Docket Nos.: 50-275
and 50-323

NOV 14 1984

LICENSEE: Pacific Gas and Electric Company

FACILITY: Diablo Canyon Nuclear Power Plant

SUBJECT: NRC MEETING WITH PG&E - SEISMIC REEVALUATION PROGRAM FOR DIABLO CANYON

A meeting was held on October 4, 1984 in Bethesda, Maryland regarding the reevaluation program of the seismic design basis for the Diablo Canyon Nuclear Power Plant. The program was identified as a license condition in the proposed full-power license amendment for Unit 1 and is discussed in detail SSER-27, Sections I.5 and IV.5. (Note: the full power license was since issued on November 2, 1984). The program is to include the following four specific elements: geology and tectonics, earthquake magnitude, ground motion, and probabilistic/deterministic analyses. Pacific Gas and Electric Company (PG&E) is to submit a program plan by the end of January 1985. The purpose of the meeting was to address the overall PG&E program (plan, schedule, organization, staffing) and the first element, geology and tectonics. Participants at the meeting were the NRC staff, D. Slemmons and members of the U.S. Geological Survey (USGS) as advisors to the staff, and PG&E staff with their consultants. A complete list of attendees is attached as Enclosure 1.

Introductory remarks were made by D. Brand, Vice President for Engineering, PG&E, and S. Brocoum, Leader of the Geology Section of Geosciences Branch, NRC. The NRC presented a brief description of its parallel program in the area of geology and tectonics (Enclosure 2). The Geosciences Branch is presently engaged in preparing contracts with the USGS and D. Slemmons. Contract preparation and agreement are expected to be completed by January 1984.

W. White, PG&E, described the PG&E organization that will carry out the seismic reevaluation program based on the requirements of the license condition. Enclosure 3 presents the PG&E view graphs that illustrate the program organization and division of effort in a preliminary and general way.

D. Hamilton, geology consultant for PG&E, described the proposed review and investigation program. The geologic program consists of five tasks: (1) identification and evaluation of post-1978 site and regional data; (2) evaluation of tectonic model; (3) review of seismic source parameters; (4) review of source to site geology and transmission path characteristics; and (5) support of parallel activities in related areas of the long-term seismic program. Details of each task are presented in the PG&E viewgraphs in Enclosure 4.

12. The three mile zone immediately offshore is notably lacking in data. Efforts should be made to obtain data in this area;

13. The responsibility for the development of the program and its execution lies with PG&E and as such PG&E should not rely on the staff or others to identify every area that requires study.

At the conclusion of the meeting it was agreed that the second meeting should be held on November 15 and 16, 1984 to address license condition element 2, earthquake magnitude, and element 3, ground motion. The third meeting, concerning probabilistic/deterministic analyses, will be held during the second or third week of December, 1984.

D. Slemmons provided his comments on the PG&E program in a letter to S. Brocoum (Enclosure 5).

Hans Schierling, Project Manager
Licensing Branch No. 3
Division of Licensing

Enclosures:
1. Attendance List
2. NRC Comments
3. PG&E Programmatic Information
4. PG&E Viewgraphs for Geologic Review and Investigation
5. Letter D. Slemmons to S. Brocoum, October 21, 1984

cc: See next page

DL:LB#3 DL:LB#3
HSchierling/yt GWKnighton
11/14/84 11/14/84

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

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As part of the PG&E presentation, R. Willlingham, geophysicist with Ogle Petroleum Company, described the types of seismic reflection and well data that are available in the offshore region from Diablo Canyon.

After a caucus by the NRC staff and its advisors, S. Brocoum made the following comments to PG&E as the opinion of the NRC Geosciences Branch and its advisors based on the PG&E presentation:

1. PG&E has made a commendable effort in its planning to respond to the license condition and the NRC staff is impressed by the quality of the program;

2. PG&E has approriately identified and defined the data bases and is preparing a program to utilize these data bases;

3. PG&E's use of panels of experts to plan and monitor the effort is a good approach;

4. PG&E should place more emphasis on the way that will resolve the issue of gaining an understanding of the tectonic framework of the part of California in which the site is located, including the characteristics of the transition from a dominantly thrust tectonic regime south of the site to a dominantly strike-slip regime north of the site;

5. PG&E needs to discuss how the data will be used that were described in the presentation in order to develop an understanding of the tectonics in the site area and onshore, northeast of the site;

6. PG&E needs to determine how thrust faults directly beneath the site will be identified and defined, or how the absence of such features will be demonstrated, and what data will be used to accomplish this;

7. The presentation emphasized the various types of data that will be used. An additional step is necessary to correlate the types of data to be obtained with the outstanding issues and show how they are to be resolved with the data;

8. The evaluation of the offshore faults should include studies and consideration of onshore faults;

9. The importance of studying associated folds to learn about faults that do not break the sea floor or ground surface should be strongly emphasized;

10. Available techniques, such as 3 dimensional logs of boreholes and bore hole breakouts, should be used to estimate the state of stress;

11. Segmentation of the faults in the Diablo Canyon region as it relates to earthquake potential should be evaluated;

12. The three mile zone immediately offshore is notably lacking in data. Efforts should be made to obtain data in this area;

13. The responsibility for the development of the program and its execution lies with PG&E and as such PG&E should not rely on the staff or others to identify every area that requires study.

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Hans Schierling

Hans Schierling, Project Manager
Licensing Branch No. 3
Division of Licensing

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2. NRC Comments
3. PG&E Programmatic Information
4. PG&E Viewgraphs for Geologic Review and Investigation
5. Letter D. Slemmons to S. Brocoum, October 21, 1984

cc: See next page

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and Geology
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Enclosure 1

Attendance List

NRC / PG&E 10/4/84 Encl. 1

Name	Organization
Hans Schierling	NRC Licensing
Stephen Brocoum	NRC GSB Branch
Len Reiter	NRC GSB
Robert L. Rothman	NRC GSB.
* Burt Slemmons	NRC consultant
Lawrence J. Chandler	NRC - OELD
Dick McMullen	NRC - GSB
Barclay Low	DCP - Licensing
Dick Willingham	Ogle Petroleum Inc.
Doug Hamilton	ESA
D. A. Brady	~~PG&E~~
W.H. White	Bechtel
Peter F. Mason	Bechtel
Bimal Sarkar	DCP - Civil
Larry Wight	TERA
Frank Brady	PG&E
R.V. Bettinger	PG and E
Phil West	SCE
Howard Friend	Bechtel
Bruce Norton	Norton, Burke, Berry & French, P.C.
Richard F. Locke	PG and E
John B. Hoch	PGFE
H. Gene Hawkins	SCE
L. Ona	NRC OPE
* [illegible] Tagamets	USGS
* David M. Perkins	US Geological Survey

Encl. 2

Enclosure 2

NRC Comments

NRC GEOLOGY AND TECTONIC STRUCTURE

DIABLO CANYON

SEISMIC LICENSE CONDITION ELEMENTS 1 AND 2

I. STATUS: WE ARE PREPARING CONTRACTS WITH OUR ADVISORS THE U. S. GEOLOGICAL SURVEY, AND DR. DAVID B. SLEMMONS. WE EXPECT THESE CONTRACTS TO BE IN PLACE BY 1 JANUARY, 1985

II. NRC GEOLOGIC AND TECTONIC PROGRAM

A. THE NRC HAS THE OVERALL RESPONSIBILITY. THE USGS AND DR. SLEMMONS WILL EACH BE INVOLVED IN ALL ASPECTS OF ELEMENTS 1 AND 2 STUDIES, BUT WITH DIFFERENT LEVELS OF RESPONSIBILITIES THAT ARE PRESENTLY BEING DEFINED. USGS EXPERTISE WILL BE USED IN GEOLOGY, OFFSHORE GEOPHYSICS AND TECTONICS, AND DR. SLEMMON'S EXPERTISE WILL BE UTILIZED IN FAULT CHARACTERISTICS AND NEOTECTONICS

B. ANTICIPATED ACTIVITIES

1. REVIEW AND ASSESS PG&E INVESTIGATION PROGRAM AND DEVELOP THE NRC PROGRAM.
2. IDENTIFY, COLLECT AND ANALYZE GEOLOGICAL, GEOPHYSICAL AND SEISMOLOGICAL DATA
3. REVIEW THE RESULTS OF THE PG&E PROGRAM
4. SYNTHESIZE ALL DATA AND FORMULATE CONCLUSIONS ON NEOTECTONICS FAULT CHARACTERISTICS AND EARTHQUAKE POTENTIAL

C. ELEMENTS 3 AND 4 (GROUND MOTION & PROBABILSITIC STUDIES) WILL BE DISCUSSED AT NEXT MEETINGS.

III. ESTIMATED LEVEL OF EFFORT OVER AN APPROXIMATELY 42 MONTH PERIOD

A. NRC - 1 TO 2 STAFF YEARS/YEAR

B. USGS - 1 TO 2 STAFF YEARS/YEAR

C. DR. SLEMMONS - 1/2 TO 3/4 STAFF YEARS/YEAR

Enclosure 3

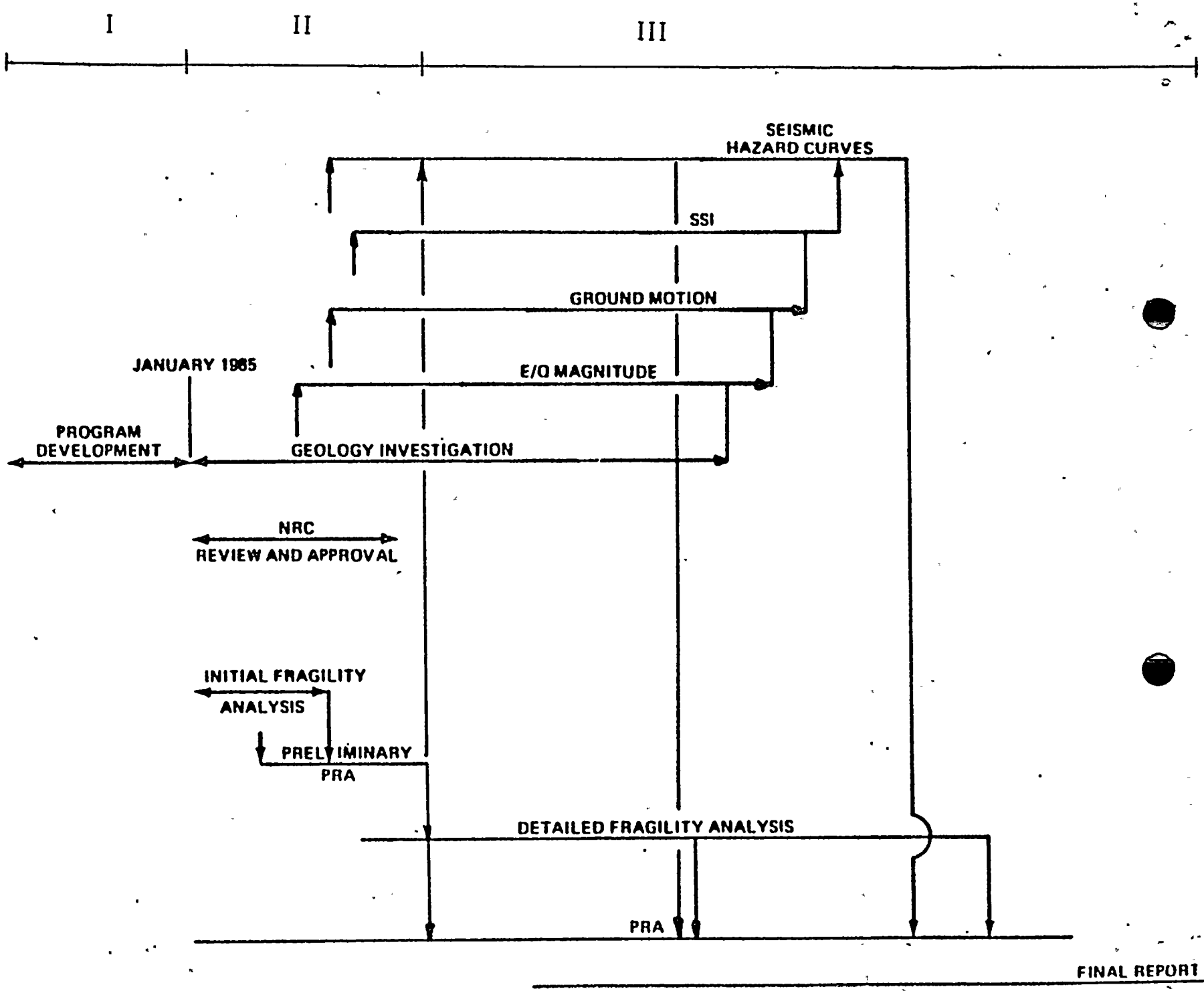
Encl. 3

PG&E Overview

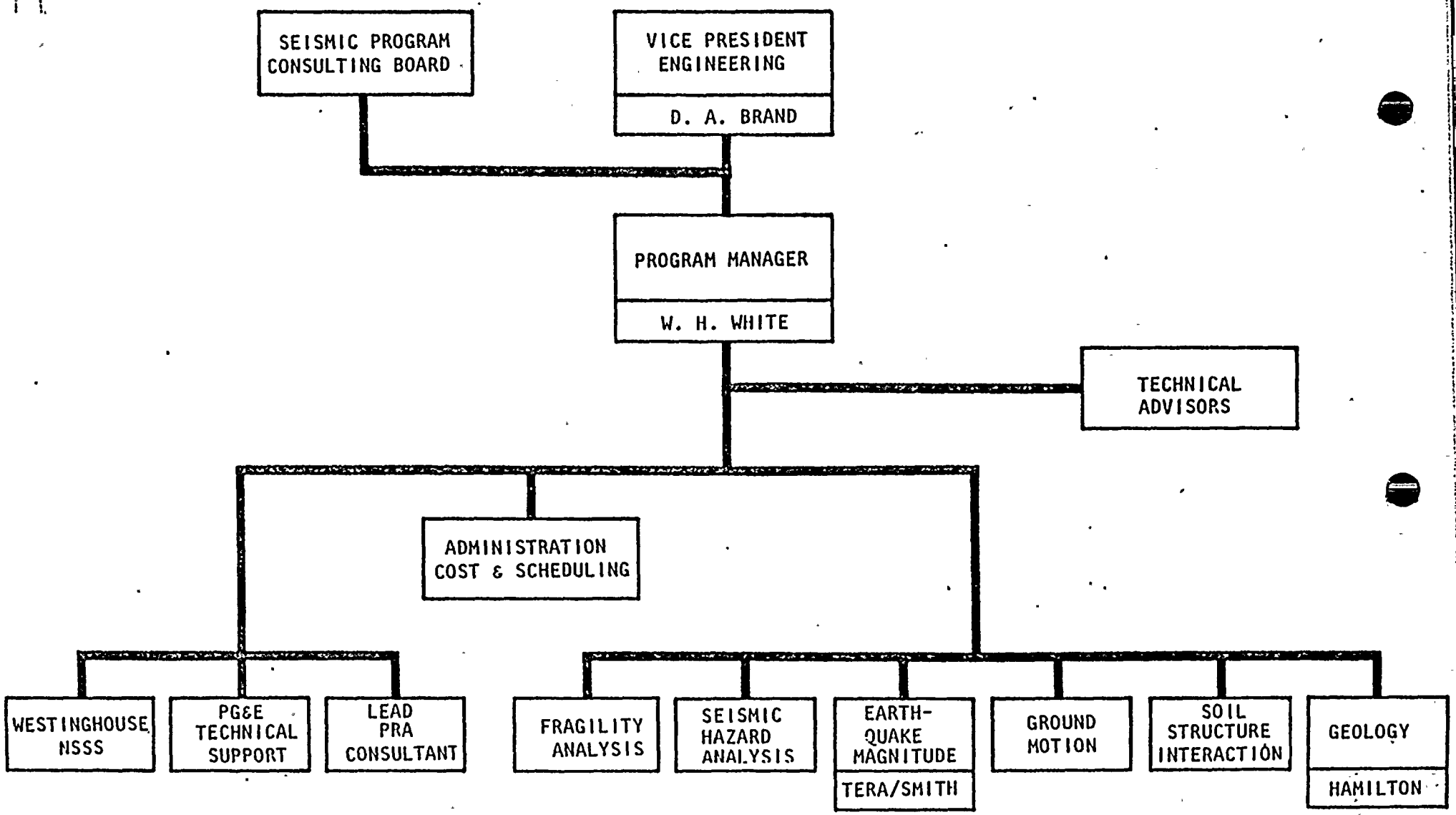
PGandE's
LONG TERM SEISMIC PROGRAM
FOR DIABLO CANYON

October 4, 1984
Phillips Building, Bethesda, MD

	Item	Speaker
1.	Introductions	H. Schierling (NRC) D. Brand (PGandE)
2.	Program Organization	W. H. White (Program Manager)
3.	Geological Investigations	D. Hamilton (Earth Science Associates)


I
II
III
SEISMIC HAZARD CURVES
SSI
GROUND MOTION
E/Q MAGNITUDE
JANUARY 1985
PROGRAM DEVELOPMENT
GEOLOGY INVESTIGATION
NRC
REVIEW AND APPROVAL
INITIAL FRAGILITY
ANALYSIS
PRELIMINARY
PRA
DETAILED FRAGILITY ANALYSIS
PRA
FINAL REPORT

DIABLO CANYON
LONG TERM SEISMIC PROGRAM
PROPOSED ORGANIZATION



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DIABLO CANYON

LONG TERM SEISMIC PROGRAM

SEISMIC PROGRAM CONSULTING BOARD	SPECIALTY QUALIFICATION
ALLIN CORNELL	PROBABILITY AND RISK ASSESSMENT
THOMAS LEPS	SEISMIC SAFETY EVALUATION OF CRITICAL FACILITIES
BRUCE BOLT	SEISMOLOGIST
CLARENCE ALLEN	TECTONOPHYSICIST
COLE McCLURE	GEOLOGIST
H. BOLTON SEED	SOIL STRUCTURE INTERACTION

DIABLO CANYON

LONG TERM SEISMIC PROGRAM

TECHNICAL ADVISORS - GEOLOGY

CLARENCE ALLEN

RICHARD HOLT

COLE McCLURE

Encl. 4

Enclosure 4

PG&E Viewgraphs

PRELIMINARY

PACIFIC GAS AND ELECTRIC COMPANY
DIABLO CANYON UNITS 1 & 2
LONG TERM SEISMIC PROGRAM

PROGRAM FOR GEOLOGIC REVIEW AND INVESTIGATION

Task 1: Identification and evaluation of post-1978 site and regional data

a. Identify, examine, and evaluate relevant offshore and onshore post-1978 geologic and geophysical data, information, and interpretations; acquire data as necessary.

b. Process the geophysical data in (a) above as necessary by application of appropriate state-of-the-art techniques.

c. Evaluate adequacy of current data for delineation and characterization of faults and other features of interest.

d. Obtain new data if necessary.

e. Review surface mapping and subsurface characterization of geology, especially tectonic features.

1. Site.

2. Local area.

3. Region of the Santa Maria Basin.

4. San Gregorio-Hosgri fault trend (including surface traces and down-dip configuration of faults along the trend).

Task 2: Evaluation of Tectonic Model

a. Assess data relating to regional tectonics, including fault orientations, style of faulting, complexity of faulting, rate of deformation, epicentral locations and focal mechanisms of earthquakes, geodetic data, and apparent relationship to plate boundaries and interplate motion.

b. Evaluate tectonic stress regime.

c. Review identification and characterization of potential seismic sources.

Task 3: Review of Seismic Source Parameters

a. Review best estimates, and assessments of uncertainty, associated with significant characteristics of faults:

1. Total length.

2. Segmentation/Continuity.

3. Orientation/Geometry.

4. Sense of slip.

5. Rate and pattern of late Quaternary (including contemporary geodetic) deformation.

6. Correlation with earthquake epicenters and foci.

b. Review current understanding of relationships between tectonic features and characteristics, and earthquake generation.

Task 4: Review of source to site geology and transmission path characteristics

a. Geologic structure along transmission path, taking alternative tectonic models into account.

b. Geophysical properties of the crust between source and site.

Task 5: Support of parallel activities in related areas of the long-term seismic program.

PRELIMINARY

LIST OF ILLUSTRATIONS

PRELIMINARY

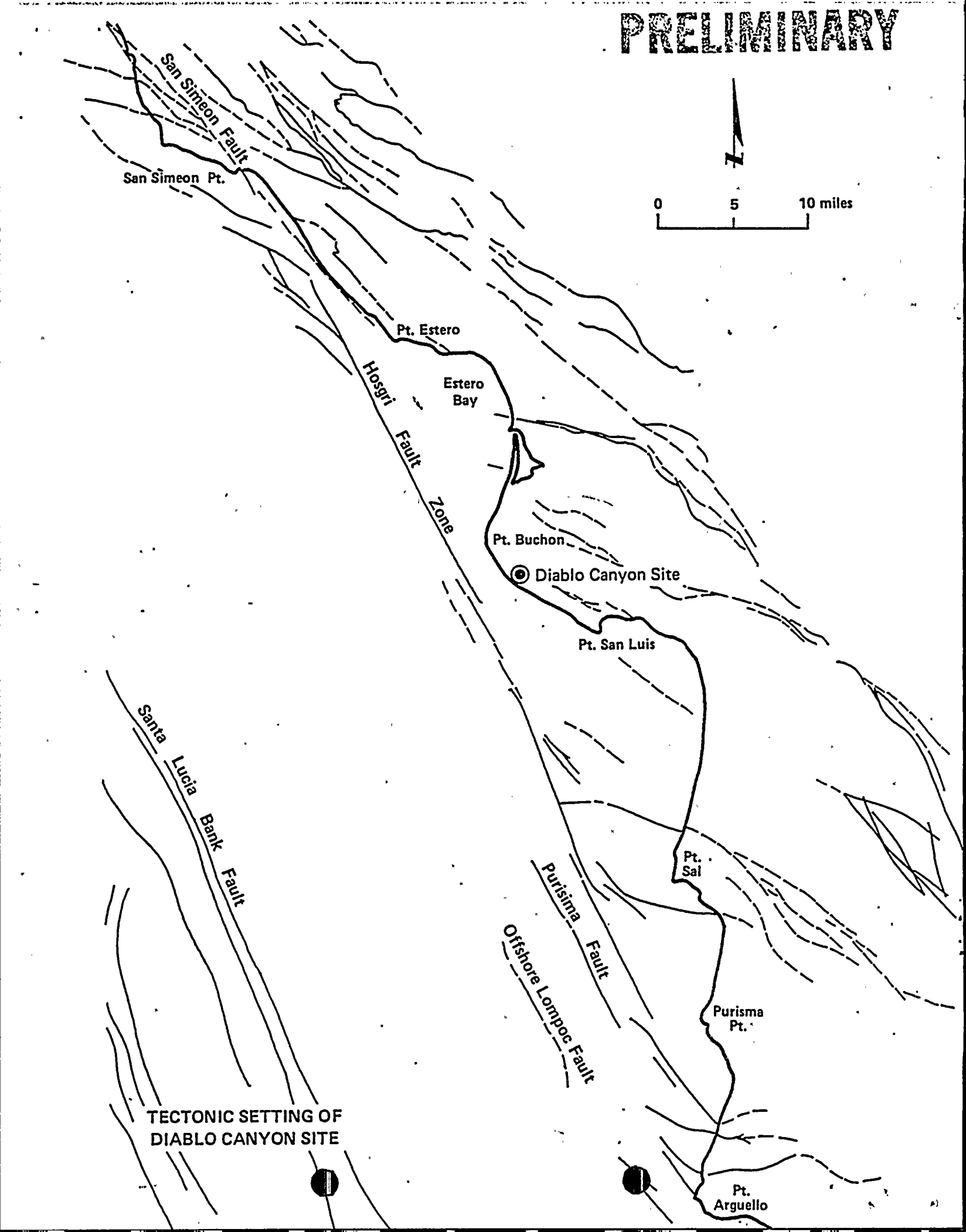
LIST OF ILLUSTRATIONS (Concluded)

PRELIMINARY

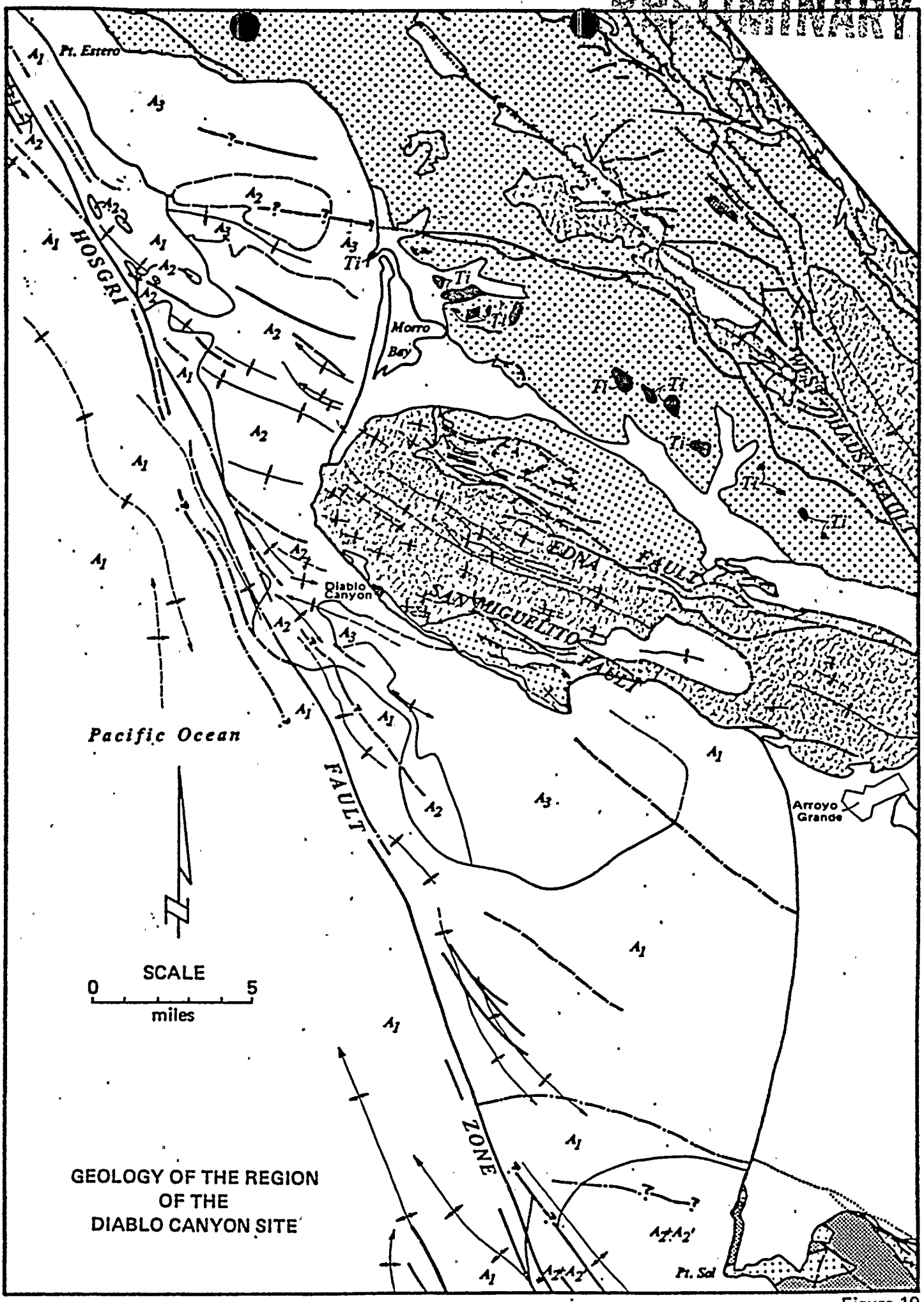
DIABLO CANYON UNITS 1 AND 2

LICENSE CONDITION NO. 1

"PG&E shall identify, examine, and evaluate all relevant geologic and seismic data, information and interpretations that have become available since the 1979 ASLB hearing in order to update the geology, seismology and tectonics in the region of the Diablo Canyon Plant. If needed to define the earthquake potential of the region as it affects Diablo Canyon Plant, PG&E will also re-evaluate the earlier information and acquire additional new data."



TECTONIC SETTING OF DIABLO CANYON SITE



GEOLOGY OF THE REGION OF THE DIABLO CANYON SITE

Figure 19

PRELIMINARY

Pacific Gas and Electric Company

Diablo Canyon Units 1 & 2
Long Term Seismic Program

Program for Geologic Review and Investigation

Task 1 — Identification and evaluation of post-1978 site and regional data

Task 2 — Evaluation of Tectonic Model

Task 3 — Review of Seismic Source Parameters

Task 4 — Review of source to site geology and transmission path characteristics

Task 5 — Support of parallel activities in related areas of the long-term seismic program

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Pacific Gas and Electric Company

Diablo Canyon Units 1 & 2
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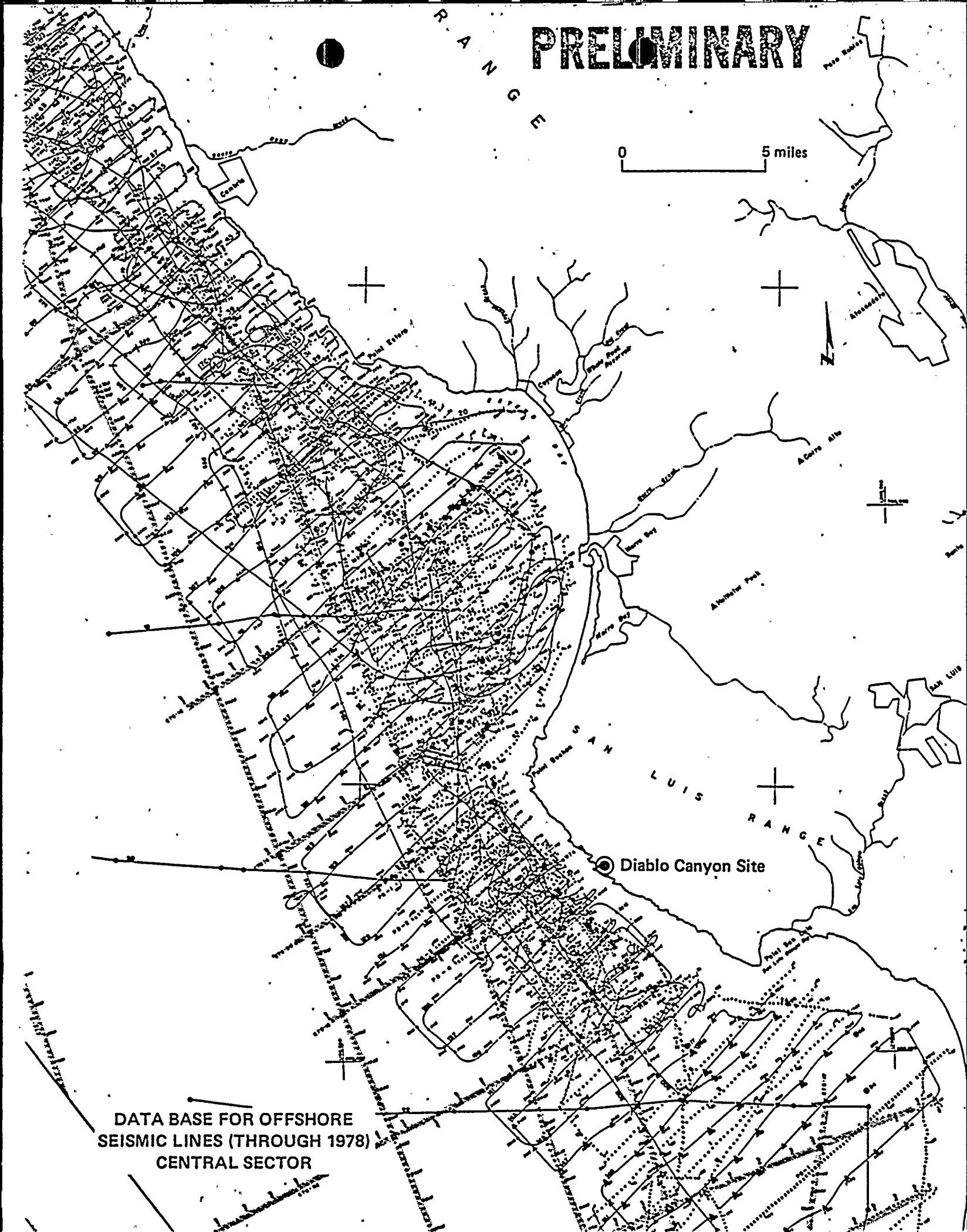
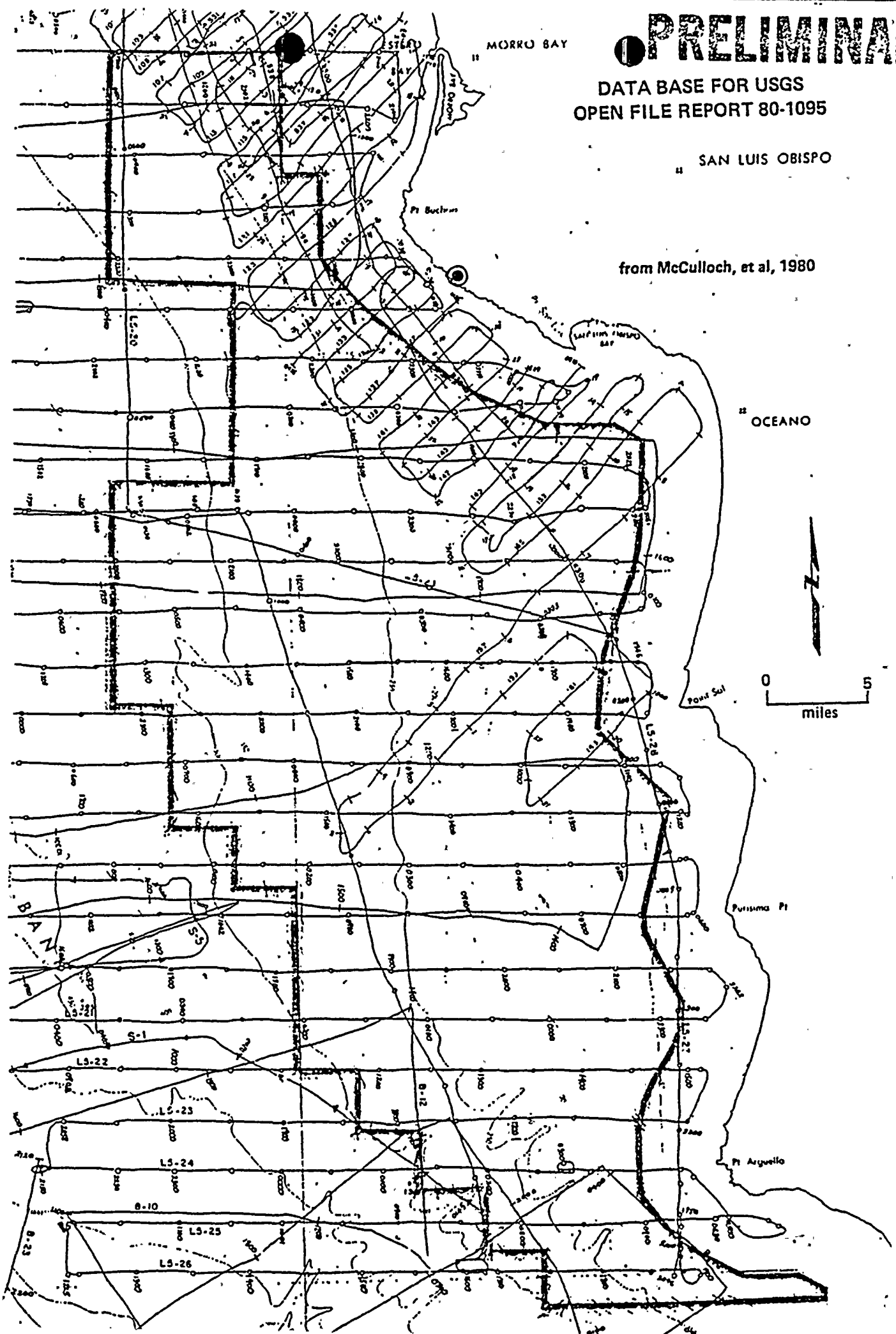

PRELIMINARY
0
5 miles
RANGE
SAN LUIS RANGE
Diablo Canyon Site
DATA BASE FOR OFFSHORE
SEISMIC LINES (THROUGH 1978)
CENTRAL SECTOR


PRELIMINARY
DATA BASE FOR USGS
OPEN FILE REPORT 80-1095
MORRO BAY
SAN LUIS OBISPO
OCEANO
Pt Buchon
Pt Sal
Purisima Pt
Pt Arguello
from McCulloch, et al, 1980
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5
miles
LS-20
LS-21
LS-22
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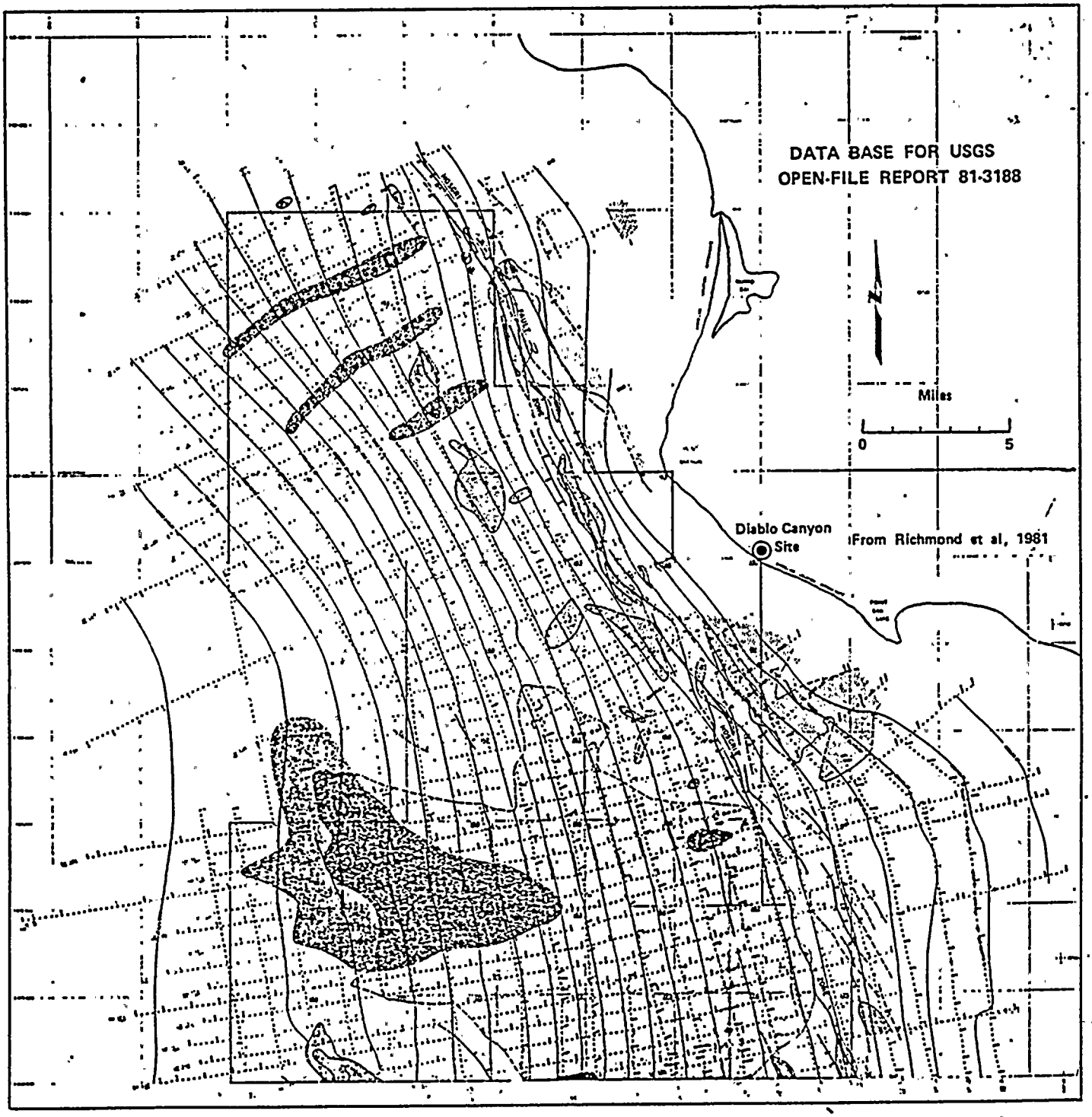
PRELIMINARY



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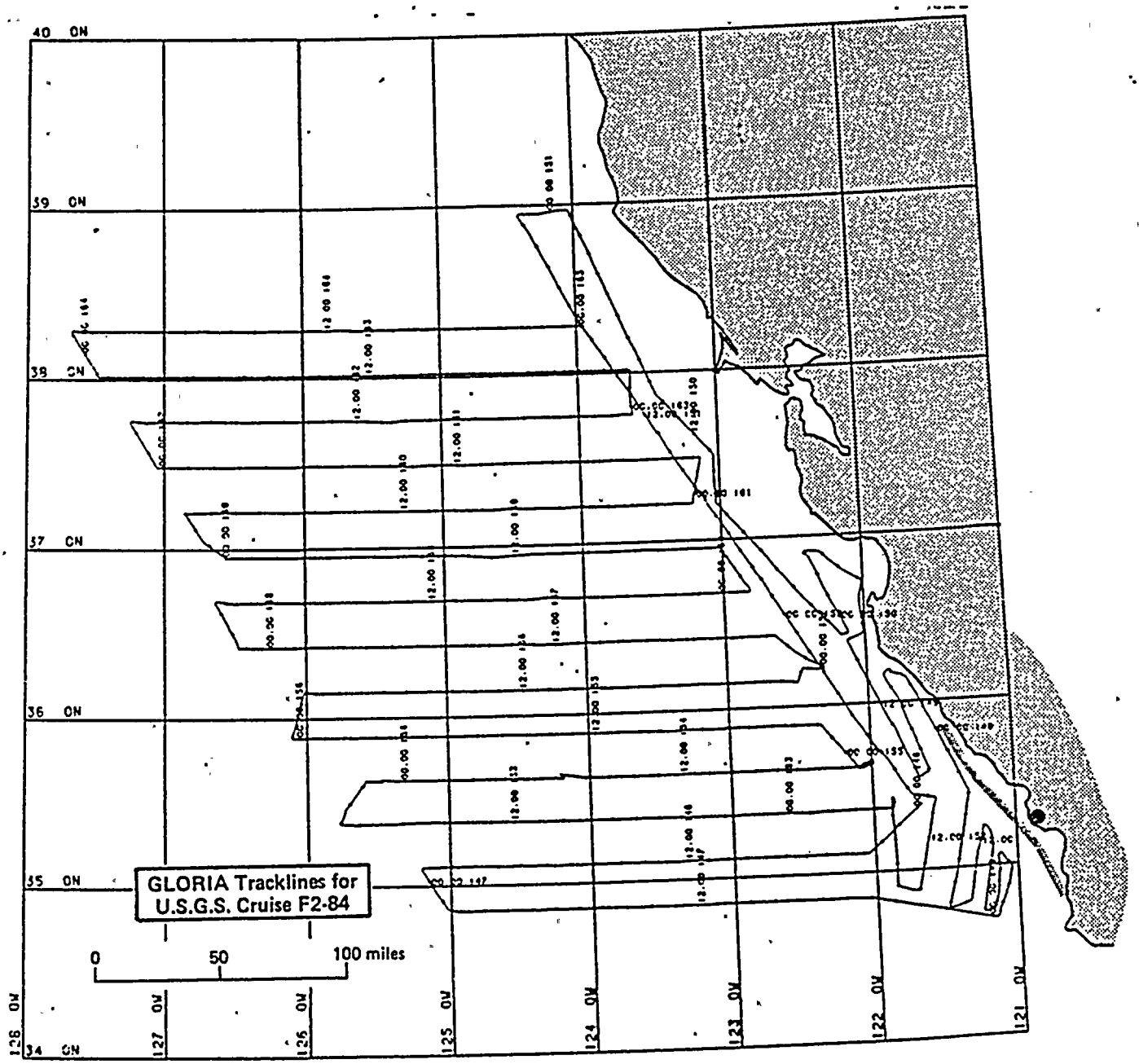
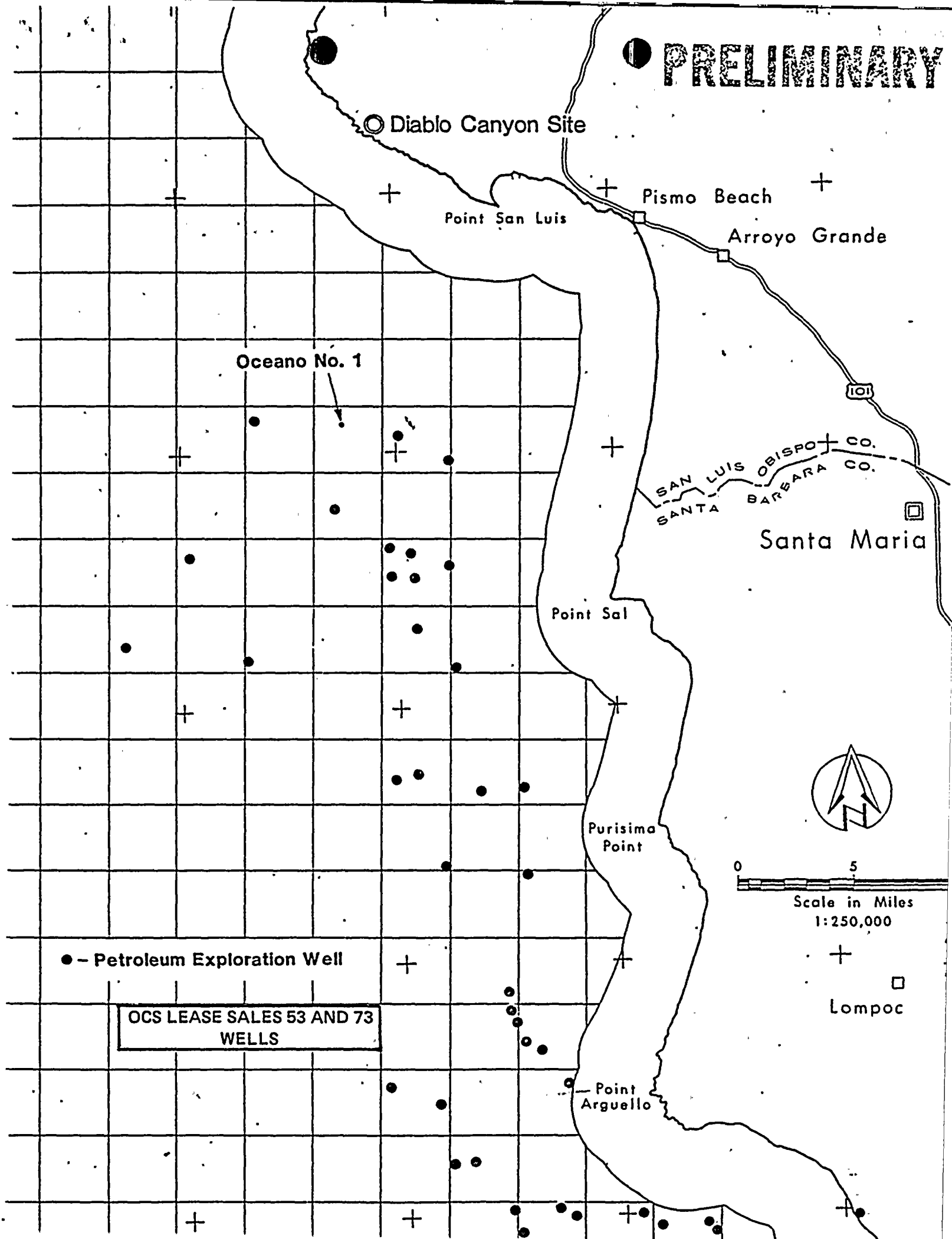
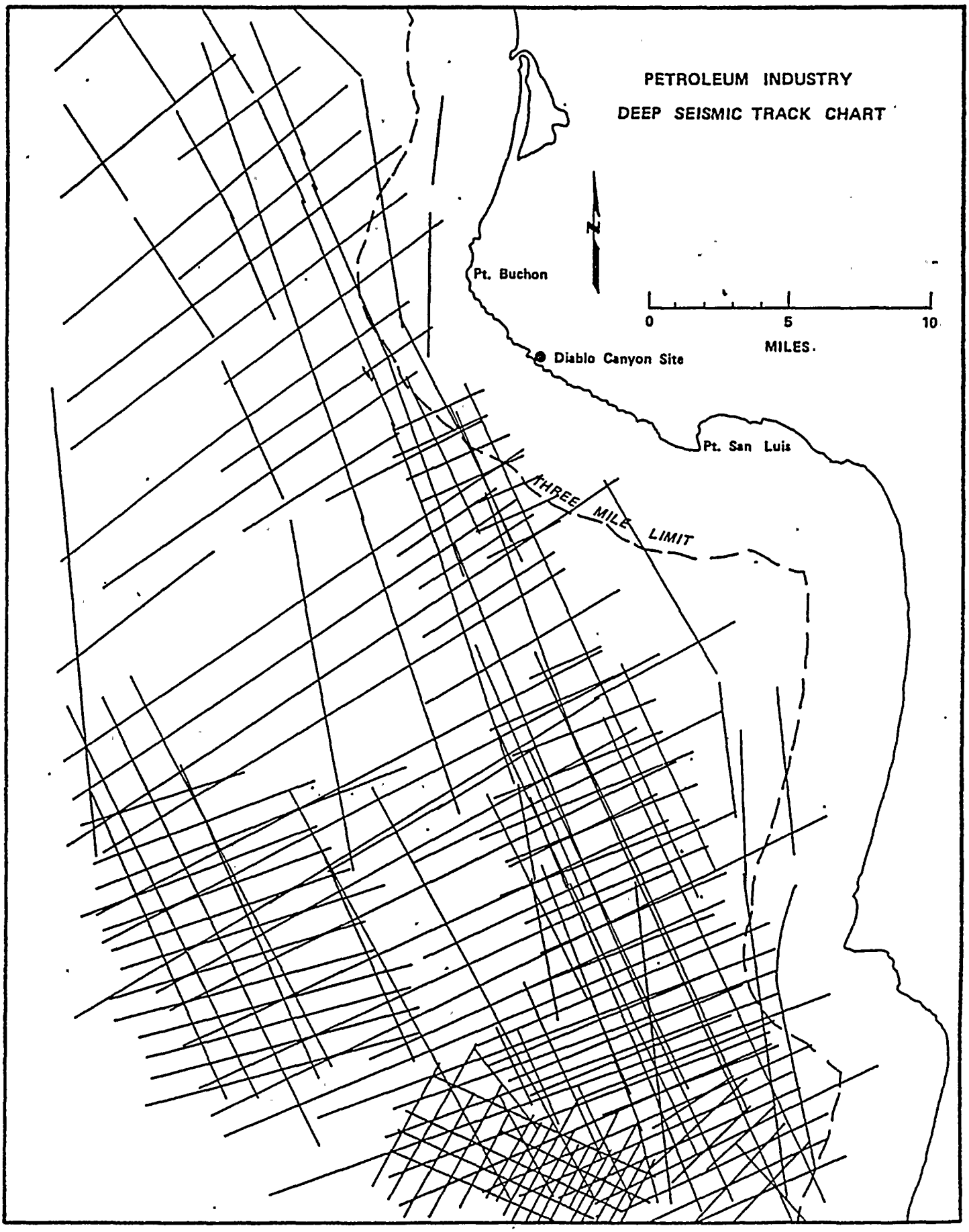
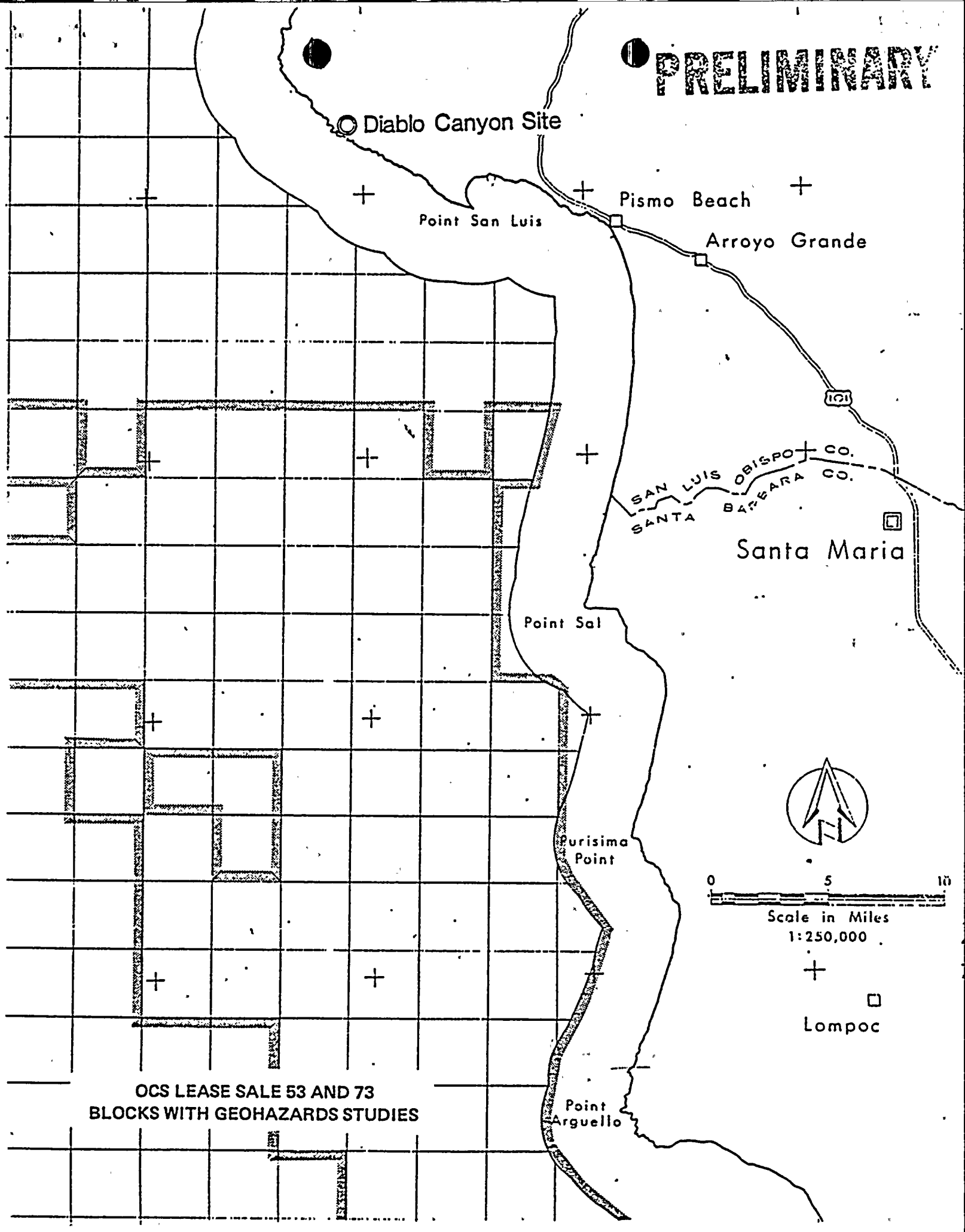



PRELIMINARY
Diablo Canyon Site
Point San Luis
Pismo Beach
Arroyo Grande
Oceano No. 1
101
SAN LUIS OBISPO CO.
SANTA BARBARA CO.
Santa Maria
Point Sal
Purisima Point
0
5
Scale in Miles
1:250,000
● – Petroleum Exploration Well
OCS LEASE SALES 53 AND 73 WELLS
Lompoc
Point Arguello

PRELIMINARY



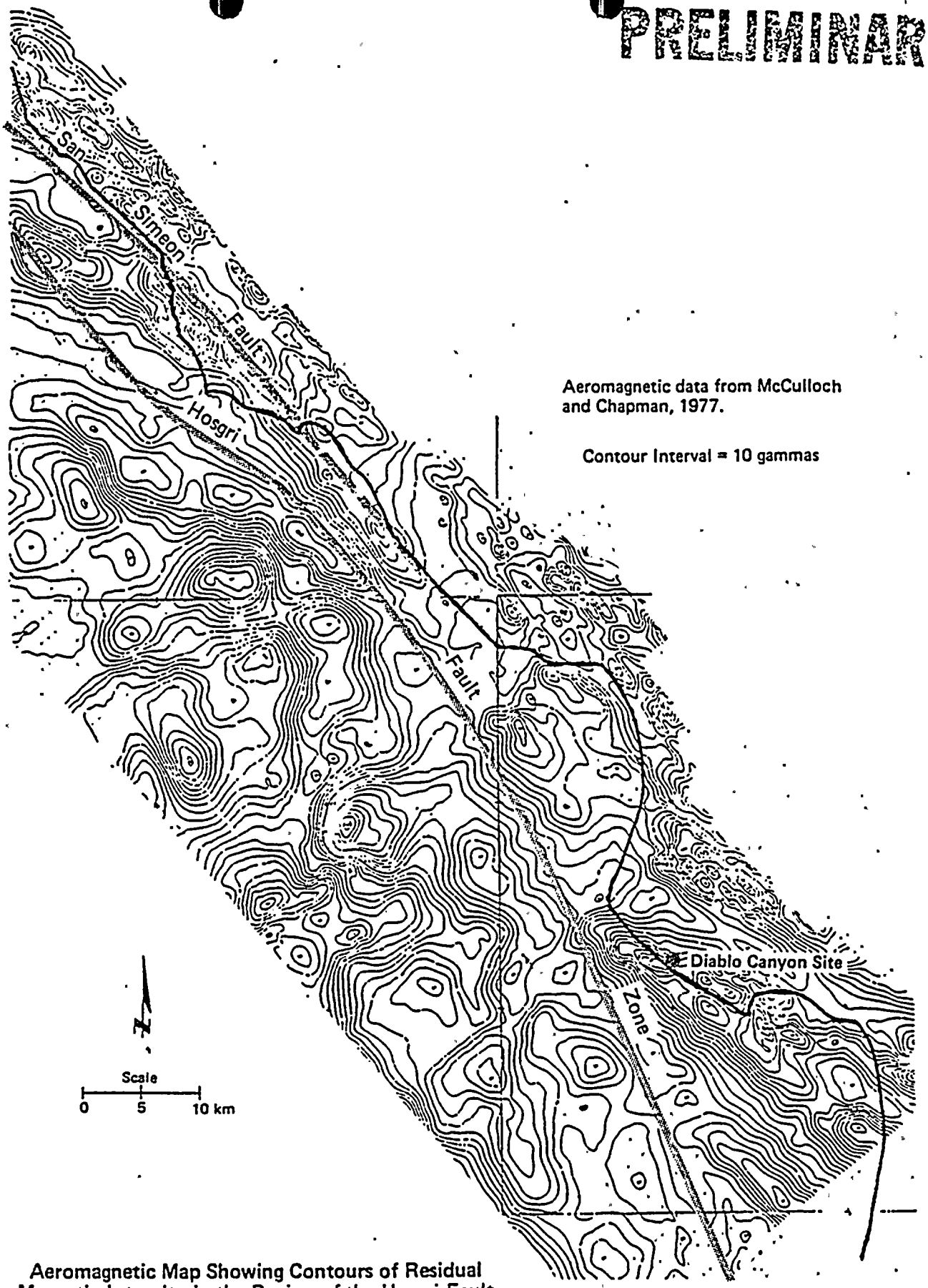

PRELIMINARY
Diablo Canyon Site
Point San Luis
Pismo Beach
Arroyo Grande
101
SAN LUIS OBISPO CO.
SANTA BARBARA CO.
Santa Maria
Point Sal
Purisima Point
0 5 10
Scale in Miles
1:250,000
Lompoc
Point Arguello
OCS LEASE SALE 53 AND 73
BLOCKS WITH GEOHAZARDS STUDIES

PRELIMINARY

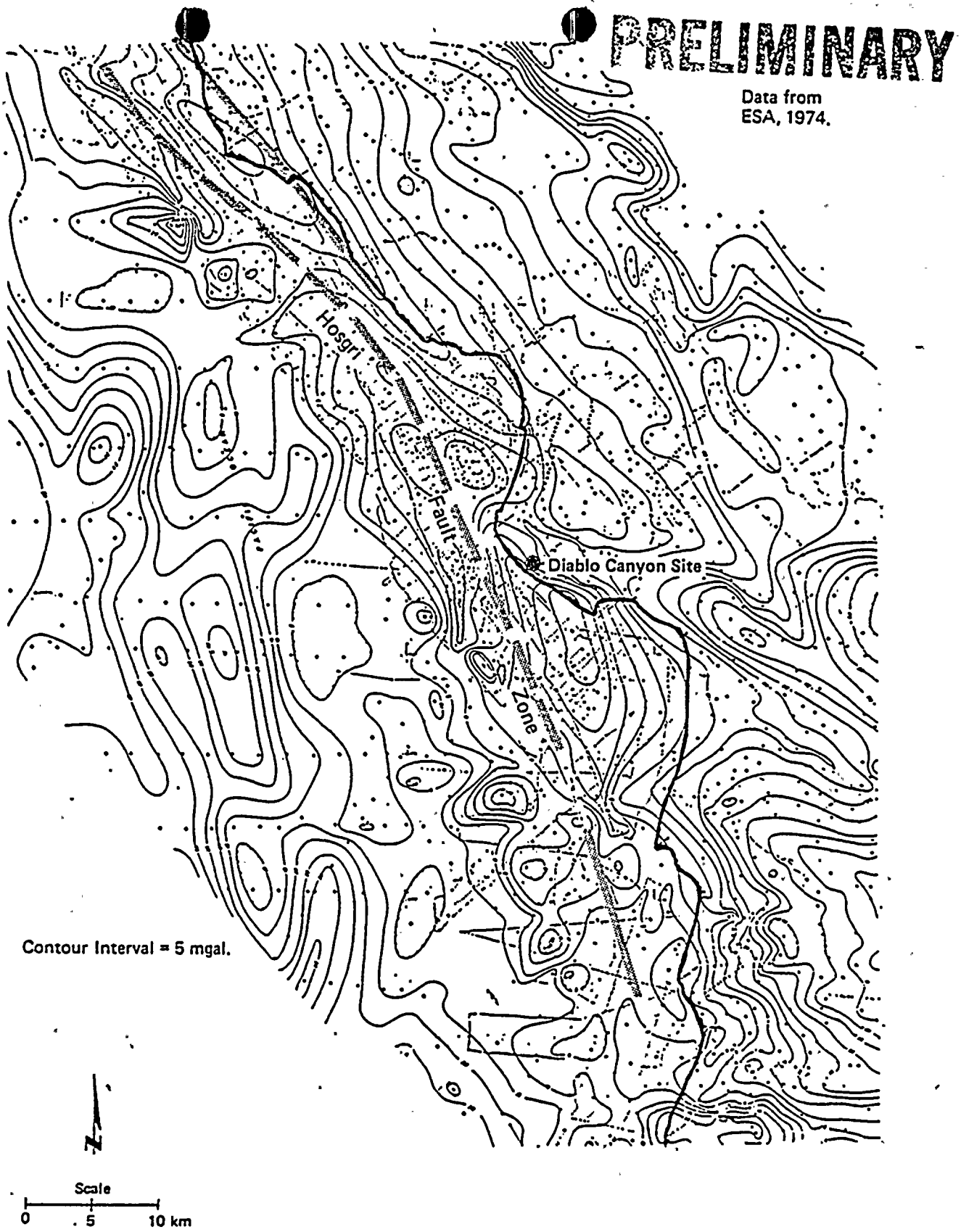
Seismic Data Reprocessing
Areas of Consideration
for Local Optimization of Data

- Velocity analysis.
- Statics corrections
- Deconvolution/Wavelet recovery
- Multiple suppression
- Filtering parameters
- Processing for optimization of events of special interest

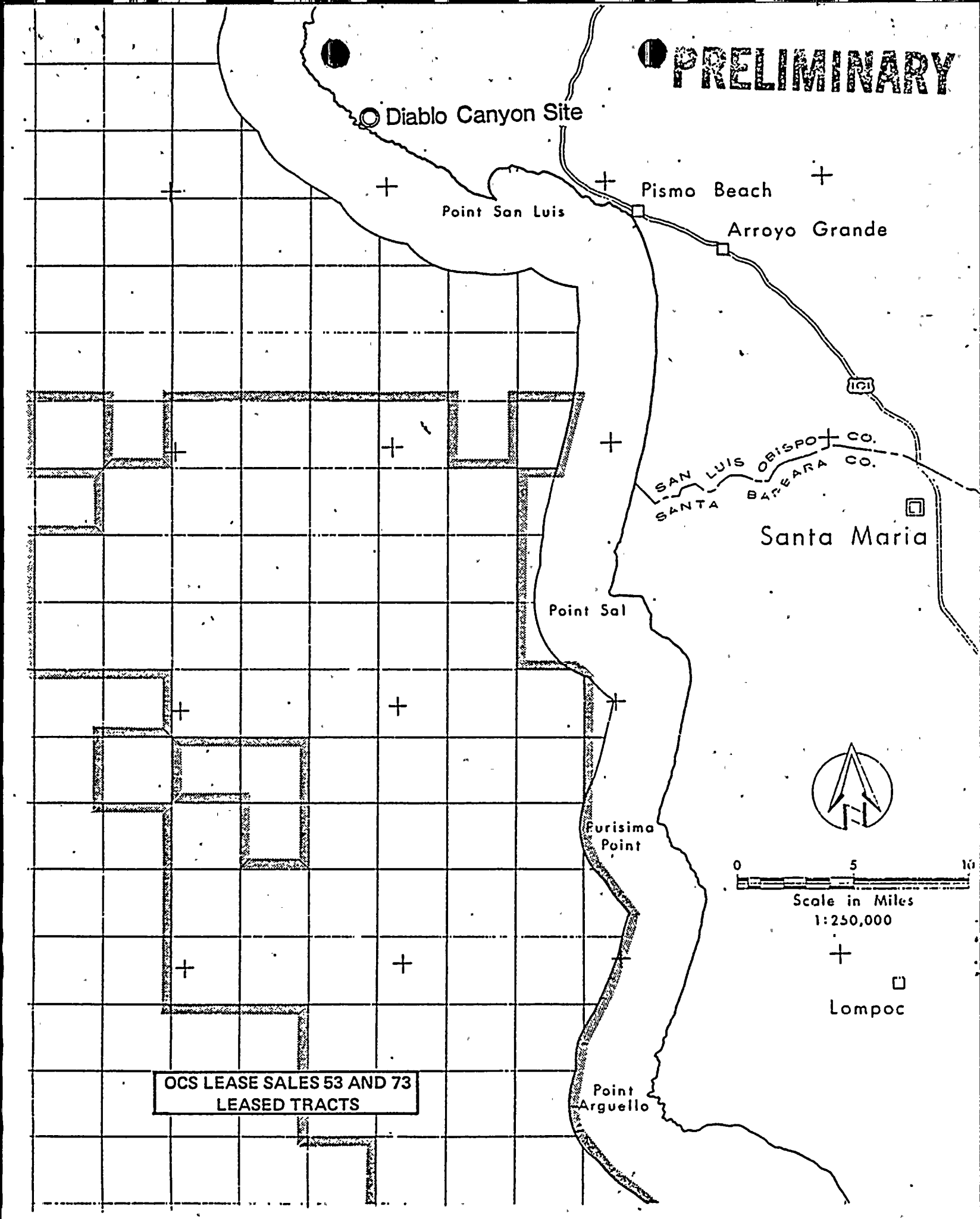
PRELIMINARY



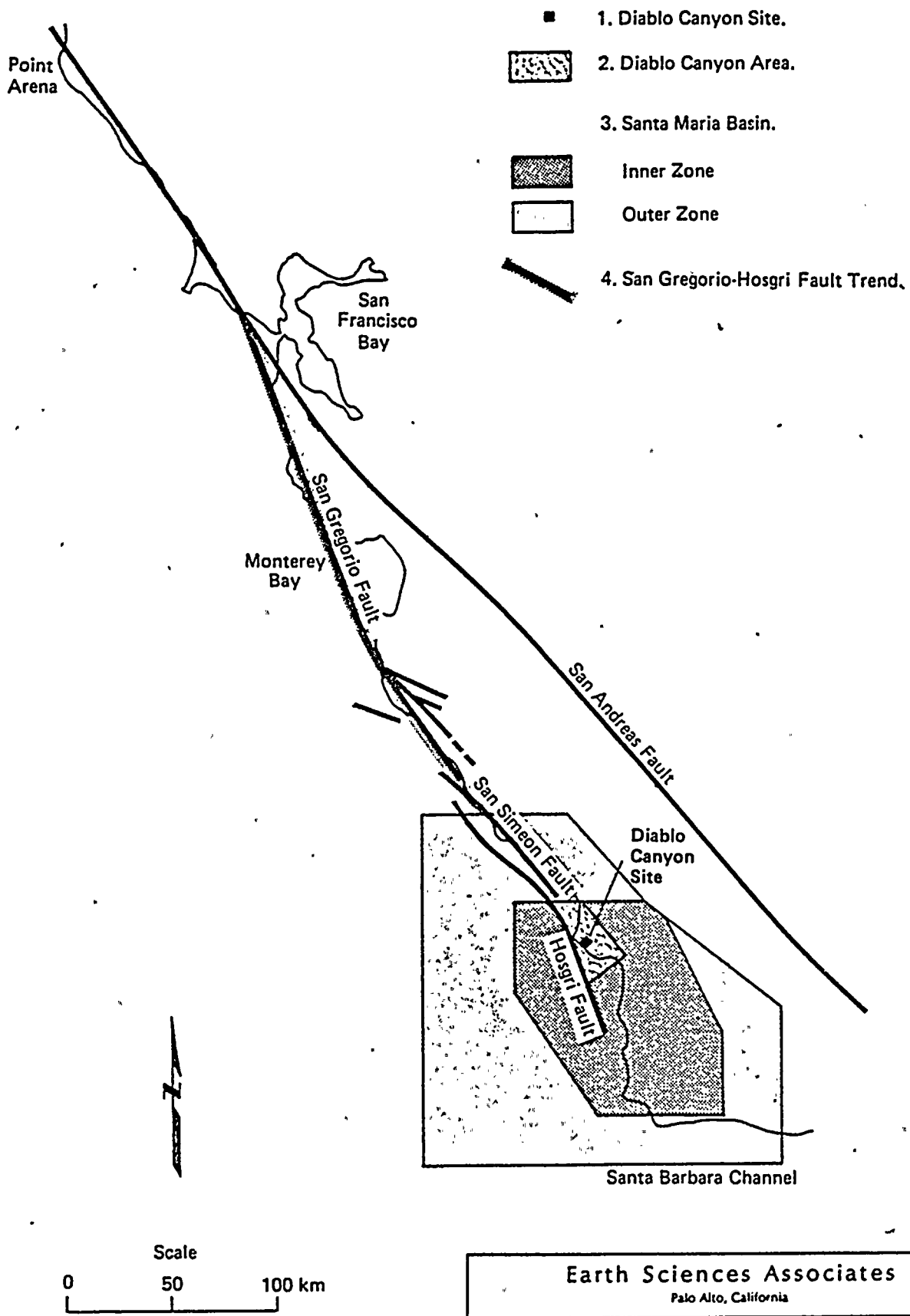
Aeromagnetic Map Showing Contours of Residual Magnetic Intensity in the Region of the Hosgri Fault North of the Latitude of Point Sal



Bouguer Gravity Anomaly Contours in the Region
of the Hosgri Fault


PRELIMINARY
Diablo Canyon Site
Point San Luis
Pismo Beach
Arroyo Grande
101
SAN LUIS OBISPO CO.
SANTA BARBARA CO.
Santa Maria
Point Sal
Furisima Point
0
5
10
Scale in Miles
1:250,000
Lompoc
Point Arguello
OCS LEASE SALES 53 AND 73
LEASED TRACTS

PRELIMINARY

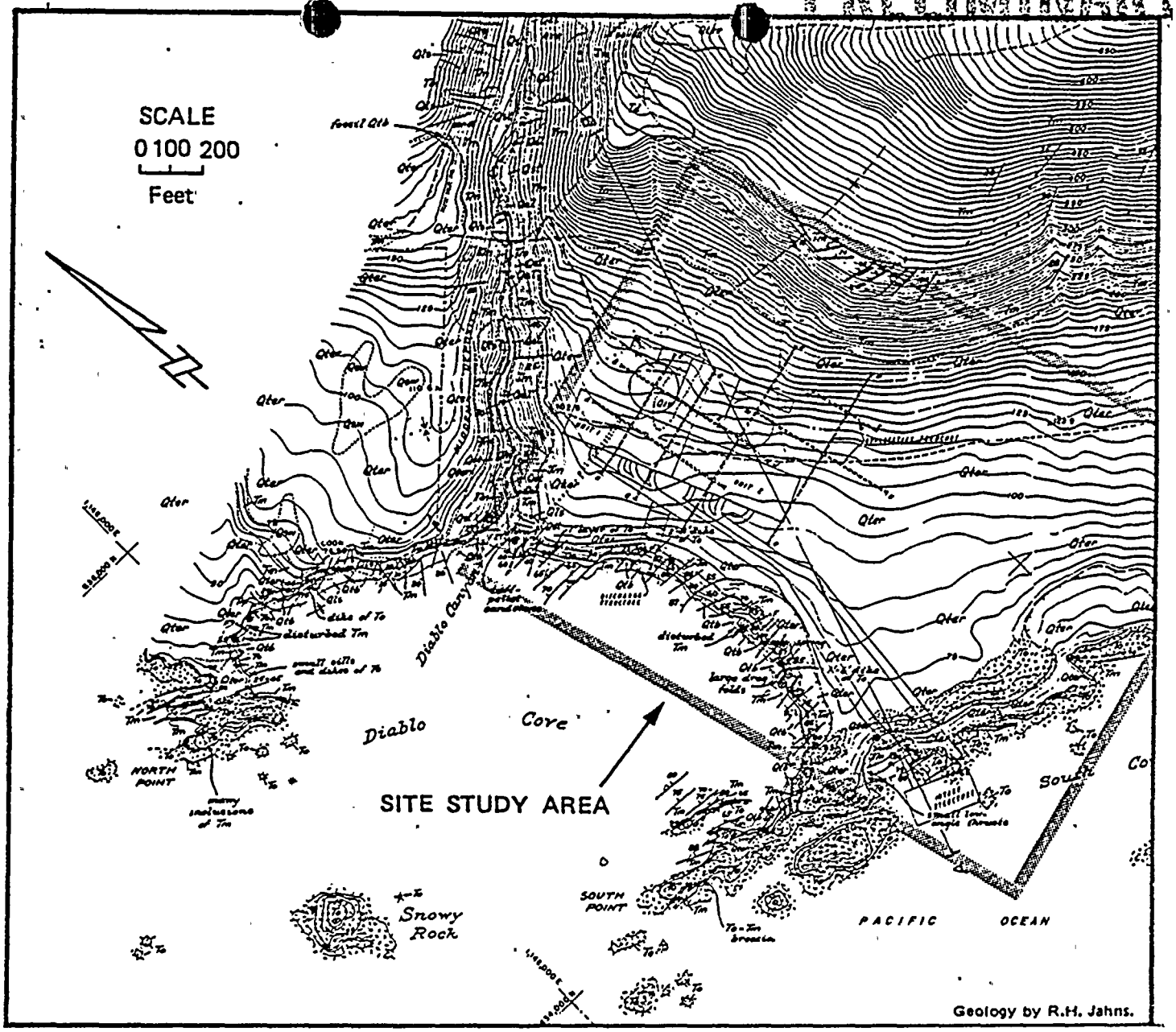


Earth Sciences Associates
Palo Alto, California

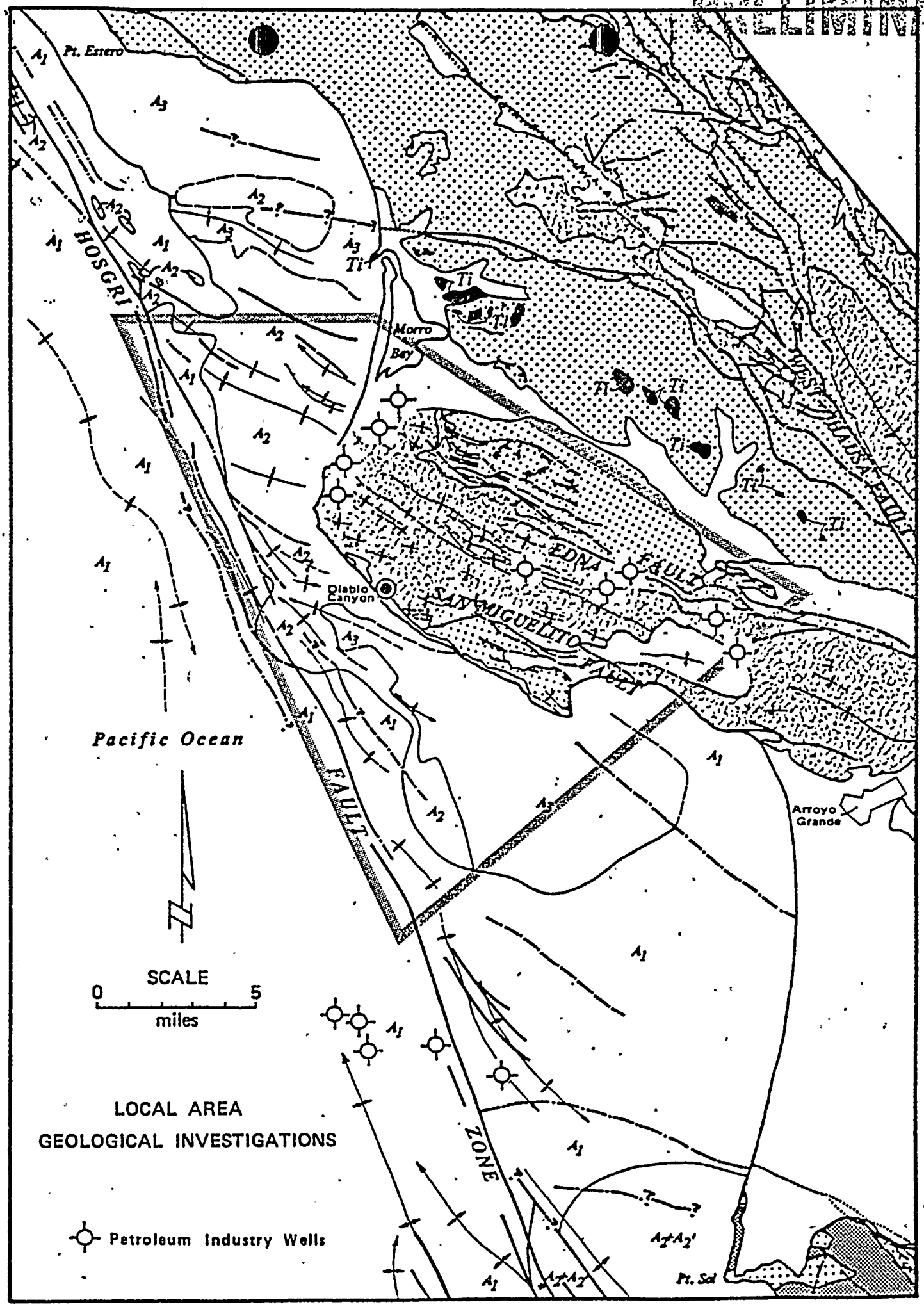
TASK 1: AREAS FOR GEOLOGIC INVESTIGATIONS

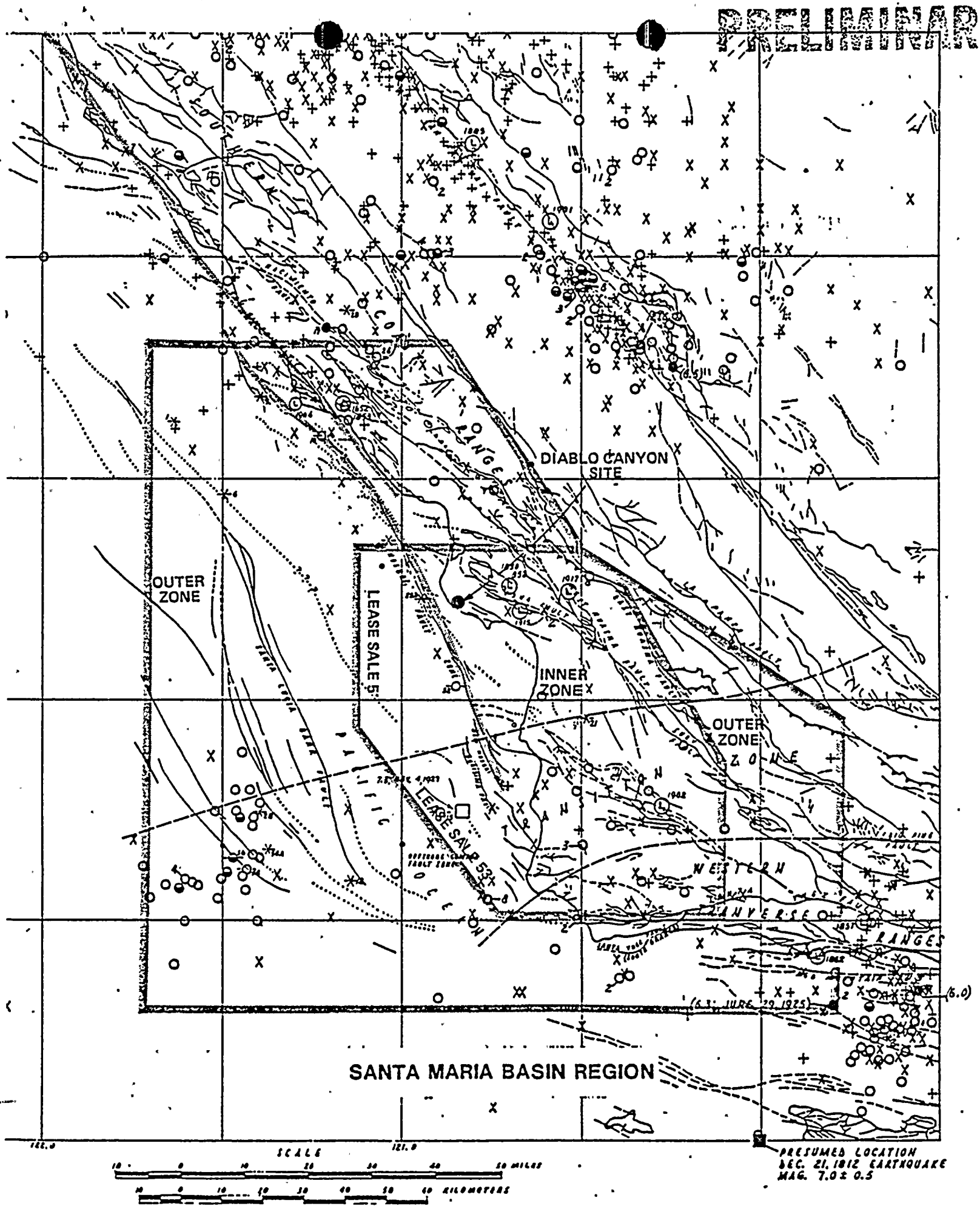
Checked by _____ Date _____	Project No.	Figure No.
Approved by _____ Date _____		1

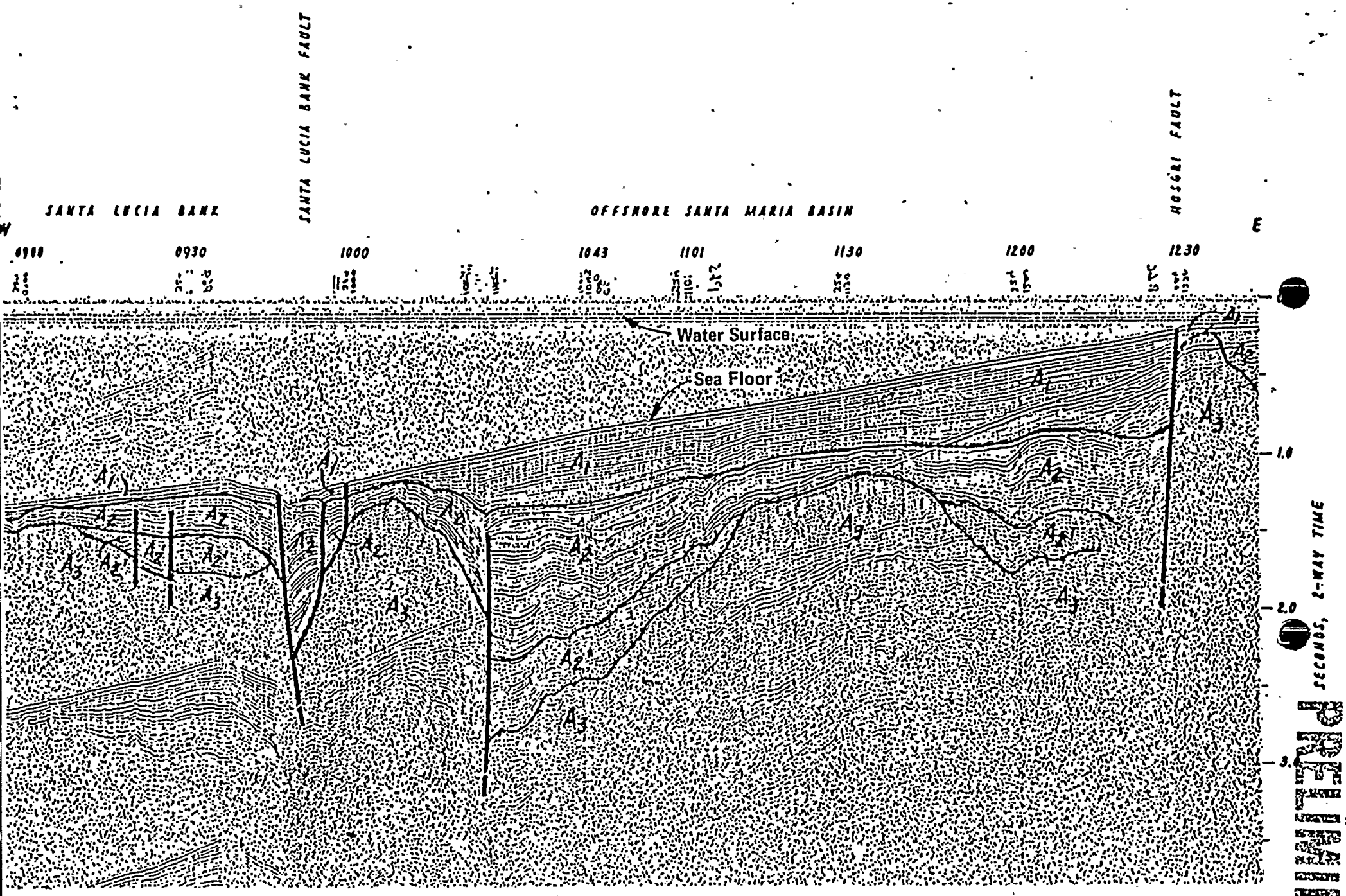
PRELIMINARY



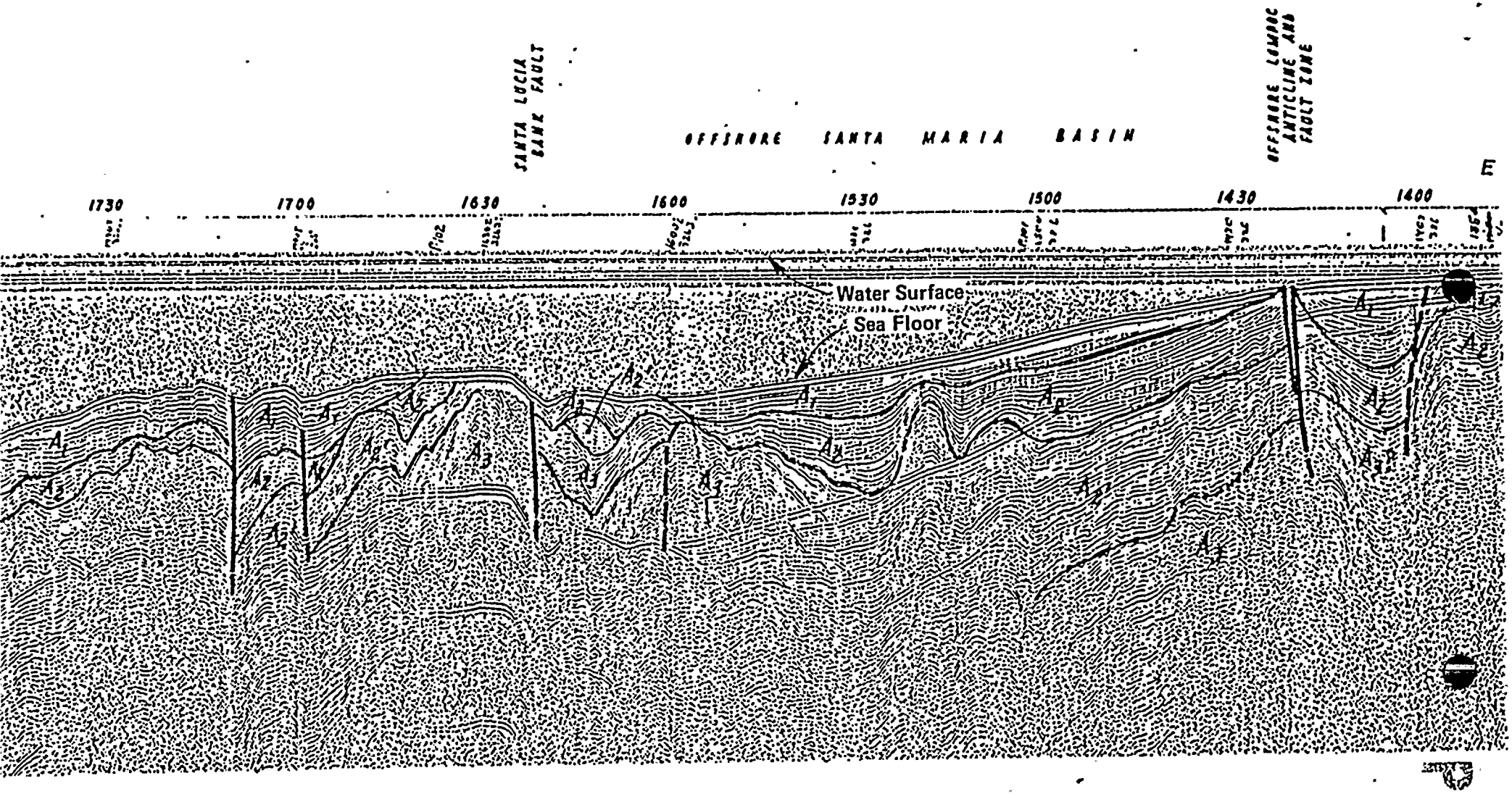
SITE GEOLOGY REVIEW AREA


Pt. Estero
HOSGRI
FAULT
Morro Bay
Diablo Canyon
EDNA FAULT
SAN MIGUELITO FAULT
WEST HUASNA FAULT
Pacific Ocean
Arroyo Grande
Pt. Sal
ZONE
SCALE
0
5
miles
LOCAL AREA
GEOLOGICAL INVESTIGATIONS
Petroleum Industry Wells

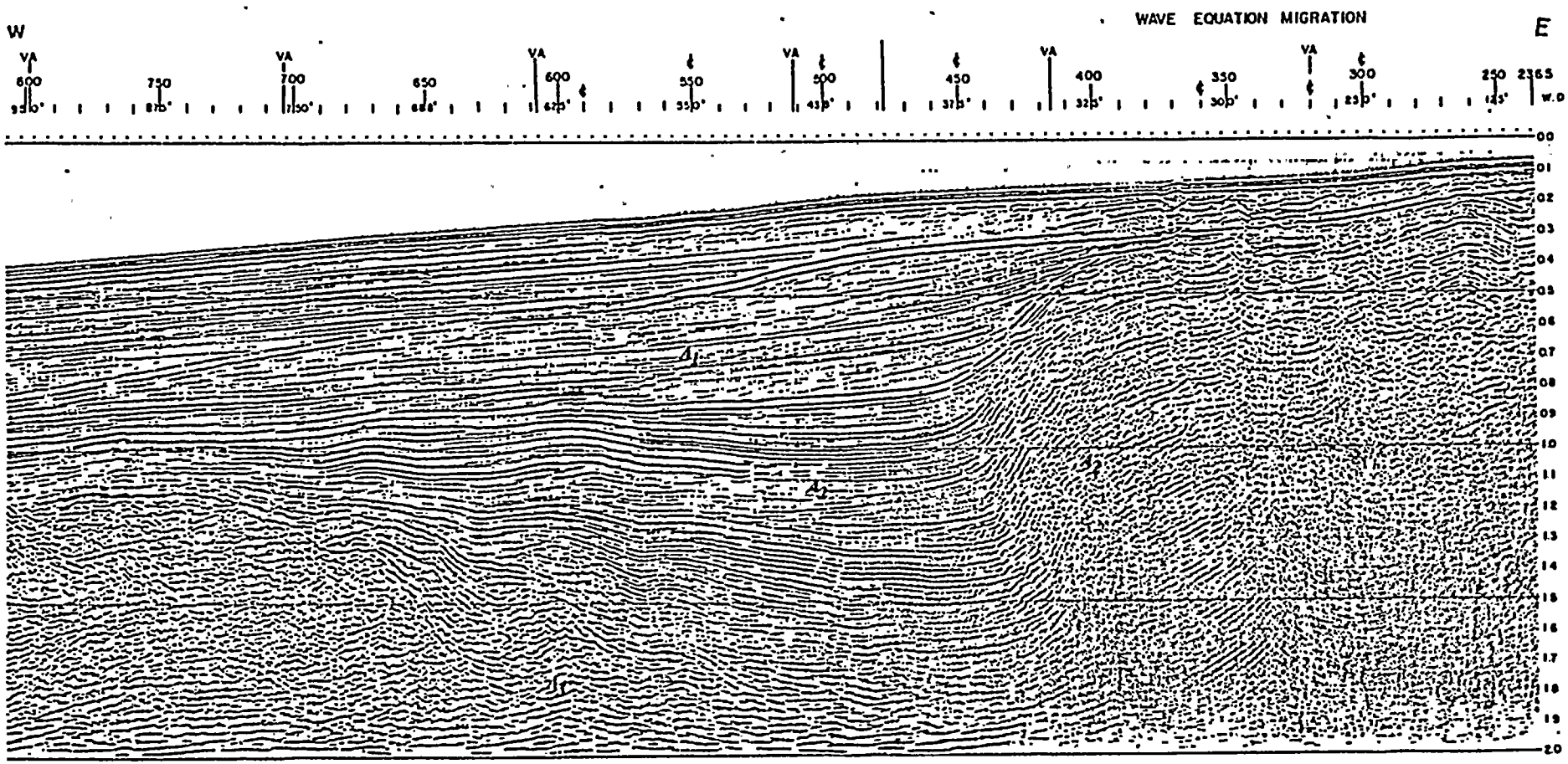




Sparker Seismic Reflection Profile, Bartlett (Leg 2) Line 18

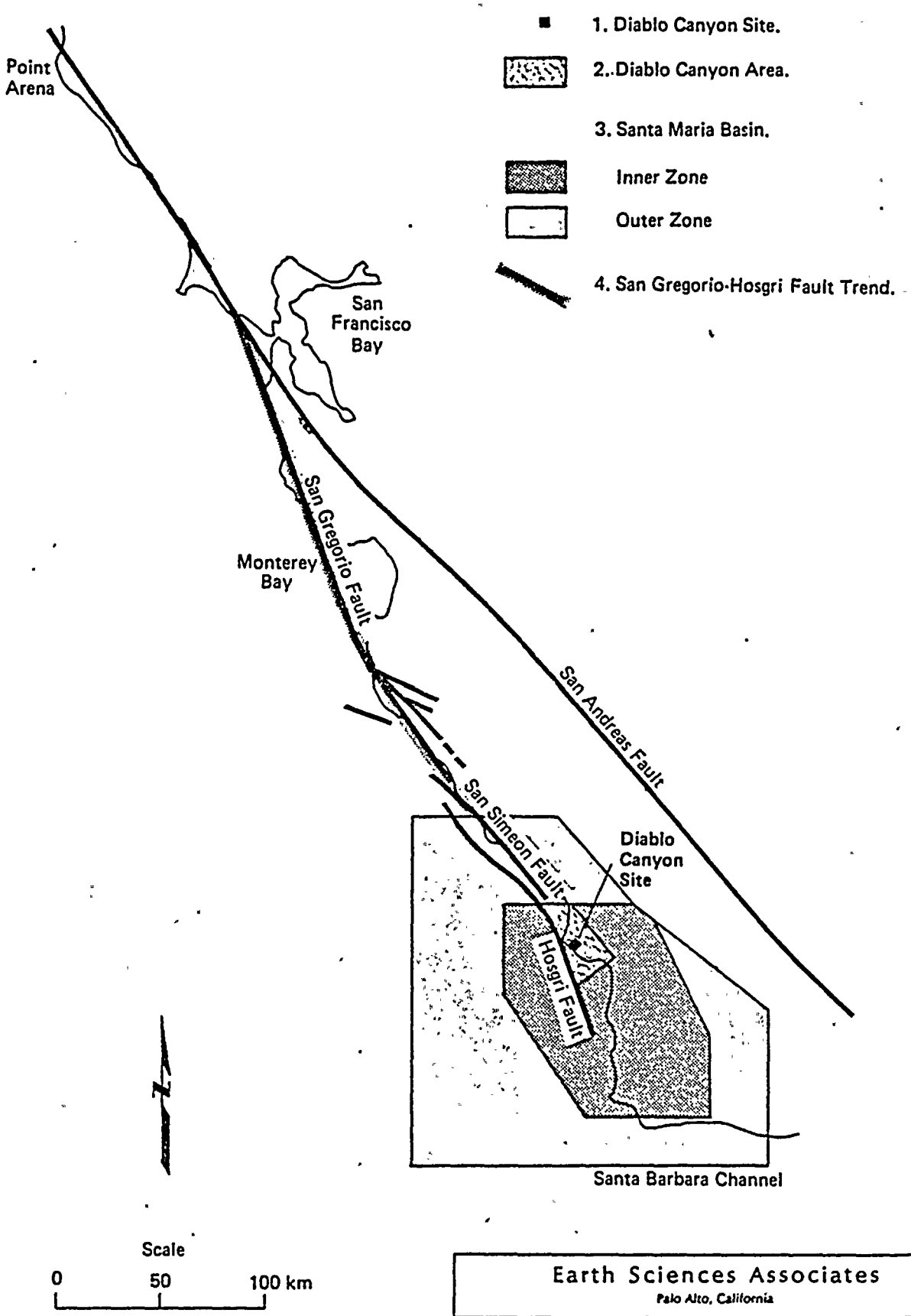


Sparker Seismic Reflection Profile, Bartlett (Leg 2) Line 28



CDP SEISMIC REFLECTION RECORD SHOWING THE HOSGRI FAULT

PRELIMINARY



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Palo Alto, California

TASK 1: AREAS FOR GEOLOGIC INVESTIGATIONS

Checked by _____ Date _____ Approved by _____ Date _____	Project No.	Figure No. 1

PRELIMINARY

Pacific Gas and Electric Company

Diablo Canyon Units 1 & 2
Long Term Seismic Program

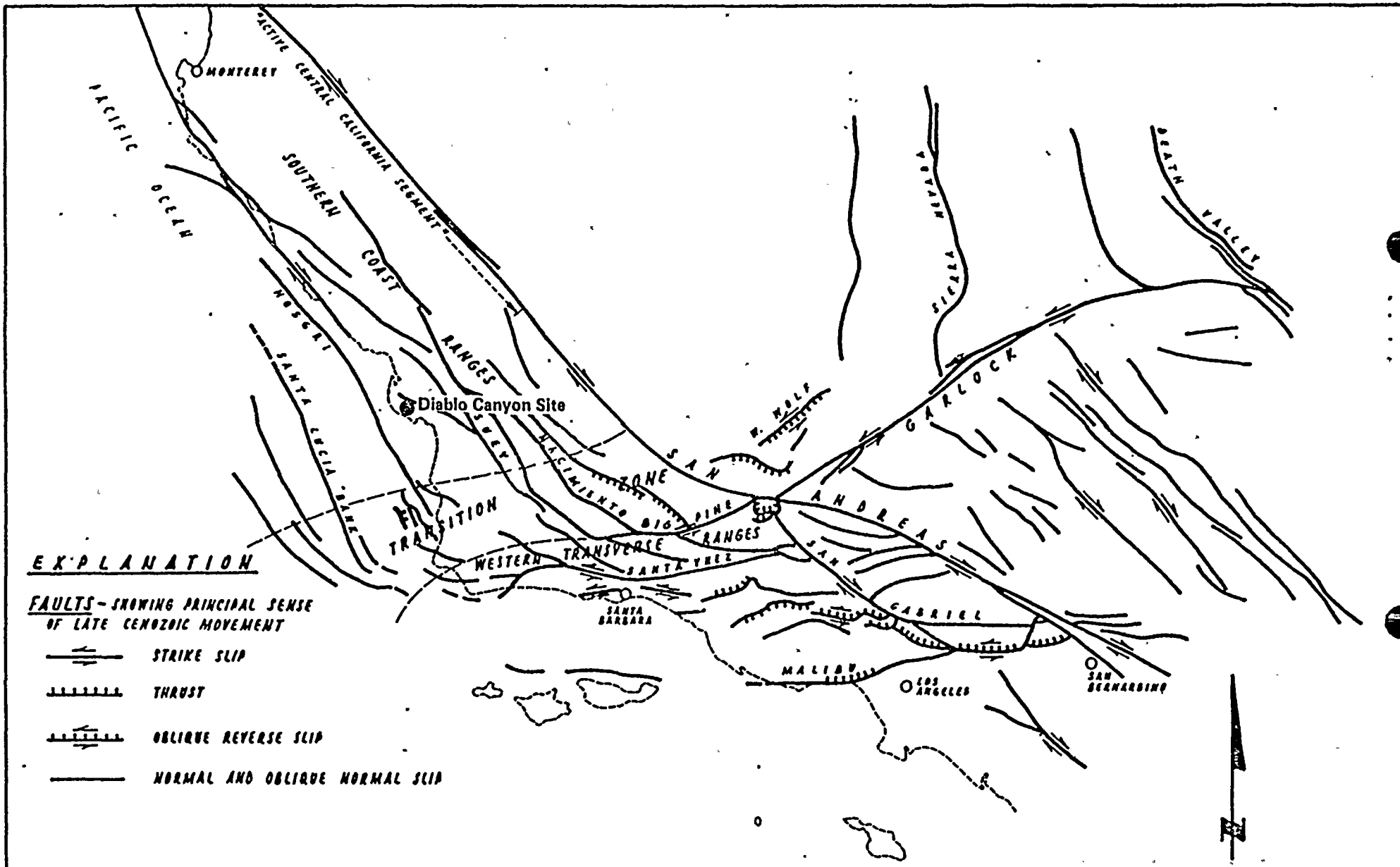
Program for Geologic Review and Investigation

Task 2: Evaluation of Tectonic Model

a. Assess data relating to regional tectonics, including fault orientations, style of faulting, complexity of faulting, rate of deformation, epicentral locations and focal mechanisms of earthquakes, geodetic data, and apparent relationships to plate boundaries and interplate motion

b. Evaluate tectonic stress regime

c. Review identification and characterization of potential seismic sources



MAP OF SOUTH CENTRAL COASTAL CALIFORNIA
SHOWING STRUCTURAL PROVINCES AND FAULTS

PRELIMINARY

Pacific Gas and Electric Company

Diablo Canyon Units 1 & 2
Long Term Seismic Program

Program for Geologic Review and Investigation

Task 3: Review of Seismic Source Parameters

a. Review best estimates, and assessments of uncertainty, associated with significant characteristics of faults:

   1. Total Length

   2. Segmentation/Continuity

   3. Orientation/Geometry

   4. Sense of slip

   5. Rate and pattern of late Quaternary (including contemporary geodetic) deformation

   6. Correlation with earthquake epicenters and foci

b. Review current understanding of relationships between tectonic features and characteristics, and earthquake generation

PRELIMINARY

Pacific Gas and Electric Company

Diablo Canyon Units 1 & 2
Long Term Seismic Program

Program for Geologic Review and Investigation

Task 4: Review of source to site geology and transmission path characteristics

a. Geologic structure along transmission path, taking alternative tectonic models into acount

b. Geophysical properties of the crust between source and site

PRELIMINARY

Pacific Gas and Electric Company

Diablo Canyon Units 1 & 2
Long Term Seismic Program

Program for Geologic Review and Investigation

Task 5: Support of parallel activites in related areas of the long-term seismic program

Encl. 5

Enclosure 5

Letter D. Slemmons to S. Brocoum
10/21/84

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