File Platform Habbegrace
Corresp.
Hillhouse

PLAN OF DEVELOPMENT

AND

OPERATION

WEST SIDE OF OCS P-0240

Prepared for the U. S. Dept. of Interior,
Geological Survey

by

Sun Oil Company - DX Division, Operator

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TABLE OF CONTENTS

	PAGE
GEOLOGY	1
History	1
SSSM Group Exploration	1
Structure	2
Stratigraphy	3
Lithology	3
Reservoirs	4
Bathymetric Survey	4
RESERVOIR ANALYSIS OF WEST SIDE OF OCS P-0240	5
Reservoir Properties	5
Primary Performance	5
Supplemental Performance	6
Reservoir Control	6
DEVELOPMENT	7
Platform Location	7
Zone Separation	8
Development Drilling	8
Plan of Development	8
Period of Development	9
Drilling and Completion	9
Drilling Mud System	10
Cementing	11
BOP Equipment	13
Safety Drills	14
Storm Chokes	14
Well Heads	14
PLATFORM HILLHOUSE	14
Gas Leak Detection	16
Standby Equipment	16
Fire Fighting Equipment	16
Control System	16
Sewage	17
Deck Areas	17
Boom and Skimmer	17
OPERATIONS	18
Onshore and Offshore Facilities	18
Future Operations	18
FIGURES	
Electric Log Indicating Zone and Sand Markers	1
Cross Section-West Side of OCS P-0240	2
Sand Properties	3
Typical Well Profile (Vertical & Slant Rig)	4
Production Scheme	5

TABLE OF CONTENTS (CONTINUED)

MAPS

Location Plat	I
Representative Structure Map	II
Bathymetric	III
Bottom Hole Locations (Phase 1)	IV
Bottom Hole Locations (Phase 2)	V

INTRODUCTION

This report was prepared in compliance with directives of the United States Department of Interior, Geological Survey. Its purpose is to present the approach of Sun Oil Company and its partners, The Superior Oil Company and Marathon Oil Company, to the development and operation of the west side of OCS P-0240, Santa Barbara Channel, California.

The exploitation of OCS P-0240 will adhere to the principle of developing the maximum quantity of reserves by the optimum method as determined by prudent operation. The development plan proposed herein incorporates the recommendations of the special DuBridge Commission Panel as approved by the Secretary of the Interior for the Union Lease in that the first seven wells (defined as Phase 1) will be shallow completions designed to reduce pressures in the upper sands at the western end of the lease.

1. GEOLOGY

1.1 History:

Prior to its lease by the SSSM Group, OCS P-0240 had been explored for hydrocarbon potential by several interests utilizing ocean bottom sampling, seismic techniques and drilled core hole analysis and geologic evaluation. Twenty-two core holes and twins had been drilled on the Tract to depths of 1050'-7770'. The deepest stratigraphic penetration occurred in the Humble No. 50 H8R (Map I) which, at 2527', had penetrated halfway through the Repetto (i.e., into R-5 zone of Repettian stage of the Lower Pliocene as shown in Figure 1). The effect of this preliminary exploration effort was to indicate a strong structural fold trending east-west across the north half of OCS P-0240, containing potential reservoir sands.

1.2 SSSM Group Exploration:

Subsequent to acquiring the lease on OCS P-0240, the SSSM Group drilled eight exploratory wells which are indicated by red circles on Map I. The deepest stratigraphic penetration by the Group occurred in P-0240 No. 1 which was drilled to 5000' and probably penetrated Upper Miocene siltstone. All eight wells penetrated the reservoir bearing section of the Repetto. The first three wells were tested through perforations in the casing. The SSSM Group exploration program has justified the future exploitation of the west side of OCS P-0240;

the east side is currently under study to determine the optimum exploitation method. Final delineation of the reservoir must await development drilling.

1.3 Structure:

Map II is a structural interpretation of a Mid-Repetto zone that is continuous across the entire tract. The trap that has been delineated is a faulted anticline. Its primary feature is an east-west elongated anticlinal fold plunging 5 degrees to the east (Map II). From ocean bottom mapping and seismic evidence, the fold is indicated to be asymmetric with a steep south flank.

The fold is cut by an east-west trending overthrust fault dipping to the south at 35-45 degrees through its core but steepening with depth into a possible bedding plane fault. This compressional type overthrust resulted in the south limb of the fold overriding the north limb so that 320'-678' of the section is repeated in all SSSM well bores.

The fold is further cut by north-south trending faults whose number and attitudes are not fully known but whose presence may be indicated by axial offsets and well bore dipmeter anomalies. The crossfault in the vicinity of the proposed location for Platform Hillhouse is based mainly on the corehole mistie of E log points rigorously honoring dipmeter direction. Sea floor paleo evidence for the fault is weak, and outcrop contacts are largely

drawn and interpreted without offset. Most of these faults are probably normal and are possibly second generation relief faults.

1.4 Stratigraphy:

The ocean floor rock outcrop beneath OCS P-0240 reveals the underlying structure. An anticlinal core of marine Upper Repetto beds is surrounded on its north and south flank and along its easterly plunge by progressively younger marine beds of the Lower and Middle Pico. These Pliocene beds appear to be in conformable contact with one another. Near the south edge of the Tract younger marine beds of the Santa Barbara (Upper Pico) of Pleistocene age rest unconformably on the older beds.

Wells on the Tract have penetrated the Repetto to the uppermost portion of the Santa Margarita formation of Upper Miocene age. Wells on surrounding tracts have penetrated Santa Margarita, Monterey and Rincon formations as deep as the Zemmorian foraminiferal stage of the Lower Miocene but have not encountered verified Vaqueros formation of the Lower Miocene.

The Repetto consists of nine foraminiferal zones, R-1 through R-9, of which the lower middle R-4 through R-8 contain the productive intervals. Refer to Figure 1.

1.5 Lithology:

The Repetto is made up of an alternating series of marine

sands and shales of various thicknesses. The shales are dark brown to greenish brown, firm, generally massive, often a mudstone and are silty. The sands are gray to gray brown, mostly very fine to fine grained, silty and contain occasional beds of medium, coarse or pebbly sand. Sand permeabilities vary considerably due to silt or clay content and range from 100 to 2200 millidarcies. Despite the variation in permeability, most major sand units seem to correlate well over the entire structure.

Using electric log correlation, the Repetto has been divided into color and alphabetical zones conforming to OCS P-0241 terminology. Within the productive section, the uppermost sand is designated "C" and the lowermost "H- 1" in this report (Figures 1 and 2).

1.6 Reservoirs:

The productive section occurs between electric log markers "C" and the Bentonite (at base of "H-1"). This productive interval includes sections repeated in each well by the thrust fault and varies from 2600' to 3200' in gross thickness. Generally, there is a northerly and easterly thickening of the sands.

1.7 Bathymetric Survey:

For reference, a bathymetric survey of OCS P-0240 is included in this report and marked Map III.

2. RESERVOIR ANALYSIS OF WEST SIDE OF OCS P-0240

2.1 Reservoir Properties:

The west side of OCS P-0240 consists of Repetto sands and interbedded shales ranging in depth from 550' to 3500' subsea. Since the field is cut by a south dipping thrust fault, some sands are repeated. Figure 1 indicates that the formations have been divided into four zones.

The sands encountered show a definite correlation between reservoir properties and depth. Refer to Figure 3. Pressure, solution gas and oil volume factors increase while viscosity decreases with depth. All oils appear to be undersaturated. With one exception, all sands tested produced 23 to 25 degree API black oil, suggesting a common geologic source. However, oil from the H-1 subthrust sand produced green 34 degree API oil, with considerably better fluid properties. The H-1 (dwn) sample is the anomalous point shown in Figure 3.

2.2 Primary Performance:

The primary recovery mechanism is presumed to be solution gas drive as no gas caps have been found in any of the crestal wells. There appears to be no natural effective water drive. Relatively shallow dips and vertical discontinuity will minimize gravity drainage. It will not be possible to reach the full areal extent of the shallow sands from the proposed platform location.

The wells should flow at relatively high initial potentials, but will experience rapid declines early in their life even with artificial lift. This rapid decline is a consequence of the solution drive recovery mechanism. The decline rate will become less severe at lower producing rates.

2.3 Supplemental Performance:

Due to the low primary recoveries and rapidly declining producing rates, some form of supplemental recovery appears to be necessary. Water injection for pressure maintenance is an attractive approach. At the conclusion of the primary development drilling program all data will be reviewed. A supplemental program may then be proposed if necessary to maintain pressures at hydrostatic or less and thereby minimize subsidence. Water injection wells and injection facilities thus may be required in the future and provisions have been made for them.

2.4 Reservoir Control:

Proper reservoir control is essential to the success of the supplemental recovery program. Monthly tests on producing wells and weekly gauges of rates and pressures on injection wells will be a minimum requirement. Tracer surveys will be used to check for stratification in injection wells. Injection wells will have provisions for controlling the distribution of injection rates among

zones. Production logging tools will be used to determine the point of water entry in producing wells for water control.

It is desirable that the waterflood front advance uniformly toward all producing wells in all sands. The injection well locations, rates and split of downhole rates will be designed to maximize this uniformity. The reservoir will be modeled on a digital computer using the best information available. This study will serve as a basis for planning and controlling of the recovery program. The plan will be updated and refined as new performance data and a better understanding of reservoir mechanics is gained.

3. DEVELOPMENT

3.1 Platform Location:

The west side of OCS P-0240 will be developed from the proposed 60 well Platform Hillhouse. Ultimately, 42 producers and possibly 11 water injection wells may be drilled from the platform. Slots are provided for 7 extra wells.

The proposed platform location is 1400' east and 3900' south of the northwest corner of OCS P-0240. This location was selected since it is near the volumetric center of the underlying productive sands.

3.2 Zone Separation:

For development purposes, the sands will be segregated into zones. The particular sands completed in each well will depend upon the following:

3.21 The proximity of other wells penetrating that sand.

3.22 The total number of wells to be completed in that sand.

3.23 The total reserves that can be attributed to that well. Each well must be economically justified.

3.3 Development Drilling:

Development of the west side of OCS P-0240 will be done by two drilling rigs operating simultaneously. To develop the shallow formations as completely as possible and to extend the horizontal development radius in sands in the deeper formations, one drilling rig will be capable of drilling 25 degree slanted holes. The advantages to be gained utilizing this approach are indicated diagrammatically in Figure 4.

3.4 Plan of Development:

The proposed plan of development for the west side of OCS P-0240 will consist of three phases. Phase 1 will include development of the Brown Zone (C & D) and the Yellow Zone (E series). This phase will also include at

least one well which will penetrate all Repetto Zones for testing purposes. The first well with the conventional rig will core the sands from the ocean floor to the top of the Brown Zone. Subsequent phases will be as follows and will be contingent upon the safe and satisfactory completion of Phase 1 and each succeeding phase.

Phase 2: Complete primary development of all zones on the west side of OCS P-0240.

Phase 3: Supplemental recovery program.

Maps IV and V indicate the bottom hole locations of wells for each development phase.

The proposed plan will permit a comprehensive evaluation of the area to be developed from this platform. This plan of development will demonstrate that the new requirements pertaining to drilling and completions are adequate to safely develop the Rincon Trend.

3.5 Period of Development:

It has been estimated that 20 days will be the average time to drill and complete each well.

3.6 Drilling and Completion:

The procedure for setting the structural or initial casing string will be to drill 100' (TVD) below the ocean floor and cement 20" O.D. casing to the ocean floor. Gravity cementing operations will be conducted

as conditions or requirements necessitate. Soil conditions at the site indicate that the casing will be anchored in firm dense sand. A typical casing program will be as follows:

Conductor:	16" O.D. set at 300' (TVD) below O.F. with cement circulated to the O.F.
Surface:	10-3/4" O.D. set at approximately 1150' (TVD) below O.F. with cement circulated to the O.F. (to conform to USGS regulations).
Production:	7" O.D. set at TD (may be used as a liner in some cases).

Recently approved procedures for OCS P-0241 will serve as guidelines for the drilling and completion of wells on OCS P-0240.

Platform drilling and exploitation in the Santa Barbara Channel should not be considered either risky or hazardous when adequate safety measures are taken. Listed below are drilling practices we will observe:

3.6.1 Drilling Mud System:

Special care will be exercised to keep mud weight low while drilling the shallow sands to avoid hydraulic fracturing. Adequate mud weight and volume shall none-the-less be maintained to prevent blowouts. Mud testing equipment will be kept on the platform at all times. Recording mud pit level indicators will be used to determine mud gain or loss.

These indicators will trigger an alarm when conditions warrant.

A degasser will be installed on the mud system to degas the drilling fluid if gaseous conditions occur.

In making a trip, the first 5 stands will be pulled without wipers to visually check the hole for swabbing conditions.

A mud volume measuring device will be used for accurately determining mud volume required to fill the hole on trips.

A flow-no-flow indicator will be installed on the mud return line to alarm in case of loss of mud returns or swabbing action while pulling drill pipe.

Adequate mud material will be maintained both on the platform and land to meet emergency situations.

3.6.2 Cementing:

Float collars will be run on conductor, surface and production strings to insure effective cement jobs. The shoe joint will be set in shale or other competent formations. In the case of structural conductor and surface strings, the

volume of cement will be sufficient to circulate back to the ocean floor.

Open hole casing packers, centralizers, stage collars, and cement baskets will be used to insure a good cementing job on the casing strings.

Cement for production strings will be a lightweight slurry with 10-15% salt content for expansion qualities and to insure adequate bonding. Cement bond logs and/or temperature surveys will be run. Secondary cementing corrections will generally be accomplished by squeezing. Cement on production strings will conform to the applicable rules.

The minimum WOC time for cement will be 12 hours under pressure or 24 hours when not under pressure. In all cases, special consideration will be given that the cement has been given sufficient time to acquire adequate compression strength before resuming any drilling operation on the well.

A minimum pressure test on all casing strings shall be 0.2 psi per foot of total setting depth. The strings must be capable of sustaining this pressure with a loss of no more than 10% for a 30-minute period. If required, corrective action will be taken prior to resuming further operations on the well.

3.6.3 BOP Equipment:

A Hydril-type preventer will be installed on the structural casing prior to drilling out. Subsequent to setting surface casing, blowout preventers will be one set of pipe rams, one set of blind rams and a Hydril preventer. All BOP equipment will be pressure tested when installed, before drilling out each casing shoe and at least once each week.

The BOP equipment will be actuated at least once each day and noted on the driller's log. The purpose of these tests will be to insure operational efficiency.

In addition to an upper kelly cock, a lower kelly safety valve will be maintained on the bottom of the kelly at all times. This valve will be able to pass through the BOP equipment.

An inside BOP assembly will be kept on the rig floors at all times. Both the assembly and the wrench to actuate it will be kept in an easily accessible designated place on the platform. BOP drills will include use of these tools by all crew members.

Lubricators will be used during all logging operations. A full opening valve will be installed on drill pipe when running wire line

directional surveys. Closing the valve will cut the line in case of emergency.

3.6.4 Safety Drills:

At least once each week drills for securing control equipment and evacuating the platform in case of emergency will be conducted. Blowout preventer drills will be conducted twice each week to insure that crews are trained to carry out necessary duties.

3.6.5 Storm Chokes:

A storm choke will be installed in the tubing of all completed flowing wells. Flowing wells will have the tubing-casing annulus sealed with a packer below the ocean floor.

3.6.6 Well Heads:

Safety valves will be installed on the well head on the platform. All lines will be equipped with check valves at their connections to the well head.

4. PLATFORM HILLHOUSE

Platform Hillhouse will be an 8 pile template type self-contained drilling and production structure to be installed in 190' of water. It will have two main decks, a drilling deck and a production deck, each 140' X 105' in size. The

production deck will be approximately 37' above MLLW and the drilling deck approximately 61' above MLLW.

The boat landings for both personnel and heavy equipment were designed with both safety and all weather usage in mind. The main boat landing is a hanging fender type which will extend along the entire north side of the platform. This fender type landing is supported by adjustable heavy cables to permit safe operations in heavy seas and changing tides. This landing allows both personnel boats and service craft to tie off solidly to it in rough seas. An additional boat landing is located on the east side of the structure to handle small boat traffic in cross seas as well as when the hanging fender is in use.

There will be two cranes located on this platform. These cranes are located adjacent to the service boat and barge fender so they can safely handle heavy loads in moderate to rough seas with winds from any direction.

Platform Hillhouse will be painted a light blue to minimize visibility from shore. The structure and its appurtenances are to be coated with a paint system that will furnish the maximum in corrosion protection as well as lasting color retention and ease of cleaning of the outside surfaces.

The submerged portion of the structure will be protected by an impressed current cathodic protection system to prevent corrosion damage or metal loss which might weaken the structure.

Special emphasis will be put on utilizing producing equipment

that will permit rigid control of operations during the producing life of the platform. In addition to safety, this equipment will stress pollution control. A summary of the proposed equipment is as follows:

4.1 Gas Detector:

A gas detector and alarm system will be installed on the platform with gas leak detectors located at strategic points.

4.2 Standby Equipment:

The platform power source will be a submarine electric cable from shore. In the event of a power failure, standby generators driven by diesel engines will automatically start and furnish power within 15 seconds. Sufficient power will be available to run one rig, fire-fighting system, shipping pump to shore, navigation aids, and electrical equipment associated with emergency shutdowns and anti-pollution mechanisms.

4.3 Fire-Fighting:

An automatic sprinkler system will be installed in all well bay areas. A closed loop fire-water system will be automatically operated by electric motor-driven turbine pumps. A standby diesel system pump will also be included in the event of power failure. There will be no fired vessels installed on the platform.

4.4 Control System:

High and low level and pressure shutdown devices and

alarms will be installed on all vessels on the platform. Remote and local automatic platform shutdown devices will insure positive control in any emergency.

Recording pressure charts will be installed on pipelines to shore. These lines will be equipped with high and low pressure sensor devices to automatically close safety valves on all well heads. All shutdown systems will be of the manual reset type.

4.5 Sewage:

An adequate, approved sewage disposal system will be installed on the platform.

4.6 Deck Areas:

Curbs, gutters and drains in all deck areas will be installed to collect contaminants for pumping to shore, where they will be cleaned prior to disposal.

4.7 Boom and Skimmer:

An approved containment boom and skimming apparatus, along with chemical dispersants, will be maintained on the platform and regularly inspected to insure operational efficiency.

The platform will be designed to withstand 35' waves and 125 MPH winds. The basic design incorporates a 15 percent seismic design factor.

5. OPERATIONS

5.1 Onshore and Offshore Facilities:

As an anti-pollution measure, handling of fluid and gas on the platform will be minimized. Figure 5 diagrammatically indicates the general scheme of processing products.

Except for well testing, separation on the platform will generally be two phase. Oil and water will be discharged from separators into a surge tank and then pumped to shore through a 12" submarine line. The fluid will be treated on shore for extraction of the water which will be clarified before disposal through an approved outfall line.

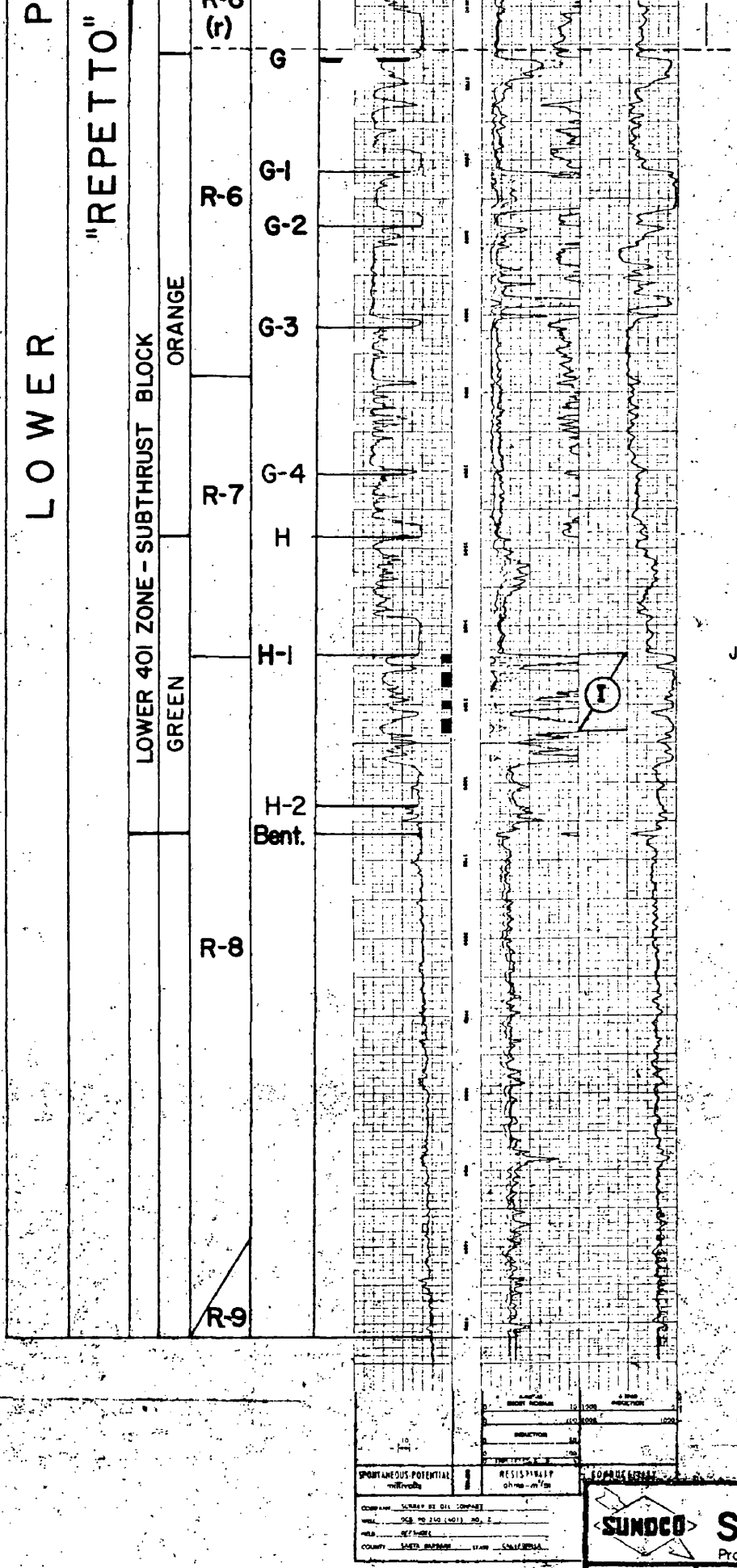
Low pressure gas from the platform will be transported to shore by a 12" line. Onshore, the gas will be treated and compressed for sale. All lines will be equipped with pigging systems.

5.2 Future Operations:

The submarine line has been sized for the possible addition of a second platform which may be installed on the east side of the Tract. Initially, all operations except the automatic well test system will be manually operated on a 24-hour surveillance basis.

Ultimately, a complete supervisory control system is contemplated for a two-platform operation. An onshore

computer station would automatically control and record the platform and onshore operation by periodically scanning all of the facets of the operation. The feasibility of this type operation will be studied when sufficient time has elapsed for the necessary accumulation of operational and production data.



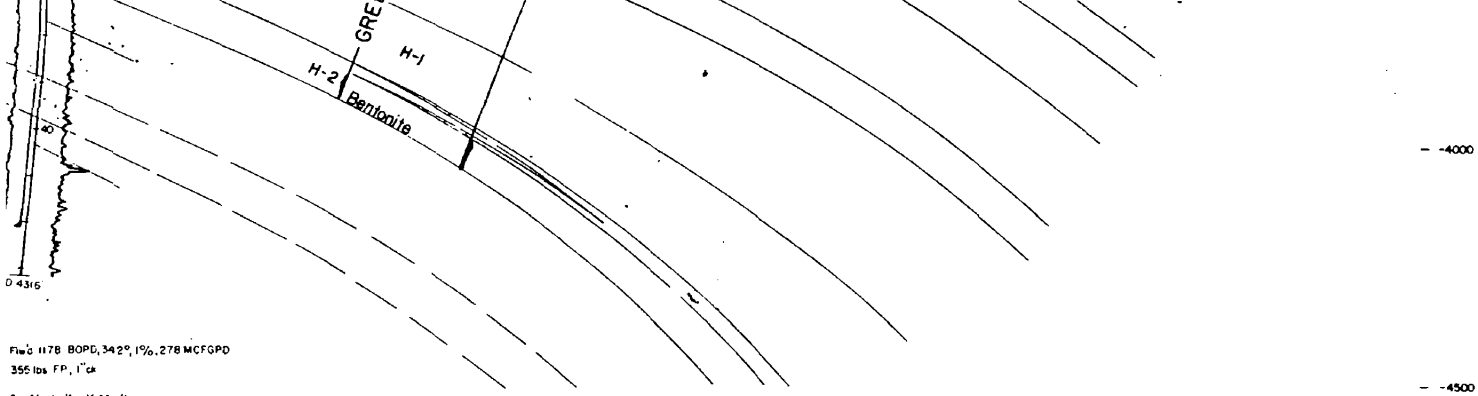
J.F.T 1 3437-47', 3460-75', 3496-3506', 3520-35'
2-1/4" JHPF in 7" csg. Flowed 2 hrs. on
1" choke. Max. flow rate: 1190 BFPD, 99% oil, 1% wtr., no sd., 278 Mcf., FP 355
API Gravity: 34.2° oil, 0.79° gas.

T.D. 4317'

FIGURE 1

SUNDCO SUN OIL COMPANY DX DIVISION
Project 401 Ventura Calif SSM Group

Drafting J.F.W.	OCS-P-0240 GEOLOGIC EXHIBIT	Date 1-15-69
Drawn by G.J.W.	SSM Group OCS-P-0240 No. 2	Revised 8-14-69
Approv	E-Log with Summary of D.S.T. Results	Scale 1"=200'



Flwd 1178 BOPD, 342°, 1%, 278 MCFGPD
355 lbs FP, 1" ck

Swabbed. Would not flow

Flwd 529 BOPD, 230°, 5%, 53 MCFGPD
100 lbs FP, 3/4" ck

Flwd 521 BOPD, 235°, 8%, 38 MCFGPD
40 lbs FP, 3/4" ck

Flwd 388 BOPD, 242°, 14%, 25 MCFGPD
48 lbs FP, 3/4" ck

- -4000
- -4500
- -5000
- -5500
- -6000
- -6500
- -7000

Figure 2

LEGEND

Multiple dip overage

Single dip

(LP-4)/(R-1) Paleo. Markers

C,D, D-1, etc. E-Log Markers

SUNOCO

SUN OIL COMPANY

Project 401 Ventura Calif. SSM Group

DX DIVISION

Drafting: J.F.W.

Drawn by: G.J.W.

Approv:

OCS-P-0240 GEOLOGIC EXHIBIT
Typical Repetto Structure Section
on West Side

Date: 1-15-69

Revised 8-14-69

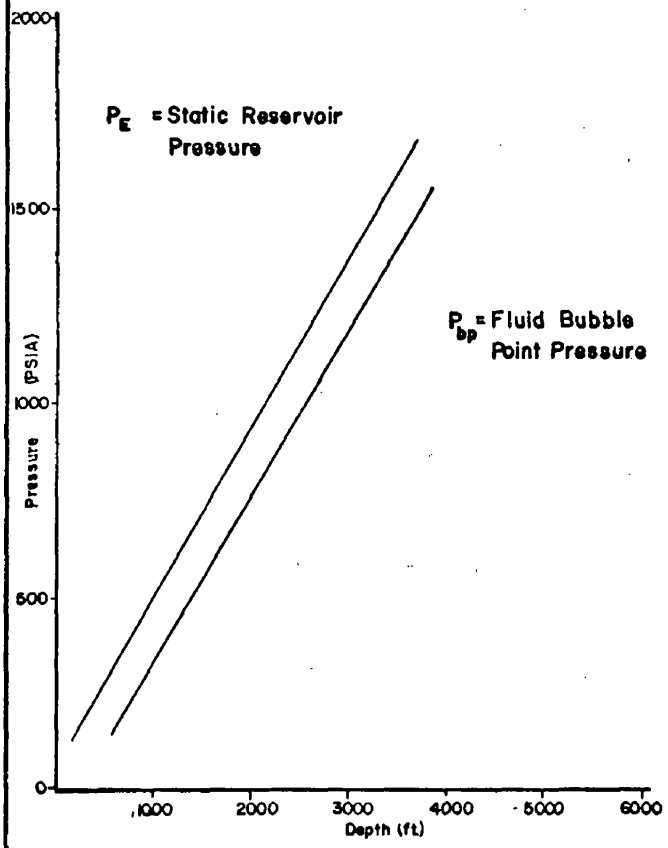
Scale: 1" = 400'

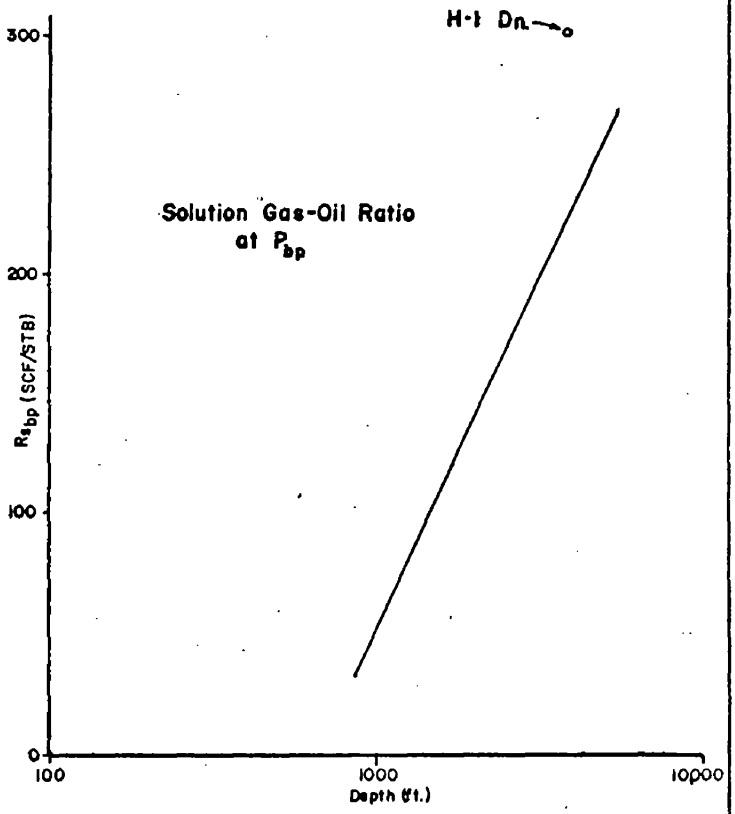
OCS-P-0240

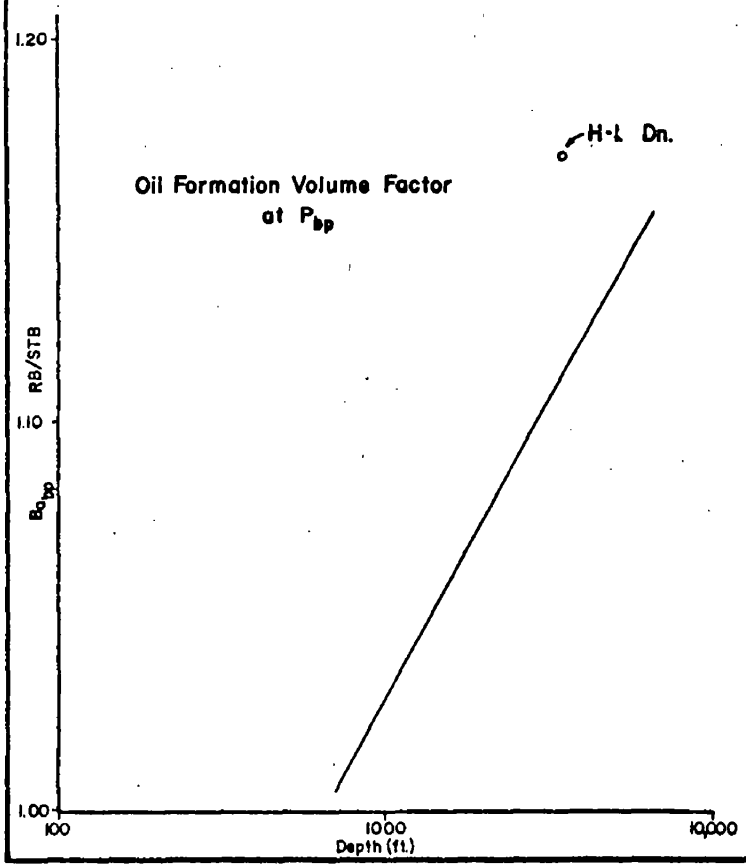
RESERVOIR PROPERTIES

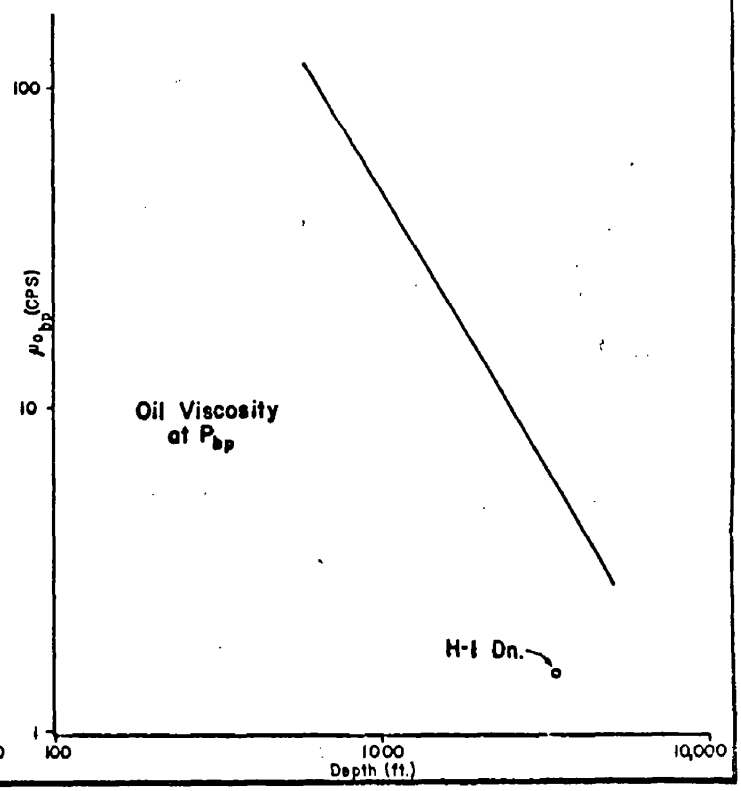
AS A FUNCTION OF DEPTH

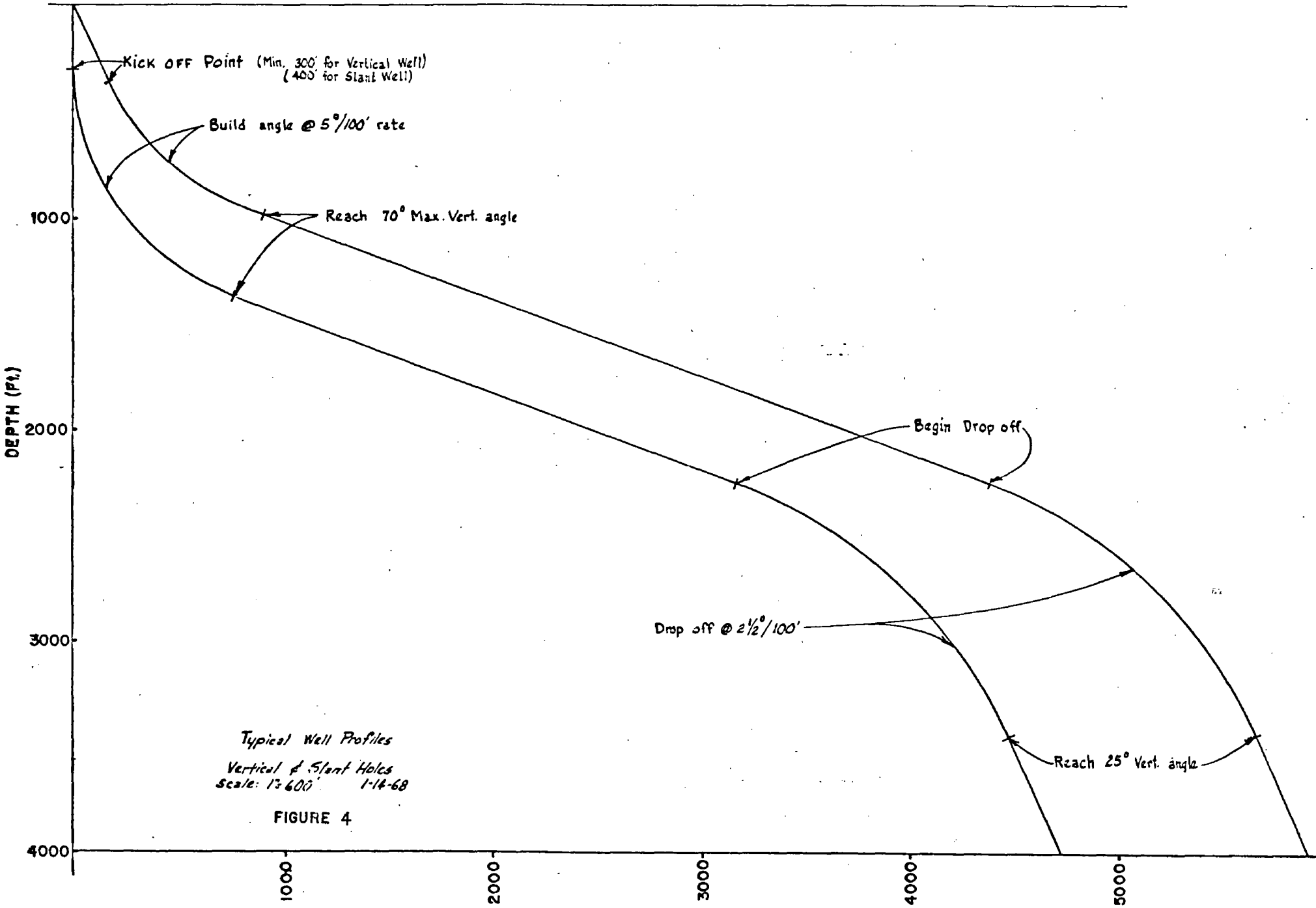
FIGURE 3











Typical Well Profiles

Vertical & Slant Holes
Scale: 1"=600' 1-14-68

FIGURE 4

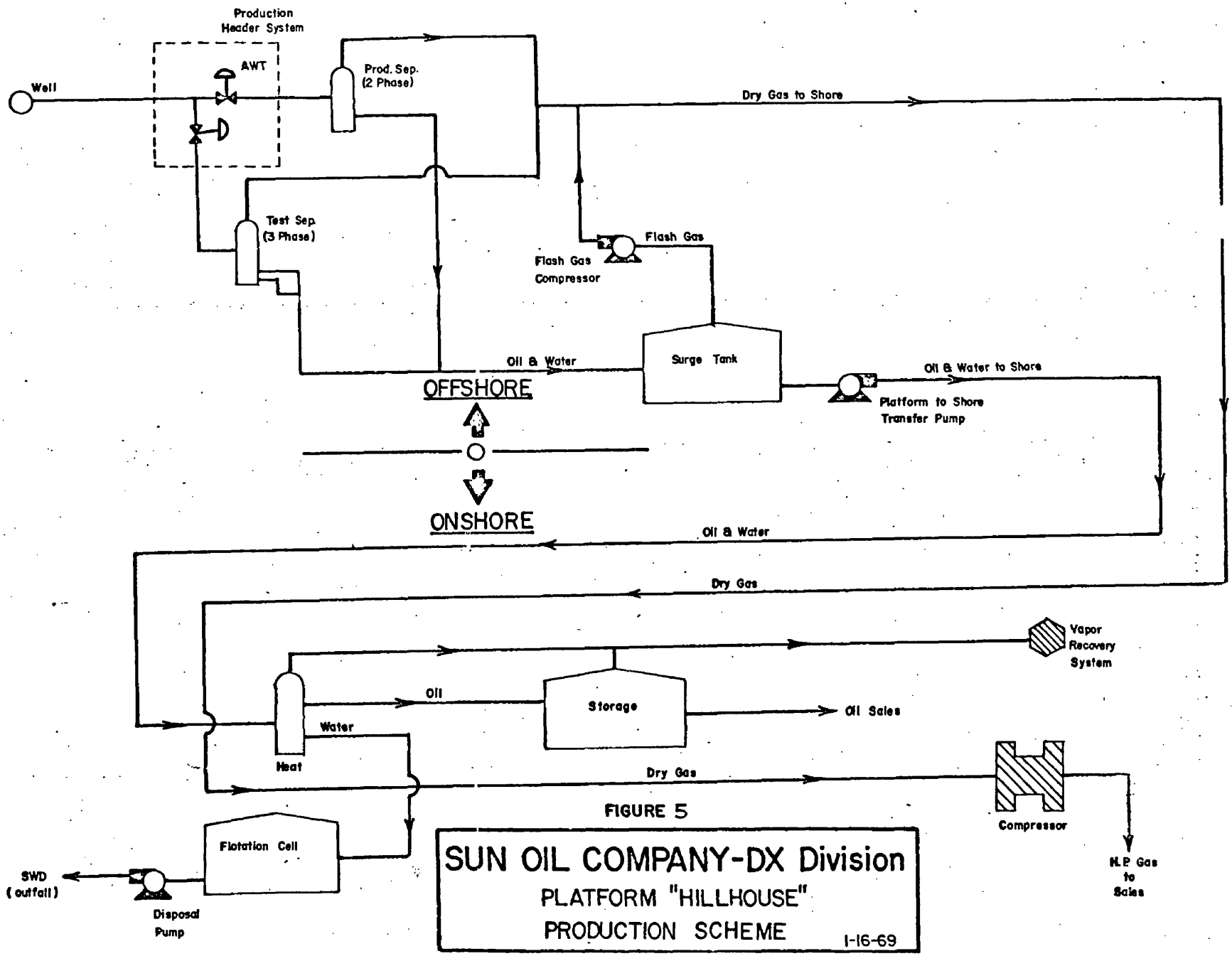


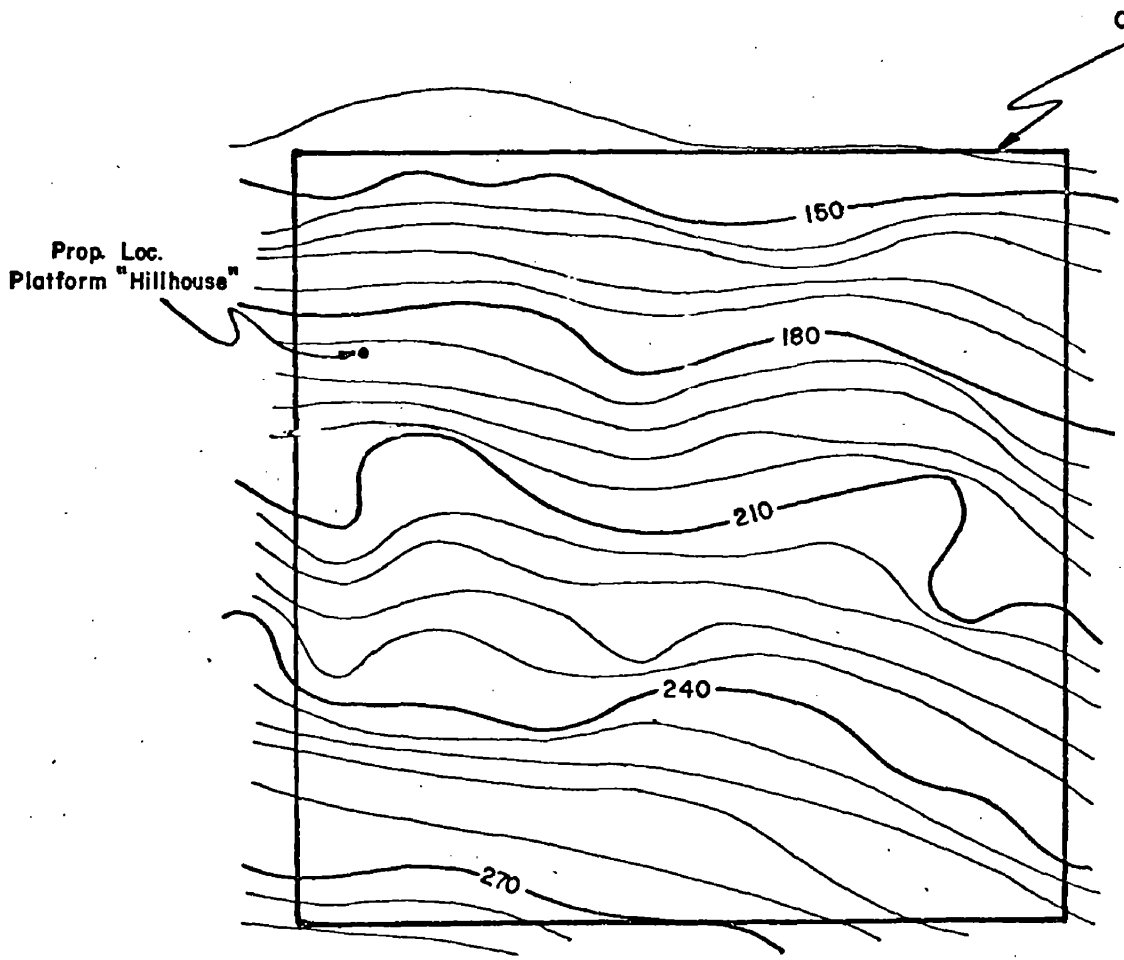
FIGURE 5

SUN OIL COMPANY-DX Division

PLATFORM "HILLHOUSE"

PRODUCTION SCHEME

1-16-69

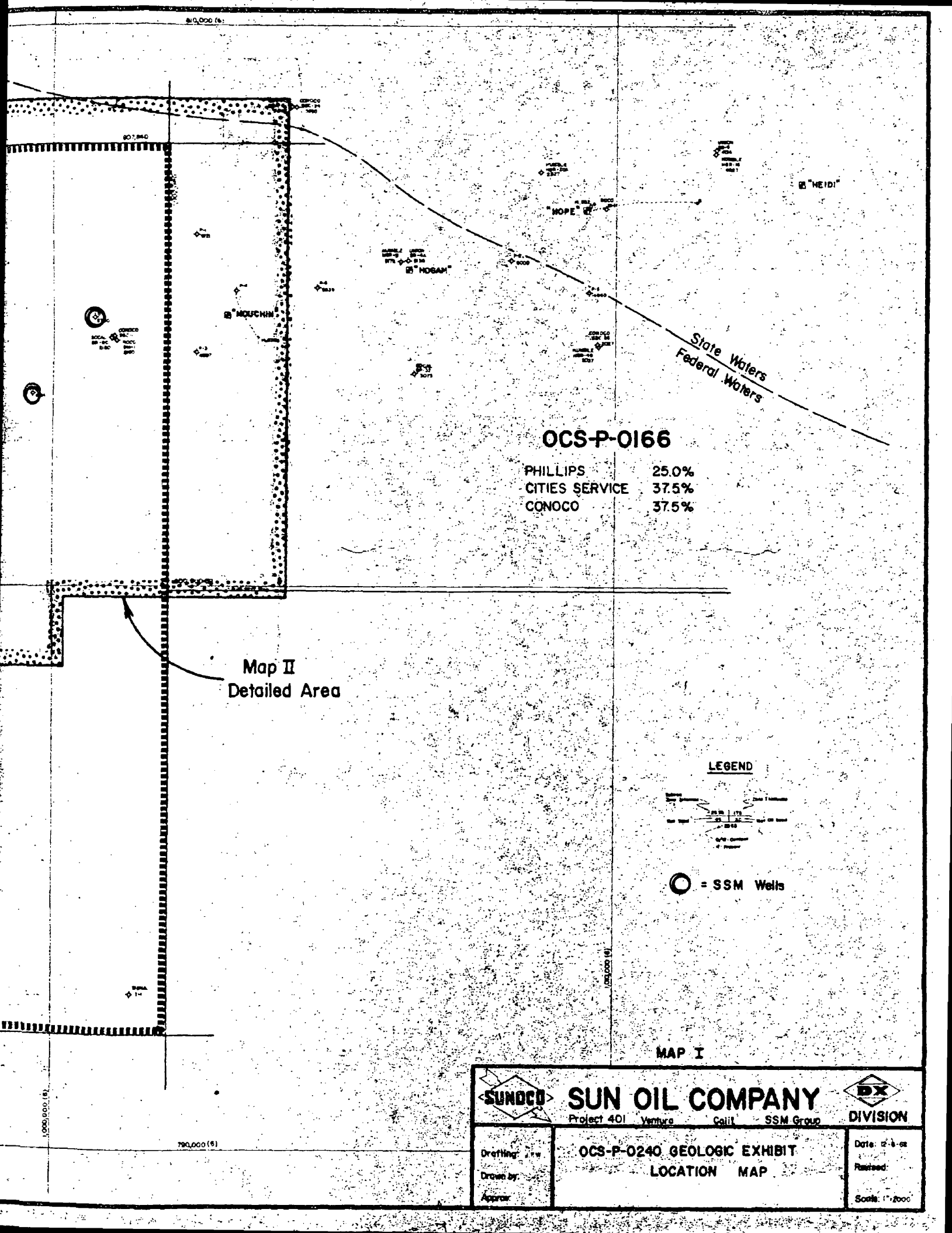


MAP III

OCS-P-0240
BATHYMETRIC MAP

Contour Interval
6 ft

1-20-69 Scale 1"=4000'


"HEIDI"
"HOPE"
"HOGAN"
"MOUCHIN"
State Waters
Federal Waters
OCS-P-0166
PHILLIPS 25.0%
CITIES SERVICE 37.5%
CONOCO 37.5%
Map II
Detailed Area
LEGEND
= SSM Wells
MAP I
SUNOCO
SUN OIL COMPANY
DX DIVISION
Project 401 Ventura Calif SSM Group
Drafting:
Drawn by:
Approv:
OCS-P-0240 GEOLOGIC EXHIBIT
LOCATION MAP
Date:
Revised:
Scale: 1" = 2000'

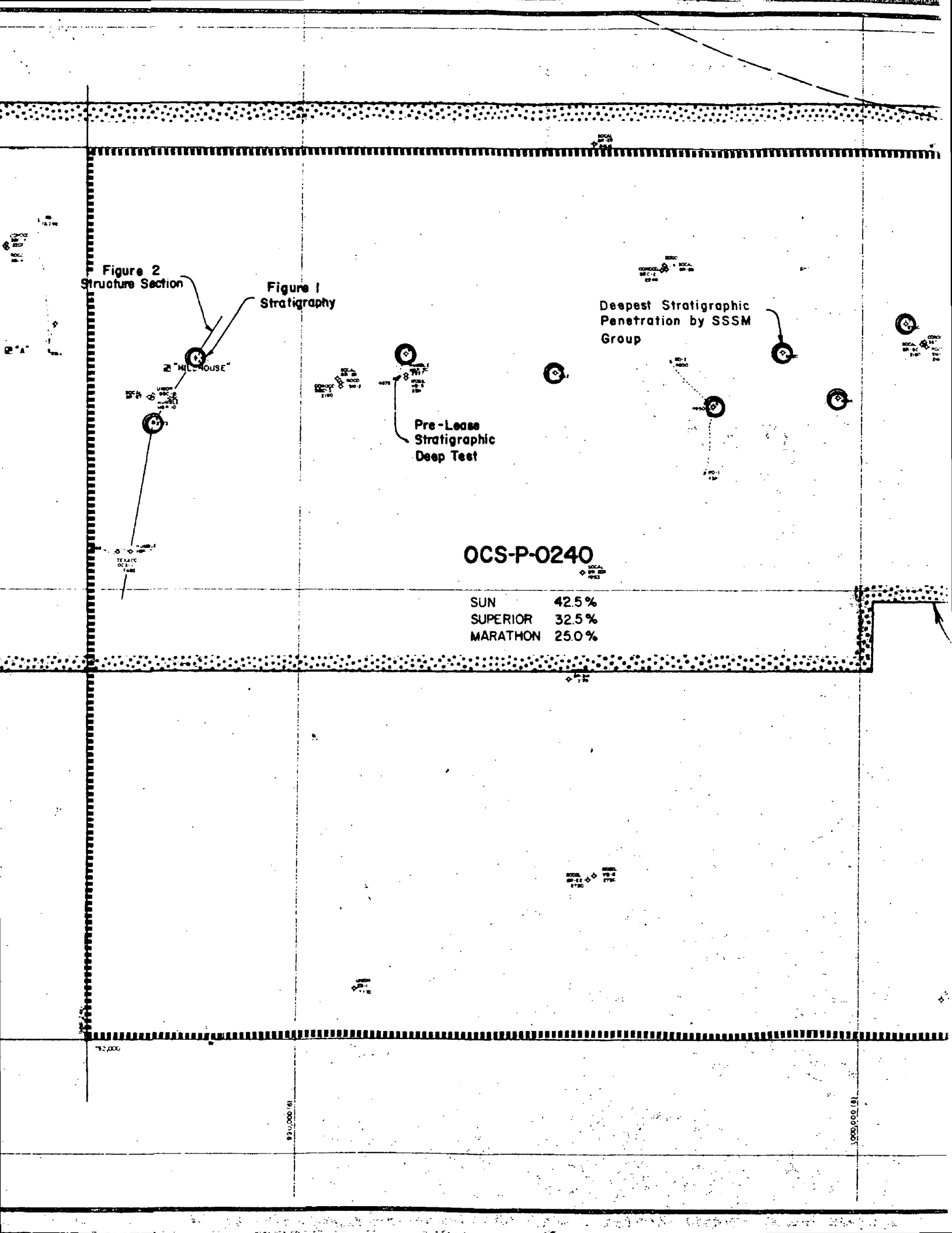


Figure 2
Structure Section
Figure 1
Stratigraphy
"HILLHOUSE"
Pre-Lease
Stratigraphic
Deep Test
Deepest Stratigraphic
Penetration by SSSM
Group
OCS-P-0240
SUN 42.5%
SUPERIOR 32.5%
MARATHON 25.0%

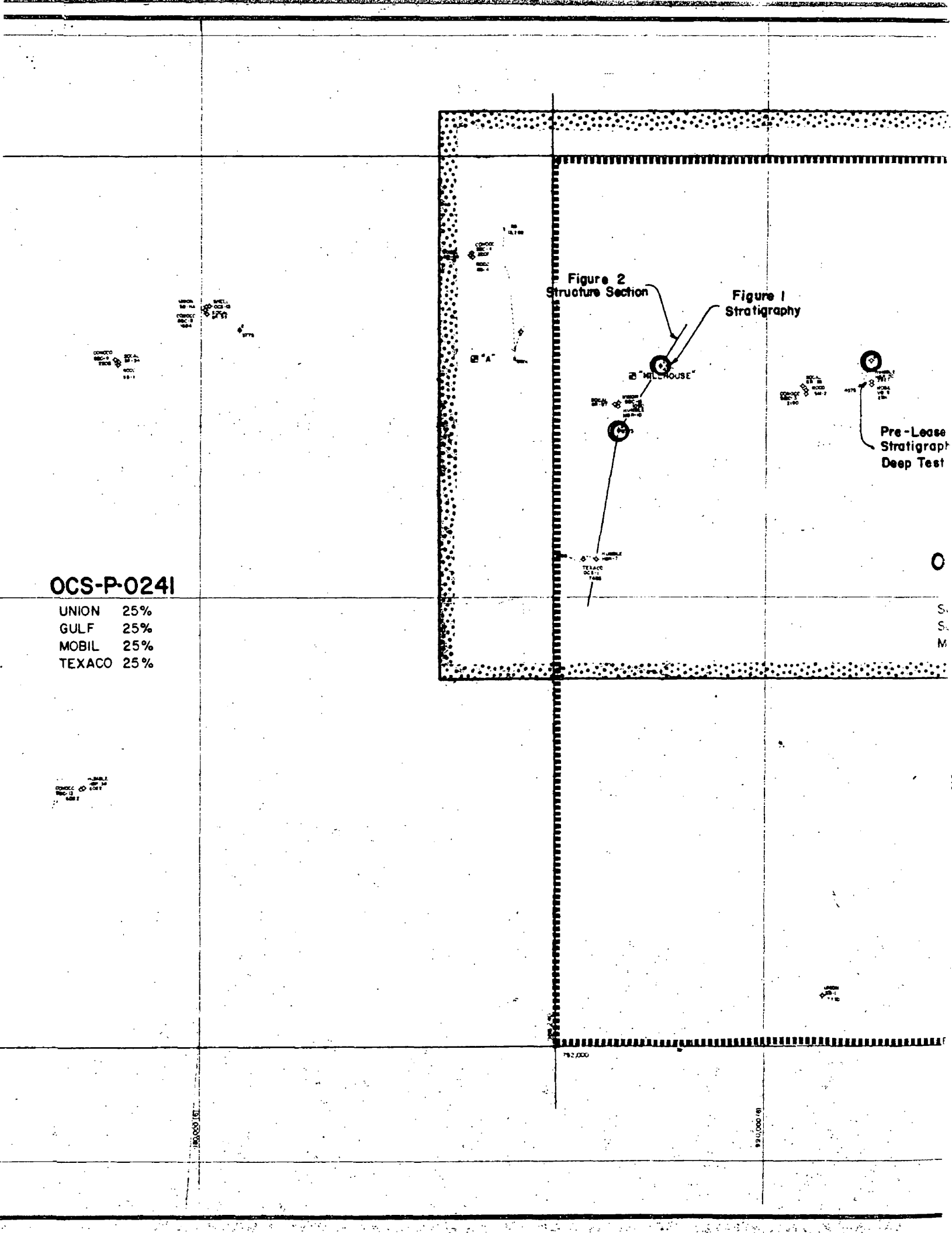
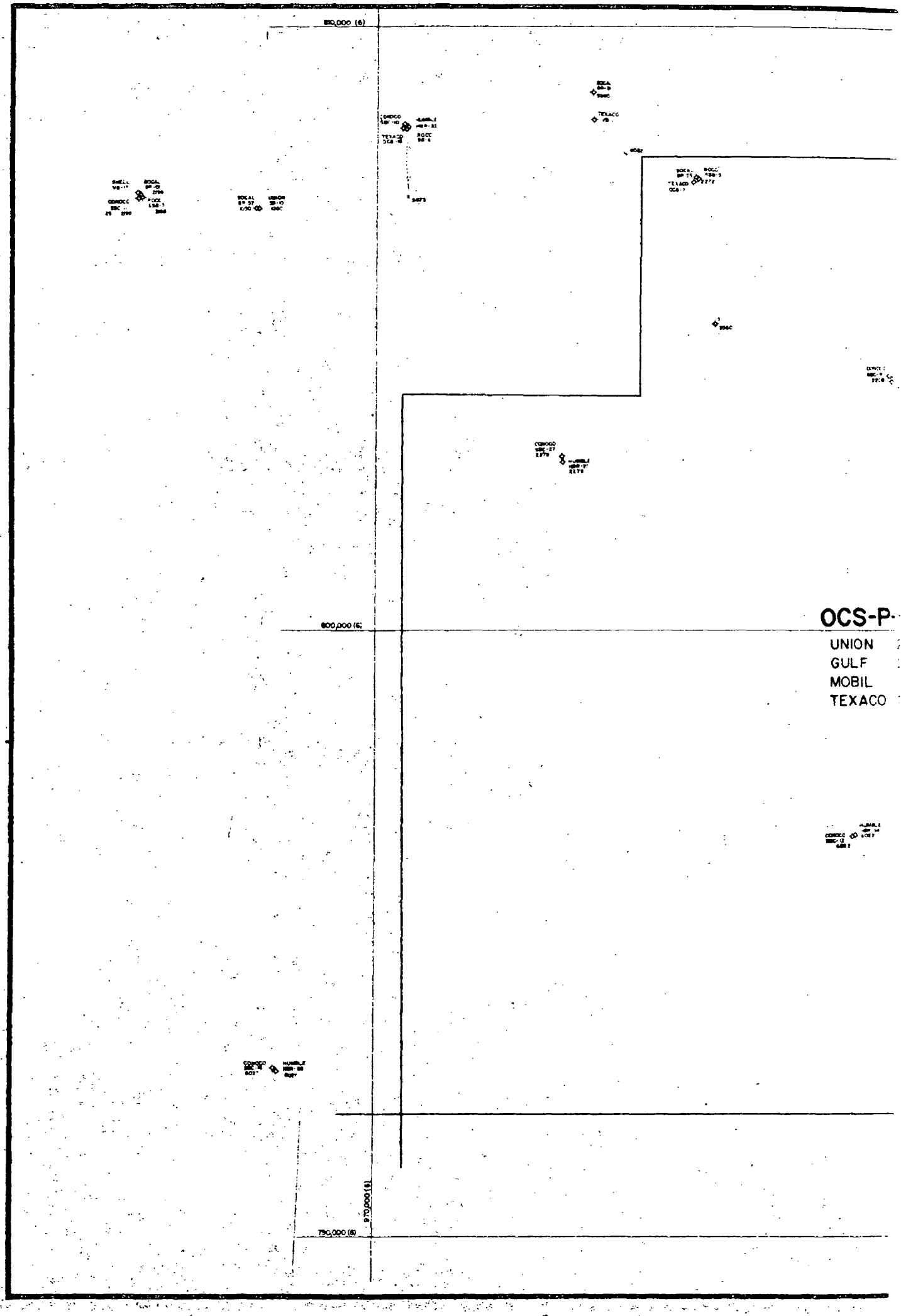
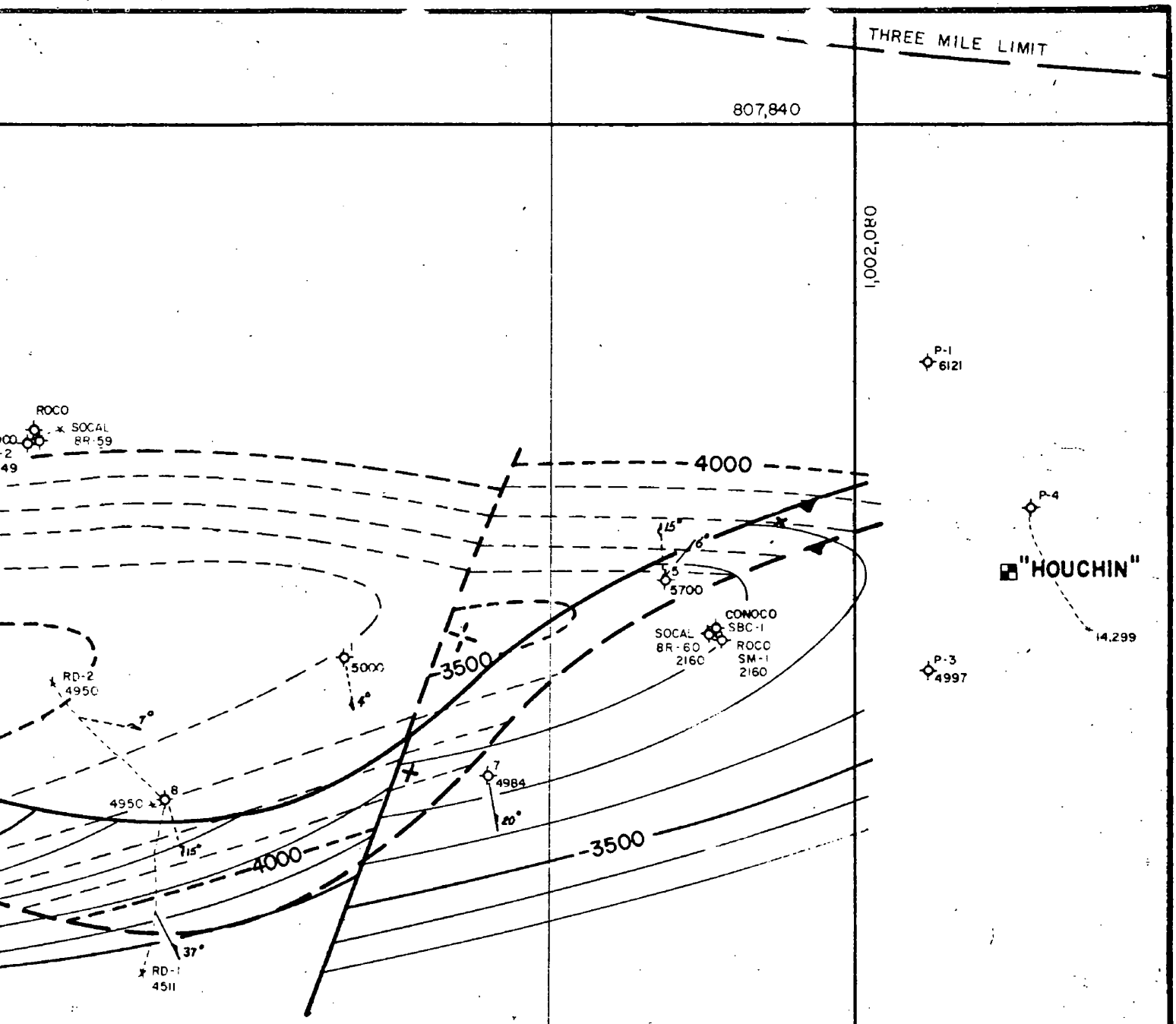


Figure 2
Structure Section
Figure 1
Stratigraphy
"MILLHOUSE"
Pre-Lease
Stratigraph
Deep Test
OCS-P-0241
UNION 25%
GULF 25%
MOBIL 25%
TEXACO 25%


810,000 (E)
800,000 (E)
790,000 (E)
870,000 (S)
OCS-P
UNION
GULF
MOBIL
TEXACO



——— -3500 ——— Contours on Top "G" Upper Block

– – – -3500 – – – Contours on Top "G" Lower Block

Adapted from maps by F.A. Reynolds

MAP II

SUNOCO

SUN OIL COMPANY

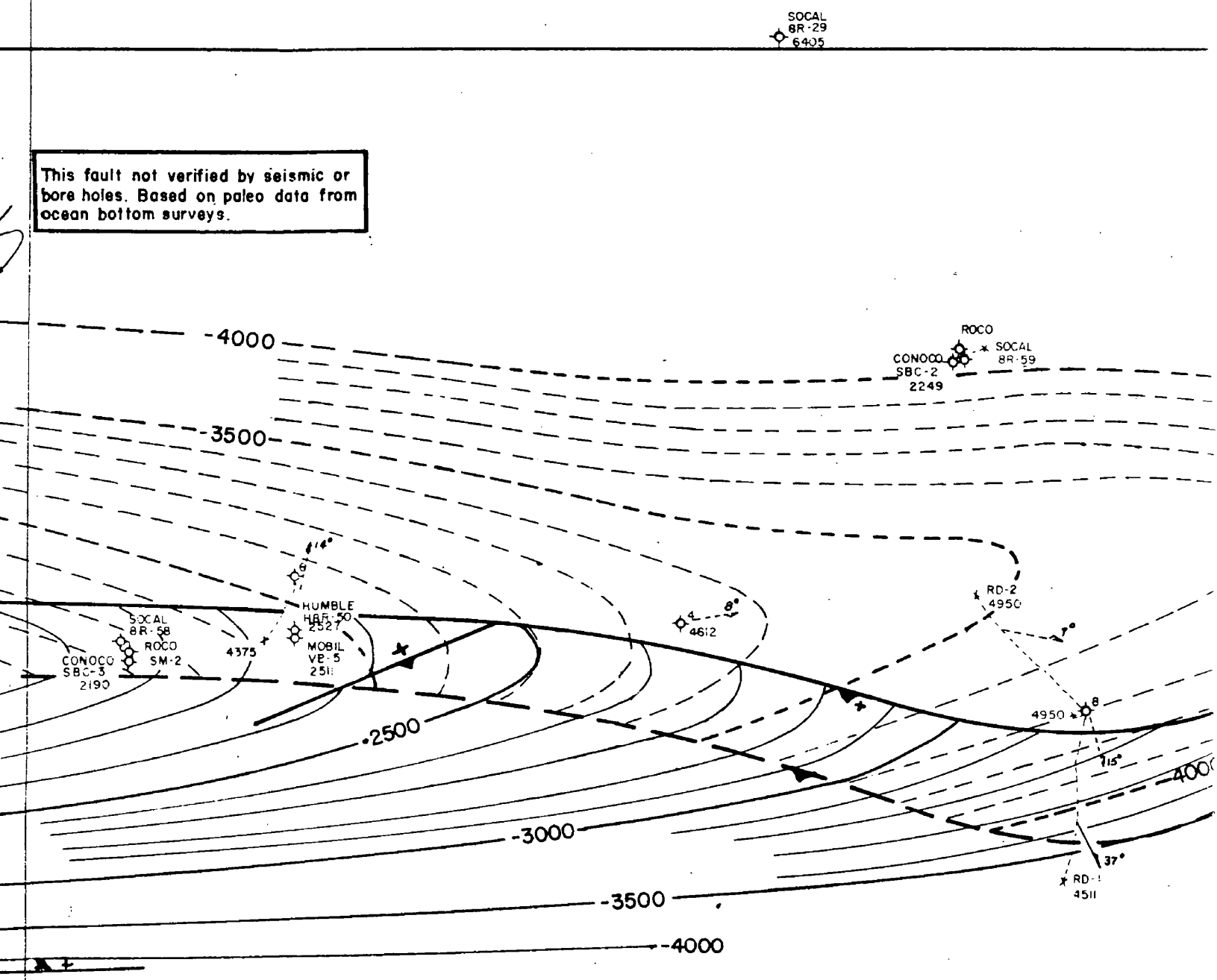
Project 401 Ventura Calif. SSM Group

DX DIVISION

Drafting J.F.W.
Drawn by G.J.W.
Approv

OCS-P-0240 GEOLOGIC EXHIBIT
Contours on "G" E-Log Marker
Representative Repetto Structure

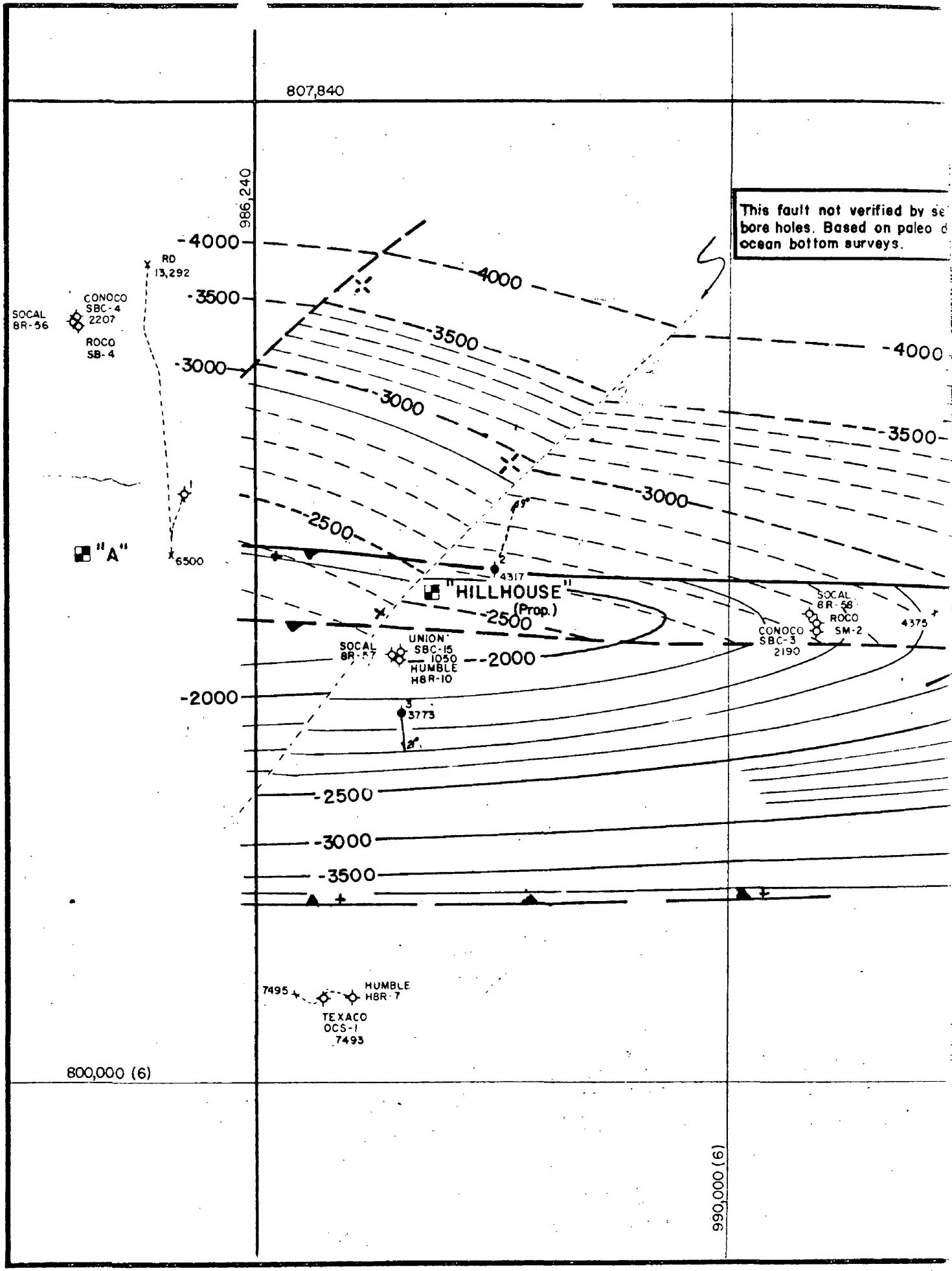
Date 1-13-69
Revised
Scale 1" = 1000'

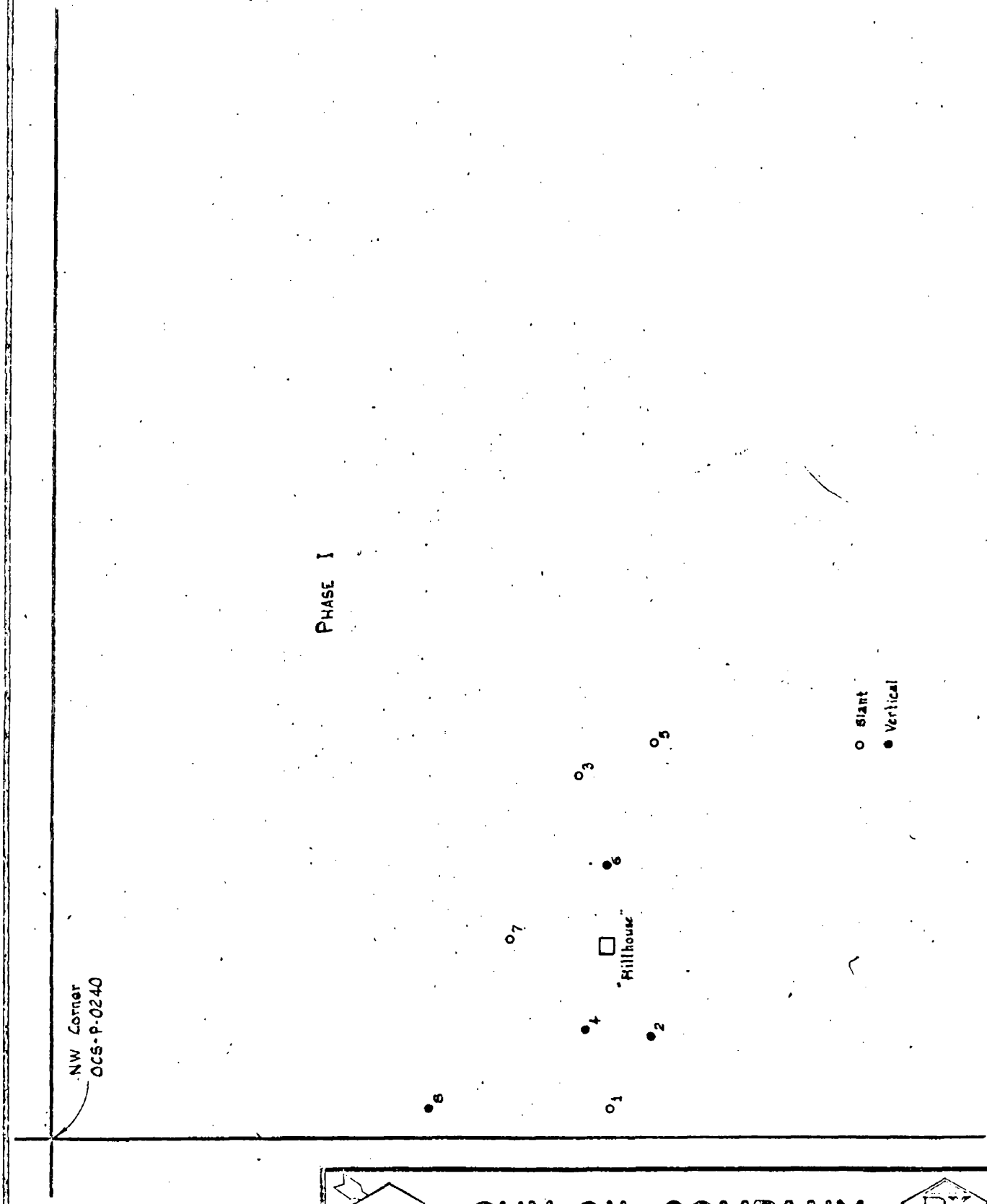


OCS-P-0240

SUN	42.5%
SUPERIOR	32.5%
MARATHON	25.0%

990,000 (9)


807,840
986,240
This fault not verified by se
bore holes. Based on paleo d
ocean bottom surveys.
-4000
-3500
-3000
-2500
-2000
4000
3500
3000
2500
2000
RD
13,292
SOCAL
BR-56
CONOCO
SBC-4
2207
ROCO
SB-4
"A"
6500
"HILLHOUSE"
(Prop.)
4317
SOCAL
BR-57
UNION
SBC-15
1050
HUMBLE
HBR-10
3773
CONOCO
SBC-3
2190
SOCAL
BR-56
ROCO
SM-2
4375
7495
HUMBLE
HBR-7
TEXACO
OCS-1
7493
800,000 (6)
990,000 (6)



SUNOCO

SUN OIL COMPANY

Project 401 Ventura Calif. SSM Group

DX DIVISION

Drafting: J.F.W.

Drawn by: B.F.B.

Approv:

PHASE I
BOTTOM HOLE LOCATIONS
WEST SIDE OCS-P-0240
MAP IV

Date: 8-12-69

Revised: 8-14-69

Scale: 1" = 1000'

SUN OIL COMPANY

Project 401 Ventura Calif. SSM Group

DX DIVISION

PHASE II
BOTTOM HOLE LOCATIONS
WEST SIDE OCS-P-0240
MAP V

Drafting: J.F.W.
Drawn by: B.F.B.
Approv:

Date: 8-12-69
Revised:
Scale: 1"=1600'