

October 4, 1983

Omega Hydrocarbons Ltd.  
630 - 330 Fifth Avenue S.W.  
Calgary, Alberta  
T2P 0L4

Attention: Mr. G. B. Patay,  
Vice President, Production

Dear Sirs:

Re: Waskada Lower Amaranth Unit No. 1 -  
Additional Water Injectors

Your application, pursuant to clause 1(1) of the Pressure Maintenance Rules of Board Order No. PM 39, for approval to inject water into the wells:

Omega Waskada 15-23-1-26 (WPM)

Omega Waskada 15-25-1-26 (WPM)

is hereby approved.

Water injection operations in these wells are subject to the Pressure Maintenance Rules set out in the above mentioned Order.

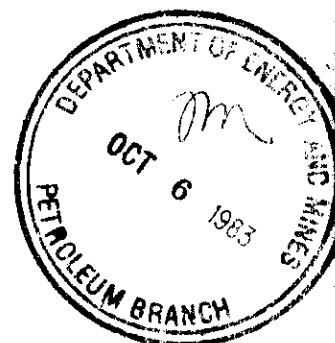
Yours sincerely,

THE OIL AND NATURAL GAS  
CONSERVATION BOARD

ORIGINAL SIGNED BY  
IAN HAUGH

Ian Haugh

b.c. Petroleum Branch ✓



October 4, 1983

The Oil and Natural Gas  
Conservation Board

H. Clare Moster  
Director, Petroleum Branch

Marc Eliesen - Chairman  
Dr. I. Haugh - Deputy Chairman  
J. F. Redgwell - Member

WASKADA LOWER AMARANTH NO. 1 - ADDITIONAL WATER INJECTORS

Omega Hydrocarbons Ltd., as operator of the Waskada Lower Amaranth Unit No. 1, has applied for approval to convert the following wells to water injection:

Omega Waskada 15-23-1-26 (WPM)

Omega Waskada 15-25-1-26 (WPM)

Notice of the application was published in the Manitoba Gazette (September 10, 1983) and The Melita New Era (September 15, 1983). No objections have been received to the notice.

Recommendations:

It is recommended that the application be approved. Attached is a draft letter of approval.

Discussion:

Board Order No. PM 39 provides for approval of pressure maintenance operations in the Waskada Lower Amaranth Unit No. 1. Clause 1(1) of the Pressure Maintenance Rules set out in that order provides for injection of water into four specific unit wells and "such other wells in the Unit Area as the Board may approve". The subject application was made pursuant to this clause of Order No. PM 39.

Figure No. 1 to this memo outlines the Waskada Lower Amaranth Unit No. 1, indicates the original four injectors as well as the proposed two additional injectors. Note that only Lower Amaranth completions are shown on this map. Also indicated are working interest owners offsetting the Unit Area.

Application for approval of injection into the two subject wells was initially made as part of Omega's application of June 23, 1983 for a field wide enlargement of pressure maintenance operations.

Early production performance of wells in the Unit indicates a somewhat positive response in wells directly offset by water injection. This response is indicated both in terms of production rate support and increasing reservoir pressures. However, such indications of response in wells not directly adjacent to injection are greatly diminished. This reflects the relatively low reservoir transmissibility and illustrates the need for a pattern injection system.

Further, previous well performance in the Unit area indicates a rapid decline of reservoir pressure to levels below the bubble point.

For the above reasons, it appears to be necessary to proceed with expanded pressure maintenance operations in the Waskada Lower Amaranth A Pool as quickly as possible.

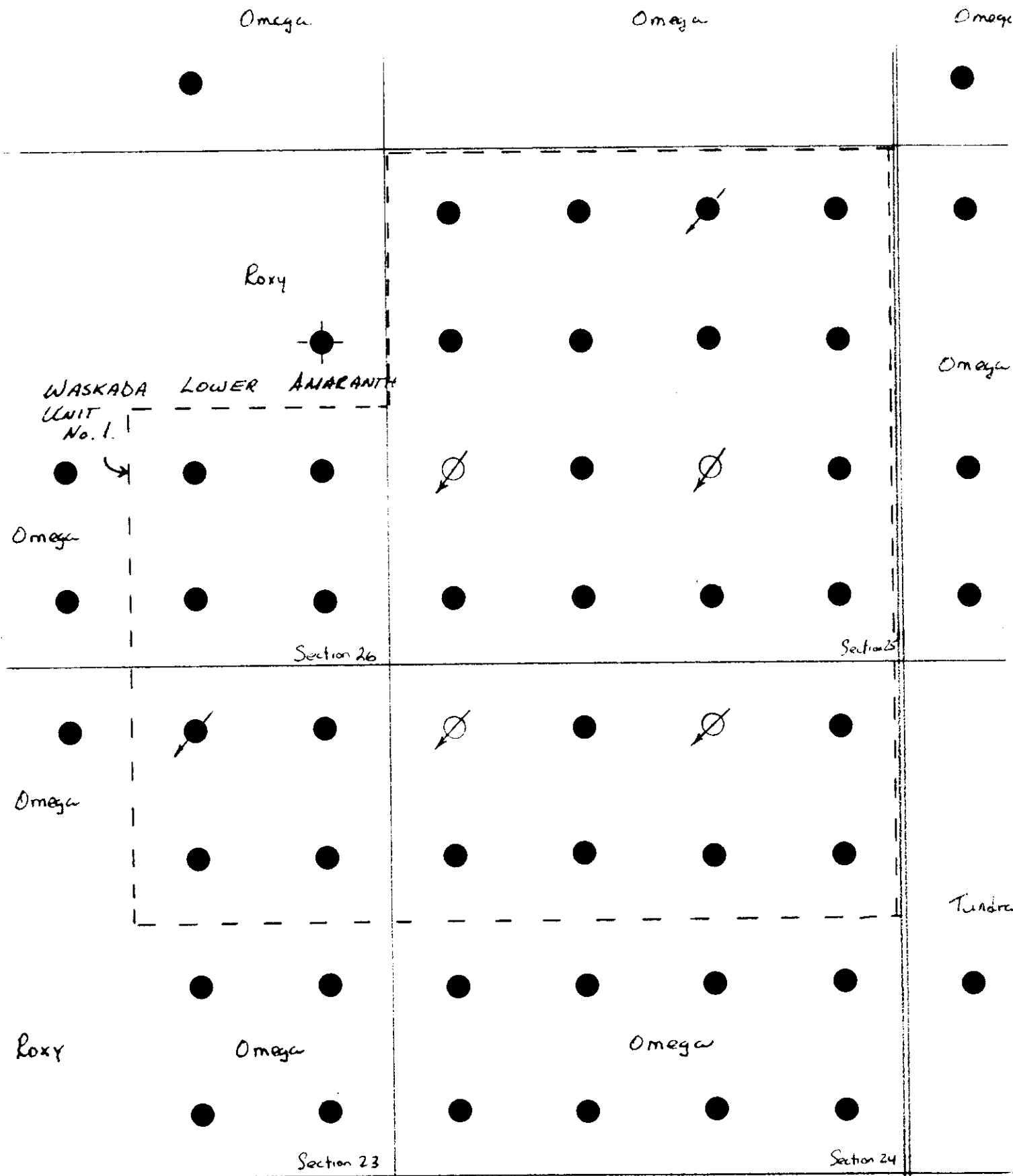
The two subject wells are the only two of the proposed injectors (Omega's June 23, 1983 application) that are both within the existing Unit area and are not offset by a working interest owner other than Omega. Consequently, conversion of these wells to injection can be proceeded with without further unitization or without jeopardizing correlative rights of offset working interest owners. In view of this and the illustrated need to proceed with pressure maintenance operations as soon as possible, it is recommended that the application be approved subject to the Pressure Maintenance Rules of Order No. PM 39.

Original Signed by H. L. Mosier

H. Clare Mosier

LRD/lk

FIGURE No. 1



LEGEND

● L.Am Producer      ● Proposed Water Injector

⊘ Water Injector

Note: Only Lower Amaranth Completions Shown

Today Gazette  
Omega Waskada 15-23-1-26 (WPM)  
Omega Waskada 15-25-1-26 (WPM)  
If no valid objection or intervention in

MINES ACT

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--37

THE HIGHWAY TRAFFIC BOARD.

W. SUMP KUN,  
Secretary.

--37  
Deputy Chairman.

all subsisting registered charge;  
place said Certificate of Title.

Manitoba Gazette  
Sept 10, 1983



MANITOBA  
DEPARTMENT OF ENERGY AND MINES

THE OIL AND NATURAL GAS CONSERVATION BOARD  
309 LEGISLATIVE BUILDING  
WINNIPEG, MANITOBA  
R3C 0V8

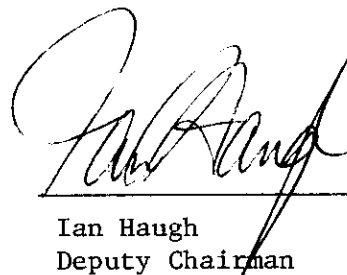
NOTICE  
WASKADA OIL FIELD

Omega Hydrocarbons Ltd., operator of Waskada Lower Amaranth Unit No. 1, has made application under The Mines Act to convert the following two wells to water injection:

Omega Waskada 15-23-1-26 (WPM)

Omega Waskada 15-25-1-26 (WPM)

If no valid objection or intervention in writing is received by the Board at 989 Century Street, Winnipeg, Manitoba R3H 0W4, within 14 days of the publication of this notice, the Board may approve the application.



---

Ian Haugh  
Deputy Chairman

Dated: August 30<sup>th</sup>, 1983



- Ideal Investment
- 3 Suite Apartment Block
- Large Room Apartments
- Located Close to Downtown



- 1983 Trailer
- 2 Bedroom
- Complete Furnished. Include Dryer, Washer, T.V., etc.
- Price to Move



- House location, Medora
- 1 Story
- Detached Garage
- 2 Bedroom
- Excellent Condition

• • • • •  
**For More Information Contact**  
**Don Cameron Realty**  
120 Main Street, Melita  
Salesmen—  
Murray Cameron  
Office—522-3371  
Res.—522-3392  
Brian Shannon  
Phone 522-3611

\$. Working in Melita and area September 6 to 16. Advance appointments necessary. 725-2878, collect. 5-1c

**CUSTOM COMBINING**—Corn and sunflower Phone Tilbury Farms, 522-3545 or 522-3681, Melita. 5-3p

**100K**—Are you interested in losing weight? We have a plan called **HERB-A-LIFE**. It is a safe diet. No medication, just vitamins and herbs. 100 percent guaranteed. For more information all Darlene Doolley, Rep., Phone 858-2555, Hartney. 38-t.f.n.

• **NOTICE**  
**THE OIL AND NATURAL GAS CONSERVATION BOARD**  
**NOTICE**  
**UNDER THE MINES ACT**  
**WASKADA OIL FIELD**

Omega Hydrocarbons Ltd., operator of Waskada Lower Amaranth Unit No. 1, has made application under The Mines Act to convert the following two wells to water injection:  
Omega Waskada 15-23-1-26 (WPM)

Omega Waskada 15-25-1-26 (WPM)  
If no valid objection or intervention in writing is received by the Board at 989 Century Street, Winnipeg, Manitoba R3H 0W4, within 14 days of the publication of this notice, the Board may approve the application.  
—Ian Haugh  
Deputy Chairman

• **Miscellaneous**  
**BUSINESS OPPORTUNITIES**—Family Restaurant—98 seats in two dining rooms. Exceptional clean operation. Exceptional documented returns, exceptional functioning kitchen, additional 60 seat private dining, additional take-out service, exceptional buy. This exceptional well established business must be sold prior to October 1st due to other business commitments which will be disclosed to potential purchasers.  
• • • • •

**WANTED**—16 or 18 gauge sheet metal squaring shear. Contact Mr. Budowski, Boissevain School, Boissevain, Man. Phone 534-2494.

**FOR SALE**—7030 A.C. tractor, 130 H.P., \$14,500., 1070 Case \$13,500. Both have cab, air, duals, etc., one has to go. Denton Barkman, Ph. 1-523-8409, Killarney.

**FOR SALE**—8 young registered quarter horse brood mares, all pregnancy tested in full; 9 quarter horse weanlings & two yearlings. Phone 234-5425, Erine Pellshok, Oak Burn, Man.

**BUILDINGS**—Steel quonsets suitable for implement storage, grain storage, workshops etc. Available at discounted prices, phone Winnipeg 775-8231.

**FARM EQUIPMENT**—Workshops 30x40, 40x40, steel buildings with galvanized or coloured sheeting available at discount prices. Call toll free 1-800-432-1908.

**HELP WANTED—Opportunity**  
**Knocks. Distributors Wanted.**  
Sell top line Aloe Vera Products. Part-time, Full-time. Excellent Earning Potential. Training Available. Phone Gail 1-738-4712 after 4:00 p.m.

**BUSINESS OPPORTUNITY**—Own The Photofinishing Business In Your Town. Revolutionary PHOTOKIS equipment processes 135, 126, 110 and disc film up to 80 rolls per day. Takes up only 15 sq. ft. Runs on 110 V. Excellent quality results. Easy to operate. Training provided. Extremely high return on investment. Requires minimum 3500 population. Costs only \$39,900. complete System. Install in existing location or open a new store. Contact: NINIT-FOTO, Ste. 301, 555-6th St., New Westminster, B.C. V3L 4H1 (604) 521-4825.

**HELP WANTED**—Mountain resort

hand, life at the Unemployment Insurance Commission seems to go on much as before, even though payouts are phenomenally higher.

In 1981, for instance, our Unemployment Insurance system cost employers, employers and the federal treasury about \$4.8-billion.

The total 1982 outlay was \$8.6-billion, and in 1983, Unemployment Insurance is expected to cost a staggering \$11.6-billion. That's a whopping \$100 per month for every working Canadian.

While there is a very real requirement to remain compassionate to the unemployed, particularly in troubled times, the rocketing costs of the system have gotten out of hand. Contributions by employers and employees, for example, were increased by 50 percent in January, and another large hike is expected at year-end.

These facts, among others, were stressed by John Bulloch, President of the Canadian Federation of Independent Business, at a recent meeting with Finance Minister Marc Lalonde. The organization is spearheading a drive to convince Ottawa to omit the anticipated year-end increase in contributions.

For smaller firms, such payroll tax increases are a near disaster because they must be paid, no matter if the firm is making or losing money. There is a very real disincentive to expand and create new jobs, and, in fact, Ottawa seems to be pushing entrepreneurs to lay off employees to save payroll costs, as well as the taxes involved.

Few argue that the Unemployment Insurance rules are

## Cards of Thanks

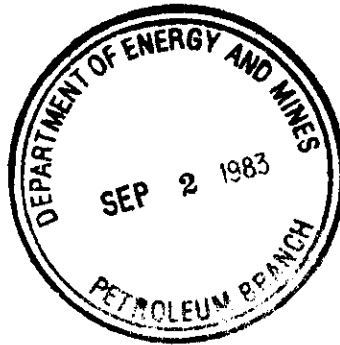
Bill and I would like to thank our family, relatives and friends for the "SURPRISE" 25th Wedding Anniversary party on September 3rd. Thank you for the memorable weekend.  
—Bill and Marion Brigden

Jim and I would like to thank you all for the very unexpected, but much appreciated gifts and presentation we received when I was home. If you're ever in North Vancouver, give us a call.  
—Jim and Tammy Burnett (nee Harmon)

We would like to thank everyone for their many acts of kindness at the time of the loss of our loved one. To neighbours, friends and relatives for meals and baking brought to us, for the flowers, donations, cards and visits. To the pallbearers, honorary pallbearers, Ken Eyers and the choir and to the Country Club for providing lunch the day of the funeral. Thanks is extended to Norma Baumeister for her sincere message at the service and her support since. To all those who gave of their time so freely to help with the harvest, a special thank you. We are sincerely grateful for your thoughtfulness and continuing support.  
—Marilyn and Family

## Mainstream Canada

## Time to tame U



September 1, 1983

Omega Hydrocarbons Ltd.  
630 - 330 Fifth Avenue S.W.  
Calgary, Alberta  
T2P 0L4

Attention: Mr. George Patey,  
Vice-President Production

Dear Sirs:

Re: Board Order No. PM 39  
Waskada Lower Amaranth Unit No. 1

Receipt of your letter of application dated August 25, 1983 requesting approval to inject water into the wells Omega Waskada 15-25-1-26 (WPM) and Omega Waskada 15-23-1-26 (WPM) is acknowledged.

The Board is reviewing the application and publishing notices respecting the application to determine if there are any interested parties with valid objections.

You will be notified of the Board's decision following the review and expiry of the notice period.

Yours sincerely,

THE OIL AND NATURAL GAS  
CONSERVATION BOARD

RECEIVED  
SEP 1 1983

Ian Haugh  
Deputy Chairman

HCM/lk

b.c. Marc Eliesen  
J. F. Redgwell  
Petroleum Branch ✓

August 29, 1983

The Oil and Natural Gas  
Conservation Board

H. Clare Moster  
Director, Petroleum Branch

Marc Eliesen - Chairman  
Dr. I. Haugh - Deputy Chairman  
J. F. Redgwell - Member

WASKADA LOWER AMARANTH UNIT NO. 1 - BOARD ORDER NO. PM 39

Omega Hydrocarbons Ltd., operator of Waskada Lower Amaranth Unit No. 1, in an application dated August 25, 1983 applied for approval to use two (2) additional wells in the subject Unit for water injection.

Recommendation:

It is recommended that the draft Notice attached be signed and published in the Manitoba Gazette, the Melita New Era and sent to adjoining working interest owners.

Discussion:

Clause 1 of Board Order No. PM 39, issued by the Board on February 9th, 1983 authorized the use of four (4) specific wells for injection of water in a pilot waterflood in the subject Unit. The Order also provided for the inclusion of additional water injection wells with the approval of the Board. Subsequently, Omega applied for and was granted an expansion of the Unit to include the NE of Section 23, the SE of Section 26 and the N $\frac{1}{2}$  of Section 25 (all in 1-26 WPM) effective July 1st, 1983.

Omega applied June 23, 1983 for a widespread expansion of the waterflood and to introduce a gas flood in the Waskada Lower Amaranth A Pool. This expansion, if approved, would add an additional 17 water injection wells and 9 gas injection wells.

The two (2) wells Omega is currently requesting approval to convert to water injection are within Amaranth Unit No. 1 and are also two of the seventeen wells proposed for conversion to water injection under the major expansion application.

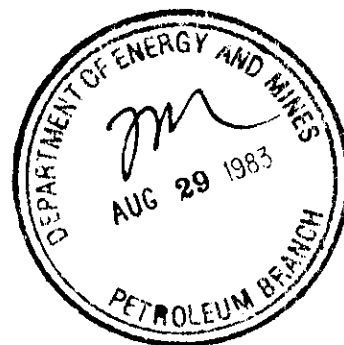
Original Signed by H. C. Moster

H. Clare Moster

August 25, 1983

The Oil and Natural Gas Conservation Board  
156 Legislative Building  
Winnipeg, Manitoba  
R3C 0V8

Attention: Mr. Marc Eliesen  
Chairman



Dear Sir:

RE: Board Order No. PM 39 -  
Waskada Lower Amaranth Unit No. 1

Omega is now in the process of applying for a widespread expansion of its pressure maintenance in the Waskada Lower Amaranth Pool. In anticipation of possible delays in Omega acquiring the necessary approvals to inject fluids in wells outside the existing Waskada Lower Amaranth Unit No. 1 boundaries, we wish to request approval to add two water injection wells to the pilot area.

Board Order No. PM 39 states in Pressure Maintenance Rules, Section 1, Subsection (1):

"Water shall be injected to the Lower Amaranth Formation of Jurassic Age through the wells:

Omega Waskada WIW 13-24LAm-1-26	(WPM)
Omega Waskada WIM 14-24-1-26	(WPM)
Omega Waskada WIM 5-25-1-26	(WPM)
Omega Waskada WIM 7-25-1-26	(WPM)

and such other wells in the Unit Area as the Board may approve."

It is under the provisions of this rule that we request permission to inject water into wells Omega Waskada 15-25-1-26 (WPM) and Omega Waskada 15-23-1-26 (WPM).

The additional two injectors are requested due to our excellent production response within the present pilot area and the fact at the higher production rates we are having difficulty replacing voidage.

(2)

Without additional injectors we are concerned that the present four injectors will not be adequate to replace voidage and this could eventually cause loss of productivity if the formation pressure dropped to below the bubble point.

It would seem that Board Order No. PM 39 provides for the addition of water injection wells within the Unit without any additional formal orders or hearings. In requesting approval for only 15-25 and 15-23 we have avoided any direct effects on other operators' oil wells. We would greatly appreciate your early attention to our request.

Yours truly,

OMEGA HYDROCARBONS LTD.



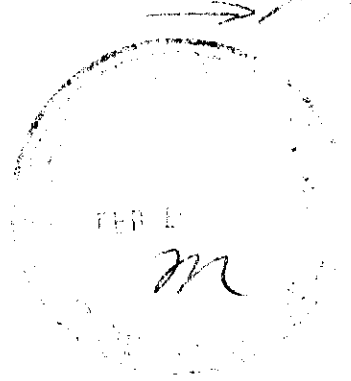
George Patey  
Vice-President Production

GP/cw

cc: Mr. Clare Moster,  
Petroleum Branch  
J. Hall  
E. Wyse



MANITOBA  
DEPARTMENT OF ENERGY AND MINES  
THE OIL AND NATURAL GAS CONSERVATION BOARD  
156 LEGISLATIVE BUILDING  
WINNIPEG, MANITOBA  
R3C 0V8



February 14, 1983

Omega Hydrocarbons Ltd.  
630 - 330 - 5th Avenue S.W.  
Calgary, Alberta  
T2P 0L4

Attention: Mr. Ed Wyse

Dear Sirs:

Re: Board Order No. PM 39 -  
Waskada Lower Amaranth Unit No. 1.

Enclosed is Board Order No. PM 39 relating to pressure maintenance operations in the Waskada Lower Amaranth Unit No. 1.

Your commitment outlined in your letter of January 24, 1983, to obtain further reservoir pressure information and production test data, is hereby acknowledged.

As has been discussed between Omega and the Petroleum Branch, the pressure data obtained at the well Omega Waskada 9-24-1-26 appears to be anomalous, and further, it is noted that there are no other valid pressure data from wells in the NE $\frac{1}{4}$  of Section 24-1-26 WPM. Consequently, you are hereby requested to obtain additional pressure data on at least one well in this quarter section prior to initiating injection.

Your application for exemption from the production allowable requirements of section 11 of Manitoba Revised Regulation M160-R4P under The Mines Act will be processed upon receipt of the remaining required pressure and production test data.

Yours sincerely

THE OIL AND NATURAL GAS  
CONSERVATION BOARD

ORIGINAL SIGNED BY  
**IAN HAUGH**

Ian Haugh  
Deputy Chairman

Enclosure

LRD/IH/ra  
cc: H. Clare Mosier

*raft cover letter  
to Omega from Board  
to accompany signed  
Order & confirm person  
tests (9-24 will also)  
Advise Omega verbally  
if you are talking  
to them.*

The Oil and Natural  
Conservation Board

February 1, 1983

H. Clare Moster  
Director, Petroleum Branch

Marc Eliesen, Chairman  
Dr. I. Haugh, Deputy Chairman  
J. F. Redgwell, Member

Waskada Lower Amaranth Unit No. 1 - Engaged Pilot Waterflood Scheme

Omega Hydrocarbons Ltd. has presented interim results of its program to obtain base line reservoir pressure and production rate information prior to initiating water injection in the Waskada Lower Amaranth Unit No. 1. Submission of this data was set as a prerequisite for approval of the pilot waterflood and the issuance of a PM Order.

Recommendations:

It is recommended that Order No. PM39, (draft attached), be issued as soon as possible. Further, a cover letter be sent to Omega confirming its commitment to additional pressure survey and production rate data acquisition.

Discussion:

1. Reservoir Pressure

Summarized on Figures 1 and 2 and detailed in Attachments to Omega's letter of January 24, 1983, (partial copy attached), are the results of all pressure information available on the Lower Amaranth reservoir in this area. The data indicates a relatively severe decline in static reservoir pressure from an initial level of approximately 10 000 kPa to a current estimated level of approximately 6 500 kPa. Extrapolation of this trend indicates that average reservoir pressure would decline to below the bubble point (4 220 kPa) by year end 1983.

A review of the pressure data tends to confirm the Branch's earlier assessment that the Lower Amaranth pool is largely a volumetric system receiving little pressure support from aquifer influx. This also tends to confirm relatively low estimates of primary recovery for the pool.

The data also points out the need to initiate pressure maintenance operations as soon as possible to attempt to arrest the rate of pressure decline and prevent some of the pool from declining below the bubble point. It is noted that the reported pressure at Omega Waskada 9-24-1-35 (1982) is already considerably below the bubble point. However, this pressure is probably anomalous, and we propose to request that Omega monitor the well.

Omega has expressed some question as to the levels of pressure observed in the recent surveys. Consequently, Omega plans to further survey 2 recently drilled wells in the near future (Omega Waskada 2-25-1-26 and Omega Waskada 3-25-1-26). This work will be conducted prior to initiating Lower Amaranth production from these wells.

Although we agree with Omega that additional pressure data would be useful, we do not expect that it will change the overall need for immediate pressure maintenance.

Consequently, we recommend that Omega's commitment to survey these two wells be accepted and they be requested to resurvey the 9-24 well.

## 2. Production Test Data

Omega's letter indicates production tests have been obtained on 10 of the 16 wells in the Unit. Recovery of load oil and additional pressure survey plans has delayed testing of 5 additional wells and one well will not be produced prior to injection.

While there have been problems in the past with Omega's production testing, it appears that the system now in place is sufficient to allow a reasonable determination of pre-flood productivity. Further, in view of the more serious concerns regarding reservoir pressure, we feel that water injection should not be further held up on this account.

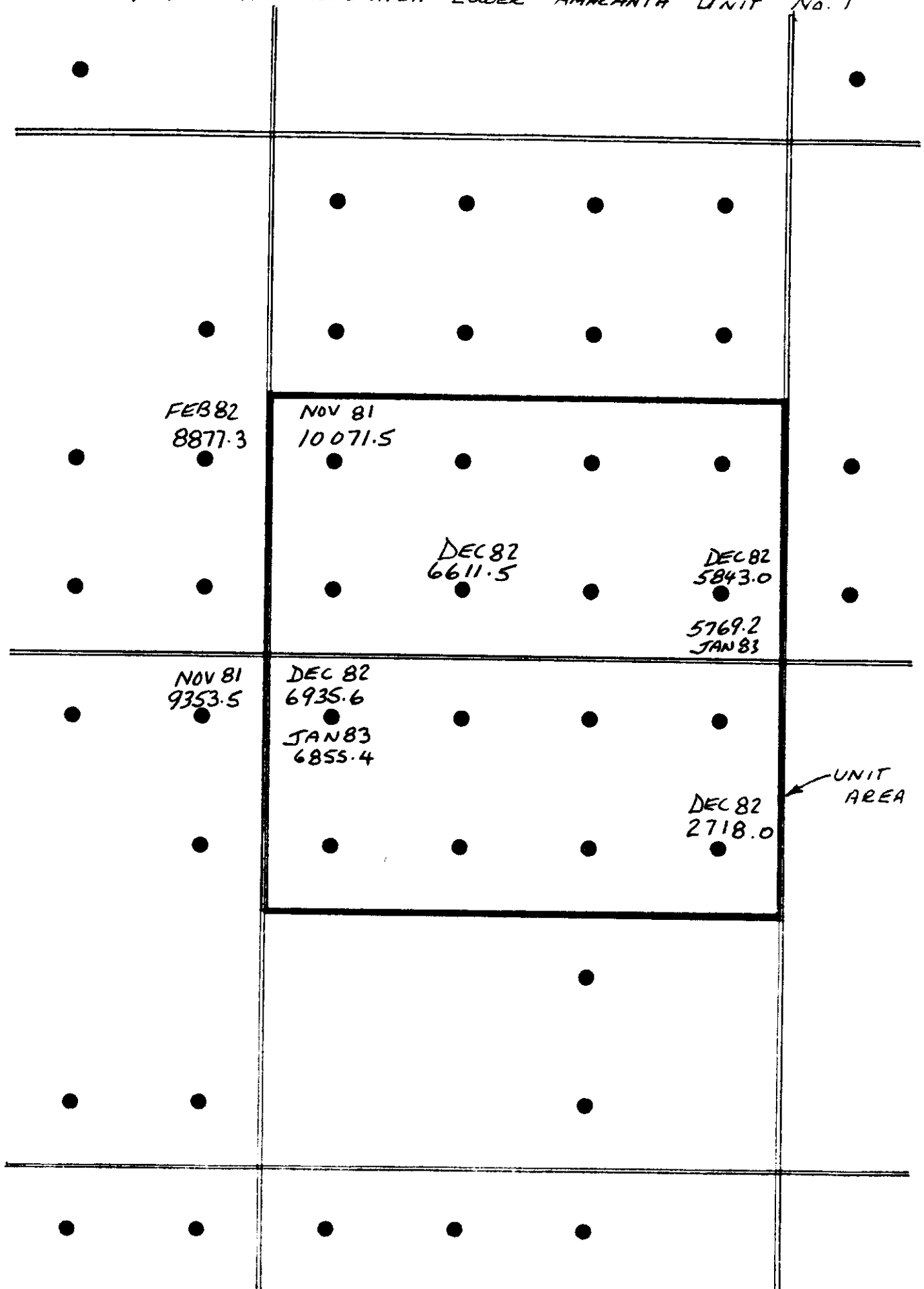
## 3. Relief from Production Allowable

As part of its original application for approval to conduct a pilot waterflood, Omega requested relief from the production allowable provisions of Section 11 of Manitoba Revised Regulation M160-R4P under The Mines Act. In previous correspondence, the Branch has indicated its agreement that such exemption provides an opportunity to better monitor flood performance as well as providing economic incentive to the operator. The Branch feels, however, that certain restrictions regarding reservoir voidage capabilities and reservoir pressure levels are necessary. Consequently, as the injection system has not yet been tested and as pressure data collection is still in progress, we see no need to process the enabling Board Order at this time. It is recommended that this order be processed when Omega's pressure surveys are complete.

Original Signed by H. C. Moster

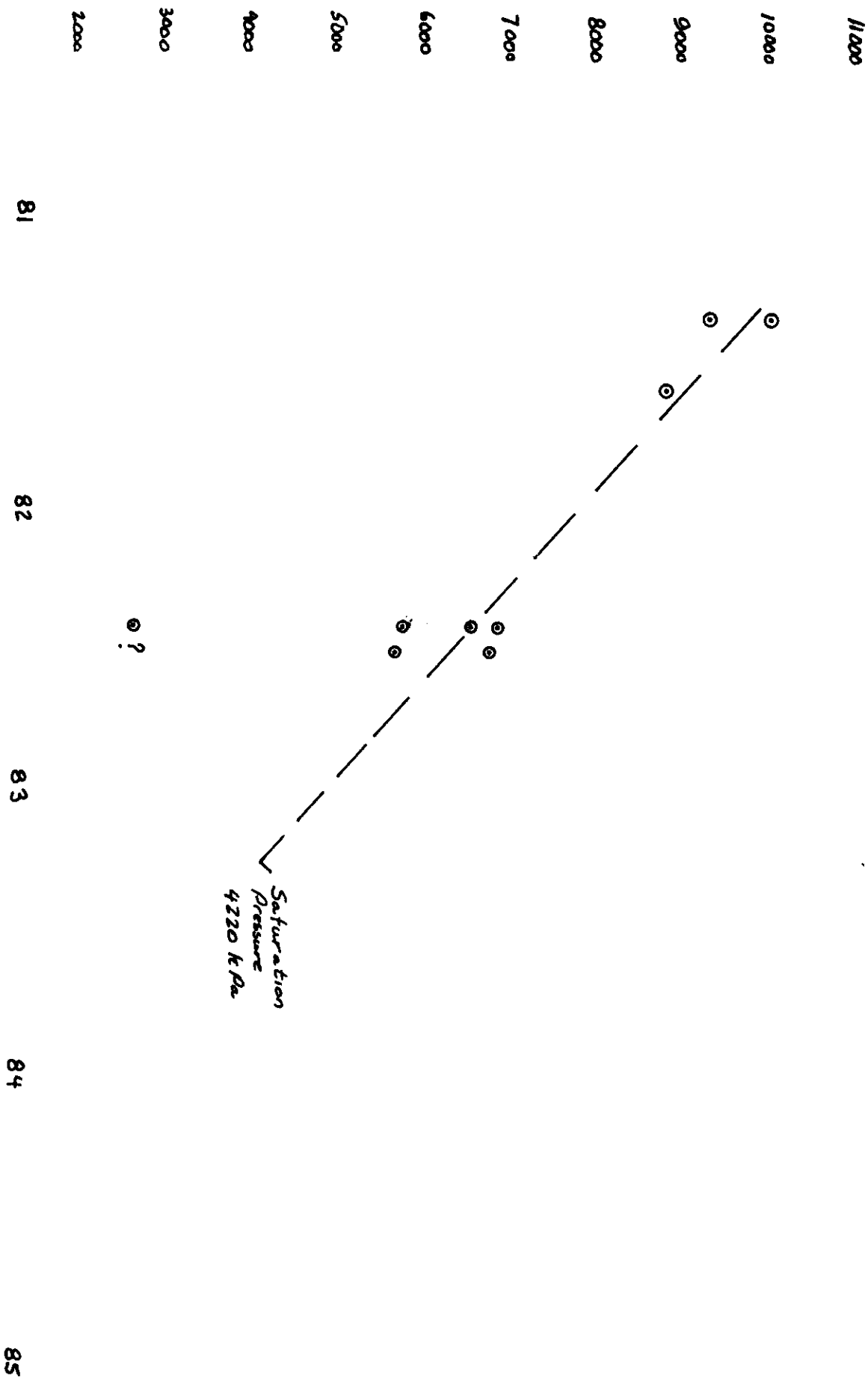
H. Clare Moster

FIGURE 1. - WASKADA LOWER AMARANTH UNIT No. 1



NOTE - ONLY LOWER AMARANTH COMPLETIONS SHOWN

FIGURE 2 - ALASKA LOUISE ALMEATH UNIT No 1  
 STATIC BOTTOM HOLE PRESSURE  
 AT DATUM (-440m ss)





**HYDROCARBONS Ltd.**

TELEPHONE: (403) 261-0743

630 - 330 FIFTH AVENUE S.W., CALGARY, ALBERTA T2P 0L4

January 24, 1983

Petroleum Branch  
Department of Energy and Mines  
975 Century Street  
Winnipeg, Manitoba  
R3H 0W4



Attention: Mr. Bob Dubreuil

Dear Sir:

RE: Waskada Lower Amaranth Unit No. 1  
Pressure Maintenance Order

The following is intended to summarize our telephone conversation of January 20 in which I detailed the results of our pressure surveys to date and the status of well tests.

The progress of this work has not been as expedient as we had anticipated largely due to unexpected results of the pressure surveys. In so far as the promised testing has not yet been completed but is still in progress, it is our hope that the results to date along with a clear statement of our intentions to complete this testing might be sufficient to affect the issuance of the pressure maintenance order that would enable us to begin water injection.

Early approval of these water injection locations if requested for two reasons:

- 1) Continuing pressure survey working, although not conclusive, seems to suggest a growing need for pressure maintenance.
- 2) Due to increasing water production at our central tank battery and the subsequent strain on the existing disposal/injection wells 1-30 and 6-30-1-25 WPM, production of higher water cut wells is already been curtailed. Additional injection capacity is required to prevent further reductions in oil production revenue due to lack of water disposal capacity.

### Pressure Surveys

Omega has already expanded upon the pressure survey that was originally planned because of the unexpected results. While we are not yet capable of fully explaining our results to date a summary and discussion is enclosed in Appendix 'F'.

Two final pressure surveys are planned for two of the recently recompleted wells 2-25 and 3-25-1-26 WPM. Both wells have been fraced and after we have cleaned out to bottom and swabbed all or close to all of the load oil we will run pressure guages.

This is expected to be all the pressure survey work required prior to initiating the water flood.

### Water Production Tests

Appendix 'G' and 'H' summarize the production to date from the unit area and the well tests run. Of the sixteen unit wells, production tests for 10 are included here. Of the six not available; one will not be done (A13-24) because the well will be made an injection well and five are recovering load oil from the frac jobs. Initial production tests for two of the five wells recovering load oil will be further delayed because of the pressure survey work (ie. 2-25 and 3-25).

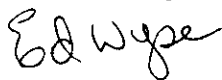
Our new satellite testing facilities are now fully operational and working well. As you can see from the well test summary reasonable repeatability is being obtained. As our operators become more familiar with the facilities and procedures, we are confident that these facilities will meet all our expectations. The initial productivity tests will be carried out diligently as soon as the wells have been recovered.

### Summary

As a responsible operating company, Omega commits to the completion of this testing program. I would suggest that the final reporting of the results of this testing program need not be a prerequisite for issuance of the pressure maintenance order provided the Board has reasonable assurance that the testing will be completed. I hope that the results submitted to-day would substantially be that assurance that Omega is fulfilling its obligations in good faith.

Please keep us advised as to the status of this request in order that we can take the necessary measures in the field to minimize lost production.

Yours truly,



Ed Wyse  
Petroleum Engineer

EW/sp

cc: w/o attachments  
George Patey  
Jack Hall

LIST OF APPENDICES

- A. Pressure Survey November 13-19, 1981.
- B. Pressure Survey January 29 - February 2, 1982.
- C. Pressure Survey December 14-17, 1982.
- D. Pressure Survey December 30, 1982 - January 6, 1983.
- E. Pressure Survey January 5-13, 1983.
- F. Summary of Lower Amaranth Pressure Surveys and Discussion of Results.
- G. Summary of Production within the Waskada Lower Amaranth Unit No. 1 Area to December 31, 1982.
- H. Well Tests for Lower Amaranth Unit No. 1 Wells.

APPENDIX 'H'  
Well Tests for  
Lower Amaranth Unit No. 1 Wells

- 1) 9-24-1-26 WPM: Currently recovering load oil from frac job. Test not available.
- 2) 10-24-1-26 WPM:
 

December 14, 1982	24 hrs.	1.6m <sup>3</sup> oil	0.2m <sup>3</sup> water	0.19km <sup>3</sup> gas
January 2, 1983	24 hrs.	2.2m <sup>3</sup> oil	0.1m <sup>3</sup> water	0.19km <sup>3</sup> gas
January 12, 1983	24 hrs.	1.8m <sup>3</sup> oil	0.1m <sup>3</sup> water	0.20km <sup>3</sup> gas
- 3) 11-24-1-26 WPM:
 

December 21, 1982	24 hrs.	1.8m <sup>3</sup> oil	0.1m <sup>3</sup> water	0.13km <sup>3</sup> gas
January 1, 1983	24 hrs.	1.9m <sup>3</sup> oil	0.1m <sup>3</sup> water	0.12km <sup>3</sup> gas
January 6, 1983	24 hrs.	2.0m <sup>3</sup> oil	0.1m <sup>3</sup> water	0.16km <sup>3</sup> gas
- 4) 12-24-1-26 WPM: Currently recovering load oil from frac job. Test not available.
- 5) A13-24-1-26 WPM: Will be an injection well. Not producing.
- 6) 14-24-1-26 WPM:
 

December 6, 1982	24 hrs.	9.1m <sup>3</sup> oil	0.4m <sup>3</sup> water	0.39km <sup>3</sup> gas
December 20, 1982	24 hrs.	8.2m <sup>3</sup> oil	0.1m <sup>3</sup> water	0.48km <sup>3</sup> gas
December 24, 1982	24 hrs.	8.4m <sup>3</sup> oil	0.4m <sup>3</sup> water	0.49km <sup>3</sup> gas
January 5, 1983	24 hrs.	8.7m <sup>3</sup> oil	0.1m <sup>3</sup> water	0.50km <sup>3</sup> gas
- 7) 15-24-1-26 WPM:
 

December 12, 1982	24 hrs.	1.4m <sup>3</sup> oil	0.1m <sup>3</sup> water	0.22km <sup>3</sup> gas
December 15, 1982	24 hrs.	0.9m <sup>3</sup> oil	0.1m <sup>3</sup> water	0.13km <sup>3</sup> gas
December 27, 1982	24 hrs.	2.0m <sup>3</sup> oil	0.1m <sup>3</sup> water	0.21km <sup>3</sup> gas
January 13, 1983	24 hrs.	2.78m <sup>3</sup> oil	0.02m <sup>3</sup> water	0.13km <sup>3</sup> gas
January 14, 1983	24 hrs.	2.0m <sup>3</sup> oil	0.1m <sup>3</sup> water	N/A
- 8) 16-24-1-26 WPM:
 

December 17, 1982	24 hrs.	6.8m <sup>3</sup> oil	0.1m <sup>3</sup> water	0.70km <sup>3</sup> gas
December 30, 1982	24 hrs.	6.7m <sup>3</sup> oil	0.1m <sup>3</sup> water	0.66km <sup>3</sup> gas
- 9) A1-25-1-26 WPM: Currently recovering load oil from frac job. Test not available.
- 10) 2-25-1-26 WPM: Currently recovering load oil from frac job. Test not available.
- 11) 3-25-1-26 WPM: Currently recovering load oil from frac job. Test not available.
- 12) 4-25-1-26 WPM:
 

December 28, 1982	24 hrs.	7.3m <sup>3</sup> oil	0.3m <sup>3</sup> water	0.16km <sup>3</sup> gas
January 8, 1983	24 hrs.	6.99m <sup>3</sup> oil	0.61m <sup>3</sup> water	0.14km <sup>3</sup> gas

Well Tests for  
Lower Amaranth Unit No. 1 Wells  
(continued)

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13) 5-25-1-26 WPM:

December 30, 1982	23½ hrs.	3.45m³ oil	0.1m³ water	0.12km³ gas
January 10, 1983	24 hrs.	7.01m³ oil	3.09m³ water	0.11km³ gas

\*Note: Well was serviced in early January, 1983.

14) 6-25-1-26 WPM:

December 29, 1982	24 hrs.	10.96m³ oil	0.83m³ water	0.22km³ gas
January 9, 1983	24 hrs.	11.83m³ oil	0.99m³ water	0.22km³ gas

15) 7-25-1-26 WPM:

January 2, 1983	24 hrs.	9.8m³ oil	0.52m³ water	0.37km³ gas
January 14, 1983	24½ hrs.	10.37m³ oil	0.43m³ water	0.35km³ gas

16) 8-25-1-26 WPM:

January 3, 1983	24 hrs.	0.89m³ oil	0.22m³ water	0.07km³ gas
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APPENDIX "F"  
SUMMARY OF LOWER AMARANTH  
PRESSURE SURVEYS AND  
DISCUSSION OF RESULTS

Prior to Omega's application for the Waskada Lower Amaranth Unit No. 1 Pilot Waterflood bottom hole pressure surveys had been done on two wells.

I) Nov. 13 to 19, 1981 Omega Waskada 5-25-1-26 WPM

The well went of production on September 18, 1981, produced 364.2 m<sup>3</sup> of oil with a final rate of 8.5 m<sup>3</sup>/d prior to being shut in at 0800 on November 13. Tandem gauges were run to a depth of -417.1 m subsea and were on bottom from 1330 on Nov. 13 to 1100 on Nov. 19. The recorded pressure built from 2653.4 kPag initially to 8256.8 kPag finally and the Horner Plot indicated an infinite build up pressure of 9848.9 kPag. Appendix "A" is the complete report of the pressure survey.

II) Jan. 29 to Feb 3, 1982 Omega Waskada 8-26-1-26 WPM

Bottom hole pressure gauges were in this well while the well was being stop cocked on a 24 hours cycle. While the purpose of this procedure was not to determine an accurate shut in pressure but rather to circulate fresh well bore fluid for collecting a pressurized oil sample for FVT analysis, the results indicated that the well quickly returned to a pressure close to 9000 kPag. The final pressure recorded was 8877.3 kPag however there is still a slow rate of build after 23 hours shut in. Appendix "B" summarizes the readings.

Prior to the start of the waterflood it was intended to do a pressure survey of four new Lower Amaranth completions with the Unit area in order to determine the initial reservoir pressure. Locations 9-24, A13-24, A1-25 and 3-25 were chosen for this purpose. It was expected that a virgin pressure of between 8000 and 10,000 kPag would be measured.

III) Dec. 14 to 17, 1982 Omega Waskada A1-25 and A13-24-1-26 WPM

On December 14, tandem pressure gauges with 3 day clocks were run in the above wells.

Waskada A1-25 had been fraced on Nov. 11. The well had had tubing, pump and rods installed but was not produced. On Dec 11, the pump and rods were pulled and the well was shut in. Tubing was left in the hole landed at 936.9 mKB. Gauges were run and left at 1145 on Dec. 14 at a depth of 905.8 mCF. The gauges were pulled at 1100 on Dec 17. Over this period the pressure was relatively constant ranging from a low of 5839.5 Kpag to a high of 5866.7 kPag.

Waskada A13-24 was perforated but not fraced and had been shut in since Nov. 7, 1982. No tubing had been run. Gauges were run and suspended at 1015 on Dec. 14 at a depth of 905.6 mCF. The gauges were pulled at 1220 on Dec. 17. Over this period a slow rate of pressure increase was recorded starting at 6893.8 kPag and finally measured at 6963.8 kPag on Dec. 17.

Appendix "C" is a complete report of the pressure survey.

These pressures were much lower than anticipated. Well A13-24 was still building however after 40 days of being shut in. It was thought that maybe there might be some interference effects from the Lower Alida wells producing on the same location. This would be tested later.

IV) Dec. 30/82 to Jan. 6/83 Omega Waskada 9-24 and 3-25-1-26 WPM

On December 30 tandem gauges with 180 hour clocks were run in the above wells.

Waskada 9-24 was recompleted and perforated but not fraced and had been shut in since 1300 on Dec. 17, 1982 when it had been swab tested. No tubing had been run and the frac had not been done due to problems with the holiday season. Gauges were run and suspended at 1115 on Dec. 30 at a depth of 910.0 mCF. The gauges were pulled at 1115 on Jan. 6. Over this period the well was building pressure but was very low, starting at 2222 kPag and finally measured at 2731 kPag on Jan. 6.

Waskada 3-25 was recompleted and perforated and had been shut in since 1630 on Dec. 17, 1982 when it had been swab tested. No tubing had been run. Gauges were run and suspended at 1000 on Dec. 30 at a depth of 907.0 mCF. The gauges were pulled at 915 on Jan. 6. Over this period the pressure seemed relatively constant recording a low of 6133 kPag and a high of 6186 kPag. The offset Lower Alida well A3-25 was put on initial production within 24 hours of the gauges being run and was produced continuously over this period.

Again these pressures were much lower than what was anticipated. This was interpreted as further indication that the formation is so tight that before the frac the wells will stabilize so slowly as to be impractical to pressure survey.

Appendix "D" is a complete report of this pressure survey.

V) Jan. 5 to 13, 1983 Omega Waskada A1-25 and A13-24-1-26 WPM

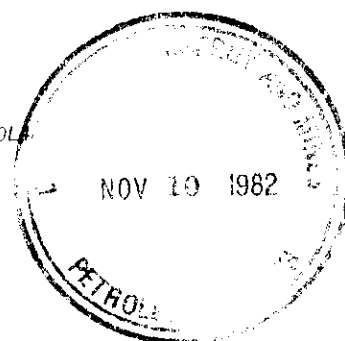
On January 5, tandem gauges with 180 hour clocks were run in the above wells. Nothing had been done to the wells since the last pressure survey however while these pressure bombs were in the hole a test for interference from the Lower Alida wells was done. On the morning of January 9 both 1-25 and 13-24-1-26, the Lower Alida wells were shut in.

At Waskada A1-25, gauges were landed at 906.8 mCF at 1400 on January 5. The clock ran out at 1500 on Jan. 12 and were recovered at 1400 on Jan. 13. Over this period the pressure was relatively constant at a low of 5796 kPag and a high of 5817 kPag. Interestingly by the low pressures were recorded towards the end of the test; after 1-25 had been shut in.

At Waskada A-13-24, gauges were landed at 905.3 mCF at 1300 on January 5. The clock ran out at 200 on Jan. 13 and were recovered at 1215 on Jan. 13. Over the period pressure was relatively constant at a low of 6869 kPag and a high of 6910 kPag. As with A1-25 the low pressures were recorded at the end of the test; after 13-24 had been shut in.

The pressures remeasured by this survey were only slightly lower than those previously measured almost a month earlier. Neither well had built any pressure and neither well seemed affected by the manipulation of its offset Lower Alida well. Particularly at Lsd. 1-25 where the Lower Amaranth well had been fraced this was taken as proof of zone integrity. See Appendix "E".

Later when well A1-25 was flowed back to run pump and rods it was very lively and as a result could only be produced during daylight hours for fear of overflowing the tank. The well produced at rates of over 300 BBL/D at casing head pressures as high as 2700 kPag, clearly at odds with the pressures previously measured.



November 8, 1982

Petroleum Branch  
975 - Century Street  
Winnipeg, Manitoba  
R3H 0W4

Attention: Mr. Bob Dubreuil

Dear Bob:

RE: Completion fo Twinned Wells  
Waskada Lower Amaranth Unit No. 1

This is to clarify the completions for the wells that have been twinned within the Unit area. The wells completed within the Lower Amaranth pool are (will be):

A1-25-1-26 WPM (11-25MC3a-1-26 WPM)  
3-25-1-26 WPM  
A13-24-1-26 WPM (13-24MC3a-1-26 WPM)

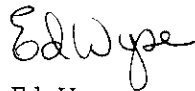
The wells completed within the Lower Alida pool are:

1-25-1-26 WPM  
A3-25-1-26 WPM (3-25MC3a-1-26 WPM)  
13-24-1-26 WPM

Wells A3-25 and 3-25 are presently both completed in the Lower Alida formation. The A3-24 location has improved pay in that formation and it is our intention, with approval of the board, to recomplete the 3-25 well to Lower Amaranth. We hope to do this work soon in order that we could incorporate the Lower Amaranth well in our pressure survey and to prevent difficulties resulting from having two Mississippian wells on that location.

In the very near future you can expect to receive a proposal for our pressure survey that we anticipate doing on the new Lower Amaranth wells 9-24 A1-25, 3-25 and A13-24. These wells have been chosen to give a most accurate measurement of virgin pressure within the pool.

Yours truly,

A handwritten signature in cursive script, appearing to read "Ed Wyse".

Ed Wyse

EW/cw

cc: George Patey  
Bob Wilcox

**November 5, 1982**

**Mr. Jim Trewin  
Waskada, Manitoba  
ROM 2EO**

**Dear Mr. Trewin:**

**Receipt of your letter dated September 22, 1982 concerning the effects that Omega Hydrocarbons Ltd.'s proposed pilot waterflood operation may have on the land is acknowledged.**

**Attached is a copy of a letter we have just recently received from Omega that outlines the precautions the company will be employing to attempt to prevent or reduce the possibility of salt water spills from occurring. You may have already been contacted by someone with Omega and had the opportunity to discuss your concerns directly with them.**

**However, if you do have any specific problem areas which you feel are not being given proper attention by the operator, I would request that you contact our District Inspection Office at Virden (Ph. 748-1557).**

**I hope the above satisfactorily answers your concerns.**

**Yours sincerely,**

**Original Signed by H. C. Moster**

**H. Clare Moster, P. Eng.  
Director, Petroleum Branch**

**HCM/lk**

**Attachment**

**c.c. Virden Office**

**b.c. Dr. I. Haugh**



**HYDROCARBONS Ltd.**

TELEPHONE: (403) 261-0743

630-330 FIFTH AVENUE S.W., CALGARY, ALBERTA T2P 0L4

November 1, 1982

Manitoba Department of Energy and Mines  
Mineral Resources Division  
Petroleum Branch  
975 - Century Street  
Winnipeg, Manitoba  
R3H 0W4



Attention Mr. L. R. Dubreuil

Dear Bob:

RE: Proposed Pilot Waterflood - J. Trewins Concerns

In reply to Mr. Jim Trewins concerns regarding Omegas proposed water flood pilot we wish to advise that Omega has overdesigned the pipelines and taken every known precaution to prevent any possible salt water spills. Our design includes the following:

1. The waters to be injected have been analyzed and compatibility tests run. The water will be filtered to remove any free materials and treated with chemicals to prevent corrosion, bacteria and the formation of scale.
2. The injection pump will be equipped with pressure shut down switches to shut down injection should the injection pressure exceed 1500 - 1600 psig or the pressure drops off from our normal injection pressure which is expected to be in the 1200 to 1500 psig.
3. All pipelines have been internally coated with a plastic type coating called Plastic Applicators Coating 519. This coating has been in use for several years and has been found to be one of the best internal coatings on the market today. The coating will prevent the salt water from coming in contact with the steel pipe but should a coating holiday develop the corrosion inhibitor would protect the linepipe.
4. The linepipe is also protected against external corrosion by the use of an extruded plastic coating called Shaw YJ1. This coating is carefully inspected prior to being lowered into the ditch using a holiday detector called a "Jeep". The Shaw YJ1 is a proven external coating that has been in service for many years. In addition to this coating we have installed two test Cathodic Protection Systems to determine the current required to protect both the wells production casing and the flowlines. A full scale cathodic system will be installed after we have sufficient data from the two tests systems. This system will be installed in the spring of 1983 at a cost estimated at \$350,000.

5. The linepipe itself has been oversized for the service.

The specifications of the 3½" pipe are as follows:

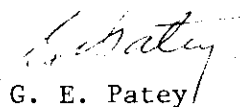
- (a) 3½" O.D. X 42 0.188 wall thickness. This pipe is tested at the mill to 2200 psig before being shipped. The internal pressure design limit is 2710 psig. The pipe is tested to 1500 psig once installed in the ditch.

Once in service the pressures at the injection pump will be monitored continuously and the pump will shut down if the system drops below the normal operating pressure or exceeds the shut down set pressure. Pressures will also be checked daily at each of the individual flowlines.

This is a water flood system and not a water disposal system therefore we would not plan to accept water from outsiders as the water quality is extremely important to obtaining a good flood.

I hope the above answers all of Jim Trewins questions. I will make a point of stopping in and visiting Jim next trip to Waskada and I did make an effort to see him on October 25, 1982 but he was at the Dentist in Brandon and had not returned before I had to leave on the evening flight to Calgary.

Yours truly,



G. E. Patey

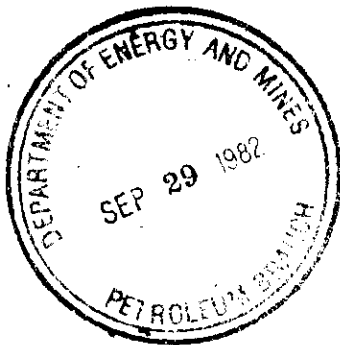
GEP/cpw

cc: R. Wilcox

Waskada 9/28/82

ccc'cc Sept 28/82

x.c. - H. Clare Moster  
September 28, 1982 - IH/ra



Waskada Man.  
Sept. 22/82

Dear Sir:

I am writing with concern about the water injection wells to be located on Tsd. 587, section 25-1-26. I am the land owner and I have seen the way the soil can be ~~so~~ destroyed around a water injection well. When they signed the surface lease it was for the purpose of finding oil. and now 1 yr. later they want it as a disposal well. What safety ~~pre~~ measures are taken? If they are able to do this then what is to stop them from making it a public water disposal well for all companies. I am a member of the Manitoba Surface Rights Ass. and am wondering what rights we do have.

Yours Truly  
Jim Iremine

P.S. This article appeared in the  
Melita Paper only on Sept. 10

October 25, 1982

Omega Hydrocarbons Ltd.  
630 - 330 - 5th Ave. S.W.  
Calgary, Alberta  
T2P 0L4

Attention: Mr. Ed Wyse

Dear Ed:

Re: Proposed Pilot Waterflood Scheme - J. Trewin's Concerns

Per our telephone conversation of today, attached is a copy of a letter from Mr. Jim Trewin, the surface owner of a portion of the proposed waterflood area. Mr. Trewin has expressed concerns related to the danger of salt water spillage.

I would ask that you provide your comments, direct to the Oil and Natural Gas Conservation Board with respect to Mr. Trewin's concerns.

Yours sincerely,

Original Signed By  
**L. R. DUBREUIL**

L. R. Dubreuil  
Chief Petroleum Engineer

LRD/lk

c.c. The Oil and Natural Gas  
Conservation Board



2000, 540 - 5TH AVENUE SOUTH WEST CALGARY, ALBERTA, CANADA T2P 0M2 PHONE 1-403-269-7751

October 20, 1982

Department of Energy and Mines  
The Oil and Gas Conservation Board  
989 Century Street  
Winnipeg, MANITOBA



ATTENTION: Ian Haugh, Deputy Chairman

Dear Sir:

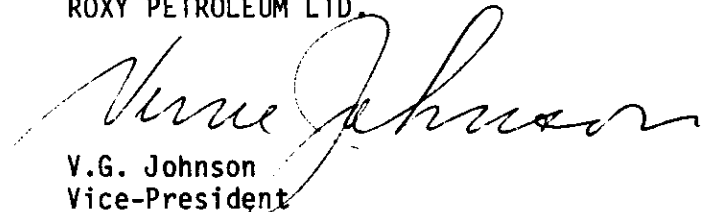
RE: Notice, Under the Mines Act, Waskada Oil Field  
The Manitoba Gazette 1982-09-11  
Proposal by Omega Hydrocarbons Ltd. For A  
Lower Amaranth Waterflood Project

Roxy Petroleum Ltd., on behalf of a joint venture group holding mineral leases directly offsetting the proposed "Waskada Lower Amaranth Unit No. 1" and proposed Lower Amaranth Waterflood Pilot Project, submitted an intervention dated 1982-09-22 to the subject proposals.

Roxy Petroleum Ltd. and Omega Hydrocarbons Ltd. have discussed the proposals and our mutual concerns and have agreed on means to protect Roxy's equity interest and to provide for ongoing participation by Roxy in the conduct of the pilot. Therefore, Roxy Petroleum Ltd. withdraws the intervention dated 1982-09-22 to the notices outlined in the Manitoba Gazette of 1982-09-11.

If any questions should arise, please feel free to contact the undersigned at (403)269-7751.

Yours truly,  
ROXY PETROLEUM LTD.



V.G. Johnson  
Vice-President  
Production

DJP/VGJ:cgn

cc - C. Moster,  
Director, Petroleum Branch  
Department Energy and Mines

- G. Patey,  
Vice-President, Production  
Omega Hydrocarbons Ltd.

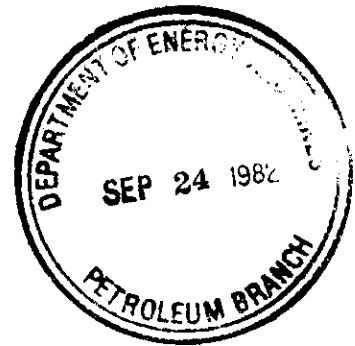


2000, 540 - 5TH AVENUE SOUTH WEST CALGARY, ALBERTA, CANADA T2P 0M2 PHONE 1-403-269-7751

September 22, 1982

Department of Energy and Mines  
The Oil and Natural Gas Conservation Board  
989 Century Street  
WINNIPEG, Manitoba

Attention: Ian Haugh  
Deputy Chairman



Dear Sir:

Re: Notice, under the Mines Act, Waskada Oil Field  
The Manitoba Gazette 1982-09-11  
Proposal by Omega Hydrocarbons Ltd for a  
Lower Amaranth Waterflood Project

Roxy Petroleum Ltd, on behalf of a joint venture group holding mineral leases directly offsetting the proposed "Waskada Lower Amaranth Unit No. 1" and proposed Lower Amaranth Waterflood Pilot Project, submits an intervention to the subject application from Omega Hydrocarbons Ltd. dated May 19, 1982.

It is our concern that waterflood operations by the applicant may result in water channelling through stimulated fractures to the offsetting mineral leases and producing wellbores. In addition, it is our opinion that insufficient technical detail has been included in the application to support the unit and waterflood proposals. Ultimately, a field wide unit, perhaps coincident with a field waterflood, will likely be optimum. Given the current early stage of development of the field, it is premature and arbitrary to consider a single section unit and pilot waterflood.

It should be emphasized that the intervenor is not objecting against the principle of Lower Amaranth waterflood operations. The intervention submitted by Roxy is based upon the principle that a properly designed waterflood with adequate preparatory laboratory and engineering studies will result in minimal technical risks in subsequent field operations for the operator, offset producers, and Royalty owners.

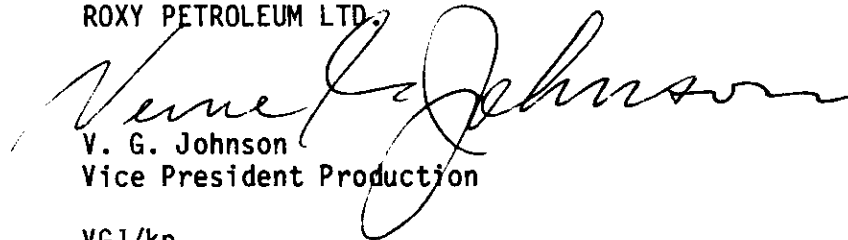
continued...

September 22, 1982  
Page 2

If any questions should arise please feel free to contact the undersigned at (403) 269-7751.

Yours truly

ROXY PETROLEUM LTD.

A handwritten signature in cursive script, reading "V. G. Johnson". The signature is written in dark ink and is positioned over the typed name and title.

V. G. Johnson  
Vice President Production

VGJ/kp

enclosure

cc: R. Dubreuil  
Chief Petroleum Engineer  
Department of Energy & Mines  
Petroleum Branch  
989 Century St.  
Winnipeg, Manitoba  
R3H 0W4

INTERVENTION TO APPLICATION BY OMEGA HYDROCARBONS LTD. FOR PROPOSED  
LOWER AMARANTH WATERFLOOD PILOT PROJECT DATED 1982-05-19

INTRODUCTION

Roxy Petroleum Ltd. as operator for a joint venture project holds lands offsetting the proposed "Waskada Lower Amaranth Unit #1" and proposed Lower Amaranth Waterflood Pilot Project.

The Mineral Leases operated by Roxy are held in the name of Shell Canada Resources Ltd. The joint venture acquired a working interest in the subject offsetting mineral rights by virtue of a farmout agreement with Shell Canada Resources Ltd. dated 1981-03-09.

Subsequent to the execution of the above document, and the related Great Basins - Adobe/Shell and Voyager/Roxy farmout agreements dated 1978-05-09 and 1981-10-20, respectively, the joint venture has drilled 31 exploration wells resulting in 8 oilwells.

The mineral ownership of the following lands:

NE 1/4 Section 26-1-26 WPM

SW 1/4 Section 24-1-26 WPM

offsetting the proposed Unit #1 is detailed in the Attachment No. 1 and depicted in the Figure No. 1.

The NE 1/4 Section 26-1-26 WPM has been evaluated by the well Roxy-Clarion et al Waskada 9-26-1-26 WPM. The 9-26 well evaluated the Mississippian MC-3 interval and is currently completed and production testing the Lower Amaranth (Spearfish) interval.

Roxy Petroleum Ltd. as operator of a joint venture with offsetting lands and production to the proposed Unit #1 and Lower Amaranth Waterflood Pilot Project intervenes and objects to approval of the subject application. In general, it is Roxy's opinion that:

1. water injection into the fracture stimulated Lower Amaranth well Omega Waskada 5-25-1-26 (WPM) may result in substantial water production increases at the Company operated Lower Amaranth producer Roxy-Clarion et al Waskada 9-26-1-26 (WPM).
2. water injection into the Lower Amaranth may cause water production or other reservoir problems in other Company operated undrilled offset lands.
3. Roxy Petroleum Ltd. submits that the proposed Lower Amaranth waterflood project is premature and the subject application is technically deficient.

## DISCUSSION

### A. LOWER AMARANTH RESERVOIR

#### 1. Fracture Stimulation Related Water Channeling

The subject application indicates that the proposed injection wells 5-25 and 15-24-1-26 have been fracture stimulated and the wells 13-24 and 7-25 will be fracture stimulated after project inception.

Engineering studies initiated on other similiar sandstone reservoirs indicate that a fracture stimulation treatment may create a fracture up to several hundred feet depending upon sand concentrations and volumes. In this scenerio the offsetting lands would definitely be affected by water injection. It is Roxy's opinion that channelling of water from the injection to producing wellbores due to stimulated fractures is a very likely possibility.

Roxy Petroleum Ltd. objects to the proposed Lower Amaranth waterflood project on the basis that water injection in the S 1/2 Section 25 and N 1/2 Section 24-1-26 WPM could channel to offsetting lands and reduce by a substantial degree the oil recovery factor and associated economic return.

Roxy would suggest that the critical path to evaluate the feasibility of waterflood operations should include the following steps:

1. Geological Studies
2. Reservoir Property Laboratory Studies
3. Computer Reservoir Simulation Model of Primary Recovery
4. Computer Reservoir Simulation Model of Secondary Recovery
5. Selection of Optimum Depletion Strategy

It is the opinion of the intervenor that the application by Omega Hydrocarbons Ltd. for approval of a Lower Amaranth waterflood project is deficient as none of the above items have been addressed or itemized in the subject application.

The above suggested critical path is detailed below as to the specific items which should be investigated and resolved prior to any selection of depletion strategy, and application or approval of waterflood operations.

#### 2. Geological Studies

Roxy recommends detailed geological studies be performed to determine the following data and the effect on a subsequent waterflood

- depositional environment
- vertical & horizontal heterogenities
- clay and mineral content
- rock type and distribution

The vertical and horizontal permeability heterogenity observed in a limited review of core data indicates that certain intervals may be waterflooded preferentially to other lower permeability sections.

There are numerous examples of waterflood inefficiencies due to permeability heterogeneities in the Cardium reservoirs of West Central Alberta.

### 3. Reservoir Property Laboratory Studies

A properly designed waterflood study requires the input of laboratory derived data. It is recommended that the following items should be reviewed for application to the proposed Lower Amaranth waterflood project

- water compatibility tests
- fines migration
- relative permeability curves
- capillary pressure
- core water displacement studies

### 4. Reservoir Simulation

The proposal for waterflood operations should include a study that delineates baseline conditions for a primary depletion scheme. The geological and laboratory data described above, combined with pressure build-up and production data could be input into a reservoir computer simulation model to predict future performance. Following a satisfactory simulation of primary depletion, a number of prediction cases should be conducted to determine the optimum waterflood pattern and spacing. At this point, a waterflood pilot project could be proposed and the engineering predictions and recommendations could be field tested with substantially reduced risk of reservoir damage.

### 5. Field Monitoring and Testing

The application for the proposed waterflood includes no proposals for monitoring of test results other than 2 production tests per month. A pilot waterflood scheme should include proposals to determine pressure maintenance and sweep efficiency.

### 6. Source Water

It is of concern to Roxy that the application did not include Blairmore/Lower Amaranth/Mississippian water compatibility tests with recommendations for biological, corrosion, and scale control.

ATTACHMENT NO. 1

MINERAL OWNERSHIP OF OFFSET LANDS

NE 1/4 SECTION 26-1-26 WPM

LESSOR: R. C. Rowe 100%

LESSEE: LSD 9 Roxy Petroleum Ltd. 50%  
Andex Oil Co. Ltd. 50%

LSD 10 - 16 (inclusive) Roxy Petroleum Ltd. 25%  
Andex Oil Co. Ltd. 25%  
Shell Canada Resources Ltd. 50%

SW 1/4 SECTION 24-1-26 WPM

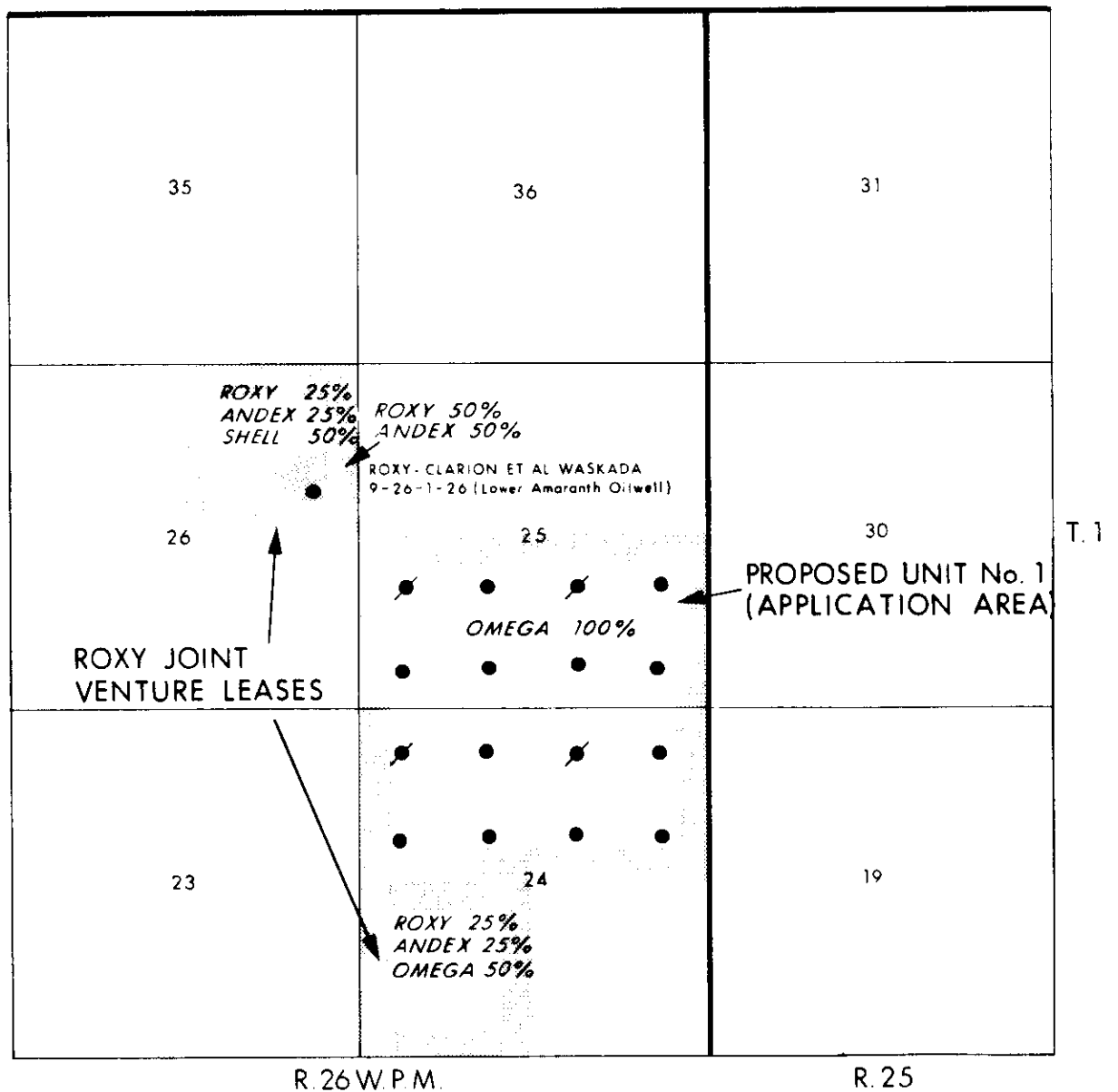
LESSOR: J. C. Spelliscy 50%

LESSEE: Roxy Petroleum Ltd. 25%  
Andex Oil Co. Ltd. 25%  
Omega Hydrocarbons 50%

FIGURE 1

WASKADA OIL FIELD

AREA OF PROPOSED WATERFLOOD OPERATIONS  
AND OFFSET ROXY JOINT VENTURE MINERAL LEASES





# Registration Receipt (Bulk)

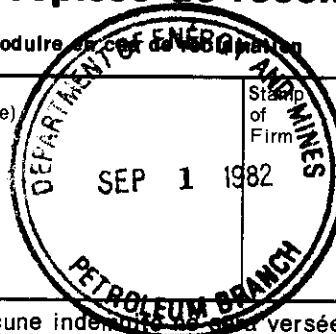
# Récépissé de recommandation (en nombre)

This receipt is necessary if enquiry is desired.

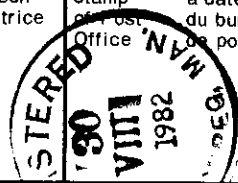
À produire en cas d'enquête

Mailed by (Name and address of firm) Déposé par (Nom et adresse de la maison expéditrice)

Petroleum Branch  
989 Century Street  
P9. Man. R3H0W4



Stamp of Firm  
Timbre de la maison expéditrice  
Date Stamp of Post Office  
Timbre à date du bureau de poste



Fragile and perishable articles are not indemnified against damage.

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Aucune indemnité n'est versée pour l'avarie d'un objet fragile ou périssable.

Vous pouvez obtenir des renseignements sur les indemnités versées et les DROITS DE RECOMMANDATION en vous adressant à votre bureau de poste.

Number Numéro	Name Nom	Fee Droit	Address (including Postal Code) Adresse (y compris le code postal)
1	Tandrea Orlt-Har		300 Assiniboine Ave. W99 Man. R3C 0X6
2	Rohy Petroleum Ltd.		480, 708-11th Ave. S.W. Calgary, Alberta T2R 0F4
3	Shell Canada Resources Ltd.		Box 100 Calgary, Alberta T2P 2H5
4	Shannon, Orlt Ltd.		14 Taggart Place Regina, Sask. S4S 4G4
5	Energy Men & Resources		580 Booth Street Ottawa, Ontario K1A 0E4
6	Canada Trust Co.,		505-2nd Street S.W. Calgary, Alberta T2P 3E6
7	H.F. Trewin		Waskada, Manitola R0M 2E0
8	M.A. Pounder		Ste. 1001, 1400 Beach Drive Victoria B.C. V8S 2M8
9	R.C. Rome		Waskada, Manitola R0M 2E0
10	M.E. Hainsworth		P.O. Box 63, Waskada, Manitoba R0M 2E0
11	M.K. Hainsworth		P.O. Box 63, Waskada, Manitoba R0M 2E0
12	E.M. Hainsworth		Waskada, Manitola R0M 2E0
13	North American Royalties Inc.		280 East Eighth Street, Chetumal, Yucatan C20 54
14	A.F. McArthur		240-1st Street Brandon, Manitoba R7A 2W5
15	D.E. McEgan		Waskada, Manitola R0M 2E0
16	Missilelinda of Canada		150-608-7th St. S.W. Calgary, Alberta T2P 1Z2
17	R.D. Jock		Carlisle, Saskatchewan S0C 0R0
18	A.S. Reiden		359 Central Ave. S. Swift Current, Sask. S9H 3G4
19	Canada Permanent Trust		311-6th Ave. S.W. Calgary, Alberta T2P 0R6
20			

Sheet No. Feuille N° No of articles Nbre d'objets

19

Accepted by (Postal Employee's Signature) Accepté par (Signature de l'employé des Postes)



MANITOBA

Department of Energy and Mines  
**The Oil and Natural Gas Conservation Board**

989 Century Street  
Winnipeg, Manitoba  
R3H 0W4

NOTICE

WASKADA OIL FIELD

Omega Hydrocarbons Ltd. has made application under The Mines Act for approval to conduct a pilot waterflood project in the Lower Amaranth Formation in that portion of the Waskada Field described as follows:

N $\frac{1}{2}$  Section 24-1-26 (WPM)

S $\frac{1}{2}$  Section 25-1-26 (WPM)

It is proposed to convert or recomplete the four wells located on the following locations to water injection:

Lsd. 13 and 15, Section 24-1-26 (WPM)

Lsd. 5 and 7, Section 25-1-26 (WPM)

The application also requests that wells producing from the Lower Amaranth Formation in the proposed pilot area be exempt from the maximum permissible rate (MPR) limitations of Section 11 of Manitoba Revised Regulation M160-R4P.

The Board is also reviewing a proposed unitization agreement relating to production from the Lower Amaranth Formation in the pilot area.

If no valid objection or intervention in writing is received by the Board at 989 Century Street, Winnipeg, Manitoba R3H 0W4, within 14 days of the publication of this notice, the Board may approve the application.

Copies of the application may be obtained from Omega Hydrocarbons Ltd., 630 - 330 Fifth Avenue S.W., Calgary Alberta T2P 0L4.

Ian Haugh  
Deputy Chairman

DATED: August 26, 1982

The Hon. G. C. & J. G. C.  
 300 Washington Ave.  
 W. J. H. REC. 016

11-19			11-19	1-15	Shirada 1st time	Threat?
11-14	✓	1005				✓
11-12	24					
11-12	24		26-13	15-24	1-26 ✓	OK
11-12	24		27-8	12-24	1-26 ✓	OK
11-12	24		27-15	1-23	1-26 ✓	OK
11-12	24		26-12	16-23	1-26 ✓	OK
11-12	24	1005	#2207	5-26	1-23 ✓	OK
11-12	24		27-14	11-26	1-15 ✓	OK
11-12	24		26-13	1-23	1-16 ✓	OK
11-12	24		26-14	3-23	1-26 ✓	OK
11-12	24		26-11	1-26	1-16 ✓	OK
11-12	24		2-65	7-26	1-16	OK

Bonnie

Please check Admin files <sup>(1956 leaves)</sup> on each of the above wells and confirm

- ① The sketch correctly shows ALL Lessons and their interests
- ② The addresses on other sheet for houses and Lessees (add if necessary - other than Dwyer) are also correct

ASAP

mm

W<sup>1</sup>/<sub>2</sub> 17-1-25

$\frac{1}{3}$  = \* David Lancelot Jack - 4080 St. Louis, Mo. (1927)

$\frac{1}{3}$  = Loretta Lapham Redden ✓

$\frac{1}{6}$  = \* John William Medford Thompson & Wife

$\frac{1}{6}$  = Robert David Jack ✓

\* Canada Remount Serv. - no transfer to

**re Matter Of The Highway Traffic Act  
The Public Utilities Board Act.**

et 11357

ke notice that, commencing on the 12th of October, 1982, at Neepawa, Man-1, pursuant to Section 44, subsection 3, e Public Utilities Board Act the Board undertake to review Section 8 of the a-provincial Public Service Vehicle ificate held by Gardewine & Sons Ltd., h reads as follows:

ection 8. "Serving all points on P.T.H. 16, west of Gladstone to its junction with .H. No. 5, and all points on P.T.H. No. 5 h of the said junction up to and includ- Dauphin, to and from Winnipeg, for eral freight."

ny interested party that wishes to be sent and make representation at the he Hearing must file such notice with e Secretary of the Board, 200-301 Weston et, Winnipeg, either by mail or person- iling, not later than 4:30 p.m. Friday, eptember 24, 1982. Notices received after i date will not be accepted.

L. G. OLIJNEK,  
Secretary.

THE MANITOBA MOTOR  
TRANSPORT BOARD

**PROTECTION ACT**

P.H. No. 59, River Lots 101 and 102, Parish t. Paul, R.M. of East St. Paul.

t. 8479, Stanley Buchko, P.R. No. 228, i.D. of Fisher.

pplication by Stanley Buchko for a per- t for an Access Driveway onto P.R. No. .S.E.¼, Section 25-23-2 West, L.G.D. of iher.

A. 9274, Village of Gretna, P.T.H. No. 30, age of Gretna.

Application by The Village of Gretna for ermit for a Backstop and Fencing for ilpark adjacent to P.T.H. No. 30, S.W.¼, ction 5-1-1 West, Village of Gretna.

A. 9275, Stanley W. Holmes, P.T.H. No. .R.M. of Portage la Prairie.

Application by Stanley W. Holmes for a rmit for an Access Driveway onto P.T.H. . 26, Parish Lot 38, Parish of Poplar int, R.M. of Portage la Prairie.

A. 9276, Edward Pawluk, P.T.H. No. 15, G.D. of Reynolds.

Application by Edward Pawluk for a per- it for an Access Driveway onto P.T.H. . 15, S.E.¼, Section 4-11-9 East, L.G.D. of eynolds.

A. 9279, Dalco Contractors Ltd., P.T.H. . 1, R.M. of Cartier.

Application by Dalco Contractors Ltd.

for a permit for Six (6) Temporary Sheds and the Change in Use of Land and Access adjacent to and onto P.T.H. No. 1, River Lots 43 and 44, Parish of St. Francois Xavier, R.M. of Cartier.

L.A. 9280, Alice Trudeau, P.T.H. No. 1, L.G.D. of Reynolds.

Application by Alice Trudeau for a per- mit for a Snack Bar and Sitting Room adja- cent to P.T.H. No. 1, S.E.¼, Sec. 19-8-9 East, L.G.D. of Reynolds.

L.A. 9281, Four Seasons Pools, P.T.H. No. 101, R.M. of East St. Paul.

Application by Four Seasons Pools for a permit for an Inground Pool adjacent to P.T.H. No. 101, River Lot 113, Parish of St. Paul, R.M. of East St. Paul.

L.A. 9282, Ronald Guimond, P.T.H. No. 11, Fort Alexander Indian Reserve No. 3.

Application by Ronald Guimond for a permit for an Access Driveway onto P.T.H. No. 11, Lot 64, Fort Alexander Indian Reserve No. 3.

1:30 P.M.

L.A. 9283, Transcona Building, P.T.H. No. 101, City of Winnipeg.

Application by Transcona Building on be- half of M. Prychitko for a permit for a Dwelling and Attached Garage adjacent to P.T.H. No. 101, Lot 20, Block 5, Plan 15,543, S½, Section 10-11-4 East, City of Winnipeg.

L.A. 9284, Metropolitan Properties Ltd., P.T.H. No. 101, City of Winnipeg.

Application by Metropolitan Properties Ltd. for a permit for Dwellings and a Fence adjacent to P.T.H. No. 101, Lots 19 to 51, Block 5, Plan 15,543, S½, Section 10-11-4 East, City of Winnipeg.

L.A. 9163, Gulf Canada Ltd., P.T.H. No. 30, R.M. of Rhineland.

Application by Gulf Canada Ltd. for a permit for a Sign adjacent to P.T.H. No. 30, N.W.¼, Section 4-2-1 West, R.M. of Rhine- land.

L.A. 3967, Gulf Canada Ltd., P.T.H. No. 5, Town of Dauphin.

Application by Gulf Canada Ltd. for a

permit for a Sign adjacent to P.T.H. No. 5, N.E.¼, Section 4-25-19 West, Town of Dauphin.

L.A. 8322, John B. Jarvis, P.T.H. No. 34, R.M. of Westbourne.

Application by John B. Jarvis for a per- mit for a Sign adjacent to P.T.H. No. 34, S.W.¼, Section 17-14-11 West, R.M. of West- bourne.

L.A. 9269, Chicken Village (The Pas) Ltd., P.T.H. No. 10, The Pas Indian Reserve No. 21E.

Application by Chicken Village (The Pas) Ltd. for a permit for a Sign adjacent to P.T.H. No. 10, Township 56-25 West, The Pas Indian Reserve No. 21E.

L.A. 9270, Chicken Village (The Pas) Ltd., P.T.H. No. 10, The Pas Indian Reserve No. 21E.

Application by Chicken Village (The Pas) Ltd. for a permit for a Sign adjacent to P.T.H. No. 10, N.W.¼, Section 34-55-26 West, The Pas Indian Reserve No. 21E.

L.A. 9271, Grand Rapids Consumers Co-op Ltd., P.T.H. No. 6, The Pas Unorganized.

Application by Grand Rapids Consumers Co-op Ltd. for a permit for a Sign adjacent to P.T.H. No. 6, N.W.¼, Section 2-48-13 West, The Pas Unorganized.

L.A. 9272, Grand Rapids Consumers Co-op Ltd., P.T.H. No. 6, The Pas Unorganized.

Application by Grand Rapids Consumers Co-op Ltd. for a permit for a Sign adjacent to P.T.H. No. 6, N.E.¼, Section 20-49-13 West, The Pas Unorganized.

The Highway Traffic Board will be pre- pared to consider any submissions regard- ing the above applications at this hearing. Any persons wishing to make a submission should either contact the Secretary at the hearing or forward their written submis- sions in advance to: W. Simpkin, Secre- tary, The Highway Traffic Board, Room 200-301 Weston Street, Winnipeg, Manitoba, R3E 3H4. Phone: 786-6708.

W. SIMPKIN,  
Secretary.

—37 THE HIGHWAY TRAFFIC BOARD.

**UNDER THE MINES ACT**

**WASKADA OIL FIELD**

Omega Hydrocarbons Ltd. has made ap- plication under The Mines Act for approval to conduct a pilot waterflood project in the Lower Amaranth Formation in that portion of the Waskada Field described as follows:  
N¼ Section 24-1-26 (WPM)  
S½ Section 25-1-26 (WPM)

It is proposed to convert or recomplete the four wells located on the following loca- tions to water injection:

Lsd. 13 and 15, Section 24-1-26 (WPM)

Lsd. 5 and 7, Section 25-1-26 (WPM)

The application also requests that wells producing from the Lower Amaranth For- mation in the proposed pilot area be ex-

empt from the maximum permissible rate (MPR) limitations of Section 11 of Manitoba Revised Regulation M160-R4P.

The Board is also reviewing a proposed unitization agreement relating to production from the Lower Amaranth Formation in the pilot area.

If no valid objection or intervention in writing is received by the Board at 989 Century Street, Winnipeg, Manitoba, R3H 0W4,

within 14 days of the publication of this notice, the Board may approve the application.

Copies of the application may be obtained from Omega Hydrocarbons Ltd., 630-330 Fifth Avenue S.W., Calgary, Alberta T2P 0L4.

Dated August 26, 1982.

IAN HAUGH,  
Deputy Chairman.

August 29, 1982, at the Progressive  
age la Prairie.  
be and took part in the many spe-  
cific tournaments.

duce stands, book stalls, progres-

This year, several hundred people

straw hat) and other Progressive  
attendance.

way from the cattle producers."

y stated funds were voted in the  
e to give a one-time pay out to  
ucers, not to tie them to a long-  
ayable Marketing Board plan.  
y appointing a well known NDP  
as chairman of the Commission  
l and administer \$41.5 million,  
mediately call the legislative  
e committee so that he and his  
man of the Commission can ex-  
answer questions in order that  
obans know that government  
not going to be misappro-  
The proposed beef stabilization  
reflects the NDP's attempt to  
armers and the farm industry.  
not clear what the objectives of  
um are.

on call: Jim Downey, M.L.A.,  
re Conservative Agriculture Cri-  
t, 522-8276.

**Long—Winded**  
a commencement speaker tries  
n length what his speech lacks

*The 17th Annual Era*  
day, September 9th, 1982

**Han't Changed**  
Down through the ages  
people have known it's  
more blessed to give than to  
receive—it's just never been  
half as popular.

**CUSTOM DISCING**  
**CUSTOM GRAIN HAULING**

And thou Bethlehem,  
in the land of Juda, art  
not the least among the  
princes of Juda: for out  
of thee shall come a  
Governor, that shall rule  
my people Israel.

Matthew 2:4-6

### The Oil and Natural Gas Conservation Board NOTICE

#### WASKADA OIL FIELD

Omega Hydrocarbons Ltd. has  
made application under The Mines  
Act for approval to conduct a pi-  
lot waterflood project in the  
Lower Amaranth Formation in  
that portion of the Waskada  
Field described as follows:

N½ Section 24-1-26 (WPM)

S½ Section 25-1-26 (WPM)

It is proposed to convert or re-  
complete the four wells located  
on the following locations to  
water injection:

LSD. 13 & 15, Section 24-1-26  
(WPM)

Lsd. 5 and 7, Section 25-1-26  
(WPM)

The application also requests that  
wells producing from the Lower  
Amaranth Formation in the pro-  
posed pilot area be exempt from  
the Maximum permissible rate  
(MPR) limitations of Section 1 of  
Manitoba Revised Regulation  
M160-R4P.

The Board is also reviewing a pro-  
posed unitization agreement re-  
lating to production from the Low-  
er Amaranth Formation in the pi-  
lot area.

If no valid objection or interven-  
tion in writing is received by the  
Board at 989 Century Street,  
Winnipeg, Manitoba R3H 0W4,  
within 14 days of the publication  
of this notice, the Board may ap-  
prove the application.

Copies of the application may be  
obtained from Omega Hydrocar-  
bons Ltd., 630-330 Fifth Avenue  
S.W., Calgary, Alberta T2P 0L4.

DATED: August 26, 1982

IAN HAUGH  
Deputy Chairman

**A  
Healthy Heart  
is a  
Family  
Affair**

give... heart fund



# Entertainn

—at the—

## Melita I

Tuesday thru Satur

Sept. 7th to

“Night People”

Popular Top Band

“Don’t Miss Them”

—in the—

## Beverage R

# FALL TILL

## SPECIAL

# 20%



MANITOBA

Department of Energy and Mines  
**The Oil and Natural Gas Conservation Board**

989 Century Street  
Winnipeg, Manitoba  
R3H 0W4

NOTICE

WASKADA OIL FIELD

Omega Hydrocarbons Ltd. has made application under The Mines Act for approval to conduct a pilot waterflood project in the Lower Amaranth Formation in that portion of the Waskada Field described as follows:

N $\frac{1}{2}$  Section 24-1-26 (WPM)

S $\frac{1}{2}$  Section 25-1-26 (WPM)

It is proposed to convert or recomplete the four wells located on the following locations to water injection:

Lsd. 13 and 15, Section 24-1-26 (WPM)


Lsd. 5 and 7, Section 25-1-26 (WPM)

The application also requests that wells producing from the Lower Amaranth Formation in the proposed pilot area be exempt from the maximum permissible rate (MPR) limitations of Section 11 of Manitoba Revised Regulation M160-R4P.

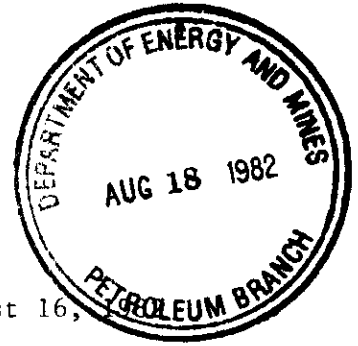
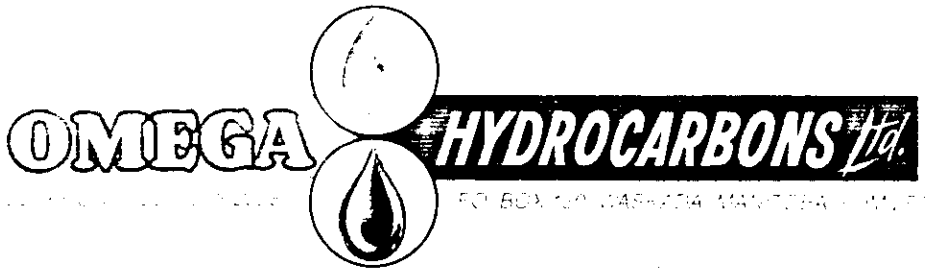
The Board is also reviewing a proposed unitization agreement relating to production from the Lower Amaranth Formation in the pilot area.

If no valid objection or intervention in writing is received by the Board at 989 Century Street, Winnipeg, Manitoba R3H 0W4, within 14 days of the publication of this notice, the Board may approve the application.

Copies of the application may be obtained from Omega Hydrocarbons Ltd., 630 - 330 Fifth Avenue S.W., Calgary Alberta T2P 0L4.

  
\_\_\_\_\_  
Ian Haugh  
Deputy Chairman

DATED: August 26, 1982



August 16,

The Oil and Natural Gas  
Conservation Board  
993 Century Street  
Winnipeg, Manitoba

Attn: Dr. Ian Haugh  
Deputy Chairman

Dear Sir:

Re: Revised Map Showing Lessors  
Waskada Lower Amaranth Unit No. 1

Please accept our apologies with this revised map showing the Lessors in the vicinity of the proposed unit as a replacement for the attachment to our original May 19, 1982 application.

Yours truly,  
OMEGA HYDROCARBONS LTD.

W. E. Wyse  
Petroleum Engineer

WEW/ms

cc: Mr. H. Clare Moster, P. Eng. ✓  
Director, Petroleum Branch

# PROPOSED WASKADA TOWNSHIP AMARANTH UNIT No.1

MAP SHOWING LESSORS

Rge 26 WPM

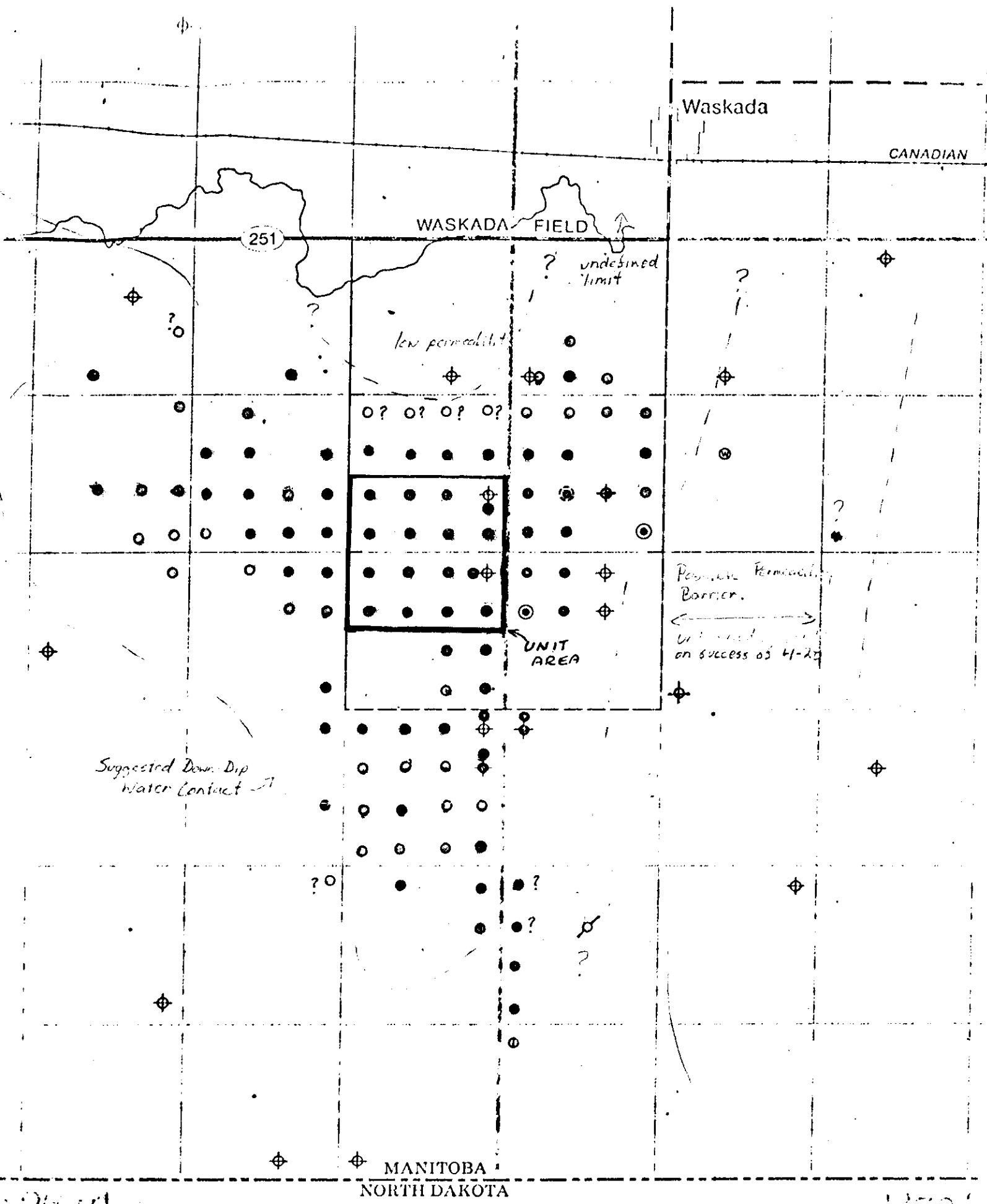
Rge 25 WPM

R.C. Rowe 100%	M.G. Pounder 100%	H.F. Trewin 100%	Canada Trust 100%
26	25	30	
M.E. Hainsworth 100%	M.G. Pounder 100%	H.F. Trewin 100%	Dept. of Energy, Mines & Res. 100%
M.K. Hainsworth 100%	N.A. Royalties 25% G.F. McArthur 50% D.E. McGregor 25%	G.F. McArthur 50% D.E. McGregor 25% Missilinda 25%	R.D. Jack 16 2/3% J.S. Redden 33 1/3% Can. Perm. Trust 50%
23	24	19	
E.M. Hainsworth 100%	G.F. McArthur 25% E.A. & M.E. McGregor 25% J.H. Spelliscy 50%	Dept. of Ener., Mines & Res. 100%	R.D. Jack 16 2/3% J.S. Redden 33 1/3% Can. Perm. Trust 50%

Twp 1

August 16, 1982

REVISION NO. 1



# MANIT<sup>BA</sup>

## Inter-Departmental Memo

To The Oil and Natural Gas  
Conservation Board

Date August 16, 1982  
From L. R. Dubreuil  
Chief Petroleum Engineer

Marc Eliesen  
Dr. I. Haugh  
J. Redgewell

Telephone 633-9543 (Ext. 176)

Subject Proposed Waskada Lower Amaranth  
Pilot Waterflood

Omega Hydrocarbons has applied for approval to conduct a pilot waterflood project in the Lower Amaranth Formation in the Waskada Field. Omega has also requested exemption from maximum production rate limitations for the wells in the pilot.

### RECOMMENDATIONS:

It is recommended that the attached Notice<sup>lx</sup> advertised in the Manitoba Gazette and the Melita New Era <sup>and</sup> ~~are~~ sent to royalty owners within the proposed pilot area as well as working interest and royalty owners ~~directly~~ offsetting the pilot area. In the absence of objections to the Notice, it is recommended that the application be approved and that a Pressure Maintenance Order (PM Order), be issued subject to an expiry date one year after the date of the order.

Table 1 indicate working interest and royalty owners in the area.

With respect to exemption of the pilot area wells from MPR limitations it is recommended that this request be granted and incorporated into the PM order with the limitation that the ability of Omega's injection system to replace production withdrawals be demonstrated on a continuous basis.

### DISCUSSION:

1. Field Development - In mid 1980, Omega recompleted the well Omega Waskada 11-30-1-25, then an uneconomic Mississippian producer, in the overlying Lower Amaranth Formation. Although the well is still marginal, its recompletion sparked interest in this formation and led to the aggressive development which is currently continuing in the area. Early in the

development, the proposed pilot area was found to be productive in the Lower Amaranth.

2. Pressure Maintenance Requirements - Although initial well production rates (after fracturing) are normally quite high (10-15 m<sup>3</sup>/d) the subsequent rate decline and the relative absence of water production suggested at an early stage that some form of pressure maintenance would be required to maximize recovery. This was further supported by reservoir fluid analyses indicating a relatively high bubble point (4220 kPa) thereby raising the possibility of decline of reservoir pressure below the bubble point, causing excess gas production.

The Lower Amaranth reservoir has relatively low permeability and is developed in distinct and continuous oil saturated zones. Figure 1 shows development of the reservoir and interpreted pool limits to date. Completion practice normally involves fracture treatments. However, in operating a waterflood, it is usually desirable not to fracture the water injectors as this may induce more severe stratification and result in bypassing of otherwise recoverable oil. In the case of the tight Lower Amaranth reservoir, it is uncertain whether fracturing is necessary to allow sufficient volumes of water injection to maintain pressure.

Recognizing the apparent need for waterflooding in this reservoir but also uncertainties regarding future development and injectivity, Omega has proposed a one section, 16 well pilot waterflood. The area of the proposal pilot is shown on Figure 1.

It is proposed to convert 4 wells (one per quarter section) to water injection to result in a nine spot injection pattern.

During processing of the application, a number of concerns were discussed with Omega. The attached correspondence discusses these concerns in some detail. The concerns raised are listed below:

1. Monitoring program to determine if pilot successful.
2. Injection system (including monitoring, compatibility etc.).
3. Basis for recoverable reserves.
4. Continued production of the Mississippian MC3a reservoir.

Through the attached correspondence and numerous discussions with Omega, the Branch is now satisfied that all technical aspects of the application are acceptable.

Although accurate recovery calculations are not possible at this time, consideration of initial primary production performance and anticipated waterflood performance would indicate a substantial increase in recoverable reserves will result from the pilot. As a result, the Petroleum Branch, recommends from a technical point of view, approval of the application.

3. Term of Pilot - The major uncertainty with regards to water injection in the Lower Amaranth Formation is that of injectivity. To properly evaluate injectivity as well as other factors, such as production and pressure response, it is recommended that the pilot waterflood be approved for a period of one year.

4. Exemption from Maximum Permissible Rates (MPR's) - Omega has requested an exemption from maximum permissible rates for wells within the pilot area. Currently, production from wells in the Waskada area is limited to 50 BPD (8.0 m<sup>3</sup>/d) by Manitoba Revised Regulation M160-R4P Section 11(1).

Omega has requested this exemption to provide an incentive for waterflood operations and to allow more meaningful evaluation of production response.

In general, the Branch staff agrees that imposition of an MPR will hinder proper evaluation of the pilot. However, it is felt that to avoid excessive pressure decline that the requested exemption be withheld until Omega has demonstrated the ability of its system to inject water in sufficient quantities to offset production voidage. Further, after this initial period, production rates should be limited by the continuing requirement to fully replace production voidage.

5. Pressure Maintenance Order - Assuming absence of objections to the Notice and subsequent approval of the application, a Pressure Maintenance Order (PM Order) will be drafted for the Board's approval. This draft will include provisions regarding the items discussed above and in the attached correspondence.

6. Unit Agreement - As mineral ownership is not common in the pilot area, it will be necessary for the area to be unitized.

At the present time, although Omega has requested the Department's comments, no official application has yet been made for issuance of a unitization order.

Section 74(3) of the Mines Act empowers the Board to approve a unitization agreement if the royalty owners express their agreement with the proposed unit plan.

The Branch has reviewed Omega's proposed unit agreement, particularly with respect to determination of tract factors and find it acceptable. Omega has submitted additional confidential interpretative data as well as calculations showing the derivation of tract factors. In general, the Branch concurs with the format and content of the draft agreement.

The Branch will contact Omega in the near future and indicate that a formal application supported by the consent <sup>of the</sup> royalty owners is required. If total consent of the royalty owners is not obtained, the Board may, pursuant to Section 76(1) of the Mines Act, issue a Unitization Order after a public hearing.

#### ADVERTISEMENT:

It is suggested that, as offset working interest owners and royalty owners could be affected by the proposed pilot, the attached notice be sent to these parties in addition to the royalty owners within the pilot, the Manitoba Gazette and the Melita New Era.

#### FUTURE EXPANSION:

The present application is quite general in technical content, reflecting the ongoing development of the field.

As development proceeds, <sup>more</sup> scientific approach to estimating ultimate recovery and field performance will be possible, particularly in view of field experience from the pilot waterflood. It is therefore recommended that any major enlargement of the unit be accompanied by a complete geologic and engineering study of the Lower Amaranth Pool at Waskada.

In the event of expiry of the pilot, a complete report summarizing all operations and conclusions arising from the pilot should be submitted.



L. R. Dubreuil

NOTICE  
UNDER THE MINES ACT

Omega Hydrocarbons Ltd. has made application for approval to conduct a pilot waterflood project in the Lower Amaranth Formation on the following:

North  $\frac{1}{2}$  Section 24-1-26 (WPM)

South  $\frac{1}{2}$  Section 25-1-26 (WPM)

It is proposed to convert four wells, located in Lsd's 13 and 15 of Section 24-1-26 (WPM) and Lsd's 5 and 7 of Section 25-1-26 (WPM), to water injection.

Omega Hydrocarbons Ltd. has also made application to exempt the wells located in the proposed pilot area from the maximum permissible rate (MPR) limitations pursuant to Manitoba Revised Regulation M160-R4P Section 11 (1).

If no valid objection or intervention in writing is received by the Board at 989 Century Street, Winnipeg, Manitoba, R3H 0W4, within 14 days of the publication of this notice, the Board may approve the application.

Copies of the application can be obtained from Omega Hydrocarbons Ltd., 630 - 330 Fifth Avenue, S.W. Calgary Alberta. T2P 0L4

Ian Haugh

Working Interest and Royalty Owners  
 Within and Offsetting Proposed  
Waskada Lower Amaranth Pilot Waterflood

Working Interest Owner

Tracts

Omega Hydrocarbons Ltd.

W $\frac{1}{2}$ -30-1-25  
 A11 25-1-26  
 SW $\frac{1}{4}$  26-1-26  
 E $\frac{1}{2}$  23-1-26  
 N $\frac{1}{2}$  24-1-26  
 SE $\frac{1}{4}$  24-1-26  
 SW $\frac{1}{4}$  24-1-26 (50%)

Roxy-Clarion Petroleum Ltd.  
 (through farmout from Shell)

NE $\frac{1}{4}$  26-1-26  
 SW $\frac{1}{4}$  24-1-26 (50%)

Brosco Fund  
 Westmead  
 Corvair Oils Ltd.

E $\frac{1}{2}$  19-1-25 (37.5%)  
 E $\frac{1}{2}$  19-1-25 (37.5%)  
 E $\frac{1}{2}$  19-1-25 (25%)

Royalty OwnerTracts

Federal Crown	SW $\frac{1}{4}$ 30-1-25
Canada Trust	NE $\frac{1}{4}$ 30-1-25
H. F. Trewin	E $\frac{1}{2}$ 25-1-26
M. G. Founder	W $\frac{1}{2}$ 25-1-26
R. C. Rowe	NE $\frac{1}{4}$ 26-1-26
M. E. Hainsworth	SE $\frac{1}{4}$ 26-1-26
M. K. Hainsworth	NE $\frac{1}{4}$ 23-1-26
E. M. Hainsworth	SE $\frac{1}{4}$ 23-1-26
North American Royalties	NW $\frac{1}{4}$ 24-1-26 (25%)
G. F. McArthur	N $\frac{1}{2}$ 24-1-26 (50%) SW $\frac{1}{4}$ 24-1-26 (25%)
D. E. McGregor	N $\frac{1}{2}$ 24-1-26 (25%) SW $\frac{1}{4}$ 24-1-26 (25%)
Missilinda of Canada	NE $\frac{1}{4}$ 24-1-26 (25%)
Provincial Crown	SE $\frac{1}{4}$ 24-1-26
R. D. Jack	E $\frac{1}{2}$ 19-1-25 (16 2/3%)
J. S. Pedden	E $\frac{1}{2}$ 19-1-25 (33 1/3%)
Canada Permenant Trust	E $\frac{1}{2}$ 19-1-25 (50%)
J. H. Spelliscy	SW $\frac{1}{4}$ 24-1-26 (50%)

## MANITOBA

## Inter-Departmental Memo

To

Dr. I. Haugh  
Deputy Chairman  
Oil & Natural Gas Conservation Board

Date

August 12, 1982

From

L. R. Dubreuil  
Chief Petroleum Engineer  
Petroleum Branch

Telephone

Subject

RE: OMEGA PROPOSED WASKADA LOWER AMARANTH UNIT NO. 1 &amp; PILOT WATERFLOOD

The attached file contains correspondence with regard to Waskada Unit No. 1. (Note Jim Redgewell's comment that a hearing with regards to the unit agreement is not necessary in the event of approval of a unit agreement (74 (3) Mines Act). If a Unit Order is issued on application of a working interest order, a hearing is required.

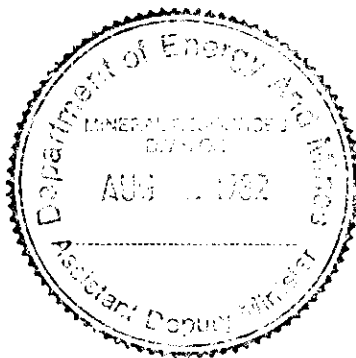
The Waskada Unit No. 1 case was complicated by the reluctance of Copperhead to join the unit. Also, as production history was available, recovery calculations and performance criteria could be considered in some detail. In the case of this application, although there are offset owners, it is not reasonable to require them to join a unit at this time as development is still ongoing and much of the well information is still confidential.

Based on the above, I propose that we proceed along the lines we discussed yesterday. i.e. -

1. Publication of notice - copies to offsetting working interest and royalty owners.
2. Inform Omega that form of Unit Agreement is satisfactory, direct Omega to obtain royalty owner consents and present to the Board for approval.
3. If notice yields no valid objections, approve pilot waterflood and issue P.M. order.
4. If notice yields valid objections, a hearing would be necessary.

*L. R. Dubreuil*  
L. R. Dubreuil

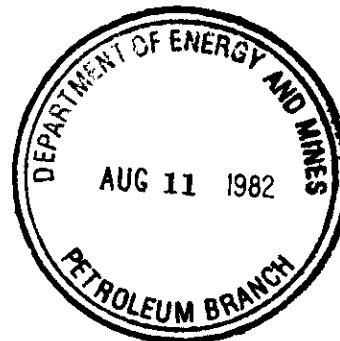
LRD/sb  
Att:



First | Fold

August 9, 1982

The Oil and Gas Natural  
Conservation Board  
993 Century Street  
Winnipeg, Manitoba



Attention: Dr. Ian Haugh  
Deputy Chairman

Dear Sirs:

RE: Proposed Waskada Lower Amaranth Unit No. 1

This letter is to summarize the July 28, 1982, conference telephone call between C. Moster, B. Dubreuil, G. Patey and E. Wyse; and to further clarify points affecting our proposed Waskada Lower Amaranth Unit No. 1.

1. Performance Monitoring of Pilot Flood

a) Omega Hydrocarbons Limited commits to determination of oil, gas and water production rates prior to the initiation of water injection on all Lower Amaranth wells within the unit except for 13-24. Well 13-24 has been excluded because the well will be placed on injection without a frac treatment and therefore initial rates would be much lower than normal and the cost to have an initial completion for production would not be justified by information that might be gained.

b) It is anticipated that initial bottom hole pressures will be obtained shortly after any Mississippian location within the unit is either recompleted or redrilled. This will supply seven evenly distributed initial pressures and while we anticipate doing all seven we assure the board we will do no less than four; one in each quarter section.

c) Monthly determination of oil, gas and water for all pilot wells after commencement of water injection will be determined by tests on a monthly or bi-monthly basis.

d) A static pressure survey on a representative number of wells will be performed between six and twelve months after start of water flood operations. Omega Hydrocarbons Limited will endeavor to supply the Board with a pressure survey proposal prior to its initiation.

e) Regarding individual well flow profile testing and control measures; at this time, Omega Hydrocarbons Limited will commit to at least one spinner type log on an injection well within the first year of operation. Further commitment by Omega Hydrocarbons Limited is considered objectionable with consideration for the accuracy and reliability of these techniques. More work may be attempted, however, we are reluctant to commit ahead of time to any specific program.

## 2. Water Injection System

The Petroleum Branch has agreed that routine injection pressure monitoring within the group satellites is permissible considering that the maximum anticipated pressure loss from satellite to wellhead is less than 1 psi.

## 3. Tract Factor Calculation

Tract Factor calculations have been done based upon remaining recoverable reserves under each respective tract. The process can be thought of as comprising two steps:

a) The log analysis technique, empirical in nature is a "flip-flopped" gamma ray log overlayed on the sonic log. This analysis yields a net porosity-meterage value for each well within the unit.

b) A reserve calculation based upon the above analysis, basic reservoir figures, and cumulative production to February 28, 1982.

Details of the first step; the log analysis, are being prepared by our Geologist, Mr. John Henderson, and will be forwarded directly, under separate cover. We would request that the details of this technique not be included with the basic unit documents and be held confidential by the Board. We recognize this information as Omega Hydrocarbons Limited "competitive edge" at Waskada.

Details of the second step; the reserve calculation, are included here as an attachment to this letter. We plan to include this with our unit document package that we will submit to the royalty interest owners. This should be considered as public record and represents our current best estimate of remaining recoverable reserves for the unit area.

## 4. Flash Liberation

Omega Hydrocarbons Limited plans to obtain sufficient flash liberation data from tests done on a recombinant sample at such time as steady state is reached with the oil gathering system currently under construction.

## 5. Production of Mississippian MC3a Reservoir

Omega Hydrocarbons Limited will continue to monitor production and performance of the above pool and will operate using good practice in order to maximize recovery.

## 6. Proposed Unit Agreement

As discussed in the preceding point 4, documents in support of tract factor calculations hopefully would be considered as a separate submission and would be considered confidential where appropriate. It is Omega Hydrocarbons' view, that having these support documents incorporated with the unit documents would greatly impair our future ability to negotiate with other working interest owners for expansions to the Unit.

## 7. Unit Well Allowables

We would request that wells within the unit be allowed to produce under good production practice; without allowable. As a stipulation to this waiving of allowable it would be reasonable to expect Omega Hydrocarbons Limited to replace voidage with due consideration for a timing lag with respect to updated calculations and current production. My letter of June 28, 1982, described how these calculations would be done.

Particularly if voidage is being replaced with injected water there is no reason to anticipate any adverse affect on the productivity and/or recovery from lands outside the unit area. In fact water injection within the unit should help maintain the pressure outside the unit boundaries.

Unit production under good production practice is requested for two sound reasons:

a) To evaluate the performance of the Lower Amaranth reservoir under water flood without any extraneous controls on production. It would be important to know whether well production under waterflood without allowable will cause any detrimental effects on recovery.

b) Economic justification of water flooding is generally based upon increased ultimate recovery. However, with a nine-spot pattern every fourth producing well is turned into a injection well with a resulting loss of productivity and allowable. An unrestricted allowable allows the producer additional economic incentive to justify this initial loss of revenue and the risk associated with water flooding.

## 8. Summary

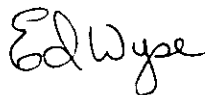
It is our hope that this letter and the forth coming dissertation regarding our log analysis will be sufficient to allay your remaining concerns regarding our waterflood and unitization plans.

We await your approval to send out the documents to the Royalty Owners.

(4)

Please do not hesitate to call either George Patey or myself on this (403-261-0743).

Yours truly,

A handwritten signature in cursive script that reads "Ed Wyse".

Ed Wyse  
Petroleum Engineer

EW/sp

cc: G. Patey - Omega  
J. Henderson - Omega  
B. Wilcox - Omega  
C. Moster - Petroleum Branch ✓

CALCULATION OF TRACT PARTICIPATION  
WASKADA LOWER AMARANTH UNIT #1

The calculation of tract participation has been done on the basis of remaining recoverable oil reserves as defined by the following formula:

$$U = (RF * 10114 * A * h * \phi * (1-S_w)/Bo_i) - Q$$

where:

U = remaining recoverable oil reserves in m<sup>3</sup>; RF = recovery factor for secondary recovery (assigned a 0.25 value by D & S Petroleum Consultants);

A = Area (16 ha per tract); h = pay thickness in metres;  $\phi$  = rock porosity as a decimal fraction; Sw = water saturation (0.40);

Bo<sub>i</sub> = Reservoir oil volume factor (1.17 by PVT analysis) and

Q = cumulative production to February 28, 1982 in m<sup>3</sup>.

TRACT	A*h (porosity-m)	Q (m <sup>3</sup> )	U (m <sup>3</sup> )	Tract Participation (%)
1	1.07	--	22199	4.4445
2	1.02	--	21162	4.2368
3	1.21	--	25103	5.0259
4	1.70	--	35269	7.0612
5	1.64	--	34025	6.8122
6	1.01	51.2	20903	4.1850
7	0.98	1236.0	19096	3.8232
8	1.47	--	30498	6.1060
9	1.71	--	35477	7.1029
10	1.53	--	31742	6.3551
11	1.66	--	34439	6.8950
12	1.90	--	39419	7.8921
13	1.96	1084.1	39579	7.9241
14	1.61	7.6	33395	6.6860
15	1.78	--	36929	7.3936
16	1.94	8.5	40240	8.0564
TOTAL	24.19	2387.4	499475	100.0000

July 16, 1982

Omega Hydrocarbons Ltd.  
630, 330 - 5th Avenue, S.W.  
Calgary, Alberta  
T2P 0L4

Attention: Mr. Ed Wyse

Dear Sir: Re: Proposed Waskada Lower Amaranth Unit No. 1

We have reviewed your letter to the Oil and Natural Gas Conservation Board, of June 28th, 1982, responding to the Board's letter of June 7, 1982.

While we are in general agreement with your proposal, we have a number of concerns and comments which we wish to present for your review. These items are discussed below in the order which they were discussed in the above mentioned letters.

1. (a & b) Performance Monitoring of Pilot Flood

While we concede that a certain amount of flexibility is required in any monitoring program, we also feel it is essential to plan a specific initial program. This program can be modified subsequently if necessary.

We feel a minimum program of monitoring flood performance should include the following elements.

a) Determination of oil, gas and water production rates for all wells prior to initiation of injection.

b) Determination of static reservoir pressure on a representative number of wells prior to initiation of injection.

c) Monthly determination of oil, gas and water rates on all wells in the pilot.

d) Determination of static reservoir pressure on a representative number of wells after six months and before one year of operation.

1. (c) We would reiterate that flow profile data would be useful in assessing the severity of stratification. Reservoir modelling will provide no new information regarding stratification but will only provide a reflection of input data (e.g. core analysis). Production performance will provide an "after the fact" indication of this factor. Flow profile data, however, will provide an early indication of this factor and would allow timely corrective measures if stratification appears more severe than originally anticipated.

2. Injection System

With respect to the optimum location of injection wellhead pressure determination, we concede that even a wellhead injection pressure is a considerable distance removed from the actual injecting (or bottom hole flowing) pressure. However, we note that this distance (i.e. depth of well) is quite consistent from well to well whereas the flow line lengths from the satellites to the wellheads, vary considerably. Consequently, we maintain that the wellhead injection pressure is a more valid measure of injection conditions than a "satellite pressure". Moreover, determination of wellhead pressures would force frequent visits to all injecting wells which, in our opinion, would probably result in a superior overall operation.

- 3 (a) We agree with your suggestion that pore volume values can best be generated by use of logs calibrated by core analysis given the data presently available. However, if a log interpretation method is to be used to generate these figures, it is necessary to document the methodology in order to ensure consistency in interpretation. We have employed the methodology which was used in your submission, as we understand it, in order to verify the pore volume values presented. The method used consisted of:
  - 1) identification of effective pay through the overlay of an inverted "flip-flopped" gamma-ray curve on the sonic curve. The curves were adjusted so that they are roughly co-incident in the upper part of the Lower Amaranth. Curve separation (with the gamma-ray to the right) of more than 10 microseconds/m sonic units was interpreted as indicating a zone of greater than 1 md. permeability.
  - 2) calculation of pore volume in these permeable zones using a linear sonic velocity/porosity calibration determined from core analysis as follows:

<u>Sonic vel. (US/m)</u>	<u>Porosity</u>
200	0
250	10
300	20

Attached are traces of the logs from all wells, in the proposed unit with valid logs, showing identification of effective pay and the pore volume calculation plus a table summarizing pore volume figures obtained from this analysis and those contained in your submission.

Please review this material and confirm that the methodology used is consistent with what is used by Omega and comment on the discrepancies in the values obtained.

3. (c) Are there any plans to obtain flash liberation data at such time when the surface separation conditions have been adequately defined. Although the "shrinkage factor" in the oil in place calculation can be approximated from differential liberation data, flash liberation data provides a more accurate result.

4. Production of Mississippian MC3a Reservoir

Our question in this regard was not meant to suggest a delay of the Lower Amaranth Waterflood to allow concurrent production of the MC3a on a 40 acre basis. Our intent was to point out that a change in the producing regime in this reservoir would occur and that consideration should be given as to how recovery from the zone could be maximized. Stated another way, are there things that should be considered now (e.g. monitoring of production rates from MC3a wells, periodic analyses of MC3a performance, etc.) to ensure recovery from the MC3a reservoir is not adversely affected by conversion of a number of wells presently completed in the MC3a to the Lower Amaranth.

5. Proposed Unit Agreement

With respect to provisions for enlargement of the Unit, we would suggest that the proposed Agreement be modified to indicate that tract participation factors for additional tracts included in the Unit through an enlargement be determined in the same manner as the tract factors for the original Unit. Further to this, it would be desirable to incorporate a documentation of the method of determining pore volume, oil in place, ultimate recoverable reserves and remaining recoverable reserves as either an appendix to the Agreement or as a formal submission to the Board in support of the unitization application.

Pending your comments with regards to the foregoing we are prepared to meet with you at your convenience if you feel further discussion is warranted. If you indicate you are in general agreement with the concerns raised here, we will indicate to the Board, our general concurrence and recommend that the approval procedure (by Publication of Notice and/or Hearing) be resumed.

Yours sincerely,

Original Signed By  
L. R. DUBREUIL

L. R. Dubreuil  
Chief Petroleum Engineer  
Petroleum Branch

LRD/sb

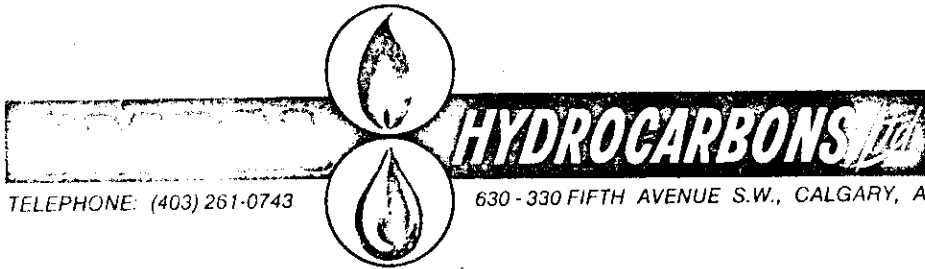
cc:-The Oil and Natural Gas Conservation Board  
-H. C. Moster

APPENDIX 1

$\phi$ -m Determinations from Logs

<u>Well</u>	<u>Submitted by Omega</u>	<u>Our Analysis</u>
9-24	1.07	1.02
10-24	1.02	1.08
11-24	1.21	1.25
12-24	1.70	.87
13-24	1.64	1.16
14-24	1.01	.85
15-24	.98	.57
A16-24	1.47	.87
1-25	1.71	1.29*
2-25	1.53	.87*
3-25	1.66	.89
4-25	1.90	1.14
5-25	1.96	1.27
6-25	1.61	1.23
7-25	1.78	1.16
A8-25	1.94	1.70

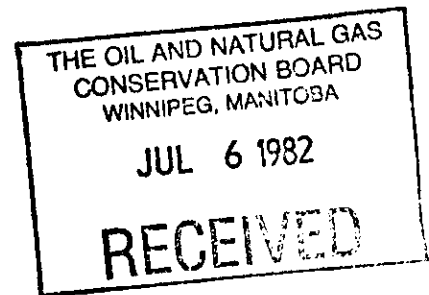
\* - extrapolated (log not considered reliable)



June 28, 1982

The Oil and Natural Gas Conservation Board  
156 Legislative Building  
Winnipeg, Manitoba  
R3C 0V8

Attn: Dr. Ian Haugh  
Deputy Chairman



Dear Sirs:

Re: Proposed Waskada Lower Amaranth Unit No. 1

This letter will address each of the points raised in your June 7 letter on the above. Firstly however, I would like to inquire as to the status of our application; a subject not mentioned in your letter. Is approval pending successful resolution of the points of your letter? Next, dealing with your comments in turn:

1. Performance Monitoring of Pilot Flood.

Waterflood monitoring can quite adequately be done by accurately testing and recording well production (oil, water and gas); injection volume and pressure; and occasionally, both pumping and static fluid levels. Prior to the initiation of the water flood, new satellite testing facilities will have been installed insuring accurate production determination. Injection water will be measured and pressure recorded at the satellites routinely. Fluid levels on producing wells will be discretionary and be taken as indicated.

With respect to point c) and d) concerning reservoir stratification and its effects, we have no plans to introduce any elaborate testing or preventative procedures to combat this. It is fully expected that in order to obtain adequate injectivity it will be necessary to frac the injection wells. That being the case, there will exist a highly permeable vertical fracture between the formation strata preventing even an attempt at selective injectivity. In any case, pending reservoir modelling and actual production monitoring of the proposed pilot will establish how serious this problem may be; and only after the need is established, will Omega undertake expensive and untrustworthy procedures to control selective injectivity.

2. Injection System.

a) As described in my application, injection pressures will be routinely measured with a gauge at the satellite and recorded. With respect to this point it must be pointed out that the criterion for selecting routine

Monitoring procedures are ease of accessibility. In addition, for more accurate measurement of pressures to be used in any reservoir work it is necessary to at least correlate these pressures with a deadweight measurement at the wellhead or a bottom hole gauge. In any event, one has to remember that even a wellhead pressure is still almost 1000 metres from the pressure that is most critical; that being the sandface pressure and that friction losses at the anticipated well rates should be minimal.

b) Distribution of injection water will ideally be controlled by production rates, i.e. the more fluid produced from an injection pattern the more are injected into it. Initially a nine-spot injection pattern will be used. (named for the fact that a single pattern for each injection well includes eight producing wells immediately surrounding it.)

In order to calculate the ideal rate for each injection well the first step is to calculate the producing rate in reservoir barrels for each producing well. This will be done with a formation volume factor of 1.17 for oil and 1.00 for water. All gas will be solution gas and will be accounted for in the formation volume factor for oil.

The replacement volume for each pattern or for each injection well is the sum of 1/2 of the reservoir volume rate for each production well directly N, S, E, or W of the injection well and 1/4 of the reservoir volume rate for each production well directly NW, NE, SW or SE of the injection well. (See attachment) Normally approximately 5-10% excess would be used to allow for reservoir fill up, losses, inaccuracies, etc., however, in this instance because there initially will be no back up injection from neighboring patterns a 50-60% excess will be targetted. It is important to remember however that these plans are only targets and if actual injectivity falls short changes will have to be made, possibly including changing the injection pattern.

c) Produced water will not be restricted to Lower Amaranth water, but will include all water produced at Omega's Waskada battery.

d) No compatibility problems are anticipated between produced water and the Swan River Formation water. Compatibility tests are currently being done on Lower Amaranth and Swan River waters.

### 3. Recoverable Reserves.

a) The pore volume map included with our application was generated by using logs calibrated by core analysis .

b) At this time, no studies of core stratification have been undertaken. This work alone with much more will be undertaken with the reservoir study not yet undertaken.

c) Attached are supporting calculations used to determine the estimate of waterflood ultimate recoverable reserves. It will be noted that this estimate of reserves was obtained by applying a 25% recovery factor as a

percentage of original oil in place. D & S Petroleum Consultants have used this experience based factor for calculating Omega reserves and presently none better exists. While it is conceivable, if not likely, that the recovery factor will be adjusted after more detailed studies have been completed; it is not expected that the relationship of one tract factor to another within the proposed unit will be more than insignificantly changed.

d) Attached is a proposal from Core Laboratories for the special core studies to be done on the proposed oil base core for the twin well in Lsd. 3 Section 25-1-26 W4M. At this time, we anticipate fully implementing these proposals.

c) The PVT analysis tests done previously did not include a flash liberation. Major changes being made to the gathering system at Waskada did not allow a reasonable fix on the appropriate conditions to do this test.

4. Production of Mississippian MC - 3a Reservoir.

In regard to this matter, it is Omega's current belief that ultimate recovery of this pool will not be effected by implementing 80 acre spacing and certainly will not be effected by these changes pending a more thorough examination of this situation. The obvious economic incentives of a successful Lower Amaranth water flood should not be jeopardized by spurious academic pursuits. Omega has no less a vested interest in obtaining optimum production from the Mississippian Formation but this is clearly a case of "first things first".

5. Proposed Unit Agreement.

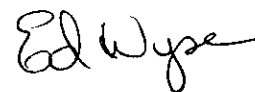
a) The proposed unit agreement is, almost verbatim, identical to countless other unit agreements currently in place throughout Western Canada.

b) Be advised that upon your suggestion Omega has revised its tract Areas to one DSU or 40 acres.

I trust that the above adequately addresses your concerns and would invite you to contact me by telephone (261-0743) if I can be of further assistance. We are anxious to know of the status of this application and are currently preparing a package to accompany the unit agreement for execution by the Royalty Interest Owners.

Yours truly,

OMEGA HYDROCARBONS LTD.



W. E. Wyse  
Petroleum Engineer

WEW/ms

cc: L. R. Dubreuil  
Chief Petroleum Engineer  
Petroleum Branch

EXAMPLE CALCULATION OF  
WATER INJECTION DESIRED FOR  
WASKADA 15-24-1-26 WIM

Define  $q_{9-24}^w$  = Average water production rate for Waskada 9-24.

$q_{14-24}^o$  = Average oil production rate for Waskada 14-24.

$q_{15-24}^I$  = Average water injection rate for Waskada 15-24.

$$\begin{aligned}
 q_{15-24} = & (1.5)1/4(1.17 q_{9-24}^o + q_{9-24}^w) + (1.5)1/2(1.17 q_{10-24}^o + q_{9-24}^w) \\
 & + (1.5)1/4(1.17 q_{11-24}^o + q_{11-24}^w) + (1.5)1/2(1.17 q_{14-24}^o + q_{14-24}^w) \\
 & + (1.5)1/4(1.17 q_{3-25}^o + q_{3-25}^w) + (1.5)1/2(1.17 q_{2-25}^o + q_{2-25}^w) \\
 & + (1.5)1/4(1.17 q_{1-25}^o + q_{1-25}^w) + (1.5)1/2(1.17 q_{16-24}^o + q_{16-24}^w)
 \end{aligned}$$

CALCULATION OF TRACT PARTICIPATION  
WASKADA LOWER AMARANTH UNIT #1

The calculation of tract participation has been done on the basis of remaining recoverable oil reserves as defined by the following formula:

$$U = (RF * 10114 * A * h * \phi * (1-S_w)/Bo_i) - Q$$

where:

U = remaining recoverable oil reserves in m<sup>3</sup>; RF = recovery factor for secondary recovery (assigned a 0.25 value by D & S Petroleum Consultants);

A = Area (16 ha per tract); h = pay thickness in metres;  $\phi$  = rock porosity as a decimal fraction; Sw = water saturation (0.40);

Bo<sub>i</sub> = Reservoir oil volume factor (1.17 by PVT analysis) and

Q = cumulative production to February 28, 1982 in m<sup>3</sup>.

<u>TRACT</u>	<u>A*h</u> (porosity-m)	<u>Q</u> (m <sup>3</sup> )	<u>U</u> (m <sup>3</sup> )	<u>Tract Participation</u> (%)
1	1.07	--	22199	4.4445
2	1.02	--	21162	4.2368
3	1.21	--	25103	5.0259
4	1.70	--	35269	7.0612
5	1.64	--	34025	6.8122
6	1.01	51.2	20903	4.1850
7	0.98	1236.0	19096	3.8232
8	1.47	--	30498	6.1060
9	1.71	--	35477	7.1029
10	1.53	--	31742	6.3551
11	1.66	--	34439	6.8950
12	1.90	--	39419	7.8921
13	1.96	1084.1	39579	7.9241
14	1.61	7.6	33395	6.6860
15	1.78	--	36929	7.3936
16	1.94	8.5	40240	8.0564
<u>TOTAL</u>	<u>24.19</u>	<u>2387.4</u>	<u>499475</u>	<u>100.0000</u>



1982 05 26

Omega Hydrocarbons Ltd.  
630, 340 - Fifth Avenue S.W.  
Calgary, Alberta  
T2P 0L4

Attention: Mr. John Henderson

Re: Waskada Spearfish Special Core Studies

As per our conversation of 1982 05 19, please find attached a Special Core Analysis Project Proposal for the Waskada Spearfish formation.

The analysis recommendations presented should provide the data base for the water flood evaluation.

Minimum sample requirements for proper representation are suggested to achieve the desired data base. Analytical procedures and the costs of these services are itemized individually.

Actual sample selection can be made entirely from Omega Hydrocarbons Waskada 6-26-1-26 W1M well, which is currently at Core Laboratories-Canada, Ltd.

Additional petrographic work may also be beneficial to the water flood evaluation. Analytical costs of these services are also included.

Your confirmation of the proposal will initiate laboratory work.

Should you have any questions or comments concerning this proposal, please contact Nestor Cebuliak or myself.

Yours truly,

CORE LABORATORIES-CANADA, LTD.

A handwritten signature in dark ink, appearing to read "Patti Colquhoun", is written over the company name.

Patti Colquhoun  
Sales Representative

Enclosure  
PC/tlb

SPECIAL CORE ANALYSIS PROJECT PROPOSAL  
FOR  
OMEGA HYDROCARBONS LTD.

<u>Analytical Recommendations</u>	<u>Minimum Number of Samples Required</u>	<u>Unit Price</u>	<u>Total Price</u>
1. Porosity and permeability measured at four simulated net overburden pressures.	4	\$ 140.00	\$ 560.00
2. Liquid permeability as a function of throughput (with reversal) room temperature:			
a) with simulated formation water.	2	360.00	720.00
b) with proposed injection fluid.	2	236.00	472.00
3. Capillary pressure Porous place cell-air brine six desaturation pressures, 240 kPa maximum.	5	338.00	1,690.00
4. Electrical Resistivity Measurements:			
a) Formation resistivity factors (at one overburden pressure).	5	326.00	1,630.00
b) Resistivity index (in conjunc- tion with capillary pressures, six liquid saturations per plug).	5	252.00	1,260.00
5. Relative Permeability Tests:			
a) Water-oil relative permeability (water saturation increasing).	5	1,280.00	6,400.00
b) Gas-oil relative permeability (gas saturation increasing) (with initial water saturation)	2	1,280.00	2,560.00
6. Formation and Injection Water Analysis and Compatibility Check (two - one litre samples of each water are required):			
a) Routine Water Analysis (includes calcium, magnesium, chloride, bicarbonate, sulphate, carbonate, hydroxide, sodium, potassium, presence or absence of iron and barium, pH, resistivity and refractive index).			
Formation Water	1	98.00	98.00
Injection Water	1	98.00	98.00
b) Compatibility Check (reservoir and injection waters). Measure- ment of precipitates for various dilution ratios.	1	44.00	44.00
TOTAL			<u>\$15,532.00</u>

PETROGRAPHIC SERVICES

1. Mineral Content by X-Ray Diffraction

Total sample and clay analysis, less than five micrometre particle size separated, resulting fractions analyzed separately. The samples are oriented, glycolated, heat-treated, acidized when necessary, and scanned at a slow rate.

\$315.00/sample

2. Thin Section

Thin section preparation and petrographic description.

\$130.00/sample

3. Scanning Electron Microscopy

One set of photographs including Energy Dispersive X-Ray Analysis as required.

\$210.00/sample

NOTE: We recommend the above on at least the same samples as in 5a).



1982 05 26

Omega Hydrocarbons Ltd.  
630, 340 - Fifth Avenue S.W.  
Calgary, Alberta  
T2P 0L4

Attention: Mr. John Henderson

Re: Waskada Spearfish Special Core Studies

As per our conversation of 1982 05 19, please find attached a Special Core Analysis Project Proposal for the Waskada Spearfish formation.

The analysis recommendations presented should provide the data base for the water flood evaluation.

Minimum sample requirements for proper representation are suggested to achieve the desired data base. Analytical procedures and the costs of these services are itemized individually.

Actual sample selection can be made entirely from Omega Hydrocarbons Waskada 6-26-1-26 WIM well, which is currently at Core Laboratories-Canada, Ltd.

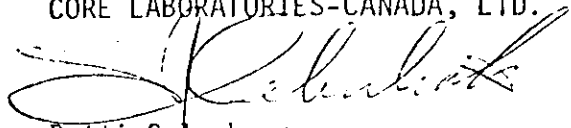
Additional petrographic work may also be beneficial to the water flood evaluation. Analytical costs of these services are also included.

Your confirmation of the proposal will initiate laboratory work.

Should you have any questions or comments concerning this proposal, please contact Nestor Cebuliak or myself.

Yours truly,

CORE LABORATORIES-CANADA, LTD.

  
Patti Colquhoun  
Sales Representative

Enclosure  
PC/tlb

SPECIAL CORE ANALYSIS PROJECT PROPOSAL  
FOR  
OMEGA HYDROCARBONS LTD.

<u>Analytical Recommendations</u>	<u>Minimum Number of Samples Required</u>	<u>Unit Price</u>	<u>Total Price</u>
1. Porosity and permeability measured at four simulated net overburden pressures.	4	\$ 140.00	\$ 560.00
2. Liquid permeability as a function of throughput (with reversal) room temperature:			
a) with simulated formation water.	2	360.00	720.00
b) with proposed injection fluid.	2	236.00	472.00
3. Capillary pressure Porous place cell-air brine six desaturation pressures, 240 kPa maximum.	5	338.00	1,690.00
4. Electrical Resistivity Measurements:			
a) Formation resistivity factors (at one overburden pressure).	5	326.00	1,630.00
b) Resistivity index (in conjunc- tion with capillary pressures, six liquid saturations per plug).	5	252.00	1,260.00
5. Relative Permeability Tests:			
a) Water-oil relative permeability (water saturation increasing).	5	1,280.00	6,400.00
b) Gas-oil relative permeability (gas saturation increasing) (with initial water saturation)	2	1,280.00	2,560.00
6. Formation and Injection Water Analysis and Compatibility Check (two - one litre samples of each water are required):			
a) Routine Water Analysis (includes calcium, magnesium, chloride, bicarbonate, sulphate, carbonate, hydroxide, sodium, potassium, presence or absence of iron and barium, pH, resistivity and refractive index).			
Formation Water	1	98.00	98.00
Injection Water	1	98.00	98.00
b) Compatibility Check (reservoir and injection waters). Measure- ment of precipitates for various dilution ratios.	1	44.00	44.00
TOTAL			<u>\$15,532.00</u>

PETROGRAPHIC SERVICES

1. Mineral Content by X-Ray Diffraction

Total sample and clay analysis, less than five micrometre particle size separated, resulting fractions analyzed separately. The samples are oriented, glycolated, heat-treated, acidized when necessary, and scanned at a slow rate.

\$315.00/sample

2. Thin Section

Thin section preparation and petrographic description.

\$130.00/sample

3. Scanning Electron Microscopy

One set of photographs including Energy Dispersive X-Ray Analysis as required.

\$210.00/sample

NOTE: We recommend the above on at least the same samples as in 5a).

EXHIBIT "B"

Attahced to and made part of an Agreement entitled  
"Unit Agreement - Waskada Lower Amaranth Unit No. 1"

Rge 26 WPM

Rge 25 WPM

35	36	31																								
26	<table><tr><td colspan="4">25</td></tr><tr><td>13</td><td>14</td><td>15</td><td>16</td></tr><tr><td>12</td><td>11</td><td>10</td><td>9</td></tr><tr><td>5</td><td>6</td><td>7</td><td>8</td></tr><tr><td>4</td><td>3</td><td>2</td><td>1</td></tr><tr><td colspan="4">24</td></tr></table>	25				13	14	15	16	12	11	10	9	5	6	7	8	4	3	2	1	24				30
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Twp 1

# COPY

June 7, 1982

Omega Hydrocarbons Ltd.  
630, 330 - 5th Ave. S.W.  
Calgary, Alberta.  
T2P 0L4

Attention: Mr. Ed Wyse, Petroleum Engineer

Dear Sir:

Re: PROPOSED WASKADA LOWER AMARANTH UNIT NO. 1

This will acknowledge receipt of your letter of May 19, 1982 in which you applied for approval of a pilot waterflood scheme for the Lower Amaranth Formation in the Waskada area.

Your application and attached proposed unitization agreement have been reviewed and a number of points have arisen to which the Board requests you give further consideration. These points are listed below.

1. Performance Monitoring of Pilot Flood

As one of the main objectives of a pilot flood is the determination of both the technical and economic viability of a full scale flood, it will be necessary to implement a comprehensive performance monitoring program. Such a program can be sufficiently flexible to react to flood experience but should include:

- a) Determination of reservoir pressure prior to initiating injection and at periodic intervals during the life of the pilot flood.
- b) Determination of producing gas-oil ratios before and during the pilot flood.
- c) Prior to water breakthrough in the producing wells, determination of the severity of reservoir stratification and potential by-pass of oil (e.g. flow profile or equivalent surveys in fractured and unfractured injectors may be useful).

- d) Proposed method of counteracting stratification if it seriously hinders flood performance (e.g. selective recompletion of injectors etc.).

## 2. Injection System

- a) Your application indicates that injection pressure will be measured at the satellite plants. However, as the injectors are located at varying distances from the satellites, this pressure measurement will not reflect the actual wellhead pressure in either absolute or relative terms. Your comments in this regard are requested.
- b) Your application indicates that injection volumes will be controlled by chokes located at the well satellites. What basis (e.g. pore volume, area, etc.) will be used for determining the water distribution.
- c) Will produced water be entirely Lower Amaranth or will there be some Mississippian water as well?
- d) Do you anticipate any problems of compatability between the produced water and the Swan River Formation water?

## 3. Recoverable Reserves

- a) What is the basis of the pore volume map included in your application (e.g. logs alone, logs calibrated by core analysis, etc.)?
- b) Have any studies of core analysis data been undertaken to estimate the degree of reservoir stratification?
- c) You are requested to provide supporting calculations used to determine the estimate of waterflood ultimate recoverable reserves which were used to determine proposed tract factors.
- d) With regard to the oil based core which is programmed for the proposed twin well in Lsd. 3 Section 25-1-26, what laboratory determinations are planned (e.g. connate water, relative permeability etc.)?
- e) Did the PVT fluid analyses tests include flash liberation or separator test data?

## 4. Production of Mississippian MC-3a Reservoir

Proposed conversion of four current Mississippian producers to Lower Amaranth completions in effect results in 80 acre spacing for the MC-3a pool. It is requested therefore that you provide a review of the effects that this would have on ultimate recovery and producibility of the MC-3a zone. This review should also discuss possible future options, including additional drilling, which might be considered for maximizing recovery from this zone.

5. Proposed Unit Agreement

a) The Board would be interested in learning the origin of the format for the proposed unit agreement. For example, is the proposed agreement patterned after unit agreements in effect elsewhere or was it specifically designed for this situation?

b) With respect to determination of tract factors on a quarter section basis, you will be aware that it is the normal practice in other Units in Manitoba to establish tracts on the basis of drilling spacing units (i.e. one legal subdivision). This approach facilitates calculation of Provincial Crown Royalties and oil taxes, and would avoid future complications which could arise if a quarter section having non-uniform mineral ownership were to be included in the Unit.

Yours sincerely,

ORIGINAL SIGNED BY

IAN HAUGH

Ian Haugh  
Deputy Chairman  
The Oil & Natural Gas  
Conservation Board

IH/sb

cc: Petroleum Branch

### Comments On Proposed Unit Agreement

1. Substantially different from "Virden Unit agreements" partially because many provisions pertaining to working interest owners have been omitted.

2. Format is very similar to a typical Alberta Unit. Terms for enlargement are again solely on the determination of the working interest owners. Similar in format to Waskada Unit No. 1 except that in Waskada Unit No. 1, an interim tract participation based on production over last 12 months was included. Final participation was based on remaining recoverable reserves. On enlargement participation was as determined by the working interest owners.

3. Tract participation is based on ultimate reserves less cumulative production as of March 1, 1982. Ultimate reserves determinations are not spelled out in unit agreement. I agree on the basis of tract participation, and having regard for the lack of production data, any "productivity" factor would be impossible to incorporate at this time.

4. Tract participation on an enlargement is determined by "the Working Interest Owners". This could lead to a situation whereby an adjacent operator may be ~~regarded~~<sup>required</sup> by the Board for conservation purposes to enter the unit and have tract participation dictated to by the sole Working Interest owner (Omega). I would suggest that it be set up to specify that tract participation be determined on the basis of remaining recoverable reserves as determined by:

- a) either a specific formula/inclusion of pore volume, productivity etc.) or
- b) a specific determination by a designated entity (perhaps the Board)

Option (b) has the advantage of flexibility. However, if the Board makes the determination, the possible future inclusion of Crown tracts would pose a conflict situation.

Perhaps the best would be to say tract participation to be determined on the basis of remaining reserves as agreed upon by the Working Interest owners and the Petroleum Branch staff with recourse to the Board if no agreement can be reached.

5. If future inclusion of tracts in the Unit results in more than one working interest owner, there will have to be either a major revision of this agreement or a parallel agreement made. The current agreement involves a number of clauses that would be included in such an agreement. I would suggest that all clauses implying plurality of working interest owners be eliminated and a clause added in the section on enlargement spelling out the steps that would be taken if a second working interest owner is involved.

6. No provision, similar to those in the "Virden Units" for rehearing or reconsideration by the Board is included. If the Board is to be involved in determining the basis for enlargements, then a clause providing for that involvement should be included.



recovery from the zone could be maximized. Stated another way, are there things that should be done now to ensure that conversion of a number of MC3a wells to the Lower Amaranth will not adversely affect recovery (e.g. plan for production monitoring of MC3a producers.)



May 19, 1982

The Chairman  
The Oil and Natural Gas Conservation Board  
993 Century Street  
Winnipeg, Manitoba

THE OIL AND NATURAL GAS  
CONSERVATION BOARD  
WINNIPEG, MANITOBA

MAY 25 1982

RECEIVED

Dear Sir:

Re: Proposed Waskada Lower Amaranth Unit No. 1

Omega Hydrocarbons, by this letter, wishes to apply for approval for a pilot waterflood scheme for the Lower Amaranth formation in the Waskada area. In support of this application we offer the following attachments and appendices:

- 1) Description of the proposed waterflood plan and development strategy.
- 2) Map of the area showing the lessors.
- 3) Map of the area showing the lessees.
- 4) Map of the area showing the status of each well.
- 5) Map of the area showing the pore volume distribution of the unit area (porosity-meters) and the proposed injection pattern.
- 6) A copy of the reservoir fluid study as sampled at Waskada 8-26-1-26 WLM.
- 7) A schematic plan of the proposed water distribution system.
- 8) A plot plan of the proposed water distribution system, and
- 9) A draft of the proposed Unit Agreement.

The proposed Lower Amaranth inverted nine-spot waterflood pilot is expected to add valuable insight and data in the following areas:

- 1) The injectivity of both fraced and unfraced wells. Is injecting into unfraced Lower Amaranth wells a viable alternative in order to minimize by-pass of floodable oil? Will a nine-spot pattern supply enough injectivity or will a higher injector to producer ratio be required?
- 2) What is the sustained productivity of the Blairmore source well at 11-29-1-26 WLM? Its productivity has not yet been taxed.
- 3) There is speculation that water break through could be very early through high permeability streaks and further that extended fractures could have a distinct directional feature. A pilot would not only aid in developing commercial scale economic analysis, it would also determine the degree of directional permeability and its repeatability. Both of these items will be vital in

- assessing a commercial flood.
- 4) Hopefully the pilot waterflood will help to assess the full, unrestricted production potential of the Lower Amaranth formation as well as help to determine if, under waterflood, unrestricted flow is detrimental to recovery.

Further to point (4) and in addition to our application to initiate a pilot waterflood, Omega would also like to formally apply for a suspension of the Maximum Permissible Rates (MPR's) for the proposed Unit area for the life of this pilot study. We feel that producing the Unit unconstrained by allowable may be necessary to fully assess the merits of water flooding and also would supply some more incentive for Omega to risk conversion of four producing wells to injection. The proposed pilot waterflood will be operated simultaneously as Omega's consulting engineering company studies the expansion to commercial water flood.

At this time Omega is also soliciting the signatures of the Royalty Interest owners to the Unit Agreement of the Waskada Lower Amaranth Unit No. 1. As a Unit Operating Agreement appears to be largely redundant, with only one working interest owner, none will be drafted. We respectfully invite your comments regarding the format of the draft Agreement and will be more formally applying for recognition of the Unit when the documents have been signed.

We concede that this application is very general in nature and does not have included the detail that would normally accompany an application for a commercial waterflood project. Please identify any deficiencies in this application as soon as possible in order that we can eliminate them. It is our hope that a working pilot can be in place and operating by the end of 1982. Please direct any comments or questions to the undersigned.

Yours truly,

OMEGA HYDROCARBONS LTD.

*Ed Wyse*

E. Wyse  
Petroleum Engineer

cc: L.B. Dubreuil  
Chief Petroleum Engineer  
Department of Energy and Mines  
Petroleum Branch  
989 Century Street  
Winnipeg, Manitoba  
R3H 0W4

APPENDIX 1  
DESCRIPTION OF THE PROPOSED WATERFLOOD PLAN  
AND DEVELOPMENT STRATEGY

---

A. GENERAL

Omega anticipates that the pilot waterflood of the Lower Amaranth formation would be carried out simultaneously with further testing and computer simulation that will determine the ultimate configuration and viability of commercial waterflood development. As development drilling may be ongoing for one to three years in the area and because a commercial waterflood scheme may be difficult to implement while the areal extent of the pool is continually being expanded it would seem prudent to utilize this development period to assess the potential of waterflood.

B. WELL STATUS

In order to implement the proposed inverted nine-spot 40 acre spacing waterflood it will ultimately be necessary to have 16 Lower Amaranth wells in the Unit. The following program will achieve this goal while allowing depletion of the Lower Alida formation:

- 1) Wells 10-24, 11-24, 14-24, 15-24, 16-24, 5-25, 6-25, 7-25 and 8-25 will remain as Lower Amaranth completions.
- 2) Twin wells will be drilled at 12-24, 1-25 and 3-25. Well 3-25 has been picked for an oil-based Lower Amaranth core. Because the Lower Alida formation is much steeper dipping and hence more sensitive as to location, the best Lower Alida well between the original well and the redrill will be completed as a Lower Alida well. Its complement will be completed as a Lower Amaranth well.
- 3) Lower Alida wells at 9-24, 13-24, 2-25 and 4-25 will be recompleted as Lower Amaranth wells.
- 4) Lower Amaranth wells 13-24, 15-24, 5-25 and 7-25 will become water injection wells. The 15-24 and 5-25 wells have already been fraced, however the fracs for 13-24 and 7-25 will be deferred until sometime after being placed on injection.

C. WATER SOURCE

The injection water for the waterflood will be a mix of produced water from the area combined with Blairmore water from the source well at 11-29-1-25 WIM. Indications are that there is ample productivity from the 11-29 well and a down hole pump will be installed only as required. The Blairmore source water will flow through the existing 3 inch 100 psi working pressure steel line to the 11-30 battery and a 500 barrel fibre glass tank. Produced water from the treater at the battery will also flow to the same tank and be mixed there.

D. WATER DISTRIBUTION SYSTEM

The water from the tank at the 11-30 battery will be pumped with a small charge pump to the high pressure pump after being filtered and inhibited. The system downstream of the high pressure pump will be rated for 1200 psig working

pressure with ANSI 600 flanges and fittings and 3 inch O.D., 0.188 inch wall thickness Grade B Steel pipe. The water will be delivered in main lateral lines to the satellites where it will be split through a header and each well's rate will be metered, pressure gauged and controlled with a choke. The proposed distribution system appears somewhat cumbersome for the proposed pilot, however, its design has been picked to complement the speedy and cost efficient future conversion of wells to injection as the water flood grows. The satellite system will be completely compatible with the oil gathering system and therefore be most flexible if the injection is ever revised from that chosen for the pilot.

#### E. WATER INJECTION WELLS

The water injection wells will be installed with internally coated tubing and packer. The tubing/casing annulus will be filled with corrosion inhibited water and will be monitored regularly to insure packer segregation. Because the choke, meter and pressure gauge for the injection wells will be located within the satellite buildings which will be visited regularly by our operators, it is anticipated that operational problems will be minimized.

#### F. OIL GATHERING SYSTEM

Oil production will be gathered through separate well flowlines to the satellites where all testing will be done. One well at a time will be tested through a test separator and the production recombined with the group production and sent in one flowline to the main battery at 11-30. This system will allow at least 2 tests per month for each producing well and be fully compatible with the water system.

# PROPOSED WASKADA LOWER AMARANTH UNIT No.1

MAP SHOWING LESSORS

Rge 26 WPM

Rge 25 WPM

26	R.C. Rowe 100%	M.G. Pounder 100%	H.F. Trewin 100%	Canada Trust 100%	
	M.E. Hainsworth 100%	M.G. Pounder 100%	H.F. Trewin 100%	Dept. of Energy, Mines & Res. 100%	30
	M.K. Hainsworth 100%	N.A. Royalties 25% G.F. McArthur 50% D.E. McGregor 25%	G.F. McArthur 50% D.E. McGregor 25% Missilinda 25%	R.D. Jack 16 2/3% J.S. Redden 33 1/3% Can. Perm. Trust 50%	
23	E.M. Hainsworth 100%	G.F. McArthur 25% D.E. McGregor 25%	Dept. of Ener., Mines & Res. 100%	R.D. Jack 16 2/3% J.S. Redden 33 1/3% Can. Perm. Trust 50%	19

Twp 1

MAY 12, 1962

# PROPOSED WASKADA LOWER AMARANTH UNIT No.1

MAP SHOWING LESSEES

Rge 26 WPM

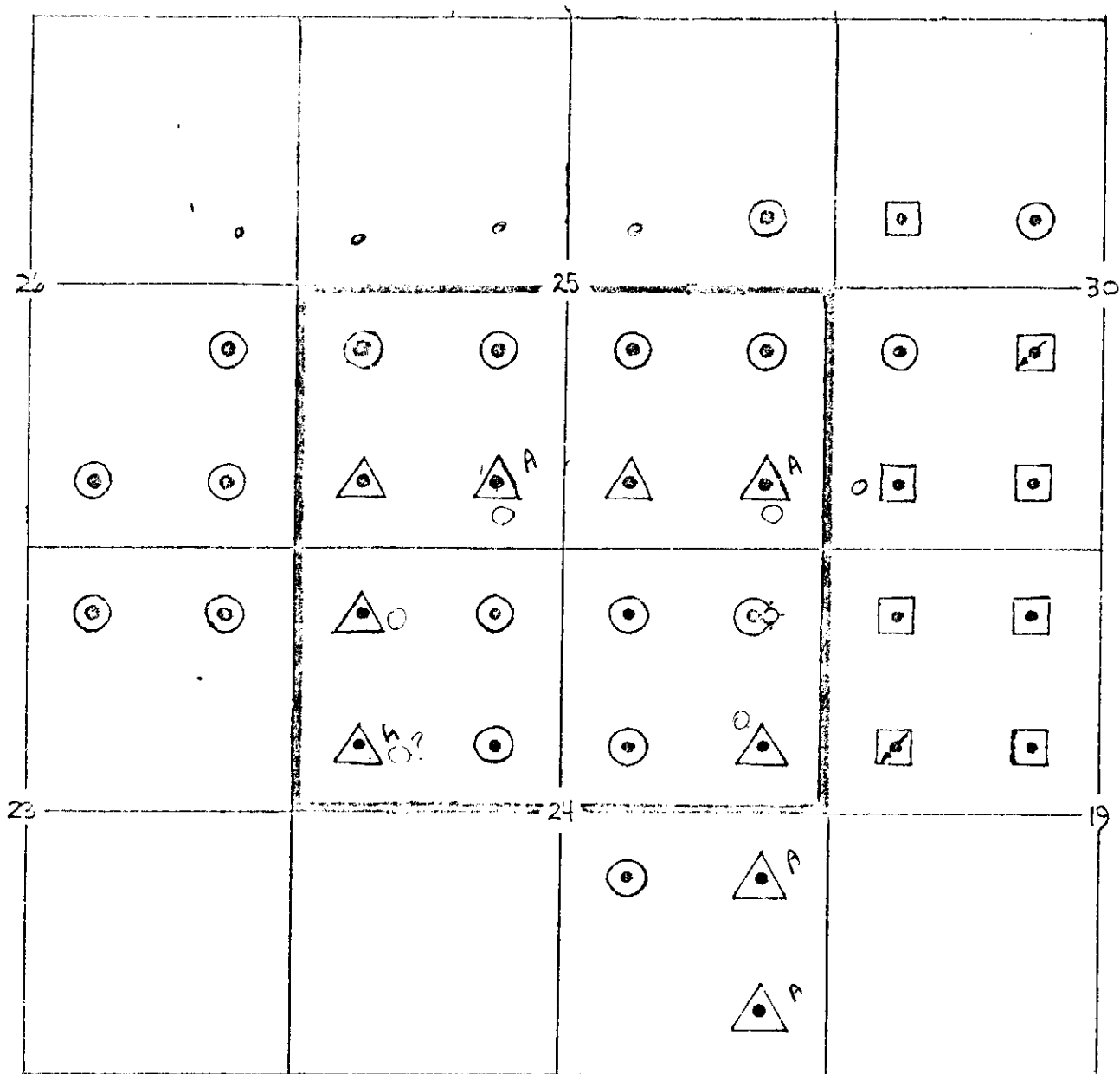
Rge 25 WPM

Shell 100%	Omega 100%	Omega 100%	Omega 100%
26	25	30	
Omega 100%	Omega 100%	Omega 100%	Omega 100%
Omega 100%	Omega 100%	Omega 100%	Brosco Fund 37.5% Westmead 37.5% Corvair 25%
23	24	19	
Omega 100%	Omega 50% Shell 50%	Omega 100%	Brosco Fund 37.5% Westmead 37.5% Corvair 25%

Twp 1

MAY 12, 1982

# PROPOSED WASKADA LOWER AMARANTH UNIT No.1 WELL STATUS MAP



LOWER ALIDA



UPPER ALIDA



LOWER AMARANTH



PRODUCING OIL WELL



WATER INJECTION WELL



ABANDONED WELL

MAY 11/82

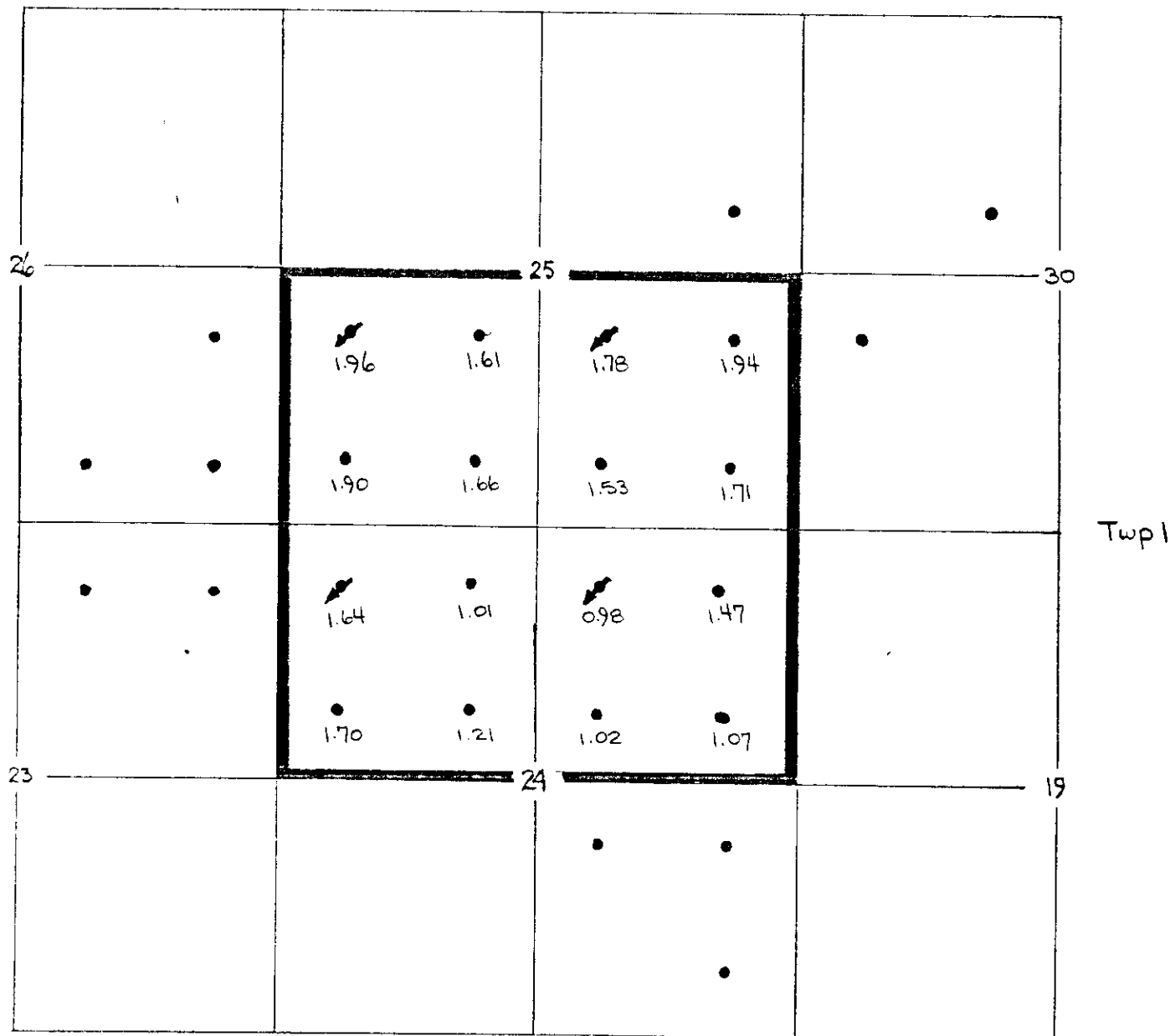
Remain as Lower Alida.  
Convert from L Alida to L Amaranth

# PROPOSED WASKADA LOWER AMARANTH UNIT No.1

MAP SHOWING PROPOSED INJECTION PATTERN  
AND POROSITY-METERS

Rge 26 WPM

Rge 25 WPM



MAY 12, 1982



1982-04-19

Omega Hydrocarbons Ltd.  
630, 330 - 5th Ave. S.W.  
Calgary, Alberta  
T2P 0L4

## APPENDIX 6

Attention: Mr. Ed Wyse

### Reservoir Fluid Study

Omega Waskada 8-26-1-26 (W1M)  
Waskada Field, Manitoba, Canada  
Our File Number: 7013-82-20

Gentlemen:

Subsurface samples of reservoir oil were taken from the above subject well by a representative of Core Laboratories-Canada Ltd. on 1982-02-02. The samples were then submitted to our laboratory for a complete reservoir fluid study.

A portion of the reservoir fluid was transferred at high pressure to a high pressure-windowed cell and then heated at constant pressure to the reported reservoir temperature of 45.0°C. The pressure-volume relations of the fluid were measured during a constant expansion down to 1 586 kPa (gauge). The saturation pressure was determined to be 4 220 kPa (gauge) at 45.0°C. The results of this test are shown on pages 1 and 2 of this report.

During differential pressure depletion at 45.0°C, the fluid evolved a total of 51.04 cubic metres of gas at 101.325 kPa (absolute) and 15°C per unit of residual oil at 15°C. The associated formation volume factor was 1.170 units of saturated fluid at 4 220 kPa (gauge) and 45.0°C per unit of residual oil. The density of the liquid phase and the properties of the evolved gases were determined at several pressure levels below the saturation pressure during this depletion. The data obtained from these tests are summarized on page 3. The viscosity of the fluid was measured under similar depletion conditions at 45.0°C, from pressures exceeding the saturation pressure down to atmospheric pressure. The viscosity of the liquid phase varied from a minimum of 1.285 mPa•s at the saturation pressure to a maximum of

Omega Hydrocarbons Ltd.

Omega Waskada 8-26-1-26 (W1M)

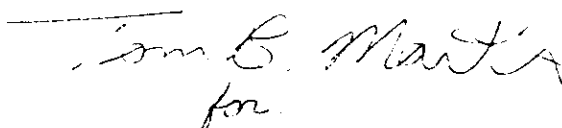
2.904 mPa•s at atmospheric pressure. The viscosity data is summarized on page 4.

The composition of the reservoir fluid was determined by low temperature, fractional distillation and is shown on pages 5 and 6.

Thank you for the opportunity to perform this study for you. Should you have any questions concerning the data, please contact us.

Yours truly,

CORE LABORATORIES-CANADA LTD.

  
for  
Dwayne E. Rasmussen

TG:cd

COPE LABORATORIES - CANADA LTD.  
Petroleum Reservoir Engineering  
CALGARY, ALBERTA

Page 1 of 15  
File 7013-82-20  
Well Omega Waskada  
8-26-1-26 (W1M)

VOLUMETRIC DATA OF RESERVOIR FLUID SAMPLE

1. Saturation pressure (bubble point pressure) 4 220 kPa (gauge) @ 45.0 °C
2. Thermal expansion of saturated oil @ 34 474 kPa (gauge) =  $\frac{V@ 45.0 \text{ °C}}{V@ 22.8 \text{ °C}}$  = 1.01830
3. Density at saturation pressure: 777.4 kg/m<sup>3</sup> @ 45.0 °C
4. Compressibility of saturated oil @ reservoir temperature: Vol/Vol/MPa:
 

From	<u>4 220</u>	kPa to	<u>6 895</u>	kPa =	<u><math>12.38 \times 10^{-4}</math></u>
From	<u>6 895</u>	kPa to	<u>13 790</u>	kPa =	<u><math>11.14 \times 10^{-4}</math></u>
From	<u>13 790</u>	kPa to	<u>20 684</u>	kPa =	<u><math>10.19 \times 10^{-4}</math></u>
From	<u>20 684</u>	kPa to	<u>27 579</u>	kPa =	<u><math>9.21 \times 10^{-4}</math></u>
From	<u>27 579</u>	kPa to	<u>34 474</u>	kPa =	<u><math>8.97 \times 10^{-4}</math></u>

Page 2 of 15  
 File 7013-82-20  
 Well Omega Waskada  
8-26-1-26 (W1M)

PRESSURE-VOLUME RELATIONS AT 45.0 °C

<u>Gauge Pressure, kPa</u>	<u>Relative Volume, V/Vsat (1)</u>	<u>Y Function (2)</u>
34 474	0.9700	
27 579	0.9760	
20 684	0.9822	
13 790	0.9891	
6 895	0.9967	
6 205	0.9975	
5 516	0.9984	
4 826	0.9991	
<u>4 220</u>	<u>1.0000</u>	
3 875	1.0307	2.826
3 503	1.0742	2.681
3 116	1.1374	2.497
2 744	1.2234	2.322
2 392	1.3385	2.166
2 082	1.4886	2.004
1 779	1.6994	1.856
1 586	1.8875	1.759

(1) Cubic metres at indicated pressure and temperature per cubic metre of saturated oil.

$$(2) \ Y = \frac{(P_{sat} - P)}{(P + 101.325)(\text{Relative Volume} - 1)}$$

**CORE LABORATORIES — CANADA LTD.**  
*Petroleum Reservoir Engineering*  
 CALGARY, ALBERTA

Page 3 of 15  
 File 7013-82-20  
 Well Omega Waskada  
8-26-1-26 (W1M)

**DIFFERENTIAL VAPORIZATION AT 45.0 °C**

Gauge Pressure, kPa	Oil Density, kg/m <sup>3</sup>	Relative Oil Volume (1)	Relative Total Volume (2)	Solution Gas/Oil Ratio (3)	Incremental Gas Density*	Cumulative Gas Density*	Deviation Factor Z	Gas Formation Volume Factor (4)	Gas Expansion Factor (5)
4 220	777.4	1.170	1.170	51.04					
3 482	779.5	1.163	1.268	47.49	0.895	0.895	0.947	0.02963	33.75
2 813	780.9	1.156	1.403	44.29	0.869	0.882	0.951	0.03658	27.34
2 082	783.2	1.147	1.699	39.84	0.883	0.882	0.960	0.04929	20.29
1 413	786.3	1.135	2.297	34.86	0.908	0.891	0.970	0.07180	13.93
958	791.1	1.119	3.366	29.35	1.028	0.926	0.979	0.10360	9.65
0	817.9	1.025	57.492	0.00	1.306	1.145	1.000	1.10632	0.90

Gravity of Residual Oil = 37.2° API at 15.56°C

Density of Residual Oil = 837.9 kg/m<sup>3</sup> at 15.56°C

\* Relative Density (AIR = 1.000)

- (1) Cubic metres of oil at indicated pressure and temperature per cubic metre of residual oil at 15°C.
- (2) Cubic metres of oil plus liberated gas at indicated pressure and temperature per cubic metre of residual oil at 15°C.
- (3) Cubic metres of gas at 101.325 kPa (absolute) and 15°C per cubic metre of residual oil at 15°C.
- (4) Cubic metres of gas at indicated pressure and temperature per cubic metre at 101.325 kPa (absolute) and 15°C.
- (5) Cubic metres of gas at 101.325 kPa (absolute) and 15°C per cubic metre at indicated pressure and temperature.

CLARE LABORATORIES — CANADA LTD.  
Petroleum Reservoir Engineering  
CALGARY, ALBERTA

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File 7013-82-20  
Well Omega Waskada  
8-26-1-26 (W1M)

VISCOSITY AT 45.0 °C

<u>Gauge Pressure kPa</u>	<u>Oil Viscosity, mPa•s</u>	<u>Gas Viscosity, * mPa•s</u>	<u>Oil/Gas Viscosity Ratio</u>
34 474	1.913		
31 026	1.843		
27 579	1.772		
24 132	1.699		
20 684	1.626		
17 237	1.554		
13 790	1.481		
10 342	1.410		
6 895	1.338		
<u>4 220</u>	<u>1.285</u>		
3 482	1.319	0.0115	114.70
2 813	1.367	0.0113	120.97
2 082	1.432	0.0110	130.18
1 413	1.548	0.0108	143.33
0	2.904	0.0102	284.71

\* Calculated from the correlation by Lee, Eakin and Gonzalez:  
"The Viscosity of Natural Gases", August 1966 — Journal of Petroleum Technology.

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E-257

# HYDROCARBON LIQUID ANALYSIS

7013-82-20

CONTAINER IDENTITY

LABORATORY NUMBER

Omega Hydrocarbons Ltd.

5 of 15

LSD 8-26-1-26 WIM

Omega Waskada 8-26-1-26

PAGE

Waskada, Manitoba

Spearfish

Core Laboratories

TEST TYPE & NO.

TEST RECOVERY

Bottom Hole

POINT OF SAMPLE

AMT. & TYPE CUSHION

MUD RESISTIVITY

906.5 - 918.5

PUMPING

FLOWING

GAS LIFT

SWAB

WATER

m<sup>3</sup>/d

OIL

m<sup>3</sup>/d

GAS

m<sup>3</sup>/d

TEST INTERVALS OR PERFS., m

1 500

@ °C

@ °C

45.0

SEPARATOR RESERVOIR

CONTAINER WHEN SAMPLED

CONTAINER WHEN RECEIVED

SEPARATOR

PRESSURES, kPa (gauge)

TEMPERATURES, °C

1982-03-19

DA

DATE SAMPLED (Y/M/D) DATE RECEIVED (Y/M/D) DATE ANALYSED (Y/M/D)

ANALYST

REMARKS

COMPONENT	MOLE FRACTION	MASS FRACTION	LIQUID VOL FRACTION
N <sub>2</sub>	.0138	.0029	.0028
CO <sub>2</sub>	.0003	.0001	.0001
H <sub>2</sub> S	.0000	.0000	.0000
C <sub>1</sub>	.0964	.0116	.0299
C <sub>2</sub>	.0874	.0198	.0428
C <sub>3</sub>	.1053	.0350	.0531
C <sub>4</sub>	.0192	.0084	.0115
C <sub>4</sub>	.0605	.0265	.0349
C <sub>5</sub>	.0279	.0152	.0187
C <sub>6</sub>	.0294	.0160	.0195
C <sub>6</sub> <sup>+</sup>	.5598	.8645	.7867
TOTAL	1.0000	1.0000	1.0000

## OBSERVED PROPERTIES OF C<sub>6</sub><sup>+</sup> RESIDUE (15/15° C)

848.2 kg/m<sup>3</sup>  
 DENSITY

.8490  
 RELATIVE DENSITY

35.2  
 API @ 15.5°C

205  
 RELATIVE MOLECULAR MASS

## CALCULATED PROPERTIES OF TOTAL SAMPLE (15/15° C)

771.7 kg/m<sup>3</sup>  
 DENSITY

.7723  
 RELATIVE DENSITY

51.8  
 API @ 15.5°C

132.75  
 RELATIVE MOLECULAR MASS

REMARKS

COMPANY  
LOCATION  
SAMPLED

Omega Hydrocarbons Ltd.  
LSD 6-06-1-26 WAM  
Bottom Hole

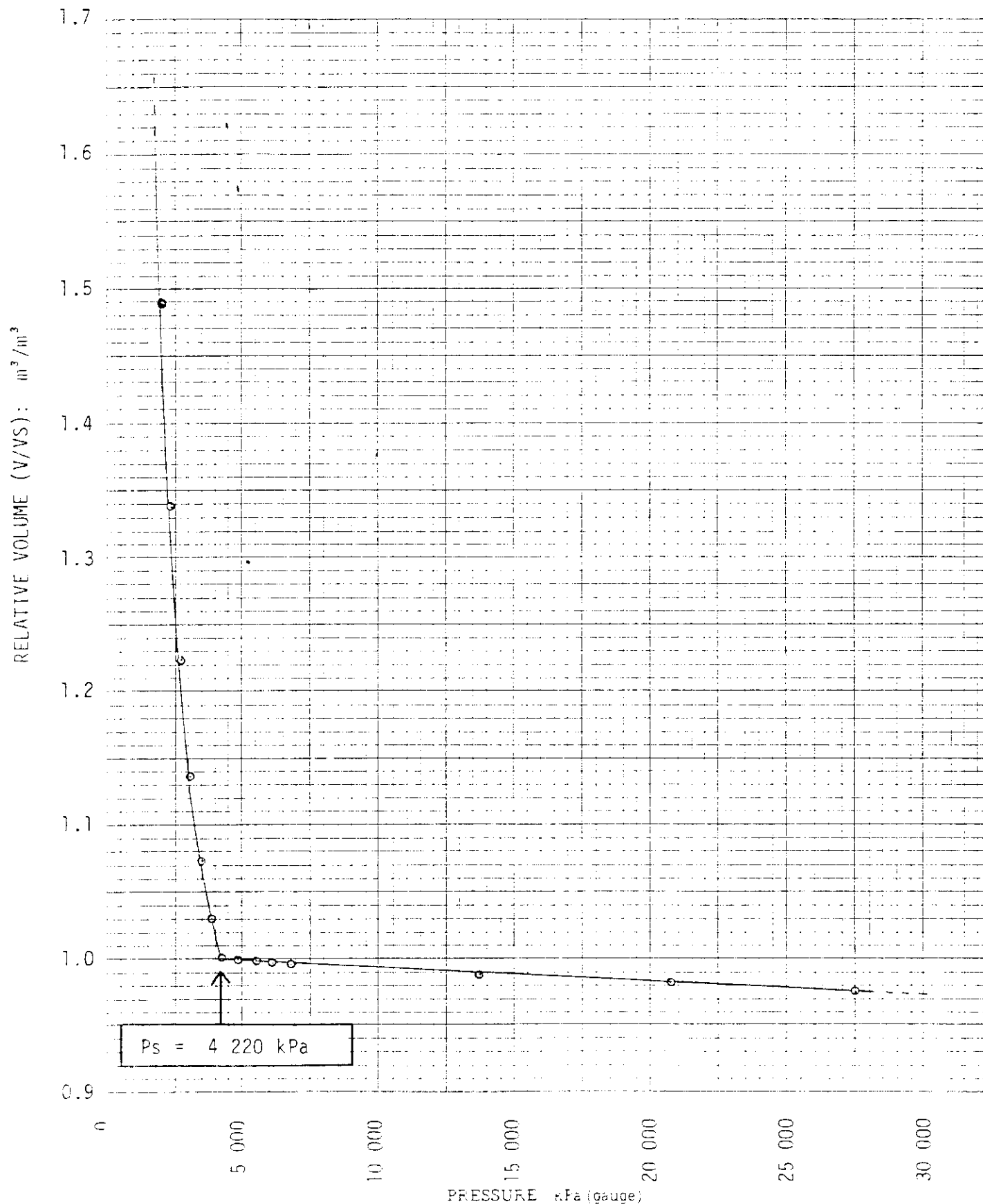
PAGE 6 of 15  
FILE 7013-80-20

Analysis of C<sub>6</sub>+ Fraction to C<sub>30</sub>+

<u>Boiling Point Range (°C)</u>	<u>Component</u>	<u>Carbon Number</u>	<u>Mole Fraction</u>	<u>Mass Fraction</u>
36.1- 68.9	Hexanes	C <sub>6</sub>	.0445	.0311
68.9- 98.3	Heptanes	C <sub>7</sub>	.0452	.0368
98.3-125.6	Octanes	C <sub>8</sub>	.0470	.0435
125.6-150.6	Nonanes	C <sub>9</sub>	.0373	.0388
150.6-173.9	Decanes	C <sub>10</sub>	.0379	.0437
173.9-196.1	Undecanes	C <sub>11</sub>	.0342	.0433
196.1-215.0	Dodecanes	C <sub>12</sub>	.0279	.0386
215.0-235.0	Tridecanes	C <sub>13</sub>	.0252	.0377
235.0-252.2	Tetradecanes	C <sub>14</sub>	.0211	.0339
252.2-270.6	Pentadecanes	C <sub>15</sub>	.0188	.0325
270.6-287.8	Hexadecanes	C <sub>16</sub>	.0169	.0310
287.8-302.8	Heptadecanes	C <sub>17</sub>	.0146	.0285
302.8-317.2	Octadecanes	C <sub>18</sub>	.0126	.0260
317.2-330.0	Nonadecanes	C <sub>19</sub>	.0107	.0233
330.0-344.4	Eicosanes	C <sub>20</sub>	.0099	.0228
344.4-357.2	Heneicosanes	C <sub>21</sub>	.0082	.0197
357.2-369.4	Docosanes	C <sub>22</sub>	.0076	.0190
369.4-380.0	Tricosanes	C <sub>23</sub>	.0070	.0185
380.0-391.1	Tetracosanes	C <sub>24</sub>	.0062	.0171
391.1-401.7	Pentacosanes	C <sub>25</sub>	.0055	.0158
401.7-412.2	Hexacosanes	C <sub>26</sub>	.0051	.0151
412.2-422.2	Heptacosanes	C <sub>27</sub>	.0044	.0137
422.2-431.7	Octacosanes	C <sub>28</sub>	.0040	.0128
431.7-441.1	Nonacosanes	C <sub>29</sub>	.0035	.0115
441.1 Plus	Triacontanes Plus	C <sub>30</sub> +	.0315	.1539
<u>AROMATICS</u>				
80.0	Benzene	C <sub>6</sub> H <sub>6</sub>	.0017	.0011
110.6	Toluene	C <sub>7</sub> H <sub>8</sub>	.0089	.0066
136.1-138.9	Ethylbenzene, p + m-Xylene	C <sub>8</sub> H <sub>10</sub>	.0093	.0080
144.4	o-Xylene	C <sub>8</sub> H <sub>10</sub>	.0047	.0040
168.9	1,2,4 Trimethylbenzene	C <sub>9</sub> H <sub>12</sub>	.0052	.0050
<u>NAPHTHENES</u>				
68.9	Cyclopentane	C <sub>5</sub> H <sub>10</sub>	.0003	.0002
72.2	Methylcyclopentane	C <sub>6</sub> H <sub>12</sub>	.0140	.0095
81.1	Cyclohexane	C <sub>6</sub> H <sub>12</sub>	.0143	.0098
101.1	Methylcyclohexane	C <sub>7</sub> H <sub>14</sub>	.0146	.0117
	TOTAL		.5598	.8645
	Mole Fraction of C <sub>7</sub> +			.4850
	Mass Fraction of C <sub>7</sub> +			.8128
	Calculated Relative Molecular Mass of C <sub>7</sub> +			223.
	Calculated Relative Density of C <sub>7</sub> +			.8602
	Calculated Density of C <sub>7</sub> + (kg/m <sup>3</sup> )			859.5

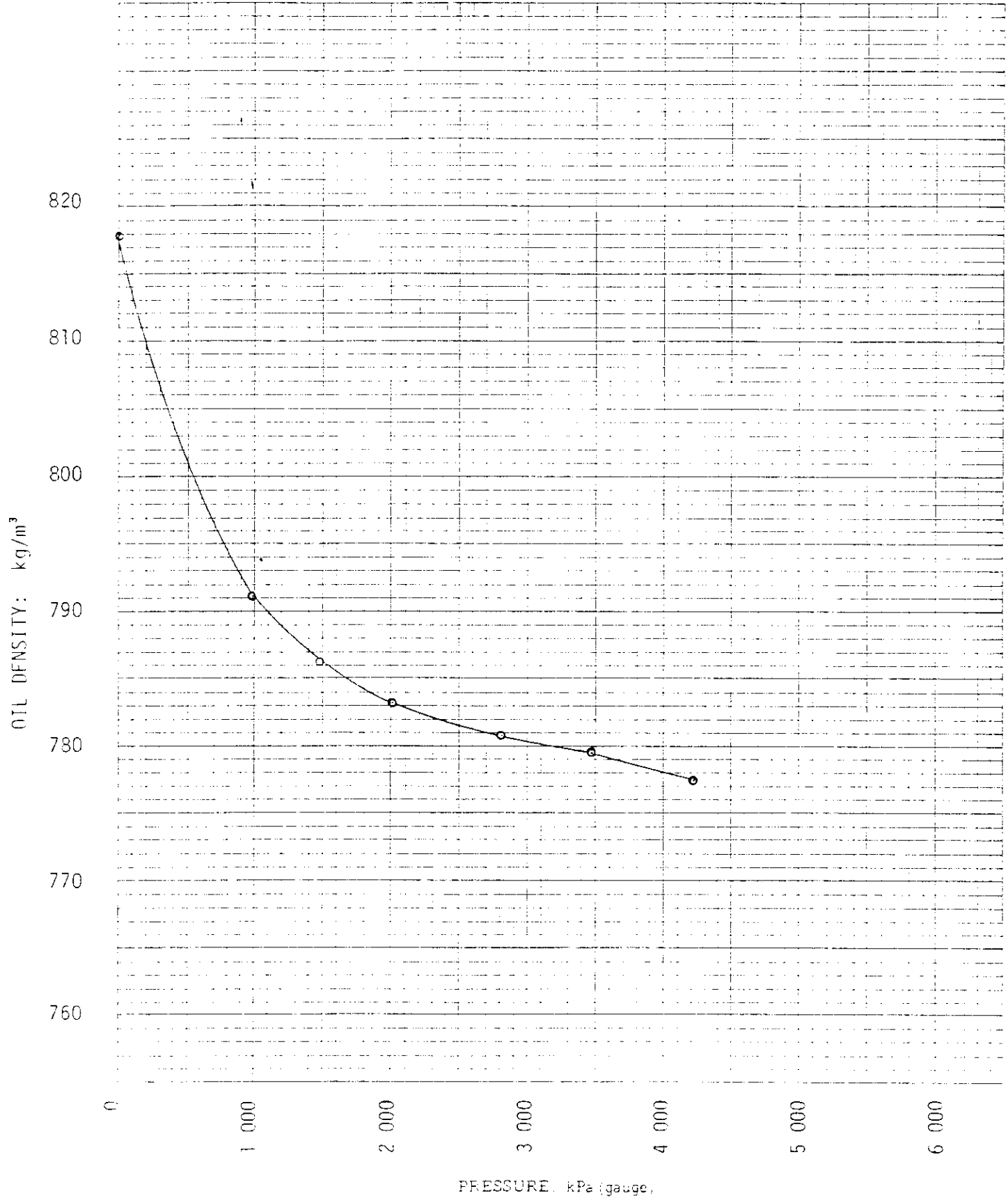
The above boiling point ranges refer to the normal paraffin hydrocarbon boiling in that range. Other hydrocarbons (aromatics, olefins, naphthenes and branched hydrocarbons) may have higher or lower carbon numbers, but are grouped and reported according to their boiling point.

Company	Omega Hydrocarbons Ltd.	Formation	Spearfish
Well	Omega Waskada 8-26-1-26 (W1M)	Province	Manitoba
Field	Waskada	Country	Canada



OIL DENSITY

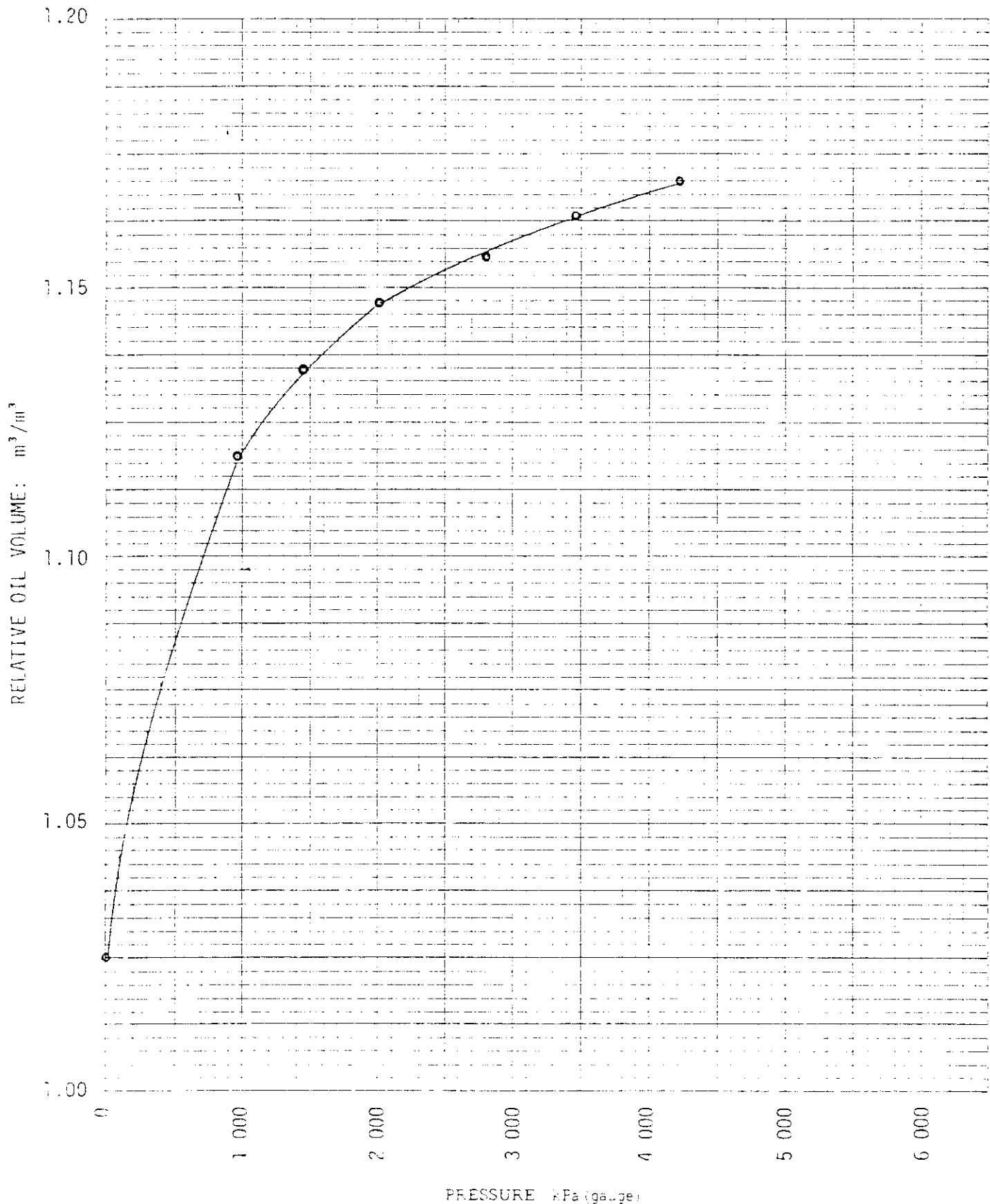
Company	Omega Hydrocarbons Ltd.	Formation	Spearfish
Well	Omega Waskada 8-26-1-26 (W1M)	Province	Manitoba
Field	Waskada	Country	Canada



# RELATIVE OIL VOLUME (VVR)

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Company	Omega Hydrocarbons Ltd.	Formation	Spearfish
Well	Omega Waskada 8-26-1-26 (W1M)	Province	Manitoba
Field	Waskada	Country	Canada



participations in the production of the same shall be deemed to be their own Participations. The amount of Unitized Substances allocated to each Tract, and only that amount, regardless of whether it be more or less than the amount of actual production of Unitized Substances from the well or wells, if any, on the Tract, shall be deemed conclusively to have been produced from the Tract.

702. Distribution Within Tracts

The Unitized Substances allocated to a Tract shall be distributed by the Working Interest Owners thereof among, or accounted for to, the Parties entitled to share in production from the Tract in the same manner, the same proportions, and upon the same conditions as they would have participated and shared in the production from the Tract, or in the proceeds from the sale thereof, had the Unitized Substances allocated to the Tract been actually produced therefrom by the Working Interest Owners.

703. Calculation Royalty

The Working Interest Owners of each Tract shall calculate royalty on the Unitized Substances allocated to the Tract at the applicable rate under the Lease, other agreement or instrument relating to the Tract. The Royalty Owners of each Tract agree to accept payment of royalty so calculated in satisfaction of the obligation of a Working Interest Owner to make royalty payments on Unitized Substances under the Lease of such Tract; but a lessee under a Lease shall not be relieved from making payment of royalty to its lessor if payment is not made by the Working Interest Owner as aforesaid. In calculating royalty on residue gas, sulphur and fluid hydrocarbons, or any of them, obtained by processing Unitized Substances, other than crude oil, by compression, absorption or other plant extraction

or stabilization, project allowances shall be paid for costs, operating charges, including a reasonable return on investment, incurred in or attributable to gathering and processing the Unitized Substances.

704. Taking Unitized Substances in Kind

The Unitized Substances allocated to a Tract shall be delivered in kind at the time and place of production to the Working Interest Owners entitled thereto who may, if there is no interference with unit operations, construct, maintain and operate in the Unit Area all necessary facilities for taking delivery in kind.

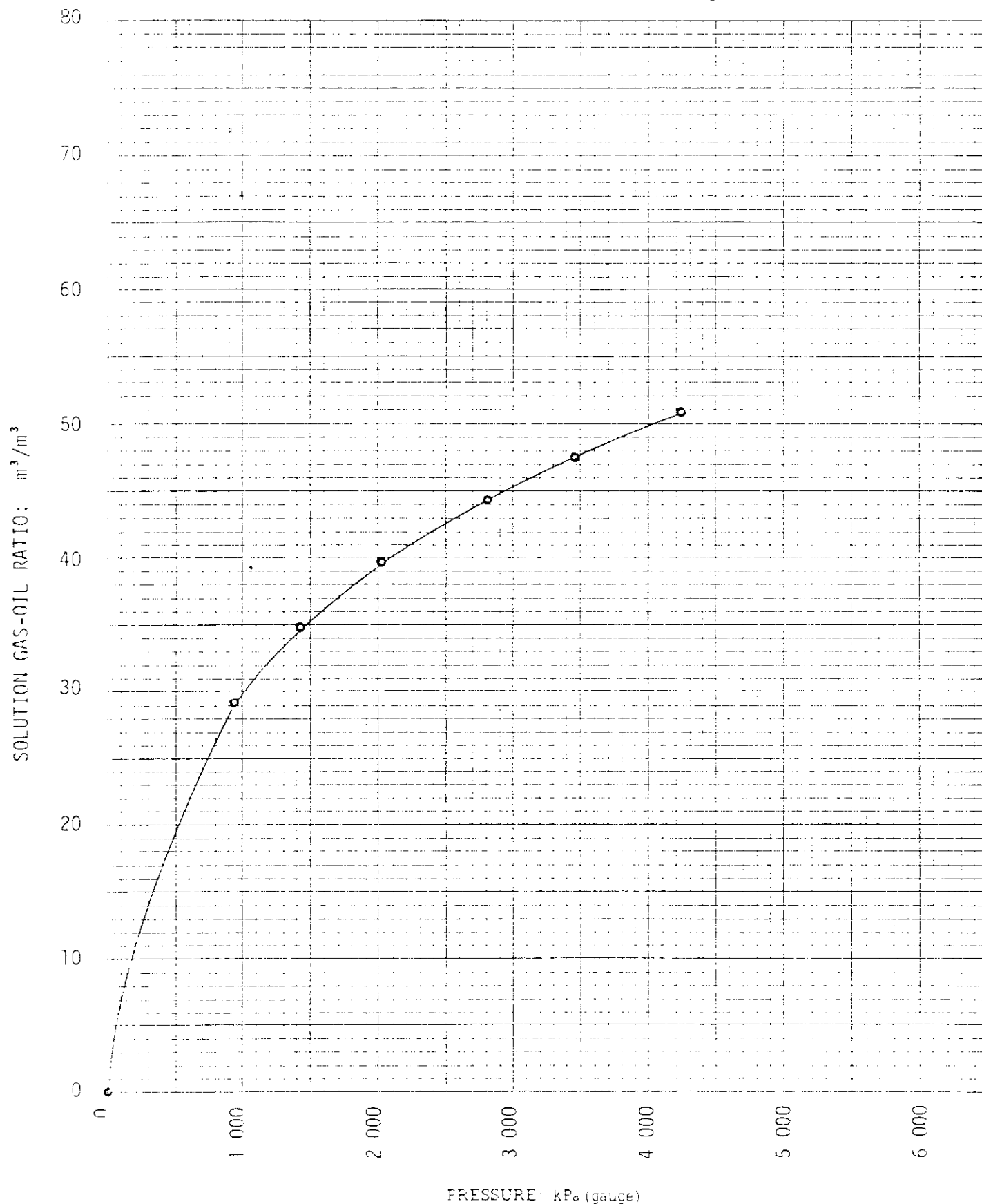
705. Failure to Take in Kind

To the extent that any Party entitled to take and receive in kind any portion of the Unitized Substances fails to take or otherwise adequately dispose of same, then so long as such failure continues the Unit Operator, as agent and, for the account and at the expense of such Party, may sell, store, inject or otherwise dispose of it. If such Party's share of Unitized Substances is sold by the Unit Operator, the proceeds remaining from the sale shall be paid to such Party. The authority of the Unit Operator to enter into contracts for the sale of such Party's share of Unitized Substances shall be restricted to contracts that are consistent with the minimum needs of the industry under the circumstances and in no event shall the term thereof exceed one year. When the Unit Operator has so contracted, and subject to the terms of the contract, such Party may take its share of the Unitized Substances in kind upon the expiration thereof. Any party not taking its share of the Unitized Substance in kind may revoke at will Unit Operator's authority hereunder taking in kind all its share of Unitized Substances not previously contracted for sale by Unit Operator.

# SOLUTION GAS-OIL RATIO

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File 7013-82-20

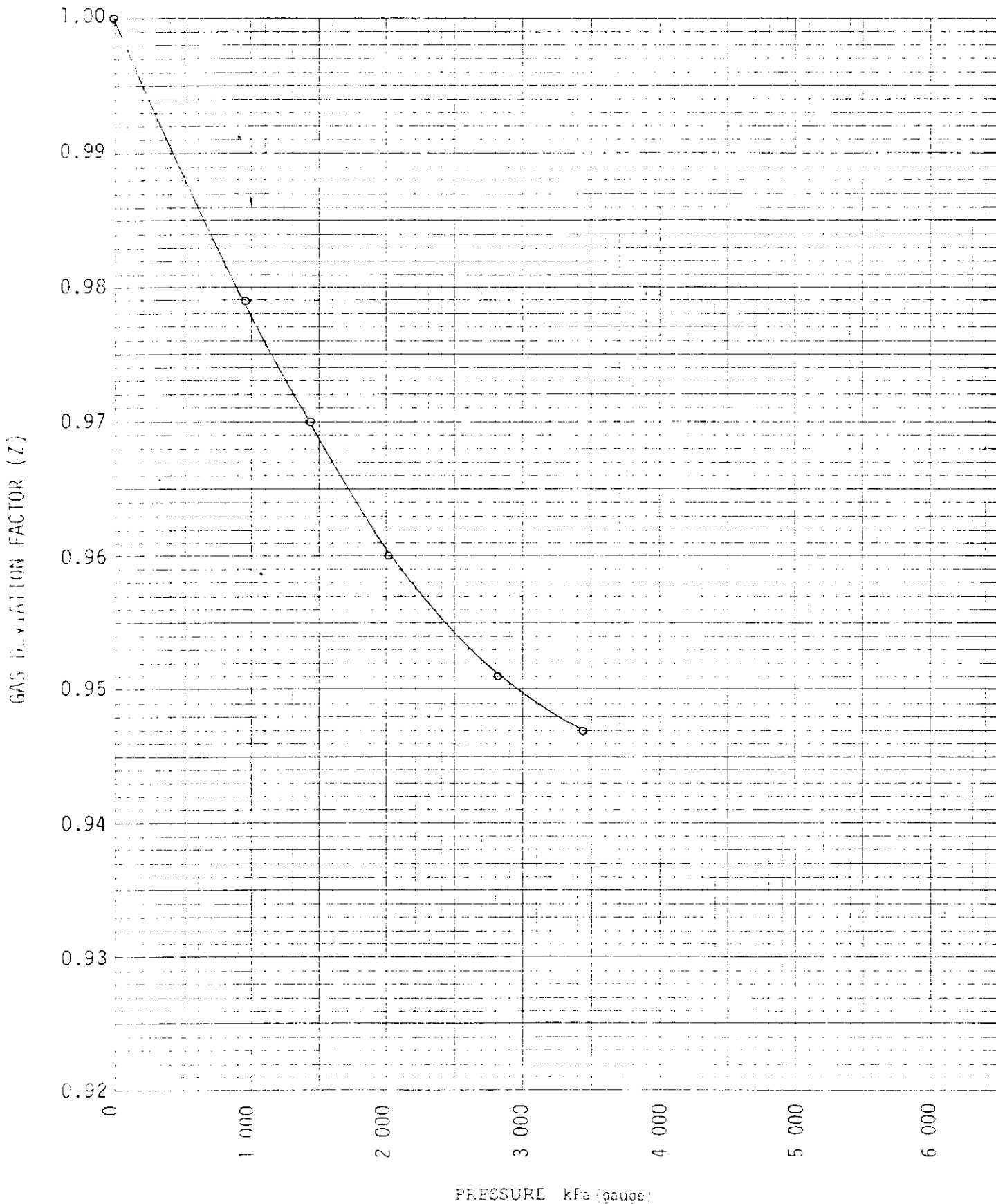
Company	Omega Hydrocarbons Ltd.	Formation	Spearfish
Well	Omega Waskada 8-26-1-26 (WIM)	Province	Manitoba
Field	Waskada	Country	Canada



GAS DEVIATION FACTOR (Z)

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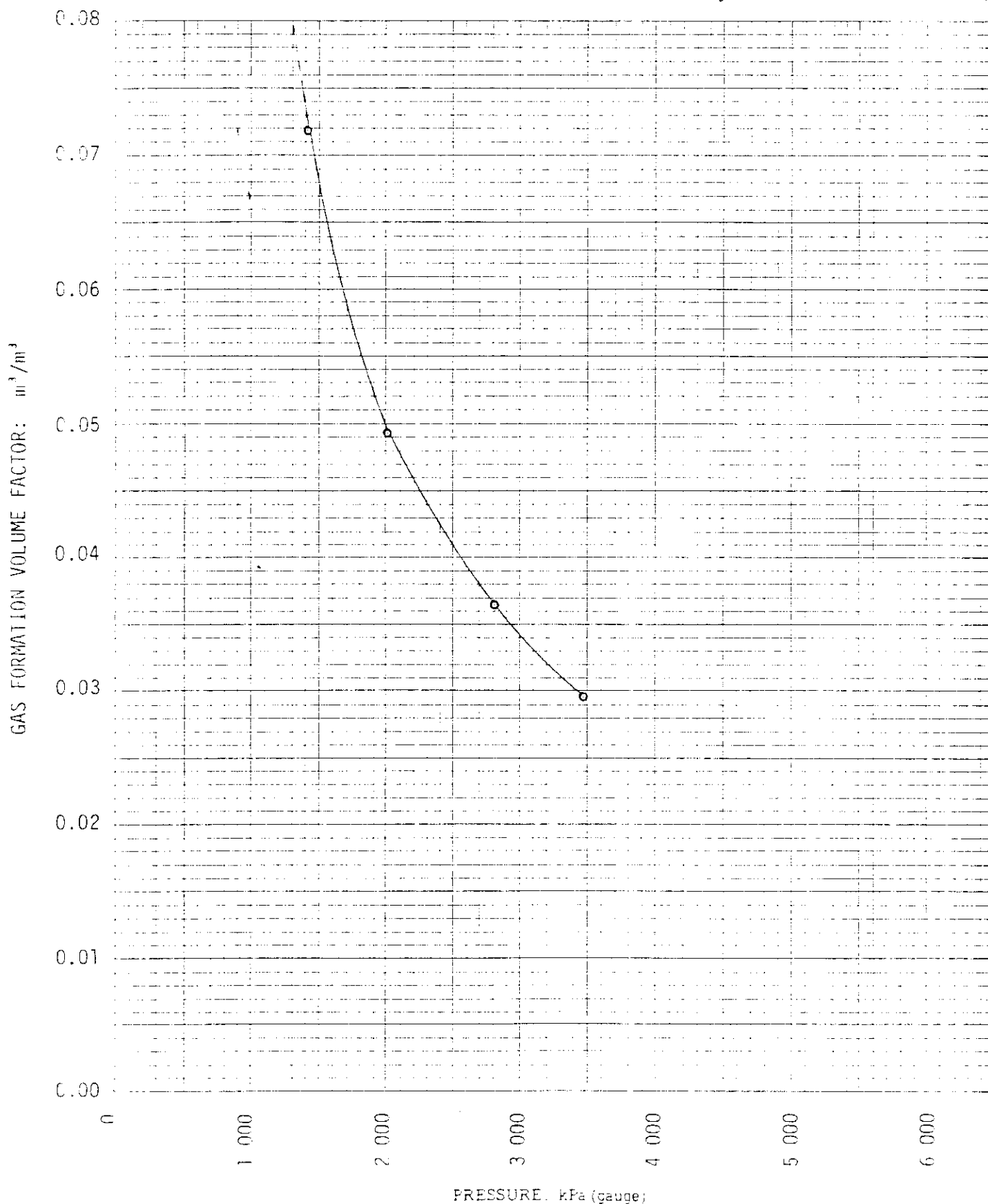
Company	Omega Hydrocarbons Ltd.	Formation	Spearfish
Well	Omega Waskada 8-26-1-26 (W1M)	Province	Manitoba
Field	Waskada	Country	Canada



# GAS FORMATION VOLUME FACTOR

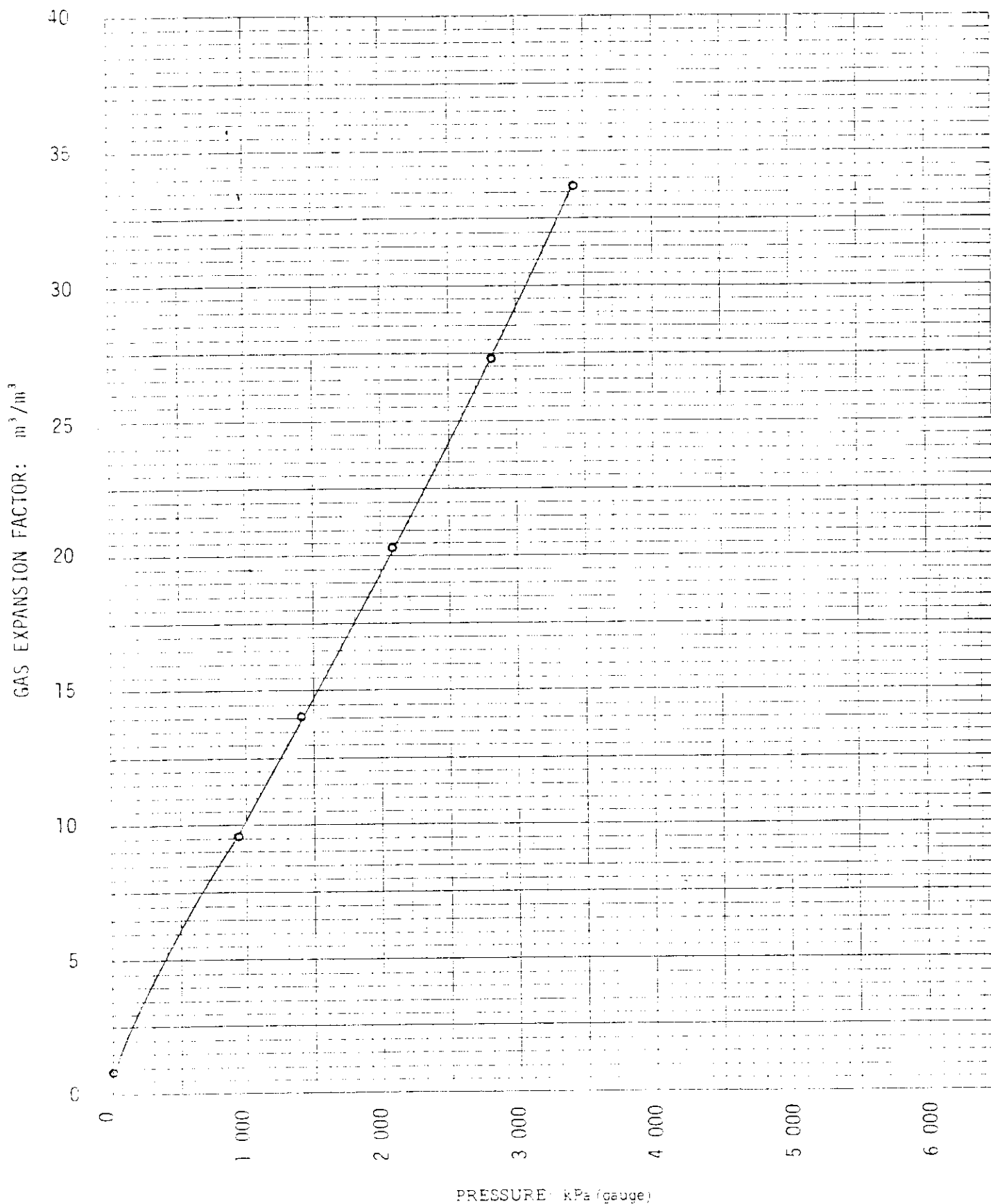
Page 10 of 15  
File 7013-82-20

Company	Omega Hydrocarbons Ltd.	Formation	Spearfish
Well	Omega Waskada 8-26-1-26 (W1M)	Province	Manitoba
Field	Waskada	Country	Canada



GAS EXPANSION FACTOR

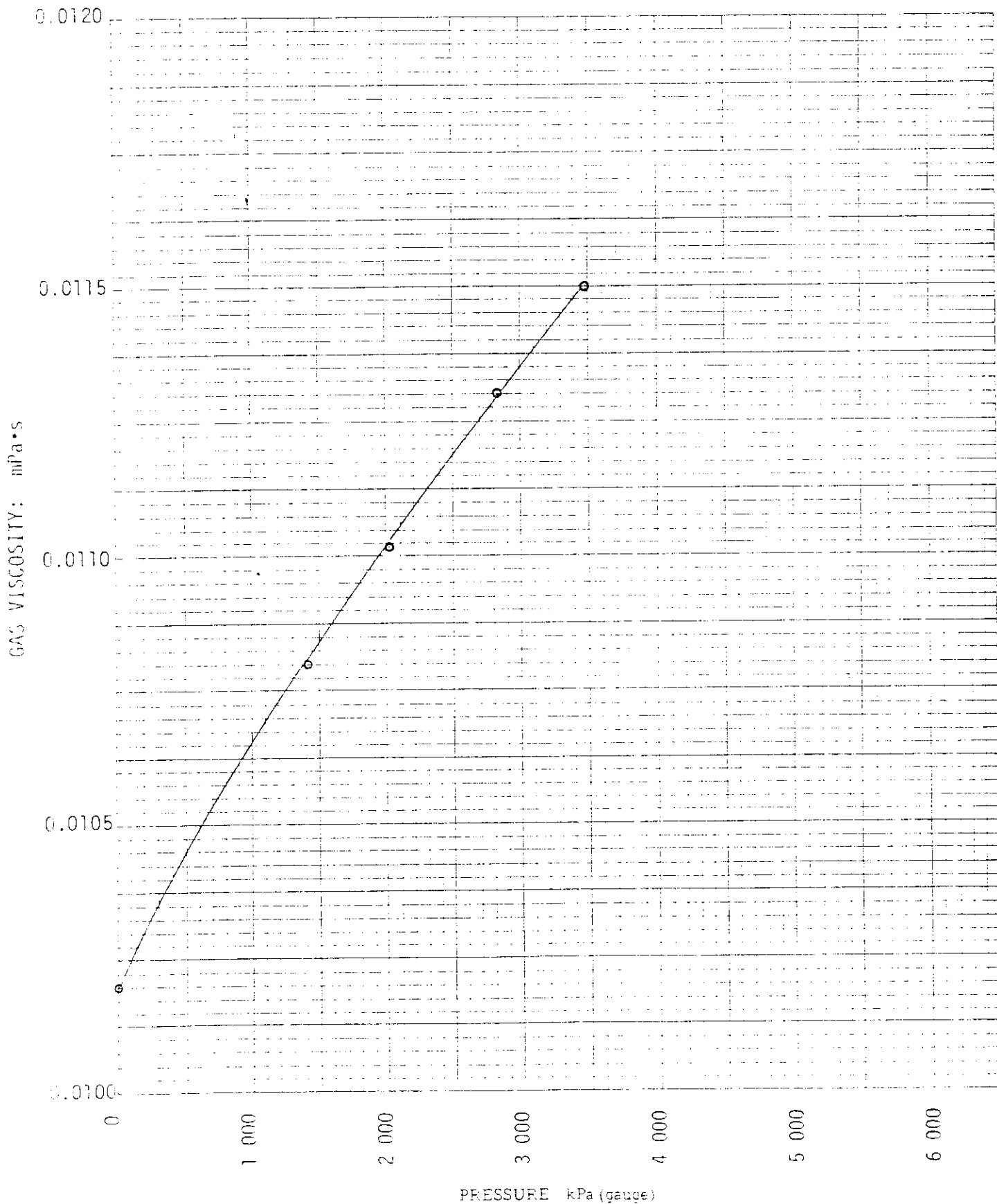
Company	Omega Hydrocarbons Ltd.	Formation	Spearfish
Well	Omega Waskada 8-26-1-26 (W1M)	Province	Manitoba
Field	Waskada	Country	Canada



# GAS VISCOSITY

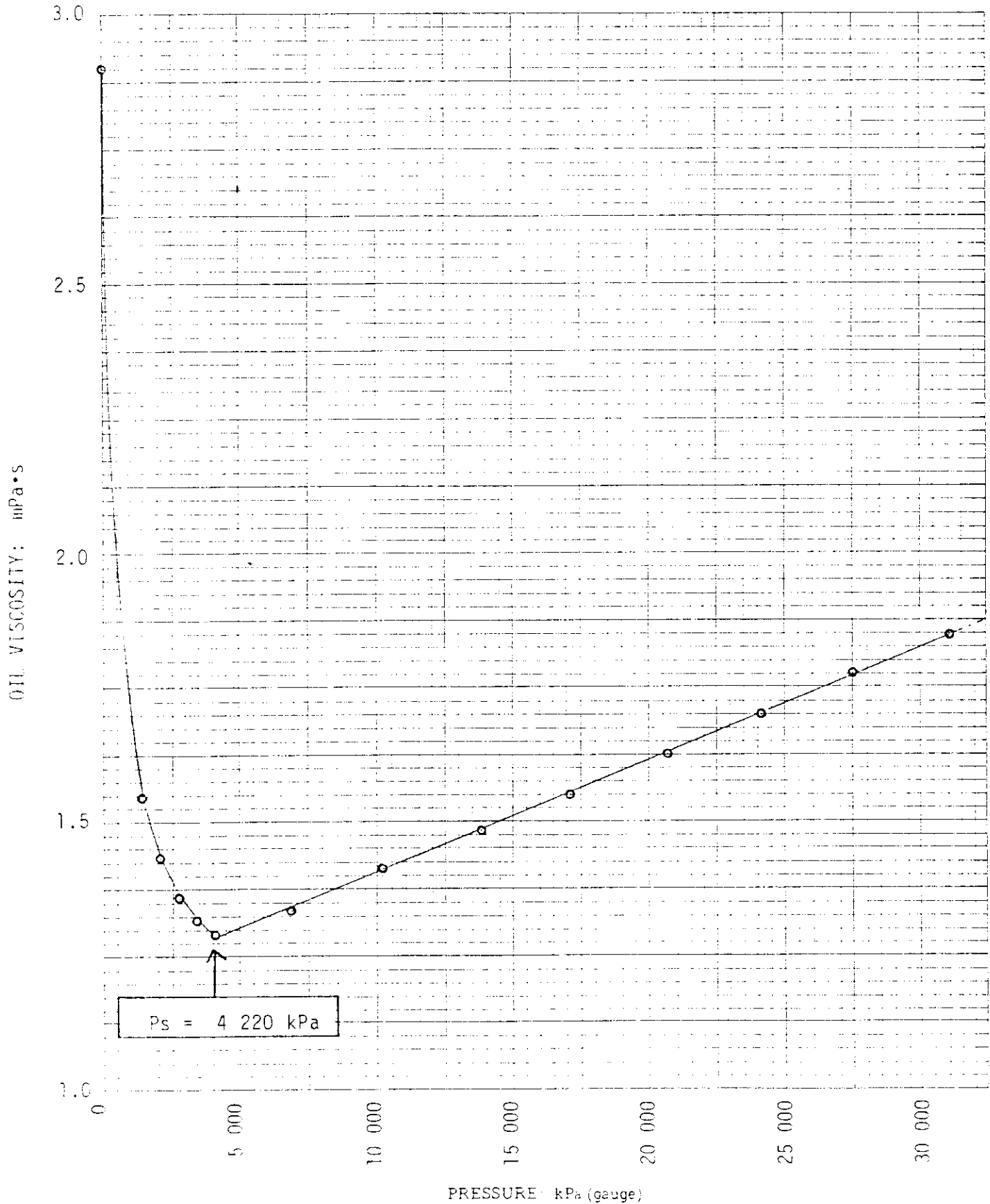
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File 7013-82-20

Company	Omega Hydrocarbons Ltd.	Formation	Spearfish
Well	Omega Waskada 8-26-1-26 (W1M)	Province	Manitoba
Field	Waskada	Country	Canada

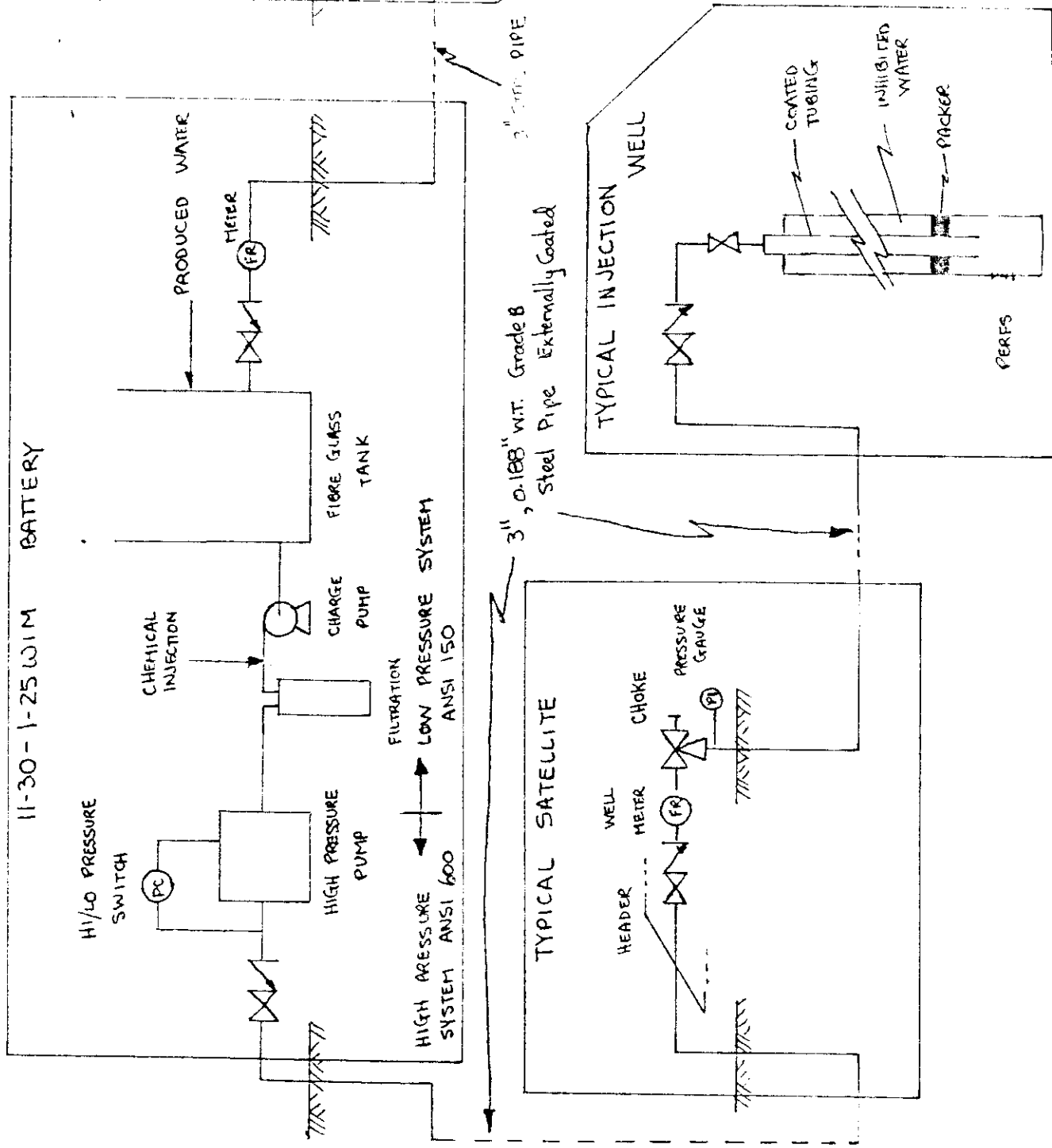


OIL VISCOSITY AT 45.0°C

Company	Omega Hydrocarbons Ltd.	Formation	Spearfish
Well	Omega Waskada 8-26-1-26 (W1M)	Province	Manitoba
Field	Waskada	Country	Canada



# PROPOSED WASKADA WATER DISTRIBUTION SYSTEM



MAY 14/20



WASKADA LOWER AVALANCHE UNIT NO. 1

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WHEREAS the Parties own Royalty Interests and Working Interests  
or either of them, in the Unitized Zone;

AND WHEREAS the Parties desire that the Unitized Zone be  
developed, produced and operated as a unit, all as hereinafter provided;

NOW, THEREFORE, in consideration of the covenants herein  
contained, the Parties agree as follows:

## ARTICLE I

### DEFINITIONS

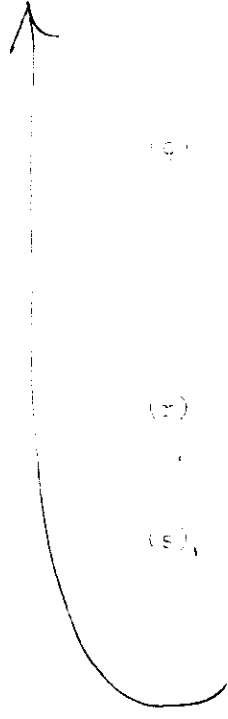
#### 101. Definitions

In this agreement:

- (a) "Conservation Board" means the Oil and Natural Gas Conservation Board of the Province of Manitoba;
- (b) "Effective Date" means the time and date referred to in Article XIV;
- (c) "Lease" means an instrument granting a Working Interest in the Unitized Zone;
- (d) "Outside Substance" means any substance initially obtained from any source other than the Unitized Zone or any Unitized Substances with respect to which royalty has been paid;
- (e) "Party" means a person who is bound by this agreement;
- (f) "Petroleum Substances" means petroleum, natural gas and other hydrocarbons (except coal) or any of them and all substances associated therewith;

the interest in the Working Interest in other than a Working Interest in Petroleum Substances, or the proceeds from the sale thereof, produced from the Unitized Zone but does not include the interest of a person as a purchaser of Petroleum Substances after production;

- (h) "Loyalty Owner" means a Party owning a Loyalty Interest;
- (i) "Spacing Unit" means the area allocated to a well by any government body having jurisdiction with respect hereto for each well drilled for the purpose of producing Petroleum Substances from the Unitized Zone;
- (j) "Tract" means a parcel of land described and given a Tract number in Exhibit "A";
- (k) "Tract Participation" means the effective percentage allotted to a Tract pursuant to Article VI and set forth in Exhibit "A";
- (l) "Unit Area" means the lands described in Exhibit "A" and shown outlined on Exhibit "E";
- (m) "Unit Operator" means the person who is so designated under the Unit Operating Agreement;
- (n) "Unit Operating Agreement" means the agreement entitled "Unit Operating Agreement - Waskada Lower Amaranth Unit No. 1" entered into by the Working Interest Owners;
- (o) "Unitized Zone" means the Lower Amaranth Formation within the Unit Area;
- (p) "Unitized Substance" means Petroleum Substances in or obtained from the Unitized Zone;

- 
- (a) "Working Interest Owner" means a Party owning a Working Interest;
- (b) "Unitized Zone" means the lower Anulianth Formation of Triassic Age underlying lands outlined on Exhibit "E", as exemplified by the geological section occurring between the induction electric log depths of 889.8 m and 924.4 m, as measured from the Kelly Bushing at Omega Waskada 15-24-1-26 WPM and shown on Exhibit "C".

## ARTICLE II

### EXHIBITS

#### 101. Exhibits

The following exhibits are attached to and incorporated in this agreement:

- (a) Exhibit "A" which numbers and describes each Tract and sets forth its Tract Participation, the names of the Working Interest Owners and their respective shares of the Working Interest, together with the names of the Royalty Owners and their respective shares of the Royalty Interest;
- (b) Exhibit "B" which is a plan of the Unit Area;
- (c) Exhibit "C" which is a copy of a portion of the induction electric log referred to in subclause 101(s) hereof.

203. Correction of Exhibits

Each exhibit shall be deemed correct to the effective time of a revision or correction thereof as herein provided.

204. Effective Time

If any mistake or mechanical error occurs in an exhibit, Unit Operator may, or upon request of the Working Interest Owners shall, prepare a corrected exhibit but the data used in establishing Tract Participations shall not be re-evaluated.

205. Supply of Exhibits

Any corrected exhibit prepared on or before the Effective Date or within 90 days thereafter shall be effective on the Effective Date. Any corrected exhibit prepared thereafter shall be effective at 0800 hours official time on the first day of the calendar month next following its preparation or on such date as is determined by the Working Interest Owners.

206. Form of Revised or Corrected Exhibits

Each time that an exhibit is revised or corrected pursuant to this agreement, Unit Operator shall supply the Conservation Board and the Department of Mines, Resources and Environmental Management with copies as may be required and shall supply each Working Interest Owner with the number of copies of the exhibits it requests. Each Working Interest Owner shall supply each of its Royalty Owners, excepting the Crown, with a copy thereof.

207. Form of Revised or Corrected Exhibits

Exhibits that are revised or corrected shall show the effective time of the revision or correction and shall be numbered consecutively.

UNITIZATION AND EFFECT

301. Unitization

On and after the Effective Date the interests of each Royalty Owner and of each Working Interest Owner in the Unitized Substances and in the Unitized Zone are hereby unitized, as if the Unitized Zone had been included in a single lease executed by the Royalty Owners, as lessors, in favour of the Working Interest Owners, as lessees, and as if the lease had been subject to this agreement.

302. Personal Property Excepted

All lease and well equipment heretofore and hereafter placed by any of the Working Interest Owners on lands comprised in the Unit Area shall be deemed conclusively to be and shall remain personal property belonging to and may be removed by the Working Interest Owners subject to the Working Interest Owners rights and interests therein as may be set forth in the Unit Operating Agreement.

303. Continuation of Leases

All operations conducted with respect to the Unitized Zone or production of Unitized Substances shall, except for the purposes of calculating payments to Royalty Owners, be deemed conclusively to be operations upon or production from all of the Unitized Zone in each Tract, and such operations or production shall continue in force and effect each Lease and any other agreement or instrument relating to the Unitized Zone or Unitized Substances as if such operations had been conducted on, and a well was producing from, each Tract of Spacing Unit, or portion thereof, in the Unit Area.

304. Amendment of

Each lease and any other agreement or instrument relating to the Unitized Zone or Unitized Substances is hereby amended only to the extent necessary to make it conform to this agreement.

305. Ratification of leases

Except where a court action involving a lease has been commenced and is pending on the Effective Date, each Royalty Owner hereby ratifies and confirms any lease, as amended by this agreement, to which it is a party and agrees that no default exists with respect thereto and that any such Lease is in effect as of the Effective Date.

306. Effect of Unitization on Titles

Nothing herein shall be construed as a transfer or exchange of any interest in the leases, Tract or Unitized Zone, or in the Unitized Substances before production thereof.

307. Name

The name of the unit hereby constituted is "Waskada Lower Amaranth Unit No. 1".

ARTICLE IV

AUTHORITY TO WORKING INTEREST OWNERS

401. Operations

The Working Interest Owners are hereby granted the right to develop and operate the Unitized Zone without regard to the provisions of the leases or the boundary lines of the Tracts or Spacing Units in such

number and by the name of the Working Interest Owners, necessary and proper and, without limiting the generality of the foregoing, the right to inject any substance or combination of substances into the Unified Zone and convert and use as injection wells any wells now existing or hereafter drilled into the Unified Zone.

402. Delegation

The Working Interest Owners may delegate to Unit Operator any of the rights and powers herein or otherwise granted to them.

403. Vote of Working Interest Owners

Any matter to be determined under this agreement by the Working Interest Owners may be determined by vote of the parties to the Unit Operating Agreement as prescribed herein.

ARTICLE V

INCLUSION AND QUALIFICATION OF TRACTS

501. Tracts Included on Effective Date

The Tracts included in the Unit Area as of the Effective Date are those Tracts which are qualified under clause 502 before the Effective Date.

502. Qualification of Tracts

- (a) A Tract is qualified for inclusion in the Unit Area when:  
owners of 100 percent of the Working Interest therein have become Parties and parties to the Unit Operating Agreement and owners of 100 percent of the Royalty Interest therein have become Parties; or

- owners of 100 percent of the Working Interest therein shall become Parties and parties to the Unit Operating Agreement and owners of less than 100 percent of the Royalty Interest therein have become Parties, and such owners of Working Interests agree: if required by the other Working Interest Owners, indemnify the other Working Interest Owners in a form and manner satisfactory to them for any loss or damages that may be suffered by such other Working Interest Owners in respect of claims and demands that, because of the inclusion of the Tract in the Unit Area, may be made by those owners of Royalty Interests in the Tract who have not become Parties; or
- (c) owners of Working Interests therein have agreed with the owners of Working Interests then Parties and parties to the Unit Operating Agreement as to the basis on which the Tract shall become qualified, where the Tract cannot be qualified pursuant to subclause (a) or (b) of this clause, and the Tract has become so qualified.

503. Late Qualification and Inclusion

A Tract qualified after the Effective Date, but within 90 days thereof, shall be included in the Unit Area as of 0800 hours official time on the first day of the first month next following expiration of the said 90 day period.

504. Revision of Exhibits

Within 60 days after the Effective Date, the exhibits shall be revised, if necessary, to set out only those Tracts included in the Unit

... of the Unit Area under clause 503. The revised Exhibit "A" shall set forth the Tract Participations of the Tracts recalculated on the same basis and using the same data as that used in the calculation of Tract Participations in the original Exhibit "A" and so that their summation equals 100 percent.

## ARTICLE VI

### TRACT PARTICIPATION

#### 601. Tract Participation

Each Tract has a Tract Participation as shown on Exhibit "A" which has been calculated on the basis of remaining recoverable reserves under waterflood to March 1, 1982. Upon the successful formation of the Unit the necessary steps will be taken to insure a well completed in the Unitized Zone in every drilling spacing unit and a pilot waterflood will be implemented. Production will be allocated according to these Tract Participations as of the Effective Date to insure equitable sharing of revenues during the development stage. All the subject work required to implement the pilot project will be completed within eight months of the Effective Date of this agreement.

## ARTICLE VII

### ALLOCATION OF UNITIZED SUBSTANCES PRODUCED

#### 701. Allocation of Tracts

Subject to clauses 801 and 802 the Unitized Substances when

711. Outside Substance

If an Outside Substance is injected into the Unitized Zone, the first like substance contained in the Unitized Substances subsequently produced and sold or used other than for operations hereunder shall be deemed conclusively to be an Outside Substance until a quantity equal to the quantity of the Outside Substance injected into the Unitized Zone is recovered. No royalty shall be payable on any substance which is deemed conclusively to be an Outside Substance.

#### ARTICLE VIII

##### USE, LOSS AND REINJECTION OF UNITIZED SUBSTANCES

###### 801. Use or loss

The Working Interest Owners may use as much of the Unitized Substances, other than crude oil, as they deem necessary for the operation and development of the Unitized Zone including, but not limited to, the injection thereof into the Unitized Zone and in the operation of any plant or plants handling Unitized Substances. Unitized Substances so used or injected and Unitized Substances lost shall be excluded in allocating Unitized Substances to Tracts, and no royalty or other payment shall be payable in respect thereof.

###### 802. Reinjection

The Working Interest Owners are hereby granted the right to inject Unitized Substances into the Unitized Zone for storage and/or enhanced oil recovery. Unitized Substances so injected shall be excluded in allocating Unitized Substances to Tracts, and no royalty or other payment shall be payable in respect thereof until they are recovered from the Unitized Zone and sold or used for operations other than operations hereunder.

- 1 -

ARTICLE II

ENLARGEMENT OF UNIT AREA

901.       Application to Enlarge

After the expiry of 90 days from the Effective Date, if an owner of a Working Interest in lands in the vicinity of the Unit Area indicated to be potentially productive of petroleum substances from the Lower Amaranth formation makes application therefore, the Working Interest Owners may, upon such terms and conditions as they may determine, approve the admission of the lands into the Unit Area. If the lands qualify under clause 502, the Unit Area shall be enlarged to include them. Even though an owner of a Royalty Interest in lands approved hereunder for admission into the Unit Area is a Party, the lands shall not qualify for inclusion in the Unit Area unless the owner again executes and delivers 2 counterparts of this agreement to Unit Operator or the lands otherwise qualify pursuant to subclause (b) or (c) of clause 502.

902.       Adjustment of Tract Participation

The Tract Participation of each Tract added pursuant to clause 901 shall be determined by the Working Interest Owners. The Tract Participations shall then be adjusted so that:

- (a) the ratios of the Tract Participations of Tracts shown on Exhibit "A" immediately prior to the enlargement of the Unit Area remain the same the one to the other; and
- (b) the total of the Tract Participations for all Tracts of the enlarge Unit Area equals 100 percent.

903. Enlargement

Unit Operator shall revise Exhibits "A" and "B" as required by the enlargement.

904. Effective Time of Enlargement

An enlargement of the Unit Area and an adjustment of Tract Participations under this Article shall become effective at 0800 hours official time on the first day of the first calendar month following approval of admission under clause 901 and Tract qualification under clause 502.

905. No Retroactive Adjustment

There shall never be any retroactive adjustment of the allocation of Unitized Substances by reason of an enlargement of the Unit Area under this Article.

ARTICLE X

DISPUTES

1001. Disputes

If the title or right of a Party to receive in kind all or any portion of the Unitized Substances allocated to a Tract, or any share of the proceeds from the sale thereof, is in dispute, the Party concerned shall forthwith give notice thereof to Unit Operator. If Unit Operator is so notified or if Unit Operator is directed to do so by the Working Interest Owners in the event that it is otherwise informed of the dispute, unit Operator shall withhold and sell the portion of Unitized Substances the title or right to which is in dispute, and hold in trust the proceeds from

Article X of the Lease:

- (a) the Party concerned furnishes security in a form and manner satisfactory to the Working Interest Owners for the proper accounting thereof to the rightful owner or owners if the title or right of the Party shall fail in whole or in part, whereupon the proceeds shall be paid to the Party; or
- (b), the title or right thereto is established by a final judgment of a Court or otherwise to the satisfaction of the Working Interest Owners, whereupon such proceeds shall be paid to the Party rightfully entitled.

If Unit Operator does not comply with this clause because it is not notified of a dispute by a Party concerned, that Party hereby agrees to indemnify and save harmless Unit Operator from any loss or damage suffered because of anything done or omitted to be done by Unit Operator because it was not notified.

## ARTICLE XI

### TITLES

#### 1101. Warranty of Titles

Each Working Interest Owner represents and warrants that it is the owner of the Working Interests claimed by it in the Tracts, as set forth in Exhibit "A", and hereby covenants to indemnify and hold the other Parties harmless from any loss due to failure in whole or in part of its titles to any such Working Interest. A Working Interest Owner whose title to the Working Interest in a Tract has so failed, shall be responsible for making at its cost, with the person entitled to such Working Interest, any adjust-

ment for investment and for the support and operating expenses, and of Unitized Substances or the proceeds thereof, resulting from such title failure. Notwithstanding the other provisions of this clause, an indemnification of the other Working Interest in a Tract fails shall, with respect to Unitized Substances, be limited to an amount equal to the cumulative value of Unitized Substances allocated to such tract.

1102. Subsequent Failure of Title

If a title of a Working Interest Owner to a Tract fails, the Tract shall be excluded from this agreement and the Unit Operating Agreement as of 0800 hours official time on the first day of the calendar month in which the failure of title is finally determined unless:

- (a) any other Party is held or declared to own the title in which event that Party shall be bound by this agreement and the Unit Operating Agreement in respect of the Tract; or
- (b) by the last day of the next following calendar month the Tract qualifies for inclusion in the Unit Area pursuant to clause 502.

1103. Revision of Exhibits

Unit Operator shall revise the exhibits to reflect any change in ownership in or exclusion from this agreement of a Tract pursuant to clause 1102. Where a Tract is excluded, the Tract Participations of the other Tracts shall each be increased, without changing their ratios the one to the other, so that their summation equals 100 percent. The revised exhibits shall be effective as of 0800 hours official time on the first day

1302. One Capacity

If a Party owns a Working Interest and a Royalty Interest, its execution of this agreement in one capacity shall also constitute execution in the other capacity.

1303. Subsequent Execution

An owner of an interest in a Tract who has not become a Party as of date the Tract was included in the Unit Area under Article V or IX, may become a Party with respect to that interest only on such terms and conditions as may be prescribed by the Working Interest Owners.

1304. No Partnership

The duties and obligations of the Parties shall be separate and not joint or collective. Nothing contained in this agreement shall be construed to create a partnership or association.

1305. Force Majeure

Neither Unit Operator nor any Party shall be deemed to be in default with respect to non-performance of its obligations hereunder, other than financial, if and so long as its non-performance is due, in whole or in part, to any cause beyond its reasonable control, but lack of funds shall not be a cause beyond a Party's reasonable control. The performance of such obligations shall begin or be resumed within a reasonable time after such cause has been removed. Neither this agreement nor any Lease or any other agreement or instrument relating to the Unitized Zone or Unitized Substances shall terminate by reason or suspension of unit operations for the cause set forth in this clause.

of the calendar month in which the release of title referred to in clause 1102 is finally determined.

## ARTICLE XII

### TRANSFER OF INTEREST

#### 1201. Disposition

In this clause "disposition" means a sale, assignment, transfer, lease, sublease, conveyance, parting with possession, or any transaction of a similar nature, whether by trust or otherwise. A disposition of an interest owned by a Party in a Tract shall cover the whole or an undivided interest in the Party's interest in such Tract. A disposition shall not be binding on the Unit Operator until at least one of the parties to such disposition has given notice thereof to the Unit Operator by copy of the instrument evidencing such a disposition, and the acquiring party, if not a Party hereto, has executed and delivered to Unit Operator a counterpart of this agreement. Unit Operator shall revise the exhibits to reflect each disposition of an interest in a Tract and the revised exhibits shall be effective as of 0800 hours official time on the first day of the calendar month in which the notice is received by Unit Operator.

## ARTICLE XIII

### IN GENERAL

#### 1301. Execution in Counterpart

This agreement may be executed in separate counterparts and all the executed counterparts together shall constitute one agreement. No Party shall be bound hereby until all have executed either one document or a counterpart.

1306. Taxes

Each Party shall be separately liable to the extent of its ownership for all taxes on or with respect to the production or sale of Unitized Substances. A Working Interest Owner may, at any time and from time to time, pay such taxes on behalf of its Royalty Owner and deduct the amount of the payment from the Royalty Owner's royalty. Taxes on production or the value thereof shall be adjusted so that they are borne as if the basis of taxation was the allocation of Unitized Substances hereunder.

1307. Right of Redemption

A Working Interest Owner may, at any time and from time to time, with full rights of subrogation, redeem for its Royalty Owner any agreement for sale, mortgage, or other lien or encumbrance of any kind or nature affecting any interest in the Unit Area in the event of default of payment by the Royalty Owner and deduct the amount of any payment made hereunder from the Royalty Owner's royalty.

1308. Interpretation

The clause headings in this agreement shall not be considered in interpreting the text.

1309. Number and Gender

In this agreement words importing the singular include the plural and vice versa; words importing the masculine gender include the feminine and vice versa; and words importing persons include firms or corporations and vice versa.

1310. Time

In this agreement all times are Central Standard Time.

1311. Notice

Any notice required to be served under this agreement shall be in writing and is properly served when sent by mail or telegram to the latest address of the Party concerned, as furnished to the Unit Operator, and shall be deemed to have been received 5 normal working days after sending.

1312. Recognition of Title

Subject to clause 305 hereof, the execution of this agreement by any Working Interest Owner or Royalty Owner shall not have the effect of recognizing the title of any other Working Interest Owner or Royalty Owner.

1313. Partition

Each Party hereto covenants that during the term of this agreement such Party shall not resort to any action at law or in equity for partition or sale of the interests unitized hereunder, and to that extent waives the benefit of all laws or rules of equity authorizing such partition or sale.

1314. Approval of the Conservation Board

This agreement is subject in its entirety to the approval of the Conservation Board.

#### ARTICLE XIV

##### EFFECTIVE DATE

1401. Effective Date

The unitization provided for herein shall become effective at 0800 hours official time on the first day of the first calendar month

following the date of the Unit Operating Agreement and written approval of this agreement from the Conservation Board.

1402.        Notice of Effective Date

As soon as possible after the Effective Date, Unit Operator shall notify all Royalty Interest Owners, Working Interest Owners, the Conservation Board and the Department of Mines, Resources and Environmental Management for the Province of Manitoba of the Effective Date.

1403.        Release of Parties

This agreement shall cease to bind the Parties if the unitization provided for herein has not become effective on or before the 1st day of October, 1982.

ARTICLE XV

TERM

1501.        Effect of Execution and Delivery

Subject to clause 1403, this agreement is binding upon a person who executes and delivers two counterparts thereof to Unit Operator, and that person is bound by this agreement as of the time of such delivery. This agreement inures to the benefit of and is binding upon the heirs, executors, administrators, successors and assigns of the Parties.

1502.        Termination

This agreement terminates 90 days after all wells for the production of Unitized Substances in the Unit Area have been abandoned, plugged or disposed of or upon the termination of the Unit Operating Agreement, and thereafter the Parties shall be governed by the terms and

provisions of their respective lease agreements or instruments relating to the Unitized Zone or Unitized Substances.

1503. Salvaging Equipment Upon Termination

Royalty Owners grant Working Interest Owners the right for a period of six months after termination of this agreement in which to salvage, sell, distribute or otherwise dispose of the personal property and facilities used in connection with unit operations.

1504. Notice to Royalty Owners

The Working Interest Owners shall give notice in accordance with their leases to their respective Royalty Owners at the termination of this agreement within 30 days thereafter.

IN WITNESS WHEREOF the Parties have executed this agreement each on the date shown opposite its execution hereof.

Date

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

LIST OF INTEREST OWNERS

Working Interest Owners

Omega	Omega Hydrocarbons Ltd.
-------	-------------------------

Royalty Interest Owners

McArthur	George F. McArthur
McGregor	Donald E. McGregor
Missilinda	Missilinda of Canada Ltd.
N.A.R.	North American Royalties
Pounder	Mabel Grace Pounder
Trewin	Harold Forbes Trewin

# EXHIBIT "A"

Attached to and made part of an agreement entitled

"Unit Agreement - Waskada Lower Amarantli Unit No. 1"

Tract Number	Land Description	Royalty Interests		Working Interests		Tract Participation (%)
		Owner	Tract Share (%)	Owner	Tract Share (%)	
1	NW 1/4 Sec 24-1-26 WPM	N.A.R.	25	Omega	100	23.084
		McArthur	50			
		McGregor	25			
2	NE 1/4 Sec 24-1-26 WPM	McArthur	50	Omega	100	18.610
		McGregor	25			
		Missilinda	25			
3	SE 1/4 Sec 25-1-26 WPM	Trowin	100	Omega	100	28.908
4	SW 1/4 Sec 25-1-26 WPM	Pounder	100	Omega	100	29.397

# UNIT "1"

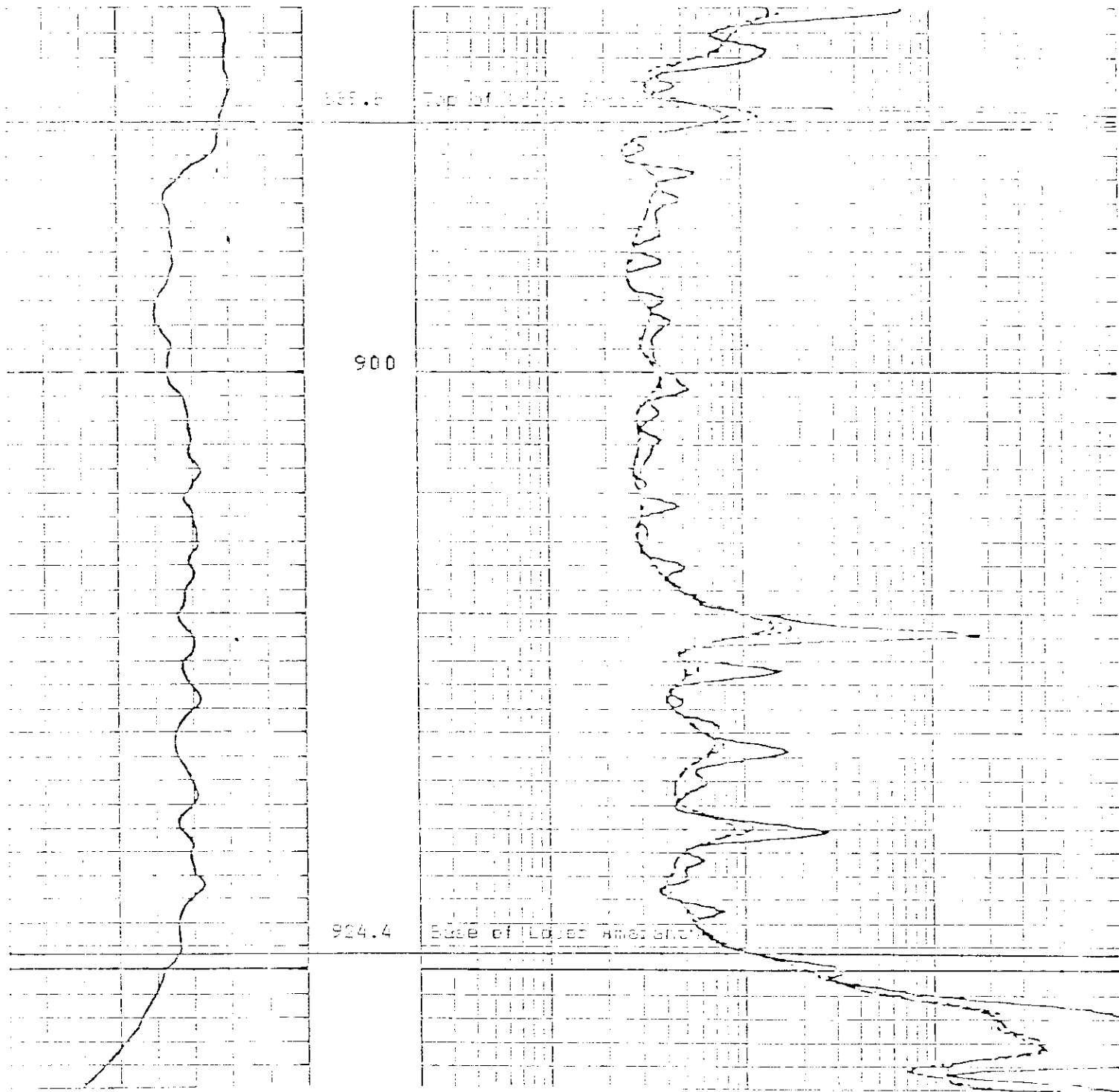
Part of the land part of a plat entitled  
"Unit Agreement - Muskoda Lower Anishinib Unit No. 1"

Rge 26 WPM

Rge 25 WPM

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26	<div> <div>25</div> <div>43</div> <div>3</div> <div>12</div> <div>2</div> </div>	30
23		19
14	13	18

Twp 1



PORTION OF DISFL LOG  
RECORDED AT WELL  
3150A USGS FOR 15-04-1-20  
KELLY FISHING AND ST. R.



1300 SUN LIFE PLAZA III  
112 - 4th AVENUE S.W.  
CALGARY, ALBERTA, CANADA T2P 0H3  
TELEPHONE (403) 261-0743

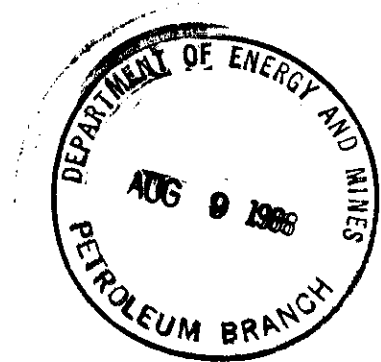
August 5, 1988

The Oil and Natural Gas  
Conservation Board  
555 - 330 Graham Avenue  
Winnipeg, Manitoba  
R3C 4E3

Attention: Mr. Charles S. Kang  
Chairman

Dear Sir:

**RE: Waskada Section 11-2-26 WPM Pilot  
Board Order No. PM43**



The purpose of this letter is to notify The Oil and Natural Gas Conservation Board that Omega Hydrocarbons Ltd. terminated water injection into the subject pilot area on June 30, 1988. Based on the total lack of waterflood response during an injection period in excess of three(3) years, an extension is not being requested of PM Order No. 43. Attachment 1 contains a graph of the historical production data for the pilot area.

Any questions related to this letter should be directed to Mr. Richard Brekke at (403) 261-0743 in our Calgary office.

Yours truly,

OMEGA HYDROCARBONS LTD.

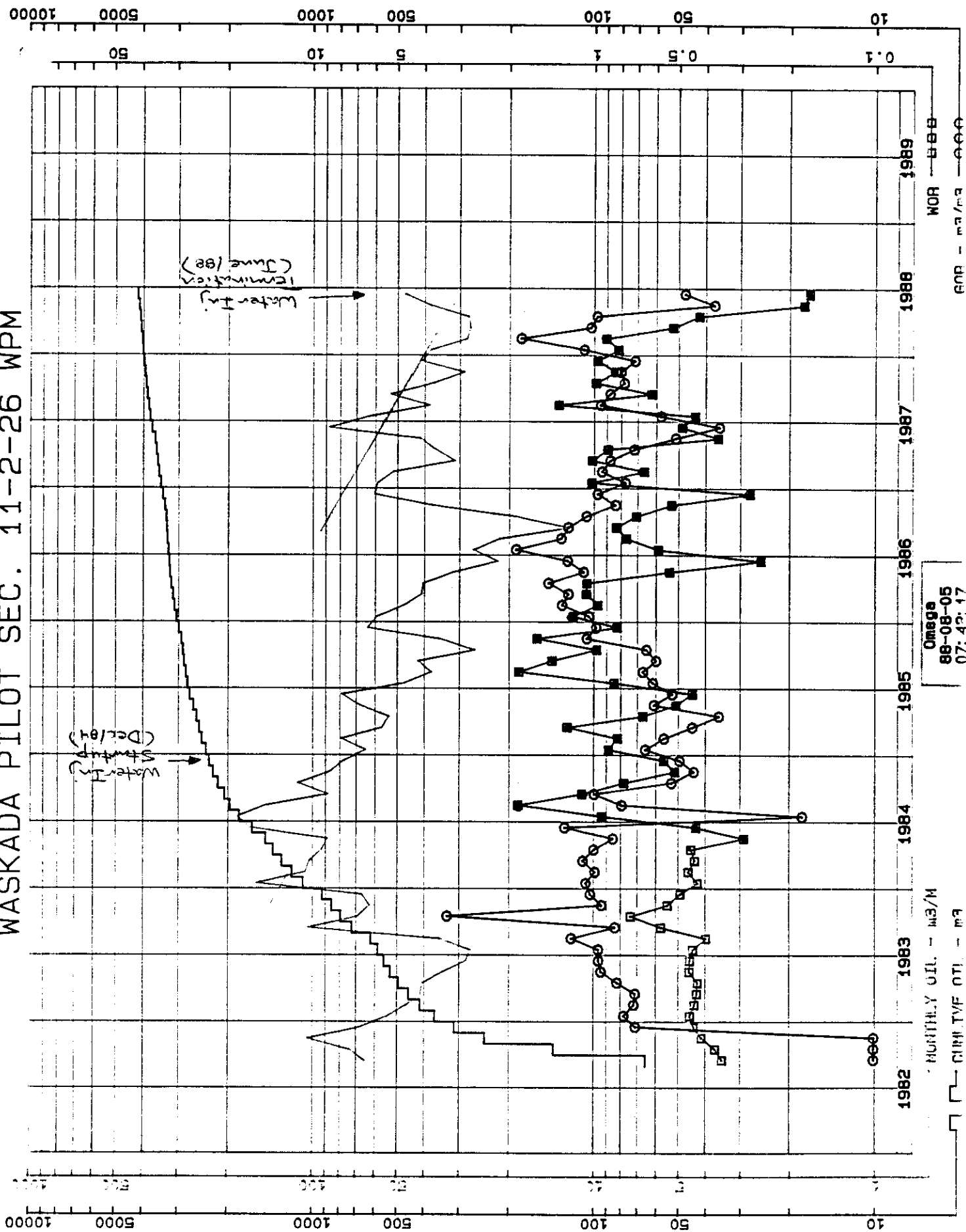
A handwritten signature in dark ink, appearing to read "G. A. Cormack".

G. A. Cormack  
Manager, Production Operations

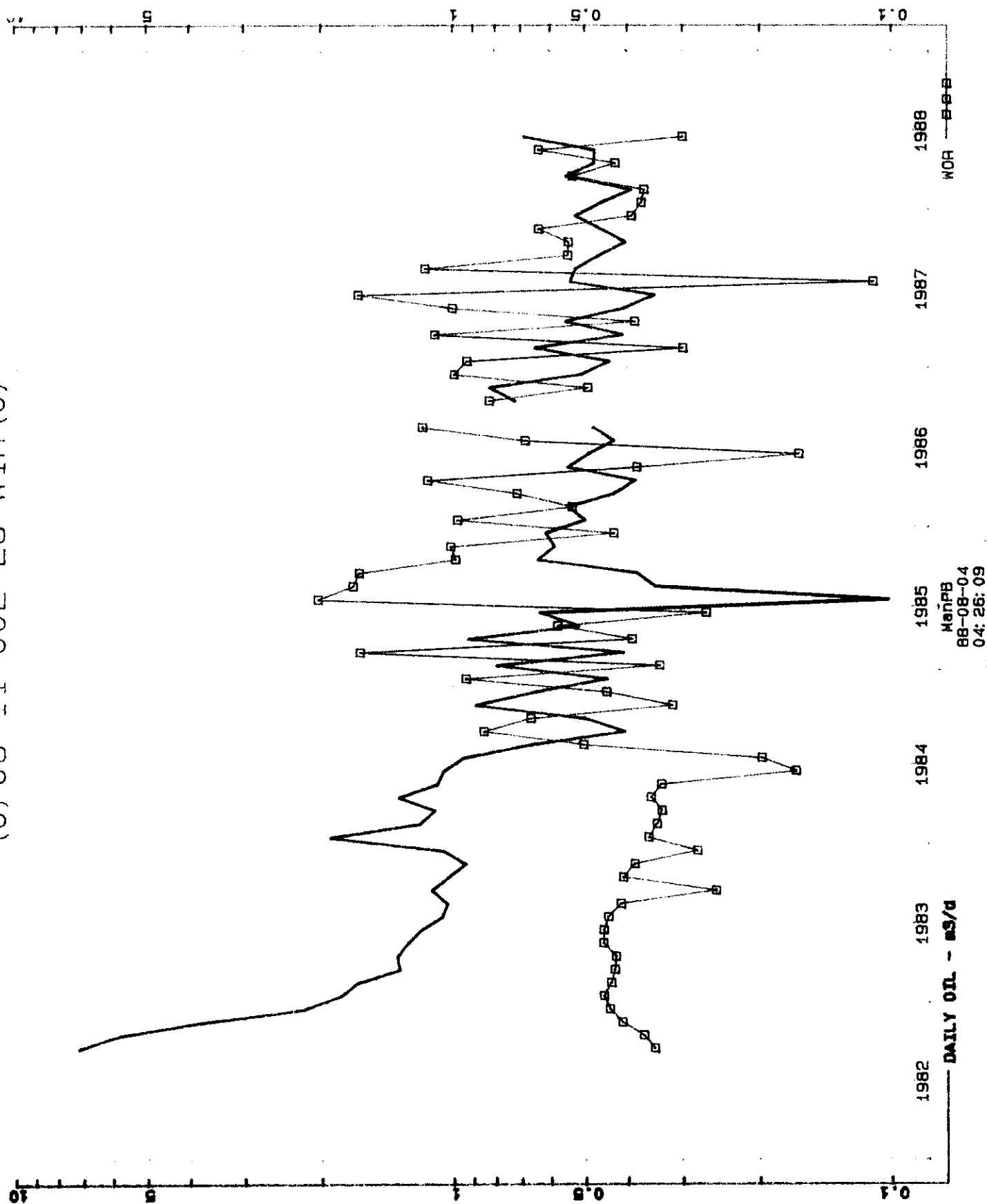
GAC/1b

c.c.: B. Dubreuil - Manitoba Petroleum Branch  
Waskada Section 11 Approval File

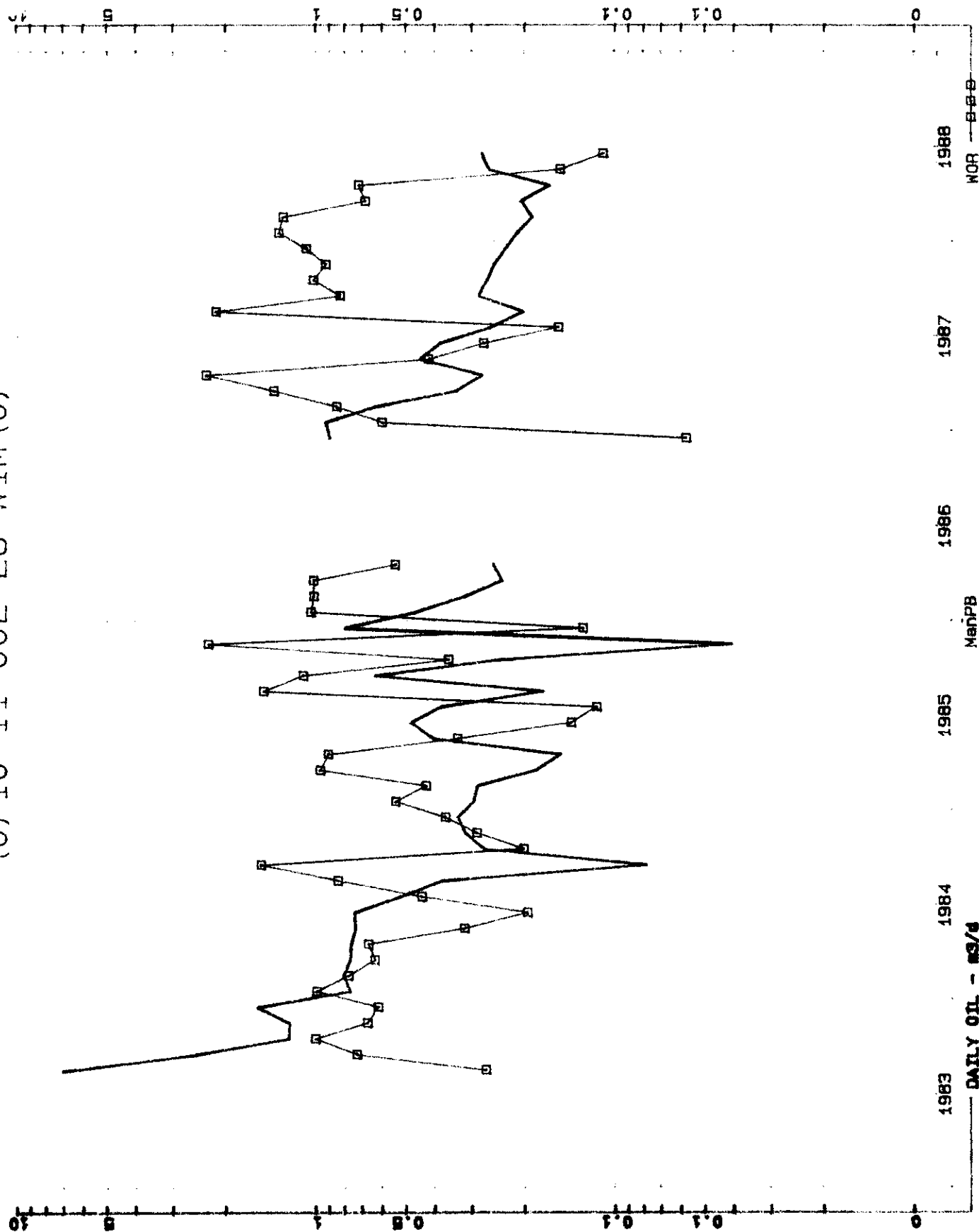
# WASKADA PILOT SEC. 11-2-26 WPM



(0) 06--11--002-26 W1M (0)



(0) 10-11-002-26 W1M (0)



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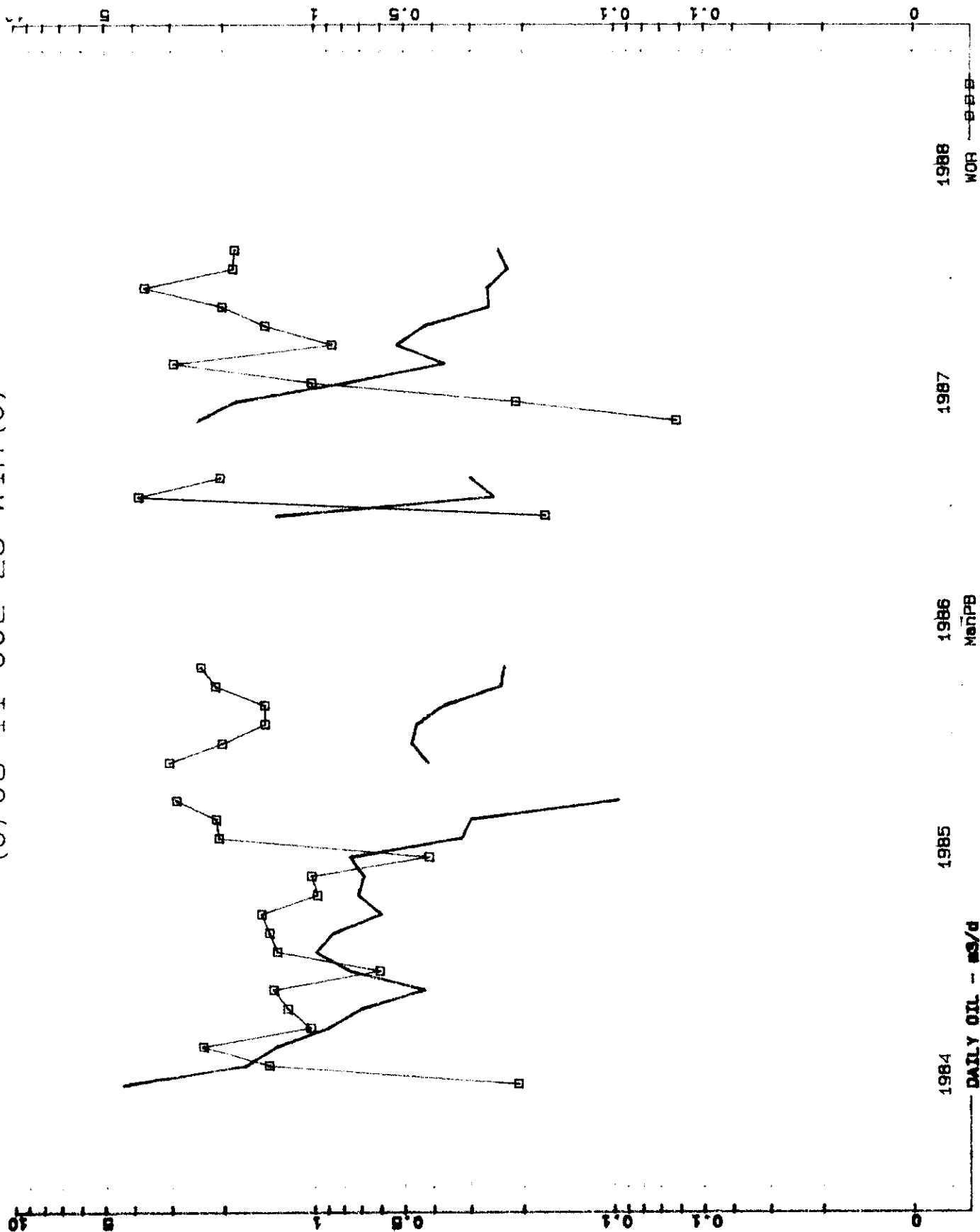
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1984

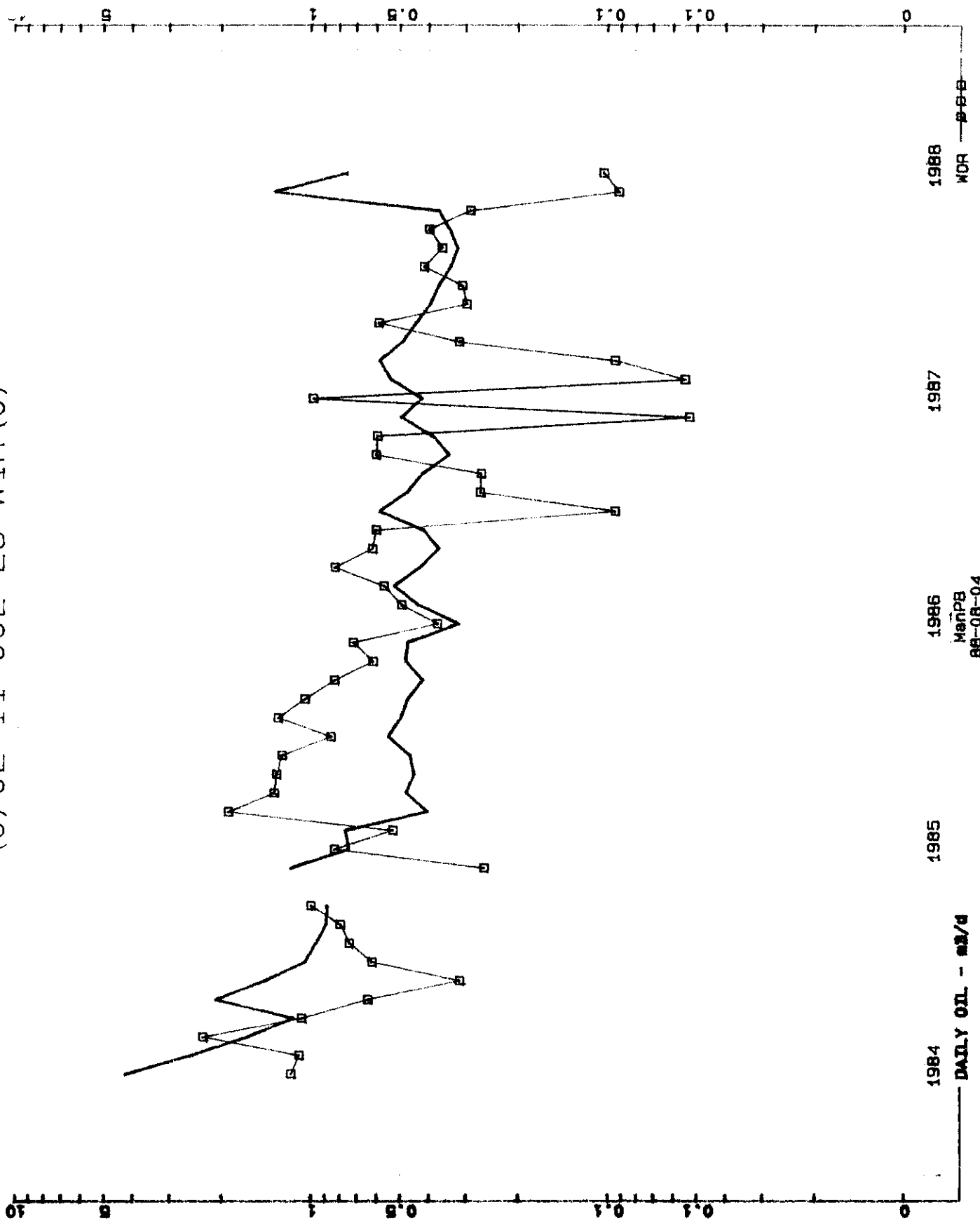
1983

DAILY OIL - MS/d

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(0) 02-11-002-26 W1M (0)



1984 DAILY OIL - m3/d

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1986

1987

1988

W1M  
88-08-04  
04: 22: 22

W1M

# Manitoba

The Oil and Natural Gas  
Conservation Board

File  
1986  
Pressure  
Maintenance



0329A

Room 309  
Legislative Building  
Winnipeg, Manitoba, CANADA  
R3C 0V8

(204) 945-3130

Omega Hydrocarbons Ltd.  
112 - 4th Ave. S.W.  
Calgary, Alberta  
T2P 0H3

Attention: Mr. G. E. Patey,  
Vice President, Production

Dear Sirs:

Re: Waterflood Pilot - Section 11-2-26 (WPM)  
Board Order No. PM 43

Your letter of June 16, 1986 requesting an extension of waterflood approval for the subject pilot scheme is acknowledged.

Pursuant to Pressure Maintenance Rule No. 9(2) of Board Order No. PM 43, the Board hereby approves an extension of the subject pilot waterflood project until July 1, 1988. All other provisions of the subject Board Order remain unchanged.

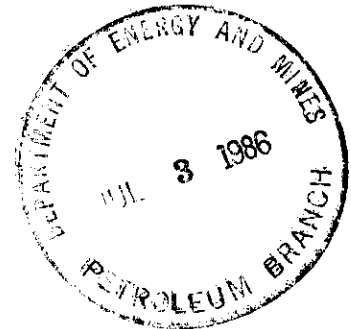
Yours sincerely,

ORIGINAL SIGNED BY  
CHARLES S. KANG

Charles S. Kang  
Chairman

LRD/lk

b.c. Wm. McDonald  
B. Ball  
Petroleum Branch





## Action / Route Slip

Date: **June 27, 1986**

To: **Charles S. Kang**

From: **H. Clare Mosler**

Telephone:

☐ Take Action

☐ Per Your Request

☐ Circulate, Initial  
and Return

☒ For Approval and  
Signature

☐ Make \_\_\_\_\_ Copies

☐ May We Discuss

☐ For Your Information

☐ Return With Comments  
or Revisions

☐ Draft Reply for  
Signature

☐ Please File

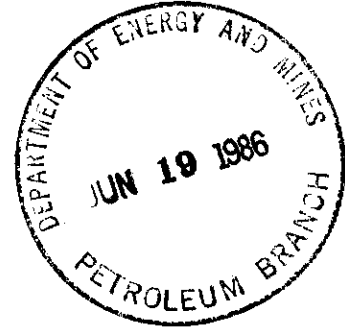
Comments: **Order No. PM 43**

**The requested extension of the pilot waterflood is recommended for  
approval.**



1300 SUN LIFE PLAZA III  
112 - 4th AVENUE S.W.  
CALGARY, ALBERTA, CANADA T2P 0H3  
TELEPHONE (403) 261-0743

June 16, 1986



The Oil and Natural Gas  
Conservation Board  
555 - 330 Graham Avenue  
Winnipeg, Manitoba  
R3C 4E3

Attention: Mr. Charles S. Kang  
Chairman

Dear Sir:

Re: Waskada Section 11-2-26 WPM Pilot  
Board Order No. PM 43

The purpose of this letter is to apply for approval to continue pressure maintenance operations within the Waskada Section 11-2-26 WPM Pilot area. Pursuant to Section 9, Subsection (2) of the Pressure Maintenance Rules contained in PM Order No. 43, Omega Hydrocarbons Ltd. requests permission to extend the term of the Order by approximately two (2) years.

An evaluation of the performance to date for the Pilot area has been submitted under separate cover, in a report titled, "Waskada Lower Amaranth Pressure Maintenance Progress Report No. 3". Based on this report it is the company's opinion that by extending the termination date for the Pilot project to December 31, 1987, sufficient time will elapse to allow a better assessment of the potential in this portion of the reservoir. Any questions related to the submission should be directed to Mr. Richard Brekke at (403) 261-0743 in our Calgary Office.

We apologize for the delay in making this submission and hope that it does not effect your internal processing procedures.

Yours truly,

OMEGA HYDROCARBONS LTD.

G. E. Patey  
Vice President, Production

cc: B. Dubreuil - Manitoba Petroleum Branch  
Waskada Section 11 Approval File

November 21, 1984

Omega Hydrocarbons Ltd.  
1300, 112 - 4th Avenue S.W.  
Calgary, Alberta  
T2P 0H3

Attention: Mr. G. E. Patey  
Vice President, Production

Dear Sir:

Re: Waskada Lower Amaranth A Pool  
Board Order No. PM 43

Enclosed herewith is a copy of Board Order No. PM 43 authorizing pilot pressure maintenance operations in a portion of the subject pool located in Section 11-2-26 (WPM). Your attention is specifically directed to subclause 4(1) which outlines pre-injection pressure survey requirements.

The Board notes that as royalty and working interest ownership is common within the project area, unitization will not be necessary.

This will also acknowledge with thanks receipt of your letters of October 23, 1984 and November 7, 1984 in which you provided additional information as requested by the Board.

Yours sincerely

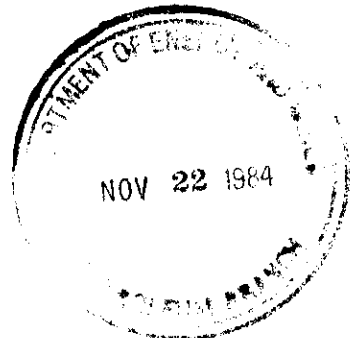
THE OIL AND NATURAL GAS  
CONSERVATION BOARD

ORIGINAL SIGNED BY  
IAN HAUGH

Ian Haugh  
Deputy Chairman

Enclosure  
cc: Marc Eliassen  
J. F. Redgwell

bc: Petroleum Branch  
LRD/IH/bb



Manitoba Regulation 242/84

Being

THE OIL AND NATURAL GAS CONSERVATION BOARD

ORDER NO. PM 43

An Order Pertaining to Pressure Maintenance by Water Flooding

WASKADA LOWER AMARANTH A POOL

Made and Passed Pursuant to "The Mines Act", Cap. M160, of the Continuing Consolidation of the Statutes of Manitoba, and Amendments Thereto, by The Oil and Natural Gas Conservation Board of Manitoba

(Filed: 09 November 84)

WHEREAS, subsection (9) (d) of Section 62 of "The Mines Act" being Chapter M160 of the Continuing Consolidation of the Statutes of Manitoba, provides as follows:

"62(9) Without restricting the generality of subsection (8) the board, with approval of the minister, may make orders

(d) requiring the repressuring, recycling, or pressure maintenance, of any pool or portion thereof where it is economical to do so, and for that purpose where necessary requiring the introduction or injection into any pool or portion thereof of gas, air, water or other substance;"

AND WHEREAS, the Board received an application dated September 12, 1984 from Omega Hydrocarbons Ltd. for approval of a pilot project to inject water into a portion of the Waskada Lower Amaranth A Pool ("the Pool") in Manitoba;

AND WHEREAS, the Board has received no objections to the application by Omega Hydrocarbons Ltd. ("the Operator").

NOW THEREFORE, the Board orders that:

1. The Operator shall conduct pressure maintenance operations by the injection of water into the portion of the Pool which underlies Legal Subdivisions 2, 6, 7, 8 and 10 of Section 11-2-26 (WPM) ("the project area").
2. The pressure maintenance operation shall be in accordance with, and subject to, the following rules:

- 3 1. (1) Water shall be injected into the Pool through the well:

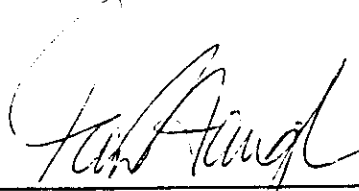
OMEGA WASKADA PROV. WIW 7-11-2-26 (WPM)

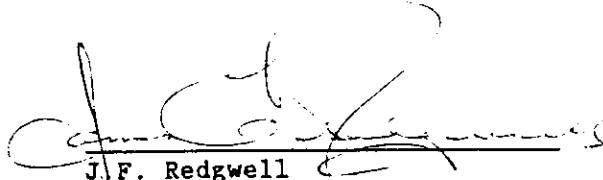
and such other wells in the project area as the Board may approve.

- (2) After the commencement of injection, the Operator shall, subject to any remedial work required to be performed on the wells referred to in subclause (1) of this clause, endeavour to maintain continuous injection.
- (3) Notwithstanding the provisions of subclause (2), the Board may, upon application by the Operator, or on its own motion, approve or require suspension of water injection into any well or wells provided that the Board is satisfied that pressure maintenance operations in the project area will not be adversely affected.
2. The completion of the well referred to in subclause (1) will be as prescribed by the Director of the Petroleum Branch.
3. The Operator, upon the request of the Board, shall satisfy the Board as to the source, suitability and method of treatment of the water to be injected.
- 4.(1) Before injection of water is commenced, the Operator shall submit to the Board results of a survey conducted to determine the static reservoir pressure in a minimum of one well in the project area.
- (2) The Operator shall, not less than six months nor more than 12 months after the commencement of injection, conduct a survey to determine the static reservoir pressure in a minimum of one well in the project area.
- (3) The Operator shall submit the details of the surveys described in subclauses (1) and (2) of this clause to the Petroleum Branch, including a list of the wells to be surveyed, the measurement technique to be used, and the intended shut-in periods for each well, and approval shall be obtained from the Director of the Petroleum Branch before the program is carried out. Within 30 days of the completion date of the surveys, a report shall be submitted to the Petroleum Branch including:
- (a) the static reservoir pressure data obtained from the survey, corrected to a common datum;
- (b) a discussion of the survey results and pressure distribution within the Pool.
- (4) The Board may, at any time, require the Operator to carry out such additional reservoir pressure surveys as it deems necessary.

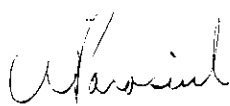
5. The Operator shall immediately report to the Board any indication of channelling or break-through of injected water to producing wells or any indication of other detrimental effects that may be attributable to the pressure maintenance operations.
6. The maximum wellhead pressure at which water is injected into the well referred to in subclause (1) of clause 1 hereof shall not exceed 10 000 kPa or such other maximum pressure as the Board may prescribe. The Board may, from time to time, prescribe a maximum or minimum rate at which water shall be injected into any well in the project area.
- 7.(1) The Operator shall, not later than the last day of each month, file with the Petroleum Branch, a report of the quantity, source and pressure of water injected during the preceding month into the well referred to in clause 1 hereof.
- (2) The Operator shall, not later than the last day of each month, file with the Petroleum Branch a summary report of production and injection operations during the preceding month. This report shall include:
- (a) a tabulation of total oil, total water and total gas produced;
  - (b) a tabulation of the number of producing wells and injection wells which were active;
  - (c) the results of at least one twenty-four hour production test on each producing well in the project area including volumes of oil, gas and water produced during the test;
  - (d) a summary of any remedial operations carried out on any well in the project area.
8. Unless otherwise authorized in writing by the Board, the Operator shall, prior to the expiration of this Order, file with the Petroleum Branch a report of the pressure maintenance program, setting out graphically such interpretive information necessary to evaluate the performance and efficacy of the waterflood. This report is also to include discussions and recommendations regarding continuation or expansion of the pilot or termination of injection.
- 9.(1) Subject to subclause (2), this Order shall terminate on December 1, 1985.
- (2) Notwithstanding the provision of subclause (1), the Board may, upon application of the Operator, extend the term of this Order.

Oil and Natural Gas Order No. PM 43,  
made and passed this 6<sup>th</sup>  
day of November A.D., 1984 at  
the City of Winnipeg, in the  
Province of Manitoba, by The  
Oil and Natural Gas  
Conservation Board.

  
\_\_\_\_\_  
Ian Haugh  
Deputy Chairman,  
The Oil and Natural Gas  
Conservation Board.

  
\_\_\_\_\_  
J. F. Redgwell  
Member,  
The Oil and Natural Gas  
Conservation Board.

Approved:

  
\_\_\_\_\_  
Wilson D. Parasiuk  
Minister of Energy and Mines

DATE: 12 November 1984

TO: H. Clare Moster

COMMENTS:

Please add acknowledgement of your  
reply to the October 23 letter

FROM: Ian Haugh

Dept.:

Branch:

Address:

Telephone:

- |  |  |
|--|--|
| <input type="radio"/> Take action                                | <input type="radio"/> Circulate  |
| <input type="radio"/> Per your request                           | <input type="radio"/> See me re attached   |
| <input type="radio"/> Call me on this matter                     | <input type="radio"/> For your information   |
| <input type="radio"/> Investigate and report                     | <input type="radio"/> Supply data for my reply                                     |
| <input type="radio"/> For your revision<br>or approval           | <input type="radio"/> Reply direct<br>with copy to me                              |
| <input type="radio"/> Return with comments<br>or recommendations | <input checked="" type="radio"/> Draft reply<br>for signature of: Ian Haugh please |





1300 SUN LIFE PLAZA III  
112 - 4th AVENUE S.W.  
CALGARY, ALBERTA, CANADA T2P 0H3  
TELEPHONE (403) 261-0743

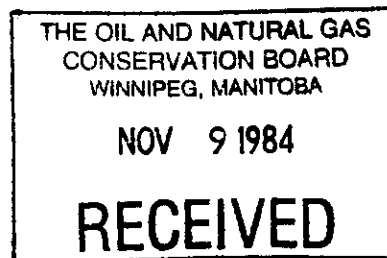
November 7, 1984

The Oil and Natural Gas Conservation Board  
309 Legislative Building  
Winnipeg, Manitoba R3C 0V8

Attention: Dr. Ian Haugh  
Deputy Chairman

Dear Sir:

RE: Pilot Pressure Maintenance Operations -  
Waskada Lower Amaranth A Pool  
Project Number Six



Further to my letter of October 23 enclosed is a map showing the details of mineral owners, surface owners and Lessees with Project Six and adjoining area.

Copies of letters of notice to all Surface Rights Owners have been forwarded to the Petroleum Branch.

Also enclosed is a revised list of wells including non-operated.

I trust this fulfills the outstanding request for further information as described in your October 3 letter.

2.

Yours truly,

OMEGA HYDROCARBONS LTD.

G. E. Patey  
V. P. Production

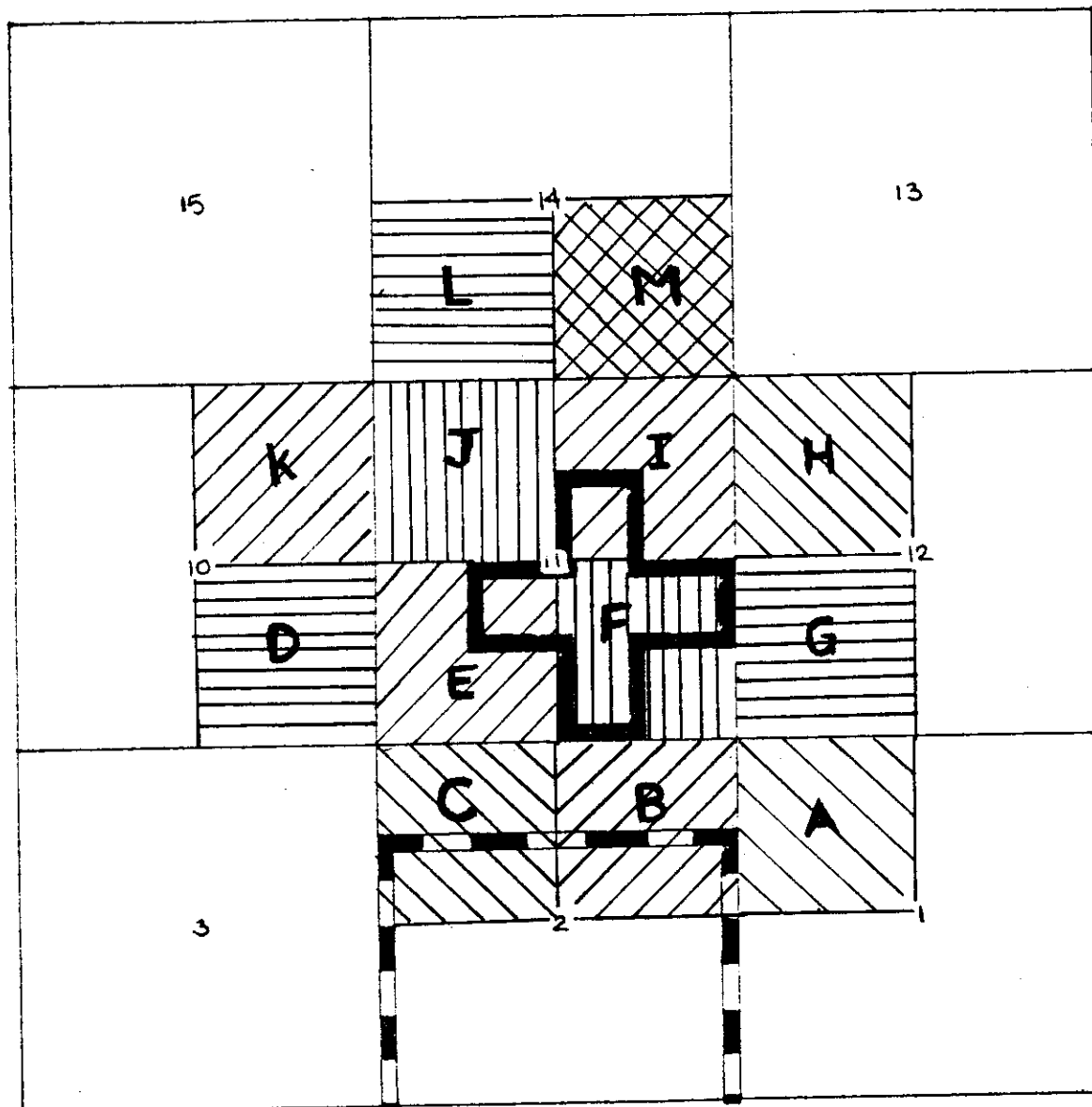
WEW/cw  
Enclosure

cc. Richard Brekke  
Land - Ann Robertson

Ian Haugh's office-12Nov84  
pc: H. C. Moster

Figure I

Waskada Lower Amaranth  
Project Number Six  
Pilot Waterflood Project



Rge 26 WPM

See Attached Legend of

- Surface Owners
- Mineral Owners, and
- Mineral Lessees

Nov. 7/84

Waskada Lower Amaranth  
Project Number Six  
Pilot Waterflood Project

LEGEND

	<u>LANDS</u>	<u>SURFACE OWNER</u>	<u>MINERAL OWNER</u>	<u>MINERAL LESSEE</u>
A	NW/4 1-2-26	Murray Gibson Hannah Waskada, MN	1. 60867 Manitoba Ltd. Deloraine, MN 2. Roydon Hannah Waskada, MN	Sasko  Shell
B	NE/4 2-2-26	1. G. & E. Vanbeselaere Waskada, MN 2. H. G. Lee Waskada, MN	1. Crown 2. PanCanadian	Rex OHL
C	NW 2-2-26	1. Murray David Smart 2. Ovey Seymour Young both Waskada, MN	1. Crown 2. PanCanadian	Rex OHL
D	SE 10-2-26	Roy Edwin Kontzie & Candice Bridgen-Kontzie Waskada, MN	1. James Forbes Trewin 2. The Toronto General Trusts Corporation 3. Roy Kontzie, Keith Kontzie & Gladys Kontzie	K-Tel Troy Oils Voyageur
E	SW 11-2-26	Murray David Smart Waskada, MN	Crown	Samedan
F	SE 11-2-26	Gerard & Elsie Vanbeselaere	Crown	Samedan
G	SE 12-2-26	Lloyd Gerard Vanbeselaere Waskada, MN	1. Prudential Trust Company 2. Lloyd Gerard Vanbeselaere	Senlac Res. Inc. Senlac Res. Inc.
H	NW 12-2-26	Donald Cecil Wickham	Wickham Century Oils Ltd. Melita, MN	Omega
I	NE 11-2-26	Donald Cecil Wickham Waskada, MN	Crown	Samedan
J	NW 11-2-26	Murray David Smart	Crown	Samedan
K	NE 10-2-26	Royden Edwin Kontzie & Candice Bridgen-Kontzie	Roy Kontzie, Keith Kontzie & Gladys Kontzie	Voyageur
L	SW/4 14-2-26	James Douglas Hooper & Ronald Davis Hooper Waskada, MN	Crown	Rex
M	SE/4 14-2-26	Hooper Farms Ltd. Waskada, Mn	Crown	Rex

## Appendix A

### Status and Zone of Wells in Adjoining Area

#### Waskada Pilot Waterflood - Project No. 6

	<u>Status and Zone</u>
1) Omega Rex Waskada 9-2-2-26 WPM	Oil Producer - LAm
2) Omega Rex Waskada 10-2-2-26 WPM	Oil Producer - LAm
3) Omega Rex Waskada 11-2-2-26 WPM	Oil Producer - LAm
4) Omega Rex Waskada 15-2-2-26 WPM	Oil Producer - LAm
5) Omega Waskada 4-3-2-26 WPM	Oil Producer - LAm
6) Omega Waskada 3-14-2-26 WPM	Oil Producer - LAm
7) Sasko et al Waskada 4-12-2-26 WPM	Oil Producer - Confidential
8) Sasko et al Waskada 13-1-2-26 WPM	Oil Producer - LAm
9) Sasko et al Waskada 14-1-2-26 WPM	Oil Producer - LAm
10) Roxy Andex et al Waskada 4-13-2-26 WPM	Abandoned - Dry
11) Chevron Imperial Dalny 8-10-2-26 WPM	Abandoned - Dry
12) Voyageur Blackrock Waskada A8-10-2-26 WPM	Standing

#### PROJECT WELLS

13) Omega Waskada 2-11-2-26 WPM	Oil Producer - LAm
14) Omega Waskada 6-11-2-26 WPM	Oil Producer - LAm
15) Omega Waskada 7-11-2-26 WPM	Oil Producer - LAm
16) Omega Waskada 8-11-2-26 WPM	Oil Producer - LAm
17) Omega Waskada 10-11-2-26 WPM	Oil Producer - LAm

OMEGA

OMEGA HYDROCARBONS LTD.  
1000-100 Avenue  
Winnipeg, Manitoba R3H 0W4  
Telephone (204) 581-1111



November 6, 1984

AS PER ATTACHED ADDRESSEE LIST

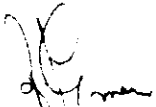
Gentlemen:

Re: Pilot Waterflood Project  
Section 11, Twp. 2, Rge. 26 W1M  
Waskada Area, Manitoba

Pursuant to the Manitoba Petroleum Drilling And Production Regulations - 1984 this letter serves to advise all surface rights owners in the affected area of the subject Project of Omega's intention to initiate the said project in an effort to improve the performance of the "tight" Spearfish reservoir in Section 11, Twp. 2, Rge. 26 W1M. The wells involved are located on LSD's 2, 6, 7, 8 and 10 of Section 11. We will inject produced salt water into the LSD 7 well to maintain reservoir pressure and "sweep" oil towards the offsetting producers in LSD's 2, 6, 8 and 10. The effectiveness of this waterflood will be evaluated by monitoring production rates at these offsetting producing wells. Further development drilling will be justified in this area if the pilot flood is successful.

Yours truly,

OMEGA HYDROCARBONS LTD.

  
R. F. Emerson  
Land Manager

:amr

xc: Mr. L. R. Dubreuil  
Chief Petroleum Engineer  
Manitoba Department of Energy & Mines  
975 Century Street  
Winnipeg, Manitoba R3H 0W4

G. Patey  
E. Wyse  
Waskada Unit No. 6

ADDRESSEE LIST  
PILOT WATERFLOOD PROJECT  
Sec. 11-2-26 W1M  
November 6, 1984

Murray Gibson Hannah  
Waskada, Manitoba ROM 2EO

H. G. Lee  
Waskada, Manitoba ROM 2EO

Ovey Seymour Young  
Waskada, Manitoba ROM 2EO

Roy Edwin Kontzie & Candice Bridgen-Kontzie  
Waskada, Manitoba ROM 2EO

Lloyd Gerard Vanbeselaere  
Waskada, Manitoba ROM 2EO

Hooper Farms Ltd.  
Waskada, Manitoba ROM 2EO

James Douglas Hooper  
Waskada, Manitoba ROM 2EO

Ronald Davis Hooper  
Waskada, Manitoba ROM 2EO



# Inter-Departmental Memo

Date November 2, 1984

To The Oil and Natural Gas  
Conservation Board

From H. Clare Moster  
Director, Petroleum Branch

Marc Eliesen - Chairman  
Dr. I. Haugh - Deputy Chairman  
J. F. Redgwell - Member

Telephone

Subject Pilot Pressure Maintenance Operations

Waskada Lower Amaranth A Pool

Omega Hydrocarbons Ltd., in its letter of September 12, 1984, has made application to conduct a pilot waterflood project in a portion of the Waskada Lower Amaranth A Pool. Notice of the application was published in the Manitoba Gazette (October 13, 1984) and the Melita New Era (October 11, 1984). Notices were also sent to all potentially affected mineral owners. No objections have been received to Omega's proposal.

In its letter of October 2, 1984, the Board requested that, prior to considering approval of the project, Omega provide additional basic information. Omega has provided additional information in its letter of October 23, 1984.

## Recommendation:

It is recommended that the application be approved and that Board Order No. PM 43 (copy attached) be issued.

## Discussion:

The technical and administrative aspects of Omega's proposal were outlined in the Branch's memo of September 26, 1984.

Board Order No. PM 43 includes similar provisions as other recently issued Orders. Subclause 9(1) provides for termination of the Order on December 1, 1985 although subclause 9(2) provides for extension if necessary. It is anticipated that within a year of initiation of injection, success or failure of the scheme should be indicated. Should the scheme be successful, this Order can be modified or replaced by an order authorizing normal pressure maintenance operations. Should the project fail, a pressure maintenance Order would not be required.

As discussed in our previous memo, unitization is not required as working interest and royalty interest ownership is common in the pilot area.

H. Clare Moster

LRD/lk

Manitoba Regulation /84

Being

THE OIL AND NATURAL GAS CONSERVATION BOARD

ORDER NO. PM 43

An Order Pertaining to Pressure Maintenance by Water Flooding

WASKADA LOWER AMARANTH A POOL

Made and Passed Pursuant to "The Mines Act", Cap. M160, of the Continuing Consolidation of the Statutes of Manitoba, and Amendments Thereto, by The Oil and Natural Gas Conservation Board of Manitoba

(Filed: )

WHEREAS, subsection (9) (d) of Section 62 of "The Mines Act" being Chapter M160 of the Continuing Consolidation of the Statutes of Manitoba, provides as follows:

"62(9) Without restricting the generality of subsection (8) the board, with approval of the minister, may make orders

(d) requiring the repressuring, recycling, or pressure maintenance, of any pool or portion thereof where it is economical to do so, and for that purpose where necessary requiring the introduction or injection into any pool or portion thereof of gas, air, water or other substance;"

AND WHEREAS, the Board received an application dated September 12, 1984 from Omega Hydrocarbons Ltd. for approval of a pilot project to inject water into a portion of the Waskada Lower Amaranth A Pool ("the Pool") in Manitoba;

AND WHEREAS, the Board has received no objections to the application by Omega Hydrocarbons Ltd. ("the Operator").

NOW THEREFORE, the Board orders that:

1. The Operator shall conduct pressure maintenance operations by the injection of water into the portion of the Pool which underlies Legal Subdivisions 2, 6, 7, 8 and 10 of Section 11-2-26 (WPM) ("the project area").
2. The pressure maintenance operation shall be in accordance with, and subject to, the following rules:

1. (1) Water shall be injected into the Pool through the well:

OMEGA WASKADA PROV. WIW 7-11-2-26 (WPM)

and such other wells in the project area as the Board may approve.

- (2) After the commencement of injection, the Operator shall, subject to any remedial work required to be performed on the wells referred to in subclause (1) of this clause, endeavour to maintain continuous injection.
  - (3) Notwithstanding the provisions of subclause (2), the Board may, upon application by the Operator, or on its own motion, approve or require suspension of water injection into any well or wells provided that the Board is satisfied that pressure maintenance operations in the project area will not be adversely affected.
2. The completion of the well referred to in subclause (1) will be as prescribed by the Director of the Petroleum Branch.
  3. The Operator, upon the request of the Board, shall satisfy the Board as to the source, suitability and method of treatment of the water to be injected.
  - 4.(1) Before injection of water is commenced, the Operator shall submit to the Board results of a survey conducted to determine the static reservoir pressure in a minimum of one well in the project area.
  - (2) The Operator shall, not less than six months nor more than 12 months after the commencement of injection, conduct a survey to determine the static reservoir pressure in a minimum of one well in the project area.
  - (3) The Operator shall submit the details of the surveys described in subclauses (1) and (2) of this clause to the Petroleum Branch, including a list of the wells to be surveyed, the measurement technique to be used, and the intended shut-in periods for each well, and approval shall be obtained from the Director of the Petroleum Branch before the program is carried out. Within 30 days of the completion date of the surveys, a report shall be submitted to the Petroleum Branch including:
    - (a) the static reservoir pressure data obtained from the survey, corrected to a common datum;
    - (b) a discussion of the survey results and pressure distribution within the Pool.
  - (4) The Board may, at any time, require the Operator to carry out such additional reservoir pressure surveys as it deems necessary.

5. The Operator shall immediately report to the Board any indication of channelling or break-through of injected water to producing wells or any indication of other detrimental effects that may be attributable to the pressure maintenance operations.
6. The maximum wellhead pressure at which water is injected into the well referred to in subclause (1) of clause 1 hereof shall not exceed 10 000 kPa or such other maximum pressure as the Board may prescribe. The Board may, from time to time, prescribe a maximum or minimum rate at which water shall be injected into any well in the project area.
- 7.(1) The Operator shall, not later than the last day of each month, file with the Petroleum Branch, a report of the quantity, source and pressure of water injected during the preceding month into the well referred to in clause 1 hereof.
- (2) The Operator shall, not later than the last day of each month, file with the Petroleum Branch a summary report of production and injection operations during the preceding month. This report shall include:
  - (a) a tabulation of total oil, total water and total gas produced;
  - (b) a tabulation of the number of producing wells and injection wells which were active;
  - (c) the results of at least one twenty-four hour production test on each producing well in the project area including volumes of oil, gas and water produced during the test;
  - (d) a summary of any remedial operations carried out on any well in the project area.
8. Unless otherwise authorized in writing by the Board, the Operator shall, prior to the expiration of this Order, file with the Petroleum Branch a report of the pressure maintenance program, setting out graphically such interpretive information necessary to evaluate the performance and efficacy of the waterflood. This report is also to include discussions and recommendations regarding continuation or expansion of the pilot or termination of injection.
- 9.(1) Subject to subclause (2), this Order shall terminate on December 1, 1985.
- (2) Notwithstanding the provision of subclause (1), the Board may, upon application of the Operator, extend the term of this Order.

Oil and Natural Gas Order No. PM 43,  
made and passed this  
day of November A.D., 1984 at  
the City of Winnipeg, in the  
Province of Manitoba, by The  
Oil and Natural Gas  
Conservation Board.

---

Ian Haugh  
Deputy Chairman,  
The Oil and Natural Gas  
Conservation Board.

---

J.F. Redgwell  
Member,  
The Oil and Natural Gas  
Conservation Board.

Approved:

---

Wilson D. Parasiuk  
Minister of Energy and Mines



100 SUN LIFE PLAZA III  
1004 4TH AVENUE SW  
CALGARY ALBERTA CANADA T2P 0H3  
TELEPHONE (403) 261-0743

November 1, 1984



Gerard & Elsie VanBeselaere  
Box 214  
Waskada, Manitoba  
R0M 2E0

Dear Sir:

RE: Pilot Waterflood Project  
Section 11, Twp. 2, Rge. 26 WPM  
Waskada Area, Manitoba - Our Files: 1125, 1126 & 1127

This will advise that Omega Hydrocarbons Ltd. intends to initiate a Pilot Waterflood Project in an effort to improve the performance of the "tight" Spearfish reservoir in Section 11, Twp. 2, Rge. 26 WPM. The wells involved are located on LSD's 2, 6, 7, 8, and 10 of Section 11. We will inject produced salt water into the LSD 7 well to maintain reservoir pressure and "sweep" oil towards the offsetting producers in LSD's 2, 6, 8 and 10. The effectiveness of this waterflood will be evaluated by monitoring production rates at these offsetting producing wells. Further development drilling will be justified in this area if the pilot flood is successful.

Yours truly,

OMEGA HYDROCARBONS LTD.

R. F. Emerson  
Land Manager

RFE/sms

cc: ✓ Mr. L. R. Dubreuil  
Chief Petroleum Engineer  
Manitoba Department of Energy and Mines  
975 Century Street  
Winnipeg, Manitoba  
R3H 0W4

George Patey

Ed Wyse

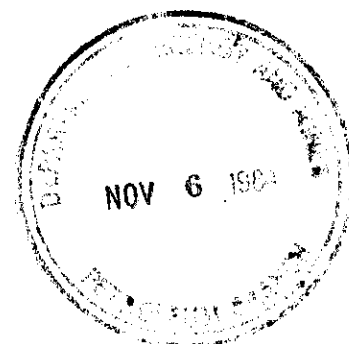
Waskada Unit No. 6

*Surface  
Owner*



1300 SUN LIFE PLAZA III  
1111 4TH AVENUE SW  
CALGARY ALBERTA CANADA T2P 0H3  
TELEPHONE (403) 261-0743

November 1, 1984



Donald Cecil Wickham  
Waskada, Manitoba  
ROM 2EO

Dear Sir:

RE: Pilot Waterflood Project  
Section 11, Twp. 2, Rge. 26 WPM  
Waskada Area, Manitoba - Our File: 1030

This will advise that Omega Hydrocarbons Ltd. intends to initiate a Pilot Waterflood Project in an effort to improve the performance of the "tight" Spearfish reservoir in Section 11, Twp. 2, Rge. 26 WPM. The wells involved are located on LSD's 2, 6, 7, 8, and 10 of Section 11. We will inject produced salt water into the LSD 7 well to maintain reservoir pressure and "sweep" oil towards the offsetting producers in LSD's 2, 6, 8 and 10. The effectiveness of this waterflood will be evaluated by monitoring production rates at these offsetting producing wells. Further development drilling will be justified in this area if the pilot flood is successful.

Yours truly,

OMEGA HYDROCARBONS LTD.

R. F. Emerson  
Land Manager

RFE/sms

cc: ✓ Mr. L. R. Dubreuil  
Chief Petroleum Engineer  
Manitoba Department of Energy and Mines  
975 Century Street  
Winnipeg, Manitoba  
R3H 0W4

George Patey

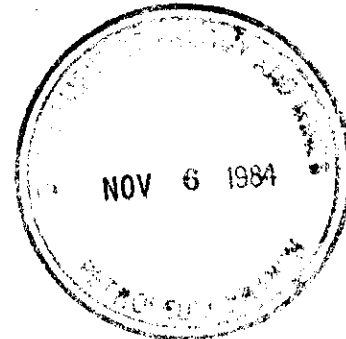
Ed Wyse

Waskada Unit No. 6



1301 SUN LIFE PLAZA III  
112 14th AVENUE S.W.  
CALGARY, ALBERTA, CANADA T2P 0H3  
TELEPHONE (403) 261-0743

November 1, 1984



Murray David Smart  
Box 128  
Waskada, Manitoba  
R0M 2E0

Dear Sir:

RE: Pilot Waterflood Project  
Section 11, Twp. 2, Rge. 26 WPM  
Waskada Area, Manitoba - Our File: 253

This will advise that Omega Hydrocarbons Ltd. intends to initiate a Pilot Waterflood Project in an effort to improve the performance of the "tight" Spearfish reservoir in Section 11, Twp. 2, Rge. 26 WPM. The wells involved are located on LSD's 2, 6, 7, 8, and 10 of Section 11. We will inject produced salt water into the LSD 7 well to maintain reservoir pressure and "sweep" oil towards the offsetting producers in LSD's 2, 6, 8 and 10. The effectiveness of this waterflood will be evaluated by monitoring production rates at these offsetting producing wells. Further development drilling will be justified in this area if the pilot flood is successful.

Yours truly,

OMEGA HYDROCARBONS LTD.

R. F. Emerson  
Land Manager

RFE/sms

cc: ✓ Mr. L. R. Dubreuil  
Chief Petroleum Engineer  
Manitoba Department of Energy and Mines  
975 Century Street  
Winnipeg, Manitoba  
R3H 0W4  
  
George Patey  
  
Ed Wyse  
  
Waskada Unit No. 6

DATE: 31 October 1984

TO:

H. Clare Moster

COMMENTS:

→ Bob

FROM: Ian Haugh

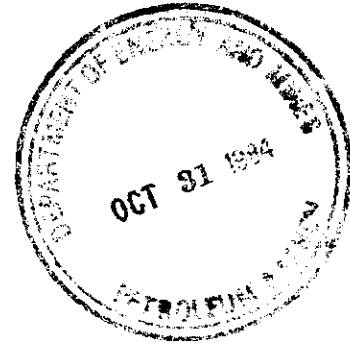
Dept.:

Branch:

Address:

Telephone:

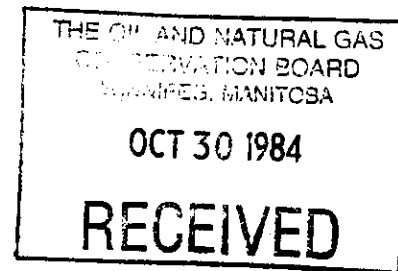
- |   |   |
|---|---|
| <input type="radio"/> Take action                             | <input type="radio"/> Circulate   |
| <input type="radio"/> Per your request                        | <input type="radio"/> See me re attached  |
| <input type="radio"/> Call me on this matter                  | <input type="radio"/> For your information                                      |
| <input type="radio"/> Investigate and report                  | <input type="radio"/> Supply data for my reply                                  |
| <input type="radio"/> For your revision or approval           | <input type="radio"/> Reply direct with copy to me                              |
| <input type="radio"/> Return with comments or recommendations | <input checked="" type="radio"/> Draft reply for signature of: Ian Haugh please |





1300 SUN LIFE PLAZA III  
112 - 4th AVENUE S.W.  
CALGARY, ALBERTA, CANADA T2P 0H3  
TELEPHONE (403) 261-0743

October 23, 1984



The Oil and Natural Gas Conservation Board  
309 Legislative Building  
Winnipeg, Manitoba  
R3C 0V8

Attention: Dr. Ian Haugh  
Deputy Chairman

Dear Sir:

RE: Pilot Pressure Maintenance Operations -  
Waskada Lower Amaranth A Pool  
Project Number Six

In response to your letter of October 3 we offer the following additional information:

- 1) Legal title searches have been ordered. Upon their receipt we will forward maps of the scheme and adjoining area showing:
  - a) Mineral Rights Owners
  - b) Leasees
  - c) Surface Rights Owners


In addition written notice to Surface Rights Owners will be supplied as soon as the searches have been received.

- 2) Attached is Figure I; a map showing the scheme area.
- 3) Attached is Figure II; Omega's Waskada Water distribution system, showing schematically both the injection well and the surface facilities.
- 4) Attached is Appendix A; a list of all wells in the scheme and adjoining area along with their respective completion zones and statuses.
- 5) Control of corrosion will be accomplished by several techniques.
  - a) Isolating the injection well casing by means of an injection packer.

- b) Cathodic protection of both the wells and the pipeline system.
  - c) Chemical inhibition in the water system as required.
  - d) Efforts to eliminate the introduction of oxygen into the system.
  - e) All water lines and tubing installed in the water injection well is internally plastic coated. In addition all pipelines have been externally coated with top grade yellow jacket.
- 6) Source of injection fluid (water) is as shown in the attached schematic. Water injected will be a mixture of produced water from Omega's 11-30 Battery and source water from Blairmore source wells 1-30 and 11-29-1-25 WPM.
- 7) Treatment of injection water will involve mechanical straining and filtration as well as chemical inhibition as required.
- 8) Measurement of injection water is intended to be similar to existing Waskada water measurement facilities with the individual well flow meters being porated back to the main Water Plant Totalizer located at 11-30-1-25 WPM. The individual meter for well 7-11 will be located within the satellite at that location.

Yours truly,

OMEGA HYDROCARBONS LTD.

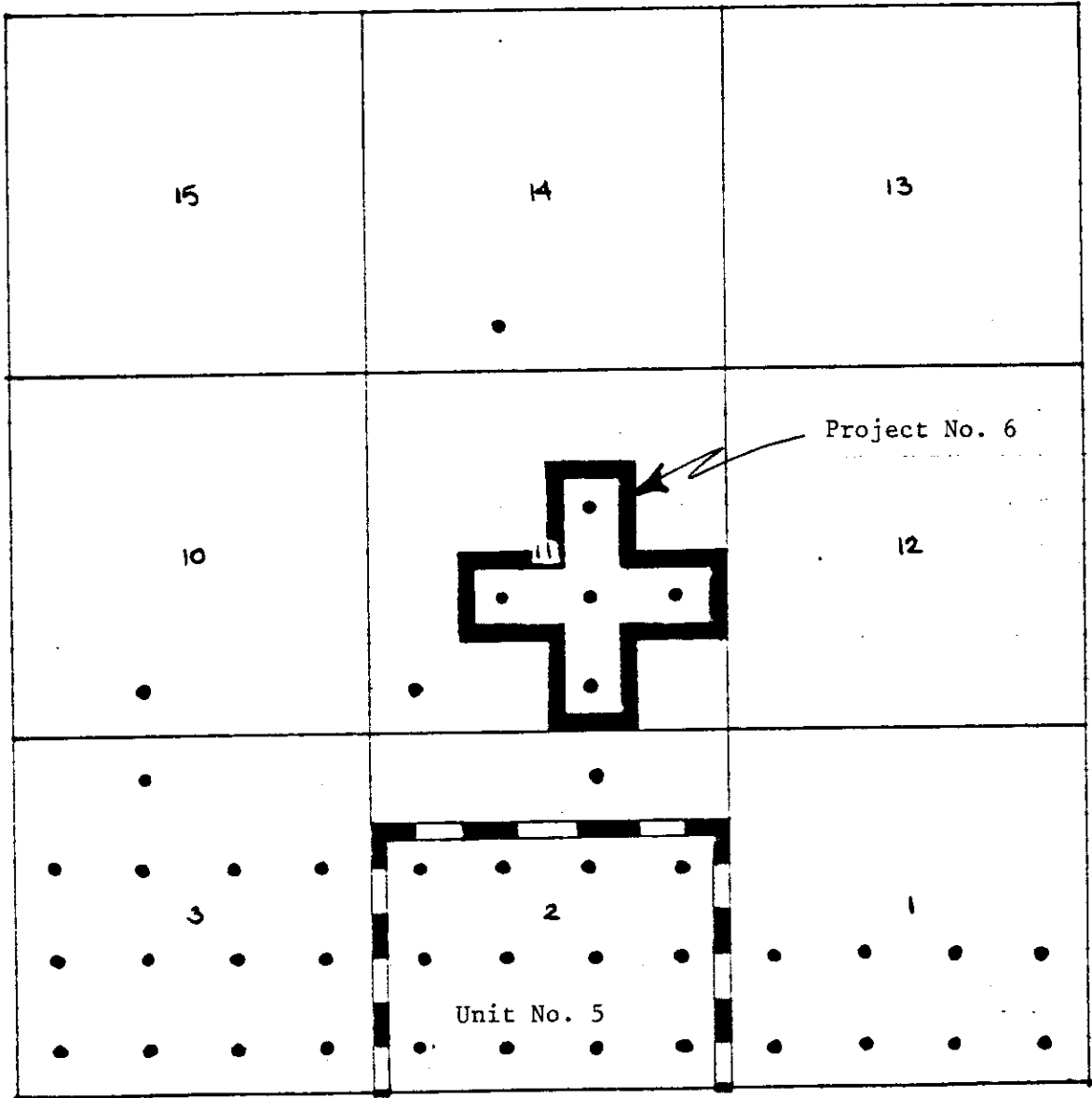
  
George Patey  
V. P. Production

WEW/cw

Enclosure

cc: Richard Brekke  
w/o attachments - Ann R.

FIGURE 1  
WASKADA LOWER AMARANTH  
PROJECT NUMBER SIX  
PILOT WATERFLOOD PROJECT

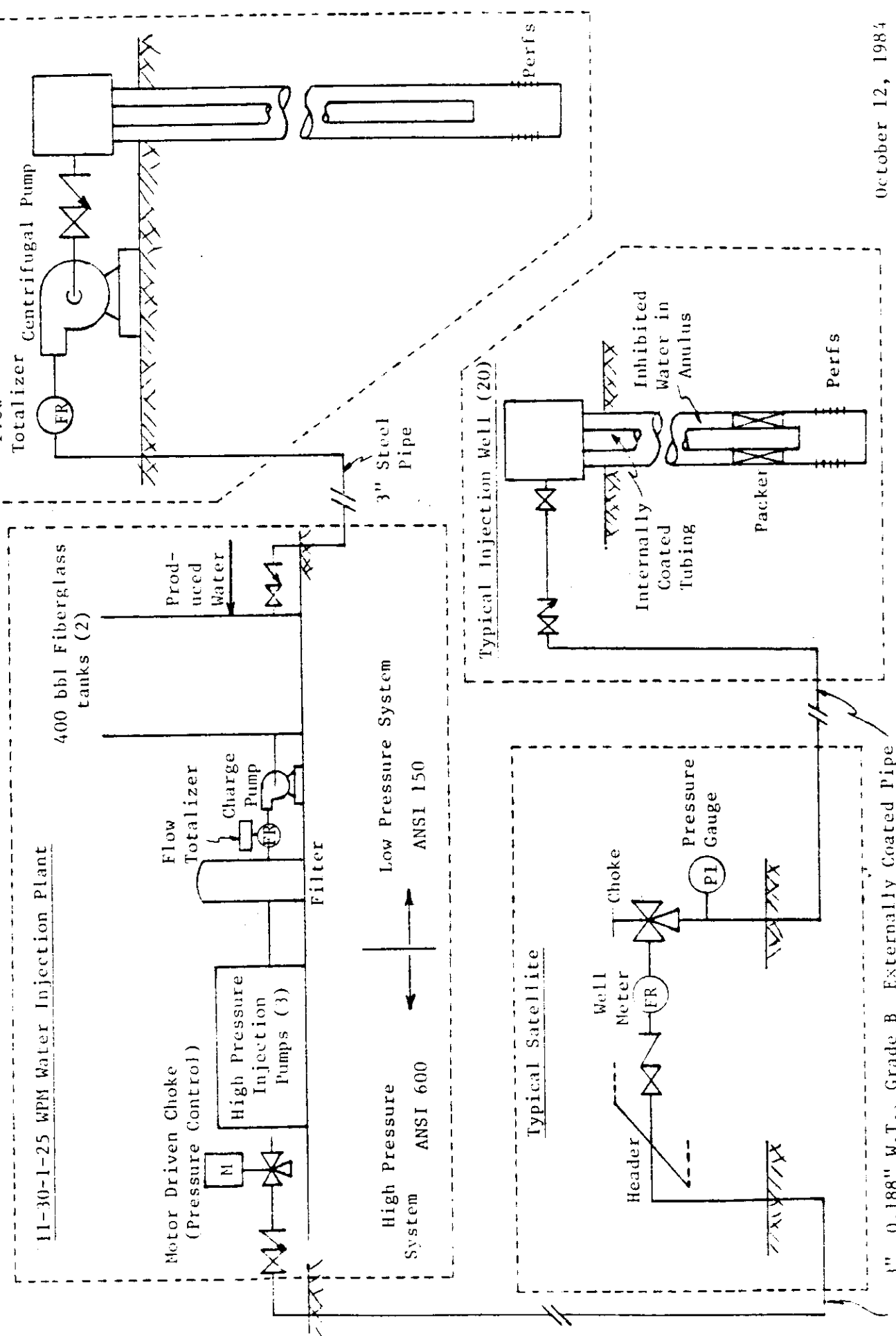


Rge 26 WPM

Oct. 23/84

FIGURE II

OMEGA HYDROCARBONS LTD.  
WASKADA WATER DISTRIBUTION SYSTEM



October 12, 1984

3", 0.188" W.T., Grade B Externally Coated Pipe

## Appendix A

### Sataus and Zone of Wells in Adjoining Area

#### Waskada Pilot Waterflood - Project No. 6

	<u>Status and Zone</u>
1) Omega Rex Waskada 9-2-2-26 WPM	Oil Producer - LAm
2) Omega Rex Waskada 10-2-2-26 WPM	Oil Producer - LAm
3) Omega Rex Waskada 11-2-2-26 WPM	Oil Producer - LAm
4) Omega Rex Waskada 15-2-2-26 WPM	Oil Producer - LAm
5) Omega Waskada 4-3-2-26 WPM ? 4-11-(?)	Oil Producer - LAm
6) Omega Waskada 3-14-2-26 WPM	Oil Producer - LAm

#### PROJECT WELLS

7) Omega Waskada 2-11-2-26 WPM	Oil Producer - LAm
8) Omega Waskada 6-11-2-26 WPM	Oil Producer - LAm
9) Omega Waskada 7-11-2-26 WPM	Oil Producer - LAm
10) Omega Waskada 8-11-2-26 WPM	Oil Producer - LAm
11) Omega Waskada 10-11-2-26 WPM	Oil Producer - LAm

Also. Sasko et al Waskada 4-12-2-26	OIL PRODUCER	Confidential
Sasko et al Waskada 13-1-2-26	"	L. Am
Sasko et al Waskada 14-1-2-26	"	L. Am
Roxy Ander et al Waskada 4-13-2-26	Abd "D"	
Chevron Imperial Dalny 8-10-2-26	Abd "D"	
Voyager Blackrock Waskada AB-10-2-26	Standing.	

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plus 9.9% APR Financing on  
the Balance.

Check Our Used 1482,  
Field Reac. and 914 Combines  
or our 2—815 Diesels w/cab  
and air.

#### MISCELLANEOUS

Shaver Post Pounder—  
Clearance 999

NH 357 Mix Mill w/Power

Feeder 3,800

Melroe 903 6F18 Plow 4,200

IHC 42 ft. (32 to 42) Vibra

Chisel w/Harrows 7,400

Versatile 30 ft. to 36 ft.

Cultivator 2,100

New Demo IHC 5500 Deep

Tillage at 39 ft.—

Clearance 13,500

New IHC 6200, 3-12 ft. w/cyl.

and hoses. 3 Drill Hitch, Track

Eraser, Just Back in Off

Rental—Call For Special Prices

IHC 496 Tandem Disc—

Clearing 16,800

New IHC 1982 5088 Tractor,

135 H.P. Must Sell

**ELLIOTT FARMLAND EQUIP.**

Manitoway City

Phone 522-3960

Melita, Manitoba

#### Livestock For Sale

**FOR SALE**—Part Arabian

Colts and Horses. Phone 522-

3780, Melita. 6-3c

**FOR SALE**—10 Good Replace-

ment Cows, ¾ and ½ Blonde

d'Aquitaines and Maine-An-

jou's and 1—Purebred Simmen-

tal Bull, easy calver. Calves sold

on September 14 and steers

average 595 lbs. and heifers

average 545 lbs. These are good

producing cows at 1200 lbs. and

over. Phone John Birch, 685-

2286, Gainsborough. 8-3c

#### NOTICE

**NOTICE**

Belmore's Feedlot Cleaning,

operating three truck spreaders.

Complete line of New Equip-

ment. Phone 482-3444, Carn-

duff, Sask. 35-t.f.n.

**FOR RENT**—Apartment, fur-  
nished. Doug Cameron, 160  
Poplar, 522-8305, Melita.

7-2p

**FOR RENT**—2 Bedroom Suite  
in Melita, available immediate-  
ly. Phone 748-1168, Virden.

8-2p

**FOR RENT**—Small two  
bedroom house located at 165  
Centre Street. Phone 522-3678,  
Melita.

8-3p

#### GIVE AWAY

**GIVE AWAY**—Female Dog,  
Terrior, one year old. Black  
with white markings. Phone  
Don, 522-3722, Melita. 7-2p

**GIVE AWAY**—One Dalmation  
and one Terrior-Dashhound  
Cross to a family that has kids  
and lives on a farm. Both dogs  
are house trained. Leave mes-  
sage at Melita Motel By The  
River. 8-1p

#### HELP WANTED

**HELP WANTED**—Earn extra  
money. Sell **Watkins Products**  
to your friends and neighbours.  
Contact A. King, 476-5512 or  
Bill Heal, 476-3029, Neepawa.  
7-3c

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**WORK WANTED**—Will do  
any and all types of jobs in-  
cluding yard cleaning, tree cut-  
ting and removal, tearing down  
buildings, building corrals,  
painting or what you have.  
Cheap rates. Book early for free  
estimates. No job too big or too  
small. Serving Southwest Mani-  
toba and Saskatchewan. Write  
to Ray or Ervin Alberts, Box  
114, Goodlands, Man. Phone  
658-3431. 2-tfn

People who believe the  
world is against them make  
it so.

Melita

**The Oil and Natural Gas  
Conservation Board  
309 Legislative Building  
Winnipeg, Manitoba  
R3C 0V8**

#### NOTICE

#### UNDER THE MINES ACT WASKADA OIL FIELD

Omega Hydrocarbons Ltd.  
has made application under The  
Mines Act to conduct a pilot  
waterflood project in the Lower  
Amaranth Formation in that  
portion of the Waskada Field  
described as follows: Lsd's 2, 6,  
7, 8 and 10 of Section 11-2-26  
(WPM).

It is proposed to convert the  
following well to water injection  
**OMEGA WASKADA PROV.**  
7-11-2-26 (WPM).

If no valid objection or in-  
tervention in writing is received  
by the Board at 555-330 Gra-  
ham Avenue, Winnipeg, Mani-  
toba, R3C 4E3 within 14 days  
of the publication of this notice,  
the Board may approve the ap-  
plication.

Copies of the application may  
be obtained from Omega  
Hydrocarbons Ltd., 630-330  
Fifth Avenue S.W., Calgary,  
Alberta, T2P 0L4.

—Yours Sincerely

The Oil and Natural Gas  
Conservation Board  
Ian Haugh

Deputy Chairman

Dated: September 28, 1984

#### WILL DO

**WILL DO**—Are you short of  
water for your cattle? I will  
winter them for you. I will  
supply water and a good bush  
shelter and labor for wages.  
You supply your own feed.  
Apply Maurice Mahy, phone  
858-2241, Hartney. 7-2p

**WILL DO**—Concrete base-  
ments, grade beams and fit-  
tings. Also wooden basements.  
Call Ron at 686-2254, Tilston.  
45-t.f.n.

Melita

Oct 11/84

Dwelling and Shed adjacent to and Access Driveway onto P.T.H. No. 1, S.W. ¼, Sec. 27-10-20 West, R.M. of Whitehead.

L.A. 9628 — Assiniboine Realty — P.T.H. No. 1 — City of Brandon.

Application by Assiniboine Realty for permit for Motel adjacent to P.T.H. No. 1, Lot 16, Parcel 1, N.E. ¼, Sec. 35-10-19 West, City of Brandon.

L.A. 9827 — A. Carey — P.T.H. No. 10 — R.M. of Morton

Application by A. Carey for permit for Access Driveway onto P.T.H. No. 10, N.W. ¼, Sec. 35-2-20 West, R.M. of Morton.

L.A. 9818 — L. Waterman — P.T.H. No. 2 — R.M. of Glenwood.

Application by L. Waterman for permit

for Sign adjacent to P.T.H. No. 2, E ½, Sec. 34-7-22 West, R.M. of Glenwood.

The Highway Traffic Board will be prepared to consider any submissions regarding the above applications at this hearing. Any persons wishing to make a submission should either contact the Acting Secretary at the hearing or forward their written submission in advance to: A. Poltaruk, Acting Secretary, The Highway Traffic Board, Room 200-301 Weston Street, Winnipeg, Manitoba, R3E 3H4.  
Phone: 945-8912.

A. POLTARUK,  
Acting Secretary,

THE HIGHWAY TRAFFIC BOARD.

—41

#### UNDER THE MINES ACT

##### Waskada Oil Field

Omega Hydrocarbons Ltd. has made application under The Mines Act to conduct a pilot waterflood project in the Lower Amaranth Formation in that portion of the Waskada Field described as follows:

Lsd's 2, 6, 7, 8 and 10 of Section 11-2-26 (WPM)

It is proposed to convert the following well to water injection

Omega Waskada Prov. 7-11-2-26 (WPM)

If no valid objection or intervention in writing is received by the Board at 555-330 Graham Avenue, Winnipeg, Manitoba R3C

4E3 within 14 days of the publication of this notice, the Board may approve the application.

Copies of the application may be obtained from Omega Hydrocarbons Ltd., 630-330 Fifth Avenue S.W., Calgary, Alberta, T2P 0L4.

Yours sincerely,  
THE OIL AND NATURAL GAS  
CONSERVATION BOARD

IAN HAUGH,  
Deputy Chairman

Dated: September 28th, 1984.

—41

October 13, 1984

#### APPLICATION SECRETARY R.M. OF S

The Rural Municipality of  
vites written application  
Secretary-Treasurer.  
approximately Janua

Preference will be  
licants enrolled in the  
completed the Munic  
course, who have exp  
Administration and w  
counting background

By virtue of a war  
Province of Manitoba  
bearing date of the 20  
parcels of land herci  
hereby give notice th  
year or more followi  
portion of the costs ch  
1984, at the hour of 1:00  
of Glenella, in Manit  
taxes and costs.

Further take not  
Municipality of Glen  
lands listed below, ev  
by another bidder on

S.E. 1-18-14w 160.0A  
N.W. W ½ 3-18-13w 80  
S.E. 3-18-13w 160.0A  
Lot 1, Blk. 4, Pln. 331  
Lot 25, Pln. 401 50.0F  
Lot 26, Pln. 401 209.01  
Lot 8, Pln. 505 528.0F  
Lots 8/12, Blk. 10, Pln  
S.E. 11-18-13w 159.96  
N.E. N ½ 12-18-13w 80  
S.W. 13-18-13w 160.0A  
N.E. w 3 rds 14-18-13  
S.W. 24-18-13w 152.05  
N.E. 7-18-12w 160.0A  
S.E. 28-18-13w 1.67A  
N ½ Lot 68, 69/70, Pln.  
N.W. 16-19-13w 160.0  
S.E. ½ Lot 4, Pln. 401  
Lot 2, Blk. 12, Pln. 67  
S.E. 20-18-11w 161.0A  
S.W. 3-18-13w 160.0A



MANITOBA

THE OIL AND NATURAL GAS CONSERVATION BOARD  
309 LEGISLATIVE BUILDING  
WINNIPEG, MANITOBA  
R3C 0V8

October 2, 1984

Omega Hydrocarbons Ltd.  
1300, 112 - 4th Avenue S.W.  
Calgary, Alberta  
T2P 0H3

Attention: Mr. G. E. Patey,  
Vice President, Production

Dear Sirs:

Re: Pilot Pressure Maintenance Operations -  
Waskada Lower Amaranth A Pool

Your application dated September 12, 1984 for approval to conduct pilot pressure maintenance operations in a low permeability area in the subject pool is acknowledged. In that your proposal is a pilot scheme, the Board is prepared to waive most of the normal technical requirements in support of an application of this type. However, there are certain basic items which should be included in any application. Please submit the information listed under Subclauses (a) (ii) and (iii) and Clauses (b), (d), (e) and (f) of Section 126 of The Petroleum Drilling and Production Regulations, 1984. While the Board intends to proceed with advertisement of your application, final approval will be withheld pending receipt of the above information.

With respect to unitization of the area, it is noted that the royalty and working interest owners are common in all parts of the project area. As a result, it does not appear necessary to proceed with unitization at this time. Your comments in this regard are solicited.

Please note that pursuant to Section 58 of The Petroleum Drilling and Production Regulations, 1984, you are required to obtain a flow line licence prior to commencing operation of any new flow line. A supply of application forms is attached. Such applications should be forwarded to the Department's Waskada District office.

Yours sincerely,

THE OIL AND NATURAL GAS  
CONSERVATION BOARD

ORIGINAL SIGNED BY  
IAN HAUGH

Ian Haugh  
Deputy Chairman

LRD/HCM/lk

c.c. Marc Eliesen  
J. F. Redgwell

b.c. Petroleum Branch :

October 1, 1984

Queen's Printer  
Statutory Publications  
200 Vaughan Street

Brad Thiessen  
Petroleum Administrator  
Petroleum Branch  
555 - 330 Graham Avenue

945-6571

Please have the attached Notice appear in the next issued of  
the Manitoba Gazette under The Mines Act.

Thank you.

  
Brad Thiessen

BT/ch  
Attachment



MANITOBA

THE OIL AND NATURAL GAS CONSERVATION BOARD  
309 LEGISLATIVE BUILDING  
WINNIPEG, MANITOBA  
R3C 0V8

NOTICE

UNDER THE MINES ACT

WASKADA OIL FIELD

Omega Hydrocarbons Ltd. has made application under The Mines Act to conduct a pilot waterflood project in the Lower Amaranth Formation in that portion of the Waskada Field described as follows:

Lsd's 2, 6, 7, 8 and 10 of Section 11-2-26 (WPM)

It is proposed to convert the following well to water injection

OMEGA WASKADA PROV. 7-11-2-26 (WPM)

If no valid objection or intervention in writing is received by the Board at 555 - 330 Graham Avenue, Winnipeg, Manitoba R3C 4E3 within 14 days of the publication of this notice, the Board may approve the application.

Copies of the application may be obtained from Omega Hydrocarbons Ltd., 630 - 330 Fifth Avenue S.W., Calgary, Alberta, T2P 0L4.

Yours sincerely,

THE OIL AND NATURAL GAS  
CONSERVATION BOARD

Ian Haugh  
Deputy Chairman

DATED: September 28<sup>th</sup>, 1984.



# Inter-Departmental Memo

Date September 26, 1984

To The Oil and Natural Gas  
Conservation Board

From H. Clare Moster  
Director, Petroleum Branch

Marc Eliesen - Chairman  
Dr. I. Haugh - Deputy Chairman  
J. F. Redgwell - Member

Telephone

Subject Pilot Pressure Maintenance Operations

Waskada Lower Amaranth A Pool

Omega Hydrocarbons Ltd. has made application to conduct a pilot waterflood project in a portion of the subject Pool. The project area is outlined on Figure No. 1.

## Recommendations:

It is recommended that:

1. Notice of the application be published in the Manitoba Gazette and the Melita New Era and sent to all working interest owners within 1 kilometre of the project area. (Table 1 lists the affected working interest owners). A copy of the proposed notice is attached.
2. A deficiency letter be sent to Omega Hydrocarbons Ltd. requesting additional supporting information required pursuant to Section 126 of The Petroleum Drilling and Production Regulations, 1984.
3. If no objections are received to the notice and if the additional information requested is received, that the application be approved and Board Order No. PM 42 (draft attached) be passed.

## Discussion:

Primary recovery in the subject Pool is characterized by relatively high initial oil rates and rapid rate declines. This behavior exemplifies a very low energy recovery mechanism (i.e. - no active aquifer support) which is reflected in very limited primary recovery (estimated at 5%). The rate of primary production decline is a function of reservoir permeability with lower permeability areas experiencing more severe declines. Figure No. 2 shows available core permeability data in the area. It is noted that immediately north of the project area, effective reservoir capacity is zero while to the south, higher kh values are indicated. In addition, Omega has submitted results of liquid permeability tests on the well Omega Waskada Prov. 7-11-2-26 (WPM) which indicate very low permeability to water in this core.

Due to the very limited reservoir permeability in the project area, effective pressure maintenance operations may not be feasible (limited injectivity). If pressure maintenance is not feasible, further development of the area (to obtain limited primary production) is not likely to occur. Based on the above, Omega proposes to conduct a pilot waterflood project consisting of a central injection well (7-11) and four offsetting producers.

Given the very limited primary reserves, the apparent near depletion (primary) of the area and the potential for further development of the area if the project is successful, it is recommended that Omega's proposal be approved.

Inasmuch as the project is considered a pilot, a rigorous technical analysis of primary and waterflood performance and reserves is not appropriate. However, Omega's application lacks much of the basic information needed to properly describe the scheme (e.g. layout of surface facilities, list of offset mineral and working interest owners, etc.). Consequently, it is recommended that a deficiency letter (draft attached) be sent to Omega outlining minimum submission requirements.

Table 1 lists working interest ownership within one kilometre of the proposed project. Inasmuch as Omega's proposal could possibly affect these interests it is recommended that a notice of application be forwarded to these parties. Advertisement in the Manitoba Gazette and the Melita New Era is also recommended.

A draft of a proposed Board Order (No. PM 42) authorizing the proposed project is attached. The Order contains normal provisions regarding completion, data acquisition and reporting requirements and injection pressure limitations. It is proposed to provide for termination of the Order approximately one year after injection is commenced, but provisions to extend the term of the Order are also included.

The working interest and royalty interest owners are common to the entire project area. In view of this and having regard for the possible negative results and early termination of the pilot, unitization does not appear to be necessary at this time. Should the scheme prove successful, future expansions would probably require formation of a Unit.

*Approved by H. C. Moster*  
H. Clare Moster

LRD/lk

TABLE 1

Working Interest Owners Within  
1 km of Project Area

<u>Working Interest Owner</u>	<u>Area</u>
Voyager Petroleum Ltd.	E $\frac{1}{2}$ -10-2-26
Sasko Oil & Gas	SW $\frac{1}{4}$ & E $\frac{1}{2}$ -12-2-26
Roxy Petroleum Ltd.	NW $\frac{1}{4}$ -12-2-26
Samedan Oil of Canada Ltd.	Section 11 (Farmor)

Twp.

Rge.

FIGURE No 1

02

26

"PILOT WATERFLOOD"

PROJECT AREA

CROWN  
OWNED  
MINERAL  
RIGHTS

PROPOSED  
WASKADA  
UNIT NO. 5

251

Twp.

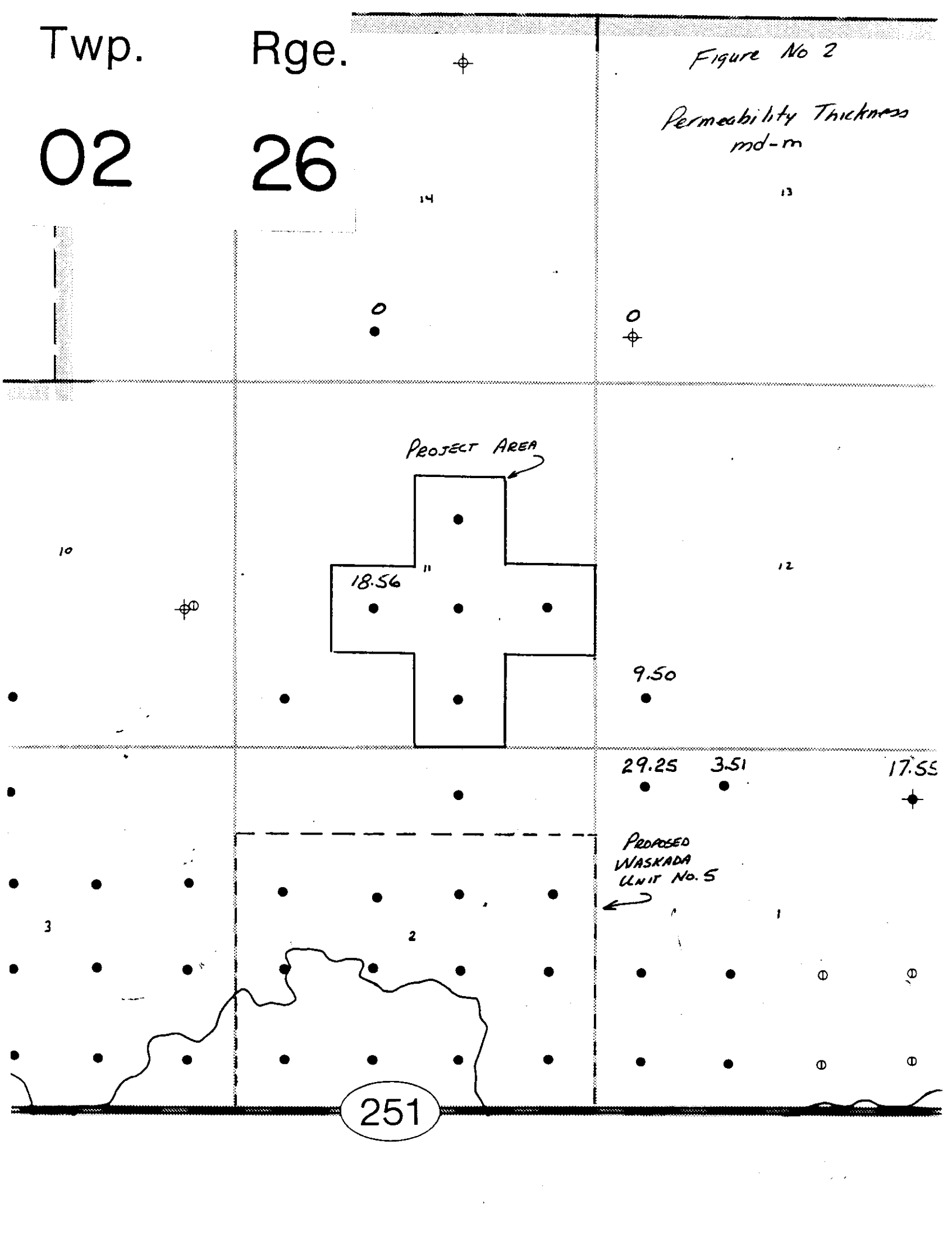
Rge.

02

26

Figure No 2

Permeability Thickness  
md-m





MANITOBA

THE OIL AND NATURAL GAS CONSERVATION BOARD  
309 LEGISLATIVE BUILDING  
WINNIPEG, MANITOBA  
R3C 0V8

NOTICE

UNDER THE MINES ACT

WASKADA OIL FIELD

Omega Hydrocarbons Ltd. has made application under The Mines Act to conduct a pilot waterflood project in the Lower Amaranth Formation in that portion of the Waskada Field described as follows:

Lsd's 2, 6, 7, 8 and 10 of Section 11-2-26 (WPM)

It is proposed to convert the following well to water injection

OMEGA WASKADA PROV. 7-11-2-26 (WPM)

If no valid objection or intervention in writing is received by the Board at 555 - 330 Graham Avenue, Winnipeg, Manitoba R3C 4E3 within 14 days of the publication of this notice, the Board may approve the application.

Copies of the application may be obtained from Omega Hydrocarbons Ltd., 630 - 330 Fifth Avenue S.W., Calgary, Alberta, T2P 0L4.

Yours sincerely,

THE OIL AND NATURAL GAS  
CONSERVATION BOARD

Ian Haugh  
Deputy Chairman

DATED: September , 1984.

Manitoba Regulation /84

Being

THE OIL AND NATURAL GAS CONSERVATION BOARD

ORDER NO. PM 42

An Order Pertaining to Pressure Maintenance by Gas Flooding

WASKADA LOWER AMARANTH A POOL

Made and Passed Pursuant to "The Mines Act", Cap. M160, of the Continuing Consolidation of the Statutes of Manitoba, and Amendments Thereto, by The Oil and Natural Gas Conservation Board of Manitoba

(Filed: )

WHEREAS, subsection (9)(d) of Section 62 of "The Mines Act" being Chapter M160 of the Continuing Consolidation of the Statutes of Manitoba, provides as follows:

"62(9) Without restricting the generality of subsection (8) the board, with approval of the minister, may make orders

(d) requiring the repressuring, recycling, or pressure maintenance, of any pool or portion thereof where it is economical to do so, and for that purpose where necessary requiring the introduction or injection into any pool or portion thereof of gas, air, water or other substance;"

AND WHEREAS, the Board received an application dated September 12, 1984 from Omega Hydrocarbons Ltd. for approval of a pilot project to inject water into a portion of the Waskada Lower Amaranth A Pool ("the Pool") in Manitoba;

AND WHEREAS, the Board has received no objections to the application by Omega Hydrocarbons Ltd. ("the Operator")

NOW THEREFORE, the Board orders that:

1. The operator shall conduct pressure maintenance operations by the injection of water into the portion of the pool which underlies Legal Subdivisions 2, 6, 7, 8 and 10 of Section 11-2-26 (WPM) ("the project area").
2. The pressure maintenance operation shall be in accordance with, and subject to, the following rules:

- 1.(1) Water shall be injected into the pool through the well:

OMEGA WASKADA PROV. WIW 7-11-2-26 (WPM)

and such other wells in the project area as the Board may approve.

- (2) After the commencement of injection, the Unit Operator shall, subject to any remedial work required to be performed on the wells referred to in subclause (1) of this clause, endeavour to maintain continuous injection.
- (3) Notwithstanding the provisions of subclause (2), the Board may, upon application by the Unit Operator, or on its own motion, approve or require suspension of water injection into any well or wells provided that the Board is satisfied that pressure maintenance operations in the project area will not be adversely affected.
2. The completion of the well referred to in subclause (1) will be as prescribed by the Director of the Petroleum Branch.
3. The operator, upon the request of the Board, shall satisfy the Board as to the source, suitability and method of treatment of the water to be injected.
- 4.(1) Before injection of water is commenced, the operator shall submit to the Board results of a survey conducted to determine the static reservoir pressure in a minimum of one well in the project area.
- (2) The operator shall, not less than six months nor more than 12 months after the commencement of injection, conduct a survey to determine the static reservoir pressure in a minimum of one well in the project area.
- (3) The operator shall submit the details of the surveys described in subclauses (1) and (2) of this clause to the Petroleum Branch, including a list of the wells to be surveyed, the measurement technique to be used, and the intended shut-in periods for each well, and approval shall be obtained from the Director of the Petroleum Branch before the program is carried out. Within 30 days of the completion date of the surveys, a report shall be submitted to the Petroleum Branch including:
  - (a) the static reservoir pressure data obtained from the survey, corrected to a common datum;
  - (b) a discussion of the survey results and pressure distribution within the Pool.
- (4) The Board may, at any time, require the operator to carry out such additional reservoir pressure surveys as it deems necessary.

5. The operator shall immediately report to the Board any indication of channelling or break-through of injected water to producing wells or any indication of other detrimental effects that may be attributable to the pressure maintenance operations.
6. The maximum wellhead pressure at which water is injected into the well referred to in subclause (1) of clause 1 hereof shall not exceed 10 000 kPa or such other maximum pressure as the Board may prescribe. The Board may, from time to time, prescribe a maximum or minimum rate at which water shall be injected into any well in the project area.
- 7.(1) The operator shall, not later than the last day of each month, file with the Petroleum Branch, a report of the quantity, source and pressure of water injected during the preceding month the well referred to in clause 1 hereof.
- (2) The operator shall, not later than the last day of each month, file with the Petroleum Branch a summary report of production and injection operations during the preceding month. This report shall include:
  - (a) a tabulation of total oil, total water and total gas produced;
  - (b) a tabulation of the number of producing wells and injection wells which were active;
  - (c) the results of at least one twenty-four hour production test on each producing well in the project area including volumes of oil, gas and water produced during the test;
  - (d) a summary of any remedial operations carried out on any well in the project area.
8. Unless otherwise authorized in writing by the Board, the operator shall, prior to the expiration of this Order, file with the Petroleum Branch a report of the pressure maintenance program, setting out graphically such interpretive information necessary to evaluate the performance and efficacy of the waterflood. This report is also to include discussions and recommendations regarding continuation or expansion of the pilot or termination of injection.
- 9.(1) Subject to subclause (2) this Order shall terminate on December 1, 1985.
- (2) Notwithstanding the provision of subclause (1) the Board may, upon application of the operator, extend the term of this Order.

Oil and Natural Gas Order No. PM 42,  
made and passed this            day of  
                                 A.D., 1984 at the City  
of Winnipeg, in the Province of  
Manitoba, by The Oil and Natural  
Gas Conservation Board.

---

Marc Eliesen  
Chairman,  
The Oil and Natural Gas  
Conservation Board

---

Ian Haugh  
Deputy Chairman,  
The Oil and Natural Gas  
Conservation Board

---

J. F. Redgwell  
Member,  
The Oil and Natural Gas  
Conservation Board

Approved:

---

Wilson D. Parasiuk  
Minister of Energy and Mines

DATE: 17 September 84

TO: H. Clare Moster

MANIT<sup>BA</sup>

COMMENTS:

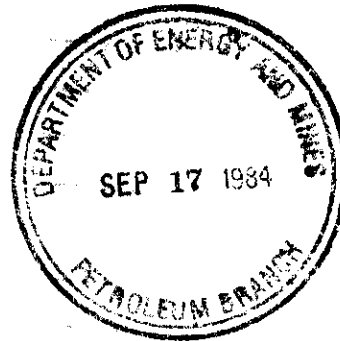
FROM: Ian Haugh

Dept.:

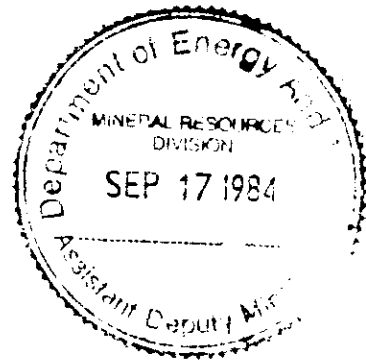
Branch:

Address:

Telephone:



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| <input type="radio"/> Take action                             | <input type="radio"/> Circulate   |
| <input type="radio"/> Per your request                        | <input type="radio"/> See me re attached  |
| <input type="radio"/> Call me on this matter                  | <input type="radio"/> For your information                                      |
| <input type="radio"/> Investigate and report                  | <input type="radio"/> Supply data for my reply                                  |
| <input type="radio"/> For your revision or approval           | <input type="radio"/> Reply direct with copy to me                              |
| <input type="radio"/> Return with comments or recommendations | <input checked="" type="radio"/> Draft reply for signature of: Ian Haugh please |



September 12, 1984

The Oil and Natural Gas  
Conservation Board  
555 - 330 Graham Avenue  
Winnipeg, Manitoba  
R3C 4E3

Attention: Dr. Ian Haugh

Dear Sir:

Re: Proposed Waskada Unit #6  
Application to Conduct a Pilot  
Waterflood Pressure Maintenance Project

Omega will presently be drafting Unit documents for the formation of a new Waskada Unit. Waskada Unit No. 6 is proposed to include five tracts (as shown on the attached plan); 2, 6, 7, 8 and 10-11-2-26 WPM. The purpose in forming this Unit is to investigate the feasibility of waterflooding the poorer quality Lower Amaranth reservoir as characterized by these wells.

Liquid permeability core studies performed on core from the intended injection well, 7-11-2-26 WPM, would suggest that water injectivity may be very, very poor (see January 4th, 1984 Report). We have been pleasantly surprised with the water injectivity at other low permeability wells (i.e. 13-25 & 15-25-1-26 WPM) and therefore there is hope here.

The attached well production plot illustrates the dramatic decline in oil rate for these wells to rates that are only very marginally economic. Future drilling in areas such as this will only result if some enhanced recovery preferably by waterflood will work.

Insofar as the economics of production from this area is poor; core analysis is not promising; and, the project area is not contiguous to the rest of the Waskada waterflood we are applying for approval of this pressure maintenance scheme as a pilot without the formalities normally associated with these projects.

Pipelines have already been installed for the proposed Unit wells and upon

Ian Haugh's office-17Sep84  
pc: H. C. Moster with attachment

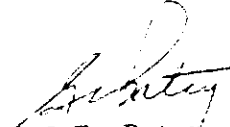
.../2

Dr. Ian Haugh  
Page 2

approval of both the Unit and the P.M. Order the project can be commenced almost immediately. We would therefore request your cooperation in an attempt to get this project underway prior to this winter.

Yours truly,

OMEGA HYDROCARBONS LTD.

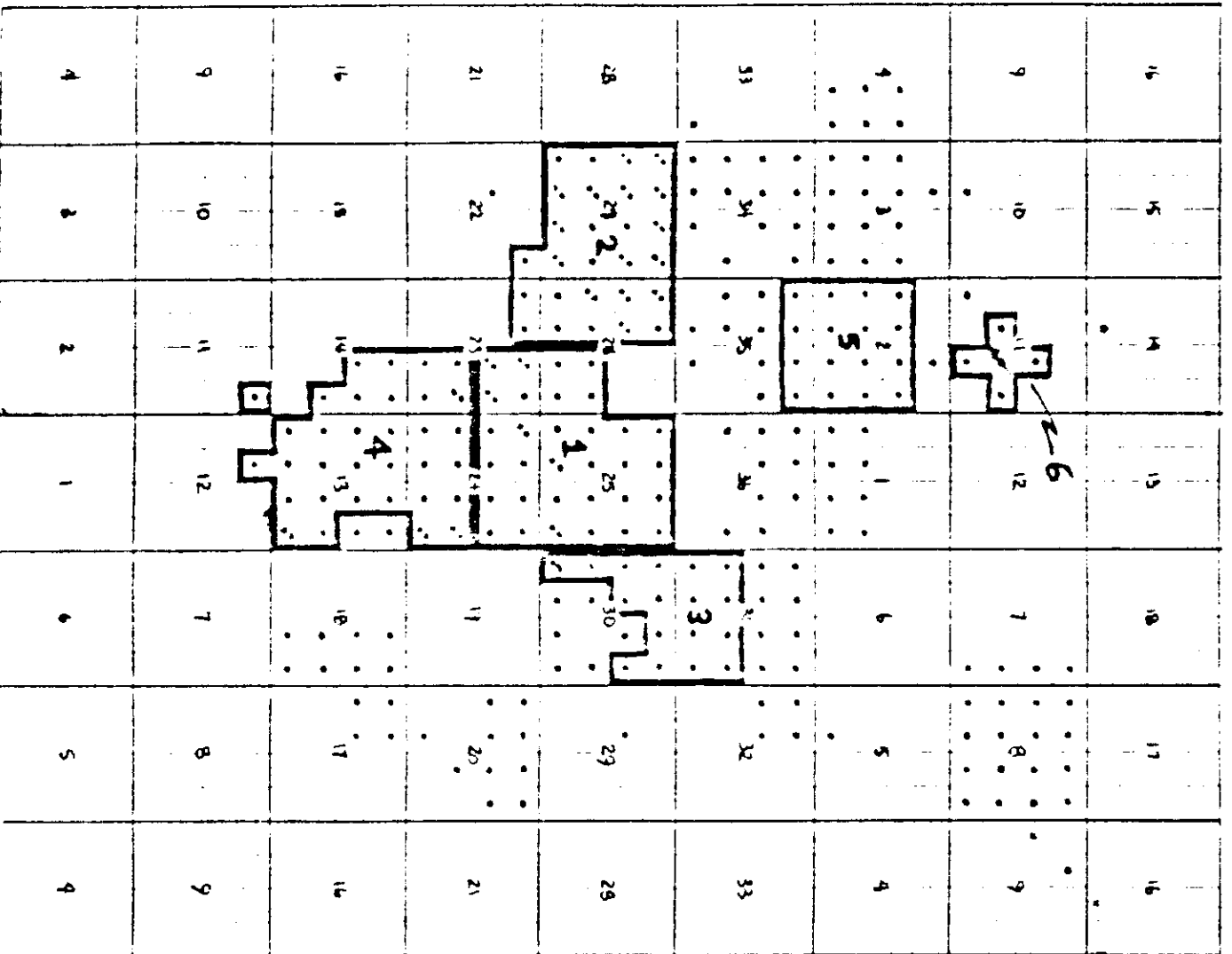
  
G.E. Patey  
V.P. Production

c.c. W.E. Wyse

Enclo:

WEW/tt

# OMEGA WASKADA FIELD



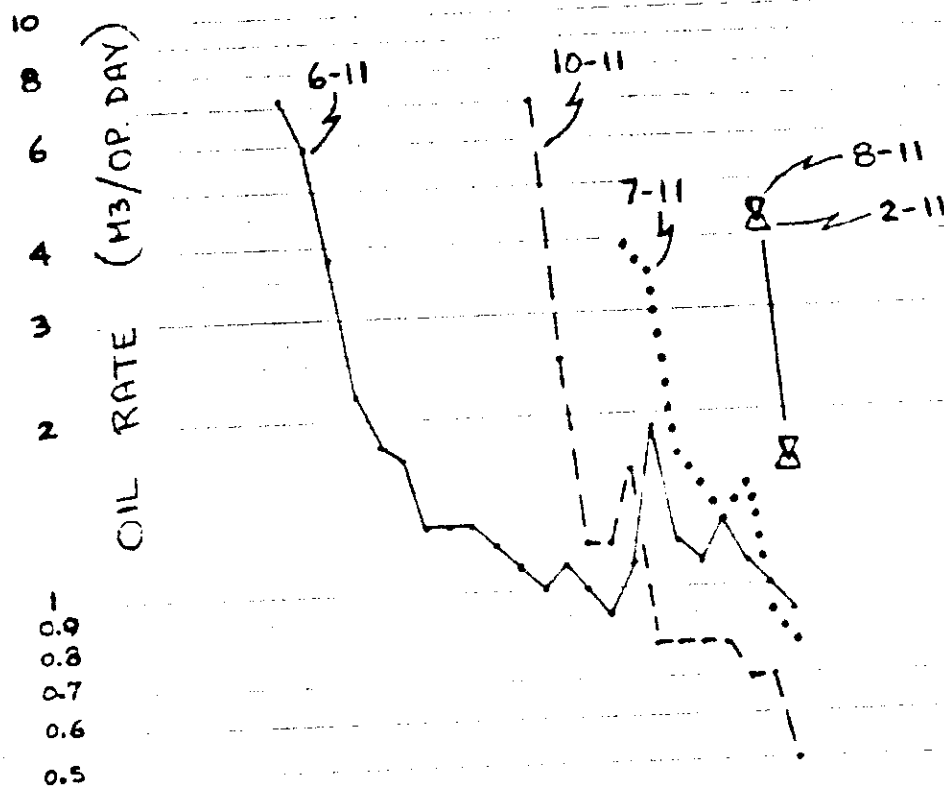
TWP 1

TWP 2

RGE 26 W/4M

RGE 25 W/4M

# PROPOSED WASKADA UNIT No. 6 WELL PERFORMANCE PLOT





1984 01 04

Omega Hydrocarbons Limited  
600, 300 - Fifth Avenue S.W.  
Calgary, Alberta  
T2P 0L4

Attention: Mr. John Henderson

Gentlemen:

SUBJECT: Special Core Analysis Study  
Omega Waskada 7-11-2-26 W1M  
Our File Number: 7009-312-82-103

Enclosed please find the preliminary Special Core Analysis test results performed on core plugs from the Spearfish Formation of the subject well.

Tests include:

1. Liquid Permeability Measurements on "Fresh-State" samples.
2. Mercury Injection Capillary Pressure Drainage Tests

The remaining Special Core Analysis Tests are in progress, and will be reported when available. If we may be of further assistance, please do not hesitate to contact us.

Yours truly,

*Tim Hawthorn*

*For L. (Clay) Hunt*

JH:jjm

**PRELIMINARY REPORT**



# CORE LABORATORIES - CANADA LTD.

CALGARY, ALBERTA



PAGE

FILE 7009-312-83-108

COMPANY Omega Hydrocarbons Limited  
WELL Omega Waskada 7-11-2-26  
LOCATION LSD 7-11-2-26 W1M

FORMATION Spearfish  
FIELD Waskada  
PROVINCE Manitoba

## LIQUID PERMEABILITY DATA

Sample Number: 2

POROSITY FRACTION 0.154  
AIR PERMEABILITY md. 5.12  
GRAIN DENSITY kg m<sup>-3</sup> 2640

### LIQUID PERMEABILITY MILLIDARCYS

### THROUGHPUT PORE VOLUME

### LIQUID AIR PERMEABILITY RATIO

	Formation Water	
0.016	0	0.0031
0.016	0.60	0.0031
0.016	1.0	0.0031
0.016	2.0	0.0031
0.015	4.0	0.0029
0.015	6.0	0.0029
0.016	Reverse	0.0031

## PRELIMINARY REPORT

These analyses, opinions or interpretations are based on observations and material supplied by the client to whom, and for whose exclusive and confidential use, this report is made. The interpretations or opinions expressed represent the best judgment of Core Laboratories - Canada Ltd., all errors and omissions excepted, but Core Laboratories - Canada Ltd. and its officers and employees assume no responsibility and make no warranty or representations as to the product, its proper operation, or profitability of any oil, gas or other mineral well or sand in connection with which such report is used or relied upon.



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CALGARY, ALBERTA



PAGE

FILE 7009-312-83-108

COMPANY Omega Hydrocarbons Limited  
WELL Omega Waskada 7-11-2-26  
LOCATION LSD 7-11-2-26 W1M

FORMATION Spearfish  
FIELD Waskada  
PROVINCE Manitoba

## LIQUID PERMEABILITY DATA

Sample Number: 37

POROSITY FRACTION 0.092  
AIR PERMEABILITY, md 0.43  
GRAIN DENSITY, kg. m<sup>-3</sup> 2760

### LIQUID PERMEABILITY MILLIDARCY'S

### THROUGHPUT PORE VOLUME

### LIQUID AIR PERMEABILITY RATIO

	Formation Water	
0.00034	0	0.00079
0.00035	0.25	0.00081
0.00033	0.44	0.00077
0.00028	Reverse	0.00065

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## CORE LABORATORIES - CANADA LTD.

CALGARY, ALBERTA



PAGE

FILE 7009-312-83-108

COMPANY Omega Hydrocarbons Limited

FORMATION Spearfish

WELL Omega Waskada 7-11-2-26

FIELD Waskada

LOCATION LSD 7-11-2-26 W1M

PROVINCE Manitoba

MERCURY INJECTION CAPILLARY PRESSURE DATA

SAMPLE NUMBER	3	10	47
POROSITY FRACTION	0.159	0.175	0.141
AIR PERMEABILITY mD	0.61	2.05	0.30
GRAIN DENSITY kg. m <sup>-3</sup>	2750	2690	2730

PRESSURE, kPa  
(absolute)WETTING PHASE SATURATION, PORE VOLUME FRACTION

20	1.000	1.000	1.000
40	1.000	1.000	1.000
60	1.000	1.000	1.000
80	1.000	1.000	1.000
101	1.000	1.000	1.000
120	1.000	1.000	1.000
140	1.000	1.000	1.000
160	1.000	1.000	1.000
180	1.000	1.000	1.000
200	1.000	1.000	1.000
300	1.000	0.996	0.984
400	1.000	0.947	0.951
550	1.000	0.849	0.907
700	0.999	0.779	0.879
1 400	0.929	0.618	0.805
2 100	0.870	0.542	0.763
3 500	0.784	0.458	0.705
5 200	0.719	0.401	0.660
6 900	0.671	0.364	0.636
8 600	0.632	0.339	0.619
10 300	0.599	0.318	0.606
12 100	0.572	0.301	0.595
13 800	0.550	0.284	0.584

**PRELIMINARY REPORT**

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MERCURY INJECTION CAPILLARY PRESSURE TEST

PAGE 1  
FILE 7009-312-83-108

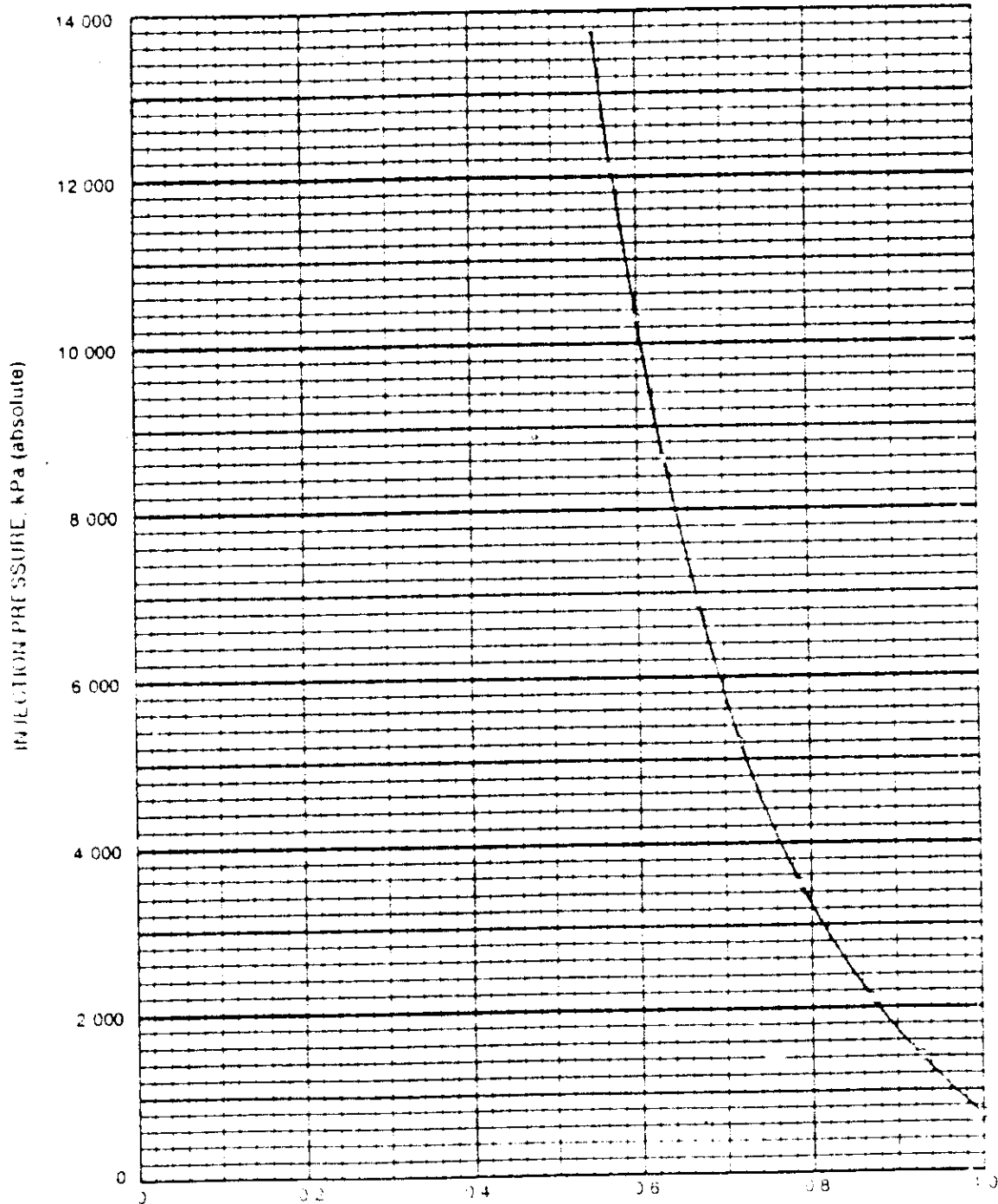
COMPANY Omega Hydrocarbons Limited  
WELL Omega Waskada 7-11-2-26  
LOCATION LSD 7-11-2-26 W1M

FORMATION Spearfish  
FIELD Waskada  
PROVINCE Manitoba

SAMPLE 3

Porosity Fraction 0.159

Permeability Millidarcys 0.61



PRELIMINARY REPORT

WETTING PHASE SATURATION PORE VOLUME FRACTION

MERCURY INJECTION CAPILLARY PRESSURE TEST

PAGE 01  
FILE 7009-312-83-108

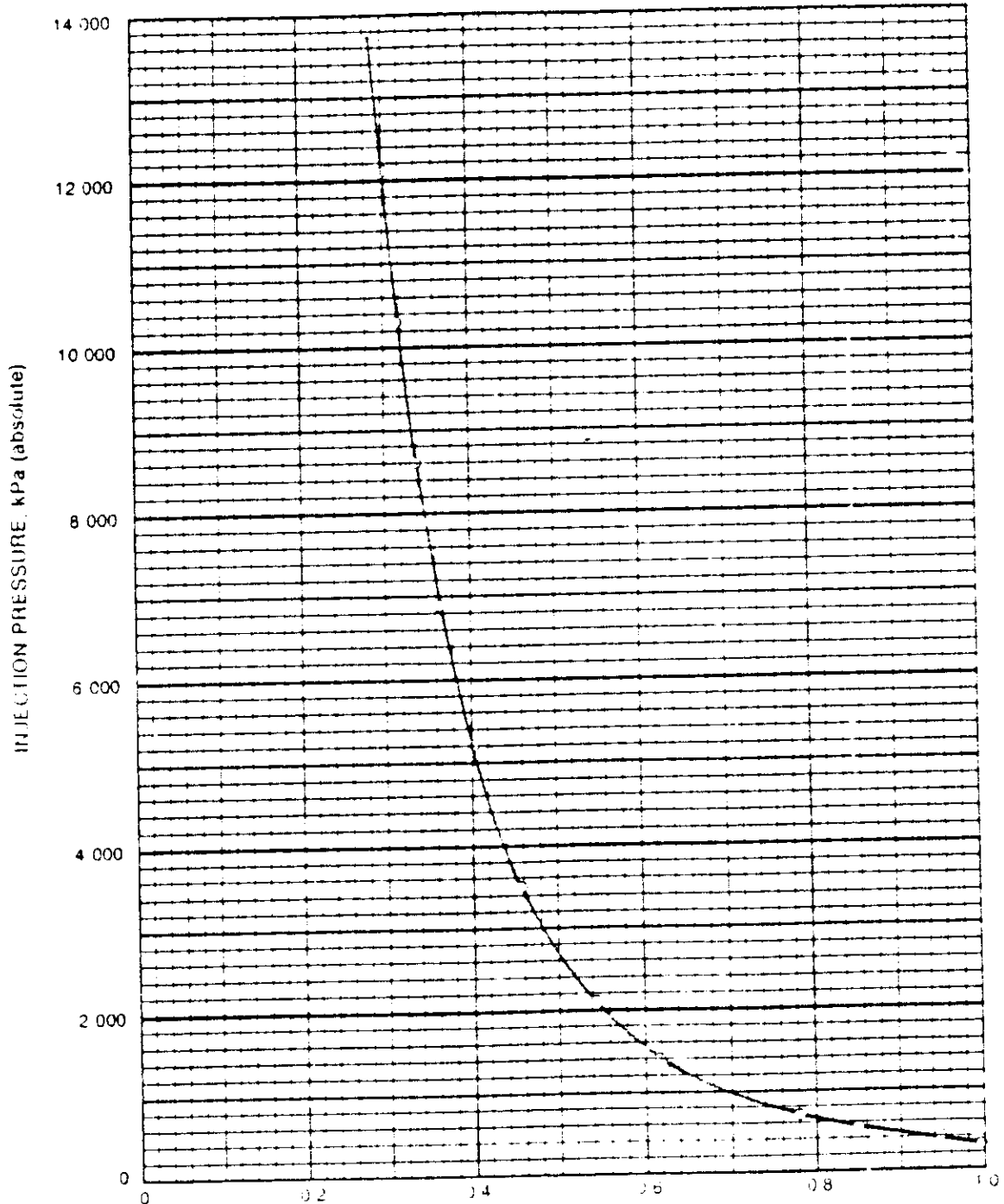
COMPANY Omega Hydrocarbons Limited  
WELL Omega Waskada 7-11-2-26  
LOCATION LSD 7-11-2-26 WIM

FORMATION Spearfish  
FIELD Waskada  
PROVINCE Manitoba

SAMPLE 10

Porosity, Fraction 0.175

Permeability, Millidarcys 2.05



PRELIMINARY REPORT

WETTING PHASE SATURATION PORE VOLUME FRACTION

MERCURY INJECTION CAPILLARY PRESSURE TEST

PAGE 1  
FILE 7009-312-83-108

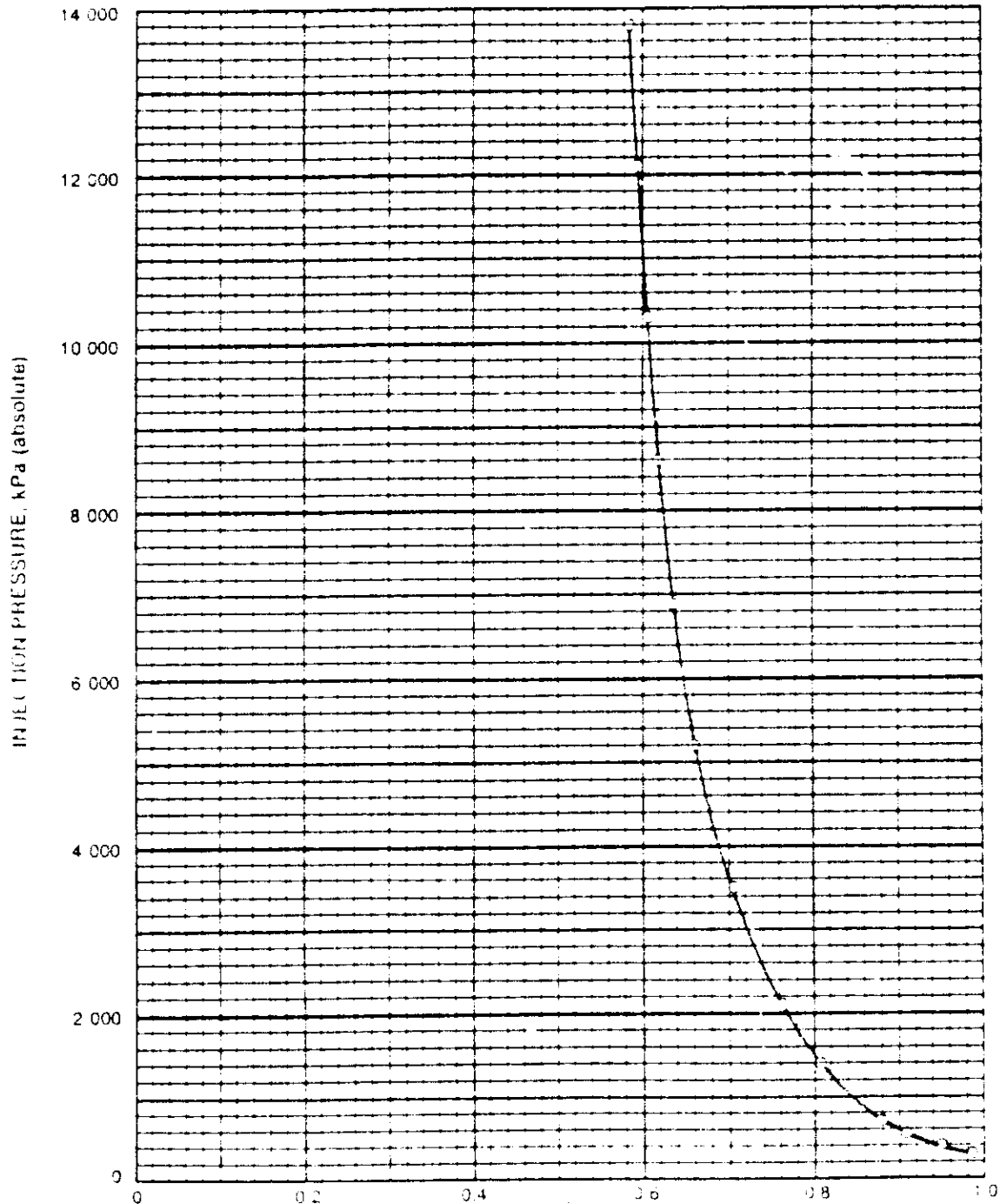
COMPANY Omega Hydrocarbons Limited  
WELL Omega Waskada 7-11-2-26  
LOCATION LSD 7-11-2-26 W1M

FORMATION Spearfish  
FIELD Waskada  
PROVINCE Manitoba

SAMPLE 47

Porosity, Fraction 0.141

Permeability, Millidarcys 0.30



PRELIMINARY REPORT

WETTING PHASE SATURATION, PORE VOLUME FRACTION

MMNTH YR/M	ON PRODUCTION HRS	DATE: 840620			ZONE IS 01			GOR	INJECTION		CUMULATIVES				
		PRODUCTION			RATES		WAT CUT		WATER M3	GAS KM3	OIL M3	WATER M3	GAS KM3	INJWAT M3	INJGAS KM3
		OIL M3	WATER M3	GAS KM3	OIL M3/D	FLUID M3/D									
8406	205	36.2	42.2	4.60	4.2	9.2	54	127	.0	.00	36	42	5	0	0
8407	656	69.8	76.2	1.20	2.6	5.3	52	17	.0	.00	106	118	6	0	0

MNTY YR/M	ON PRODUCTION HRS	DATE: 820920				ZONE IS 01		RATES		WAT CUT	GOR	INJECTION		CUMULATIVES					
		PRODUCTION		GAS		OIL M3/D	GAS M3/D	OIL M3	GAS M3			WATER M3	GAS M3	OIL M3	WATER M3	GAS M3	INJWAT M3	INJGAS M3	
8209	216	65.0	22.5	.00	.00	7.2	9.7	7.2	9.7	26	0	.0	.00	65	23	0	0	0	0
8210	300	73.4	26.9	.00	.00	5.9	8.0	5.9	8.0	27	0	.0	.00	138	49	0	0	0	0
8211	654	103.8	42.6	.00	.00	3.8	5.4	3.8	5.4	29	0	.0	.00	242	92	0	0	0	0
8212	744	68.0	29.8	4.83	4.83	2.2	3.2	2.2	3.2	30	71	.0	.00	310	122	5	0	0	0
8301	720	54.2	24.5	4.18	4.18	1.8	2.6	1.8	2.6	31	77	.0	.00	364	146	9	0	0	0
8302	672	46.2	20.1	3.28	3.28	1.7	2.4	1.7	2.4	30	71	.0	.00	411	166	12	0	0	0
8303	744	41.0	17.5	2.86	2.86	1.3	1.9	1.3	1.9	30	70	.0	.00	452	184	15	0	0	0
8304	720	40.3	17.1	3.25	3.25	1.3	1.9	1.3	1.9	30	81	.0	.00	492	201	18	0	0	0
8305	648	34.2	15.5	3.18	3.18	1.3	1.8	1.3	1.8	31	93	.0	.00	526	217	22	0	0	0
8306	576	28.3	12.8	2.66	2.66	1.2	1.7	1.2	1.7	31	94	.0	.00	554	229	24	0	0	0
8307	618	27.2	12.0	2.61	2.61	1.1	1.5	1.1	1.5	31	96	.0	.00	582	241	27	0	0	0
8308	725	31.0	12.8	3.80	3.80	1.0	1.4	1.0	1.4	29	123	.0	.00	613	254	31	0	0	0
8309	720	33.6	8.4	2.80	2.80	1.1	1.4	1.1	1.4	20	83	.0	.00	646	263	33	0	0	0
8310	726	30.9	12.6	10.20	10.20	1.0	1.4	1.0	1.4	29	330	.0	.00	677	275	44	0	0	0
8311	710	27.6	10.6	2.60	2.60	.9	1.3	.9	1.3	28	94	.0	.00	705	286	46	0	0	0
8312	264	11.6	3.2	1.20	1.20	1.1	1.3	1.1	1.3	22	103	.0	.00	716	289	47	0	0	0
8401	341	27.2	9.7	2.90	2.90	1.9	2.6	1.9	2.6	26	107	.0	.00	743	299	50	0	0	0
8402	680	33.7	11.5	3.30	3.30	1.2	1.6	1.2	1.6	25	98	.0	.00	777	310	54	0	0	0
8403	744	34.0	11.3	3.70	3.70	1.1	1.5	1.1	1.5	25	109	.0	.00	811	321	57	0	0	0
8404	648	36.0	12.7	3.60	3.60	1.3	1.8	1.3	1.8	26	100	.0	.00	847	334	61	0	0	0
8405	632	28.5	9.5	2.40	2.40	1.1	1.4	1.1	1.4	25	84	.0	.00	876	344	63	0	0	0
8406	713	31.1	5.1	3.90	3.90	1.0	1.2	1.0	1.2	14	125	.0	.00	907	349	67	0	0	0
8407	740	29.0	5.7	.50	.50	.9	1.1	.9	1.1	16	17	.0	.00	936	354	68	0	0	0

PRODUCTION/INJECTION HISTORY FOR WELL 0007110022610

PAGE 1

Mnth YR/M	ON PRODUCTION HRS	DATE: 831222			ZONE IS 01		GOR	WAT CUT		RATES OIL FLUID M3/D M3/D		INJECTION WATER GAS M3 KM3		CUMULATIVES OIL WATER GAS INJWAT INJGAS M3 M3 M3 M3			
		OIL M3	WATER M3	GAS KM3	OIL M3/D	FLUID M3/D											
8312	138	22.6	9.5	2.30	3.9	5.6	102	30				.0	.00	23	10	2	0
8401	744	108.7	35.7	11.50	3.5	4.7	106	25				.0	.00	131	45	14	0
8402	672	48.9	19.0	4.80	1.7	2.4	98	28				.0	.00	180	64	19	0
8403	744	45.0	18.5	4.90	1.5	2.0	109	29				.0	.00	225	83	24	0
8404	648	35.4	14.7	3.50	1.3	1.9	99	29				.0	.00	261	97	27	0
8405	623	38.7	9.4	3.30	1.5	1.9	85	20				.0	.00	299	107	30	0
8406	713	27.6	9.9	3.50	.9	1.3	127	26				.0	.00	327	117	34	0
8407	684	22.6	15.7	.50	.8	1.3	22	41				.0	.00	350	132	34	0

DUCTION/INJECTION HISTORY FOR WELL 0008110022610

MNTN YR/M	ON PRODUCTION HRS	DATE: 840619		ZONE IS 01		RATES		WAT CUT	GOR	INJECTION		CUMULATIVES				
		OIL M3	WATER M3	GAS KM3	OIL M3/D	FLUID M3/D	WATER M3			GAS KM3	OIL M3	WATER M3	GAS KM3	INJWAT M3	INJGAS KM3	
8406	278	50.6	10.5	6.40	4.4	5.3	17	126		.0	.00	51	11	6	0	0
8407	664	46.9	66.6	.90	1.7	4.1	59	19		.0	.00	97	77	7	0	0

Mnth Yr/M	On Production Hrs	Date: 830831		Zone IS 01		GOR	Injection		Cumulatives							
		Production		Rates			Water	Gas	Oil	Water	Gas	InjWt	InjGas			
		M3	M3	M3/D	M3/D		M3	KM3	M3	M3	M3	M3	M3	M3	M3	M3
8308	14	4.1	1.1	.40	7.0	98	.0	.00	4	1	0	0	0	0	0	0
8309	660	69.6	50.6	5.80	2.5	83	.0	.00	74	52	6	0	0	0	0	0
8310	744	38.0	38.0	12.50	1.2	329	.0	.00	112	90	19	0	0	0	0	0
8311	682	34.7	23.2	3.20	1.2	92	.0	.00	146	113	22	0	0	0	0	0
8312	495	32.3	19.9	3.30	1.6	102	.0	.00	179	133	25	0	0	0	0	0
8401	683	21.7	21.5	2.30	.8	106	.0	.00	200	154	28	0	0	0	0	0
8402	688	23.1	17.9	2.30	.8	100	.0	.00	224	172	30	0	0	0	0	0
8403	728	23.1	14.6	2.50	.8	108	.0	.00	247	187	32	0	0	0	0	0
8404	672	21.2	14.1	2.10	.8	99	.0	.00	268	201	34	0	0	0	0	0
8405	696	21.2	6.7	1.80	.7	85	.0	.00	289	208	36	0	0	0	0	0
8406	701	21.6	4.2	2.70	.7	125	.0	.00	311	212	39	0	0	0	0	0
8407	738	15.9	7.0	.20	.5	13	.0	.00	327	219	39	0	0	0	0	0



The Oil and Natural Gas  
Conservation Board

Room 309  
Legislative Building  
Winnipeg, Manitoba, CANADA  
R3C 0V8

(204) 945-3130

## Order No. PM 58

### An Order Pertaining to Pressure Maintenance by Water Flooding Waskada Lower Amaranth A Pool

WHEREAS, subsection (9)(d) of Section 62 of "The Mines Act", being Chapter M160 of the Continuing Consolidation of the Statutes of Manitoba, provides as follows:

"62(9) Without restricting the generality of subsection (8) the board, with the approval of the minister, may make orders

(d) requiring the repressuring, recycling, or pressure maintenance, of any pool or portion thereof where it is economical so to do, and for that purpose where necessary requiring the introduction or injection into any pool or portion thereof of gas, air, water or other substance;"

AND WHEREAS, Board Order No. PM 54 provides for pressure maintenance by water flooding in Waskada Lower Amaranth Unit No. 1, Waskada Unit No. 2, Waskada Unit No. 3, Waskada Unit No. 4, Waskada Unit No. 5, Waskada Unit No. 7, Waskada Unit No. 8, Waskada Unit No. 13 and Waskada Unit No. 15.

AND WHEREAS, the Board received an application dated December 3, 1987 from Omega Hydrocarbons Ltd. for approval of a project to inject water into the Waskada Lower Amaranth A Pool ("the pool") in the proposed Waskada Unit No. 14 area in Manitoba.

AND WHEREAS, notice of the application was published in the Manitoba Gazette December 26, 1987 and the Deloraine Times and Star on December 30, 1987.

AND WHEREAS, the Board has received no objections or interventions with respect to the application by Omega Hydrocarbons Ltd.

AND WHEREAS, Omega Hydrocarbons Ltd. is the Unit operator of the Waskada Lower Amaranth Unit No. 1, Waskada Unit No. 2, Waskada Unit No. 3, Waskada Unit No. 4, Waskada Unit No. 5, Waskada Unit No. 7, Waskada Unit No. 8, Waskada Unit No. 13, Waskada Unit No. 14 and Waskada Unit No. 15 ("the unit areas").

NOW THEREFORE, the Board orders that:

1. Board Order No. PM 54 is hereby rescinded.
2. The unit operator shall conduct pressure maintenance operations by the injection of water into the pool underlying the unit areas.
3. The pressure maintenance operation shall be in accordance with, and subject to, the following rules:

PRESSURE MAINTENANCE RULES

1(1)

Water shall be injected into the pool through the wells:

Omega Waskada WIW 13-17-1-25 (WPM)  
Omega Waskada WIW 7-18-1-25 (WPM)  
Omega Waskada Prov. WIW 5-20-1-25 (WPM)  
Omega Waskada WIW 7-20-1-25 (WPM)  
Omega Waskada WIW 13-20-1-25 (WPM)  
Omega Waskada WIW 15-20-1-25 (WPM)  
Omega Waskada WIW 5-30-1-25 (WPM)  
Omega Waskada Prov. WIW A7-30-1-25 (WPM)  
Omega Waskada WIW 13-30-1-25 (WPM)  
Omega Waskada WIW 15-30-1-25 (WPM)  
Omega Waskada WIW 5-31-1-25 (WPM)  
Omega Waskada WIW 7-31-1-25 (WPM)  
Omega Waskada WIW 13-31-1-25 (WPM)  
Omega Waskada WIW 15-31-1-25 (WPM)  
Omega et al Waskada WIW 5-32-1-25 (WPM)  
Omega et al Waskada WIW 7-32-1-25 (WPM)  
Omega Waskada WIW 13-32-1-25 (WPM)  
Omega Waskada Prov. WIW 16-11-1-26 (WPM)  
Omega Waskada WIW 5-13-1-26 (WPM)  
Omega Waskada WIW 7-13-1-26 (WPM)  
Omega Waskada WIW 13-13-1-26 (WPM)  
Omega Waskada WIW 15-13-1-26 (WPM)  
Omega Waskada WIW 15-14-1-26 (WPM)  
Omega Waskada WIW 7-23-1-26 (WPM)  
Omega Waskada WIW 13-23-1-26 (WPM)  
Omega Waskada WIW 15-23-1-26 (WPM)  
Omega Waskada WIW 5-24-1-26 (WPM)  
Omega Waskada WIW 7-24-1-26 (WPM)  
Omega Waskada WIW 13-24LAm-1-26 (WPM)  
Omega Waskada WIW 15-24-1-26 (WPM)  
Omega Waskada WIW 5-25-1-26 (WPM)  
Omega Waskada WIW 7-25-1-26 (WPM)  
Omega Waskada WIW 13-25-1-26 (WPM)  
Omega Waskada WIW 15-25-1-26 (WPM)  
Omega Waskada WIW 5-26-1-26 (WPM)  
Omega Waskada WIW 7-26-1-26 (WPM)  
Omega Waskada WIW 13-26-1-26 (WPM)

Omega Waskada WIW 5-27-1-26 (WPM)  
Omega Waskada WIW 7-27-1-26 (WPM)  
Omega Waskada WIW 13-27LAm-1-26 (WPM)  
Omega Waskada WIW 15-27LAm-1-26 (WPM)  
Omega et al Waskada WIW 7-33-1-26 (WPM)  
Omega Waskada WIW 13-33-1-26 (WPM)  
Omega Sasko Waskada WIW 15-33-1-26 (WPM)  
Omega Chevron Waskada WIW 5-34-1-26 (WPM)  
Omega Chevron Waskada WIW 13-34-1-26 (WPM)  
Omega Chevron Waskada WIW 15-34-1-26 (WPM)  
Omega Waskada WIW 5-35-1-26 (WPM)  
Omega Waskada WIW 13-35-1-26 (WPM)  
Omega Waskada WIW 15-35-1-26 (WPM)  
Omega Waskada WIW 5-36-1-26 (WPM)  
Omega Waskada WIW 7-36-1-26 (WPM)  
Omega Waskada WIW 13-36-1-26 (WPM)  
Omega Waskada WIW 15-36-1-26 (WPM)  
Omega Waskada WIW 7-5-2-25 (WPM)  
Omega Waskada WIW 5-8-2-25 (WPM)  
Omega Waskada WIW 7-8-2-25 (WPM)  
Omega Waskada WIW 13-8-2-25 (WPM)  
Omega Waskada WIW 15-8-2-25 (WPM)  
Omega Andex Waskada WIW 5-1-2-26 (WPM)  
Omega Andex Waskada WIW 7-1-2-26 (WPM)  
Omega et al Waskada WIW 13-1-2-26 (WPM)  
Omega Waskada WIW 15-1-2-26 (WPM)  
Omega Chevron Waskada WIW 5-2-2-26 (WPM)  
Omega Waskada WIW 7-2-2-26 (WPM)  
Omega Waskada Prov. WIW 15-2-2-26 (WPM)  
Omega Waskada WIW 7-3-2-26 (WPM)  
Omega Waskada WIW 13-3-2-26 (WPM)  
Omega et al Waskada WIW 15-3-2-26 (WPM)  
Omega Waskada WIW 5-4-2-26 (WPM)  
Omega et al Waskada WIW 7-4-2-26 (WPM)

and such other wells in the unit areas as the Board may approve.

1(2) After the commencement of injection, the unit operator shall, subject to any remedial work required to be performed on the wells referred to in subsection (1), endeavour to maintain continuous injection.

1(3) Notwithstanding the provisions of subsection (2), the Board may, upon application by the unit operator, approve the suspension of water injection into any well or wells, provided that the Board is satisfied that pressure maintenance operations in the unit areas will not be adversely affected.

1(4) The completion of the wells referred to in subsection (1) will be as prescribed by the Executive Director of the Petroleum Division.

2 The unit operator, upon the the request of the Board, shall satisfy the Board as to the source, suitability and method of treatment of the water to be injected.

3(1) Before injection of water is commenced, the unit operator shall submit, to the Board, results of a survey conducted to determine the static reservoir pressure in a minimum of one well in each injection pattern.

3(2) The unit operator shall, not less than six months nor more than 12 months after the commencement of injection, and at yearly intervals thereafter, conduct a survey to determine the static reservoir pressure in a minimum of one well in each injection pattern within the unit areas.

3(3) The unit operator shall submit the details of the surveys described in subsections (1) and (2) to the Petroleum Division, including a list of the wells to be surveyed, the measurement technique to be used, and the intended shut-in periods for each well, and approval shall be obtained from the Executive Director of the Petroleum Division before the program is carried out and within 30 days of the completion date of the surveys, a report shall be submitted to the Petroleum Division including:

- (a) the static reservoir pressure data obtained from the survey, corrected to a common datum; and
- (b) a discussion of the survey results and pressure distribution within the pool.

3(4) Unless otherwise authorized by the Board, the unit operator shall, in those portions of the unit areas where the Mississippian Formations are known to be oil bearing, conduct a pressure or other survey to investigate the presence and effect of communication between the pool and the Mississippian Formations within one year of commencement of injection and at intervals of three years thereafter.

3(5) The Board may, at any time, require the unit operator to carry out such additional reservoir pressure surveys as it deems necessary.

4 The unit operator shall immediately report to the Board any indication of channelling or break-through of injected water to producing wells or any indication of other detrimental effects that may be attributable to the pressure maintenance operations.

5 The maximum wellhead pressure at which water is injected into the wells referred to in subsection 1(1) shall not exceed 10 000 kPa or such other maximum pressure as the Board may prescribe and the Board may, from time to time, prescribe a maximum or minimum rate at which water shall be injected into any well in the unit areas.

6(1) The unit operator shall, not later than the last day of each month, file with the Petroleum Division, a report of the quantity, source and pressure of water injected during the preceding month into each well referred to in subsection 1(1).

6(2) The unit operator shall, not later than the last day of each month, file with the Petroleum Division a summary report of production and injection operations during the preceding month, which report shall include:

- (a) a tabulation of total oil, total water and total gas produced;
- (b) a tabulation of the number of producing wells and injection wells which were active;
- (c) the results of at least one twenty-four hour production test on each producing well in the unit areas including volumes of oil, gas and water produced during the test; and

(d) a summary of any remedial operations carried out on any well in the unit areas.

7 The unit operator, shall, within 60 days of the end of each calendar year, file with the Petroleum Division a report of the pressure maintenance program, setting out graphically such interpretive information necessary to evaluate the efficacy of the waterflood.



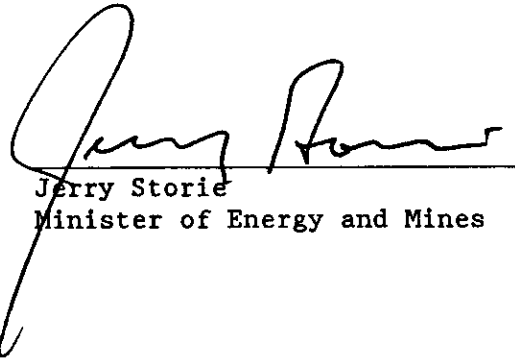
Wm. McDonald  
Deputy Chairman



Charles S. Kang  
Chairman

OIL AND NATURAL GAS CONSERVATION  
BOARD ORDER NO. PM 58 APPROVED THIS  
2<sup>nd</sup> DAY OF FEBRUARY A.D., 1988  
AT THE CITY OF WINNIPEG

APPROVED:



Jerry Storie  
Minister of Energy and Mines

THE MINES ACT  
(C.C.S.M. c.M160)

Pressure Maintenance (Waskada Lower Amaranth A Pool) Order No. 5\*

Regulation  
Filed

Definitions

1 In this order,

"pool" means the Waskada Lower Amaranth A Pool;

"unit area" means the Waskada Unit No. 16.

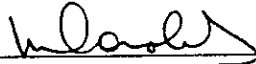
"unit operator" means Enron Oil Canada Ltd.

Pressure Maintenance Operations

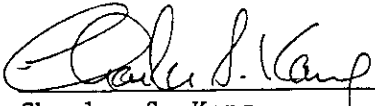
2 In response to an application dated August 13, 1986 from the unit operator for approval of a project to inject water into the pool in proposed Waskada Unit No. 16, the board orders that the unit operator shall conduct pressure maintenance operations by the injection of water into the pool underlying the unit area.

3 The pressure maintenance operation shall be in accordance with and subject to the rules set out in the schedule.


February 9, 1987  
Date

  
Wm. McDonald  
Deputy Chairman

THE OIL AND NATURAL GAS  
CONSERVATION BOARD:

  
Charles S. Kang  
Chairman

Approved:

  
Minister, Department of  
Energy and Mines

\* This Order is Oil and Natural Gas Conservation Board Order No.  
PM 57.

SCHEDULE  
(Section 3)

PRESSURE MAINTENANCE RULES

1(1) Water shall be injected into the pool through the wells:

Andex et al Waskada Prov. WIW 5-4-2-25 (WPM)  
Andex et al Waskada Prov. WIW 11-4-2-25 (WPM)  
Andex et al Waskada Prov. WIW 15-4-2-25 (WPM)  
Andex et al Waskada 16-5-2-25 (WPM)

and such other wells in the unit area as the Board may approve.

1(2) After the commencement of injection, the unit operator shall, subject to any remedial work required to be performed on the wells referred to in subsection (1), endeavour to maintain continuous injection.

1(3) Notwithstanding the provisions of subsection (2), the Board may, upon its own motion or upon application by the unit operator, order the suspension of water injection into any well or wells, provided that the Board is satisfied that pressure maintenance operations in the unit area will not be adversely affected.

1(4) The completion of the wells referred to in subsection (1) will be as prescribed by the Executive Director of the Petroleum Division.

2 The unit operator, upon the request of the Board, shall satisfy the Board as to the source, suitability and method of treatment of the water to be injected.

3(1) Before injection of water is commenced, the unit operator shall submit, to the Board, results of a survey conducted to determine the static reservoir pressure in a minimum of four wells in the unit area.

3(2) The unit operator shall, not less than six months nor more than 12 months after the commencement of injection, and at yearly intervals thereafter, conduct a survey to determine the static reservoir pressure in a minimum of four wells in the unit area.

3(3) The unit operator shall submit the details of the surveys described in subsections (1) and (2) to the Petroleum Division, including a list of the wells to be surveyed, the measurement technique to be used, and the intended shut-in periods for each well, and approval shall be obtained from the Executive Director of the Petroleum Division before the program is carried out and within 30 days of the completion date of the surveys, a report shall be submitted to the Petroleum Division including:

- (a) the static reservoir pressure data obtained from the survey, corrected to a common datum;
- (b) an isobaric map of the pool within the unit areas based on the data obtained; and
- (c) a discussion of the survey results and pressure distribution within the pool.

3(4) The Board may, at any time, require the unit operator to carry out such additional reservoir pressure surveys as it deems necessary.

4 The unit operator shall immediately report to the Board any indication of channelling or break-through of injected water to producing wells or any indication of other detrimental effects that may be attributable to the pressure maintenance operations.

5 The maximum wellhead pressure at which water is injected into the wells referred to in subsection 1(1) shall not exceed 10 000 kPa or such other maximum pressure as the Board may prescribe and the Board may, from time to time, prescribe a maximum or minimum rate at which water shall be injected into any well in the unit area.

6(1) The unit operator shall, not later than the last day of each month, file with the Petroleum Division, a report of the quantity, source and pressure of water injected during the preceding month into each well referred to in subsection 1(1).

6(2) The unit operator shall, not later than the last day of each month, file with the Petroleum Division a summary report of production and injection operations during the preceding month, which report shall include:

- (a) a tabulation of total oil, total water and total gas produced;
- (b) a tabulation of the number of producing wells and injection wells which were active;
- (c) the results of at least one twenty-four hour production test on each producing well in the unit area including volumes of oil, gas and water produced during the test; and
- (d) a summary of any remedial operations carried out on any well in the unit area.

7 The unit operator, shall, within 60 days of the end of each calendar year, file with the Petroleum Division a report of the pressure maintenance program, setting out graphically such interpretive information necessary to evaluate the efficacy of the waterflood.

THE MINES ACT  
(C.G.S.M. c.M160)

Pressure Maintenance (Waskada Lower Amaranth A Pool) Order No. 4\*

Regulation  
Filed

Definitions

1 In this order,

"pool" means the Waskada Lower Amaranth A Pool;

"unit areas" means the Waskada Lower Amaranth Unit No. 1, Waskada Unit No. 2, Waskada Unit No. 3, Waskada Unit No. 4, Waskada Unit No. 5, Waskada Unit No. 7, Waskada Unit No. 8, Waskada Unit No. 13 and Waskada Unit No. 15;

"unit operator" means Omega Hydrocarbons Ltd.

Pressure Maintenance Operations

2 In response to an application dated October 8, 1986 from the unit operator for approval of a project to inject water into the pool in proposed Waskada Unit No. 15, the board orders that the unit operator shall conduct pressure maintenance operations by the injection of water into the pool underlying the unit areas.

3 The pressure maintenance operation shall be in accordance with and subject to the rules set out in the schedule.

Repeal

4. Manitoba Regulation 227/86 (Board Order No. PM 52) is repealed.

Jan. 29/87

Date



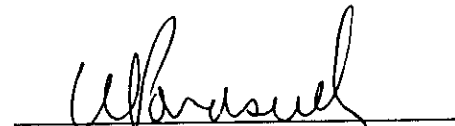
Charles S. Kang  
Chairman

THE OIL AND NATURAL GAS  
CONSERVATION BOARD:



Wm. McDonald  
Deputy Chairman

Approved:



Minister, Department of  
Energy and Mines

SCHEDULE  
(Section 3)

PRESSURE MAINTENANCE RULES

1(1) Water shall be injected into the pool through the wells:

Omega Waskada WIW 13-17-1-25 (WPM)  
Omega Waskada WIW 7-18-1-25 (WPM)  
Omega Waskada Prov. WIW 5-20-1-25 (WPM)  
Omega Waskada WIW 7-20-1-25 (WPM)  
Omega Waskada WIW 13-20-1-25 (WPM)  
Omega Waskada WIW 15-20-1-25 (WPM)  
Omega Waskada WIW 5-30-1-25 (WPM)  
Omega Waskada Prov. WIW A7-30-1-25 (WPM)  
Omega Waskada WIW 13-30-1-25 (WPM)  
Omega Waskada WIW 15-30-1-25 (WPM)  
Omega Waskada WIW 5-31-1-25 (WPM)  
Omega Waskada WIW 7-31-1-25 (WPM)  
Omega Waskada WIW 13-31-1-25 (WPM)  
Omega Waskada WIW 15-31-1-25 (WPM)  
Omega Waskada WIW 13-32-1-25 (WPM)  
Omega Waskada Prov. WIW 16-11-1-26 (WPM)  
Omega Waskada WIW 5-13-1-26 (WPM)  
Omega Waskada WIW 7-13-1-26 (WPM)  
Omega Waskada WIW 13-13-1-26 (WPM)  
Omega Waskada WIW 15-13-1-26 (WPM)  
Omega Waskada WIW 15-14-1-26 (WPM)  
Omega Waskada Prov. WIW 16-22-1-26 (WPM)  
Omega Waskada WIW 7-23-1-26 (WPM)  
Omega Waskada WIW 15-23-1-26 (WPM)  
Omega Waskada WIW 5-24-1-26 (WPM)  
Omega Waskada WIW 7-24-1-26 (WPM)  
Omega Waskada WIW 13-24LAm-1-26 (WPM)  
Omega Waskada WIW 15-24-1-26 (WPM)  
Omega Waskada WIW 5-25-1-26 (WPM)  
Omega Waskada WIW 7-25-1-26 (WPM)  
Omega Waskada WIW 13-25-1-26 (WPM)  
Omega Waskada WIW 15-25-1-26 (WPM)  
Omega Waskada WIW 5-26-1-26 (WPM)  
Omega Waskada WIW 7-26-1-26 (WPM)  
Omega Waskada WIW 13-26-1-26 (WPM)  
Omega Waskada WIW 5-27-1-26 (WPM)  
Omega Waskada WIW 7-27-1-26 (WPM)  
Omega Waskada WIW 13-27LAm-1-26 (WPM)  
Omega Waskada WIW 15-27LAm-1-26 (WPM)  
Omega et al Waskada WIW 7-33-1-26 (WPM)  
Omega Waskada WIW 13-33-1-26 (WPM)  
Omega Sasko Waskada WIW 15-33-1-26 (WPM)  
Omega Chevron Waskada WIW 5-34-1-26 (WPM)

Omega Chevron Waskada WIW 13-34-1-26 (WPM)  
 Omega Chevron Waskada WIW 15-34-1-26 (WPM)  
 Omega Waskada WIW 5-35-1-26 (WPM)  
 Omega Waskada WIW 13-35-1-26 (WPM)  
 Omega Waskada WIW 15-35-1-26 (WPM)  
 Omega Waskada WIW 5-36-1-26 (WPM)  
 Omega Waskada WIW 7-36-1-26 (WPM)  
 Omega Waskada WIW 13-36-1-26 (WPM)  
 Omega Waskada WIW 15-36-1-26 (WPM)  
 Omega Waskada WIW 7-5-2-25 (WPM)  
 Omega Waskada WIW 5-8-2-25 (WPM)  
 Omega Waskada WIW 7-8-2-25 (WPM)  
 Omega Waskada WIW 13-8-2-25 (WPM)  
 Omega Waskada WIW 15-8-2-25 (WPM)  
 Omega Andex Waskada WIW 5-1-2-26 (WPM)  
 Omega Andex Waskada WIW 7-1-2-26 (WPM)  
 Omega et al Waskada WIW 13-1-2-26 (WPM)  
 Omega Waskada WIW 15-1-2-26 (WPM)  
 Omega Chevron Waskada WIW 5-2-2-26 (WPM)  
 Omega Waskada WIW 7-2-2-26 (WPM)  
 Omega Waskada Prov. WIW 15-2-2-26 (WPM)  
 Omega Waskada WIW 7-3-2-26 (WPM)  
 Omega Waskada WIW 13-3-2-26 (WPM)  
 Omega et al Waskada WIW 15-3-2-26 (WPM)  
 Omega Waskada WIW 5-4-2-26 (WPM)  
 Omega et al Waskada WIW 7-4-2-26 (WPM)

and such other wells in the unit areas as the Board may approve.

1(2) After the commencement of injection, the unit operator shall, subject to any remedial work required to be performed on the wells referred to in subsection (1), endeavour to maintain continuous injection.

1(3) Notwithstanding the provisions of subsection (2), the Board may, upon application by the unit operator, approve the suspension of water injection into any well or wells, provided that the Board is satisfied that pressure maintenance operations in the unit areas will not be adversely affected.

1(4) The completion of the wells referred to in subsection (1) will be as prescribed by the Executive Director of the Petroleum Division.

2 The unit operator, upon the the request of the Board, shall satisfy the Board as to the source, suitability and method of treatment of the water to be injected.

3(1) Before injection of water is commenced, the unit operator shall submit, to the Board, results of a survey conducted to determine the static reservoir pressure in a minimum of one well in each injection pattern.

3(2) The unit operator shall, not less than six months nor more than 12 months after the commencement of injection, and at yearly intervals thereafter, conduct a survey to determine the static reservoir pressure in a minimum of one well in each injection pattern within the unit areas.

3(3) The unit operator shall submit the details of the surveys described in subsections (1) and (2) to the Petroleum Division, including a list of the wells to be surveyed, the measurement technique to be used, and the intended shut-in periods for each well, and approval shall be obtained from the Executive Director of the Petroleum Division before the program is carried out and within 30 days of the completion date of the surveys, a report shall be submitted to the Petroleum Division including:

- (a) the static reservoir pressure data obtained from the survey, corrected to a common datum;
- (b) an isobaric map of the pool within the unit areas based on the data obtained; and
- (c) a discussion of the survey results and pressure distribution within the pool.

3(4) Unless otherwise authorized by the Board, the unit operator shall, in those portions of the unit areas where the Mississippian Formations are known to be oil bearing, conduct a pressure or other survey to investigate the presence and effect of communication between the pool and the Mississippian Formations within one year of commencement of injection and at intervals of three years thereafter.

3(5) The Board may, at any time, require the unit operator to carry out such additional reservoir pressure surveys as it deems necessary.

4 The unit operator shall immediately report to the Board any indication of channelling or break-through of injected water to producing wells or any indication of other detrimental effects that may be attributable to the pressure maintenance operations.

5 The maximum wellhead pressure at which water is injected into the wells referred to in subsection 1(1) shall not exceed 10 000 kPa or such other maximum pressure as the Board may prescribe and the Board may, from time to time, prescribe a maximum or minimum rate at which water shall be injected into any well in the unit areas.

6(1) The unit operator shall, not later than the last day of each month, file with the Petroleum Division, a report of the quantity, source and pressure of water injected during the preceding month into each well referred to in subsection 1(1).

6(2) The unit operator shall, not later than the last day of each month, file with the Petroleum Division a summary report of production and injection operations during the preceding month, which report shall include:

- (a) a tabulation of total oil, total water and total gas produced;
- (b) a tabulation of the number of producing wells and injection wells which were active;
- (c) the results of at least one twenty-four hour production test on each producing well in the unit areas including volumes of oil, gas and water produced during the test; and
- (d) a summary of any remedial operations carried out on any well in the unit areas.

7 The unit operator, shall, within 60 days of the end of each calendar year, file with the Petroleum Division a report of the pressure maintenance program, setting out graphically such interpretive information necessary to evaluate the efficacy of the waterflood.

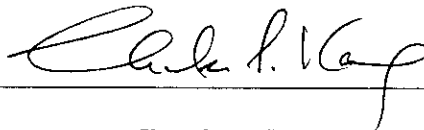
THE REGULATIONS ACT

CERTIFICATE

I, Charles S. Kang, Chairman of The Oil and Natural Gas Conservation Board, hereby certify that the attached regulation is the original Order:--

- (a) entitled Pressure Maintenance (Waskada Lower Amaranth A Pool) Order No. 4
- (b) made pursuant to The Mines Act;
- (c) by The Oil and Natural Gas Conservation Board;
- (d) on the 29<sup>th</sup> day of January A.D. 1987;
- (e) approved by the Honourable the Minister of Energy and Mines on the 29<sup>th</sup> day of January A.D. 1987; and
- (f) which regulation comes into force on the day of filing with the Registrar of Regulations.

DATED this 29<sup>th</sup> day of January A.D 1987



Charles S. Kang  
Chairman  
The Oil and Natural Gas  
Conservation Board

THE MINES ACT  
(C.C.S.M. c.M160)

Pressure Maintenance (Waskada Lower Amaranth A Pool) Order No. 5\*

Regulation  
Filed

Definitions

1 In this order,

"pool" means the Waskada Lower Amaranth A Pool;

"unit area" means the Waskada Unit No. 16.

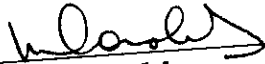
"unit operator" means Enron Oil Canada Ltd.

Pressure Maintenance Operations

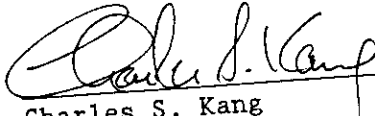
2 In response to an application dated August 13, 1986 from the unit operator for approval of a project to inject water into the pool in proposed Waskada Unit No. 16, the board orders that the unit operator shall conduct pressure maintenance operations by the injection of water into the pool underlying the unit area.

3 The pressure maintenance operation shall be in accordance with and subject to the rules set out in the schedule.


February 9, 1987  
Date

  
Wm. McDonald  
Deputy Chairman

THE OIL AND NATURAL GAS  
CONSERVATION BOARD:

  
Charles S. Kang  
Chairman

Approved:

  
Minister, Department of  
Energy and Mines

\* This Order is Oil and Natural Gas Conservation Board Order No.  
PM 57.

SCHEDULE  
(Section 3)

PRESSURE MAINTENANCE RULES

1(1) Water shall be injected into the pool through the wells:

Andex et al Waskada Prov. WIW 5-4-2-25 (WPM)  
Andex et al Waskada Prov. WIW 11-4-2-25 (WPM)  
Andex et al Waskada Prov. WIW 15-4-2-25 (WPM)  
Andex et al Waskada 16-5-2-25 (WPM)

and such other wells in the unit area as the Board may approve.

1(2) After the commencement of injection, the unit operator shall, subject to any remedial work required to be performed on the wells referred to in subsection (1), endeavour to maintain continuous injection.

1(3) Notwithstanding the provisions of subsection (2), the Board may, upon its own motion or upon application by the unit operator, order the suspension of water injection into any well or wells, provided that the Board is satisfied that pressure maintenance operations in the unit area will not be adversely affected.

1(4) The completion of the wells referred to in subsection (1) will be as prescribed by the Executive Director of the Petroleum Division.

2 The unit operator, upon the request of the Board, shall satisfy the Board as to the source, suitability and method of treatment of the water to be injected.

3(1) Before injection of water is commenced, the unit operator shall submit, to the Board, results of a survey conducted to determine the static reservoir pressure in a minimum of four wells in the unit area.

3(2) The unit operator shall, not less than six months nor more than 12 months after the commencement of injection, and at yearly intervals thereafter, conduct a survey to determine the static reservoir pressure in a minimum of four wells in the unit area.

3(3) The unit operator shall submit the details of the surveys described in subsections (1) and (2) to the Petroleum Division, including a list of the wells to be surveyed, the measurement technique to be used, and the intended shut-in periods for each well, and approval shall be obtained from the Executive Director of the Petroleum Division before the program is carried out and within 30 days of the completion date of the surveys, a report shall be submitted to the Petroleum Division including:

- (a) the static reservoir pressure data obtained from the survey, corrected to a common datum;
- (b) an isobaric map of the pool within the unit areas based on the data obtained; and
- (c) a discussion of the survey results and pressure distribution within the pool.

3(4) The Board may, at any time, require the unit operator to carry out such additional reservoir pressure surveys as it deems necessary.

4 The unit operator shall immediately report to the Board any indication of channelling or break-through of injected water to producing wells or any indication of other detrimental effects that may be attributable to the pressure maintenance operations.

5 The maximum wellhead pressure at which water is injected into the wells referred to in subsection 1(1) shall not exceed 10 000 kPa or such other maximum pressure as the Board may prescribe and the Board may, from time to time, prescribe a maximum or minimum rate at which water shall be injected into any well in the unit area.

6(1) The unit operator shall, not later than the last day of each month, file with the Petroleum Division, a report of the quantity, source and pressure of water injected during the preceding month into each well referred to in subsection 1(1).

6(2) The unit operator shall, not later than the last day of each month, file with the Petroleum Division a summary report of production and injection operations during the preceding month, which report shall include:

- (a) a tabulation of total oil, total water and total gas produced;
- (b) a tabulation of the number of producing wells and injection wells which were active;
- (c) the results of at least one twenty-four hour production test on each producing well in the unit area including volumes of oil, gas and water produced during the test; and
- (d) a summary of any remedial operations carried out on any well in the unit area.

7 The unit operator, shall, within 60 days of the end of each calendar year, file with the Petroleum Division a report of the pressure maintenance program, setting out graphically such interpretive information necessary to evaluate the efficacy of the waterflood.

Manitoba Regulation /85

Being

The Oil and Natural Gas Conservation Board

Order No. PM 45

An Order Pertaining to Pressure Maintenance by Water Flooding

Waskada Lower Amaranth A Pool

Made and Passed Pursuant to "The Mines Act", Cap. M160, of the  
Continuing Consolidation of the Statutes of Manitoba, and  
Amendments Thereto, by The Oil and Natural Gas  
Conservation Board of Manitoba

(Filed: )

WHEREAS, subsection (9)(d) of Section 62 of "The Mines Act", being Chapter M160 of the Continuing Consolidation of the Statutes of Manitoba, provides as follows:

"62(9) Without restricting the generality of subsection (8) the board, with the approval of the minister, may make orders

(d) requiring the repressuring, recycling, or pressure maintenance, of any pool or portion thereof where it is economical to do so, and for that purpose where necessary requiring the introduction or injection into any pool or portion thereof of gas, air, water or other substance;"

AND WHEREAS, Board Order No. PM 40 provides for pressure maintenance by water flooding in Waskada Lower Amaranth Unit No. 1, Waskada Unit No. 2 and Waskada Unit No. 3.

AND WHEREAS, Board Order No. PM 41 provides for pressure maintenance by gas injection in Waskada Unit No. 4.

AND WHEREAS, Board Order No. PM 42 provides for pressure maintenance by waterflooding in Waskada Unit No. 5.

AND WHEREAS, the Board received an application dated August 6, 1985 from Omega Hydrocarbons Ltd. for approval of a project to inject water into the Waskada Lower Amaranth A Pool ("the pool") in the proposed Waskada Unit No. 8 area in Manitoba.

AND WHEREAS, the Board received applications dated March 7, October 1 and October 8, 1985 from Omega Hydrocarbons Ltd. for approval to convert certain gas injection wells and certain producing wells in Waskada Unit No. 4 to water injection wells.

AND WHEREAS, the Board has received no objections or interventions with respect to the applications by Omega Hydrocarbons Ltd.

AND WHEREAS, Omega Hydrocarbons Ltd. is the Unit Operator of the Waskada Lower Amaranth Unit No. 1, Waskada Unit No. 2, Waskada Unit No. 3, Waskada Unit No. 4, Waskada Unit No. 5 and Waskada Unit No. 8 ("the Unit Areas")

NOW THEREFORE, the Board orders that:

1. Board Order No. PM 40 (Manitoba Regulation 250/83), Board Order No. PM 41 (Manitoba Regulation 15/84) and Board Order No. PM 42 (Manitoba Regulation 241/84) are hereby rescinded.
2. The Unit Operator shall conduct pressure maintenance operations by the injection of water into the pool underlying the Unit Areas.
3. The pressure maintenance operation shall be in accordance with, and subject to, the following rules:

PRESSURE MAINTENANCE RULES

- 1(1) Water shall be injected into the pool through the wells:

Omega Waskada WIW 5-30-1-25 (WPM)  
Omega Waskada WIW 13-30-1-25 (WPM)  
Omega Waskada WIW 15-30-1-25 (WPM)  
Omega Waskada WIW 5-31-1-25 (WPM)  
Omega Waskada WIW 7-31-1-25 (WPM)  
Omega Waskada WIW 13-31-1-25 (WPM)  
Omega Waskada WIW 15-31-1-25 (WPM)  
Omega Waskada WIW 13-32-1-25 (WPM)  
Omega Waskada Prov. WIW 16-11-1-25 (WPM)  
Omega Waskada WIW 5-13-1-26 (WPM)  
Omega Waskada WIW 7-13-1-26 (WPM)  
Omega Waskada WIW 13-13-1-26 (WPM)  
Omega Waskada WIW 15-13-1-26 (WPM)  
Omega Waskada WIW 15-14-1-26 (WPM)  
Omega Waskada Prov. WIW 16-22-1-26 (WPM)  
Omega Waskada WIW 7-23-1-26 (WPM)  
Omega Waskada WIW 15-23-1-26 (WPM)  
Omega Waskada WIW 5-24-1-26 (WPM)  
Omega Waskada WIW 7-24-1-26 (WPM)  
Omega Waskada WIW 13-24LAm-1-26 (WPM)  
Omega Waskada WIW 15-24-1-26 (WPM)  
Omega Waskada WIW 5-25-1-26 (WPM)  
Omega Waskada WIW 7-25-1-26 (WPM)  
Omega Waskada WIW 13-25-1-26 (WPM)  
Omega Waskada WIW 15-25-1-26 (WPM)  
Omega Waskada WIW 5-26-1-26 (WPM)  
Omega Waskada WIW 7-26-1-26 (WPM)  
Omega Waskada WIW 13-26-1-26 (WPM)  
Omega Waskada WIW 5-27-1-26 (WPM)  
Omega Waskada WIW 7-27-1-26 (WPM)  
Omega Waskada WIW 13-27LAm-1-26 (WPM)

Omega Waskada WIW 15-27LAM-1-26 (WPM)  
Omega Waskada WIW 5-35-1-26 (WPM)  
Omega Waskada WIW 13-35-1-26 (WPM)  
Omega Waskada WIW 15-35-1-26 (WPM)  
Omega Waskada WIW 13-36-1-26 (WPM)  
Omega Waskada WIW 15-36-1-26 (WPM)  
Omega Waskada WIW 5-8-2-25 (WPM)  
Omega Waskada WIW 7-8-2-25 (WPM)  
Omega Waskada WIW 13-8-2-25 (WPM)  
Omega Waskada WIW 15-8-2-25 (WPM)  
Omega Chevron Waskada WIW 5-2-2-26 (WPM)  
Omega Waskada WIW 7-2-2-26 (WPM)

and such other wells in the Unit Areas as the Board may approve.

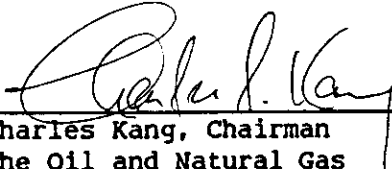
- (2) After the commencement of injection, the Unit Operator shall, subject to any remedial work required to be performed on the wells referred to in subclause (1) of this clause, endeavour to maintain continuous injection.
  - (3) Notwithstanding the provisions of subclause (2), the Board may, upon application by the Unit Operator, approve the suspension of water injection into any well or wells, provided that the Board is satisfied that pressure maintenance operations in the Unit Areas will not be adversely affected.
  - (4) The completion of the wells referred to in subclause (1) will be as prescribed by the Director of the Petroleum Branch.
2. The Unit Operator, upon the the request of the Board, shall satisfy the Board as to the source, suitability and method of treatment of the water to be injected.
- 3(1) Before injection of water is commenced, the Unit Operator shall submit, to the Board, results of a survey conducted to determine the static reservoir pressure in a minimum of one well in each injection pattern.
- (2) The Unit Operator shall, not less than six months nor more than 12 months after the commencement of injection, and at yearly intervals thereafter, conduct a survey to determine the static reservoir pressure in a minimum of one well in each injection pattern within the Unit Areas.
  - (3) The Unit Operator shall submit the details of the surveys described in subclauses (1) and (2) of this clause to the Petroleum Branch, including a list of the wells to be surveyed, the measurement technique to be used, and the intended shut-in periods for each well, and approval shall be obtained from the Director of the Petroleum Branch before the program is carried out. Within 30 days of the completion date of the surveys, a report shall be submitted to the Petroleum Branch including:


- (a) the static reservoir pressure data obtained from the survey, corrected to a common datum;
  - (b) an isobaric map of the Pool within the Unit Areas based on the data obtained; and
  - (c) a discussion of the survey results and pressure distribution within the Pool.
- (4) Unless otherwise authorized by the Board, the Unit Operator shall, in those portions of the Unit Areas where the Mississippian Formations are known to be oil bearing, conduct a pressure or other survey to investigate the presence and effect of communication between the Pool and the Mississippian Formations within one year of commencement of injection and at intervals of three years thereafter.
- (5) The Board may, at any time, require the Unit Operator to carry out such additional reservoir pressure surveys as it deems necessary.
- 4. The Unit Operator shall immediately report to the Board any indication of channelling or break-through of injected water to producing wells or any indication of other detrimental effects that may be attributable to the pressure maintenance operations.
- 5. The maximum wellhead pressure at which water is injected into the wells referred to in subclause (1) of clause 1 hereof shall not exceed 10 000 kPa or such other maximum pressure as the Board may prescribe. The Board may, from time to time, prescribe a maximum or minimum rate at which water shall be injected into any well in the Unit Areas.
- 6(1) The Unit Operator shall, not later than the last day of each month, file with the Petroleum Branch, a report of the quantity, source and pressure of water injected during the preceding month into each well referred to in clause 1 hereof.
- (2) The Unit Operator shall, not later than the last day of each month, file with the Petroleum Branch a summary report of production and injection operations during the preceding month. This report shall include:
  - (a) a tabulation of total oil, total water and total gas produced;
  - (b) a tabulation of the number of producing wells and injection wells which were active;
  - (c) the results of at least one twenty-four hour production test on each producing well in the Unit including volumes of oil, gas and water produced during the test;

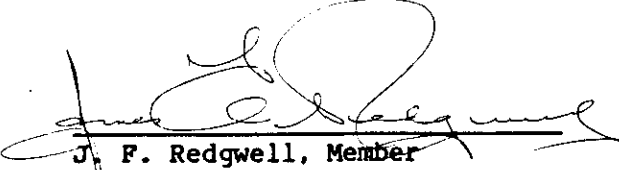
(d) a summary of any remedial operations carried out on any well in the Unit Areas.

7. The Unit Operator, shall, within 60 days of the end of each calendar year, file with the Petroleum Branch a report of the pressure maintenance program, setting out graphically such interpretive information necessary to evaluate the efficacy of the waterflood.

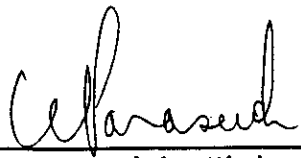
OIL AND NATURAL GAS ORDER NO. PM 45,  
MADE AND PASSED THIS *25th* DAY OF  
*October* A.D., 1985, AT THE CITY OF  
WINNIPEG, IN THE PROVINCE OF MANITOBA,  
BY THE OIL AND NATURAL GAS CONSERVATION BOARD

  
Charles Kang, Chairman  
The Oil and Natural Gas  
Conservation Board

  
Wm. McDonald, Deputy Chairman  
The Oil and Natural Gas  
Conservation Board

  
J. F. Redgwell, Member  
The Oil and Natural Gas  
Conservation Board

Approved:

  
Wilson Parasiuk, Minister  
Department of Energy and Mines

Being

THE OIL AND NATURAL GAS CONSERVATION BOARD

ORDER NO. PM 43

An Order Pertaining to Pressure Maintenance by Water Flooding

WASKADA LOWER AMARANTH A POOL

Made and Passed Pursuant to "The Mines Act", Cap. M160, of the Continuing Consolidation of the Statutes of Manitoba, and Amendments Thereto, by The Oil and Natural Gas Conservation Board of Manitoba

(Filed: )

WHEREAS, subsection (9) (d) of Section 62 of "The Mines Act" being Chapter M160 of the Continuing Consolidation of the Statutes of Manitoba, provides as follows:

"62(9) Without restricting the generality of subsection (8) the board, with approval of the minister, may make orders

(d) requiring the repressuring, recycling, or pressure maintenance, of any pool or portion thereof where it is economical to do so, and for that purpose where necessary requiring the introduction or injection into any pool or portion thereof of gas, air, water or other substance;"

AND WHEREAS, the Board received an application dated September 12, 1984 from Omega Hydrocarbons Ltd. for approval of a pilot project to inject water into a portion of the Waskada Lower Amaranth A Pool ("the Pool") in Manitoba;

AND WHEREAS, the Board has received no objections to the application by Omega Hydrocarbons Ltd. ("the Operator").

NOW THEREFORE, the Board orders that:

1. The Operator shall conduct pressure maintenance operations by the injection of water into the portion of the Pool which underlies Legal Subdivisions 2, 6, 7, 8 and 10 of Section 11-2-26 (WPM) ("the project area").
2. The pressure maintenance operation shall be in accordance with, and subject to, the following rules:

1. (1) Water shall be injected into the Pool through the well:


OMEGA WASKADA PROV. WIW 7-11-2-26 (WPM)

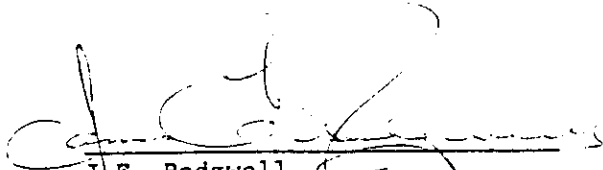
and such other wells in the project area as the Board may approve.

- (2) After the commencement of injection, the Operator shall, subject to any remedial work required to be performed on the wells referred to in subclause (1) of this clause, endeavour to maintain continuous injection.
  - (3) Notwithstanding the provisions of subclause (2), the Board may, upon application by the Operator, or on its own motion, approve or require suspension of water injection into any well or wells provided that the Board is satisfied that pressure maintenance operations in the project area will not be adversely affected.
2. The completion of the well referred to in subclause (1) will be as prescribed by the Director of the Petroleum Branch.
  3. The Operator, upon the request of the Board, shall satisfy the Board as to the source, suitability and method of treatment of the water to be injected.
  - 4.(1) Before injection of water is commenced, the Operator shall submit to the Board results of a survey conducted to determine the static reservoir pressure in a minimum of one well in the project area.
    - (2) The Operator shall, not less than six months nor more than 12 months after the commencement of injection, conduct a survey to determine the static reservoir pressure in a minimum of one well in the project area.
    - (3) The Operator shall submit the details of the surveys described in subclauses (1) and (2) of this clause to the Petroleum Branch, including a list of the wells to be surveyed, the measurement technique to be used, and the intended shut-in periods for each well, and approval shall be obtained from the Director of the Petroleum Branch before the program is carried out. Within 30 days of the completion date of the surveys, a report shall be submitted to the Petroleum Branch including:
      - (a) the static reservoir pressure data obtained from the survey, corrected to a common datum;
      - (b) a discussion of the survey results and pressure distribution within the Pool.
    - (4) The Board may, at any time, require the Operator to carry out such additional reservoir pressure surveys as it deems necessary.

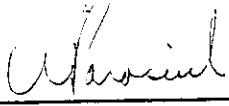
5. The Operator shall immediately report to the Board any indication of channelling or break-through of injected water to producing wells or any indication of other detrimental effects that may be attributable to the pressure maintenance operations.
6. The maximum wellhead pressure at which water is injected into the well referred to in subclause (1) of clause 1 hereof shall not exceed 10 000 kPa or such other maximum pressure as the Board may prescribe. The Board may, from time to time, prescribe a maximum or minimum rate at which water shall be injected into any well in the project area.
- 7.(1) The Operator shall, not later than the last day of each month, file with the Petroleum Branch, a report of the quantity, source and pressure of water injected during the preceding month into the well referred to in clause 1 hereof.
- (2) The Operator shall, not later than the last day of each month, file with the Petroleum Branch a summary report of production and injection operations during the preceding month. This report shall include:
  - (a) a tabulation of total oil, total water and total gas produced;
  - (b) a tabulation of the number of producing wells and injection wells which were active;
  - (c) the results of at least one twenty-four hour production test on each producing well in the project area including volumes of oil, gas and water produced during the test;
  - (d) a summary of any remedial operations carried out on any well in the project area.
8. Unless otherwise authorized in writing by the Board, the Operator shall, prior to the expiration of this Order, file with the Petroleum Branch a report of the pressure maintenance program, setting out graphically such interpretive information necessary to evaluate the performance and efficacy of the waterflood. This report is also to include discussions and recommendations regarding continuation or expansion of the pilot or termination of injection.
- 9.(1) Subject to subclause (2), this Order shall terminate on December 1, 1985.
- (2) Notwithstanding the provision of subclause (1), the Board may, upon application of the Operator, extend the term of this Order.

Oil and Natural Gas Order No. PM 43,  
made and passed this 6<sup>th</sup>  
day of November A.D., 1984 at  
the City of Winnipeg, in the  
Province of Manitoba, by The  
Oil and Natural Gas  
Conservation Board.

  
\_\_\_\_\_  
Ian Haugh  
Deputy Chairman,  
The Oil and Natural Gas  
Conservation Board.

  
\_\_\_\_\_  
J.F. Redgwell  
Member,  
The Oil and Natural Gas  
Conservation Board.

Approved:

  
\_\_\_\_\_  
Wilson D. Parasiuk  
Minister of Energy and Mines

Manitoba Regulation /84:

Being

The Oil and Natural Gas Conservation Board

Order No. PM 42

An Order Pertaining to Pressure Maintenance by Water Flooding

Waskada Lower Amaranth A Pool

Made and Passed Pursuant to "The Mines Act", Cap. M160, of the Continuing Consolidation of the Statutes of Manitoba, and Amendments Thereto, by The Oil and Natural Gas Conservation Board of Manitoba

(Filed: )

WHEREAS, subsection (9)(d) of Section 62 of "The Mines Act", being Chapter M160 of the Continuing Consolidation of the Statutes of Manitoba, provides as follows:

"62(9) Without restricting the generality of subsection (8) the board, with the approval of the minister, may make orders

(d) requiring the repressuring, recycling, or pressure maintenance, of any pool or portion thereof where it is economical to do so, and for that purpose where necessary requiring the introduction or injection into any pool or portion thereof of gas, air, water or other substance;"

AND WHEREAS the Board received an application dated April 13, 1984 from Omega Hydrocarbons Ltd. for approval of a project to inject water into the Waskada Lower Amaranth A Pool ("the Pool") in Manitoba.

AND WHEREAS the Board has received letters from Omega Hydrocarbons Ltd. dated August 28, 1984 and October 11, 1984 in response to the Board's request for additional information.

AND WHEREAS Omega Hydrocarbons is the Unit Operator of the Waskada Unit No. 5;

NOW THEREFORE, the Board orders that:

1. The Unit operator shall conduct pressure maintenance operations by the injection of water into the Waskada Lower Amaranth A Pool underlying the area of Waskada Unit No. 5 ("the Unit area").
2. The pressure maintenance operations shall be in accordance with, and subject to, the following rules:

PRESSURE MAINTENANCE RULES

1. (1) Water shall be injected into the Lower Amaranth Formation through the wells:

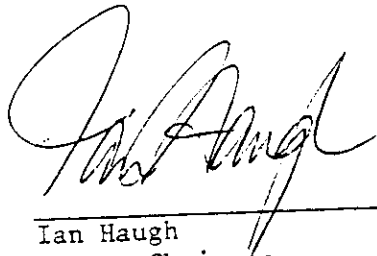
Omega Waskada WIW 13-35-1-26 (WPM)  
Omega Waskada WIW 15-35-1-26 (WPM)  
Omega Chevron Waskada WIW 5-2-2-26 (WPM)  
Omega Waskada WIW 7-2-2-26 (WPM)

and such other wells in the Unit Area as the Board may approve.

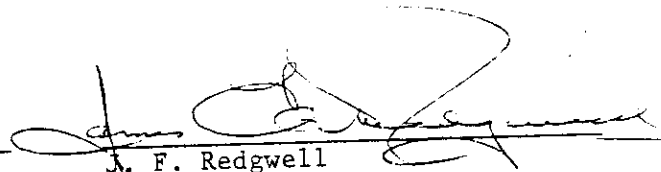
- (2) After the commencement of injection, the Unit Operator shall, subject to any remedial work required to be performed on the wells referred to in subclause (1) of this clause, endeavour to maintain continuous injection.
  - (3) Notwithstanding the provisions of subclause (2), the Board may, upon application by the Unit Operator, approve the suspension of water injection into any well or wells, provided that the Board is satisfied that pressure maintenance operations in the Unit Area will not be adversely affected.
  - (4) The completion of the wells referred to in subclause (1) will be as prescribed by the Director of the Petroleum Branch.
2. The Unit Operator, upon the request of the Board, shall satisfy the Board as to the source, suitability and method of treatment of the water to be injected.
  3. (1) Before injection of water is commenced, the Unit Operator shall submit to the Board results of a survey conducted to determine the static reservoir pressure in a minimum of two wells in the Unit Area.
  - (2) The Unit Operator shall, not less than six months nor more than 12 months after the commencement of injection, and at yearly intervals thereafter, conduct a survey to determine the static reservoir pressure in a minimum of one well in each injection pattern within the Unit Area.
  - (3) The Unit Operator shall submit the details of the surveys described in subclauses (1) and (2) of this clause to the Petroleum Branch, including a list of the wells to be surveyed, the measurement technique to be used, and the intended shut-in periods for each well, and approval shall be obtained from the Director of the Petroleum Branch before the program is carried out. Within 30 days of the completion date of the surveys, a report shall be submitted to the Petroleum Branch including:

- (a) the static reservoir pressure data obtained from the survey, corrected to a common datum;
  - (b) an isobaric map of the Pool within the Unit Area based on the data obtained; and
  - (c) a discussion of the survey results and pressure distribution within the Pool.
- (4) The Board may, at any time, require the Unit Operator to carry out such additional reservoir pressure surveys as it deems necessary.
4. The Unit Operator shall immediately report to the Board any indication of channelling or break-through of injected water to producing wells or any indication of other detrimental effects that may be attributable to the pressure maintenance operations.
5. The maximum wellhead pressure at which water is injected into the wells referred to in subclause (1) of clause 1 hereof shall not exceed 10 000 kPa or such other maximum pressure as the Board may prescribe. The Board may, from time to time, prescribe a maximum or minimum rate at which water shall be injected into any well in the Unit Area.
6. (1) The Unit Operator shall, not later than the last day of each month, file with the Petroleum Branch, a report of the quantity, source and pressure of water injected during the preceding month into each well referred to in clause 1 hereof.
- (2) The Unit Operator shall, not later than the last day of each month, file with the Petroleum Branch a summary report of production and injection operations during the preceding month. This report shall include:
- (a) a tabulation of total oil, total water and total gas produced;
  - (b) a tabulation of the number of producing wells and injection wells which were active;
  - (c) the results of at least one twenty-four hour production test on each producing well in the Unit including volumes of oil, gas and water produced during the test;
  - (d) a summary of any remedial operations carried out on any well in the Units.
7. The Unit Operator shall, within 60 days of the end of each calendar year, file with the Petroleum Branch a report of the pressure maintenance program, setting out graphically such interpretive information necessary to evaluate the efficacy of the waterflood.

Oil and Natural Gas Order No. PM 42,  
made and passed this 5<sup>th</sup> day of  
*November* A.D., 1984, at the City  
of Winnipeg, in the Province of  
Manitoba, by The Oil and Natural  
Gas Conservation Board.

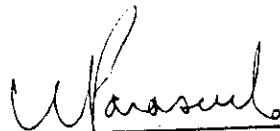


Ian Haugh  
Deputy Chairman  
The Oil and Natural Gas  
Conservation Board



J. F. Redgwell  
Member  
The Oil and Natural Gas  
Conservation Board

Approved:



Wilson Parasiuk  
Minister of Energy and Mines

## Manitoba Regulation 15/84

*Being*

## THE OIL AND NATURAL GAS CONSERVATION BOARD

ORDER NO. PM 41

An Order Pertaining to Pressure Maintenance by Gas Flooding

WASKADA LOWER AMARANTH A POOL

*Made and Passed Pursuant to "The Mines Act", Cap. M160, of the Continuing Consolidation of the Statutes of Manitoba, and Amendments Thereto, by The Oil and Natural Gas Conservation Board of Manitoba*

*(Filed February 3, 1984)*

WHEREAS, subsection (9) (d) of Section 62 of "The Mines Act" being Chapter M160 of the Continuing Consolidation of the Statutes of Manitoba, provides as follows:

"62 (9) Without restricting the generality of subsection (8) the board, with approval of the minister, may make orders

(d) requiring the repressuring, recycling, or pressure maintenance, of any pool or portion thereof where it is economical to do so, and for that purpose where necessary requiring the introduction or injection into any pool or portion thereof of gas, air, water or other substance;"

AND WHEREAS, the Board received an application dated June 23, 1983 from Omega Hydrocarbons Ltd. for approval of a project to inject water and gas into the Waskada Lower Amaranth A Pool ("the Pool") in Manitoba;

AND WHEREAS, by Board Order No. PM 40 the Board approved injection of water into certain portions of the Pool;

AND WHEREAS, the Board received an intervention to the said application from Chevron Canada Resources Limited dated October 4, 1983 pertaining to certain aspects of the proposed gas injection;

AND WHEREAS, the Board has received a letter from Omega Hydrocarbons Ltd. dated December 8, 1983 requesting that the said application be modified to exclude two wells, Omega Waskada Prov. 16-11-1-26 (WPM) and Omega Waskada 7-13-1-26 (WPM) from the list of proposed gas injection wells;

AND WHEREAS, the Board has received a letter from Chevron Canada Resources Limited, dated December 20, 1983 withdrawing its intervention to the modified application;

AND WHEREAS, the Board has received letters of concern regarding certain aspects of the project from Roxy Petroleum Ltd. dated October 18, 1983, and Tundra Oil and Gas dated October 6, 1983;

AND WHEREAS, Omega Hydrocarbons Ltd. is the Unit Operator of the proposed Waskada Unit No. 4 ("the Unit").

NOW, THEREFORE, the Board orders that:

1. The Unit Operator shall conduct pressure maintenance operations by the injection of gas into the Waskada Lower Amaranth A Pool underlying the area of the proposed Waskada Unit No. 4 ("the Unit Area").

2. The Pressure maintenance operations shall be in accordance with, and subject to, the following rules:

**PRESSURE MAINTENANCE RULES**

1. (1) Gas shall be injected into the Lower Amaranth Formation through the wells:
    - Omega Waskada GIW 5-13-1-26 (WPM)
    - Omega Waskada GIW 13-13-1-26 (WPM)
    - Omega Waskada GIW 15-13-1-26 (WPM)
    - Omega Waskada GIW 15-14-1-16 (WPM)
    - Omega Waskada GIW 7-23-1-26 (WPM)
    - Omega Waskada GIW 5-24-1-26 (WPM)
    - Omega Waskada GIW 7-24-1-26 (WPM)and such other wells in the Unit Area as the Board may approve.
  - (2) After the commencement of injection, the Unit Operator shall, subject to any remedial work required to be performed on the wells referred to in subclause (1) of this clause, endeavour to maintain continuous injection.
  - (3) Notwithstanding the provisions of subclause (2), the Board may, upon application by the Unit Operator, or on its own motion, approve or require suspension of gas injection into any well or wells provided that the Board is satisfied that pressure maintenance operations in the Unit Area will not be adversely affected.
  - (4) The Board may, upon application by the Unit Operator, or on its own motion, approve or require the conversion of any well or wells from gas injection to water injection if the Board is of the opinion that continued gas injection would be detrimental to pressure maintenance operations or to ultimate recovery or if the Board is of the opinion that there is an insufficient supply of gas for injection.
  - (5) The completion of the wells referred to in subclause (1) will be as prescribed by the Director of the Petroleum Branch.
2. (1) Before the injection of gas is commenced, the Unit Operator shall submit to the Board the results of a survey conducted to determine the static reservoir pressure in a minimum of six wells in the Unit Area.
  - (2) The Unit Operator shall, not less than six months nor more than twelve months after the commencement of injection, and at yearly intervals thereafter, conduct a survey to determine the static reservoir pressure in a minimum of six wells in the Unit Area.
  - (3) The Unit Operator shall submit the details of the surveys described in subclauses (1) and (2) of this clause to the Petroleum Branch, including a list of the wells to be surveyed, the measurement technique to be used, and the intended shut-in periods for each well, and approval shall be obtained from the Director of the Petroleum Branch before the program is carried out. Within 30 days of the completion date of the surveys, a report shall be submitted to the Petroleum Branch including:
    - (a) the static reservoir pressure data obtained from the survey, corrected to a common datum;
    - (b) an isobaric map of the Pool within the unit Area based on the data obtained; and
    - (c) a discussion of the survey results and pressure distribution within the Pool.
  - (4) The Board may, at any time, require the Unit Operator to carry out such additional reservoir pressure surveys as it deems necessary.

dance with, and subject to, the

# RULES

h Formation through the wells;

(PM)

(WPM)

(WPM)

(WPM)

(PM)

(PM)

(PM)

Board may approve.

Operator shall, subject to any wells referred to in subclause (1) of clause 1 hereof, conduct gas injection.

The Board may, upon application by the Operator, suspend or require suspension of gas injection if the Board is satisfied that pressure in the well to be adversely affected.

The Operator, or on its own motion, shall suspend gas injection from wells from gas injection to water if continued gas injection would be detrimental to ultimate recovery or if the gas supply of gas for injection.

Clause (1) will be as prescribed by

The Operator shall submit to the Board the static reservoir pressure

not more than twelve months after the end of each calendar year, conduct surveys at intervals thereafter, conduct surveys in a minimum of six wells in

surveys described in subclauses 3 and 4 hereof, including a list of the wells to be surveyed, the intended shut-in period, and the intended shut-in period from the Director of the Petroleum Branch. Within 30 days of the receipt of the report submitted to the Petroleum

from the survey, corrected to a

based on the data obtained;

distribution within the Pool.

The Operator to carry out such surveys as necessary.

3. The Unit Operator shall immediately report to the Board any indication of channeling or breakthrough of injected gas to producing wells or any indication of other detrimental effects that may be attributable to the pressure maintenance operations.
4. The Unit Operator shall, within 30 days of the effective date of this Order, submit to the Director of the Petroleum Branch, for approval, a comprehensive program of incorporation of a chemical or other tracer material in the injected gas, together with a comprehensive program of monitoring gas production from wells in or adjoining the Unit Area and completed in the Mississippian Formation, in order to determine the presence of the tracer material.
5. The maximum wellhead pressure at which gas is injected into the wells referred to in subclause (1) of clause 1 hereof shall not exceed 17 000 kPa or such other maximum pressure as the Board may prescribe. The Board may, from time to time, prescribe a minimum or maximum rate at which gas shall be injected into any well in the Unit Area.
6. (1) The Unit Operators shall, not later than the last day of each month, file with the Petroleum Branch, a report of the quantity and pressure of gas injected during the preceding month into each well referred to in subclause 1 (1) hereof.
- (2) The Unit Operator shall, not later than the last day of each month, file with the Petroleum Branch a summary report of production and injection operations during the preceding month. This report shall include:
  - (a) a tabulation of total oil, total water and total gas produced;
  - (b) a tabulation of the number of producing wells and injection wells which were active;
  - (c) the results of at least one twenty-four hour production test on each producing well in the Units including volumes of oil, gas and water produced during the test;
  - (d) interpreted results of the monitoring program required pursuant to clause 4 hereof;
  - (e) a summary of any remedial operations carried out on any well in the Unit.
7. The Unit Operator shall, within 60 days of the end of each calendar year, file with the Petroleum Branch a report of the pressure maintenance program, setting out graphically such interpretive information necessary to evaluate the efficacy of the gas flood.

THE REGULATIONS ACT

CERTIFICATE

I, Marc Eliesen, Chairman of The Oil and Natural Gas Conservation Board, hereby certify that the attached regulation is the original Order:--

- (a) entitled The Oil and Natural Gas Conservation Board Order No. PM 41;
- (b) made pursuant to The Mines Act;
- (c) by The Oil and Natural Gas Conservation Board;
- (d) on the 31st day of January A.D. 1984;
- (e) approved by the Honourable the Minister of Energy and Mines on the 31st day of January A.D. 1984; and
- (f) which regulation comes into force on the day of filing with the Registrar of Regulations.

DATED this 31st day of January A.D. 1984

*Marc Eliesen*

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Marc Eliesen  
Chairman,  
The Oil and Natural Gas  
Conservation Board

Manitoba Regulation /84

Being

THE OIL AND NATURAL GAS CONSERVATION BOARD

ORDER NO. PM 41

An Order Pertaining to Pressure Maintenance by Gas Flooding

WASKADA LOWER AMARANTH A POOL

Made and Passed Pursuant to "The Mines Act", Cap. M160, of the Continuing Consolidation of the Statutes of Manitoba, and Amendments Thereto, by The Oil and Natural Gas Conservation Board of Manitoba

(Filed: )

WHEREAS, subsection (9)(d) of Section 62 of "The Mines Act" being Chapter M160 of the Continuing Consolidation of the Statutes of Manitoba, provides as follows:

"62(9) Without restricting the generality of subsection (8) the board, with approval of the minister, may make orders

(d) requiring the repressuring, recycling, or pressure maintenance, of any pool or portion thereof where it is economical to do so, and for that purpose where necessary requiring the introduction or injection into any pool or portion thereof of gas, air, water or other substance;"

AND WHEREAS, the Board received an application dated June 23, 1983 from Omega Hydrocarbons Ltd. for approval of a project to inject water and gas into the Waskada Lower Amaranth A Pool ("the Pool") in Manitoba;

AND WHEREAS, by Board Order No. PM 40 the Board approved injection of water into certain portions of the Pool;

AND WHEREAS, the Board received an intervention to the said application from Chevron Canada Resources Limited dated October 4, 1983 pertaining to certain aspects of the proposed gas injection;

AND WHEREAS, the Board has received a letter from Omega Hydrocarbons Ltd. dated December 8, 1983 requesting that the said application be modified to exclude two wells, Omega Waskada Prov. 16-11-1-26 (WPM) and Omega Waskada 7-13-1-26 (WPM) from the list of proposed gas injection wells;

AND WHEREAS, the Board has received a letter from Chevron Canada Resources Limited, dated December 20, 1983 withdrawing its intervention to the modified application;

AND WHEREAS, the Board has received letters of concern regarding certain aspects of the project from Roxy Petroleum Ltd. dated October 18, 1983, and Tundra Oil and Gas dated October 6, 1983;

AND WHEREAS, Omega Hydrocarbons Ltd. is the Unit Operator of the proposed Waskada Unit No. 4 ("the Unit").

NOW, THEREFORE, the Board orders that:

1. The Unit Operator shall conduct pressure maintenance operations by the injection of gas into the Waskada Lower Amaranth A Pool underlying the area of the proposed Waskada Unit No. 4 ("the Unit Area"):
2. The Pressure maintenance operations shall be in accordance with, and subject to, the following rules:

PRESSURE MAINTENANCE RULES

1. (1) Gas shall be injected into the Lower Amaranth Formation through the wells:

Omega Waskada GIW 5-13-1-26 (WPM)  
Omega Waskada GIW 13-13-1-26 (WPM)  
Omega Waskada GIW 15-13-1-26 (WPM)  
Omega Waskada GIW 15-14-1-16 (WPM)  
Omega Waskada GIW 7-23-1-26 (WPM)  
Omega Waskada GIW 5-24-1-26 (WPM)  
Omega Waskada GIW 7-24-1-26 (WPM)

and such other wells in the Unit Area as the Board may approve.

- (2) After the commencement of injection, the Unit Operator shall, subject to any remedial work required to be performed on the wells referred to in subclause (1) of this clause, endeavour to maintain continuous injection.
- (3) Notwithstanding the provisions of subclause (2), the Board may, upon application by the Unit Operator, or on its own motion, approve or require suspension of gas injection into any well or wells provided that the Board is satisfied that pressure maintenance operations in the Unit Area will not be adversely affected.
- (4) The Board may, upon application by the Unit Operator, or on its own motion, approve or require the conversion of any well or wells from gas injection to water injection if the Board is of the opinion that continued gas injection would be detrimental to pressure maintenance operations or to ultimate recovery or if the Board is of the opinion that there is an insufficient supply of gas for injection.

- (5) The completion of the wells referred to in subclause (1) will be as prescribed by the Director of the Petroleum Branch.
2.
  - (1) Before the injection of gas is commenced, the Unit Operator shall submit to the Board the results of a survey conducted to determine the static reservoir pressure in a minimum of six wells in the Unit Area.
  - (2) The Unit Operator shall, not less than six months nor more than twelve months after the commencement of injection, and at yearly intervals thereafter, conduct a survey to determine the static reservoir pressure in a minimum of six wells in the Unit Area.
  - (3) The Unit Operator shall submit the details of the surveys described in subclauses (1) and (2) of this clause to the Petroleum Branch, including a list of the wells to be surveyed, the measurement technique to be used, and the intended shut-in periods for each well, and approval shall be obtained from the Director of the Petroleum Branch before the program is carried out. Within 30 days of the completion date of the surveys, a report shall be submitted to the Petroleum Branch including:
    - (a) the static reservoir pressure data obtained from the survey, corrected to a common datum;
    - (b) an isobaric map of the Pool within the Unit Area based on the data obtained; and
    - (c) a discussion of the survey results and pressure distribution within the Pool.
  - (4) The Board may, at any time, require the Unit Operator to carry out such additional reservoir pressure surveys as it deems necessary.
3. The Unit Operator shall immediately report to the Board any indication of channeling or breakthrough of injected gas to producing wells or any indication of other detrimental effects that may be attributable to the pressure maintenance operations.
4. The Unit Operator shall, within 30 days of the effective date of this order, submit to the Director of the Petroleum Branch, for approval, a comprehensive program of incorporation of a chemical or other tracer material in the injected gas, together with a comprehensive program of monitoring gas production from wells in or adjoining the Unit Area and completed in the Mississippian Formation, in order to determine the presence of the tracer material.

5. The maximum wellhead pressure at which gas is injected into the wells referred to in subclause (1) of clause 1 hereof shall not exceed 17 000 kPa or such other maximum pressure as the Board may prescribe. The Board may, from time to time, prescribe a minimum or maximum rate at which gas shall be injected into any well in the Unit Area.
6.
  - (1) The Unit Operators shall, not later than the last day of each month, file with the Petroleum Branch, a report of the quantity and pressure of gas injected during the preceding month into each well referred to in subclause 1(1) hereof.
  - (2) The Unit Operator shall, not later than the last day of each month, file with the Petroleum Branch a summary report of production and injection operations during the preceding month. This report shall include:
    - (a) a tabulation of total oil, total water and total gas produced;
    - (b) a tabulation of the number of producing wells and injection wells which were active;
    - (c) the results of at least one twenty-four hour production test on each producing well in the Units including volumes of oil, gas and water produced during the test;
    - (d) interpreted results of the monitoring program required pursuant to clause 4 hereof;
    - (e) a summary of any remedial operations carried out on any well in the Unit.
7. The Unit Operator shall, within 60 days of the end of each calendar year, file with the Petroleum Branch a report of the pressure maintenance program, setting out graphically such interpretive information necessary to evaluate the efficacy of the gas flood.

Oil and Natural Gas Order No. PM 41,  
made and passed this 31st day of  
January A.D., 1984, at this City  
of Winnipeg, in the Province of  
Manitoba, by The Oil and Natural  
Gas Conservation Board.



Marc Eliesen  
Chairman,  
The Oil and Natural Gas  
Conservation Board



Ian Haugh  
Deputy Chairman,  
The Oil and Natural Gas  
Conservation Board



J. F. Redgwell  
Member,  
The Oil and Natural Gas  
Conservation Board

Approved:



Wilson D. Parasiuk  
Minister of Energy and Mines

## Manitoba Gazette

December 17, 1983 No. 51

PUBLISHED EVERY SATURDAY

## PUBLIC NOTICES

Business Names Registration	
of Name Act: .....	\$ 7.50
Unions Act: .....	8.75
of Incorporation .....	12.75
on .....	3.25
.....	8.75
Control Act: .....	18.50
al Act, City of	
Act:	
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1983 .....	23.00
of Manitoba Gazette ..	.60

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## Manitoba Regulation 250/83

Being

The Oil and Natural Gas Conservation Board

Order No. PM 40

An Order Pertaining to Pressure Maintenance by Water Flooding  
Waskada Lower Amaranth A Pool

Made and Passed Pursuant to "The Mines Act", Cap. M160, of the Continuing  
Consolidation of the Statutes of Manitoba, and Amendments Thereto,  
by The Oil and Natural Gas Conservation Board of Manitoba

(Filed November 30, 1983)

WHEREAS, subsection (9) (d) of Section 62 of "The Mines Act", being Chapter M160 of the  
Continuing Consolidation of the Statutes of Manitoba, provides as follows:

"62 (9) Without restricting the generality of subsection (8) the board, with the  
approval of the minister, may make orders

(d) requiring the repressuring, recycling, or pressure maintenance, of any  
pool or portion thereof where it is economical to do so, and for that purpose  
where necessary requiring the introduction or injection into any pool or portion  
thereof of gas, air, water or other substance;"

AND WHEREAS the Board received an application dated June 23, 1983 from Omega  
Hydrocarbons Ltd. for approval of a project to inject water and gas into the Waskada Lower  
Amaranth A Pool ("the pool") in Manitoba.

AND WHEREAS the Board has received an intervention, to the said application, from  
Chevron Canada Resources Limited dated October 4, 1983 pertaining to certain aspects of the  
proposed gas injection;

AND WHEREAS the Board has received a letter from Omega Hydrocarbons Ltd. dated  
October 6, 1983 requesting that those portions of the said application pertaining to gas  
injection be held in abeyance;

AND WHEREAS the Board has received letters of concern regarding certain aspects of the  
project from Roxy Petroleum Ltd. dated October 18, 1983, and Tundra Oil and Gas dated  
October 6, 1983;

AND WHEREAS Omega Hydrocarbons is the Unit Operator of the Waskada Lower  
Amaranth Unit No. 1, the Waskada Unit No. 2 and the Waskada Unit No. 3 ("the Units");

NOW THEREFORE, the Board orders that:

1. The Unit Operator shall conduct pressure maintenance operations by the injection of  
water into the Waskada Lower Amaranth A Pool underlying the areas of Lower  
Amaranth Unit No. 1, Waskada Unit No. 2 and Waskada Unit No. 3 ("the Unit Areas").

2. The pressure maintenance operations shall be in accordance with, and subject to, the following rules:

**PRESSURE MAINTENANCE RULES**

1. (1) Water shall be injected into the Lower Amaranth Formation through the wells:
    - Omega Waskada WIW 5-30-1-25 (WPM)
    - Omega Waskada WIW 13-30-1-25 (WPM)
    - Omega Waskada WIW 15-30-1-25 (WPM)
    - Omega Waskada WIW 5-31-1-25 (WPM)
    - Omega Waskada WIW 7-31-1-25 (WPM)
    - Omega Waskada Prov. WIW 16-22-1-26 (WPM)
    - Omega Waskada WIW 15-23-1-26 (WPM)
    - Omega Waskada WIW 13-24LAm-1-26 (WPM)
    - Omega Waskada WIW 15-24-1-26 (WPM)
    - Omega Waskada WIW 5-25-1-26 (WPM)
    - Omega Waskada WIW 7-25-1-26 (WPM)
    - Omega Waskada WIW 13-25-1-26 (WPM)
    - Omega Waskada WIW 15-25-1-26 (WPM)
    - Omega Waskada WIW 5-26-1-26 (WPM)
    - Omega Waskada WIW 7-26-1-26 (WPM)
    - Omega Waskada WIW 13-26-1-26 (WPM)
    - Omega Waskada WIW 5-27-1-26 (WPM)
    - Omega Waskada WIW 7-27-1-26 (WPM)
    - Omega Waskada WIW 13-27-1-26 (WPM)
    - Omega Waskada WIW 15-27LAm-1-26 (WPM)and such other wells in the Unit Areas as the Board may approve.
  - (2) After the commencement of injection, the Unit Operator shall subject to any remedial work required to be performed on the wells referred to in subclause (1) of this clause, endeavour to maintain continuous injection.
  - (3) Notwithstanding the provisions of subclause (2), the Board may, upon application by the Unit Operator, approve the suspension of water injection into any well or wells, provided that the Board is satisfied that pressure maintenance operations in the Unit Areas will not be adversely affected.
  - (4) The completion of the wells referred to in subclause (1) will be as prescribed by the Director of the Petroleum Branch.
3. The Unit Operator, upon the request of the Board, shall satisfy the Board as to the source, suitability and method of treatment of the water to be injected.
  4. (1) Before injection of water is commenced, the Unit Operator shall submit to the Board results of a survey conducted to determine the static reservoir pressure in a minimum of one well in each injection pattern within the Unit Areas.
  - (2) The Unit Operator shall, not less than six months nor more than 12 months after the commencement of injection, and at yearly intervals thereafter, conduct a survey to determine the static reservoir pressure in a minimum of one well in each injection pattern within the Unit Areas.

- (3) The Unit Operator shall submit the details of the surveys described in subclauses (1) and (2) of this clause to the Petroleum Branch, including a list of the wells to be surveyed, the measurement technique to be used, and the intended shut-in periods for each well, and approval shall be obtained from the Director of the Petroleum Branch before the program is carried out. Within 30 days of the completion date of the surveys, a report shall be submitted to the Petroleum Branch including:
- (a) the static reservoir pressure data obtained from the survey, corrected to a common datum;
  - (b) an isobaric map of the Pool within the Unit Areas based on the data obtained; and
  - (c) a discussion of the survey results and pressure distribution within the Pool.
- (4) The Board may, at any time, require the Unit Operator to carry out such additional reservoir pressure surveys as it deems necessary.
5. The Unit Operator shall immediately report to the Board any indication of channelling or break-through of injected water to producing wells or any indication of other detrimental effects that may be attributable to the pressure maintenance operations.
6. The Unit Operator shall, within 30 days of the effective date of this order, submit to the Director of the Petroleum Branch, for approval, a comprehensive program of incorporation of a chemical or other tracer material in the injected water, together with a comprehensive program of monitoring water production from wells in or adjoining the Unit Areas and completed in the Mississippian Formation, in order to determine the presence of the tracer material.
7. The maximum wellhead pressure at which water is injected into the wells referred to in subclause (1) of clause 1 hereof shall not exceed 10 000 kPa or such other maximum pressure as the Board may prescribe. The Board may, from time to time, prescribe a maximum or minimum rate at which water shall be injected into any well in the Unit Areas.
8. (1) The Unit Operator shall, not later than the last day of each month, file with the Petroleum Branch, a report of the quantity, source and pressure of water injected during the preceding month into each well referred to in clause 1 hereof.
- (2) The Unit Operator shall, not later than the last day of each month, file with the Petroleum Branch a summary report of production and injection operations during the preceding month. This report shall include:
- (a) a tabulation of total oil, total water and total gas produced;
  - (b) a tabulation of the number of producing wells and injection wells which were active;
  - (c) the results of at least one twenty-four hour production test on each producing well in the Units including volumes of oil, gas and water produced during the test;
  - (d) interpreted results of the monitoring program required pursuant to clause 5 hereof;
  - (e) a summary of any remedial operations carried out on any well in the Units.

9. The Unit Operator shall, within 60 days of the end of each calendar year, file with the Petroleum Branch a report of the pressure maintenance program, setting out graphically such interpretive information necessary to evaluate the efficacy of the waterflood.

10. Board Order No. PM 39, being Manitoba Regulation 36/83, is hereby repealed.

Oil and Natural Gas Order No. PM40, made and passed this 28th day of November A.D., 1983, at this City of Winnipeg, in the Province of Manitoba, by The Oil and Natural Gas Conservation Board.

*"Marc Eliesen"*

Marc Eliesen  
Chairman  
The Oil and Natural Gas  
Conservation Board

*"James F. Redgwell"*

J.F. Redgwell  
Member  
The Oil and Natural Gas  
Conservation Board

Approved:

*"Wilson D. Parasiuk"*

Wilson D. Parasiuk  
Minister of Energy and Mines

*"Ian Haugh"*

Ian Haugh  
Deputy Chairman  
The Oil and Natural Gas  
Conservation Board

1. In this regulation described in
2. Subject to section 2 as grading, blocking of burning, for herbicides, or tents, or Area.
3. Subject to section 2 or using a person accommodated the lawful use using the
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December 5, 1983

Omega Hydrocarbons Ltd.  
630, 330 - 5th Avenue S.W.  
Calgary, Alberta  
T2P 0L4

Attention: Mr. G. E. Patay  
Vice President, Production

Dear Sirs:

Re: Board Order No. PM 40 -  
Waskada Lower Amaranth A Pool

Enclosed is Board Order No. PM 40 relating to pressure maintenance operations in the Waskada Lower Amaranth Unit No. 1 and proposed Waskada Units No. 2 and 3. The Board wishes to draw your attention specifically to the following points:

- (a) Board approval of the unitization agreements for the proposed Waskada Units 2 and 3 is required prior to initiation of injection in these Units.
- (b) Clause No. 6 of Order No. PM 40 requires that within 30 days of the effective date of the Order, Omega submit to the Petroleum Branch a comprehensive program for incorporating tracer material in the injected water.
- (c) It will be necessary for Omega to apply for an exemption from provisions of The Pipe Line Act relating to obtaining a construction permit and an operating licence for those parts of Omega's injection system not covered in a previous exemption dated January 25, 1983. A copy of submission requirements for an application for such an exemption is enclosed.

Yours sincerely

THE OIL AND NATURAL GAS  
CONSERVATION BOARD

*(Signature)*  
IAN HAUGH

Ian Haugh  
Deputy Chairman

LRD/IH/ra

bc: Petroleum Branch

Manitoba Regulation /83

Being

The Oil and Natural Gas Conservation Board

Order No. PM 40

An Order Pertaining to Pressure Maintenance by Water Flooding

Waskada Lower Amaranth A Pool

Made and Passed Pursuant to "The Mines Act", Cap. M160, of the  
Continuing Consolidation of the Statutes of Manitoba, and  
Amendments Thereto, by The Oil and Natural Gas  
Conservation Board of Manitoba

(Filed: )

WHEREAS, subsection (9)(d) of Section 62 of "The Mines Act", being Chapter M160 of the Continuing Consolidation of the Statutes of Manitoba, provides as follows:

"62(9) Without restricting the generality of subsection (8) the board, with the approval of the minister, may make orders

(d) requiring the repressuring, recycling, or pressure maintenance, of any pool or portion thereof where it is economical to do so, and for that purpose where necessary requiring the introduction or injection into any pool or portion thereof of gas, air, water or other substance;"

AND WHEREAS the Board received an application dated June 23, 1983 from Omega Hydrocarbons Ltd. for approval of a project to inject water and gas into the Waskada Lower Amaranth A Pool ("the Pool") in Manitoba.

AND WHEREAS the Board has received an intervention, to the said application, from Chevron Canada Resources Limited dated October 4, 1983 pertaining to certain aspects of the proposed gas injection;

AND WHEREAS the Board has received a letter from Omega Hydrocarbons Ltd. dated October 6, 1983 requesting that those portions of the said application pertaining to gas injection be held in abeyance;

AND WHEREAS the Board has received letters of concern regarding certain aspects of the project from Roxy Petroleum Ltd. dated October 18, 1983, and Tundra Oil and Gas dated October 6, 1983;

AND WHEREAS Omega Hydrocarbons is the Unit Operator of the Waskada Lower Amaranth Unit No. 1, the Waskada Unit No. 2 and the Waskada Unit No. 3 ("the Units");

NOW THEREFORE, the Board orders that:

1. The Unit operator shall conduct pressure maintenance operations by the injection of water into the Waskada Lower Amaranth A Pool underlying the areas of Lower Amaranth Unit No. 1, Waskada Unit No. 2 and Waskada Unit No. 3 ("the Unit Areas").
2. The pressure maintenance operations shall be in accordance with, and subject to, the following rules:

PRESSURE MAINTENANCE RULES

1. (1) Water shall be injected into the Lower Amaranth Formation through the wells:

Omega Waskada WIW 5-30-1-25 (WPM)  
Omega Waskada WIW 13-30-1-25 (WPM)  
Omega Waskada WIW 15-30-1-25 (WPM)  
Omega Waskada WIW 5-31-1-25 (WPM)  
Omega Waskada WIW 7-31-1-25 (WPM)  
Omega Waskada Prov. WIW 16-22-1-26 (WPM)  
Omega Waskada WIW 15-23-1-26 (WPM)  
Omega Waskada WIW 13-24LAm-1-26 (WPM)  
Omega Waskada WIW 15-24-1-26 (WPM)  
Omega Waskada WIW 5-25-1-26 (WPM)  
Omega Waskada WIW 7-25-1-26 (WPM)  
Omega Waskada WIW 13-25-1-26 (WPM)  
Omega Waskada WIW 15-25-1-26 (WPM)  
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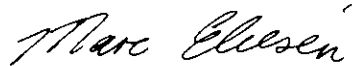
and such other wells in the Unit Areas as the Board may approve.

- (2) After the commencement of injection, the Unit Operator shall subject to any remedial work required to be performed on the wells referred to in subclause (1) of this clause, endeavour to maintain continuous injection.
- (3) Notwithstanding the provisions of subclause (2), the Board may, upon application by the Unit Operator, approve the suspension of water injection into any well or wells, provided that the Board is satisfied that pressure maintenance operations in the Unit Areas will not be adversely affected.

- (4) The completion of the wells referred to in subclause (1) will be as prescribed by the Director of the Petroleum Branch.
3. The Unit Operator, upon the request of the Board, shall satisfy the Board as to the source, suitability and method of treatment of the water to be injected.
4.
  - (1) Before injection of water is commenced, the Unit Operator shall submit to the Board results of a survey conducted to determine the static reservoir pressure in a minimum of one well in each injection pattern within the Unit Areas.
  - (2) The Unit Operator shall, not less than six months nor more than 12 months after the commencement of injection, and at yearly intervals thereafter, conduct a survey to determine the static reservoir pressure in a minimum of one well in each injection pattern within the Unit Areas.
  - (3) The Unit Operator shall submit the details of the surveys described in subclauses (1) and (2) of this clause to the Petroleum Branch, including a list of the wells to be surveyed, the measurement technique to be used, and the intended shut-in periods for each well, and approval shall be obtained from the Director of the Petroleum Branch before the program is carried out. Within 30 days of the completion date of the surveys, a report shall be submitted to the Petroleum Branch including:
    - (a) the static reservoir pressure data obtained from the survey, corrected to a common datum;
    - (b) an isobaric map of the Pool within the Unit Areas based on the data obtained; and
    - (c) a discussion of the survey results and pressure distribution within the Pool.
  - (4) The Board may, at any time, require the Unit Operator to carry out such additional reservoir pressure surveys as it deems necessary.
5. The Unit Operator shall immediately report to the Board any indication of channelling or break-through of injected water to producing wells or any indication of other detrimental effects that may be attributable to the pressure maintenance operations.
6. The Unit Operator shall, within 30 days of the effective date of this order, submit to the Director of the Petroleum Branch, for approval, a comprehensive program of incorporation of a chemical or other tracer material in the injected water, together with a comprehensive program of monitoring water production from wells in or adjoining the Unit Areas and completed in the Mississippian Formation, in order to determine the presence of the tracer material.

7. The maximum wellhead pressure at which water is injected into the wells referred to in subclause (1) of clause 1 hereof shall not exceed 10 000 kPa or such other maximum pressure as the Board may prescribe. The Board may, from time to time, prescribe a maximum or minimum rate at which water shall be injected into any well in the Unit Areas.
8.
  - (1) The Unit Operator shall, not later than the last day of each month, file with the Petroleum Branch, a report of the quantity, source and pressure of water injected during the preceding month into each well referred to in clause 1 hereof.
  - (2) The Unit Operator shall, not later than the last day of each month, file with the Petroleum Branch a summary report of production and injection operations during the preceding month. This report shall include:
    - (a) a tabulation of total oil, total water and total gas produced;
    - (b) a tabulation of the number of producing wells and injection wells which were active;
    - (c) the results of at least one twenty-four hour production test on each producing well in the Units including volumes of oil, gas and water produced during the test;
    - (d) interpreted results of the monitoring program required pursuant to clause 5 hereof;
    - (e) a summary of any remedial operations carried out on any well in the Units.
9. The Unit Operator shall, within 60 days of the end of each calendar year, file with the Petroleum Branch a report of the pressure maintenance program, setting out graphically such interpretive information necessary to evaluate the efficacy of the waterflood.
10. Board Order No. PM 39, being Manitoba Regulation 36/83, is hereby repealed.

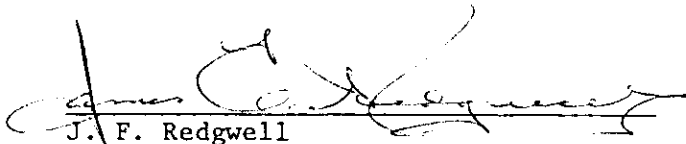
Oil and Natural Gas Order No. PM 40,  
made and passed this 28 day of  
November A.D., 1983, at this City  
of Winnipeg, in the Province of  
Manitoba, by The Oil and Natural  
Gas Conservation Board.



Marc Eliesen  
Chairman,  
The Oil and Natural Gas  
Conservation Board

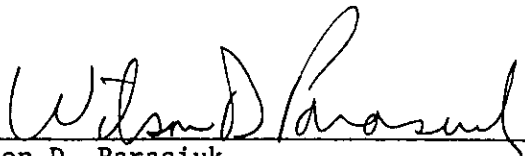


Ian Haugh  
Deputy Chairman,  
The Oil and Natural Gas  
Conservation Board



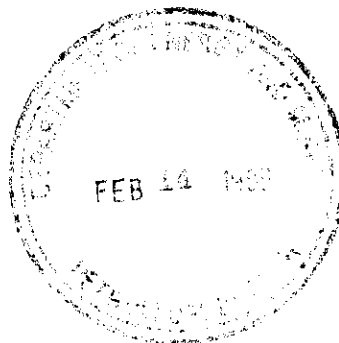
J. F. Redgwell  
Member,  
The Oil and Natural Gas  
Conservation Board

Approved:



Wilson D. Parasiuk  
Minister of Energy and Mines

THE REGULATIONS ACT  
CERTIFICATE



I, Marc Eliesen, Chairman of The Oil and Natural Gas Conservation Board, hereby certify that the attached regulation is the original Order:—

- (a) entitled The Oil and Natural Gas Conservation Board Order No. PM 39;
- (b) made pursuant to The Mines Act;
- (c) by The Oil and Natural Gas Conservation Board;
- (d) on the 9th day of February A.D. 1983;
- (e) approved by the Honourable the Minister of Energy and Mines on the 9th day of February A.D. 1983;
- (f) which regulation comes into force on the day of filing with the Registrar of Regulations.

DATED this 9th day of February A.D. 1983



Marc Eliesen,  
Chairman,  
The Oil and Natural Gas  
Conservation Board

Manitoba Regulation /83

Being

THE OIL AND NATURAL GAS CONSERVATION BOARD

ORDER NO. PM 39

An Order Pertaining to Pressure Maintenance by Water Flooding

WASKADA LOWER AMARANTH UNIT NO. 1

Made and Passed Pursuant to "The Mines Act", Cap. M160, of the  
Continuing Consolidation of the statutes of Manitoba, and  
Amendments Thereto, by The Oil and Natural Gas  
Conservation Board of Manitoba

(Filed: )

WHEREAS, subsection (9)(d) of Section 62 of "The Mines Act", being Chapter M160 of the Continuing Consolidation of the Statutes of Manitoba, provides as follows:

"62(9) Without restricting the generality of subsection (8) the board, with the approval of the minister, may make orders

(d) requiring the repressuring, recycling, or pressure maintenance, of any pool or portion thereof where it is economical to do so, and for that purpose where necessary requiring the introduction or injection into any pool or portion thereof of gas, air, water or other substance;"

AND WHEREAS, the Board received a submission, dated May 19, 1982, from Omega Hydrocarbons Ltd. as operator of Waskada Lower Amaranth Unit No. 1 for approval of a pilot waterflood scheme in the Lower Amaranth Formation in a portion of the Waskada Field in Manitoba.

AND WHEREAS, the Board has received no objections to the original application by Omega Hydrocarbons Ltd.

AND WHEREAS, upon due consideration of the said application, the Board has found it is reasonably necessary to conduct a pilot waterflood in the Lower Amaranth Formation in a portion of the Waskada Field in Manitoba.

AND WHEREAS, Omega Hydrocarbons Ltd. is the Unit Operator.

NOW, THEREFORE, the Board orders that:

1. The Unit Operator shall conduct pressure maintenance operations by the injection of water to the Lower Amaranth Formation of Jurassic Age underlying the Unit Area:
2. The pressure maintenance operations shall be in accordance with, and subject to, the following rules:

PRESSURE MAINTENANCE RULES

1. (1) Water shall be injected to the Lower Amaranth Formation of Jurassic Age through the wells:

Omega Waskada WIW 13-24LAM-1-26 (WPM)

Omega Waskada WIW 15-24-1-26 (WPM)

Omega Waskada WIW 5-25-1-26 (WPM)

Omega Waskada WIW 7-25-1-26 (WPM)

and such other wells in the Unit Area as the Board may approve.

- (2) After the commencement of injection, the Unit Operator shall, subject to any remedial work required to be performed on the wells referred to in this clause, endeavor to maintain continuous injection.
  - (3) Notwithstanding the provisions of subclause (2), the Board may, upon application by the Unit Operator, approve the suspension of water injection, provided the Board is satisfied that the pressure maintenance operation in the Unit Area will not be adversely affected.
  - (4) The completion of said wells will be as prescribed by the Director of the Petroleum Branch.
2. (1) Before the injection of water is commenced and from time to time after the commencement of injection, and upon the request of the Board, the Unit Operator shall satisfy the Board as to the source, suitability, and method of treatment of the water to be injected.
  - (2) Before any change is made in the source of water being injected, the Unit Operator shall satisfy the Board as to the suitability of the water to be injected.
3. (1) Before the injection of water is commenced, the Unit Operator shall submit to the Board results of a survey conducted to determine the static reservoir pressure in a minimum of four producing wells in the Unit Area.
  - (2) The Unit Operator shall, not less than six months nor more than 12 months after commencement of injection, conduct a survey to determine the static reservoir pressure in a minimum of four producing wells in the Unit Area.

(3) The Unit Operator shall submit the details of such programs to the Petroleum Branch, including the wells to be surveyed, the measurement technique to be used and the intended shut in periods for each well, and approval must be obtained from the Director of the Petroleum Branch before the program is carried out. Within 30 days of having the program approved and carried out, a report shall be submitted to the Branch including:

- (a) The static reservoir pressure data obtained from the survey corrected to a common datum
- (b) An isobaric map of the reservoir or Unit Area based on the data obtained
- (c) A discussion of the survey results and pressure distribution within the reservoir

(4) The Board may at any time during the term of the pilot waterflood or within 60 days of the expiration of such term, require the Unit Operator to carry out such additional reservoir pressure surveys as it deems necessary.

4. The Unit Operator shall immediately report to the Board any indication of channelling or break-through of injected water to producing wells or any indication of other detrimental effects that may be attributable to the pressure maintenance operations.

5. The maximum wellhead pressure at which water is injected into the wells referred to in subclause (1) of clause 1 hereof shall not exceed 10 000 kPa or such other maximum pressure as the Board may prescribe. The Board may, from time to time, prescribe a maximum or minimum rate at which water shall be injected into any well in the Unit.

6. (1) The Unit Operator shall, not later than the twenty-fifth day of each month, file with the Petroleum Branch, a report of the quality source and pressure of water injected during the preceding month to each well referred to in clause 1, hereof.

should be  
quantity

(2) The Unit Operator shall, not later than the twenty-fifth day of each month file, with the Petroleum Branch, a summary report of production and injection operations during the preceding month. This report is to include:


- (a) Tabulation of total oil, total water and total gas produced
- (b) The number of producing wells and injection wells which were active
- (c) The results of at least one twenty-four hour production test on each producing well in the

unit including volumes of oil gas and water produced during the test

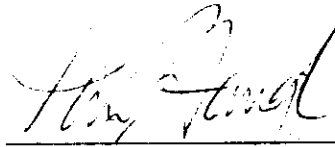
(d) A summary of any remedial well operations

7. Unless otherwise authorized in writing by the Board, the Unit Operator shall, prior to the expiration of this order, file with the Petroleum Branch, a report of the pressure maintenance program, setting out graphically such interpretive information necessary to evaluate the performance and efficacy of the waterflood. This report is also to include discussions and recommendations regarding continuation or expansion of the pilot or termination of injection.
8. (1) This order shall terminate on February 29, 1984.  
(2) Notwithstanding the provisions of subclause (1), the Board may upon application by the Unit Operator, extend the term of this order.

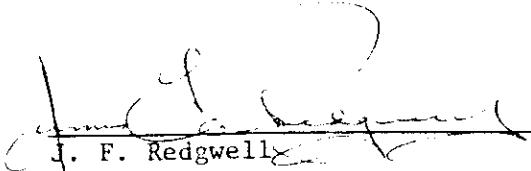
Oil and Natural Gas Order No. PM 39,  
made and passed this **9th** day of  
**February** A.D., 1983, at the City  
of Winnipeg, in the Province of  
Manitoba, by The Oil and Natural  
Gas Conservation Board.



Marc Eliesen  
Chairman,  
The Oil and Natural Gas  
Conservation Board

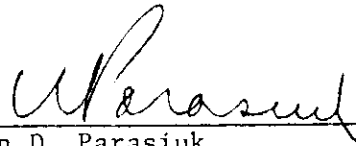


Dr. I. Haugh  
Deputy Chairman,  
The Oil and Natural Gas  
Conservation Board



J. F. Redgwell  
Member,  
The Oil and Natural Gas  
Conservation Board

Approved:



Wilson D. Parasiuk  
Minister of Energy and Mines