Manitoba

ne Oil and Natural Gas
Conservation Board

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

(204) 945-3130

September 13, 1991

Mr. H. Dale Logie, P. Eng.
Chief Reservoir Engineer
Enron Oil Canada Ltd.
1300, 700 - 9th Avenue S.W.
Calgary, Alberta
T2P 3V4

Dear Mr. Logie:

Re: Waskada Unit No. 18
Pressure Maintenance Approval

The Board has completed its review of your application for approval of waterflood operations in the Waskada Lower Amaranth A Pool. Attached is a copy of Board Order No. PM 68 authorizing pressure maintenance operations in Waskada Unit No. 18.

Please note that water injection into Waskada Unit No. 18 is not authorized until the Board has approved the Unit Agreement as required by Section 74 of The Mines Act.

The Board requests that Enron, in the annual progress report required under Section 7 of Board Order No. PM 68, include a discussion of the performance of the well, Enron Waskada 4-21-1-25 (WPM), its plans for conversion of the well and the effect of reservoir anisotropy on waterflood performance.

If you have any questions in respect of this matter, please contact L.R. Dubreuil, Director of Petroleum or John N. Fox, Chief Petroleum Engineer, at (204) 945-6573 or 945-6574, respectively.

Yours respectfully,

H. Clare Moster
Deputy Chairman

Manitoba

The Oil and Natural Gas
Conservation Board

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

(204) 945-3130

Order No. PM 68

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, the Board received an application dated June 17, 1991 from Enron Oil Canada Ltd. for approval of a project to inject water into the Waskada Lower Amaranth A Pool ("the pool") in the proposed Waskada Unit No. 18.

AND WHEREAS, upon publication of notice of the application the Board received no objections to or interventions in the application.

AND WHEREAS, Enron Oil Canada Ltd. is the proposed unit operator of the proposed Waskada Unit No. 18 ("the unit area").

AND WHEREAS, upon due consideration, the Board has found it is reasonable and desirable to approve the application.

NOW THEREFORE, the Board orders that:

1. The unit operator shall conduct pressure maintenance operations by the injection of water into the pool underlying the unit area.

2. 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:

Waskada Unit No. 18 Prov. WIW A11-16-1-25 (WPM)
Waskada Unit No. 18 WIW 15-16-1-25 (WPM)
Waskada Unit No. 18 WIW 6-21-1-25 (WPM)
Waskada Unit No. 18 WIW 10-21-1-25 (WPM)

and such other wells in the unit area as the Board may order or 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 Director of Petroleum.

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 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 the unit area.

3(3) The unit operator shall submit to the Petroleum Branch, the details of the surveys described in subsections (1) and (2), 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 Petroleum before the program is carried out.

3(4) The unit operator shall submit to the Petroleum Branch, within 30 days of the completion date of the surveys described in subsections (1) and (2), a report which shall include:

(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.

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 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 subsection 1(1).

6(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, 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 Branch a report of the pressure maintenance program, setting out graphically such interpretive information necessary to evaluate the efficacy of the waterflood.

H. Clare Moster
Deputy Chairman

Ian Haugh
Chairman

OIL AND NATURAL GAS CONSERVATION BOARD ORDER NO. PM 68 APPROVED THIS 12 DAY OF Sept A.D. 1991 AT THE CITY OF WINNIPEG.

APPROVED:

Harold Neufeld
Minister of Energy and Mines

August 30, 1991

The Oil and Natural Gas
Conservation Board
- Ian Haugh, Chairman
- H. Clare Moster, Deputy Chairman
- Wm. McDonald, Member

John N. Fox
Chief Petroleum Engineer
Petroleum Branch

RE: Waskada Unit No. 18
Pressure Maintenance Application

Enron Oil Canada Ltd.'s application for approval of pressure maintenance operations in the Waskada Lower Amaranth A Pool in the proposed Waskada Unit No. 18 was advertised in the Manitoba Gazette and Melita New Era. No objections to the application were received.

RECOMMENDATIONS:

It is recommended that the Board approve Enron's application. A copy of Board Order No. 68 covering pressure maintenance operations in Waskada Unit No. 18 is attached. Also attached is a copy of the proposed Board letter of approval to accompany the order.

DISCUSSION:

Enron has made application to create a new waterflood in a portion of Sections 16 and 21 in Township 1, Range 25 (WPM) in the Waskada Lower Amaranth A Pool. The proposed Waskada Unit No. 18 includes the conversion of 4 wells to water injection to create 4 full or partial inverted 7-spot injection patterns (Figures 1 and 2).

Enron estimates original oil-in-place in Waskada Unit No. 18 of 2020 x 10^3m^3 (96.2 x 10^3m^3 per well). Currently (June, 1991) the 18 wells produce 34 m^3/d at a WOR of 0.28 m^3/m^3. Cumulative production to June 30, 1991 is 14.2 x 10^3m^3 or 0.7% OOIP. A plot of the unit production history is shown in Figure 3.

Enron's simulation study for Unit No. 18 predicted a primary recovery of 111.1 x 10^3m^3 or 5.5% OOIP and a waterflood recovery of 254.5 x 10^3m^3 or 12.6% OOIP after 20 years. The predicted recoveries for Unit No.'s 16 and 17 are listed below.

	Primary Recovery	Secondary Recovery
Unit No. 16	9.3%	19.8%
Unit No. 17	7.5%	16%
Unit No. 18	5.5%	12.6%

The lower recovery predictions are a result of the lower permeability, lower structural position and higher initial water cuts of wells in Unit No. 18, when compared to wells in Unit No.'s 16 and 17. In the study area, the lack of core and reservoir pressure data and minimal pressure history have an effect on the accuracy of the simulation study.

The Branch agrees with Enron's estimate of increased waterflood recovery and based on the performance of the waterflood in Unit No. 16 recommends approval of the application. Proposed Board Order No. PM 68 covering pressure maintenance operations in Unit No. 18 is attached. Injection in Unit No. 18 is not to commence until the Board approves the Unit Agreement.

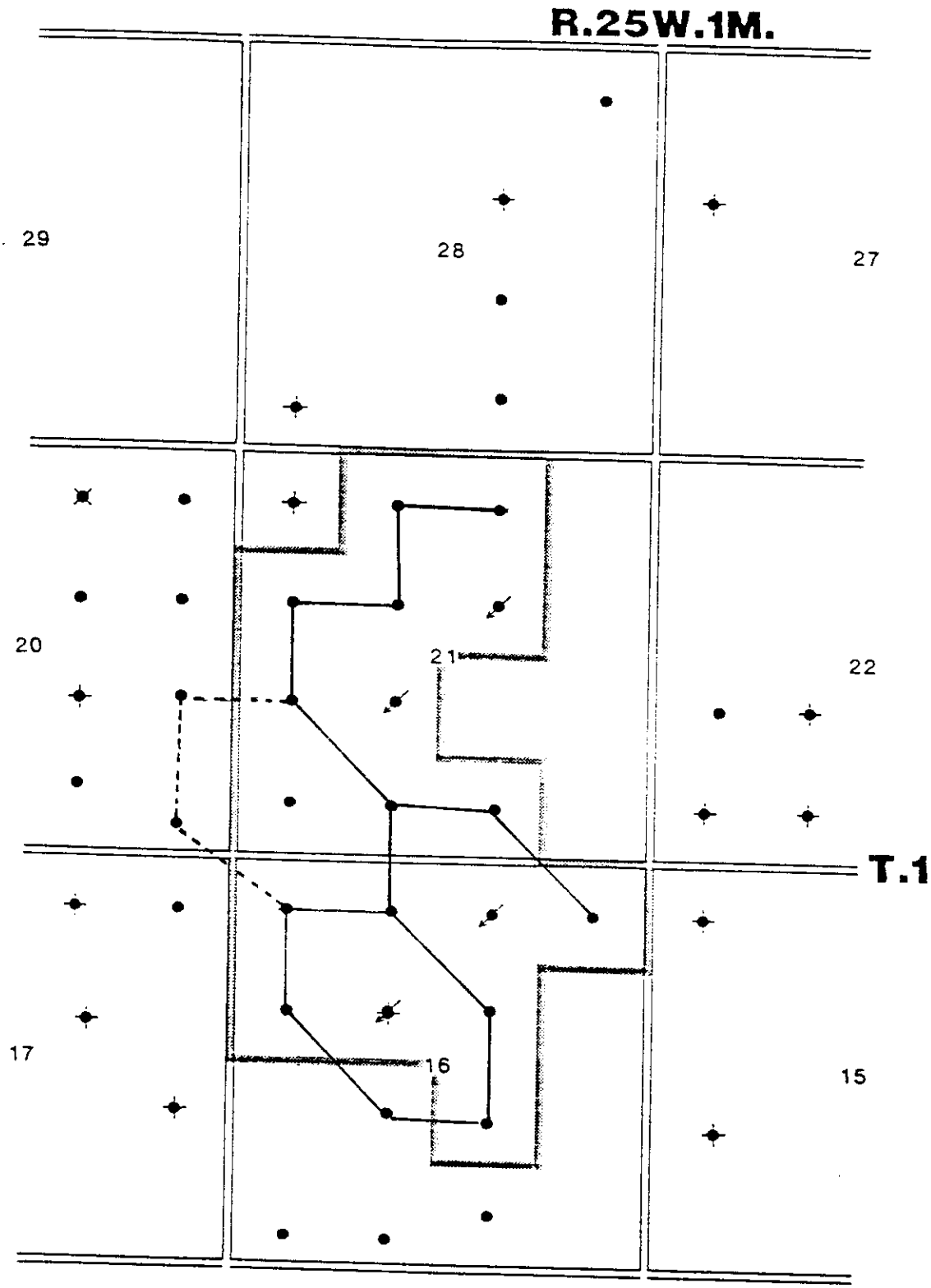
Enron does not plan to convert the 4-21-1-25 well to injection at this time (Figure 1). If 4-21 is converted to injection now, the estimated additional recovery is only 2.2 x $10^3 m^3$ after 20 years. Enron's plan to convert the well if reservoir voidage cannot be met or if premature water breakthrough occurs at 4-21 is acceptable. It is recommended that the Board request Enron report annually on the performance of 4-21 and its plans for conversion of the well.

ORIGINAL SIGNED BY
JOHN N. FOX

John N. Fox

Encl.

Approved: _____
L.R. Dubreuil, Director



LEGEND

- OIL WELL
- WATER INJECTOR
- UNIT No. 18

ENRON Oil Canada Ltd.

1300, 700 - 9th AVENUE S.W., CALGARY, ALBERTA PH: 403/298-2600

SOUTH WASKADA, MANITOBA

UNIT NO. 18

FIGURE 1

DATE: 12-06-91	BY: D. LOGIE	CONT. INT.:
SCALE: 1:25,000	REVISIONS:	

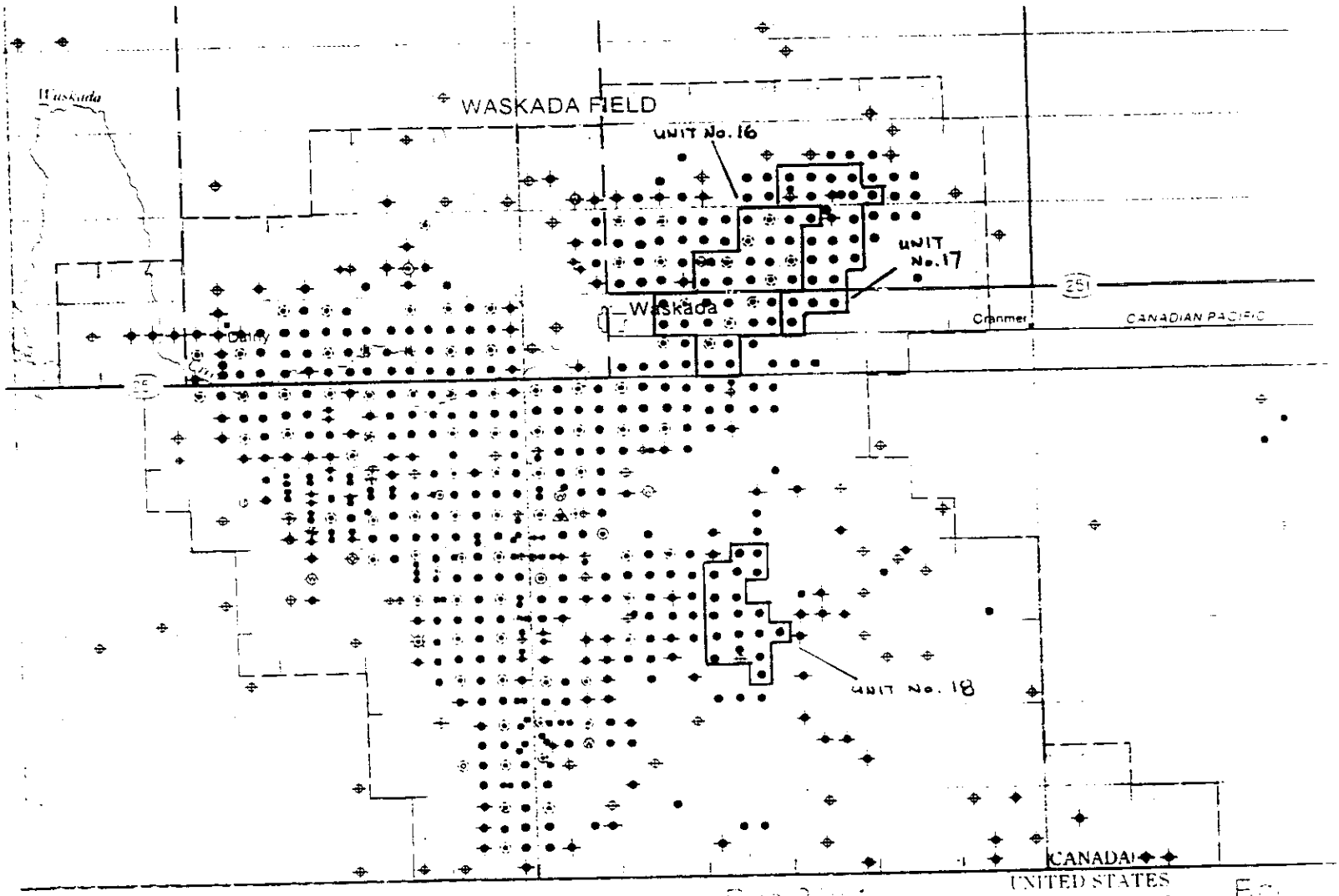

WASKADA FIELD
UNIT No. 16
UNIT No. 17
UNIT No. 18
Waskada
Cranmer
CANADIAN PACIFIC
251
CANADA
UNITED STATES

FIG. 2

WASKADA UNIT NO. 18

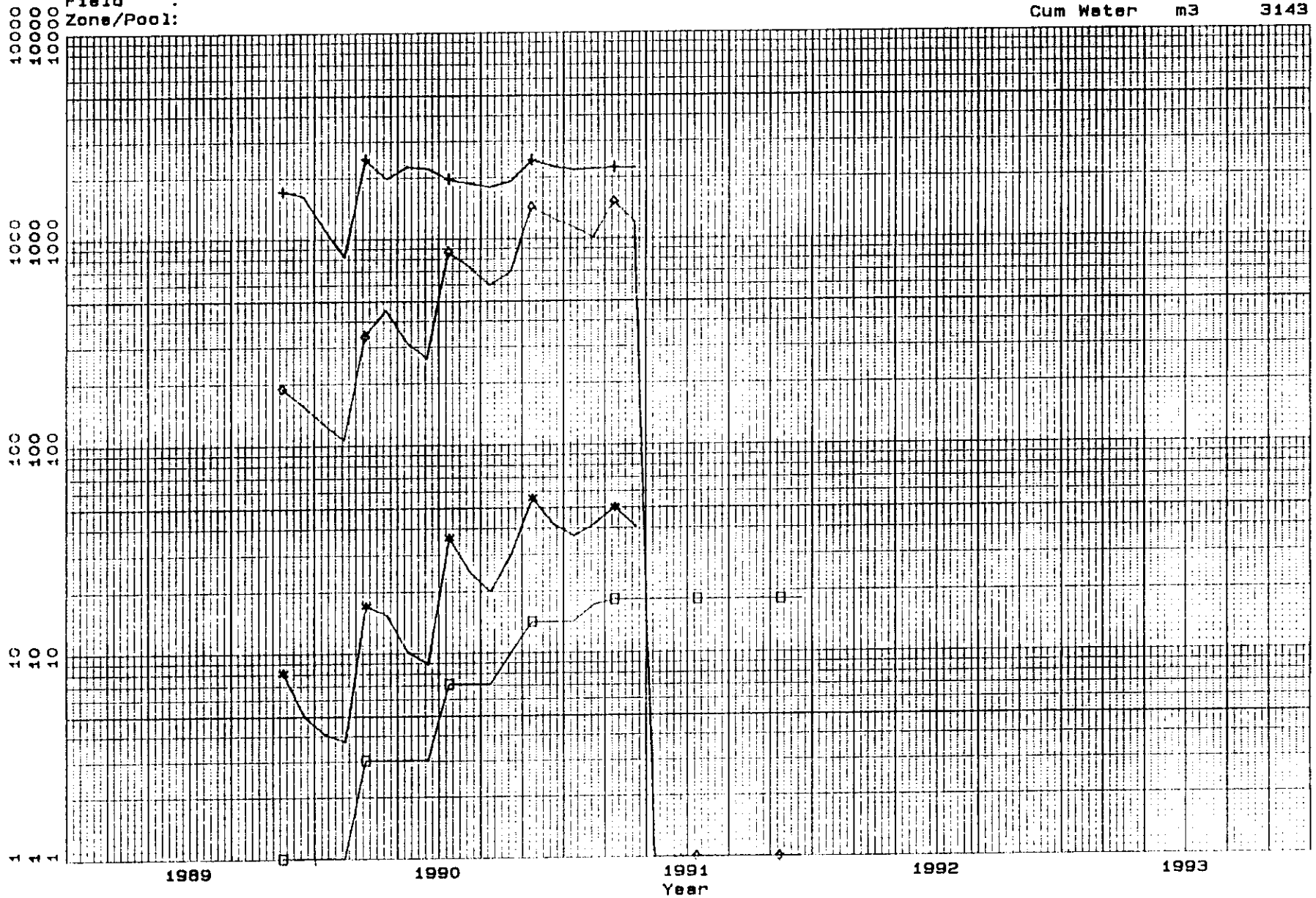
FIGURE 3

08/17/91 09: 14

Type

Data 8911-9112
Operator :
Field :
Zone/Pool:

Cum Oil	m3	12056
Cum Gas	E3m3	0
Cum Water	m3	3143



□ □ Num Wells
* * Avg Daily Oil m3/d
◇ ◇ Monthly Oil m3

Water Cut %

Manitoba

The Oil and Natural Gas Conservation Board

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

(204) 945-3130

Mr. H. Dale Logie, P. Eng.
Chief Reservoir Engineer
Enron Oil Canada Ltd.
1300, 700 - 9th Avenue S.W.
Calgary, Alberta
T2P 3V4

Dear Mr. Logie:

Re: Waskada Unit No. 18
Pressure Maintenance Approval

The Board has completed its review of your application for approval of waterflood operations in the Waskada Lower Amaranth A Pool. Attached is a copy of Board Order No. PM 68 authorizing pressure maintenance operations in Waskada Unit No. 18.

Please note that water injection into Waskada Unit No. 18 is not authorized until the Board has approved the Unit Agreement as required by Section 74 of The Mines Act.

The Board requests that Enron, in the annual progress report required under Section 7 of Board Order No. PM 68, include a discussion of the performance of the well, Enron Waskada 4-21-1-25 (WPM), its plans for conversion of the well and the effect of reservoir anisotropy on waterflood performance.

If you have any questions in respect of this matter, please contact L.R. Dubreuil, Director of Petroleum or John N. Fox, Chief Petroleum Engineer, at (204) 945-6573 or 945-6574, respectively.

Yours respectfully,

H. Clare Moster
Deputy Chairman

Manitoba

The Oil and Natural Gas
Conservation Board

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

(204) 945-3130

Order No. PM 68

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, the Board received an application dated June 17, 1991 from Enron Oil Canada Ltd. for approval of a project to inject water into the Waskada Lower Amaranth A Pool ("the pool") in the proposed Waskada Unit No. 18.

AND WHEREAS, upon publication of notice of the application the Board received no objections to or interventions in the application.

AND WHEREAS, Enron Oil Canada Ltd. is the proposed unit operator of the proposed Waskada Unit No. 18 ("the unit area").

AND WHEREAS, upon due consideration, the Board has found it is reasonable and desirable to approve the application.

NOW THEREFORE, the Board orders that:

1. The unit operator shall conduct pressure maintenance operations by the injection of water into the pool underlying the unit area.

2. 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:

Waskada Unit No. 18 Prov. WIW A11-16-1-25 (WPM)
Waskada Unit No. 18 WIW 15-16-1-25 (WPM)
Waskada Unit No. 18 WIW 6-21-1-25 (WPM)
Waskada Unit No. 18 WIW 10-21-1-25 (WPM)

and such other wells in the unit area as the Board may order or 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 Director of Petroleum.

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 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 the unit area.

3(3) The unit operator shall submit to the Petroleum Branch, the details of the surveys described in subsections (1) and (2), 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 Petroleum before the program is carried out.

3(4) The unit operator shall submit to the Petroleum Branch, within 30 days of the completion date of the surveys described in subsections (1) and (2), a report which shall include:

(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.

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 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 subsection 1(1).

6(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, 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 Branch a report of the pressure maintenance program, setting out graphically such interpretive information necessary to evaluate the efficacy of the waterflood.

H. Clare Moster
Deputy Chairman

Ian Haugh
Chairman

OIL AND NATURAL GAS CONSERVATION BOARD ORDER NO. PM 68 APPROVED THIS DAY OF A.D. 1991 AT THE CITY OF WINNIPEG.

APPROVED:

Harold Neufeld
Minister of Energy and Mines

Manitoba

Memorandum

Date: August 2, 1991

To: The Oil and Natural Gas Conservation Board
- Ian Haugh, Chairman
- H. Clare Moster, Deputy Chairman
- Wm. McDonald, Member

From: John N. Fox
Chief Petroleum Engineer
Petroleum Branch

Telephone:

Subject:

First | Fold

Re: Application for Pressure Maintenance
Waskada Lower Amaranth A Pool - Waskada Unit No. 18

Enron Oil Canada Ltd. has responded to the Board's deficiency letter dated June 25, 1991. The company's response adequately addressed the Board's concerns.

Recommendations:

It is recommended that notice of the application be published in the Melita New Era and Manitoba Gazette. A copy of the proposed notice is attached.

It is also recommended that the working interest and royalty owners in and within 0.5 km of the project area and the surface owners of the locations that will be converted to water injection be notified of the application directly by the Branch.

A technical review of the application is underway and recommendations will be forwarded to the Board when the review is complete.

John N. Fox
Chief Petroleum Engineer

JNF/sml

Attachments

Recommended for Approval:

L. R. Dubreuil, Director

Manitoba

The Oil and Natural Gas Conservation Board

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

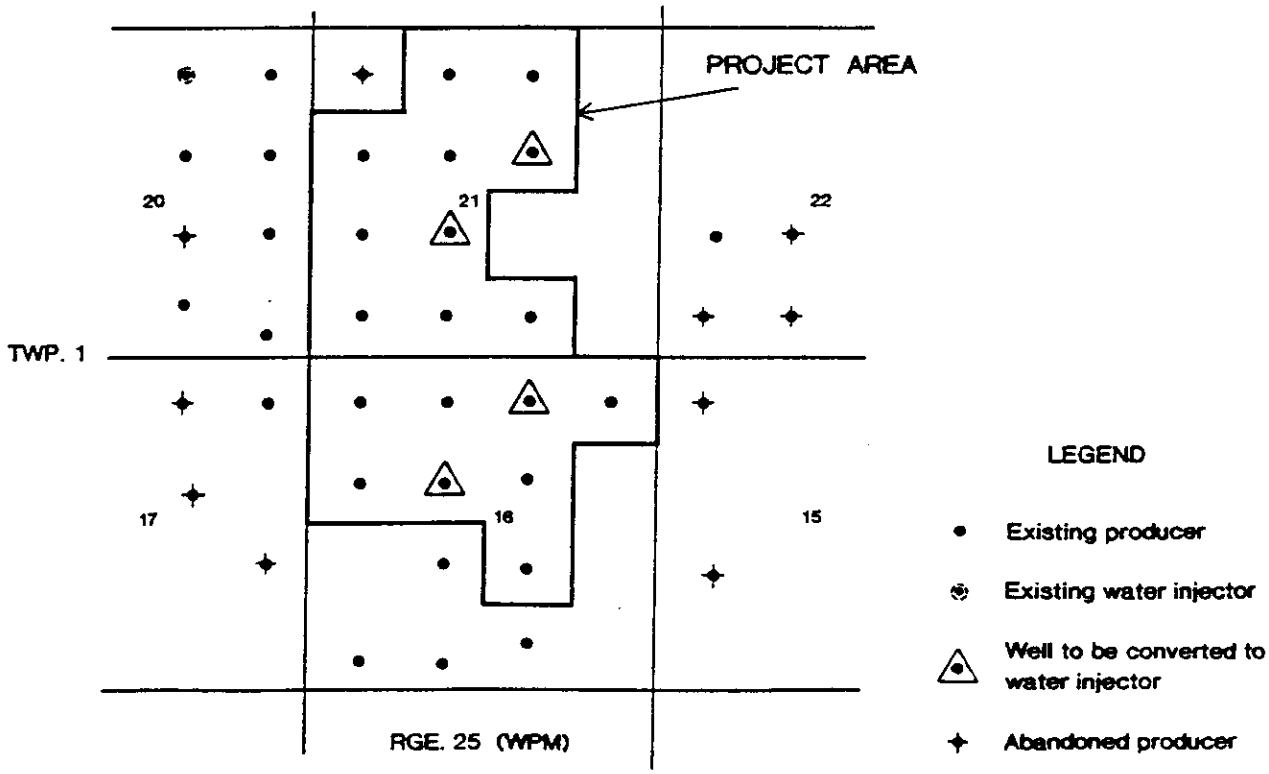
(204) 945-3130

NOTICE

UNDER THE MINES ACT

WASKADA OIL FIELD

Enron Oil Canada Ltd. has made application under The Mines Act to conduct a waterflood project in the Lower Amaranth Formation in that portion of the Waskada Field described as follows: LSD's 7, 10, 11, 12, 13, 14, 15 and 16 of Section 16-1-25 (WPM) and LSD's 2, 3, 4, 5, 6, 10, 11, 12, 14 and 15 of Section 21-1-25 (WPM) and shown below.



It is proposed to convert the following wells to water injection :

Enron Waskada Prov. A11-16-1-25 (WPM)
Enron et al Waskada 15-16-1-25 (WPM)
Enron Waskada 6-21-1-25 (WPM)
Enron Waskada 10-21-1-25 (WPM)

If no valid objection or intervention in writing is received by The Oil and Natural Gas Conservation Board at Room 309, Legislative Building, Winnipeg, Manitoba, R3C 0V8 before August 27, 1991, the Board may approve the application.

Copies of the application may be obtained from:

Enron Oil Canada Ltd.
1300, 700 - 9th Avenue S.W.
Calgary, Alberta
T2P 3V4
(403) 298-2600

The application may be viewed at the offices of the Petroleum Branch:

555 - 330 Graham Avenue
Winnipeg, Manitoba
(204) 945-6577

Waskada, Manitoba
(204) 673-2472

Dated at Winnipeg, this 2nd day of August, 1991.

H. Clare Moster
Deputy Chairman

ENRON
Oil Canada Ltd.

TABLE 4

WASKADA UNIT NO. 18 ADDRESS LIST

I. Surface Owners Within Proposed Unit Area

Robert Roy Radcliffe
Box 166
Waskada, Manitoba
ROM 2EO

George Leslie Delgaty
Box 126
Waskada, Manitoba
ROM 2EO

James F. Trewin
Box 52
Waskada, Manitoba
ROM 2EO

Blayne Thomas Temple
Box 173
Waskada, Manitoba
ROM 2EO

II. Mineral Owners Within Proposed Unit Area - Lessors

A.J.R. Holdings Ltd.
Box 166
Waskada, Manitoba
ROM 2EO

Radcliffe Enterprises Ltd.
Box 166
Waskada, Manitoba
ROM 2EO

Joyce Irva Vasey
301, 3244 Quadra Street
Victoria, British Columbia
V8X 1G2

Helen Madeline Belden
Ross Emerson Vasey
11 April Street
Winnipeg, Manitoba
R3T 2S6

Table 4
Waskada Unit #18 Address List (cont'd)

George Leslie Delgaty
Box 126
✓ Waskada, Manitoba
ROM 2EO

Robert Vasey Westcott
c/o W. Adair
37 Queens Drive
✓ Weston, Ontario
M9N 2H3

The Canada Trust Company
c/o Montreal Trust
411 - 8 Avenue S.W.
✓ Calgary, Alberta
T2P 1E7

Blayne Thomas Temple
Box 173
Waskada, Manitoba
ROM 2EO

Niwert Holdings Ltd.
P.O. Box 52
✓ Waskada, Manitoba
ROM 2EO

Mineral Owners Within Proposed Unit Area - Lessee

Amoco Canada Resources Ltd.
✓ Box 200, Station M
Calgary, Alberta
T2P 2H8

IV. Adjoining Lands - Lessors

Amoco Canada Resources Ltd.
Box 200, Station M
Calgary, Alberta
T2P 2H8

Milli-Four Resources Ltd.
✓ Waskada, Manitoba
ROM 2EO

Table 4
Waskada Unit #18 Address List (cont'd)

Waskada Plains Enterprises Ltd.
Waskada, Manitoba
ROM 2EO

Charles Carlton McGregor
Brandon, Manitoba

Prairie Leaseholds Ltd.
c/o Law Dept.
P.O. Box 2844
Calgary, Alberta
T2P 3E3

Doreen Gertrude Millard
R.M. of Brenda, Manitoba
Waskada, Manitoba
ROM 2EO

<u>Adjoining Lands - Lessee</u>

Omega Hydrocarbons Ltd.
1300, 112 - 4 Avenue S.W.
Calgary, Alberta
T2P OH3

June 25, 1991

H. Dale Logie, P. Eng.
Chief Reservoir Engineer
Enron Oil Canada Ltd.
1300, 200 - 9th Avenue S.W.
Calgary, Alberta
T2P 3V4

Dear Sir:

RE: Application for Pressure Maintenance
Waskada Lower Amaranth A Pool - Waskada Unit No. 18

The Board has completed its preliminary review of the application and requests the following additional information be filed in support of the application:

(1) What are Enron's development plans for the NW/4 of Section 16, E/2 of Section 21 and the S/2 of Section 28, all in Township 1, Range 25 (WPM)?

(2) Does Enron plan to eventually convert the 4-21-1-25 (WPM) well to water injection? Please comment on what effect conversion of 4-21 would have on waterflood recovery.

(3) In the 20 year waterflood forecast, the cumulative WOR is only 0.59. Why is the cumulative WOR so low? Please include a plot of WOR versus time for both the primary and waterflood production forecasts (Figures 6 and 7).

(4) Please provide a list of the final simulation grid block oil saturations by layer.

(5) Please provide the addresses of the lessors and lessees listed in Table 2.

If you have any questions in respect of this matter, please contact L.R. Dubreuil, Director of Petroleum at (204) 945-6573.

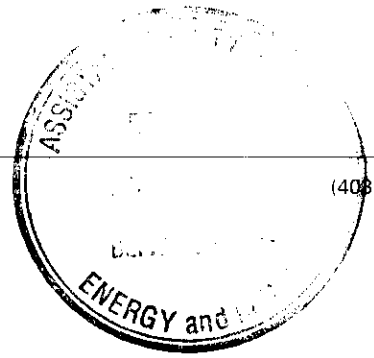
Yours respectfully,

ORIGINAL SIGNED BY
H. CLARE MOSTER

H. Clare Moster
Deputy Chairman

ENRON
Oil Canada Ltd.

(403) 298-2600



July 8, 1991

Manitoba Oil and Natural Gas
Conservation Board
Room 309
Legislative Building
Winnipeg, Manitoba R3C OV8

Attn.: Mr. H. Clare Moster
Deputy Chairman

Dear Mr. Moster:

RE: APPLICATION FOR PRESSURE MAINTENANCE
WASKADA LOWER AMARANTH A POOL -
WASKADA UNIT NO. 18

Enron Oil Canada Ltd. supplies the following additional information in response to the questions posed in your letter dated May 6, 1991:

1) Enron has committed to drill wells at 5-16-1-25 WPM and 3-28-1-25 WPM before November 1991. Enron is also considering drilling wells at 9-16, 7-21, 8-21 and 9-21 to fill out the seven-spot water injection patterns. Company fiscal constraints will determine whether these wells will be drilled in late 1991 or deferred to 1992. Enron also plans to continue step-out drilling into the S½ of Section 28, dependent on the indicated success of initial waterflood operations.

2) If sufficient water cannot be injected to match reservoir voidage withdrawals within the Unit, the 4-21-1-25 WPM well will be converted to water injection. The 4-21 well would also be converted if premature water break-through occurs along the line of injectors. If the 4-21 well is initially converted to injection service, the cumulative oil production within the project area after 20 years of waterflooding would be 256.6 10^3m^3. This is only marginally higher than the 254.4 10^3m^3 projected oil recovery had the 4-21 well not been converted.

3) Routine core analyses indicate that the main productive Lower Amaranth interval within the study area has a consistent porosity and low permeability. Thus, lower production and injection rates are anticipated resulting in extended water break-through times. If an unforeseen higher permeability streak should be present, water breakthrough would occur faster than projected. Figure 8 enclosed is a plot comparing WOR versus time for the primary and waterflood production forecasts. The initial conversion of four wells to injection results in a lowering of the project producing WOR which then increases as waterflood progresses. The erratic WOR behaviour under primary operations is due to wells with varying WOR's being shut-in due to low oil production.

4) The final simulation oil and water saturation maps for each of the three layers after twenty years of waterflood operations are attached.

5) The addresses of the lessors and lessees within the proposed Unit area is attached as Table 4.

Please also find enclosed Tables 1 to 3 which present the technical data used to arrive at the royalty interest ownership in Waskada Unit No. 18. Participation is based on 40% reserves and 60% initial well oil productivity, which is the same participation formula used in the creation of Waskada Units Nos. 16 and 17. The first four months of well oil productivity were used in Waskada Unit No. 18 calculations.

Yours very truly,

ENRON OIL CANADA LTD.

H. Dale Logie, P. Eng.
Chief Reservoir Engineer

HDL:cas
attachs.

WASKADA UNIT NO. 18

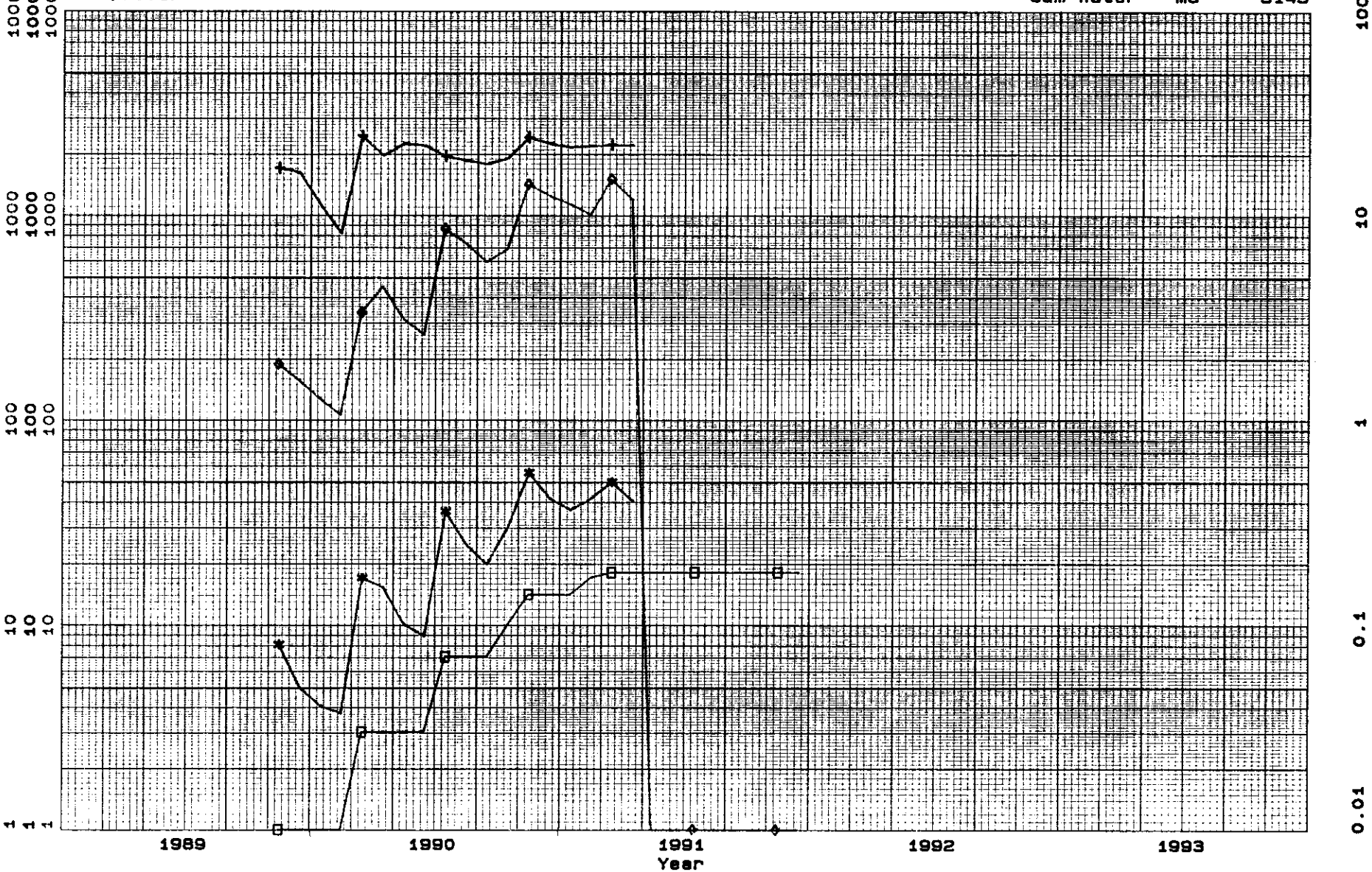
FIGURE 2

06/17/91 09:14

Type :

Data 8911-9112
Operator :
Field :
Zone/Pool:

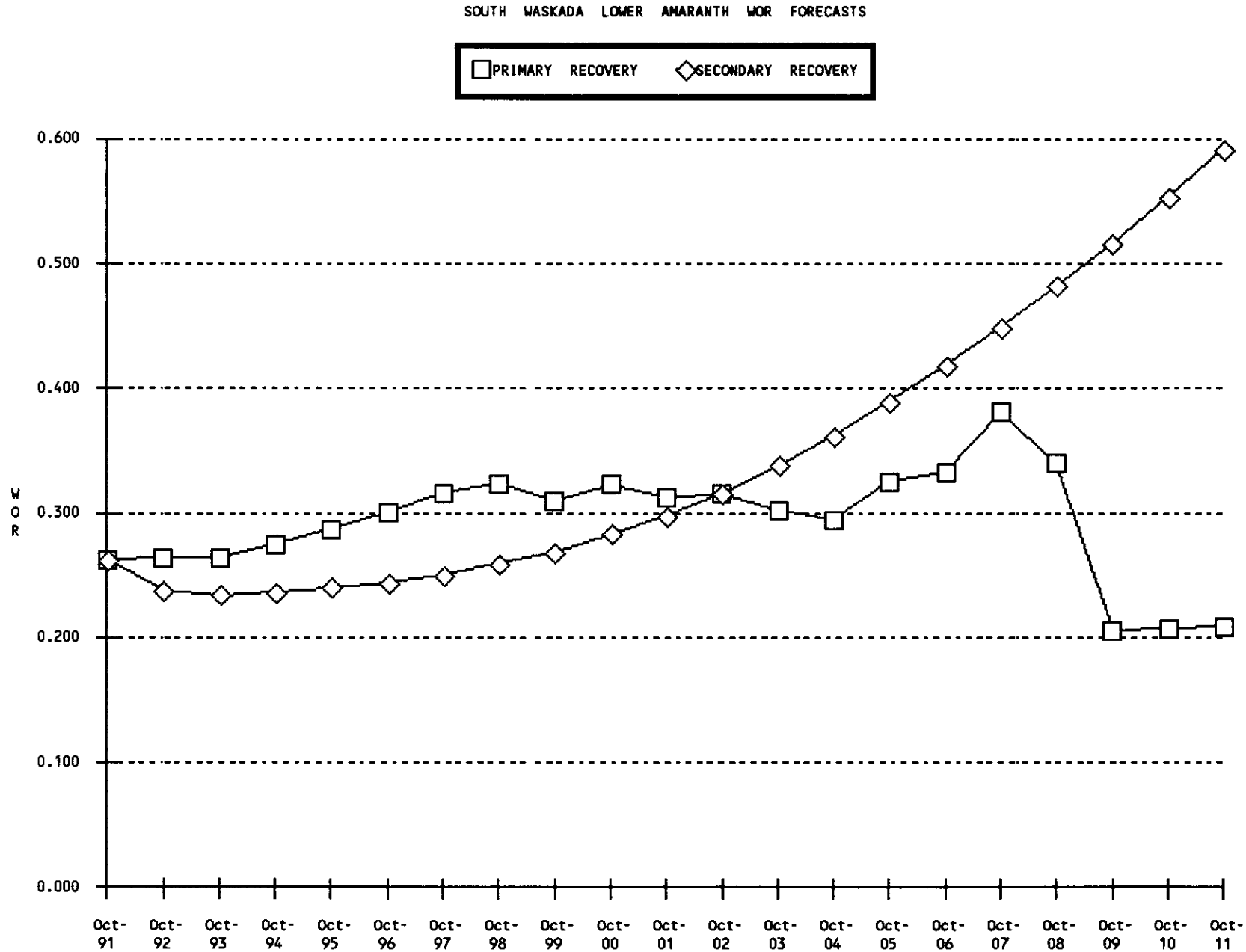
Cum Oil	m3	12056
Cum Gas	E3m3	0
Cum Water	m3	3143



□ □ Num Wells
* * Avg Daily Oil m3/d
◇ ◇ Monthly Oil m3

Water Cut % + +

FIGURE 8


SOUTH WASKADA LOWER AMARANTH WOR FORECASTS
PRIMARY RECOVERY
SECONDARY RECOVERY
WOR
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Oct-11

SIMULATION TIME = 9520.0000 DAYS (2011 SEP 25)

OIL SATURATIONS — LYR 1 RUNTIME

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1)							0.4015	0.4021	0.4015	
(2)							0.4009	0.4035	0.4009	
(3)							0.3985	0.3999	0.3985	
(4)							0.3876	0.3883	0.3877	
(5)							0.3977	0.3981	0.3986	
(6)							0.3992	0.3992	0.3991	
(7)				0.3932	0.3990	0.3990	0.3976	0.3964	0.3972	
(8)				0.3990	0.4006	0.3964	0.3896	0.3681	0.3920	
(9)				0.3993	0.3977	0.3901	0.3662	0.3276	0.3808	
(10)	0.3415	0.3494	0.3623	0.4010	0.3954	0.3734	0.3291	0.2759	0.3581	
(11)	0.3456	0.3553	0.3676	0.3962	0.3772	0.3530	0.2898	0.2328	0.3222	
(12)	0.3520	0.3580	0.3700	0.3785	0.3646	0.3895	0.3787	0.3338	0.3999	
(13)	0.3911	0.3853	0.3680	0.3357	0.2982	0.3628				
(14)	0.3922	0.3752	0.3386	0.2843	0.2336	0.3145				
(15)	0.3930	0.3885	0.3740	0.3420	0.2954	0.3601				
(16)	0.3985	0.3978	0.3949	0.3830	0.3590	0.3841	0.4276	0.4308	0.4309	
(17)	0.3983	0.3976	0.3978	0.3970	0.3898	0.3995	0.4255	0.4109	0.4263	
(18)	0.3964	0.3964	0.3969	0.4012	0.4022	0.4024	0.3956	0.3567	0.4036	
(19)	0.3775	0.3802	0.3930	0.4273	0.4211	0.3927	0.3356	0.2812	0.3420	0.3911
(20)	0.3760	0.3799	0.3937	0.4244	0.3996	0.3633	0.2818	0.2263	0.2813	0.3499
(21)	0.3756	0.3788	0.3923	0.4105	0.3783	0.4097	0.3482	0.2803	0.3386	0.3887
(22)	0.3720	0.3761	0.3823	0.3628	0.2972	0.3938	0.4051	0.3560	0.3927	
(23)	0.3718	0.3650	0.3427	0.2880	0.2296	0.2888	0.3675	0.3882	0.4170	
(24)	0.3729	0.3765	0.3840	0.3633	0.2835	0.3540	0.4043	0.4220	0.4239	
(25)				0.3996	0.3437	0.3936	0.4204	0.4259	0.4273	
(26)				0.4027	0.3819	0.4024	0.4256	0.4264	0.4281	
(27)				0.4027	0.4026	0.4030	0.4273	0.4280	0.4287	

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(19)	0.4066	0.4108
(20)	0.3910	0.4109
(21)	0.4059	0.4108
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SIMULATION TIME = 9520.0000 DAYS (2011 SEP 25)

OIL SATURATIONS LYR 2 RUNTIME

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1)							0.4788	0.4795	0.4788	
(2)							0.4791	0.4819	0.4791	
(3)							0.4763	0.4768	0.4763	
(4)							0.4667	0.4604	0.4699	
(5)							0.4848	0.4829	0.4851	
(6)							0.4833	0.4819	0.4835	
(7)				0.4829	0.4832	0.4818	0.4715	0.4618	0.4736	
(8)				0.4831	0.4787	0.4607	0.4144	0.3531	0.4402	
(9)				0.4826	0.4656	0.4110	0.3361	0.2866	0.3881	
(10)	0.4077	0.4150	0.4348	0.4796	0.4391	0.3569	0.2858	0.2448	0.3402	
(11)	0.4090	0.4258	0.4416	0.4596	0.3872	0.3373	0.2594	0.2221	0.3000	
(12)	0.4175	0.4261	0.4291	0.4015	0.3732	0.4359	0.3856	0.3098	0.4767	
(13)	0.4698	0.4446	0.3803	0.3128	0.2738	0.3856				
(14)	0.4716	0.4015	0.3121	0.2545	0.2221	0.2890				
(15)	0.4720	0.4536	0.3989	0.3213	0.2645	0.3712				
(16)	0.4788	0.4770	0.4629	0.4137	0.3516	0.4366	0.5344	0.5444	0.5439	
(17)	0.4792	0.4784	0.4788	0.4738	0.4507	0.4856	0.5138	0.4492	0.5174	
(18)	0.4763	0.4770	0.4818	0.4921	0.4898	0.4660	0.3999	0.3216	0.4349	
(19)	0.4533	0.4634	0.4892	0.5319	0.4921	0.3902	0.3009	0.2495	0.3153	0.4192
(20)	0.4532	0.4667	0.4870	0.5055	0.3980	0.3399	0.2496	0.2206	0.2500	0.3191
(21)	0.4532	0.4609	0.4623	0.4237	0.3639	0.4509	0.3268	0.2489	0.3057	0.4099
(22)	0.4491	0.4422	0.3934	0.3180	0.2565	0.3890	0.4402	0.3296	0.4001	
(23)	0.4495	0.3920	0.3125	0.2517	0.2207	0.2508	0.3483	0.3776	0.4836	
(24)	0.4504	0.4471	0.4170	0.3242	0.2458	0.3018	0.4005	0.5031	0.5259	
(25)				0.4269	0.2987	0.3854	0.4842	0.5282	0.5355	
(26)				0.4780	0.3974	0.4633	0.5279	0.5353	0.5377	
(27)				0.4903	0.4898	0.4900	0.5364	0.5374	0.5381	

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(19)	0.4826	0.5057
(20)	0.4264	0.5063
(21)	0.4778	0.5047
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SIMULATION TIME = 9520.0000 DAYS (2011 SEP 25)

OIL SATURATIONS LYR 3 RUNTIME

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1)							0.4092	0.4105	0.4104	
(2)							0.4088	0.4109	0.4094	
(3)							0.4068	0.4087	0.4074	
(4)							0.3871	0.3886	0.3878	
(5)							0.3886	0.3920	0.3900	
(6)							0.3981	0.3982	0.3992	
(7)				0.3904	0.3945	0.3994	0.4001	0.3985	0.4001	
(8)				0.4002	0.4035	0.4005	0.3938	0.3721	0.3948	
(9)				0.4030	0.4028	0.3957	0.3701	0.3194	0.3786	
(10)	0.3041	0.3094	0.3257	0.4057	0.4006	0.3802	0.3339	0.2620	0.3423	
(11)	0.3078	0.3257	0.3549	0.3955	0.3708	0.3673	0.2982	0.2230	0.3132	
(12)	0.3263	0.3345	0.3584	0.3704	0.3533	0.3846	0.3883	0.3358	0.4033	
(13)	0.3905	0.3770	0.3550	0.3285	0.2964	0.3515				
(14)	0.3919	0.3582	0.3303	0.2915	0.2469	0.3143				
(15)	0.3918	0.3808	0.3641	0.3342	0.2990	0.3453				
(16)	0.4002	0.3974	0.3904	0.3736	0.3495	0.3714	0.4447	0.4598	0.4615	
(17)	0.3999	0.3975	0.3980	0.3944	0.3832	0.3941	0.4519	0.4357	0.4524	
(18)	0.4002	0.3989	0.3995	0.4043	0.4085	0.4107	0.4087	0.3573	0.4134	
(19)	0.3641	0.3723	0.3982	0.4594	0.4491	0.4118	0.3289	0.2728	0.3292	0.3931
(20)	0.3609	0.3718	0.4025	0.4545	0.4086	0.3777	0.2798	0.2250	0.2758	0.3474
(21)	0.3598	0.3719	0.4007	0.4385	0.3998	0.4433	0.3405	0.2733	0.3254	0.3903
(22)	0.3540	0.3700	0.3920	0.3824	0.3070	0.4163	0.4171	0.3571	0.3962	
(23)	0.3530	0.3569	0.3432	0.2923	0.2317	0.2890	0.3723	0.4027	0.4353	
(24)	0.3550	0.3649	0.3844	0.3758	0.2846	0.3593	0.4238	0.4451	0.4479	
(25)				0.4126	0.3451	0.4050	0.4430	0.4523	0.4545	
(26)				0.4082	0.3856	0.4085	0.4521	0.4546	0.4565	
(27)				0.4045	0.4042	0.4055	0.4547	0.4562	0.4570	

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(19)	0.4150	0.4212
(20)	0.3940	0.4207
(21)	0.4143	0.4212
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SIMULATION TIME = 9520.0000 DAYS (2011 SEP 25)

WATER SATURATION LYR 1 RUNTIME

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1)							0.5836	0.5839	0.5836	
(2)							0.5835	0.5846	0.5835	
(3)							0.5838	0.5844	0.5838	
(4)							0.5934	0.5933	0.5935	
(5)							0.6002	0.5974	0.6006	
(6)							0.6008	0.6008	0.6009	
(7)				0.5982	0.6010	0.6010	0.6024	0.6036	0.6028	
(8)				0.6010	0.5991	0.6036	0.6104	0.6319	0.6080	
(9)				0.6007	0.6023	0.6099	0.6338	0.6724	0.6192	
(10)	0.6480	0.6506	0.6377	0.5990	0.6046	0.6266	0.6709	0.7241	0.6419	
(11)	0.6527	0.6443	0.6324	0.6038	0.6228	0.6470	0.7102	0.7672	0.6778	
(12)	0.6480	0.6420	0.6300	0.6215	0.6354	0.6105	0.6213	0.6662	0.6001	
(13)	0.6089	0.6147	0.6320	0.6643	0.7018	0.6372				
(14)	0.6078	0.6247	0.6614	0.7157	0.7664	0.6855				
(15)	0.6070	0.6115	0.6260	0.6580	0.7046	0.6399				
(16)	0.6015	0.6022	0.6051	0.6170	0.6410	0.6159	0.5724	0.5692	0.5691	
(17)	0.6017	0.6024	0.6022	0.6030	0.6102	0.6005	0.5745	0.5891	0.5737	
(18)	0.6036	0.6036	0.6031	0.5988	0.5978	0.5976	0.6044	0.6433	0.5964	
(19)	0.6225	0.6198	0.6070	0.5727	0.5789	0.6073	0.6644	0.7188	0.6580	0.6089
(20)	0.6240	0.6201	0.6063	0.5756	0.6004	0.6367	0.7182	0.7737	0.7187	0.6501
(21)	0.6244	0.6212	0.6077	0.5895	0.6217	0.5903	0.6518	0.7197	0.6614	0.6113
(22)	0.6280	0.6239	0.6177	0.6372	0.7028	0.6062	0.5949	0.6440	0.6073	
(23)	0.6282	0.6350	0.6573	0.7120	0.7704	0.7112	0.6325	0.6118	0.5830	
(24)	0.6271	0.6235	0.6160	0.6367	0.7165	0.6460	0.5957	0.5780	0.5761	
(25)				0.6004	0.6563	0.6064	0.5796	0.5741	0.5727	
(26)				0.5973	0.6181	0.5976	0.5744	0.5736	0.5719	
(27)				0.5973	0.5974	0.5970	0.5727	0.5720	0.5713	

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(19)	0.5934	0.5892
(20)	0.6090	0.5891
(21)	0.5941	0.5892
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SIMULATION TIME = 9520.0000 DAYS (2011 SEP 25)

WATER SATURATION — LYR 2 RUNTIME

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1)							0.4880	0.4881	0.4880	
(2)							0.4881	0.4878	0.4881	
(3)							0.4901	0.4906	0.4901	
(4)							0.5114	0.5096	0.5113	
(5)							0.5152	0.5137	0.5149	
(6)							0.5167	0.5181	0.5165	
(7)				0.5171	0.5168	0.5182	0.5285	0.5382	0.5264	
(8)				0.5169	0.5204	0.5393	0.5856	0.6469	0.5598	
(9)				0.5174	0.5344	0.5890	0.6639	0.7134	0.6119	
(10)	0.5923	0.5850	0.5652	0.5204	0.5609	0.6431	0.7142	0.7552	0.6598	
(11)	0.5910	0.5739	0.5584	0.5404	0.6128	0.6627	0.7406	0.7779	0.7000	
(12)	0.5825	0.5739	0.5709	0.5985	0.6268	0.5641	0.6144	0.6902	0.5233	
(13)	0.5302	0.5554	0.6197	0.6872	0.7262	0.6144				
(14)	0.5284	0.5985	0.6879	0.7455	0.7779	0.7110				
(15)	0.5280	0.5464	0.6011	0.6787	0.7355	0.6288				
(16)	0.5212	0.5230	0.5371	0.5863	0.6484	0.5634	0.4656	0.4556	0.4561	
(17)	0.5208	0.5216	0.5212	0.5262	0.5493	0.5144	0.4862	0.5508	0.4826	
(18)	0.5237	0.5230	0.5182	0.5079	0.5102	0.5340	0.6001	0.6784	0.5651	
(19)	0.5467	0.5366	0.5108	0.4681	0.5079	0.6098	0.6991	0.7505	0.6847	0.5808
(20)	0.5468	0.5333	0.5130	0.4945	0.6020	0.6601	0.7504	0.7794	0.7500	0.6809
(21)	0.5468	0.5391	0.5377	0.5763	0.6361	0.5491	0.6732	0.7511	0.6943	0.5901
(22)	0.5509	0.5578	0.6066	0.6820	0.7435	0.6110	0.5598	0.6704	0.5999	
(23)	0.5505	0.6080	0.6875	0.7483	0.7793	0.7492	0.6517	0.6224	0.5164	
(24)	0.5496	0.5529	0.5830	0.6758	0.7542	0.6982	0.5995	0.4969	0.4741	
(25)				0.5731	0.7013	0.6146	0.5158	0.4718	0.4645	
(26)				0.5220	0.6026	0.5367	0.4721	0.4647	0.4623	
(27)				0.5097	0.5102	0.5100	0.4636	0.4626	0.4619	

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(19)	0.5174	0.4943
(20)	0.5736	0.4937
(21)	0.5222	0.4953
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SIMULATION TIME = 9520.0000 DAYS (2011 SEP 25)

WATER SATURATION — LYR 3 RUNTIME

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1)							0.5740	0.5736	0.5727	
(2)							0.5739	0.5756	0.5732	
(3)							0.5736	0.5740	0.5730	
(4)							0.5918	0.5907	0.5911	
(5)							0.5940	0.5911	0.5948	
(6)							0.5983	0.5984	0.5987	
(7)				0.5967	0.5970	0.5990	0.5994	0.6011	0.5996	
(8)				0.5987	0.5942	0.5994	0.6062	0.6279	0.6052	
(9)				0.5970	0.5972	0.6043	0.6299	0.6806	0.6214	
(10)	0.6959	0.6906	0.6743	0.5943	0.5994	0.6198	0.6661	0.7380	0.6577	
(11)	0.6922	0.6743	0.6451	0.6045	0.6292	0.6327	0.7018	0.7770	0.6868	
(12)	0.6737	0.6655	0.6416	0.6296	0.6467	0.6154	0.6117	0.6642	0.5967	
(13)	0.6095	0.6230	0.6450	0.6715	0.7036	0.6485				
(14)	0.6081	0.6418	0.6697	0.7085	0.7531	0.6857				
(15)	0.6082	0.6192	0.6359	0.6658	0.7010	0.6547				
(16)	0.5998	0.6026	0.6096	0.6264	0.6505	0.6286	0.5553	0.5402	0.5385	
(17)	0.6001	0.6025	0.6020	0.6056	0.6168	0.6059	0.5481	0.5643	0.5476	
(18)	0.5998	0.6011	0.6005	0.5957	0.5915	0.5893	0.5913	0.6427	0.5866	
(19)	0.6359	0.6277	0.6018	0.5406	0.5509	0.5882	0.6711	0.7272	0.6708	0.6069
(20)	0.6391	0.6282	0.5975	0.5455	0.5914	0.6223	0.7202	0.7750	0.7242	0.6526
(21)	0.6402	0.6281	0.5993	0.5615	0.6002	0.5567	0.6595	0.7267	0.6746	0.6097
(22)	0.6460	0.6300	0.6080	0.6176	0.6930	0.5837	0.5829	0.6429	0.6038	
(23)	0.6470	0.6431	0.6568	0.7077	0.7683	0.7110	0.6277	0.5973	0.5647	
(24)	0.6450	0.6351	0.6156	0.6242	0.7154	0.6407	0.5762	0.5549	0.5521	
(25)				0.5874	0.6549	0.5950	0.5570	0.5477	0.5455	
(26)				0.5918	0.6144	0.5915	0.5479	0.5454	0.5435	
(27)				0.5955	0.5958	0.5945	0.5453	0.5438	0.5430	

	(11)	(12)
(1)		
(2)		
(3)		
(4)		
(5)		
(6)		
(7)		
(8)		
(9)		
(10)		
(11)		
(12)		
(13)		
(14)		
(15)		
(16)		
(17)		
(18)		
(19)	0.5850	0.5788
(20)	0.6060	0.5793
(21)	0.5857	0.5788
(22)		
(23)		
(24)		
(25)		
(26)		
(27)		

June 26, 1991

The Oil and Natural Gas
Conservation Board
- Ian Haugh, Chairman
- H. Clare Moster, Deputy Chairman
- Wm. McDonald, Member

John N. Fox
Chief Petroleum Engineer
Petroleum Branch

RE: Application for Pressure Maintenance
Waskada Lower Amaranth A Pool - Waskada Unit No. 18

Enron Oil Canada Ltd. has made application to conduct a waterflood in Sections 16 and 21-1-25 (WPM) in the Waskada Lower Amaranth A Pool in the proposed Waskada Unit No. 18.

RECOMMENDATION

It is recommended that the Board request Enron provide further information in support of its application. Attached is a copy of the proposed Board deficiency letter.

DISCUSSION

Enron proposes to convert 4 wells to water injection in the proposed Waskada Unit No. 18 (Figure 1) to develop 4 inverted 7-spot injection patterns.

Enron's estimate of original oil in place in Unit No. 18 is 2020 x 10^3m^3. The estimated primary recoverable reserves are 97 x 10^3m^3 or 4.8% OOIP. Enron has predicted the waterflood will increase recovery to 12.6% OOIP after 20 years.

The Branch's concerns with the application include Enron's proposed development plans for offsetting lands, its plans for converting 4-21-1-25 to injection and additional details concerning the computer simulation. Attached is a copy of the Board's proposed deficiency letter.

ORIGINAL SIGNED BY
JOHN N. FOX

John N. Fox

Att'd.

Approved: _____
L.R. Dubreuil, Director

0423Q

Manitoba

The Oil and Natural Gas Conservation Board

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

(204) 945-3130

June 25, 1991

H. Dale Logie, P. Eng.
Chief Reservoir Engineer
Enron Oil Canada Ltd.
1300, 200 - 9th Avenue S.W.
Calgary, Alberta
T2P 3V4

Dear Sir:

RE: Application for Pressure Maintenance
Waskada Lower Amaranth A Pool - Waskada Unit No. 18

The Board has completed its preliminary review of the application and requests the following additional information be filed in support of the application:

(1) What are Enron's development plans for the NW/4 of Section 16, E/2 of Section 21 and the S/2 of Section 28, all in Township 1, Range 25 (WPM)?

(2) Does Enron plan to eventually convert the 4-21-1-25 (WPM) well to water injection? Please comment on what effect conversion of 4-21 would have on waterflood recovery.

(3) In the 20 year waterflood forecast, the cumulative WOR is only 0.59. Why is the cumulative WOR so low? Please include a plot of WOR versus time for both the primary and waterflood production forecasts (Figures 6 and 7).

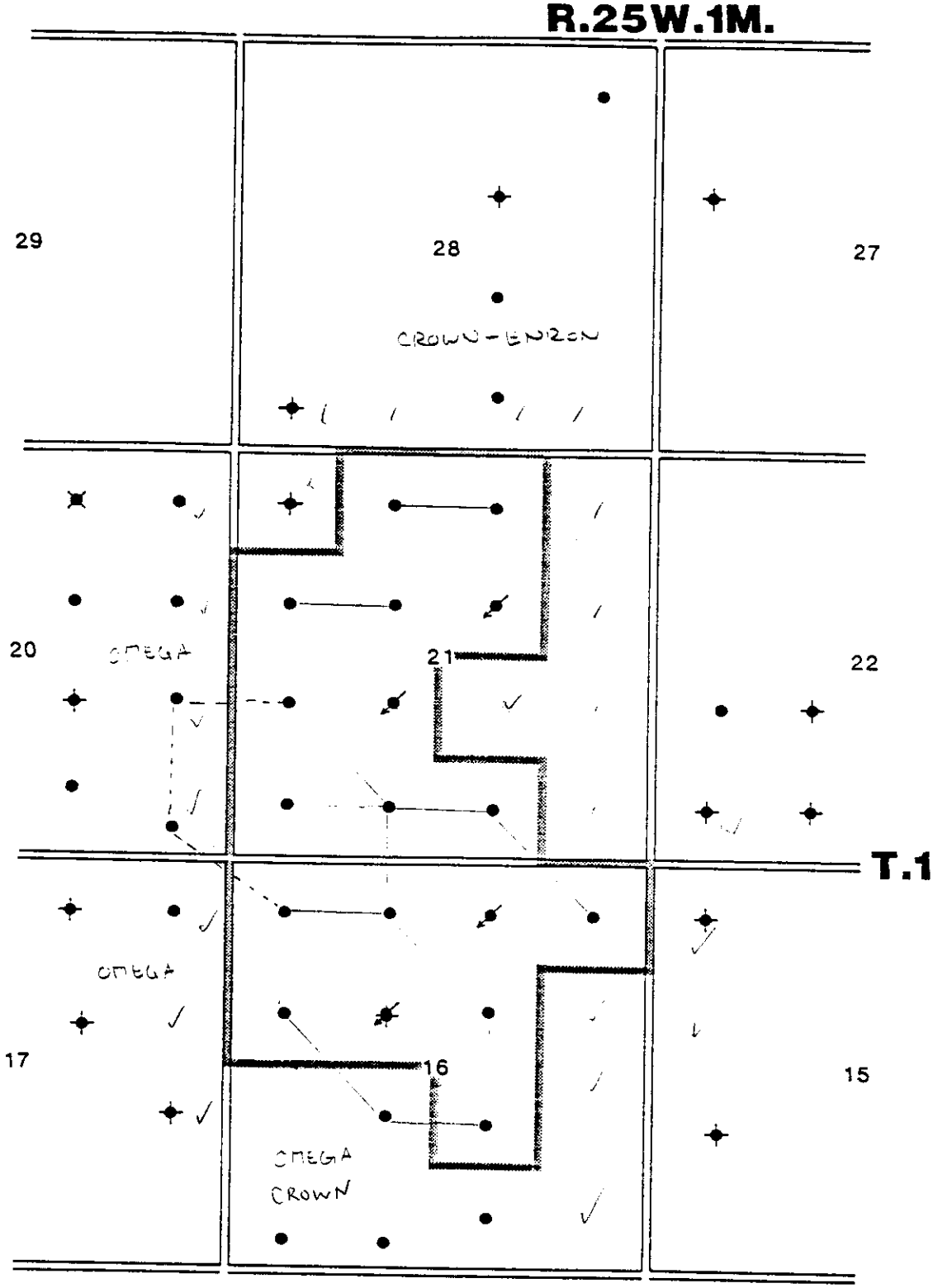
(4) Please provide a list of the final simulation grid block oil saturations by layer.

(5) Please provide the addresses of the lessors and lessees listed in Table 2.

If you have any questions in respect of this matter, please contact L.R. Dubreuil, Director of Petroleum at (204) 945-6573.

Yours respectfully,

H. Clare Moster
Deputy Chairman



LEGEND

- OIL WELL
- WATER INJECTOR
- UNIT No. 18

ENRON Oil Canada Ltd.

1300, 700- 9th AVENUE S.W., CALGARY, ALBERTA PH: 403/298-2600

SOUTH WASKADA, MANITOBA

UNIT NO. 18

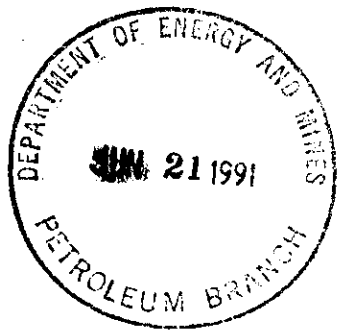
FIGURE 1

DATE: 12-06-81	BY: D. LOGIE	CONT. INT.:
SCALE: 1:25,000	REVISIONS:	

ENRON
Oil Canada Ltd.

(403) 298-2600

17 June 1991



Manitoba Energy and Mines
#555, 330 Graham Avenue
Winnipeg, Manitoba
R3C 4E3

Attention: **Mr. L.R. Dubreuil,**
Director

Dear Mr. Dubreuil:

Re: **South Waskada Lower Amaranth "A" Pool**
Pressure Maintenance Application

Enron Oil Canada Ltd. hereby makes application to create a new waterflood project in a portion of the Waskada Lower Amaranth "A" Pool located in Sections 16 and 21-1-25 WPM shown in Figure 1. Enron will have a 100% working interest ownership in the new Unit shown in Figure 1 and formal Unit Agreement documents will be issued for execution to all mineral owners in the near future. Permission is requested to create a seven-spot waterflood pattern by injecting water into wells Enron Waskada Prov. A11-16-1-25, Enron et al Waskada 15-16-1-25, Enron Waskada 6-21-1-25 and Enron Waskada 10-21-1-25 coincident with the effective date of the new Unit.

A historical production plot for wells within the application area is presented in Figure 2. April 1991 individual oil productivities in the proposed waterflood area are presented in Table 1. The wells within this waterflood project area stabilize at lower oil rates than the wells in Enron's northern waterflood projects in Township 2, Range 25 WPM.

The enclosed South Waskada Lower Amaranth Waterflood Study dated June 1991 provides the necessary detailed information in support of this application. The following items are included for additional application support:

1. Table 2 showing the surface owners, lessors and lessees in and adjoining the area of application.

2. Schematic diagram of a typical injection well completion.

3. Schematic of the Waskada water distribution system.

Enron will use the existing battery at 15-9-2-25 WPM to handle produced and injected fluids for this new waterflood project area.

If you have any questions concerning this application, please contact the undersigned at (403) 298-2656.

Yours very truly,

ENRON OIL CANADA LTD.

H. Dale Logie, P.Eng.
Chief Reservoir Engineer

HDL:pdc
attach

TABLE 1

WASKADA LOWER AMARANTH
APRIL 1991 DAILY OIL PRODUCTIVITY
(m^3/producing day)

Location	Oil Production (m^3/d)
7-16-1-25 WPM	2.7
10-16	3.3
11-16 *	2.0
12-16	1.7
13-16	2.0
15-16 *	1.8
16-16	2.4
2-21	1.9
3-21	1.8
4-21	1.7
5-21	4.0
6-21 *	1.3
10-21 *	2.0
11-21	1.6
12-21	1.8
14-21	4.8
15-21	2.2

* Recommended injector locations.

TABLE 2

WASKADA UNIT NO. 18
(Twp 1, Rge 25 WPM)

I. Surface Owners Within Proposed Unit Area

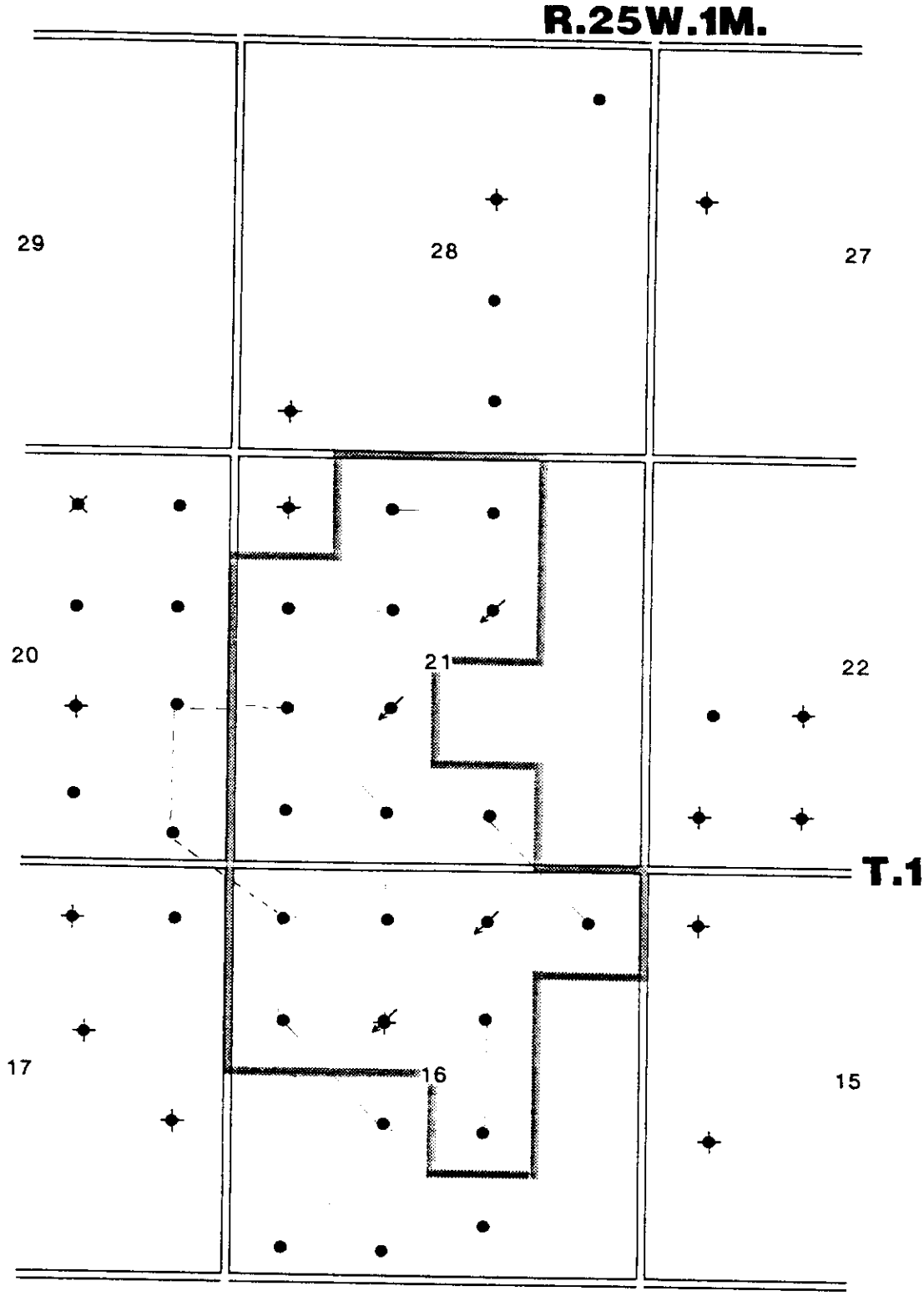
Lsd 7	Section 16	R. Radcliffe
N½	Section 16	R. Radcliffe
Lsd 2	Section 21	G.L. Delgaty
W½	Section 21	J.F. Trewin
NE¼	Section 21	B.T. Temple

II. Mineral Owners Within Proposed Unit Area

Area	Lessor #1	Lessee
E½ Section 16	A.J.R. Holdings Ltd. Radcliffe Enterprises Ltd.	Amoco
NW¼ Section 16	Crown	Enron
SE¼ Section 21	J.I. Vasey R.E. Vasey G.L. Delgaty H.M. Belden R.V. Westcott	Enron
SW¼ Section 21	Canada Trust	Enron
NE¼ Section 21	B.T. Temple	Enron
NW¼ Section 21	Niwert Holdings Ltd.	Enron

III. **Additional Adjoining Mineral Holders**

Area	Lessor #1	Lessee
Lsd 12 & 13 of Section 15	Amoco Canada Resources Ltd.	Omega
SW¼ Section 16	Crown	Omega
Lsd 8, 9 & 16 of Section 17	Milli-Four Resources Ltd.	Omega Amoco
Lsd 1 & 8 of Section 20	Waskada Plains Enterprises Ltd.	Omega
Lsd 9 & 16 of Section 20	C.C. McGregor	Omega
Lsd 4 of Section 22	Prairie Leaseholds Ltd. (50%) D.G. Millard (50%)	Omega
S½ Section 28	Crown	Enron

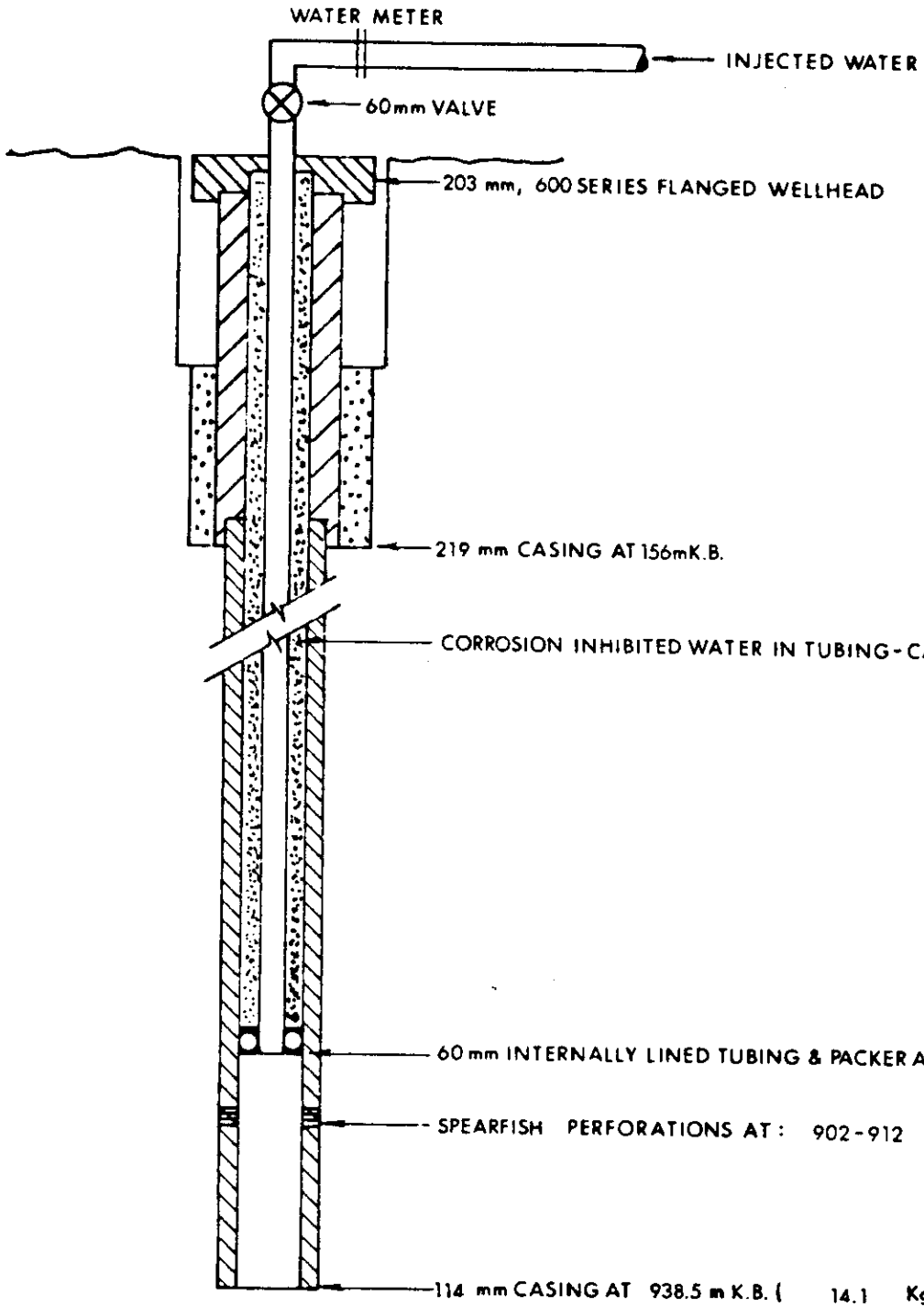


LEGEND

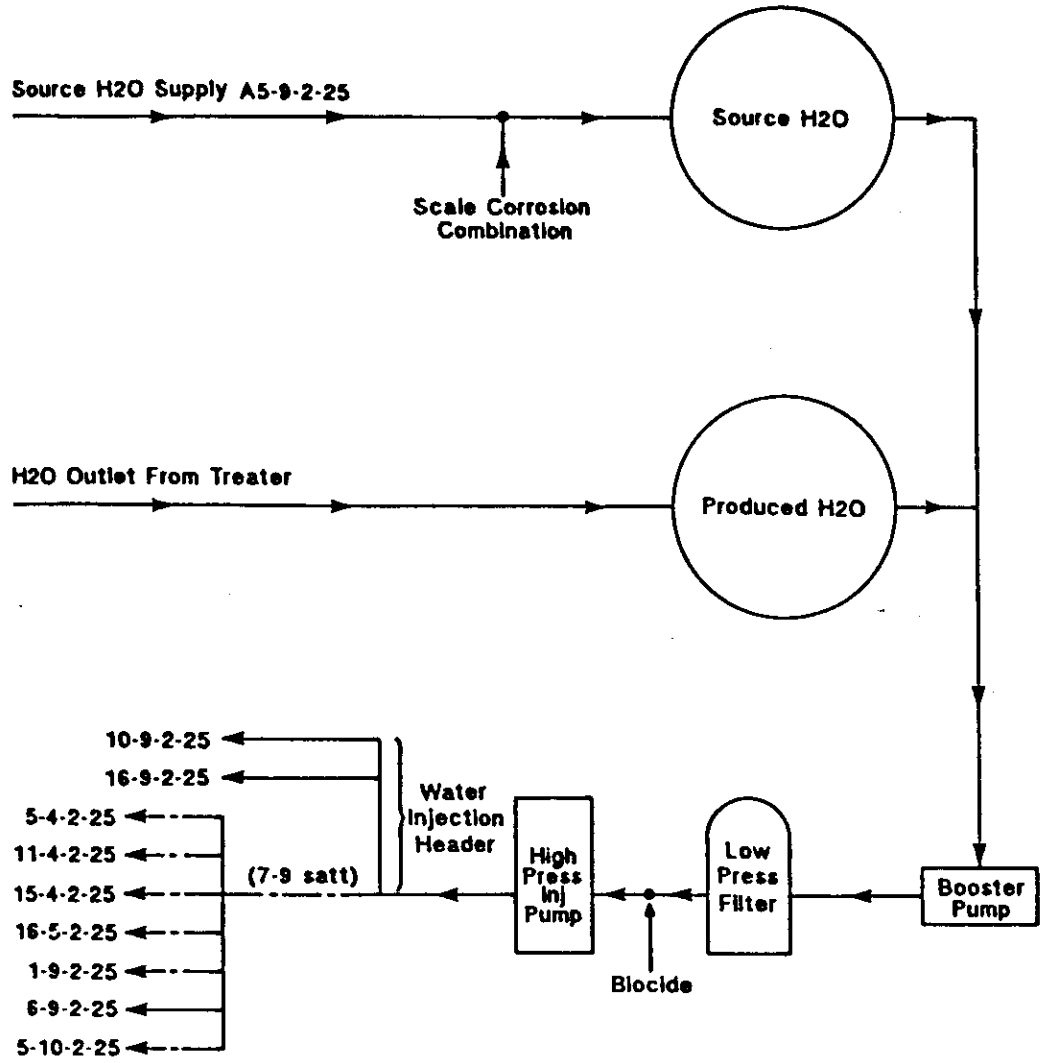
- OIL WELL
- WATER INJECTOR
- UNIT No. 18

ENRON Oil Canada Ltd.		
1300, 700 - 9th AVENUE S.W., CALGARY, ALBERTA PH: 403/298-2600		
SOUTH WASKADA, MANITOBA UNIT NO. 18 FIGURE 1		
DATE: 12-06-91	BY: D. LOGIE	CONT. INT.:
SCALE: 1:25,000	REVISIONS:	

PROPOSED INJECTION WELL
SUBSURFACE EQUIPMENT



ENRON Oil Canada Ltd.		
1300, 700 - 9th AVENUE S.W., CALGARY, ALBERTA PH: 403/299-2600		
SCHEMATIC DIAGRAM ENRON WASKADA PROV. A11-16-1-25 WPM		
DATE: 12-06-91	BY D. STOODLEY	FILE NO:
SCALE: NTS	REVISIONS	



LEGEND

——·—— Internally Coated Water Line

——— Un-coated Water Line

ENRON Oil Canada Ltd.

1300, 700 - 9th AVENUE S.W. CALGARY, ALBERTA PH: 403/298-2600

WASKADA
WATER HANDLING FACILITIES
15-9-2-25 BATT.

DATE: 09-11-89	BY: D. STOODLEY	CONT. INT.:
SCALE:	REVISIONS:	

SOUTH WASKADA LOWER AMARANTH WATERFLOOD STUDY UNIT NO. 18

June 1991

Prepared by:

H. Dale Logie, P.Eng.

INTRODUCTION

This study was conducted on a portion of the Waskada Lower Amaranth "A" pool located in Sections 16, 21 and 28-1-25 WPM in southwestern Manitoba shown in Figure 1. The study was undertaken to evaluate the potential of waterflooding the South Waskada primary oil producing lands operated by Enron. The Lower Amaranth formation in the study area exhibits a lower permeability than is present in the other two waterflood projects operated by Enron (Waskada Units No. 16 and No. 17). The Lower Amaranth zone is also structurally lower in the study area which results in higher producing water cuts. But the Mississippian caprock is thicker and thus Lower Amaranth/Mississippian communication problems should not exist in the study area, providing good containment of waterflood operations to the Lower Amaranth zone.

The Lower Amaranth oil is undersaturated with a bubble point pressure of 4 200 kPa at the reservoir temperature of 43°C. No gas/oil or water/oil contacts are evident within the study area. Primary depletion is by solution gas drive.

CONCLUSIONS

1. Due to lower structure and lower permeabilities, the wells in the South Waskada study area produce with higher initial water cuts than the northern Enron operated wells in Waskada Units No. 16 and No. 17. Good Mississippian caprock exists within the study area, which should result in good waterflood containment to the Lower Amaranth zone.

2. The average oil-in-place in the Waskada Lower Amaranth zone within the study area is estimated to be 96.2 10^3m^3 (605 MSTB) per Lsd or 2 020 10^3m^3 (12.71 MMSTB) for the whole study area (21 wells).

3. Solution gas drive reservoir depletion would result in a primary recovery of only 4.84% of the original oil-in-place after 10 years (5.5% recovery after twenty years). This amounts to an average production of 4 650 m^3 (29,260 Bbls) per Lsd after 10 years or 5 290 m^3 (33,320 Bbls) per Lsd after 20 years.

4. If a seven-spot waterflood operation is instituted in the study area by converting wells 11-16, 15-16, 6-21 and 10-21 to water injectors as shown in Figure 8, a total recovery of 7.0% of the original oil-in-place would be possible after 10 years of production (12.6% recovery after 20 years). This amounts to an average production of 6 720 m^3 (42,320 Bbls) per Lsd after 10 years or 12,110 m^3 (76,220 Bbls) per Lsd after 20 years.

5. The results of this study should be considered general due to the lack of pressure data and small number of available core analyses. This study qualitatively indicates that waterflood operations can be successfully applied in the study area.

RECOMMENDATIONS

1. Conduct a waterflood in the South Waskada Lower Amaranth study area. Convert wells 11-16, 15-16, 6-21 and 10-21 from producers to water injectors to create a seven-spot waterflood pattern (modified line drive).

2. Inject sufficient water to replace reservoir production voidage. A voidage replacement ratio of 1.2 should be implemented during the first year of waterflood operations to re-pressure the reservoir.

DISCUSSION

Input Data

1. Grid System:

   A 12 x 27 x 3 Cartesian coordinate grid system was chosen to model the production performance of the South Waskada Lower Amaranth formation (Figure 2). This allows the wells to be placed in the middle of each 1.8 hectare areal grid block with a minimum of two grid blocks between wells. There is no vertical communication between layers.

2. Reservoir Rock Properties:

   Only 5 of the 21 wells were cored. Results of the routine core analyses are contained in Table 1. The breakdown of the Lower Amaranth zone into three layers is illustrated on the type log of Figure 3. Layer 1 is a bioturbated sand/shale lens sequence which may not be continuous between wells. Layer 2 is of fairly constant thickness between wells and has regular anhydrite stringers exhibited on logs. Porosity and permeability are consistent throughout layer 2 and this is the layer which will contribute the majority of the oil productivity. Layer 3 is variable in thickness between wells but is generally thin and should not contribute significantly. Due to the limited core analysis and difficult log interpretation, a constant value of porosity was applied to each layer (14% for layer 1, 15% for layer 2 and 13% for layer 3). Net pay was assigned from a log to core comparison and permeabilities were assigned based upon a core to stabilized well oil productivity correlation. Grid block values of net pay and permeability for each of the three layers are contained in Appendix 1.

   A rock compressibility of 6.7×10^{-7} kPa^{-1} was used in this model study.

3. Fluid Properties:

Fluid properties are based upon the PVT study contained in previous applications. The oil and gas properties are shown in Table 2. The oil is undersaturated with a bubble point pressure of 4 220 kPa at the reservoir temperature of 43°C.

Water compressibility is estimated from correlations to be 4.4 x 10^{-7} kPa^{-1}.

4. Relative Permeability:

Previous special core analysis on small plug core samples resulted in variations of water/oil relative permeability curves as a function of absolute air permeability. The air permeabilities from core analysis across the main layer 2 production zone are more consistent, but lower than those exhibited in Enron's waterflood operations to the north. The same water/oil and gas/oil relative permeability curves were used for all three layers in this simulation study (Figures 4 and 5).

Due to lower structure and lower permeabilities in the study area compared to Enron's northern waterflood operations, an oil/water capillary pressure curve was added to all three layers to provide for initial mobile water. The oil/water capillary pressure curve was lower for the more permeable layer 2. The resulting initial water saturations are as follows:

Layer 1:	Sw = 60%
Layer 2:	Sw = 51% most porous and permeable layer
Layer 3:	Sw = 59%

5. Original In-Place Fluids:

Initialization of the simulation model resulted in the following distribution of fluids at initial conditions for the total study area:

Reservoir Pore Volume, (10^3m^3)	5 050.0
Original Oil-In-Place, (10^3m^3)	2 020.0
Original Solution Gas, (10^6m^3)	101.9
Original Water-In-Place, (10^3m^3)	2 709.0

History Match

No pressure history match was made because no pressure data was available within the study area.

Core derived permeabilities to air were universally reduced by 50% in all grid blocks to more accurately described liquid permeabilities at overburden pressure.

Oil production was input for each well on an average daily basis. Comparison of produced volumes up to the end of April 1991 is given as follows:

	Produced Oil (10^3m^3)	Produced Water (10^3m^3)
Actual	15.59	3.81
Simulator	15.58	3.52

In preparation for running production forecasts, production in April 1991 was used to set individual well oil productivity indices. The well productivity indices were altered to obtain a low bottom-hole pressure to simulate the near pumped off condition of all producing wells.

Production Forecasts

1. Case 1 - Primary Recovery:

   This is the base case run for comparison purposes. This case assumes no conversion of producers to injectors and all wells continue to produce under solution gas drive. Forecast average oil production rates and cumulative oil production within the study area are illustrated in Figures 6 and 7 and summarized in Table 3. Staring October 1, 1991 ten and twenty year production forecasts are as follows:

	10 Year Forecast	20 Year Forecast
Start Daily Oil, m^3/d (STBD)	37.5 (236)	37.5 (236)
End Daily Oil, m^3/d (STBD)	10.0 (63)	0.6 (4)
Cumulative Oil Production, 10^3m^3 (MSTB)	97.7 (615)	111.2 (700)
Primary Recovery, %	4.84	5.50

2. Case 2 - Seven-Spot Waterflood:

A seven-spot (modified line drive) waterflood pattern is set up as illustrated in Figure 8 by the conversion of wells 11-16, 15-16, 6-21 and 10-21 to water injection. Waterflood operations would commence on October 1, 1991. A reservoir fluid voidage replacement ratio of 1.0 was maintained within the study area. Forecast average oil production rates and cumulative oil production for the study area are compared to primary production results in Figures 6 and 7 and summarized in Table 3. Starting October 1, 1991 ten and twenty year production forecasts are as follows:

	10 Year Forecast	20 Year Forecast
Start Daily Oil, m^3/d (STBD)	31.5 (198)	31.5 (198)
End Daily Oil, m^3/d (STBD)	32.3 (203)	28.5 (179)
Cumulative Oil Production, 10^3m^3 (MSTB)	141.2 (889)	254.4 (1601)
Total Recovery, %	6.99	12.59
WOR, m^3/m^3	0.298	0.592

TABLES

TABLE 1

SOUTH WASKADA LOWER AMARANTH CORE ANALYSES

	LAYER 1			LAYER 2			LAYER 3		
WID	h (m)	Ø (%)	k (mD)	h (m)	Ø (%)	k (mD)	h (m)	Ø (%)	k (mD)
11-16	2.06	15.10	3.99	7.99	15.91	6.22	2.10	13.41	8.84
3-21	1.09	13.30	8.14	5.23	15.41	4.82	N.C.	-	-
11-21	2.76	14.36	1.69	6.66	14.53	3.19	N.C.	-	-
2-28	0.53	10.70	1.09	4.85	15.03	3.58	2.99	12.76	2.44
7-28	N.A.	-	-	1.87	12.48	3.31	0.10	14.90	1.00
Weighted Average		14.12	3.47		15.06	4.50		13.06	5.00

N.A. = Not analyzed
N.C. = No core cut

N.B. Not all of Layer 2 was cored in wells 3-21 and 11-21.

TABLE 2

1

WASKADA LOWER AMARANTH

FLUID PROPERTY DATA IN BLACK OIL FORMAT

SURFACE GAS SPECIFIC GRAVITY = 0.99500

DENSITY OF OIL AT STOCK TANK = 830.00 KG/M3

BUBBLE POINT PRESSURE = 4220.0 KPA

PRESSURE KPA	OIL FORMATION FACTOR RM3/SCM3	SOLUTION GAS RATIO M3/M3	GAS FORMATION FACTOR RM3/SCM3	OIL VISCOSITY CP	GAS VISCOSITY CP
101.00	1.0250	0.	1.00000	2.90400	0.01020
958.00	1.1190	29.35	0.10363	2.00000	0.01060
1413.00	1.1350	34.86	0.07179	1.54800	0.01080
2082.00	1.1470	39.84	0.04929	1.43200	0.01100
2813.00	1.1560	44.29	0.03658	1.36700	0.01130
3482.00	1.1630	47.49	0.02963	1.31900	0.01150
4220.00	1.1700	51.04	0.02488	1.28500	0.01180
6895.00	1.1660	60.28	0.01543	1.35000	0.01280
10343.00	1.1620	71.98	0.01046	1.45000	0.01400
13790.00	1.1580	84.04	0.00800	1.58000	0.01520

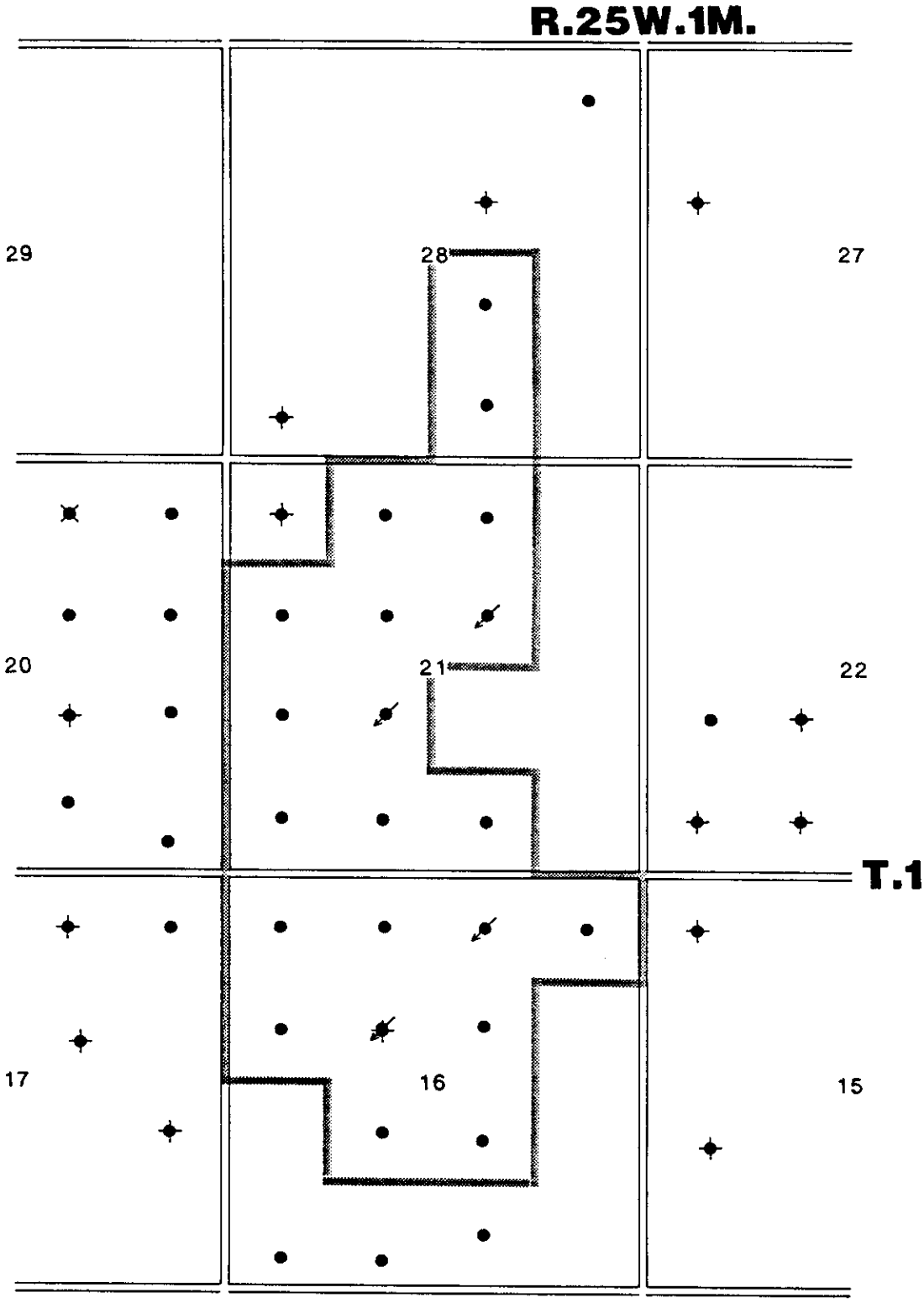
ROCK COMPRESSIBILITY V/V/KPA = 0.6700E-06

TABLE 3

SOUTH WASKADA LOWER AMARANTH
STUDY AREA PRODUCTION FORECASTS

	PRIMARY		SECONDARY	
Date	Daily Oil (m^3/d)	Cum. Oil (10^3m^3)	Daily Oil (m^3/d)	Cum. Oil (10^3m^3)
October 1991	37.5	21.86	31.5	21.86
October 1992	30.3	33.64	32.1	32.98
October 1993	27.8	44.22	33.1	44.97
October 1994	25.1	53.86	33.2	57.08
October 1995	22.7	62.60	33.2	69.22
October 1996	20.5	70.44	33.2	81.34
October 1997	18.4	77.51	33.1	93.46
October 1998	16.1	83.85	33.1	105.53
October 1999	13.1	89.20	32.9	117.56
October 2000	11.9	93.74	32.3	129.43
October 2001	10.9	97.66	32.3	141.22
October 2002	8.3	100.96	32.2	152.98
October 2003	7.2	103.73	32.1	164.70
October 2004	4.8	105.81	32.0	176.40
October 2005	4.1	107.40	31.9	188.05
October 2006	2.9	108.72	31.4	199.60
October 2007	2.2	109.66	30.9	210.94
October 2008	1.2	110.40	30.3	222.10
October 2009	0.7	110.72	29.8	233.06
October 2010	0.6	110.95	29.2	243.81
October 2011	0.6	111.18	28.5	254.36

FIGURES



LEGEND

- OIL WELL
- WATER INJECTOR
- STUDY AREA

ENRON Oil Canada Ltd.

1300, 700 - 9th AVENUE S.W., CALGARY, ALBERTA PH: 403/298-2600

SOUTH WASKADA, MANITOBA
STUDY AREA
FIGURE 1

DATE: 29-05-91	BY: D. LOGIE	CONT. INT.:
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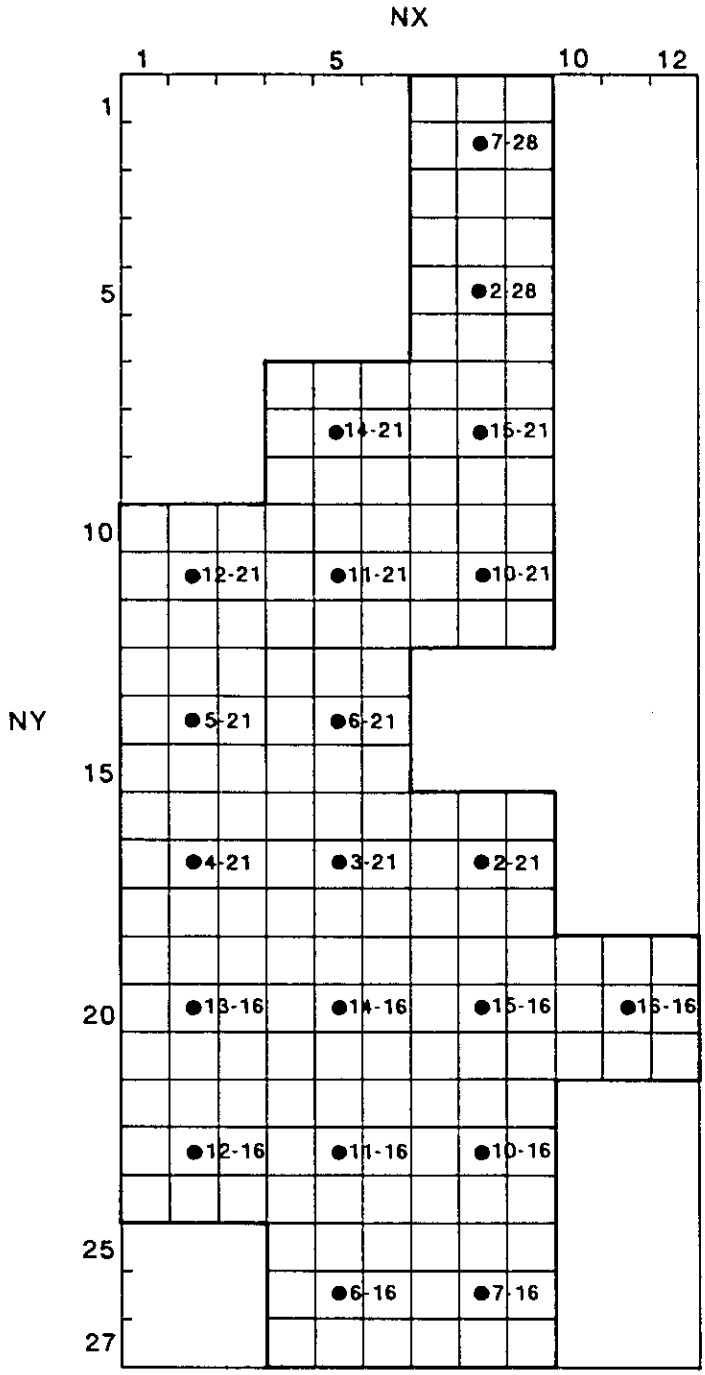


FIGURE 2
SOUTH WASKADA LOWER AMARANTH
COMPUTER MODEL GRID SYSTEM

FIGURE 3
SOUTH WASKADA LOWER AMARANTH
TYPE LOG (15-16-1-25WPM)

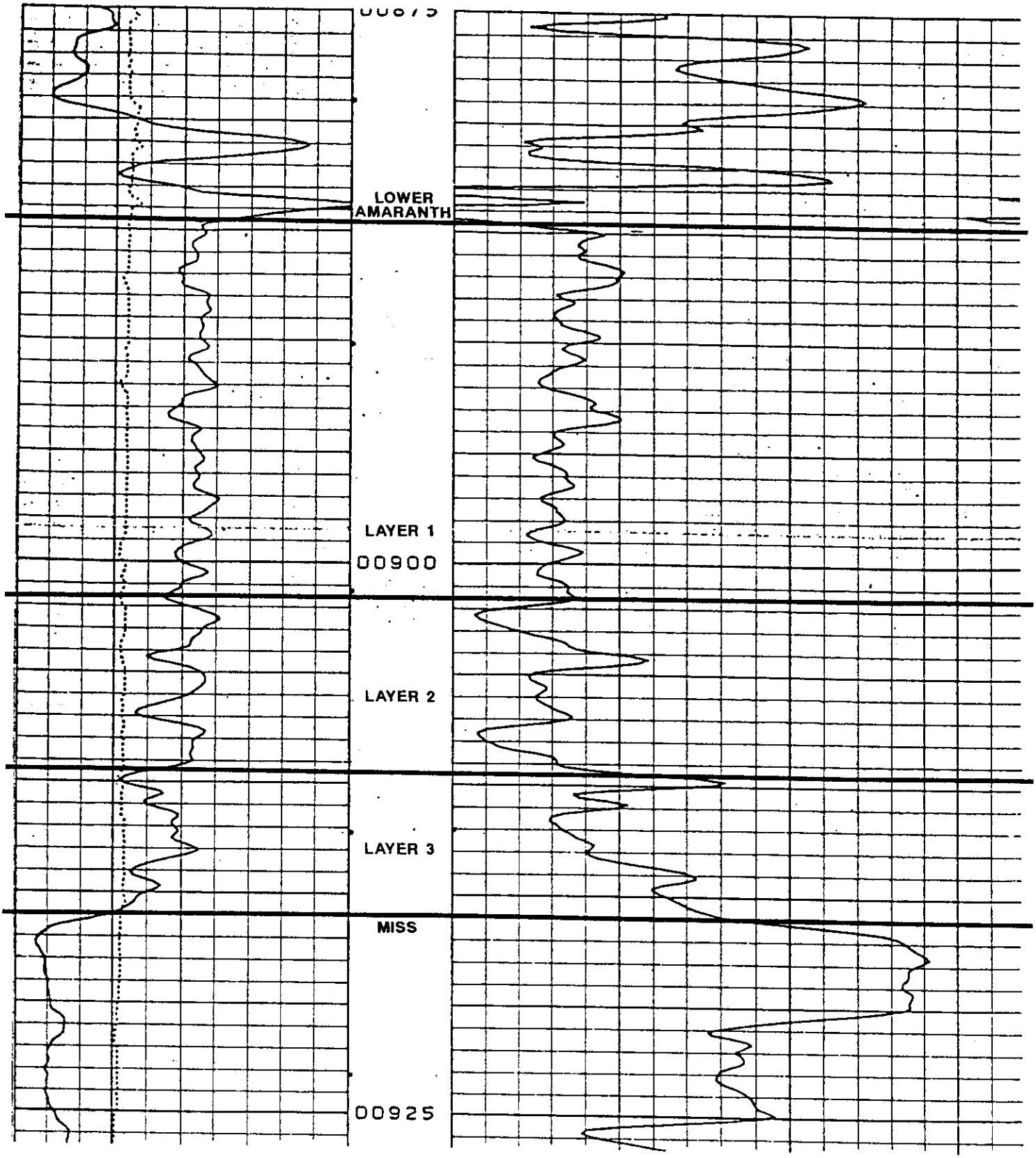


FIGURE 4
SOUTH WASKADA LOWER AMARANTH
OIL-WATER RELATIVE PERMEABILITY CURVE

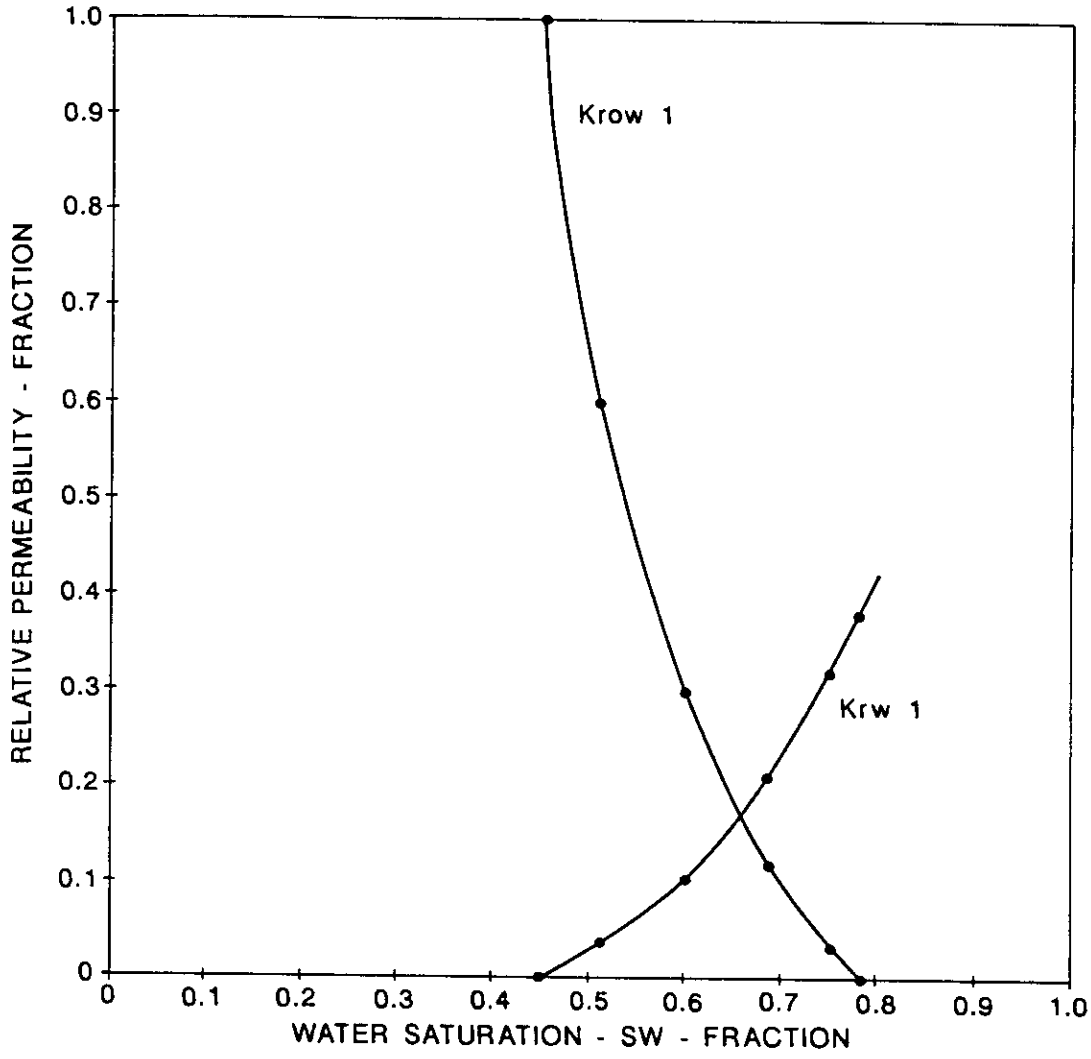


FIGURE 5
SOUTH WASKADA LOWER AMARANTH
GAS-OIL RELATIVE PERMEABILITY CURVE

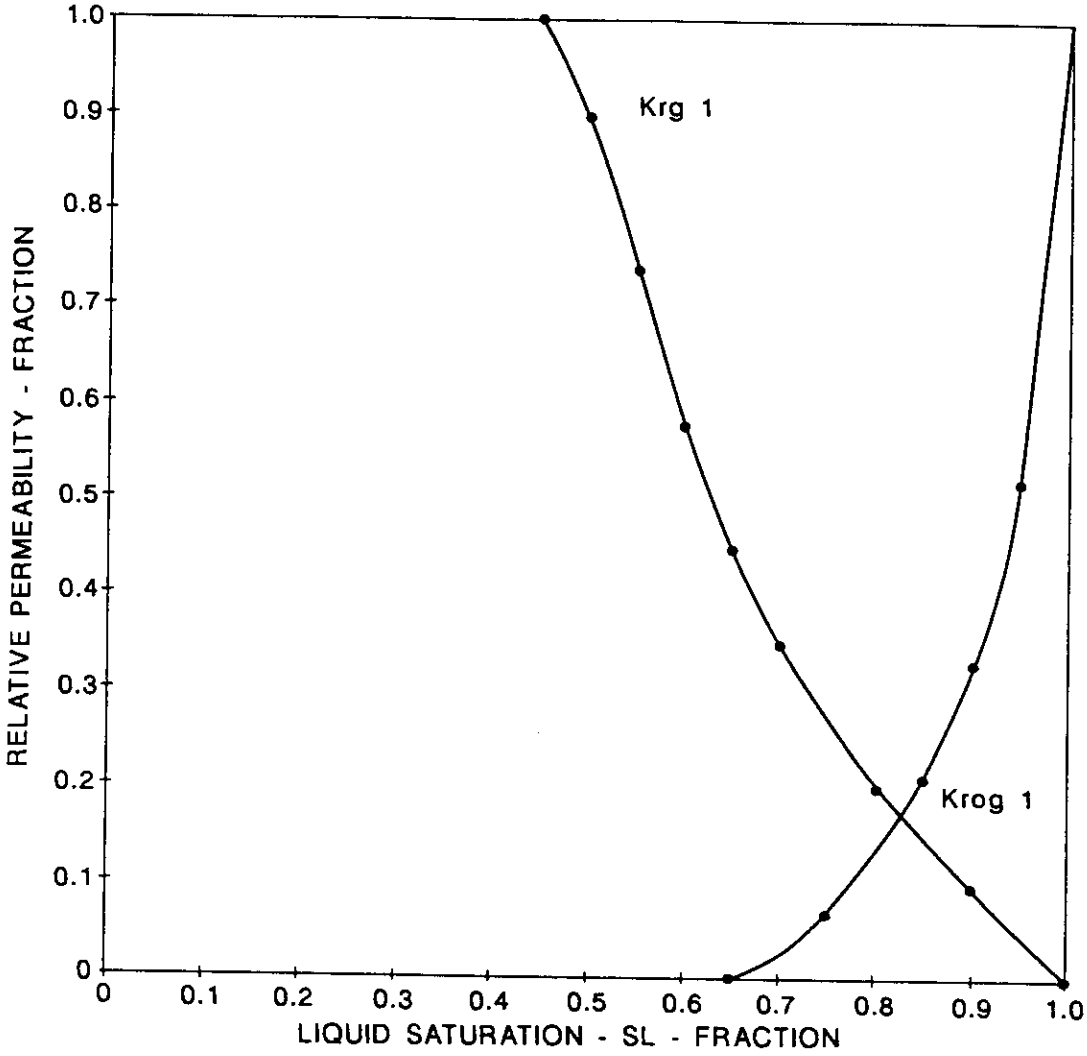
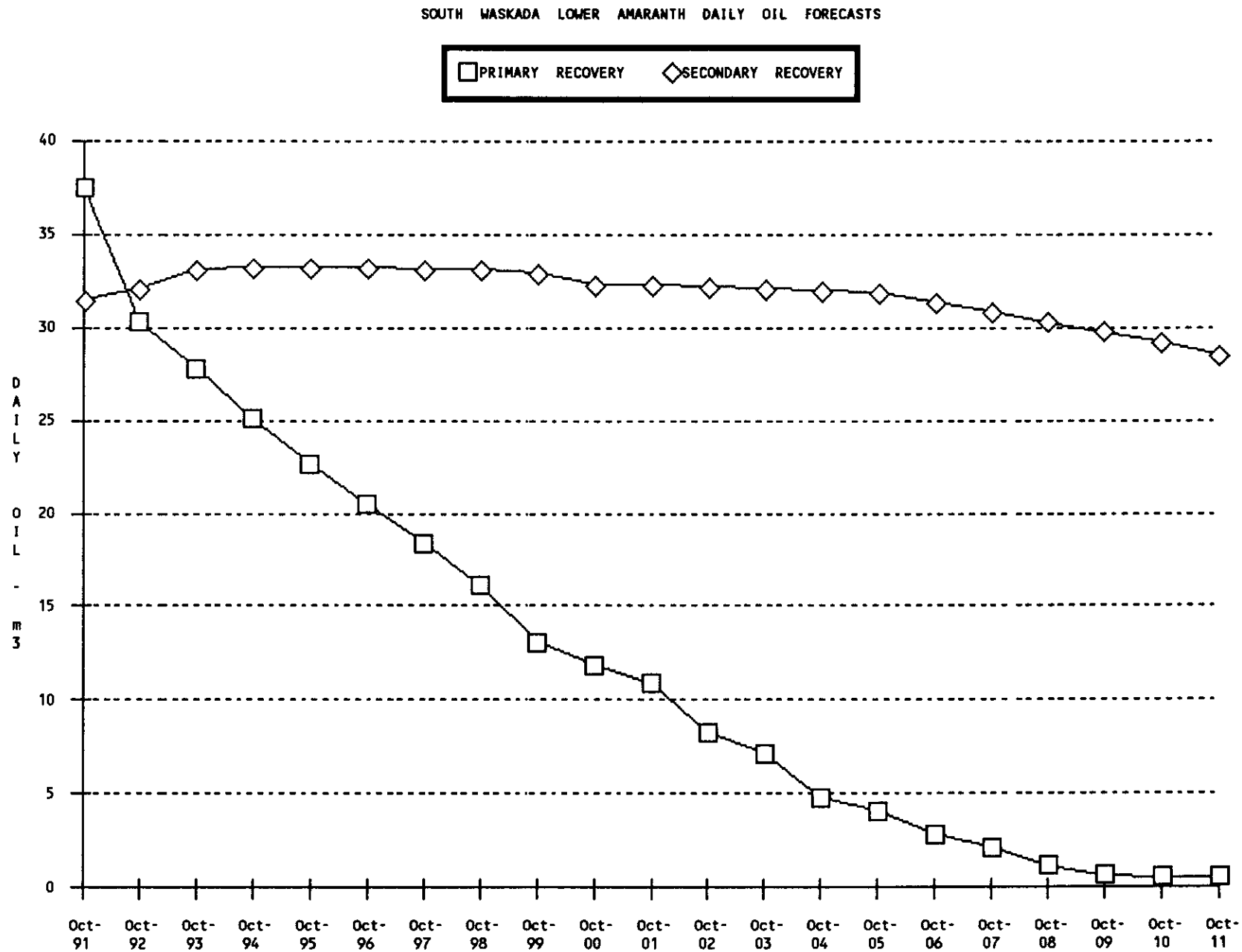


FIGURE 6


SOUTH WASKADA LOWER AMARANTH DAILY OIL FORECASTS
PRIMARY RECOVERY
SECONDARY RECOVERY
DAILY OIL - m3
40
35
30
25
20
15
10
5
0
Oct-91
Oct-92
Oct-93
Oct-94
Oct-95
Oct-96
Oct-97
Oct-98
Oct-99
Oct-00
Oct-01
Oct-02
Oct-03
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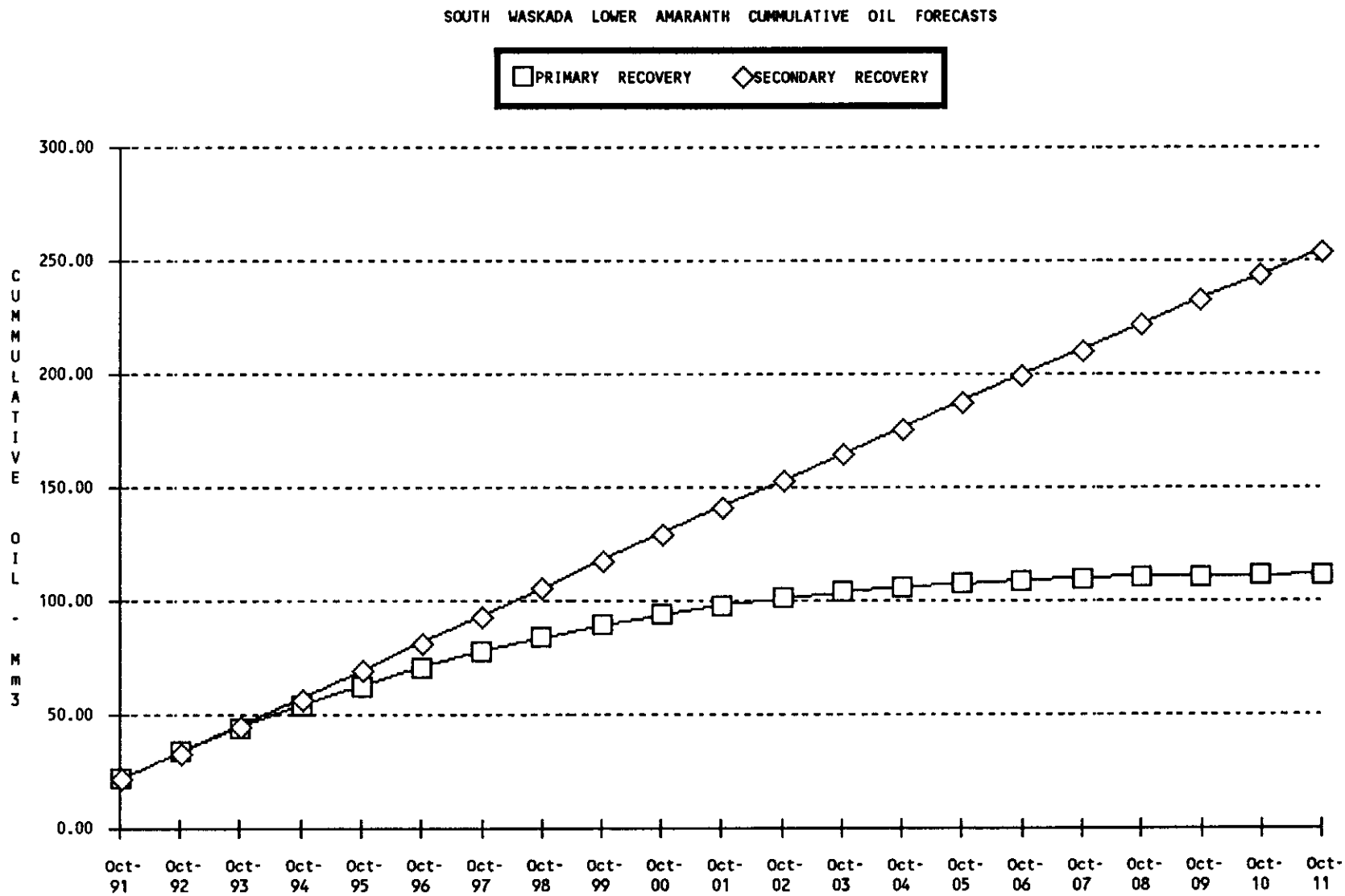
Oct-08
Oct-09
Oct-10
Oct-11

FIGURE 7


SOUTH WASKADA LOWER AMARANTH CUMMULATIVE OIL FORECASTS
PRIMARY RECOVERY
SECONDARY RECOVERY
CUMMULATIVE OIL - Mm3
300.00
250.00
200.00
150.00
100.00
50.00
0.00
Oct-91
Oct-92
Oct-93
Oct-94
Oct-95
Oct-96
Oct-97
Oct-98
Oct-99
Oct-00
Oct-01
Oct-02
Oct-03
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Oct-05
Oct-06
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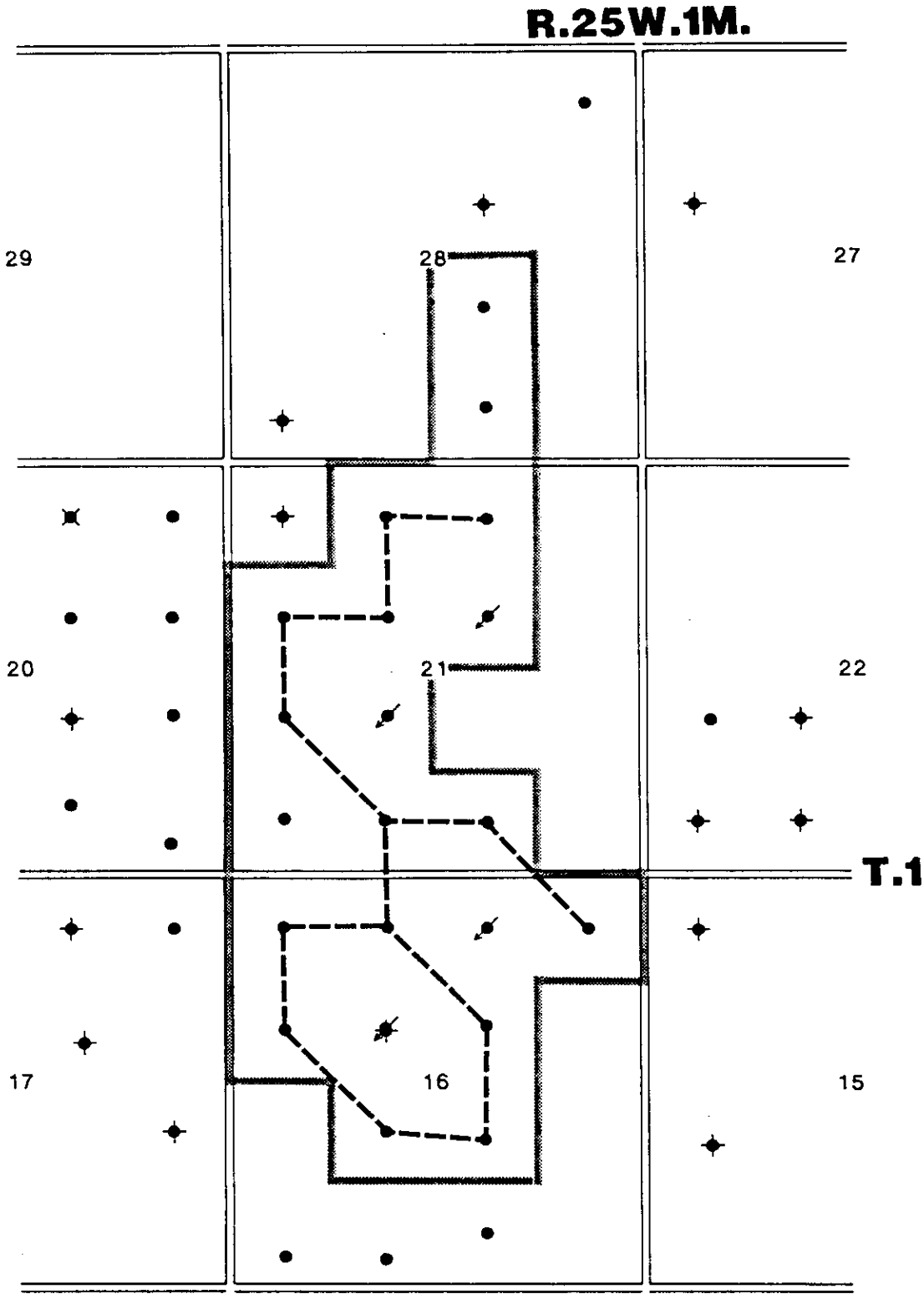
Oct-09
Oct-10
Oct-11



LEGEND

- OIL WELL
- WATER INJECTOR
- STUDY AREA
- 7 SPOT PATTERN

ENRON Oil Canada Ltd.

1300, 700 - 9th AVENUE S.W., CALGARY, ALBERTA PH: 403/298-2600

SOUTH WASKADA, MANITOBA
WATER INJECTION PATTERN
FIGURE 8

DATE: 29-05-91	BY: D. LOGIE	CONT. INT.:
SCALE: 1:25,000	REVISIONS:	

APPENDICES

SIMULATION TIME = 0.0000 DAYS (1985 SEP 1)
Waskada Unit 09 FORMATION THICKNESS METERS LYR 1 RUNTIME

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1)							2.000	2.000	2.000	
(2)							2.000	2.000	2.000	
(3)							2.100	2.000	2.100	
(4)							2.100	2.100	2.100	
(5)							2.100	2.000	2.100	
(6)							2.100	2.100	2.100	
(7)				2.100	2.100	2.100	2.200	2.200	2.200	
(8)				2.100	2.000	2.200	2.300	2.500	2.300	
(9)				2.200	2.200	2.200	2.200	2.300	2.200	
(10)	2.300	2.300	2.300	2.200	2.200	2.200	2.200	2.200	2.200	
(11)	2.300	2.500	2.300	2.200	2.200	2.200	2.200	2.200	2.200	
(12)	2.300	2.300	2.300	2.200	2.200	2.200	2.200	2.200	2.300	
(13)	2.200	2.300	2.200	2.200	2.200	2.100				
(14)	2.100	2.200	2.100	2.100	2.000	2.200				
(15)	2.100	2.000	2.000	2.000	2.100	2.200				
(16)	1.900	1.800	1.900	1.900	2.100	2.300	2.500	2.500	2.500	
(17)	1.900	1.500	1.900	2.000	2.000	2.400	2.600	3.000	2.500	
(18)	2.000	2.000	2.100	2.200	2.300	2.500	2.500	2.600	2.400	
(19)	2.200	2.200	2.200	2.300	2.500	2.600	2.500	2.500	2.400	2.400
(20)	2.400	2.500	2.500	2.600	3.000	2.800	2.600	2.300	2.400	2.300
(21)	2.400	2.600	2.800	2.800	2.900	2.800	2.800	2.600	2.600	2.300
(22)	2.700	2.900	2.900	3.000	3.100	3.000	2.900	2.800	2.600	
(23)	2.700	3.000	2.900	2.900	3.300	2.900	3.000	3.000	2.600	
(24)	2.500	2.700	2.700	2.800	2.900	2.900	2.800	2.800	2.800	
(25)				2.600	2.600	2.700	2.800	2.800	2.600	
(26)				2.500	2.000	2.600	2.700	3.000	2.600	
(27)				2.500	2.500	2.600	2.700	2.700	2.500	

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(17)		
(18)		
(19)	2.300	2.200
(20)	2.100	2.200
(21)	2.200	2.200
(22)		
(23)		
(24)		
(25)		
(26)		
(27)		

SIMULATION TIME = 0.0000 DAYS (1985 SEP 1)

Waskada Unit 18 FORMATION THICKNESS METERS LYR 2 RUNTIME

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1)							6.400	6.400	6.400	
(2)							6.400	6.300	6.400	
(3)							6.500	6.500	6.500	
(4)							6.600	6.600	6.500	
(5)							6.600	6.800	6.600	
(6)							6.600	6.600	6.600	
(7)				6.700	6.700	6.700	6.800	6.700	6.700	
(8)				6.800	6.500	6.800	6.800	6.600	6.700	
(9)				6.900	6.900	6.900	6.900	6.800	6.700	
(10)	7.100	7.100	7.100	7.100	7.200	7.100	6.900	6.900	6.900	
(11)	7.100	7.100	7.100	7.100	7.700	7.000	6.900	7.000	6.900	
(12)	7.000	7.000	7.000	7.100	7.100	7.000	6.900	6.900	6.900	
(13)	7.000	7.000	7.000	6.900	6.800	6.800				
(14)	7.000	7.200	6.900	6.700	6.000	6.600				
(15)	7.000	6.900	6.900	6.800	6.600	6.700				
(16)	7.000	6.900	6.800	6.700	6.700	6.700	6.800	6.800	6.800	
(17)	6.900	7.000	6.900	6.800	6.800	6.800	6.900	7.000	6.900	
(18)	6.800	6.900	6.900	6.900	6.900	6.900	6.900	7.000	6.900	
(19)	6.800	6.800	6.800	6.900	7.000	7.000	7.000	7.000	7.000	7.000
(20)	6.700	6.500	6.800	7.100	7.200	7.200	7.100	7.100	7.100	7.000
(21)	6.700	6.700	7.000	7.100	7.200	7.400	7.400	7.300	7.100	7.000
(22)	6.800	6.900	7.000	7.200	7.400	7.500	7.500	7.400	7.300	
(23)	6.700	6.700	7.000	7.300	8.000	7.600	7.500	7.600	7.300	
(24)	6.600	6.800	7.000	7.300	7.500	7.500	7.500	7.500	7.400	
(25)				7.100	7.400	7.400	7.400	7.400	7.200	
(26)				7.100	7.200	7.300	7.300	7.200	7.200	
(27)				7.100	7.200	7.300	7.300	7.300	7.200	

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(14)		
(15)		
(16)		
(17)		
(18)		
(19)	6.900	6.900
(20)	6.800	6.900
(21)	7.000	7.000
(22)		
(23)		
(24)		
(25)		
(26)		
(27)		

SIMULATION TIME = 0.0000 DAYS (1985 SEP 1)

Waskada Unit 1B — FORMATION THICKNESS METERS — LYR 3 RUNTIME

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1)							1.200	1.100	1.000	
(2)							1.200	1.400	1.100	
(3)							1.100	1.000	1.000	
(4)							0.9000	0.8000	0.8000	
(5)							0.8000	0.6000	0.8000	
(6)							0.7000	0.7000	0.7000	
(7)				0.8000	0.6000	0.6000	0.5000	0.5000	0.5000	
(8)				0.6000	0.4000	0.4000	0.5000	0.6000	0.5000	
(9)				0.5000	0.3000	0.4000	0.4000	0.4000	0.5000	
(10)	0.4000	0.2000	0.2000	0.2000	0.3000	0.3000	0.4000	0.3000	0.3000	
(11)	0.3000	0.2000	0.2000	0.3000	0.2000	0.4000	0.4000	0.2000	0.3000	
(12)	0.2000	0.3000	0.3000	0.4000	0.4000	0.4000	0.4000	0.4000	0.4000	
(13)	0.3000	0.3000	0.3000	0.4000	0.5000	0.5000				
(14)	0.3000	0.2000	0.4000	0.6000	1.000	0.8000				
(15)	0.2000	0.3000	0.4000	0.5000	0.8000	0.9000				
(16)	0.3000	0.3000	0.4000	0.5000	0.7000	0.9000	1.200	1.400	1.300	
(17)	0.4000	0.2000	0.4000	0.5000	0.5000	0.9000	1.200	2.000	1.400	
(18)	0.3000	0.4000	0.5000	0.5000	0.7000	0.9000	1.100	1.200	1.200	
(19)	0.6000	0.7000	0.6000	0.5000	0.6000	0.9000	1.000	1.000	1.100	1.200
(20)	0.8000	1.300	0.8000	0.7000	0.3000	0.9000	1.100	1.000	1.200	1.100
(21)	0.9000	1.000	1.100	1.000	1.000	1.100	1.300	1.200	1.200	1.100
(22)	1.200	1.200	1.200	1.300	1.500	1.400	1.400	1.400	1.400	
(23)	1.200	1.200	1.200	1.400	2.000	1.600	1.600	2.000	1.500	
(24)	1.000	1.200	1.300	1.400	1.700	1.600	1.600	1.700	1.500	
(25)				1.400	1.600	1.600	1.500	1.500	1.400	
(26)				1.400	1.500	1.500	1.500	1.200	1.300	
(27)				1.400	1.400	1.500	1.500	1.400	1.300	

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(16)		
(17)		
(18)		
(19)	1.100	1.000
(20)	0.8000	1.100
(21)	1.000	1.000
(22)		
(23)		
(24)		
(25)		
(26)		
(27)		

SIMULATION TIME = 0.0000 DAYS (1985 SEP 1)
Waskada Unit 1B

KX - PERMEABILITY(MD) LYR 1 RUNTIME

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1)							0.7500	0.7500	0.7500	
(2)							0.7500	0.7500	0.7500	
(3)							1.000	1.100	1.100	
(4)							1.250	1.475	1.300	
(5)							1.425	1.950	1.400	
(6)							1.375	1.450	1.375	
(7)				0.9750	1.150	1.200	1.300	1.350	1.350	
(8)				1.000	1.125	1.200	1.250	1.200	1.275	
(9)				1.025	1.075	1.175	1.225	1.250	1.275	
(10)	1.025	1.050	1.025	1.025	1.025	1.075	1.050	1.150	1.150	
(11)	1.050	1.125	1.050	0.9000	0.8000	0.9500	1.050	1.275	1.150	
(12)	1.100	1.000	0.9500	0.8750	0.8750	0.9250	1.000	1.050	1.050	
(13)	1.000	0.9750	0.9250	0.8500	0.8000	0.8500				
(14)	0.9500	1.000	0.9000	0.8000	0.5250	0.8500				
(15)	0.9500	0.8750	0.8750	0.8000	0.8500	0.9000				
(16)	0.9000	0.8250	0.8250	0.8750	0.9750	1.025	1.175	1.225	1.200	
(17)	0.8500	0.7250	0.8750	0.9250	1.125	1.175	1.250	1.400	1.300	
(18)	0.8000	0.8750	0.9250	1.000	1.100	1.200	1.250	1.350	1.300	
(19)	0.8750	0.9250	0.9750	1.025	1.150	1.275	1.350	1.375	1.325	1.325
(20)	0.9250	1.000	0.9500	1.150	1.200	1.325	1.475	1.575	1.450	1.325
(21)	0.8500	0.9250	1.050	1.150	1.250	1.475	1.550	1.550	1.500	1.425
(22)	0.9250	0.9750	1.050	1.150	1.375	1.475	1.650	1.650	1.650	
(23)	0.9000	0.8000	1.025	1.250	1.550	1.600	1.700	1.975	1.725	
(24)	0.8000	0.9500	1.050	1.225	1.500	1.600	1.700	1.750	1.750	
(25)				1.200	1.500	1.525	1.650	1.675	1.675	
(26)				1.225	1.500	1.525	1.625	1.600	1.650	
(27)				1.300	1.350	1.525	1.600	1.625	1.650	

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(16)		
(17)		
(18)		
(19)	1.250	1.200
(20)	1.125	1.250
(21)	1.375	1.375
(22)		
(23)		
(24)		
(25)		
(26)		
(27)		

SIMULATION TIME = 0.0000 DAYS (1985 SEP 1)
Waskada Unit 1B KX - PERMEABILITY(MD) LYR 2 RUNTIME

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1)							1.500	1.500	1.500	
(2)							1.500	1.500	1.500	
(3)							2.000	2.200	2.200	
(4)							2.500	2.950	2.600	
(5)							2.850	3.900	2.800	
(6)							2.750	2.900	2.750	
(7)				1.950	2.300	2.400	2.600	2.700	2.700	
(8)				2.000	2.250	2.400	2.500	2.400	2.550	
(9)				2.050	2.150	2.350	2.450	2.500	2.550	
(10)	2.050	2.100	2.050	2.050	2.050	2.150	2.100	2.300	2.300	
(11)	2.100	2.250	2.100	1.800	1.600	1.900	2.100	2.550	2.300	
(12)	2.200	2.000	1.900	1.750	1.750	1.850	2.000	2.100	2.100	
(13)	2.000	1.950	1.850	1.700	1.600	1.700				
(14)	1.900	2.000	1.800	1.600	1.050	1.700				
(15)	1.900	1.750	1.750	1.600	1.700	1.800				
(16)	1.800	1.650	1.650	1.750	1.950	2.050	2.350	2.450	2.400	
(17)	1.700	1.450	1.750	1.850	2.250	2.350	2.500	2.800	2.600	
(18)	1.600	1.750	1.850	2.000	2.200	2.400	2.500	2.700	2.600	
(19)	1.750	1.850	1.950	2.050	2.300	2.550	2.700	2.750	2.650	2.650
(20)	1.850	2.000	1.900	2.300	2.400	2.650	2.950	3.150	2.900	2.650
(21)	1.700	1.850	2.100	2.300	2.500	2.950	3.100	3.100	3.000	2.850
(22)	1.850	1.950	2.100	2.300	2.750	2.950	3.300	3.300	3.300	
(23)	1.800	1.600	2.050	2.500	3.100	3.200	3.400	3.950	3.450	
(24)	1.600	1.900	2.100	2.450	3.000	3.200	3.400	3.500	3.500	
(25)				2.400	3.000	3.050	3.300	3.350	3.350	
(26)				2.450	3.000	3.050	3.250	3.200	3.300	
(27)				2.600	2.700	3.050	3.200	3.250	3.300	

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(15)		
(16)		
(17)		
(18)		
(19)	2.500	2.400
(20)	2.250	2.500
(21)	2.750	2.750
(22)		
(23)		
(24)		
(25)		
(26)		
(27)		

SIMULATION TIME = 0.0000 DAYS (1985 SEP 1)
Waskada Unit 18 KX - PERMEABILITY(MD) LYR 3 RUNTIME

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1)							0.7500	0.7500	0.7500	
(2)							0.7500	0.7500	0.7500	
(3)							1.000	1.100	1.100	
(4)							1.250	1.475	1.300	
(5)							1.425	1.950	1.400	
(6)							1.375	1.450	1.375	
(7)				0.9750	1.150	1.200	1.300	1.350	1.350	
(8)				1.000	1.125	1.200	1.250	1.200	1.275	
(9)				1.025	1.075	1.175	1.225	1.250	1.275	
(10)	1.025	1.050	1.025	1.025	1.025	1.075	1.050	1.150	1.150	
(11)	1.050	1.125	1.050	0.9000	0.8000	0.9500	1.050	1.275	1.150	
(12)	1.100	1.000	0.9500	0.8750	0.8750	0.9250	1.000	1.050	1.050	
(13)	1.000	0.9750	0.9250	0.8500	0.8000	0.8500				
(14)	0.9500	1.000	0.9000	0.8000	0.5250	0.8500				
(15)	0.9500	0.8750	0.8750	0.8000	0.8500	0.9000				
(16)	0.9000	0.8250	0.8250	0.8750	0.9750	1.025	1.175	1.225	1.200	
(17)	0.8500	0.7250	0.8750	0.9250	1.125	1.175	1.250	1.400	1.300	
(18)	0.8000	0.8750	0.9250	1.000	1.100	1.200	1.250	1.350	1.300	
(19)	0.8750	0.9250	0.9750	1.025	1.150	1.275	1.350	1.375	1.325	1.325
(20)	0.9250	1.000	0.9500	1.150	1.200	1.325	1.475	1.575	1.450	1.325
(21)	0.8500	0.9250	1.050	1.150	1.250	1.475	1.550	1.550	1.500	1.425
(22)	0.9250	0.9750	1.050	1.150	1.375	1.475	1.650	1.650	1.650	
(23)	0.9000	0.8000	1.025	1.250	1.550	1.600	1.700	1.975	1.725	
(24)	0.8000	0.9500	1.050	1.225	1.500	1.600	1.700	1.750	1.750	
(25)				1.200	1.500	1.525	1.650	1.675	1.675	
(26)				1.225	1.500	1.525	1.625	1.600	1.650	
(27)				1.300	1.350	1.525	1.600	1.625	1.650	

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(15)		
(16)		
(17)		
(18)		
(19)	1.250	1.200
(20)	1.125	1.250
(21)	1.375	1.375
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SIMULATION TIME = 0.0000 DAYS (1985 SEP 1)
Waskada Unit 18 INITIAL WATER SATURATION LYR 1 RUNTIME

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1)							0.5870	0.5870	0.5870	
(2)							0.5870	0.5870	0.5870	
(3)							0.5874	0.5870	0.5874	
(4)							0.5993	0.5993	0.5993	
(5)							0.5993	0.5990	0.5993	
(6)							0.5993	0.5993	0.5993	
(7)				0.6000	0.6000	0.6000	0.6006	0.6006	0.6006	
(8)				0.6000	0.5997	0.6006	0.6011	0.6021	0.6011	
(9)				0.6006	0.6006	0.6006	0.6006	0.6011	0.6006	
(10)	0.6533	0.6533	0.6533	0.5969	0.5969	0.5969	0.5969	0.5969	0.5969	
(11)	0.6533	0.6543	0.6533	0.5969	0.5969	0.5969	0.5969	0.5969	0.5969	
(12)	0.6533	0.6533	0.6533	0.5969	0.5969	0.5969	0.5969	0.5969	0.5972	
(13)	0.6076	0.6081	0.6076	0.6227	0.6227	0.6222				
(14)	0.6071	0.6076	0.6071	0.6222	0.6217	0.6227				
(15)	0.6071	0.6066	0.6066	0.6217	0.6222	0.6227				
(16)	0.6011	0.6006	0.6011	0.6011	0.6021	0.6031	0.5692	0.5692	0.5692	
(17)	0.6011	0.5993	0.6011	0.6016	0.6016	0.6036	0.5695	0.5708	0.5692	
(18)	0.6016	0.6016	0.6021	0.6026	0.6031	0.6041	0.5692	0.5695	0.5688	
(19)	0.6227	0.6227	0.6227	0.5705	0.5712	0.5715	0.6191	0.6191	0.6186	0.5898
(20)	0.6237	0.6242	0.6242	0.5715	0.5729	0.5722	0.6196	0.6181	0.6186	0.5895
(21)	0.6237	0.6247	0.6257	0.5722	0.5726	0.5722	0.6207	0.6196	0.6196	0.5895
(22)	0.6282	0.6292	0.6292	0.5663	0.5666	0.5663	0.5761	0.5758	0.5751	
(23)	0.6282	0.6297	0.6292	0.5660	0.5672	0.5660	0.5765	0.5765	0.5751	
(24)	0.6272	0.6282	0.6282	0.5656	0.5660	0.5660	0.5758	0.5758	0.5758	
(25)				0.5976	0.5976	0.5979	0.5722	0.5722	0.5715	
(26)				0.5972	0.5955	0.5976	0.5719	0.5729	0.5715	
(27)				0.5972	0.5972	0.5976	0.5719	0.5719	0.5712	

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(19)	0.5895	0.5891
(20)	0.5888	0.5891
(21)	0.5891	0.5891
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SIMULATION TIME = 0.0000 DAYS (1985 SEP 1)
Waskada Unit 1B

INITIAL WATER SATURATION LYR 2 RUNTIME

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1)							0.4873	0.4873	0.4873	
(2)							0.4873	0.4866	0.4873	
(3)							0.4880	0.4880	0.4880	
(4)							0.5126	0.5126	0.5119	
(5)							0.5126	0.5140	0.5126	
(6)							0.5126	0.5126	0.5126	
(7)				0.5147	0.5147	0.5147	0.5154	0.5147	0.5147	
(8)				0.5154	0.5133	0.5154	0.5154	0.5140	0.5147	
(9)				0.5161	0.5161	0.5161	0.5161	0.5154	0.5147	
(10)	0.5907	0.5907	0.5907	0.5105	0.5112	0.5105	0.5091	0.5091	0.5091	
(11)	0.5907	0.5907	0.5907	0.5105	0.5147	0.5098	0.5091	0.5098	0.5091	
(12)	0.5900	0.5900	0.5900	0.5105	0.5105	0.5098	0.5091	0.5091	0.5091	
(13)	0.5267	0.5267	0.5267	0.5471	0.5464	0.5464				
(14)	0.5267	0.5281	0.5260	0.5457	0.5408	0.5450				
(15)	0.5267	0.5260	0.5260	0.5464	0.5450	0.5457				
(16)	0.5197	0.5189	0.5182	0.5175	0.5175	0.5175	0.4556	0.4556	0.4556	
(17)	0.5189	0.5197	0.5189	0.5182	0.5182	0.5182	0.4562	0.4568	0.4562	
(18)	0.5182	0.5189	0.5189	0.5189	0.5189	0.5189	0.4562	0.4568	0.4562	
(19)	0.5464	0.5464	0.5464	0.4597	0.4603	0.4603	0.5408	0.5408	0.5408	0.4943
(20)	0.5457	0.5443	0.5464	0.4609	0.4614	0.4614	0.5415	0.5415	0.5415	0.4943
(21)	0.5457	0.5457	0.5478	0.4609	0.4614	0.4626	0.5436	0.5429	0.5415	0.4943
(22)	0.5506	0.5513	0.5520	0.4500	0.4509	0.4515	0.4691	0.4685	0.4679	
(23)	0.5499	0.5499	0.5520	0.4503	0.4544	0.4521	0.4691	0.4697	0.4679	
(24)	0.5492	0.5506	0.5520	0.4503	0.4515	0.4515	0.4691	0.4691	0.4685	
(25)				0.5091	0.5112	0.5112	0.4626	0.4626	0.4614	
(26)				0.5091	0.5098	0.5105	0.4620	0.4614	0.4614	
(27)				0.5091	0.5098	0.5105	0.4620	0.4620	0.4614	

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(19)	0.4936	0.4936
(20)	0.4929	0.4936
(21)	0.4943	0.4943
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SIMULATION TIME = 0.0000 DAYS (1985 SEP 1)

Waskada Unit 18 — INITIAL WATER SATURATION — LYR 3 RUNTIME

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1)							0.5774	0.5766	0.5759	
(2)							0.5774	0.5788	0.5766	
(3)							0.5766	0.5759	0.5759	
(4)							0.5992	0.5985	0.5985	
(5)							0.5985	0.5971	0.5985	
(6)							0.5978	0.5978	0.5978	
(7)				0.5999	0.5985	0.5985	0.5978	0.5978	0.5978	
(8)				0.5985	0.5971	0.5971	0.5978	0.5985	0.5978	
(9)				0.5978	0.5963	0.5971	0.5971	0.5971	0.5978	
(10)	0.6971	0.6947	0.6947	0.5886	0.5893	0.5893	0.5900	0.5893	0.5893	
(11)	0.6959	0.6947	0.6947	0.5893	0.5886	0.5900	0.5900	0.5886	0.5893	
(12)	0.6947	0.6959	0.6959	0.5900	0.5900	0.5900	0.5900	0.5900	0.5900	
(13)	0.6077	0.6077	0.6077	0.6350	0.6359	0.6359				
(14)	0.6077	0.6069	0.6086	0.6368	0.6403	0.6385				
(15)	0.6069	0.6077	0.6086	0.6359	0.6385	0.6394				
(16)	0.5992	0.5992	0.5999	0.6007	0.6025	0.6042	0.5379	0.5394	0.5386	
(17)	0.5999	0.5985	0.5999	0.6007	0.6007	0.6042	0.5379	0.5436	0.5394	
(18)	0.5992	0.5999	0.6007	0.6007	0.6025	0.6042	0.5372	0.5379	0.5379	
(19)	0.6368	0.6377	0.6368	0.5372	0.5379	0.5401	0.6315	0.6315	0.6324	0.5802
(20)	0.6385	0.6429	0.6385	0.5387	0.5358	0.5401	0.6324	0.6315	0.6333	0.5795
(21)	0.6394	0.6403	0.6412	0.5408	0.5408	0.5415	0.6341	0.6333	0.6333	0.5795
(22)	0.6473	0.6473	0.6473	0.5288	0.5302	0.5295	0.5506	0.5506	0.5506	
(23)	0.6473	0.6473	0.6473	0.5295	0.5337	0.5309	0.5520	0.5548	0.5513	
(24)	0.6456	0.6473	0.6482	0.5295	0.5316	0.5309	0.5520	0.5527	0.5513	
(25)				0.5956	0.5971	0.5971	0.5443	0.5443	0.5436	
(26)				0.5956	0.5963	0.5963	0.5443	0.5422	0.5429	
(27)				0.5956	0.5956	0.5963	0.5443	0.5436	0.5429	

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(18)		
(19)	0.5795	0.5788
(20)	0.5774	0.5795
(21)	0.5788	0.5788
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SIMULATION TIME = 0.0000 DAYS (1985 SEP 1)

Waskada Unit 18 INITIAL OIL SATURATIONS LYR 1 RUNTIME

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1)							0.4130	0.4130	0.4130	
(2)							0.4130	0.4130	0.4130	
(3)							0.4126	0.4130	0.4126	
(4)							0.4007	0.4007	0.4007	
(5)							0.4007	0.4010	0.4007	
(6)							0.4007	0.4007	0.4007	
(7)				0.4000	0.4000	0.4000	0.3994	0.3994	0.3994	
(8)				0.4000	0.4003	0.3994	0.3989	0.3979	0.3989	
(9)				0.3994	0.3994	0.3994	0.3994	0.3989	0.3994	
(10)	0.3467	0.3467	0.3467	0.4031	0.4031	0.4031	0.4031	0.4031	0.4031	
(11)	0.3467	0.3457	0.3467	0.4031	0.4031	0.4031	0.4031	0.4031	0.4031	
(12)	0.3467	0.3467	0.3467	0.4031	0.4031	0.4031	0.4031	0.4031	0.4028	
(13)	0.3924	0.3919	0.3924	0.3773	0.3773	0.3778				
(14)	0.3929	0.3924	0.3929	0.3778	0.3783	0.3773				
(15)	0.3929	0.3934	0.3934	0.3783	0.3778	0.3773				
(16)	0.3989	0.3994	0.3989	0.3989	0.3979	0.3969	0.4308	0.4308	0.4308	
(17)	0.3989	0.4007	0.3989	0.3984	0.3984	0.3964	0.4305	0.4292	0.4308	
(18)	0.3984	0.3984	0.3979	0.3974	0.3969	0.3959	0.4308	0.4305	0.4312	
(19)	0.3773	0.3773	0.3773	0.4295	0.4288	0.4285	0.3809	0.3809	0.3814	0.4102
(20)	0.3763	0.3758	0.3758	0.4285	0.4271	0.4278	0.3804	0.3819	0.3814	0.4105
(21)	0.3763	0.3753	0.3743	0.4278	0.4274	0.4278	0.3793	0.3804	0.3804	0.4105
(22)	0.3718	0.3708	0.3708	0.4337	0.4334	0.4337	0.4239	0.4242	0.4249	
(23)	0.3718	0.3703	0.3708	0.4340	0.4328	0.4340	0.4235	0.4235	0.4249	
(24)	0.3728	0.3718	0.3718	0.4344	0.4340	0.4340	0.4242	0.4242	0.4242	
(25)				0.4024	0.4024	0.4021	0.4278	0.4278	0.4285	
(26)				0.4028	0.4045	0.4024	0.4281	0.4271	0.4285	
(27)				0.4028	0.4028	0.4024	0.4281	0.4281	0.4288	

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(19)	0.4105	0.4109
(20)	0.4112	0.4109
(21)	0.4109	0.4109
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SIMULATION TIME = 0.0000 DAYS (1985 SEP 1)
Waskada Unit 18 INITIAL OIL SATURATIONS LYR 2 RUNTIME

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1)							0.5127	0.5127	0.5127	
(2)							0.5127	0.5134	0.5127	
(3)							0.5120	0.5120	0.5120	
(4)							0.4874	0.4874	0.4881	
(5)							0.4874	0.4860	0.4874	
(6)							0.4874	0.4874	0.4874	
(7)				0.4853	0.4853	0.4853	0.4846	0.4853	0.4853	
(8)				0.4846	0.4867	0.4846	0.4846	0.4860	0.4853	
(9)				0.4839	0.4839	0.4839	0.4839	0.4846	0.4853	
(10)	0.4093	0.4093	0.4093	0.4895	0.4888	0.4895	0.4909	0.4909	0.4909	
(11)	0.4093	0.4093	0.4093	0.4895	0.4853	0.4902	0.4909	0.4902	0.4909	
(12)	0.4100	0.4100	0.4100	0.4895	0.4895	0.4902	0.4909	0.4909	0.4909	
(13)	0.4733	0.4733	0.4733	0.4529	0.4536	0.4536				
(14)	0.4733	0.4719	0.4740	0.4543	0.4592	0.4550				
(15)	0.4733	0.4740	0.4740	0.4536	0.4550	0.4543				
(16)	0.4803	0.4811	0.4818	0.4825	0.4825	0.4825	0.5444	0.5444	0.5444	
(17)	0.4811	0.4803	0.4811	0.4818	0.4818	0.4818	0.5438	0.5432	0.5438	
(18)	0.4818	0.4811	0.4811	0.4811	0.4811	0.4811	0.5438	0.5432	0.5438	
(19)	0.4536	0.4536	0.4536	0.5403	0.5397	0.5397	0.4592	0.4592	0.4592	0.5057
(20)	0.4543	0.4557	0.4536	0.5391	0.5386	0.5386	0.4585	0.4585	0.4585	0.5057
(21)	0.4543	0.4543	0.4522	0.5391	0.5386	0.5374	0.4564	0.4571	0.4585	0.5057
(22)	0.4494	0.4487	0.4480	0.5500	0.5491	0.5485	0.5309	0.5315	0.5321	
(23)	0.4501	0.4501	0.4480	0.5497	0.5456	0.5479	0.5309	0.5303	0.5321	
(24)	0.4508	0.4494	0.4480	0.5497	0.5485	0.5485	0.5309	0.5309	0.5315	
(25)				0.4909	0.4888	0.4888	0.5374	0.5374	0.5386	
(26)				0.4909	0.4902	0.4895	0.5380	0.5386	0.5386	
(27)				0.4909	0.4902	0.4895	0.5380	0.5380	0.5386	

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(19)	0.5064	0.5064
(20)	0.5071	0.5064
(21)	0.5057	0.5057
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SIMULATION TIME = 0.0000 DAYS (1985 SEP 1)

Waskada Unit 1 INITIAL OIL SATURATIONS LYR 3 RUNTIME

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1)							0.4226	0.4234	0.4241	
(2)							0.4226	0.4212	0.4234	
(3)							0.4234	0.4241	0.4241	
(4)							0.4008	0.4015	0.4015	
(5)							0.4015	0.4029	0.4015	
(6)							0.4022	0.4022	0.4022	
(7)				0.4001	0.4015	0.4015	0.4022	0.4022	0.4022	
(8)				0.4015	0.4029	0.4029	0.4022	0.4015	0.4022	
(9)				0.4022	0.4037	0.4029	0.4029	0.4029	0.4022	
(10)	0.3029	0.3053	0.3053	0.4114	0.4107	0.4107	0.4100	0.4107	0.4107	
(11)	0.3041	0.3053	0.3053	0.4107	0.4114	0.4100	0.4100	0.4114	0.4107	
(12)	0.3053	0.3041	0.3041	0.4100	0.4100	0.4100	0.4100	0.4100	0.4100	
(13)	0.3923	0.3923	0.3923	0.3650	0.3641	0.3641				
(14)	0.3923	0.3931	0.3914	0.3632	0.3597	0.3615				
(15)	0.3931	0.3923	0.3914	0.3641	0.3615	0.3606				
(16)	0.4008	0.4008	0.4001	0.3993	0.3975	0.3958	0.4621	0.4606	0.4614	
(17)	0.4001	0.4015	0.4001	0.3993	0.3993	0.3958	0.4621	0.4564	0.4606	
(18)	0.4008	0.4001	0.3993	0.3993	0.3975	0.3958	0.4628	0.4621	0.4621	
(19)	0.3632	0.3623	0.3632	0.4628	0.4621	0.4599	0.3685	0.3685	0.3676	0.4198
(20)	0.3615	0.3571	0.3615	0.4613	0.4642	0.4599	0.3676	0.3685	0.3667	0.4205
(21)	0.3606	0.3597	0.3588	0.4592	0.4592	0.4585	0.3659	0.3667	0.3667	0.4205
(22)	0.3527	0.3527	0.3527	0.4712	0.4698	0.4705	0.4494	0.4494	0.4494	
(23)	0.3527	0.3527	0.3527	0.4705	0.4663	0.4691	0.4480	0.4452	0.4487	
(24)	0.3544	0.3527	0.3518	0.4705	0.4684	0.4691	0.4480	0.4473	0.4487	
(25)				0.4044	0.4029	0.4029	0.4557	0.4557	0.4564	
(26)				0.4044	0.4037	0.4037	0.4557	0.4578	0.4571	
(27)				0.4044	0.4044	0.4037	0.4557	0.4564	0.4571	

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(19)	0.4205	0.4212
(20)	0.4226	0.4205
(21)	0.4212	0.4212
(22)		
(23)		
(24)		
(25)		
(26)		
(27)		