WEST SEAHORSE - 1
WELL COMPLETION REPORT

PERMIT Vic/P11
1982

Hudbay Oil (Australia) Ltd.

PE601381
Lithological Log

PE601379 Velocity Log

PE601380 ExLog Mud Log

PE603908 Composite Log

PE604583 Pressure Log

PE905512 Air Gun Well
Velocity Survey

PE902689 Tectonic
Elements Map

WEST SEAHORSE No.1

WELL COMPLETION REPORT

Authors: B. Butcher,
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AREA GEOLOGIST

Hudbay Oil (Australia) Ltd.

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1.0 WELL HISTORY

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1.0 WELL HISTORY

1.1 Name and Address of Operator:-

Hudbay Oil (Australia) Ltd.,
256 Adelaide Terrace,
PERTH W.A. 6000

1.2 Participants

Beach Petroleum N.L.,
G.P.O. Box 1280L,
MELBOURNE VIC. 3000

Gas and Fuel Exploration N.L.,
171 Flinders Street,
MELBOURNE VIC. 3000

Hudbay Oil (Australia) Ltd.,
256 Adelaide Terrace,
PERTH W.A. 6000

1.3 Petroleum Title

Vic/P-11

1.4 District:- Melbourne

1.5 Location - Ref. Figure No.1

Latitude 38^{o} 12' 17.17" S

Longitude 147^{o} 37' 21.70" E

AMG Co-ordinates:

E 554519

N 5771267

Final position is 9 metres S.S.W. of the intended location.

1.6

Water Depth	-	39.35 m below Mean Spring Low Water
Total Depth	-	2490 m below Rotary Table, reached on October 20, 1981.
Rotary Table	-	9.45 m above Mean Spring Low Water
Rig on Location	-	September 15, 1981
Spud Date	-	September 16, 1981
Rig Release Date	-	November 3, 1981
Drilling Unit	-	Petromar "North Sea" (Drillship)

1.7 Well Status on Rig Release

Suspended Oil Well

1.8 Drilling Summary

The drillship "Petromar North Sea" was mobilized from the Northwest Shelf of Western Australia to Gippsland Basin and arrived at the West Seahorse location on September 15th 1981 at 0600 hours. The anchors were run and tensioned, and the Temporary Guide Base was landed on the sea floor.

The well was spudded on September 16th 1981 at 1800 hours. A 36" hole was drilled to 61m and the Hole Opener was pulled and laid down. The 26" assembly was run in and 26" hole was drilled to 205m. After spotting Hi-viscosity mud and checking for fill, the drilling assembly was pulled and a casing string, comprising one 30" pile joint plus 20" casing, was run to 189m. The casing was cemented in place with 2000 sacks of Class 'G' cement. The landing string was pulled and the 20-3/4" stack was stump tested and run. The stack was landed and finally pressure tested after a test plug failure.

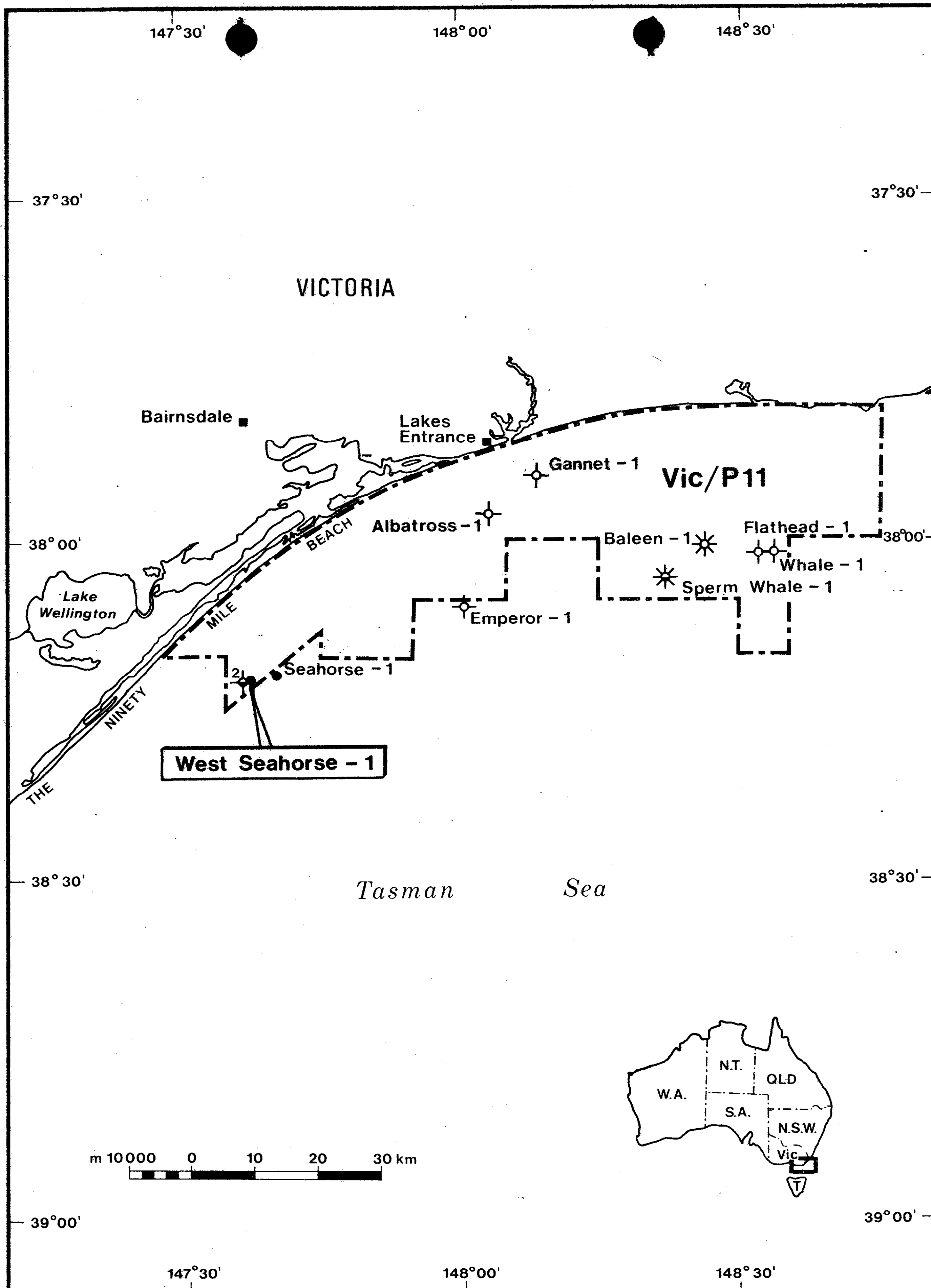
A 17½" assembly was run, the cement and shoe were drilled out, and the hole was deepened to 200m. A pressure integrity test was performed to a 1.07 SG equivalent. The 17½" hole was drilled to 1320m and a series of electric logs were run. A conditioning trip was made prior to running 13-3/8" casing. The 13-3/8" shoe was set at 1305m and cemented back to seafloor. The 20-3/4" stack was pulled and replaced by the 13-5/8" stack.

The 13-3/8" shoe was drilled out with a 12¼" assembly and a pressure integrity test was performed after drilling to 1323m. Drilling continued until 1450m where it was decided to cut a core. An 11m core was cut and retrieved. The hole was deepened to 1744m and a series of logs were run. Drilling continued to 2210m where four RFT's were run at 1505.5m, 1421m, 1417m and 1502m. The hole was deepened to 2365m at which point the drill string parted at the rotary sub below the kelly. The fish was recovered and drilling continued to 2490m. The remainder of the open hole was logged and the well was plugged back to 1565m. A string of 9-5/8" casing was run to 1552m and cemented in place. The 13-5/8" stack was pulled and the UPR's changed to 3½". The stack was stump tested, rerun, and then pressure tested after landing. The 3½" tubing was run with an 8½" bit and 9-5/8" casing scraper. After pulling the tubing, a CBL-VDL-GR-CCL was run, the casing was pressure tested to 2200 psi and the interval 1411 - 1415m was perforated. A cased hole DST was performed over the interval 1411 - 1415m with a 288m fresh water cushion. During the DST, the well flowed gas and oil at rates of ¼ MMSCFD and 1800 BOPD respectively. Approximately 0.7 bbls of oil was recovered from the test string. A wireline bridge plug was then set at 1394m. A cement plug was spotted on top of the bridge plug and a second cement plug was placed at 160m. The 13-5/8" stack was retrieved, a corrosion cap was installed, a marker buoy was attached to the PGB, and the guide lines were cut. The anchors were pulled and the rig was moved to Baleen No 1.

1.9 Geological Summary (Enclosure 1)

West Seahorse-1 was drilled to test an asymmetric anticline formed by arching into a major reverse fault. Closure was mapped at three different horizons, designated "Top Latrobe", "Intra Latrobe" and "Top Strzelecki" (Figure 2). No samples were caught prior to the installation of the marine riser at 189 metres R.T. The interval 189-1344.5 metres consisted of skeletal calcarenites, calcisiltites, calcilutites and marl, with minor sandstones and calcareous claystones. This section ranged in age from pre-Miocene to latest Oligocene and was underlain by 51 metres of glauconitic calcilutite and calcisiltite of uncertain age. Underlying these was a sequence of non-marine sandstones, siltstones and claystones with coal seams common at the top but decreasing towards the total depth at 2490 metres. The non-marine sequence ranged in age from Lower Eocene to Senonian and represents the Latrobe Group.

Movable hydrocarbons were encountered in two zones within the Latrobe Group, and the well flowed at 1800 BOPD during a DST over the interval 1411-1416 metres. Electric logs indicated a density and corresponding velocity below 2275 metres. The seismic reflections from this interface dip more steeply to the south-west than overlying reflections and, therefore, the well penetrated a marked unconformity before bottoming in sediments of Upper Cretaceous/Senonian age.



Scale	Hudbay Oil (Australia) Ltd. LOCATION MAP **WEST SEAHORSE - 1**	Date April 1982
Drawn by H.O.A.L.		Drawing Nº A4-GP-484

Figure 1

2.0 DRILLING

(Pages 4-14)

2.0 DRILLING

2.1.1 Drilling Data Summary

Drilling Contractor:	Petromarine Drilling Aust. Pty Ltd Office Suite 1-5 1st Floor, Stratham House 49 Melville Parade SOUTH PERTH WA
Drawworks:	National 1625 powered by two 752 GE Traction motors
Blow Out Preventor Equipment:	Two stack system 20-3/4" x 2000 psi - Hydril MSP Cameron double gate Type U 13-5/8" x 5000 psi - Hydril GL Cameron triple gate Type U
Elevation:	RT to MSL - 9.45m Water Depth - 39.35m Datum - rotary table
Pumps:	Two National 12-P-160 Triplex driven by two GE 752 motors

2.1.2 General Well Data

Location:	Latitude 38^{o} 12' 17.17" S Longitude 147^{o} 37' 21.70" E
Dates:	1600 hrs August 15th 1981 - Rig released from Lawley No. 1 0600 hrs September 15th 1981 - arrived at location 1800 hrs September 16th 1981 - spudded 1300 hrs October 20th 1981 - TD reached 1400 hrs November 3rd 1981 - Rig released Days to total depth - 34 days

2.2 Daily Operation Record

2.2.1 Daily Drilling Operation Summary

See attachment

Hudbay Oil (Australia) Ltd.
Subsidiary of Hudson's Bay Oil and Gas Company Limited

DAILY DRILLING OPERATIONS SUMMARY

WELL WEST SEAHORSE NO. 1

DATE	DEPTH	OPERATION
16.09.81	-	Ran and set anchors. Picked up TGB and landed same.
17.09.81	61m	Made up 36" BHA. Drilled 36" hole to 61m.
18.09.81	205m	Laid down 36" BHA and picked up 26" BHA. Drilled 26" hole to 205m.
19.09.81	205m	Spotted hi-vis mud in 26" hole. POOH to run 20" casing. Ran 20" casing and cemented same. Stump tested 20-3/4" stack and began running same.
20.09.81	205m	Finished running 20-3/4" stack. Choke line failed on pressure test. Pulled LMR package to install new choke line hose at the goose neck. Pressure tested PR's and annulars after changing seals on the test plug. Pressure tested the stand pipe and choke manifolds to 3000 and 5000 psi respectively. Made up 17½" BHA and RIH.
21.09.81	477m	Tagged cement at 176m. Drilled out shoe and cleaned out to 205m. Drilled 17½" hole to 208m. Performed integrity test to 1.07 SG. Drilled 17½" hole to 353m. Dropped survey. Overshot would not pass through jars. POOH to retrieve survey. RIH and drilled 17½" hole to 477m.
22.09.81	856m	Drilled 17½" hole to 856m. POOH for bit change.
23.09.81	960m	POOH with bit No. 3 and laid down bumper sub. Made up new bit and bumper sub and RIH. Drilled 17½" hole to 960m.
24.09.81	1138m	Drilled 17½" hole to 1138m.
25.09.81	1318m	Drilled 17½" hole to 1318m.
26.09.81	1320m	Drilled 17½" hole to 1320m. Conditioned hole and dropped survey. POOH to 1272m. Picked up Kelly to work past tight spot. POOH to the jars to retrieve survey. RIH to 1267m. Ream and wash to 1320m. Condition hole and POOH to log. Ran DIT-BHC-GR.
27.09.81	1320m	Ran FDC-CNL-GR and CST, RIH to 1272m with 17½" bit. Reamed and washed to bottom. Conditioned hole and then POOH to run 13-3/8" casing.
28.09.81	1320m	Finished POOH with 17½" bit. Ran 13-3/8" casing and landed same on HWDP.
29,09,81	1320m	Cemented 13-3/8" casing. Backed out running tool and washed wellhead. Pulled 20-3/4" stack.
30.09.81	1320m	Function tested 13-5/8" stack. Ran 13-5/8" stack. Pressure tested stack and choke manifold. Set 13-5/8" WB after modifying the threads. Made up 12¼" assembly and RIH.
01.10.81	1440m	Tagged cement at 1260m and drilled to 1323m. Performed pressure integrity test to 1.99 SG equivalent. Drilled 12¼" hole to 1412m and circulated bottoms up for sample. Drilled 12¼" hole to 1440m circulating bottoms up every 5m.
02.10.81	1461m	Drilled 12¼" hole to 1450m. Made a 5 stand wiper trip and circulated bottoms up. POOH with 12¼" bit and RIH with core barrel. Cut core to 1461m and POOH.
03.10.81	1560m	Recovered core and made up 12¼" bit. Unable to pass bit through wellhead. RIH and retrieve damaged WB. RIH with 12¼" bit and drilled to 1560m.
04.10.81	1678m	Drilled 12¼" hole to 1662m. POOH with plugged jets. Ran new 13-5/8" WB. Made up new bit and RIH to drill to 1678m.
05.10.81	1744m	Drilled 12¼" hole to 1744m. Made 15 stand wiper trip. POOH to log. Ran ISF-BHCS-GR, FDC-CNL-GR, and DLT-MSFL-GR.
06.10.81	1744m	Reran DLT-MSFL-GR due to tool failure. Ran HDT, RFT's, and CST's.
07.10.81	1801m	Finished running CST's. RIH with 12¼" bit and drilled to 1801m.
08.10.81	1975m	Drilled 12¼" hole to 1975m. Dropped survey and POOH.
09.10.81	2078m	Finished POOH. Retrieved WB and ran test plug. Pressure tested stack. Retrieved test plug and ran WB. Made up 12¼" bit and drilled to 2078m. POOH for bit change.
10.10.81	2158m	Finished POOH. RIH with new bit to 2111m. Surveyed. Drilled ahead to 2158m.

Hudbay Oil (Australia) Ltd.
Subsidiary of Hudson's Bay Oil and Gas Company Limited

DAILY DRILLING OPERATIONS SUMMARY

WELL WEST SEAHORSE NO. 1

DATE	DEPTH	OPERATION
11.10.81	2210m	Drilled $12\frac{1}{4}$" hole to 2168m. Surveyed. Drilled to 2210m and dropped survey. Made wiper trip to the shoe and then POOH.
12.10.81	2210m	Finished POOH. Made four RFT runs. RIH with $12\frac{1}{4}$" bit. Reamed from 2183-2200m.
13.10.81	2276m	Ream to bottom and drilled to 2212m. POOH to 2183m and reamed the interval 2183 - 2212m. Drilled to 2276m. Dropped survey and POOH.
14.10.81	2325m	Finished POOH. Made up new bit and RIH to 2249. Reamed 2249 - 2276m. Drilled to 2325m and dropped survey.
15.10.81	2357m	Retrieved survey. Drilled $12\frac{1}{4}$" hole to 2357m. Dropped survey and POOH for a bit change.
16.10.81	2365m	Finish POOH. RIH with new bit and ream 2350 - 2357m. Drilled to 2365m and then twisted off. POOH and made up overshot. RIH and latched onto fish. POOH with fish.
17.10.81	2366m	Finished POOH with fish. RIH with $12\frac{1}{4}$" bit and junk sub. Milled on junk to 2366m. POOH with bit and junk sub.
18.10.81	2387m	Retrieved 13-5/8" WB and RIH with test plug. Tested stack, choke manifold, standpipe manifold and Kelly Cock. Pulled test plug and ran WB. RIH to 2366m and drilled to 2387m.
19.10.81	2416m	Drilled to 2416m. RIH with new bit.
20.10.81	2485m	RIH to 2402m. Reamed to 2416m. Drilled $12\frac{1}{4}$" hole to 2485m.
21.10.81	2490m	Drilled to 2490m. Dropped survey and POOH to log. Ran MSFL-DLL-GR, BHCS-GR, and FDC-CNL-GR.
22.10.81	2490m	Ran HDT, velocity survey, and CST's.
23.10.81	2490m	Finished running CST's and ran RFT's. Laid down 8" DC's and picked up $6\frac{1}{2}$" DC's.
24.10.81	1565m PBD	Finished picking up $6\frac{1}{2}$" DC's. RIH with OEDP to 2015m. Set cement plug No. 1 over the interval 2015 - 1940m. POOH to 1675m and set plug No. 2 over the interval 1675 - 1575m. POOH to lay down excess DP.
25.10.81	1527m PBD	RIH with $12\frac{1}{4}$" bit and tagged plug No. 2 at 1556m. POOH and retrieved WB. Ran 9-5/8" casing to 1552m. Cemented 9-5/8" casing.
26.10.81	1527m PBD	Displaced cement and backed out the running tool. POOH with running tool and RIH with 9-5/8" seal assembly. Set seal assembly. Pressure tested same and POOH with running tool. Pulled 13-5/8" stack and changed UPR to $3\frac{1}{2}$". Stump tested stack and then ran stack.
27.10.81	1527m PBD	Finished running BOP. Landed stack and RIH with test plug to pressure test. POOH and reran test plug on $3\frac{1}{2}$" pipe to test UPR. POOH with test plug and RIH with WB. RIH with $8\frac{1}{2}$" bit, 9-5/8" scraper on $3\frac{1}{2}$" tubing.
28.10.81	1527m PBD	Finished RIH with bit and scraper. Worked scraper over the interval 1350-1400m. POOH with scraper. Ran CBL-VDL-GR-CCL. Pressure tested casing to 2200 psi. Perforated the interval 1411 - 1416m. Began making up DST tools.
29.10.81	1527m PBD	Made up DST tools and ran same on $3\frac{1}{2}$" tubing. Repaired leak in SSTT and then ran same. Started hooking up surface installations.
30.10.81	1527m PBD	Completed surface installations. Rigged up wireline equipment, and pressure tested surface equipment. Conducted DST No. 1.
31.10.81	1527m PBD	Closed PCT, reversed out tubing and rigged down pressure control equipment. Unsealed packer and circulate the well. POOH laying down tubing and DC's. Laid down testing tools. RIH with OEDP to 1514m and circulate high pH mud.
01.11.81		POOH and set BP at 1390m. Spotted 100 sacks of cement on top of BP. POOH to 160m and spotted 100 sacks of cement. Retrieved WB and then pulled 13-5/8" stack.
02.11.81		Ran corrosion cap. Attached marker buoy and cut guide wires. Rig shut down due to seamen's strike.
03.11.81		Pulled anchors 6, 2, 3 and 1.
04.11.81		Pulled anchors 7, 5, 4 and 8. Rig released 1400 hours November 3rd 1981.

2.2.2 Bottom Hole Assembly Record

36" hole:	26" bit, 36" HO, bit sub, 8" DC, XO, 5" HWDP
26" hole:	26" bit, bit sub, 12x8" DC, 11x5" HWDP
17½" hole:	17½" bit, bit sub, 6x8" DC, bumper sub, 5x8" DC, XO, 1x5" HWDP, jars, 9x5" HWDP
12¼" hole:	1305 - 1450m
	12¼" bit, bit sub, 6x8" DC, bumper sub, 8x8" DC, XO, 1x5" HWDP, jars, 9x5" HWDP
	1461 - 1662m
	12¼" bit, bit sub, 2x8" DC, stab, 1x8" DC, stab, 3x8" DC, bumper sub, 5x8" DC, XO, 1x5" HWDP, jars, 9x5" HWDP
	1662 - 2078m
	12¼" bit, bit sub, 2x8" DC, stab, 1x8" DC stab, 3x8" DC, bumper sub, 8x8" DC, XO, 1x5" HWDP jars, 9x5" HWDP
	2078 - 2210m
	12¼" bit, bit sub, 3x8" DC, stab, 1x8" DC, stab, 2x8" DC, bumper sub, 8x8" DC, XO, 10x5" HWDP
	2210 - 2365m
	12¼" bit, bit sub, 2x8" DC, stab, 1x8" DC, stab, 3x8" DC, bumper sub, 14x8" DC, XO, 13x5" HWDP
	2365 - 2416m
	12¼" bit, junk sub, bit sub, 2x8" DC, stab, 1x8" DC, stab, 3x8" DC, bumper sub, 14x8" DC, XO, 13x5" HWDP
	2416 - 2490m
	12¼" bit, junk sub, bit sub, 2x8" DC, stab, 1x8" DC, stab, 17x8" DC, XO, 13x5" HWDP

2.2.3 Bit Record

(See attachment.)

2.2.4 Time Breakdown Analysis

(See attachment.)

2.2.5 Time vs Depth Chart

(See attachment.)

2.3 Casing Record

2.3.1 Casing Details

(See 'Casing and Tubing Tally Reports' attached.)

2.3.2 Cementation Details

(See 'Casing Running Reports' attached.)

B I T R E C O R D

NO.	SIZE	MAKE	TYPE	SERIAL NO.	JETS	DEPTH OUT	METRES	HRS	M/HR	WOB 1000LBS	RPM	PUMP PRESS	SPM	DULL COND T	DULL COND B	DULL COND G	REMARKS
1	26"	HTC	OSC3AJ	RB267	Open	61	12.02	10½		5/10	80	250	75	2	1	I	
2	26"	HTC	OSC3AJ	LJ320	Open	205	143	21½	6.6	20	100	600	160				
3	17½"	HTC	OSC3A	A2030	3x24	856	651	37	17.5	35	100	1350	150				
4	17½"	HTC	OSC3AJ	A2031	3x24	1320	464	52½	7.4	35	100	1350	150	2	2	I	
5	12¼"	HTC	OSC3AJ	EV151	3x14	1450	137	12	11.4	35	120	1300	100	8	6	I	
C#1	8-15/32	CHRIS	C20	81E0672		1461	11	2	5.5								
6	12¼"	HTC	J4	EZ415	3x14	1662	201	18½	10.9	40	75/80	2200	110	3	2	I	
7	12¼"	HTC	OSC3AJ	EV983	3x14	1744	82	6	13.6	40	70	1875	110	3	5	1/8	
RR6	12¼"	HTC	J4	EZ415	3x14	1975	231	26½	8.7	40/50	75	2300	130	5	2	1/8	
8	12¼"	HTC	JD3	HX252	3x14	2078	103	14	7.4	40	80	1800	110	5	2	1/16	
9	12¼"	HTC	JD3	HX191	3x14	2210	132	26	5.1	25/40	90	1750	110	6	2	1/8	
10	12¼"	HTC	J7	BK061	3x13	2276	66	16½	4	50/60	80	1250	100				
11	12¼"	SMITH	A1	BN7038	2x15 1x10	2357	81	32	2.5	26	100	1000	110	7	7	3/8	
12	12¼"	HTC	JD3	HX271	3x13	2365	8	3	2.7	20/30	70	1000	110	4	2	I	fished due to parted bumper sub
RR7	12¼"	HTC	OSC3AJ	EV983	3x13	2366	1	½	2.0	20/30	70	1000	110				mill on junk
13	12¼"	HTC	J44	075CF	3x13	2416	50	25½	2.0					2	2	I	
14	12¼"	SMITH	F57	BN3634	3x13	2487	71	27	2.6	40	60	1300	120	2	2	I	
15	8½"	HTC	XV	57062	Open												clean inside 9-5/8" casing

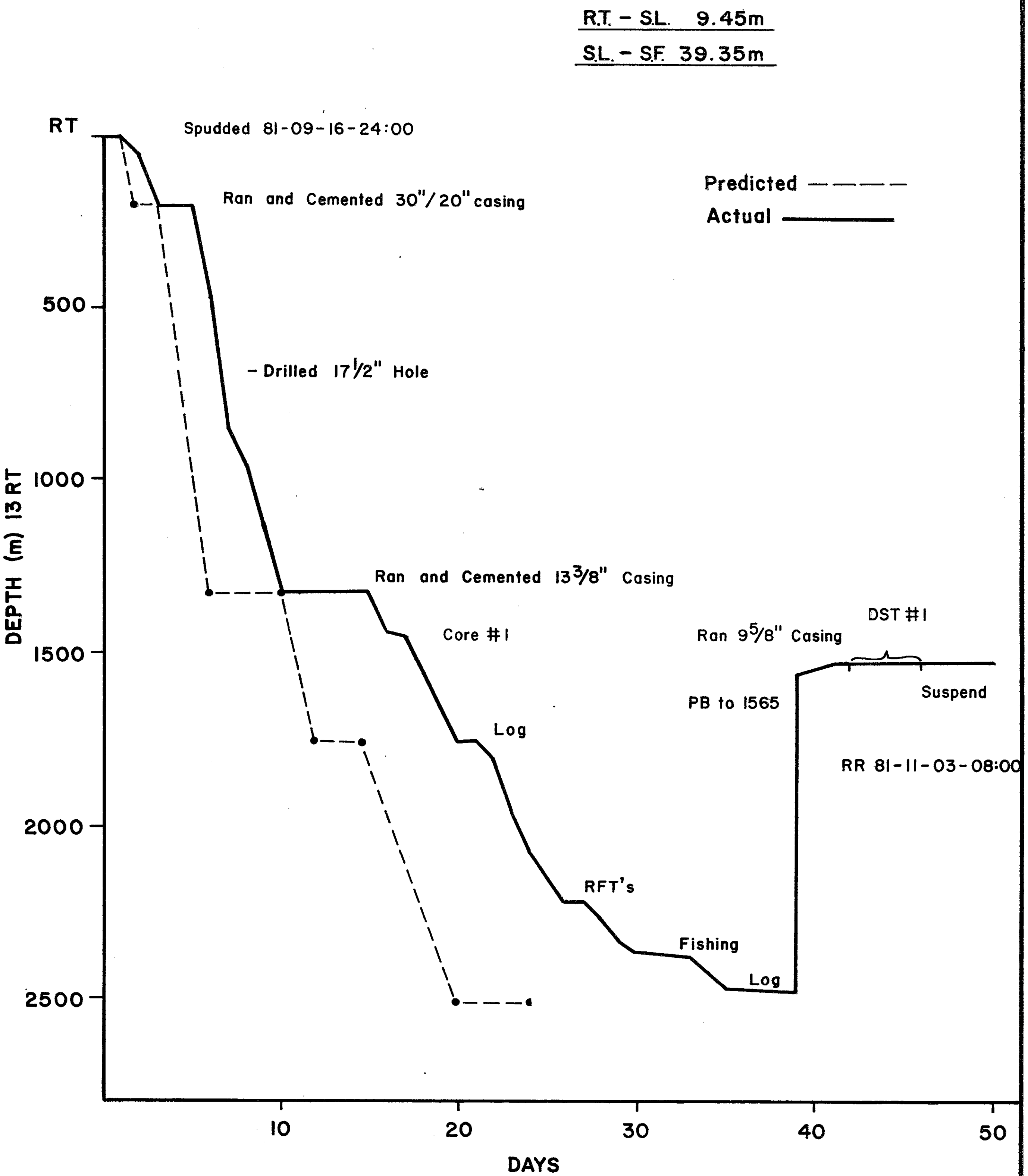
WELL: WEST SEAHORSE NO 1

WELL TIME BREAKDOWN ANALYSIS

Hudbay Oil (Australia) Ltd.

Author: A.I.
Drawn: A.Clark
Date: March 1982
Scale: N.T.S.
Drawing Nº A4-DR-468

TIME ANALYSIS (Hours)	Moving/ Anchoring	36"/26" Hole	17½" Hole	12¼" Hole	8½" Hole	6" Hole	Comp/Test	Total	%
			SECTION OF HOLE						
DRILLING:									
Moving to/from Location	374							374	23.6
Anchor Handling	48						21	69	4.3
Drilling		32	97	203½				332½	20.9
Round Trips		9½	22	81½				113	7.1
Reaming, Cond. Hole, Cond. Trips		5½	28	37				70½	4.4
Running, Pulling and Cementing Casing		9	42	7½			19	77½	4.9
Running, Pulling Subsea Equipment		21	23½					44½	2[illegible]
Testing Wellhead and BOP's		15	6½	8				29½	1.9
Plugging Back, Abandonment, Completion							56½	56½	3.6
Curing Lost Circulation									
Fishing and Washouts				34½				34½	2.2
Well Control									
Surveys			½	8				8½	0.5
Downtime: Weather									
Mechanical Surface			5½	7				12½	0.8
Mechanical Subsea									
Others		5½						5½	0.3
EVALUATION:									
Circulating Samples				6½				6½	0.4
Hole Cond, Trips for Coring, Logging, Testing				56				56	3.5
Coring				5				5	.3
Electric Logging			12½	66½				79	5[illegible]
Wireline Flow Testing				35½				35½	2.2
Drill Stem and Production Testing							135½	135½	8.5
Downtime: Logging				8				8	0.5
Flow Testing									
Others									
OTHERS				10			24½	34½	2.2
Total Time	422	97½	237½	574½			256½	1588	
% Downtime			2	3					



Author: K. Putnam	Hudbay Oil (Australia) Ltd.	Date: November, 1981
Drawn by: K. Ryan	**WEST SEAHORSE - 1** Time Vs Depth Chart	Drawing Nº A4/DR-363

HUDBAY OIL (AUSTRALIA) LIMITED

Casing and Tubing Tally
(METRIC)

Well Name and No. WEST SEAHORSE NO 1 Date 17 SEPTEMBER 1982 Casing Size 20 inch

Weight (0.438 in WT) 94 lb/ft Grade X 52 Connection Cameron 'CC' Joints Run

Joint No.	Length of (m) joint	Total in (m) Hole
	.	
	.	
01	13.15	incl shoe
02	12.50	
03	12.00	
04	12.00	
05	12.00	
06	12.00	
07	12.00	
08	12.50	
09	12.00	
10	12.00	
Sub tot	122.15	
11	12.00	
12	10.15	
13	.	
14	.	
15	.	
16	.	
17	.	
18	.	
19	.	
20	.	
Sub tot	22.15	
21	.	
22	.	
23	.	
24	.	
25	.	
26	.	
27	.	
28	.	
29	.	
30	.	
Sub tot	.	
31	.	
32	.	
33	.	
34	.	
35	.	
36	.	
37	.	
38	.	
39	.	
40	.	
Sub tot	.	

Joint No.	Length of (m) Joint	Total in (m) Hole
Carried Forward		
41	.	
42	.	
43	.	
44	.	
45	.	
46	.	
47	.	
48	.	
49	.	
50	.	
Sub tot	.	
51	.	
52	.	
53	.	
54	.	
55	.	
56	.	
57	.	
58	.	
59	.	
60	.	
Sub tot	.	
61	.	
62	.	
63	.	
64	.	
65	.	
66	.	
67	.	
68	.	
69	.	
70	.	
Sub tot	.	
71	.	
72	.	
73	.	
74	.	
75	.	
76	.	
77	.	
78	.	
79	.	
80	.	
Sub tot	.	

Joint No.	Length of Joint	Total in Hole
Carried Forward		
81	.	
82	.	
83	.	
84	.	
85	.	
86	.	
87	.	
88	.	
89	.	
90	.	
Sub tot	.	
91	.	
92	.	
93	.	
94	.	
95	.	
96	.	
97	.	
98	.	
99	.	
100	.	
Sub tot	.	

TALLY SUMMARY

Group No. Ending	Length (Forward)
10	122.15
20	22.15
30	.
40	.
50	.
60	.
70	.
80	.
90	.
100	.
TOTAL	144.30

Tally By

Checked By

REMARKS 1) 30" x 20" combination landing joint measured from top of 20" casing housing to bottom of 20" 'CC' connector box.

2) Length of 20" float shoe 0.90 m.

Operator's Representative H Shire

HUDBAY OIL (AUSTRALIA) LIMITED

Casing and Tubing Tally

(METRIC)

Well Name and No. WEST SEAHORSE NO 1 Date 27 SEPTEMBER 1981 Casing Size 13-3/8 inch

Weight 61 lb/ft Grade Connection BTC Joints Run 105

Joint No.	Length of (m) joint	Total in (m) Hole	Joint No.	Length of (m) Joint	Total in (m) Hole	Joint No.	Length of Joint	Total in Hole
Shoe	0·60	0.60						
01	12·06	12.66	Carried Forward			Carried Forward		
Collar	0·43	13.09	41	11·99	490.79	81	11·41	969.01
02	12·07	25.16	42	12·02	502.81	82	12·08	981.09
03	11·75	36.91	43	12·10	514.91	83	12·11	993.20
04	11·89	48.80	44	11·96	526.87	84	12·07	1005.27
05	11·76	60.56	45	12·02	538.89	85	11·91	1017.18
06	11.91	72.47	46	11·83	550.72	86	11·98	1029.16
07	11·60	84.07	47	11·86	562.58	87	11·89	1041.05
08	12·01	96.08	48	11·98	574.56	88	11·99	1053.04
09	11·90	107.98	49	11·98	586.54	89	11·89	1064.93
10	12·07	120.05	50	12·08	598.62	90	11·93	1076.86
Sub tot	120·05		Sub tot	119·82		Sub tot	119·26	
11	12·08	132.13	51	12·08	610.70	91	11·97	1088.83
12	11·93	144.06	52	11·95	622.65	92	11·75	1100.58
13	11·98	156.04	53	12·08	634.73	93	12·08	1112.66
14	11·97	168.01	54	12·00	646.73	94	12·08	1124.74
15	11·92	179.93	55	12·08	658.81	95	12·03	1136.77
16	12·02	191.95	56	11·87	670.68	96	11·82	1148.59
17	11·99	203.94	57	12·08	682.76	97	11·82	1160.41
18	12·04	215.98	58	11·90	694.66	98	11·91	1172.32
19	11·98	227.96	59	12·03	706.69	99	11·95	1184.27
20	12·08	240.04	60	11·94	718.63	100	12·03	1196.30
Sub tot	119·99		Sub tot	120·01		Sub tot	119·44	
21	12·09	252.13	61	11·92	730.55			
22	11·89	264.02	62	12.06	742.61			
23	11·95	275.97	63	11.97	754.58			
24	11·98	287.95	64	11.96	766.54			
25	11·98	299.93	65	11.94	778.48			
26	12·03	311.96	66	11.88	790.36			
27	12·08	324.04	67	12.08	802.44			
28	11·83	335.87	68	11·98	814.42			
29	11·87	347.74	69	11·97	826.39			
30	12·01	359.75	70	12·08	838.47			
Sub tot	119·71		Sub tot	119·84				
31	11·86	371.61	71	11·85	850.32			
32	12·10	383.71	72	11·62	861.94			
33	11·92	395.63	73	11·86	873.80			
34	11·86	407.49	74	11·89	885.69			
35	12·08	419.57	75	11·99	897.68			
36	11·64	431.21	76	12·07	909.75			
37	12·04	443.25	77	12·08	921.83			
38	11·53	454.78	78	12·04	933.87			
39	12·05	466.83	79	12·05	945.92			
40	11·97	478.80	80	11·68	957.60			
Sub tot	119.05		Sub tot	119·13				

TALLY SUMMARY

Group No. Ending	Length (Forward)
10	120·05
20	119·99
30	119·71
40	119·05
50	119·82
60	120·01
70	119·84
80	119·13
90	119·26
100	119·44
TOTAL	1196.30

Tally By H Shire

Checked By

REMARKS

Length Work String = 45.0m

Shoe Depth = 1305.5m

Operator's Representative

HUDBAY OIL (AUSTRALIA) LIMITED

Casing and Tubing Tally

(METRIC)

Well Name and No. WEST SEAHORSE NO 1 Date 27 SEPTEMBER 1981 Casing Size 13-3/8 inch

Weight 61 lb/ft Grade K-55 Connection BTC Joints Run 105

Joint No.	Length of (m) joint	Total in (m) Hole	Joint No.	Length of (m) Joint	Total in (m) Hole	Joint No.	Length of Joint	Total in Hole
	.							
	.		Carried Forward			Carried Forward		
101	11·92	1208.22	41	.		81	.	
102	11·63	1219.85	42	.		82	.	
03	11·98	1231.83	43	.		83	.	
04	11·87	1243.70	44	.		84	.	
05	11·83	1255.53	45	.		85	.	
06	.		46	.		86	.	
07	.		47	.		87	.	
08	.		48	.		88	.	
09	.		49	.		89	.	
10	.		50	.		90	.	
Sub tot	59·23		Sub tot	.		Sub tot	.	
11	.		51	.		91	.	
12	.		52	.		92	.	
13	.		53	.		93	.	
14	.		54	.		94	.	
15	.		55	.		95	.	
16	.		56	.		96	.	
17	.		57	.		97	.	
18	.		58	.		98	.	
19	.		59	.		99	.	
20	.		60	.		100	.	
Sub tot	.		Sub tot	.		Sub tot	.	
21	.		61	.				
22	.		62	.				
23	.		63	.				
24	.		64	.				
25	.		65	.				
26	.		66	.				
27	.		67	.				
28	.		68	.				
29	.		69	.				
30	.		70	.				
Sub tot	.		Sub tot	.				
31	.		71	.				
32	.		72	.				
33	.		73	.				
34	.		74	.				
35	.		75	.				
36	.		76	.				
37	.		77	.				
38	.		78	.				
39	.		79	.				
40	.		80	.				
Sub tot	.		Sub tot	.				

TALLY SUMMARY

Group No. Ending	Length (Forward)
10	.
20	.
30	.
40	.
50	.
60	.
70	.
80	.
90	.
100	.

TOTAL

Tally By

Checked By

REMARKS

Operator's Representative

HUDBAY OIL (AUSTRALIA) LIMITED

Casing and Tubing Tally
(METRIC)

Well Name and No. WEST SEAHORSE NO 1 Date 10 OCTOBER 1981 Casing Size 9-5/8 inch

Weight 40 lb/ft Grade K55 Connection BTC Joints Run

Joint No.	Length of (m) joint	Total in (m) Hole	Joint No.	Length of (m) Joint	Total in (m) Hole	Joint No.	Length of Joint	Total in Hole
Shoe	0.57							
01	11.99		Carried Forward			Carried Forward		
Collar	0.45		41	12.01		81	11.57	
02	11.96		42	11.98		82	11.71	
03	12.06		43	12.10		83	12.04	
04	11.87		44	11.77		84	11.98	
05	12.07		45	12.04		85	11.98	
06	11.77		46	11.95		86	11.66	
07	12.02		47	12.00		87	11.98	
08	11.87		48	11.87		88	11.36	
09	11.81		49	12.09		89	12.00	
10	12.09		50	12.08		90	12.09	
Sub tot	119.51		Sub tot	119.89		Sub tot	118.37	
11	12.10		51	11.92		91	11.75	
12	11.86		52	11.66		92	12.05	
13	11.82		53	11.75		93	11.94	
14	12.00		54	11.75		94	11.79	
15	11.77		55	11.89		95	11.68	
16	11.35		56	11.76		96	11.77	
17	12.02		57	11.74		97	11.95	
18	11.78		58	12.06		98	11.77	
19	11.79		59	11.92		99	11.69	
20	11.96		60	11.95		100	11.74	
Sub tot	118.45		Sub tot	118.40		Sub tot	118.13	
21	11.92		61	11.91				
22	11.98		62	12.07				
23	12.09		63	11.62				
24	11.81		64	11.84				
25	11.85		65	11.93				
26	11.81		66	11.81				
27	11.91		67	11.77				
28	11.91		68	11.83				
29	11.83		69	11.93				
30	11.67		70	11.95				
Sub tot	118.78		Sub tot	118.66				
31	11.97		71	11.72				
32	11.86		72	11.86				
33	11.80		73	11.93				
34	11.75		74	11.72				
35	11.66		75	12.10				
36	11.75		76	11.82				
37	12.10		77	12.05				
38	11.96		78	11.65				
39	11.78		79	11.99				
40	11.61		80	11.79				
Sub tot	118.24		Sub tot	118.63				

TALLY SUMMARY

Group No. Ending	Length (Forward)
10	119.51
20	118.45
30	118.78
40	118.24
50	119.89
60	118.40
70	118.66
80	118.63
90	118.37
100	118.13
TOTAL	1187.06

Tally By H Shire

Checked By

REMARKS Ran a total of 126 Jts K55 40 lb casing with shoe @ 1552.15m. Broke circulation @ 1300m - OK. Thread locked all connections from shoe to collar. Centralizers at 1st, 3rd and 5th Jt, and Jts 40, 41 and 42. Pressure tested cmt line to 3500 psi, pumped 10 bbl DW ahead. Mixed and pumped 503 sx 'G' cmt with 5 pct CFR2. Launched dart and sheared plug with 3250 psi. Followed with 2 bbl DW, followed with 370 bbls mud. Bumped plug 1750 psi. Checked float shoe - holding OK.

Note: Average slurry wt. 15.6 - 15.8 ppg.

Operator's Representative H Shire

HUDBAY OIL (AUSTRALIA) LIMITED

Casing and Tubing Tally

(METRIC)

Well Name and No. WEST SEAHORSE NO 1 Date 10 OCTOBER 1982 Casing Size 9-5/8 inch

Weight 40 lb/ft Grade K55 Connection BTC Joints Run

Joint No.	Length of (m) joint	Total in (m) Hole	Joint No.	Length of (m) Joint	Total in (m) Hole	Joint No.	Length of Joint	Total in Hole
	.							
	.		Carried Forward			Carried Forward		
101	12.07		41	.		81	.	
102	11.76		42	.		82	.	
03	11.70		43	.		83	.	
04	11.74		44	.		84	.	
05	11.65		45	.		85	.	
06	11.73		46	.		86	.	
07	12.09		47	.		87	.	
08	11.38		48	.		88	.	
09	11.63		49	.		89	.	
10	11.68		50	.		90	.	
Sub tot	117.43		Sub tot	.		Sub tot	.	
11	11.70		51	.		91	.	
12	12.09		52	.		92	.	
13	11.89		53	.		93	.	
14	11.91		54	.		94	.	
15	12.09		55	.		95	.	
16	11.74		56	.		96	.	
17	11.63		57	.		97	.	
18	11.92		58	.		98	.	
19	11.65		59	.		99	.	
20	11.79		60	.		100	.	
Sub tot	118.41		Sub tot	.		Sub tot	.	
21	11.86		61	.				
22	11.81		62	.				
23	11.93		63	.				
24	11.79		64	.				
25	11.98		65	.				
26	11.75		66	.				
27	3.96	Pup Jt	67	.				
28	4.02	Pup Jt	68	.				
29	4.05	Hanger Jt	69	.				
30	.		70	.				
Sub tot	83.15		Sub tot	.				
31	.		71	.				
32	.		72	.				
33	.		73	.				
34	.		74	.				
35	.		75	.				
36	.		76	.				
37	.		77	.				
38	.		78	.				
39	.		79	.				
40	.		80	.				
Sub tot	.		Sub tot	.				

TALLY SUMMARY

Group No. Ending		Length (Forward)
110		117.43
120		118.41
130		83.15
40		.
50		.
60	c/f	1187.06
70		.
80		.
90		.
100		.
TOTAL		1506.05

Tally By

Checked By

REMARKS

Operator's Representative

HUDBAY OIL (AUSTRALIA) LIMITED

Casing, Running Report

Well Name and No. WEST SEASHORE NO. 1 Date 18 SEPTEMBER 1981 Casing Size 20"

HOLE	Size	36"	26"			
	Depth (m)	61m	205m			
CASING	Size	20"	20"			
	Depth (m)		189.38			

MUD: Type Seawater spud mud s.g. 1.04 Vis. 100+ YP WL

Power Tong Torque Maximum N/A ft/lbs. Minimum N/A ft/lbs.

Fill up Points Ea. Jt

Calc. Displ. (m3) None Pump Strokes Including Landing String

psi psi

CASING INFORMATION	Length	Depth B/RT
TD		205.00m
OFF BOTTOM	15.62	
Shoe (make and type) Baker Float Shoe Landed at		189.38
Length Shoe	.90	188.48
11 Joints. Grade X52 wt. 94 lb/ft ID. 19.124ns.	133.25	55.23
Landing Collar (make and type)		
30"x20" combination landing Jt with 20" CIW casing housing	10.15	45.08
Top of 20" casing housing 45.08m B/RT		
Hanger or Suspension joint (make and type)		
Top Hanger or Suspension joint		
Landing String	47.00	
metres above R.T. at Zero Tide	2.08	
Less tide of	1.30	
metres up from R.T.	.78	

DETAILED CASING AND CEMENTING REPORT

1330 to 1900 hrs ran and landed 11 Jts 20" 94# casing washed from 188m to 189m with seawater with float shoe at 189.38m. Circulated out full casing volume 180 bbl.

1930 - 2100 Test cement line to 3000 psi, ok. Mix and pump 2000 sx Class 'G' neat cement slurry start 15.4 ppg tail of slurry 15.8 ppg. Displaced with 154 bbls sea water.

Ck for back flow static float holding ok.

Operators Representative Harold Shire

HUDBAY OIL (AUSTRALIA) LIMITED

Casing, Running Report

Well Name and No. WEST SEAHORSE NO. 1 Date 28 SEPTEMBER 1981 Casing Size 13-3/8"

HOLE	Size	17½"				
	Depth (m)	1320.00				
CASING	Size	13-3/8				
	Depth (m)	1305				

MUD: Type ______ s.g. 1.08 Vis. 38 YP 9 WL 18.4

Power Tong Torque Maximum 7000 ft/lbs. Minimum 6000 ft/lbs.

Fill up Points Cont. & Ea 5 Jts

Calc. Displ. (m^3) 624.5 Pump Strokes 5000 + 10 bbls with HOWCO

______ psi 1800 psi

CASING INFORMATION

TD		1320.00
OFF BOTTOM	15.00	
Shoe (make and type) Baker Float Shoe Landed at	1305	1305.00
Length Shoe	.60	1304.40
105 Joints. Grade K55 wt. 61 lb/ft ID. 12.515 ins.	1254.64	49.76
Landing Collar (make and type) Baffle collar BTC	.43	49.33
Wellhead	4.37	44.96
Wellhead to rotary table	44.96	
Hanger or Suspension joint (make and type)		
Top Hanger or Suspension joint		
Landing String	52.10	
metres above R.T. at Zero Tide		
Less tide of		
metres up from R.T.	7.14m	

DETAILED CASING AND CEMENTING REPORT

Run 105 Jt K55 61 lb/ft casing from 0730 to 0530 . Rough weather cont. Adjusting anchor mooring to keep rig on location. Rig up 350 ton casing equipment @ 20" shoe and broke circulation.

Landed casing in 20" casing housing and circulated full casing volume prior to cementing with 13-3/8" casing shoe at 1305m.

Pumped 10 bbls CS-2 spacer ahead. Pressure test cement line and head to 3500 psi, OK. Start cement at 08.10 mix and pump 2350 sx Class 'G' in 520 bbls mixing water containing 2.5% prehydrated bentonite and 0.1% HRL average slurry wt on lead 13.5 ppg. Mix and pump 300 sx Class 'G' cement in 36 bbls seawater with 0.1% HRL average slurry wt on tail 15.8. Finish mixing 0950.

Release dart and shear top plug with 3500 psi. Pump 10 bbls seawater with cement unit followed with 621 bbls using rig pump. Final pumping pressure 1800 psi. Plug did not bump. Had displaced 7 bbls over casing volume to F.collar, OK. Float shoe not holding work float by surging-holding OK.

Operators Representative Harold Shire

HUDBAY OIL (AUSTRALIA) LIMITED

Casing, Running Report

Well Name and No. WEST SEAHORSE NO. 1 Date 25 OCTOBER 1981 Casing Size 9-5/8"

HOLE	Size	36	26	17½	12¼	
	Depth (m)	61	205	1320	2490	
CASING	Size	30"	20"	13-3/8"	9-5/8"	
	Depth (m)	53	189	1305	1552	

MUD: Type Gel/Polymer s.g. 1.08 Vis. 38 YP 8 WL 7

Power Tong Torque Maximum ______ ft/lbs. Minimum ______ ft/lbs.

Fill up Points

Calc. Displ. (m³) 376 bbls Pump Strokes ______

______ psi ______ psi

CASING INFORMATION

TD		2490
OFF BOTTOM		
Shoe (make and type) Landed at		1552
Length Shoe	.57	1551.43
1 Joint. Grade K55 wt. 40 lb/ft ID 8.835 ins.	11.99	1539.44
Landing Collar (make and type)	.45	1538.99
125 Joints Gr. K5, wt 40 lb/ft ID 8.835 ins.	1481.01	57.98
Pup Joint	3.96	54.02
Pup Joint	4.02	50.00
Hanger or Suspension joint (make and type)		
Top Hanger or Suspension joint	4.05	45.95 R.T.
Landing String HWDP		
metres above R.T. at Zero Tide		
Less tide of		
metres up from R.T.		

DETAILED CASING AND CEMENTING REPORT

Ran a total of 126 joints K55 40 lb/ft casing with shoe at 1552.15. Broke circulation at 1300m OK thread lock all conn F/Shoe to collar. Cent 1st 3rd 5th joints and jt 40-41-41. Pressure test cement line to 3500, pump 10 bbl DW ahead. Mix and pump 503 sax 'G' cement with .5% CFK2. Launch dart and shear plug with 3250 psi followed with 2 bbl DW followed with 370 bbls mud. Bump plug 1750 psi. Check float shoe holding, OK. Note: Average slurry weight 15.6 - 15.8.

Operators Representative Harold Shire

2.4 Mud System

2.4.1 Mud Report Summary

Water Depth 49m, Hole to 205, Set 30" Casing at 189m

This hole was spudded at 1800 hrs on the 16th September in 39m of water. 20-25 bbls of high viscosity mud was pumped on each connection and 400 bbls of mud spotted in the open hole at casing point. A further 400 bbls of mud was spotted after a wiper trip prior to running casing.

Drill 17½" Hole to 1320m, Set 13-3/8" Casing at 1305m

The cement was drilled and a leak off test conducted to an SG of 1.07. The hole was then displaced to mud. All settling tanks were cleaned and solids control equipment checked out.

At the outset seawater was accidentally added to the system which raised the chlorides to 14000 ppm by 470m. Thereafter drill water was added at the shakers, partly compensating for the 25-35 bbls/hour losses from the desilter.

The traps were dumped when necessary and dilution volume made from Q-Mix prepared in the reserve tanks and fresh water. The mud weight was kept below 1.10 SG.

At 960m the drillship ran out of drill water necessitating the use of seawater. Dextrid additions commenced at 1318m so that the WL was reduced to below 15 mls.

The hole was conditioned at 1320m for logs. The hole showed a few signs of instability when POOH - at 1272m there was 50 tonne overpull. The pipe was pumped out to 1233m with the hole swabbing to 1220m. RIH the hole bridged at 1217m and reaming was required to 1320m. The hole was circulated and conditioned prior to logging. During logging the hole took 30 bbls of mud and afterwards, when conditioning the hole 1272 - 1320m required reaming with bridges at 1272 and 1288m and 2m of fill on bottom. Cuttings showed signs of geopressures.

The 13-3/8" casing was landed and set without problem with cement returns to the surface. This mud system was then dumped and new mud prepared.

12¼" Hole Interval

The 12¼" hole section was spudded with bit No. 5 on the 29th September after drilling the shoe and cement. The ensuing leak off test recorded an equivalent MW of 1.99 SG. The mud weight was raised to 1.08 SG at 1412m then cut back to 1.05 SG at 1421m. The interval 1412 - 1456 was drilled in 5-10m spurts with bottoms up being circulated out each time. A core was cut from 1456 - 1460 with 81% recovery.

Cement from within one of the collars blocked the jets at 1662m. On re-entering the hole the interval 1658 - 1678 required washing and reaming.

Intermediate logs were run at 1745m. 4 runs plus 2 RFT and 2 CST tests were conducted with no hole trouble. The hole was shown to be in good gauge.

There was a drilling break at 1929m and then slow seepage to the formation (approximately 70 bbls) thereafter. The mud weight then was 1.06 SG. Drilling continued to 2210m where 4 RFT runs were made with no hole problems. 2183 - 2210m required washing and reaming on return to drilling.

A fishing operation was mounted at 2365m for the BHA below the bumper sub. The fish was retrieved and a mill tooth bit run with junk basket subsequently.

TD was reached on the 20th October at 2489m. The last 74m were drilled noticeably faster due to a different bit (Smith F57) being employed.

Two days logging followed with the suite being completed with no hole problems.

2.4.2 Mud Engineering

Mud Engineering services and mud additives were provided by Baroid Australia Pty Ltd.

2.4.3 Mud Record (Daily Characteristics)

(See 'Mud Properties' Record attached.)

HUDBAY OIL (AUSTRALIA) LIMITED

Mud Properties

WELL WEST SEAHORSE NO. 1

MUD COMPANY: BAROID

1. Specific gravity
2. Viscosity (sec)
3. A.P.I. Water Loss (ml)
4. Cake Condition
5. A.P.I. Cake (millimetre)
6. Sand (%)
7. Chloride (ppm x 1000)
8. pH
9. Solids (%)
10. Plastic Viscosity (cp @ 50°C)
11. Yield Point (lb/100ft.^{2})
12. Gels (lb/100ft.^{2} 10 sec/10 min)
13. Total Hardness (epm)
14. Pf
15. Mf
16. Oil %
17. "N" Factor
18. Bentonite (lbs/bbl)

Date	Depth 0600 hrs (metres)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
17/9	61	1.04	100																
18	205	1.04	100																
19	205	1.04	100																
20	205	1.01	36	19		1	0	9	10					6	1.5				28
21	477	1.10	48	24		3	.5	14	8					6	0				34
22	856	1.08	40	18		2	.5	8.5	10	8				12	.4				34
23	959	1.07	35	32		2	.4	12.5	8.3	6	5	14	6/9	80	.1				34
24	1138	1.08	36	35		2	.5	14.7	9.5	6	4	13	6/10	100	Tr				23
25	1318	1.09	40	13.6		2	.5	19	8.5	7	9	15	2/6	80	Tr				43
26	1320	1.10	38	13.8		2	.5	19	8.5	6	8	8	2/4	80	.1				34
27	1320	1.08	38	16.8		2	.6	19	8.3	6	6	9	2/5	80	Tr				34
28	1320	1.08	38	18.4		2	.5	19	8.0	6	5	9	2/4	80	0				34
29	1320	1.08	38	18.4		2	.5	19	8.0	6	5	9	2/4	80	0				34
30	1320	1.02	38	6		1	0	8.5	9:2	1	9	7	0/1	14	.7				28
1/10	1440	1.06	43	5.4		1	.4	10	9.0	4	8	14	8/14	12	.3				28
2	1460	1.06	48	6.3		1	1.0	10	9.6	3	10	21	8/15	6	.5				23
3	1551	1.06	42	7.5		1	1.25	12.5	8.5	4	10	10	6/9	14	.15				23
4	1678	1.03	40	7.8		1	.2	12.5	8.7	4	7	12	2/5	22	.2				23
5	1745	1.04	40	4.4		1	.4	12.5	8.7	3	10	12	3/10	22	.1				23
6	1745	1.04	40	4.4		1	.4	12.5	8.7	3	10	12	3/10	22	.1				23
7	1801	1.05	39	4.0		1	Tr	12	8.6	3	9	7	2/5	50	.1				23
8	1975	1.06	44	4.2		1.5	Tr	10.5	9.5	2.5	14	14	2/7	200	Tr				30
9	2077	1.07	44	4.8		1.5	Tr	10	9.5	2.5	14	12	2/11	200	.1				28
10	2160	1.07	45	4.4		1.5	Tr	10	9.5	2.5	15	14	2/11	200	Tr				33
11	2210	1.08	44	4.0		1.5	Tr	10	9.5	3	14	12	2/10	200	.1				32
12	2220	1.07	44	3.6		1.5	Tr	9.5	9.5	2.5	14	13	2/8	180	.1				32
13	2276	1.08	42	5.6		1.5	Tr	8.5	9.0	3	13	12	2/10	160	Tr				28
14	2325	1.07	43	4.8		1.5	Tr	8	9.5	2.5	13	12	2/8	140	.1				29
15	2357	1.08	41	4.2		1.5	Tr	7.5	9.5	3	14	10	1/7	150	.1				29
16	2365	1.07	42	4.6		1.5	Tr	7.5	9.5	3	14	12	2/9	150	.1				29
17	2365	1.07	40	4.8		1.5	Tr	7.2	9.5	3	13	10	1/6	120	.1				28
18	2386	1.06	45	4.8		1.5	Tr	7	9.5	2.5	15	14	2/11	100	.1				27
19	2416	1.06	43	4.8		1.5	Tr	7	9.5	2.5	14	13	2/9	100	.1				28
20	2484	1.06	40	4.0		1.5	Tr	6	9.5	3.0	11	10	2/6	100	Tr				26

2.4.4 Materials Consumption and Costs

MATERIALS	UNIT	COST PER UNIT	QUANTITY		COST	
			EST.	ACTUAL	EST.	ACTUAL
36" & 26" hole Interval 49 - 205m						
Gel	100 lb	10.15	212	185	2151.80	1877.75
Caustic	50 kg	35.50	4	8	142.00	284.00
Bicarbonate	50 kg	21.49	5	5	107.45	107.45
Mon Pac	50 lb	135.84	-	12	-	1630.08
Lime	25 kg	6.17	7	8	43.19	49.36
Total Cost for 36"/26" hole					2444.44	3948.64
17½" hole Interval 205 - 1320m						
Gel	100 lb	10.15	720	781	7308.00	7927.15
Soda Ash	50 kg	17.75	40	24	710.00	426.00
Caustic	50 kg	35.50	31	20	1100.50	710.00
Caustic	20 kg	14.20	-	28	-	397.00
Dextrid	50 lb	39.90	115	150	4588.50	5985.00
Barite	100 lb	6.21	-	108	-	670.68
Q-Broxin	50 lb	24.15	-	53	-	1279.95
Coat 888	50 lb	23.20	-	18	-	417.60
Surfla H35	55 gal	473.50	-	1	-	473.50
Total Cost for 17½" hole					13707.00	19178.58

2.4.4 (Continued)

		12¼" hole Interval 1320 - 2450m				
Gel	100 lb	10.15	106	554	1075.90	5623.10
Dextrid	50 lb	39.90	386	502	15401.40	20029.80
Mon Pac	50 lb	135.84	154	138	20919.36	18745.92
XC Polymer	50 lb	250.80	-	3		752.40
Caustic Soda	20 kg	14.20	68	83	965.60	1178.60
Soda Ash	50 kg	17.75	72	30	1278.00	532.50
Bicarbonate	50 kg	21.49	-	20		429.80
Barite	100 lb	6.21	2900	881	18009.00	5471.01
Coat 888	50 lb	23.20	-	20		464.00
Surflo H35	55 gal	473.50	-	1		473.00
		Total Cost for 12¼" hole			57642.20	53700.63

		Consumption for 36", 26", 17½" & 12¼" hole				
Gel	100 lb	10.15	1038	1520	10535.70	15428.00
Dextrid	50 lb	39.90	501	652	19989.90	26014.80
Mon Pac	50 lb	135.84	154	150	20919.36	20376.00
XC Polymer	50 lb	250.80	-	3		752.40
Q-Broxin	50 lb	24.15	-	53		1279.95
Caustic Soda	20 kg	14.20	68	111	965.60	1576.20
Caustic Soda	50 kg	35.50	35	28	1242.50	994.00
Bicarbonate	50 kg	21.49	5	25	107.45	537.25
Soda Ash	50 kg	17.75	112	54	1988.00	958.50
Lime	25 kg	6.17	7	8	43.19	49.36
Barite	100 lb	6.21	2900	989	18009.00	6141.69
Coat 888	50 lb	23.20	-	38		881.60
Surflo H35	55 gal	473.50	-	2		947.00
		Total Cost for all Intervals			73800.00	74108.15

2.4.5 Mud Equipment Description

1. Reserve mud storage tanks 4 x 500 bbls.
2. Active mud storage 400 bbls complete with 150 bbl settling tank and 85 bbl pill tank.
3. Brandt Duel Tandem shaker.
4. Demco Desander, 6 cone x 6 inch rated at 1050 gpm with Mission 6 inch x 8 inch centrifuged pump and 75 HP electric motor.
5. Demco Desilter, 12 cone x 4 inch rated at 1080 gpm with Ingersoll-Rand centrifuged pump and 75 HP electric motor.
6. Pioneer Mud Cleaner, 16 cone x 4 inch rated at 800 gpm with 75 psi head.
7. Degasser - Drilco.
8. Pit Volume Totalizer.
9. Mud Mixer, Lightning mixers 2 ea x 25 HP in active tanks, 4 ea x 25 HP in reserve tanks.
10. Pioneer Sidewinder Mud Mixing Hopper.
11. Mud Mixing Pumps, Ingersoll-Rand MIR 150 with 75 HP electric motors, two on active tank, two on reserve tanks.
12. Mud/Gas separator with vent to Crown block.
13. Swaco super adjustable choke 10,000 psi with control panel.
14. Trip tank - 25 bbls with high-low level switch activated motor for transfer pump to annulus.

2.5 Flow Testing

2.5.1 Flow Testing Summary

One drill stem test was run over the interval 1411-1416 m R.T. The interval was perforated with a 4 inch casing gun at 4 shots per foot with a 90 degree phasing.

Three downhole gauges were used to record pressures and temperatures during the test and a Surface Pressure Read Out (SPRO) unit was used to provide a continuous surface monitor of the downhole conditions.

An initial 11 minute flow period was followed by a 69 minute initial shut in period. The final flow period last 411 minutes and was followed by a final shut in period of 553 minutes. During the final flow period, the well flowed oil at an average rate of 1827 BOPD and gas at an average rate of 242 Mscf/d through a 1/2 inch choke at a wellhead pressure of 460 psi. The flow was switched through a separator and several gas and oil samples were obtained. The oil had a gravity of 48^{o} API and an estimated solution gas-oil ratio of 200 scf/bbl. The gas contained approximately 200 ppm H_2S.

2.5.2 Flow Data

The flow data as reported by Flopetrol are attached as Appendix A1 to this report.

2.5.3 Pressure Data

The bottomhole pressure data as reported by Dowell Schlumberger are attached as Appendix A2 to this report.

2.5.4 Interpretation and Analysis

The interpretation and analysis of the DST is as follows:

- The well flowed in excess of 1800 stb/d of 48^{o} API light crude on a one half inch choke.
  Separator gas rates averaged 242 Mscf/d and contained 200 ppm H_2S.
- The reservoir is undersaturated with a bubble point pressure of 800-900 psi as estimated from the two DST samples. The solution gas-oil ratio is about 200 cf/stb.

- Formation permeability is estimated to be in the range of 118 to 175 md.
- The well has a skin factor of -1.7 to -3.3,thus indicating no wellbore damage.
- The radius of investigation of the test is approximately 800 feet.
- The test did not indicate any barriers or reservoir boundaries,nor did it indicate reservoir depletion.
- The productivity index of the well is 8.4 BPD/psi.

2.6 General Data

2.6.1 Positioning Report

(See attached Appendix A3.)

2.6.2 Downhole Surveys

Depth	Drift
205m	$3/4^{o}$
856m	1^{o}
1320m	1^{o}
1450m	1^{o}
1744m	$1\frac{1}{2}^{o}$
2078m	$7\frac{1}{2}^{o}$
2111m	$6\frac{1}{2}^{o}$
2168m	7^{o}
2210m	7^{o}
2325m	7^{o}
2357m	6^{o}
2489m	6^{o}

2.6.3 Plug Back and Squeeze Cementation Record

On October 24, 1981 the well was plugged back to 1556m to facilitate testing of the Latrobe section as follows:

Plug No 1	2015 - 1940m	200 sacks
Plug No 2	1675 - 1575m	267 sacks

Plug No 2 was tagged at 1556m.

2.6.4 Fishing Operations

On October 16th, 1981 the BHA parted at the bumper sub. The fish consisted of bit, bit sub, 2 x 8" DC, stab, 1 x 8" DC, stab, 3 x 8" DC, bumper sub mandrel.

The fishing BHA consisted of overshot with 6-3/4" spiral grapple, XO, bumper sub, 14 x 8" DC, XO, jars, 13 HWDP. The fish was successfully caught and recovered. A junk sub was run on subsequent bit run to collect remaining bumper sub pieces.

2.6.5 Side Tracked Hole

None performed.

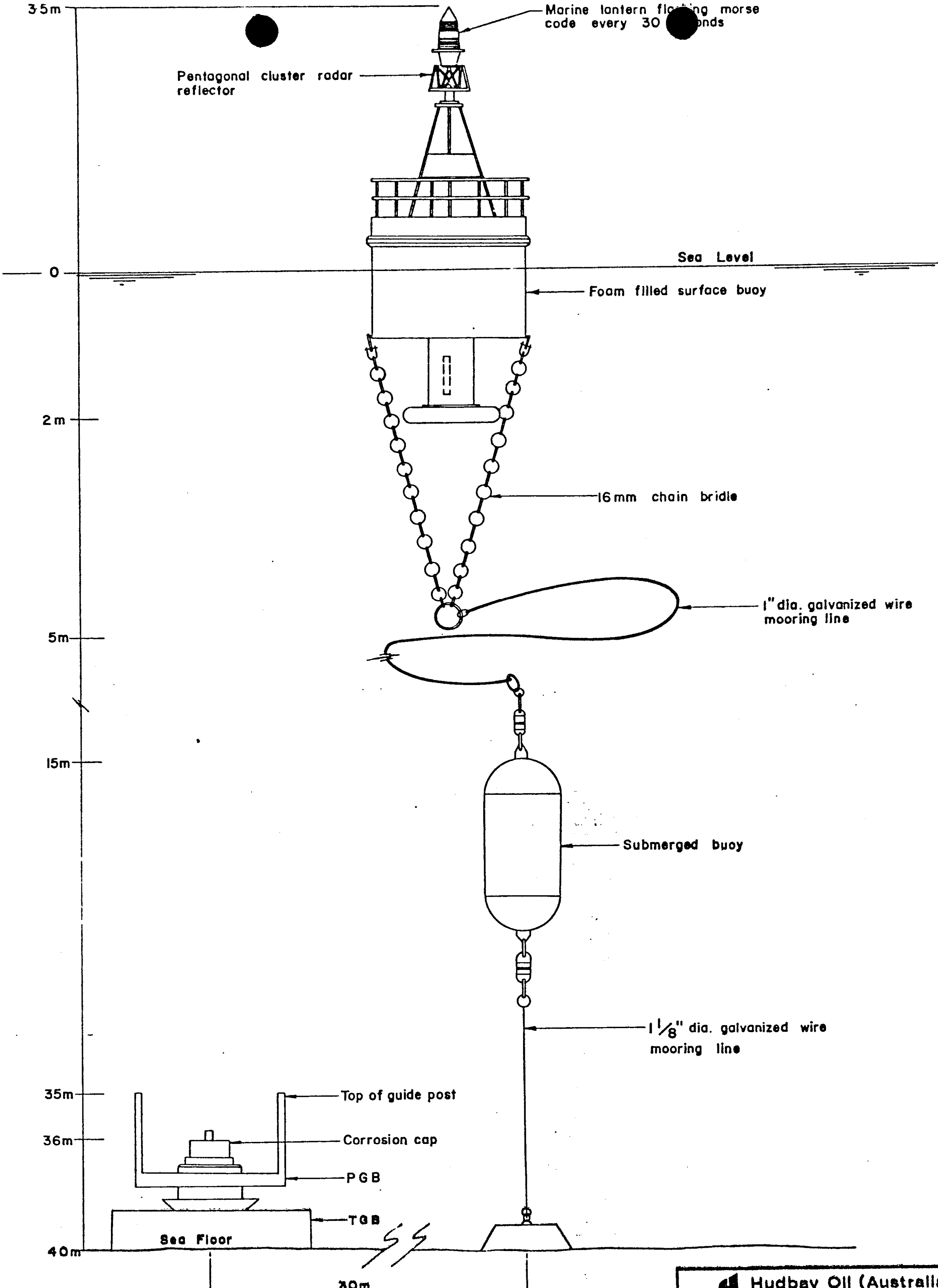
2.7 Abandonment Report

West Seahorse No. 1 was suspended on November 3rd, 1981.

The Mud in the 9-5/8" casing was conditioned to a pH of 11 and a wireline BP was set at 1394m. After pressure testing to 2200 psi, 100 sacks of cement was circulated onto the BP. Another 100 sack plug was placed over the interval 160 - 77m. A corrosion cap was placed over the wellhead, pinger operation was checked, and the guide lines were cut. A temporary marker buoy was attached to the PGB in lieu of a permanent type buoy to be placed at a later date. See attached schematic for downhole and subsea configuration.

2.8 Recommendation For Future Drilling Programmes

With the exception of the fishing job, there were no major problems either downhole or mechanical associated with this well. Some excessive bit weight below 1744 did cause some deviation however no problem resulted due to the drift. The section of hole from 2200 - 2490m was particularly firm and required longer to drill than expected. With regard to changes in future drilling programmes, one possible area to examine would be the mud programme - not from a hole problem viewpoint but for evaluation purposes. The salinity of the formation waters appears to be fairly low which tends to complicate log interpretation. By adjusting the salinity of the mud to contrast that of the formation fluid, electric logs and RFT's may be more readily evaluated.

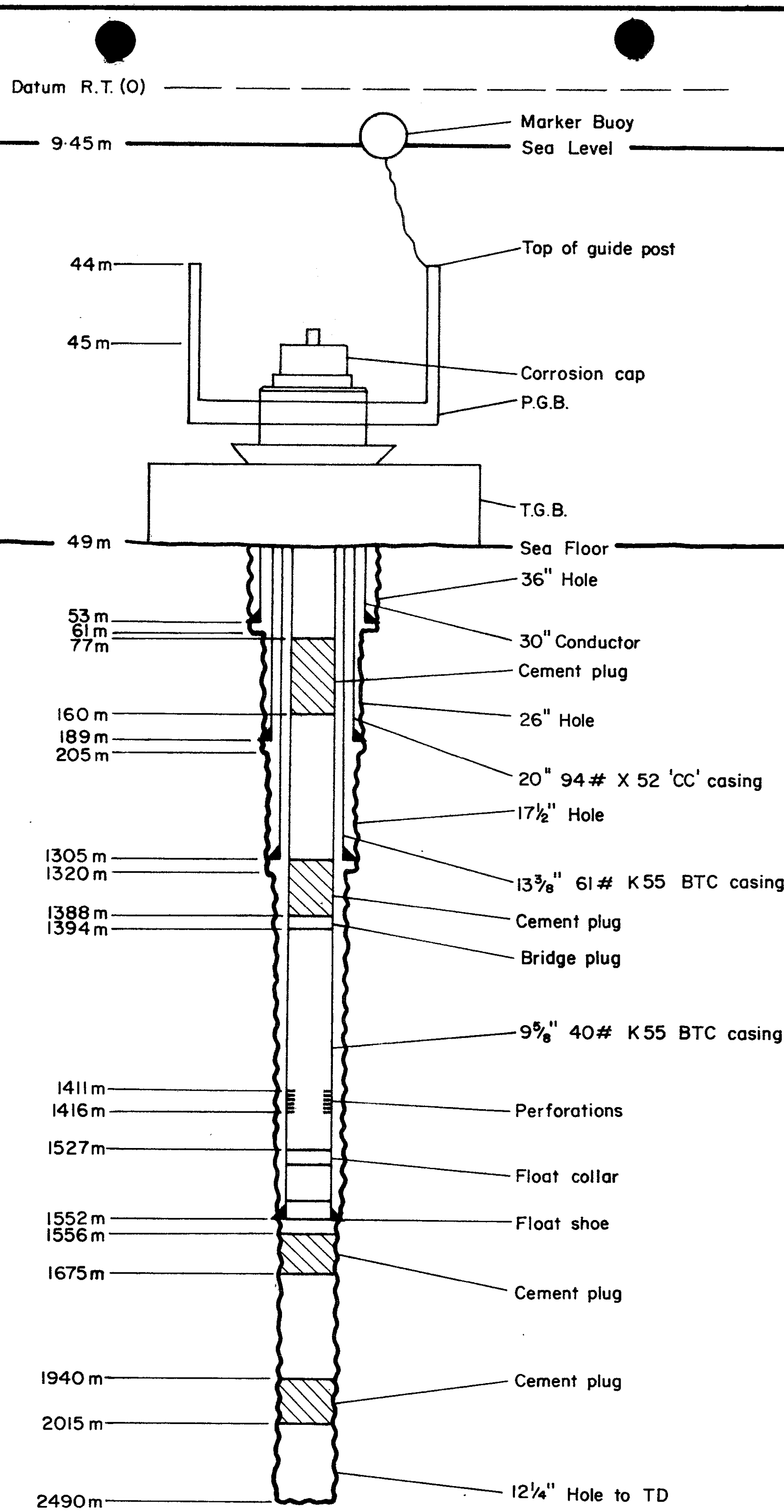


Hudbay Oil (Australia) Ltd.

MARKER BUOY SYSTEM

WEST SEAHORSE – 1

Authors: K. Putnam	Scale: Not to Scale
Drawn by: A. Clark	Drawing Nº
Date: December 1981	A3-DR-69



NOT TO SCALE

Author: K. Putnam	Hudbay Oil (Australia) Ltd.	Date: November, 1981
Drawn by: J. Brenton	**WEST SEAHORSE - 1** AS SUSPENDED	Drawing Nº A4-DR-367

APPENDIX A1. W E L L   T E S T I N G   R E P O R T

No. 26108131181

FLOPETROL

DIVISION : N.T.D.

BASE : PERTH

REPORT N°: 261081311081

Well Testing Report

Client: HUDBAY OIL

Field : WEST SEAHORSE Well: # 1

Zone: SANDSTONE 1411M - 1418M Date: 26.10.81 TO 31.10.81

(INCLUDES INFORMATION ON R.F.T. TRANSFERS OBTAINED PRIOR TO TEST AND P.C.T. CHAMBER TRANSFERS OBTAINED DURING TEST).

N°: DOP 100

INDEX

Flopetrol chief operator
Name : K. RUSSELL/I. WRIGHT

Client representative
Name : B. McELHINNEY

- TEST PROCEDURE -

1) SCHLUMBERGER R.I.H. WITH 4" CASING GUN 90° PHASING AND PERFORATE INTERVAL 1411 1418 METERS.

2) R.I.H. WITH D.S.T. TEST STRING CONSISTING OF P.C.T., MODIFIED M.F.E., FLOPETROL E.Z. TREE AND FLOPETROL LUBRICATOR VALVE.

3) AFTER SPACE-OUT THE FLOWHEAD WAS FITTED AND THE SYSTEM PRESSURE TESTED.

4) THE "POSITEST" PACKER WAS SET.

5) THE SPRO LATCH WAS RUN IN HOLE AND LATCHED TO GAUGE.

6) THE WELL WAS FLOWED FOR A PRE-FLOW PERIOD OF 11 MINUTES THEN SHUT-IN FOR AN INITIAL BUILD UP OF 69 MINUTES.

7) THE WELL WAS THEN FLOWED TO BURNERS ON ½" CHOKE AND AFTER CLEANING UP WAS SWITCHED THROUGH THE SEPARATOR TO OBTAIN RATES OF ± 1800 BBLS/DAY OF LIGHT CRUDE OIL WITH GAS RATES IN THE REGION OF 242 MSCF/DAY.

8) AFTER FLOWING FOR A NUMBER OF HOURS H2S STARTED TO APPEAR IN LARGE QUANTITIES (IN THE ORDER OF ± 200 PPM CONSISTANTLY).

9) TWO OIL AND TWO GAS SAMPLES WERE OBTAINED AND THE WELL THEN SHUT-IN FOR FINAL BUILD UP.

10) THE WELL WAS THEN KILLED AND THE STRING REMOVED FROM THE WELL.

FLOPETROL

Base : PERTH

Client : HUDBAY OIL
Field : WEST SEAHORSE
Well : # 1

Section : 2
Page : 01
Report N° 26108131108

_ MAIN RESULTS _ D.S.T. NO. 1

Tested interval: SANDSTONE Perforations: 1411 - 1418 M

OPERATION	DURATION	BOTTOM HOLE PRESSURE	WELL HEAD PRESSURE	OIL PROD. RATE	GAS PROD. RATE	G.O.R
Units	MIN	PSIG	PSIG	B.O.P.D.	MSCF/D	MSCF/BBL
PRE-FLOW ON ½" CHOKE	11	-	200			
INITIAL BUILD UP P.C.T. CLOSED	69	-	261			
FLOW PERIOD ½" FIXED CHOKE	65	-	472			
FLOW THRO' SEPARATOR ON ½" CHOKE	340	-	450	1752	242.1	7.24 0·138

Depth of bottom hole measurements : ______ Reference : RT

Temperature : ______ at : ______ depth

Separator gas gravity (air : 1) at choke size : .655 @ ½" FIXED CHOKE

STO gravity at choke size : ______

BSW : ______ Water cut : -

REMARKS AND OTHER OPERATIONS

NO WATER PRODUCED DURING TEST.
RATES AVERAGED.
REFER DOWELL SCHLUMBERGER SPRO REPORT FOR B.H.P. AND TEMPERATURE.
UNABLE TO FLOW TO GAUGE TANK DUE TO H2S PRODUCTION.

N°: DOP 103

FLOPETROL

Base : PERTH

Client : HUDBAY OIL

Field : WEST SEAHORSE

Well : # 1

Section : 3

Page : 01

Report N°: 2610813110

OPERATING AND MEASURING CONDITIONS

A - TYPE OF GAUGE

BOTTOM HOLE :
- Pressure : SPRO - DOWELL GAUGES J200
- Temperature : SPRO - DOWELL GAUGES MAXI THERM.

WELL HEAD :
- Pressure : FOXBORO - D.W.T. PRESSURE GAUGE,
- Temperature : GLASS ROD THERMOMETER

SEPARATOR :
- Pressure : BARTON STATIC 0-1000 PSIG
- Temperature : GLASS ROD THERMOMETER

B - PRODUCTION RATE CONDITIONS AND SOURCES

OIL PRODUCTION RATE
- ■ Tank
- ■ Meter — ■ Floco / ☐ Rotron
- ☐ Dump
- ☐ ____

Reference conditions.
- ■ Separator
- ■ Atmospheric pressure 60°F

Shrinkage measurement.
- ☐ With tank
- ■ With shrinkage tester

GAS PRODUCTION RATE
- ■ Orifice meter
- ☐ ____

Standard conditions.

14.73 @ 60°F

WATER PRODUCTION RATE
- ☐ Tank
- ■ Meter
- ☐ NIL PRODUCED

C - WELL DATA

WELL STATE DURING SURVEY :

Well producing through : tubing ~~drill pipe / casing~~

Main casing size 9 5/8" set at 1500 M Total well depth ____

Tubing size 3½ PH6 set at ____ Packer ____ set at ____

Perforations :
- Zone ____ From ____ to ____ From ____ to ____
- Zone ____ From ____ to ____ From ____ to ____
-

WELL STATE BEFORE TEST : EXPLORATION

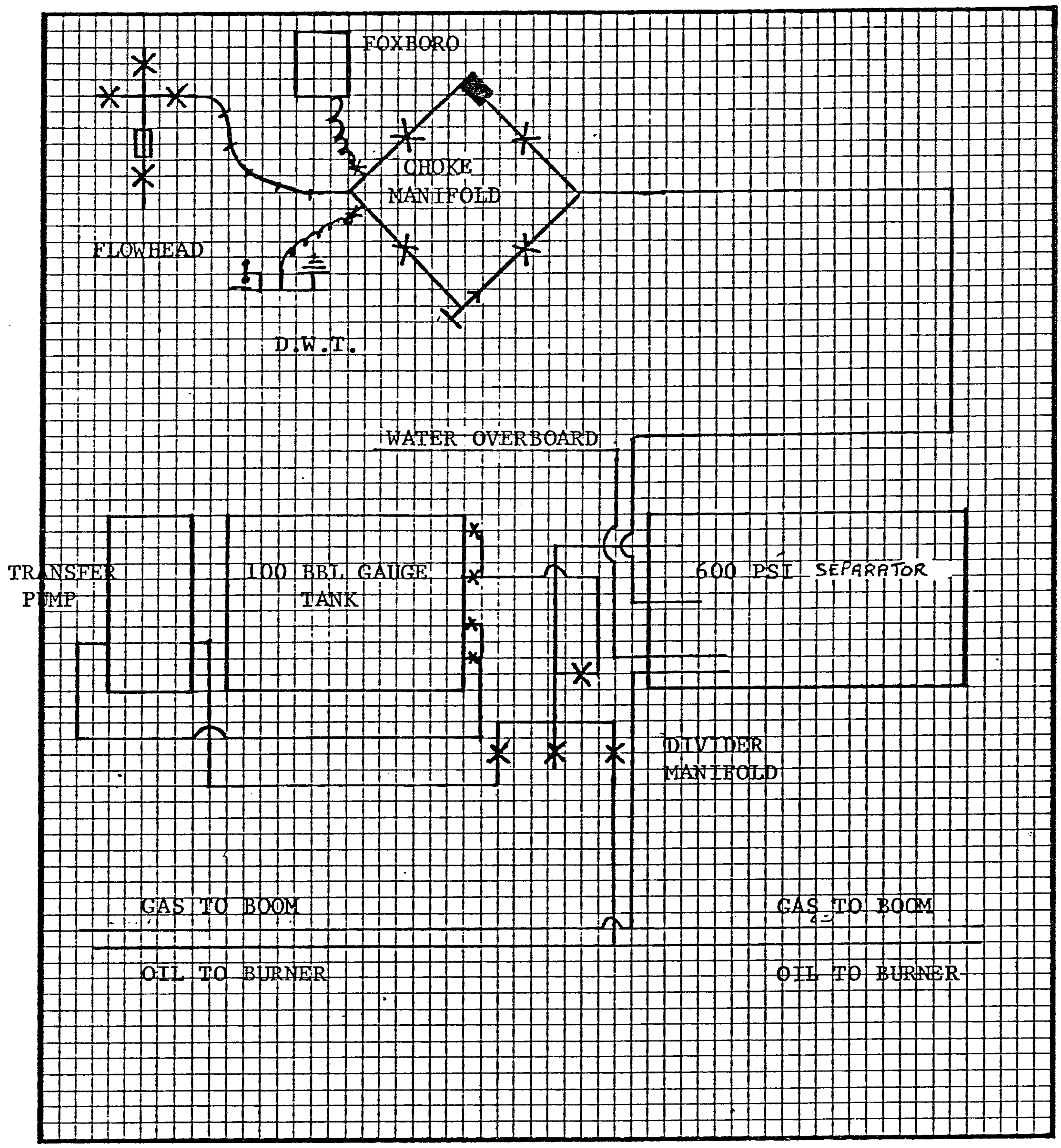
☐ Well closed since ____

☐ Well flowing since ____ Producing zone ____

Choke size ____

DOP 104

- SURFACE EQUIPMENT LAYOUT -



REMARKS :

NOT TO SCALE.

FIXED PIPING FROM RIG FLOOR DOWN.

FLOPETROL

Base : PERTH

Client : HUDBAY OIL

Field : WEST SEAHORSE

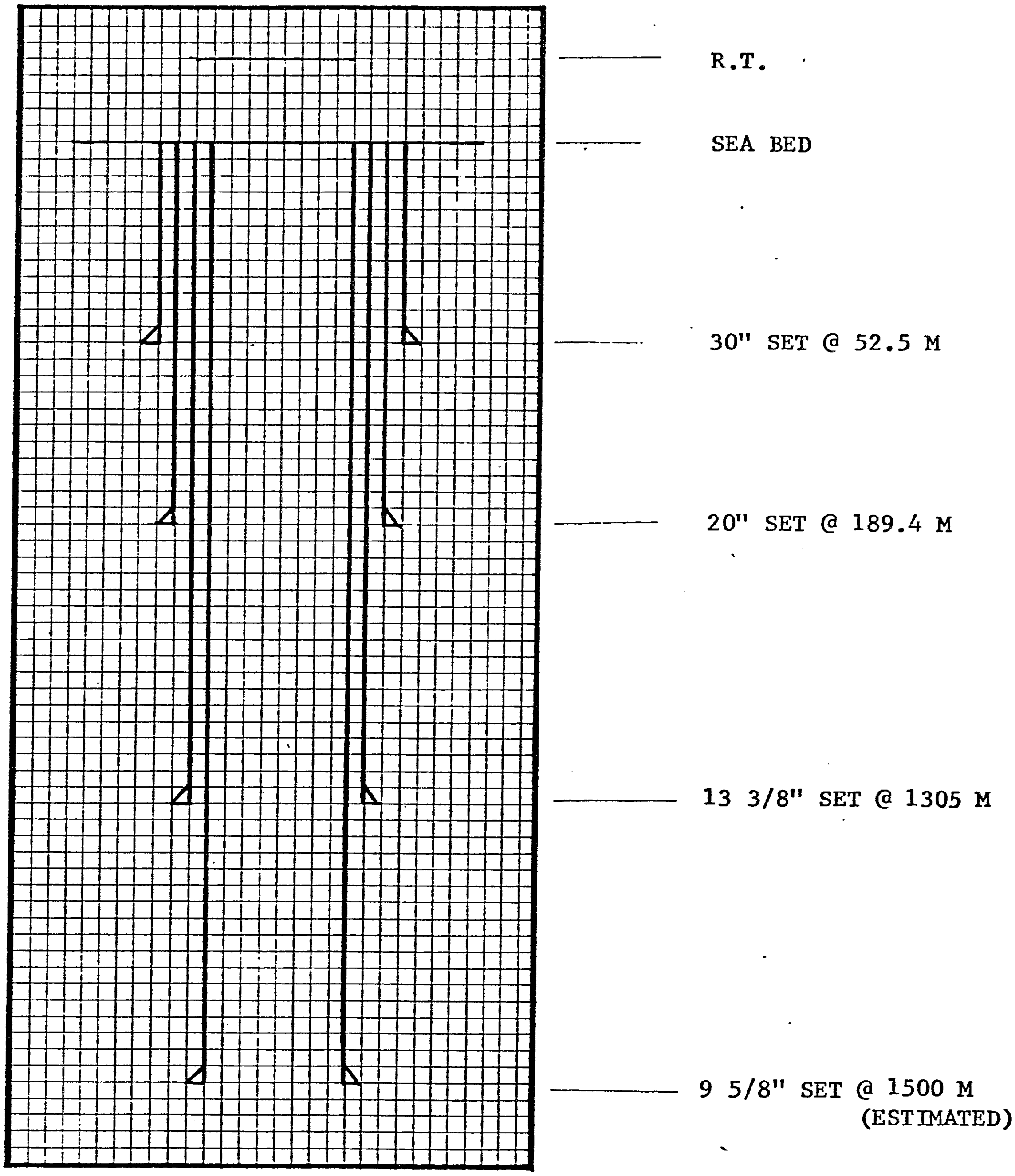
Well : # 1

Section : 5

Page : 01

Report N° 26108131108

- WELL COMPLETION DATA -



REMARKS :

N.T.S.

FOR TEST STRING LAYOUT REFER HUDBAY DRAWING NO. A4DR-283 AND/OR DOWELL SCHLUMBERGER REPORT.

FLOPETROL Base : PERTH	Client : HUDBAY OIL Field : WEST SEAHORSE Well : # 1	Section : 6 Page : 01 Report N°: 2610813110

- SEQUENCE OF EVENTS -

DATE	TIME	OPERATION
		D.S.T. # 1
		PERFORATIONS @ 1411M - 1418 M
		POSITEST PACKER
		WATER CUSHION - 228 METERS.
28.10.81		SCHLUMBERGER PERFORATE INTERVAL 1411 - 1418M WITH 4" CASING
		GUN 4 SHOTS PER FT. 90° PHASING.
		TEST STRING R.I.H.
29.10.81	0330	E.Z. TREE R.I.H. AFTER UNLATCH ON SURFACE.
	0430	LUBRICATOR VALVE R.I.H.
	0515	START RIG UP TO FLOWHEAD AND SURFACE EQUIPMENT. SET PACKER.
	0820	SPRO LATCH R.I.H. AND LATCHED ONTO GAUGE AT 1376.8 METERS.
		START PRESSURE TESTING OF SURFACE LINES.
	1235	PRESSURE ANNULUS TO OPEN P.C.T. VALVE - STEADY PRESSURE BLOWIN
		WATER OUT OF BUBBLE HOSE.
	1240	OPEN WELL TO BURNER ON ADJ. CHOKE ½".
	1244	WATER CUSHION TO SURFACE.
	1246	BLEED DOWN ANNULUS PRESSURE TO CLOSE P.C.T.
	1355	PRESSURE ANNULUS TO OPEN P.C.T. FOR 2ND FLOW PERIOD.
	1356	FLOWING WATER CUSHION TO SURFACE.
	1358	CHANGE TO ½" FIXED CHOKE.
	1359	WELL SLUGGING WATER CUSHION.
	1402	SLUGGING WATER AND MUD.
	1407	OIL TO SURFACE.
	1411	B.S.W. - 97% LIGHT CRUDE AND 3% SEDIMENT.
	1500	SWITCHED FLOW THROUGH SEPARATOR.
	1515	CHANGE BURNER DUE TO WIND DIRECTION.
	1700	SWITCH FLOW TO GAUGE TANK.
	1710	BY-PASS GAUGE TANK DUE TO H2S PRODUCTION + 200 PPM

DOP 107

DATE	TIME	OPERATION
29.10.81	1920	START TO TAKE SEPARATOR SAMPLES GAS, SAMPLE # 1 BOTTLE NO.
		A-8287. OIL, SAMPLE # 1 BOTTLE NO. 22024-7.
	1950	FINISH TAKING ABOVE SAMPLES.
	2010	START TO TAKE SEPARATOR SAMPLES GAS, SAMPLE # 3 BOTTLE NO.
		A-11927, OIL, SAMPLE # 4, BOTTLE NO. 9209-52-1980.
	2040	FINISH TAKING ABOVE SAMPLES. BY-PASS SEPARATOR.
	2045	BLEED DOWN ANNULUS TO CLOSE P.C.T. FOR FINAL BUILD UP.
30.10.81	0630	UNLATCH SPRO AND P.O.O.H.
	0700	SHEAR REVERSE-SUB AND START TO REVERSE CIRCULATE.
	1205	START TO RIG DOWN AND P.O.O.H.
	1300	LUBRICATOR VALVE ON SURFACE.
	1355	E.Z. TREE ON SURFACE.
		<u>END OF D.S.T. # 1</u>.

No.: DOP 109

FLOPETROL

Base : PERTH

Client : HUDBAY OIL

Field : WEST SEAHORSE

Well : # 1

- WELL TESTING DATA SHEET -

Section : 7

Page : 01

Report N°: 26108131108

DATE - TIME		PRESSURE AND TEMPERATURE MEASUREMENTS							PROD. RATES AND FLUID PROPERTIES					GOR			
		BOTTOM HOLE		WELL HEAD			SEPARATOR		OIL OR CONDENSATE			GAS					
Time	Cumul	Temp.	Pressure	Tg.temp	Tg.press.	Cg.press.	Temp.	Press.	Rate	Gravity	BSW	Rate	Gravity				
HR MIN	MIN			°C	PSIG	PSIG							Air = 1				Units
							D.S.T. # 1										
							PERFORATIONS @ 1411 - 1418 METERS.										
							PACKER = POSI-TEST										
29.10.81							CUSHION = WATER 228 METERS.										
1235	0		PRESSURE ANNULUS TO OPEN P.C.T. VALVE.														
	-		STEADY PRESSURE BLOWING WATER OUT OF BUBBLE HOSE (¾" EFFECTIVE CHOKE)														
1235	0			38	35												
1240	-		OPEN WELL TO BURNER ON ADJ. CHOKE ½"														
1240	5			38	60												
1244	9		WATER CUSHION FLOWING TO SURFACE.														
1245	10			34	160				LIGHT CRUDE TO SURFACE.								
1246	11		BLEED DOWN ANNULUS PRESSURE TO CLOSE P.C.T.														
1247	12			34	215												

LIQUID FLOW RATE MEASURING CONDITIONS :

14.73 @ 60°F

TESTED INTERVAL : SANDSTONE

DEPTH REFERENCE : RT

DEPTH OF B.H. MEASUREMENTS :

No.: DOP 110

FLOPETROL — WELL TESTING DATA SHEET (Continuation)

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Report N°: 261081311081
Section: 7

DATE - TIME		PRESSURE AND TEMPERATURE MEASUREMENTS							PROD. RATES AND FLUID PROPERTIES					GOR			
		BOTTOM HOLE		WELL HEAD			SEPARATOR		OIL OR CONDENSATE			GAS					
Time	Cumul	Temp.	Pressure	Tg. temp	Tg. press.	Cg. press.	Temp.	Press.	Rate	Gravity	BSW	Rate	Gravity	MSCUF/			
HR MIN	MIN			°C	PSIG	PSIG			B.O.P.D.			MSCUF/D	Air=1	BBL			Units
1247																	
1248	13			34	220												
1249	14			33	222												
1250	15			33	226												
1300	25			35	254												
1305	30			36	255												
1310	35			37	262												
1315	40			37	254												
1320	45			34	260												
1330	55			31	268												
1340	65			29	281												
1355	80		PRESSURE ANNULUS OPEN P.C.T. FOR 2ND FLOW														
1355	-			29	370												
29.10.81									WELL OPENED TO BURNER ON ½" ADJ.								
1356	81			29	290				FLOWING WATER CUSHION TO SURFACE.								
1357	82			29	430												
1358	83			27	420				CHANGE TO ½" FIXED CHOKE.								
1359	84			26	310				WELL SLUGGING WATER CUSHION.								

No.: DOP 110

FLOPETROL — WELL TESTING DATA SHEET (Continuation)

Page : 03
Report N° 261081311081

Section : 7

DATE - TIME		PRESSURE AND TEMPERATURE MEASUREMENTS							PROD. RATES AND FLUID PROPERTIES					GOR				
		BOTTOM HOLE		WELL HEAD			SEPARATOR		OIL OR CONDENSATE			GAS						
Time	Cumul	Temp.	Pressure	Tg. temp	Tg. press.	Cg. press.	Temp.	Press.	Rate	Gravity	BSW	Rate	Gravity					
HR MIN	MIN			°C	PSIG	PSIG							Air=1					Units
1359																		
1400	85			26	400													
1401	86			27	400													
1402	87			27	410				SLUGGING LARGE AMOUNTS OF WATER AND MUD.									
1403	88			28	450													
1404	89			28	460													
1405	90			28	462													
1406	91			28	481													
1401	92			29	480				OIL TO SURFACE.									
1408	93			29	485													
1409	94			29	493													
1410	95			29	495													
1411	96			29	490				BWS = 97% LIGHT CRUDE AND 3% SEDIMENT.									
1415	100			29	475													
1420	105			29	477													
1425	110			30	487													
1430	115			29	479													
1445	130			32	480													

No.: DOP 110

FLOPETROL — WELL TESTING DATA SHEET (Continuation)

Page : 04
Report N°: 261081311081
Section : 7

DATE - TIME		PRESSURE AND TEMPERATURE MEASUREMENTS							PROD. RATES AND FLUID PROPERTIES					GOR			
		BOTTOM HOLE		WELL HEAD			SEPARATOR		OIL OR CONDENSATE			GAS			H2S		
Time	Cumul	Temp.	Pressure	Tg. temp °C	Tg. press. PSIG	Cg. press. PSIG	Temp. °F	Press. PSIG	Rate B.O.P.D.	Gravity SP GR	BSW %	Rate MSCF/D	Gravity Air=1	MSCF/BBL	PPM		Units
1445																	
29.10.81																	
1500	145			35	472												
1500	-		SWITCH FLOW THROUGH SEPARATOR										.6375		(95% CRUDE 5% SEDIMENT)		
1515	160			33	457												
1515	-		CHANGE BURNERS DUE TO WIND DIRECTION.														
1530	175			33	460		77	180					.635				
1545	190			34	460		75	180	1502		TR	253.4	.6725	6			
1600	205			34	460		75	180	1802		TR	240.8	.672	7			
1615	220			35	460		75	180	1802	.789 @ 19°C	TR	240.8		7			
1630	235			34	460		79	170	1802		TR	224.9		8	(98% CRUDE 2% SEDIMENT)		
1645	250			33	460		79	180	1662		TR	233.9	.655	7			
1700	265			33	460		79	180	1906		TR	242.3		8	200		
1700	-		SWITCH FLOW THROUGH GAUGE TANK.														
1710	275		BY PASS GAUGE TANK DUE TO H2S														
1715	280			31	455		81	180	1774			242.3		7.3			
1730	295			31	455		81	175	1784	.784 @ 21°C		239.1		7	± 200		
1745	310			31	457		81	175	1774			239.1		7			

No.: DOP 110

FLOPETROL

WELL TESTING DATA SHEET(Continuation)

Page : 05
Report N°: 261081311081

Section : 7

DATE - TIME		PRESSURE AND TEMPERATURE MEASUREMENTS							PROD. RATES AND FLUID PROPERTIES					GOR			
		BOTTOM HOLE		WELL HEAD			SEPARATOR		OIL OR CONDENSATE			GAS			H2S		
Time	Cumul	Temp.	Pressure	Tg.temp	Tg. press.	Cg. press.	Temp.	Press.	Rate	Gravity	BSW	Rate	Gravity	MSCF/	PPM		
				°C	PSIG	PSIG	°F	PSIG	B.O.P.D.	SP GR	%	MSCF/D	Air=1	BBL			Units
1745																	
1800	325			33	458		82	180	1770	.784 @ 21°C		242.1		7	± 200		
1815	340			33	455		82	180	1850			242.1		8			
1830	355			33	455		82	180	1690			246.4		7	± 200		
1845	370			33	453		82	180	1774	.784 @ 21°C		246.4		7.0			
1900	385			33	453		82	180	1765			242.1		7	± 200		
1915	400			33	452		82	180	1784			242.1		7			
1920	405		START TO TAKE FIRST OF SEPARATOR PRESSURE SAMPLES.														
1930	415			32	450		82	180	1746			242.1		7			
1945	430			33	450		82	180	1634			242.1		7			
2000	445			33	450		82	180	1709			242.1		7			
2015	460			33	450		82	180	1812			242.1		7			
2030	475			33	450		82	180	1859			242.1		8			
2040	485		BY PASS SEPARATOR														
2045	490		BLEED DOWN ANNULUS TO CLOSE P.C.T. FOR FINAL BUILD UP.														
					END OF D.S.T. # 1												

FLOPETROL

DIVISION = N.T.D.

BASE = PERTH

REPORT N°= 261081311081

Well Testing Report
Annexes

Client = HUDBAY OIL

Field = WEST SEAHORSE Well = #1

Zone = SANDSTONE Date = 26.10.81 TO 31.10.81

N°: DOP 111

INDEX of ANNEXES

- LIQUID PRODUCTION RATE MEASUREMENT -

2.1 - MEASUREMENT WITH TANK -

$$V_o = V \times K \times (1 - BSW)$$

V_o : Net oil volume at 60°F and atmospheric pressure.
V : Gross oil volume measured by tank gauging.
K : Volume correction factor to be applied between the tank temperature during gauging and 60°F.
BSW: Basic sediments and water.

2.2 - MEASUREMENT WITH METER -

a) Shrinkage factor is measured by shrinkage tester.

$$V_o = V_S \times f \times (1 - Shr) \times K \times (1 - BSW)$$

V_o : Net oil volume at 60°F and atmospheric pressure.
V_S : Gross oil volume measured by meter under separator conditions.
f : Meter correction factor = $\frac{\text{Volume measured in tank}}{\text{Volume measured by meter}}$
Shr: Percentage of oil volume reduction between separator and tank conditions, reported to oil volume at separator conditions.
K : Volume correction factor to be applied between the final temperature during shrinkage measurement and 60°F.
BSW: Basic sediments and water.

b) Shrinkage factor is measured with tank.

$$V_o = V_S \times (1 - Shr') \times K \times (1 - BSW)$$

V_o, V_S, K and BSW : Same meaning as in a).
$(1 - Shr')$: Shrinkage factor including meter correction factor.

No.: DOP 120

FLOPETROL Base : PERTH	Client : HUDBAY OIL Field : WEST SEAHORSE Well : # 1	- OIL PRODUCTION RATE - - MEASUREMENT WITH TANK -	Section : ANNEX 2.1 Page : 01 Report N° 261081311081

DATE - TIME		Gauge	TANK VOLUME		STO GRAVITY			K	BSW	Net volume	Net STO	Cumulative	
Time	Interval	graduation	Volume V	Temp.	Gravity	Temp.	Grav. 60°F			of STO V_o	product. rate	production	
									%		/ day		Units
29.10.81													

DUE TO H2S PRODUCTION UNABLE TO FLOW TO GAUGE TANK DURING TEST.

METERS CHECHED AGAINST GAUGE TANK AND HALLIBURTON PUMP AFTER TEST.

HALLIBURTON PUMPED 10 BBLS WATER.

FLOCO METER SHOWED 9.5 BBLS WATER.

GAUGE TANK SHOWED 9.9 BBLS WATER.

TESTED INTERVAL :

PERFORATIONS :

No.: DOP 122

FLOPETROL Base : PERTH	Client : HUDBAY OIL Field : WEST SEAHORSE Well : # 1	- OIL PRODUCTION RATE - - MEASUREMENT WITH METER -	Section: ANNEX 2.2 Page : 02 Report N°: 26108131108

DATE - TIME Time HR MIN	Interval MIN	Meter reading BBLS	V_S BBLS	BSW %	V'_o* BBL	1 - Shr Factor 1-%	Temp. °C	OIL GRAVITY Gravity SP GR	Temp. oC	Grav. 60°F API	K	Net volume of STO: V_o BBLS	Net STO product. rate BBLS /day	Cumulative production BBLS	Units
29.10.81					D.S.T. # 1										
		WELL OPENED TO BURNER AT ADJ. CHOKE CHANGING TO ½" FIXED.													
1500		SWITCH FLOW THROUGH SEPARATOR													
1530		START TO TAKE READINGS.													
		PRODUCTION FROM 1355 HRS TO 1530 HRS ESTIMATED AT 108 BBLS.													
		1.6		TR											
1530		1.6		TR										108.00	
1545	15	17.6	16.0	TR	16.0							15.65	1502.1	123.65	
1600	15	36.8	19.2	TR	19.2	.98	19	.789	19	48.1	.9979	18.78	1802	142.43	
1615	15	56.0	19.2	TR	19.2							18.78	1802	161.21	
1630	15	75.2	19.2		19.2	.98	18	.784	21	48.1		18.78	1802	179.99	
1645	15	92.9	17.70	TR	17.70	.98	19				.9975	17.31	1662	197.30	
1700	15	113.2	20.30	TR	20.30							19.85	1906	217.15	

Shrinkage factor measured by Shrinkage tester ☒ Tank ☐

*$V'_o = V_S \times f \times (1 - BSW)$ = Net oil volume at separator conditions. f = 1

TESTED INTERVAL : SANDSTONE

PERFORATIONS : 1411 - 1418 MTRS.

No.: DOP 123

FLOPETROL | MEASUREMENT WITH METER -(Continuation) | Page : 03 Report N : 2610813110$1 | Section: ANNEX 2.2

DATE - TIME Time HR MIN	Interval MIN	Meter reading BBLS	V_S BBLS	BSW %	V'_o BBL	1 - Shr Factor 1-%	Temp. °C	OIL GRAVITY Gravity SP GR	Temp. °C	Grav. 60°F API	K	Net volume of STO: V_o BBLS	Net STO product. rate BBL /day	Cumulative production BBL	Units
1700		113.2													
1715	15	132.1	18.9	TR	18.90							18.48	1774	235.63	
1730	15	151.1	19.0	TR	19.00	.98	18	.784	21	48.1	.9975	18.58	1784	254.21	
1745	15	170.0	18.9	TR	18.9							18.48	1774	272.69	
1800	15	188.85	18.85	TR	18.85	.98	18	.784	21	48.1	.9975	18.43	1770	291.12	
1815	15	208.55	19.70	TR	19.70							19.27	1850	310.39	
1830	15	226.30	18.00	TR	18.00							19.60	1690	327.99	
1845	15	245.2	18.90	TR	18.90			.784	21	48.1	.9975	18.48	1774	346.47	
1900	15	264.0	18.80	TR	18.80							18.39	1765	364.86	
1915	15	283.0	19.00	TR	19.00							18.58	1784	383.44	
1930	15	301.6	18.60	TR	18.60							18.19	1746	401.63	
1945	15	319.0	17.40	TR	17.40							17.02	1634	418.65	
2000	15	337.2	18.20	TR	18.20							17.80	1709	436.45	
2015	15	356.5	19.30	TR	19.30							18.87	1812	455.32	
2030	15	376.3	19.80	TR	19.80							19.36	1859	474.68	
2040	-	BY PASS SEPARATOR READY FOR FINAL BUILD UP													
2045	BLEED DOWN ANNULUS TO CLOSE P.C.T.														

FLOPETROL	Client : HUDBAY OIL	Section: ANNEX 3
Base : PERTH	Field : WEST SEAHORSE Well : # 1	Page : 01 Report N°: 2610813110

- GAS PRODUCTION RATE MEASUREMENT by orifice meter -

Reference is made to the rules and coefficients given in AGA gas measurement Comittee Report No.3 for orifice metering.

a) EQUATIONS -

$$Q = C\sqrt{hw \times Pf}$$

Q : Production rate at reference conditions.
C : Orifice flow coefficient.
hw: Differential pressure in inches of water.
Pf : Flowing pressure in psia.

$$C = F_u \times F_b \times F_g \times Y \times F_{tf} \times F_{pv}$$

F_u : Unit conversion factor in desired reference conditions.
F_b : Basic orifice factor (Q in Cu.ft / hour).
F_g : Specific gravity factor.
Y : Expension factor
F_{tf} : Flowing temperature factor.
F_{pv}: Supercompressibility factor (estimated).

Remarks

F_m: Manometer factor is equal one since only bellows type meters are used.
F_r : Reynolds factor is considered to be one.

TABLE OF F_u FACTOR

UNITS	REFERENCE CONDITIONS 60°F 14.73 psia	0°C 760mmHg*	15°C 760mmHg *	15°C 750mmHg *
Cu.ft / hour	1	0.9483	1.0004	1.0137
Cu.ft / day	24	22.760	24.009	24.329
m^3 / hour	0.02832	0.02685	0.02833	0.02870
m^3 / day	0.6796	0.6445	0.6799	0.6889

* Mercury at 32°F

b) METER DATA -

Meter type : DANIEL
Flange taps - Pf taken down/up stream
Flow recorder type: BARTON
ID of meter tube : 4.026"

c) SPECIFIC GRAVITY SOURCE -

Sampling point : GAS OUTLET LINE ON SEPARATOR BODY
Gravitometer type: KIMRAY

d) SUPERCOMPRESSIBILITY FACTOR F_{pv} -

All coefficients are taken from AGA NX 19 manual for natural gas free of air, CO_2 and H_2S. More accurate values could only be determined by laboratory measurement.

No.: DOP 124

No. DOP 125

FLOPETROL

Base : PERTH

Client : HUDBAY OIL

Field : WEST SEAHORSE

Well : # 1

- GAS PRODUCT. RATE MEASUREMENT -

Section : ANNEX 3

Page : 01

Report N 261081311081

DATE - TIME Time HR MIN	Interval MIN	Flowing Temp. OF	P_f absolute psia	h_w "of wat.	$\sqrt{h_w \times P_f}$	Orifice diameter Inches	Gas gravity (air=1)	F_b	F_g	Y	F_{tf}	F_{pv}	C	Gas production rate : Q MSCF/D	Cumulative Production CUFT
29.10.81					D.S.T. # 1										
				PERFORATIONS AT		- 1411 - 1418M									
				PACKER SET @		-									
				CUSHION = WATER		= 228 METERS.									
		WELL OPENED TO BURNER ON ADJ. CHOKE CHANGING TO ½" FIXED.													
1500		SWITCH FLOW THROUGH SEPARATOR													
1530	30	START TO TAKE READINGS.													
1530		77	195			.500	.635	50.224							
1545	15	75	195	62	109	.625	.6725	78.421	1.2194	1.0021	.9859	1.016	2304.75	253.4	2640
1600	15	75	195	56	104.5	.625	.6725	78.421	1.2194	1.0019	.9859	1.016	2304.75	240.8	5148
1615	15	75	195	56	104.5	.625	.6725	78.421	1.2194	1.0019	.9859	1.016	2304.28	240.8	7656
1630	15	79	185	52	98.08	"	"	"	"	"	.9882	1.015	2292.65	224.9	9998
1645	15	79	195	52	100.70	"	.655	"	1.2356	1.0018	.9822	1.015	2323.16	233.9	12435
1700	15	81	195	56	104.5	"	"	"	"	1.0019	.9804	1.015	2318.75	242.3	14959

F_u = 24

Recorder ranges : P_f = 1000 PSIG

h_w = 200" Temp. =

TESTED INTERVAL : SANDSTONE

PERFORATIONS : 1411 - 1418M

No.: DOP 126

FLOPETROL | GAS PRODUC. RATE MEASUREMENT–(Continuation) | Page : 02 | Report N°: 2610813110811 | Section: ANNEX **3**

DATE – TIME Time HR MIN	Interval MIN	Flowing Temp. °F	P_f absolute psia	h_w "of wat.	$\sqrt{h_w \times P_f}$	Orifice diameter Inches	Gas gravity (air = 1)	F_b	F_g	Y	F_{tf}	F_{pv}	C	Gas production rate : Q	Cumulative Production
1700															
1715	15	81	195	56	104.5	.625	.655	78.421	1.2356	1.0019	.9804	1.015	2318.75	242.3	17483
1730	15	81	190	56	103.15	"	"	"	"	1.0020	.9804	"	2317.89	239.1	19974
1745	15	81	190	56	"	"	"	"	"	"	"	"	"	239.1	22465
1800	15	82	195	56	104.50	"	"	"	"	1.0019	.9795	"	2316.40	242.1	24986
1815	15	82	195	56	"	"	"	"	"	"	"	"	"	242.1	27507
1830	15	82	195	58	106.35	"	"	"	"	1.0020	.9795	"	2316.55	246.4	30073
1845	15	82	195	58	"	"	"	"	"	"	"	"	"	246.4	32639
1900	15	82	195	56	104.50	"	"	"	"	1.0019	"	"	2316.40	242.1	35160
1915	15	82	195	56	"	"	"	"	"	"	"	"	"	242.1	37681
1930	15	82	195	56	"	"	"	"	"	"	"	"	"	242.1	40202
1945	15	82	195	56	"	"	"	"	"	"	"	"	"	242.1	32723
2000	15	82	195	56	"	"	"	"	"	"	"	"	"	242.1	45244
2015	15	82	195	56	"	"	"	"	"	"	"	"	"	242.1	47765
2030	15	82	195	56	"	"	"	"	"	"	"	"	"	242.1	50286
2040	10	82	195	56	"	"	"	"	"	"	"	"	"	242.1	51967
2040	-	BY PASS SEPARATOR READY FOR FINAL BUILD UP.													

FLOPETROL		PAGE 01
Base : PERTH Date of Sampling : Date of Transfer : 23 TO 26 OCTOBER 1981	Customer : HUDBAY OIL Field : WEST SEAHORSE Well : # 1 Service Order No : Sampling No : # 1 Run No :	F.I.T. & R.F.T. BOTTOM HOLE SAMPLE

Reservoir and Well Characteristics

Producing Zone :	Sample Depth :
Depth Origin : Z :	Casing – Diameter : Shoe :

Sampling and Transfer Conditions

Sampling Bottom Hole Pressure (Amerada) ______ psig	Volume of Bottle 628 cc (a)
Sampling Bottom Hole Temp. (Schlumberger) ______ °F	Volume of top liner 22 cc (b)
Time at which Sample taken ______	Total volume = a+b 650 cc (c)
OPENING PRESSURE Surface Pressure of Sample 35 psig	Vol. Hg. at end of transfer 590 cc (d)
OPENING TEMPERATURE Surface Temp. of Sample 70 °F	(1) Vol. Hg. remaining in bottle 60 cc (c-d)
Transfer Pressure ± 6500 psig	Vol. Hg. withdrawn 19 cc (e)
Transfer Temperature ± 175 °F	Bubble point measured in bottle ______ psig
Gradient (when necessary) ______	Bubble Point temperature ______ °F
Transfer by gravity ☑ by pump ☑	(2) Vol. Hg. remaining in bottle = (1) - (e) 41 cc
Final Conditions in Bottle Vol. Hg. Remaining in bottle = (2)- (1) = 5 cc Pressure 0 psig Temp. 66 °F	Vol. Hg. withdrawn to decompression of shipping bottle = 36 cc (f) R.F.T. CHAMBER OPENING PRESSURE = 35 PSIG @ 70°F

Identification of Sample

Bottle Serial No. 80-291/201 FLO No. ______ sent the ______ by ______

Destination : ______

Coupled with Bottle Serial No 80-291/236, 80-291/207, 80-291/242, 80-291/234 FLO No. ______

From the same FIT Run

COMMENTS : (Special Advice to Laboratory)	Chief Operator
5 BOTTLES TAKEN FROM R.F.T. CHAMBER (VERY LIGHT CRUDE)	K. RUSSELL.

FLOPETROL	Customer : HUDBAY OIL	PAGE 02
Base : PERTH	Field : WEST SEAHORSE Well : # 1	F.I.T. & R.F.T.
Date of Sampling :	Service Order No : Sampling No : # 2	BOTTOM HOLE
Date of Transfer : 23 TO 26 OCTOBER 1981	Run No :	SAMPLE

Reservoir and Well Characteristics

Producing Zone :	Sample Depth :
Depth Origin : Z :	Casing – Diameter : Shoe :

Sampling and Transfer Conditions

Sampling Bottom Hole Pressure (Amerada)	psig	Volume of Bottle	628 cc (a)
Sampling Bottom Hole Temp. (Schlumberger)	°F	Volume of top liner	N/A cc (b)
Time at which Sample taken		Total volume = a+b	628 cc (c)
OPENING PRESSURE Surface Pressure of Sample	35 psig	Vol. Hg. at end of transfer	cc (d)
OPENING TEMPERATURE Surface Temp. of Sample	70 °F	(1) Vol. Hg. remaining in bottle	60 cc (c-d)
Transfer Pressure	± 6500 psig	Vol. Hg. withdrawn	20 cc (e)
Transfer Temperature	± 175 °F	Bubble point measured in bottle	psig
Gradient (when necessary)		Bubble Point temperature	°F
Transfer by gravity ☑	by pump ☑	(2) Vol. Hg. remaining in bottle = (1) - (e)	40 cc
Final Conditions in Bottle Vol. Hg. Remaining in bottle = (2)- (1) = 5 cc Pressure 0 psig Temp. 72 *F		Vol. Hg. withdrawn to decompression of shipping bottle =	35 cc (f)

Identification of Sample

Bottle Serial No. 80-291/207 FLO No. ______ sent the ______ by ______

Destination :

Coupled with Bottle Serial No. 80-291/236, ~~80-291/201~~ FLO No.
From the same FIT Run 80-291/242, 80-291/234

COMMENTS : (Special Advice to Laboratory)	5 SAMPLES TAKEN FROM R.F.T. CHAMBER. (VERY LIGHT CRUDE)	Chief Operator K. RUSSELL.

FLOPETROL	Customer : HUDBAY OIL	PAGE 03
Base : PERTH	Field : WEST SEAHORSE Well : # 1	F.I.T. & R.F.T.
Date of Sampling :	Service Order No : Sampling No : # 3	BOTTOM HOLE
Date of Transfer : 23 - 26 OCTOBER, 1981	Run No :	SAMPLE

Reservoir and Well Characteristics

Producing Zone :	Sample Depth :
Depth Origin : Z :	Casing — Diameter : Shoe :

Sampling and Transfer Conditions

Sampling Bottom Hole Pressure (Amerada) ______ psig	Volume of Bottle 628 cc (a)
Sampling Bottom Hole Temp. (Schlumberger) ______ °F	Volume of top liner - cc (b)
Time at which Sample taken ______	Total volume = a+b 628 cc (c)
OPENING PRESSURE Surface Pressure of Sample 35 psig	Vol. Hg. at end of transfer 568 cc (d)
OPENING TEMPERATURE Surface Temp. of Sample 70 °F	(1) Vol. Hg. remaining in bottle 60 cc (c-d)
Transfer Pressure ± 6500 psig	Vol. Hg. withdrawn 21 cc (e)
Transfer Temperature ± 175 °F	Bubble point measured in bottle ______ psig
Gradient (when necessary) ______	Bubble Point temperature ______ °F
Transfer by gravity ☑ by pump ☑	(2) Vol. Hg. remaining in bottle = (1) - (e) 39 cc
Final Conditions in Bottle Vol. Hg. Remaining in bottle = (2)- (1) = 5 cc Pressure 0 psig Temp. 72 *F	Vol. Hg. withdrawn to decompression of shipping bottle = 34 cc (f)

Identification of Sample

Bottle Serial No. 80-291/236 FLO No. ______ sent the ______ by ______

Destination : ______

Coupled with Bottle Serial No. 80-291/242 ~~80-291/234~~ FLO No. ______

From the same FIT Run 80-291/207 80-291/207

COMMENTS : (Special Advice to Laboratory) 5 SAMPLES TAKEN FROM R.F.T. CHAMBER.

Chief Operator
K. RUSSELL.

FLOPETROL	Customer : HUDBAY OIL	PAGE 04
Base : PERTH	Field : WEST SEAHORSE Well : # 1	F.I.T. & R.F.T.
Date of Sampling :	Service Order No : Sampling No : # 4	BOTTOM HOLE
Date of Transfer : 23 - 26 OCTOBER 1981	Run No :	SAMPLE

Reservoir and Well Characteristics

Producing Zone :	Sample Depth :
Depth Origin : Z :	Casing – Diameter : Shoe :

Sampling and Transfer Conditions

Sampling Bottom Hole Pressure (Amerada)	psig	Volume of Bottle	628 cc (a)
Sampling Bottom Hole Temp. (Schlumberger)	°F	Volume of top liner	- cc (b)
Time at which Sample taken		Total volume = a+b	628 cc (c)
OPENING PRESSURE Surface Pressure of Sample	35 psig	Vol. Hg. at end of transfer	568 cc (d)
OPENING TEMPERATURE Surface Temp. of Sample	70 °F	(1) Vol. Hg. remaining in bottle	60 cc (c-d)
Transfer Pressure	± 6500 psig	Vol. Hg. withdrawn	21 cc (e)
Transfer Temperature	± 175 °F	Bubble point measured in bottle	psig
Gradient (when necessary)		Bubble Point temperature	°F
Transfer by gravity ☑	by pump ☑	(2) Vol. Hg. remaining in bottle = (1) - (e)	39 cc
Final Conditions in Bottle Vol. Hg. Remaining in bottle = (2)- (1) = 5 cc Pressure 0 psig Temp. 73 °F		Vol. Hg. withdrawn to decompression of shipping bottle =	34 cc (f)

Identification of Sample

Bottle Serial No. 80-291/234 FLO No. ______ sent the ______ by ______

Destination :

Coupled with Bottle Serial No. 80-291/236, 80-291/242 FLO No.

From the same FIT Run 80-291/207, 80-291/201

COMMENTS : (Special Advice to Laboratory) 5 SAMPLES TAKEN FROM R.F.T. CHAMBER. (VERY LIGHT CRUDE).

Chief Operator: K. RUSSELL.

FLOPETROL	Customer : HUDBAY OIL	PAGE 05
Base : PERTH	Field : WEST SEAHORSE Well : # 1	F.I.T. & R.F.T.
Date of Sampling :	Service Order No : Sampling No : # 5	BOTTOM HOLE
Date of Transfer : 23 - 26 OCTOBER 1981	Run No :	SAMPLE

Reservoir and Well Characteristics

Producing Zone :	Sample Depth :
Depth Origin : Z :	Casing — Diameter : Shoe :

Sampling and Transfer Conditions

Sampling Bottom Hole Pressure (Amerada) ______ psig	Volume of Bottle 628 cc (a)
Sampling Bottom Hole Temp. (Schlumberger) ______ °F	Volume of top liner - cc (b)
Time at which Sample taken ______	Total volume = a+b 628 cc (c)
OPENING PRESSURE Surface Pressure of Sample 35 psig	Vol. Hg. at end of transfer 568 cc (d)
OPENING TEMPERATURE Surface Temp. of Sample 70 °F	(1) Vol. Hg. remaining in bottle 60 cc (c-d)
Transfer Pressure ± 6500 psig	Vol. Hg. withdrawn 21 cc (e)
Transfer Temperature ± 175 °F	Bubble point measured in bottle ______ psig
Gradient (when necessary) ______	Bubble Point temperature ______ °F
Transfer by gravity ☑ by pump ☑	(2) Vol. Hg. remaining in bottle = (1) - (e) 39 cc
Final Conditions in Bottle Vol. Hg. Remaining in bottle = (2)- (1) = 5 cc Pressure 0 psig Temp. 73 *F	Vol. Hg. withdrawn to decompression of shipping bottle = 34 cc (f)

Identification of Sample

Bottle Serial No. 80-291/242 FLO No. ______ sent the ______ by ______

Destination : ______

Coupled with Bottle Serial No. 80-291/234 ~~80-291/236~~ FLO No. ______

From the same FIT Run 80-291/207 80-291.201

COMMENTS : (Special Advice to Laboratory)	Chief Operator
5 SAMPLES TAKEN FROM R.F.T. CHAMBER. (VERY LIGHT CRUDE).	K. RUSSELL.

FLOPETROL	Client : HUDBAY OIL	Section : ANNEX 4.2
Base : PERTH	Field : WEST SEAHORSE Well : # 1	Page : 01 Report N° : 26108131108

SURFACE SAMPLING

Date of sampling : 29.10.81 Service order : ______ Sampling No : # 1

Sample nature : GAS Sampling point : TOP GAS OUTLET LINE ON SEPARATOR

A – RESERVOIR AND WELL CHARACTERISTICS –

Producing zone : ______ Perforations : ______ Sampling interval : ______

Depth origin : RT Tubing Dia. : 3½" Casing Dia. : ______

Surface elevation : ______ Shoe : ______ Shoe : ______

Bottom hole static conditions			
Initial pressure :	at depth :	date :	
Latest pressure measured :	at depth :	date :	
Temperature :	at depth :	date :	

B – MEASUREMENT AND SAMPLING CONDITIONS –

Time at which sample was taken : 1920-1950HR Time elapsed since stabilisation : ± 4 HR

Bottom hole dynamic conditions			
Choke size : ½" since OPENING	Well head pressure : 450PSIG	Well head temp. : 91°F	
Bottom hole pressure : 1770 PSIG	at depth : 1376.8 MTR	date : 29.10.81	
Bottom hole temp. : 150°F	at depth : 1376.8 MTR	date : 29.10.81	

Flow measurement of sampled gas – Gravity (air: 1) : .655 Factor Fpv = $\frac{1}{\sqrt{Z}}$: 1.015

Values used for calculations :

Separator		
Pressure : 18 PSIG Temp. : 82 °F	Rates – Gas : 242.1 M SCFD Oil (separator cond.) : 1634 BOPD [B]	GOR : 7 MMSCF/BBL (separator cond.)

Stock tank		
Atmosphere : ______ mmHg – ______ °F Tank temperature : ______ °F	Oil at 60 °F : ______ BOPD [A][B][C][a][b]	

BSW : – % WLR : – %

Transfering fluid : VACUUM Transfer duration : 30 MINS

Final conditions of the shipping bottle :
Pressure : 180°F Temp : 19°C/82°F

C – IDENTIFICATION OF THE SAMPLE –

Shipping bottle No. : A-8287 sent on : ______ by : ______ Shipping order No. : ______

Addressee : ______

Coupled with

	LIQUID		GAS	
Bottom hole samples No.				
Surface samples No.	9209-52-1980 22024-7		A-11927	

Measurement conditions.

[A] – Tank. [B] – Meter. [C] – Dump.
[a] – Corrected with shrinkage tester. [b] – Corrected with tank.

D – REMARKS –

H2S AT TIME OF SAMPLING= ±200 PPM.

Visa Chief Operator

No.: DOP 127

FLOPETROL Base : PERTH	Client : HUDBAY OIL Field : WEST SEAHORSE Well : # 1	Section : ANNEX 42 Page : 02 Report N° 26108131108

- SURFACE SAMPLING -

Date of sampling : 29.10.81 Service order : Sampling No. : #2
Sample nature : OIL Sampling point : BOTTOM OIL SIGHT GLASS ON SEPARATOR

A - RESERVOIR AND WELL CHARACTERISTICS -

Producing zone : Perforations : Sampling interval :

Depth origin : RT Tubing Dia. : 3½" Casing Dia. :
Surface elevation : Shoe : Shoe :

Bottom hole static conditions			
Initial pressure :	at depth :	date :	
Latest pressure measured :	at depth :	date :	
Temperature :	at depth :	date :	

B - MEASUREMENT AND SAMPLING CONDITIONS -

Time at which sample was taken : 1920-1950 HRS Time elapsed since stabilisation : ± 4 HRS

Bottom hole dynamic conditions

Choke size : ½" since : OPENING Well head pressure : 450 PSIG Well head temp. : 91°F
Bottom hole pressure : 1770 PSIG at depth : 1376.8 MTR date : 29.10.81
Bottom hole temp. : 150°F at depth : 1376.8 MTR date : 29.10.81

Flow measurement of sampled gas - Gravity (air: 1) : .655 Factor $Fpv = \frac{1}{\sqrt{Z}}$: 1.015
Values used for calculations :

Separator Pressure : 180 PSIG Temp. : 82 °F
Rates - Gas : 242.1 M SCFD
Oil (separator cond.) : 1634 BOPD [B]
GOR : 7 MSCF/BBL (separator cond.)

Stock tank Atmosphere : mmHg - °F
Tank temperature : °F
Oil at 60 °F : BOPD [A] [B] [C] [a] [b]

BSW : – % WLR : – %

Transfering fluid : MERCURY Transfer duration : 30 MINS

Final conditions of the shipping bottle :
Pressure : 60 PSIG Temp. : 82°F

C - IDENTIFICATION OF THE SAMPLE -

Shipping bottle No. : 22024.7 sent on : by : Shipping order No. :
Addressee :

Coupled with

	LIQUID		GAS	
Bottom hole samples No.				
Surface samples No.	9209-52.1980		A-8287 A-11927	

Measurement conditions.
[A] - Tank. [B] - Meter. [C] - Dump.
[a] - Corrected with shrinkage tester. [b] - Corrected with tank.

D - REMARKS -

H2S AT TIME OF SAMPLING = ± 200 PPM.
VOL. OF BOTTLE = 628 cc.
VOL. WITHDRAWN = 560 cc.
GAS CAP = 56 cc.
HG REMAINING = 12 cc.

Visa Chief Operator

No.: DOP 127

FLOPETROL

Base : PERTH

Client : HUDBAY OIL

Field : WEST SEAHORSE

Well : # 1

Section: ANNEX 4.2

Page : 03

Report N° 26108131108I

SURFACE SAMPLING

Date of sampling : 29.10.81 Service order : Sampling No.: #3

Sample nature : GAS Sampling point : TOP GAS OUTLET ON SEPARATOR

A – RESERVOIR AND WELL CHARACTERISTICS –

Producing zone : Perforations : Sampling interval :

Depth origin : RT Tubing Dia. : 3½" Casing Dia. :

Surface elevation : Shoe : Shoe :

Bottom hole static conditions	Initial pressure :	at depth :	date :
	Latest pressure measured :	at depth :	date :
	Temperature :	at depth :	date :

B – MEASUREMENT AND SAMPLING CONDITIONS –

Time at which sample was taken: 2010-2040HR Time elapsed since stabilisation: ± 4½ HRS

Bottom hole dynamic conditions	Choke size : ½"	since : OPENING	Well head pressure : 450PSIG	Well head temp. : 91°F
	Bottom hole pressure : 1768.5PSIG	at depth : 1376.8 MTRS	date : 29.10.81	
	Bottom hole temp. : 150.4°F	at depth : 1376.8 MTRS	date : 29.10.81	

Flow measurement of sampled gas – Gravity (air : 1) : .655 Factor Fpv = $\frac{1}{\sqrt{Z}}$: 1.015

Values used for calculations :

Separator	Pressure : 180 PSIG Temp. : 82 °F	Rates – Gas : 242.1M SCFD Oil (separator cond.) : 1859 BOPD [B]	GOR : 78 MMSCF/BBL (separator cond.)
Stock tank	Atmosphere : mmHg - °F Tank temperature : °F	Oil at 60 °F : BOPD [A][B][C][a][b]	

BSW : - % WLR : - %

Transfering fluid : VACUUM Transfer duration : 30 MINS

Final conditions of the shipping bottle :

Pressure : 180 PSIG Temp : 82°F

C – IDENTIFICATION OF THE SAMPLE –

Shipping bottle No. : A-11927 sent on : by : Shipping order No. :

Addressee :

Coupled with	LIQUID		GAS	
Bottom hole samples No.				
Surface samples No.	9209-521980 22024-7		A-8287	

Measurement conditions.

[A] – Tank . [B] – Meter . [C] – Dump .

[a] – Corrected with shrinkage tester. [b] – Corrected with tank.

D – REMARKS –

H2S AT TIME OF SAMPLING = ± 200 PPM

Visa Chief Operator

No.: DOP 127

FLOPETROL

Base : PERTH

Client : HUDBAY OIL
Field : WEST SEAHORSE
Well : # 1

Section: ANNEX 42
Page : 04
Report N°: 26108131108 1

- SURFACE SAMPLING -

Date of sampling : 29.10.81   Service order :   Sampling No.: #4
Sample nature : OIL   Sampling point : BOTTOM OF OIL SIGHT GLASS ON SEPARATOR

A - RESERVOIR AND WELL CHARACTERISTICS -

Producing zone :   Perforations :   Sampling interval :

Depth origin : RT   Tubing Dia. : 3½"   Casing Dia. :
Surface elevation :   Shoe :   Shoe :

Bottom hole static conditions	Initial pressure :	at depth :	date :
	Latest pressure measured :	at depth :	date :
	Temperature :	at depth :	date :

B - MEASUREMENT AND SAMPLING CONDITIONS -

Time at which sample was taken : 2010-2040HRS   Time elapsed since stabilisation : ± 4½ HRS

Bottom hole dynamic conditions

Choke size : ½" since : OPENING Well head pressure : 450PSIG Well head temp. : 91°F
Bottom hole pressure : 1768.5PSIG at depth : 1376.8 MTR date : 29.10.81
Bottom hole temp. : 150.4°F at depth : 1376.8 MTR date : 29.10.81

Flow measurement of sampled gas - Gravity (air:1) : .655   Factor Fpv = $\frac{1}{\sqrt{Z}}$: 1.015
Values used for calculations :

Separator

Pressure : 180 PSIG   Temp. : 82 °F
Rates - Gas : 242.1 M SCFD
Oil (separator cond.) : 1859 BOPD [B]
GOR : 8 MSCF/BBL (separator cond.)

Stock tank

Atmosphere : mmHg - °F
Tank temperature : °F
Oil at 60 °F : BOPD A B C a b

BSW : - %   WLR : - %

Transfering fluid : MERCURY   Transfer duration : 30 MINS

Final conditions of the shipping bottle :
Pressure : 60 PSIG   Temp : 82°F

C - IDENTIFICATION OF THE SAMPLE -

Shipping bottle No. : 9209-52-1980   sent on :   by :   Shipping order No. :
Addressee :

Coupled with

	LIQUID		GAS	
Bottom hole samples No.				
Surface samples No.	22024-7		A-8287	
			A-11927	

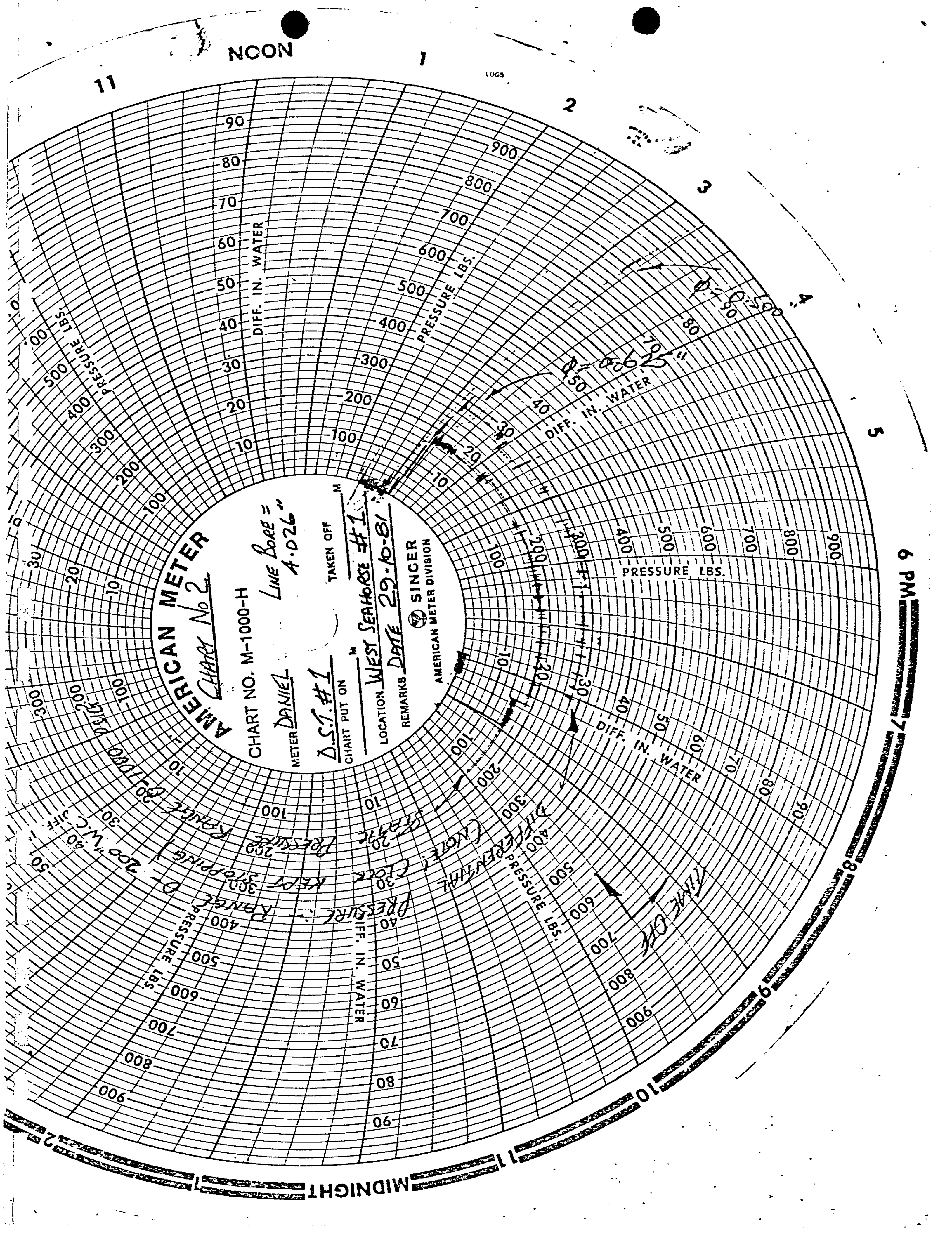
Measurement conditions.
[A] - Tank.   [B] - Meter.   [C] - Dump.
[a] - Corrected with shrinkage tester.   [b] - Corrected with tank.

D - REMARKS -

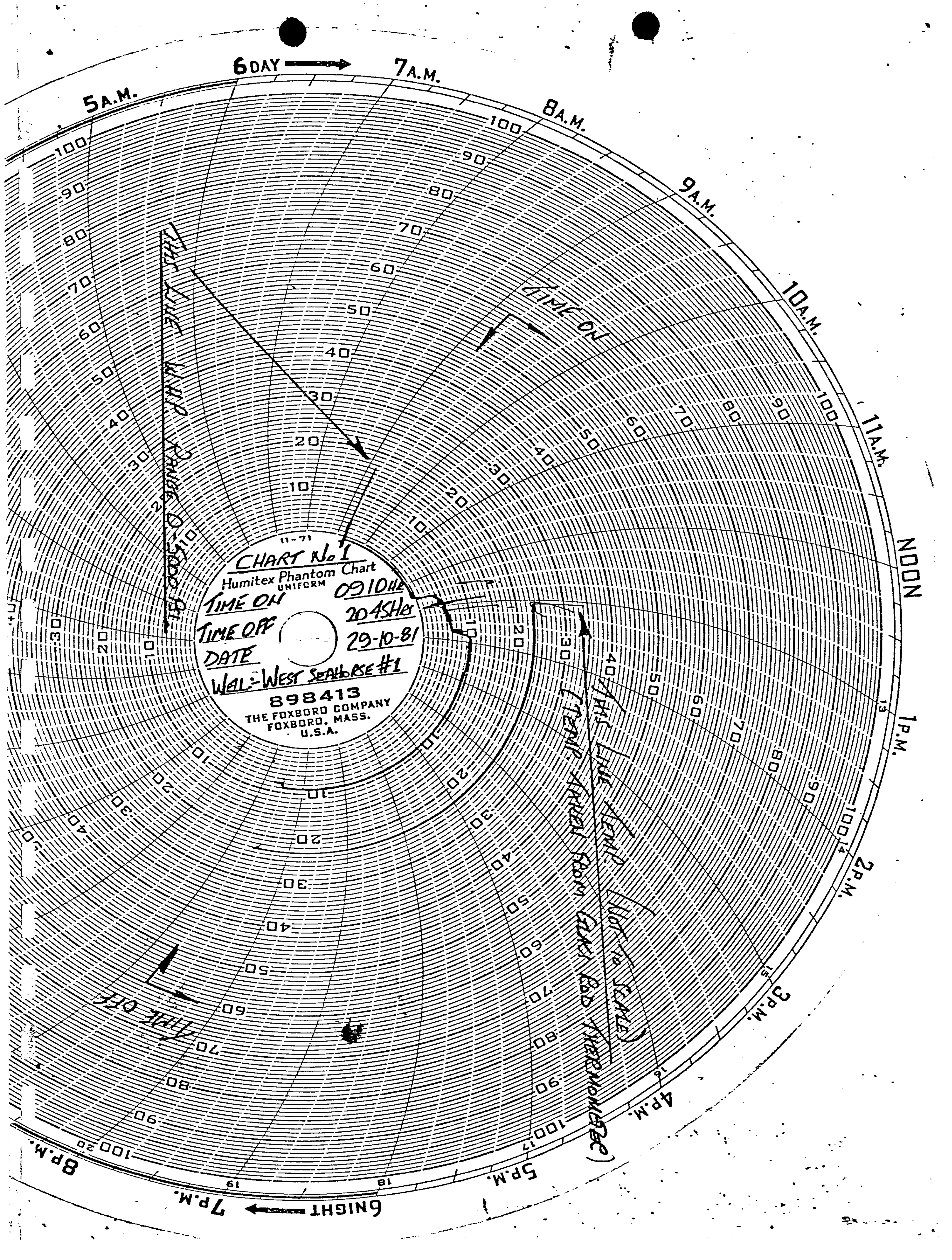
H2S AT TIME OF SAMPLING = ± 200 PPM.
VOL. OF BOTTLE = 628 cc.
VOL. WITHDRAWN = 560 cc.
GAS CAP = 56 cc.
REMAINING HG = 12 cc.

Visa Chief Operator

No.: DOP 127



AMERICAN METER
CHART No 2
CHART NO. M-1000-H
LINE BORE = 4.026"
METER DANIEL
TAKEN OFF
D.S.T. #1
CHART PUT ON
LOCATION WEST SEAHORSE #1
REMARKS DATE 29-10-81
SINGER
AMERICAN METER DIVISION
NOON
MIDNIGHT
6 PM
DIFF. IN. WATER
PRESSURE LBS.
DIFFERENTIAL
STATIC PRESSURE
PRESSURE :- RANGE 0-1000 psig
0 - 200" W.C. DIFF
(NOTE: CLOCK KEPT STOPPING)
TIME OFF


6 DAY
5 A.M.
7 A.M.
8 A.M.
9 A.M.
10 A.M.
11 A.M.
NOON
1 P.M.
2 P.M.
3 P.M.
4 P.M.
5 P.M.
6 NIGHT
7 P.M.
8 P.M.
11-71
CHART No 1
Humitex Phantom Chart
UNIFORM
TIME ON 0910Hr
TIME OFF 2045Hr
DATE 29-10-81
WELL:- WEST SEAHORSE #1
898413
THE FOXBORO COMPANY
FOXBORO, MASS.
U.S.A.
TIME ON
TIME OFF
THIS LINE W.H.P. RANGE 0-5000 PSI
THIS LINE TEMP (NOT TO SCALE)
(TEMP TAKEN FROM GLASS ROD THERMOMETER)

SAMPLE NO. 1 FROM R.F.T. CHAMBER

25.10.81

BOTTLE NO. 80-291/201

BOTTLE VOL. 628 cc.

TRANSFER = $\pm$ 6500 PSIG/170^{o}F

CHAMBER OPENING PRESSURE
= 35 PSIG @ 70^{o}F

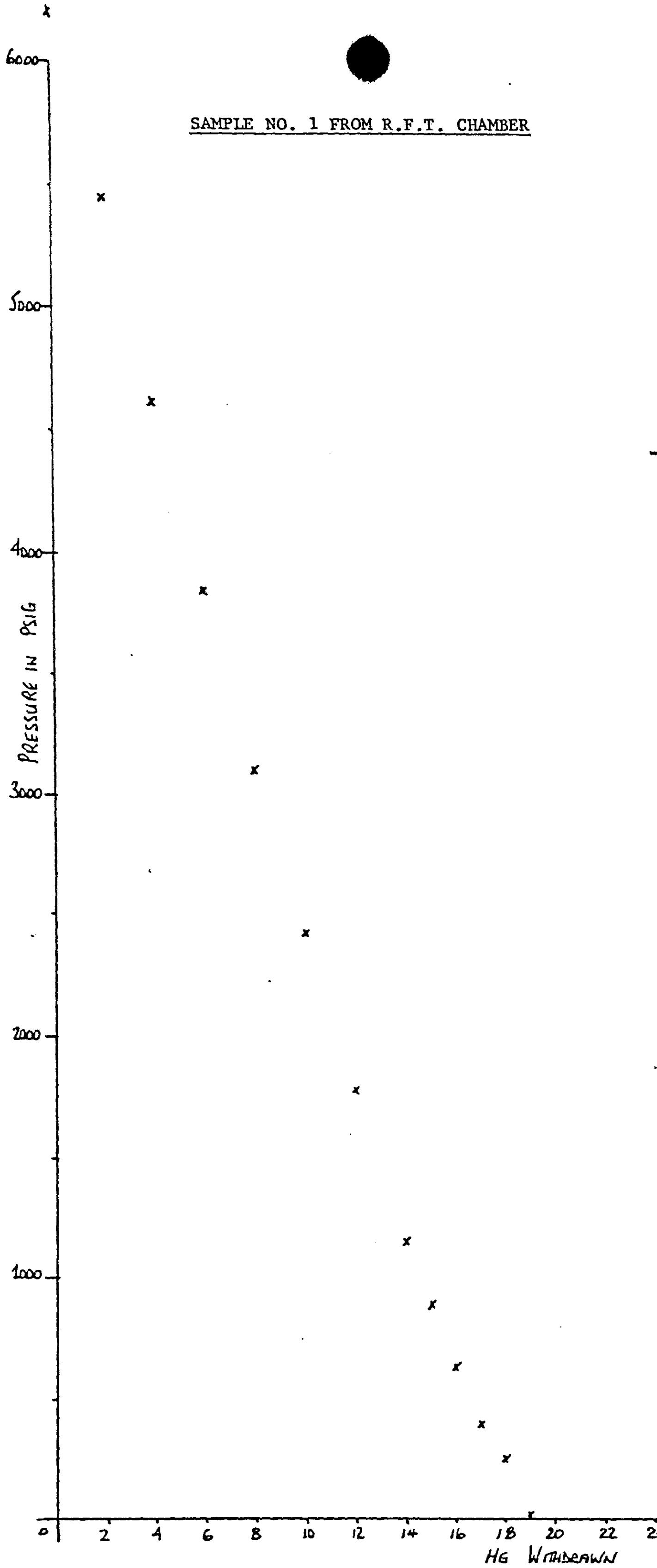
PSIG	HG
6300	0
5440	2
4610	4
3840	6
3100	8
2420	10
1780	12
1160	14
890	15
640	16
400	17
160	18
10	19

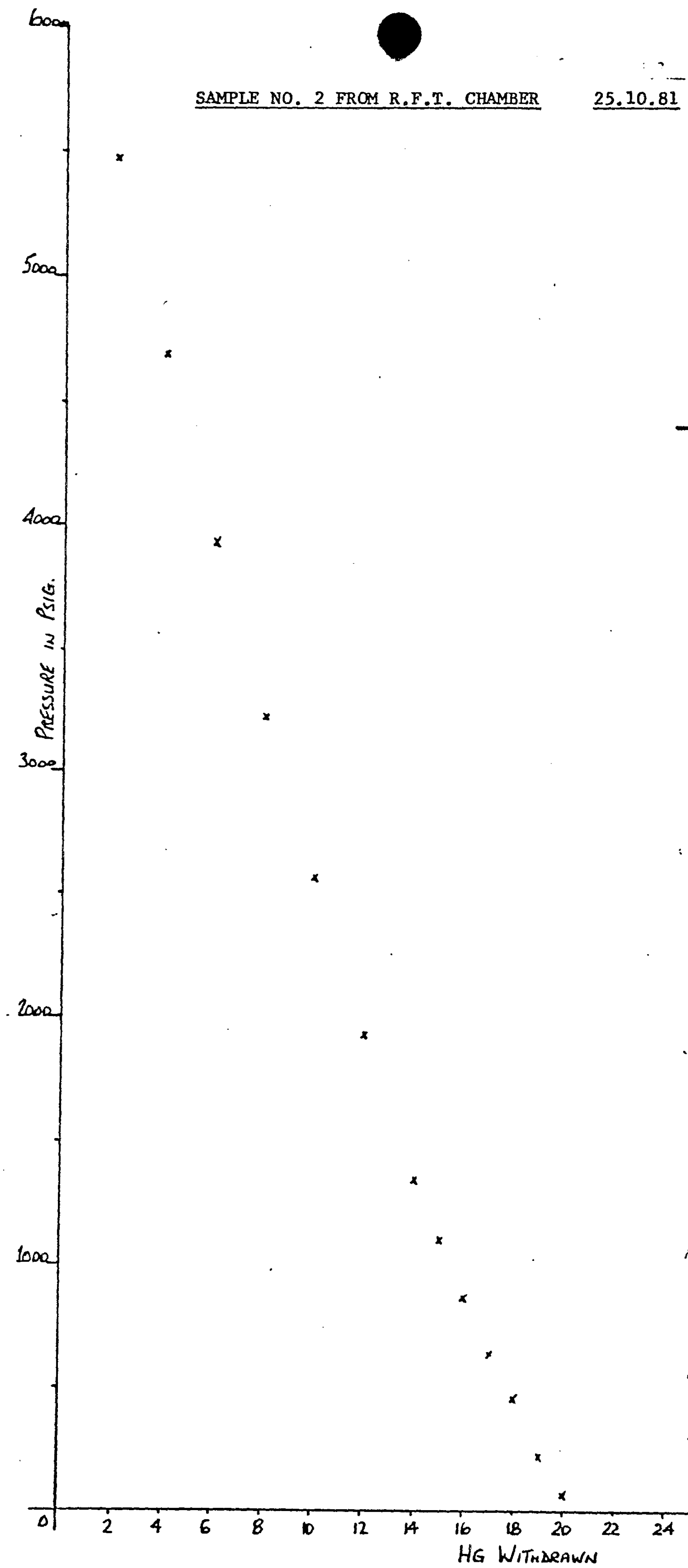
FINAL CONDITIONS

PRESSURE = 0 PSI

TEMPERATURE $\doteq$ 19^{o}C

5cc LEFT IN BOTTLE





SAMPLE NO. 2 FROM R.F.T. CHAMBER 25.10.81

BOTTLE NO. 80-291/207

BOTTLE VO. 628 cc.

TRANSFER = ± 6500 PSIG / 175°F

CHAMBER OPENING PRESSURE
= 35 PSIG @ 70°F

PSIG	HG
6300	0
5475	2
4680	4
3925	6
3220	8
2560	10
1930	12
1340	14
1100	15
860	16
640	17
460	18
230	19
75	20

FINAL CONDITIONS

PRESSURE = 0 PSIG

TEMP. = 22°C

5 cc. LEFT IN BOTTLE

SAMPLE NO. 3 FROM R.F.T. CHAMBER   25.10.81

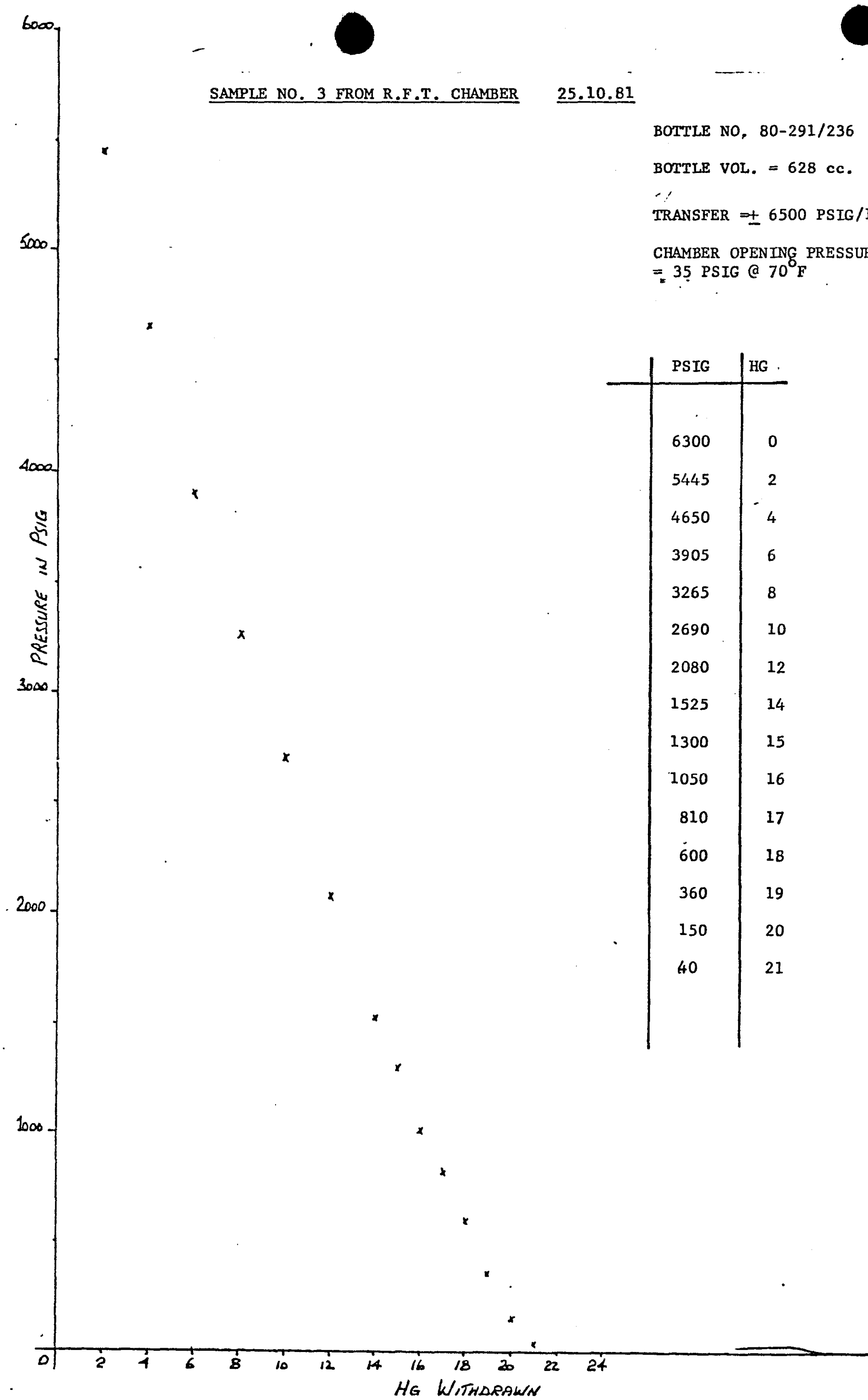
BOTTLE NO, 80-291/236

BOTTLE VOL. = 628 cc.

TRANSFER =± 6500 PSIG/175°F

CHAMBER OPENING PRESSURE
= 35 PSIG @ 70°F

PSIG	HG
6300	0
5445	2
4650	4
3905	6
3265	8
2690	10
2080	12
1525	14
1300	15
1050	16
810	17
600	18
360	19
150	20
40	21



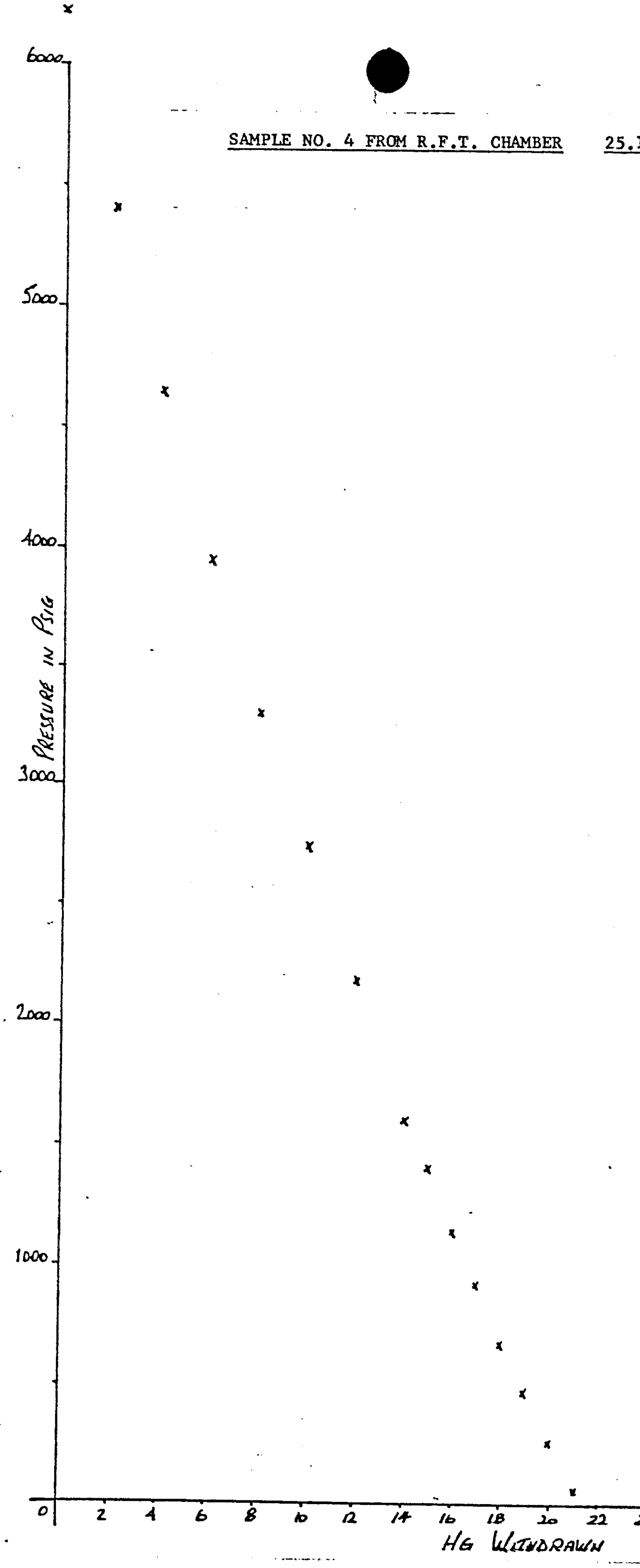
SAMPLE NO. 4 FROM R.F.T. CHAMBER 25.10.81

BOTTLE NO. 80-291/234

BOTTLE VOL. - 628cc.

TRANSFER = ± 6500 PSIG/175°F

CHAMBER OPENING PRESSURE
= 35 PSIG @ 70°F



PSIG	HG
6300	0
5400	2
4645	4
3940	6
3300	8
2740	10
2180	12
1600	14
1400	15
1140	16
920	17
680	18
480	19
270	20
60	21

FINAL CONDITIONS

PRESSURE = 0 PSIG

TEMP. = 23°C

5 cc. Hg LEFT IN BOTTLE.

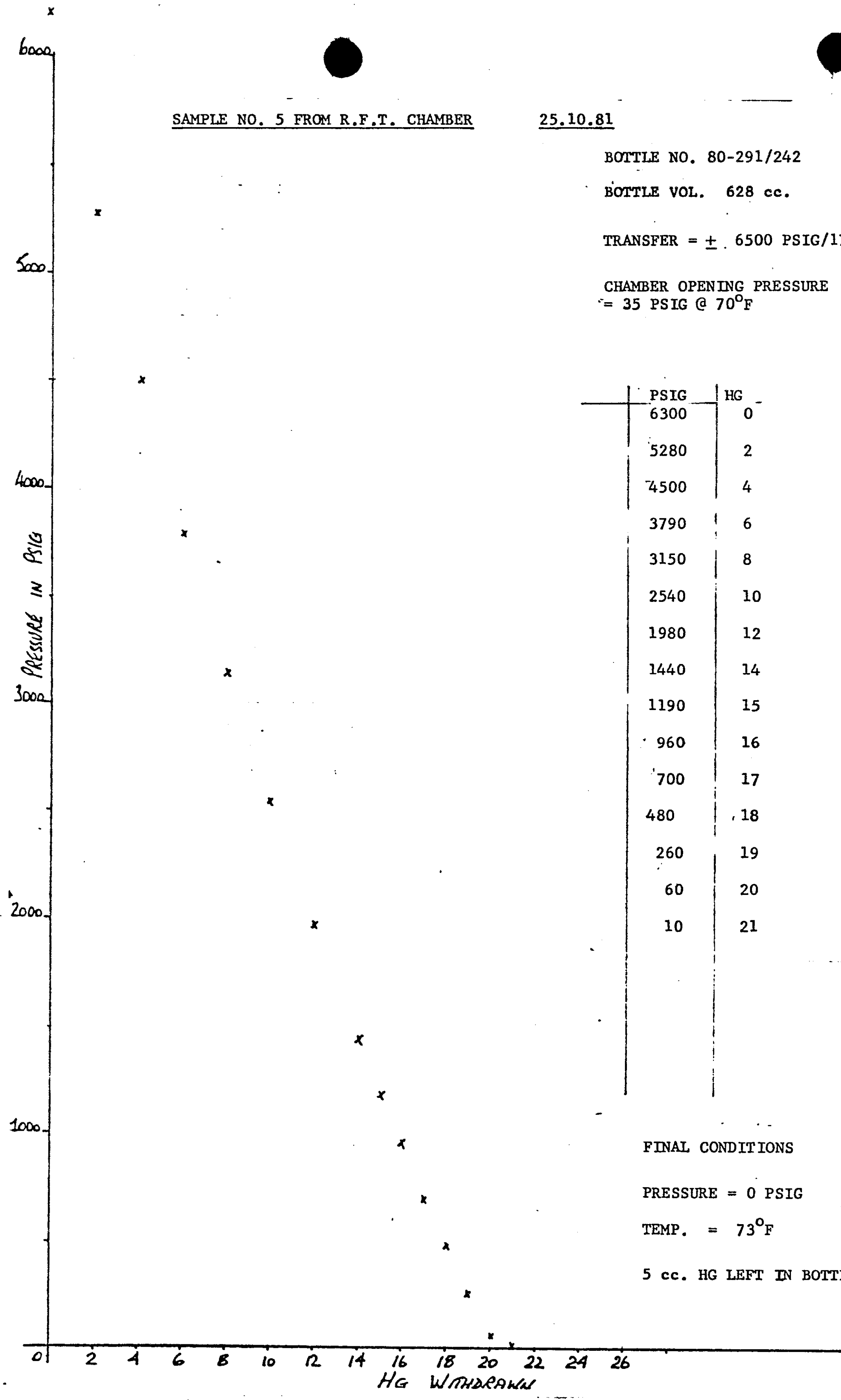
SAMPLE NO. 5 FROM R.F.T. CHAMBER 25.10.81

BOTTLE NO. 80-291/242

BOTTLE VOL. 628 cc.

TRANSFER = ± 6500 PSIG/175°F

CHAMBER OPENING PRESSURE
= 35 PSIG @ 70°F



PSIG	HG
6300	0
5280	2
4500	4
3790	6
3150	8
2540	10
1980	12
1440	14
1190	15
960	16
700	17
480	18
260	19
60	20
10	21

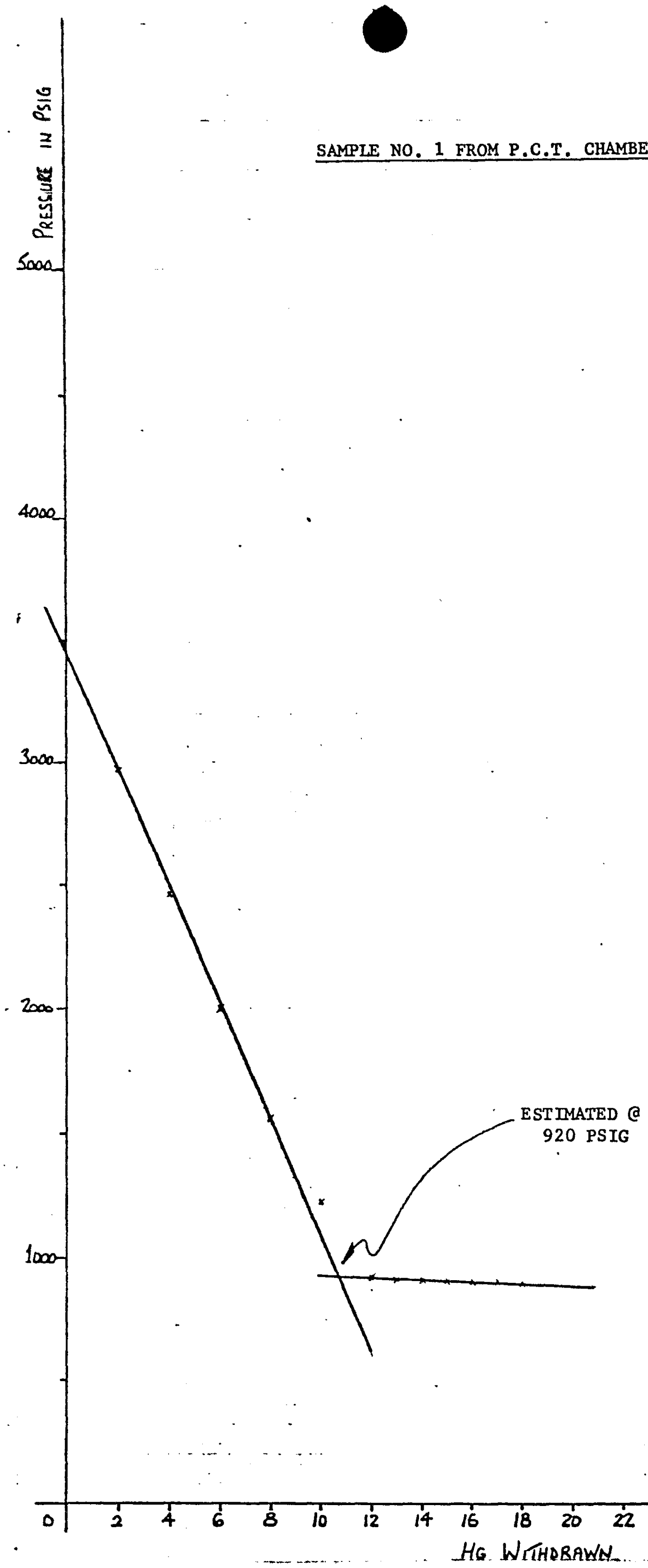
FINAL CONDITIONS

PRESSURE = 0 PSIG

TEMP. = 73°F

5 cc. HG LEFT IN BOTTLE.

SAMPLE NO. 1 FROM P.C.T. CHAMBER 31.10.81



BOTTLE NO. = 9024-37

BOTTLE VOL. = 628 cc.

TRANSFER @ ± 3500 PSIG/15°C

CHAMBER OPENING PRESSURE
= 735 PSIG / 17°C

TEMP	PSIG	HG
15°C	3500	0
	2970	2
14.5	2460	4
	2000	6
	1560	8
	1120	10
14.0	920	12
	915	13
	910	14
	905	15
	900	16
	895	17
14	890	18

SHIPPING BOTTLE

FINAL CONDITIONS
PRESSURE 765 PSIG

TEMP. 14°C

10cc. HG LEFT IN BOTTLE

SAMPLE NO. 2 FROM P.C.T. CHAMBER 31.10.81

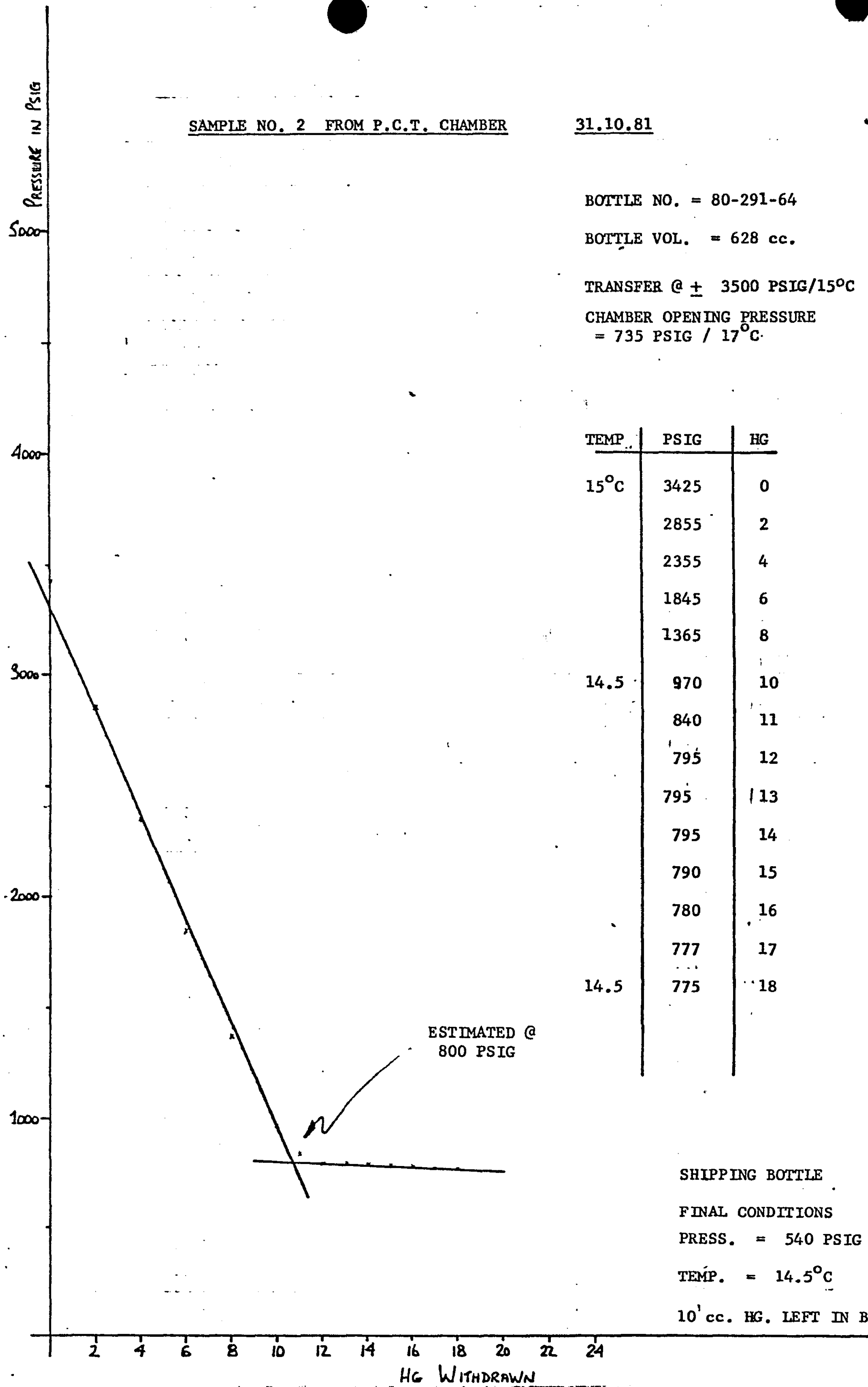
BOTTLE NO. = 80-291-64

BOTTLE VOL. = 628 cc.

TRANSFER @ ± 3500 PSIG/15°C

CHAMBER OPENING PRESSURE
= 735 PSIG / 17°C

TEMP	PSIG	HG
15°C	3425	0
	2855	2
	2355	4
	1845	6
	1365	8
14.5	970	10
	840	11
	795	12
	795	13
	795	14
	790	15
	780	16
	777	17
14.5	775	18



SHIPPING BOTTLE

FINAL CONDITIONS
PRESS. = 540 PSIG

TEMP. = 14.5°C

10 cc. HG. LEFT IN BOTTLE

APPENDIX A2. D O W E L L S C H L U M B E R G E R T E C H N I C A L

R E P O R T No. 81014

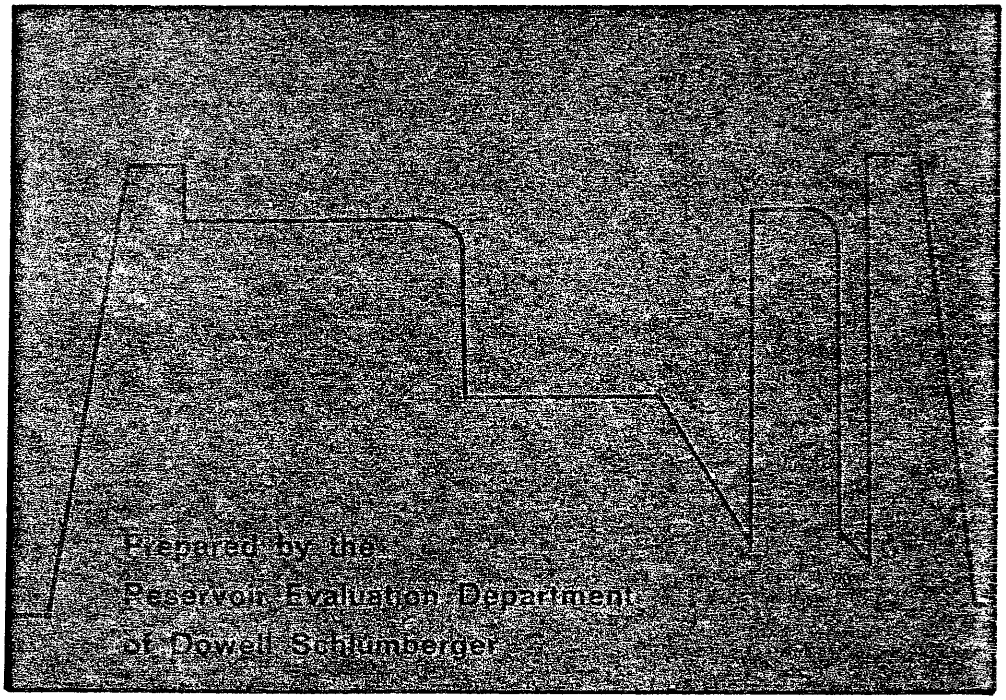
REPORT N° 81014
JOB N°
INVOICE/SIR. 61384-61385
DATE 29-10-81

DOWELL Schlumberger

TECHNICAL REPORT

COMPANY HUDBAY OIL AUSTRALIA WELL WEST SEAHORSE # 1 FIELD

TEST N° 1 COUNTRY AUSTRALIA



Dowell Schlumberger (Western) S.A.

(Incorporated with limited liability in Panama)

Telephone: 451 4319
Cables:
Telex: Orang AA 94215

January 4th, 1982

Report No: 81014

Dear Sirs,

The enclosed report would be of a mechanically sound Drill Stem Test. Surface pressure readout equipment was used and it performed satisfactorily. The well flowed at an approximate mean rate of 1775 Bbls/Day of oil. While H_2S gas was encountered its effect (approx 200 ppm in ¼ MMCFD) was considered negligible.

The controlling factor would be the anomalies noted during both shut-in build-ups. The break upward in slope exhibited during the initial shut-in would suggest that the anomaly was close to the well bore. After a drawdown of eight (8) minutes the radius of investigation would be slightly more than a few feet. Since the recorder (SPRO) reflected this heterogenity it would suggest that the immediate well bore was non-homogeneous. The final shut-in also reflected heterogenities. Multiple zones or a lenticular formation could be present. A phase change of fluids - (i.e. - water - oil) would not be suspected since the anomaly was close to the well bore. Water production would have become evident during the final flow period.

The formation exhibited high permeability and depletion was not apparent.

Respectfully yours

John F. Viscarde
TECHNICAL DEPARTMENT

8 KINGSCOTE STREET, KEWDALE, W.A. 6105

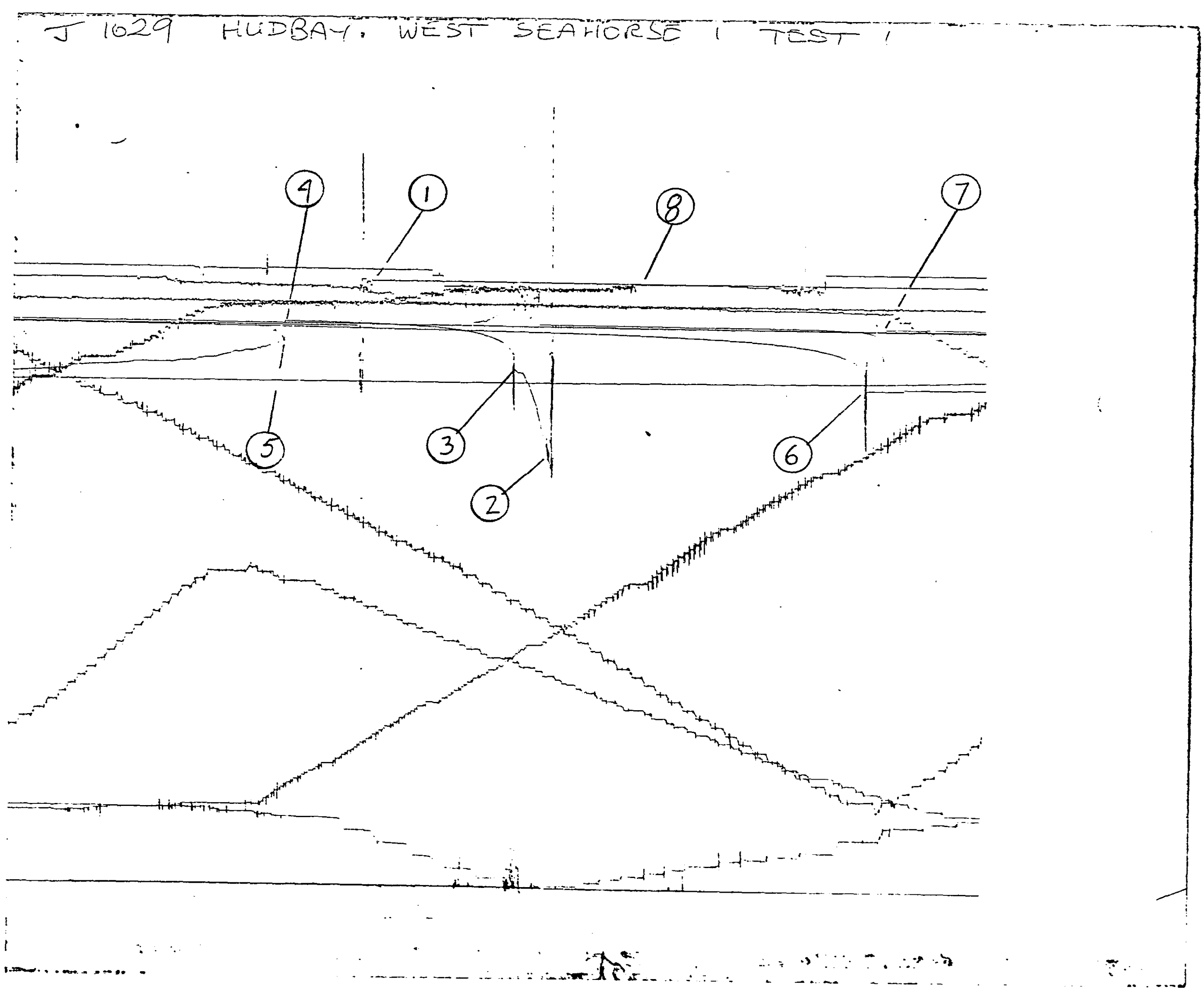
RECORDER No : J-1629 CAPACITY : 2800 psi DEPTH : 1385

OPENING : Inside TEMPERATURES : 150 °F

CLOCK No : 9-0354

CAP: 48 HRS

Pressure Data From This Chart Is Presented On The Next Page



PRESSURE DATA FOR RECORDER : J-1629

DESCRIPTION	LABEL POINT	PRESSURE (PSI)
INITIAL HYDROSTATIC	1	2070.1
INITIAL FLOW (1)	2	1620.3
INITIAL FLOW (2)	3	1821.4
INITIAL SHUT-IN	4	1975.8
SECOND FLOW (1)	5	1921.0
SECOND FLOW (2)	6	1792.4
SECOND SHUT-IN	7	1986.4
THIRD FLOW (1)		
THIRD FLOW (2)		
THIRD SHUT-IN		
FINAL FLOW (1)		
FINAL FLOW (2)		
FINAL SHUT-IN		
FINAL HYDROSTATIC	8	2068.4

RECORDER NO: J-1629 DEPTH: 13855 M

DESCRIPTION	TIME (MINS)	PRESSURE
Initial Flow (1)	0	1620.3
	1	1650.6
	2	1653.2
	3	1669.9
	4	1694.4
	5	1721.1
	6	1746.1
	7	1773.4
	8	1792.5
	9	1807.5
	10	1809.6
Initial Flow (2)	11	1821.4
	0	1821.4
	1	1877.5
	2	1891.5
	3	1901.3
	4	1909.4
	5	1915.4
	6	1920.5
	7	1924.7
	8	1938.7
	9	1942.2
	10	1944.7
	15	1956.7
	20	1963.2
	25	1968.9
	30	1971.9
	45	1973.8
Initial Shut-In	69	1975.8

RECORDER NO: J-1629 - Continuation

DESCRIPTION	TIME (MINS)	PRESSURE
Final Flow (1)	0	1921.0
	1	1921.6
	2	1924.4
	3	1953.5
	4	1930.8
	5	1924.4
	6	1920.7
	7	1916.4
	8	1913.6
	9	1910.2
	10	1909.4
	15	1902.3
	20	1884.6
	25	1879.8
	30	1871.0
	45	1863.5
	60	1832.4
	90	1821.4
	120	1818.4
	150	1818.6
	180	1815.2
	240	1812.2
	300	1811.6
	360	1809.4
	400	1807.2
Final Flow (2)	412	1805.2
	0	1792.4
	1	1838.4
	2	1851.4
	3	1860.8
	4	1871.6
	5	1875.1
	6	1880.5
	7	1886.5
	8	1890.0

RECORDER NO: J-1629 - Continuation

DESCRIPTION	TIME (MINS)	PRESSURE
	9	1894.5
	10	1897.9
	15	1912.9
	20	1922.7
	25	1929.7
	30	1936.2
	45	1945.1
	60	1951.3
	90	1960.4
	120	1965.3
	150	1970.4
	180	1974.3
	240	1979.3
	300	1983.8
	360	1984.8
	420	1984.9
	480	1985.5
	540	1986.0
Final Shut-In	572	1986.4

[redacted]

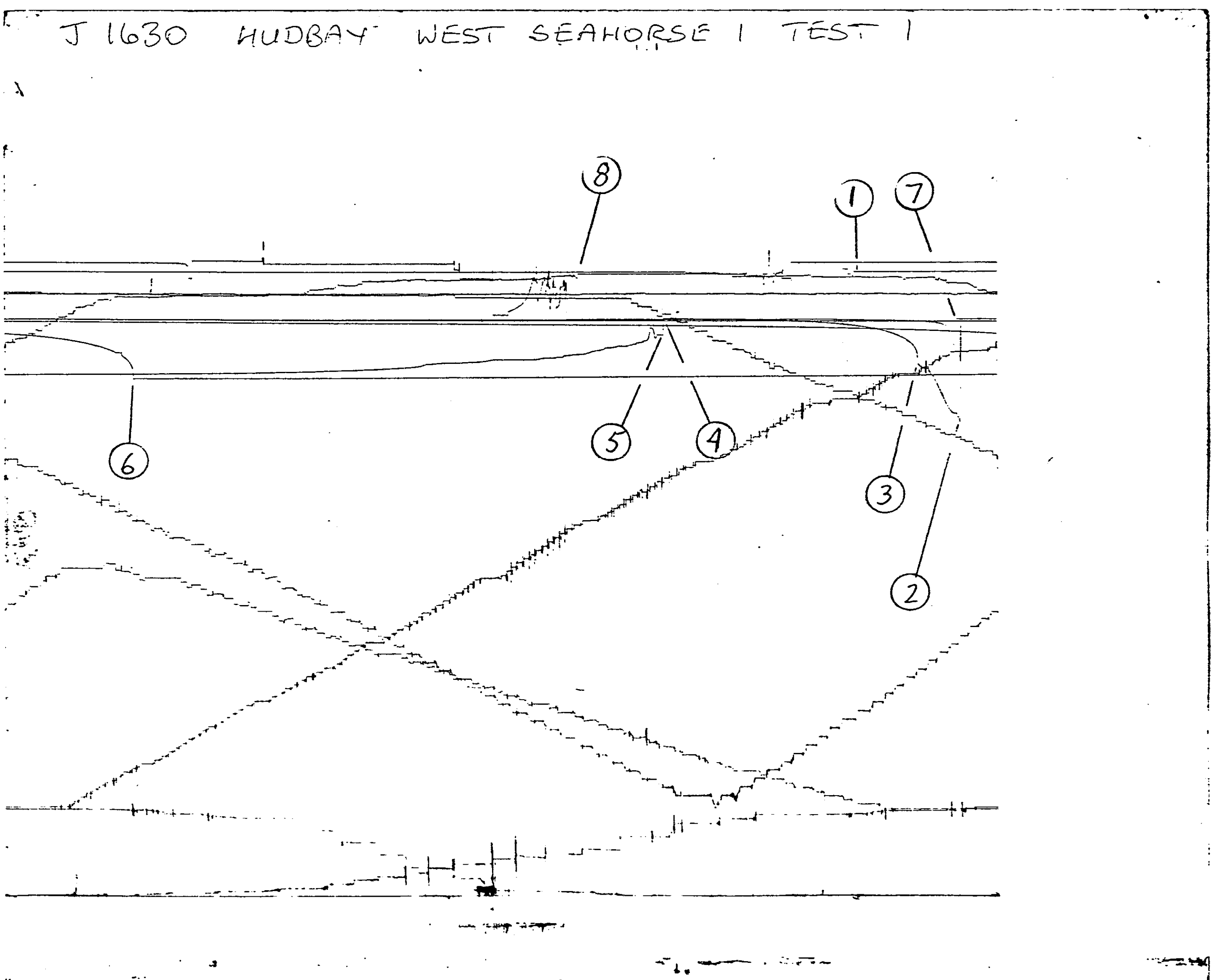
RECORDER No : J-1630 CAPACITY : 2816 psi DEPTH : 1398

OPENING : Outside TEMPERATURES : 150 °F

CLOCK No : 9-1583

CAP: 48 HRS

Pressure Data From This Chart Is Presented On The Next Page



PRESSURE DATA FOR RECORDER : J-1630

DESCRIPTION	LABEL POINT	PRESSURE (PSI)
INITIAL HYDROSTATIC	1	2091.0
INITIAL FLOW (1)	2	1641.3
INITIAL FLOW (2)	3	1842.5
INITIAL SHUT-IN	4	1996.5
SECOND FLOW (1)	5	1943.5
SECOND FLOW (2)	6	1812.2
SECOND SHUT-IN	7	2007.8
THIRD FLOW (1)		
THIRD FLOW (2)		
THIRD SHUT-IN		
FINAL FLOW (1)		
FINAL FLOW (2)		
FINAL SHUT-IN		
FINAL HYDROSTATIC	8	2088.1

RECORDER NO: J-1630 DEPTH: 1398 M

DESCRIPTION	TIME (MINS)	PRESSURE
Initial Flow (1)	0	1641.3
	1	1671.6
	2	1674.0
	3	1690.7
	4	1716.6
	5	1744.0
	6	1771.0
	7	1797.0
	8	1816.0
	9	1830.6
	10	1831.3
Initial Flow (2)	11	1842.5
	0	1842.5
	1	1898.7
	2	1912.8
	3	1922.3
	4	1930.2
	5	1936.3
	6	1941.5
	7	1945.9
	8	1949.9
	9	1953.8
	10	1956.6
	15	1968.4
	20	1975.2
	25	1980.8
	30	1984.9
	45	1993.2
Initial Shut-In	69	1996.5
Final Flow (1)	0	1943.0
	1	1943.5
	2	1936.4
	3	1965.1

RECORDER NO: J-1630 - Continuation

DESCRIPTION	TIME (MINS)	PRESSURE
	4	1928.0
	5	1922.3
	6	1918.4
	7	1914.0
	8	1911.1
	9	1907.7
	10	1906.6
	15	1899.1
	20	1881.9
	25	1876.2
	30	1867.9
	45	1861.0
	60	1830.8
	90	1820.0
	120	1817.2
	150	1817.8
	180	1815.4
	240	1814.2
	300	1813.8
	360	1813.2
	400	1812.8
Final Flow (2)	412	1812.2
	0	1811.0
	1	1857.1
	2	1870.6
	3	1880.1
	4	1890.9
	5	1894.2
	6	1899.9
	7	1905.0
	8	1908.8
	9	1913.3
	10	1916.7
	15	1931.3
	20	1941.0
	25	1948.2

RECORDER NO: J-1630 - Continuation

DESCRIPTION	TIME (MINS)	PRESSURE
	30	1954.9
	45	1963.9
	60	1970.1
	90	1979.2
	120	1984.3
	150	1889.3
	180	1993.2
	240	1998.8
	300	2003.3
	360	2005.5
	420	2007.8
Final Shut-In	572	2007.8

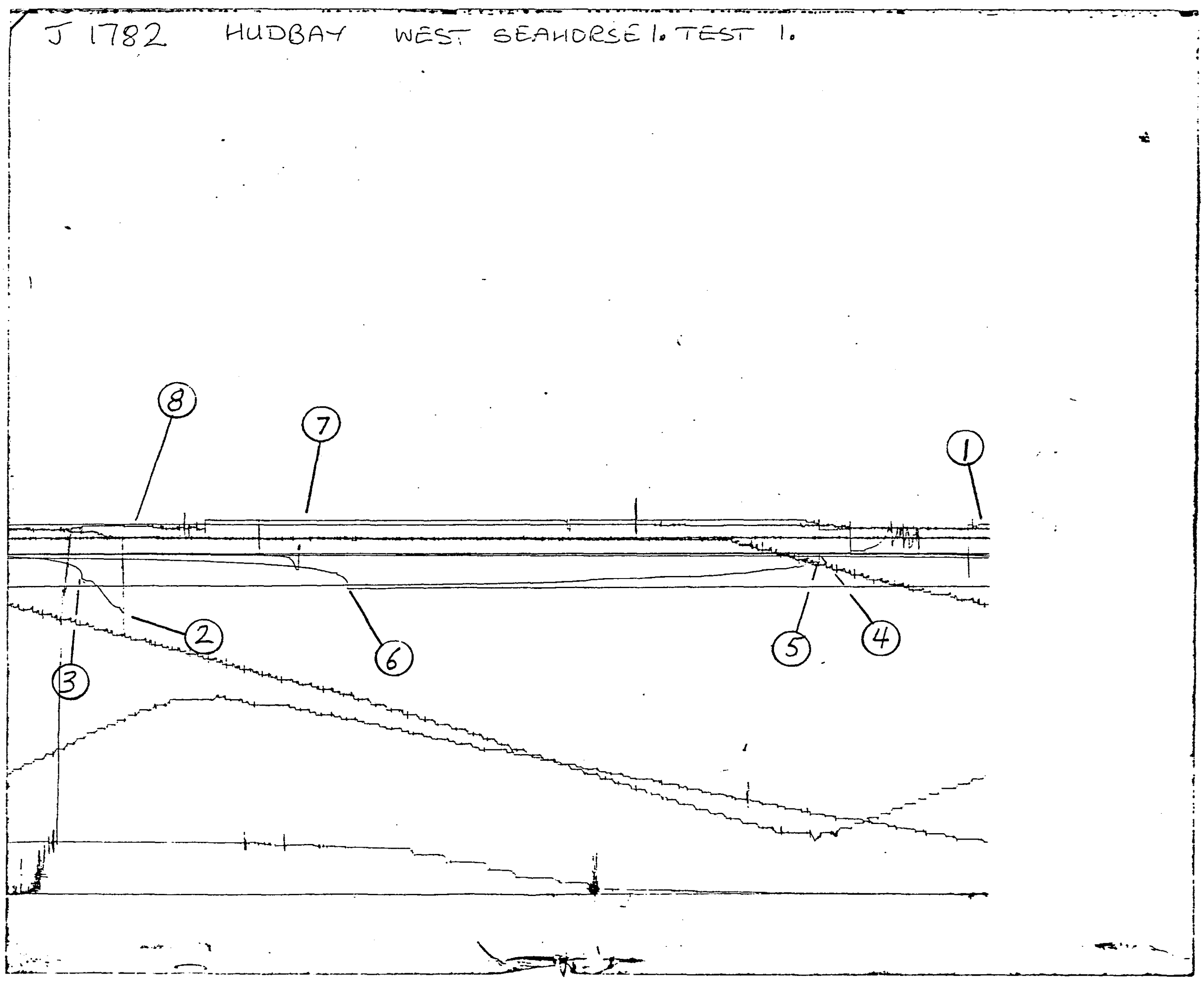
RECORDER No : J-1782 CAPACITY : 4700 psi DEPTH : 1400

OPENING : Outside TEMPERATURES : 150 ^{o}F

CLOCK No : 9-3487

CAP: 48 HRS

<u>Pressure Data From This Chart Is Presented On The Next Page</u>



PRESSURE DATA FOR RECORDER : J-1782

DESCRIPTION	LABEL POINT	PRESSURE (PSI)
INITIAL HYDROSTATIC	1	2101.4
INITIAL FLOW (1)	2	1639.5
INITIAL FLOW (2)	3	1846.9
INITIAL SHUT-IN	4	2007.2
SECOND FLOW (1)	5	1941.2
SECOND FLOW (2)	6	1780.9
SECOND SHUT-IN	7	1999.6
THIRD FLOW (1)	N/A	
THIRD FLOW (2)	N/A	
THIRD SHUT-IN		
FINAL FLOW (1)		
FINAL FLOW (2)		
FINAL SHUT-IN		
FINAL HYDROSTATIC	8	2110.9

RECORDER NO: J-1782 DEPTH: 1400 M

DESCRIPTION	TIME (MINS)	PRESSURE
Initial Flow (1)	0	1639.5
	1	1674.7
	2	1677.0
	3	1693.2
	4	1719.1
	5	1746.9
	6	1774.1
	7	1800.0
	8	1819.1
	9	1835.4
	10	1835.4
Initial Flow (2)	11	1846.9
	0	1846.9
	1	1901.1
	2	1915.8
	3	1925.4
	4	1933.1
	5	1939.4
	6	1942.8
	7	1948.4
	8	1952.1
	9	1956.8
	10	1959.5
	15	1971.5
	20	1978.1
	25	1983.4
	30	1987.9
	45	2000.1
Initial Shut-In	69	2007.2
Final Flow (1)	0	1941.2
	1	1941.7
	2	1935.8

DESCRIPTION	TIME (MINS)	PRESSURE
	3	1967.1
	4	1929.1
	5	1925.1
	6	1921.1
	7	1917.2
	8	1914.1
	9	1910.0
	10	1909.6
	15	1902.1
	20	1886.1
	25	1879.1
	30	1870.1
	45	1864.1
	60	1833.8
	90	1823.4
	120	1820.4
	150	1820.6
	180	1800.1
	240	1790.1
	300	1785.1
	360	1784.1
	400	1782.1
Final Flow (2)	412	1780.9
	0	1780.9
	1	1831.1
	2	1842.4
	3	1857.3
	4	1868.1
	5	1874.6
	6	1886.1
	7	1898.1
	8	1901.3
	9	1905.8
	10	1909.2
	15	1923.7

RECORDER NO: J-1782 - Continuation

DESCRIPTION	TIME (MINS)	PRESSURE
	20	1933.3
	25	1940.5
	30	1947.0
	45	1956.1
	60	1962.4
	90	1971.1
	120	1976.2
	150	1981.4
	180	1985.3
	240	1990.2
	300	1993.2
	360	1996.0
	420	1998.2
Final Shut-In	572	1999.6

DOWELL Schlumberger

Formation Testing Field Report

Report No. 81014

WELL IDENTIFICATION

Company : HUDBAY OIL AUSTRALIA Well No : WEST SEAHORSE # 1 Test No. : 1
Field : ______ Location : BASS STRAIT Country : AUSTRALIA
Tested Interval : From 4629 Ft, to 4645.6 Ft. 1411 M - 1416 M
Co-ordinates : LAT - 147 37 21.83E LONG - 038 12 10.93S
Type Test : Open Hole☐ Casing ;☐ Conventional☐ Straddle ;☐ Land rig☐ Jack-up☐ Floater☒
Valve : MFE☐ PCT☒ SPRO☒ Other : with Packer☒ Retainer☐

HOLE DATA

Geologic Level : UPPER CRETACEOUS/LWR TERTIARY Description : SANDSTONE - SHALE - COAL
Net Productive Interval : 5 M 16.4 ft. Estimated Porosity : ______ %
Total Depth : 1527 M ft. Depths measured from : KB Elevation : 9.35 M ft.
Open Hole Size : 12¼ in. ______ Rat Hole Size : 9-5/8 in., from 1390-1527 M ft.
Casing Size : 9-5/8 in. 40 lbs/ft. Liner Size : ______ in., ______ lbs/ft. from ______ ft
Before test : Caliper Yes☐ No☐ Scraper Yes☒ No☐ Circulation Yes☐ for hrs; No☒

MUD DATA

Mud Type : LO/SOLIDS POLIMER Weight : 1.07 SG 8.9 lb/gal
Viscosity : 38 Water Loss 10 cc Mud Resistivity .5 - .7 at 65 °F
Filtrate Resistivity : ______ at ______ °F ; Chloride ppm : 4400

INSTRUMENT AND CHART DATA

Recorder No.		J.1782	J-1630	J-1629	
Capacity (psig)		4700	2800	2800	
Depth		1400.17 m	1398.37 M	1385.37	
Inside/Outside		Out	Out	In	
Above/Below valve		Below	Below	Below	
Clock No.		9-13487	9-11583	9-10354	
Capacity (hrs.)		48 Hrs	48 Hrs	48 Hrs	
Temperature		144 °F	146 °F	146 °F	
Initial Hydrostatic Pressure		2167 psi	2136 psi		
Pre-flow	(1) Start Pressure	1837	1844		
	(2) Finish Pressure				
Initial Shut-in Pressure		1837	1844		
Second Flow	(1) Start Pressure	1998	1995		
	(2) Finish Pressure	1781	1793		
Second Shut-in Pressure		1828	1832		
Final Flow	(1) Start Pressure				
	(2) Finish Pressure				
Final Shut-in Pressure		2007	1995		
Final Hydrostatic Pressure		2195	2192		

OPERATIONS SUMMARY

Left Station at 22 : 00 on 25 Oct. On Location at 07 : 30 on 26 Oct.
Started Operations at 02 : 00 on 28 Oct. Finished Operations at 10 : 00 on 31 Oct.
Off Location at ______ : ______ on ______ Return Station at ______ : ______ on ______ Mileage ______

Comments : ______

Station : AUS SIR No. : 61384 - 61385 Date : ______
Customer Purchase Order ______ Tester D. ADAMS, A. ABREU & D. POSADA Customer Representative BRUCE McElhinney

DOWELL Schlumberger

Surface Data

Report No. 81014

Customer : HUDBAY OIL AUSTRALIA	Well No : WEST SEAHORSE # 1	Test No. 1

TEST SEQUENCE AND FLOW RATE DATA

Description and Flow Rates		Date	Time hrs	Time mins	Pressure psig	Surface Choke
Packer Depth : 4563.6 ft. 1391 M	Set at :	29-10-81	08	37		
Opened Tool :	(Annulus pressure 1300 psi)					
1235	Good Blow		12	35	35	¼ BH
1244	Water Cushion to surface		12	44	160	½ ADJ
1245	Light crude oil to surface		12	45		"
1246	Bled off to close tool		12	46	200	"
1354	Press up on annulus				1400	"
1355	Tool Open (2nd flow)		13	55		"
	Open to burner		13	55	370	"
1358	Well slugging rat hole mud + oil		13	58	420	"
1401	Oil to surface - Bur ning off		14	01	400	"
1500	Switch flow to seperator		15	00	480	"
2046	Bled off to close tool		20	46	450	"
0600	Unlatch SPRO	30-10-81	06	00		
0620	Prepare to reverse out		06	20		
0628	Pressure up on annulus to overpressure		06	28	2200	
	PCT (					
	Bleed off annulus		06	29		
	Press up on TBG to pump out sub		06	46	5-600	
	Start Reversing out thru burner		06	49	400	
	Stop reversing out		07	10		
	Attempt to unset packer - will not		08	20		
	go to safety					
	Held string weight - reverse out		08	30		
	down DP up annulus					
	Finish reversing		11	50		
	P.O.H. laying down tubing		12	30		
	Tools at floor		19	30		
Reverse Circulation Started	(Pump pressure 400 psig)	30-10-81	06	50		
Reverse Circulation Finished			11	50		
Pulled Packer Loose/~~Pulled Out of Retainer~~			08	20		
Cushion Type : WATER	Amount bbls ; Length 288M ft ; Pressure 324psi				Bottom Choke	1" PCT

RECOVERY DATA

	Recovery Description	Feet	Bbls	% Oil	% Water	% Other
1	1 STAND D/C	85	0.7	100		
2						
3						
4						
5						
6						

	Oil-API Gravity	Gas Gravity	G.O.R.	Resistivity	Chlorides
1	.784 ° at 66 °F			at °F	ppm
2	° at °F			at °F	ppm
3	° at °F			at °F	ppm
4	° at °F			at °F	ppm
5	° at °F			at °F	ppm
6	° at °F			at °F	ppm

Comments :

DOWELL Schlumberger

Equipment Data

Report No. 81014

Customer: HUDBAY OIL AUSTRALIA **Well No.:** WEST SEAHORSE # 1 **Test No.:** 1

SAMPLE CHAMBER RECOVERY DATA

Sampler Drained	Recovery	Resistivity	Chlorides (ppm)
On Location [X] Transferred to shipping bottles	Gas ____ cu ft.	Water ____ at ____ °F	
Elsewhere [ ]	Oil ____ c.c.	Mud ____ at ____ °F	
Name: FLOPETROL	Water ____ c.c.	Mud Filtrate ____ at ____ °F	
Address:	Mud ____ c.c.	Pit Mud ____ at ____ °F	
	____ °API ____ °F	Pit Mud Filtrate ____ at ____ °F	

Gas/Oil Ratio cu ft./bbl Sample Chamber Pressure 735 psi. 17°C

EQUIPMENT SEQUENCE

Components (including D.P. and D.C.)	Type	O.D. (in)	I.D. (in)	Length	Depth
FLOW HEAD					
Floor					
Drill Pipe ,				9.58	
X-Over				2.21	
Lub Valve				2.21	
X-Over				2.21	
Tubing				31.50	
X-Over				4.76	
EZ Tree	FLOPETROL			4.76	
Slick Joint	FLOPETROL			4.76	
Fluted Hangar	FLOPETROL			4.76	
X-Over				4.76	
Tubing				1147.13	
X-Over					
Slip Joint (extended)	JOTCO	5"	2¼	8.68	
Slip Joint (collapsed)	JOTCO	5"	2¼	7.16	
X-Over		6¼	2-11/16	0.30	
X-Over		6¼	2-7/8	0.50	
Drill Collars (4 stands)		6½	2-7/8	111.36	
X-Over		6½	2-5/16	0.81	
Pump Out Sub (Pin type)	JOTCO	6-1/8	2-3/4	0.36	
Drill Collar (1 stand)		6-1/8	2-7/8	26.34	
Pump Out Sub (800 psi)	JOTCO	6-1/8	2-3/4	0.36	
Drill Collar (1 stand)		6-1/8	2-7/8	25.88	
X-Over		6"	2-7/8	0.25	
X-Over		4-3/4	2-7/16	0.25	
SPRO Connection/Housing	JOTCO	4-3/4	2¼	2.40	1375.80
PCT	JOTCO	4-3/4	1"	4.66	
MFE/HRT (collapsed)	JOTCO	5"	1-3/8	2.90	
Recorder Carrier J-200, J-1629	JOTCO	4-7/8	1½	1.80	1385.37
Hydraulic Jars	JOTCO	4-7/8	1½	2.35	
Safety Joint	BOWEN	4-5/8	27/16	0.60	
X-Over		4-3/4	2-5/16	0.33	
Packer Above Seat	JOTCO		3"	0.55	
Packer Below Seat	JOTCO		3"	0.95	
X-Over		4-3/4	2-5/16	0.32	
Perforated Anchor	JOTCO	4-3/4	2¼		1398.37
Recorder Carrier J200 J-1630	JOTCO	4-7/8	1½	1.80	1400.17
Recorder Carrier J200 J-1782	JOTCO	4-7/8	1½	1.80	
Bullnose	JOTCO	4-3/4	2¼	0.25	
Total Drill Pipe /Tubing 1188.21 Meters	TOOLS BELOW PACKER		-	11.22	1402.22
Total Drill Collar 163.58 Meters					

Comments: Start Picking up tools 054- 28th Oct. 0900 Slip Joints in.
Tools our of the hole 1930 30th Oct. SLip Joints Remainder 2215-2400
Tools exposed to H2S 200 ppm in ¼ MMCFD Gas with 1800 BOPD

DOWELL Schlumberger

Formation Evaluation Data

To be completed by Customer Representative

Report No. 81014

Customer : HUDBAY OIL AUSTRALIA **Well No. :** WEST SEAHORSE # 1 **Test No. :** 1

Tested Interval	Sand-stone	Lime-stone	Chalk	Clay	Shale	Other (please specify)
Major Mineral Species	X					
Minor Mineral Species						
Stringers or Lenses						

Is the tested interval : Open Hole : [ ] I.D. [ ] in

In Casing : [X] O.D. 9-5/8 in. Wt : 40 lb./ft. I.D. 8.835 in.

Open Hole Interval : (Total Depth) 1527 PBTD (Foot of Casing)

Perforated Intervals : 1411 M TO 1416 M

In the tested interval how many productive zones do logs show :

1 [X] 2 [ ] 3 [ ] more [ ]

What is the average porosity of the interval ? [ ] %

Is the interval homogeneous ? Yes [X] No [ ]

Is formation consolidation : Good [ ] Mod [ ] Low [X]

What is the clay content : % or High [ ] Mod [ ] Low [X]

Is the formation fractured Heavily [ ] Mod [ ] Little [X]

In this interval, is there expected near the wellbore :

Geological fault ? Yes [ ] No [ ]

Interval thickness change ? Yes [ ] No [X]

Fluid phase contact ? Yes [X] No [ ]

—If yes :— Oil-Water [X] Gas-Water [ ] Oil-Gas [ ]

During drilling of the interval, was there :

Lost circulation ? Yes [ ] No [X]

Sand production ? Yes [ ] No [X]

Other (please specify) ____

Before testing was there a :

Scraper run ? Yes [X] No [ ]

Caliper run ? Yes [ ] No [X]

Mud circulation to bottom ? Yes [X] No [ ]

—If yes :— for how long [ ] If no, how long since [ ]

Additional Comments : ____

Customer Representative : ____

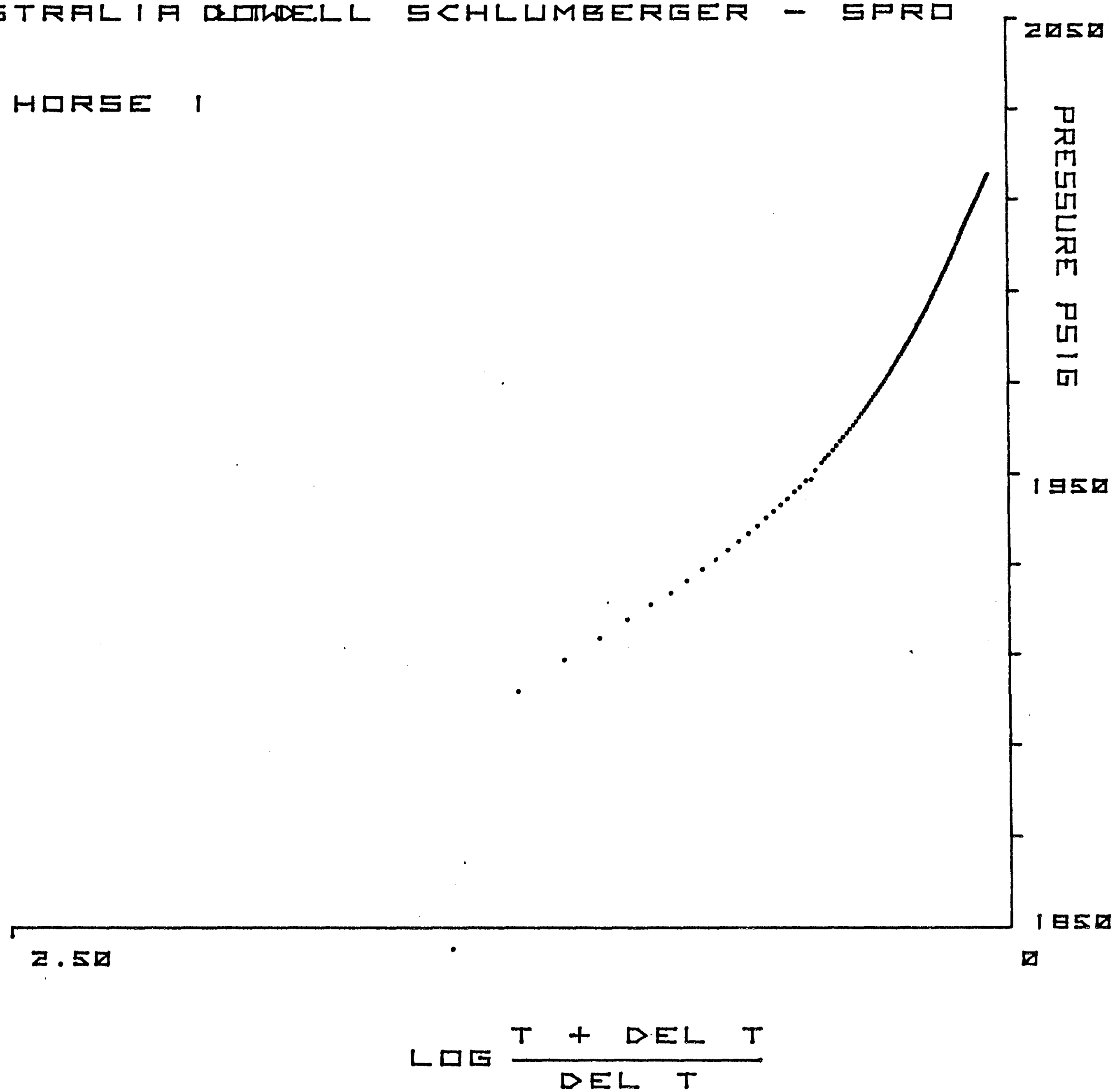
HUDBAY OIL AUSTRALIA DOWELL SCHLUMBERGER - SPRO

WELL WEST SEA HORSE 1

TEST 1

SHUTIN 1

T= 8 MIN



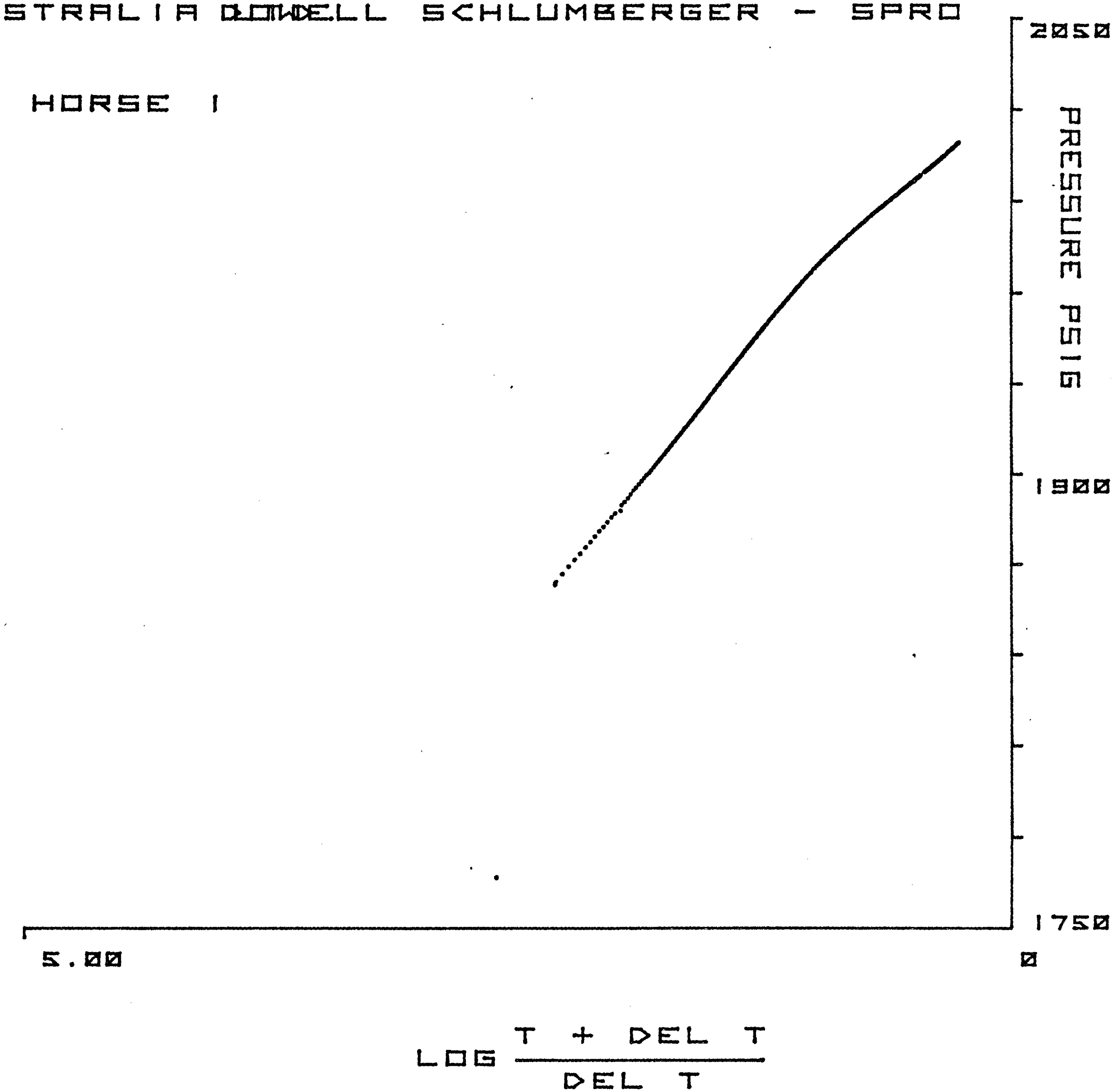
HUDBAY OIL AUSTRALIA DOWELL SCHLUMBERGER - SPRO

WELL WEST SEA HORSE 1

TEST 1

SHUTIN 2

T= 402 MIN



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SYMBOLS USED

$\triangle T$ – INCREMENT OF TIME (MINUTES)

$\frac{T + \triangle T}{\triangle T}$ – DIMENSIONLESS TIME CONSTANT USED FOR THE HORNER PLOT

$\triangle T$ IS THE INCREMENT OF SHUT-IN TIME (MINUTES)

T IS TOTAL FLOW TIME PRECEDING SHUT-IN (MINUTES)

LOG – LOGARITHM TO BASE 10 OF $\frac{T + \triangle T}{\triangle T}$

Pw – Pf – PRESSURE BUILD-UP ABOVE FINAL FLOWING PRESSURE PRECEDING THE BUILD UP WHICH IS USED FOR THE MCKINLEY PLOT.

DOWELL SCHLUMBERGER
****

SURFACE
PRESSURE
READ
OUT
****

COMPANY	HUDBAY OIL AUSTRALIA LTD.
WELL	WEST SEA HORSE 1
TEST	1
DEPTH	PBTD. 1527 mts.
PRESS/TEMP GAUGE	FLOPETROL 81193
GAUGE CAPACITY	10000
GAUGE DEPTH	1374.8 mts.

TIME HR:MN:SE	DEL T MIN	PRESSURE PSI	TEMPERATURE DEGREES F	T+DEL T DEL T	LOG(T+DEL T) (DEL T)	PRESSURE DIFF	COMMENTS
12:34:00		2754.6	121.38				SPRO LATCHED
12:34:10		2754.6	121.38				
12:34:20		2754.7	121.38				
12:34:30		2754.8	121.38				
12:34:40		2754.8	121.38				
12:34:50		2754.9	121.38				
12:35:00		2756.4	92.61				
12:35:10		2756.5	92.61				
12:35:20		2756.9	92.61				
12:35:30		2757.7	92.61				
12:35:40		2759.1	92.61				
12:35:50		2761.3	92.61				
12:36:00		2763.9	101.17				
12:36:10		2767.4	101.17				
12:36:20		2771.5	101.17				

12:36:30		2775.5	101.17	
12:36:41		2777.5	101.17	
12:36:50		1404.1	101.17	
12:37:00		1421.1	142.81	
12:37:10		1440.4	142.81	
12:37:20		1457.5	142.81	
12:37:31		1463.9	142.81	
12:37:40		2805.4	142.81	
12:37:50		2810.5	142.81	
12:38:00	0.0	2819.0	107.79	INITIAL FLOW
12:38:10	0.2	2824.2	107.79	
12:38:20	0.3	2828.8	107.79	
12:38:30	0.5	2833.6	107.79	
12:38:40	0.7	1583.6	107.79	
12:38:50	0.8	1599.4	107.79	
12:39:00	1.0	1609.7	144.42	
12:39:10	1.2	1623.1	144.42	
12:39:20	1.3	1635.2	144.42	
12:39:30	1.5	1648.6	144.42	
12:39:40	1.7	1660.6	144.42	
12:39:50	1.8	1670.9	144.42	
12:40:00	2.0	1679.7	145.12	
12:40:10	2.2	1690.2	145.12	
12:40:20	2.3	1700.0	145.12	
12:40:30	2.5	1709.2	145.12	
12:40:40	2.7	1719.7	145.12	
12:40:50	2.8	1729.5	145.12	
12:41:00	3.0	1737.3	145.66	
12:41:10	3.2	1745.8	145.66	
12:41:20	3.3	1754.0	145.66	
12:41:30	3.5	1761.6	145.66	
12:41:40	3.7	1766.2	145.66	
12:41:50	3.8	1776.5	145.66	
12:42:00	4.0	1784.2	146.06	
12:42:10	4.2	1790.6	146.06	
12:42:20	4.3	1791.3	146.06	
12:42:30	4.5	1787.7	146.06	
12:42:40	4.7	1791.6	146.06	
12:42:50	4.8	1805.2	146.06	
12:43:00	5.0	1811.2	146.34	
12:43:10	5.2	1818.5	146.34	
12:43:20	5.3	1823.6	146.34	
12:43:30	5.5	1827.0	146.34	
12:43:40	5.7	1829.9	146.34	
12:43:50	5.8	1829.8	146.34	

12:44:00	6.0	1829.9	146.53			
12:44:10	6.2	1829.2	146.53			
12:44:20	6.3	1825.9	146.53			
12:44:30	6.5	1821.4	146.53			
12:44:40	6.7	1823.6	146.53			
12:44:50	6.8	1824.3	146.53			
12:45:00	7.0	1828.4	146.65			
12:45:10	7.2	1829.5	146.65			
12:45:20	7.3	1831.7	146.65			
12:45:30	7.5	1834.2	146.65			
12:45:40	7.7	1836.9	146.65			
12:45:50	7.8	1840.1	146.65			
12:46:00	8.0	1842.2	146.72			

FIRST SHUT IN

12:46:10	0.2	1843.8	146.72	49.000	1.6902	-1
12:46:20	0.3	1845.3	146.72	25.000	1.3979	0
12:46:30	0.5	1901.8	146.72	17.000	1.2304	57
12:46:40	0.7	1908.8	146.72	13.000	1.1139	64
12:46:50	0.8	1913.6	146.72	10.600	1.0253	69
12:47:00	1.0	1917.7	146.77	9.000	0.9542	73
12:47:10	1.2	1921.0	146.77	7.857	0.8953	76
12:47:20	1.3	1923.7	146.77	7.000	0.8451	79
12:47:30	1.5	1926.3	146.77	6.333	0.8016	81
12:47:40	1.7	1928.9	146.77	5.800	0.7634	84
12:47:50	1.8	1931.1	146.77	5.364	0.7295	86
12:48:00	2.0	1933.2	146.79	5.000	0.6990	88
12:48:10	2.2	1935.1	146.79	4.692	0.6714	90
12:48:20	2.3	1936.9	146.79	4.429	0.6463	92
12:48:30	2.5	1938.5	146.79	4.200	0.6232	93
12:48:40	2.7	1940.2	146.79	4.000	0.6021	95
12:48:50	2.8	1941.7	146.79	3.824	0.5825	97
12:49:00	3.0	1943.2	146.77	3.667	0.5643	98
12:49:10	3.2	1944.5	146.77	3.526	0.5473	100
12:49:21	3.3	1946.0	146.77	3.388	0.5300	101
12:49:30	3.5	1947.1	146.77	3.286	0.5166	102
12:49:41	3.7	1948.5	146.77	3.172	0.5013	103
12:49:51	3.8	1948.8	146.77	3.078	0.4883	104
12:50:00	4.0	1950.9	146.71	3.000	0.4771	106
12:50:14	4.2	1952.5	146.71	2.890	0.4609	107
12:50:22	4.4	1953.3	146.71	2.832	0.4521	108
12:50:30	4.5	1954.1	146.71	2.778	0.4437	109
12:50:40	4.7	1955.2	146.71	2.714	0.4337	110
12:50:50	4.8	1956.2	146.71	2.655	0.4241	111
12:51:00	5.0	1957.1	146.62	2.600	0.4150	112
12:51:10	5.2	1958.1	146.62	2.548	0.4063	113
12:51:20	5.3	1958.9	146.62	2.500	0.3979	114

12:51:30	5.5	1959.8	146.62	2.455	0.3900	115
12:51:40	5.7	1960.7	146.62	2.412	0.3823	116
12:51:50	5.8	1961.5	146.62	2.371	0.3750	116
12:52:00	6.0	1962.4	146.52	2.333	0.3680	117
12:52:10	6.2	1963.1	146.52	2.297	0.3612	118
12:52:20	6.3	1963.9	146.52	2.263	0.3547	119
12:52:30	6.5	1964.7	146.52	2.231	0.3485	120
12:52:40	6.7	1965.4	146.52	2.200	0.3424	120
12:52:50	6.8	1966.1	146.52	2.171	0.3366	121
12:53:00	7.0	1966.8	146.41	2.143	0.3310	122
12:53:10	7.2	1967.6	146.41	2.116	0.3256	123
12:53:20	7.3	1968.2	146.41	2.091	0.3203	123
12:53:30	7.5	1968.9	146.41	2.067	0.3153	124
12:53:40	7.7	1969.5	146.41	2.043	0.3104	125
12:53:50	7.8	1970.1	146.41	2.021	0.3056	125
12:54:00	8.0	1970.7	146.29	2.000	0.3010	126
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12:54:20	8.3	1971.9	146.29	1.960	0.2923	127
12:54:30	8.5	1972.5	146.29	1.941	0.2881	128
12:54:40	8.7	1973.0	146.29	1.923	0.2840	128
12:54:50	8.8	1973.6	146.29	1.906	0.2800	129
12:55:00	9.0	1974.2	146.18	1.889	0.2762	129
12:55:10	9.2	1974.7	146.18	1.873	0.2725	130
12:55:20	9.3	1975.2	146.18	1.857	0.2688	130
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12:55:40	9.7	1976.2	146.18	1.828	0.2619	131
12:55:50	9.8	1976.7	146.18	1.814	0.2585	132
12:56:00	10.0	1977.2	146.08	1.800	0.2553	132
12:56:10	10.2	1977.7	146.08	1.787	0.2521	133
12:56:20	10.3	1978.2	146.08	1.774	0.2490	133
12:56:30	10.5	1978.6	146.08	1.762	0.2460	134
12:56:40	10.7	1979.0	146.08	1.750	0.2430	134
12:56:50	10.8	1979.5	146.08	1.738	0.2402	135
12:57:00	11.0	1979.9	145.99	1.727	0.2374	135
12:57:10	11.2	1980.4	145.99	1.716	0.2346	135
12:57:20	11.3	1980.8	145.99	1.706	0.2319	136
12:57:30	11.5	1981.2	145.99	1.696	0.2293	136
12:57:40	11.7	1981.6	145.99	1.686	0.2268	137
12:57:50	11.8	1982.1	145.99	1.676	0.2243	137
12:58:00	12.0	1982.5	145.91	1.667	0.2218	137
12:58:10	12.2	1982.9	145.91	1.658	0.2195	138
12:58:20	12.3	1983.2	145.91	1.649	0.2171	138
12:58:30	12.5	1983.5	145.91	1.640	0.2148	139
12:58:40	12.7	1983.9	145.91	1.632	0.2126	139
12:58:50	12.8	1984.3	145.91	1.623	0.2104	139

12:59:00	13.0	1984.7	145.84	1.615	0.2083	140
12:59:10	13.2	1985.0	145.84	1.608	0.2062	140
12:59:20	13.3	1985.4	145.84	1.600	0.2041	140
12:59:30	13.5	1985.7	145.84	1.593	0.2021	141
12:59:40	13.7	1986.0	145.84	1.585	0.2001	141
12:59:50	13.8	1986.3	145.84	1.578	0.1982	141
13:00:00	14.0	1986.7	145.77	1.571	0.1963	142
13:00:20	14.3	1987.4	145.77	1.558	0.1926	142
13:00:40	14.7	1987.9	145.77	1.545	0.1891	143
13:01:00	15.0	1988.6	145.72	1.533	0.1856	144
13:01:20	15.3	1989.1	145.72	1.522	0.1823	144
13:01:40	15.7	1989.7	145.72	1.511	0.1792	145
13:02:00	16.0	1990.2	145.67	1.500	0.1761	145
13:02:20	16.3	1990.8	145.67	1.490	0.1731	146
13:02:40	16.7	1991.3	145.67	1.480	0.1703	146
13:03:00	17.0	1991.8	145.62	1.471	0.1675	147
13:03:20	17.3	1992.3	145.62	1.462	0.1648	147
13:03:40	17.7	1992.8	145.62	1.453	0.1622	148
13:04:00	18.0	1993.2	145.58	1.444	0.1597	148
13:04:20	18.3	1993.7	145.58	1.436	0.1573	149
13:04:40	18.7	1994.2	145.58	1.429	0.1549	149
13:05:00	19.0	1994.6	145.53	1.421	0.1526	150
13:05:20	19.3	1995.0	145.53	1.414	0.1504	150
13:05:40	19.7	1995.5	145.53	1.407	0.1482	150
13:06:00	20.0	1995.8	145.49	1.400	0.1461	151
13:06:20	20.3	1996.2	145.49	1.393	0.1441	151
13:06:40	20.7	1996.6	145.49	1.387	0.1421	152
13:07:00	21.0	1997.0	145.45	1.381	0.1402	152
13:07:20	21.3	1997.3	145.45	1.375	0.1383	152
13:07:40	21.7	1997.7	145.45	1.369	0.1365	153
13:08:00	22.0	1998.0	145.41	1.364	0.1347	153
13:08:20	22.3	1998.4	145.41	1.358	0.1330	153
13:08:40	22.7	1998.7	145.41	1.353	0.1313	154
13:09:00	23.0	1999.0	145.37	1.348	0.1296	154
13:09:20	23.3	1999.3	145.37	1.343	0.1280	154
13:10:00	24.0	2000.0	145.33	1.333	0.1249	155
13:10:30	24.5	2000.4	145.33	1.327	0.1227	155
13:11:00	25.0	2000.8	145.29	1.320	0.1206	156
13:11:30	25.5	2001.2	145.29	1.314	0.1185	156
13:12:00	26.0	2001.7	145.25	1.308	0.1165	157
13:12:30	26.5	2002.0	145.25	1.302	0.1146	157
13:13:00	27.0	2002.4	145.21	1.296	0.1127	157
13:13:30	27.5	2002.8	145.21	1.291	0.1109	158
13:14:00	28.0	2003.2	145.17	1.286	0.1091	158
13:14:30	28.5	2003.5	145.17	1.281	0.1074	159

13:15:00	29.0	2003.8	145.13	1.276	0.1058	159
13:15:30	29.5	2004.1	145.13	1.271	0.1042	159
13:16:00	30.0	2004.5	145.08	1.267	0.1027	160
13:16:40	30.7	2004.9	145.08	1.261	0.1007	160
13:17:30	31.5	2005.4	145.04	1.254	0.0983	160
13:18:20	32.3	2005.8	145.00	1.247	0.0960	161
13:19:10	33.2	2006.3	144.96	1.241	0.0938	161
13:20:00	34.0	2006.7	144.93	1.235	0.0918	162
13:20:50	34.8	2007.1	144.93	1.230	0.0898	162
13:21:40	35.7	2007.5	144.90	1.224	0.0879	163
13:22:30	36.5	2007.8	144.88	1.219	0.0861	163
13:23:00	37.0	2008.1	144.85	1.216	0.0850	163
13:24:00	38.0	2008.5	144.81	1.211	0.0830	163
13:25:00	39.0	2008.9	144.77	1.205	0.0810	164
13:26:00	40.0	2009.3	144.74	1.200	0.0792	164
13:27:00	41.0	2009.6	144.71	1.195	0.0774	165
13:28:00	42.0	2010.0	144.68	1.190	0.0757	165
13:30:00	44.0	2010.6	144.62	1.182	0.0726	166
13:32:00	46.0	2011.2	144.57	1.174	0.0696	166
13:34:00	48.0	2011.8	144.52	1.167	0.0669	167
13:36:00	50.0	2012.3	144.48	1.160	0.0645	167
13:38:00	52.0	2012.8	144.45	1.154	0.0621	168
13:40:00	54.0	2013.2	144.41	1.148	0.0600	168
13:42:00	56.0	2013.5	144.38	1.143	0.0580	169
13:44:00	58.0	2013.9	144.34	1.138	0.0561	169
13:46:00	60.0	2014.3	144.32	1.133	0.0544	169
13:48:00	62.0	2014.5	144.29	1.129	0.0527	170
13:50:00	64.0	2014.9	144.27	1.125	0.0512	170
13:52:00	66.0	2015.2	144.24	1.121	0.0497	170
13:54:00	68.0	2015.4	144.22	1.118	0.0483	170
13:55:01	0.0	1904.5	144.21			
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13:55:50	0.8	1948.1	144.21			
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13:56:40	1.7	1919.6	144.20			
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13:59:00	4.0	1908.1	144.29
13:59:10	4.2	1904.3	144.29
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13:59:50	4.8	1904.2	144.29
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14:00:50	5.8	1899.8	144.37
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14:02:40	7.7	1896.8	144.73
14:02:50	7.8	1896.2	144.73
14:03:00	8.0	1894.7	144.97
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14:03:40	8.7	1890.9	144.97
14:03:50	8.8	1890.4	144.97
14:04:00	9.0	1889.5	145.22
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14:04:30	9.5	1887.9	145.22
14:04:40	9.7	1888.1	145.22
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14:18:30	23.5	1857.8	146.98
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14:19:30	24.5	1856.1	147.05
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14:24:00	29.0	1844.3	147.29
14:24:30	29.5	1845.6	147.29
14:25:00	30.0	1846.5	147.33
14:25:30	30.5	1847.0	147.33
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14:26:30	31.5	1845.7	147.36
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14:28:00	33.0	1841.3	147.42
14:28:30	33.5	1839.7	147.42
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14:31:00	36.0	1842.9	147.50
14:31:30	36.5	1843.0	147.50
14:32:00	37.0	1842.9	147.53
14:32:30	37.5	1843.7	147.53
14:33:00	38.0	1844.0	147.55
14:33:30	38.5	1843.6	147.55
14:34:00	39.0	1843.5	147.57
14:34:30	39.5	1843.6	147.57
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14:35:30	40.5	1843.4	147.58
14:36:00	41.0	1842.8	147.60
14:36:30	41.5	1843.2	147.60
14:37:00	42.0	1843.2	147.61
14:37:30	42.5	1842.8	147.61
14:38:00	43.0	1842.5	147.63
14:38:30	43.5	1842.8	147.63
14:39:00	44.0	1842.3	147.65
14:39:30	44.5	1842.6	147.65
14:40:00	45.0	1841.8	147.66
14:40:30	45.5	1839.8	147.66
14:41:00	46.0	1838.1	147.67
14:41:30	46.5	1836.9	147.67
14:42:00	47.0	1835.4	147.69
14:42:30	47.5	1834.4	147.69

14:43:00	48.0	1833.1	147.70
14:43:30	48.5	1832.2	147.70
14:44:00	49.0	1831.3	147.72
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14:45:00	50.0	1830.3	147.74
14:45:30	50.5	1829.7	147.74
14:46:00	51.0	1829.4	147.75
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14:47:00	52.0	1829.3	147.77
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14:48:00	53.0	1828.8	147.79
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14:49:00	54.0	1827.8	147.80
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14:50:00	55.0	1827.6	147.82
14:50:30	55.5	1827.9	147.82
14:51:00	56.0	1827.9	147.84
14:51:30	56.5	1827.4	147.84
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14:53:30	58.5	1826.4	147.88
14:54:00	59.0	1826.9	147.89
14:54:30	59.5	1826.3	147.89
14:55:00	60.0	1825.9	147.90
14:55:30	60.5	1825.3	147.90
14:56:00	61.0	1824.6	147.91
14:56:30	61.5	1824.1	147.91
14:57:00	62.0	1822.7	147.92
14:57:30	62.5	1822.3	147.92
15:01:01	66.0	1810.0	147.92
15:02:00	67.0	1808.2	148.01
15:03:00	68.0	1807.0	148.03
15:04:00	69.0	1806.3	148.05
15:05:00	70.0	1805.1	148.08
15:06:00	71.0	1804.7	148.10
15:07:00	72.0	1804.3	148.12
15:07:30	72.5	1804.0	148.12
15:07:40	72.7	1803.7	148.12
15:07:50	72.8	1803.6	148.12
15:08:00	73.0	1803.4	148.14
15:08:10	73.2	1803.2	148.14
15:08:20	73.3	1802.9	148.14
15:08:30	73.5	1802.9	148.14
15:08:40	73.7	1802.8	148.14

15:08:50	73.8	1802.6	148.14
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15:09:30	74.5	1802.3	148.16
15:09:40	74.7	1802.3	148.16
15:09:50	74.8	1802.1	148.16
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15:10:10	75.2	1802.0	148.18
15:10:20	75.3	1801.9	148.18
15:10:30	75.5	1801.8	148.18
15:10:40	75.7	1801.7	148.18
15:10:50	75.8	1801.7	148.18
15:11:00	76.0	1801.6	148.20
15:11:10	76.2	1801.5	148.20
15:11:20	76.3	1801.5	148.20
15:11:30	76.5	1801.3	148.20
15:11:40	76.7	1801.2	148.20
15:11:50	76.8	1801.2	148.20
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15:12:10	77.2	1800.9	148.22
15:12:20	77.3	1800.9	148.22
15:12:30	77.5	1800.7	148.22
15:12:40	77.7	1800.6	148.22
15:12:50	77.8	1800.5	148.22
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15:13:10	78.2	1800.6	148.23
15:13:20	78.3	1800.2	148.23
15:13:30	78.5	1800.2	148.23
15:13:40	78.7	1800.1	148.23
15:13:50	78.8	1800.1	148.23
15:14:00	79.0	1799.9	148.25
15:14:10	79.2	1799.9	148.25
15:14:20	79.3	1799.8	148.25
15:14:30	79.5	1799.7	148.25
15:14:40	79.7	1799.6	148.25
15:14:50	79.8	1799.5	148.25
15:15:00	80.0	1799.5	148.26
15:15:10	80.2	1799.3	148.26
15:15:20	80.3	1799.3	148.26
15:15:30	80.5	1799.3	148.26
15:15:40	80.7	1799.2	148.26
15:16:00	81.0	1798.9	148.28
15:17:00	82.0	1798.5	148.29
15:18:00	83.0	1798.1	148.31

15:19:00	84.0	1798.1	148.32
15:20:00	85.0	1797.7	148.34
15:21:00	86.0	1797.4	148.35
15:22:00	87.0	1796.7	148.36
15:23:00	88.0	1796.3	148.37
15:24:00	89.0	1795.9	148.39
15:25:00	90.0	1795.5	148.40
15:26:00	91.0	1795.1	148.41
15:27:00	92.0	1794.8	148.42
15:28:00	93.0	1794.5	148.43
15:29:00	94.0	1793.5	148.45
15:30:00	95.0	1793.0	148.46
15:31:00	96.0	1792.5	148.47
15:32:00	97.0	1789.7	148.48
15:33:00	98.0	1791.6	148.49
15:34:00	99.0	1791.2	148.51
15:35:00	100.0	1790.2	148.52
15:36:00	101.0	1790.6	148.53
15:37:00	102.0	1790.3	148.54
15:38:00	103.0	1790.0	148.56
15:39:00	104.0	1789.8	148.57
15:40:00	105.0	1789.4	148.58
15:41:00	106.0	1789.1	148.59
15:42:00	107.0	1788.9	148.60
15:43:00	108.0	1788.7	148.61
15:44:00	109.0	1788.5	148.63
15:45:00	110.0	1788.4	148.64
15:46:00	111.0	1788.0	148.65
15:47:00	112.0	1787.3	148.66
15:48:00	113.0	1786.8	148.67
15:49:00	114.0	1786.5	148.68
15:50:00	115.0	1786.3	148.69
15:52:00	117.0	1786.4	148.70
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15:56:00	121.0	1785.5	148.74
15:58:00	123.0	1786.7	148.76
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16:02:00	127.0	1784.3	148.80
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16:06:00	131.0	1784.5	148.84
16:08:00	133.0	1784.2	148.86
16:10:00	135.0	1783.9	148.88
16:12:00	137.0	1783.8	148.89
16:14:00	139.0	1783.5	148.91
16:16:00	141.0	1783.2	148.93

16:18:00	143.0	1783.2	148.95
16:20:00	145.0	1782.8	148.97
16:22:00	147.0	1782.6	148.99
16:24:00	149.0	1782.6	149.00
16:26:00	151.0	1782.3	149.02
16:28:00	153.0	1782.0	149.04
16:30:00	155.0	1782.0	149.05
16:32:00	157.0	1781.6	149.07
16:34:00	159.0	1781.2	149.09
16:36:00	161.0	1781.1	149.10
16:38:00	163.0	1781.2	149.12
16:40:00	165.0	1781.1	149.13
16:42:00	167.0	1780.8	149.15
16:44:00	169.0	1780.9	149.16
16:46:00	171.0	1780.7	149.18
16:48:00	173.0	1780.6	149.19
16:50:00	175.0	1780.4	149.21
16:52:00	177.0	1780.3	149.22
16:54:00	179.0	1780.2	149.24
16:56:00	181.0	1780.0	149.25
16:58:00	183.0	1779.9	149.27
17:00:00	185.0	1779.9	149.28
17:02:00	187.0	1779.8	149.30
17:04:00	189.0	1779.3	149.31
17:06:00	191.0	1779.3	149.33
17:08:00	193.0	1779.0	149.34
17:10:00	195.0	1779.1	149.36
17:12:00	197.0	1778.3	149.37
17:14:00	199.0	1778.1	149.39
17:16:00	201.0	1778.3	149.40
17:18:00	203.0	1777.2	149.42
17:20:00	205.0	1777.2	149.43
17:22:00	207.0	1777.5	149.44
17:24:00	209.0	1777.7	149.46
17:26:00	211.0	1777.8	149.47
17:28:00	213.0	1777.2	149.48
17:30:00	215.0	1777.7	149.50
17:32:00	217.0	1776.5	149.51
17:34:00	219.0	1777.3	149.52
17:36:00	221.0	1777.1	149.54
17:38:00	223.0	1776.6	149.55
17:40:00	225.0	1780.1	149.56
17:42:00	227.0	1777.3	149.58
17:44:00	229.0	1776.3	149.59
17:46:00	231.0	1776.1	149.60

17:48:00	233.0	1776.4	149.61
17:50:00	235.0	1776.3	149.62
17:52:00	237.0	1776.2	149.64
17:54:00	239.0	1775.9	149.65
17:56:00	241.0	1775.9	149.66
17:58:00	243.0	1775.2	149.67
18:00:00	245.0	1775.2	149.68
18:02:00	247.0	1775.9	149.70
18:04:00	249.0	1774.0	149.71
18:06:00	251.0	1775.5	149.72
18:08:00	253.0	1774.5	149.73
18:10:00	255.0	1775.8	149.74
18:12:00	257.0	1775.7	149.75
18:12:40	257.7	1774.8	149.75
18:13:20	258.3	1775.1	149.76
18:14:00	259.0	1774.8	149.76
18:14:40	259.7	1775.4	149.76
18:15:00	260.0	1774.8	149.77
18:16:00	261.0	1774.3	149.77
18:17:00	262.0	1775.2	149.79
18:18:00	263.0	1774.3	149.79
18:19:00	264.0	1774.2	149.80
18:20:00	265.0	1774.1	149.80
18:21:00	266.0	1774.3	149.81
18:22:00	267.0	1773.9	149.81
18:23:00	268.0	1774.3	149.82
18:24:00	269.0	1774.0	149.82
18:25:00	270.0	1774.2	149.83
18:26:00	271.0	1775.0	149.83
18:27:00	272.0	1774.3	149.84
18:34:41	279.7	1773.5	149.84
18:35:00	280.0	1774.5	149.88
18:36:00	281.0	1773.9	149.88
18:37:00	282.0	1773.5	149.89
18:38:00	283.0	1775.1	149.89
18:39:00	284.0	1774.2	149.90
18:40:00	285.0	1775.9	149.90
18:41:00	286.0	1773.3	149.91
18:42:00	287.0	1774.1	149.91
18:43:00	288.0	1771.2	149.92
18:44:00	289.0	1773.3	149.92
18:45:00	290.0	1773.0	149.93
18:46:00	291.0	1772.8	149.93
18:47:00	292.0	1774.1	149.94
18:48:00	293.0	1773.8	149.94

18:49:00	294.0	1773.5	149.95
18:50:00	295.0	1773.9	149.95
18:51:00	296.0	1772.2	149.96
18:52:00	297.0	1774.0	149.96
18:53:00	298.0	1772.2	149.97
18:54:00	299.0	1772.6	149.97
18:56:00	301.0	1773.5	149.98
18:58:00	303.0	1772.9	149.99
19:00:00	305.0	1772.7	150.00
19:02:00	307.0	1772.0	150.01
19:04:00	309.0	1772.4	150.02
19:06:00	311.0	1772.0	150.03
19:08:00	313.0	1772.2	150.04
19:10:00	315.0	1772.1	150.05
19:12:00	317.0	1772.2	150.06
19:14:00	319.0	1770.1	150.07
19:16:00	321.0	1769.2	150.08
19:18:00	323.0	1771.8	150.09
19:20:00	325.0	1771.0	150.10
19:22:00	327.0	1771.1	150.11
19:24:00	329.0	1769.5	150.11
19:26:00	331.0	1771.5	150.12
19:28:00	333.0	1771.2	150.13
19:30:00	335.0	1771.3	150.14
19:32:00	337.0	1770.5	150.15
19:34:00	339.0	1770.8	150.16
19:36:00	341.0	1770.3	150.17
19:38:00	343.0	1770.2	150.18
19:40:00	345.0	1771.1	150.19
19:42:00	347.0	1770.6	150.19
19:44:00	349.0	1768.4	150.20
19:46:00	351.0	1770.6	150.21
19:48:00	353.0	1769.8	150.22
19:50:00	355.0	1770.0	150.23
19:52:00	357.0	1770.5	150.24
19:54:00	359.0	1770.1	150.24
19:56:00	361.0	1770.0	150.25
19:58:00	363.0	1769.6	150.26
20:00:00	365.0	1769.3	150.27
20:02:00	367.0	1768.1	150.28
20:04:00	369.0	1769.6	150.29
20:06:00	371.0	1769.7	150.29
20:08:00	373.0	1769.5	150.30
20:10:00	375.0	1769.5	150.31
20:12:00	377.0	1769.1	150.32

20:14:00	379.0	1770.2	150.32				
20:16:00	381.0	1769.1	150.33				
20:18:00	383.0	1768.6	150.34				
20:20:00	385.0	1767.6	150.35				
20:22:00	387.0	1768.6	150.36				
20:24:00	389.0	1768.2	150.36				
20:26:00	391.0	1769.0	150.37				
20:28:00	393.0	1770.5	150.38				
20:30:00	395.0	1768.0	150.39				
20:32:00	397.0	1768.5	150.40				
20:34:00	399.0	1768.0	150.40				
20:36:00	401.0	1767.9	150.41				
20:38:00	403.0	1764.9	150.42				
20:40:00	405.0	1768.8	150.43				
20:42:00	407.0	1768.9	150.43				
20:44:00	409.0	1768.4	150.44				
20:46:00	411.0	1766.7	150.45				
20:46:59	412.0	1863.2	150.45				
20:47:00	412.0	1863.7	150.45				SECON
							SECOND SHUT IN
20:47:10	0.2	1866.5	150.45	2413.000	3.3826	100	
20:47:20	0.3	1869.0	150.45	1207.000	3.0817	103	
20:47:30	0.5	1871.4	150.45	805.000	2.9058	105	
20:47:40	0.7	1873.4	150.45	604.000	2.7810	107	
20:47:50	0.8	1875.5	150.45	483.400	2.6843	109	
20:48:00	1.0	1877.3	150.44	403.000	2.6053	111	
20:48:10	1.2	1879.2	150.44	345.571	2.5385	113	
20:48:20	1.3	1880.9	150.44	302.500	2.4807	115	
20:48:30	1.5	1882.4	150.44	269.000	2.4298	116	
20:48:40	1.7	1884.0	150.44	242.200	2.3842	118	
20:48:51	1.9	1885.6	150.44	218.297	2.3390	120	
20:49:01	2.0	1886.9	150.42	200.339	2.3018	121	
20:49:17	2.3	1887.8	150.42	177.058	2.2481	122	
20:49:20	2.3	1889.6	150.42	173.286	2.2388	124	
20:49:30	2.5	1890.8	150.42	161.800	2.2090	125	
20:49:40	2.7	1892.0	150.42	151.750	2.1811	126	
20:49:50	2.8	1893.2	150.42	142.882	2.1550	127	
20:50:00	3.0	1894.6	148.77	135.000	2.1303	129	
20:50:10	3.2	1895.5	148.77	127.947	2.1070	130	
20:50:20	3.3	1896.7	148.77	121.600	2.0849	131	
20:50:30	3.5	1897.7	148.77	115.857	2.0639	132	
20:50:40	3.7	1898.7	148.77	110.636	2.0439	133	
20:50:50	3.8	1899.8	148.77	105.870	2.0248	134	
20:51:00	4.0	1900.3	150.34	101.500	2.0065	134	
20:51:10	4.2	1901.3	150.34	97.480	1.9889	135	

20:51:20	4.3	1902.2	150.34	93.769	1.9721	136
20:51:30	4.5	1903.1	150.34	90.333	1.9558	137
20:51:40	4.7	1904.0	150.34	87.143	1.9402	138
20:51:50	4.8	1904.9	150.34	84.172	1.9252	139
20:52:00	5.0	1905.7	150.29	81.400	1.9106	140
20:52:10	5.2	1906.5	150.29	78.806	1.8966	140
20:52:20	5.3	1907.3	150.29	76.375	1.8830	141
20:52:30	5.5	1908.1	150.29	74.091	1.8698	142
20:52:40	5.7	1908.8	150.29	71.941	1.8570	143
20:52:50	5.8	1909.6	150.29	69.914	1.8446	144
20:53:00	6.0	1910.4	150.23	68.000	1.8325	144
20:53:10	6.2	1911.1	150.23	66.189	1.8208	145
20:53:20	6.3	1911.9	150.23	64.474	1.8094	146
20:53:30	6.5	1912.5	150.23	62.846	1.7983	146
20:53:40	6.7	1913.1	150.23	61.300	1.7875	147
20:53:50	6.8	1913.9	150.23	59.829	1.7769	148
20:54:01	7.0	1914.5	150.16	58.292	1.7656	149
20:54:10	7.2	1915.2	150.16	57.093	1.7566	149
20:54:20	7.3	1915.8	150.16	55.818	1.7468	150
20:54:30	7.5	1916.4	150.16	54.600	1.7372	150
20:54:40	7.7	1917.0	150.16	53.435	1.7278	151
20:54:50	7.8	1917.7	150.16	52.319	1.7187	152
20:55:00	8.0	1918.2	150.09	51.250	1.7097	152
20:55:10	8.2	1918.8	150.09	50.224	1.7009	153
20:55:20	8.3	1919.4	150.09	49.240	1.6923	153
20:55:30	8.5	1920.0	150.09	48.294	1.6839	154
20:55:40	8.7	1920.5	150.09	47.385	1.6756	155
20:55:50	8.8	1921.0	150.09	46.509	1.6675	155
20:56:00	9.0	1921.6	150.02	45.667	1.6596	156
20:56:10	9.2	1922.1	150.02	44.855	1.6518	156
20:56:20	9.3	1922.7	150.02	44.071	1.6442	157
20:56:30	9.5	1923.2	150.02	43.316	1.6366	157
20:56:40	9.7	1923.7	150.02	42.586	1.6293	158
20:56:50	9.8	1924.3	150.02	41.881	1.6220	158
20:57:00	10.0	1924.7	149.95	41.200	1.6149	159
20:57:10	10.2	1925.3	149.95	40.541	1.6079	159
20:57:20	10.3	1925.7	149.95	39.903	1.6010	160
20:57:30	10.5	1926.2	149.95	39.286	1.5942	160
20:57:40	10.7	1926.7	149.95	38.687	1.5876	161
20:57:50	10.8	1927.1	149.95	38.108	1.5810	161
20:58:00	11.0	1927.6	149.87	37.545	1.5746	162
20:58:10	11.2	1928.0	149.87	37.000	1.5682	162
20:58:20	11.3	1928.5	149.87	36.471	1.5619	162
20:58:30	11.5	1929.0	149.87	35.957	1.5558	163
20:58:40	11.7	1929.4	149.87	35.457	1.5497	163

20:58:50	11.8	1929.8	149.87	34.972	1.5437	164
20:59:00	12.0	1930.2	149.80	34.500	1.5378	164
20:59:10	12.2	1930.7	149.80	34.041	1.5320	165
20:59:20	12.3	1931.0	149.80	33.595	1.5263	165
20:59:30	12.5	1931.5	149.80	33.160	1.5206	166
20:59:40	12.7	1931.9	149.80	32.737	1.5150	166
20:59:50	12.8	1932.3	149.80	32.325	1.5095	166
21:00:00	13.0	1932.6	149.73	31.923	1.5041	167
21:00:10	13.2	1933.1	149.73	31.532	1.4987	167
21:00:20	13.3	1933.5	149.73	31.150	1.4935	167
21:00:30	13.5	1933.8	149.73	30.778	1.4882	168
21:00:40	13.7	1934.2	149.73	30.415	1.4831	168
21:00:50	13.8	1934.6	149.73	30.060	1.4780	169
21:01:00	14.0	1935.0	149.66	29.714	1.4730	169
21:01:10	14.2	1935.3	149.66	29.376	1.4680	169
21:01:20	14.3	1935.7	149.66	29.047	1.4631	170
21:01:30	14.5	1936.0	149.66	28.724	1.4582	170
21:01:40	14.7	1936.4	149.66	28.409	1.4535	170
21:01:50	14.8	1936.7	149.66	28.101	1.4487	171
21:02:00	15.0	1937.1	149.59	27.800	1.4440	171
21:02:10	15.2	1937.4	149.59	27.505	1.4394	171
21:02:20	15.3	1937.8	149.59	27.217	1.4348	172
21:02:30	15.5	1938.1	149.59	26.935	1.4303	172
21:02:40	15.7	1938.4	149.59	26.660	1.4259	172
21:02:50	15.8	1938.7	149.59	26.389	1.4214	173
21:03:00	16.0	1939.1	149.53	26.125	1.4171	173
21:03:10	16.2	1939.4	149.53	25.866	1.4127	173
21:03:20	16.3	1939.6	149.53	25.612	1.4084	174
21:03:30	16.5	1940.0	149.53	25.364	1.4042	174
21:03:40	16.7	1940.3	149.53	25.120	1.4000	174
21:03:50	16.8	1940.6	149.53	24.881	1.3959	175
21:04:01	17.0	1940.9	149.47	24.624	1.3914	175
21:04:10	17.2	1941.2	149.47	24.417	1.3877	175
21:04:20	17.3	1941.5	149.47	24.192	1.3837	176
21:04:30	17.5	1941.8	149.47	23.971	1.3797	176
21:04:40	17.7	1942.1	149.47	23.755	1.3757	176
21:04:50	17.8	1942.3	149.47	23.542	1.3718	176
21:05:00	18.0	1942.6	149.41	23.333	1.3680	177
21:05:10	18.2	1942.9	149.41	23.128	1.3641	177
21:05:20	18.3	1943.2	149.41	22.927	1.3604	177
21:05:30	18.5	1943.5	149.41	22.730	1.3566	177
21:05:40	18.7	1943.7	149.41	22.536	1.3529	178
21:05:50	18.8	1944.1	149.41	22.345	1.3492	178
21:06:00	19.0	1944.3	149.36	22.158	1.3455	178
21:06:10	19.2	1944.6	149.36	21.974	1.3419	179

21:06:20	19.3	1944.9	149.36	21.793	1.3383	179
21:06:30	19.5	1945.1	149.36	21.615	1.3348	179
21:06:40	19.7	1945.4	149.36	21.441	1.3312	179
21:06:50	19.8	1945.6	149.36	21.269	1.3277	180
21:07:00	20.0	1945.8	149.30	21.100	1.3243	180
21:07:10	20.2	1946.1	149.30	20.934	1.3208	180
21:07:20	20.3	1946.3	149.30	20.770	1.3174	180
21:07:30	20.5	1946.6	149.30	20.610	1.3141	181
21:07:40	20.7	1946.8	149.30	20.452	1.3107	181
21:07:50	20.8	1947.1	149.30	20.296	1.3074	181
21:08:00	21.0	1947.3	149.25	20.143	1.3041	181
21:08:10	21.2	1947.6	149.25	19.992	1.3009	182
21:08:20	21.3	1947.8	149.25	19.844	1.2976	182
21:08:30	21.5	1948.0	149.25	19.698	1.2944	182
21:08:40	21.7	1948.3	149.25	19.554	1.2912	182
21:08:50	21.8	1948.5	149.25	19.412	1.2881	182
21:09:00	22.0	1948.7	149.20	19.273	1.2849	183
21:09:30	22.5	1949.4	149.20	18.867	1.2757	183
21:10:00	23.0	1950.0	149.15	18.478	1.2667	184
21:10:30	23.5	1950.6	149.15	18.106	1.2578	185
21:11:00	24.0	1951.3	149.10	17.750	1.2492	185
21:11:30	24.5	1951.9	149.10	17.408	1.2408	186
21:12:00	25.0	1952.5	149.06	17.080	1.2325	186
21:12:30	25.5	1953.0	149.06	16.765	1.2244	187
21:13:00	26.0	1953.7	149.00	16.462	1.2165	188
21:13:30	26.5	1954.2	149.00	16.170	1.2087	188
21:14:00	27.0	1954.8	148.95	15.889	1.2011	189
21:14:30	27.5	1955.3	148.95	15.618	1.1936	189
21:15:00	28.0	1955.8	148.91	15.357	1.1863	190
21:15:30	28.5	1956.3	148.91	15.105	1.1791	190
21:16:00	29.0	1956.8	148.86	14.862	1.1721	191
21:16:30	29.5	1957.2	148.86	14.627	1.1652	191
21:17:00	30.0	1957.7	148.81	14.400	1.1584	192
21:17:30	30.5	1958.2	148.81	14.180	1.1517	192
21:18:00	31.0	1958.7	148.77	13.968	1.1451	193
21:18:30	31.5	1959.1	148.77	13.762	1.1387	193
21:19:00	32.0	1959.5	148.72	13.562	1.1323	194
21:19:30	32.5	1960.0	148.72	13.369	1.1261	194
21:20:00	33.0	1960.4	148.68	13.182	1.1200	194
21:20:30	33.5	1960.8	148.68	13.000	1.1139	195
21:21:00	34.0	1961.2	148.63	12.824	1.1080	195
21:21:30	34.5	1961.6	148.63	12.652	1.1022	196
21:22:00	35.0	1962.0	148.59	12.486	1.0964	196
21:23:00	36.0	1962.7	148.55	12.167	1.0852	197
21:24:00	37.0	1963.5	148.51	11.865	1.0743	198

21:25:00	38.0	1964.2	148.47	11.579	1.0637	198
21:26:00	39.0	1964.9	148.43	11.308	1.0534	199
21:27:00	40.0	1965.6	148.40	11.050	1.0434	200
21:28:00	41.0	1966.2	148.36	10.805	1.0336	200
21:29:00	42.0	1966.8	148.33	10.571	1.0241	201
21:30:00	43.0	1967.4	148.29	10.349	1.0149	201
21:31:00	44.0	1968.0	148.26	10.136	1.0059	202
21:32:00	45.0	1968.6	148.23	9.933	0.9971	203
21:33:00	46.0	1969.1	148.20	9.739	0.9885	203
21:34:00	47.0	1969.6	148.18	9.553	0.9801	204
21:35:00	48.0	1970.2	148.15	9.375	0.9720	204
21:36:00	49.0	1970.7	148.12	9.204	0.9640	205
21:37:00	50.0	1971.1	148.09	9.040	0.9562	205
21:38:00	51.0	1971.6	148.06	8.882	0.9485	206
21:39:00	52.0	1972.1	148.04	8.731	0.9411	206
21:40:00	53.0	1972.5	148.02	8.585	0.9337	206
21:41:00	54.0	1973.0	147.99	8.444	0.9266	207
21:42:00	55.0	1973.4	147.97	8.309	0.9196	207
21:43:00	56.0	1973.8	147.94	8.179	0.9127	208
21:44:00	57.0	1974.2	147.91	8.053	0.9059	208
21:45:00	58.0	1974.6	147.89	7.931	0.8993	209
21:46:00	59.0	1975.0	147.86	7.814	0.8928	209
21:47:00	60.0	1975.3	147.84	7.700	0.8865	209
21:48:00	61.0	1975.7	147.82	7.590	0.8803	210
21:49:00	62.0	1976.1	147.79	7.484	0.8741	210
21:50:00	63.0	1976.5	147.77	7.381	0.8681	211
21:52:00	65.0	1977.2	147.73	7.185	0.8564	211
21:54:00	67.0	1977.8	147.69	7.000	0.8451	212
21:56:00	69.0	1978.4	147.65	6.826	0.8342	212
21:58:00	71.0	1979.0	147.61	6.662	0.8236	213
22:00:00	73.0	1979.6	147.59	6.507	0.8134	214
22:02:00	75.0	1980.1	147.57	6.360	0.8035	214
22:04:00	77.0	1980.7	147.55	6.221	0.7938	215
22:06:00	79.0	1981.2	147.52	6.089	0.7845	215
22:08:00	81.0	1981.7	147.49	5.963	0.7755	216
22:10:00	83.0	1982.1	147.46	5.843	0.7667	216
22:12:00	85.0	1982.6	147.42	5.729	0.7581	217
22:14:00	87.0	1983.1	147.39	5.621	0.7498	217
22:16:00	89.0	1983.5	147.36	5.517	0.7417	217
22:18:00	91.0	1983.9	147.33	5.418	0.7338	218
22:20:00	93.0	1984.3	147.32	5.323	0.7261	218
22:22:00	95.0	1984.8	147.30	5.232	0.7186	219
22:24:00	97.0	1985.1	147.27	5.144	0.7113	219
22:26:00	99.0	1985.5	147.25	5.061	0.7042	220
22:28:00	101.0	1985.8	147.22	4.980	0.6972	220

22:30:00	103.0	1986.3	147.20	4.903	0.6905	220
22:32:00	105.0	1986.6	147.17	4.829	0.6838	221
22:34:00	107.0	1986.9	147.15	4.757	0.6773	221
22:36:00	109.0	1987.2	147.13	4.688	0.6710	221
22:38:00	111.0	1987.5	147.11	4.622	0.6648	221
22:40:00	113.0	1987.9	147.09	4.558	0.6587	222
22:42:00	115.0	1988.2	147.07	4.496	0.6528	222
22:44:00	117.0	1988.5	147.05	4.436	0.6470	222
22:46:00	119.0	1988.8	147.03	4.378	0.6413	223
22:48:00	121.0	1989.1	147.01	4.322	0.6357	223
22:50:00	123.0	1989.3	146.99	4.268	0.6303	223
22:52:00	125.0	1989.7	146.97	4.216	0.6249	224
22:54:00	127.0	1989.9	146.95	4.165	0.6197	224
22:56:00	129.0	1990.2	146.94	4.116	0.6145	224
22:58:00	131.0	1990.4	146.92	4.069	0.6095	224
23:00:00	133.0	1990.7	146.91	4.023	0.6045	225
23:02:00	135.0	1990.9	146.89	3.978	0.5996	225
23:04:00	137.0	1991.1	146.88	3.934	0.5949	225
23:06:00	139.0	1991.4	146.87	3.892	0.5902	225
23:08:00	141.0	1991.7	146.85	3.851	0.5856	226
23:10:00	143.0	1991.8	146.84	3.811	0.5811	226
23:12:00	145.0	1992.1	146.81	3.772	0.5766	226
23:14:00	147.0	1992.3	146.80	3.735	0.5723	226
23:16:00	149.0	1992.5	146.77	3.698	0.5680	227
23:18:00	151.0	1992.8	146.75	3.662	0.5637	227
23:20:00	153.0	1993.0	146.73	3.627	0.5596	227
23:22:00	155.0	1993.2	146.72	3.594	0.5555	227
23:24:00	157.0	1993.4	146.70	3.561	0.5515	227
23:26:00	159.0	1993.6	146.69	3.528	0.5476	228
23:28:00	161.0	1993.8	146.68	3.497	0.5437	228
23:30:00	163.0	1994.0	146.66	3.466	0.5399	228
23:32:00	165.0	1994.2	146.65	3.436	0.5361	228
23:34:00	167.0	1994.4	146.64	3.407	0.5324	228
23:36:00	169.0	1994.6	146.63	3.379	0.5287	229
23:38:00	171.0	1994.7	146.61	3.351	0.5252	229
23:40:00	173.0	1995.0	146.60	3.324	0.5216	229
23:41:00	174.0	1995.0	146.59	3.310	0.5199	229
23:42:00	175.0	1995.2	146.59	3.297	0.5181	229
23:43:00	176.0	1995.2	146.58	3.284	0.5164	229
23:44:00	177.0	1995.3	146.58	3.271	0.5147	229
23:45:00	178.0	1995.4	146.57	3.258	0.5130	229
23:46:00	179.0	1995.5	146.57	3.246	0.5113	229
23:47:00	180.0	1995.5	146.56	3.233	0.5097	230
23:48:00	181.0	1995.6	146.56	3.221	0.5080	230
23:49:00	182.0	1995.8	146.54	3.209	0.5063	230

23:50:00	183.0	1995.8	146.54	3.197	0.5047	230
23:51:00	184.0	1995.9	146.53	3.185	0.5031	230
23:52:00	185.0	1995.9	146.53	3.173	0.5015	230
23:53:00	186.0	1996.0	146.51	3.161	0.4999	230
23:54:00	187.0	1996.2	146.51	3.150	0.4983	230
23:55:00	188.0	1996.2	146.50	3.138	0.4967	230
23:56:00	189.0	1996.3	146.50	3.127	0.4951	230
23:57:00	190.0	1996.4	146.49	3.116	0.4936	230
23:58:00	191.0	1996.5	146.49	3.105	0.4920	230
23:59:00	192.0	1996.6	146.47	3.094	0.4905	231
00:01:00	194.0	1996.7	146.46	3.072	0.4874	231
00:02:00	195.0	1996.8	146.46	3.062	0.4859	231
00:03:00	196.0	1996.8	146.45	3.051	0.4844	231
00:04:00	197.0	1996.9	146.45	3.041	0.4830	231
00:05:00	198.0	1997.0	146.43	3.030	0.4815	231
00:06:00	199.0	1997.1	146.43	3.020	0.4800	231
00:07:00	200.0	1997.1	146.42	3.010	0.4786	231
00:08:00	201.0	1997.3	146.42	3.000	0.4771	231
00:09:00	202.0	1997.2	146.41	2.990	0.4757	231
00:10:00	203.0	1997.4	146.41	2.980	0.4743	231
00:11:00	204.0	1997.4	146.40	2.971	0.4728	231
00:12:00	205.0	1997.5	146.40	2.961	0.4714	232
00:13:00	206.0	1997.5	146.39	2.951	0.4700	232
00:14:00	207.0	1997.7	146.39	2.942	0.4686	232
00:16:00	209.0	1997.8	146.38	2.923	0.4659	232
00:17:00	210.0	1997.8	146.37	2.914	0.4645	232
00:18:00	211.0	1997.9	146.37	2.905	0.4632	232
00:19:00	212.0	1998.0	146.35	2.896	0.4618	232
00:20:00	213.0	1998.1	146.35	2.887	0.4605	232
00:21:00	214.0	1998.2	146.34	2.879	0.4592	232
00:37:08	230.1	1999.3	146.34	2.747	0.4388	233
00:38:00	231.0	1999.3	146.24	2.740	0.4378	233
00:39:00	232.0	1999.3	146.23	2.733	0.4366	233
00:40:00	233.0	1999.3	146.23	2.725	0.4354	233
00:41:00	234.0	1999.5	146.22	2.718	0.4342	234
00:42:00	235.0	1999.5	146.22	2.711	0.4331	234
00:43:00	236.0	1999.6	146.21	2.703	0.4319	234
00:44:00	237.0	1999.7	146.21	2.696	0.4308	234
00:45:00	238.0	1999.7	146.21	2.689	0.4296	234
00:46:00	239.0	1999.8	146.21	2.682	0.4285	234
00:47:00	240.0	1999.8	146.20	2.675	0.4273	234
00:48:00	241.0	1999.9	146.20	2.668	0.4262	234
00:49:00	242.0	2000.0	146.18	2.661	0.4251	234
00:50:00	243.0	2000.0	146.18	2.654	0.4240	234
00:51:00	244.0	2000.2	146.17	2.648	0.4228	234

00:52:00	245.0	2000.1	146.17	2.641	0.4217	234
00:53:00	246.0	2000.2	146.16	2.634	0.4206	234
00:54:00	247.0	2000.3	146.16	2.628	0.4195	234
00:55:00	248.0	2000.3	146.15	2.621	0.4185	234
00:56:00	249.0	2000.4	146.15	2.614	0.4174	234
00:57:00	250.0	2000.4	146.14	2.608	0.4163	234
00:58:00	251.0	2000.5	146.14	2.602	0.4152	234
00:59:00	252.0	2000.6	146.13	2.595	0.4142	235
01:00:00	253.0	2000.6	146.13	2.589	0.4131	235
01:01:00	254.0	2000.7	146.12	2.583	0.4121	235
01:02:00	255.0	2000.7	146.12	2.576	0.4110	235
01:03:00	256.0	2000.8	146.12	2.570	0.4100	235
01:04:00	257.0	2000.8	146.12	2.564	0.4090	235
01:05:00	258.0	2000.9	146.11	2.558	0.4079	235
01:06:00	259.0	2001.0	146.11	2.552	0.4069	235
01:07:00	260.0	2001.0	146.10	2.546	0.4059	235
01:08:00	261.0	2001.0	146.10	2.540	0.4049	235
01:10:00	263.0	2001.2	146.09	2.529	0.4029	235
01:12:00	265.0	2001.3	146.08	2.517	0.4009	235
01:14:00	267.0	2001.3	146.07	2.506	0.3989	235
01:16:00	269.0	2001.4	146.07	2.494	0.3970	235
01:18:00	271.0	2001.6	146.06	2.483	0.3950	236
01:20:00	273.0	2001.7	146.05	2.473	0.3931	236
01:22:00	275.0	2001.8	146.04	2.462	0.3913	236
01:24:00	277.0	2001.9	146.03	2.451	0.3894	236
01:26:00	279.0	2002.0	146.02	2.441	0.3875	236
01:28:00	281.0	2002.1	146.01	2.431	0.3857	236
01:30:00	283.0	2002.2	146.00	2.420	0.3839	236
01:32:00	285.0	2002.2	145.99	2.411	0.3821	236
01:34:00	287.0	2002.4	145.99	2.401	0.3803	236
01:36:00	289.0	2002.5	145.97	2.391	0.3786	236
01:38:00	291.0	2002.6	145.96	2.381	0.3768	237
01:40:00	293.0	2002.6	145.95	2.372	0.3751	237
01:42:00	295.0	2002.7	145.94	2.363	0.3734	237
01:44:00	297.0	2002.8	145.93	2.354	0.3717	237
01:46:00	299.0	2002.9	145.92	2.344	0.3700	237
01:48:00	301.0	2003.0	145.91	2.336	0.3684	237
01:50:00	303.0	2003.1	145.90	2.327	0.3667	237
01:52:00	305.0	2003.2	145.89	2.318	0.3651	237
01:54:00	307.0	2003.3	145.88	2.309	0.3635	237
01:56:00	309.0	2003.4	145.87	2.301	0.3619	237
01:58:00	311.0	2003.5	145.86	2.293	0.3603	237
02:00:00	313.0	2003.6	145.85	2.284	0.3588	238
02:02:00	315.0	2003.7	145.84	2.276	0.3572	238
02:04:00	317.0	2003.7	145.83	2.268	0.3557	238

02:06:00	319.0	2003.8	145.82	2.260	0.3541	238
02:08:00	321.0	2003.9	145.81	2.252	0.3526	238
02:10:00	323.0	2004.0	145.80	2.245	0.3511	238
02:12:00	325.0	2004.0	145.79	2.237	0.3497	238
02:14:00	327.0	2004.1	145.78	2.229	0.3482	238
02:16:00	329.0	2004.2	145.77	2.222	0.3467	238
02:18:00	331.0	2004.3	145.77	2.215	0.3453	238
02:20:00	333.0	2004.4	145.76	2.207	0.3438	238
02:22:00	335.0	2004.5	145.75	2.200	0.3424	238
02:24:00	337.0	2004.5	145.75	2.193	0.3410	239
02:26:00	339.0	2004.6	145.75	2.186	0.3396	239
02:28:00	341.0	2004.7	145.74	2.179	0.3382	239
02:30:00	343.0	2004.7	145.73	2.172	0.3369	239
02:32:00	345.0	2004.8	145.72	2.165	0.3355	239
02:36:00	349.0	2005.0	145.70	2.152	0.3328	239
02:40:00	353.0	2005.2	145.68	2.139	0.3302	239
02:44:00	357.0	2005.3	145.66	2.126	0.3276	239
02:48:00	361.0	2005.4	145.64	2.114	0.3250	239
02:52:00	365.0	2005.6	145.63	2.101	0.3225	240
02:56:00	369.0	2005.7	145.61	2.089	0.3200	240
03:00:00	373.0	2005.8	145.59	2.078	0.3176	240
03:04:00	377.0	2006.0	145.58	2.066	0.3152	240
03:08:00	381.0	2006.1	145.56	2.055	0.3128	240
03:12:00	385.0	2006.2	145.55	2.044	0.3105	240
03:16:00	389.0	2006.4	145.53	2.033	0.3082	240
03:20:00	393.0	2006.5	145.52	2.023	0.3060	241
03:24:00	397.0	2006.6	145.50	2.013	0.3038	241
03:28:00	401.0	2006.8	145.49	2.002	0.3016	241
03:32:00	405.0	2006.9	145.48	1.993	0.2994	241
03:36:00	409.0	2007.0	145.47	1.983	0.2973	241
03:40:00	413.0	2007.1	145.46	1.973	0.2952	241
03:44:00	417.0	2007.2	145.45	1.964	0.2931	241
03:48:00	421.0	2007.3	145.43	1.955	0.2911	241
03:52:00	425.0	2007.5	145.42	1.946	0.2891	241
03:56:00	429.0	2007.6	145.41	1.937	0.2871	242
04:00:00	433.0	2007.7	145.40	1.928	0.2852	242
04:10:00	443.0	2007.9	145.40	1.907	0.2805	242
04:20:00	453.0	2008.2	145.38	1.887	0.2759	242
04:30:00	463.0	2008.5	145.35	1.868	0.2714	242
04:40:00	473.0	2008.8	145.33	1.850	0.2671	243

APPENDIX A3. <u>R I G P O S I T I O N I N G R E P O R T</u>

APPENDIX A3

WEST SEAHORSE-1

RIG POSITIONING REPORT

P.A. CARTER

SEPTEMBER, 1981

TABLE OF CONTENTS

INTRODUCTION

The West Seahorse-1 well location is in the south-west corner of the Vic/P-11 permit block and four kilometres west of the Seahorse-1 oil discovery.

The proposed location for West Seahorse was S.P. 152.8 on line GB81-1A. The co-ordinates for this position were:

Latitude 38^{o} 12' 16.93" South
Longitude 147^{o} 37' 21.88" East

UTM co-ordinates from central Meridian 147^{o}

554523 metres East
5771275 metres North

Water Depth: 40 metres

The positioning survey consisted of four phases:

1. Setting up the Trisponder survey
2. Checking the survey system
3. Positioning and setting the anchor buoys.
4. Determining the final rig position.

The survey system consisted of a Trisponder System and a JMR-4 satellite receiver both supplied and operated by Decca Survey Australia. The Trisponder net was the primary navigation system used for positioning the rig with the satellite navigation providing an independent check on the system and a 100% back-up if the Trisponder system did not function. A licensed surveyor, contracted from Navigation Australia, was on board the "Yardie Creek" during the positioning of the "Petromar North Sea" to verify all readings during the positioning operations.

Independent reports were prepared by Navigation Australia and Decca Survey Australia.

CONCLUSION

The "Petromar North Sea" was moored in the final position for the West Seahorse-1 well on September 16, 1981. The calm seas and good Trisponder signals allowed the rig to be positioned and moored within twenty one hours. The Trisponder system proved to be both accurate and reliable throughout the whole operation.

Final position for West Seahorse-1

Latitude	38^{o}	12'	17.17"	South
Longitude	147^{o}	37'	21.70"	East

UTM co-ordinates from the 147^{o} central Meridian:

Australian Map Grid: Zone 55

Northing	5771267 metres
Easting	554519 metres

Proposed location to final location 9 metres at a bearing of 206^{o}.

JMR-4 Satellite Doppler observations were taken on board the "Petromar North Sea" to check the location of West Seahorse-1 which had been established by Trisponder observations. The final Satellite position (Lat. 38^{o} 12' 17.288", Long. 147^{o} 37' 21.504") was very close to the Trisponder location.

DAILY LOG

Friday - September 11

0800 P. Carter and R. Keene (Navigation Australia's surveyor) departed Melbourne for Port Welshpool.

1100 Arrived Port Welshpool. Checked "Yardie Creek" and found Decca personnel, Trisponder equipment and JMR-4 receiver installed. Base plate guide also aboard.

Saturday - September 12

Rough seas in survey area. Waiting on rig.

Sunday - September 13

0930 "Yardi Creek" departed Port Welshpool enroute to Vic/P-11 permit block.

1710 Arrived at Seahorse buoy. Checked Trisponder location with known location of Seahorse buoy. Trisponder net checked out (3 way fix 1m).

1840 Headed for anchorage closer to shore. Seas moderate.

Monday - September 14

0700 Departed anchorage enroute to West Seahorse-1 location.

0745 Arrived on location and proceeded to position marker buoys. Seas calm. Trisponder signals excellent.

1030 All anchor buoys and Moon Pool buoy positioned and double checked. Two good satellite fixes placed Moon Pool within 20 metres of Trisponder location.

1100 Anchored within marker buoy pattern. Alterted local fishing fleet of rig positioning.

Tuesday - September 15

0530 "Petromar North Sea" within 5 km of location. Seas calm. Yardie Creek checked Moon Pool buoy location (within 25m of proposed location due to ocean current).

0945 "Lady Joyce" dropped #5 anchor. "Sea Emerald" towed rig towards Moon Pool buoy.

1200 "Sea Emerald" dropped #1 anchor. Rig blown south of proposed location.

1400 Four anchors dropped. First Trisponder fix on the rig, 150m S.S.E. of proposed location.

1720 All anchors in position. Petromar North Sea 25 metres N.W. of proposed location. Trisponder signals very good. (3 way fix: 4m).

1900 HOAL Perth office informed of rigs location.

Wednesday - September 16

0000 Commenced tensioning up anchors. Satellite fix placed position within 20 metres of Trisponder location.

0330 Completed tensioning up. Rig 10m off proposed location at a bearing of 210^{o}. Trisponder signals good.

0410 Phoned R. Keto, Perth. Rig location accepted. Rig still 10m off location at 210^{o}. Three way fix: 3m.

0810 Position by Trisponder:

Latitude 38^{o} 12' 17.3"
Longitude 147^{o} 37' 21.7"

UTM co-ordinates
5771262 N.
554520 E.

No satellite fixes since 0330. Decca remained on board to take further satellite passes and determine final Trisponder position.

0830 P. Carter and R. Keene departed rig by helicopter for Bairnsdale.

0845 Arrived Bairnsdale

0915 Departed Bairnsdale

1045 Arrived Melbourne

1900 Departed Melbourne

2130 Arrived Perth.

RIG LOCATION AND BUOY PATTERN

Proposed Location

The proposed location for West Seahorse-1 was shotpoint 152.8 on line GB81-1A.

The co-ordinates for this position were:

Latitude 38° 12' 16.93" South
Longitude 147° 37' 21.83" East

UTM co-ordinates from central Meridian 147°

554523 metres East
5772375 metres North

Water depth: 40 metres.

The following base stations were used for the Trisponder survey net:

	Easting	Northing
Mt. Nowa Nowa Tower	596073.9	5827551.6
Mt. Taylor Tower	549316.2	5826499.9
Longford Tower	513544.2	5769507.0
Jimmys Lookout Tower (Back-up)	584670.0	5806793.0

Distances to West Seahorse-1 from base stations:

Mt. Nowa Nowa Tower	69980 metres
Mt. Taylor Tower	55494 metres
Longford Tower	41033 metres
Jimmys Lookout Tower	46603 metres

Anchor Pattern

The optimum bow heading for the "Petromar North Sea" was decided as 230°. Using this heading the position of the anchors was determined graphically.

The following table lists the positions:

Anchor Number	Bearing	Northing	Easting
1	260°	5771180	554028
2	290°	5771412	554056
3	350°	5771764	554488

4	020°	5771738	554731
5	080°	5771369	555023
6	110°	5771127	554993
7	170°	5770790	554551
8	200°	5770818	554308

Nine marker buoys were used for the positioning, eight anchor buoys and one Moon Pool buoy. They consisted of 2-inch pipe, approximately eighteen feet long, with a Norwegian buoy at the centre, a 2 foot length section of chain attached to the bottom and a coloured pennant attached to the top. These were anchored by 3, three foot lengths of steel railing, each weighing 150 LBS. Three small concrete cylinders were also attached to the base of buoy in order to keep the pipe vertical.

Forty seven metres of rope were used at each marker buoy. This allowed a maximum swing of 25 metres. A full set of spare marker buoys, weights and ropes were left aboard the "Yardie Creek".

SURVEY NET VERIFICATION

A large buoy marking the location of the Seahorse-1 well was used to verify the Trisponder survey net. Decca supplied the exact location of the buoy knowing its maxium radius of drift, 49 metres, and the direction of the ocean currents. Decca obtained this information from Esso Australia.

By positioning the Yardie Creek alongside the Seahorse-1 buoy and comparing the Trisponder location with the known location a concrete check was made. The Trisponder system located the buoy to within 1 metre of its known location.

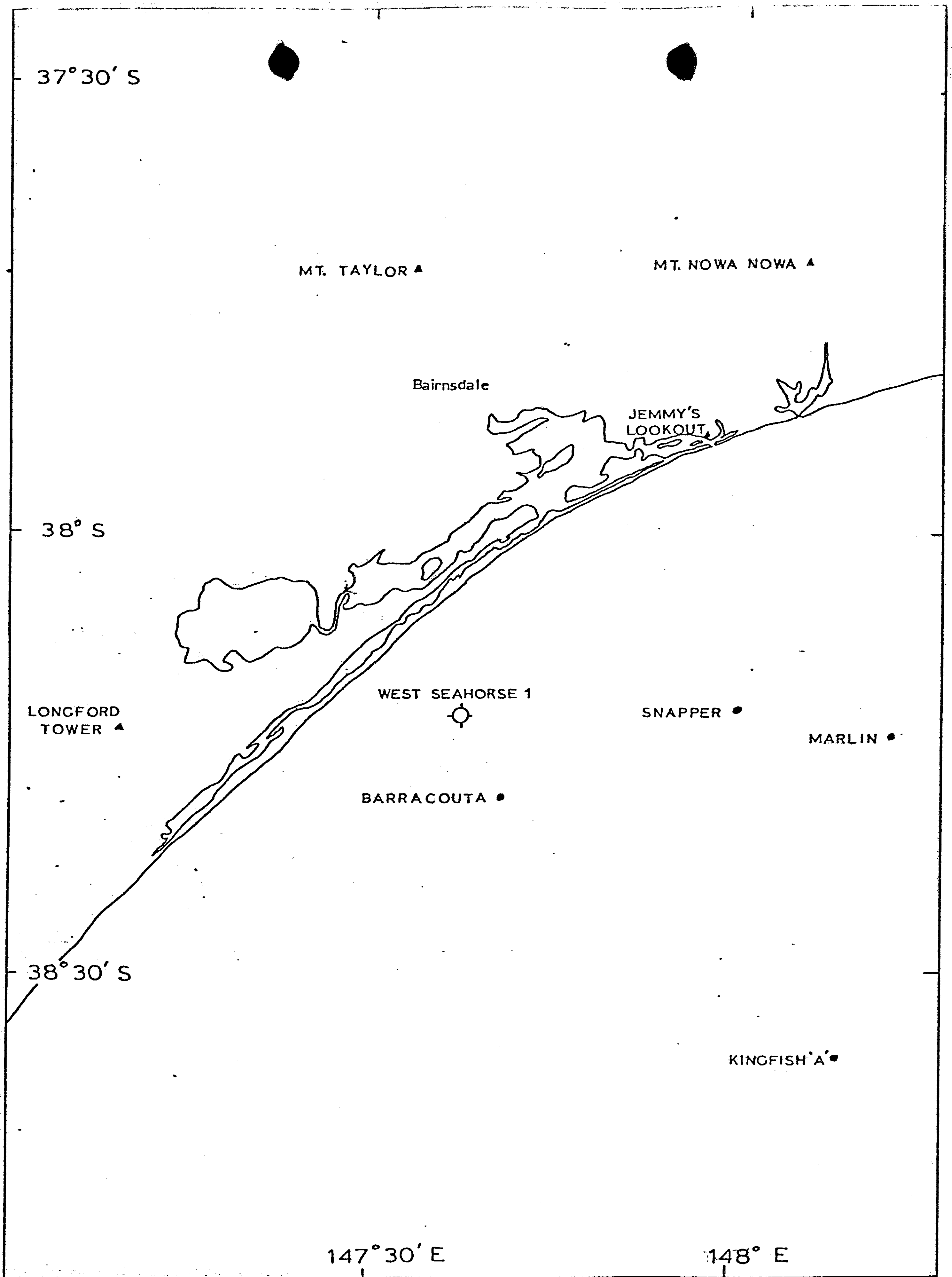
The JMR-4 Satellite Doppler receiver was also used to check the Trisponder survey net. The location of the Moon Pool buoy was checked with the JMR-4 and after two passes found to be within 15 metres of the Trisponder location. The final position for West Seahorse-1 was also checked with the satellite receiver. Twenty one passes were taken over a period of three days.

Final Satellite Position		Final Trisponder Position
5771264	Northing	5771267
554514	Easting	554519

Thus there is a very close agreement between the Satellite location and the Trisponder position.

PERSONNEL

Ian Freeman	Decca Survey Australia
Rod Keene	Navigation Australia
Paul Carter	Hudbay Oil (Australia) Ltd.



APPENDIX 1

AREA OF OPERATIONS

H U D B A Y   P R O J E C T

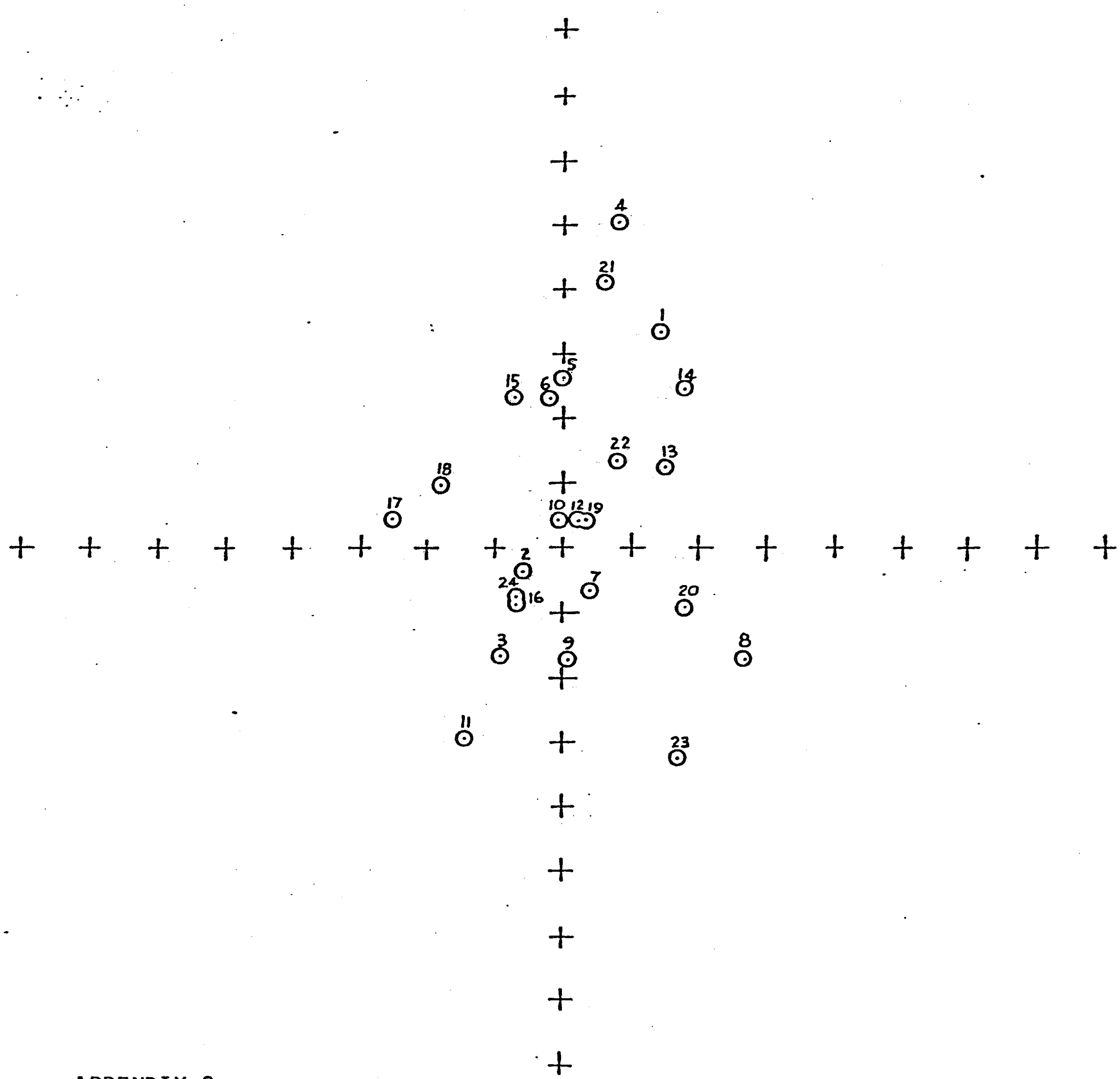
EST SEAHORSE-1 LOCATION

DSA 1118

Moonpool position	Latitude	Longitude
A.G.D.	38° 12' 17".288 South	147° 37' 21".504 East

SCATTER PLOT OF ACCEPTED PASSES

SCALE 1:1000

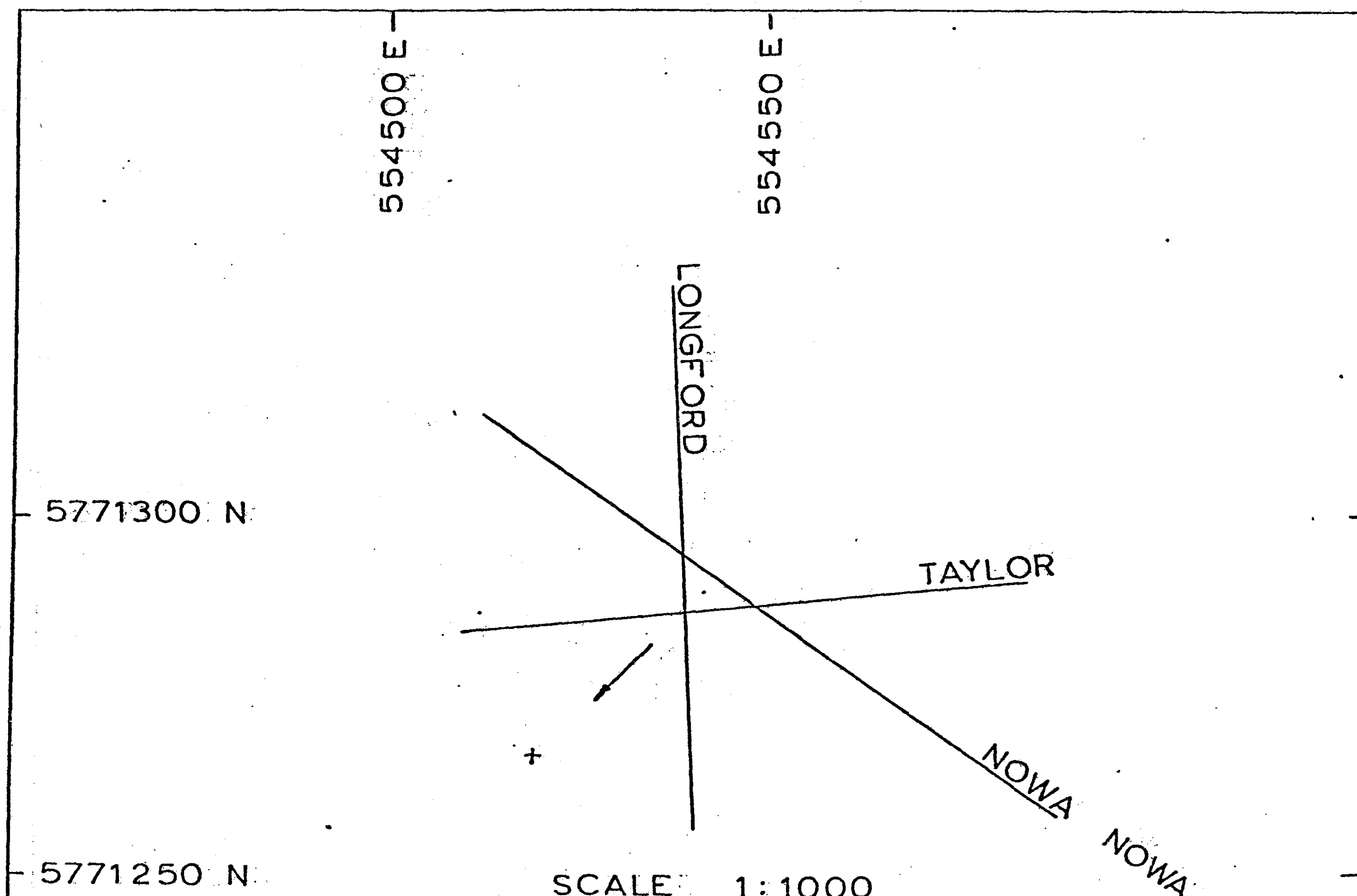


APPENDIX 2

THREE POINT SIX

DRILL STEM

EASTING 554519
NORTHING 5771267



STATION	RANGE
LONGFORD TOWER	41051
MT TAYLOR TOWER	55484
MT NOWA NOWA TOWER	69954

OFFSET ANTENNA TO DRILLSTEM BRG. 225°
DIST. 32.5m

APPENDIX 3

3.0 GEOLOGY

(Pages 15-40)

3.0 GEOLOGY

3.1 Summary of Previous Investigations

Gippsland Basin exploration commenced in 1924 with the reported discovery of oil and gas in a water bore drilled onshore near Lakes Entrance. To date, over 125 wells have been drilled in the onshore part of the basin but only minor hydrocarbon accumulations have been encountered.

Initial exploration in the offshore Gippsland Basin was conducted by the Bureau of Mineral Resources when they undertook a regional gravity and aeromagnetic survey between 1951 and 1956. The first permits, covering a large part of the offshore Gippsland Basin, were taken up by BHP Co. Ltd. (later Hematite Petroleum Pty. Ltd.) in 1960. Esso joined the original permittee in 1964 and the first offshore well, Barracouta No.1, was drilled in 1965. Over eighty offshore wells have now been drilled in the basin resulting in the discovery of recoverable reserves approximately 3 billion barrels (0.466×10^{12} m^3) of oil and 8 trillion cubic feet (220.4×10^{12} m^3) of gas.

A summary of early contributions to the understanding of the geology and hydrocarbon potential of the Gippsland Basin was presented by W.F. Threlfall and others in 1974. Esso-BHP have published several papers on basinal stratigraphy and geological evolution during their exploration and development of the basin, and papers dealing with the geology of individual fields have been published as the fields were developed.

Exploration Permit Vic/P-11 consists of 51 blocks which previously formed parts of the Exploration Permits Vic/P-1 and Vic/P-8, held by Esso-BHP and a consortium headed by BOC Australia respectively. The area now covered by Vic/P-11 was gazetted in December 1976 and applications for the permit were invited. The permit was granted to Gas and Fuel Corporation of Victoria on August 8, 1978, and Beach Petroleum subsequently became joint Permittee and Operator.

Hudbay Oil (Australia) Ltd. farmed into the Permit in December, 1980, and in February 1981 shot the GB81 Seismic Survey, consisting of 359 line kilometres of 36-fold seismic survey. Detailed mapping, incorporating data from the GB81 survey, Beach Petroleum's GB79 Seismic Survey and trade data from Esso's G80A Seismic Survey, defined several prospects. West Seahorse-1 was the first of these to be drilled, and was the first well to be drilled by HOAL outside Western Australian waters.

3.2 Geological Setting

3.2.1 Regional Setting

The West Seahorse structure lies towards the northern margin of the Gippsland Basin, which is situated in south-eastern Australia and is bounded to the north and south by the Victorian Highlands and Bassian Rise respectively (Enclosure 2). The western limit of the basin is taken as the Mornington Peninsula and to the east the basin opens to the Tasman Sea. The Gippsland Basin covers approximately 50,000 km^2 and is filled with up to 10,000 metres of Lower Cretaceous to Recent sediments.

3.2.2 Tectonic Elements (Enclosure 2)

The offshore Gippsland Basin is separated by fault complexes into three major divisions: The North Platform, or Lakes Entrance Platform; the graben-like Central Deep or Strzelecki Basin; and the South Platform (Hocking & Taylor, 1964; James and Evans, 1971; Hocking, 1972).

The stable platforms to the north and south are areas where the Tertiary sequence unconformably overlies Palaeozoic basement. In these areas the structures within the Tertiary section consist simply of small-scale drapes over palaeo-topographic ridges and small fault scarps.

The Southern Platform is separated from the Central Deep Basin by a major fault complex, the South Bounding Fault. This is an offshore extension of the Foster Fault System and consists of a system of down-to-basin normal faults arranged en echelon. The northern boundary of the Central Deep is less well defined.

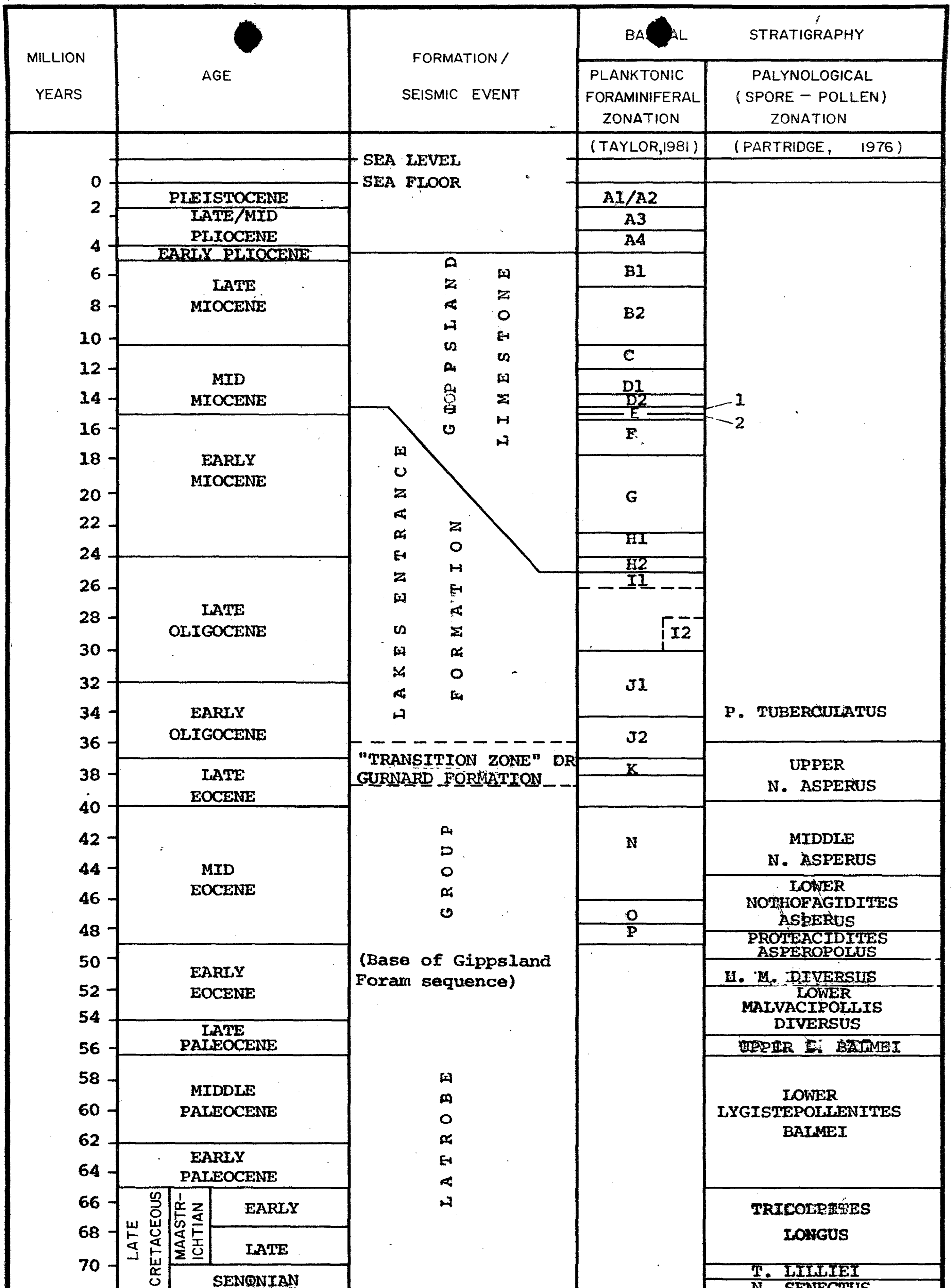
Major fault trends within the central part of the basin are offshore extensions of the southwest-northeast trending Yarram Fault and the antithetic, east-west trending Rosedale Fault System. The latter is known to be a reverse fault superimposed upon an older normal fault within the Lower Cretaceous, and to have a throw of up to 160 metres in the West Seahorse area. Reverse movement along the fault system is believed to have occurred as a result of the same stresses that led to the development of the major anticlines in the central basin during the late Eocene to early Oligocene. Numerous northwest-southeast, basin-forming normal faults have been recognized within the Central Deep.

The major hydrocarbon-bearing anticline structures in the central basin are elongate, with a dominant southwest-northeast axial trend. They were formed by right-lateral, convergent shearing brought about by the movement of continental plates, as will be discussed in Section 3.2.3. The main hydrocarbon traps in the Vic/P-11 Permit were formed as a result of the same shearing stress, resulting in arching associated with reverse movement superimposed upon older normal faults.

3.2.3 Geological Evolution and Regional Stratigraphy (Figure 2)

During the Lower to Middle Palaeozoic a series of major orogenies occurred within the Tasman Geosyncline. this resulted in a dominantly north-south structural grain within the tightly folded and faulted Palaeozoic metamorphics. These geosynclinal sediments were subsequently intruded by Lower Devonian granitic rocks. A major rift formed across southern Australia during the Jurassic due to the operation of the Antarctic and Australian cratons. The rift valley formed over the entire length of the present southern coast of Australia. Into this major depositional axis a typical sequence of rift valley sediments was rapidly deposited, as clastics were stripped from the adjacent Palaeozoic highlands. The initial deposits of the Upper Jurassic to Lower Neocomian consists of conglomeratic wedges and alluvial fan detritus, commonly of a quartzose sandstone nature. Jurassic intrusives and Lower Cretaceous extrusives, both associated with rifting, provided a major provenance for the 3,500 metres of Lower Cretaceous Strzelecki Group sediments.

During Lower Cretaceous times, the Gippsland Basin formed a half graben with the major subsidence along the southern Foster Fault system. The Strzelecki Group sediments are texturally mature but mineralogically immature, being felspathic and chloritic. They consist of a monotonous,



Author: B. Butcher

Drawn: A. Clark

Date: April 1982

Hudbay Oil (Australia) Ltd.

OFFSHORE GIPPSLAND BASIN

REGIONAL STATIGRAPHIC COLUMN

Scale:

Drawing Nº A4-GL-490

Figure 2

cyclic sequence of interbedded sands, silts and muds deposited on a subsiding fluvial plain. A large east-west rift developed, separating sediments of the Tasman Geosyncline. The eastern end of this rift is believed to have terminated in a triple junction formed by the Australian, Antarctic and Lord Howe Rise plates. The western arm of the triple junction was coincident with the ancestral Otway and Gippsland Basins and, as this arm of the triple junction failed during the Turonian, the Lord Howe Rise plate moved eastwards away from the Australian-Antarctic plate. This resulted in the rifting of the eastern portion of the Antarctic and Australian plates along a line parallel to, and off the west coast of,Tasmania. Therefore the Tasmanian craton remained attached to the Australian plate but was separated from it by an east-west, aborted,rift valley basin.

The Lower Cretaceous Strzelecki Group sediments are unconformably overlain by up to 5,000 metres of fluviatile and lacustrine Latrobe Group sediments. Upper Cretaceous sedimentation tended to be superimposed on the underlying Strzelecki Group with the deposition of shales, minor coals and poorly sorted sandstones in a fluviatile environment. In the early Senonian, approximately 85 million years B.P., the Lord Howe Rise Plate moved away, resulting in the deposition of a complex system of fluvial and deltaic plain sediments sourced from the northwest and north. Growth and movement on the basin-forming normal faults resulted in continued subsidence of the basin during the Palaeocene and Eocene.

The northern part of the basin was uplifted as fault movement elsewhere in the basin lessened during the Eocene. A period of submarine and subaerial channel-cutting occurred during the Middle to Upper Eocene in the Tuna-Flounder area. The channel-cutting marked the onset of a marine transgression from the southeast during the uppermost Eocene to Lower Oligocene, a period of instability and basin tilting. The en echelon disposition of the fold trends and fault systems is most likely the result of Upper Eocene east-west, right lateral, convergent shear deformation. The crestal areas of the folds were subsequently eroded during an associated period of relative sea level drop, while the deeper parts of the basin continued to receive sediments. The compressional regime reactivated the severe channeling and the Marlin Channel was formed as subaerial and submarine drainage systems were laterally restricted.

The transgression continued into the Lower Oligocene with the deposition of the shallow water glauconitic sands and silts of the Gurnard Formation. Around the margins of the basin, sand buildups occurred as the transgression reached its maximum extent. During the uppermost Eocene to Lower Oligocene, a marked change in sediment type occurred: the fluvial and deltaic coarse grained clastics were replaced by fine grained, calcareous shales and marls. The change in sediment type may be due, in part, to a change in provenance related to the widespread deposition onshore of volcanics during the Upper Eocene wrenching episode.

Sea level fluctuations during the Miocene produced a complex system of interfingering and overlapping channels, which cut into the soft limestones and marls of the Lakes Entrance Formation and Gippsland Limestone. A linear, submarine slump zone of over 125 kilometres in length has been observed along the major south-bounding fault system. A wedge of sediment moved towards the centre of the basin as a result of reactivation of this fault system during the Miocene, and a major cratonic uplift, the Kosciusko Uplift, occurred during the Upper Pliocene and Lower Pleistocene. The Victorian Highlands were uplifted and provided a renewed clastic provenance, while faults and associated structures around the northern margins of the basin were rejuvenated. Extensive erosion is currently occurring in the Strzelecki Hills and a relatively thin veneer of Quarternary sediments is being deposited across the southeastern Gippsland coastal plain.

3.3 Stratigraphy

A sedimentary section ranging in age from Recent to Upper Cretaceous (Senonian) was penetrated in West Seahorse No.1 (Figure 3).

Age determinations are based upon palaeontological and palynological studies of sidewall cores (Appendices B1 and B2). The boundaries of individual units were established by using the age determinations in conjunction with lithological data from the microscopic examination of drill cuttings and sidewall cores, and wireline log interpretations. Time-rock subdivisions were placed midway between sidewall core points, unless more accurate subdivisions were made possible by log response or cuttings lithology.

Owing to the standard practice of not installing a marine riser until after the setting of the 20 inch casing, no samples were recovered from the seabed to 189 metres.

The stratigraphy encountered in the well is described below. All depths quote are below the Rotary Table, which is 9.45 metres above Mean Spring Low Water.

Upper Cretaceous (2093 - 2490 metres)

Underlying the Palaeocene is a conformable non-marine sequence of medium and coarse grained sandstones, with minor interbeds of siltstone and claystone, plus occasional thin coal seams. The sandstones show an increasing degree of recrystallisation with depth, and below 2310 metres have been cemented by dolomite.

Lower Eocene to Palaeocene (1395.5 - 2093 metres)

The Latrobe Group sediments underlying the transition zone are represented by non-marine sequence of coarse sandstones, siltstones and minor claystones, with abundant coal in the section above 1800 metres. Above 1422 metres no reliable palynological dating could be obtained, but samples between 1422-1468 m were assigned to the M. diversus biostratigraphic zone. Between 1651-2083 metres the rocks were again largely devoid of diagnostic palynomorphs, but recognition of L. balmei in a few samples enabled the assignation of a Palaeocene age.

?Latest Oligocene to Lower Eocene (1344.5 - 1395.5 metres)

The interval between 1344.5 metres and 1395.5 metres was devoid of diagnostic planktonic foraminifera and could not be assigned a definite age.

The glauconitic calcisiltites and calcilutites of this zone are distinguished from overlying lithologies by their high glauconite content, and appear to constitute a zone of transition between the marine sequence above and the non-marine lithologies below. The absence of sediments bearing Zone K/J planktonic foraminifera suggests a marked unconformity between the latest Eocene and latest Oligocene in West Seahorse No.1

Lower Miocene to Latest Oligocene (640 - 1344.5 metres)

Most of the Lower Miocene section above 930 metres is represented by recrystallised calcarenite with minor calcilutite, calcisiltite and very coarse quartz sand. Below 930 metres the lithology changes fairy rapidly to an interbedded sequence of calcisiltite/calcilutite and marl, which grades, with an incerasing porportion of clay minerals, to the calcareous claystones and carbonates of the Lakes Entrance Formation.

The uppermost part of the Lower Mioceen was deposited on a beach front, in water depths of less than 10 metres. This was transitional to a near shore canyon head (about 40 metres deep) at around 770 metres and to a submarine canyon between 802 and 1055 metres. Below 1100 metres, the unit was deposited in a mid-shelf environment, in water depths of 40-150 metres, and there is evidence of a rapid transgression at the base of this zone.

Middle Miocene (400 - 640 metres)

Below 400 metres the Middle Miocene consists of very coarse to medium skeletal fragments, calcilutite and calcisiltite, with minor quartz sandstone below 525 metres. A decrease with depth, in the average size of the skeletal fragments was apparent over this interval, and below 515 metres a gradually increasing degree of recrystallisation was observed.

The entire interval was deposited in an inner shelf environment, in water depths of 10-40 metres.

Recent to Middle Miocene (205 - 400 metres)

A carbonate sequence, consisting of varying proportions of skeletal fragments, calcite silt and micrite, with minor amounts of coarse quartz grains, was the first of the Gippsland Limestone logged in West Seahorse No.1. Faunal types recognized included corals, echinoids, pelecypods and forams, and fragment sizes were dominantly very coarse to rudaceous. The lower half of this zone was deposited in an inner shelf, seaweed zone in water depths of 10-40 metres.

STRATIGRAPHY.	PLANKTONIC FORAM ZONE	PALYNOLOGICAL (SPORE – POLLEN)	DRILL DEPTH	SUBSEA DEPTH	EVENT	DEPOSITIONAL ENVIRONMENT
	(TAYLOR, 1981)	(PARTRIDGE, 1976)				
			9.45	0	SEA LEVEL	
			48.8	39.35	SEA FLOOR	
RECENT TO MIOCENE	A to ?D				GIPPSLAND LIMESTONE	313.5
						INNER SHELF, SEAWEED ZONE
			400	391		473 (10-40m)
MID MIOCENE	D					INNER SHELF
			607	598		
	? E1					
			?640	631		640 (10-40m)
EARLY MIOCENE	E					BEACH FRONT (0-10m) TO NEAR SHORE CANYON
			678	669		
	?					
			752	743		
	F					
			788	779		785 (40m)
	?					?
			819.5	810		
	? G					
			932.5	923		SUBMARINE CANYON
	G					
			1060	1051	1060	1090
			1154.3	1144.8	LAKES ENTRANCE FORMATION	MID SHELF (40-150m)
	H-1					
			1244	1235		
	? H-1					
			1334	1325		
LATEST OLIGOCENE	H 2					RAPID TRANSGRESSION
			1344.5	1335		
?	?				TRANSITION ZONE ?	BACK BARRIER LAGOON
BASE OF FORMINIFERAL SEQUENCE EXAMINED			1395.5	1386	1395.5	1392.0
			1404		LATROBE GROUP	
?		BARREN				
			1421	1412		
EARLY EOCENE TO LATE PALAEOCENE		?M. diversus				
			1448	1439		
		M. diversus (?UPPER)				NON MARINE
			1650	1641		
		BARREN				
			1759	1750		
PALAEOCENE		L. balmei				
			2093	2084		
?MAESTRICHTIAN		T. longus				NON MARINE
			2114	2105		
CAMPANIAN		T. lilliei				NON MARINE
			2208	2199		
?		BARREN				NON MARINE
			2368	2359		
SENONIAN (T.D.)		N. senectus				NON MARINE
			2486.9	2477.5		

Author: B. Butcher.

Drawn by: K. Lynch

Hudbay Oil (Australia) Ltd.

WEST SEAHORSE - 1

STRATIGRAPHIC TABLE

Date: March, 1982

Drawing №: A4-GL-470

Figure 3

3.4 Structure

West Seahorse No.1 was drilled on the southern side of a major east-west, high angle reverse fault which is upthrown to the south, i.e. towards the centre of the basin. Reverse movement, associated with wrenching along a pre-existing, normal, down-to-the-basin fault trend, caused arching into the fault and thereby formed the northern boundary of the structure.

The normal fault trend formed during Upper Jurassic to Lower Cretaceous times, with further growth continuing during the Upper Cretaceous and Lower Tertiary. The wrench faulting believed to have been associated with the reverse movement took place during the Upper Eocene to Lower Oligocene.
The West Seahorse structure is a 5 km by 2 km, east-northeast trending, asymmetric anticline. Closure has been mapped at three horizons,designated "Top Latrobe", "Intra Latrobe" and "Top Strzelecki", though palynological data indicates that the latter may be a misnomer (Figure 3).

A high resolution dipmeter was run from 2482 metres to the base of the 13-3/8" casing, at 1305 metres. Interpretations of the dipmeter data were enhanced by the use of a Cluster-Pooled Arrow Plot, Cyberdip and a Geodip run over selected intervals. The dipmeter data may be subdivided into several intervals, according to the magnitude and direction of recorded dips, viz:

Above 1345 m	:	dips are generally high, varying between 10-32^{o}; mainly to the northeast
1345-1411 m	:	less than 5^{o}; dominantly 1-2^{o}; random orientation
1412-1425 m	:	7-20^{o}; direction variable but mainly east to south
1425-1437 m	:	3-9^{o}; south-south-easterly
1441-1448 m	:	generally higher, 6-14^{o}; generally east-north-easterly
1450-1492 m	:	less than 6^{o}; random or very generally to the south
1500-1790 m	:	mainly less than 6^{o}, with occasional

		higher readings of between 14-18^{o}, random orientation
1790-1960 m	:	slightly higher dips, 8-14^{o}, mainly about 10^{o}, random orientation
1960-1980 m	:	14-18^{o}; random orientation
1980-2100 m	:	2-12^{o}; mainly 6-10^{o}; random or very general south-south-easterly orientation
2100-2131 m	:	dips mainly between 8^{o} and 32^{o}; southerly orientation
2131-2410 m	:	2-15^{o} (average about 8-10^{o}); southerly or south-south-easterly orientation
2410-2480 m	:	14-28^{o}; south-south-easterly orientation

3.5 Predicted and Actual Depth to Seismic Markers

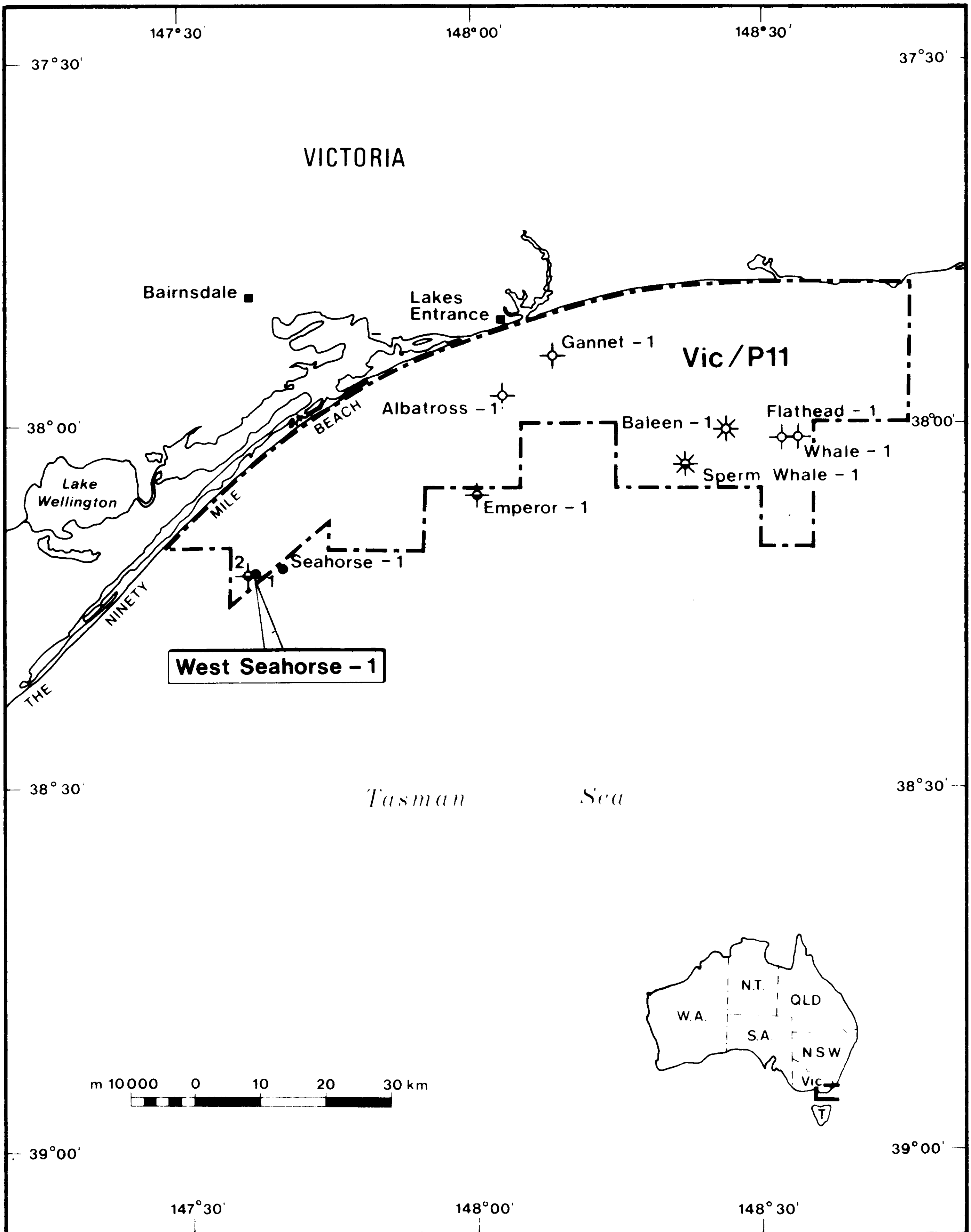
The depths to the main seismic events recognized in West Seahorse No.1 are listed in the following table. Further details are given in Enclosures 3 and 4, and Figure 4.

Horizon Identification - West Seahorse-1

Location : Line GB81-1A Shot Point 152.5

Horizon	Predicted Depth*	Actual Depth	Recorded 2-way Time
Water Bottom	-40 m	-40 m	0.052
Top Latrobe	-1404 m	-1386 m	1.120
Intra Latrobe		-1552 m	1.246
Top Strzelecki	-1842 m	(under review)	

* Note: Depths quoted in this table are subsea, i.e. R.T. Depth - 9.45 m.



Scale	Hudbay Oil (Australia) Ltd.	Date
	Vic/P11	May, 1982
Drawn by H.O.A.L.	WEST SEAHORSE - 1	Drawing N°
	PREDICTED AND ACTUAL SECTION	**A4-GL-511**

Figure 4

Hudbay Oil (Australia) Ltd.

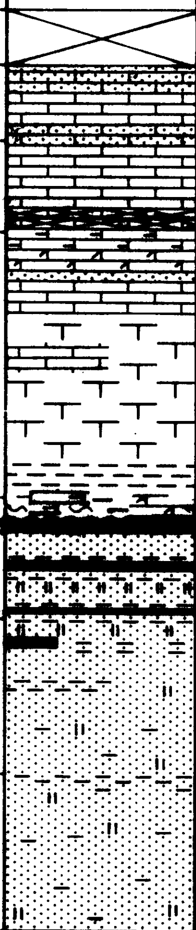
Subsidiary of Hudson's Bay Oil & Gas Company Ltd.

WEST SEAHORSE - 1

ACTUAL SECTION

LAT. 38° 12' 17·17" S. LONG. 147° 37' 21·70" E. S.P. 152·8 LINE. GB 81-1A

WATER DEPTH 39·35 METRES



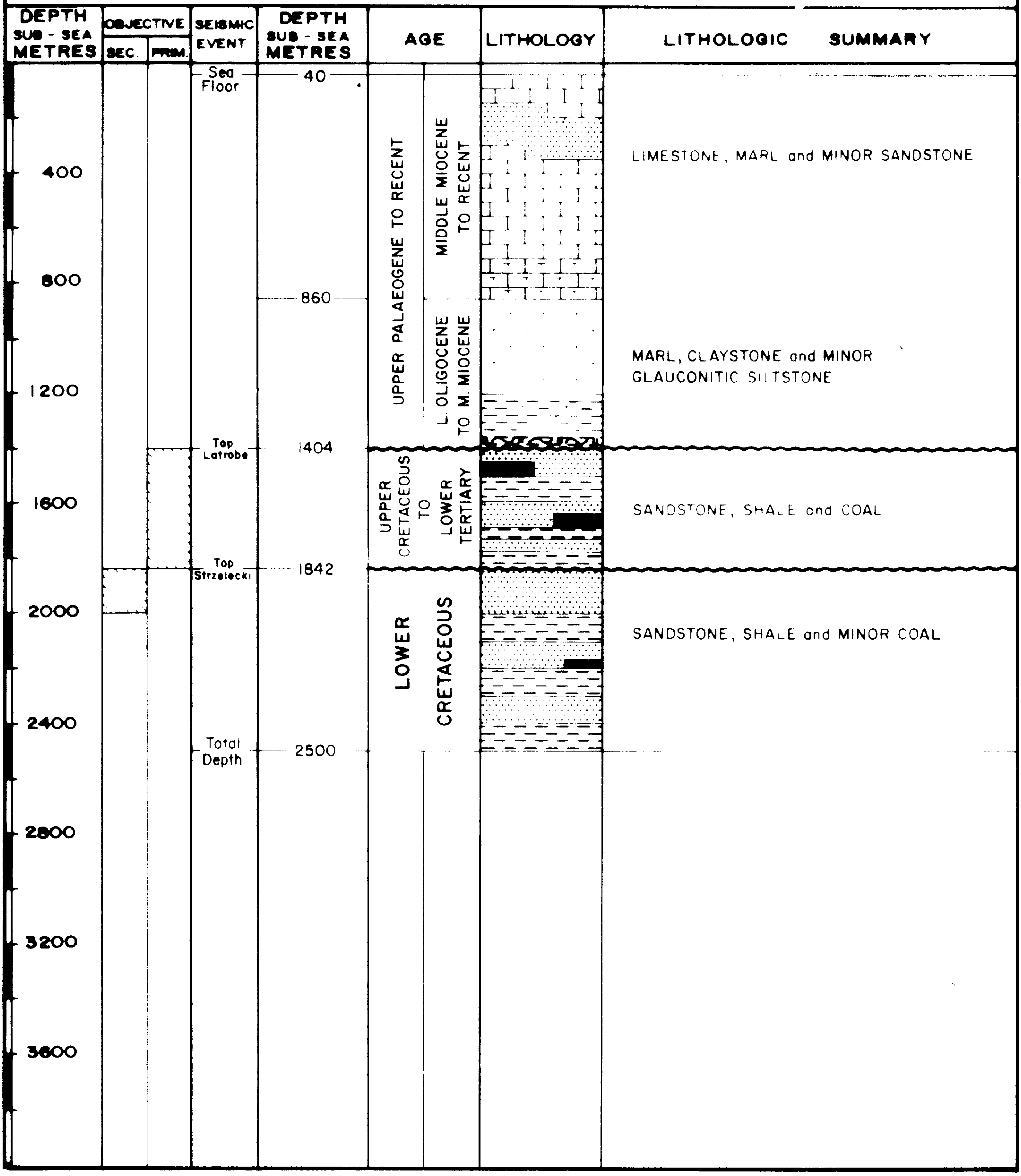
SEISMIC EVENT & DRILLING DATA	DEPTH SUB-SEA METRES	AGE	LITHOLOGIC SUMMARY
Sea Floor	39·35	RECENT TO MIOCENE	NO RETURNS
	189		SKELETAL LIMESTONE / CALCARENITE, CALCISILTITE and CALCILUTITE, MINOR SANDSTONE
Gippsland Limestone	391	MIDDLE MIOCENE	
	631	LOWER MIOCENE TO LATEST OLIGOCENE	RECRYSTALLISED LIMESTONE with CALCILUTITE, CALCISILTITE and MINOR SANDSTONE
Lakes Entrance Formation			MARL with CALCILUTITE / CALCISILTITE
			CALCAREOUS CLAYSTONE
	1335		GLAUCONITIC CALCISILTITE / CALCILUTITE and SHALE
"Top Latrobe"	1386	? ?	
	1402	LOWER EOCENE TO UPPER PALAEOCENE	SANDSTONE and COAL with MINOR SILTSTONE and CLAYSTONE
"Intra Latrobe"	1552		
	1641	PALAEOCENE	SANDSTONE, SILTSTONE and CLAYSTONE
Latrobe Group	2084	UPPER CRETACEOUS (SENONIAN)	SANDSTONE, with MINOR CLAYSTONE SILTSTONE and COAL
Total Depth	2480		

Hudbay Oil (Australia) Ltd.

WEST SEAHORSE -1

PREDICTED SECTION

LAT 38°12' 16·93" S LONG 147°37' 21·83" E
SP 152·8 LINE GB81-1A
WATER DEPTH 40 METRES



3.6 Porosity and Permeability

Porosities for West Seahorse No.1 have been estimated by wireline log interpretation and microscopic examination. A detailed breakdown of porous zones is given in the Log Analysis section of this report (Appendix B3).

Two sandstone interval in the upper part of the Latrobe Group, between 1411-1416 metres and between 1455-1453.5 metres, have sonic-derived porosities of 28-30% and 31% respectively. However visual examination showed that the upper sand contained a large proportion of silty, finely divided mica flakes and carbonaceous material, which would be expected to reduce permeability in that interval.

Several zones in the Eocene to Palaeocene section between 1500-1770 metres showed porosities of between 20-30%, with a maximum value of 31% calculated for the zone between 1500-1516 metres. Below 1770 metres porosities were reduced by an increase in the amount of silty clay in the matrix; below 1960 metres, the sands showed evidence of recrystallisation and cementation by silica; and below 2310 metres porosity was further reduced by dolomite cement.

Based on data obtained from DST No.1, formation permeability is estimated to be in the range of 118 to 175 md. The radius of investigation of the DST was approximately 244 metres, indicating that there are no major permeability barriers in the vicinity of the well.

Analyses of Core No.1 cut over the interval 1450-1461 metres determined a maximum porosity of 29.4%. This figure was obtained from a sample of sandstone at the top of the core, i.e. at 1450.0 metres. Analytical procedures and further results are detailed in Appendix B4.

3.7 Hydrocarbon Indications

3.7.1 Summary

Interpretation of wireline logs from West Seahorse No.1 indicated two oil-bearing zones, which were subsequently confirmed by testing. Several thin zones apparently containing hydrocarbons were also noted, but these are interpreted as being due to shoulder effects (Appendix B3).

The oil-bearing zones were between 1500-1503 metres (R.T.) and between 1411-1418 metres (R.T.).

The well flowed at a rate of 1800 stb/d of 48^{0} API light crude on a half inch choke during DST No.1 over the 1411-1416 m interval.

3.7.2 During Drilling

Continuous Gas Monitoring

A continuous record of gas levels in the drilling mud was maintained by Exploration Logging Inc., using a total gas analyser and gas chromatograph. Monitoring commenced at 205 metres, in the 17-1/2 inch hole, and continued to the total depth of 2490 metres.

Table 1, on the following page, summarizes the gas readings observed during drilling.

Fluorescence from Drill Cuttings

Examination of drill cuttings showed up to 20% fluorescence on quartz grains between 1417 and 1565 metres. This was described as being bright,blue-white and yellow-white, with a trace of dull yellow-gold, and exhibited slow to fast-streaming,blue-white solvent fluorescence.

Traces of fluorescence were observed in drill cuttings below 1565 metres, but may have been from cavings or contamination.

RANGE OF GAS READINGS

DEPTH (m)	Total Gas	Pet. Vap.	C_1	C_2	C_3	iC_4	nC_4	C_5
205-870	0	0	0	0	0	0	0	0
870-1040	0-Tr	0	0-20	0	0	0	0	0
1040-1380	Tr-5	0	25-700	0-25	Tr-15	0	0	0
1380-1415	12-140	Tr-20	1480-17050	71-910	36-700	5-310	5-340	0-85
1415-1475	4-65	Tr-10	137-8000	9-400	Tr-300	Tr-150	Tr-150	0
1475-1550	3-32	Tr-2	320-3249	150-342	35-380	30-74	Tr-124	0
1550-1975	Tr-10	Tr-1.5	25-872	Tr-250	Tr-140	Tr-15	Tr-20	0
1975-2005	Tr	0	Tr-7	0	0	0	0	0
2005-2180	Tr-10	0-1	9-1433	0-156	0-56	0-3	0-8	0
2180-2205	Tr	Tr	15-77	Tr	0	0	0	0
2205-2490 T.D.	Tr-9	0-Tr	46-1750	Tr-54	0-60	0-Tr	0	0

Notes:
1) "Petroleum Vapours" includes C_2 and higher hydrocarbons.
2) Total Gas and Petroleum Vapours are given in units, where 1 unit = 200 ppm
3) C_1 - C_5 are given in ppm.
4) The high gas readings are generally associated with coal seams rather than hydrocarbon zones.

Oil Staining/Free Oil

Light brown to dark brown staining was observed on quartz grains between 1495-1565 metres. Furthermore, a small amount of free oil, calculated at less than 0.5% from mud analysis, was observed as a sum on the surface of the mud in the mud pits. Geochemical Analyses of the West Seahorse-1 oil are contained in Appendix B5.

3.7.3 Sidewall Cores and Conventional Cores

Bright, greenish-gold and blue-white fluorescence was observed in sidewall cores between 1385.5 and 1503.5 metres. This ranged from a few bright pinpricks on a fresh cross-sectional surface of core to 100% of the core surface. Maximum fluorescence occurred in two zones: from 1411.2-1423.4 metres and from 1499.5-1501.6 metres. Dull, brown-gold fluorescence was also observed in several sidewall cores between these intervals.

For further details, refer to the Sidewall Core Descriptions in Appendix B6.

Traces of pinpoint and spotty, blue-white fluorescence were observed on Core No.1, which was recovered from 1450-1458.9 metres. Moderately fast, blue-white to milky white solvent fluorescence was obtained from several sections of core. Further details are again provided in Appendix B6.

3.7.4 Further Indications

Section 2.5 of this report summarizes the DST results. The RFT program is summarized in Section 4.3.2 and discussed further in Appendix B3.

3.8 Contributions to Geological Knowledge

1. West Seahorse No.1 confirmed the presence of suitable reservoir rocks towards the northern edge of the Central Deep Basin in the western portion of Vic/P-11. Maximum log-derived porosities were calculated at 31%, for sands near the top of the Latrobe Group sequence between 1411-1453 metres. Porosities decrease with depth, and below approximately 2200 metres the sequence displayed poor reservoir characteristics.

2. West Seahorse No.1 contained moveable hydrocarbons in two separate zones, viz: 1411.1418 metres and 1500-1503 metres.

3. The top of the Latrobe Group, the base of the first oil sand, and certain of the intervening coal/ sandstone intervals can be correlated with reasonable surety from West Seahorse No.1 to Seahorse No.1, although the following differences were observed:

   i) the top of the Latrobe Group is represented in Seahorse No.1 by a sandstone and in West Seahorse No.1 by a coal seam.
   ii) the base of the first oil sand in Seahorse No.1 is a shale unit and in West Seahorse No.1 it is a dolomitic sandstone.

4. The upper hydrocarbon zone in West Seahorse No.1 may share a common oil-water contact with that in Seahorse No.1.

5. The apparent absence of sediments of latest Eocene to latest Oligocene age (Zones K/J-H2) in West Seahorse No.1 and their presence in Seahorse No.1 strongly suggests faulting during the Upper Oligocene (25-32 m.y.) between the two locations, with Seahorse No.1 on the downthrown side (Appendix B1).

6. The oil recovered from West Seahorse No.1 tested at 48^{o} API and flowed at 1800 barrels/day, which compares reasonably well with results from Seahorse No.1

(53^o API; 2040 BOPD). However, West Seahorse No.1 produced with a gas/oil ratio of 200 scf/bbl whereas Seahorse No.1 produced with 1100 scf/bbl. The gas from West Seahorse No.1 contained approximately 200 ppm H_2S, compared with 300 ppm H_2S in gas from Seahorse No.1.

7. The drill stem test over the 1411-1416 m interval tested a radius of 244 m, indicating that the formation is homogeneous, i.e. that no major permeability barriers exist in the vicinity of West Seahorse No.1

8. West Seahorse No.1 bottomed in dolomitic, silicified sandstone of Senonian age. The well penetrated both a marked angularity which had been interpreted from seismic studies and a change in lithological character corresponding to a density increase on the logs below 2275 m.

9. A Repeat Formation Test at 1976.1m recovered water with a surface scum of oil. Wireline log interpretation shows up to 20% hydrocarbon saturation at this point, which is consistant with the RFT results. Several other thin zones in the interval between 1976-2005m are also interpreted to contain hydrocarbons, but all show less than 20% hydrocarbon saturation (See enclosures to Appendix B3).

4.0 WELL DATA

4.1 Formation Sampling

A standard "Alpha" unit from Exploration Logging Australia Inc. was used for the 1981-82 Gippsland Basin drilling programme. Exlog personnel provided continuous monitoring of ditch gas and mud pit levels, and recorded the following parameters every 5 metres: ditch gas, gas chromatography, calcimetry, blendor gas analyses and mud weight in and out. Corrected drilling exponent calculations were also performed every 5 metres in shaly intervals, but are not considered reliable due to a faulty motion compensator on the drilling vessel. A Drill Monitor System panel provided continuous readings of engineering/drilling parameters, which were noted every 5 metres.

Washed and dried cuttings samples were collected in 5 metre (minimum) compilations from below the base of the 20" casing shoe, at 189 m, to total depth at 2489.6m. Hudbay and Exlog geologists maintained separate lithological logs (see Enclosures 5 & 6 and Appendix B7).

400 g unwashed, 15m composite samples were bagged from below the 20" casing shoe, and 100 g unwashed, 15 m composite samples were taken from below the 13-3/8 inch casing shoe, at 1304m. The former were submitted for palynological study; the latter were sealed, with preservative, in cans and submitted for geochemical analysis.

4.2 Coring Program

4.2.1 Conventional Cores

One conventional core was cut in West Seahorse No.1:

Core No.1

Cut	:	11 metres (1450 - 1461 m)
Recovered	:	8.9 metres ("1450 - 1458.9 m")
Recovery	:	81%

Lithological Description (see also Appendix B6).

1450 - 1451.15 metres

Sandstone, clear, very fine to granule, dominantly coarse, angular to rounded, moderately sorted, 5% clay minerals, trace calcite cement, trace carbonaceous matter, unconsolidated.

1451.15 - 1451.18 metres

Coal, black, bituminous, brittle.

1451.18 - 1451.70 metres

Sandstone, clear to light grey, very fine to granule, dominantly medium, angular to rounded, dominantly sub-angular, poorly sorted, 5-15% quartz silt, trace-10% clay minerals, moderately hard to unconsolidated, excellent porosity.

1451.70 - 1451.75 metres

Coal, black, brittle as thin laminae.

1451.75 - 1452 metres

Sandstone, light olive grey to olive grey, very fine to granular, dominantly very fine to fine, bimodal, 10-20% quartz silt, 5-20% clay minerals, moderately hard, poor to very good porosity, becoming silty with depth.

1452 - 1453 metres

Siltstone, micaceous, medium dark grey to dark grey, 5-30% quartz silt, 20-40% clay minerals, 10-50% biotite mica, preferentially orientated, 0-30% carbonaceous material, hard, subfissile, separating into interbedded white to very light grey siltstone with dark grey to dark brown micaceous siltstone in millimetre laminae towards 1453 metres. Cross bedded, trace convoluted bedding, rare slump structures.

1453 - 1453.3 metres

Sandstone, silty, clear to white to light grey, very fine to fine, occasionally medium, dominantly very fine, moderately well sorted, angular to subrounded, dominantly angular, 20% quartz silt, 5% clay, 5% carbonaceous material, trace pyrite moderately hard, good porosity, good permeability, cross bedded.

1453.3 - 1455.13 metres

Claystone, light olive grey to olive grey, up to 15% quartz silt, 0-5% carbonaceous material, trace mica, moderately hard to hard, becoming harder with depth, possible slickensides at 1453.7 metres.

1455.13 - 1455.6 metres

Sandstone, silty, carbonaceous, micaceous, clear to white to dark brown grey, fine to granular, dominantly medium, poorly sorted, subangular to subrounded, 20% quartz silt, 10% mica, 10% mica, 10% carbonaceous material, moderately hard, fair to good intergranular porosity.

1455.6 - 1455.9 metres

Siltstone, micaceous, carbonaceous, dark grey to black, subfissile, hard.

1455.9 - 1456.1 metres

Coal, black, vitreous, conchoidal fracture, blocky, brittle to hard, possible slickensides.

1456.1 - 1456.6 metres

Siltstone, argillaceous, micaceous in part, carbonaceous in part, white to light grey to olive brown-black, 20-30% clay minerals, 10-20% micaceous material, 5-20% carbonaceous material, trace-5% pyrite inclusions, hard.

1456.6 - 1457.0 metres

Coal, black, brittle, interbedded with minor laminae of siltstone as between 1456.1-1456.6 metres, abundant slickensides.

1457.0 - 1457.6 metres

Siltstone, argillaceous, dark green grey to olive grey, 40% clay minerals, 10% mica, trace carbonaceous material, hard.

1457.6 - 1457.7 metres

Claystone, micaceous, dark olive grey to black, hard.

1457.7 - 1458.0 metres

Coal, black, vitreous, conchoidal fracture, brittle, with slickensides.

1458.0 - 1458.1 metres

Claystone, micaceous, carbonaceous, very dark grey to black, very hard.

1458.1 - 1458.2 metres

Coal, black, brittle.

1458.2 - 1458.6 metres

Claystone, silty, micaceous, carbonaceous, dark grey to black with coaly deformations and en echelon fracturing in the coal.

1458.6 - 1458.7 metres

Siltstone, argillaceous, micaceous, carbonaceous, dark grey to dark olive grey, subfissile, very hard.

1458.7 - 1458.9 metres

Coal, black, brittle, vitreous, hard, high rank, becoming silty.

1458.9 - 1461 metres

No recovery.

4.2.2 Sidewall Cores

Summary

Suite 1 (26/9/81)

Interval Cored	:	191.0 - 1293.0 metres
Shots attempted	:	30
Cores recovered	:	29
Bullets empty	:	1
Bullets misfired	:	nil
Bullets lost	:	nil

Suite 2 (6/10/81)

Interval cored	:	435.8 - 1732.0 metres
Shots attempted	:	60 (2 x 30)
Cores recovered	:	55
Bullets empty	:	4
Bullets misfired	:	nil
Bullets lost	:	1

Suite 3 (22/10/81)

Interval cored	:	1322.0 - 2486.7 metres
Shots attempted	:	90 (3 x 30)
Cores recovered	:	72
Bullets empty	:	16
Bullets misfired	:	nil
Bullets lost	:	2

TOTAL : 180 shots 156 recovered

Refer to Appendix B6 for Sidewall Core Description sheets.

42 sidewall cores over the interval 313.5-1390.0 metres were sent to Paltech Pty. Ltd. for palaeontological examination (Appendix B1).

52 sidewall cores over tne interval 1403.6-2486.9 metres were sent to Western Mining Corporation, South Australia, for palynological examination (Appendix B2).

4.3 Wireline Logs and Wireline Sampling

Schlumberger Seaco ran the following wireline logs and Repeat Formation Tests in West Seahorse No.1:

Suite	Date	Logs	Interval	Remarks
1	26/09/81	DIT-BHC-GR (1:200 & 1:500)	191 - 1293 m	
	26/09/81	FDC-GR (1:200 & 1:500)	191 - 1293 m	
	26/09/81	CST (1:200)	191 - 1293 m	
2	04/10/81	DIT-BHC-GR (1:200 & 1:500)	1306 - 1743 m	
	04/10/81	FDC-CNL-GR (1:200 & 1:500)	1305 - 1743 m	
	05/10/81	DLL-MSFL-GR (1:200 & 1:500)	1305 - 1737 m	
	05/10/81	HDT (1:200)	1304 - 1742 m	
	05/10/81	RFT-GR	1413 - 1716 m	
	06/10/81	CST (1:200)	1438 - 1732 m	
	11/10/81	RFT	1417 - 1505 m	
3	20/10/81	BHC-GR (1:200 & 1:500)	1305 - 2482 m	
	20/10/81	FDC-CNL-GR (1:200 & 1:500)	1700 - 2486 m	
	20/10/81	DLL-MSFL-GR (1:200 & 1:500)	1672 - 2482 m	
	21/10/81	HDT (1:200)	1730 - 2486 m	
	22/10/81	RFT	1805 - 2420 m	
	22/10/81	CST (1:200)	1322 - 2486 m	
	27/10/81	CBL-VDL (1:200)	1305 - 1525 m	
	28/10/81	Perforation Record (1:200)	1411 - 1416 m	
	31/10/81	Bridge Plug Setting Record (1:200)	1375 - 1405 m	

Additional Services

Date	Logs	Interval
05/10/81	Geodip (1:40 & 1:200)	1375 - 1575 m

05/10/81	Geodip (1:20)	1400 - 1570 m
17/10/81	Geodip (1:20)	620 - 1000 m
10/10/81	Cyberdip (1:100)	1305 - 1741 m
11/10/81	Cyberlook (1:200)	1305 - 1743 m
21/10/81	CST Dipmeter (1:500)	1313 - 2479 m

Log interpretations and further details of the logging programme are provided in Appendix B3.

A Vertical Seismic Profile (VSP) was run by Seismic Services Limited (Enclosures 3 & 4).

Repeat Formation Tests (RFT)

The following Table summarizes the Repeat Formation Testing programme in West Seahorse No.1:

Date	Interval (m)	Pressure Tests	Sampling Attempts	Total
05/10/81	1413.5 - 1716.5	7	8	15
11/10/81	1417.0 - 1505.5	1	8	9
22/10/81	1975.8 - 2420.5	18	1	19
		26	17	43

The RFT programme indicated the following:

a) a free oil-water contact occurs at 1503 m.
b) there is apparently no oil-water contact within the 1411-1418 m sand.
c) the silty sand underlying the permeability barrier at 1418-1419.5 metres is water saturated.

Oil recoveries of at least 1700 cc were recovered from tests at 1415.5 m, 1417.0 m and 1502.0 m; traces of oil were recovered from tests at 1413.5 m, 1505.0 m, 1505.5 m and 1976.1 m.

Details of the RFT programme at West Seahorse No.1 are given in Appendix B3. Enclosure 2 therein is a plot of the pressure gradient determined from the RFT results.

5.0 REFERENCES

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APPENDIX B1 **P A L A E O N T O L O G Y   R E P O R T**

FORAMINIFERAL SEQUENCE IN WEST SEAHORSE # 1.

for:- HUDBAY OIL (AUSTRALIA) LTD.

December 4th, 1981.

Paltech Report 1981/22.

PALTECH PTY LTD
MARINE MICROPALEONTOLOGISTS
SYDNEY NEW SOUTH WALES
MIDLAND WESTERN AUSTRALIA

THE FORAMINIFERAL SEQUENCE
IN WEST SEAHORSE # 1.

Forty sidewall cores from WEST SEAHORSE # 1 were examined for foraminiferal content. On the basis of that examination the following breakdown of the sequence according to broad E-log patterns was noted:-

Sidewall Cores Depth (m)	Approx. E-log Unit Boundary	Age	Zone*	Paleoenvironment
313.5 to 455.2	Top	? to Miocene	? to D	Inner shelf, seaweed zone (10-40m)
	473			
494.8 to 624.0		Mid Miocene	D to E-1	Inner shelf, undifferentiated (10-40m)
	-?			
662.8 to 773.1		Early Miocene	E to F	Transitional from near shore canyon head (∿40m) at base to beach front (0-10m) at top.
802.0 to 1055.0		Early Miocene	?G to G	Submarine canyon (Depth indeterminate)
	1090			
1100.1 to 1336.8		Early Miocene	G to H-2	Mid shelf (40-150m) with rapid transgression at base.
	1344.5			
1359.4 to 1392.0		?	No diagnostic foraminifera	Back barrier lagoon
	base of sequence examined			

*Planktonic foraminiferal zones after Taylor (in prep.).

Planktonic foraminiferal content of the samples was generally poor, mainly due to the persistence of environments unfavourable to planktonic life (back barrier lagoon - inner shelf) or preservation of these fragile forms (canyon).

P.T.O.

Tables I & II (herein) detail the record summarised above. A micropaleontological data sheet shows the interpreted reliability of the planktonic foraminiferal zone determinations.

The list of sidewall cores studied is shown on Tables I & II. Sidewall cores at 590.1 and 623.9m were not examined as they were near duplicates of other samples. Sidewall core at 1247m had no sample in the jar.

OLIGOCENE FAULTING BETWEEN SEAHORSE # 1 AND WEST SEAHORSE # 1.

SEAHORSE # 1 recorded a Latest Eocene to Early Oligocene (Zone K/J) shallow water facies overlain unconformably by a basin deep facies of latest Oligocene age (Zone H-2) with reworked shallow water elements of Zone K/J age. None of these sediments were recorded in WEST SEAHORSE # 1. On the evidence of this study it seems reasonable to suggest that during the latest Oligocene (Zone H-2) the shelf/slope break was between WEST SEAHORSE # 1 and SEAHORSE # 1 and that sediments of Latest Eocene to Mid Oligocene age at WEST SEAHORSE # 1 (if present originally) were exposed, eroded and transported to the nearby basin deep areas such as at the SEAHORSE # 1 site. The SEAHORSE # 1 and WEST SEAHORSE # 1 sites were not at comparable paleowater depths subsequently until mid Early Miocene (Zone G).

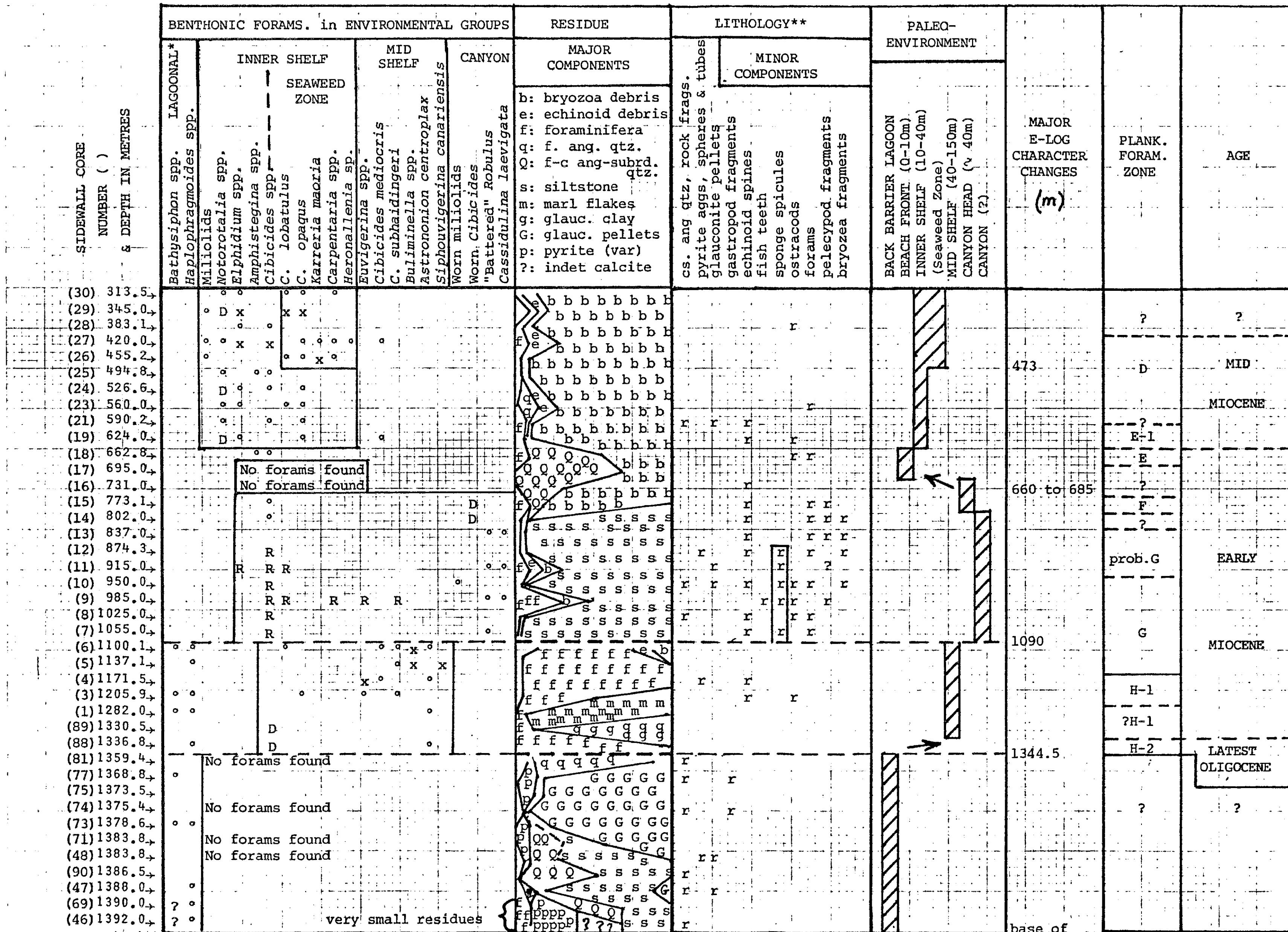
This evidence strongly suggests faulting during the late Oligocene (25-32m.y.) between SEAHORSE # 1 and WEST SEAHORSE # 1 with SEAHORSE # 1 on the down thrown side.

SIDEWALL CORE NUMBER ( )	& DEPTH in METRES	G'ina woodi woodi	G'ina ? euapertura	G'ina praebulloides	G'alia continuosa	G'alia nana	G'alia obesa	G'ina woodi connecta	Cat. dissimilis	G'quad dehiscens (S.S.)	G'quad dehiscens (S.L.)	G'alia bella	G'oides trilobus	G'alia zealandica (S.S.)	G'alia miozea miozea	G'alia praescitula	G'ina spp. indet	G'quad altispira globosa	G'oides bisphericus	Praeorb glomerosa gp.	Orb suturalis	Orb universa	G'ina bulloides	G'ina decoraperta	Orb sp. indet	G'alia praemenardii	PLANK. FORAM. ZONE	AGE
(30)	313.5	o																				o	o					
(29)	345.0	o																				o	o	o			?	?
(28)	383.1	o															o											
(27)	420.0																								o	o		
(26)	455.2																o					o	o	o				
(25)	494.8	NO PLANKTONICS SEEN																									D	MID
(24)	526.6	NO PLANKTONICS SEEN																										
(23)	560.0																					x						MIOCENE
(21)	590.2	NO PLANKTONICS SEEN																									?	
(19)	624.0	o													o	o				x	x						E-1	
(18)	662.8	o																		o							E	
(17)	695.0	NO PLANKTONICS SEEN																										
(16)	731.0	NO PLANKTONICS SEEN																									?	
(15)	773.1																		o								F	
(14)	802.0																o										?	
(13)	837.0	o											x															
(12)	874.3									o			o				o										prob.G	EARLY
(11)	915.0	o						o					o															
(10)	950.0	o											x		o	o												
(9)	985.0	x						o		o			x		o	o		o										
(8)	1025.0	o															o											
(7)	1055.0	o														o	o										G	
(6)	1100.1	x			o			o					x		o	o												MIOCENE
(5)	1137.1	o						o	o			o	x	o														
(4)	1171.5	o		o	o	o		o	o			o																
(3)	1205.9	x				o	o	o	o	o	o	?															H-1	
(1)	1282.0	o	o						?																			
(89)	1330.5	o			o	o		?																			?H-1	
(88)	1336.8	x	o	o	o	o	o																				H-2	LATEST
(81)	1359.4	NO PLANKTONICS SEEN																										
(77)	1368.8																											OLIGOCENE
(75)	1373.5																											
(74)	1375.4																										?	?
(73)	1378.6																											
(71)	1383.8																											
(48)	1383.8																											
(90)	1386.5																											
(47)	1388.0																											
(69)	1390.0																											
(46)	1392.0	Base of sequence examined																										

KEY – o <20 specimens
x >20 specimens
? questionable identification

TABLE 1: PLANKTONIC FORAMINIFERAL DISTRIBUTION – WEST SEAHORSE #1.

CAF A4 2mm.



KEY: *in absence of other forams
° <20 specimens
x >20 specimens
D >60% of total count
R = reworked

r = rare
**visual estimate of processed sample.

TABLE 2: SIGNIFICANT BENTHONIC FORAMINIFERAL DISTRIBUTION, RESIDUE LITHOLOGY & PALEOENVIRONMENTAL ASSESSMENT - WEST SEAHORSE # 1.

MICROPALEONTOLOGICAL DATA SHEET

BASIN: GIPPSLAND ELEVATION: KB: 9.8m GL: -40.0m

WELL NAME: WEST SEAHORSE #1 TOTAL DEPTH:

AGE		FORAM. ZONULES	HIGHEST DATA Preferred Depth	Rtg	Alternate Depth	Rtg	Two Way Time	LOWEST DATA Preferred Depth	Rtg	Alternate Depth	Rtg	Two Way Time
PLEISTOCENE		A_1										
		A_2										
PLIOCENE		A_3										
		A_4										
		B_1										
MIOCENE	LATE	B_2										
		C										
	MIDDLE	D_1	420.0	2	455.2	1						
		D_2						560.0	1			
		E_1	624.1	1								
		E_2						662.8	2			
	EARLY	F	773.1	2				773.1	2			
		G	837.0	2	950.0	1		1137.1	1			
		H_1	1171.5	2				1205.0	1			
OLIGOCENE	LATE	H_2	1282.0	2				1336.8	1			
		I_1										
		I_2										
	EARLY	J_1										
		J_2										
EOCENE		K										
		Pre-K										

COMMENTS:

CONFIDENCE RATING:

- O: SWC or Core - Complete assemblage (very high confidence).
- 1: SWC or Core - Almost complete assemblage (high confidence).
- 2: SWC or Core - Close to zonule change but able to interpret (low confidence).
- 3: Cuttings - Complete assemblage (low confidence).
- 4: Cuttings - Incomplete assemblage, next to uninterpretable or SWC with depth suspicion (very low confidence).

NOTE: If an entry is given a 3 or 4 confidence rating, an alternative depth with a better confidence rating should be entered, if possible. If a sample cannot be assigned to one particular zone, then no entry should be made, unless a range of zones is given where the highest possible limit will appear in one zone and the lowest possible limit in another.

DATA RECORDED BY: *PALTECH PTY. LTD.* DATE: December 1, 1981.

DATA REVISED BY: DATE:

APPENDIX B2. P A L Y N O L O G Y R E P O R T

WEST SEAHORSE NO. 1 WELL

PALYNOLOGICAL EXAMINATION OF SIDEWALL CORE

by

W.K. Harris

WESTERN MINING CORPORATION LIMITED

PALYNOLOGICAL REPORT

CLIENT: Hudbay Oil (Australia) Ltd.

STUDY: West Seahorse No. 1 Well, Gippsland Basin.

AIMS: Determination of age of sediments from 53 sidewall cores.

INTRODUCTION

Fifty three sidewall cores from West Seahorse No. 1 Well drilled in the Gippsland Basin at Lat. 38° 12'17.17"S, Long. 147°37'21.7"E in Vic P-11, were processed by normal palynological procedures.

The basis for the biostratigraphic and consequent age determinations are based on Stover and Partridge (1973) and Partridge (1976). The current nomenclature of zones and their correlation with the geological time scale is presented in Figure 1.

OBSERVATIONS AND INTERPRETATION

Table 1 summarizes the distribution of palynomorph species that have significant time ranges during the Late Cretaceous and Early Tertiary. Long ranging species have been omitted.

Table II summarizes the interpreted biostratigraphy and age determinations based on the observations collated in Table I. Many of the samples from this well are barren of plant microfossils and this is mostly due to unfavourable lithologies being samples. The lithologies that dominate these barren samples are light grey to white argillaceous sandstones and claystones and these would generally represent oxidising environments.

In general the assemblages were not well preserved and were mostly very sparse with regard to numbers of microfossils although many samples yielded moderate amounts of organic matter. Poorly preserved assemblages are predominant in the lower section of the well in the Late Cretaceous and Paleocene sections whereas assemblages in the Malvacipollis diversus Assemblage Zone are reasonaby well preserved but are very sparse. The organic matter in these samples consists mostly of inertinite-like material suggestive of at least some oxidation during deposition.

These two factors result in many samples being classed as "indeterminate". For the same reasons it has not been possible to more finely subdivide the assemblages into "Lower", "Middle" or "Upper" units.

Nothofagidites senectus Zone - two samples at 2468 and 2403.1m are identified as this zone. In particular the assemblages include Nothofagidites senectus, Tricolpites sabulosus, Aequitriradites sp. aff. A. verrucosus and Krauselisporites aff. K. jubatus. Diagnostic species from the succeeding unit are absent. The assemblage is non-marine.

Figure 1

Correlation of Gippsland Basin zonations

with the geological time scale (From Partridge, 1976)

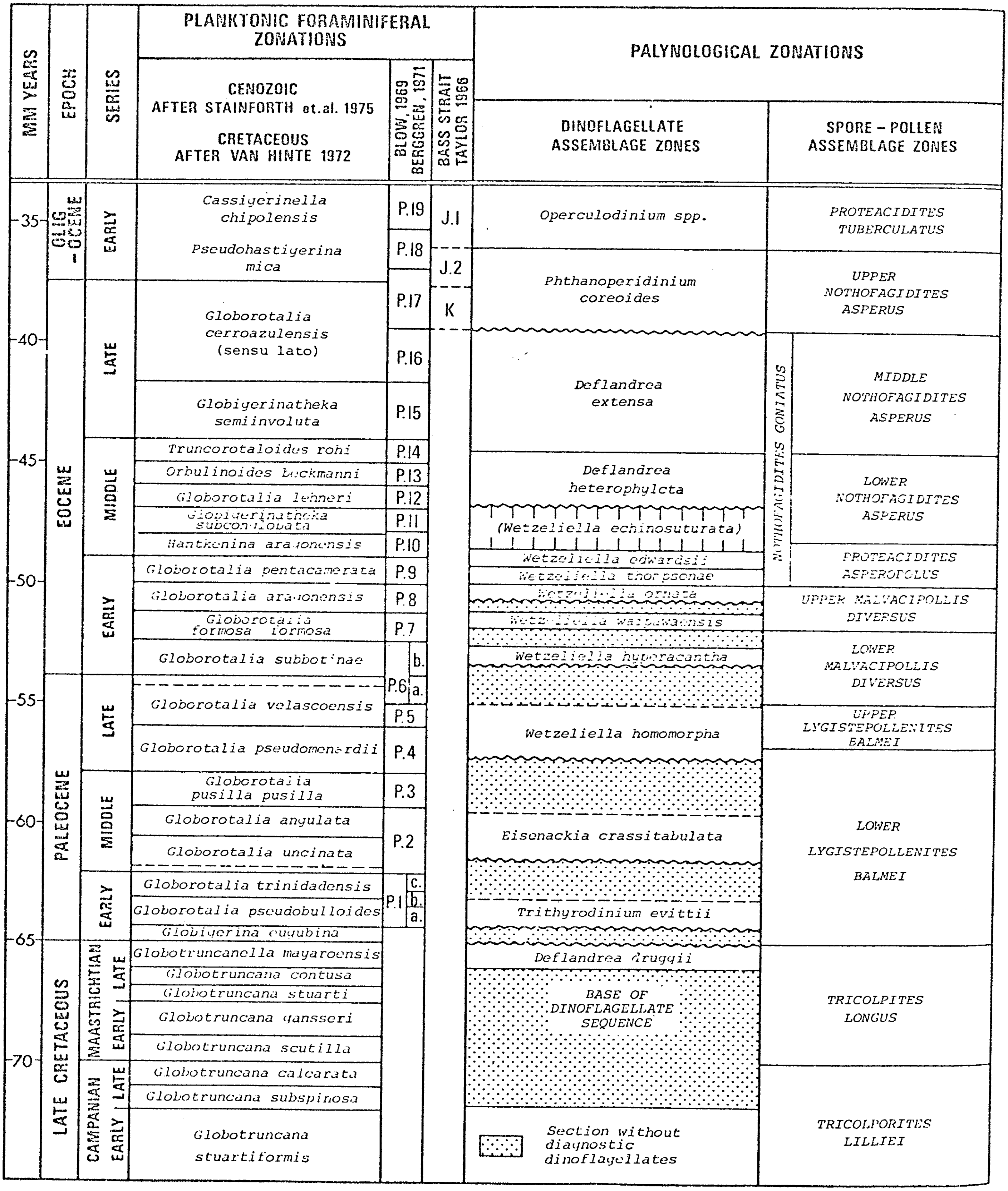


TABLE 1

West Seahorse No. 1 Well

Distribution of selected species

Species \ Depth in metres	2468.0	2403.1	2204.5	2125.1	2103.1	2083.2	1894.2	1872.0	1855.3	1778.0	1648.2	1594.9	1512.8	1487.2	1475.5	1460.5	1435.8	1434.0	1423.4	1422.4
Aequitriradites cf A. verrucosus	X	X																		
Krauselisporites cf K. jubatus	X																			
Tricolpites sabulosus	X	X																		
Nothofagidites senectus	X	X																		
Gambierina rudata	X	X	X	X	X	X	X													
Proteacidites amoloseximus	X	X																		
Tricolpites lilliei			X																	
Tricolpites confessus			X																	
Lygistepollenites balmei			X	X	X	X	X	X	X	X										
Latrobosporites ohaiensis			X	X	X	X	X		X	X										
Triporopollenites sectilis			X	X	X	X														
Nothofagidites endurus			X	X	X															
Proteacidites scaboratus			X	X	X	X	X			X										
Gambierina edwardsii				X	X	X	X		X	X										
Tricolpites gillii				X	X	X	X			X										
Tricolpites longus				X																
Tetracolporites verrucosus					X		X		X											
Herkosporites elliottii						X	X		X	X		X		X						
Phyllocladidites reticulosaccatus					X	X	X		X											
Proteacidites angulatus							X		X	X										
Dilwynites granulatus								X	X	X										
Austalopollis obscurus								X	X	X										
Simplicepollis meridianus								X	X											
Nothofagidites flemingii									X	X		X	X	X						
Rugulatisporites mallatus										X		X								
Malvacipollis diversus											X	X	X	X		X	X	X	X	X
Cupanieidites orthoteichus											X	X	X			X		X	X	X
Verrucosisporites kopukuensis											X	X		X		X			X	
Liliacidites lanceolatus											X	X						X	X	
Proteacidites pachypolus													X	X		X		X		
Kuylisporites waterbolki														X		X				
Santalumidites cainozoicus															X	X		X	X	
Tricolporites adelaidensis															X		X		X	X
Periporopollenites demarctus																	X	X		X

TABLE II

WEST SEAHORSE NO. 1 WELL

SUMMARY OF BIOSTRATIGRAPHY AND AGE DETERMINATIONS

SWC No.	Depth in Metres	Biostratigraphic Unit	Age
44	1403.6m	Indeterminate	
68	1405.0m	Indeterminate	
43	1408.4m	Indeterminate	
67	1409.0m	Indeterminate	
55	1411.2m	Indeterminate	
54	1416.0m	Barren	
40	1418.7m	Barren	
65	1422.4m	? M. diversus	Late Paleocene to Early Eocene
39	1423.4m	? M. diversus	Late Paleocene to Early Eocene
38	1432.2m	Barren	
64	1434.0m	? M. diversus	Late Paleocene to Early Eocene
30	1435.8m	? M. diversus	Late Paleocene to Early Eocene
62	1460.5m	M. diversus	Late Paleocene to Early Eocene
25	1475.5m	M. diversus	Late Paleocene to Early Eocene
24	1484.6m	Indeterinate	
36	1487.2m	? M. diversus	Late Paleocene to Early Eocene
22	1498.4m	Indeterminate	
32	1512.8m	? M. diversus	Late Paleocene to Early Eocene
15	1530.2m	Barren	
60	1574.2m	Barren	
11	1594.9m	? M. diversus	Late Paleocene to Early Eocene
8	1648.2m	M. diversus	Late Paleocene to Early Eocene
7	1651.8m	Barren	
6	1662.5m	Barren	
31	1665.0m	Barren	
58	1726.0m	Barren	
57	1738.2m	Barren	
56	1741.0m	Barren	
53	1778.0m	L. balmei	Paleocene
52	1787.5m	Barren	
51	1796.8m	Barren	
50	1801.5m	Barren	
49	1855.3m	L. balmei	Paleocene
48	1872.0m	L. balmei	Paleocene
47	1881.5m	Barren	
46	1894.2m	L. balmei	Paleocene
45	1913.6m	Barren	
43	1933.4m	Barren	
41	1947.2m	Barren	
40	1968.4m	Indeterminate	
36	2031.8m	Indeterminate	
35	2072.1m	Indeterminate	
34	2083.2m	L. balmei	Paleocene
33	2103.1m	No older than T. longus	?Maastrichtian
32	2125.1m	No older than T. lilliei	?Campanian
30	2171.8m	Barren	
29	2204.5m	T. lilliei	Campanian
28	2211.3	Barren	
19	2332.2m	Indeterminate	
12	2403.1m	N. senectus	Senonian
11	2409.9m	Barren	
3	2468.0m	N. senectus	Senonian
1	2486.9m	Barren	

Tricolpites lilliei Assemblage Zone - The base of this zone is marked by the first appearance of T. lilliei at 2204.5m. Associated species include Lygistepollenites balmei, Gambierina rudata, Tricolpites confessus and Latrobosporites ohaiensis. The zone extends to 2125.1m and is non-marine.

?Tricolpites longus Assemblage Zone - One sample at 2103.1m yielded a sparse assemblage which cannot be accurately placed. It is no older than the T. longus assemblage but may belong to the younger Lygistepollenites balmei Assemblage Zone. The assemblage includes Gambierina spp., Tetracolporites verrucosus and Phyllocladidites reticulosaccatus. The last named species would tend to argue for a correlation with the L. balmei zone but there is insufficient evidence to confirm this. The unit is non-marine.

Lygistepollenties balmei Assemblage Zone - this unit extends from 2083.2m to at least 1778.0m and the section contains many either barren or indeterminate samples. The base of the zone is marked by the consistent occurrence of Haloragacidites harrisii, Phyllocladidites reticulosaccatus, Herkosporites elliottii, Rugulatisporites mallatus and Simplicepollis meridianus. Nothofagidites flemingii ocurs at 1855.3m suggesting that the upper part of the L. balmei zone is present. There are however no other criteria in the samples to support a finer zonation of the unit in this well. The zone in this well is non-marine.

Malvacipollis diversus Assemblage Zone - The assemblage from 1648.2m contains both Malvacipolis diversus and Cupanieidites orthoteichus indicating a correlation with this zone. Other elements in this zone include Proteacidites pachypolus, P. kopiensis, Kuylisporites waterbolki often abundant Haloragacidites harrisii and frequent Nothofagidites spp. The presence of Santalumidites cainozoicus at 1475.5m would suggest that this sample is within the Upper M. diversus zone. As mentioned previously the residues from this part of the section consist almost entirely of inertinite-like matter with very few spores and pollen. Consequently no further subdivision of this zone is possible. Indeed the extreme paucity of identifiable microfossils from betwen 1418.7 and 1403.6m hinders any correlation of these samples. However it is unlikely that they are much younger from those at about 1422m. The kerogens are essentially similar and indicate that the same lithological unit is represented between 1422 and 1403m.

No marine microfossils were recorded from this unit.

REFERENCES

Stover, L.E.,& Partridge, A.D., 1973: Tertiary and Late Cretaceous spores and Pollen from the Gippsland Basin, southeastern Australia. Proc. R. Soc. Vict., 85: 237-286.

Partridge, A.D., 1976: The Geological Expression of Eustacy in the Early Tertiary of the Gippsland Basin. J. Aust. Petrol. Expl. Assoc., 16: 73-79.

W.K. Harris
Consulting Geologist - Petroleum

WEST SEAHORSE NO. 1 WELL

KEROGEN TYPES AND SPORE COLOURATION

FROM SELECTED SIDEWALL CORES

by

W.K. Harris
Consulting Geologist - Petroleum

WESTERN MINING CORPORATION LIMITED

PALYNOLOGICAL REPORT

Client: Hudbay Oil (Australia) Ltd.

Study: West Seahorse No. 1 Well, Gippsland Basin.

Aims: Kerogen typing and spore colouration.

INTRODUCTION

During routine palynological processing of sidewall cores from the above well, an unoxidised kerogen sample was taken and the nature of the kerogens and spore colouration are documented in Table II. Only those samples which yielded spore/pollen assemblages have been examined for this report. Spore colour is expressed as the "Thermal Alteration Index" (TAI) of Staplin (1969) according to the scale in Table I.

TABLE I

Thermal - Alteration Index	Organic matter/spore colour
1 - none	fresh, yellow
2 - slight	brownish yellow
3 - moderate	brown
4 - strong	black
5 - severe	black and evidence of rock metamorphism

Total organic matter (TOM) is expressed semi-quantitatively in the scale-abundant, moderate, low, very low, barren. Samples classed as having abundant or moderate amounts of TOM would be expected to have TOC's (total organic content) greater than 1%.

In this report four classes of organic matter are recognised - amorphogen, phyrogen, hylogen and melanogen and these terms are more or less synonymous with amorphous, herbaceous, woody and coaly. For reasons as outlined by Bujak et al. (1977) the former terms are preferred because they do not have a botanical connatation. The thermal alteration index scale follows that of Staplin (1969) and as outlined by Bujak et al. (1977). At a TAI of 2+ all four types of organic material contribute to hydrocarbon generation whereas at a TAI of 2, only amorphogen forms liquid hydrocarbons. The upper boundary defining the oil window is at a TAI of approximately 3 but varies according to the organic type. Above TAI 3+ all organic types only have a potential for thermally derived methane.

INTERPRETATION

The best potential source rocks occur between 1430 and 1770m where high organic yields have been recorded. These occur within the M. diversus assemblage zone and are only very marginally mature to immature for hydrocarbon generation. However amorphogen is often the dominant organic matter and may produce hydrocarbons at a low temperature regime.

The organic matter near the base of the well in the Late Cretaceous section is very variable in TOM with some samples yielding moderate amounts. This section is also more mature and the kerogens tend to be dominated by phyrogen which when mature would be expected to source liquid hydrocarbons.

In general the thermal maturity of West Seahorse No. 1 appears to be low and little if any hydrocarbons would appear to have been generated from this section.

TABLE II

WEST SEAHORSE NO. 1 WELL

DISTRIBUTION OF KEROGEN TYPES AND SPORE COLOUR IN SELECTED SAMPLES

Depth (m)	TAI	TOM	Amorpho.	Phyro.	Hylo.	Melano
1422.4	1+	v. low	95	5	Tr	Tr
1423.4	1+	v. low	90	5	Tr	5
1434.0	2-	abundant	60	10	10	20
1435.8	2-	moderate	50	10	10	30
1460.5	2-	abundant	90	5	Tr	5
1475.5	2-	abundant	Tr	10	20	70
1487.2	2-	moderate	Tr	10	20	70
1512.8	2-	moderate	Tr	75	15	10
1594.9	2-	v. low	Tr	50	5	45
1648.2	2-	abundant	Tr	30	10	60
1778.0	2	moderate	Tr	90	Tr	10
1855.3	2	low	Tr	5	5	90
1894.2	2	low	5	20	5	70
2083.2	2	low	Tr	55	15	30
2125.1	2	v. low	-	5	5	90
2332.5	2	low	-	75	5	10
2703.1	2	moderate	-	80	10	10
2468.0	2+	moderate	-	30	5	65

Kerogen macerals are given as a percentage. Less than 5% is recorded as a trace (Tr).

REFERENCES

Bujak, J.P., Barss, M.S., and Williams, G.L., 1977: Offshore East Canada's Organic Type and Color and Hydrocarbon Potential. Oil Gas J., 45 (14): 198-202.

Staplin, F.L., 1969: Sedimentary Organic Matter, Organic Metamorphism and Oil and Gas Occurrence. Bull. Can. Pet. Geol., 17: 47-66.

W.K. Harris
Consulting Geologist - Petroleum

17 March 1982.

APPENDIX B3. W I R E L I N E   L O G   I N T E R P R E T A T I O N

(Refer to accompanying report)

APPENDIX B4. PETROLOGY REPORT

SPECIAL CORE ANALYSIS STUDY

FOR

HUDBAY OIL (AUSTRALIA) LTD

WELL: WEST SEAHORSE 1

24A LIM TECK BOO ROAD, [?]APORE 1953. TELEX: RS21423 TEL: 282 1222

CORE LABORATORIES
Special Core Analysis

Hudbay Oil (Australia) Ltd
256 Adelaide Terrace
Perth
Western Australia

ATTENTION: MR. E M L TUCKER
MR. G DANN

Subject: Special Core Analysis
Well : West Seahorse 1
File : SNSCAL 81056

31st March 1982

Gentlemen,

In a letter dated 7 October, 1981, from Mr. Tucker of Hudbay Oil (Australia) Ltd, Core Laboratories were requested to perform formation resistivity factor tests on core samples from the subject well.

Seven one-and-one-half-inch diameter plug-size core samples were drilled with liquid nitrogen at our Perth facility for use in this study. The samples were received in our Singapore Laboratory on 7th November 1981. These samples are described with respect to depth and lithology on page 1 of this report.

All samples were cleaned in cool solvents before drying in a humidity oven maintained at 40-45% relative humidity and 60°c.

Following measurements of helium injection porosity, the samples were saturated with a brine having a concentration of approximately 200,000 ppm. The brine comprised 80% sodium chloride, 10% calcium chloride and 10% potassium chloride since an exact analysis was not available. The electrical resistivities of the brine saturated samples and the saturant brine were measured on consecutive days until the readings stabilised indicating ionic equilibrium within the samples. Formation factor values were then calculated and plotted against porosity; the resultant plot yielded values of 1.00 for "a", the intercept, and an average value of 1.68 for "m", the cementation exponent.

All samples were then re-cleaned, humidity dried, porosities were re-measured and then the samples were re-saturated with a brine having a concentration of approximately 30,000 ppm. Again the constituents were 80% sodium chloride, 10% calcium chloride and 10% potassium chloride.

As before electrical readings were made until they became stable, whereupon formation factor values were calculated. The subsequent plot yielded values of 1.00 for "a" and 1.67 for "m". The data is presented in tabular form on page 2 and in graphical form on pages 3 and 4.

To all intents and purposes formation factor data yielded using 200,000 ppm is no different from the data using the 30,000 ppm brine.

In a telex (ref. no. 1314) dated 15 February 1982, from our Perth office, we were requested to perform cation exchange capacity measurements on the seven samples used for formation factor measurements. The ammonium-acetate, wet-chemistry technique was used and data is given on page 5, together with core resistivities (values for Ro) as requested.

Please contact us should you require any further assistance.

Yours faithfully
CORE LABORATORIES INTERNATIONAL LTD

Tony Kennaird

TONY KENNAIRD
Manager - Core Analysis Services

Enc

TK:sb

COMPANY: HUDBAY OIL (AUSTRALIA) LTD

FORMATION:

WELL : WEST SEAHORSE 1

COUNTRY : AUSTRALIA

FIELD :

IDENTIFICATION AND DESCRIPTION OF SAMPLES

Sample Number	Depth, Metres	Lithological Description
1	1450.0	SST:lt brn, cg, p-mod cmtd, subang-subrnd, mod std, carb lam.
2	1450.3	SST:lt brn, m-vcg, mod cmtd, subang-subrnd, mod std, carb lam.
3	1450.6	A A
4	1450.9	SST:lt brn, m-cg, mod cmtd, subang-subrnd, w std.
5	1451.2	SST:lt brn, f-vcg, mod cmtd, subang-subrnd, p-mod std, carb lam.
6	1451.5	SST:gy, mg, mod cmtd, subang-subrnd, p std, arg, carb.
7	1451.8	SST:lt gy, vfg, mod-w cmtd, subang-subrnd, w std, abd arg lams.

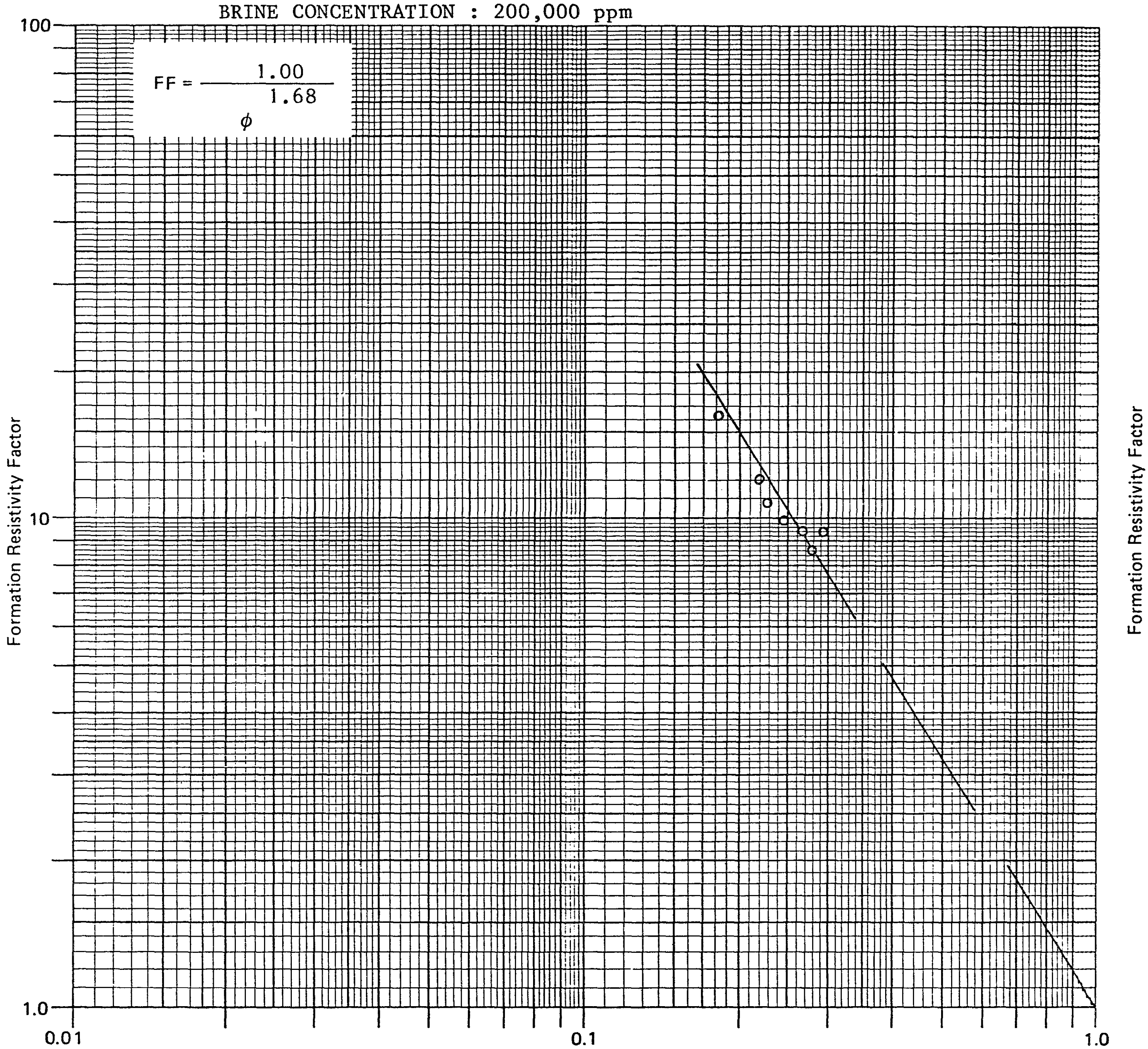
FORMATION RESISTIVITY FACTOR DATA

Resistivity of saturant brine, Ohm/m 0.061 200,000 ppm
0.267 30,000 ppm

Sample Number	Porosity, Per Cent	Formation Factor	
		200,000 ppm	30,000 ppm
1	29.4	9.4	9.4
2	24.7	9.9	9.9
3	26.7	9.4	9.3
4	27.8	8.6	8.6
5	21.9	12.1	12.1
6	18.3	16.4	16.1
7	22.7	10.6	10.1

Company HUDBAY OIL (AUSTRALIA) LTD
Well WEST SEAHORSE 1
Field
Formation
Country AUSTRALIA

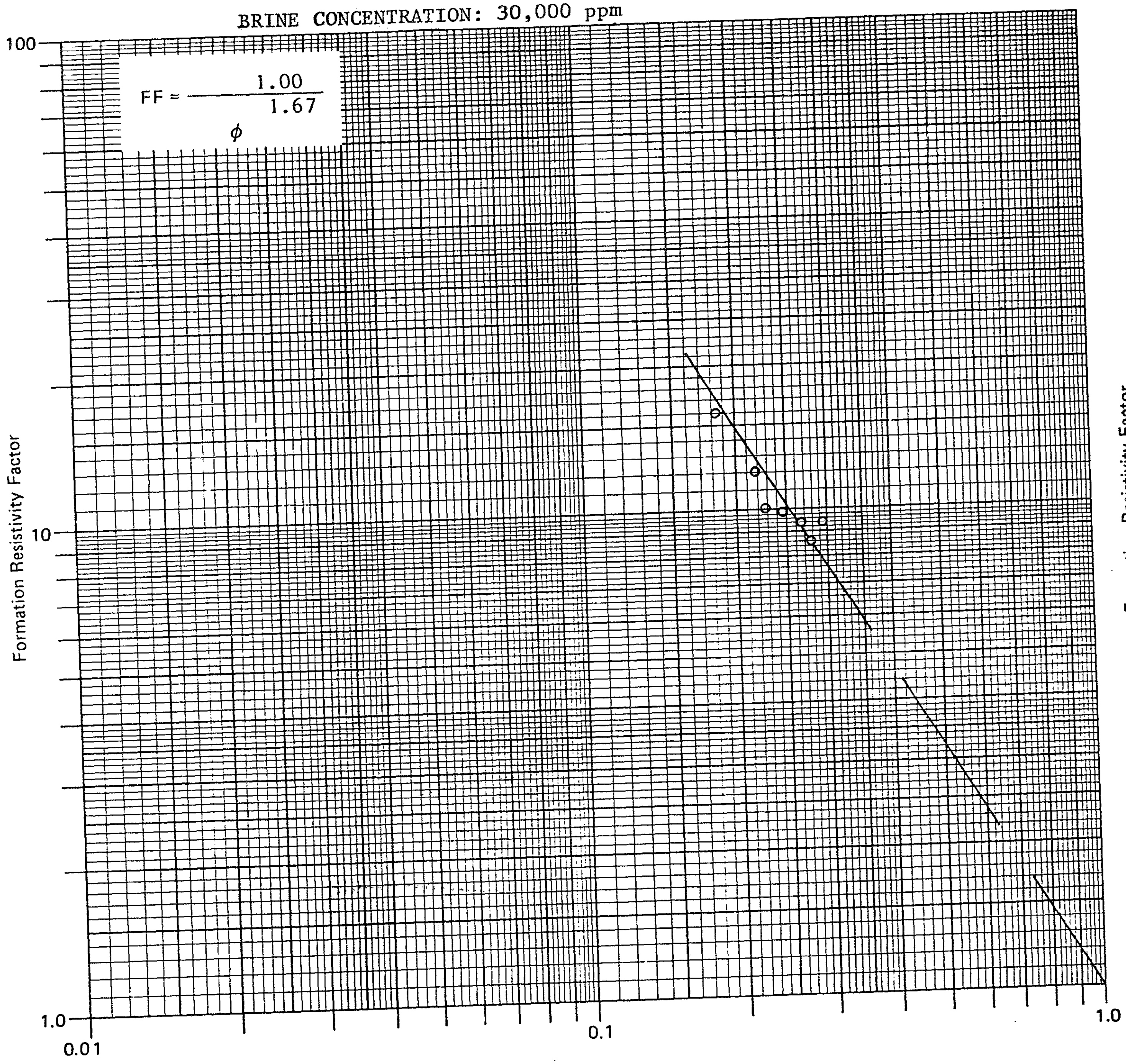
BRINE CONCENTRATION : 200,000 ppm



Porosity, Fraction

Company HUDBAY OIL (AUSTRALIA) LTD
Well WEST SEAHORSE 1
Field
Formation
Country AUSTRALIA

BRINE CONCENTRATION: 30,000 ppm



ELECTRICAL RESISTIVITY AND CATION EXCHANGE CAPACITY DATA

Company : Hudbay Oil (Australia) Ltd — Well : West Seahorse 1

Formation: — Field:

Country : Australia

Resistivity of Saturant Brine, Ohm-Metres: 0.052 @ 72°F* 200,000 ppm
0.226 @ 72°F* 30,000 ppm

Sample Number	Porosity Per Cent	Grain Density gm/cc	Cation Exchange Capacity Meq/100gms	Core Resistivity Ro	Formation Factor	Cementation Exponent m**
				200,000 ppm		
1	29.4	2.66	0.70	0.490	9.4	1.83
2	24.7	2.66	0.50	0.516	9.9	1.64
3	26.7	2.66	0.52	0.491	9.4	1.70
4	27.8	2.66	0.66	0.447	8.6	1.68
5	21.9	2.61	0.59	0.631	12.1	1.64
6	18.3	2.63	1.22	0.854	16.4	1.65
7	22.7	2.67	1.31	0.552	10.6	1.59
				30,000 ppm		
1	29.4	2.66	0.70	2.124	9.4	1.83
2	24.7	2.66	0.50	2.237	9.9	1.64
3	26.7	2.66	0.52	2.102	9.3	1.69
4	27.8	2.66	0.66	1.944	8.6	1.68
5	21.9	2.61	0.59	2.735	12.1	1.64
6	18.3	2.63	1.22	3.639	16.1	1.64
7	22.7	2.67	1.31	2.283	10.1	1.56

* Temperature at which Ro measurements were made
** Assuming intercept "a" is 1.00

APPENDIX B5. G E O C H E M I C A L   A N A L Y S E S

GEOCHEMICAL EVALUATION OF WEST SEAHORSE #1 OILS

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Petroleum Geochemistry Group
School of Applied Chemistry
W.A. Institute of Technology
Kent Street
BENTLEY 6102

CONTENTS

TABULATED DATA

GRAVITY AND SULPHUR DATA

OILNAME	API GRAVITY (deg)	% SULPHUR (w/w)
W.SEAHORSE DST 1	48.3	0.22
W.SEAH. RFT 4a 1417m	44.3	0.25
W.SEAH. RFT 4b 1417m	40.2	9.22
W.SEAHHORSE 1502m OI	45.3	0.07
W.SEAH. RFT 5a 1502m	47.7	0.10
W.SEAH. RFT 5a 1502m	44.4	8.40
W.SEAH. RFT 1505.5m	nd	nd

COMPOSITIONAL DATA

	OILNAME	%SAT	%AROM	%NSO	PRIST/PHYT	PRIST/NC17	PHYT/NC18	PAP	AROM/SAT	CPI(1)	CPI(2)	21+22/28+29
	W.SEAHORSE DST 1	84.9	10.2	4.8	5.32	.36	.07	nd	0.12	1.09	1.09	5.1
OIL	W.SEAH. RFT 4a 1417m	91.1	7.3	1.6	5.40	.36	.07	nd	0.08	1.09	1.09	4.9
EMU.	W.SEAH. RFT 4b 1417m	92.8	5.4	1.8	5.70	.36	.07	nd	0.06	1.09	1.08	5.1
	W.SEAHHORSE 1502m OI	91.5	6.8	1.6	5.61	.30	.06	nd	0.07	1.10	1.09	6.5
OIL	W.SEAH. RFT 5a 1502m	92.0	7.1	1.0	5.39	.29	.06	nd	0.08	1.07	1.06	5.8
EMU.	W.SEAH. RFT 5a 1502m	91.5	7.6	0.8	5.36	.31	.06	nd	0.08	1.10	1.09	5.6
	W.SEAH. RFT 1505.5m	44.1	53.2	2.7	5.62	.40	.07	nd	1.20	1.03	1.02	5.2

1

N-ALKANE DISTRIBUTIONS

	OILNAME	CN12	CN13	CN14	CN15	CN16	CN17	CN18	CN19	CN20	CN21	CN22	CN23	CN24	CN25	CN26	CN27	CN28	CN29	CN30	CN31
	W.SEAHORSE DST 1	0.0	0.0	0.7	2.8	8.5	12.0	11.9	11.3	9.6	8.7	7.6	6.6	5.3	4.5	3.1	2.6	1.8	1.4	0.9	0.7
OIL	W.SEAH. RFT 4a 1417m	0.0	0.0	0.7	2.9	8.4	11.8	11.5	10.9	9.6	8.5	7.6	6.8	5.5	4.7	3.4	2.8	1.8	1.4	0.9	0.8
EMU.	W.SEAH. RFT 4b 1417m	0.0	0.0	0.7	3.3	9.1	12.7	12.2	10.6	9.7	8.4	7.3	6.4	5.1	4.3	3.1	2.5	1.8	1.3	0.8	0.7
	W.SEAHHORSE 1502m OI	9.4	9.7	9.9	10.2	9.8	9.1	8.0	6.8	5.8	4.7	3.9	3.3	2.6	2.1	1.5	1.2	0.8	0.5	0.3	0.3
OIL	W.SEAH. RFT 5a 1502m	10.0	10.4	10.4	10.0	9.0	8.1	7.1	6.5	5.6	4.7	4.1	3.6	2.9	2.3	1.6	1.3	0.9	0.6	0.4	0.3
EMU.	W.SEAH. RFT 5a 1502m	9.1	9.2	10.0	9.4	8.6	7.9	7.4	6.9	6.1	5.2	4.6	4.0	3.1	2.6	1.8	1.5	1.0	0.7	0.5	0.4
	W.SEAH. RFT 1505.5m	6.3	6.7	7.0	7.3	7.8	8.4	8.2	7.7	7.3	6.5	5.8	5.2	4.2	3.6	2.7	1.9	1.4	0.9	0.6	0.4

KEY

%SAT	=	Percentage by weight of saturated compounds in the oil
%AROM	=	Percentage by weight of aromatic compounds in the oil
%NSO	=	Percentage by weight of asphaltenes plus resins in the oil
NC17	=	n-heptadecane (i.e. n-alkane with 17 carbon atoms)
NC18	=	n-octadecane (i.e. n-alkane with -8 carbon atoms)
CPI	=	Carbon Preference Index
PRIST	=	Pristane
PHYT	=	Phytane
PAP	=	Percentage of aromatic protons in the aromatic fraction

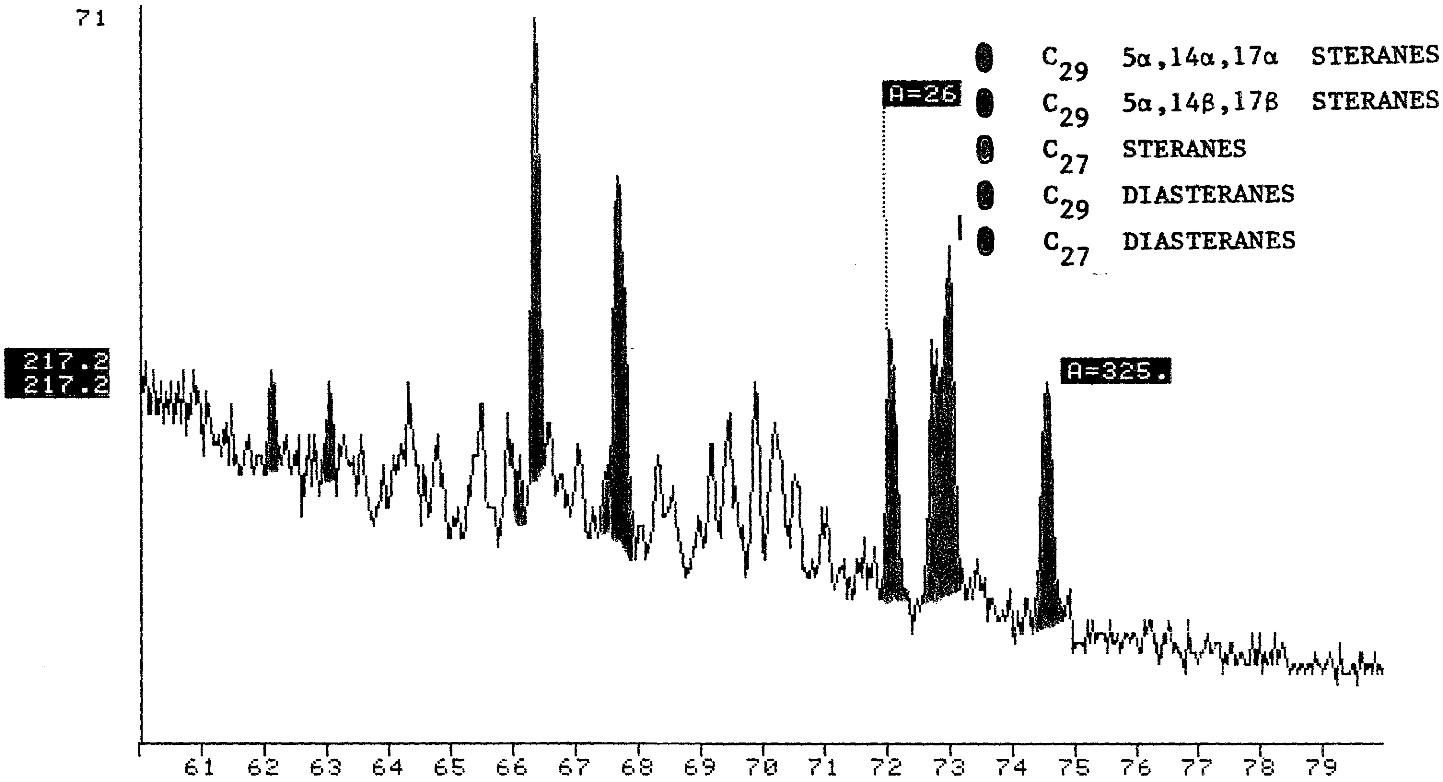
n-Alkane Composition: CN12 etc. = n-alkane with 12 carbon atoms etc.
(Values are weight percent of the n-alkane fraction)

nd	=	No data
HC	=	Hydrocarbon

21+22/28+29: Sum of percentages of n-alkanes with carbon numbers 21 and 22 divided by sum of percentages of n-alkanes with carbon numbers 28 and 29

MASS FRAGMENTOGRAMS

NAME WEST SEAHORSE # , DST 1, 1411-16m. SATS. FRN 5279
MISC 31-5-82. GEC. 1 M/L.



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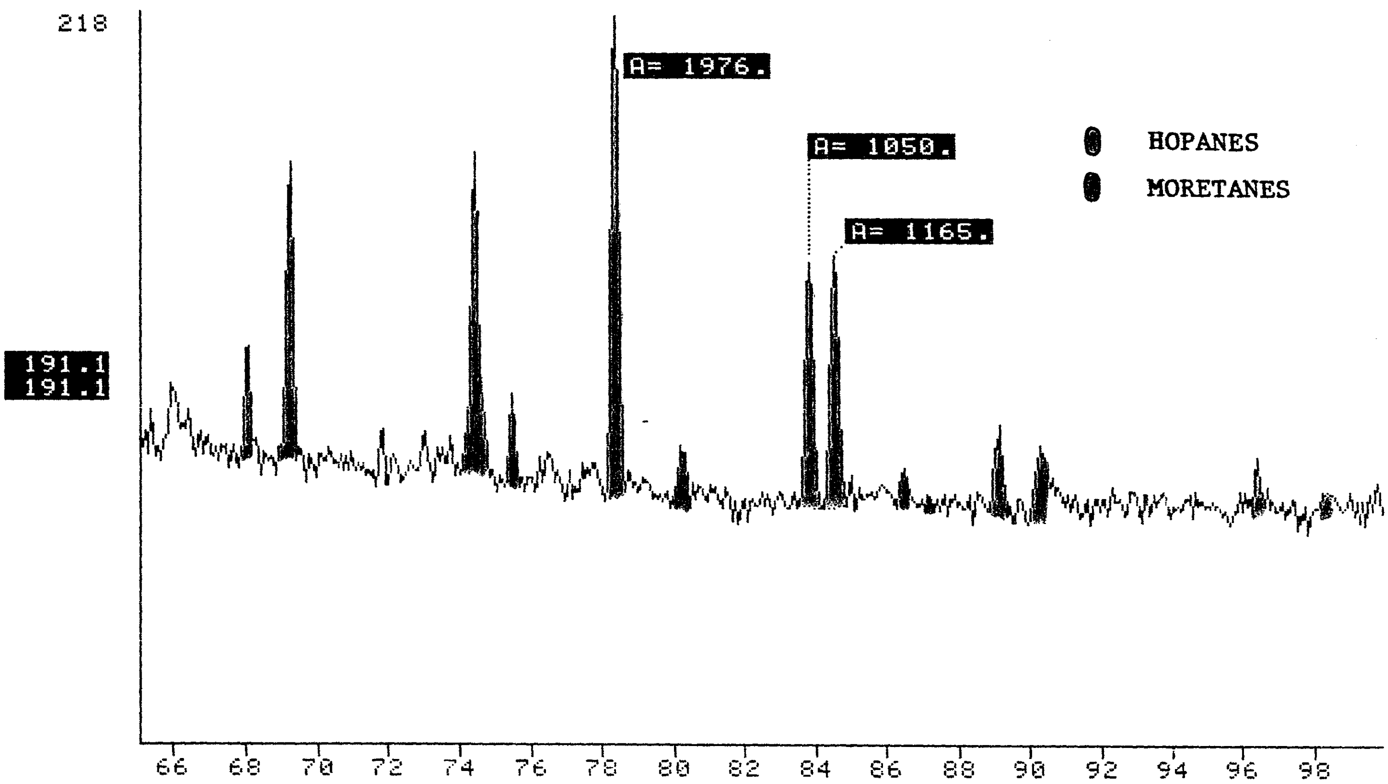

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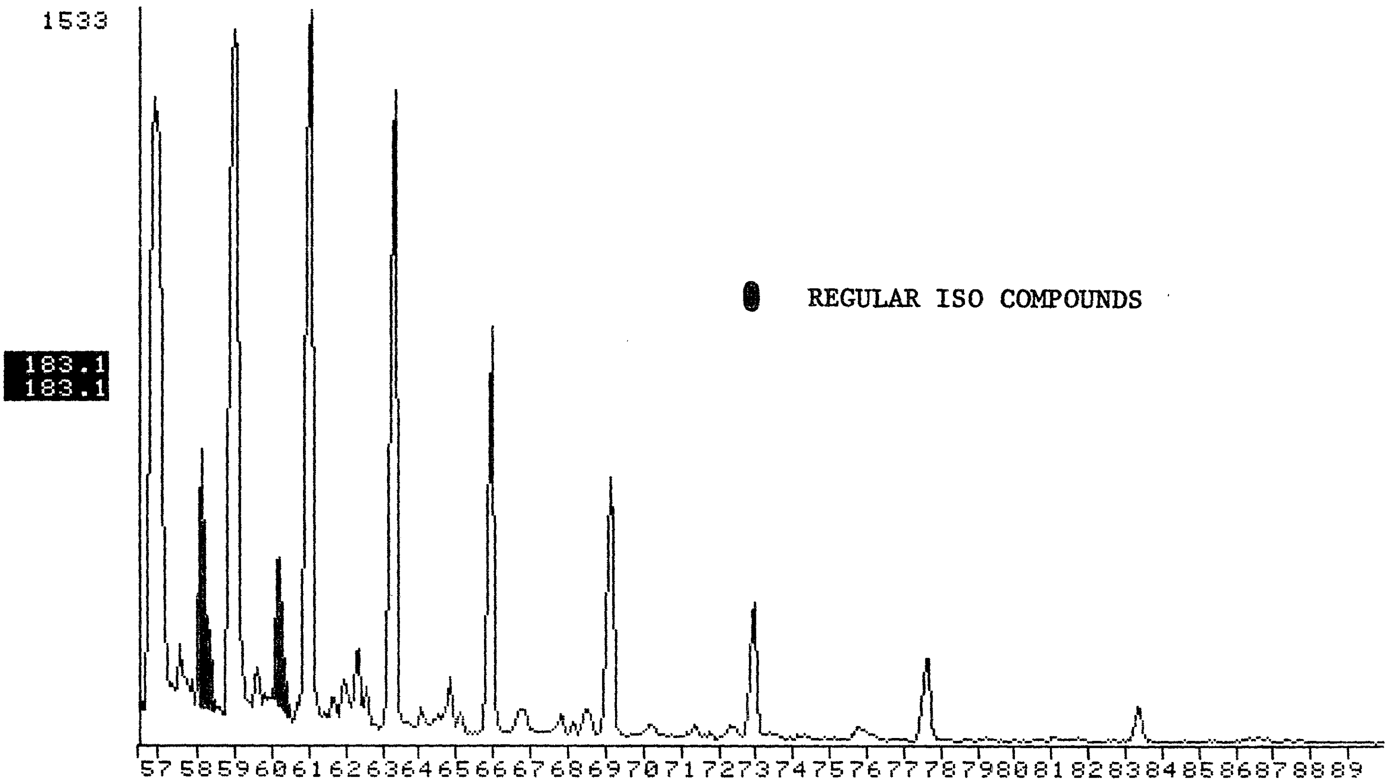

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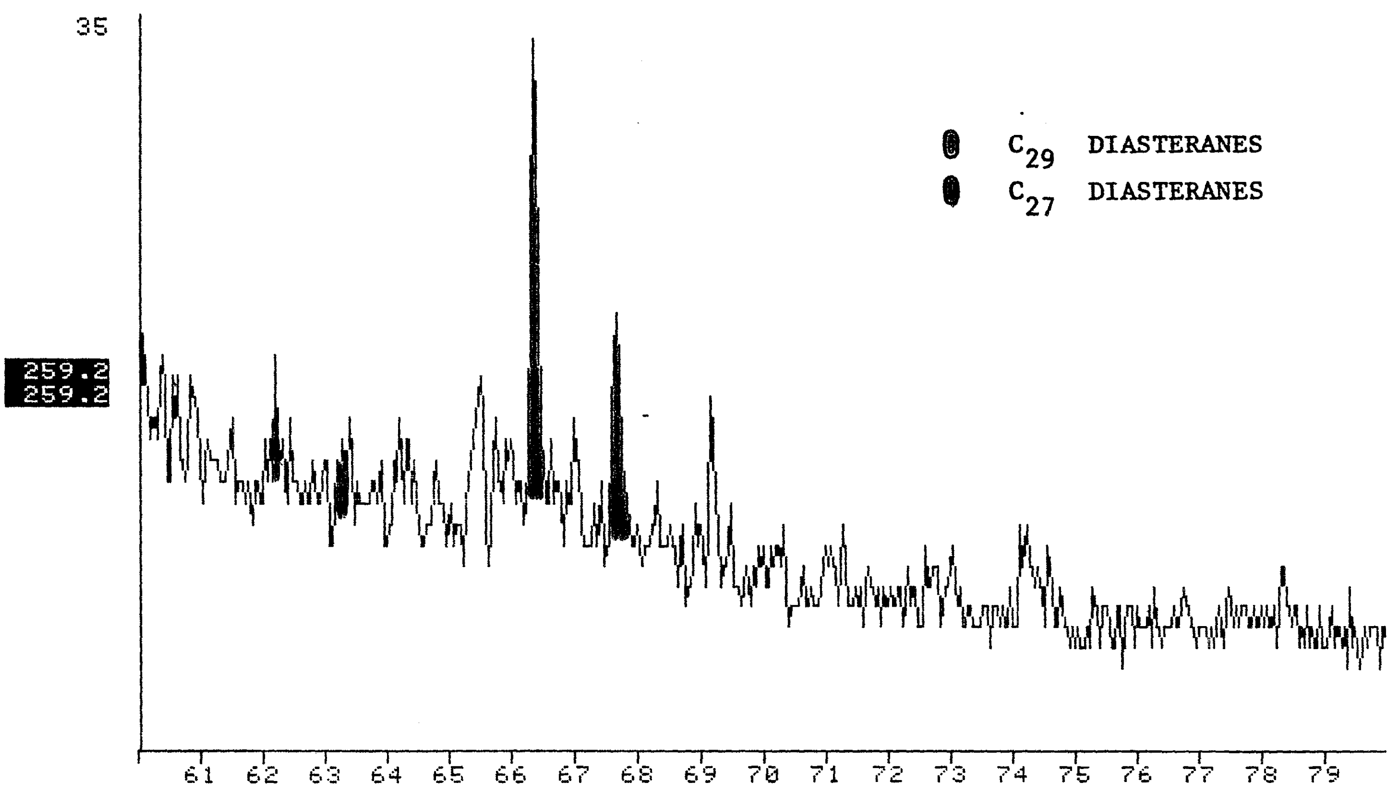

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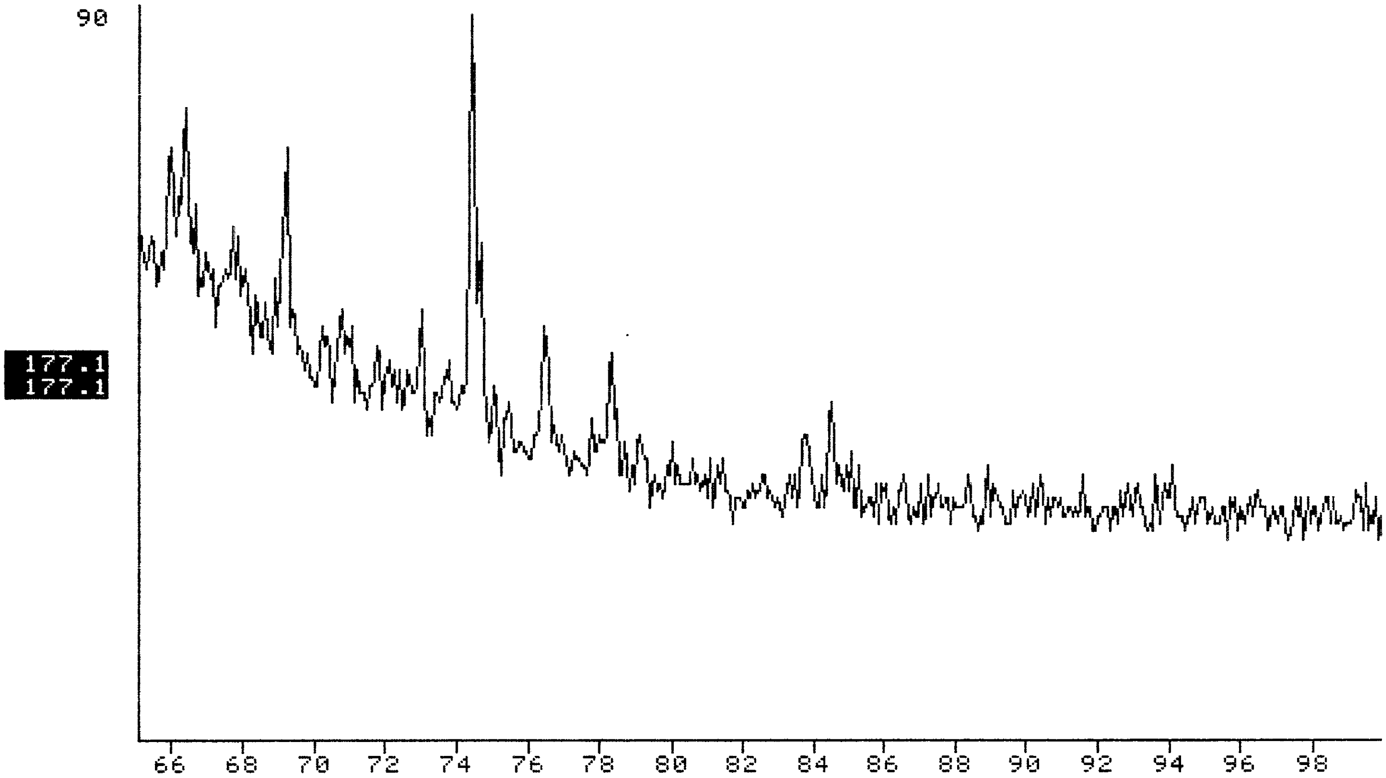

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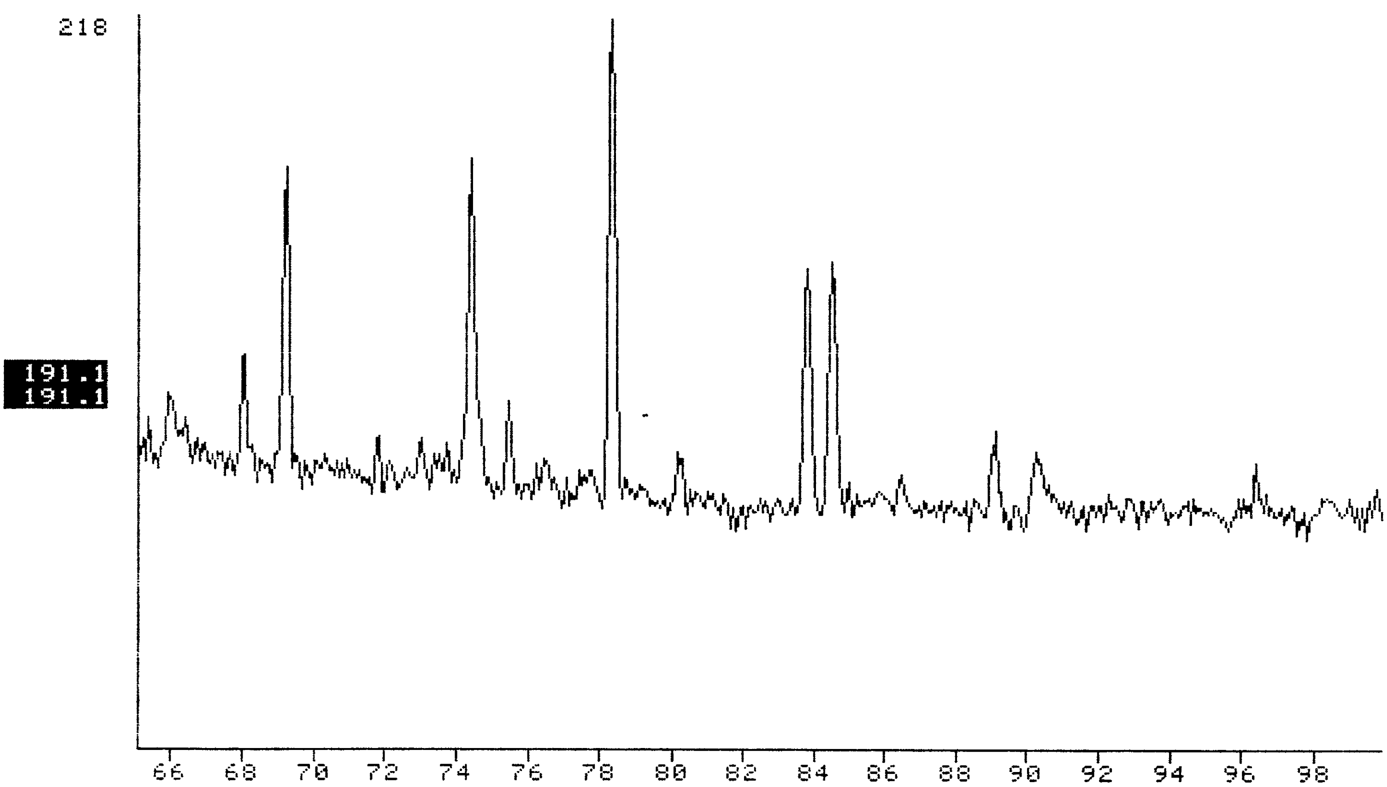

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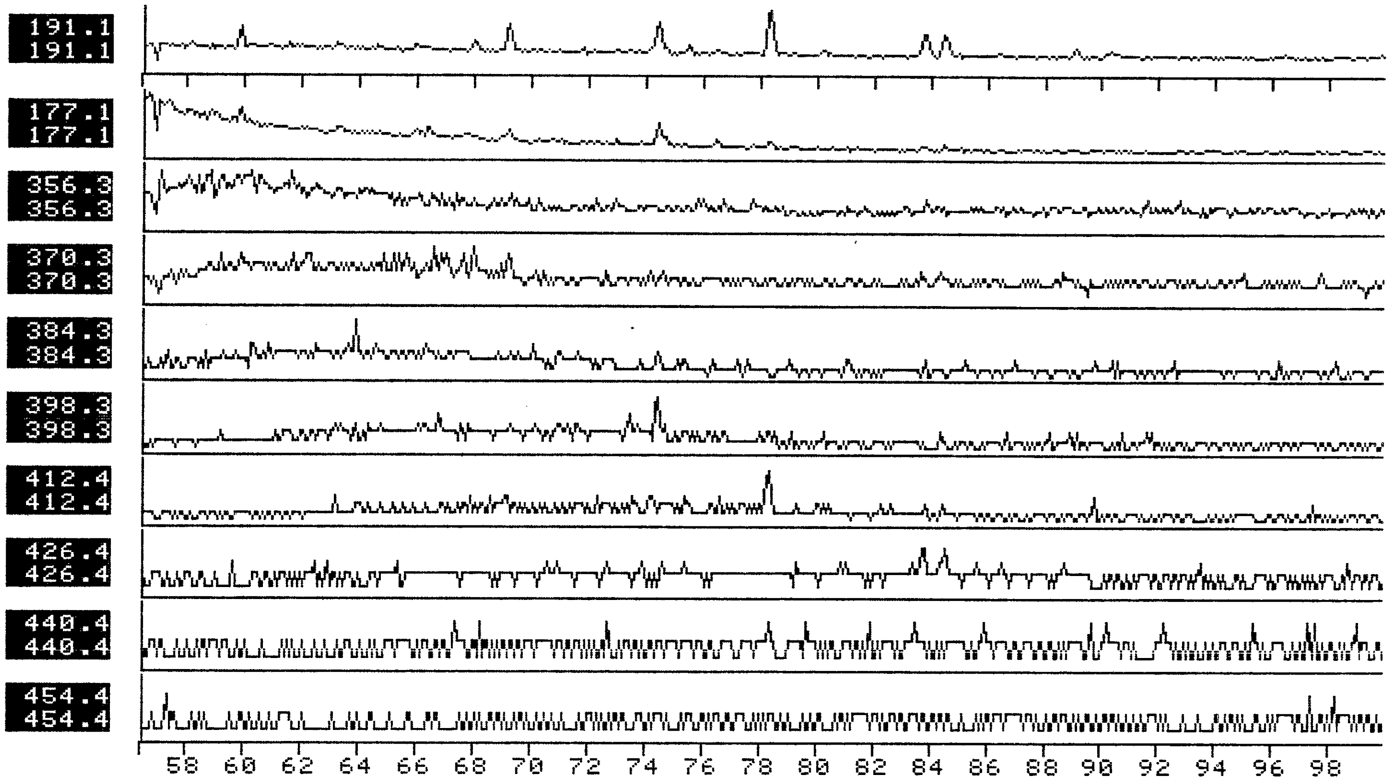
FRN 5279



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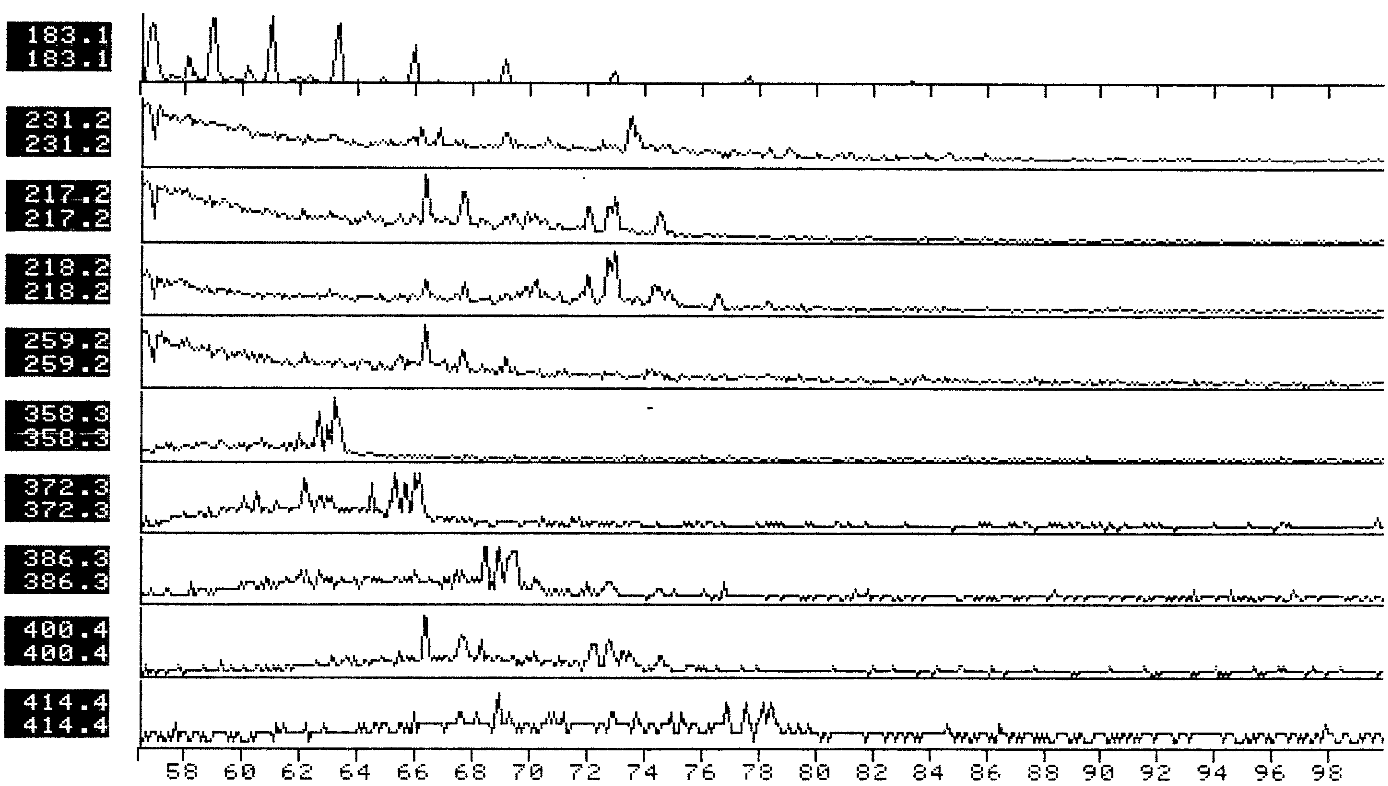
FRN 5279



THEORY AND METHOD

THEORY AND METHOD

1. API GRAVITY

A 1 ml specific gravity (SG) bottle was accurately weighed, then filled with crude oil at 60°F and finally reweighed. The weight difference was divided by the weight of 1 ml of water at 60°F to obtain the specific gravity. The following formula was then used to calculate the API gravity :

$$\text{API Gravity} = \left(\frac{141.5}{\text{SG (60°F)}}\right) - 131.5$$

The reported gravity value is the average of duplicate determinations.

2. SULPHUR DETERMINATION

The % sulphur values were measured using an x-ray fluorescence spectrometer equipped with a liquid sample holder. This parameter is influenced by the nature of the source material from which a crude is derived, the depositional environment of the source rocks, and reservoir alteration processes such as bacterial alteration.

3. SEPARATION OF OIL INTO CONSTITUENT FRACTIONS

The oils were separated into saturated, aromatic and NSO (asphaltenes plus resins) fractions by column chromatography on silicic acid. The crude was applied to the top of a silicic acid column (sample to adsorbent ratio 1:50) and the saturated compounds were eluted with n-pentane, aromatic compounds with a 50:50 mixture of ether and n-pentane, and finally the NSO fraction was eluted with a 20:1 mixture of methanol and dichloromethane. The neat fractions were recovered by careful removal of the solvent by fractional distillation and weighed.

The weight of each fraction was used to calculate the % by weight of each fraction in the oil according to the following formula:

$$\%\ \text{Fraction} = \frac{\text{Wt. Fraction}}{\text{Wt. All Fractions}} \times \frac{100}{1}$$

4. GLC ANALYSIS OF SATURATED COMPOUNDS

Capillary GLC traces were recorded for each saturate fraction. The following information was obtained from these traces:

(a) n-Alkane Distribution - The C_{12}-C_{31} n-alkane distribution was determined from the area under peaks representing each of these n-alkanes. This distribution can yield information about both the level of maturity and the source type (LeTran et al., 1974).

(b) Carbon Preference Index - Two values were determined:

$$CPI(1) = \frac{(C_{23} + C_{25} + C_{27} + C_{29})Wt\% + (C_{25} + C_{27} + C_{29} + C_{31})Wt\%}{2 \times (C_{24} + C_{26} + C_{28} + C_{30})Wt\%}$$

$$CPI(2) = \frac{(C_{23} + C_{25} + C_{27})Wt\% + (C_{25} + C_{27} + C_{29})Wt\%}{2 \times (C_{24} + C_{26} + C_{28})Wt\%}$$

The CPI is believed to be a function of both the level of maturity (Cooper and Bray, 1963; Scalan and Smith, 1970) and the source type (Tissot and Welte, 1978). Marine crudes tend to have values close to 1 irrespective of maturity whereas values for terrestrial crudes decrease with maturity from values as high as 20 but don't usually reach a value of 1.

(c) $C_{21}+C_{22}/C_{28}+C_{29}$ - This parameter provides information about the source of the organic matter (Philippi, 1974). Generally, a terrestrial source gives values <1.2 whereas a marine source results in values >1.5.

(d) Pristane/Phytane Ratio - This value was determined from the areas of peaks representing these compounds. The ratio renders information about the depositional environment according to the following scale (Powell and McKirdy, 1975):

<3.0 Marine depositional environment (i.e. reducing environment)

3.0-4.5 Mixed depositional environment (i.e. reducing/oxidising environment)

>4.5 Terrestrial depositional environment (i.e. oxidising environment)

(e) Pristane/n-C_{17} Ratio - This ratio was determined from the areas of peaks representing these compounds. The value can provide information about both the source type and the level of maturation

(Lijmbach, 1975). Very immature crude oil has a pristane/n-C_{17} ratio >1.0, irrespective of the source type. However, the following classification can be applied to mature crude oil:

<0.5	Marine source
0.5–1.0	Mixed source
>1.0	Terrestrial source

In the case of sediment extracts these values are significantly higher and the following classification is used:

<1.0	Marine source
1.0–1.5	Mixed source
>1.5	Terrestrial source

(f) Phytane/n-C_{18} Ratio - This ratio was determined from the areas of peaks representing these compounds. The value usually only provides information about the level of maturity of petroleum. The value decreases with increased maturation.

(g) Relative Amounts of n-Alkanes and Naphthenes - Since n-alkanes and naphthenes are the two dominant classes of compounds in the saturate fraction, a semi-quantitative estimate of the relative amounts of these compounds was made. This information can be used to assess the degree of maturation and/or the source type of the petroleum (Philippi, 1974; Tissot and Welte, 1978). Very immature petroleum has only small proportions of n-alkanes, but as maturity increases the relative amount of n-alkanes increases. In addition, terrestrial petroleum has a greater proportion of high molecular weight naphthenes than marine petroleum.

5. DETERMINATION OF THE PAP VALUE

The PAP value (percentage of aromatic protons in the aromatic fraction) was determined by proton magnetic resonance spectroscopy on the aromatic fraction. This parameter is a quantitative measure of the level of maturation of petroleum (Alexander et. al., 1979).

6. CARBON ISOTOPE ANALYSIS

This measurement was carried out on one or more of the following mixtures; topped oil; saturate fraction; aromatic fraction; NSO fraction. The organic matter was combusted at 860°C in oxygen and the carbon dioxide formed was purified and transferred to an isotope mass spectrometer. The carbon isotope ratio was measured relative to a standard gas of known isotopic composition. In this case the standard gas was prepared from the NBS No. 22 oil. However, since the isotopic relationship between NBS No. 22 oil and the international reference PDB limestone are known, the values were adjusted to be relative to PDB limestone.

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COMMENTS AND CONCLUSIONS

General

Seven samples (one DST and six RFT tests) of formation fluid were provided for geochemical analysis. The RFT 4b (1417m) and RFT 1b (1505.5m), and one of the RFT 5a (1502m) samples were oil:water emulsions whereas all other samples were neat crude oil.

The following comments summarize the results from the geochemical analysis of these samples.

API Gravity

Since the values are generally in the mid to high forties these samples are all considered light crudes. The value of 48.3 for the DST sample is likely to be the most accurate due to the method by which this sample has been collected. The RFT samples are likely to be slightly water wet resulting in a lowering of the API gravity. The low values for the samples received as emulsions is probably related to their high sulphur content.

Sulphur Content

The DST 1 and RFT 4a samples have similar %S values at around 0.25%. The two oil samples from 1502m also have similar %S values of approximately 0.10%. Although both of these values are considered low, there is a measureable difference between the two pairs of oils, and this difference is most likely due to the fact that the shallower pair of oils are apparently partially biodegraded whereas the deeper pair are unaltered.

The samples provided as emulsions have very high %S values and this is most likely attributed to dissolved hydrogen sulphide and elemental sulphur, and to a lesser extent organic sulphur compounds.

Hydrocarbon Composition

The %SAT, %AROM and %NSO values show that the six shallowest samples generally have similar gross compositions. The slight difference between the DST sample and the other five samples probably reflects the more representative sampling method used for the DST. The gross composition of the deepest sample (1505.5m) is significantly different from that of the six shallower samples. However, this sample was provided as a very small volume of petroleum in a large volume of water and has clearly been severely affected by the presence of the large volume of water. Consequently, data for this sample should be used with caution. This gross composition data shows that the crudes are very rich in saturated compounds. Further, the GLC traces show that the saturated fraction is dominated by n-alkanes and hence these crudes are highly paraffinic.

The n-alkane distributions for the three samples from the shallowest depth are very similar, each showing an absence of the low molecular weight compounds as a result of biodegradation and/or water washing. The three samples from 1502m have distributions which are similar within the group but are different to the shallower group in that they have a significant low molecular weight component and hence are not biodegraded.

The pristane/n-C_{17} and $(C_{21}+C_{22})/(C_{28}+C_{29})$ ratios, and CPI values all suggest that the West Seahorse crudes are derived from marine or hydrogen rich organic matter. This suggestion is somewhat difficult to understand when considering the pristane/phytane ratios because these values indicate that the crudes are derived from source rocks deposited in a relatively oxidising depositional enviroment. Such enviroments are usually associated with terrestrial organic matter.

Gas Chromatography/Mass Spectrometry Analysis of Saturates

A GC/MS run was carried out on the DST#1 (1411-1416m) sample. Although this technique has its greatest application as an oil:oil or oil:source rock correlation tool, it can still be used to accurately determine specific information about a single crude. The data from the GC/MS analysis consists of 20 ion fragmentograms, of which the five most useful for this sample have been magnified to a size more useful for interpretation. These latter fragmentograms represent the following compound classes:

177	Triterpanes
183	Isoprenoids
191	Triterpanes
217	Steranes (including diasteranes)
259	Diasteranes

The C_{29} 5α,14α,17α 20S/20R and C_{29} 5α,14α,17α (20R)/5α,14β,17β (20R) sterane ratios (0.98 and 1.33 respectively) clearly indicate that this crude is highly mature, and further the latter parameter appears not to have been significantly influenced by migration suggesting that the source of this oil is reasonably close to the reservoir. The C_{29} 5α,14α,17α (20R) sterane is present in a much greater quantity than the corresponding C_{27} compound and this dominance of the C_{29} compound suggests that this oil has a significant terrestrial component. This contention is supported by the diasteranes which also show a dominance of the C_{29} compounds over the C_{27} compounds. Further, the consistent dominance of C_{29} steranes and diasteranes over their corresponding C_{27} compounds suggests that the West Seahorse crude is not a mixed oil i.e. it is from one type of source, and that it has not been severely biodegraded.

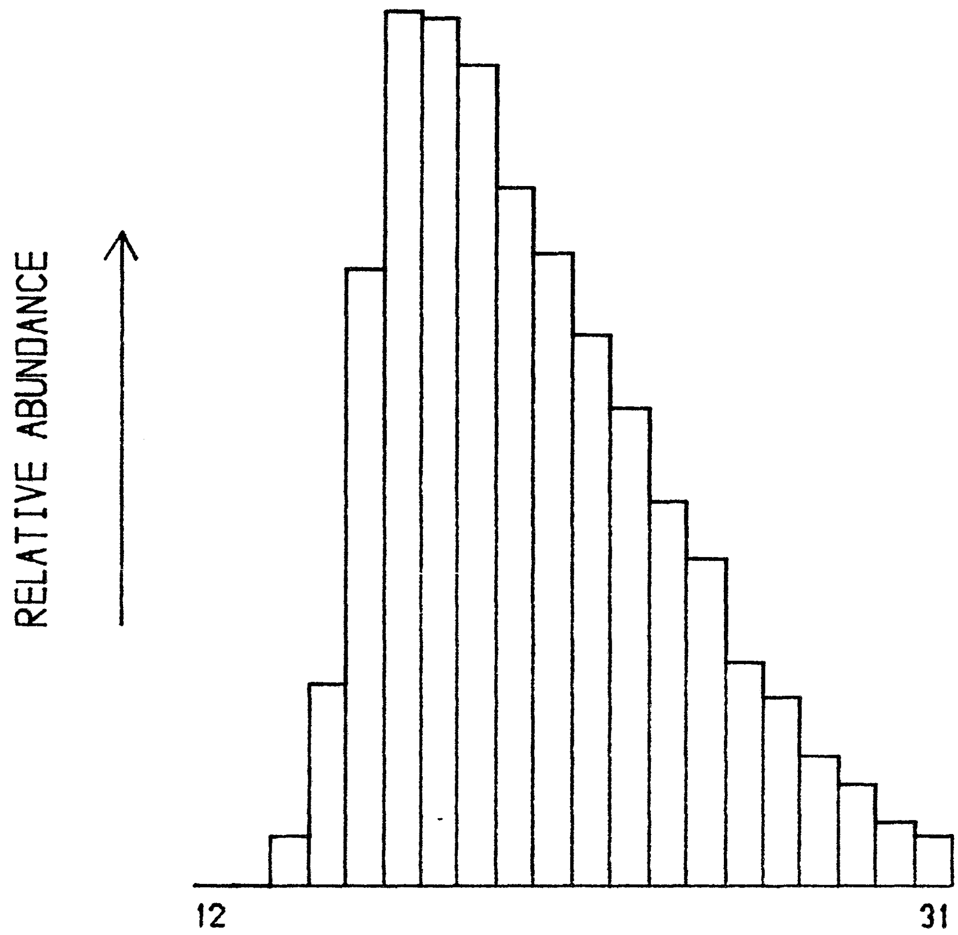
The C_{31} 17α,21β 22S/22R hopane ratio and the C_{29} and C_{30} hopane/moretane ratios support the steranes in suggesting that this crude is highly mature. Further, since the triterpane fragmentogram is dominated by hopanes and moretanes, and appears to have a very low content of higher plant triterpanes, the source rocks for this crude oil are likely to be geologically older than

Cretaceous.

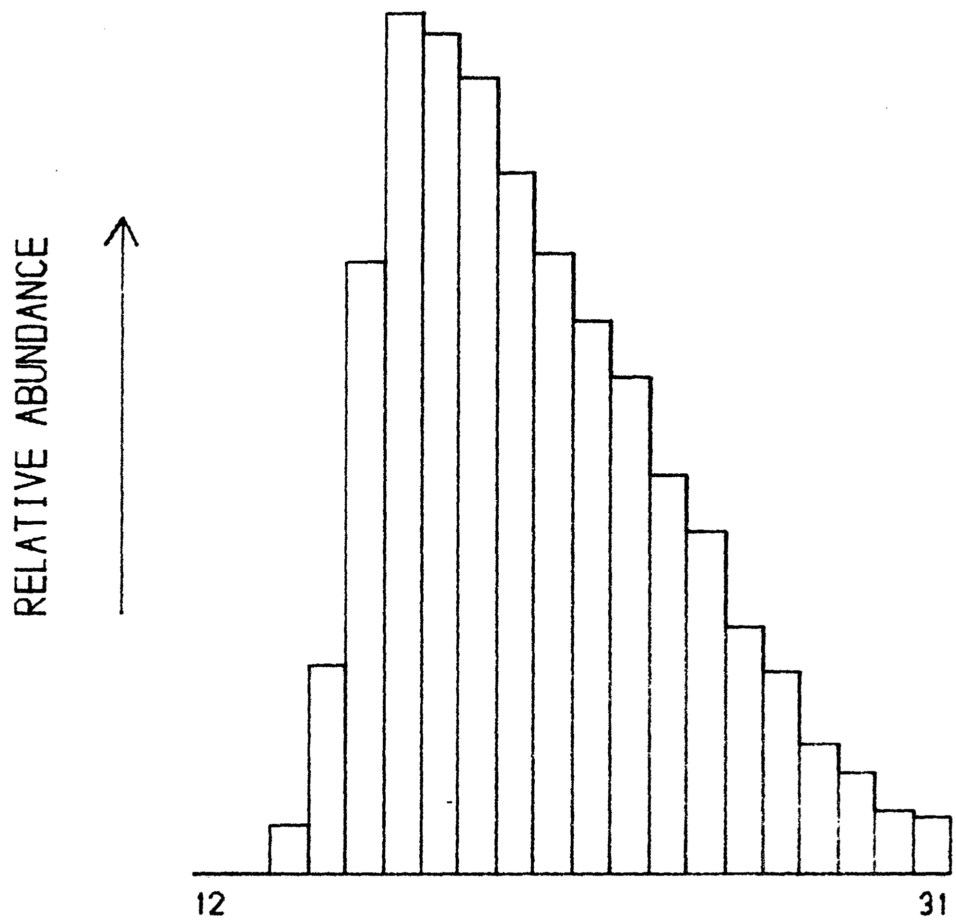
Since the steranes are derived from the organic matter deposited in sediments and the hopanes result from bacterial activity at the time of deposition, the C_{29} sterane/C_{30} hopane ratio reflects the degree of preservation of the organic matter in the source rocks. Our experience is that this ratio varies from 0.3 to 13.0. The value of 0.57 for West Seahorse crude indicates that there was a relatively poor preservation of organic matter in the source rocks from which this crude was derived.

In conclusion, although the use of GC/MS for correlation cannot be demonstrated with data from one sample, it is worthy of note that the source type dependence of the distributions of steranes, diasteranes, regular isoprenoids and triterpanes makes this technique particularly powerful for correlation studies.

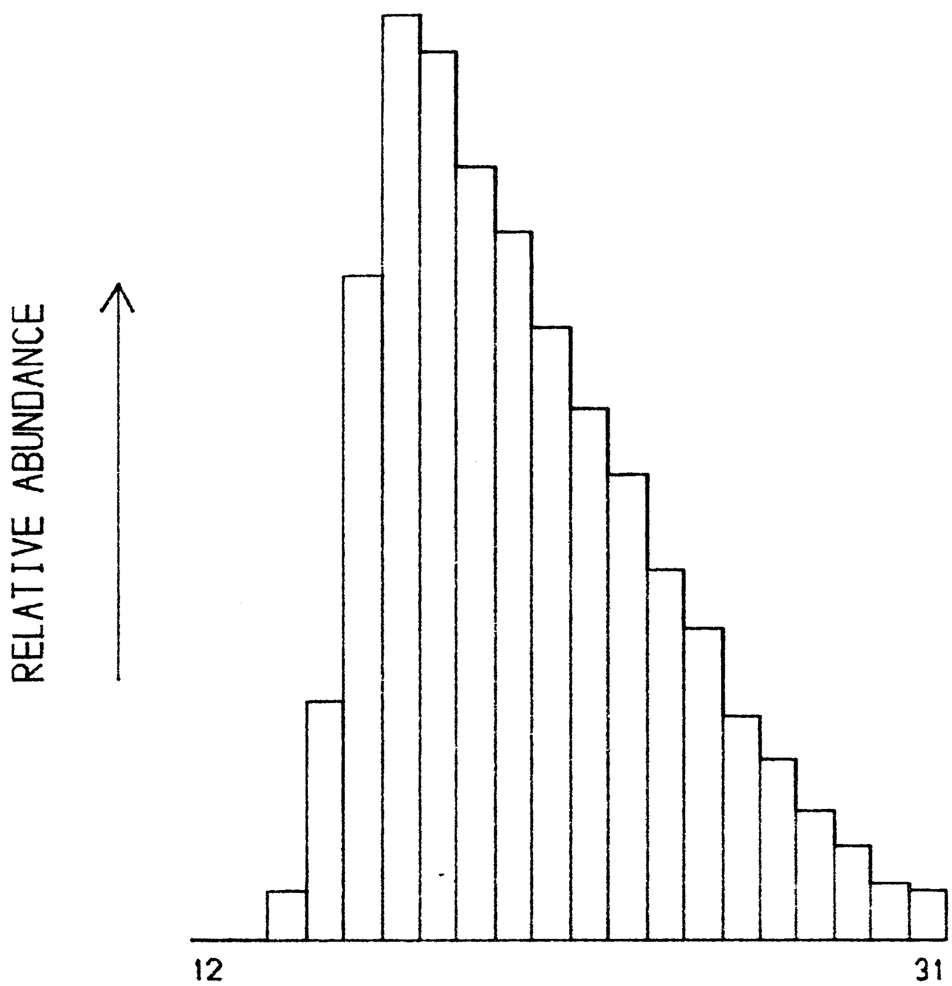
n-ALKANE DISTRIBUTIONS



WEST SEAHORSE 1 DST 1



WEST SEAHORSE 1 RFT 4A 1417M



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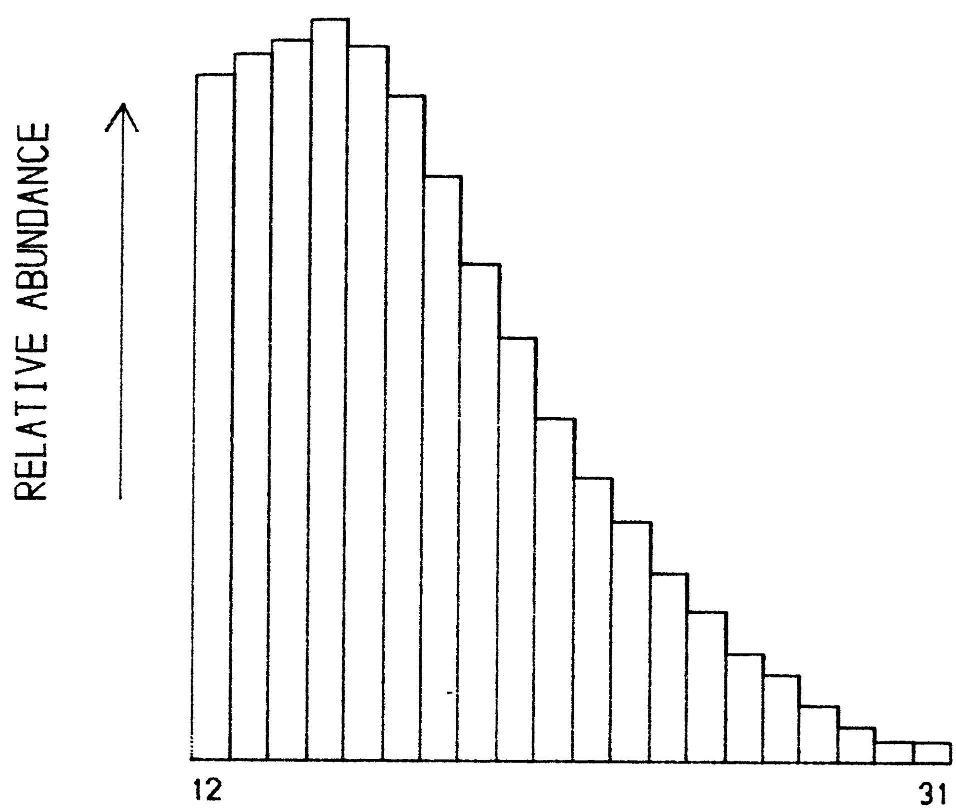
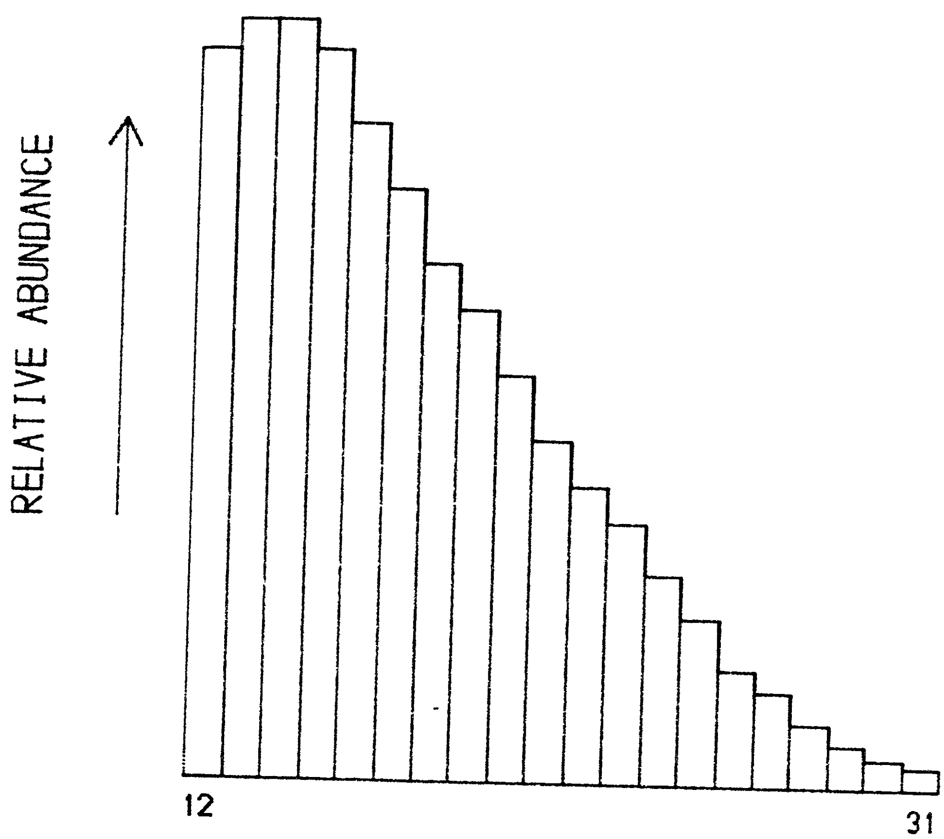
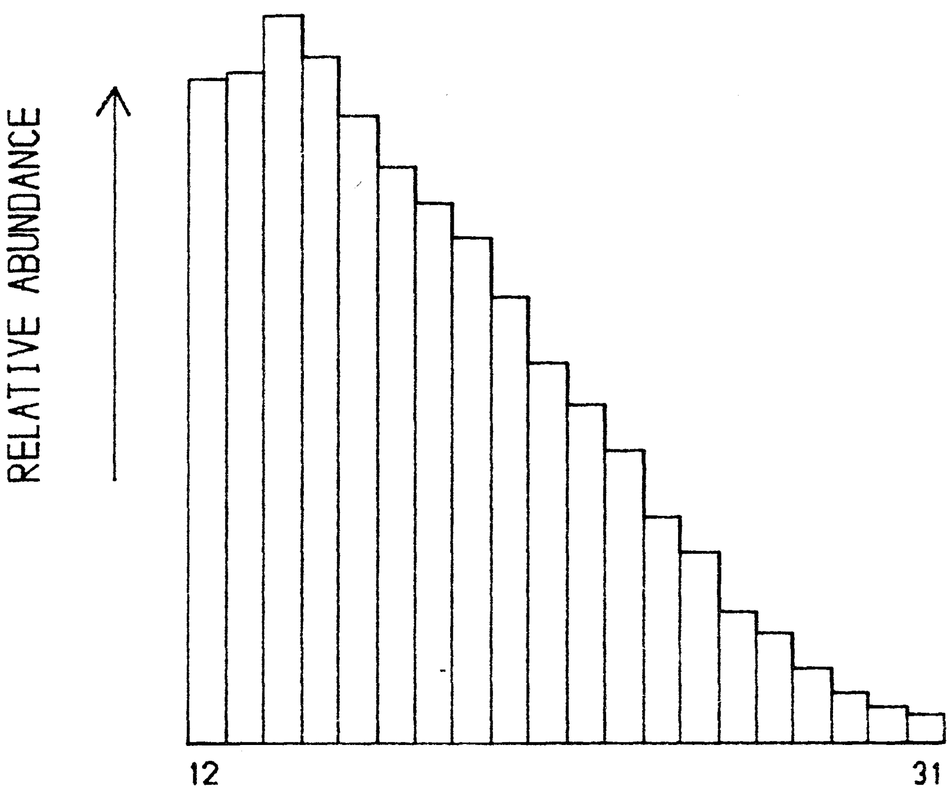


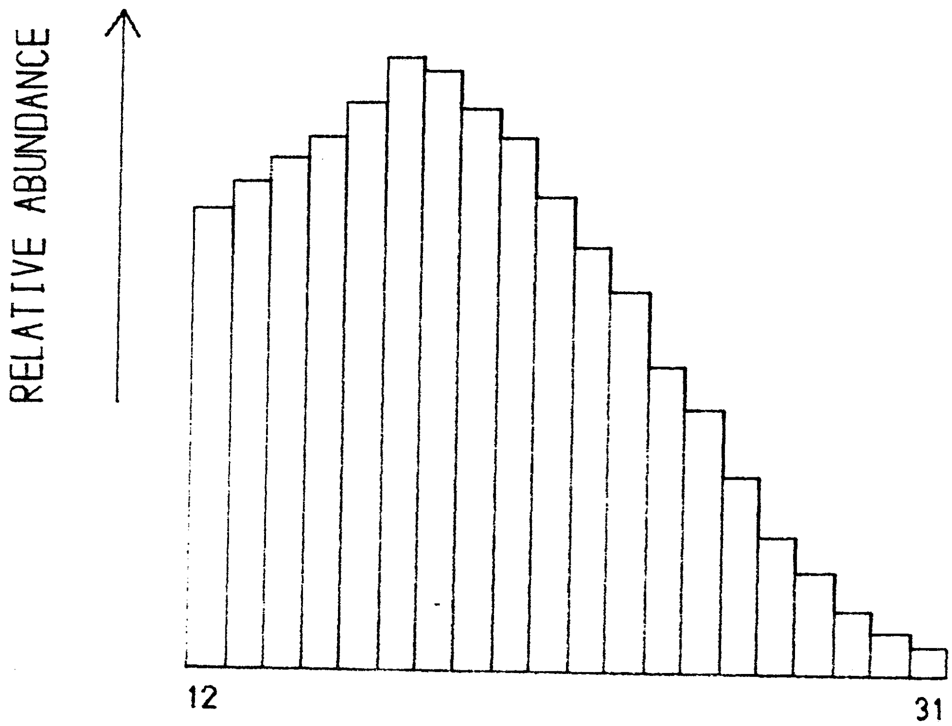
WEST SEAHORSE 1 1502M OIL



WEST SEAHORSE 1 RFT 5A 1502M
(CIL)

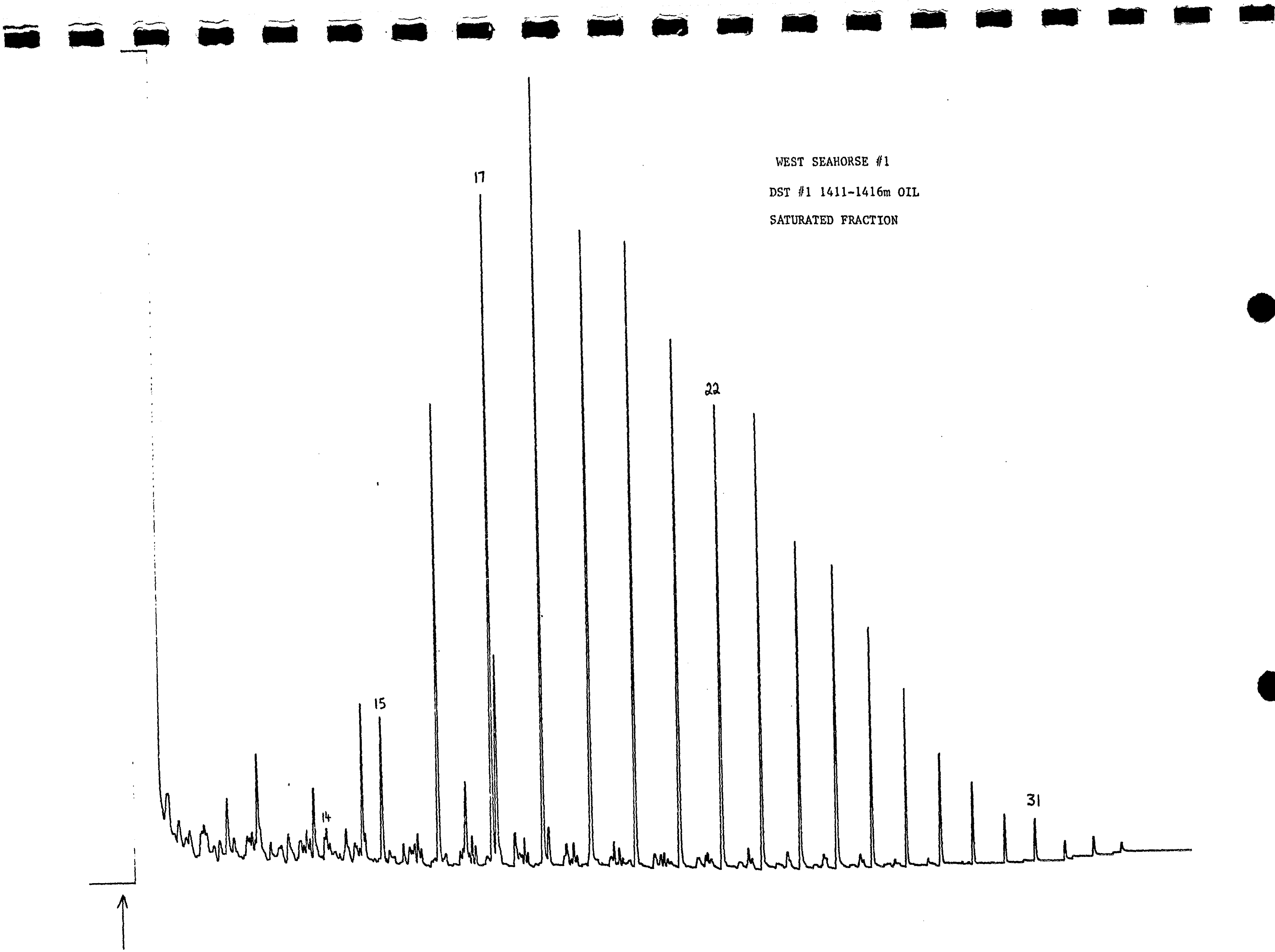


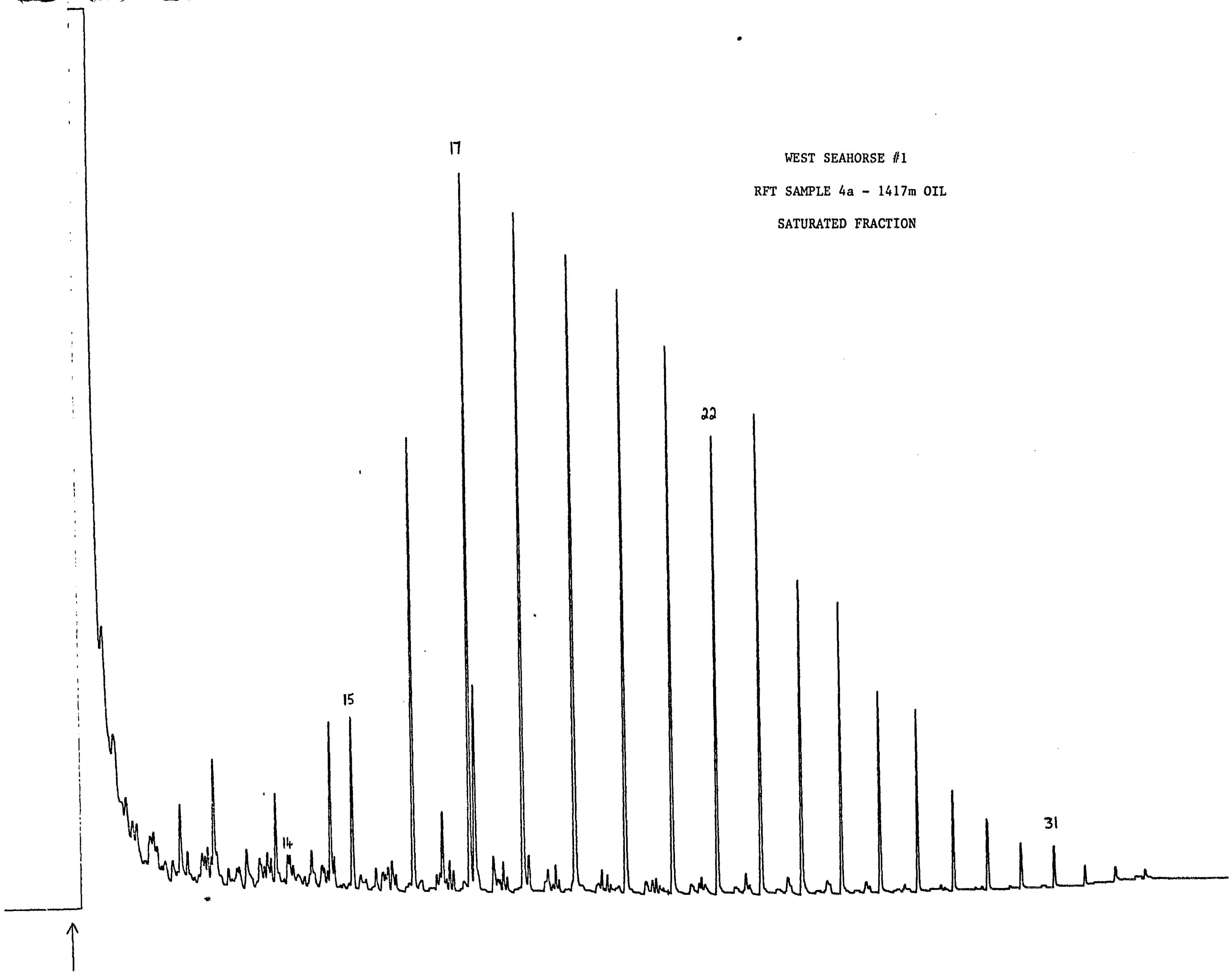
WEST SEAHORSE 1 RFT 5A 1502M
(EMULSION)



WEST SEAHORSE 1 RFT 1505.5M

CAPILLARY GLC TRACES

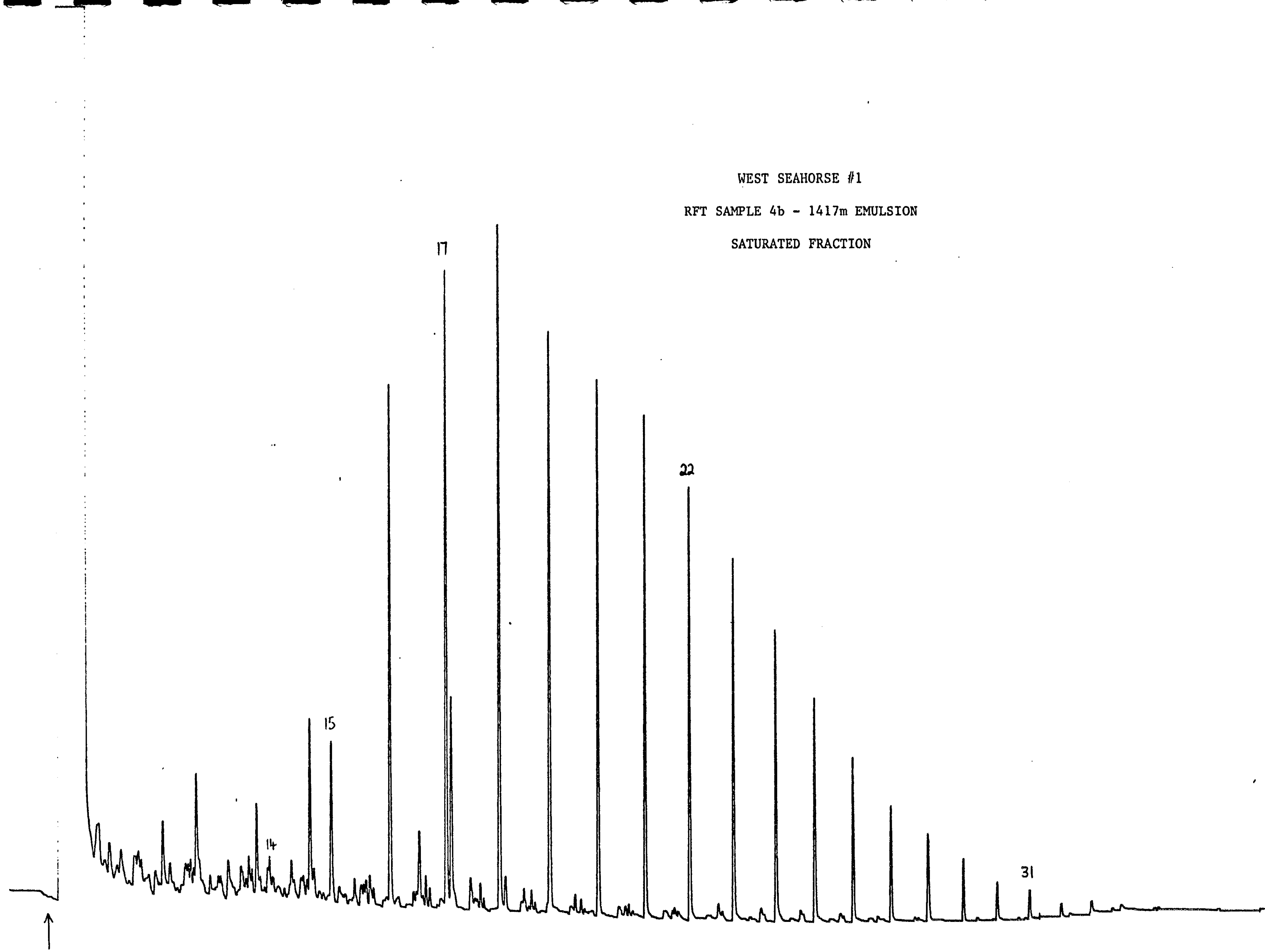

WEST SEAHORSE #1
DST #1 1411-1416m OIL
SATURATED FRACTION
14
15
17
22
31

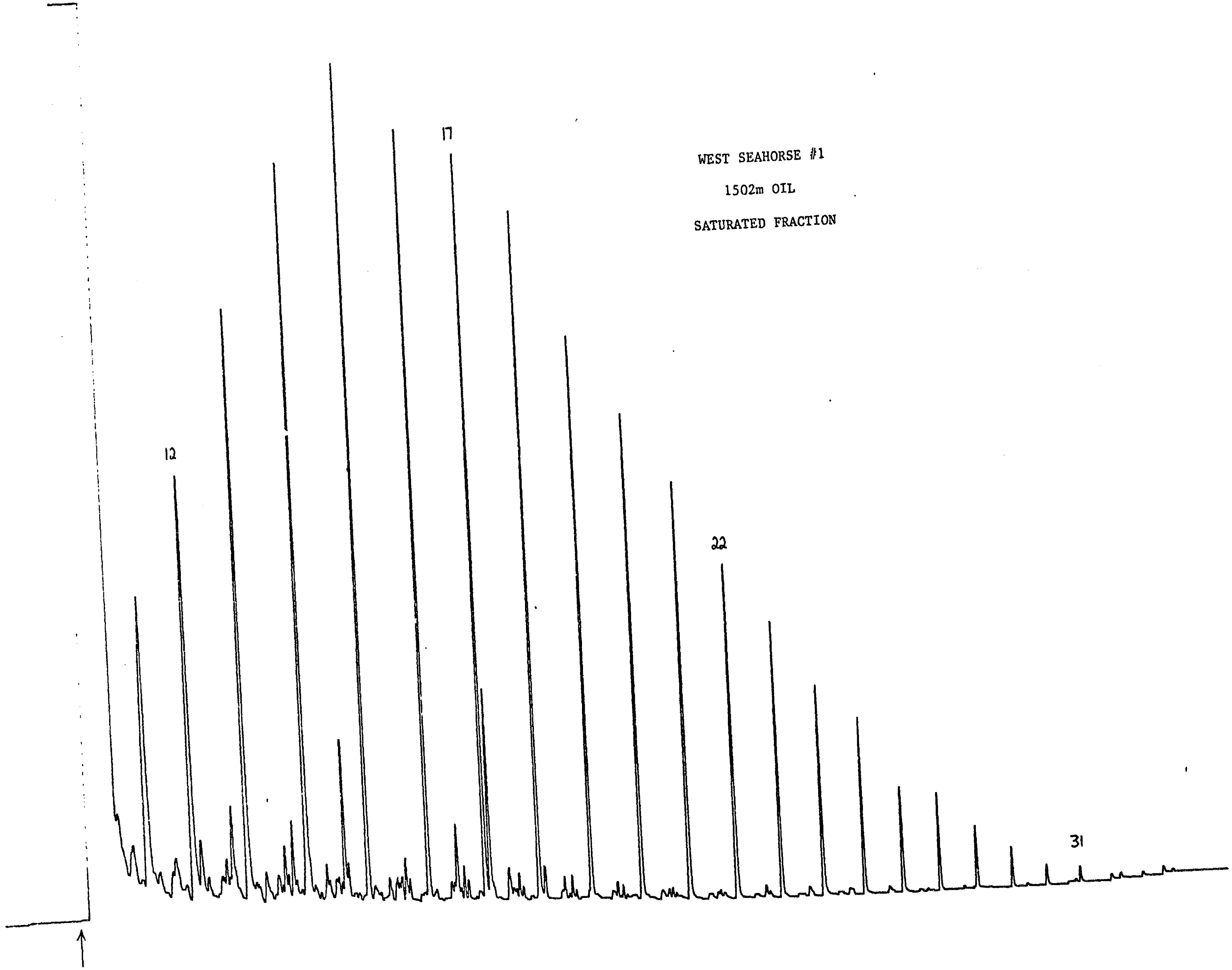

WEST SEAHORSE #1
RFT SAMPLE 4a - 1417m OIL
SATURATED FRACTION
17
22
15
14
31

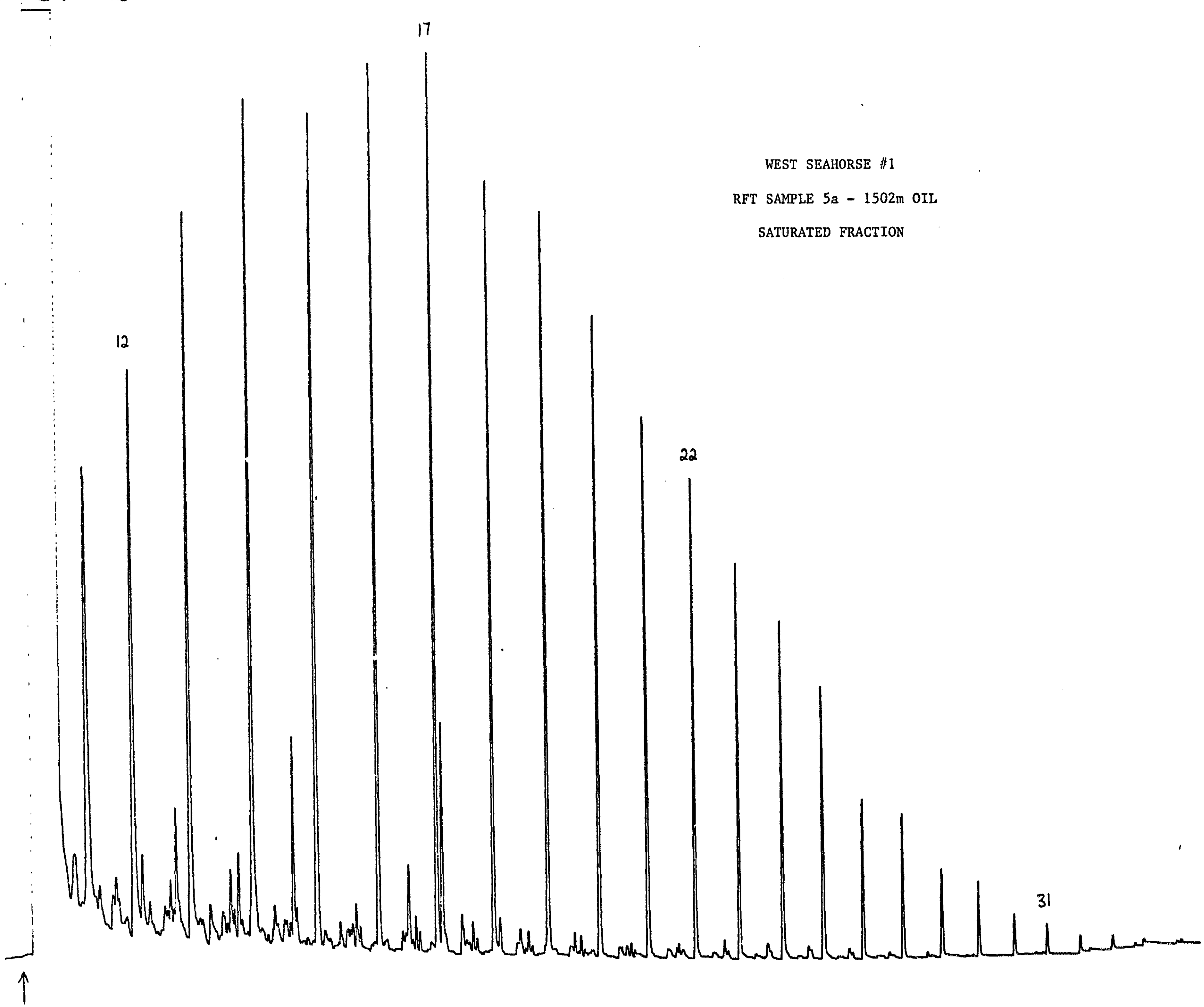
WEST SEAHORSE #1

RFT SAMPLE 4b - 1417m EMULSION

SATURATED FRACTION



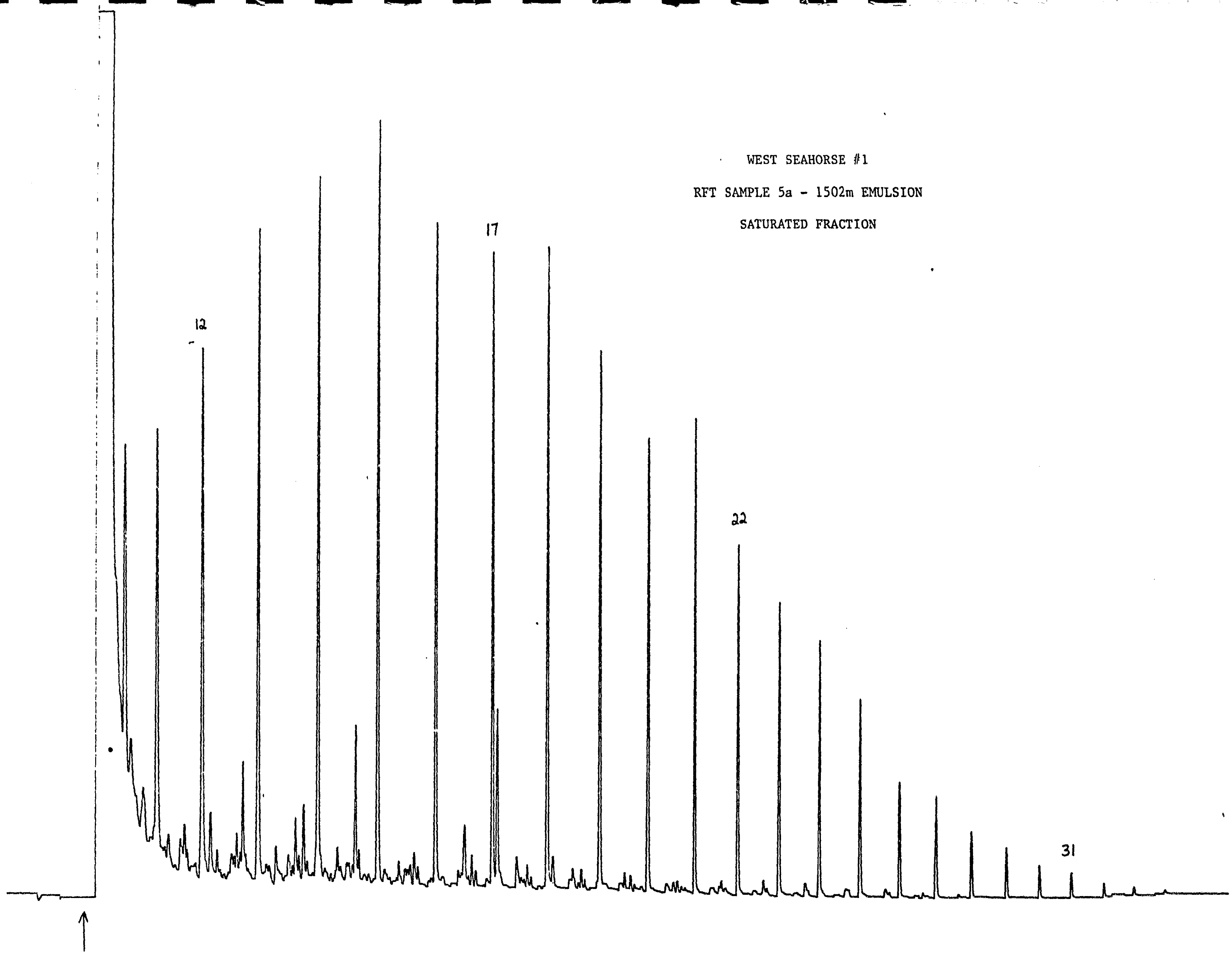

WEST SEAHORSE #1
1502m OIL
SATURATED FRACTION
12
17
22
31

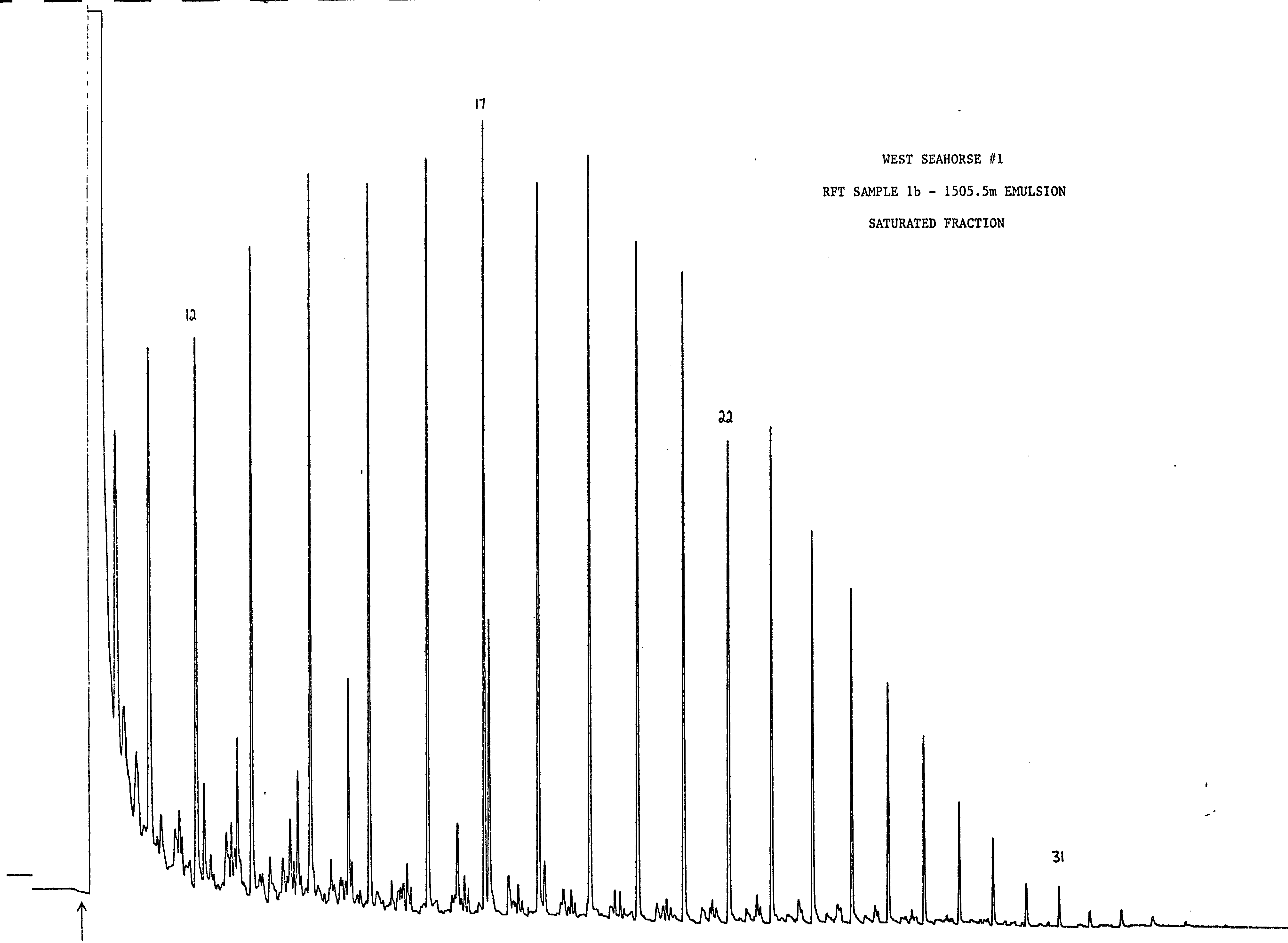

17
12
22
31
WEST SEAHORSE #1
RFT SAMPLE 5a - 1502m OIL
SATURATED FRACTION

WEST SEAHORSE #1

RFT SAMPLE 5a - 1502m EMULSION

SATURATED FRACTION




WEST SEAHORSE #1
RFT SAMPLE 1b - 1505.5m EMULSION
SATURATED FRACTION
12
17
22
31

APPENDIX B6. LOG OF CORES

CL-1005

CORE LABORATORIES, INC. CORELAB *Petroleum Reservoir Engineering*

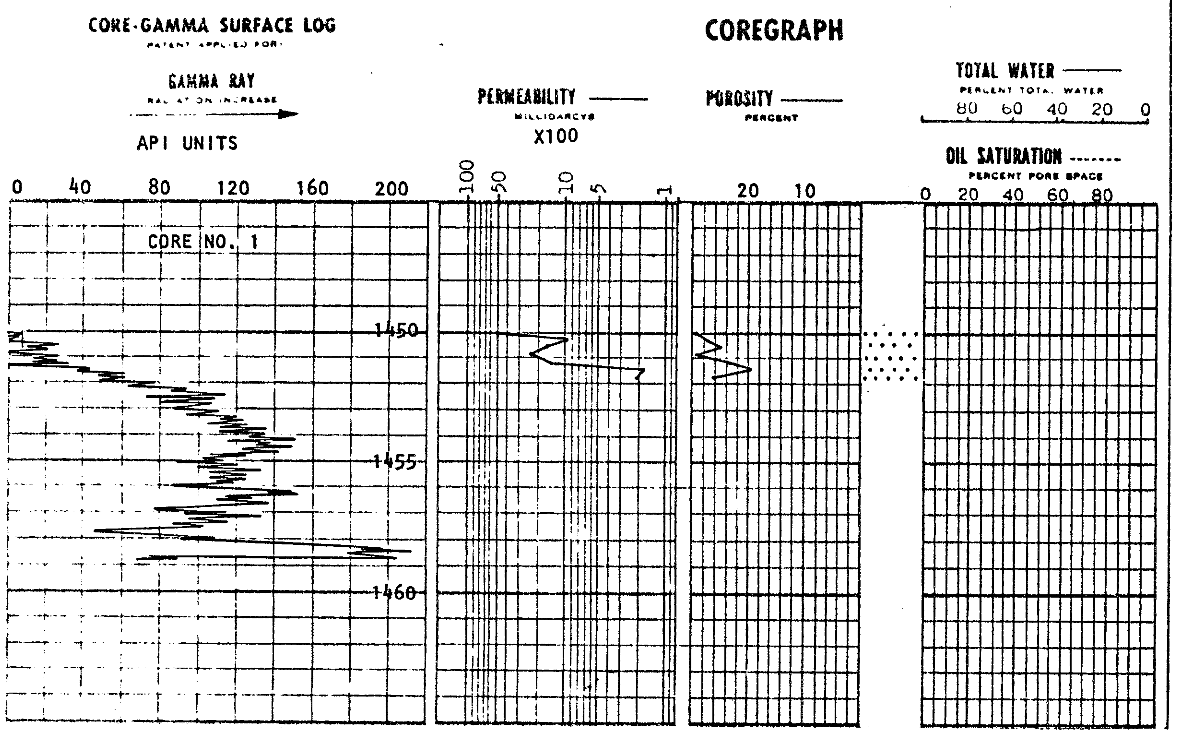
COMPANY HUDBAY OIL (AUST) LTD FIELD FILE WA-CA-167

WELL WEST SEAHORSE NO. 1 DATE 21ST JANUARY,82

LOCATION ELEV.

CORE-GAMMA CORRELATION

VERTICAL SCALE 1 CM. = 2 METERS
(1:200)



Hudbay Oil (Australia) Ltd.
Subsidiary of Hudson's Bay Oil and Gas Company Limited

SIDEWALL CORE DESCRIPTIONS

WELL: **WEST SEAHORSE -1**

DEPTH (metres)	RECOVERY (centimetres)	ROCK TYPE	COLOUR	CLAY SIZE % CLAY MINERALS	CLAY SIZE % MICRITE	SILT SIZE % QUARTZ	SILT SIZE % CALCITE	GRAINS TYPE & % QUARTZ	GRAINS TYPE & % SKELETAL	GRAINS TYPE & % CALCITE	GRAINS SIZE RANGE	GRAINS SIZE DOMINANT	CEMENT TYPE & %	CEMENT TYPE & %	DIAGENESIS TYPE	DIAGENESIS %	DIAGENESIS TEXTURE	ROUNDING	SORTING	HARDNESS	POROSITY TYPE & %	ACCESSORIES TYPE & %	ACCESSORIES TYPE & %	ACCESSORIES TYPE & %	HYDROCARBONS	SEDIMENTARY STRUCTURES	SUPPLEMENTARY DATA
313.5	5.0	Calcisiltitic Calcilutitic CALCARENITE	Lt olv gry - dk grn gry	10	20	Tr	20		30	20					X	Tr	Mx		P	S		G Tr					
345.0	5.2	Argillaceous Calcilutitic CALCARENITE	Gry grn - grn gry	20	20	Tr	10		5	45	VF-F	VF			X	Tr	Mx		P	M		G Tr					
383.1	4.5	Calcarenitic Calcilutitic CALCISILTITE	Grn gry - gry wh	5	20	Tr	30		20	10			C 5		X	10	Mx			S	v;i10	Py Tr					Fossil frags are rexlzd & hard
420.0	4.7	Calcarenitic CALCISILTITE	Dusky yel grn- dk grn gry	15	15	Tr	40		20	10					X	Tr	Mx			S		Py Tr					Fossil frags are hard & rexlzd
455.2	5.6	Argillaceous CALCISILTITE	Gry-olv grn - dk grn gry	20	15	Tr	50		10	5					X	Tr	Mx			M		Py Tr	G Tr				
494.8	5.1	Calcilutitic CALCISILTITE	Gry grn	5	30	Tr	55		5	5					X	Tr	Mx			S		G Tr					
526.6	4.7	Calcilutitic Calcisiltitic CALCARENITE	Dk grn gry	5	20	Tr	30		5	35	VF-F	VF			X	5	Mx			S	i;v 5	G Tr					Fossil frags rexlzd
560.0	5.0	Calcisiltitic Calcilutitic CALCARENITE	Gry grn	5	20		35		Tr	40	VF-F	VF			X	Tr	Mx			M		Py Tr					Some Calcite crystals formed
590.1	4.5	Calcisiltitic Calcilutitic CALCARENITE	Med dk gry - grn gry	10	25		30		Tr	35	VF-F	VF			X	Tr	Cx			S		G Tr					Two bullets at this depth
590.2	4.75	Calcilutitic Calcarenitic CALCISILTITE	Med dk gry - grn gry	10	25		35		Tr	30	VF-F	VF			X	Tr	Cx			S-M	g Tr						

STRUCTURES (STRATIFICATION, SEDIMENTARY, DIAGENETIC)

SYNGENETIC STRUCTURES

Stratification

Parallel Type

Thickness of bedding
Metric System
millimeter bed 1mm-10mm mm
centimeter bed 1cm-10cm cm

Cross Bedding
in general
with angle indicated 10°
chevron
climbing
festoon
planar

Irregular bedding
Graded bedding
No apparent bedding
Nodular bedding

Current-produced markings

Ripple marks
asymmetrical a
interference i
symmetrical s
Pull over flame structure
Scour and fill
Flute cast
Groove cast
Striation
Parting lineation

Organism-produced markings

Burrowed
slightly burrowed s
moderately burrowed m
well burrowed w
Churned
Bored
Bored surface
Organism tracks and trails
Plant root tubes
Vertebrate tracks

Penecontemporaneous deformation structures

Mud cracks
Rain or hail prints
Pull-apart
Slump structures and contorted bedding
Convolute bedding
Load cast
Tepee structure
Birdseye, fenestral fabric

EPIGENETIC STRUCTURES

Solution structures

Breccia, solution, collapse S
Disolution - compaction (horse tail)
Sylolite
Vadose pisolite
Vadose silt
Boxwork
Salt hoppers or casts

Tectonic structures

Fractures
Slickensides
Breccia, tectonic T

Miscellaneous

Geopetal fabric
Cone-in-cone
Stromatactics
Boudinage, ball and age flow

Abbreviations

GRAIN SIZE
VF Very Fine
F Fine
M Medium
C Course
VC Very Coarse
G Granule & larger

CEMENT
Q Silica
Py Pyrite
C Calcite
D Dolomite
Sd Siderite

DIAGENESIS
D Dolomitization
Q Silicification
X Recrystallization
Ce Chloritization

ROUNDING
R Rounded
SR Subrounded
SA Subangular
A Angular

SORTING
P Poor
M Moderate
W Well
VW Very Well

HARDNESS
U Unconsolidated
VS Very Soft
S Soft
M Moderate
H Hard

POROSITY
g Intergranular
v Vugular
i Intraskeletal

ACCESSORIES
Py Pyrite
Mc Mica
Ch Chert
Cc Lignite/Coal
Hm Heavy minerals
Lf Lithic fragments
Gl Glauconite

DIAGENETIC TEXTURES
CX Crypto <1/256mm
MX Micro 1/256 - 1/16mm

HYDROCARBONS
* Signifies presence
Full details described under supplementary data

A4-GL-519

Hudbay Oil (Australia) Ltd.
Subsidiary of Hudson's Bay Oil and Gas Company Limited

SIDEWALL CORE DESCRIPTIONS

WELL: WEST SEAHORSE -1

DEPTH (metres)	RECOVERY (centimetres)	ROCK TYPE	COLOUR	CLAY SIZE %: CLAY MINERALS	CLAY SIZE %: MICRITE	SILT SIZE %: QUARTZ	SILT SIZE %: CALCITE	GRAINS TYPE & %: QUARTZ	GRAINS TYPE & %: SKELETAL	GRAINS TYPE & %: CALCITE	GRAINS SIZE: RANGE	GRAINS SIZE: DOMINANT	CEMENT: TYPE & %	CEMENT: TYPE & %	DIAGENESIS: TYPE	DIAGENESIS: %	DIAGENESIS: TEXTURE	ROUNDING	SORTING	HARDNESS	POROSITY TYPE & %	ACCESSORIES: TYPE & %	ACCESSORIES: TYPE & %	ACCESSORIES: TYPE & %	HYDROCARBONS	SEDIMENTARY STRUCTURES	SUPPLEMENTARY DATA
623.9	3.6	Calcisiltitic CALCARENITE	Med lt gry - gry grn	5	15	Tr	20		Tr	50					X	10	Mx			M		G Tr					Two bullets at this depth
624	4.0	Calcisiltitic Calcilutitic CALCARENITE	Med lt gry - gry grn	5	25		20		Tr	40	VF-F	VF			X	10	Mx			M	g Tr						
662.8	4.2	Calcilutitic Calcisiltitic SANDSTONE	Lt olv gry - wh	5	20	5	20	40	Tr	10	M-C	M	C Tr					SA -R	M	M	g 5	Lf Tr	G Tr				Pore space occupied by calcareous material
695	3.6	Calcilutitic SANDSTONE	Lt gry - lt gry wh	Tr	20	5	5	50		20	M-G	M						SA -R	P	S	g 5	Lf Tr					Pores clogged with calcareous material
731	3.4	Calcilutitic CALCISILTITE	Lt olv gry - med gry	Tr	30	Tr	60		Tr	10	VF	VF			X	Tr	Mx			S		Py Tr					
773.1	3.4	Calcilutitic CALCISILTITE	Lt gry - lt gry wh	10	25	Tr	60	Tr		5					X	Tr	Mx			S							
802	2.1	Calcilutitic CALCISILTITE	Lt olv gry - grn gry	Tr	30	Tr	70			Tr					X	Tr	Mx			S							
837	4.5	Argillaceous Calcilutitic CALCISILTITE	Med dk gry - dk gry	30	20		40		Tr	10					X	Tr	Mx			M						cm	3 interbeds of calcisiltite; subfissile
874.3	2.2	CALCILUTITE	Dk grn gry - gry	10	90				Tr											S							
915	2.3	MARL	Dk gry	65	35			Tr	Tr											S							

STRUCTURES (STRATIFICATION, SEDIMENTARY, DIAGENETIC)

SYNGENETIC STRUCTURES

Stratification
Parallel Type
Thickness of bedding
Metric System
millimeter bed 1mm-10mm mm
centimeter bed 1cm-10cm cm
Cross Bedding
in general
with angle indicated
chevron
climbing
festoon
planar

Irregular bedding
Graded bedding
No apparent bedding
Nodular bedding

Current-produced markings
Ripple marks
asymmetrical
interference
symmetrical
Pull over flame structure
Scour and fill
Flute cast
Groove cast
Striation
Parting lineation

Organism-produced markings
Burrowed
slightly burrowed
moderately burrowed
well burrowed
Churned
Bored
Bored surface
Organism tracks and trails
Plant root tubes
Vertebrate tracks

Penecontemporaneous deformation structures
Mud cracks
Rain or hail prints
Pull-apart
Slump structures and contorted bedding
Convolute bedding
Load cast
Tepee structure
Birdseye, fenestral fabric

EPIGENETIC STRUCTURES

Solution structures
Breccia, solution, collapse
Disolution - compaction (horse tail)
Sylolite
Vadose pisolite
Vadose silt
Boxwork
Salt hoppers or casts

Tectonic structures
Fractures
Slickensides
Breccia, tectonic

Miscellaneous
Geopetal fabric
Cone-in-cone
Stromatactics
Boudinage, ball and age flow

Abbreviations

GRAIN SIZE: VF Very Fine; F Fine; M Medium; C Course; VC Very Coarse; G Granule & larger

CEMENT: Q Silica; Py Pyrite; C Calcite; D Dolomite; Sd Siderite

DIAGENESIS: D Dolomitization; Q Silicification; X Recrystallization; Ce Chloritization

ROUNDING: R Rounded; SR Subrounded; SA Subangular; A Angular

SORTING: P Poor; M Moderate; W Well; VW Very Well

HARDNESS: U Unconsolidated; VS Very Soft; S Soft; M Moderate; H Hard

POROSITY: g Intergranular; v Vugular; i Intraskeletal

ACCESSORIES: Py Pyrite; Mc Mica; Ch Chert; Cc Lignite/Coal; Hm Heavy minerals; Lf Lithic fragments; Gl Glauconite

DIAGENETIC TEXTURES: CX Crypto <1/256mm; MX Micro 1/256 - 1/16mm

HYDROCARBONS: * Signifies presence. Full details described under supplementary data

Hudbay Oil (Australia) Ltd.
Subsidiary of Hudson's Bay Oil and Gas Company Limited

SIDEWALL CORE DESCRIPTIONS

WELL: WEST SEAHORSE - 1

DEPTH (metres)	RECOVERY (centimetres)	ROCK TYPE	COLOUR	CLAY SIZE % CLAY MINERALS	CLAY SIZE % MICRITE	SILT SIZE % QUARTZ	SILT SIZE % CALCITE	GRAINS TYPE & % QUARTZ	GRAINS TYPE & % SKELETAL	GRAINS TYPE & % CALCITE	GRAINS SIZE RANGE	GRAINS SIZE DOMINANT	CEMENT TYPE & %	CEMENT TYPE & %	DIAGENESIS TYPE	DIAGENESIS %	DIAGENESIS TEXTURE	ROUNDING	SORTING	HARDNESS	POROSITY TYPE & %	ACCESSORIES TYPE & %	ACCESSORIES TYPE & %	ACCESSORIES TYPE & %	HYDROCARBONS	SEDIMENTARY STRUCTURES	SUPPLEMENTARY DATA
950	2.0	Argillaceous Calcilutitic CALCISILTITE	Dk gry - dk olv gry	30	20		50													S							
985	4.2	MARL	Dk gry	60	40															S							
1025	3.0	Calcisiltitic Calcilutitic CLAYSTONE	Dk gry - olv gry	40	20		40													S							
1055	2.5	Argillaceous Calcilutitic CALCISILTITE	Dk gry - grnsh gry	30	20	Tr	50													S							
1100.1	5.5	MARL	Dk olv gry - grn blk	35	65		Tr													S		Py Tr				mm	1 mm thick band of Pyrite across sample
1137.1	4.2	MARL	Dk gry - gry blk	50	50															S							Subfissile
1171.5	4.2	MARL	Dk grn gry - dk gry	40	60															S		Py Tr					Subfissile
1205.9	3.5	MARL	Dk gry grn - grn gry	40	60															M							Blocky - subfissile
1247		NO RECOVERY																									Bullet empty
1282	5.0	CLAYSTONE	Dk gry - gry blk	100																M							Subfissile with white specks

STRUCTURES (STRATIFICATION, SEDIMENTARY, DIAGENETIC)

SYNGENETIC STRUCTURES

Stratification

Parallel Type

Thickness of bedding

Metric System
- millimeter bed 1mm-10mm mm
- centimeter bed 1cm-10cm cm

Cross Bedding
- in general
- with angle indicated
- chevron
- climbing
- festoon
- planar

- Irregular bedding
- Graded bedding
- No apparent bedding
- Nodular bedding

Current-produced markings
- Ripple marks
  - asymmetrical
  - interference
  - symmetrical
- Pull over flame structure
- Scour and fill
- Flute cast
- Groove cast
- Striation
- Parting lineation

Organism-produced markings
- Burrowed
  - slightly burrowed
  - moderately burrowed
  - well burrowed
- Churned
- Bored
- Bored surface
- Organism tracks and trails
- Plant root tubes
- Vertebrate tracks

Penecontemporaneous deformation structures
- Mud cracks
- Rain or hail prints
- Pull-apart
- Slump structures and contorted bedding
- Convolute bedding
- Load cast
- Tepee structure
- Birdseye, fenestral fabric

EPIGENETIC STRUCTURES

Solution structures
- Breccia, solution, collapse
- Disolution - compaction (horse tail)
- Sylolite
- Vadose pisolite
- Vadose silt
- Boxwork
- Salt hoppers or casts

Tectonic structures
- Fractures
- Slickensides
- Breccia, tectonic

Miscellaneous
- Geopetal fabric
- Cone-in-cone
- Stromatactics
- Boudinage, ball and age flow

Abbreviations:

GRAIN SIZE: VF Very Fine; F Fine; M Medium; C Course; VC Very Coarse; G Granule & larger

CEMENT: Q Silica; Py Pyrite; C Calcite; D Dolomite; Sd Siderite

DIAGENESIS: D Dolomitization; Q Silicification; X Recrystallization; Ce Chloritization

ROUNDING: R Rounded; SR Subrounded; SA Subangular; A Angular

SORTING: P Poor; M Moderate; W Well; VW Very Well

HARDNESS: U Unconsolidated; VS Very Soft; S Soft; M Moderate; H Hard

POROSITY: g Intergranular; v Vugular; i Intraskeletal

ACCESSORIES: Py Pyrite; Mc Mica; Ch Chert; Cc Lignite/Coal; Hm Heavy minerals; Lf Lithic fragments; Gl Glauconite

DIAGENETIC TEXTURES: CX Crypto <1/256mm; MX Micro 1/256 - 1/16mm

HYDROCARBONS: * Signifies presence. Full details described under supplementary data

Hudbay Oil (Australia) Ltd.
Subsidiary of Hudson's Bay Oil and Gas Company Limited

SIDEWALL CORE DESCRIPTIONS

WELL: WEST SEAHORSE - 1

DEPTH (metres)	RECOVERY (centimetres)	ROCK TYPE	COLOUR	CLAY SIZE % CLAY MINERALS	CLAY SIZE % MICRITE	SILT SIZE % QUARTZ	SILT SIZE % CALCITE	GRAINS TYPE & % QUARTZ	GRAINS TYPE & % SKELETAL	GRAINS TYPE & % CALCITE	GRAINS SIZE RANGE	GRAINS SIZE DOMINANT	CEMENT TYPE & %	CEMENT TYPE & %	DIAGENESIS TYPE	DIAGENESIS %	DIAGENESIS TEXTURE	ROUNDING	SORTING	HARDNESS	POROSITY TYPE & %	ACCESSORIES TYPE & %	ACCESSORIES TYPE & %	ACCESSORIES TYPE & %	HYDROCARBONS	SEDIMENTARY STRUCTURES	SUPPLEMENTARY DATA
1322.0	Nil																										No recovery - bullet lost
1330.5	5.5	Glauconitic CLAYSTONE	Dk olv gry	35	25	Tr														M-H		G 40			Nil		
1336.8	5.3	CLAYSTONE	Olv gry	75	15	5														M-H		G 5			Nil		
1341.1	Nil																										No recovery - bullet lost
1347.8	Nil																										No recovery - bullet lost
1350	Nil																										No recovery - bullet lost
1353.3	Nil																										No recovery - bullet lost
1355.6	Nil																										No recovery - bullet lost
1357.3	Nil																										No recovery - bullet lost
1359.4	5.0	CLAYSTONE	Olv gry	85	5	5														M		G 5			Nil		No Fl No Sol Fl

STRUCTURES (STRATIFICATION, SEDIMENTARY, DIAGENETIC)

SYNGENETIC STRUCTURES

Stratification
Parallel Type

Thickness of bedding
Metric System
millimeter bed 1mm-10mm mm
centimeter bed 1cm-10cm cm

Cross Bedding
in general
with angle indicated 10°
chevron
climbing
festoon
planar

Irregular bedding
Graded bedding
No apparent bedding
Nodular bedding

Current-produced markings
Ripple marks
asymmetrical
interference
symmetrical
Pull over flame structure
Scour and fill
Flute cast
Groove cast
Striation
Parting lineation

Organism-produced markings
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moderately burrowed
well burrowed
Churned
Bored
Bored surface
Organism tracks and trails
Plant root tubes
Vertebrate tracks

Penecontemporaneous deformation structures
Mud cracks
Rain or hail prints
Pull-apart
Slump structures and contorted bedding
Convolute bedding
Load cast
Tepee structure
Birdseye, fenestral fabric

EPIGENETIC STRUCTURES

Solution structures
Breccia, solution, collapse
Disolution - compaction (horse tail)
Sylolite
Vadose pisolite
Vadose silt
Boxwork
Salt hoppers or casts

Tectonic structures
Fractures
Slickensides
Breccia, tectonic

Miscellaneous
Geopetal fabric
Cone-in-cone
Stromatactics
Boudinage, ball and age flow

Abbreviations:

GRAIN SIZE
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F Fine
M Medium
C Course
VC Very Coarse
G Granule & larger

CEMENT
Q Silica
Py Pyrite
C Calcite
D Dolomite
Sd Siderite

DIAGENESIS
D Dolomitization
Q Silicification
X Recrystallization
Ce Chloritization

ROUNDING
R Rounded
SR Subrounded
SA Subangular
A Angular

SORTING
P Poor
M Moderate
W Well
VW Very Well

HARDNESS
U Unconsolidated
VS Very Soft
S Soft
M Moderate
H Hard

POROSITY
g Intergranular
v Vugular
i Intraskeletal

ACCESSORIES
Py Pyrite
Mc Mica
Ch Chert
Cc Lignite/Coal
Hm Heavy minerals
Lf Lithic fragments
Gl Glauconite

DIAGENETIC TEXTURES
CX Crypto <1/256mm
MX Micro 1/256 - 1/16mm

HYDROCARBONS
* Signifies presence
Full details described under supplementary data

A4-GL-519

Hudbay Oil (Australia) Ltd.
Subsidiary of Hudson's Bay Oil and Gas Company Limited

SIDEWALL CORE DESCRIPTIONS

WELL: WEST SEAHORSE - 1

DEPTH (metres)	RECOVERY (centimetres)	ROCK TYPE	COLOUR	CLAY SIZE %: CLAY MINERALS	CLAY SIZE %: MICRITE	SILT SIZE %: QUARTZ	SILT SIZE %: CALCITE	GRAINS TYPE & %: QUARTZ	GRAINS TYPE & %: SKELETAL	GRAINS TYPE & %: CALCITE	GRAINS SIZE: RANGE	GRAINS SIZE: DOMINANT	CEMENT: TYPE & %	CEMENT: TYPE & %	DIAGENESIS: TYPE	DIAGENESIS: %	DIAGENESIS: TEXTURE	ROUNDING	SORTING	HARDNESS	POROSITY TYPE & %	ACCESSORIES: TYPE & %	ACCESSORIES: TYPE & %	ACCESSORIES: TYPE & %	HYDROCARBONS	SEDIMENTARY STRUCTURES	SUPPLEMENTARY DATA
1361.2	Nil																										No recovery - bullet lost
1363.3	Nil																										No recovery - bullet lost
1365.2	Nil																										No recovery - bullet lost
1368.8	5.4	CLAYSTONE	Dk olv blk	75	5	5	5		5		VF-F	VF								M		G 5			Nil		
1370.9	Nil																										No recovery - bullet lost
1373.5	5.5	Glauconitic CLAYSTONE	Olv blk	40	10	10			10		VF-M	F								M		G 30			Nil		
1375.4	5.5	Glauconitic CLAYSTONE	Olv blk	45	15	15														M		G 25			Nil		
1378.6	4.2	Silty Glauconitic CLAYSTONE	Olv blk	55		30														S-M		G 15	Cc Tr		Nil		No Fl No Sol Fl
1380.3	Nil																										No recovery - bullet lost
1383.8	5.5	CLAYSTONE	Olv grn - olv blk	65		15		10			VF-M	F								M		G 10					A. Nil. B. Very slow, very weak wh on crushing

STRUCTURES (STRATIFICATION, SEDIMENTARY, DIAGENETIC)

SYNGENETIC STRUCTURES

Stratification
Parallel Type

Thickness of bedding
Metric System
millimeter bed 1mm-10mm mm
centimeter bed 1cm-10cm cm
Cross Bedding
in general
with angle indicated 10°
chevron
climbing
festoon
planar

Irregular bedding
Graded bedding
No apparent bedding
Nodular bedding

Current-produced markings
Ripple marks
asymmetrical
interference
symmetrical
Pull over flame structure
Scour and fill
Flute cast
Groove cast
Striation
Parting lineation

Organism-produced markings
Burrowed
slightly burrowed
moderately burrowed
well burrowed
Churned
Bored
Bored surface
Organism tracks and trails
Plant root tubes
Vertebrate tracks

Penecontemporaneous deformation structures
Mud cracks
Rain or hail prints
Pull-apart
Slump structures and contorted bedding
Convolute bedding
Load cast
Tepee structure
Birdseye, fenestral fabric

EPIGENETIC STRUCTURES

Solution structures
Breccia, solution, collapse
Disolution - compaction (horse tail)
Sylolite
Vadose pisolite
Vadose silt
Boxwork
Salt hoppers or casts

Tectonic structures
Fractures
Slickensides
Breccia, tectonic

Miscellaneous
Geopetal fabric
Cone-in-cone
Stromatactics
Boudinage, ball and age flow

Abbreviations:

GRAIN SIZE
VF Very Fine
F Fine
M Medium
C Course
VC Very Coarse
G Granule & larger

CEMENT
Q Silica
Py Pyrite
C Calcite
D Dolomite
Sd Siderite

DIAGENESIS
D Dolomitization
Q Silicification
X Recrystallization
Ce Chloritization

ROUNDING
R Rounded
SR Subrounded
SA Subangular
A Angular

SORTING
P Poor
M Moderate
W Well
VW Very Well

HARDNESS
U Unconsolidated
VS Very Soft
S Soft
M Moderate
H Hard

POROSITY
g Intergranular
v Vugular
i Intraskeletal

ACCESSORIES
Py Pyrite
Mc Mica
Ch Chert
Cc Lignite /Coal
Hm Heavy minerals
Lf Lithic fragments
Gl Glauconite

DIAGENETIC TEXTURES
CX Crypto <1/256mm
MX Micro 1/256 - 1/16mm

HYDROCARBONS
✱ Signifies presence
Full details described under supplementary data

A4-GL-519

Hudbay Oil (Australia) Ltd.
Subsidiary of Hudson's Bay Oil and Gas Company Limited

SIDEWALL CORE DESCRIPTIONS

WELL: WEST SEAHORSE-1

DEPTH (metres)	RECOVERY (centimetres)	ROCK TYPE	COLOUR	CLAY SIZE %: CLAY MINERALS	CLAY SIZE %: MICRITE	SILT SIZE %: QUARTZ	SILT SIZE %: CALCITE	GRAINS TYPE & %: QUARTZ	GRAINS TYPE & %: SKELETAL	GRAINS TYPE & %: CALCITE	GRAINS SIZE: RANGE	GRAINS SIZE: DOMINANT	CEMENT: TYPE & %	CEMENT: TYPE & %	DIAGENESIS: TYPE	DIAGENESIS: %	DIAGENESIS: TEXTURE	ROUNDING	SORTING	HARDNESS	POROSITY TYPE & %	ACCESSORIES: TYPE & %	ACCESSORIES: TYPE & %	ACCESSORIES: TYPE & %	HYDROCARBONS	SEDIMENTARY STRUCTURES	SUPPLEMENTARY DATA
1383.8	5.1	Silty Glauconitic CLAYSTONE	Olv gry	50		35														M		G 15			*		A. Nil B. V.Slow, v pale yel-grn
1386.5	4.0	Argillaceous SILTSTONE	Lt olv gry-olv gry	40		55		5			VF-F	VF								S-M		Cc Tr			*		A. 30% bright yel on siltstone B. Fast, pale, yel-wh. C. Lt brn
1388.0	appr 4.0	CLAYSTONE	Olv blk with olv gry bnds	70		15														S		Cc 15			*	cm	A. Nil. B.Mod slow, pale grn-wh - paler bands more silty
1390.0	3.5	Silty CLAYSTONE	Olv blk - lt gry	70		30		Tr			VF-F	VF								S-M		Cc Tr	Py Tr	? G Tr	*		A. Slight trace, pinpoint gold B. Med fast mod strong wh lent slty pods
1392.0	3.0	Argillaceous SILTSTONE	Olv gry	20		80														M					*		A. Faint trace pinpoint gold B. Slow, pale,yel-wh
1397.5	4+	Argillaceous COAL	Brnsh blk	20																H		Cc 80			*		A. Trace spotty, grn-yel B. Slow pale grn-wh. Scraping taken
1403.6	3.7	CLAYSTONE	Olv gry - lt olv gry	100		Tr														M		Cc Tr			*		A. Trace pinpoint gold B. V weak, slow, pale yel-gold
1405	5.0	Argillaceous SILTSTONE	Yelsh gry - v lt olv gry	40		60														S		Cc Tr	Py Tr		*		A. 70% wh. B. Fast, strong bl-wh-yel C. Lt brn
1408.4	3+	Carbonaceous CLAYSTONE	Olv blk - brnsh blk	65		10														M-H		Cc 25			*		A. Nil. B. Slow, mod, pale yel-wh. Scrapings taken
1409	3.9	Argillaceous SILTSTONE	Olv gry - brn blk	30		50														M		Cc 10	Py 10		*		A. Mod strong pale wh in Bnds = 40% B. Slow mod strong wh of Spl - Oblique bedding planes

STRUCTURES (STRATIFICATION, SEDIMENTARY, DIAGENETIC)

SYNGENETIC STRUCTURES

Stratification
Parallel Type

Thickness of bedding
Metric System
millimeter bed 1mm-10mm mm
centimeter bed 1cm-10cm cm

Cross Bedding
- in general
- with angle indicated 10°
- chevron
- climbing
- festoon
- planar

Irregular bedding
Graded bedding
No apparent bedding
Nodular bedding

Current-produced markings
Ripple marks
- asymmetrical a
- interference i
- symmetrical s

Pull over flame structure
Scour and fill
Flute cast
Groove cast
Striation
Parting lineation

Organism-produced markings
Burrowed
- slightly burrowed s
- moderately burrowed m
- well burrowed w

Churned
Bored
Bored surface
Organism tracks and trails
Plant root tubes
Vertebrate tracks

Penecontemporaneous deformation structures
Mud cracks
Rain or hail prints
Pull-apart
Slump structures and contorted bedding
Convolute bedding
Load cast
Tepee structure
Birdseye, fenestral fabric

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Breccia, solution, collapse
Disolution - compaction (horse tail)
Sylolite
Vadose pisolite
Vadose silt
Boxwork
Salt hoppers or casts

Tectonic structures
Fractures
Slickensides
Breccia, tectonic

Miscellaneous
Geopetal fabric
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DIAGENESIS
D Dolomitization
Q Silicification
X Recrystallization
Ce Chloritization

ROUNDING
R Rounded
SR Subrounded
SA Subangular
A Angular

SORTING
P Poor
M Moderate
W Well
VW Very Well

HARDNESS
U Unconsolidated
VS Very Soft
S Soft
M Moderate
H Hard

POROSITY
g Intergranular
v Vugular
i Intraskeletal

ACCESSORIES
Py Pyrite
Mc Mica
Ch Chert
Cc Lignite/Coal
Hm Heavy minerals
Lf Lithic fragments
Gl Glauconite

DIAGENETIC TEXTURES
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A4-GL-519

Hudbay Oil (Australia) Ltd.
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SIDEWALL CORE DESCRIPTIONS

WELL: WEST SEAHORSE-1

DEPTH (metres)	RECOVERY (centimetres)	ROCK TYPE	COLOUR	CLAY SIZE %: CLAY MINERALS	CLAY SIZE %: MICRITE	SILT SIZE %: QUARTZ	SILT SIZE %: CALCITE	GRAINS TYPE & %: QUARTZ	GRAINS TYPE & %: SKELETAL	GRAINS TYPE & %: CALCITE	GRAINS SIZE: RANGE	GRAINS SIZE: DOMINANT	CEMENT: TYPE & %	CEMENT: TYPE & %	DIAGENESIS: TYPE	DIAGENESIS: %	DIAGENESIS: TEXTURE	ROUNDING	SORTING	HARDNESS	POROSITY TYPE & %	ACCESSORIES: TYPE & %	ACCESSORIES: TYPE & %	ACCESSORIES: TYPE & %	HYDROCARBONS	SEDIMENTARY STRUCTURES	SUPPLEMENTARY DATA
1410.2	Nil																										No recovery - bullet lost
1411.2	3.8	Argillaceous Carbonaceous SILTSTONE	Lt olv gry - olv blk	25		35		20			VF-M	VF						SA-SR	M	VS		Cc 20			*		A. 60% strong bl-wh on siltylithology B. Fast, mod strong pale grn-wh E. Dk brn oil stain on qtz grns
1412.2.	5.0	Argillaceous SANDSTONE	Grnsh gry	40		10		50			VF-M	F						SA-SR	M	VS	g 5				*		A. 100% strong yel-wh B. Strong fast yel-wh F. HC odour
1413.2	3.5	Argillaceous Silty SANDSTONE	Lt grnsh gry (brnsh blk strks)	35		20		40			VF-M	F						SA-SR	M	S	g Tr	Cc 5			*	mm	A. 80% even strong bl-wh B. Fast mod strong lt grn-wh. Brn blk coal bands up to 1.5mm wide
1414.2	4.0	Silty Argillaceous SANDSTONE	Grnsh gry	20		20		60			VF-M	F						SA-SR	M	VS	g 5-10				*		A. 100% weak to strong bl-wh B. Fast, streaming pale bl-wh F. strong HC odour
1415.1	3.6	Argillaceous Carbonaceous SANDSTONE	Grnsh gry - olv gry	30		15		40			VF-M	F						A-SR	M	S	g Tr	Cc 15			*		A. 95% strong bl-wh & grn-wh B. Fast, mod strong yel-wh C. Lt brn F.Brn, patchy oil stain
1416.0	4.0	Argillaceous Arenaceous SILTSTONE	Lt grnsh gry	20		55		25			VF-M	VF						SA-SR	M	S	g Tr				*		A. 80% strong bl-wh B. Mod strong pale-yel
1417	Nil																										No recovery - bullet smashed
1418	0.5	(Dolomitic) SANDSTONE	Med dk gry	15				55			F-C	M	Dol 20	Q 10						VH	Nil				*		A. 30% dull gold; 10% mod wh B. Slow, dull wh Very hard
1418.7	4.0	Argillaceous Arenaceous SILTSTONE	Lt olv gry - olv gry	35		40		25			VF-M	F								S					*	cm	A. 10% mod strong, even grn-wh on sdy Bnds B.V slow wk grn-wh. Mainly pale silty mat w dkr clay Bnds

STRUCTURES (STRATIFICATION, SEDIMENTARY, DIAGENETIC)

SYNGENETIC STRUCTURES

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millimeter bed 1mm-10mm mm
centimeter bed 1cm-10cm cm

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Graded bedding
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interference i
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Vertebrate tracks

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Rain or hail prints
Pull-apart
Slump structures and contorted bedding
Convolute bedding
Load cast
Tepee structure
Birdseye, fenestral fabric

EPIGENETIC STRUCTURES

Solution structures
Breccia, solution, collapse
Disolution - compaction(horse tail)
Sylolite
Vadose pisolite
Vadose silt
Boxwork
Salt hoppers or casts

Tectonic structures
Fractures
Slickensides
Breccia, tectonic

Miscellaneous
Geopetal fabric
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Stromatactics
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DIAGENESIS
D Dolomitization
Q Silicification
X Recrystallization
Ce Chloritization

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SR Subrounded
SA Subangular
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SORTING
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M Moderate
W Well
VW Very Well

HARDNESS
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VS Very Soft
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M Moderate
H Hard

POROSITY
g Intergranular
v Vugular
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ACCESSORIES
Py Pyrite
Mc Mica
Ch Chert
Cc Lignite/Coal
Hm Heavy minerals
Lf Lithic fragments
Gl Glauconite

DIAGENETIC TEXTURES
CX Crypto<1/256mm
MX Micro 1/256 - 1/16mm

HYDROCARBONS
* Signifies presence
Full details described under supplementary data

A4-GL-519

Hudbay Oil (Australia) Ltd.
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SIDEWALL CORE DESCRIPTIONS

WELL: WEST SEAHORSE -1

DEPTH (metres)	RECOVERY (centimetres)	ROCK TYPE	COLOUR	CLAY SIZE % CLAY MINERALS	CLAY SIZE % MICRITE	SILT SIZE % QUARTZ	SILT SIZE % CALCITE	GRAINS TYPE & % QUARTZ	GRAINS TYPE & % SKELETAL	GRAINS TYPE & % CALCITE	GRAINS SIZE RANGE	GRAINS SIZE DOMINANT	CEMENT TYPE & %	CEMENT TYPE & %	DIAGENESIS TYPE	DIAGENESIS %	DIAGENESIS TEXTURE	ROUNDING	SORTING	HARDNESS	POROSITY TYPE & %	ACCESSORIES TYPE & %	ACCESSORIES TYPE & %	ACCESSORIES TYPE & %	HYDROCARBONS	SEDIMENTARY STRUCTURES	SUPPLEMENTARY DATA
1419.7	4.2	Silty Argillaceous SANDSTONE	Grnsh gry	20		25		55			VF-M	VF						SA-R	M	VS	g 5				*		A. Trace pinpoint gold. B. Ver[illegible]low very pale yel F. Viscous bubbls w HCl
1422.4	4.0	Argillaceous SILTSTONE	Olv gry	35		50		10			VF-M	VF								M		Cc 5			*		A. Dull pinpoint gold B. Slow, weak, pale yel-wh
1423.4	3.7	Argillaceous Arenaceous SILTSTONE	Lt grnsh gry - olv gry	35		45		20			VF-M	VF								M					*		A. Mod strong even pale grn-wh on 80% of sample (=paler col, silty mat) B. Slow - strong grn-wh
1432.2	3.0	CLAYSTONE	Olv gry	85		15														S-M					*		A. Trace pinpoint yel B. Mod strong grn-wh
1434.0	4.7	CLAYSTONE	Olv gry - lt olv gry	75		10		10			VF-M	F								M		Cc 5			*	cm	A. Trace pinpoint gold B. Fast mod strong wh from pinpoints Banding :silty/clay layers
1435.8	3.8	CLAYSTONE	Dk olv gry	100		Tr														S-M					*		A. Nil B. Very slow, wk, bl-wh
1444.4	Nil																										No recovery - bullet shattered
1444.4	Nil																										No recovery - bullet shattered
1449.5	5.1	Silty Argillaceous SANDSTONE	Lt gry	25		20		55			VF-M	F							A-SR	VS		Cc Tr			*		A. Nil B. Very dull, v slow grn-gold
1457.6	3+	COAL	Blk-brn blk	10		Tr	5	Tr												H		Cc 85	Py Tr		*		A. Nil B.Slow, mod strong grn-wh, C. Lt brn. Scrapings taken.

STRUCTURES (STRATIFICATION, SEDIMENTARY, DIAGENETIC)

SYNGENETIC STRUCTURES

Stratification

Parallel Type

Thickness of bedding

Metric System
- millimeter bed 1mm-10mm mm
- centimeter bed 1cm-10cm cm

Cross Bedding
- in general
- with angle indicated
- chevron
- climbing
- festoon
- planar

- Irregular bedding
- Graded bedding
- No apparent bedding
- Nodular bedding

Current-produced markings
- Ripple marks
  - asymmetrical
  - interference
  - symmetrical
- Pull over flame structure
- Scour and fill
- Flute cast
- Groove cast
- Striation
- Parting lineation

Organism-produced markings
- Burrowed
  - slightly burrowed
  - moderately burrowed
  - well burrowed
- Churned
- Bored
- Bored surface
- Organism tracks and trails
- Plant root tubes
- Vertebrate tracks

Penecontemporaneous deformation structures
- Mud cracks
- Rain or hail prints
- Pull-apart
- Slump structures and contorted bedding
- Convolute bedding
- Load cast
- Tepee structure
- Birdseye, fenestral fabric

EPIGENETIC STRUCTURES

Solution structures
- Breccia, solution, collapse
- Disolution - compaction(horse tail)
- Sylolite
- Vadose pisolite
- Vadose silt
- Boxwork
- Salt hoppers or casts

Tectonic structures
- Fractures
- Slickensides
- Breccia, tectonic

Miscellaneous
- Geopetal fabric
- Cone-in-cone
- Stromatactics
- Boudinage, ball and age flow

Abbreviations:

GRAIN SIZE: VF Very Fine; F Fine; M Medium; C Course; VC Very Coarse; G Granule & larger

CEMENT: Q Silica; Py Pyrite; C Calcite; D Dolomite; Sd Siderite

DIAGENESIS: D Dolomitization; Q Silicification; X Recrystallization; Ce Chloritization

ROUNDING: R Rounded; SR Subrounded; SA Subangular; A Angular

SORTING: P Poor; M Moderate; W Well; VW Very Well

HARDNESS: U Unconsolidated; VS Very Soft; S Soft; M Moderate; H Hard

POROSITY: g Intergranular; v Vugular; i Intraskeletal

ACCESSORIES: Py Pyrite; Mc Mica; Ch Chert; Cc Lignite/Coal; Hm Heavy minerals; Lf Lithic fragments; Gl Glauconite

DIAGENETIC TEXTURES: CX Crypto <1/256mm; MX Micro 1/256 - 1/16mm

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WELL: WEST SEAHORSE-1

DEPTH (metres)	RECOVERY (centimetres)	ROCK TYPE	COLOUR	CLAY SIZE %: CLAY MINERALS	CLAY SIZE %: MICRITE	SILT SIZE %: QUARTZ	SILT SIZE %: CALCITE	GRAINS TYPE & %: QUARTZ	GRAINS TYPE & %: SKELETAL	GRAINS TYPE & %: CALCITE	GRAINS SIZE: RANGE	GRAINS SIZE: DOMINANT	CEMENT: TYPE & %	CEMENT: TYPE & %	DIAGENESIS: TYPE	DIAGENESIS: %	DIAGENESIS: TEXTURE	ROUNDING	SORTING	HARDNESS	POROSITY TYPE & %	ACCESSORIES: TYPE & %	ACCESSORIES: TYPE & %	ACCESSORIES: TYPE & %	HYDROCARBONS	SEDIMENTARY STRUCTURES	SUPPLEMENTARY DATA
1459	Nil																										No recovery - bullet lost
1460.5	4.5	CLAYSTONE	Olv gry	90		10														M-H		Cc Tr	Py Tr		*		A. Nil B. Very weak, wh
1468.7	3+	Silty Argillaceous COAL	Olv blk	20		20														M-H		Cc 60	Py Tr		*		A. Nil B. Slow, wk, even, grn-wh C. Lt brn Scraping taken
1475.5	appr 4.0	CLAYSTONE	Olv gry - lt olv gry	90		10														S		Py Tr			*	mm	A. Nil B. Fast, strong, milky wh on 80%. Slty laminae <1mm have lt col
1484.6	4+	Silty CLAYSTONE	Olv gry - lt olv gry	50		40		5			VF-F	VF								M		Cc 5	Mc Tr		*	mm	A. Nil B.Med fast, strong grn-wh. Scrapings taken - minor coal; ≤1.5 mm laminae of silt/claystone
1487.2	appr 4.0	Silty CLAYSTONE	Olv blk - lt olv gry	85		15														S-M					*	mm	A. Trace pinprick bl-wh B. Med fast mod strong grn-wh. Mainly dk clayst w/1mm paler silt bnds
1490.7	4+	COAL	Blk - dk brn blk	Tr		Tr														H		Cc 100			*		Scraping taken A. Nil B. Slow bl-wh, mod strong
1498.4	3.1	Argillaceous SILTSTONE	Lt olv gry	35		60		5			VF-F	VF								M					*		A. Trace pinpoint/gold B. Med fast, strong, pale grn-wh
1499.5	4.1	Argillaceous SANDSTONE	Lt grnsh gry	40		10		50			VF-M	F						SA-SR	M	VS	g Tr				*		A. 95% fair to strong bl-wh B. Fast, pale yel-wh
1500.6	3.6	Argillaceous Silty SANDSTONE	Lt olv gry	30		25		45			VF-M	F						A-SR	M	VS	g Tr				*		A. 90% strong bl-wh B. Med slow mod strong grn-wh C.Lt brn F.Hc odour & acid bubbles

STRUCTURES (STRATIFICATION, SEDIMENTARY, DIAGENETIC)

SYNGENETIC STRUCTURES

Stratification

Parallel Type

Thickness of bedding

Metric System
- millimeter bed 1mm-10mm mm
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- Breccia, solution, collapse
- Disolution - compaction (horse tail)
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- Vadose silt
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- Fractures
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ROUNDING
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SORTING
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- M Moderate
- W Well
- VW Very Well

HARDNESS
- U Unconsolidated
- VS Very Soft
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DEPTH (metres)	RECOVERY (centimetres)	ROCK TYPE	COLOUR	CLAY SIZE %		SILT SIZE %		GRAINS TYPE & %			GRAINS SIZE		CEMENT		DIAGENESIS			ROUNDING	SORTING	HARDNESS	POROSITY TYPE & %	ACCESSORIES			HYDROCARBONS	SEDIMENTARY STRUCTURES	SUPPLEMENTARY DATA
				CLAY MINERALS	MICRITE	QUARTZ	CALCITE	QUARTZ	SKELETAL	CALCITE	RANGE	DOMINANT	TYPE & %	TYPE & %	TYPE	%	TEXTURE					TYPE & %	TYPE & %	TYPE & %			
1501.6	4.0	**Arenaceous SILTSTONE**	V lt gry - yel gry	5		55		40			VF-M	F	C Tr					A-R	P	VS					*		A. Very strong, even 100% grn-g B. Very strong, fast strmg grn-wh
1502.6	4.4	Argillaceous SANDSTONE	Lt olv gry	35		10		55			VF-VC	M						A-SR	P	VS	g Tr				*		A. 80% mod to strong bl-wh B. Slow pale yel-wh
1503.5	3.0	Argillaceous SANDSTONE	Lt olv gry	25		5		70			VF-M	M						A-SA	M	VS	g 5-10				*		A. ? very slight trace, pinpt bl-wh B. Nil
1504.6	3.9	Silty SANDSTONE	Lt gry - med gry	5		20		75			VF-VC	M						A-SR	P	U	g 15	Mica Tr			*		A. Trace spotty, creamy-wh B. Dull, grn-wh, med. fast
1505.6	appr 4.0	Argillaceous SANDSTONE	Lt olv gry - dk grn gry	40		5		55			F-G	C						A-SR	M	VS	g 5	Cc Tr			*		A. Nil B. V dull, v slow gold
1506.6	3.0	Argillaceous SANDSTONE	Dk yelsh brn - olv gry	20		15		65			VF-G	VC						A-SA	P	VS	g 15 - 20				*		A. Slight Tr, pinpoint yel B. V weak wh
1507.8	4.8	SANDSTONE	Clr - lt gry			Tr		100			M-C	C						A-SR	M	U	g - 25	G Tr			*		A. Nil B. Trace very dull yel-wh
1508.9	3.0	Argillaceous SANDSTONE	Lt olv gry	25		5		70			VF-G	C						SA SR	P	VS	g 10				*		A. V slight Tr pinpoint yel-grn B. Nil
1509.2	3.9	Argillaceous SANDSTONE	Yelsh gry - dk grn gry	35		5		60			M-G	VC	Tr C					A-SA	M	VS	g 10	Mc Tr	Cc Tr		*		A. Nil B. Fast strong, bl-wh
1510.5	3.7	SANDSTONE	Clr-lt gry			? Tr	Tr	100			F-G	C						A-SR	P	U	g - 25	G Tr					

STRUCTURES (STRATIFICATION, SEDIMENTARY, DIAGENETIC)

SYNGENETIC STRUCTURES

Stratification

Parallel Type

Thickness of bedding

Metric System
- millimeter bed 1mm-10mm mm
- centimeter bed 1cm-10cm cm

Cross Bedding
- in general
- with angle indicated
- chevron
- climbing
- festoon
- planar

- Irregular bedding
- Graded bedding
- No apparent bedding
- Nodular bedding

Current-produced markings
- Ripple marks
  - asymmetrical
  - interference
  - symmetrical
- Pull over flame structure
- Scour and fill
- Flute cast
- Groove cast
- Striation
- Parting lineation

Organism-produced markings
- Burrowed
  - slightly burrowed
  - moderately burrowed
  - well burrowed
- Churned
- Bored
- Bored surface
- Organism tracks and trails
- Plant root tubes
- Vertebrate tracks

Penecontemporaneous deformation structures
- Mud cracks
- Rain or hail prints
- Pull-apart
- Slump structures and contorted bedding
- Convolute bedding
- Load cast
- Tepee structure
- Birdseye, fenestral fabric

EPIGENETIC STRUCTURES

Solution structures
- Breccia, solution, collapse
- Disolution - compaction (horse tail)
- Sylolite
- Vadose pisolite
- Vadose silt
- Boxwork
- Salt hoppers or casts

Tectonic structures
- Fractures
- Slickensides
- Breccia, tectonic

Miscellaneous
- Geopetal fabric
- Cone-in-cone
- Stromatactics
- Boudinage, ball and age flow

Abbreviations:

GRAIN SIZE
- VF Very Fine
- F Fine
- M Medium
- C Course
- VC Very Coarse
- G Granule & larger

CEMENT
- Q Silica
- Py Pyrite
- C Calcite
- D Dolomite
- Sd Siderite

DIAGENESIS
- D Dolomitization
- Q Silicification
- X Recrystallization
- Ce Chloritization

ROUNDING
- R Rounded
- SR Subrounded
- SA Subangular
- A Angular

SORTING
- P Poor
- M Moderate
- W Well
- VW Very Well

HARDNESS
- U Unconsolidated
- VS Very Soft
- S Soft
- M Moderate
- H Hard

POROSITY
- g Intergranular
- v Vugular
- i Intraskeletal

ACCESSORIES
- Py Pyrite
- Mc Mica
- Ch Chert
- Cc Lignite/Coal
- Hm Heavy minerals
- Lf Lithic fragments
- Gl Glauconite

DIAGENETIC TEXTURES
- CX Crypto <1/256mm
- MX Micro 1/256 - 1/16mm

HYDROCARBONS
- * Signifies presence
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A4-GL-519

Hudbay Oil (Australia) Ltd.
Subsidiary of Hudson's Bay Oil and Gas Company Limited

SIDEWALL CORE DESCRIPTIONS

WELL: WEST SEAHORSE-1

DEPTH (metres)	RECOVERY (centimetres)	ROCK TYPE	COLOUR	CLAY SIZE %: CLAY MINERALS	CLAY SIZE %: MICRITE	SILT SIZE %: QUARTZ	SILT SIZE %: CALCITE	GRAINS TYPE & %: QUARTZ	GRAINS TYPE & %: SKELETAL	GRAINS TYPE & %: CALCITE	GRAINS SIZE: RANGE	GRAINS SIZE: DOMINANT	CEMENT: TYPE & %	CEMENT: TYPE & %	DIAGENESIS: TYPE	DIAGENESIS: %	DIAGENESIS: TEXTURE	ROUNDING	SORTING	HARDNESS	POROSITY TYPE & %	ACCESSORIES: TYPE & %	ACCESSORIES: TYPE & %	ACCESSORIES: TYPE & %	HYDROCARBONS	SEDIMENTARY STRUCTURES	SUPPLEMENTARY DATA
1512.8	appr 3.5	Arenaceous Silty CLAYSTONE	Olv gry - lt grnsh gry	60		30		10			VF-F	VF								S					*	cm	A. Slight Tr, pinpoint bl-wh [illegible]ed slow mod strong grn-yel. Paler [illegible] Bnds=sdy Slt; Dkr Bnds=slty clay
1514.5	4.8	SANDSTONE	Clr - lt gry			Tr		100			F-G	C						A-SR	P	U	g - 25				*		A. Nil B. Very slow, weak, yel-wh
1520.0	5.5	Argillaceous SANDSTONE	Olv gry	40		Tr		60			F-VC	C						A-SA	M	H	g 5	Py Tr			*		A. Tr pinpoint gold (=min fl) B. Nil Speckled appearance
1525.0	4.0	COAL	Blk - brn blk																	H		Cc 100			*		A. Mod strong, grn-wh B. Med fast, mod strong wh :V hd, scraping taken
1530.2	2.8	Argillaceous SILTSTONE	Lt olv gry - olv gry-blk	20		55		15			VF-M	F								S		Mc Tr	Cc 10		*	mm	Finely laminated. A. Trace pinprick, brt grn-wh B. Med slow, mod strong grn-wh
1548.8	5.1	Argillaceous SANDSTONE	Lt gry - lt grn gry	20		15		65			VF-G	VF						SA -R	P	VS -U	g 5	G Tr			*		A. 100% faint, even, brn-gold B. Very slow, dull, yel-wh C. Nil
1558.2	3.5	Argillaceous SANDSTONE	Lt gry - lt grn gry	30		10		60			F-G	VC						A-SR	P	VS -U	g 5	Mc Tr					
1574.2	3.4	Silty CLAYSTONE	Lt olv gry dk olv gry	75		25		Tr					C Tr							M							A. Nil B. Very slow, weak, wh, from most of sample
1578.5	4.4	Argillaceous SANDSTONE	Lt olv gry	20		5		75			VF-C	F						A-R	M	VS	g Tr				*		A. Nil B. Weak grn-wh
1594.9	3.2	CLAYSTONE	Lt olv gry	95		5														M					*		A. Very dull brn, even, 80% B. Mod. strong grn-wh

STRUCTURES (STRATIFICATION, SEDIMENTARY, DIAGENETIC)

SYNGENETIC STRUCTURES

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- Disolution - compaction (horse tail)
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- Vadose silt
- Boxwork
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- Fractures
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ROUNDING
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- SR Subrounded
- SA Subangular
- A Angular

SORTING
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- M Moderate
- W Well
- VW Very Well

HARDNESS
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- VS Very Soft
- S Soft
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- H Hard

POROSITY
- g Intergranular
- v Vugular
- i Intraskeletal

ACCESSORIES
- Py Pyrite
- Mc Mica
- Ch Chert
- Cc Lignite/Coal
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- CX Crypto <1/256mm
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Hudbay Oil (Australia) Ltd.
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SIDEWALL CORE DESCRIPTIONS

WELL: WEST SEAHORSE -1

DEPTH (metres)	RECOVERY (centimetres)	ROCK TYPE	COLOUR	CLAY SIZE %: CLAY MINERALS	CLAY SIZE %: MICRITE	SILT SIZE %: QUARTZ	SILT SIZE %: CALCITE	GRAINS TYPE & %: QUARTZ	GRAINS TYPE & %: SKELETAL	GRAINS TYPE & %: CALCITE	GRAINS SIZE: RANGE	GRAINS SIZE: DOMINANT	CEMENT: TYPE & %	CEMENT: TYPE & %	DIAGENESIS: TYPE	DIAGENESIS: %	DIAGENESIS: TEXTURE	ROUNDING	SORTING	HARDNESS	POROSITY TYPE & %	ACCESSORIES: TYPE & %	ACCESSORIES: TYPE & %	ACCESSORIES: TYPE & %	HYDROCARBONS	SEDIMENTARY STRUCTURES	SUPPLEMENTARY DATA
1600.0	4.3	Silty SANDSTONE	Wh-gry	5		25		70			VF-G	M						SA-R	P	VS-U	g - 5				*		A. Very dull brn B. Nil - very weak grn
1621.4	Nil																										No recovery - bullet lost
1626.3	3.6	Argillaceous SANDSTONE	Lt gry - brn blk	30		10		55			VF-M	VF						SA-R	M	S	g Tr	Cc 5	Mc Tr		*	mm	≤2mm Laminae of coaly-rich mat A. Nil B. Mod strong grn-wh (contamiant fluor at edges)
1648.2	4.7	CLAYSTONE	Olv gry	100		Tr														VS					*		A. Nil B. Mod strong grn
1651.8	2.0	Argillaceous SILTSTONE	Lt gry	40		60		Tr			VF-M									VS		Cc Tr	Mc Tr		*		A. Nil B. Mod strong grn
1662.5	4.0	CLAYSTONE	Lt gry	95		5														S					*		A. 100% dull gold B. Strong grn-wh C. Faint brn
1665.0	Nil																										No Recovery
1665.0	5.1	CLAYSTONE	Gnsh gry - lt grnsh gry	100																	S				*		A. Trace patchy gold B. V slow, dull gold
1685.0	3.2	Silty Argillaceous SANDSTONE	Lt gry - dk gry	20		20		55			VF-G	F								S-VS	g Tr	Py 5	Cc Tr			cm	Coarsely laminated (4mm): Dkr bands of Pyr & carb mat
1707.7	3.1	Pyritic SANDSTONE	Med gry	Tr		Tr		65			M-G	VC	Q Tr					A-SR	M	VS-H	g - 25	Py35			*	cm	Hard Pyr bands A. Nil B. Med grn-wh solvent fluor

STRUCTURES (STRATIFICATION, SEDIMENTARY, DIAGENETIC)

SYNGENETIC STRUCTURES

Stratification
Parallel Type
Thickness of bedding
Metric System
millimeter bed 1mm-10mm mm
centimeter bed 1cm-10cm cm
Cross Bedding
in general
with angle indicated
chevron
climbing
festoon
planar

Irregular bedding
Graded bedding
No apparent bedding
Nodular bedding

Current-produced markings
Ripple marks
asymmetrical
interference
symmetrical
Pull over flame structure
Scour and fill
Flute cast
Groove cast
Striation
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Organism-produced markings
Burrowed
slightly burrowed
moderately burrowed
well burrowed
Churned
Bored
Bored surface
Organism tracks and trails
Plant root tubes
Vertebrate tracks

Penecontemporaneous deformation structures
Mud cracks
Rain or hail prints
Pull-apart
Slump structures and contorted bedding
Convolute bedding
Load cast
Tepee structure
Birdseye, fenestral fabric

EPIGENETIC STRUCTURES

Solution structures
Breccia, solution, collapse
Disolution - compaction (horse tail)
Sylolite
Vadose pisolite
Vadose silt
Boxwork
Salt hoppers or casts

Tectonic structures
Fractures
Slickensides
Breccia, tectonic

Miscellaneous
Geopetal fabric
Cone-in-cone
Stromatactics
Boudinage, ball and age flow

Abbreviations:

GRAIN SIZE: VF Very Fine; F Fine; M Medium; C Course; VC Very Coarse; G Granule & larger

CEMENT: Q Silica; Py Pyrite; C Calcite; D Dolomite; Sd Siderite

DIAGENESIS: D Dolomitization; Q Silicification; X Recrystallization; Ce Chloritization

ROUNDING: R Rounded; SR Subrounded; SA Subangular; A Angular

SORTING: P Poor; M Moderate; W Well; VW Very Well

HARDNESS: U Unconsolidated; VS Very Soft; S Soft; M Moderate; H Hard

POROSITY: g Intergranular; v Vugular; i Intraskeletal

ACCESSORIES: Py Pyrite; Mc Mica; Ch Chert; Cc Lignite/Coal; Hm Heavy minerals; Lf Lithic fragments; Gl Glauconite

DIAGENETIC TEXTURES: CX Crypto <1/256mm; MX Micro 1/256 - 1/16mm

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A4-GL-519

Hudbay Oil (Australia) Ltd.
Subsidiary of Hudson's Bay Oil and Gas Company Limited

SIDEWALL CORE DESCRIPTIONS

WELL: WEST SEAHORSE-1

DEPTH (metres)	RECOVERY (centimetres)	ROCK TYPE	COLOUR	CLAY SIZE %: CLAY MINERALS	CLAY SIZE %: MICRITE	SILT SIZE %: QUARTZ	SILT SIZE %: CALCITE	GRAINS TYPE & %: QUARTZ	GRAINS TYPE & %: SKELETAL	GRAINS TYPE & %: CALCITE	GRAINS SIZE: RANGE	GRAINS SIZE: DOMINANT	CEMENT: TYPE & %	CEMENT: TYPE & %	DIAGENESIS: TYPE	DIAGENESIS: %	DIAGENESIS: TEXTURE	ROUNDING	SORTING	HARDNESS	POROSITY TYPE & %	ACCESSORIES: TYPE & %	ACCESSORIES: TYPE & %	ACCESSORIES: TYPE & %	HYDROCARBONS	SEDIMENTARY STRUCTURES	SUPPLEMENTARY DATA
1725.7	2.2	SILTSTONE	Lt bl gry	15		80		5												S		Py Tr	G Tr			mm	Finely laminated clay/silty la[illegible] ≤0.5mm
1726.0	4.0	Argillaceous Arenaceous SILTSTONE	Lt gry	40		40		20			VF-M	VF								M							A. Trace pinpoint gold. B.
1732.0	3.2	Silty Argillaceous SANDSTONE	Lt bl gry - med bl gry	30		30		40			VF-G	M						A-SR	P	VS	g Tr	G Tr					
1738.2	4.6	Argillaceous Arenaceous SILTSTONE	Med lt gry	35		40		25			VF-M	F	-					SA-SR	M	M		Py Tr	Cc Tr				
1741.0	4.0	Argillaceous SILTSTONE	Lt gry - med lt gry	45		35		15			VF	VF								M		Py 5				mm	Minor mineralogical banding, 1mm
1753.5	5.2	Argillaceous SANDSTONE	Med lt gry - med gry	25		10		60			VF-M	F						SA-SR	M	M		Py 5					V crs Pyr grs A. Tr pinpoint gold B. Nil
1766.0	3.4	Silty Pyritic Argillaceous SANDSTONE	Med gry	25		25		35			VF-C	F	-					SA-SR	P	H		Py 15					A. Tr pinpoint gold B. Nil. Pyrite granules
1778.0	3.3	CLAYSTONE	Dusky yelsh brn	85		15		Tr			VF		-							M							A. Nil B. Slow, mod strong from most of sample
1787.5	3.6	CLAYSTONE	Dk gry	85		15		Tr			VF-F	VF								M		Py Tr	Cc Tr				A. Tr pinpoint gold B. Slow med strong wh from 2 spots
1796.8	4.9	Silty Pyritic CLAYSTONE	Lt gry - dk gry	55		25		Tr			VF-F	VF		(Py)						H		Py 20				≋	A. 40% even, v dull brn on claystone B. Nil. Dkr part = pyritic claystone

STRUCTURES (STRATIFICATION, SEDIMENTARY, DIAGENETIC)

SYNGENETIC STRUCTURES

Stratification

Parallel Type

Thickness of bedding
Metric System
- millimeter bed 1mm-10mm (mm)
- centimeter bed 1cm-10cm (cm)

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- in general
- with angle indicated
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- climbing
- festoon
- planar

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- Graded bedding
- No apparent bedding
- Nodular bedding

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- Ripple marks
  - asymmetrical
  - interference
  - symmetrical
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- Scour and fill
- Flute cast
- Groove cast
- Striation
- Parting lineation

Organism-produced markings
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  - slightly burrowed
  - moderately burrowed
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- Bored surface
- Organism tracks and trails
- Plant root tubes
- Vertebrate tracks

Penecontemporaneous deformation structures
- Mud cracks
- Rain or hail prints
- Pull-apart
- Slump structures and contorted bedding
- Convolute bedding
- Load cast
- Tepee structure
- Birdseye, fenestral fabric

EPIGENETIC STRUCTURES

Solution structures
- Breccia, solution, collapse
- Disolution - compaction (horse tail)
- Sylolite
- Vadose pisolite
- Vadose silt
- Boxwork
- Salt hoppers or casts

Tectonic structures
- Fractures
- Slickensides
- Breccia, tectonic

Miscellaneous
- Geopetal fabric
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- Stromatactics
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Abbreviations:

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WELL: WEST SEAHORSE - 1

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1801.5	3.7	Silty CLAYSTONE	Lt gry	75		20		5												M							
1855.3	3.9	Silty CLAYSTONE	Med gry - brn gry	80		20														M		Cc Tr					
1872.0	2.8	Carbonaceous CLAYSTONE/ SILTSTONE	Lt gry - med gry-blk	50		40														M		Cc 10			*		A. Tr pinpoint grn B. Tr fast, strong grn-wh
1881.5	4.1	Silty CLAYSTONE	Lt gry - med gry	60		35		5			VF-F	VF								M							
1894.2	2.7	Silty CLAYSTONE	v lt gry - med dk gry	45		40		10			VF-F	VF								M		Cc 5			*		A. Tr pinpoint grn-wh B. V slow dull grn ? inclined bedding
1913.6	4.0	Carbonaceous SILTSTONE/ CLAYSTONE	Lt gry - med dk gry-blk (Cc)	30		25		15			F-C	M		(Py)				SA-SR	M	H	g 5	Py 10	Cc20			mm	Trace mineral fluorescence Bnd of coal & pyrite
1919.0	3.9	Argillaceous SANDSTONE	Lt gry - med gry	40		Tr		60			F-VC	M						SA-SR	M	S	g 5	Py Tr					
1933.5	2.6	Silty Arenaceous CLAYSTONE	Med gry, med dk gry	50		25		25			VF-M	VF						A-SR	M	S		Py Tr					
1941.0	3.3	Carbonaceous Argillaceous SANDSTONE	Med gry to gry blk	25		15		25			VF-M	VF						A-SR	M	S	g Tr	Cc 35	PyTr			mm	A. Tr pinpoint gold. B. Nil Irr blk mins; coaly bnds
1947.2	2.5	Silty Arenaceous CLAYSTONE	Lt gry - lt olv gry	50		20		30			VF-M	VF	Tr DOL					A-SA	M	S	g Tr	Cc Tr	PyTr		*	mm	A. Sli tr, pinpoint yel B. V slow wh on crushing. Dkr less silty bnds up to 1mm wide

STRUCTURES (STRATIFICATION, SEDIMENTARY, DIAGENETIC)

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Parallel Type

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Ce Chloritization

ROUNDING
R Rounded
SR Subrounded
SA Subangular
A Angular

SORTING
P Poor
M Moderate
W Well
VW Very Well

HARDNESS
U Unconsolidated
VS Very Soft
S Soft
M Moderate
H Hard

POROSITY
g Intergranular
v Vugular
i Intraskeletal

ACCESSORIES
Py Pyrite
Mc Mica
Ch Chert
Cc Lignite/Coal
Hm Heavy minerals
Lf Lithic fragments
Gl Glauconite

DIAGENETIC TEXTURES
CX Crypto <1/256mm
MX Micro 1/256 - 1/16mm

HYDROCARBONS
* Signifies presence
Full details described under supplementary data

A4-GL-519

Hudbay Oil (Australia) Ltd.
Subsidiary of Hudson's Bay Oil and Gas Company Limited

SIDEWALL CORE DESCRIPTIONS

WELL: WEST SEAHORSE - 1

DEPTH (metres)	RECOVERY (centimetres)	ROCK TYPE	COLOUR	CLAY SIZE %: CLAY MINERALS	CLAY SIZE %: MICRITE	SILT SIZE %: QUARTZ	SILT SIZE %: CALCITE	GRAINS TYPE & %: QUARTZ	GRAINS TYPE & %: SKELETAL	GRAINS TYPE & %: CALCITE	GRAINS SIZE: RANGE	GRAINS SIZE: DOMINANT	CEMENT: TYPE & %	CEMENT: TYPE & %	DIAGENESIS: TYPE	DIAGENESIS: %	DIAGENESIS: TEXTURE	ROUNDING	SORTING	HARDNESS	POROSITY TYPE & %	ACCESSORIES: TYPE & %	ACCESSORIES: TYPE & %	ACCESSORIES: TYPE & %	HYDROCARBONS	SEDIMENTARY STRUCTURES	SUPPLEMENTARY DATA
1968.4	1.7	CLAYSTONE	Dk gry	85		10		Tr			VF		C-Tr							M		Cc 5			*		A. Nil B. Very slow, dull grn
1975.2	2.8	Argillaceous SANDSTONE	Lt med gry	40		5		55			VF-C	F						A-SA	P	S	g Tr	Py Tr					
1976.3	3.3	Argillaceous SANDSTONE	V lt gry-lt gry	30		15		55			VF-VC	M						A-SR	P	S	g 5	Py Tr					
1978.0	2.0	Argillaceous SANDSTONE	V lt gry - lt gry	35				65			M-G	C						A-SR	M	S	g 5	Py Tr			*		A. 40% V dull yel-wh B. V slow, V dull/wh
2031.8	3.2	CLAYSTONE	Olv blk	95		5														M		Cc Tr	Py Tr		*		A. Trace pinpoint bl-wh B. Med fast bright bl-wh from 40% of sample
2072.1	3.4	CLAYSTONE	Olv gry	85		10		Tr			VF-F	VF								M		Cc 5					A. Nil B. V slow, V dull grn
2083.2	5.2	CLAYSTONE	Dk gry	95		5														M		Cc Tr					
2103.1	2.3	CLAYSTONE/ SILTSTONE	Med - dk gry	45		45		5			VF-M	F								M		Cc 5			*	cm	A. Tr pinpoint yel-grn B. V slow v weak grn-wh Mineralogical bnding
2125.1	3.2	CLAYSTONE	Med gry	80		15		5			VF-M	M								M							
2140.0	3.4	SANDSTONE	Lt - med gry	10				75			M-G	VC	Py 5		Q	5	Ms	A-SR	M	S	g 10	Py 5			*		A. Tr spotty grn-yel B. V slow V dull/grn

STRUCTURES (STRATIFICATION, SEDIMENTARY, DIAGENETIC)

Stratification

Parallel Type

Thickness of bedding

Metric System
millimeter bed 1mm-10mm mm
centimeter bed 1cm-10cm cm

Cross Bedding
in general
with angle indicated
chevron
climbing
festoon
planar

Irregular bedding
Graded bedding
No apparent bedding
Nodular bedding

SYNGENETIC STRUCTURES

Current-produced markings
Ripple marks
asymmetrical
interference
symmetrical
Pull over flame structure
Scour and fill
Flute cast
Groove cast
Striation
Parting lineation

Organism-produced markings
Burrowed
slightly burrowed
moderately burrowed
well burrowed
Churned
Bored
Bored surface
Organism tracks and trails
Plant root tubes
Vertebrate tracks

Penecontemporaneous deformation structures
Mud cracks
Rain or hail prints
Pull-apart
Slump structures and contorted bedding
Convolute bedding
Load cast
Tepee structure
Birdseye, fenestral fabric

EPIGENETIC STRUCTURES

Solution structures
Breccia, solution, collapse
Disolution - compaction (horse tail)
Sylolite
Vadose pisolite
Vadose silt
Boxwork
Salt hoppers or casts

Tectonic structures
Fractures
Slickensides
Breccia, tectonic

Miscellaneous
Geopetal fabric
Cone-in-cone
Stromatactics
Boudinage, ball and age flow

Abbreviations:

GRAIN SIZE: VF Very Fine; F Fine; M Medium; C Course; VC Very Coarse; G Granule & larger

CEMENT: Q Silica; Py Pyrite; C Calcite; D Dolomite; Sd Siderite

DIAGENESIS: D Dolomitization; Q Silicification; X Recrystallization; Ce Chloritization

ROUNDING: R Rounded; SR Subrounded; SA Subangular; A Angular

SORTING: P Poor; M Moderate; W Well; VW Very Well

HARDNESS: U Unconsolidated; VS Very Soft; S Soft; M Moderate; H Hard

POROSITY: g Intergranular; v Vugular; i Intraskeletal

ACCESSORIES: Py Pyrite; Mc Mica; Ch Chert; Cc Lignite/Coal; Hm Heavy minerals; Lf Lithic fragments; Gl Glauconite

DIAGENETIC TEXTURES: CX Crypto <1/256mm; MX Micro 1/256 - 1/16mm

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A4-GL-519

Hudbay Oil (Australia) Ltd.

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SIDEWALL CORE DESCRIPTIONS

WELL: WEST SEAHORSE - 1

DEPTH (metres)	RECOVERY (centimetres)	ROCK TYPE	COLOUR	CLAY SIZE %: CLAY MINERALS	CLAY SIZE %: MICRITE	SILT SIZE %: QUARTZ	SILT SIZE %: CALCITE	GRAINS TYPE & %: QUARTZ	GRAINS TYPE & %: SKELETAL	GRAINS TYPE & %: CALCITE	GRAINS SIZE: RANGE	GRAINS SIZE: DOMINANT	CEMENT: TYPE & %	CEMENT: TYPE & %	DIAGENESIS: TYPE	DIAGENESIS: %	DIAGENESIS: TEXTURE	ROUNDING	SORTING	HARDNESS	POROSITY TYPE & %	ACCESSORIES: TYPE & %	ACCESSORIES: TYPE & %	ACCESSORIES: TYPE & %	HYDROCARBONS	SEDIMENTARY STRUCTURES	SUPPLEMENTARY DATA
2171.8	3.0	Argillaceous SILTSTONE	Lt gry - med gry	40		45		5			M-C	M	-							M - H		Py 10				cm	Banded: 1 cm lighter bands/3m dkr pyrite-rich bands
2204.5	4.2	CLAYSTONE	Dsky brn	80				5			M-C	C	-							M		Cc 15			*		A. Tr pinprich grn-wh B. V slow, weak grn
2211.3	3.5	Silty Sandy CLAYSTONE	Lt gry	55		25		20			VF-M	VF						A-SR	M	M/S		Py Tr					Trace mineral fluor
2223.0	3.9	Silty Argillaceous SANDSTONE	Wh-lt gry	30		20		45			VF-M	VF						A-SR	P	M		Py 5					A. Nil B. Weak slow grn 1.5mm diam pyrite sphere
2249.0	3.0	Argillaceous SANDSTONE	Wh- lt gry	40		5		40			VF-G	F	Dol 5		Q	10	MS	A-SA	P	M						≈≈	Mineral fluor Pod of wh clay in centre of sample
2259.4	2.9	Argillaceous SANDSTONE	Med gry - Olv gry	40		5		55			VF-C	C						A-SR	M	M	g Tr				*		Minor dull yel min fluor A. Nil B. Slow, weak milky
2275.4	3.7	Argillaceous SANDSTONE/ CLAYST, Pyritic	Lt gry - gry blk	25 70		5		60			F-G	M	Dol Tr		Q	10	MS	A-SR	P	M	g Tr	Py 30				cm	2 separate lithologies:- Dull gold mineral fluor
2285.2	1.0	Silicified SANDSTONE	Wh - med lt gry	15				50			M-G	C	Dol 15		Q	20	MS	A-SR	M	H	g Tr	Cc Tr					Mineral fluors - extremely hard.
2296.8	3.3	Argillaceous SANDSTONE	Wh-dk gry	25		15		45			F-G	C	Dol 5		Q	10	MS	A-SA	P	M	g Tr	Py Tr				mm	Minor mineral fluor Small bnds of dark clay minerals
2314.4	2.9	Argillaceous SANDSTONE	Wh - dk gry	25		5		45			F-VC	M	Dol 10	Py 5	Q	10	MS	A	P	M	g Tr						Blocky texture due to silicification Minor mineral fluor

STRUCTURES (STRATIFICATION, SEDIMENTARY, DIAGENETIC)

SYNGENETIC STRUCTURES

Stratification

Parallel Type

Thickness of bedding

Metric System
- millimeter bed 1mm-10mm mm
- centimeter bed 1cm-10cm cm

Cross Bedding
- in general
- with angle indicated 10°
- chevron
- climbing
- festoon
- planar

- Irregular bedding
- Graded bedding
- No apparent bedding
- Nodular bedding

Current-produced markings
- Ripple marks
  - asymmetrical a
  - interference i
  - symmetrical s
- Pull over flame structure
- Scour and fill
- Flute cast
- Groove cast
- Striation
- Parting lineation

Organism-produced markings
- Burrowed
  - slightly burrowed s
  - moderately burrowed m
  - well burrowed w
- Churned
- Bored
- Bored surface
- Organism tracks and trails
- Plant root tubes
- Vertebrate tracks

Penecontemporaneous deformation structures
- Mud cracks
- Rain or hail prints
- Pull-apart
- Slump structures and contorted bedding
- Convolute bedding
- Load cast
- Tepee structure
- Birdseye, fenestral fabric

EPIGENETIC STRUCTURES

Solution structures
- Breccia, solution, collapse S
- Disolution - compaction (horse tail)
- Sylolite
- Vadose pisolite
- Vadose silt
- Boxwork
- Salt hoppers or casts

Tectonic structures
- Fractures
- Slickensides
- Breccia, tectonic T

Miscellaneous
- Geopetal fabric
- Cone-in-cone
- Stromatactics
- Boudinage, ball and age flow

Abbreviations

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DIAGENESIS: D Dolomitization; Q Silicification; X Recrystallization; Ce Chloritization

ROUNDING: R Rounded; SR Subrounded; SA Subangular; A Angular

SORTING: P Poor; M Moderate; W Well; VW Very Well

HARDNESS: U Unconsolidated; VS Very Soft; S Soft; M Moderate; H Hard

POROSITY: g Intergranular; v Vugular; i Intraskeletal

ACCESSORIES: Py Pyrite; Mc Mica; Ch Chert; Cc Lignite/Coal; Hm Heavy minerals; Lf Lithic fragments; Gl Glauconite

DIAGENETIC TEXTURES: CX Crypto <1/256mm; MX Micro 1/256 - 1/16mm

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SIDEWALL CORE DESCRIPTIONS

WELL: WEST SEAHORSE - 1

DEPTH (metres)	RECOVERY (centimetres)	ROCK TYPE	COLOUR	CLAY SIZE %: CLAY MINERALS	CLAY SIZE %: MICRITE	SILT SIZE %: QUARTZ	SILT SIZE %: CALCITE	GRAINS TYPE & %: QUARTZ	GRAINS TYPE & %: SKELETAL	GRAINS TYPE & %: CALCITE	GRAINS SIZE: RANGE	GRAINS SIZE: DOMINANT	CEMENT: TYPE & %	CEMENT: TYPE & %	DIAGENESIS: TYPE	DIAGENESIS: %	DIAGENESIS: TEXTURE	ROUNDING	SORTING	HARDNESS	POROSITY TYPE & %	ACCESSORIES: TYPE & %	ACCESSORIES: TYPE & %	ACCESSORIES: TYPE & %	HYDROCARBONS	SEDIMENTARY STRUCTURES	SUPPLEMENTARY DATA
2320.5	3.4	Argillaceous SANDSTONE	wh-med gry	20		5		70			VF-G	C/M	Dol 5					A-SR	P			Py Tr					Gold mineral fluor
2332.2	3.2	Sandy Argillaceous SILTSTONE	Lt gry - dk gry	30		35		25			VF-M	VF	Dol 10						M			Cc Tr					Slight Tr pinpoint gold mineral fluor
2343.5	3.0	Silty Argillaceous SANDSTONE	Lt gry - olv gry	30		25		35			VF-M	VF	Dol 10					A-SR	M			Cc Tr			*		A. Nil B. Weak, slow dull grn. Tr gold mineral fluor
2351.0	Nil																										No recovery - empty
2360.5	Nil																										No recovery - empty
2368.7	3.5	Argillaceous SANDSTONE	Lt gry	30		10		45			VF-C	F	Dol 15					A-SR	M	M	g Tr	Py Tr	Cc Tr			mm	Blk bands of coal up to 0.5mm wide
2376.0	3.2	Argillaceous SANDSTONE	Wh - lt gry	35		5		45			VF-M	F	Dol 15					A-SR	P	M	g Tr	Py Tr					Dull gold mineral fluor
2391.0	Nil																										No recovery - bullet lost
2403.1	3.1	Silty CLAYSTONE	Olv gry	60		20		10			VF-M	F	Dol 10							M		Cc Tr			*		A. 90% dull gold B. V slow, dull grn
2409.9	2.75	Silty Arenaceous CLAYSTONE	Olv gry	50		15		20			VF-M	F	Dol 15							M		Cc Tr			*		A. 40% dull gold on claystone B. Slow, med - wk grn-wh

STRUCTURES (STRATIFICATION, SEDIMENTARY, DIAGENETIC)

SYNGENETIC STRUCTURES

Stratification — Parallel Type

Thickness of bedding
Metric System
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- centimeter bed 1cm-10cm cm

Cross Bedding
- in general
- with angle indicated
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- festoon
- planar

- Irregular bedding
- Graded bedding
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- Nodular bedding

Current-produced markings
- Ripple marks
  - asymmetrical
  - interference
  - symmetrical
- Pull over flame structure
- Scour and fill
- Flute cast
- Groove cast
- Striation
- Parting lineation

Organism-produced markings
- Burrowed
  - slightly burrowed
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- Churned
- Bored
- Bored surface
- Organism tracks and trails
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Penecontemporaneous deformation structures
- Mud cracks
- Rain or hail prints
- Pull-apart
- Slump structures and contorted bedding
- Convolute bedding
- Load cast
- Tepee structure
- Birdseye, fenestral fabric

EPIGENETIC STRUCTURES

Solution structures
- Breccia, solution, collapse
- Disolution - compaction (horse tail)
- Sylolite
- Vadose pisolite
- Vadose silt
- Boxwork
- Salt hoppers or casts

Tectonic structures
- Fractures
- Slickensides
- Breccia, tectonic

Miscellaneous
- Geopetal fabric
- Cone-in-cone
- Stromatactics
- Boudinage, ball and age flow

Abbreviations

GRAIN SIZE
- VF Very Fine
- F Fine
- M Medium
- C Course
- VC Very Coarse
- G Granule & larger

CEMENT
- Q Silica
- Py Pyrite
- C Calcite
- D Dolomite
- Sd Siderite

DIAGENESIS
- D Dolomitization
- Q Silicification
- X Recrystallization
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- W Well
- VW Very Well

HARDNESS
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POROSITY
- g Intergranular
- v Vugular
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ACCESSORIES
- Py Pyrite
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- Hm Heavy minerals
- Lf Lithic fragments
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- CX Crypto <1/256mm
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WELL: WEST SEAHORSE - 1

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2416.1	Nil																										No recovery - bullet lost
2420.1	3.0	Silty SANDSTONE	Wh-gry	15		20		50			VF-C	F	Dol 10	Py 5	Q	Tr	MS	A-SR	P	H	g Tr						Py occurs as encrusting "cement" on silty grains. Tr dull gold min. fluor
2424.2	3.0	Silty SANDSTONE	Wh - lt gry	10		20		55			VF-VC	F	Dol 10	Py Tr	Q	5	MS	A-SR	P	H	g Tr						Minor mineral fluorescence
2435.3	2.5	Argillaceous SANDSTONE	Wh - gry	20				60			M-G	C	Dol 10		Q	15	MS	A-SA	M	H	g 5	Py Tr			*		A. 10% spotty, bright bl-wh B. Mod wh-lt yel. F. Viscous Bubls in HCl
2447.0	3.4	Argillaceous SANDSTONE	Wh-gr-olv blk	30		10		40			VF-VC	F	Dol 5					A=SA	P	H	g 5	Lf 15	Py Tr				Sst is very dirty. Gold mineral fluor = dolomite
2458.0	1.75	Argillaceous SANDSTONE	Wh-gry	20		10		50			VF-VC	F	Dol 10	Py Tr	Q	10	MS	A	M	S-M	g 5						Wh clay resembles Fd (high power)but breaks up % of dolomite qtz & por unsure
2466.0	4.2	Silicified SANDSTONE	Wh-lt gry	Tr				70					Dol 5	Py Tr	Q	25	MS	A-SA	P	M-H	g 5						% of diagenesis difficult to estimate
2468.0	3.25	Silty, Pyritic CLAYSTONE	Olv gry - lt gry	40		10		15					Dol 5							M-H	g Tr	Py 30					Lt gry steaks = dolomitic sst. Silt size pyrite throughout
2474.9	2.2	Dolomitic Silty SANDSTONE	Wh-v lt gry	25				45			C-G	VC	Dol 10		Q	15	MS	A-SA	M	VS	g 10	Py 5				mm	Bnds of claystone up to 1mm thick; Difficult to estimate % of qtz.
2486.9	3.0	Arenaceous CLAYSTONE/ SILTSTONE	Dk gry - v lt gry	100		- 40		- 35			f-c	M	Dol 15	Pyr 10				A-SA	M	S-M	g 5						Mineral fluor from dolomite 2 lithologies

STRUCTURES (STRATIFICATION, SEDIMENTARY, DIAGENETIC)

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- centimeter bed — 1cm-10cm cm

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- Load cast
- Tepee structure
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EPIGENETIC STRUCTURES

Solution structures
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- Disolution - compaction(horse tail)
- Sylolite
- Vadose pisolite
- Vadose silt
- Boxwork
- Salt hoppers or casts

Tectonic structures
- Fractures
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SORTING
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HARDNESS
- U Unconsolidated
- VS Very Soft
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POROSITY
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ACCESSORIES
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- Mc Mica
- Ch Chert
- Cc Lignite/Coal
- Hm Heavy minerals
- Lf Lithic fragments
- Gl Glauconite

DIAGENETIC TEXTURES
- CX Crypto <1/256mm
- MX Micro 1/256 - 1/16mm

HYDROCARBONS
- * Signifies presence
- Full details described under supplementary data

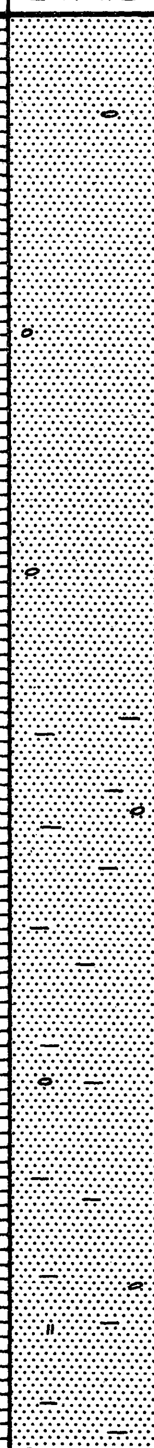
Hudbay Oil (Australia) Ltd.

West Seahorse-1

CORE DESCRIPTION

Core Nº: 1

>Granule	Granule	V.Coarse	Coarse	Medium	Fine	V.Fine	Silt	Clay	DEPTH (metres)	LITHOLOGY STRUCTURES TEXTURES SEDIMENTARY DIP	STRUCTURAL DIP	LITHOLOGICAL DESCRIPTION	HYDROCARBON INDICATIONS
	✓	✓	D	✓	✓	✓			1450.0			SANDSTONE:- Clear, very fine to granule, dominantly coarse, angular to rounded, dominantly subrounded, moderately sorted, trace calcite cement, trace carbonaceous material, unconsolidated, excellent porosity.	A. Trace pin-point blue white fluorescence. B. Moderately fast blue white solvent fluorescence.
									1450.1				
									1450.2				
									1450.3				
									1450.4				
	✓	✓	D	✓	✓	✓	✓	✓	1450.5			SANDSTONE:- Clear, very fine to granule, dominantly coarse, angular to rounded, moderately sorted, 5% clay minerals, trace calcite cement, trace carbonaceous matter, unconsolidated, excellent porosity.	A. Trace pin-prick blue white fluorescence. B. Moderately fast solvent fluorescence.
									1450.6				
	✓	✓	D	✓	✓	✓	✓	✓				SANDSTONE:- Clear, very fine to granule, dominantly medium, angular to rounded, moderately sorted, 5% clay minerals, trace calcite cement, trace carbonaceous matter, unconsolidated, excellent porosity.	
									1450.7				
									1450.8				
									1450.9				
									1451.0				



Geology By: E.T., & J.R.	Vertical Scale: 1:5 (20cm = 1m)	Drawing Nº: A4-GL-528
Drawn By: K. Lynch	Date: 2-10-'81	

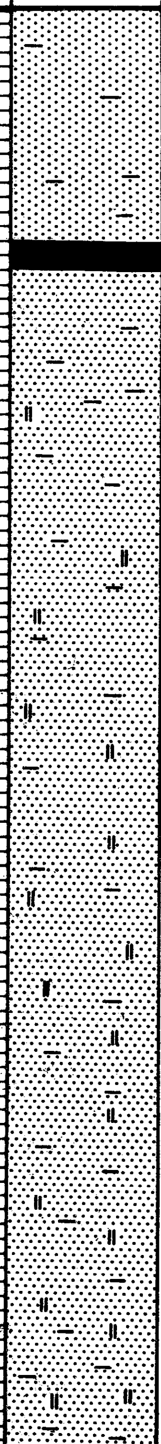
Hudbay Oil (Australia) Ltd.

West Seahorse - 1

CORE DESCRIPTION

Core Nº: 1

LITHOLOGY (>Granule, Granule, V.Coarse, Coarse, Medium, Fine, V.Fine, Silt, Clay)	DEPTH (metres)	LITHOLOGY STRUCTURES TEXTURES SEDIMENTARY DIP	STRUCTURAL DIP	LITHOLOGICAL DESCRIPTION	HYDROCARBON INDICATIONS
	1451.0				
	1451.1				
	1451.2			COAL:- Black, bituminous, brittle.	
Granule ✓, V.Coarse ✓, Coarse ✓, Medium D, Fine ✓, V.Fine ✓, Silt ✓, Clay ✓	1451.3			SANDSTONE:- Clear to light grey, very fine to granule, dominantly medium, angular to rounded, dominantly sub-angular, poorly sorted, 5 to 15% quartz silt trace - 10% clay minerals, thin coal laminae, moderately hard to unconsolidated, good to excellent porosity.	A. Trace spotty blue white sample fluorescence. B. White solvent fluorescence.
	1451.4				
	1451.5				
	1451.6				
	1451.7			Thin coal laminae.	
Granule ✓, V.Coarse ✓, Coarse ✓, Medium ✓, Fine D, V.Fine D, Silt ✓, Clay ✓	1451.8			SANDSTONE:- Light olive grey to olive grey, fine to granule, dominantly very fine to fine, 10-20% quartz silt, 5-20% clay minerals, poor to very good porosity, moderately hard. Interval is becoming silty with depth.	
	1451.9				
	1452.0				



Geology By: E.T., & J.R.

Drawn By: K. Lynch

Vertical Scale: 1:5 (20cm = 1m)

Date: 2-10-81

Drawing Nº: A4 - GL - 528

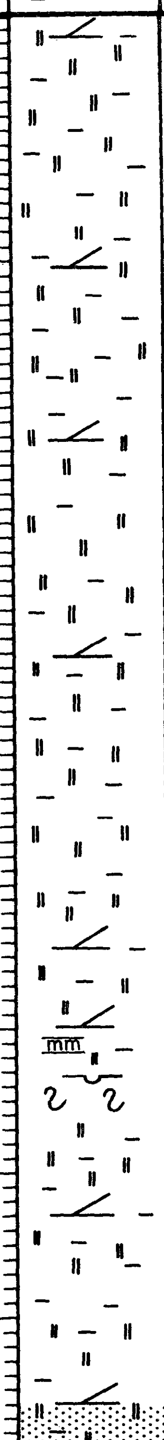
Hudbay Oil (Australia) Ltd.

West Seahorse - 1

CORE DESCRIPTION

Core No: 1

LITHOLOGY (>Granule, Granule, V.Coarse, Coarse, Medium, Fine, V.Fine, Silt, Clay)	DEPTH (metres)	LITHOLOGY STRUCTURES TEXTURES SEDIMENTARY DIP	STRUCTURAL DIP	LITHOLOGICAL DESCRIPTION	HYDROCARBON INDICATIONS
Silt: D, Clay: ✓	1452.0			SILTSTONE:- Medium dark grey to dark grey, micromicaceous, 10-20% mica, 20-30% clay minerals, 5-10% quartz silt, hard, carbonaceous in part.	
	1452.1				
	1452.2			SILTSTONE:- Micaceous, medium dark grey to grey black, vitreous, 40-50% mica-biotite, 10-15% quartz silt, 20-30% carbonaceous material, hard, preferrentially orientated platelets of mica.	
	1452.3				
	1452.4				
	1452.5				
Silt: D, Clay: ✓	1452.6			SILTSTONE:- Medium grey to light olive green grey, 0-30% quartz silt, 20% mica, 40% clay minerals, 0-10% carbonaceous material, hard, subfissile.	
	1452.7				
Silt: D, Clay: ✓	1452.8			SILTSTONE:- White to very light grey to dark grey, 50-70% quartz silt, 0-10% clay, 20% mica, trace pyrite, trace carbonaceous material, interbedded, mica more prevellent in dark fraction.	
	1452.9				
	1453.0				



Geology By: E.T., & J.R.	Vertical Scale: 1:5 (20cm = 1m)	Drawing No: A4 - GL - 528
Drawn By: K. Lynch	Date: 2-10-81	

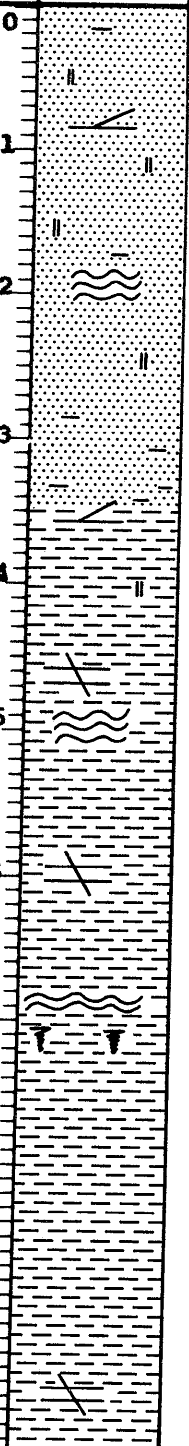
Hudbay Oil (Australia) Ltd.

West Seahorse - 1

CORE DESCRIPTION

Core Nº: 1

LITHOLOGY (>Granule, Granule, V.Coarse, Coarse, Medium, Fine, V.Fine, Silt, Clay)	DEPTH (metres)	LITHOLOGY STRUCTURES TEXTURES SEDIMENTARY DIP	STRUCTURAL DIP	LITHOLOGICAL DESCRIPTION	HYDROCARBON INDICATIONS
Medium ✓, Fine ✓, V.Fine D, Silt ✓, Clay ✓	1453.0			SANDSTONE:- Silty, clear to white to light grey, very fine to fine, occasionally medium, dominantly very fine, moderately well sorted, angular to subrounded, dominantly angular, 70% quartz grains, 20% quartz silt, 5% clay, 5% carbonaceous material trace pyrite, moderately hard, good permeability and porosity.	
	1453.1				
	1453.2				
	1453.3				
Clay D				CLAYSTONE:- Olive grey, 80% clay minerals, 15% quartz silt, 5% carbonaceous material, trace mica, moderately hard to hard.	
	1453.4				
	1453.5				
	1453.6				
Clay D	1453.7			CLAYSTONE:- Light olive grey, soapy feel with possible slickensides, hard.	
	1453.8				
	1453.9				
	1454.0				



Geology By: E.T., & J.R.	Vertical Scale: 1:5 (20cm = 1m)	Drawing Nº: A4 - GL - 528
Drawn By: K. Lynch	Date: 2-10-'81	

Hudbay Oil (Australia) Ltd.

West Seahorse - 1

CORE DESCRIPTION

Core Nº: 1

LITHOLOGY (>Granule, Granule, V.Coarse, Coarse, Medium, Fine, V.Fine, Silt, Clay)	DEPTH (metres)	LITHOLOGY STRUCTURES TEXTURES SEDIMENTARY DIP	STRUCTURAL DIP	LITHOLOGICAL DESCRIPTION	HYDROCARBON INDICATIONS
	1454.0				
D (Clay)	1454.1			CLAYSTONE:- Light blue to grey, 5% mica, hard.	
	1454.2				
	1454.3				
	1454.4				
D (Clay)				CLAYSTONE:- Olive grey, trace mica, blocky, hard.	
	1454.5				
	1454.6				
D (Clay)	1454.7			CLAYSTONE:- Olive grey, 5-10% mica, blocky, hard.	
	1454.8				
	1454.9				
D (Clay)				CLAYSTONE:- Brownish black, 10-25% mica, blocky, hard.	
	1455.0				

Geology By: E.T., & J.R.	Vertical Scale: 1:5 (20cm = 1m)	Drawing Nº: A4 - GL - 528
Drawn By: K. Lynch	Date: 2-10-81	

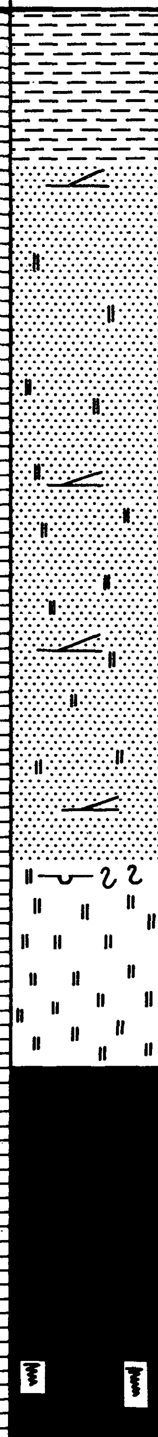
Hudbay Oil (Australia) Ltd.

West Seahorse - 1

CORE DESCRIPTION

Core Nº: 1

LITHOLOGY (>Granule, Granule, V.Coarse, Coarse, Medium, Fine, V.Fine, Silt, Clay)	DEPTH (metres)	LITHOLOGY STRUCTURES TEXTURES SEDIMENTARY DIP	STRUCTURAL DIP	LITHOLOGICAL DESCRIPTION	HYDROCARBON INDICATIONS
	1455.0				
Coarse ✓, Medium ✓, Fine D, V.Fine ✓, Silt ✓	1455.1			SANDSTONE:- Silty, carbonaceous, micaceous, clear to white to dark brown grey, fine to granular, dominately medium, poorly sorted, subangular to subrounded, 20% quartz silt, 10% mica, 10% carbonaceous matter, moderately hard, fair to good intergranular porosity.	A. Trace to pinpoint blue white fluorescence. B. Moderately fast milky blue white solvent fluorescence.
	1455.2				
	1455.3				
	1455.4				
	1455.5				
Silt D, Clay ✓	1455.6			SILTSTONE:- Micro micaceous, dark grey to black, subfissile, carbonaceous, hard.	A. Trace pinpoint fluorescence. B. Moderately fast blue white solvent fluorescence on crushing.
	1455.7				
	1455.8				
	1455.9			COAL:- Black, vitreous, conchoidal fracture, high grade, blocky, brittle to hard, high rank anthracite depicting slicken side, tectonic structures.	
	1456.0				



Geology By: E.T., & J.R.

Drawn By: K. Lynch

Vertical Scale: 1:5 (20cm = 1m)

Date: 2-10-81

Drawing Nº: A4 - GL - 528

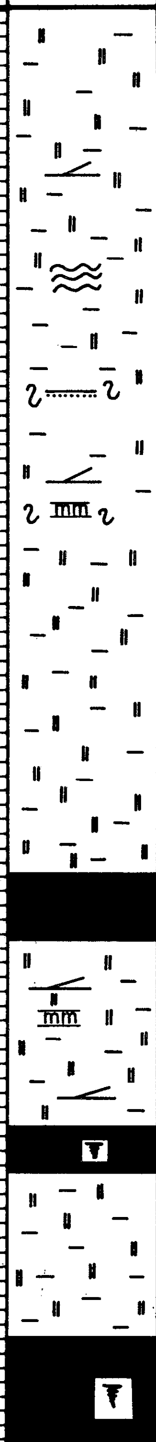
Hudbay Oil (Australia) Ltd.

West Seahorse - 1

CORE DESCRIPTION

Core Nº: 1

LITHOLOGY (>Granule, Granule, V.Coarse, Coarse, Medium, Fine, V.Fine, Silt, Clay)	DEPTH (metres)	LITHOLOGY STRUCTURES TEXTURES SEDIMENTARY DIP	STRUCTURAL DIP	LITHOLOGICAL DESCRIPTION	HYDROCARBON INDICATIONS
	1456.0				
Silt: D, Clay: ✓	1456.1			SILTSTONE:- White to light grey to olive brown black, 20% clay, 20% mica, 20% carbon-aceous material, hard.	
	1456.2				
Silt: D, Clay: ✓	1456.3			SILTSTONE:- Dark grey, 30% clay, 10% mica, 15% carbonaceous material, 5% pyrite inclusions, hard.	
	1456.4				
	1456.5				
	1456.6			COAL:- Black, brittle, high rank, minor siltstone inter-beds.	
	1456.7				
	1456.8			COAL:- Black, brittle, high rank.	
	1456.9			COAL:- Black, vitreous, fractured, brittle, high rank, with interbedded siltstone as at 1456.32 M.	
	1457.0				



Geology By: E.T., & J.R.
Drawn By: K. Lynch
Vertical Scale: 1:5 (20cm = 1m)
Date: 2-10-'81
Drawing Nº: A4 - GL - 528

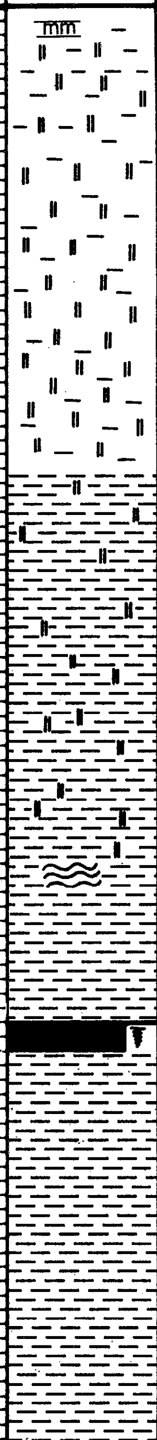
Hudbay Oil (Australia) Ltd.

West Seahorse - 1

CORE DESCRIPTION

Core Nº: 1

LITHOLOGY (>Granule, Granule, V.Coarse, Coarse, Medium, Fine, V.Fine, Silt, Clay)	DEPTH (metres)	LITHOLOGY STRUCTURES TEXTURES SEDIMENTARY DIP	STRUCTURAL DIP	LITHOLOGICAL DESCRIPTION	HYDROCARBON INDICATIONS
	1457.0				
	1457.1				
	1457.2				
Silt: D; Clay: D	1457.3			SILTSTONE:- Argillaceous, dark green grey to olive dark grey, 40% clay minerals, 10% mica, trace carbonaceous material, hard. Grading to	
	1457.4				
	1457.5				
Clay: D	1457.6			CLAYSTONE:- Dark olive grey to black, micromicaceous, hard, trace coal.	
	1457.7			COAL	
	1457.8				
	1457.9				
	1458.0				



Geology By: E.T., & J.R.	Vertical Scale: 1:5 (20cm = 1m)	Drawing Nº: A4 - GL - 528
Drawn By: K. Lynch	Date: 2-10-81	

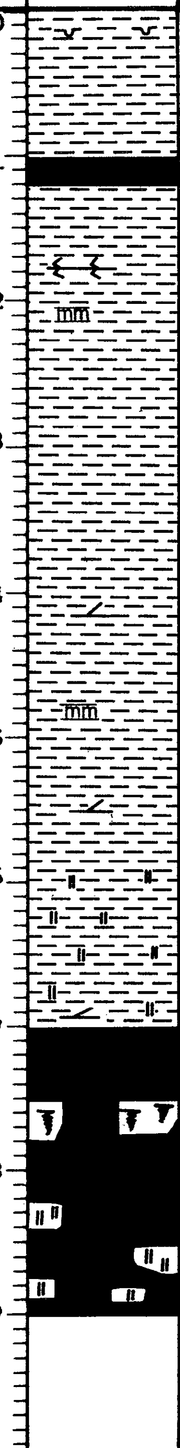
Hudbay Oil (Australia) Ltd.

West Seahorse - 1

CORE DESCRIPTION

Core Nº: 1

LITHOLOGY (>Granule, Granule, V.Coarse, Coarse, Medium, Fine, V.Fine, Silt, Clay)	DEPTH (metres)	LITHOLOGY STRUCTURES TEXTURES SEDIMENTARY DIP	STRUCTURAL DIP	LITHOLOGICAL DESCRIPTION	HYDROCARBON INDICATIONS
Clay: D	1458.0			CLAYSTONE:- Very dark grey to black, micromicaceous, carbonaceous, very hard.	A. Trace, spotty blue, white pinpoint fluorescence
	1458.1			COAL:- Black, brittle.	B. Moderately fast, blue white milky solvent fluorescence on crushing.
Clay: D	1458.2			CLAYSTONE:- Dark grey to black, silty, micromicaceous, carbonaceous, shows coaly deformations and en echelon fractures.	
	1458.3				
	1458.4				
	1458.5				
Silt: D, Clay: D	1458.6			SILTSTONE:- Dark grey to dark olive grey, argillaceous, micromicaceous, carbonaceous, subfissile, very hard.	
	1458.7			COAL:- Black, brittle, vitreous, hard, high rank, becoming silty towards base of core.	
	1458.8				
	1458.9			NO RECOVERY	



Geology By: E.T., & J.R.	Vertical Scale: 1:5 (20cm = 1m)	Drawing Nº: A4 - GL - 528
Drawn By: K. Lynch	Date: 2-10-'81	

APPENDIX B7. LOG OF SAMPLES

WEST SEAHORSE No.1 - LOG OF SAMPLES

Cuttings Sample Descriptions

All depths quoted are below Rotary Table, which is 9.45 metres above Mean Spring Low Water and 48.8 metres above sea floor.

Colours are taken from the Geological Society of America "Rock Colour Chart".

Samples were collected from the base of the 20 inch casing shoe, at 189 metres R.T.

200 - 215 metres (15 metres)	Sandstone, clear to white to light grey, fine to granule, dominantly coarse to very coarse, moderately well sorted, unconsolidated. With 35-45% Calcirudite, skeletal,white to grey to reddish brown, coarse to rudaceous, dominantly rudaceous, poorly to moderately sorted, unconsolidated. And 5% Calcilsiltite, silty in part, light grey to medium grey, 10-20% quartz silt, poor porosity.
215 - 230 metres (15 metres)	Calcilutite, olive grey, 20-25% silt sized skeletal fragments, 5-10% quartz silt, soft. With 15-25% Calcirudite, as between 200-215 m. And 5-10% Sandstone, as between 200-215 m.
230 - 250 metres (20 metres)	Calcarenite, calciruditic, skeletal, white to light grey, very fine to granule, dominantly medium, poorly sorted, unconsolidated. And 0-10% Calcilutite, as between 215-230 m.
250 - 325 metres (75 metres)	Calcisiltite, calcilutitic, calcarenitic in part, olive grey, 25-35% micrite, 15-25% fossil fragments, very fine to medium, dominantly very fine, trace to 5% clay minerals, trace to 5% calcite cement, soft to moderately hard, nil to trace porosity.

With 15-20% Calcarenite, calciruditic, generally as between 230-250 m, but becoming dominantly coarse.

And 0-10% Sandstone, light grey to white to clear, medium to very coarse, dominantly coarse, poorly to moderately sorted, unconsolidated.

325 - 355 metres (30 metres)	Calcarenite, skeletal, white to light grey to dark grey, 100% skeletal fragments, fine to rudaceous, dominantly coarse, moderately well sorted, angular to subrounded, unconsolidated.
	With 30-50% Calcisiltite, calcilutitic, calcarenitic in part, olive grey, 40% calcite silt, 20-30% micrite, 15-25% skeletal fragments, very fine to fine, dominantly very fine, poorly to moderately sorted, angular to subrounded, soft to moderately hard, nil-trace intergranular porosity.
	And trace to 10% Sandstone, as between 250-325 m.
355 - 410 metres (55 metres)	Calcisiltite, calcilutitic, olive grey to light grey, 30-35% micrite, 15% skeletal fragments, very fine to fine, dominantly very fine, nil-trace clay minerals, 5% calcite cement, moderately hard, nil porosity.
	With 35-50% Calcarenite, calciruditic, as between 250-325 m.
	And 0-10% Sandstone, as between 250-325 m.
410 - 515 metres (105 metres)	Calcarenite, calciruditic in part, white to light grey to dark grey, skeletal, fine to rudaceous, dominantly coarse and very coarse, poorly to moderately sorted, unconsolidated.

With 10-55% Calcisiltite, calcilutic, calcarenitic in part, olive grey to light grey, dominantly silt size fossil fragments, 25-40% micrite, 15-20% very fine to fine fossil fragments, trace-5% calcite cement, trace-5% quartz silt, very soft to moderately hard.

And 0-5% Sandstone, clear to white, fine to granule, dominantly coarse and medium, subangular to rounded, poorly to moderately sorted, unconsolidated.

515 - 880 metres (365 metres)

Calcarenite, calciruditic in part, white to light grey to dark brown grey, skeletal, very fine to rudaceous, dominantly coarse and very coarse, nil-5% calcite cement, nil-15% recrystallisation, nil-5% micrite, traces of pyrite, glauconite, chlorite and mica, unconsolidated to moderately hard where recrystallised.

Grading below 840 metres to Recrystallised Limestone, calcarenitic, white to light grey, 10-25% carbonate grains, 10-45% skeletal fragments, fine to rudaceous, dominantly coarse, poorly to moderately sorted, nil-trace micrite, traces of pyrite, chlorite, glauconite and carbonaceous material, sucrosic, moderately hard, poor porosity.

With 10-65% (maximum between 635-645m) Calcisiltite, calcilutitic, calcarenitic in part, as between 410-515 m.

And between 520-795 m, 5-35% Sandstone, as between 410-515 m.

And below 750 m, trace-40% Marl, skeletal in part, olive grey, 5-25% skeletal fragments, very fine to fine, very soft to soft, trace intergranular porosity.

880 - 915 metres (35 metres)	Sandstone, colourless to light grey, medium to granule dominantly very coarse and granular, poorly sorted, unconsolidated. With 15-40% Limestone, skeletal, recrystallized, as between 840-880 m. And 5-35% Marl, skeletal, as between 750-880 m.
915 - 965 metres (50 metres)	Marl, skeletal in part, olive grey to dark greenish grey to light grey, trace-20% skeletal fragments, trace-5% pyrite, very soft to moderately hard. With 5-35% Sandstone, as between 880-915 m. And 5-20% Limestone, skeletal, recrystallized, as between 840-880 m.
965 - 1155 metres (190 metres)	Calcisiltite, calcilutitic, becoming argillaceous below 1050m, medium grey to greenish grey, 20-35% clay minerals, 0-5% calcite cement, 0-5% recrystall-isation, trace pyrite, trace chlorite and below 1125m trace glauconite, soft to moderately hard. With 25-60% Marl, olive grey to dark greenish grey, 35-40% micrite, 0-10% calcite silt, trace-5% pyrite, soft to moderately hard. And 0-5% Sandstone, clear to white, very fine to very coarse, dominantly medium, subangular to rounded, poorly sorted, unconsolidated. Note: Calcisiltite becoming more argillaceous with depth and grading to marl.
1155 - 1200 metres (45 metres)	Marl, calcisiltitic in part, olive-grey to grey-black, 35-60% clay minerals, 35-65% micrite, 0-35% calcite silt (decreasing with depth), trace skeletal fragments, trace pyrite, trace glauconite, moderately hard.

With Calcisiltite, calcilutitic, argillaceous in part, medium grey to dark greenish grey, 30-50% calcite silt, 30-40% micrite, 10-35% clay minerals, 0-10% skeletal fragments, moderately hard.

1200 - 1320 metres (120 metres)	Claystone, calcisiltitic, calcilutitic, dark grey to olive grey to greenish black to (below 1310m) light blue-grey, 30-60% clay minerals, 20-40% calcite silt, 20-30% micrite, trace-10% skeletal fragments, trace pyrite, trace glauconite, trace chlorite, moderately hard. With 10-35% Marl, medium grey to dark grey, and olive black, main constituents as between 1180 - 1200 metres.
1320 - 1360 metres (40 metres)	Calcisiltite, calcarenitic in part, white to light grey to olive grey, 10-45% calcite silt, 10-45% calcite grains, 5% quartz grains, fine to granule, dominantly fine granined, angular to subangular, 5% micrite, trace clay minerals, glauconite, pyrite, soft.
1360 - 1390 metres (30 metres)	Calcilutite, in part calcisiltitic and, below 1380m, glauconitic, very light grey to medium light grey, 15-70% micrite, 15-20% calcite silt, 5% calcite grains, trace quartz grains, medium to granule, dominantly medium, subangular to rounded, trace-15% clay minerals, 5-30% glauconite, traces pyrite, carbonaceous material, trace recrystallisation, soft to moderately hard.
1390 - 1410 metres (20 metres)	Coal, lignitic, micaceous below 1405m, dark reddish brown to greyish black to black, 0-5% quartz silt, 0-35% mica, trace clay minerals, plant fragments, pyrite, subfissile to blocky, brittle to moderately hard. With 0-10% Calcisiltite, very light grey to greenish grey, 0-5% micrite, traces pyrite, glauconite.

And below 1405m, 0-5% Sandstone, clear to white, 90-100% quartz grains, very coarse to granular, dominantly granular, subangular to subrounded, 0-10% calcite cement, traces pyrite cement, glauconite, carbonaceous matter, moderately hard, poor porosity.

1410 - 1415 metres
(5 metres)

Claystone, micaceous and carbonaceous in part, reddish brown to dark reddish brown, 0-10% quartz silt, 0-35% clay minerals, 0-20% carbonaceous matter, 30% mica, 5% glauconite, soft to moderately hard.

With Sandstone, up to 30% between 1414-1415m, as between 1405-1410 metres, poor porosity.

1415 - 1425 metres
(10 metres)

Calcisiltite, calcilutitic in part, medium dark grey to greenish black, trace-15% calcite grains, 60-80% calcite silt, 10-20% micrite, trace-5% clay minerals, trace-10% glauconite, traces pyrite, carbonaceous material, soft to moderately hard.

With 0-10% Sandstone, as between 1405-1410 metres, poor porosity.

1425 - 1435 metres
(10 metres)

Coal, lignitic, dark reddish brown to black, subfissile to blocky, dominantly subfissile, brittle to moderately hard.

And trace Sandstone, as between 1405-1410 metres, poor porosity.

1435 - 1447 metres
(12 metres)

Coal, silty, micaceous, dark brown to black, 30% quartz silt, 30% mica, 40% carbonaceous material, trace clay, moderately hard.

With 30% Limestone, calcisiltitic, calcilutitic, medium grey to grey, 50-70% calcite silt, 20% calcilutite, 10-30% coaly material, moderately hard.

And 5% Sandstone, clear to white, 100% quartz grains, fine to granular, dominantly coarse, poorly sorted, angular to subrounded, trace calcite cement, trace pyrite, unconsolidated.

1447 - 1450 metres (3 metres)	Sandstone, clear to white, 100% quartz grains, fine to granular, dominantly coarse, poorly sorted, angular to subrounded, trace calcite cement, trace pyrite, unconsolidated.
1450 - 1461 metres (11 metres)	Core number 1, 02/10/81, recovered 81%, lithology to 1459 metres only. (See detailed lithological description under Section 4.2)
1461 - 1465 metres (4 metres)	Sandstone, clear to white, 90-95% quartz grains, 5-10% calcite grains, fine to granular, dominantly coarse, moderately sorted, angular to subrounded, trace calcite cement, trace pyrite, unconsolidated. With 30% Coal, black, brittle, high rank, moderately hard.
1465 - 1480 metres (15 metres)	Coal, as between 1461-1465 m.
1480 - 1490 metres (10 metres)	Sandstone, as between 1458.9 - 1465 m.
1490 - 1495 metres (5 metres)	Coal, as between 1465 and 1480 m.
1495 - 1520 metres (25 metres)	Sandstone, clear to white, nil-trace calcite grains, 100% quartz grains, medium to granular, dominantly coarse, poorly sorted, angular to subrounded, nil-trace pyrite, unconsolidated. With 0-10% Siltstone, brown to dark brown, micaceous, carbonaceous, moderately hard.

And nil to 20% Coal, as between 1465 - 1480m.

1520 - 1525 metres (5 metres)	Coal, black, brittle.
1525 - 1560 metres (35 metres)	Sandstone, clear to white, 100% quartz grains, medium to granular, dominantly very coarse, poorly sorted, angular to subrounded, trace pyrite, unconsolidated. With 0-40% Coal, black brittle.
1560 - 1565 metres (5 metres)	Coal, black, vitreous, conchoidal fracture, brittle, high rank.
1565 - 1585 metres (20 metres)	Sandstone, clear to white, 100% quartz grains, fine to granular, occasional pebbles, dominantly very coarse, poorly sorted, subangular to subrounded, trace calcite cement, unconsolidated.
1585 - 1590 metres (5 metres)	Coal, black, brittle.
1590 - 1615 metres (60 metres)	Sandstone, clear to white, 100% quartz grains, medium to granular, dominantly very coarse, occasional pebbles, poorly sorted, angular to subrounded, unconsolidated.
1615 - 1620 metres (5 metres)	Coal, black, vitreous, brittle, anthracitic.
1620 - 1745 metres (125 metres)	Sandstone, clear to white, slightly grey at lower end of interval, 95-100% quartz grains, very fine to granular, dominantly medium to very coarse, poorly sorted, angular to subrounded, trace-5% clay matrix between 1740 and 1745 metres, trace calcite cement, trace siliceous cement, trace-10% pyrite, unconsolidated to moderately hard, fining downwards. With 0-30% Siltstone, argillaceous, micaceous in part, maximum at 1660m, light grey to greenish grey to dark brown, 30-50% quartz silt, 30-40% clay minerals, 0-30% mica, slightly calcareous, trace glauconite, trace carbonaceous material, soft.

And at 1620m, 5% Coal, black, brittle.

And trace Siltstone, light greyish brown to grey, 50% quartz silt, 30% mica, 20% clay trace carbonaceous material, moderately hard.

1745 - 1770 metres
(25 metres)

Sandstone clear to white to light grey, very fine to granular, dominantly coarse, poorly to moderately sorted, 0-5% clay minerals, trace-5% pyrite, trace glauconite, trace carbonaceous material, trace calcite cement, unconsolidated.

With trace-15% Siltstone, argillaceous, light grey to grey brown, 30-50% clay minerals, 0-10% mica, trace glauconite, moderately hard.

And 0-10% Coal, black to brownish black, brittle, moderately hard.

1770 - 1775 metres
(5 metres)

Coal, black to dark brownish black, vitreous, 10% pyrite, hard, brittle with conchoidal fracture.

With 45% Siltstone, argillaceous, as between 1745-1770 m.

And 5% Sandstone, as between 1745-1770m.

1775 - 1780 metres
(5 metres)

Claystone, silty, light grey to brownish grey to greenish grey, 20% quartz silt, trace calcite cement, trace pyrite, trace glauconite, soft.

With 10% Sandstone, as between 1745-1770m.

1780 - 1790 metres
(10 metres)

Coal, as between 1770-1775m.

With 30-45% Claystone, silty, as between 1775-1780m.

And trace Sandstone, as between 1745-1770m.

1790 - 1800 metres (10 metres)	Sandstone, as between 1745-1770 m. With 10% Claystone, silty in part, light grey to light greenish grey to dark brown, 10-20% quartz silt, 5-15% calcite cement, trace glauconite, soft. And nil to 10% Coal, as between 1770-1775 m.
1800 - 1805 metres (5 metres)	Claystone, silty, as between 1790-1800 m. With 25% Sandstone, as between 1745-1770 m.
1805 - 1875 metres (70 metres)	Sandstone, as between 1745-1770 m. With 5-15% Claystone, silty in part,as between 1790-1800 m. And nil-10% Coal, as between 1770-1775 m.
1875 - 1950 metres (100 metres)	Sandstone, clear to white to light grey, very fine to granule, dominantly coarse between 1875-1935 m, dominantly fine to medium between 1935-1955 m, dominantly granular (with siliceous overgrowths) below 1960m, poorly to moderately sorted, angular to subrounded, trace calcite cement, trace-5% pyrite, trace-10% glauconite (maximum at 1935 m), unconsolidated. With trace-35% Claystone, silty, white to medium grey to dark brown, 50-70% clay minerals, 20-45% quartz silt, 5-20% calcite cement, trace-5% glauconite, soft to moderately hard. And nil-10% Coal, as between 1770-1775 m.
1975 - 2070 metres (95 metres)	Sandstone, clear to white, 90-100% quartz grains, fine to granular, dominantly very coarse, poorly to moderately sorted, angular to subangular, occasionally subrounded, trace pyrite trace-10%

silicification, unconsolidated to moderately hard.

With trace Siltstone, argillaceous at 2040 metres, light grey to dark grey, 40% quartz silt, 40% clay minerals, 10% micaceous material, 10% carbonaceous material, soft.

And 5% Coal, at 2070 metres, black, brittle.

2070 - 2130 metres (60 metres)

Sandstone, clear to white, 90-100% quartz grains, fine to granule, dominantly coarse to very coarse, poorly to moderately well sorted, angular to subangular, trace-10% clay, trace-10% pyrite, trace silicification, moderately hard to unconsolidated.

With trace-30% Siltstone, argillaceous, light grey to medium greyish brown to grey, 50% quartz silt, 45% clay minerals, 5% pyrite, trace carbonaceous material, soft to hard.

Grading to

2130 - 2140 metres (10 metres)

Claystone, silty, light grey to dark grey, 30% quartz silt, 20% matrix, trace micrite, moderately hard.

With 20-40% Sandstone, as between 2070 and 2130m.

2140 - 2150 metres (10 metres)

Sandstone, as between 2070 - 2130 m.

2150 - 2175 metres (25 metres)

Sandstone, clear to white, 75% quartz grains, medium to granule, dominantly coarse to very coarse, poorly sorted, angular to subrounded, dominantly subangular, conchoidal fracturing across grains, trace-20% clay matrix, 10-20% silicification, 5% pyrite, moderately hard to hard, fair to good intergranular porosity.

2175 - 2210 metres (35 metres)

Sandstone, clear to white to yellow, 85-100% quartz grains, very fine to granule, dominantly coarse, poor to moderately sorted, angular to subangular.

trace-20% clay matrix, trace-5% pyrite, trace-20% silica cement, moderately hard to hard, fair to good intergranular porosity, conchoidal fracture.

With 0-10% Siltstone, argillaceous, light grey to dark grey black, 40-60% quartz silt, 40-50% clay minerals, 0-10% pyrite, trace carbonaceous material, moderately hard to hard.

2210 - 2250 metres (40 metres)	Sandstone, silicified in part, clear to white to grey, very fine to granule, dominantly coarse, poorly to moderately well sorted, angular to subangular, trace kaolin, trace-5% pyrite, 0-20% silicification, hard, poor to fair intergranular porosity, conchoidal fracturing across grains.
2250 - 2265 metres (15 metres)	Sandstone, as between 2210-2250 m, with trace lithic fragments, trace feldspars, trace very fine quartz sandstone fragments.
2265 - 2315 metres (50 metres)	Sandstone, clear to white to grey, occasionally reddish brown, 75-100% quartz grains, very fine to very coarse, dominantly very coarse down to 2280m, becoming dominantly medium below 2290m, poorly sorted, angular to subangular, trace clay matrix, trace-5% pyrite, 0-20% silicification, moderately hard to hard, poor to fair intergranular porosity.
2315 - 2350 metres (35 metres)	Sandstone, clear to white to grey, very fine to granule, dominantly medium above 2325 m, becoming very coarse below 2330 m, poorly to moderately well sorted, angular to subangular, trace clay matrix above 2325 m, trace pyrite, trace-5% dolomite cement, nil-trace lithic fragments, 0-15% silicification, moderately hard to hard, poor to fair intergranular porosity.

With 10-20% Dolomite, white to light grey, coarse to very coarse crystals, strong yellow mineral fluorescence.

And trace-5% Siltstone, argillaceous, brown to greyish brown and black, moderately hard.

And at 2330m, 5% Coal, black, hard, conchoidal fracture (? cavings).

2350 - 2380 metres (30 metres)	Sandstone, dolomitic, clear to white to grey, fine to granule, dominantly medium and coarse, moderately well sorted, angular to subangular, 5-20% dolomite cement, trace-5% pyrite, trace-5% silicification, moderately hard, poor porosity.
2380 - 2400 metres (20 metres)	Sandstone, clear to white to grey, rarely to light orange pink, fine to granule, dominantly medium and coarse, poorly to moderately well sorted, angular to subangular, occasionally subrounded, 10% dolomite cement, trace pyrite, trace glauconite, nil-trace lithic fragments, trace-5% silicification, moderately hard, poor porosity. With, at 2390 and 2400 metres, nil-20% Coal, black, moderately hard, vitreous lustre, conchoidal fracture. And nil-5% Siltstone, argillaceous, brown to very dark brown, 40% clay minerals, nil-5% glauconite, moderately hard.
2400 - 2415 metres (15 metres)	Sandstone, dolomitic in part, clear to white to grey, rarely to moderate orange pink, fine to granule, dominantly coarse, moderately well sorted, angular to subangular, 15-20% dolomite cement, trace pyrite, trace glauconite, trace lithic fragments, 5% silicification, moderately hard, trace porosity. With trace-5% Coal, black, moderately hard, conchoidal fracture, sub-vitreous lustre.

2415 - 2480 metres
(65 metres)

Sandstone, silicified in part, clear to white to grey, fine to granular, dominantly coarse and very coarse, moderately well sorted, angular to subrounded, trace-25% silicification, trace-5% dolomite cement, trace-5% pyrite,trace lithic fragments, 0-5% glauconite, nil-trace chlorite, trace to fair porosity.

With nil-5% Siltstone, argillaceous, brown to grey to light grey, 40% clay minerals, trace coal, trace glauconite.

2480 - 2490 metres
(10 metres)

Sandstone, silicified, clear to white to light grey, rarely to orange-red, medium to granule, dominantly very coarse, moderately well sorted, angular to subangular, 20-25% silicification, 5-10% dolomite cement, trace-5% pyrite, trace lithic fragments, hard, trace porosity.

With trace Siltstone, argillaceous, brown to grey brown, moderately hard.

And nil-trace Coal, (2489), black, moderately hard.

PE905512

This is an enclosure indicator page.
The enclosure PE905512 is enclosed within the container PE902688 at this location in this document.

The enclosure PE905512 has the following characteristics:

ITEM_BARCODE = PE905512
CONTAINER_BARCODE = PE902688
NAME = Air Gun Well Velocity Survey and Calibrated Log Data
BASIN = GIPPSLAND
PERMIT = VIC/P11
TYPE = WELL
SUBTYPE = VELOCITY_CHART
DESCRIPTION = Air Gun Velocity Survey and Calibrated Log Data(from WCR) for West Seahorse-1
REMARKS =
DATE_CREATED = 21/10/81
DATE_RECEIVED = 18/06/82
W_NO = W755
WELL_NAME = WEST SEAHORSE-1
CONTRACTOR =
CLIENT_OP_CO = HUDBAY OIL (AUSTRALIA) LTD

(Inserted by DNRE - Vic Govt Mines Dept)

PE902689

This is an enclosure indicator page.
The enclosure PE902689 is enclosed within the container PE902688 at this location in this document.

The enclosure PE902689 has the following characteristics:

ITEM_BARCODE = PE902689
CONTAINER_BARCODE = PE902688
NAME = Tectomic Elements Map
BASIN = GIPPSLAND
PERMIT = VIC/P11
TYPE = WELL
SUBTYPE = GEOL_MAP
DESCRIPTION = Tectomic Elements Map (enclosure from WCR) fro West Seahorse-1
REMARKS =
DATE_CREATED = 31/05/82
DATE_RECEIVED = 18/06/82
W_NO = W755
WELL_NAME = West Seahorse-1
CONTRACTOR = HUDBAY OIL AUSTRALIA LTD
CLIENT_OP_CO = HUDBAY OIL AUSTRALIA LTD

(Inserted by DNRE - Vic Govt Mines Dept)

PE905512

This is an enclosure indicator page.
The enclosure PE905512 is enclosed within the container PE902688 at this location in this document.

The enclosure PE905512 has the following characteristics:

ITEM_BARCODE = PE905512
CONTAINER_BARCODE = PE902688
NAME = Air Gun Well Velocity Survey and Calibrated Log Data
BASIN = GIPPSLAND
PERMIT = VIC/P11
TYPE = WELL
SUBTYPE = VELOCITY_CHART
DESCRIPTION = Air Gun Velocity Survey and Calibrated Log Data(from WCR) for West Seahorse-1
REMARKS =
DATE_CREATED = 21/10/81
DATE_RECEIVED = 18/06/82
W_NO = W755
WELL_NAME = WEST SEAHORSE-1
CONTRACTOR = SEISMOGRAPH SERVICE ENGLAND LTD
CLIENT_OP_CO = HUDBAY OIL (AUSTRALIA) LTD

(Inserted by DNRE - Vic Govt Mines Dept)

PE604583

This is an enclosure indicator page.
The enclosure PE604583 is enclosed within the container PE902688 at this location in this document.

The enclosure PE604583 has the following characteristics:

ITEM_BARCODE = PE604583
CONTAINER_BARCODE = PE902688
NAME = Pressure Log
BASIN = GIPPSLAND
PERMIT = VIC/P11
TYPE = WELL
SUBTYPE = WELL_LOG
DESCRIPTION = Pressure Log (from WCR) for West Seahorse-1
REMARKS =
DATE_CREATED =
DATE_RECEIVED =
W_NO = W755
WELL_NAME = WEST SEAHORSE-1
CONTRACTOR = DOWELL SCHLUMBERGER
CLIENT_OP_CO = HUDBAY OIL (AUSTRALIA) LTD

(Inserted by DNRE - Vic Govt Mines Dept)

PE603908

This is an enclosure indicator page.
The enclosure PE603908 is enclosed within the container PE902688 at this location in this document.

The enclosure PE603908 has the following characteristics:

ITEM_BARCODE =	PE603908
CONTAINER_BARCODE =	PE902688
NAME =	Composite Well Log
BASIN =	GIPPSLAND
PERMIT =	VIC/P11
TYPE =	WELL
SUBTYPE =	COMPOSITE_LOG
DESCRIPTION =	Composite Well Log(from WCR) for West Seahorse-1
REMARKS =	
DATE_CREATED =	3/11/81
DATE_RECEIVED =	18/06/82
W_NO =	W755
WELL_NAME =	WEST SEAHORSE-1
CONTRACTOR =	
CLIENT_OP_CO =	HUDBAY OIL (AUSTRALIA) LTD

(Inserted by DNRE - Vic Govt Mines Dept)

PE601380

This is an enclosure indicator page.
The enclosure PE601380 is enclosed within the container PE902688 at this location in this document.

The enclosure PE601380 has the following characteristics:

ITEM_BARCODE = PE601380
CONTAINER_BARCODE = PE902688
NAME = Exlog Formation Evaluation Log/Mud Log
BASIN = GIPPSLAND
PERMIT = VIC/P11
TYPE = WELL
SUBTYPE = MUD_LOG
DESCRIPTION = Exlog Formation Evaluation Log/Mud Log (enclosure from WCR) for West Seahorse-1
REMARKS =
DATE_CREATED = 20/10/81
DATE_RECEIVED = 18/06/82
W_NO = W755
WELL_NAME = West Seahorse-1
CONTRACTOR = EXLOG
CLIENT_OP_CO = HUDBAY OIL AUSTRALIA LTD

(Inserted by DNRE - Vic Govt Mines Dept)

PE601381

This is an enclosure indicator page.
The enclosure PE601381 is enclosed within the container PE902688 at this location in this document.

The enclosure PE601381 has the following characteristics:

```
     ITEM_BARCODE = PE601381
CONTAINER_BARCODE = PE902688
             NAME = Wellsite Lithology Log
            BASIN = GIPPSLAND
           PERMIT = VIC/P11
             TYPE = WELL
          SUBTYPE = WELL_LOG
      DESCRIPTION = Wellsite Lithology Log (enclosure from
                    WCR) for West Seahorse-1
          REMARKS =
     DATE_CREATED = 3/11/81
    DATE_RECEIVED = 18/06/82
             W_NO = W755
        WELL_NAME = West Seahorse-1
       CONTRACTOR = HUDBAY OIL AUSTRALIA LTD
     CLIENT_OP_CO = HUDBAY OIL AUSTRALIA LTD
```

(Inserted by DNRE - Vic Govt Mines Dept)

PE601379

This is an enclosure indicator page.
The enclosure PE601379 is enclosed within the container PE902688 at this location in this document.

The enclosure PE601379 has the following characteristics:

ITEM_BARCODE = PE601379
CONTAINER_BARCODE = PE902688
NAME = Velocity Log Linear Time Scale
BASIN = GIPPSLAND
PERMIT = VIC/P11
TYPE = WELL
SUBTYPE = VELOCITY_CHART
DESCRIPTION = Velocity Log Linear Time Scale (encloure from WCR) for West Seahorse-1
REMARKS =
DATE_CREATED = 21/10/81
DATE_RECEIVED = 18/06/82
W_NO = W755
WELL_NAME = West Seahorse-1
CONTRACTOR = Seismograph Service England Ltd
CLIENT_OP_CO = HUDBAY OIL AUSTRALIA LTD

(Inserted by DNRE - Vic Govt Mines Dept)