I INTRODUCTION

Union Oil Company of California is the sole lessee and operator for the Hueneme Offshore Field. The field is located in Federal waters about four miles off the Ventura-Oxnard, California coast in Federal Leases OCS P-0202 and P-0203 in about 95 feet of water.

A fifteen-slot platform will be set in December, 1979, to develop the Hueneme and Sespe formations. Six producers and six injectors will be drilled beginning in March, 1980, with all wells having gravel-packed completions. Reservoir pressure will be maintained by the injection of produced water and seawater. Initial production rates are anticipated to be 1,143 barrels of oil per day, per well, with a gas-oil ratio of 195 SCF/STB. Over ninety percent of this rate will be from the Hueneme formations. Peak production rate for the field will be 6,450 BOPD in September, 1980. Injection will be maintained at 7,500 barrels of water per day. Ultimate estimated recovery in 18 years will be 9.53 million barrels of oil and 1.72 billion cubic feet of gas.

This report is a complete description and evaluation of the field and is the Plan of Development to be submitted to the concerned agencies as described in OCS Order Nos. 8 and 11. This report will, therefore, include the following: (1) the field history and geology, (2) the drilling and testing history, (3) the reservoir descriptions and evaluations, (4) the platform structure and site, (5) the drilling facilities, procedures, and completions, (6) the platform production facilities, (7) the gathering systems, (8) the onshore site and

facilities, (9) the safety controls and pollution prevention facilities, and (10) an appendix. The appendix will contain the following: (A) the reservoir rock and fluid characteristics, (B) drilling rig and drilling deck diagrams, and (C) the reservoir performance prediction.

The development plan includes:

1. Fabrication and installation of a drilling and production platform in 95 feet of water.
2. Fabrication and installation of the facilities on said platform necessary
   (a) to test, measure and transport the production,
   (b) to clean, treat and inject seawater for pressure maintenance operations, and
   (c) to inject produced water for pressure maintenance operations.
3. Installation of a drilling rig with associated facilities.
4. Installation of a production line to shore and a return line for produced water.
5. Installation of onshore facilities necessary to receive, heat, separate, measure and distribute the production.
6. Installation of safety controls and pollution prevention facilities necessary to protect operating equipment and the environment.

As many as fifteen wells can be drilled from the platform, with six producers and six injectors planned initially.

Exploratory drilling has indicated the Hueneme sand and the Sespe sand to have accumulations of oil, and the fractured Monterey to have an accumulation of gas. The Hueneme formation has produced 15.4°API crude with a gas-oil ratio of about 87 cubic feet per barrel. The Sespe formation has produced 14.1°API crude with a gas-oil ratio of about 152 cubic feet per barrel. The Monterey formation has produced gas at a low rate.

II HUENEME FIELD HISTORY AND GEOLOGY

General

The Hueneme field is located in the southeast corner of the Santa Barbara Channel in Fereral Leases OCS P-0202 and P-0203 approximately four miles west-southwest of Port Hueneme. Mobil and Union were equal partners in these leases, formerly Tracts 350 and 351, which were acquired in a Federal lease sale in April, 1968, for a total bonus of $6,579,000. On October 19, 1978, Mobil assigned their interest to Union. The leases total 8582 acres. The field lies on the Beaver structural trend. This linear series of anticlinal features has been interpreted as being the offshore extension of the Oxnard producing trend. The structure is a large anticline which trends ENE-WSW. Bounding the structure to the south is the Hueneme high angle reverse fualt (Plates I, III, IV, and V). This large anticline is comprised of three closures separated by two shallow saddles. The most easterly closure is the Hueneme field, and it is further separated from the remainder of the structure by the Tract Line reverse fault (Plates I, III, IV, and VI).

Hueneme Field Discovery

The Hueneme field was discovered in July, 1969, by Mobil OCS P-0202 No. 1-A (Plate V), the first well drilled on the lease. The productive zones consist of the Oligocene Sespe formation (Plate III)---oil, and the Miocene Hueneme sand (Plate I)---oil. See Figure 1 for a typical electric log of the field. All formation testing referred to in this section was performed in Mobil OCS P-0202 No. 1-A.

Thirty-one feet of the total 134 feet of Sespe net pay sand was tested through overall perforations from 5382' to 5421' M.D. at a stabilized flow rate of 46 BOPD, 7 MCFD, 5% cut, 14.1°API gravity, with a gas-oil ratio of 152 SCF/STB. The test indicated a PI of 0.23 BOPD/psi, a permeability to oil of 140 millidarcies, and an initial reservoir pressure of 2540 psia at the deepest observed oil at -5501' or 5526' M.D. (Plate III).

The Hueneme sand (Plates I and II), which contains the bulk of the field's reserves, flowed at a stabilized rate of 1035 BOPD, 90 MCFD, 6% mud cut, 15.4°API gravity, with a GOR of 87 SCF/STB, and an average PI of 62 BOPD/psi from 121 feet of pre-packed liner from 5101' to 5222' M.D. The interval is one massive sand and contains 103 feet of net oil sand. Initial reservoir pressure based on the average final shut-in pressure was 2370 psia at 5160' M.D. Average permeability of the formation from the drill stem test was 6900 millidarcies.

The fractured Monterey formation was tested in the intervals 4170'-4312' M.D. and 4380'-4468' M.D. and flowed 0.624 specific gravity gas at a low rate.

A thin Pico sand tested 10 MCFD, decreasing to an immeasurable rate after five minutes. The fluid recovered was drilling mud with solid tar particles. The interval tested was 3673'-3704' M.D. Analysis by the testing company indicates that the casing perforations may have been plugged on this test and that no meaningful calculations can be made from the data recorded during this test.

See Figure 2 for a more detailed summary of the drill stem tests.

Although five attempts were made to core Well No. 1-A, very little recovery was achieved in either the Hueneme or Sespe formation. However, many sidewall samples were taken and the following values were obtained from their analyses:

Hueneme Sand

Arithmetic Mean Permeability - 2212 md

Geometric Mean Permeability - 1238 md

Permeability Variation - 0.45

Average Core Porosity - 32.4%

Average Residual Oil Saturation of Core - 33.1%

Average Residual Water Saturation of Core - 32.1%

Number of Samples - 22

Sespe Sand

Arithmetic Mean Permeability - 256 md

Geometric Mean Permeability - 181 md

Permeability Variation - 0.62 or higher

Average Core Porosity - 30.2%

Average Residual Oil Saturation of Core - 16.7%

Average Residual Water Saturation of Core - 52.0%

Number of Samples (those having residual oil saturation) - 9

Fractured Monterey

No analysis made

Confirmation Drilling

Two wells, Mobil OCS P-0202 Nos. 3 (Plate VI) and 4, were drilled in the first half of 1975 and were left in a suspended condition. Their purpose was to confirm the production established by the discovery well and to more accurately estimate field size. The maximum limit of Hueneme sand reserves was determined by OCS P-0202 No. 4 where the Hueneme and Sespe zones were wet. The Monterey formation was tested at a structural elevation nearly flat with OCS P-0202 No. 1-A, but OCS P-0202 No. 4 found the fractured shale reservoir to have very low porosity and permeability at this location. Only small amounts of water and asphaltic oil were recovered.

Mobil OCS P-0202 No. 3 (Plate VI) found oil in both the Hueneme and Sespe reservoirs. No testing was conducted. The minimum limit for the Hueneme sand is derived from this well at -5235'. The maximum limit from OCS P-0202 No. 4 is -5530', thus limiting the uncertainty of the extent of the accumulation to 95 vertical feet. It is believed that the actual oil-water contact is nearer the greater depth since OCS P-0202 No. 4 did exhibit approximately 20% residual oil saturation. A very short transition zone probably exists in this exceptionally good reservoir.

Sespe oil has been found to a depth of -5501' in OCS P-0202 No. 1-A. Each Sespe sand probably has its own oil-water contact. There is some evidence for varying oil-water contacts in the Sespe since OCS P-0202 No. 4 found wet Sespe sands at a shallower depth than oil sands in OCS P-0202 No. 1-A (Plates V and VI). The inconsistencies in the oil-water interfaces for the Sespe in these wells are not explainable by any structural separation.

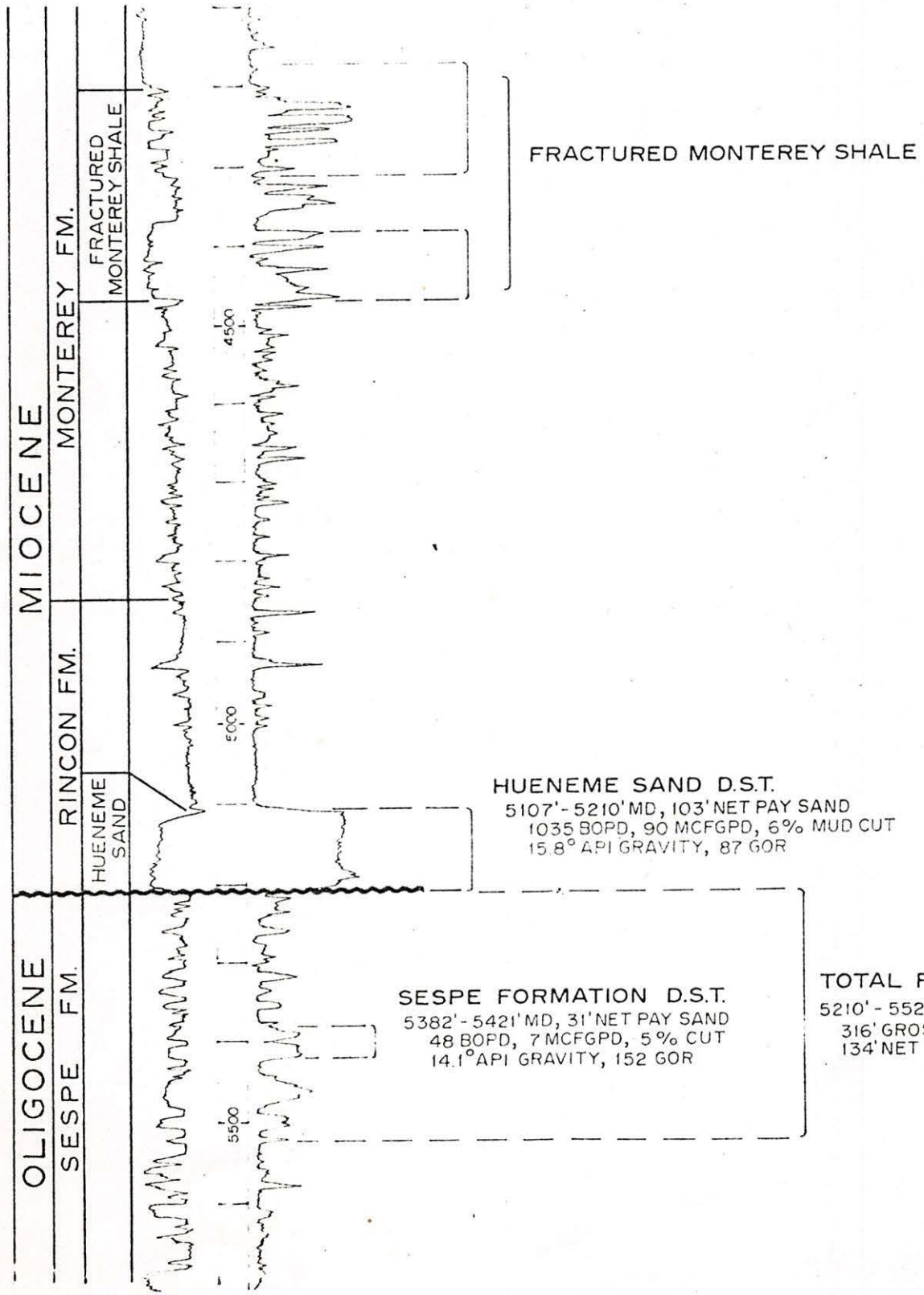
The combined geological and geophysical interpretation indicates the Hueneme sand oil pool to have a maximum areal extent of 220 acres and a minimum areal extent of 135 acres. Oil in place, as determined by model studies is 24.7 million barrels in the Hueneme. The Sespe, based on the oil-water contact seen in Well No. 1-A, has an areal extent of 346 acres and 30.7 million barrels of oil in place.

FIGURE 1

CONFIDENTIAL

TYPICAL ELECTRIC LOG
HUENEME FIELD
SANTA BARBARA CHANNEL, CALIFORNIA

FROM MOBIL-OCS P-0202 N° 1A



Well Name	Marker	Depth MD	Depth SS	OWC	Net Pay/ Net Sand
Mobil OCS P-0202 #1-A	Monterey	3955			
	Hueneme	5107	-5082		103' net pay
	Sespe	5250	-5225	-5515	134' net pay

Drillstem Tests

DST #1 5109'-5182' (Hueneme) - Recovered mud cut oil, 13.5° API gravity, 76% oil, 24% B.S. & W. Very little gas. F.L. 280' from surface.

DST #2 5109'-5222' (Hueneme) - Well flowed at stabilized rate of 1101 B/D (1035 net oil), 15.4° API gravity, at a surface press. of 360 psi. Gas rate was 90 MCFD, GOR - 87 SCF/BBL. Actual fluid recovery = 206.2 BBLS oil, 8.7 BBLS H_2O 27.1 BBLS mud. Max. temp. = 145°F. From I.S.I. assume P_i = 2351 psig @ 5120' MD (5095' SS) P.I. = 62 B/D/psi. k = 6900 md.

DST #3A 5448'-5473', 5493'-5506' (Sespe) - Test failed; tool plugged with sand.

DST #3B 5448'-5473', 5493'-5506' (Sespe) - No fluid to surface. Tool plugged with sand (trace of oil).

DST #4A 5382'-5396', 5403'-5421' (Sespe) - 1000' rise in fluid level. No gas prod. Recovered mud and sand with a trace of oil.

DST #4B 5382'-5396'-, 5403'-5421' (Sespe)-Recovered 8.5 BBLS in 5½ hours. Ave rate of 48 B/D gross (46 B/D net), 14.1°API oil and 7 MCFD gas. GOR = 152 P.I. = 0.23 B/D/psi, S.P.I. = 0.003 B/D/psi ft. NOTE: only 70' of the 134' of Sespe net pay sand was tested. P_i = 2545 psia @ 5515' SS k = 140 md.

Well Name	Marker	Depth MD	Depth SS	OWC	Net Pay/ Net Sand	Drillstem Tests
Mobil OCS P-0202 #3	Pico	3756'			39'/47'	Comments:
	Monterey	4469'	-4177'		Incalculable	Sespe sands present in well P-0202 #1-A from 5210'-5330' MD are absent in this well due to Oligocene-Miocene unconfirmity. From logs. Hueneme and Sespe were found to be oil saturated.
	Hueneme	5922'	-5154'		77'/104'	
	Sespe	6042'	-5235'		155'/225'	
Mobil OCS P-0202 #4	Monterey	4707'	-4396'			Comments:
	Hueneme	5646'	-5330'		86' net sand	Five DST's were run which showed the well to b wet. Markers encountered 80'± lower than anticipated. Max. oil extent established for Hueneme sand at -5330'. Most Sespe sands found in well P-0202 #1-A were not found here due to unconformity.
	Sespe	5732'	-5416'		No pay	

III RESERVOIR EVALUATION

Arp's recovery factors for the Hueneme sand indicate that only 10% of the oil-in-place would be recovered by depleting the reservoir by solution gas drive, but that 55% of the oil could be recovered by a strong water drive. Tarner material balance work (included in Appendix A) and the reservoir simulation study also indicate that only 10% of the oil-in-place would be recovered by solution gas drive. Because of the limited extent of the Hueneme sand, however, little, if any, water drive is expected. Therefore, pressure maintenance by water injection will be required.

A plan for the economical optimization of the field was developed using Intercomp's Beta II three-phase, three-dimensional, reservoir simulator at Union Oil Company's Brea Research Center. Reservoir and fluid characteristics of the Hueneme and Sespe formations, as used in the model, can be found in Appendix A.

Because of the much greater productivity of the Hueneme sand, initial studies were made on this sand only. Recovery from a reservoir under pressure maintenance is affected only slightly by flow rates; so the first level of optimization was on well patterns. It was assumed that all injectors would be drilled at the oil-water contact, as they would be used to delineate the field. Four patterns were then investigated as follows: (1) five producers, five injectors, (2) six producers, four injectors, (3) six producers, six injectors, and (4) seven producers, seven injectors. Pressure maintenance of the reservoir requires that the same reservoir volume of fluid be injected as is produced. Flow rates

were maintained at 1000 barrels of fluid per day per well, and all wells were assumed to be redrilled at some time during the life of the field. The production schedules as developed by the model were then smoothed using a hyperbolic decline curve fit, and were evaluated using Union Oil Company's EP12 computer program. Some of the data on pattern recoveries is presented in the table below:

Hueneme Sand Only

No. of Producers	No. of Injectors	MODEL DATA Recovery MBBLS	Life Yrs.	SMOOTHED DATA Recovery MBBLS	Life Yrs.
5	5	7,615	16	7,858	20
6	4	7,338	13	7,314	16
6	6	7,511	14	7,987	16
7	7	7,599	12	7,717	15

It should be noted that the ultimate recovery based on the smoothed data is greater than that determined by the model due to the use of a limiting water-cut per well in the model as opposed to a field economic limit for the smoothed data.

The six producers, six injectors pattern maximized oil recovery and was used as the development well pattern on final model runs that included the Sespe formation. Because of the much greater productivity of the Hueneme zone than that of the Sespe zone, it will be necessary to maintain the pressure in the Hueneme at some value lower than initial pressure, so that maximum recovery from the total field will be achieved. Several cases were studied in which the Hueneme pressure was allowed to

drop, resulting in lower recovery from the Hueneme zone but greater recovery from the Sespe zone. These cases revealed that the value of the additional Sespe recovery by this scheme is rapidly minimized by the loss of Hueneme oil. Therefore, some optimum pressure for maintenance will be determined once injectivity and productivity is verified. This optimum pressure in the Hueneme zone is about 2200 psia.

For performance prediction, it was assumed that injection would not begin until after all six producers had been placed on production, and that production and injection rates would be maintained at 1,250 reservoir barrels per day, per well. According to the model, average reservoir pressure for the Hueneme sand under this scheme would be 2140 psia and for the Sespe 2250 psia. Initial production rates would be 1042 BOPD with a gas-oil ratio of 195 SCF/STB. Peak platform rate will be 6450 BOPD. The production schedule as calculated by the model is presented in Appendix C. The table below lists some of the results of the combined Sespe-Hueneme model run:

MODEL RESULTS					SMOOTHED DATA				
RECOVERY, MMBBLS					RECOVERY, MMBBLS				
Hueneme	Sespe	Total	% OOIP	Life Yrs.	Hueneme	Sespe	Total	% OOIP	Life Yrs.
7.6	1.4	9.0	16.1	15	8.1	1.4	9.5	17.1	17

For the Hueneme zone, 8.1 million barrels represent 32.8% recovery, and for the Sespe, 1.4 million barrels represent 4.6% recovery.

IV DRILLING PROCEDURES

Six producers and six injectors will be drilled from the proposed platform. Average measured well depth for the producers is 5450' and for the injectors is 5750'. Estimated time to drill and complete each well is 27 days. Figures 6 and 7 are schematic drawings of typical well completions. It would be preferred to separate the completion intervals in all wells by cemented blank casing, as shown for the typical producer, but because of the close proximity of the two zones, this may not be practical, necessitating a single interval completion, as shown for the typical injectors.

The proposed drilling rig is a Pool Company "1000" manufactured by O.I.M.E., Odessa, Texas. The rig is capable of drilling to 12,000' with 4-1/2" drill pipe. Appendix B contains drawings of the proposed rig and drilling deck.

CONFIDENTIAL

TYPICAL PRODUCER

PROCEDURE

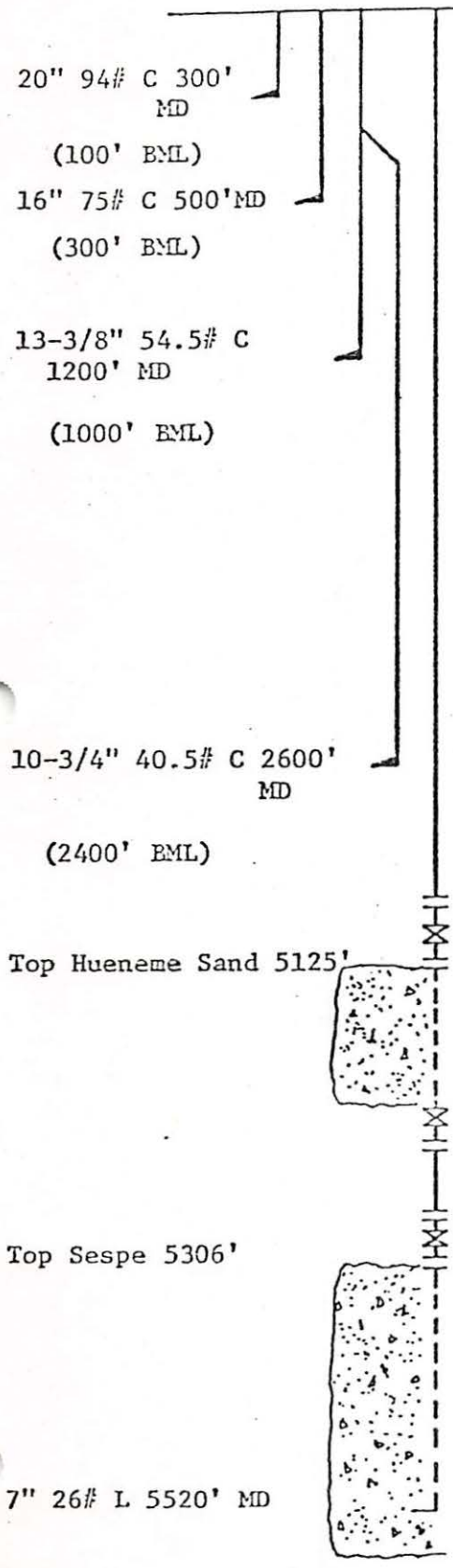
1. Rig up over celler.
2. Drill 26" hole to 300' MD (100' BML).
3. Run and cement 20" casing 100' BML.
4. Drill 17-1/2" hole to 500' MD (300' BML). Underream hole to 22" to 500' MD.
5. Run and cement 16" casing 300' BML. Install 20" Hydril.
6. Drill 12-1/4" hole to 1200' MD (1000' BML); open hole to 18".
7. Run and cement 13-3/8" casing 1000' BML. Install and test 13-5/8" BOPE.
8. Drill 12-1/4" hole to 2600' MD (2400' BML); open hole to 15".
9. Run and cement 10-3/4" liner from 1100' MD to 2600' MD (2400' BML).
10. Directionally drill 9-7/8" hole to 5540' TMD, 5340' TVD (5140' TVD BML).
11. Run logs.
12. Underream to 15" in two stages: Sespe interval 5306' to 5540' and Hueneme interval 5125' to 5215' MD.
13. Run Caliper log.
14. Run 7" combination blank and slotted 20-mesh wire wrapped casing to 5520' MD.
15. Gravel pack in two stages, Sespe and Hueneme intervals.
16. Cement blank section between gravel packed intervals.
17. Cement blank section above top gravel packed interval.
18. Run Cement Bond log.
19. Run pumping equipment on 2-7/8" tubing.
20. Remove BOPE and install Christmas tree.
21. Place well on production, pumping from Sespe and Hueneme gravel packed intervals.

FIGURE 6
HUENEME FIELD
SANTA BARBARA CHANNEL
UNION-OCS P-0202 N°

CONFIDENTIAL

PROPOSED CONDITION
HUENEME AND SESPE PRODUCER

TYPICAL WELL SCHEMATIC



RT to MLLW	100'
Water depth	100'
RT to ML	200'

10-3/4" x 13-3/8" hanger

7" F.O. cementer 5100'

7" Lynes packer 5107'

7" P.C. 5123'

9-7/8" hole opened to 15" 5125'-5215' MD
20-mesh wire-wrapped casing 5125'-5215'
gravel packed with 10-20 mesh gravel
7" Lynes packer 5225'
F.O. cementer 5241'

F.O. cementer 5281'
7" Lynes packer 5288'
7" P.C. 5304'

9-7/8" hole opened to 15" 5306'-5540' MD

20-mesh wire-wrapped casing 5306'-5520'

Gravel packed with 10-20 mesh gravel

5540' TMD
5340' TVD
5140' TVD BML

CONFIDENTIAL

TYPICAL INJECTOR

PROCEDURE

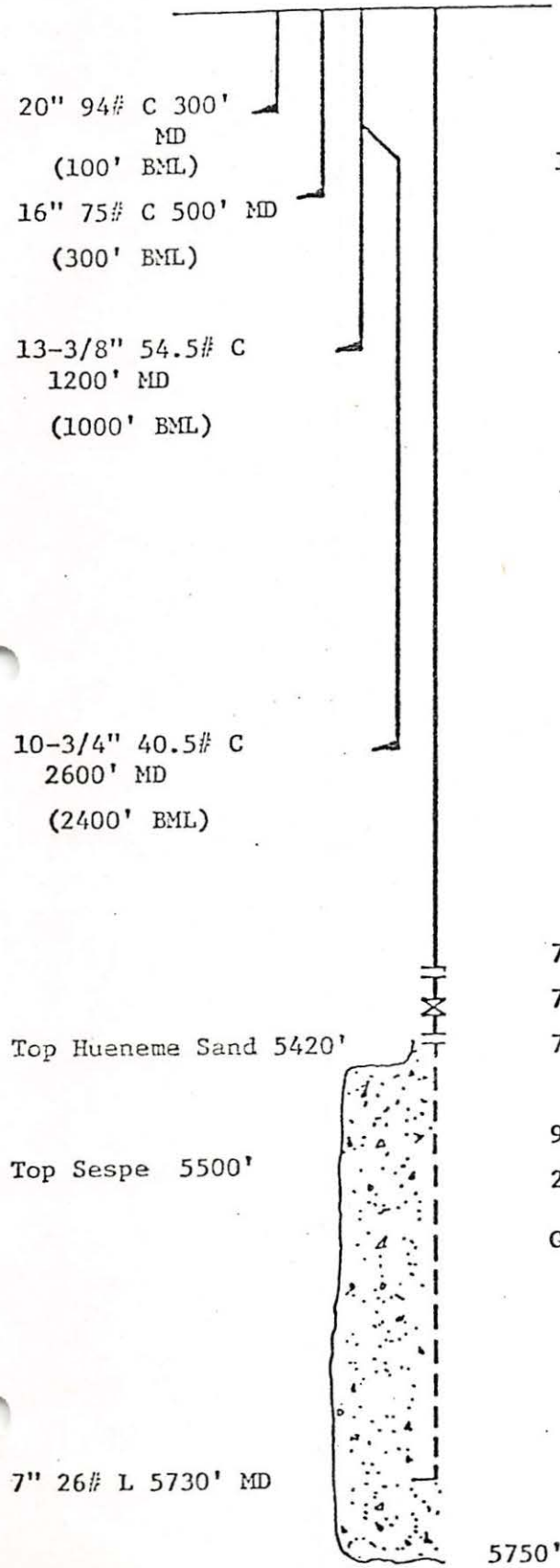
1. Rig up over cellar.
2. Drill 26" hole to 300' MD (100' BML).
3. Run and cement 20" casing 100' BML.
4. Drill 17-1/2" hole to 500' MD (300' BML). Underream hole to 22" to 500'MD.
5. Run and cement 16" casing 300' BML. Install 20" Hydril.
6. Drill 12-1/4" hole to 1200' MD (1000' BML); open hole to 18".
7. Run and cement 13-3/8" casing 1000' BML. Install and test 13-5/8" BOPE.
8. Drill 12-1/4" hole to 2600' MD (2400' BML); open hole to 15".
9. Run and cement 10-3/4" liner from 1100' MD to 2600' MD (2400' BML).
10. Directionally drill 9-7/8" hole to 5750' TMD, 5000' TVD (4800' TVD BML).
11. Run logs.
12. Underream to 15" across Sespe and Hueneme intervals from 5420' to 5750' MD.
13. Run Caliper log.
14. Run 7" combination blank and slotted 20-mesh wire wrapped casing to 5730' MD.
15. Gravel pack Sespe and Hueneme intervals.
16. Cement blank section above gravel packed interval.
17. Run Cement Bond log.
18. Run 2-7/8" injection string.
19. Remove BOPE and install injection head.
20. Commence water injection into the Sespe and Hueneme intervals.

FIGURE 7
HUENEME FIELD
SANTA BARBARA CHANNEL
UNION-OCS P-0202 N°

CONFIDENTIAL

PROPOSED CONDITION
HUENEME AND SESPE INJECTOR

TYPICAL WELL SCHEMATIC



RT to MLLW 100'
Water depth 100'
RT to ML 200'

10-3/4" x 13-3/8" hanger

7" F.O. cementer 5395'
7" Lynes packer 5402'
7" P.C. 5418'

9-7/8" hole opened to 15" 5420'-5750'
20-mesh wire-wrapped casing 5420'-5730'
Gravel packed with 10-20 mesh gravel

5750' TMD
5000' TVD
4800' TVD BML

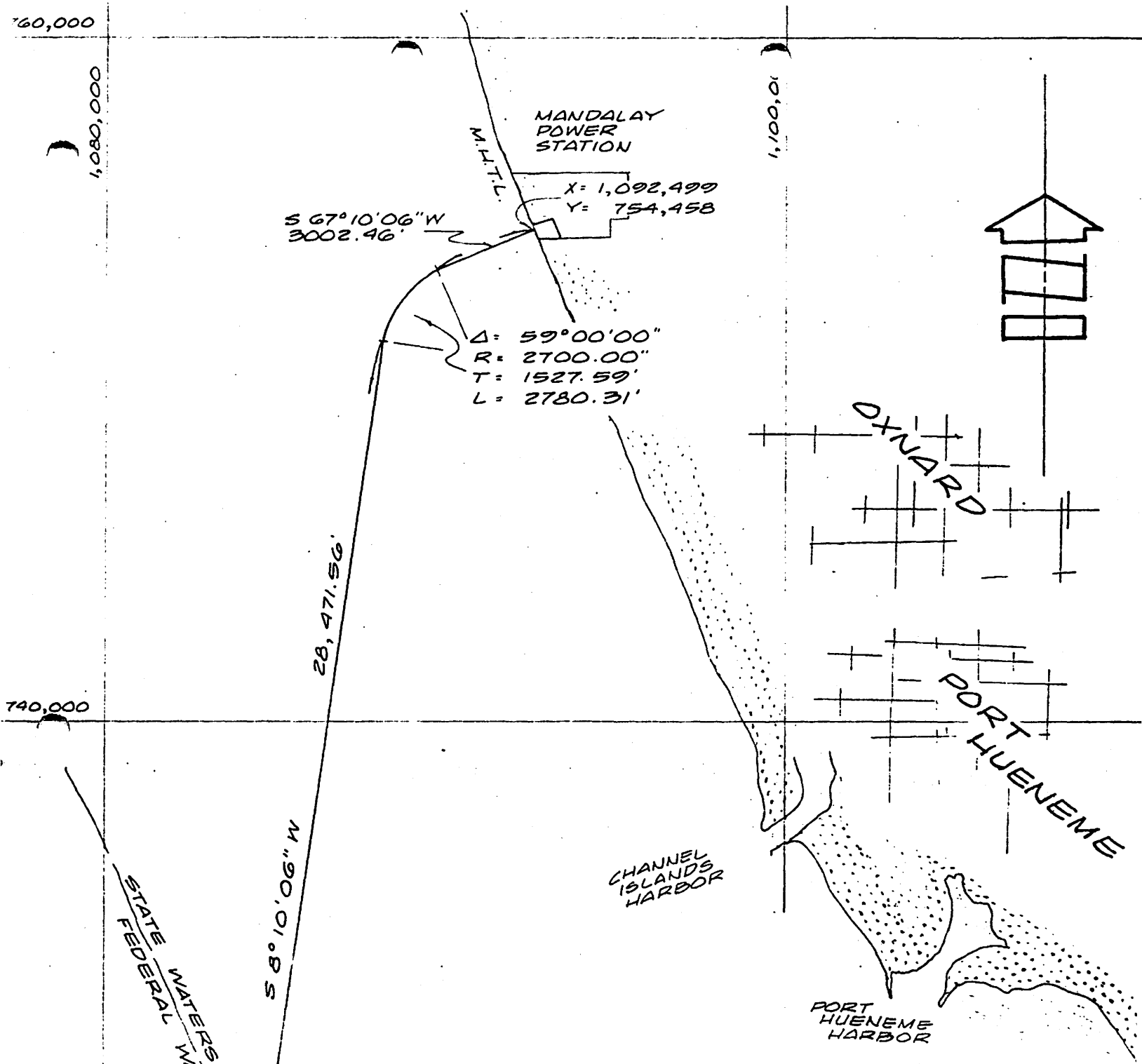
V PLATFORM STRUCTURE AND SITE

The proposed platform will be a six pile structure set in 95' of water at Lambert Grid *coordinates X = 1,084,062 and Y = 723,005, OCS P-0202 approximately four miles west of Port Hueneme. Piling will be driven and/or drilled to a depth sufficient to satisfy all safety requirements as set out in API RP-2A latest edition. The Geotechnical Consultants, Inc., report dated March, 1976, will be used for pile design, etc. The Platform will be designed to conform to the requirements for earthquake stability as set out in API RP-2A. Fifteen well slots will be provided.

The superstructure will consist of a drilling deck 96' x 80' at +63' MLLW elevation, a wellhead deck 40' x 70' at +43' MLLW elevation and a subdeck 40' x 16' at +27' MLLW elevation. The platform will have a heliport, quarters for 6-8 persons, one pedestal-mounted crane, and two boat landings.

The platform will be cathodically protected below sea level and coated with protective paint above sea level. Special provisions will be made for protection in the splash zone. Concurrent with the installation of the support facilities, a standard drilling rig with all required equipment will be installed. Power will be supplied by a submarine power cable from the onshore site. See Figure 3 for a map of the proposed location and pipeline route.

*California Zone VI



UNION OIL COMPANY OF CALIFORNIA

SKETCH SHOWING

PROPOSED PIPELINE ROUTE O.C.S. P-0202

SANTA BARBARA CHANNEL CALIFORNIA

NOVEMBER, 1978 SCALE: 1"=4000'

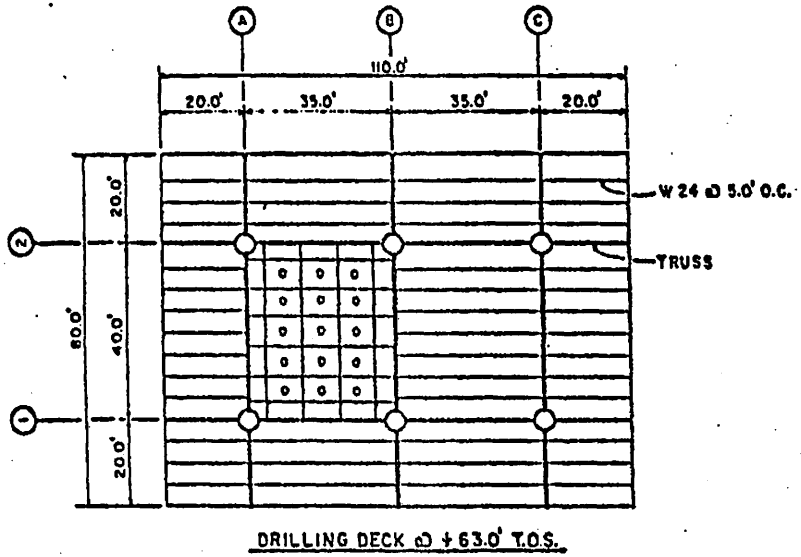
NOTE: BEARINGS, DISTANCES AND COORDINATES SHOWN ON THIS SKETCH CONFORM WITH THE CALIFORNIA COORDINATE SYSTEM (LAMBERT

LEWIS & LEWIS, INC.
surveyors
1600 Callens Road P. O. Box 820

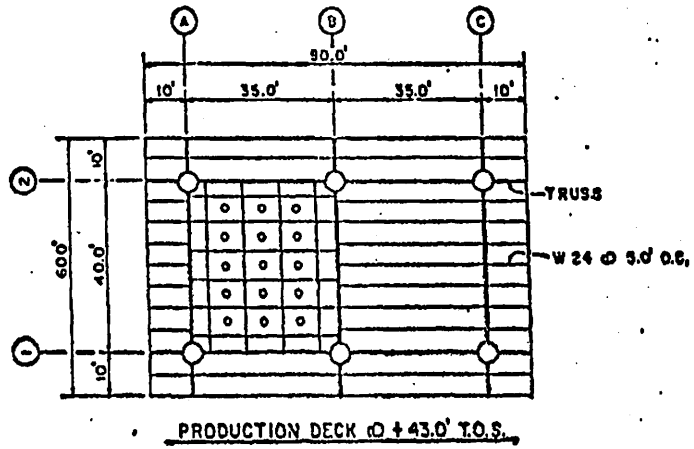
VI PLATFORM SPECIFICATIONS

Water Depth	95'
No. Piles	6
Drill Deck	96' x 80' +63' above MLLW
Production Deck	70' x 40' +43' above MLLW
Sub-Deck	40' x 16' +27' above MLLW
One Crane	North side center, 110' boom Max. load = 76 kips
Heliport	40' x 40' Max. 8,000# capacity
Clear Deck Space	10'
Well Slots	15
Max. load on drill deck	2900 Kips (Load is inside of piling perimeter)
Max. load on prod. deck	600 Kips
Wellhead Room	200#/sq.ft. in well area
Sub-deck	Designed for 85,000# total
South Boat Landing	2 Tier, small for emergency use
North Boat Landing	3 Tier, larger for primary use
Crane Pedestal	Equipped for fuel storage
Cargo Hatch	Near center of drill deck (±15'/sq.ft.)
Pipeline Risers	4 - clamped to jacket (size 2-10" 2-6")
Power Cable	2 - 6" from -85' to ±14'
Cutting Chute	2 - 12" from -80' to ±14'
Sewage Disposal Chute	1 - 4" from -80' to ±14'
Fire Water Source Cans	2 - 12" from -20' to ±14', slotted - closed ends
Pressure Main. Source	2 - 8" from -60" to ±14', slotted - closed ends
Sacrificial Anodes	Attached to jacket (designed and furnished by Union)
Decks	Shall be equipped with curbs and drains

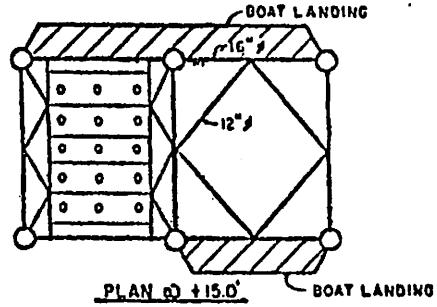
Drawings of the proposed platform are presented in Figures 4 and 5.



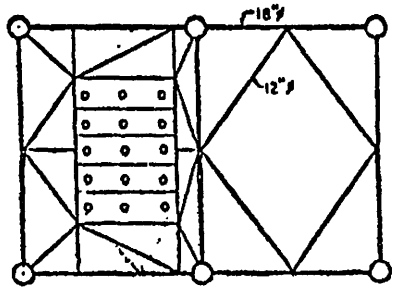
DRILLING DECK @ +63.0' T.O.S.



PRODUCTION DECK @ +43.0' T.O.S.



PLAN @ +15.0'



PLAN @ -40.0'

FIGURE 4

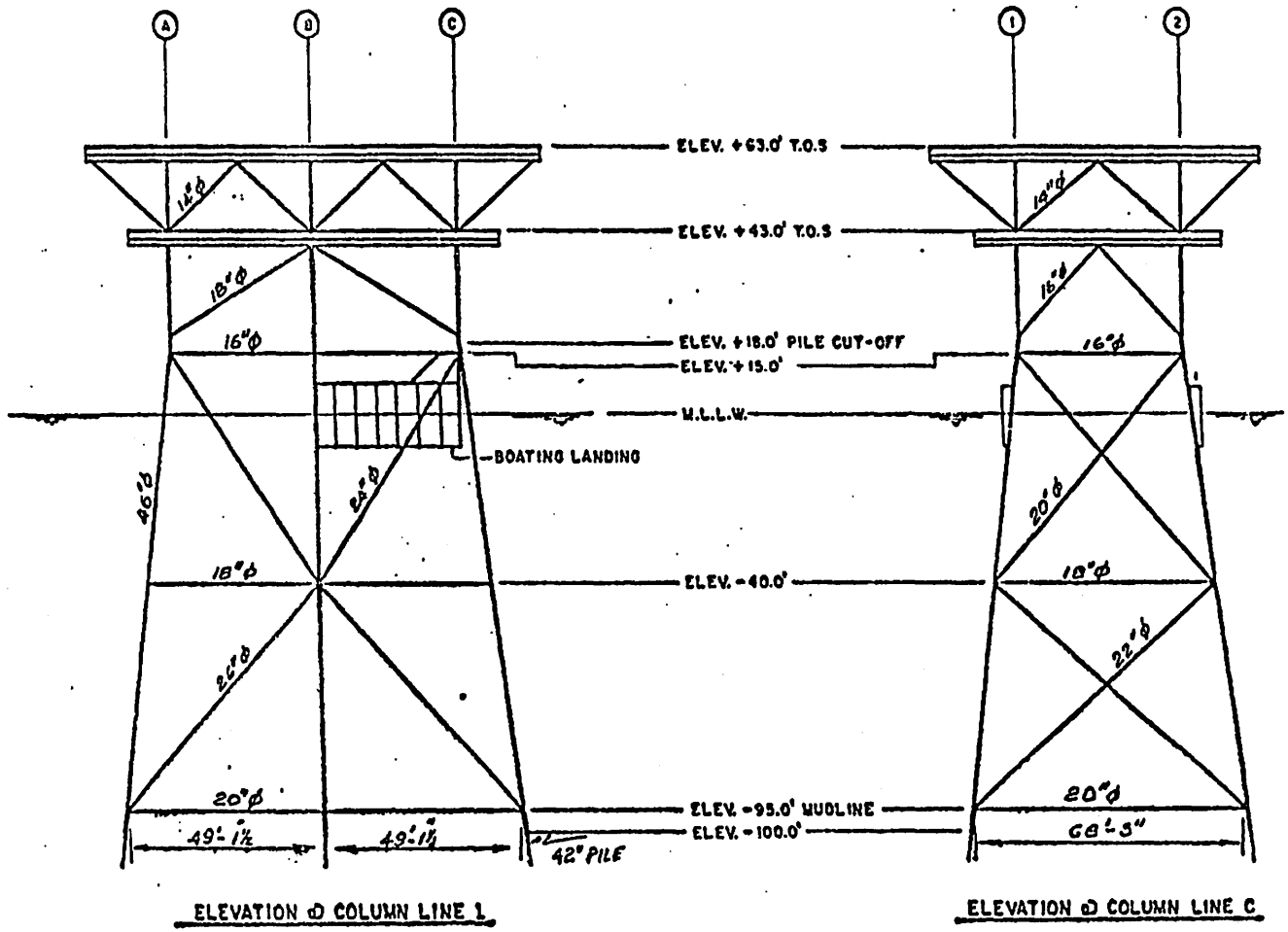

A
B
C
1
2
ELEV. +63.0' T.O.S
ELEV. +43.0' T.O.S
14"ϕ
18"ϕ
16"ϕ
ELEV. +18.0' PILE CUT-OFF
ELEV. +15.0'
M.L.L.W.
BOATING LANDING
16"ϕ
20"ϕ
18"ϕ
ELEV. -40.0'
22"ϕ
20"ϕ
ELEV. -95.0' MUDLINE
ELEV. -100.0'
49'-1½"
49'-1½"
42" PILE
68'-3"
ELEVATION ⓓ COLUMN LINE 1
ELEVATION ⓓ COLUMN LINE C

FIGURE 5

VI DESIGN CRITERIA

Earthquake	Use API RP-2A latest edition
Wave	
Maximum	42' (once every 100 years)
Period	15 seconds
Direction of approach	175°
Wind	50 knots sustained - 75 knot gusts from 165°

VII PLATFORM FACILITIES

Support Systems

The platform will be equipped with the following items which are considered support for the drilling and production operations.

1. 1 - Electrically driven fire water pump.
2. 1 - Diesel driven fire water pump.
3. 1 - Crane 70 ton on drill deck.
4. 1 - Crane 2.5 ton on production deck.
5. Deck drain collection and disposal system.
6. Potable water tank and pump.
7. Sewage disposal unit.
8. Public address system.
9. Alarm system.
10. Navigational aids (fog horn and lights).
11. Life saving and floatation equipment.
12. Oil containment and clean-up equipment.
13. Fire hose reels and monitors as required.
14. Direct telephone communications.
15. Radio communications.
16. Emergency generator (12.5 KVA for communications and navigational aids).
17. Gas detectors.
18. Flame detectors.

Pressure Maintenance System

The pressure maintenance system will be composed of the following items:

1. Seawater charge pump.
2. Vacuum tower for oxygen removal.
3. Sand filters.
4. Injection pumps.
5. Injection pumps for returned treated produced water.

Production System

Pumps will be installed in each well to deliver 1250 bbls. of fluid per day at a pressure of 2100 psig (bubble point is 2046 psig). Each well (6) will be equipped with a meter and cut monitor as well as all necessary safety devices. After measurement, the well effluent will go directly into the gathering system line for transport ashore. Metered data, as well as other pertinent information, will be telemetered to the onshore site.

Gathering System

The gathering system will consist of a 10.75" OD line, .500 wall thickness and have a design working pressure of 2160 psig. Produced gas, oil, and water will be transported. First separation will occur in the free water knockout at the onshore treating facility.

The second line (6-5/8" OD) will be installed to return the produced water to the platform for injection for pressure maintenance.

VIII SAFETY, POLLUTION PREVENTION, CONTROLS

The platform decks will be equipped with curbs to contain any spillage which might occur. The spillage will be collected in a tank on the sub-deck, then pumped into the pipeline for transportation ashore. The platform will have onboard such pollution control/containment equipment (booms, skimmers, etc.) as required by the U.S.G.S.

Aids to Navigation, as required and approved by the U.S. Coast Guard, will be installed and maintained in a manner acceptable to the U.S.C.G. U.S.C.G. approved life rafts and life preservers will be provided.

Hand rails, stairways, etc., shall all be installed and maintained to OSHA regulations.

All construction and design shall meet or exceed applicable codes and/or API recommended practices.

Production and drilling equipment shall be equipped with all safety and control devices as required by OCS Orders for the Pacific Area.

The onshore facility shall be constructed and operated to comply with the appropriate California, Cal OSHA, and Federal OCS regulations. A SPCC Plan will be prepared for the onshore facility.

Fire fighting equipment, both water and chemical, will be installed on the platform and at the onshore facility. Training in the use of this equipment will be provided for the operators.

Prior to the beginning of operations, the Oil Spill Contingency Plan will be updated. Thereafter, the Contingency Plan will be updated on a schedule consistent with U.S.G.S. procedures. It should be pointed out, however, that no treating or storage of hydrocarbons will occur on the platform. The maximum amount of hydrocarbons which will ever be on the platform at any one period of time is 10 barrels or less.

IX ONSHORE SITE

The onshore facility will be located on a leased parcel of approximately two acres adjoining on the southwest of the Mandalay generating plant. This parcel is owned by the County of Ventura and adjoins additional County property which will be developed as Mandalay Beach Park. The County has no plans for developing the proposed site. The site is in the existing onshore Montalvo oilfield. It will be landscaped and constructed in a manner acceptable to the City of Oxnard and the Ventura County Department of Parks.

The produced effluent will come to the onshore facility, through a pig receiver, at a temperature of 50°F. Using waste cooling water from the adjoining Mandalay power plant, the stream will be heated to a temperature of +80°F and passed into a FWKO (1000 barrel capacity) where gas and water will be removed. The oil will then go to a gas-fired heater treater for treating to pipeline specifications, thence to a shipping surge tank and a LACT unit to the pipeline. Approximately 2.5 MM BTU/Hr will be reclaimed from the waste water and an additional 3.5 MM BTU/Hr will be needed from the gas-fired heater treater.

All vessels will be under vapor recovery. Gas will be gathered, treated, and compressed for sale.

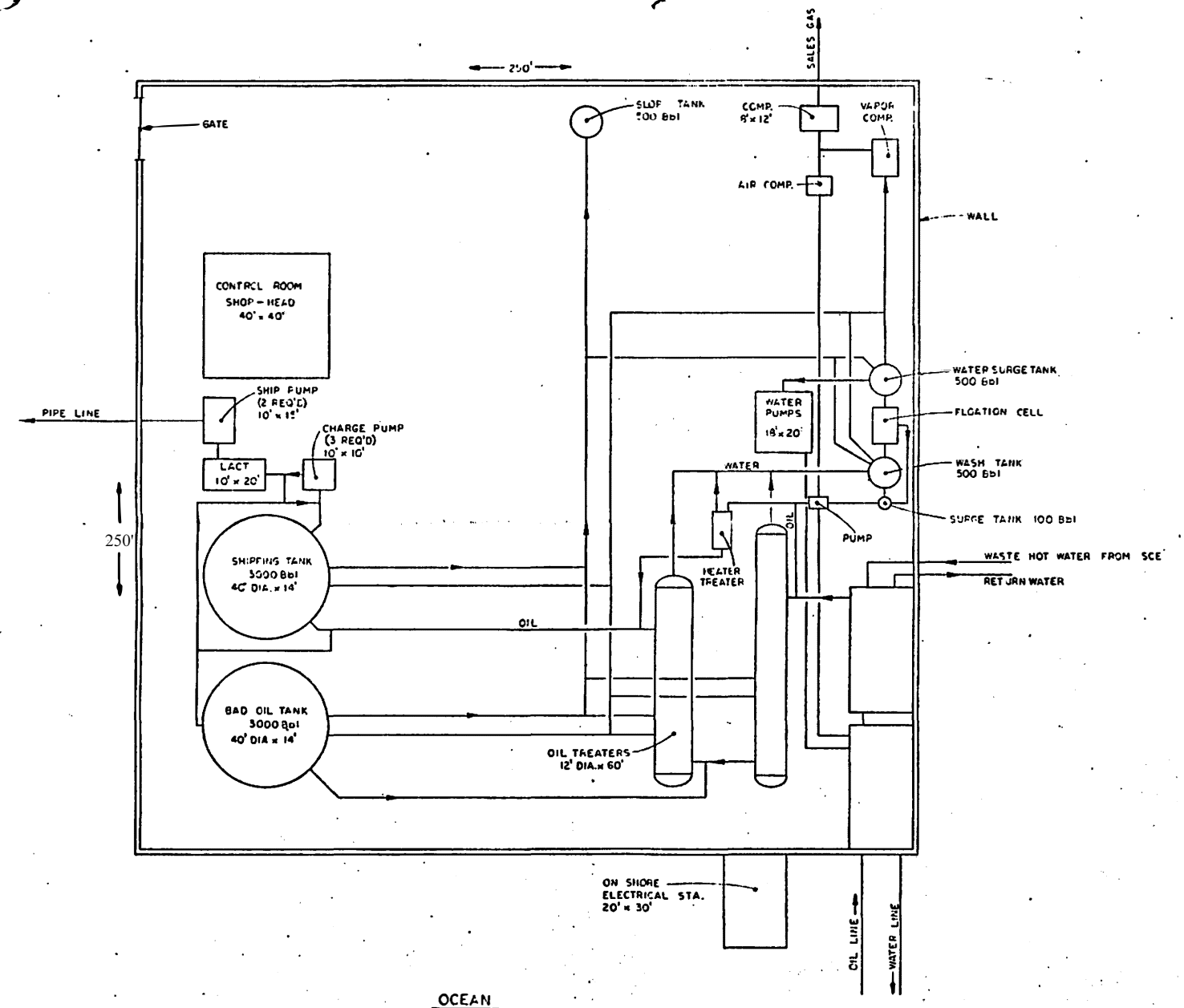
All water will be accumulated in a wash tank for further treatment through an induced gas flotation cell. From the cell, the water will

be pumped back to the platform for injection. Slop oil and water from the flotation cell and the wash tank will go to a small high-temperature heater treater for further treatment. Accumulated sand, sludge, and untreatable oil will go to a sump. From time to time, it will be necessary to haul the sump material to an approved Class I disposal site.

All platform data will be transmitted to the onshore site for direct readout. The onshore site will have the ability to exercise certain commands to the platform as deemed appropriate.

Oil and gas sales will be shipped through lines which presently exist at or near the onshore facility.

Figure 8 is a schematic drawing of the proposed onshore site.



Mc GRATH STATE BEACH

MANDALAY POWER PLANT
—PLOT N—

ASSOCIATED DESIGN

L. NEMUS

SCALE:

1/16" = 1'

1001

HUENEME FIELD

PROPOSED WELL LOCATIONS
SANTA BARBARA CHANNEL

CONFIDENTIAL

LAMBERT GRID ZONE VI

BOTTOM HOLE LOCATIONS:

	Well	X	Y
Injectors	1	1,083,000	723,050
	2	1,084,200	722,650
	3	1,084,200	723,850
	4	1,082,600	721,850
	5	1,085,000	723,150
	6	1,081,800	722,250
Producers	1	1,081,400	723,450
	2	1,085,000	722,650
	3	1,081,800	721,450
	4	1,083,800	724,250
	5	1,082,600	723,850
	6	1,084,200	721,850

Surface location of all wells will approximately be at

X = 1,084,062
Y = 723,005

HUENEME FIELD HUENEME SAND PRIMARY DEPLETION

MATERIAL BALANCE CALCULATION

RESERVOIR TEMPERATURE	141.0
GAS CAP FACTOR, M	0.0
GAS INJECTED, PCT	0.0
WATER INFLUX, A	0.13000E-04
INTERSTITIAL WATER SAT.	0.0450
CRITICAL GAS SATURATION	0.0700
KG/KO CURVE USED IS	AVSD

					FORM. VOL. FACTORS		
PRES	OIL PROD PCT.	PROD COR	OIL SAT	SOLN GOR	OIL B	GAS V X100	COMPOSITE U
2450.	0.0	199.	0.955	199.	1.092	0.112	1.092
2060.	0.878	199.	0.955	199.	1.095	0.133	1.095
1716.	4.422	171.	0.916	171.	1.085	0.161	1.130
1112.	8.058	2581.	0.874	114.	1.068	0.254	1.284
710.	9.148	5848.	0.858	75.	1.056	0.409	1.563
314.	9.977	6289.	0.845	35.	1.045	0.944	2.594
15.	11.167	852.	0.827	1.	1.032	20.565	41.664

Reservoir Fluid and Rock Characteristics

Hueneme Zone

CONFIDENTIAL

I	Oil Gravity, ^{o}API	
	A. Core Laboratories, Inc. Analysis of OCS P-0202 No. 1-A sample	15.4
	B. Measured in field	15.8
	C. Mobil Research	15.5
	D. Union Research	15.2
	E. Saybolt (Open hole test)	15.3
	F. Value used in model	15.4
II	Sulfur Content of Oil, %	
	A. Saybolt	3.43
	B. Mobil Research	3.62
	C. Union Research	3.53
III	Bubble Point Pressure @ Reservoir Temperature, psia	
	A. Core Laboratories, Inc.	2,061
IV	Reservoir Temperature	
	A. Drill stem test	141^{o}F
V	Gas Gravity	
	A. Core Laboratories	0.576
	B. Field measured	0.584
	C. Value used in model	0.576
VI	Gas in Solution, SCF/STB	
	A. Producing GOR	87
	B. Core Laboratories, Inc.	199

VII Compressibility of Saturated Oil @ Reservoir Temperature, Vol/Vol/psi

A.	Core Laboratories, 5,000 psi-4,000 psi	4.66×10^{-6}
B.	Core Laboratories, 4,000 psi-3,000 psi	4.90×10^{-6}
C.	Core Laboratories, 3,000 psi-2,046 psi	5.31×10^{-6}
D.	Value used in model (average)	4.94×10^{-6}

VIII Formation Water Salinity, PPM NaCL

A.	From $R_w = 0.12$ @ 147^oF (#4)	26,000
B.	From $R_w = 0.17$ @ 141^oF (#1-A)	19,000

IX Formation Water Viscosity @ Reservoir Temp., cp

A.	Based on correlations	0.48
B.	Used in model	0.5

X Formation Water Density, gm/cc 1.03

XI Formation Water Compressibility, Vol/Vol/psi

A.	Dodson and standing	3.3×10^{-6}
B.	Used in model	2.0×10^{-6}

XII Formation Water Formation Volume Factor, RB/STB

A.	Dodson and standing	1.014
B.	Used in model	1.013

XIII Rock Compressibility, Vol/Vol/psi

A.	Hall	3.6×10^{-6}
B.	Ventura field and West Montalvo correlation	26.0×10^{-6}
C.	Value used in model	10.0×10^{-6}

XIV Initial Formation Pressure

A.	Drill stem test analysis	2351 psig @ 5120'
B.	Used in model	2435 psia @ 5344'

XV Permeability, md

A.	Arithmetic mean of sidewall cores (#1-A)	2,212
B.	Geometric mean of sidewall cores (#1-A)	1,238
C.	Permeability variation of sidewall cores (#1-A)	0.45
D.	Drill stem test analysis	6,900
E.	Schlumberger correlation, based on log analysis	2,000
F.	Used in model	2,200

XVI Formation Porosity, %

A.	Average core porosity (#1-A)	32.4
B.	Average log effective porosity (#1-A)	24.3
C.	Average log effective porosity (#3)	29.9
D.	Average log effective porosity (#4)	18.5
E.	Value used in model	varies

XVII Initial Water Saturation, %

A.	Based on correlation using core values	18
B.	Average log effective S_w (#1-A)	4.5
C.	Average log effective S_w (#3)	4.6
D.	Schlumberger correlation	5
E.	Value used in model	4.5

XVIII Residual Oil Saturation, %

A.	From Arps correlation	43
B.	From core data corrected to reservoir conditions	37
C.	Value used in model	37

Additional fluid and rock data is presented in the following graphs:

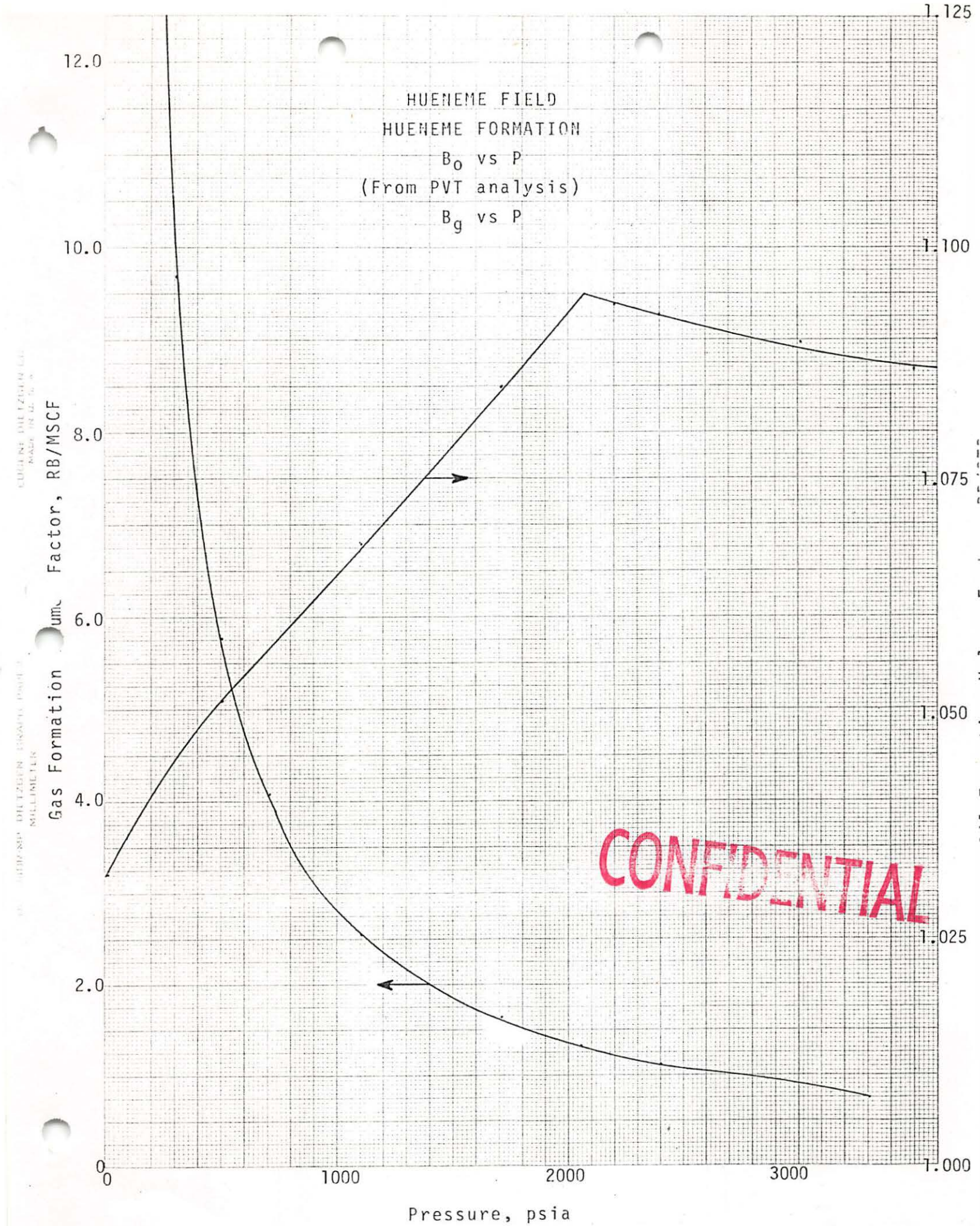
1. Oil formation volume factor from Core Laboratory's PVT analysis
2. Oil viscosity from Core Laboratory
3. Gas in solution from Core Laboratory

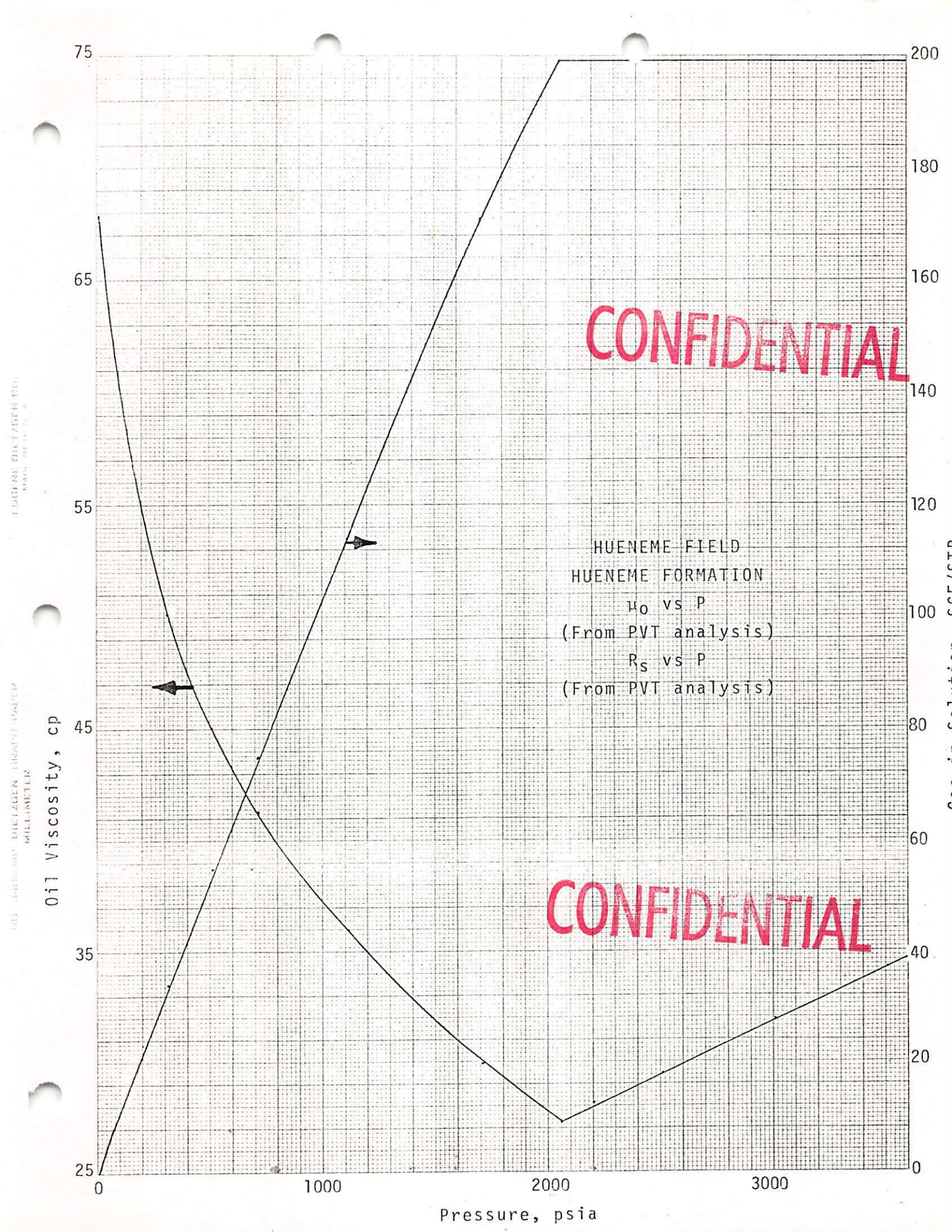
4. Gas viscosity from Core Laboratory.

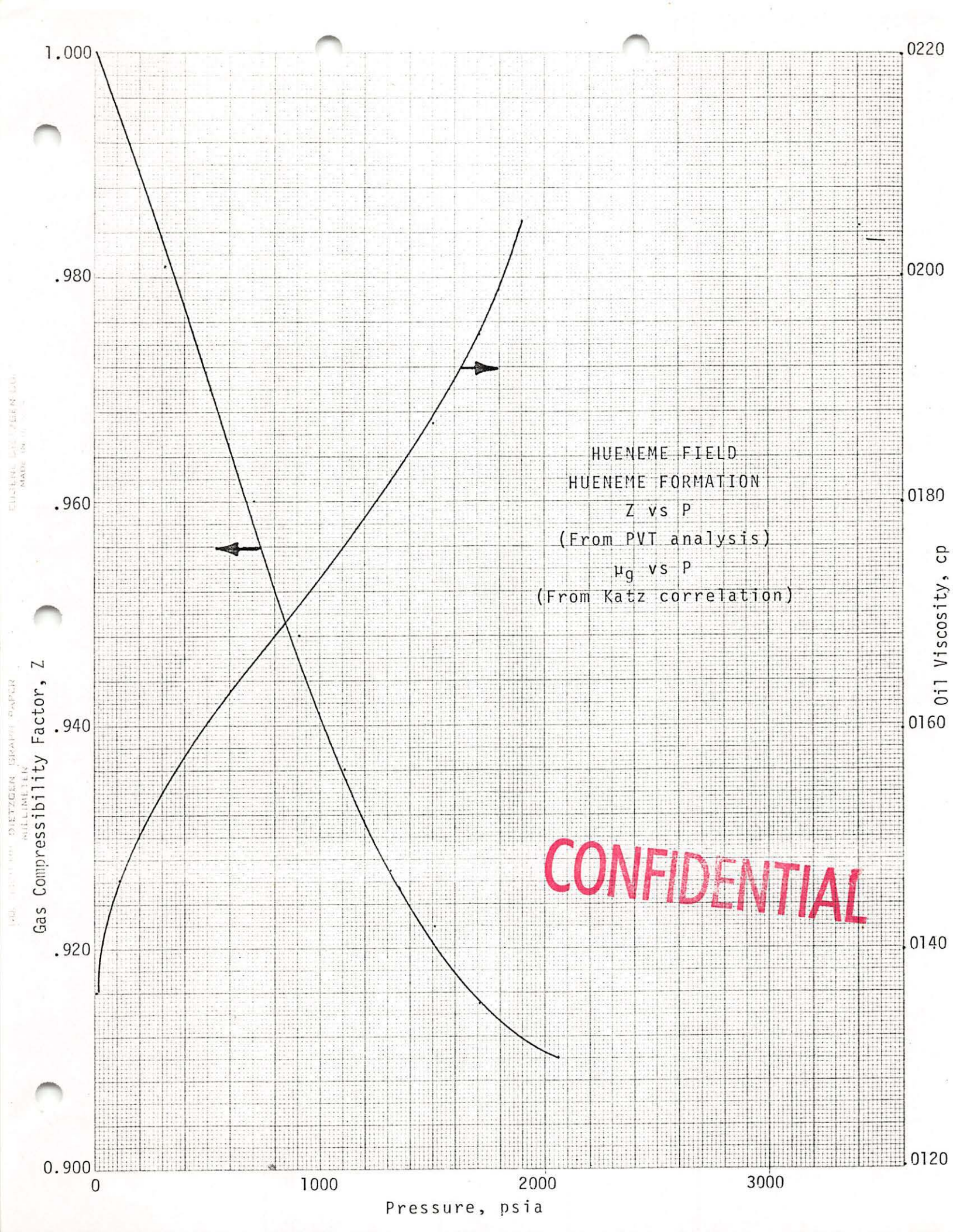
5. Gas compressibility factor, Z, from Core Laboratory

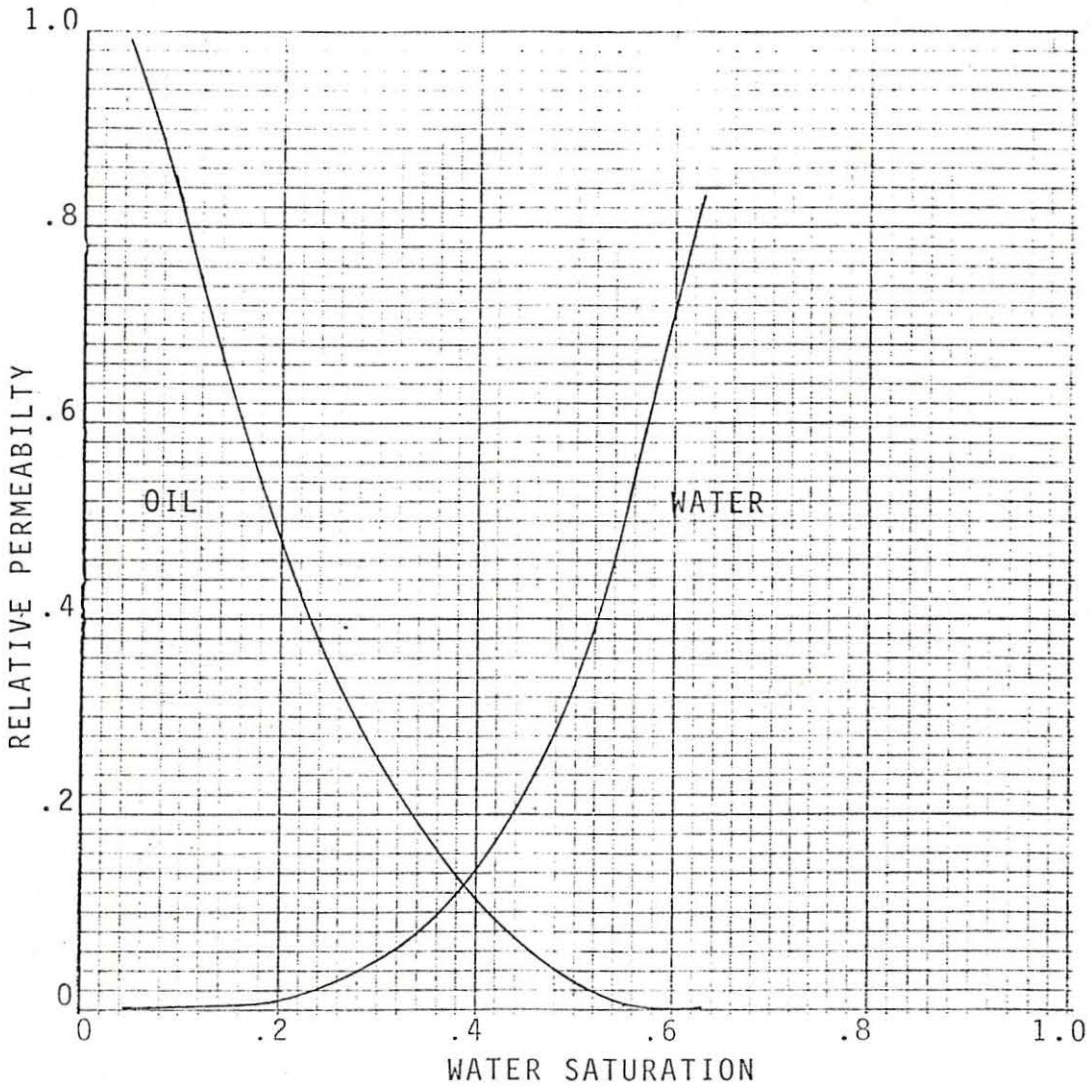
6. Dead oil viscosity
   a. Mobil Research
   b. Union Research
   c. Core Laboratory

7. Relative permeability curves as calculated by correlations presented by Wyllie in Petroleum Production Handbook, Vol. II, and normalized for S_{wi} = 4.5% and S_{or} = 37%


HUENEME FIELD
HUENEME FORMATION
B_o vs P
(From PVT analysis)
B_g vs P
Gas Formation Volume Factor, RB/MSCF
Pressure, psia
12.0
10.0
8.0
6.0
4.0
2.0
0
1000
2000
3000
1.125
1.100
1.075
1.050
1.025
1.000
CONFIDENTIAL

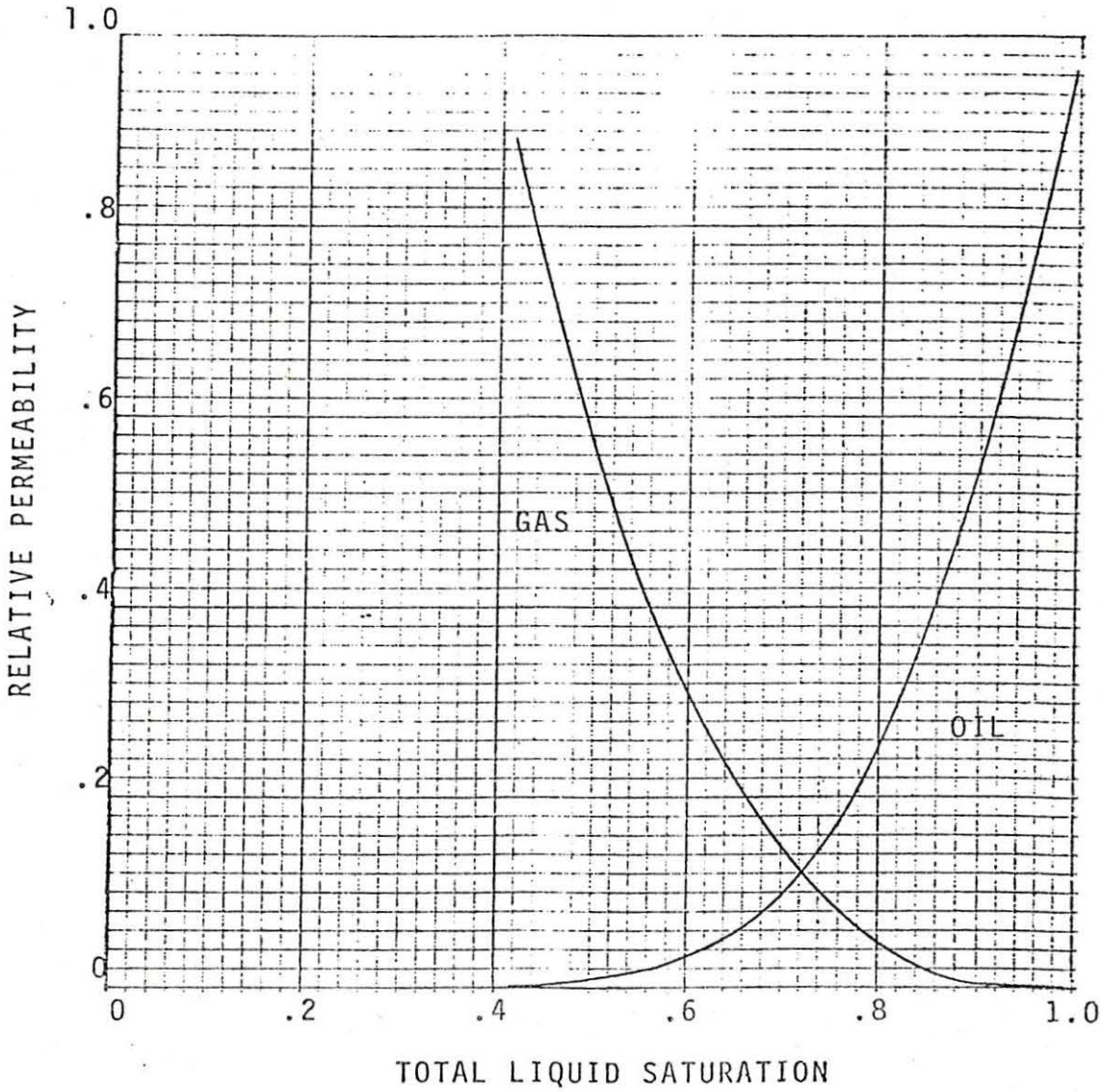

75
65
55
45
35
25
200
180
160
140
120
100
80
60
40
20
0
0
1000
2000
3000
Oil Viscosity, cp
Pressure, psia
CONFIDENTIAL
CONFIDENTIAL
HUENEME FIELD
HUENEME FORMATION
μ_o vs P
(From PVT analysis)
R_s vs P
(From PVT analysis)


1.000
.980
.960
.940
.920
0.900
Gas Compressibility Factor, Z
0220
0200
0180
0160
0140
0120
Oil Viscosity, cp
0
1000
2000
3000
Pressure, psia
HUENEME FIELD
HUENEME FORMATION
Z vs P
(From PVT analysis)
μg vs P
(From Katz correlation)
CONFIDENTIAL



OIL-WATER RELATIVE PERMEABILITY CURVES

HUENEME ZONE



GAS-OIL RELATIVE PERMEABILITY CURVES

HUENEME ZONE

Fluid and Rock Characteristics

Sespe Formation

I	Oil Gravity, ^{o}API	
	A. Field reading, DST (#1-A)	14.1^{o}
	B. Mobil Research	13.6
	C. Value used in model	14.1^{o}
II	Sulfur Content of Oil, %	
	A. Mobil Research	3.26
III	Bubble Point Pressure @ Reservoir Temperature, psia	
	A. Estimated from DST (#1-A)	2450 psia
IV	Reservoir Temperature, ^{o}F	
	A. From DST (#1-A)	148
V	Gas Gravity	
	A. From DST	0.595
VI	Gas in Solution, SCF/STB	
	A. From DST	152
VII	Compressibility of Saturated Oil @ Reservoir Temperature, Vol/Vol/psi	
	A. Using Trube's correlation	3.9 X 10^{-6}
VIII	Formation Water Salinity, PPM NaCl	
	A. From R_w = 0.14 @ 141^{o}F (#1-A)	20,000
	B. From R_w = 0.21 @ 108^{o}F (#1-A)	20,000
	C. From R_w = 0.18 @ 148^{o}F (#3)	17,000
	D. From R_w = 0.098 @ 160^{o}F (#4)	30,000
	E. Value used	20,000

IX Formation Water Viscosity @ Reservoir Temperature, cp

A.	Based on correlations	0.44
B.	Used in model	0.5

X Formation Water Density, gm/cc

A.	From correlations	0.994
B.	Used in model	1.030

XI Formation Water Compressibility, Vol/Vol/psi

A.	From correlations	3.27×10^{-6}
B.	Used in model	2.0×10^{-6}

XII Formation Water Formation Volume Factor, RB/STB

A.	Dodson and Standing	1.016
B.	Used in model	1.013

XIII Rock Compressibility

A.	Hall	3.5×10^{-6}
B.	Ventura and West Montalvo	26.0×10^{-6}
C.	Used in model	10.0×10^{-6}

XIV Initial Formation Pressure

A.	Drill stem test analysis	2433 psig @ 5258'SS
B.	Used in model	2550 psia @ 5515'SS

XV Permeability, md

A.	Arithmetic mean of sidewall cores (#1-A)	256
B.	Geometric mean of sidewall cores (#1-A)	181
C.	Permeability variation of sidewall cores (#1-A)	.62
D.	Drill stem test analysis	140
E.	Schlumberger correlation, based on log analysis	110
F.	Used in model	140

XVI Porosity, %

A.	Average core porosity (#1-A)	30.2
B.	Average log effective porosity (#1-A)	20.4
C.	Average log effective porosity (#3)	24.5
D.	Average log effective porosity (#4)	24.5
E.	Value used in model	22.5

XVII Initial Water Saturation, %

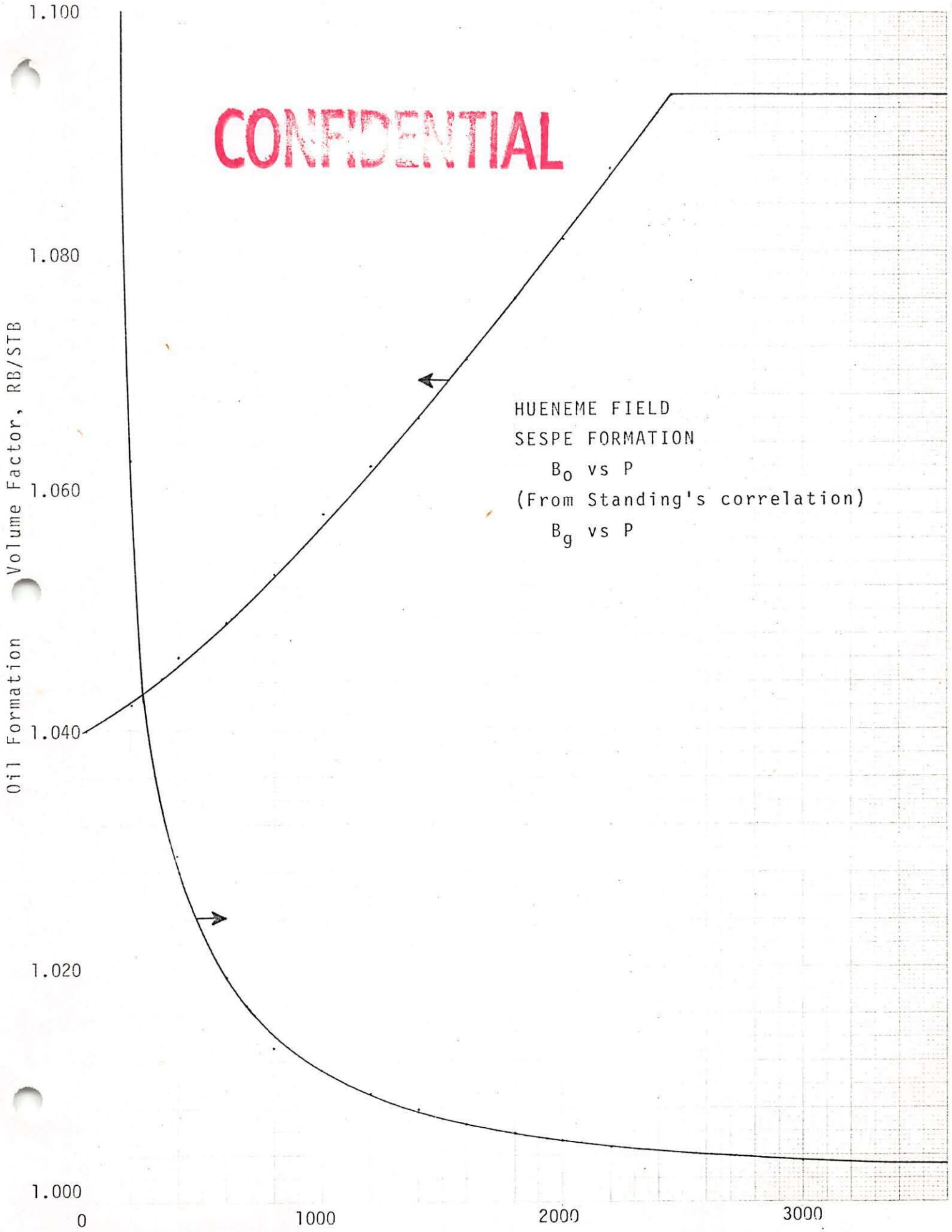
A.	Based on correlation using core values	33
B.	Average log effective S_w (#1-A)	31.3
C.	Average log effective S_w (#3)	22.8
D.	Schlumberger correlation	25
E.	Value used in model (weight average)	27

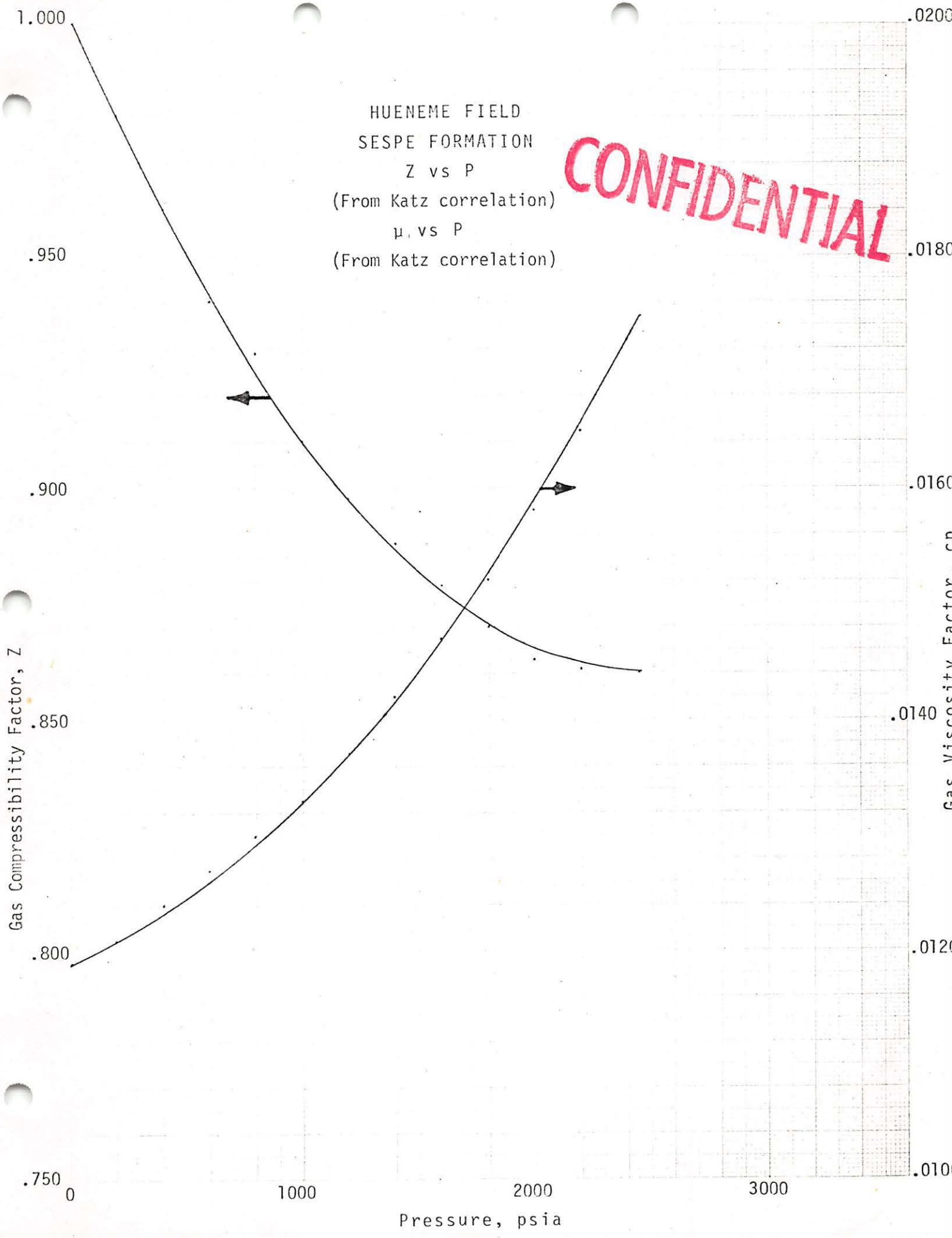
XVIII Residual Oil Saturation, %

A.	From Arps correlation	56
B.	From porosity correlation	33
C.	Core data corrected to reservoir conditions	18
D.	Value used in model	34.6

Additional fluid and rock data is presented in the following graphs:

1. Oil formation volume factor as derived from Standing's correlation
2. Oil viscosity as derived from Beal's correlation
3. Gas in solution as derived from Standing's correlation assuming a bubble-point pressure of 2450 psia
4. Gas viscosity as derived from Katz's assuming a constant gas gravity of 0.60
5. Gas compressibility factor as derived from Katz's assuming a constant gas gravity of 0.6
6. Relative permeability curves as calculated by correlations presented by Wyllie in Petroleum Production Handbook, Vol. II, and normalized for S_{wi} = 27.0%, and S_{or} = 34.6%




HUENEME FIELD
SESPE FORMATION
Z vs P
(From Katz correlation)
μ, vs P
(From Katz correlation)
CONFIDENTIAL
1.000
.950
.900
.850
.800
.750
.0200
.0180
.0160
.0140
.0120
.0100
Gas Compressibility Factor, Z
Gas Viscosity Factor, cp
0
1000
2000
3000
Pressure, psia

HUENEME FIELD

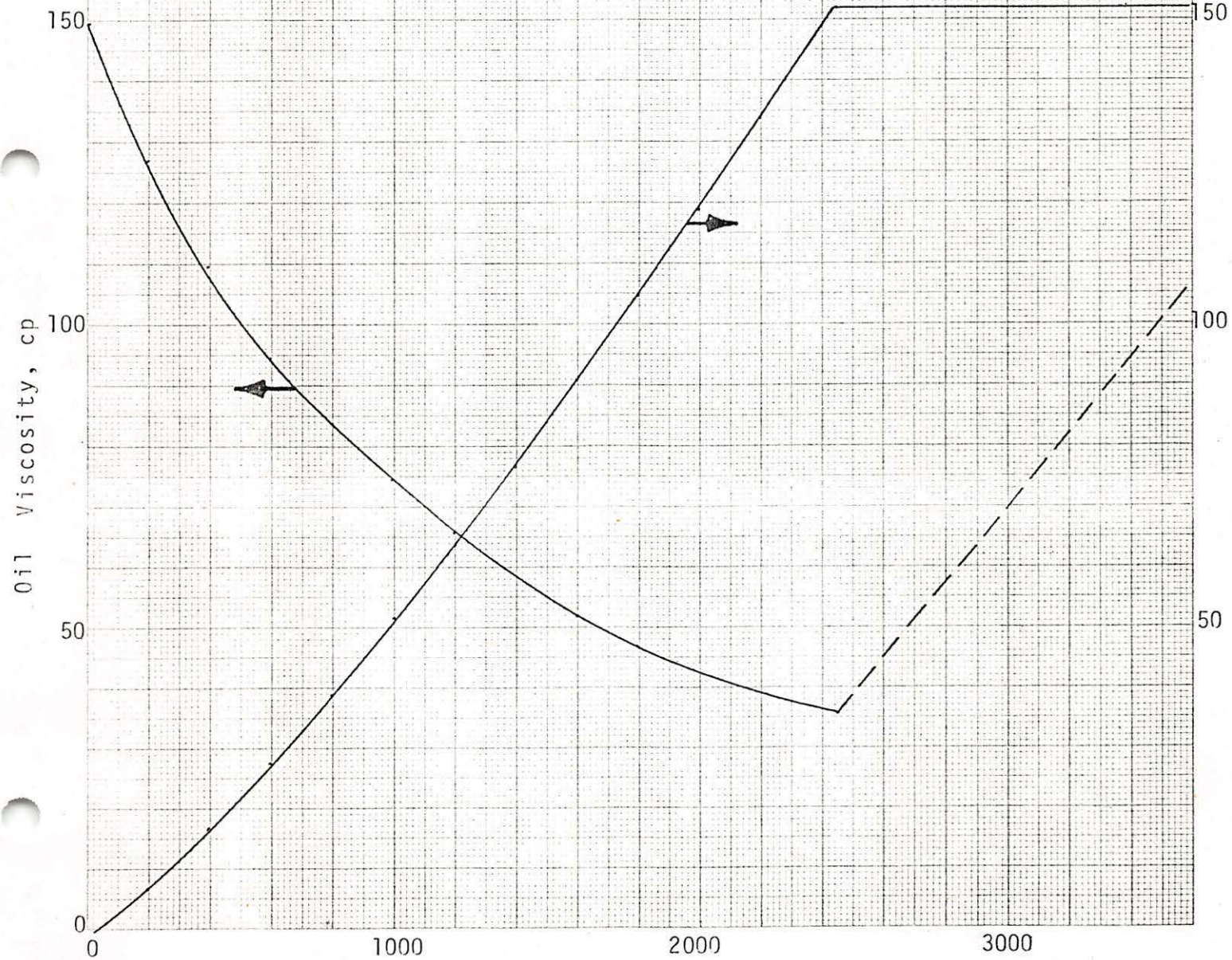
SESPE FORMATION

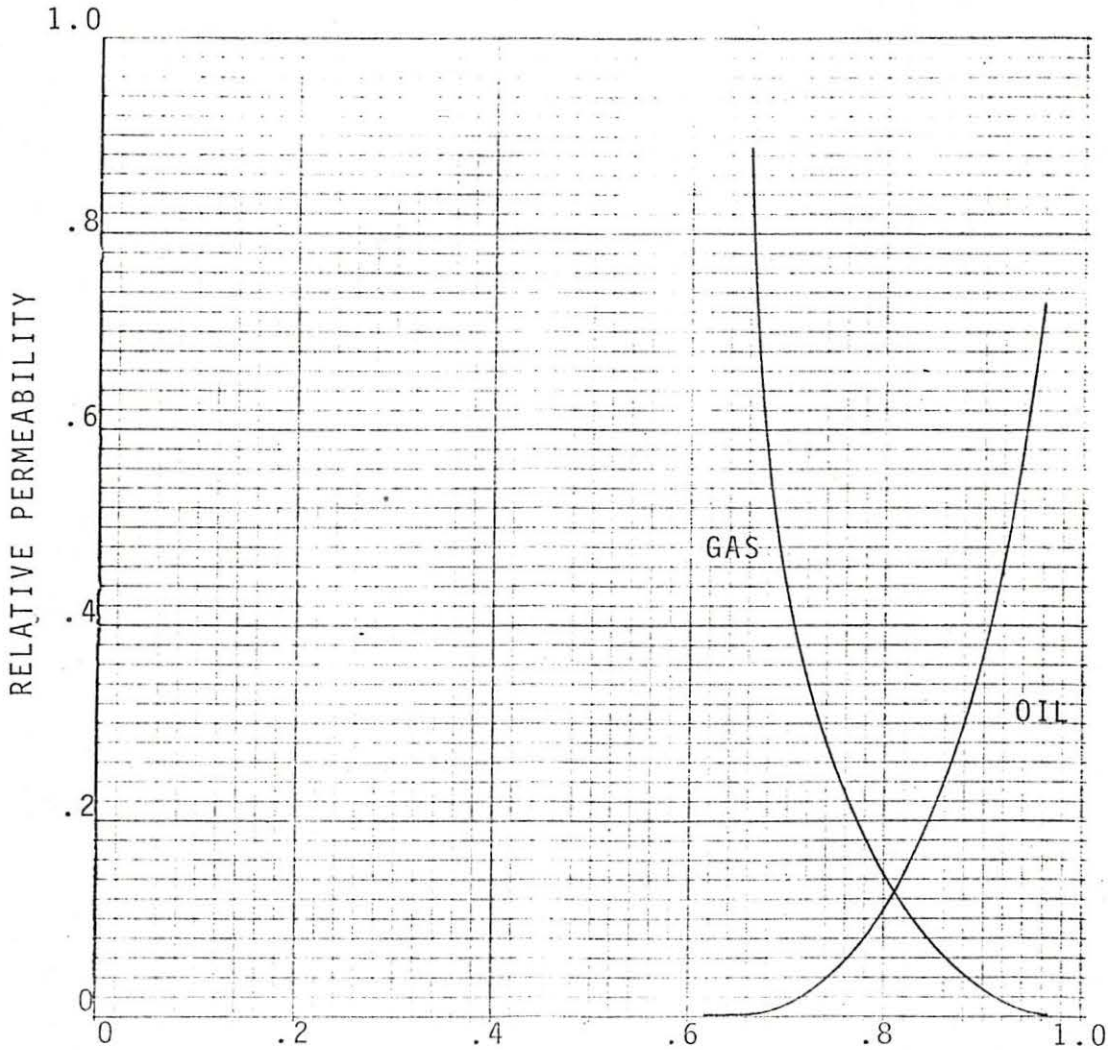
μ_o vs P

(From correlation by Beal)

R_s vs P

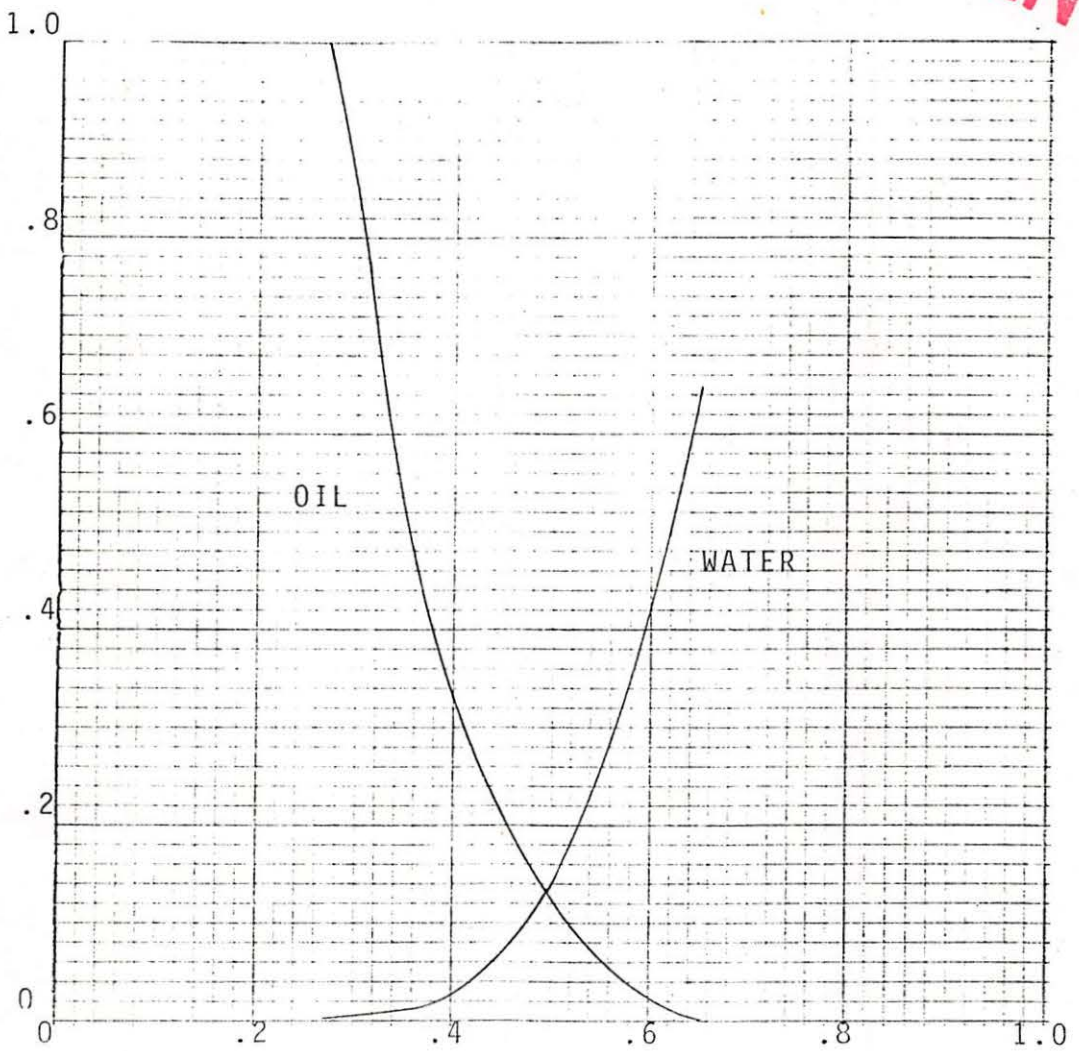
(From correlation by Standing)





GAS-OIL RELATIVE PERMEABILITY CURVES

SESPE ZONE



OIL-WATER RELATIVE PERMEABILITY CURVES

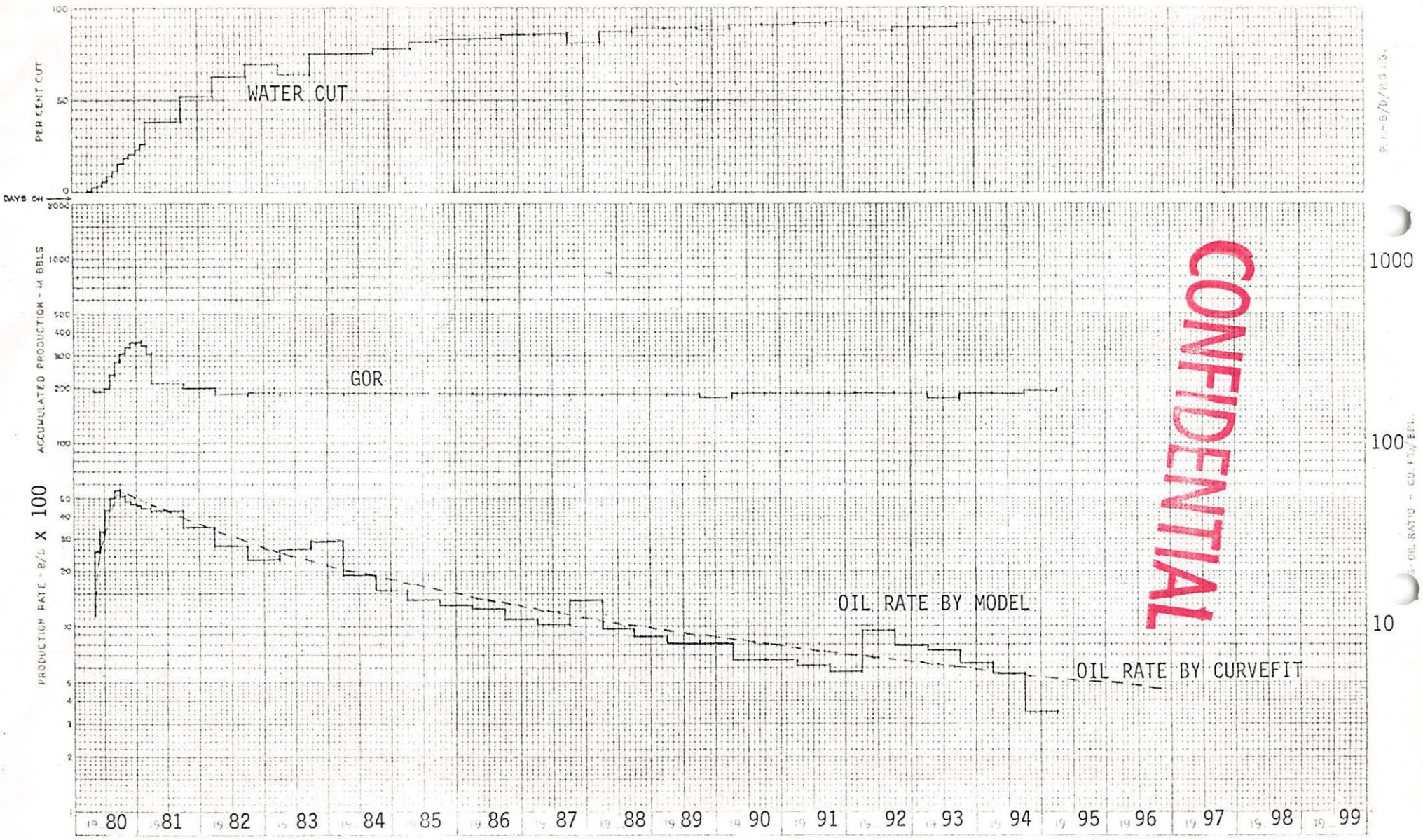
SESPE ZONE

6 Producers
6 Injectors

Model Study

7500 BWPD Inj.

Hueneme
Hueneme & Sespe



CONFIDENTIAL

HUENEME FIELD

YEARLY PRODUCTION RATES

YEAR	GROSS OIL	GROSS GWG	NET OIL	NET GWG	GWG SOLD
1978					
1979					
1980	1,181,166	212,610	984,301	177,174	159,457
1981	1,576,210	283,718	1,313,503	236,431	212,787
1982	1,160,386	208,869	966,985	174,057	156,651
1983	902,842	162,511	752,364	135,426	121,883
1984	727,151	130,887	605,956	109,072	98,165
1985	601,502	108,270	501,249	90,225	81,202
1986	508,019	91,443	423,347	76,202	68,582
1987	435,667	78,420	363,054	65,350	58,815
1988	379,172	68,251	315,975	56,875	51,188
1989	333,794	60,083	278,161	50,069	45,062
1990	296,308	53,335	246,922	44,446	40,001
1991	265,598	47,808	221,331	39,840	35,856
1992	240,141	43,225	200,116	36,021	32,419
1993	217,793	39,203	181,493	32,669	29,402
1994	198,617	35,751	165,513	29,792	26,813
1995	182,556	32,860	152,129	27,383	24,645
1996	168,299	30,294	140,248	25,245	22,720
1997	155,767	28,038	129,805	23,365	21,028
1998					
1999					
2000					
2001					
2002					
2003 -5					
TOTAL	9,530,988	1,715,576	7,942,452	1,429,642	1,286,676

Based on smoothed data, assuming platform will be set in December, 1979, with production beginning in April, 1980.

MATERIAL LIST

ITEM NO	QTY REQD	PART NO	DESCRIPTION	ITEM WEIGHT	TOTAL WEIGHT

QTY | NEXT ASSEMBLY | USED ON

TOLERANCES
STRUCTURAL ITEMS FRACTIONAL ±
MACHINERY ITEMS ROUGH (CUTG) FRACTIONAL ± DECIMAL ±

SCALE 3/32" = 1'-0"
DRAWN BY
CHECKED BY
APPD BY
RELEASED BY

NO | REVISION | NAME | DATE

UNION OIL OF CALIFORNIA

POOL COMPANY
HOUSTON, TEXAS

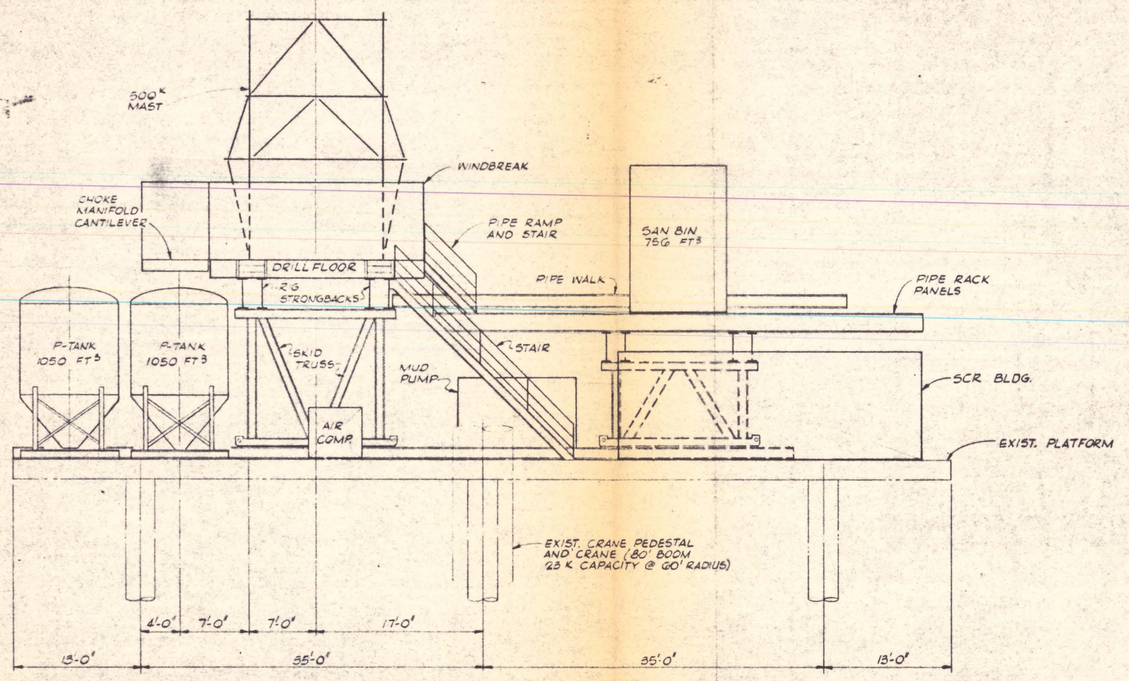
6-PILE 96x80 PLATFORM
PLAN @ DRILLFLOOR

DRAWING NO 5092-106 SHT 1 OF 1

HALLIBURTON UNIT (BELOW)

35'-0"
13'-0"
35'-0"
13'-0"
90'-0"
4'-0" 7'-0" 7'-0"
℄ WELL
SCHLUMBERGER UNIT ABV TOOL HOUSE
QUARTERS SUPPLIED BY UNION OIL
CEN'L PUMPS
250 BBL. RESERVE MUD TANK 12# MUD
TO PLATFORM
DN
DN
DN
DOWN TO THE PLATFORM
TRIP TANK
RAMP
PIPE WALK (SLIDES WITH RIG)
8-P80 MUD PUMPS BELOW (TWO REQD)
PIPE RACK AREA
750 FT³ SAND BIN
13'-0½"
S.C.R. HOUSE
℄ EXISTING CRANE W/80' BOOM (23000# CAP AT 60' RAD.)
SETBACK AREA
ROTARY
DRAWWORKS AREA
WALKWAY
SKID TRUCKS (TYP)
AIR COMP.
'D' TANK 1050 FT³
'D' TANK 1050 FT³
JACKING BEAM
CHOKE MANIFOLD CANTILEVER
JACKING BEAM
℄ WELLS
5'-0" 5'-0" 5'-0" 5'-0" 15'-0"
20'-0" 40'-0" 20'-0"
80'-0"
B
A

MATERIAL LIST					
ITEM NO.	QTY REQ'D.	PART NO.	DESCRIPTION	ITEM WEIGHT	TOTAL WEIGHT



SIDE ELEVATION

NO	REVISION	NAME	DATE

QTY	NEXT ASSEMBLY	USED ON

TOLERANCES
STRUCTURAL ITEMS FRACTIONAL ±
MACHINERY ITEMS ROUGH CSTG ± FRACTIONAL ± DECIMAL ±

THIS DRAWING INCLUDING ALL NOVEL AND PATENTED OR PATENTABLE SUBJECT MATTER THEREIN IS THE PROPERTY OF POOL COMPANY AND IS LOANED WITH THE UNDERSTANDING THAT IT WILL NOT BE REPRODUCED, COPIED OR USED FOR ANY PURPOSE EXCEPT THAT FOR WHICH LOANED UNLESS WRITTEN PERMISSION IS OBTAINED FROM POOL COMPANY AND IT SHALL BE RETURNED ON DEMAND

SCALE 1/8"=1'-0"
DRAWN BY BARKA 7-14-6
CHECKED BY
APPD BY
RELEASED BY

COOPER DRILLING RIG
UNION OIL OF CALIFORNIA

POOL COMPANY
HOUSTON, TEXAS

6 PILE 96'x80' PLATFORM
SIDE ELEVATION

DRAWING NO 8092-107 SHT 1 of 1