PA: CALGARY COPY D.A. 1270

Canada Oil and Gas Lands Administration / Administration du pétrole et du gaz des terres du Canada

9211-P28-1-6

				Well Status	
Nova Scotia	☐	West Coast	☐	Suspended	☐
Newfoundland	☐	Northern	☐	Completed	☒
Gulf of St. Lawrence	☐	Hudson Bay	☐	Abandoned	☐

WELL TERMINATION RECORD

This record is submitted in triplicate in compliance with Section 184 of the Canada Oil and Gas Drilling Regulations.

WELL DATA

Well Name: PCI Canterra Tweed Lake A-67 Area: Tweed Lake

Grid Area: 67-00-125-45 Field/Pool: Tweed Lake

Permit or Lease No.: N/A Final Coordinates: Lat.: 66°56'11.60" Long: 125°56'18.88"

Testing ~~Drilling~~ Unit: Roll'n Rig #35 Elevations: KB: 397.1m GL: 390.9m

Date Moved On: 86-02-05 Rig Released: 86-03-09 Total Depth: 1345.5 mKb

CASING AND CEMENTING

O.D.:	Weight:	Grade:	Depth Set:	Cement and Additives:
340mm	101.2 kg/m	K-55	61.5 mKB	20t, Class G + 3% $CaCl_2$
245mm	60 kg/m	MN-80	7540 mKB	36t, Class G, 15.5t, Class G + 2% $CaCl_2$
178mm	43 kg/m	L-80	1347 mKB	28.4t, Class G + 5% DG5, 2.3t Class + 2% $CaCl_2$

PLUGGING PROGRAM

Approval of the following program was obtained by (person) Brian Wells from (person) Kem Singh of the Canada Oil and Gas Lands Administration by means of telephone on March 5 19 86

Type of Plug:	Interval:	Felt:	Cement and Additives:
E-Z Drill Bridge Plug at 1260 mKB capped with cement	1260-1250.7 mKB	Yes	6 sacks Class G

Lost Circulation/Overpressure Zones: Lost circulation zone 9m - 65m - air drilled to 754m with fresh water being produced.

Equipment left on Seafloor (Describe): N/A

Provision for Re-entry (Describe and attach sketch): N/A

Cores: Type: Conventional Intervals: Core #1 1276.0 1288.0 m

#2 1288.0 - 1302.0

Other Downhole Completion/Suspension Equipment: None

CERTIFICATION

I certify on the basis of personal knowledge of operations undertaken at the above named well that the above information is accurate.

Signed: Brian Wells P. Eng. Title: Senior Production Engineer

Name: Brian Wells P.Eng. Date: April 8, 1987

Acknowledged by: [signature] Engineering Branch

Date: 16 Apr 87

File: 9211-P28-1-6

Department of Energy, Mines and Resources / Ministère de l'Énergie, des Mines et des Ressources

Department of Indian Affairs and Northern Development / Ministère des Affaires indiennes et du Nord canadien

Canada

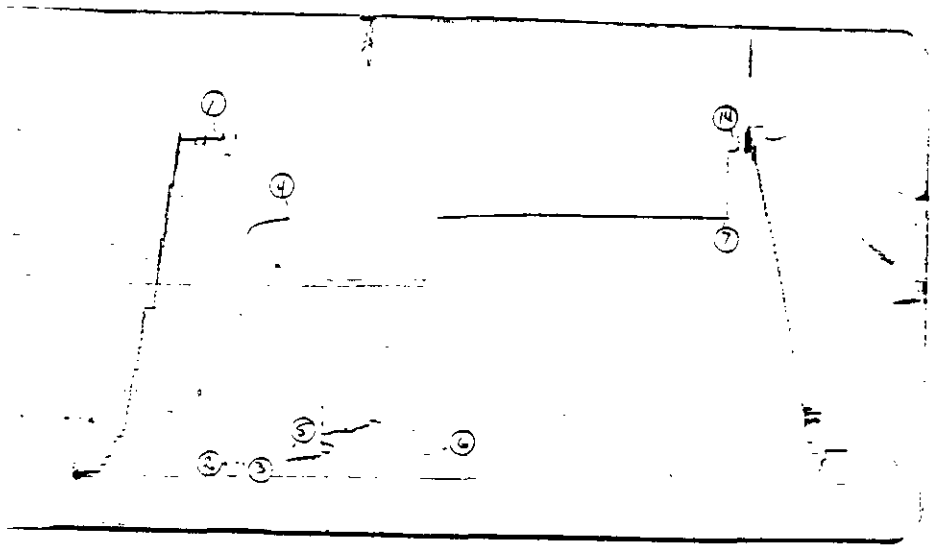
F#:C-70-999-73029-66

TEST DATE: 85/12/17

PCI CANTERRA TWEED LAKE A-67
400/ 67.000 / 125.450 /00
DST#01
1290.00m to 1301.00m
BASAL SAND-MOUNT CLARKE

9211-P28-1-6

CALGARY COPY



DEPTH: 1292.00m

	PRESSURE kPa(a)
1) Initial Hydro :	16444.
2) 1st Flow Start:	724.
3) 1st Flow End :	845.
4) END 1st Shutin:	12738.
5) 2nd Flow Start:	965.
6) 2nd Flow End :	1293.
7) END 2nd Shutin:	13014.
14) Final Hydro. :	0.

TEST TIMES (MIN)	
1st FLOW :	4.0
SHUTIN:	82.0
2nd FLOW :	269.0
SHUTIN:	412.0

RECOVERY DATA

TOTAL FLUID RECOVERY WAS 60.00 M CONSISTING OF 1.00 M OF CONDENSATE AND 59.00 M OF GAS CUT DRILLING MUD. GAS TO SURFACE WITH A FINAL FLOW RATE OF 4 475.00 M3/D INCREASING TO 50 705.00 M3/D THEN DECREASING TO A CLOSING RATE OF 11 607.00 M3/D. CLOSED CHAMBER TEST WAS RUN DURING THE FIRST FLOW.

REMARKS AND TEST SUMMARY

Test results indicate a mechanically successful test. Bottom hole pressures and the shape of the shut-in curves suggest HIGH PERMEABILITY within the interval tested. A Closed Chamber report is included for the first flow.
Changed the choke in the manifold at 170 minutes.
Reservoir calculations are included with this report.

TABLE OF CONTENTS

LYNES UNITED SERVICES LTD
DST#01 REPORT

Well name : PCI CANTERRA TWEED LAKE A-67
Location : 400/ 67.000 / 125.450 /00
Interval : 1290.00m to 1301.00m
Test Date : 85/12/17
Test Type : INFLATE STRADDLE
Formation : BASAL SAND-MOUNT CLARKE

K.B.Elevation : 397.10m
Grd.Elevation : 390.90m
TD @ test Date: 1347.00m
Ticket Number : 73029
Unit Number :

Started in hole at : 0930 hrs
Tool opened at : 1358 hrs
Reverse circulated? NO
Contractor & Rig No: ATCO #76
Lynes#1 : 1 of 1 on the same trip.

Log Temp : 12.2C
Porosity : 11.0 %
Estimated Pay : 3.60m

Operator: PETRO-CANADA INC.
ROOM 937 WEST
150 - 6TH AVE. S.W.
CALGARY ALBERTA
T2P3E3

Company Rep : HOPE Y
Testers : HILLER E

5 REPORTS(S) TO: DIANE THEISEN
Company:

BLOW DESCRIPTION

Preflow: Closed Chamber was run by Lynes.
Final flow: Strong air blow immediately. Gas to surface in 1 minute.

TOTAL LIQUID RECOVERY : 60.00m

For DST# 1 through DST# 1

3 Fluid Samples
Sent to: CORE LABS

Btm. Hole Sampler #: 176,302
Sent to: CORE LABS

1.00m CONDENSATE.
59.00m GAS CUT DRILLING MUD.

GAS MEASUREMENTS Device: FLOOR MANIFOLD
Device:
Riser: 50.8mm

Bomb#: 6694
Sent to: CORE LABS

Gas Measurements Continued on Next Page

Dst#01
PCI CANTERRA TWEED LAKE A-67
1290.00m To 1301.00m

FLOW #	TIME MIN	CHOKE mm	READING kPa	CUBIC METRES/D
2	5.	9.52	230.	4475.0
2	10.	9.25	300.	5459.0
2	15.	9.52	400.	6867.0
2	20.	9.52	450.	7572.0
2	25.	9.52	410.	7008.0
2	30.	9.52	380.	6585.0
2	35.	9.52	310.	5600.0
2	40.	9.52	310.	5600.0
2	45.	9.52	300.	5459.0
2	50.	9.52	310.	5600.0
2	55.	9.52	280.	5178.0
2	60.	9.52	380.	6585.0
2	65.	9.52	400.	6867.0
2	70.	9.52	1000.	15389.0
2	75.	9.52	1400.	21141.0
2	80.	9.52	1450.	21864.0
2	85.	9.52	1500.	22588.0
2	90.	9.52	1540.	23168.0
2	95.	9.52	1500.	22588.0
2	100.	9.52	1540.	23168.0
2	105.	9.52	1400.	21141.0
2	110.	9.52	1420.	21430.0
2	115.	9.52	1410.	21285.0
2	120.	9.52	1410.	21285.0
2	125.	9.52	1490.	22443.0
2	130.	9.52	1580.	23748.0
2	135.	9.52	1600.	24038.0
2	140.	9.52	1650.	24765.0
2	145.	9.52	1730.	25930.0
2	150.	9.52	1750.	26221.0
2	155.	9.52	1800.	26951.0
2	160.	9.52	1880.	28120.0
2	165.	9.52	1880.	28120.0
2	170.	12.70	1840.	50705.0
2	175.	12.70	1600.	44266.0
2	180.	12.70	1500.	41594.0
2	185.	12.70	1250.	34945.0
2	190.	12.70	1140.	32033.0
2	195.	12.70	1020.	28865.0
2	200.	12.70	950.	27021.0
2	205.	12.70	920.	26232.0
2	210.	12.70	900.	25706.0
2	215.	12.70	800.	23081.0
2	220.	12.70	650.	19155.0
2	230.	12.70	530.	16026.0
2	240.	12.70	450.	13944.0
2	250.	12.70	450.	13944.0

Continued on next page

1290.00m To 1301.00m

Gas measurement readings continued

FLOW #	TIME MIN	CHOKE mm	READING kPa	CUBIC METRES/D
2	260.	12.70	400.	12645.0
2	269.	12.70	360.	11607.0

DST#01
PCI CANTERRA TWEED LAKE A-67
1290.00m to 1301.00m

TOOL SEQUENCE

SUB	LENGTH (m)
PUMP OUT SUB	.33
CROSS OVER SUB	.30
CROSS OVER SUB	.30
INSIDE RECORDER	1.38
CHOKE SUB	.30
HYDRAULIC TOOL	1.50
BTM. HOLE SAMPLER	1.03
BTM. HOLE SAMPLER	1.03
INSIDE RECORDER	1.38
HYDRAULIC JARS	2.22
SAFETY JOINT	.65
INFLATE PUMP	2.28
SCREEN	1.16
TOP INFLATE PACKER	1.78
PACKER STICK DOWN	.82
PORT SUB	.30
OUTSIDE RECORDER	2.06
SPACING	7.32
PACKER STICK UP	.50
BTM.INFLATE PACKER	1.90
PERFORATED SPACING	1.22
BAR STOP SUB	.30
BELLY SPRING	2.00
******** TOOL TOTAL	32.06
DRILL COLLARS	
ID= 70.0mm:	170.17
ID= :	
DRILL PIPE	
OD=114.3mm:	1107.29
OD= :	
COLLAR-PIPE TOTAL	1277.46

RECORDER SUMMARY

1) NUMBER : 001749
TYPE : DMRB
LOCATION: OUTSIDE
RANGE: 68900.00kPa(a)
DEPTH : 1292.00m

2) NUMBER : 013127 ABOVE
TYPE : K-3 INTERVAL
LOCATION: INSIDE RECORDER
RANGE: 19700.00kPa
DEPTH : 1282.00m

3) NUMBER : 013832
TYPE : K-3
LOCATION: OUTSIDE
RANGE: 19300.00kPa
DEPTH : 1292.00m

4) NUMBER : 013960 BELOW
TYPE : K-3 STRADDLE
LOCATION: INSIDE
RANGE: 19700.00kPa
DEPTH : 1303.00m

5) NUMBER : 019661
TYPE : K-3
LOCATION: OUTSIDE
RANGE: 22700.00kPa
DEPTH : 1292.00m

6) NUMBER : 021424 ABOVE
TYPE : K-3 SHUT-IN TOOL
LOCATION: INSIDE
CAPACITY: 42400.00kPa
DEPTH : 1276.00m

STICK UP ABOVE TABLE : 3.10
TOOL ABOVE INTERVAL : 15.64
TOTAL INTERVAL : 11.00
BOTTOM CHOKE SIZE: 12.70 mm

MUD AND HOLE DATA

Calipered Hole Size @ Test Depth: 216.00mm Water Loss : 10.5cc/s
Hole Condition at Test Time : FAIR Filter Cake: 2.0 mm
Hole Conditioned Prior to Test? : YES
Mud Weight : 1270.0 kg/m3 Main Hole Size: 216.00mm
Mud Type : GEL CHEMICAL/SALT
Viscosity : 51.0s/l Temperature @1292.00m = 12.2C

DST#01
PCI CANTERRA TWEED LAKE A-67
1290.00 m to 1301.00 m

Location: 400/ 67.000 / 125.450 /00
Test Type: INFLATE STRADDLE
Formation: BASAL SAND-MOUNT CLARKE

Recorder Number: 001749
Recorder Depth: 1292.00 m
Subsea Depth: -894.90 m

TIME-PRESSURE LISTING

CHART LABEL	COMMENTS	TIME MIN.	DELTA P kPa	PRESSURE kPa(a)	(T+dt)/dt ABSCISSA	PRESSURE SQUARED kPa(a)^2/10^6
1	INITIAL HYDROSTATIC			16444		
2	START OF 1st FLOW	0.0		724		
		1.0		707		
		2.0		741		
		3.0		810		
3	END OF 1st FLOW	4.0		845		
	1st SHUTIN PERIOD	0.0		845		
		1.0	2361	3206	5.0000	10.2788
		2.0	6653	7498	3.0000	56.2208
		4.0	9825	10670	2.0000	113.8404
		5.0	10342	11187	1.8000	125.1423
		6.0	10652	11497	1.6667	132.1810
		7.0	10859	11704	1.5714	136.9790
		8.0	10997	11842	1.5000	140.2259
		9.0	11083	11928	1.4444	142.2748
		10.0	11169	12014	1.4000	144.3386
		12.0	11273	12118	1.3333	146.8338
		13.0	11325	12169	1.3077	148.0894
		14.0	11376	12221	1.2857	149.3504
		15.0	11411	12255	1.2667	150.1949
		16.0	11428	12273	1.2500	150.6167
		17.0	11445	12290	1.2353	151.0417
		18.0	11480	12324	1.2222	151.8884
		20.0	11514	12359	1.2000	152.7400
		21.0	11531	12376	1.1905	153.1654
		22.0	11549	12393	1.1818	153.5939
		23.0	11549	12393	1.1739	153.5939
		24.0	11583	12428	1.1667	154.4503
		25.0	11583	12428	1.1600	154.4503
		26.0	11600	12445	1.1538	154.8780
		28.0	11618	12462	1.1429	155.3064
		29.0	11618	12462	1.1379	155.3064

* VALUES USED FOR EXTRAPOLATIONS

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TIME-PRESSURE LISTING

CHART LABEL	COMMENTS	TIME MIN.	DELTA P kPa	PRESSURE kPa(a)	(T+dt)/dt ABSCISSA	PRESSURE SQUARED kPa(a)^2/10^6
		30.0	11635	12480	1.1333	155.7379
		31.0	11652	12497	1.1290	156.1675
		32.0	11652	12497	1.1250	156.1675
		33.0	11669	12514	1.1212	156.5977
		34.0	11669	12514	1.1176	156.5977
		36.0	11687	12531	1.1111	157.0310
		37.0	11687	12531	1.1081	157.0310
		38.0	11704	12548	1.1053	157.4624
		39.0	11704	12548	1.1026	157.4624
		40.0	11721	12566	1.1000	157.8968
		41.0	11721	12566	1.0976	157.8968
		42.0	11721	12566	1.0952	157.8968
		44.0	11738	12583	1.0909	158.3294
		45.0	11738	12583	1.0889	158.3294
		46.0	11755	12600	1.0870	158.7625
		47.0	11755	12600	1.0851	158.7625
		48.0	11755	12600	1.0833	158.7625
		49.0	11755	12600	1.0816	158.7625
		50.0	11773	12617	1.0800	159.1988
		52.0	11773	12617	1.0769	159.1988
		53.0	11790	12635	1.0755	159.6331
		54.0	11790	12635	1.0741	159.6331
		55.0	11790	12635	1.0727	159.6331
		56.0	11790	12635	1.0714	159.6331
		57.0	11807	12652	1.0702	160.0681
		58.0	11807	12652	1.0690	160.0681
		60.0	11824	12669	1.0667	160.5061
		61.0	11824	12669	1.0656	160.5061
		62.0	11824	12669	1.0645	160.5061
		63.0	11824	12669	1.0635	160.5061
		64.0	11824	12669	1.0625	160.5061
		65.0	11824	12669	1.0615	160.5061
		66.0	11842	12686	1.0606*	160.9423
		68.0	11842	12686	1.0588*	160.9423
		69.0	11859	12704	1.0580*	161.3789
		70.0	11859	12704	1.0571*	161.3789

* VALUES USED FOR EXTRAPOLATIONS

DST#01
PCI CANTERRA TWEED LAKE A-67
1290.00 m to 1301.00 m

Location: 400/ 67.000 / 125.450 /00
Test Type: INFLATE STRADDLE
Formation: BASAL SAND-MOUNT CLARKE

Recorder Number: 001749
Recorder Depth: 1292.00 m
Subsea Depth: -894.90 m

TIME-PRESSURE LISTING

CHART LABEL	COMMENTS	TIME MIN.	DELTA P kPa	PRESSURE kPa(a)	(T+dt)/dt ABSCISSA	PRESSURE SQUARED kPa(a)^2/10^6
		71.0	11859	12704	1.0563*	161.3789
		72.0	11859	12704	1.0556*	161.3789
		73.0	11859	12704	1.0548*	161.3789
		74.0	11859	12704	1.0541*	161.3789
		76.0	11876	12721	1.0526*	161.8188
		77.0	11876	12721	1.0519*	161.8188
		78.0	11876	12721	1.0513*	161.8188
		79.0	11893	12738	1.0506*	162.2567
		80.0	11893	12738	1.0500*	162.2567
		81.0	11893	12738	1.0494*	162.2567
4	END OF 1st SHUTIN	82.0	11893	12738	1.0488*	162.2567
5	START OF 2nd FLOW	0.0		965		
		2.0		776		
		5.0		827		
		7.0		879		
		9.0		914		
		12.0		983		
		14.0		1017		
		16.0		1034		
		18.0		1034		
		21.0		1000		
		23.0		965		
		25.0		914		
		28.0		983		
		30.0		965		
		32.0		931		
		34.0		914		
		37.0		983		
		39.0		965		
		41.0		931		
		44.0		1017		
		46.0		965		
		48.0		931		
		50.0		914		

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CHART LABEL	COMMENTS	TIME MIN.	DELTA P kPa	PRESSURE kPa(a)	(T+dt)/dt ABSCISSA	PRESSURE SQUARED kPa(a)^2/10^6
		53.0		931		
		55.0		896		
		57.0		1034		
		60.0		1034		
		62.0		1017		
		64.0		983		
		66.0		2137		
		69.0		2068		
		71.0		2137		
		73.0		2189		
		76.0		2258		
		78.0		2293		
		80.0		2258		
		82.0		2293		
		85.0		2413		
		87.0		2396		
		89.0		2361		
		92.0		2379		
		94.0		2361		
		96.0		2482		
		98.0		2430		
		101.0		2258		
		103.0		2241		
		105.0		2224		
		108.0		2361		
		110.0		2430		
		112.0		2344		
		114.0		2293		
		117.0		2344		
		119.0		2465		
		121.0		2430		
		124.0		2482		
		126.0		2534		
		128.0		2534		
		130.0		2568		
		133.0		2551		

* VALUES USED FOR EXTRAPOLATIONS

DST#01
PCI CANTERRA TWEED LAKE A-67
1290.00 m to 1301.00 m

Location: 400/ 67.000 / 125.450 /00
Test Type: INFLATE STRADDLE
Formation: BASAL SAND-MOUNT CLARKE

Recorder Number: 001749
Recorder Depth: 1292.00 m
Subsea Depth: -894.90 m

TIME-PRESSURE LISTING

CHART LABEL	COMMENTS	TIME MIN.	DELTA P kPa	PRESSURE kPa(a)	(T+dt)/dt ABSCISSA	PRESSURE SQUARED kPa(a)^2/10^6
		135.0		2568		
		137.0		2586		
		140.0		2637		
		142.0		2672		
		144.0		2706		
		146.0		2723		
		149.0		2706		
		151.0		2654		
		153.0		2982		
		156.0		2844		
		158.0		2827		
		160.0		2810		
		162.0		2810		
		165.0		2844		
		167.0		2672		
		169.0		2775		
		172.0		2775		
		174.0		2654		
		176.0		2568		
		178.0		2482		
		181.0		2499		
		183.0		2293		
		185.0		2206		
		188.0		2155		
		190.0		2137		
		192.0		2017		
		194.0		1931		
		197.0		1896		
		199.0		1948		
		201.0		1844		
		204.0		1775		
		206.0		1741		
		208.0		1724		
		210.0		1706		
		213.0		1586		
		215.0		1551		

* VALUES USED FOR EXTRAPOLATIONS

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PCI CANTERRA TWEED LAKE A-67
1290.00 m to 1301.00 m

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Test Type: INFLATE STRADDLE
Formation: BASAL SAND-MOUNT CLARKE

Recorder Number: 001749
Recorder Depth: 1292.00 m
Subsea Depth: -894.90 m

TIME-PRESSURE LISTING

CHART LABEL	COMMENTS	TIME MIN.	DELTA P kPa	PRESSURE kPa(a)	(T+dt)/dt ABSCISSA	PRESSURE SQUARED kPa(a)^2/10^6
		217.0		1603		
		220.0		1500		
		222.0		1465		
		224.0		1431		
		226.0		1413		
		229.0		1396		
		231.0		1362		
		233.0		1431		
		236.0		1413		
		238.0		1362		
		240.0		1327		
		242.0		1327		
		245.0		1362		
		247.0		1327		
		249.0		1327		
		252.0		1310		
		254.0		1293		
		256.0		1293		
		258.0		1293		
		261.0		1293		
		263.0		1396		
		265.0		1344		
		268.0		1293		
6	END OF 2nd FLOW	269.0		1293		
	2nd SHUTIN PERIOD	0.0		1293		
		3.0	11618	12910	92.0000	166.6784
		7.0	11721	13014	40.0000	169.3590
		10.0	11721	13014	28.3000	169.3590
		13.0	11721	13014	22.0000	169.3590
		17.0	11721	13014	17.0588	169.3590
		20.0	11721	13014	14.6500	169.3590
		24.0	11721	13014	12.3750	169.3590
		27.0	11721	13014	11.1111	169.3590
		31.0	11721	13014	9.8065	169.3590

* VALUES USED FOR EXTRAPOLATIONS

DST#01
PCI CANTERRA TWEED LAKE A-67
1290.00 m to 1301.00 m

Location: 400/ 67.000 / 125.450 /00
Test Type: INFLATE STRADDLE
Formation: BASAL SAND-MOUNT CLARKE

Recorder Number: 001749
Recorder Depth: 1292.00 m
Subsea Depth: -894.90 m

TIME-PRESSURE LISTING

CHART LABEL	COMMENTS	TIME MIN.	DELTA P kPa	PRESSURE kPa(a)	(T+dt)/dt ABSCISSA	PRESSURE SQUARED kPa(a)^2/10^6
		34.0	11721	13014	9.0294	169.3590
		38.0	11738	13031	8.1842	169.8070
		41.0	11721	13014	7.6585	169.3590
		44.0	11721	13014	7.2045	169.3590
		48.0	11721	13014	6.6875	169.3590
		51.0	11738	13031	6.3529	169.8070
		55.0	11738	13031	5.9636	169.8070
		58.0	11721	13014	5.7069	169.3590
		62.0	11721	13014	5.4032	169.3590
		65.0	11738	13031	5.2000	169.8070
		68.0	11721	13014	5.0147	169.3590
		72.0	11738	13031	4.7917	169.8070
		75.0	11721	13014	4.6400	169.3590
		79.0	11738	13031	4.4557	169.8070
		82.0	11738	13031	4.3293	169.8070
		86.0	11738	13031	4.1744	169.8070
		89.0	11738	13031	4.0674	169.8070
		92.0	11738	13031	3.9674	169.8070
		96.0	11738	13031	3.8438	169.8070
		99.0	11738	13031	3.7576	169.8070
		103.0	11738	13031	3.6505	169.8070
		106.0	11738	13031	3.5755	169.8070
		110.0	11738	13031	3.4818	169.8070
		113.0	11738	13031	3.4159	169.8070
		116.0	11738	13031	3.3534	169.8070
		120.0	11721	13014	3.2750	169.3590
		123.0	11721	13014	3.2195	169.3590
		127.0	11721	13014	3.1496	169.3590
		130.0	11721	13014	3.1000	169.3590
		133.0	11721	13014	3.0526	169.3590
		137.0	11721	13014	2.9927	169.3590
		140.0	11721	13014	2.9500	169.3590
		144.0	11721	13014	2.8958*	169.3590
		147.0	11721	13014	2.8571*	169.3590
		151.0	11721	13014	2.8079*	169.3590
		154.0	11721	13014	2.7727*	169.3590

* VALUES USED FOR EXTRAPOLATIONS

DST#01
PCI CANTERRA TWEED LAKE A-67
1290.00 m to 1301.00 m

Location: 400/ 67.000 / 125.450 /00
Test Type: INFLATE STRADDLE
Formation: BASAL SAND-MOUNT CLARKE

Recorder Number: 001749
Recorder Depth: 1292.00 m
Subsea Depth: -894.90 m

TIME-PRESSURE LISTING

CHART LABEL	COMMENTS	TIME MIN.	DELTA P kPa	PRESSURE kPa(a)	(T+dt)/dt ABSCISSA	PRESSURE SQUARED kPa(a)^2/10^6
		157.0	11704	12997	2.7389*	168.9116
		161.0	11721	13014	2.6957*	169.3590
		164.0	11704	12997	2.6646*	168.9116
		168.0	11721	13014	2.6250*	169.3590
		171.0	11704	12997	2.5965*	168.9116
		175.0	11704	12997	2.5600*	168.9116
		178.0	11704	12997	2.5337*	168.9116
		181.0	11704	12997	2.5083*	168.9116
		185.0	11704	12997	2.4757*	168.9116
		188.0	11704	12997	2.4521*	168.9116
		192.0	11704	12997	2.4219*	168.9116
		195.0	11721	13014	2.4000*	169.3590
		199.0	11721	13014	2.3719*	169.3590
		202.0	11721	13014	2.3515*	169.3590
		205.0	11721	13014	2.3317*	169.3590
		209.0	11721	13014	2.3062*	169.3590
		212.0	11721	13014	2.2877*	169.3590
		216.0	11721	13014	2.2639*	169.3590
		219.0	11721	13014	2.2466*	169.3590
		223.0	11721	13014	2.2242*	169.3590
		226.0	11721	13014	2.2080*	169.3590
		229.0	11721	13014	2.1921*	169.3590
		233.0	11721	13014	2.1717*	169.3590
		236.0	11721	13014	2.1568*	169.3590
		240.0	11721	13014	2.1375*	169.3590
		243.0	11721	13014	2.1235*	169.3590
		247.0	11721	13014	2.1053*	169.3590
		250.0	11721	13014	2.0920*	169.3590
		253.0	11721	13014	2.0791*	169.3590
		257.0	11721	13014	2.0623*	169.3590
		260.0	11721	13014	2.0500*	169.3590
		264.0	11721	13014	2.0341*	169.3590
		267.0	11721	13014	2.0225*	169.3590
		271.0	11721	13014	2.0074*	169.3590
		274.0	11721	13014	1.9964*	169.3590
		277.0	11721	13014	1.9856*	169.3590

* VALUES USED FOR EXTRAPOLATIONS

DST#01
PCI CANTERRA TWEED LAKE A-67
1290.00 m to 1301.00 m

Location: 400/ 67.000 / 125.450 /00
Test Type: INFLATE STRADDLE
Formation: BASAL SAND-MOUNT CLARKE

Recorder Number: 001749
Recorder Depth: 1292.00 m
Subsea Depth: -894.90 m

TIME-PRESSURE LISTING

CHART LABEL	COMMENTS	TIME MIN.	DELTA P kPa	PRESSURE kPa(a)	(T+dt)/dt ABSCISSA	PRESSURE SQUARED kPa(a)^2/10^6
		281.0	11721	13014	1.9715*	169.3590
		284.0	11721	13014	1.9613*	169.3590
		288.0	11721	13014	1.9479*	169.3590
		291.0	11721	13014	1.9381*	169.3590
		295.0	11721	13014	1.9254*	169.3590
		298.0	11721	13014	1.9161*	169.3590
		301.0	11721	13014	1.9070*	169.3590
		305.0	11721	13014	1.8951*	169.3590
		308.0	11721	13014	1.8864*	169.3590
		312.0	11721	13014	1.8750*	169.3590
		315.0	11721	13014	1.8667*	169.3590
		319.0	11721	13014	1.8558*	169.3590
		322.0	11721	13014	1.8478*	169.3590
		325.0	11721	13014	1.8400*	169.3590
		329.0	11721	13014	1.8298*	169.3590
		332.0	11721	13014	1.8223*	169.3590
		336.0	11721	13014	1.8125*	169.3590
		339.0	11721	13014	1.8053*	169.3590
		343.0	11721	13014	1.7959*	169.3590
		346.0	11721	13014	1.7890*	169.3590
		349.0	11721	13014	1.7822*	169.3590
		353.0	11721	13014	1.7734*	169.3590
		356.0	11721	13014	1.7669*	169.3590
		360.0	11721	13014	1.7583*	169.3590
		363.0	11721	13014	1.7521*	169.3590
		367.0	11721	13014	1.7439*	169.3590
		370.0	11721	13014	1.7378*	169.3590
		373.0	11721	13014	1.7319*	169.3590
		377.0	11704	12997	1.7241*	168.9116
		380.0	11721	13014	1.7184*	169.3590
		384.0	11721	13014	1.7109*	169.3590
		387.0	11721	13014	1.7054*	169.3590
		391.0	11721	13014	1.6982*	169.3590
		394.0	11721	13014	1.6929*	169.3590
		397.0	11721	13014	1.6877*	169.3590
		401.0	11721	13014	1.6808*	169.3590

* VALUES USED FOR EXTRAPOLATIONS

DST#01
PCI CANTERRA TWEED LAKE A-67
1290.00 m to 1301.00 m

Location: 400/ 67.000 / 125.450 /00
Test Type: INFLATE STRADDLE
Formation: BASAL SAND-MOUNT CLARKE

Recorder Number: 001749
Recorder Depth: 1292.00 m
Subsea Depth: -894.90 m

TIME-PRESSURE LISTING

CHART LABEL	COMMENTS	TIME MIN.	DELTA P kPa	PRESSURE kPa(a)	(T+dt)/dt ABSCISSA	PRESSURE SQUARED kPa(a)^2/10^6
		404.0	11721	13014	1.6757*	169.3590
		408.0	11721	13014	1.6691*	169.3590
		411.0	11721	13014	1.6642*	169.3590
7	END OF 2nd SHUTIN	412.0	11721	13014	1.6626*	169.3590
14	FINAL HYDROSTATIC			0		

* VALUES USED FOR EXTRAPOLATIONS

1st SHUT-IN
HORNER EXTRAPOLATION 12972.07 kPa(a)
HORNER SLOPE 290.40967 (kPa(a)**2/10**6)/CYCLE

2nd SHUT-IN
HORNER EXTRAPOLATION 13022.97 kPa(a)
HORNER SLOPE .94848 (kPa(a)**2/10**6)/CYCLE

DST#01
PCI CANTERRA TWEED LAKE A-67
1290.00 m to 1301.00 m

Location: 400/ 67.000 / 125.450 /00
Formation: BASAL SAND-MOUNT CLARKE

Recorder Number: 001749
Recorder Depth: 1292.00 m
Subsea Depth: -894.90 m

PLOT SUMMARY:
****

HORNER PLOTS: Figs. 1

RESERVOIR CALCULATIONS: GAS CALCULATIONS BASED ON SECOND SHUT-IN
****

RESERVOIR PARAMETERS USED:
****

NET PAY....: 3.60 m
POROSITY...: 11. %
TEMPERATURE: 12.20 C
FLOW RATE..: 21141.0 m3/d

SPECIFIC GRAVITY: .630
Z FACTOR: .731
VISCOSITY: .020 mPa.s
COMPRESSIBILITY: .8510E-04 /kPa

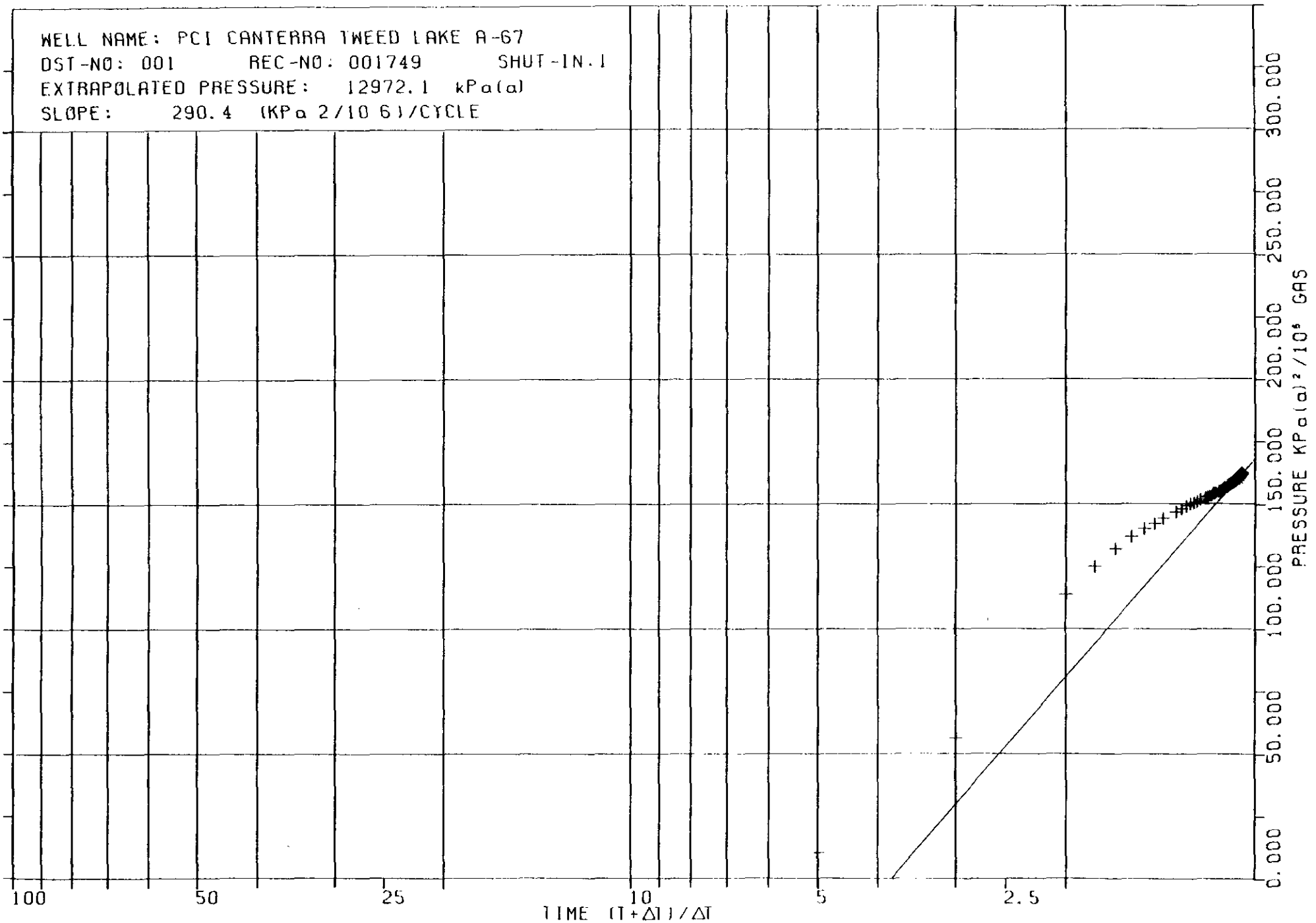
TOTAL FLOW TIME.....: 273.0 min.
FINAL FLOWING PRESSURE.: 1293. kPa(a)
HORNER SLOPE.....: .948 (kPa(a)**2/10**6)/cycle
HORNER EXTRAPOLATION...: 13023. kPa(a)
ASSUMED DRAINAGE RADIUS: 908.0 m
WELLBORE RADIUS.....: 108.00 mm

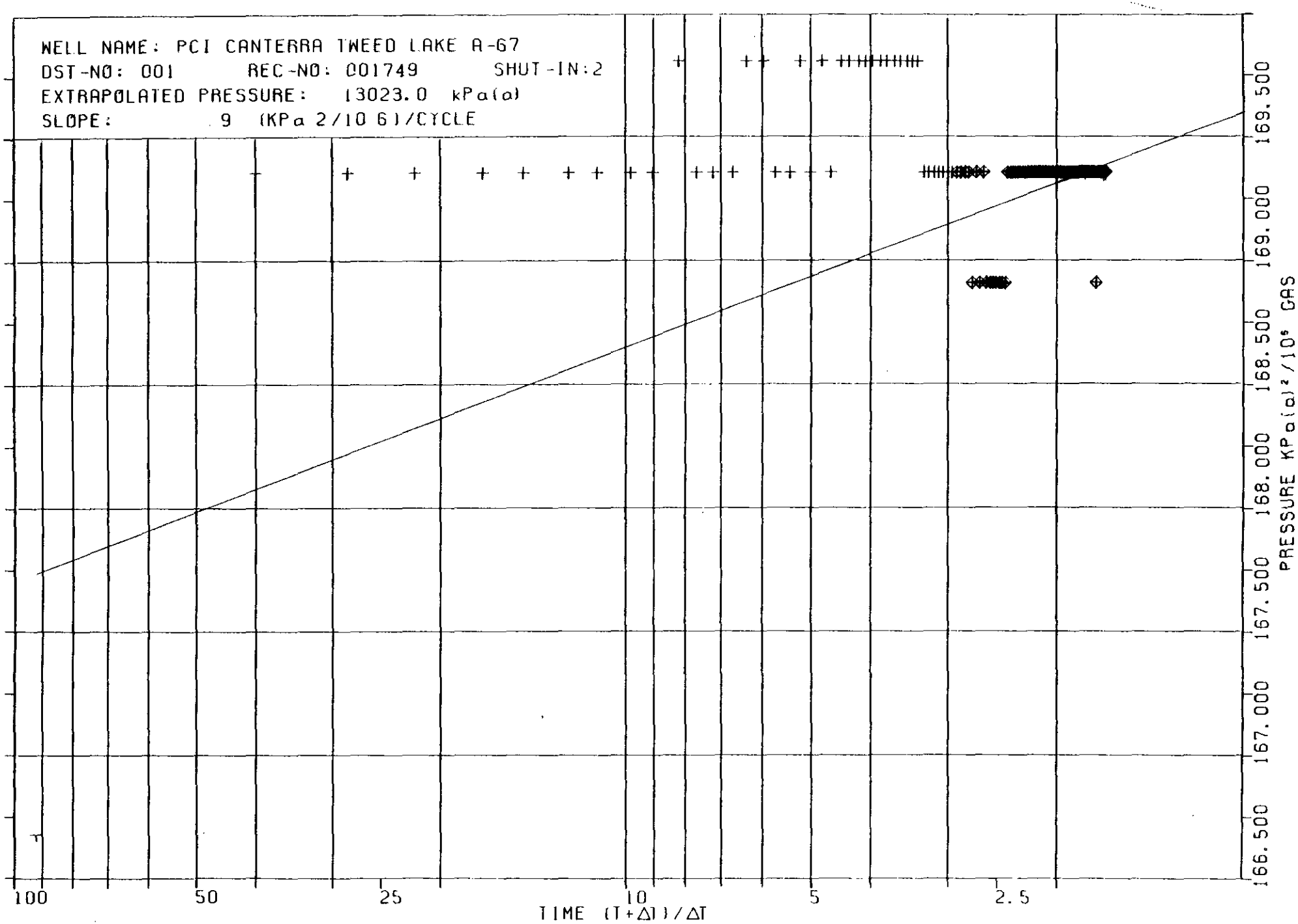
RESULTS:
****

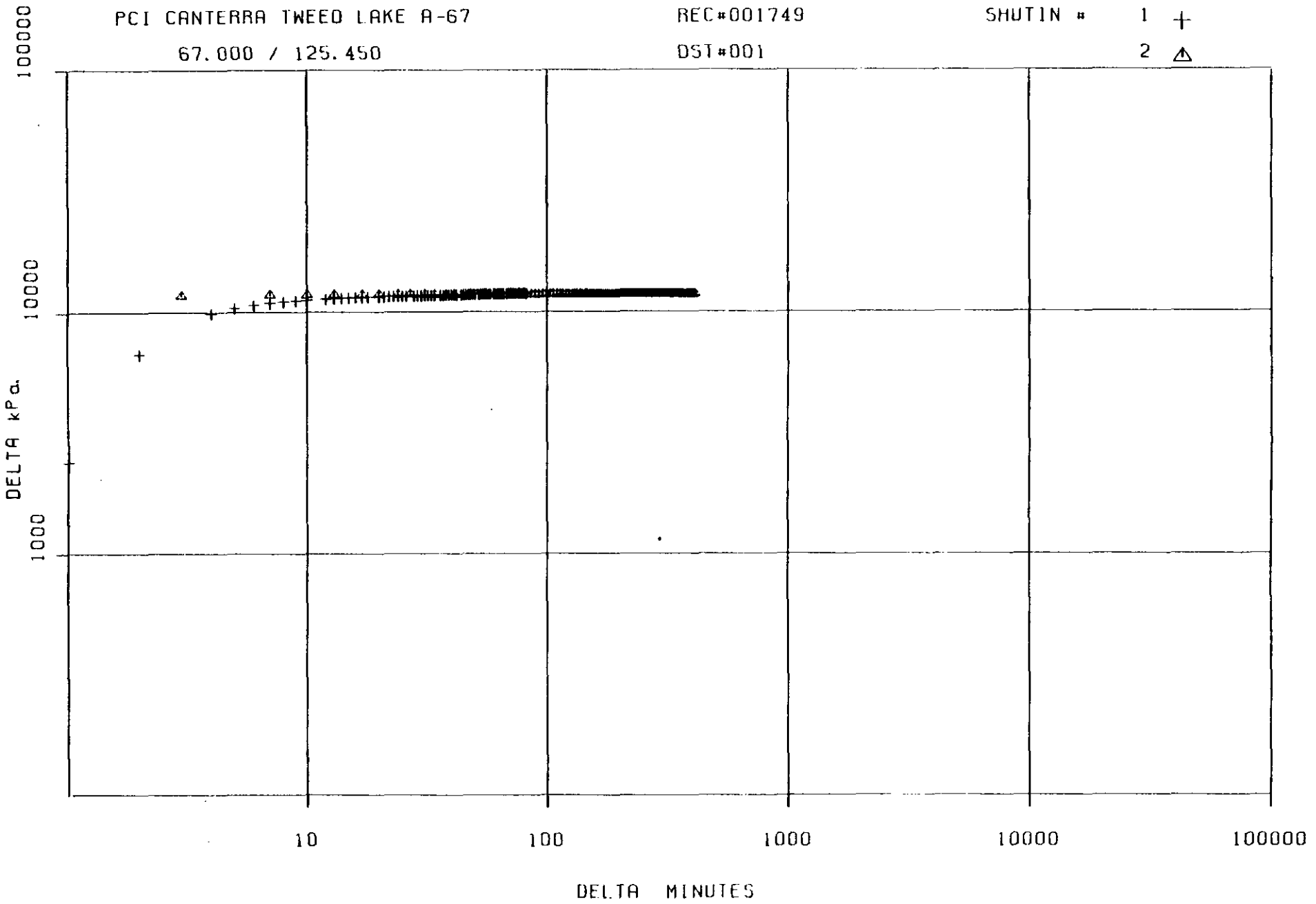
Effective permeability...(k)..:39.28 mD
Transmissibility.....(kh/u).:6932.19 mD.m/mPa.s
Flow Capacity.....(kh).:141.42 mD.m
Skin.....(s)..:197.09
Pressure Drop Across Skin.....:11518.18 kPa

Radius of Investigation.....:116.12 m

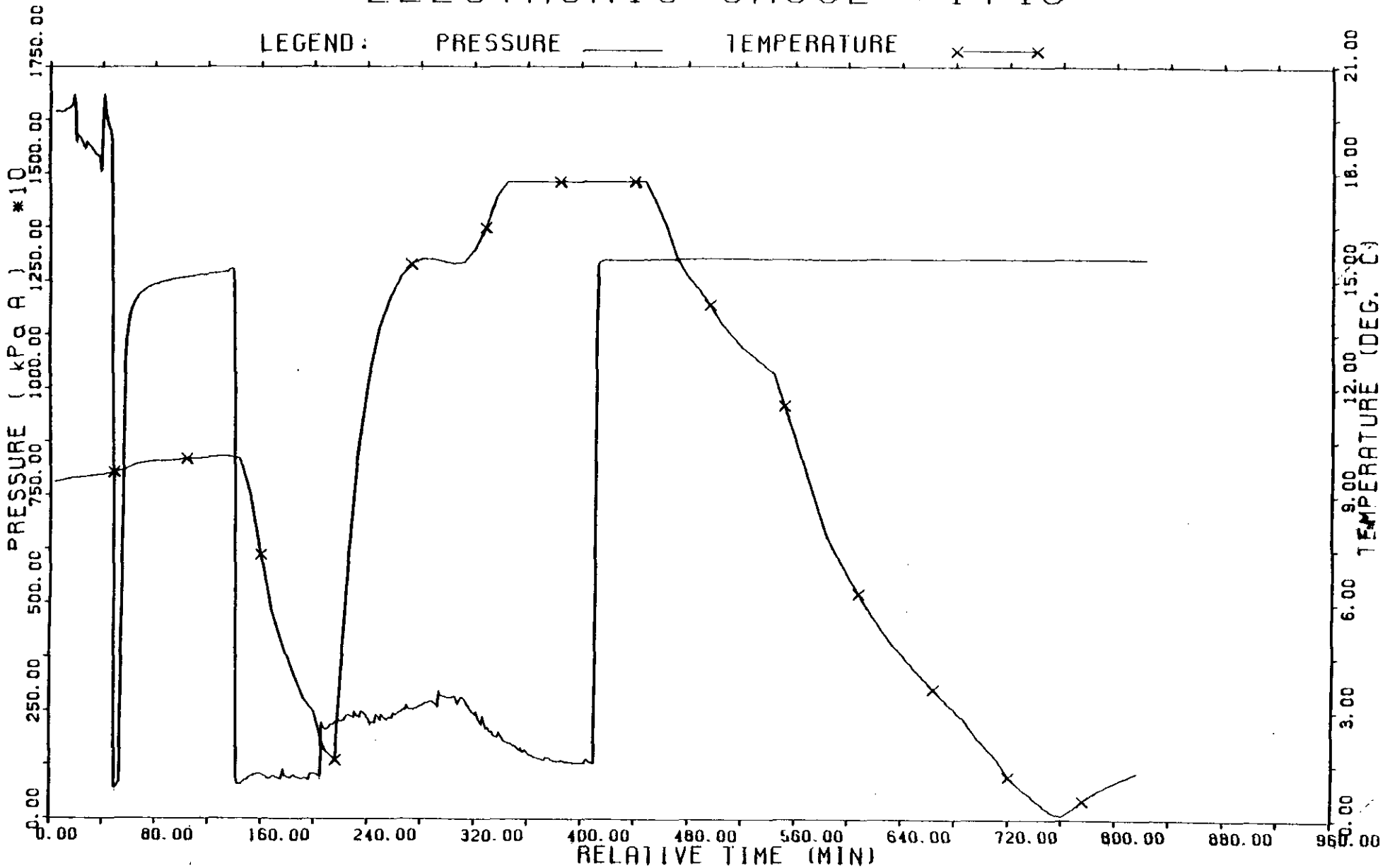
Calculated Damage Ratio.....:30.46
AOF.....:21346.89 m3/d
AOF with Damage Removed.....:650354.13 m3/d
Est. Stabilized AOF(No Damage):525234.50 m3/d
% Depletion.....:.00


WELL NAME: PCI CANTERRA TWEED LAKE A-67
DST-NO: 001 REC-NO: 001749 SHUT-IN.1
EXTRAPOLATED PRESSURE: 12972.1 kPa(a)
SLOPE: 290.4 (KPa 2/10 6)/CYCLE
PRESSURE KPa(a)²/10⁶ GAS
0.000
50.000
100.000
150.000
200.000
250.000
300.000
100
50
25
10
5
2.5
TIME (T+ΔT)/ΔT


WELL NAME: PCI CANTERRA TWEED LAKE A-67
DST-NO: 001 REC-NO: 001749 SHUT-IN:2
EXTRAPOLATED PRESSURE: 13023.0 kPa(a)
SLOPE: 9 (KPa 2/10 6)/CYCLE
169.500
169.000
168.500
168.000
167.500
167.000
166.500
PRESSURE KPa(a)²/10⁶ GAS
100
50
25
10
5
2.5
TIME (T+Δ)/Δ


PCI CANTERRA TWEED LAKE A-67
67.000 / 125.450
REC#001749
DST#001
SHUTIN # 1
2
100000
10000
1000
DELTA kPa
10
100
1000
10000
100000
DELTA MINUTES

PCI CANTERRA TWEED LAKE A-67
400 67.000 125.450 DST #1
ELECTRONIC GAUGE #1749



DST#01
PCI CANTERRA TWEED LAKE A-67
1290.00m to 1301.00m

PRESSURE RECORDER NUMBER : 001749

DEPTH : 1292.00m LOCATION : OUTSIDE
TYPE : DMRB CAPACITY : 68900.00kPa(a)

***** TEMPERATURE AT RECORDER DEPTH = 12.2 C

	PRESSURE kPa(a)
1) Initial Hydro :	16444.
2) 1st Flow Start:	724.
3) 1st Flow End :	845.
4) END 1st Shutin:	12738.
5) 2nd Flow Start:	965.
6) 2nd Flow End :	1293.
7) END 2nd Shutin:	13014.
14) Final Hydro. :	0.

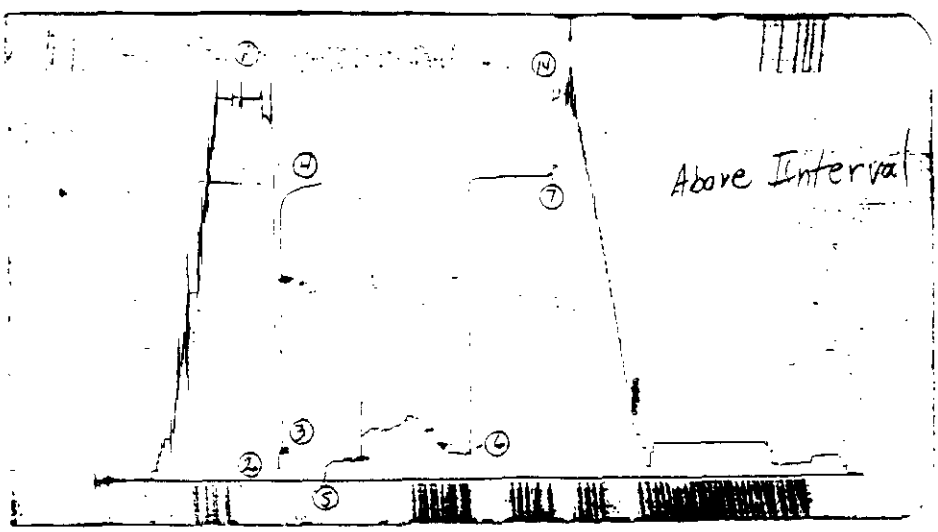
TEST TIMES(MIN)

1st FLOW :	4.0
SHUTIN:	82.0
2nd FLOW :	269.0
SHUTIN:	412.0

PRESSURE RECORDER NUMBER : 013127

DEPTH : 1282.00m LOCATION : INSIDE
TYPE : K-3 CAPACITY : 19700.00 kPa

	PRESSURE kPa
1) Initial Hydro :	16303.
2) 1st Flow Start:	435.
3) 1st Flow End :	1185.
4) END 1st Shutin:	12588.
5) 2nd Flow Start:	589.
6) 2nd Flow End :	1105.
7) END 2nd Shutin:	12874.
14) Final Hydro. :	16237.



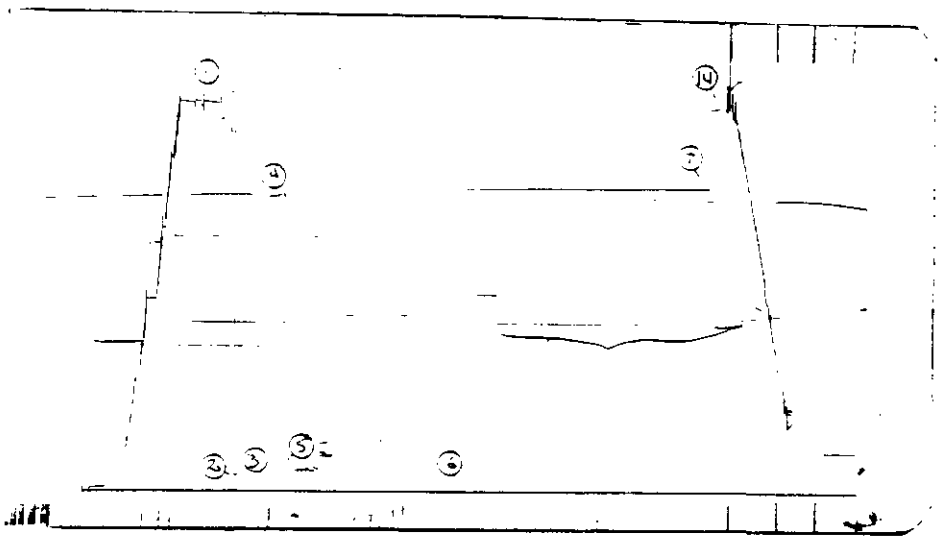
ABOVE INTERVAL RECORDER

DST#01
PCI CANTERRA TWEED LAKE A-67
1290.00m to 1301.00m

PRESSURE RECORDER NUMBER : 013832

DEPTH : 1292.00m
TYPE : K-3
LOCATION : OUTSIDE
CAPACITY : 19300.00 kPa

	PRESSURE kPa
1) Initial Hydro :	16579.
2) 1st Flow Start:	639.
3) 1st Flow End :	704.
4) END 1st Shutin:	12605.
5) 2nd Flow Start:	786.
6) 2nd Flow End :	1220.
7) END 2nd Shutin:	12897.
14) Final Hydro. :	16555.

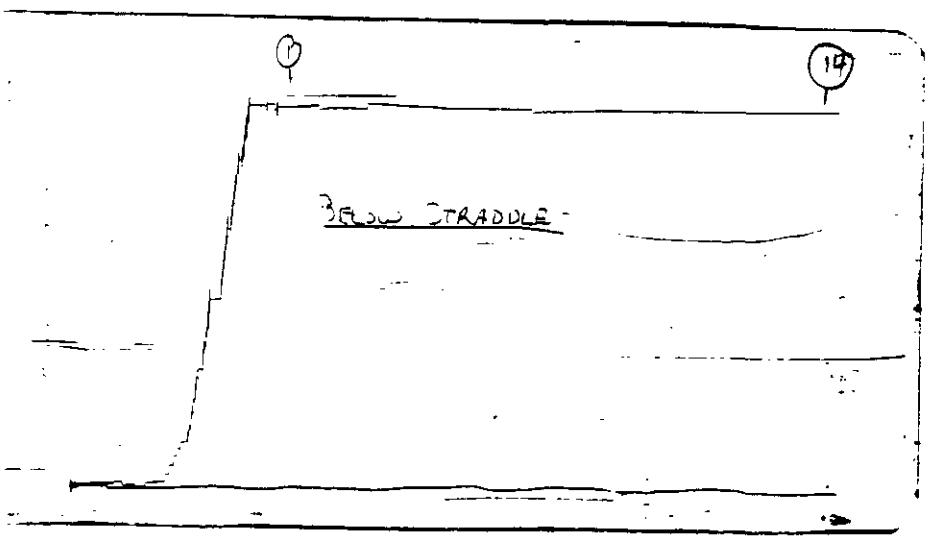


TEST TIMES (MIN)	
1st FLOW :	4.0
SHUTIN:	82.0
2nd FLOW :	269.0
SHUTIN:	412.0

PRESSURE RECORDER NUMBER : 013960

DEPTH : 1303.00m
TYPE : K-3
LOCATION : INSIDE
CAPACITY : 19700.00 kPa

	PRESSURE kPa
1) Initial Hydro :	16502.
14) Final Hydro. :	16453.

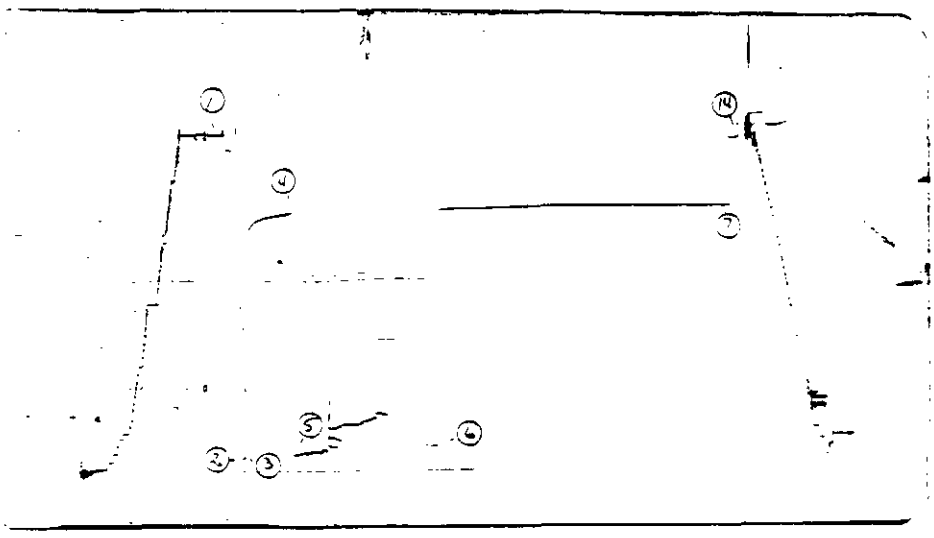


BELOW STRADDLE

DST#01
PCI CANTERRA TWEED LAKE A-67
1290.00m to 1301.00m

PRESSURE RECORDER NUMBER : 019661

DEPTH : 1292.00m LOCATION : OUTSIDE
TYPE : K-3 CAPACITY : 22700.00 kPa

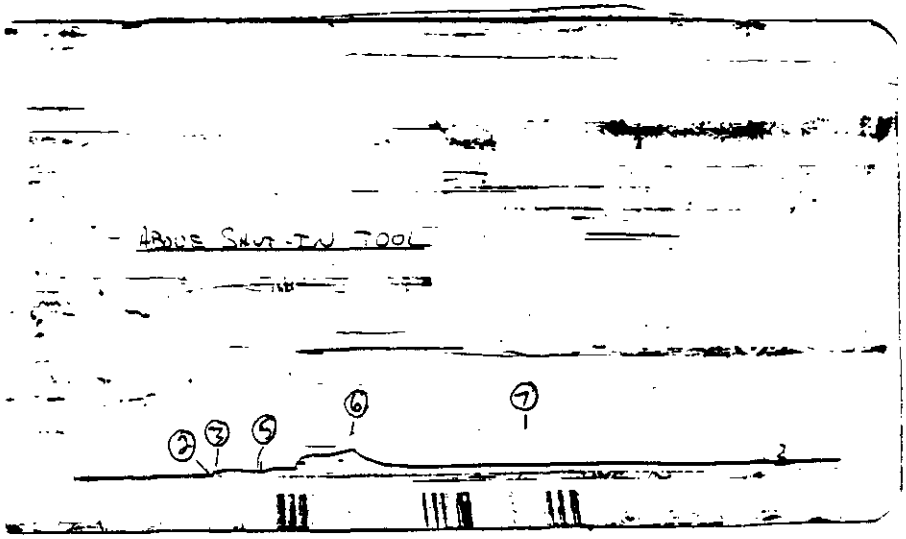


	PRESSURE kPa
1) Initial Hydro :	16490.
2) 1st Flow Start:	592.
3) 1st Flow End :	630.
4) END 1st Shutin:	12557.
5) 2nd Flow Start:	773.
6) 2nd Flow End :	1212.
7) END 2nd Shutin:	12879.
14) Final Hydro. :	16490.

TEST TIMES (MIN)	
1st FLOW :	4.0
SHUTIN:	82.0
2nd FLOW :	269.0
SHUTIN:	412.0

PRESSURE RECORDER NUMBER : 021424

DEPTH : 1276.00m LOCATION : INSIDE
TYPE : K-3 CAPACITY : 42400.00 kPa



	PRESSURE kPa
1) Initial Hydro :	
2) 1st Flow Start:	0.
3) 1st Flow End :	274.
4) END 1st Shutin:	
5) 2nd Flow Start:	274.
6) 2nd Flow End :	2110.
7) END 2nd Shutin:	377.
14) Final Hydro. :	

ABOVE
SHUT-IN TOOL

LYNES UNITED SERVICES
1144 29th AVE. N.E., CALGARY
ALBERTA, T2E 7P1

CLOSED CHAMBER DST REPORT

Well name: PCI CANTERRA TWEED LAKE

Location: 67.000 - 125.450

DST No.: 1

Interval: 1290-1301 m

Date: 85/12/17

LYNES UNITED SERVICES, CALGARY, ALBERTA

Table of Contents

1. GENERAL INFORMATION

Company:	PETRO-CANADA	Date:	85/12/17
Well name:	PCI CANTERRA TWEED LAKE	Tester:	HILLER E
Well no:	67.000 - 125.450	CC Tester:	YELENIK B
DST #:	1	Ticket #:	15779
Interval:	1290-1301 m	Hole size:	216 mm

Formation: BASAL SD-MT CLARKE

Type of test: INFLATE STRADDLE

Primary objective of closed chamber: PRECISION

Cushion:	0.000 m	Volume:	0.000 m^3
Gas cushion:	0.000 kPa	Volume:	0.000 Sm^3
Chamber volume:	8.849 m^3	Sump volume:	.260 m^3

RECORDER DATA

DSR #:	243	DMR #:	1749	Depth:	1292 m
Above shut-in recorder #:			21424	Depth:	1276 m
Surface probe #:			1528		

CONSTANTS AND FORMATION PARAMETERS

Bottom hole choke size(d):	12.7 mm	No. run:	1	Coeff(FP):	17.5
Est. form pressure:	13000 kPa	Est. form temp:	285.35 deg K		
Gas spec. gravity:	.6	(z):	.72		
Estimated gas-water ratio(R):	2.4	Surface pressure:	99.9431 kPa		

PRETEST CALCULATION RESULTS

	Max rate m^3/d	Max dp/dt kPa/min	Conversion m^3/d/kPa/min
Gas:	348264.60	2549.68	136.59
Gas saturated water:	2084.62 G/ 868.59 W	22.64	92.09
Gas free water:	868.59	7.38	117.77

2.1 Test Report Summary

A drill stem test was conducted on PCI CANTERRA TWEED LAKE 67.000-125.450 under closed chamber conditions according to LYNES STANDARD CLOSED CHAMBER TESTING PROCEDURE.

The surface pressure was monitored throughout the entire test. All measured data is presented both graphically and in tabular form in segments 3 and 4 of this report along with the calculated rates.

2.2 Results determined from the test data

1) PREFLOW PERIOD

Flow time 5.75 minutes
Surface pressure start 99.943 kPaa
Surface pressure end 245.447 kPaa

Indicated priduction: gas

Closed chamber flow rates:

Initial rate 93 m3/d
Maximum rate 6336 m3/d @ 5.25 minutes
Last rate 3580 m3/d
Average rate 3457 m3/d

2) INITIAL SHUT-IN PERIOD

Shut-in time 82 minutes
The surface pressure increased slightly then was stable during the shut-in.

3) REPORTED RECOVERY

1 m of consensate
59 m of gas cut drilling mud

4) PRESSURE READIGS FROM DOWNHOLE GAUGE

IF Start 0 kPa
IF End 274 kPa
FF Start 274 kPa
FF End 2110 kPa
FSI End 377 kPa

2.3 Comments on the test

The results indicate a zone that produced predominately gas during the test. The gas rate during the preflow was essentially increasing except for the very last gas rate. This rate may not be accurate as the tool

may have been closed in between the 5.5 and 5.75 minute reading. The increasing gas rate is probably a result of the formation cleaning up (the DST results indicate a damaged formation). The closed chamber preflow gas rate is less than the gas rate during the final flow. Again, this is probably a result of the formation cleaning up during the test.

Closed chamber testing was discontinued after the initial shut-in.

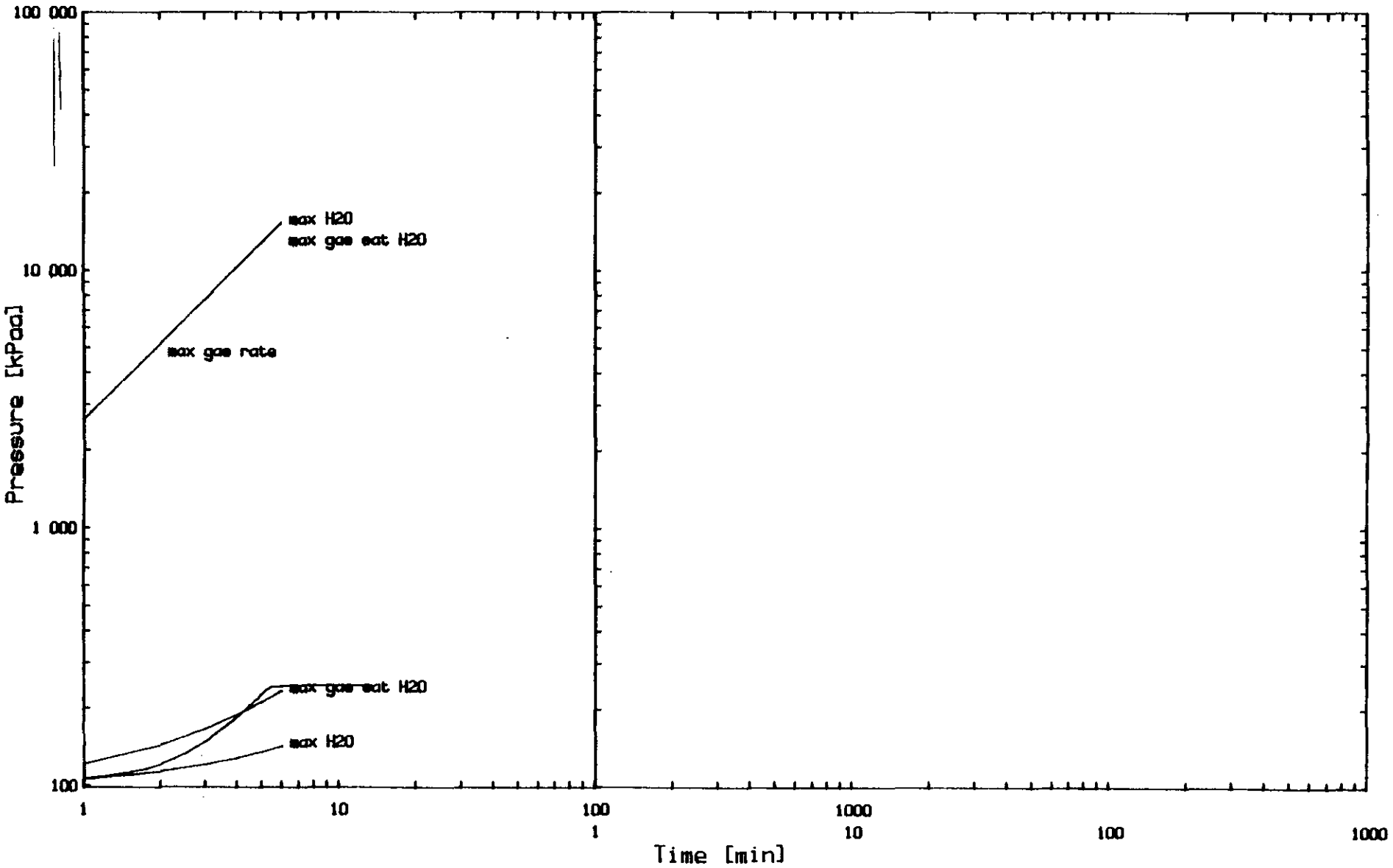
2.4 Conclusion

The DST and closed chamber results indicate a damaged zone that is cleaning up during the test.

LYNES UNITED SERVICES

PCI CANTERRA TWEED LAKE
67.000 - 125.450
DST# 1

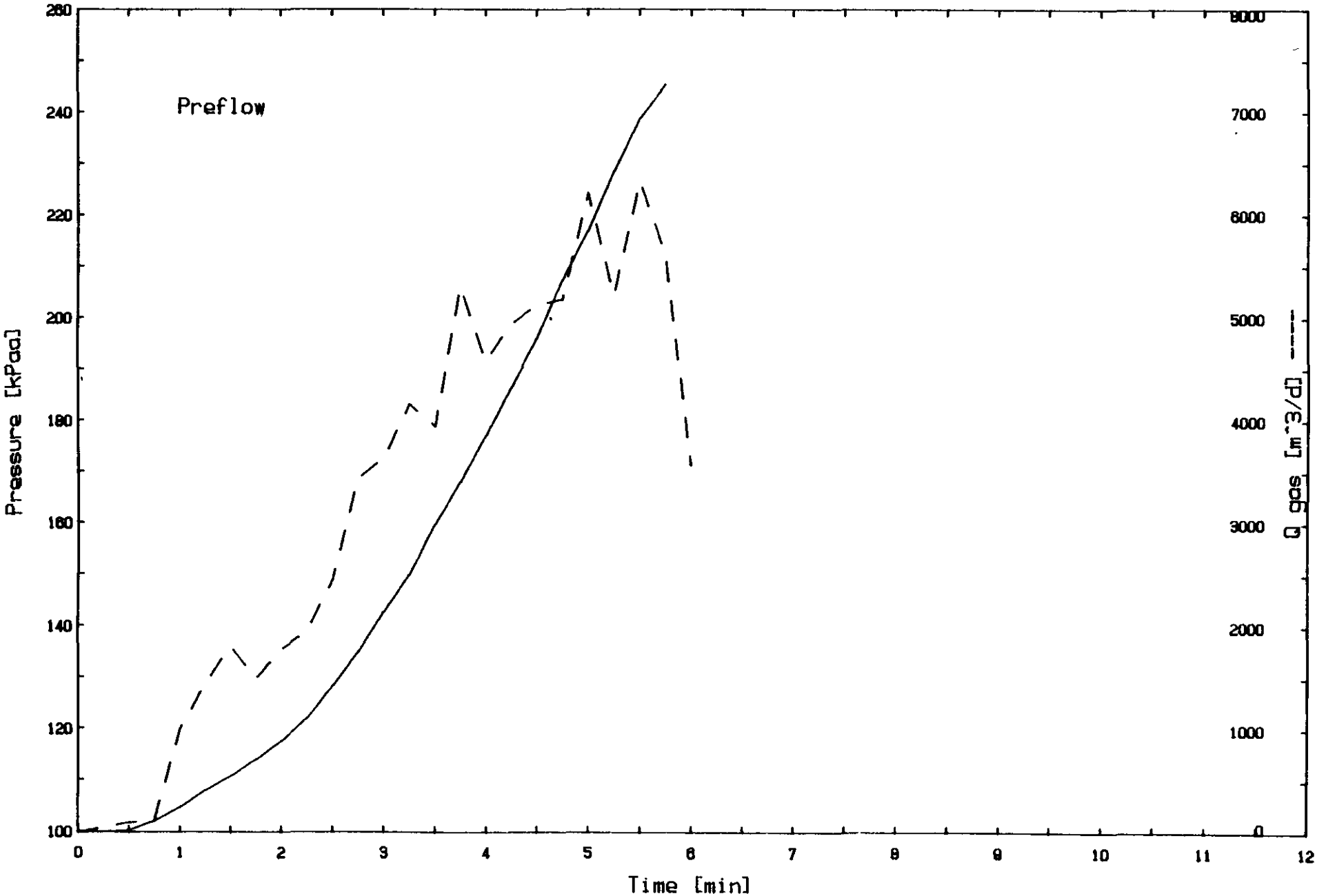
Fig. 3-1



LYNES UNITED SERVICES

PCI CANTERRA TWEED LAKE
67.000 - 125.450
DST# 1

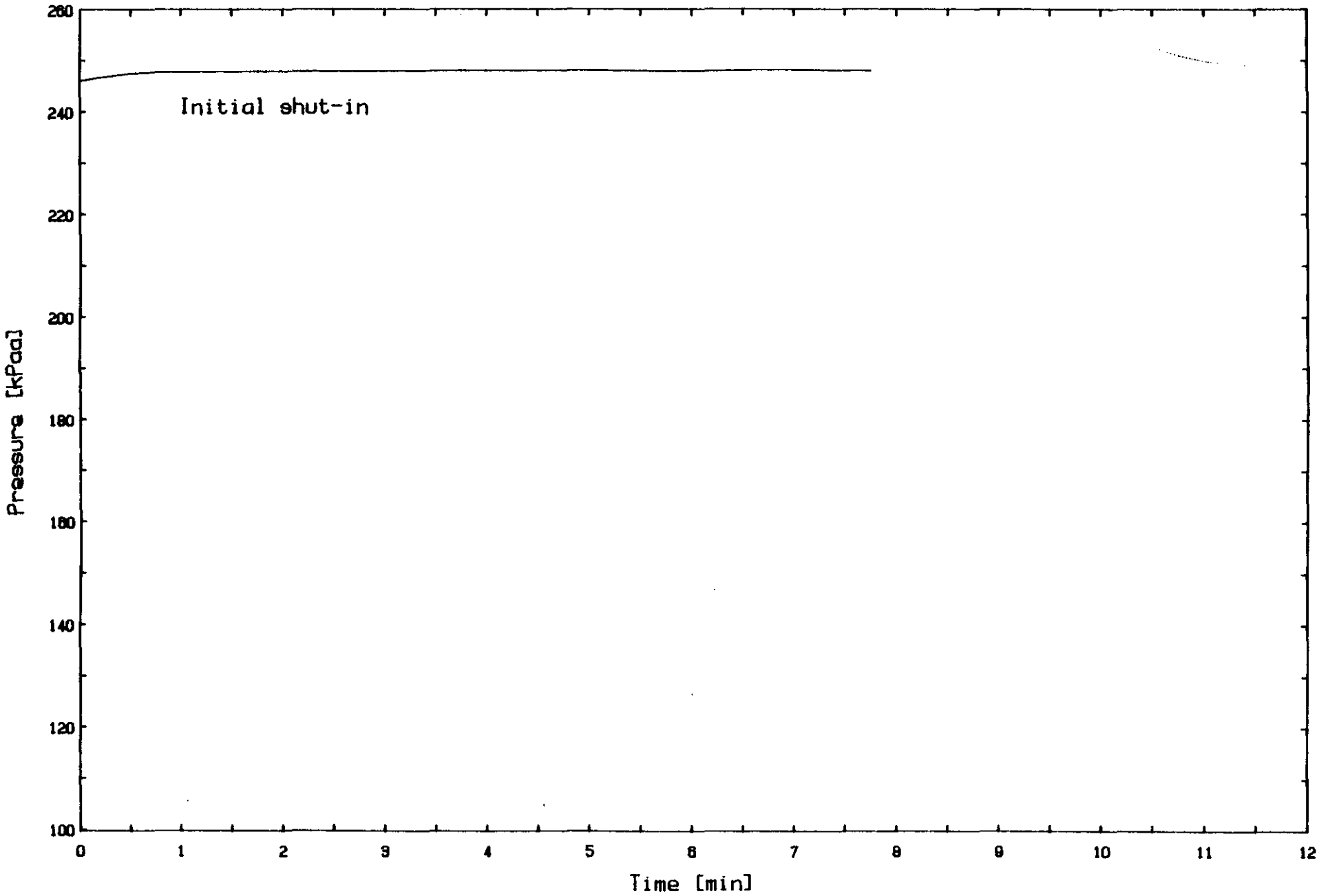
Fig. 3-2



LYNES UNITED SERVICES

PCI CANTERRA TWEED LAKE
67.000 - 125.450
DST# 1

Fig. 3-3



4. DATA LISTINGS

First flow (surface valve closed, downhole valve open)

Elapsed time min	Press kPaa	dp/dt kPa/min	Qg m^3/d
0.00	99.943	0.000	0.000
.25	100.113	.680	92.828
.50	100.322	.836	114.190
.75	102.157	7.340	1002.581
1.00	104.810	10.612	1449.508
1.25	108.128	13.272	1812.841
1.50	110.869	10.964	1497.588
1.75	114.134	13.060	1783.883
2.00	117.708	14.296	1952.710
2.25	122.179	17.884	2442.800
2.50	128.481	25.208	3443.196
2.75	135.138	26.628	3637.155
3.00	142.763	30.500	4166.037
3.25	149.998	28.940	3952.955
3.50	159.719	38.884	5311.219
3.75	168.111	33.568	4585.100
4.00	177.162	36.204	4945.154
4.25	186.555	37.572	5132.011
4.50	196.048	37.972	5186.648
4.75	207.435	45.548	6221.464
5.00	217.005	38.280	5228.718
5.25	228.602	46.388	6336.201
5.50	238.895	41.172	5623.740
5.75	245.447	26.208	3579.787

First shut-in (surface valve closed, downhole valve closed)

Elapsed time min	Press kPaa	dp/dt kPa/min
0.00	246.197	0.000
.25	247.099	3.608
.50	247.721	2.488
.75	248.011	1.160
1.00	248.044	.132
2.00	248.145	.101
3.00	248.175	.030
4.00	248.273	.098
5.00	248.240	-.033
6.00	248.134	-.106
7.00	248.245	.111

PCI CANTERRA TWEED LAKE
67.000 - 125.450
DST# 1

APPENDIX A

A.1 PRETEST PLANNING PARAMETERS AND CALCULATIONS

1	Surface temperature	273.150 deg K	measured
2	Average chamber temperature	279.250 deg K	(est. form temp + surftemp)/2
3	Chamber deviation factor(z)	.950	given
4	Sump volume	.260 m^3	calculated
5	Top packer depth	1290.000 mKB	given
6	Bottom packer depth	1301.000 mKB	given
7	Test valve depth	1278.000 mKB	given
8	Stick up above KB	3.100 mKB	given
9	Total chamber length	1280.560 m	given
10	Lower drill collar length	170.170 m	given
11	Lower drill collar ID	70.000 mm	given
12	Lower drill collar capacity	.00385 m^3/m	calculated
13	Lower drill collar volume	.655 m^3	calculated
14	Upper drill collar length	0.000 m	given
15	Upper drill collar ID	0.000 mm	given
16	Upper drill collar capacity	0.00000 m^3/m	calculated
17	Upper drill collar volume	0.000 m^3	calculated
18	Lower drill pipe length	1107.290 m	given
19	Lower drill pipe size	114.300 mm	given
20	Lower drill pipe capacity	.00740 m^3/m	given
21	Lower drill pipe volume	8.194 m^3	calculated
22	Upper drill pipe length	0.000 m	given
23	Upper drill pipe size	0.000 mm	given
24	Upper drill pipe capacity	0.00000 m^3/m	given
25	Upper drill pipe volume	0.000 m^3	calculated
26	Total chamber volume	8.849 m^3	total of tubular volumes
27	Water cushion length	0.000 m	measured
28	Water cushion volume	0.000 m^3	calculated
29	Net air/gas volume	8.849 m^3	calculated
30	Minimum time to produce sump volume	.431 min	calculated
31	Corresponding surface pressure increase	3.275 kPa	calculated

A.2 MAXIMUM POSSIBLE RATES OF dp/dt AND FLOW:

32	Gas	2549.68 kPa/min	348264.60 m^3/d	
33	Gas saturated water	22.64 kPa/min	2084.62 G/	868.59 M m^3/d
34	Gas free water	7.38 kPa/min	868.59 m^3/d	

A.3 PRETEST PLANNING SUMMARY

From the above parameters it is clear that a surface pressure change greater than 2549.682 kPa/min would not occur during this test. Surface pressure changes greater than 22.637 kPa/min indicate hydrocarbon influx, and pressure changes less than 7.376 kPa/min may indicate liquid or low rate gas.

If gas is produced, a surface pressure increase of 1 kPa/min corresponds to 136.591 m^3/d of gas influx to the chamber.

9211-P28-1-6

CORE LABORATORIES - CANADA, LTD.

Petroleum Reservoir Engineering

PERMEABILITY VALUES REPRESENT MEASUREMENTS ON AIR-DRIED, NON-EXTRACTED SAMPLES ONLY. POROSITY DERIVED FROM SUMMATION OF FLUIDS METHOD.

CORE ANALYSIS

PETRO-CANADA EXPLORATION INC.
PCI CANTERRA TWEED LAKE A-67
TWEED LAKE, NORTHWEST TERRITORIE
58°11' NLAT, 126 56'18" WLONG,
85-12-12

CORE LABORATORIES — CANADA, LTD.

COMPANY PETRO-CANADA EXPLORATION INC.
WELL PCI CANTERRA TWEED LAKE A-67
FIELD TWEED LAKE, NORTHWEST TERRITORIE
LOCATION 66 56'11" NLAT. 126 56'18" WLONG.

FORMATION MOUNT CLARK
CORING EQUIPMENT DIAMOND
CORE DIAMETER.(mm) 89
CORING FLUID WATER BASE MUD

PAGE 1
FILE 70175-85-1593c
DATE 85-12-12
ANALYSTS CL

DEC 17 1985

FULL DIAMETER ANALYSIS

PERMEABILITY VALUES REPRESENT MEASUREMENTS ON AIR-DRIED, NON-EXTRACTED SAMPLES ONLY. POROSITY DERIVED FROM SUMMATION OF FLUIDS METHOD.

Sample Number	Depth Metres (m)	m Rep.	Sample Length	Permeability to Air Millidarcys mD Max.	mD 90 deg.	mD V	Perm. X m	Porosity	Porosity X m	Density kg/m3 Bulk	Density kg/m3 Grain	Residual Saturation (Frac of Pore Vol) Oil	Residual Saturation (Frac of Pore Vol) Water	VISUAL EXAMINATION
	CORE NO. 1 1276.00 m - 1287.50 (core received 11.50 m) (8 Boxes)													
-	1276.00-78.29	2.29	-	-	-	-	-	-	-	-	-	-	-	dol shy sdy
1	1278.29-78.64	0.35	-	5.18	-	-	1.813	0.091	0.032	-	-	trace	0.572	
2	1278.64-78.94	0.30	-	0.97	-	-	0.291	0.114	0.034	-	-	0.060	0.253	
3	1278.94-79.13	0.19	-	1.13	-	-	0.215	0.156	0.030	-	-	0.042	0.355	
4	1279.13-79.38	0.25	-	6.19	-	-	1.548	0.118	0.029	-	-	0.000	0.615	
5	1279.38-79.59	0.21	-	1.02	-	-	0.214	0.107	0.022	-	-	0.045	0.450	
6	1279.59-79.95	0.36	-	0.72	-	-	0.259	0.102	0.037	-	-	0.069	0.345	
ASIS	1279.95-80.04	0.09	-	1.02	-	-	0.092	-	-	-	-	-	-	
7	1280.04-80.34	0.30	-	0.08	-	-	0.024	0.065	0.020	-	-	trace	0.398	
8	1280.34-80.53	0.19	-	0.13	-	-	0.025	0.109	0.021	-	-	0.082	0.404	
9	1280.53-80.84	0.31	-	0.14	-	-	0.044	0.100	0.031	-	-	0.069	0.249	
10	1280.84-81.37	0.53	-	0.05	-	-	0.025	0.099	0.052	-	-	0.070	0.195	
11	1281.37-81.98	0.61	-	0.20	-	-	0.122	0.101	0.062	-	-	0.135	0.385	
12	1281.98-82.27	0.29	-	1.33	-	-	0.386	0.066	0.019	-	-	0.108	0.210	
13	1282.27-82.86	0.59	-	0.70	-	-	0.413	0.141	0.083	-	-	0.061	0.222	
14	1282.86-83.13	0.27	-	0.64	-	-	0.173	0.113	0.031	-	-	0.118	0.320	
-	1283.13-85.18	2.05	-	-	-	-	-	-	-	-	-	-	-	dol sdy shy
-	1285.18-87.50	2.32	-	-	-	-	-	-	-	-	-	-	-	sh

COMPANY PETRO-CANADA EXPLORATION INC. FORMATION PAGE 2
WELL PCI CANTERRA TWEED LAKE A-67 CORING EQUIPMENT DIAMOND FILE 70175-85-1593c

FULL DIAMETER ANALYSIS

PERMEABILITY VALUES REPRESENT MEASUREMENTS ON AIR-DRIED, NON-EXTRACTED SAMPLES ONLY. POROSITY FROM SUMMATION OF FLUIDS METHOD.

Sample Number	Depth Metres (m)	m Rep.	Sample Length	Permeability to Air Millidarcys mD Max.	mD 90 deg.	mD V	Perm. X m	Porosity	Porosity X m	Density kg/m3 Bulk	Grain	Residual Saturation (Frac of Pore Vol) Oil	Water	VISUAL EXAMINATION
	CORE NO. 2 1287.60 m - 1302.10 (core received 14.50 m) (10 Boxes)													
-	1287.60-88.74	1.14	-	-	-	-	-	-	-	-	-	-	-	sh shy
15	1288.74-88.90	0.16	-	2.64	-	-	0.423	0.099	0.016	-	-	0.000	0.468	
16	1288.90-89.16	0.26	-	9.14	-	-	2.376	0.039	0.010	-	-	0.000	0.570	
SP 17	1289.16-89.28	0.12	-	0.14	-	-	0.017	0.094	0.011	-	-	0.051	0.369	
18	1289.28-89.83	0.55	-	0.80	-	-	0.440	0.134	0.074	-	-	trace	0.474	
SP 19	1289.83-90.15	0.32	-	-	-	-	-	0.167	0.053	-	-	0.000	0.664	frac
20	1290.15-90.54	0.39	-	-	-	-	-	0.139	0.054	-	-	0.000	0.630	frac
21	1290.54-90.97	0.43	-	0.74	-	-	0.318	0.096	0.041	-	-	0.000	0.279	
SP 22	1290.97-91.21	0.24	-	0.26	-	-	0.067	0.058	0.014	-	-	0.000	0.277	
23	1291.21-91.46	0.25	-	2.31	-	-	0.577	0.126	0.031	-	-	0.000	0.373	
24	1291.46-91.75	0.29	-	0.97	-	-	0.281	0.071	0.021	-	-	0.000	0.626	
SP 25	1291.75-91.94	0.19	-	0.37	-	-	0.070	0.074	0.014	-	-	0.000	0.713	
SP 26	1291.94-92.13	0.19	-	0.12	-	-	0.023	0.078	0.015	-	-	0.000	0.736	
27	1292.13-92.51	0.38	-	8.28	-	-	3.146	0.132	0.050	-	-	0.000	0.551	
28	1292.51-93.14	0.63	-	23.9	-	-	15.057	0.109	0.069	-	-	0.000	0.347	
SP 29	1293.14-93.59	0.45	-	0.21	-	-	0.095	0.094	0.042	-	-	0.073	0.368	
30	1293.59-93.81	0.22	-	2.21	-	-	0.486	0.054	0.012	-	-	0.131	0.366	
SP 31	1293.81-94.53	0.72	-	-	-	-	-	0.103	0.074	-	-	0.067	0.298	frac
SP 32	1294.53-94.68	0.15	-	0.03	-	-	0.005	0.102	0.015	-	-	0.068	0.380	
SP 33	1294.68-95.08	0.40	-	0.06	-	-	0.024	0.068	0.027	-	-	0.134	0.200	
SP 34	1295.08-95.71	0.63	-	0.27	-	-	0.170	0.111	0.070	-	-	0.157	0.239	
SP 35	1295.71-95.92	0.21	-	0.58	-	-	0.122	0.134	0.028	-	-	0.173	0.206	
AS134	1295.92-96.28	0.36	-	0.27	-	-	0.097	0.111	0.040	-	-	0.157	0.239	
AS135	1296.28-96.35	0.07	-	0.03	-	-	0.002	0.102	0.007	-	-	0.068	0.380	
36	1296.35-96.65	0.30	-	0.36	-	-	0.108	0.091	0.027	-	-	0.170	0.209	

CORE LABORATORIES - CANADA, LTD.

COMPANY PETRO-CANADA EXPLORATION INC. FORMATION PAGE 3
WELL PCI CANTERRA TWEED LAKE A-67 CORING EQUIPMENT DIAMOND FILE 70175-85-1593c

DEC 17 1985

FULL DIAMETER ANALYSIS

PERMEABILITY VALUES REPRESENT MEASUREMENTS ON AIR-DRIED, NON-EXTRACTED SAMPLES ONLY. POROSITY BY SATURATION/SUBTRACTION OF FLUIDS METHOD.

Sample Number	Depth Metres (m)	m Rep.	Sample Length	Permeability to Air Millidarcys mD Max.	mD 90 deg.	mD V	Perm. X m	Porosity	Porosity X m	Density kg/m3 Bulk	Grain	Residual Saturation (Frac of Pore Vol) Oil	Water	VISUAL EXAMINATION
	CORE NO. 2 CONTINUED													
SF 37	1296.65-97.15	0.50	-	0.60	-	-	0.300	0.100	0.050	-	-	0.197	0.268	
SF 38	1297.15-97.90	0.75	-	0.52	-	-	0.390	0.081	0.061	-	-	0.141	0.316	
AST36	1297.90-97.98	0.08	-	0.36	-	-	0.029	0.091	0.007	-	-	0.170	0.209	
SF 39	1297.98-98.38	0.40	-	0.25	-	-	0.100	0.076	0.030	-	-	0.179	0.384	
SF 40	1298.38-98.59	0.21	-	0.06	-	-	0.013	0.058	0.012	-	-	0.000	0.771	
41	1298.59-98.88	0.29	-	-	-	-	-	0.070	0.020	-	-	0.000	0.806	
-	1298.88- 2.10	3.22	-	-	-	-	-	-	-	-	-	-	-	sh shy

24.3

CORE LABORATORIES — CANADA, LTD.

CODE KEY — DESCRIPTIONS

anhy = Anhydrite
ASI = Appears similiar to
brk = Break
bldr = Boulder
c = Coarse
calc = Calcite (areous)
carb = Carbonaceous
cbl = Cobble
CEC = Cation exchange capacity
cgl = Conglomerate
cht = Chert
coal = Coal/Coal Inclusion
dol = Dolomite
f = Fine
fest = Ironstone
foss = Fossil (iferous)
frac = Fracture
fri = Friable
glauc = Glauconite (ic)
grnl = Granule
gyp = Gypsum
h frac = Horizontal fracture
hal = Halite (Salt)
i = Intersranular
lam = Laminae (Laminated)
lmy = Limy
ls = Limestone
lv = Large vug
m = Medium
mi = Mud invaded
mic = Micaceous
mshy or shy = Moderately shaly (20-40%)
mv = Medium vug
NA = Not analysed by request
NP = No permeability measurement
ool = Oolitic
OB = Overburden
P = Preserved for future studies
pbl = Pebble
POA = portion removed for oil analysis
ppv = Pinpoint Vug
PSA = Particle size analysis
pyr = Pyrite (ic)
pyrbit = Pyrobitumen
SCAL = removed for special core analysis
sdy = Sandy
SEM = Scanning electron microscope analysis
sh = Shale
sltst = Siltstone
slty = Silty
ss = Sandstone
sshy = Slightly Shaly(<20%)
sty = Stylolite (ic)
sulf = Sulphur
sv = small vug
tr = Trace
TS = Thin section
uncons = Unconsolidated
vfrac = Vertical fracture
vf = Very fine
VOB = Vertical overburden sample
vshy = Very shaly (>40%)
vug = Vuggy (ular)
* = broken core
** = Permeability > 10240 mD
SA = Sieve Analysis

CLEANING

Solvent	TOLUENE
Extraction Equipment	CO2/VAPOR PHASE
Extraction Time	36 HOURS/18 HOURS
Drying Equipment	FRICTION AIR
Drying Time	1 HOUR/2 HOURS
Drying Temperature	90 DEGREES C

ANALYSIS

Pore volume measured by Boyle's Law in a Hassler holder using He
Grain vol msrd by Boyle's Law in a modified U.S.B.M. porosimeter using He
Grain volume measured by Boyle's Law in a matrix cup using He
Bulk volume measured by calipering
Bulk Volume by Archimedes Principle
X Porosity determined by summation of fluids (retort)
Fluid saturations by retort on end pieces of full diameter samples
X Fluid saturation by retort
Water saturations by Dean-Stark
Oil saturations by weight difference in Dean-Stark
Permeabilities measured on 20mm cubes
X Permeabilities measured on 25.4 mm diameter drilled plugs
X Core Gamma Composite
Core Gamma Spectral

REMARKS:

...GHT MEASUREMENTS ON ... SAMPLES ONLY. POROSITY ... CONTROL OF FLUIDS METHOD.

DEC 17 1985

CORE LABORATORIES – CANADA, LTD.

LAB *Petroleum Reservoir Engineering*

COMPANY PETRO-CANADA EXPLORATION INC. FILE NO. 70175-85-1593C

WELL PCI CANTERRA TWEED LAKE A-67 DATE

FIELD TWEED LAKE FORMATION MOUNT CLARK ELEV.

PROVINCE NORTHWEST TERRITORIES DRLG. FLD. WATER BASE MUD CORES 1,2

LOCATION 66° 56'11" NLAT. 126° 56'18" WLONG.

CORRELATION COREGRAPH

VERTICAL SCALE: 10 cm = 24m

Gamma Ray
API UNITS
0 200

Depth meters

Grain Density (Kg/m³) — — —
2550 2650 2750 2850 2950

Porosity (FRACTION) ———
.60 .45 .30 .15 0

1275
1285
1295
1305
1315
1325

CORE LABORATORIES - CANADA LTD.
Petroleum Reservoir Engineering
CALGARY ALBERTA

GAS ANALYSIS

CALGARY COPY

DST Chamber #176 — CONTAINER IDENTITY
70380-86-263 — LABORATORY NUMBER

Petro-Canada Inc. — OPERATOR
1 of 8 — PAGE

66° 56' 11.60" NL
125° 56' 18.88" WL — LOCATION
PCI Canterra Tweed Lake A-67 — WELL OR SAMPLE LOCATION NAME
397.10 — KB ELEV m
390.90 — GRD ELEV m

Northwest Territories — FIELD OR AREA
Basal Sand MT Clark — POOL OR ZONE
Lynes United Services — SAMPLER

DST #1 — TEST TYPE & NUMBER
TOOL: 200 mL Muddy Water, 100 mL Condensate — TEST RECOVERY

DST Chamber #176 — POINT OF SAMPLE
AMOUNT & TYPE OF CUSHION
@ C — MUD RESISTIVITY

PUMPING FLOWING GAS LIFT SWAB

1290 - 1301 — TEST INTERVALS OR PERFS. m

WATER m³/d OIL m³/d GAS m³/d

SEPARATOR RESERVOIR — @ °C — CONTAINER WHEN SAMPLED
1875 @ 21 °C — CONTAINER WHEN RECEIVED
SEPARATOR

PRESSURES, kPa (gauge) — TEMPERATURES, °C

1985 12 17 — DATE SAMPLED (Y/M/D)
1986 02 04 — DATE RECEIVED(Y/M/D)
1986 02 04 — DATE ANALYZED (Y/M/D)
RH — ANALYST
REMARKS

COMPONENT	MOLE FRACTION AIR FREE AS RECEIVED	MOLE FRACTION AIR FREE ACID GAS FREE	mL/m³ AIR FREE AS RECEIVED
H_2	0.0001		
He	0.0070		
N_2	0.2064		
CO_2	TRACE		
H_2S	0.0000		
C_1	0.6615		
C_2	0.0672		
C_3	0.0265		97.5
iC_4	0.0070		30.6
C_4	0.0095		40.0
iC_5	0.0054		26.4
C_5	0.0035		16.9
C_6	0.0045		24.7
C_7+	0.0014		9.6
TOTAL	1.0000		245.7
		C_5+	77.6

CALCULATED GROSS HEATING VALUE
MJ/m³ @ 15° C & 101.325 kPa (abs.)

36.37 — MOISTURE FREE
36.34 — MOISTURE & ACID GAS FREE

CALCULATED VAPOUR PRESSURE
kPa (abs.) @ 37.8° C

87.5 — PENTANES PLUS

CALCULATED TOTAL SAMPLE PROPERTIES (AIR=1) @ 15° C & 101.325 kPa
MOISTURE FREE AS SAMPLED

0.920 kg/m³ — DENSITY
0.751 57°API — RELATIVE DENSITY
21.7 — RELATIVE MOLECULAR MASS

CALCULATED PSEUDOCRITICAL PROPERTIES

AS SAMPLED		ACID GAS FREE	
4298.3 kPa (abs.)	196.6 K	kPa (abs.)	K
pPc	pTc	pPc	pTc

REMARKS

Note: The Gross Heating Value has been calculated in accordance to AGA Report #5

CORE LABORATORIES-CANADA LTD.

COMPANY Petro-Canada Inc. PAGE 2 of 8
LOCATION PCI Canterra Tweed Lake A-67 FILE 70380-86-263
SAMPLED FROM Condensate recovered from DST Chamber #176 DATE 1986 02 06

Analysis to C30+

Boiling Point Range (C)	Component	Carbon Number	Mole Fraction	Mass Fraction
-161.7	Methane	C1	0.0000	0.0000
- 88.9	Ethane	C2	0.0005	0.0001
- 42.2	Propane	C3	0.0037	0.0015
- 11.7	Iso Butane	C4	0.0057	0.0031
- 0.6	Normal Butane	C4	0.0154	0.0083
27.8	Iso Pentane	C5	0.0338	0.0227
36.1	Normal Pentane	C5	0.0326	0.0219
36.1- 68.9	Hexanes	C6	0.1429	0.1146
68.9- 98.3	Heptanes	C7	0.2005	0.1870
98.3-125.6	Octanes	C8	0.1944	0.2066
125.6-150.6	Nonanes	C9	0.0899	0.1074
150.6-173.9	Decanes	C10	0.0743	0.0984
173.9-196.1	Undecanes	C11	0.0358	0.0521
196.1-215.0	Dodecanes	C12	0.0210	0.0333
215.0-235.0	Tridecanes	C13	0.0027	0.0046
235.0-252.2	Tetradecanes	C14	0.0015	0.0029
252.2-270.6	Pentadecanes	C15	0.0010	0.0021
270.6-287.8	Hexadecanes	C16	0.0008	0.0016
287.8-302.8	Heptadecanes	C17	0.0004	0.0008
302.8-317.2	Octadecanes	C18	0.0002	0.0005
317.2-330.0	Nonadecanes	C19	0.0001	0.0003
330.0-344.4	Eicosanes	C20	0.0000	0.0001
344.4-357.2	Heneicosanes	C21	0.0000	0.0000
357.2-369.4	Docosanes	C22	0.0000	0.0000
369.4-380,0	Tricosanes	C23	0.0000	0.0000
380.0-391.1	Tetracosanes	C24	0.0000	0.0000
391.1-401.7	Pentacosanes	C25	0.0000	0.0000
401.7-412.2	Hexacosanes	C26	0.0000	0.0000
412.2-422.2	Heptacosanes	C27	0.0000	0.0000
422.2-431.7	Octacosanes	C28	0.0000	0.0000
431.7-441.1	Nonacosanes	C29	0.0000	0.0000
441.1 PLUS	Triacontanes Plus	C30+	0.0000	0.0000
	AROMATICS			
80.0	Benzene	C6H6	0.0015	0.0011
110.6	Toluene	C7H8	0.0091	0.0078
136.1-138.9	Ethylbenzene, p + m-Xylene	C8H10	0.0422	0.0417
144.4	o-Xylene	C8H10	0.0094	0.0093
168.9	1,2,4 Trimethylbenzene	C9H12	0.0059	0.0066
	NAPHTHENES			
48.9	Cyclopentane	C5H10	0.0047	0.0031
72.2	Methylcyclopentane	C6H12	0.0145	0.0114
81.1	Cyclohexane	C6H12	0.0128	0.0101
101.1	Methylcyclohexane	C7H14	0.0427	0.0390
	TOTAL		1.0000	1.0000

The above hexanes plus values are based upon a measured mass fraction and a calculated mole fraction, and assume a total hydrocarbon recovery from the chromatographic system.

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Petroleum Reservoir Engineering
CALGARY ALBERTA

GAS ANALYSIS

DST Chamber #302 — CONTAINER IDENTITY
70380-86-263 — LABORATORY NUMBER

Petro-Canada Inc. — OPERATOR
3 of 8 — PAGE

66° 56' 11.60" NL
125° 56' 18.88" WL — LOCATION
PCI Canterra Tweed Lake A-67 — WELL OR SAMPLE LOCATION NAME
397.10 — KB ELEV m
390.90 — GRD ELEV m

Northwest Territories — FIELD OR AREA
Basal Sand MT Clark — POOL OR ZONE
Lynes United Services — SAMPLER

DST #1 — TEST TYPE & NUMBER
TOOL: 250 mL Muddy Water, 25 mL Condensate — TEST RECOVERY

DST Chamber #302 — POINT OF SAMPLE
AMOUNT & TYPE OF CUSHION
@ C — MUD RESISTIVITY

PUMPING FLOWING GAS LIFT SWAB

1290 - 1301 — TEST INTERVALS OR PERFS, m

WATER m^3/d OIL m^3/d GAS m^3/d

SEPARATOR RESERVOIR — @ °C CONTAINER WHEN SAMPLED — 500 @ 21 °C CONTAINER WHEN RECEIVED — SEPARATOR

PRESSURES, kPa (gauge) — TEMPERATURES, °C

1985 12 17 — DATE SAMPLED (Y/M/D)
1986 02 04 — DATE RECEIVED (Y/M/D)
1986 02 04 — DATE ANALYZED (Y/M/D)
RH — ANALYST
REMARKS

COMPONENT	MOLE FRACTION AIR FREE AS RECEIVED	MOLE FRACTION AIR FREE ACID GAS FREE	mL/m³ AIR FREE AS RECEIVED
H_2	0.0004		
He	0.0053		
N_2	0.1650		
CO_2	TRACE		
H_2S	0.0000		
C_1	0.6386		
C_2	0.0903		
C_3	0.0538		197.9
iC_4	0.0132		57.7
C_4	0.0158		66.5
iC_5	0.0070		34.2
C_5	0.0041		19.8
C_6	0.0049		26.9
C_7+	0.0016		10.9
TOTAL	1.0000		413.9
		C_5+	91.8

CALCULATED GROSS HEATING VALUE
MJ/m³ @ 15° C & 101.325 kPa (abs.)

41.60 — MOISTURE FREE
41.59 — MOISTURE & ACID GAS FREE

CALCULATED VAPOUR PRESSURE
kPa (abs.) @ 37.8° C

90.9 — PENTANES PLUS

CALCULATED TOTAL SAMPLE PROPERTIES (AIR=1) @ 15° C & 101.325 kPa
MOISTURE FREE AS SAMPLED

0.975 kg/m³ — DENSITY
0.796 — RELATIVE DENSITY
23.0 — RELATIVE MOLECULAR MASS

CALCULATED PSEUDOCRITICAL PROPERTIES

AS SAMPLED		ACID GAS FREE	
4336.5 kPa (abs.)	210.7 K	kPa (abs.)	K
pPc	pTc	pPc	pTc

REMARKS

Note: The Gross Heating Value has been calculated in accordance to AGA Report #5.

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Petroleum Reservoir Engineering
CALGARY ALBERTA

DST Chamber #302 (CONTAINER IDENTITY)		70380-86-263 (LABORATORY NUMBER)
66° 56' 11.60" NL	Petro-Canada Inc. (OPERATOR)	4 of 8 (PAGE)
125° 56' 18.88 WL (LOCATION)	PCI Canterra Tweed Lake A-67 (WELL OR SAMPLE LOCATION NAME)	397.10 KB ELEV / 390.90 GRD ELEV
Northwest Territories (FIELD OR AREA)	Basal Sand MT Clark (POOL OR ZONE)	Lynes United Services (SAMPLER)
DST #1 (TEST TYPE & NO.)	TOOL: 250 mL Muddy Water, 25 mL Condensate (TEST RECOVERY)	
DST Chamber #302 (POINT OF SAMPLE)	(AMT. & TYPE CUSHION)	@ °C (MUD RESISTIVITY)
1290 - 1301 (TEST INTERVALS OR PERFS)	PUMPING / FLOWING / GAS LIFT / SWAB WATER m³/d OIL m³/d GAS m³/d	
SEPARATOR RESERVOIR PRESSURES, kPa	@ °C CONTAINER WHEN SAMPLED; @ °C CONTAINER WHEN RECEIVED	SEPARATOR TEMPERATURES, °C
1985 12 17 (DATE SAMPLED Y/M/D)	1986 02 04 (DATE RECEIVED Y/M/D)	1986 02 05 (DATE ANALYSED Y/M/D) LS (ANALYST) (REMARKS)

MUD FILTRATE ANALYSIS

Resistivity (Ohm-meters at 25°C) = 0.040

Chloride (mg/litre) = 169500

4.9/1 - 1[illegible]-E

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Petroleum Reservoir Engineering
CALGARY ALBERTA

GAS ANALYSIS

6694 — CONTAINER IDENTITY

70380-86-263 — LABORATORY NUMBER

Petro-Canada Inc. — OPERATOR

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66° 56' 11.60" NL
125° 56' 18.88" WL — LOCATION

PCI Canterra Tweed Lake A-67 — WELL OR SAMPLE LOCATION NAME

397.10 — KB ELEV m

390.90 — GRD ELEV m

Northwest Territories — FIELD OR AREA

Basal Sand MT Clark — POOL OR ZONE

Lynes United Services — SAMPLER

DST #1 — TEST TYPE & NUMBER

TEST RECOVERY

Bubble Hose — POINT OF SAMPLE

AMOUNT & TYPE OF CUSHION

@ °C — MUD RESISTIVITY

1290 - 1301 — TEST INTERVALS OR PERFS. m

PUMPING FLOWING GAS LIFT SWAB

WATER m³/d OIL m³/d GAS m³/d

SEPARATOR RESERVOIR — @ °C CONTAINER WHEN SAMPLED — 175 @ 21 °C CONTAINER WHEN RECEIVED — SEPARATOR

PRESSURES, kPa (gauge) — TEMPERATURES, °C

1985 12 17 — DATE SAMPLED (Y/M/D)

1986 02 04 — DATE RECEIVED(Y/M/D)

1986 02 04 — DATE ANALYZED (Y/M/D)

RH — ANALYST

REMARKS

COMPONENT	MOLE FRACTION AIR FREE AS RECEIVED	MOLE FRACTION AIR FREE ACID GAS FREE	mL/m³ AIR FREE AS RECEIVED
H_2	0.0000		
He	0.0070		
N_2	0.2102		
CO_2	0.0004		
H_2S	0.0000		
C_1	0.6880		
C_2	0.0637		
C_3	0.0178		65.5
iC_4	0.0036		15.7
C_4	0.0045		18.9
iC_5	0.0018		8.8
C_5	0.0010		4.8
C_6	0.0014		7.7
C_{7+}	0.0006		4.1
TOTAL	1.0000		125.5
		C_{5+}	25.4

CALCULATED GROSS HEATING VALUE
MJ/m³ @ 15° C & 101.325 kPa (abs.)

33.65 — MOISTURE FREE

33.65 — MOISTURE & ACID GAS FREE

CALCULATED VAPOUR PRESSURE
kPa (abs) @ 37.8° C

85.6 — PENTANES PLUS

CALCULATED TOTAL SAMPLE PROPERTIES (AIR=1) @ 15° C & 101.325 kPa
MOISTURE FREE AS SAMPLED

0.869 kg/m³ — DENSITY

0.709 — RELATIVE DENSITY

20.5 — RELATIVE MOLECULAR MASS

CALCULATED PSEUDOCRITICAL PROPERTIES

AS SAMPLED		ACID GAS FREE	
4318.7 kPa (abs.)	189.6 K	kPa (abs)	K
pPc	pTc	pPc	pTc

REMARKS

Note: The Gross Heating Value has been calculated in accordance to AGA Report #5.

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GAS ANALYSIS

DST Chamber #191 — CONTAINER IDENTITY
70380-86-263 — LABORATORY NUMBER

Petro-Canada Inc. — OPERATOR
6 of 8 — PAGE

66° 56' 11.60" NL
125° 56' 18.88" WL — LOCATION
PCI Canterra Tweed Lake A-67 — WELL OR SAMPLE LOCATION NAME
397.10 — KB ELEV m
390.90 — GRD ELEV m

Northwest Territories — FIELD OR AREA
MT Clark — POOL OR ZONE
Lynes United Services — SAMPLER

DST #2 — TEST TYPE & NUMBER
TOOL: 1500 mL Muddy Water — TEST RECOVERY

DST Chamber #191 — POINT OF SAMPLE
AMOUNT & TYPE OF CUSHION
@ C — MUD RESISTIVITY

PUMPING FLOWING GAS LIFT SWAB

1278 - 1286 — TEST INTERVALS OR PERFS, m

WATER m³/d OIL m³/d GAS m³/d

SEPARATOR RESERVOIR
@ °C — CONTAINER WHEN SAMPLED
375 @ 21 °C — CONTAINER WHEN RECEIVED
SEPARATOR

— PRESSURES, kPa (gauge) —
— TEMPERATURES, °C —

1985 12 20 — DATE SAMPLED (Y/M/D)
1986 02 04 — DATE RECEIVED(Y/M/D)
1986 02 04 — DATE ANALYZED (Y/M/D)
RH — ANALYST
REMARKS

COMPONENT	MOLE FRACTION AIR FREE AS RECEIVED	MOLE FRACTION AIR FREE ACID GAS FREE	mL/m³ AIR FREE AS RECEIVED
H_2	0.0004		
He	0.0078		
N_2	0.2259		
CO_2	TRACE		
H_2S	0.0000		
C_1	0.6806		
C_2	0.0601		
C_3	0.0149		54.8
iC_4	0.0028		12.2
C_4	0.0035		14.7
iC_5	0.0012		5.9
C_5	0.0007		3.4
C_6	0.0008		4.4
C_{7+}	0.0013		8.9
TOTAL	1.0000		104.3
		C_5+	22.6

CALCULATED GROSS HEATING VALUE
MJ/m³ @ 15° C & 101.325 kPa (abs.)

32.54 — MOISTURE FREE
32.53 — MOISTURE & ACID GAS FREE

CALCULATED VAPOUR PRESSURE
kPa (abs.) @ 37.8° C

69.1 — PENTANES PLUS

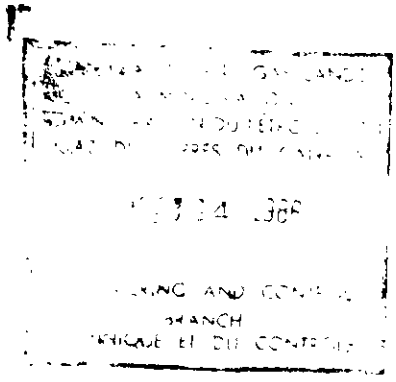
CALCULATED TOTAL SAMPLE PROPERTIES (AIR=1) @ 15° C & 101.325 kPa
MOISTURE FREE AS SAMPLED

0.865 kg/m³ — DENSITY
0.706 — RELATIVE DENSITY
20.4 — RELATIVE MOLECULAR MASS

CALCULATED PSEUDOCRITICAL PROPERTIES

AS SAMPLED		ACID GAS FREE	
4296.0 kPa (abs.)	186.8 K	kPa (abs.)	K
pPc	pTc	pPc	pTc

REMARKS



Note: The Gross Heating Value has been calculated in accordance to AGA Report #5.

FORM NO 7012-1

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Petroleum Reservoir Engineering
CALGARY ALBERTA

DST Chamber #191 (CONTAINER IDENTITY)		70380-86-263 (LABORATORY NUMBER)
	Petro-Canada Inc. (OPERATOR)	7 of 8 (PAGE)
66° 56' 11.60" NL 125° 56' 18.88 WL (LOCATION)	PCI Canterra Tweed Lake A-67 (WELL OR SAMPLE LOCATION NAME)	397.10 KB ELEV; 399.90 GRD ELEV
Northwest Territories (FIELD OR AREA)	MT Clark (POOL OR ZONE)	Lynes United Services (SAMPLER)
DST #2 (TEST TYPE & NO.)	TOOL: 1500 mL Muddy Water (TEST RECOVERY)	
DST Chamber #191 (POINT OF SAMPLE)	(AMT. & TYPE CUSHION)	@ °C (MUD RESISTIVITY)
1278 - 1286 (TEST INTERVALS OR PERFS)	PUMPING / FLOWING / GAS LIFT / SWAB WATER m³/d OIL m³/d GAS m³/d	
SEPARATOR RESERVOIR	@ °C CONTAINER WHEN SAMPLED; @ °C CONTAINER WHEN RECEIVED	SEPARATOR
PRESSURES, kPa		TEMPERATURES, °C
1985 12 20 (DATE SAMPLED Y/M/D)	1986 02 04 (DATE RECEIVED Y/M/D)	1986 02 05 (DATE ANALYSED Y/M/D); LS (ANALYST); (REMARKS)

MUD FILTRATE ANALYSIS

Resistivity (Ohm-meters at 25°C) = 0.040

Chloride (mg/litre) = 168047

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Petroleum Reservoir Engineering
CALGARY ALBERTA

GAS ANALYSIS

6672 — CONTAINER IDENTITY
70380-86-263 — LABORATORY NUMBER

Petro-Canada Inc. — OPERATOR
8 of 8 — PAGE

66° 56' 11.60" NL
125° 56' 18.88" WL — LOCATION
PCI Canterra Tweed Lake A-67 — WELL OR SAMPLE LOCATION NAME
397.10 — KB ELEV m
399.90 — GRD ELEV m

Northwest Territories — FIELD OR AREA
MT Clark — POOL OR ZONE
Lynes United Services — SAMPLER

DST #2 — TEST TYPE & NUMBER
TEST RECOVERY

Bubble Hose — POINT OF SAMPLE
AMOUNT & TYPE OF CUSHION
@ °C — MUD RESISTIVITY

PUMPING FLOWING GAS LIFT SWAB

1278 - 1286 — TEST INTERVALS OR PERFS., m

WATER m³/d OIL m³/d GAS m³/d

SEPARATOR RESERVOIR — @ C CONTAINER WHEN SAMPLED — 15 @ 21 °C CONTAINER WHEN RECEIVED — SEPARATOR

PRESSURES, kPa (gauge) — TEMPERATURES, °C

1985 12 19 — DATE SAMPLED (Y/M/D)
1986 02 04 — DATE RECEIVED(Y/M/D)
1986 02 04 — DATE ANALYZED (Y/M/D)
RH — ANALYST
REMARKS

COMPONENT	MOLE FRACTION AIR FREE AS RECEIVED	MOLE FRACTION AIR FREE ACID GAS FREE	mL/m³ AIR FREE AS RECEIVED
H_2	TRACE		
He	0.0073		
N_2	0.2297		
CO_2	0.0021		
H_2S	0.0000		
C_1	0.6723		
C_2	0.0607		
C_3	0.0165		60.7
iC_4	0.0033		14.4
C_4	0.0042		17.7
iC_5	0.0016		7.8
C_5	0.0010		4.8
C_6	0.0011		6.0
C_7+	0.0002		1.4
TOTAL	1.0000		112.8
		C_5+	20.0

CALCULATED GROSS HEATING VALUE
MJ/m³ @ 15° C & 101 325 kPa (abs.)

32.49 — MOISTURE FREE
32.56 — MOISTURE & ACID GAS FREE

CALCULATED VAPOUR PRESSURE
kPa (abs.) @ 37.8° C

95.2 — PENTANES PLUS

CALCULATED TOTAL SAMPLE PROPERTIES (AIR=1) @ 15° C & 101.325 kPa
MOISTURE FREE AS SAMPLED

0.873 kg/m³ — DENSITY
0.712 — RELATIVE DENSITY
20.6 — RELATIVE MOLECULAR MASS

CALCULATED PSEUDOCRITICAL PROPERTIES

AS SAMPLED		ACID GAS FREE	
4300.3 kPa (abs.)	187.5 K	kPa (abs.)	K
pPc	pTc	pPc	pTc

REMARKS

Note: The Gross Heating Value has been calculated in accordance to AGA Report #5

A-67

THE EARLY CAMBRIAN TWEED LAKE GASFIELD AND RELATED GAS OCCURRENCES

NORTHWEST TERRITORIES CANADA

J.M Bever
I.A. McIlreath

June, 1992

*THE EARLY CAMBRIAN TWEED LAKE GASFIELD AND RELATED GAS OCCURRENCES, NORTHWEST TERRITORIES, CANADA

* **Presentation prepared for the 1992 AAPG Convention Session on Sub-Devonian Plays of North America, in the Big Four/Upper Level on Wednesday, June 24 at 2:00 P.M.**

Introduction

Exploration success in Cambrian sediments in the remote northern reaches of Canada has proven the existence of source rocks for both gas and oil, sandstone reservoirs with fair to good reservoir quality and structural traps which contain large recoverable reserves of natural gas.

This Early-Middle Cambrian play can be characterized as follows:

- The traps are high relief, fault-bounded, anticlinal structural closures within a North-South fairway that is at least 130 by 20 km in length. Gas (and possibly oil) is contained in laterally continuous marine and nearshore sandstones which are top-sealed by widespread Middle Cambrian marine shales and Upper Cambrian evaporites.

- The hydrocarbon source is predominately from algal-rich intervals in the overlying shales and carbonates. The total gas composition is peculiar, with a large proportion (>20% by volume) of inorganic gases consisting mainly of nitrogen.

- The current estimated combined proven and probable natural gas reserve is 240 BCF in three separate gasfields. However the play type is considered to be

only in its infancy and there maybe over 1 TCF of gas sales yet to be discovered. Development of this play has been stalled since 1986, any exploitation of the known reserves and future exploration for additional reserves will require the building of pipelines and infrastructure for gas production.

These are the key parameters which characterize this play. For the remainder of this talk we want to provide you with a sense of location, the geologic setting and details of this unique gas occurrence by focusing on the Tweed Lake gasfield

Location

A present day view of the study area as seen from the North Pole show it between 65° and 69° North Latitude and 123°-129° Longitude, just North of Great Bear Lake and East of the Mackenzie River. The study area in the Colville Hills is about 1800 km (or greater than a thousand miles) north of Calgary. The study area and the location of the well control is shown on the accompanying regional map. The orientation of a regional stratigraphic cross section is outlined by the line A-A' extending from Tedji Lake to Bele.

Stratigraphy

This cross-section is datumed on the base of the Siluro-Ordovician Franklin Mountain Formation. The cross-section is along the longitudinal axis of the Cambrian-aged sedimentary basin and displays the tripartite formational subdivision of the Cambrian

section. The Cambrian stratigraphy from bottom-up consists of the Lower Cambrian Mount Clark comprised of sandstones and siltstones, the Lower to Middle Cambrian Mount Cap consisting of mostly shales, siltstones and carbonates and the Middle to Upper Cambrian Saline River dominated by evaporites. The Saline River is subdivided into a lower unit composed of mainly salt and an upper unit of interbedded carbonates and shales. The section shows relative location of the three significant gas discoveries made to date found along the North-South structural trend; Tedji Lake, Tweed Lake and Bele.

An east-west orientated seismic line across the Tweed Lake structure illustrates a thin Lower Paleozoic sedimentary section compared to the thick underlying and structurally complex Proterozoic section which extends the full 6 seconds of seismic two-way travel time. A prevalent feature penetrating both the Paleozoic and Proterozoic stratigraphy is a high angled fault with reverse motion. This feature is orientated North-South and is part of a complicated, basement fault zone which is associated with the prospective Lower Cambian gas trend.

The global reconstruction of continental land masses during Early Cambrian shows the study area in a tropical location, i.e. at about 15° North latitude on the North American continent. (These low latitudes resulted in a far more warmer climate for the deposition of source rock and reservoir sandstones than the frigid global setting which the study area occupies today).

The sandstones of the Mount Clark Formation which contain the reservoir cover an area of greater than 50,000 square kilometres.

The original sands accumulated during a transgression over a peneplained (previously structured) Proterozoic volcano-sedimentary surface between broad topographic highs. The highs are Colville to the northeast, Wolverine to the southeast and the Mackenzie High to the west. These sands, although diachronous are laterally continuous and form a "blanket" which is 10 to 70 metres thick across the study area.

The next part of this talk will focus on the Tweed Lake Gasfield at the center of the map, just east of Lac Belot.

TWEED LAKE GASFIELD

Terrane Analysis

The Tweed Lake Gasfield is a structural trap located on a fault-bounded anticline formed by compressional stresses causing basement fault reactivation during the early Tertiary Laramide Orogeny. These structural features were not entirely masked by later depositional and erosional events such as the extensive continental glacial episodes of the Pleistocene.

A summer time Landsat photo of the Tweed Lake area shows tonal anomalies which subtly outline structural features. The satellite photo and topographic maps for the area reveal a radial drainage pattern around topographic highs which are the surface expression of an underlying structure.

The Tweed Lake Gasfield was first accurately located by terrane analysis and then later confirmed with seismic and exploration/delineation drilling. The use of terrane analysis for the Cambrian Structural Play has been proven to be an extremely cost effective technique to highgrade exploration areas by reducing the need for extensive regional seismic lines in a remote, (difficult to access) areas.

Stratigraphy and Structure

The detailed lithostratigraphy for the Tweed Lake Area was taken from the PCI et al C-12 well. This surface to total depth lithology log shows over 1,000 metres of Lower Paleozoic shales, carbonates and evaporites capped by a thin (less than 50 metre) veneer of Cretaceous shales and Quaternary tills.

The basal Mount Clark reservoir sandstone "sits" uncomformably over Proterozoic volcanics, at a depth of about 1,200 metres.

A structure contour map at the top of the Mount Clark Formation illustrates the fault-bounded anticlinal closure with a structural relief of about 250 metres. The major fault trace is shown as a high angle reverse to normal fault striking NNW with a "throw" which varies from about 50 to 200 metres of downward displacement to the east.

A hydrocarbon water contact is outlined by the red line.

The field covers an area of 75 sq. km. and contains an estimated 112 BCF of recoverable natural gas.

an eastwest structural cross section shows the two successful wells; M-47 the discovery well and A-67 a downdip delineation well. The M-47 well tested 5.5 MMCFD and the A-67 well, despite suspected formation damage, tested .4 to 1.8 MMCFD. Both tests recovered condensate.

The next slide is an eastwest seismic line which approximately follows the line of the structural schematic. The two marker horizons outline the structural closure in time. The Top of the Saline River and Top of Proterozoic parallel one another in the section and together provide reliable markers to map the structural closure for the Mount Clark reservoir.

Reservoir Development

The next slide presents a series of plots which depict the lithofacies and reservoir quality of the Mount Clark Formation at the Tweed Lake A-67 location. The Gamma Ray Curve at the left of the Figure is annotated with colour to show the main lithologies; yellow as sandstone, green as shale, purple as carbonate and red as the underlying volcanic. The Mount Clark Formation can be divided into a basal and an upper sandstone separated by a shaly interval. The remaining plots are the results of conventional core analysis which show permeability, porosity and fluid saturations (both oil and water).

The Net Pay for the basal sandstone is 7.6 metres with an average porosity of 10.8% and an permeability of 3.5 md and the Net Pay for the upper sand is 2.6 metres with an average porosity of 9.7% and an permeability of 1.4 md.

The sands accumulated in a shallow, shelf, tropical marine environment and demonstrate textures and bedforms characteristic of shoreline, bar and tidal channel depositioned settings, as well as more quiescent, shelf dominated subenvironments dominated by highly bioturbated and burrowed facies.

The sandstones are comprised predominantly of remnant, fine-medium, monocrystalline quartz grains that are variably cemented by mostly silica, authigenic clay and dolomite. The sandstones have a complex diagenetic history. The slide illustrates para-diagenetic sequences of major destructive processes for porosity in red and those major processes which create porosity in blue. Progressively the events which reduce the primary reservoir quality after deposition are early calcite cement, mechanical compaction, silica overgrowths, authigenic clay, dolomite and barite cement, authigenic pyrite, significant "bitumen" precipitation and final barite cement. The processes which enhance and improve reservoir quality, all occur in the mesodiagenetic environment and are primarily the pervasive dissolution of detrital felspar grains and calcite cement happening as, at least, two separate events. Another, less frequent form of reservoir enhancement is oblique to vertical fractures which are probably associated with the late compression and uplift caused by the Laramide orogeny. These processes occurred throughout the study area but locally may have occurred more than once or in slightly different order. Never the less the

final reservoir porosity is mostly a remnant or reopened intergranular type with subsidiary, secondary moldic, after felspar and/or liable grain dissolution.

Reservoir Distribution

However, despite the overwhelmingly secondary nature of the porosity development, there is evidence from core examination which reveal that the distribution of final reservoir porosity development in the reservoir is controlled by the original rock fabric and is texturally dependent on grain size and structurally dependent on bedforms.

The slide on the right is an enlarged photograph of a nuclear magnetic resonnance (NMR) scan of a piece of core from the Tweed Lake A-67 well. The scales along the left side and top of the core are in centimeters. The NMR is able to remote sense the fluid content of the rock which can be related to the volume of voids or the rock's total porosity. The mauve or background colour is tight sandstone and the red colour relatively represents the most porous. The figure presents a two dimensional slice from the core which was selected perpendicular to a stacked set of high angle cross beds. The lower set of cross bedding occurred in a fine grained sand which, as shown by the mauve colour is mostly tight. The streaks of blue outline the forsets and are subtly more coarser grains with slightly higher porosity.

The upper set of foresets are more medium grained with the higher porosity streaks associated with a larger grain size. The tight streak in the upper right part of the core is a barite vein which preferentially followed the contact between foreset beds.

Geochemistry

The gas composition of the Tweed Lake and nearby occurrences is unique to western Canada. Therefore we have chosen in this talk to elaborate on the geochemistry of the hydrocarbons and discuss the potential source rock for these accumulations. There is also another very important aspect to the geochemistry and that is the distinct possibility of oil pools in the study area.

Hydrocarbon Types

Gas Composition

The gas composition from Bele to Tedji Lake is peculiar being comprised of methane, some liquid natural gases and a large proportion of inorganic gases. As illustrated here, based on a sample taken from a DST of the Mount Clark Formation in the Tweed Lake M-47 well. The inorganic gas component is greater than 20% by volume of the total gas and consists primarily of nitrogen with some helium. It is thought that the inorganic gas has been sourced from mineral alteration and occlusion in the underlying Proterozoic volcanics.

Distribution of Gases

Regionally, the gas composition is relatively uniform with inorganic gases ranging from 15 to 30% and natural gas liquids from 5 to 12%. Such uniformity indicates regionally consistent distribution of source rocks and/or longer distance migration to the

gasfields which would provide more opportunity for the mixing of gases from multiple sources.

A notable difference in composition is the higher proportion of natural gas liquids at Tweed Lake. This and the recovery of condensates during testing could imply a contribution from local source rocks and/or different migration pathways. More importantly, the liquid content discovered at Tweed Lake is encouraging for the possibility of oil legs existing below the gas or possibly even finding separate oil pools.

Source Rocks

55 cutting and sidewall core samples from the Petro-Canada Canterra et al Tweed Lake were taken from near surface to total depth to search the complete sedimentary section for stratigraphic intervals with source rock potential and to develop an organic maturation profile with depth. The most promising samples were from the Saline River and Mount Cap Formations and these two figures illustrate a correlation of detailed source rock analysis to rock properties for these two stratigraphic units.

Somewhat disappointingly all samples have very low total organic carbon with just two intervals exceeding 0.5% TOC. The upper interval correlates to a basal shale marker in the Lower Saline River which is laterally discontinuous between well control and is intraformationally sealed in salt. The lower interval correlates with a low velocity zone on the sonic log. The low velocity zone is a shale bed within the Mount Cap Formation which is regionally continuous and thickens away from the Tweed Lake - Tedji structural trend.

Two other marginal source rock intervals with greater than 0.3% TOC can be correlated to another, shale marker in the Saline River and a regional continuous high Gamma Ray Marker in the lower part of the Mount Cap Formation directly above the Mount Clark sandstone reservoir. The primary source for the trapped hydrocarbons along the Bele to Tedji Lake Trend is thought to be the "High Gamma" and "Low Velocity" shale markers in the Mount Cap Formation.

Dissemated organic matter was examined on kerogen slides selected from the more organic-rich samples. The relative occurrence of "vitrinite-like" material, exinite and amorphous material is shown by the bar chart on Figure 21.

The amorphous material was found to have a variable concentration, appearing higher in zones of greater TOC. The presence of amorphous material is encouraging for oil generation which would be expected to occur between the "oil window" vitrinite reflectance values of 0.5 and 1.2 Ro. or below 930 m in the Tweed Lake M-47 well.

The source rock intervals are mature for hydrocarbon generation at the field as shown by the vitrinite profile and would be expected to generate hydrocarbons even more prolifically in the regionally thicker and deeper regions surrounding the Tweed Lake Field.

Distribution of Probable Source Rocks

Figures 22 and 23 are isopach maps which show the regional distribution of the two "most probable" source rocks; the "Low Velocity Shale" and the "High Gamma Ray Shale" of the Mount Cap Formation. Although the units are above the reservoir, downward migration to the "carrier bed" is possible and/or through fault displacements which could connect source rock with the underlying reservoir or provide a fault conduit for vertical fluid movement.

The maps present a thick regionally extensive distribution of two probable source rocks, which despite their low organic content, would be capable of generating sufficient hydrocarbons to fill the structural traps.

The migration model summarizes the possible pathways for the hydrocarbons generated from the overlying "High Gamma" and "Low Velocity" shales and the underlying volcanic as a possible source rock for the inorganic gases.

Burial History Plot

This slide presents a plot of the sediment burial through time in the Colville Hills and Tweed Lake area. The plot illustrates slow, gradual subsidence during the Lower Paleozoic interpreted only by a Late Devonian orogenic uplift which formed a brief depositional hiatus. Rapid subsidence occurred after the Late Jurassic Columbian orogeny forming a thick, foreland, sedimentary wedge during the Early Cretaceous.

The deep burial, at this time, of the Mount Cap source rock is the suspected cause for the onset of hydrocarbon generation. The Late Cretaceous - Early Tertiary Laramide orogeny reactivated and uplifted Pre-Cambrian faults to form a North-South trend of structural features and formed fault-bounded traps which extend from Bele to Tedji Lake.

EXPLORATION HISTORY AND SUMMARY

The last slides illustrate the Exploration and Field Appraisal Drilling as a histogram of wells drilled per year from 1970 to the present 1992 for the Lower Cambrian Sandstone Play in the Colville Hills and Tweed Lake Areas, N.W.T. The results of the wells are coded blue for a water recovery, red for a significant gas flow, light red for indicated gas and brown for a mud recovery. The early 1970's began with an investigation of structural closure for oil and culminated in the successful discovery of gas at Tedji Lake in 1974. A moratorium on federal lands during the late 70's and early 80's halted all activity until both the barriers to land access were lifted and the introduction of Federal PIP Grants. During the early and mid 1980's, until the oil price collapse there was a flurry of drilling activity which saw eleven wells drilled; five found gas and two large gasfields were discovered and delineated.

There has been no activity since 86 with depressed oil and gas price discouraging the industry to make the high expenditures needed to develop and produce the resource in such a remote location.

The future, with the uncertainty of what the commodity prices will do in the short term is difficult to predict, however with the location of the study area near the proposed pipeline routes to the Arctic it is expected that it will only be a matter of time before we see a renewed cycle of exploration. We hope this talk has shown you the attractiveness of this Pre-Devonian Play with large reserves of gas and possibly oil trapped in structurally closures that can be easily delineated with seismic and terrane analysis.

Finally, I would like to acknowledge the many Petro-Canada employees who worked as an integrated team on this area and play type in 1981 and 1986. They provided and formed most of the technical thought and details which we compiled, updated and presented to you today.

1992 ANNUAL AAPG CONVENTION

Host Society : CSPG

With : SEPM

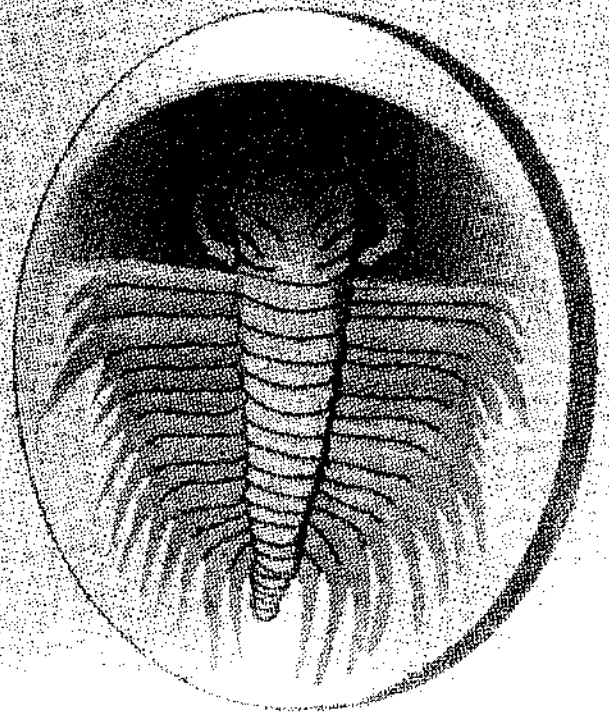
AAPG Sub-Devonian Plays Of North America

PRESIDING

Jack McMillan
and
Ian McIlreath

04293G

THE EARLY CAMBRIAN TWEED LAKE GASFIELD AND RELATED GAS OCCURRENCES, NORTHWESTERN ONTARIO, CANADA



J.M. Bevel
L.A. McIlreath

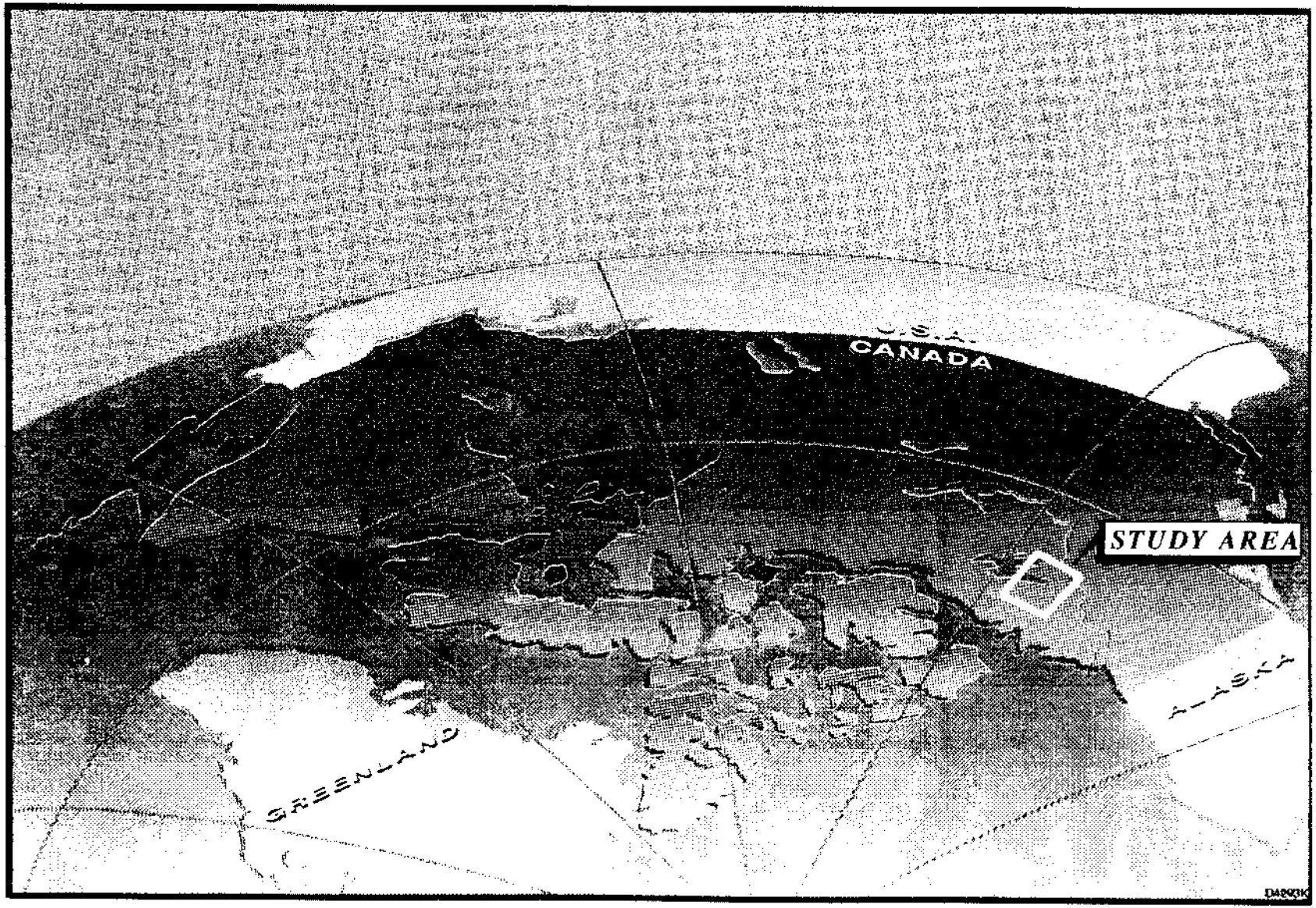
PETRO CANADA

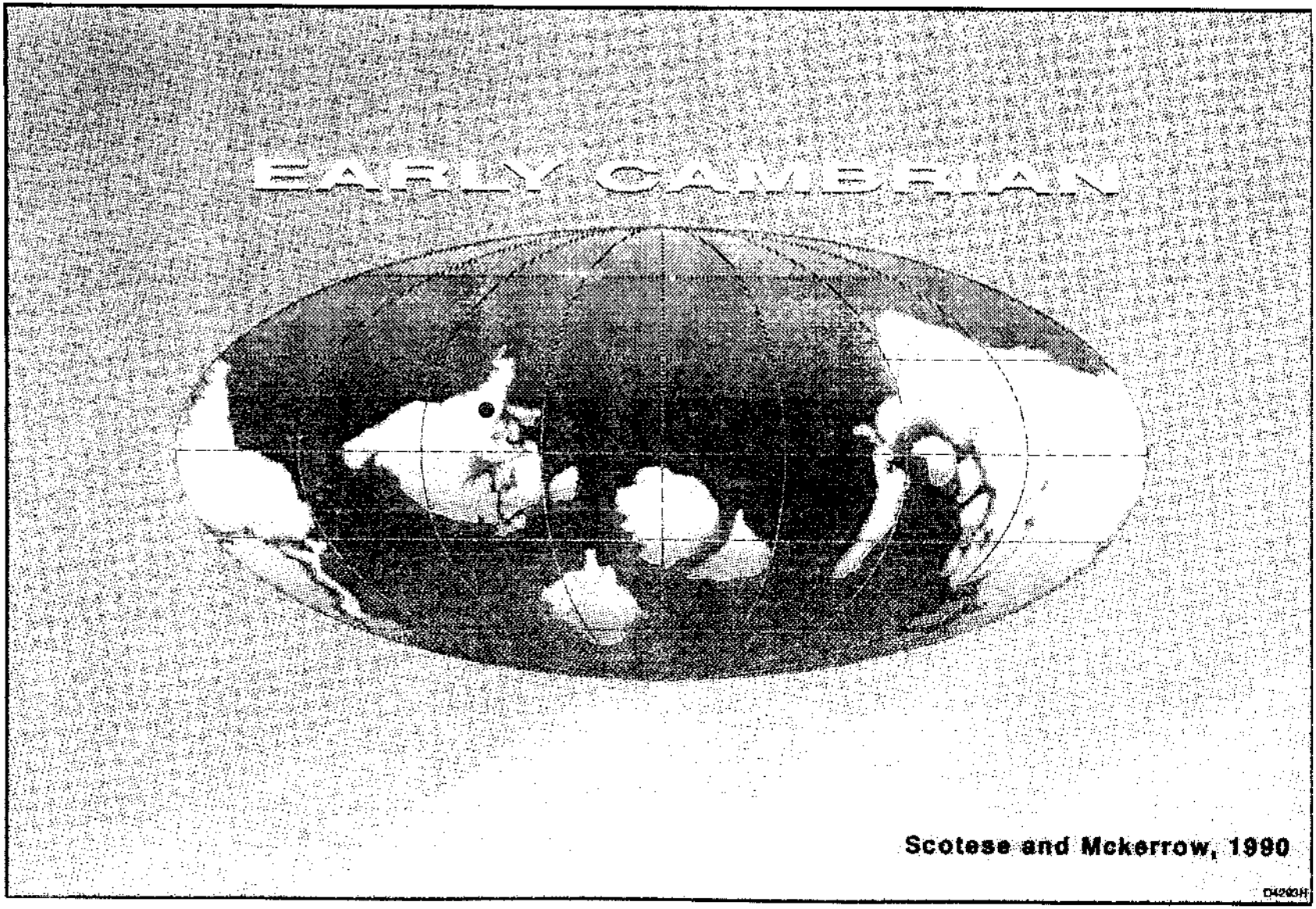
D4203A

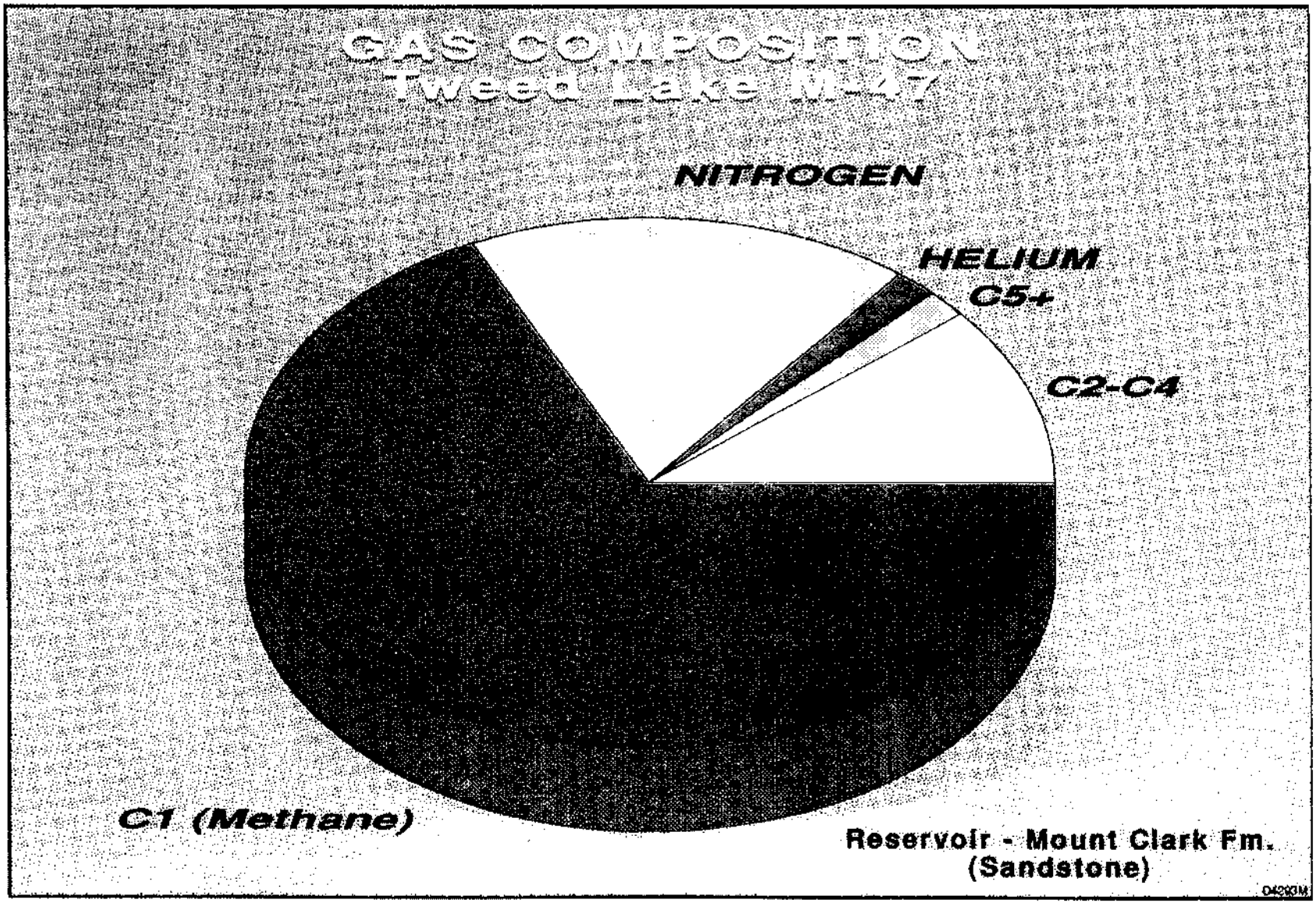
PLAY SUMMARY

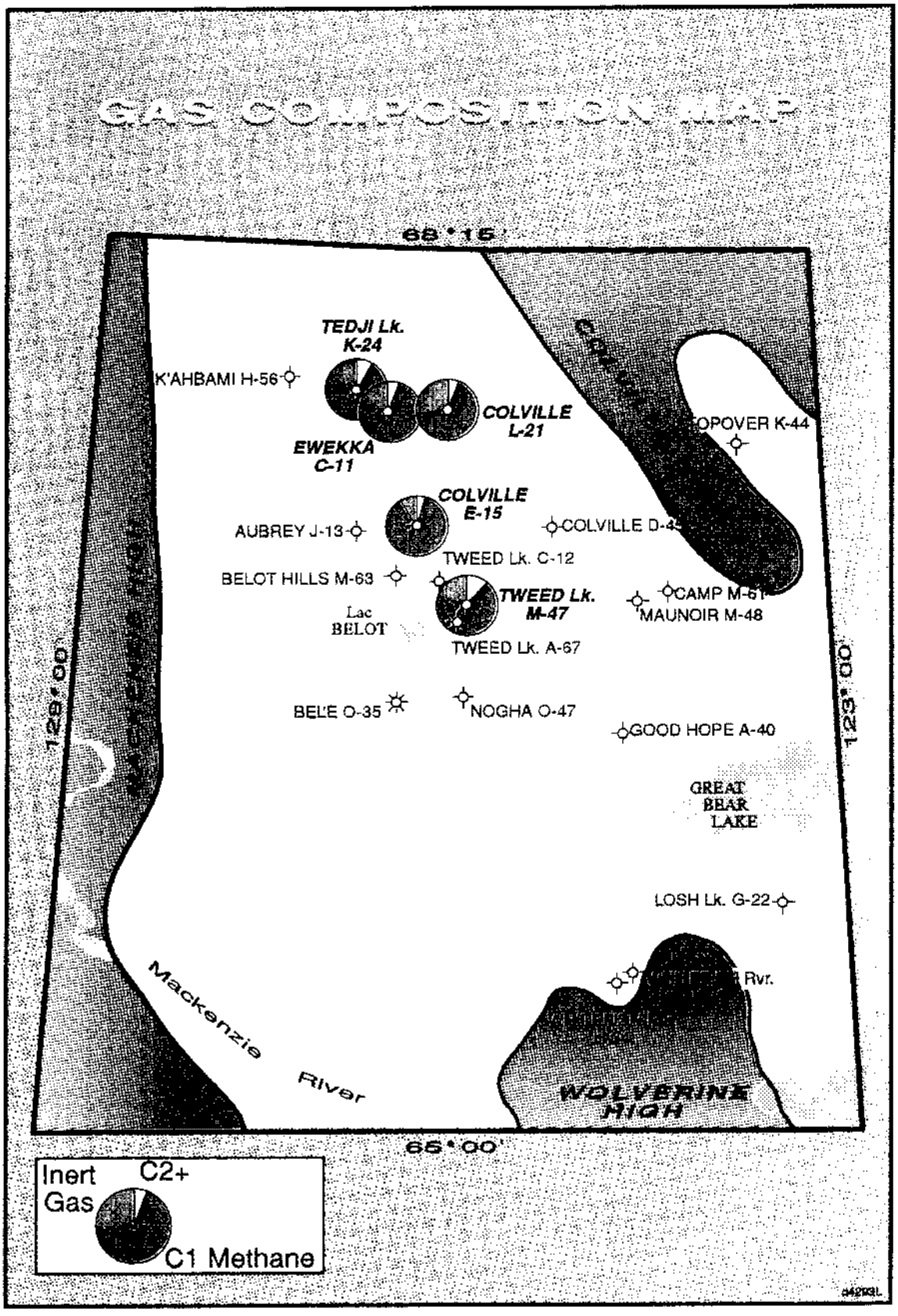
- Type - structural
- Trap - fault bounded anticline
- Extent - 130 km x 20 km Laramide structural lineament
- Reservoir - Lower Cambrian marine sandstones
- Seal - Middle Cambrian shales and Upper Cambrian evaporites
- Source - Cambrian shales and algal-rich carbonates; Proterozoic(?)
- Hydrocarbons - natural gas (high inert gas content, some liquids)
- Reserves - 240 Bcf recoverable sales gas
- Potential Reserves - >1 Tcf

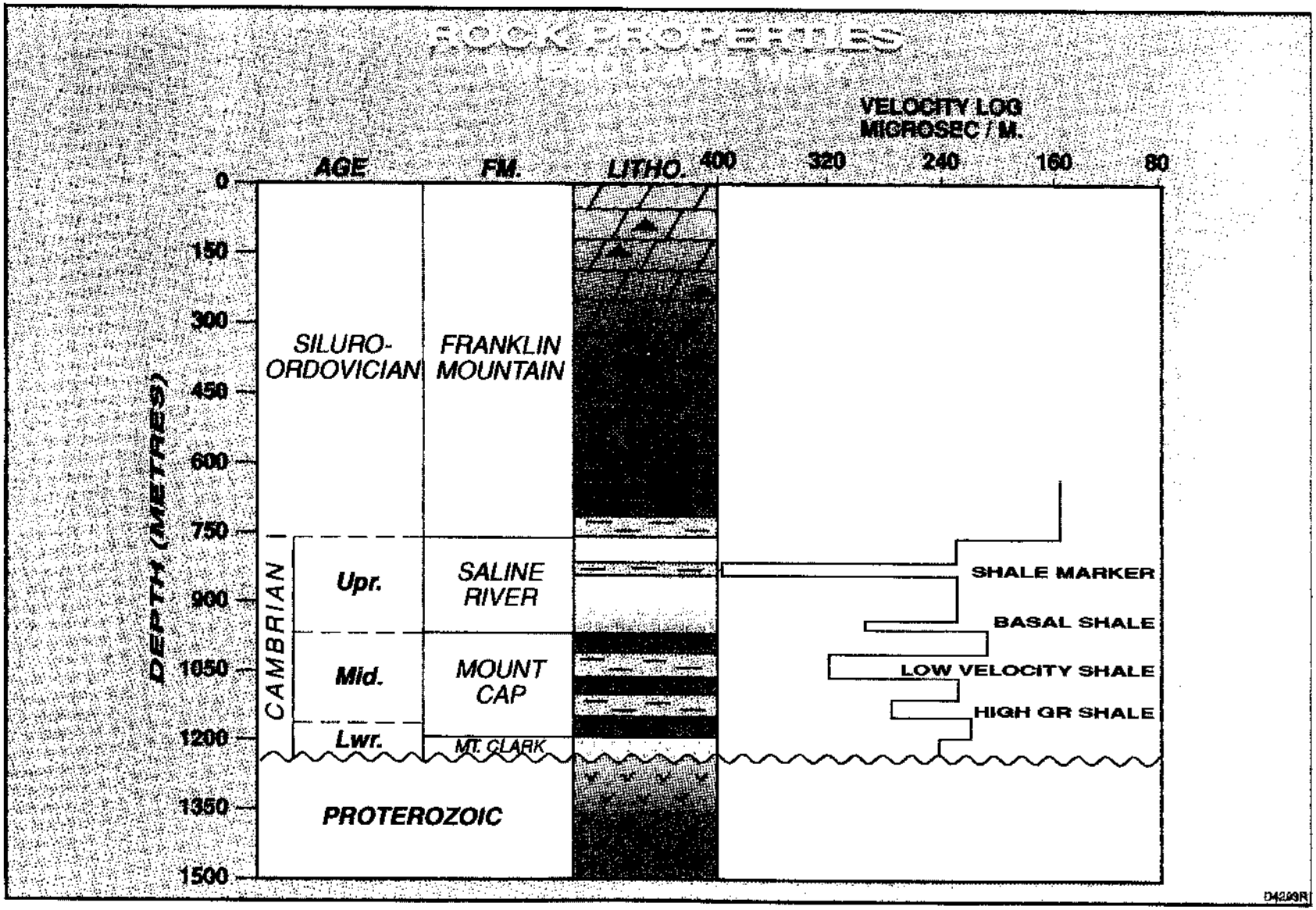
D4233C

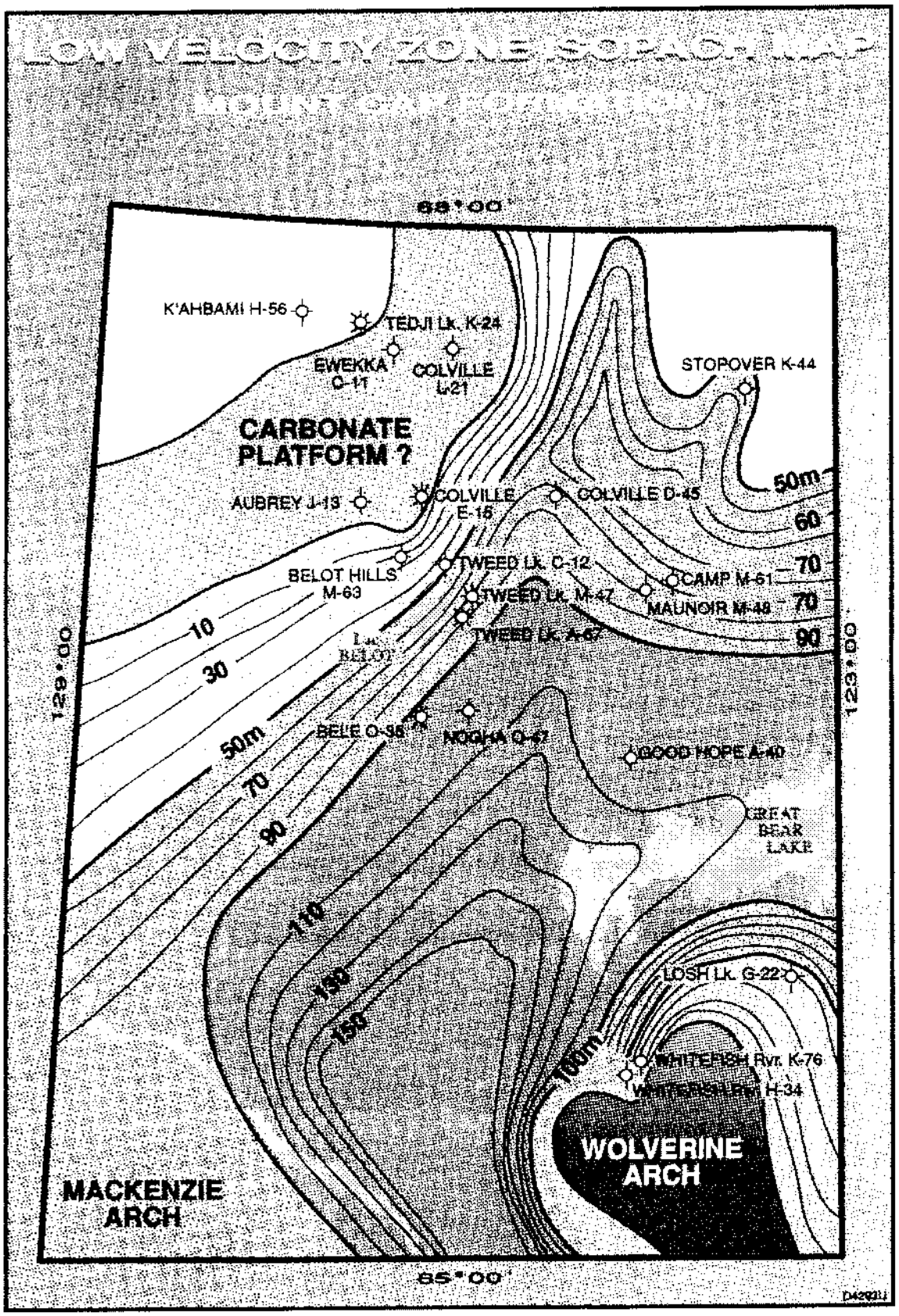

U.S.A.
CANADA
STUDY AREA
GREENLAND
ALASKA

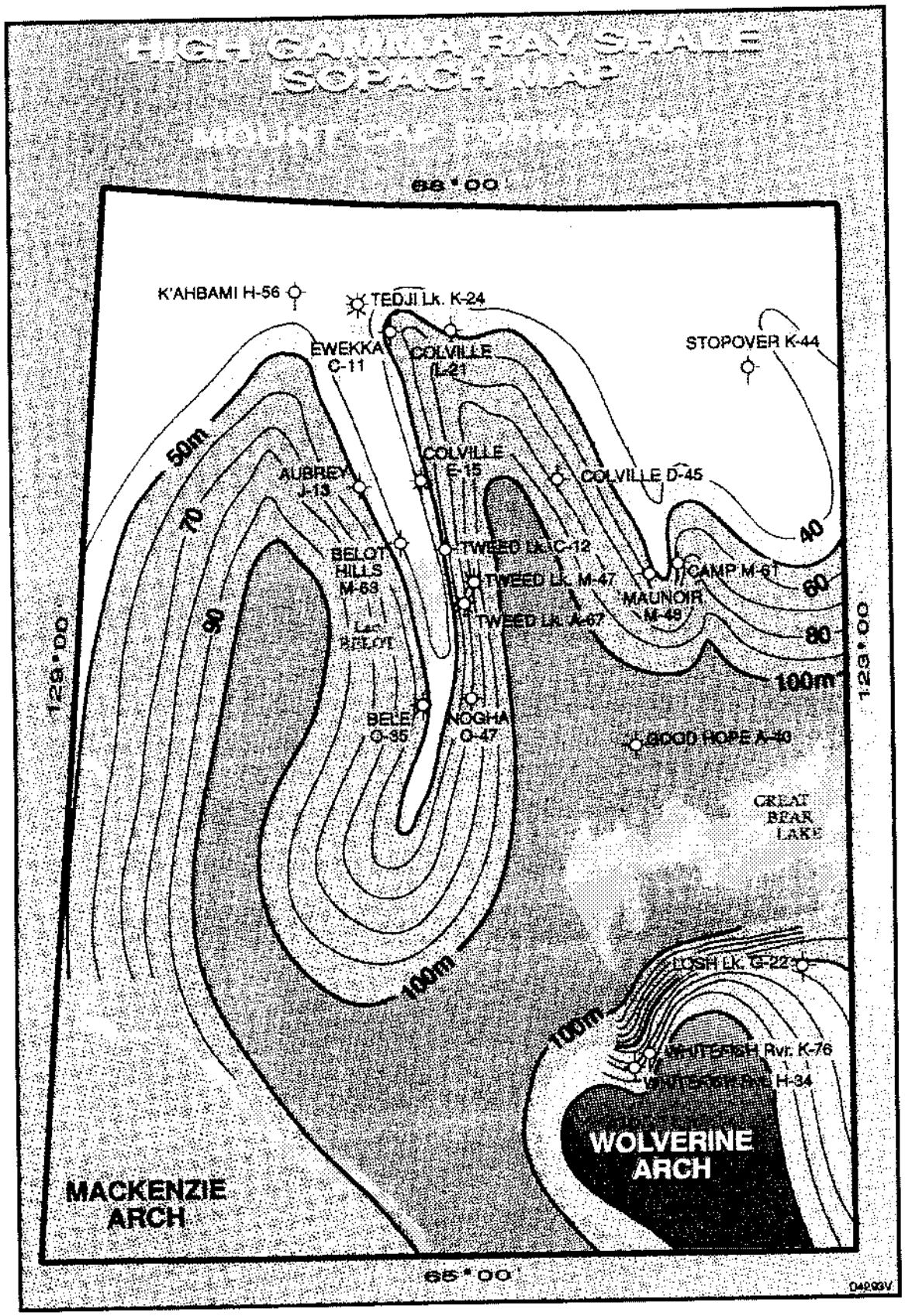

EARLY CAMBRIAN
Scotese and Mckerrow, 1990

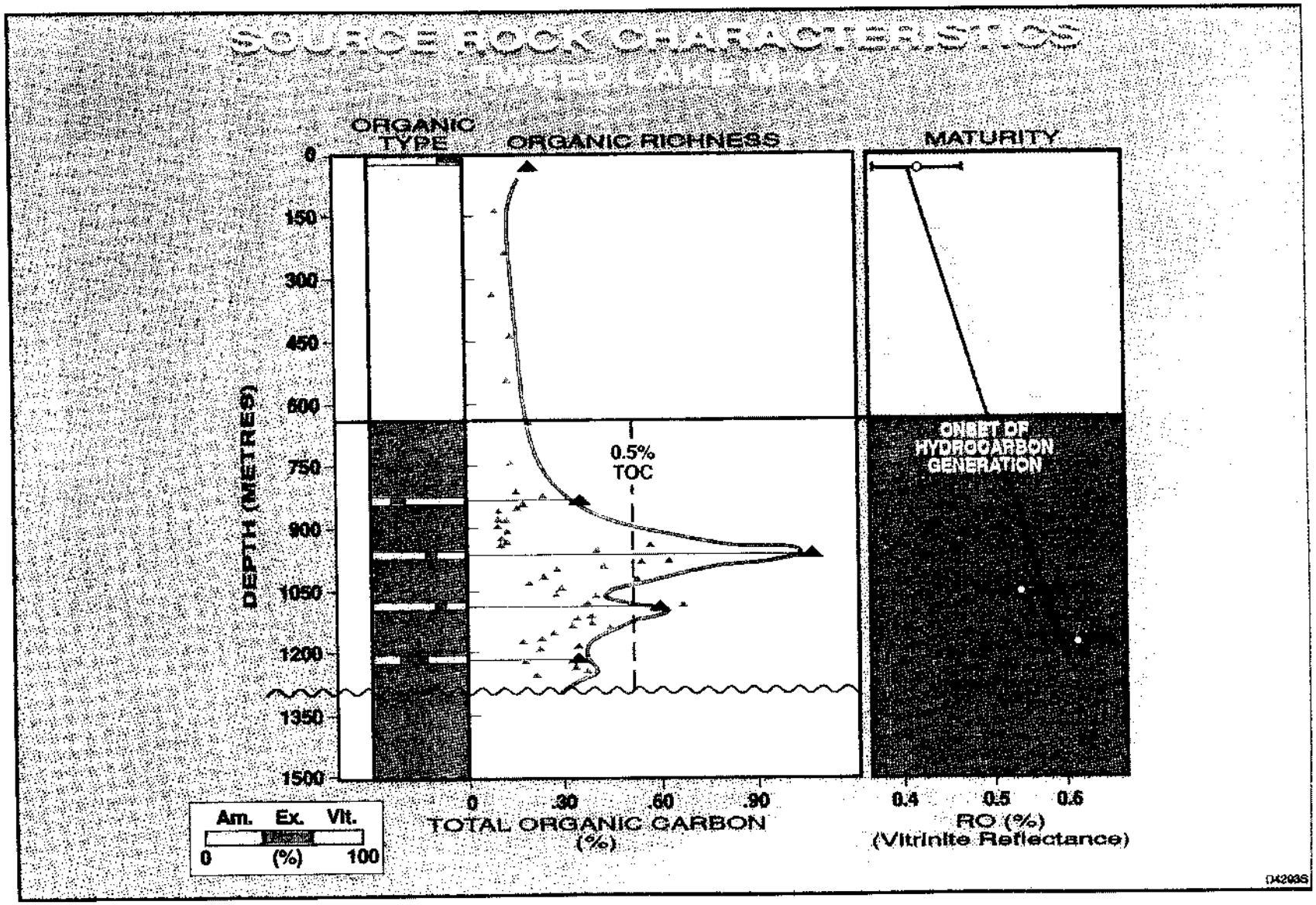

GAS COMPOSITION
Tweed Lake M-47
NITROGEN
HELIUM
C5+
C2-C4
C1 (Methane)
Reservoir - Mount Clark Fm.
(Sandstone)
04293M

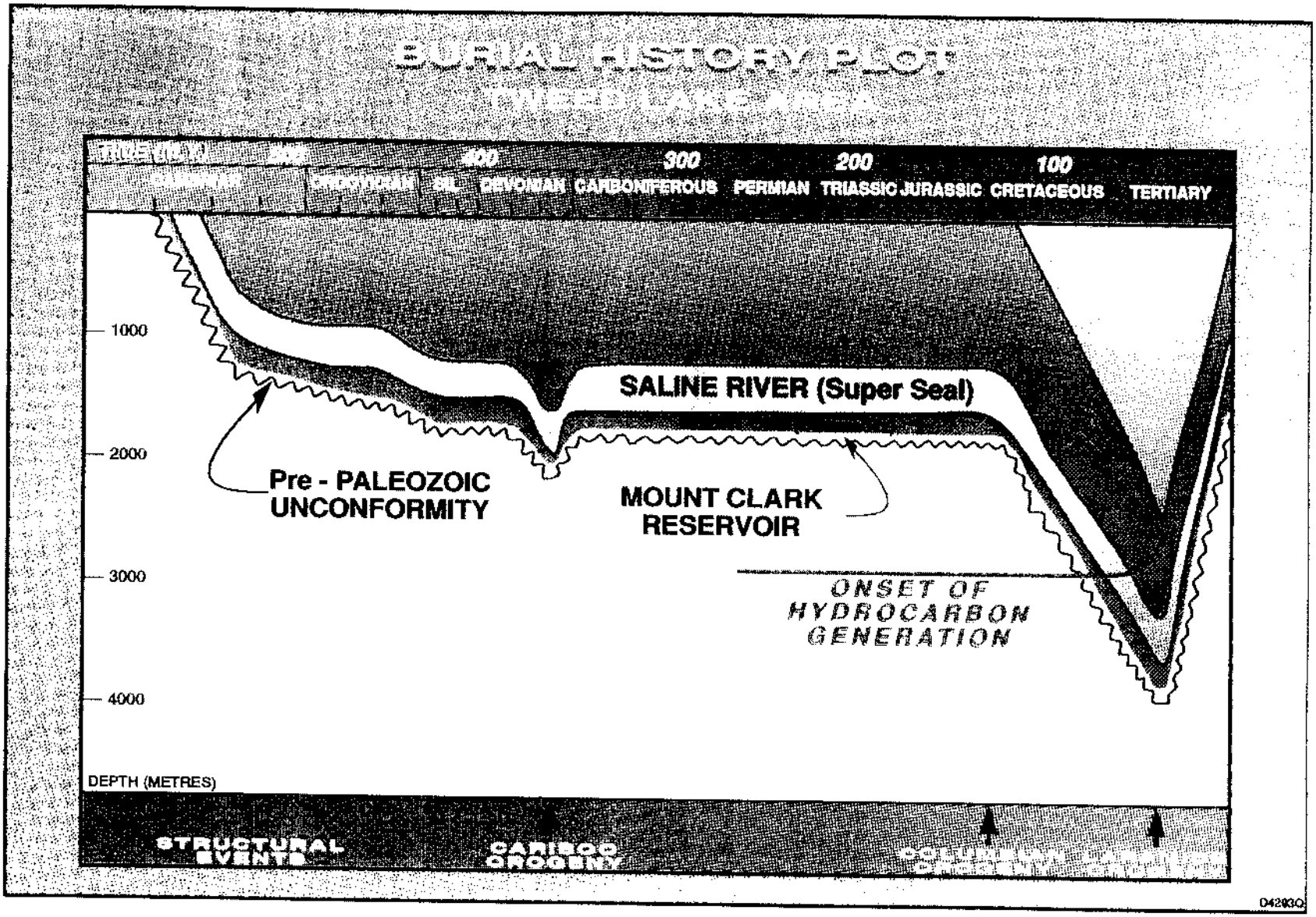

GAS COMPOSITION MAP
68°15'
TEDJI Lk.
K-24
K'AHBAMI H-56
COLVILLE
L-21
EWEKKA
C-11
COLVILLE
E-15
AUBREY J-13
COLVILLE D-45
TWEED Lk. C-12
BELOT HILLS M-63
TWEED Lk.
M-47
Lac
BELOT
TWEED Lk. A-67
CAMP M-61
MAUNOIR M-48
BEL'E O-35
NOGHA O-47
GOOD HOPE A-40
GREAT
BEAR
LAKE
LOSH Lk. G-22
Rvr.
Mackenzie
River
WOLVERINE
HIGH
65°00'
129°00'
123°00'
Inert
Gas
C2+
C1 Methane

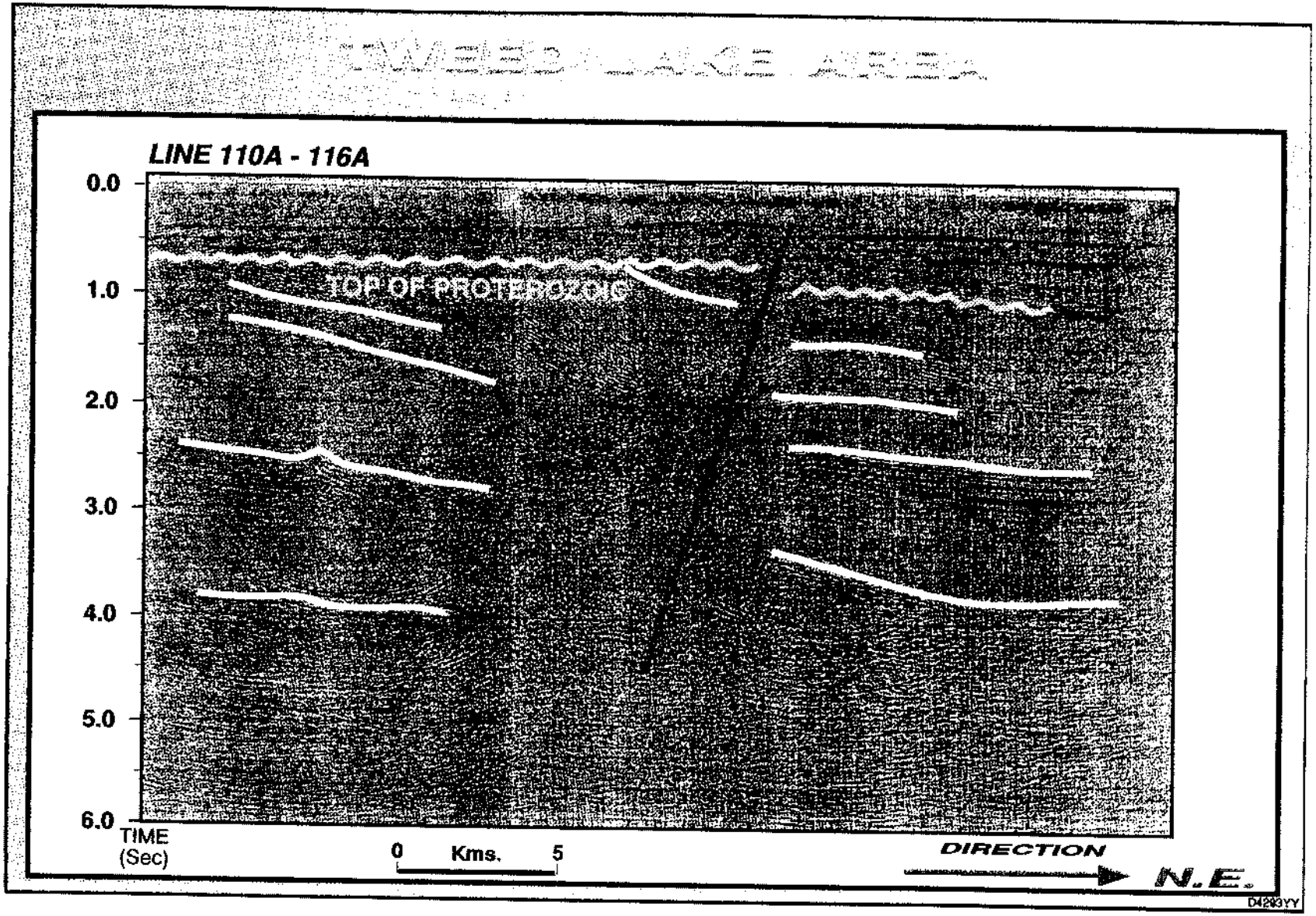

ROCK PROPERTIES
VELOCITY LOG
MICROSEC / M.
400
320
240
160
80
AGE
FM.
LITHO.
0
150
300
450
600
750
900
1050
1200
1350
1500
DEPTH (METRES)
SILURO-
ORDOVICIAN
FRANKLIN
MOUNTAIN
CAMBRIAN
Upr.
Mid.
Lwr.
SALINE
RIVER
MOUNT
CAP
MT. CLARK
PROTEROZOIC
SHALE MARKER
BASAL SHALE
LOW VELOCITY SHALE
HIGH GR SHALE
D4249R


LOW VELOCITY ZONE ISOPACH MAP
MOUNT GAMBIER REGION
68°00'
K'AHBAMI H-56
TEDJI Lk. K-24
EWEKKA O-11
COLVILLE L-21
STOPOVER K-44
CARBONATE PLATFORM ?
AUBREY J-13
COLVILLE E-15
COLVILLE D-45
50m
60
70
70
90
BELOT HILLS M-63
TWEED Lk. C-12
CAMP M-61
TWEED Lk. M-47
MAUNOIR M-48
TWEED Lk. A-67
10
30
50m
70
90
110
130
150
BELLE O-38
NOGHA O-47
GOOD HOPE A-40
GREAT BEAR LAKE
LOSH Lk. G-22
100m
WHITEFISH Rvr. K-76
WHITEFISH Rvr. H-34
WOLVERINE ARCH
MACKENZIE ARCH
129°00'
123°00'
65°00'
D4203-1

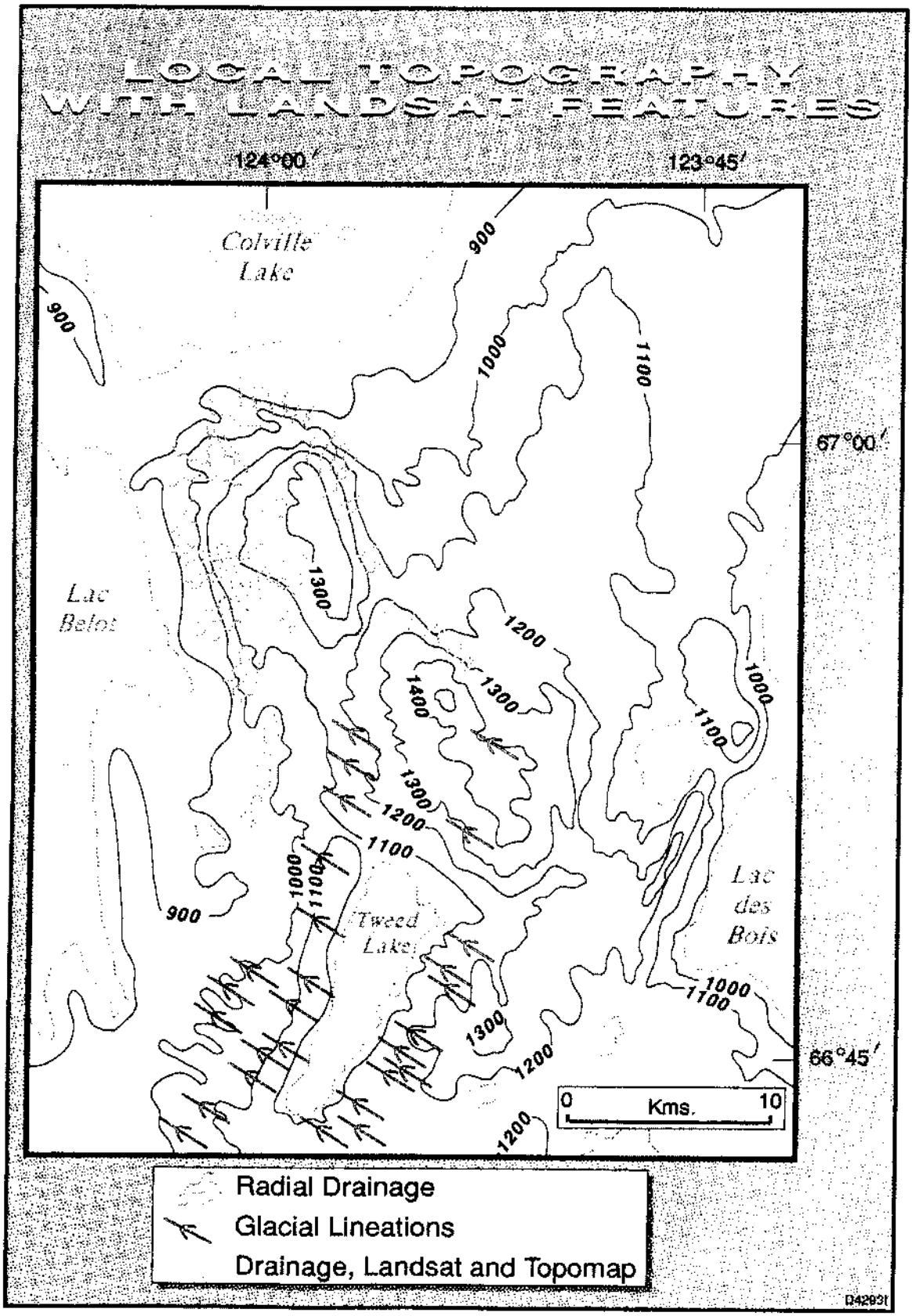

HIGH GAMMA RAY SHALE
ISOPACH MAP
MOUNTAIN FORMATION
68°00'
K'AHBAMI H-56
TEDJI Lk. K-24
EWEKKA C-11
COLVILLE L-21
STOPOVER K-44
50m
70
90
AUBREY J-13
COLVILLE E-15
COLVILLE D-45
40
60
80
100m
BELOT HILLS M-63
TWEED Lk. C-12
TWEED Lk. M-47
TWEED Lk. A-67
CAMP M-61
MAUNOIR M-49
BELOT
BELOT O-35
NOGHA O-47
GOOD HOPE A-40
GREAT BEAR LAKE
LOSH Lk. G-22
WHITEFISH Rvr. K-76
WHITEFISH Rvr. H-34
WOLVERINE ARCH
MACKENZIE ARCH
129°00'
129°00'
65°00'
04993V

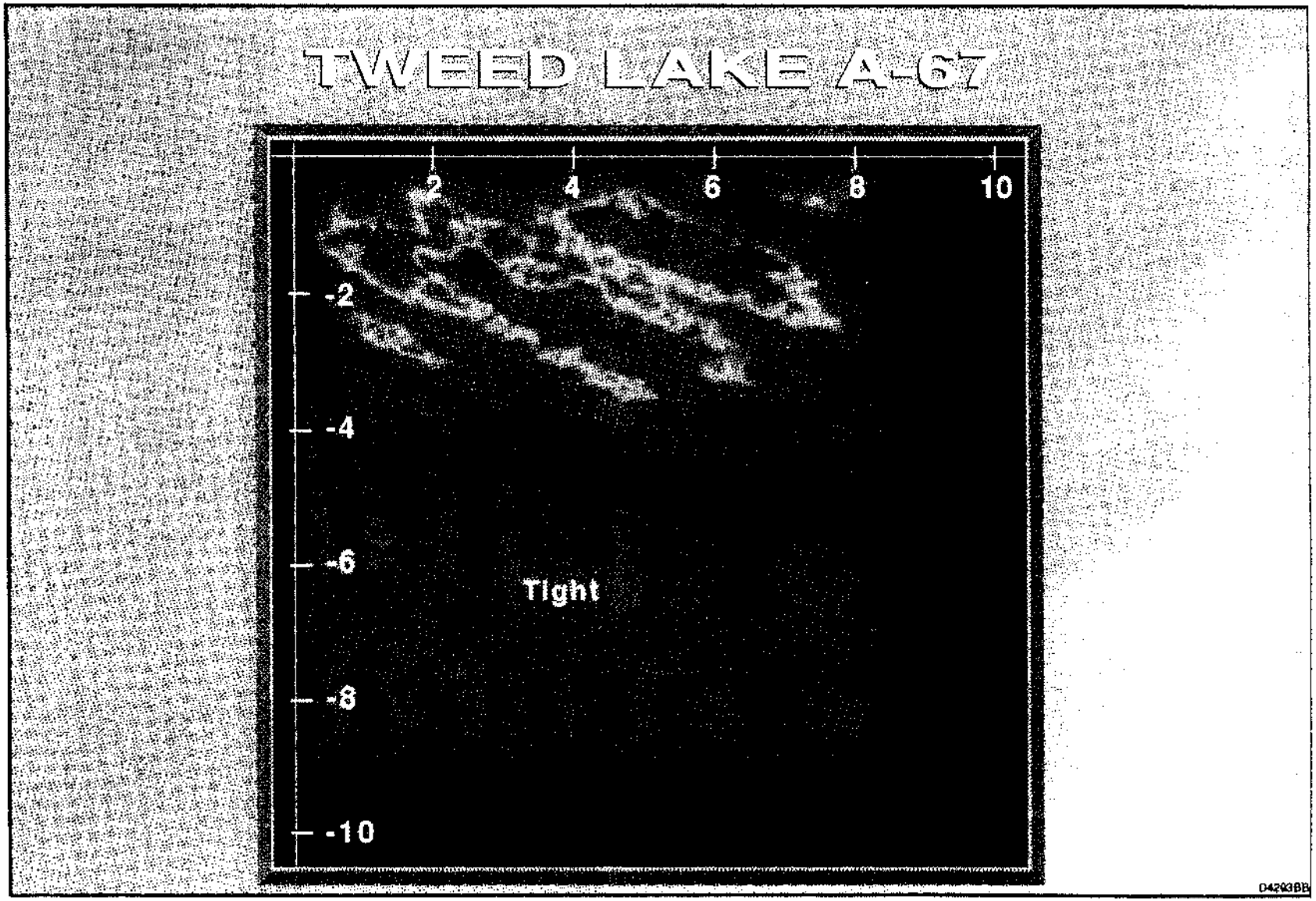

SOURCE ROCK CHARACTERISTICS
ORGANIC TYPE
ORGANIC RICHNESS
MATURITY
DEPTH (METRES)
0
150
300
450
600
750
900
1050
1200
1350
1500
0.5% TOC
ONSET OF HYDROCARBON GENERATION
Am. Ex. Vit.
0 (%) 100
0 .30 .60 .90
TOTAL ORGANIC CARBON (%)
0.4 0.5 0.6
RO (%)
(Vitrinite Reflectance)
D4293S


BURIAL HISTORY PLOT
INDEX LAKE AREA
400
300
200
100
DEVONIAN
CARBONIFEROUS
PERMIAN
TRIASSIC
JURASSIC
CRETACEOUS
TERTIARY
1000
2000
3000
4000
SALINE RIVER (Super Seal)
Pre - PALEOZOIC
UNCONFORMITY
MOUNT CLARK
RESERVOIR
ONSET OF
HYDROCARBON
GENERATION
DEPTH (METRES)
STRUCTURAL
EVENTS
CARIBOO
OROGENY
D42903Q


LINE 110A - 116A
0.0
1.0
2.0
3.0
4.0
5.0
6.0
TIME
(Sec)
TOP OF PROTEROZOIC
0
Kms.
5
DIRECTION
N.E.


WEED LAKE N.W.T.
D4203W


LOCAL TOPOGRAPHY
WITH LANDSAT FEATURES
124°00′
123°45′
67°00′
66°45′
Colville Lake
Lac Belot
Tweed Lake
Lac des Bois
900
1000
1100
1200
1300
1400
0 Kms. 10
Radial Drainage
Glacial Lineations
Drainage, Landsat and Topomap
D42931


TWEED LAKE A-67
2
4
6
8
10
-2
-4
-6
-8
-10
Tight
D4293BB

ACKNOWLEDGEMENTS

All Members of
Petro-Canada's
Cambrian Task Forces
(1981 and 1986)

D4293AA

GEOLOGICAL WELLSITE REPORT

FOR

P.C.I. CANTERRA TWEED LAKE A-67

UNIT A, SECTION 67, GRID AREA 67° 00', 125°45'

Prepared For

PETRO CANADA INCORPORATED

By

Tim Vader

PRO GEO CONSULTANTS

December, 1985

PRO GEO CONSULTANTS

TABLE OF CONTENTS

WELL SUMMARY

WELL NAME:	P.C.I. CANTERRA TWEED LAKE A-67
COORDINATES:	66.9365569°, 125.9385772°
LOCATION:	North Lat 66° 56' 11.60", West Long 125° 56' 18.88"
ELEVATIONS:	Ground: 390.90m KB: 397.10m
OPERATOR:	Petro Canada Incorporated
DRILLING CONTRACTOR:	Atco/Equtak #76
WELLSITE SUPERVISION:	Toolpusher: D. Lauck/B. Lickoch Engineer: M. Prichuck/Y. Hope Geologist: T. Vader
BIT SIZES:	Conductor: 445.0mm Surface: 311.0mm Downhole: 216.0mm
CASING SIZES:	Conductor: 340.0mm Surface: 244.5mm Production: 178.0mm
TOTAL DEPTH:	Driller: 1347.0m Logger: 1345.5m
BOTTOM HOLE FORMATION:	Proterozoic
CORES CUT:	Core #1 - 1276.0 - 1287.53m Core #2 - 1287.6 - 1302.0m
LOGS RUN:	Run #1 - CNL-LDT-GR; DISFL-GR; NGT; BHC-GR; DIR; Run #2 - DLL-MSFL-GR; NGT-AMS; BHC-GR; ML-MLL; HDT; WST; CNL-LDT-GR
DRILL STEM TESTS:	DST #1 - 1290 - 1301m; DST #2 1278 - 1286m
RIG RELEASED:	0800 hours 1985/12/23
WELL STATUS:	Mt. Clarke Gaswell

DAILY SUMMARY

1985/11/13

- Prepare to spud
- Spud at 0500 hours
- Drill 311mm pilot hole to 15m
- Drill mouse hole
- Drill pilot rat hole

1985/11/14

- Pilot rat hole and mouse hole
- Ream rat hole and mouse hole

1985/11/15

- Drill 311mm pilot hole for conductor to 40m (lost circulation)
- Mix lost circulation material

1985/11/16

- Drill 311mm pilot hole for conductor to 57m

1985/11/17

- Drill 311mm pilot hole for conductor to 65m
- POOH
- Pick up 444mm hole opener
- Ream conductor hole

1985/11/18

- Ream conductor hole
- POOH
- Rig to run casing
- Run casing
- Cement conductor casing
- PD at 1030 hours
- WOC
- Cement under matting

1985/11/19

- WOC
- Cement under matting around cellar
- WOC
- Cut casing
- Weld on casing bowl
- Nipple up diverter system
- Pump additional cement around cellar

1985/11/20

- Nipple up diverter system
- Slip and cut line
- RIH with bit 31 HW JD7 (RR)
- Pull rat hole sleeve
- Split open to remove kelly and cement
- Drill out cement
- Repair diverter spool crack
- Change out burst kelly hose
- Drill out cement

1985/11/21

- Drill out cement and shoe
- Ream open hole to 65m
- Drill 311mm hole to 105m
- Trip for bit
- Rig for air drilling

1985/11/22

- Rig for air drilling
- RIH with bit #2 HW JD7
- Lay down two drill collars and pick up drill pipe
- Blow hole dry
- Drill 311mm hole to 151mm

1985/11/23

- Drill 311mm hole to 207m
- Trip for bit
- Lay down drill pipe
- Slip and cut line
- RIH with bit #3 J-33
- Blow hole dry with air
- Drill ahead to 217m (hole making water from 140m) with air

1985/11/24

- Foam drill 311mm hole to 280m
- Change position of blooie line discharge
- Foam drill to 312m

1985/11/25

- Foam drill 311mm hole to 420m

1985/11/26

- Foam drill 311mm hole to 447m
- Trip for bit
- Remove kelly spinner
- RIH with bit #4 HW J-33
- Foam drill 311mm hole to 471m

1985/11/27

- Foam drill 311mm hole to 558 m

1985/11/28

- Foam drill 311mm hole to 613m
- Trip for bit

1985/11/29

- RIH with Bit #5 HW JD7
- Ream undergauge hole from 605 - 613m
- Foam drill ahead to 623m
- Trip for bit
- RIH with Bit #6 HW J-33
- Foam drill ahead to 658m

19m85/11/30

- Foam drill 311mm hole to 701m
- Run 10 stand wiper trip
- Foam drill 311mm hole to 732m

1985/12/01

- Foam drill 311mm hole to 754m
- Complete drilling 0645 hours
- Condition hole wiper trip to drill collars (20 stands)
- Run in hole and circulate (30m fill)
- Trip to log
- Log #1 DISFL/GR from 754m to 10m
- Log #2 CNL/LDT/NGT-CAL 754m to 10m with CAL to 60m

1985/12/02

- Log #3 BHC/SONIC/GR-CAL 754m to 97m (top of fluid)
- Log #4 directional survey 754m to 61m
- Rig out Schlumberger
- Run in hole no fill
- Trip to run casing
- 62 joints 750.17m of 245mm 60 kg/m 60 754m
- FC at 740m, Lynes DV tool and ECP on top point #58, ECD at 49.50m
- Displace hole with 34m^3 H_2O
- Cement with 36 tonnes "G" 27m^3 slurry

1985/12/03

- Wait on cement
- Cut casing bowl and weld on McEvoy 279mm, 29mPa x 245m casing bowl
- Nipple up BOP's
- Pressure test bowl to 15mPa O.K.

1985/12/04

- Nipple up BOP's
- Pressure test blind rams, manifold, HCR and test for function
- Test casing to DV tool 18mPa
- Test upper and lower pipe rams
- Drill out DV tool and test to 18mPa
- Tag cement at 44m, drill out to 50m
- Trip out and inspect collars with Guardian Black Light

1985/12/05

- POOH
- Inspect drill collars
- RIH (tag cement at 295.5m)
- Lay down extra drill pipe
- Thaw standpipe (2 1/4 hours)
- Drill out top plug and cement from 295.5 to 556m with bit #7 HW J-2 (216mm)

1985/12/06

- Drill out cement to 754m
- Drill 216mm hole to 759m
- Run PIT
- POOH to pick up jars and shock sub
- Clean mud tanks
- RIH with bit #8B (HW J-22)
- Displace hole to fresh water
- Drill ahead to 774m

1985/12/07

- Drill 26mm hole to 802m
- Circulate and saturate mud system with salt
- Drill ahead to 970m

1985/12/08

- Drill 216mm hole to 1133m

1985/12/09

- Drill 216mm hole to 1171m
- POOH
- RIH with bit #9B (JW J-22) and stabilizers
- Drill 216mm hole to 1197m

1985/12/10

- Drill 216mm hole to 1274m

1985/12/11

- Drill 216mm hole to 1276m
- Circulate sample
- Run 20 stand wiper trip
- Clean 4 stands to bottom
- POOH for core #1
- Pick up core barrel
- RIH
- Slip and cut drilling line
- Circulate and condition hole
- Cut Core #1 with Bit #10C 159mm (SS 226 diamond) to 1283m

1985/12/12

- Cut Core 31 to 1287.5m
- Hoist and recover core #1 (1276 - 1287.6m) jammed
- RIH to ream rat hole with Bit #11C (HW JD7)
- Ream rat hole
- Circulate 1 hour
- POOH for Core #2

1985/12/13

- Pick up core barrel
- RIH with bit #12C 159mm (Christ C-201)
- Cut Core #2 1287.6 - 1302m (jammed)
- POOH
- Recover Core #2
- Lay down core barrel
- RIH and ream rathole with bit 13C (HW J-33)

1985/12/14

- Ream rat hole
- Drill 216mm hole to 1347m (FTD)
- Circulate and condition hole
- Run 20 stand wiper trip
- Circulate and condition hole
- POOH to log

1985/12/15

- POOH to log
- Rig up Schlumberger
- Logging with Schlumberger

1985/12/16

- Logging with Schlumberger

1985/12/17

- Logging with Schlumberger
- Run in hole for clean out trip
- Circulate and condition hole

1985/12/18

- Make up test tool
- RIH with test tool
- Run DST #1 (1290 - 1301m)

1985/12/19

- Run DST #1
- POOH with DST #1
- Recover DST #1
- Make up test tool for DST #2

1985/12/20

- RIH with DST (1278 - 1286m)
- Run DST #2

1985/12/21

- Run DST #2
- POOH with DST #2
- Recover DST #2
- RIH
- Circulate and condition hole
- POOH to run casing

1985/12/22

- Run 177mm production casing
- Circulate casing
- Cement casing
- WOC

1985/12/23

- WOC
- Rig release at 0800 hours

CASING SUMMARY

Conductor Casing

ran 5 joints, 340mm, 101.2 kg/m, K-55, BT&C conductor casing. Cemented by Dowell with 20 tonnes class "G" + 3% $CaCl_2$. Landed at 61.5m KB plug down at 1985/11/18 at 1030 hours. 2.5m^3 returns to surface.

Surface Casing

Ran 62 joints 245mm, 60 kg/m, MN-80 LT&C (ECP + DV tool at 49.6m). Cemented by Dowell with 36.0 tonnes of "G", 15.5 tonnes of "G" + 2% $CaCl_2$ - STAGE 2 - 5 tonnes "G" + 2% $CaCl_2$. Landed at 754.0m. Good cement returns to surface on second stage. 458.5m cement left in casing after cement job.

Production Casing

Ran 59 joints 177mm, 43.0 kg/m L-80 LT&C production casing. Cemented by Dowell with 28.4 tonnes Class "G" + 0.5% DG5, tailed in with 2.3 tonnes "G" + 2% $CaCl_2$. Landed at 1347.0m. No cement returns to surface. Estimated cement top at 200m.

DRILL STEM TEST SUMMARY

DST #1 1290 - 1302m Fm: Mt. Clarke Type: Inflate Straddle

TIMES:	5/90/270/540
PREFLOW:	GTS throughout
VO:	
RECOVERY:	
HP:	
SIP:	
FP:	1293 KPa
OTHER:	21141 m^3/day (750mcf/day)

DST #2 1278 1286m Fm: Mt. Clarke

TIMES:	10/90/120/240
RECOVERY:	4m drilling mud
HP:	16357/16737
SIP:	12289/13013
FP:	361/396/396/413
OTHER:	GTS throughout; 9 mcf/day

GEOLOGICAL SUMMARY

PCI Canterra Tweed Lake A-67 was drilled as a confirmation well to further prove up oil potential of the Tweed Lake structure penetrated by the M-47 gas condensate discovery. A-67 was drilled about one mile to the south east structurally and about 110 meters downdip to the Mount Clarke formation in the M-47 well in anticipation of penetrating an oil zone of the structure.

Cuttings samples were caught from surface to total depth in this well.

The Mount Kindle formation frequently outcrops at surface in the area and exhibits karst features. At A-67 well centre about 3 meters of locally derived glacial material overlaid the heavily weathered Mount Kindle. The weathered zone seemed to extend to about 30 meters in depth. No samples were caught from 40 meters to 65 meters due to lost circulation problems. Samples were then caught from 65 meters to total depth. At about 76 meters the Mount Kindle formation gave way to the Franklin Mountain formation and was evidenced by a distinct color change from a tan to a light grey.

The Franklin Mountain formation consisted of clean cherty dolomites in the upper two thirds. Common fracture and intercrystalline porosity was observed throughout this zone. This part of the hole was drilled with an air and foam drilling fluid to combat lost circulation problems. Throughout the drilling of the Franklin Mountain formation the well produced vast amounts of fresh water. The lower 1/3 of the Franklin Mountain formation consisted of interbedded shales and argillaceous dolomites, with shale bands becoming more frequent towards the base. The shales are red and green in color and are soft. penetration rate increases through the shales.

A thick red shale band marks the top of the Saline River formation. Drilling through this band changes the color of the drilling fluid to red.

The Saline River consists of interbedded red and green shale with minor beds of anhydrite and cryptocrystalline, argillaceous dolomite.

The Saline River salt member consists of halite with minor thin bands of shale and anhydrite. Upon penetration of the salt member the mud system was saturated with salt and was kept saturated for the remainder of the well.

A marked decrease in the penetration rate is encountered at the top of the Mount Cap formation. The Mount Cap consists of interbeds of shale and dolomite with minor anhydrite bands. The shales of the Mount Cap commonly have a bituminous quality. The dolomite stringers as well have bituminous material engrained within and are occasionally cherty.

Two sandstone sequences near the base of the Mount Cap correlated quite well with the M-47 well. The sandstones in this well however were somewhat dirtier and less permeable than the sands in the M-47 well. Poor visible hydrocarbon shows were observed through the sands. immediately below these sands lies a four meter thick dolomite bed which marks the base of the Mount Cap Formation. Core #1 was cut from 2 meters into this dolomite through the Upper Mount Clarke sand. Core 32 was then cut through the main Mount Clarke sand and into the Proterozoic.

Visual porosity in the Upper Mount Clarke ranged from poor to fair in the silt to medium grained sandstones and siltstones. Poor patchy shows of fluorescence and cut were observed. Gas detection equipment showed minor responses throughout the zone.

The lower sand showed fair to good porosity in the silt to coarse grained sands. Common weak orange fluorescence and a fast yellow/orange cut was observed in the sands. Minor dead oil and live oil staining was also observed. Gas detection equipment showed poor responses throughout the core intervals probably due to the minor amount of gas being liberated.

After coring the well was drilled to a depth of 1347m, 48 meters into the Proterozoic. The Proterozoic in this well consisted of a red to dark grey basalt with minor fractures infilled with dolomite.

FORMATION TOPS

FORMATION	SAMPLE (m)		LOG (m)	
	Depth	Subsea	Depth	Subsea
Mount Kindle	9	(+389.1)	--	--
Franklin Mountain	76	(+321.1)	76	(+321.1)
Saline River	727	(-329.9)	754	(-356.9)
Saline River Salt Member	796	(-398.9)	796	(-398.9)
Shale Marker	875	(-877.9)	867	(-469.9)
Mount Cap	1073	(-675.9)	1074	(-676.9)
High Gamma Ray Shale	1217	(-819.9)	1200	(-802.9)
Mount Clarke Formation	1278	(-880.9)	1279	(-881.9)
Proterozoic	1299	(-901.9)	1301	(-903.9)
F.T.D.	1347	(-949.9)	1345.5	(-948.4)

SAMPLE DESCRIPTIONS

Depth	Description
5 - 10m	Dolomite; tan, cryptocrystalline to very fine crystalline, massive to sucrosic texture clean, fair fracture and vug porosity, heavily weathered, boulders in dolomite sand matrix.
10 - 28m	Dolomite; cream to tan cryptocrystalline to very fine crystalline, massive to sucrosic, clean, limey in part, fair buff and fracture porosity, weathered boulders and gravel in a dolomite sand matrix, occasional rounded quartz and chert grains.
28 - 33m	Dolomite; cream to light brown, cryptocrystalline to very fine crystalline massive to sucrosic, clean, limey in part, fair fracture and vug porosity, occasional weathered surfaces, trace of quartz grains,
33 - 40m	Dolomite; cream to tan, cryptocrystalline to very fine crystalline, massive to sucrosic texture, clean, fair fracture and minor vug porosity, trace of quartz grains.
40 - 65m	LOST CIRCULATION at 40m. regained intermittently between 40 and 65m. Returns bypassed shaker, hole severely washing out. Conductor hole 0 - 65m. * Samples through this interval were extremely poor due to severe hole washout, partial and full lost circulation. Returns intermittently pumped from cellar over shaker, proper lag times impossible.
65 - 76m	Dolomite; cream to tan, very fine crystalline, sucrosic texture, subhedral, occasionally cryptocrystalline, poor intercrystalline and fracture porosity.
FRANKLIN MOUNTAIN FORMATION 76m (+321.10m)	
76 - 83m	Dolomite; light grey, very fine to medium crystalline, sucrosic texture in part, common dolomite rhombohedrons, euhedral, rare clear quartz grain inclusions, poor to fair intercrystalline porosity, trace of disseminated pyrite inclusions.

83 - 93m — Dolomite light grey, fine to medium crystalline, occasionally coarse crystalline, sucrosic texture in part, euhedral, common dolomite rhombohedrons, rare clear quartz and chert inclusions, poor to fair intercrystalline porosity

93 - 105m — Dolomite; light grey, tan, cryptocrystalline to fine crystalline, occasionally medium crystalline, subhedral, massive to occasionally sucrosic texture, poor effective intercrystalline porosity, trace of metasomatic chert.

105 - 111m — Dolomite; white to cream, fine to medium crystalline, euhedral, sucrosic texture in part, common dolomite rhombohedrons, trace of chert, rare quartz crystals, fair effective intercrystalline porosity

111 - 127m — Dolomite; white to light grey, fine to medium crystalline, subhedral, massive to sucrosic texture, occasionally coarse crystalline, common dolomite rhombohedrons, pockets of metasomatic chert and quartz crystals, poor effective intercrystalline porosity, trace of vuggy porosity

127 - 142m — Dolomite; light to occasionally medium grey, fine to medium crystalline, anhedral to subhedral, massive texture, rare dolomite rhombohedrons, poor effective intercrystalline porosity with rare bands and pockets of
Chert; white to light grey, hard, conchoidal fracture, trace of quartz crystals.

142 - 159m — Dolomite; white to light grey, very fine to fine crystalline, occasionally medium to coarse crystalline, massive texture, occasional dolomite rhombs, poor effective intercrystalline porosity with occasional bands and pockets of
Chert; as above

159 - 169m — Dolomite; light grey, occasionally medium grey, cryptocrystalline to fine crystalline, clean, subhedral, rare dolomite rhombs, massive texture, poor effective intercrystalline porosity, trace of vug porosity with common bands of
Chert; white to light grey, hard, conchoidal fracture, translucent in part, trace of light grey shale.

169 - 175m — Dolomite; as above with rare thin bands of
Chert; as above

175 - 180m — Interbeds of Dolomite; as above and
Chert; as above

180 - 195m Dolomite; white to light grey, cream, very fine to fine crystalline subhedral, massive texture, clean, poor vug and fracture porosity, with occasional thin bands and pockets of
Chert, white, light grey, clear, hard, conchoidal fracture, common quartz crystals, rare laminae of light grey/green dolomitic shale.

195 - 206m Dolomite; white to light grey, very fine to fine crystalline, occasionally medium crystalline, subhedral, clean, massive texture, poor vug and fracture porosity, occasional coarse dolomite rhombs, with occasional bands and pockets of
Chert; white, clear, light grey, hard, conchoidal fracture, translucent to opaque, trace of quartz crystals, trace of light grey/green dolomitic shale

206 - 222m Dolomite; light to medium grey, very fine to medium crystalline, massive to sucrosic texture, subhedral, occasional coarse dolomite rhombs, slightly argillaceous, poor vug and fracture porosity, trace of disseminated pyrite, with common bands and pockets of
Chert; as above

222 - 226m Interbeds of Chert; white, clear, light grey, opaque to translucent, trace of quartz crystals, and
Dolomite; light to medium grey, fine to medium crystalline, sucrosic texture, occasional dolomite rhombs, slightly argillaceous, poor vug and fracture porosity

226 - 237m Dolomite; as above with occasional thin bands and pockets of
Chert; as above

237 - 240m Dolomite; cream to light grey, microcrystalline to fine crystalline, occasionally medium crystalline, subhedral, sucrosic texture, clean, rare coarse dolomite rhombs, poor vug and fracture porosity, trace of chert

240 - 250m Dolomite; light to medium grey, cream, cryptocrystalline to medium crystalline, subhedral, slightly argillaceous in part, sucrosic in part, poor vug and fracture porosity, trace of chert

250 - 260m Dolomite cream, light to medium grey, cryptocrystalline to very fine crystalline, rarely fine to medium crystalline, massive texture, very slightly argillaceous in part, tight

260 - 266m Dolomite; cream, light to medium grey, cryptocrystalline to medium crystalline, massive to sucrosic texture, argillaceous in part, tight

266 - 274m	Dolomite; as above but with rare thin bands and pockets of Chert; white to light grey, hard conchoidal fracture, abundant dolomite (fine crystalline), rhombohedron inclusions
274 - 285m	Dolomite; cream, occasional light grey, cryptocrystalline to fine crystalline sucrosic, subhedral, tight
285 - 290m	Dolomite; light brown, light grey/brown cryptocrystalline to medium crystalline, subhedral, sucrosic in part, poor effective intercrystalline porosity
290 - 295m	MISSED SAMPLE
295 - 300m	Dolomite; as above
300 - 315m	Dolomite; cream, light grey/brown, cryptocrystalline to microcrystalline, occasionally medium crystalline, subhedral, massive texture, trace of vug and fracture porosity, with rare thin bands and pockets of Chert; white, translucent, hard, conchoidal fracture, trace of fine grained dolomite rhombohedron inclusions.
315 - 332m	Dolomite; cream, light grey/brown, cryptocrystalline to medium crystalline, subhedral, massive, sucrosic in part, clean, trace of vug and fracture porosity, trace of quartz crystals.
332 - 341m	Dolomite; cream, tan, light grey, microcrystalline to medium crystalline, massive to sucrosic texture, slightly argillaceous in part, trace of vug and fracture porosity
341 - 348m	Dolomite; cream to light brown, microcrystalline to fine crystalline, occasionally medium crystalline, subhedral, massive texture, slightly argillaceous in part, trace of vug and fracture porosity
348 - 357m	Dolomite; cream, tan, occasionally light brown, microcrystalline to medium crystalline, subhedral, sucrosic in part, clean to very slightly argillaceous in part, poor vug, fracture and intercrystalline porosity, trace of quartz crystals
357 - 372m	Dolomite, cream, tan, light grey/brown, microcrystalline to fine crystalline, occasionally medium crystalline, massive to sucrosic texture, subhedral, trace of vug and fracture porosity, trace of quartz crystals

372 - 386m Dolomite, tan, light grey, cryptocrystalline to fine crystalline, occasionally medium crystalline, subhedral, massive to sucrosic texture, clean, trace of vug and fracture porosity, trace of quartz crystals

386 - 391m Dolomite; tan to medium grey/brown, cryptocrystalline to microcrystalline, anhedral, dense; massive texture, slightly argillaceous, tight

391 - 397m Dolomite; cream to tan, occasionally light brown, cryptocrystalline to microcrystalline, anhedral, massive texture, dense, clean, tight

397 - 415m Dolomite; tan, light to medium brown, microcrystalline to very fine crystalline, occasional medium crystalline, subhedral, massive slightly argillaceous, tight, trace of chert and quartz crystals

415 - 427m Dolomite; cream to tan, light brown, cryptocrystalline to microcrystalline, occasionally fine to medium crystalline, massive texture, anhedral, slightly argillaceous in part, trace of vug and fracture porosity, trace of disseminated pyrite, trace of quartz crystals, trace of chert.

427 - 436m Dolomite; cream, light to medium brown, cryptocrystalline to microcrystalline, massive texture, anhedral, slightly argillaceous in part trace of vug and fracture porosity, trace of disseminated pyrite, trace of quartz crystals.

436 - 453m Dolomite; cream, tan, light grey/brown, cryptocrystalline to microcrystalline, massive, anhedral, dense, very slightly argillaceous in part, tight, trace of disseminated pyrite.

453 - 461m Dolomite; cream, tan, light to medium grey/brown, cryptocrystalline to medium crystalline, subhedral massive to sucrosic texture, slightly argillaceous in part, occasional coarse dolomite rhombs, poor intercrystalline porosity, trace quartz crystals, trace of light grey/green dolomitic shale.

461 - 478m Dolomite; tan, light brown, cryptocrystalline to fine crystalline, subhedral, massive texture, very slightly argillaceous, tight, trace disseminated pyrite

478 - 483m Dolomite; tan to light brown, very fine to fine crystalline, subhedral to euhedral, sucrosic texture, clean, poor intercrystalline and pinpoint porosity

483 - 499m	Dolomite; light grey, light brown, cryptocrystalline, occasionally microcrystalline, anhedral, massive texture, tight, dense
499 - 511m	Dolomite; white cream, light grey, cryptocrystalline, occasionally microcrystalline to very fine crystalline, anhedral, massive texture, tight, dense
511 - 522m	Dolomite; cream, tan, light brown, cryptocrystalline to fine crystalline, subhedral, massive to sucrosic texture, tight; trace of shale
522 - 537m	Dolomite; cream, light brown, microcrystalline to medium crystalline, sucrosic in part, euhedral in part, poor intercrystalline and vug porosity, with common laminae and bands of Shale; white light grey/green, soft, slightly dolomitic, bentonitic, with pyrite and dolomite inclusions, possibly derived from diatomaceous or radiolarian ooze
537 - 551m	Dolomite, cream, tan, cryptocrystalline, anhedral, massive texture, tight, traces of shale pyrite, traces of diatoms? or radiolarians?
551 - 567m	Dolomite; cream, tan, light grey, cryptocrystalline to microcrystalline, anhedral, massive texture, clean, tight, trace of chert, quartz crystals, pyrite
567 - 581m	Dolomite; cream to light brown, cryptocrystalline to microcrystalline, occasionally very fine crystalline, massive texture subhedral, very slightly argillaceous in part, tight, trace of chert
581 - 587m	Dolomite; cream to tan, cryptocrystalline to microcrystalline, massive texture, clean, anhedral, tight
587 - 600m	Dolomite; cream, light grey, light to medium brown, cryptocrystalline to fine crystalline, massive to sucrosic texture, subhedral, slightly argillaceous in part, trace of vuggy porosity, trace of pyrite, trace of quartz crystals, trace of shale
600 - 605m	MISSED SAMPLE
605 - 610m	Dolomite; cream, tan, light brown, cryptocrystalline to microcrystalline, anhedral, massive texture, clean to very slightly argillaceous, tight trace of grey/green shale partings, trace of pyrite, trace of chert
610 - 624m	Dolomite; cream, light grey/brown, cryptocrystalline, anhedral, massive texture, slightly argillaceous, hard, tight, trace of disseminated pyrite

624 - 636m Dolomite;, cream to light grey/brown, light brown, cryptocrystalline, occasionally microcrystalline, slightly limey, anhedral, massive texture, slightly argillaceous hard, tight, trace of pyrite

636 - 640m Dolomite; as above, with rare thin laminae of Shale; light grey/green, medium grey, grey/green, blocky, soft, slightly dolomitic in part, waxy in part, trace of disseminated pyrite

640 - 651m Dolomite; cream, tan, light brown, slightly limey, cryptocrystalline to microcrystalline, subhedral, massive texture, very slightly argillaceous, hard, tight

651 - 660m Dolomite; cream, tan, light grey/brown, limey to very limey, anhedral, massive texture, slightly argillaceous, hard, tight

660 - 671m Dolomite; cream, tan, cryptocrystalline, slightly limey, anhedral, massive texture, very slightly argillaceous, hard, tight

671 - 676m Dolomite; cream, tan, light brown, cryptocrystalline, slightly limey in part, anhedral, massive texture, very slightly argillaceous to argillaceous, hard, tight, trace of grey/green shale partings

676 - 684m Dolomite; cream, tan, cryptocrystalline, slightly limey in part, anhedral, massive texture, clean to slightly argillaceous, hard, tight

684 - 695m Dolomite; cream, tan, light brown, slightly limey in part, cryptocrystalline to microcrystalline, subhedral, massive texture, clean to slightly argillaceous, hard, trace of vug and fracture porosity, trace of chert, trace of grey/green shale partings.

695 - 711m Dolomite; cream, tan, slightly limey, cryptocrystalline anhedral, massive texture, clean to slightly argillaceous, hard, tight trace of chert, trace of anhydrite

711 - 721m Dolomite; light brown, light to medium grey/brown, slightly limey, cryptocrystalline, anhedral, massive texture, slightly argillaceous to very argillaceous, moderately hard, trace of anhydrite, with occasional thin bands of
Shale; medium to dark grey/green, blocky, moderately hard, waxy in part, slightly dolomitic, trace of disseminated pyrite inclusions.

721 - 727m Dolomite; tan, light to medium grey/brown, slightly limey, cryptocrystalline, anhedral, massive texture, slightly argillaceous to very argillaceous, tight; trace of disseminated pyrite, grades to dolomitic shale in part, interbedded with
Shale; light to medium grey, light to medium grey/green blocky, moderately hard, waxy in part, dolomitic in part, trace of disseminated pyrite, grades to argillaceous dolomite

SALINE RIVER FORMATION ? 727m (-329.9m SS)

727 - 734m Dolomite; cream, tan, light to medium grey/brown slightly limey, cryptocrystalline, occasionally microcrystalline, anhedral, massive texture, slightly argillaceous to very argillaceous, tight; grades to dolomitic shale in part, with common bands and beds of
Shale light to medium grey/green, as above, and
Shale; brick red, brown, blocky, moderately hard, slightly dolomitic, grades to very argillaceous dolomite in part

734 - 747m Interbeds of Dolomite; cream tan, light grey/brown, light red/brown, cryptocrystalline, anhedral, massive texture, clean to very argillaceous, tight; grades to dolomitic shale and
Shale; grey/green, green, red, as above

747 - 754m Dolomite; cream, tan, light grey/brown, red/brown, cryptocrystalline, anhedral, massive texture, clean to very argillaceous, tight; grades to dolomitic shale in part, interbedded with
Shale; grey/green, green red, red/brown, blocky, moderately hard, dolomitic in part, grades to very argillaceous dolomite in part

754 - 764m Interbeds of Shale; red, red/brown, green, grey/green, subfissile, slightly micromicaceous in part, waxy in part, dolomitic in part, anhydritic in part, and
Dolomite; light grey, light brown, red/brown, cryptocrystalline to very fine crystalline, anhedral, massive clean to argillaceous, tight, grades to shale in part, trace of anhydrite

764 - 778m Interbeds of Shale; red, green, red/brown, subfissile, micromicaceous in part, soft, waxy in part, dolomitic in part, anhydritic in part, and;
Dolomite; tan, light brown, grey/brown, cryptocrystalline, anhedral, massive, slightly argillaceous to argillaceous, trace of anhydrite cement, tight, grades to shale in part, trace of anhydrite

778 - 787m Interbeds of Shale; red, red/brown, green, grey/green, blocky to subfissile, micromicaceous in part, soft, waxy in part, dolomitic in part, anhydritic in part, and
Dolomite; cream, light grey/brown, red/brown, cryptocrystalline, anhedral, massive, abundant anhydrite cement, argillaceous to very argillaceous, tight, grades to shale in part, trace of anhydrite

787 - 796m Interbeds of Shale; green, grey/green, minor red, soft, blocky to subfissile, micromicaceous in part, waxy in part, very dolomitic in part, very anhydritic in part, grades to dolomite in part, and
Dolomite; cream, light brown, cryptocrystalline, anhedral, massive, abundant anhydrite cement, slightly argillaceous to very argillaceous, tight; grades to shale in part

SALT MEMBER 796m (-389.9m SS)

796 - 820m Salt; dissolved in mud system, with occasional thin bands and laminae of
Shale; red, green, grey/green, soft, blocky to subfissile, micromicaceous in part, waxy in part, dolomitic in part, anhydritic in part, and;
Anhydrite; light grey, translucent, flakey in part, argillaceous in part, dolomitic in part, and
Dolomite; as above

820 - 837m Halite; clear, minor orange and red, vitreous, soft, with rare thin bands of
Shale; green, grey/green, soft, waxy, dolomitic in part, anhydritic in part, traces of
Dolomite; cream, light grey/brown, cryptocrystalline, anhedral, massive, abundant anhydrite cement, argillaceous in part, tight; and
Anhydrite; light to medium grey, flakey, dolomitic in part, argillaceous in part, translucent in part, trace of salt casts

837 - 860m Halite; clear, minor orange, vitreous, soft, with rare thin laminae of
Anhydrite; light grey/green, blocky, soft, argillaceous in part, slightly dolomitic in part, rare laminae of shale and dolomite

860 - 875m Halite; clear, trace of orange, soft, vitreous with rare laminae of
Anhydrite; as above, trace of shale

SHALE MARKER 875m (-477.9m SS)

875 - 888m — Anhydrite; cream. light grey, light grey/green, soft, massive to microcrystalline, slightly argillaceous in part, chalky texture in part, slightly dolomitic in part, with minor bands and laminae of
Shale; light grey, light grey/green, rarely brown and red, very soft, subfissile, micromicaceous in part, slightly dolomitic in part, waxy in part, anhydritic in part, trace of dolomite

888 - 910m — Halite; clear, minor to commonly orange, vitreous, soft, traces of anhydrite

910 - 915m — Halite; clear, rarely orange, soft, vitreous, trace of anhydrite

915 - 935m — Halite; clear, white, rarely orange, vitreous to drusy, soft, trace of anhydrite inclusions

935 - 942m — Anhydrite; cream, light grey, very fine crystalline, chalky texture, soft, slightly dolomitic in part, slightly argillaceous in part, minor halite inclusions, trace of dolomite, trace of shale, with thin bands of
Halite, as above

942 - 955m — Halite; clear, white, rarely orange, soft, vitreous to drusy, rare anhydrite inclusions, trace of anhydrite laminae

955 - 972m — Halite; clear, minor white and orange, soft, vitreous to occasionally drusy, rare anhydrite inclusions,t race of anhydrite

972 - 981m — Halite; clear, minor white, commonly orange, soft, vitreous to occasionally drusy, rare anhydrite inclusions

981 - 1002m — Halite; clear, white, rarely orange, soft, vitreous to drusy, rare anhydrite inclusions

1002 - 1007m — Halite; clear, white, commonly orange, soft, vitreous to drusy, rare anhydrite inclusions, trace of anhydrite

1007 - 1014m — Halite; as above with rare thin laminae of
Anhydrite; light grey, light orange, cream, soft, microcrystalline, flaky in part, argillaceous in part, slightly dolomitic in part

1014 - 1020m — Interbeds of Halite; as above, and
Anhydrite; cream, tan, light grey, soft massive to microcrystalline, massive to chalky texture, argillaceous in part, dolomitic in part, and

1014 - 1020m (cont'd) Dolomite; cream, tan, soft, microcrystalline, trace of anhydrite cement, trace of calcite cement, slightly argillaceous in part, trace of pinpoint porosity, trace of shale

1020 - 1032m Halite; clear, white, minor orange, soft, vitreous to drusy, common anhydrite inclusions, trace of anhydrite

1032 - 1038m Interbeds of Halite; as above, and
Dolomite; as above

1038 - 1047m Halite; as above, with rare thin bands of
Dolomite; as above, and rare thin bands of
Anhydrite; cream, light grey, soft, chalky texture, slightly argillaceous, dolomitic, grades to anhydritic dolomite

1047 - 1053m Interbeds of Halite; clear, white, orange, soft, vitreous to drusy minor anhydrite inclusions, and
Dolomite; as above with thin bands and laminae of
Shale; green, subfissile, waxy in part, dolomitic in part, anhydrite in part, and
Anhydrite; as above

1053 - 1073m Halite clear, white, rarely orange, vitreous to occasionally drusy, rare thin bands of shale and anhydrite, and dolomite

1073m MOUNT CAP (-675m SS)

1073 - 1087m Interbeds of Shale; medium grey, grey/green, blocky to sue, slightly dolomitic in part, slightly anhydritic in part, and
Dolomite; cream, tan, light grey, cryptocrystalline to microcrystalline, common anhydrite cement, moderately hard, slightly argillaceous to argillaceous, trace of effective intercrystalline porosity, trace of anhydrite

1087 - 1099m Interbeds of Shale; medium grey, light to medium grey/green, blocky to subfissile, slightly dolomitic in part, and
Dolomite; cream, tan, light grey, cryptocrystalline to microcrystalline, common anhydrite cement, slightly argillaceous to argillaceous, trace of intercrystalline porosity, with rare thin bands or pockets of
Anhydrite, cream, white, massive to chalky texture, dolomitic in part, slightly argillaceous in part

1099 - 1104m Interbeds of Shale; as above,
Anhydrite; as above, and
Dolomite; cream, tan, light grey, cryptocrystalline to microcrystalline, common anhydrite cement, tight

1104 - 1113m Dolomite; cream, tan, medium brown, cryptocrystalline to microcrystalline, slightly limey in part, anhedral, trace of anhydrite cement, bitumen engrained, tight; with minor thin bands of
Shale as above, and
Anhydrite; as above, trace of dark brown bituminous shale laminae, trace of chert

1113 - 1123m Dolomite; cream, light to medium brown, microcrystalline to very fine crystalline, subhedral, sucrosic texture in part, silicified in part, common anhydrite cement, bitumen engrained, poor pinpoint and intercrystalline porosity with common bands of
Shale; light to medium grey, grey/green, red/brown soft to moderately hard, slightly dolomitic in part.

1123 - 1133m Shale; medium to dark grey, occasionally grey/green, blocky to subfissile, slightly micromicaceous in part, slightly calcareous, with occasional thin bands of
Dolomite; cream, tan, light to medium brown, cryptocrystalline to microcrystalline, slightly limey in part, silicified in part, trace of anhydrite cement, slightly argillaceous to argillaceous, bitumen engrained trace of intercrystalline porosity

1133 - 1135m Limestone; cream, tan, light to dark brown, bioclastic, slightly dolomitic, slightly argillaceous to very argillaceous, bitumen engrained, trace of intergranular porosity, grades to limey shale, trace of dolomite, trace of anhydrite

1135 - 1142m Shale; medium to dark grey/green, medium grey, blocky to subfissile, micromicaceous in part, waxy in part, slightly calcareous in part, with rare thin bands of
Dolomite; as above

1142 - 1151m Shale; as above with rare thin laminae or beds of
Dolomite; tan, light to dark brown, cryptocrystalline to microcrystalline, slightly limey in part, argillaceous to very argillaceous, bitumen engrained, tight to trace porosity

1151 - 1161m Shale; as above with common bands of
Limestone; tan, light to dark brown, micritic to very fine granular, slightly argillaceous to argillaceous, slightly dolomitic, bitumen engrained in part, tight

1161 - 1177m Shale; medium grey, medium grey/green, subfissile, slightly micromicaceous in part, slightly calcareous in part, with common bands of
Limestone; tan, light to dark brown, micritic to very fine granular, slightly argillaceous to argillaceous, slightly dolomitic, bitumen engrained in part, tight; and rare bands of
Dolomite; tan to light brown, cryptocrystalline to microcrystalline, subhedral massive texture, clean to argillaceous, limey in part, trace of earthy porosity

1177 - 1186m Shale; light to medium grey/green, medium grey/brown, blocky to subfissile, micromicaceous in part, calcareous in part, moderately hard, with occasional thin bands of
Limestone; cream, tan, light to medium brown, micritic, moderately hard, calcite cement, argillaceous to very argillaceous, grades to limey trace pelecypoda shale in part, with rare thin bands of
Dolomite; cream, tan, cryptocrystalline to microcrystalline, subhedral, massive texture, argillaceous, tight

1186 - 1192m Shale; medium to dark grey dark grey/brown, blocky to subfissile, micromicaceous, calcareous, moderately hard, bituminous in part, with common beds of
Limestone; tan, light to medium brown, micritic to very fine granular, slightly dolomitic, argillaceous to very argillaceous, tight; common pelecypods

1192 - 1200m Dolomite; light to dark brown, cryptocrystalline to microcrystalline, slightly limey in part, massive texture, argillaceous to very argillaceous, bitumen engrained in part, very poor effective intercrystalline porosity, common dull orange fluorescence, slow weak yellow green massive cut, with occasional bands of
Shale; medium to dark grey/brown, occasionally brown/black, blocky to subfissile, micromicaceous, bituminous, and rare laminae of
Limestone; cream to tan, micritic, slightly argillaceous, tight

1200 - 1205m Dolomite; tan to dark brown, cryptocrystalline, very silty, argillaceous, bitumen plugged grades to siltstone, poor effective earthy porosity, abundant weak yellow fluorescence, slow weak yellow massive cut, with rare laminae of
Shale; as above

1205 - 1207m Dolomite; cream, tan, light to medium brown, cryptocrystalline to microcrystalline, argillaceous to very argillaceous, slightly limey in part, bitumen engrained in part, tight, trace of very weak orange fluorescence trace of slow weak yellow massive cut

1207 - 1211m Shale; medium grey, blocky to subfissile, very micromicaceous in part, slightly calcareous in part

1211 - 1217m Limestone; tan, light to medium brown, micritic to very fine granular, dolomitic to very dolomitic in part, slightly argillaceous to very argillaceous, slightly bitumen engrained, tight, grades to limey dolomite

1217m HIGH GAMMA RAY SHALE (-819.9m SS)

1217 - 1228m Shale; medium grey, subfissile, very micromicaceous slightly calcareous in part, moderately hard

1228 - 1229m Sandstone; white to light grey, quartz, silt to very fine grained, subangular, well sorted, clean, abundant dolomite cement, abundant silica cement, tight, poor intergranular porosity

1229 - 1231m Dolomite; cream, tan, light brown, cryptocrystalline, clean to argillaceous, slightly limey, tight

1231 - 1239m Sandstone; white to cream, light brown, silt to very fine grained, subangular, well sorted, abundant dolomite cement, abundant silica cement, clean to slightly argillaceous, poor intergranular porosity, with rare laminae of
Shale; medium grey, blocky to subfissile, very micromicaceousin part, slightly calcareous in part, moderately hard.

1239 - 1252m Shale; medium to dark grey, dark grey/brown, blocky to subfissile, micromicaceous to very micromicaceous, bituminous in part, slightly calcareous in part

1252 - 1260m Dolomite; medium to dark brown, mottled, occasionally light brown, cryptocrystalline to medium crystalline, subhedral, massive texture, bitumen engrained, argillaceous to very argillaceous, tight

1260 - 1263m Sandstone; white, cream, light grey, silt to very fine grained, subangular, well sorted, abundant dolomite cement, abundant silica cement, slightly argillaceous to argillaceous matrix in part, friable to moderately hard, poor effective intergranular porosity, common bright yellow fluorescence very slow weak yellow/green massive cut

1262 - 1265m Interbeds of Shale; as above, and
Dolomite; as above

1266 - 1274m Sandstone; cream, light grey, occasionally medium grey, silt to occasionally very fine grained, subangular, well sorted, abundant silica and dolomite cement, slightly argillaceous to argillaceous matrix in part, friable to moderately hard, occasional mica flakes, poor effective intergranular porosity, trace bright yellow fluorescence, very slow very weak yellow/green massive cut, with rare thin bands of
Shale; medium to dark grey, blocky to subfissile, micromicaceous in part, slightly dolomitic in part, slightly bituminous in part, and
Dolomite; medium to dark brown, mottled, cryptocrystalline to medium crystalline, subhedral, massive texture, silty and sandy in part, bitumen engrained, argillaceous to very argillaceous, tight

1274 - 1276m Dolomite; light to dark brown, mottled, microcrystalline to medium crystalline, subhedral, massive texture, rarely silty and sandy, bitumen engrained, argillaceous to very argillaceous, tight

1276 - 1302m SEE DETAILED CORE DESCRIPTION

1302 - 1320m Basalt; dark red, dark grey/red, dark grey, blocky, aphanitic to very fine crystalline, hematitic, hard, with rare fracture infilling of dolomite

1320 - 1333m Basalt; red, dark grey/red, grey, blocky, hard, aphanitic to fine crystalline, hard, hematitic in part, with common to abundant veins and fissures infilled with
Dolomite; red/brown, tan, cryptocrystalline to microcrystalline, dolomite cement, calcite cement, clean to slightly argillaceous, iron stained in part, tight

1333 - 1347m Basalt; red, maroon, red/brown, blocky, hard, aphanitic, occasionally very fine to fine crystalline, common mica flakes, hematitic

1347m F.T.D. (-949.9m SS)

DETAILED CORE DESCRIPTIONS

CORE #1 1276.0 - 1287.53m Cut 11.53m Rec 11.53m

Coring Times: (minutes/.20m)

27,19,20,19,22;	32,18,16,13,9;	12,3,3,4,3;
3,3,4,13,14;	10,11,13,23,24;	26,18,13,17,10 ;
28,15,9,10,10;	31,34,41,30,26;	22,19,18,12,13;
14,17,18,17,17;	17,16,33,5,2;	16,19,12

1276.0 - 1277.69m
1.69m

Dolomite; light to medium grey, dark grey/brown, microcrystalline to medium crystalline, subhedral, massive texture, bituminous shale laminae throughout, tight; no visible shows

1277.69 - 1278.28m
0.59m

Dolomite; light to medium grey/brown, fine to medium crystalline, subhedral, massive texture, abundant fine to medium quartz grains, rounded to well rounded, common argillaceous laminae, slightly limey, sand content increases toward base, occasionally grading to dolomitic sandstone, tight, no shows

1278.28 - 1280.17m
1.89m

Sandstone; tan to medium grey/brown, grey/green, quartz, silt to medium grained, occasionally coarse grained, common calcite cement, slightly argillaceous to argillaceous matrix, rounded to well rounded, poor to fair effective intergranular porosity, becoming increasingly fine grained towards base, trace of patchy weak yellow fluorescence fast yellow green massive cut, minor ball and pillow structures,

1280.17 - 1283.37m
3.20m

Sandstone; light grey, tan to light brown, light grey/brown, quartz, silt to very fine grained, rounded to well rounded, well sorted abundant silica cement, minor calcite cement slightly argillaceous matrix in part, occasional argillaceous laminae, poor to fair effective intergranular porosity, common yellow/white fluorescence, very slow weak yellow/white cut (shows to 1282.33) no shows 1282.33 - 1283.37m, fluorescence due in part to possible mineral fluorescence

1283.37 - 1284.87m
1.50m

Siltstone; light grey, tan, quartz, silt abundant silica cement, trace of calcite cement, subangular to subrounded, well sorted, common argillaceous laminae increases towards base, grading to silty shale in part, poor effective intergranular porosity, common yellow/white fluorescence, very slow weak yellow white cut, shows due in part to possible mineral fluorescence

1284.87 - 1287.53m

Shale; medium to dark grey/brown, blocky, hard, slightly micromicaceous, siliceous?, conchoidal fracture in part, common vertical and horizontal fractures, abundant to rare silt lenses and laminae decreasing towards base

- ALL INTERVAL CONTACTS ARE GRADATIONAL

CORE #2 1287.6 - 1302.0m Cut 14.4m Rec. 14.4m

Coring Times: (minutes/.20m)

10,8;	13,13,17,14,4;	2,4,3,4,3;
1,2,1,7,8;	10,14,11,6,7;	8,3,3,1,2;
10,9,9,12,11;	12,12,14,20,16;	24,5,8,7,7;
8,7,8,6,7:	7,6,8,7,9;	10,21,16,10,23;
13,13,14,14,13;	13,12,6,11,7;	13,14,14,15,14

1287.6 - 1288.7m
1.10m

Shale; medium to dark grey, fissile, slightly micromicaceous, trace of disseminated pyrite, common blebs and laminae of siltstone, possible pelecypod fragment

1288.7 - 1289.28m
0.58m

Sandstone; light to medium grey, quartz, minor chert fine to coarse grained, subrounded to well rounded, poorly sorted, hard, abundant silica cement, common silty matrix, abundant argillaceous laminae, rare pyrite blebs, poor to fair effective intergranular porosity, common mineral fluorescence

1289.28 - 1290.50m
1.22m

Sandstone; light grey/green, quartz, fine to coarse grained, subrounded to well rounded, poorly sorted, silty matrix, clean, poorly indurated, friable, poorly cemented with silica cement fair to good effective intergranular porosity, no visible shows, possible flushed, no bedding features, sharp upper contact

1290.5 - 1292.15m 1.65m	Sandstone; light grey, light grey/brown, quartz, silt to very fine grained, subrounded, well sorted, silica cement, minor siderite cement, hard, slightly argillaceous in part poor effective intergranular porosity, trace of cast porosity, occasional sideritic bands, bioturbated, common mineral fluorescence? (no cut, possibly due to very low permeability
1292.15 - 1293.04m 0.89m	Sandstone; (same as 189.28 - 1290.50m interval) with occasional vertical bands of coarse grained sandstone with dead oil staining
1293.04 - 1295.0m 1.96m	Sandstone; tan to dark grey, quartz, silt to very fine grained, subangular to subrounded, well sorted, silica cement, common argillaceous matrix, poor to fair effective intergranular porosity, trace of dead oil staining, trace of live oil staining, common weak orange fluorescence, fast yellow/orange massive cut, occasional siderite bands.
1295 - 1298.33m 3.33m	Sandstone; tan to dark grey, silt to fine grained, subangular to subrounded, moderately sorted, silica cement, argillaceous matrix in part, poor to fair effective intergranular porosity, common dead oil staining, abundant weak yellow/orange fluroescence, fast yellow/orange massive cut, petroliferous odor, common large scale cross bedding, hard,
1298.33 - 1298.78m 0.45m	Sandstone; dark red/grey, quartz, very fine to medium grained, subrounded to well rounded, moderately sorted, silica cement, argillaceous matrix, hard, poor effective porosity, no shows
1298.78 - 1299.18m 0.40m	Interbedded Sandstone; as above, and Basalt; red, aphanitic texture, hard
1299.18 - 1302.0m 2.82m	Basalt; red, maroon, hard, massive aphanitic texture, hematitic, dolomite infill of minor fracture.

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PETRO CANADA INC.

REPORT ON COMPLETION

OF

PCI CANTERRA TWEED A-67

January 29th to March 17, 1986

Prepared by: Chris Baillie

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Northern District Manager
86/04/1

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86-03-25

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INTRODUCTION:

PCI Canterra Tweed Lake A-67 was drilled to TD at 1347 mKB on 85/12/23. A completion program was designed to investigate the deliverability and characteristics of the Mount Clark formation.

DISCUSSION:

Roll'n rig #35 was moved from Red Deer to the Tweed Lake location on 86/02/04. Cement was drilled out from 1308 mKB to 1331 mKB. Using 127 mm TCP guns, Schlumberger perforated the Mount Clark from 1290.5 to 1301.0 mKB at 39 JSPM. The well was swabbed in and flowed through a 31.75 mm orifice plate for 2 1/2 hours with a tubing pressure dropping from 2800-1800 kPa.

Dowell/Schlumberger pickled the tubing with 0.5 m^3 of 15% HCl and then performed a 6 m^3 15% HCl 67% methanol gas well acid wash/squeeze at 7.0 MPa. After swabbing and cleaning up, the well flowed at 43 10^3m^3 with 5800 kPa on the tubing. The tubing pressure climbed to 10.8 MPa after 8 hours of build-up.

Dowell/Schlumberger then performed a squeeze by pumping 3 m^3 of methanol, 6 m^3 of 7 1/2% HCl gas well acid, and 24 m^3 of 1 1/2% HF acid, 7 1/2% HCl acid, 10% mutual solvent, at 7.0 MPa. The resulting flow rate was 45 10^3m^3 at a tubing pressure of 3780 kPa. A build-up of 10 hours resulted in a tubing pressure of 11.0 MPa. A Halliburton RBP was set at 1288.5 mKB in order to investigate the upper Mount Clark. Using a 79 mm Computalog casing gun, the Mount Clark was perforated from 1278.5-1284.5 mKB at 13 JSPM.

Dowel/Schlumberger performed a 6 m^3 15% HCl, 67% methanol gas well acid wash/squeeze at 7.0 MPa. After the acid job a flow rate of 32.5 10^3m^3 at 4780 kPa was achieved. A 26 hour build-up resulted in a pressure of 10.9 MPa.

Dowell/Schlumberger then frac'd the upper Mount Clark with 8 tonnes of 20/40 sand in H_2O/Nz foam. A 2 rate test showed 58.6 10^3m^3 at 8.0 MPa and 82.0 10^3m^3 at 6.6 MPa. After 11 hours of build-up the pressure was 10.8 MPa.

The Halliburton bridge plug was removed and an RTTS packer set at 1288.6 mKB in order to frac the lower Mount Clark. 12 tonnes of 20/40 sand was pumped in H_2O/Nz foam. After the frac the well flowed at 120 10^3m^3 at 6.0 MPa and 102 10^3m^3 at 8.0 MPa. A 13 hour build-up gave a pressure of 10.9 MPa.

A further flow period at 6.0 MPa resulted in a rate of 98 10^3m^3. The well was shut in for 12 hours and the pressure increased to 10.8 MPa. Concern for hydrate formation resulted in flowing the well again at 8.0 MPa and 90 10^3m^3 then 6.0 MPa and 106 10^3m^3.

When the testing was concluded an EZ drill bridge plug was set at 1260 MKB and capped with cement to 1250.7 mKB. Roll'n rig #35 was moved back to Red Deer and released on 86/03/20.

CONCLUSION:

PCI Canterra Tweed Lake A-67 is presently a suspended gas well.

WELL DATA SUMMARY

LOCATION: PCI Canterra Tweed Lake A-67

DATE: 86/03/08

KB: 397.10 m GL: 390.90 m KB-CF: 6.35 m

KB-THF: 5.80 m TD: 1347.0 mKB PDB: 1250.7 mKB

~~SURFACE CASING:~~ CONDUCTOR CASING: 5 jts 340 mm, 101.2 kg/m, K-55, ST & C at 61.5 mKB

SURFACE CASING: 62 jts 245 mm, 60 kg/m, MN-80, LT&C at 754.0 mKB

~~PRODUCTION CASING:~~

PRODUCTION CASING: 132 jts, 178 mm, 43 kg/m, L-80 LT & C at 1347.0 mKB

LINER:

~~PRODUCTION~~ PACKERS: 1 Halliburton EZ drill bridge plug at 1260 mKB - capped with 9.3 m of class G cement

NIPPLES:

PERFORATIONS: Mount Clark (lower) 1290.5-1301.0 mKB - 399 23 gm charges

Mount Clark (upper) 1278.5-1284.5 MKB - 158 12 gm charges

PETRO CANADA

PERFORATING DATA

DATE: 86-02-10

Well Name PCI Canterra Tweed Lake LOCATION A-67

Reason for Perforating Obtain gas production

Formation Perforated Mount Clark

Description of Casing (Perforated Interval) Size 178 mm Weight 43 kg/m Grade L-80

K.B. to Casing Flange 6.35 m K.B. to Top Tubing Spool 5.80

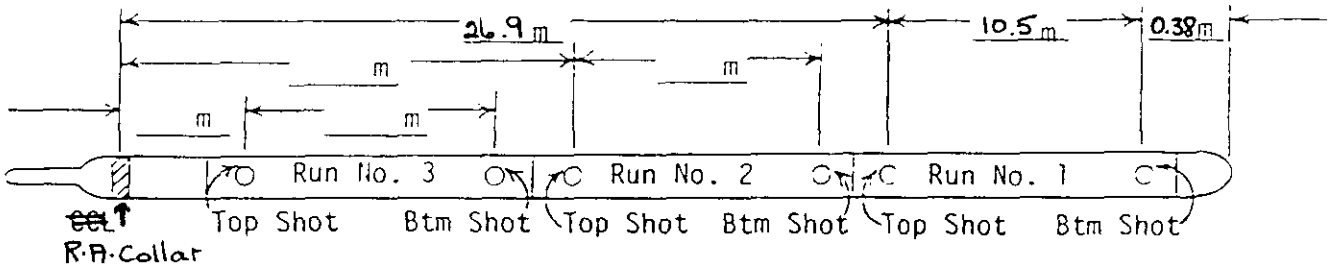
WIRELINE

Type of Gun and Size of Perforations Tubing conveyed - 23 gr

O.D. of Tool 127 mm No. of Runs 1

Fluid Level ____ Type of Fluid 10% KCl B.H. Temp 12°C

Run Number	Perforated Log Depth	Density of Shots (SPM)	Total No. of Shots
1	1290.5-1301.0 mKB	39	399



RECORD OF MEASUREMENTS

What Log was Used for Correlation Schlumberger BHC/sonic Date 85/12/15

Remarks: ____

LOG PRESENTATION:

1. Run pass across perf interval with collar locator showing 7 collars if possible. Also use tension device to show pick up off bottom where applicable.

2. When preparing to shoot, log 3 collars below perf interval. Stop and shoot gun. At that point shift pen recording collars and log 3 collars above the perforated interval. This method will allow for exact point where gun was fired to be determined from log.

   *NOTE: Mark with asterisk (*) collar used for positioning.

Work Supervised by: Jack McQuick

PETRO-CANADA

PERFORATING DATA

DATE: 86-02-10

Well Name PCI Canterra Tweed Lake LOCATION A-67

Reason for Perforating Obtain gas production

Formation Perforated Mount Clark

Description of Casing (Perforated Interval) Size 178 mm Weight 43 kg/m Grade L-80

K.B. to Casing Flange 6.35 m K.B. to Top Tubing Spool 5.80

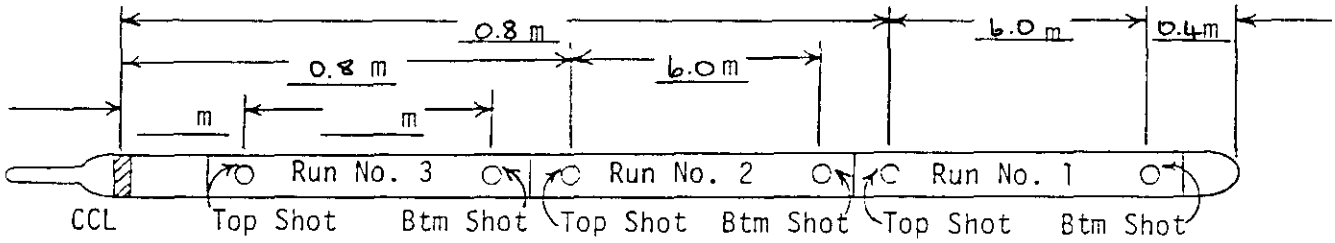
WIRELINE

Type of Gun and Size of Perforations 79 mm casing gun - 12 gm charges

O.D. of Tool 79 mm No. of Runs 2

Fluid Level 325 m Type of Fluid 10% KCl water B.H. Temp 12°C

Run Number	Perforated Log Depth	Density of Shots (SPM)	Total No. of Shots
1	1278.5-1284.5 mKB	13	79
2		13	79



RECORD OF MEASUREMENTS

What Log was Used for Correlation Computalog CBL Date 86/02/06

Remarks: Gun was run to PBTD at 1284.9 mKB and fired.
Four collars were logged above perf interval.

LOG PRESENTATION:

1. Run pass across perf interval with collar locator showing 7 collars if possible. Also use tension device to show pick up off bottom where applicable.

2. When preparing to shoot, log 3 collars below perf interval. Stop and shoot gun. At that point shift pen recording collars and log 3 collars above the perforated interval. This method will allow for exact point where gun was fired to be determined from log.

   *NOTE: Mark with asterisk (*) collar used for positioning.

Work Supervised by: Chris Baillie

PETRO-CANADA

ACID - CHEMICAL - SQUEEZE

WELL NAME	DATE
PCI Canterra Tweed Lake A-67	86-02-11

FORMATION TREATED: Mount Clark INTERVAL: 1290.5-1301.0 mKB PERFS: 397

SERVICE COMPANY: Dowell Schlumberger PACKER TYPE: Nil AT: _____ K.B.

TUBING SIZE: 73 mm DEPTH: 1304.85 Perf Pup CASING SIZE: 177.8 mm DEPTH: 1347 mKB

TUBING CAPACITY: 3.9 m^3 MAX. ALLOWABLE TREATING PRESSURE: 7000 kPa

CASING CAPACITY - BASE OF TUBING TO PERFS: 0 m^3 ANNULUS CAPACITY: 19.83 m^3

TYPE TREATMENT AND OBJECT: Wash 2m^3 of 15% HCl with 67% Methanol to clean out perfs. Squeeze 4m^3 of 15% HCl 67% Methanol to formation, max. surface press = 7 MPa

MATERIALS: MIXED: Inhibitor (0.4% A166-4 L/m^3 + 0.5 kg/m^3 of A179) (Quantity, Concentrations, Etc.)

4 m^3 of acid overflush

BACKWASHED: 2 m^3 of acid (Quantity) TO FORMATION: with 0.1 m^3 10% KCl water (Quantity)

PROGRAM

Pump 0.5 m^3 of 15% HCl acid at 0.04 m^3/min to bottom of tubing and reverse circ. out for cleaning tubing. Stage wash 2 m^3 15% HCl 67% Methanol five min between stages. Squeeze 4 m^3 15% HCl 67% Methanol, maximum surface press 7 MPa

TIME RECORD

TIME	PRESSURES MPa		m^3 PUMPED	PUMP RATE m^3 / MIN	REMARKS
	CASING	TUBING			
6:05					Hold safety meeting
6:10			.3	.15	Break circulation
6:12					Press. test lines to 21 MPa (tbg line)
6:14					Press. test csg. line 10 MPa
6:21	2	2	.5	.05	Start tubing cleaning acid
6:31	2	2		.05	End of tubing cleaning acid
6:32	2	2	3.4	.05	Start displacement
7:40				.05	End displacement
7:41			3.9	.17	Start backwash
8:00					End backwash (Rezero)
8:07				.33	Start 7 1/2% HCl gas well acid
8:22	2	2	4.3	.29	Stop first wash over perfs
8:36	2	2	.4	.1	Second wash
8:45	4	4	.4	.1	Third wash
8:57	5	5	.4	.1	Fourth wash

SUPERVISOR: Jack M. Quick

ACID-CHEMICAL-FRACTURE-SQUEEZE

SHEET 2

WELL NAME: PCI Canterra Tweed Lake A-67	DATE: 86-02-11

TIME	PRESSURES		m^3 Pumped	Pump Rate m^3/m	Sand kg/m^3	REMARKS
	CSG	TBG				
9:07	5.5	5.5	.4	.1		Fifth wash
9:22	6.5	6.5				Squeeze acid
9:25	7	7				Squeeze acid 7 MPa bleeding down
			0.18			to 6 MPa in 3 min intervals
						for 5 min stages
9:37						Start 10% KCl water behind
9:40						Shut in tbg and csg and circulate
						manifold to prevent freezing
9:45	7	7	.023			Squeeze acid to formation
9:50	6.5	6.5	.023			" " "
9:55	7	7	.023			" " "
9:59	7	7	.023			" " "
10:05	7	7	.023			" " "
10:07	7	7	.023			" " "
10:10	7	7	.023			End Hesitation Squeeze
10:17	6.5	6.5		.03		Pump steadily
10:35	6.5	6.5		.03		Stop pump
10:36	1	1	.472			Bleed off fast to truck
10:37	7	7				Repressure
10:40						Repeat bleeding off and press. up
10:41	7	7		.073		Squeeze at steady rate
11:32	7	7	3.21			Acid in formation
11:35	7	7	.1	.1		Overdisplace acid 0.1 m^3
11:39	1.5	1.7	6.5	.33		Backwash wash acid
12:00						Rig out acid pumper

PETRO-CANADA

ACID - CHEMICAL - SQUEEZE

WELL NAME	DATE
PCI Canterra Tweed Lake A-67	86/02/14

FORMATION TREATED Mount Clark INTERVAL 1290.5-1301.0 mKB PERFS/~~OPEN HOLE~~ perfs 399

SERVICE COMPANY Dowell/Schlumberger PACKER TYPE None AT _____ K.B.

TUBING SIZE 73 mm 9.67 kg/m DEPTH. 1297 mKB CASING SIZE 178 mm 43 kg/m DEPTH. 1347 mKB

TUBING CAPACITY 3.89 m^3 MAX. ALLOWABLE TREATING PRESSURE 7,000 kPa

CASING CAPACITY - BASE OF TUBING TO PERFS 0.08 m^3 ANNULUS CAPACITY 19.71 m^3

TYPE TREATMENT AND OBJECT 24 m^3 7 1/2% HF with 1 1/2% HCl acid job spear headed with 6 m^3 of 7 1/2% HCl and 3 m^3 of Methanol. To obtain gas production

MATERIALS MIXED In the 7% HCl: A-166 at 24 l. A-179 at 3 kg (in 6 m^3 of HCl)
(Quantity, Concentrations, Etc.)
In 24 m^3 of 7 1/2% HF: 2400 l U-66, 120 l F-78, 3.6 kg Fe Stabilizer 48 l A-200

BACKWASHED _____ (Quantity) TO FORMATION _____ (Quantity)

PROGRAM

Pump 3.0 m^3 of Methanol into formation at 0.3 m^3/min at 9 MPa. Follow with 6 m^3 7 1/2 HCl maximum rate at limiting surface press 7 MPa. Follow with 24 m^3 of 1 1/2% HF 7 1/2% HCl acid maximum rate at limiting surface press 7 MPa

TIME RECORD

TIME	PRESSURES MPa		m^3	PUMP RATE	REMARKS
	CASING	TUBING	PUMPED	m^3 / MIN	
					Hold Safety Meeting
01:00	10	21			Press test lines Tbg 21 MPa, Csg 10 MPa
01:10	1.5	1.5	3.0	.4	Spot Methanol
01:40	1.8	1.8			End of Methanol
01:48	1.8	1.8	.9	.4	Start 7 1/2% HCl
01:53	9.0	9.0	3.0	.3	Shut in casing, inject Methanol
02:17	9.0	9.0			Methanol in formation
02:18	6.0	6.0	2.1	.05	Start squeeze 7 1/2% HCl
02:50	6.0	6.0	3.9	.065	Start pumping HF
03:40	5.0	5.0	.65	.065	7 1/2% HCl acid in formation, Squeezing HF
04:00	4.0	4.0	1.0	.1	Increase rate
04:10	5.0	5.0	3.6	.21	Increase rate
04:30	6.0	6.0	15.9	.21	HF in formation, start displacement
05:32	6.0	6.0	5.9	.3	Displacement complete
05:47	6.0	6.0			Instant shut down pressure 6 MPa
06:03	3.0	3.0			After 15 min shut in 3 MPa

SUPERVISOR Jack M. Quirk

818A-8301

PETRO-CANADA

ACID - CHEMICAL - SQUEEZE

WELL NAME	DATE
PCI Canterra Tweed Lake A-67	86/02/21

FORMATION TREATED: Mount Clark | INTERVAL: 1278.5-1284.5 mKB | PERFS/OPEN HOLE: perfs

SERVICE COMPANY: Dowell/Schlumberger | PACKER TYPE: RTTS | AT: Not set K.B.

TUBING SIZE: 73 mm | DEPTH: 1284.8 | CASING SIZE: 177.8mm 43 kg/m | DEPTH: 1347 mKB

TUBING CAPACITY: 3.85 m^3 | MAX. ALLOWABLE TREATING PRESSURE: 7 MPa

CASING CAPACITY - BASE OF TUBING TO PERFS: Nil m^3 | ANNULUS CAPACITY: 19.52 m^3

TYPE TREATMENT AND OBJECT: Acid wash and squeeze. Wash 2 m^3 15% HCl 67% Methanol in .15 m^3 wash five min between washes. Squeeze 4 m^3 15% HCl 67% Methanol.

MATERIALS: MIXED: 7 MPa max squeeze pressure. (Quantity, Concentrations, Etc.) 4 m^3 acid overflush

BACKWASHED: 2 m^3 of wash acid (Quantity) | TO FORMATION: .1 m^3 10% KCl water. (Quantity)

PROGRAM

Stage wash 2 m^3 15% HCl 67% Methanol five min between stages

Squeeze 4 m^3 15% HCl 67% Methanol maximum surface press 7 MPa.

TIME RECORD

TIME	PRESSURES		m^3 PUMPED	PUMP RATE m^3 / MIN	REMARKS
	CASING	TUBING			
6:05	MPa	MPa			Safety Meeting
6:07					Press test surf lines to 18 MPa
6:12		1.0	4.00	0.50	Fill hole with 10% KCl water
6:20			3.90	0.40	Circulate acid down to perfs
6:33	2.0	2.0	0.15	0.15	Wash #1
6:40	2.0	2.0	0.15	0.15	Wash #2
6:45	2.0	2.0	0.15	0.15	Wash #3
6:50	2.0	2.0	0.15	0.15	Wash #4
6:57	2.0	2.0	0.15	0.15	Wash #5
7:03	2.1	2.1	0.15	0.15	Wash #6
7:08	2.5	2.5	0.15	0.15	Wash #7
7:15	5.0	5.0	0.15	0.15	Wash #8
7:21	3.5	3.5	0.15	0.15	Wash #9
7:28	3.5	3.5	0.15	0.15	Wash #10
7:34	3.5	3.5	0.15	0.15	Wash #11

SUPERVISOR

ACID-CHEMICAL-FRACTURE-SQUEEZE

SHEET 2

WELL NAME: PCI Canterra Tweed Lake A-67	DATE: 86-02-21

TIME	PRESSURES		m^3 Pumped	Pump Rate m^3/m	Sand kg/m^3	REMARKS
	CSG	TBG				
	MPa	MPa				
7:40	3.53	3.5	0.15	0.15.		Wash #12
7:46	3.5	3.5	0.15	0.15		Wash #13
7:57	6	6	0.15			Shut in to squeeze
8:07	6	6				Bleed back to truck,press up 4 times
8:17	6	6				Shut in and squeeze
8:44	4.7	4.7	0.9			Start water behind acid 3.9 m^3
8:52						Circulate Manifold
8:58	5	5				Squeeze acid
9:11	4.5	4.5				Slight bleed off
9:12	6	6				Squeeze
9:27	5	5				1 MPa bleed off 15 min
9:28						Circ manifold
9:37	4.5	4.5				Press inject squeeze acid
9:39	6	6				Bleed back to truck,press up 4 times
9:40	6	6				Squeeze acid
9:59	5	5				1 MPa bleed off
10:00	6	6				Squeeze
10:10	6	6				Bleed back and press up
10:34	5	5				1 MPa bleed off
10:37	6	6				Squeeze
10:46	6	6				Bleed back to truck,press up 4 times
10:57						Circ manifold
11:02	6	6				Bleed back to truck,press up 4 times
11:13	6	6				Squeeze
11:42	5	5				1 MPa bleed off
11:44	6	6				Squeeze
12:01	5.5	5.5				Slight bleed off
12:02	6	6				Squeeze 0.9 m^3 acid in formation
12:38	5	5				Bleed back to truck,press up twice
1:03	7	7				Press up squeeze
1:27	6.5	6.5				Bleed back to truck,press up twice
1:55						Circ manifold

ACID-CHEMICAL-FRACTURE-SQUEEZE

SHEET 2

WELL NAME: PCI Canterra Tweed Lake A-67	DATE: 86-02-21

TIME	PRESSURES		m^3 Pumped	Pump Rate m^3/m	Sand kg/m^3	REMARKS
	CSG	TBG				
	MPa	MPa				
2:00	6.5	6.5	3.2	.09		Squeeze rate increases
2:33	5.5	5.5		.09		Squeeze acid to formation
2:33	5.5	5.5				Instant shut down press
2:43	2	2				After 10 min shut in press 2 MPa
2:44	1	1				Backwash 'wash' acid
3:06	1	1		.3		Wash acid at surface
3:15	1	1		.2		Acid to pit
3:20	1	1				Stop pump. Job complete.
						Rig out Dowell

PETRO CANADA

WELL FRACTURING REPORT

DATE: 86-02-02

WELL NAME AND LOCATION: PCI Canterra Tweed Lake A-67

NAME OF FORMATION: Mount Clark (Lower)

PERFORATIONS: 1290.5-1301.0 mKB

STATUS: Exploratory gas well

RIGGED UP (Company) Dowell/Schlumberger

RIGGED UP (Special Equipment)

SET RELIEF VALVE AT 18.0 MPa PSI TEST ANNULUS OF 178 mm by 73 mm

PSI TO — MPa HELD OK — KEPT — MPa ON ANNULUS DURING FRAC

FRAC MATERIALS	SIZE/MESH	AMOUNT TONNES
Sand	20/40	12.0

DISPLACED ___ m^3 ___ PERCENT ___ ACID WITH N_2 or CO_2 VOL RATIO ___ m^3/m^3.

THROUGH ___ mm TUBING MAXIMUM PSI ___ MPa.

FRACTURED FORMATION WITH ☑ WATER ☐ OIL ☑ N_2 ☐ CO_2 VOLUME RATIO 407-656 m^3/m^3.

BATCH	AMOUNT TONNES	MATERIAL	SIZE/MESH	AVE CONC kg/m^3	AVE RATE m^3/m	AVE. PRESSURE
1	12.0	Sand	20/40	340-1370	0.6	25 MPa
2			*	120-480	2.5	
3						

* Note: Batch 1 concentrations at blender, batch 2 at wellhead with/NZ

ADDITIONAL COMMENTS: Mixed 1.2 kg/m^3 of J266 gelling agent in 32 m^3 of 3% KCl water and 30% Methanol. Add 8 l/m^3 of F52.1 foaming agent on the fly. Frac'd well as per attached schedule

FRAC THROUGH TBG. ☑ TBG/CSG ☐ CSG ☐

FLUID IN TBG. ☐ TBG/CSG ☐ CSG ☐ — m^3

FRAC FLUID

	TYPE	BATTERY	COMPANY	
FLUID TRUCKED IN	Water	Slough		22.4 m^3
FLUID TRUCKED IN	Methanol			9.6 m^3
FLUID TRUCKED IN				m^3

TOTAL FRAC FLUID PRIOR TO FRAC 32.0 m^3

TOTAL FRAC FLUID AFTER FRAC m^3

TOTAL FRAC FLUID TO RECOVER 32.0 m^3

PETRO-CANADA'S REPRESENTATIVE Chris Baillie

HIS/HER COMPANY AFFILIATION Comp Sup

ACID-CHEMICAL-FRACTURE-SQUEEZE

SHEET 2

WELL NAME: PCI Canterra Tweed Lake A-67	DATE: 86-03-02

TIME	PRESSURES		m^3 Pumped	Pump Rate m^3/m	Sand kg/m^3	REMARKS
	CSG	TBG				
	MPa	MPa				
15:50	-	-	-	-	-	Safety Meeting
16:08	0	50.0				Press test surface lines
16:18	0	15.0	0.95	0.6		Fill hole
16:21	0	23.0	12.50	0.6		Start pad
16:41	0	23.5	1.80	0.8	340	Start sand at 340 kg/m^3
16:43	0	23.5	1.80	0.8	685	Increase sand to 685 kg/m^3
16:46	1	23.5	2.80	0.8	1000	" " 1000 "
16:49	1	25.0	5.40	0.8	1375	" " 1370 "
16:55	2	27.0	1.20	0.8		Start flush
16:56	3	29.0				Stop pumps
16:56	3	20.0				ISIP
17:01	3	12.5				5 min SI
	* Above concentrations and volumes at blender (i.e. not including N_2)					
	N_2					
15:50	0					Safety meeting
16:08	0	50.0				Pressure test surface lines
16:18	0	15.0	3.9	2.5		Fill hole
16:21	0	23.0	49.9	2.5		Start pad
16:41	0	23.0	5.0	2.5	120	Start sand at 120 kg/m^3
16:43	0	23.5	5.0	2.5	240	Increase sand to 240 "
16:46	1	23.5	8.0	2.5	360	" " 360 "
16:49	1	25.0	15.3	2.5	480	" " 480 "
16:55	2	27.0	3.4	2.5		Start flush
16:56	3	29.0				Stop pumps
16:56	3	20.0				ISIP
17:01	3	12.5				5 min SI
	* Above concentrations and volumes include N_2					

ACID-CHEMICAL-FRACTURE-SQUEEZE

SHEET 2

WELL NAME: PCI Canterra Tweed Lake A-67	DATE: 86-02-26

TIME	PRESSURES		m^3 Pumped	Pump Rate m^3/m	Sand kg/m^3	REMARKS
	CSG	TBG				
	MPa	MPa				
15:00	-	-	-	-	-	Safety Meeting
15:11	0	50.0				Press test surface lines
15:34	5.0	11.0	1.0	0.6		Fill hole
15:36	14.0	23.0	5.7	0.6		Start pad
15:45	14.0	24.0	1.4	0.8	360	Start sand at 360 kg/m^3
15:48	14.0	26.0	1.4	0.8	685	Increase to 685 kg/m^3
15:49	14.0	26.0	1.4	0.8	1030	" " 1030 "
15:51	14.0	27.0	3.7	0.8	1370	" " 1370 "
15:53	14.0	27.0	1.2	0.8		Start flush
15:55	14.0	27.0				Stop pumps
15:55	14.0	16.0				ISIP
15:58	14.0	14.0				3 min shut in
	* Above concentrations and volumes at blender (i.e. not					
	including N_2)					
15:00						Safety meeting
15:11		50.0				Pressure test lines
15:34	5.0	11.0	3.0	2.5		Fill hole
15:36	14.0	23.0	22.7	2.5		Start pad
15:45	14.0	24.0	4.0	2.5	120	Start sand at 120 kg/m^3
15:48	14.0	26.0	4.0	2.5	240	Increase to 240 kg/m^3
15:49	14.0	26.0	4.0	2.5	360	" " 360 "
15:51	14.0	27.0	10.7	2.5	480	" " 480 "
15:53	14.0	27.0	3.4	2.5		Start flush
15:55	14.0	27.0				Stop pumps
15:55	14.0	16.0				ISIP
15:58	14.0	14.0				3 min shut in
	* Above concentrations and volumes are including N_2					
	(i.e. at wellhead)					

PETRO-CANADA

WELL FRACTURING REPORT

DATE: 86-02-26

WELL NAME AND LOCATION: PCI Canterra Tweed Lake A-67

NAME OF FORMATION: Mount Clark (Upper) | PERFORATIONS: 1278.5 to 1284.5 mKB

STATUS: Exploratory gas well

RIGGED UP (Company) Dowell/Schlumberger

RIGGED UP (Special Equipment)

SET RELIEF VALVE AT 18 MPa PSI TEST ANNULUS OF 178 mm by 73 mm

PSI TO ___ MPa HELD OK -✓ KEPT 14 MPa ON ANNULUS DURING FRAC

FRAC MATERIALS	SIZE/MESH	AMOUNT TONNES
Sand	20/40	8.0

DISPLACED ___ m^3 ___ PERCENT ___ ACID WITH N_2 or CO_2 VOL RATIO ___ m^3/m^3.

THROUGH ___ mm TUBING MAXIMUM PSI ___ MPa.

FRACTURED FORMATION WITH ☑ WATER ☐ OIL ☑ N_2 ☐ CO_2 VOLUME RATIO 407-656 m^3/m^3.

BATCH	AMOUNT TONNES	MATERIAL	SIZE/MESH	AVE CONC kg/m^3	AVE RATE m^3/m	AVE. PRESSURE
1	8.0	Sand	20/40	360-1370	0.6	26 MPa
2				120-480	2.5	
3						

* Note: Batch 1 concentrations at the blender, batch 2 at the formation

ADDITIONAL COMMENTS: Mixed 1.2 kg/m^3 of J266 gelled agent in 23.7 m^3 of 3% KCl water (and 30% Methanol). Added 8 l/m^3 of F52.1 foaming agent on the fly. Frac'd well as per attached schedule

FRAC THROUGH TBG. ☑ TBG/CSG ☐ CSG ☐

FLUID IN TBG. ☐ TBG/CSG ☐ CSG ☐ — m^3

FRAC FLUID

	TYPE	BATTERY	COMPANY	
FLUID TRUCKED IN	Water	Slough		16.6 m^3
FLUID TRUCKED IN	Methanol			7.1 m^3
FLUID TRUCKED IN				m^3
TOTAL FRAC FLUID PRIOR TO FRAC				23.7 m^3
TOTAL FRAC FLUID AFTER FRAC				8.0 m^3
TOTAL FRAC FLUID TO RECOVER				15.7 m^3

PETRO-CANADA'S REPRESENTATIVE Chris Baillie

HIS/HER COMPANY AFFILIATION Comp Sup

PETRO-CANADA

CASING AND TUBING TALLY SHEET

WELL NAME	LOCATION	DATE (YR-MO-DAY)
PCI Canterra Tweed Lake	A-67	85/02/18
TYPE OF STRING: 9.67 kg/m, J-55, EUE tubing	SIZE: 73.0 mm	

NO.	LENGTH / m	NO	LENGTH / m	NO	LENGTH / m	NO.	LENGTH / m	NO	LENGTH / m	NO.	LENGTH / m	TOTAL / m
1	9.10	11	9.16	21	9.11	31	8.78	41	9.11	51	9.12	1 92.32
2	9.20	12	9.10	22	9.43	32	9.08	42	9.11	52	9.10	2 92.52
3	9.50	13	9.17	23	9.15	33	9.10	43	9.11	53	9.12	3 92.11
4	9.07	14	9.74	24	9.11	34	9.15	44	9.42	54	9.10	4 91.62
5	9.15	15	9.13	25	9.42	35	9.16	45	9.12	55	9.18	5 92.37
6	9.10	16	9.16	26	9.10	36	9.12	46	9.12	56	9.05	6 91.74
7	9.13	17	9.84	27	9.11	37	9.11	47	9.20	57	9.10	
8	9.11	18	9.10	28	9.46	38	9.80	48	9.10	58	9.11	
9	9.76	19	9.06	29	9.11	39	9.15	49	9.42	59	9.75	
10	9.20	20	9.06	30	9.11	40	9.17	50	9.66	60	9.11	
TOTAL	92.32		92.52		92.11		91.62		92.37		91.74	552.68

NO.	LENGTH / m	NO.	LENGTH / m	NO	LENGTH / m	NO	LENGTH / m	NO	LENGTH / m	NO	LENGTH / m	TOTAL / m
61	9.14	71	9.45	81	9.16	91	9.11	101	9.10	111	9.10	1 91.52
62	9.11	72	9.10	82	9.10	92	9.11	102	9.11	112	9.14	2 91.80
63	9.10	73	9.14	83	9.70	93	9.38	103	9.10	113	9.15	3 93.30
64	9.18	74	9.06	84	9.70	94	9.15	104	9.16	114	9.46	4 91.86
65	9.12	75	9.15	85	9.60	95	9.12	105	9.37	115	8.95	5 92.62
66	9.15	76	9.15	86	9.10	96	9.45	106	9.15	116	9.10	6 91.35
67	8.80	77	9.10	87	9.11	97	9.16	107	9.15	117	9.10	
68	9.16	78	9.10	88	9.57	98	9.14	108	9.21	118	9.10	
69	9.62	79	9.10	89	9.14	99	9.11	109	9.45	119	9.15	
70	9.14	80	9.45	90	9.12	100	9.13	110	9.82	120	9.10	
TOTAL	91.52		91.80		93.30		91.86		92.62		91.35	552.45

NO.	LENGTH / m	NO.	LENGTH / m	NO	LENGTH / m	NO	LENGTH / m	NO	LENGTH / m	NO	LENGTH / m	TOTAL / m
121	9.15	131	9.10	141	9.14	151		161		171		1
122	9.11	132	9.12	142	9.20	152		162		172		2
123	9.12	133	9.11	143	9.18	153		163		173		3
124	9.40	134	9.16	144	9.11	154		164		174		4
125	9.14	135	9.11	145	9.22	155		165		175		5
126	9.11	136	9.34	146	9.10	156		166		176		6
127	9.14	137	9.15	147		157		167		177		
128	9.14	138	9.10	148		158		168		178		
129	9.12	139	9.11	149		159		169		179		
130	9.10	140	9.10	150		160		170		180		
TOTAL	91.53		91.40									

NO	LENGTH / m	NO.	LENGTH / m	NO	LENGTH / m	NO	LENGTH / m	NO	LENGTH / m	NO	LENGTH / m	TOTAL / m
181		191		201		211		221		231		1
182		192		202		212		222		232		2
183		193		203		213		223		233		3
184		194		204		214		224		234		4
185		195		205		215		225		235		5
186		196		206		216		226		236		6
187		197		207		217		227		237		
188		198		208		218		228		238		
189		199		209		219		229		239		
190		200		210		220		230		240		
TOTAL												

REMARKS

226 jts delivered to location.
146 jts used + 80 jts new transferred to PCI stockyard in Norman Wells

SIGNATURE OF COMPANY REPRESENTATIVE

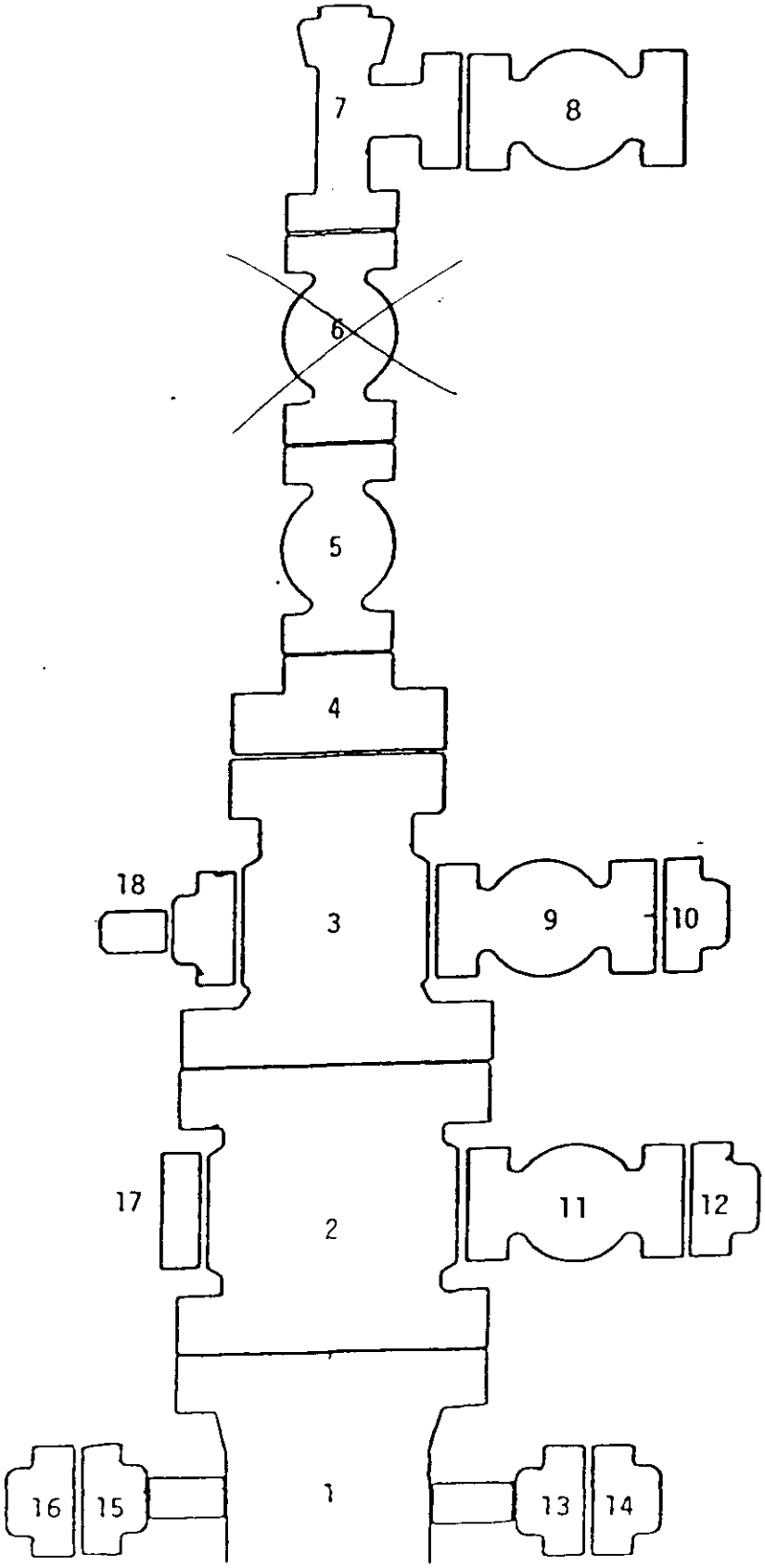
Chris Baillie

All joints delivered to lease must be tallied.
Circle joints not run and left on rack.

PUMPING WELLHEAD DETAIL

LOCATION: PCI Canterra Tweed Lake A-67

DATE: 86-03-08



1. 245 mm x 279.4 mm 21 MPa McEvoy casing bowl. W.O. GR-5788698
3. 279.4 mm x 179.4 mm x 21 MPa Cameron tubing spool. 15055-20-10-10
4. 179.4 mm x 65.1 mm 21 MPa Cameron bonnet
5. 65.1 mm x 63.5 mm bore - 21 MPa Cameron gate valve. S/N - 101390
7. 65.1 mm x 52.4 mm x 73 mm EUE 21 MPa Cameron flowtee
8. 52.4 mm x 50.8 mm bore - 21 MPa Cameron gate valve. S/N FB-150840
9. 52.4 mm x 50.8 mm bore - 21MPa Cameron gate valve S/N 121620
10. 52.4 mm x 50.8 mm LP - 21 MPa Cameron companion flance
13. Std surface vent assembly
15.. 52.4 mm x 21 MPa blind flange
18. 52.4 mm x 50.8 mm LP 21MPa Cameron companion flange

Note: All outlets are bull plugged and valves chained

73 mm Cameron dognut w/BPV threads left in tubing spool

Master & wing valves are washed and

PCI CANTERRA - TWEED L. A-67 TIGHT HOLE MOUNT CLARK

86-01-29 / 86-02-04 - - $218,960

Moved camp from Norman Wells to lease and rig up. Move Roll'n rig #35 from Red Deer to lease and spotted.

86-02-05 - - $259,015

Install derrick on rig and rig up rig. Clean out cellar, install tubing hanger spool. Energize seals and test to 10 MPa, held ok. Install surf casing vent. Install prefabs and BOP's. Repair controls on draw works. Ran in bit and scraper on drifted and measured 73mm tbg, tag PBTD at 1308 mKB. Circulate mud out of well with water.

86-02-06 - - $305,301

Install packoff. Pick up power swivel. Drill out cement from 1308m KB to 1331m KB. Circulate hole clean with fresh water, clean out rig tank and mix up 10% KCl solution. Rig out packoff and power swivel. Circulate hole over to 10% KCl water. Pulled out of hole with 73mm tbg and layed down bit and scraper. Computalog ran CBL VDL GR CCL from 1329m up to 1190 mKB. Ran pressure pass with 7 MPa. Cement top at 683m KB. Schlumberger making up 127mm guns with 39 SPM.

86-02-07 - - $346,858

Schlumberger loading 127mm guns, 10.5m with 39 SPM. Pick up 12.2m of 127mm guns. Pick up sub backed out of guns while screwing guns together. Last 12.2m of 127mm guns down hole. Make up Schlumberger sub to fish guns and ran in well on 73mm tbg. Screw into fish. Swab tbg down to 1000m and rig up to pull tbg. Pulled 94 jts of 73mm tbg - 95th jt was wet. Swabbed tbg down remaining 440m and pulled out of hole with fish. Layed down 127mm guns. Made up and ran Schlumberger tbg conveyed perforating assembly on 73mm tbg. Spaced out tbg, landed dognut and rigged in computalog. Ran positioning log and space out. Run after positioning log correlated to Schlumberger BHC Sonic dated 85.12.15, 127mm guns set to shoot. Mount Clark formation from 1290.5m to 1301.0m KB with 39 SPM, 22 gram charges at 120° phasing. Rig out computalog. Remove BOP's and install wellhead.

86-02-08 - - $359,341

Rig to swab. Swab tbg and annulus down to 800m KB. Rig out swab equipt. Schlumberger drop bar to fire 127mm guns at 39 SPM to perforate Mount Clark formation from 1290.5m to 1301.0m KB. Small initial puff of air. Install gauge in Wellhead 0 pressure after 50 min. Remove gauge well dead. Rigged up to swab. Swab well down from 800m to 1025m in 13 swabs and recovered 4.1m^3 of 10% KCl water. No gas to surface. Shut well in rig outswab equipt. Fill hole. Pressure on annulus to 7 MPa no feed rate to formation. Mix up 8m^3 of 10% KCl water. Circ hole, no gas recovery. Remove wellhead, install 30P's, rig up floor. Hoist 73mm tbg to recover guns.

PCI CANTERRA - TWEED L. A-67 TIGHT HOLE MOUNT CLARK

86-02-09 - - $383,322

Finish pulling out of hole. Lay down Schlumberger 127mm guns. Guns did not fire. Schlumberger rebuilding firing head for guns. Make up and ran Schlumberger's 127mm guns and perforating assembly on 73mm tbg. Ran 138 jts. At Schlumberger's request, tbg was pulled in order to re-load primer cord in firing head. Reran 127mm guns on 138 jts of 73mm tbg, spaced out with same pups and landed dognut leaving RA collar at correlated depth. Remove BOP's, installed wellhead and rigged up to swab. Pull 13 swabs, swab well down to 1000m. Schlumberger drop bar to fire 127mm guns with 39 shots per meter. Perforate Mount Clark formation from 1290.5m to 1301m KB. At 07:00 hours, pressure at 1550 kPa.

86-02-10 - - $412,524

Well shut in. Tbg press came up to 3000 kPa, annulus up to 2900 kPa. Pump 0.6m of methanol in annulus. Open tbg to tank through 2mm choke tbg press came down to 1200 kPa in 5 min. Annulus press 2900 kPa. Open choke to 19mm choke, tbg went dead. Annulus stayed at 2900 kPa. Rig to swab. Pull 6 swabs, recovered 5.83m^3 10% KCl water. Well started flowing. Shut well in. Rig out swab equipt. Tbg press rose from 2400 kPa to 3300 kPa and casing press from 1700 kPa to 3500 kPa in 4 hours. Installed a 3.175mm orifice plate and flowed the well through a critical flow prover. Pumped methanol down annulus at 15 l/hr. Flowing temperature at flow prover was constant at -5°C.

Flow test results:

Time	Tbg press	Csg press
16:00	2800kPa	3500kPa
16:30	2700	3200
17:00	2400	3000
17:30	2200	2800
18:00	2000	2625
18:30	1800	2575
Shut in at 18:30		

Rigged out flow equipt and mixed 3 sacks of KCl to bring solution up to 10%. Killed well by circulating 24m^3 of 10% KCl. Removed wellhead, installed BOP's and rigged up to pull 73mm tbg. Mixed 34 sacks of KCl in 8m^3 of fresh water for a 10% solution. Hoist 73mm tbg, lay down Schlumberger 127mm guns, 397 shots fired and 2 shots missfired. Run in 73mm EUE tbg with Baker R nipple with 57.15mm profile, on bottom then 0.61m 73mm pup, one jt 73mm tbg, one 1.23m perforated pup, 73mm tbg to surface. Land perforated pup at 1304.85m KB. Rig in Dowell acid pumper, Held safety meeting. Press test lines to 21MPa. Acidize tbg with 0.5m^3 HCl. Pump acid down tbg at .04^3/min to 1302m.

PCI CANTERRA - TWEED L. A-67 TIGHT HOLE MOUNT CLARK

86-02-11 - - $435,793

Reverse circulate out 0.5m^3 of HCl acid from tubing. Start acid wash and squeeze with 6m^3 15% HCl with 67% methanol. Pump 4.3m^3 acid down tbg, acid across perfs, stop pump. Stage 4 more washes of .4m^3 acid. Wait 10 min between washes. Increase back press on each wash from 2 MPa to 6.5 MPa. On last wash 6.5 MPa after 10 min went down to 6.2 MPa. Squeeze 4m^3 of 15% HCl with 67% methanol. First .3m^3 squeezed went in intervals by building pressure up to 7 MPa. Stop pump for 3 to 5 min for press to come down to 6 MPa. Release press back to pumper down to 0 MPa from 7 MPa, repeat 3 times. Squeezed the remainder of acid 3.4m^3 to formation at .073m^3/min at 7 MPa. The last 0.3m^3 of acid + 0.1m^3 of overflush squeezed away at 0.1m^3/min at 6 MPa. Reverse circulate wash acid to pit. Hoist 2 jts of 73mm tbg, leaving perforated pup at 1285.9m KB and tail pipe at 1297.2m KB. Removed BOP's, installed 70 MPa frac head and top section of wellhead. Rigged up to swab. Pulled 18 swabs and recovered 21m^3 of gasified KCl water containing spent acid. Casing press increased from 0 to 1240 kPa in the last 6 swabs. Well started flowing and was shut in to install choke. Well shut in, install choke, allowed tbg press to increase to 2800kPa. Flow well to pit through choke. Take readings.

Time	Tbg Press (kPa)	Csg Press (kPa)	Choke Setting (mm)
1:00	2800	2800	3.175
1:30	2925	3000	3.175
2:00	3200	3400	3.175
2:30	3800	4200	4.762
3:00	3900	4900	4.762
	Well started to kick small amount of fluid		
3:30	2450	5300	5.556
4:00	2200	5600	5.556
4:30	2650	6050	4.762
5:00	2000	6700	4.762
	Shut tbg in press build up to 2425 kPa at 06:15 hours		
	Flow well to pit through choke		
6:30	2575	7600	3.175
7:00	2150	8000	2.381

86-02-12 - - $456,965

Flow well through choke to pit.

Time	Tbg Press (KPa)	Csg Press (KPa)	Choke Setting (mm)
7:30	2100	8200	2.381
8:00	1700	8425	5.959
8:30	3500	8100	7.937
9:00	5900	6700	7.937
9:30	5600	6600	6.746
10:00	6000	6900	6.746
10:30	6200	7000	6.746
11:00	6400	7100	6.746
11:30	6600	7200	6.746

PCI CANTERRA - TWEED L. A-67 TIGHT HOLE MOUNT CLARK

86-02-12 - - $456,965

Start slugging water and acid at 08:00 hrs. to 09:00 hrs. From 09:00 to 11:30 light spray of water and acid. Hooking up to separator. Flowed well through separator.

Time (hrs)	Tbg Press (kPa)	Csg Press (kPa)	Choke (mm)	Rate (10^3m^3)	Temp (Deg C)	Fluid (m^3)
13:00	5680	5880	6.35	27.2	3	0.16
14:00	4720	5600	6.35	23.9	3	-
15:00	3870	5270	7.14	29.6	0	0.12
16:00	3370	4120	7.94	33.8	1	0.04
17:00	3150	3850	7.94	34.7	2	-
18:00	3170	3770	8.33	37.5	2	0.08
19:00	3080	3630	8.73	40.3	2	-
21:00	3230	3680	8.73	42.8	2	-
22:00	3700	4070	7.94	40.85	2	-
23:00	3900	4260	7.94	42.82	2	-
24:00	4180	4590	7.54	42.82	2	.02
01:00	4550	4950	7.14	42.26	2	-
02:00	4670	5080	7.14	43.11	2	-
03:00	4710	5130	7.14	43.95	2	-
04:00	5080	5470	6.75	42.26	2	-
05:00	5180	5570	6.75	43.11	2	-
06:00	5210	5610	6.75	43.39	2	-
07:00	5600	5950	6.35	40.85	2	Total water and acid
						$0.42m^3$

Total production 19 hrs. 30.67 10^3m^3

86-02-13 - - $470,958

Flow well through separator.

07:30	5640	6060	6.35	-	-	-
08:00	5680	6100	6.35	41.98	2	-
09:00	5700	6120	6.35	42.82	2	-
10:00	5710	6120	6.35	42.82	2	.02
11:00	5740	6150	6.35	43.11	2	-
12:00	5780	6180	6.35	43.39	2	-
13:00	5790	6200	6.35	43.67	1	-
14:00	5800	6210	6.35	43.95	1	-

Shut in at 14:00 for build-up. Total gas flared during 26 hr. test 43.24 10^3m^3. Total acid water produced $0.44m^3$.

PCI CANTERRA - TWEED L. A-67 TIGHT HOLE MOUNT CLARK

86-02-13 - - $470,958

Build-up test.

Time (hrs)	Tbg Press (kPa)	Csg Press (kPa)
14:05	6500	6690
14:10	6940	7040
14:15	7290	7470
14:20	7650	7770
14:30	8250	8420
14:40	8780	8990
14:50	9150	9420
15:00	9550	9840
15:15	9920	10330
15:30	10190	10500
16:00	10450	10890
16:30	10600	10940
17:00	10680	10960
17:30	10720	10970
18:00	10770	10970
19:00	10780	10980
20:00	10780	10980
21:00	10790	11000
22:00	10800	11000

End build-up test and rig up Dowell/Schlumberger to perform acid squeeze on Mount Clark formation. Rig up to circulate well over to 10% KCL water. Hold safety meeting. Circulate 24.6m^3 of 10% KCL and killed well. Rigged Dowell's squeeze manifold to the wellhead. Pressure test lines to 21 mPa. Do acid squeeze on Mount Clark formation from 1290.5m to 1301.0m. Pump 3m^3 Methanol ahead followed by 6m^3 of 7 1/2% HCL, with 0.4% A66, + 0.5 kg/m^3 of A179. Followed with 24m^3 of 1 1/2% HF 7 1/2% HCL acid with 2400L-U-66, + 120L-F-78, + 3.6 kg - FeST, + 48L-A-200. Pump methanol to perfs followed by 7 1/2% HCL. Close annulus valve, squeeze methanol into formation at 0.3m^3/min at 9 mPa. Squeeze 6m^3 of 7 1/2% HCL acid to formation at 0.05m^3 per min at 6 mPa. Squeeze 24m^3 of 1 1/2% HF 7 1/2% HCL acid to formation starting at .065m^3/min for 4.5m^3 pressure 6 mPa dropping to 5 mPa. Pick up rate to .1m^3 pressure at 4 mPa. Pick up rate to .21m^3/min for 5m^3, pressure at 5 mPa. Pick up rate to .28m^3/min for 13.5m^3 pressure at 6 mPa. Displace acid with 5.9m^3 10% KCL water at rate .3m^3/min, pressure at 6 mPa, instantaneous shut in 6 mPa. After 15 min. shut in 3 mPa. Rig to swab. Pull one swab.

PCI CANTERRA - TWEED L. A-67 TIGHT HOLE MOUNT CLARK

86-02-14 - - $537,190

Pull 16 swabs pressure on annulus camp up to 2200 kPa, well started kicking. Well flowing acid and water 10% KCl. Well shut in. Pressure build up to 1900 kPa on tbg 3625 kPa on annulus. Flow well to pit throug choke.

Time	Tbg Press (kPa)	Csg Press (kPa)	Choke (mm)
16:00	1150	3825	6.35
16:30	1000	3975	6.35
17:00	800	4100	6.35
17:30	800	4425	6.35
18:00	800	4600	6.35
18:30	900	4900	6.35
19:00	1050	5000	6.35
19:30	2200	5000	6.35
20:00	2200	4500	6.35
20:30	2100	4400	6.35
21:00	1800	4200	6.35
21:30	1750	4300	6.35
22:00	1900	4500	6.35
22:30	1900	4600	6.35
23:00	1900	4600	6.35

From 16:00 hours to 20:00 hours flow was slugging water and acid decreasing to 23:00 hours.
23:45 Hook up to separator
23:45 to 07:10 Norward flowing well through separator.

Time	Tbg Press (kPa)	Csg press (kPa)	Choke (mm)	Rate ($10^3 m^3$)	Temp (°C)	Fluid (m^3)
24:00	4170	5420	8.33	15.64	3	
01:00	2500	3400	7.94	28.12	3	
02:00	2150	3300	7.14	18.88	5	.03
03:00	2460	3590	7.14	20.29	5	.04
04:00	2670	3690	7.14	22.54	5	.03
05:00	2760	3740	7.14	23.67	5	.06
06:00	2800	3770	7.14	24.23	3	
07:00	2880	3830	7.14	24.82	3	.08

Gas flared last 7.25 hours = 19.04 $10^3 m^3$
Total water in last 7.25 hours = 0.24 m^3

86-02-15 - - $553,034

Norward flowing well through separator

07:30	2950	3880	7.14		3	
08:00	3000	3900	7.14	25.55	3	.08
09:00	3030	3880	7.14	26.51	3	
10:00	3080	3920	7.14	27.05	2	.09
11:00	3160	3980	7.14	27.64	2	.045
12:00	3200	4010	7.14	28.46	2	
13:00	3240	4020	7.14	29.02	2	.09
14:00	3300	4040	7.14	29.86	2	.09

PCI CANTERRA - TWEED L. A-67 TIGHT HOLE MOUNT CLARK

86-02-15 (contd.)

15:00	3330	4050	7.14	30.43	2	
16:00	3340	4060	7.14	30.71	1	
17:00	3370	4090	7.14	31.84	1	
19:00	3450	4110	7.14	32.40	0	.08
20:00	3480	4120	7.14	32.68	0	
21:00	3510	4150	7.14	32.96	0	.08
22:00	3410	4040	7.54	35.78	0	
23:00	3310	3880	7.54	34.94	0	
24:00	3310	3870	7.54	34.94	0	.120
01:00	3320	3870	7.54	35.22	0	
02:00	3360	3870	7.54	35.78	0	
03:00	3390	3900	7.54	36.34	0	.10
04:00	3440	3930	7.54	36.63	0	
05:00	3460	3930	7.54	36.91	0	
06:00	3530	3980	7.54	37.47	0	
07:00	3550	3990	7.54	37.47	0	

Total gas flared in last 24 hours = 32.33 10^3m^3
Cumm gas flared since 23:45 hours Feb 14/86 = 51.37 10^3m^3
Total water produced in last 24 hours = $1.015m^3$
Cumm water produced since 23:45 hours Feb 14/86 = $1.255m^3$

86-02-16 - - $567,528

08:00	3540	3980	7.54	37.19	0	.10
09:00	3570	4030	7.54	37.19	0	
10:00	3630	4080	7.54	38.03	0	.07

Shut well in, rig up rapid wireline, run recorders. Record casing pressure build up.

10:25		4470				
10:30		4780				
10:45		5880				
11:00		6700				
11:30		8180				
12:00		9200				
13:00		10270				
13:47	10600	10620				
13:53	10570	10600 - pressure up to choke				

Norward flow well through separator

14:30	8100	8500	7.54	62.26	0	
15:00	7010	7440	7.54	47.33	1	
16:00	5720	5310	7.54	43.95	.5	
17:00	4230	4750	7.94	51.84	0	
18:00	3520	4040	8.33	42.54	1	
19:00	3440	3950	8.33	40.29	1	

PCI CANTERRA - TWEED L. A-67 TIGHT HOLE MOUNT CLARK

86-02-16 (contd.)						
	20:00	3450	3930	8.33	39.73	1	
	21:00	3490	3960	8.33	40.57	1	
	22:00	3510	3960	8.33	40.85	1	
	23:00	3510	3960	8.33	41.13	1	
	24:00	3560	4000	8.33	41.42	1	
	01:00	3600	4020	8.33	41.98	1	
	02:00	3630	4030	8.33	42.26	1	
	03:00	3650	4040	8.33	42.82	1	
	04:00	3680	4050	8.33	42.82	1	
	05:00	3690	4070	8.33	43.11	1	
	06:00	3710	4070	8.33	43.67	1	.120
	07:00	3750	4100	8.33	44.23	1	
	Gas flared in last 24 hours				= 38.33 $10^3 m^3$		
	Total gas flared				= 88.70 $10^3 m^3$		
	Water produced in last 24 hours				= .120m^3		
	Total water produced				=1.375m^3		
86-02-17	-					-	$582,707
	Norward flowing well through separator.						
	08:00	3760	4110	8.33	44.51	1	
	09:00	3770	4110	8.33	44.80	1	
	10:00	3770	4110	8.33	44.80	1	
	11:00	3790	4130	8.33	44.80	0	0.06
	12:00	3820	4150	8.33	45.08	0	
	Shut well in.						
	Build up test.						
	12:05	4480	4600				
	12:10	4930	4920				
	12:15	5170	5430				
	12:20	5660	5670				
	12:25	5920	6160				
	12:30	6400	6480				
	12:45	7160	7430				
	13:00	8160	8250				
	13:15	8620	8860				
	13:30	9330	9400				
	13:45	9600	9720				
	14:00	9930	9950				
	14:30	10330	10350				
	15:00	10580	10610				
	15:30	10720	10740				
	16:00	10820	10850				
	17:00	10900	10940				
	18:00	10940	10980				
	19:00	10970	11010				
	20:00	10990	11030				
	20:30	11000	11040				
	21:00	11000	11040				
	21:30	11000	11040				
	22:00	11000	11050				
	22:00 end build up.						

Pull temp and press recorders and rig up to run static gradient. Rig out rapid wireline. Kill well with 25.1m^3 of 10% KCl water. Mix up 4.8m^3 of 10% KCl water. Remove wellhead, install BOP's, rig up floor and rotate tongs to warm up oil. Replace tong hose.

PCI CANTERRA - TWEED L. A-67 TIGHT HOLE MOUNT CLARK

86-02-18 - - $602,901

Warm up tongs, function test BOP's, tarp in BOP's. Hoist 73mm tbg and stand in derrick. Made up and ran a Halliburton model 3 reetrievable bridge plug on 73mm tbg. Attempted to set plug at 1288.5m KB - plug had slipped out of overshot and fallen down hole. Run 4 jts of 73mm tbg and tag plug at 1328m KB. Hatched on to plug and pulled up to 1288.5m KB. Set bridge plug and pressure tested to 14MPa for 15 mins with no leak off. Dump 1 1/2 sacks of 20/40 sand on top of plug. Pulled out of hole with 73mm tbg and layed down overshot. Rigged up Schlumberger to run GR strip over interval. Ran GR tool and tagged sand on RBP at 1287m KB. Confirmed cellar sufficient for perforating. Pulled GR tool and layed down. Made up 127mm perforating guns. Make up Schlumberger 127mm conveyed tbg gun on 73mm tbg. Run in hole, land tbg hanger. Rig up Schlumberger wireline, run log to position guns. Space out gun to shoot Mount Clark formation 1278.5 to 1284.5m KB. Run after positioning log, rig out Schlumberger, remove BOP's

86-02-19 - - $623,546

Install wellhead and tarp in. Rig to swab. Pull swabs. Swab well down to 600mKB. Rig out swab equip. Dropped bar to fire 127mm guns at 39 JSPM across Mount Clark from 1278.5 to 1284.5mKB. Guns did not appear to fire. Rigged in Rapid Wireline and fished bar out of tbg. Impression on bar indicated contact with the firing head. Dropped bar again to fire guns. Guns did not appear to fire. Fished bar out of tbg and rigged out Rapid. Filled hole with 10.9m^3 of 10% KCl, removed wellhead and installed BOP's. Installed working floor, pre-fabs and tarped in BOP's. Pulled 73mm tbg and layed down Schlumberger's TCP guns. Guns had not fired. Wait on delivery of Schlumberger's perforating charges.

86-02-20 - - $638,892

Waiting on delivery of Schlumberger perforating charges. Schlumberger making up 127 mm gun, 6m with 39 shots per meter. Ran 127 mm guns on 73 mm tbg and spaced out with same pups leaving RA collar at correlated depth. Landed dognut, leaving guns across Mount Clark from 1278.5 to 1284.5 mKB. Removed BOP's, installed wellhead and rigged up to swab. Swabbed well down to 600 m and rigged out swab equip. Schlumberger dropped bar to fire 127 mm guns at 39 JSPM. Guns did not appear to fire. Rigged up rapid wireline to pull bar, Rapid skid unit's transmission not operational. Rig up swab lubricator. Run overshot on sand line and retrieve bar. Impression on bar indicated contact with firing head. Removed wellhead, installed BOP's and rigged up to pull pipe. Pulled 73 mm tbg and layed down TCP guns. Guns did not fire. Make up F nipple on bottom of tbg, run in 70 jts. Rig to swab. Swab well down to 300 mKB. Rig out swab equip. Hoist 73 mm tbg.

Note: Schlumberger do not have enough parts to make up another TCP gun in Canada. Schlumberger released.

PCI CANTERRA - TWEED L. A-67 TIGHT HOLE MOUNT CLARK

86-02-21 - - $681,007

Wait for computalog wireline truck for perforating. Rig up computalog. Ran 79 mm csg guns on wireline and perforated Mount Clark formation from 1278.5 to 1284.5 mKB. Make two runs at 13 JSPM per run and fired a total of 158 12 gram charges. Ran in hole with an overshot for Halliburton's RBP, an R nipple, a 1.28 m pup, 1 jt of tbg, a Halliburton RTTS packer and tbg to surface. Spaced out with pups and landed overshot at 1284.8 mKB. Rigged up Dowell to perform a 6 m^3 15% HCl acid squeeze with 67% methanol. Held safety meeting and press tested surface lines to 21 MPa, Pumped 4.05 m^3 of acid down tbg and stopped pumps for 5 min. Repeated .15m^3 stage washes 12 more times. Washed a total of 2.0 m^3 of acid by perfs raising back press from 2500 kPa to 3500 kPa. Squeeze 4 m^3 of 15% HCl 67% methanol, first 0.8 m^3 squeezed in intervals by pressuring up to 7 MPa, stop pump. Press would bleed down to 6 MPa in 10 to 20 min. Build press to 7 MPa, and release press back to pumper to 0 MPa, several times for 6 hours. Finally acid started to feed to formation. Remainder of 3.2 m^3 of acid and overflush squeezed away at .09 m^3 min. Press at 6.5 MPa going down to 5.5 MPa at end of squeeze. Shut in press 5.5 MPa after 10 min 2 MPa. Back wash out wash acid. Rig out Dowell. Pull up set RTTS packer at 1257.70 mKB end of tailpipe at 1271.48 mKB. Remove BOP's, install wellhead.

86-02-22 - - $718,800

Pressure test seals in frac head to 14 MPa, ok. Rig to swab, pull 3 swabs recover 4.5 m^3 of 10% KCl water and spent acid, well started to kick. Shut well in, Rig up choke. Rig out swab equip. Press build up to 4100 kPa. Flowed well to pit for clean up.

Time (hours)	Tbg press (kPa)	Choke (mm)	Fluid (m^3)
10:00	2480	6.35	steady spray of acid/water
10:15	960	6.35	"
10:30	1100	5.56	"
10:45	1240	5.56	"
11:00	1380	5.56	"
11:30	1450	5.56	"
12:00	1580	5.16	"
12:30	1690	5.16	"
13:00	1790	5.16	"
13:30	2000	5.16	"

Shut well in and hooked up lines to separator. Flowed well through separator .

Time (hours)	Tbg press (kPa)	Choke (mm)	Gas Rate ($10^3 m^3$)	Fluid (m^3)	Temp (°C)
14:00	7280	6.35			4
14:15	4880	6.35			4
14:30	4300	6.35			4
14:45	4080	6.35			4
15:00	4100	6.35	26.46		4
15:15	4150	6.35	(H_2S - 0%)		4
15:30	4190	6.35			4

PCI CANTERRA - TWEED L. A-67 TIGHT HOLE MOUNT CLARK

86-02-22 (contd.)

16:00	4200	6.35	27.61	0.021	4
16:30	4200	6.35		(ph=1)	4
17:00	4210	6.35	27.61	0.020	4
18:00	4210	6.35	27.61		3
19:00	4320	6.35	27.75	0.140	2
20:00	4350	6.35	28.46		2
21:00	4390	6.35	29.02		1
22:00	4440	6.35	29.58	0.140	1
23:00	4490	6.35	29.86		1
24:00	4500	6.35	30.15		1
01:00	4550	6.35	30.71	0.140	1
02:00	4580	6.35	30.71		1
03:00	4640	6.35	30.99		1
04:00	4670	6.35	31.55		1
05:00	4670	6.35	31.55	0.150	1
06:00	4710	6.35	31.84		1
07:00	4720	6.35	31.84		1

Total gas flared since 14:00 hours Feb 22, 1986 = 20.98 $10m^3m^3$
Total water produced since 14:00 hours = $0.611m^3$

86-02-23 - - $733,066

Norward flow well through separator

07:30	4720	6.35			1
08:00	4740	6.35	31.84		1
09:00	4740	6.35	32.12	0.120	1
10:00	4760	6.35	32.12		1
11:00	4760	6.35	32.40		1
12:00	4760	6.35	32.40		1
13:00	4780	6.35	32.68		0
14:00	4800	6.35	32.96	0.150	0

Shut well in build up. Total gas flared in 24 hour period was 30.40 10^3m^3. Total acid/water dumped in 24 hour period was 0.881 m^3

Time	Tbg press	Time	Tbg press
14:05	6370	16:00	10450
11:10	7500	16:30	10540
14:15	8290	17:00	10620
14:20	8850	18:00	10670
14:25	9240	19:00	10760
14:30	9470	20:00	10800
14:35	9660	21:00	10800
14:40	9780	22:00	10830
14:45	9880	23:00	10840
14:50	9970	24:00	10840
14:55	10030	01:00	10840
15:00	10090	02:00	10840
15:15	10200	03:00	10840
15:30	10290	04:00	10850
15:45	10380	05:00	10850
		06:00	10850
		07:00	10850

PCI CANTERRA - TWEED L. A-67 TIGHT HOLE MOUNT CLARK

86-02-24 - - $747,332

Well shut in. Recording pressure build up.

Time	Tbg Press (kPa)	Time	Tbg Press (kPa)
08:00	10850	12:00	10860
09:00	10860	13:00	10860
10:00	10860	14:00	10860
11:00	10860	18:00	10870

Waiting for frac equip to arrive at lease. Tubing press at 07:00 hours = 10880 kPa.

86-02-25 - - $821,218

Wait for Nitrogen pumper. The rest of frac equipt on lease and rigging up. Dowell reported to us Nitrogen pumper was repaired and left Norman Wells at 22:30 hours.

86-02-26 - - $904,932

Temp = 42°C. Wait for Dowell N_2 pumper. All frac equip on lease. Rigged in N_2 pumper. Mixed 1.2 kg/m^3 of J266 gelling agent in 23.7 m^3 of 3% KCl water. Warmed up pumpers and surface lines. Held safety meeting. Press tested surface lines to 50 MPa. Filled hole with 3.8 m^3 of 75% quality nitrogen/water foam. Pumped a 22.7 m^3 75% quality foam pad at 2.5 m^3/min and an average press of 23 MPa. Press increased from 11-23 MPa with no breakdown. Pumped 8.0 tonnes of 20/40 sand in 22.7 m^3 of 65% foam at 2.5 m^3/min and 26 MPa. Sand concentration increased from 120 - 480 kg/m^3. Flushed sand with 3.4 m^3 of 65% foam at 2.5 m^3/min and 27 MPa. ISIP was 16 MPa. Rigged out Dowell and installed top section of wellhead. Installed choke. Press 1 1/2 hours after frac was 10300 kPa. Opened well on a 19.1 mm choke to clean-up. Flowed N_2 water and sand back to pit. Continued clean-up

Time(hrs)	Choke (mm)	Tbg Press(kPa)	Remarks
18:00	19.1	1380	
19:00	19.1	1030	Steady mist of water. Reduce choke
20:00	7.9	3850	
21:00	7.9	3950	Flame not staying lit
22:00	7.1	4400	Reduce choke.
23:00	7.1	4400	Flame not staying lit.
24:00	7.1	4400	
01:00	7.1	4400	
02:00	7.1	4200	Choke washed setting
03:00	6.35	4100	will not be correct.
05:00	5.16	5700	Very light mist of
06:00	5.16	6200	frac fluid with gas.
06:30	5.16	6200	

Shut well in. Norward hooking up to flow through separator.

PCI CANTERRA - TWEED L. A-67 TIGHT HOLE MOUNT CLARK

86-02-27 - - $930,626

Temp. equals -37 degrees celcius
Norward testers flowing well through seperator

Time(hrs)	Tbg Press(kPa)	Choke(mm)	Rate(10^3m^3)	Temp(C)	Fluid(m^3)
07:00	9860	5.56	59.45	1	
07:15	8650	6.75		0	
07:30	8320	6.75		-1	
08:00	8140	6.75	59.45	-1	
09:00	8100	6.75	58.88	-1	
10:00	8110	6.75	58.88	-1	
11:00	8110	6.75	58.88	-1	
11:30	8090	6.75	58.60	-1	
12:00	8090	6.75	58.60	-1	
12:30	8090	6.75	58.60	-1	
13:00	8090	6.75	58.60	-1	0.090
13:30	8090	6.75	58.60	-1	ph 1.0
14:00	8090	6.75	58.60	-1	0.150
14:10	Shut in to run recorders				
14:30	9600	Tubing pressure recorded with gauge not dead weight!			"
14:45	10050	"			"
15:00	10250	"			"
15:15	10250	"			"
15:30	10250	"			"
16:00	10450	"			"
16:30	10050	"			"
17:00	10660	"			"
	Flow well to separator				
17:05	9720	6.75		-3	
17:10	9120	6.75		-2	
17:15	8910	6.75		-2	
17:30	8700	6.75		-2	
18:00	8410	6.75	61.70	-2	
	Open choke and change orifice plate				
18:15	7640	7.54		-2	
18:30	7490	7.54		-2	
19:00	7380	7.54	74.66	-2	
20:00	7270	7.54	71.84	-2	0.160
21:00	7200	7.54	70.43	-2	0.150
	Open choke				ph 1.0 trace
22:00	6850	7.94	76.07	-2	of fines
23:00	6840	7.94	75.51	-2	0.180
	Open choke				
24:00	6520	8.33	78.61	-2	
01:00	6550	8.33	79.73	-2	0.160
02:00	6540	8.33	79.73	-2	0.130
03:00	6570	8.33	79.73	-2	
04:00	6600	8.33	80.30	-2	0.160
05:00	6600	8.33	81.42	-2	
06:00	6590	8.33	80.86	-2	0.140
07:00	6580	8.33	81.42	-2	

Flowed well for 21 hours in last 24 hours. Total gas flared in 21 hours was 61.85 10^3m^3. Total water produced in 21 hours was $1.32m^3$.

PCI CANTERRA - TWEED L. A-67 TIGHT HOLE MOUNT CLARK

86-02-28 - - $ 952,291

Temp. equals minus 42°C
Norward testers flowing well through separator.

Time(hrs)	Tbg Press(kPa)	Choke(mm)	Rate(10^3m^3)	Temp(C)	Fluid(m^3)
07:30	6580	8.33			
08:00	6580	8.33	81.42	-2	.120
09:00	6600	8.33	81.42	-2	
10:00	6620	8.33	81.42	-2	.120
11:00	6630	8.33	81.70	-2	
12:00	6630	8.33	81.70	-2	0.150
13:00	6620	8.33	81.99	-2	
14:00	6620	8.33	81.99	-2	0.120
15:00	6620	8.33	81.99	-2	
16:00	6630	8.33	81.99	-2	0.110
17:00	6630	8.33	81.99	-2	
18:00	6630	8.33	81.99	-2	0.140

Shut well in for build-up. Total gs flared in past 11 hours 37.48 10^3m^3. Total fluid dumped in past 11 hours 0.760m^3.
Total gas flared in past 32 hours 99.33 10^3m
Total fluid dumped in past 32 hours 2.08m^3.

Time(hrs)	Tbg Press(kPa)	Time(hrs)	Tbg Press(kPa)
18:05	8570	18:25	9710
18:10	9220	18:30	9790
18:15	9440	18:45	9960
18:20	9600	19:00	10090
19:15	10170	22:00	10530
19:30	10240	22:30	10590
19:45	10270	23:00	10620
20:00	10330	24:00	10680
20:30	10410	01:00	10720
21:00	10470	02:00	10760
21:30	10510	03:00	10800
		04:00	10810
		05:00	10830

Rig up Rapid Wireline. Pull pressure recorders. Run gradient.

86-03-01 - $976,327

Temp equals 42 degrees celcius
Rapid Wireline run gradient. Kill well with 5.2m^3 10% KCL water. Remove wellhead, install BOP. Pressure test BOPs and annulus to 10 MPa. Unseat RTTS packer. Circulate down annulus up tubing. Well dead. Install pack off and pick up 2 jts of 73mm tubing. Reverse circulate sand off the top of Halliburtons RBP. Latch onto plug and release. Well flowing up both tubing and casing. Circulate one complete hole volume with 10% KCl water - gas to surface. Well still flowing. Weight up to 12% KCl (170 kg/m^3) and circulate well over. Well dead. Removed pack off, tarped in working floor and rigged up to pull tbg. Pulled 73mm tbg., layed down RBP and redressed RTTS packer. Make up 177.8mm RTTS packer with 0.14m nipple in bottom of packer. R nipple 57.15mm profile on top of packer, one 0.28m pup and tbg. to surface. Ran 10 jts. tbg. stop to thaw out airlines. Work on airlines. Temp. -38 degrees. Running in 73mm tbg. with RTTS packer. Replacing air control valve on panel. Running in 73mm tbg.

86-03-02 - - $ 1,093,862

Temp. equals minus 38°C
Run in 73mm tbg. with RTTS packer to 1225m. Rig up Computalog. Could not get down tbg. with GR tool, ice in tbg. Circulate tbg. for 15 min. Computalog ran tracer log from 1305m up to 1250m. Rig out Computalog. Run in 73mm tbg. to 1289m. Circulate tbg. for 15 min. Set RTTS packer element at 1288.6m. Bottom of nipple in packer at 1289.90m KB. Packer set with 7200 daN compression. Remove BOPs install wellhead. Pressure test seals in frac head to 14 MPa - O.K. Rigged up to swab. Pulled 3 swabs and well started flowing. Recovered 8.6m^3 of 10-12% KCl water. Rigged in Dowell to perform 12 tonne foam frac. Mixed 1.2 kg/m^3 of J-266 gelling agent in 32m^3 of 3% KCl water and 30% methanol. Warmed up pumpers and surface lines. Held safety meeting. Pressure tested lines to 50 MPa. Filled hole with 3.9m^3 of 75% quality nitrogen/water foam. Pumped a 49.9m^3 75% quality pad at 2.5m^3/min. and a pressure increasing from 15 MPa to 23.0 MPa with no breakdown. Pumped 12.0 tonnes of 20/40 sand in 33.3m^3 of 65% foam at 2.5m^3/min. and 25.0 MPa. Flushed sand with 3.4m^3 of 65% foam at 2.5m^3/min. and 28 MPa. Pumps stopped at 29.0 MPa and the ISIP was 20.0 MPa leaking off to 20.0 MPa in 5 minutes. Rigged out Dowell, installed top section of wellhead and choke. Opened choke to 19.1mm and flowed water, N2 and sand to pit. Replaced badly washed seat and stem in choke and continued clean-up.

Time(hrs)	Choke(mm)	Tbg. Press.(kPa)	Remarks
21:00	6.35	9650	Flowing N2, water & sand
21:30	6.35	8500	
22:00	6.35	6000	
22:30	6.35	5900	
23:00	6.35	5500	Slugging frac fluid
23:30	6.35	5250	
24:00	6.35	5050	
01:00	6.35	5050	
02:00	6.35	5050	Choke washed some setting
03:00	5.55	6000	will not be correct.
04:00	5.55	7100	
05:00	5.55	6900	
06:00	5.55	6600	Light mist of frac fluid.
07:00	5.55	7000	

86-03-03 - - $ 1,137,424

Norward testers hooking well up to separator. Norward flowing well through separator.

Time(hrs)	Tbg Press(kPa)	Choke(mm)	Rate(10^3m^3/d)	Temp(C)	Fluid(m^3)
07:30	10200	4.76			
07:45	9400	6.75			
08:00	8920	8.33	81.98	3	
08:30	8020	8.33		4	
09:00	7570	8.33	83.96	3	
09:30	7280	8.33		0	0.020
10:00	7650	8.33	78.89	1	
10:30	7980	8.33		3	
11:00	8000	8.33	81.99	3	0.150
11:30	6830	9.92	106.78	2	0.460
12:00	6580	9.92	114.10	2	0.300

Continued on page 16

86-03-03cont.-

Time(hrs)	Tbg Press(kPa)	Choke(mm)	Rate(10^3m^3/d)	Temp(C)	Fluid(m^3)
12:30	6380	9.92		2	
13:00	6290	9.92	117.77	1	0.400
13:30	6230	9.92		1	
14:00	6170	9.92	118.89	1	0.400
14:30	6130	9.92		1	0.140
15:00	6050	9.92	119.74	1	0.100
15:30	6000	9.92		1	0.160
16:00	5940	9.92	120.30	1	0.130

16:01 Shut in to run recorders.

Total gas flared during clean-up through separator was 36.28 10^3m^3. Frac fluid dumped was 2.38m^3. Rigged in Rapid Wireline to run recorders. Ran a 57.9mm gauge ring to the R-nipple at 1287m KB. Gauge ring was haning up in ice while running in. Pumped 0.6m^3 of methanol while running gauge ring. Ran dart to 460m - hanging up in tubing. Pumped another 0.6m^3 of methanol and worked dart to 650m. Pumped 0.1m^3 of methanol but could not move dart. Worked line on surface and pulled up to 455m. Continued to work on dart and line parted approx. 15m above rope socket. Mixed 3m^3 of 10% KCl water and heated up rig tank. Rigged up to kill well down tbg. with 4m^3 of hot 10% KCl water.

86-03-04 - - $1,156,261

Temp. = 30 degrees C. Pumped 8.1m^3 of 10% KCl down tubing and killed well. Rigged in Rapid Wireline and ran a 57.9mm gauge ring and tagged wire at 1277m KB. Ran a 58.4mm inside wire-grab and tagged wire at 1277m KB. Worked tool and started up hole with fish. Pulled 15m of wire, stem and running tool for dart out of the hole. Dart was not in tool. Ran 40.6mm blind box and confirmed dart was on R-nipple at 1287m KB. Ran pressure and temperature recorders and landed on dart. Rigged out Rapid. Rigged up to swab. Swabbed 4.6m^3 of KCl water to rig tank and well was flowing. Flowed well on 9.92mm choke for clean-up for 1/2 hour. Shut well in and hooked up lines to separator for further clean-up.

Time(hrs)	Tbg Press(kPa)	Choke(mm)	Rate(10^3m^3)	Temp(C)	Fluid(m^3)
16:30	10200	7.14			
17:00	8880	7.94	90.72	5	
17:30	8550	7.94		5	
18:00	8280	7.94	98.05	4	0.10
18:30	7950	7.94		4	
19:00	8070	7.54	94.10	4	0.20
19:30	8010	7.54		4	0.12
20:00	8110	7.14	90.44	4	0.10
21:00	7900	7.14	99.17	4	0.24
Shut in well to inspect choke					
22:00	8890	6.35	63.95	4	
23:00	8020	7.94	96.07	2	0.12
24:00	8030	7.54	93.82	2	0.22
01:00	7600	7.54	107.34	2	0.24
02:00	7820	5.95	103.40	2	0.24
03:00	7670	5.95	109.88	3	0.21
04:00	7840	5.16	106.78	3	
05:00	7740	5.16	110.16	2	0.12
06:00	7430	5.16	109.60	1	0.26
07:00	6250	3.57	132.14	1	0.26

Fluid sample shows ph = 1.0, BS & W = 0.2% Water = 99.8% Choke is washed - setting will not be correct. Total gas flare over 14 1/2 hrs=59.38. Total fluid dumped over 14 1/2 hrs=2.53m^3. Temp. = -35°C.

PCI CANTERRA - TWEED L. A-67 TIGHT HOLE MOUNT CLARK

86-03-05 - - $1,175,630

Temp. equals minus 35°C
Continue to flow well through Norward's separator.

Time(hrs)	Tbg Press(kPa)	Choke(mm)	Rate(10^3m^3)	Temp(C)	Fluid(m^3)	
07:00	6250	3.57	132.14	1	0.26	
Shut well in to inspect choke-replaced seat & stem						
07:30	9780	7.94		1		
08:00	8660	7.94	96.07	1		
09:00	8300	8.33		0		
09:30	7940	8.33	110.72	2	0.10	
10:00	7890	8.33	110.44	1	0.08	
11:00	7930	7.94	108.47	0	0.16	
12:00	8210	7.54	98.60	0		
13:00	8040	7.54	104.24	3	0.12	
14:00	7790	7.54	108.75	0	0.10	
15:00	8270	6.35	98.89	0		
16:00	8050	6.35	102.27	1	0.06	
17:00	7950	5.95	105.65	2	0.08	
17:45	Shut well in and replaced seat & stem					
17:55	10040	Open well slowly				
18:30	8600	7.94		1		pH = 1.0
18:40	7820	8.73				Fines=trace
18:45	8230	8.33				
19:00	8110	8.33	105.37	0		
19:15	8130	8.14				
19:30	8150	8.14	103.96	0		
19:35	7970	7.74				
Continue to flow well through separator. Working choke in order to maintain 8000 kPa wellhead pressure.						
19:54	7980	7.34				
20:00	8160	7.34	103.68	0	0.11	
20:08	8210	7.54				pH = 1
20:15	8020	7.24				Fines= .1%
20:30	8230	7.34		0	0.10	
21:00	8080	7.44	101.71	0		Someapparent
21:11	7960	7.14				Crushed sand
21:14	7990	7.04				in fines.
21:28	7980	6.75				
21:30	8010	6.75		0	0.12	
22:00	8050	6.55	101.98	0		pH = 1
22:03	7960	6.35				Fines=trace
22:08	7820	5.95				
22:20	7880	5.56				
22:22	7890	5.16				
22:25	7960	4.76				
22:30	8000	4.76		0	0.12	
22:32	7970	4.37				
22:42	7930	3.57				
22:44	7900	2.78				
22:47	7920	1.98				
22:50	7920	0				
23:00	7880	0	109.32	0	0.10	

Choke washed to the point where 8000 kPa back pressure on wellhead could no longer be held. Well was shut-in for build-up. Total gas flared in 15 1/2 hrs. = 67.41 10^3. Total fluid produced in 15 1/2 hrs. = 1.39m^3. Cummulative gas flare in 38.2 hrs. = 163.07 10^3m^3. Cummulative water produced in 38.2 hrs. = 6.30m^3.

PCI CANTERRA - TWEED L. A-67 TIGHT HOLE MOUNT CLARK

86-03-05 - Cont.

NOTE: Choke settings are incorrect due to washing and because of constant working of choke, rates are averaged. (Last 5 hrs. of test choke was constantly worked).

Build up Test:

Time(hrs)	Tbg Press(kPa)	Time(hrs)	Tbg Press(kPa)
23:02	9300	01:00	10580
23:04	9550	02:00	10650
23:06	9720	03:00	10690
23:08	9840	04:00	10710
23:10	9910	05:00	10750
23:15	10040	06:00	10770
23:20	10140	07:00	10800
23:25	10220		
23:30	10260		
23:45	10370		
24:00	10440		
24:30	10510		

86-03-06 - - $ 1,219,611

Temp. = 35 degrees C. Continue build up test

Time(hrs)	Tbg. Press.(kPa)
07:00	10800
08:00	10810
09:00	10830
10:00	10850
11:00	10870
12:00	10880

Pumped 1.6m^3 of methanol down tubing and shut well in. Hooked up flow lines to separator and opened choke slowly for second portion of flow test.

Time(hrs)	Tbg Press(kPa)	Choke(mm)	Rate(10^3m^3)	Temp(C)	Fluid(m^3)
13:30	6600	9.53	109.88	4	
14:00	6100	8.33	96.64	2	
14:30	Shut well in, replaced washed stem & seat with a 7.94mm positive choke.				
15:00	10220	Open Well			
15:30	8430	7.94	74.38	3	0.06
16:00	8020	7.94	76.92	1	
	Opening by-pass valve in order to draw down well.				
16:30	6850	7.94			
17:00	7720	7.94	71.28	1	0.060
17:30	7850	7.94	69.03	4	pH=5
18:00	7660	7.94	70.15	1	0.060
18:30	7640	7.94		1	Sal=125000ppm
18:40	Shut-in. Remove positive choke & installed stem & seat.				
19:00	7900	9.13	112.13	0	Fines=0.1%
19:30	6550	9.13	92.69	0	0.120
20:00	6670	9.13	85.65	0	
20:30	6270	9.53	92.69	0	0.140
21:00	6220	9.53	90.72	0	0.120
22:00	6070	9.53	91.85	0	0.080
23:00	6060	9.53	92.97	0	0.080
24:00	6020	9.53	91.85	0	0.110

86-03-06 - (Contd)

Time(hrs)	Tbg Press(kPa)	Choke(mm)	Rate (10^3m^3)	Temp (C)	Fluid(m^3)
01:00	6000	9.53	96.36	0	0.120
02:00	6270	9.13	93.54	0	0.120
03:00	6300	9.13	93.54	0	0.100
04:00	6130	9.33	96.36	0	0.100
05:00	6070	9.33	96.36	0	0.100
06:00	6080	9.33	96.92	0	0.100
07:00	6080	9.33	96.92		

Water sample at 04:00 pH=5, Sal= 152000 ppm & Fines = .1%

Total gas flared in 17.25 hours 64.20 10^3m^3.
Total fluid produced in 17.25 hours $1.3m^3$
Orifice plate was calipered at 00:30 hours - O.K. Meter was monitored - O.K.

86-03-07 - - $ 1,237,294

T = 35 degrees C
Continue second portion of flow test

07:00	6080	9.33	96.92	0	0.10
08:00	6050	9.33	98.05	-1	0.06
09:00	6060	9.33	98.05	0	0.12
10:00	6080	9.33	98.05	0	0.11

Shut well in for build-up.
Gas flared in last 3 hrs. = 12.26 10^3m^3
Fluid produced in last 3 hrs.= $0.29m^3$. Samples show pH = 5 to 6, Sal = 170000ppm and a trace of fines.
Build-up Test

Time(hrs)	Tbg Press(kPa)	Time(hrs)	Tbg. Press(kPa)
10:02	8070	13:35	10340
10:04	8550	14:00	10390
10:06	8780	15:00	10480
10:08	8920	16:00	10550
10:10	9000	17:00	10600
10:15	9190	18:00	10660
10:20	9300	19:00	10700
10:25	9400	20:00	10730
10:30	9480	21:00	10760
10:45	9650	22:00	10780
11:00	9770	End Build-up Test.	
11:15	9870		
11:30	9960		
12:00	10090		

Rapid ran a 49mm gauge ring to 1272m KB. No constrictions while running or pulling but gauge ring has "slushy" hydrates on it at surface.

Open well slowly through Norward's testing unit. Draw tubing pressure down to 8000 kPa and attempt to stabilize.

86-03-07 - Contd. - $ 1,237,294

Time(hrs)	Tbg Press(kPa)	Choke(mm)	Rate(10^3m^3)	Temp(C)	Fluid(m^3)	
22:15	10080	5.16				
22:20	9600	6.35				
22:30	8850	7.14	90.16	1		
23:00	8200	7.94	98.05	0		
23:30	8180	7.94	96.64	0		
24:00	7950	7.94	98.05	0	0.05	
01:00	8030	7.54	88.74	0	pH=5,Fine=.1%	
02:00	7820	7.54	88.46	0	Sal=111500ppm	

Start opening choke to draw down tubing to a stabile 6000 kPa.
Continue flow test:

02:30	6620	8.73	103.68	0	0.10
03:00	6310	9.33	107.34	0	pH=5,Fine=.1%
03:30	6050	9.33	107.62	0	0.12
04:00	6040	9.33	106.78	0	Sal=152000ppm
05:00	5970	9.33	106.22	0	0.12
06:00	6030	9.23	105.09	0	0.12

Shut well in - end test.
Total gas flared in last 7.8 hrs. = 32.57 10^3m^3
Total fluid produced in last 7.8hrs= $0.46m^3$
Cummulative gas flared on test = 272.1 10^3m^3
Cummulative fluid produced on test = $8.9m^3$
Rigged in Rapid Wireline to retrieve pressure recorders. T = 27 degrees C

86-03-08 - - $ 1,284,372

T = 27 degrees C
Rapid ran a 49mm gauge ring to 1272m KB and pulled same. Ran pulling tool and pulled pressure and temperature recorders to surface. Ran a static gradient with 6-3 minute stops and 1-5 minute on bottom. Killed well by pumping $1.6m^3$ of methanol ahead of $7.9m^3$ of 10% NaCl water down tubing. Rapid ran a 57.9mm gauge to 1280m KB and pulled the same. Ran a SB pulling tool and attempted to recover dart. Pulled out of hole with tool-did not recover the dart. Re-ran JDC pulling tool and pulled out of hole with the dart. Filled tubing, removed wellhead and frachead and installed BOP's. Unset Halliburton RTTS packer, pulled 2 jts. and installed pack off spool. Reverse circulated out sand down to 1313m KB. Pulled 40 jts. of 73mm tubing and rigged in Computalog. Ran a RA tracer log from 1313m KB to 1250m KB. Gamma ray intensity increased through interval of interest from 1290.5 to 1301.0m KB. Pulled remainder of 73mm tubing and layed down RTTS packer. Computalog ran and EZ drill bridge plug to 1260m KB. Pulg would not set. Pulled plug and redressed firing head assembly. Re-ran Halliburton EZ drill plug and set at 1260m KB. Pressure tested plug and casing to 10 MPa for 15 minutes with no leak off. Mixed 6 sacks of class G cement in fresh water and dump bailed on plug in 3 runs. Cement top to 1250.7m KB. Rigged out Computalog. Ran 42 jts. of bull plugged tubing to 385m and displaced $1.6m^3$ of 10% NaCl water to the pit. Removed BOP's and installed wellhead. Topped off well with $1.6m^3$ of diesel.
T = 44 degrees C.

Final Completion Report!!!!
Rig moving reports will continue.

PCI CANTERRA - TWEED L. A-67 TIGHT HOLE MOUNT CLARK

86-03-09 - - $1,301,456

Rigged out service rig and equipment. Moved all equipment off pad for lease clean up and rig move.

86-03-10 - - $1,318,550

Moving camp from site to Norman Wells.

86-03-11 - - $1,326,285

Moved remainder of Western Geophysical camp to Norman Wells. Moved 30% of Roll'n #35 from location to Norman Wells.

86-03-12 - - $1,336,760

Trucks returning to location for remainder of service rig.

86-03-13 - - $1,341,473

Trucks arrived on location, loading remaining rig equipment.

86-03-14 - - $1,350,562

Load remainder of rig equipt and start move back to Norman Wells.

86-03-15 - - $1,365,995

Unload rig and equipt in Norman Wells. Waiting for Land Transport to move equipt South.

86-03-16 - - $1,444,669

Loaded rig in Norman Wells and started move back to Red Deer.

86-03-17 - - $1,535,394

Moving rig and equipment back to Red Deer. Extended costs to include trip back.

FINAL REPORT

PETRO CANADA INCORPORATED

PCI CANTERRA TWEED LAKE A-67

Well History Report

Prepared by: B. Speirs
1986-01-06

PCI CANTERRA TWEED LAKE A-67

WELL HISTORY REPORT

a) INTRODUCTION

- i) Summary
- ii) Location Map

b) GENERAL DATA

- i) Well Name and Number
- ii) Well Location
- iii) Unique Well Identifier
- iv) Operator and Drilling Contractor
- v) Drilling Unit
- vi) Position Keeping
- vii) Support Craft
- viii) Drilling Unit Performance
- ix) Difficulties and Delays

c) SUMMARY OF DRILLING OPERATIONS

- i) Elevations
- ii) Total Depth
- iii) Date Spudded
- iv) Date Drilling Completed
- v) Date of Rig Release
- vi) Well Status
- vii) Hole Sizes and Depth
- viii) Casing and Cementing Record
- ix) Sidetracked Hole
- x) Drilling Fluids
- xi) Fishing Operation
- xii) Well Kicks
- xiii) Formation Leak-Off Tests

c) SUMMARY OF DRILLING OPERATIONS (cont'd)

xiv) Time Breakdown

xv) Deviation Survey

xvi) Abandonment Plugs

xvii) Composite Well Records

APPENDIX

Drilling Data

1. Deviation Records
2. Final Survey Plan
3. Wellbore Schematic

PCI CANTERRA TWEED LAKE A-67

a) INTRODUCTION

i) Summary:

PCI Canterra Tweed Lake A-67, located in the Colville Lake area of the Northwest Territories, was drilled to a total depth of 1347 m. Drilling was completed in 32 days.

Petro-Canada Incorporated of Calgary operated the well. ATCO Drilling Ltd. of Calgary, the contractor, used Atco/Equtak Rig #76, a diesel mechanical rig built in 1983.

The location coordinates for this well are 66° 56' 11.60" North Latitude and 125° 56' 18.88" West Longitude. Ground elevation is 390.9 m above sea level.

This exploratory well was drilled to delineate the gas and condensate discovery made at PCI Canterra Tweed Lake M-47 in February 1985. The wells objective was to prove the presence of gas and/or oil as well as reservoir continuity in the Sandstone of the Lower Cambrian Mount Clark formation.

PCI Canterra Tweed Lake A-67 was spudded on 1985-11-13 at 0500 hours. A 311 mm hole was drilled and reamed to 444 mm at a depth of 65 m. 340 mm conductor casing was set at 61.5 m.

A 311 mm hole was drilled to 105 m with gel/kelzan XC polymer mud drilling fluid. At 105 m, drilling resumed with air as the drilling fluid.

A small amount of fresh water began to be produced at 145 m. At 280 m, approximately 23 m^3 of water per drilling hour was being produced.

An air/foam drilling fluid was used at 312 m. From 420 m, approximately 50 m^3/hour of water was produced; salinity 200 ppm, calcium content 240 mg/l. Drilling continued to 754 m. Surface casing was set at 754.00 m.

The 216 mm main hole was drilled with gel mud to a depth of 802 m, and with a salt saturated mud from 802 - 1347 m.

Two conventional cores were cut, from 1276 - 1288 m, and from 1288 - 1302 m. The hole was logged from 1345 - 694 m.

Two DST's were run, 1347 m of 178 mm production casing was set, and Atco/Equtak Rig #76 was released on 85-12-23 at 0800 hours.

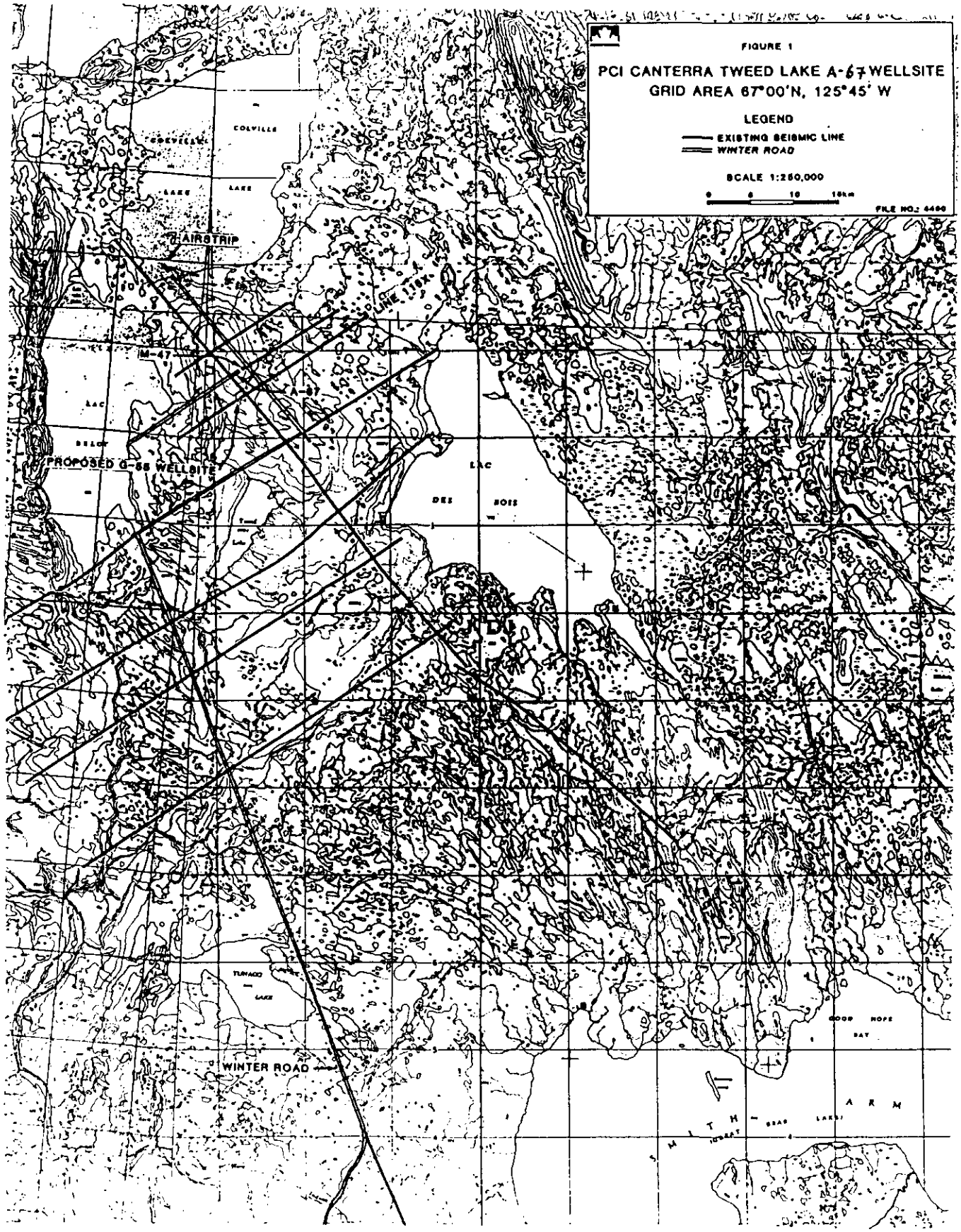


FIGURE 1
PCI CANTERRA TWEED LAKE A-67 WELLSITE
GRID AREA 67°00'N, 125°45' W
LEGEND
EXISTING SEISMIC LINE
WINTER ROAD
SCALE 1:250,000
FILE NO.: 6460
COLVILLE
AIRSTRIP
LINE 118X
M-47
A-67
PROPOSED G-55 WELLSITE
LAC
DES
BOIS
WINTER ROAD

b) GENERAL DATA

i)	Well Name and Number	PCI Canterra Tweed Lake A-67 Grid Area: 67° 00', 125° 45'
ii)	Well Location:	North Latitude 66° 56' 11.60" West Longitude 125° 56' 18.88"
iii)	Unique Well Identifier:	300A676700125450
iv)	Operator:	Petro-Canada Incorporated P.O. Box 2844 Calgary, Alberta T2P 3E3
	Contractor:	Atco Drilling Limited 700, 800 - 6th Avenue S.W. Calgary, Alberta
v)	Drilling Unit:	Name: Atco/Equtak Rig #76 Type: Triple diesel mechanical Year built: 1983 Location: Nisku, Alberta
vi)	Position Keeping:	N/A to this well
vii)	Support Craft:	N/A to this well
viii)	Drilling Unit Performance:	N/A to this well
ix)	Difficulties & Delays:	No difficulties or delays were encountered that were not directly associated with downhole operations.

c) SUMMARY OF DRILLING OPERATIONS

i) Elevations: Ground: 390.9 m
Kelly Bushing: 397.1 m

ii) Total Depth: Drilled: 1347 m
Logged: 1345 m

iii) Date and Hour Spudded: 1985-11-13 0500 hours

iv) Date Drilling Completed: 1985-12-14 1845 hours

v) Date of Rig Release: 1985-12-23 0800 hours

vi) Well Status: Suspended

vii) Hole Sizes and Depths:

Classification	Bit Number	Size (mm)	Depth (m) in	Depth (m) out	Metres Drilled	Remarks
Conductor	1A	311	0	41	41	
	2A	311	41	65	24	
	Hole Opener	444	0	65	65	Reamed hole to 444 mm
Surface	1	311	65	105	40	
	2	311	105	207	102	
	3	311	207	447	240	
	4	311	447	613	166	
	5	311	613	623	10	Reamed undergauge hole 605 - 613
	6	311	623	754	131	
Main	7B	216	754	759	5	Drilled out cement
	8B	216	759	1171	412	
	9B	216	1171	1276	105	
	10C	159	1276	1288	12	Coring
	11B	216	1288	1288	0	Ream hole 1276 - 1288
	12C	159	1288	1303	15	Coring
	13B	216	1303	1347	44	Ream from 1288 - 1303 Drilled ahead to 1347

viii) Casing and Cementing Details:

Hole Classification:	Conductor	Surface		Main	
Hole Size: mm	444	311		216	
Casing Size: mm	340	245		178	
Weight: kg/m	101	60		43	
Grade:	K-55	MN-80		L-80/S00-95	
Coupling:	BT&C	LT&C		LT&C	
Number of Joints:	5	62		48/59	
Number of Centralizers:	3	11		12	
Date of Run:	85-11-18	85-12-02		85-12-22	
Shoe Depth: m	61.5	754		1347	
Tonnes of Cement:	20.0	27.3	5.0	28.4	2.3
Type of Cement:	Class G	Class G	Class G	Class G	Class G
Additives:	.3% $CaCl_2$	None	2% $CaCl_2$	.5% D65	2% $CaCl_2$
Height of Cement:	Surface	420 m	Surface	1247	
Based on:	Returns to Surface	Caliper Log	Returns to surface	Preflush Water to Surface	

ix) Sidetracked Hole: N/A to this well

x) Drilling Fluid: Air drilling was used from 105 m to approximately 312 m; air foam fluid was used to 754 m. From 754 m to 802 m a gel/kelzan XC polymer mud was used. A saturated salt mud was used from 802 m - 1347 m.

Summary of Mud Properties:

Section	Interval (m)	Weight (kg/m^3)	Properties Funnel Vis (S/L)	Water Loss (average, cm^3)	PH (average)	Cl (10^3 mg/l)
Conductor	0- 65	1030-1100	62 - 80	-	10.4	-
Surface	65- 105	1040	35	-	11.0	100
Surface	105- 312	Air	-	-	-	-
Main	312- 754	Air Foam	-	-	-	-
Main	754- 802	1025	42	12	10.5	-
Main	802-1347	1235-1285	38 - 56	14.9	10.4	156 - 172

xi) Fishing Operation: None

xii) Well Kicks: None

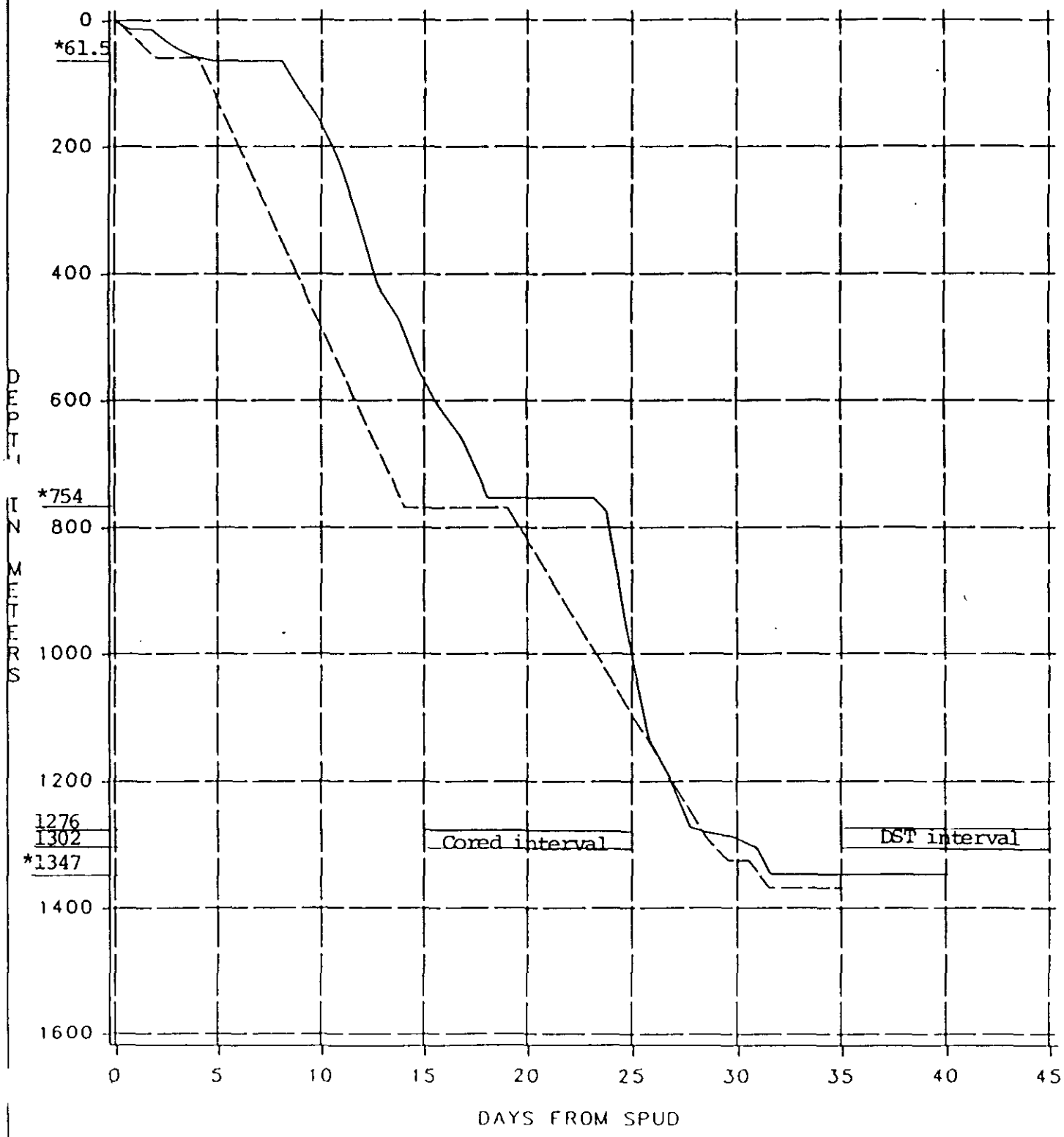
xiii) Formation Leak-off Tests: A pressure integrity test was run on day 24 after drilling out the surface casing shoe at 754 m and drilling a 216 mm hole to 759 m. Mud (density 1050 kg/m^3) was used for the test and a pressure of 8000 KPa at surface was reached (equivalent mud weight 2124 kg/m^3). The formation did not breakdown. The formation integrity was 20.9 KPa/m.

xiv) Time Breakdown:

Time Breakdown	Conductor	Surface	Main	Total
Drill	27.75	181.75	90.25	299.75
Trip	3.00	28.00	52.75	83.75
Ream/Clean	12.50	4.50	1.25	18.25
Conditioning	6.50	7.00	33.50	47.00
Rig Service	2.50	8.75	10.25	21.50
Mechanical Downtime	-	1.25	4.25	5.50
Survey	1.00	8.50	5.75	15.25
Csg - Cmt. - WOC	33.25	20.75	9.50	63.50
Headup/Pressure Test	7.00	27.50	22.75	57.25
Coring			72.00	72.00
Logging		16.50	51.75	68.25
DST			42.25	42.25
Drill Out Cement		9.25	23.25	32.50
Rig Up Air		9.25		9.25
B.O.P. Drill		0.75	0.25	1.00
Wait On Daylight			18.00	18.00
Teardown B.O.P.	3.00			3.00
Lost Circulation	26.75			26.75
Stuck In Hole	5.50			5.50
Drill Mouse Hole	10.25			10.25
Clean Tanks			13.00	13.00
Inspect Drill Collars			2.25	2.25
Maintenance		12.00		12.00
Drill Out DV			3.00	3.00
TOTAL	139.00	335.75	456.00	930.75

PCI CANTERRA TWEED LAKE A-67

ACTUAL AND PLANNED PENETRATION CURVES
SPUD 85-11-13 @ 5:00 , RR: 85-12-23 @ 8:00
DRILLING CONTRACTOR: ATCO/EQUTAK #76



* Casing Depth

LAST UPDATE: 85-12-24

actual ——— planned - - - - -

REF 2064 PAGE 1

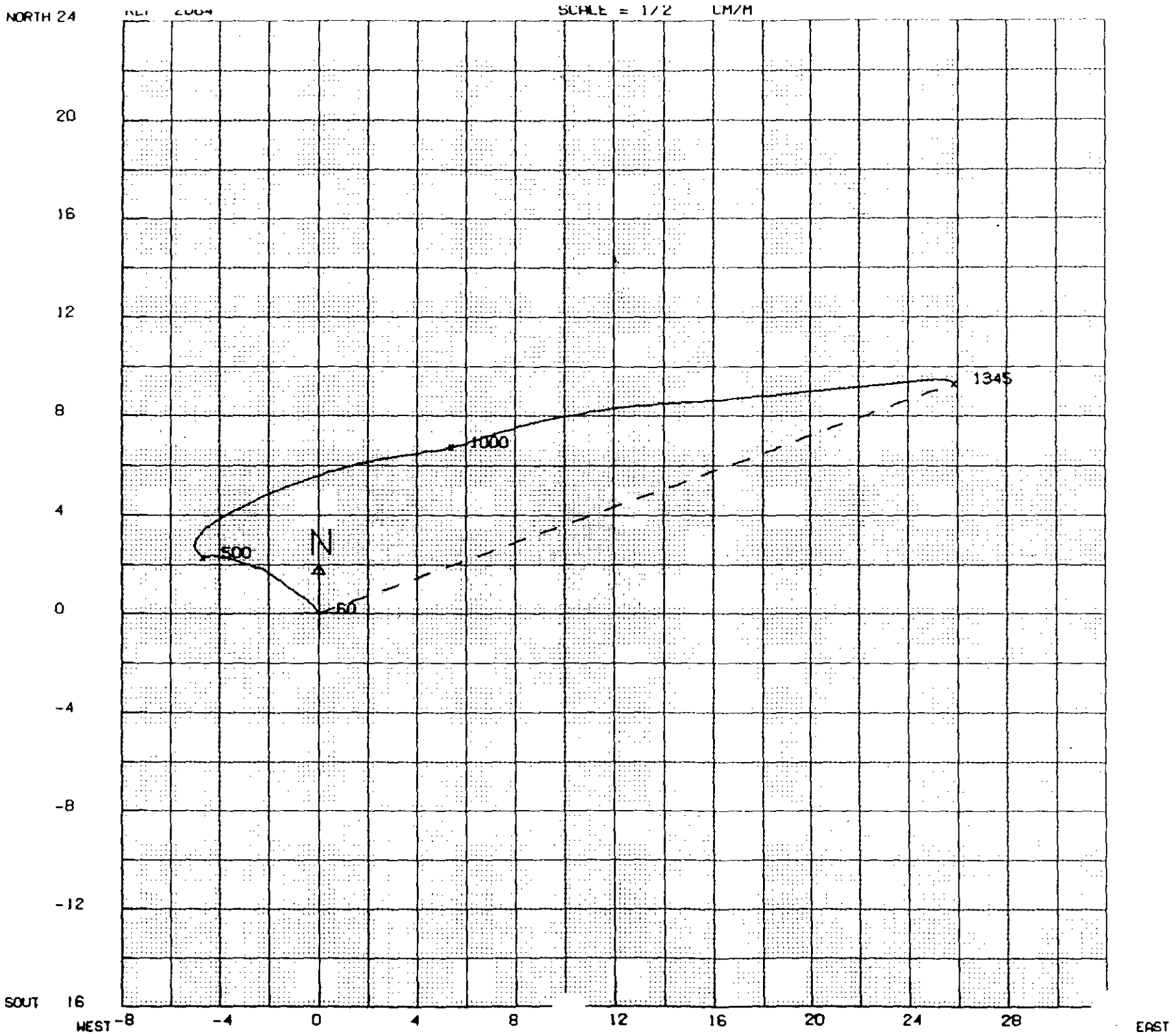
MEAS. DEPTH M	DEVIATION DEGREES	AZIMUTH DEGREES	TRUE VERTICAL DEPTH M	CO-ORDINATES + NORTH - SOUTH	CO-ORDINATES + EAST - WEST	COURSE LENGTH M
60.0	0.0	0	60.0	0.0	0.0	0.0
64.2	0.7	323	64.2	0.0	0.0	0.0
80.0	1.1	321	80.0	0.2	-0.2	0.3
100.0	0.9	319	100.0	0.5	-0.4	0.6
120.0	0.7	302	120.0	0.7	-0.6	0.9
140.0	0.9	311	140.0	0.8	-0.8	1.2
160.0	0.5	298	160.0	1.0	-1.1	1.4
180.0	0.9	308	180.0	1.1	-1.3	1.7
200.0	0.5	314	200.0	1.3	-1.5	2.0
220.0	0.7	320	220.0	1.4	-1.7	2.2
240.0	0.9	310	240.0	1.6	-1.9	2.5
260.0	0.9	301	260.0	1.8	-2.2	2.8
280.0	1.0	282	280.0	1.9	-2.5	3.1
300.0	1.0	294	300.0	2.0	-2.8	3.5
320.0	1.0	284	320.0	2.1	-3.2	3.8
340.0	1.1	289	340.0	2.2	-3.5	4.1
360.0	0.6	282	360.0	2.3	-3.7	4.4
380.0	0.3	267	380.0	2.3	-3.9	4.5
400.0	0.7	287	400.0	2.3	-4.1	4.7
420.0	0.4	268	420.0	2.3	-4.3	4.9
440.0	0.2	271	440.0	2.3	-4.4	5.0
460.0	0.1	230	460.0	2.3	-4.5	5.0
480.0	0.4	265	480.0	2.3	-4.6	5.1
500.0	0.0	0	500.0	2.3	-4.6	5.2
520.0	0.2	303	520.0	2.3	-4.7	5.3
540.0	0.5	324	540.0	2.4	-4.8	5.4
560.0	0.5	316	560.0	2.5	-4.9	5.5
580.0	0.5	339	580.0	2.7	-5.0	5.7
600.0	0.3	3	600.0	2.7	-5.0	5.7
620.0	0.1	2	620.0	2.8	-5.0	5.8
640.0	0.2	33	640.0	3.0	-5.0	5.8
660.0	0.4	48	660.0	3.1	-4.9	5.8
680.0	0.4	39	680.0	3.2	-4.8	5.8
700.0	0.4	39	700.0	3.3	-4.7	5.7
720.0	0.5	42	720.0	3.4	-4.7	5.8
740.0	0.6	67	740.0	3.5	-4.6	5.7
760.0	1.6	52	760.0	3.6	-4.3	5.6
780.0	1.9	58	779.9	4.0	-3.8	5.5
800.0	2.0	65	799.9	4.3	-3.2	5.3
820.0	2.2	61	819.9	4.6	-2.5	5.2
840.0	2.4	69	839.9	4.9	-1.8	5.2
860.0	2.6	70	859.9	5.2	-1.0	5.3
880.0	2.6	71	879.9	5.5	-0.2	5.5
900.0	2.7	74	899.8	5.8	0.7	5.9
920.0	2.7	75	919.8	6.1	1.6	6.3
940.0	2.8	80	939.8	6.3	2.6	6.8

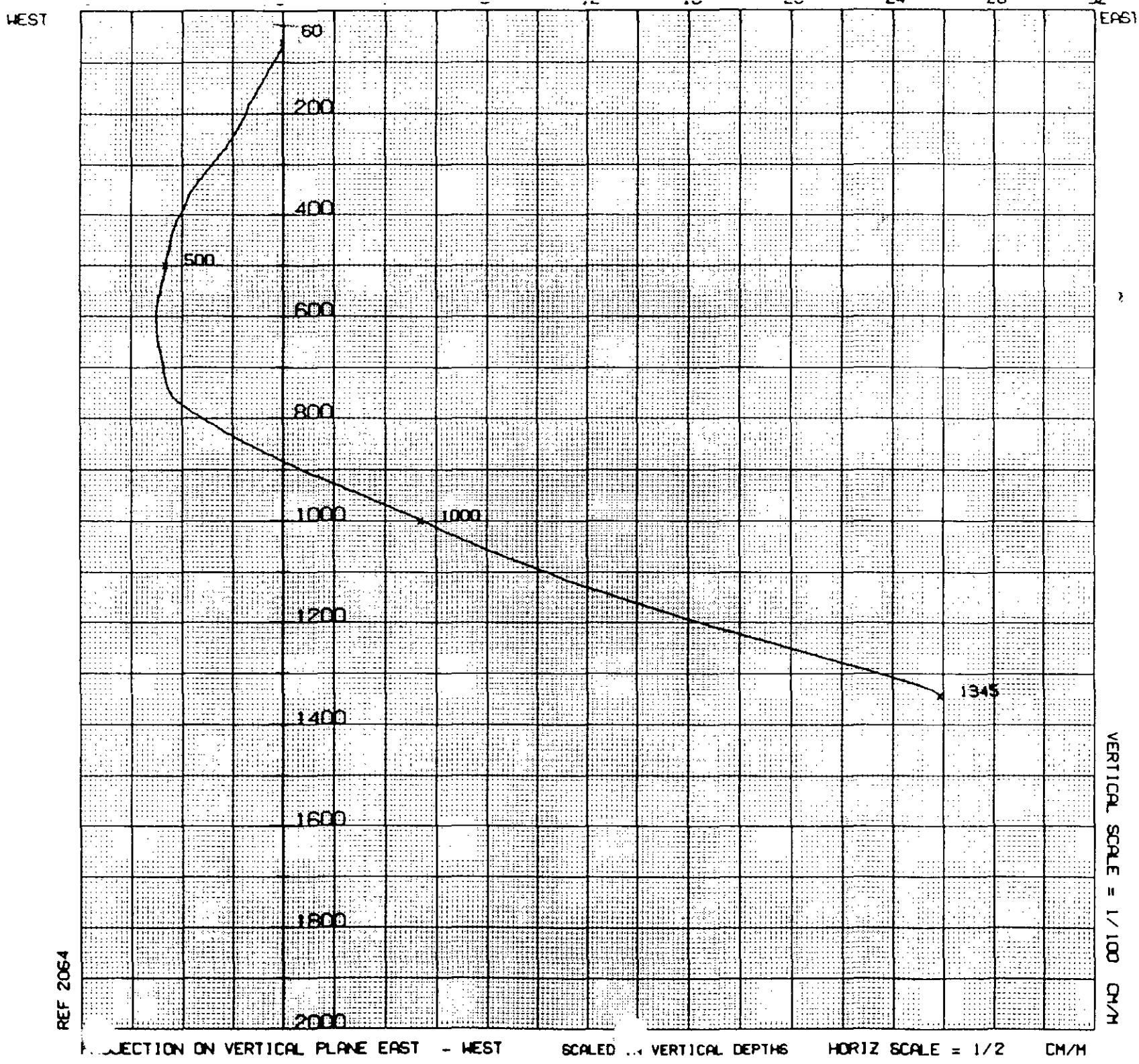
MEAS. DEPTH M	DEVIATION DEGREES	AZIMUTH DEGREES	TRUE VERTICAL DEPTH M	CO-ORDINATES + NORTH - SOUTH	CO-ORDINATES + EAST - WEST	COURSE LENGTH M
960.0	2.7	81	959.8	6.4	3.5	7.3
980.0	2.8	83	979.7	6.6	4.5	8.0
1000.0	2.6	75	999.7	6.7	5.4	8.6
1020.0	2.6	73	1019.7	7.0	6.3	9.4
1040.0	2.9	71	1039.7	7.3	7.1	10.2
1060.0	3.0	75	1059.7	7.5	8.1	11.1
1080.0	3.2	76	1079.6	7.8	9.2	12.0
1100.0	3.2	80	1099.6	8.0	10.3	13.0
1120.0	3.2	80	1119.6	8.2	11.3	14.0
1140.0	3.6	84	1139.5	8.4	12.5	15.1
1160.0	3.6	85	1159.5	8.5	13.8	16.2
1180.0	3.7	86	1179.5	8.6	15.1	17.3
1200.0	3.8	85	1199.4	8.6	16.4	18.5
1220.0	4.1	85	1219.4	8.8	17.8	19.8
1240.0	4.0	85	1239.3	8.9	19.2	21.2
1260.0	4.1	84	1259.3	9.0	20.6	22.5
1280.0	4.0	84	1279.2	9.2	22.0	23.9
1300.0	4.1	86	1299.2	9.3	23.4	25.2
1320.0	3.8	84	1319.1	9.5	24.8	26.5
1340.0	1.8	118	1339.1	9.4	25.7	27.4
1345.0	1.7	121	1344.1	9.3	25.9	27.5

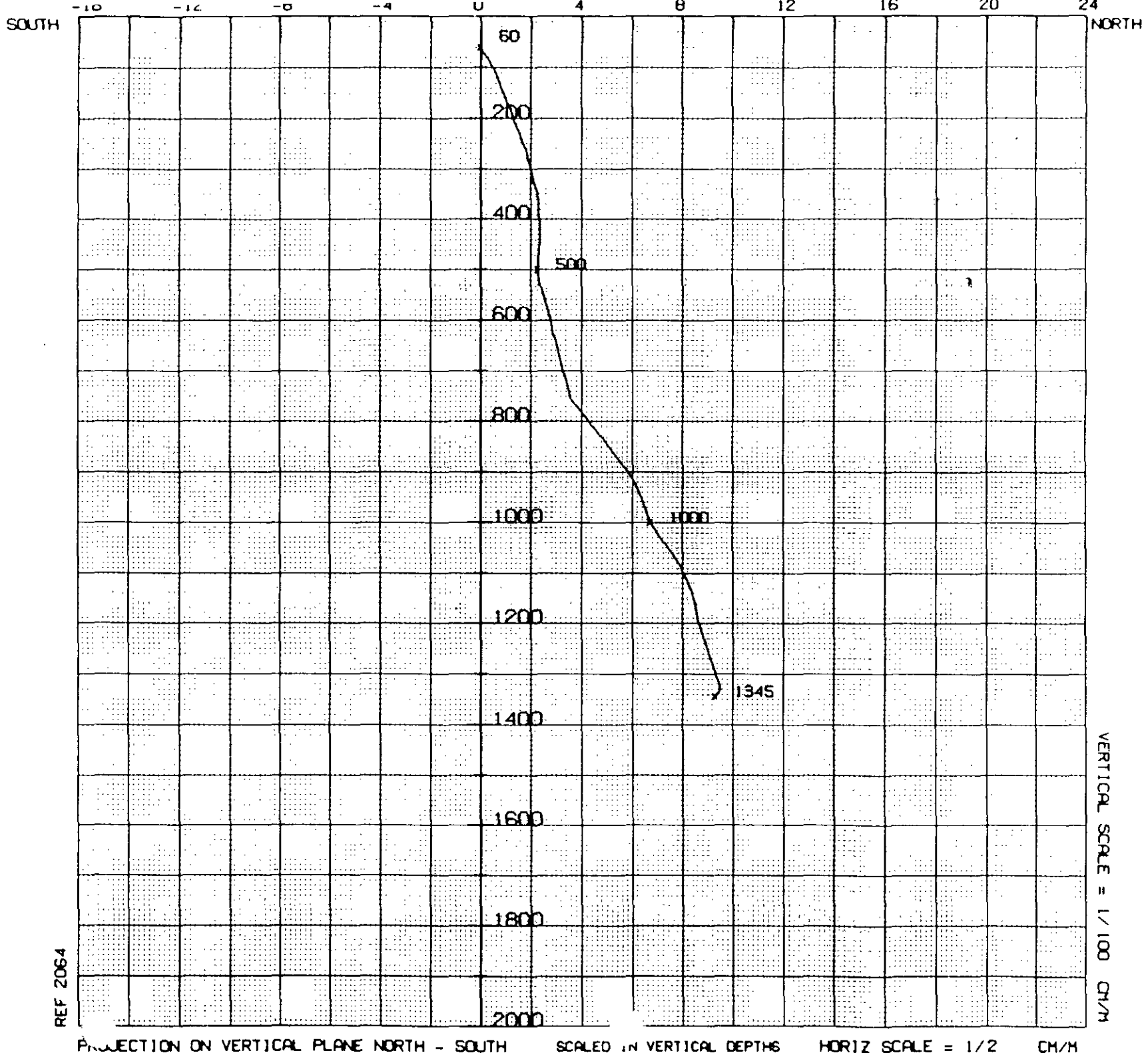
BOTTOM HOLE LOCATION

COURSE LENGTH:	27.5	M
COURSE AZIMUTH:	70.2	DEGREES
MEASURED DEPTH:	1345.0	M
TRUE VERTICAL DEPTH:	1344.1	M
DISTANCE NORTH:	9.3	M
DISTANCE EAST:	25.9	M

EXACT RADIUS OF CURVATURE METHOD


SCALE = 1/2 CM/M
NORTH 24
20
16
12
8
4
0
-4
-8
-12
SOUT 16
WEST -8
-4
0
4
8
12
16
20
24
28
EAST
N
500
1000
1345
60


WEST
EAST
60
200
400
500
600
800
1000
1000
1200
1345
1400
1600
1800
2000
VERTICAL SCALE = 1/100 CM/M
REF 2064
PROJECTION ON VERTICAL PLANE EAST - WEST
SCALED VERTICAL DEPTHS
HORIZ SCALE = 1/2 CM/M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4
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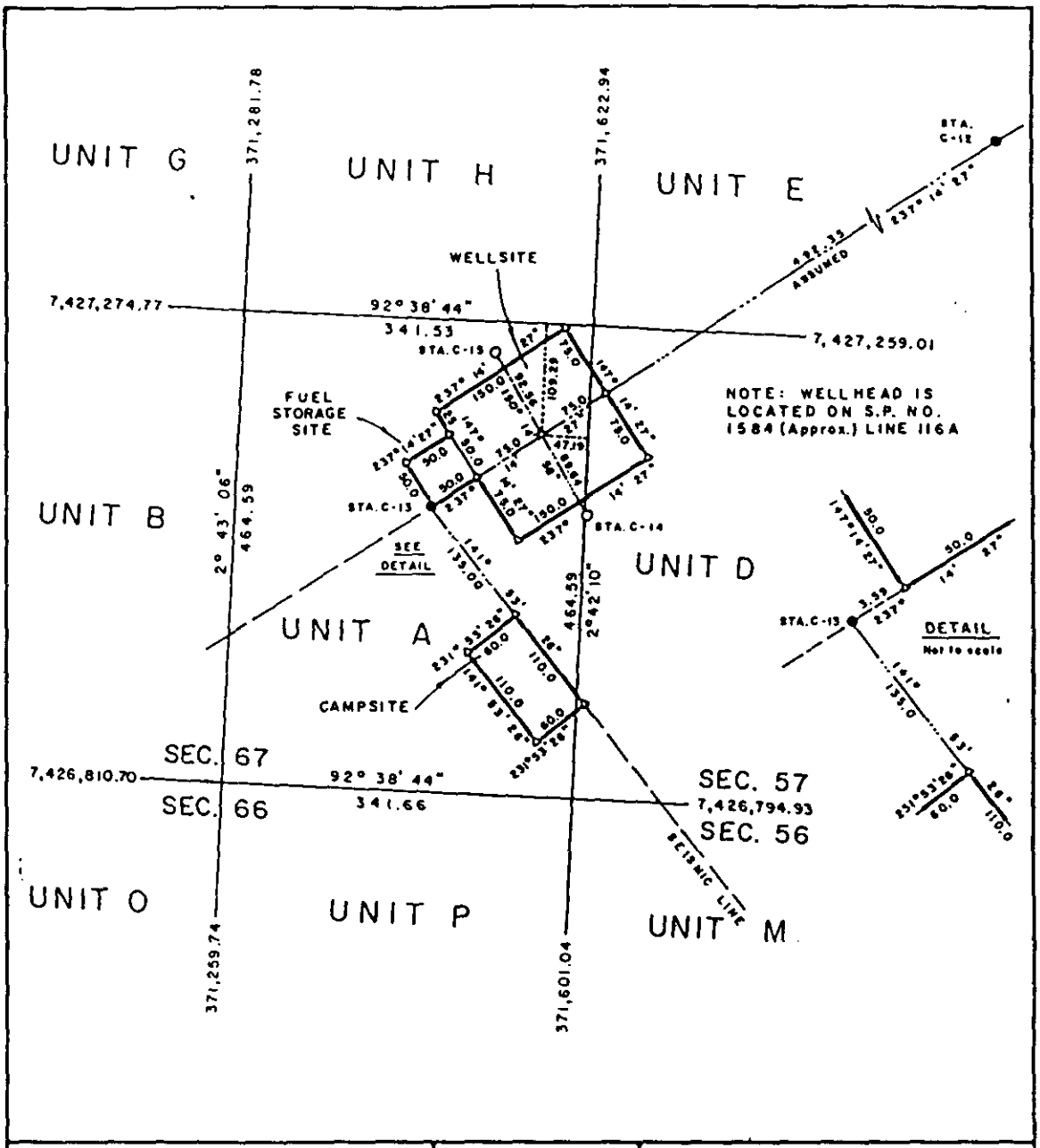
12
16
20
24
SOUTH
NORTH
60
200
400
500
600
800
1000
1000
1200
1345
1400
1600
1800
2000
REF 2064
VERTICAL SCALE = 1/100 CM/M
PROJECTION ON VERTICAL PLANE NORTH - SOUTH
SCALED IN VERTICAL DEPTHS
HORIZ SCALE = 1/2 CM/M



N.T.S. MAP SHEET: 96 K 13	METRIC	NORTHWEST TERRITORIES

PETRO-CANADA INC.

PRELIMINARY SKETCH SHOWING WELL LOCATION

PCI CANTERRA TWEED LAKE A-67

UNIT A, SECTION 67, GRID AREA 67°00', 125°45'

PETRO-CANADA INC.

CERTIFIED CORRECT:
THIS 2nd. DAY OF APRIL, A.D. 1985.

CANADA LANDS SURVEYOR

ELEVATION	GEOGRAPHIC CO-ORD'S.	U.T.M. CO-ORDINATES
ON GROUND AT WELLHEAD : 389.80	NORTH LATITUDE: 66° 56' 11.60" (66.9365569°) WEST LONGITUDE: 125° 56' 18.88" (125.9385772°)	NORTHING: 7,427,152.02 EASTING: 371,570.65 CO-ORDINATES ARE COMPUTED FOR ZONE 10, CENTRAL MERIDIAN 123°W.

LEGEND	AREAS REQUIRED	
Survey Monument found ●	WELLSITE : 5.56 Acres 2.250 ha.	HOSFORD, IMPEY, WELTER AND ASSOCIATES LTD.
Survey Monument placed ○	CAMPSITE : 1.63 Acres 0.660 ha.	P.O. BOX 1409, YELLOWKNIFE, X1A 2P1
Traverse Station ⊙	FUEL SITE : 0.62 Acres 0.250 ha.	NORTHWEST TERRITORIES
SCALE 1:5000	TOTAL : 7.81 Acres 3.160 ha	FILE NO. Y85-002 DATE: Apr. 2/85

TWEED LAKE A-67 WELLBORE SCHEMATIC