



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

DOE Program File

109

APR 18 1979

WM-7 File

MEMORANDUM FOR: James C. Malaro, Chief
High-Level Licensing Management Branch

FROM: Regis R. Boyle

SUBJECT: MINUTES OF NRC/DOE MEETING ON GEOLOGIC EXPLORATION FOR
HLW REPOSITORY SITES

On April 11, 1979, the second in a series of meetings was held in Silver Spring with the U.S. Department of Energy (DOE) and their contractors. The purpose of this meeting was to provide the NRC staff and our contractors with a better understanding of the geologic exploration program being implemented by DOE to identify sites for nuclear waste repositories. NRC staff members from NMSS, SD, NRR, and RES attended. A copy of the meeting notice was placed in the NRC public document room at 1717 H Street and was sent to those individuals who had requested that they be notified of NRC/DOE meetings on waste management matters. The total attendance at the meeting was about 100 persons including several individuals from the public, other Government agencies, and congressional staffs.

DOE briefly described their program for selecting a repository site. Attached is a set of all vu-graphs which were used by DOE or the contractors during the meeting. The sequence of geologic investigations in this process is to (1) identify geologic formations of interest, (2) perform regional reconnaissance studies on favorable geologic formations, (3) perform more detailed studies on smaller areas ($\sim 1000 \text{ mi}^2$) within a favorable geologic formation, and (4) prepare detailed site specific confirmation studies on areas of no more than a few square miles.

The geologic exploration work in both salt and non-salt media by DOE is taking place in seven areas in the United States. These include the Gulf Interior Region (Texas, Louisiana, Mississippi), the Paradox Basin (Colorado, Utah), the Permian Basin (Oklahoma, Texas, New Mexico), the Salina Basin (Ohio, New York), the WIPP site. By 1984, work should have progressed in these areas to the point where DOE will be able to determine the feasibility of developing a repository at specific sites within these regions, Hanford, and the Nevada Test Site.

APR 18 1979

Mr. Malaro

- 2 -

DOE is starting a program to examine geologic media other than salt but DOE has not yet defined geographic regions of interest. This work will focus primarily on argillaceous and crystalline rocks. The geologic exploration program in non-salt media will not be completed until 1985.

The next meeting between DOE and NRC on waste management matters is tentatively scheduled for April 27, 1979, when the topic of criteria development will be discussed.



Regis R. Boyle
High-Level Licensing
Management Branch

Enclosure:
As stated

DEPARTMENT OF ENERGY BRIEFING
FOR NUCLEAR REGULATORY COMMISSION

"PROGRAM FOR IDENTIFYING SITES FOR NUCLEAR WASTE REPOSITORIES"

APRIL 11, 1979

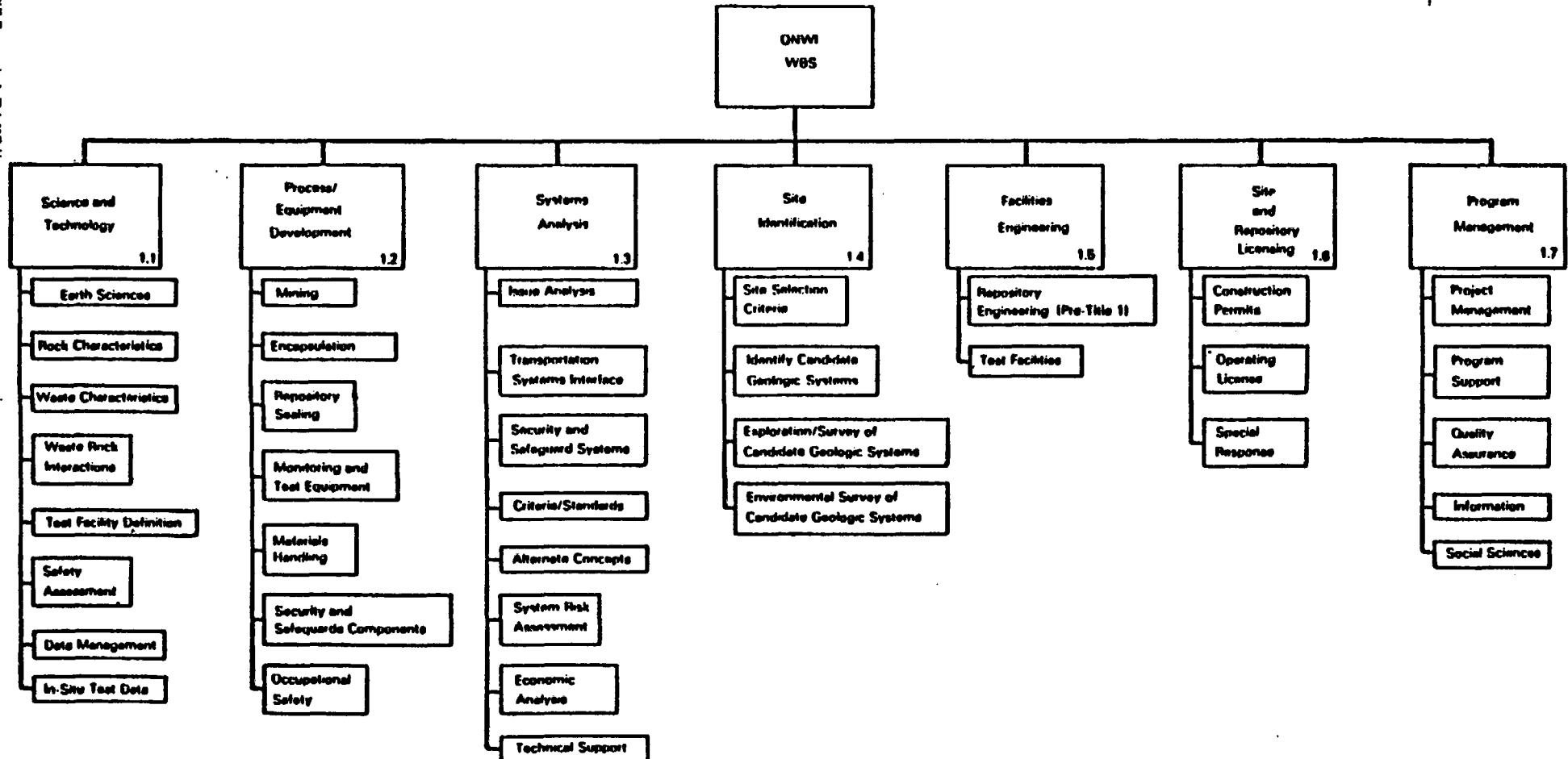
AGENDA FOR NRC BRIEFING BY DOE
April 11, 1979 - Room 150, Willste Bldg.,
7915 Eastern Ave., Silver Spring, Md.

^{*}
GEOLOGIC EXPLORATION FOR THE NWTs PROGRAM

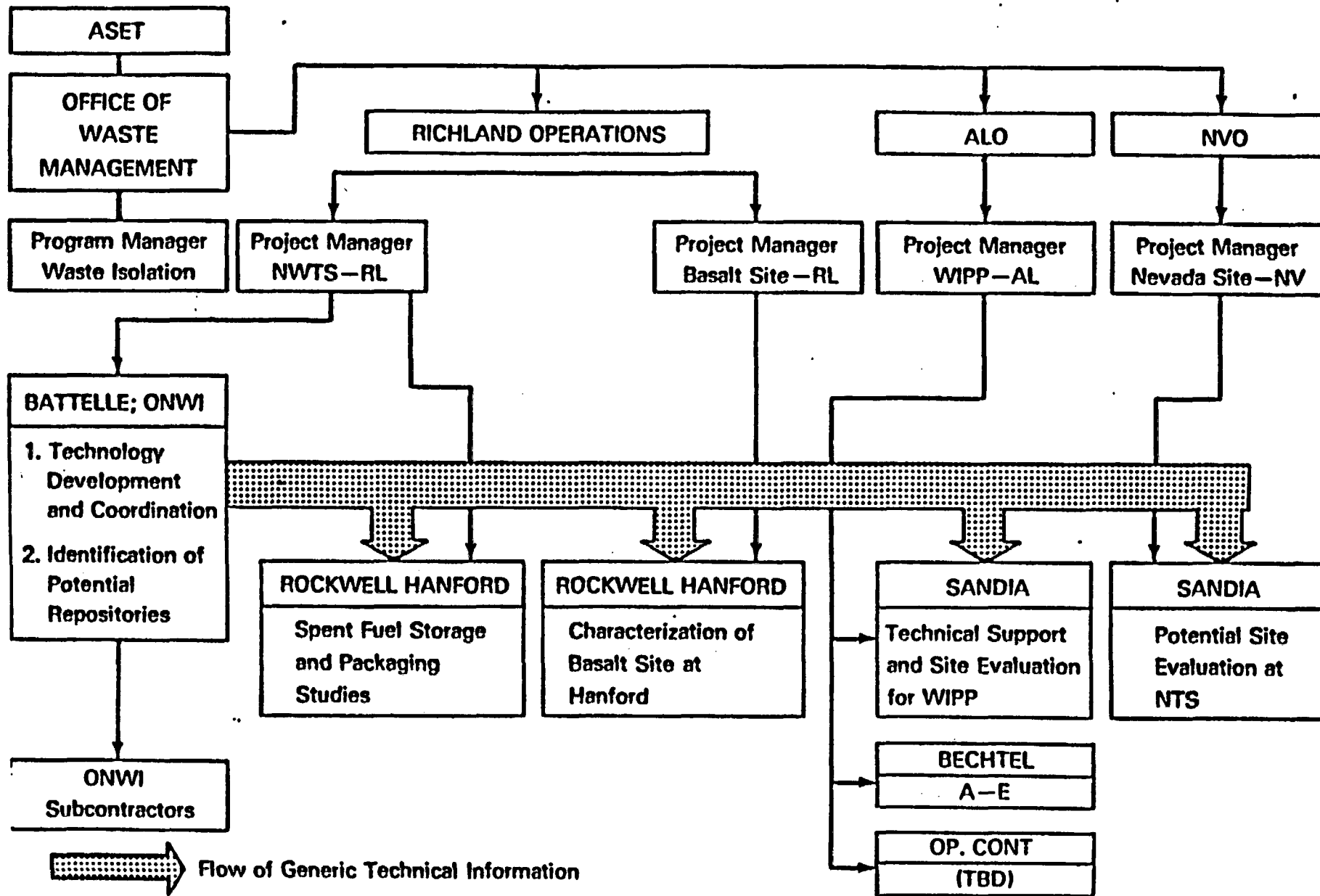
9:30 a.m.	Introduction (C. Heath, DOE-HQ)
9:40 a.m.	Site & Repository Development (M. Kehnemuyi, ONWI)
9:50 a.m.	Geologic Documentation for License Application (R. Laughon, ONWI)
10:30 a.m.	BREAK
10:45 a.m.	Plans for Exploration of Non-Salt Media (R. Laughon, ONWI)
11:05 a.m.	Geologic Exploration - Gulf Interior Region (P. Patchick, ONWI)
11:50 a.m.	Geologic Exploration - Paradox Basin (N. Frazier, ONWI)
12:10 p.m.	Geologic Exploration - Permian Basin (W. Newcomb, ONWI)
12:30 p.m.	LUNCH
1:30 p.m.	Geologic Exploration - Salina Basin (W. Newcomb, ONWI)
1:50 p.m.	Geologic Exploration - New Mexico (L. Hill, Sandia)
2:20 p.m.	Geologic Exploration - Washington (D. Brown, Rockwell)
2:50 p.m.	Geologic Exploration - Nevada (S. Sinnock)
3:20 p.m.	BREAK
3:30 p.m.	Discussion and Questions
4:00 p.m.	Concluding Remarks

*National Waste Terminal Storage

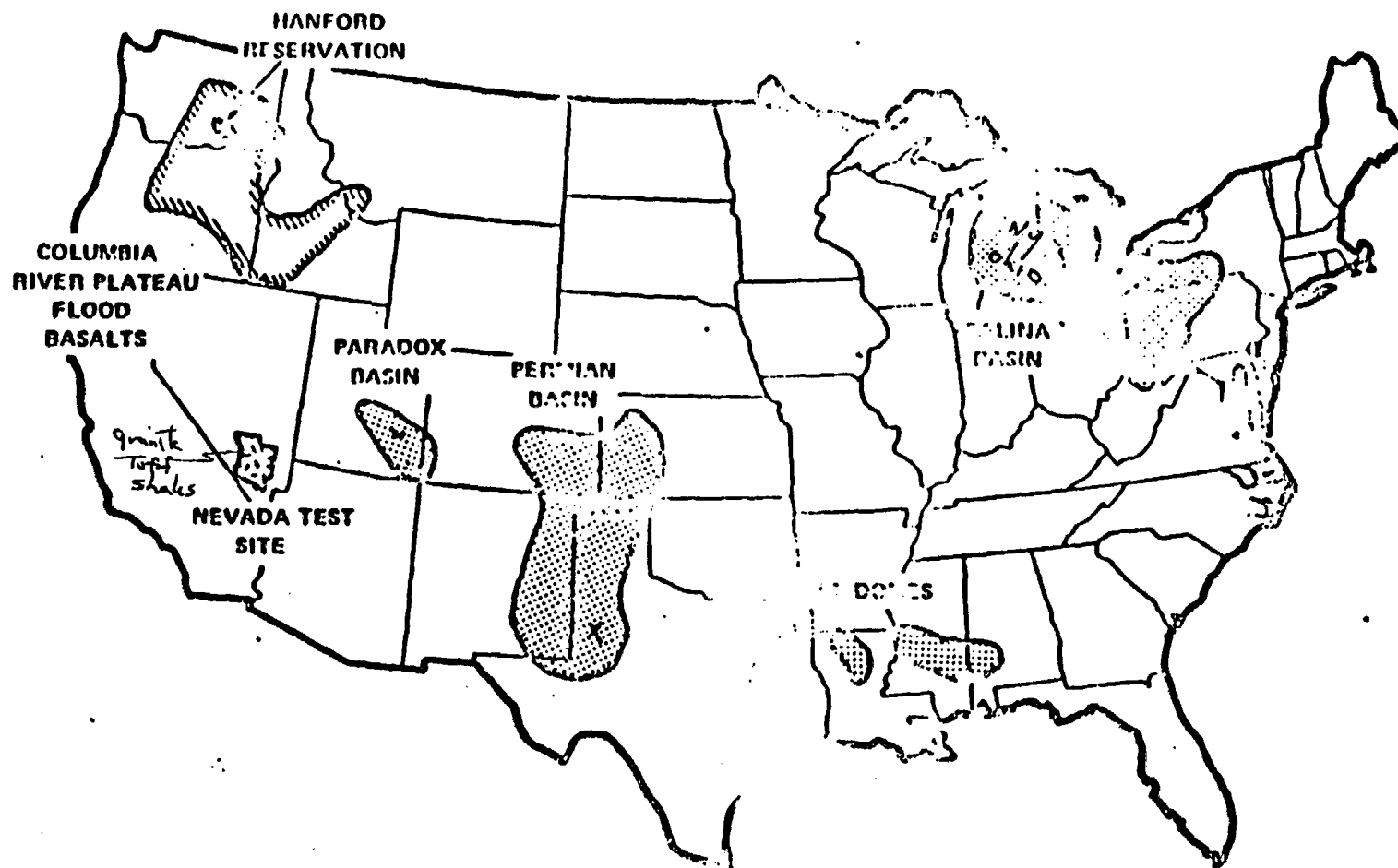
ONWI Work Breakdown Structure



NWTS MANAGEMENT STRUCTURE

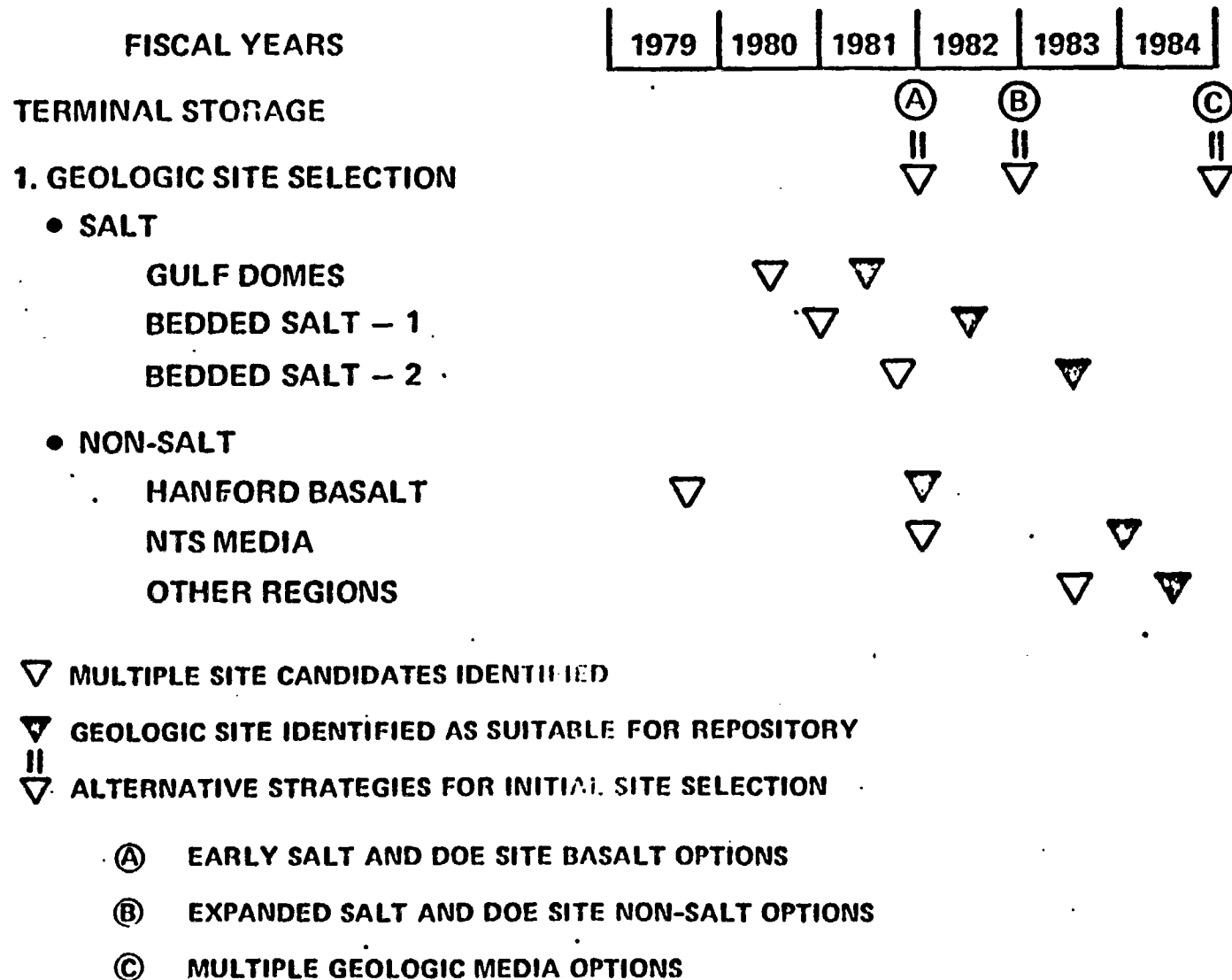


SUBJECT TO REVISION



**REGIONS BEING INVESTIGATED FOR TERMINAL STORAGE
OF RADIOACTIVE WASTES**

COMMERCIAL WASTE MANAGEMENT PROGRAM SITING SCHEDULE



1/8/79

ASSUMED LICENSING PROCESS

0 INFORMATION EXCHANGE

- E.G., • WASTE ISOLATION SAFETY ASSESSMENT PROGRAM (WISAP)
- SITING & ENGINEERING CRITERIA
- GEOLOGIC EXPLORATION
- ENVIRONMENTAL SURVEYS

0 PRELIMINARY INFORMATION REPORT

0 APPLICATION PREPARATION

- SAR PREPARATION
- ER PREPARATION

0 FORMAL LICENSING

2/6/79



Battelle

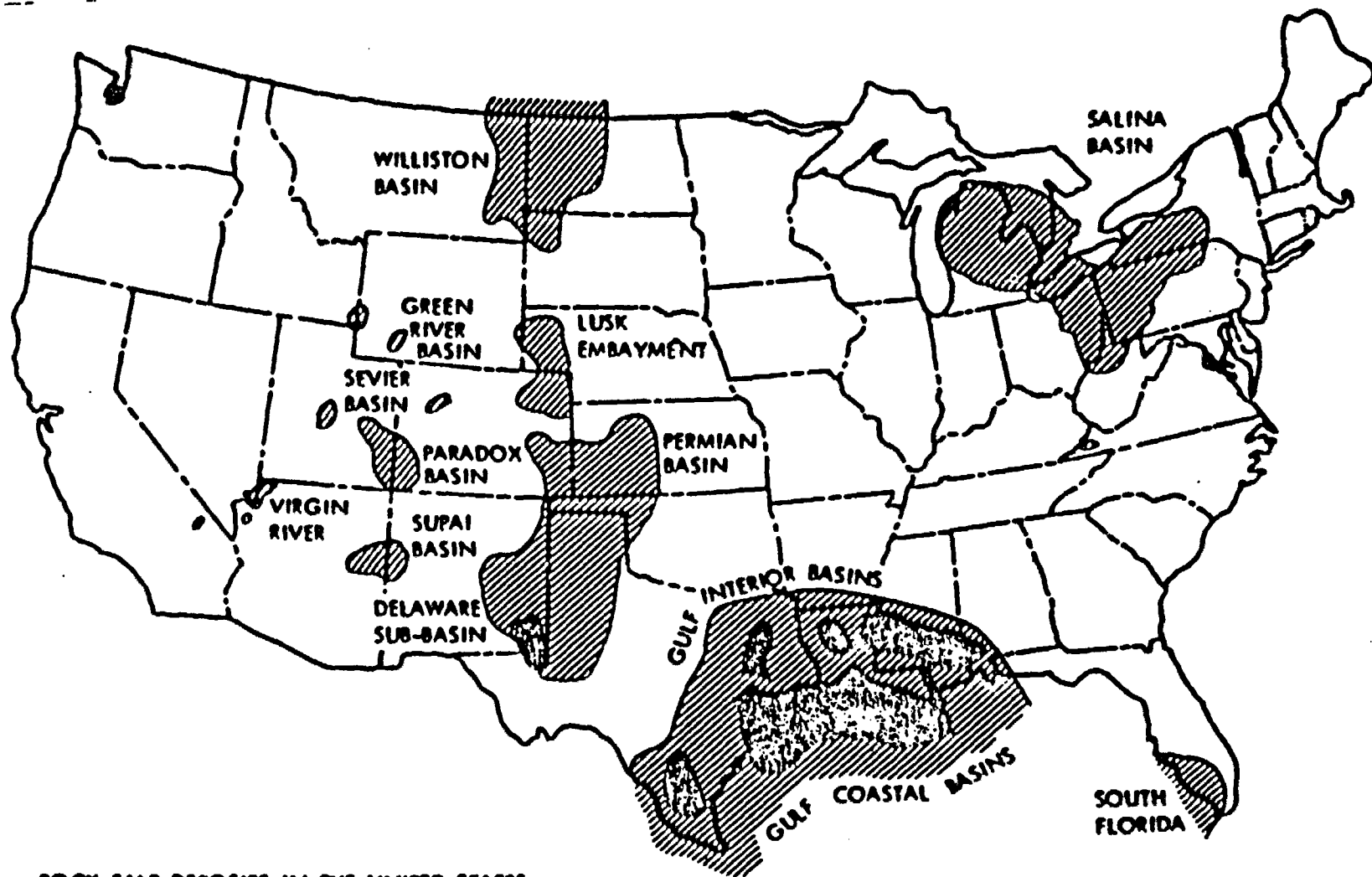
Project Management Division
Office of Nuclear Waste Isolation

GEOLOGIC DOCUMENTATION

R. B. LAUGHON

HISTORY OF WASTE DISPOSAL EFFORT

- 1957** NAS-NRC RECOMMENDATION FOR DISPOSAL IN SALT
- 1963-1967** PROJECT SALT VAULT
- 1968** EVALUATION OF HANFORD BASALTS BEGINS
- 1970** PROPOSED PILOT FACILITY AT LYONS, KANSAS
- 1972** WITHDRAWAL FROM LYONS, KANSAS
SEARCH CONTINUES IN KANSAS; EXPANDED TO NEW MEXICO
USGS SURVEY OF GULF COAST SALT DOMES
USGS BEGINS RECONNAISSANCE IN PARADOX BASIN
- 1974** WIPP FACILITY PROPOSED
EVALUATION OF SALT DOMES BEGINS
- 1976** NWTs PROGRAM ANNOUNCED
EVALUATION OF GEOLOGIC FORMATIONS AT NTS BEGINS
EVALUATION OF PERMIAN BASIN, EXCLUDING DELAWARE SUB-BASIN
- 1977** EVALUATION OF SALINA SALT BASIN BEGINS
EVALUATION OF PALO DURO SUB-BASIN BEGINS
- 1978** STUDY AREAS RECOMMENDED IN GULF COAST AND SALINA SALT REGIONS
ONWI FORMED AT BMI
- 1979** IRG REPORT ISSUED
WORK PROCEEDING AT WIPP, NTS, COLUMBIA PLATEAU BASALTS, AND FOUR SALT BASINS
EVALUATION OF OTHER NON-SALT MEDIA ACCELERATED



ROCK SALT DEPOSITS IN THE UNITED STATES
(AFTER PIERCE AND RICH, U.S.G.S. BULL. 1148)

GEOLOGIC EXPLORATION ACTIVITIES

GEOLOGIC AND HYDROLOGIC INVESTIGATIONS

SEPARATE AND DISTINCT FROM ENVIRONMENTAL SURVEY ACTIVITIES

COMPILATION, REVIEW, AND EVALUATION OF EXISTING DATA

COLLECTION AND EVALUATION OF NEW DATA

BASELINE FOR SAFETY ANALYSIS AND ENVIRONMENTAL REPORTS

RESULTS MUST SATISFY:

THE NEPA PROCESS

NRC LICENSING REQUIREMENTS

STATE AND LOCAL OFFICIALS

THE SCIENTIFIC COMMUNITY

THE PUBLIC AT LARGE

COVERED BY QA PROGRAM

INCLUDES PARTICIPATION BY STATE AGENCIES/UNIVERSITIES

SUBJECTED TO INDEPENDENT PEER REVIEW(S)

SEQUENCE OF GEOLOGIC INVESTIGATIONS

IDENTIFICATION OF FORMATIONS OF INTEREST

NO AREAL LIMIT

EVALUATION OF EXISTING LITERATURE AND DATA

BASED ON FUNDAMENTAL ROCK PROPERTIES

BASIS FOR SELECTION OF REGIONS OF INTEREST

REGIONAL RECONNAISSANCE

**REGION BOUNDED BY OCCURRENCE OF FAVORABLE GEOLOGIC
SYSTEM/MEDIUM**

EVALUATION OF EXISTING LITERATURE AND DATA

BASIS FOR RECOMMENDATION OF STUDY AREAS

AREA STUDIES

AREA OF FAVORABLE GEOLOGY OR ABOUT 1000 mi²

COLLECTION AND EVALUATION OF NEW DATA

DATA SPECIFIC TO WASTE ISOLATION PROBLEM

**BASIS FOR RECOMMENDATION OF POTENTIAL LOCATIONS
(CANDIDATE SITES)**

CONFIRMATION STUDIES

AREA OF A FEW mi²

DETAILED, SITE SPECIFIC DATA COLLECTION

RESULTS IN QUALIFICATION OF REJECTION OF A SITE

GEOLOGIC BASIS FOR SUBMITTAL OF PSAR AND ER

TOPICS TO BE ADDRESSED

GEOLOGY

- **PHYSIOGRAPHY**
EROSION & DENUDATION
- **STRATIGRAPHY**
DEPTH, THICKNESS, EXTENT
GEOCHEMISTRY
PHYSICAL PROPERTIES
- **STRUCTURE/TECTONICS**
LINEAMENTS, FAULTS, JOINTS
FOLDS
UPLIFT & SUBSIDENCE
DISSOLUTION FEATURES
TECTONIC HISTORY
IGNEOUS ACTIVITY
- **SEISMOLOGY**
- **ENERGY & MINERAL RESOURCES**

HYDROLOGY

- **SURFACE WATER**
GROUNDWATER

FUTURE GEOLOGIC EVENTS

PRODUCT OF SITE SELECTION ACTIVITIES

- **IDENTIFICATION OF APPROPRIATE SAFE, ACCEPTABLE, LICENSABLE SITES FOR LOCATION OF REPOSITORIES**
- **SITE QUALIFICATION REPORTS THAT WILL SUPPORT LICENSING DOCUMENTS (PSAR, ER, EIS)**

SOURCES OF GEOLOGIC EXPERTISE

- **CONSULTANTS**
- **DOE LABORATORIES**
- **GEOTECHNICAL FIRMS**
- **STATE GEOLOGICAL SURVEYS**
- **UNIVERSITIES – ACADEMIC DEPARTMENTS, RESEARCH LABORATORIES**
- **U.S. GEOLOGICAL SURVEY**

GEOLOGIC DOCUMENTATION (Ideal Case)

DOCUMENT(S) DEMONSTRATING CHOICE OF GEOLOGIC MEDIA/SYSTEMS

DOCUMENT(S) DEMONSTRATING CHOICE OF REGIONS

**REGIONAL CHARACTERIZATION REPORT, DEMONSTRATING CHOICE OF
AREAS**

PLAN FOR FIELD ACTIVITIES AND DETAILED EVALUATION

**AREA CHARACTERIZATION REPORT, DEMONSTRATING CHOICE OF
POTENTIAL SITES**

**SITE CHARACTERIZATION REPORT, DEMONSTRATING VALIDITY OF SITE
GEOLOGIC CONTRIBUTION TO PSAR AND ER**

GEOLOGY

DETAILED LITHOLOGIC DESCRIPTION OF ALL UNITS IN STRATIGRAPHIC SECTION

THREE DIMENSIONAL OVERALL STRUCTURAL CONFIGURATION

DESCRIPTION OF ZONES OF ALTERATION AND/OR WEATHERING

DESCRIPTION OF STRUCTURAL DETAILS – JOINTS, FAULTS, SHISTOSITY, FOLDS, BEDDING PLANES, FOLIATION

RELATION OF STRUCTURAL FEATURES TO STRESS REGIME

TECTONIC SETTING AND GEOLOGIC HISTORY

CRUSTAL STABILITY

REGIONAL STRESS REGIME

GEO THERMOMETRY

HISTORIC SEISMICITY AND RELATION TO STRUCTURE

SEISMIC MONITORING/DEFINITION OF SEISMOGENIC STRUCTURES

EARTHQUAKE RECURRENCE RATE

MAXIMUM CREDIBLE EARTHQUAKES

SEISMIC WAVE TRANSMISSION CHARACTERISTICS

IDENTIFICATION OF CAUSES/EFFECTS OF INDUCED SEISMICITY

MAXIMUM VIBRATORY GROUND MOTION

EROSION/DENUDATION PROCESSES AND RATES

POTENTIAL FOR EROSION/DENUDATION RATE CHANGE DUE TO CLIMATIC FLUCTUATIONS

NATURAL RESOURCE POTENTIAL AND PROJECTED NEED

HYDROLOGY

SURFACE WATERS

DETAILED HYDROLOGIC DESCRIPTION OF SITE ENVIRONMENT
DESCRIPTION OF SIGNIFICANT TRIBUTARIES IN VICINITY
PATTERN AND GRADIENTS OF DRAINAGE
EXPECTED SEASONAL/TEMPORAL VARIATIONS OF FLOW, CURRENTS,
TEMPERATURE, SALINITY, STREAM LOAD, SEDIMENTATION RATE
SOURCE AND NATURE OF ANY BACKGROUND POLLUTANTS
LOW AND AVERAGE FLOW CONDITIONS FOR ANY STREAM TO BE
USED
PERIOD-OF-RECORD DROUGHT

GROUNDWATER

PIEZOMETRIC CONTOUR MAPS AND HYDRAULIC GRADIENTS
PERMEABILITIES; TOTAL AND EFFECTIVE POROSITIES
BULK DENSITIES AND STORAGE COEFFICIENTS
DISPERSION AND DISTRIBUTION (SORPTION) COEFFICIENTS
DEFINITION OF RECHARGE ZONES AND ANNUAL RECHARGE
DEFINITION OF DISCHARGE AREAS
DEFINITION OF RETENTION TIME
DISTANCE TO NEAREST DOWN-GRADIENT WELL/WATER BODY

WATER CHEMISTRY

TIME HISTORIES OF GROUNDWATER FLUCTUATIONS
DATA ON DRAWDOWN FROM INDUSTRY/MUNICIPALITIES

ONWI NON-SALT ACTIVITIES

1979

BEGIN REVIEW TO IDENTIFY FORMATIONS/REGIONS OF INTEREST

- **ARGILLACEOUS ROCKS**
- **CRYSTALLINE ROCKS**

BEGIN LABORATORY STUDIES OF ROCK PROPERTIES

- **ARGILLACEOUS ROCKS**

COMPLETE SUBREGIONAL STUDIES IN SOUTHEAST

1980

REVIEW OF GEOLOGIC/ENVIRONMENTAL "SYSTEMS"

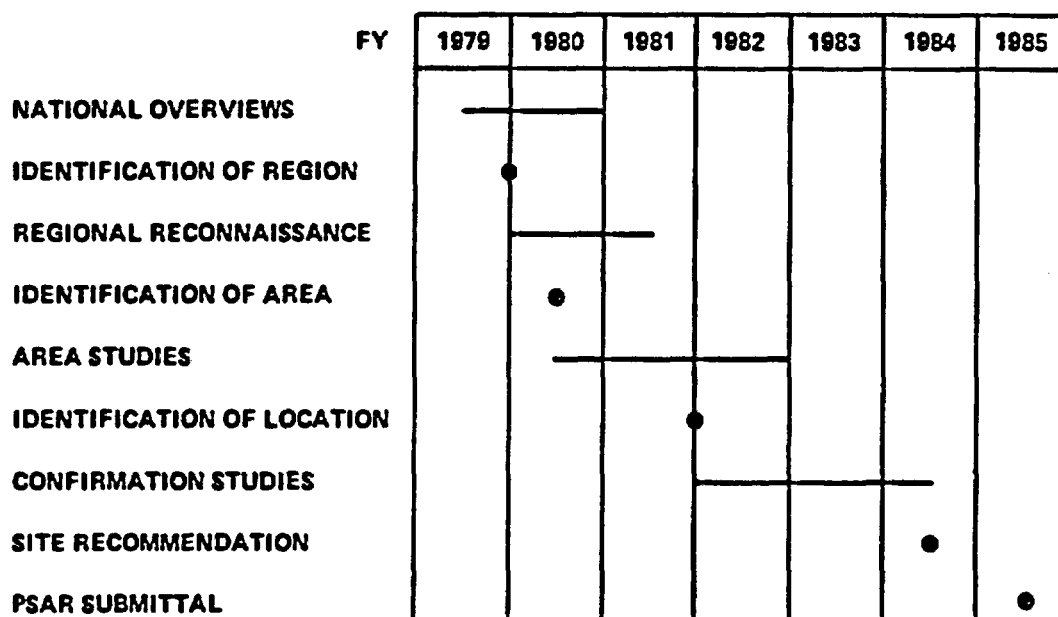
BEGIN REGIONAL RECONNAISSANCE

- **ARGILLACEOUS ROCKS**
- **CRYSTALLINE ROCKS**

BEGIN AREA STUDIES

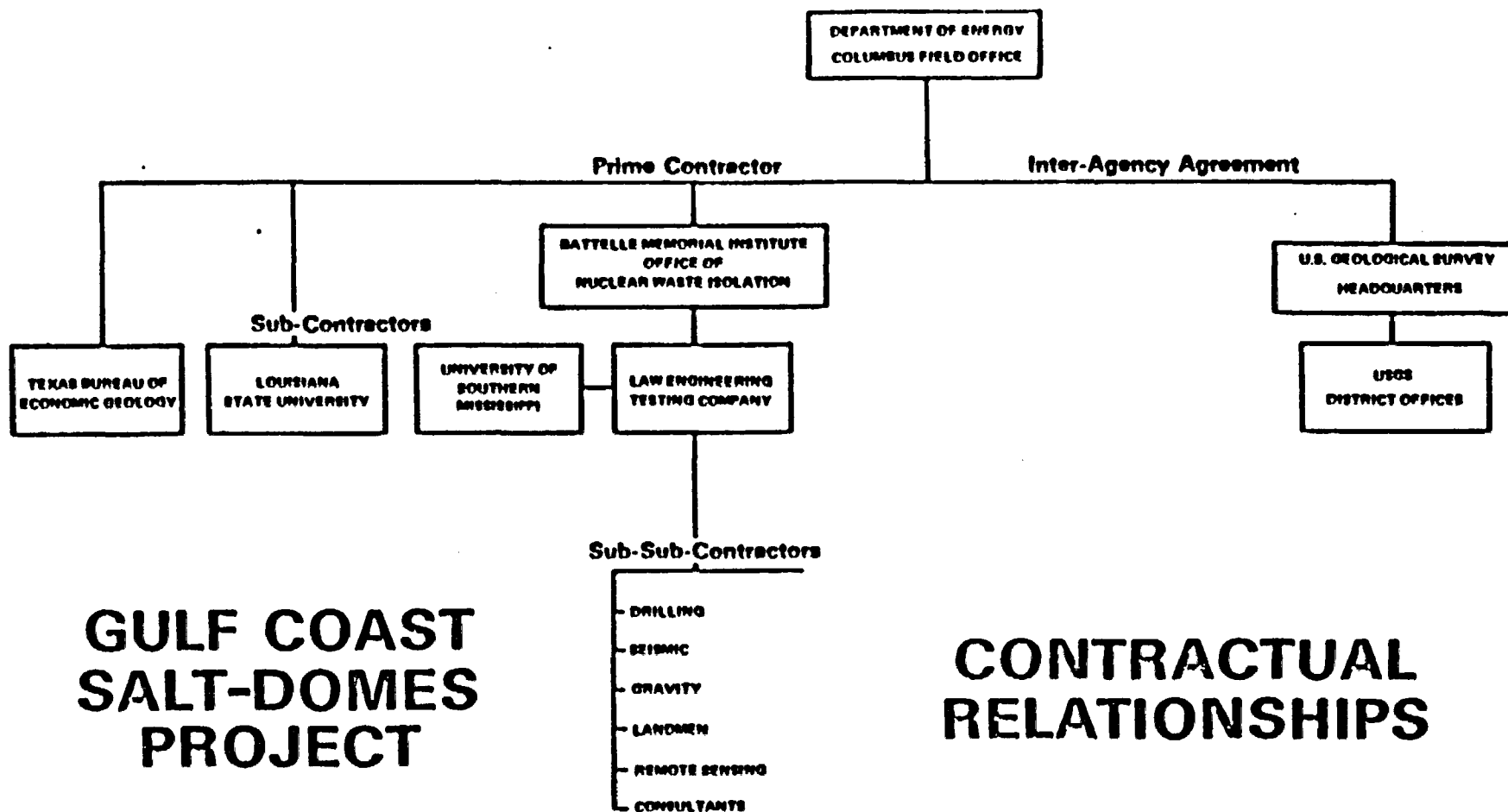
- **CRYSTALLINE ROCKS**

ONWI NON-SALT SCHEDULE



GEOLOGICAL INVESTIGATIONS
GULF COAST INTERIOR REGION

P. F. PATCHICK



**FAVORABLE CHARACTERISTICS
OF SALT DOMES**

MINERAL RESOURCES

**ALL DOMES HAVE HUGE RESERVES
OF HALITE**

**INTERIOR DOMES GENERALLY NOT AS-
SOCIATED WITH OIL/GAS ON FLANKS**

**NO OIL/GAS DEPOSITS KNOWN
WITHIN DOMES**

**SOME DOMES HAVE SULFUR IN
"CAPROCK"**

**SOME DOMES HAVE GYPSUM IN
"CAPROCK"**

FAVORABLE CHARACTERISTICS FOR SALT DOMES

HYDROLOGIC

**HYDROLOGICALLY STABLE ROCK-TYPE
NEAR-ZERO CONNATE WATER CONTENT
NO SIGNIFICANT GROUNDWATER FLOWS
WITHIN DOME INTERIORS
DOMES SURROUNDED BY NONPOTABLE
GROUNDWATER AT DEPTH
VERY LOW TO ZERO PERMEABILITY TO GROUNDWATER**

MECHANICAL/PHYSICAL PROPERTIES

**VERY HOMOGENEOUS
STRUCTURALLY SOUND
GOOD RADIATION SHIELDING PROPERTIES
EASY TO MINE
GOOD THERMAL PROPERTIES
TRANSMITS HEAT AWAY
DIFFUSES HEAT
HIGH INHERENT PLASTICITY
FRACTURES CAN "HEAL"
HALITE WILL REMAIN INTACT FOR EONS**

**FAVORABLE CHARACTERISTICS
OF SALT DOMES**

SEISMIC

**OCCUR IN SEISMICALLY STABLE REGION
ZONE 0 TO ZONE 1**

TECTONIC

**TECTONICALLY STABLE STRUCTURES
125 IN GULF INTERIOR BASINS**

**LAST MOVEMENTS, MAINLY DOWNWARD,
IN LATE TRIASSIC**

**NO IGNEOUS ACTIVITY SINCE LATE
TRIASSIC AND LATE CRETACEOUS**

**LAST MAJOR TECTONIC ACTIVITY (BLOCK
FAULTING) DURING LATE TRIASSIC**

**INTERIOR DOMES LAST IMPLACED (INTRUDED)
DURING MIOCENE TIME**

FAVORABLE CHARACTERISTICS OF SALT DOMES

GEOLOGIC

MULTIPLE BARRIERS MAY BE PRESENT

- AQUICLUDES
- AQUITARDS

MANY DOMES NOT TOO DEEP

- < 915 M

NUMEROUS ONSHORE DOMES

- 263 IN GULF COASTAL PLAIN

VERY THICK DEPOSITS OF HALITE

- THOUSANDS OF FEET

"CAPROCK" THICKNESS VARIES GREATLY

SUFFICIENT AREAL EXTENT

- > 1000 AC + 500 FT BARRIER ZONE

GULF INTERIOR DOMES GENERALLY
LOCATED BENEATH HILLY, WELL-
DRAINED TERRAIN

MAJOR STEPS IN SCREENING PROCESS

ONSHORE/OFFSHORE DOMES

~ 500

ONSHORE

263



TOO DEEP

148

UNAVAILABLE

79

USGS 1973

POTENTIALLY ACCEPTABLE

- DEPTH TO SALT < 2000'
- LACK OF PREVIOUS USE

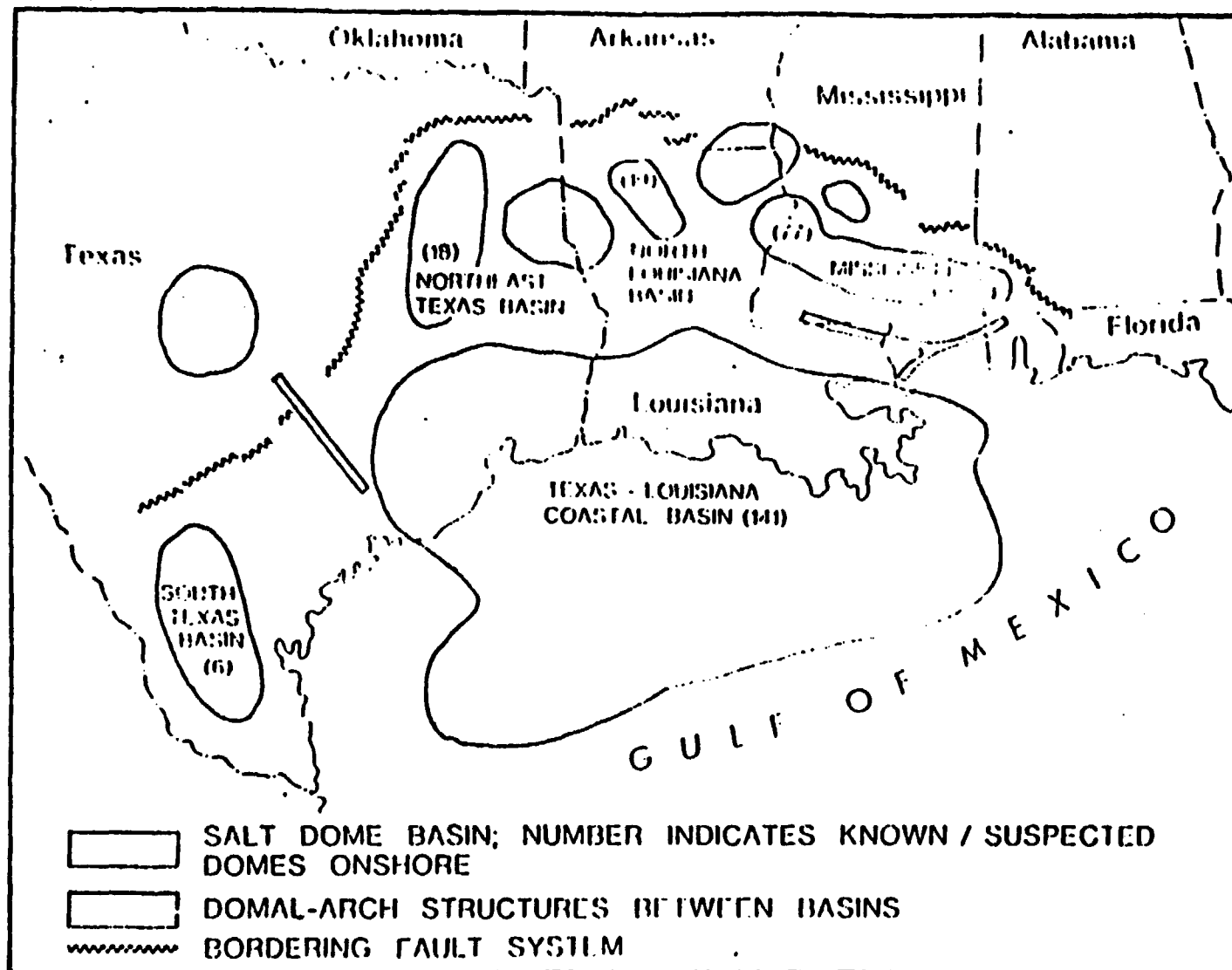
36

COASTAL
+
INTERIOR

36

INTERIOR

TX. 7
LA. 8
MISS. 14



MAP SHOWING THE FIVE SALT DOME BASINS AND OUTLINING OTHER MAJOR STRUCTURAL FEATURES OF THE GULF COAST REGION.

MAJOR STEPS IN SCREENING PROCESS (Continued)

ONSHORE DOMES

263 → 125

- DOME SIZE
- REPOSITORY DEPTH/COVER
- DOME UTILIZATION

OWI 1975

INTERIOR DOMES: 29 → 25

NSAI 1976

1975

(LA) 19 → 11 → 3

LSU 1976

1978

(TX) 20 → 3

TBEG 1978

125 → 11 → 7

GPM 1978

7 + 1 → 8

GPM/RPM 1979

RECOMMENDED FOR ADDITIONAL STUDY
AREA CHARACTERIZATION PHASE

GULF INTERIOR REGION

**REGIONAL
CHARACTERIZATION
STUDY**

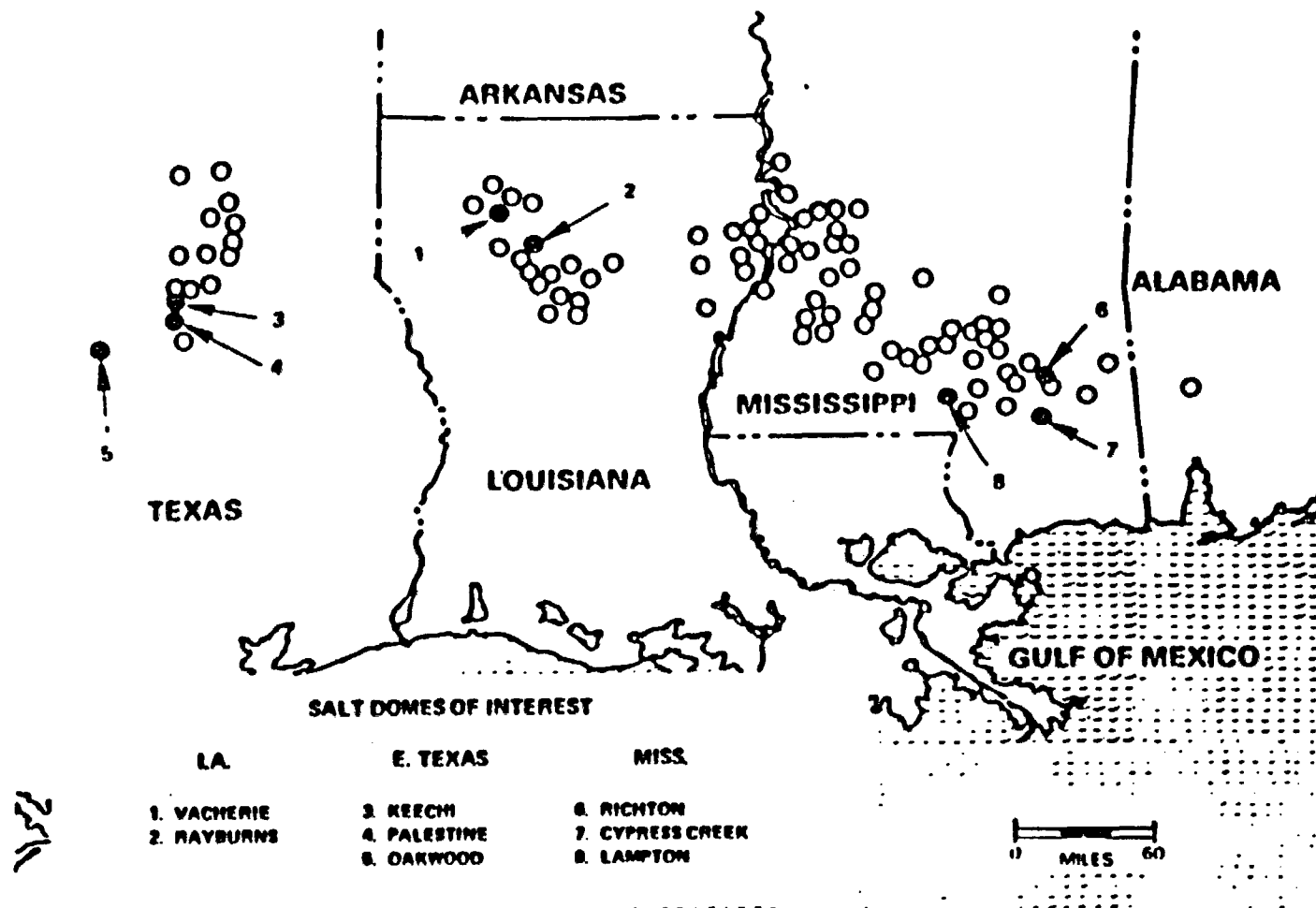
**BECHTEL 11/78
LAW ENGINEERING 4/78**

**3 BASINS
(STUDY AREAS)**

**SALT DOMES
OF INTEREST:**

RAYBURN'S	LA.
VACHERIE	LA.
CYPRESS CREEK	MISS.
LAMPTON	MISS.
RICHTON	MISS.
KEECHI	TEX.
OAKWOOD	TEX.
PALESTINE	TEX.

INTERIOR PIERCEMENT SALT DOMES OF EAST TEXAS, NORTH LOUISIANA, & MISSISSIPPI



GULF COAST SALT DOMES STUDY

<u>BASIN</u>	<u>DOME</u>	<u>DEPTH TO SALT (FT)</u>	<u>APPROXIMATE AREA OF SALT (Acres)</u>		
			<u>Feet Below Ground Surface</u>		
			<u>1000</u>	<u>2000</u>	<u>3000</u>
<u>LOUISIANA BASIN</u>					
	Vacherie	777	1620	2400	2860
	Rayburns	130	940	1730	2370
<u>MISSISSIPPI BASIN</u>					
	Richton	720	4025	4500	4275
	Lampton	1650	170	1040	1440
	Cypress Creek	1447 (flank)	2200	2850	3300
<u>EAST-TEXAS BASIN</u>					
	Keechi	400	80	500	1100
	Oakwood	1000	760	1820	2140
	Palestine	100	715	1330	2275

ACCOMPLISHMENTS

Geologic Exploration: Salt Domes

- 1974** • **LSU UNDER DOE CONTRACT**
- 1975** • **LITERATURE SURVEYS, REGIONAL CHARACTERISTICS**
 - **BEGAN SEISMIC WORK IN LOUISIANA**
- 1976** • **LIMITED FIELD RECONNAISSANCE, LOUISIANA**
 - **50 MISSISSIPPI DOMES INVESTIGATED (LITERATURE SEARCH) AND MAPS PREPARED**
- 1977** • **SCREENING SPECIFICATIONS DRAFTED**
 - **GPM SELECTED**
 - **PLANS MADE TO CORE TWO DOMES IN LOUISIANA**
 - **HYDROLOGIC STABILITY RESEARCH INITIATED**
 - **19 LOUISIANA DOMES STUDIED AND TENTATIVELY RANKED**
 - **TEXAS BUREAU OF ECONOMIC GEOLOGY UNDER DOE CONTRACT**
 - **EAST-TEXAS DOME RESEARCH BEGUN**

ACCOMPLISHMENTS

Geologic Exploration: Salt Domes (Continued)

1978

- **VACHERIE DOME, LOUISIANA DRILLED TO 5,043 FEET**
- **RAYBURN'S DOME, LOUISIANA DRILLED TO 5,013 FEET**
- **TOTAL OF 5,064 FEET OF CORE RECOVERED, LOUISIANA**
- **TOTAL OF 304 FEET OF CAPROCK CORED, LOUISIANA**
- **ONWI GEOLOGIC EXPLORATION DEPARTMENT FORMED**
- **TECTONIC STABILITY RESEARCH BEGUN AT LOUISIANA DOMES**
- **MINED-OPENINGS RESEARCH BEGUN, LOUISIANA**
- **MINERAL RESOURCES MAPS PREPARED FOR 2 LOUISIANA DOMES**
- **GRAVITY GEOPHYSICAL RESEARCH BEGUN OVER 3 LOUISIANA DOMES**

ACCOMPLISHMENTS

Geologic Exploration: Salt-Domes (Continued)

1978

- **PETROGRAPHIC DESCRIPTION OF RAYBURN'S DOME, LOUISIANA CORE COMPLETED**
- **45 CORED, SHALLOW DRILL-HOLES COMPLETED AT VACHERIE AND RAYBURN'S DOMES, LOUISIANA TOTALLING 1,400 FEET**
- **6 LARGE-DIAMETER HOLES DRILLED TO CAPROCK AT RAYBURN'S**
- **REGIONAL GEOLOGIC/HYDROLOGIC STUDIES UNDERWAY FOR EAST TEXAS**
- **PRELIMINARY FINDINGS ON 26 EAST-TEXAS DOMES; 3 RECOMMENDED FOR FURTHER STUDY**

ACCOMPLISHMENTS

Geologic Exploration: Salt-Domes (Continued)

1979

- **SITE-SELECTION PROGRAM PLAN PREPARED BY GPM – 8 DOMES WINNOWNED FROM 125**
- **RPM/GPM PREPARED SUMMARY CHARACTERIZATION REPORT – STUDY AREAS RECOMMENDED**
- **DRILLING PROGRAMS PLANNED: 3 STATES**
- **LAND ACCESS ACTIVITIES BEGUN IN 3 STATES; C of E ON BOARD IN LOUISIANA**
- **REMOTE THERMAL-IR SENSOR FLOWN OVER 8 DOMES**
- **UNIVERSITY OF SOUTHERN MISSISSIPPI UNDER CONTRACT**
- **COMPLETED TOPOGRAPHIC MAPPING, VACHERIE DOME, LOUISIANA**

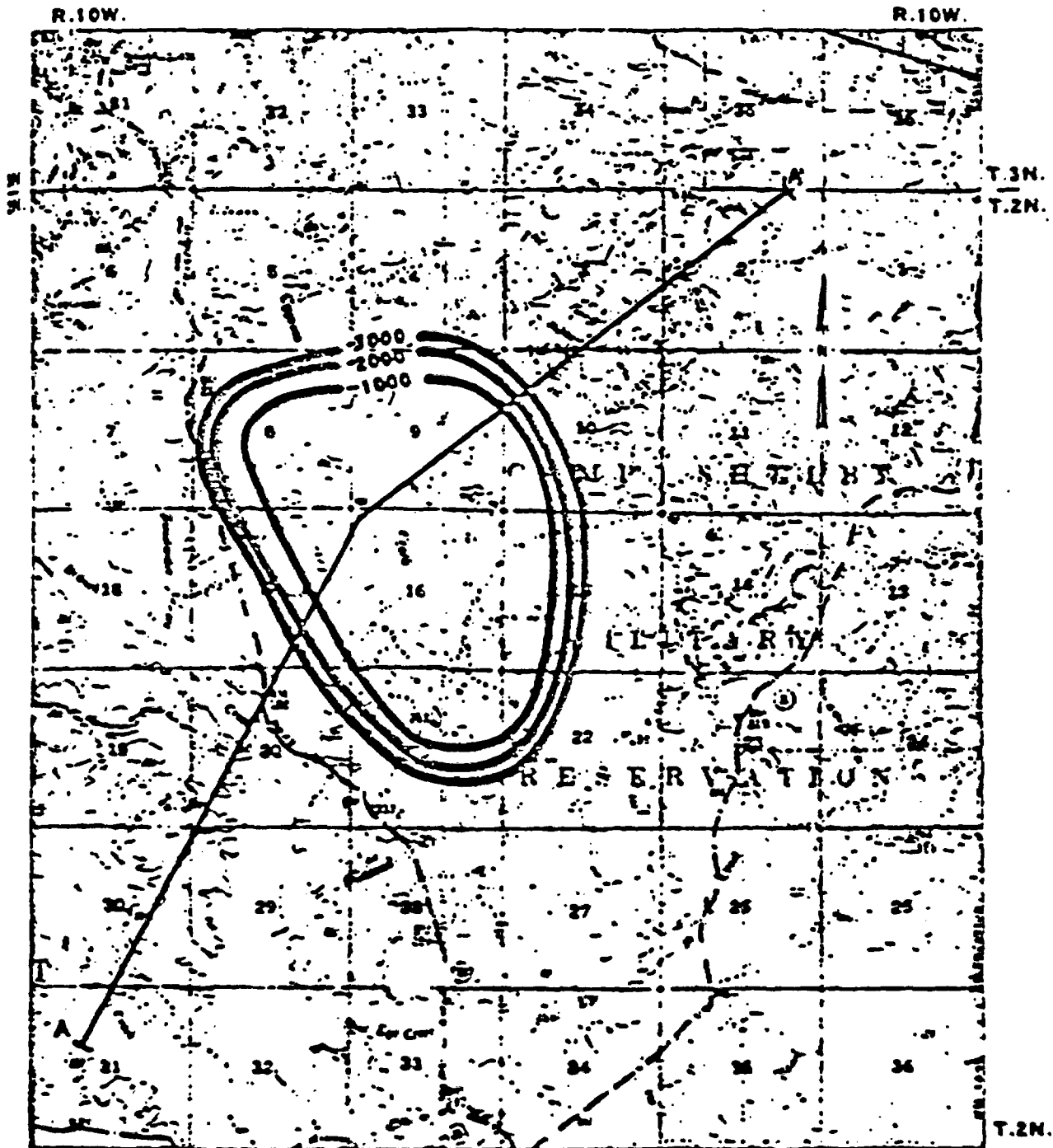
ACCOMPLISHMENTS

Geologic Exploration: Salt-Domes (Continued)

1979

- **20-COUNTY REGIONAL GROUNDWATER MAP PREPARED: EAST TEXAS**
- **GRAVITY MODEL COMPLETED AT KEECHI AND OAKWOOD DOMES, EAST TEXAS, AND PARTIALLY COMPLETED AT CYPRESS CREEK AND LAMPTON DOMES, MISSISSIPPI**
- **11 GEOLOGIC CROSS-SECTIONS COMPLETED ACROSS EAST TEXAS BASIN**
- **2,646 WELLS PLOTTED ON 1:250,000 SCALE MAP FOR EAST TEXAS REGIONAL STUDIES**
- **GROUNDWATER MODEL CONSTRUCTED FOR OAKWOOD DOME VICINITY**
- **8 TILTMETERS INSTALLED AND OPERATING AT VACHERIE DOME, LOUISIANA**
- **ELECTRICAL RESISTIVITY WORK STARTED AT VACHERIE DOME**
- **DRILLING IN PROGRESS AT CYPRESS CREEK DOME, MISSISSIPPI – FIRST DEEP STRATIGRAPHIC TEST-HOLE COMPLETED 4/5/79: 3006 FT**

CYPRESS CREEK DOME LOCATION MAP



SCALE IN MILES

4-79

LEGEND



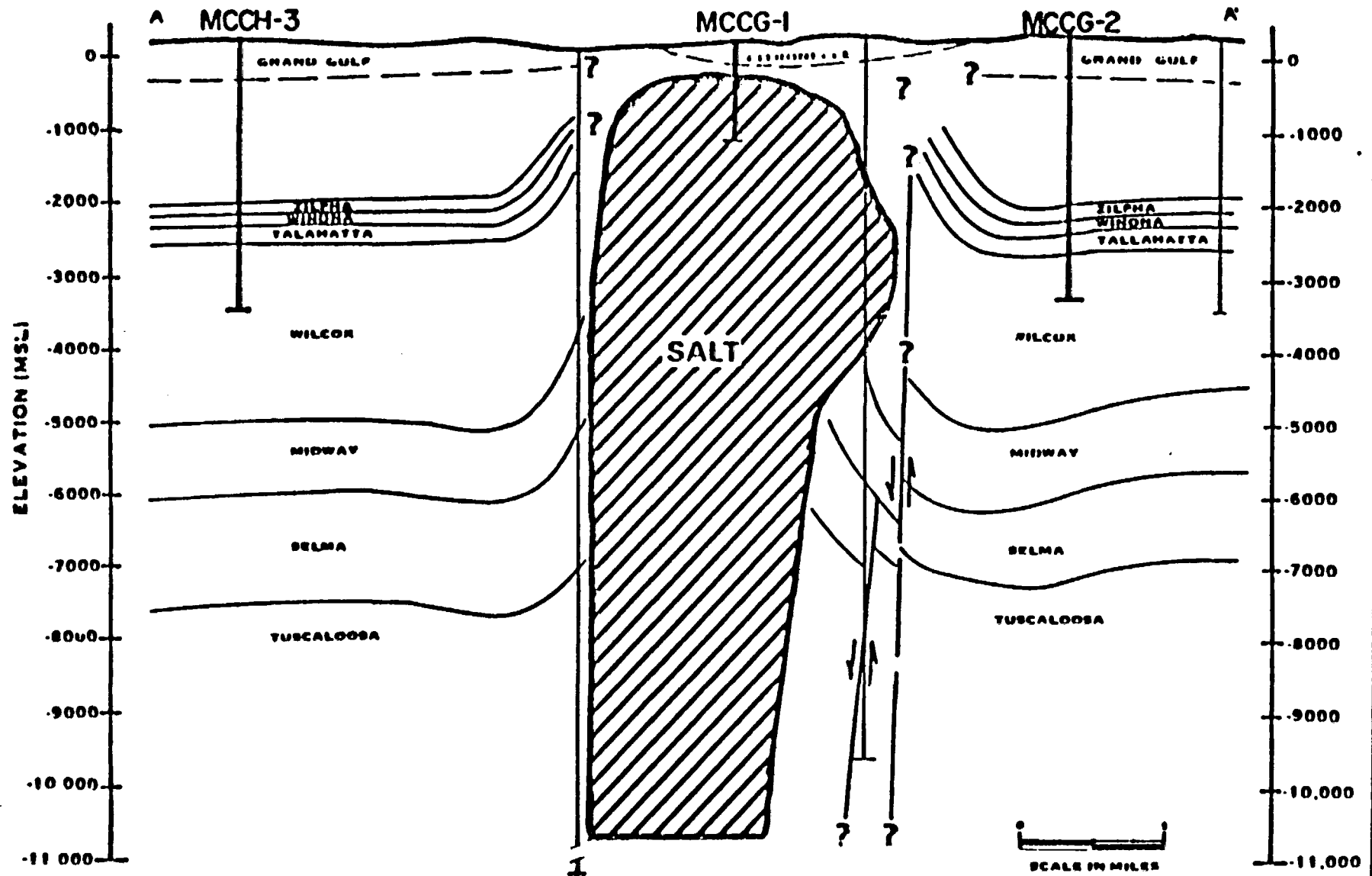
SALT STRUCTURAL CONTOURS



CROSS SECTION LOCATION

ON/WI
Oil and Natural Gas Institute
 Battelle

CYPRESS CREEK SALT DOME






GEOLOGIC CROSS-SECTION

PRELIMINARY ASSESSMENT GEOLOGIC FACTORS GULF COAST SALT-DOME PROJECT

FAVORABLE FEATURES		SALT DOMES						
		MISS.			LA.		E. TEX	
		RICHTON	CYPRESS CREEK	LAMPTON	VACHERIE	RAYBURNS	OAKWOOD	PALESTINE
SIZE	EXCESSIVELY LARGE	YES	YES					
	LARGE ENOUGH			YES	YES	YES	YES	YES
MULTIPLE BARRIERS	CAPROCK PRESENT ON TOP	YES		YES	YES	YES	YES	YES
	CAPROCK PRESENT ON FLANK	YES	?	YES	YES	?	YES	?
	POSSIBLE SHALE/CLAY "SHEATH" OVER OR AROUND DOME			?			?	
	POSSIBLE AQUICLUDE(S) OVER DOME	?	YES	YES	YES	?	YES	YES
	POSSIBLE AQUITARD(S) OVER DOME							

KEY:

-  NOT APPLICABLE
-  INCONCLUSIVE EVIDENCE
-  NOT STUDIED TO DATE

PRELIMINARY ASSESSMENT GEOLOGIC FACTORS GULF COAST SALT-DOME PROJECT

	FAVORABLE FEATURES	SALT DOMES							
		MISS.				LA.		E. TEX.	
		RICHTON	CYPRESS CREEK	LAMPTON	VACHERIE	RAYBURNS	OAKWOOD	PALESTINE	KEECHI
SEISMIC AND TECTONIC STABILITY	QUATERNARY TERRACES NOT OFFSET OR UNWARPED				NO	?	NO	NO	NO
	GROWTH-RATE HISTORY DETERMINED				YES	YES			
	PREDICTED SEISMIC RISK <3.0	YES	YES	YES	YES	YES	YES	YES	YES
HYDROLOGIC STABILITY	DOME TOP BELOW OR NEAR BASE OF FRESH GROUNDWATER			?	?		NO	YES	YES
MULTIPLE USAGE	NO CURRENT SIGNIFICANT INDUSTRIAL USE	YES	YES	YES	YES	YES	YES	YES	YES
	NO CURRENT SIGNIFICANT HYDROCARBON PRODUCTION	YES	YES	YES	YES	YES	YES	YES	YES
REPOSITORY ROCK	EXTREMELY LOW WATER CONTENT				YES	YES			

KEY:

- ☐ ? INCONCLUSIVE EVIDENCE
☐ NOT STUDIED TO DATE

PRELIMINARY ASSESSMENT GEOLOGIC FACTORS GULF COAST SALT-DOME PROJECT

SALT DOMES								QUESTIONABLE FEATURES
MISS.				LA.		E. TEX.		
RICHTON	CYPRESS CREEK	LAMPTON	VACHERIE	RAYBURNS	OAKWOOD	PALESTINE	KEECHI	
		NO	NO	?		?	NO	
		NO	?	NO	?		?	POSSIBLE HYDROLOGIC INSTABILITY
		NO	?	NO	?		?	ANOMALOUS SALINITY DISTRIBUTIONS IN TERTIARY AQUIFERS
NO	NO	NQ	NO	NO	NO	YES	NO	LAKE OVER DOME
								REGIONAL, TECTONIC FAULTS WITHIN 3 MILES
NO	YES	NO	NO	NO	YES	NO	NO	CURRENT PETROLEUM PRODUCTION WITHIN 2.5 MI. RADIUS OF DOME CENTER

HYDROLOGIC
TECTONIC
RESOURCE CONFLICT

HYDROLOGIC

TECTONIC

RESOURCE
CONFLICT

KEY:

- ☐ ? INCONCLUSIVE EVIDENCE
☐ NOT STUDIED TO DATE

GEOLOGIC EXPLORATION FUTURE PLANS

Gulf Coast Salt-Domes

1979

MISSISSIPPI

- **DRILL CORE-HOLES AT 3 DOMES**
- **DRILL NEAR-DOME GEOLOGIC TEST HOLES**
- **DRILL SHALLOW TEST-HOLES OVER 3 DOMES**
- **BEGIN DOME-STABILITY RESEARCH**
- **BEGIN AREA CHARACTERIZATION STUDIES**

EAST TEXAS

- **DRILL CORE-HOLES AT 2 DOMES**
- **DRILL NEAR-DOME GEOLOGIC TEST HOLES**
- **DRILL SHALLOW TEST-HOLES OVER 3 DOMES**

LOUISIANA

- **INSTALL MICROSEISMIC RECORDING EQUIPMENT**
- **DRILL NEAR-DOME GEOLOGIC TEST HOLES**
- **COMPLETE PETROGRAPHIC DESCRIPTION OF
VACHERIE DOME CORE**

HYDROLOGIC EXPLORATION FUTURE PLANS

Gulf Coast Salt-Domes

1979

MISSISSIPPI

- **DRILL REGIONAL HYDROLOGIC BOREHOLES**
- **RUN PUMPING TESTS**
- **COLLECT WATER SAMPLES**

EAST TEXAS

- **DRILL REGIONAL HYDROLOGIC BOREHOLES**
- **RUN PUMPING TESTS**
- **COLLECT WATER SAMPLES**

LOUISIANA

- **DRILL REGIONAL HYDROLOGIC BOREHOLES**
- **RUN PUMPING TESTS**
- **COLLECT WATER SAMPLES**

GEOPHYSICAL EXPLORATION FUTURE PLANS

Gulf Coast Salt-Domes

1979

MISSISSIPPI

- **CONDUCT HIGH-RESOLUTION SEISMIC REFLECTION SURVEY – SIX 2-MILE LINES: 3 DOMES**
- **RUN GEOPHYSICAL SUITE OF LOGS IN DRILL-HOLES**
- **COMPLETE GRAVITY SURVEYS OVER 3 DOMES**

EAST TEXAS

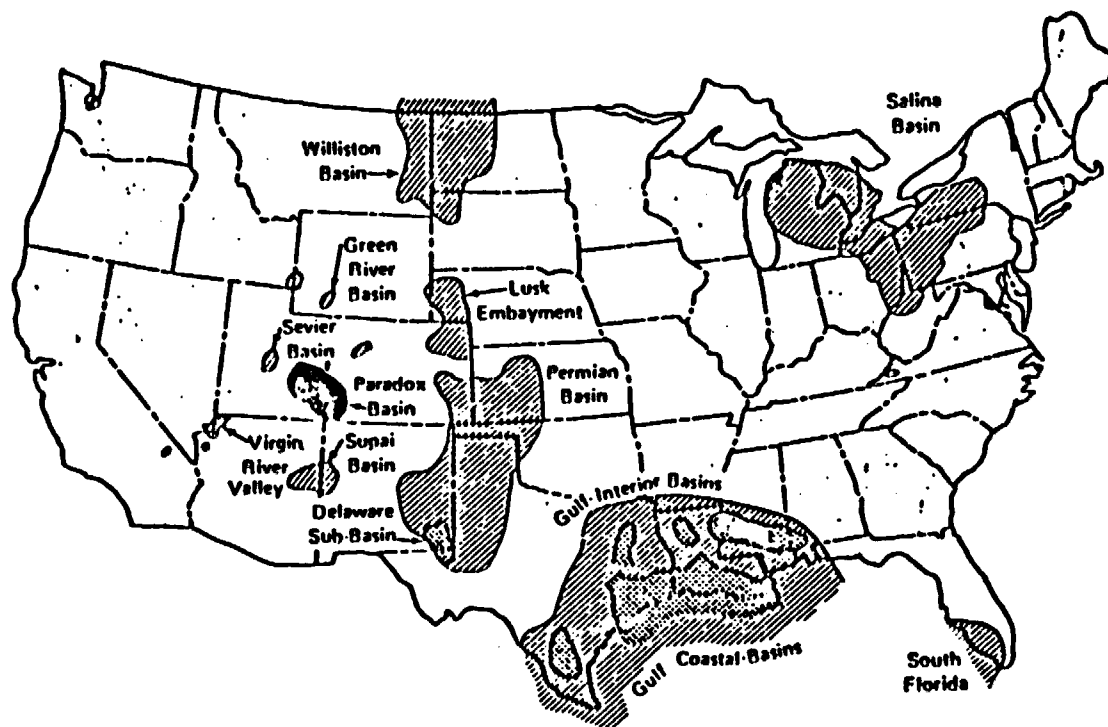
- **CONDUCT HIGH-RESOLUTION SEISMIC REFLECTION SURVEY – FOUR 2-MILE LINES: 2 DOMES**
- **RUN GEOPHYSICAL SUITE OF LOGS IN DRILL-HOLES**

LOUISIANA

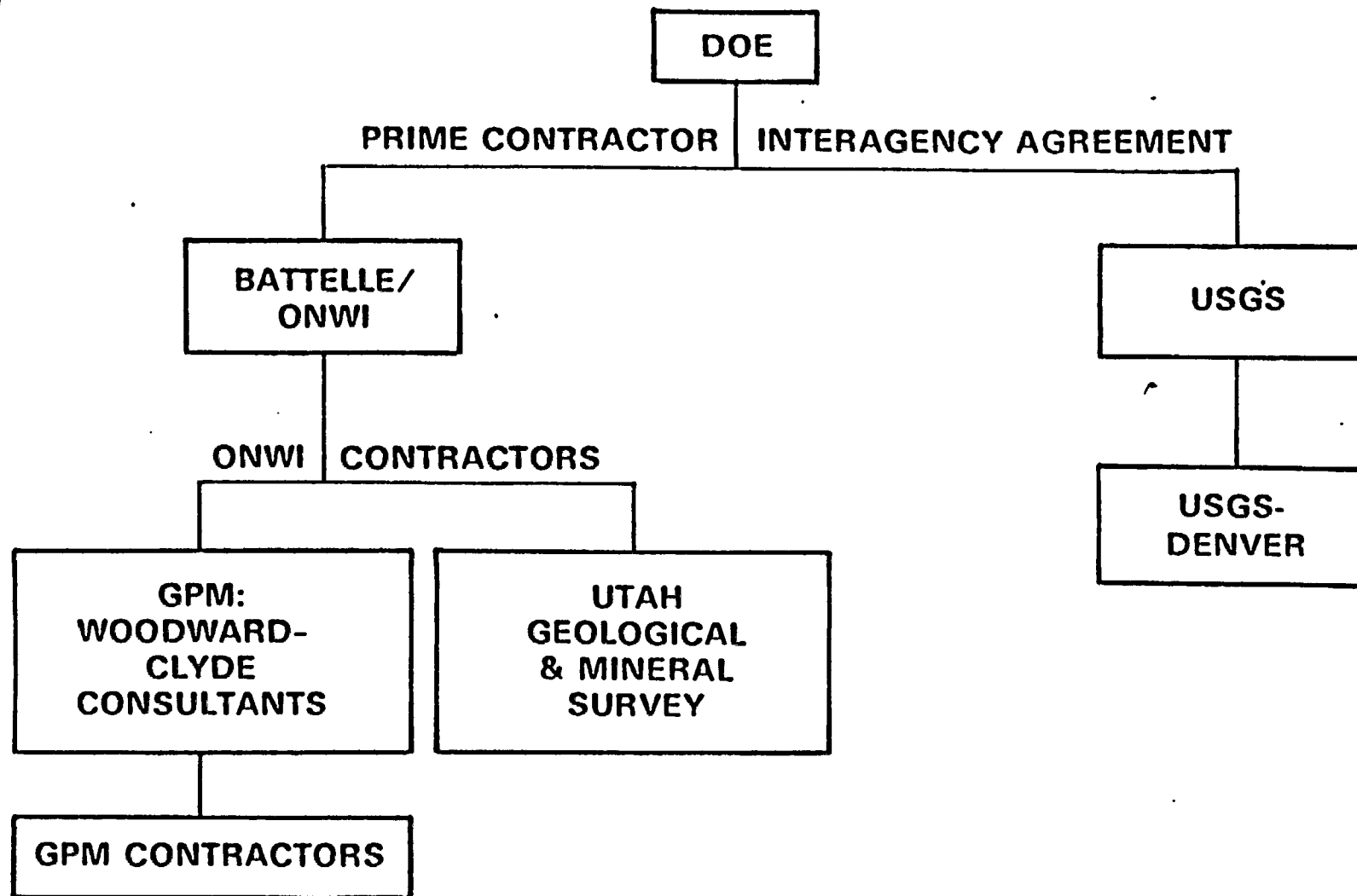
- **CONDUCT HIGH-RESOLUTION SEISMIC REFLECTION SURVEY – SIX 2-MILE LINES: 2 DOMES**
- **RUN GEOPHYSICAL SUITE OF LOGS IN DRILL-HOLES**
- **CONDUCT GRAVITY SURVEY AT 2 DOMES**
- **COMPLETE SHALLOW ELECTRICAL RESISTIVITY SURVEY, 2 DOMES**

GEOLOGICAL INVESTIGATIONS
PARADOX BASIN
UTAH AND COLORADO

N. A. FRAZIER



LOCATION OF PARADOX BASIN



**GEOLOGICAL PARTICIPANTS
PARADOX BASIN**

4/79

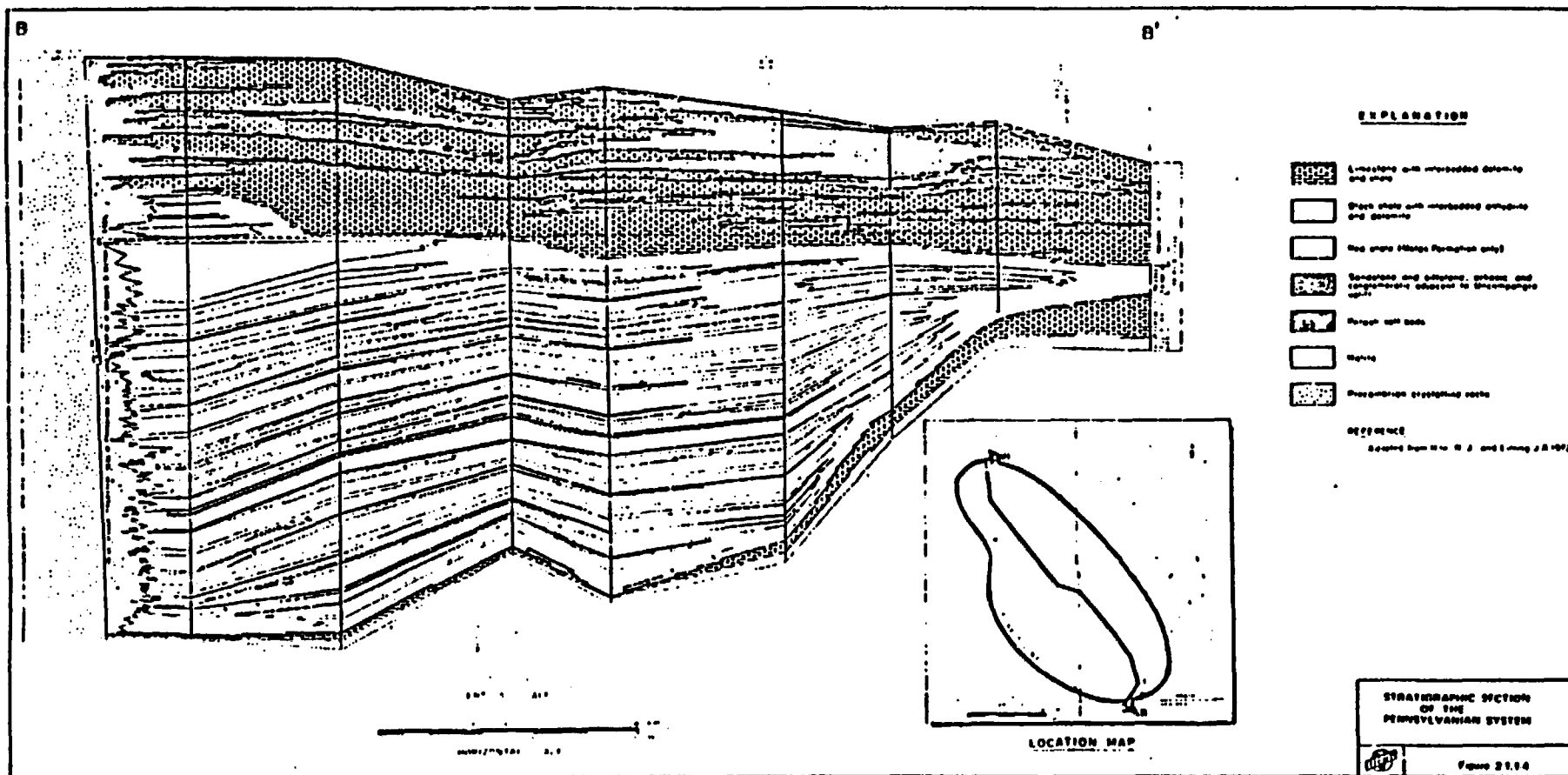


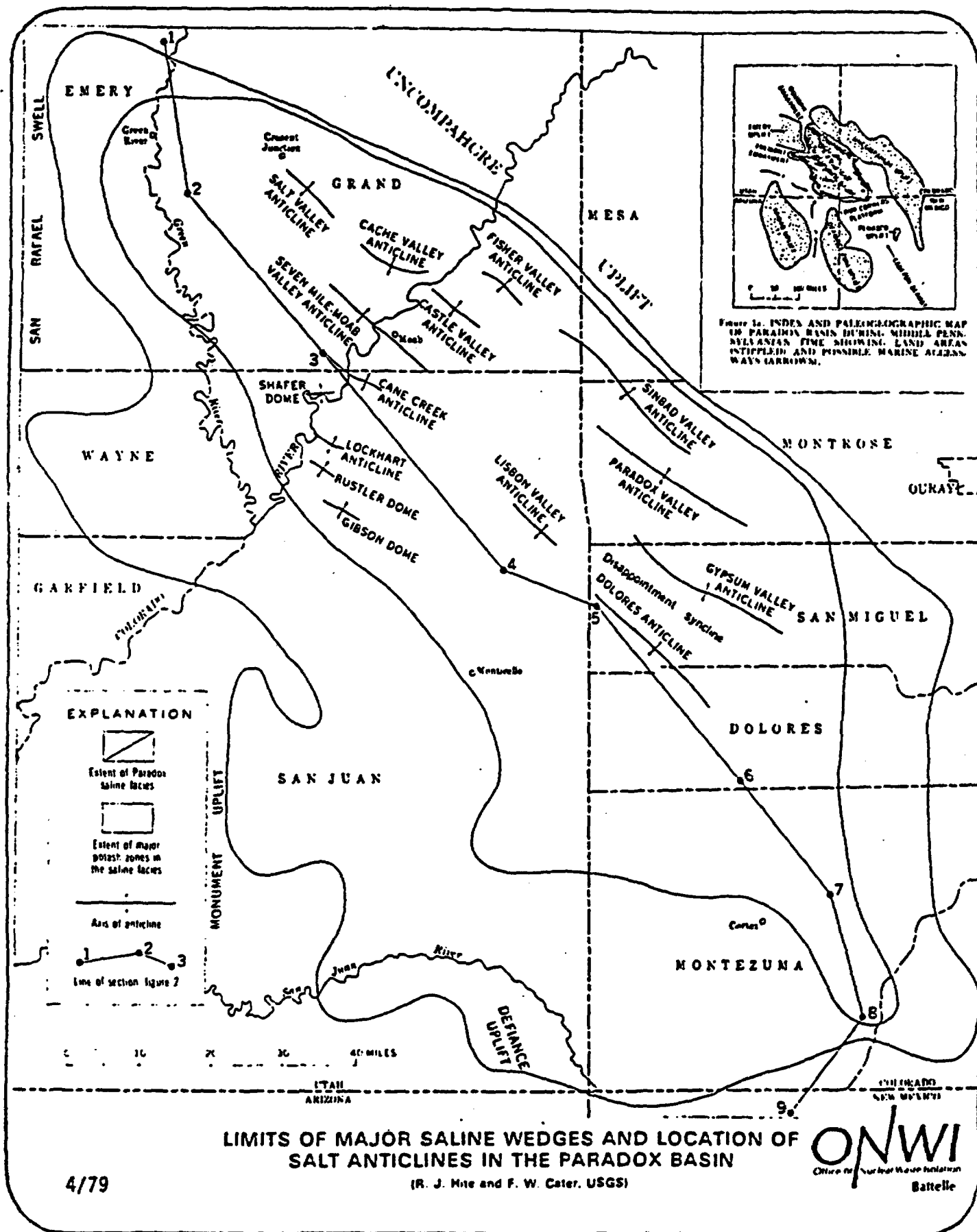
ERAS	PERIODS	EPOCHS	MILLIONS OF YEARS	
			DURATION	BEFORE THE PRESENT
CENOZOIC	Quaternary	Pleistocene	1,000,000	1,000,000
		Pliocene	42,000,000	
		Miocene	22,000,000	
		Oligocene	14,000,000	
		Eocene	22,000,000	
MESOZOIC		Paleocene	5,000,000	63,000,000
	Cretaceous		72,000,000	
	Jurassic	Late Early	46,000,000	
	Triassic		48,000,000	
				230,000,000
	Permian		50,000,000	
	Pennsylvanian		30,000,000	
	Mississippian		35,000,000	
	Devonian	Late Early	60,000,000	
	Silurian		20,000,000	
PALEOZOIC	Ordovician		75,000,000	
	Cambrian		100,000,000	
				600,000,000

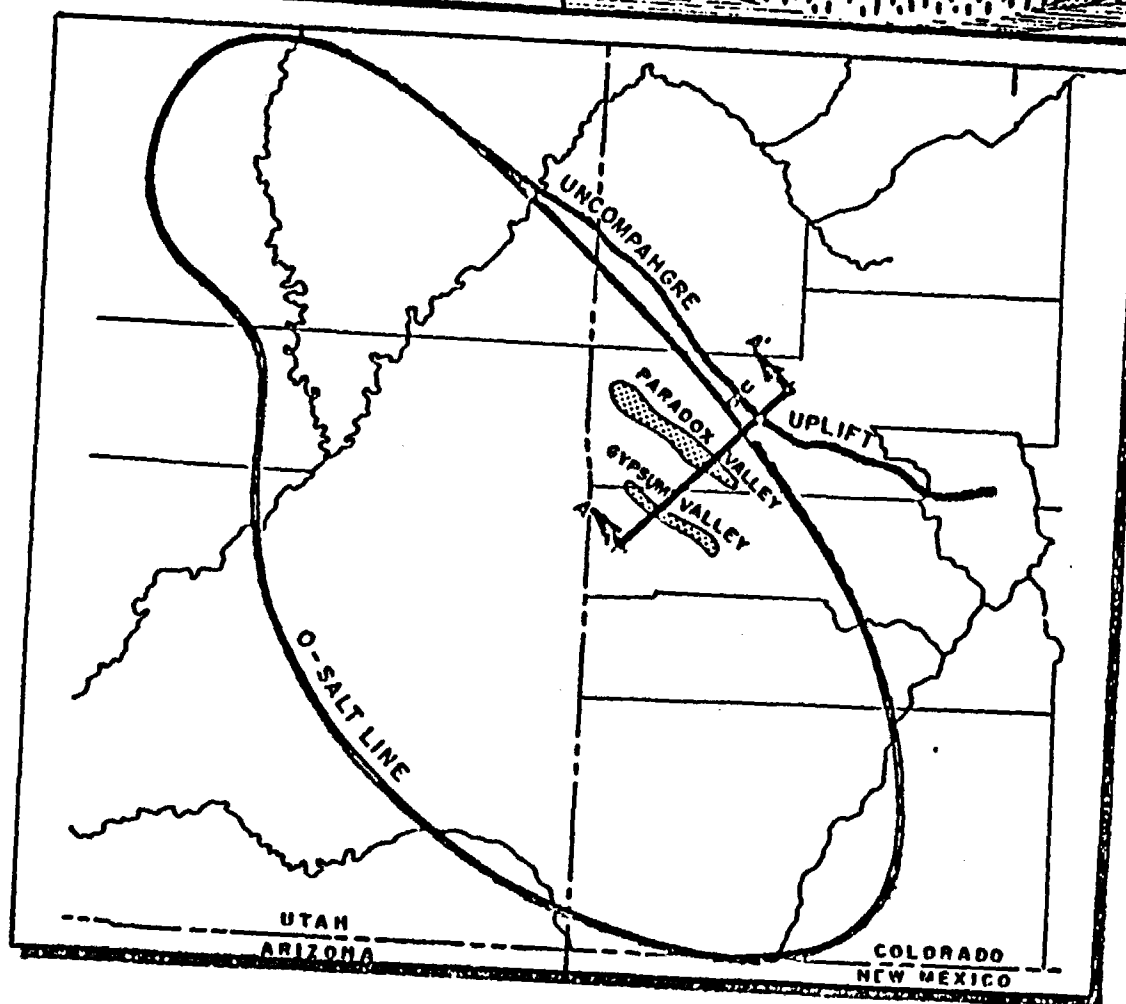
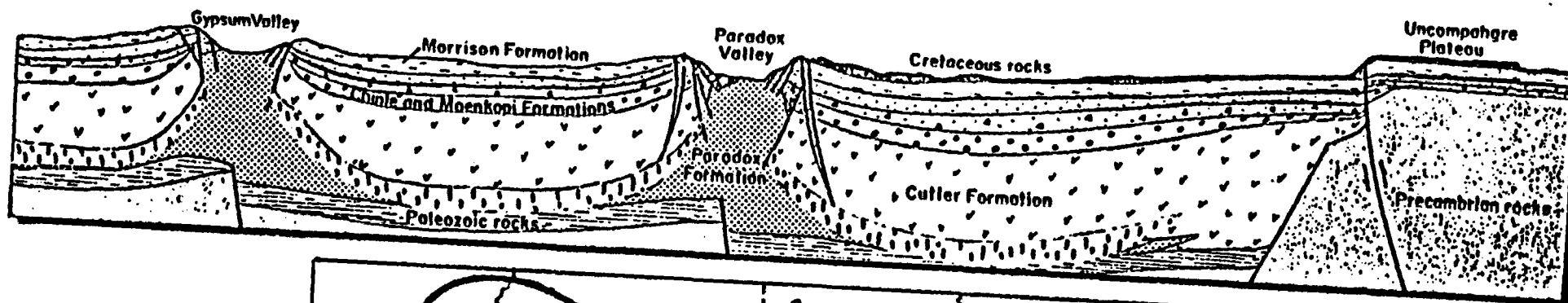


Precambrian time
 Late
 Early

AGE OF PARADOX BASIN SALT





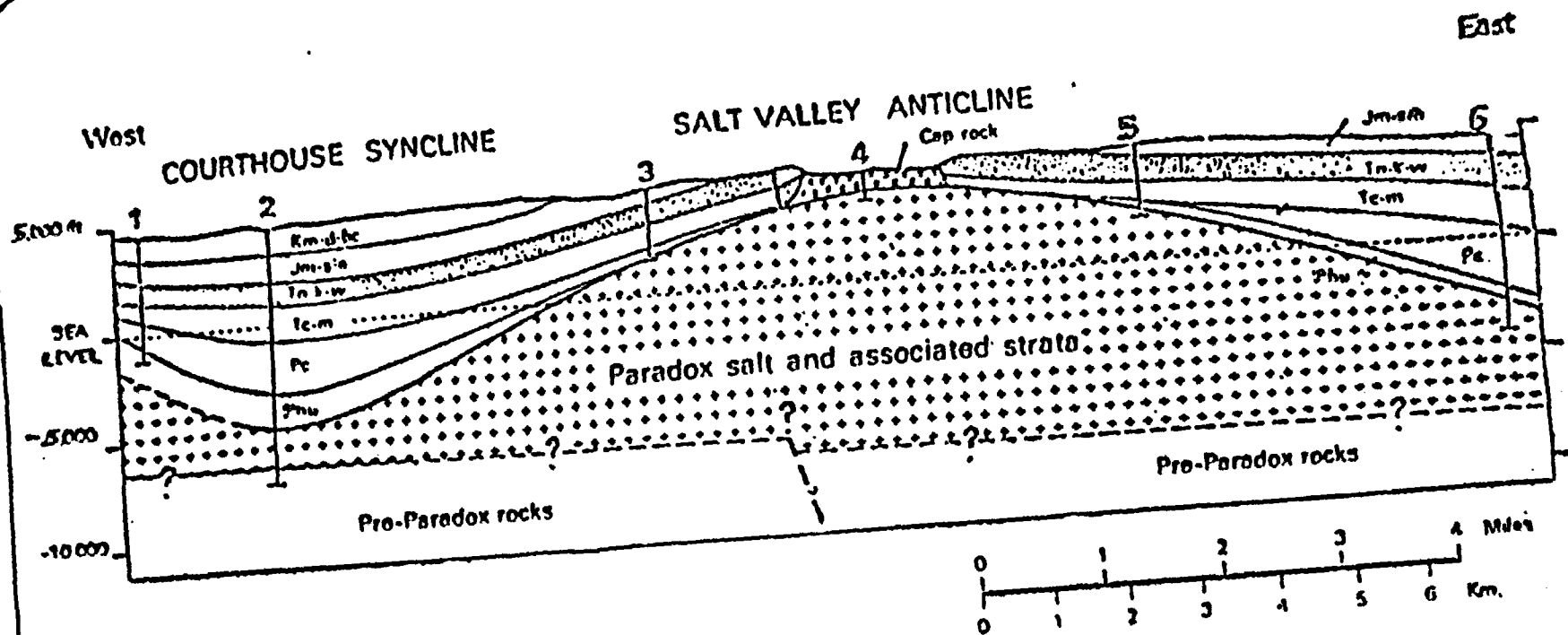


0 20 40 60 80 KM
0 10 20 30 40 50 MI

Modified from
Cater, 1970

ONWI
Office of Nuclear Waste Isolation
Battelle

4/79



WELLS USED IN SECTION

1. Equity, Donahue No. 1
2. Texaco, McKinnon No. 1
3. Continental, Gov't.—Hall No. 1
4. Western Allies
5. Purn, Salt Valley No. 1
6. Union, Devils Garden—USA No. 1

Km-d-bc	Mancos-Dakota-Duro Canyon
Jm-s-o	Morrison-Summerville-Entrada
Tn-k-w	Navajo-Kayenta-Wingate
Tc-m	Chinle-Moenkopi
Pc	Cutler
Phu	Hermosa (Upper Member)

CROSS SECTION THROUGH SALT VALLEY ANTICLINE
(Modified from Hite and Lohman, 1973)

ONWI
Oil and Natural Gas
Battelle

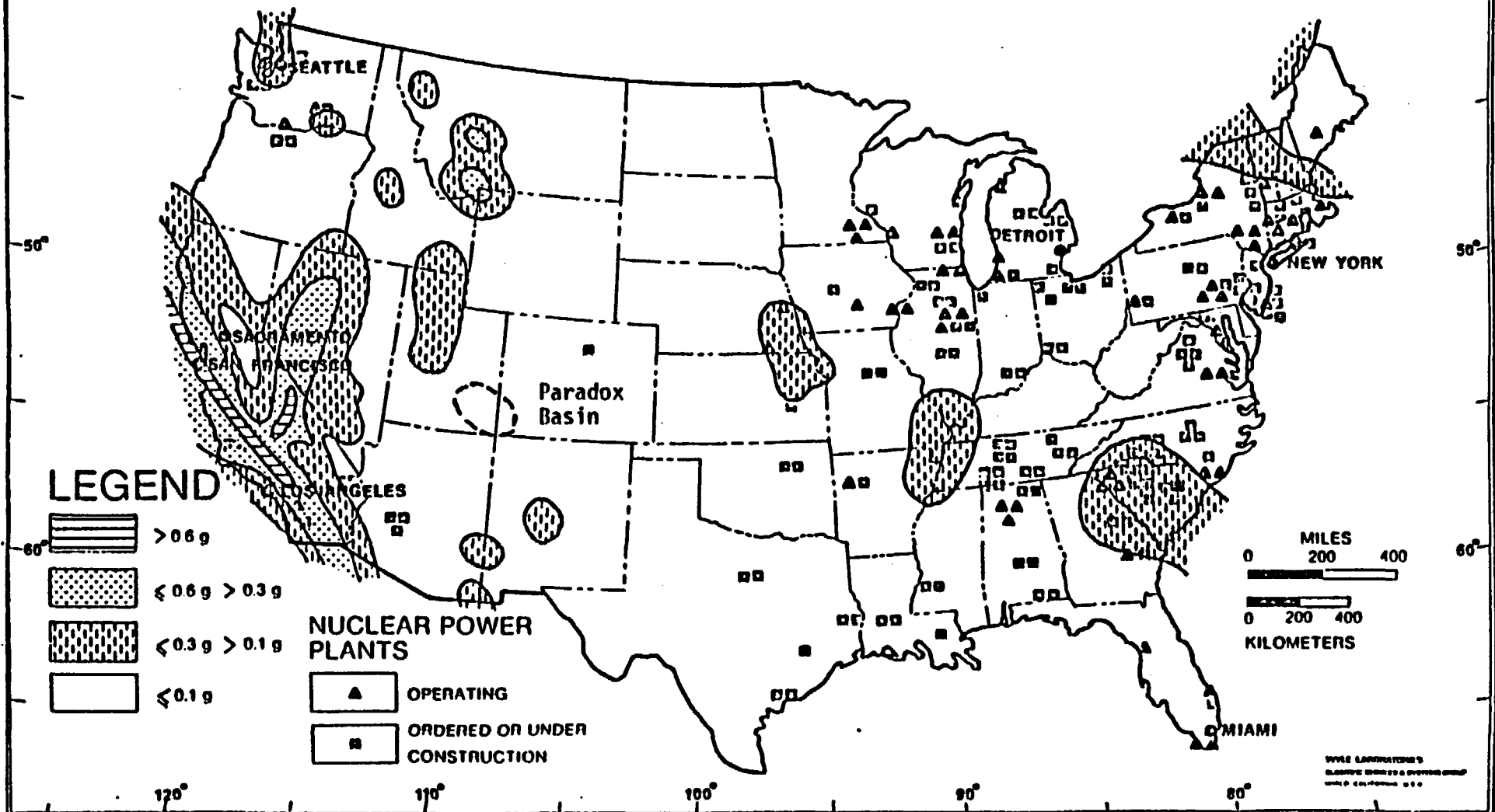
4/79

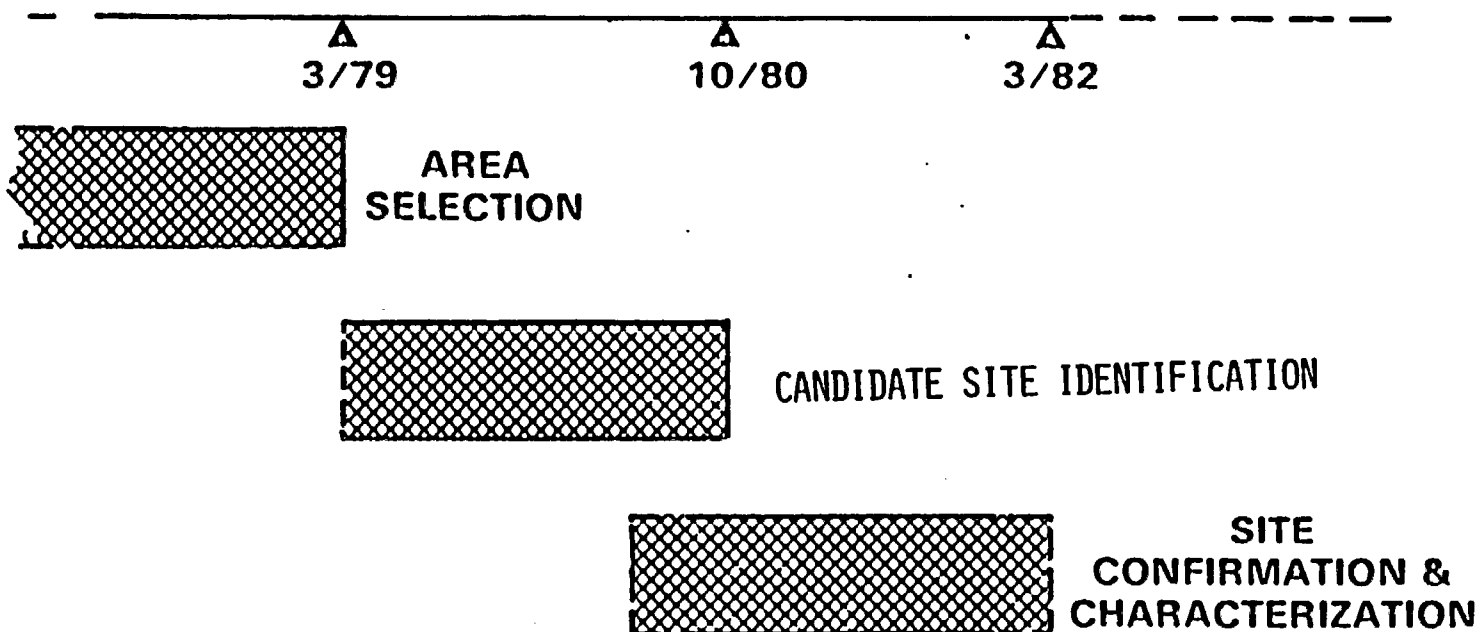
U.S. SEISMIC ZONE MAP

ONWI
Oilfield Nuclear Waste Inc.
 Battelle

SEISMIC DATA ADAPTED FROM: EERI, JULY 1976, VOL. 10, NO. 4,
 ALGERMISSEN & PERKINS, U.S.G.S., PG. 78.

40° NUCLEAR POWER PLANT DATA FROM: NUCLEAR NEWS INDUSTRY
REPORT 1977-78 A REPRINT, LA GRANGE PARK, ILL. 1978



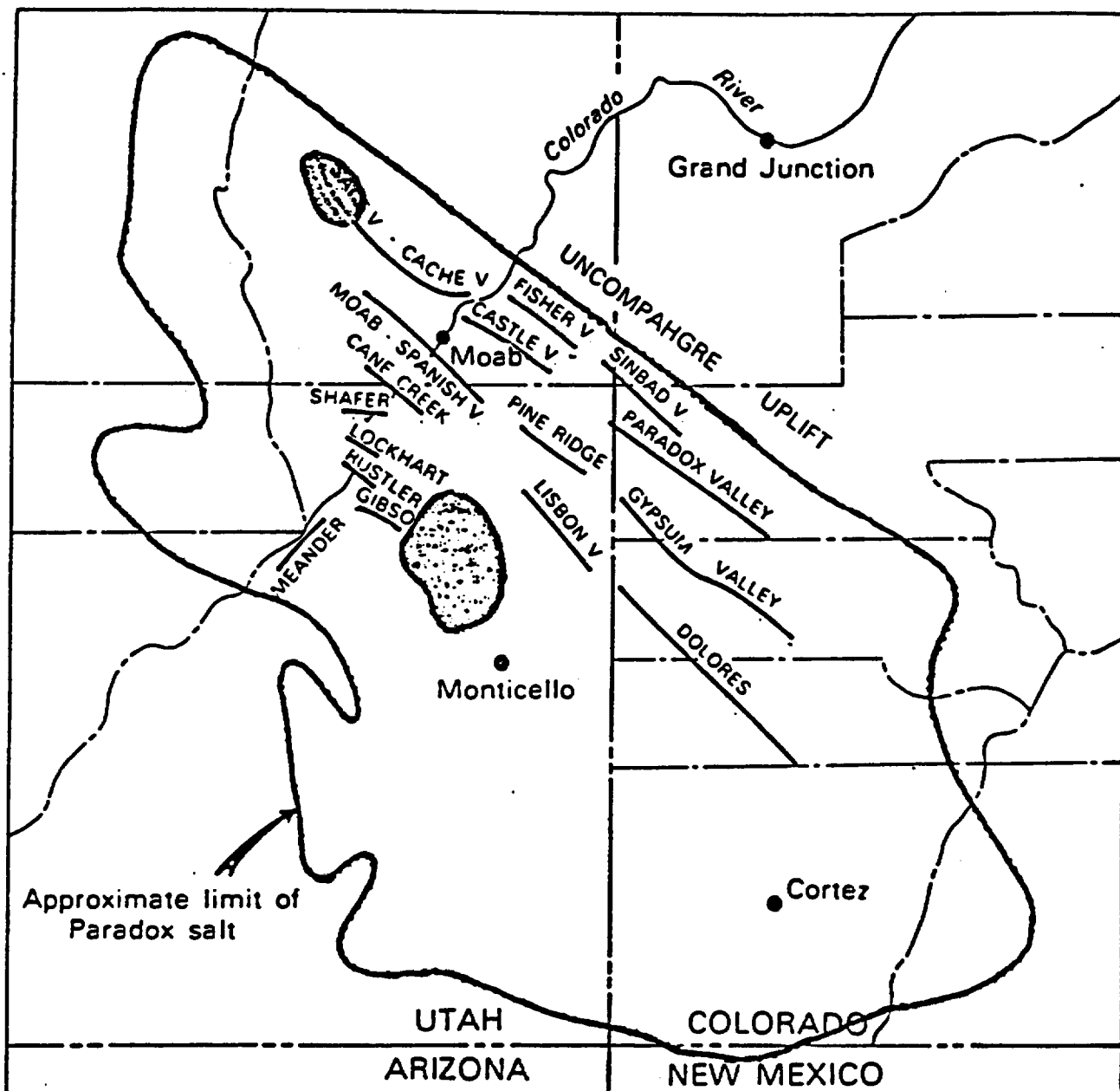


**GEOLOGIC MILESTONE PLAN
PARADOX BASIN**

4/79

STATUS AND ACCOMPLISHMENTS—PARADOX BASIN

- **GEOLOGIC APPRAISAL PARADOX BASIN SALT**
- **3-HOLE DRILLING/TESTING PROGRAM
SALT VALLEY, UTAH**
- **VERTICAL SEISMIC PROFILING EXPERIMENT
SALT VALLEY, UTAH**
- **SALT VALLEY COMPLETION REPORT**
- **GEOLOGIC EXPLORATION WORK PLAN**
- **REGIONAL GEOLOGY**
- **REGIONAL HYDROLOGY**
- **ENERGY AND MINERAL RESOURCES**
- **REGION-TO-AREA SCREENING**
- **FUTURE WORK**



— Salt anticline or Salt dome

PROBABLE AREAS FOR GEOLOGICAL EXPLORATION—PARADOX BASIN

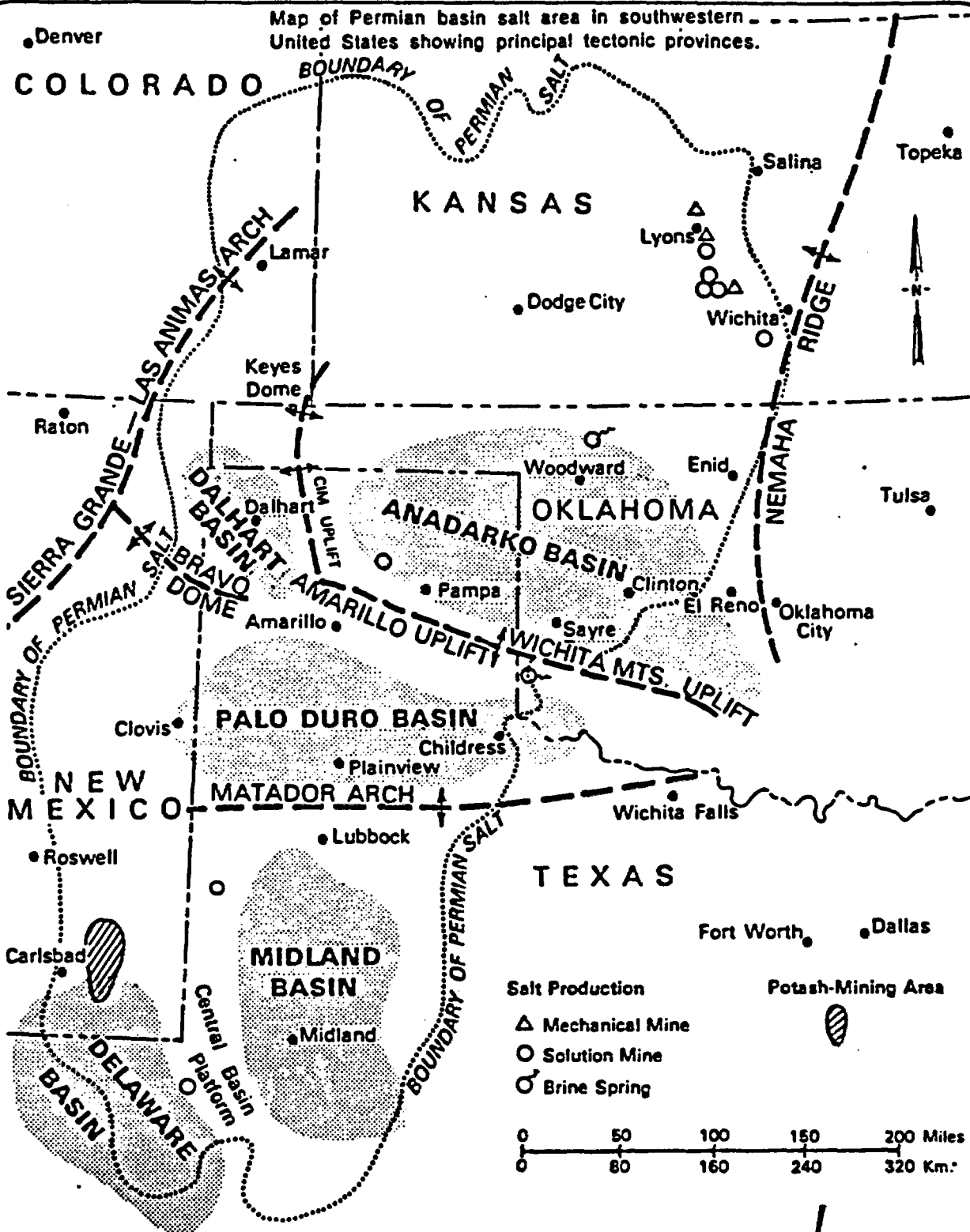
30 Miles
50 Km.

GEOLOGICAL INVESTIGATIONS

PERMIAN BASIN

TEXAS

W. E. Newcomb



CURRENT PERMIAN BASIN SCHEDULE

SITE IDENTIFICATION 3/83

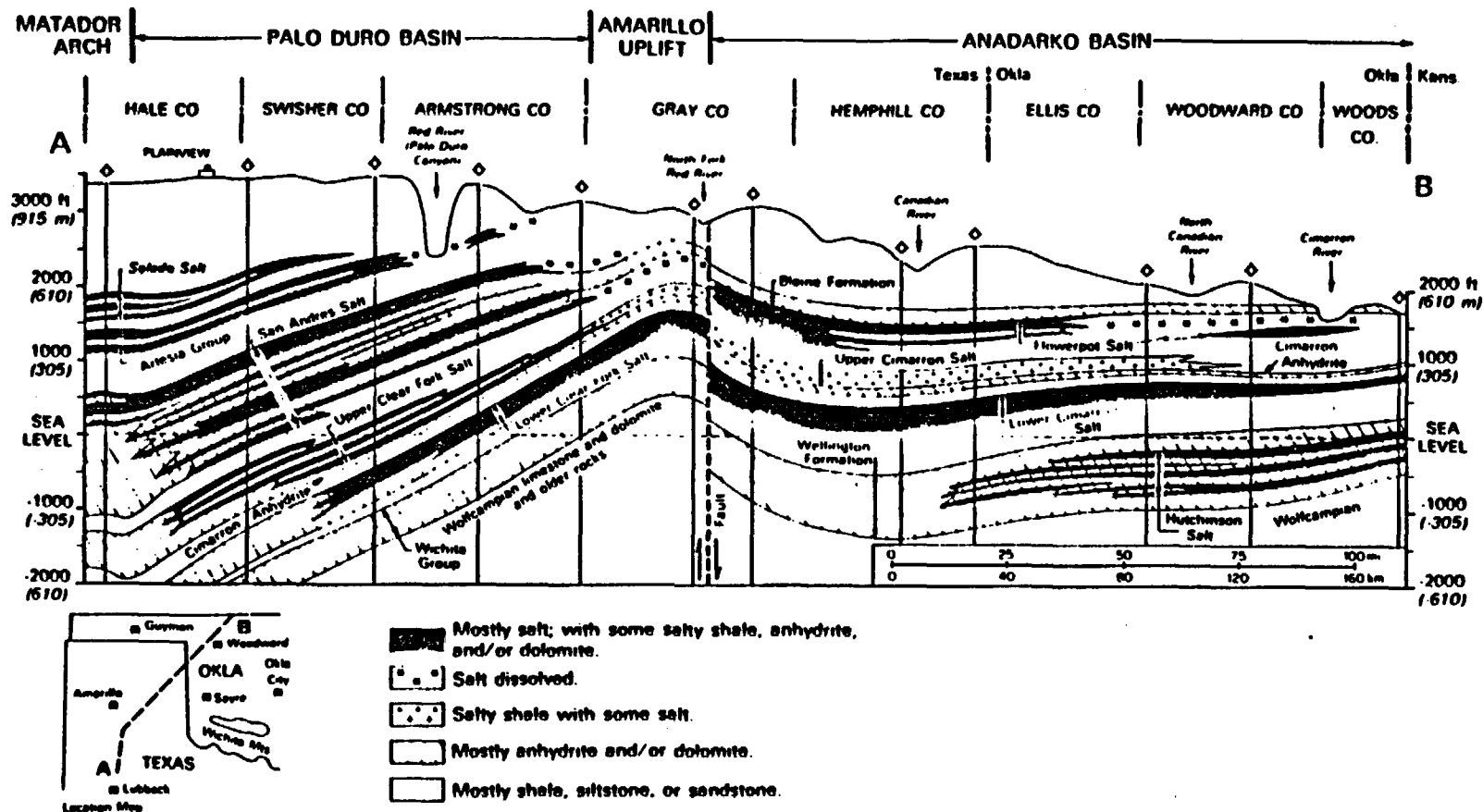
PERMIAN BASIN (BEG)

ACCOMPLISHMENTS

**COMPLETED DRILLING PROGRAM
COMPLETED DESCRIPTION OF CORES
BEGAN HYDROLOGIC CHARACTERIZATION
CONTINUED REGIONAL FIELD STUDIES**

REMAINDER OF FY 79

**COMPLETE FULL CHARACTERIZATION OF CORES
PUBLISH PENNSYLVANIA/PERMIAN STRATIGRAPHY
RECOMMENDATION OF STUDY AREAS
SELECTION OF COMMERCIAL SUBCONTRACTOR
BEGIN HYDROLOGIC DRILLING/TESTING (?)**



Generalized structural cross section showing Permian salts and associated strata in Texas Panhandle and western Oklahoma

GEOLOGICAL INVESTIGATIONS

SALINA BASIN

NEW YORK AND OHIO

W. E. Newcomb

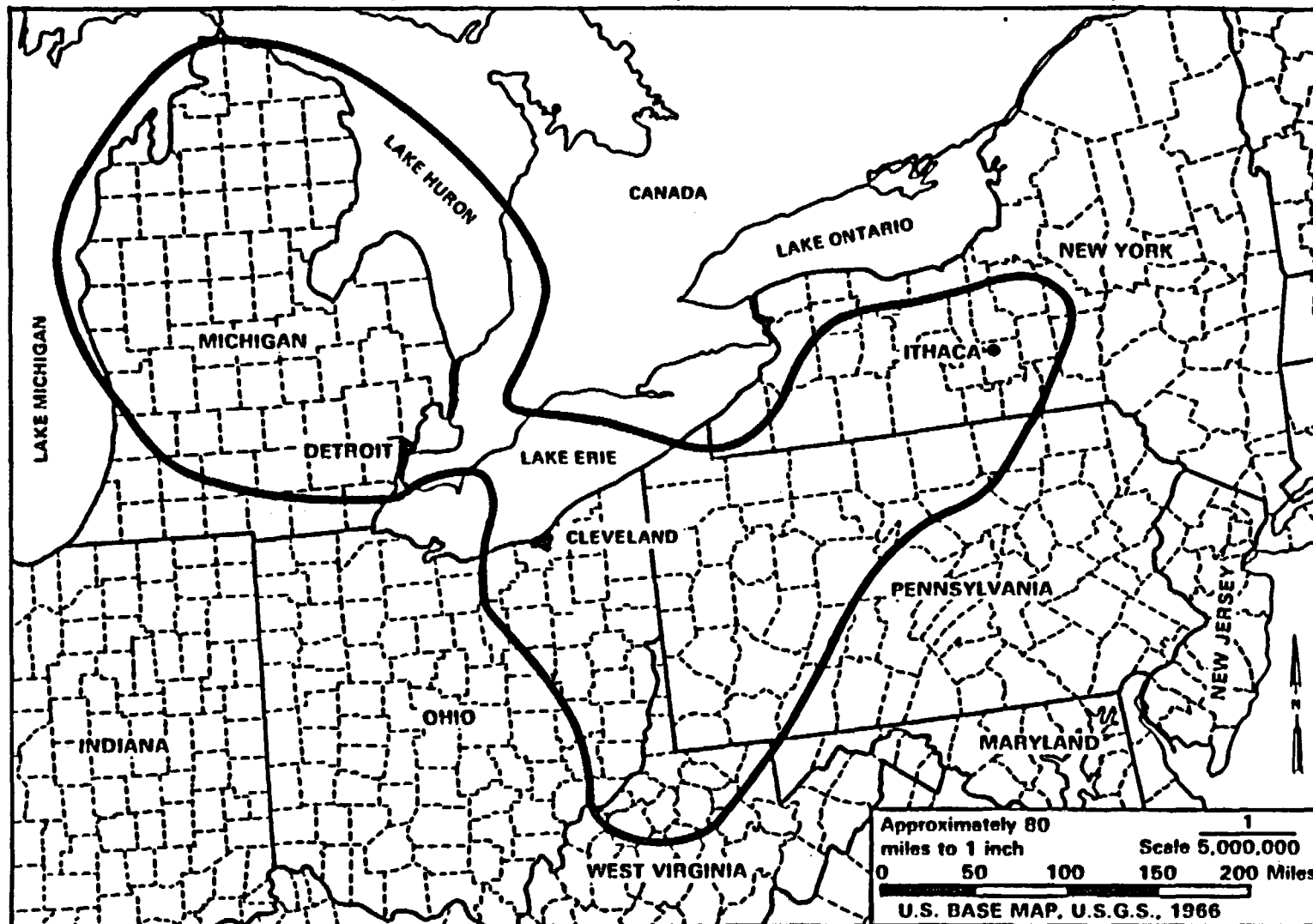
4-6-79

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Office of Nuclear Waste Isolation
Battelle

NO FIELD WORK HAS BEEN DONE IN THE SALINA BASIN.

STATE CONCURRENCE ON COURSE OF STUDIES WILL BE
SOUGHT PRIOR TO FIELD WORK.

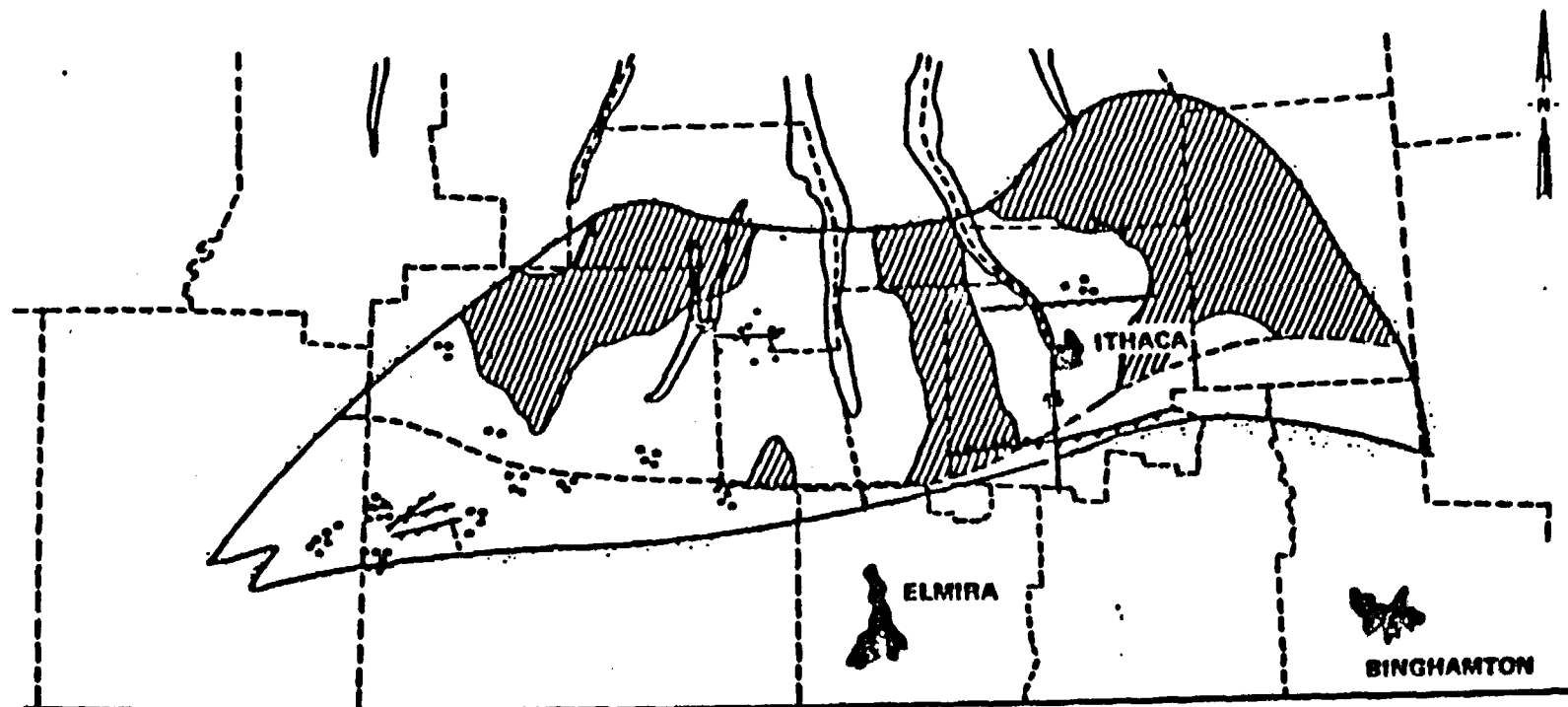
BOUNDARIES OF SALINA SALT BASIN (APPALACHIAN AND MICHIGAN BASINS)



4-6-79








ONWI
Office of Non-Point Water Pollution
Baltimore

AREAS FAVORABLE FOR FURTHER EXPLORATION IN NEW YORK STUDY AREA

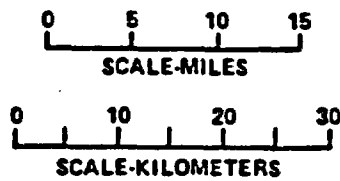
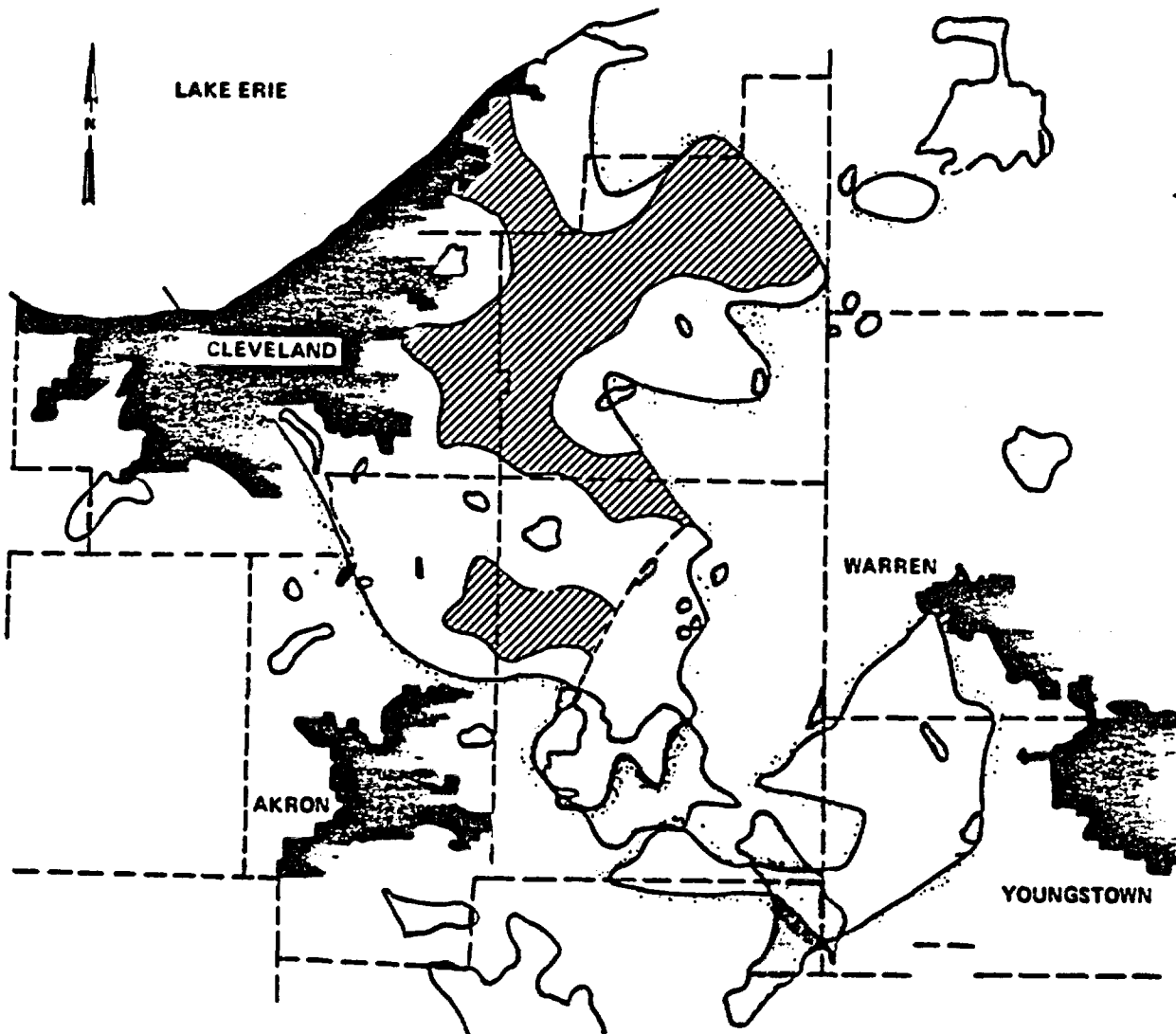


LEGEND

0 5 10 15
SCALE-MILES
0 10 20 30
SCALE-KILOMETERS

-  AREAS FAVORABLE FOR FURTHER STUDY
-  OUTLINE OF STUDY AREA
-  3000 FT DEPTH TO POSSIBLE SITING HORIZON, DEEPER ON SOUTH SIDE
-  THRUST FAULTS
-  NORMAL FAULT
-  INFERRED STRIKE-SLIP FAULTS
-  OIL AND GAS FIELDS

AREAS FAVORABLE FOR FURTHER EXPLORATION IN OHIO STUDY AREA



- LEGEND**
- 3000 FOOT DEPTH
 - BORDER OF STUDY AREA
 - ▨ AREA FAVORABLE FOR FURTHER EXPLORATION
 - OIL & GAS FIELDS - GAS STORAGE AND BRINE FIELDS

4-6-79

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Battelle

109

2 of 2

4-11-79

GEOLOGIC INVESTIGATIONS
BASALTS OF THE COLUMBIA PLATEAU

D. J. BROWN

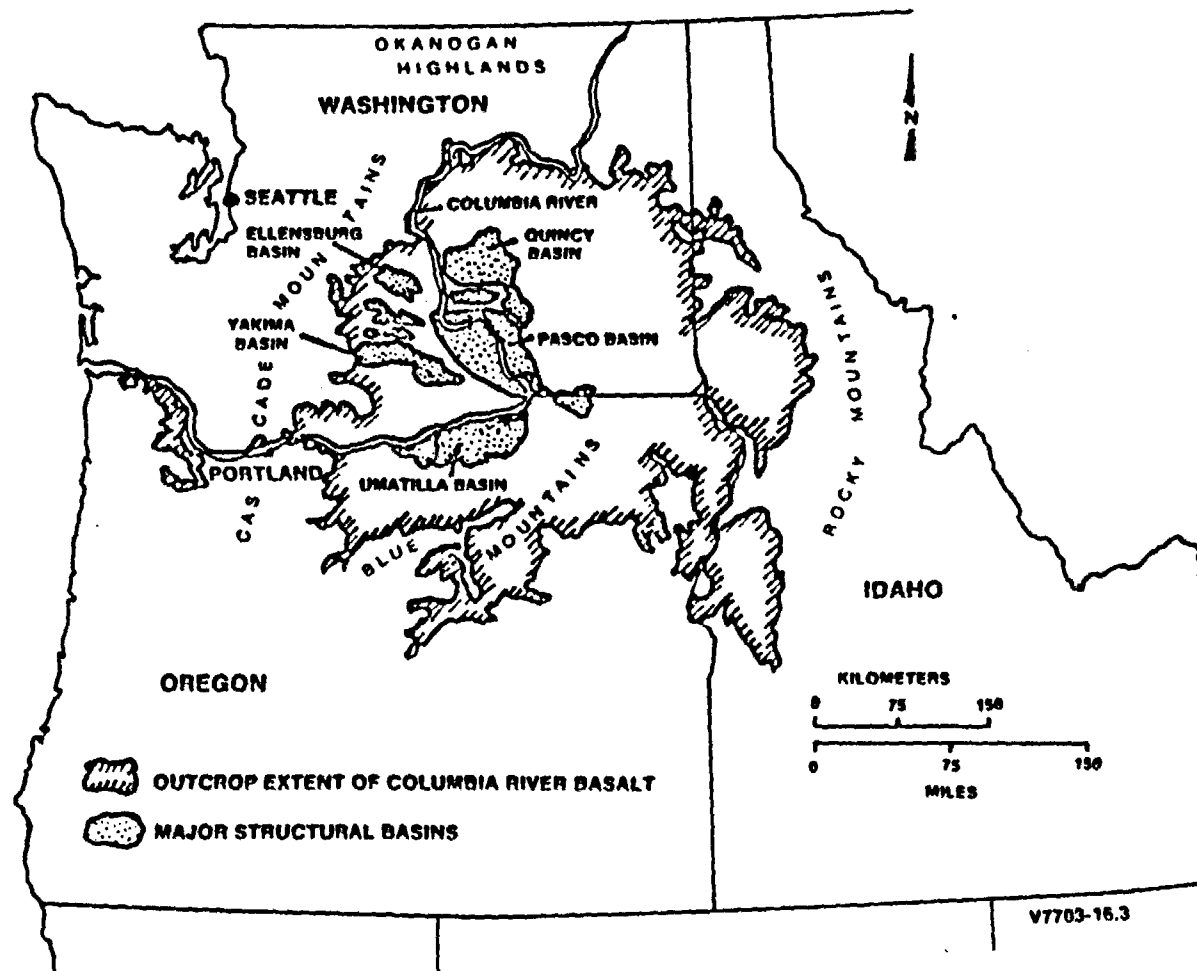
EXPLORATION ACTIVITIES

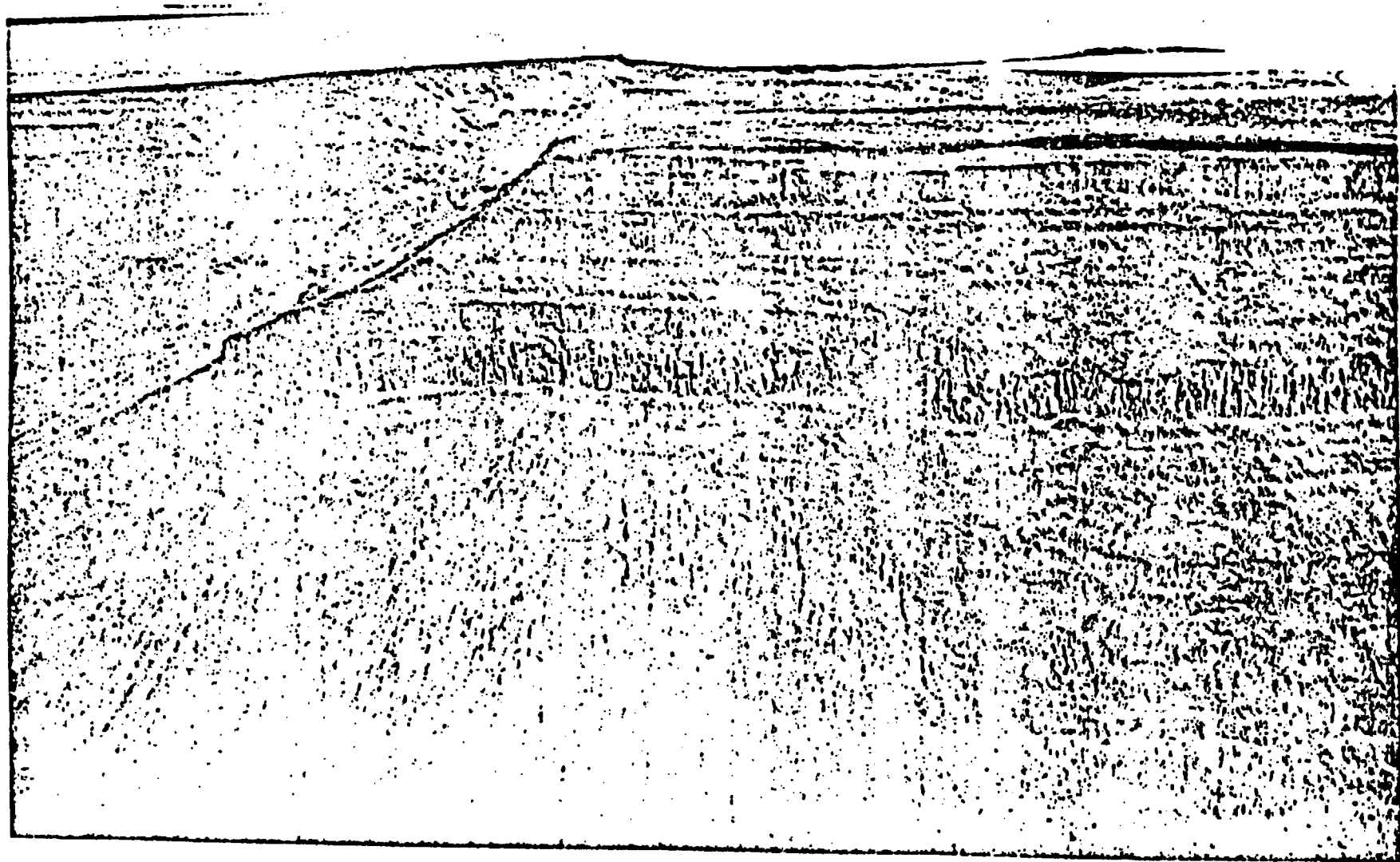
0 GEOSCIENCES

0 HYDROLOGY

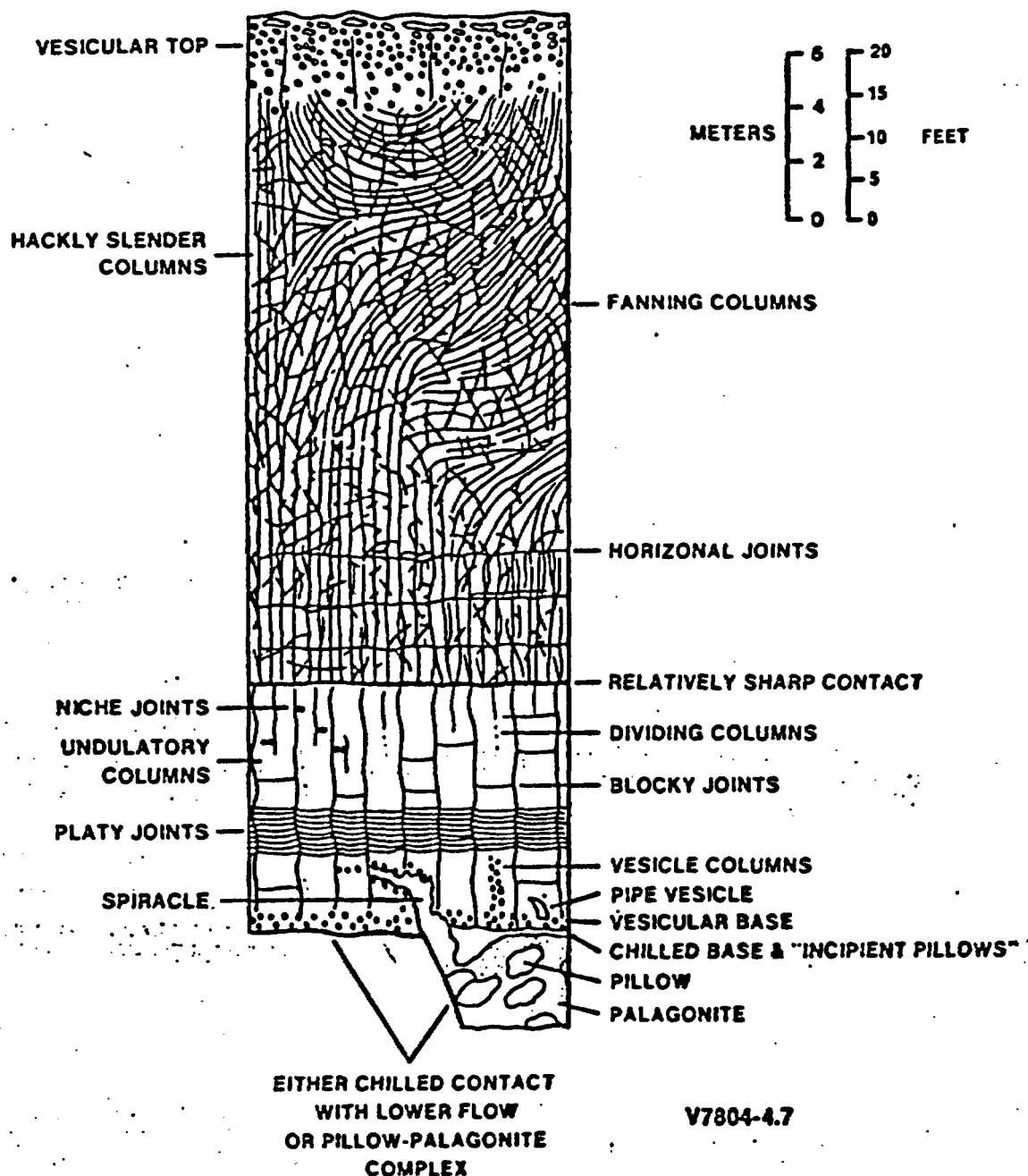
0 ENGINEERED BARRIERS

The Columbia Plateau





MAJOR INTRAFLOW STRUCTURES OF TYPICAL COLUMBIA RIVER BASALT FLOW



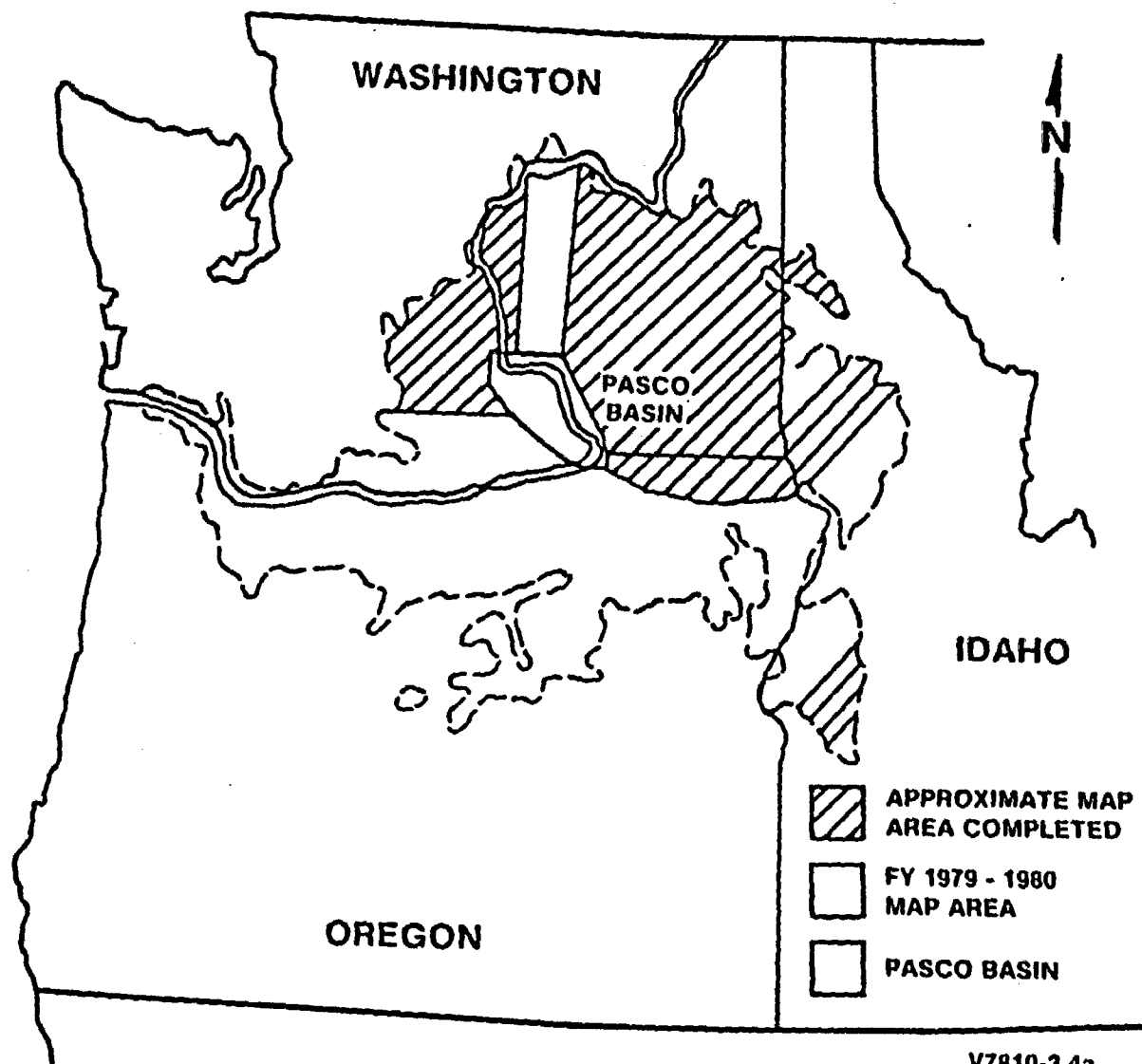
Geology

- **REGIONAL STUDIES**
- **MAPPING OF LOCALLY PROMINENT STRUCTURES**
- **STRATIGRAPHIC CORRELATION**
- **FRACTURE ANALYSES**
- **PALEOGEOLOGY**
- **TECTONICS**

V7709-18.11

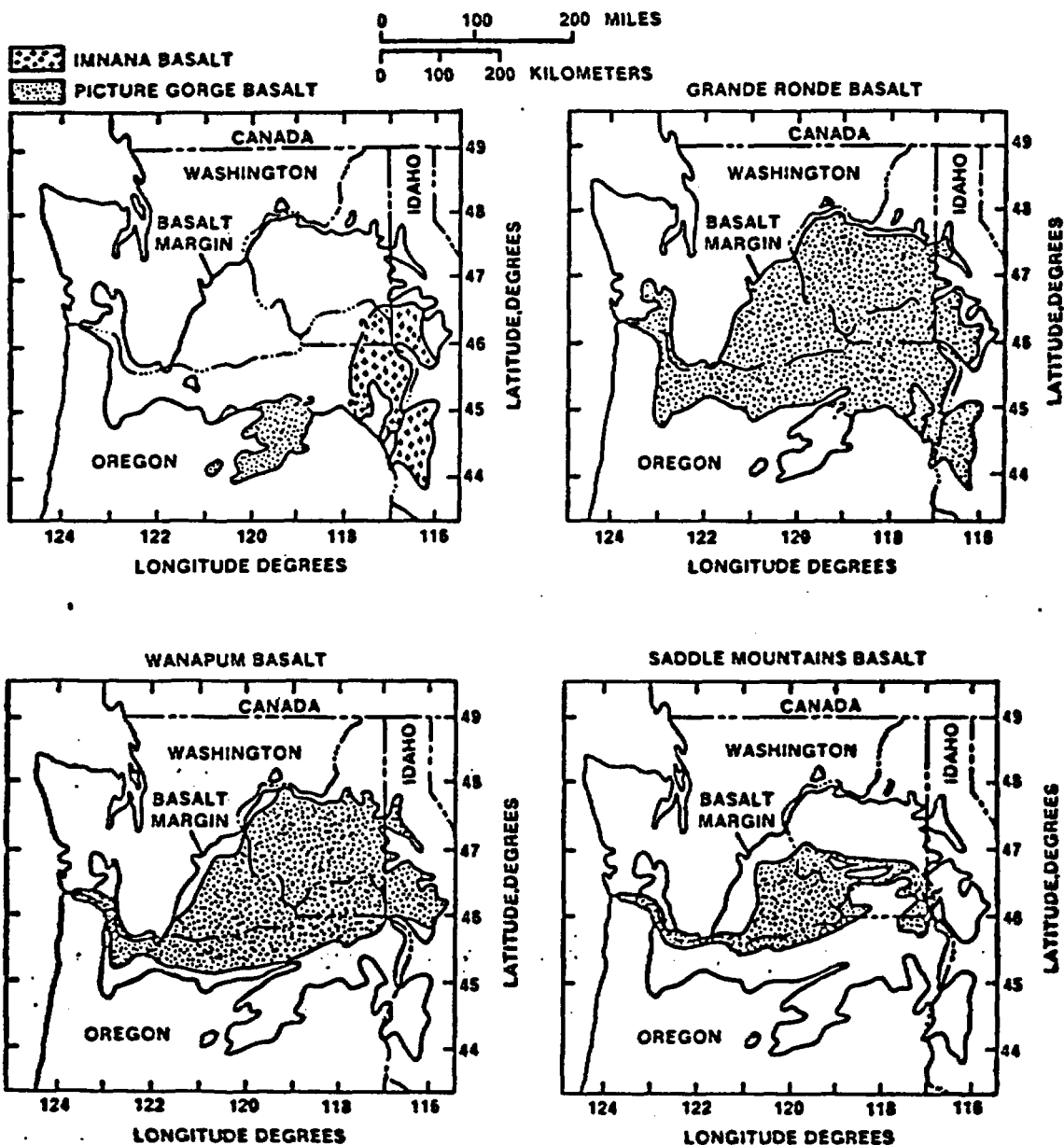
SUBCONTRACTORS SUPPORTING GEOLOGIC INVESTIGATIONS

- **SEISMOGRAPH SERVICES CORPORATION**
- **QUIGSON PROSPECTS**
- **SENTURION SCIENCES**
- **LAWRENCE BERKELEY LABORATORIES**
- **PENNSYLVANIA STATE UNIVERSITY**
- **BRIGHAM YOUNG UNIVERSITY**
- **WASHINGTON STATE UNIVERSITY**
- **WOODWARD-CLYDE CONSULTANTS**
- **STATE OF IDAHO**
- **STATE OF OREGON**
- **U.S. GEOLOGICAL SURVEY - WESTERN DIVISION**
- **UNIVERSITY OF OREGON**
- **TELEDYNE ISOTOPE**
- **WASHINGTON STATE**
- **U.S. GEOLOGICAL SURVEY - WATER RESOURCES**
- **W.K. SUMMERS AND ASSOCIATES**
- **GEOCHRON**



V7810-3.4a

DISTRIBUTION OF FORMATIONS WITHIN THE COLUMBIA RIVER BASALT GROUP

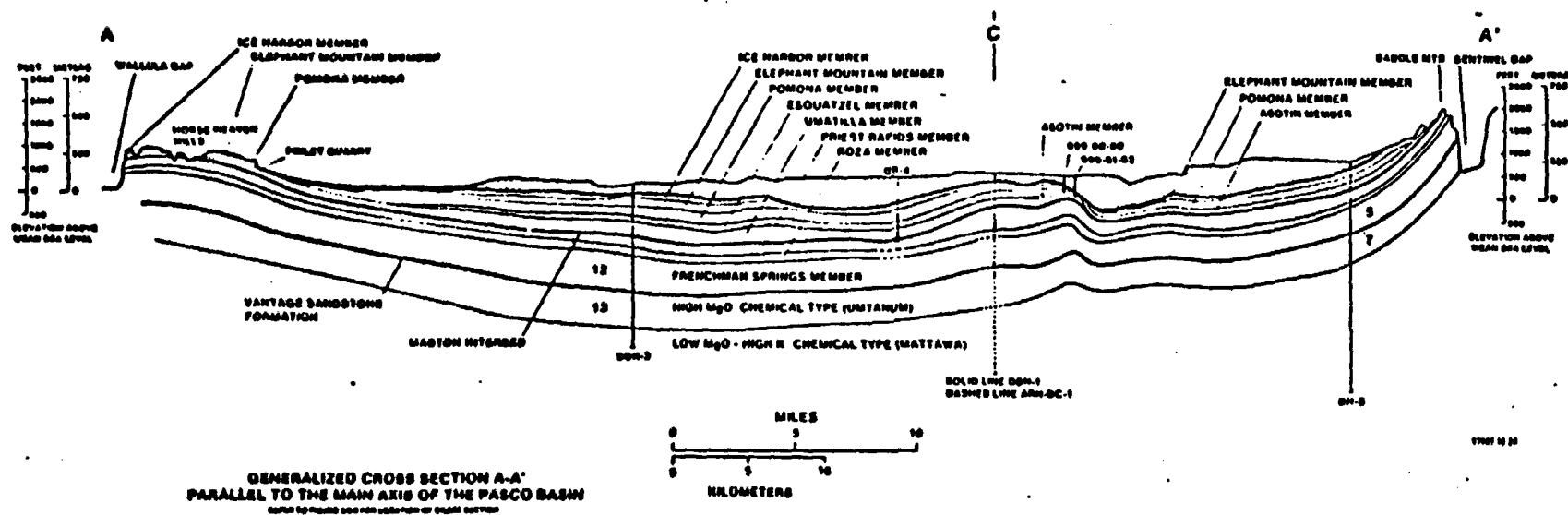


Stratigraphic Correlation

- **GEOCHEMISTRY**
- **PALEOMAGNETIC SAMPLING**
- **GEOPHYSICAL LOGGING**
- **PETROGRAPHY - MINERALOGY**

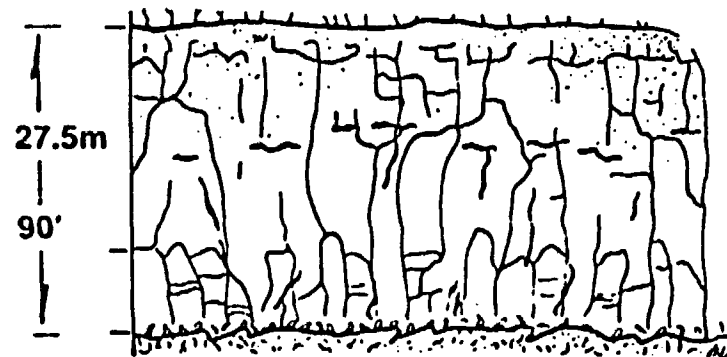
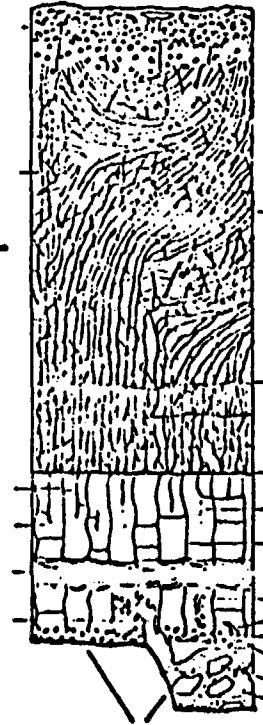
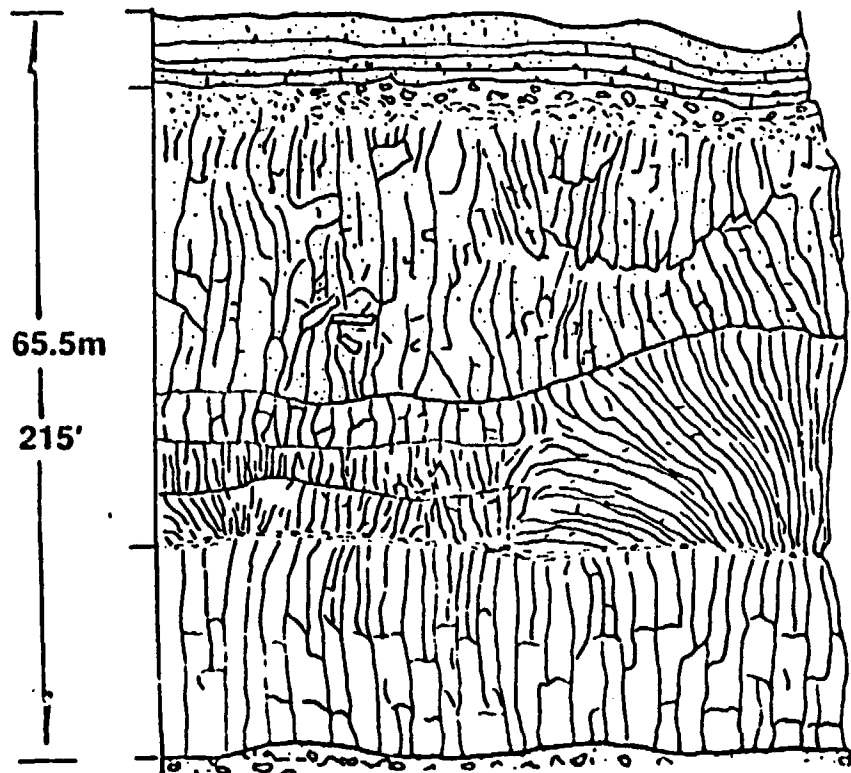
V7709-18.13

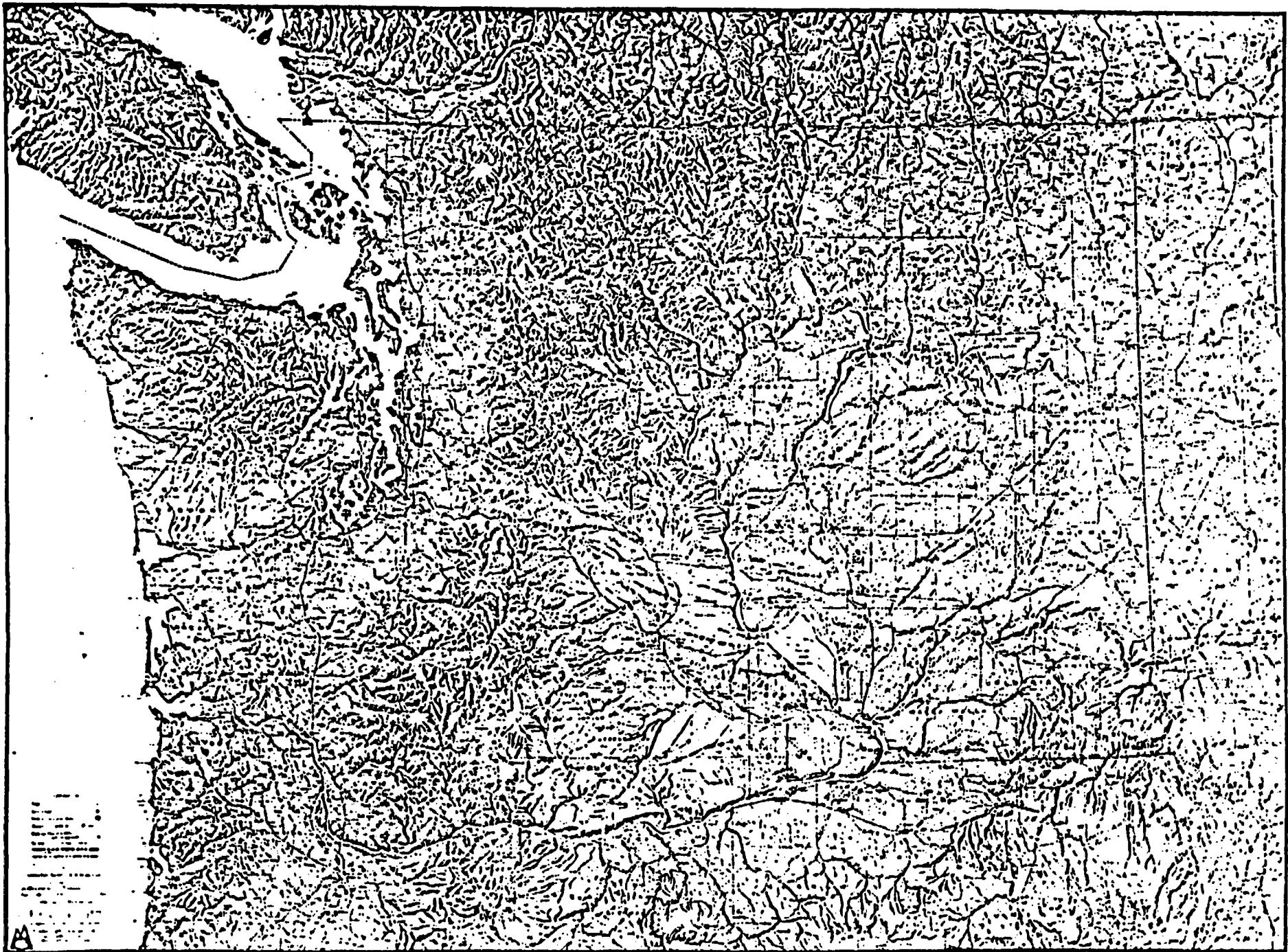




INTRAFLOW STRUCTURES

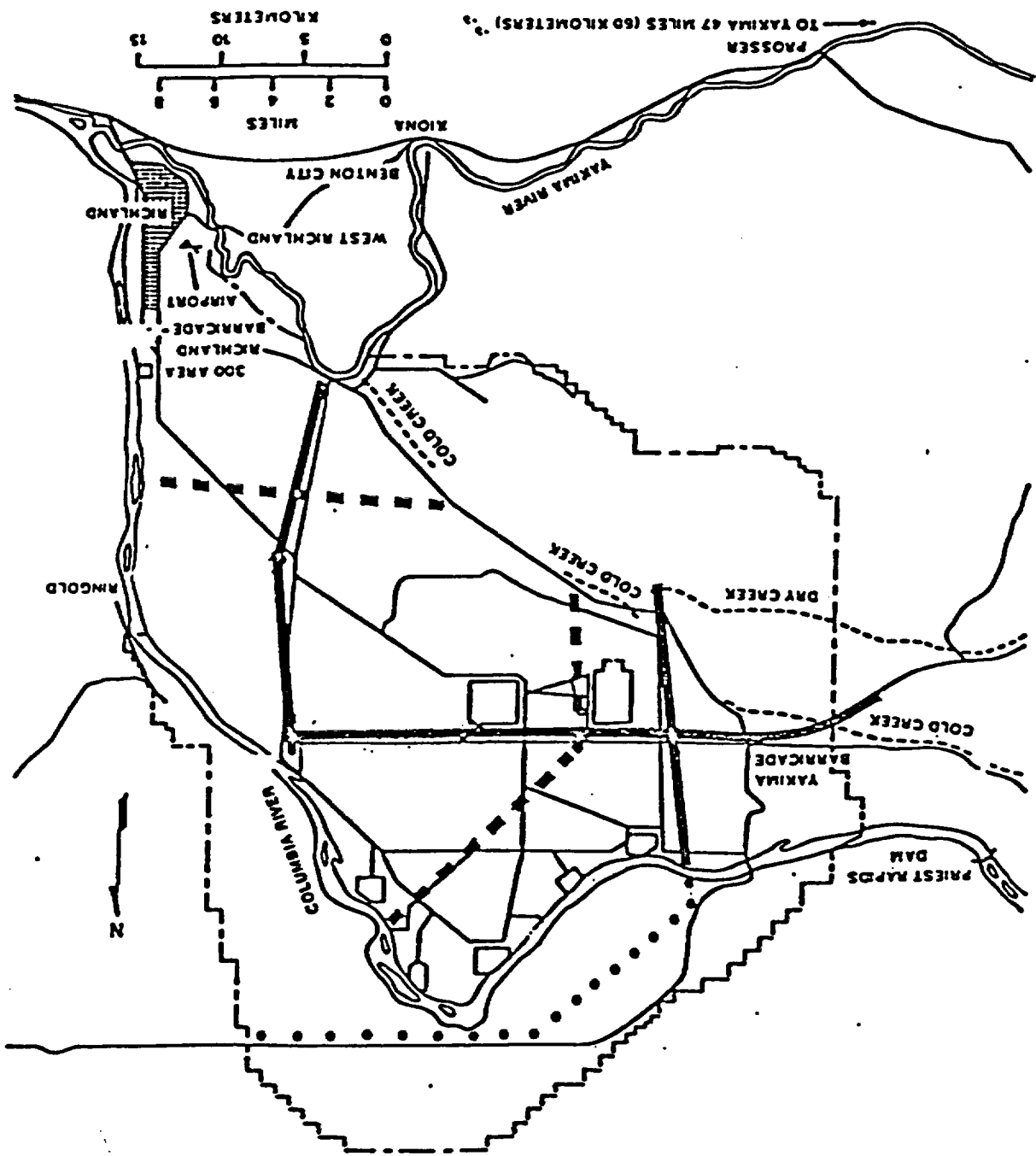
HYPOTHETICAL
FLOW





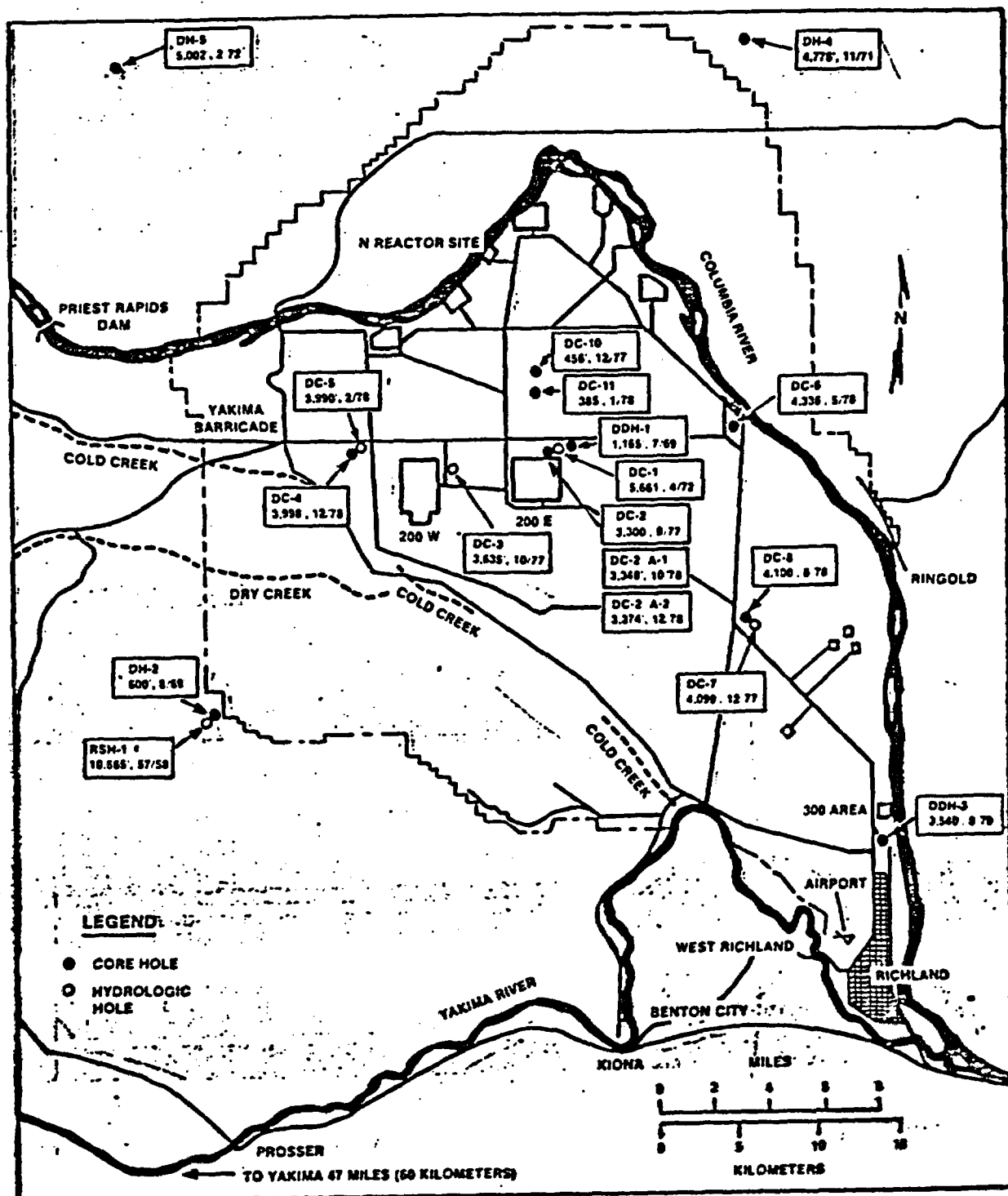
STATE OF WASHINGTON

SEISMIC LINES COMPLETED
 SEISMIC LINES SCHEDULED
 ADDITIONAL PROPOSED SEISMIC LINES



HYDROLOGY ACTIVITIES

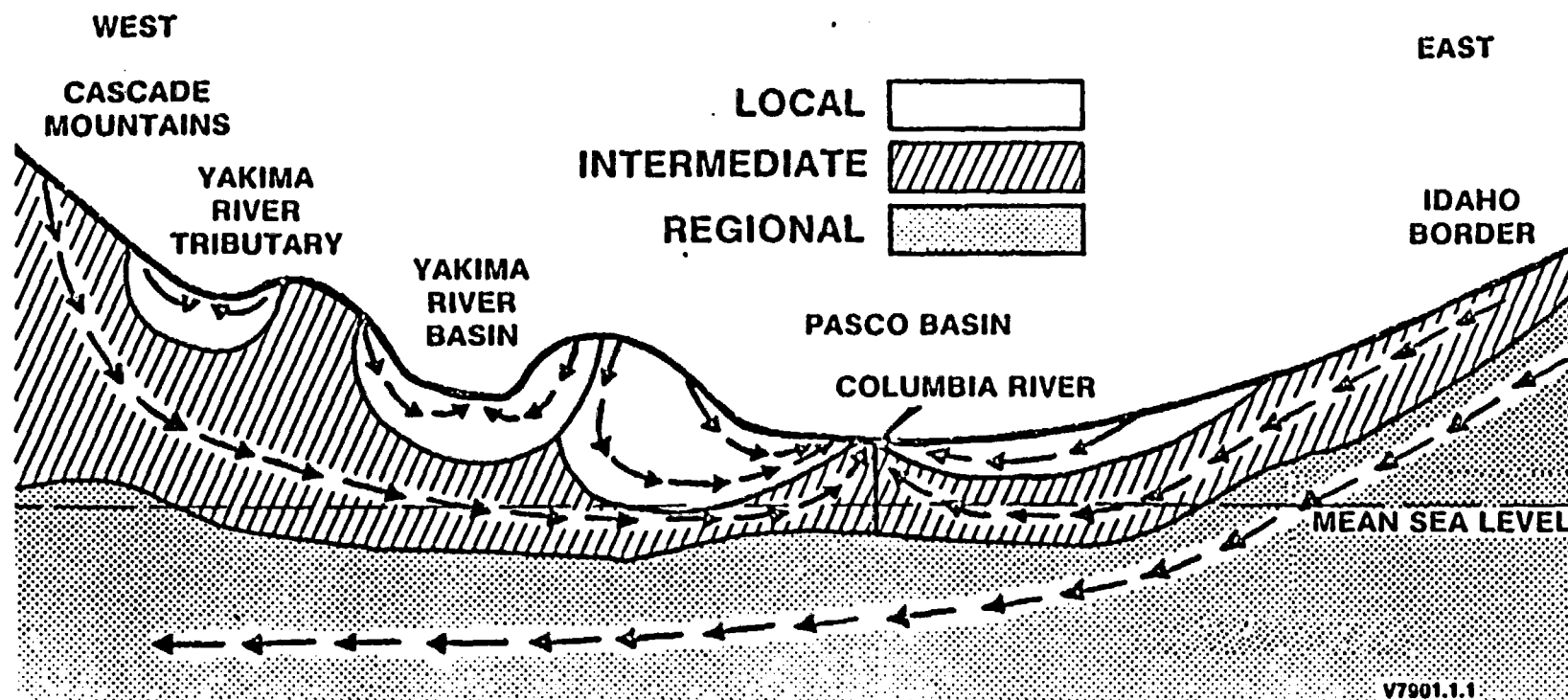
- **PASCO BASIN HYDROLOGY**
 - **DATA EVALUATION**
 - **FIELD STUDIES**
 - **FLOW MODEL DEVELOPMENT**
- **COLUMBIA PLATEAU HYDROLOGY**
 - **DATA EVALUATION**
 - **FLOW MODEL DEVELOPMENT**



**BASALT WASTE ISOLATION PROGRAM
DRILL HOLES AS OF 12/31/78**

V7902-10

FLOW SYSTEMS



**NEVADA
NUCLEAR WASTE
STORAGE
INVESTIGATIONS**

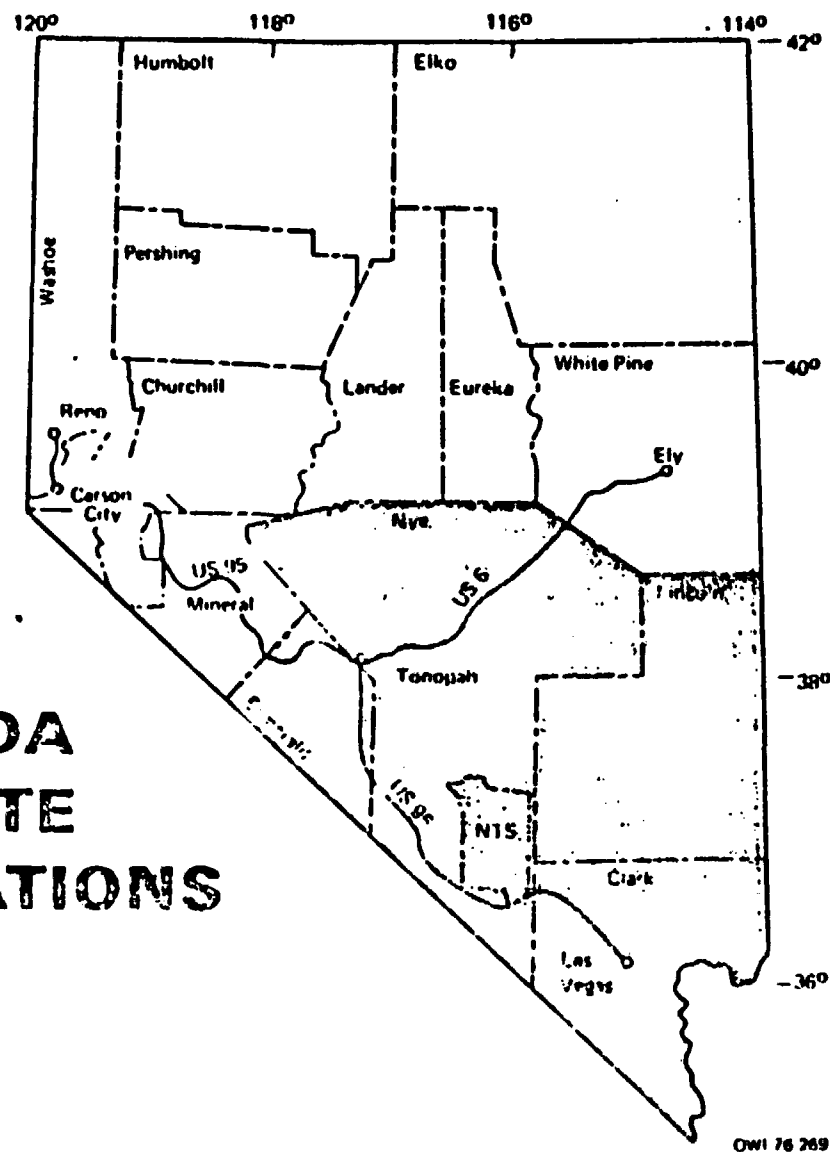
REASONS FOR CONSIDERING NTS FOR WASTE ISOLATION

GEOLOGY/HYDROLOGY - THE NTS HAS SEVERAL POTENTIALLY SUITABLE GEOLOGIC FORMATIONS AND A DEEP WATER TABLE WITH LONG FLOW PATHS WHICH EVENTUALLY DISCHARGE INTO HYDROLOGICALLY CLOSED, DESERT BASINS

LAND OWNERSHIP AND DEDICATION - THE NTS CONSISTS OF 1350 SQUARE MILES OF FEDERALLY OWNED LAND MANAGED BY DOE. A DEDICATED RADIOLOGICAL SAFETY MANAGEMENT PROGRAM EXISTS AND WILL CONTINUE INDEFINITELY

LOGISTICAL BASE - A SUBSTANTIAL WORK FORCE ORIENTED TOWARDS MAJOR CONSTRUCTION PROJECTS OF A TECHNICAL NATURE IS AVAILABLE AT NTS

NEVADA OFF SITE INVESTIGATIONS

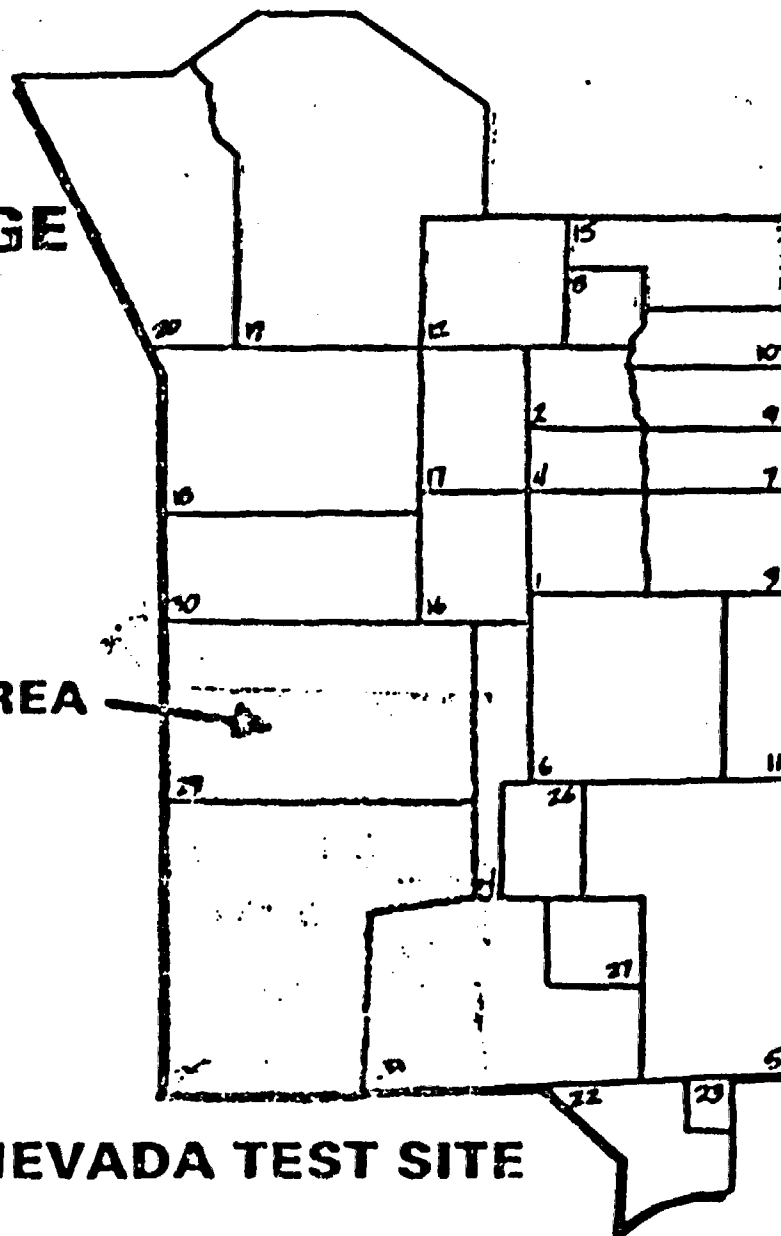


NTS TERMINAL WASTE STORAGE PROGRAM

COMPATIBLE AREA

GROUND MOTION
STUDIES

NEVADA TEST SITE



EARTH-SCIENCE FACTORS

- SUITABILITY OF MEDIUM: ROCK TYPE, FRACTURING
- AVAILABLE VOLUME: AREA, THICKNESS, DEPTH
- COMPLEXITY: STRUCTURE, STRATIGRAPHY, HYDROLOGY
- TECTONICS: FAULTS, UPLIFT, ETC.
 - SEISMICITY
 - VOLCANISM
- GROUND-WATER SYSTEM
 - DESTINATION
 - FLOW-PATH DEPTH
 - FLOW-PATH LENGTH
 - FLOW VELOCITY
 - SORPTIVE PROPERTIES OF ROCKS

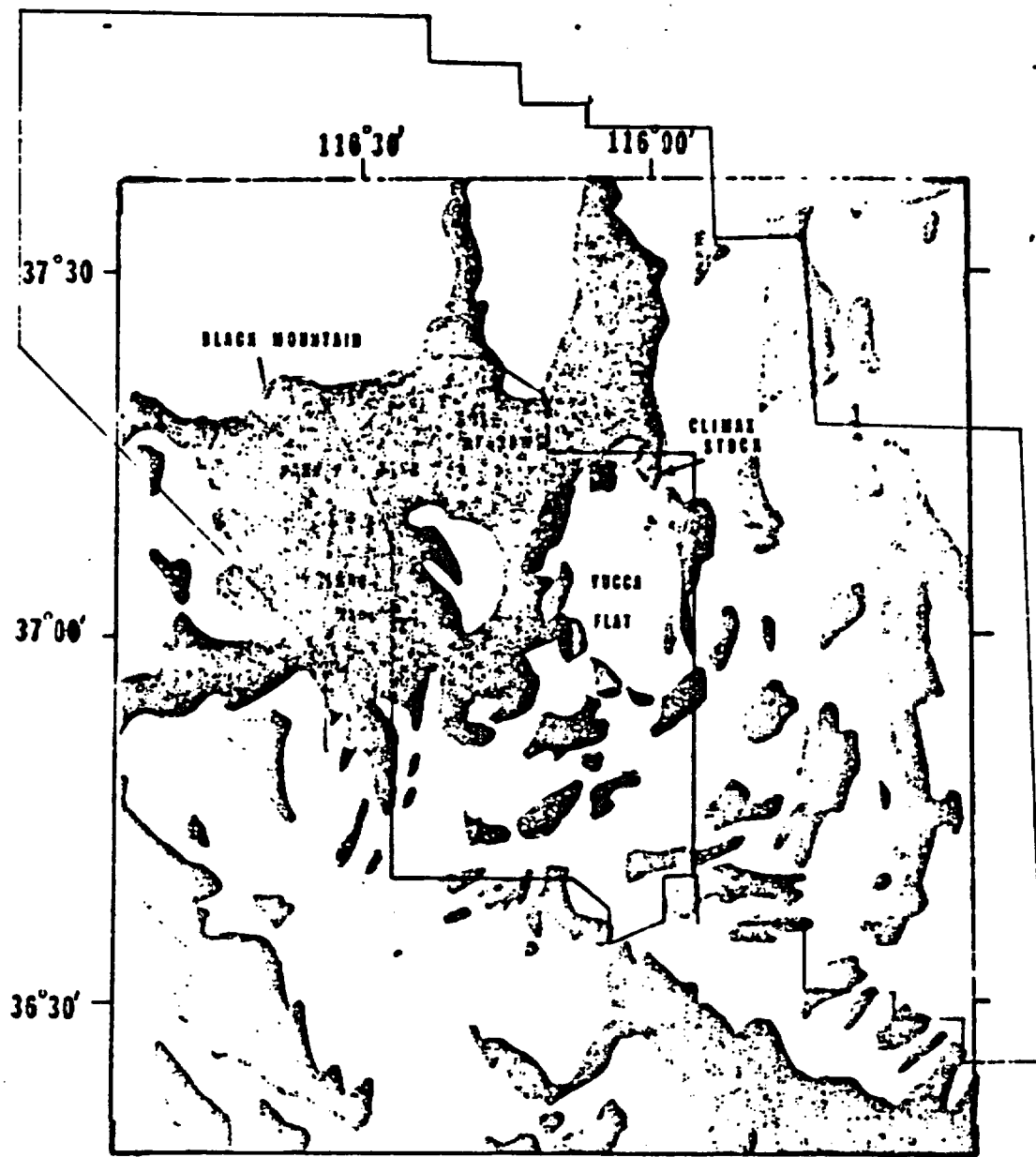
}	TRANSIT	}	CONCEN- TRATION VS. TIME
	TIME		
- SURFACE-WATER SYSTEM
 - FLOODING POTENTIAL
 - DISTRIBUTION OF GROUND-WATER DISCHARGE
- RESOURCE COMPETITION
 - MINERALS
 - FUELS
 - WATER
 - AGRICULTURE

3/2/79-10

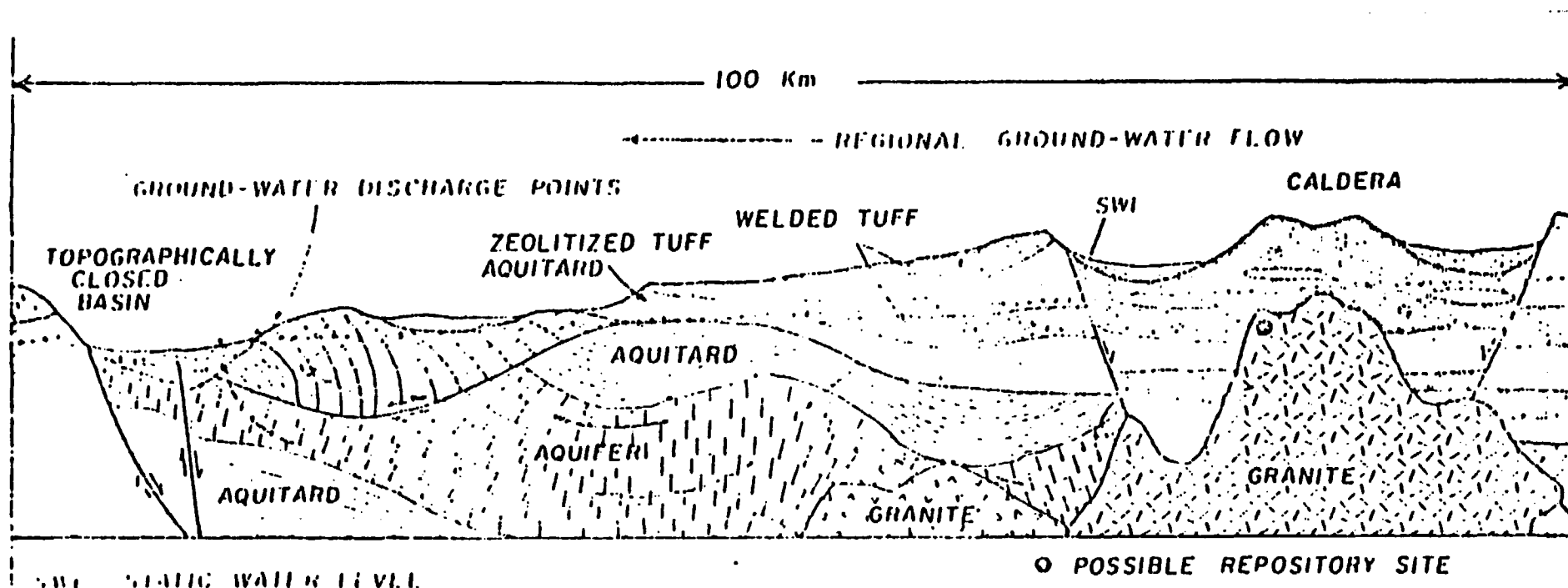
NTS TERMINAL WASTE STORAGE PROJECT

EARTH SCIENCE ACTIVITIES

NO DRILLING	GEOLOGIC RECON — MAPPING	HYDROLOGIC RECON — AVAILABLE OBSERVATIONS	REGIONAL GEOPHYSICS SURFACE TECHNIQUES	PRELIMINAR MEDIA EVALUATION	INVENTORY & LITERATURE SEARCH
EXPLORATORY DRILLING	DRILLING — STRATIGRAPHY — HISTORY — RESOURCE ASSESSMENT	HYDRAULIC TESTS — CHEMICAL — ISOTOPIC	BOREHOLE METHODS	LAB - SCALE MEDIA STUDIES — PHYSICAL PROPS — THERMOMECHANICAL — GEOCHEMICAL	CANDIDATE SITE IDENTIFICATION
DRILLING WITH STRICT CONTROLS	DETAILED DRILLING	TRACER TESTING SITE MODELING	HOLE-SURFACE HOLE-HOLE	SHALLOW OR REMOTE IN-SITU TESTS	SITE SELECTION
NEED FOR PLUGGING	—————	VERIFICATION TESTS	—————	IN-SITU RESPONSE TESTS	SITE CONFIRMATION







MULTIPLE BARRIER MODEL TUFF IN GREAT BASIN

NTS TERMINAL WASTE STORAGE PROGRAM

POTENTIAL REPOSITORY SITES

ELIMINATED

ACTIVE

POSSIBLES

ON THE NTS

SYNCLINE RIDGE ELEANA

C

CENTRAL BLOCK

S

NORTHERN BLOCK

C

CLIMAX STOCK

C

TWINRIDGE

C

TIMBER MOUNTAIN

C

YUCCA MOUNTAIN

A

CALICO HILLS - GRANITE

A

WAHMONIE

A

TOPOPAH WASH - ARGILLITE

P

SKULL MOUNTAIN

P

JACKASS FLATS

P

DOMM MOUNTAIN

P

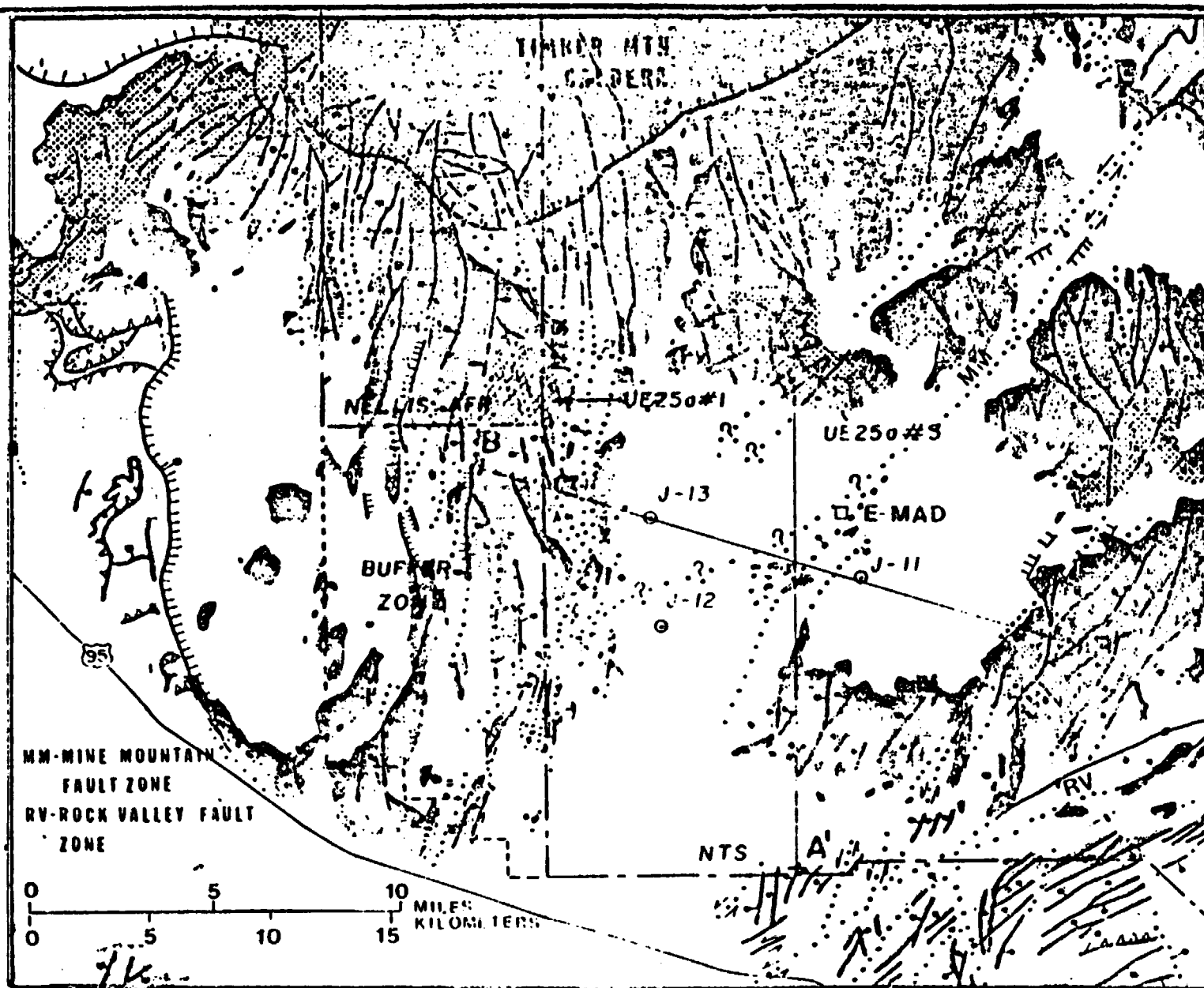
OFF THE NTS

BLACK MOUNTAIN

P

OTHER

P



ALLUVIUM



PALEOZOIC ROCKS

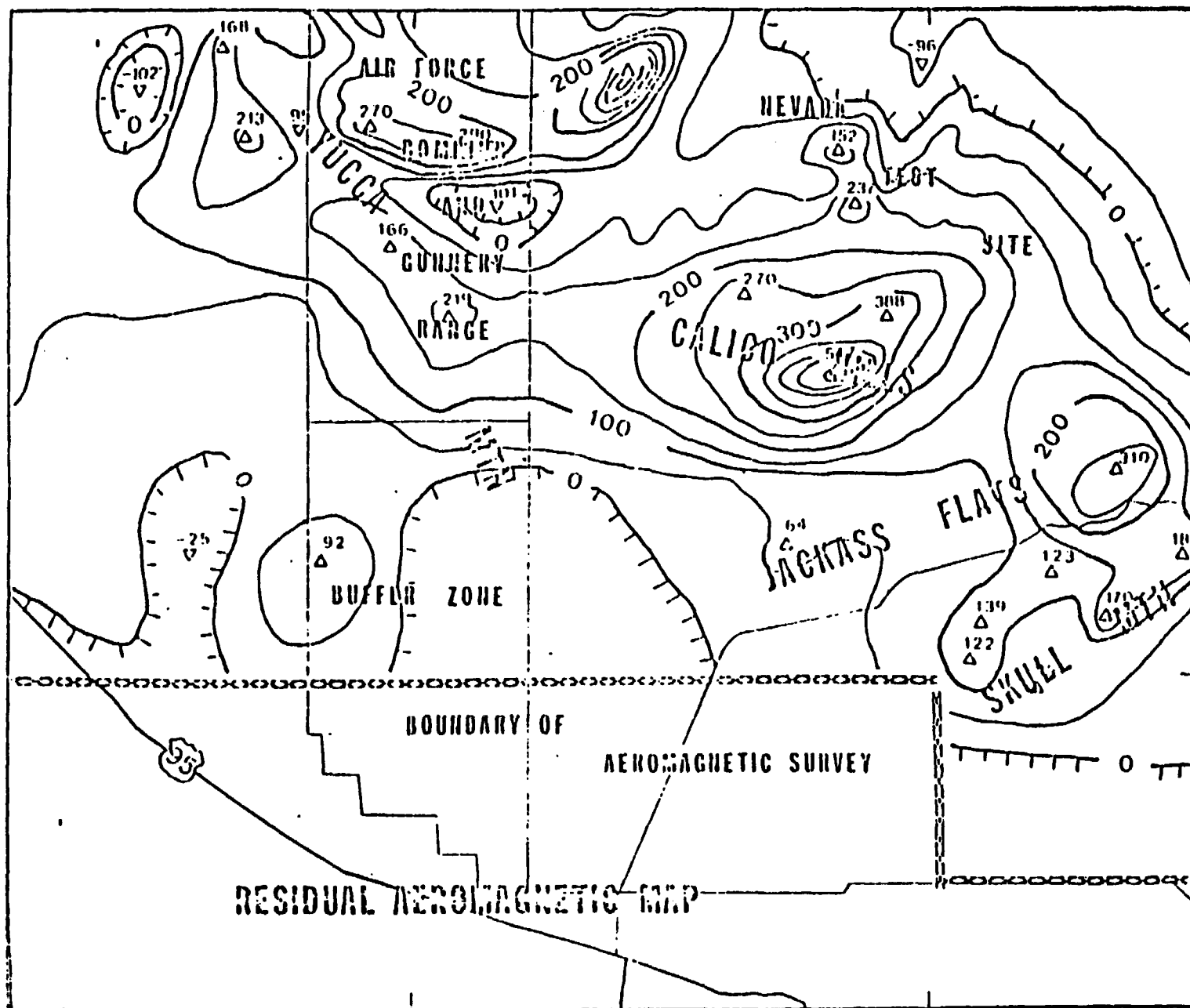


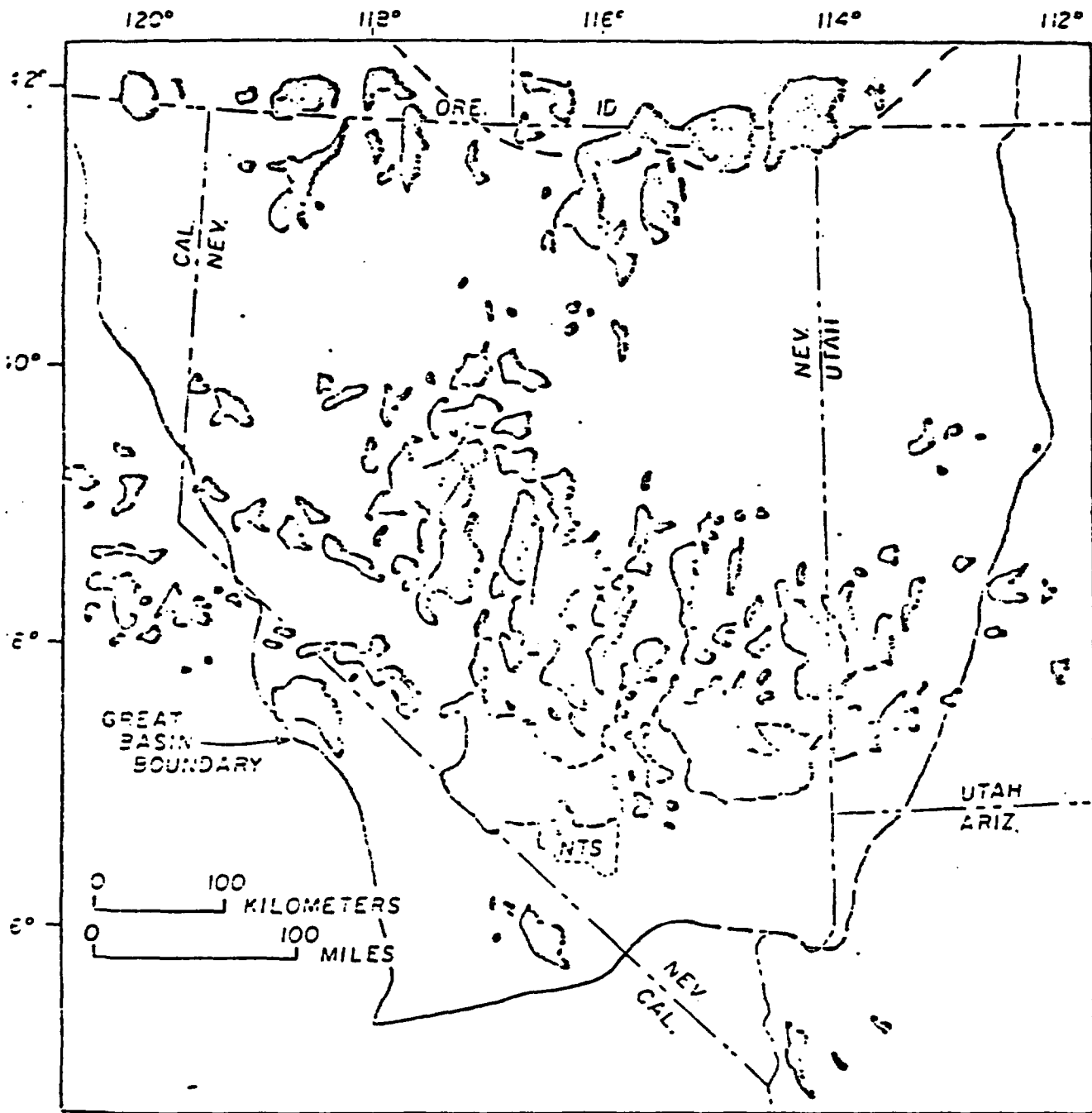
VOLCANIC ROCKS



HYDROTHERMAL ALTERATION

FAULT DISPLACING
ALLUVIUM

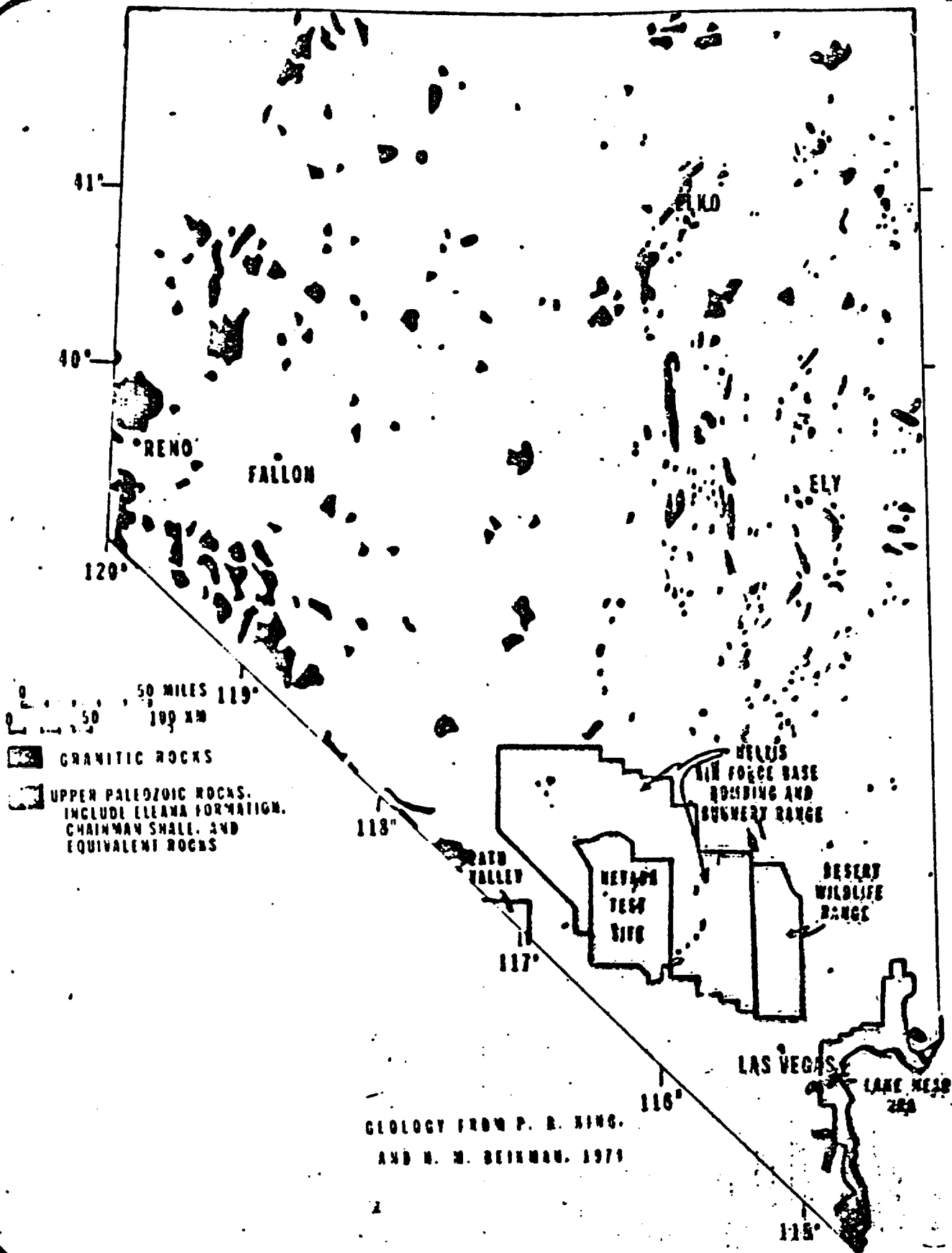




DISTRIBUTION OF SILICIC TUFF IN THE SOUTHERN
GREAT BASIN OF NEVADA-UTAH-CALIFORNIA-ARIZONA

COMPILED FROM
STEWART AND CARLSON 1976

3/2/79-Z



3/2/79-14

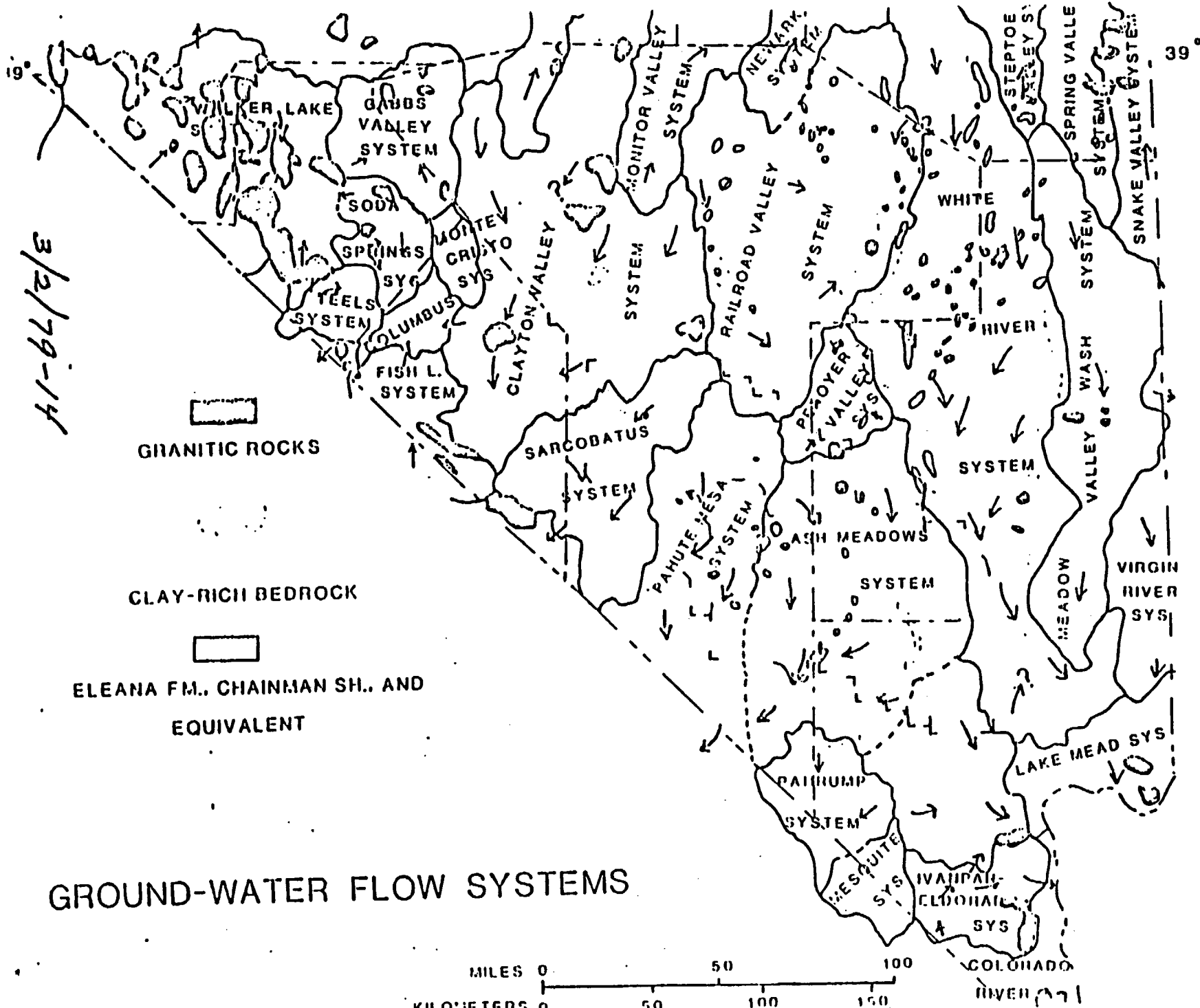
GROUND-WATER FLOW SYSTEMS

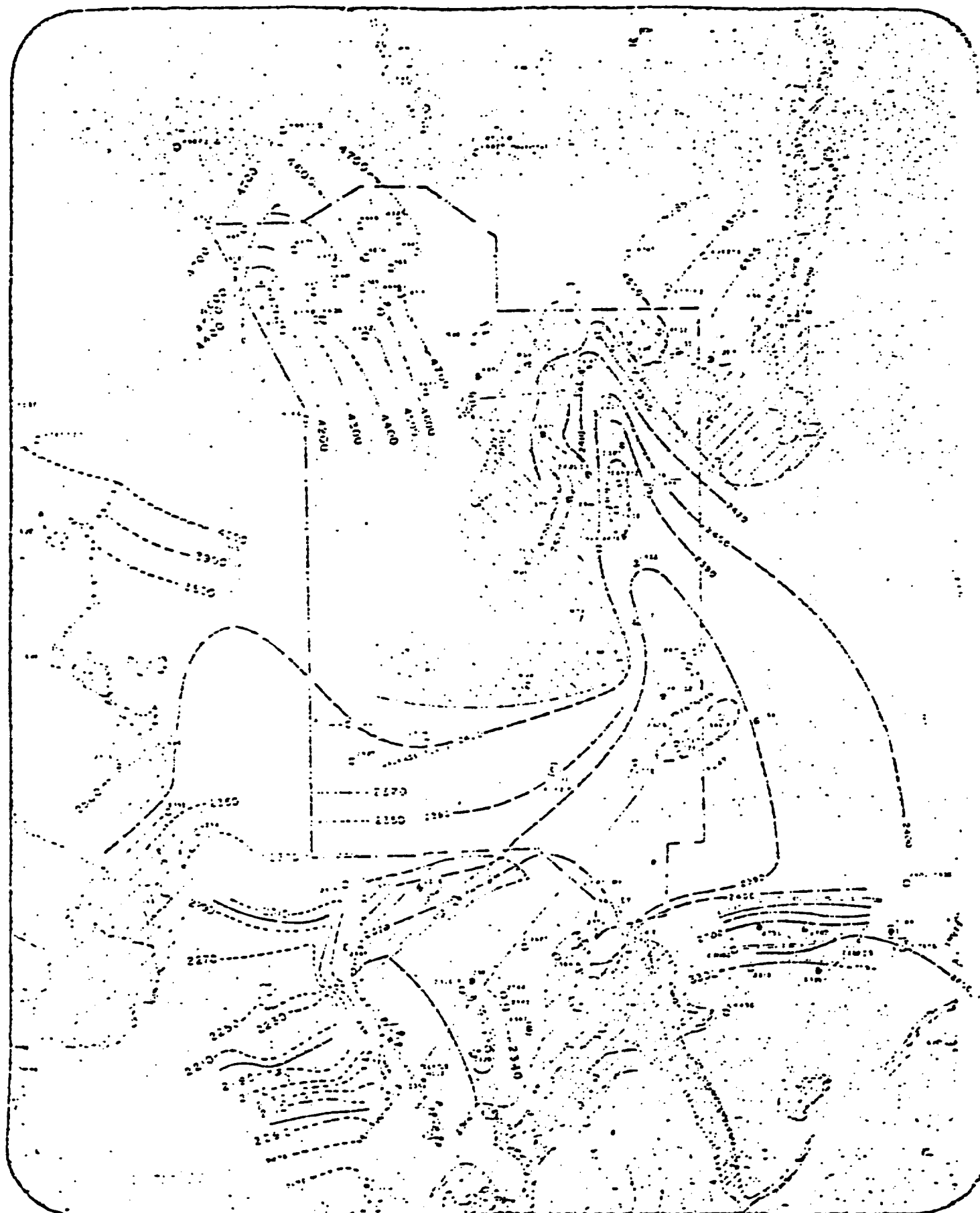
ELEANA FM., CHAINMAN SH., AND
EQUIVALENT

CLAY-RICH BEDROCK

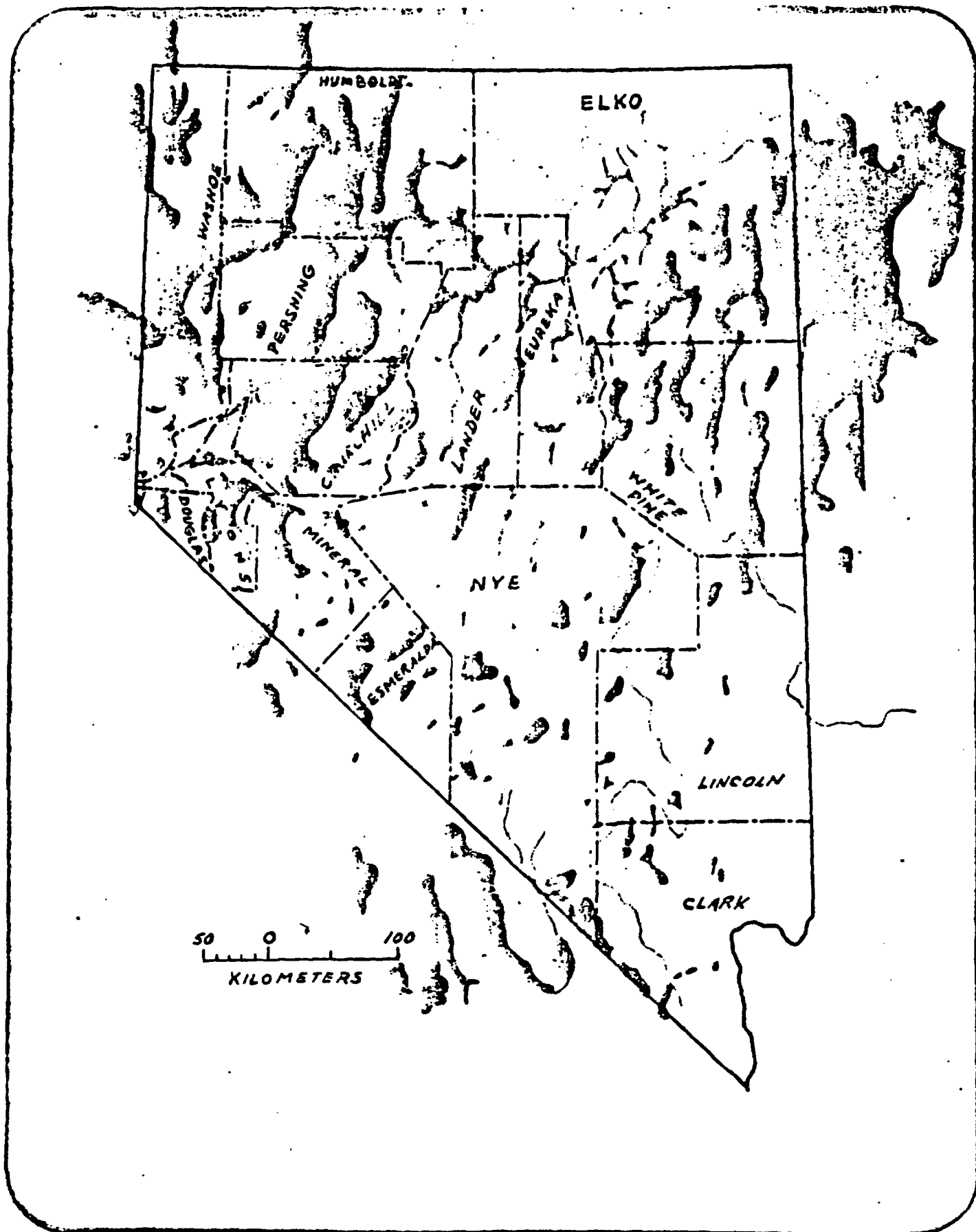
GRANITIC ROCKS

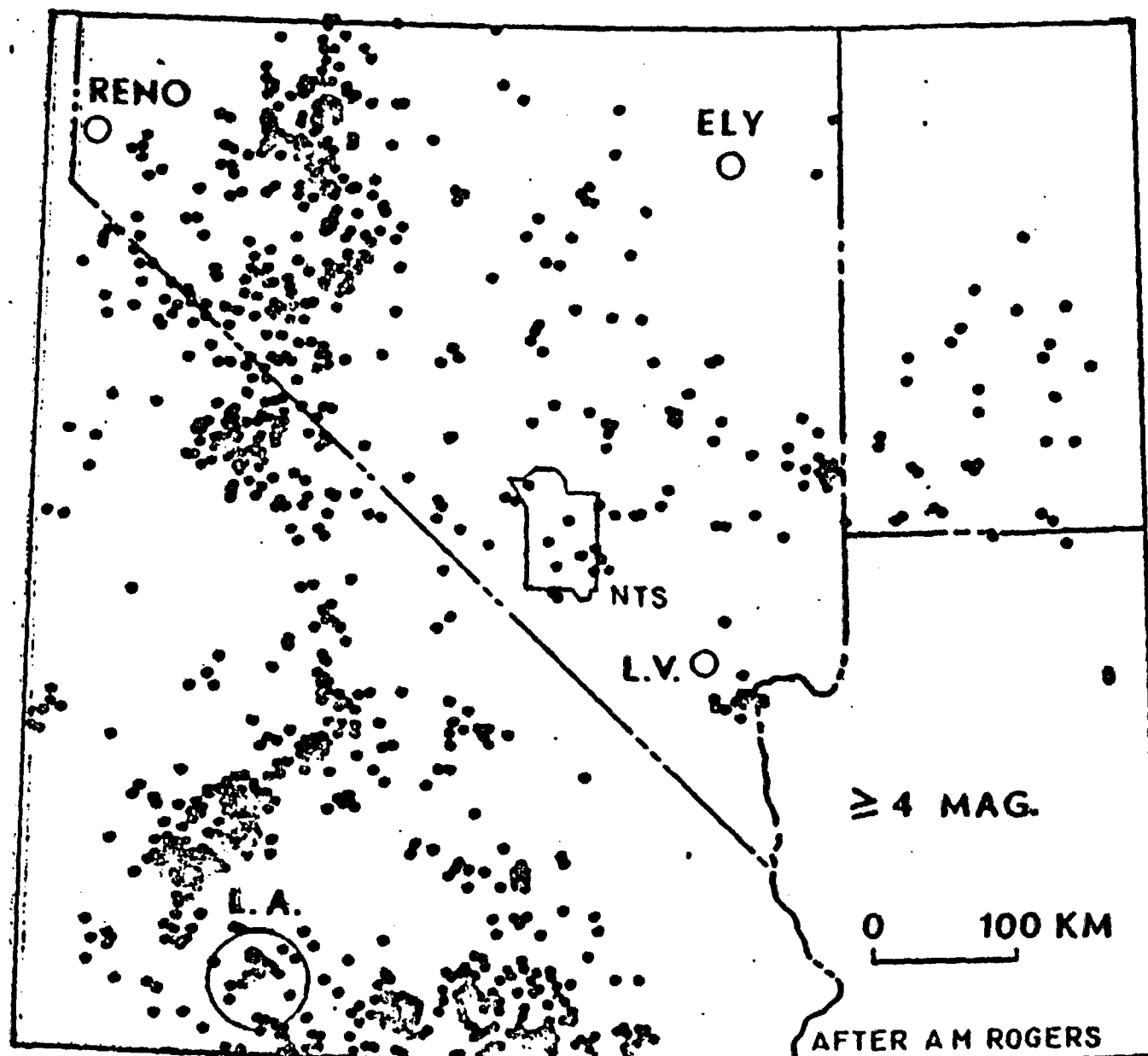
MILES 0 50 100
KILOMETERS 0 50 100 150



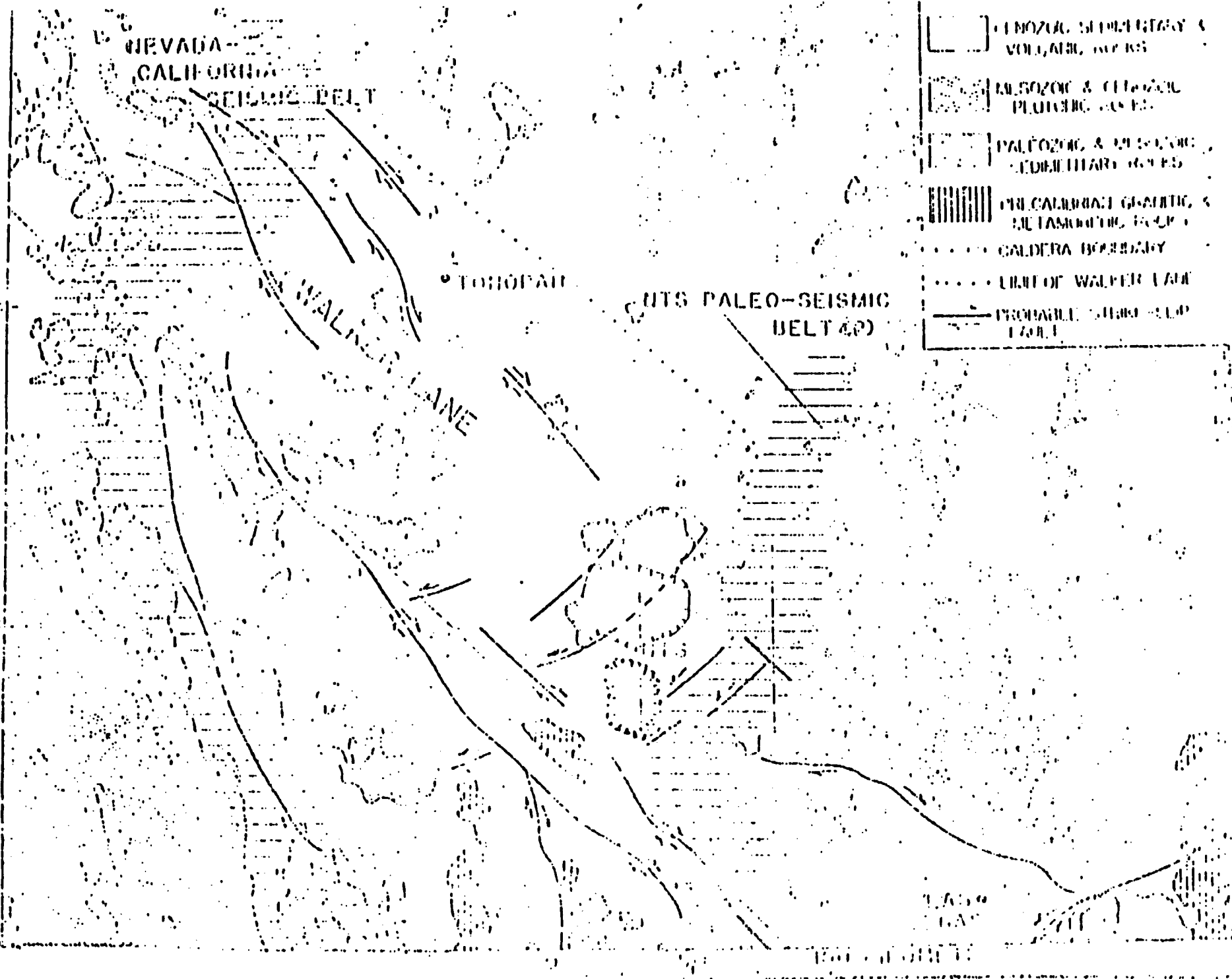


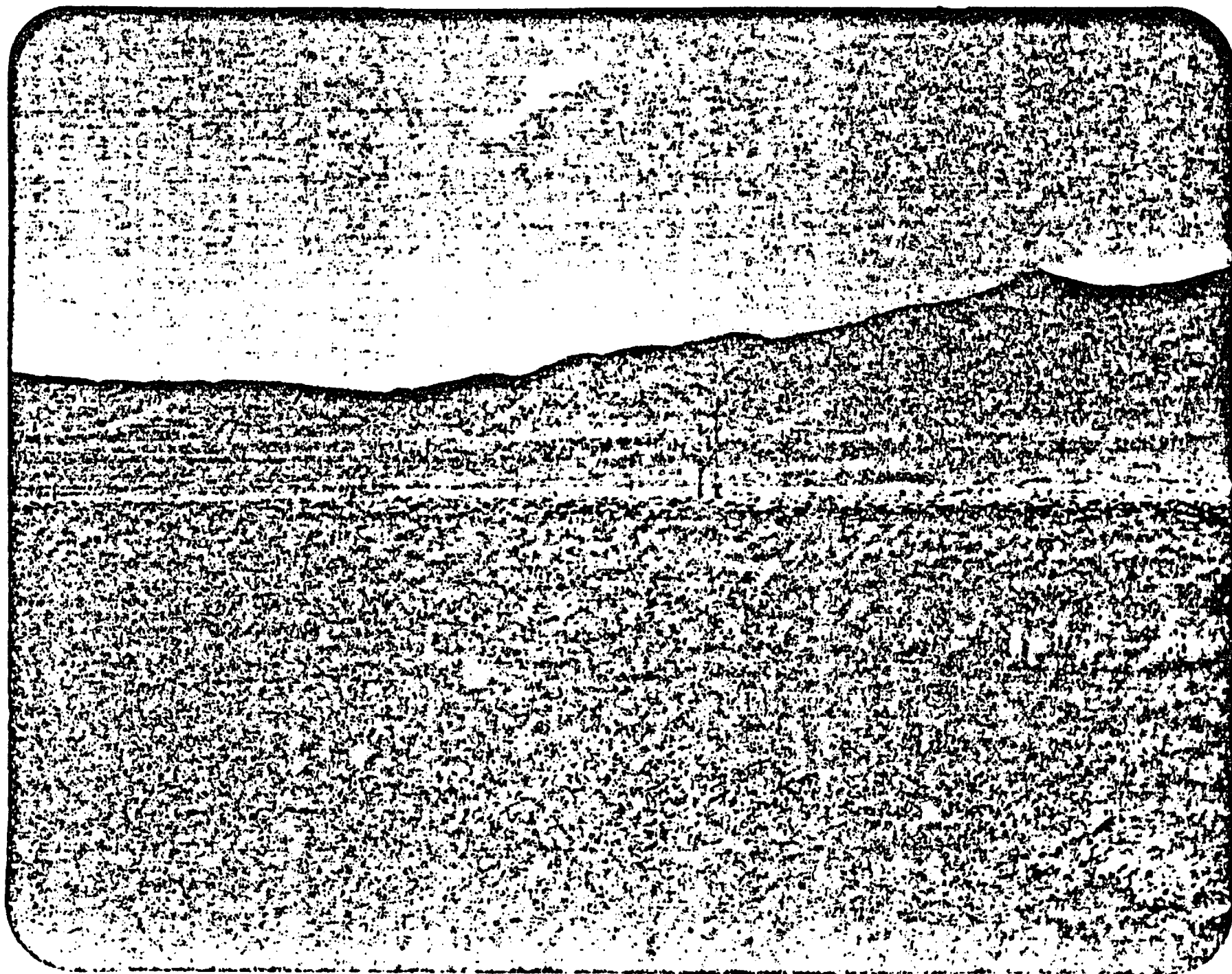
ITS GROUND-WATER ALTITUDE CONTOURS
3/2/79-32 MASTER VU-GRAPH MOUNT

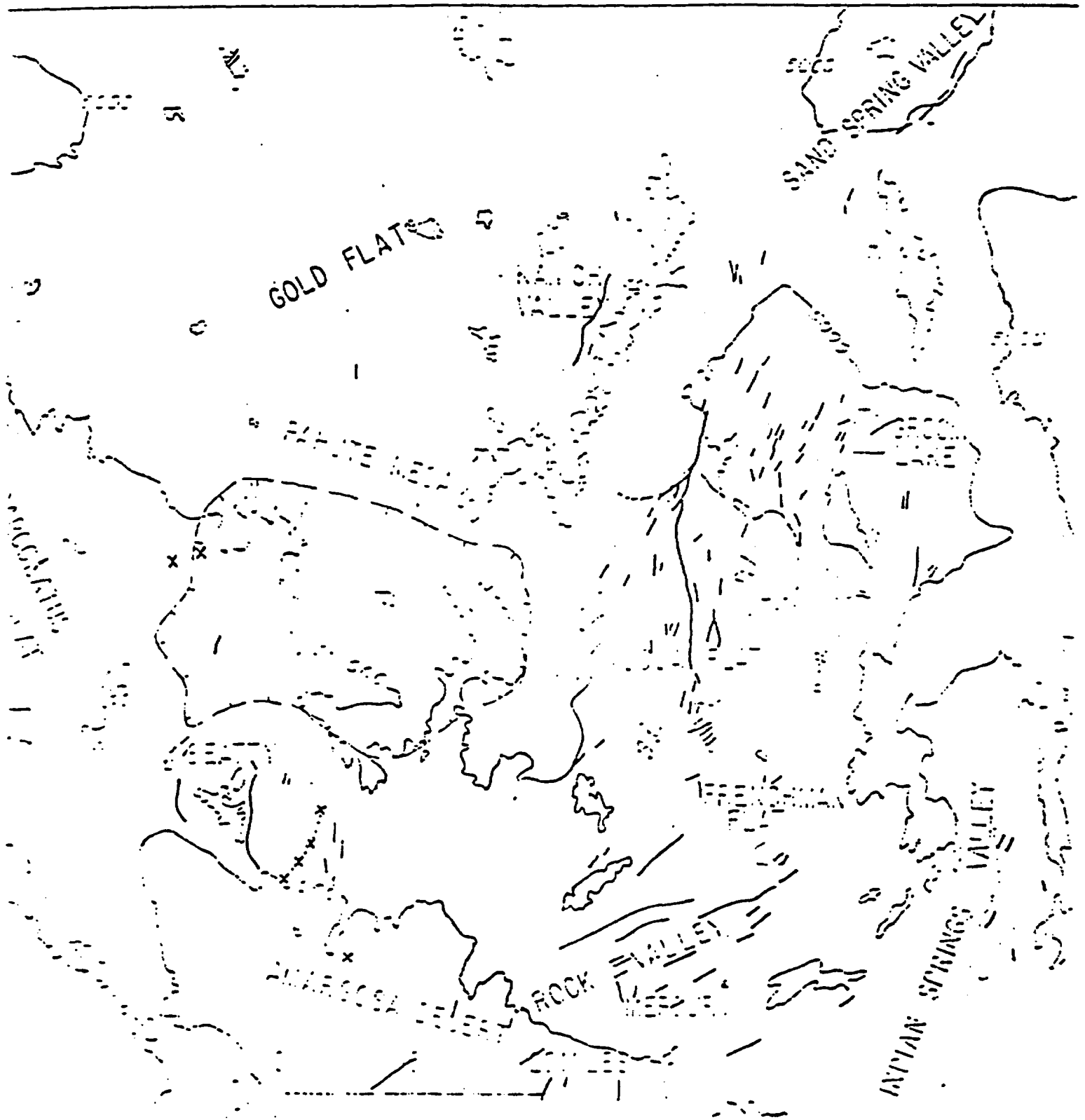




3/2/79-27

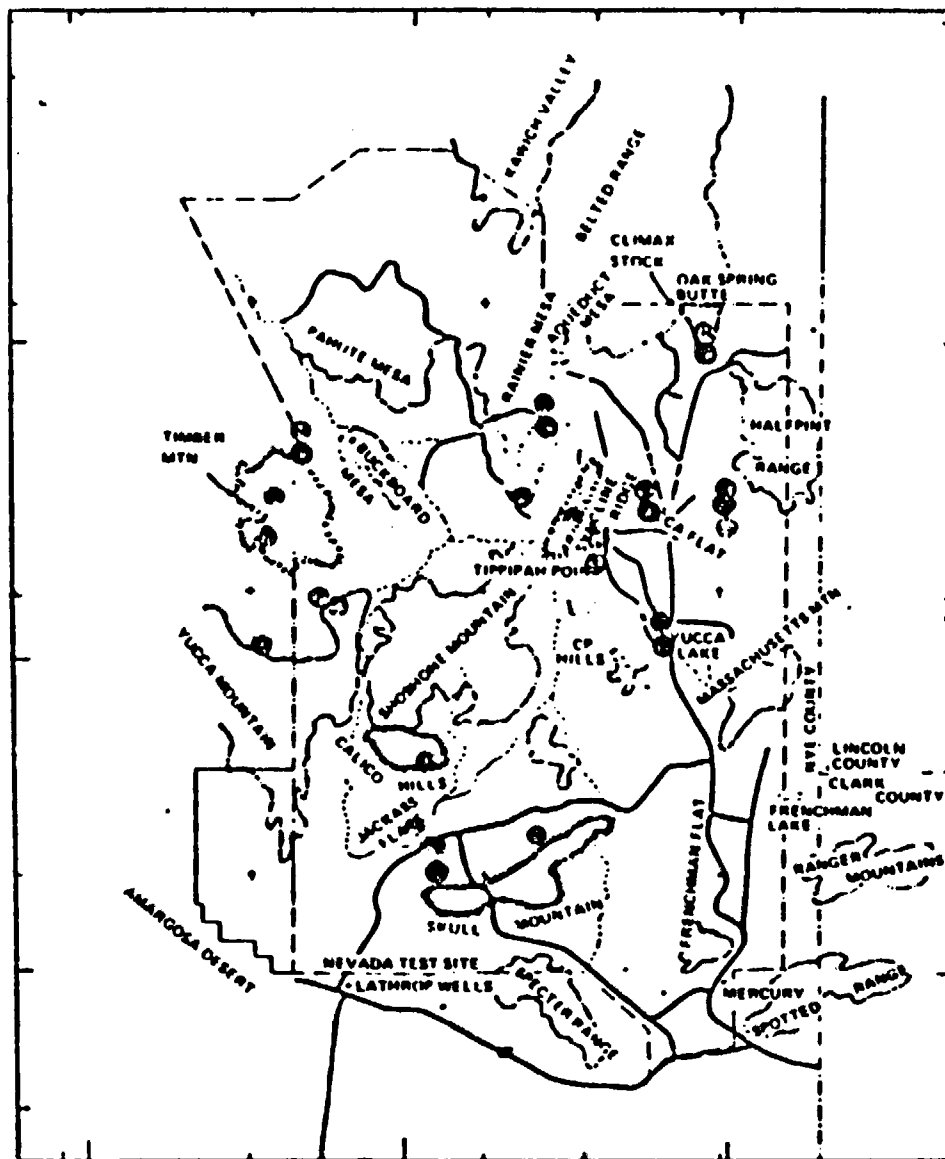






QUATERNARY FAULTS AND FRACTURES NTS REGION

3/2/79-28



MAP OF THE NEVADA TEST SITE SHOWING
PRINCIPAL TOPOGRAPHIC FEATURES

1. HISTORIC FORTITUDE - 1882

2. ACTIVE - QUATERNARY FOLDING

3. INACTIVE - QUATERNARY FOLDING

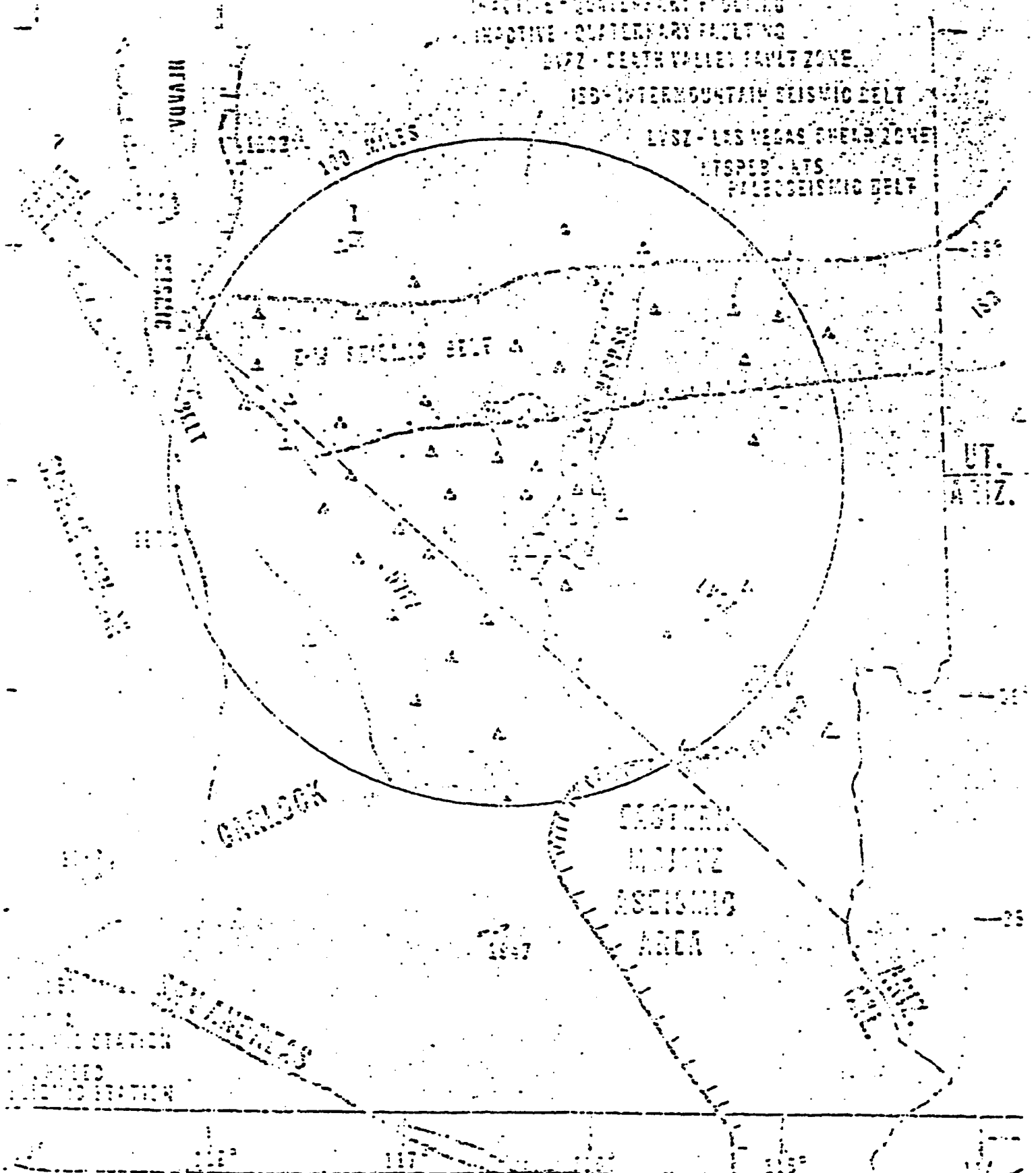
4. INACTIVE - QUATERNARY FOLDING

5. DEATH VALLEY FAULT ZONE

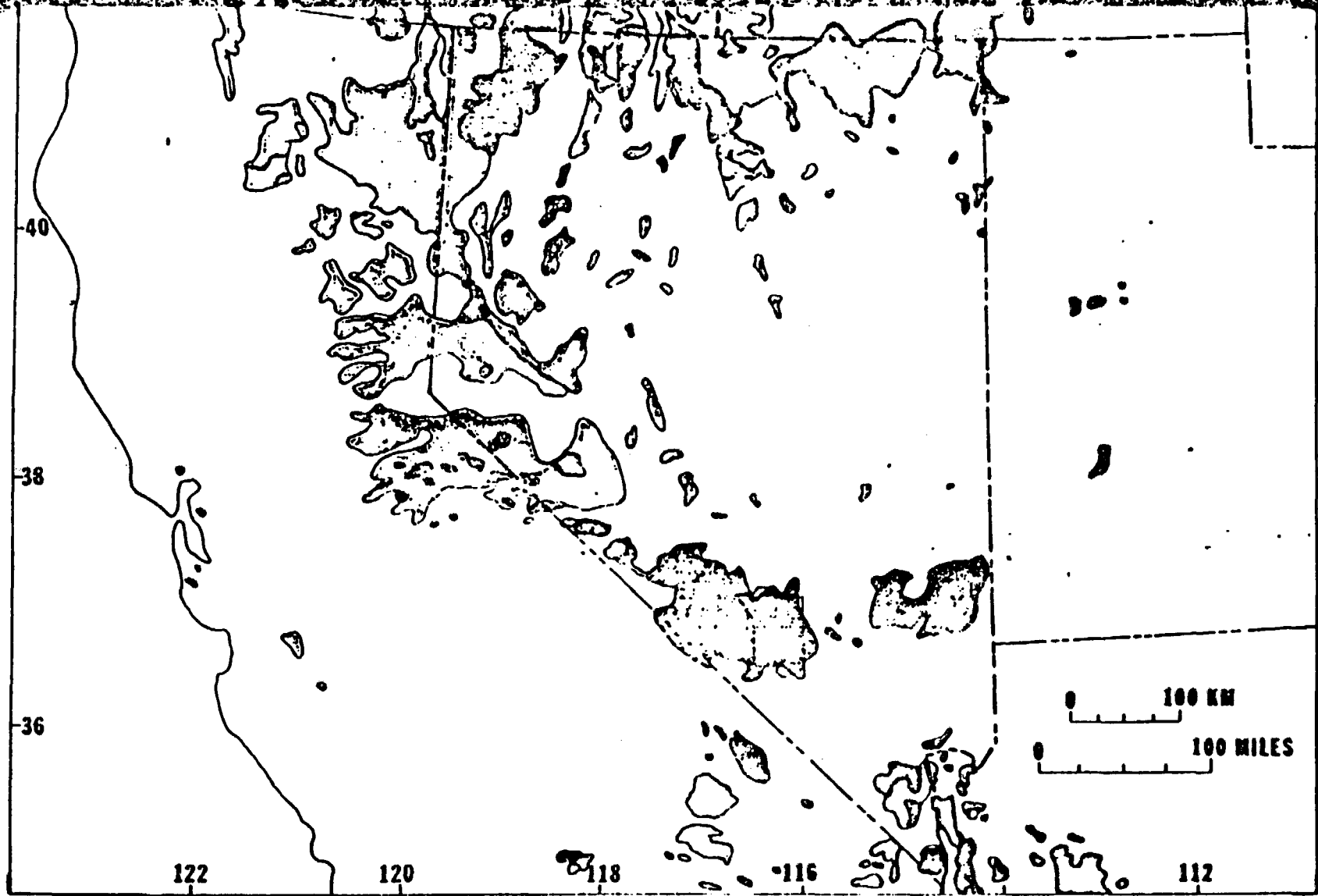
6. INTERMOUNTAIN SEISMIC BELT

7. LOS ANGELES SHEAR ZONE

8. LOS ANGELES
SEISMIC BELT



3/2/79-12



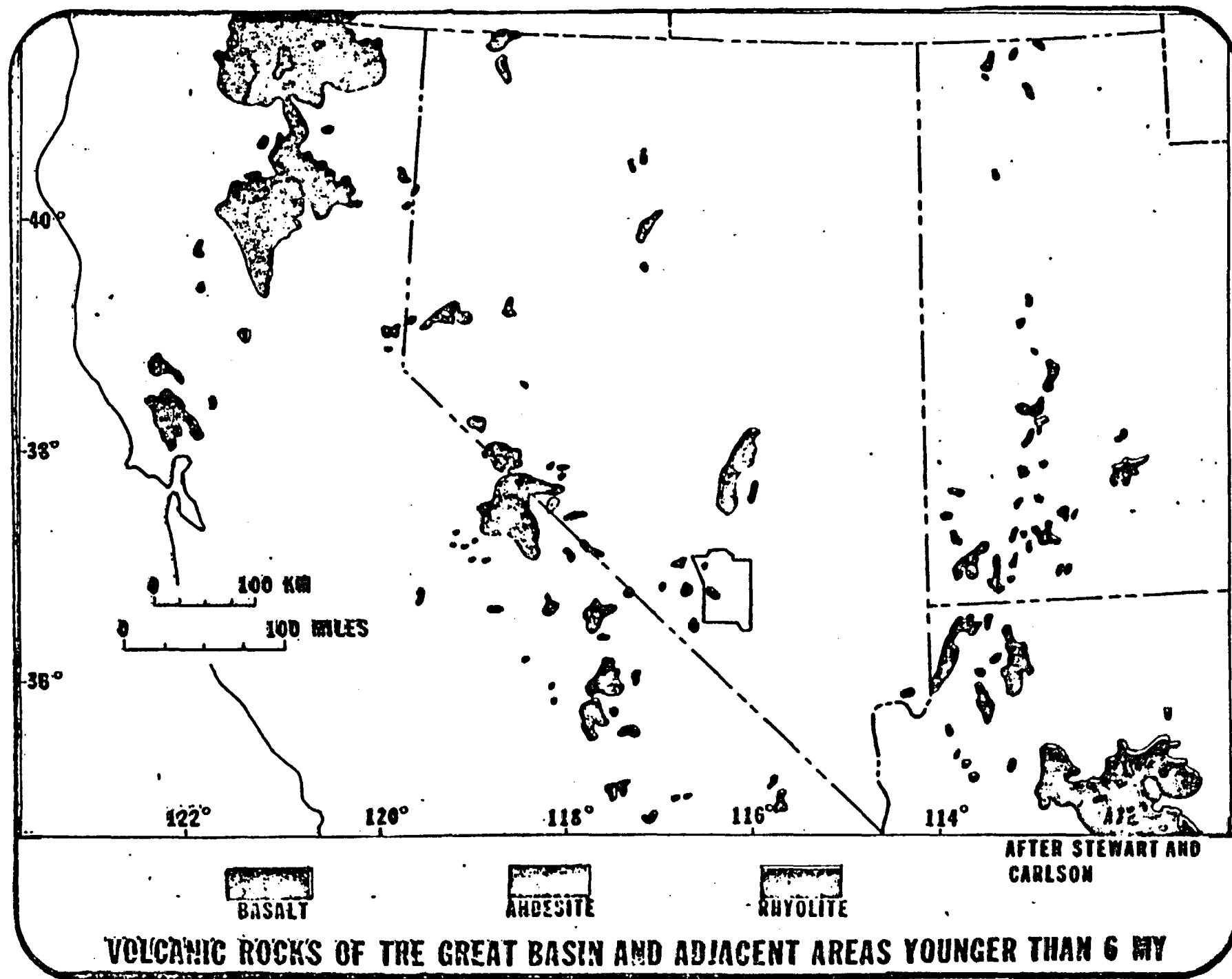

BASALT


ANDESITE

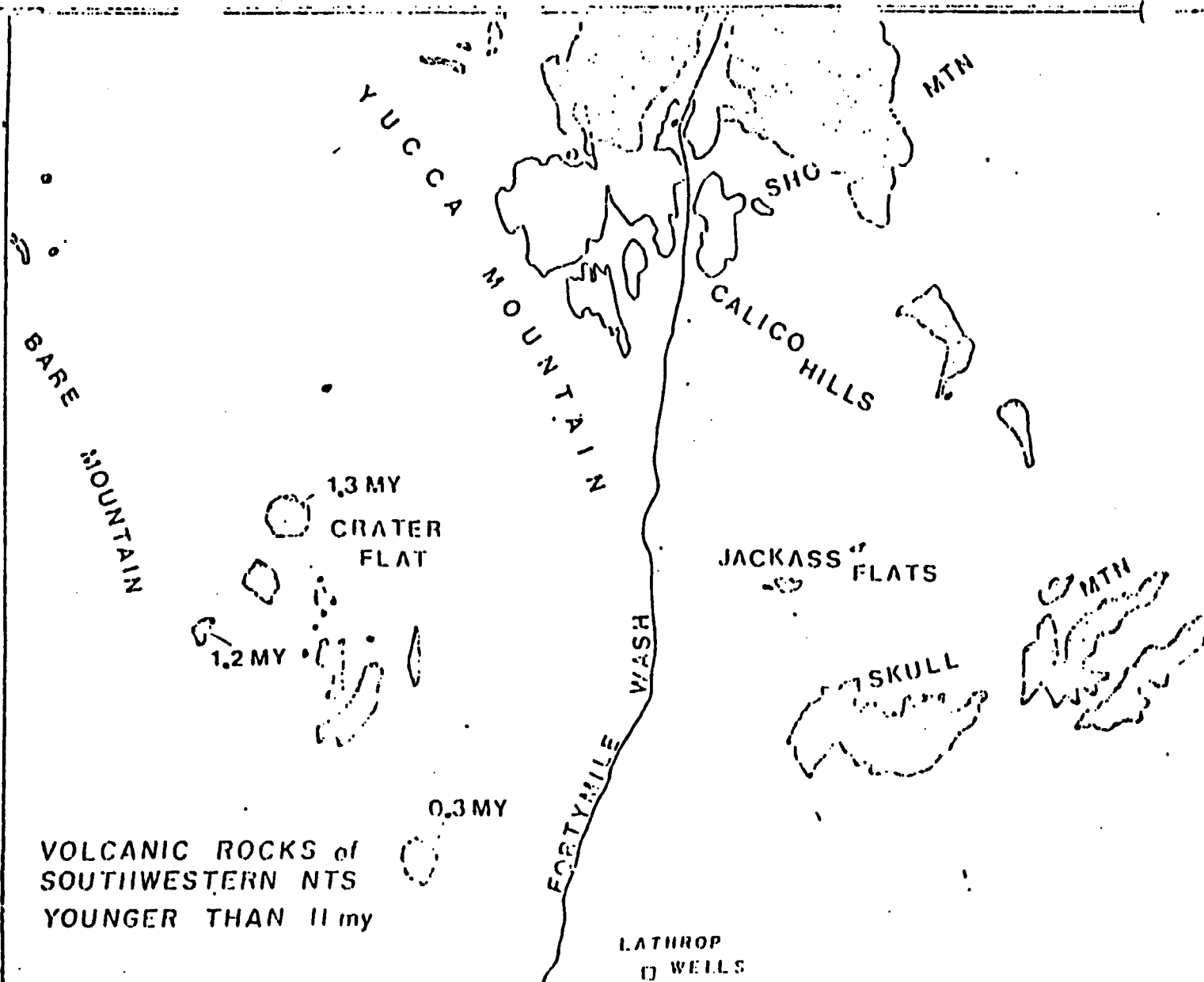
 RHYOLITE AND INTRUSIVES

AFTER STEWART
AND CARLSON

VOLCANIC ROCKS OF THE GREAT BASIN AND ADJACENT AREAS 17 MY-6MY OLD



3/2/79-40 (overlay on #33)



[] BASALTS OF CRATER FLAT

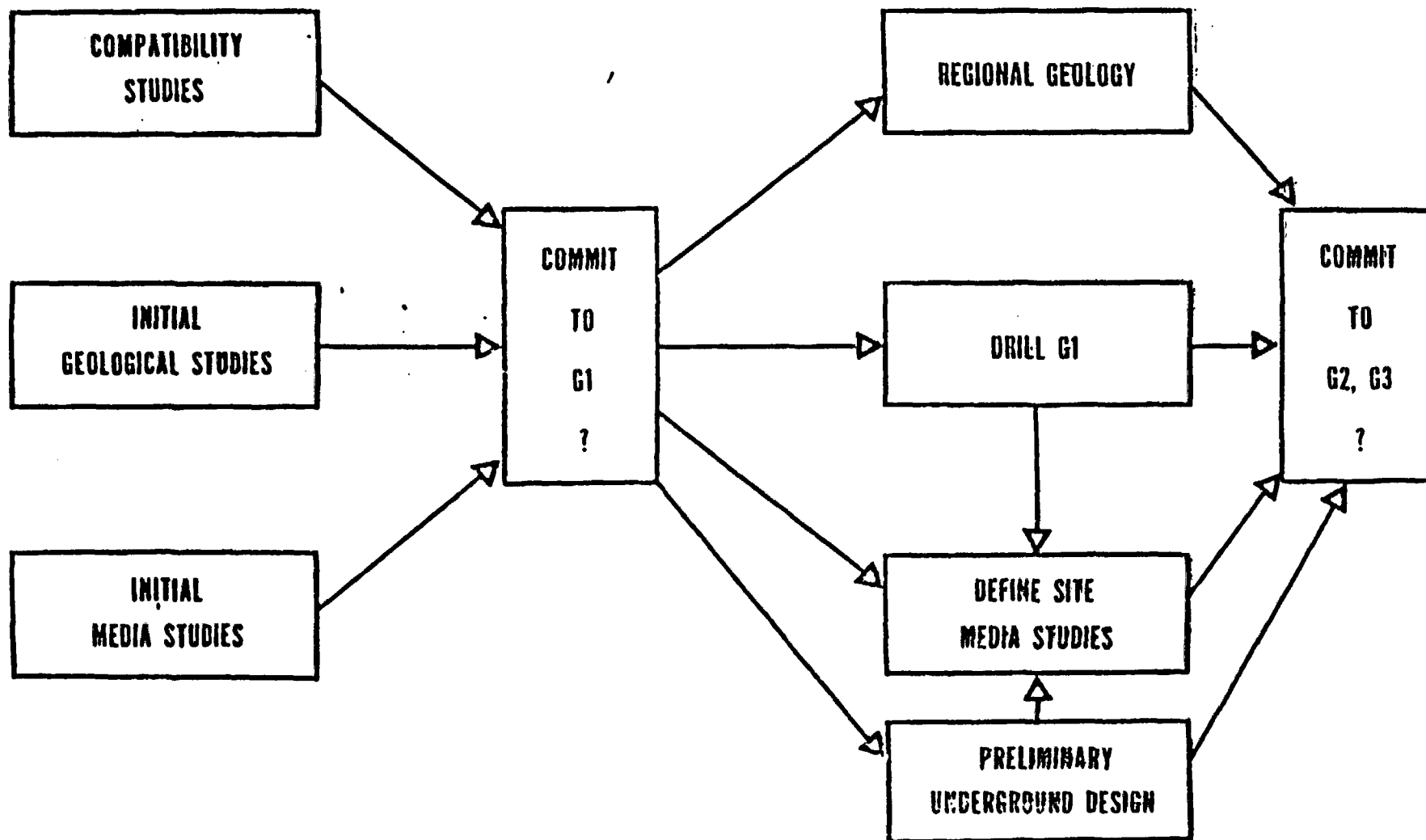
[] THIRSTY CANYON TUFF 1.2 MY

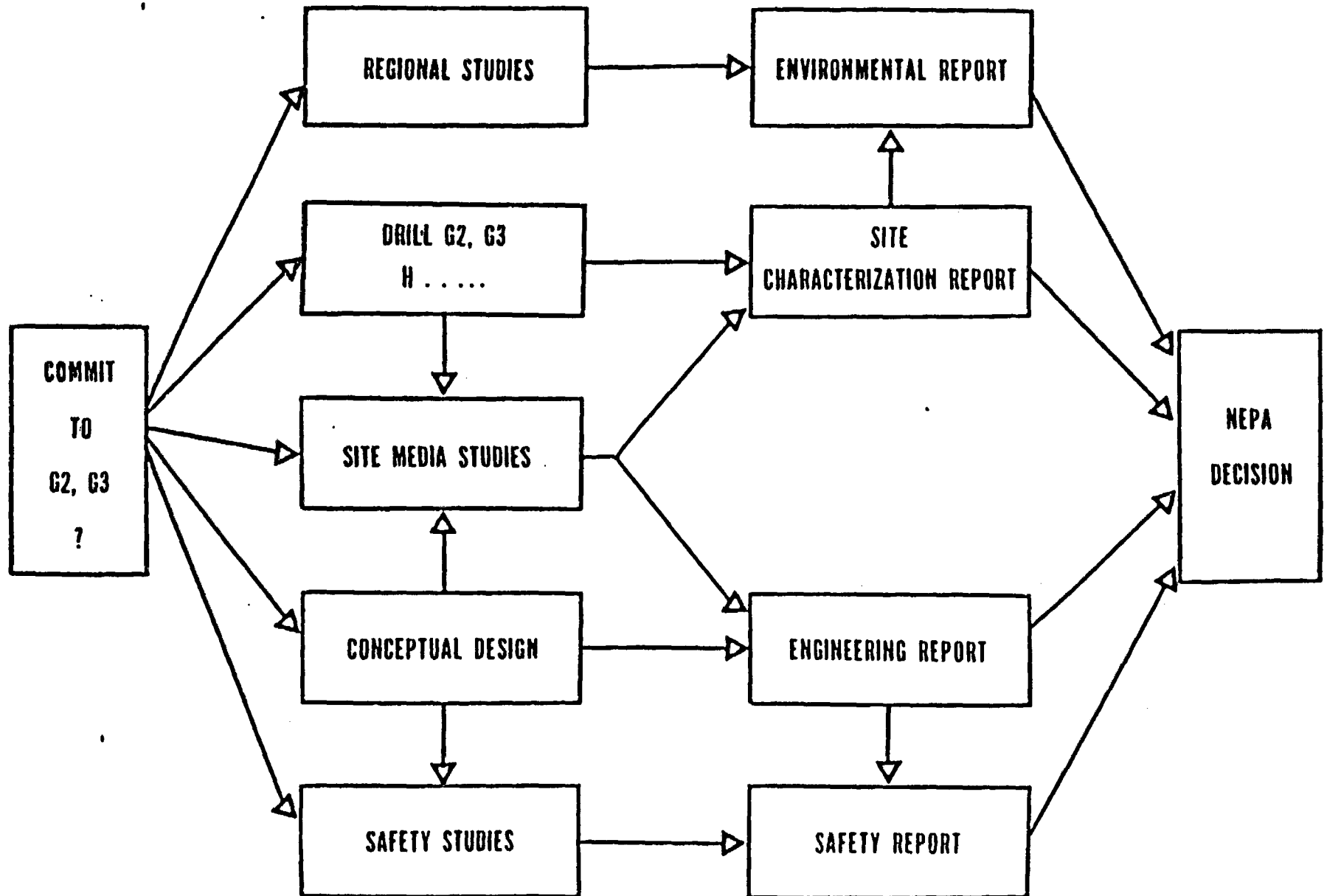
[] RHYOLITES OF BOUNDARY BUTTE AND SHOSHONE MTS

[] BASALTS OF BEATTY WASH, DOME MTH, KIWI MESA AND SKULL MTH 1.3-0.3 MY

[] RHYOLITES OF FORTY MILE CANYON 1.0 MY

PRESENT STATUS (3/30/79)
FOR YUCCA MOUNTAIN
CALICO HILLS
UPPER TOPOPAH WASH
WAHMOHIE STOCK





PRELIMINARY IDENTIFICATIONS

PROJECT BASELINE

PROGRAM ACTIVITIES	FY 1978	FY 1979	FY 1980	FY 1981	FY 1982
1. SEISMIC STUDIES					
• WEAPONS TEST	1	2			
• NATURAL EARTHQUAKES		3, 4	5	6	
2. SITE IDENTIFICATION					
• SYNCLINE RIDGE	7				
• NON-SW MTS AREAS	8				
• CALICO HILLS - TONOPAH WASH	9	10, 11			
• WAHMONIE STOCK		12			
• YUCCA MOUNTAIN	13	14			
• SKULL - LITTLE SKULL MTN., J.A. FLATS		15			
• OFF - IS	16	17, 18, 19			
3. MEDIA STUDIES - GENERIC					
• GRANITE	20	21			
• APSILLITE		22, 23			
• TUFF	24	25, 26	27	28	
4. SPENT FUEL TEST - CLIMAX					
• CONSTRUCTION	29	30			
• TEST			31		

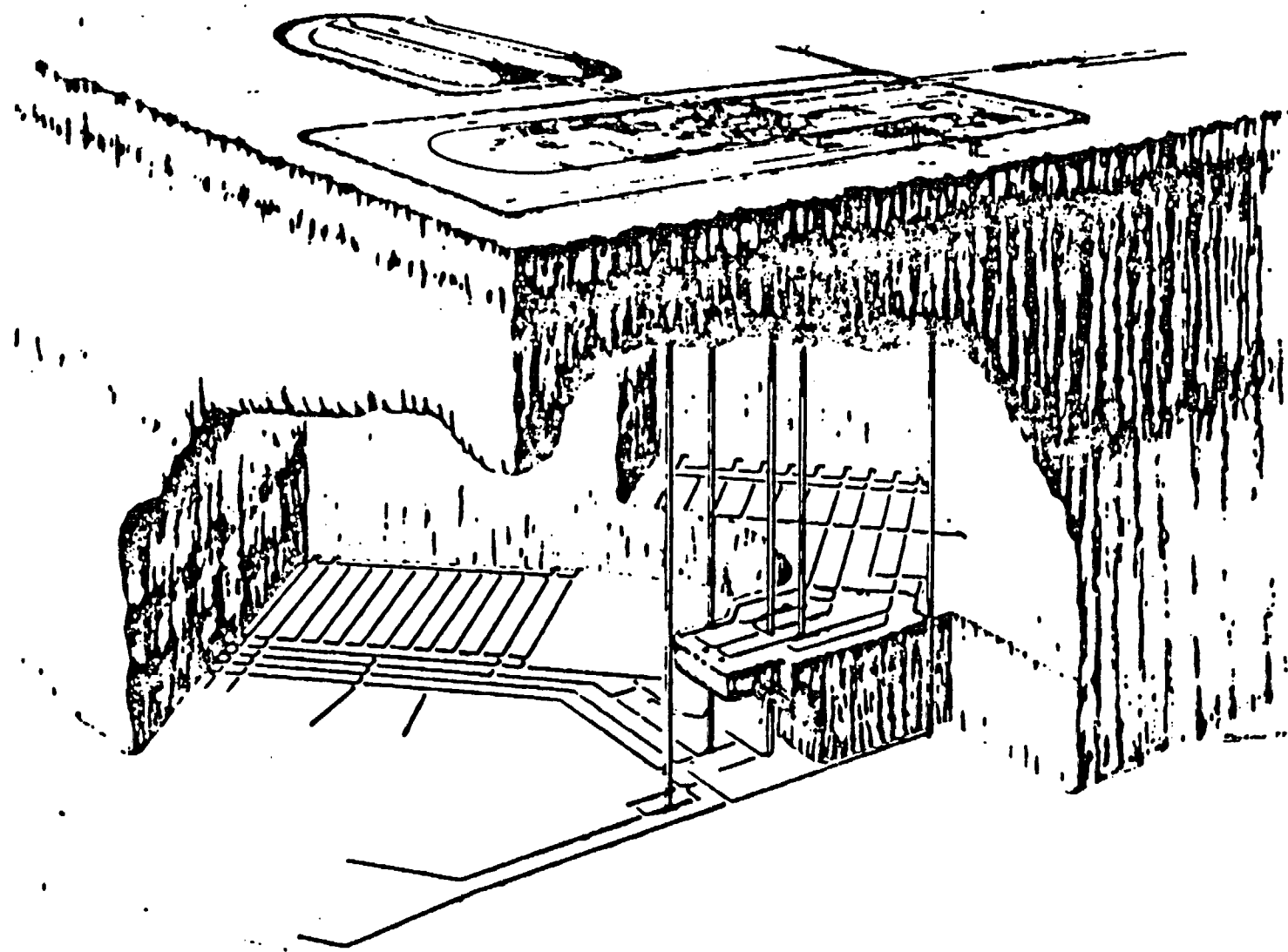
ON-NES OPTIONS -
PRELIMINARY IDENTIFICATIONS
PROJECT BASELINE

PROGRAM ACTIVITIES	1 YEAR	2 YEARS	3 YEARS	4 YEARS	5 YEARS
5. SITE SELECTION & CONFIRMATION					
○ STRATIGRAPHIC DRILLING	37△	33△			
○ HYDROLOGIC DRILLING	31△	35△			
○ MEDIUM VERIFICATION STUDIES			36△		
○ SEISMIC ANALYSIS			32△		
○ ECOLOGICAL STUDIES			38△		
○ PRELIMINARY WISAP STUDIES		39△	40△		
SITE CHARACTERIZATION			41△		

WHAT IS THE WIPP ?

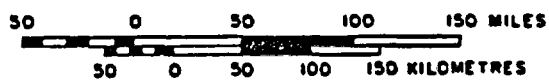
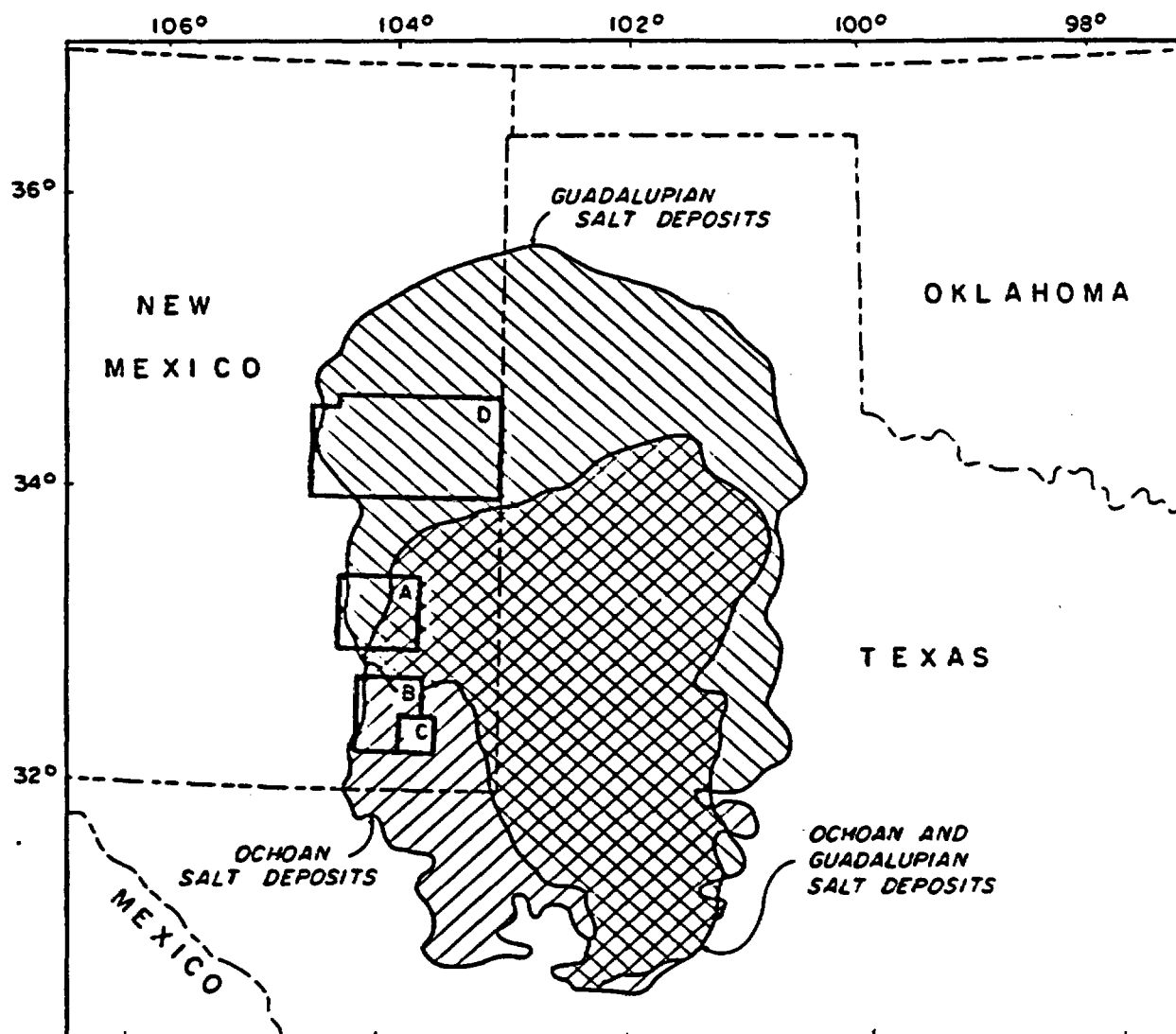
- A DEMONSTRATION OF RADIOACTIVE WASTE DISPOSAL IN BEDDED SALT
(Solid Wastes Mechanically Emplaced in Mined Chambers)
- RADIOACTIVE WASTES ACCOMMODATED :
 - Defense Transuranic - Contact Handling (< 200 mr/hr)
 - Defense Transuranic - Remote Handling (> 200 mr/hr)
 - High Level Waste - For Experiments
 - Spent Fuel (Option) - For Demonstration
- "PILOT PLANT" IMPLIES :
 - Initial Period of Limited Operations
 - Retrievability of all Wastes
 - Decision Required to Commence Full-Scale Disposal Operation

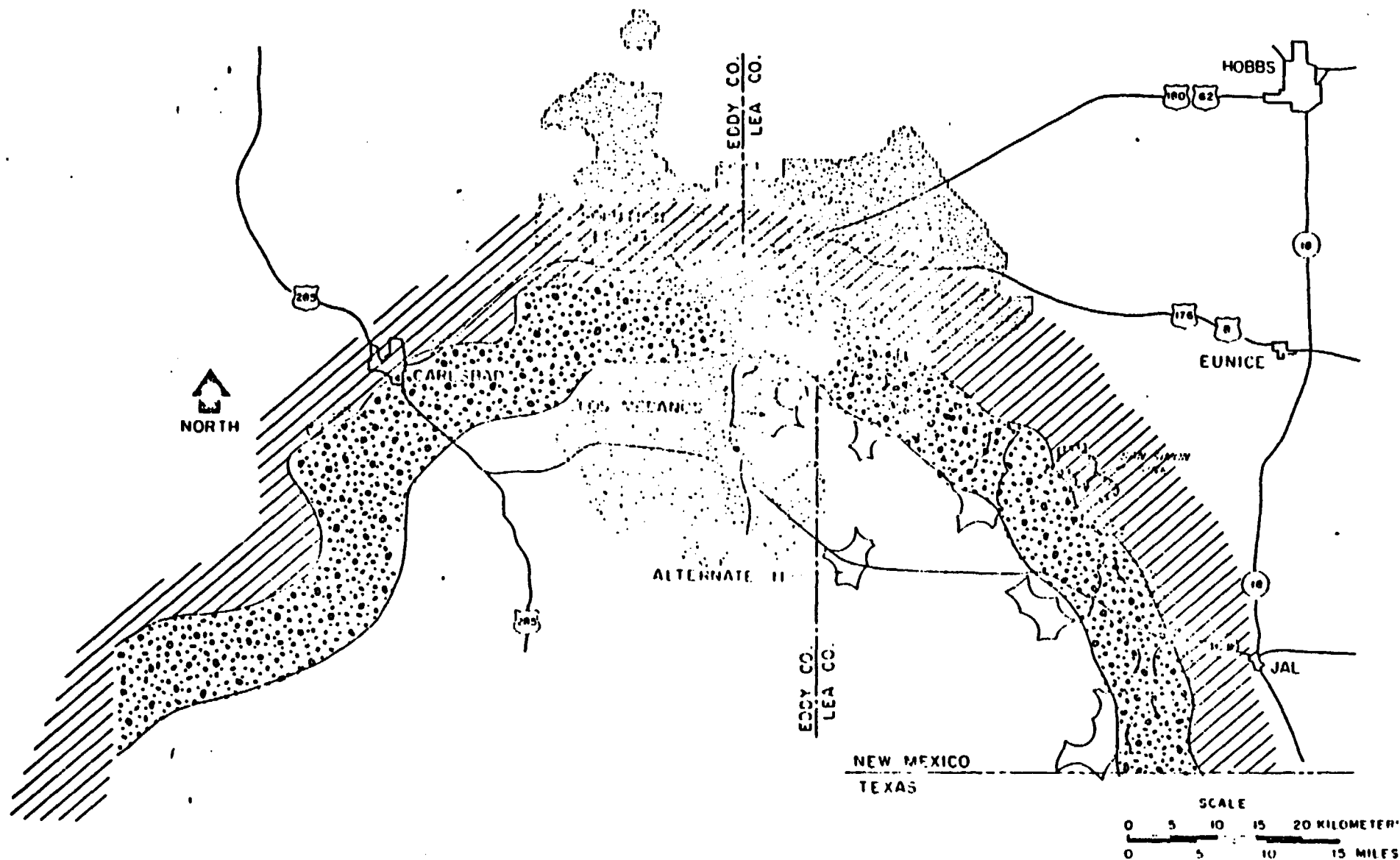




WASTE ISOLATION PILOT PLANT

 Sverdrup Corporation





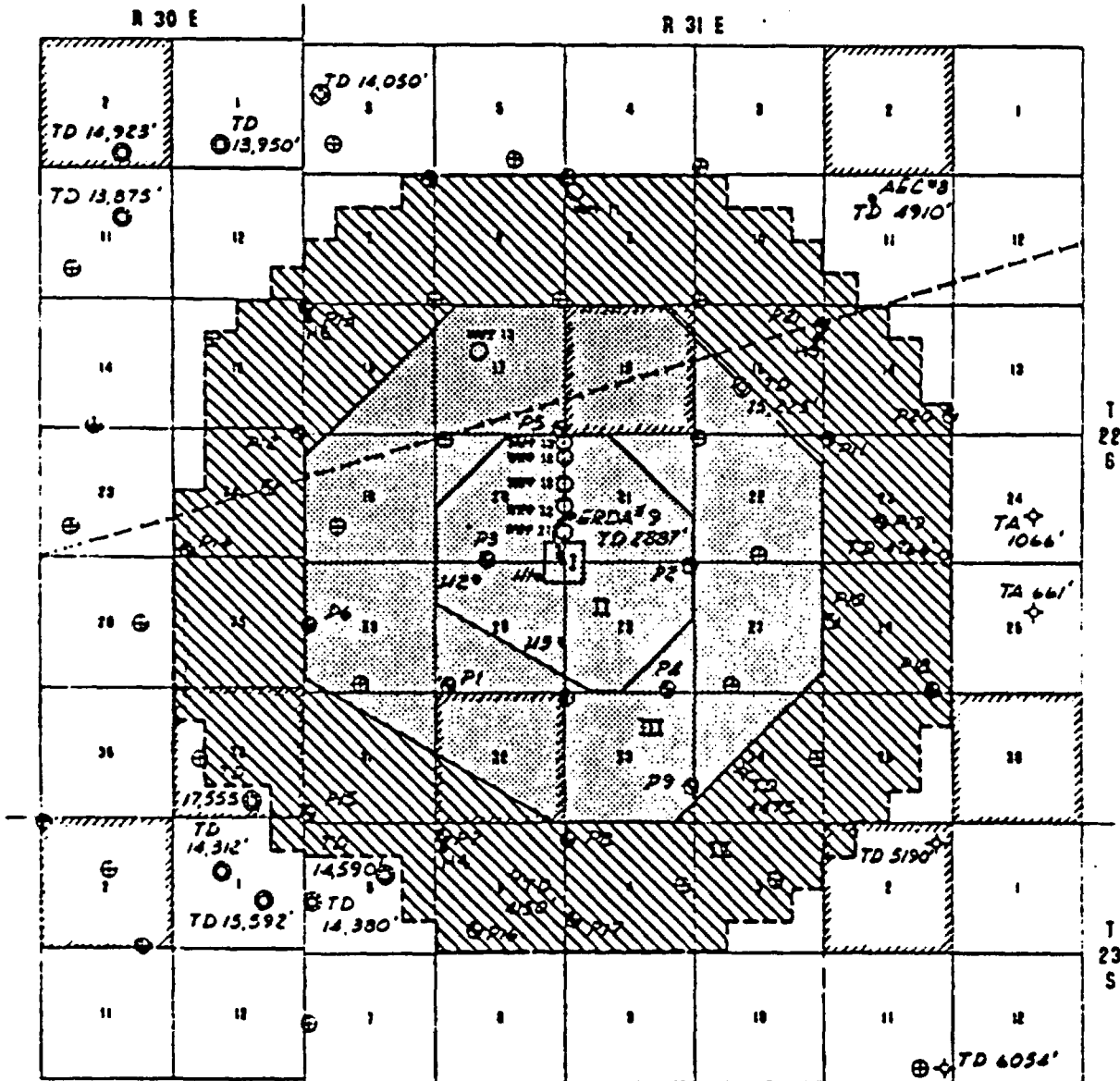
APPLICATION OF THE SITE-SELECTION CRITERIA TO THE DELAWARE BASIN

ARTESIAN BRINE FLOW
 KNOWN POTASH DISTRICT
 SOLUTION FRONT

DEFORMATION FRONT
 CAPITAN REEF FRONT

WIPP DRILL HOLE STATUS

MARCH 1978



LEGEND

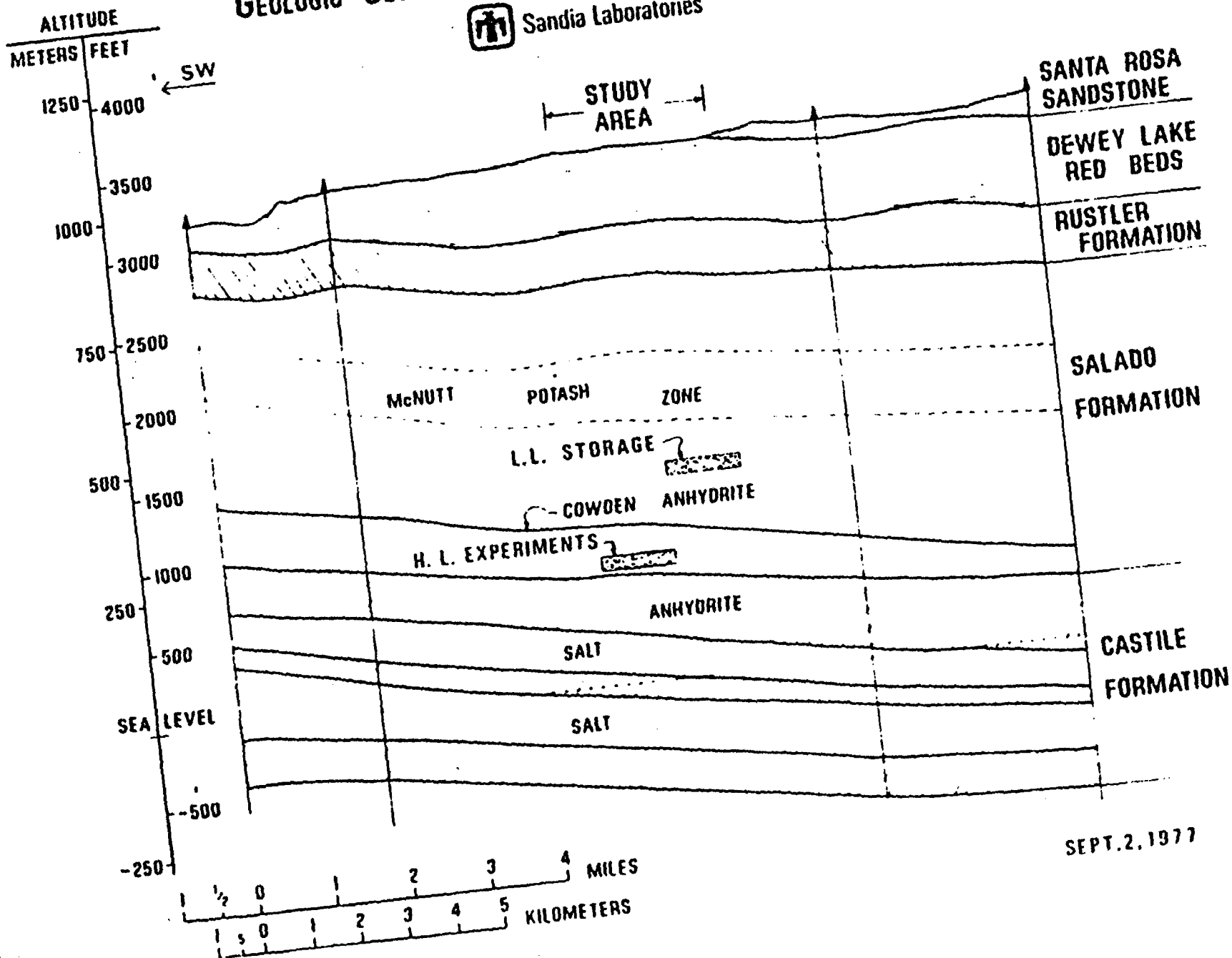
- TD=Total Depth
 TA=Temporarily Abandoned
 ● Deep Producing Gas
 ◆ Abandoned Well
 ⊙ Deep & Abandoned
 ⊕ Potash Drill Holes
 ○ Geological Holes
 • Hydrological Holes
 ⊕ ERDA Potash Drill Holes (P1 - P21)
 ///// State Land
 --- Natural Gas Pipeline
 - - - - Land Withdrawal Boundary

ZONE	AREA
I	58 acres
II	1,880 "
III	8,230 "
IV	10,812 "
TOTAL	18,880 acres

GEOLOGIC SECTION THROUGH THE LOS MEDAÑOS AREA



NE →



SEPT. 2, 1977

WIPP SITE NATURAL RESOURCE RESERVES

	<u>WIPP SITE ZONES I-III</u>	<u>WIPP SITE ZONE IV</u>	<u>USA</u>
POTASH (LANGBEINITE) MILLIONS OF TONS	1.2	3.2	42.4
CRUDE OIL MILLIONS OF BARRELS	NIL	NIL	29,500
NATURAL GAS RESERVES BILLIONS OF CUBIC FEET	23.5	13.4	208,800

NOTE: 1) 313 MILLION TONS SYNTHETIC LANGBEINITE (MOSTLY GREAT SALT LAKE)
2) CURRENT PRICES AND TECHNOLOGY (RESERVES)
3) LANGBEINITE (1600'), OIL (14000'), GAS (14000')

SELECTED REFERENCES

Geology and Salt Deposits of the Salina Basin, by Stone & Webster Engineering Corp., ONWI/SUB E 512-00600/1 (in press)

National Waste Terminal Storage Program, Geologic Evaluation of Gulf Coast Salt Domes, Site Selection Program Plan, by Law Engineering Testing Co., April 19, 1978 (Draft).

Salt Deposits in the United States and Regional Geologic Characteristics Important for Storage of Radioactive Waste, by K. S. Johnson and S. Gonzales Y/OWI/SUB-7414/1 (1978).

Subsurface Geology of a Potential Waste Emplacement Site, Salt Valley Anticline, Grand County, Utah, by R. J. Hite, USGS, Open File Report No. 77-761 (1977).

The Pierre Shale, Northern Great Plains: A Potential Waste Isolation Medium, by G. W. Schurr, USGS, Open File Report 77-776 (1977).

Possibilities for Nuclear Waste Disposal in Michigan Salt Beds, by K. K. Landes and H. L. Bourne, ORNL/SUB-7010/2. 1976.

Evaluation of Permian Salt Deposits in the Texas Panhandle and Western Oklahoma for Underground Storage of Radioactive Wastes, by K. S. Johnson Y/OWI/SUB-4494/1 (1976).

Preliminary Study of the Present and Possible Future Oil and Gas Development of Areas Immediately Surrounding the Interior Salt Domes, Upper Gulf Coast Salt Dome Basins of E. Texas, N. Louisiana, and Mississippi, by Netherland, Sewell & Assoc., ORNL/SUB-75/87988 (1975).

Geologic Appraisal of Paradox Basin Salt Deposits, by R. J. Hite and S. W. Lohman, USGS Open File Report 4339/6 (1973).

NEW YORK AND OHIO PORTION OF SALINA BASIN (STONE & WEBSTER; USGS)

ACCOMPLISHMENTS

FINAL VERSION OF REGIONAL CHARACTERIZATION

COMPLETED PLANS AND SCHEDULES

COMPLETED DRAFT SUMMARY DOCUMENT

REMAINDER OF FY 79

CONTINUE WORK ON HYDROLOGICAL MODEL

COMPLETE REEVALUATION OF STUDY AREAS

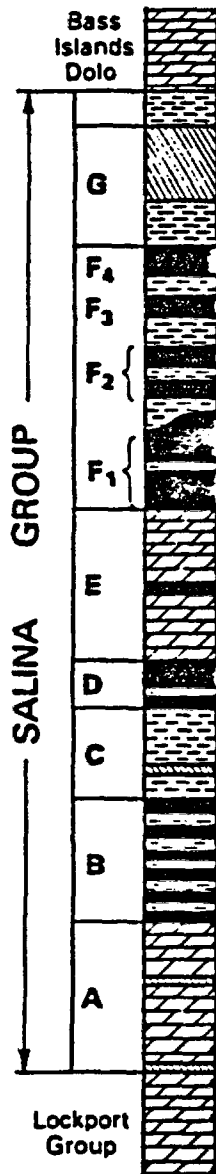
**COMPLETE "DICTIONARY" OF GEOLOGICAL EXPLORATION
TECHNIQUES AND ASSOCIATED TERMINOLOGY**

COMPILE TOPICAL STATUS REPORT ON SALINA BASIN EXPLORATION

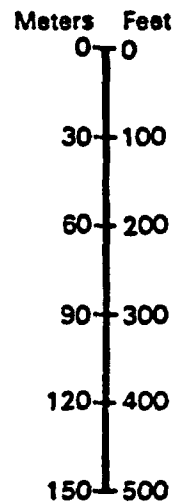
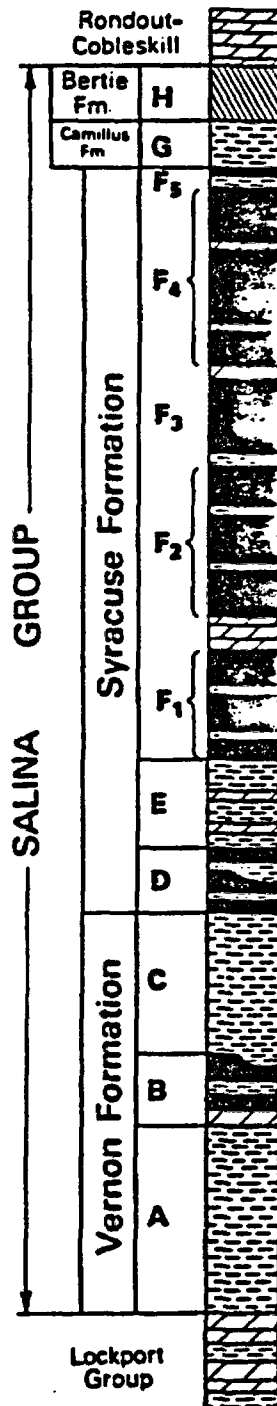
PERIOD	STAGE	WEST	MICHIGAN	EAST	EASTERN OHIO	WESTERN NEW YORK	
DEVONIAN	CHAUTAUQUAN	ANTRIM			OHIO SHALE	CLEVELAND	CONEWANGO
						CHAGRIN	CONNEAUT
	CANADAWAY						
	JAVA						
	WEST FALLS						
	SONYEA						
	GENESSEE						
	SENECAN					LEICESTER PYRITE	TULLY
					ERIAN	TRAVERSE GROUP	MOCCON
	SQUAW BAY					LUCKWILL	
TRAVERSE	SKANEATELES						
ULSTERIAN	BELL	MARCELLUS					
	DUNDEE-ROGERS CITY	ONONDAGA					
	DETROIT RIVER	BOIS BLANC	BOIS BLANC-SPRINGVALE				
	BOIS BLANC	ORISKANY	ORISKANY				
	GARDEN ISLAND	HELDERSBERG	HELDERSBERG				
	BASE ISLANDS	BASE ISLANDS	BERTIE-AERON				
SILURIAN	CAVUCAN	SALINA GROUP	G UNIT	G UNIT	CAMILLUS		
			F UNIT	F UNIT	SYRACUSE		
			E UNIT	D & E UNITS	VERNON		
			D UNIT	C UNIT			
			C UNIT	B UNIT			
			B UNIT	A UNIT			
	WAGARAN	MAGARA GROUP	LOCKPORT	LOCKPORT	LOCKPORT		
			CLINTON	ROCHESTER	ROCHESTER		
			ALEXANDRIAN	CATARACT GROUP	CAROTHEAD	DAYTON	IRONDEQUET
					MANTOUX	U CAROTHEAD	SODUS
	QUEENSTON	ALBION GROUP	U GRIMSBY	THOROLD	GRIMSBY		
			M GRIMSBY	POWER GLEN	WHIRLPOOL		
			L GRIMSBY	QUEENSTON	QUEENSTON		
			6 CAROTHEAD	QUEENSTON	QUEENSTON		
			QUEENSTON	QUEENSTON	QUEENSTON		
			QUEENSTON	QUEENSTON	QUEENSTON		

Generalized columnar sections of Salina Group in northeastern Ohio

NORTHEAST
OHIO



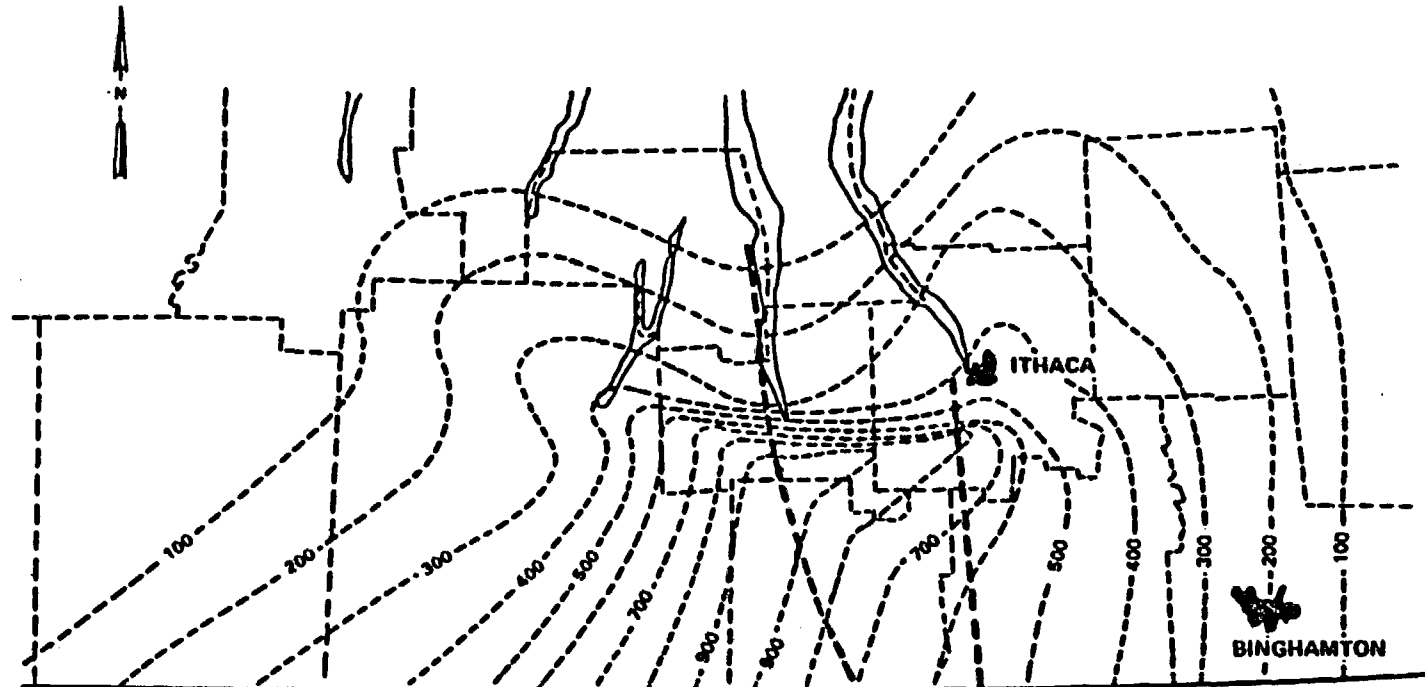
SOUTH-CENTRAL
NEW YORK



*Thickness may in part be due to deformation.

ON/WI
Office of Nuclear Waste Isolation
Battelle

AGGREGATE SALT THICKNESS



LEGEND

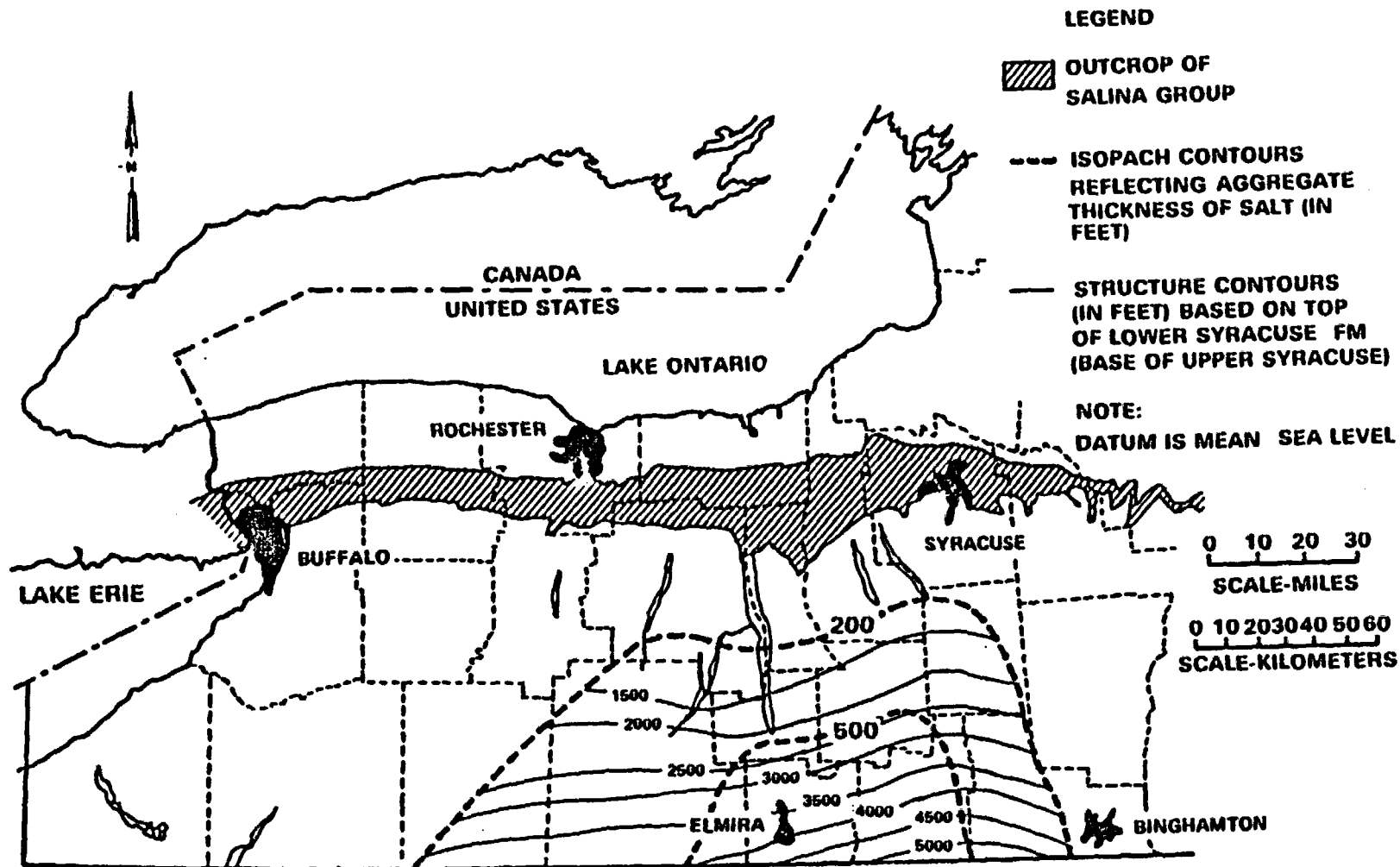
0 5 10 15
SCALE-MILES

0 10 20 30
SCALE-KILOMETERS

- ISOPACH CONTOURS, INTERVAL 100 FEET
- LOCATION OF INFERRED STRIKE-SLIP FAULTS

NOTE: AGGREGATE THICKNESS INCLUDES
ANHYDRITE IN WELLS WHERE
DISTINCTION WAS NOT POSSIBLE

LOCATION OF THE STUDY REGION IN NEW YORK



ONWI
Office of Nuclear Waste Isolation
Battelle