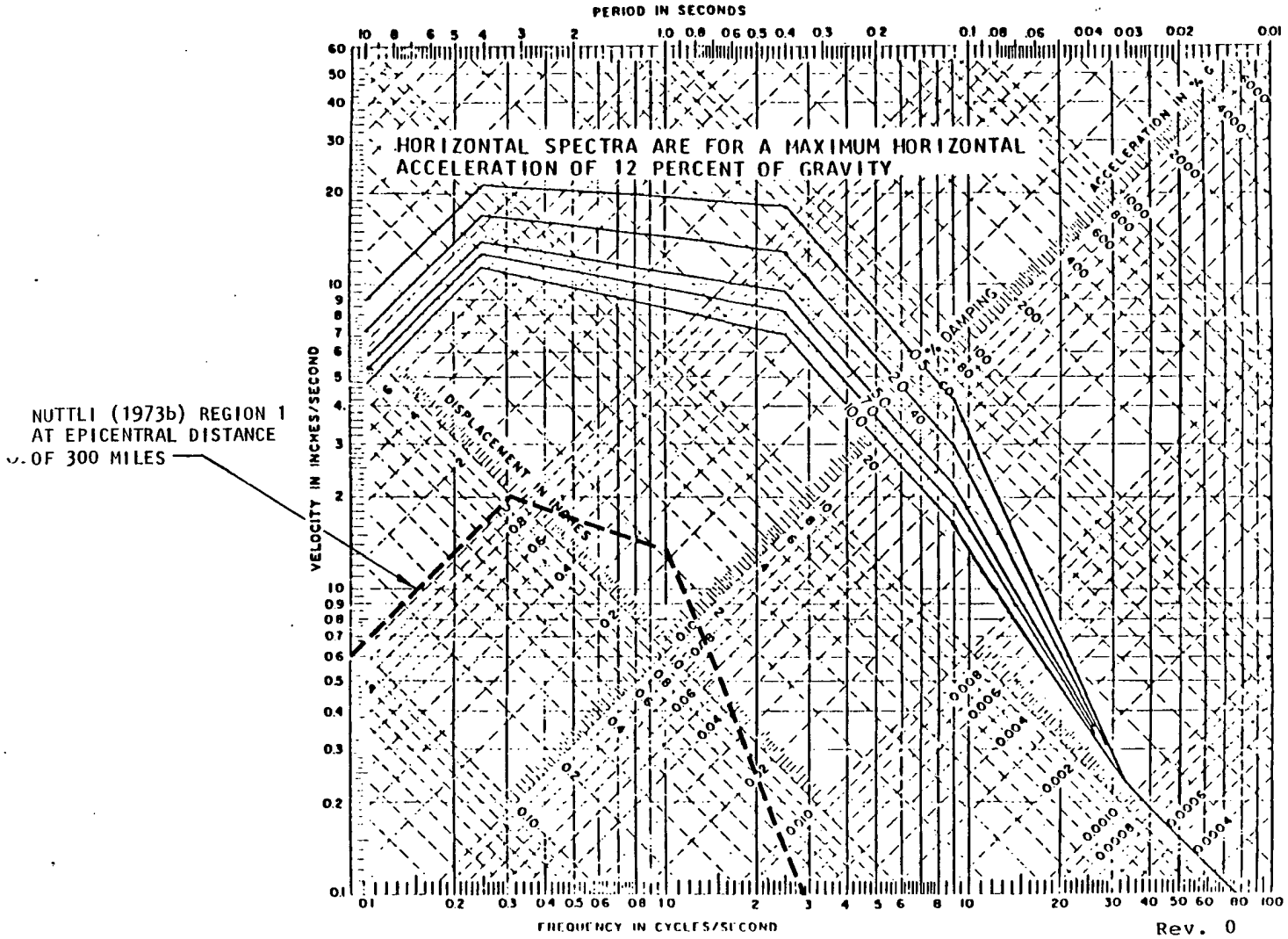
TOKACHI - oki MAY 16, 1968
HACHINOHE HARBOR 5% RESPONSE SPECTRA ENVELOPE SCALED TO PEAK GROUND ACCELERATION OF 0.045g

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

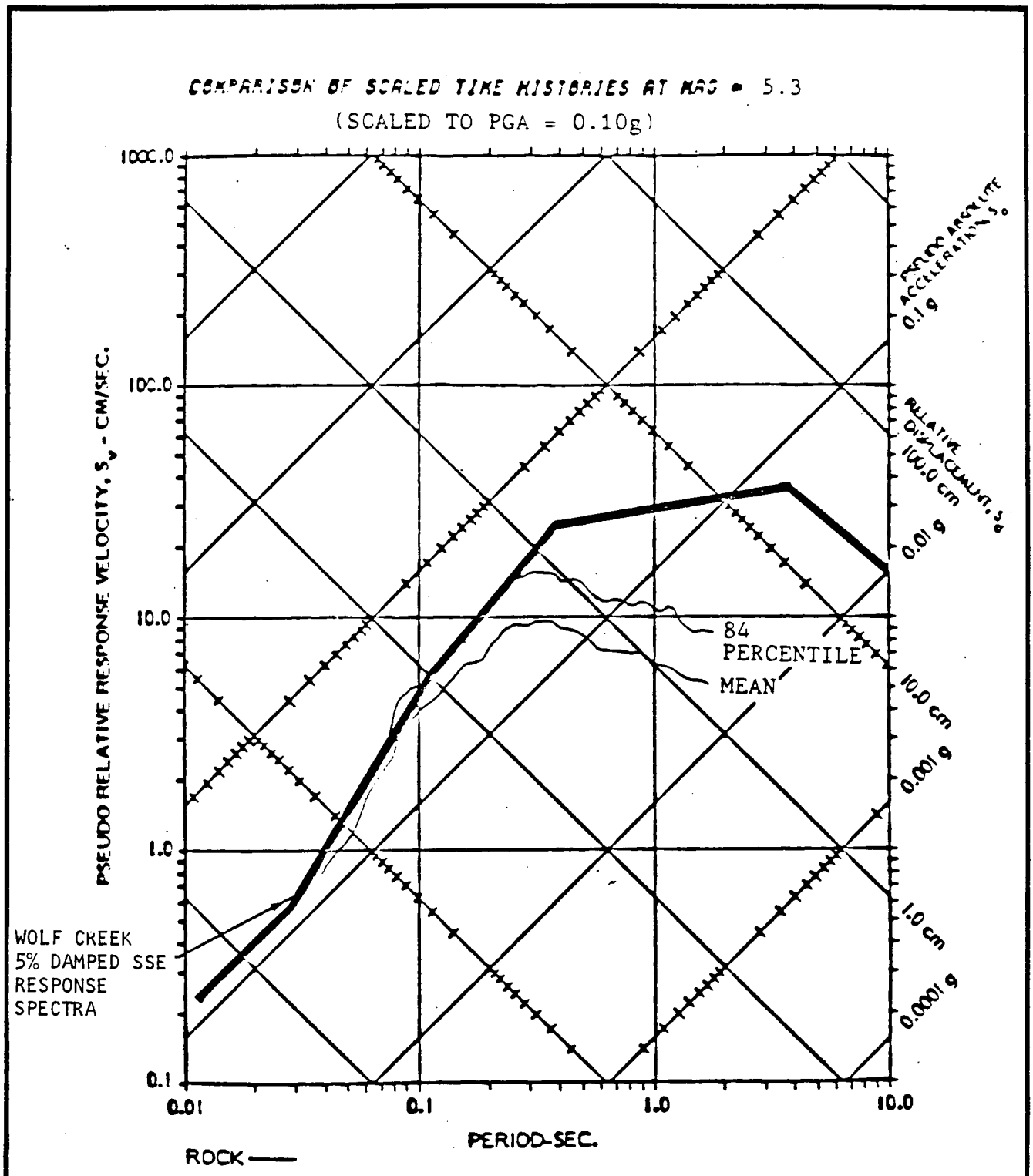
Figure 2.5-85b

Horizontal Response Spectra, Safe Shutdown Earthquake, Compared with the Tokachi-Oki Earthquake Response Spectra



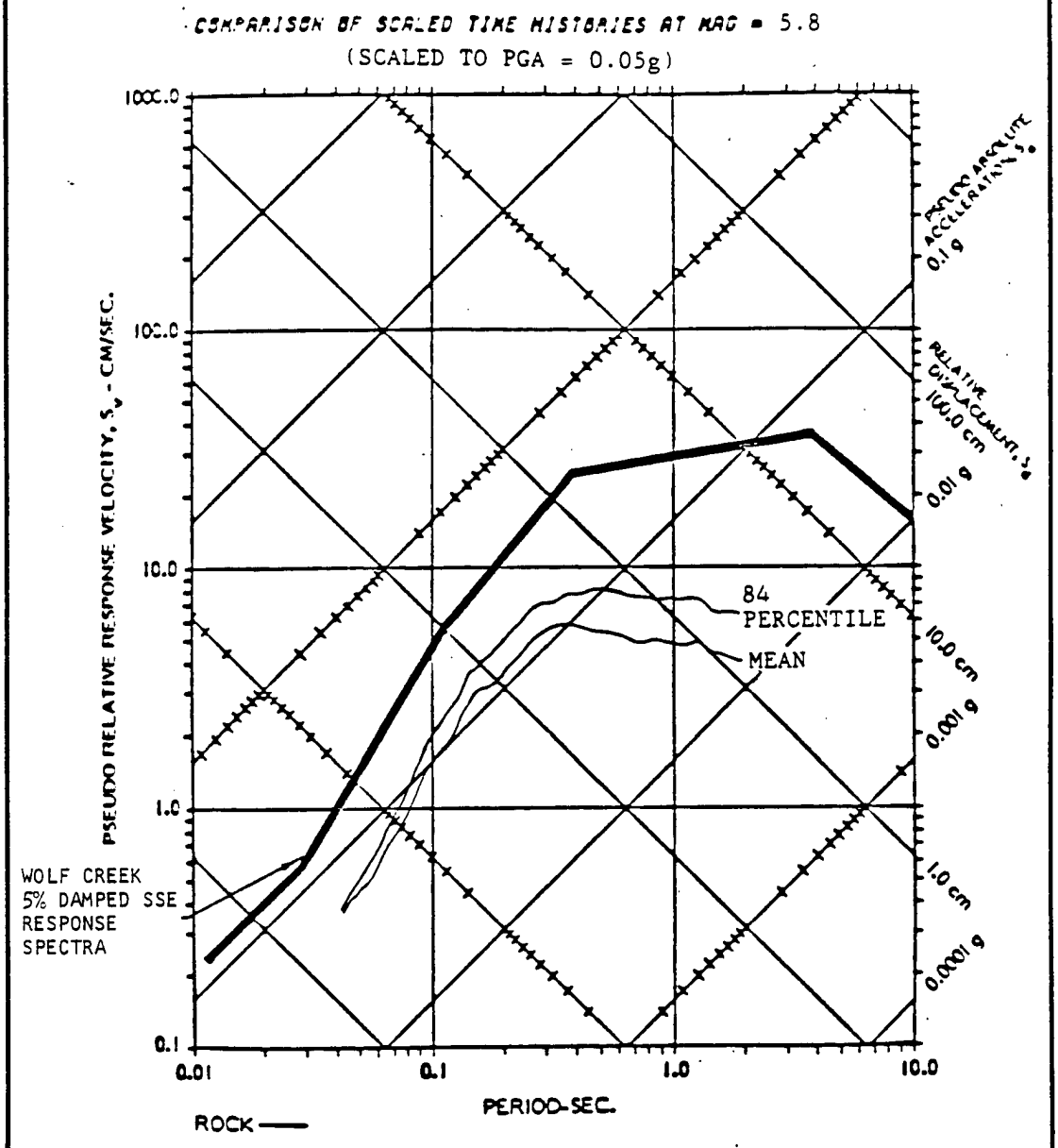
Rev. 0

WOLF CREEK UPDATED SAFETY ANALYSIS REPORT
Figure 2.5-85c Horizontal Response Spectra, Safe Shutdown Earthquake, Compared with Nuttli's (1973b) Proposed Spectra



Rev. 0

WOLF CREEK UPDATED SAFETY ANALYSIS REPORT
Figure 2.5-85d Maximum Random Event Spectra Scaled to 0.10g, Compared with Wolf Creek 5% Damped SSE Spectra

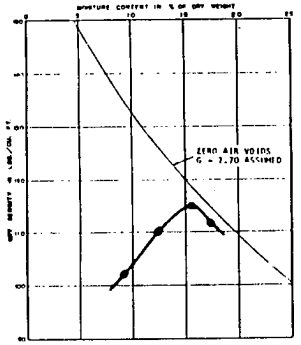


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

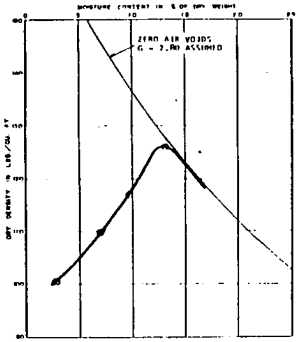
Figure 2.5-85e

Maximum Nemaha Event Spectra, Scaled to 0.05g, Compared with Wolf Creek 5% Damped SSE Spectra

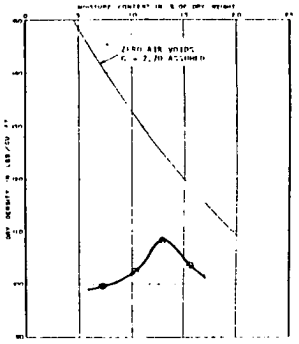


BORING B-1 REPRESENTATIVE SAMPLE FROM
9.5 TO 10.0 FEET, MOTTLED GRAY AND LIGHT
BROWN SILTY CLAY (CF-CH)

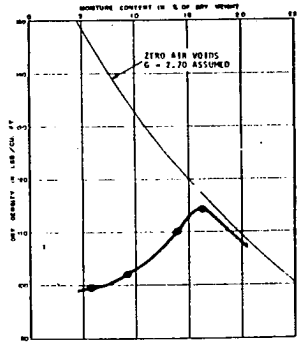
OPTIMUM MOISTURE = 15.7%
MAXIMUM DRY DENSITY = 115.4 PCF
METHOD = HARVARD MINIATURE
5 LAYERS
25 TAMPS PER LAYER
40 POUND SPRING



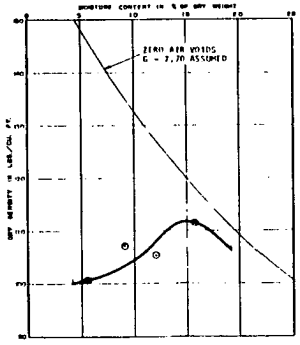
BORING P-6 AT A DEPTH OF 5.0 FEET
MOTTLED GRAY, BROWNISH-BROWN AND BLACK
SILTY SAND (SM)
OPTIMUM MOISTURE = 13.0%
MAXIMUM DRY DENSITY = 126.1 PCF
METHOD = HARVARD MINIATURE
5 LAYERS
25 TAMPS PER LAYER
40 POUND SPRING



BORING P-8 AT A DEPTH OF 3.5 FEET
GRAY SILTY CLAY WITH A TRACE OF
FINE SAND (CL)
OPTIMUM MOISTURE = 13.0%
MAXIMUM DRY DENSITY = 126.2 PCF
METHOD = HARVARD MINIATURE
5 LAYERS
25 TAMPS PER LAYER
40 POUND SPRING



BORING P-9 AT A DEPTH OF 2.0 FEET
ORANGISH-BROWN TO GRAY SILTY CLAY
WITH SOME SAND (CL)
OPTIMUM MOISTURE = 16.3%
MAXIMUM DRY DENSITY = 116.3 PCF
METHOD = HARVARD MINIATURE
5 LAYERS
25 TAMPS PER LAYER
40 POUND SPRING



BORING P-12 AT A DEPTH OF 3.0 FEET TO 3.5 FEET
MOTTLED BROWN AND LIGHT GRAY SILTY CLAY WITH
SOME SAND (CL)
OPTIMUM MOISTURE = 15.6%
MAXIMUM DRY DENSITY = 117.2 PCF
METHOD = HARVARD MINIATURE
5 LAYERS
25 TAMPS PER LAYER
40 POUND SPRING

NOTES:

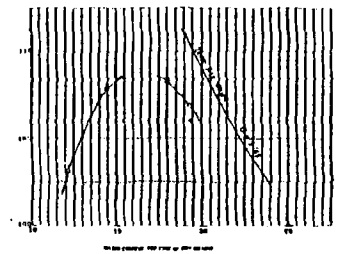
1. LOCATION OF BORING B-1 IS SHOWN ON FIGURE 2.5-29.
2. LOCATION OF BORINGS P-6, P-8, P-9 AND P-12 ARE SHOWN ON FIGURE 2.5-31.

Rev. 0

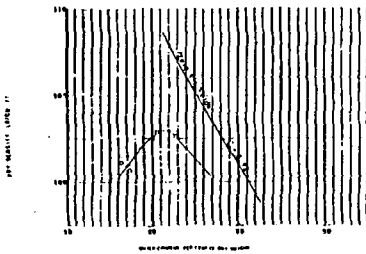
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-86

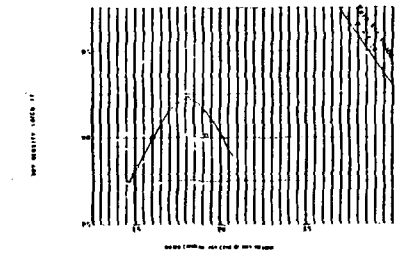
Results of Compaction Tests for Borings



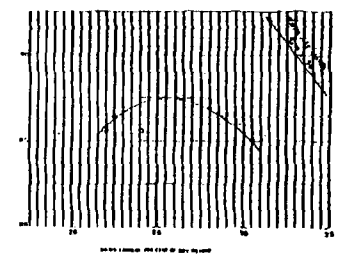
TEST PIT 1 AT A DEPTH OF 1.0 FEET TO 3.0 FEET
MOTTLED grayish BROWN AND GRAY SILTY CLAY WITH SOME SAND (CL)
OPTIMUM MOISTURE = 16.5%
MAXIMUM DRY DENSITY = 108.0 LBS/CU.FT.
METHOD = STANDARD PROCTOR



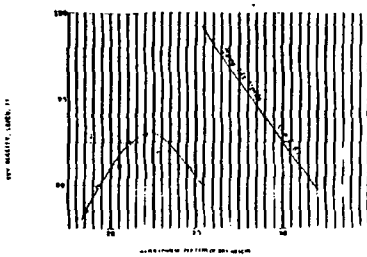
TEST PIT 2 AT A DEPTH FROM 1.0 FEET TO 4.0 FEET
DARK GRAY AND BROWN SILTY CLAY WITH SOME SAND AND GRAVEL IN LIGHT GRAY CLAY (CH)
OPTIMUM MOISTURE = 20.7%
MAXIMUM DRY DENSITY = 103.9 LBS/CU.FT.



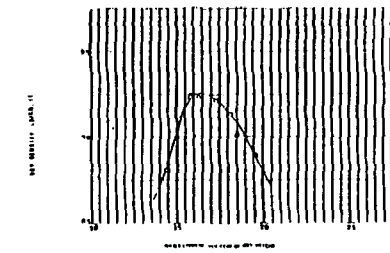
TEST PIT 3 AT A DEPTH FROM 1.0 FEET TO 5.0 FEET
GRAYISH-BROWN SILTY CLAY, BROWN SILTY CLAY AND MOTTLED GRAY CLAY AND GRAYISH-BROWN SILTY CLAY WITH TRACE OF SAND AND GRAVEL (CH)
OPTIMUM MOISTURE = 18.3%
MAXIMUM DRY DENSITY = 97.2 LBS/CU FT.
METHOD = STANDARD PROCTOR



TEST PIT 5 AT A DEPTH OF 1.5 FEET TO 3.0 FEET
MOTTLED GRAYISH-BROWN AND GRAYISH-BLACK SILTY CLAY WITH OCCASIONAL SAND AND ORANGE CLAY WITH TRACE OF SAND (CH)
OPTIMUM MOISTURE = 25.7%
MAXIMUM DRY DENSITY = 87.4 LBS/CU FT.
METHOD = STANDARD PROCTOR



TEST PIT 6 AT A DEPTH OF 3.0 FEET TO 6.0 FEET
LIGHT OLIVE GRAY SILTY CLAY (CL)
OPTIMUM MOISTURE = 21.6%
MAXIMUM DRY DENSITY = 91.1 LBS/CU.FT.
METHOD = STANDARD PROCTOR



COMMENTS:
TEST PIT A AT A DEPTH FROM 3.0 FEET TO 4.0 FEET
DARK GRAYISH-BROWN CLAY WITH SOME SILT TO LIGHT BROWNISH GRAY CLAY (CH) WITH
TEST PIT K FROM 1.5 FEET TO 4.5 FEET
VERY DARK GRAYISH-BROWN CLAY AND MOTTLED GRAYISH BROWN, YELLOWISH BROWN AND DARK GRAY CLAY WITH SOME SILT AND TRACE OF SAND (CH)
OPTIMUM MOISTURE = 16.5%
MAXIMUM DRY DENSITY = 97.6 LBS/CU FT
METHOD = STANDARD PROCTOR

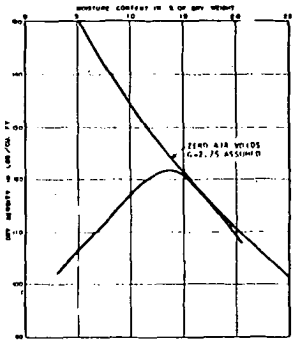
NOTE: LOCATIONS OF THE TEST PITS ARE SHOWN ON FIGURE 2.5-86

Rev. 0

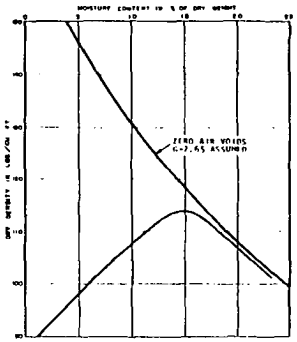
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-87 (Sheet 1 of 3)

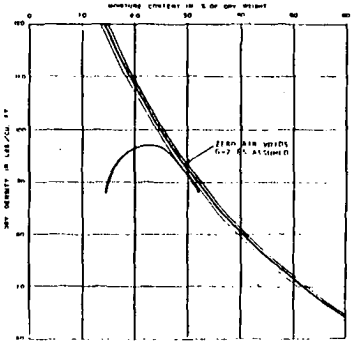
Results of Compaction Tests for Test Pits



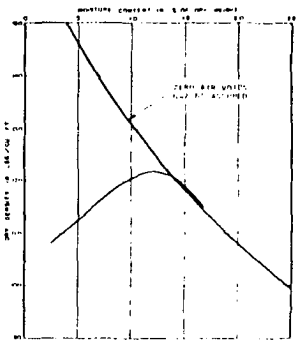
TEST PIT 9 AT A DEPTH OF 5 FEET
MOTTLED LIGHT GRAY AND YELLOW SILTY CLAY;
TRACE OF FINE SAND (CH)
OPTIMUM MOISTURE = 14%
MAXIMUM DRY DENSITY = 122 PCF
METHOD = ASTM D1557-70 METHOD A



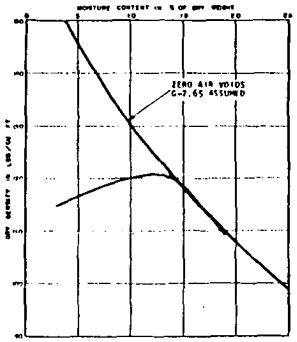
TEST PIT 9 AT A DEPTH FROM 5 TO 7 FEET
MOTTLED LIGHT GRAY AND YELLOW SILTY CLAY;
TRACE FINE SAND (CH)
OPTIMUM MOISTURE = 15%
MAXIMUM DRY DENSITY = 116 PCF
METHOD = STANDARD PROCTOR



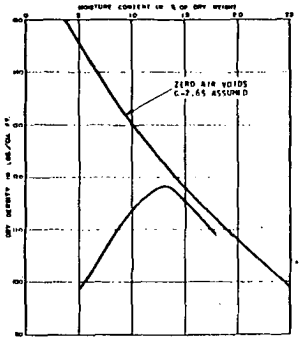
TEST PIT 10 AT A DEPTH FROM 2 TO 7 FEET
MEDIUM BROWN SILTY CLAY (CH)
OPTIMUM MOISTURE = 25%
MAXIMUM DRY DENSITY = 97.5 PCF
METHOD = STANDARD PROCTOR



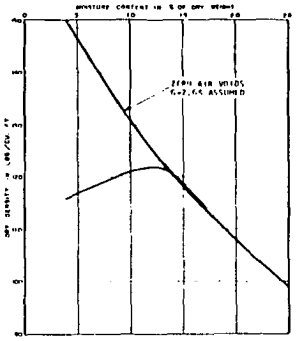
TEST PIT 11 AT A DEPTH
LIGHT BROWN CLAYEY SILT AND SAND FINE
(CL-ML)
OPTIMUM MOISTURE CONTENT = 12.5%
MAXIMUM DRY DENSITY = 122 PCF
METHOD = ASTM D1557-70 METHOD A



TEST PIT 11 AT A DEPTH FROM 5 TO 8.5 FEET
DARK YELLOWISH-ORANGE SILTY CLAY; SOME RED
SANDSTONE FRAGS. (CL)
OPTIMUM MOISTURE = 11%
MAXIMUM DRY DENSITY = 123.5 PCF
METHOD = ASTM D1557-70 METHOD A



TEST PIT 12 AT A DEPTH OF 2.6 FEET
BROWN SILTY CLAY SPACE FINE SAND AND MEDIUM
ROUNDED GRAVEL (CH)
OPTIMUM MOISTURE = 13.5%
MAXIMUM DRY DENSITY = 118.5 PCF
METHOD = ASTM D1557-70 METHOD A



TEST PIT 12 AT A DEPTH OF 5 FEET
BROWN SILTY CLAY; SPACE FINE SAND AND
MEDIUM ROUNDED GRAVEL
OPTIMUM MOISTURE = 12.5%
MAXIMUM DRY DENSITY = 122 PCF
METHOD = ASTM D1557-70 METHOD A

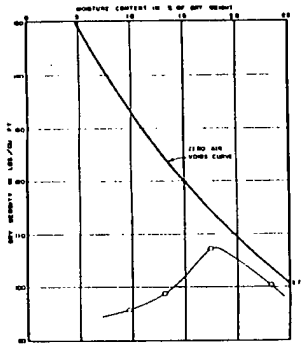
NOTE: LOCATIONS OF THE TEST PITS ARE SHOWN
IN FIGURE 2.5-30

Rev. 0

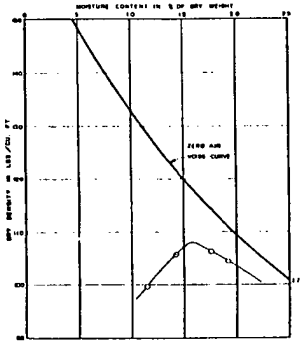
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-87 (Sheet 2 of 3)

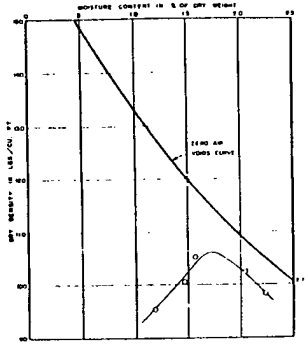
Results of Compaction Tests for Test Pits



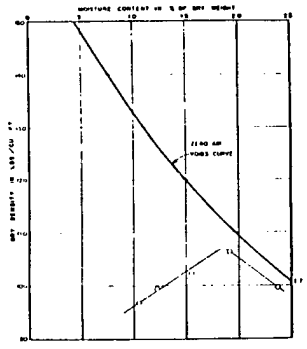
A.S.T.M. D 698 (STANDARD PROCTOR)
TPL-1B AT 5.0-6.0 FEET
MOTTLED GRAY AND BROWN SILTY CLAY
OPTIMUM MOISTURE 18.0%
MAXIMUM DRY DENSITY 107 lb/ft³
LIQUID LIMIT 42
PLASTICITY INDEX 27



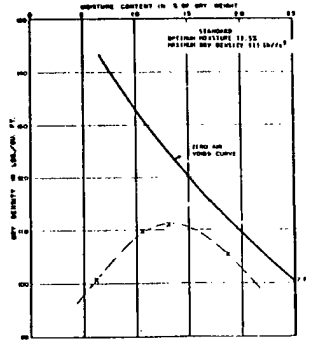
A.S.T.M. D 698 (STANDARD PROCTOR)
TPL-4B AT 8.0-10.0 FEET
MOTTLED GRAY AND BROWN SILTY CLAY
OPTIMUM MOISTURE 16.0%
MAXIMUM DRY DENSITY 108 lb/ft³
LIQUID LIMIT 45
PLASTICITY INDEX 23



A.S.T.M. D698 (STANDARD PROCTOR)
TPL-5C at 11.0-13.0 FEET
MOTTLED GRAY AND YELLOWISH-BROWN
SILTY CLAY
OPTIMUM MOISTURE 17.5%
MAXIMUM DRY DENSITY 106 lb/ft³
LIQUID LIMIT 36
PLASTICITY INDEX 19



A.S.T.M. D 698 (STANDARD PROCTOR)
TPL-6D AT 10.0-11.5 FEET
GRAYISH-BROWN SILTY CLAY
OPTIMUM MOISTURE 18.5%
MAXIMUM DRY DENSITY 107 lb/ft³
LIQUID LIMIT 42
PLASTICITY INDEX 23



A.S.T.M. D 698
(STANDARD PROCTOR) SHOWN
AS A DASHED LINE.

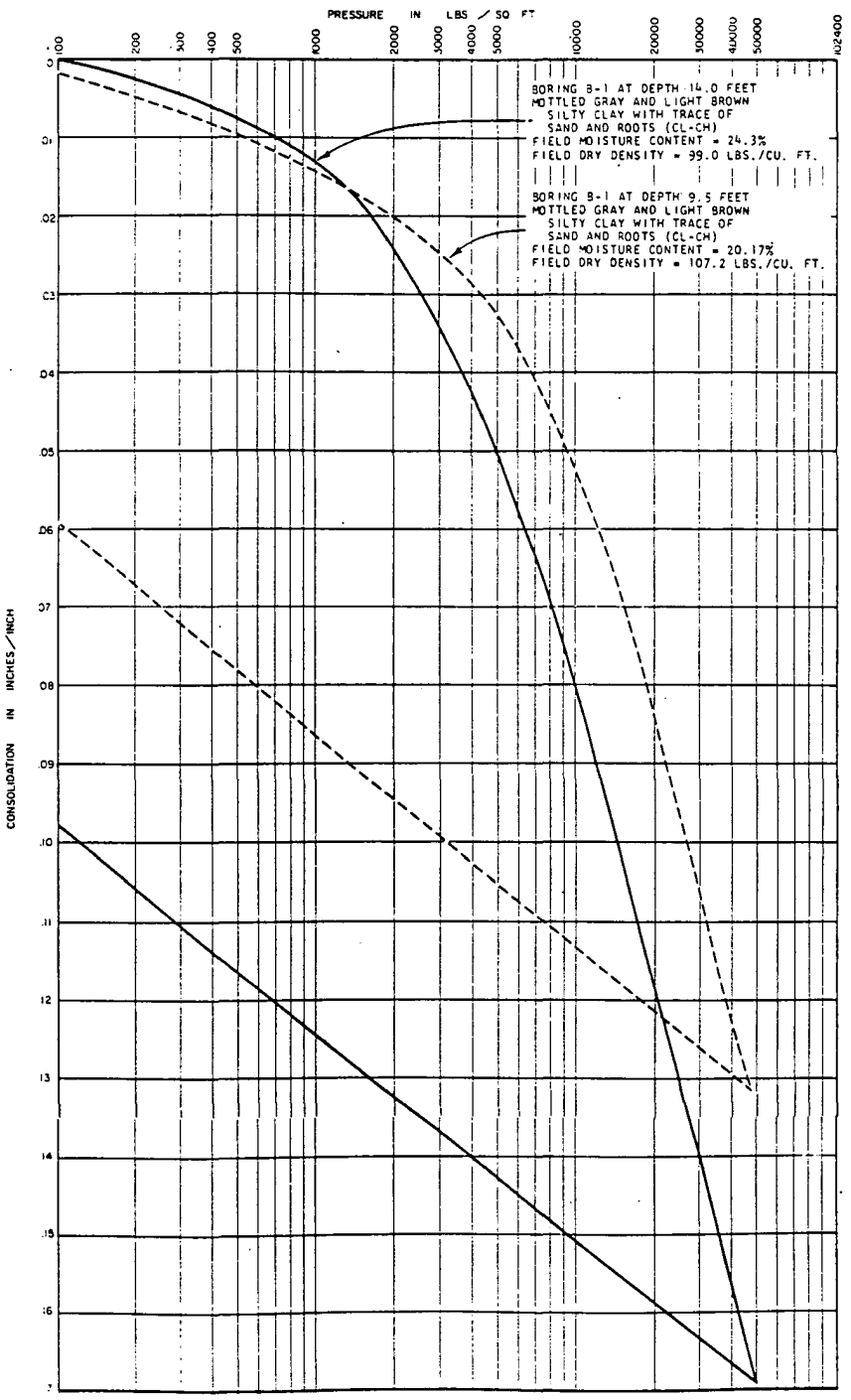
TEST PIT NO.	LIQUID LIMIT	PLASTICITY INDEX
TPL-1B	42	27
TPL-4B	45	23
TPL-6D	42	23

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-87 (Sheet 3 of 3)

Results of Compaction Tests for Test Pits



Rev. 0

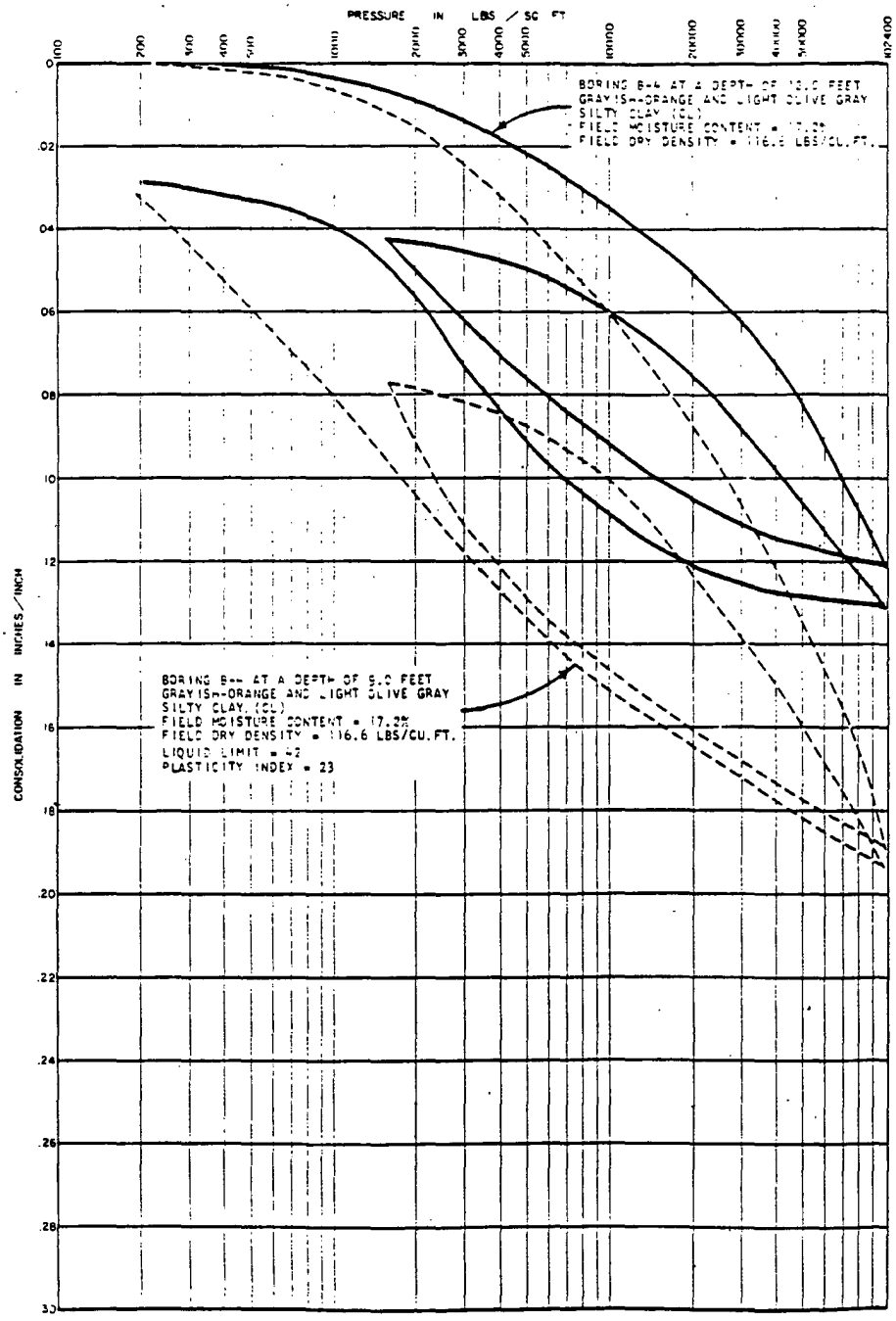
NOTE:

LOCATION OF BORING B-1 IS SHOWN ON FIGURE 2.5-28.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-88a

Results of Consolidation Tests - Boring B-1



Rev. 0

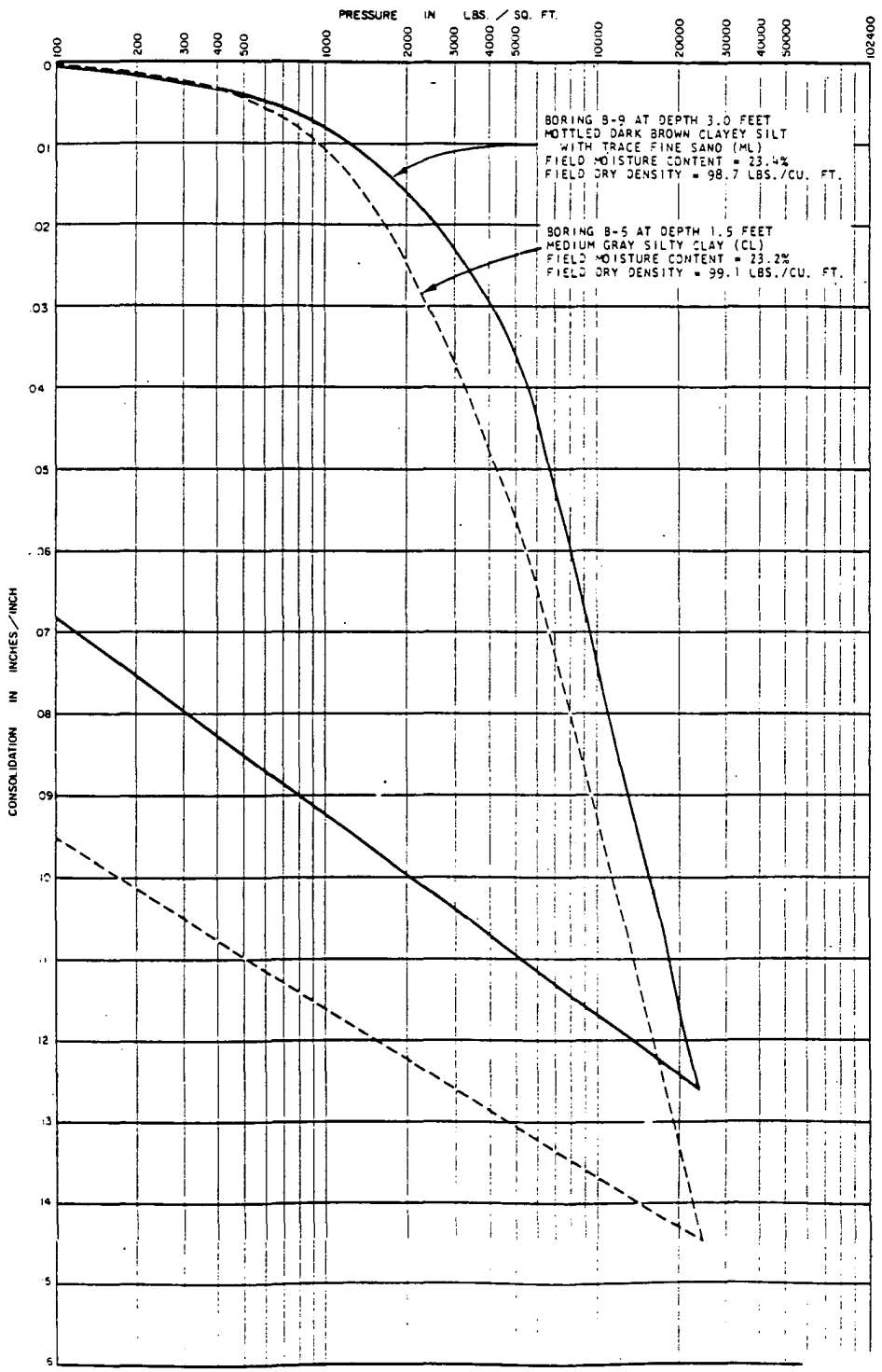
NOTE:

LOCATION OF BORING B-4 IS SHOWN ON FIGURES 2.5-28, 2.5-30 AND 2.5-31.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-88b

Results of Consolidation Tests - Boring B-4



Rev. 0

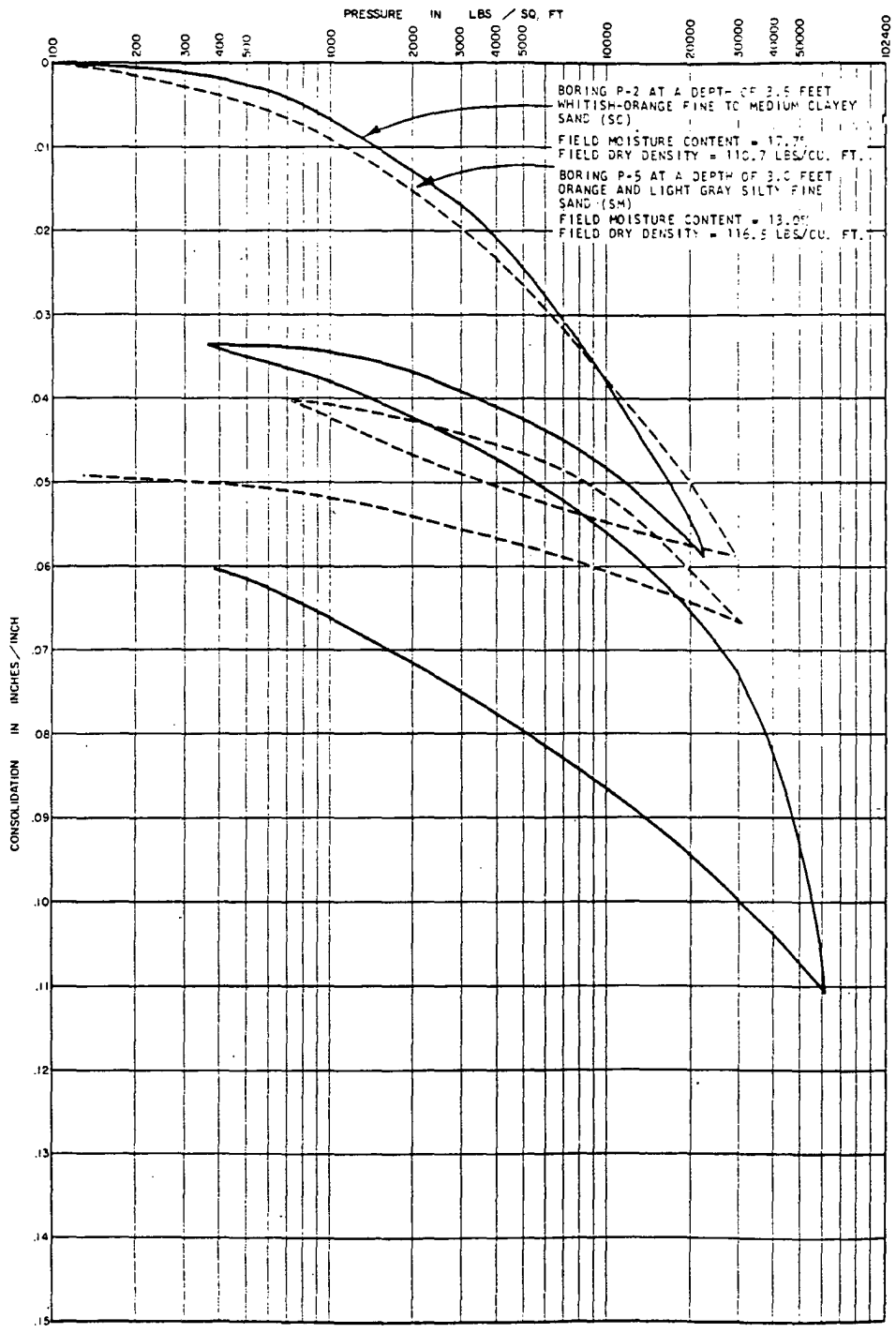
NOTE:

LOCATION OF BORINGS B-5 AND B-9 ARE SHOWN ON FIGURE 2.5-28.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-88c

Results of Consolidation Tests - Borings B-5 and B-9



Rev. 0

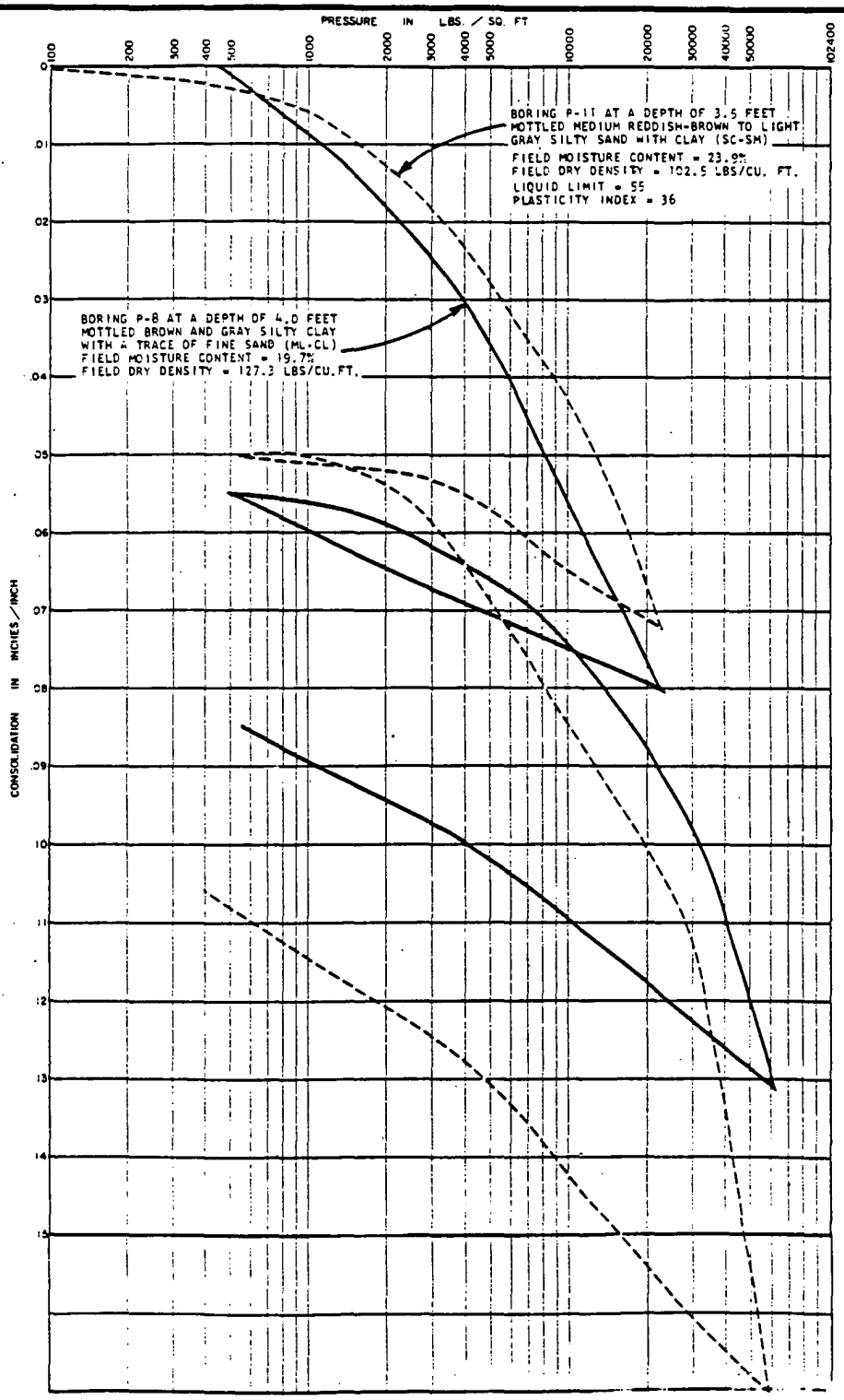
NOTE:

LOCATION OF BORINGS P-2 AND P-5 ARE SHOWN ON FIGURE 2.5-31.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-88d

Results of Consolidation Tests - Borings P-2 and P-5



Rev. 0

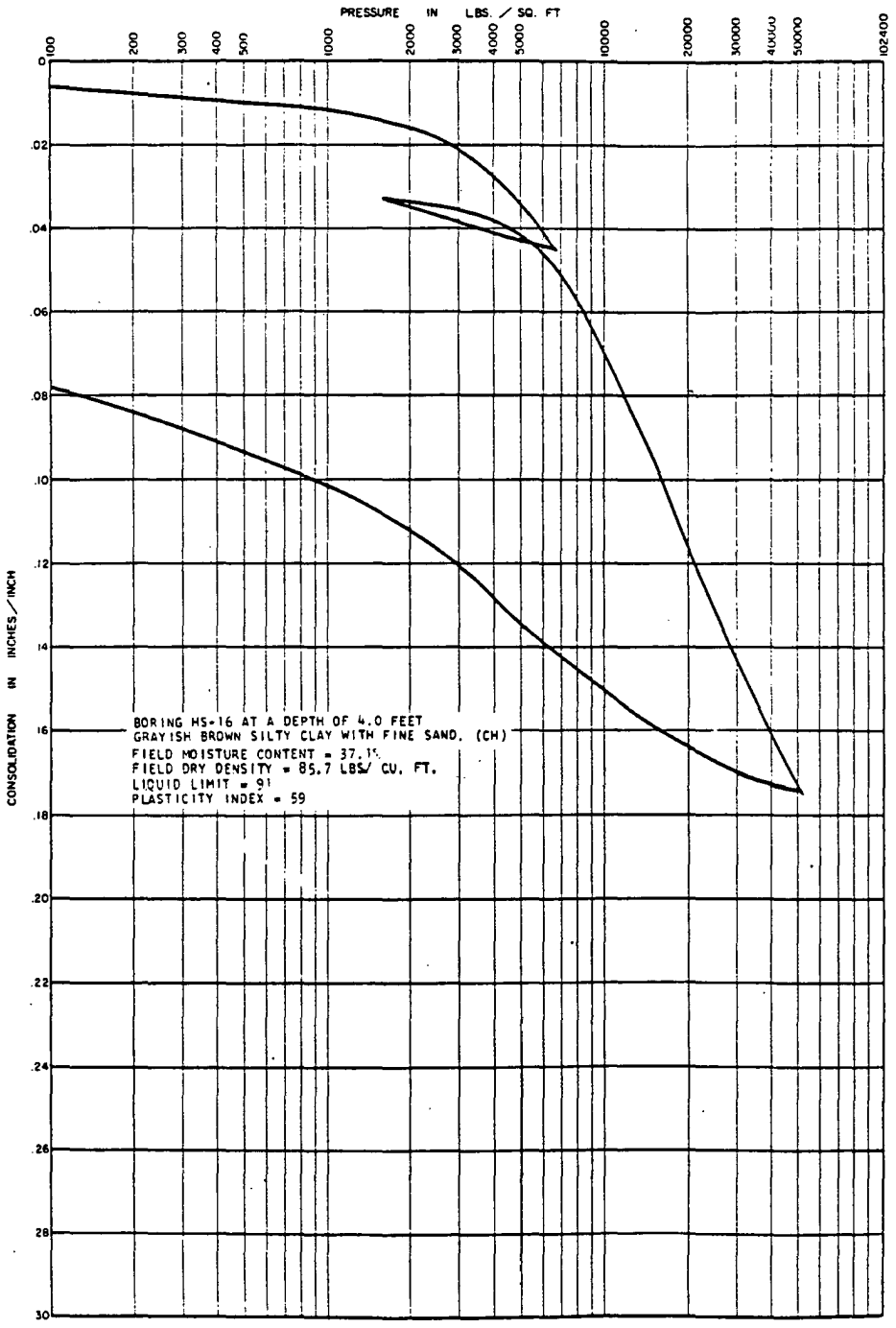
NOTES:

LOCATION OF BORINGS P-8 AND P-11 ARE SHOWN ON FIGURE 2.5-31.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-88e

Results of Consolidation Tests - Borings P-8 and P-11



Rev. 0

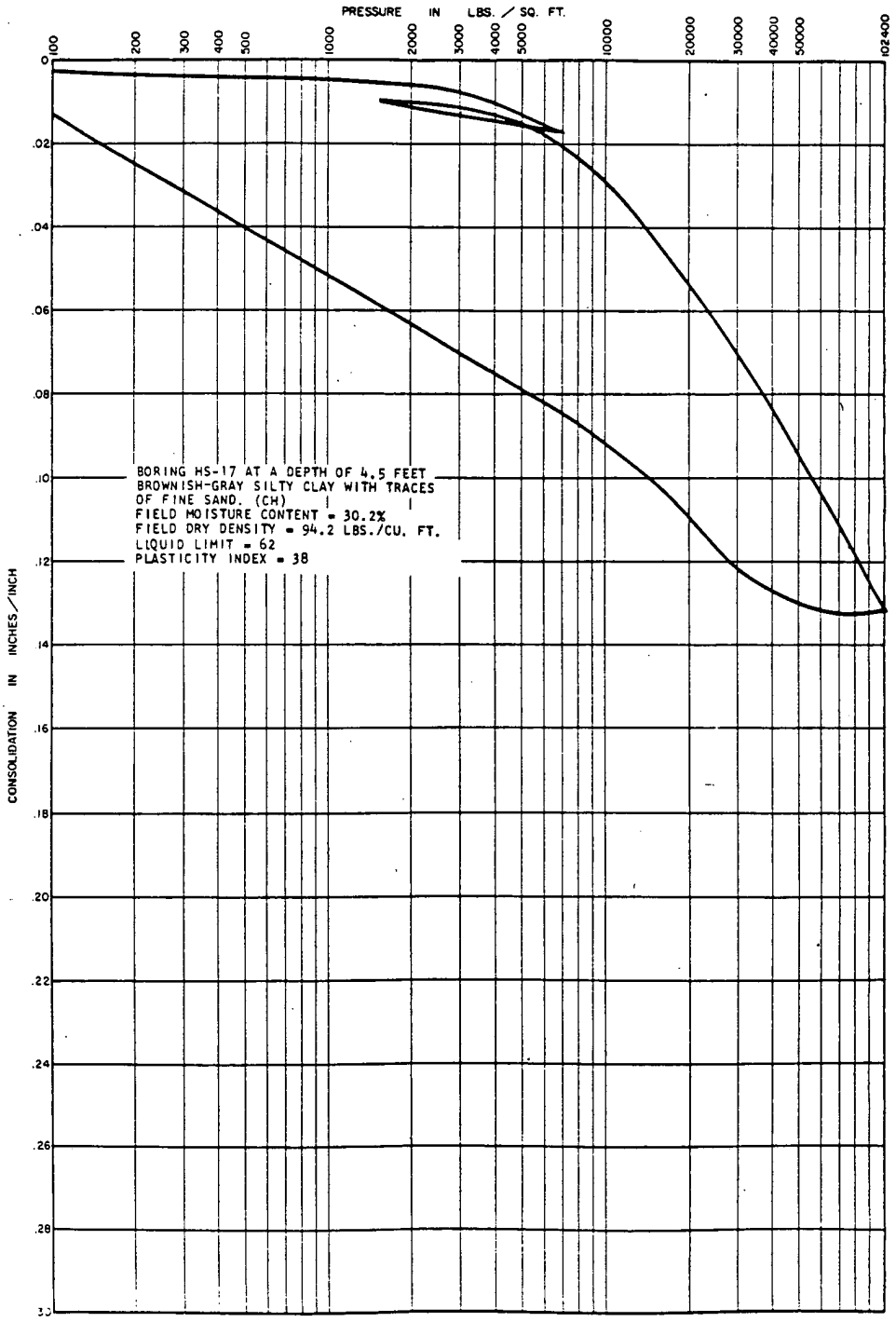
NOTE:

LOCATION OF BORING HS-16 IS SHOWN ON FIGURE 2.5-30.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-88f

Results of Consolidation Tests - Boring HS-16



Rev. 0

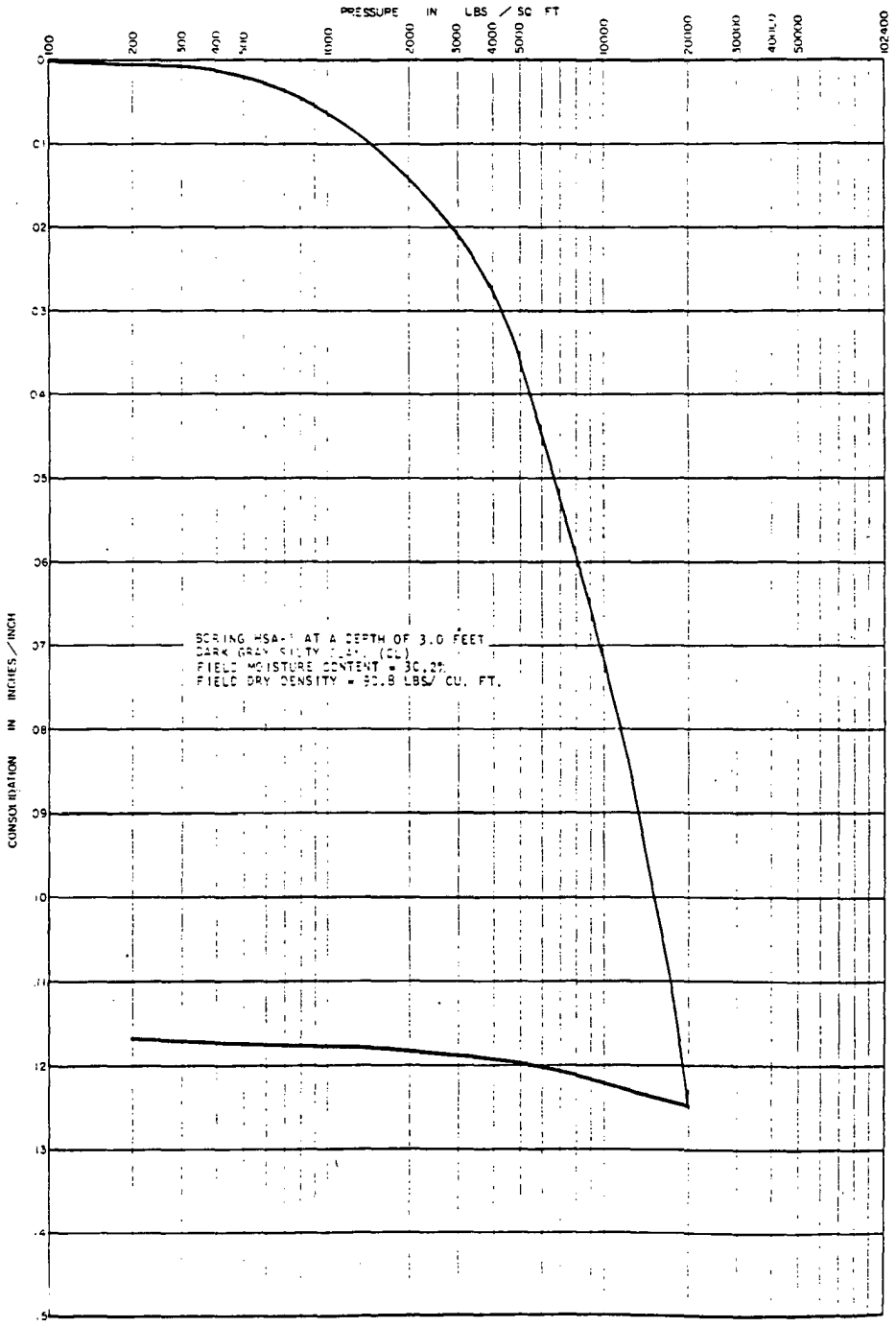
NOTE:

LOCATION OF BORING HS-17 IS SHOWN ON FIGURE 2.5-30.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-88g

Results of Consolidation Tests - Boring HS-17



Rev. 0

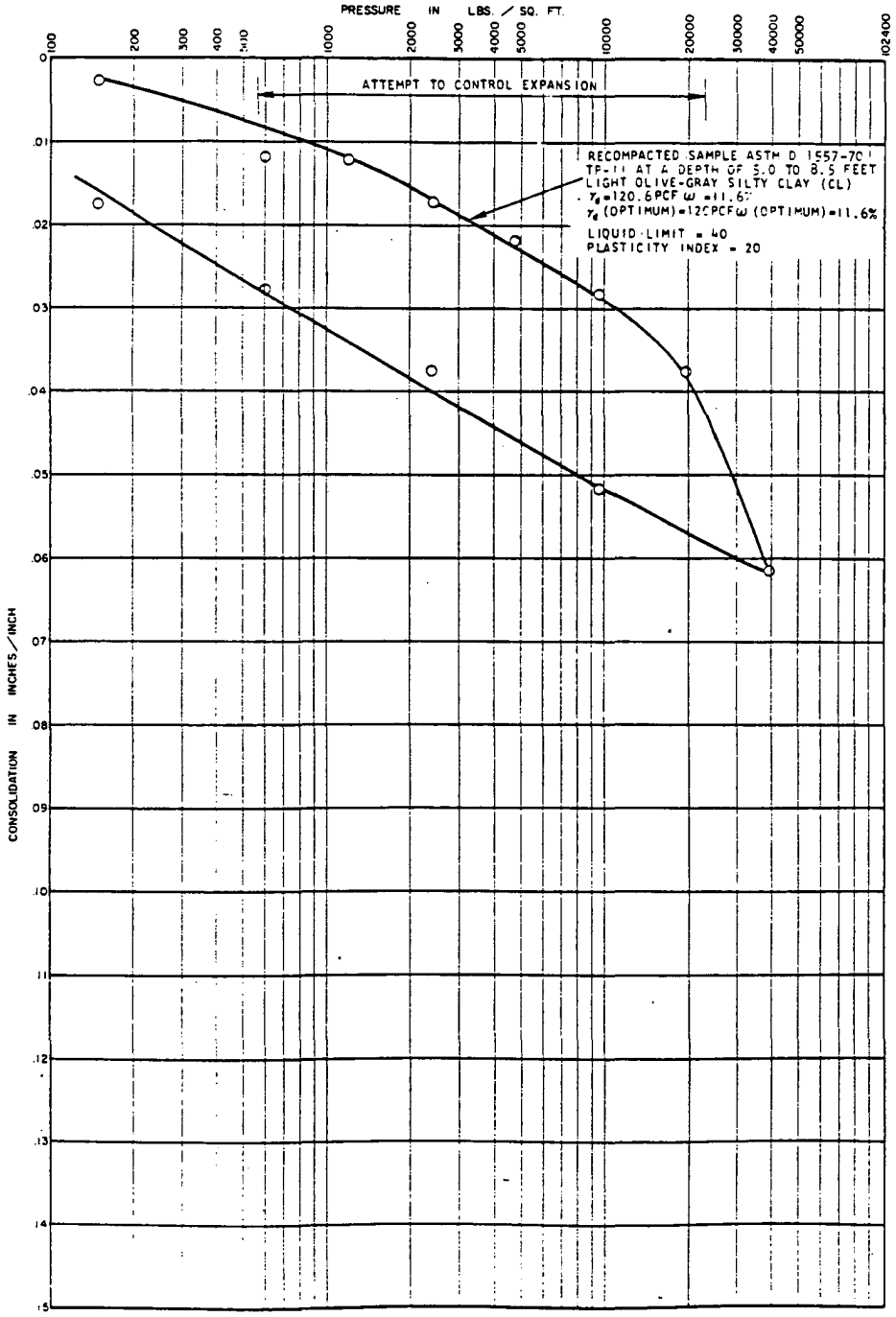
NOTE:

LOCATION OF BORING HSA-1 IS SHOWN ON FIGURE 2.5-34.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-88h

Results of Consolidation Tests - Boring HSA-1

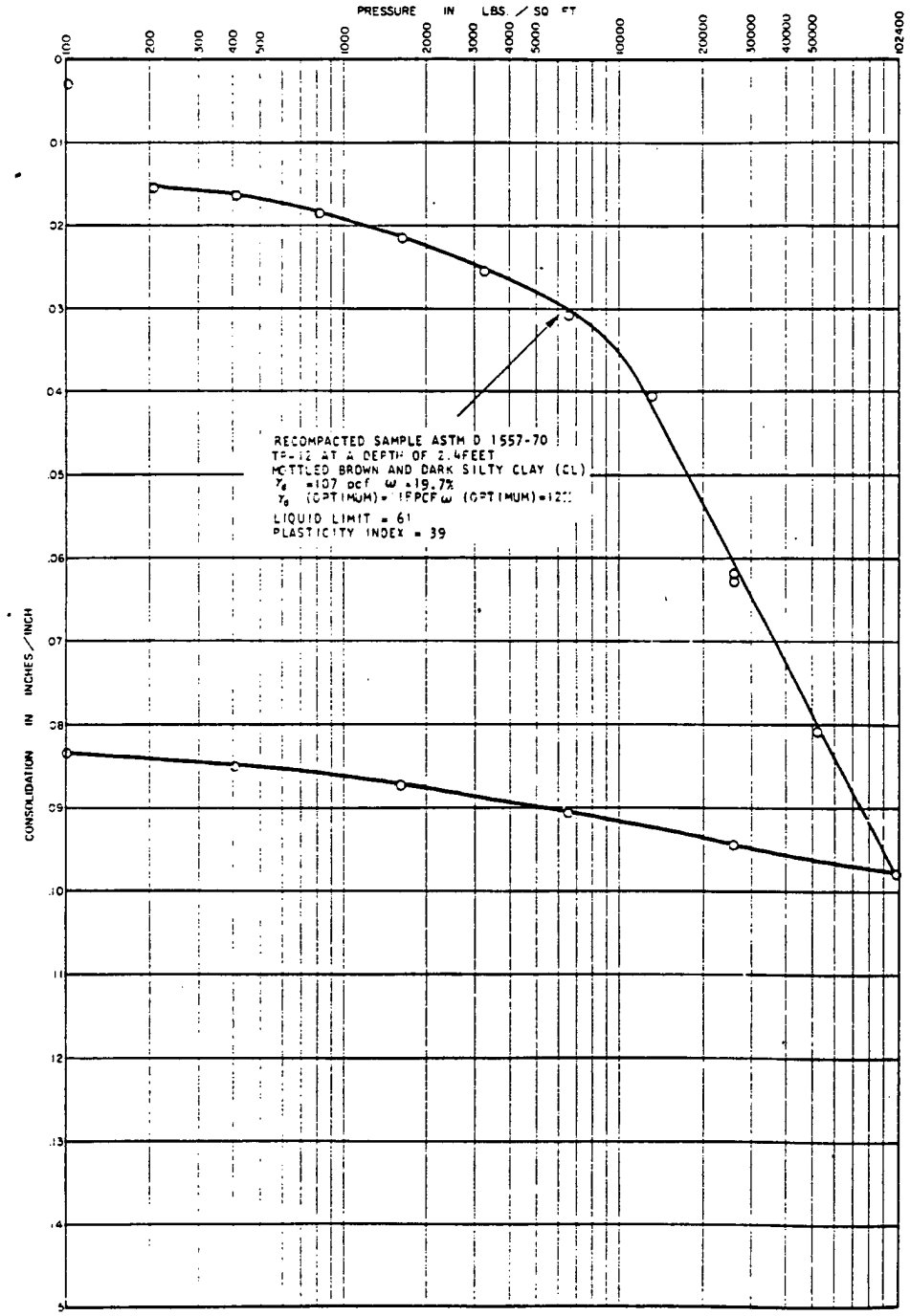


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-88i

Results of Consolidation Tests - Test Pit-11

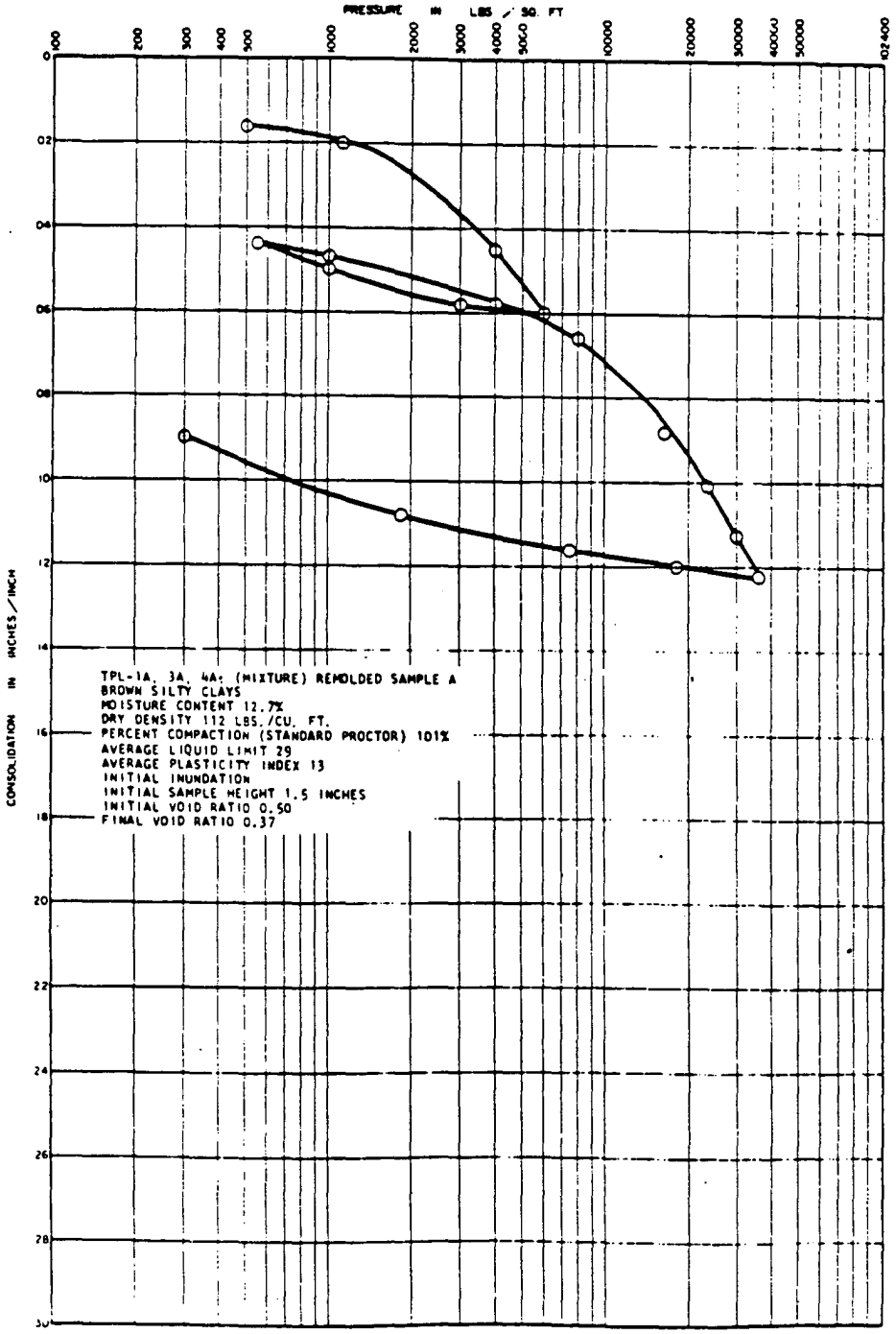


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-88j

Results of Consolidation Tests - Test Pit-12

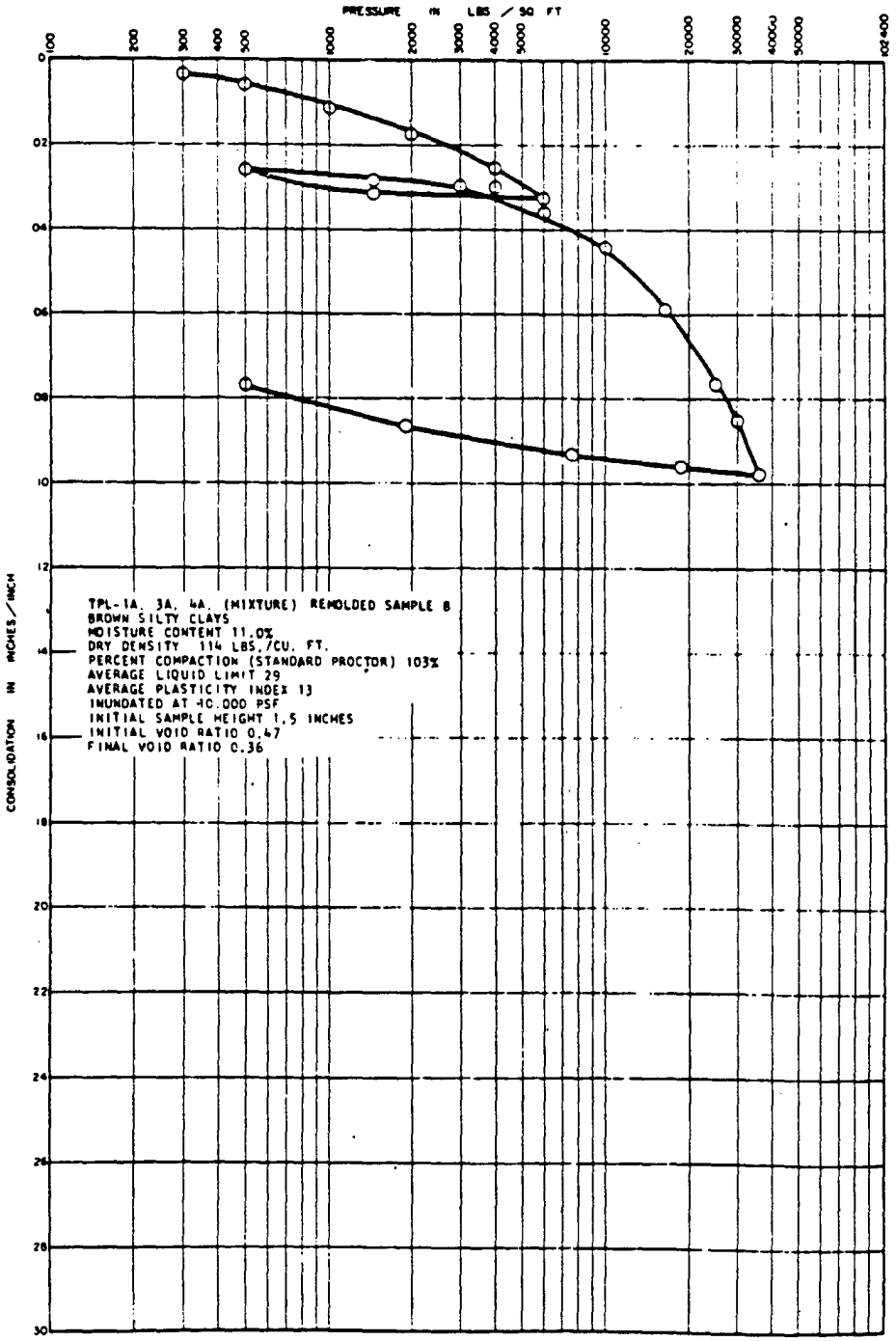


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-89 (Sheet 1 of 4)

Consolidation Test Data

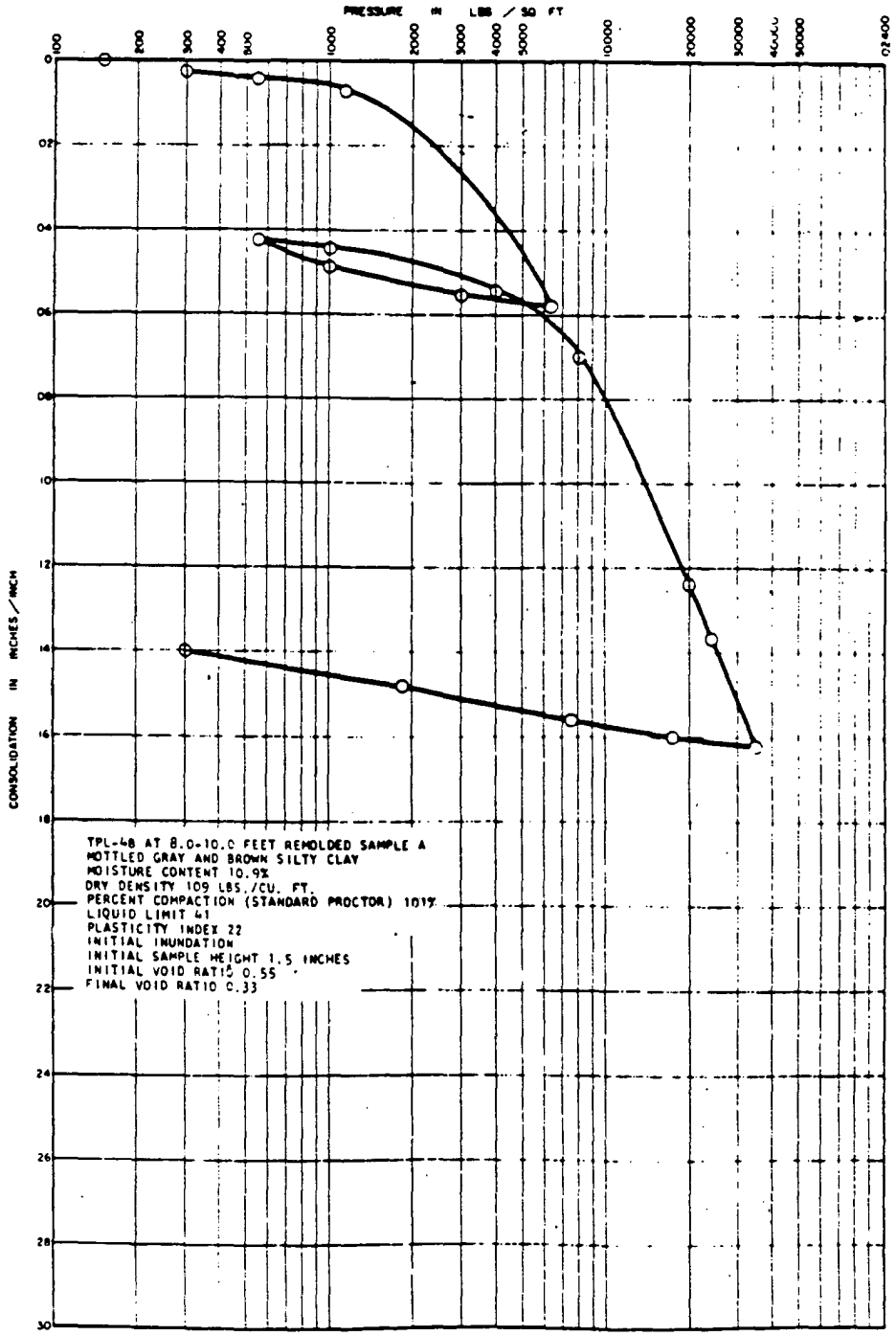


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-89 (Sheet 2 of 4)

Consolidation Test Data

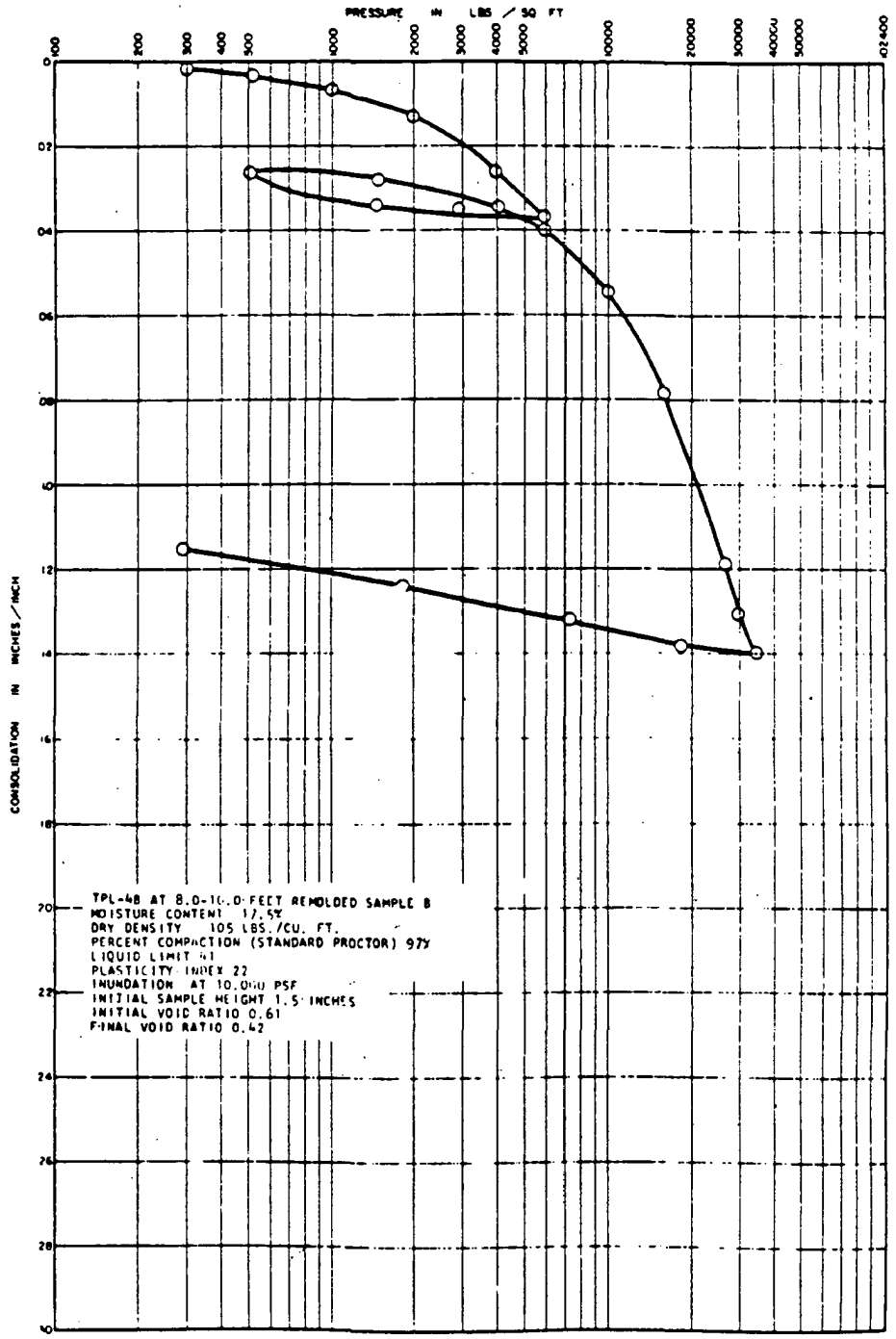


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-89 (Sheet 3 of 4)

Consolidation Test Data

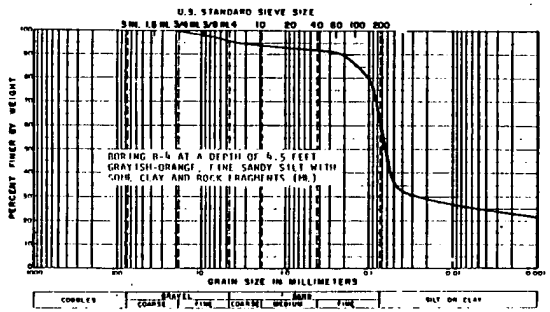


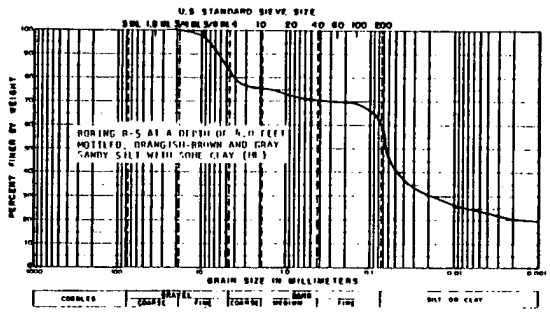
Rev. 0

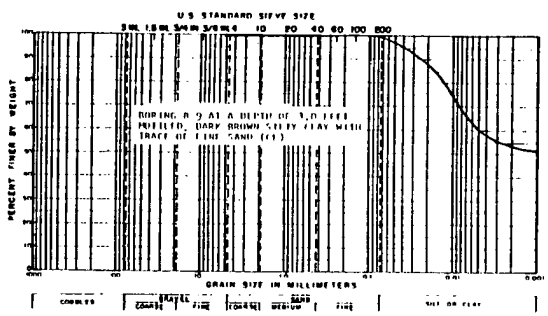
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

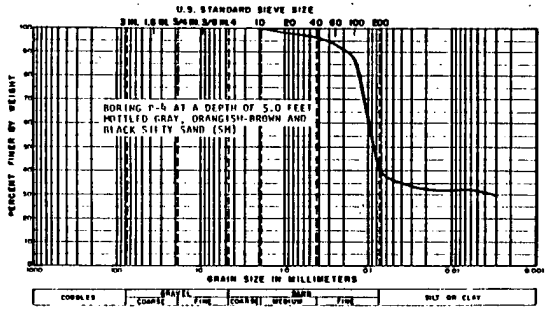
Figure 2.5-89 (Sheet 4 of 4)

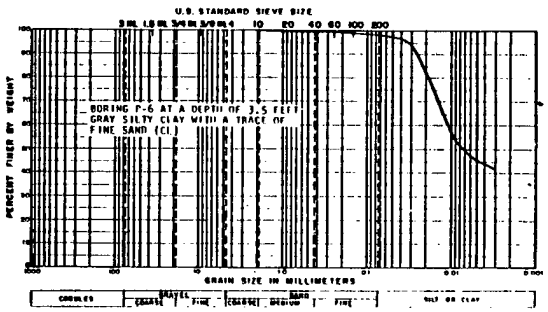
Consolidation Test Data

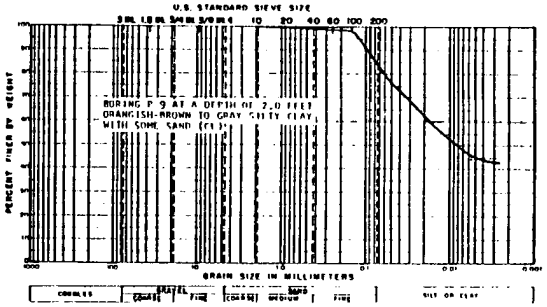


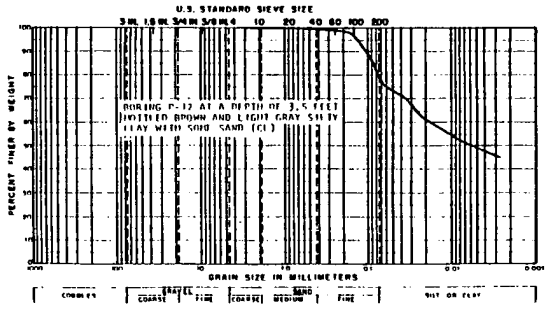


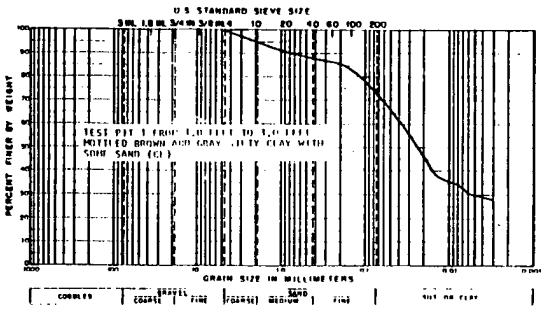












NOTE:

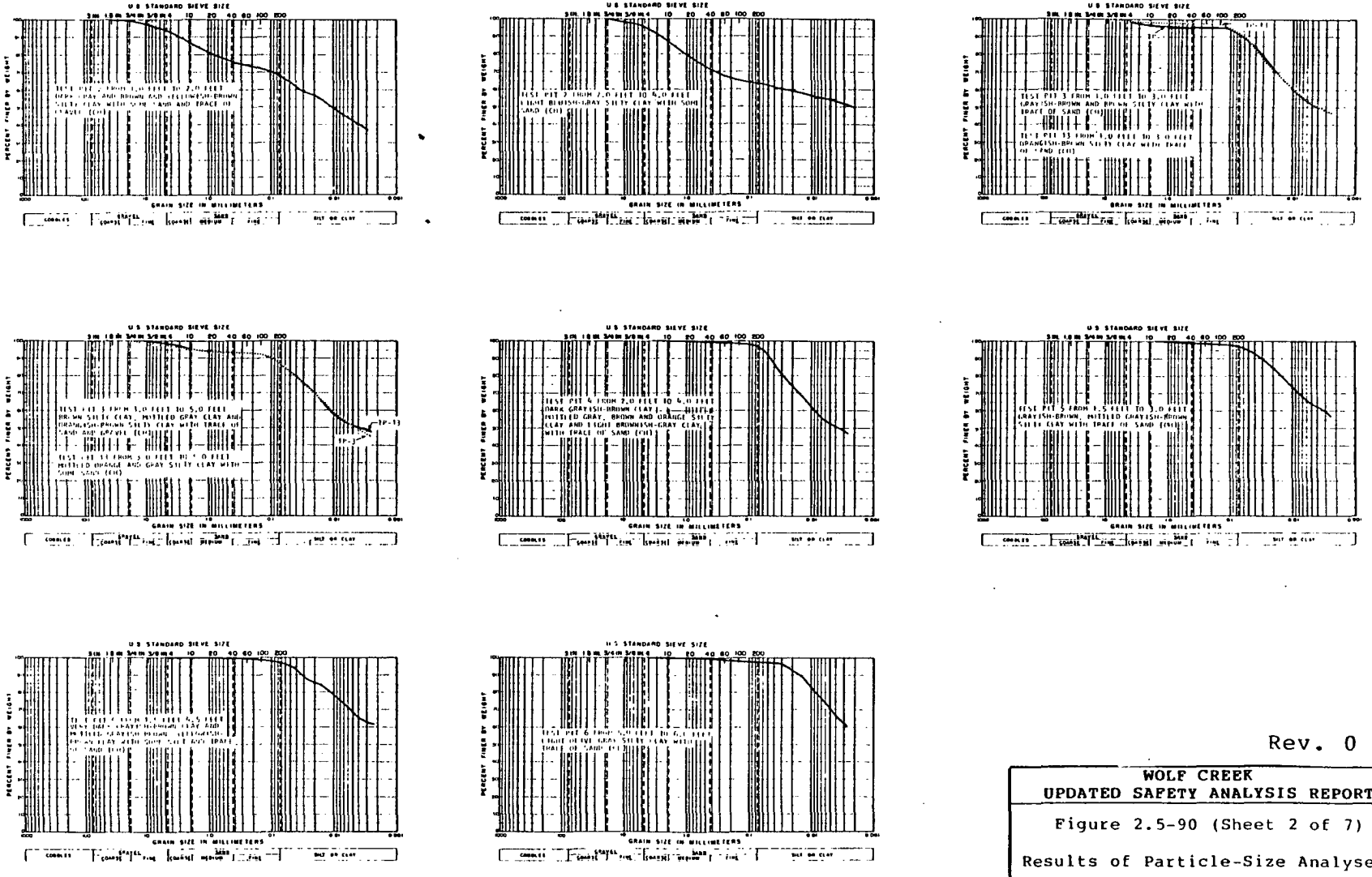
THE LOCATIONS OF THE BORINGS ARE SHOWN ON FIGURES 2.5-28, 2.5-30, AND 2.5-31.

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-90 (Sheet 1 of 7)

Results of Particle-Size Analyses



NOTE

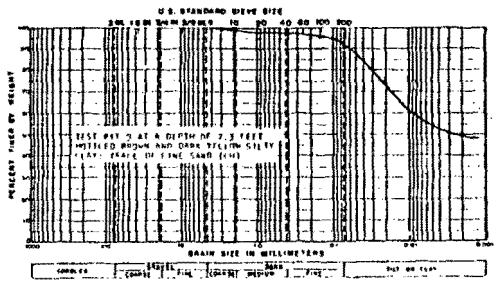
THE LOCATIONS OF THE TEST PITS ARE SHOWN ON FIGURE 2.5-30

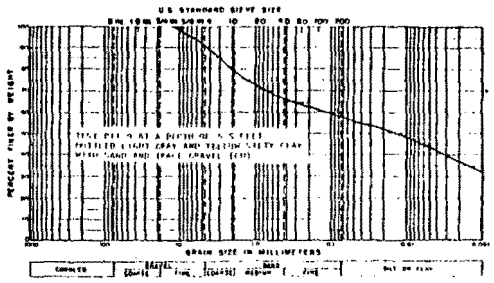
Rev. 0

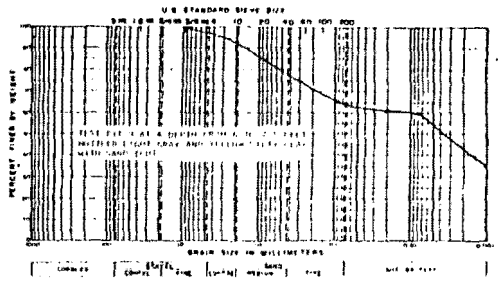
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

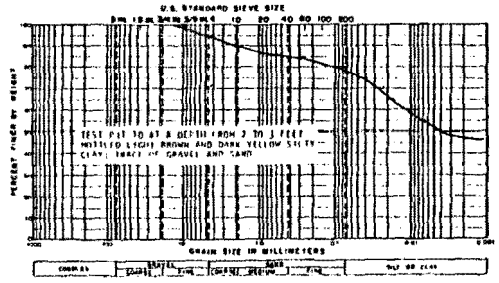
Figure 2.5-90 (Sheet 2 of 7)

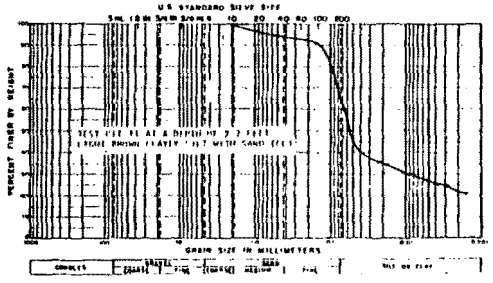
Results of Particle-Size Analyses

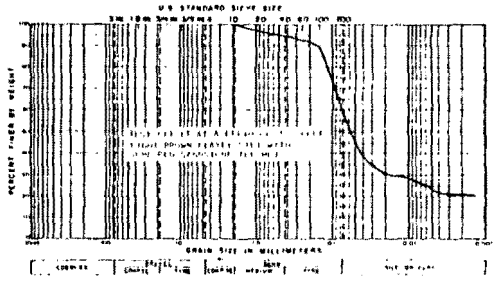


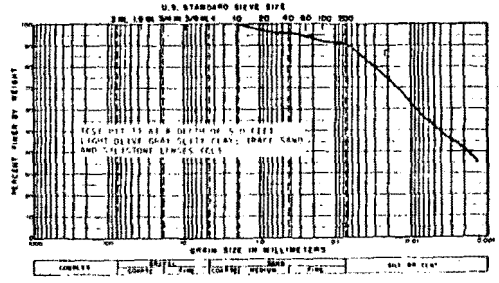


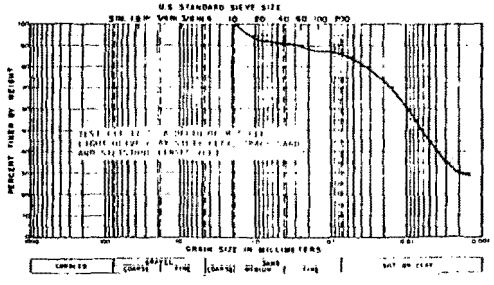










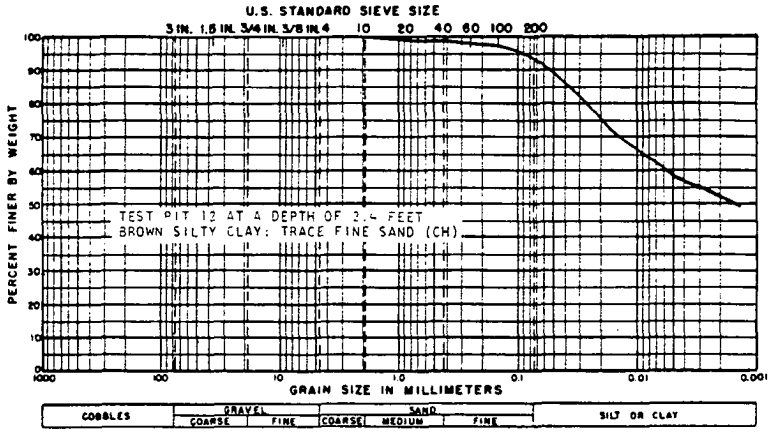


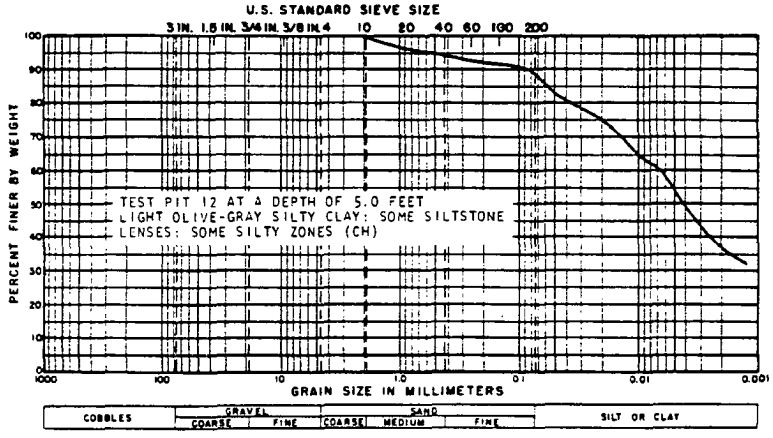
Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-90 (Sheet 3 of 7)

Results of Particle-Size Analyses



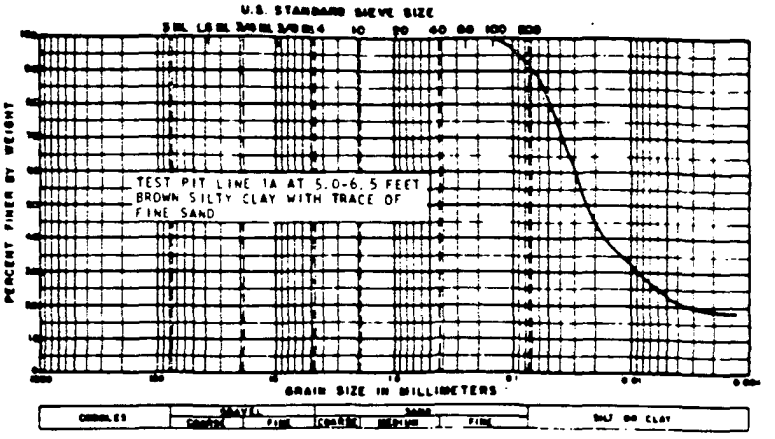


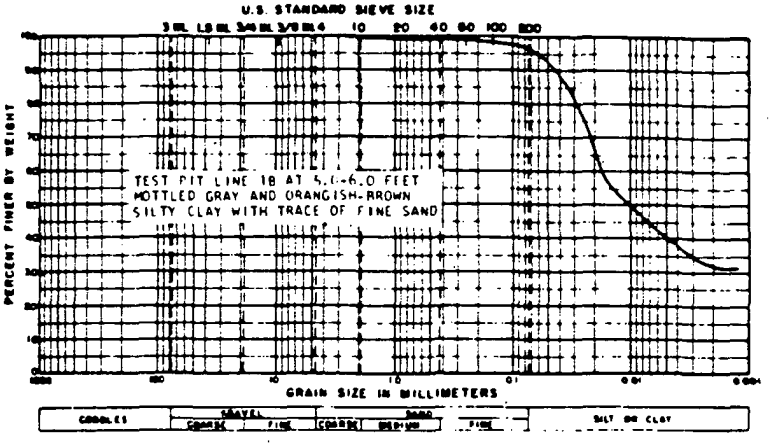
Rev. 0

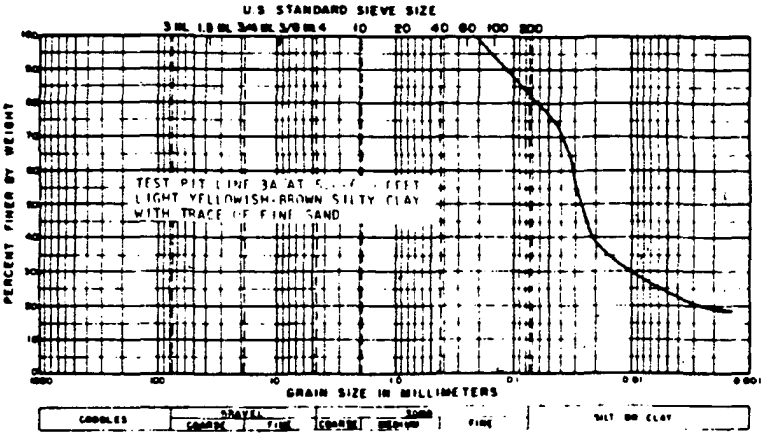
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-90 (Sheet 4 of 7)

Results of Particle-Size Analyses





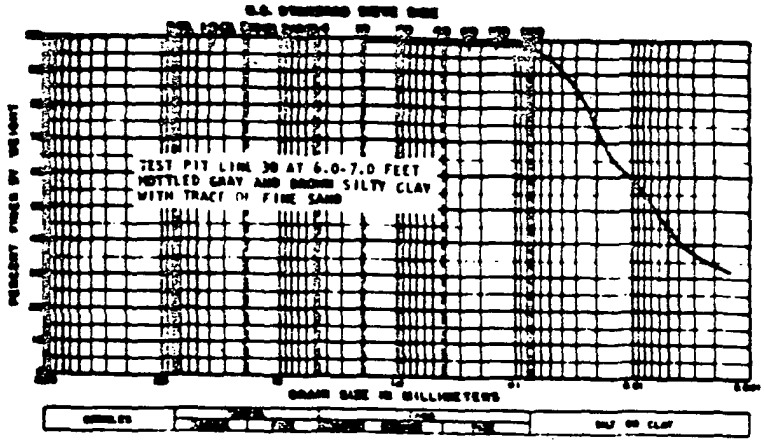


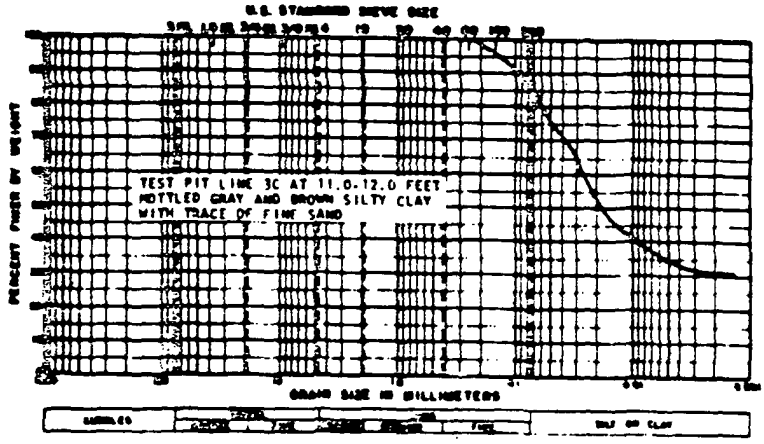
Rev. 0

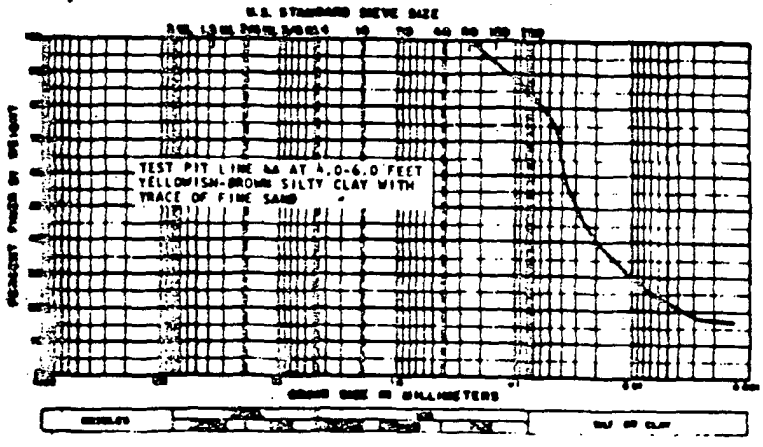
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-90 (Sheet 5 of 7)

Results of Particle-Size Analyses





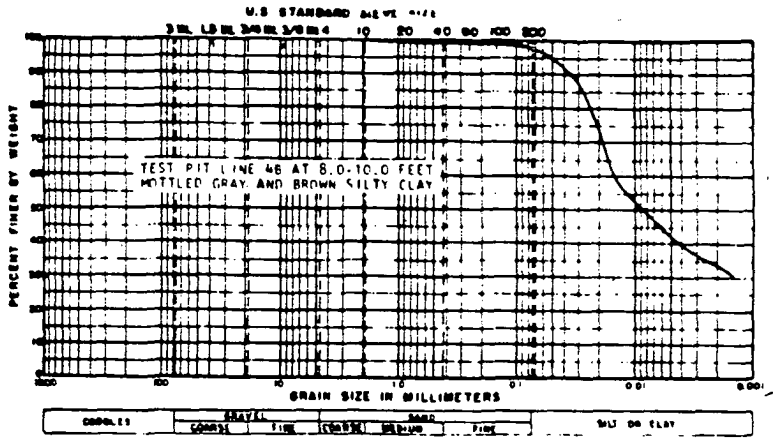


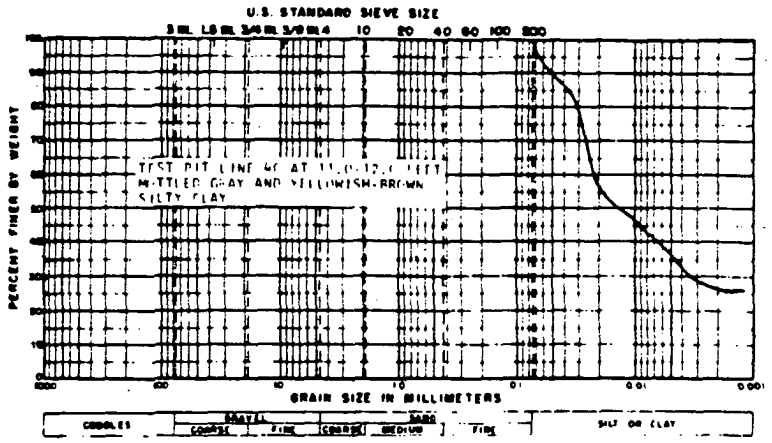
Rev. 0

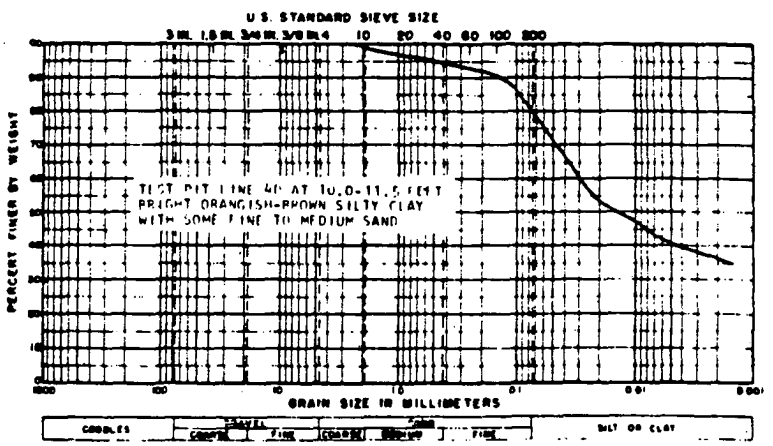
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-90 (Sheet 6 of 7)

Results of Particle-Size Analyses





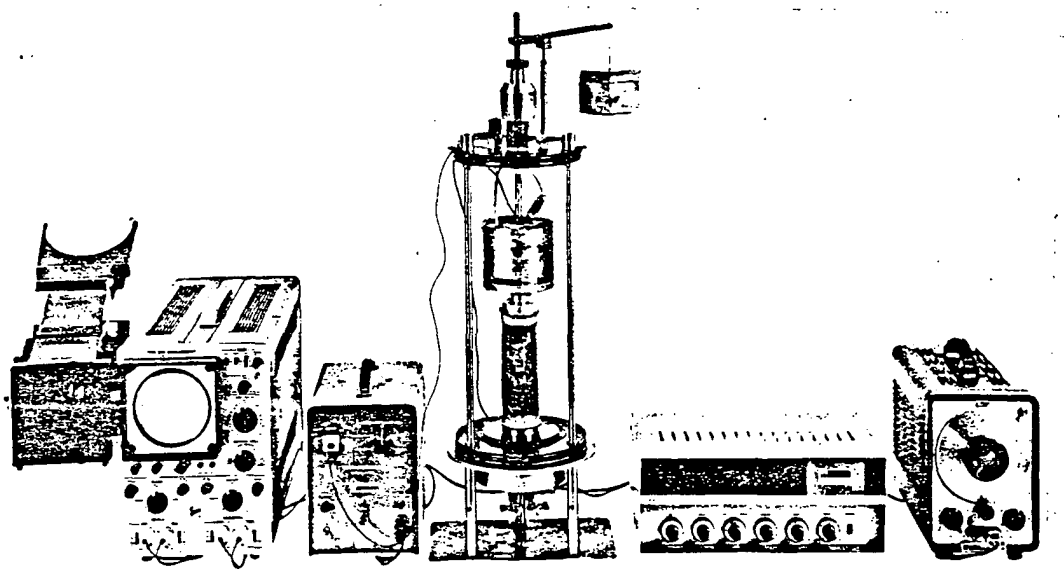


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-90 (Sheet 7 of 7)

Results of Particle-Size Analyses



RESONANT COLUMN TESTS ARE PERFORMED TO EVALUATE THE DYNAMIC PROPERTIES OF THE SOIL OR ROCK SAMPLES. UTILIZING THE RESONANT COLUMN APPARATUS, A CYLINDRICAL COLUMN OF SOIL OR ROCK IS SUBJECTED TO A STEADY STATE SINUSOIDAL FORCING FUNCTION, WHICH STRESSES THE SAMPLE IN TORSION. THE FREQUENCY OF THE APPLIED FORCE IS VARIED UNTIL THE RESONANT FREQUENCY OF THE SOIL APPARATUS SYSTEM IS OBTAINED. THE RESONANT FREQUENCY IS THAT WHICH PRODUCES THE MAXIMUM AMPLITUDE OF OUTPUT RECORDED. THE RESONANT FREQUENCY THUS OBTAINED IS RELATED TO THE TORSIONAL SHEAR MODULUS OF THE MATERIAL TESTED.

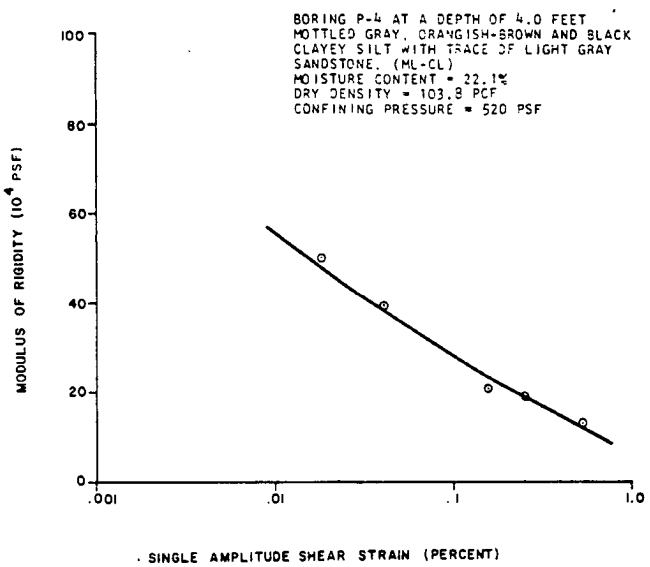
RESONANT COLUMN TESTS ARE PERFORMED ON UNDISTURBED OR RECONSTITUTED CYLINDRICAL SAMPLES OF SOIL APPROXIMATELY 6 INCHES IN LENGTH AND 2½ INCHES IN DIAMETER. THE SAMPLES ARE ENCASED IN A RUBBER MEMBRANE AND PLACED IN A TEST CHAMBER. THE TESTS MAY BE PERFORMED CONFINED OR UNCONFINED ON SOILS AT FIELD MOISTURE OR ON ARTIFICIALLY SATURATED SAMPLES. THE APPARATUS EMPLOYS A VIBRATION EXCITATION DEVICE, POWERED BY A VARIABLE FREQUENCY SINE WAVE GENERATOR WHICH APPLIES A FORCING TORQUE TO THE FREE END OF THE SPECIMEN. THE RESULTING VIBRATIONS ARE MEASURED BY AN ACCELEROMETER WHICH PRODUCES A CALIBRATED OUTPUT THAT IS A MEASURE OF THE ANGULAR ACCELERATION OF THE FREE END OF THE SPECIMEN. THE SINUSOIDAL VOLTAGE USED TO PRODUCE THE FORCING TORQUE AND THE OUTPUT OF THE ACCELEROMETER ARE DISPLAYED ON THE X-Y AXES OF THE OSCILLOSCOPE RESULTING IN ELLIPTICAL CONFIGURATIONS FOR ASSOCIATED FREQUENCIES. THESE ELLIPTICAL LOOPS ARE PHOTOGRAPHED AND EVALUATED TO DETERMINE THE DAMPING CHARACTERISTICS OF THE SAMPLES TESTED.

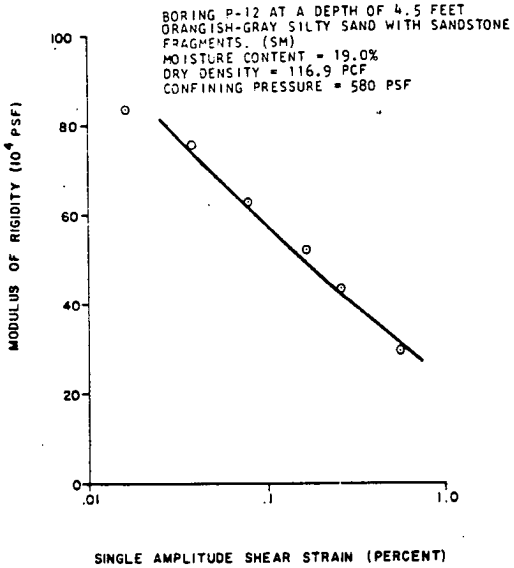
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

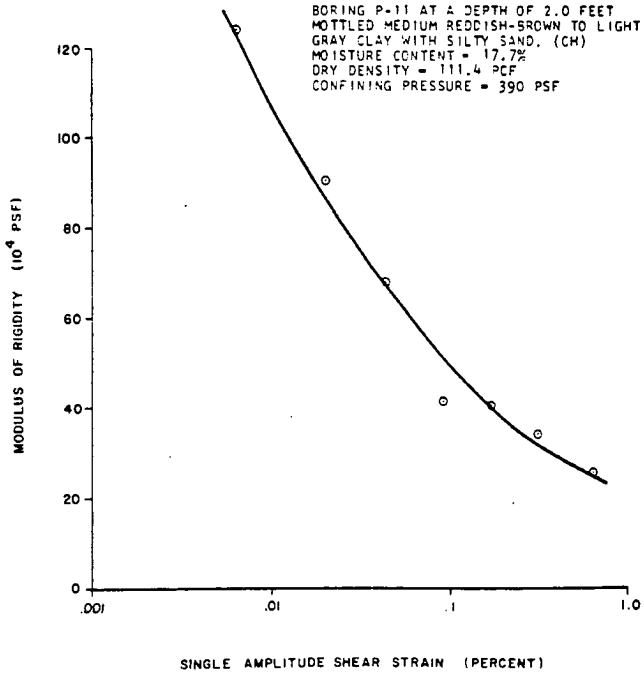
Figure 2.5-91

Method of Performing Resonant Column Tests

Rev. 0







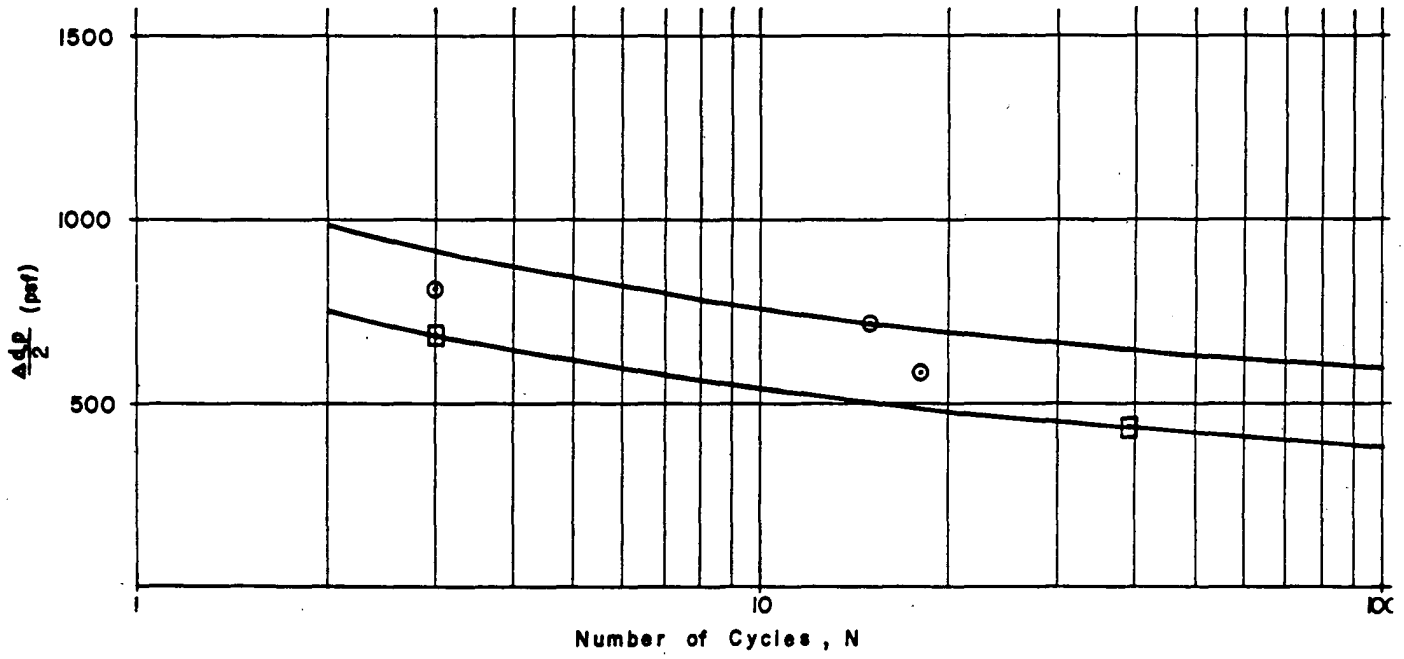
Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-92

Results of Dynamic Triaxial Testing

NOTE: 1. THE LOCATION OF BORINGS P-4, P-11 AND P-12 IS SHOWN ON FIGURE 2.5-31.
2. DYNAMIC TRIAXIAL TEST RESULTS ARE PRESENTED IN TABLE 2.5-31



LEGEND (TP-13)

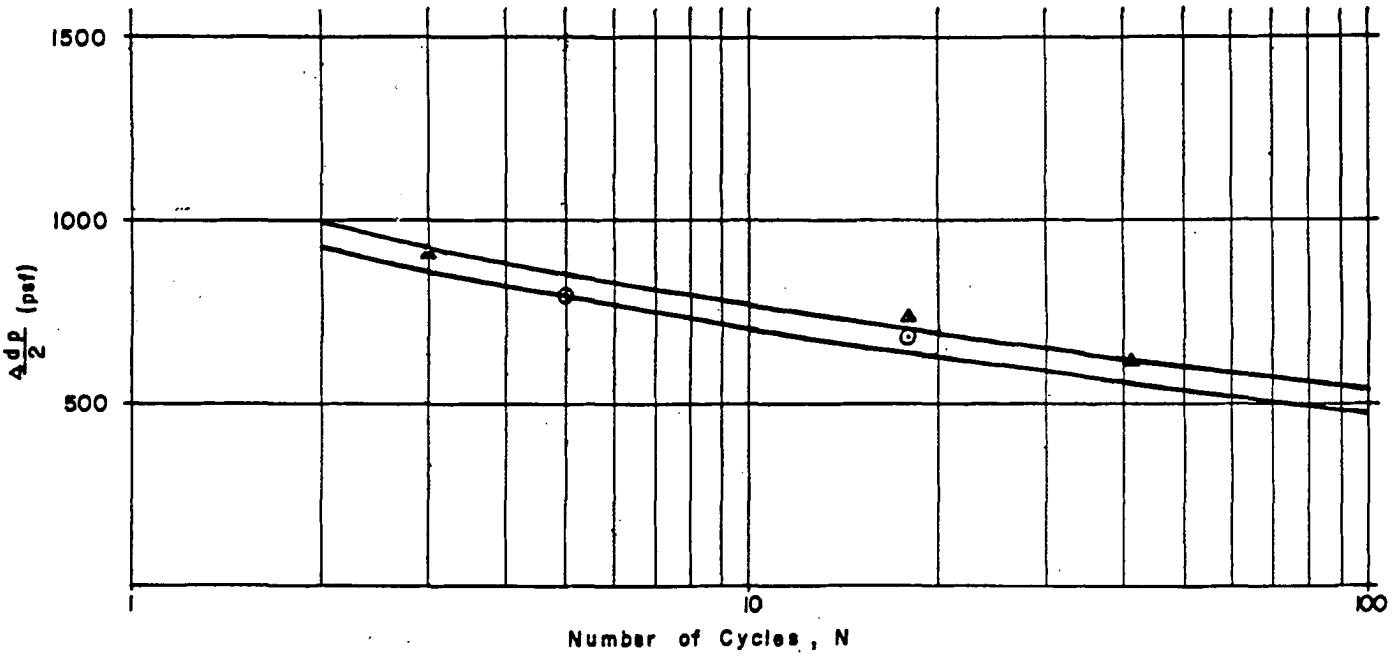
	σ_{3c} (tsf)	K_c
⊙	0.6	1.75
⊡	0.2	1.75

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-93 (Sheet 1 of 2)

Results of Stress-Controlled Cyclic Triaxial Tests for Five Percent Strain



LEGEND (TP-3)

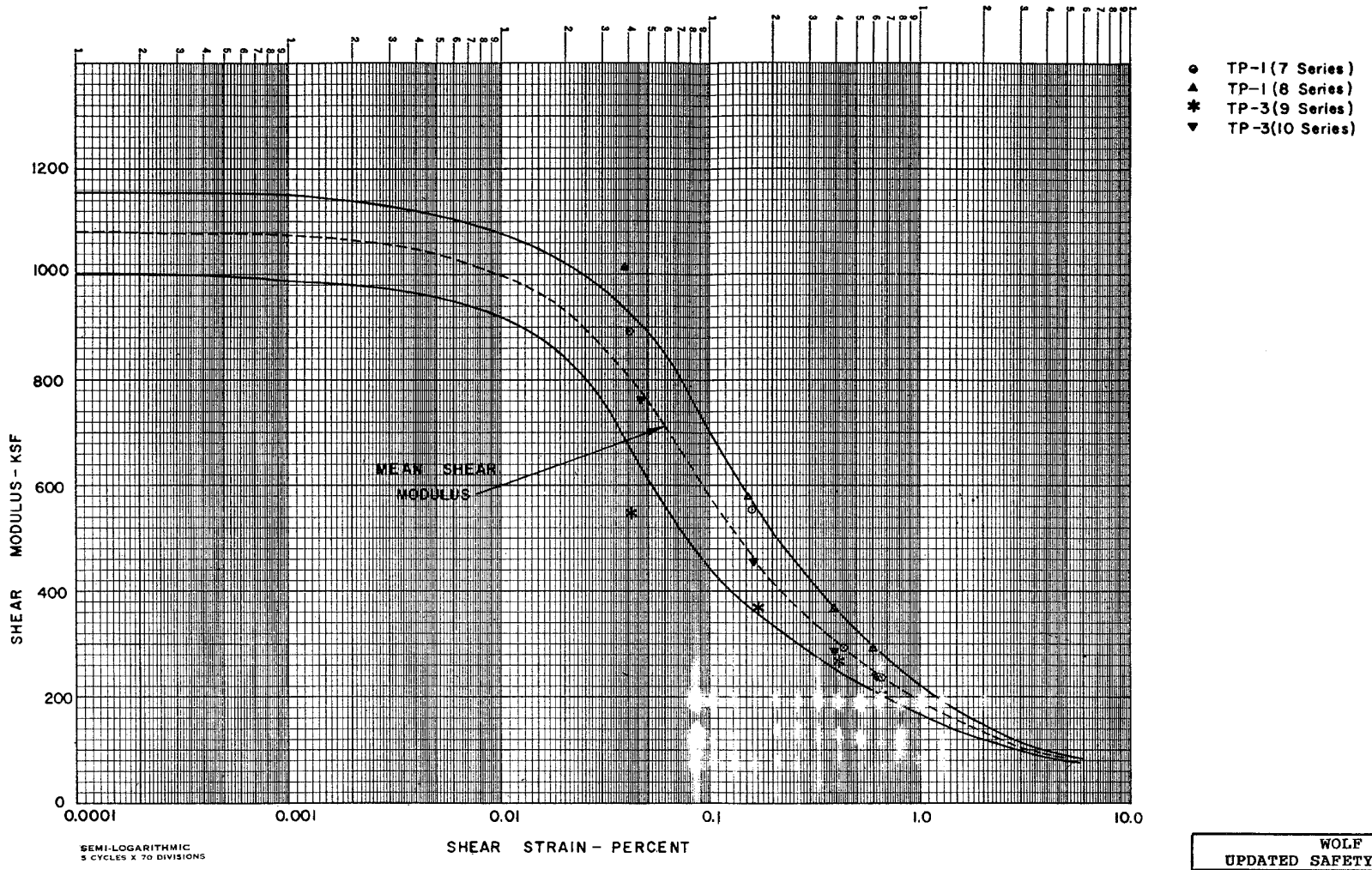
	σ_{3c} (tsf)	K_c
▲	0.9	1.25
⊙	0.6	1.25

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

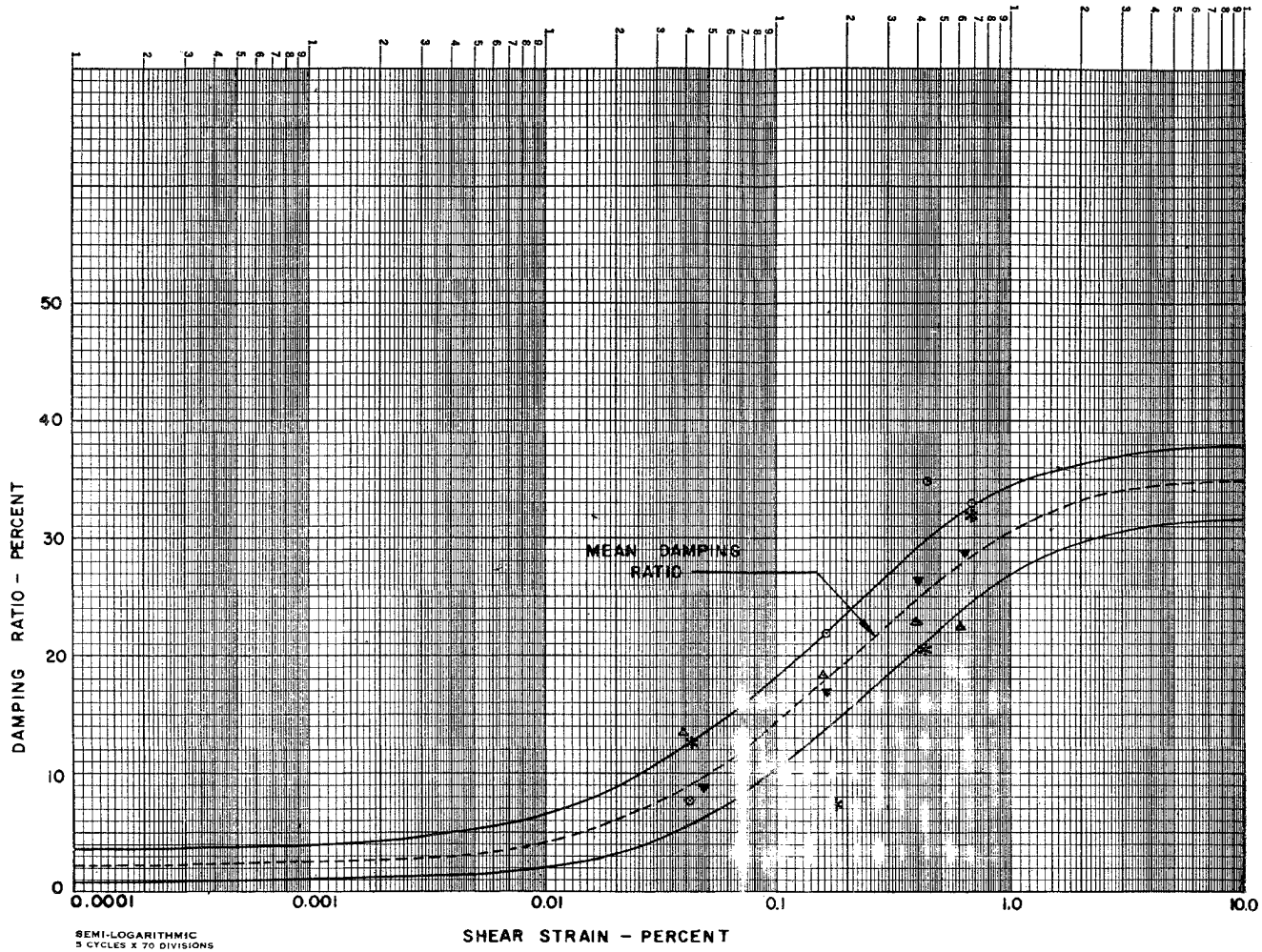
Figure 2.5-93 (Sheet 2 of 2)

Results of Stress-Controlled Cyclic Triaxial Tests for Five Percent Strain



Rev. 0

WOLF CREEK UPDATED SAFETY ANALYSIS REPORT
FIGURE 2.5-94
LABORATORY DATA - SHEAR MODULI FOR CLAY

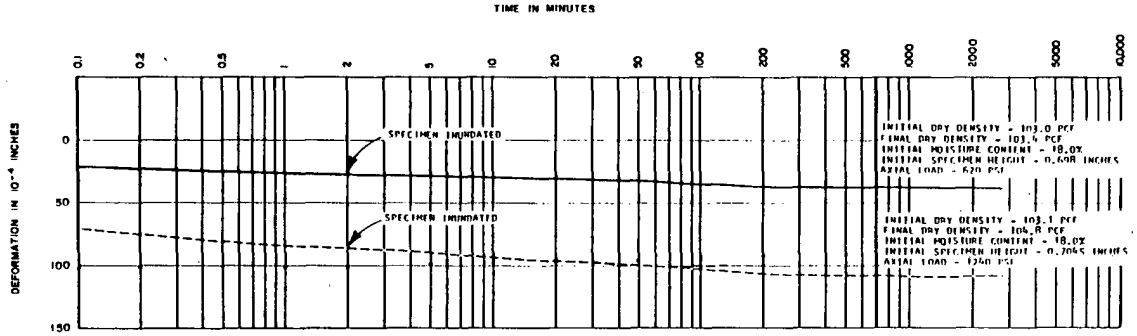


Rev. 0

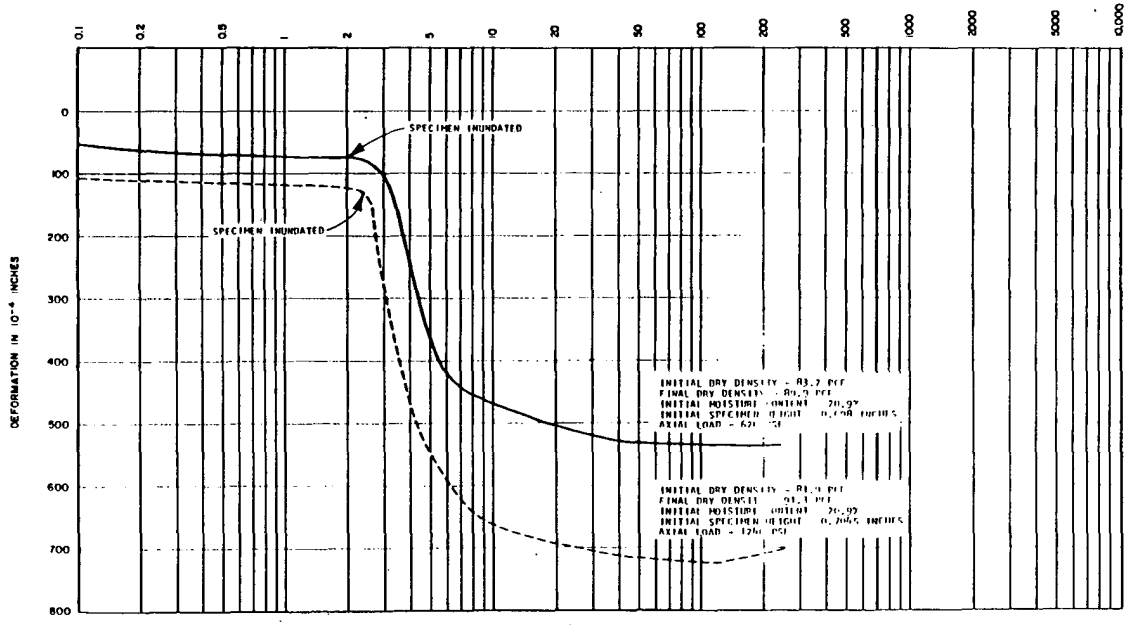
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

FIGURE 2.5-95

LABORATORY DATA - DAMPING RATIOS FOR CLAY



TEST PIT 1 AT A DEPTH OF 1.0 FEET TO 3.0 FEET
MOTTLED BROWN AND GRAY SILTY CLAY WITH SOME SAND
(CL)



TEST PIT 3 AT A DEPTH OF 1.0 FEET TO 5.0 FEET
MOTTLED BROWN AND GRAY SILTY CLAY WITH TRACE OF
SAND AND GRAVEL (CH)

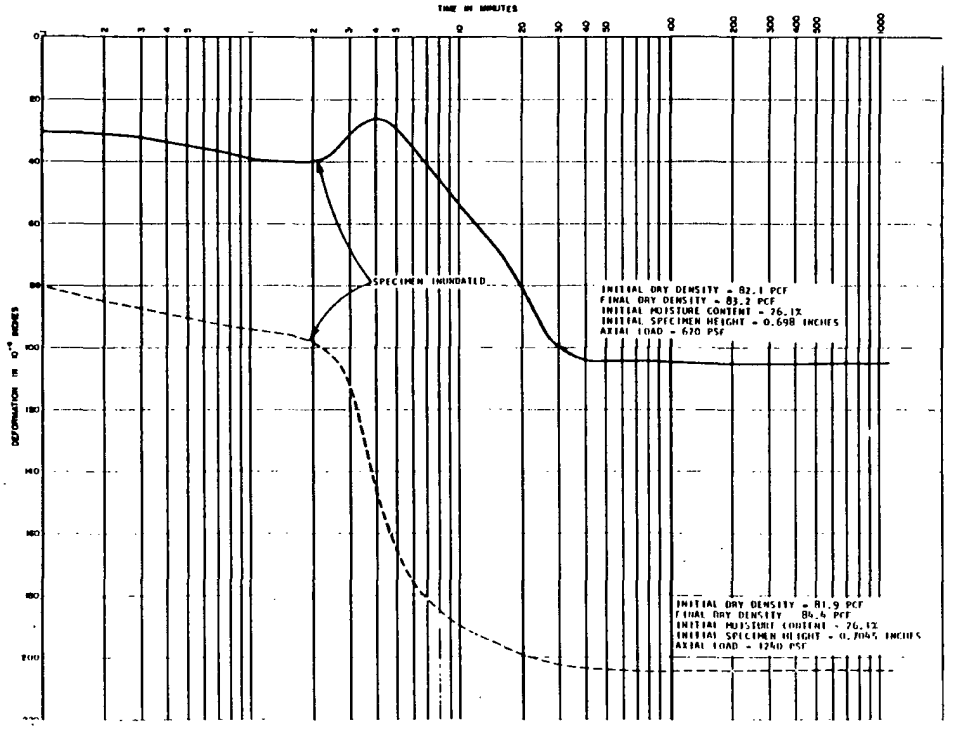
NOTES: 1. THE LOCATIONS OF TEST PITS 1 AND 3 ARE SHOWN ON FIGURE 2.5-30.
2. SHALY SAMPLES COMPACTED TO 95 PERCENT ASTM D 698-70.

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-96a

Results of Swell Load Testing - Test Pits 1 and 3



TEST PIT 5 AT A DEPTH OF 1.5 FEET TO 3.0 FEET
MOTTLED GRAYISH-BROWN AND GRAYISH-BLACK SILTY CLAY WITH OCCASIONAL SAND AND ORANGE CLAY WITH TRACE OF SAND (CH)

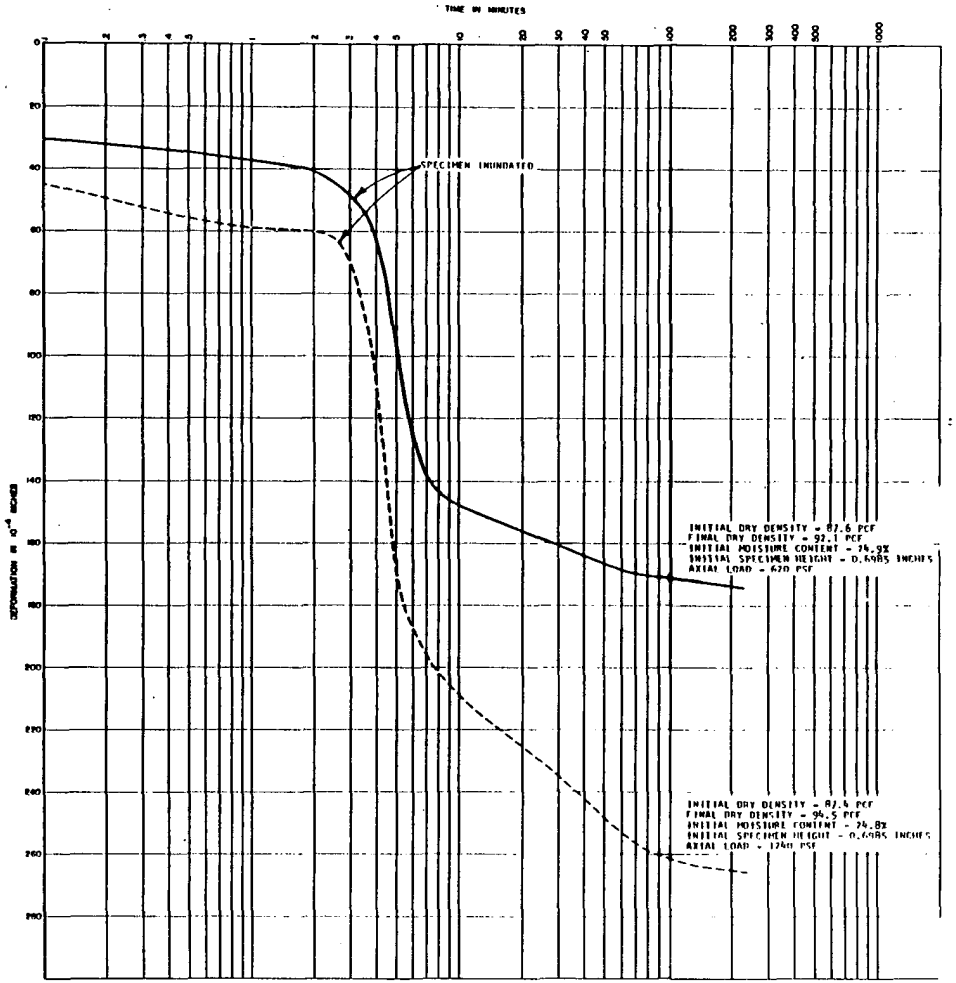
NOTE: 1. THE LOCATION OF TEST PIT 5 IS SHOWN ON FIGURE 2.5-10.
2. SAMPLES COMPACTED TO 95 PERCENT ASTM D 698-70.

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-96b

Results of Swell Load Testing - Test Pit 5



TEST PIT 6 AT A DEPTH OF 5.0 FEET TO 6.0 FEET
LIGHT OLIVE GRAY SILTY CLAY (CL)

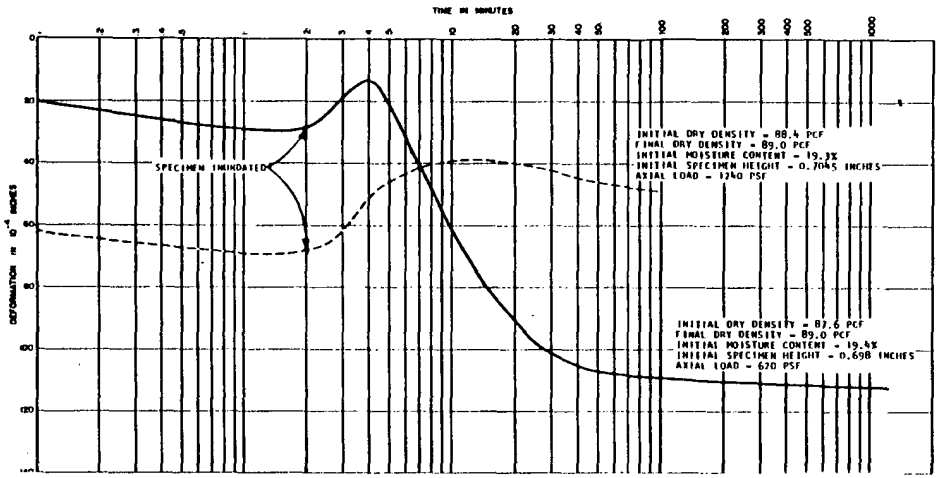
NOTE: 1. THE LOCATION OF TEST PIT 6 IS SHOWN IN FIGURE 2.5-10.
2. SAMPLES COMPACTED TO 95 PERCENT ASTM D 698-70

Rev. 0

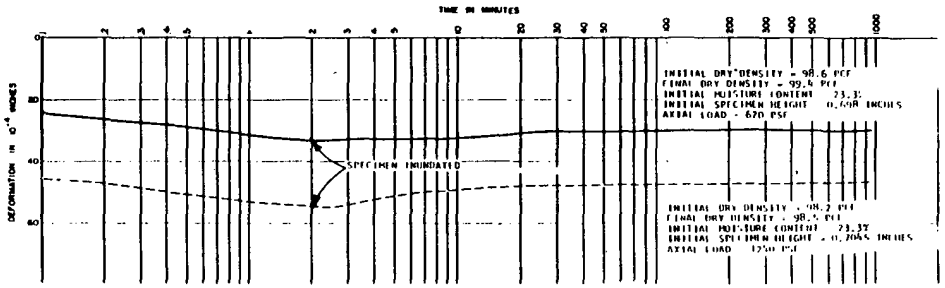
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-96c

Results of Swell Load Testing - Test Pit 6



TEST PIT 4 AT A DEPTH OF 2.0 FEET TO 4.0 FEET
DARK GRAYISH-BROWN CLAY WITH SOME SILT TO LIGHT BROWNISH-GRAY CLAY (CH) WITH
TEST PIT 6 AT A DEPTH OF 1.5 FEET TO 4.5 FEET
VERY DARK GRAYISH-BROWN CLAY AND MOTTLED GRAYISH-BROWN, YELLOWISH-BROWN AND DARK GRAY CLAY WITH SOME SILT AND TRACE OF SAND (CH)



TEST PIT 2 AT A DEPTH OF 1.0 FEET TO 4.0 FEET
DARK GRAY AND BROWN SILTY CLAY WITH SOME SAND AND GRAVEL TO LIGHT GRAY CLAY (CH)

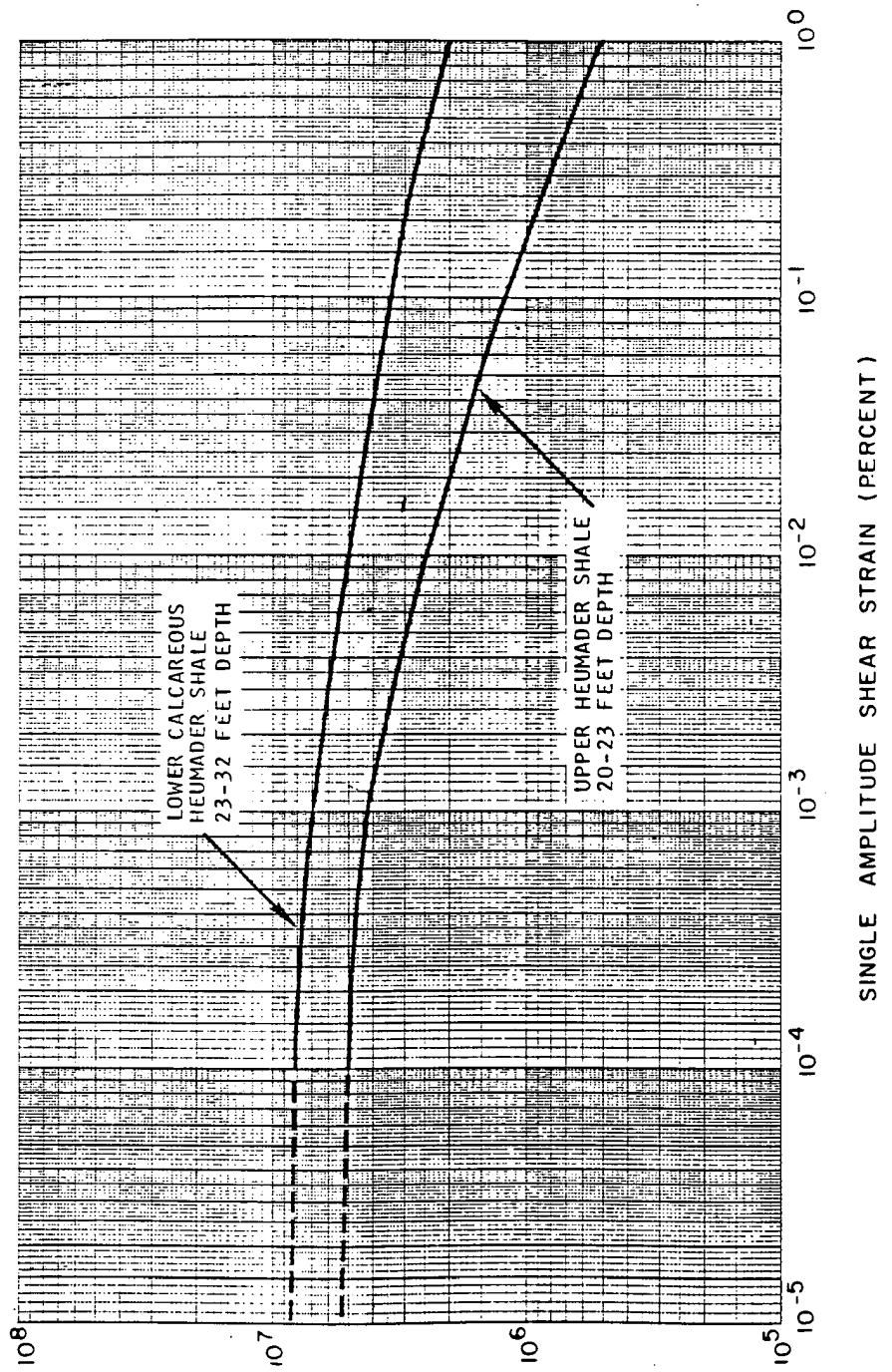
NOTE: 1. THE LOCATION OF TEST PITS 4 AND 6 IS SHOWN IN FIGURE 2.5-30
2. SAMPLES COMPACTED TO 95 PERCENT ASTM D 698-70.

Rev. (

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-96d

Results of Swell Load Testing - Test Pit 2 and Combination Test Pits 4 and 6

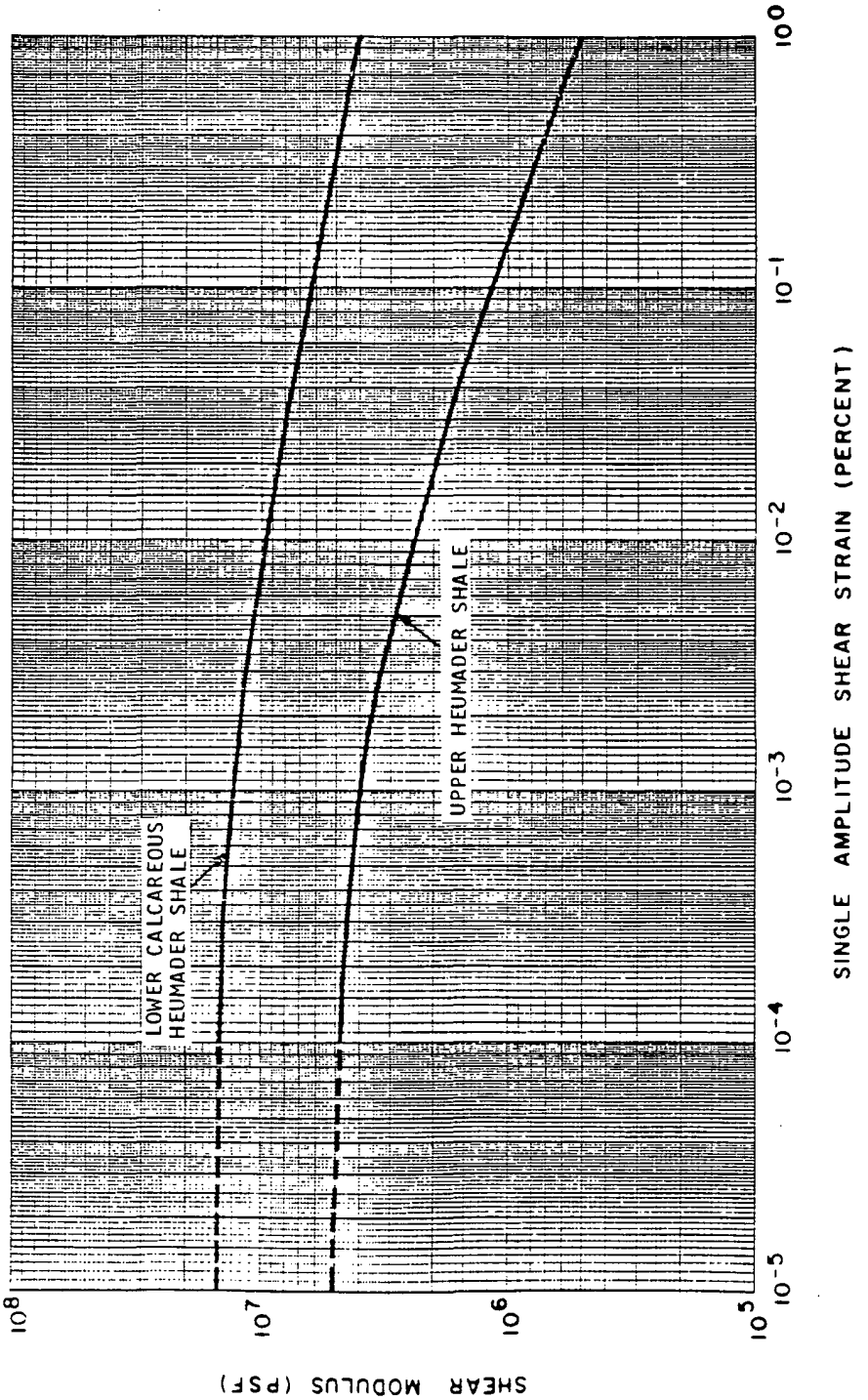


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-97a

Recommended Design Shear Modulus Versus Shear Strain Curves for the Heumader Shale Member at the ESWS Pumphouse

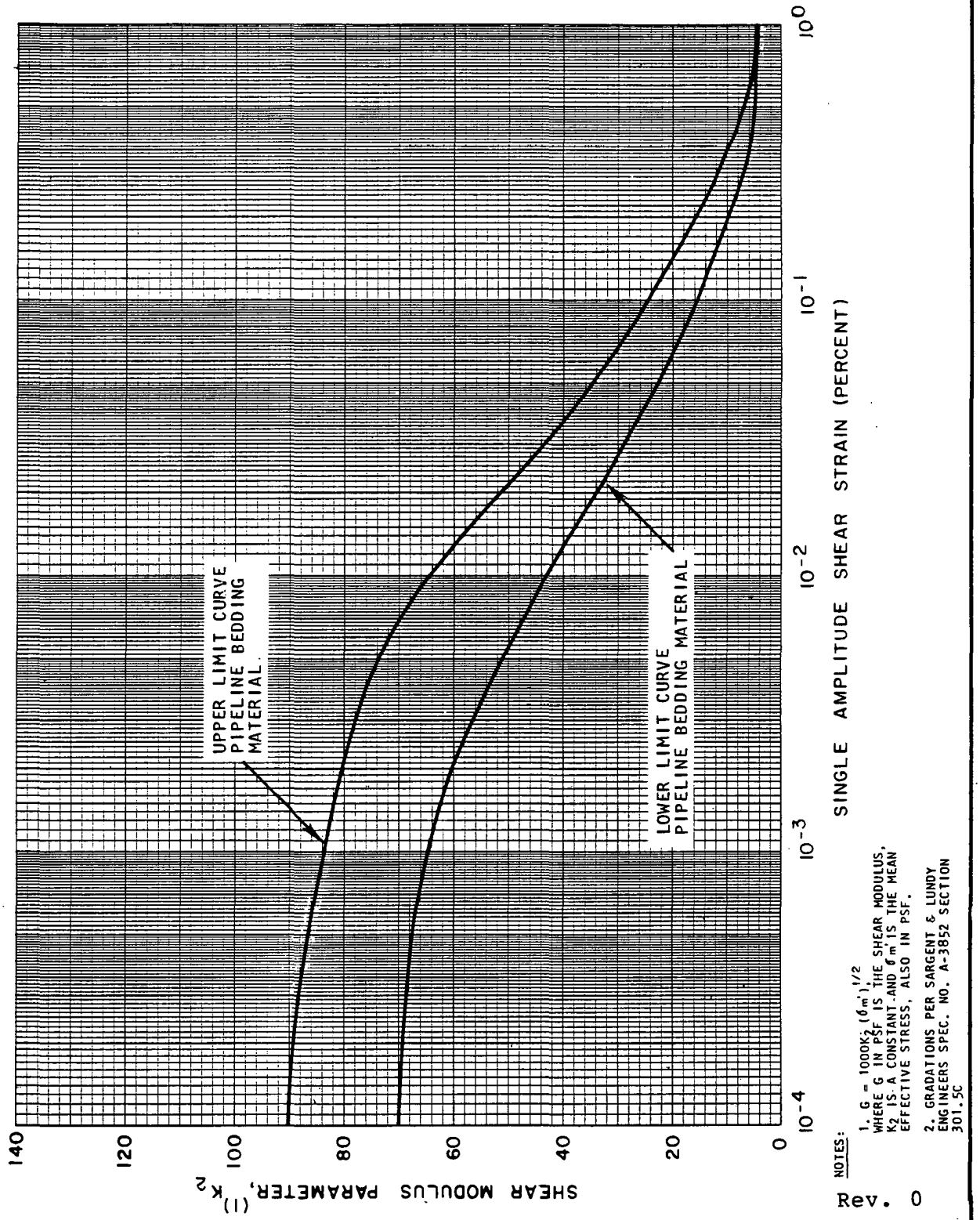


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-97b

Recommended Design Shear Modulus Versus Shear Strain Curves for the Heumader Shale Member at the Plant Site

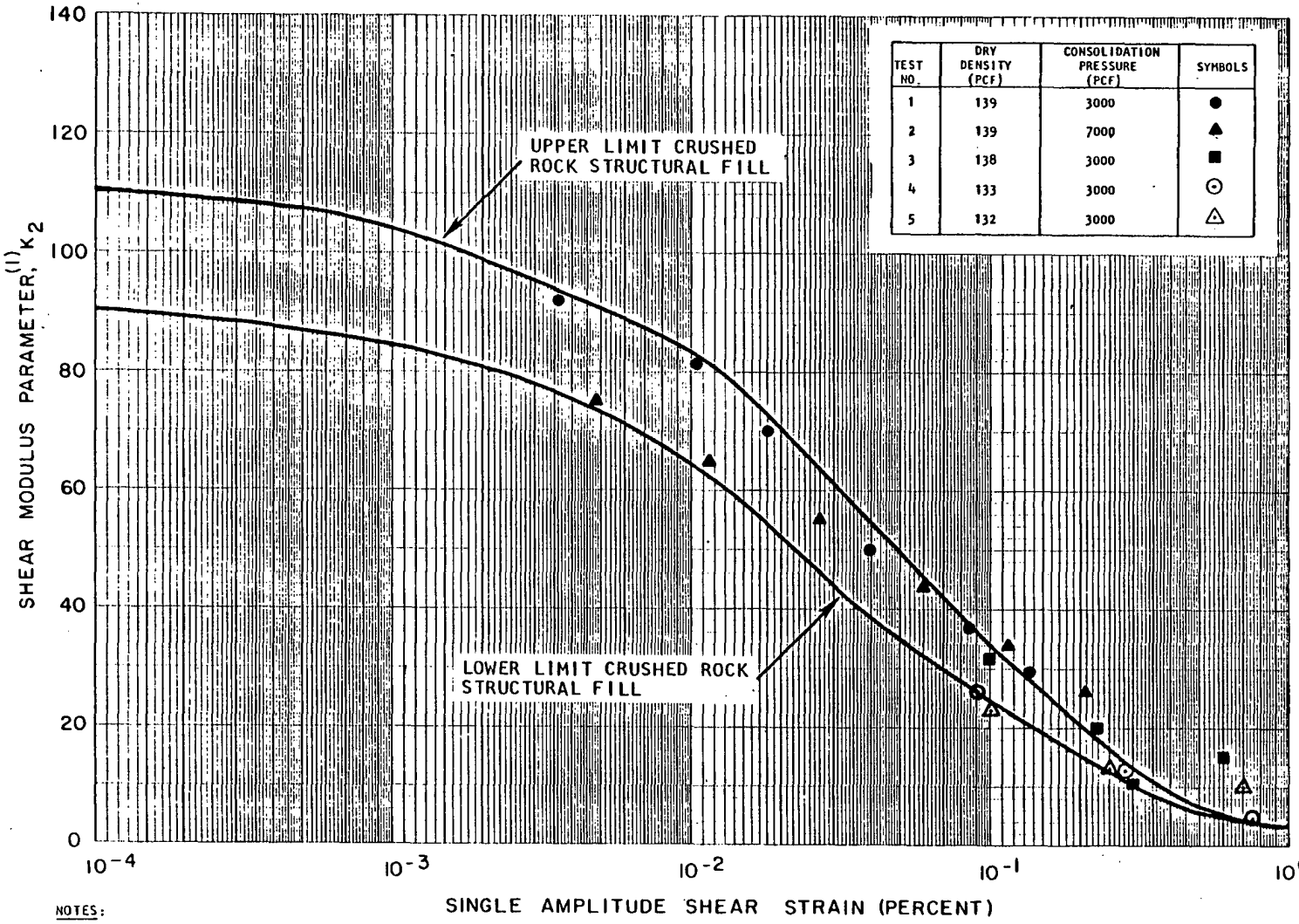


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-97c

Recommended Shear Modulus Versus Shear Strain Curve for Crushed Rock Pipeline Bedding Material



NOTES:

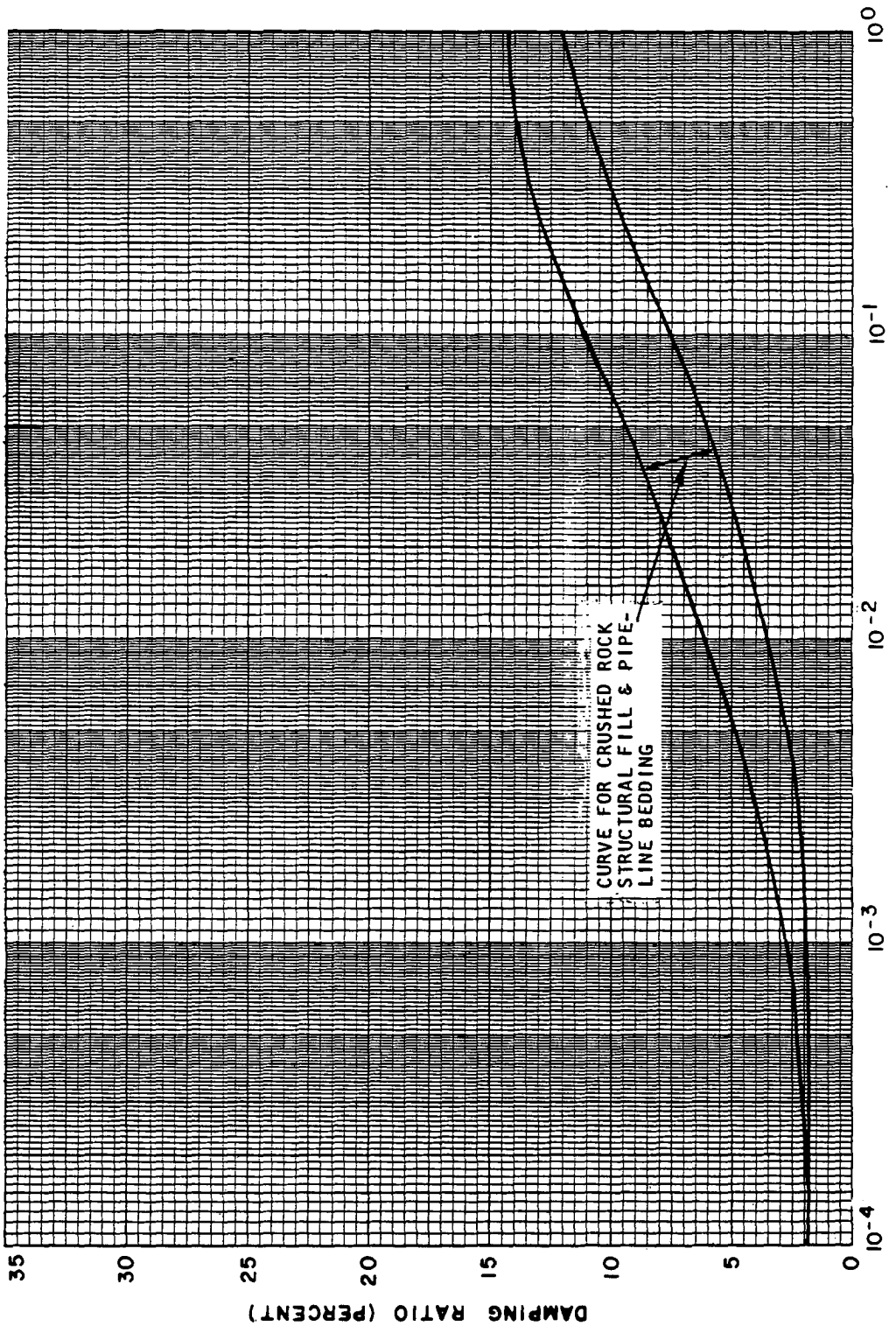
1. $G = 1000K_2 (\sigma_m')^{1/2}$, WHERE G IN PSF IS THE SHEAR MODULUS, K_2 IS A CONSTANT, AND σ_m' IS THE MEAN EFFECTIVE STRESS, ALSO IN PSF.
2. GRADATIONS PER DMLK-419, JULY 6, 1977.

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-97d

Recommended Shear Modulus Versus Strain Curve for Crushed Rock Structural Fill

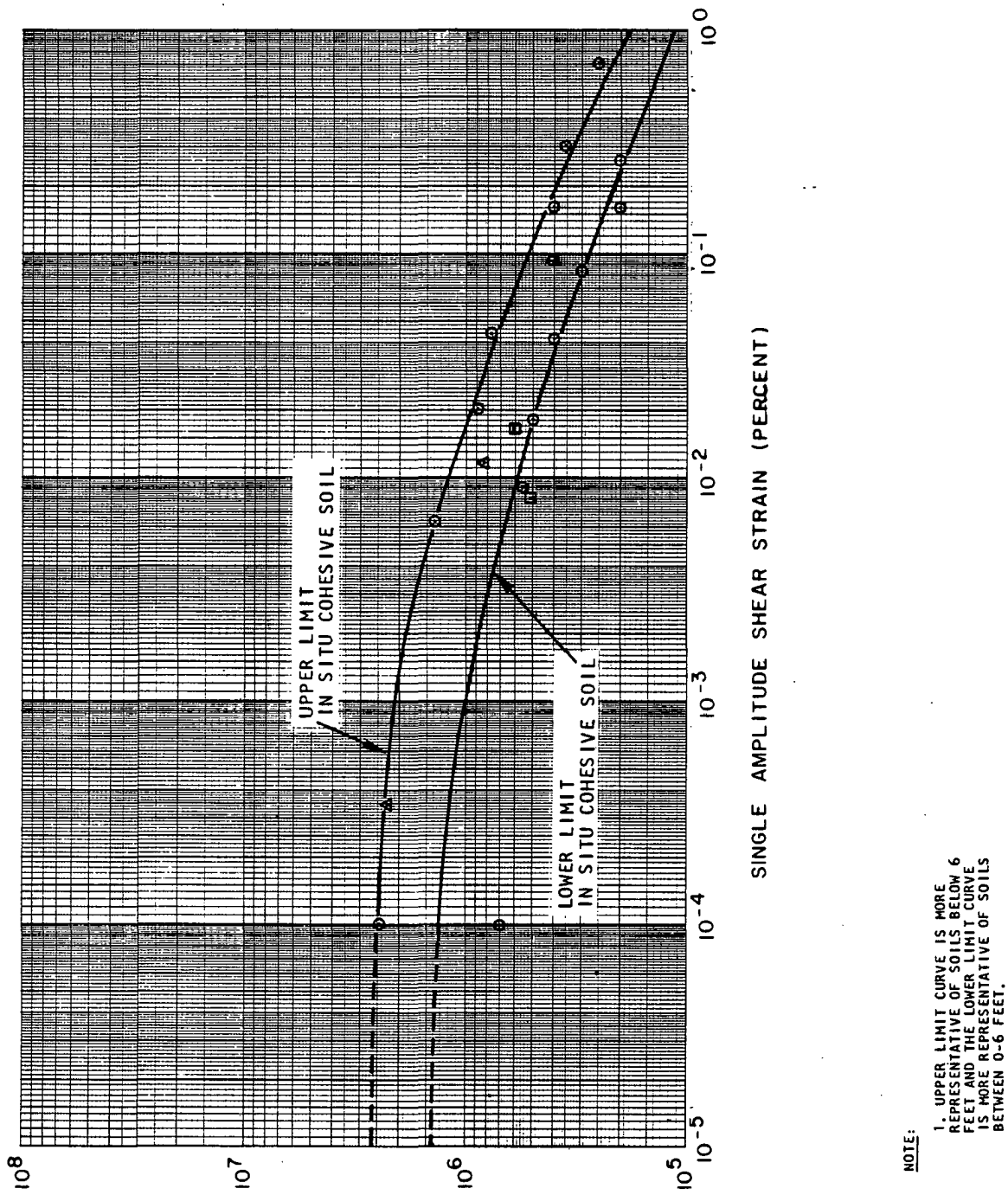


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-97e

Recommended Damping Ratio Versus Shear Strain Curve for Crushed Rock Backfill

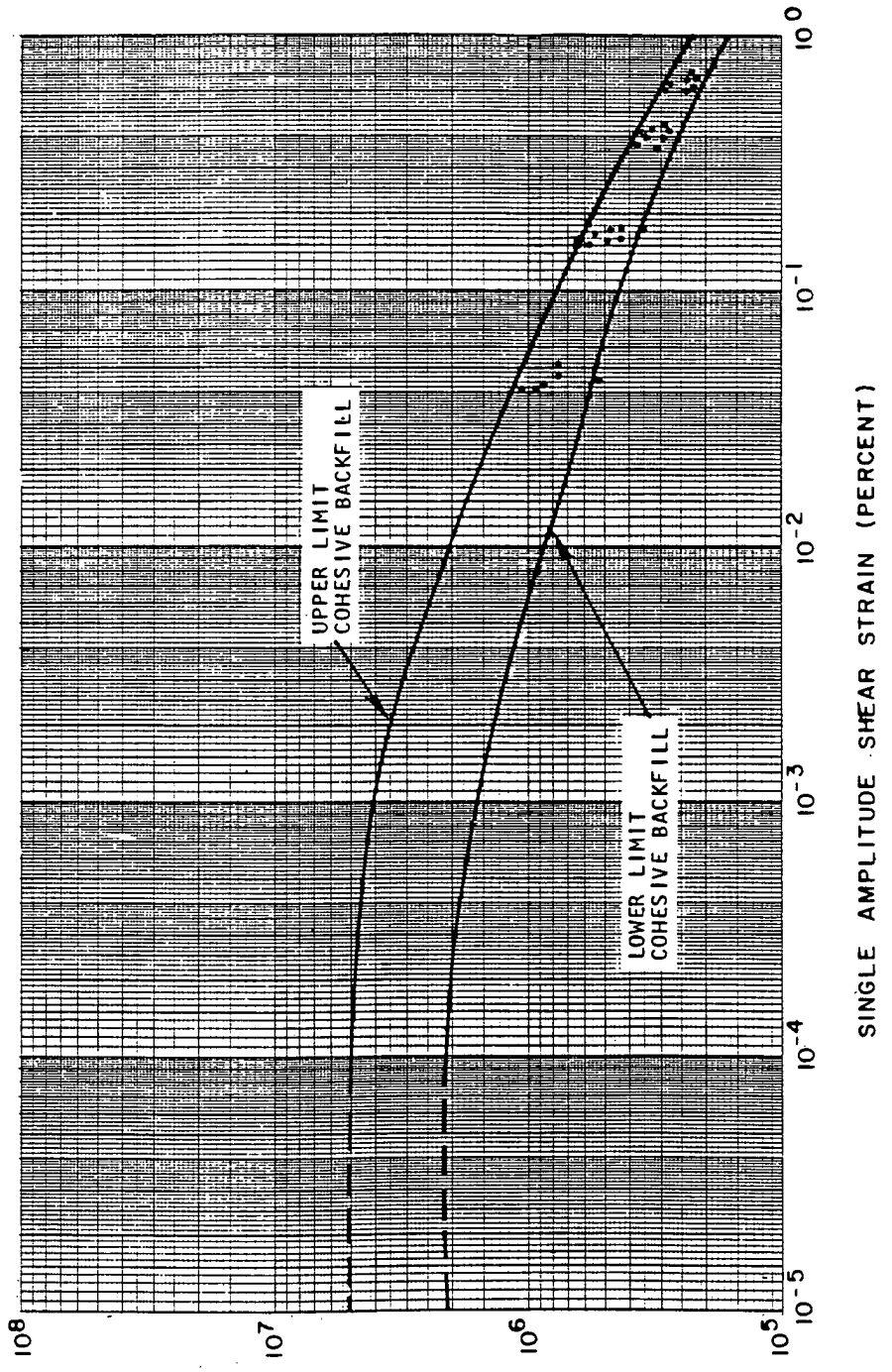


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-97f

Recommended Design Shear Modulus Versus Shear Strain Curves for in Situ Cohesive Soils at the ESWS Pumphouse



NOTE:

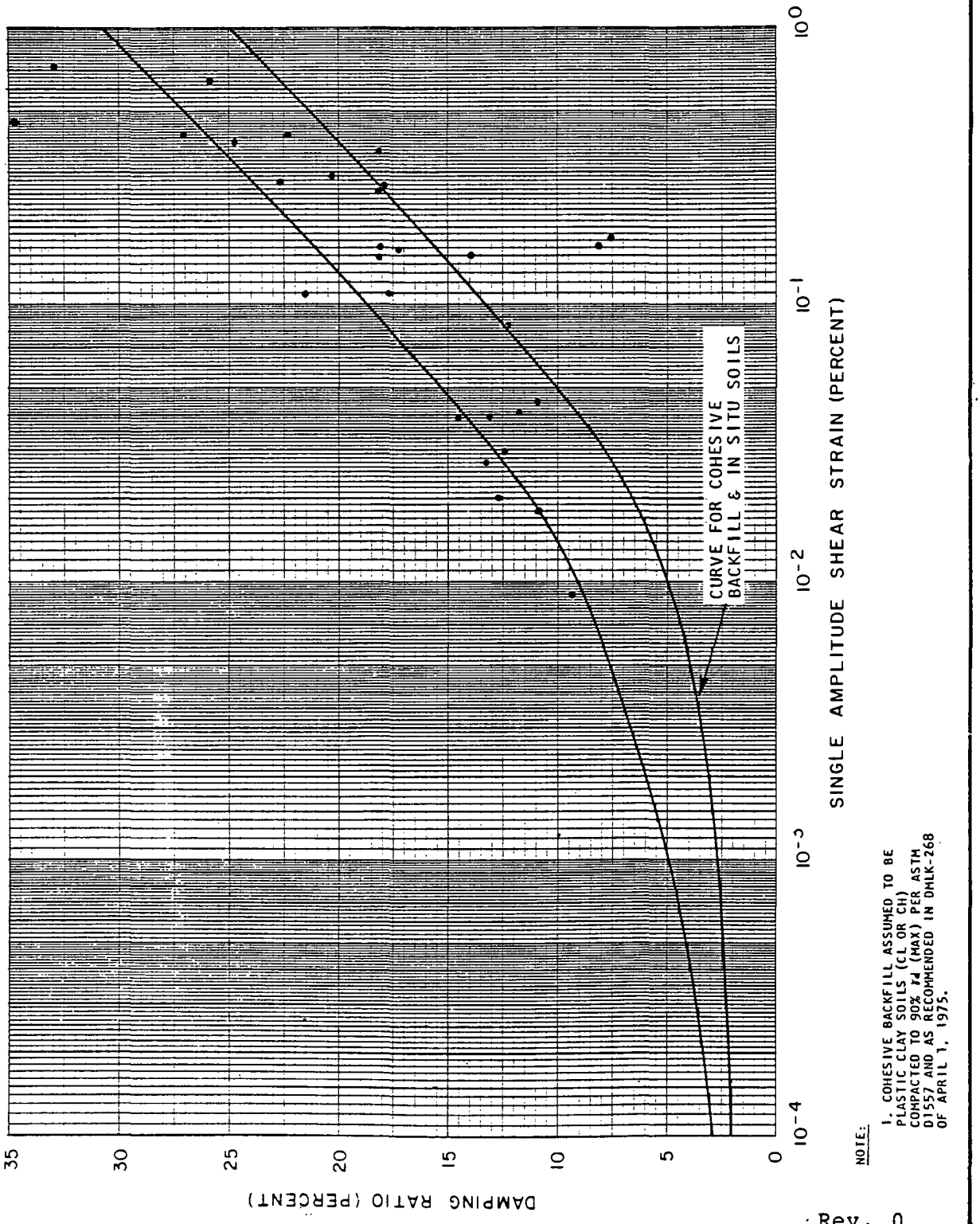
1. COHESIVE BACKFILL ASSUMED TO BE PLASTIC CLAY SOILS (CL OR CH) COMPACTED TO 90% Yd (MAX) PER ASTM D1557 .

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-97g

Recommended Design Shear Modulus Versus Shear Strain Curves for Cohesive Backfill at the ESWS Pumphouse

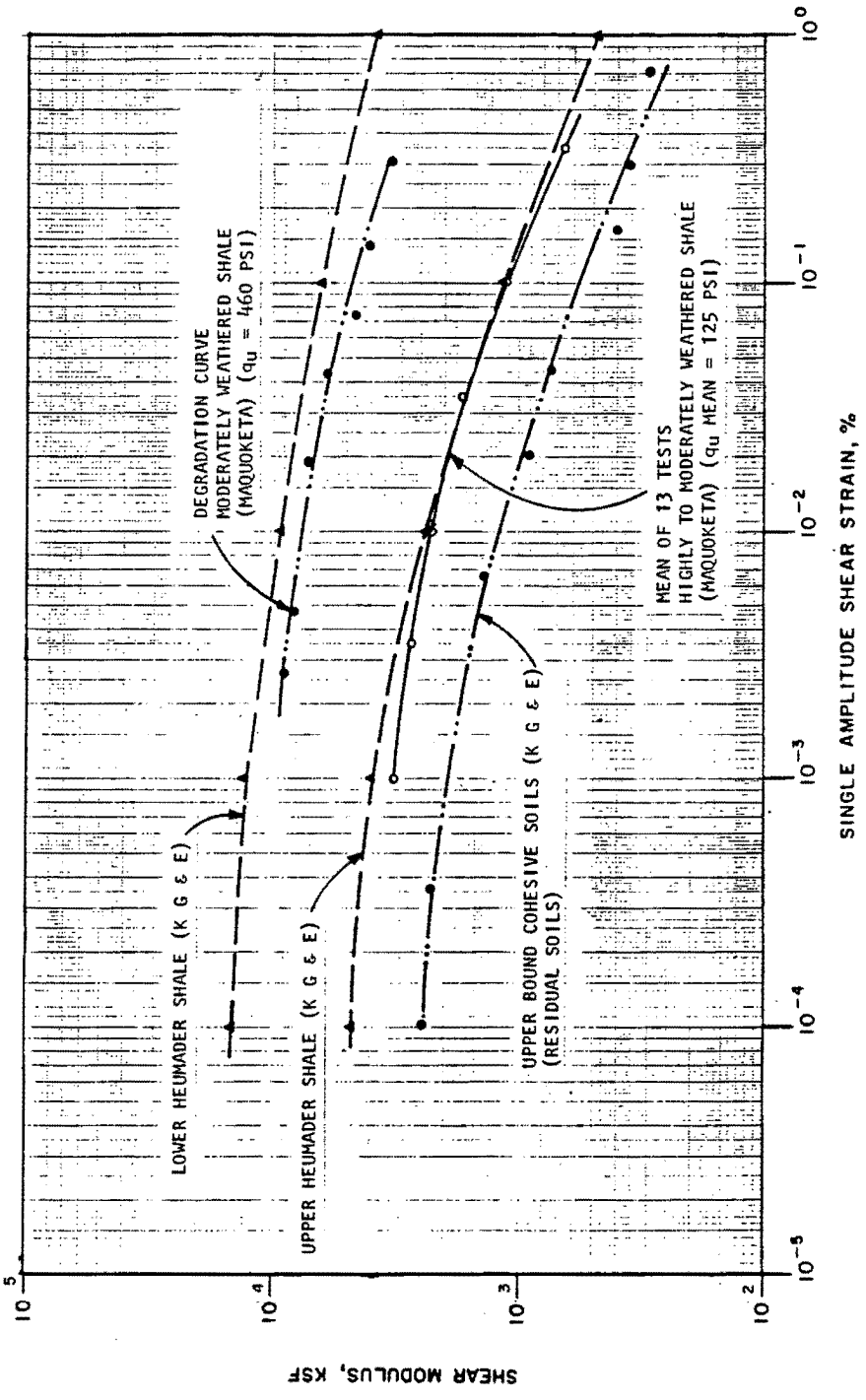


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-97h

Recommended Damping Ratio Versus Shear Strain Curve for Cohesive Backfill and in Situ Soils at the ESWS Pumphouse

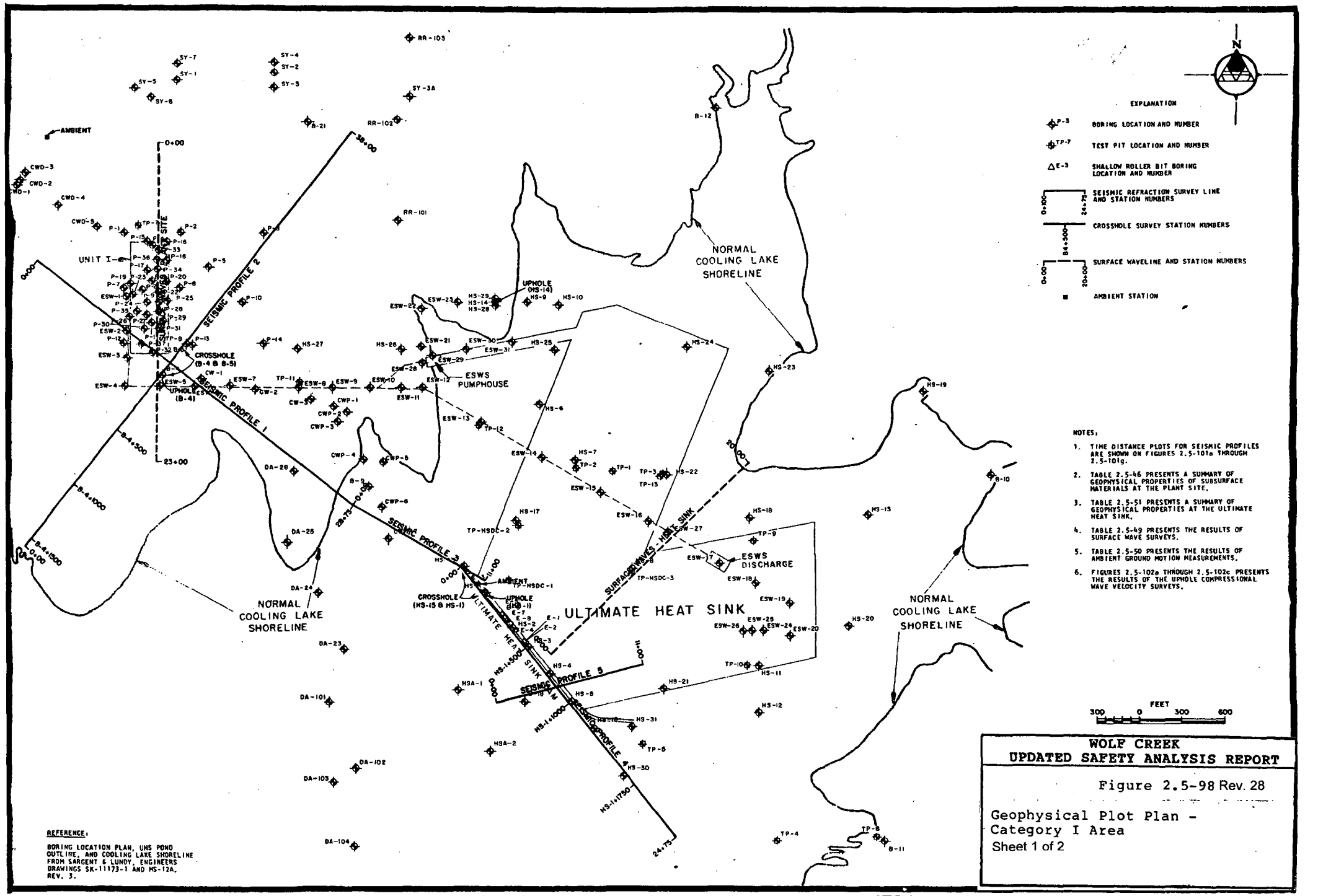


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-97i

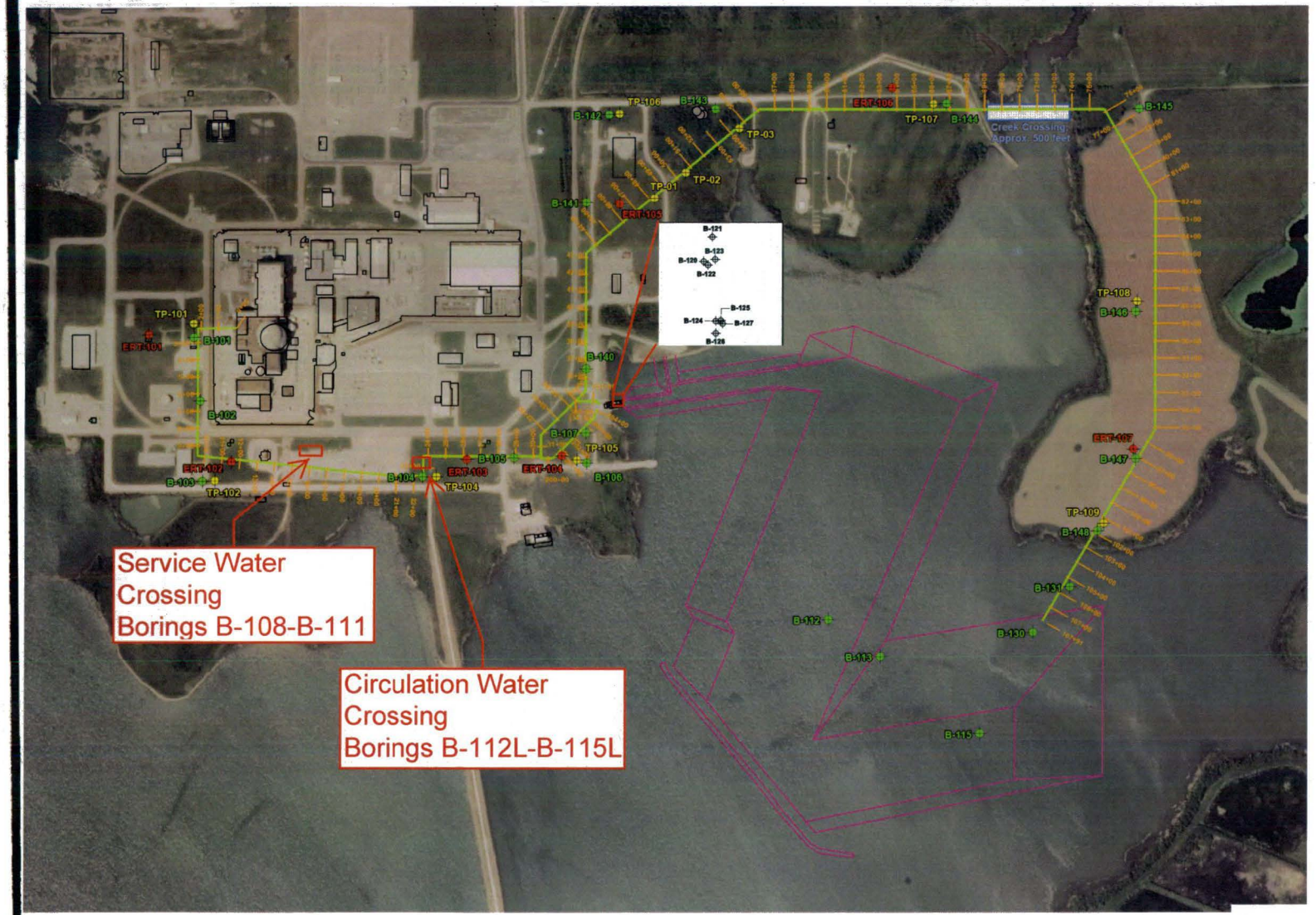
Strain Degradation Curves for Heumader Shale and Maquoketa Shale



WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-98 Rev. 28

Geophysical Plot Plan - Category I Area
Sheet 1 of 2

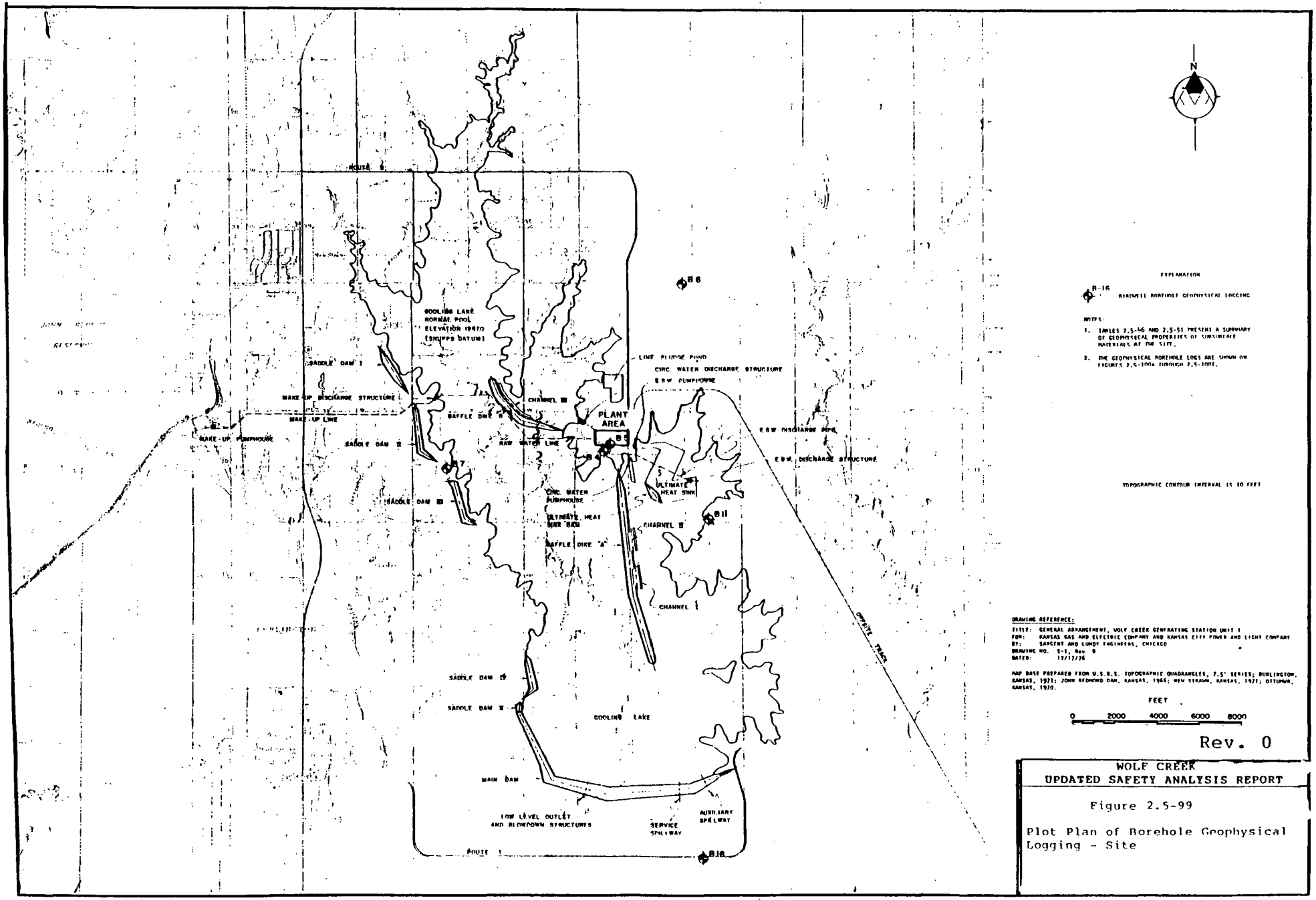


Notes:
Borings B-108-B-111 and B-112L-B115L were drilled in the vicinity of the areas shown.

Drawing Reference:
Drawing comes from Attachment 2 of Bechtel calculation 25707-000-30R-K01G-00002 Rev. 02

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-98 Rev. 28
Geophysical Plot Plan -
Category I Area
Sheet 2 of 2



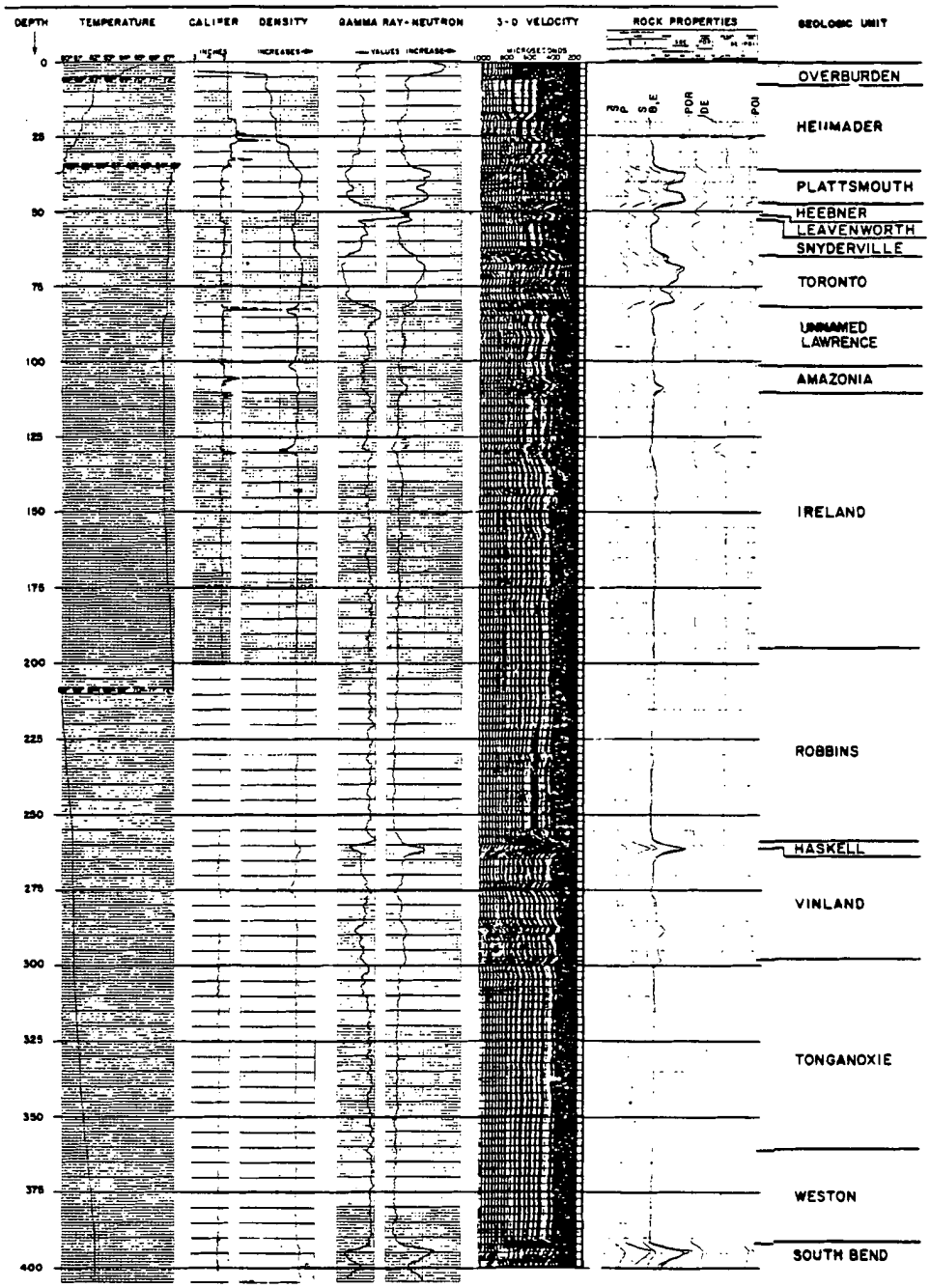
Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-99

Plot Plan of Borehole Geophysical Logging - Site

BORING B-4



EXPLANATION OF SYMBOLS FOR ROCK PROPERTIES

$\bar{S}$	SHEAR WAVE TIME	S	SHEAR MODULUS
P	PRESSURE WAVE TIME	B	BULK MODULUS
		E	YOUNG'S MODULUS
		POR	POROSITY
		DE	DENSITY
		POI	POISSON'S RATIO

NOTES:

1. GEOPHYSICAL BOREHOLE LOGGING WAS PERFORMED BY THE BIRDWELL DIVISION OF THE SEISMOGRAPH SERVICE CORPORATION.
2. LOCATION OF BOREHOLE LOGGING IS SHOWN ON FIGURE 2.5-99.

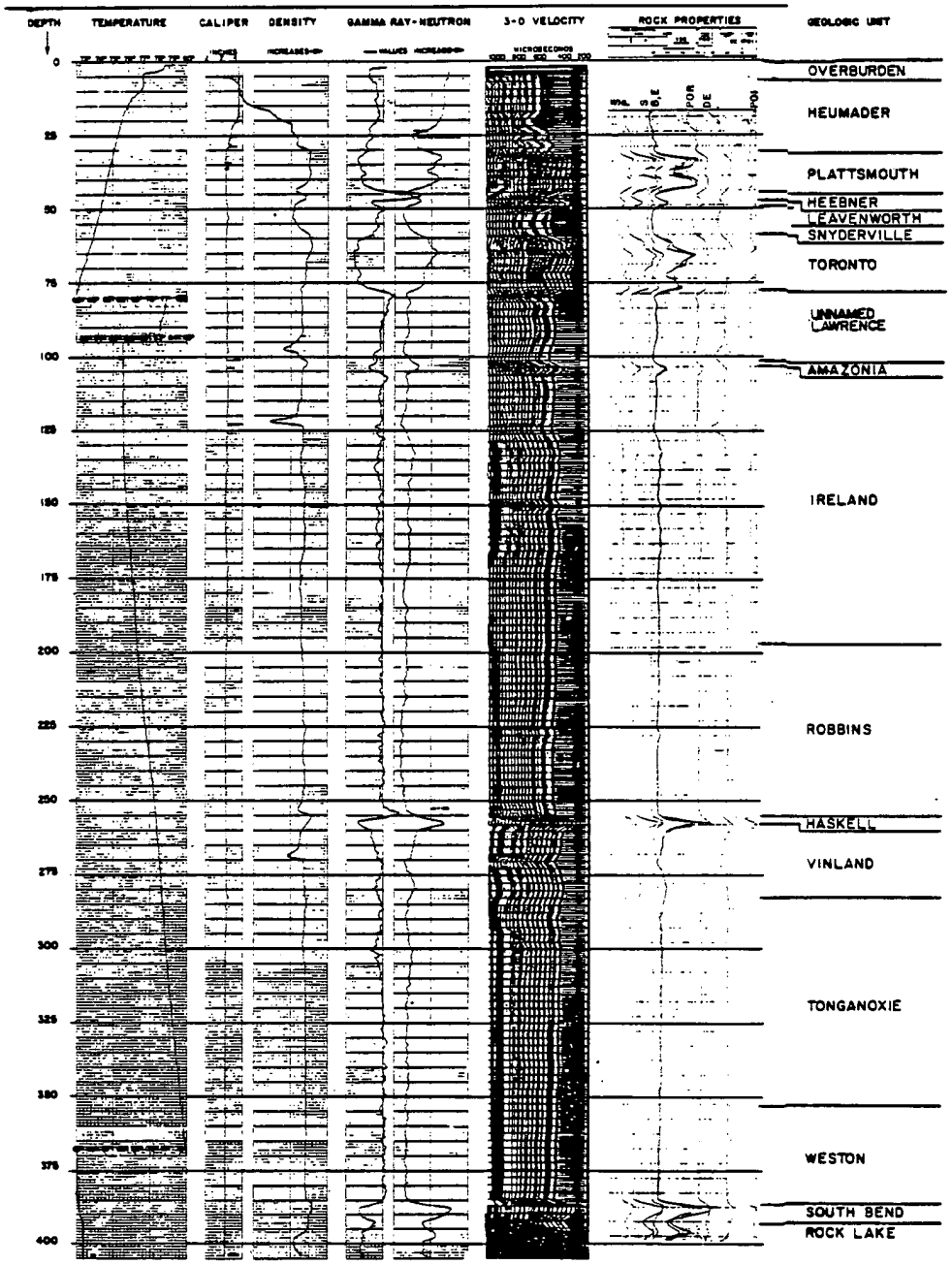
Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-100a

Birdwell Geophysical Logging - Boring B-4

BORING B-5



EXPLANATION OF SYMBOLS FOR ROCK PROPERTIES

S	SHEAR WAVE TIME	S	SHEAR MODULUS
P	PRESSURE WAVE TIME	B	BULK MODULUS
		E	YOUNG'S MODULUS

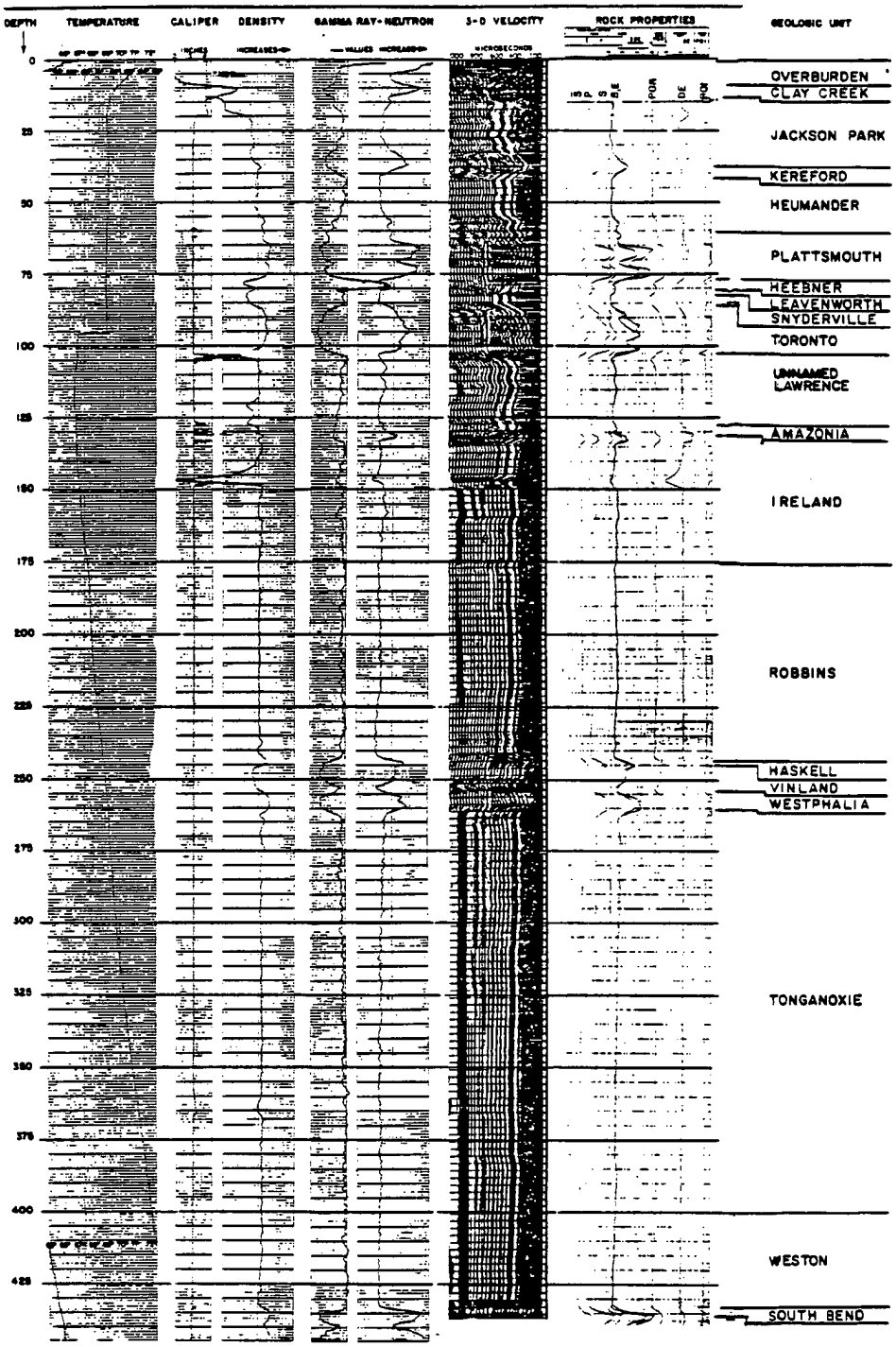
POR POROSITY
DE DENSITY
POI POISSON'S RATIO

NOTES:

1. GEOPHYSICAL BOREHOLE LOGGING WAS PERFORMED BY THE BIRDWELL DIVISION OF THE SEISMOGRAPH SERVICE CORPORATION.
2. LOCATION OF BOREHOLE LOGGING IS SHOWN ON FIGURE 2.5-99.

Figure 2.5-100b
Birdwell Geophysical Logging - Boring B-5

BORING B-6



EXPLANATION OF SYMBOLS FOR ROCK PROPERTIES

t_s	SHEAR WAVE TIME	μ	SHEAR MODULUS
t_p	PRESSURE WAVE TIME	B	BULK MODULUS
		E	YOUNG'S MODULUS

POR POROSITY
DE DENSITY
POI POISSON'S RATIO

NOTES:

1. GEOPHYSICAL BOREHOLE LOGGING WAS PERFORMED BY THE BIRDWELL DIVISION OF THE SEISMOGRAPH SERVICE CORPORATION.
2. LOCATION OF BOREHOLE LOGGING IS SHOWN ON FIGURE 2.5-99.

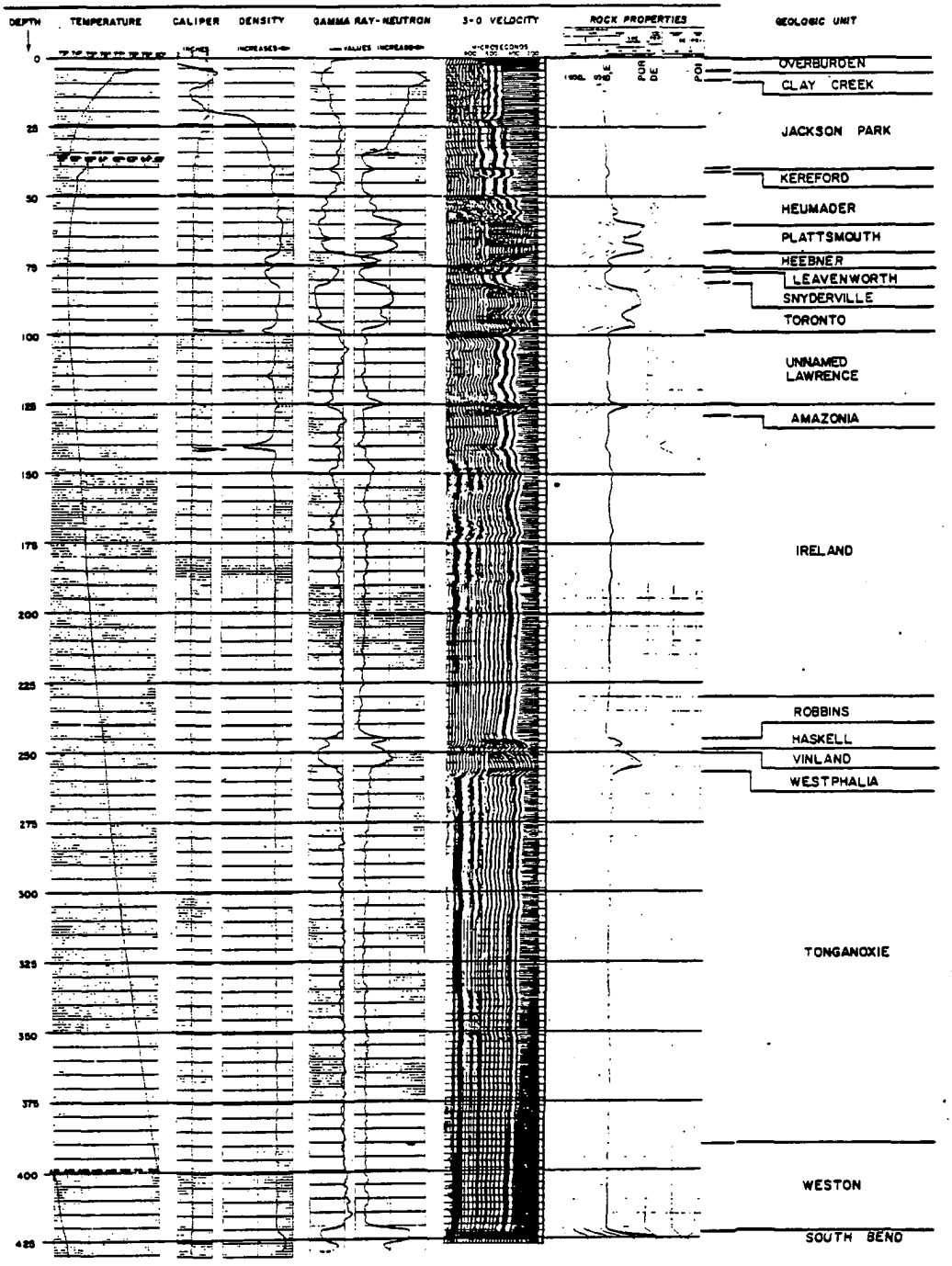
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-100c

Birdwell Geophysical Logging - Boring B-6

Rev. 0

BORING B-7



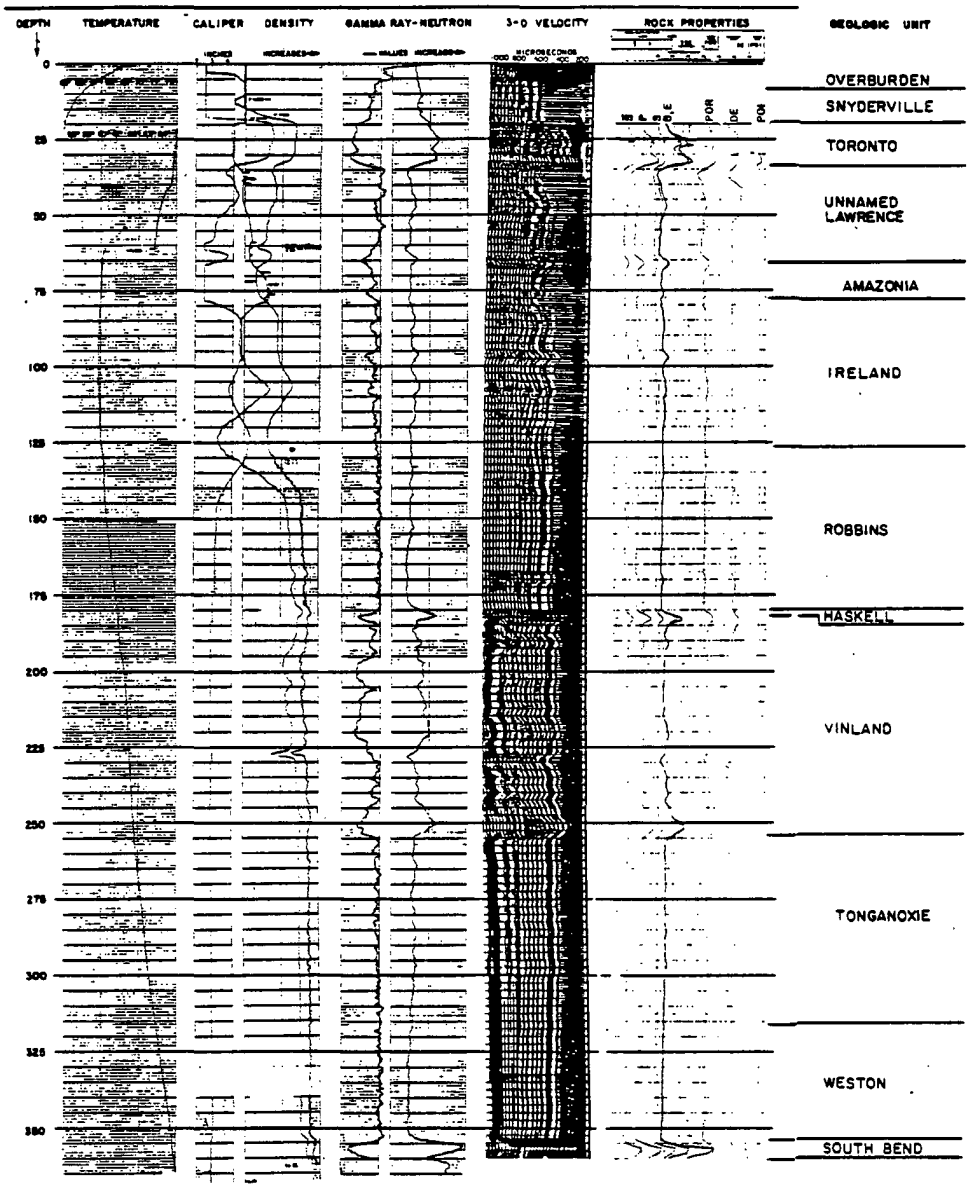
EXPLANATION OF SYMBOLS FOR ROCK PROPERTIES

t_s SHEAR WAVE TIME	μ SHEAR MODULUS	POR POROSITY	
t_p PRESSURE WAVE TIME	β BULK MODULUS	DE DENSITY	
	E YOUNG'S MODULUS	POI POISSON'S RATIO	

NOTES:

1. GEOPHYSICAL BOREHOLE LOGGING WAS PERFORMED BY THE BIRDWELL DIVISION OF THE SEISMOGRAPH SERVICE CORPORATION.
2. LOCATION OF BOREHOLE LOGGING IS SHOWN ON FIGURE 2.5-99.

BORING B-11



EXPLANATION OF SYMBOLS FOR ROCK PROPERTIES

S	SHEAR WAVE TIME	S SHEAR MODULUS	POR POROSITY
P	PRESSURE WAVE TIME	B BULK MODULUS	DE DENSITY
		E YOUNG'S MODULUS	POI POISSON'S RATIO

NOTES:

1. GEOPHYSICAL BOREHOLE LOGGING WAS PERFORMED BY THE BIRDWELL DIVISION OF THE SEISMOGRAPH SERVICE CORPORATION.
2. LOCATION OF BOREHOLE LOGGING IS SHOWN ON FIGURE 2.5-99.

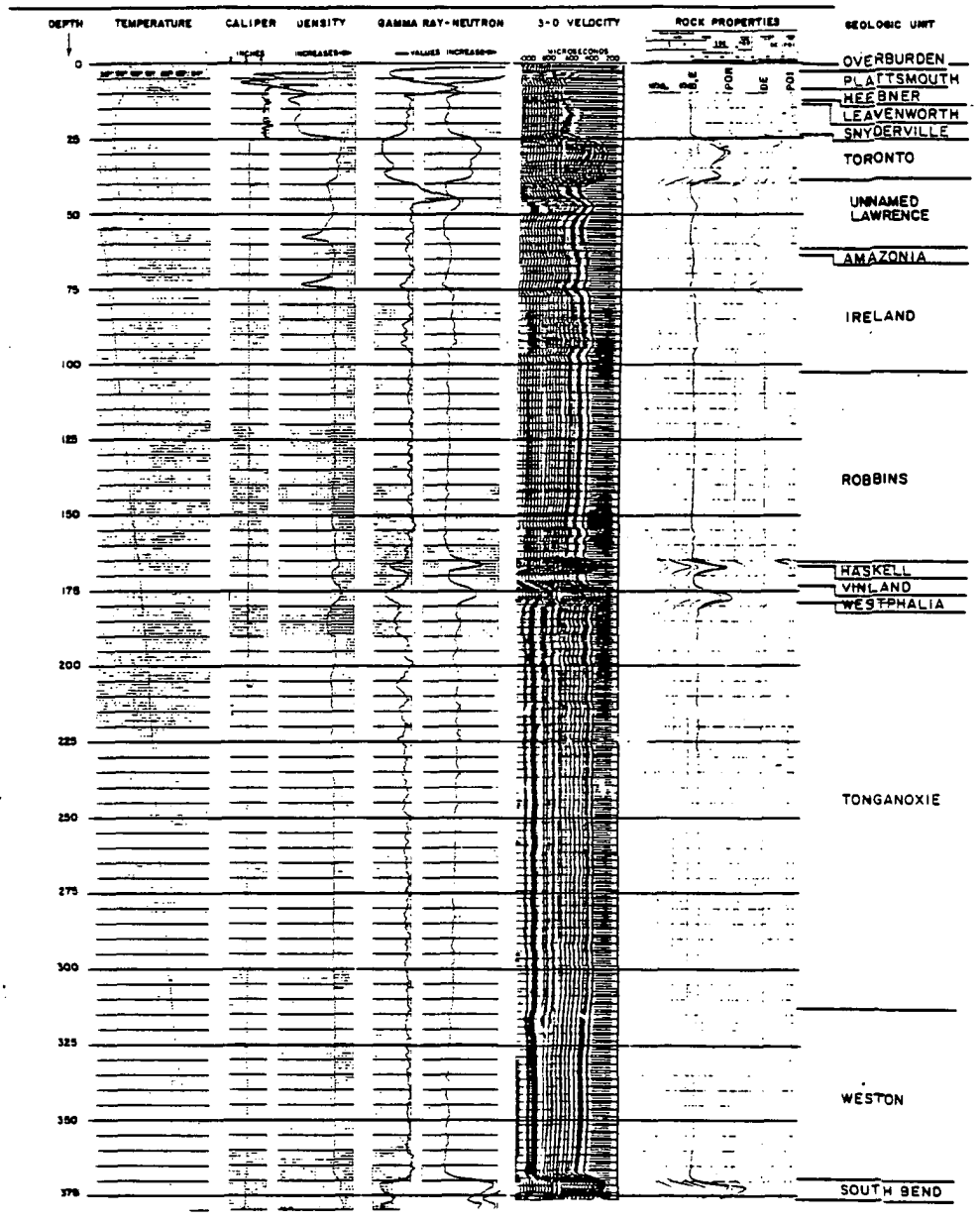
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-100e

Birdwell Geophysical Logging - Boring B-11

Rev. 0

BORING B-16



EXPLANATION OF SYMBOLS FOR ROCK PROPERTIES

S SHEAR WAVE TIME	S SHEAR MODULUS	POR POROSITY
P PRESSURE WAVE TIME	B BULK MODULUS	DE DENSITY
	E YOUNG'S MODULUS	POI POISSON'S RATIO

NOTES:

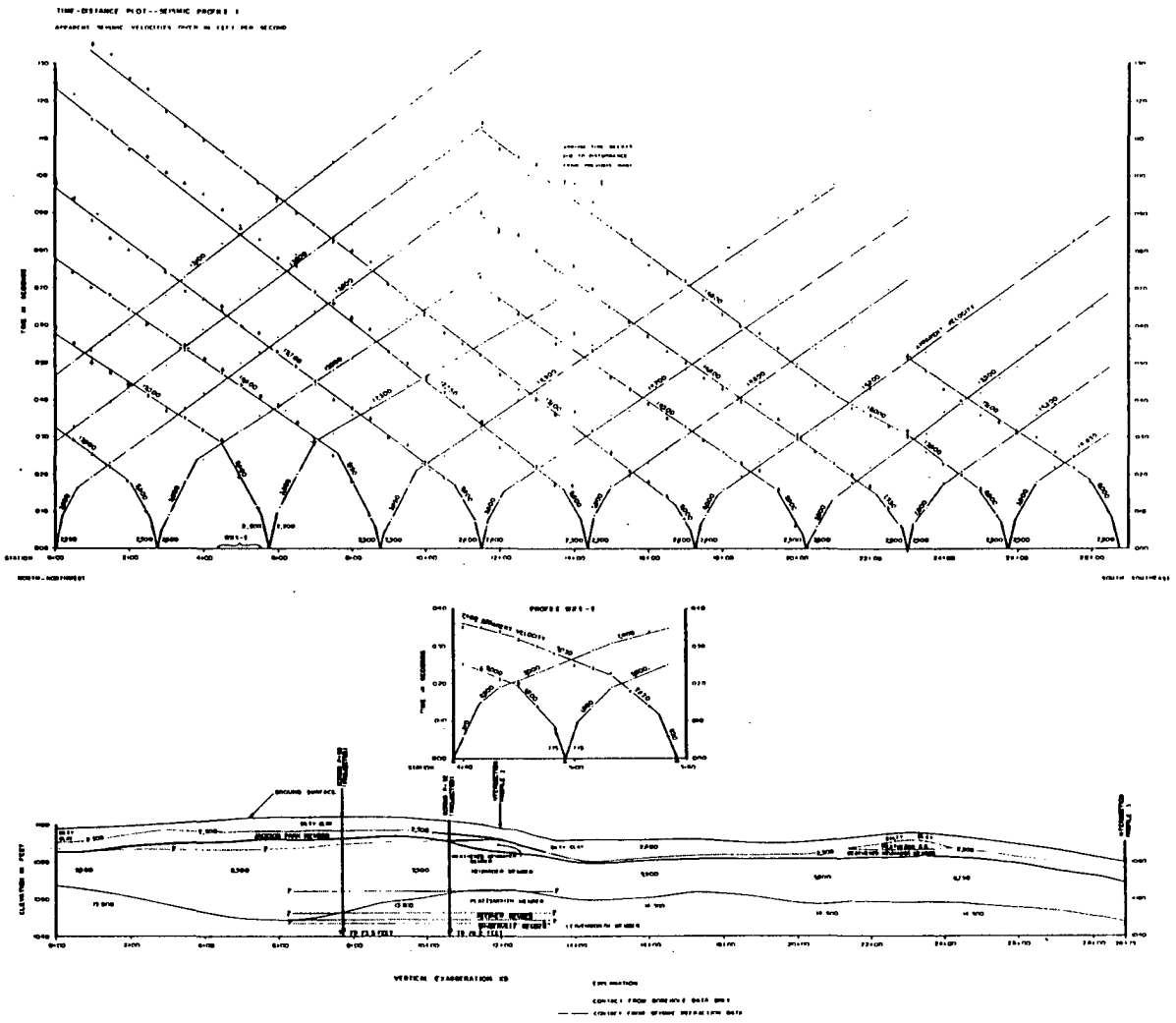
1. GEOPHYSICAL BOREHOLE LOGGING WAS PERFORMED BY THE BIRDWELL DIVISION OF THE SEISMOGRAPH SERVICE CORPORATION.
2. LOCATION OF BOREHOLE LOGGING IS SHOWN ON FIGURE 2.5-99.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-100f

Birdwell Geophysical Logging - Boring B-16

Rev. 0

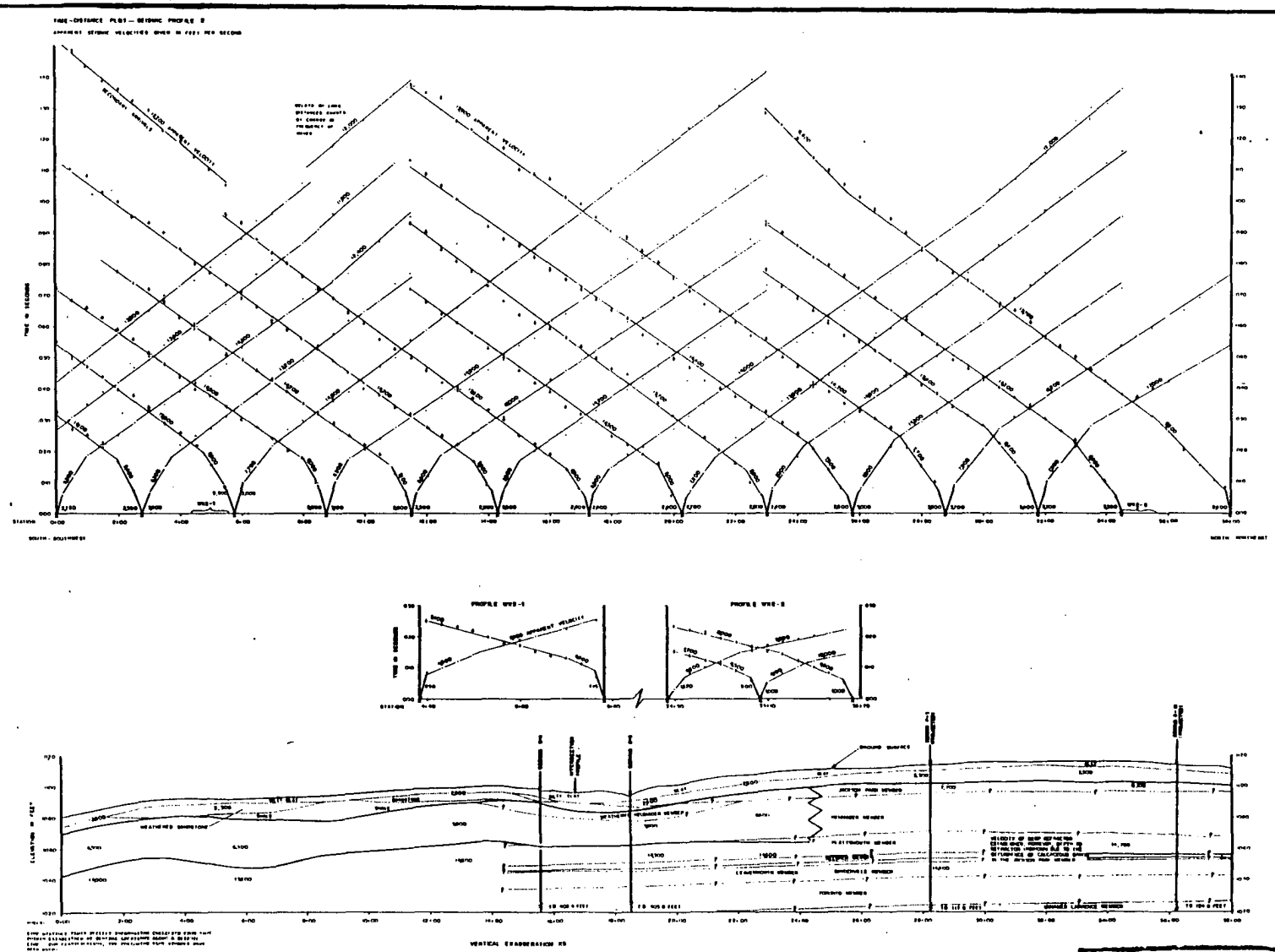


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-101a

Seismic Refraction Profile 1

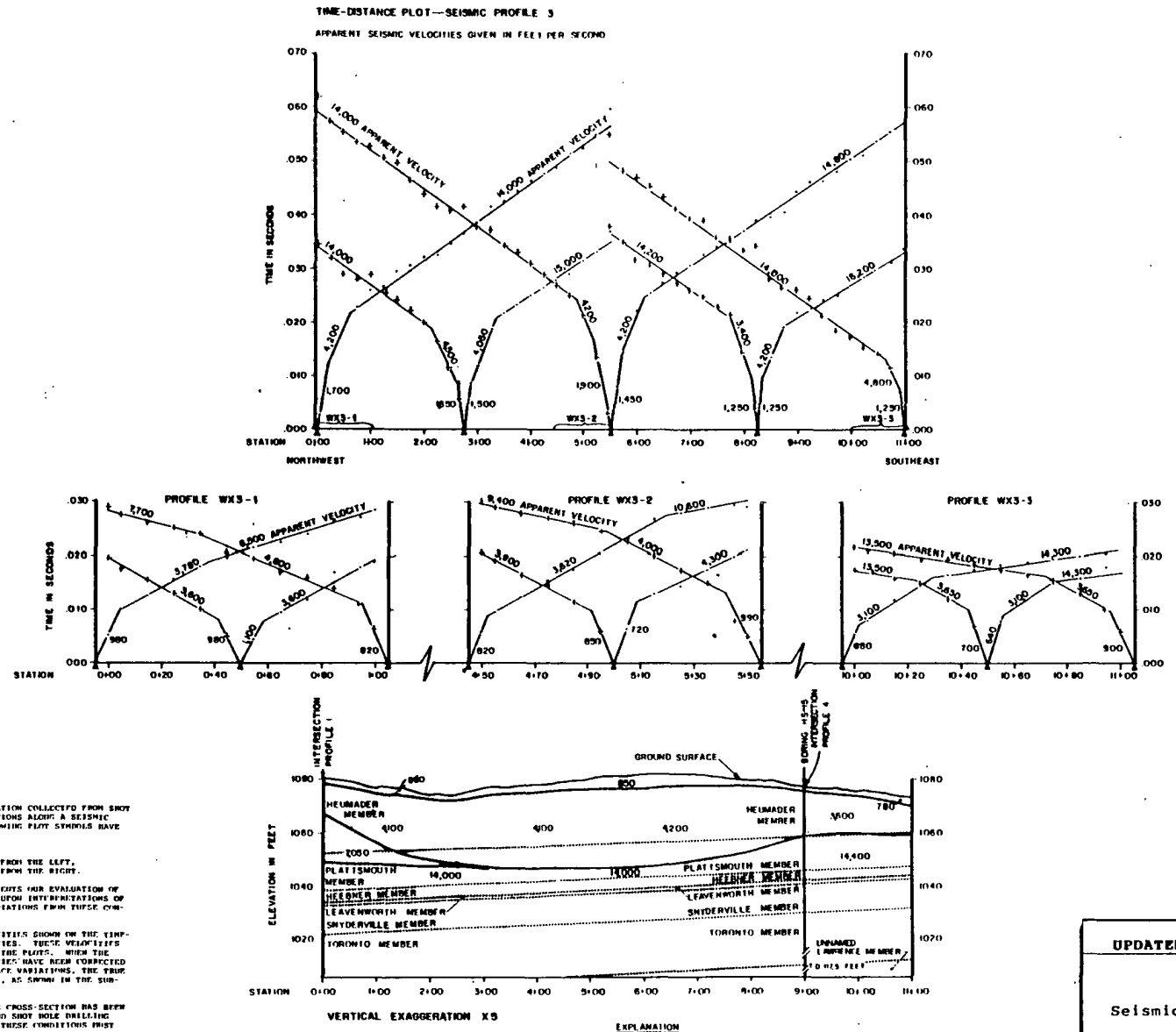


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-101b

Seismic Refraction Profile 2



NOTES:

TIME-DISTANCE PLOTS REFLECT INFORMATION COLLECTED FROM SHOT POINTS ESTABLISHED AT SEVERAL LOCATIONS ALONG A SEISMIC LINE. FOR CLARIFICATION, THE FOLLOWING PLOT SYMBOLS HAVE BEEN USED:

▲ SHOT POINT LOCATION.
· ORIGIN OF THE SPHERE FROM THE LEFT.
· ORIGIN OF THE SPHERE FROM THE RIGHT.

THE SUBSURFACE SECTION SHOWN REPRESENTS OUR EVALUATION OF THE MOST PROBABLE CONDITIONS BASED UPON INTERPRETATIONS OF PRESENTLY AVAILABLE DATA. SOME VARIATIONS FROM THESE CONDITIONS MUST BE EXPECTED.

ALL OF THE COMPRESSIONAL WAVE VELOCITIES SHOWN ON THE TIME-DISTANCE PLOTS ARE APPARENT VELOCITIES. THESE VELOCITIES HAVE BEEN DETERMINED DIRECTLY FROM THE PLOTS. WHEN THE APPARENT COMPRESSIONAL WAVE VELOCITIES HAVE BEEN CORRECTED FOR SURFACE TOPOGRAPHY AND SUBSURFACE VARIATIONS, THE TRUE COMPRESSIONAL WAVE VELOCITY RESULTS, AS SHOWN IN THE SUBSURFACE CROSS SECTIONS.

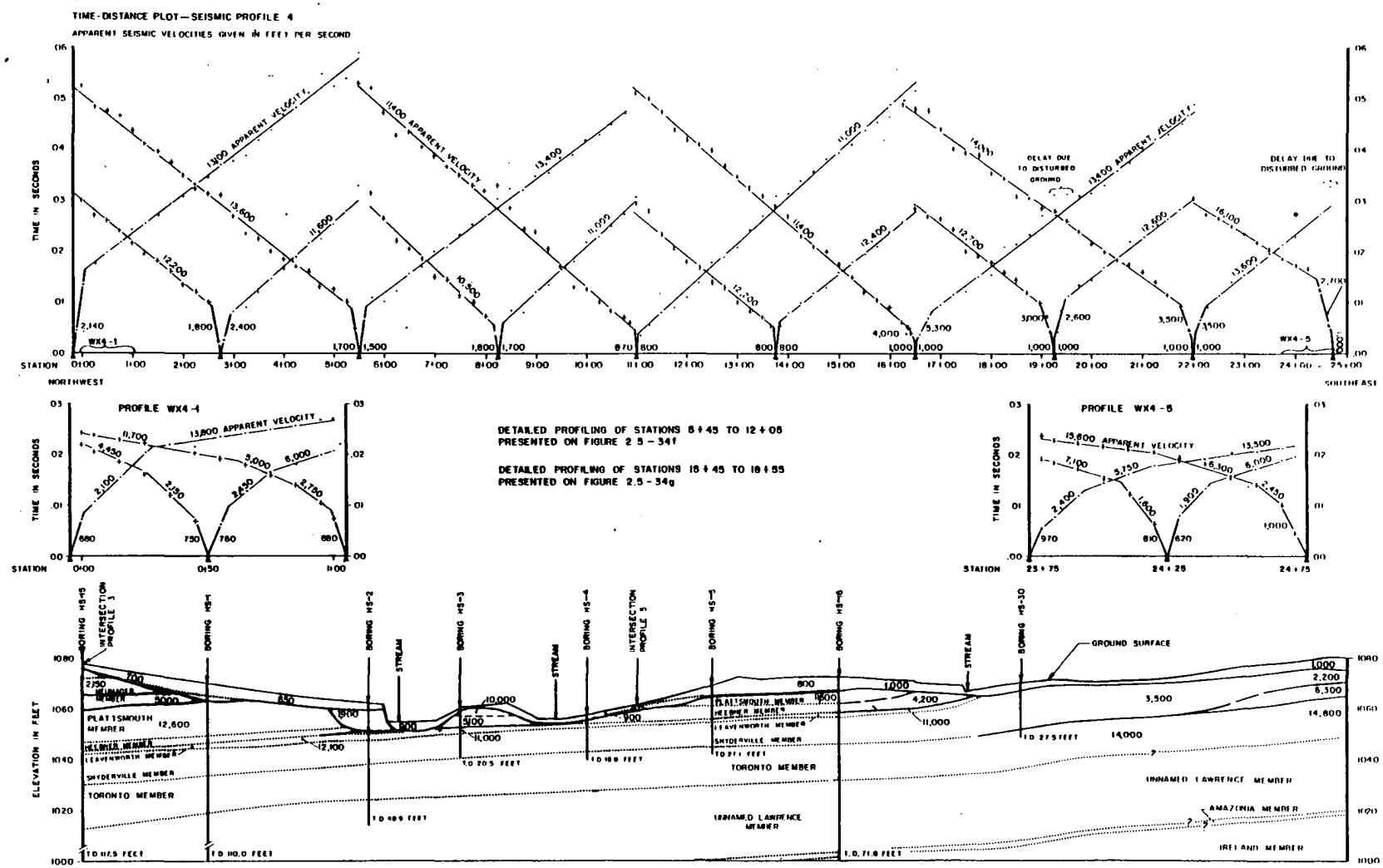
THE GEOLOGY SHOWN ON THE SUBSURFACE CROSS-SECTION HAS BEEN INTERPRETED FROM GEOLOGIC BORING AND SHOT HOLE DRILLING INFORMATION. SOME VARIATIONS FROM THESE CONDITIONS MUST BE EXPECTED.

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-101c

Seismic Refraction Profile 3



NOTES:

TIME-DISTANCE PLOTS REFLECT INFORMATION COLLECTED FROM SHOT POINTS ESTABLISHED AT SEVERAL LOCATIONS ALONG A SEISMIC LINE. FOR CLARITY SAKE, THE FOLLOWING PLOT SYMBOLS HAVE BEEN USED:

- SHOT POINT LOCATION.
- ORIGIN OF THE SHOCK FROM THE LEFT.
- ORIGIN OF THE SHOCK FROM THE RIGHT

THE SUBSURFACE SECTION SHOWN REPRESENTS OUR EVALUATION OF THE MOST PROBABLE CONDITION & BASED UPON INTERPRETATION OF PRESENTLY AVAILABLE DATA. SOME VARIATIONS FROM THESE CONDITIONS MUST BE EXPECTED.

ALL OF THE COMPRESSIONAL WAVE VELOCITIES SHOWN ON THE TIME-DISTANCE PLOTS ARE APPARENT VELOCITIES. THESE VELOCITIES HAVE BEEN CORRECTED FOR SUPPLY TOPOGRAPHY AND CONSTRUCTIONAL VARIATIONS. THE TRUE COMPRESSIONAL WAVE VELOCITY PROFILES, AS SHOWN IN THE SUBSURFACE CROSS SECTION.

THE GEOLOGY SHOWN ON THE SUBSURFACE CROSS SECTION HAS BEEN INTERPRETED FROM GEOLOGIC BORING AND SHOT HOLE DRILLING INFORMATION. SOME VARIATIONS FROM THESE CONDITIONS MUST BE EXPECTED.

EXPLANATION

CONTACT FROM BOREHOLE DATA ONLY

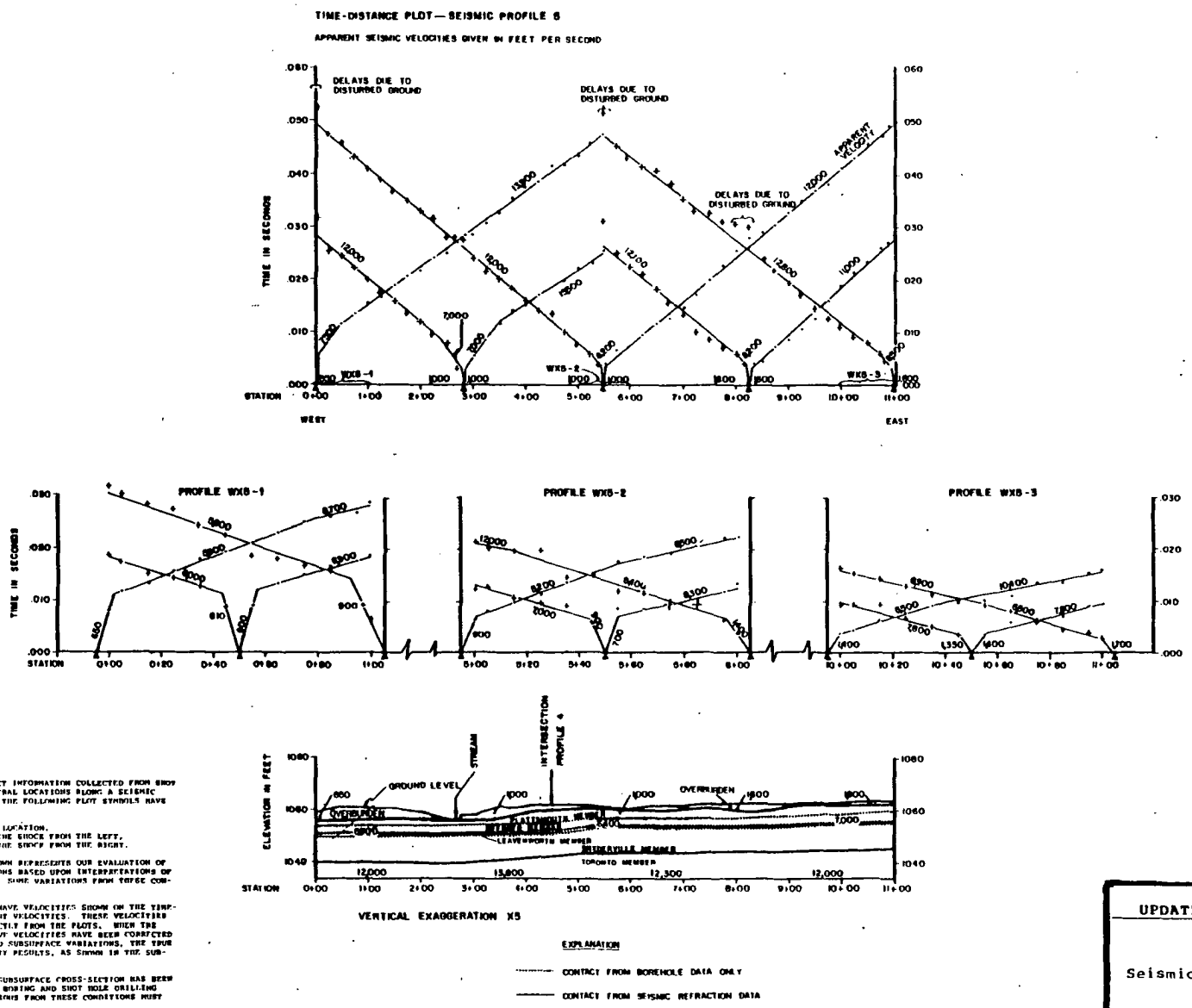
——— CONTACT FROM SEISMIC REFRACTION DATA

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-101d

Seismic Refraction Profile 4

Rev. 0



NOTES:

TIME-DISTANCE PLOTS REFLECT INFORMATION COLLECTED FROM SHOT POINTS ESTABLISHED AT SEVERAL LOCATIONS ALONG A SEISMIC LINE. FOR CLARIFICATION, THE FOLLOWING PLOT SYMBOLS HAVE BEEN USED:

▲ SHOT POINT LOCATION.
' ORIGIN OF THE SHOCK FROM THE LEFT.
' ORIGIN OF THE SHOCK FROM THE RIGHT.

THE SUBSURFACE SECTION SHOWN REPRESENTS OUR EVALUATION OF THE MOST PROBABLE CONDITIONS BASED UPON INTERPRETATIONS OF PRESENTLY AVAILABLE DATA. SOME VARIATIONS FROM THESE CONDITIONS MUST BE EXPECTED.

ALL OF THE COMPRESSIONAL WAVE VELOCITIES SHOWN ON THE TIME-DISTANCE PLOTS ARE APPARENT VELOCITIES. THESE VELOCITIES WERE DETERMINED DIRECTLY FROM THE PLOTS. WHEN THE APPARENT COMPRESSIONAL WAVE VELOCITIES HAVE BEEN CORRECTED FOR SURFACE TOPOGRAPHY AND SUBSURFACE VARIATIONS, THE TRUE COMPRESSIONAL WAVE VELOCITY RESULTS, AS SHOWN IN THE SUBSURFACE CROSS-SECTIONS.

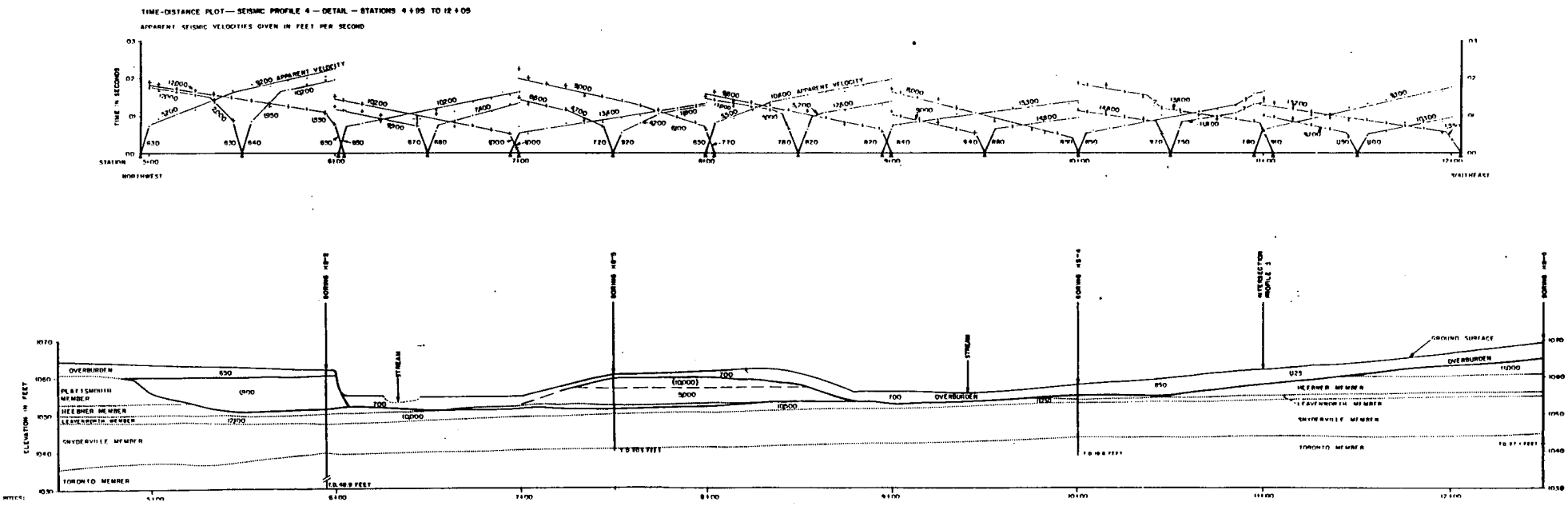
THE GEOLOGY SHOWN ON THE SUBSURFACE CROSS-SECTION WAS BEEN INTERPRETED FROM GEOLOGIC BORING AND SHOT HOLE DRILLING INFORMATION. SOME VARIATIONS FROM THESE CONDITIONS MUST BE EXPECTED.

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-101e

Seismic Refraction Profile 5



NOTES:

TIME-DISTANCE PLOTS REFLECT INFORMATION COLLECTED FROM SHOT POINTS ESTABLISHED AT SEVERAL LOCATIONS ALONG A SEISMIC LINE. FOR CLARIFICATION, THE FOLLOWING PLOT SYMBOLS HAVE BEEN USED:

- ▲ SHOT POINT LOCATION.
- · ORIGIN OF THE SHOCK FROM THE LEFT.
- + ORIGIN OF THE SHOCK FROM THE RIGHT.

THE SUBSURFACE SECTION SHOWN REPRESENTS OUR EVALUATION OF THE MOST PROBABLE CONDITIONS BASED UPON INTERPRETATIONS OF PRESENTLY AVAILABLE DATA. SOME VARIATIONS FROM THESE CONDITIONS MUST BE EXPECTED.

ALL OF THE COMPRESSIONAL WAVE VELOCITIES SHOWN ON THE TIME-DISTANCE PLOTS ARE APPARENT VELOCITIES. THESE VELOCITIES HAVE BEEN DETERMINED DIRECTLY FROM THE PLOTS. WHEN THE APPARENT COMPRESSIONAL WAVE VELOCITIES HAVE BEEN CORRECTED FOR SURFACE TOPOGRAPHY AND SUBSURFACE VARIATIONS, THE TRUE COMPRESSIONAL WAVE VELOCITY RESULTS, AS SHOWN IN THE SUBSURFACE CROSS-SECTIONS.

THE GEOLOGY SHOWN ON THE SUBSURFACE CROSS SECTION HAS BEEN INTERPRETED FROM GEOLOGIC BORING AND SHOT HOLE DRILLING INFORMATION. SOME VARIATIONS FROM THESE CONDITIONS MUST BE EXPECTED.

EXPLANATION

CONTACT FROM BOREHOLE DATA ONLY

CONTACT FROM SEISMIC REFRACTION DATA

Rev. 0

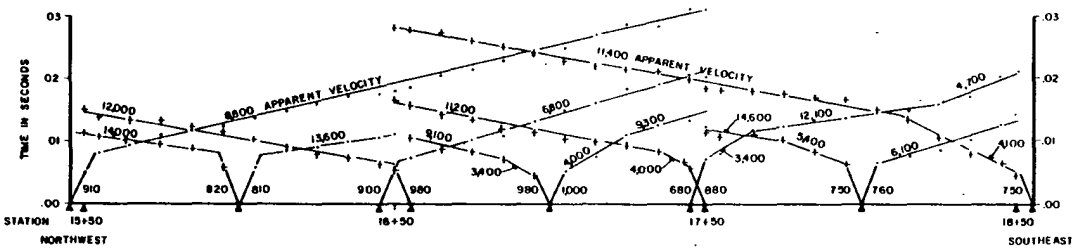
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

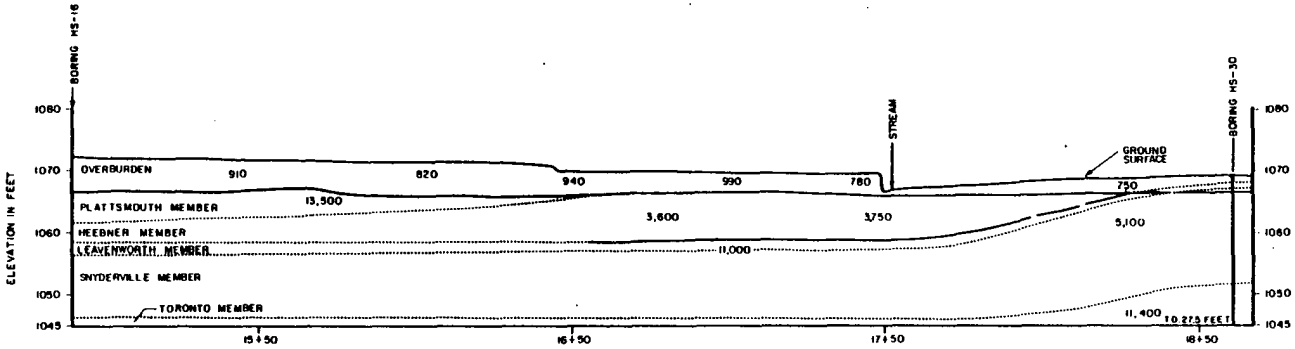
Figure 2.5-101f

Seismic Refraction Profile 4 - Stations 4+95 to 12+05

TIME-DISTANCE PLOT—SEISMIC PROFILE 4 – DETAIL – STATIONS 14+95 TO 18+55

APPARENT SEISMIC VELOCITIES GIVEN IN FEET PER SECOND





VERTICAL EXAGGERATION X2

NOTES:

TIME-DISTANCE PLOTS REFLECT INFORMATION COLLECTED FROM SHOT POINTS ESTABLISHED AT SEVERAL LOCATIONS ALONG A SEISMIC LINE. FOR CLARIFICATION, THE FOLLOWING PLOT SYMBOLS HAVE BEEN USED:

▲ SHOT POINT LOCATION.
' ORIGIN OF THE SHOCK FROM THE LEFT.
' ORIGIN OF THE SHOCK FROM THE RIGHT.

THE SUBSURFACE SECTION SHOWN REPRESENTS OUR EVALUATION OF THE MOST PROBABLE CONDITIONS BASED UPON INTERPRETATIONS OF PRESENTLY AVAILABLE DATA. SOME VARIATIONS FROM THESE CONDITIONS MUST BE EXPECTED.

ALL OF THE COMPRESSIONAL WAVE VELOCITIES SHOWN ON THE TIME-DISTANCE PLOTS ARE APPARENT VELOCITIES. THESE VELOCITIES HAVE BEEN DETERMINED DIRECTLY FROM THE PLOTS. WHEN THE APPARENT COMPRESSIONAL WAVE VELOCITIES HAVE BEEN CORRECTED FOR SURFACE TOPOGRAPHY AND SUBSURFACE VARIATIONS, THE TRUE COMPRESSIONAL WAVE VELOCITY RESULTS, AS SHOWN IN THE SUBSURFACE CROSS-SECTIONS.

THE GEOLOGY SHOWN ON THE SUBSURFACE CROSS-SECTION HAS BEEN INTERPRETED FROM GEOLOGIC BORING AND SHOT HOLE DRILLING INFORMATION. SOME VARIATIONS FROM THESE CONDITIONS MUST BE EXPECTED.

EXPLANATION

..... CONTACT FROM BOREHOLE DATA ONLY

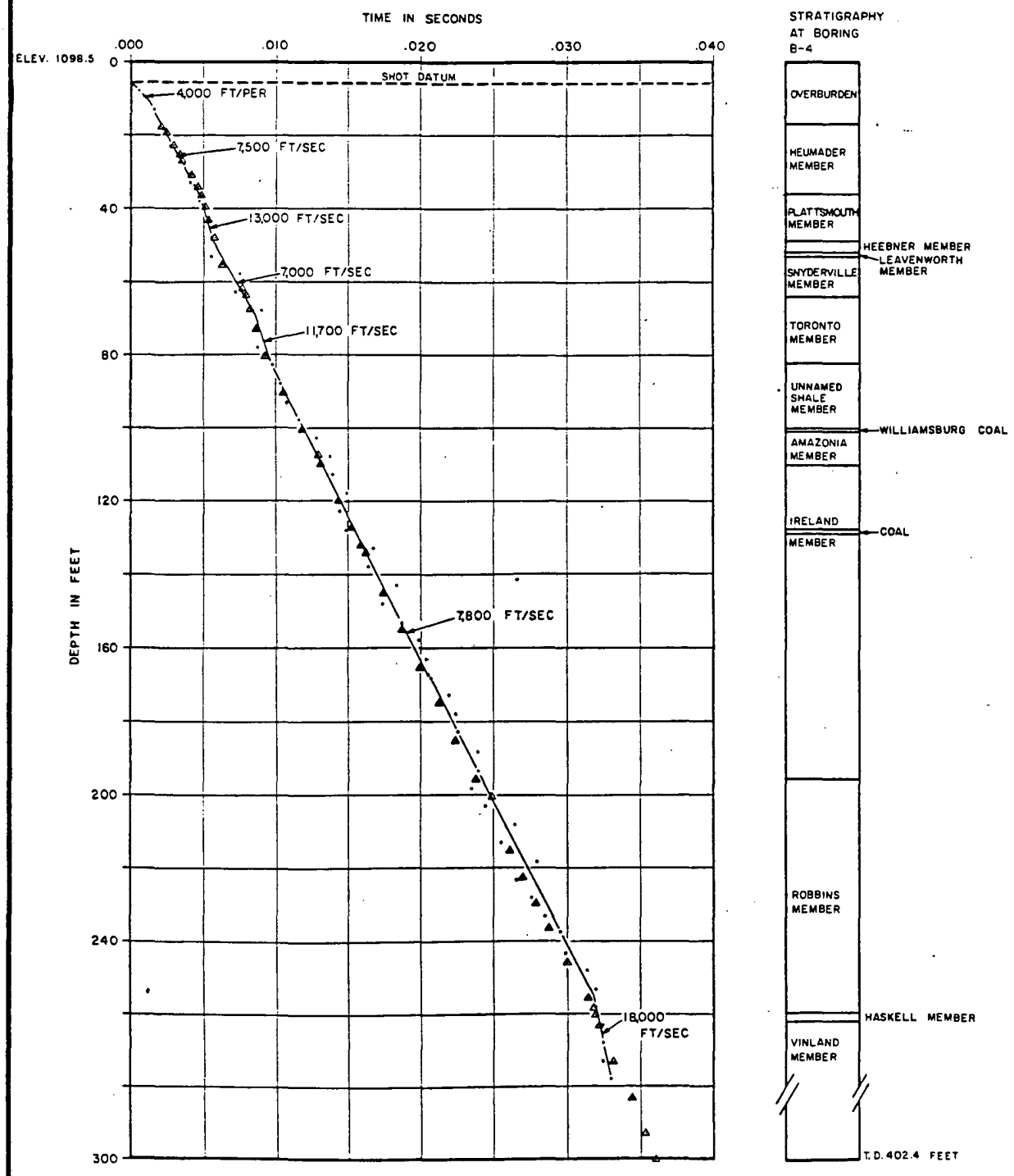
——— CONTACT FROM SEISMIC REFRACTION DATA

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-101g

Seismic Refraction Profile 4 - Stations 14+95 to 18+55



Rev. 0

NOTES:

LOCATION OF GEOPHYSICAL WORK IS SHOWN ON FIGURE 2.5-98.

FOR CLARIFICATION, THE FOLLOWING PLOT SYMBOLS HAVE BEEN USED:

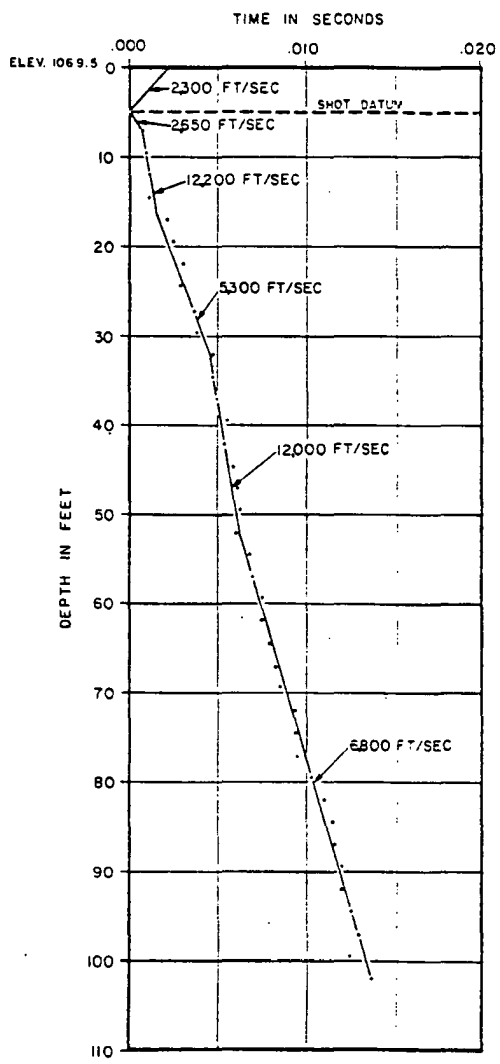
- · TRAVEL TIME FROM UPHOLE SURVEY
- △ INTERGRATED TRAVEL TIME FROM BIRDWELL LOG.

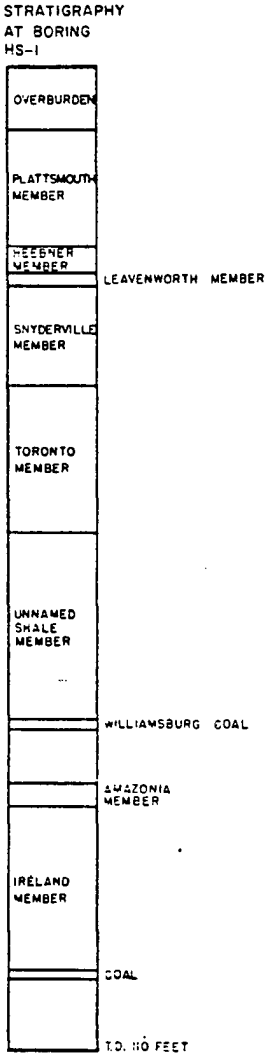
THE COMPRESSIONAL WAVE VELOCITIES SHOWN HAVE BEEN CORRELATED WITH, AND ADJUSTED TO FIT, THE LITHOLOGIES FROM THE BORING LOG AND THE MEASURED VELOCITIES FROM OTHER GEOPHYSICAL STUDIES AT THE SITE.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-102a

Uphole Compressional Wave Velocity Survey - Boring B-4





Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

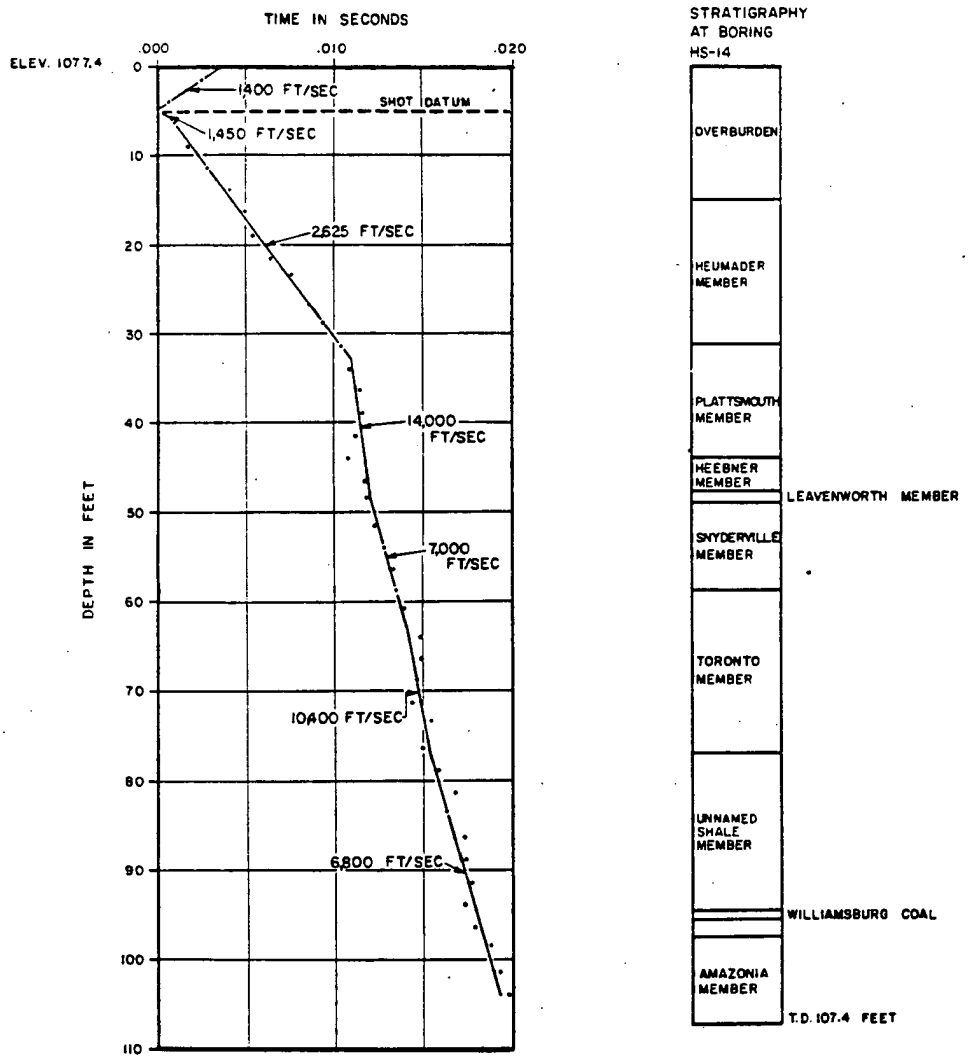
Figure 2.5-102b

Uphole Compressional Wave Velocity Survey - Boring HS-1

NOTES:

LOCATION OF GEOPHYSICAL WORK IS SHOWN ON FIGURE 2.5-98.

THE COMPRESSIONAL WAVE VELOCITIES SHOWN HAVE BEEN CORRELATED WITH, AND ADJUSTED TO FIT, THE LITHOLOGIES FROM THE BORING LOG AND THE MEASURED VELOCITIES FROM OTHER GEOPHYSICAL STUDIES AT THE SITE.



NOTES:

LOCATION OF GEOPHYSICAL WORK IS SHOWN ON FIGURE 2.5-98.

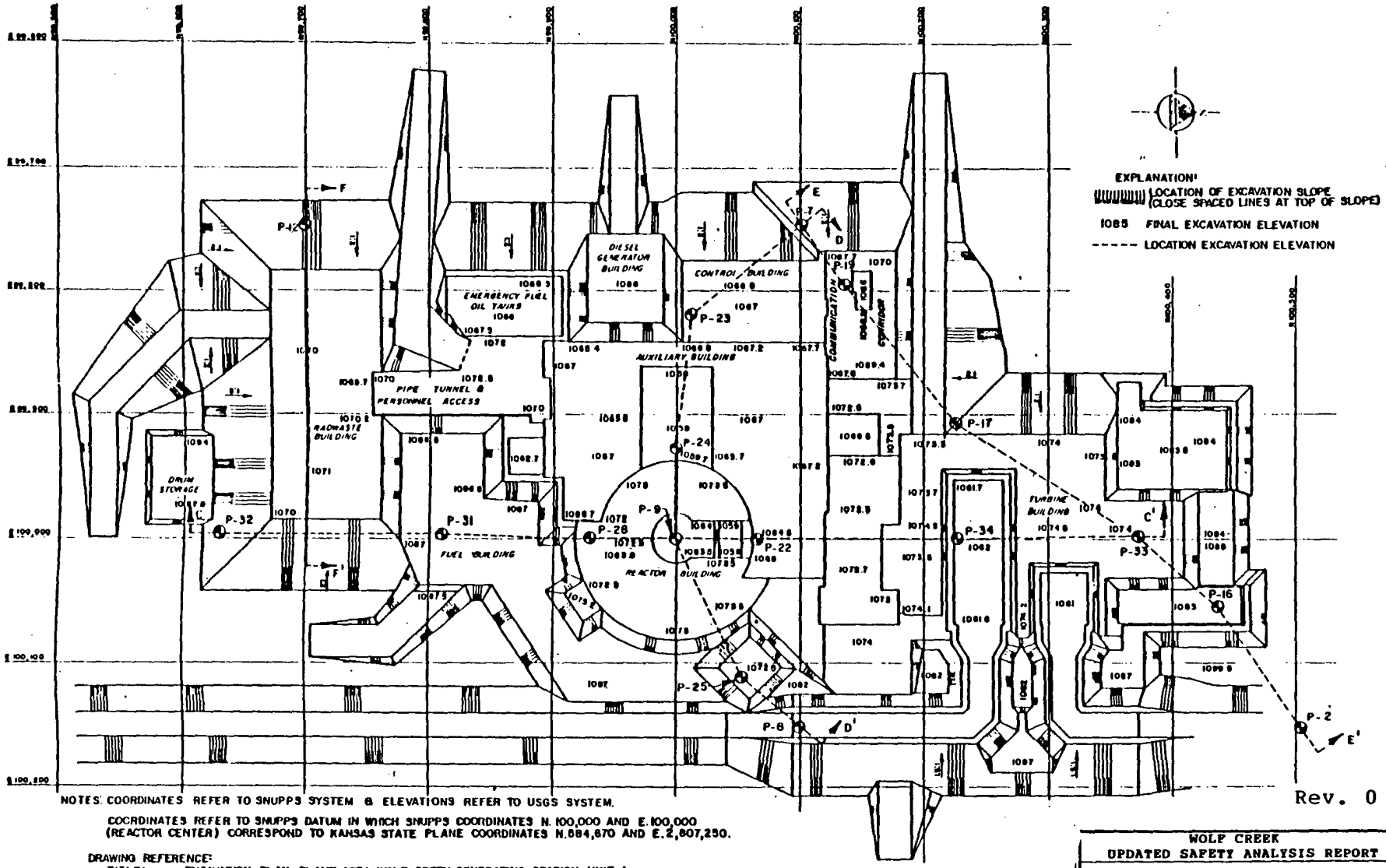
THE COMPRESSIONAL WAVE VELOCITIES SHOWN HAVE BEEN CORRELATED WITH, AND ADJUSTED TO FIT, THE LITHOLOGIES FROM THE BORING LOG AND THE MEASURED VELOCITIES FROM OTHER GEOPHYSICAL STUDIES AT THE SITE.

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-102c

Uphole Compressional Wave Velocity Survey - Boring HS-14



Rev. 0

NOTES: COORDINATES REFER TO SNUPPS SYSTEM & ELEVATIONS REFER TO USGS SYSTEM.

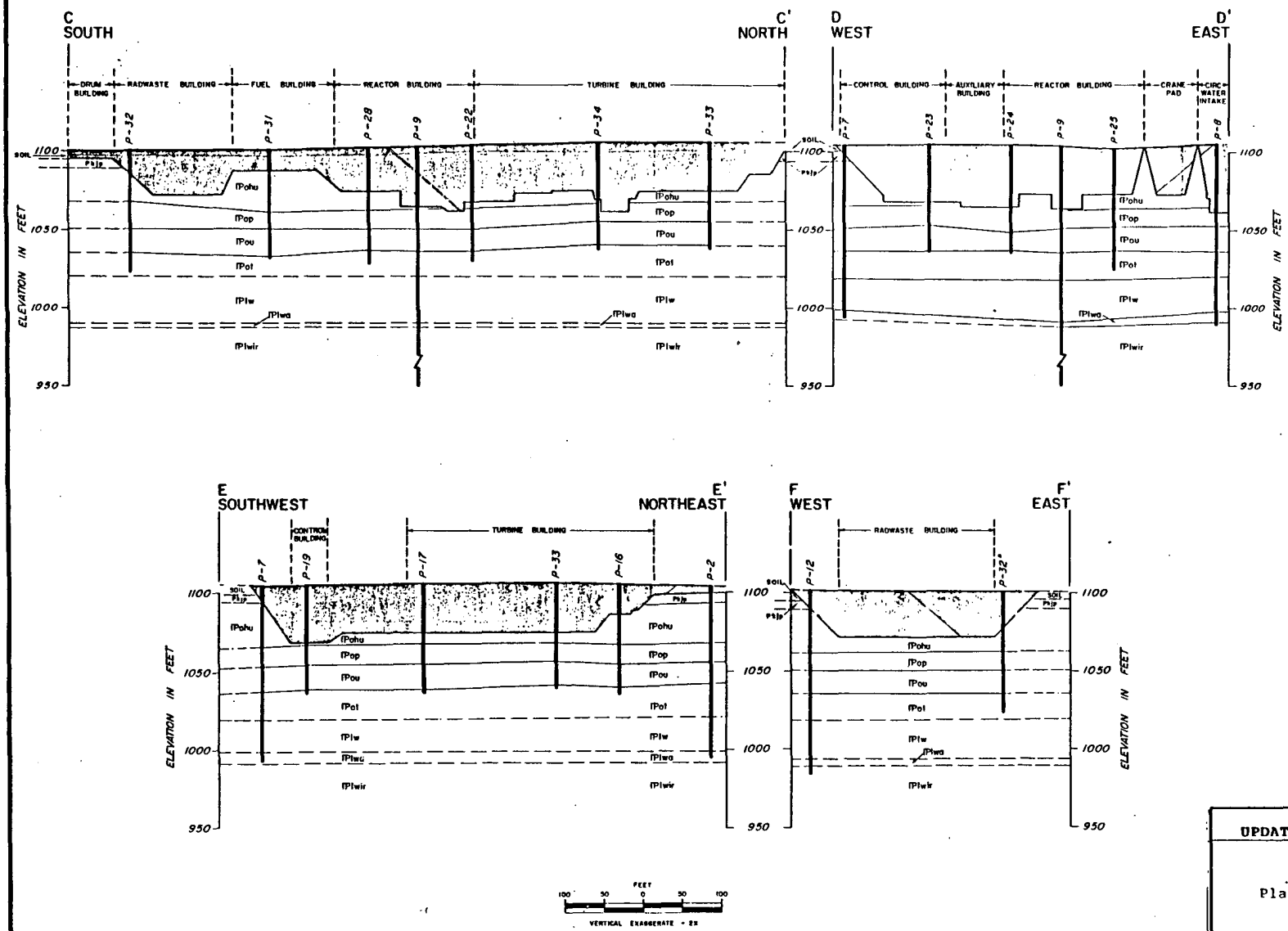
COORDINATES REFER TO SNUPPS DATUM IN WHICH SNUPPS COORDINATES N. 100,000 AND E. 100,000 (REACTOR CENTER) CORRESPOND TO KANSAS STATE PLANE COORDINATES N.884,670 AND E.2,807,250.

DRAWING REFERENCE:
TITLE: EXCAVATION PLAN, PLANT AREA, WOLF CREEK GENERATING STATION UNIT 1
FOR: KANSAS GAS & ELECTRIC COMPANY AND KANSAS CITY POWER & LIGHT COMPANY
BY: SARGENT & LUNDY ENGINEERS, CHICAGO
DRAWING NO.: 8-181 REV. 8
DATE: 4/15/77

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-103

Excavation Plan

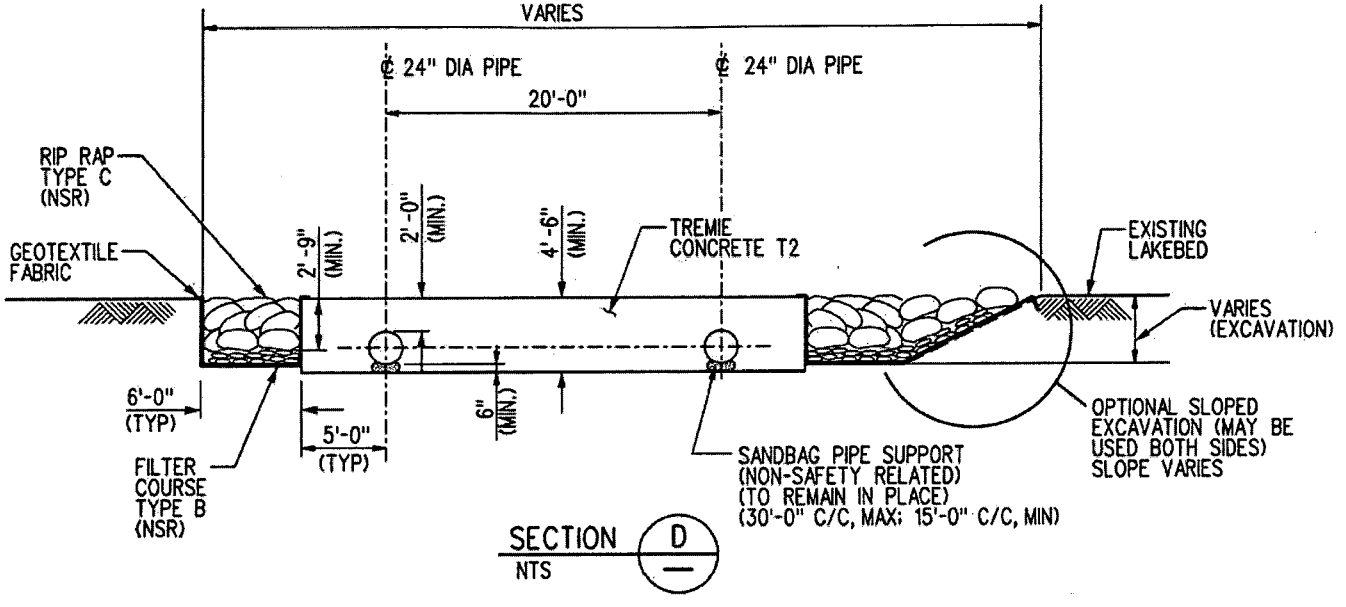


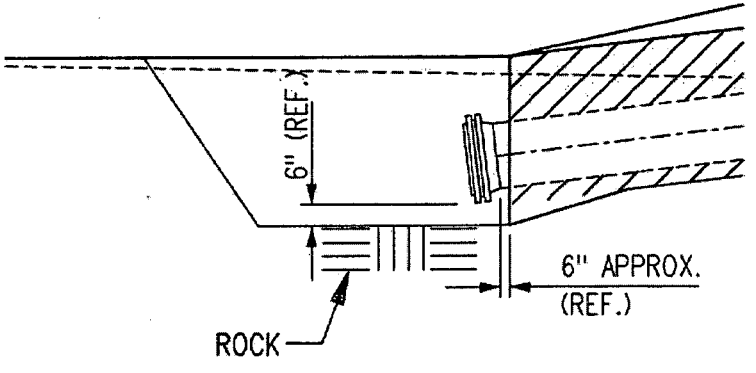
Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-104

Plant Excavation Profiles

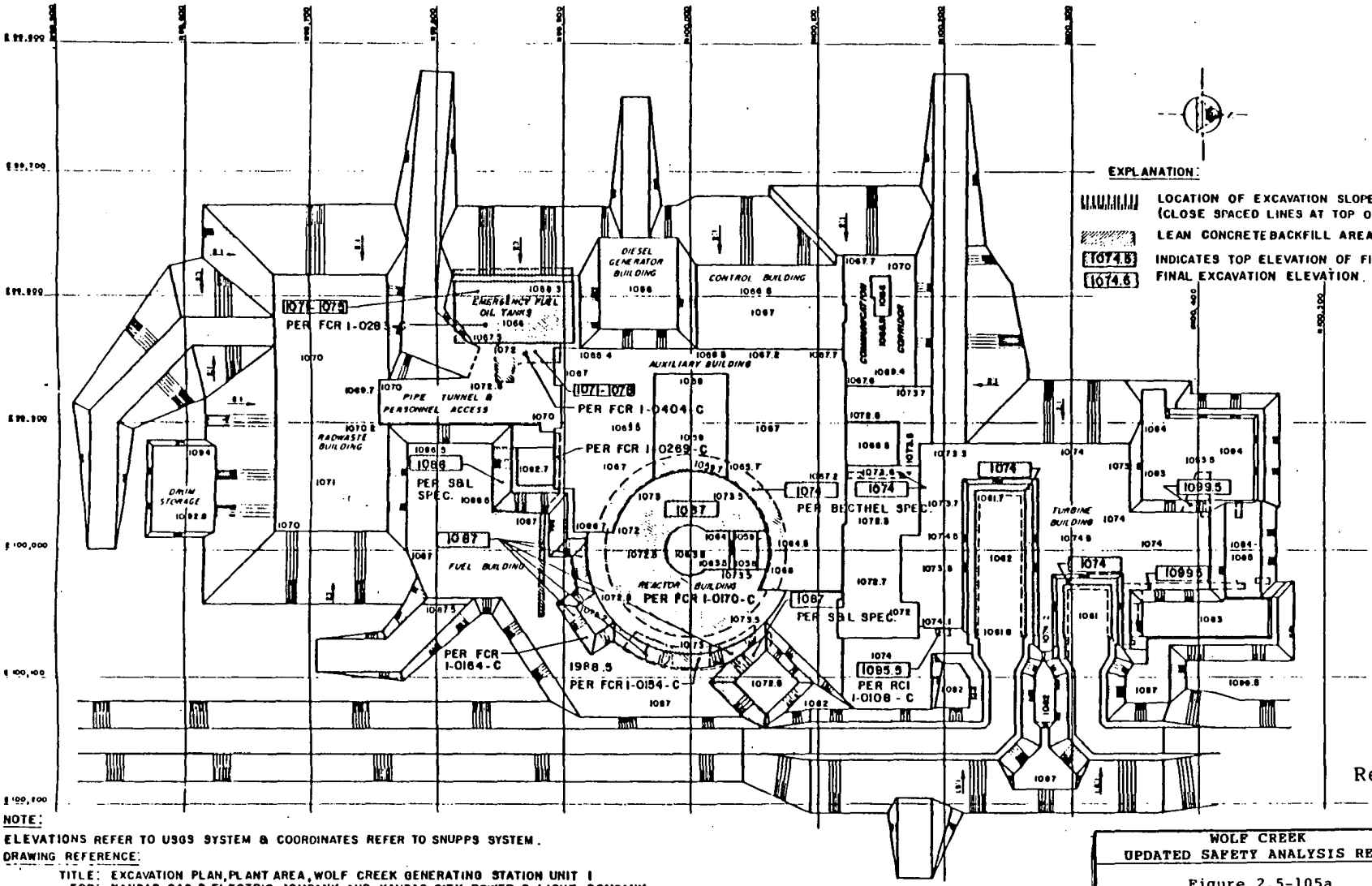




Drawing Number:
C-K276 Rev. 03
By: Bechtel Engineers

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-105 Rev. 28
ESWS Discharge Pipe Encasement and Discharge Point Sections
Sheet 1 of 1



Rev. 0

NOTE:

ELEVATIONS REFER TO USGS SYSTEM & COORDINATES REFER TO SNUPPS SYSTEM.

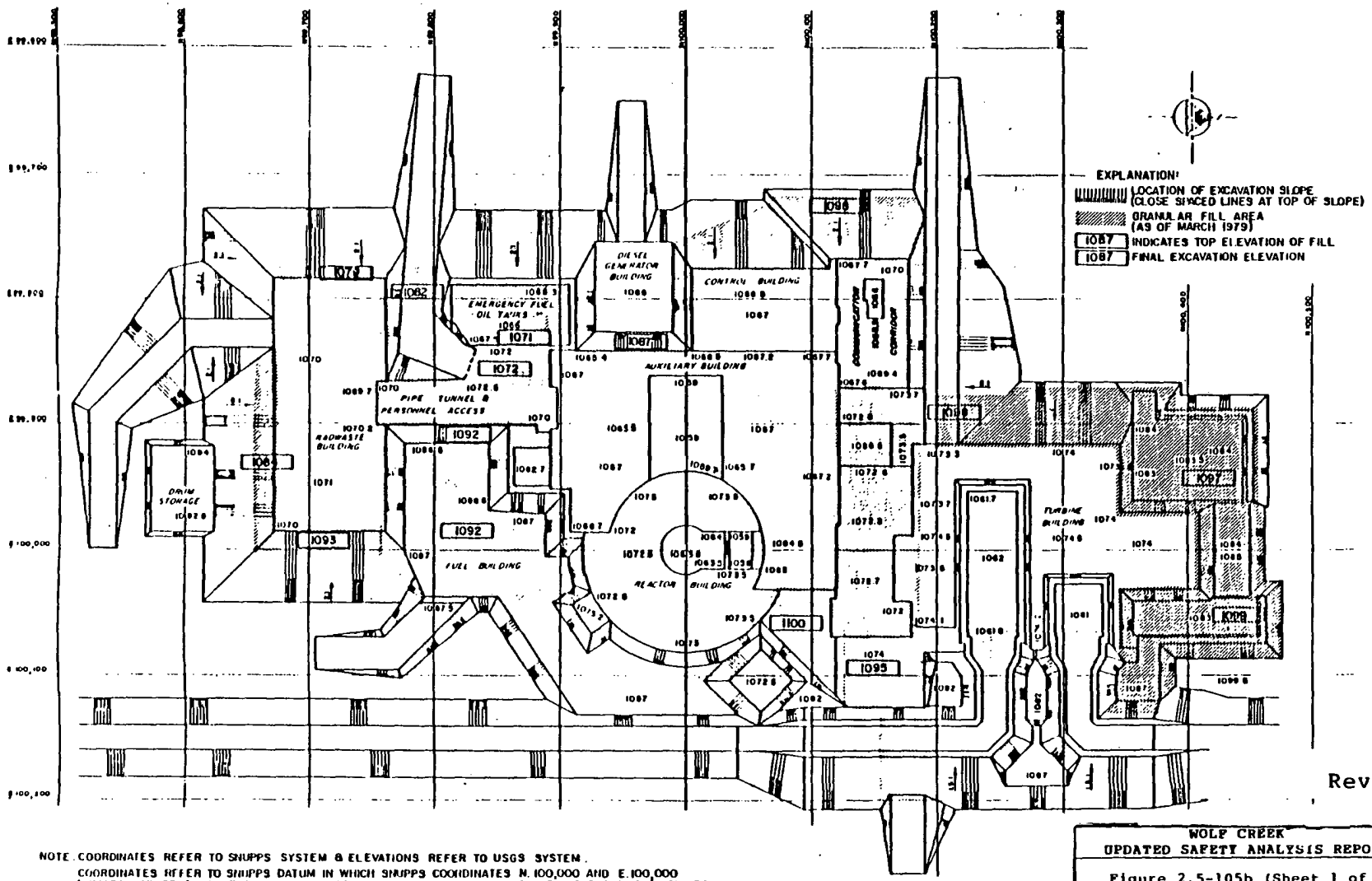
DRAWING REFERENCE:

TITLE: EXCAVATION PLAN, PLANT AREA, WOLF CREEK GENERATING STATION UNIT 1
FOR: KANSAS GAS & ELECTRIC COMPANY AND KANSAS CITY POWER & LIGHT COMPANY
BY: SARGENT & LUNDY ENGINEERS, CHICAGO, ILL.
DRAWING NO: S-181 REV. 0
DATE: 4/15/84

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-105a

Lean Concrete Status



Rev. 0

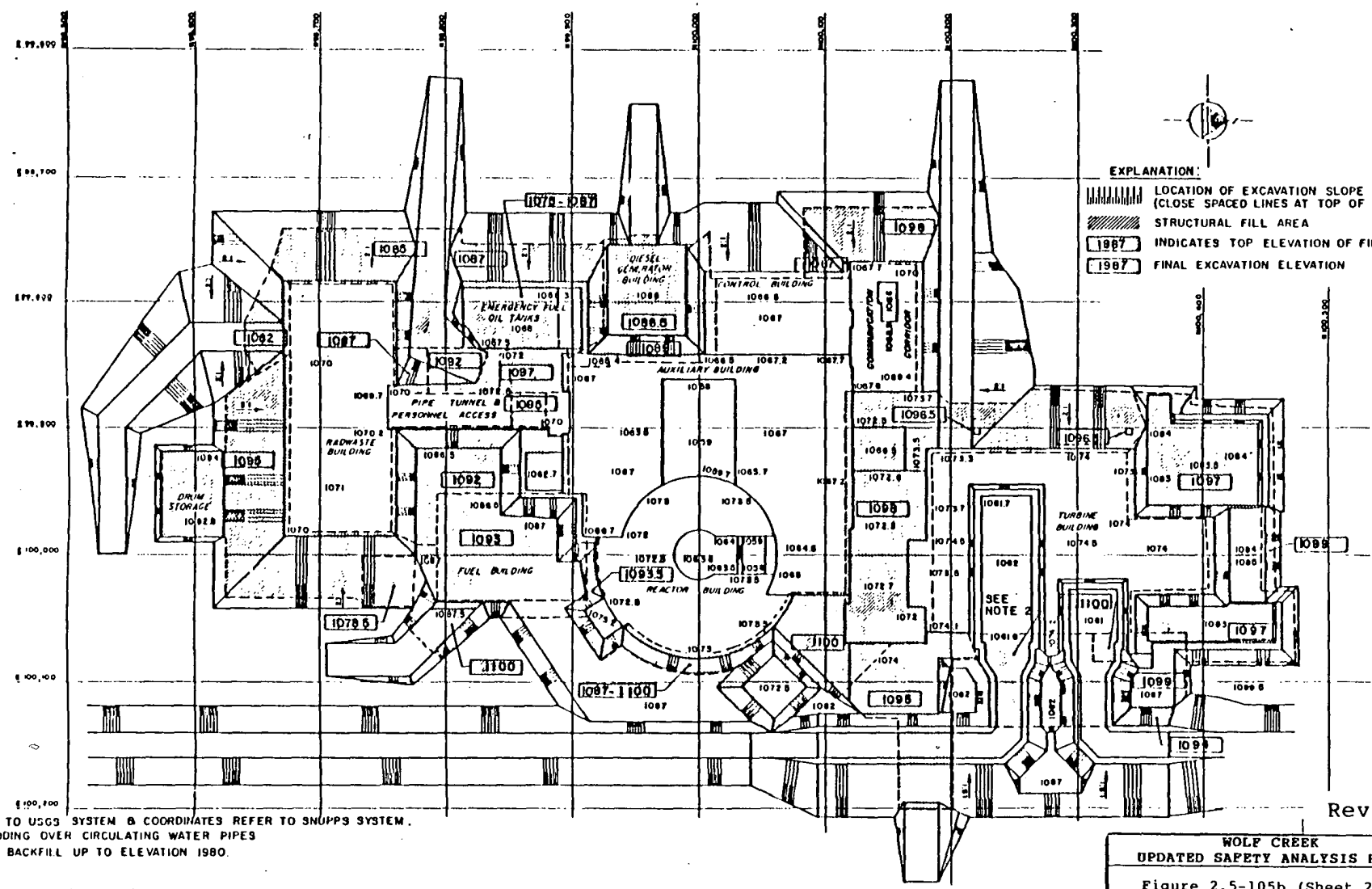
NOTE: COORDINATES REFER TO SNUPPS SYSTEM & ELEVATIONS REFER TO USGS SYSTEM.
COORDINATES REFER TO SNUPPS DATUM IN WHICH SNUPPS COORDINATES N.100,000 AND E.100,000 (REACTOR CENTER) CORRESPOND TO KANSAS STATE PLANE COORDINATES N.584,670 AND E.2,807,250.

DRAWING REFERENCE:
TITLE: EXCAVATION PLAN, PLANT AREA, WOLF CREEK GENERATING STATION UNIT 1
FOR: KANSAS GAS & ELECTRIC COMPANY AND KANSAS CITY POWER & LIGHT COMPANY
BY: SARGENT & LUNDY ENGINEERS, CHICAGO
DRAWING NO.: S-181 REV. 0
DATE: 4/15/77

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-105b (Sheet 1 of 2)

Granular Fill Status



NOTES:

ELEVATIONS REFER TO USGS SYSTEM & COORDINATES REFER TO SNUPPS SYSTEM.
1 FOOT OF PIPE BEDDING OVER CIRCULATING WATER PIPES
THEN STRUCTURAL BACKFILL UP TO ELEVATION 1980.

DRAWING REFERENCE:

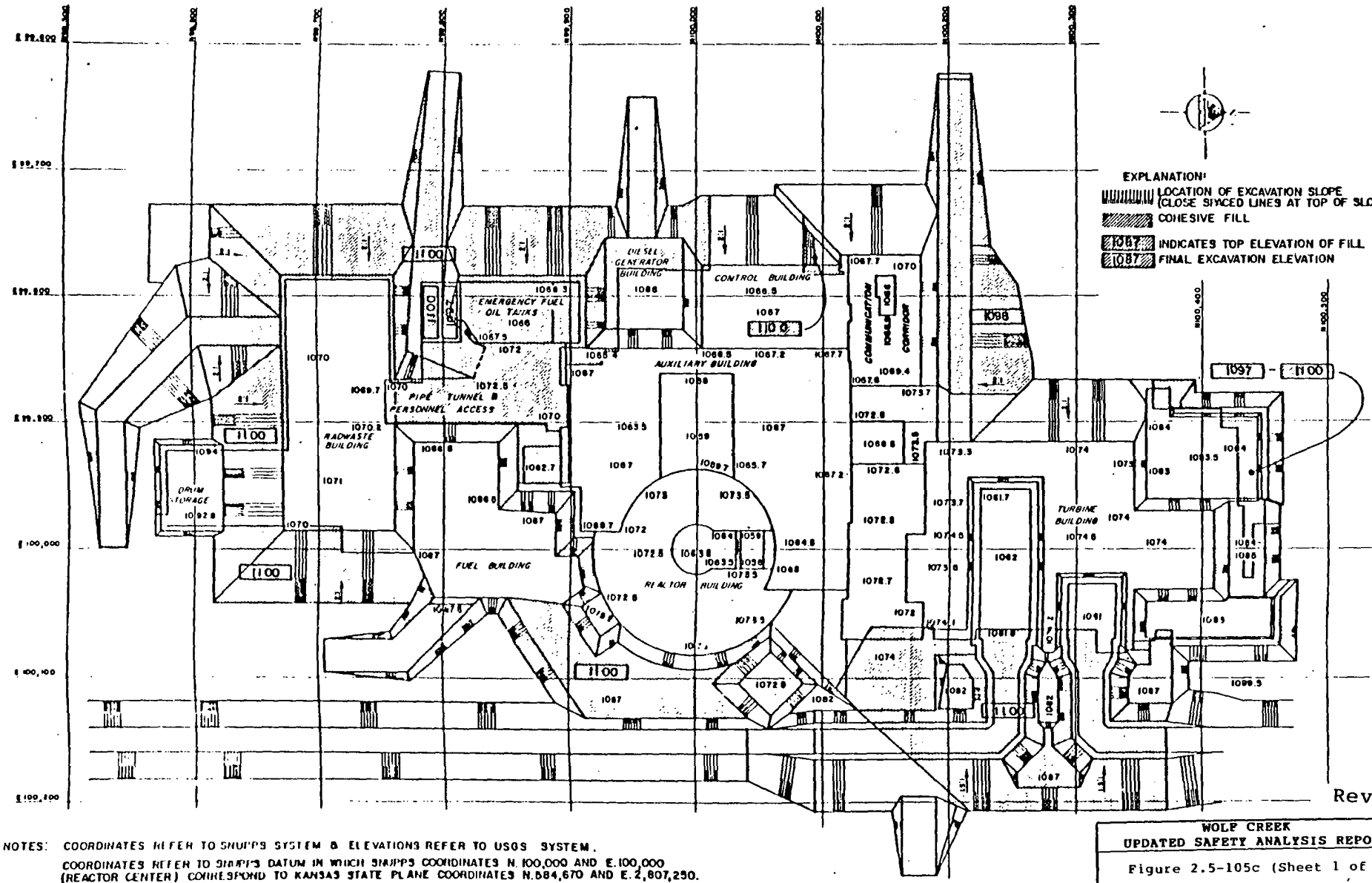
TITLE: EXCAVATION PLAN, PLANT AREA, WOLF CREEK GENERATING STATION UNIT 1
FOR: KANSAS GAS & ELECTRIC COMPANY AND KANSAS CITY POWER & LIGHT COMPANY
BY: SARGENT & LUNDY ENGINEERS, CHICAGO, ILL.
DRAWING NO: S-181 REV 0
DATE: 4/15/77

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-105b (Sheet 2 of 2)

Granular Fill Status



Rev. 0

NOTES: COORDINATES REFER TO SHUPPS SYSTEM & ELEVATIONS REFER TO USGS SYSTEM.

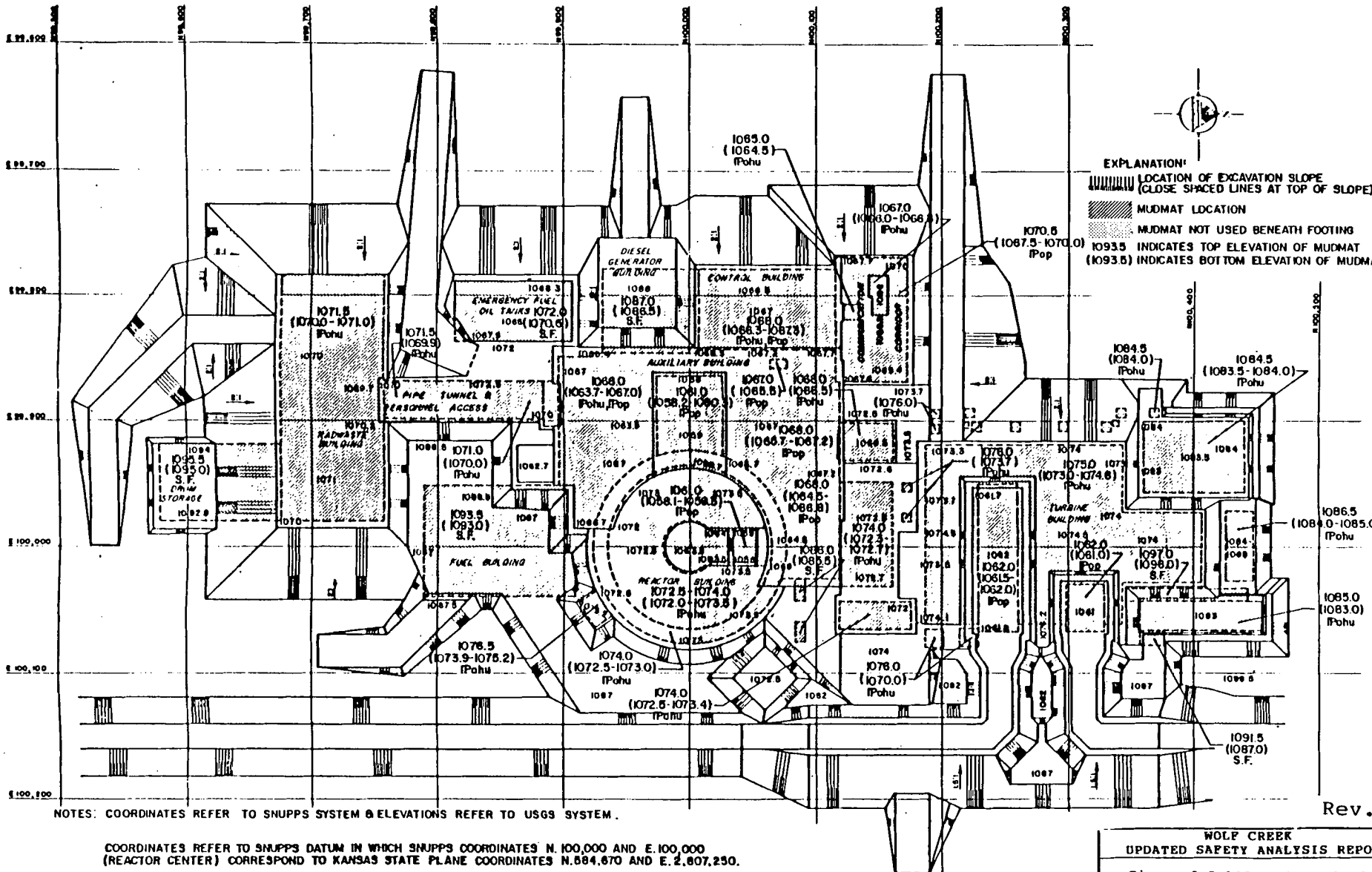
COORDINATES REFER TO SHUPPS DATUM IN WHICH SHUPPS COORDINATES N.100,000 AND E.100,000 (REACTOR CENTER) CORRESPOND TO KANSAS STATE PLANE COORDINATES N.684,670 AND E.2,807,250.

DRAWING REFERENCE:
TITLE: EXCAVATION PLAN, PLANT AREA, WOLF CREEK GENERATING STATION UNIT 1
FOR: KANSAS GAS & ELECTRIC COMPANY AND KANSAS CITY POWER & LIGHT COMPANY
BY: SARGENT & LUNDY ENGINEERS, CHICAGO
DRAWING NO.: S-181 REV. 0
DATE: 4/15/77

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-105c (Sheet 1 of 3)

Cohesive Backfill Status



NOTES: COORDINATES REFER TO SNUPPS SYSTEM & ELEVATIONS REFER TO USGS SYSTEM.

COORDINATES REFER TO SNUPPS DATUM IN WHICH SNUPPS COORDINATES N. 100,000 AND E. 100,000 (REACTOR CENTER) CORRESPOND TO KANSAS STATE PLANE COORDINATES N.884,670 AND E. 2,807,250.

DRAWING REFERENCE:
TITLE: EXCAVATION PLAN, PLANT AREA, WOLF CREEK GENERATING STATION UNIT 1
FOR: KANSAS GAS & ELECTRIC COMPANY AND KANSAS CITY POWER & LIGHT COMPANY
BY: SARGENT & LUNDY ENGINEERS, CHICAGO
DRAWING NO.: S-181 REV. 8
DATE: 4/15/77

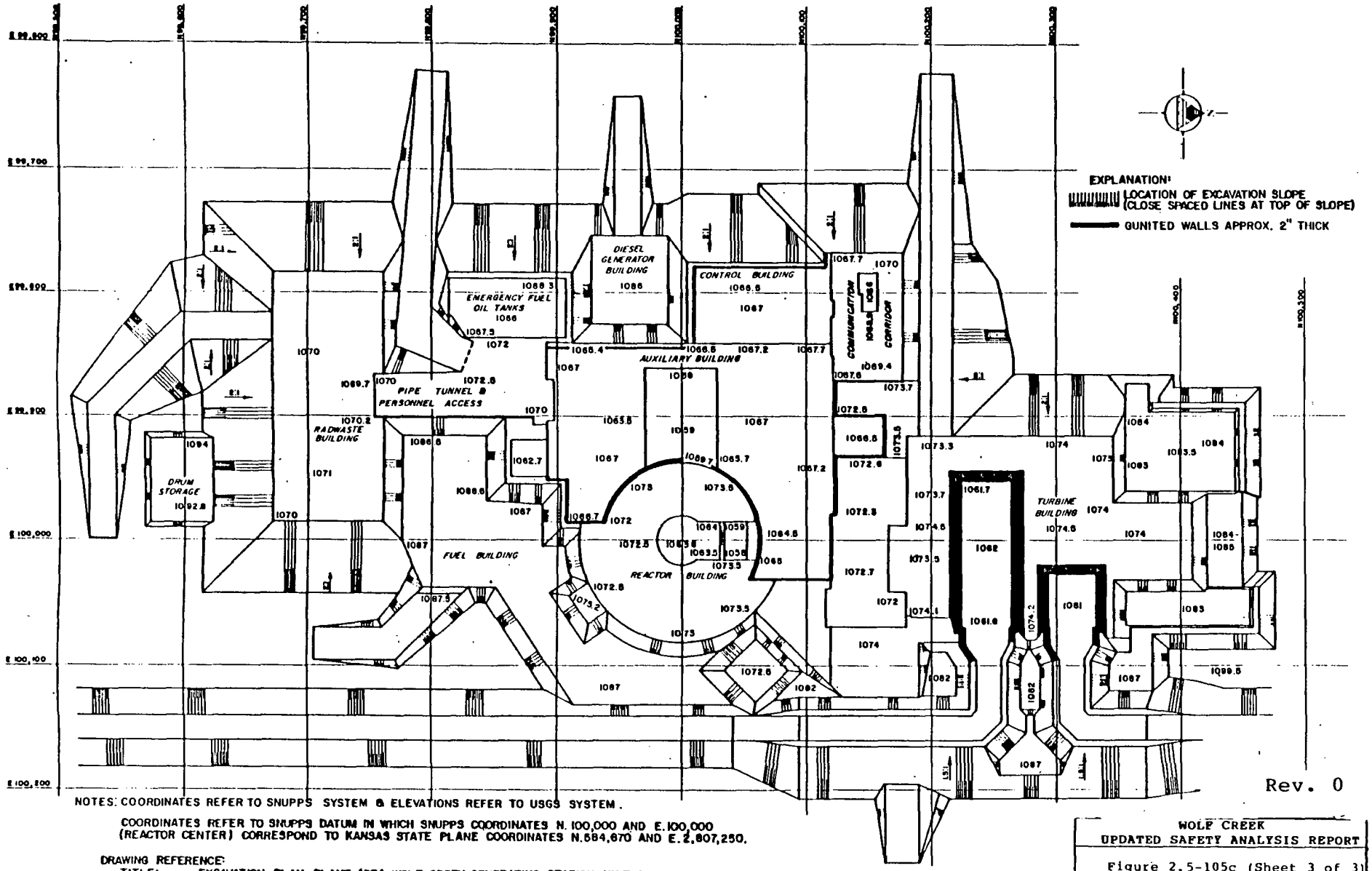
SUB-BASE MATERIALS:
S.F. STRUCTUAL FILL
fPohu HEUMADER SHALE MEMBER
fPop PLATTSMOUTH LIMESTONE MEMBER

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-105c (Sheet 2 of 3)

Cohesive Backfill Status



Rev. 0

NOTES: COORDINATES REFER TO SNUPPS SYSTEM & ELEVATIONS REFER TO USGS SYSTEM.

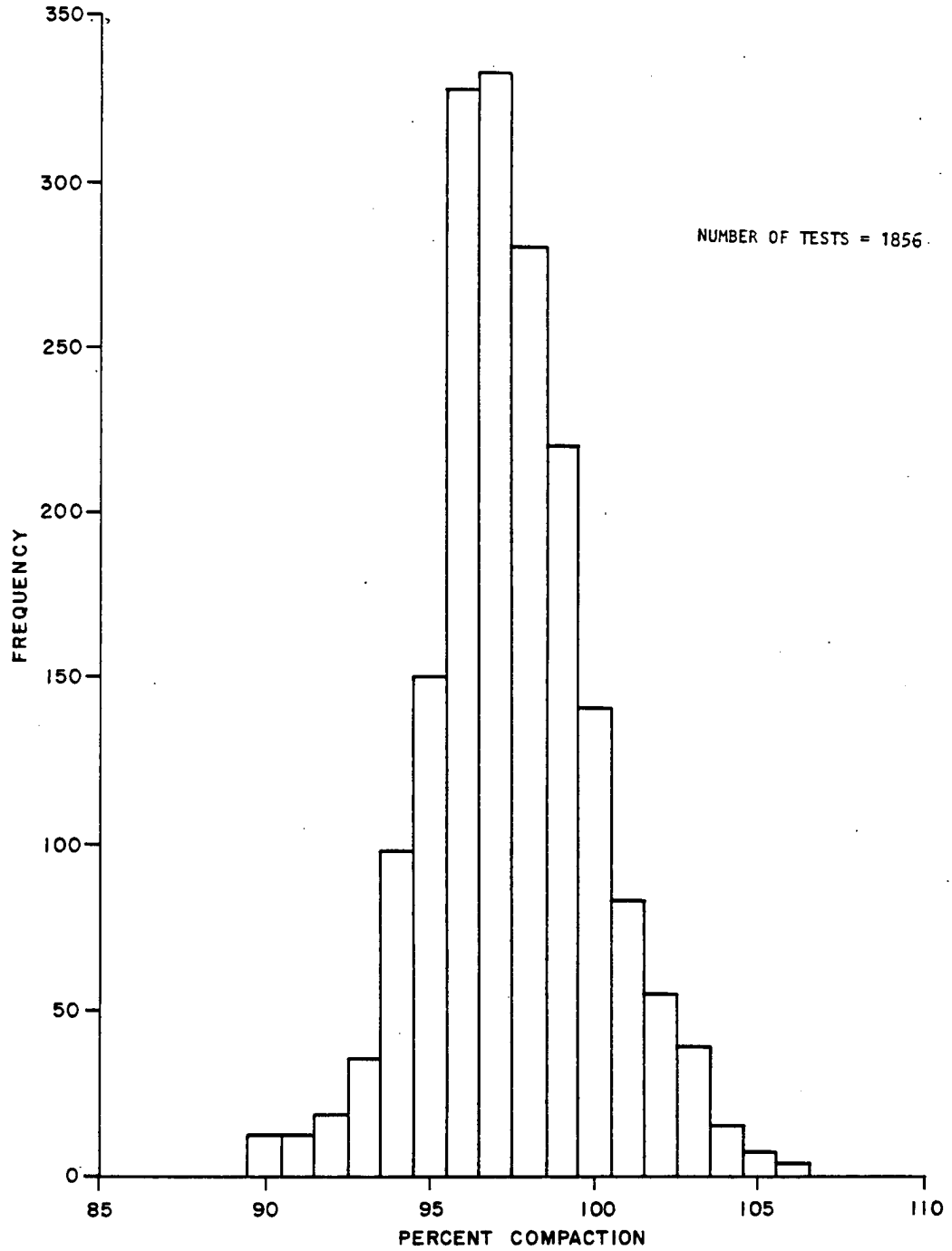
COORDINATES REFER TO SNUPPS DATUM IN WHICH SNUPPS COORDINATES N. 100,000 AND E. 100,000 (REACTOR CENTER) CORRESPOND TO KANSAS STATE PLANE COORDINATES N.584,670 AND E.2,807,250.

DRAWING REFERENCE:
TITLE: EXCAVATION PLAN, PLANT AREA, WOLF CREEK GENERATING STATION UNIT 1
FOR: KANSAS GAS & ELECTRIC COMPANY AND KANSAS CITY POWER & LIGHT COMPANY
BY: SARGENT & LUNDY ENGINEERS, CHICAGO
DRAWING NO.: S-181 REV. 0
DATE: 4/18/77

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-105c (Sheet 3 of 3)

Cohesive Backfill Status



NOTES:

1. RETESTS ON AREAS WHERE TESTS DID NOT MEET COMPACTION CRITERIA ARE INCLUDED IN THIS PLOT.
2. MIMIMUM COMPACTION IS 95% ASTM D-15

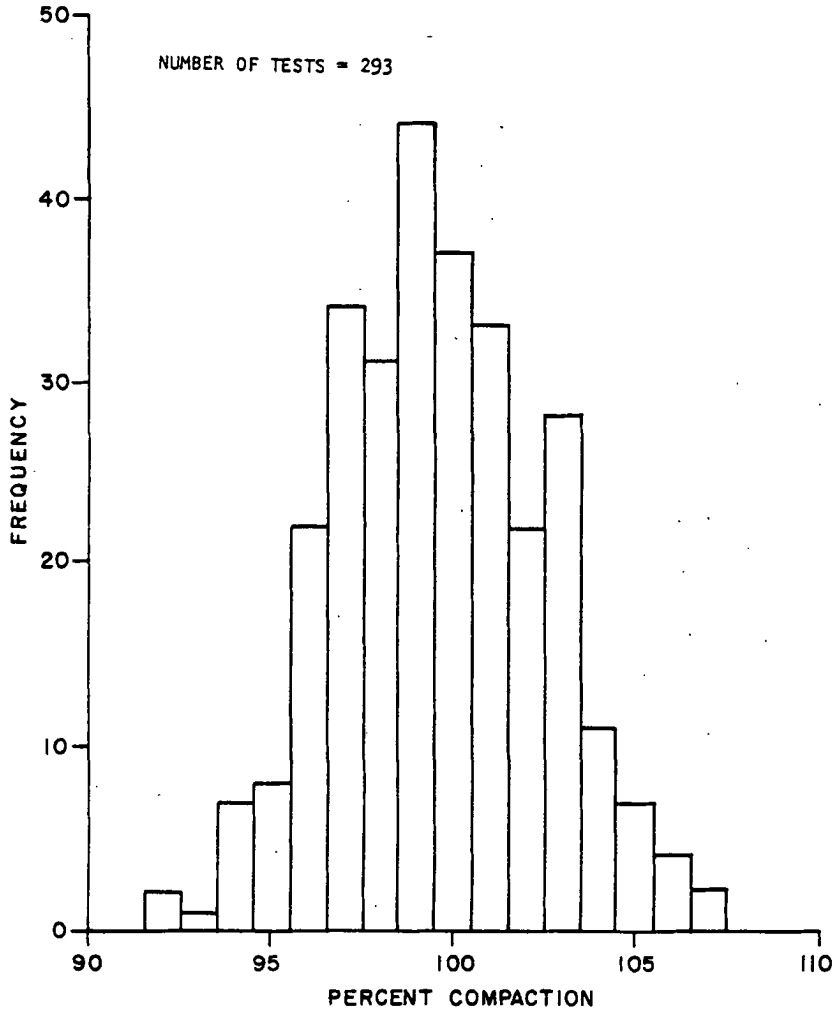
Rev. 0

7699-064-07

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-105d

Power Block - Structural Fill
Statistical Distribution Plot



NOTES:

1. RETESTS ON AREAS WHERE TESTS DID NOT MEET COMPACTION CRITERIA ARE INCLUDED IN THIS PLOT.

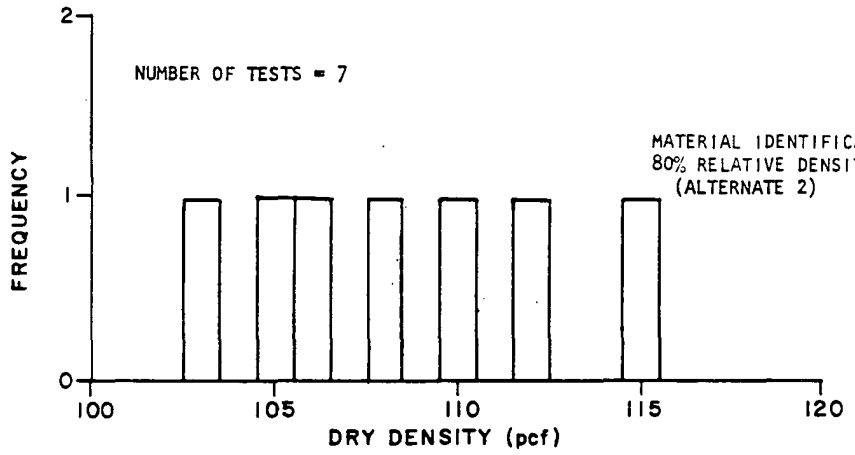
2. MINIMUM COMPACTION IS 95% ASTM D-698.

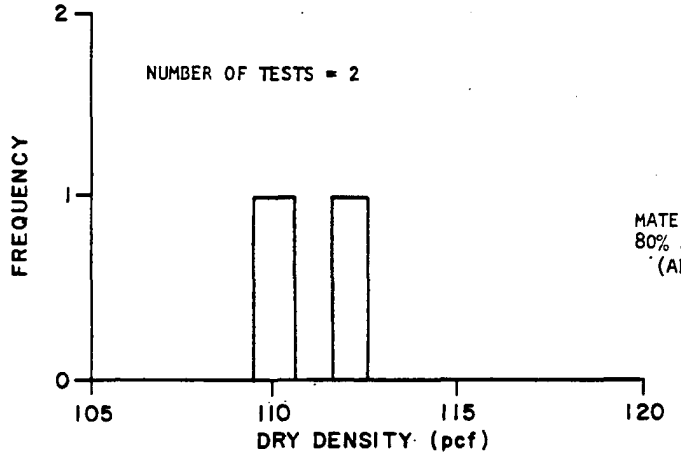
Rev. 0

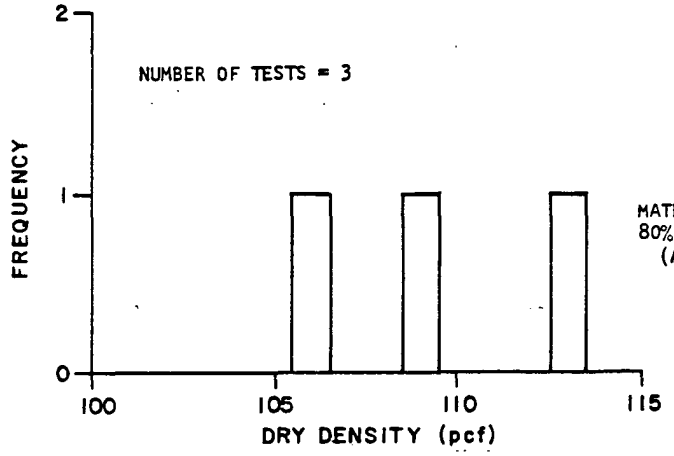
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-105e

Power Block - Cohesive Fill
Statistical Distribution Plot







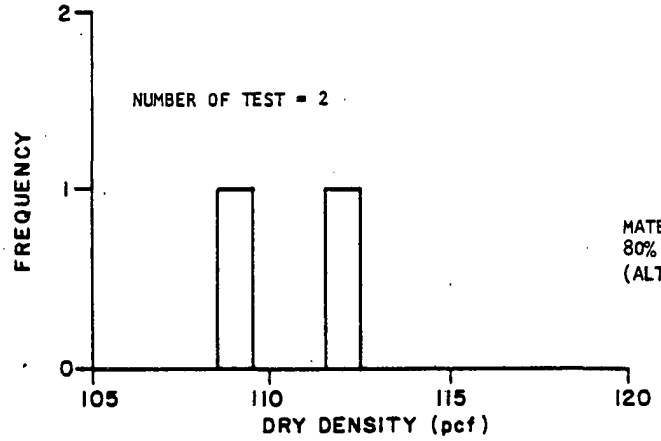
7699-064-07

Rev. 0

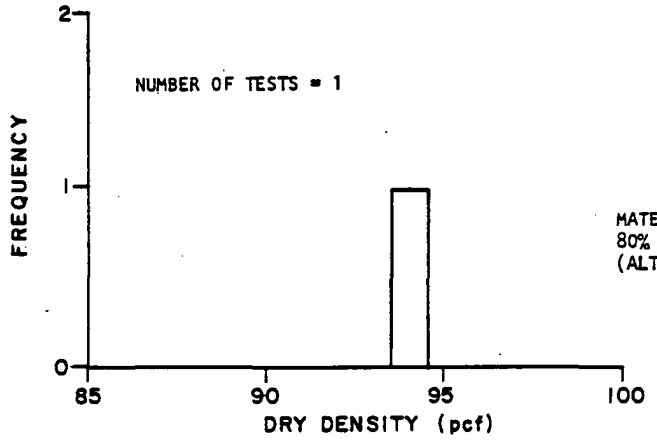
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-105f

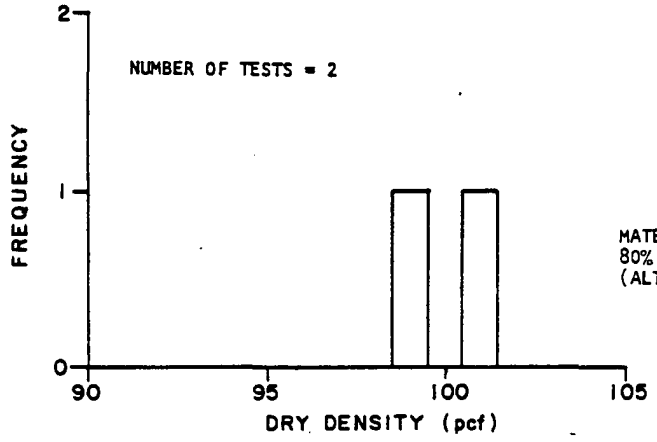
Power Block - Pipe Bedding
Material Statistical Distribution
Plot



MATERIAL IDENTIFICATION NO. RD-24
80% RELATIVE DENSITY = 96 pcf
(ALTERNATE 5)



MATERIAL IDENTIFICATION NO. RD-29
80% RELATIVE DENSITY = 93 pcf
(ALTERNATE 5)



MATERIAL IDENTIFICATION NO. RD-30
80% RELATIVE DENSITY = 99 pcf
(ALTERNATE 5)

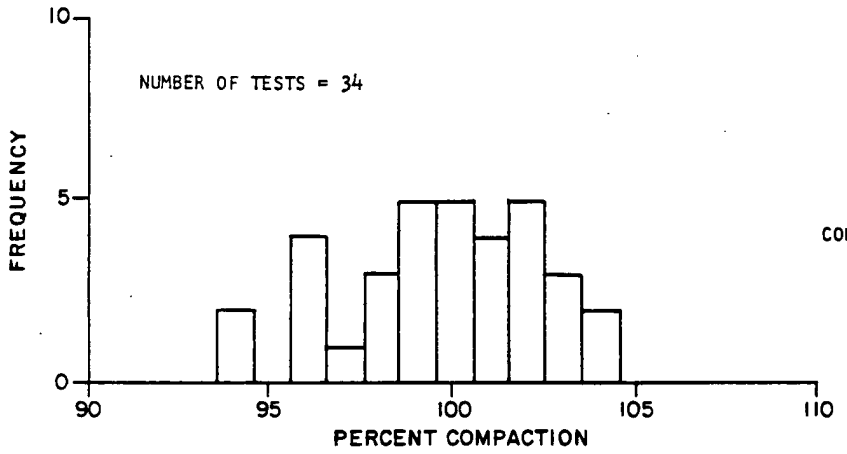
Rev. 0

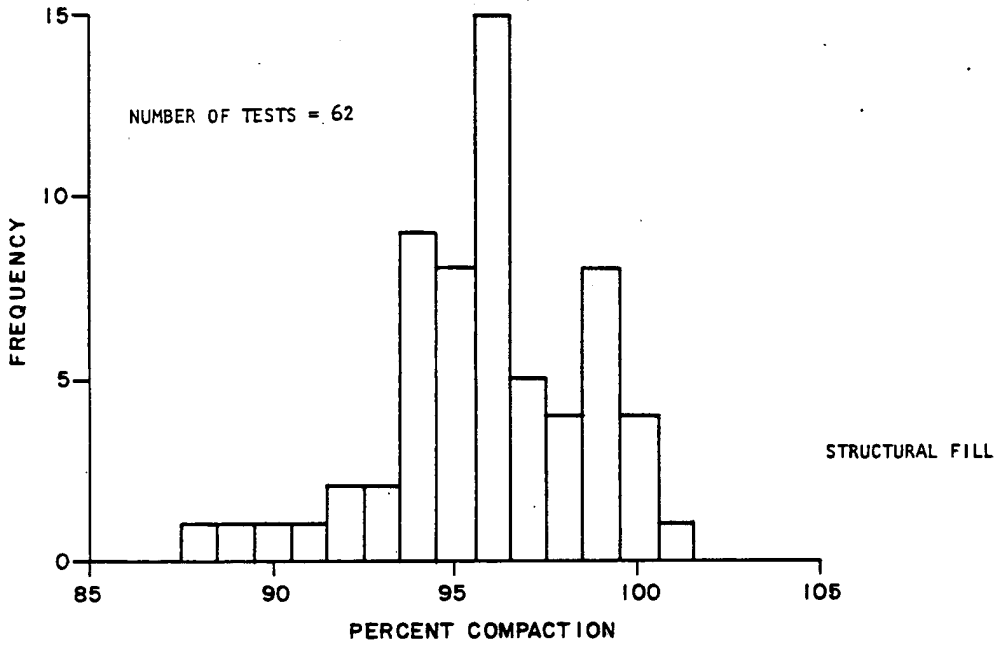
7699-064-07

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-105g

Power Block - Pipe Bedding
Material Statistical Distribution
Plot





NOTES:

1. RETESTS ON AREAS WHERE TESTS DID NOT MEET COMPACTION CRITERIA ARE INCLUDED IN THESE PLOTS.

2. MINIMUM COMPACTION IS 95% ASTM D-698 FOR COHESIVE FILL, 95% ASTM D-1557 FOR STRUCTURAL FILL.

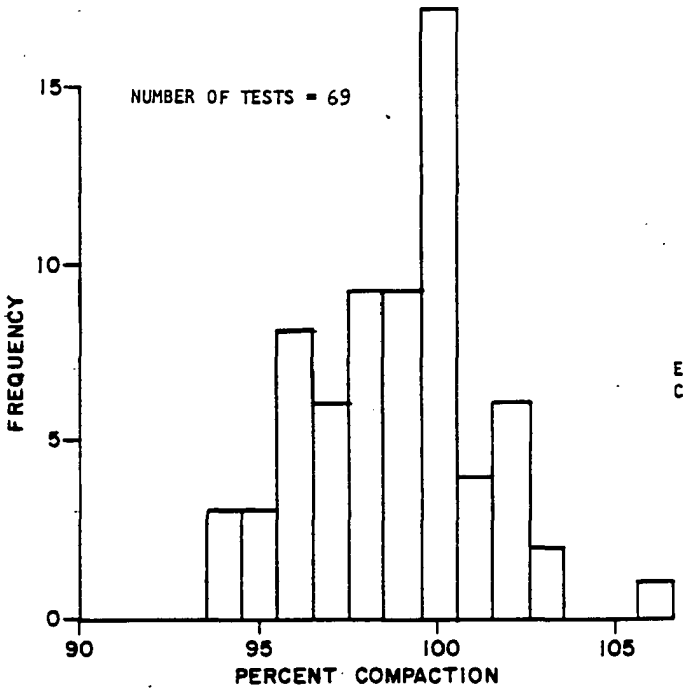
Rev. 0

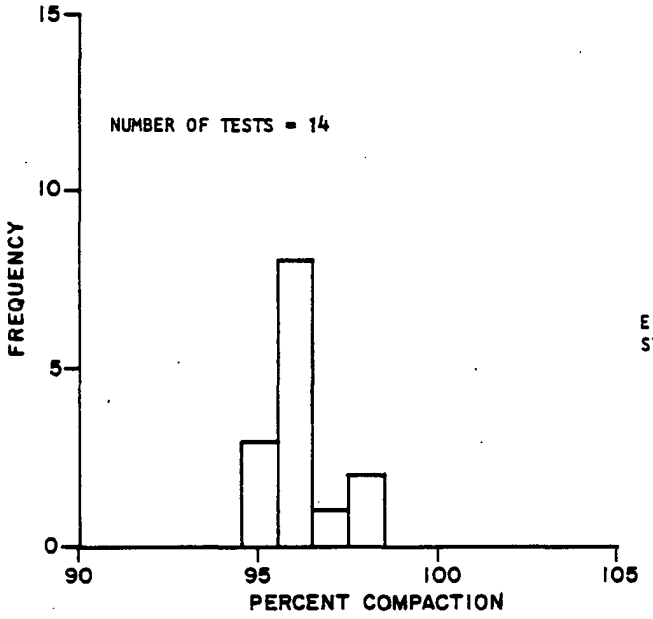
7699-064-07

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-105h

ESWS Structures - Statistical Distribution Plot





NOTES:

1. RETESTS ON AREAS WHERE TESTS DID NOT MEET COMPACTION CRITERIA ARE INCLUDED IN THESE PLOTS.
2. MINIMUM COMPACTION IS 95% ASTM D-698 FOR COHESIVE FILL, 95% ASTM D-1557 FOR STRUCTURAL FILL.

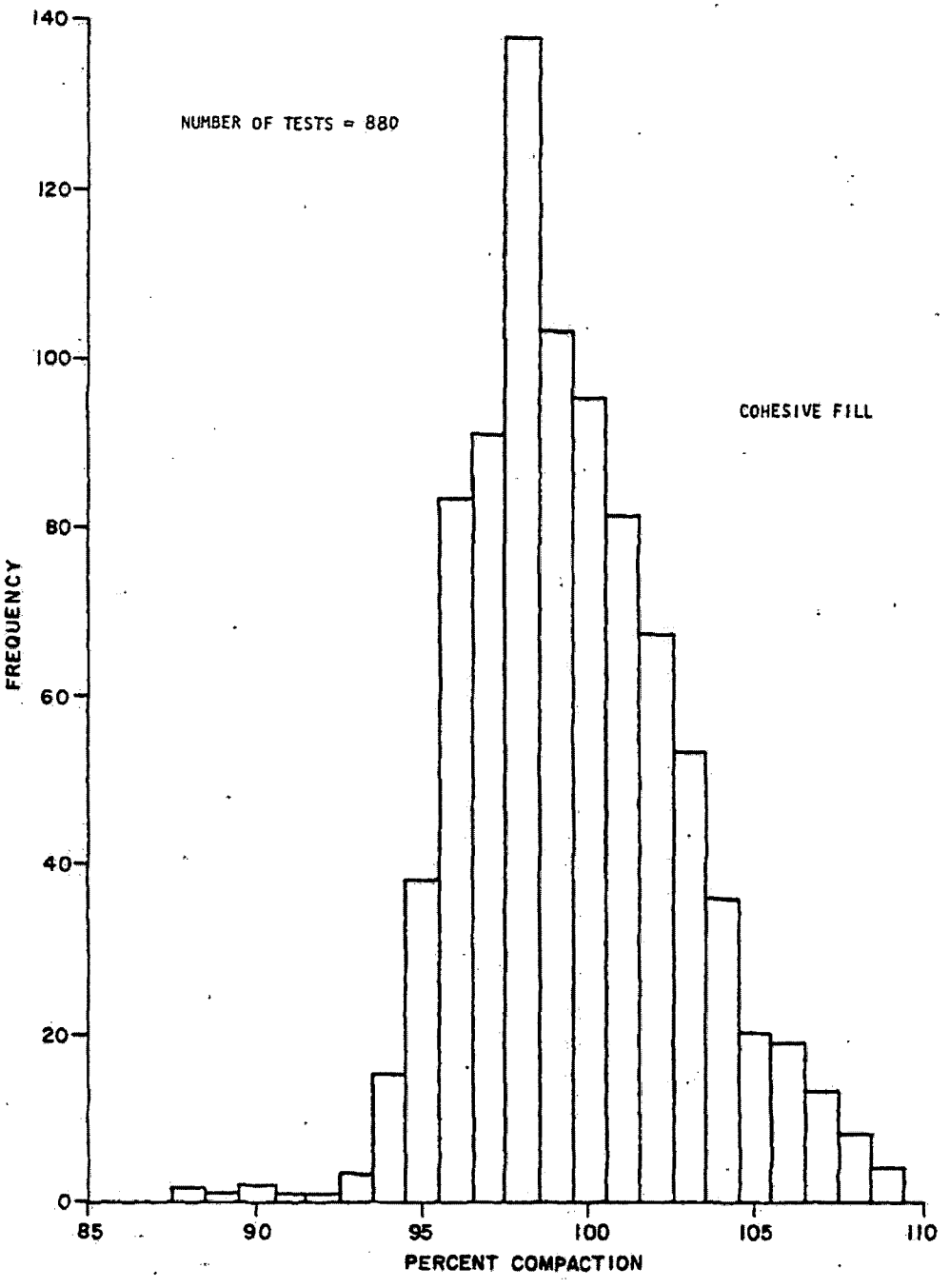
Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-105i

ESWS - Statistical Distribution Plot

7699-064-07

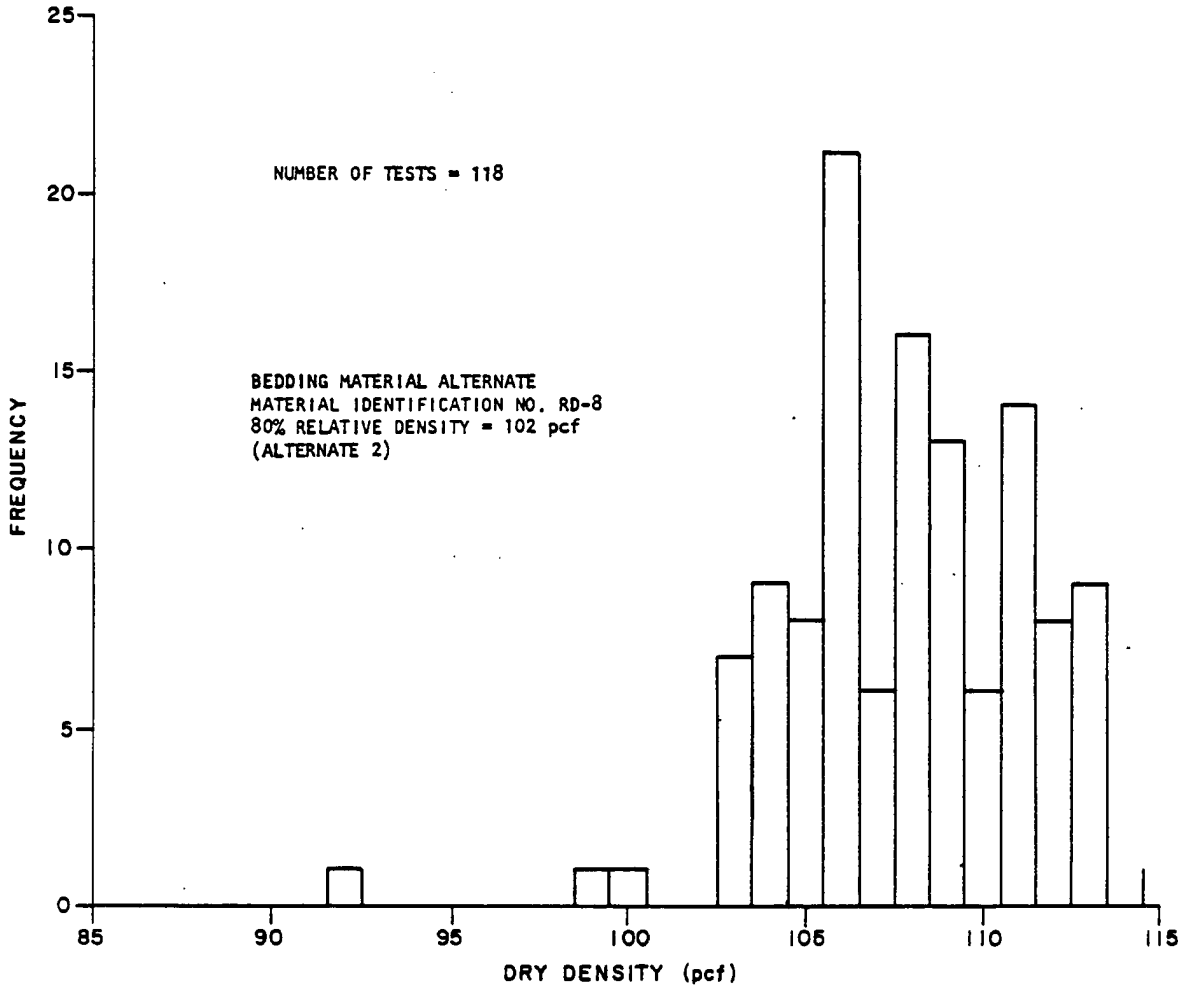


NOTES:

1. RETESTS ON AREAS WHERE TESTS DID NOT MEET COMPACTION CRITERIA ARE INCLUDED IN THIS PLOT.
2. MINIMUM COMPACTION IS ASTM D-1557.
3. 12 additional tests were performed for the ESW pipe replacement with similar distribution to that shown.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-105j Rev. 28
ESWS Pipeline and Duct Bank -
Statistical Distribution Plot
Sheet 1 of 1



NOTES:

1. RETESTS ON AREAS WHERE TESTS DID NOT MEET COMPACTION CRITERIA ARE INCLUDED IN THIS PLOT.

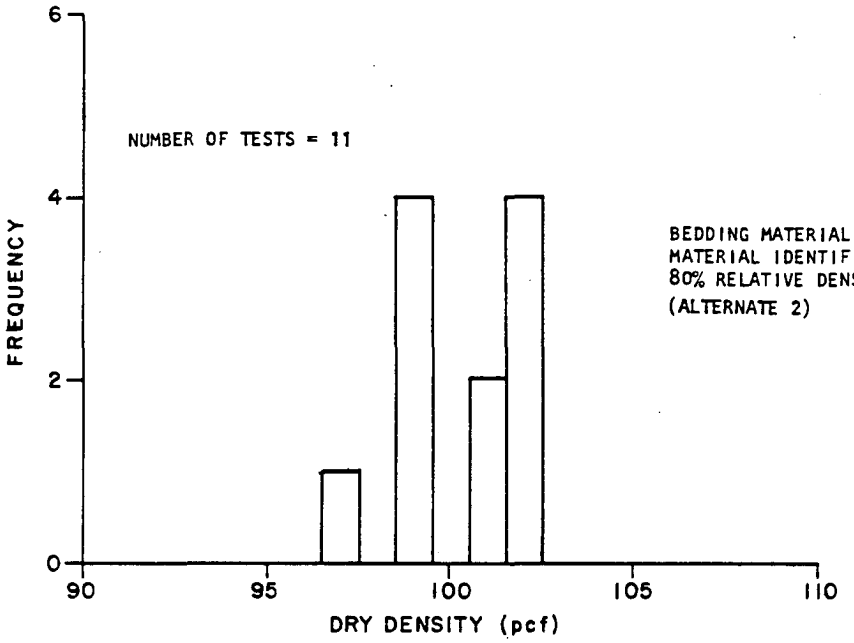
Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-105k

ESWS Pipeline and Duct Bank - Statistical Distribution Plot

7699-064-07



NOTES:

1. RETESTS ON AREAS WHERE TESTS DID NOT MEET COMPACTION CRITERIA ARE INCLUDED IN THIS PLOT.

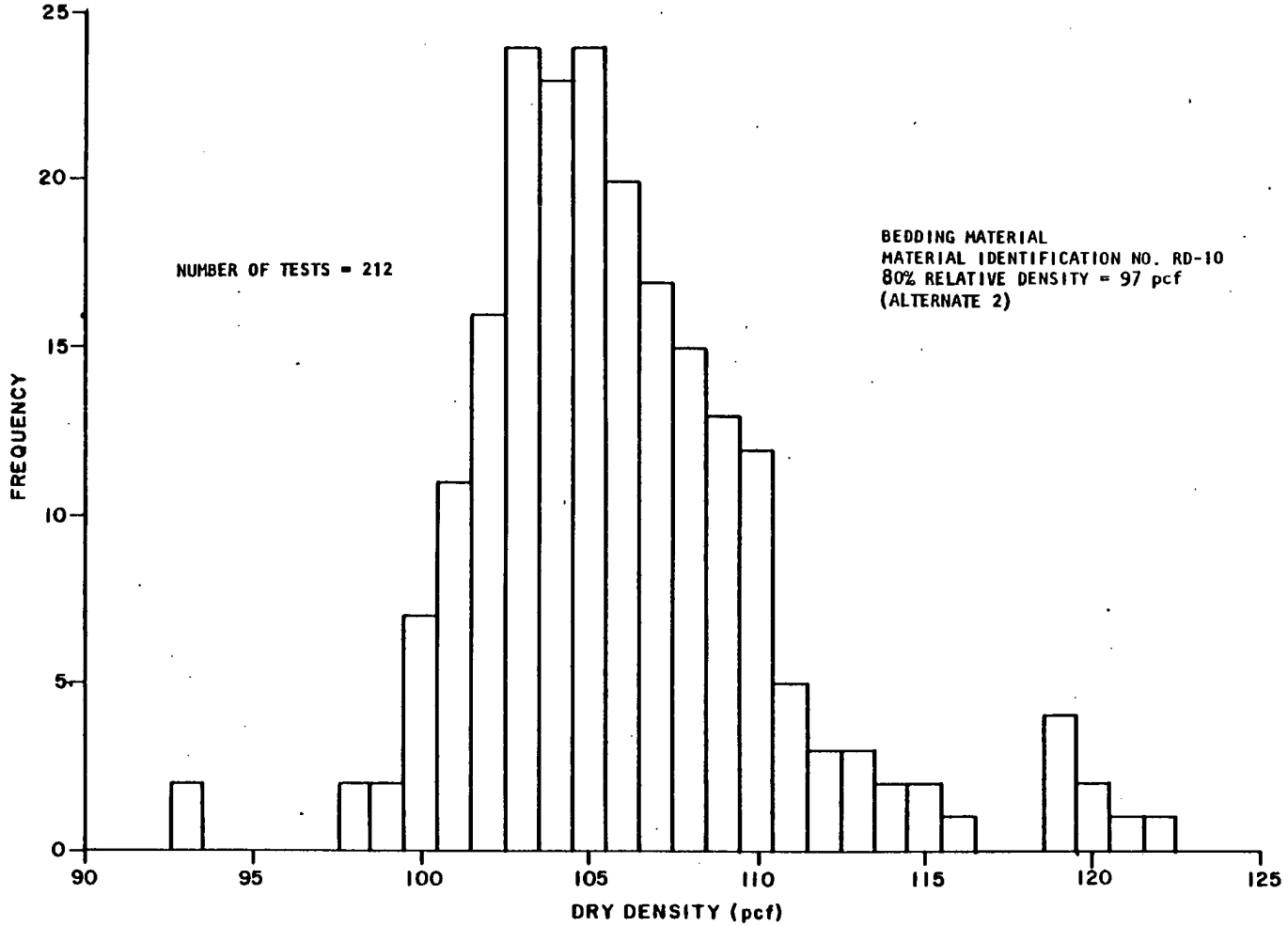
7699-064-07

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-1051

ESWS Pipeline and Duct Bank - Statistical Distribution Plot



NOTES:

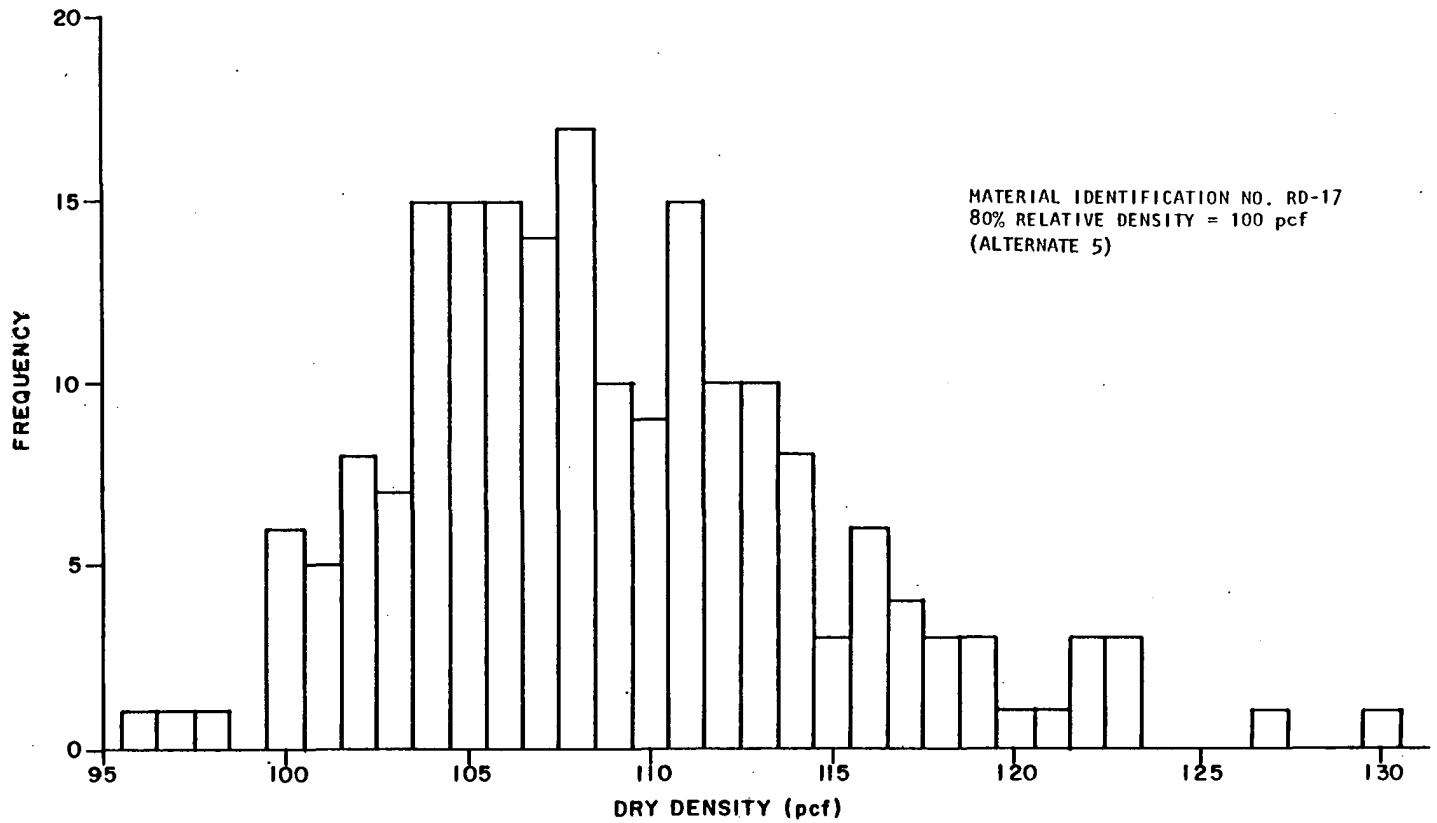
1. RETESTS ON AREAS WHERE TESTS DID NOT MEET COMPACTION CRITERIA ARE INCLUDED IN THIS PLOT.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-105m

ESWS Pipeline and Duct Bank -
Statistical Distribution Plot

Rev. 0



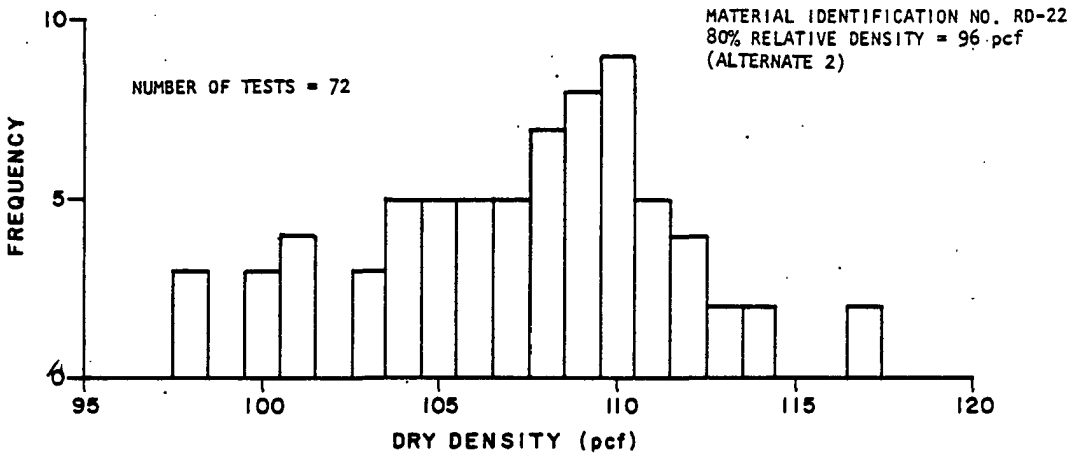
NOTES:

1. RETESTS ON AREAS WHERE TESTS DID NOT MEET COMPACTION CRITERIA ARE INCLUDED IN THIS PLOT.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-105n

ESWS Pipeline - Bedding Material
Statistical Distribution Plot

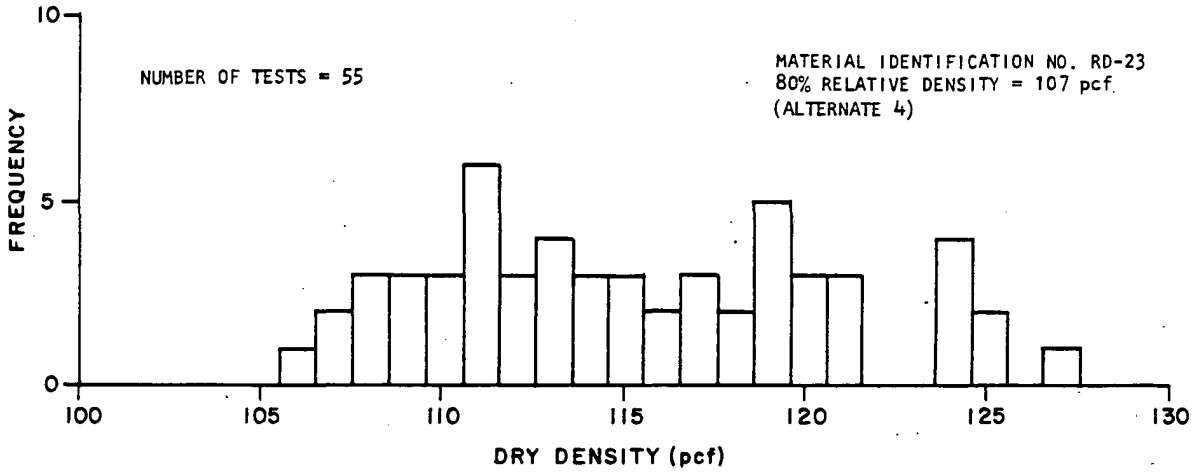


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-105o

ESWS Pipeline and Duct Bank - Bedding Material Statistical Distribution Plot



NOTES:

1. RETESTS ON AREAS WHERE TESTS DID NOT MEET COMPACTION CRITERIA ARE INCLUDED IN THIS PLOT.

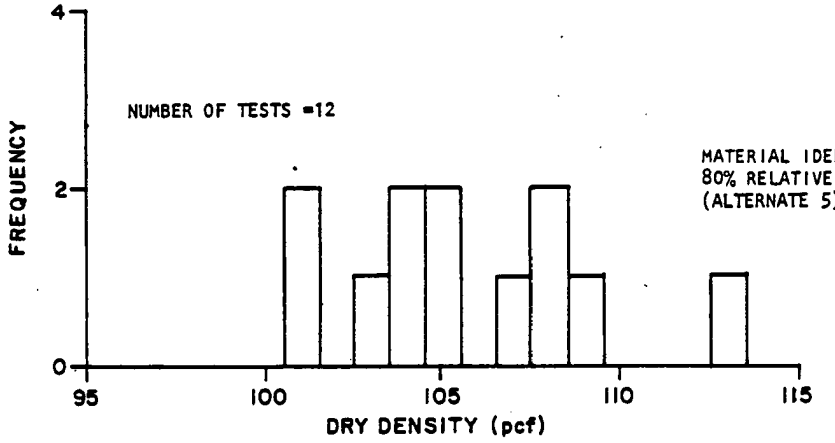
7699-064-07

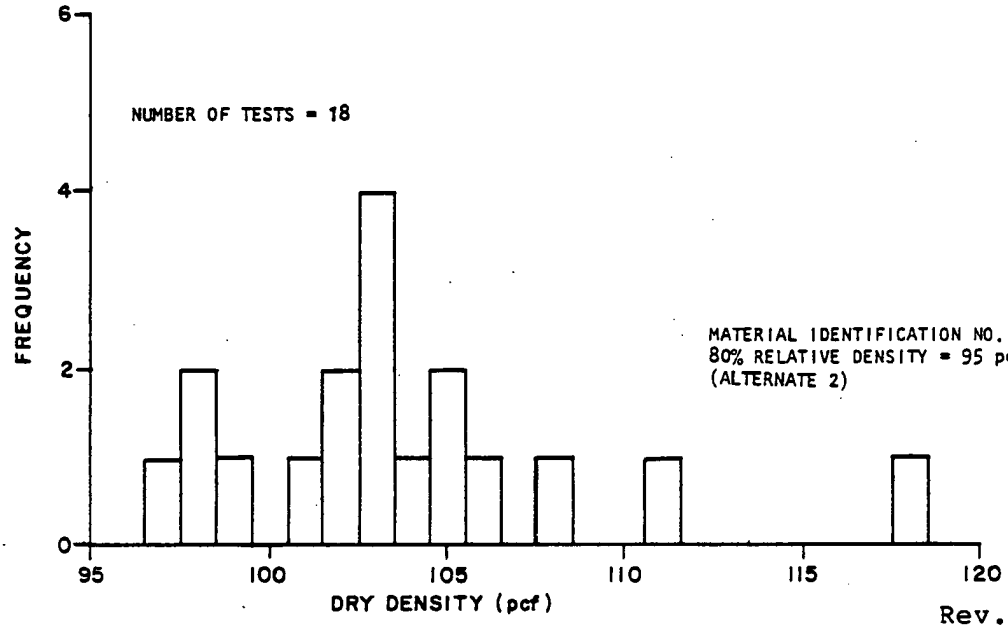
Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-105p

ESWS Pipeline and Duct Bank - Bedding Material Statistical Distribution Plot





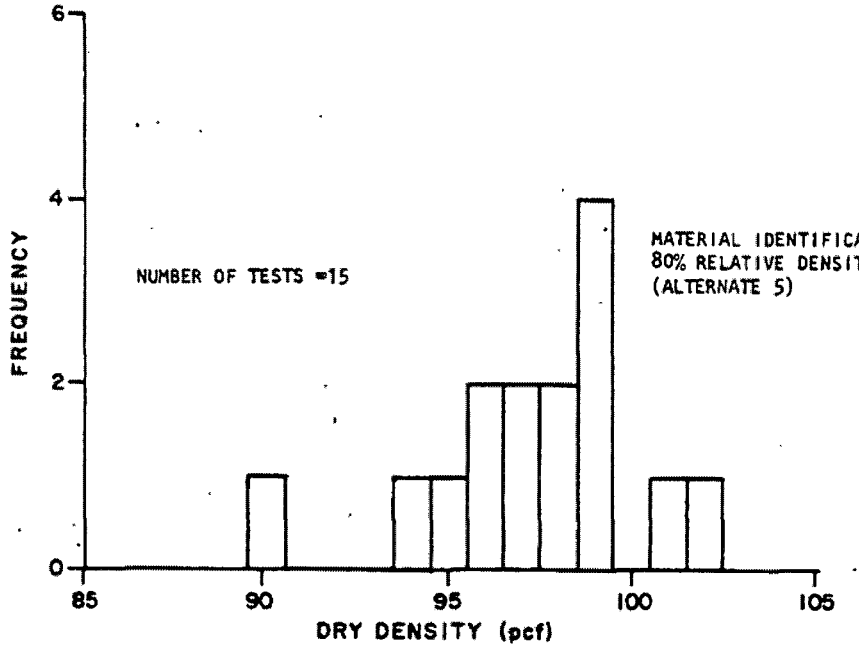
Rev. 0

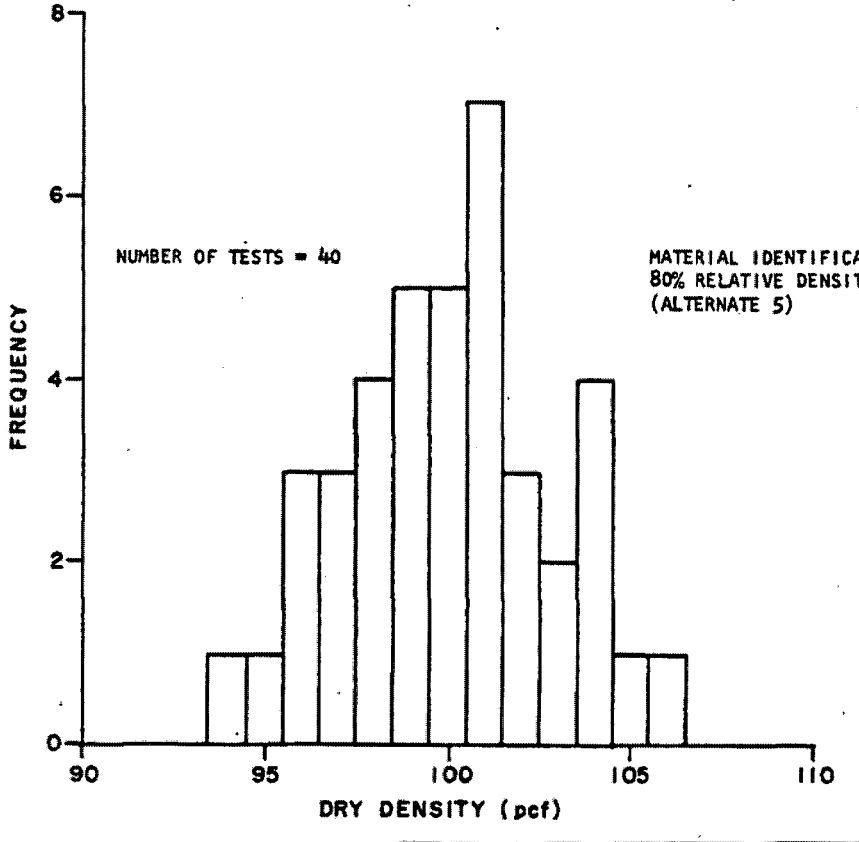
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-105q

ESWS Pipeline and Duct Bank - Bedding Material Statistical Distribution Plot

7699-064-07





NOTES:

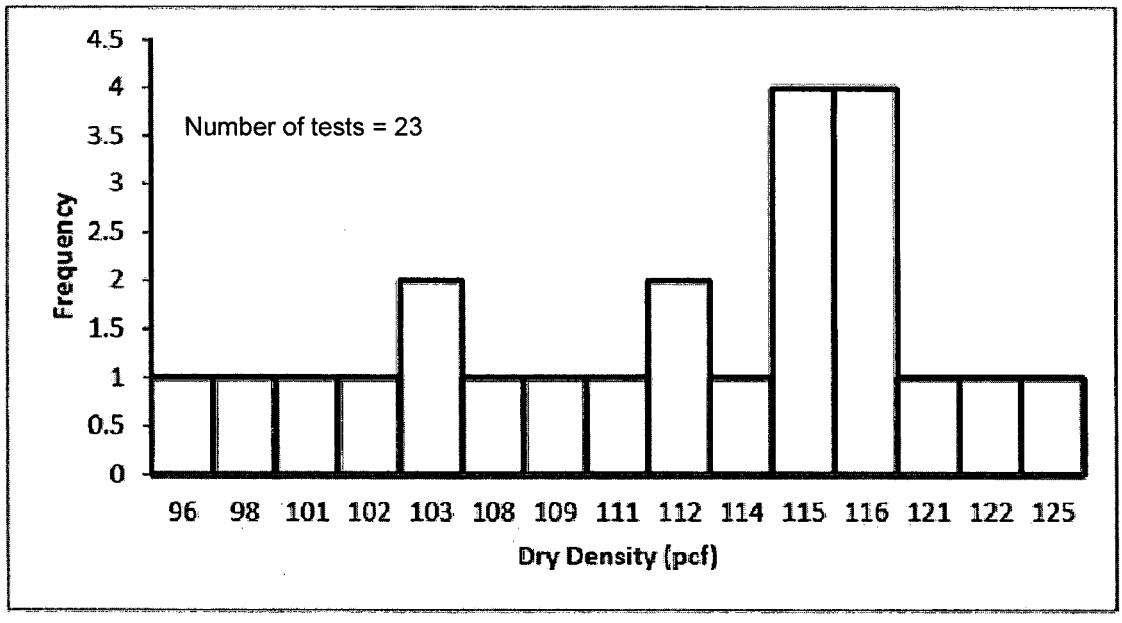
1. RETESTS ON AREAS WHERE TESTS DID NOT MEET COMPACTION CRITERIA ARE INCLUDED IN THESE PLOTS.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-105r Rev. 28

ESWS Pipeline and Duct Bank - Bedding Material Statistical Distribution Plot

Sheet 1 of 2



NOTES:

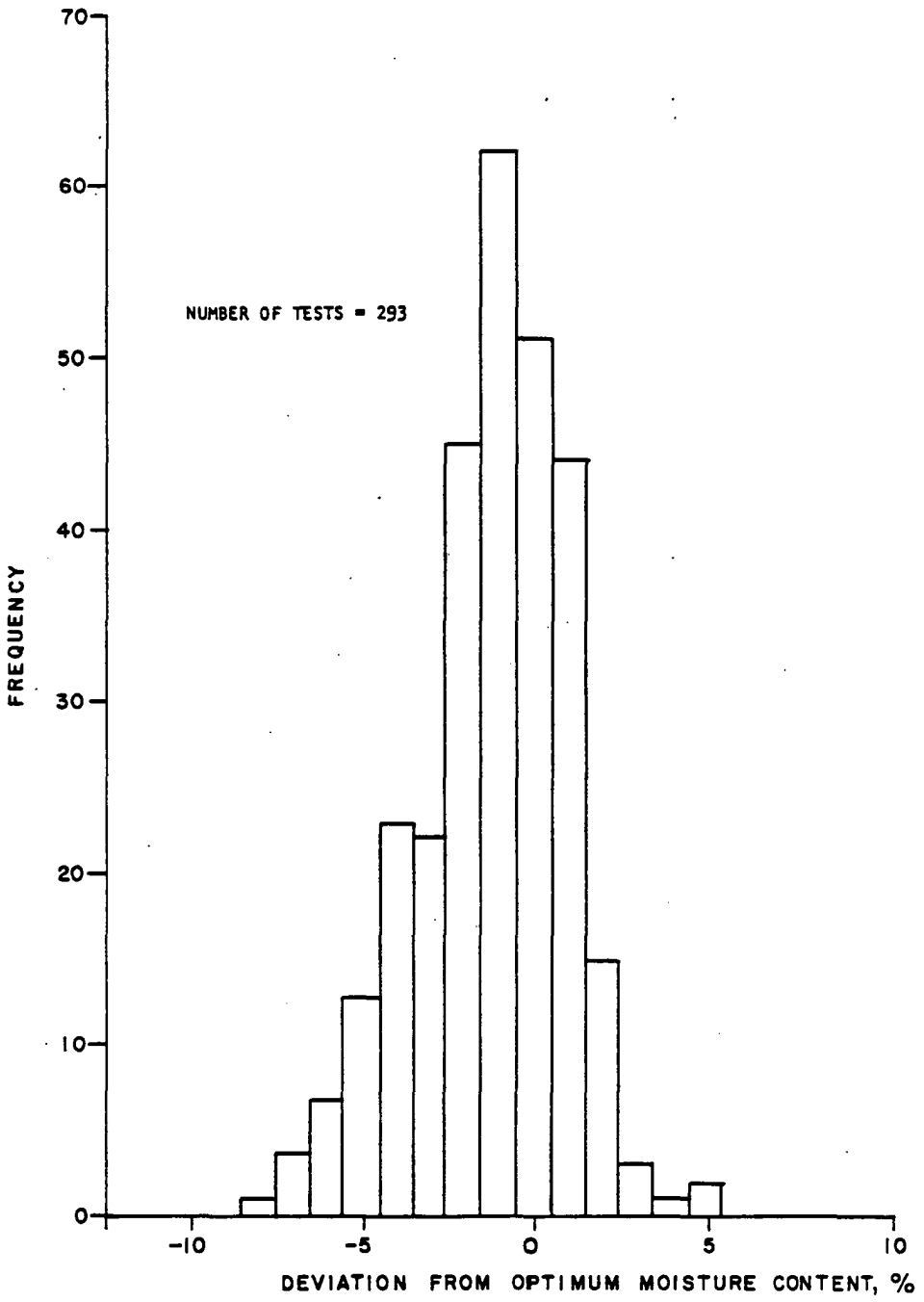
1. Bedding material for the ESW replacement is plotted above.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-105r Rev. 28

ESWS Pipeline and Duct Bank - Bedding Material Statistical Distribution Plot

Sheet 2 of 2



Rev. 0

NOTES:

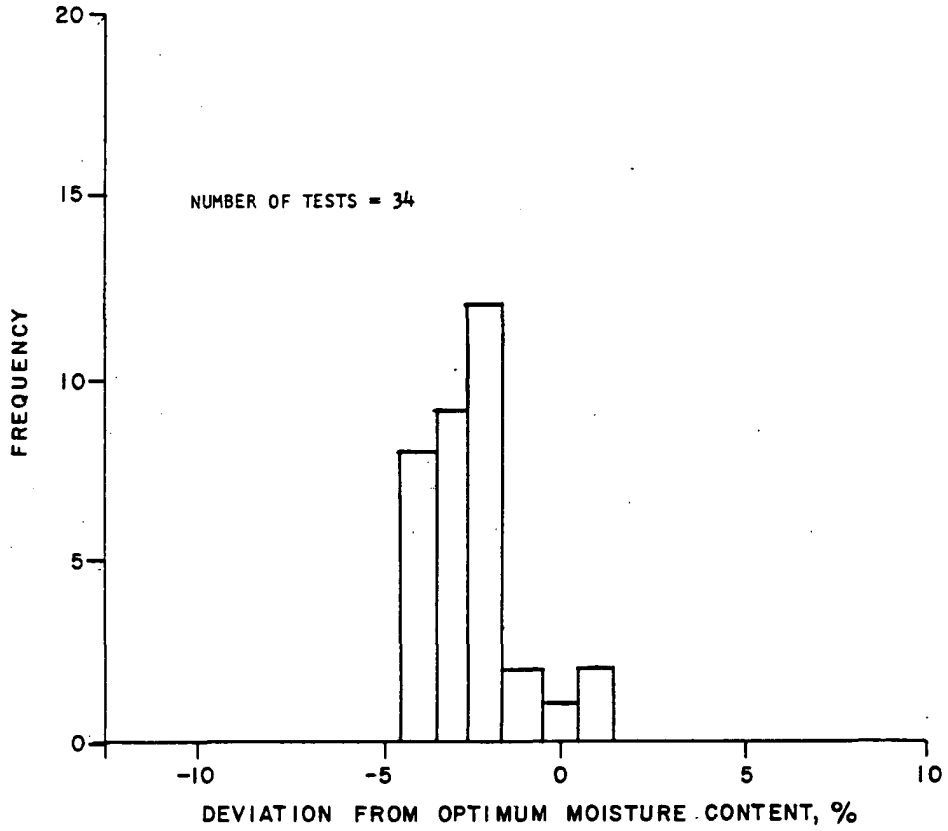
1. RETESTS ON AREAS WHERE TESTS DID NOT MEET COMPACTION CRITERIA ARE INCLUDED IN THIS PLOT.
2. ACCEPTANCE CRITERIA IS ± 2% OF OPTIMUM MOISTURE CONTENT, HOWEVER FAILING TESTS ON THE DRY SIDE WERE GENERALLY ACCEPTED IF THE DENSITY REQUIREMENTS WERE MET.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-105s

Power Block - Cohesive Fill
Statistical Distribution Plot

7699-064-07



Rev. 0

7699-064-07

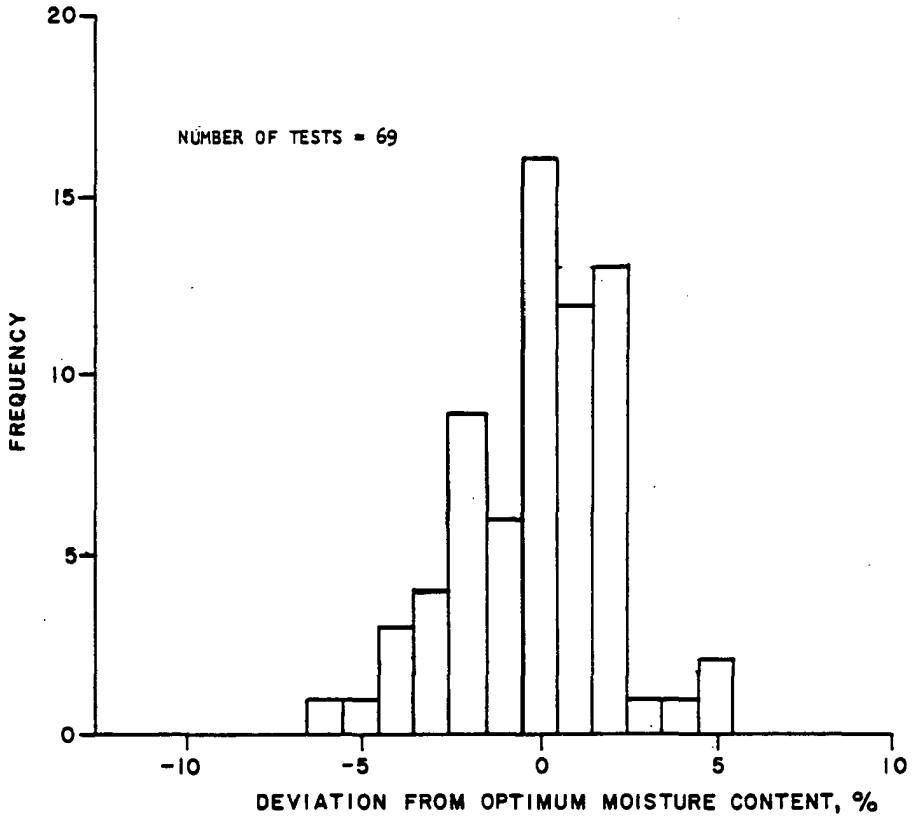
NOTES:

1. RETESTS ON AREAS WHERE TESTS DID NOT MEET COMPACTION CRITERIA ARE INCLUDED IN THIS PLOT.
2. ACCEPTANCE CRITERIA IS ± 2% OF OPTIMUM MOISTURE CONTENT, HOWEVER FAILING TESTS ON THE DRY SIDE WERE GENERALLY ACCEPTED IF THE DENSITY REQUIREMENTS WERE MET.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-105t

ESWS Structures - Cohesive Fill
Statistical Distribution Plot



Rev. 0

NOTES:

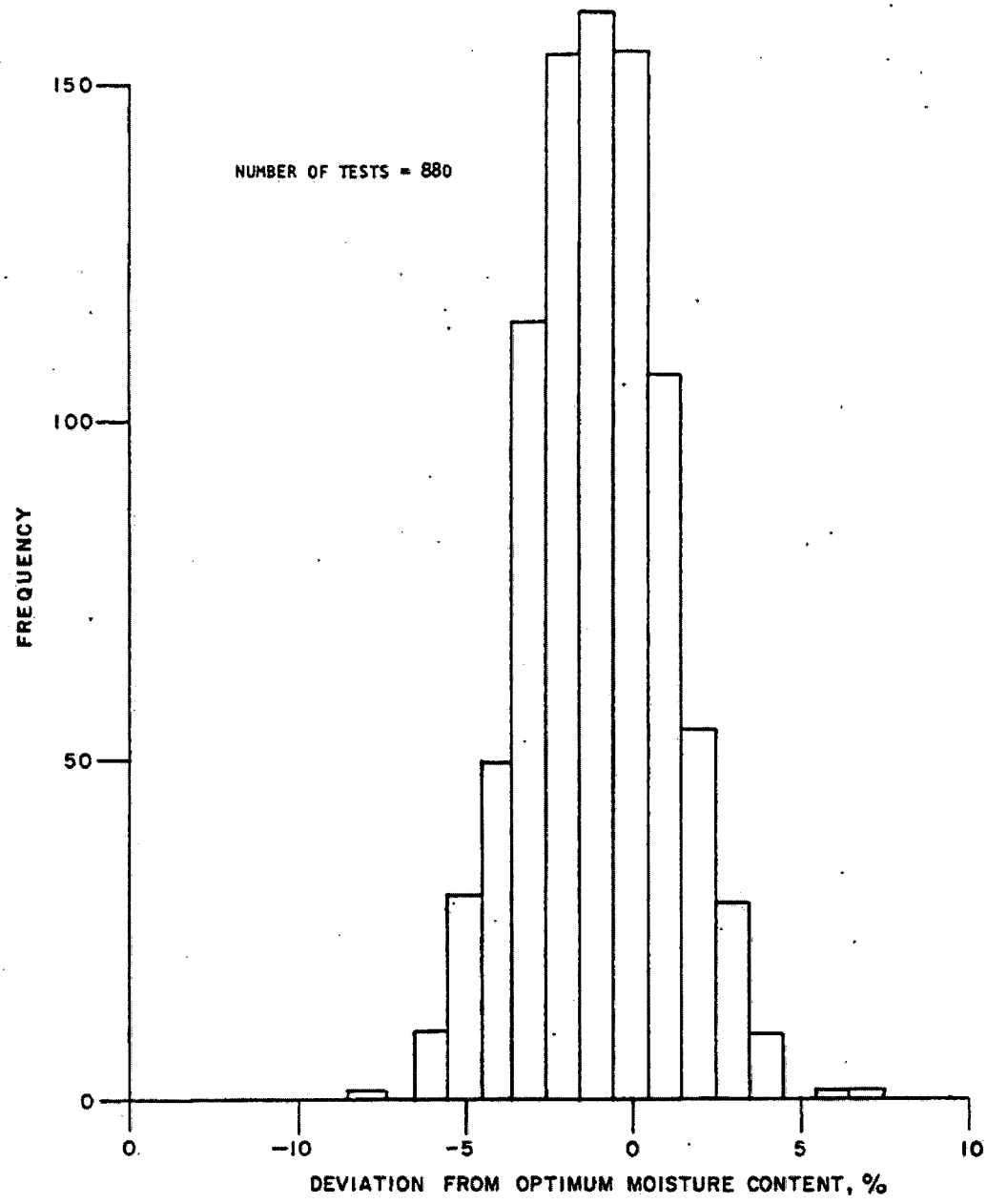
1. RETESTS ON AREAS WHERE TESTS DID NOT MEET COMPACTION CRITERIA ARE INCLUDED IN THIS PLOT.
2. ACCEPTANCE CRITERIA IS ± 2% OF OPTIMUM MOISTURE CONTENT, HOWEVER FAILING TESTS ON THE DRY SIDE WERE GENERALLY ACCEPTED IF THE DENSITY REQUIREMENTS WERE MET.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-105u

ESWS Unit 2 Plug - Cohesive Fill
Statistical Distribution Plot

7699-064-07



NOTES:

1. RETESTS ON AREAS WHERE TESTS DID NOT MEET COMPACTION CRITERIA ARE INCLUDED IN THIS PLOT.

2. ACCEPTANCE CRITERIA IS +/- 2% OF OPTIMUM MOISTURE CONTENT. HOWEVER FAILIHNG TESTS ON THE DRY SIDE WERE GENERALLY ACCEPTED IF THE

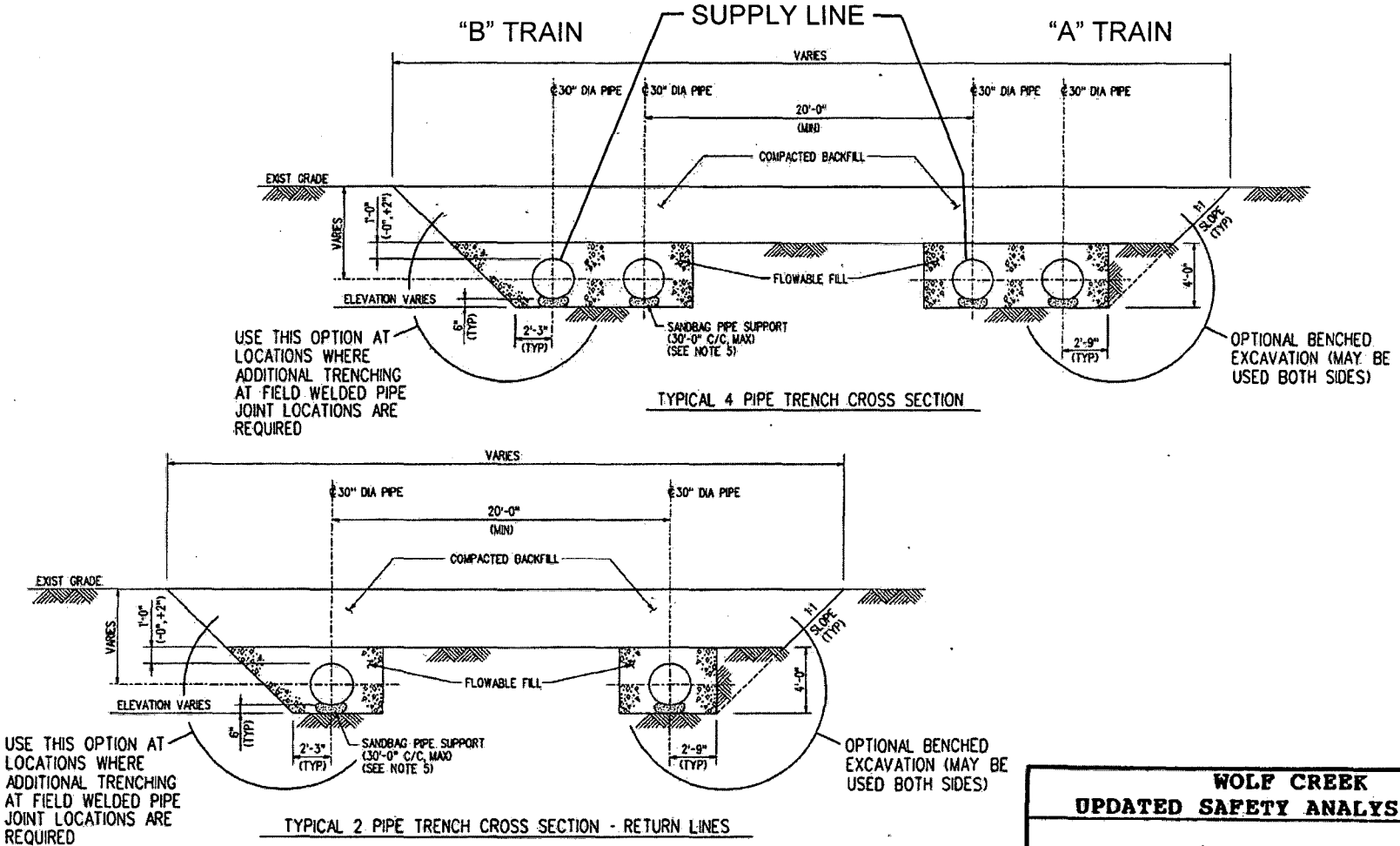
3. 12 NEW TESTS POINTS TAKEN FOR ESW REPLACEMENT PROJECT. HOWEVER DUE TO DROUGHT CONDITIONS MOST DATA POINTS ARE OUTSIDE OF CHART AREA. DENSITY REQUIREMENTS WERE MET.

REV. 28

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-105v

ESWS Pipeline - Cohesive Backfill
Statistical Distribution Plot



REV. 28

DRAWING REFERENCE
DRAWING NO.: C-K236 REV. 01
BY BECHTEL ENGINEERS

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-105w

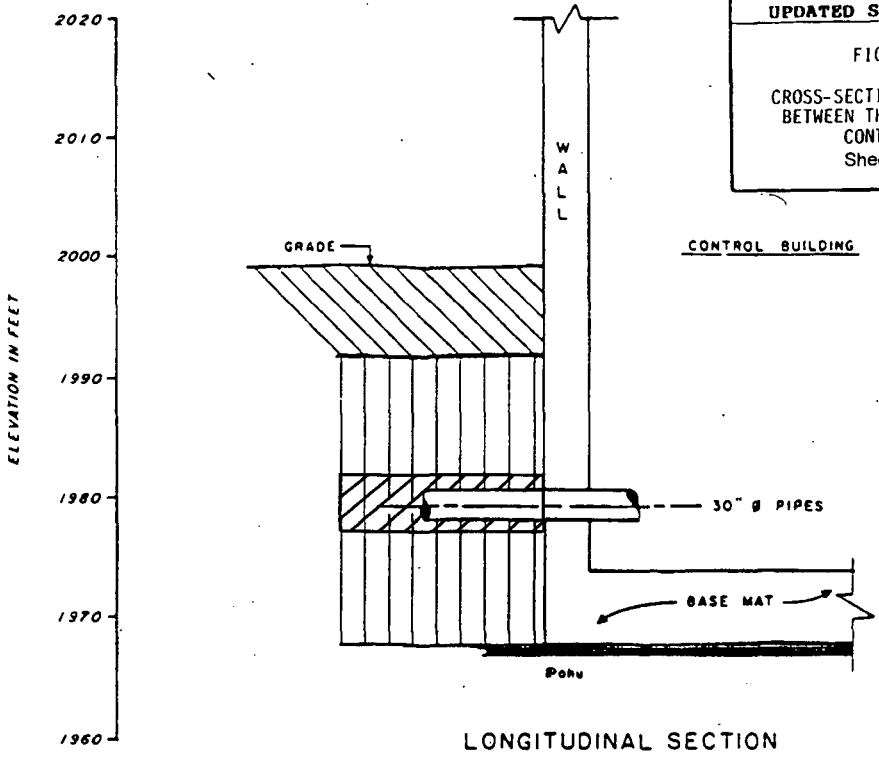
TYPICAL ESWS TRANSVERSE CROSS-SECTION

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

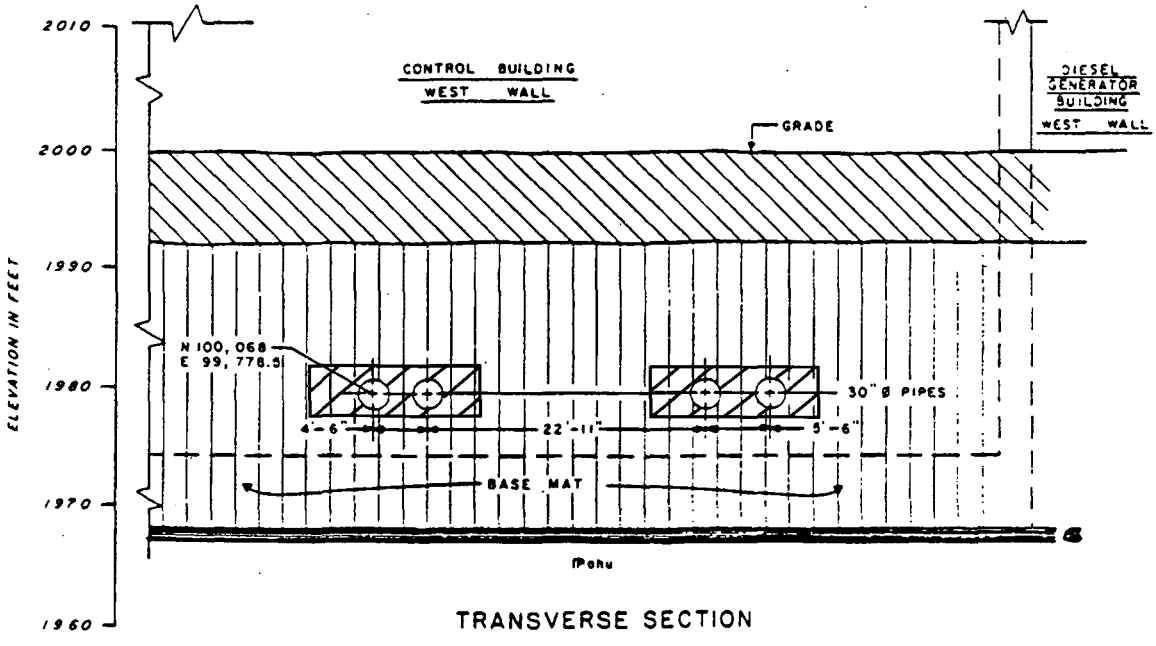
FIGURE 2.5-105x Rev. 28

CROSS-SECTIONS NEAR THE INTERFACE BETWEEN THE ESWS PIPES AND THE CONTROL BUILDING

Sheet 1 of 1



LONGITUDINAL SECTION



TRANSVERSE SECTION



KEY:

- COHESIVE FILL
- PIPE BEDDING
- MUD MAT
- SM

EXPLANATION

SYMBOL	STRATIGRAPHIC MEMBER
Pohu	HEUMADER SHALE MEMBER

NOTE:

ELEVATIONS AND COORDINATES REFER TO SNUPPS SYSTEM.

N100,000 SNUPPS = N584,670 STATE PLANE COORDINATE SYSTEM

E100,000 SNUPPS = E2,807,250 STATE PLANE COORDINATE SYSTEM

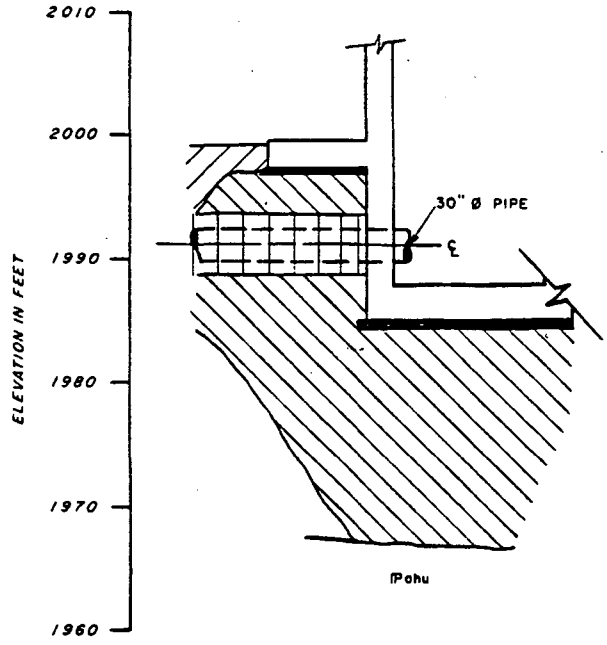
ELEVATION 2,000' SNUPPS = 1,100' U.S.C.S. DATUM.

DRAWING REFERENCE
DRAWING NOS. C-0C 3312, REV. 1;
C-0C 3902, REV. 14;
C-0R 3901, REV. 9;
BY: BECHTEL ENGINEERS

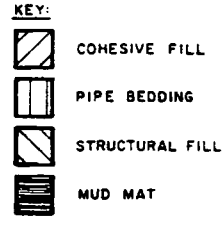
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

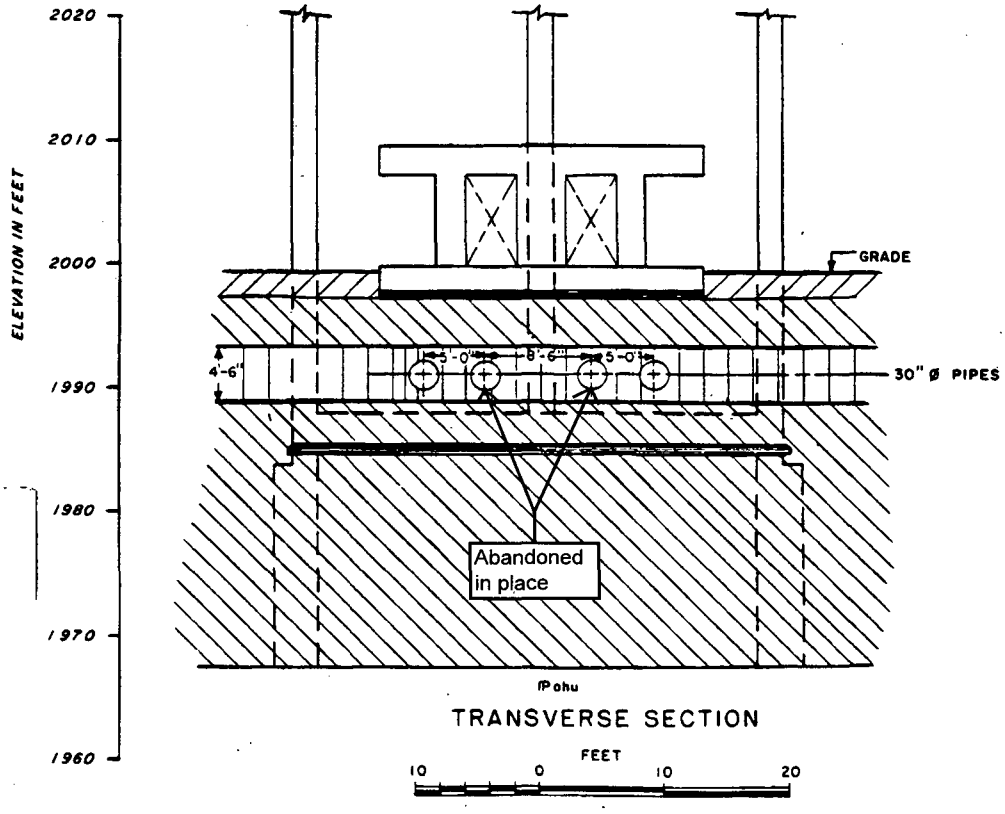
FIGURE 2.5-105y Rev. 28

CROSS SECTIONS NEAR THE INTERFACE BETWEEN THE ESWS PIPES AND THE PUMPHOUSE
Sheet 1 of 1



LONGITUDINAL SECTION





TRANSVERSE SECTION

DRAWING REFERENCE:

DRAWING NOS.: C-KC 301, REV. 4;
C-KC 302, REV. 3;
C-KC 303, REV. 3;
C-KC 305, REV. 4;
C-KC 306, REV. 4;
BY: BECHTEL ENGINEERS

NOTE:

ELEVATIONS REFER TO SNUPPS SYSTEM.

ELEVATION 2,000' SNUPPS = 1,100' U.S.G.S. DATUM.

EXPLANATION

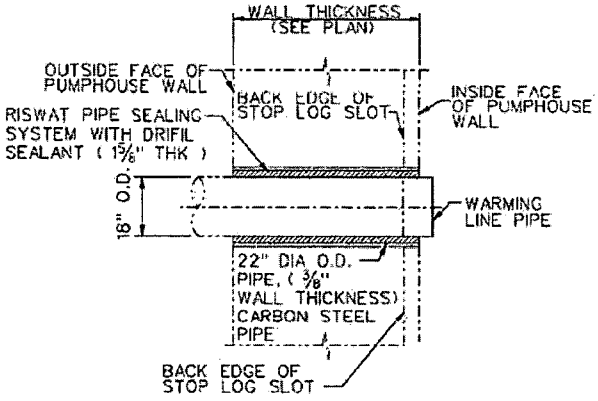
SYMBOL	STRATIGRAPHIC MEMBER
Pohu	HEUMADER SHALE MEMBER

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

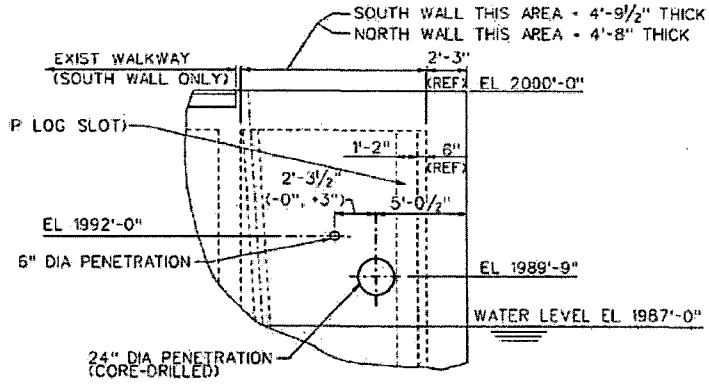
FIGURE 2.5-105Z

CROSS-SECTIONS NEAR THE INTERFACE BETWEEN THE ESWS WARMING LINES AND THE PUMPHOUSE

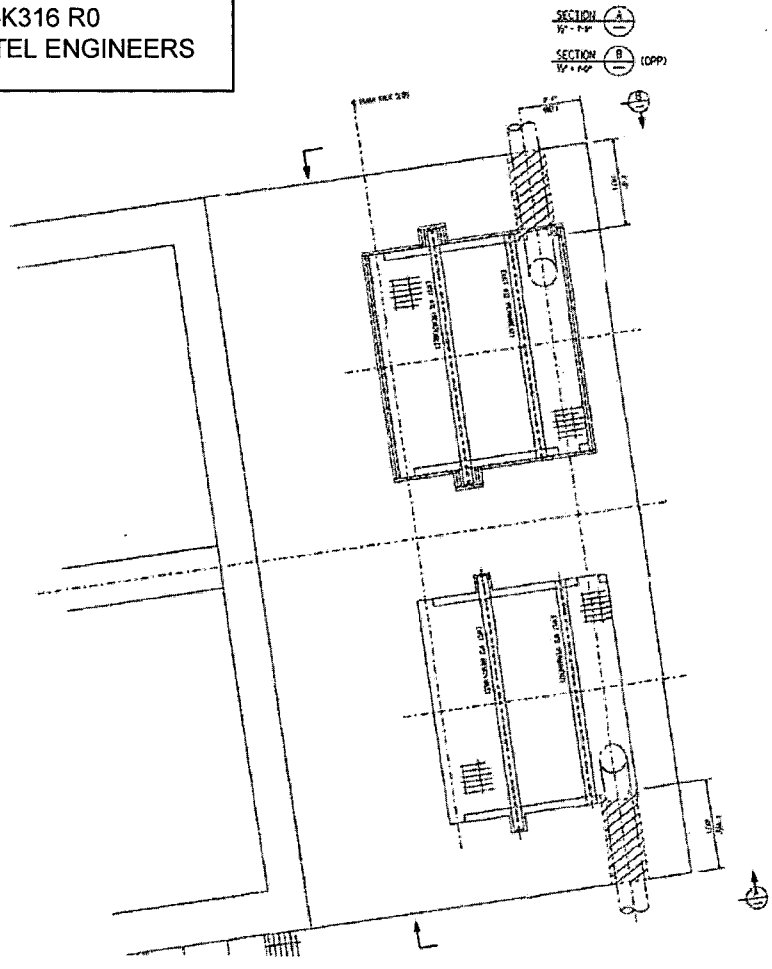
REV. 28



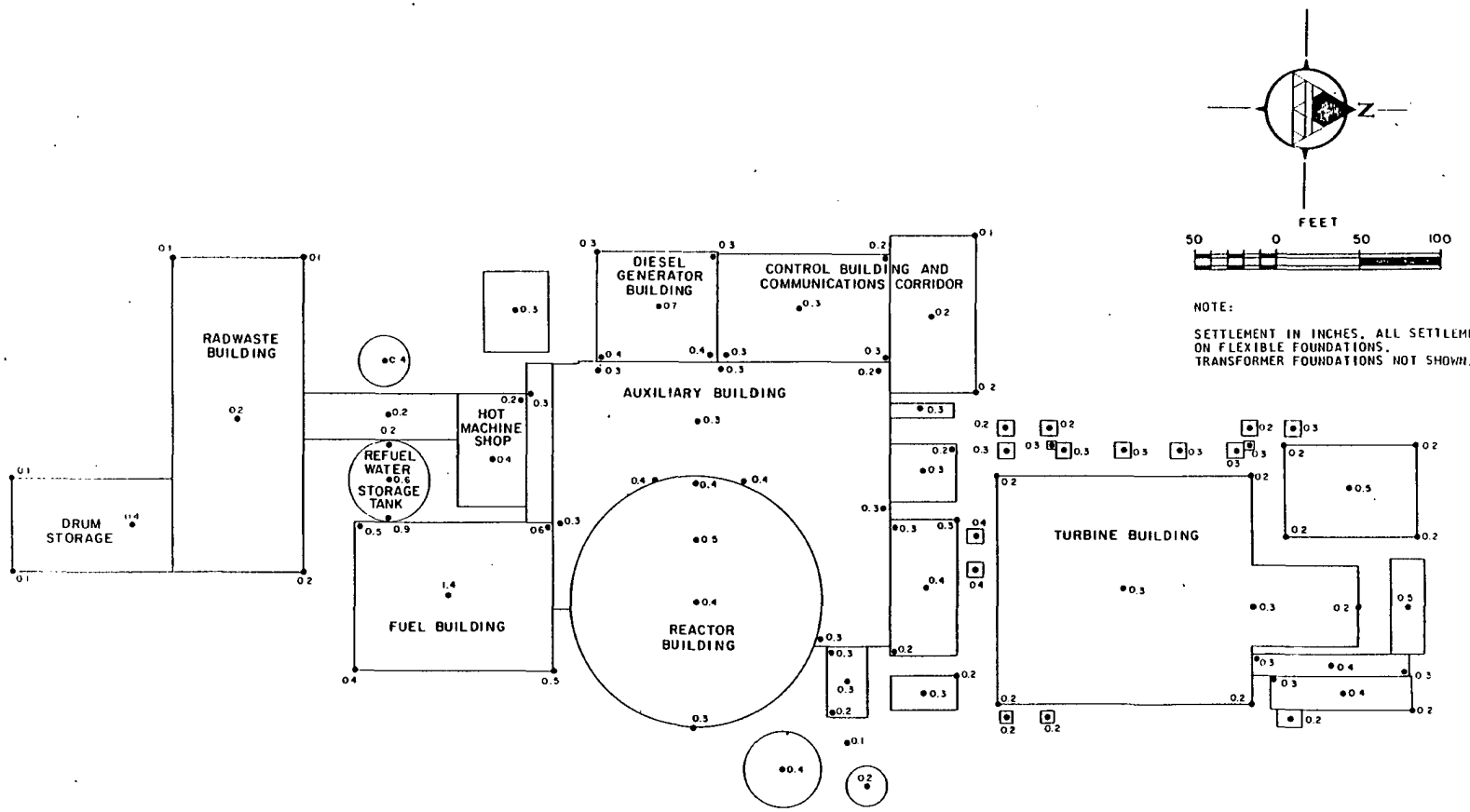
WARMING LINE PENETRATION DETAIL



DRAWING REFERENCE:
C-KC303 R18
C-K316 R0
BY BECHTEL ENGINEERS



ESWS PUMPHOUSE PLAN

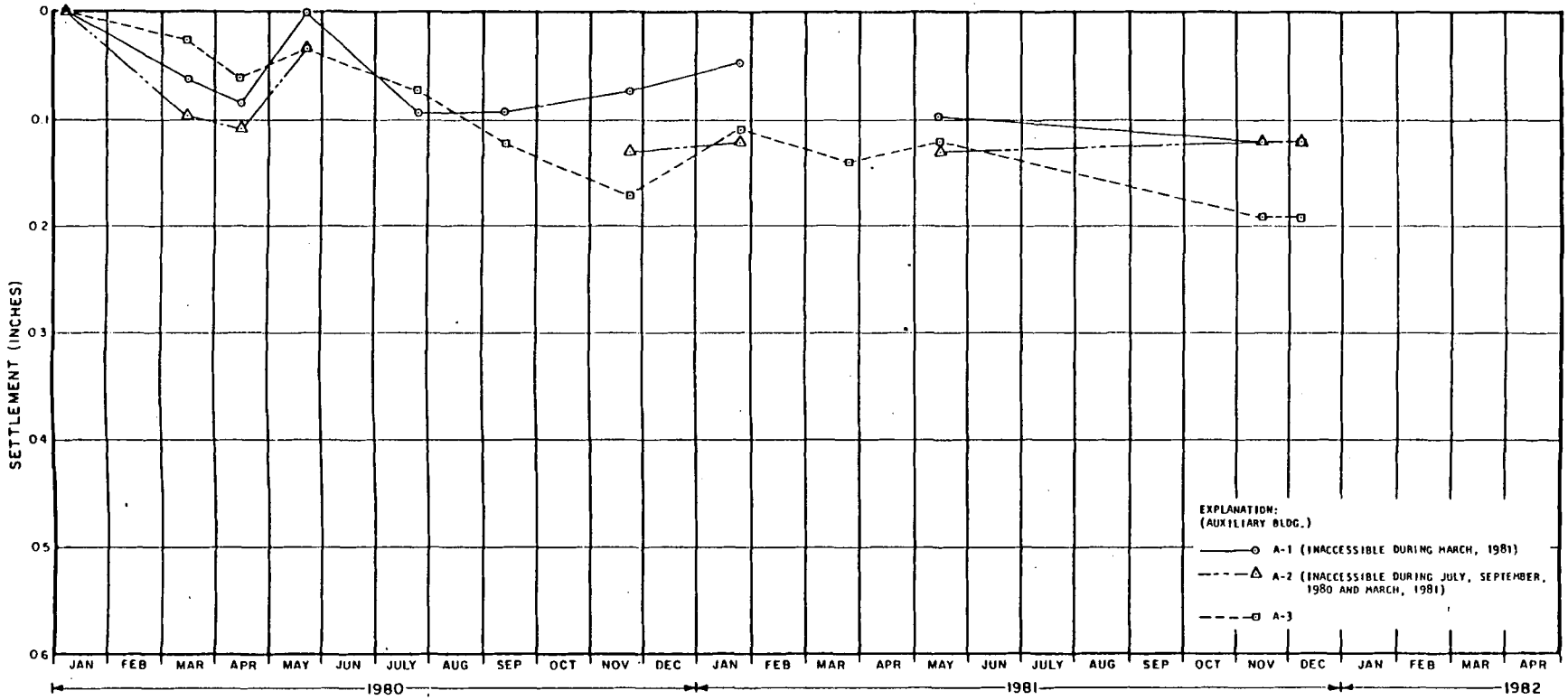


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-106

Computed Settlement



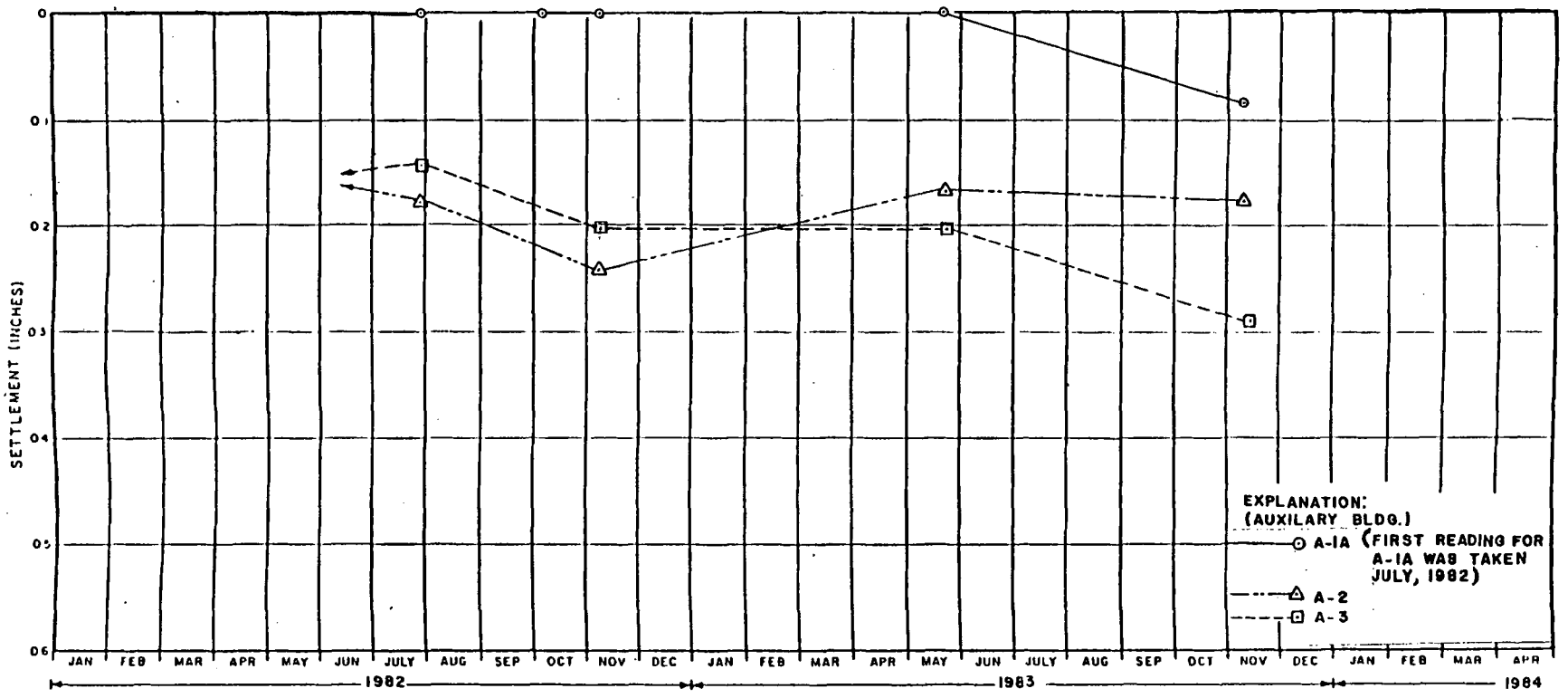
7699-064-07

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-106a (Sheet 1 of 2)

Measured Settlement, Auxiliary Building

Rev. 0



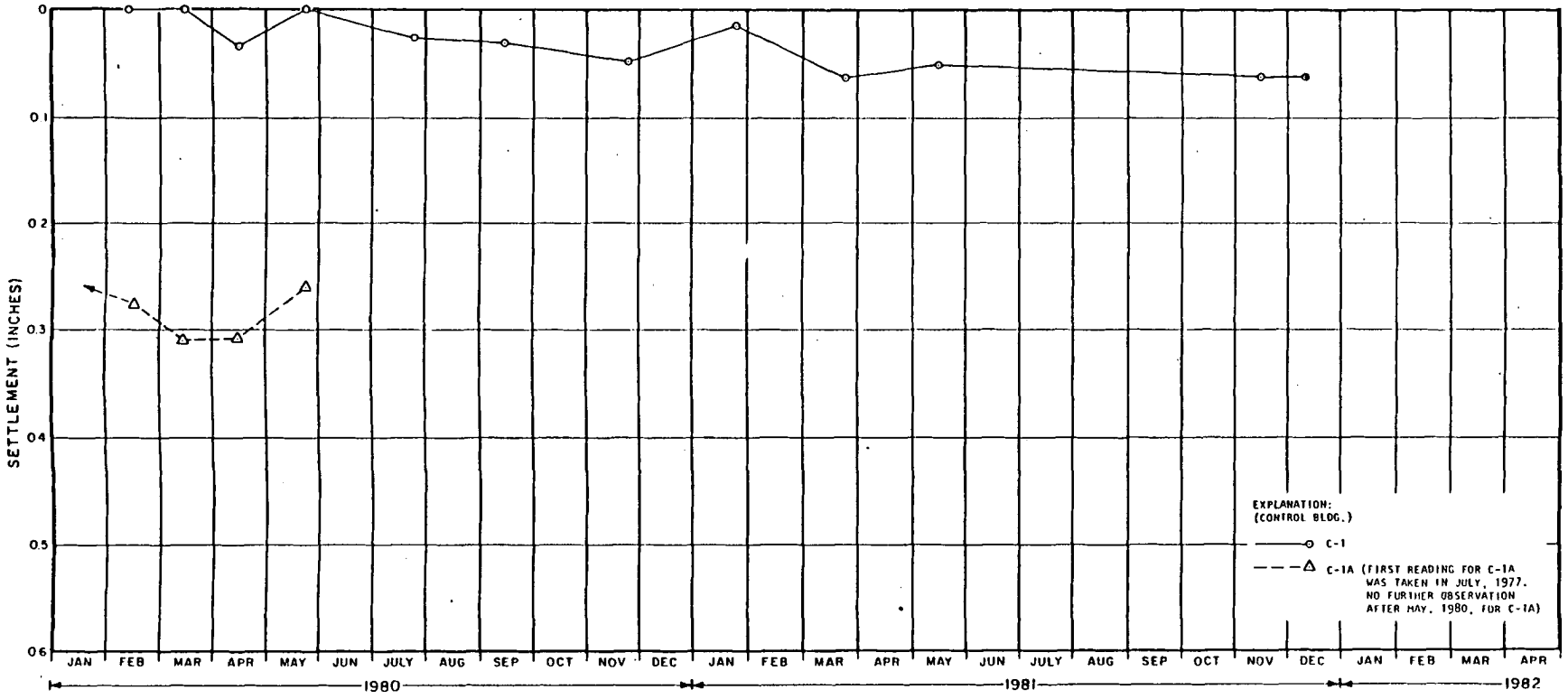
7699-054-07

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-106a (Sheet 2 of 2)

Measured Settlement, Auxiliary Building

Rev. 0



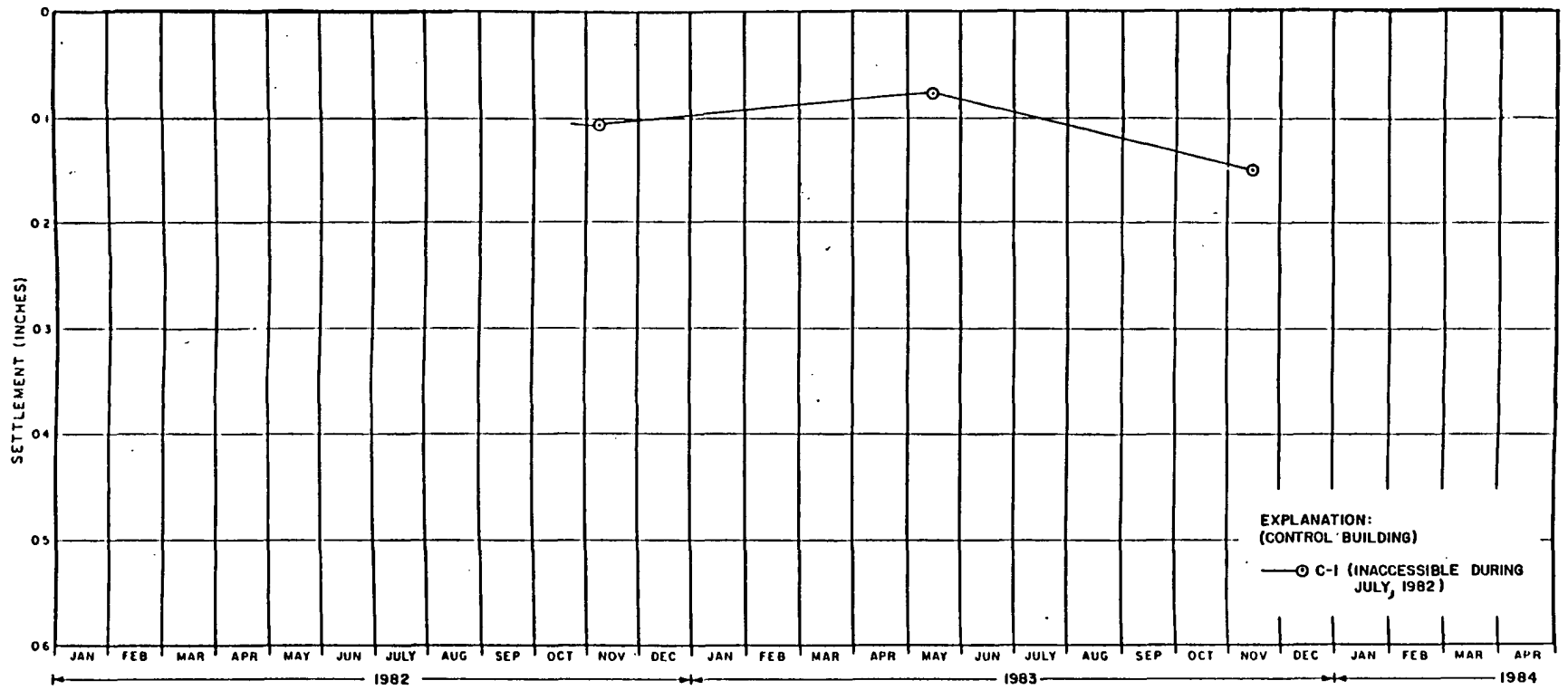
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-106b (Sheet 1 of 2)

Measured Settlement, Control Building

Rev. 0

7699-064-07



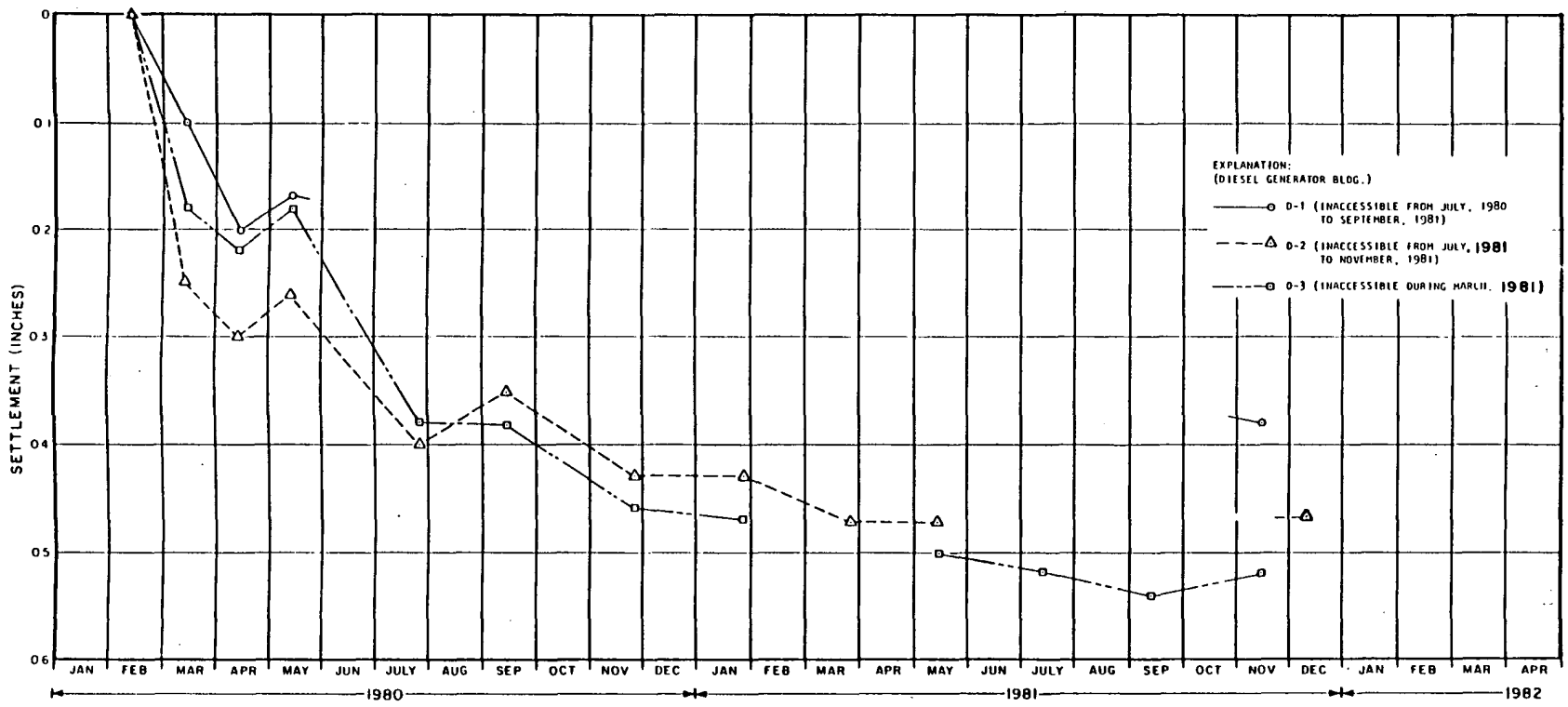
7699-064-07

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-106b (Sheet 2 of 2)

Measured Settlement, Control Building

Rev. 0



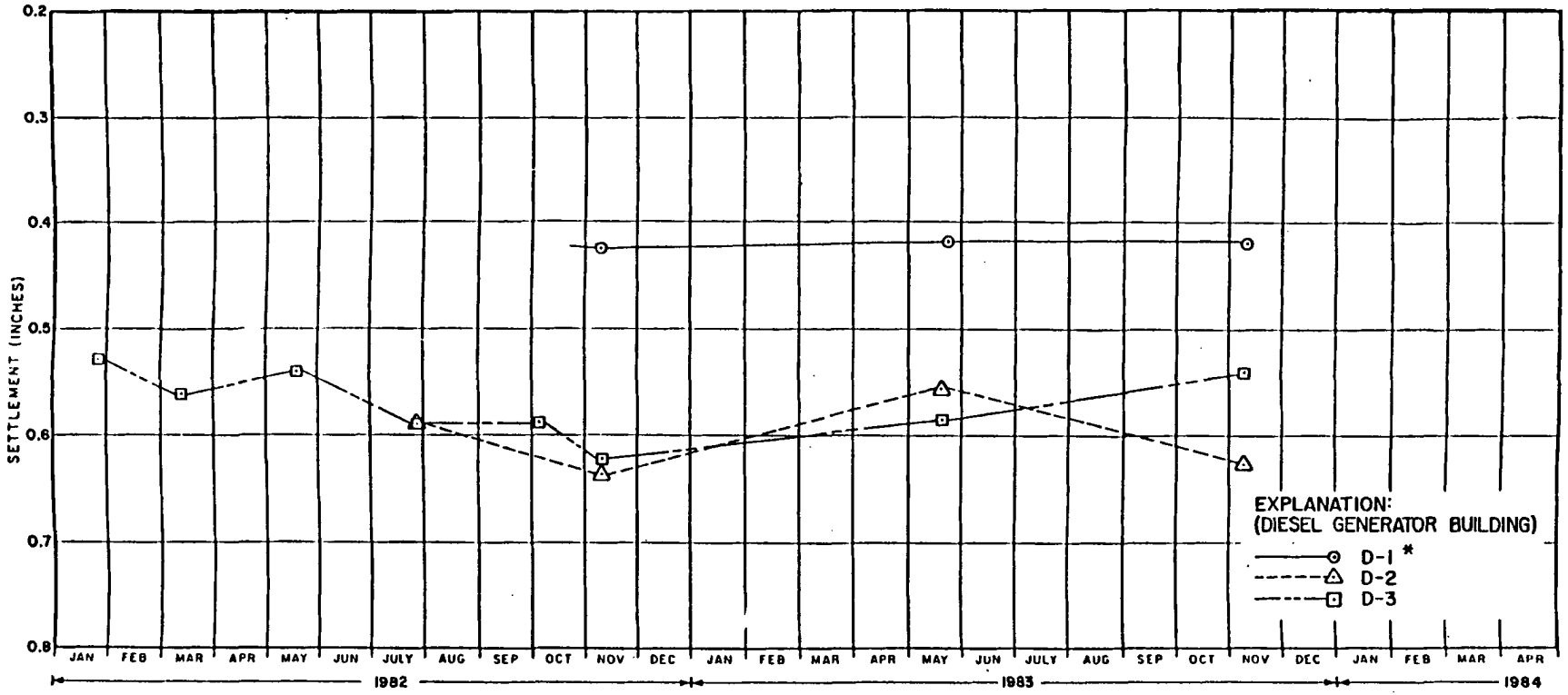
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-106c (Sheet 1 of 2)

Measured Settlement, Diesel Generator Building

Rev. 0

7699-064-07



*(INACCESSIBLE DURING JULY, 1982)

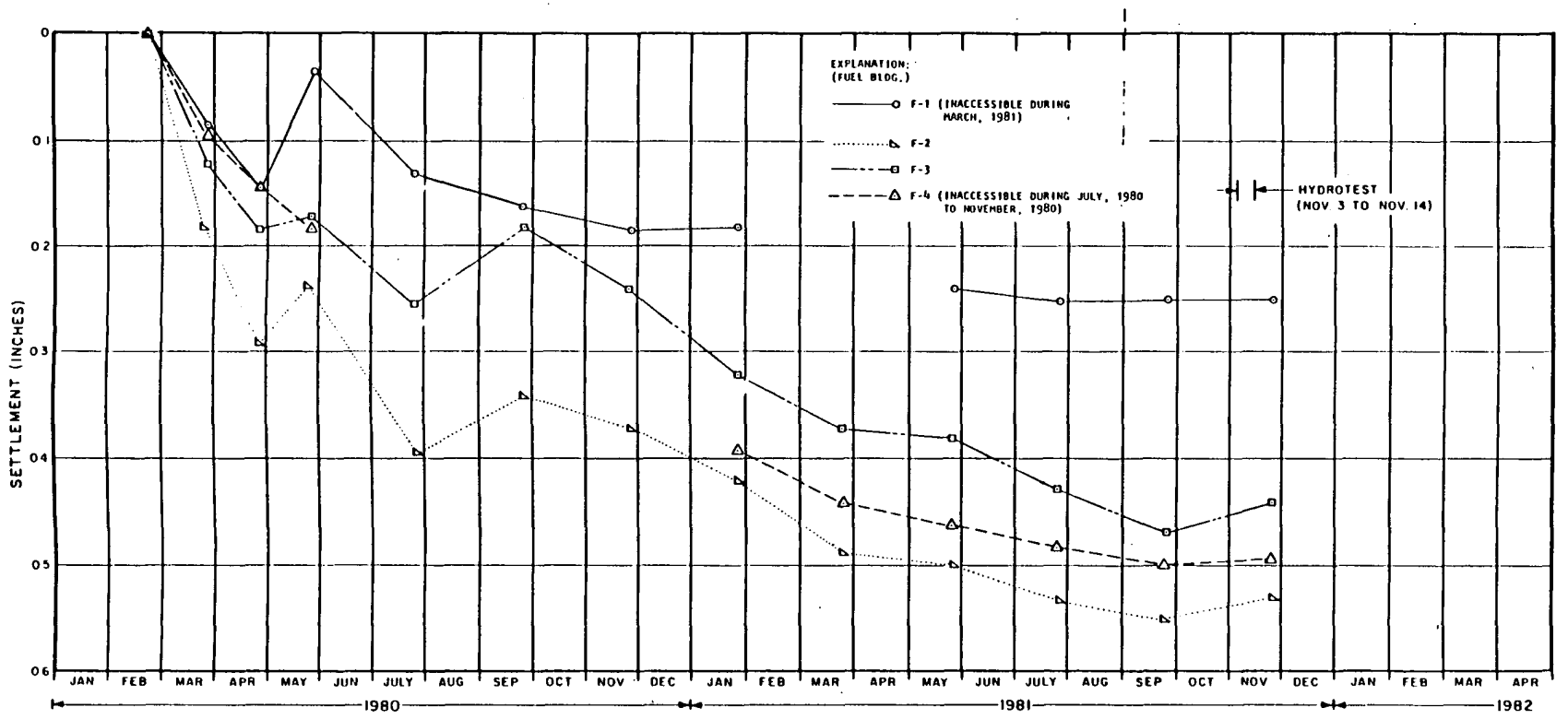
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-106c (Sheet 2 of 2)

Measured Settlement, Diesel Generator Building

Rev. 0

7699-064-07



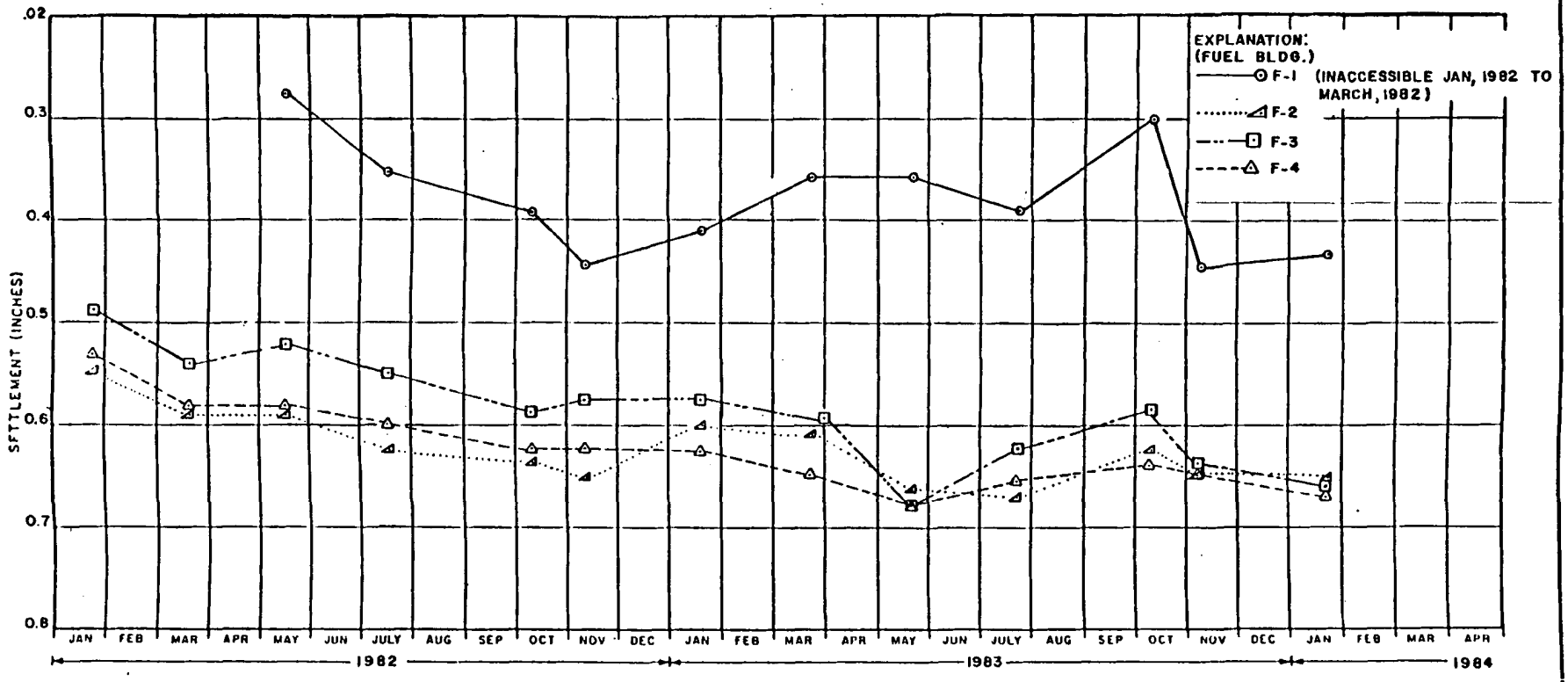
7699-064-07

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-106d (Sheet 1 of 2)

Measured Settlement, Fuel Building

Rev. 0



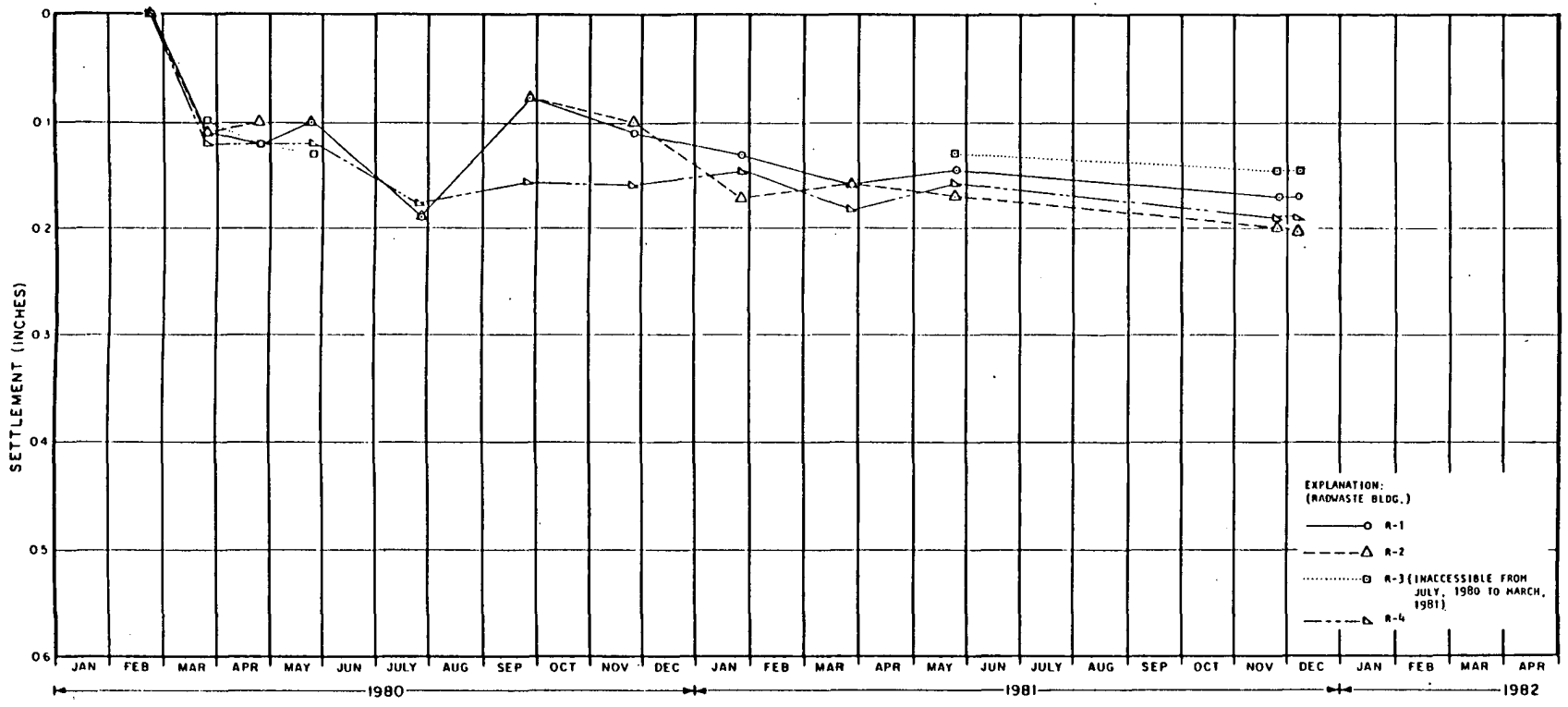
7699-064-07

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-106d (Sheet 2 of 2)

Measured Settlement, Fuel Building

Rev. 0



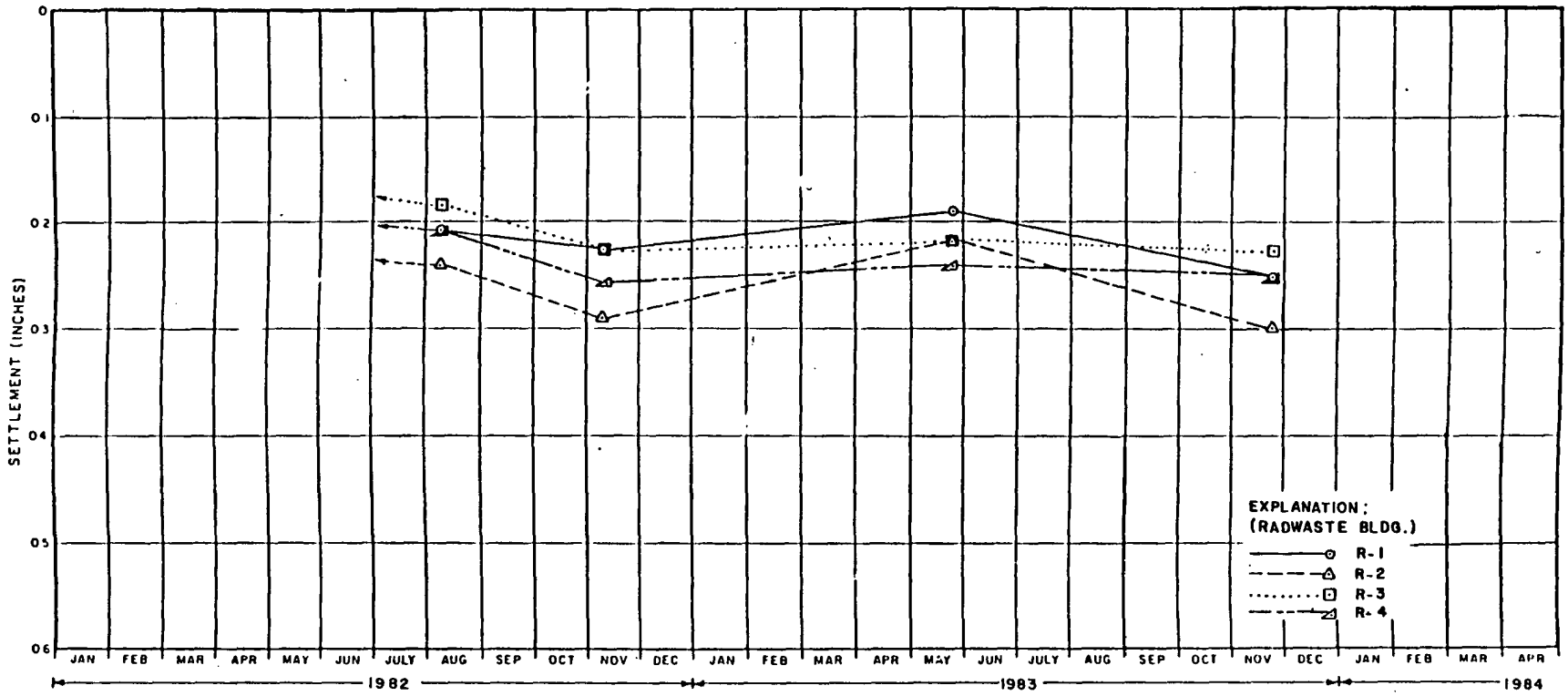
7699-064-07

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-106e (Sheet 1 of 2)

Measured Settlement, Radwaste Building

Rev. 0



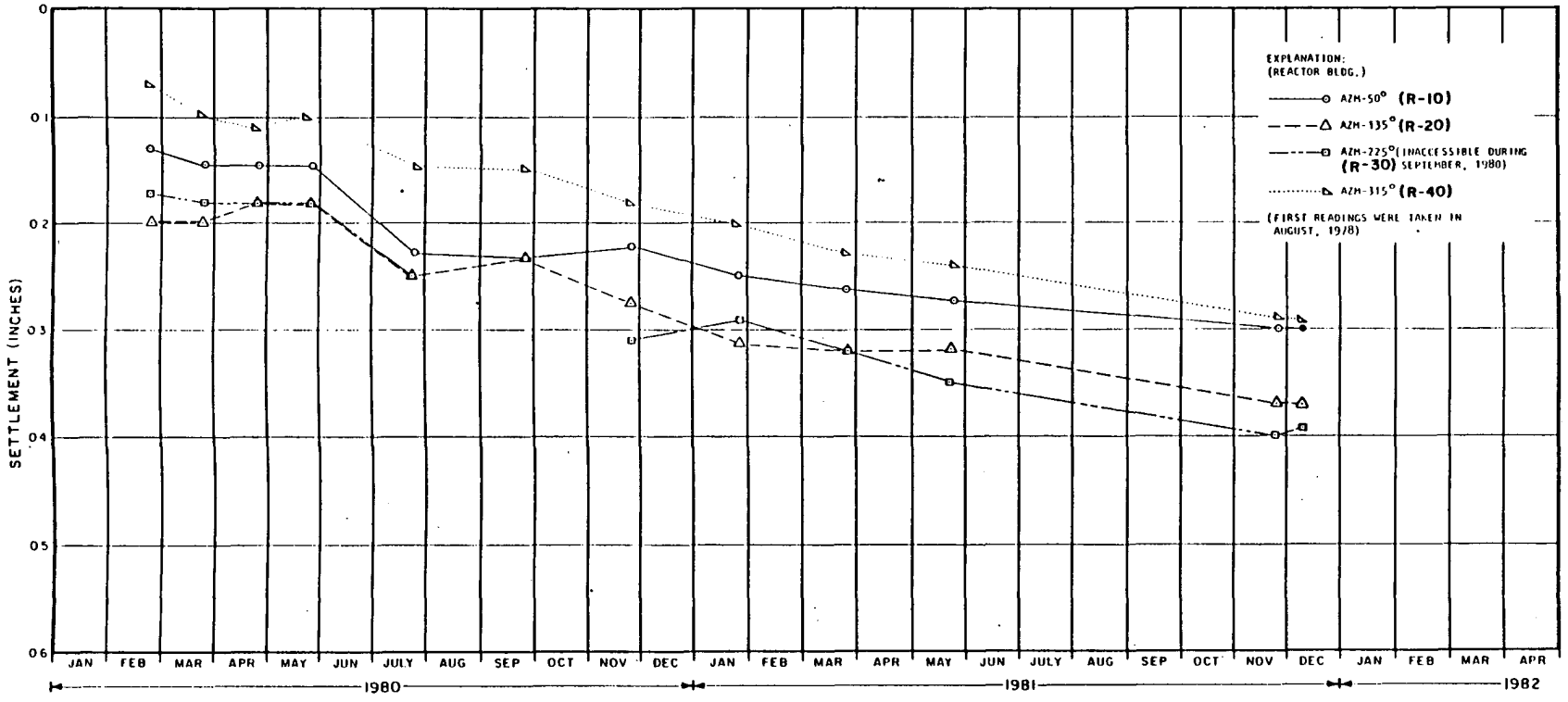
7699-054-07

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-106e (Sheet 2 of 2)

Measured Settlement, Radwaste Building

Rev. 0



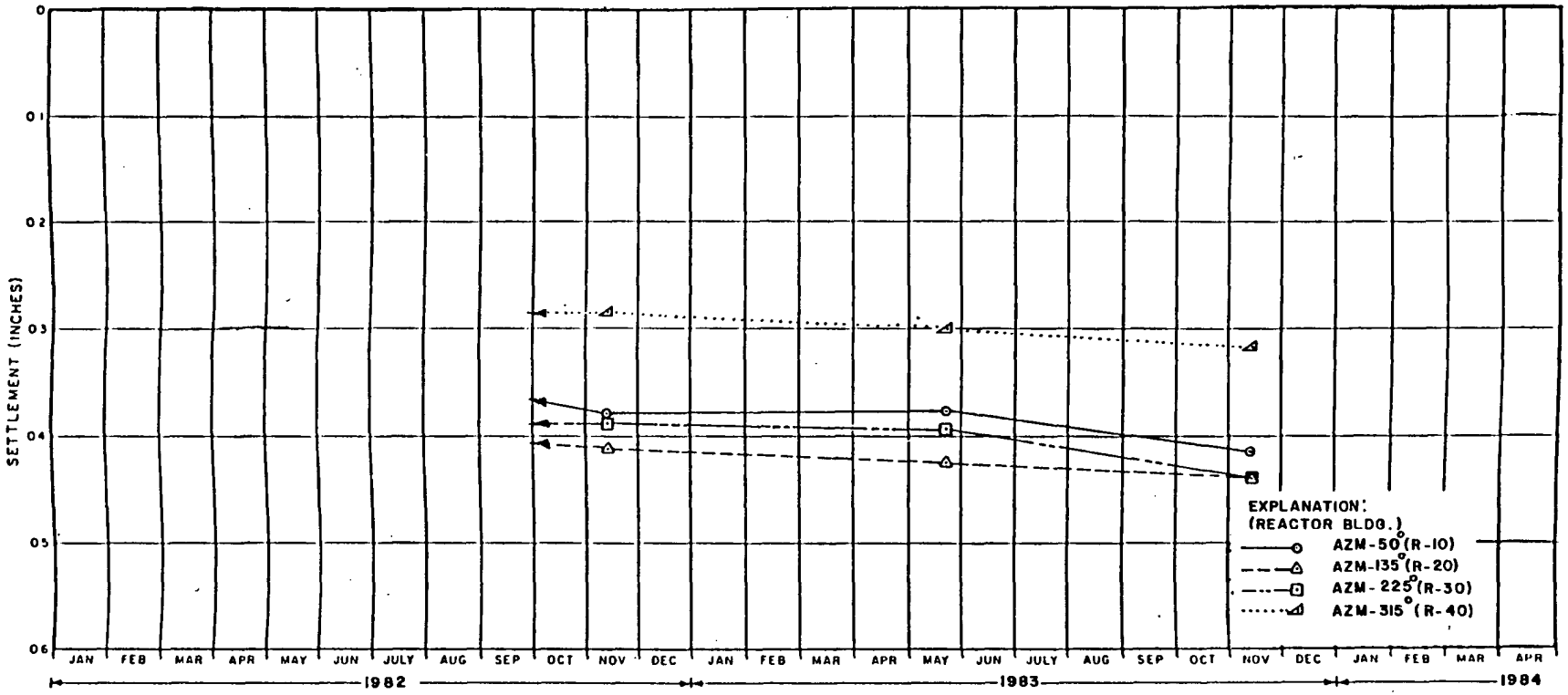
7699-064-07

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-106f (Sheet 1 of 2)

Measured Settlement, Reactor Building

Rev. 0



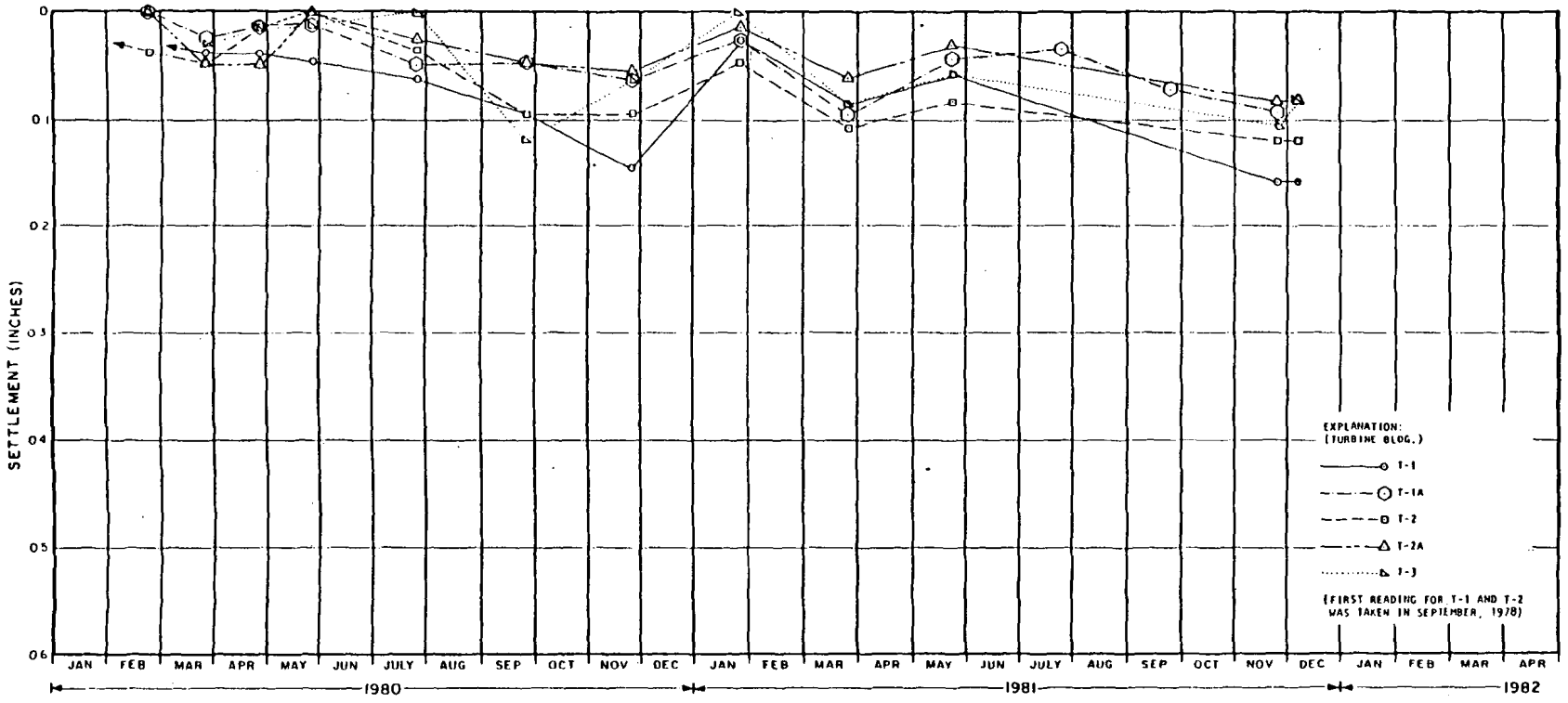
7699-C54-07

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-106f (Sheet 2 of 2)

Measured Settlement, Reactor Building

Rev. 0



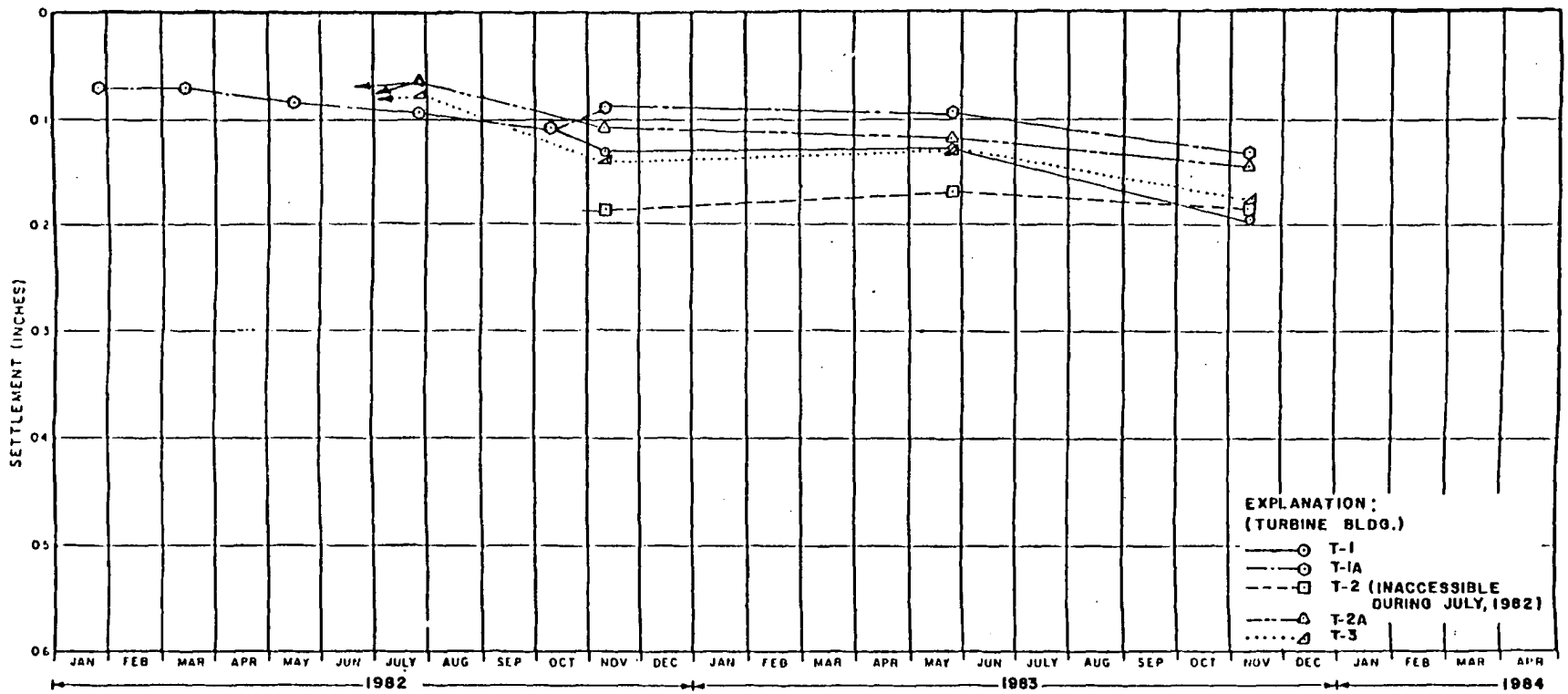
7699-064-07

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-106g (Sheet 1 of 4)

Measured Settlement, Turbine Building

Rev. 0



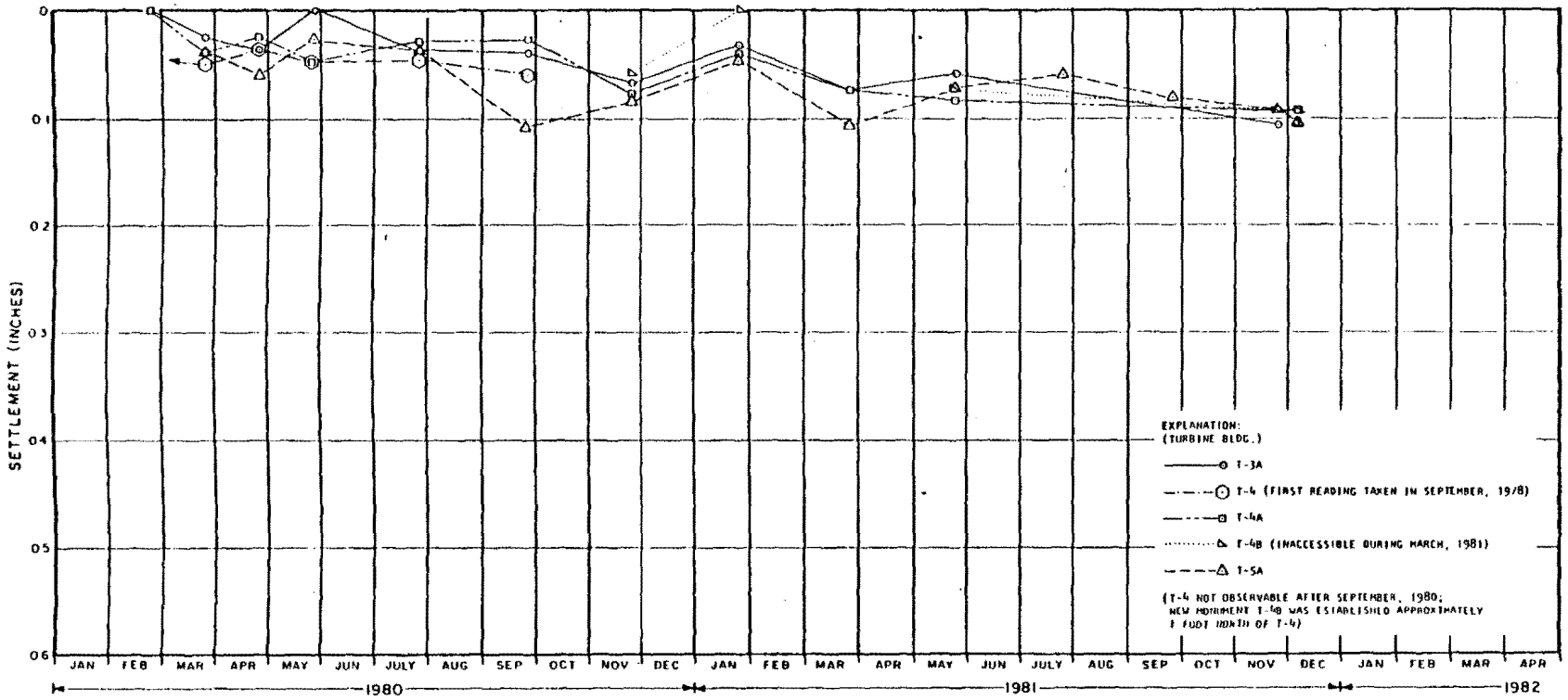
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-106g (Sheet 2 of 4)

Measured Settlement, Turbine Building

Rev. 0

7699.224.07



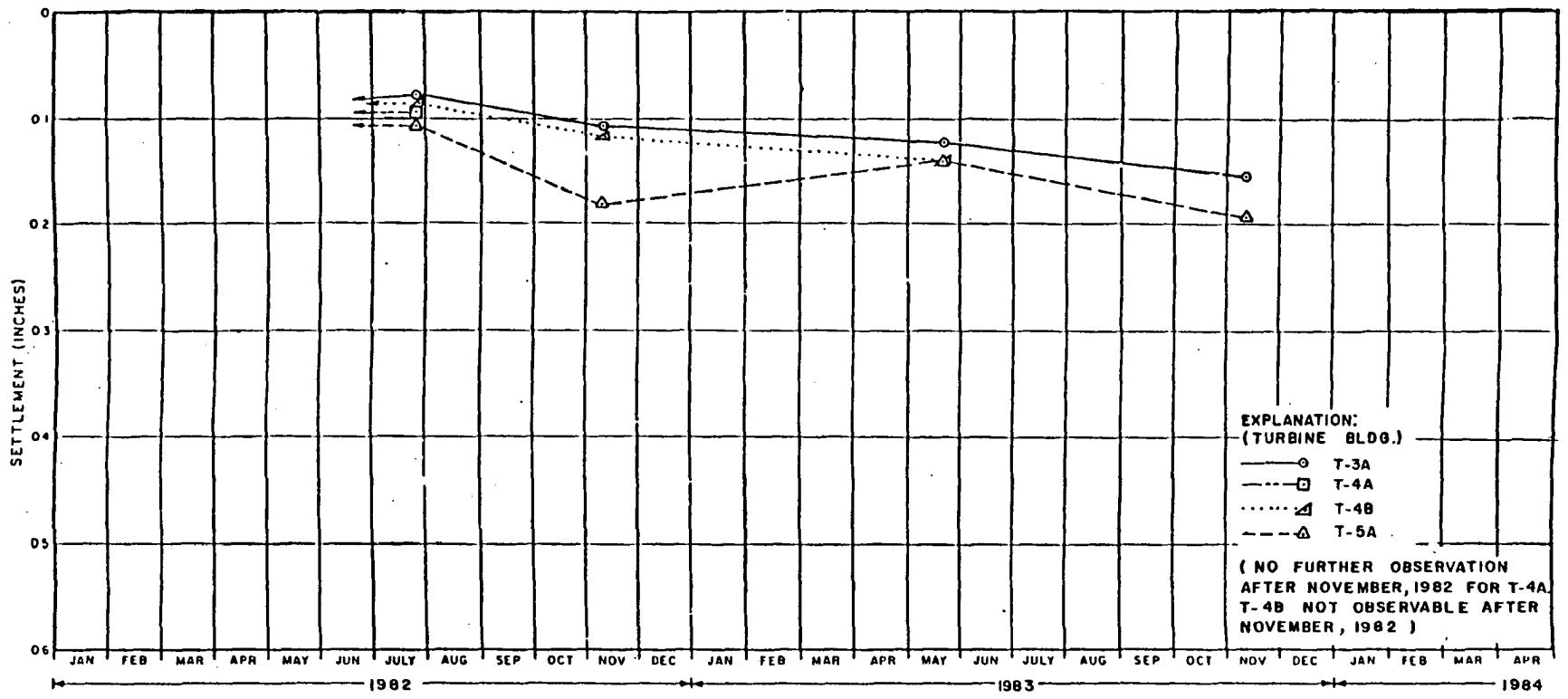
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-106g (Sheet 3 of 4)

Measured Settlement, Turbine Building

Rev. 0

7699-064-07



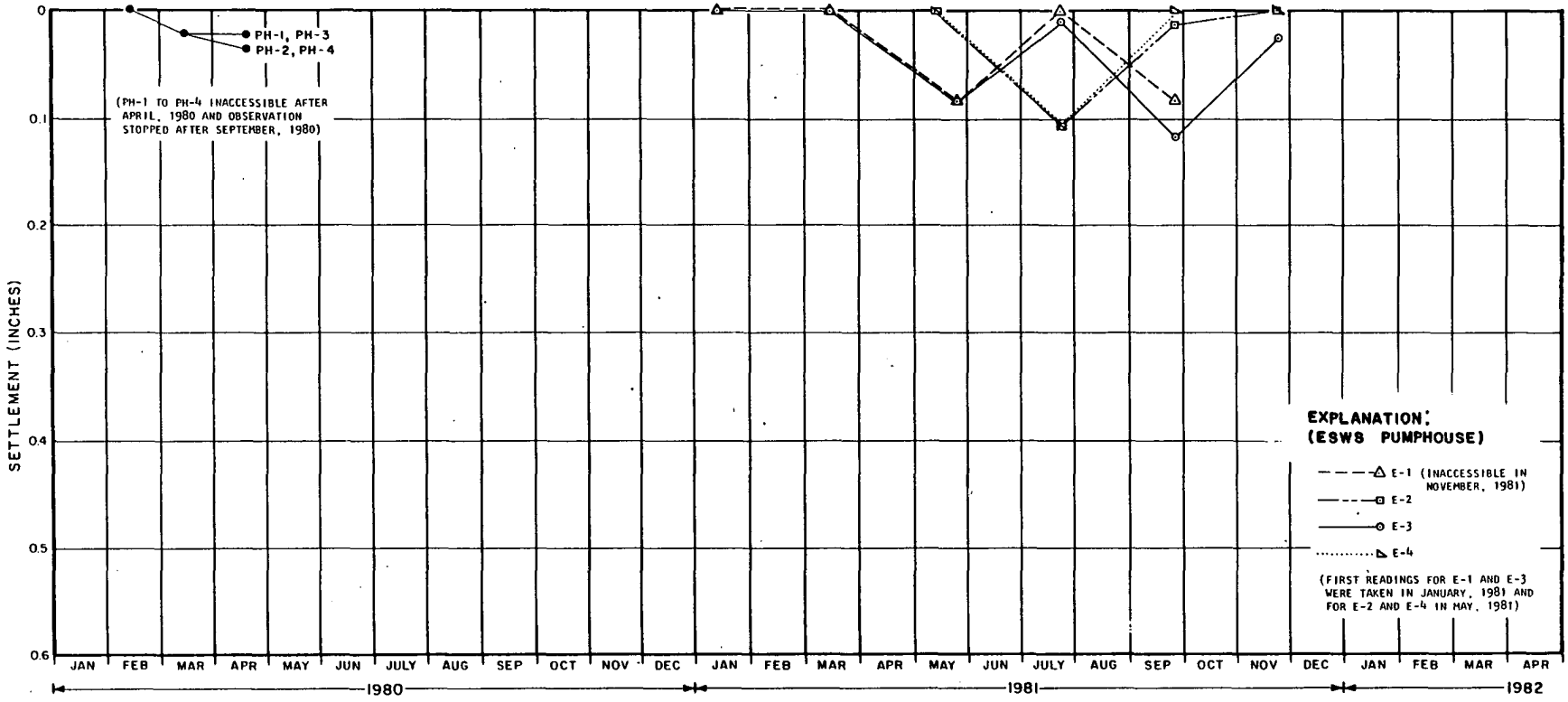
7699-C54-07

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-106g (Sheet 4 of 4)

Measured Settlement, Turbine Building

Rev. 0



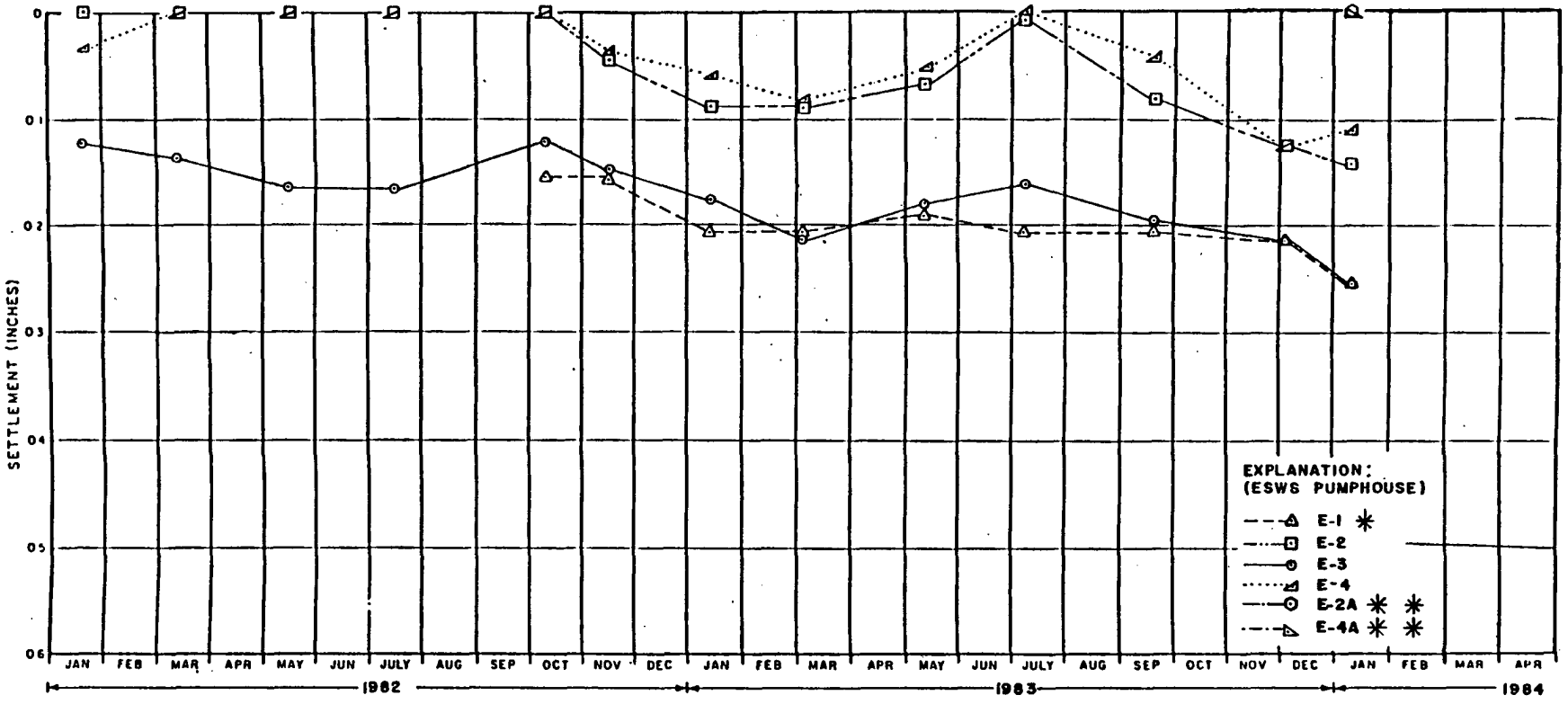
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

FIGURE 2.5-106h (Sheet 1 of 2)

MEASURED SETTLEMENT,
ESWS PUMPHOUSE

Rev. 0

7699-064-07



*INACCESSIBLE FROM JAN. 1982 TO JULY, 1982

**FIRST READING FOR E-2A & E-4A WERE TAKEN JAN., 1984

Rev. 0

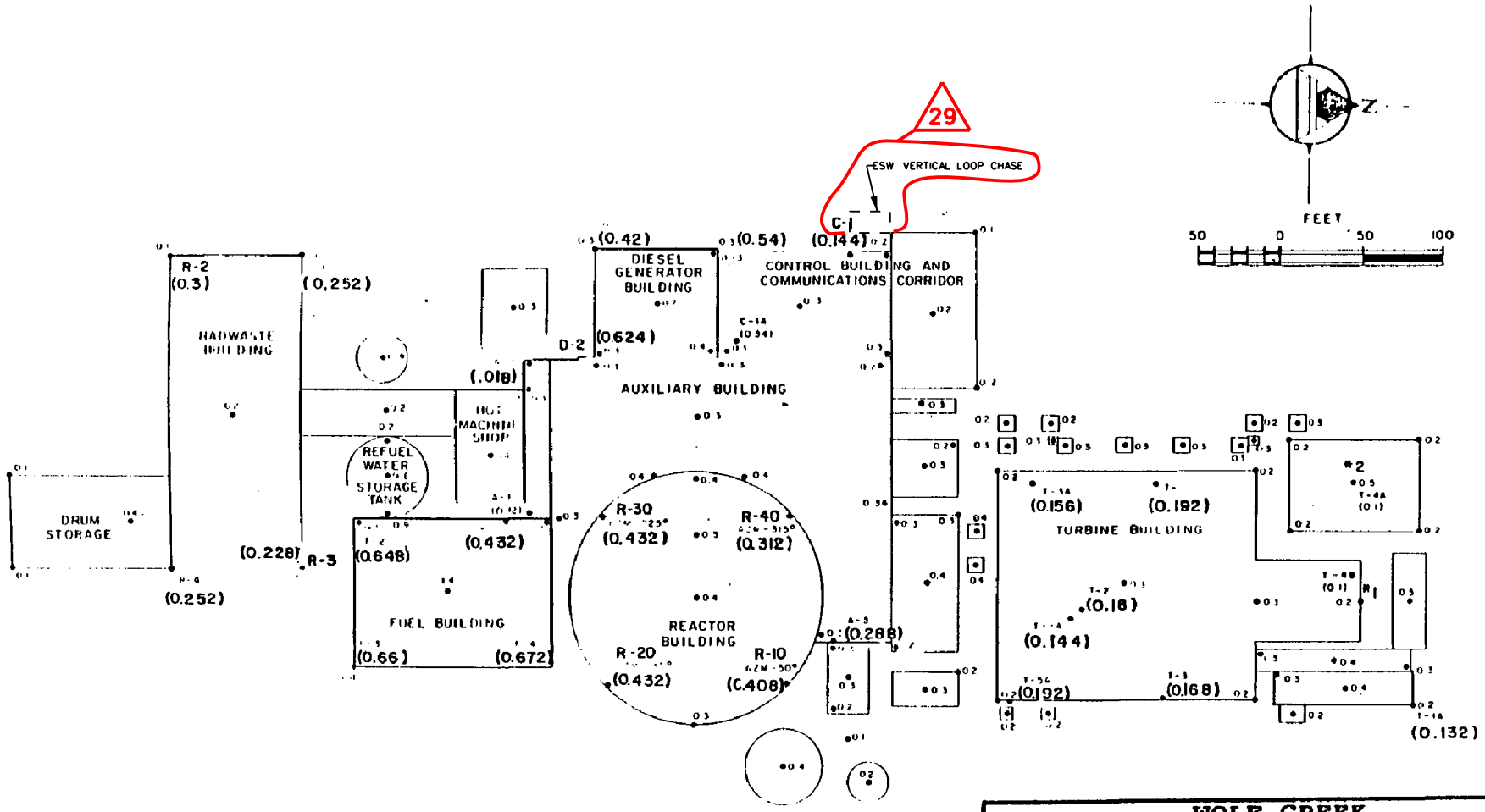
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

FIGURE 2.5-106h

MEASURED SETTLEMENT,
ESWS PUMPHOUSE

(Sheet 2 of 2)

7599-054-07



REV. 29

NOTES:

SETTLEMENT IN INCHES. ALL COMPUTED SETTLEMENTS ARE BASED ON FLEXIBLE FOUNDATIONS. TRANSFORMER FOUNDATIONS NOT SHOWN.

0.2 INDICATES COMPUTED SETTLEMENT.

(0.3) INDICATES MEASURED SETTLEMENT.

R-3 INDICATES NUMBER AND LOCATION OF SETTLEMENT MONUMENT.

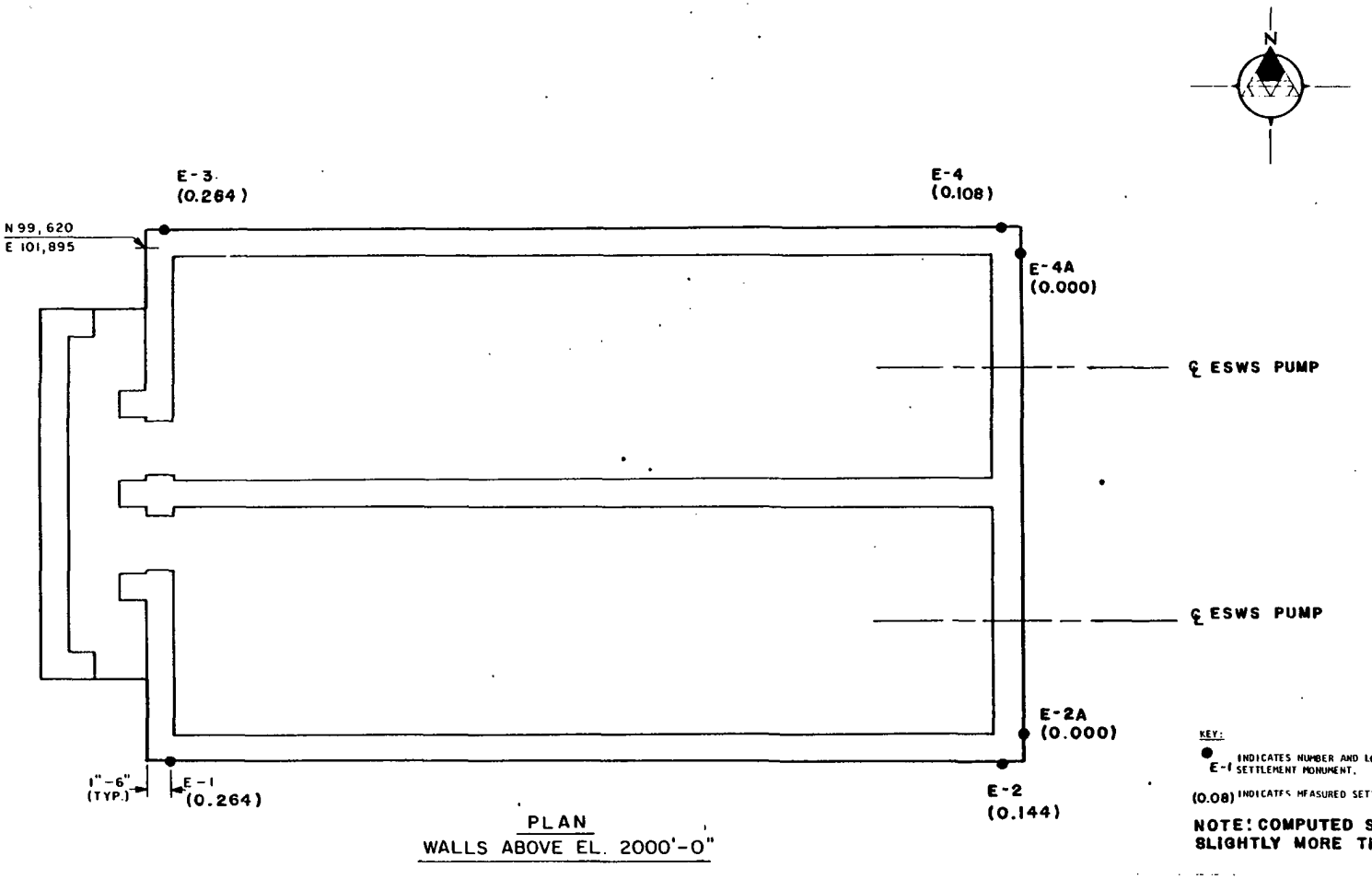
*1. T-4B DESTROYED (11/09/83)

*2. T-4A NOT ACCESSABLE FROM 7/82

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-106i

Computed and Measured Settlement, Power Block

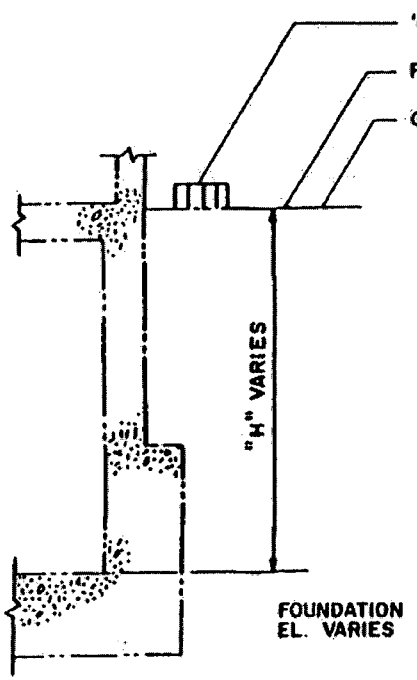


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

FIGURE 2.5-106j

MEASURED SETTLEMENT,
ESWS PUMPHOUSE

Rev. 0



NOTE:
WALL CONFIGURATION IS FOR PICTORIAL PURPOSE ONLY

	CASES	STATIC LOADS		DYNAMIC LOADS	
		AT REST	SURCHG.	AT REST	SURCHG.
1	SAFE SHUTDOWN EARTHQUAKE (SSE) (0.15 G)	100 H	0.45 q	22.5 H	.225 q
2	OPERATING BASIS EARTHQUAKE (OBE) (0.06G)	100 H	0.45 q	9 H	.09 q

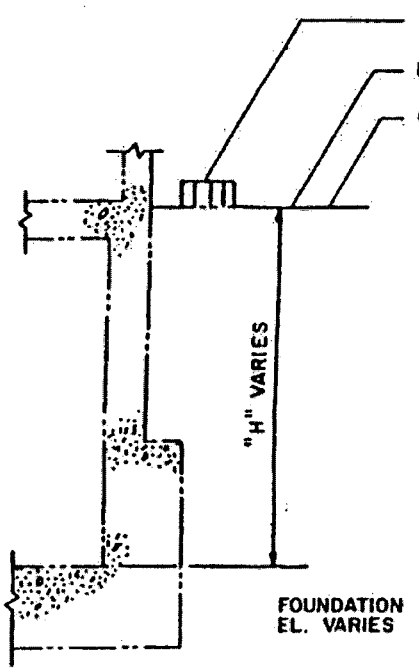
NOTES:
1. K_o TAKEN AS 0.45
2. UNIT WEIGHT OF SOIL
   SATURATED 150 PCF
   BUOYANT 88 PCF
3. CLSM CAN BE CREATED WITH SIMILAR PROPERTIES AS BACKFILL AND GENERATES A SMALLER LOAD AGAINST A STRUCTURE.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

FIGURE 2.5-107a

DESIGN CRITERIA FOR LATERAL EARTH PRESSURES - WOLF CREEK SITE (GRANUAL BACKFILL)

REV. 28



NOTE:
WALL CONFIGURATION IS FOR PICTORIAL PURPOSE ONLY

	CASES	STATIC LOADS		DYNAMIC LOADS	
		AT REST	SURCHG.	AT REST	SURCHG.
1	SAFE SHUTDOWN EARTHQUAKE (SSE) (0.15 G)	106 H	0.65 q	20 H	.225 q
2	OPERATING BASIS EARTHQUAKE (OBE) (0.06 G)	106 H	0.65 q	8 H	.09 q

NOTES:

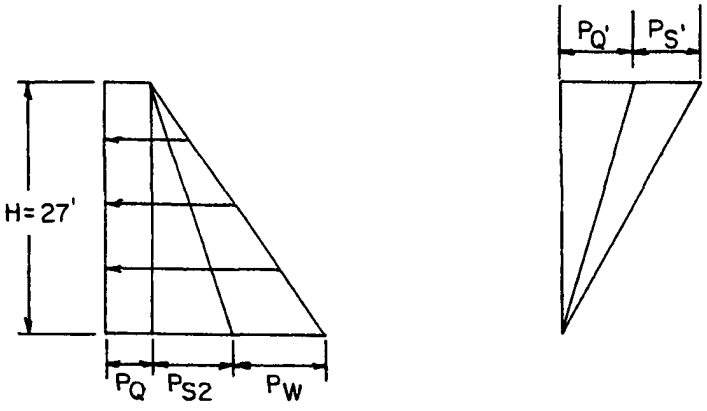
1. K_o TAKEN AS 0.65
2. UNIT WEIGHT OF SOIL
   SATURATED 130 PCF
   BUOYANT 68 PCF
3. CLSM CAN BE CREATED WITH SIMILAR PROPERTIES AS BACKFILL AND GENERATES A SMALLER LOAD AGAINST A STRUCTURE.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

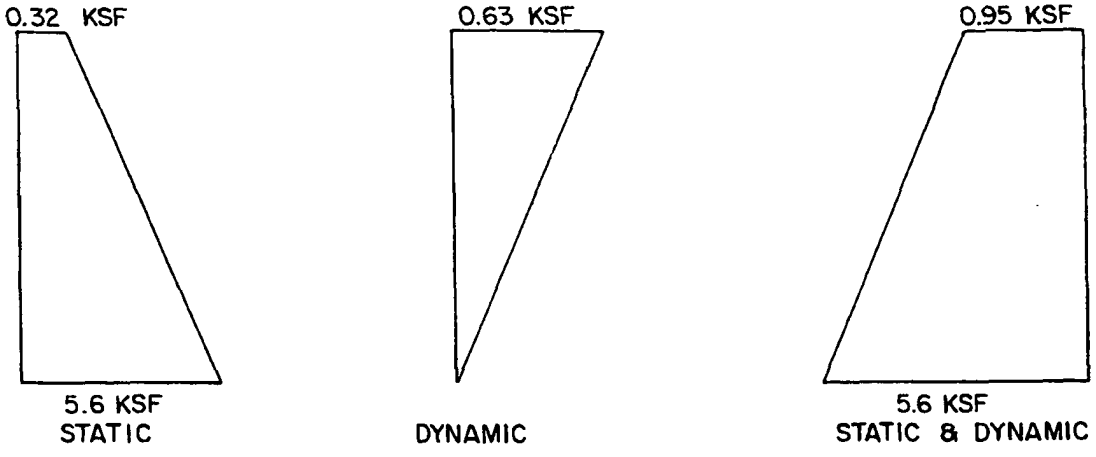
FIGURE 2.5-107b

DESIGN CRITERIA FOR LATERAL EARTH PRESSURES - WOLF CREEK SITE (COHESIVE FILL)

REV. 28



STATIC X 1.7 (KSF)			DYN X 1.9 (KSF)		TOTAL WITH LOAD FACTORS	
					EARTH PRESS	EARTH PRESS
P_Q	P_{S2}	P_W	P_Q'	P_S'	@ EL. 2000'	@ EL. 1973'
0.32	2.43	2.85	0.10	0.53	0.95 KSF	5.6 KSF



P_Q, which is the static pressure due to surcharge loading, varied according to the imposed load due to the building adjacent to the exterior wall of the auxiliary building.

NOTES:

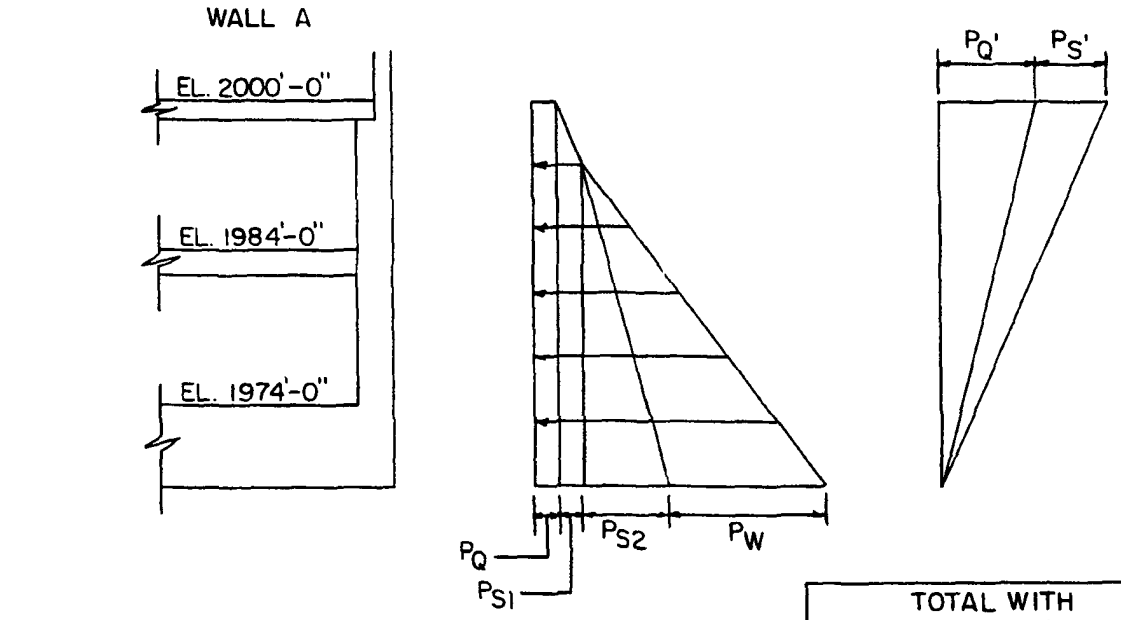
1. The watertable is assumed to be at grade level.
2. Values shown are derived from lateral earth pressures based on an SSE = 0.25g. The licensing basis for lateral earth pressure is however based on an SSE = 0.2g as shown on Figure 2.5-152.

Rev. 14

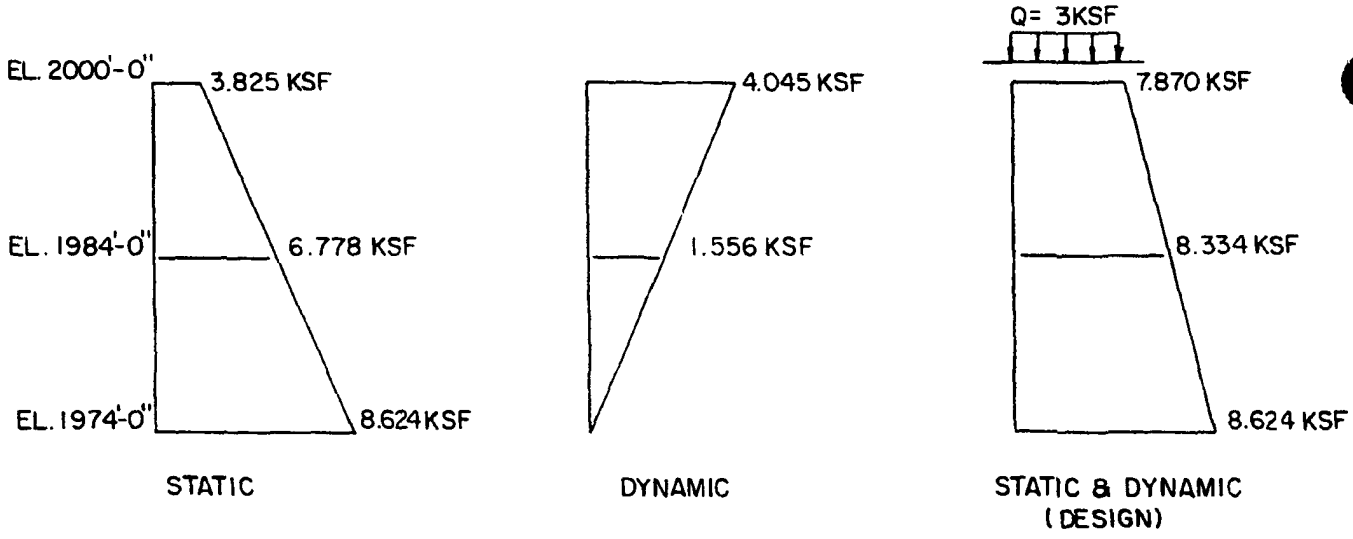
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

FIGURE 2.5-107c

Auxiliary Building Exterior Wall Design



	STATIC X 1.7 (KSF)			DYN X 1.9 (KSF)		TOTAL WITH LOAD FACTORS	
						EARTH PRESS	EARTH PRESS
P_Q	P_{S1}	P_{S2}	P_W	P_Q'	P_S'	@ EL. 2000'	@ EL. 1974'
3.825	1.198	1.651	1.95	2.622	1.423	7.870	8.624



Rev. 14

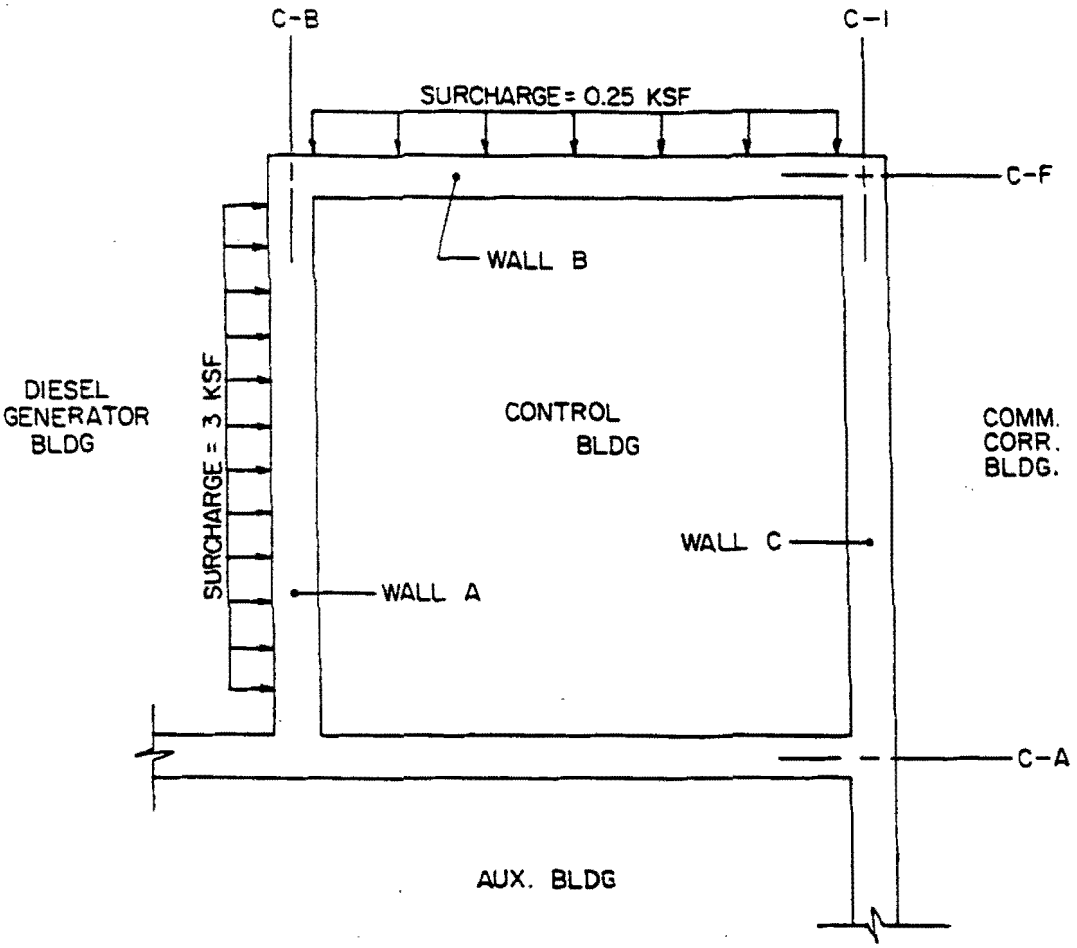
NOTES:

1. The watertable is assumed to be at grade level.
2. Values shown are derived from lateral earth pressures based on an SSE = 0.25g. The licensing basis for lateral earth pressure is however based on an SSE = 0.2g as shown on Figure 2.5-152.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

FIGURE 2.5-107d

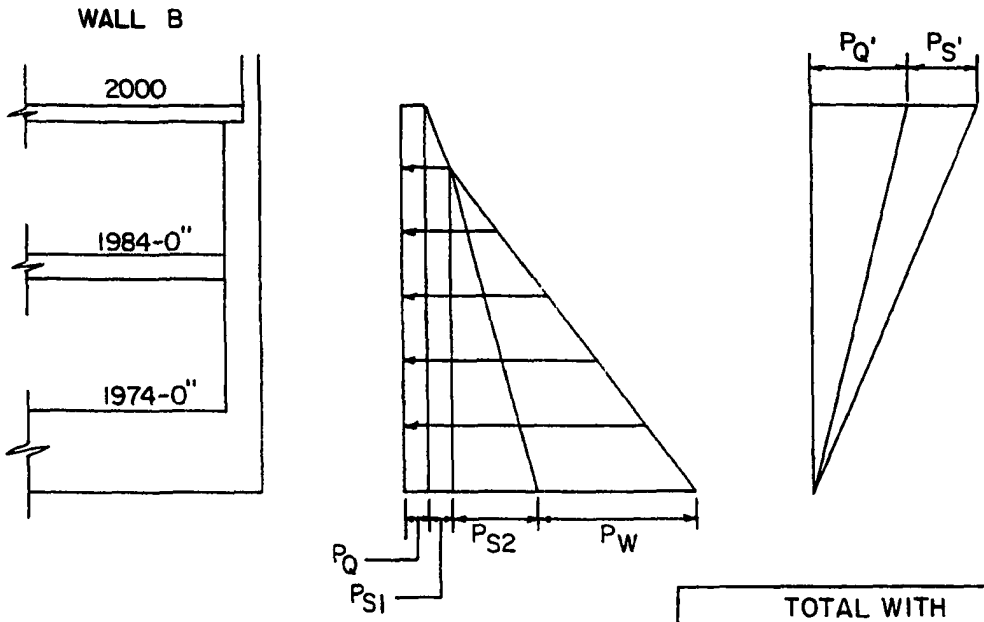
Control Building Exterior Wall Design



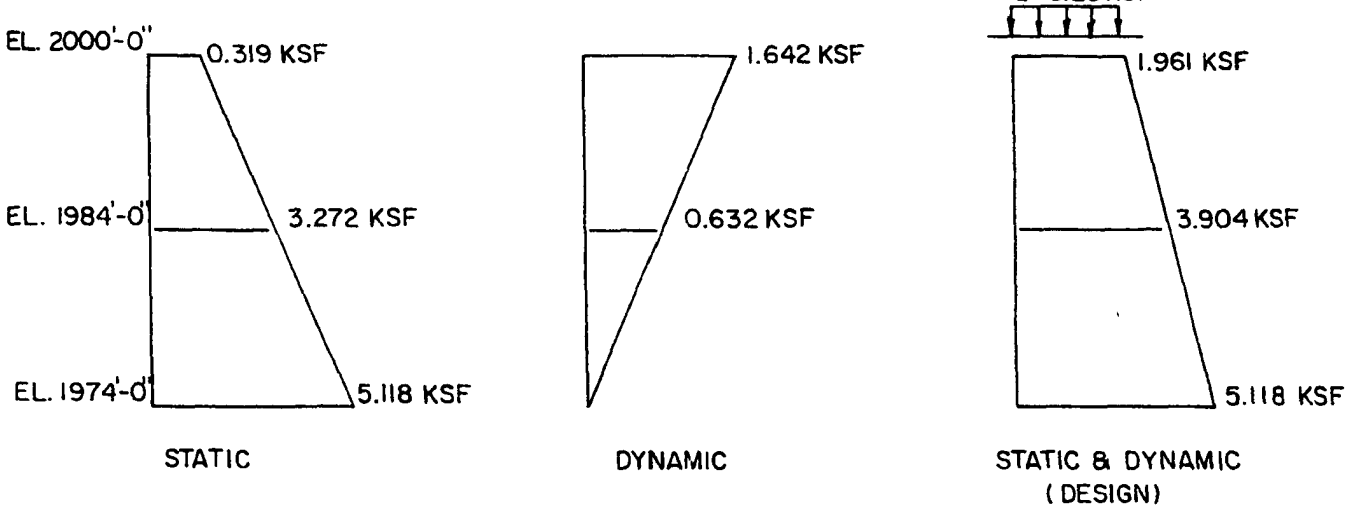
PLAN VIEW

Rev. 0

WOLF CREEK UPDATED SAFETY ANALYSIS REPORT
Figure 2.5-107e Control Building Exterior Wall Design



STATIC X 1.7 (KSF)				DYN X 1.9 (KSF)		TOTAL WITH LOAD FACTORS	
						EARTH PRESS	EARTH PRESS
P_Q	P_{S1}	P_{S2}	P_W	P_Q'	P_S'	@ EL. 2000'	@ EL. 1974'
0.319	1.198	1.651	1.75	0.219	1.423	1.961	5.118



Rev. 14

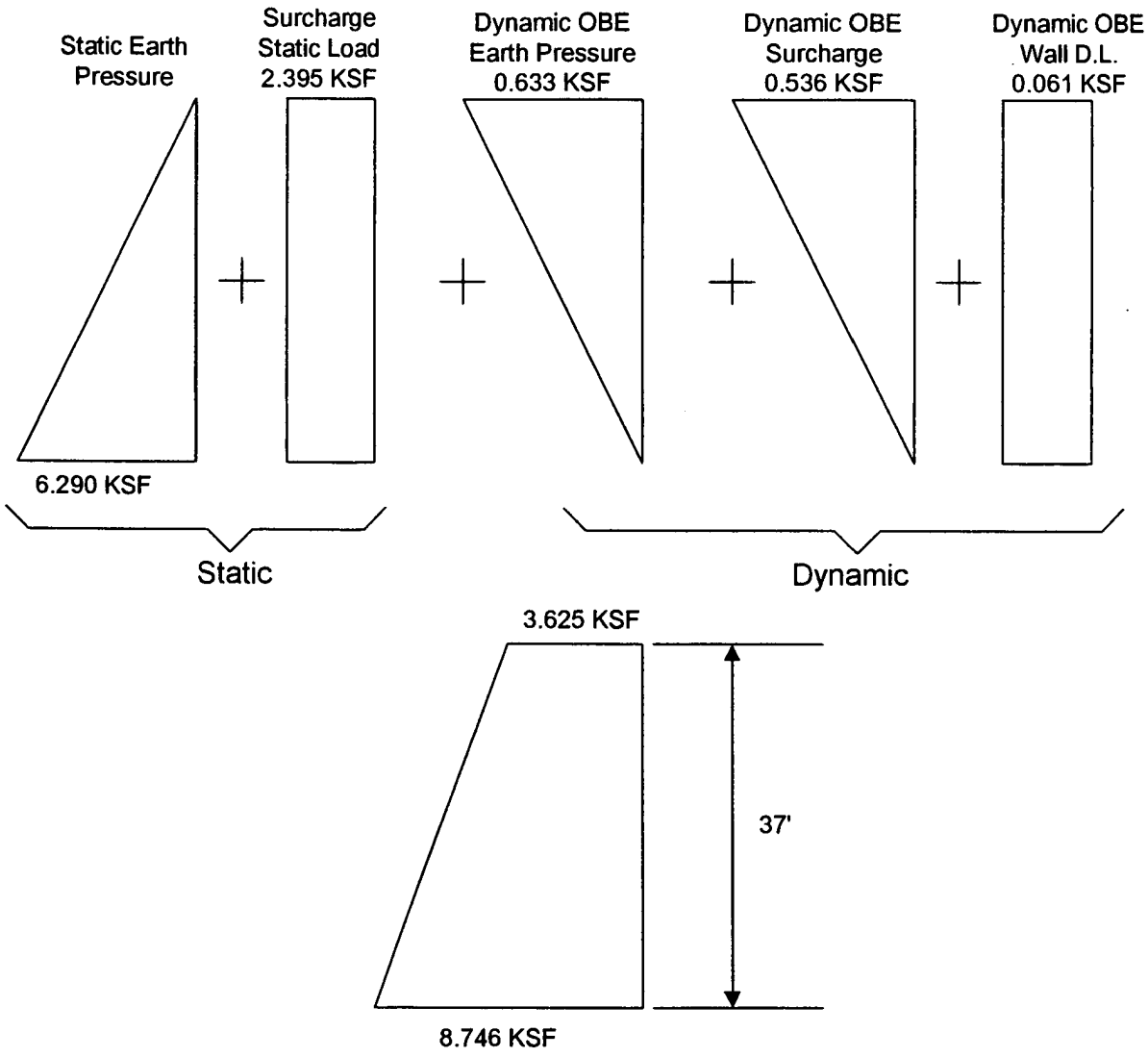
NOTES:

1. The watertable is assumed to be at grade level.
2. Values shown are derived from lateral earth pressures based on an SSE = 0.25g. The licensing basis for lateral earth pressure is however based on an SSE = 0.2g as shown on Figure 2.5-152.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

FIGURE 2.5-107f

Control Building Exterior Wall Design

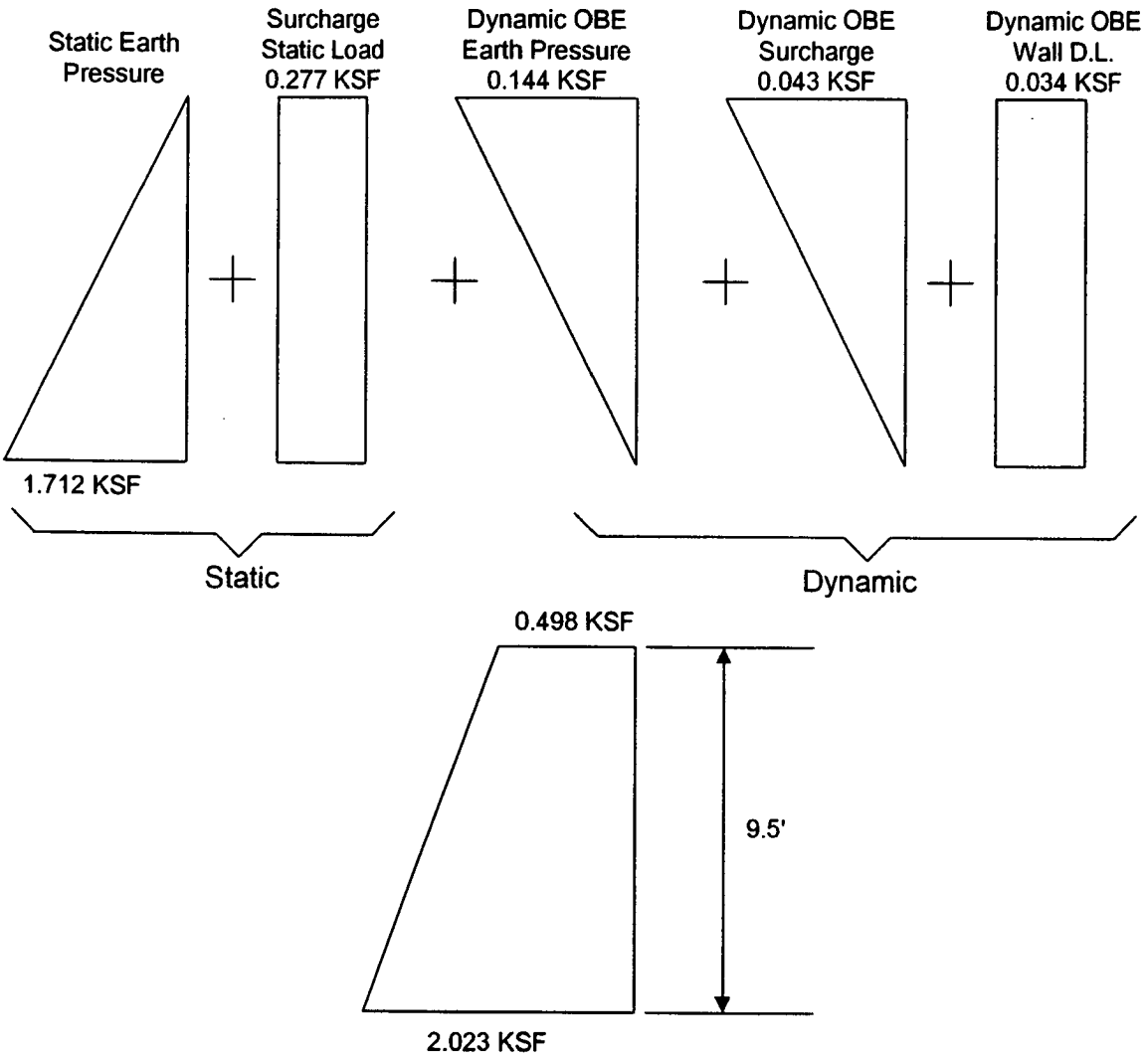


Static & Dynamic

Note: Pressures are Ultimate Loads

Rev. 14

WOLF CREEK UPDATED SAFETY ANALYSIS REPORT
Figure 2.5-107g ESWS Pumphouse Exterior Wall Design



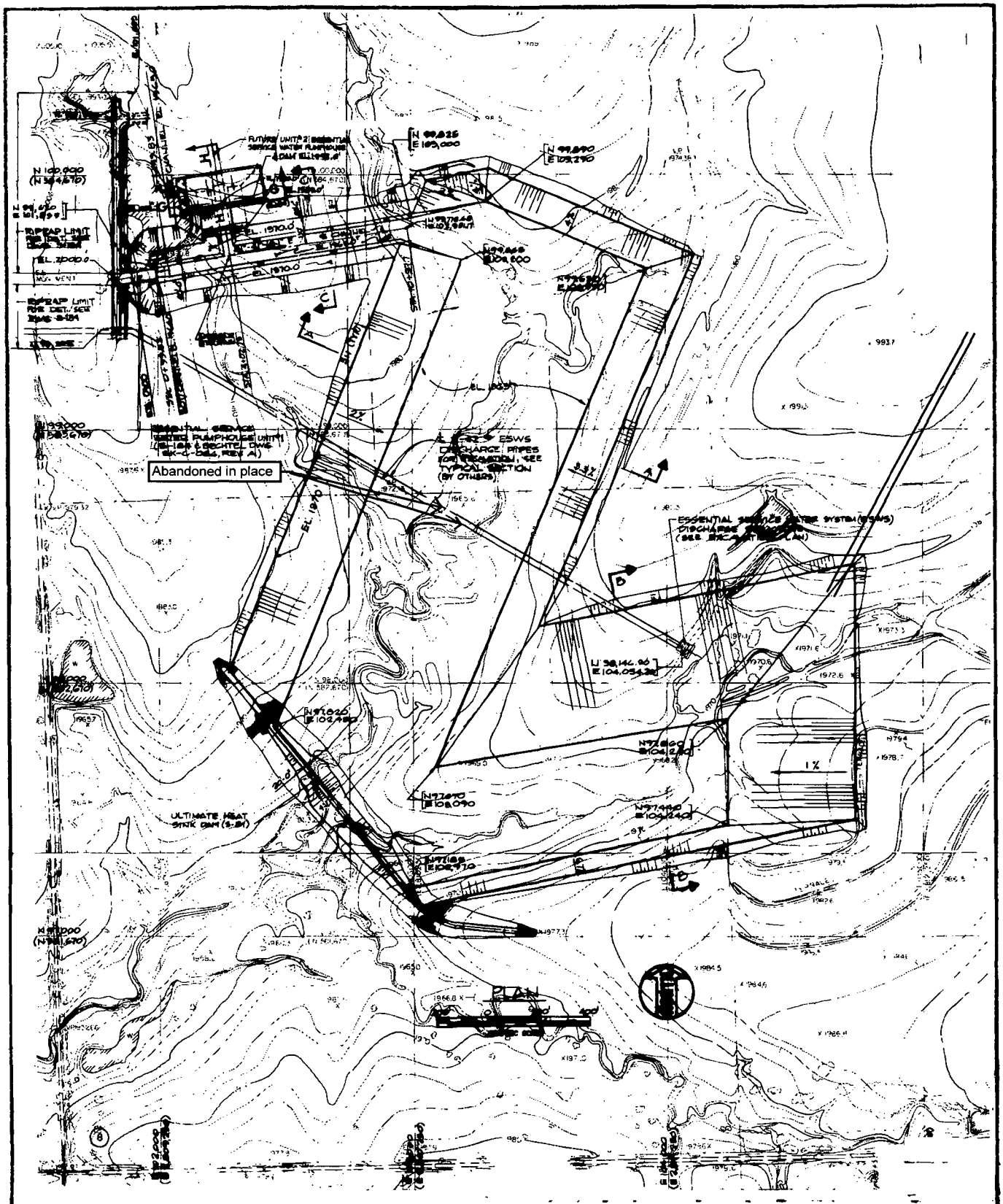
Note: Pressures are Ultimate Loads

Rev. 14

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-107h

ESWS Discharge Structure Exterior Wall Design

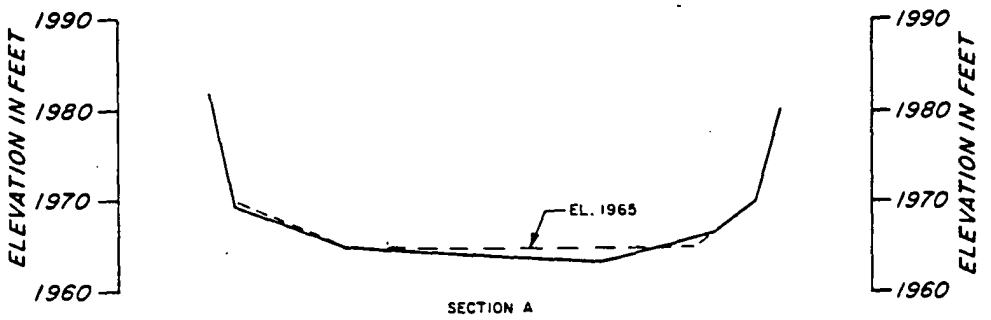


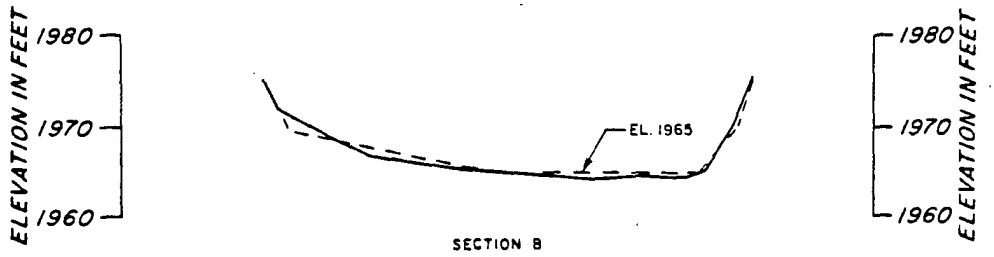
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-108 Rev. 28

Ultimate Heat Sink

Sheet 1 of 1





EXPLANATION:

- - - - INDICATES DESIGN GRADE

——— INDICATES AS-BUILT GRADE

FEET
200 0 200 400
HORIZONTAL SCALE

NOTES:

1. ELEVATIONS REFER TO SHUPPS DATUM
   ELEV. 2000' SHUPPS = 1100' USGS DATUM.

DRAWING REFERENCE:

TITLED: ULTIMATE HEAT SINK PLAN & SECTIONS

FOR: WOLF CREEK GENERATION STATION UNIT 1
KANSAS GAS & ELECTRIC CO.
KANSAS CITY POWER & LIGHT CO.

BY: SARGENT & LUNDY ENGINEERS
CHICAGO, ILL.

DRAWING NO: S-80, REV. J

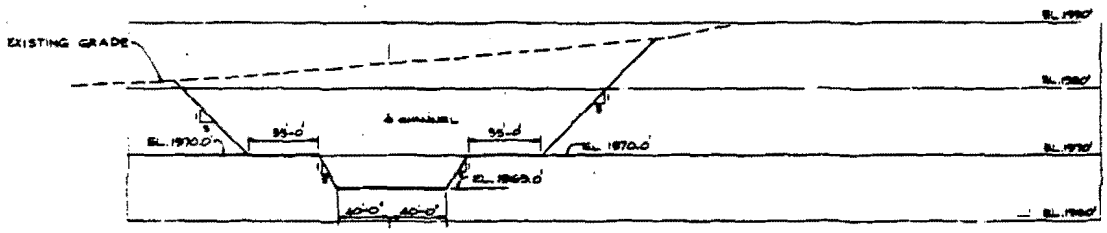
DATE: 8-25-80

Rev. 0

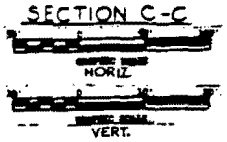
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-109

Ultimate Heat Sink - Typical Man-Made Slopes



SECTION C-C

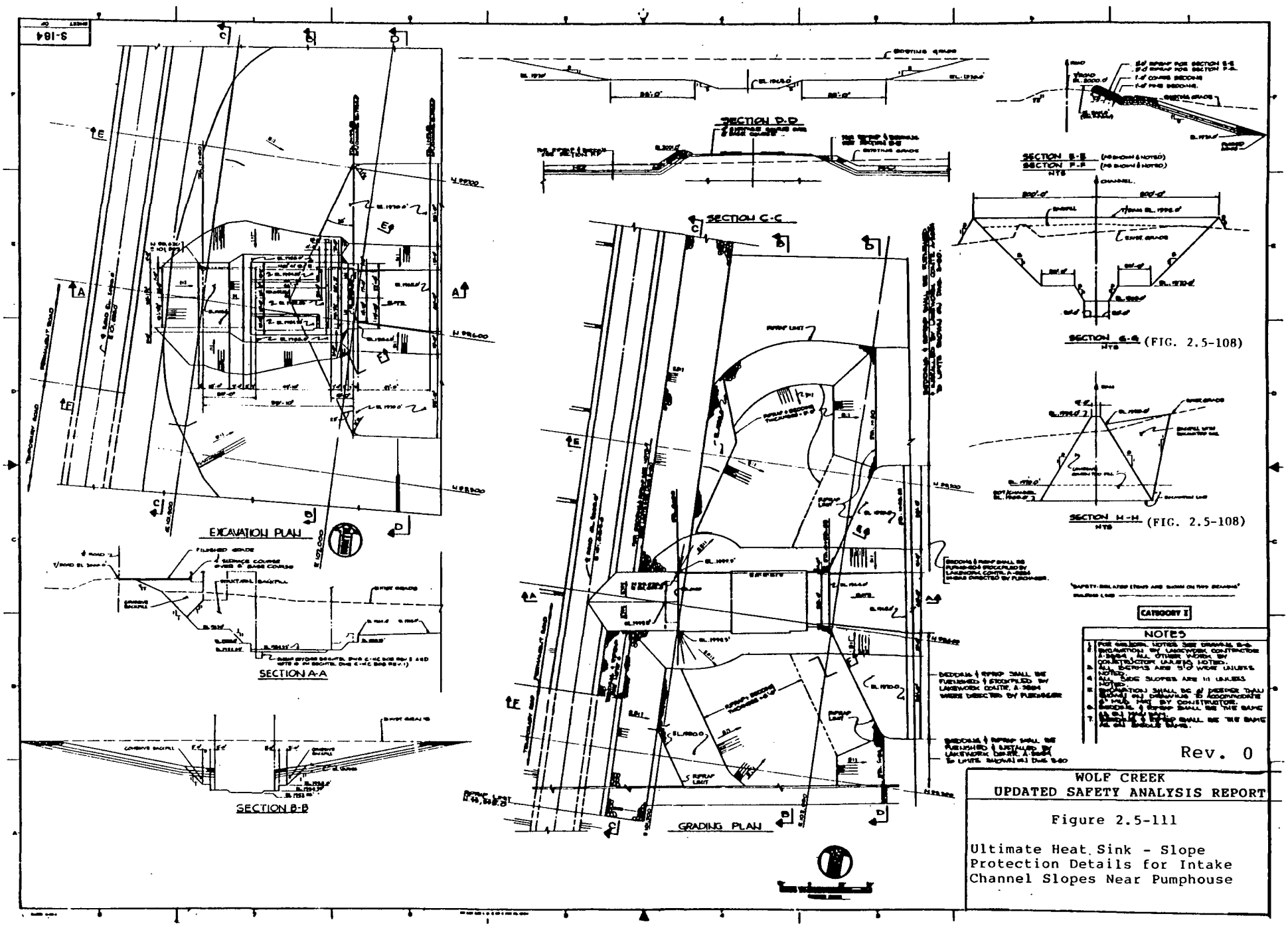


NOTE:

CROSS-SECTION LOCATION SHOWN IN FIGURE 2.5-108 "ULTIMATE HEAT SINK".

Rev. 0

WOLF CREEK UPDATED SAFETY ANALYSIS REPORT
Figure 2.5-110 Ultimate Heat Sink - Intake Channel Section



WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

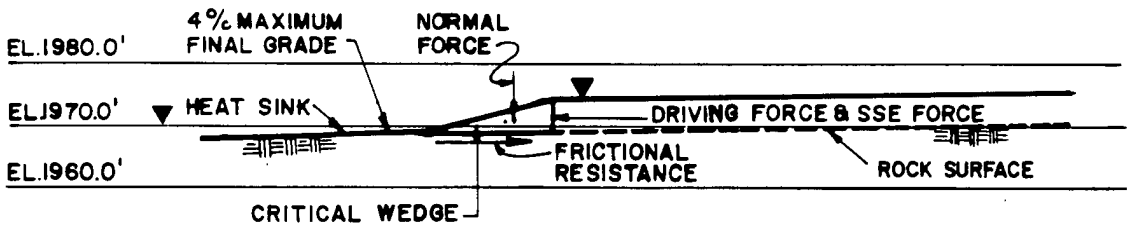
Figure 2.5-111

Ultimate Heat Sink - Slope Protection Details for Intake Channel Slopes Near Pumphouse

SECTION G-G (FIG. 2.5-108)

SECTION H-H (FIG. 2.5-108)

CONDITION	SOIL PARAMETERS	MINIMUM FACTOR OF SAFETY
End of Construction	γ=124pcf ϕ_{cu}=10° ^{c}cu=585 psf	7.8
Steady State	γ=124pcf ϕ' =20° c' =400psf	5.3
Steady State Plus SSE (0.12g)	γ=124pcf ϕ' =20° c' =400psf	3.5



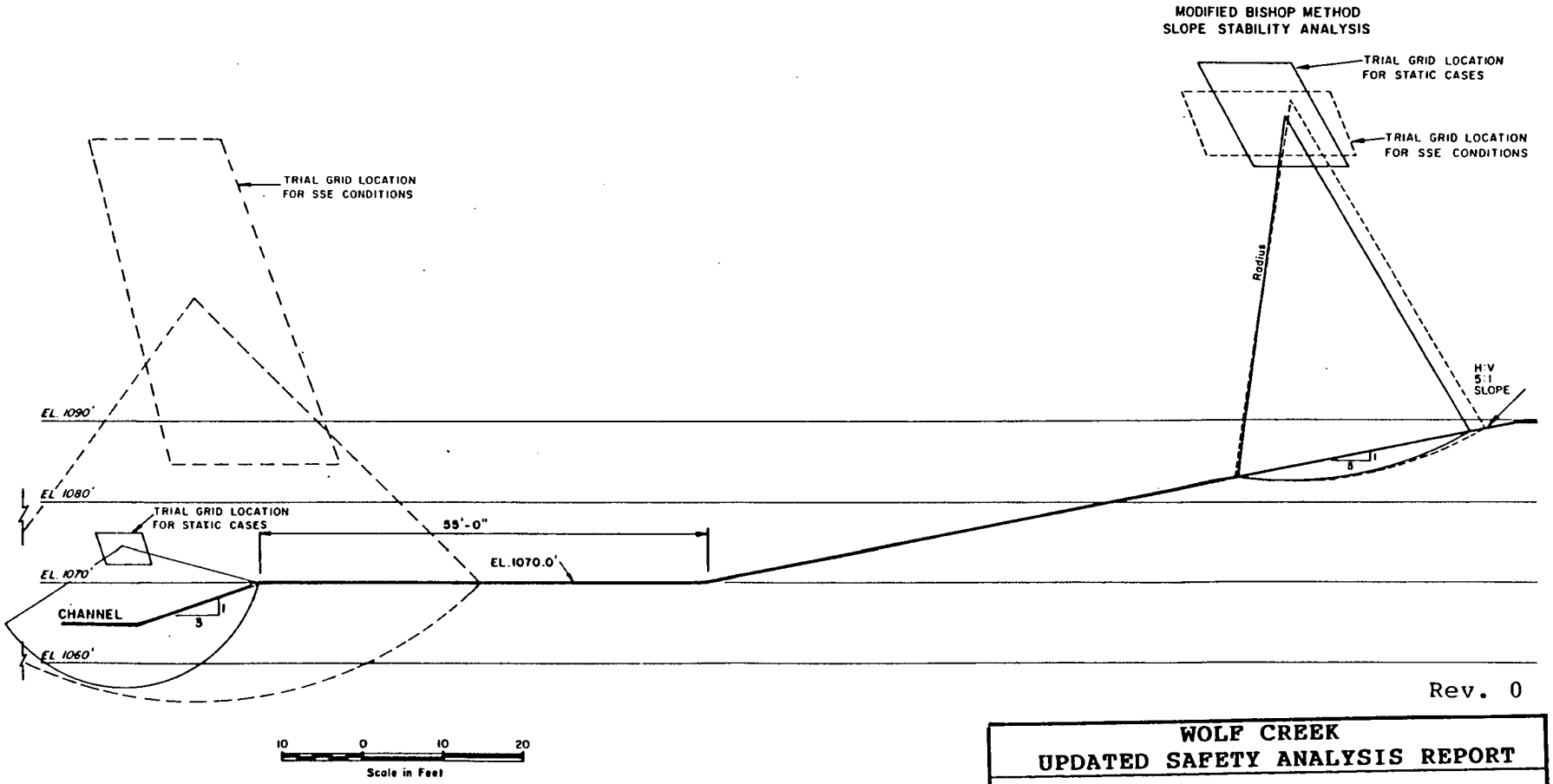


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-112

Ultimate Heat Sink - Wedge Analysis of Excavated Sites



Rev. 0

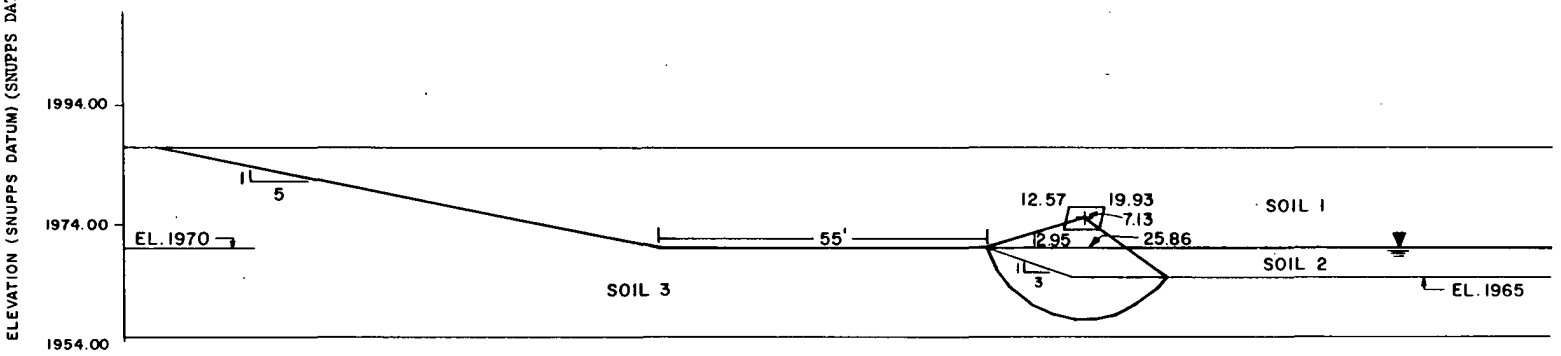
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-113

Ultimate Heat Sink - Intake Channel Slope Stability Analysis (Modified Bishop Method)

SOIL	SOIL DESCRIPTION	SOIL PARAMETERS		
		UNIT WT. γ_T PCF	COHESION C PSF	FRICTION ANGLE Ø DEGREE
1	DUMMY LAYER	0	0	0
2	WATER	62.4	0	0
3	RESIDUAL	124	400	20
4	ROCK	150	5000	35

MINIMUM SAFETY FACTOR = 7.13



Rev. 0

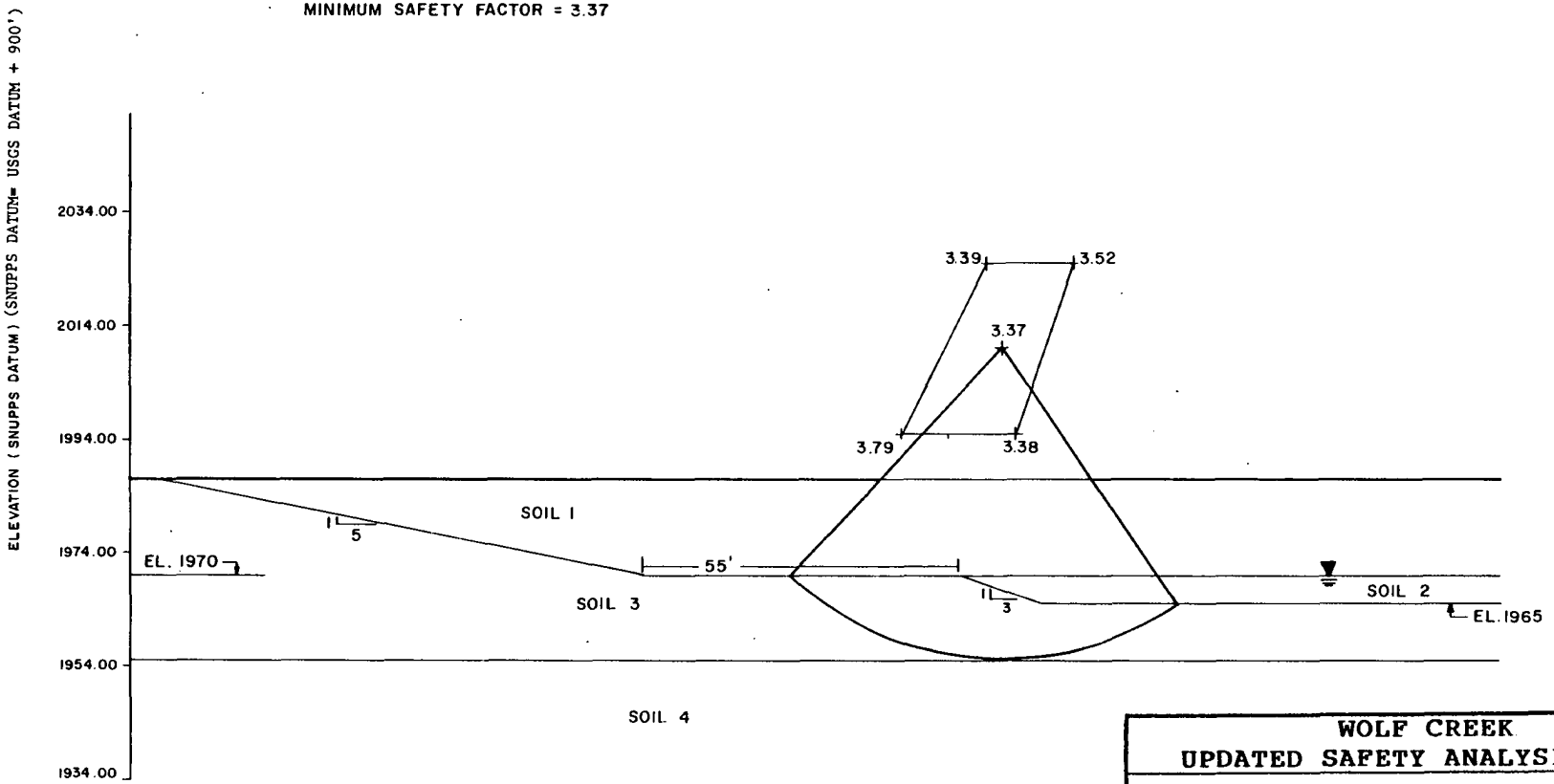
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-113a

ESWS Intake Channel Slope
Stability Analysis, 3:1 Slope
Submerged Condition

SOIL	SOIL DESCRIPTION	SOIL PARAMETERS		
		UNIT WT. γ_T PCF	COHESION C PSF	FRICTION ANGLE Ø DEGREE
1	DUMMY LAYER	0	0	0
2	WATER	62.4	0	0
3	RESIDUAL	124	400	20
4	ROCK	150	5000	35

MINIMUM SAFETY FACTOR = 3.37



Rev. 0

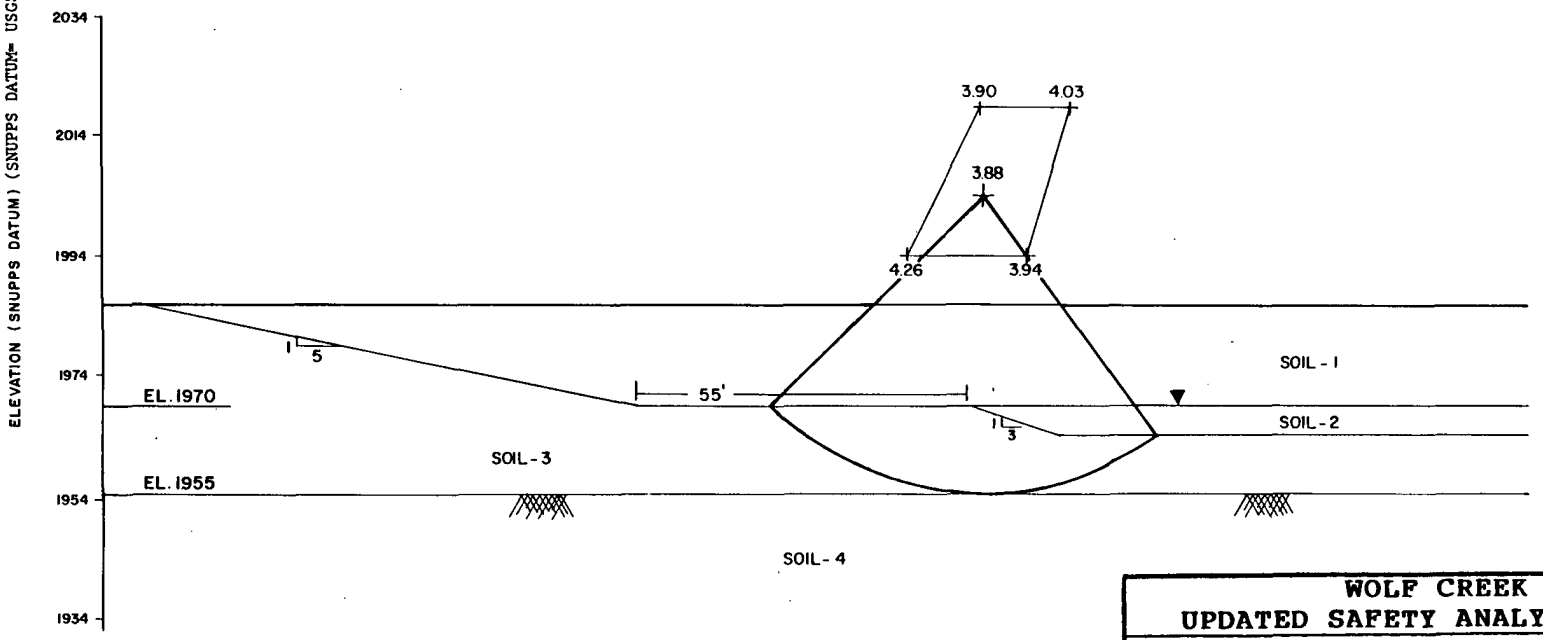
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-113b

ESWS Intake Channel Slope Stability Analysis, 3:1 Slope Submerged with SSE - Effective Stress Parameters

SOIL	SOIL DESCRIPTION	SOIL PARAMETERS		
		UNIT WT. γ_T PCF	COHESION C PSF	FRICTION ANGLE ϕ DEGREE
1	DUMMY LAYER	0	0	0
2	WATER	62.4	0	0
3	RESIDUAL	124	585	10
4	ROCK	150	5000	35

MINIMUM SAFETY FACTOR = 3.88



Rev. 0

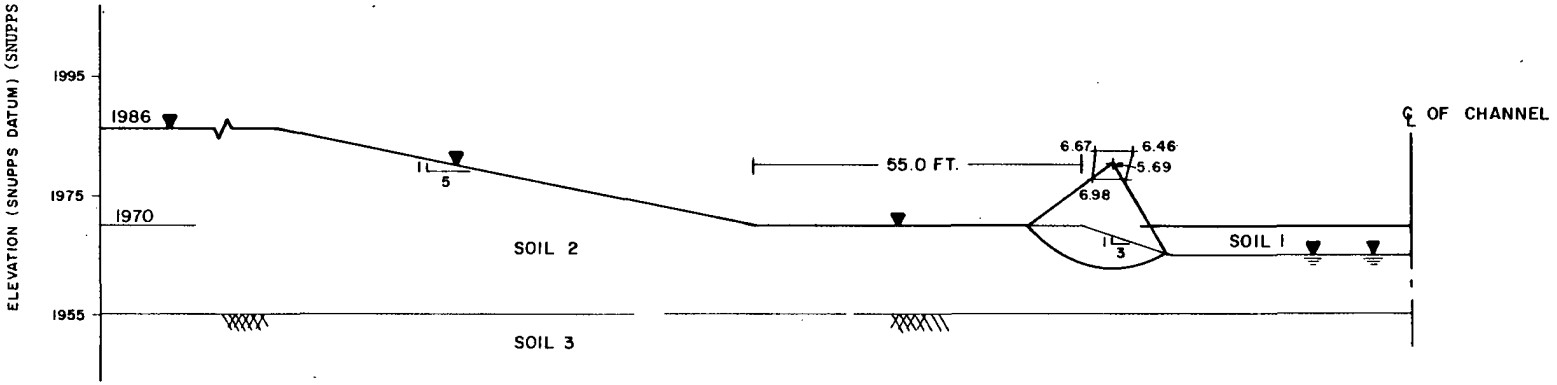
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-113c

ESWS Intake Channel Slope Stability Analysis, 3:1 Slope Submerged with SSE - Total Stress Parameters

SOIL	SOIL DESCRIPTION	SOIL PARAMETERS		
		DENSITY γ_T PCF	COHESION C PSF	FRICTION ANGLE ϕ DEGREE
1	DUMMY LAYER	0	0	0
2	RESIDUAL	124	585	10
3	ROCK	150	5000	35

MINIMUM SAFETY FACTOR = 5.69



Rev. 0

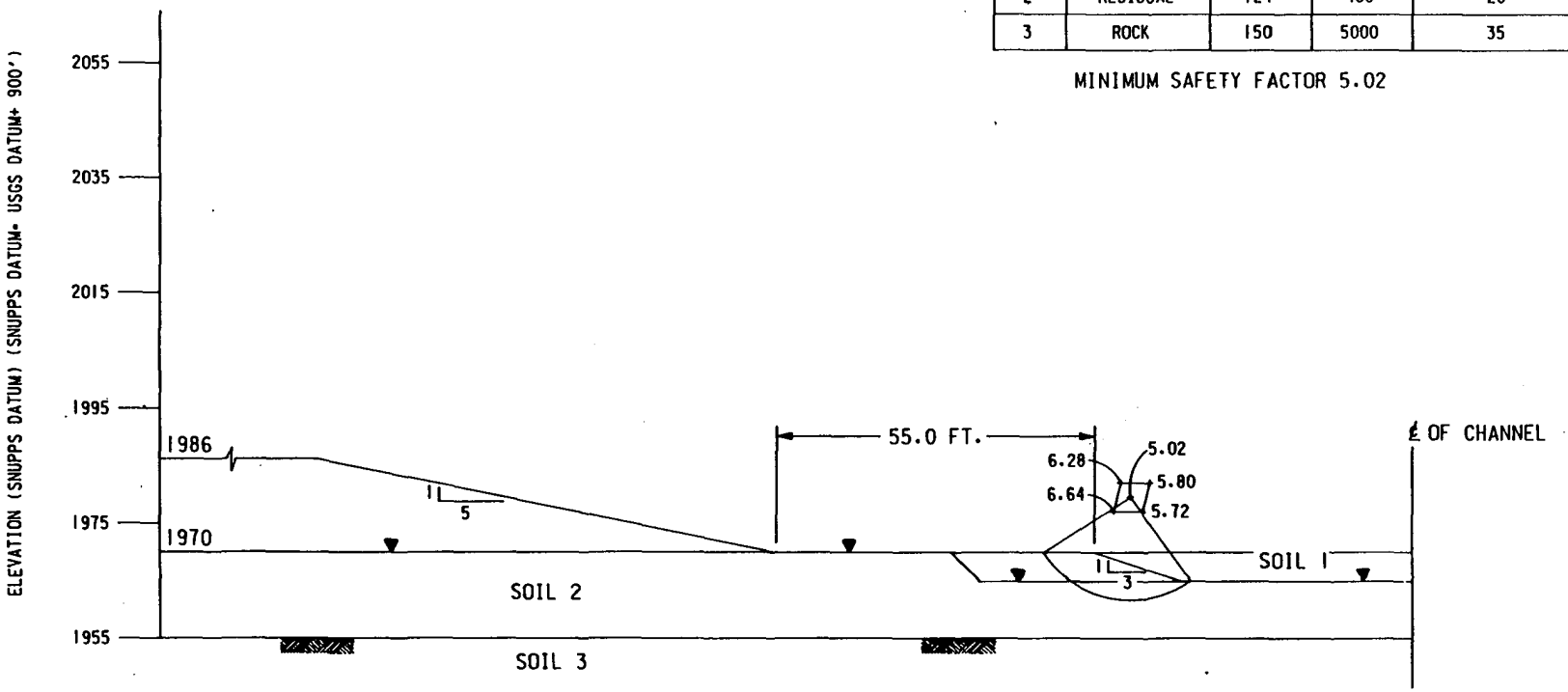
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-113d

ESWS Intake Channel Slope
Stability Analysis, 3:1 Slope
End of Construction - Short Term

SOIL	SOIL DESCRIPTION	SOIL PARAMETERS		
		DENSITY γ_T PCF	COHESION C PSF	FRICTION ANGLE ϕ DEGREE
1	DUMMY LAYER	0	0	0
2	RESIDUAL	124	400	20
3	ROCK	150	5000	35

MINIMUM SAFETY FACTOR 5.02



Rev. 0

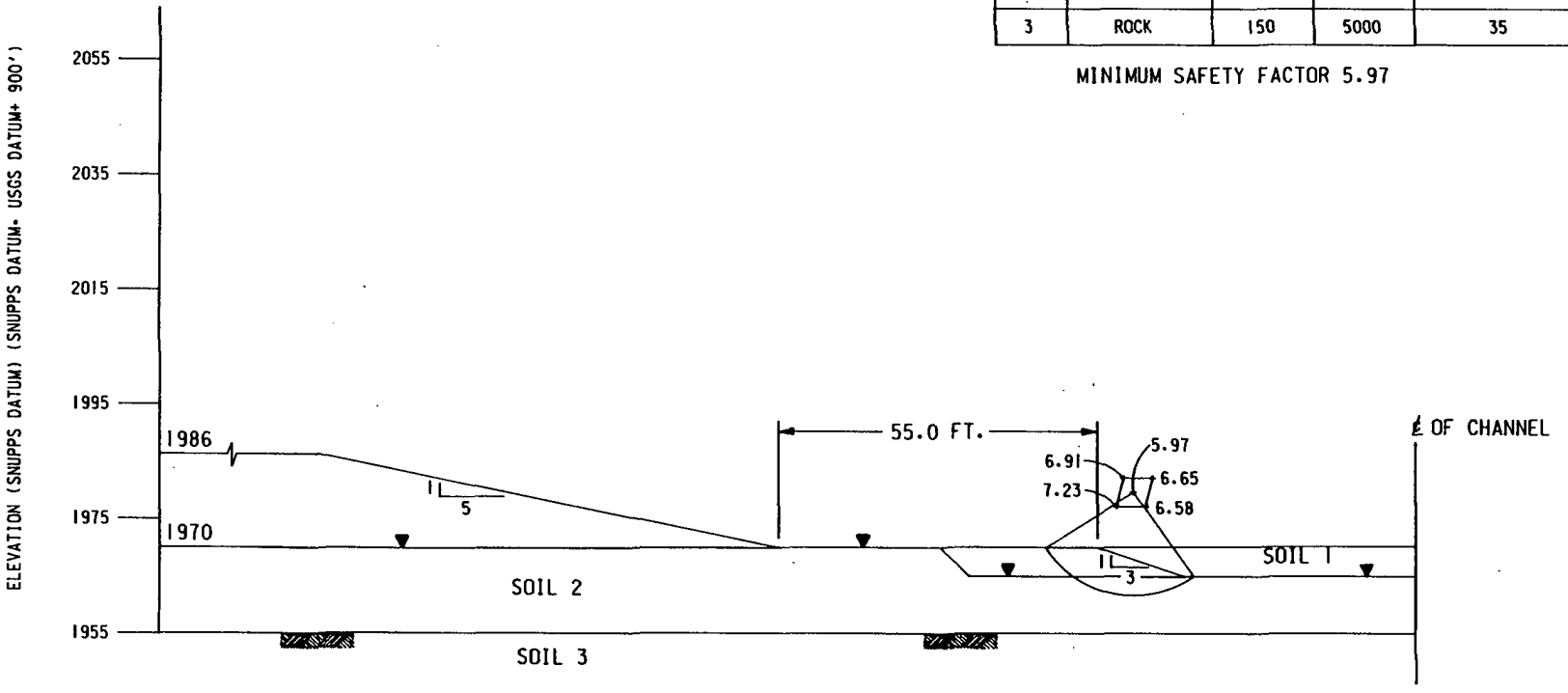
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-113e

ESWS Intake Channel Slope Stability Analysis, 3:1 Slope End of Construction - Effective Stress Parameters

SOIL	SOIL DESCRIPTION	SOIL PARAMETERS		
		DENSITY γ_T PCF	COHESION C PSF	FRICTION ANGLE ϕ DEGREE
1	DUMMY LAYER	0	0	0
2	RESIDUAL	124	585	10
3	ROCK	150	5000	35

MINIMUM SAFETY FACTOR 5.97



Rev. 0

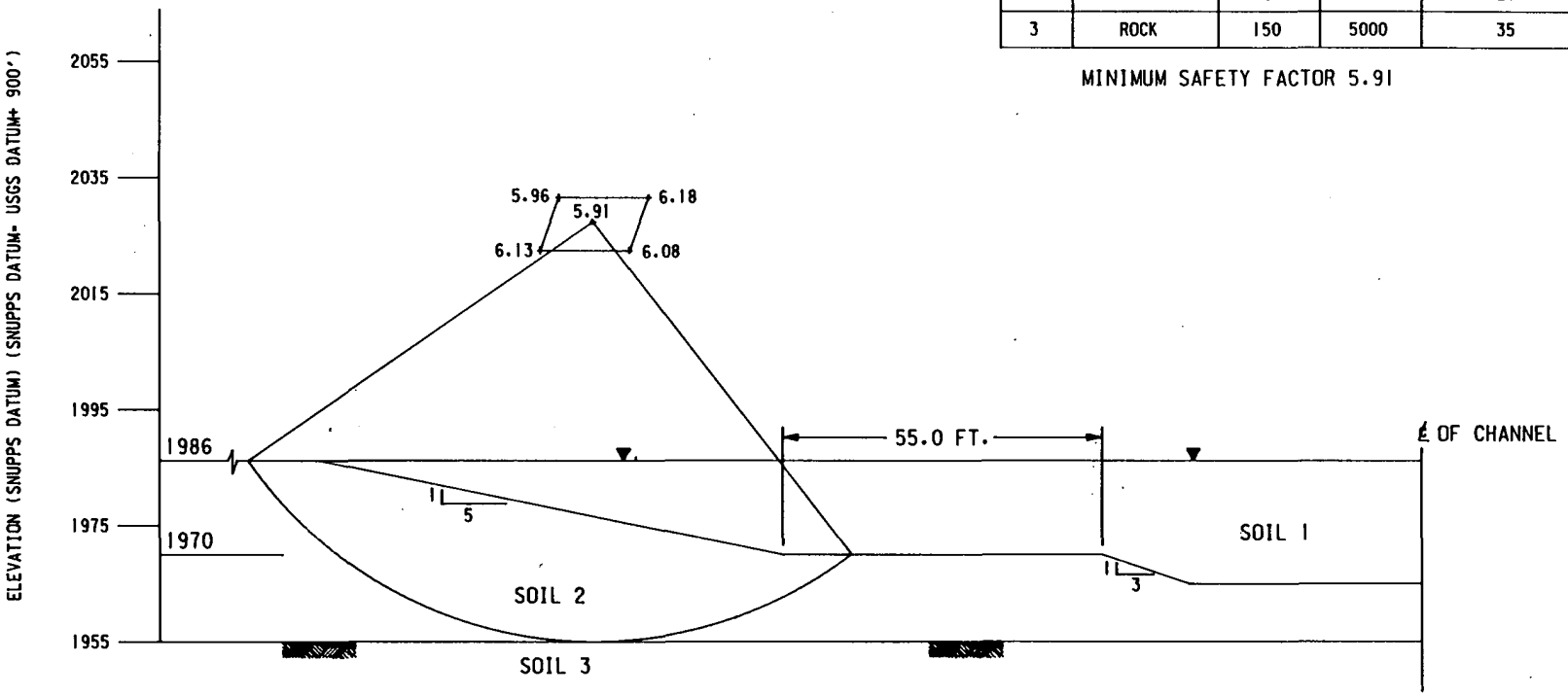
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-113f

ESWS Intake Channel Slope Stability Analysis, 3:1 Slope End of Construction - Total Stress Parameters

SOIL	SOIL DESCRIPTION	SOIL PARAMETERS		
		DENSITY γ_T PCF	COHESION C PSF	FRICTION ANGLE ϕ DEGREE
1	WATER	62.4	0	0
2	RESIDUAL	124	400	20
3	ROCK	150	5000	35

MINIMUM SAFETY FACTOR 5.91



Rev. 0

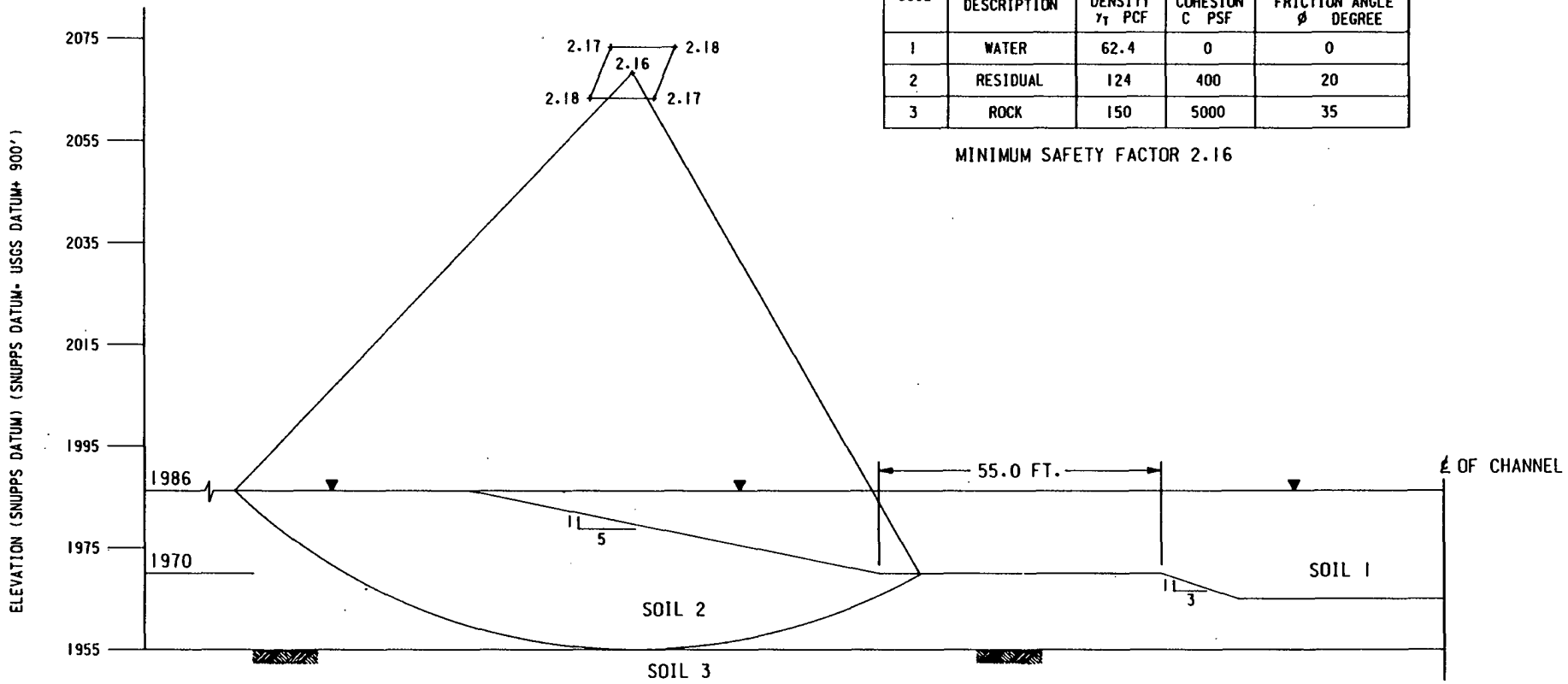
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-113g

ESWS Intake Channel Slope Stability Analysis, 5:1 Slope Submerged Conditions

SOIL	SOIL DESCRIPTION	SOIL PARAMETERS		
		DENSITY γ_T PCF	COHESION C PSF	FRICTION ANGLE ϕ DEGREE
1	WATER	62.4	0	0
2	RESIDUAL	124	400	20
3	ROCK	150	5000	35

MINIMUM SAFETY FACTOR 2.16



Rev. 0

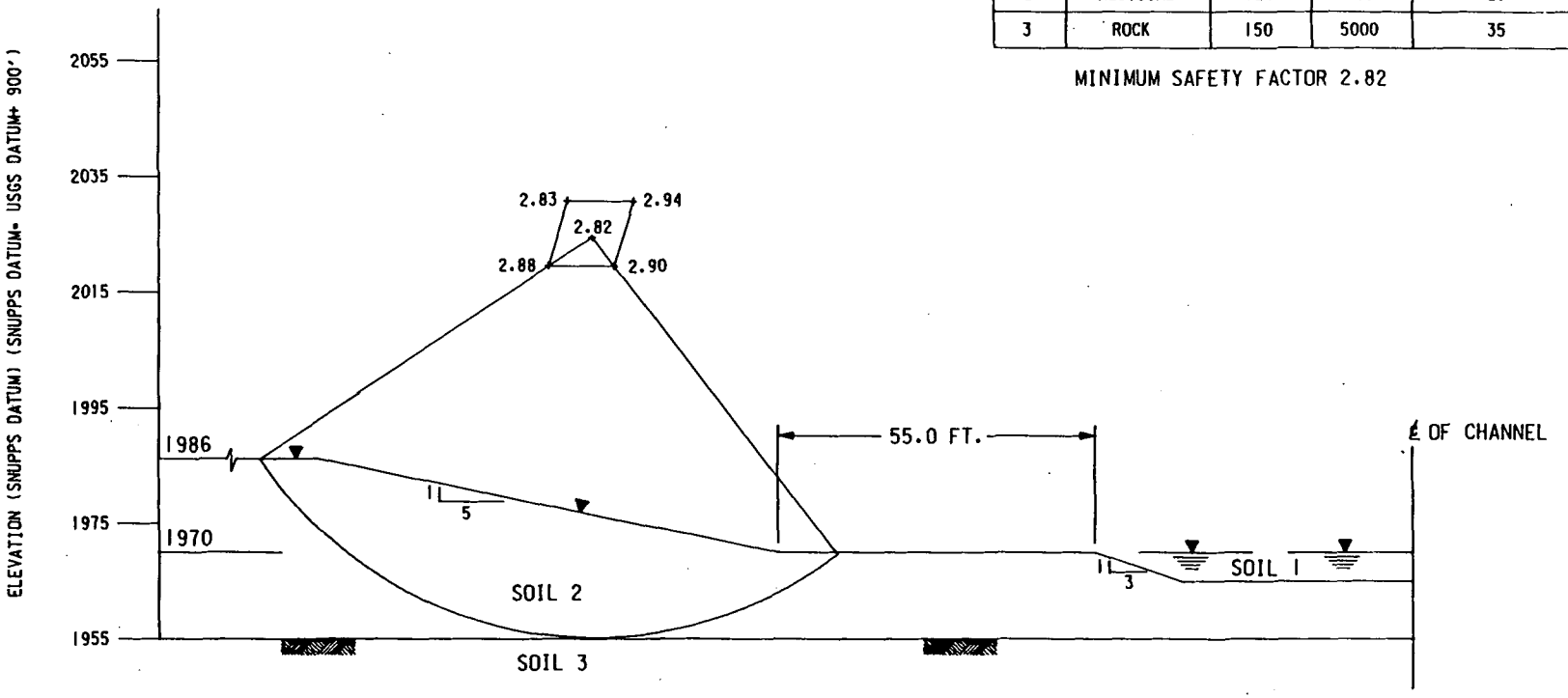
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-113h

ESWS Intake Channel Slope Stability Analysis, 5:1 Slope Submerged with SSE

SOIL	SOIL DESCRIPTION	SOIL PARAMETERS		
		DENSITY γ_T PCF	COHESION C PSF	FRICTION ANGLE ϕ DEGREE
1	WATER	62.4	0	0
2	RESIDUAL	124	400	20
3	ROCK	150	5000	35

MINIMUM SAFETY FACTOR 2.82



Rev. 0

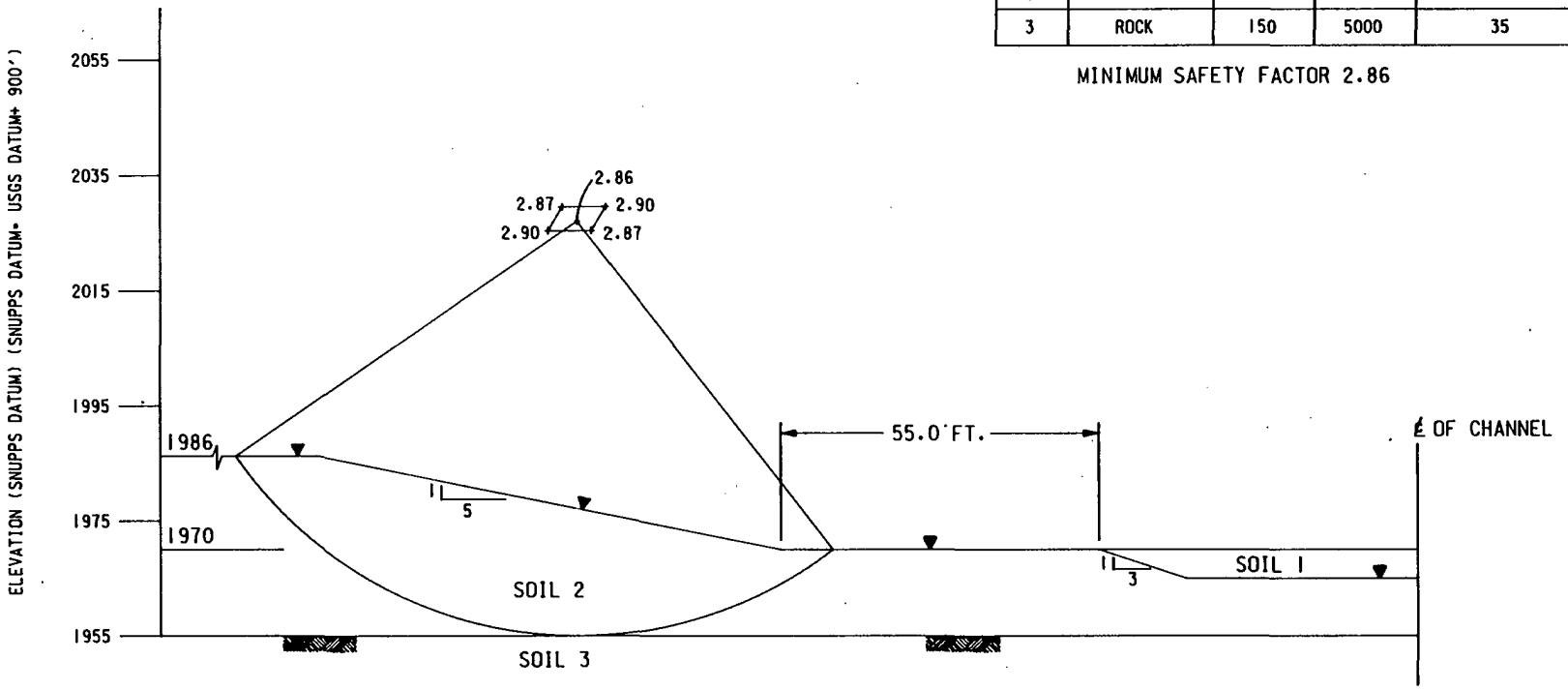
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-113i

ESWS Intake Channel Slope
Stability Analysis, 5:1 Slope
Rapid Drawdown

SOIL	SOIL DESCRIPTION	SOIL PARAMETERS		
		DENSITY γ_T PCF	COHESION C PSF	FRICTION ANGLE ϕ DEGREE
1	DUMMY LAYER	0	0	0
2	RESIDUAL	124	585	10
3	ROCK	150	5000	35

MINIMUM SAFETY FACTOR 2.86



Rev. 0

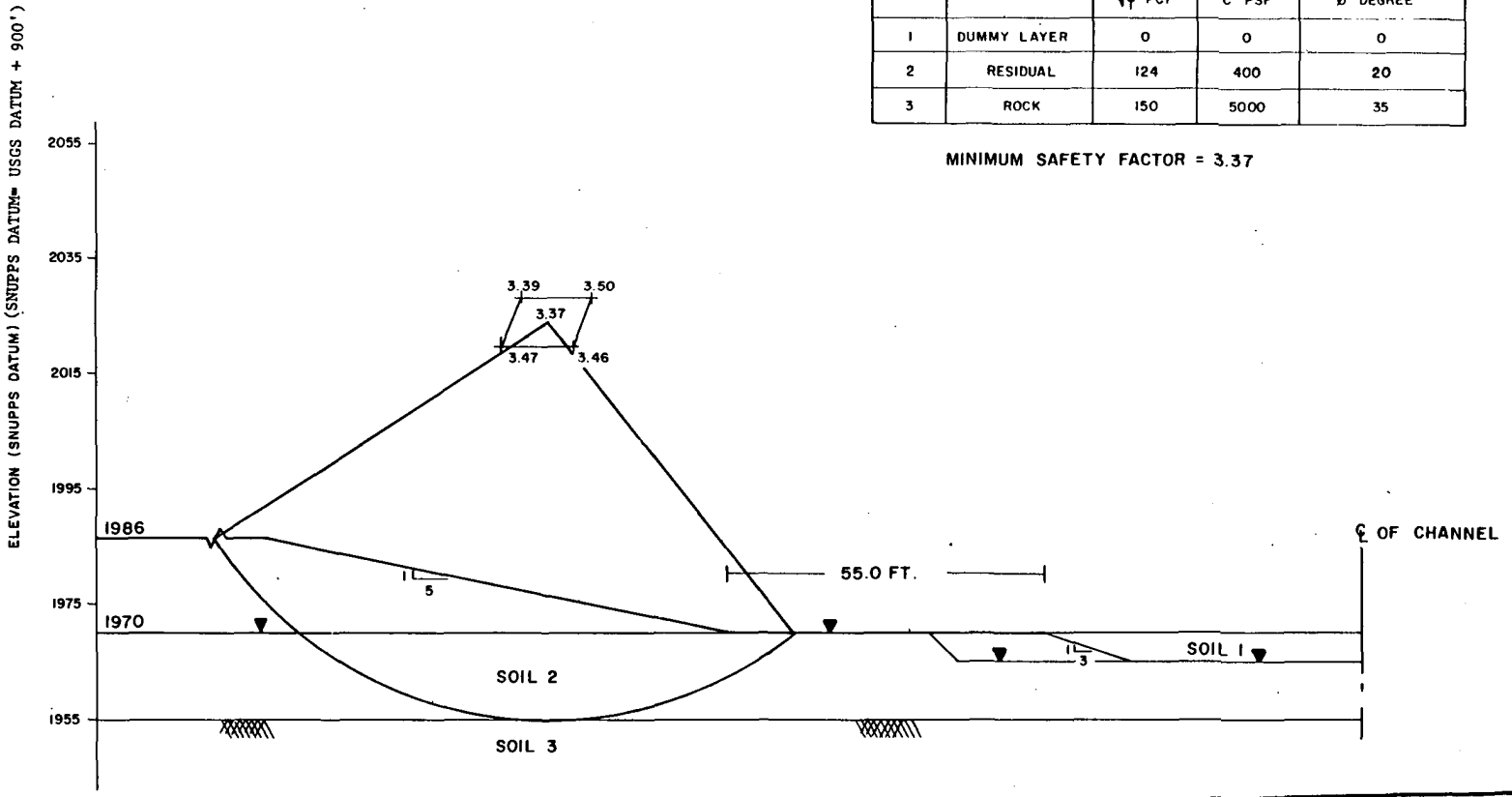
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-113j

ESWS Intake Channel Slope
Stability Analysis, 5:1 Slope
End of Construction - Short Term

SOIL	SOIL DESCRIPTION	SOIL PARAMETERS		
		DENSITY $\sqrt{T}$ PCF	COHESION C PSF	FRICTION ANGLE ϕ DEGREE
1	DUMMY LAYER	0	0	0
2	RESIDUAL	124	400	20
3	ROCK	150	5000	35

MINIMUM SAFETY FACTOR = 3.37



Rev. 0

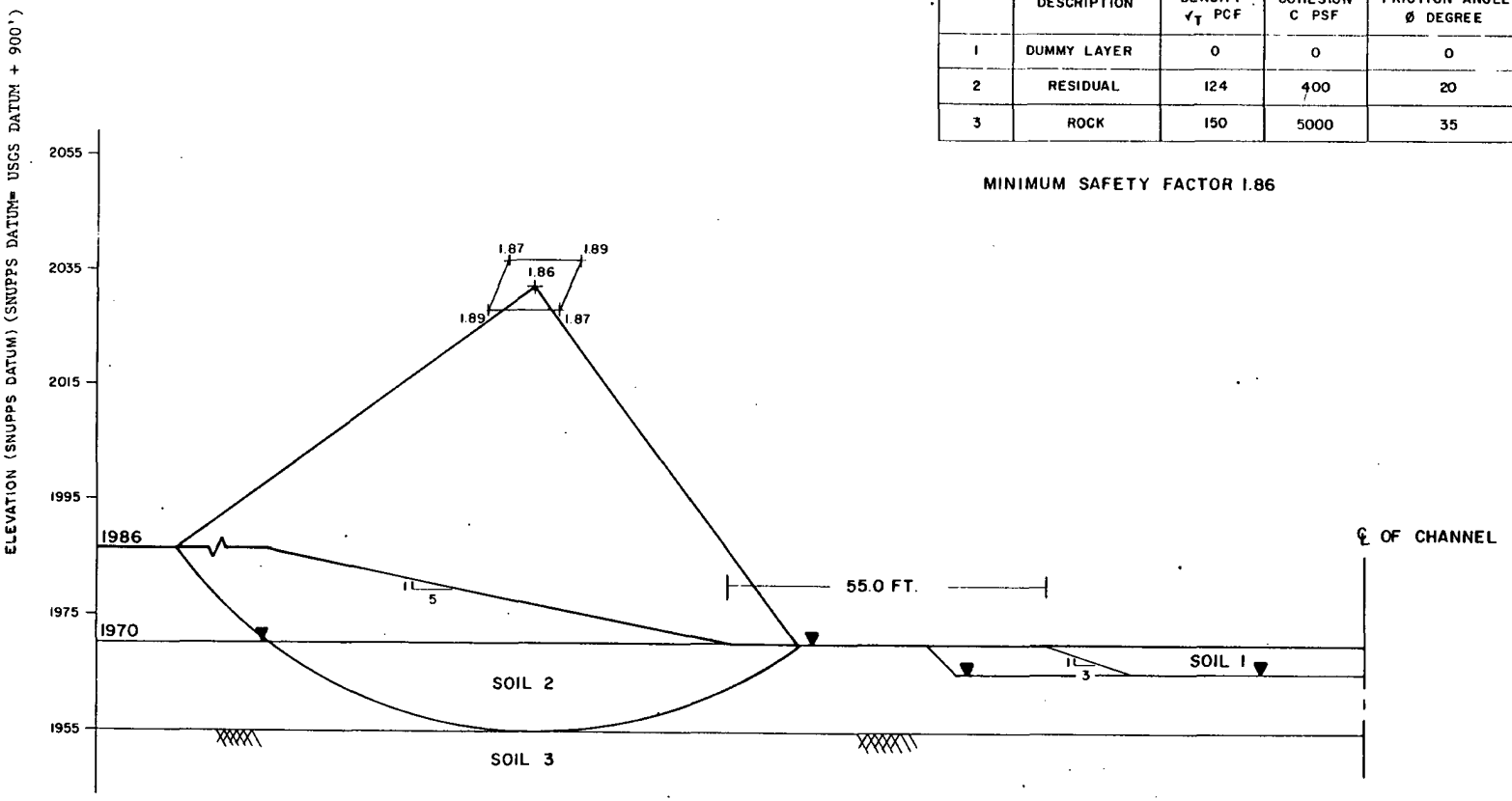
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-113k

ESWS Intake Channel Slope
Stability Analysis, 5:1 Slope
End of Construction - Effective
Stress Parameters

SOIL	SOIL DESCRIPTION	SOIL PARAMETERS		
		DENSITY γ_T PCF	COHESION C PSF	FRICTION ANGLE Ø DEGREE
1	DUMMY LAYER	0	0	0
2	RESIDUAL	124	400	20
3	ROCK	150	5000	35

MINIMUM SAFETY FACTOR 1.86



Rev. 0

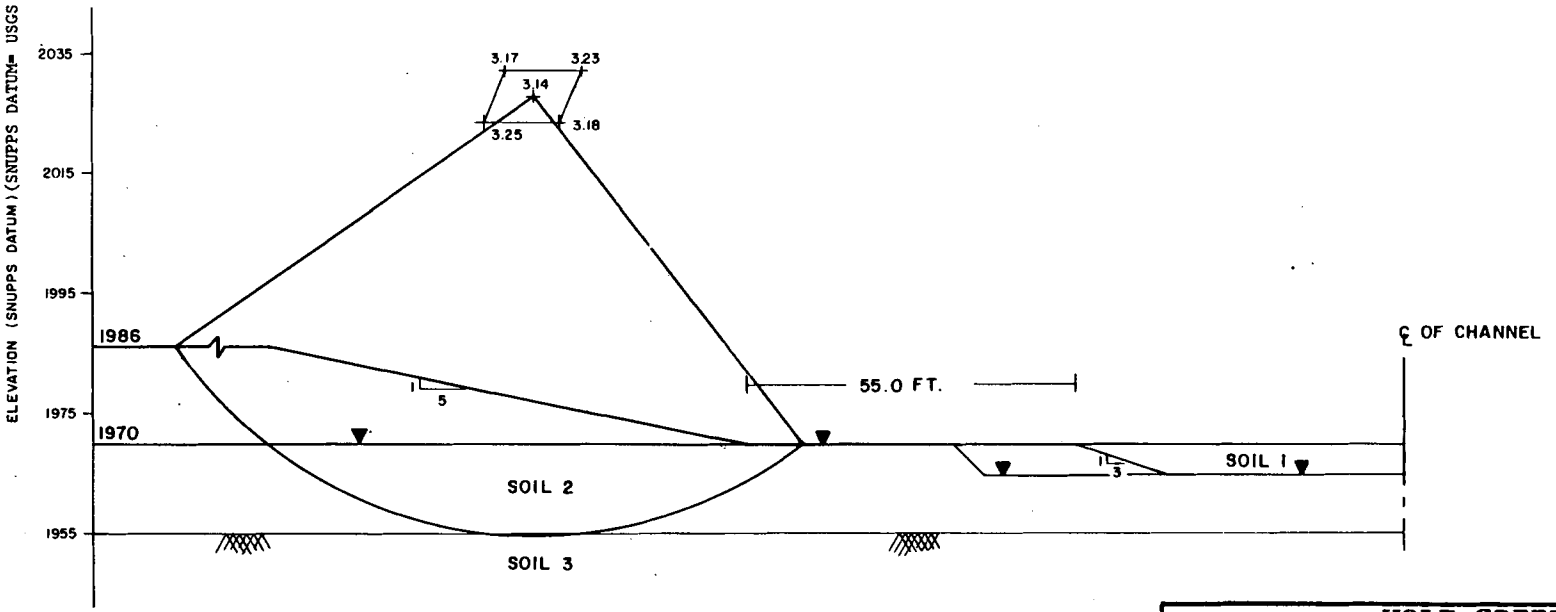
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-1131

ESWS Intake Channel Slope Stability Analysis, 5:1 Slope End of Construction with SSE - Effective Stress Parameters

SOIL	SOIL DESCRIPTION	SOIL PARAMETERS		
		DENSITY γ_T PCF	COHESION C PSF	FRICTION ANGLE Ø DEGREE
1	DUMMY LAYER	0	0	0
2	RESIDUAL	124	585	10
3	ROCK	150	5000	35

MINIMUM SAFETY FACTOR = 3.14



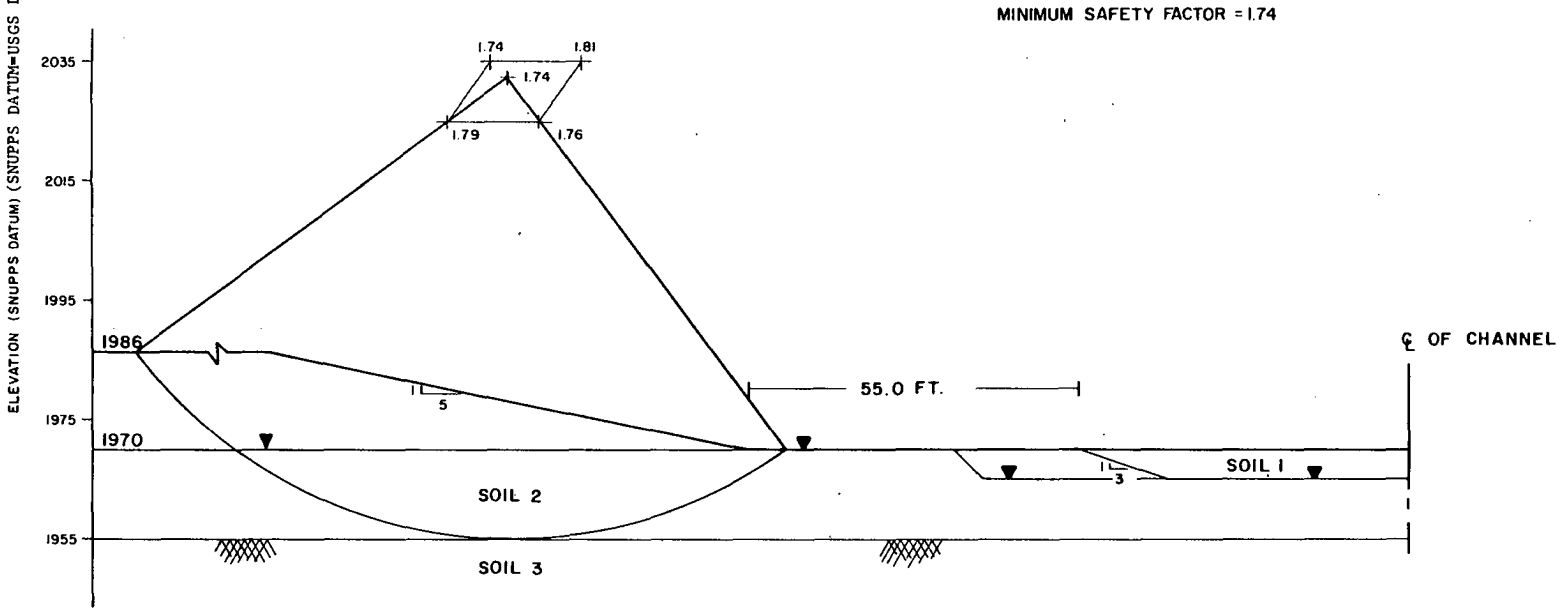
Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-113m

ESWS Intake Channel Slope Stability Analysis, 5:1 Slope End of Construction - Total Stress Parameters

SOIL	SOIL DESCRIPTION	SOIL PARAMETERS		
		DENSITY PCF	COHESION C PSF	FRICTION ANGLE Ø DEGREE
1	DUMMY LAYER	0	0	0
2	RESIDUAL	124	585	10
3	ROCK	150	5000	35

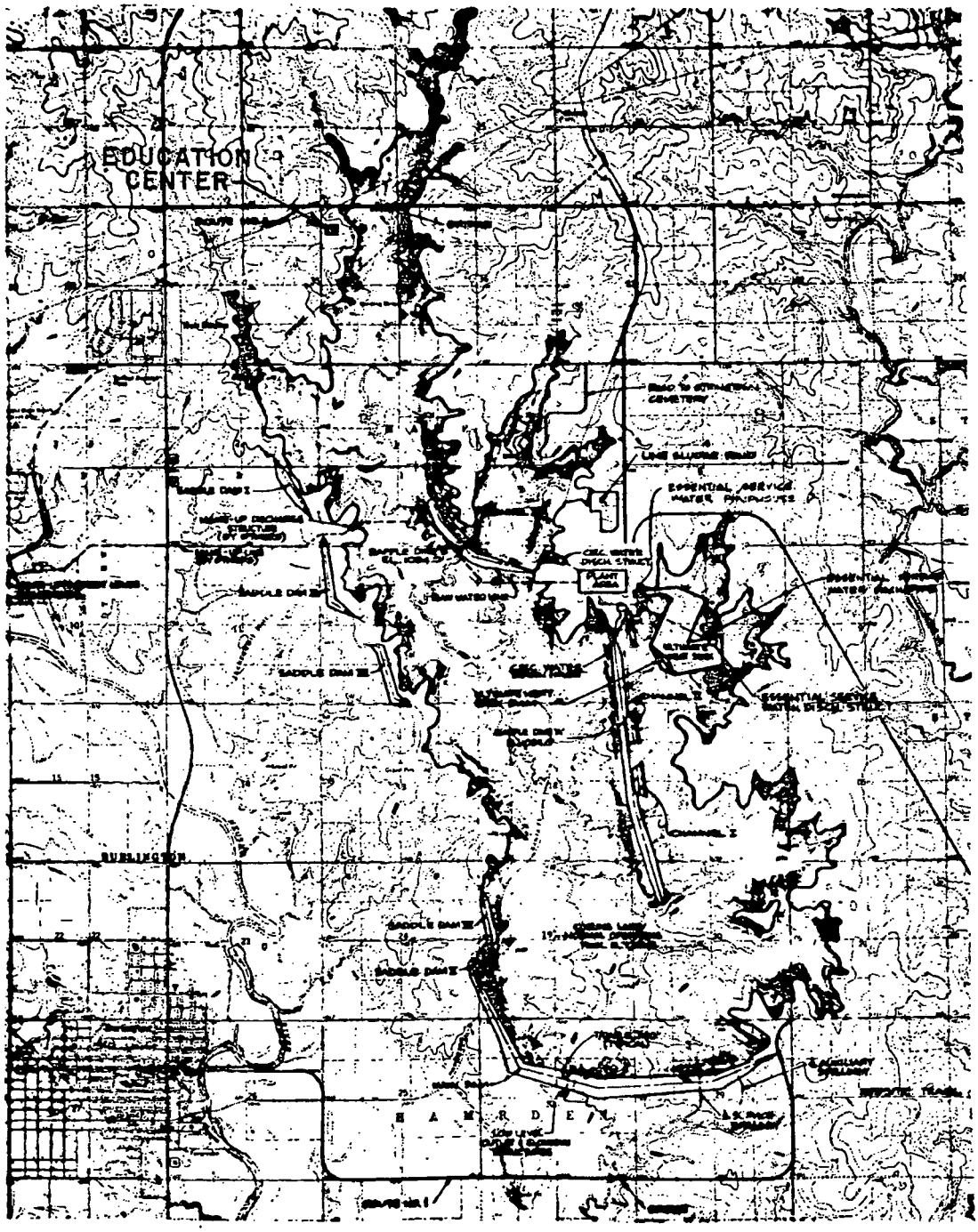


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-113n

ESWS Intake Channel Slope Stability Analysis, 5:1 Slope End of Construction with SSE - Total Stress Parameters



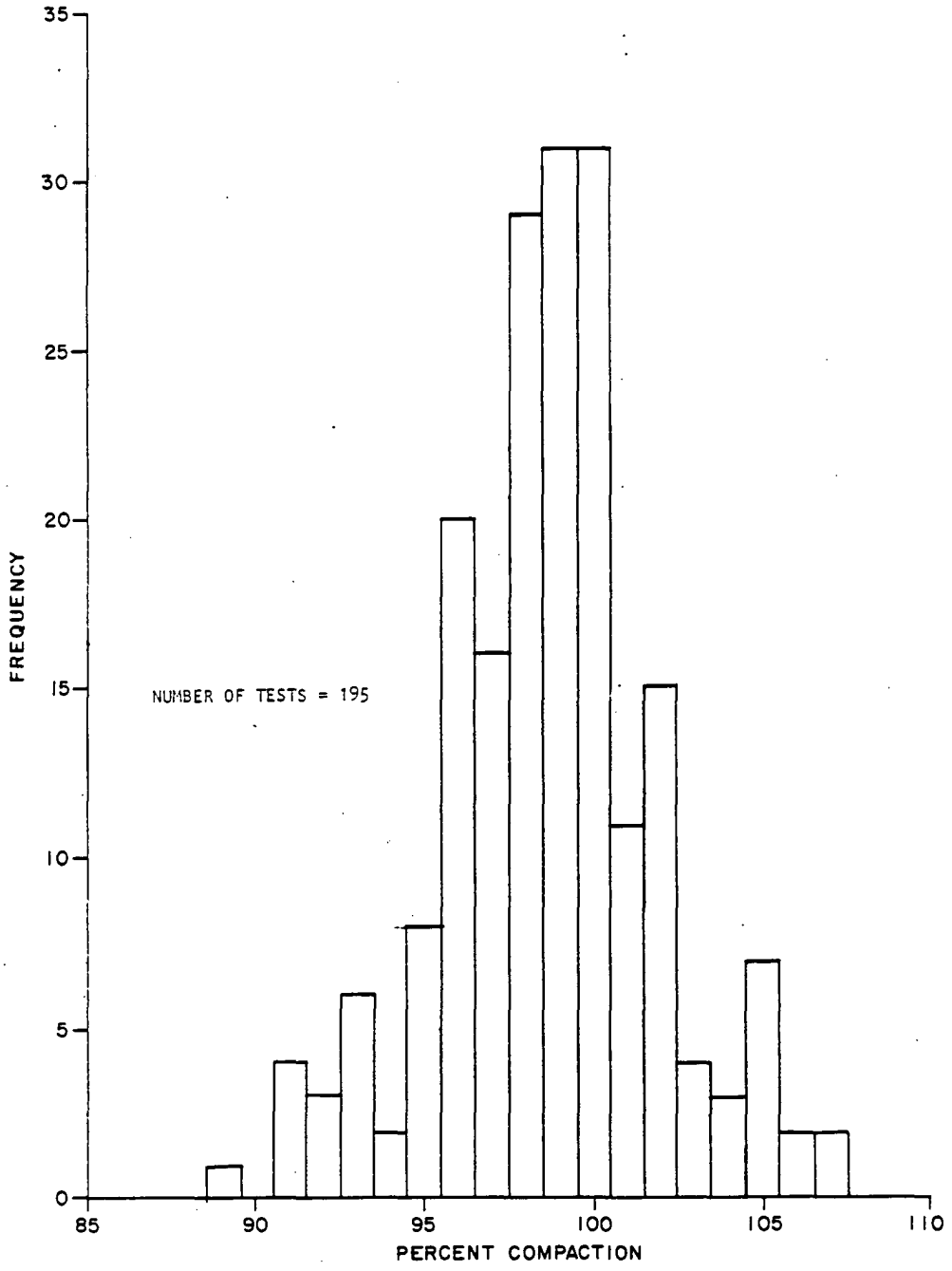
Note:
ESWS Discharge Structure is historic. See Figure2.5-30 for the location of the new ESWS Discharge Point.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-114 Rev. 28

Plot Plan - Site

Sheet 1 of 1



Rev. 0

NOTES:

1. RETESTS ON AREAS WHERE TESTS DID NOT MEET COMPACTION CRITERIA ARE INCLUDED IN THESE PLOTS.
2. MINIMUM COMPACTION IS ASTM D-698.

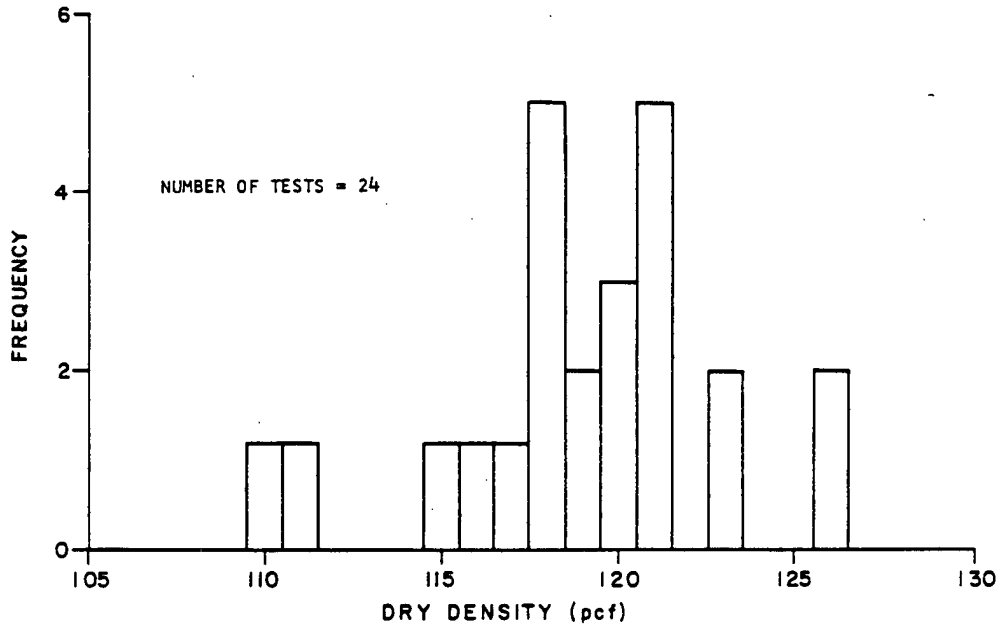
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-114a

UHS Dam - Earth Fill Embankment
Statistical Distribution Plot

7699-064-07

MATERIAL IDENTIFICATION NO. LWRD-22
80% RELATIVE DENSITY = 117 pcf



NOTES:

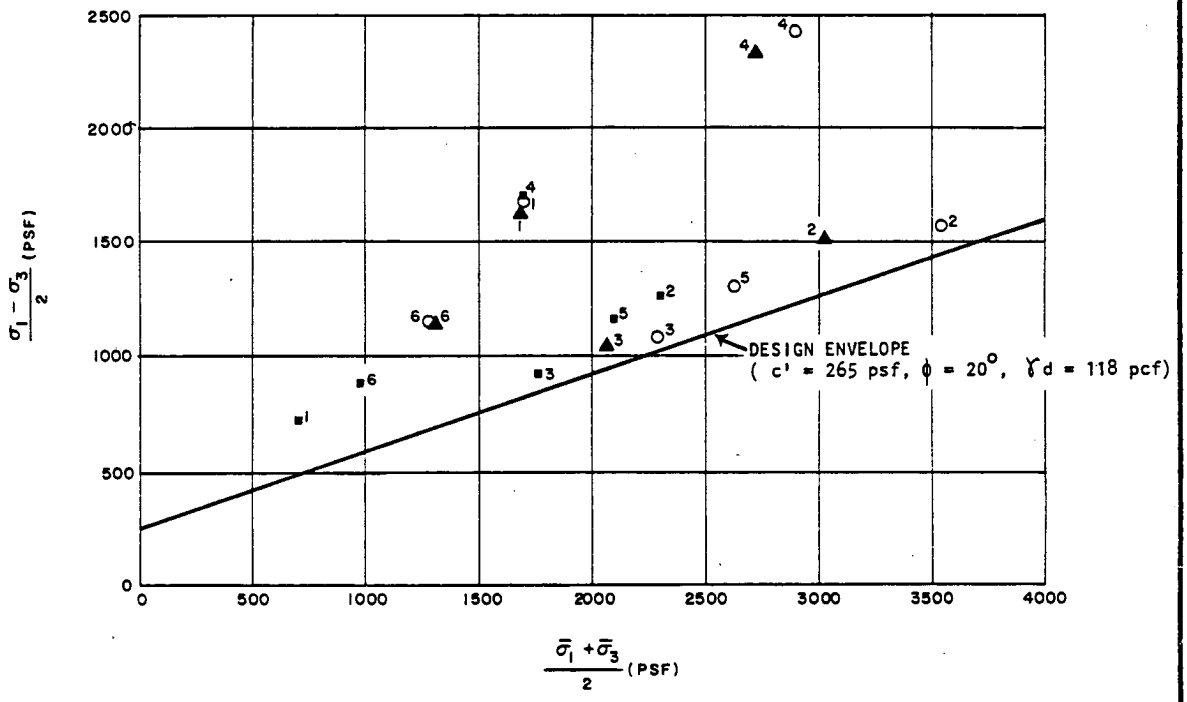
1. RETESTS ON AREAS WHERE TESTS DID NOT MEET COMPACTION CRITERIA ARE INCLUDED IN THIS PLOT.

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-114b

UHS Dam - Fine Riprap Bedding
Statistical Distribution Plot



KEY:

3 — INDICATES TEST NUMBER

STRESS CONDITIONS AT:

▲ 10% STRAIN

○ MAX $\sigma_1 - \sigma_3$

■ MAX $\bar{\sigma}_1 / \bar{\sigma}_3$

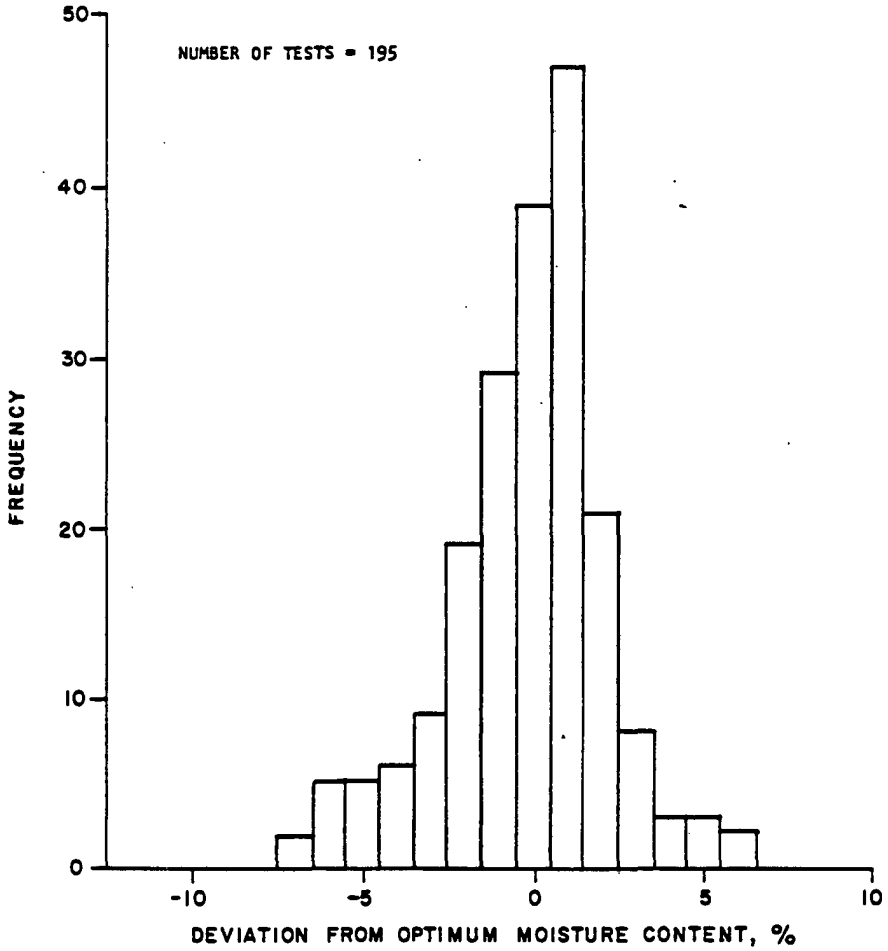
Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-114c

Consolidated - Undrained Triaxial Test Results, Ultimate Heat Sink Dam

7699-064-07



Rev. 0

NOTES:

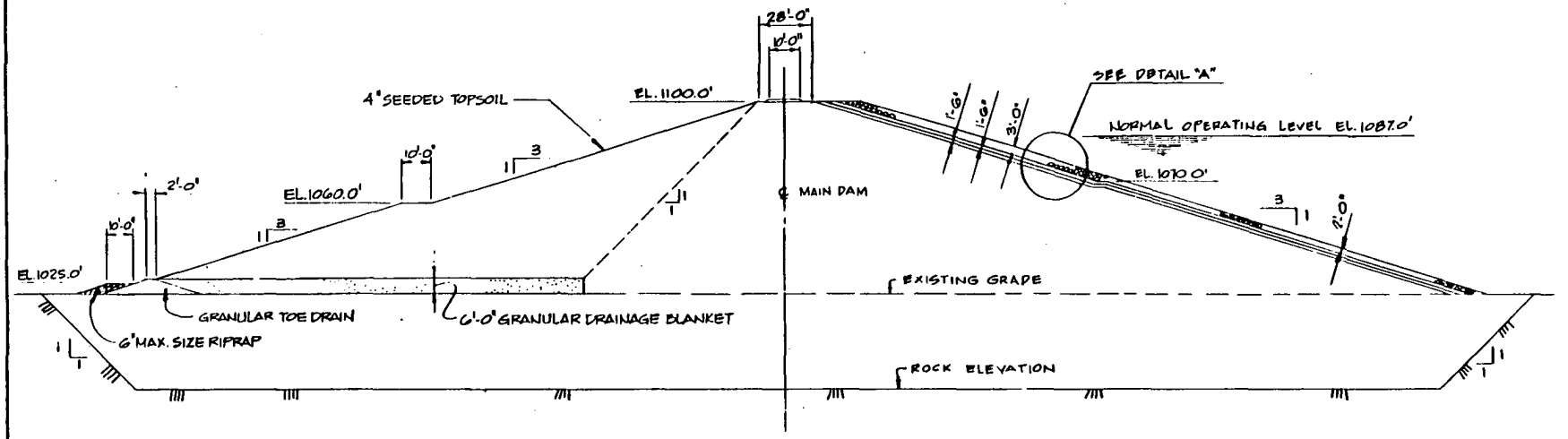
1. RETESTS ON AREAS WHERE TESTS DID NOT MEET COMPACTION CRITERIA ARE INCLUDED IN THIS PLOT.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

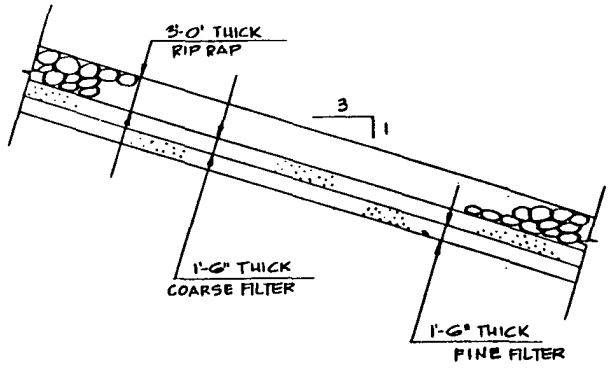
Figure 2.5-114d

UHS Dam - Statistical Distribution Plot

7699-064-07



TYPICAL SECTION
MAIN DAM



DETAIL "A"

Rev. 0

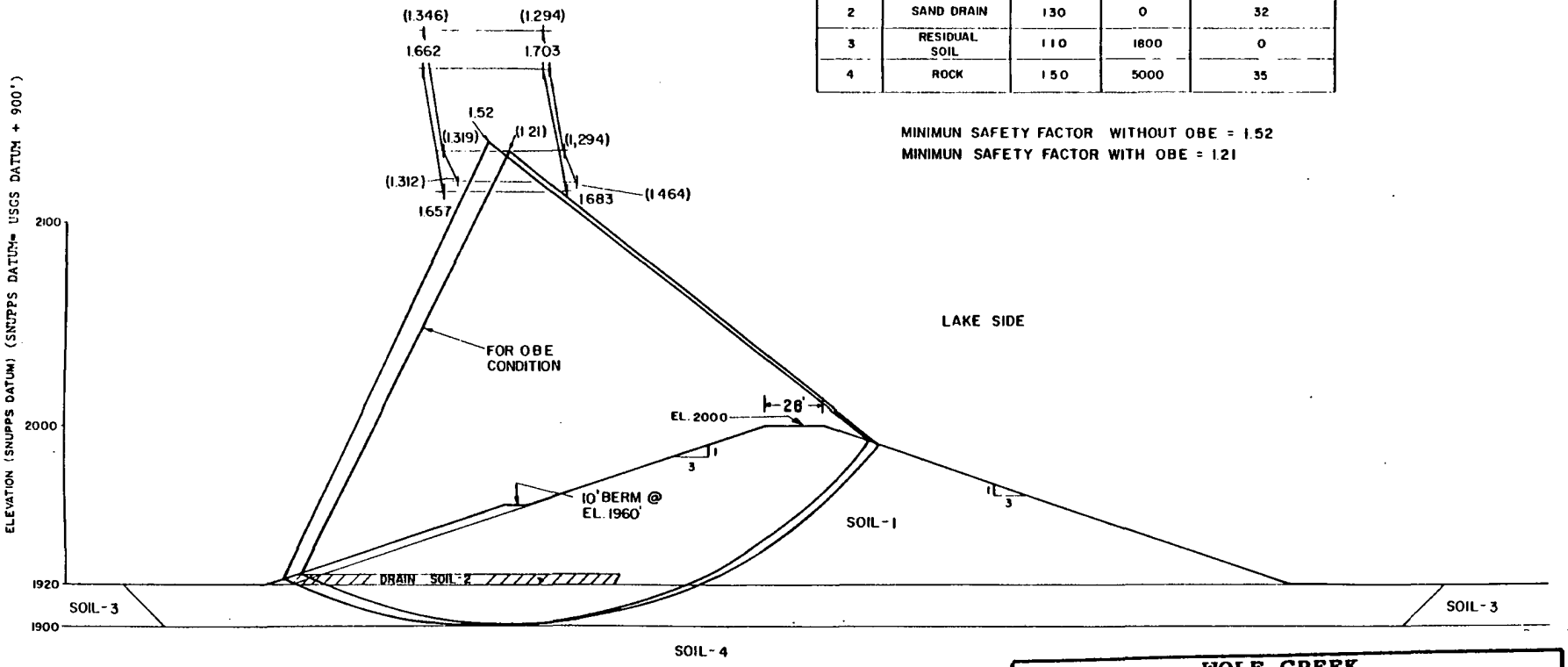
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-115a

Typical Section - Main Dam

SOIL	SOIL DESCRIPTION	SOIL PARAMETERS		
		DENSITY γ_T PCF	COHESION C PSF	FRICTION ANGLE ϕ DEGREE
1	COMPACTED CLAY	121	1800	0
2	SAND DRAIN	130	0	32
3	RESIDUAL SOIL	110	1800	0
4	ROCK	150	5000	35

MINIMUN SAFETY FACTOR WITHOUT OBE = 1.52
MINIMUN SAFETY FACTOR WITH OBE = 1.21



NOTE
1. Values in parenthesis are for OBE condition. OBE of 0.06g

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

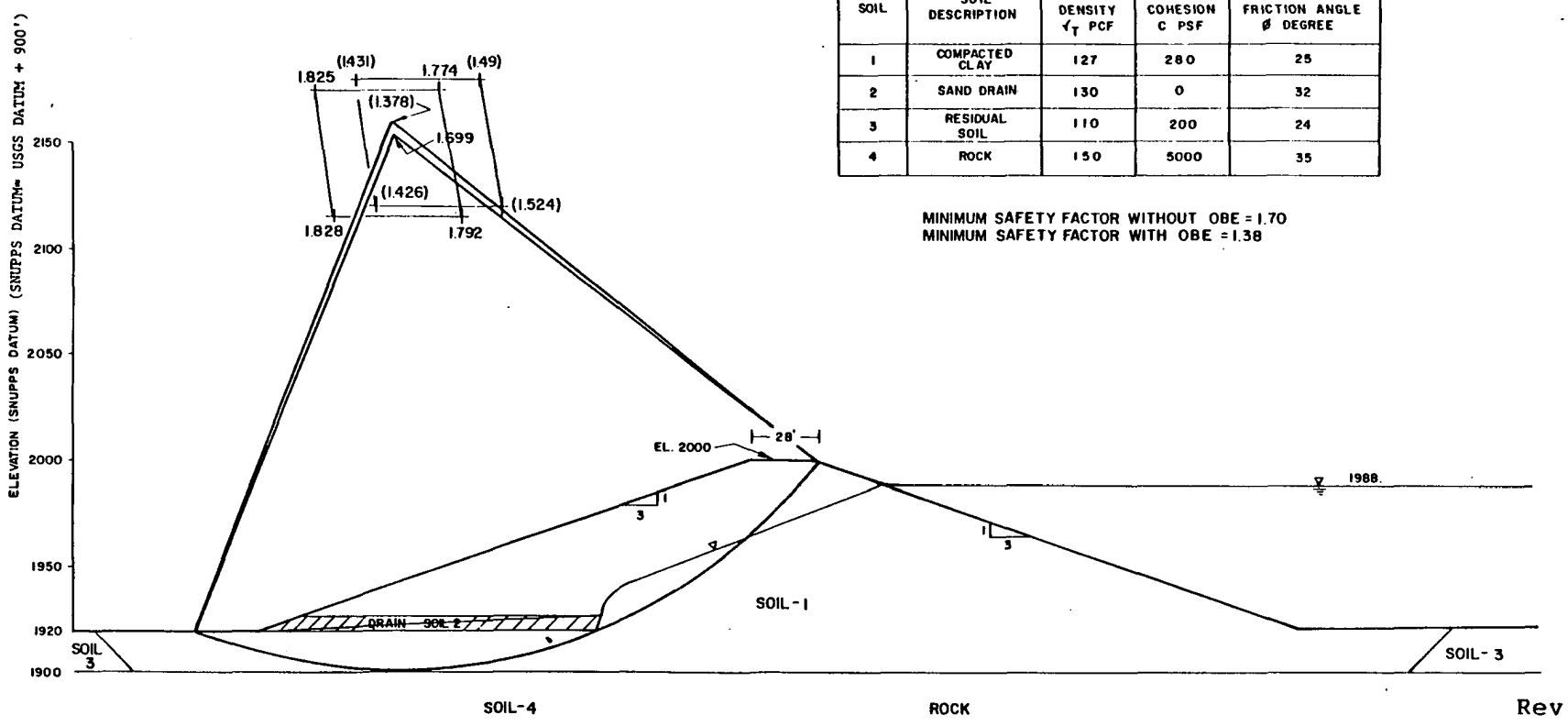
Figure 2.5-115b

Main Dam - Slope Stability Analysis - End of Construction

Rev. 0

SOIL	SOIL DESCRIPTION	SOIL PARAMETERS		
		DENSITY γ_T PCF	COHESION C PSF	FRICTION ANGLE ϕ DEGREE
1	COMPACTED CLAY	127	280	25
2	SAND DRAIN	130	0	32
3	RESIDUAL SOIL	110	200	24
4	ROCK	150	5000	35

MINIMUM SAFETY FACTOR WITHOUT OBE = 1.70
MINIMUM SAFETY FACTOR WITH OBE = 1.38



NOTE

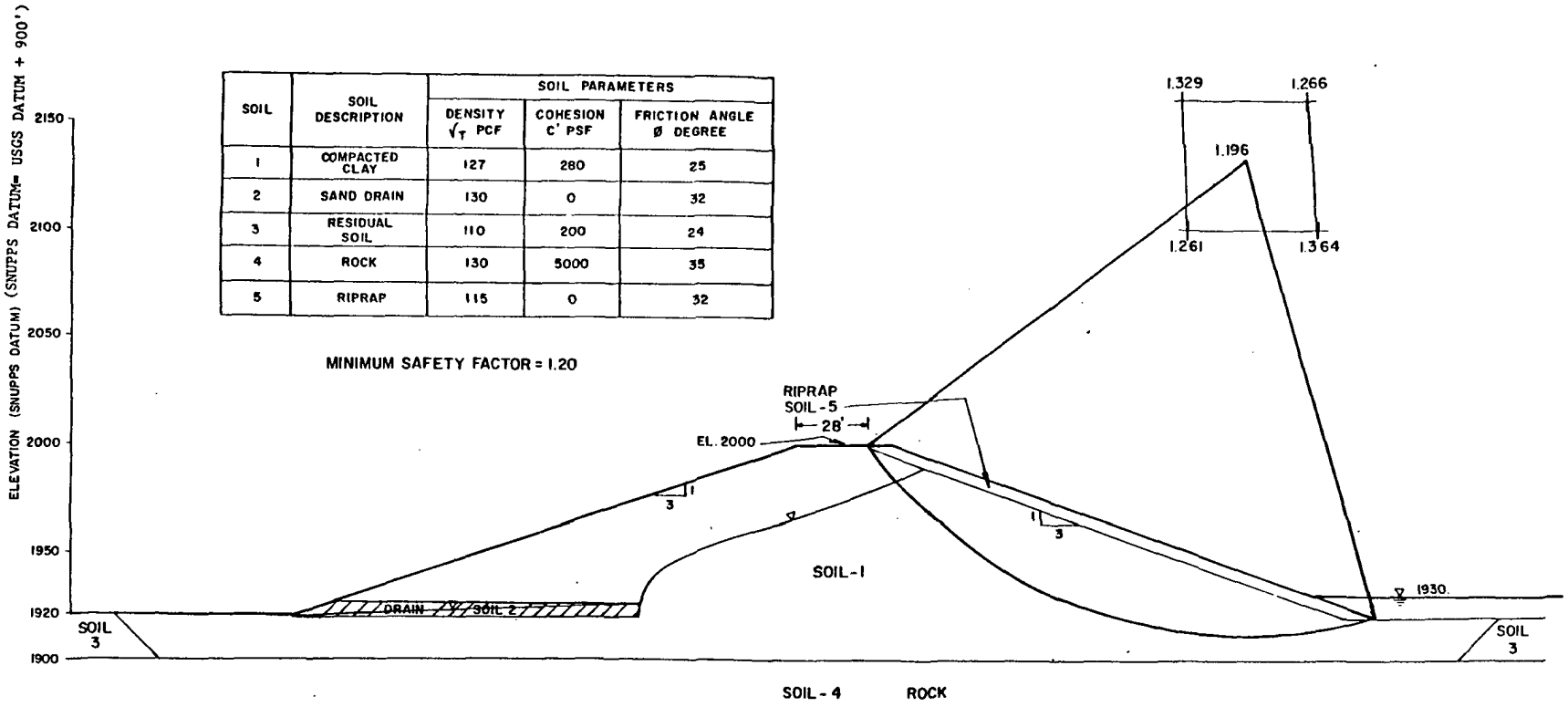
1. Values in parenthesis are for OBE condition. OBE of 0.06g

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-115c

Main Dam - Slope Stability Analysis - Steady State Conditions



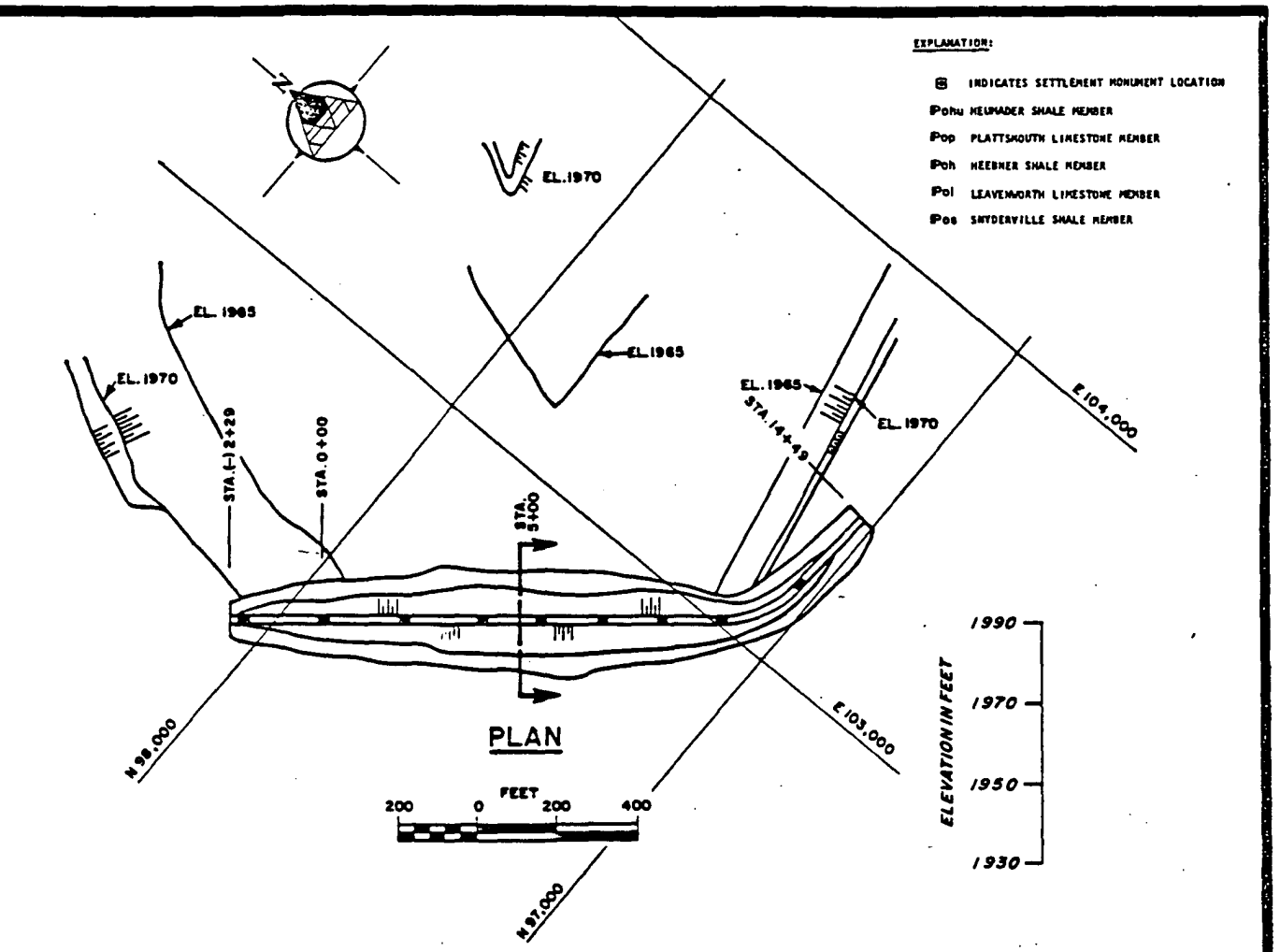
SOIL	SOIL DESCRIPTION	SOIL PARAMETERS		
		DENSITY $\sqrt{T}$ PCF	COHESION C' PSF	FRICTION ANGLE Ø DEGREE
1	COMPACTED CLAY	127	280	25
2	SAND DRAIN	130	0	32
3	RESIDUAL SOIL	110	200	24
4	ROCK	130	5000	35
5	RIPRAP	115	0	32

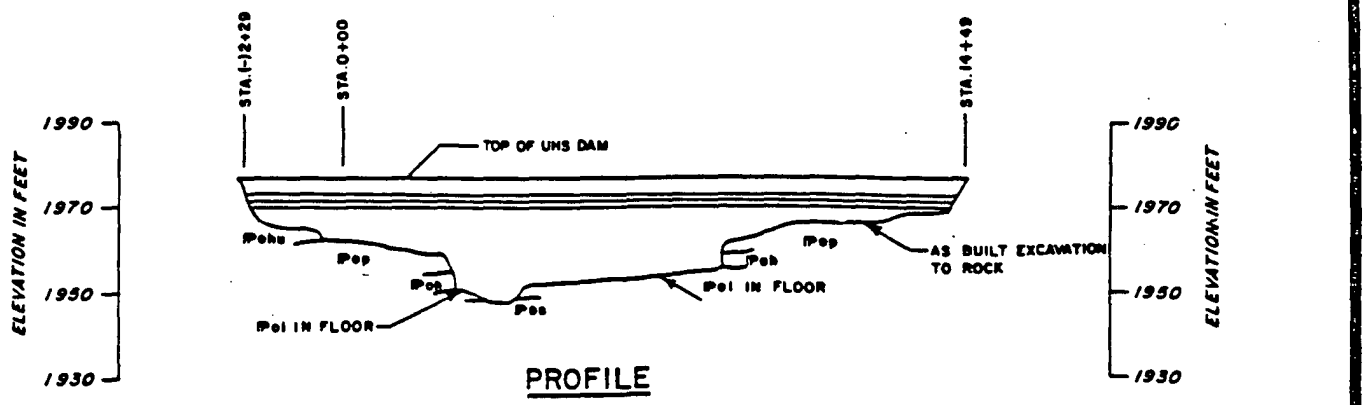
Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-115d

Main Dam - Slope Stability
Analysis - Rapid Drawdown





Rev. 0

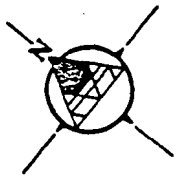
DRAWING REFERENCE:

TITLED: ULTIMATE HEAT SINK DAM
PLAN, PROFILE & SECTION
FOR: WOLF CREEK GENERATING STATION
UNIT 1; KANSAS GAS & ELECTRIC COMP.
KANSAS CITY POWER & LIGHT COMPANY
BY: SARGENT & LUNDY ENGINEERS
CHICAGO, ILLINOIS
DRAWING NO.: S-81, REV. E.
DATED: 8-25-80

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

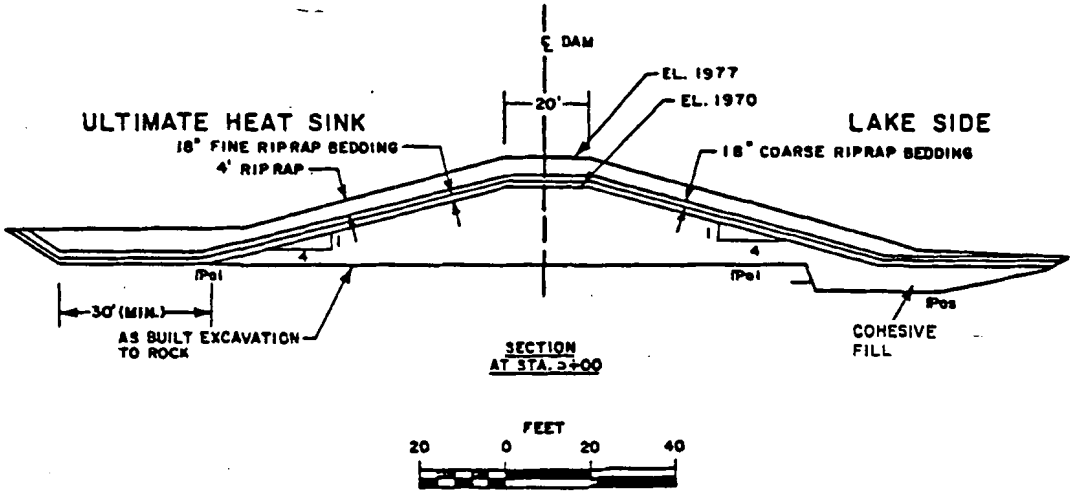
Figure 2.5-116

Ultimate Heat Sink Dam - Plan and Profile



EXPLANATION:

Pol LEAVENWORTH LIMESTONE MEMBER
Pos SNYDERVILLE SHALE MEMBER

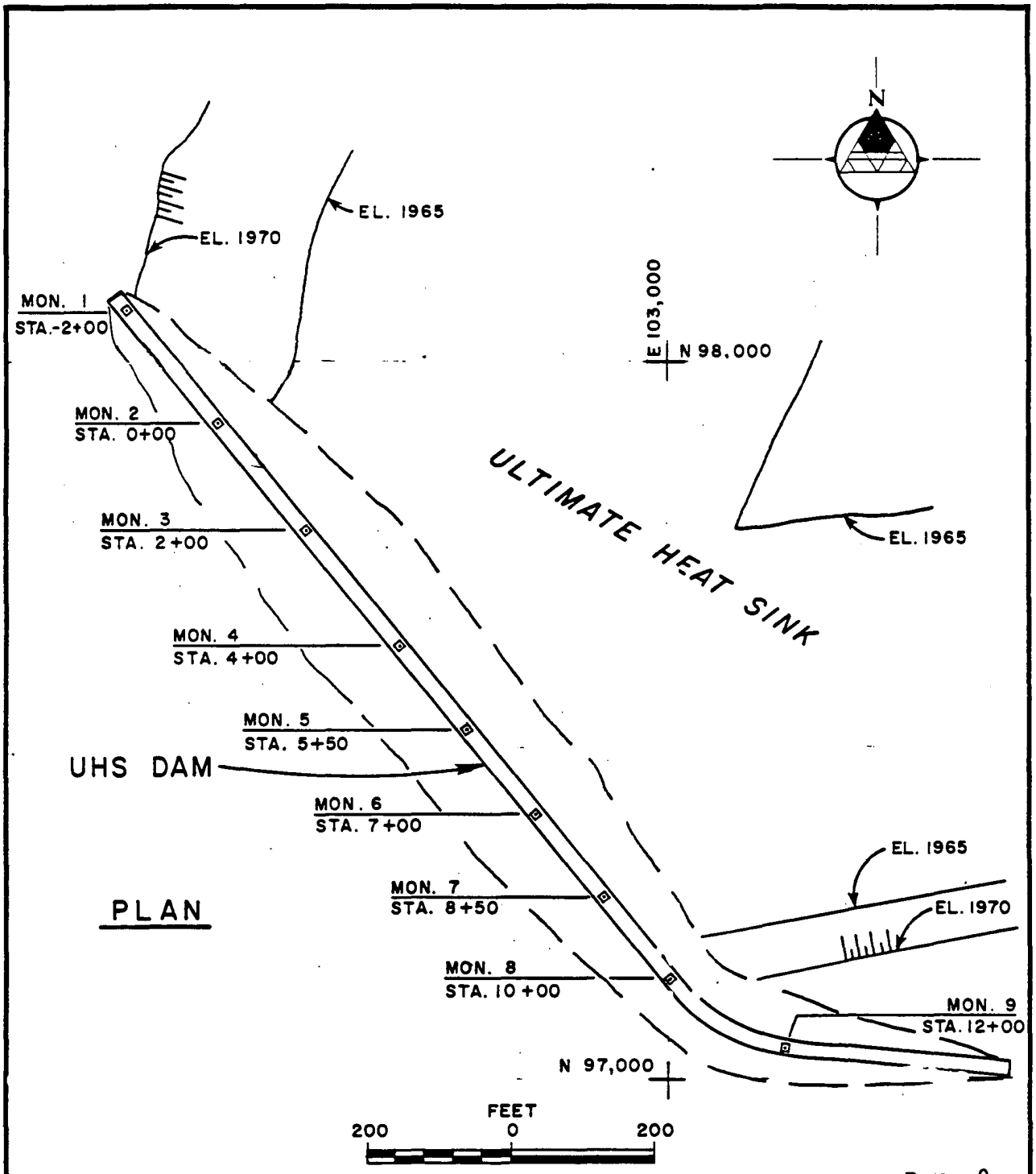


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-117

Typical Section - UHS Dam



KEY:

MON. 1 — MOVEMENT MONUMENT LOCATION AND NUMBER

Rev. 0

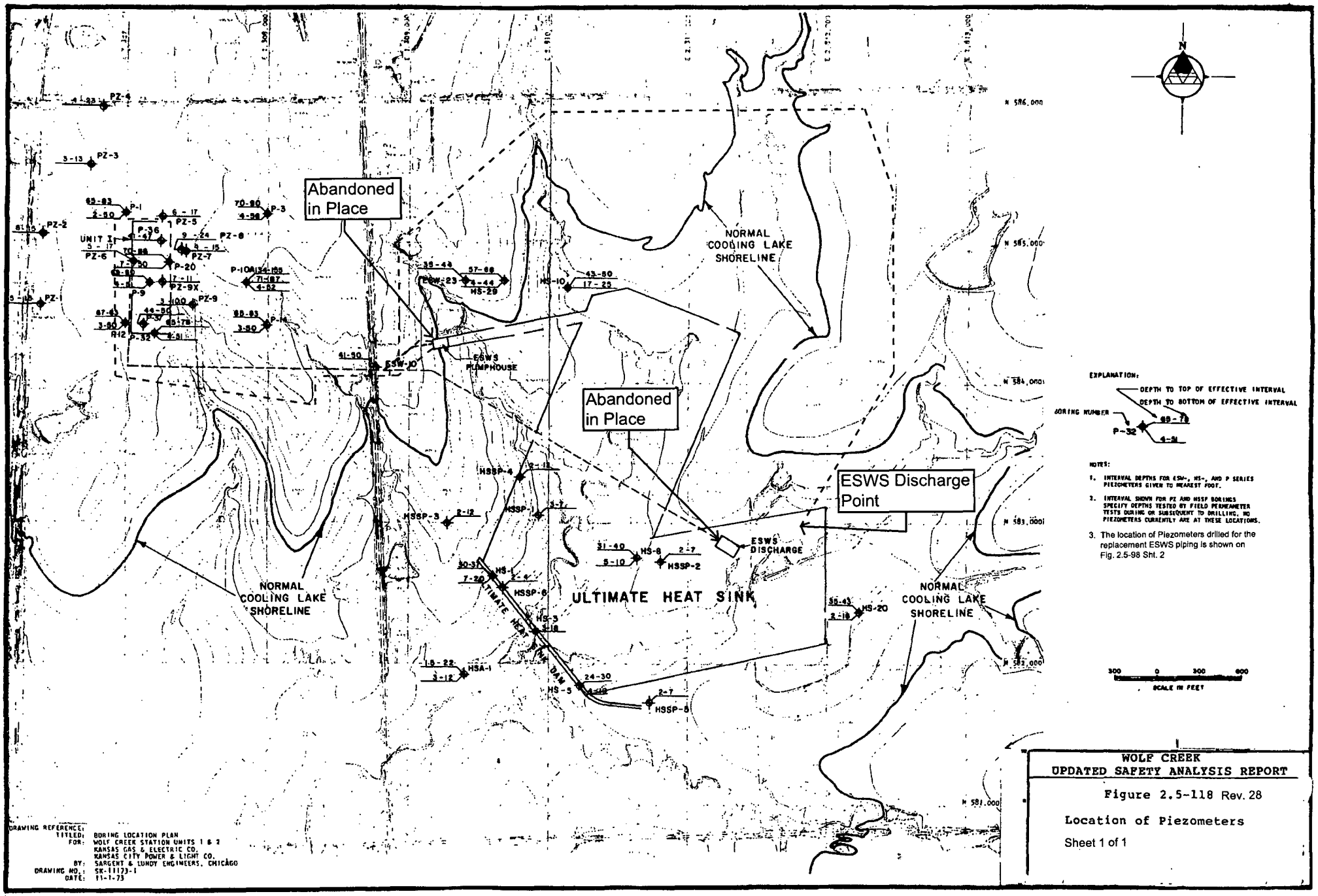
DRAWING REFERENCE:

CAMPBELL, BARBER, LAMBETH & ASSOCIATES, P.A.
6223 SLATER
P.O. BOX 315
SHAWNEE MISSION, KANSAS 66201
PHONE: 913-722-1220

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-117a

Movement Monument Location - UHS Dam

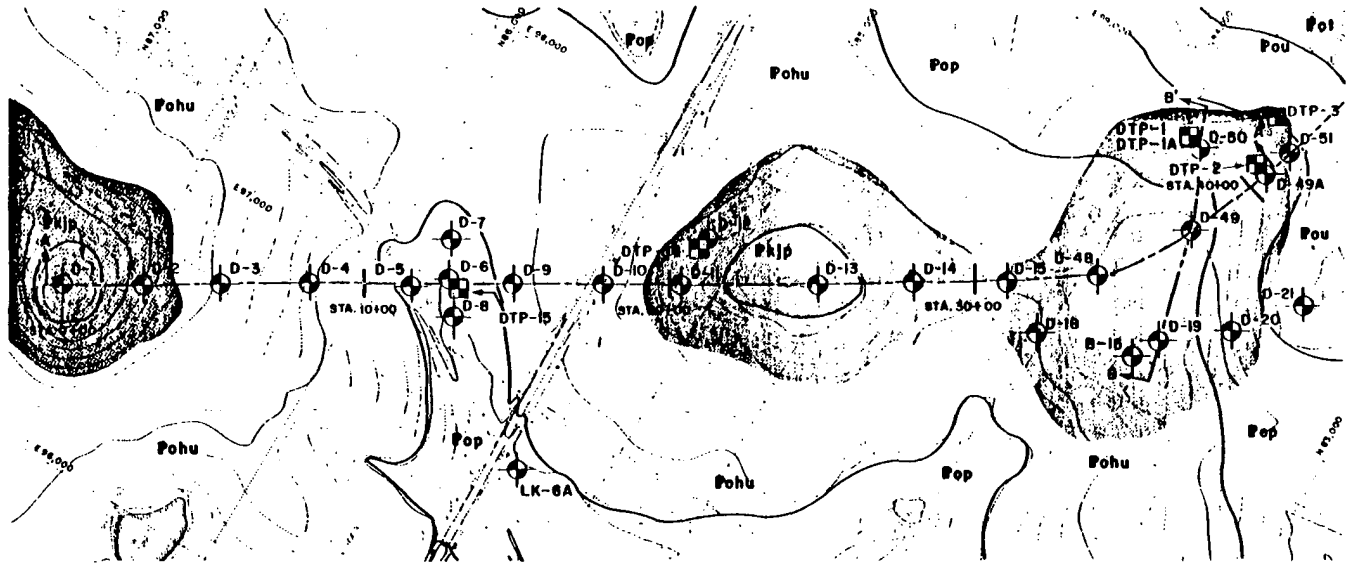


WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

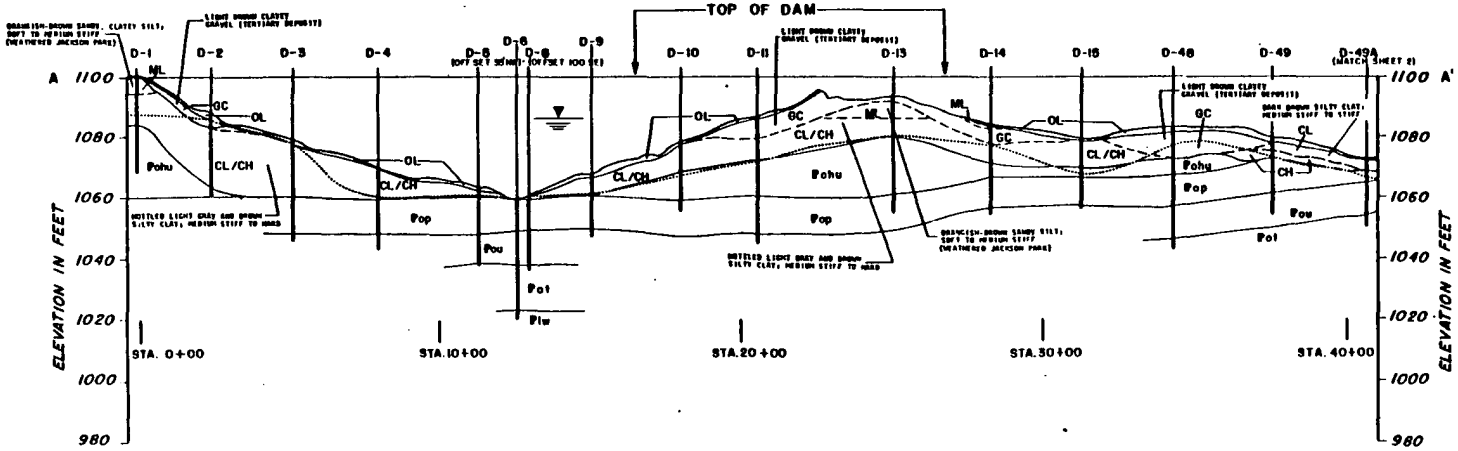
Figure 2.5-118 Rev. 28

Location of Piezometers

Sheet 1 of 1



NOTE: THE GEOLOGIC STRIP MAPS INDICATE THE APPROXIMATE SURFACE LIMITS OF THE RESIDUAL SOILS, AS RELATED TO THEIR RESPECTIVE BEDROCK UNIT.



BASE MAP MODIFIED FROM,

TITLED: WOLF CREEK PROJECT TOPOGRAPHIC MAPS

BY: KANSAS GAS AND ELECTRIC COMPANY

DRAWING NUMBER: 8025-E-1001

REVISION DATED: 1-16-76

SHEET NUMBER: 24

NOTE:

THE DEPTH AND THICKNESS OF SOIL AND ROCK STRATA INDICATED ON THE SUBSURFACE SECTION WERE OBTAINED BY INTERPOLATING BETWEEN BORINGS. INFORMATION ON ACTUAL SOIL AND ROCK CONDITIONS EXIST ONLY AT BORING LOCATIONS. IT IS POSSIBLE THAT SOIL AND ROCK CONDITIONS BETWEEN BORINGS MAY VARY FROM THOSE INDICATED.

EXPLANATION:

- GEOLOGIC CONTACT
- INFERRED GEOLOGIC CONTACT
- TEST BORING LOCATION AND DEPTH ON SUBSURFACE SECTION
- GROUND LEVEL
- COOLING LAKE WATER LEVEL

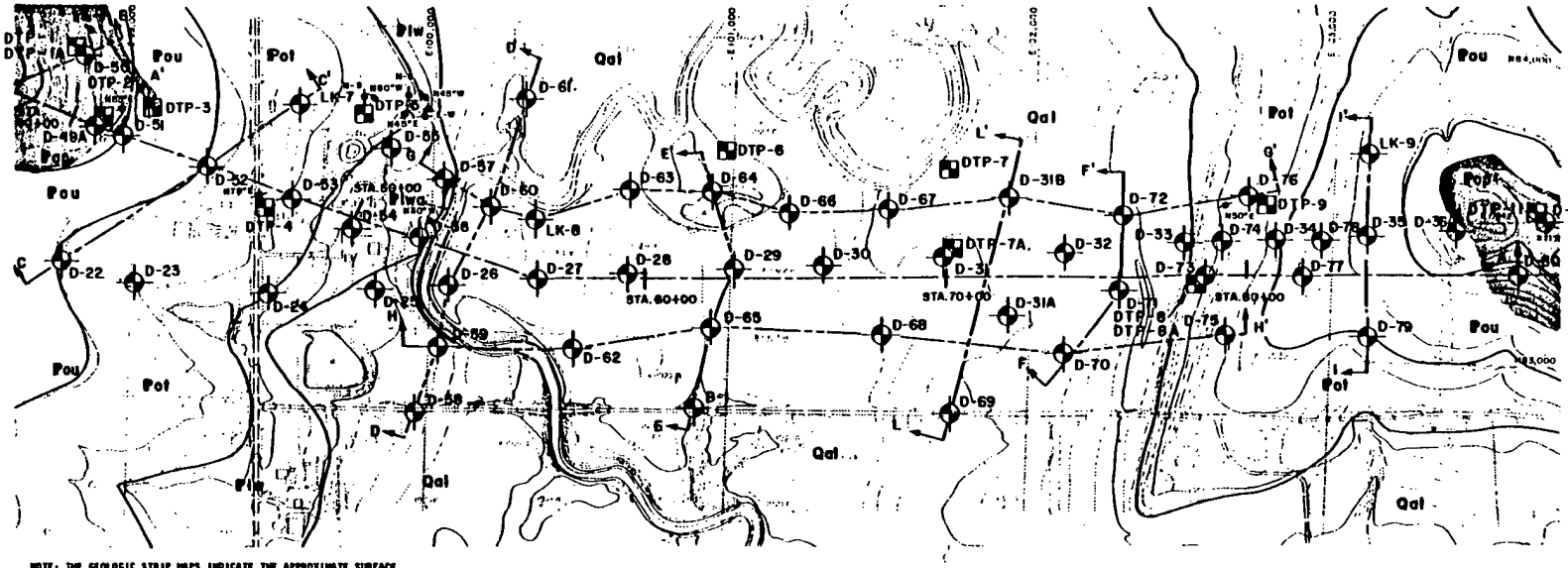
FEET
100 0 100 200 300 400 500

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-119 (Sheet 1 of 3)

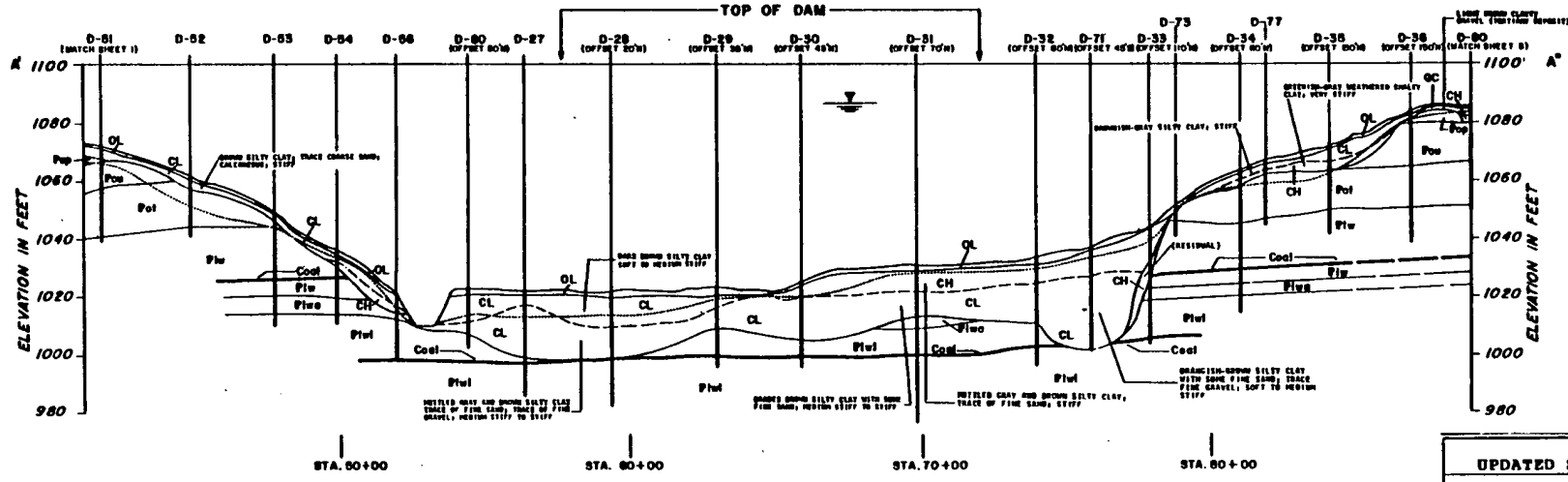
Plot Plan with Geologic Strip Map and Main Dam Subsurface Sections A-A', A'A", and A'-A'''



NOTE: THE GEOLOGIC STRIP MAPS INDICATE THE APPROXIMATE SURFACE LIMITS OF THE RESIDUAL SOILS, AS RELATED TO THEIR RESPECTIVE BEDROCK UNITS.

EXPLANATION:

- GEOLOGIC CONTACT
- INFERRED GEOLOGIC CONTACT
- TEST BORING LOCATION AND DEPTH ON SUBSURFACE SECTION
- GROUND LEVEL
- COOLING LAKE WATER LEVEL



Rev. 0

FEET
100 0 100 200 300 400 500

BASE MAP MODIFIED FROM:

TITLED: WOLF CREEK PROJECT TOPOGRAPHIC MAPS

BY: KANSAS GAS AND ELECTRIC COMPANY

DRAWING NUMBER: 0875-E-1001

REVISION DATED: 3-15-76

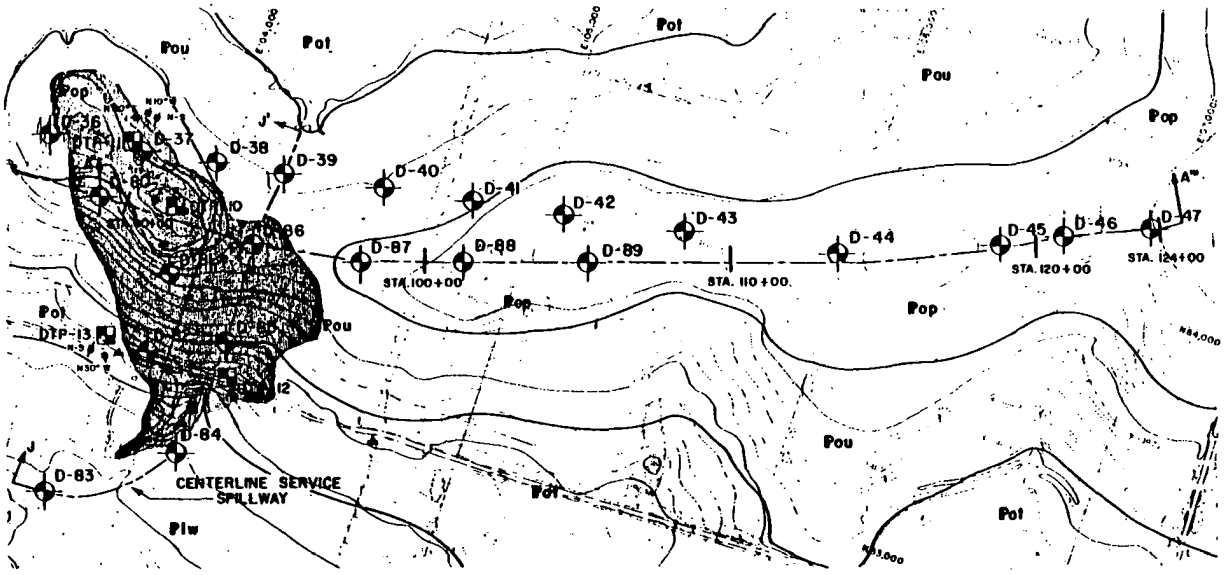
SHEET NUMBER: 24

NOTE: THE DEPTH AND THICKNESS OF SOIL AND ROCK STRATA INDICATED ON THE SUBSURFACE SECTION WERE OBTAINED BY INTERPOLATING BETWEEN BORINGS. INFORMATION ON ACTUAL SOIL AND ROCK CONDITIONS EXIST ONLY AT BORING LOCATIONS. IT IS POSSIBLE THAT SOIL AND ROCK CONDITIONS BETWEEN BORINGS MAY VARY FROM THOSE INDICATED.

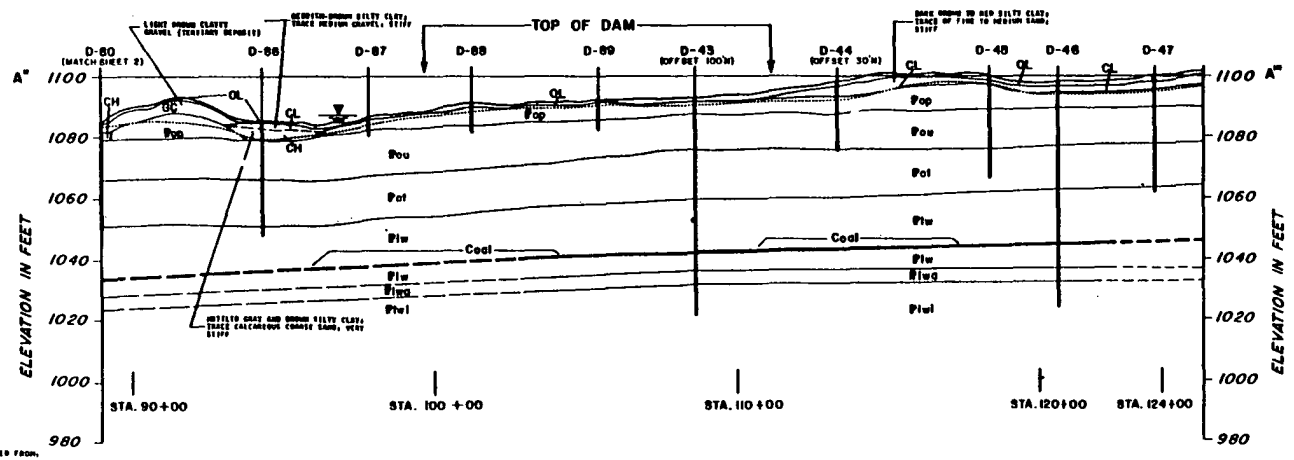
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-119 (Sheet 2 of 3)

Plot Plan with Geologic Strip Map and Main Dam Subsurface Sections A-A', A'A", and A'-A'''



NOTE: THE GEOLOGIC STRIP MAPS INDICATE THE APPROXIMATE SURFACE LIMITS OF THE RESIDUAL SOILS, AS RELATED TO THEIR RESPECTIVE BEDROCK UNIT.



BASE MAP MODIFIED FROM,
TITLED, WOLF CREEK PROJECT TOPOGRAPHIC MAPS
BY, KANSAS GAS AND ELECTRIC COMPANY
DRAWING NUMBER, 8035-E-1001
REVISION DATED, 1-16-76
SHEET NUMBER, 26

NOTE:
THE DEPTH AND THICKNESS OF SOIL AND ROCK STRATA INDICATED ON THE SUBSURFACE SECTION WERE OBTAINED BY INTERPOLATING BETWEEN BORINGS. INFORMATION ON ACTUAL SOIL AND ROCK CONDITIONS EXIST ONLY AT BORING LOCATIONS. IT IS POSSIBLE THAT SOIL AND ROCK CONDITIONS BETWEEN BORINGS MAY VARY FROM THOSE INDICATED.

EXPLANATION:
- GEOLOGIC CONTACT
- INFERRED GEOLOGIC CONTACT
- TEST BORING LOCATION AND DEPTH ON SUBSURFACE SECTION
- GROUND LEVEL
- COOLING LAKE WATER LEVEL

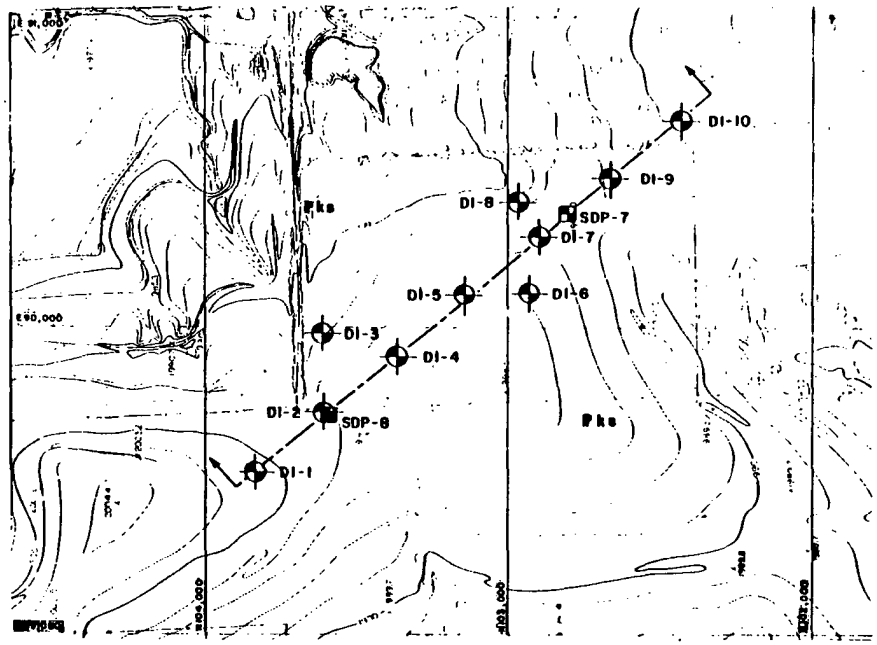
FEET
100 0 100 200 300 400 500

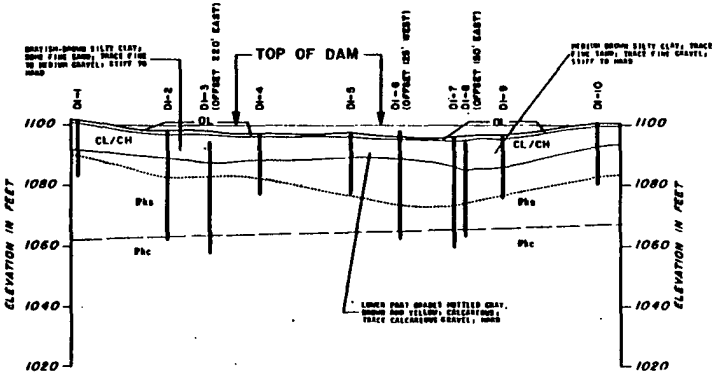
Rev. 0

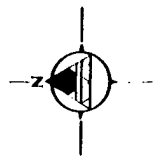
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-119 (Sheet 3 of 3)

Plot Plan with Geologic Strip Map and Main Dam Subsurface Sections A-A', A'A", and A'-A'''









Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

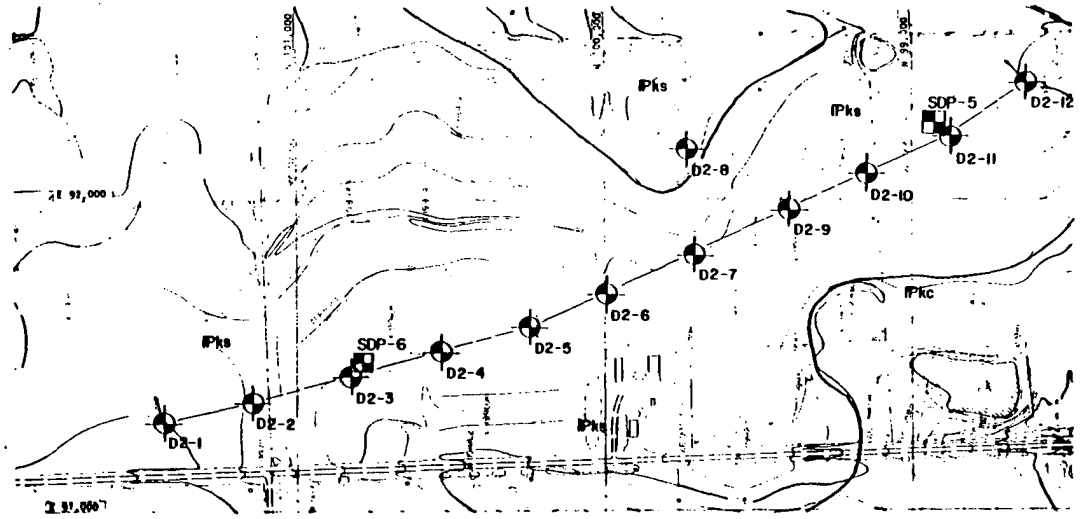
Figure 2.5-120

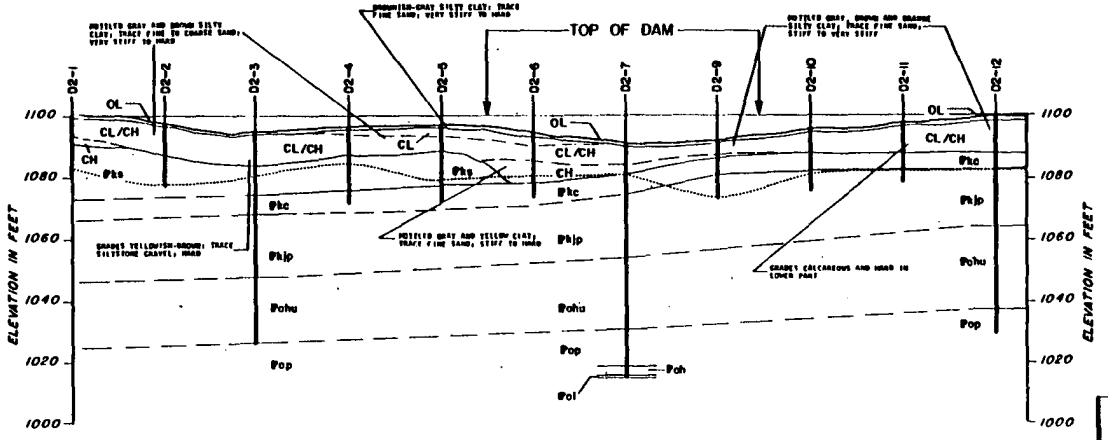
Plot Plan with Geologic Strip Map and Subsurface Section - Saddle Dam I

BASE MAP MODIFIED FROM:
TITLED: WOLF CREEK PROJECT TOPOGRAPHIC MAPS
BY: KANSAS GAS AND ELECTRIC COMPANY
DRAWING NUMBER: 8025-E-1001
REVISION DATED: 5/13/74
SHEET NUMBER: 13 AND 14

NOTE:
THE DEPTH AND THICKNESS OF SOIL AND ROCK STRATA INDICATED ON THE SUBSURFACE SECTION WERE OBTAINED BY INTERPOLATING BETWEEN BORINGS. INFORMATION ON ACTUAL SOIL AND ROCK CONDITIONS EXIST ONLY AT BORING LOCATIONS. IT IS POSSIBLE THAT SOIL AND ROCK CONDITIONS BETWEEN BORINGS MAY VARY FROM THOSE INDICATED.

EXPLANATION:
GEOLOGIC CONTACT
INFERRED GEOLOGIC CONTACT
TEST BORING LOCATION AND DEPTH OR SUBSURFACE SECTION
GROUND LEVEL
CONSTRUCTION WATER LEVEL







NOTE:

THE DEPTH AND THICKNESS OF SOIL AND ROCK STRATA INDICATED ON THE SUBSURFACE SECTION WERE OBTAINED BY INTERPOLATING BETWEEN BORINGS. INFORMATION ON ACTUAL SOIL AND ROCK CONDITIONS EXIST ONLY AT BORING LOCATIONS. IT IS POSSIBLE THAT SOIL AND ROCK CONDITIONS BETWEEN BORINGS MAY VARY FROM THOSE INDICATED.

EXPLANATION:

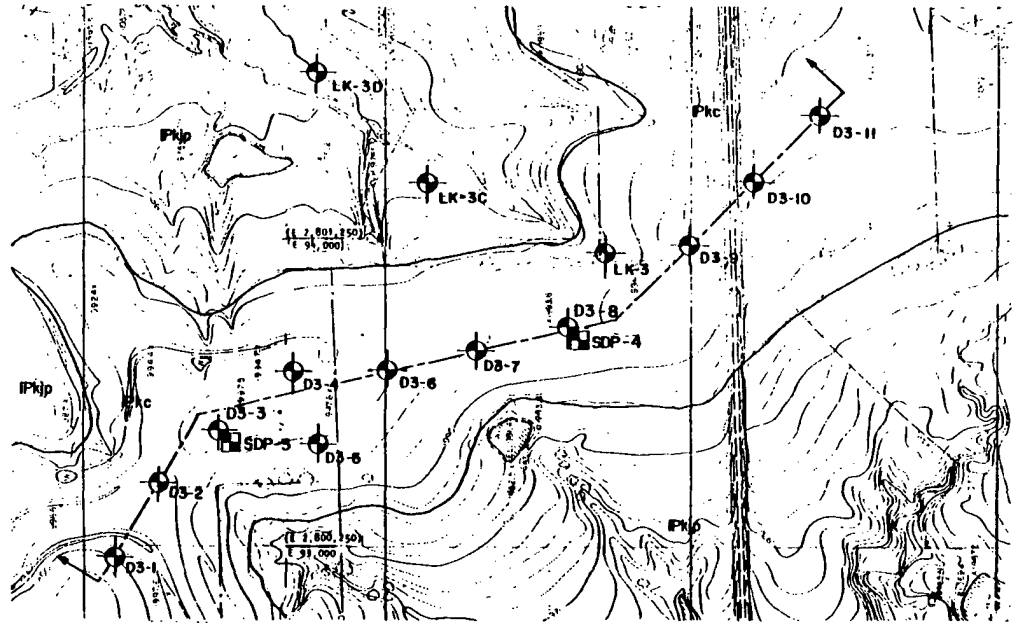
- GEOLOGIC CONTACT
- INFERRED GEOLOGIC CONTACT
- TEST BORING LOCATION AND DEPTH ON SUBSURFACE SECTION
- GROUND LEVEL
- COOLING LAKE WATER LEVEL

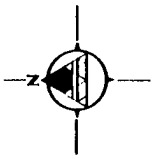
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

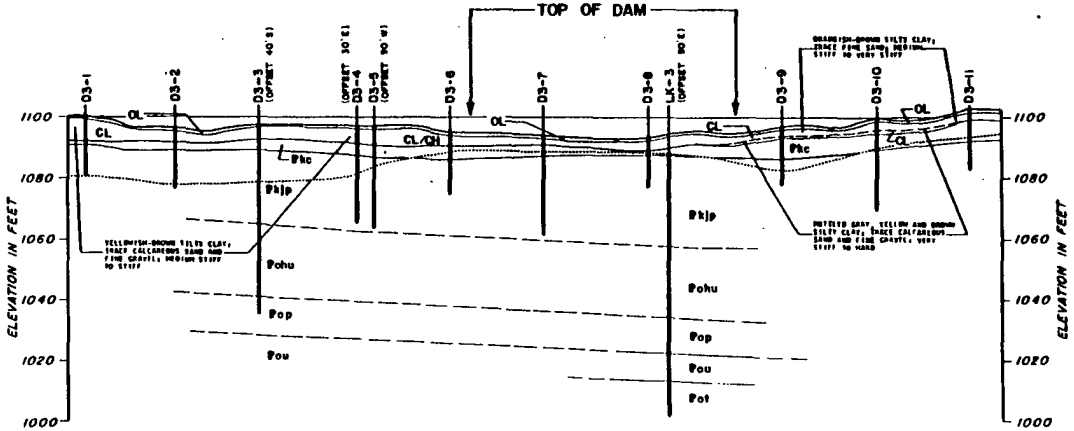
Figure 2.5-121

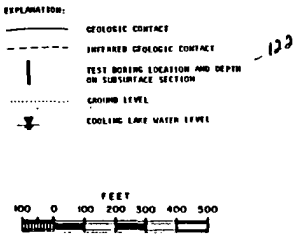
Plot Plan with Geologic Strip Map and Subsurface Section - Saddle Dam II

Rev. 0









BASE MAP ADAPTED FROM
DRAWN: WOLF CREEK PROJECT TOPOGRAPHIC MAPS
BY: KANSAS GAS AND ELECTRIC COMPANY
DRAWING NUMBER
REVISION DATED

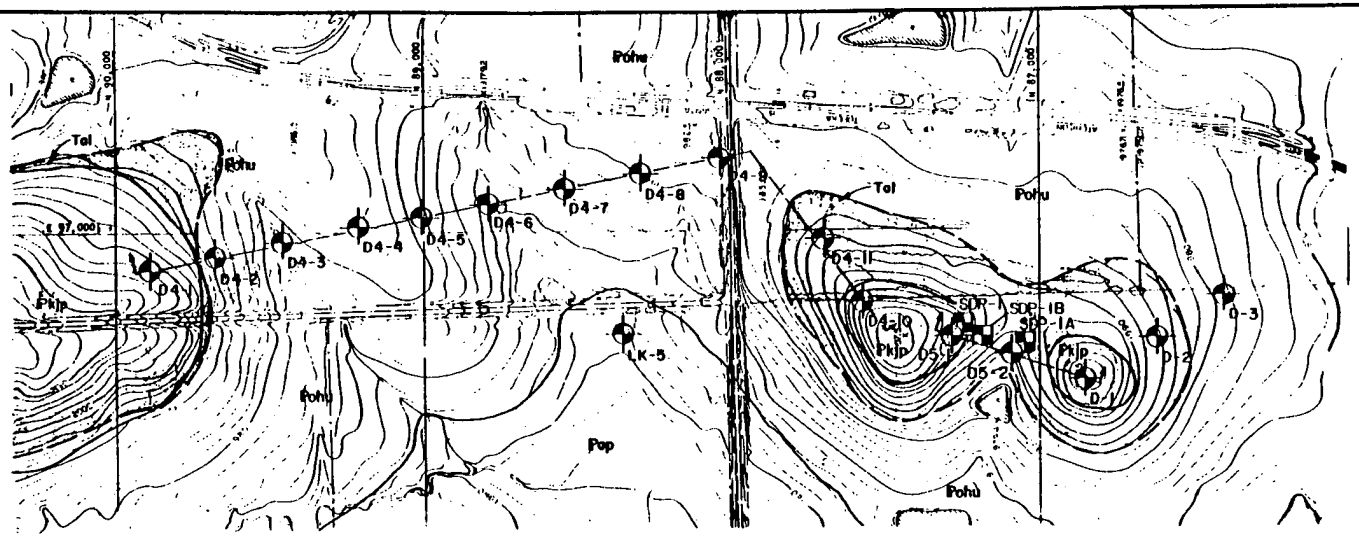
NOTE:
THE DEPTH AND THICKNESS OF SOIL AND ROCK STRATA INDICATED ON THE SUBSURFACE SECTION WERE OBTAINED BY INTERPOLATING BETWEEN BORINGS. INFORMATION ON ACTUAL SOIL AND ROCK CONDITIONS EXIST ONLY AT BORING LOCATIONS. IT IS POSSIBLE THAT SOIL AND ROCK CONDITIONS BETWEEN BORINGS MAY VARY FROM THOSE INDICATED.

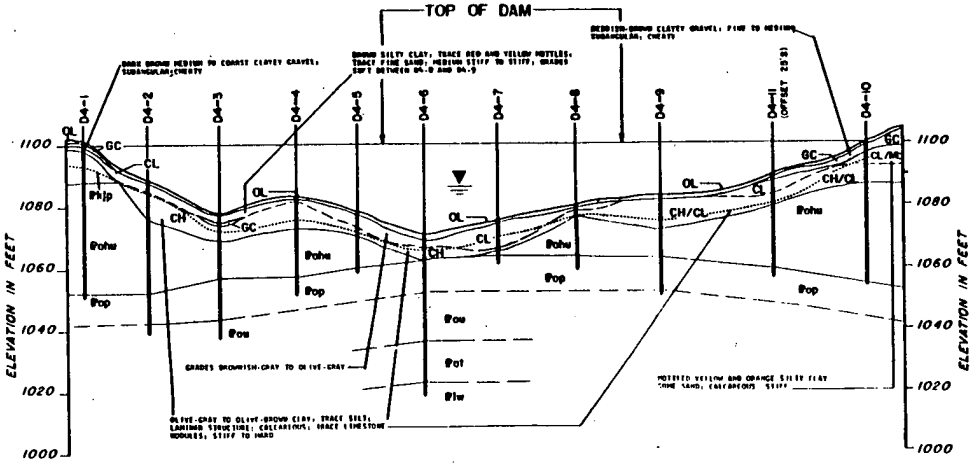
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

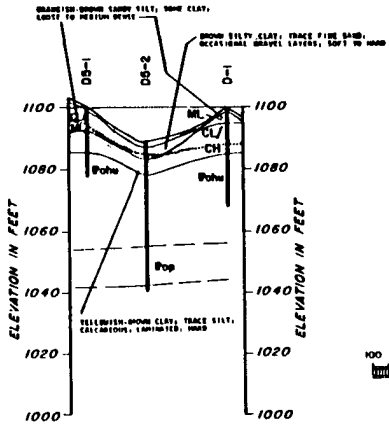
Figure 2.5-122

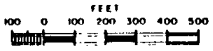
Plot Plan with Geologic Strip Map and Subsurface Section - Saddle Dam III

Rev. 0









Rev. 0

BASE MAP MODIFIED FROM:
TITLED: WOLF CREEK PROJECT TOPOGRAPHIC MAPS
BY: KANSAS GAS AND ELECTRIC COMPANY
DRAWING NUMBER: B075-E-1001
REVISION DATED: 6-17-76
SHEET NUMBER: 70

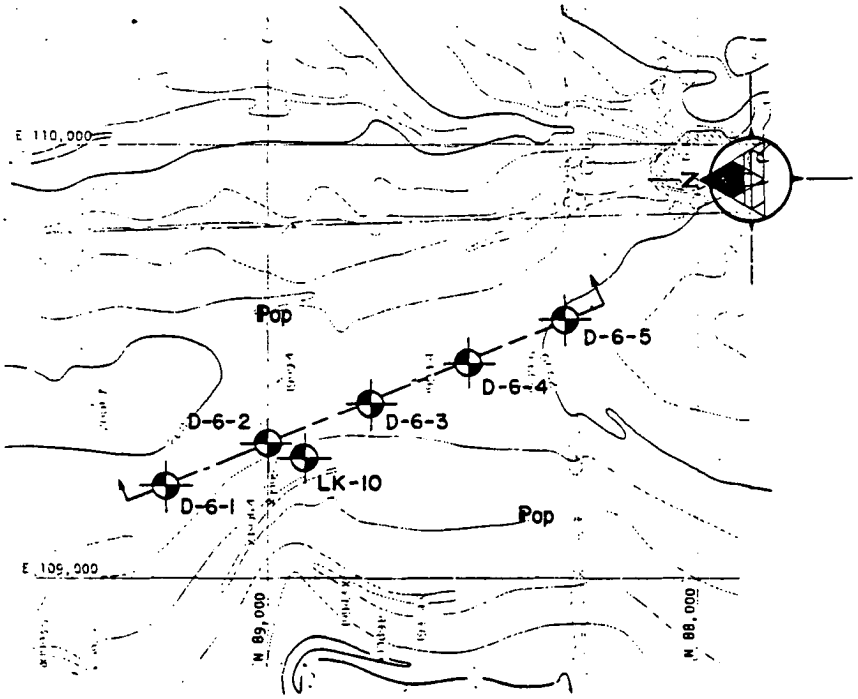
NOTE:
THE DEPTH AND THICKNESS OF SOIL AND ROCK STRATA INDICATED ON THE SUBSURFACE SECTION WERE OBTAINED BY INTERPOLATING BETWEEN BORINGS. INFORMATION ON ACTUAL SOIL AND ROCK CONDITIONS EXIST ONLY AT BORING LOCATIONS. IT IS POSSIBLE THAT SOIL AND ROCK CONDITIONS BETWEEN BORINGS MAY VARY FROM THOSE INDICATED.

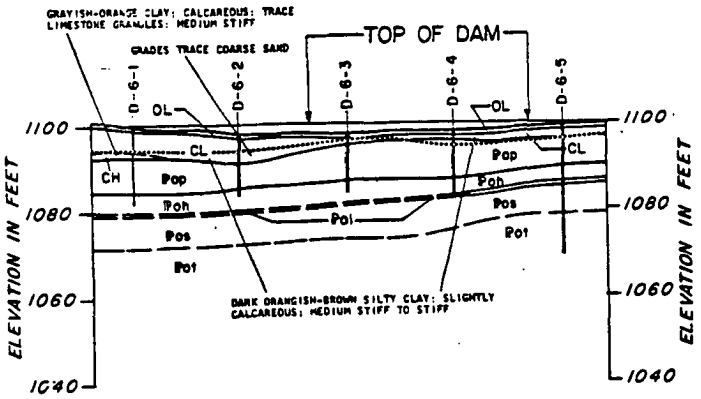
EXPLANATION:
- GEOLOGIC CONTACT
- INFERRED GEOLOGIC CONTACT
- TEST BORING LOCATION AND DEPTH ON SUBSURFACE SECTION
- GROUND LEVEL
- COOLING LAKE WATER LEVEL

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-123

Plot Plan with Geologic Strip Map and Subsurface Section - Saddle Dams IV and V





NOTE:

THE DEPTH AND THICKNESS OF SOIL AND ROCK STRATA INDICATED ON THE SUBSURFACE SECTION WERE OBTAINED BY INTERPOLATING BETWEEN BORINGS. INFORMATION ON ACTUAL SOIL AND ROCK CONDITIONS EXIST ONLY AT BORING LOCATIONS. IT IS POSSIBLE THAT SOIL AND ROCK CONDITIONS BETWEEN BORINGS MAY VARY FROM THOSE INDICATED.

EXPLANATION:

- GEOLOGIC CONTACT
- INFERRED GEOLOGIC CONTACT
- TEST BORING LOCATION AND DEPTH ON SUBSURFACE SECTION
- GROUND LEVEL
- COOLING LAKE WATER LEVEL

BASE MAP MODIFIED FROM:

TITLED: WOLF CREEK PROJECT TOPOGRAPHIC MAPS

BY: KANSAS GAS AND ELECTRIC COMPANY

DRAWING NUMBER: 8025-E-1001

REVISION DATED: 5-17-74

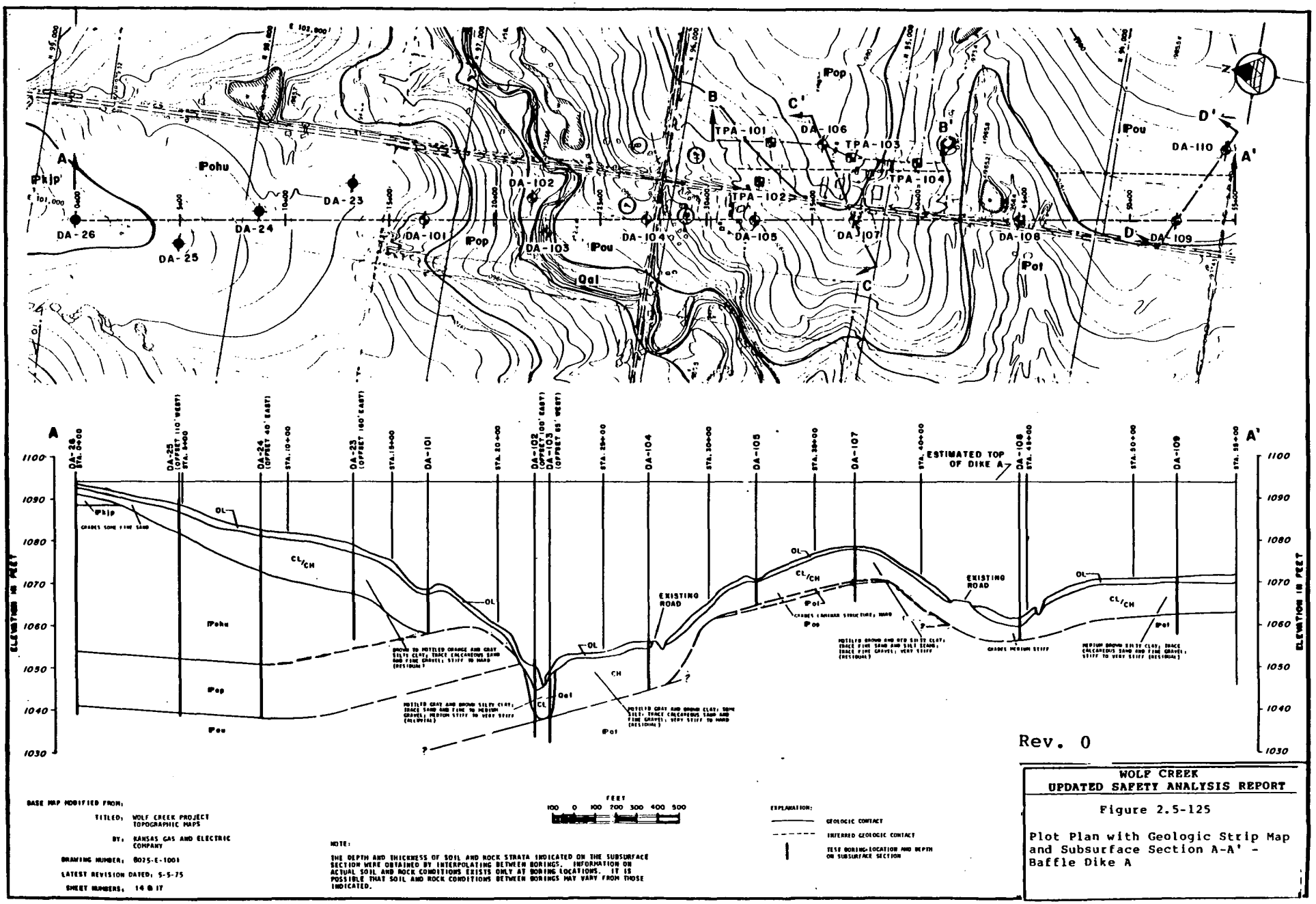
SHEET NUMBER: 21

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-124

Plot Plan with Geologic Strip Map and Subsurface Section - Saddle Dam VI

Rev. 0



BASE MAP MODIFIED FROM:

TITLED: WOLF CREEK PROJECT TOPOGRAPHIC MAPS

BY: KANSAS GAS AND ELECTRIC COMPANY

DRAWING NUMBER: 8025-E-1001

LATEST REVISION DATED: 5-5-75

SHEET NUMBERS: 14 & 17

NOTE:

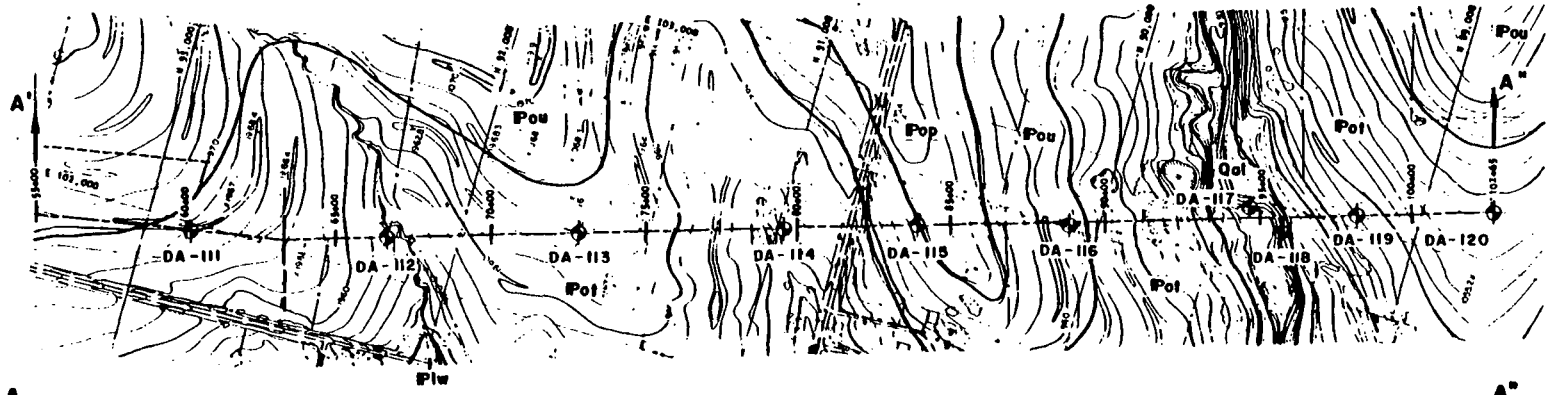
THE DEPTH AND THICKNESS OF SOIL AND ROCK STRATA INDICATED ON THE SUBSURFACE SECTION WERE OBTAINED BY INTERPOLATING BETWEEN BORINGS. INFORMATION ON ACTUAL SOIL AND ROCK CONDITIONS EXISTS ONLY AT BORING LOCATIONS. IT IS POSSIBLE THAT SOIL AND ROCK CONDITIONS BETWEEN BORINGS MAY VARY FROM THOSE INDICATED.

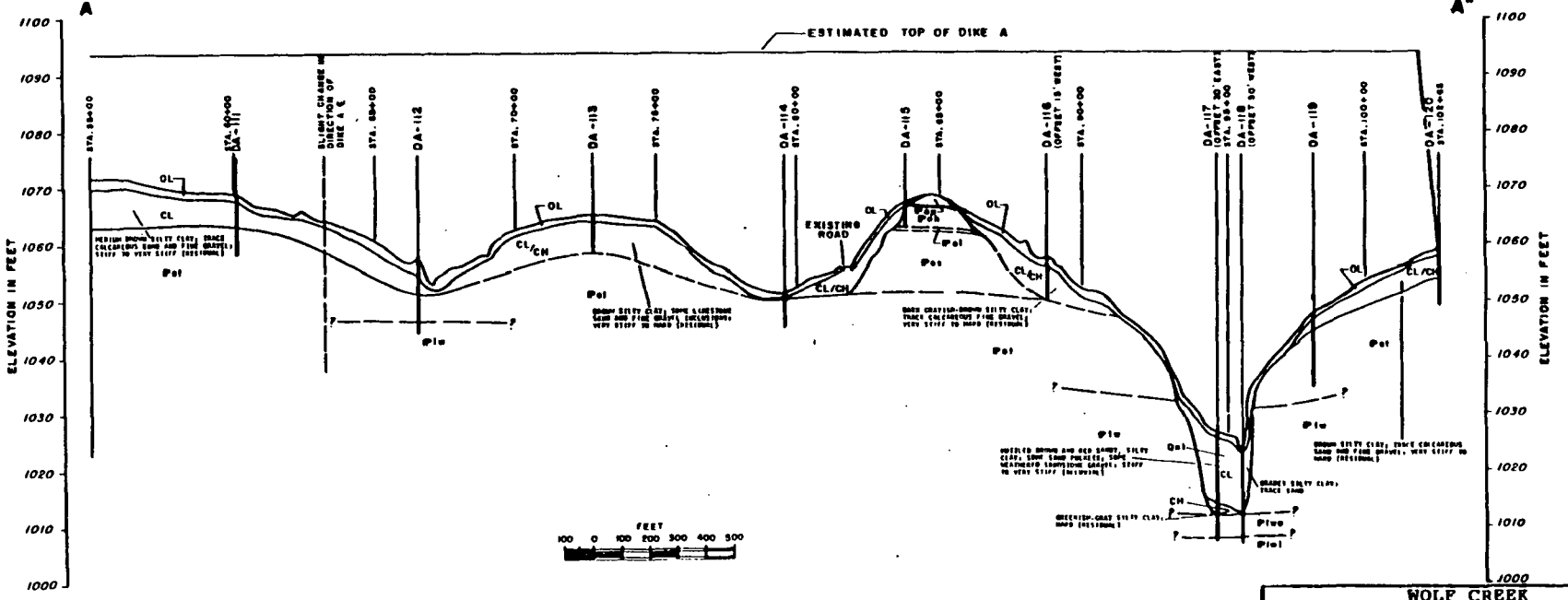
Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-125

Plot Plan with Geologic Strip Map and Subsurface Section A-A' - Baffle Dike A





BASE MAP MODIFIED FROM:

TITLED: WOLF CREEK PROJECT TOPOGRAPHIC MAPS

BY: KANSAS GAS AND ELECTRIC COMPANY

DRAWING NUMBER: 8079-E-1001

LATEST REVISION DATED: 5-5-75

SHEET NUMBERS: 17, 18, 20 & 21

NOTE:

THE DEPTH AND THICKNESS OF SOIL AND ROCK STRATA INDICATED ON THE SUBSURFACE SECTION WERE OBTAINED BY INTERPOLATING BETWEEN BORINGS. INFORMATION ON ACTUAL SOIL AND ROCK CONDITIONS EXISTS ONLY AT BORING LOCATIONS. IT IS POSSIBLE THAT SOIL AND ROCK CONDITIONS BETWEEN BORINGS MAY VARY FROM THOSE INDICATED.

EXPLANATION:

GEOLOGIC CONTACT

INFERRED GEOLOGIC CONTACT

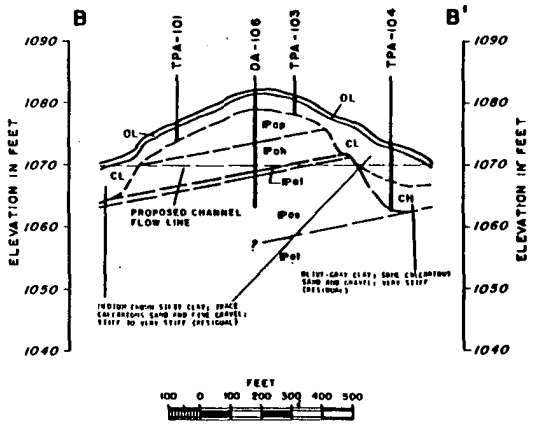
TEST BORING LOCATION AND DEPTH ON SUBSURFACE SECTION

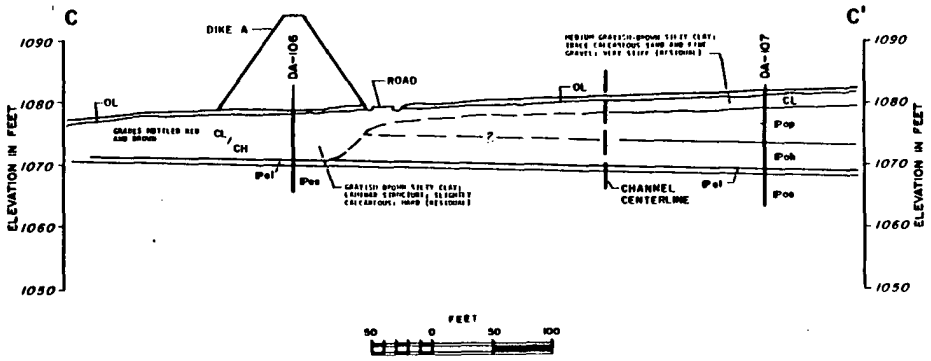
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

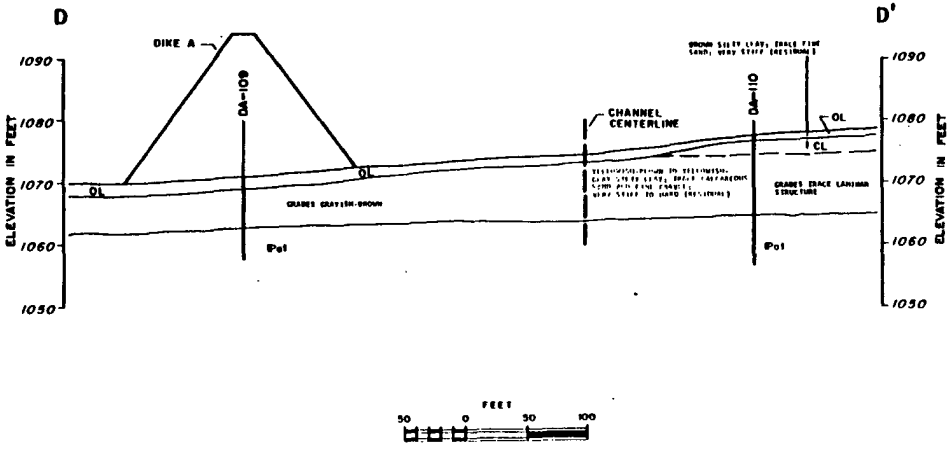
Figure 2.5-126

Plot Plan with Geologic Strip Map and Subsurface Section - A'-A" - Baffle Dike A

Rev. 0







NOTE:

THE DEPTH AND THICKNESS OF SOIL AND ROCK STRATA INDICATED ON THE SUBSURFACE SECTION WERE OBTAINED BY INTERPOLATING BETWEEN BORINGS. INFORMATION ON ACTUAL SOIL AND ROCK CONDITIONS EXISTS ONLY AT BORING LOCATIONS. IT IS POSSIBLE THAT SOIL AND ROCK CONDITIONS BETWEEN BORINGS MAY VARY FROM THOSE INDICATED.

EXPLANATION:

GEOLOGIC CONTACT

INFERRED GEOLOGIC CONTACT

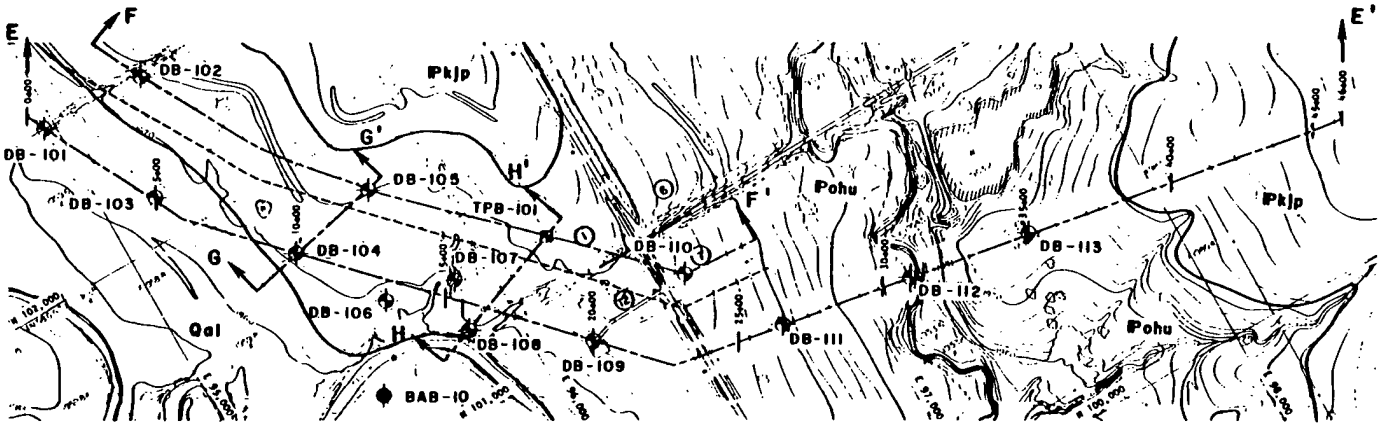
TEST BORING LOCATION AND DEPTH OF SUBSURFACE SECTION

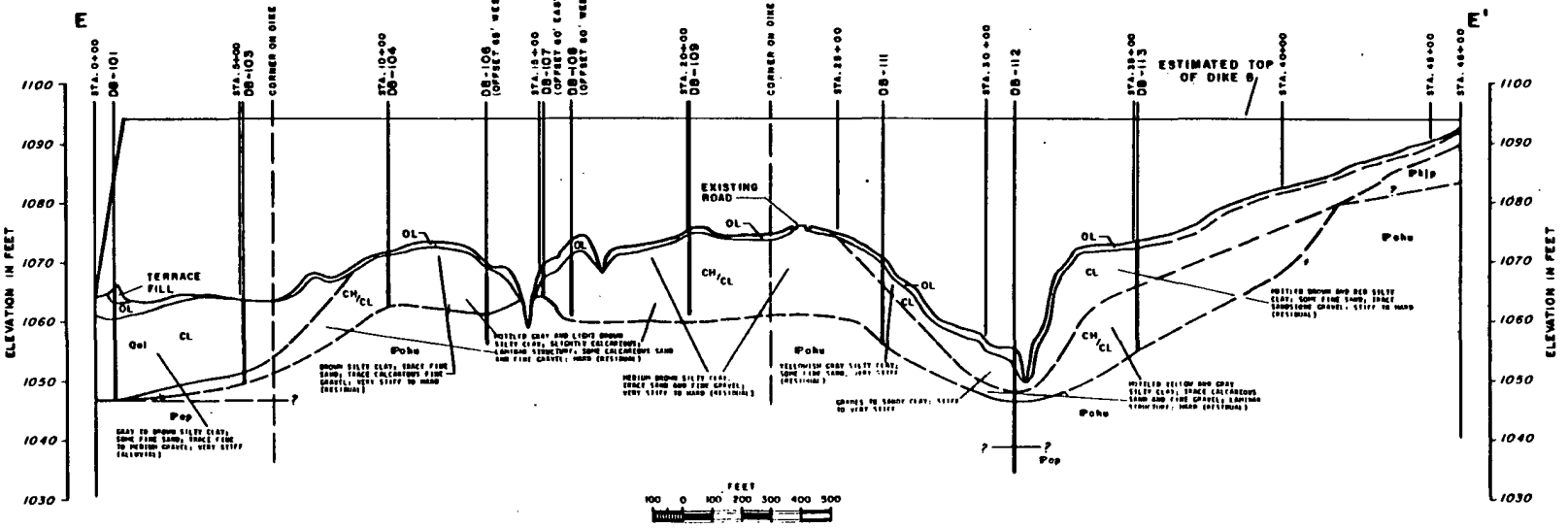
Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-127

Subsurface Sections B-B', C-C', and D-D' - Baffle Dike A





Rev. 0

BASE MAP MODIFIED FROM:

TITLED: WOLF CREEK PROJECT TOPOGRAPHIC MAPS

BY: KANSAS GAS AND ELECTRIC COMPANY

DRAWING NUMBER: 8025-E-1001

LATEST REVISION DATED: 5-5-75

SHEET NUMBERS: 13 & 14

NOTE:

THE DEPTH AND THICKNESS OF SOIL AND ROCK STRATA INDICATED ON THE SUBSURFACE SECTION WERE OBTAINED BY INTERPOLATING BETWEEN BORINGS. INFORMATION ON ACTUAL SOIL AND ROCK CONDITIONS EXISTS ONLY AT BORING LOCATIONS. IT IS POSSIBLE THAT SOIL AND ROCK CONDITIONS BETWEEN BORINGS MAY VARY FROM THOSE INDICATED.

EXPLANATION:

GEOLOGIC CONTACT

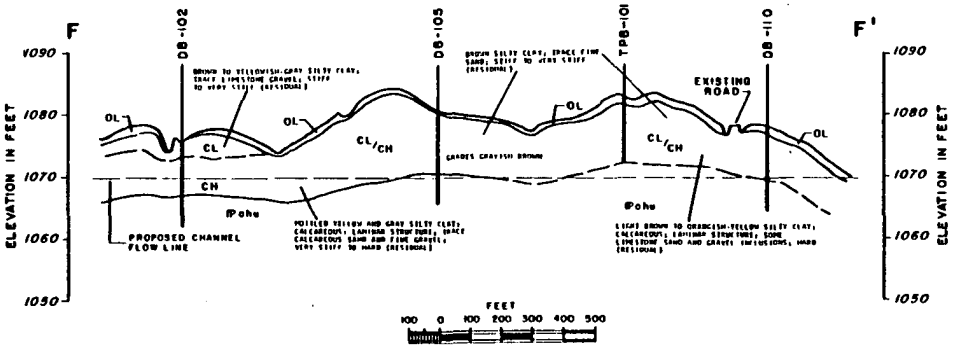
INFERRED GEOLOGIC CONTACT

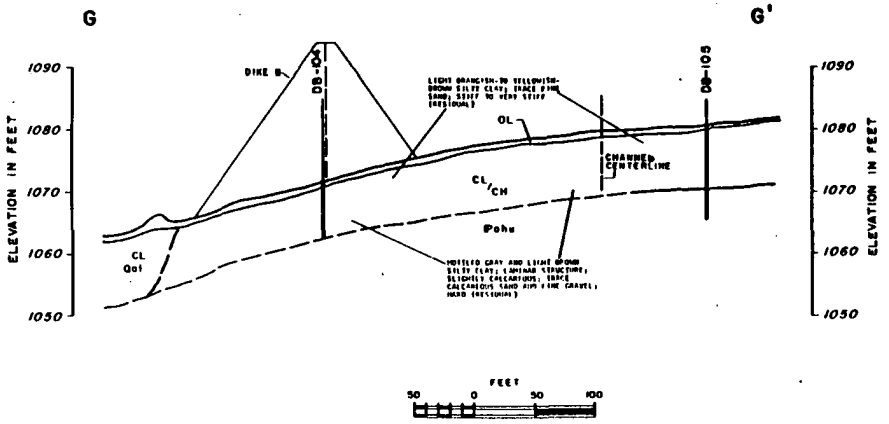
TEST BORING LOCATION AND DEPTH ON SUBSURFACE SECTION

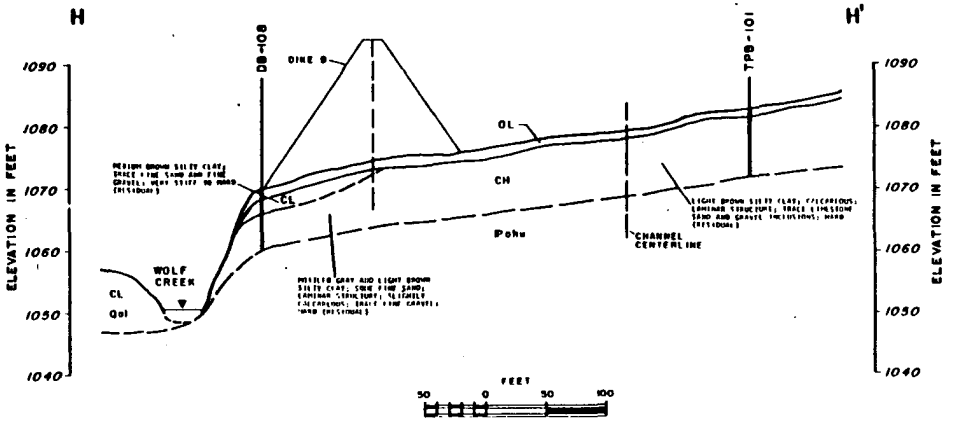
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-128

Plot Plan with Geologic Strip Map and Subsurface Section E-E' - Baffle Dike B







Rev. 0

NOTE:

THE DEPTH AND THICKNESS OF SOIL AND ROCK STRATA INDICATED ON THE SUBSURFACE SECTION WERE OBTAINED BY INTERPOLATING BETWEEN BORINGS. INFORMATION ON ACTUAL SOIL AND ROCK CONDITIONS EXISTS ONLY AT BORING LOCATIONS. IT IS POSSIBLE THAT SOIL AND ROCK CONDITIONS BETWEEN BORINGS MAY VARY FROM THOSE INDICATED.

EXPLANATION:

GEOLOGIC CONTACT

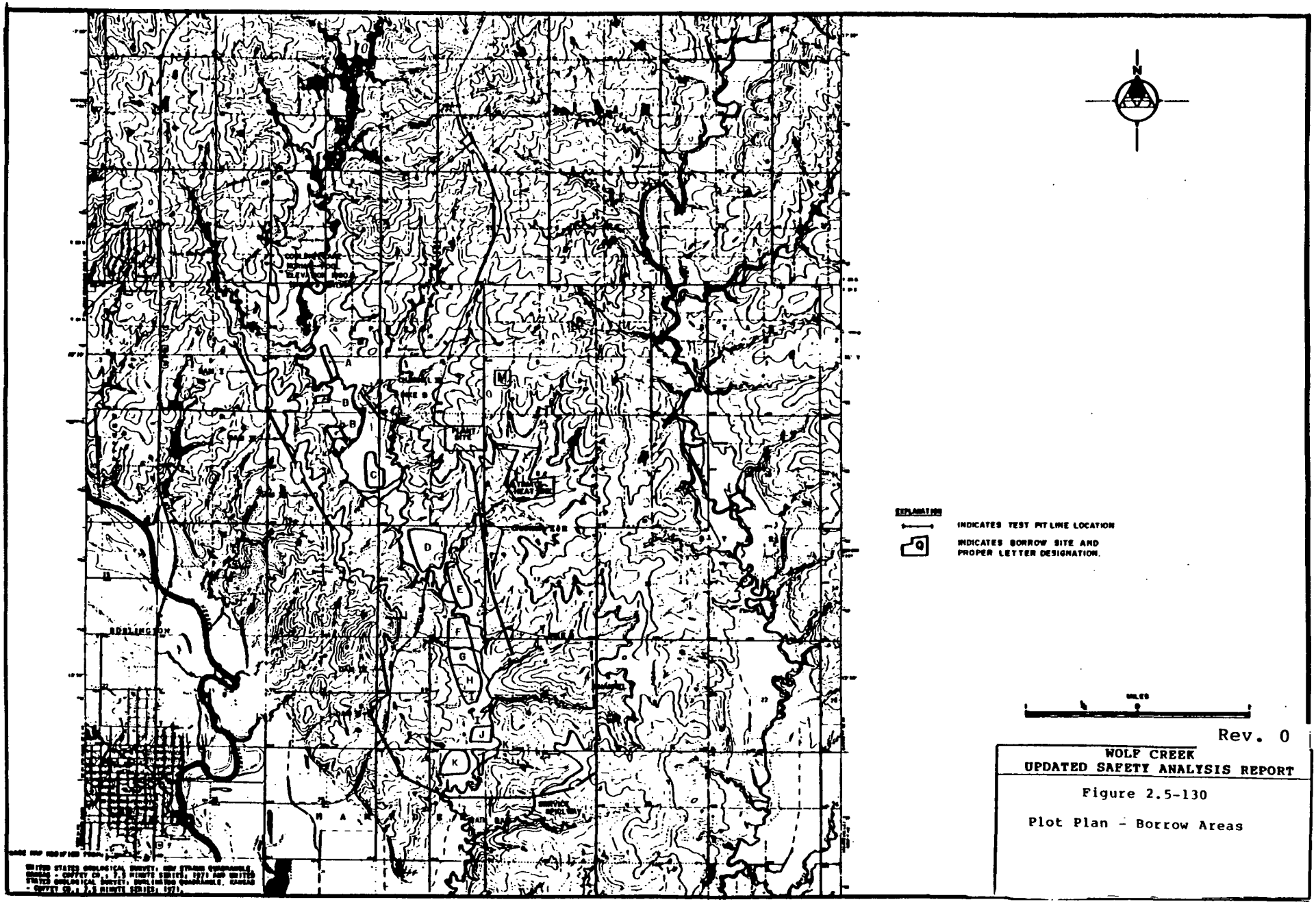
INFERRED GEOLOGIC CONTACT

TEST BORING LOCATION AND DEPTH ON SUBSURFACE SECTION

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-129

Subsurface Sections F-F', G-G', and H-H' - Baffle Dike B

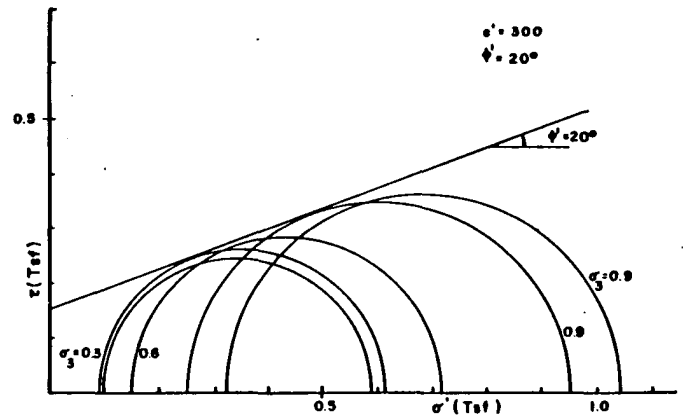


Rev. 0

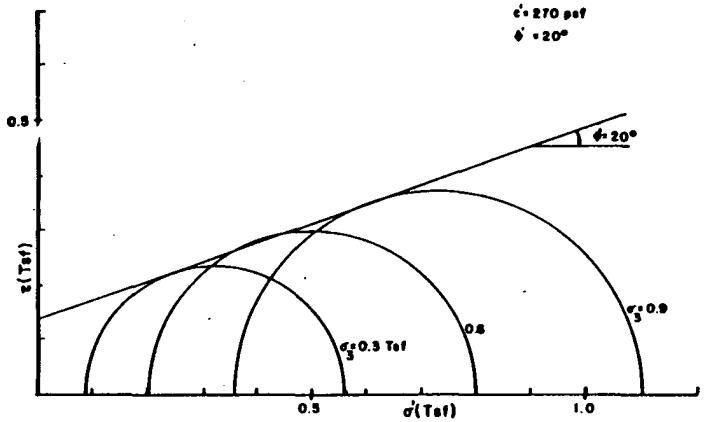
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-130

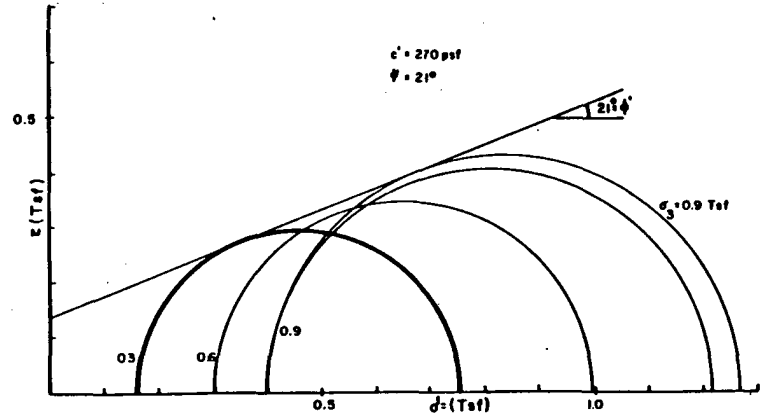
Plot Plan - Borrow Areas



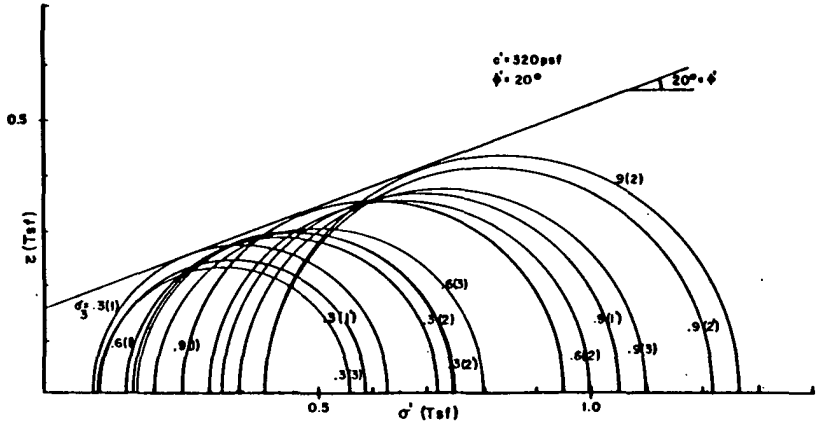
c v Test on TP-1



c v Test on TP-3



c v Test on TP-2



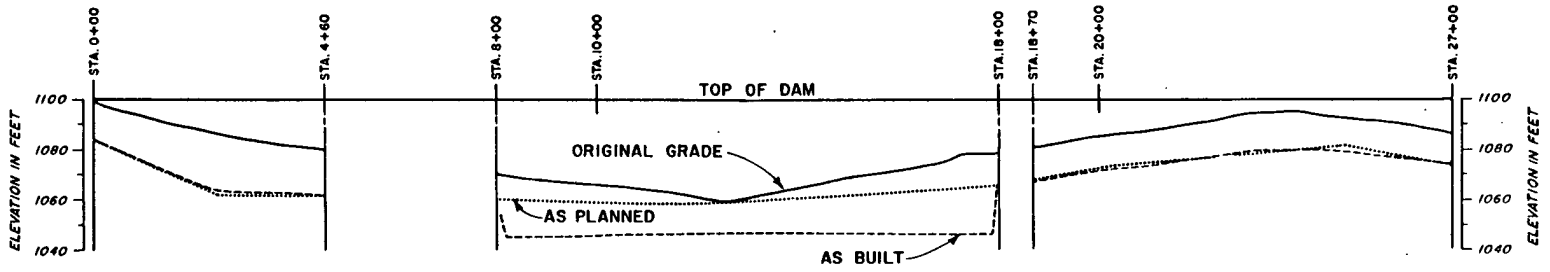
c v Test on TP-1, TP-2 and TP-3

Rev. 0

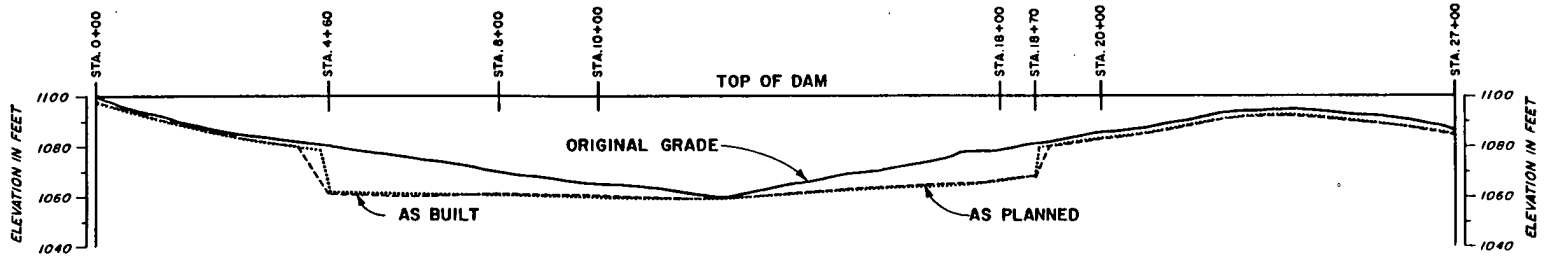
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-131

Mohr Diagram for Consolidated Undrained Test



CENTERLINE PROFILE FOR MAIN DAM KEY TRENCH



CENTERLINE PROFILE FOR MAIN DAM FOUNDATION



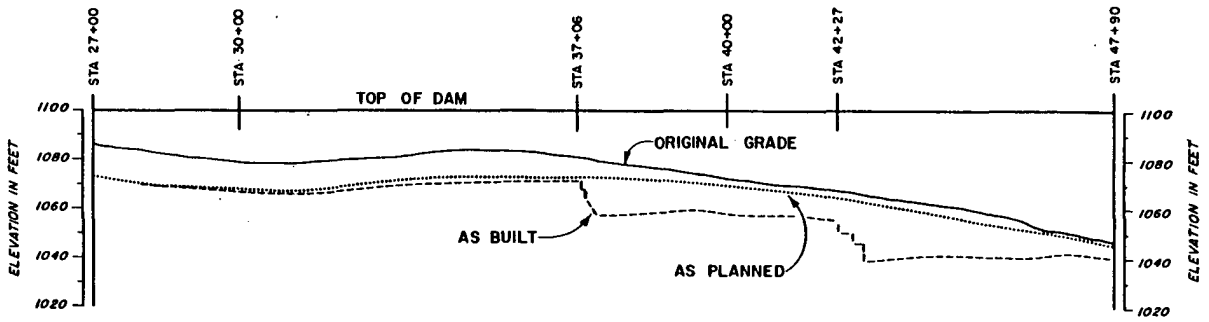
REFERENCE:
SARGENT AND LUNDY
DRAWINGS S250, S29E

Rev. 0

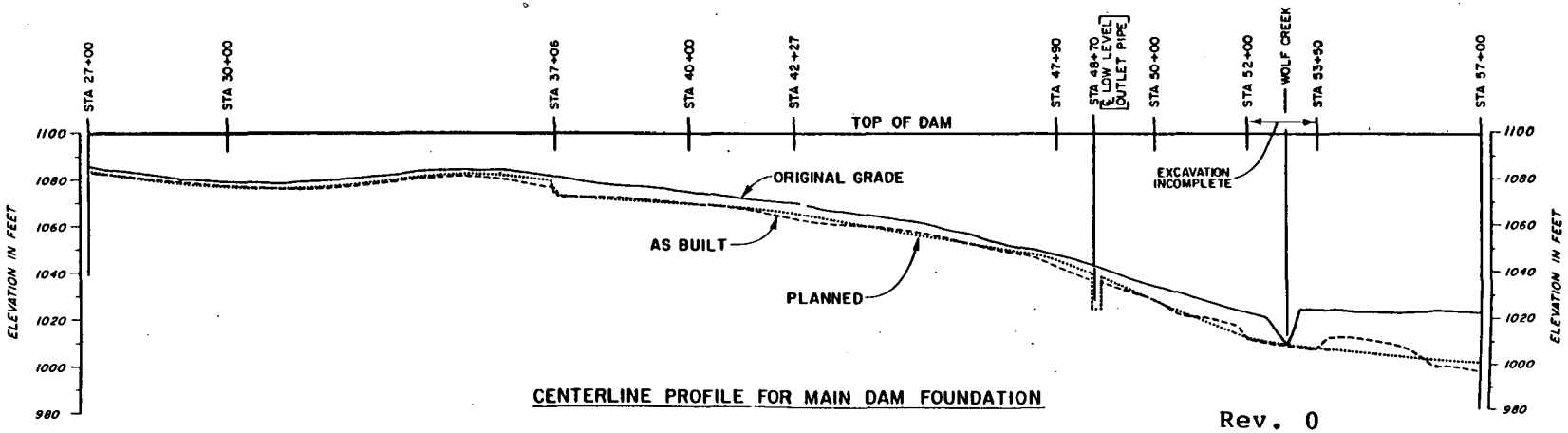
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-132 (Sheet 1 of 4)

Centerline Profiles for Main Dam & Keytrenches



CENTERLINE PROFILE FOR MAIN DAM KEY TRENCH



CENTERLINE PROFILE FOR MAIN DAM FOUNDATION

Rev. 0

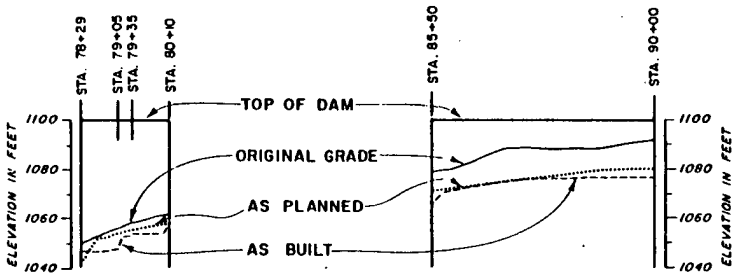
100 0 200 400
FEET
VERTICAL EXAGGERATION: 5X

REFERENCE:
SARGENT AND LUNDY
DRAWINGS S26E, S29E

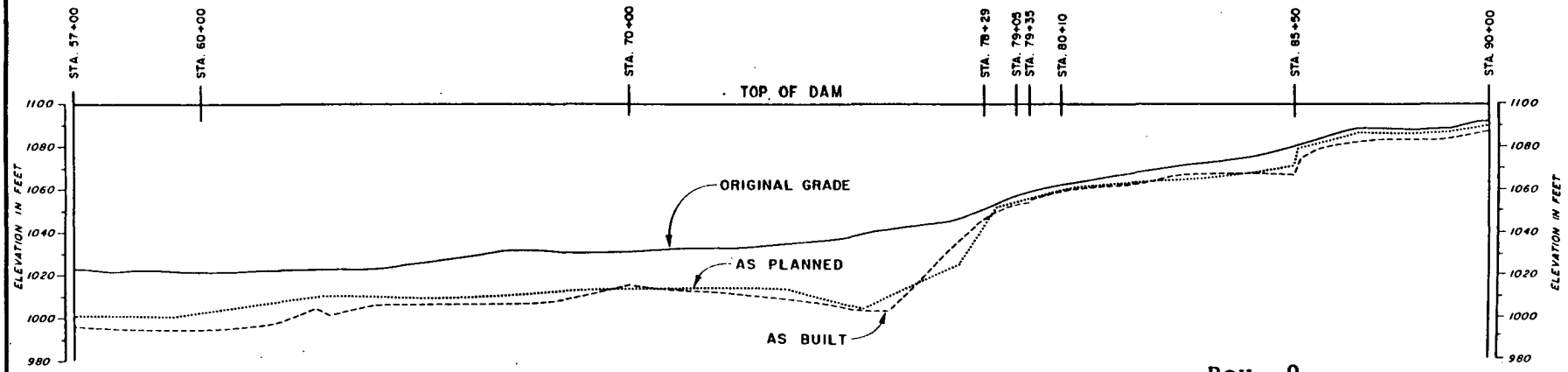
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-132 (Sheet 2 of 4)

Centerline Profiles for Main Dam & Keytrenches



CENTERLINE PROFILE FOR MAIN DAM KEY TRENCH



CENTERLINE PROFILE FOR MAIN DAM FOUNDATION



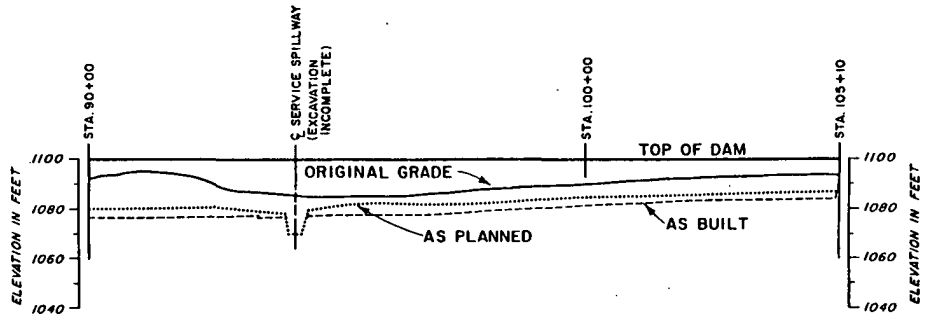
REFERENCE
SARGENT AND LUNDY
DRAWINGS S27C, S29E

Rev. 0

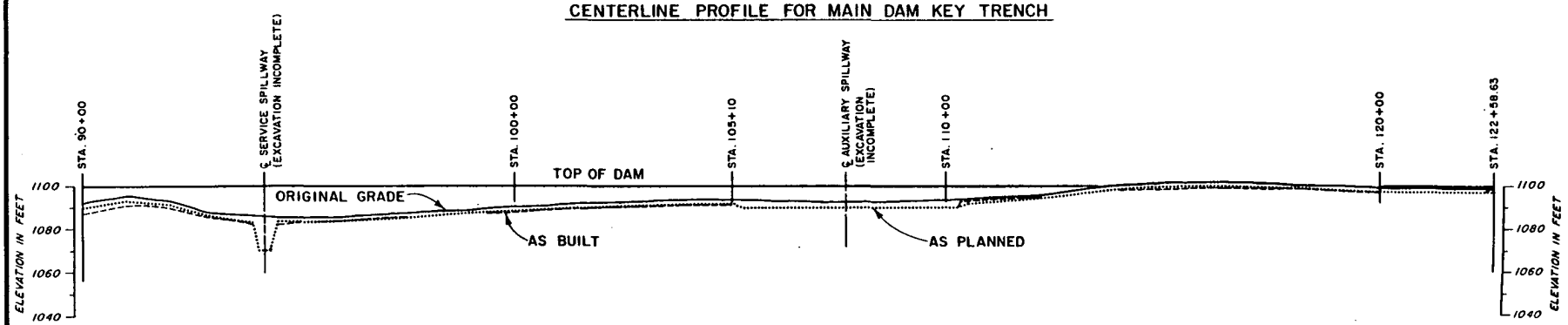
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-132 (Sheet 3 of 4)

Centerline Profiles for Main Dam & Keytrenches



CENTERLINE PROFILE FOR MAIN DAM KEY TRENCH



CENTERLINE PROFILE FOR MAIN DAM FOUNDATION



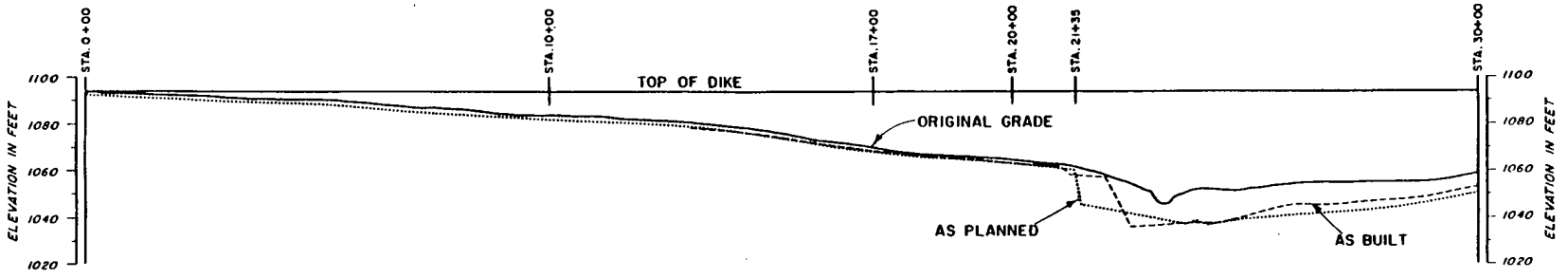
REFERENCE:
SARGENT AND LUNDY
DRAWINGS S28D, S29E

Rev. 0

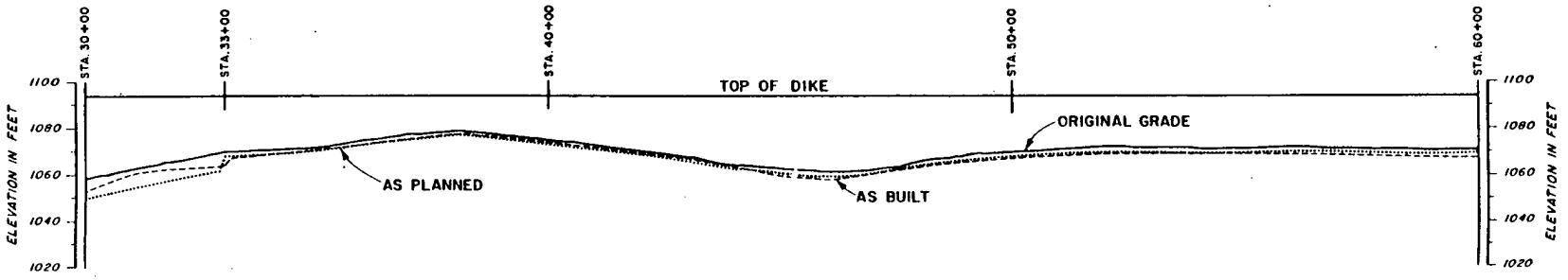
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-132 (Sheet 4 of 4)

Centerline Profiles for Main Dam & Keytrenches



CENTERLINE PROFILE FOR BAFFLE DIKE "A"



CENTERLINE PROFILE FOR BAFFLE DIKE "A" (CONT'D)

Rev. 0

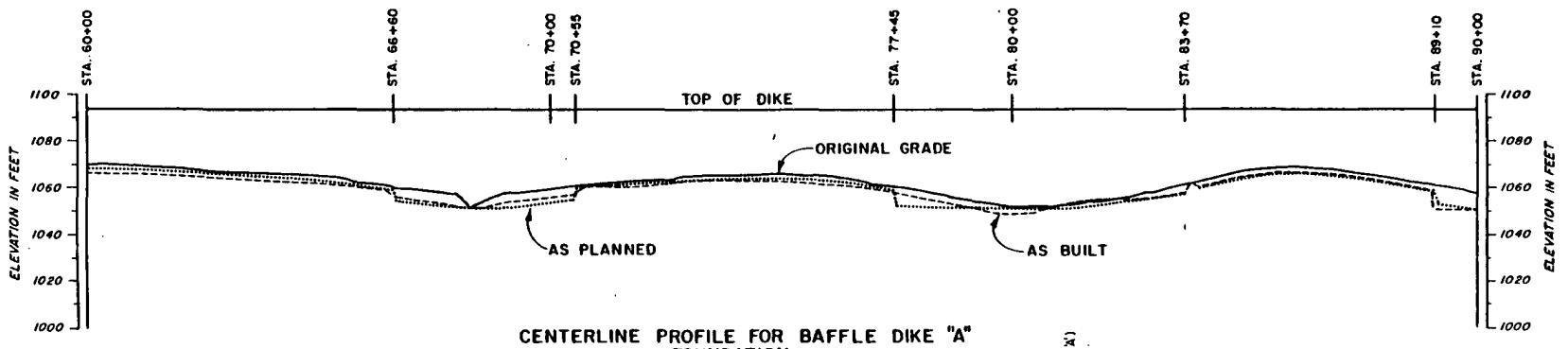


REFERENCE:
SARGENT AND LUNDY
DRAWINGS S46E, S45C, S47D

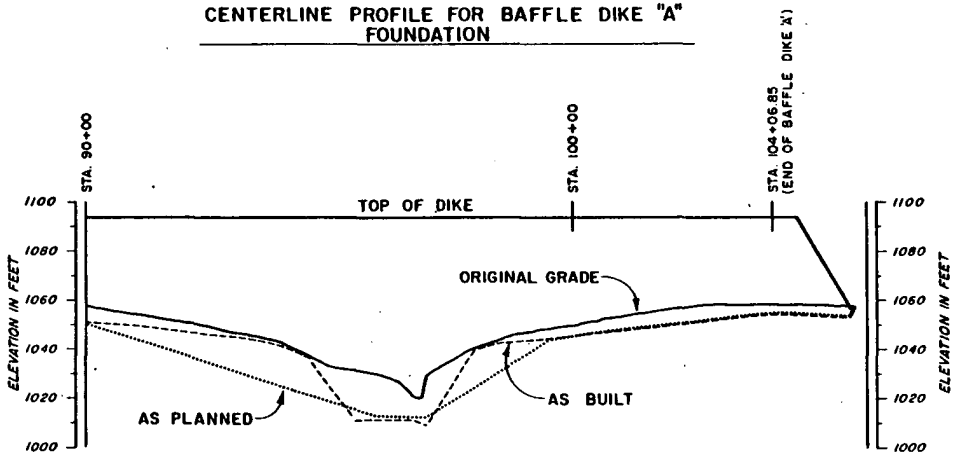
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-133 (Sheet 1 of 3)

Centerline Profiles for Baffle Dikes



CENTERLINE PROFILE FOR BAFFLE DIKE "A" FOUNDATION



CENTERLINE PROFILE FOR BAFFLE DIKE "A" FOUNDATION

Rev. 0

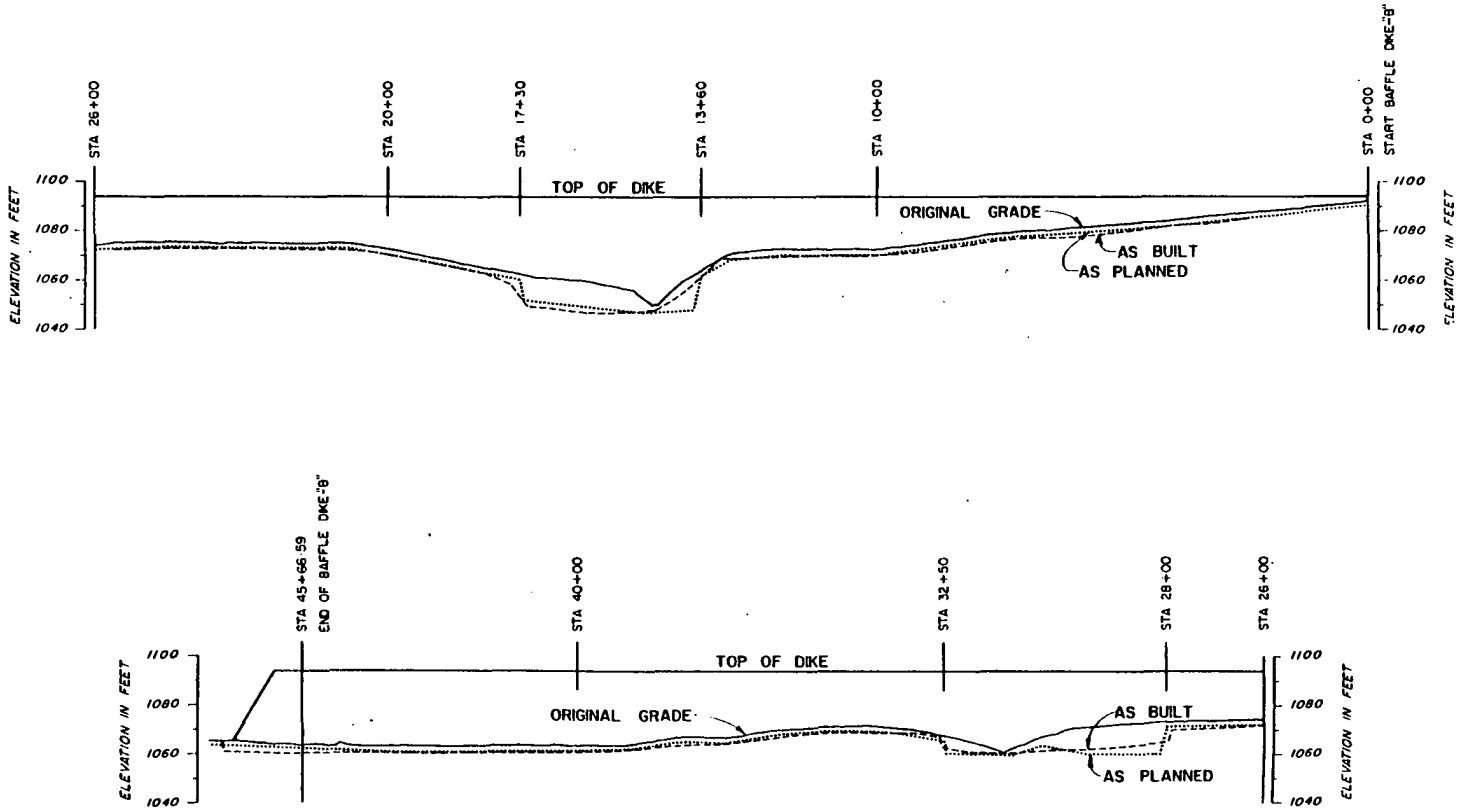


REFERENCE:
SARGENT AND LUNDY
DRAWINGS S48C, S45C, S49C

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-133 (Sheet 2 of 3)

Centerline Profiles for Baffle Dikes



CENTERLINE PROFILE FOR BAFFLE DIKE "B" FOUNDATION

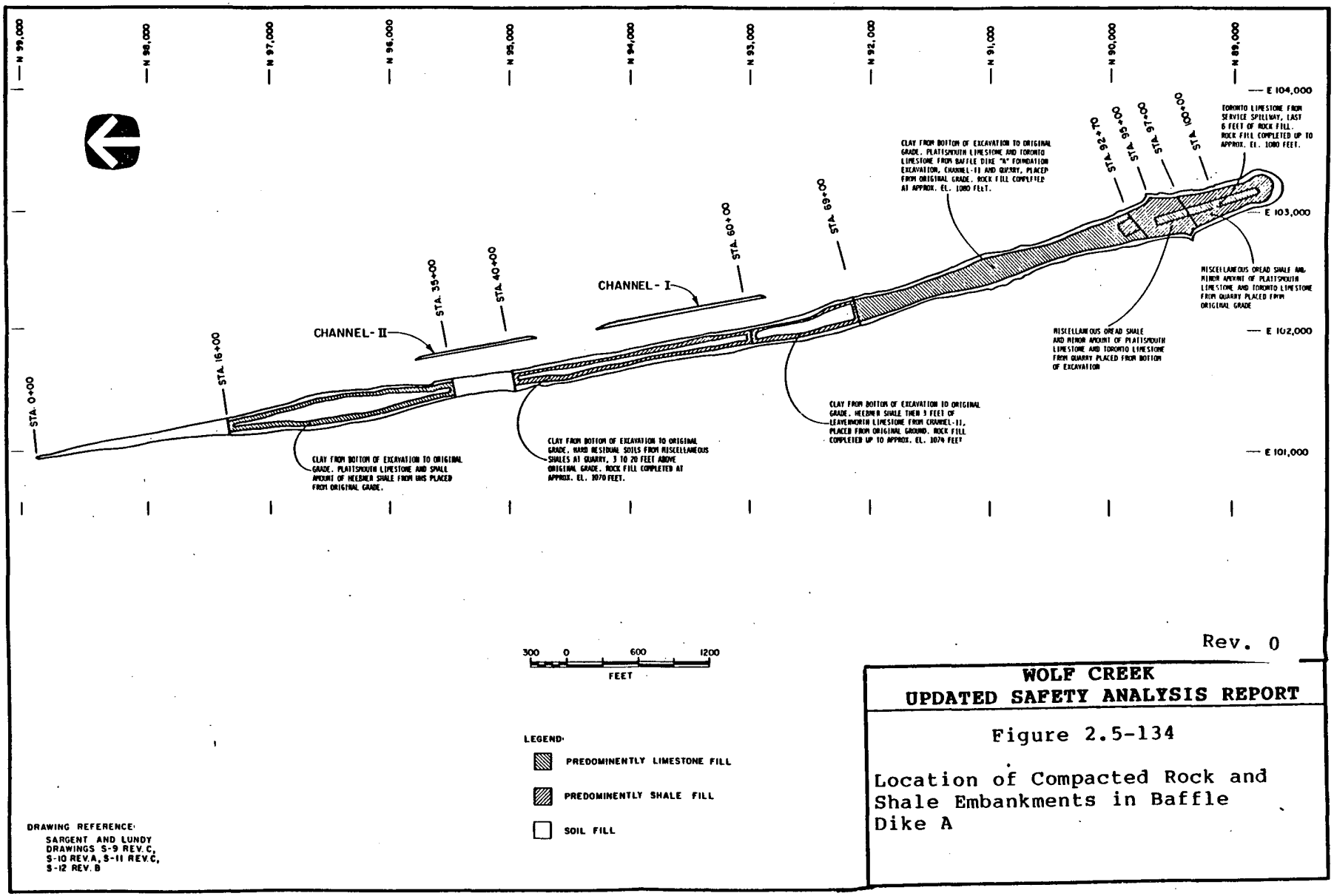
REFERENCE:
SARGENT AND LUNDY
DRAWINGS S50D, S51B, S45C

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-133 (Sheet 3 of 3)

Centerline Profiles for Baffle Dikes

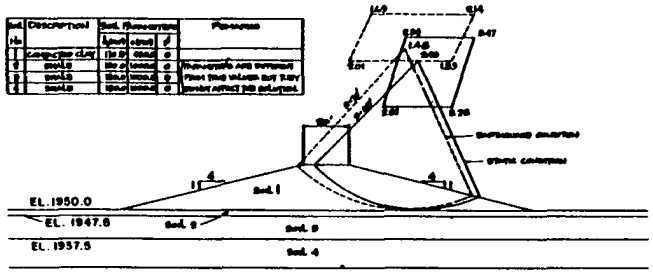


Rev. 0

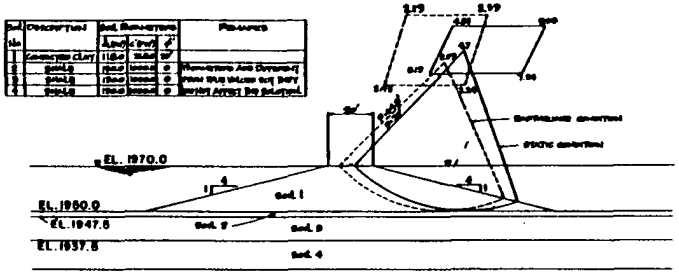
WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-134

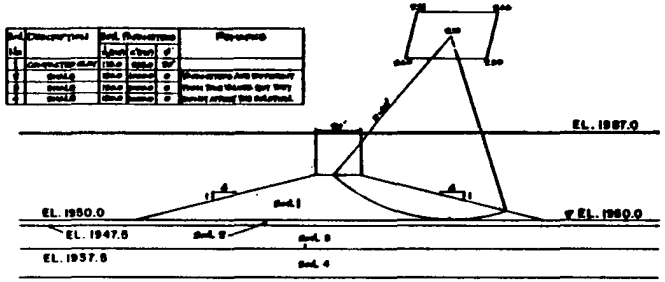
Location of Compacted Rock and Shale Embankments in Baffle Dike A



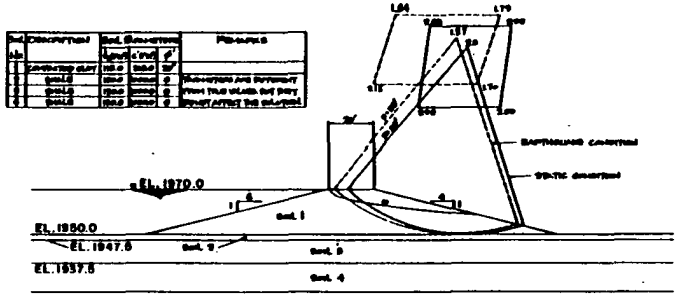
END OF CONSTRUCTION



FULLY SUBMERGED CONDITION



SUDDEN DRAWDOWN CONDITION (FROM 1987.0 TO 1950.0)



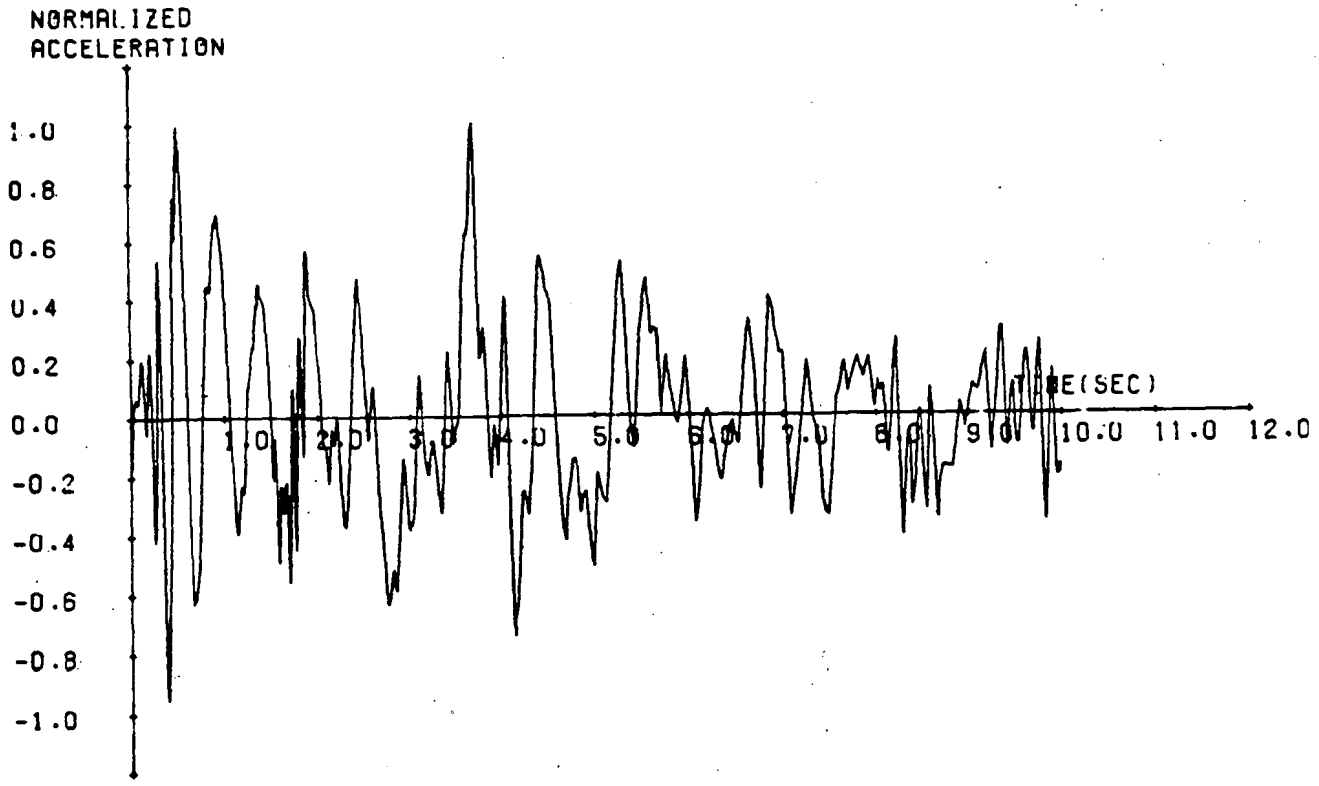
STEADY STATE SEEPAGE CONDITION

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

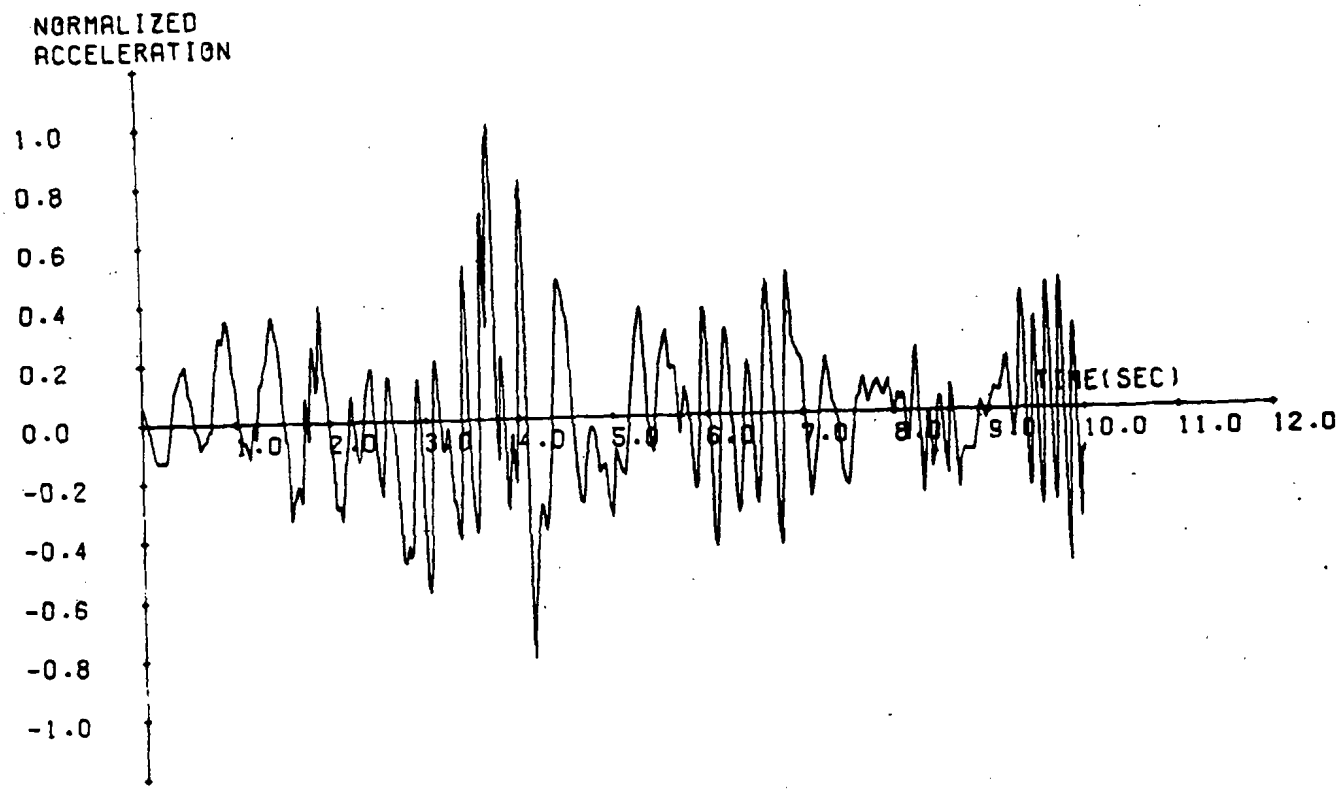
Figure 2.5-135

Stability Analysis Results - UHSD



Rev. 0

WOLF CREEK UPDATED SAFETY ANALYSIS REPORT
Figure 2.5-136 Artificial Accelerogram for Horizontal Ground Motion

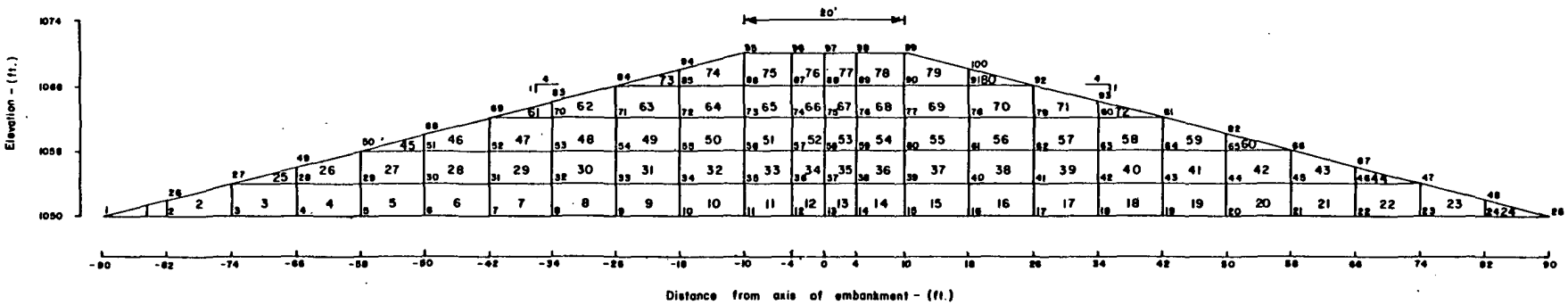


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-137

Artificial Accelerogram for
Vertical Ground Motion

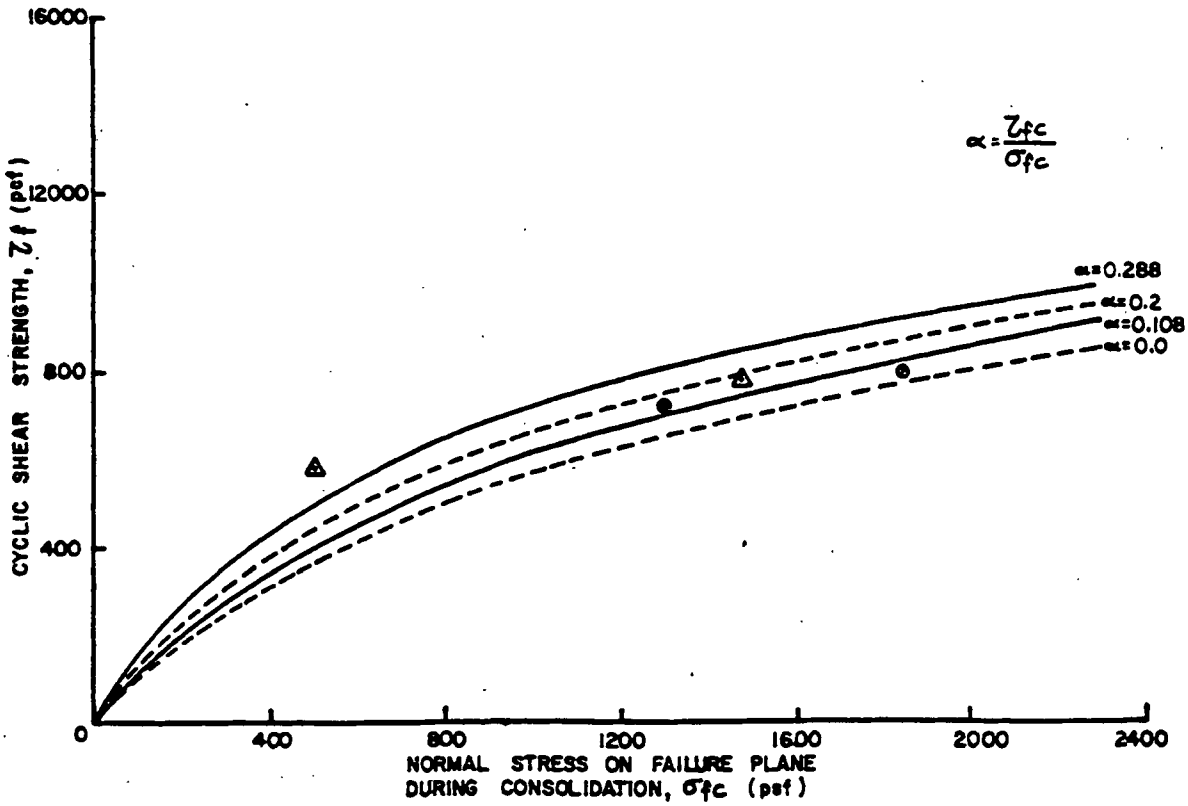


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

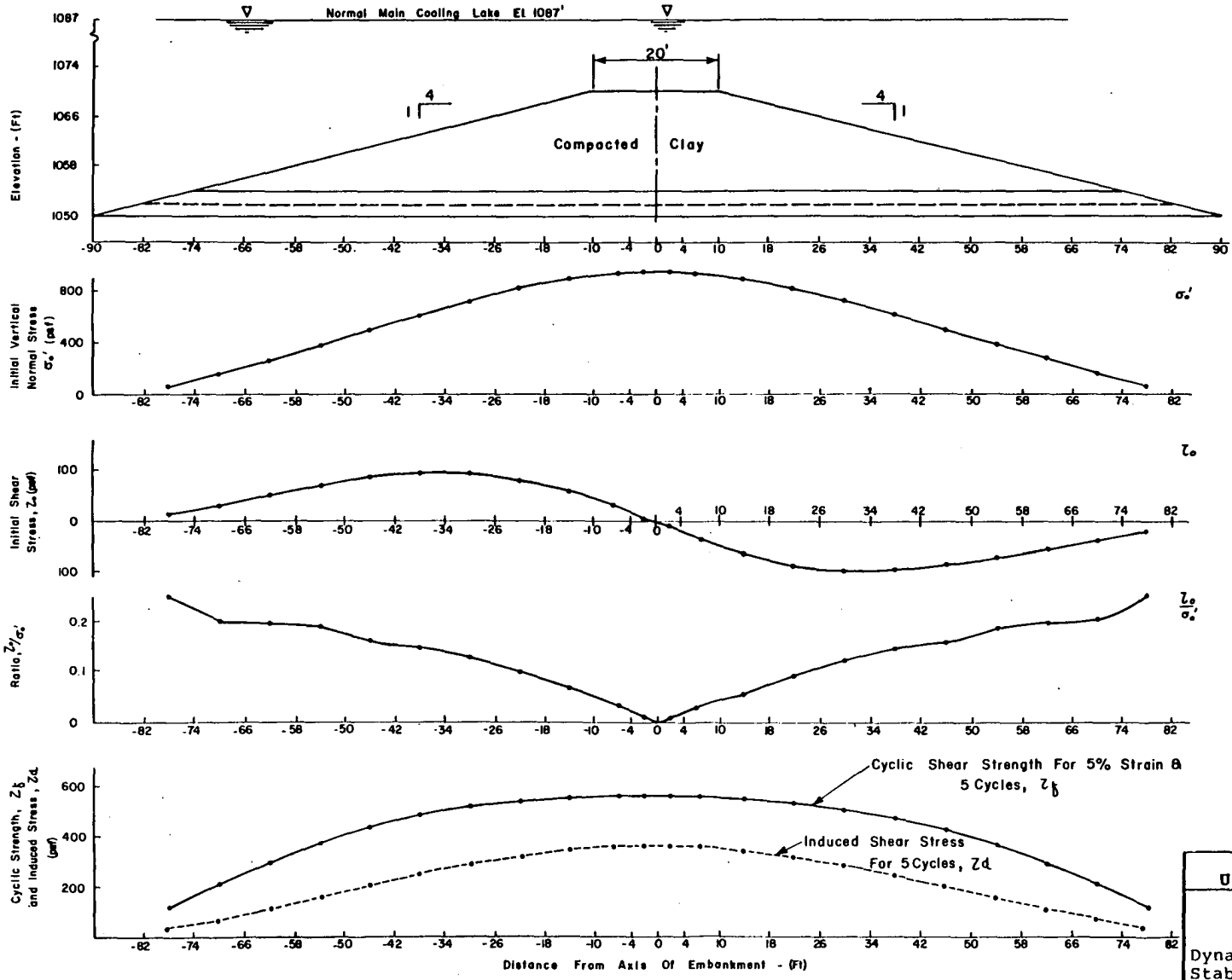
Figure 2.5-138

Submerged UHS Dam - Finite Element Representation for Dynamic Analysis



Rev. 0

WOLF CREEK UPDATED SAFETY ANALYSIS REPORT
Figure 2.5-139 Cyclic Shear Strength for Five Percent Strain and Five Cycles Versus Normal Effective Stress



Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-140

Dynamic Analysis of Soil Stability Along the Base of UHSD (Elevation 1052')

● PHASE 7, TEST NO. 1

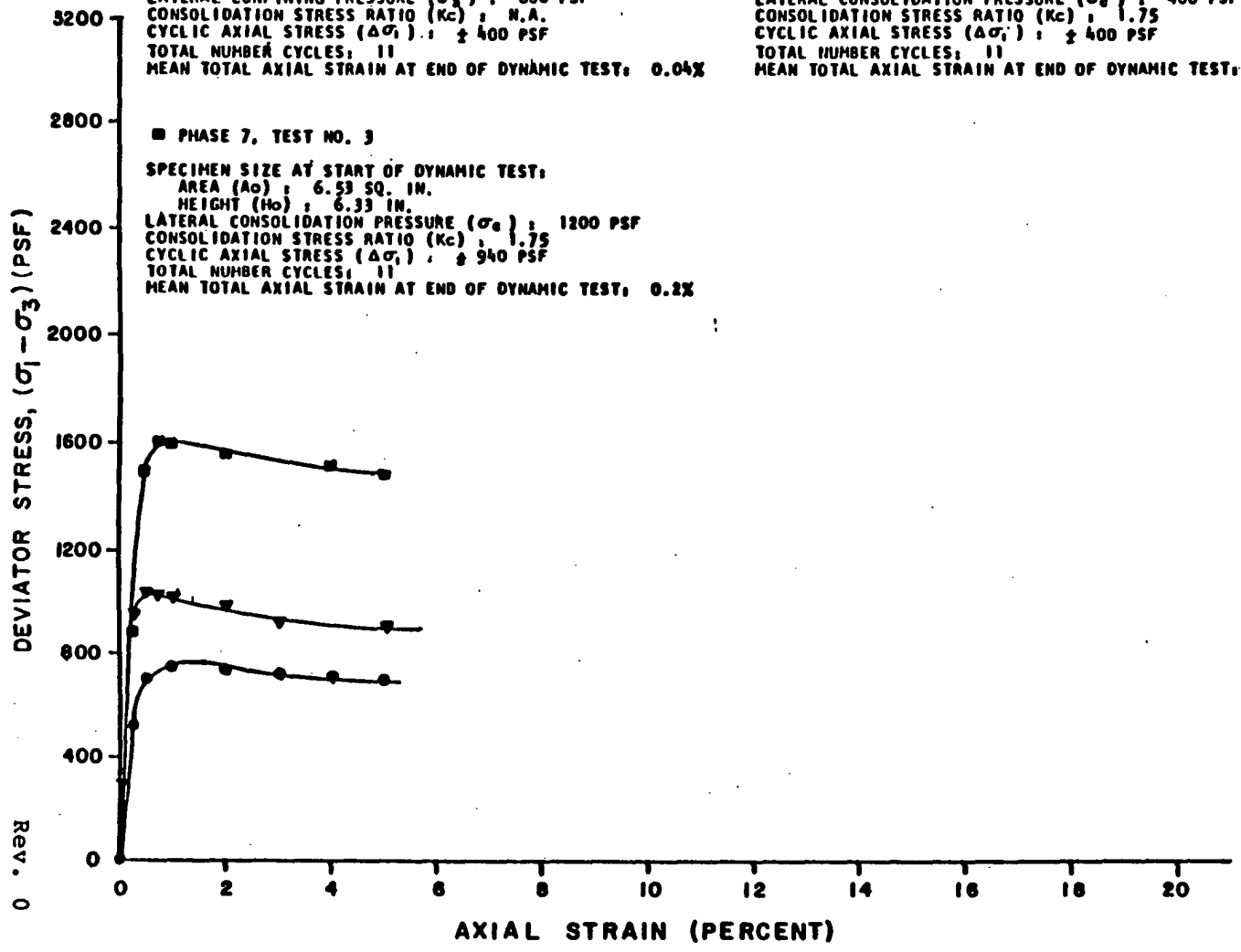
SPECIMEN SIZE AT START OF DYNAMIC TEST:
AREA (Ao) : 6.65 SQ. IN.
HEIGHT (Ho) : 6.48 IN.
LATERAL CONFINING PRESSURE (σ_3) : 600 PSF
CONSOLIDATION STRESS RATIO (Kc) : N.A.
CYCLIC AXIAL STRESS ($\Delta\sigma_1$) : ± 400 PSF
TOTAL NUMBER CYCLES: 11
MEAN TOTAL AXIAL STRAIN AT END OF DYNAMIC TEST: 0.04%

▼ PHASE 7, TEST NO. 2

SPECIMEN SIZE AT START OF DYNAMIC TEST:
AREA (Ao) : 6.59 SQ. IN.
HEIGHT (Ho) : 6.47 IN.
LATERAL CONSOLIDATION PRESSURE (σ_3) : 400 PSF
CONSOLIDATION STRESS RATIO (Kc) : 1.75
CYCLIC AXIAL STRESS ($\Delta\sigma_1$) : ± 400 PSF
TOTAL NUMBER CYCLES: 11
MEAN TOTAL AXIAL STRAIN AT END OF DYNAMIC TEST: 0.01%

■ PHASE 7, TEST NO. 3

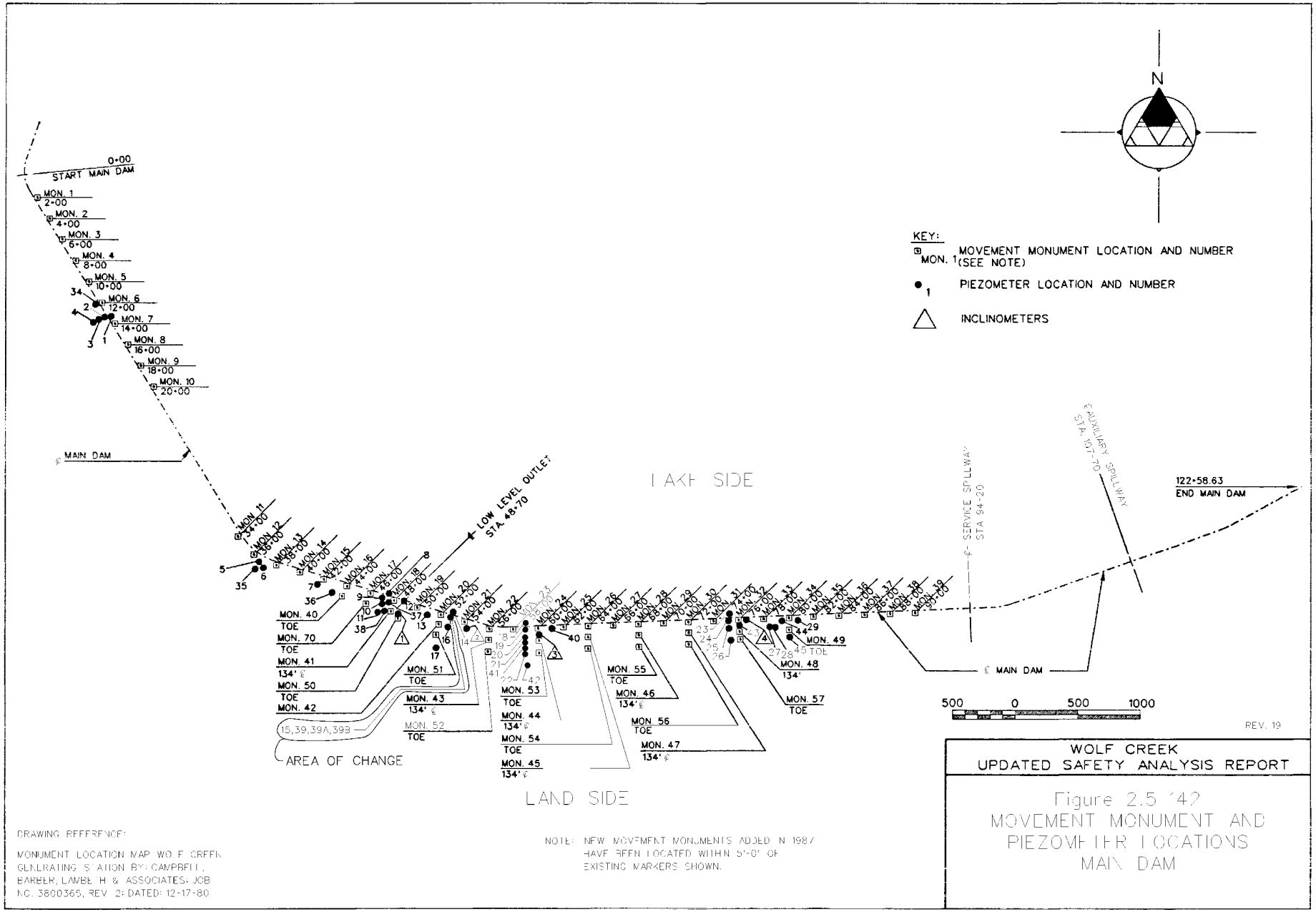
SPECIMEN SIZE AT START OF DYNAMIC TEST:
AREA (Ao) : 6.53 SQ. IN.
HEIGHT (Ho) : 6.33 IN.
LATERAL CONSOLIDATION PRESSURE (σ_3) : 1200 PSF
CONSOLIDATION STRESS RATIO (Kc) : 1.75
CYCLIC AXIAL STRESS ($\Delta\sigma_1$) : ± 940 PSF
TOTAL NUMBER CYCLES: 11
MEAN TOTAL AXIAL STRAIN AT END OF DYNAMIC TEST: 0.2%



WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-141

Results of Static Triaxial Tests
After Cyclic Stressing



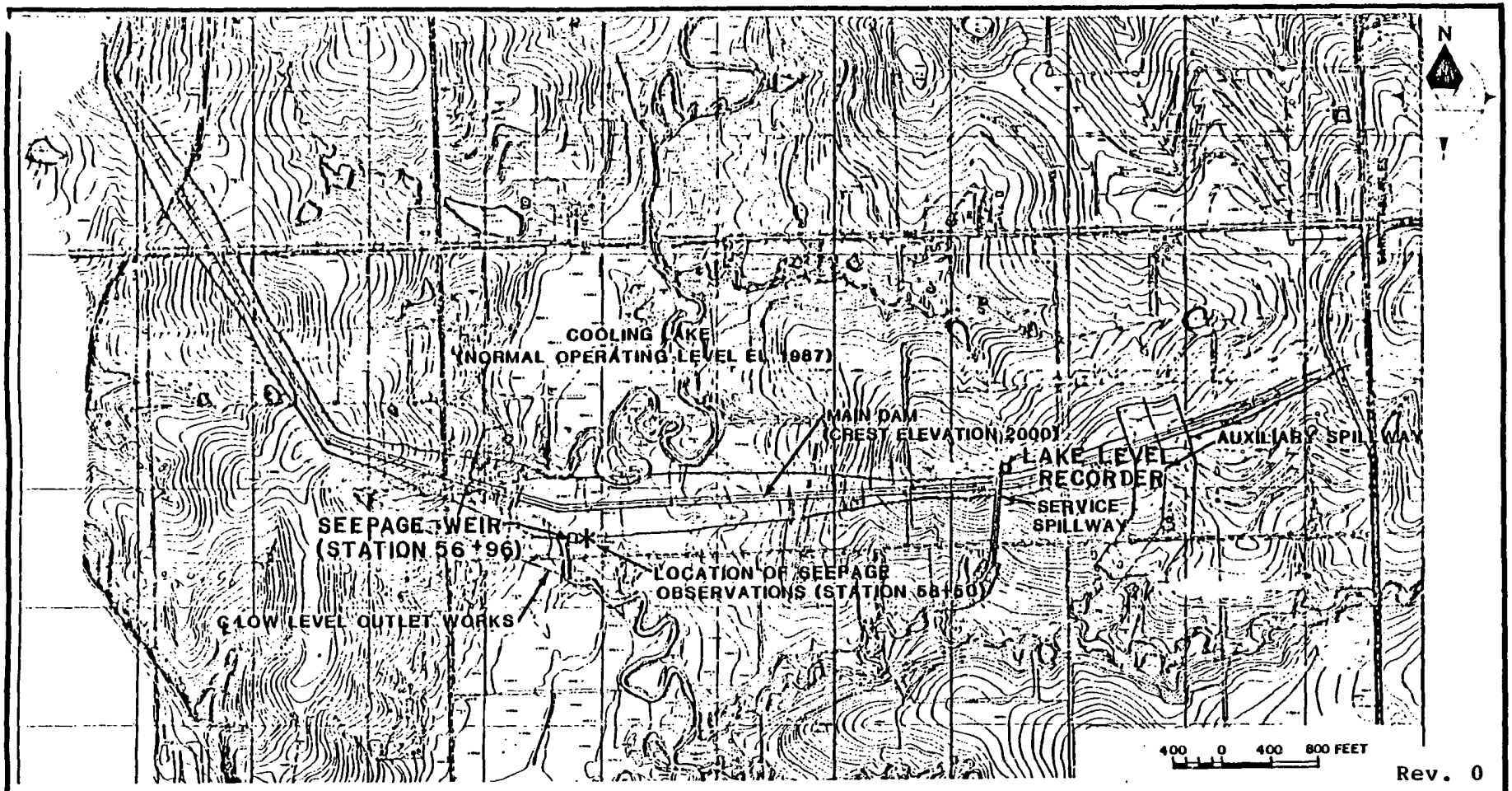
DRAWING REFERENCE:

MONUMENT LOCATION MAP, WOLF CREEK GENERATING STATION BY: CAMPBELL, BARBER, LAMBETH & ASSOCIATES; JOB NO. 3800365, REV. 2; DATED: 12-17-80

NOTE: NEW MOVEMENT MONUMENTS ADDED IN 1987 HAVE BEEN LOCATED WITHIN 5'-0" OF EXISTING MARKERS SHOWN.

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5 '42
MOVEMENT MONUMENT AND PIEZOMETER LOCATIONS
MAIN DAM

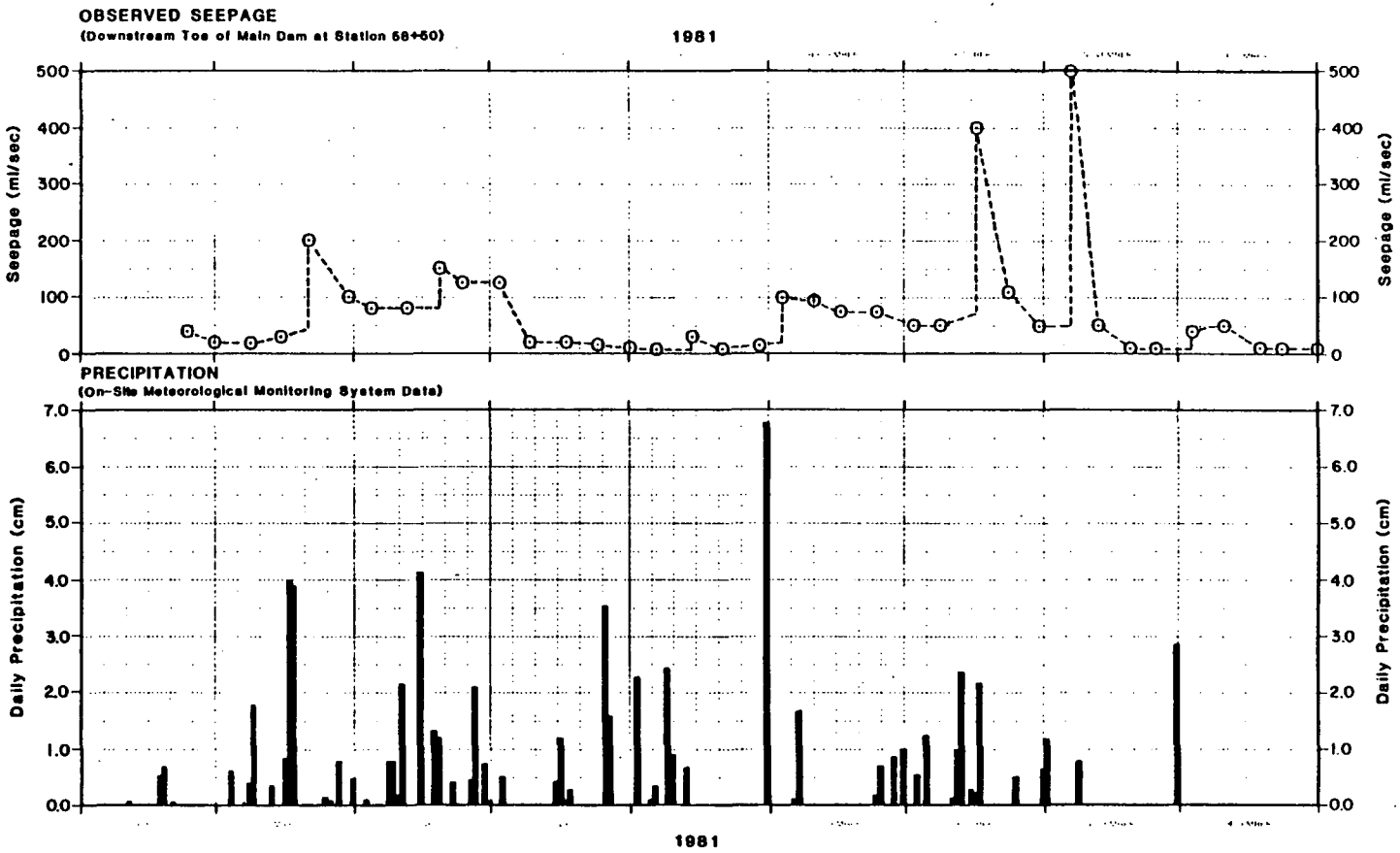


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-143

Location of Seepage Observations at Main Dam

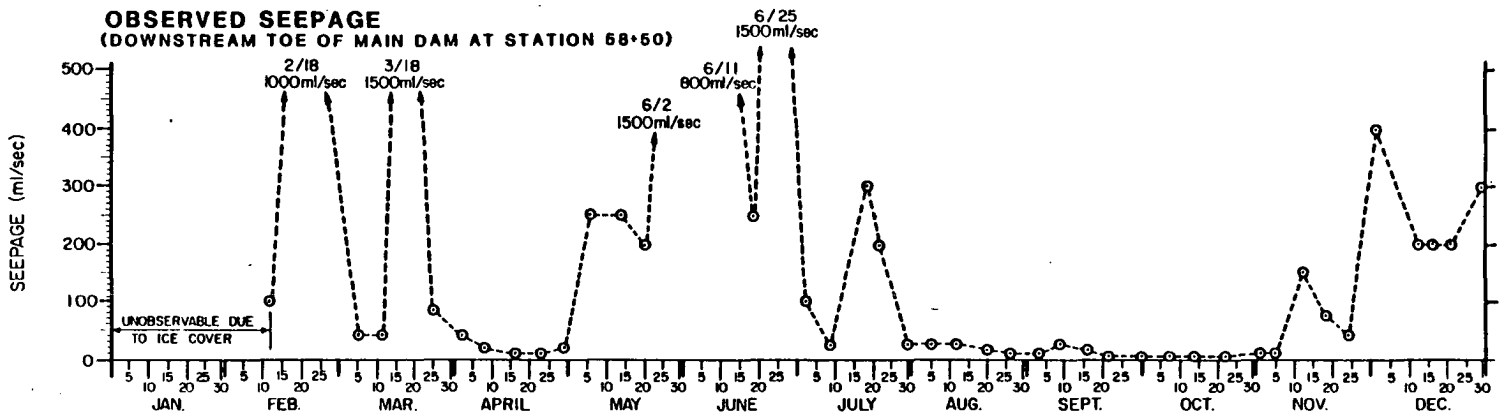


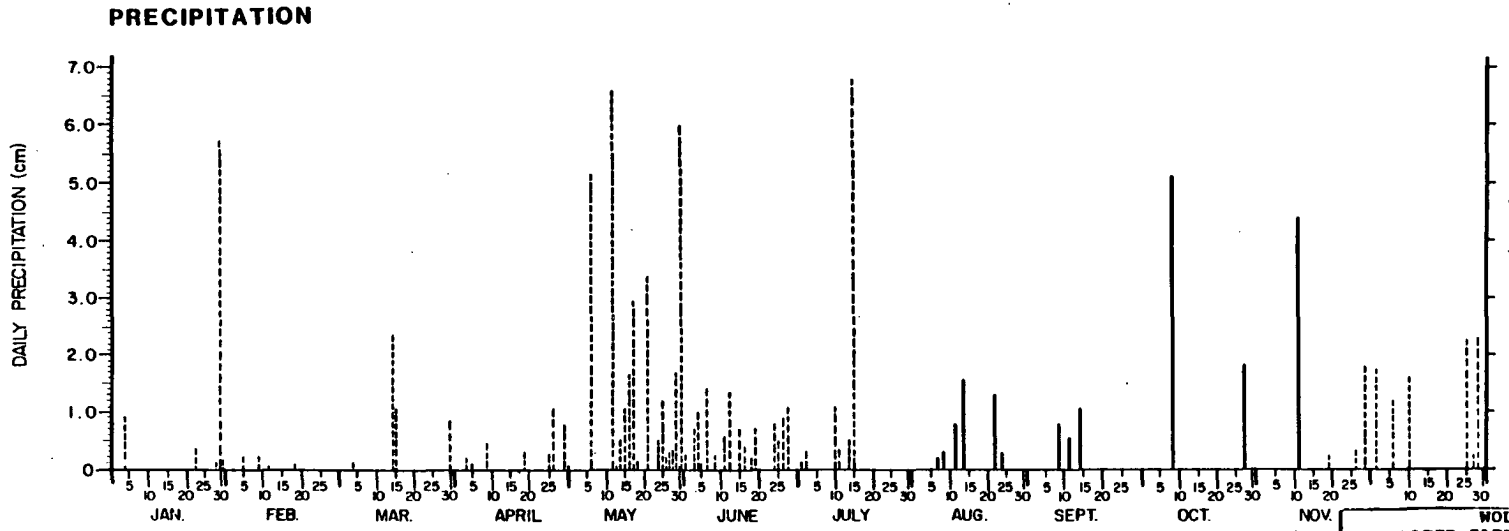
Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-144 (Sheet 1 of 3)

Observed Seepage and
Precipitation Data





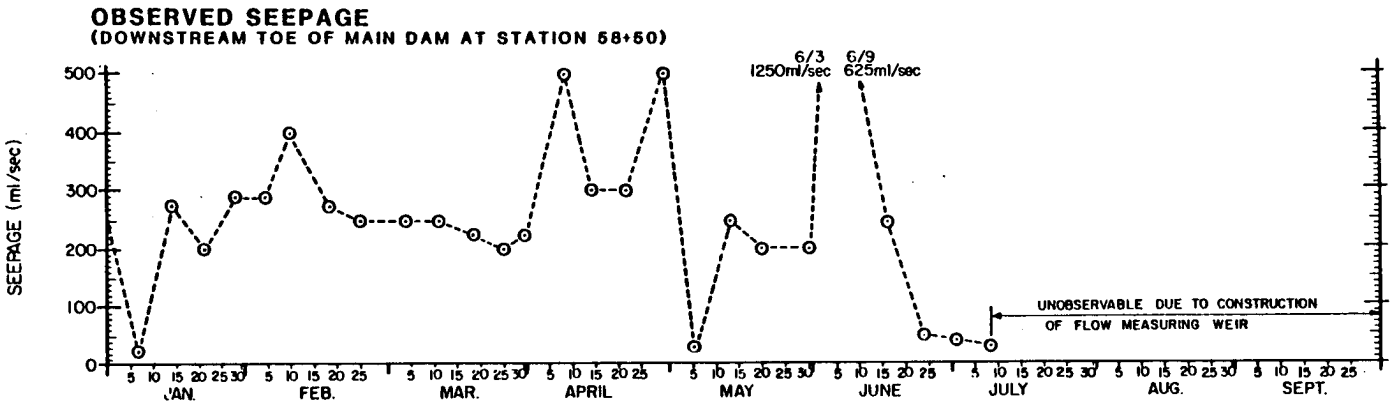
1982

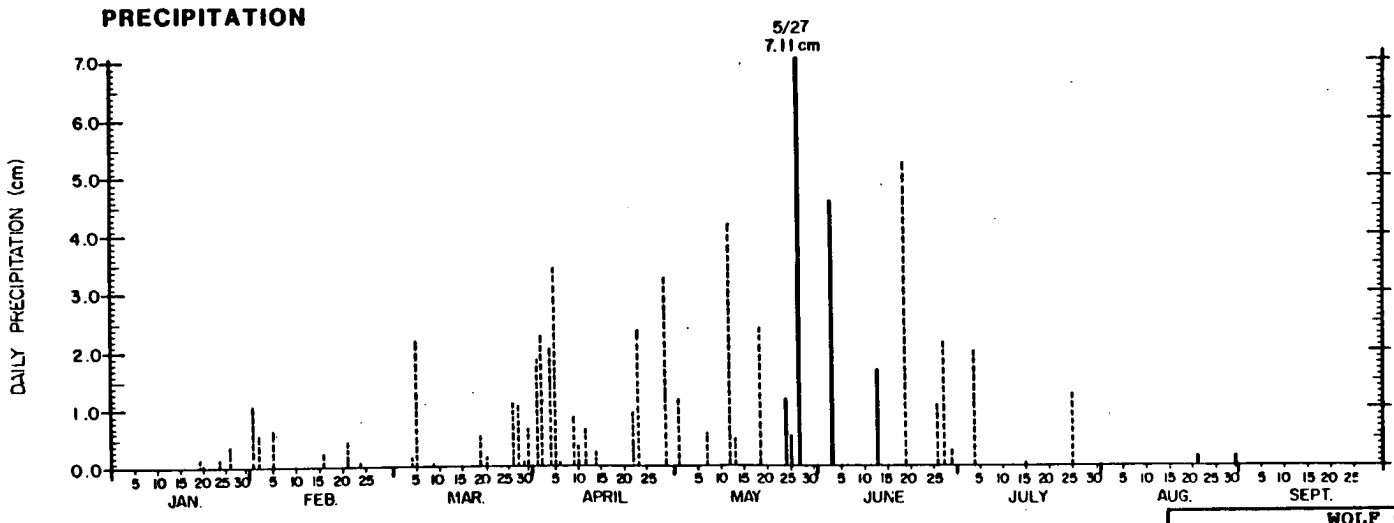
Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-144 (Sheet 2 of 3)

Observed Seepage and Precipitation Data





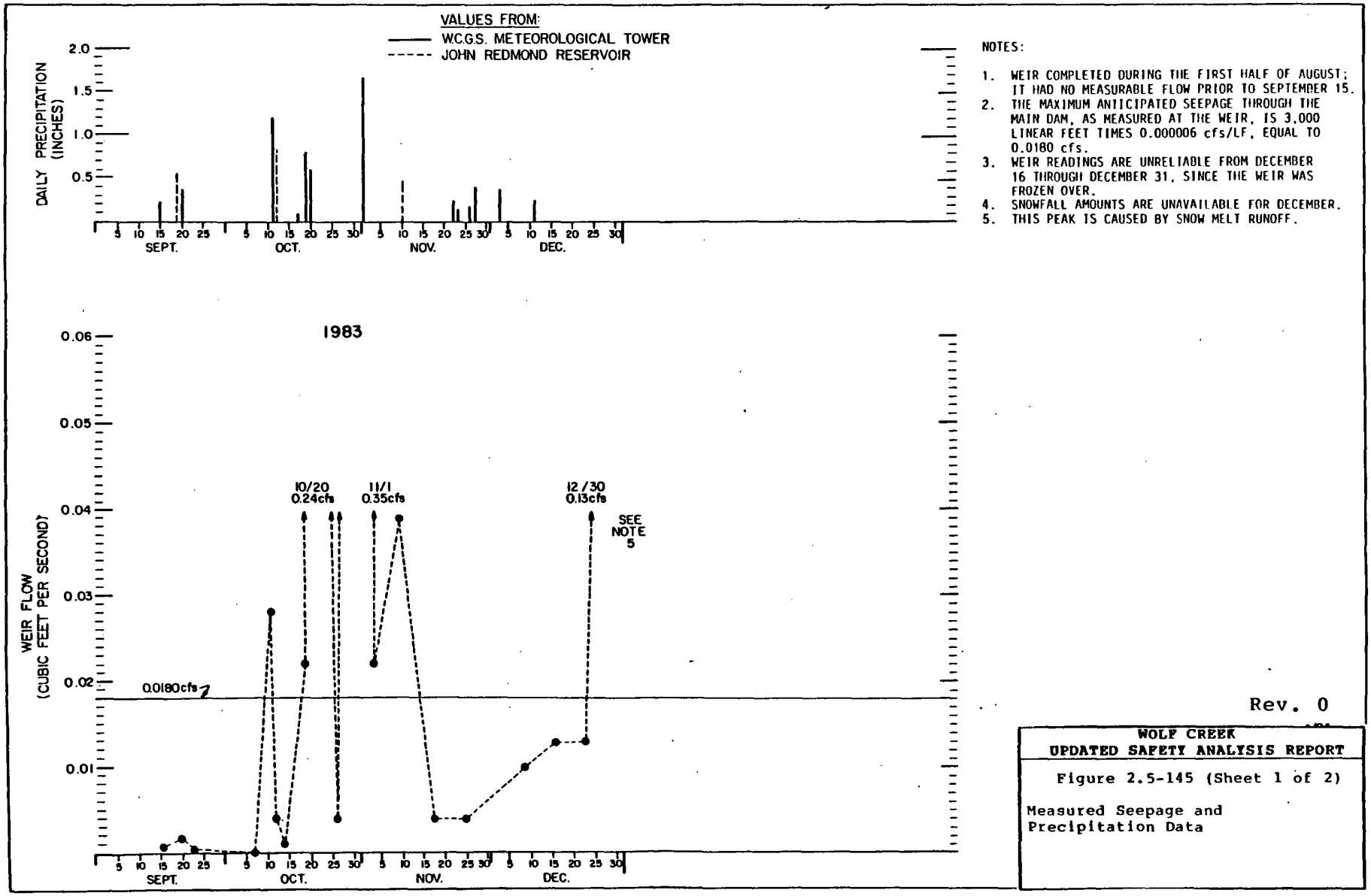
1983

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-144 (Sheet 3 of 3)

Observed Seepage and Precipitation Data



NOTES:

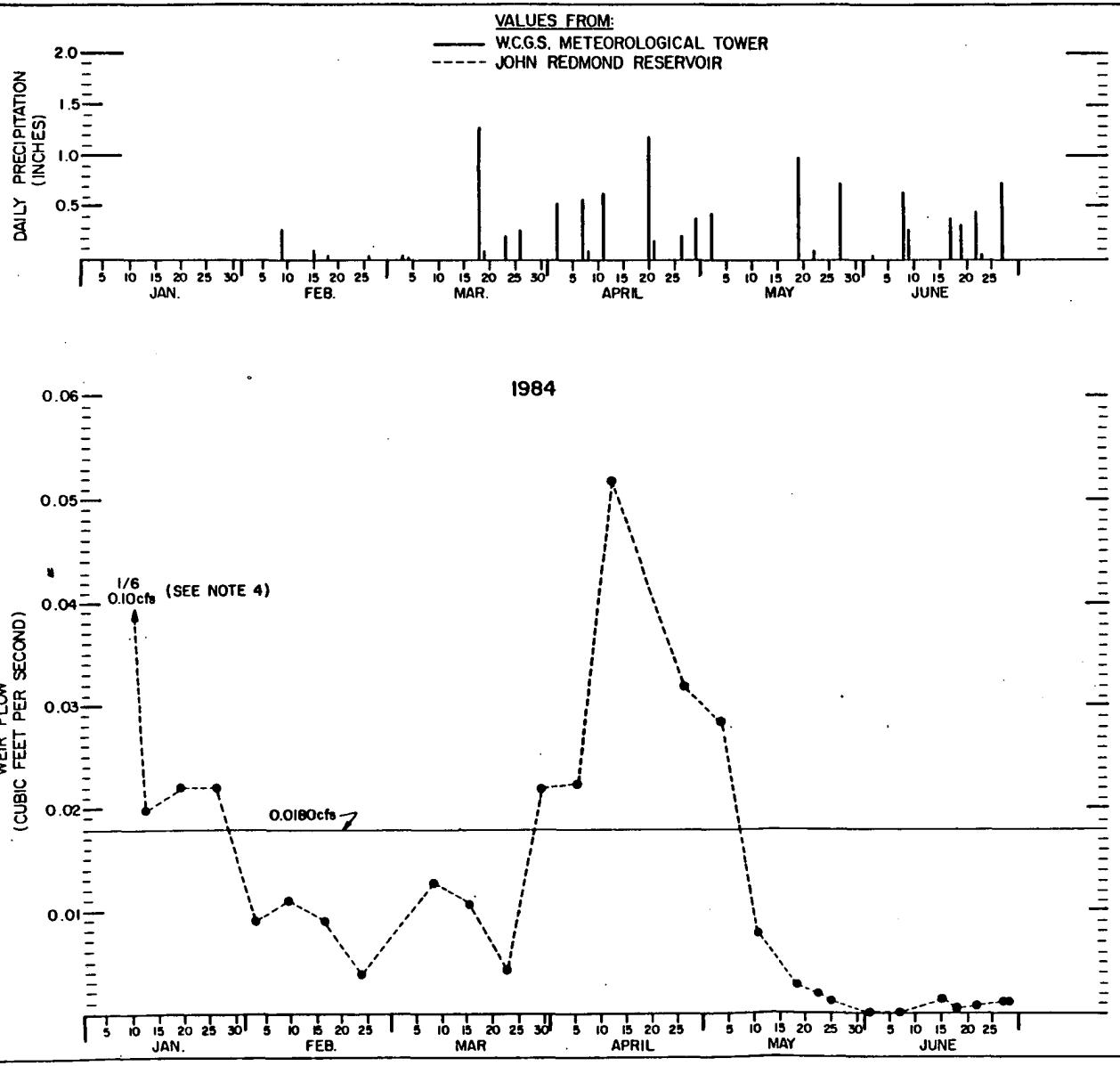
1. WEIR COMPLETED DURING THE FIRST HALF OF AUGUST; IT HAD NO MEASURABLE FLOW PRIOR TO SEPTEMBER 15.
2. THE MAXIMUM ANTICIPATED SEEPAGE THROUGH THE MAIN DAM, AS MEASURED AT THE WEIR, IS 3,000 LINEAR FEET TIMES 0.000006 cfs/LF, EQUAL TO 0.0180 cfs.
3. WEIR READINGS ARE UNRELIABLE FROM DECEMBER 16 THROUGH DECEMBER 31, SINCE THE WEIR WAS FROZEN OVER.
4. SNOWFALL AMOUNTS ARE UNAVAILABLE FOR DECEMBER.
5. THIS PEAK IS CAUSED BY SNOW MELT RUNOFF.

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-145 (Sheet 1 of 2)

Measured Seepage and Precipitation Data



NOTES:

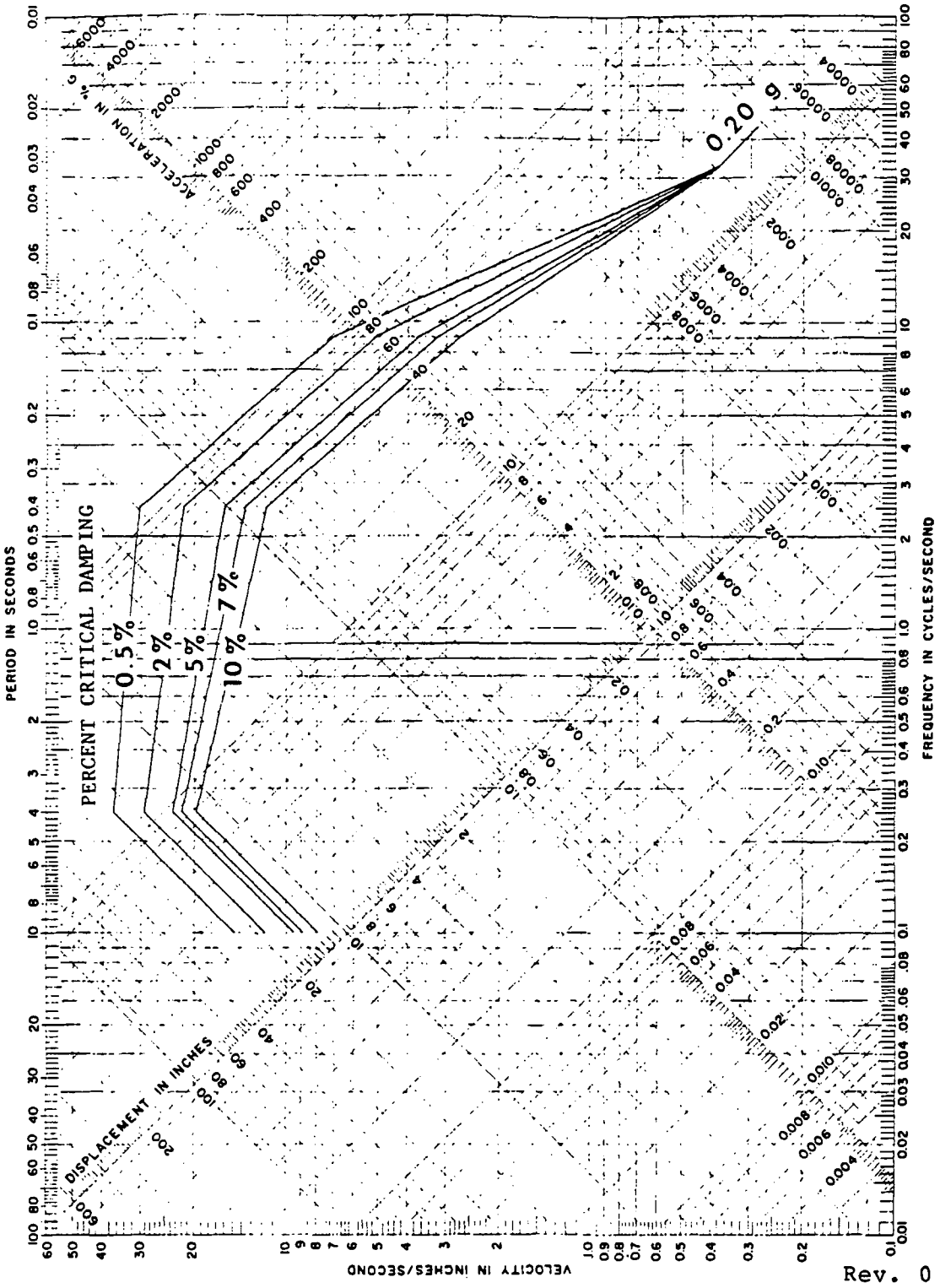
1. THE MAXIMUM ANTICIPATED SEEPAGE THROUGH THE MAIN DAM, AS MEASURED AT THE WEIR, IS 3000 LINEAR FEET TIMES 0.000006 cfs/LF, EQUAL TO 0.0180 cfs.
2. WEIR READINGS ARE UNRELIABLE FROM JANUARY 1 THROUGH JANUARY 27, SINCE THE WEIR WAS FROZEN OVER.
3. SNOWFALL AMOUNTS ARE UNAVAILABLE FOR JANUARY AND FEBRUARY.
4. THIS PEAK IS CAUSED BY SNOW MELT RUNOFF.

Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-145 (Sheet 2 of 2)

Measured Seepage and Precipitation Data

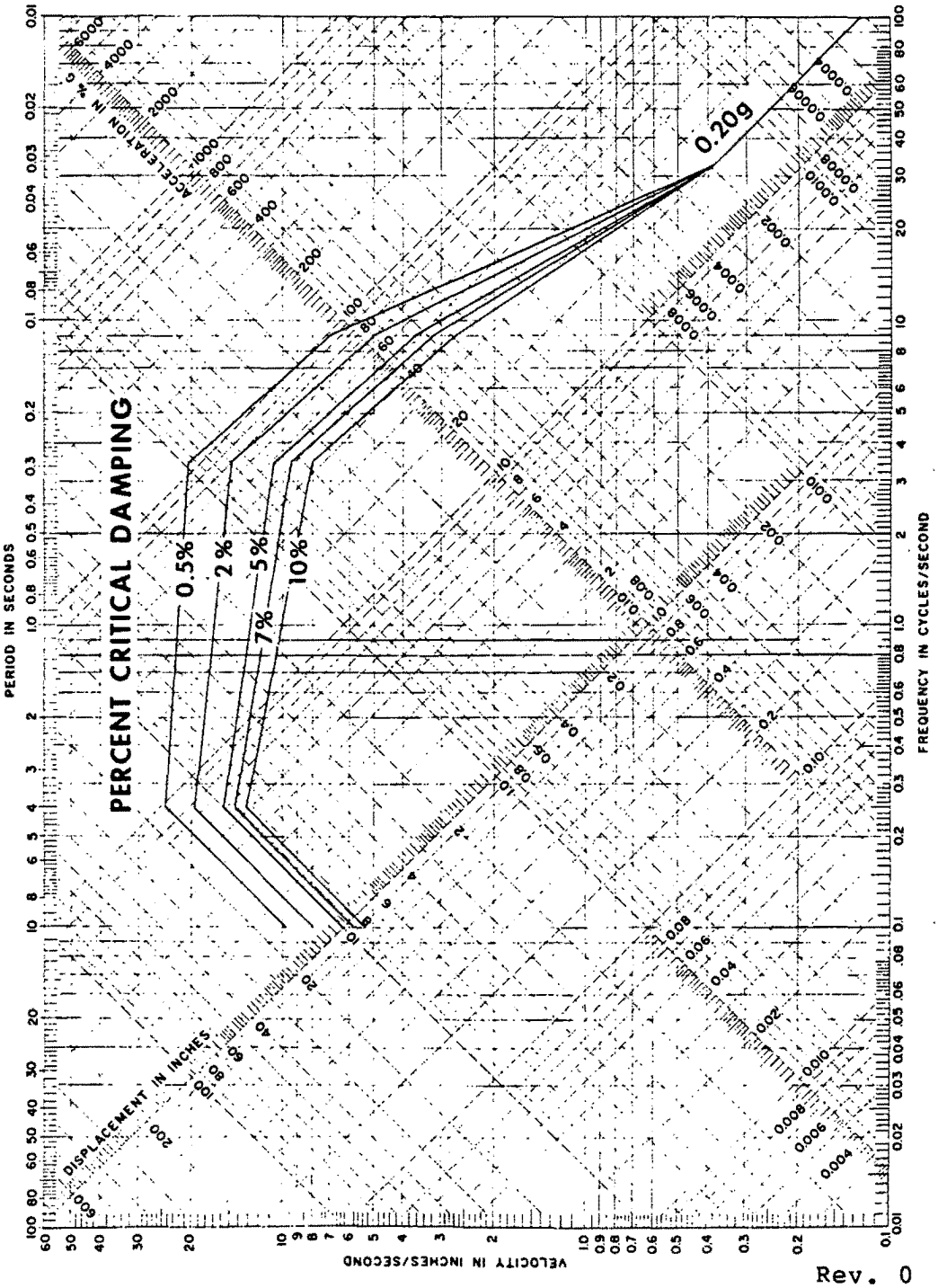


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-146

SSE Horizontal Design Spectra

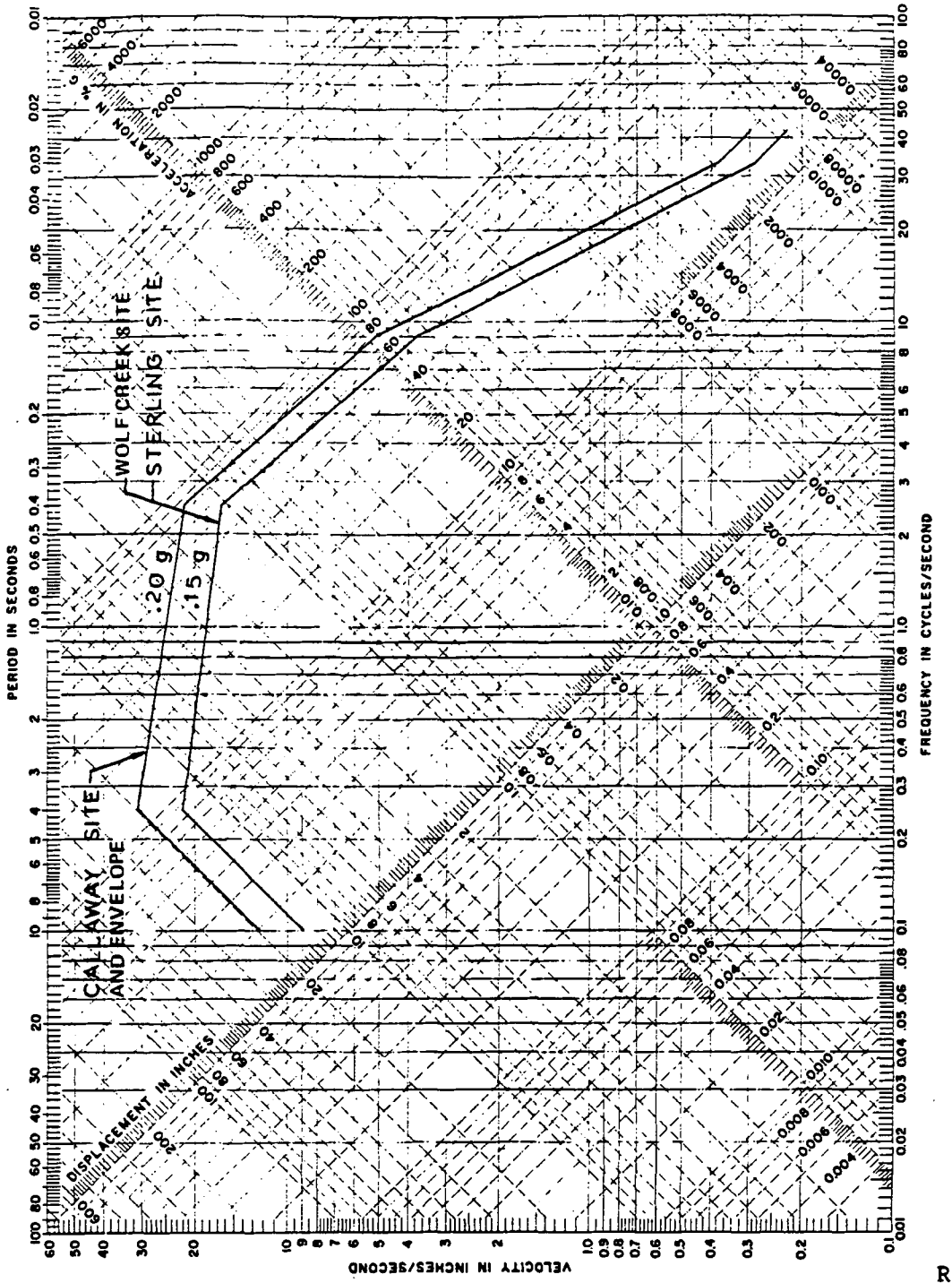


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

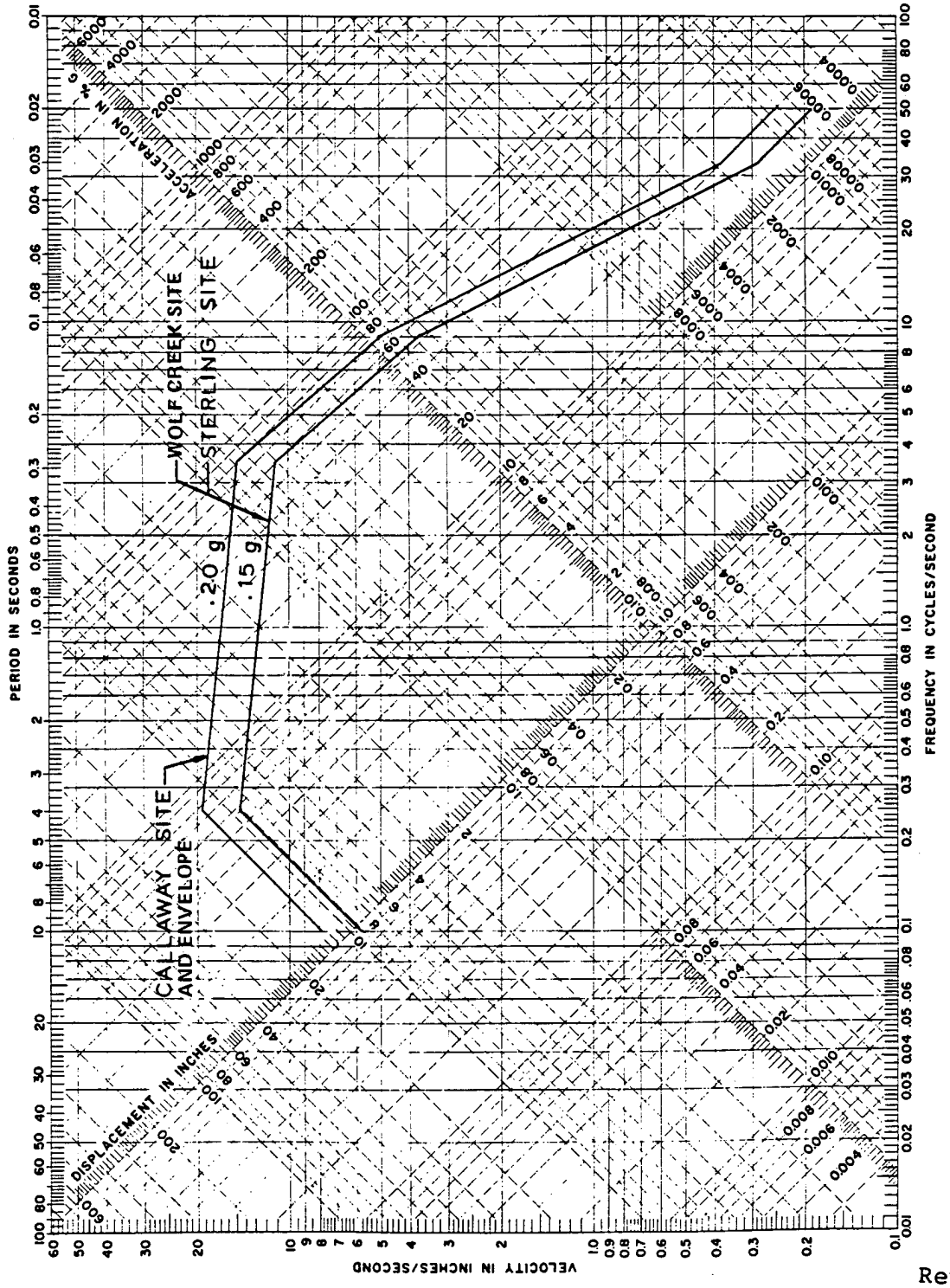
Figure 2.5-147

SSE Vertical Design Spectra



Rev. 0

WOLF CREEK UPDATED SAFETY ANALYSIS REPORT
Figure 2.5-148 Envelope of Site SSE Horizontal Design Spectra for 2% Damping

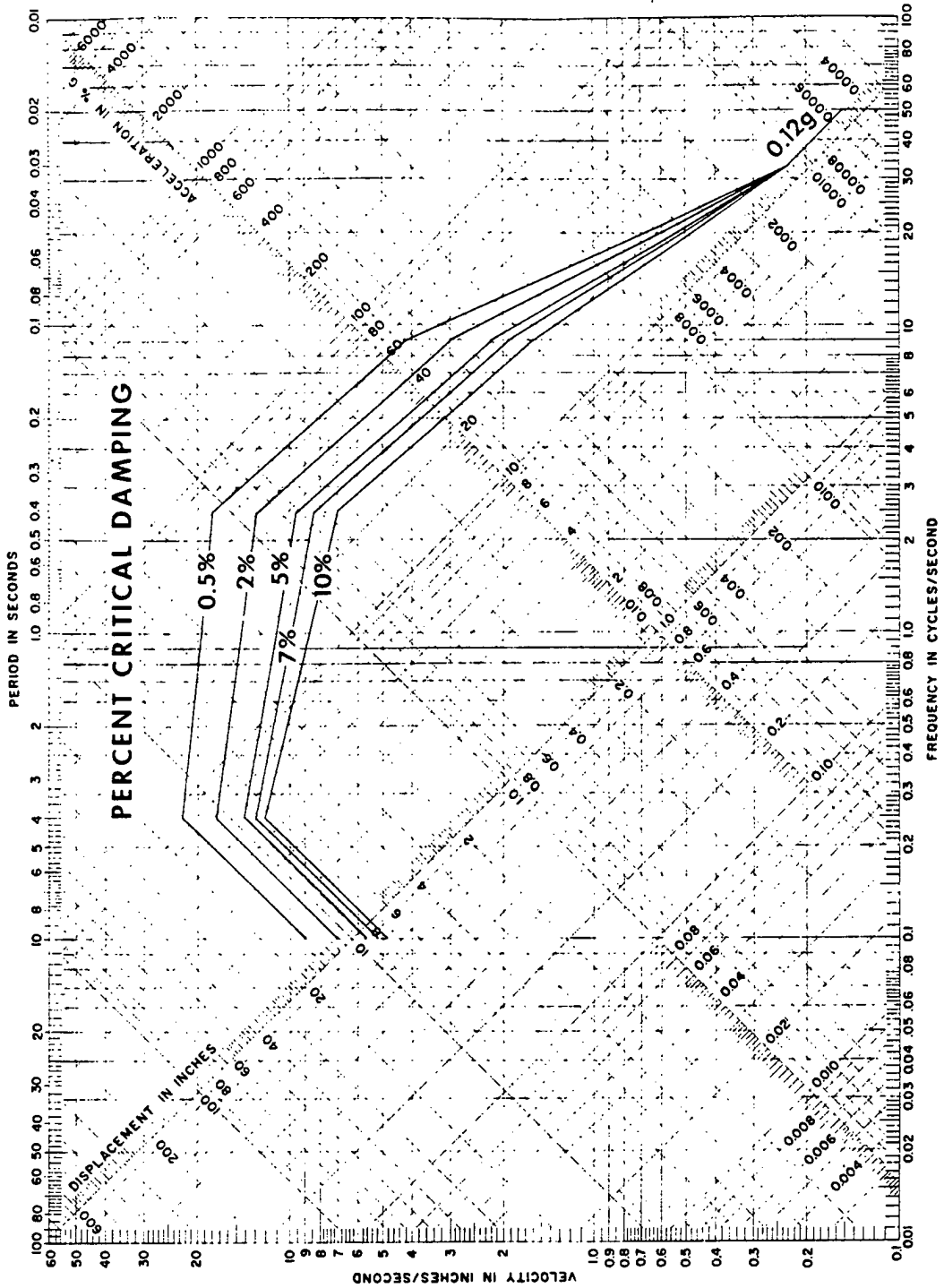


Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

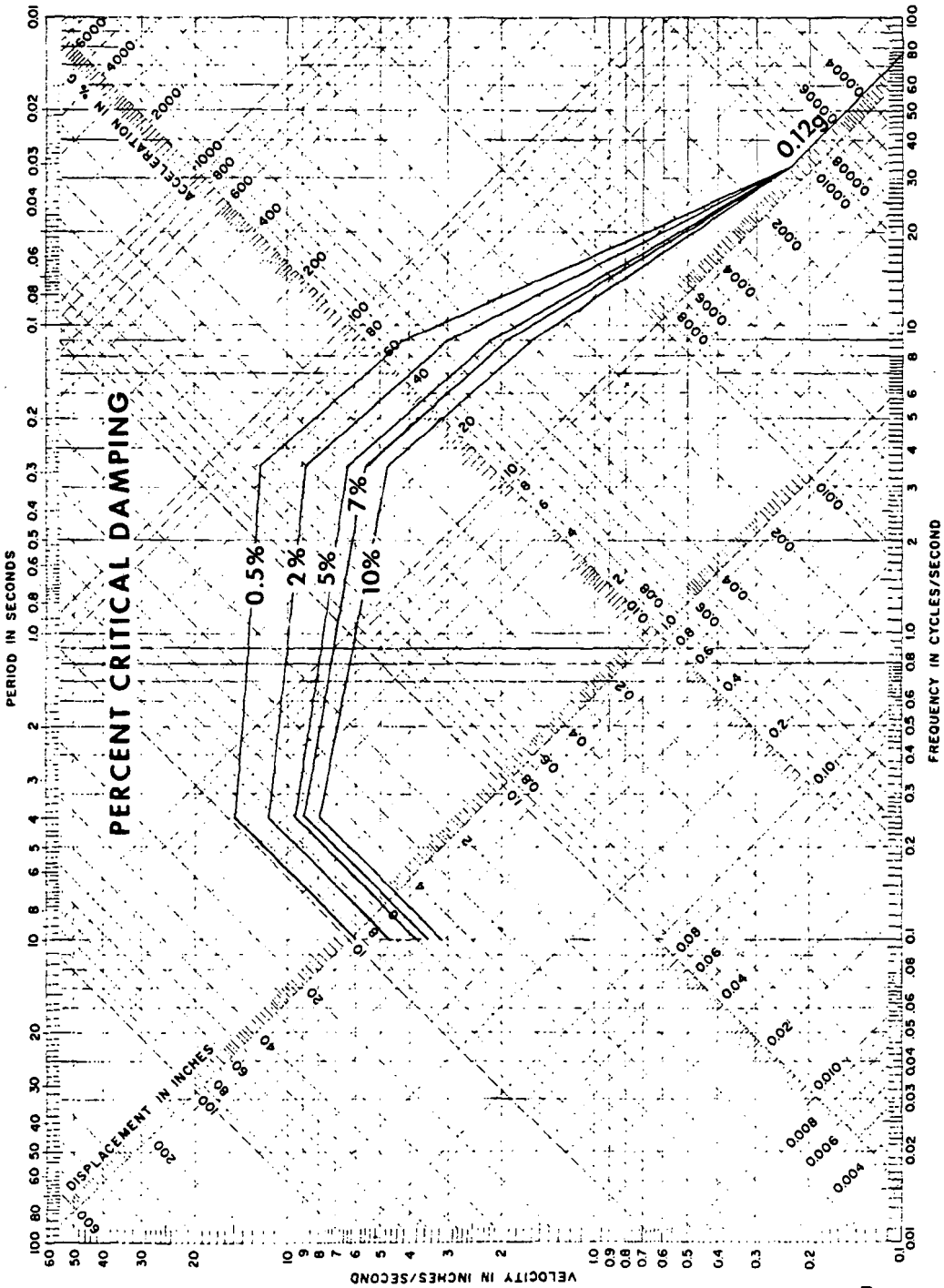
Figure 2.5-149

Envelope of Site SSE Vertical Design Spectra for 2% Damping



Rev. 0

WOLF CREEK UPDATED SAFETY ANALYSIS REPORT
Figure 2.5-150
OBE Horizontal Design Spectra



Rev. 0

WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-151

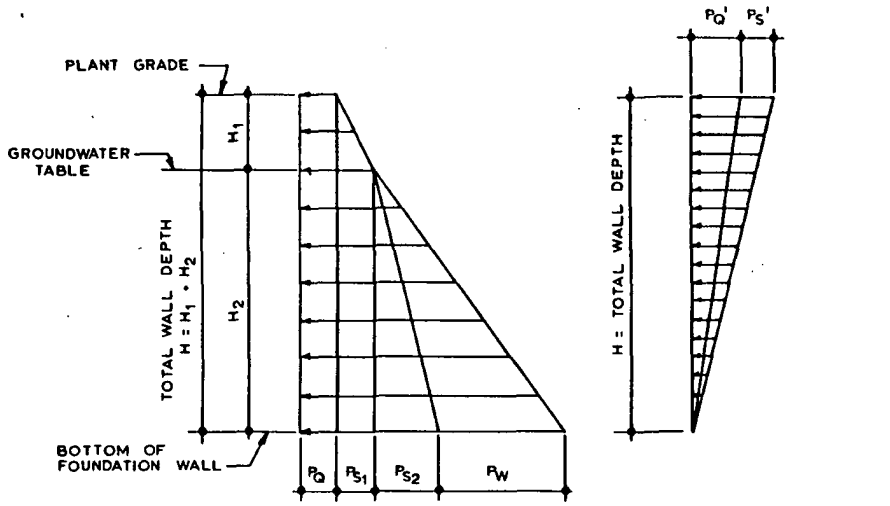
OBE Vertical Design Spectra

LATERAL EARTH PRESSURE EQUATIONS

SITE	DESIGN WATER TABLE ELEVATION	UNIT WEIGHTS (PCF)			STATIC PRESSURES				DYNAMIC PRESSURES			
									ENVELOPING OBE = 0.12G		ENVELOPING SSE = 0.20G	
		MOIST	SATURATED	BUOYANT	P_Q	P_{S_1}	P_{S_2}	P_W	P_Q'	P_S'	P_Q'	P_S'
TYRONE ENERGY PARK (5)	BELOW GRADE $H_1 = 7.50'$	125	133	70	0.75Q	$94H_1$	$52.5H_2$	$62.5H_2$	.42Q	$\frac{1476 + 395H_2 + 14.7H_2^2}{(7.5 + H_2)}$	.82Q	$\frac{2882 + 771H_2 + 28.7H_2^2}{(7.5 + H_2)}$
	BELOW WALL $H_2 = 0$				0.75Q	$94H_1$	—	—	.42Q	$26H_1$	.82Q	$51H_1$
WOLF CREEK	AT GRADE $H_1 = 0$	—	130	68	0.65Q	—	$106H_2$ (4)	—	.18Q	$15H_2$ (4)	.30Q	$27H_2$ (4)
CALLAWAY	AT GRADE $H_1 = 0$	—	150	88	.33Q	—	$92H_2$ (4)	—	.18Q	$18H_2$ (4)	.30Q	$30H_2$ (4)
STERLING	AT GRADE $H_1 = 0$	—	127	65	0.70Q	—	$108H_2$ (4)	—	.12Q	$11H_2$ (4)	.20Q	$19H_2$ (4)

NOTES:

1. THE EQUATIONS SHOWN IN THE TABLE ARE USED TO COMPUTE THE LATERAL EARTH PRESSURES AT THE TOP AND BOTTOM OF THE CATEGORY I FOUNDATION WALLS OF THE STANDARD PLANT AT EACH SITE. THE DYNAMIC EFFECT OF THE EARTH PRESSURES AT EACH SITE IS BASED ON THE ENVELOPING SSE AND OBE.
2. THE MAXIMUM EARTH PRESSURES COMPUTED AT THE TOP AND BOTTOM OF THE WALLS ARE TAKEN AS THE ENVELOPING PRESSURES AND ARE USED IN DESIGN OF THE CATEGORY I STRUCTURES.
3. THE FOLLOWING DEFINITIONS APPLY:
   - P_Q = STATIC PRESSURE DUE TO SURCHARGE LOADING
   - P_{S_1} = STATIC PRESSURE DUE TO SOIL ABOVE WATER TABLE
   - P_{S_2} = STATIC PRESSURE DUE TO SOIL BELOW WATER TABLE
   - P_W = HYDROSTATIC PRESSURE DUE TO GROUNDWATER
   - P_S' = DYNAMIC PRESSURE DUE TO SOIL
   - P_Q' = DYNAMIC PRESSURE DUE TO SURCHARGE LOADING
   - H_1 = DEPTH TO GROUNDWATER TABLE
   - H_2 = DEPTH FROM GROUNDWATER TABLE TO BOTTOM OF FOUNDATION WALL
   - H = TOTAL DEPTH OF WALL $= H_1 + H_2$
4. INCLUDES EFFECT OF HYDROSTATIC PRESSURE.
5. THE LATERAL EARTH PRESSURES AT THE TYRONE ENERGY PARK SITE ARE ANALYZED FOR THE CONDITIONS OF GROUNDWATER AT 7.50' BELOW GRADE AND GROUNDWATER BELOW THE FOUNDATION WALL.
6. ALL PRESSURES IN POUNDS PER SQUARE FOOT (PSF).



WOLF CREEK
UPDATED SAFETY ANALYSIS REPORT

Figure 2.5-152

Lateral Earth Pressure Schematic

Rev. 0