



Date July 11, 1994

Memorandum

To Floyd Phillips, Chief
Terrestrial Quality Management
Manitoba Environment

From John N. Fox,
Chief Petroleum Engineer
Petroleum Branch

Subject **Viriden Roselea Unit No. 1**
Well Licence Applications

Telephone

Chevron has made application for five more well licences in Viriden Roselea Unit No. 1. I'm forwarding you a copy of the surveys for the five locations 13B-21-10-25 (WPM) (Well #2), 4C-28-10-25 (WPM) (Well #8), 1A-29-10-25 (WPM) (Well #7), 1B-29-10-25 (WPM) (Well #9) and 1C-29-10-25 (WPM) (Well #13).

The sites have been reviewed by our Petroleum Inspectors and they have no concerns. There is a 4m drop east to west across the 13B-21 lease. The lease will be dyked to ensure there is no run-off of fluids from the wellsite. The 1A-29 well has been moved off the side slope of the river valley and poses no concerns. The 1B-29 and 1C-29 locations are in crop land on the floor of the Assiniboine valley.

The 4C-28 wellsite is adjoining the municipal road that runs near the bottom of the eastern slope of the Assiniboine Valley. The proposed location has native tree and shrub cover and there is a 20m drop east to west across the 4C-28 lease. The following conditions will be included in the well licence:

- 1) a survey for rare and endangered plant species is to be conducted;
- 2) wellsite preparation is to be discussed with our Viriden District Office and disturbance to the natural area is to be minimized;
- 3) no drilling pits will be allowed;
- 4) the wellsite will be dyked to ensure there is no run-off of drilling and produced fluids; and
- 5) where runoff water is diverted around the wellsite, erosion is to be minimized - installation of flow control structures may be necessary.

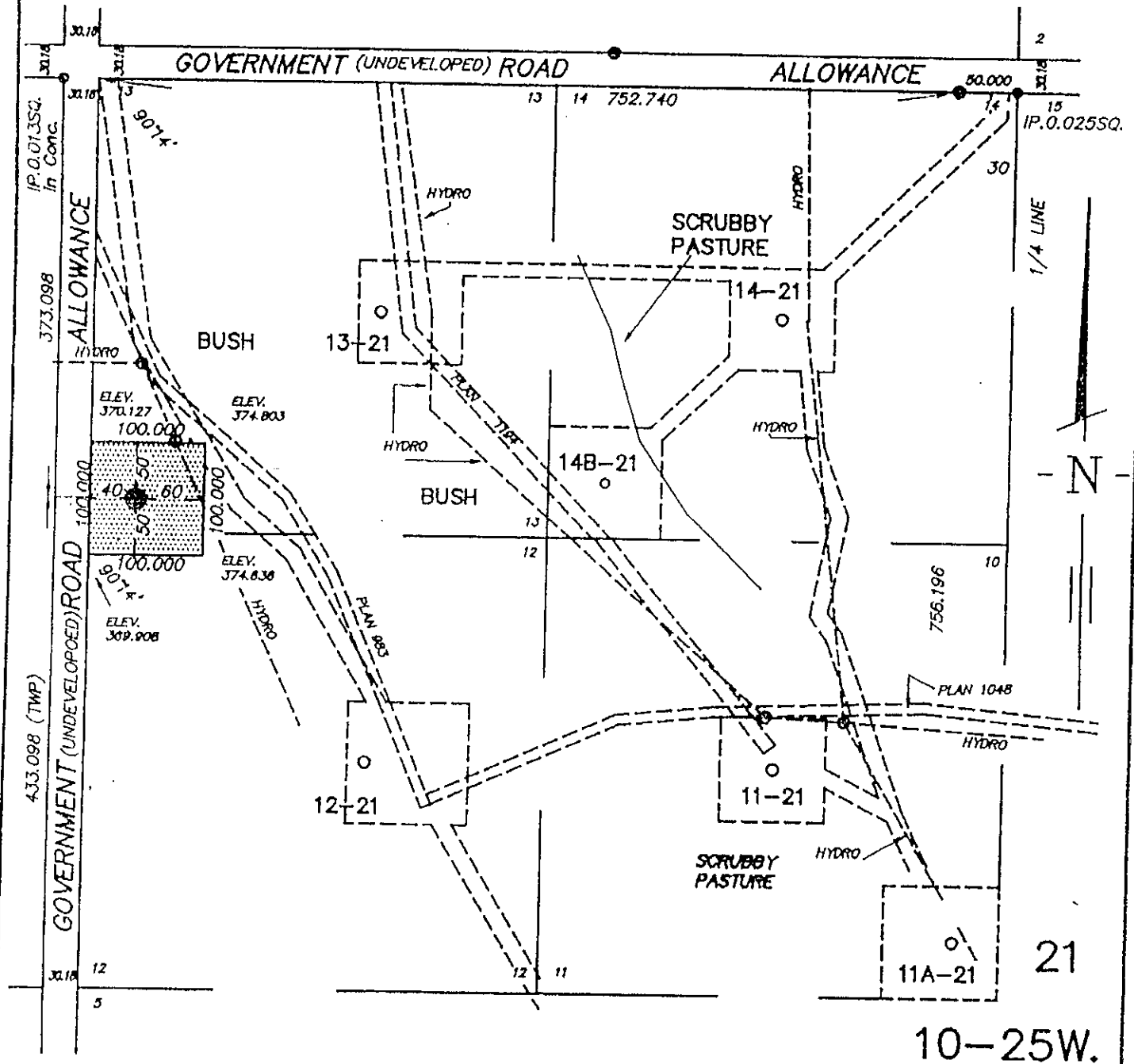
Chevron will be drilling these wells between mid-July and early September. If you have any questions or concerns with the proposed wellsites, please call me when you return from holidays.

cc. Ken McGill, Agriculture

First | Fold

PLAN OF WELL SITE LOCATION
CHEVRON VIRDEN ROSELEA UNIT # 1
LSD. 13B ,SEC. 21 ,TP. 10 ,RGE. 25 W.P.M.
MANITOBA

Scale 1: 5000



NOTES

All distances are in metres or decimals of a metre and may be converted to feet by multiplying by 3.28084. Well location is shown thus ----- (S)

Well location is shown thus ----- (9)
Area required is shown outlined thus -----

Area required is shown outlined thus -----
Survey monuments found are shown thus ----- o

Survey monuments found are shown thus ----- O

Iron posts 0.025 SQ. planted are shown thus -----

Iron posts 0.020 Sq. planted are shown thus -----

Well Coordinates: 373.098 S. OF N. BDRY. SEC.21
40.000 E. OF W. BDRY. SEC.21

Ground elevation at well: 370.720

Areas Well Site 1.000 ha., 2.47 acres

Access Road 0.000 ha., 0.00 acres

Total 1.000 ha., 2.47 acres

Plan and Survey
certified correct
this 10th day of June, 1994.

Richard C. Burns
Manitoba Land Surveyor

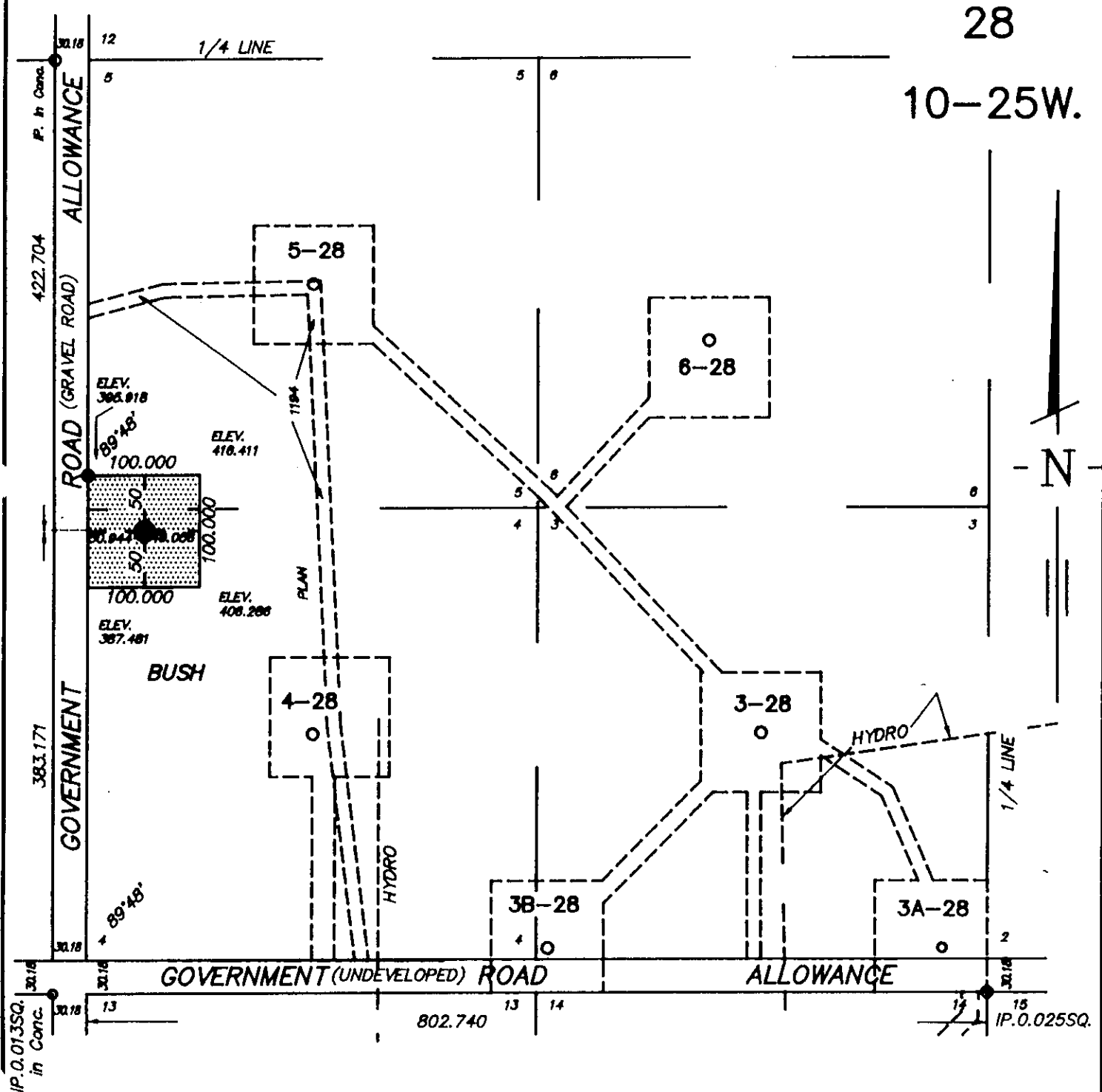
Elaine Brown.
Witness

LENNON SURVEYS
1840 Rosser Avenue
Brandon, Manitoba R7A 0M8
(204) 727-0651
FAX (204) 727-5247






CHEVRON CANADA RESOURCES LTD.

PLAN OF WELL SITE LOCATION CHEVRON VIRDEN ROSELEA UNIT # 1 LSD. 4C ,SEC. 28 ,TP. 10 ,RGE. 25 W.P.M. MANITOBA

Scale 1: 5000



NOTES

All distances are in metres or decimals of a metre and may be converted to feet by multiplying by 3.28084
Well location is shown thus 
Area required is shown outlined thus 
Survey monuments found are shown thus 
Iron posts 0.025 SQ. planted are shown thus 
Iron posts 0.013 Diam. planted are shown thus 
Well Coordinates: 383.171 N. OF S. BDY. SEC.28
50.944 E. OF W. BDY. SEC.28


Ground elevation at well: 400.125
Area Well Site 1.000 ha., 2.47 acres
Access Road 0.000 ha., 0.00 acres
Total 1.000 ha., 2.47 acres

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Plan and Survey
certified correct
this 15th day of June, 1994.


Richard C. Pomeroy
Manitoba Land Surveyor

Witness

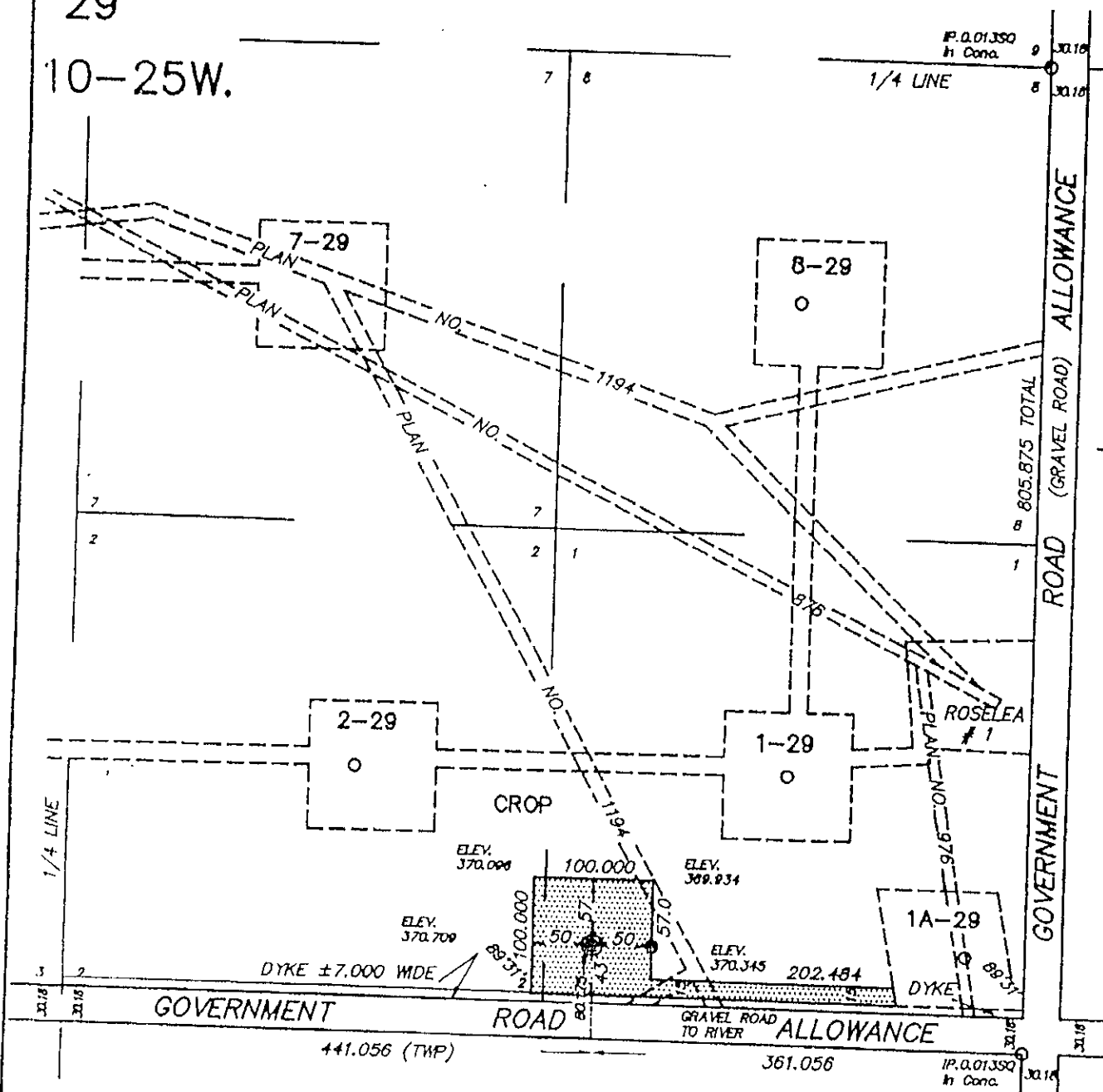

Glen R. Lennon
LENNON SURVEYS
1840 Rosser Avenue
Brandon, Manitoba R7A 0M8
(204) 727-0651
FAX (204) 727-5247

PLAN OF WELL SITE LOCATION CHEVRON VIRDEN ROSELEA UNIT # 1 LSD. 1B ,SEC. 29 ,TP. 10 ,RGE. 25 W.P.M. MANITOBA

Scale 1: 5000

29

10-25W.



NOTES

All distances are in metres or decimals of a metre and may be converted to feet by multiplying by 3.28084

Well location is shown thus

Area required is shown outlined thus

Survey monuments found are shown thus

Iron posts 0.025 SQ. planted are shown thus

Iron posts 0.013 Diam. planted are shown thus

Well Coordinates: 50.000 N. OF S. BDRY. SEC.29
361.056 W. OF E. BDRY. SEC.29

Ground elevation at well: 370.184

Area Well Site 1.000 ha., 2.47 acres

Access Road 0.306 ha., 0.76 acres

Total 1.306 ha., 3.23 acres

Plan and Survey
certified correct
this 13th day of June, 1994

Richard C. Powers
Manitoba Land Surveyor

Witness

LENNON SURVEYS
1840 Rosser Avenue
Brandon, Manitoba R7A 0M8
(204) 727-0051
FAX (204) 727-5247

CHEVRON CANADA RESOURCES LTD.

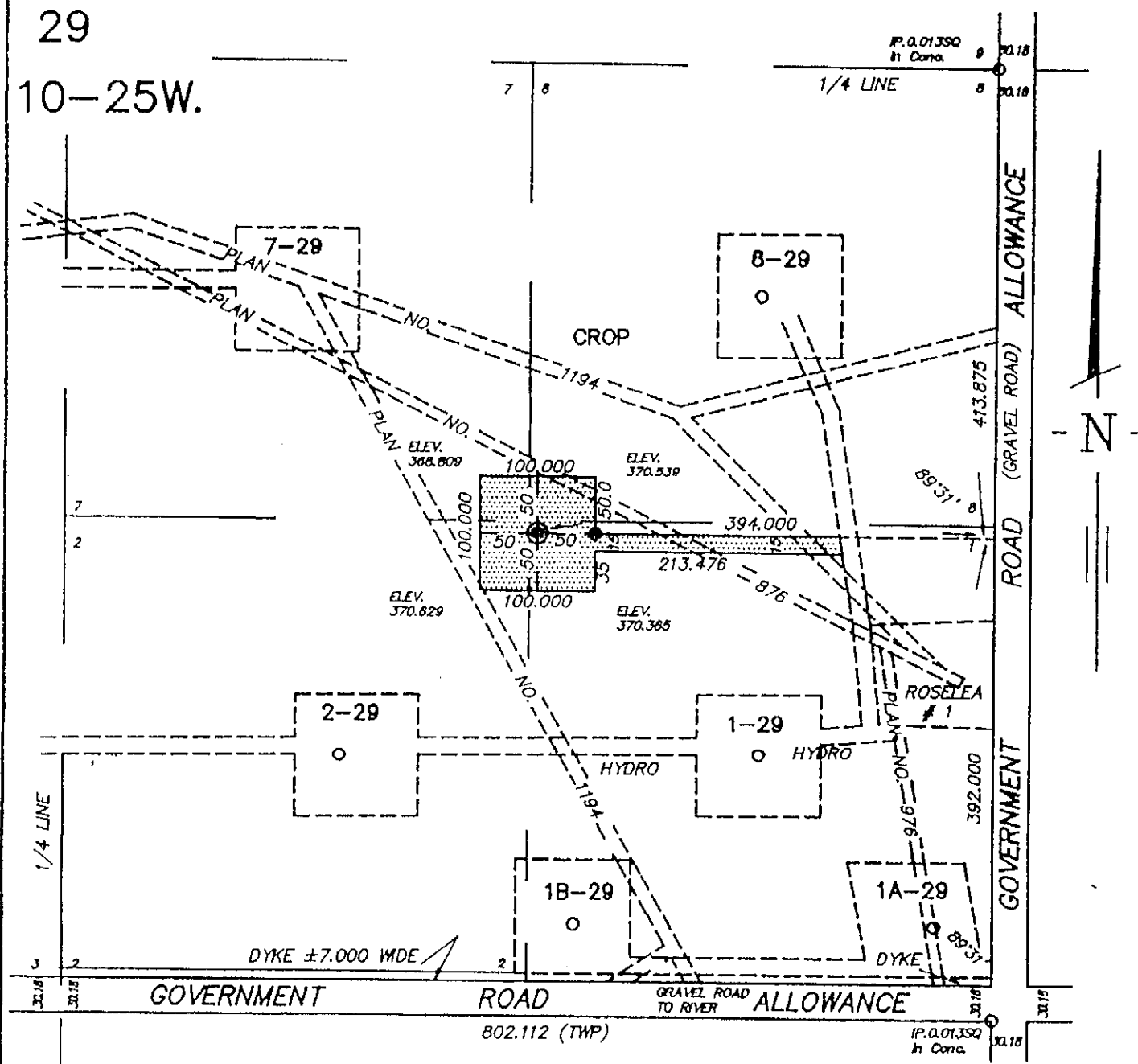
FB/PGE 299/50

JOB No. 94-0991

PLAN OF WELL SITE LOCATION
CHEVRON VIRDEN ROSELEA UNIT # 1
LSD. 1C ,SEC. 29 ,TP. 10 ,RGE. 25 W.P.M.
MANITOBA

Scale 1: 5000

29
10-25W.



NOTES

All distances are in metres or decimals of a metre and may be converted to feet by multiplying by 3.28084

Well location is shown thus ———— (6)

Area required is shown outlined thus -----

Survey monuments found are shown thus ----- O

Iron posts 0.025 SQ. planted are shown thus ----- ■

Iron posts 0.013 Diam. planted are shown thus ----- ●

Well Coordinates: 392.000 N. OF S. BDRY. SEC.29

394.000 W. OF E. BDRY. SEC.29

Ground elevation at well: 370.594

Areas Well Site 1,000 ha., 2,47 acres

Access Road 0.319 ha., 0.79 acres

Total 1,319 ha., 3.26 acres

Plan and Survey
certified correct
this 13th day of June, 1994

Richard C. Peters
Manitoba Land Surveyor

Elaine Brown.
Witness

LENNON SURVEYS
1640 Rosser Avenue
Brandon, Manitoba R7A 0M8
(204) 727-0051
FAX (204) 727-5247

CHEVRON CANADA RESOURCES LTD.



FAX NO.: (204) 945-0586

(204) 945-6577
FAX: (204) 945-0586DATE: July 5/97TOTAL NO. OF PAGES (including this page) 6PLEASE DELIVER THE FOLLOWING PAGES TO:

NAME:	<u>FLOYD PHILLIPS / KEN MCGILL</u>	FROM:	<u>John N. Fox</u> <u>Chief Petroleum Engineer</u>
BRANCH:	<u>5229</u> <u>145-2256</u>	BRANCH:	<u>Petroleum Branch</u>
FAX NO:		PHONE:	<u>(204) 945-6574</u>

COMMENTS: KEN/FLOYD - SECOND BATCH OF VIRDEN ROSULEA INFILL
WELL - PLEASE REVIEW LOCATIONS AND PROVIDE
ME YOUR COMMENTS - THIS WORK.

This message is intended only for the use of the individual or entity to which it is addressed, and may contain information that is privileged, confidential and exempt from disclosure under applicable law.

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ORIGINALS WILL BE:

 Mailed to you: Delivered to you: Picked up
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July 5, 1994

Memorandum

To: Floyd Phillips, Chief
Terrestrial Quality Management
Manitoba Environment

From: John N. Fox,
Chief Petroleum Engineer
Petroleum Branch

Subject: **Viriden Roselea Unit No. 1
Well Licence Applications**

Telephone:

Chevron has made application for three more well licences in Viriden Roselea Unit No. 1. I'm forwarding you a copy of the surveys for the three locations 10C-21-10-25 (WPM), 11A-21-10-25 (WPM) and 14B-21-10-25 (WPM) (referred to as wells 1, 3 and 4 in the original application).

The sites have been reviewed by our Petroleum Inspectors and they have no concerns. The 10C-21 is approximately 30 m from the south edge of the slough and the location will be dyked to ensure there is no run-off of fluids from the wellsite, the 11A-21 location is in the pasture and the 14B-21 location is on the edge of the bush in pasture land. Please review the proposed sites and call me with any comments as soon as possible.

cc. Ken McGill, Agriculture

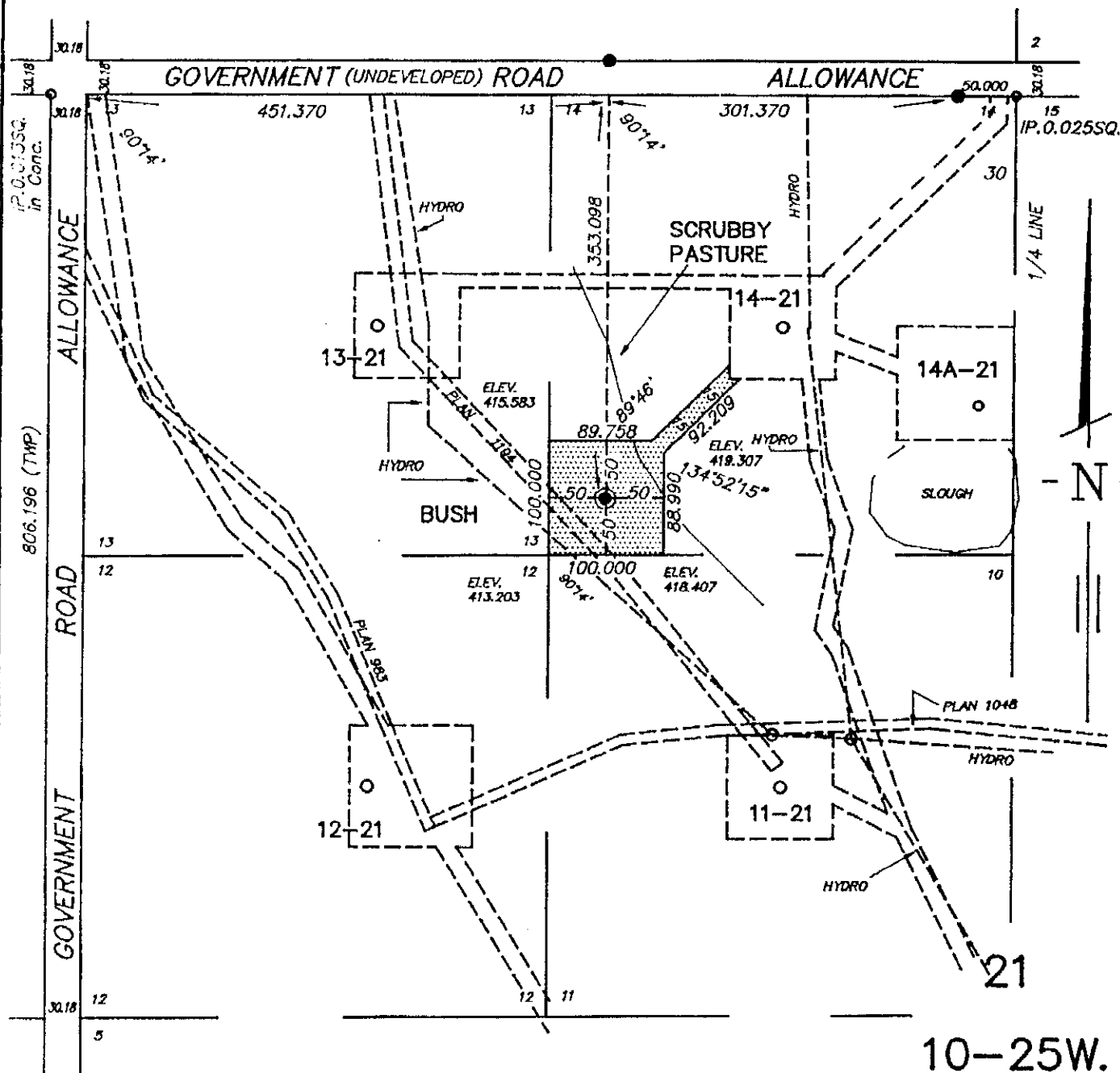
10C-21 - well #3

11A-21 - well #1

14B-21 - well #4

PLAN OF WELL SITE LOCATION **CHEVRON VIRDEN ROSELEA UNIT # 1** LSD. 14B ,SEC. 21 ,TP. 10 ,RGE. 25 W.P.M. MANITOBA

Scale 1: 5000



NOTES

All distances are in metres or decimals of a metre and may be converted to feet by multiplying by 3.28084

Well location is shown thus

Area required is shown outlined thus

Survey monuments found are shown thus

Iron posts 0.025 SQ. planted are shown thus

Iron posts 0.013 Diam. planted are shown thus

Well Coordinates: 353.098 S. OF N. BDRY. SEC. 21

451.370 E. OF W. BDRY. SEC. 21

Ground elevation at well: 417.094

Areas Well Site 1.000 ha., 2.47 acres

Access Road 0.129 ha., 0.32 acres

Total 1.129 ha., 2.79 acres

Plan and Survey
 certified correct
 this 27th day of May, 1994.

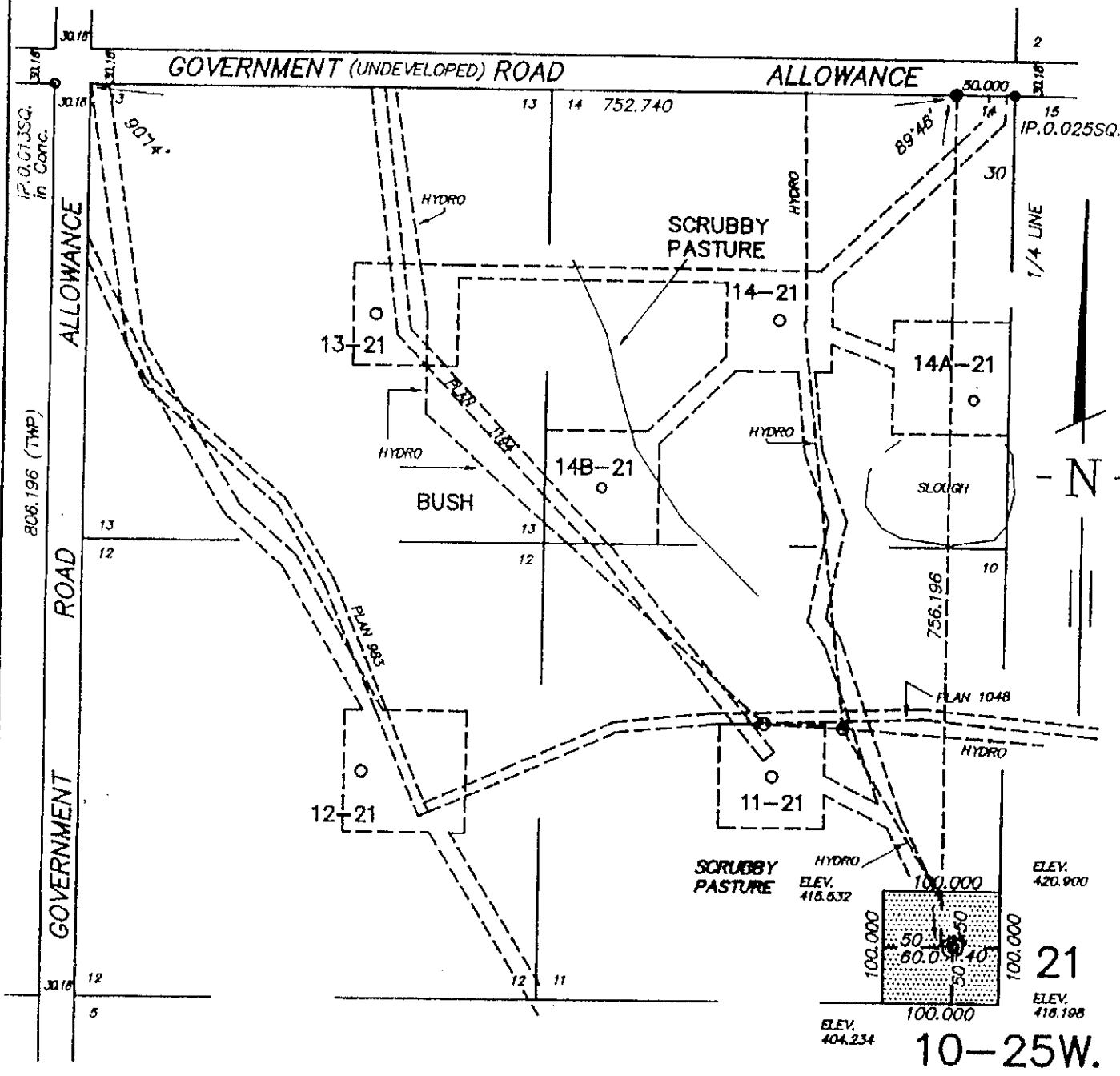
Richard C. Purvis
 Manitoba Land Surveyor

Witness






LENNON SURVEYS
 1640 Rosser Avenue
 Brandon, Manitoba R7A 0M6
 (204) 727-0631
 FAX (204) 727-5247

CHEVRON CANADA RESOURCES

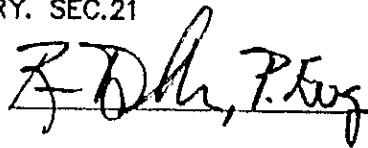
PLAN OF WELL SITE LOCATION
CHEVRON VIRDEN ROSELEA UNIT # 1
LSD. 11A ,SEC. 21 ,TP. 10 ,RGE. 25 W.P.M.
MANITOBA
Scale 1: 5000



NOTES

All distances are in metres or decimals of a metre and may be converted to feet by multiplying by 3.28084
Well location is shown thus 
Area required is shown outlined thus 
Survey monuments found are shown thus 
Iron posts 0.025 SQ. planted are shown thus 
Iron posts 0.013 Diam. planted are shown thus 
Well Coordinates: 756.196 S. OF N. BDRY. SEC.21
762.740 E. OF W. BDRY. SEC.21

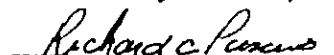
Ground elevation at well: 417.000
Area Well Site 1.000 ha., 2.47 acres
Access Road 0.000 ha., 0.00 acres
Total 1.000 ha., 2.47 acres



CHEVRON CANADA RESOURCES LTD.

(REVISED)

Plan and Survey
certified correct
this 10th day of June, 1994.


Richard C. Parsons
Manitoba Land Surveyor


Witness

LENNON SURVEYS
1040 Rosser Avenue
Brandon, Manitoba R7A 0M8
(204) 727-0851
FAX (204) 727-5247



A25986



Date June 21, 1994

Memorandum

To Floyd Phillips, Chief
Terrestrial Quality Management
Manitoba Environment

From John N. Fox,
Chief Petroleum Engineer
Petroleum Branch

Subject **Viriden Roselea Unit No. 1**
Well Licence Applications

Telephone

Chevron has made application for licences to drill the first two of the proposed fourteen infill wells in Viriden Roselea Unit No. 1. I'm forwarding you a copy of the surveys for the two locations 3A-28-10-25 (WPM) and 3B-28-10-25 (WPM) (referred to as wells 5 and 6 in the original application) and a copy of Chevron's generic drilling program and contingency plan.

Both sites have been reviewed by our Petroleum Inspectors and they have no concerns. The 3A-28 location is on the edge of the bush in pasture land and 3B-28 is in the pasture. Please review the proposed sites and call me with any comments as soon as possible.

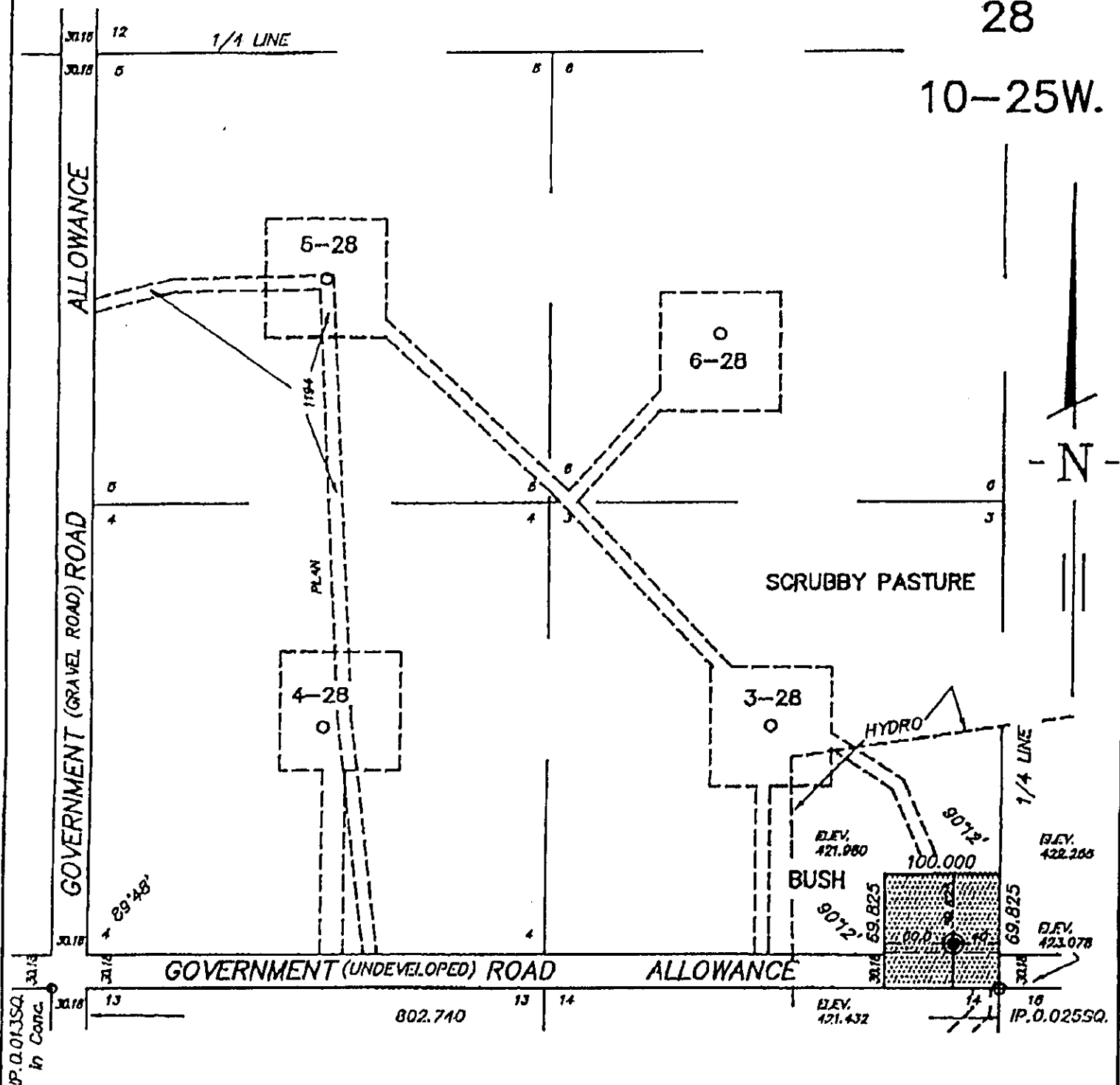
cc. Ken McGill, Agriculture

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Scale 1: 5000

28

10-25W.



All distances are in metres or decimals of a metre and
may be converted to feet by multiplying by 3.28084
Well location is shown thus ----- ●
Area required is shown outlined thus -----
Survey monuments found are shown thus ----- ○
Iron posts 0.025 SQ. planted are shown thus ----- ■
Iron posts 0.013 Diam. planted are shown thus ----- ●
Well Coordinates: 10.000 N. OF S. BDRY. SEC.28
762.740 E. OF W. BDRY. SEC.28

Ground elevation at well: 423.093
 Areas Well Site 1.000 ha., 2.47 acres
 Access Road 0.000 ha., 0.00 acres
 Total 1.000 ha., 2.47 acres

Plan and Survey
certified correct
this 3rd. day of June, 1994.

Richard A. Peters
Manitoba Land Surveyor

Witness

LENNON SURVEYS
1640 Rosser Avenue
Brandon, Manitoba R7A 0M6
(204) 727-0631
FAX (204) 727-5247

CHEVRON CANADA RESOURCES



Memorandum

Date April 19, 1994

To The Undernoted

From John N. Fox
Chief Petroleum Engineer
Petroleum Branch
Energy and Mines
555-330 Graham Avenue

Telephone

Subject **Viriden Roselea Unit No. 1**
Reduced Spacing Approval

Attached is as copy of the Oil and Natural Gas Conservation Board's approval of Chevron's application for reduced 8 ha spacing. You will note the approval incorporates the infill well siting criteria suggested in your comments. Also attached is a copy of Chevron's response to the Board's deficiency letter.

When Chevron applies for a well licence to drill an infill location in Viriden Roselea Unit No. 1, the Branch will send you a copy of the wellsite survey and other siting information for your review and comments. A one week turnaround of the application would be appreciated.

Please let me know, if you would like to have any field staff present when Chevron surveys the 14 infill wells to be drilled this summer.

John N. Fox

cc: Bruno Gossen, Rural Development
Ken McGill, Agriculture
Floyd Phillips, Environment

First | Fold



The Oil and Natural Gas
Conservation Board

555 — 330 Graham Avenue
Winnipeg MB R3C 4E3
CANADA

(204) 945-1111
FAX: (204) 945-0586

April 19, 1994

Mr. K. G. Matieshin, P. Eng.
Manager, Environment, Safety and Regulations
Chevron Canada Resources
500 - 5th Avenue SW
Calgary AB T2P 0L7

Dear Mr. Matieshin:

Re: Virden Roselea Unit No. 1
Reduced Spacing Project Approval

The Board has completed its review of your application for approval of reduced 8 ha spacing in Virden Roselea Unit No. 1 (VRU No. 1) and for approval to convert two wells to water injection.

Board Order No. SU 10 establishes 8 ha drilling spacing units for VRU No. 1. The Petroleum Branch and Departments of Rural Development, Environment and Agriculture have developed well siting criteria and conditions which are to be used when selecting locations under Board Order No. SU 10. Attachment 1 lists the well siting criteria and conditions. The proposed locations for the 14 infill wells outlined on the air photos in your deficiency letter (March 1, 1994) are acceptable. However, final approval of infill well locations will be based on a survey of the site. In order to avoid having to resurvey and relocate any infill locations, Chevron should contact the Petroleum Branch's Virden District Office and have a Petroleum Inspector participate in the final site selection for the following locations; 14A-21, 14B-21, 4B-28, 4C-28 and 8A-30-10-25 (WPM).

Future infill locations will be reviewed at the time of licensing. Proposed locations will be reviewed by the Petroleum Branch and the Departments of Agriculture and Environment to ensure the well siting criteria and conditions are met and environmental and land use impacts are minimized. To accommodate the review process, well licences should be submitted at least one month prior to the expected drilling date. Please note Clause 5 of Board Order SU No. 10 provides that;

5. Where in the opinion of the Director of Petroleum, drilling a well on a site that is proposed in an application for a well licence might cause significant adverse impact on the environment or significantly impair use of the surrounding land, the Director may refuse to issue the licence.

Board Order No. PM 65 (May 14, 1991) covers pressure maintenance operations in VRU No. 1. The conversion of 2-28-10-25 and 1-29-10-25 to water injection is hereby approved under Section 1(1) of Board Order No. PM 65. Application for future injection conversions should be made under this section.

Section 7 of Board Order No. PM 65 requires Chevron to submit an annual waterflood progress report. The report is to contain the information listed in Attachment 2.

Plans for the following activities, as outlined by Chevron in its application, are acceptable:

- (1) spill mitigation and surveillance,
- (2) housekeeping, and
- (3) facility design and construction.

You are reminded that in accordance with Section 56 of the Petroleum Drilling and Production Regulation, wells are to be production tested at least quarterly.

A copy of Chevron's contingency plan for well control is to be submitted with the applications for a well licence.

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

Yours respectfully,



H. Clare Moster
Deputy Chairman

cc: B. Gossen, Rural Development
F. Phillips, Environment
K. McGill, Agriculture



The Oil and Natural Gas
Conservation Board

Room 143
Legislative Building
Winnipeg, Manitoba, CANADA
R3C 0V8

(204) 945-3130
FAX: (204) 945-0586

Order No. SU 10

An Order Pertaining to Drilling Spacing Units
Virden Lodgepole B Pool

WHEREAS, subsection (9) (b) 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

(b) respecting the designation of the area that shall be allocated to a well in connection with fixing allowable production;"

AND WHEREAS, subsection (1) (f) of section 63 of "The Mines Act" being Chapter M160 of the Continuing Consolidation of the Statutes of Manitoba, provides as follows:

"63(1) For the purpose of carrying out the provisions of this Part and Part III according to their intent, the Lieutenant Governor in Council may make such regulations and orders as are ancillary thereto, and are not inconsistent therewith; and every such regulation or order made under, and in accordance with the authority granted by, this section has the force of law; and, without restricting the generality of the foregoing, the Lieutenant Governor in Council may make regulations and orders, not inconsistent with any other provision of this Part of Part III,

(f) prescribing spacing units and the size and shape of spacing units;"

AND WHEREAS, subsection (1) of Section 20 of Manitoba Regulation 430/87R under The Mines Act ("the Petroleum Drilling and Production Regulation") provides as follows:

"20(1) Notwithstanding section 19, the board may, after a public hearing or after publication of notice, prescribe by order special drilling spacing units which may differ from normal drilling spacing units in size, shape or target area."

AND WHEREAS, subsection (3) of Section 21 of the Petroleum Drilling and Production Regulation provides as follows:

"21(3) Where a special drilling spacing unit is prescribed under section 20, the board may prescribe the target area within which a well shall be completed in order to qualify for a maximum permissible production rate based on the area of the special drilling spacing unit."

AND WHEREAS, the Board received an application dated November 10, 1993 from Chevron Canada Resources as unit operator of Virden Roselea Unit No. 1 ("the unit area") for approval to reduce the size of drilling spacing units in the unit area outlined in Schedule A.

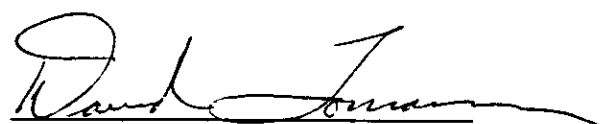
AND WHEREAS, upon publication of notice of the application, the Board received an objection to the application, which was subsequently withdrawn.

AND WHEREAS, the Board considers that establishment of smaller drilling spacing units within the unit area will result in an increase in recovery of crude oil from the unit area.

NOW THEREFORE, the Board orders that:


1. Subject to clause 2 and 4 herein, the spacing unit for each well drilled, or to be drilled, for the purpose of obtaining oil from or injecting salt water into the Mississippian Lodgepole Formation within the unit area is a square, 8 hectares in area, with corners located at the midpoints of the boundaries of each legal subdivision, as illustrated in Schedule A.
2. Where a spacing unit established by clause 1 intersects the boundary of the unit area, the unit boundary shall truncate the spacing unit and form part of the spacing unit boundary as illustrated in Schedule A.
3. The target area of each drilling spacing unit shall be an area having sides sixty-five metres from the sides of the drilling spacing unit and parallel to them.
4. Notwithstanding clause 3, no well shall be completed nearer to any boundary of the unit area than 100 metres or nearer to any other well than 130 metres.

5. Where in the opinion of the Director of Petroleum, drilling a well on a site that is proposed in an application for a well licence might cause significant adverse impact on the environment or significantly impair use of the surrounding land, the Director may refuse to issue the licence.
6. Board Order No. SU 8 is hereby rescinded.

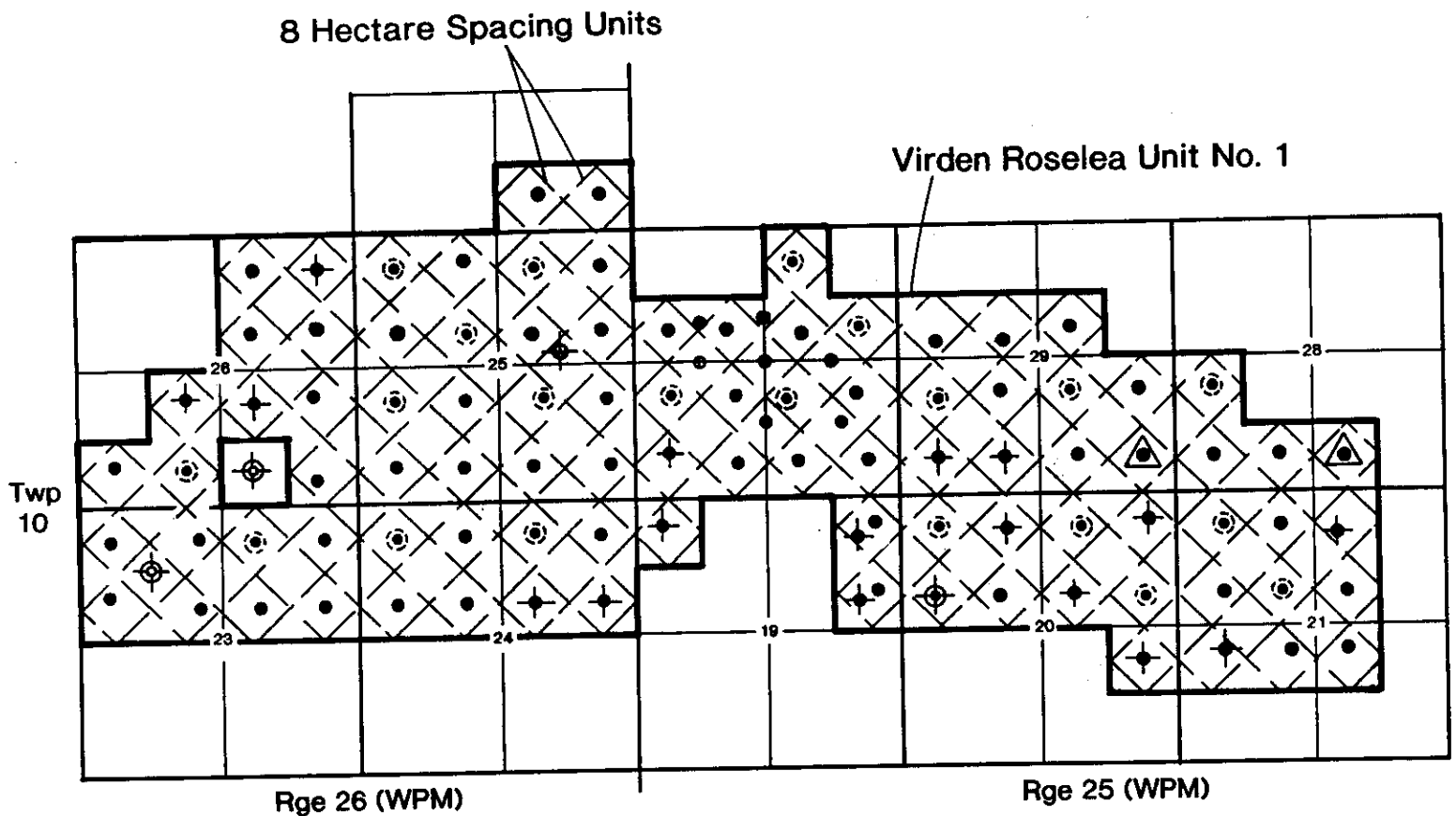

H. Clare Moster
Deputy Chairman
David Tomasson
Chairman

OIL AND NATURAL GAS
CONSERVATION BOARD ORDER
NO. SU 10 APPROVED THIS
14th DAY OF April A.D., 1994
AT THE CITY OF WINNIPEG.

APPROVED:


Donald W. Orchard
Minister of Energy and Mines

**SCHEDULE A
BOARD ORDER NO. SU 10
VIRDEN ROSELEA UNIT NO. 1
8 Hectare Drilling Spacing Units**



LEGEND

- | | |
|---------------------------------|---------------------------------|
| ● Oil producer | ✦ Abandoned water supply well |
| ✦ Abandoned oil producer | ⊙ Standing well |
| ⊙ Water injection well | ⚠ Proposed water injection well |
| ✦ Abandoned water disposal well | |

Attachment 1

INFILL WELL SITING CRITERIA

1. WATER-COVERED AREAS

Where there is potential for contaminants to enter water-covered areas, the wellsite should be

- (1) where possible, moved above the high water level, and
- (2) diked to prevent runoff of drilling or produced fluids.

2. NATURAL AREAS

In natural areas with native tree or shrub cover, to avoid significant habitat loss and habitat fragmentation, site disturbance is to be minimized.

3. SPECIAL AREAS

River valleys and other special areas, because of their unique microclimates, have greater potential for the occurrence of rare or endangered plant species. In special areas, a survey for rare and endangered plant species will be required and the site relocated if such species are found.

4. AREAS SUBJECT TO EROSION

Where there is potential for erosion at a wellsite, the wellsite should be

- (1) revegetated,
- (2) diked to divert runoff water around the wellsite, and
- (3) where necessary to prevent erosion by diverted runoff water, flow control structures installed.

5. CULTIVATED LAND

In order to minimize the loss of cultivated land and inconvenience to farming operations, the wellsite should be;

- (1) where possible, located along the edge of cultivated fields, and
- (2) where the wellsite cannot be located in accordance with (1), it should be located a minimum of 60 m from the edge of a field or such other distance as may be required to minimize inconvenience to farming operations.

Attachment 2

Virden Roselea Unit No. 1 Annual Waterflood Progress Report Requirements

Pursuant to Section 7 of Board Order No. PM 65 the report of the pressure maintenance program to be submitted annually is to include;

- (a) the oil production rate, injection rate, GOR and WOR during each month for each injection pattern and for the whole unit;
- (b) the cumulative volume of oil, gas and water produced and fluid injected for each injection pattern and for the whole unit at year end;
- (c) the monthly wellhead injection pressure for each injection well;
- (d) a summary of the result of any survey of reservoir pressure conducted during the year;
- (e) the date and type of any well servicing;
- (f) calculations of the voidage replacement ratio on a monthly and cumulative basis for each injection pattern and for the unit area;
- (g) an outline of the method used for quality control and treatment of the injected fluid;
- (h) a report of any unusual performance problems and remedial measures taken or being considered;
- (i) an estimate of incremental recoverable reserves attributable to reduced 8 ha spacing and pattern realignment; and
- (j) any other information that the operator or Director of Petroleum considers necessary to evaluate the performance of the waterflood.

The data referred to in clauses (a) to (c) is to be submitted in tabular and graphical form.



Date April 7, 1994

Memorandum

To David Tomasson
Chairman

From H. Clare Moster
Deputy Chairman
TO Oil and Natural Gas Conservation Bd.
314 Legislative Building
1111

Subject VIRDEN ROSELEA UNIT NO. 1 - REDUCED WELL SPACING

D-1

Attached and recommended for your signature and the Minister's approval are two (2) copies of Board Order No. SU 10.

The subject Order is being made under Subsection 62(9) of The Mines Act.

As indicated in the attached memo dated April 6, 1994 from the Petroleum Branch, the applicant, Chevron Canada Resources as unit operator, has addressed the concerns raised in the Board's deficiency letter to Chevron dated January 20, 1994. Also, the issues raised by the departments of Agriculture, Environment and Rural Development in their review of the application have been addressed. The original objection by one landowner (Mr. John Fefchak and Ms. Norma Tibbits-Fefchak) has been withdrawn following Chevron's addressing their initial concerns.

If you have any questions on this Order please contact either myself or Bob Dubreuil.

Please return signed copies of Order to my attention.

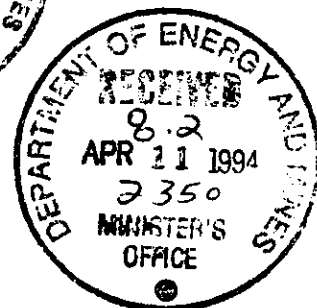
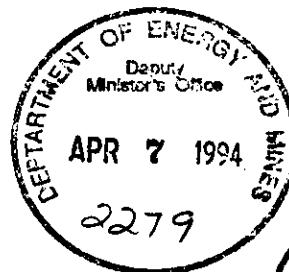
H. Clare Moster

cc: Bob Dubreuil

Attachments

HCM:p

MemDT124 Doc



Action/Route Slip

Date: April 6, 1994

To: H. Clare Moster

From: Bob Dubreuil

The attached Board Order No. SU 10 and letter to Chevron Canada Resources is recommended for approval.



Memorandum

Date

To The Undernoted

From John N. Fox
Chief Petroleum Engineer
Petroleum Branch
Energy and Mines
555-330 Graham Avenue

Telephone

Subject **Viriden Roselea Unit No. 1**
Reduced Spacing Approval

Attached is as copy of the Oil and Natural Gas Conservation Board's approval of Chevron's application for reduced 8 ha spacing. You will note the approval incorporates the infill well siting criteria suggested in your comments. Also attached is a copy of Chevron's response to the Board's deficiency letter.

When Chevron applies for a well licence to drill an infill location in Viriden Roselea Unit No. 1, the Branch will send you a copy of the wellsite survey and other siting information for your review and comments. A one week turnaround of the application would be appreciated.

Please let me know, if you would like to have any field staff present when Chevron surveys the 14 infill wells to be drilled this summer.

John N. Fox

cc: Bruno Gossen, Rural Development
Ken McGill, Agriculture
Floyd Phillips, Environment

First | Fold



Memorandum

Date April 6, 1994

To The Oil and Natural Gas
Conservation Board
- David Tomasson, Chairman
- Clare Moster, Deputy Chairman

From John N. Fox
Chief Petroleum Engineer

Subject Virден Roselea Unit No. 1
Reduced Spacing Application

Telephone

The Branch has reviewed Chevron's response to the Board's deficiency letter (Jan. 20/94). Comments on the application have been received from Rural Development, Agriculture and Environment.

RECOMMENDATIONS

It is recommended that Board Order No. SU 10 be issued approving reduced 8 ha spacing in Virден Roselea Unit No. 1. The two proposed injector conversions should be approved under Section 1(1) of Board Order No. PM 65 which does not need to be amended at this time. A copy of the proposed Board Order No. SU 10 is attached. Also attached is the proposed Board letter to accompany the order.

DISCUSSION

The following issues were addressed by Chevron in its deficiency letter:

- (1) plans for expanding infill drilling unit-wide;
- (2) the cost and benefits associated with Phase 2 and future phases of infill drilling;
- (3) incremental recoverable reserve estimates for Phase 1, Phase 2 and future phases of infill drilling;
and
- (4) Phase 2 infill well siting.

Infill Drilling Schedule

There are 55 undrilled 8 ha spacing units in VRU No. 1. Chevron plans to drill 14 infill wells this year in Phase 2, 14 wells in each of 1995 and 1996 and 9 wells in 1997 (Fig. 1). The company also plans to convert 7 wells to injection; 2 conversions in each of 1994 and 1995 and 3 conversions in 1996, to create 32 ha inverted 9-spot injection patterns throughout the majority of the unit.

First Fold

Project Costs and Benefits

The costs for Phase 2, including drilling, completion artificial lift and tie-in of 14 wells, two injector conversions and battery upgrading at 1-29-10-25, are \$2688M. Estimated benefits to the Crown, freehold mineral owners, landowners and the rural municipality are \$2283M (Table 1).

The costs to complete unit-wide development on 8 ha spacing are \$7083M (\$1994); 1995-\$2688M, 1996-\$2728M and 1997-\$1667M. Chevron has indicated future phases are dependent on a number of factors, in particular, Phase 2 infill well performance, oil prices and unit partner approval.

Incremental Recoverable Reserves

There has been a considerable degree of uncertainty associated with incremental recoverable reserve estimates for reduced spacing projects. This application is no exception.

Decline curve analysis - rate vs. time, rate vs. cumulative production and WOR vs. cumulative production, conducted by Chevron and the Branch yielded incremental recoverable reserves of 45 700 to 143 000 m³ (1.7 to 5.2% OOIP) for the Phase 1 infill wells. The wide range in incremental recovery estimates is a function of the brief, two year production history for the infill wells.

As a result of infill well performance Chevron has reduced the estimated incremental recoverable reserves for Phase 1 from 90 000 to 60 000 m³ (3.3 to 2.2% OOIP). Incremental recoverable reserves estimates for Phase 2 and unit-wide 8 ha development are shown on Table 2. The discrepancy between the Phase 1 incremental recovery of 2.2% OOIP and the Phase 2 and future phases incremental recovery of 5% OOIP has not been explained by Chevron.

Despite the uncertainty associated with the exact volume of incremental reserves, the Branch is satisfied, based on Phase 1 performance to date, that reduced 8 ha spacing and pattern realignment in VRU No. 1 will result in incremental recovery of 2-5% OOIP. It is recommended that Chevron be requested to annually refine its reduced spacing incremental recoverable reserves estimate as part of the unit waterflood progress report.

Environmental and Land Use Impacts

Agriculture and Environment have submitted infill well siting criteria and requested the criteria be considered when VRU No. 1 infill well locations are chosen (Table 3). Agriculture and Environment also commented on the locations for the Phase 2 infill wells. Both departments have asked to

review future infill locations prior to the Branch issuing well licences (Attachments 1 and 2).

Chevron has submitted air photos showing the 14 proposed infill well locations including access roads and flowline rights of way. The locations have been selected in accordance with the siting criteria and comments from the other departments. The following is a brief summary of the 14 locations (refer to the air photos for more detail);

- (1) Assiniboine River Valley side slope locations - 4B-28, 4C-28 and 8A-30 - moved close to the bottom of the slope, a survey for rare and endangered plant species to be conducted, site disturbance to be minimized, and a berm to be constructed around the wellsite to divert runoff;
- (2) Pasture - 11A-21, 3A-28 and 3B-28 no siting conditions; 14A-21 and 14B-21 near slough are to be diked to prevent runoff;
- (3) Cultivated land - 13B-21, 3C-29, and 5C-29 have been moved to the edge of the field; to remain on-target 1B-29, 5D-29 and 8B-29 must be located on cultivated land.

Chevron has had discussions with the landowners in the SE/4 of Section 25-10-26 who objected to the application. It appears Chevron has satisfied the landowners concerns. Attachments 3 and 4 are copies of the correspondence between Chevron and the landowners.

The Branch is satisfied the infill well siting criteria and interdepartmental review mechanism will ensure environmental and land use impacts of VRU No. 1 infill locations are minimized.

Drilling Program

In an effort to reduce drilling costs, Chevron has chosen to drill using a 1300 kg/m³ drilling mud. According to Branch calculations this results in an underbalance of 1100 - 2000 kPa at the reservoir. Chevron believes the risk of an uncontrolled salt water flow at the surface is minimal and is prepared to submit a detailed contingency plan for well control prior to drilling. Underbalanced drilling has become an accepted practice in horizontal drilling and the Branch is prepared to approve underbalanced drilling in VRU No. 1, if Chevron's contingency plan is acceptable.

Board Approval

The Branch recommends that reduced 8 ha spacing be approved for VRU No. 1. At this time, despite low oil prices, it appears Chevron is prepared to complete infill drilling in

Phase 2 in 1994. Future phases will depend on the Phase 2 results. Proposed Board Order No. SU 10 approving reduced 8 ha spacing is attached. In recognition of potential environmental and land use concerns with future infill locations SU 10 contains the following clause, similar to one found in The Oil and Gas Act (Section 93);

Where in the opinion of the Director of Petroleum, drilling a well on a site that is proposed in an application for a well licence might cause significant adverse impact on the environment or significantly impair use of the surrounding land, the Director may refuse to issue the licence.


It is proposed to approve the two conversions, 2-28-10-25 and 1-29-10-25 under Section 1(1) of Board Order No. PM 65 which provides the Board with discretion to approve additional injection wells in VRU No.'s 1, 2 and 3.

The proposed Board letter of approval to accompany the orders contains conditions regarding; (1) infill well siting and approval, (2) annual waterflood progress report contents, (3) the Phase 2 drilling program, and (4) infill well production testing.



John N. Fox

Recommended for Approved:


L.R. Dubreuil, Director

JNF/hw

TABLE 1

VRU NO. 1 PHASE 2 INFILL DRILLING BENEFITS

	<u>Incremental Project Benefits</u>
Crown Royalties and Production Tax	\$337M
Freehold royalties	\$1302M
Surface lease rentals	\$392M*
Property taxes	\$252M*

* based on 20 year producing life

TABLE 2

VRU NO. 1 INFILL WELL PERFORMANCE

	Phase 1	Phase 2	Future Phases
No. of Wells Drilled	7	14	37
No. of Wells Converted	2	2	5
Average Initial Productivity (m ³ /d)	3.6	2	2
Average Initial Water-Cut	35.8	50	---
Original Oil-in-Place (10 ³ m ³)	2728	2496	7928*
Incremental Rec. Reserves (10 ³ m ³)	60	125	210
Incremental Rec. Reserves/well (m ³)	8570	8929	5714
Incremental Recovery Factor (% OOIP)	2.2	5.0	5.0

* OOIP VRU No. 1

TABLE 3
INFILL WELL SITING CRITERIA

1. WATER-COVERED AREAS

Where there is potential for contaminants to enter water-covered areas, the wellsite should be

- (1) where possible, moved above the high water level, and
- (2) diked to prevent runoff of drilling or produced fluids.

2. NATURAL AREAS

In natural areas with native tree or shrub cover, to avoid significant habitat loss and habitat fragmentation, site disturbance is to be minimized.

3. SPECIAL AREAS

River valleys and other special areas, because of their unique microclimates, have greater potential for the occurrence of rare or endangered plant species. In special areas, a survey for rare and endangered plant species will be required and the wellsite relocated if such species are found.

4. AREAS SUBJECT TO EROSION

Where there is potential for erosion at a wellsite, the wellsite should be

- (1) revegetated,
- (2) diked to divert runoff water around the wellsite, and
- (3) where necessary to prevent erosion by diverted runoff water, flow control structures installed.

5. CULTIVATED LAND

In order to minimize the loss of cultivated land and inconvenience to farming operations, the wellsite should be;

- (1) where possible, located along the edge of cultivated fields, and
- (2) where the wellsite cannot be located in accordance with (1), it should be located a minimum of 60 m from the edge of a field or such other distance as may be required to minimize inconvenience to farming operations.



the Oil and Natural Gas
Conservation Board

Room 143
Legislative Building
Winnipeg, Manitoba, CANADA
R3C 0V8

(204) 945-3130
FAX: (204) 945-0586

Order No. SU 10

An Order Pertaining to Drilling Spacing Units Virden Lodgepole B Pool

WHEREAS, subsection (9) (b) 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

(b) respecting the designation of the area that shall be allocated to a well in connection with fixing allowable production;"

AND WHEREAS, subsection (1) (f) of section 63 of "The Mines Act" being Chapter M160 of the Continuing Consolidation of the Statutes of Manitoba, provides as follows:

"63(1) For the purpose of carrying out the provisions of this Part and Part III according to their intent, the Lieutenant Governor in Council may make such regulations and orders as are ancillary thereto, and are not inconsistent therewith; and every such regulation or order made under, and in accordance with the authority granted by, this section has the force of law; and, without restricting the generality of the foregoing, the Lieutenant Governor in Council may make regulations and orders, not inconsistent with any other provision of this Part of Part III,

(f) prescribing spacing units and the size and shape of spacing units;"

AND WHEREAS, subsection (1) of Section 20 of Manitoba Regulation 430/87R under The Mines Act ("the Petroleum Drilling and Production Regulation") provides as follows:

"20(1) Notwithstanding section 19, the board may, after a public hearing or after publication of notice, prescribe by order special drilling spacing units which may differ from normal drilling spacing units in size, shape or target area."

AND WHEREAS, subsection (3) of Section 21 of the Petroleum Drilling and Production Regulation provides as follows:

"21(3) Where a special drilling spacing unit is prescribed under section 20, the board may prescribe the target area within which a well shall be completed in order to qualify for a maximum permissible production rate based on the area of the special drilling spacing unit."

AND WHEREAS, the Board received an application dated November 10, 1993 from Chevron Canada Resources as unit operator of Virden Roselea Unit No. 1 ("the unit area") for approval to reduce the size of drilling spacing units in the unit area outlined in Schedule A.

AND WHEREAS, upon publication of notice of the application, the Board received an objection to the application, which was subsequently withdrawn.

AND WHEREAS, the Board considers that establishment of smaller drilling spacing units within the unit area will result in an increase in recovery of crude oil from the unit area.

NOW THEREFORE, the Board orders that:

1. Subject to clause 2 and 4 herein, the spacing unit for each well drilled, or to be drilled, for the purpose of obtaining oil from or injecting salt water into the Mississippian Lodgepole Formation within the unit area is a square, 8 hectares in area, with corners located at the midpoints of the boundaries of each legal subdivision, as illustrated in Schedule A.
2. Where a spacing unit established by clause 1 intersects the boundary of the unit area, the unit boundary shall truncate the spacing unit and form part of the spacing unit boundary as illustrated in Schedule A.
3. The target area of each drilling spacing unit shall be an area having sides sixty-five metres from the sides of the drilling spacing unit and parallel to them.
4. Notwithstanding clause 3, no well shall be completed nearer to any boundary of the unit area than 100 metres or nearer to any other well than 130 metres.

5. Where in the opinion of the Director of Petroleum, drilling a well on a site that is proposed in an application for a well licence might cause significant adverse impact on the environment or significantly impair use of the surrounding land, the Director may refuse to issue the licence.
6. Board Order No. SU 8 is hereby rescinded.

H. Clare Moster
Deputy Chairman

David Tomasson
Chairman

OIL AND NATURAL GAS
CONSERVATION BOARD ORDER
NO. SU 10 APPROVED THIS
DAY OF A.D., 1994
AT THE CITY OF WINNIPEG.

APPROVED:

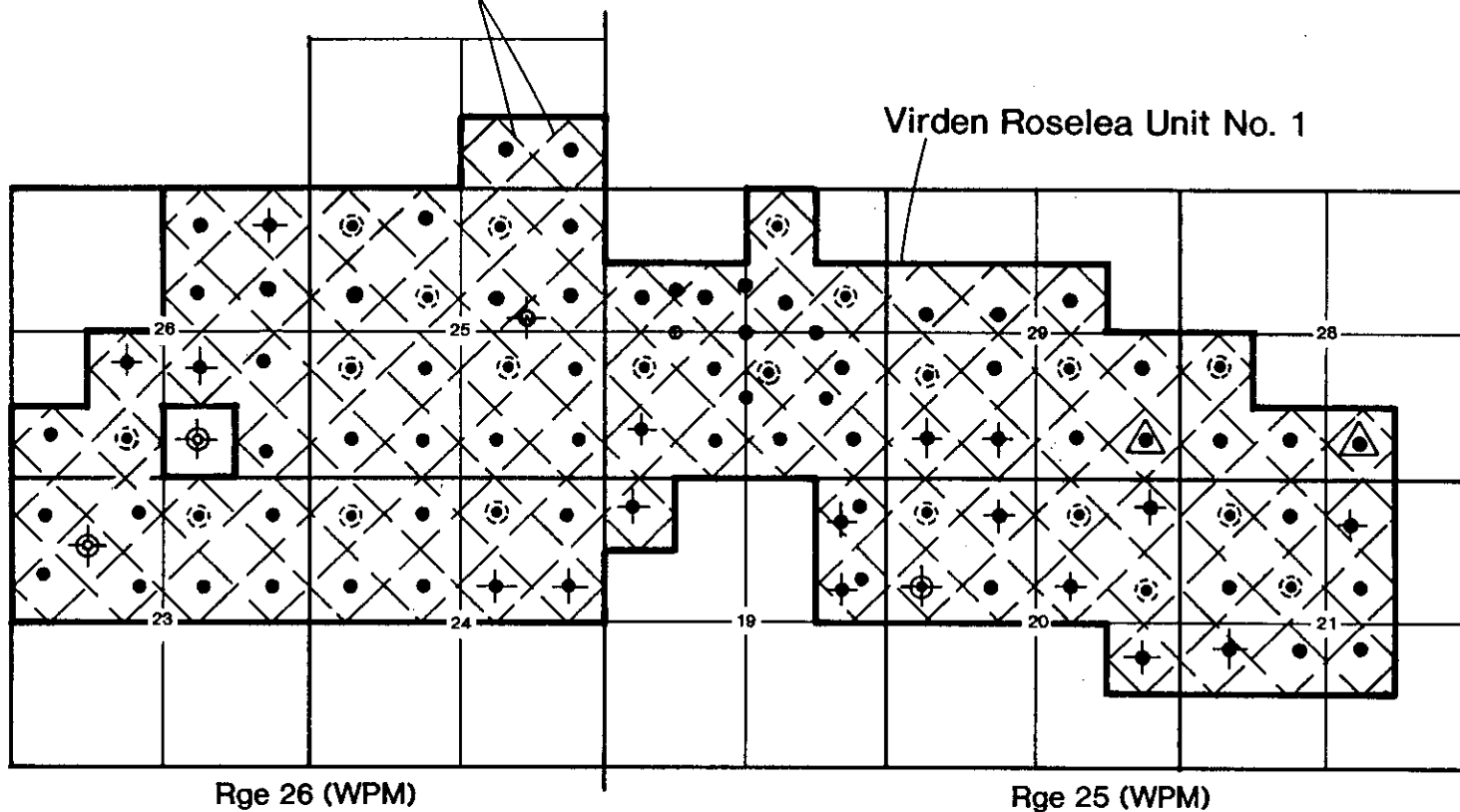
Donald W. Orchard
Minister of Energy and Mines

**SCHEDULE A
BOARD ORDER NO. SU 10
VIRDEN ROSELEA UNIT NO.1
8 Hectare Drilling Spacing Units**

8 Hectare Spacing Units

Virden Roselea Unit No. 1

Twp
10



LEGEND

- | | |
|---------------------------------|---------------------------------|
| ● Oil producer | ⊕ Abandoned water supply well |
| ⊕ Abandoned oil producer | ⊙ Standing well |
| ⊙ Water injection well | ⚠ Proposed water injection well |
| ⊕ Abandoned water disposal well | |



Petroleum and Natural Gas
Conservation Board

555 — 330 Graham Avenue
Winnipeg MB R3C 4E3
CANADA

(204) 945-1111
FAX: (204) 945-0586

Mr. K. G. Matieshin, P. Eng.
Manager, Environment, Safety and Regulations
Chevron Canada Resources
500 - 5th Avenue SW
Calgary AB T2P 0L7

Dear Mr. Matieshin:

Re: Virden Roselea Unit No. 1
Reduced Spacing Project Approval

The Board has completed its review of your application for approval of reduced 8 ha spacing in Virden Roselea Unit No. 1 (VRU No. 1) and for approval to convert two wells to water injection.

Board Order No. SU 10 establishes 8 ha drilling spacing units for VRU No. 1. The Petroleum Branch and Departments of Rural Development, Environment and Agriculture have developed well siting criteria and conditions which are to be used when selecting locations under Board Order No. SU 10. Attachment 1 lists the well siting criteria and conditions. The proposed locations for the 14 infill wells outlined on the air photos in your deficiency letter (March 1, 1994) are acceptable. However, final approval of infill well locations will be based on a survey of the site. In order to avoid having to resurvey and relocate any infill locations, Chevron should contact the Petroleum Branch's Virden District Office and have a Petroleum Inspector participate in the final site selection for the following locations; 14A-21, 14B-21, 4B-28, 4C-28 and 8A-30-10-25 (WPM).

Future infill locations will be reviewed at the time of licensing. Proposed locations will be reviewed by the Petroleum Branch and the Departments of Agriculture and Environment to ensure the well siting criteria and conditions are met and environmental and land use impacts are minimized. To accommodate the review process, well licences should be submitted at least one month prior to the expected drilling date. Please note Clause 5 of Board Order SU No. 10 provides that;

5. Where in the opinion of the Director of Petroleum, drilling a well on a site that is proposed in an application for a well licence might cause significant adverse impact on the environment or significantly impair use of the surrounding land, the Director may refuse to issue the licence.

Board Order No. PM 65 (May 14, 1991) covers pressure maintenance operations in VRU No. 1. The conversion of 2-28-10-25 and 1-29-10-25 to water injection is hereby approved under Section 1(1) of Board Order No. PM 65. Application for future injection conversions should be made under this section.

Section 7 of Board Order No. PM 65 requires Chevron to submit an annual waterflood progress report. The report is to contain the information listed in Attachment 2.

Plans for the following activities, as outlined by Chevron in its application, are acceptable:

- (1) spill mitigation and surveillance,
- (2) housekeeping, and
- (3) facility design and construction.

You are reminded that in accordance with Section 56 of the Petroleum Drilling and Production Regulation, wells are to be production tested at least quarterly.

A copy of Chevron's contingency plan for well control is to be submitted with the applications for a well licence.

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

Yours respectfully,

H. Clare Moster
Deputy Chairman

cc: B. Gossen, Rural Development
F. Phillips, Environment
K. McGill, Agriculture

Attachment 1

INFILL WELL SITING CRITERIA

1. WATER-COVERED AREAS

Where there is potential for contaminants to enter water-covered areas, the wellsite should be

- (1) where possible, moved above the high water level, and
- (2) diked to prevent runoff of drilling or produced fluids.

2. NATURAL AREAS

In natural areas with native tree or shrub cover, to avoid significant habitat loss and habitat fragmentation, site disturbance is to be minimized.

3. SPECIAL AREAS

River valleys and other special areas, because of their unique microclimates, have greater potential for the occurrence of rare or endangered plant species. In special areas, a survey for rare and endangered plant species will be required and the site relocated if such species are found.

4. AREAS SUBJECT TO EROSION

Where there is potential for erosion at a wellsite, the wellsite should be

- (1) revegetated,
- (2) diked to divert runoff water around the wellsite, and
- (3) where necessary to prevent erosion by diverted runoff water, flow control structures installed.

5. CULTIVATED LAND

In order to minimize the loss of cultivated land and inconvenience to farming operations, the wellsite should be;

- (1) where possible, located along the edge of cultivated fields, and
- (2) where the wellsite cannot be located in accordance with (1), it should be located a minimum of 60 m from the edge of a field or such other distance as may be required to minimize inconvenience to farming operations.

Attachment 2

Virden Roselea Unit No. 1 Annual Waterflood Progress Report Requirements

Pursuant to Section 7 of Board Order No. PM 65 the report of the pressure maintenance program to be submitted annually is to include;

- (a) the oil production rate, injection rate, GOR and WOR during each month for each injection pattern and for the whole unit;
- (b) the cumulative volume of oil, gas and water produced and fluid injected for each injection pattern and for the whole unit at year end;
- (c) the monthly wellhead injection pressure for each injection well;
- (d) a summary of the result of any survey of reservoir pressure conducted during the year;
- (e) the date and type of any well servicing;
- (f) calculations of the voidage replacement ratio on a monthly and cumulative basis for each injection pattern and for the unit area;
- (g) an outline of the method used for quality control and treatment of the injected fluid;
- (h) a report of any unusual performance problems and remedial measures taken or being considered;
- (i) an estimate of incremental recoverable reserves attributable to reduced 8 ha spacing and pattern realignment; and
- (j) any other information that the operator or Director of Petroleum considers necessary to evaluate the performance of the waterflood.

The data referred to in clauses (a) to (c) is to be submitted in tabular and graphical form.



The Oil and Natural Gas
Conservation Board

555 — 330 Graham Avenue
Winnipeg MB R3C 4E3
CANADA

(204) 945-1111
FAX: (204) 945-0586

Mr. John Fefchak and Ms. Norma Tibbits-Fefchak
P.O. Box 2142
Virden MB R0M 2C0

Dear Mr. Fefchak and Ms. Tibbits-Fefchak:

**Re: Virden Roselea Unit No. 1
Reduced Spacing Approval**

The Board is in receipt of a copy of your letter to Chevron Canada Resources, indicating you are satisfied that Chevron will address your concerns when siting its infill wells in the SE/4 of Section 25-10-26 (WPM).

For your information, attached is a copy of Board Order No. SU 10 approving reduced 8 ha spacing in Virden Roselea Unit No. 1. Also attached is a copy of the infill well siting criteria and conditions Chevron is to follow when locating the infill wells.

If you have any questions, please contact L.R. Dubreuil, Director of Petroleum or John N. Fox, Chief Petroleum Engineer at 945-6573 or 945-6574 respectively.

Yours respectfully,

H. Clare Moster
Deputy Chairman

cc: Chevron Canada Resources

R.25W1M

T.10

R.25W1M

VIRDEN ROSELEA UNIT 1

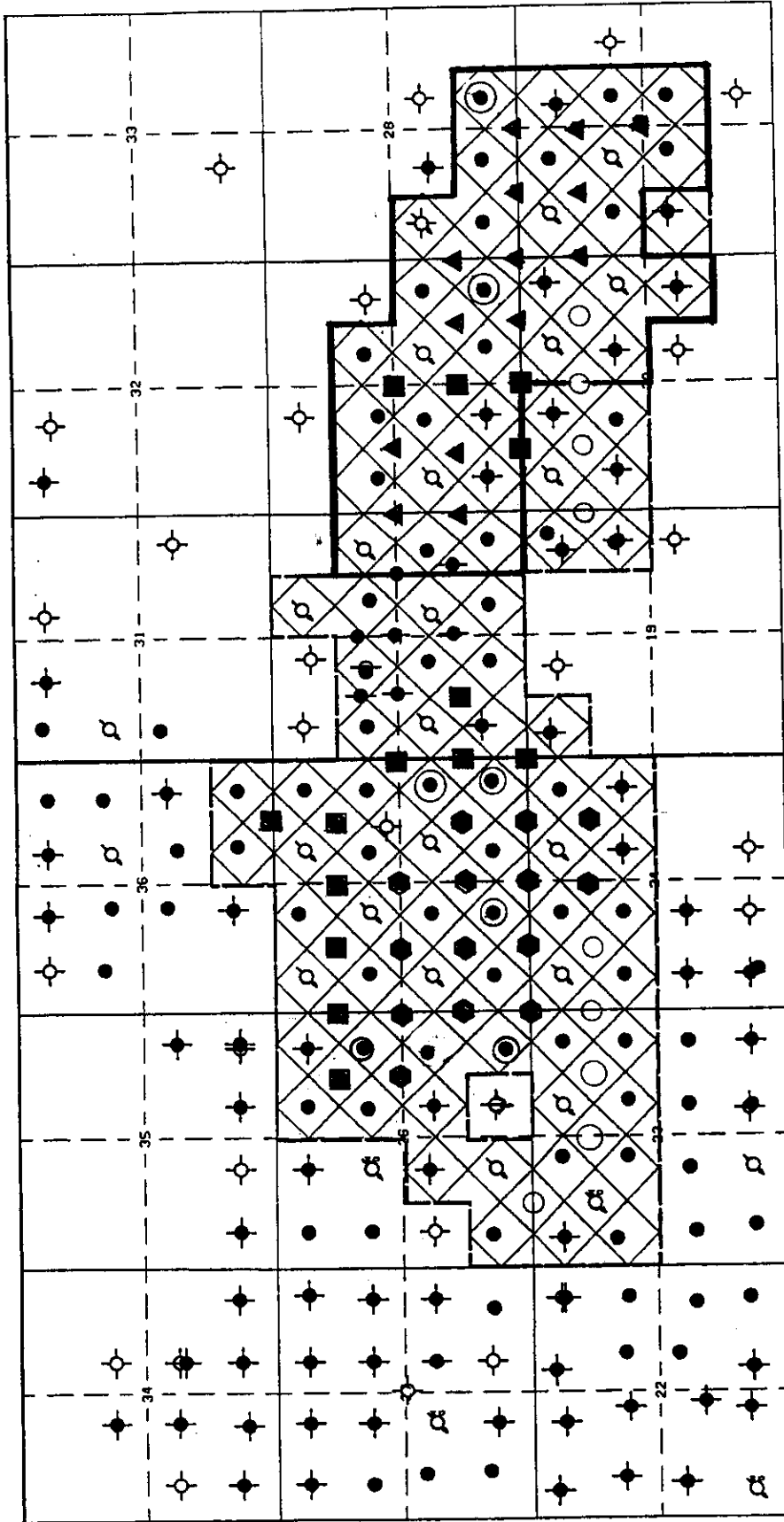
8 HECTARE DRILLING SPACING UNITS

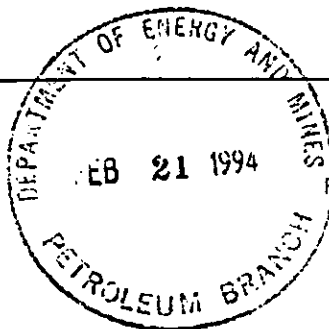
- PHASE 2 PROTECT AREA
- 1991 INFILL WELLS
- ▲ 1994 INFILL WELLS
- 1995 INFILL WELLS
- 1996 INFILL WELLS
- ⊙ PROPOSED WIW CONVERSIONS

R.26W1M

T.10

R.26W1M



Manitoba**Memorandum**

Date February 17, 1994
 To John N. Fox
 Chief Petroleum Engineer
 Petroleum Branch
 555-330 Graham Avenue

From Floyd Phillips, Chief
 Terrestrial Quality
 Management

Subject **Virden Roselea Reduced Spacing**

Telephone 945-7003

Thank you for the air photos with the locations of the 14 infill wells proposed for 1994. As I indicated at the meeting, the concerns that I have relate to:

1. Potential for contaminants to enter wetlands, during both the drilling and operational phases. This impact can be prevented by siting wells above the high water mark of a wetland. If the land slopes toward the wetland, a dike should be constructed to prevent any runoff and potentially harmful contaminants from reaching the wetland.
2. Disturbance to natural areas, e.g. areas with native tree or shrub cover. The intent is to minimize habitat loss and habitat fragmentation. This can be accomplished by siting wells at the edge of a bush, rather than in the middle.
3. Siting the wells on river or creek valley slopes. Valleys because of their unique microclimates have a greater potential for the occurrence of rare or endangered plant species. If a well is to be located on a valley slope, a vegetation survey should be conducted for the site as well as any access disturbance to ensure that rare or endangered plants are not destroyed. Where feasible, the well site should be located in an area where rare or endangered species will not be lost.

Another concern is for loss of habitat due to erosion resulting from the siting of a well on a valley slope. Erosion not only affects vegetation communities downslope of the site but has the potential to cause siltation of the river or creek or may even carry toxic chemicals to the waterway. Erosion can be minimized by diverting runoff water around the well site and using flow control structures to slow the water where the diverted water may create a stream.

4. The loss of cultivated agricultural land and the inconvenience in farming the land. Often this can be accomplished by locating the wells along the edge of fields, e.g. along fence lines or in the edge of a bush or pasture land. If a well must be located in the field, it should be at least 60 m from the edge of the field to enable the farmer to operate wide machinery between the edge of the field and the well.

I have the following specific suggestions regarding the siting of the 14 wells proposed for 1994:

- 1- Move to the edge of the bush; possibly due south on the edge of the naturally vegetated ridge.
- 2- Move to the edge of the bush; north where it would be close to the road.
- 3- Okay as long as the site is above the high water mark of the slough and the slough is protected from direct runoff from the site by a dike.
- 4- Site in the edge of the bush.

- 5- Okay.
- 6- Okay as long as the land does not slope toward the small slough to the NE.
- 7- Move west to the edge of the open area adjacent to the road.
- 8- Move to the edge of the bush, either north, south or west near the edge of the road.
- 9- Okay as long as it is close to the edge of the field. It also looks like there is a drainage ditch immediately to the south of this well site which probably drains to the river. Specific protection measures (e.g. dike) should be used to prevent spills at the well site from entering that drain.
- 10- Okay as this seems to be a damp area of the field on the site of an old oxbow.
- 11- Move to the edge of the bush.
- 12- Okay
- 13- Okay out in the field but could move north to the south edge of the wetland as long as a dike was installed to keep contaminants out of the slough.
- 14- This well appears to be on the slope of the valley. A vegetation survey for rare or endangered plant species would be needed, and the site would require erosion protection measures. It might be preferable to move the well to the non-treed strip to the west, thus reducing the amount of tree removal. In addition, the slope may improve as one moves away from the river, i.e. up out of the valley.

Other measures such as stripping the topsoil prior to drilling or trenching, and respreading it after the well is developed and after the flow lines are installed, should be standard practice.

I would like the opportunity to review the balance of the infill well locations, prior to their approval by the Petroleum Branch, in subsequent years.

I trust that these comments will provide you with criteria respecting the environmentally acceptable siting of future wells. If you have further questions or need clarification of my recommendations please let me know.

Thank you for the opportunity to comment on this infill project.

Floyd
Floyd

Note: I thought you might need the air photos back. → Sent to Ken McGill with instructions to return to you.
What about the proposal document?
JF.

Manitoba



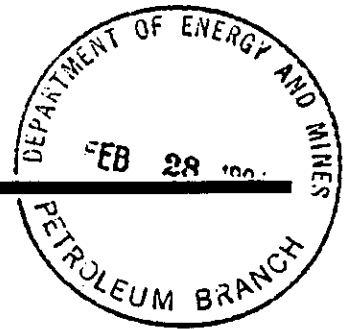
February 24, 1994

MEMORANDUM

John N. Fox, Chief Petroleum Engineer
Petroleum Branch
Energy & Mines
555 - 330 Graham Avenue
Winnipeg, Manitoba

Ken McGill, A/Chief
Soil Survey & Land Utilization
Manitoba Agriculture
Box 1149
Carman, Manitoba

Reduced Spacing Application - Virden Roselea Unit No 7



Floyd Philips forwarded the air photos supplied to him on which were located the 14 specific infill well sites identified in the above proposal for development in 1994.

It appears that only four of these sites are located in annually cropped fields (9, 11, 12, 13). The remaining seem to be located either in bush areas (1, 2, 4, 7, 8, 14), in non annually cropped (pasture?) land (6), along the edge of fields (5) or adjacent to non cultivated land (3, 10).

With regard to the four sites within annually cultivated fields, the preferred location would be either at the edge of the field or, if not possible, into the field far enough to provide adequate clearance between the installation and the edge of the field (50 meters or more). Specifically:

Site 9 - preferred location would be as far to the south, adjacent to the field border, if possible. There appears to be an access road, drain or some pasture at the southern edge of the field.

Site 11 - preferred location would be as far to the west as possible, adjacent to the bush area.

Site 12 - satisfactory if it is not feasible to move the site south and adjacent to the non cultivated oxbow area.

Site 13 - preferred location would be as far to the west as possible, at the edge of the field.

I believe one of the important considerations in ultimately siting the installations is that the individual landowners/managers are consulted, actively involved in the site selection, "support the infill program" on their property and that the project "not proceed without the full consent of the affected land owner".

The remaining comments provided in my memo of February 2, 1994 still apply. In particular, I would like to indicate agreement with the 14 sites now identified is not an acceptance of the entire project involving up to a total of 55 infill wells, 41 of which have yet to be specified.

Handwritten signature of Ken McGill, consisting of a stylized 'K' followed by 'NL'.

Ken McGill, A/Chief
Soil Survey & Land Utilization



February 14, 1994

Mr. John Fefchak and Ms. Norma Tibbits-Fefchak
P.O. Box 2142
Virden, Manitoba
R0M 2C0

Chevron Canada Resources
P.O. Box 100
Virden, Manitoba R0M 2C0
Phone (204) 748-1334
Fax (204) 748-6762

Dear Mr. Fefchak and Ms. Tibbits-Fefchak:

**RE: CONCERNS ON CHEVRON'S APPLICATION FOR REDUCED SPACING IN
VIRDEN ROSELEA UNIT #1**

This letter is to address your concerns regarding the impact of possible drilling operations and the subsequent producing operations on your land and the immediate surrounding lands as a result of our Reduced Spacing Application in Virden Roselea Unit #1.

As discussed with you on February 7, 1994, should drilling be planned in the future on or near your property, Chevron will minimize both the inconvenience to you and the disturbance of the land as follows:

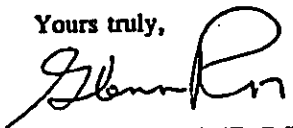
1. Noise from the drilling operations will be minimized by the use of a small drilling rig and the use of mufflers on the rig. If the drilling operations were carried out close to your residence such that it affected your routine schedule, an annoyance compensation would be discussed with you and agreed upon prior to the commencing of the drilling operations.
2. Noise and the "eyesore" from the artificial lift equipment installed on new wells is a concern to you. Normally a pumpjack is used to recover the oil. Chevron will review the use of installing smaller less visible alternatives if the situations allow. Chevron will use natural buffer zones (existing trees or planting of trees) as much as practical to reduce noise.
3. Once the actual well locations have been chosen, you will be notified so that we can discuss the sites, view the sites and ensure that the sites are situated in spots that are both acceptable to you and to Chevron. This should eliminate the concerns expressed as to nature's garden/water springs in the area and habitat for birds and wildlife.
4. No plans to build additional surface facilities to handle new production are planned. Additional production can be handled with either no increase or a slight increase in the size of our present facilities.
5. Currently, a shallow well supplies your home with water. A water sample would be taken from your well and analyzed prior to our operation. If you detect any contamination of the well resulting from the proposed drilling operations in your area, Chevron would resample and reanalyze your water and if contamination has resulted, we would ensure that a water supply acceptable to you and Chevron would be provided.

Hopefully the above adequately addresses all your concerns regarding the Virden Roselea Unit #1 Reduced Spacing Application. The drilling in your area is tentatively scheduled for 1995 but may change or not happen at all. You will be notified as early as possible when specific locations are finalized so that you and Chevron can review them to ensure that they are acceptable to both parties.

If this letter does address your concerns, a letter indicating such to Chevron or The Oil and Natural Gas Conservation Board would be appreciated.

If you have more concerns, please contact Glenn Ross at the Virden office at 748-6341.

Yours truly,


for J.E. CAUSGROVE, P.Eng
Virden Business Unit Manager

Attachment 4

P.O. BOX 2142,
Virden, Manitoba,
R0M 2C0.

February 21, 1994.

Chevron Canada Resources,
P.O. Box 100
Virden, Manitoba,
R0M 2C0.

ATTENTION: Mr. J.E. Causgrove, P. Eng.

Dear Mr. Causgrove:

RE: CONCERNS ON CHEVRON'S APPLICATION FOR REDUCED SPACING IN VIRDEN ROSELEA
UNIT # 1

Receipt of your letter dated 14 FEB 94, in regard to and addressing our concerns is hereby acknowledged.

Please be advised that your letter does address the concerns that we initially presented. We both feel Chevron has taken a serious and conscientious attitude in reducing or eliminating the concerns that were voiced in our initial objections and notice of intervention to The Oil and Natural Gas Conservation Board.

We are quite satisfied that Chevron staff has openly discussed the alternatives with us personally. We must state that their intentions appear to be most commendable in regard to our personal concerns and the surrounding nature of the land and wildlife therein.

Yours truly,


John Fefchak


Norma Tibbits-Fefchak



Chevron

Calgary, Alberta
March 1, 1994

Chevron Canada Resources

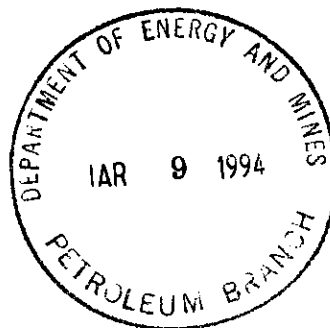
500 - Fifth Avenue S.W.
Calgary, Alberta T2P 0L7
Phone (403) 234-5000
Fax (403) 234-6206

K. G. Matieshin

Manager
Environment, Safety and Regulations

Oil and Natural Gas Conservation Board
Attention: Mr. John Fox
Room 309
Legislative Building
Winnipeg, Manitoba
R3C 0V8

VIRDEN LODGEPOLE "B" POOL
VIRDEN ROSELEA UNIT 1
REDUCED SPACING APPLICATION



Dear Mr. Fox

In response to the deficiencies of the subject application raised in your letter of January 20, 1994, Chevron offers the attached information.

If there are any questions regarding this letter, please contact Jan Major in our Calgary office at (403) 234-5034.

Yours very truly,

⁶⁴K.G. Matieshin, P. Eng

Attach.

1991 VRU No. 1 Reduced Spacing Pilot Analysis

Incremental Reserves

Attachments 1 through 6 present decline analysis of remaining reserves for the entire Unit 1 with and without the 1991 infill wells and WIW conversions (09-30 and 15-30-10-25). The results are summarized as follows:

Decline Analysis Method	Without 1991 Pilot Total Reserves E3 m3	With 1991 Pilot Total Reserves E3 m3	Incremental Reserves E3 m3
Exponential Decline	2599 ✓	2659 ✓	60
Rate vs. Cumulative Oil	2579 ✓	2660 ✓	81
WOR vs. Cumulative Oil	2534	2677	143
Average	2571	2665	94

We have also looked at the sweep efficiencies of the production scenarios with and without the 1991 pilot project. As seen on Attachment 7, the sweep efficiency for the entire Unit has been increased by the 1991 infill wells and WIW conversions. From January 1992 to the forecasted life of the Unit we expect to inject 0.4 pore volumes. Referring to Figure 7, this corresponds to a sweep efficiency of 38 percent versus 36 percent for the old production scenario - a 2 percent increase. This corresponds to an incremental volume of 54 E3 m3.

- * Chevron feels the incremental recovery for the 1991 infill project is in the order of 60 E3 m3 - not the 90 E3 m3 previously reported. *2571 m3/well*

Oil / Water Contact

The apparent discrepancy in elevation of the oil-water contact in the 1991 pilot area analysis is a result of some confusion in terminology. The figure of -180 meters MSL represents the interpreted minimum elevation (highest) of the original "free water level". The "free water level" represents the elevation below which the reservoir is 100% water saturated. Chevron generally uses "oil-water contact" to represent the elevation below which water saturation is too high to allow economic production. The placement of the contact is somewhat arbitrary and is usually placed at 50 or 60% water saturation as determined by log evaluation.

In most oil-fields there is a very thin transition zone between the reservoir at irreducible water saturation and the reservoir below "free water level". In these cases the "oil-water contact" and "free water level" are near-coincident. In the Virden Lodgepole pools there is little (if any) reservoir at irreducible water saturation and most production comes from a very thick transition zone.

check against swab results { Log analysis of the three wells with Cherty pay shows "oil-water contacts" at -165.4m (10C-30), -169.2m (8C-30), and -171.7m (8B-30). As discussed above, the elevations given represent the elevations below which water saturation is greater than 50% (at the time of logging). Attachments 8, 9, 10, and 11 are the Log Evaluation sheets for the above referenced wells and for 11B-30.

We are at a loss to fully explain the water production from 11B-30. The well was drilled into a mature pool that has been under waterflood for some time. It may be that all moveable oil had been drained or swept from the area prior to drilling. Alternately, high water influx via vertical fractures may have dominated any potential oil flow from oil-bearing zones. It is interesting to note that fluid containing 10% oil was swabbed from the Sandhill and Crinoidal during the testing of the well.

Natural Fractures

A review of the wellsite core descriptions was done to determine the extent of natural fractures. The following conclusions were reached. The majority of fractures are vertical and are not confined to any single zone. It is not possible to determine the orientation (NW-SE for ex.) of the fractures from core descriptions. Fractures do appear to be more prevalent on the structural flanks. This is consistent with the theory that structure in this area is caused by underlying salt solution.

1993 (1994) Virden Roselea Unit No. 1 Reduced Spacing Application

Incremental Recovery

OOIP for the 1994 infill Project Area is estimated to be 2500 E3 m3. Thus the 125 E3 m3 incremental recovery represents a 5 % incremental recovery factor. Chevron feels this 5 % increase can be achieved through infill drilling and pattern realignment which is also currently being evaluated. Attachment 12 and 12A are tables of the OOIP and expected incremental recovery on a per LSD basis for the 1994 project area.

compare with 1991 Δ recovery

Drilling Procedures

12.69 kPa/m
The 1300 kg/m³ drilling mud density used in the Reduced Spacing Application, reflects the mud density required to offset the bottom hole pressure encountered in 6 of the 7 wells drilled in the 1991 Roselea Infill Drilling Program.

Due to the low productivity of wells in this area of the field, we believe these wells can be safely drilled, without undue risk of a uncontrolled salt water flow at surface, with a 1300 kg/m³ mud density. The average total fluid production rate for wells in the waterflood patterns where the 1994 infills wells will be drilled is approximately 10 m³/day, while being pumped. (November 1993 production information)

check

The 11B-30 location drilled in 1991, which was never tied in, showed signs of waterflood breakthrough during completion. After bleeding off a shut-in casing pressure of around 5200 kpa, the well flowed at approximately 0.5 m³/hr with a flowing pressure too small to measure. Another well 4A-29, which had been tied in and was producing when waterflood breakthrough occurred in 1991, appeared to stabilize at 4.7 m³/hr, with a flowing wellhead pressure too small to measure. It's initial shut-in pressure was recorded as 4800 kpa. Given these low influx rates, there is more than adequate time to effectively circulate a kill weight mud into the wellbore. Presently there is no conclusive evidence to suggest that the high flow rate, high pressure zones encountered while drilling in the Daly field will be seen in new drills in Roselea Unit #1.

In any event, a detailed contingency plan for well control will be in place prior to the beginning of drilling operations. The following issues will be addressed by this plan:

- minimum surface casing requirements
- leak-off testing of the surface shoe
- on-site kill weight drilling fluids
- on-site salt water storage
- off-site salt water disposal / injection
- well control methods
- emergency contacts and phone numbers

This plan will be submitted for your approval prior to the start of the program.

Testing Procedures

- ✓ In accordance with the proposed new Drilling and Production Regulations, Chevron will test new wells quarterly.

Future Phases of Infill Drilling in VRU No. 1

To drill out VRU No.1 to 8 ha spacing would require a total of 51 locations. Drilling 14 this year would leave 37 locations remaining. Under Chevron's current budget forecasts, we would expect to continue drilling an average 14 infill wells per year. In light of this constraint, the future phases would be:

	1995	1996	1997
		<u>Producers</u>	
1	02 B - 29 - 10 - 25	01 B - 25 - 10 - 26	13 B - 24 - 10 - 26
2	03 B - 29 - 10 - 25	02 B - 25 - 10 - 26	14 B - 24 - 10 - 26
3	07 B - 29 - 10 - 25	03 B - 25 - 10 - 26	15 B - 23 - 10 - 26
4	10 B - 29 - 10 - 25	04 B - 25 - 10 - 26	16 B - 23 - 10 - 26
5	04 B - 30 - 10 - 25	05 B - 25 - 10 - 26	13 B - 20 - 10 - 25
6	05 B - 30 - 10 - 25	06 B - 25 - 10 - 26	14 B - 20 - 10 - 25
7	06 B - 30 - 10 - 25	07 B - 25 - 10 - 26	15 B - 20 - 10 - 25
8	12 B - 30 - 10 - 25	08 B - 25 - 10 - 26	16 B - 20 - 10 - 25
9	13 B - 25 - 10 - 26	10 B - 25 - 10 - 26	03 B - 26 - 10 - 26
10	14 B - 25 - 10 - 26	11 B - 25 - 10 - 26	
11	15 B - 25 - 10 - 26	12 B - 25 - 10 - 26	37 infill wells
12	16 B - 25 - 10 - 26	09 B - 26 - 10 - 26	
13	16 B - 26 - 10 - 26	15 B - 24 - 10 - 26	
14	01 B - 36 - 10 - 26	16 B - 24 - 10 - 26	

Continuing with the plan to complete infill wells as producers and to achieve repeated inverted nine-spot patterns, the following WIW conversions would be required:

	1995	1996	1997
		<u>Injectors</u>	
1	09 - 25 - 10 - 26 2.02	01 - 25 - 10 - 26 4.76	
2	09 - 26 - 10 - 26 0.67	03 - 25 - 10 - 26 1.64	
3		01 - 26 - 10 - 26 0.54	

This pattern realignment is still being evaluated.

See Attachment 13 for development phases.

Increase in Recovery

The estimated increase in ultimate recovery is 5 % and is achieved both by infill drilling and pattern realignment. Assuming an average production increase of 2 m3opd per well, the Unit estimated production increase would be 62 m3opd. This assumes 37 wells are drilled with 6 of these wells being uneconomic to complete.

2 m3opd
production
loss due to
conversions

16%
1/6 chance well will be uneconomic
to complete

Facility Upgrades

Facility upgrades are estimated to follow the completion of each phase of drilling to ensure proper design. Therefore the upgrade would occur as follows:

1994 01 - 29 - 10 - 25
1995 10 - 25 - 10 - 26
1995 04 - 25 - 10 - 26

*contained on existing
battery sites*

Capital Costs

Estimated Costs for the 1994 project and future costs are as follows (1994 Dollars) :

	Tangible Unit Cost \$M	Intangible Unit Cost \$M	Total Tang Cost \$M	Total Intang Cost \$M	Total Cost \$M
1994					
Drill 14 wells	17	115	238	1,610	1,848
Complete 14 Wells	17	18	238	252	490
Tie - in 14 Wells (includes pumpjacks)					255
Convert 2 wells to water injection	10	10	20	20	40
Tie-in 2 WIW's	10	10	20	20	40
Upgrade 1 Facility	5	10	5	10	<u>15</u>
					2,688
1995					
Same as 1994					2,688
1996					
Same as 1994 plus one WIW conversion		(add \$ 40M)			2,728
1997					
Drill 9 wells	17	115	153	1,035	1,188
Complete 9 Wells	17	18	153	162	315
Tie - in 9 Wells					<u>164</u>
					1,667

Benefits

Attachments 14 and 14 A present the annual benefits to the Crown and Freehold mineral rights owners. The increased income will be distributed in an equitable fashion to all Lessees and Lessors.

Other benefits will include revenues through Provincial taxes on oil field equipment and flowlines, and surface rights compensation.

\$ /year rental *\$ /well + flowline*

Risk

Infill drilling in Virden Roselea Unit 1 may be postponed if the wells encounter areas already swept by the waterflood and therefore fail to produce economic rates. Oil price is a main factor in determining the economic feasibility of a project ; sustained low oil prices may make infill drilling uneconomic.

Chevron, and the other Working Interest Owners have a variety of projects to fund each year within their own capital budgets. It is possible that approval under the Unit Operating agreement could not be obtained if enough companies choose not to support infill drilling.

Chevron - 68.5 %

Enhanced Oil Recovery

Amerada Hess - 19.2 %

Talisman - 5.5 %

In 1987, Chevron completed a scoping evaluation of implementing a hydrocarbon miscible flood in the North Virden Scallion field. It was concluded that such a project was technically risky and was not feasible.

Chevron continues to review HCMF projects in the Virden area, although we believe there are more attractive fields than Virden Roselea Unit 1.

Environmental and Land Use Impacts

Attachments 15,16,17, and 18 are aerial photographs showing the proposed locations and flowline routes. Two locations indicated in the original Application have been revised to fall within target areas.

02 B - 28 - 10 - 25 is now 03 A - 28 - 10 - 25 this will move the location away from a pothole and limit the amount of scrub brush to be removed

05 A - 29 - 10 - 25 is now 03 C - 29 - 10 - 25 this will move the location from a low area which is hayed up to higher ground on the edge of the area being hayed.

Following is a brief description of the proposed sites

✓ 1. Chevron VRU No. 1 11 A - 21-10-25 WPM ✓
Pasture: rocky, minimal bush removal required, close to lease road.

✓ 2. Chevron VRU No. 1 13 B - 21-10-25 WPM ✓
River valley: located on edge between cultivated land and trees. Negligible surface impact.

✓ 3. Chevron VRU No. 1 14 A - 21-10-25 WPM ✓ P.B. will have to waive water covered area regulatory offset
Pasture: north-west of slough. Will need to construct a contoured berm around the well site to divert run-off water and re-vegetate the well site including the berm.

✓ 4. Chevron VRU No. 1 14 B - 21-10-25 WPM ✓ drill east of access road between 11-21-10-25
Pasture: extremely rocky, located near edge of slope. Will need to minimize disturbance of natural vegetation, construct a contoured berm around the well site to divert run-off water and re-vegetate the well site including the berm.

✓ 5. Chevron VRU No. 1 03 A - 28-10-25 WPM ✓ (formerly 02 B - 28 - 10 - 25)
Pasture: minimal bush removal required, moved away from pothole

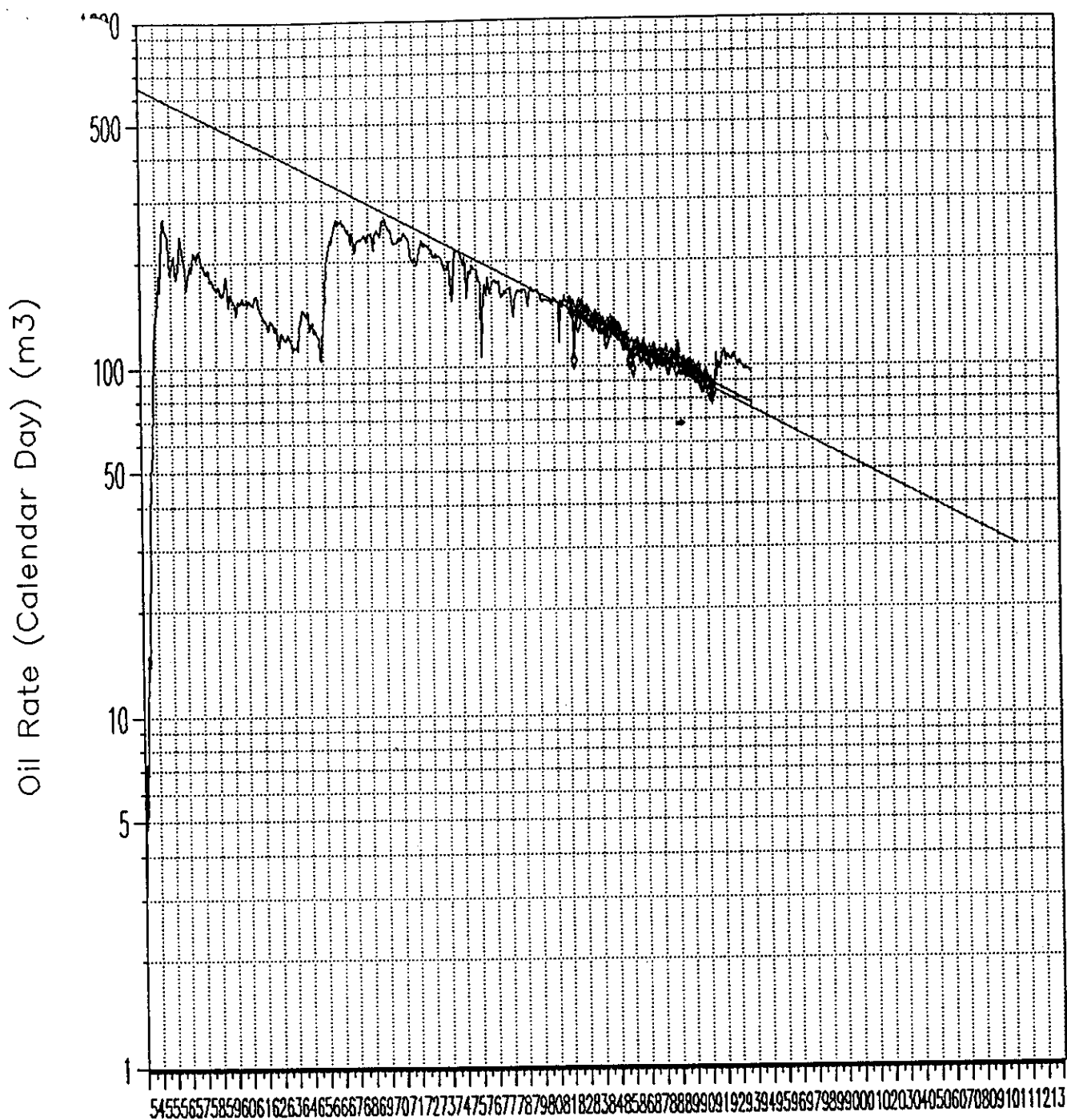
✓ 6. Chevron VRU No. 1 03 B - 28-10-25 WPM ✓
Pasture: minimal bush removal required

7. Chevron VRU No. 1 04 B -28-10-25 WPM ✓
Slope: bush, close to access road to Chevron's 01-29-10-25 Battery. Placing site close to road will minimize tree clearing and damage to hillside. **Survey for rare or endangered plant species. Will need to minimize disturbance of natural vegetation, construct a contoured berm around the well site to divert run-off water and re-vegetate the well site including the berm.**
8. Chevron VRU No. 1 04 C -28-10-25 WPM ✓
Slope: bush, close to access road to Chevron's 01-29-10-25 Battery. Placing site close to road will minimize tree clearing and damage to hillside. **Survey for rare or endangered plant species. Will need to minimize disturbance of natural vegetation, construct a contoured berm around the well site to divert run-off water and re-vegetate the well site including the berm.**
Same as 04 B -28 above.
9. Chevron VRU No. 1 01 B -29-10-25 WPM ✓
River valley: cultivated land. Movement of this location off of the cultivated land would result in being off-target and an unsatisfactory drainage pattern.
10. Chevron VRU No. 1 03 C -29-10-25 WPM (formerly 05 A -29-10-25) ✓
River valley: moved to higher ground on edge of cultivated land
no difference
- ✓ 11. Chevron VRU No. 1 05 C -29-10-25 WPM ✓
River valley: move location to edge of trees / cropland. Negligible surface impact. < 100 m from river
12. Chevron VRU No. 1 05 D -29-10-25 WPM ✓
River valley: cultivated land. Movement of this location off of the cultivated land would result in being off-target and an unsatisfactory drainage pattern.
13. Chevron VRU No. 1 08 B -29-10-25 WPM ✓
River valley: cultivated land. Movement of this location off of the cultivated land would result in being off-target and an unsatisfactory drainage pattern.
14. Chevron VRU No. 1 08 A -30-10-25 WPM ✓
River valley: locate site on edge of trees at bottom of slope.
Survey for rare or endangered plant species. Will need to minimize disturbance of natural vegetation, construct a contoured berm around the well site to divert run-off water and re-vegetate the well site including the berm.

Landowner Objection

Chevron has spoken with the landowners John Fefchak and Norma Tibbits-Fefchak concerning the SE 1/4 25-10-26. We have sent them a letter addressing their concerns. Chevron has since received a letter from the above landowners indicating their concerns have been addressed. Copies of both letters are included in Attachments 19 and 20.

Virden Roselea Unit 1



Decline Rate (frac) Nominal: 0.004425 Effective: 0.004415 Annual: 0.051713

Current Oil rate: 85.3 m³/d

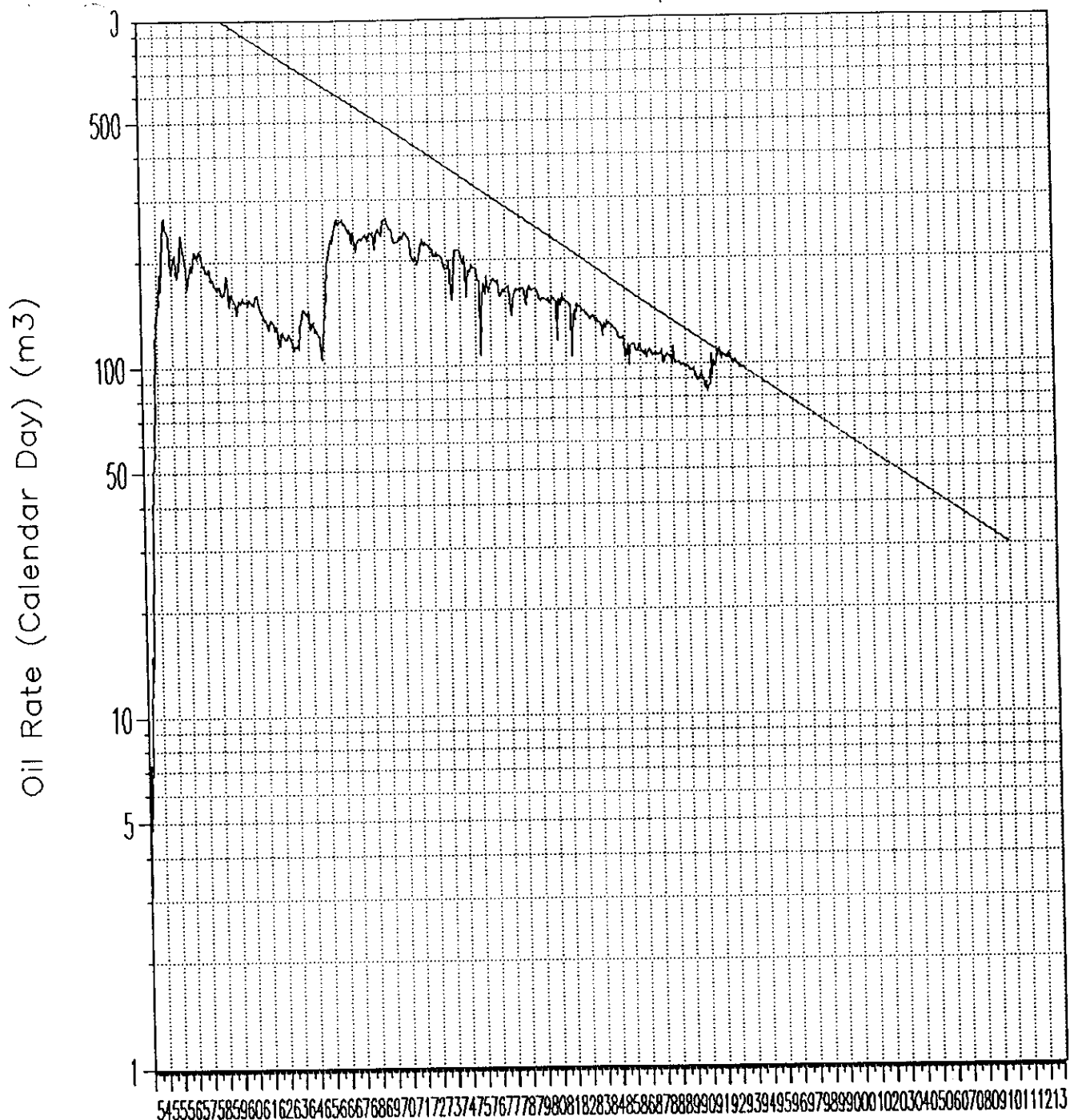
Economic Limit: 30.0 m³/d

Cumulative Oil Produced: 2218.2 E3m³

Remaining Reserves: 380.9 E3m³

Total Reserves: 2599.1 E3m³ - At the Economic Limit

Viriden Roselea Unit 1 All Wells except 7B-30 and 10B-30



Decline Rate (frac) Nominal: 0.005680 Effective: 0.005664 Annual: 0.065892

Current Oil rate: 95.5 m³/d

Economic Limit: 30.0 m³/d

Cumulative Oil Produced: 2307.7 E3m³

Remaining Reserves: 350.9 E3m³

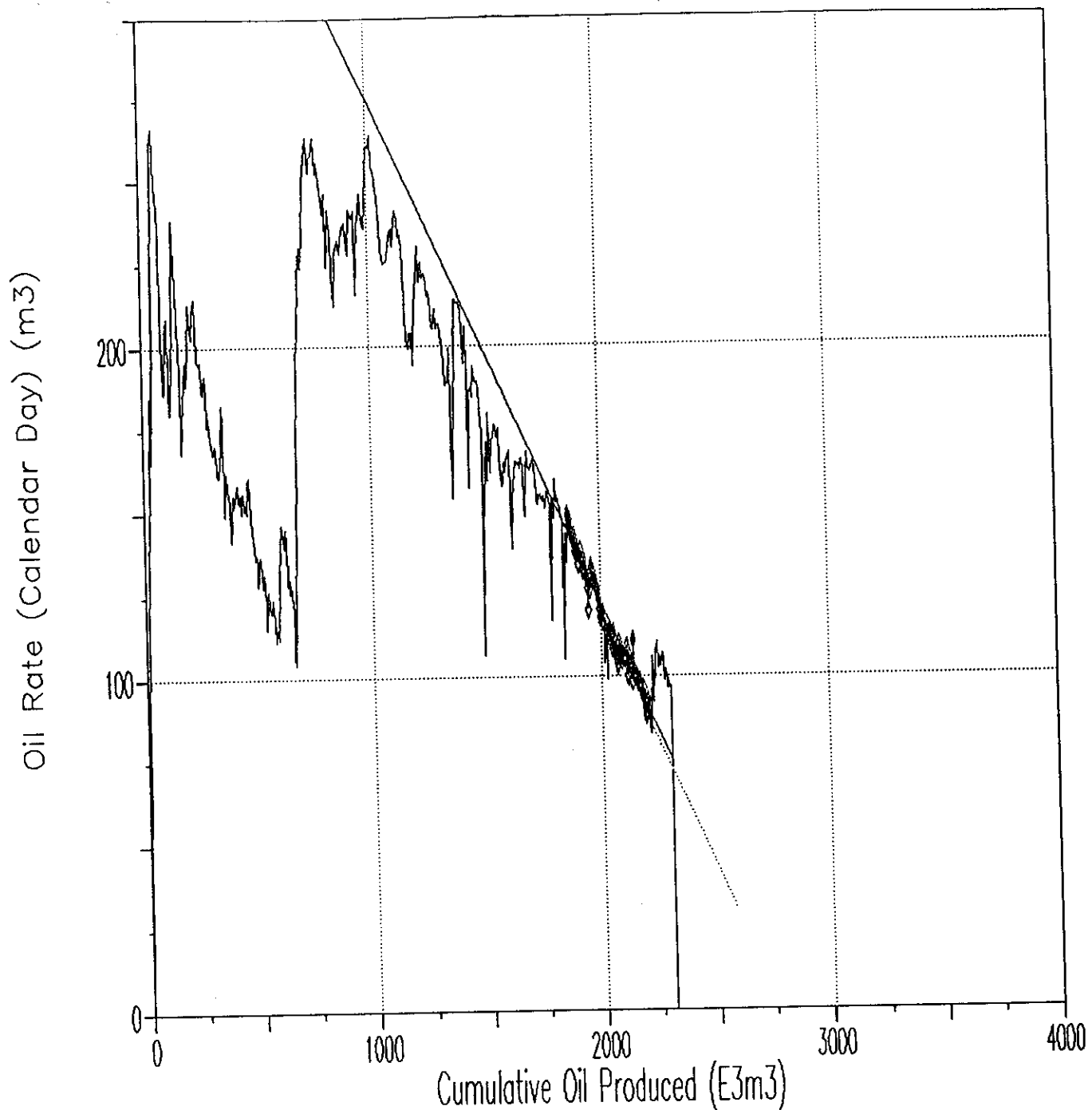
Total Reserves: 2658.6 E3m³ - At the Economic Limit

Does comparison of Attachment

* 1 & 2 indicate acceleration component

pre-infill unit decline 4.4%
post-infill unit decline 5.9%

Virde Roselea Unit 1 All Wells except 7B-30 and 10B-30



Oil Rate vs Cum. Oil slope: -0.00466207 1/month

Current Oil rate: 85.3 m³/d

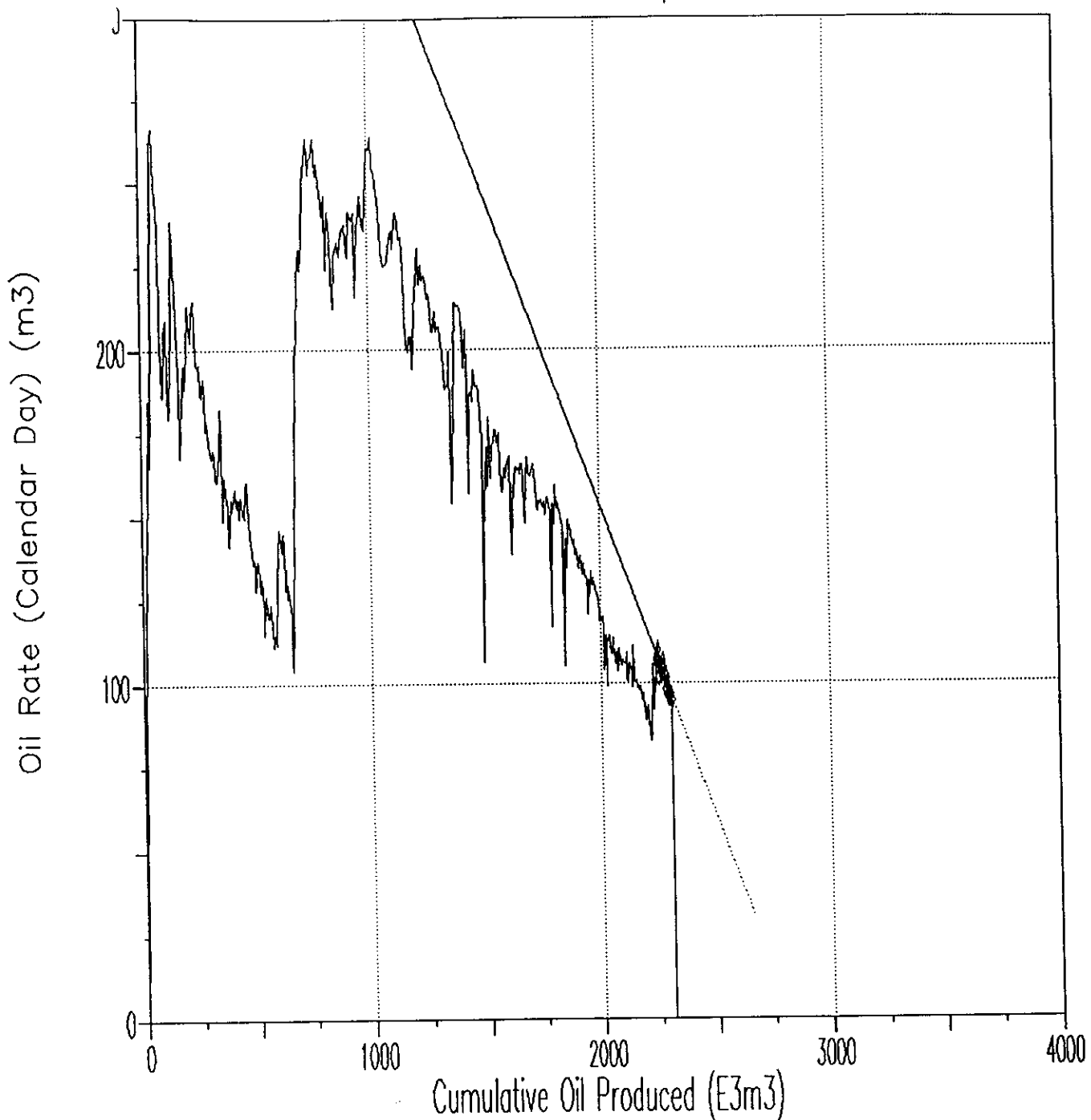
Economic Limit: 30.0 m³/d

Cumulative Oil Produced: 2218.2 E3m³

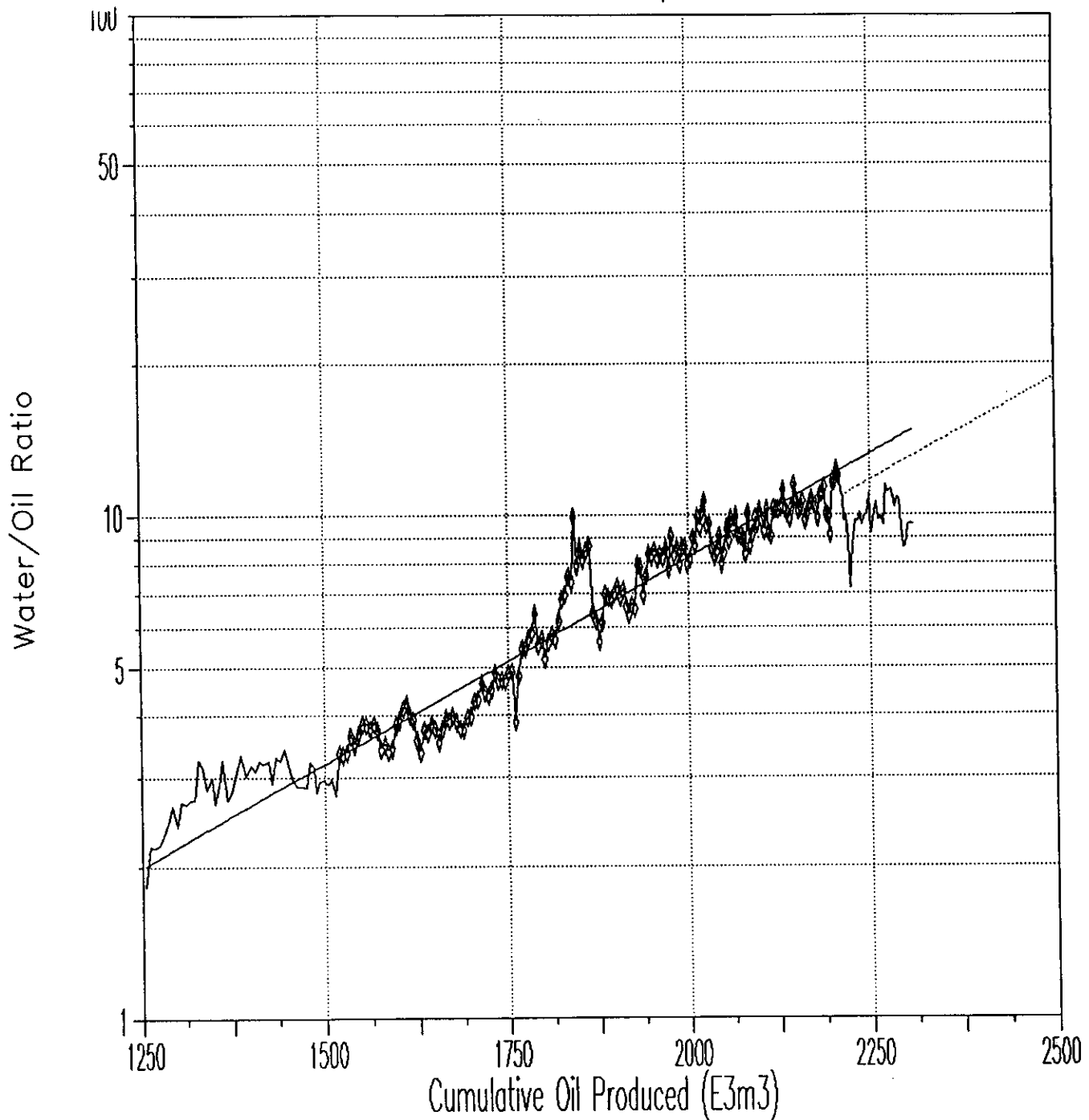
Remaining Reserves: 360.8 E3m³

Total Reserves: 2579.0 E3m³

Viriden Roselea Unit 1 All Wells except 7B-30 and 10B-30

Oil Rate vs Cum. Oil slope: -0.0056599 1/monthCurrent Oil rate: 95.5 m³/dEconomic Limit: 30.0 m³/dCumulative Oil Produced: 2307.7 E3m³Remaining Reserves: 352.0 E3m³Total Reserves: 2659.7 E3m³

Viriden Roselea Unit 1 All Wells except 7B-30 and 10B-30



Slope WOR vs Cum. Oil: 0.00082

Current WOR: 11.0

Limiting WOR: 20.0

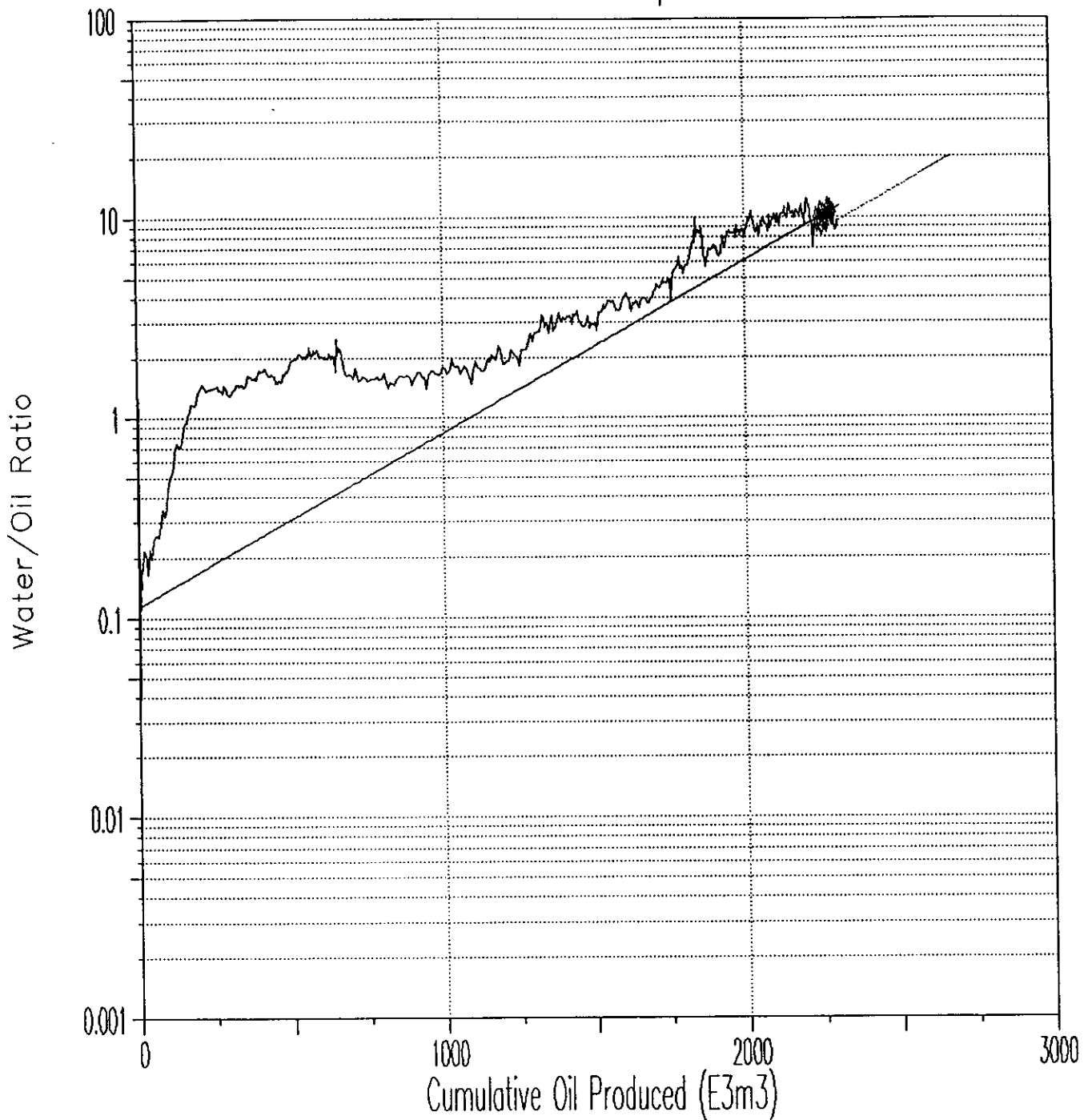
Cumulative Oil Produced: 2218.0 E3m3

Remaining Reserves: 316.3 E3m3

Total Reserves: 2534.3 E3m3

Attachment 6 WOR vs. Cumulative Oil With 1991 Infill Wells

Virde Roselea Unit 1 All Wells except 7B-30 and 10B-30



Slope WOR vs Cum. Oil: 0.00086

Current WOR: 9.6

Limiting WOR: 20.0

Cumulative Oil Produced: 2308.0 E3m3

Remaining Reserves: 368.6 E3m3

Total Reserves: 2676.6 E3m3

Attachment 7

Viriden Roselea Unit 1 1991 Incremental Sweep Efficiency

Viriden Roselea Unit 1 Pore Volume	17,200 E3 m3	17,200
1993 Average Injection Rate	368 E3 m3	368
Remaining Life	18 years to economic limit	OR 20 year forecast
Remaining Pore Volume Injected	0.38 fraction	0.43
Pore Volume Injected to Nov, 1993	0.63	0.63
Total Pore Volume Injected	1.01	1.06

WITHOUT 1991 PILOT
Streamtube 1993-01 to 1993-09

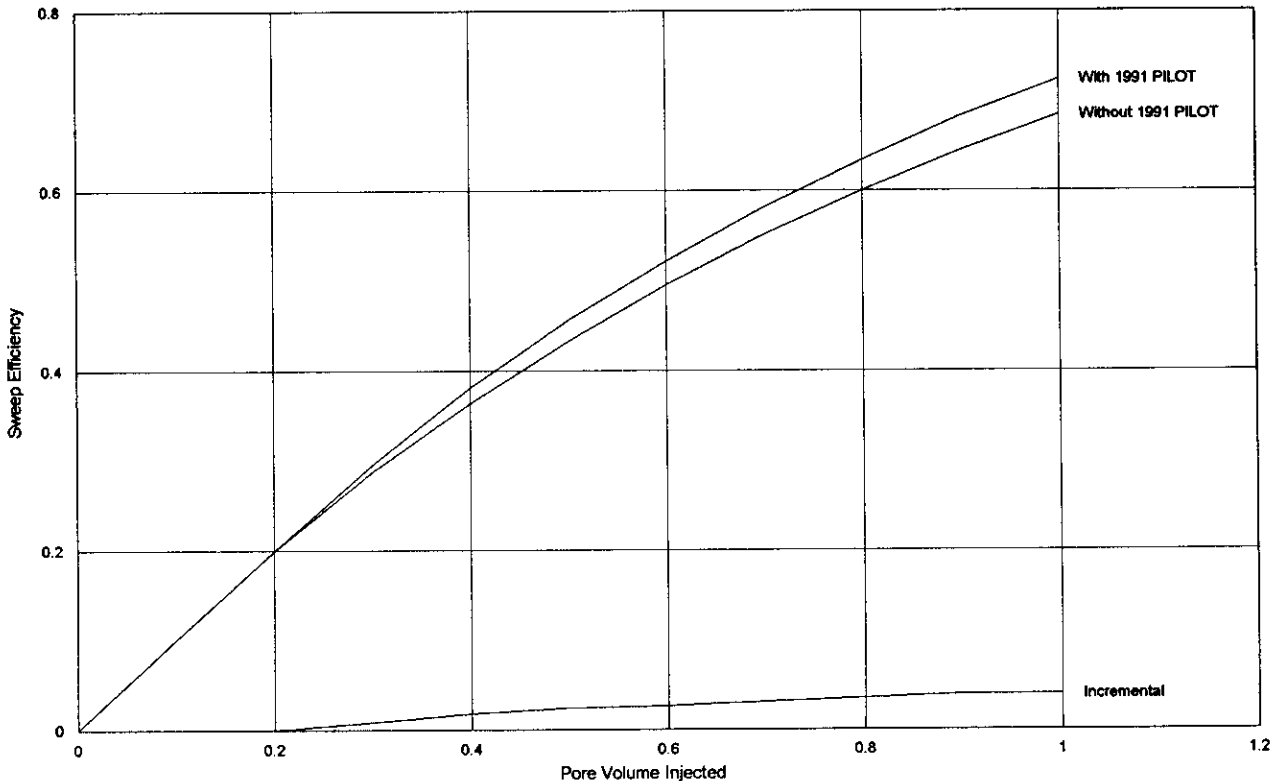
WITH 1991 PILOT
Streamtube 1993-01 to 1993-09

1991 Project area OOIP 2,896 E3 m3

PVI selected	Sweep	PVI Selected	Sweep	Incremental Sweep	
0.000	0.000	0.000	0.000	0.000	0
0.200	0.200	0.200	0.200	0.000	0
0.300	0.287	0.300	0.295	0.008	22
0.400	0.364	0.400	0.381	0.017	47
0.500	0.433	0.500	0.457	0.024	65
0.600	0.496	0.600	0.522	0.026	70
0.700	0.551	0.700	0.581	0.030	82
0.800	0.600	0.800	0.634	0.034	92
0.900	0.645	0.900	0.683	0.039	104
1.000	0.685	1.000	0.724	0.039	105
1.100	0.720	1.100	0.757	0.037	100
1.200	0.753	1.200	0.787	0.035	94
1.300	0.780	1.300	0.816	0.036	97
1.400	0.801	1.400	0.842	0.041	110
1.500	0.819	1.500	0.865	0.046	124
1.600	0.835	1.600	0.887	0.051	139
1.700	0.851	1.700	0.902	0.052	140
1.800	0.865	1.800	0.912	0.047	126
1.900	0.879	1.900	0.921	0.041	112
2.000	0.891	2.000	0.928	0.038	102

partial realignment
improved sweep
sweep accounts for
67-78% Δ recovery

Viriden Roselea Unit 1



LOG EVALUATION SHEET

PTL 1.0
08-05-1993

Wellname: Chev Virden Roselea U#1 8B-30-10-25w1
Formation: lodgpole
Eval. by: j. halas

a = 1 pna = 2730 dtna = Por. Cut = .07 Rmf @ FT = GRmax = RtSh = Mud Type = gel chem
m = 2.0/2.4 pmf = 1000 dtmf = Sw Cut = .5 Rw @ FT = .05 GRmin = PhiSh = Mud Wt. = 2040
n = 2 PhiSw Cut = .08 Source Rw: field Steiber Corr. Factor =

[illegible]

560.5	561.8	1.3	.135	.150	.144	1	45	.281	.040	.63	PAY
561.8	562.2	.4	.150	.120	.137	1	19	.457	.063	.24	MARG
562.2	563.0	.8	.210	.150	.182	1	28	.275	.050	.66	PAY
563.0	564.0	1.0	.135	.140	.138	1	30	.361	.050	.38	PAY
564.0	565.0	1.0	.150	.140	.146	1	15	.479	.070	.22	MARG
565.0	565.6	.6	.160	.160	.160	1	25	.336	.054	.44	PAY
565.6	566.5	.9	.140	.140	.140	1	30	.355	.050	.40	PAY
566.5	567.8	1.3	.170	.170	.170	1	15	.405	.069	.30	PAY
567.8	569.2	1.4	.140	.140	.140	1	15	.502	.070	.20	MARG
569.2	570.0	.8	.170	.170	.170	1	15	.405	.069	.30	PAY

Pay thickness	= 15.3 m	1.5 m	4.3 m	9.5 m
Average porosity	= .142	.144	.122	.153
Average Sw	= .361	.340	.364	.386
Average PhiSw	= .051	.048	.045	.059

Average porosity from total porosity (POR).
ND X-Plot Porosity Algorithm = Bateman-Konen.
Average Sw calculated using Archie (SW).

.07349
 .14045
 .56105

1891 - 1565 - 13,667

Dolomite lithologies in Crinoidal, Sandhill, and Oolites; $n = 2.0$.
Limestone " " " " " : ; $n = 2.4$ due
to increased vug / pore throat ratio (ie higher tortuosity).

Field analysis also suggests that within the Cherty $n = 2.0$ if $\phi < .10$ and $n = 2.2$ if $\phi > .10$.

Crinoidal has some minor oil pay. Oolites are wet. Best oil pay zones are in the Cherty and Sandhill.

Filename: ros8b30.prn

Attachment 9

Log Evaluation Sheet 08C-30-10-25

LOG EVALUATION SHEET

PTL 1.0
08-05-1993

Wellname: Chev Virden Roselea U#1 8C-30-10-25w1

Formation: lodgopole

Eval. by: j. halas

a = 1.0 pna = 2730 dtma = Por. Cut = .07 Rmf @ FT = GRmax = RtSh = Mud Type = gel chem
 m = 2.0/2.2 pmf = 1000 dtmf = Sw Cut = .5 Rw @ FT = .05 GRmin = PhiSh = Mud Wt. = 2030
 n = 2.0 PhiSw Cut = .08 Source Rw: field Steiber Corr. Factor =

TOP	BASE	H	CNL	DPOR	DT	POR	GR	SP	LITH	VSH	RT	RKO	SW	SWSH	EPOR	SXO	PHISW	RNA	COMMT
Crinoidal																			
538.5	539.1	.6	.110	-.010		.062			d		20		.806			.050	.08	TIGHT	
539.1	539.6	.5	.180	.025		.111			d		100		.201			.022	1.23	PAY	
539.6	540.0	.4	.120	-.020		.062			d		1000		.114			.007	3.84	TIGHT	
540.0	540.5	.5	.045	-.070		.013			d		80		1.923			.025	.01	TIGHT	
540.5	541.2	.7	.160	.030		.103			d		180		.162			.017	1.91	PAY	
541.2	541.7	.5	.155	.010		.092			d		65		.301			.028	.55	PAY	
541.7	542.2	.5	.095	-.030		.047			d		200		.336			.016	.44	TIGHT	
542.2	542.5	.3	.110	-.030		.054			d		1000		.131			.007	2.92	TIGHT	
542.5	543.2	.7	.045	-.050		.019			d		300		.679			.013	.11	TIGHT	
543.2	543.7	.5	.120	-.015		.065			d		100		.344			.022	.42	TIGHT	
543.7	544.3	.6	.075	-.060		.028			d		25		1.597			.045	.02	TIGHT	
544.3	545.0	.7	.125	.005		.075			d		9		.994			.075	.05	WET	
545.0	545.5	.5	.115	.000		.068			d		5.5		1.402			.095	.03	TIGHT	
545.5	546.5	1.0	.135	.000		.078			d		15		.740			.058	.09	WET	
546.5	547.2	.7	.075	-.040		.035			d		18		1.506			.053	.02	TIGHT	
547.2	547.5	.3	.140	.000		.080			d		15		.722			.058	.10	WET	
547.5	548.0	.5	.120	.010		.075			d		16		.745			.056	.09	WET	
548.0	548.5	.5	.150	.010		.089			d		20		.562			.050	.16	WET	
548.5	549.5	1.0				.000			sh									NONRES	
Sandhill																			
549.5	549.8	.3	.075	-.040		.035			d		80		.714			.025	.10	TIGHT	
549.8	550.0	.2	.105	-.030		.052			d		90		.453			.024	.24	TIGHT	
550.0	550.3	.3	.075	-.045		.033			d		125		.606			.020	.14	TIGHT	
550.3	550.7	.4	.130	-.010		.071			d		140		.266			.019	.71	PAY	
550.7	551.0	.3	.110	-.010		.062			d		150		.294			.018	.58	TIGHT	
551.0	551.4	.4	.140	-.005		.078			d		160		.227			.018	.97	PAY	
551.4	551.8	.4	.085	-.045		.037			d		175		.457			.017	.24	TIGHT	
551.8	552.1	.3	.100	-.040		.045			d		220		.335			.015	.45	TIGHT	
552.1	552.8	.7	.065	-.060		.024			d		310		.529			.013	.18	TIGHT	
552.8	553.5	.7	.145	.010		.087			d		130		.225			.020	.98	PAY	
553.5	554.0	.5	.075	-.050		.031			d		120		.658			.020	.12	TIGHT	
1st Oolite																			
554.0	555.0	1.0	.030	-.100		.002			d		50		5.811			.032	.00	TIGHT	
555.0	556.0	1.0				.000			sh									NONRES	
2nd Oolite																			
556.0	556.5	.5	.045	-.075		.012			d		60		2.406			.029	.01	TIGHT	

556.5	557.0	.5	.070	-.050	.029	d	45	1.149	.033	.04	TIGHT
557.0	557.0	1.0			.000	sh					NONRES
3rd Oolite											
558.0	558.5	.5	.045	-.075	.012	d	100	1.863	.022	.01	TIGHT
558.5	559.5	1.0	.045	-.100	.005	d	240	2.887	.014	.01	TIGHT
559.5	560.0	.5	.070	-.040	.032	d	35	1.181	.038	.04	TIGHT
560.0	561.5	1.5			.000	sh					NONRES
4th Oolite											
561.5	562.5	1.0	.055	-.010	.035	d	160	.505	.018	.20	TIGHT
Cherty											
563.0	563.5	.5	.100	.075	.090	d/l	75	.287	.026	.61	PAY
563.5	564.4	.9	.170	.060	.121	d/l	50	.323	.039	.48	PAY
564.4	565.0	.6	.100	.055	.082	d/l	55	.368	.030	.37	PAY
565.0	565.5	.5	.145	.080	.117	d/l	65	.294	.034	.58	PAY
565.5	566.0	.5	.120	.075	.102	d/l	50	.390	.040	.37	PAY
566.0	567.0	1.0	.170	.120	.148	d/l	45	.273	.040	.67	PAY
567.0	567.7	.7	.195	.135	.168	d/l	60	.205	.034	1.19	PAY
567.7	568.0	.3	.160	.140	.151	d/l	90	.189	.029	1.41	PAY
568.0	569.0	1.0	.135	.080	.112	d/l	150	.203	.023	1.21	PAY
569.0	569.5	.5	.160	.110	.138	d/l	80	.221	.030	1.03	PAY
569.5	570.5	1.0	.190	.135	.165	d/l	65	.201	.033	1.23	PAY
570.5	571.0	.5	.140	.130	.136	d/l	70	.240	.033	.87	PAY
571.0	571.5	.5	.115	.100	.109	d/l	80	.286	.031	.61	PAY
571.5	572.0	.5	.140	.110	.127	d/l	60	.279	.035	.64	PAY
572.0	572.5	.5	.170	.135	.154	d/l	20	.391	.060	.33	PAY
572.5	573.0	.5	.200	.190	.195	d/l	8	.477	.093	.22	WET
573.0	573.5	.5	.240	.205	.224	d/l	5	.518	.116	.19	WET
573.5	574.0	.5	.190	.190	.190	d/l	3.5	.743	.141	.09	WET

TOTAL NET PAY SUMMARY: Crinoidal Sandhill Cherty

Pay thickness	= 12.7 m	1.7 m	1.5 m	9.5 m
Average porosity	= .117	.102	.079	.128
Average Sw	= .263	.221	.239	.277
Average PhiSw	= .031	.022	.019	.034

Average porosity from total porosity (POR).
ND X-Plot Porosity Algorithm = Bateman-Konen.
Average Sw calculated using Archie (SW).

ANALYST COMMENTS:

Entire Crinoidal, Sandhill, and Oolites is dolomitized.

Dolomite lithologies in Crinoidal, Sandhill, and Oolites; $m = 2.0$.

Field analysis also suggests that within the Cherty $m = 2.0$ if $\phi < .10$
and $m = 2.2$ if $\phi > .10$.

Scattered streaks of pay within the Crinoidal. Sandhill appears to be marginal
to tight. Oolites are tight. Best oil pay is within the Cherty.

Log Evaluation Sheet 10C-30-10-25

PTL 1.0
08-05-1993

a = 1.0 pma = 2730 dtma = Por. Cut = .07 Rmf @ FT = GRmax = RtSh = Mud Type = gel chem
m = 2.0/2.4 pmf = 1000 dtmf = Sw Cut = .5 Rw @ FT = .05 GRmin = PhiSh = Mud Wt. = 2000
n = 2.0 PhiSw Cut = .08 Source Rw: field Steiber Corr. Factor =

[illegible]

4th Oolite

Interval	593.8	594.2	595.7	Porosity	Sw	PhiSw	Unit	Thickness	Porosity	Sw	PhiSw	Pay
593.8 - 594.2	593.8	594.2	595.7	.4	.060	.040	d	20	.926	.050	.06	TIGHT
594.2 - 595.7	594.2	595.7	595.7	1.5	.120	.070	d	120	.206	.020	1.18	PAY

Cherty

595.5 - 596.3	595.5	596.3	596.3	.8	.150	.140	l	60	.240	.035	.87	PAY
596.3 - 597.0	596.3	597.0	597.0	.7	.090	.090	l/d	45	.370	.033	.36	PAY
597.0 - 597.5	597.0	597.5	597.5	.5	.150	.130	l/d	40	.305	.043	.54	PAY
597.5 - 598.0	597.5	598.0	598.0	.5	.120	.120	l	28	.435	.052	.26	PAY
598.0 - 598.8	598.0	598.8	598.8	.8	.140	.140	l	32	.344	.048	.42	PAY
598.8 - 600.0	598.8	600.0	600.0	1.2	.110	.100	l	42	.407	.043	.30	PAY
600.0 - 600.6	600.0	600.6	600.6	.6	.160	.160	l	34	.288	.046	.60	PAY
600.6 - 601.7	600.6	601.7	601.7	1.1	.100	.110	l	60	.341	.036	.43	PAY
601.7 - 602.5	601.7	602.5	602.5	.8	.160	.160	l	28	.317	.051	.50	PAY
602.5 - 603.0	602.5	603.0	603.0	.5	.150	.150	l	23	.376	.056	.35	PAY
603.0 - 603.5	603.0	603.5	603.5	.5	.130	.150	l	16	.479	.068	.22	PAY
603.5 - 604.2	603.5	604.2	604.2	.7	.110	.140	l	9	.721	.092	.10	WET
604.2 - 604.7	604.2	604.7	604.7	.5	.180	.180	l	6	.602	.108	.14	WET
604.7 - 605.0	604.7	605.0	605.0	.3	.180	.180	l	5	.659	.119	.11	WET
605.0 - 605.8	605.0	605.8	605.8	.8	.180	.200	l	3.2	.768	.147	.08	WET
605.8 - 606.3	605.8	606.3	606.3	.5	.170	.170	l	3.3	.864	.147	.07	WET
606.3 - 607.0	606.3	607.0	607.0	.7	.230	.220	l	4.2	.563	.127	.16	WET
607.0 - 607.5	607.0	607.5	607.5	.5	.190	.190	l	4.7	.641	.122	.12	WET
607.5 - 608.0	607.5	608.0	608.0	.5	.210	.200	l	3.4	.693	.142	.10	WET
608.0 - 608.7	608.0	608.7	608.7	.7	.230	.210	l	2.8	.703	.155	.10	WET
608.7 - 609.3	608.7	609.3	609.3	.6	.230	.210	l	3.5	.629	.139	.13	WET
609.3 - 609.7	609.3	609.7	609.7	.4	.170	.190	l	3.5	.779	.142	.08	WET

TOTAL NET PAY SUMMARY:	Crinoidal	Sandhill	Oolites	Cherty
Pay thickness = 14.8 m	2.4 m	2.5 m	1.9 m	8.0 m
Average porosity = .114	.092	.090	.092	.133
Average Sw = .310	.247	.227	.326	.355
Average PhiSw = .036	.023	.020	.029	.046

Average porosity from total porosity (POR).
 ND X-Plot Porosity Algorithm = Bateman-Konen.
 Average Sw calculated using Archie (SW).

ANALYST COMMENTS:

Entire Crinoidal, Sandhill, and Oolite intervals are dolomitized.

Dolomite lithologies in Crinoidal, Sandhill, and Oolites; $m = 2.0$.

Field analysis also suggests that within the Cherty $m = 2.0$ if $\phi < .10$
 and $m = 2.2$ if $\phi > .10$.

Scattered oil pay within the Crinoidal, Sandhill, Oolites, and Cherty zones.

Filename: ros10c30.prn

LOG EVALUATION SHEET

PTL 1.0
07-27-1993Wellname: Chev Virden Roselea U 1 11b-30-10-25W1
Formation: Lodgepole
Eval. by: B. Clark

a = 1.0 pma = 2730 dtma = Por. Cut = .07 Rmf @ FT = GRmax = RtSh = Mud Type = gel chem
 m = 2.0/2.4 pmf = 1000 dtmf = Sw Cut = .5 Rw @ FT = .05 GRmin = PhiSh = Mud Wt. = 1960
 n = 2.0 PhiSw Cut = .08 Source Rw: field Steiber Corr. Factor =

TOP	BASE	H	CNL	DPOR	DT	POR	GR	SP	LITH	VSH	RT	RXO	SW	SWSH	EPPOR	SXO	PHISW	RWA	COMMT
Crinoidal																			
572.5	573.7	1.2	.140	.020		.089			d		100		.251				.022	.79	MARG
573.7	574.2	.5	.105	.000		.063			d		1000		.112				.007	3.97	TIGHT
574.2	575.0	.8	.110	.040		.082			d		350		.146				.012	2.35	MARG
575.0	575.9	.9	.135	.110		.124			d/l		18		.425				.053	.28	PAY
575.9	576.6	.7	.060	.070		.066			l		65		.724				.048	.10	TIGHT
576.6	577.4	.8	.060	.050		.057			l		35		1.176				.067	.04	TIGHT
577.4	578.6	1.2				.000			sh										NONRES
578.6	579.2	.6	.045	.060		.053			l		17		1.841				.098	.01	TIGHT
579.2	579.7	.5				.000			sh										NONRES
Sandhill																			
579.7	581.0	1.3	.140	.140		.140			l		62		.301				.042	.55	PAY
581.0	582.0	1.0	.130	.105		.120			l/d		60		.368				.044	.37	PAY
582.0	582.7	.7	.130	.090		.113			d/l		68		.371				.042	.36	PAY
582.7	583.5	.8				.000			sh										NONRES
1st Oolite																			
583.5	584.5	1.0	.110	.110		.110			l		20		.707				.078	.10	WET
584.5	585.2	.7				.000			sh/l										NONRES
2nd Oolite																			
585.2	586.0	.8	.155	.160		.158			l		14		.547				.086	.17	WET
586.0	587.0	1.0				.000			sh/l										NONRES
3rd Oolite																			
587.0	588.2	1.2	.140	.130		.136			l		15		.633				.086	.12	WET
588.2	589.0	.8				.000			sh/l										NONRES
4th Oolite																			
589.0	590.7	1.7	.075	.090		.083			l		31		.796				.066	.08	WET

TOTAL NET PAY SUMMARY:

CRINOIDAL

SANDHILL

Pay thickness = 5.9 m	H = 2.9 m	H = 3.0 m
Average porosity = .113	Phi = .098	Phi = .127
Average Sw = .421	Sw = .276	Sw = .34
Average PhiSw = .036	PhiSw = .028	PhiSw = .043

Average porosity from total porosity (POR).

ND-X-Plot Porosity Algorithm = Bateman-Konen.
Average Sw calculated using Archie (SW).

ANALYST COMMENTS:

Dolomite lithologies ... $m=2.0$
Limestone lithologies ... $m=2.4$ due to increased vug / pore throat ratio
(ie higher tortuosity).
Crinoidal looks marginal to tight. Sandhill exhibits the only decent oil
pay at this location. Oolite zones appear to be wet.

Filename: vir1lb30.prn

LOG EVALUATION SHEET

PTL 1.0
07-27-1993

Wellname: Chev Virden Roselea U 1 11b-30-10-25W1

Formation: Lodgepole / Cherty

Eval. by: B. Clark

a = 1.0- pma = 2730 dtma = Por. Cut = .07 Rmf @ FT = GRmax = RtSh = Mud Type = gel chem
 m = 2.0 pmf = 1000 dtmf = Sw Cut = .5 Rw @ FT = .05 GRmin = PhiSh = Mud Wt. = 1960
 n = 2.0 PhiSw Cut = .08 Source Rw: field Steiber Corr. Factor =

TOP	BASE	H	CNL	DPOR	DT	POR	GR	SP	FC	VSH	RT	RXO	SW	SWSH	EPOR	SXO	PHISW	RWA	COMMT
590.7	592.0	1.3	.105	.115		.111			1		12		.582				.065	.15	WET
592.0	593.6	1.6	.150	.150		.150			1		5		.667				.100	.11	WET
593.6	594.2	.6	.165	.160		.163			1		4		.686				.112	.11	WET
594.2	595.0	.8	.140	.140		.140			1		6		.652				.091	.12	WET
595.0	595.9	.9	.170	.140		.157			1		4.3		.687				.108	.11	WET
595.9	596.8	.9	.110	.125		.119			1		9		.626				.074	.13	WET
596.8	598.0	1.2	.165	.165		.165			1		4.1		.669				.110	.11	WET
598.0	598.7	.7	.140	.140		.140			1		4.8		.729				.102	.09	WET
598.7	599.7	1.0	.150	.160		.156			1		4		.717				.112	.10	WET
599.7	600.7	1.0	.105	.120		.114			1		9		.654				.075	.12	WET
600.7	601.5	.8	.120	.180		.155			1		3.1		.819				.127	.07	WET
601.5	602.0	.5	.140	.140		.140			1		3		.922				.129	.06	WET
602.0	602.6	.6		.210		.210			1		2.1		.735				.154	.09	WET
602.6	603.3	.7		.185		.185			1		1.8		.901				.167	.06	WET

NET PAY SUMMARY:

Pay thickness = .0 m
 Average porosity = .000
 Average Sw = .000
 Average PhiSw = .000
 HC Pore Volume = .00 m

Average porosity from total porosity (POR).

ND X-Plot Porosity Algorithm = Bateman-Konen.

Average Sw calculated using Archie (SW).

SP used as NET PAY discriminator: NO

Filter cake (FC) used as NET PAY discriminator: NO

ANALYST COMMENTS:

Field analysis suggests m=2.0 when phi<0.1 and m=2.2 when phi>0.1.

Cherty zone looks wet throughout. Porosity development is the better than the overlying Lodgepole zones. The Cherty will likely produce significant water volumes.

Filename: chr11b30.pwk

Attachment 12

1994 Infill Drilling Project Area

OOIP E3 m3

LSD	Section	Status	Crinoidal	Sandhill	Oolites				Cherty	Total	CUMULATIVE PRODUCTION 1EC 51/93	CURRENT RECOVERY %
					1 st	2 nd	3 rd	4 th				
9	19	Prod										
16	19	Prod										
8	20	Aban 15	0				6	4	68	78	1495	0.6
9	20	Inj 65	0	0	2	10	13	90		116	2281	2.0
10	20	Aban 86	0	0	1	0	8	5	61	75	16331	13.8
11	20	Prod										
12	20	Aban										
13	20	Inj										
14	20	Aban										
15	20	Inj 65	0	6	5	3	6	4	81	107	5285	5.0
* 16	20	Aban 91	0	3	4	3	9	5	100	124	74336	59.9
5	21	Aban										
6	21	Prod						5	55	60	12183	20.3
7	21	Prod						4	53	57	11181	19.6
10	21	Prod						1	59	60	11586	19.3
11	21	Inj 65			0		1	7	80	87	4035	4.6
12	21	Prod		0	2		7	13	90	112	20014	17.9
13	21	Inj 65		2	3	4	10	5	102	126	4777	3.8
14	21	Prod			0	0	3	7	76	86	27310	21.7
15	21	Aban 13						1	34	35	82	0.2
2	28	Prod						0	66	66	8612	13.0
3	28	Prod				0	1	7	99	107	15175	14.2
4	28	Prod		0	0	8	9	8	99	125	18690	15
5	28	Inj 58			0	9	8	7	40	64	256	0.4
1	29	Prod	0	1	4	10	9	6	69	99	24720	24.9
2	29	Prod	0	4	5	9	8	7	71	105	24686	23.5
3	29	Aban 87	0	10	6	7	5	5	57	91	46415	51.0
* 4	29	Aban 91	0	11	9	9	10	5	70	114	79287	67.6
5	29	Inj 65		2	1	2	5	3	71	85	13090	15.4
6	29	Prod		6	4	4	6	4	60	84	28341	33.7
7	29	Inj 65	0	2	5	6	5	4	40	63	4325	6.8
8	29	Prod	0	0	4	9	7	6	38	64	28150	44.1
10	29	Prod										
11	29	Prod		1	0	0	1	5	59	67	14983	22.4
12	29	Prod					0	1	37	37	12268	32.4
1	30	Prod		3	1	8	8	11	40	72	48225	67.0
8	30	Prod		0		1	2	11	81	96	49354	51.4
* 9	30	Inj						8	29	36	41142	114.2
			2	53	56	105	148	249	1,885	2,496	641.6	25.7

Attachment 12 A

1994 Infill Drilling Project Area

Assume 5 % incremental recovery

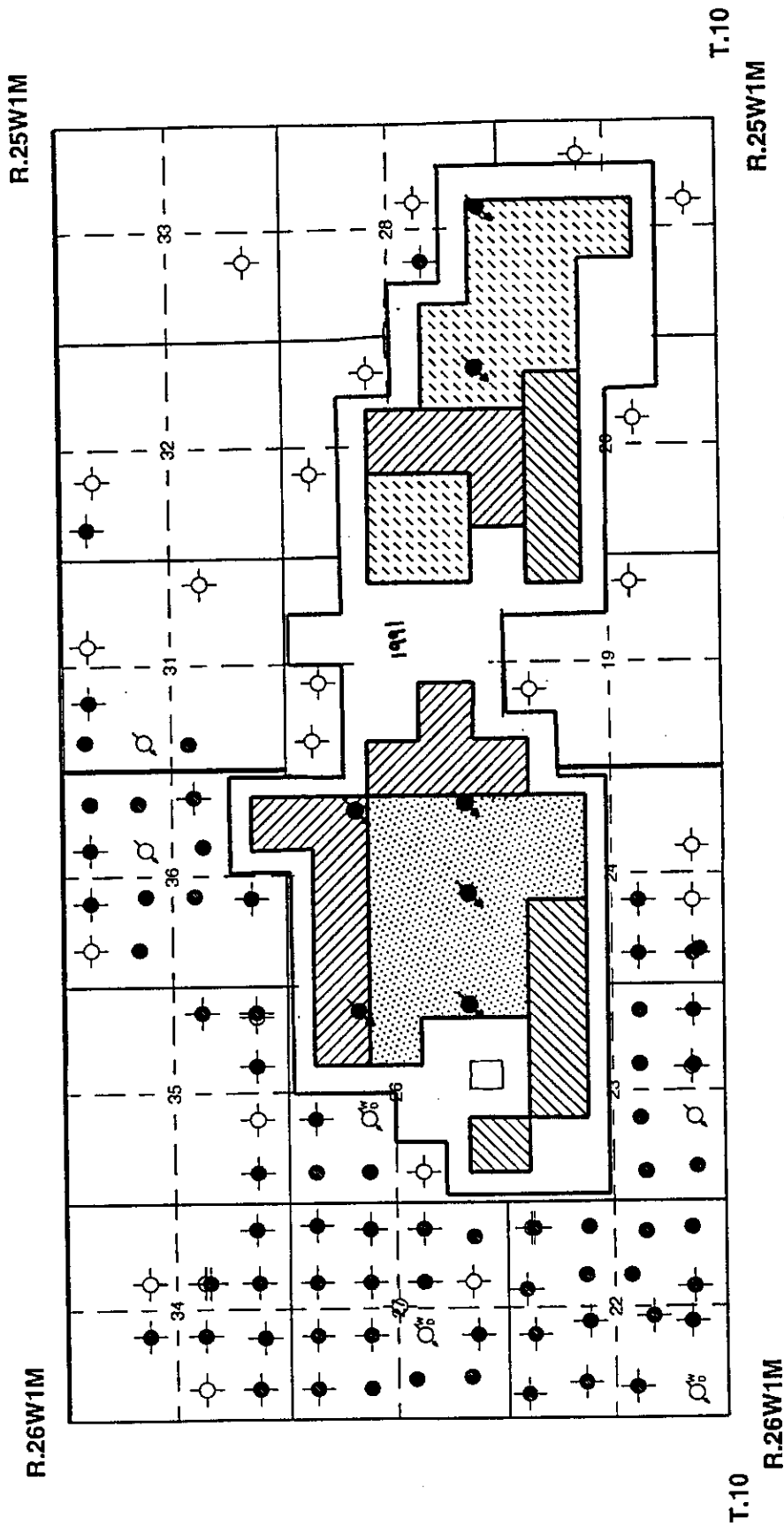
Estimated Incremental Recovery by Zone E3 m3

LSD	Section	Status	Crinoidal	Sandhill	Oolites				Cherty	Total
					1 st	2 nd	3 rd	4 th		
9	19	Prod								
16	19	Prod								
8	20	Aban	0				0	0	3	4
9	20	Inj	0	0	0	0	1	5		6
10	20	Aban	0	0	0	0	0	0	3	4
11	20	Prod								
12	20	Aban								
13	20	Inj								
14	20	Aban								
15	20	Inj	0	0	0	0	0	0	4	5
16	20	Aban	0	0	0	0	0	0	5	6
5	21	Aban								
6	21	Prod						0	3	3
7	21	Prod						0	3	3
10	21	Prod						0	3	3
11	21	Inj			0		0	0	4	4
12	21	Prod		0	0		0	1	4	6
13	21	Inj		0	0	0	1	0	5	6
14	21	Prod			0	0	0	0	4	4
15	21	Aban						0	2	2
2	28	Prod						0	3	3
3	28	Prod				0	0	0	5	5
4	28	Prod		0	0	0	0	0	5	6
5	28	Inj			0	0	0	0	2	3
1	29	Prod	0	0	0	1	0	0	3	5
2	29	Prod	0	0	0	0	0	0	4	5
3	29	Aban	0	1	0	0	0	0	3	5
4	29	Aban	0	1	0	0	1	0	3	6
5	29	Inj		0	0	0	0	0	4	4
6	29	Prod		0	0	0	0	0	3	4
7	29	Inj	0	0	0	0	0	0	2	3
8	29	Prod	0	0	0	0	0	0	2	3
10	29	Prod								
11	29	Prod		0	0	0	0	0	3	3
12	29	Prod					0	0	2	2
1	30	Prod		0	0	0	0	1	2	4
8	30	Prod		0		0	0	1	4	5
9	30	Inj						0	1	2
			0	3	3	5	7	12	94	125 ✓

11A-21 3250 m³
 14A-21 3250 m³
 14B-21 4250 m³
 15B-21 5750 m³
 3A-28 3500 m³
 3B-28 4750 m³
 4B-28 5750 m³
 1C-28 4250
 1B-29 5250
 8B-29 4000
 3C-29 4750
 5C-29 3250
 5D-29 4250
 8A-30 4750
 61000 m³

14 new wells
 8.9 E3 m3 / well

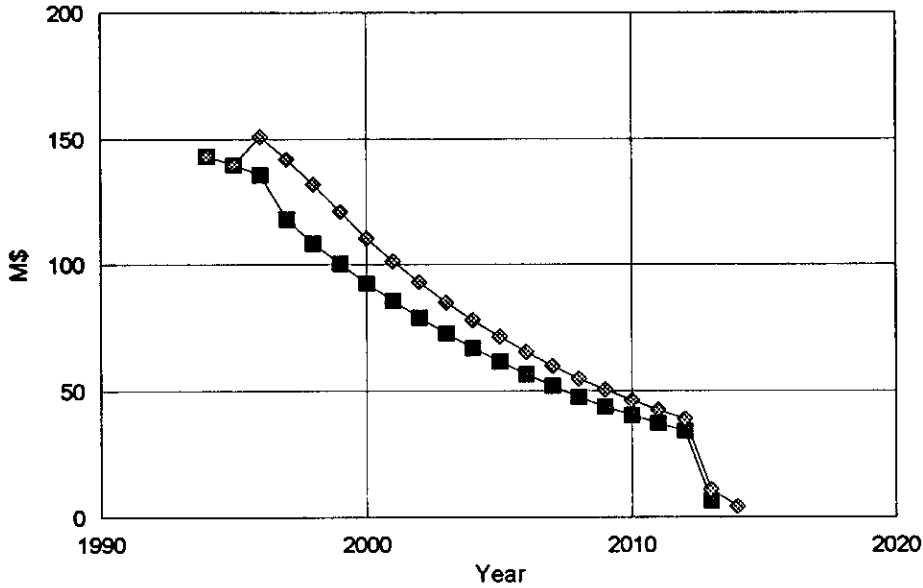
VIRDEN ROSELEA UNIT 1 8 HECTARE DRILLING PHASE DEVELOPMENT



Attachment 14

Virden Roselea Unit No. 1

Crown Royalties vs. Time

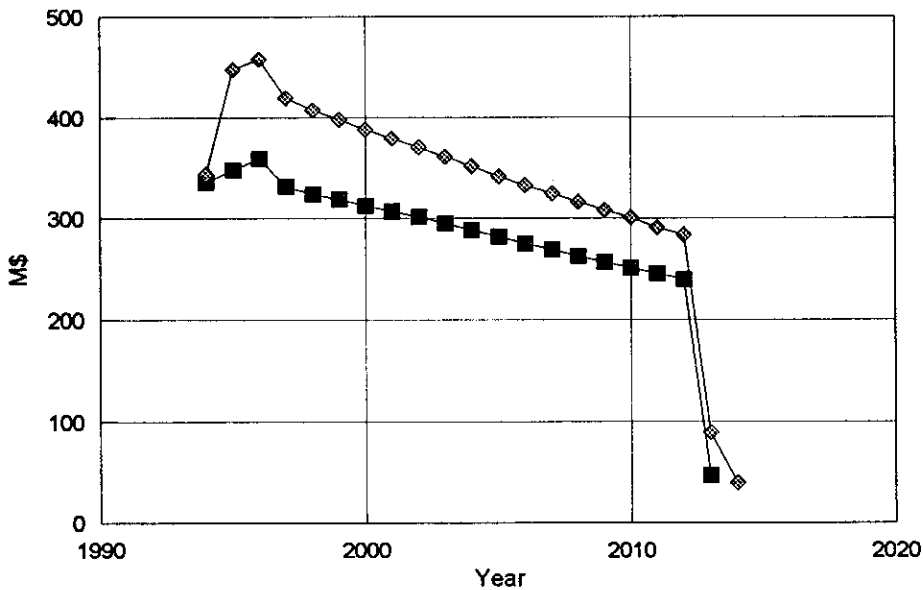


■ Base Case
◆ 1994 Infill Program

ECONOMICS GRAPHS INDICATE
IF ACCUMULATION IS A FACTOR
ROYALTIES PAID ON
INCREMENTAL PRODUCTION
EXCEED ROYALTIES SAVING
(NEW VS OLD) ON
ACCUMULATED PRODUCTION

Virden Roselea Unit No. 1

Freehold Royalty vs. Time

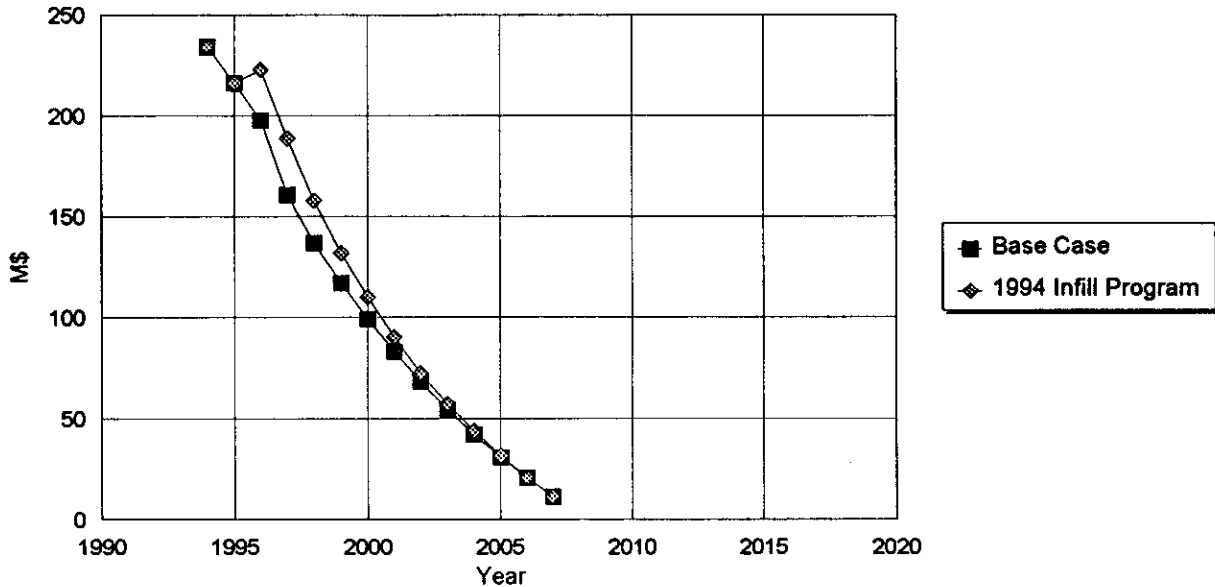


■ Base Case
◆ 1994 Infill Program

Attachment 14 A

Virden Roselea Unit No. 1

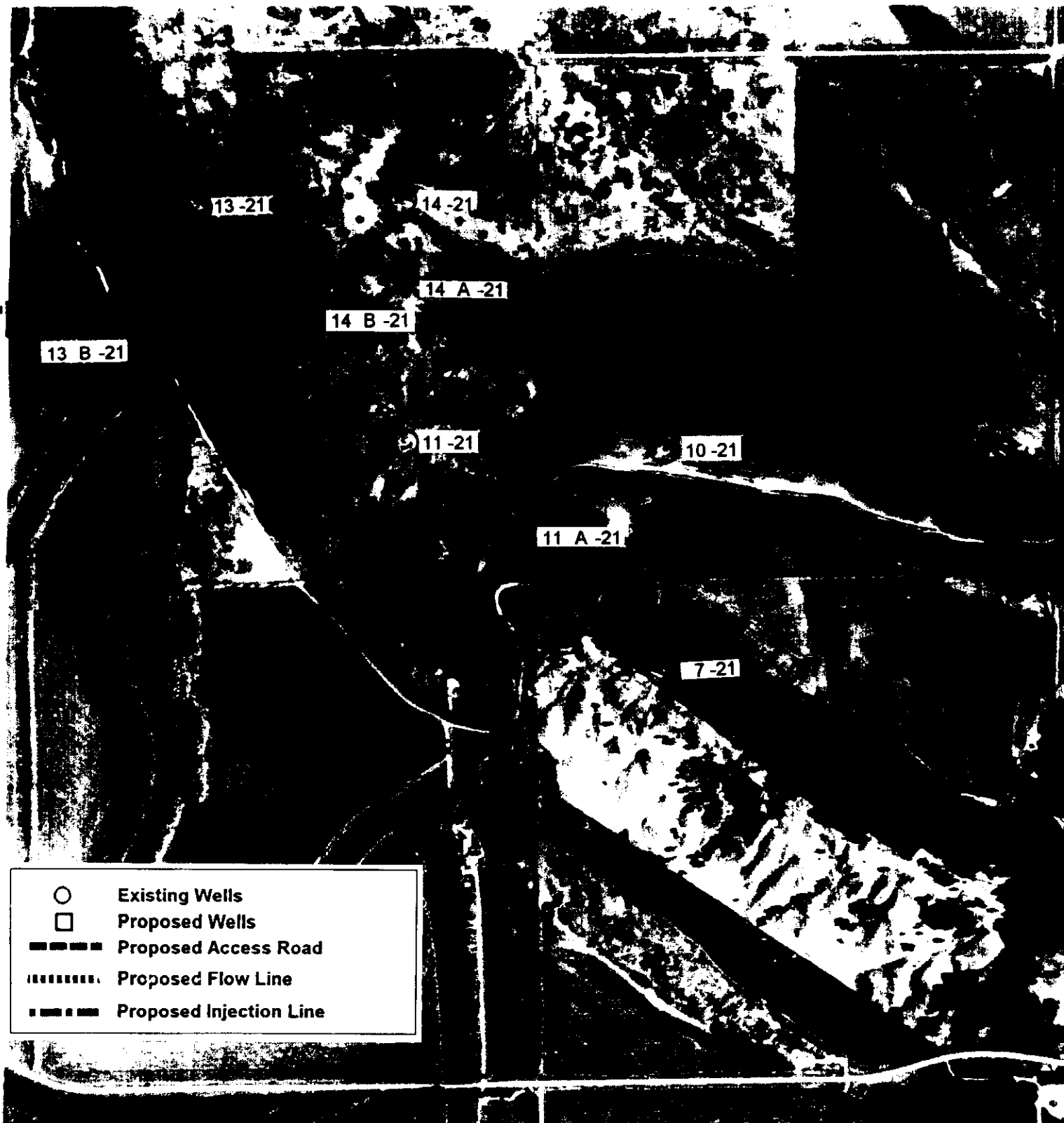
Freehold Mineral Tax vs. Time



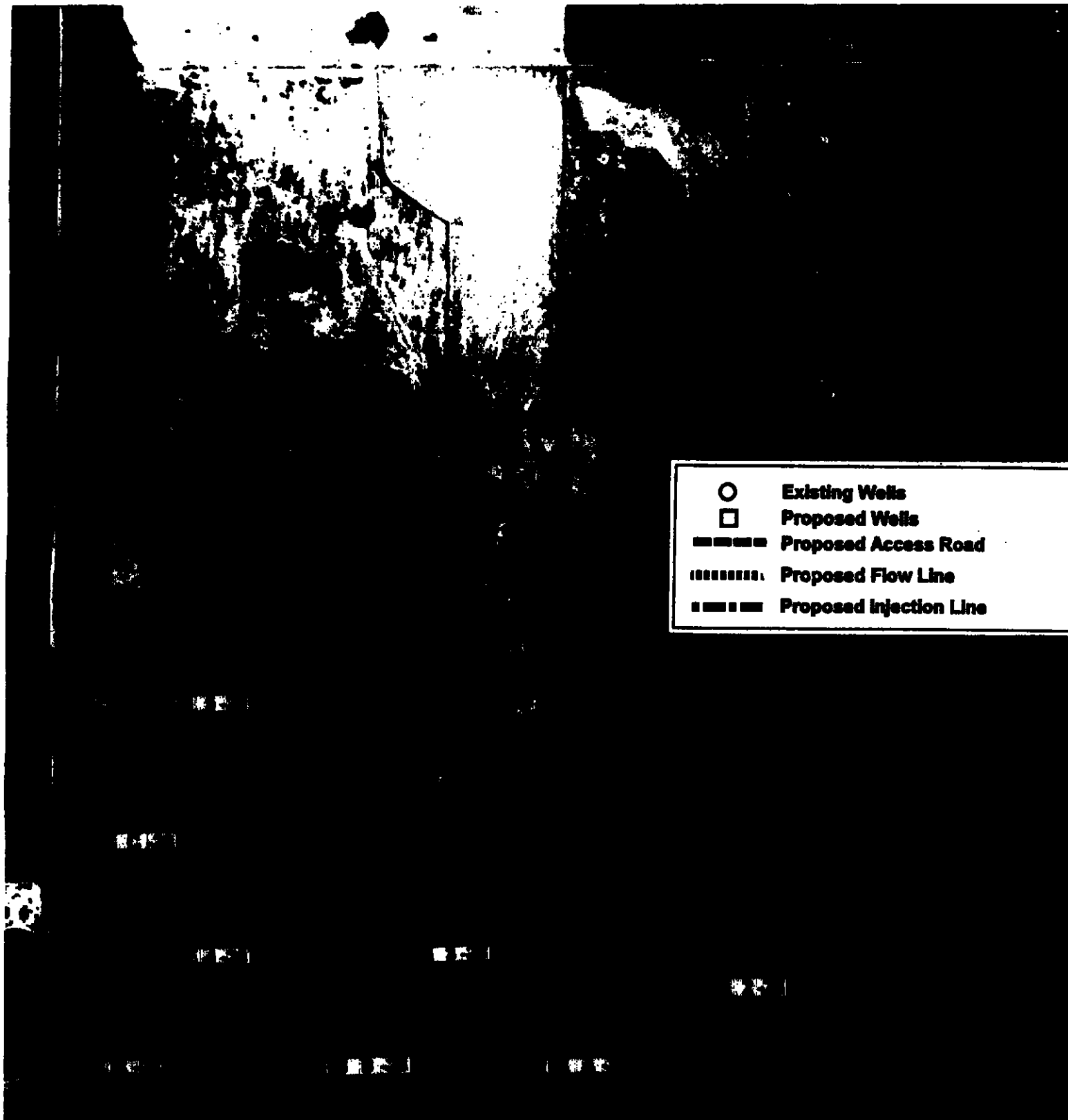
Year	Base Case			1994 Infill Case		
	Crown Royalty	Freehold Mineral Tax	Freehold Royalty	Crown Royalty	Freehold Mineral Tax	Freehold Royalty
	M\$	M\$	M\$	M\$	M\$	M\$
1994	143.4	234.5	335.9	143.4	234.5	343.9
1995	139.7	216.5	347.9	139.7	216.5	447.9
1996	135.6	198.0	359.0	151.1	223.1	458.0
1997	117.8	160.7	331.7	141.9	188.9	419.7
1998	108.3	136.8	324.2	131.8	158.0	407.3
1999	100.3	116.8	319.0	120.7	131.8	398.1
2000	92.4	99.0	312.6	110.2	109.8	387.9
2001	85.5	82.9	307.3	101.2	90.1	379.3
2002	79.0	68.0	301.5	92.8	72.3	370.4
2003	72.7	54.3	295.2	85.0	57.1	361.2
2004	66.9	41.9	288.3	77.8	43.8	351.4
2005	61.5	30.7	281.8	71.2	31.7	341.6
2006	56.5	20.4	275.3	65.3	20.7	332.7
2007	51.8	11.2	269.1	59.7	11.2	324.4
2008	47.6		262.8	54.7		316.2
2009	43.8		256.8	50.4		308.3
2010	40.3		250.9	46.3		300.9
2011	37.1		245.3	42.5		290.9
2012	34.0		239.6	39.0		283.9
2013	6.4		46.7	10.9		89.5
2014				4.1		39.3
Total	1,520.6	1,471.7	5,650.7	1,739.7	1,589.3	6,952.7

Δ 219.1 Δ 117.6 Δ 130.2
 CROWN SHARE = 336,700

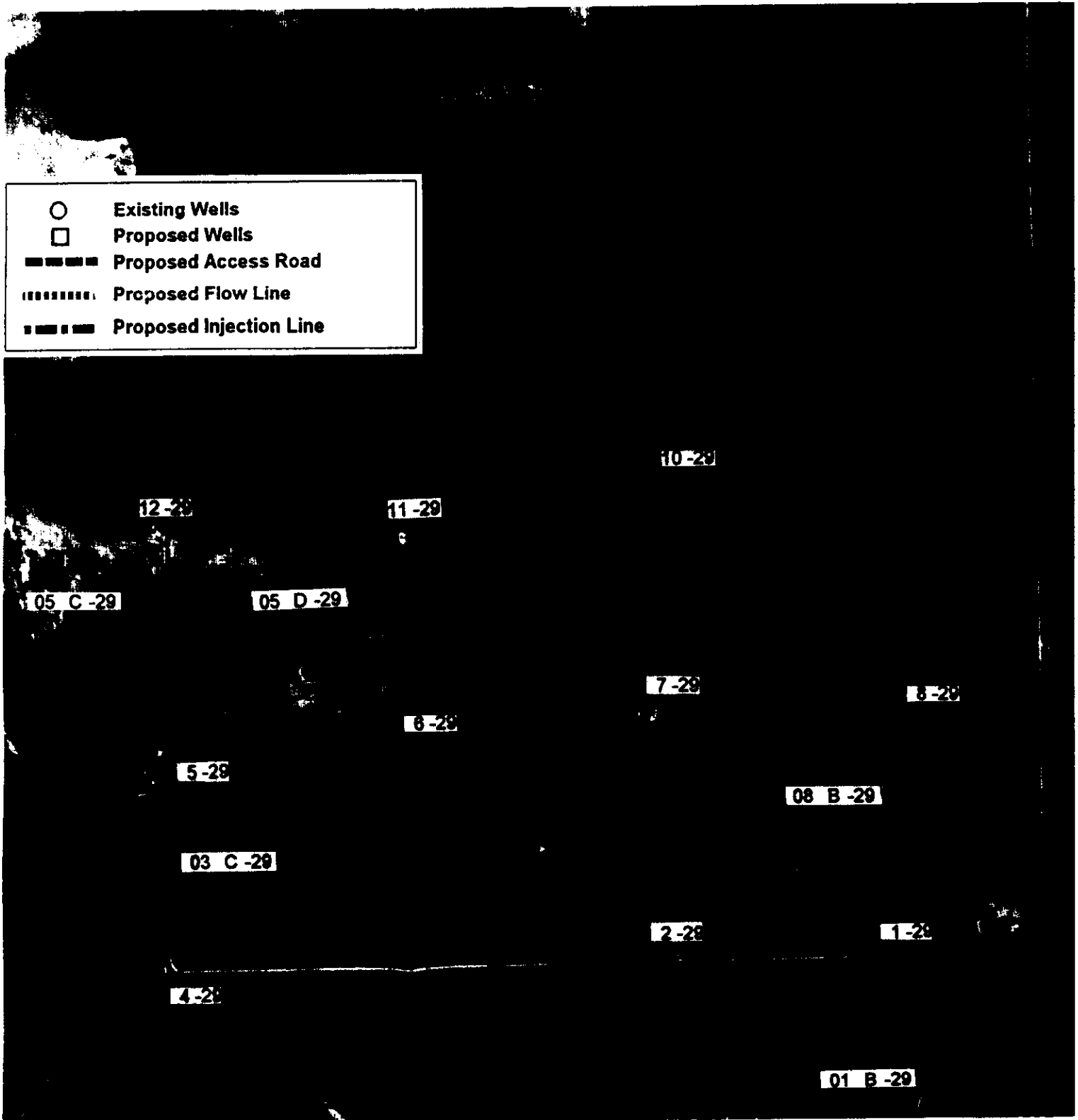
Virde Roselea Unit 1 Section 21-10-25 wpm



Viriden Roselea Unit 1 Section 28-10-25 wpm

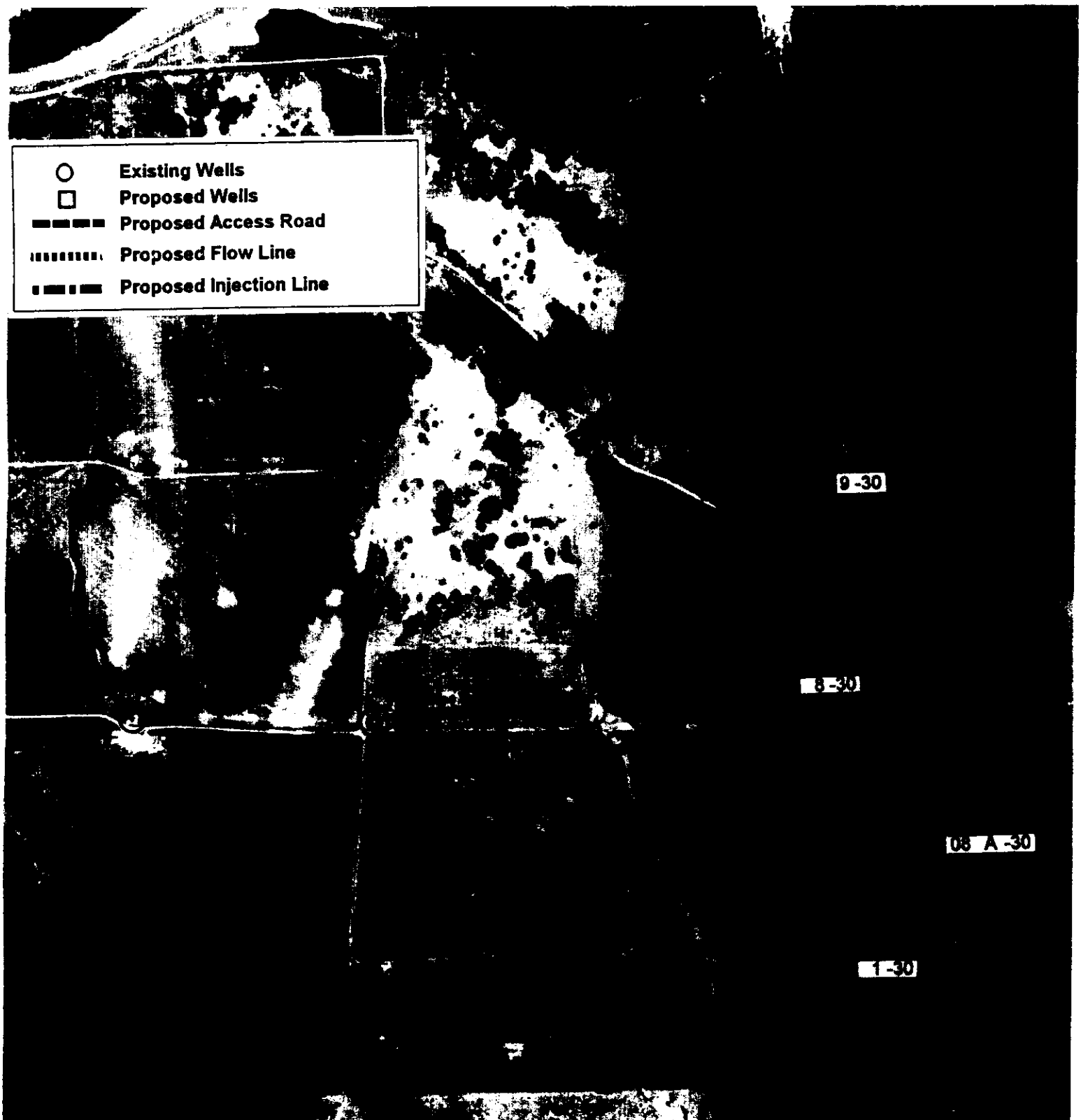


Viriden Roselea Unit 1 Section 29-10-25 wpm



Attachment 18

Virden Roselea Unit 1 Section 30-10-25 wpm





February 14, 1994

Mr. John Fefchak and Ms. Norma Tibbits-Fefchak
P.O. Box 2142
Virden, Manitoba
R0M 2C0

Chevron Canada Resources
P.O. Box 100
Virden, Manitoba R0M 2C0
Phone (204) 748-1334
Fax (204) 748-6762

Dear Mr. Fefchak and Ms. Tibbits-Fefchak:

**RE: CONCERNS ON CHEVRON'S APPLICATION FOR REDUCED SPACING IN
VIRDEN ROSELEA UNIT #1**

This letter is to address your concerns regarding the impact of possible drilling operations and the subsequent producing operations on your land and the immediate surrounding lands as a result of our Reduced Spacing Application in Virden Roselea Unit #1.

As discussed with you on February 7, 1994, should drilling be planned in the future on or near your property, Chevron will minimize both the inconvenience to you and the disturbance of the land as follows:

1. Noise from the drilling operations will be minimized by the use of a small drilling rig and the use of mufflers on the rig. If the drilling operations were carried out close to your residence such that it affected your routine schedule, an annoyance compensation would be discussed with you and agreed upon prior to the commencing of the drilling operations.
2. Noise and the "eyesore" from the artificial lift equipment installed on new wells is a concern to you. Normally a pumpjack is used to recover the oil. Chevron will review the use of installing smaller less visible alternatives if the situations allow. Chevron will use natural buffer zones (existing trees or planting of trees) as much as practical to reduce noise.
3. Once the actual well locations have been chosen, you will be notified so that we can discuss the sites, view the sites and ensure that the sites are situated in spots that are both acceptable to you and to Chevron. This should eliminate the concerns expressed as to nature's garden/water springs in the area and habitat for birds and wildlife.
4. No plans to build additional surface facilities to handle new production are planned. Additional production can be handled with either no increase or a slight increase in the size of our present facilities.
5. Currently, a shallow well supplies your home with water. A water sample would be taken from your well and analyzed prior to our operation. If you detect any contamination of the well resulting from the proposed drilling operations in your area, Chevron would resample and reanalyze your water and if contamination has resulted, we would ensure that a water supply acceptable to you and Chevron would be provided.

Hopefully the above adequately addresses all your concerns regarding the Virden Roselea Unit #1 Reduced Spacing Application. The drilling in your area is tentatively scheduled for 1995 but may change or not happen at all. You will be notified as early as possible when specific locations are finalized so that you and Chevron can review them to ensure that they are acceptable to both parties.

If this letter does address your concerns, a letter indicating such to Chevron or The Oil and Natural Gas Conservation Board would be appreciated.

If you have more concerns, please contact Glenn Ross at the Virden office at 748-6341.

Yours truly,

for J.E. CAUSGROVE, P.Eng
Virden Business Unit Manager

Attachment 20

P.O. BOX 2142,
Virden, Manitoba,
R0M 2C0.

February 21, 1994.

Chevron Canada Resources,
P.O. Box 100
Virden, Manitoba,
R0M 2C0.

ATTENTION: Mr. J.E. Causgrove, P. Eng.

Dear Mr. Causgrove:

RE: CONCERNS ON CHEVRON'S APPLICATION FOR REDUCED SPACING IN VIRDEN ROSELEA
UNIT # 1

Receipt of your letter dated 14 FEB 94, in regard to and addressing our concerns is hereby acknowledged.

Please be advised that your letter does address the concerns that we initially presented. We both feel Chevron has taken a serious and conscientious attitude in reducing or eliminating the concerns that were voiced in our initial objections and notice of intervention to The Oil and Natural Gas Conservation Board.

We are quite satisfied that Chevron staff has openly discussed the alternatives with us personally. We must state that their intentions appear to be most commendable in regard to our personal concerns and the surrounding nature of the land and wildlife therein.

Yours truly,


John Fefchak


Norma Tibbits-Fefchak



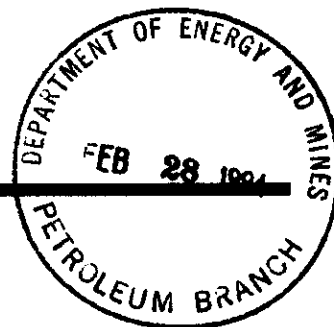
February 24, 1994

MEMORANDUM

John N. Fox, Chief Petroleum Engineer
Petroleum Branch
Energy & Mines
555 - 330 Graham Avenue
Winnipeg, Manitoba

Ken McGill, A/Chief
Soil Survey & Land Utilization
Manitoba Agriculture
Box 1149
Carman, Manitoba

Reduced Spacing Application - Virden Roselea Unit No 7



Floyd Philips forwarded the air photos supplied to him on which were located the 14 specific infill well sites identified in the above proposal for development in 1994.

It appears that only four of these sites are located in annually cropped fields (9, 11, 12, 13). The remaining seem to be located either in bush areas (1, 2, 4, 7, 8, 14), in non annually cropped (pasture?) land (6), along the edge of fields (5) or adjacent to non cultivated land (3, 10).

With regard to the four sites within annually cultivated fields, the preferred location would be either at the edge of the field or, if not possible, into the field far enough to provide adequate clearance between the installation and the edge of the field (50 meters or more). Specifically:

Site 9 - preferred location would be as far to the south, adjacent to the field border, if possible. There appears to be an access road, drain or some pasture at the southern edge of the field. DONE

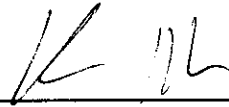
Site 11 - preferred location would be as far to the west as possible, adjacent to the bush area. DONE

Site 12 - satisfactory if it is not feasible to move the site south and adjacent to the non cultivated oxbow area. NOT FEASIBLE TO MOVE

Site 13 - preferred location would be as far to the west as possible, at the edge of the field. NOT FEASIBLE

I believe one of the important considerations in ultimately siting the installations is that the individual landowners/managers are consulted, actively involved in the site selection, "support the infill program" on their property and that the project "not proceed without the full consent of the affected land owner".

The remaining comments provided in my memo of February 2, 1994 still apply. In particular, I would like to indicate agreement with the 14 sites now identified is not an acceptance of the entire project involving up to a total of 55 infill wells, 41 of which have yet to be specified.

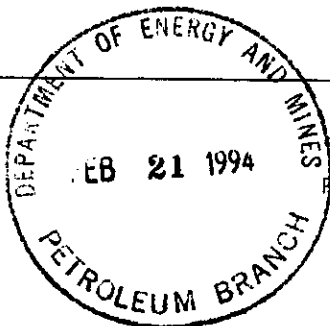
A handwritten signature in black ink, appearing to read 'K. McGill', is positioned above a horizontal line.

Ken McGill, A/Chief
Soil Survey & Land Utilization

Manitoba



Date February 17, 1994
 To John N. Fox
 Chief Petroleum Engineer
 Petroleum Branch
 555-330 Graham Avenue



Memorandum

From Floyd Phillips, Chief
 Terrestrial Quality
 Management

Subject **Virden Roselea Reduced Spacing**

Telephone 945-7003

Thank you for the air photos with the locations of the 14 infill wells proposed for 1994. As I indicated at the meeting, the concerns that I have relate to:

1. Potential for contaminants to enter wetlands, during both the drilling and operational phases. This impact can be prevented by siting wells above the high water mark of a wetland. If the land slopes toward the wetland, a dike should be constructed to prevent any runoff and potentially harmful contaminants from reaching the wetland.
2. Disturbance to natural areas, e.g. areas with native tree or shrub cover. The intent is to minimize habitat loss and habitat fragmentation. This can be accomplished by siting wells at the edge of a bush, rather than in the middle.
3. Siting the wells on river or creek valley slopes. Valleys because of their unique microclimates have a greater potential for the occurrence of rare or endangered plant species. If a well is to be located on a valley slope, a vegetation survey should be conducted for the site as well as any access disturbance to ensure that rare or endangered plants are not destroyed. Where feasible, the well site should be located in an area where rare or endangered species will not be lost.

Another concern is for loss of habitat due to erosion resulting from the siting of a well on a valley slope. Erosion not only affects vegetation communities downslope of the site but has the potential to cause siltation of the river or creek or may even carry toxic chemicals to the waterway. Erosion can be minimized by diverting runoff water around the well site and using flow control structures to slow the water where the diverted water may create a stream.

4. The loss of cultivated agricultural land and the inconvenience in farming the land. Often this can be accomplished by locating the wells along the edge of fields, e.g. along fence lines or in the edge of a bush or pasture land. If a well must be located in the field, it should be at least 60 m from the edge of the field to enable the farmer to operate wide machinery between the edge of the field and the well.

I have the following specific suggestions regarding the siting of the 14 wells proposed for 1994:

- 1- Move to the edge of the bush; possibly due south on the edge of the naturally vegetated ridge. *moved north to edge of bush*
- 2- Move to the edge of the bush; north where it would be close to the road. *moved west to edge of bush*
- 3- Okay as long as the site is above the high water mark of the slough and the slough is protected from direct runoff from the site by a dike. *- yes moved to north side of slough*
- 4- Site in the edge of the bush. *- yes*

First | Fold

- 5- Okay. -YES
- 6- Okay as long as the land does not slope toward the small slough to the NE. YES
- 7- Move west to the edge of the open area adjacent to the road. DONE
- 8- Move to the edge of the bush, either north, south or west near the edge of the road. DONE
- 9- Okay as long as it is close to the edge of the field. It also looks like there is a drainage ditch immediately to the south of this well site which probably drains to the river. Specific protection measures (e.g. dike) should be used to prevent spills at the well site from entering that drain. CONFIRM
- 10- Okay as this seems to be a damp area of the field on the site of an old oxbow. YES
- 11- Move to the edge of the bush. DONE
- 12- Okay YES
- 13- Okay out in the field but could move north to the south edge of the wetland as long as a dike was installed to keep contaminants out of the slough. -NO
- 14- This well appears to be on the slope of the valley. A vegetation survey for rare or endangered plant species would be needed, and the site would require erosion protection measures. It might be preferable to move the well to the non-treed strip to the west, thus reducing the amount of tree removal. In addition, the slope may improve as one moves away from the river, i.e. up out of the valley. - DONE

Other measures such as stripping the topsoil prior to drilling or trenching, and respreading it after the well is developed and after the flow lines are installed, should be standard practice.

I would like the opportunity to review the balance of the infill well locations, prior to their approval by the Petroleum Branch, in subsequent years.

I trust that these comments will provide you with criteria respecting the environmentally acceptable siting of future wells. If you have further questions or need clarification of my recommendations please let me know.

Thank you for the opportunity to comment on this infill project.

Floyd
Floyd

Note: I thought you might need the air photos back. → Sent to Ken McGill with instructions to return to you.
What about the proposal document?
JP



Date February 8, 1994

Memorandum

To Ken McGill, Chief
Soil Survey and Land Utilization
Agriculture
Box 1149
Carmen MB

From John N. Fox
Chief Petroleum Engineer
Energy and Mines
555-330 Graham Avenue

Telephone

Subject **REDUCED SPACING APPLICATION - VIRDEN ROSELEA UNIT NO. 1**

I have reviewed your comments and offer the following in response to your concerns:

- (1) As the application does not provide specific siting criteria for the 14 infill wells proposed to be drilled in 1994, nor the remaining 41 infill location, it is suggested specific siting conditions for wells drilled on cropland, pasture, forested land, river valleys, and near residential property should be developed. Siting conditions would be part of the individual infill well licensing procedure. Chevron's siting criteria you listed will certainly apply to wells drilled on agricultural land.
- (2) To my knowledge an "agricultural" impact assessment of existing infill drilling projects has not been done. With regards to compensation, I have attached a surface lease, an agreement between the landowner and oil company for access to the land for drilling. In the agreement compensation is a function of a number of different items and takes the form of a one-time up-front bonus payment and an annual rental. Surface leases and right of entry onto land for the purpose of drilling are regulated under The Surface Rights Act (copy attached).
- (3) The Petroleum Branch has inspection staff, that inspect field operations to ensure compliance with the Petroleum Drilling and Production Regulation and with any conditions of an order of The Oil and Natural Gas Conservation Board and the licence issued to drill the well.
- (4) I will ask Chevron for details of its weed control program.

As I discussed with you, we will be meeting with Chevron, Monday, February 7 to discuss these issues among others. I will give you a call in the next couple of weeks to discuss any further questions or concerns you may have.

John N. Fox

Encl.

MANITOBA SURFACE LEASE

This Indenture of Lease made the _____ day of _____ A.D. 19 _____

BETWEEN: _____
of the Postal District of Virden, in the Province of Manitoba, Farmer
(hereinafter called "the Lessor")

— and —

(hereinafter called "the Lessee")

WHEREAS the Lessor is the registered owner (or entitled to become the registered owner under an agreement for sale or unregistered transfer or otherwise) of an estate in fee simple, subject, however to the exceptions, conditions, encumbrances, liens and interests contained in or noted upon the existing Certificate of Title of and in that certain parcel or tract of land situate, lying and being in the Province of Manitoba and described as follows:

(hereinafter referred to as "the said lands"); and

WHEREAS the Lessor has agreed to lease and grant a certain portion of the said lands to the Lessee for the purposes and upon the terms and conditions hereinafter set forth:

NOW THEREFORE THIS INDENTURE WITNESSETH:

THE LESSOR, at the compensation hereinafter set forth, HEREBY LEASES to the Lessee all and singular those parts or portions of the said lands shown outlined in red on the sketch or plan hereto attached (hereinafter called "the demised premises"), to be held by the Lessee as tenant for the term of Thirty (30) years from the date hereof for any and all purposes and uses as may be necessary or useful in connection with all its operations.

YIELDING AND PAYING UNTO THE LESSOR the sum of FIFTY-FIVE HUNDRED Dollars (\$ 5500.-) for the first year, determined in accordance with the following particulars: WPA

- | | | |
|--|-----------------------------------|------------------|
| (a) Value of land | <u>(3.31) acres x \$ 500/acre</u> | \$ <u>1655.-</u> |
| (b) Loss of Use of the land, or of an interest therein: | <u>(3.31) acres x \$ 75/acre</u> | \$ <u>249.-</u> |
| (c) Increased costs to the Lessor and occupant, if any, by reason of the works and operations of the Lessee: | | \$ <u>594.-</u> |
| (d) Adverse effect of the right of entry on the remaining land by reason of severance, if applicable: | | \$ <u>-</u> |
| (e) Payment or allowance for nuisance and inconvenience to the Lessor and occupant, if any, or to the remaining land, that might be caused by, arise from or is likely to arise from or in connection with the operations of the Lessee: | | \$ <u>800.-</u> |
| (f) Cumulative effect, if any, of the surface rights previously acquired by the Lessee under a lease, agreement or right of entry existing at the time of acquisition of this Lease with respect to the said lands: | | \$ <u>50.-</u> |
| (g) Any other matter peculiar to this case: <u>Bonus</u> | | |

including compensation for the fact that the Lessor voluntarily consented to the granting of this Lease thereby sparing the Lessee the effort, delay, inconvenience and expense of a Board hearing and other proceedings that might otherwise have been necessary:

AND FOR EACH SUBSEQUENT YEAR annual compensation of FOURTEEN HUNDRED Dollars (\$ 1400.-) payable annually in advance upon each anniversary date of this Lease, determined in accordance with the following particulars:

- | | | |
|--|--------------------------------|-----------------|
| (b) Loss of Use of the land, or of an interest therein: | <u>3.31 acres x \$ 75/acre</u> | \$ <u>249.-</u> |
| (c) Increased costs to the Lessor and occupant, if any, by reason of the works and operations of the Lessee: | | \$ <u>594.-</u> |
| (d) Adverse effect of the right of entry on the remaining land by reason of severance, if applicable: | | \$ <u>-</u> |
| (e) Payment or allowance for nuisance and inconvenience to the Lessor and occupant, if any, or to the remaining land, that might be caused by, arise from or is likely to arise from or in connection with the operations of the Lessee: | | \$ <u>400.-</u> |
| (f) Cumulative effect, if any, of the surface rights previously acquired by the Lessee under a lease, agreement or right of entry existing at the time of acquisition of this Lease with respect to the said lands: | | \$ <u>50.-</u> |
| (g) Any other matter peculiar to this case: <u>Bonus</u> | | \$ <u>107.-</u> |

THE LESSOR HEREBY COVENANTS AND AGREES TO AND WITH THE LESSEE:

1. Taxes Paid by Lessor:

That the Lessor will promptly pay and satisfy all taxes, rates and assessments that may be assessed or levied against the said lands during the continuance of this Lease save where such are to be paid by the Lessee.

2. Quiet Enjoyment:

That the Lessor has good title to the said lands as hereinbefore set forth, has good right and full power to grant and Lease the said lands, rights and privileges in the manner aforesaid, and that the Lessee, upon observing and performing the covenants and conditions on the Lessee's part herein contained, shall and may peaceably possess and enjoy the demised premises and the rights and privileges hereby granted during the said term and any extension thereof without any interruption or disturbance from or by the Lessor or any other person claiming by, through or under the Lessor.

3. Renewal:

That if the Lessee be not in default in respect of any of the covenants and conditions contained in this Lease at the date of expiration of the term of Thirty (30) years hereinbefore mentioned then this Lease shall be renewed automatically and the term extended for a further period of Thirty (30) years at an annual compensation calculated from time to time as hereinafter provided for that portion of the term subsequent to the first year thereof. Such extended term shall be subject to all the provisions hereof including this provision for renewal.

THE LESSEE HEREBY COVENANTS AND AGREES TO AND WITH THE LESSOR:

4. Fencing:

To replace all fences which the Lessee may have removed for its purposes and repair all fences which it may have damaged, and, if reasonably required to ensure the safety and prevent the straying of livestock normally on the said lands, erect and put upon the boundaries of the demised premises a good substantial fence, and if reasonably required by the Lessor, to provide proper livestock guards at any point of entry upon the demised premises used by the Lessee and, upon the use thereof, to close all gates.

5. Notice re Spills:

To promptly advise the Lessor (or issue a notice if the Lessor is not readily accessible) of the flow of any drilling fluid salt water or oil upon the said lands but excluding the demised premises of which the Lessee has knowledge arising as a result of an act or omission of the Lessee, its contractors, agents, or employees and take reasonable action to remove such drilling fluid, salt water or oil and, where reasonable, to remedy or cure such damage.

6. Taxes Payable by Lessee:

To pay all taxes, rates and assessments that may be assessed or levied in respect of any and all machinery, equipment, structures and works placed by the Lessee, in, on, over or under the demised premises.

7. Compensation for Damages:

To pay compensation for damage done by its servants, agents or assigns which without restricting the generality thereof shall include growing crops, fences, buildings or other improvements of the Lessor upon the said lands other than the demised premises.

THE LESSOR AND THE LESSEE DO HEREBY MUTUALLY COVENANT AND AGREE EACH WITH THE OTHER AS FOLLOWS:

8. Review of Annual Compensation:

Notwithstanding anything contained in the Lease, upon the request of either party to this Lease, the amount of annual compensation payable in respect to the demised premises shall be subject to review at the end of three years from the date hereof and at the end of each succeeding three year period. Such request shall be in writing and given to the other party at least ninety (90) days prior to the commencement of the period in respect of which the review of annual compensation is sought. In case of any disagreement as to the amount of annual compensation to be payable or any other matter in connection therewith, the same shall be determined according to The Surface Rights Act.

9. Surrender:

The Lessee shall have the right at any time and from time to time to surrender all or part and terminate this Lease by written notice to the Lessor provided however that there shall be no refund to the Lessee of any annual compensation which may have been paid in advance. This Lease may be protected by way of a caveat and the Lessee shall upon termination of this Lease register a withdrawal of that caveat.

10. Removal of Equipment:

The Lessee may at all times during the continuance of this Lease remove or cause to be removed from the demised premises all buildings, structures, fixtures, casing in wells, pipelines, material and equipment of whatsoever nature or kind which it may have placed on or in the demised premises or in any area to be surrendered.

11. Discharge of Encumbrances:

The Lessee may at its option pay or discharge all or part of any arrears under any Agreement for Sale or Mortgage, or of any tax, charge, lien or encumbrance of any kind or nature whatsoever which may now or hereafter exist on or against or in any way affect the said lands, in which event the Lessee shall be subrogated to the rights of the holder or holders thereof, and may in addition thereto, at its option, reimburse itself by applying on account of repayment of the amount so paid by it the annual compensation or other sums accruing to the Lessor under the terms of this Lease.

12. Disposition by Lessor

No sale, agreement for sale, or other disposition of the said lands, and no assignment of the reversion or of annual compensation payable hereunder made by the Lessor shall be binding upon the Lessee until the Lessee shall be furnished not less than sixty (60) days before any annual compensation may be due with a certified copy of the instrument effecting any such disposition together with proof that such instrument has been registered on the existing Certificate of Title.

13. Assignment by Lessee:

The Lessee may delegate, assign or convey to other persons or corporations, all or any of the powers, rights, and interests obtained by or conferred upon the Lessee hereunder, and may enter into all agreements, contracts, and writings and do all necessary acts and things to give effect to the provisions of this clause. The Lessee shall notify the Lessor of any such assignment or conveyance.

14. Default:

Notwithstanding anything herein contained to the contrary, the Lessee shall not be in default in the performance of any of its covenants or obligations under this Lease, unless and until the Lessor has notified the Lessee of such default and the Lessee has failed to commence action to remedy the same, within sixty (60) days of the receipt of such notice, except in the case of failure to pay annual compensation, the Lessee must pay the annual compensation within the 60 day period.

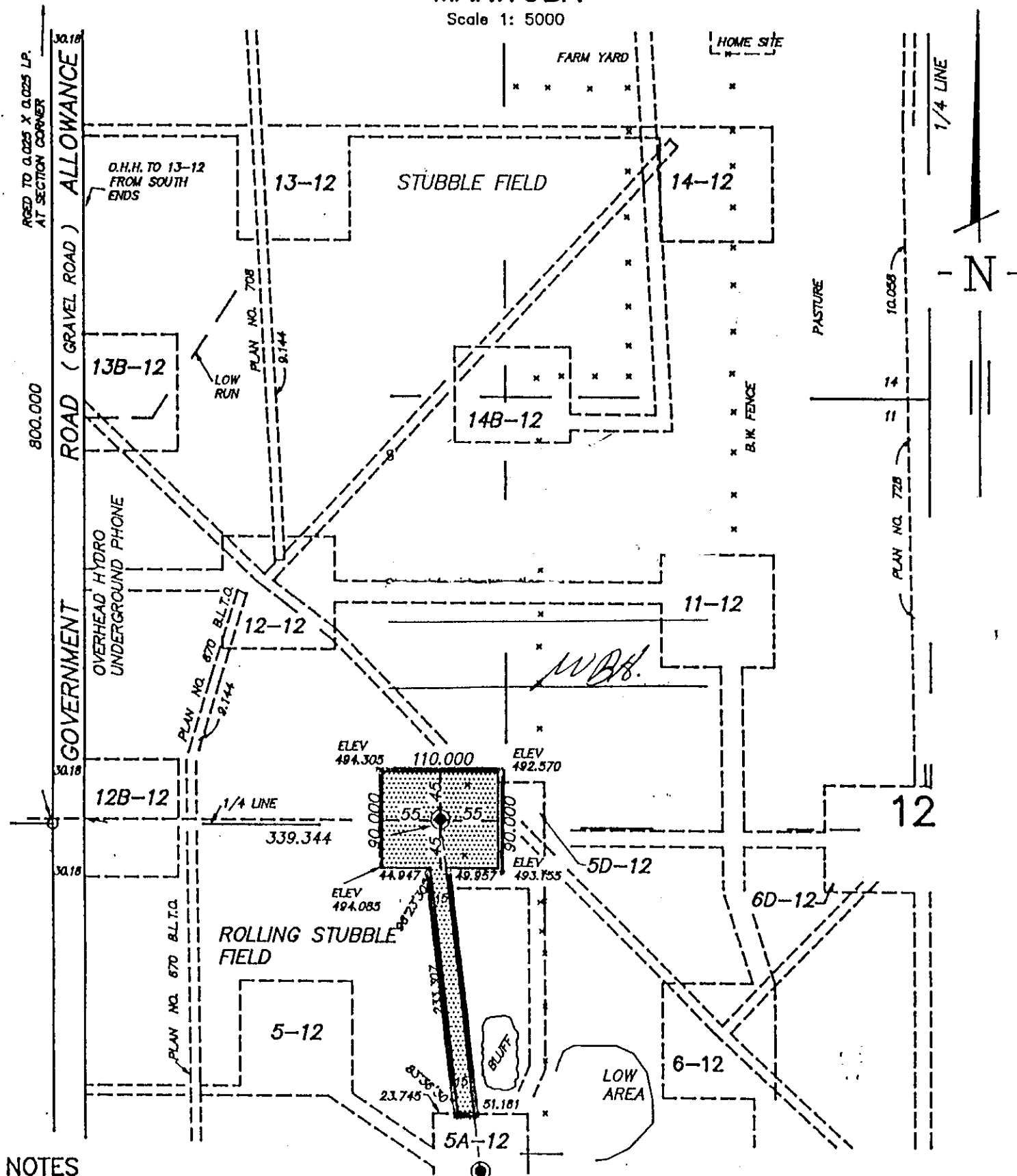
15. Notices:

All notices to be given hereunder may be given personally or by registered letter addressed to the party to whom the notice is to be given and when mailed, any such notice shall be deemed to be given to, and received by, the addressee seven (7) days after the mailing thereof, postage prepaid, provided that if at the time of such mailing or during the ensuing seven (7) days, there is in effect any industrial dispute, natural disaster or force majeure which may delay the receipt of such notice, the same shall be effective only if delivered.





PLAN OF WELL SITE LOCATION

MANITOBA

Scale 1: 5000



NOTES

All distances are in metres or decimals of a metre and may be converted to feet by multiplying by 3.28084
Well location is shown thus 
Area required is shown outlined thus 
Survey monuments found are shown thus 
Iron posts planted are shown thus 
Well Coordinates: 800.000 S. OF N. BDRY. SEC. 12
339.344 E. OF W. BDRY. SEC. 12

Ground elevation at well: 494.032
Area Well Site 0.990 ha., 2.45 acres
Access Road 0.350 ha., 0.86 acres
Total 1.340 ha., 3.31 acres

Plan and Survey
certified correct
this 17th day of May, 1991.

Richard C. Perris
Manitoba Land Surveyor

[Signature]
Witness

LENNON SURVEYS
P.O. Box 1346, 1840 Rossier Avenue
Brandon, Manitoba R7A8N2
(204) 727-0651
FAX (204) 727-5247



Memorandum

Date February 3, 1994

To John N. Fox
Chief Petroleum Eng.
Petroleum Branch
Energy & Mines
555-330 Graham Ave

From Bruno Gossen
Senior Planner
Corporate Planning &
Business Development
607-800 Portage Ave

Subject **VIRDEN ROSELEA UNIT NO. 1**
APPLICATION FOR REDUCED SPACING

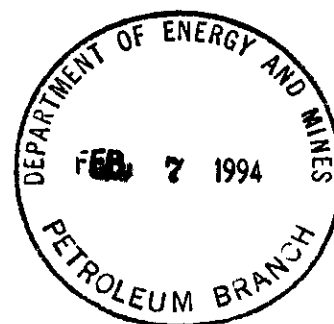
Telephone

← File

I have reviewed the above noted application for reduced spacing with our Community Economic Development office in Brandon and advise we have no concerns with this matter proceeding.

Due to vacation leave, I was unable to respond to you sooner. Please accept my apologies.

Bruno Gossen



Manitoba

February 2, 1994

MEMORANDUM

John N. Fox, Chief Petroleum Engineer
Petroleum Branch
Energy & Mines
555-330 Graham Avenue
Winnipeg, Manitoba

Ken McGill, Chief
Soil Survey & Land Utilization
Box 1149
Carman, Manitoba
745-2324

Reduced Spacing Application - Virden Roselea Unit No.7

I have reviewed the document you circulated regarding the above proposal. In response, I would like to offer the following general comments and concerns:

1. It appears from a copy of the letter from Chevron (K.G. Matieshin) to yourself dated November 10, 1993 and contained at the beginning of the proposal document that Chevron is requesting approval for reduced spacing drilling for the entire Virden Roselea Unit 1. This appears to be confirmed on page 5 ("Chevron is requesting reduced spacing for the entire Virden Roselea Unit 1"). However, "the sequence of drilling the reduced spacing locations is yet to be finalized" and the proponent only identifies 14 potential infill sites in sections 21,28,29 and 30 of 10-25w. Your cover memo indicates that "as many as 55 infill wells could be drilled if the application is approved".

It is very difficult to assess the proposal without a full knowledge of the ultimate extent of the project and with a possibility the entire project could be approved on the basis of an assessment of only a few specific (14) sites which represent only about 25 % of the total possible locations in the project.
2. While 14 sites are located by number and legal location, without some maps or preferably air photos indicating the precise locations of the proposed infill wells, it is also difficult to assess, particularly when the proposal indicates that it would be unlikely to deviate to any extent from the predetermined location directly or by using horizontal (deviated) wells. From an agricultural standpoint specific locations can be a significant issue particularly when dealing with annually cultivated land. Without a knowledge of the locations it is impossible to give a sound response.
3. The proposal begins with an "Analysis of the 1991 Virden Roselea Unit 1 Reduced Spacing Pilot" and declares "the infill drilling pilot was a technical and economic success". However, there is no indication given in this report, nor as I am lead to believe, has there ever been an assessment of the impact of any reduced spacing projects on the management and production activities (particularly for annual crops) associated with agricultural operations on the properties on which reduced spacings are located. Such an evaluation would be very useful in reviewing infill project proposals and would certainly be valuable in determining whether landowners/operators are being adequately compensated for the impact of such installations on their agricultural operations.
4. A number of efforts outlined in the proposal are to be commended. These include:
 - a) Minimizing the amount of land impacted by ensuring construction activities are conducted within the flowline rights of way, maximizing existing the use of lease roads, etc.

FEB 3 '94 14:37

MB. GOV'T SOILS & CR PAGE.002

Soils & Crops Branch
Box 1149
Carman, Manitoba
R0G 0J0

Phone: 745-2040 or 2324
Fax: 745-2299

FAX TRANSMITTAL SHEET

TO: John Fox

PHONE: _____

FAX: 945-0586

FROM: Ken McGill

NUMBER OF PAGES 3 (INCLUDING COVER SHEET)

COMMENTS: _____

- 2 -

- b) Reclamation procedures to: ensure the drill site is fully restored to be incorporated into the normal agricultural operation of the surrounding land; prevent soil mixing and top soil compaction and ensure top soil is conserved so the productive capacity of the soil is maintained; and rehabilitate areas affected by a spill.
- c) Controlling weeds around production facilities to ensure weeds do not infest surrounding areas.
- d) Minimizing interference with farming operations by using non-built up trails.
- e) Providing compensations for any losses due to spills, impacts installation have on agricultural operations, and providing assistance to land owners if the use of dugout or drinking water is inhibited.
- f) Informing land owners/operators of proposal activities and, involving them in such activities as ensuring construction is within rights of way and determining tie-in routings etc.

I would assume that these in fact are closely adhered to. I would also anticipate that weed control procedures are "recommended" for Manitoba and don't involve the use of herbicides which have a long term residual effect. In addition I would suggest that any compensation or assistance required is equitable, adequate and in line with the negative impact created and, in the case of damage to a water supply, a satisfactory long term solution is provided.

Clearly there are some areas where I would like more information before I can provide any final comments. I would also like to be assured that landowners "fully support the infill program" and, thus the project "will not proceed without the full consent of the affected land owners."



Ken McGill, Chief
Soil Survey & Land Utilization

cc. Bruno Gossen
Floyd Phillips

COMMENTS - AGRICULTURE'S REVIEW OF VRU #1 INFILL APPLICATION

1. SITE IMPACT ASSESSMENT REQUIRES

- (a) air photos or other mapping
- (b) address total unit & not just 14 Phase 2 locations

2. VRU #1 PHASE 1 - AGRICULTURE'S IMPACT ASSESSMENT

- effect -- "management & production" activities associated with agricultural operations (particularly for annual crops. \Rightarrow address the "heads of compensation"

- compensation - outline Chevron's compensation formula & amounts being paid under surface leases.

3. Assume Agriculture the Branch inspects field operations to ensure compliance with regulations & drilling licence conditions which reflect companies plans as outlined in the application.

4. Chevron to provide details of its weed control program.

5. discuss surface rights legislation, surface lease process

CHEVRON - PETROLEUM BR. MTA.

RE: VIBURN ROSOLUN UNIT NO. 1

• response to VRU #1 deficiency letter

Future Phases

- Phase 4 marginal location, least probability of proceeding
- no new facilities required, upgrading of existing facilities necessary

ENV. - don't drill in a pot hole / slough / wet land

- prefer to see wells located on edge of field vs location in middle of a "natural area", to reduce habitat destruction

- endangered flora & fauna more likely to occur in unique habitat such as a river valley

- draw on experience in drilling in these particular circumstances

- project risk → clear company handles @ \$15/bbl flat oil price forecast
- PRI has EOR screening model.

Calgary, Alberta
FEBRUARY , 1994

1991 VRU No. 1 Reduced Spacing Pilot Analysis

Q. 1 Incremental Reserves

Figures 1 through 6 present decline analysis of remaining reserves for the entire Unit 1 with and without the 1991 infill wells and conversions (09-30 and 15-30-10-25). The results are summarized as follows:

Decline Analysis Method	Without 1991 Pilot	With 1991 Pilot Incremental	
	Total Reserves E3 m3	Total Reserves E3 m3	Reserves E3 m3
Exponential Decline	2599	2659	60
Rate vs. Cumulative Oil	2579	2660	81
WOR vs. Cumulative Oil	2534	2677	143
Average	2571	2665	94

We have also looked at the sweep efficiencies of the production scenarios with and without the 1991 pilot project. As seen on Figure 7, the sweep efficiency for the entire Unit has been increased by the 1991 infill wells and WIW conversions. From January 1992 to the forecasted life of the Unit we expect to inject 0.4 pore volumes. Referring to Figure 7, this corresponds to a sweep efficiency of 38 percent versus 36 percent for the old production scenario - a 2 percent increase. This corresponds to an incremental volume of 54 E3 m3.

Chevron feels the incremental recovery for the 1991 infill project is in the order of 60 E3 m3 - not the 90 E3 m3 previously reported.

Q. 2 Oil/Water Contact, Natural Fracture Review

The apparent discrepancy in elevation of the oil-water contact in the 1991 pilot area analysis is a result of some confusion in terminology. The figure of -180 meters MSL represents the interpreted minimum elevation (highest) of the original "free water level". The "free water level" represents the elevation below which the reservoir is 100% water saturated. Chevron generally uses "oil-water contact" to represent the elevation below which water saturation is too high to allow economic production. The placement of the contact is somewhat arbitrary and is usually placed at 50 or 60% water saturation as determined by log evaluation.

In most oil-fields there is a very thin transition zone between the reservoir at irreducible water saturation and the reservoir below "free water level". In these cases the oil-water contact and free water level are near-coincident. In the Virden Lodgepole pools there is little (if any) reservoir at irreducible water saturation and most production comes from a very thick transition zone.

Log analysis of the three wells with Cherty pay shows "oil-water contacts" at -165.4m (10C-30), -169.2m (8C-30), and -171.7m (8B-30). As discussed above, the elevations given represent the elevations below which water saturation is greater than 50% (at the time of logging).

We are at a loss to fully explain the water production from 11B-30. The well was drilled into a mature pool that has been under waterflood for some time. It may be that all moveable oil had been drained or swept from the area prior to drilling. Alternately, high water influx via vertical fractures may have dominated any potential oil flow from oil-bearing zones. It is interesting to note that fluid containing 10% oil was swabbed from the Sandhill and Crinoidal during the testing of the well.

Virден Roselea Unit 1 - Natural fracture review

A review of the original wellsite core descriptions was done to determine the extent of natural fractures. the following conclusions were reached:

- fractures are not contained to single zones
- majority of fractures are vertical
- the orientation (NW-SE for ex.) of the fractures can not be determined from core descriptions
- fractures appear to be more prevalent in the western portion of the pool - this may be a result of the number of wells cored
- fractures are more prevalent on the structural flanks ?

1993 Virден Roselea Unit No. 1 Reduced Spacing Application

Q. 1 Incremental Recovery

OOIP for the 1994 infill Project Area is estimated to be 2500 E3 m3. Thus the 125 E3 m3 incremental recovery represents a 5 % incremental recovery factor. Chevron feels this 5 % increase is can be achieved through infill drilling and pattern realignment which is also currently being evaluated.

Q. 2 Drilling Procedures

Q. 3 Testing Procedures

Future Phases of Infill Drilling in VRU No. 1

Q. 1 Future Phases

In order to drill out the VRU No.1 down to 8 ha spacing would require a total of 51 locations. Drilling 14 this year would leave 37 locations remaining. Under Chevron's current budgeting procedures, we would expect to be able to continue drilling an average 14 infill wells per year. In light of this constraint, the future phases would be:

	1995	1996	1997
	<u>Producers</u>		
1	02 B - 29 - 10 - 25	01 B - 25 - 10 - 26	13 B - 24 - 10 - 26
2	03 B - 29 - 10 - 25	02 B - 25 - 10 - 26	14 B - 24 - 10 - 26
3	07 B - 29 - 10 - 25	03 B - 25 - 10 - 26	15 B - 23 - 10 - 26
4	10 B - 29 - 10 - 25	04 B - 25 - 10 - 26	16 B - 23 - 10 - 26
5	04 B - 30 - 10 - 25	05 B - 25 - 10 - 26	13 B - 20 - 10 - 25
6	05 B - 30 - 10 - 25	06 B - 25 - 10 - 26	14 B - 20 - 10 - 25
7	06 B - 30 - 10 - 25	07 B - 25 - 10 - 26	15 B - 20 - 10 - 25
8	12 B - 30 - 10 - 25	08 B - 25 - 10 - 26	16 B - 20 - 10 - 25
9	13 B - 25 - 10 - 26	10 B - 25 - 10 - 26	03 B - 26 - 10 - 26
10	14 B - 25 - 10 - 26	11 B - 25 - 10 - 26	
11	15 B - 25 - 10 - 26	12 B - 25 - 10 - 26	
12	16 B - 25 - 10 - 26	09 B - 26 - 10 - 26	
13	16 B - 26 - 10 - 26	15 B - 24 - 10 - 26	
14	01 B - 36 - 10 - 26	16 B - 24 - 10 - 26	

Continuing with the plan to complete infill wells as producers and to achieve repeated inverted nine-spot patterns, the following WIW conversions would be required:

	1995	1996	1997
	<u>Injectors</u>		
1	09 - 25 - 10 - 26	01 - 25 - 10 - 26	
2	09 - 26 - 10 - 26	03 - 25 - 10 - 26	
3		01 - 26 - 10 - 26	

This pattern realignment is still being evaluated.

See attached figure for development phases.

Q. 2 Increase in Recovery

The estimated increase in ultimate recovery is 5 % and is achieved both by infill drilling and pattern realignment.

Assuming an average production increase of 2 m3opd per well, the Unit estimated production increase would be 62 m3opd. This assumes 37 wells are drilled with 6 of these wells being uneconomic to complete.

Q. 3 Facility Upgrades

Facility upgrades are estimated to follow the completion of each phase of drilling to ensure proper design. Therefore the upgrade would occur as follows:

1994 01 - 29 - 10 - 25
1995 10 - 25 - 10 - 26
1995 04 - 25 - 10 - 26

Q. 4 Capital Costs

Estimated Costs for the 1994 project and future costs are as follows (1994 Dollars) :

	Unit Cost \$M	Total Cost \$M	Annual Cost \$M
1994			
Drill 14 wells	141	1,974	
Complete 14 Wells	62	868	
Tie - in 14 Wells	52	728	
Convert 2 wells to water injection	26	52	
Tie-in 2 WIW's	62	124	
Upgrade 1 Facility	254	<u>254</u>	
			4,000
1995			
Same as 1994			4,000
1996			
Same as 1994 plus one WIW conversion			4,090
1997			
Drill 9 wells	141	1,269	
Complete 9 Wells	62	558	
Tie - in 9 Wells	52	<u>468</u>	
			2,295

Q. 5 Benefits

Figures (to be attached) show the annual benefits to the Crown and Freehold mineral rights owners. the increased income will be distributed in an equitable fashion to all Lessees and Lessors.

Other benefits will include revenues through Provincial taxes on oil field equipment and flowlines, surface rights payments, and indirect benefits to the local economy in the service sector.

Q.6 Risk

Infill drilling in Virden Roselea Unit 1 may be postponed if the wells encounter areas already completely swept and fail to produce economic rates. The oil price is a main factor in determining the economic feasibility of a project and sustained low oil prices may make infill drilling uneconomic.

Chevron, and the other Working Interest Owners have a variety of projects to fund each year within their own capital budgets. As such, each company must decide on those projects which provide the best investment for their company. Working Interest Owners may have other projects they view as being more attractive and would choose to defer infill drilling. In this instance, it is possible that approval under the Unit Operating agreement could not be obtained if enough companies choose not to support infill drilling.

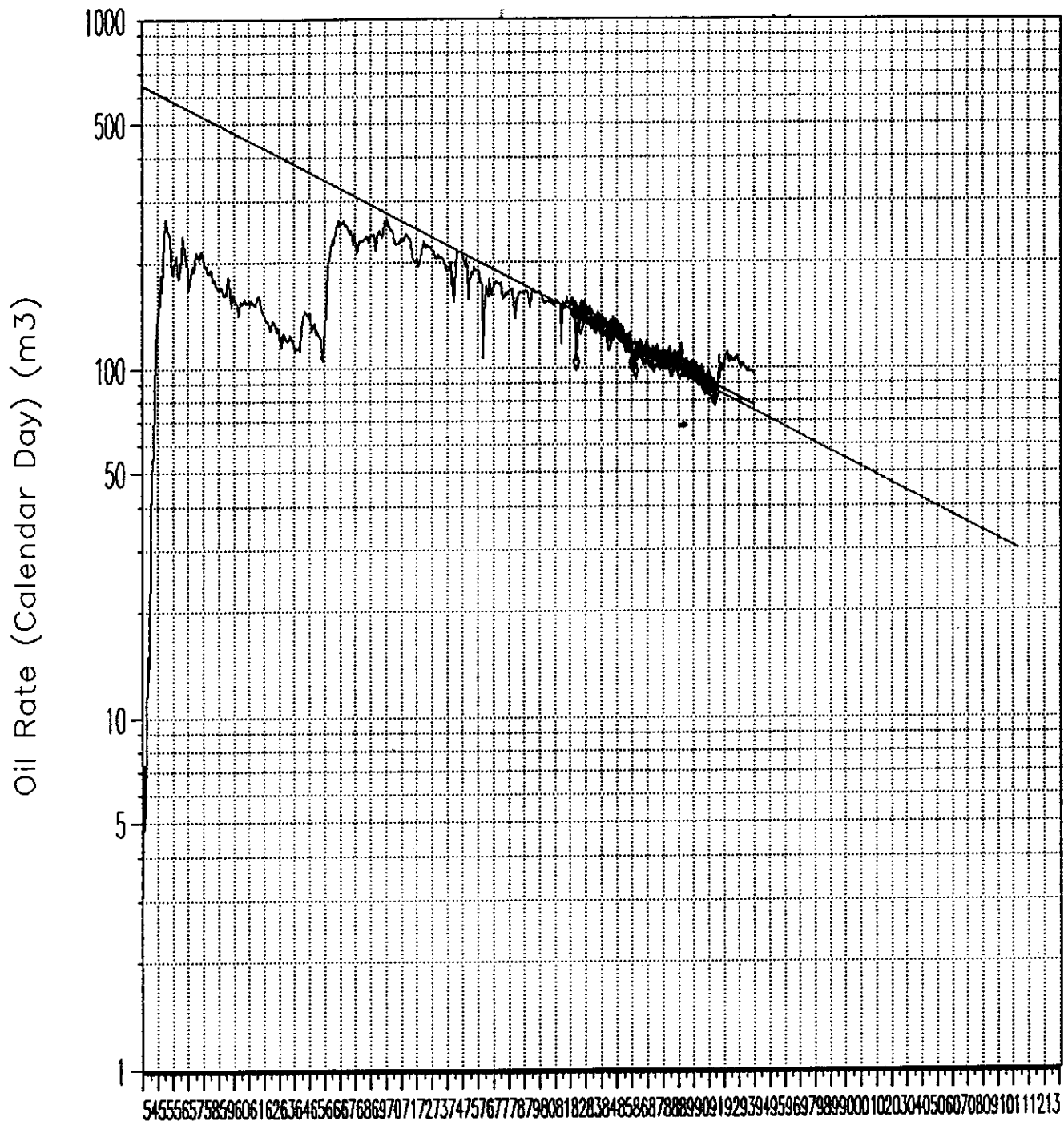
Q.7 Enhanced Oil Recovery

In 1987, Chevron completed a scoping evaluation of implementing a hydrocarbon miscible flood in the North Virden Scallion field. It was concluded that such a project was not feasible because of the marginal nature of the reservoir for HCMF compared to Alberta reservoirs. Also the fact that the majority of the land is freehold made it virtually impossible for the Manitoba government to provide enough incentives for a HCMF to be economically feasible.

Chevron has again looked at a HCMF project in the NVSU No. 1 field using similar assumptions, but on a pilot basis. Under the current economic environment, a pilot is still not feasible. In order for the pilot to be attractive to Chevron and its partners would require incentives worth \$ in 1994.

Environmental and Land Use Impacts

Viriden Roselea Unit 1



Decline Rate (frac) Nominal: 0.004425 Effective: 0.004415 Annual: 0.051713

Current Oil rate: 85.3 m³/d

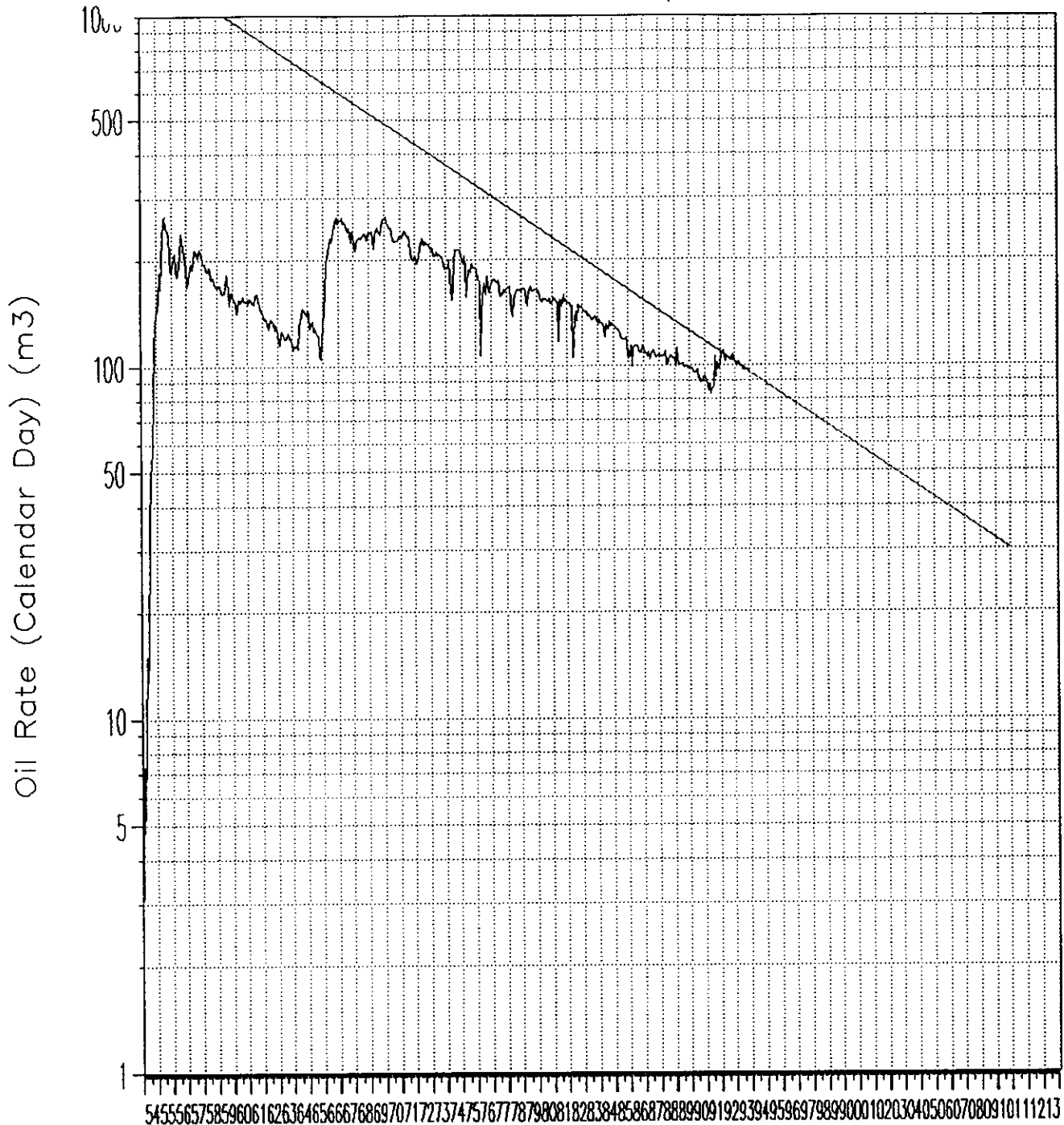
Economic Limit: 30.0 m³/d

Cumulative Oil Produced: 2218.2 E3m³

Remaining Reserves: 380.9 E3m³

Total Reserves: 2599.1 E3m³ - At the Economic Limit

Viriden Roselea Unit 1, All Wells except 7B-30 and 10B-30



545556575859606162636465666768697071727374757677787980818283848586878889909192939495969798990001020304050607080910111213

Decline Rate (frac) Nominal: 0.005680 Effective: 0.005664 Annual: 0.065892

Current Oil rate: 95.5 m³/d

Economic Limit: 30.0 m³/d

Cumulative Oil Produced: 2307.7 E3m³

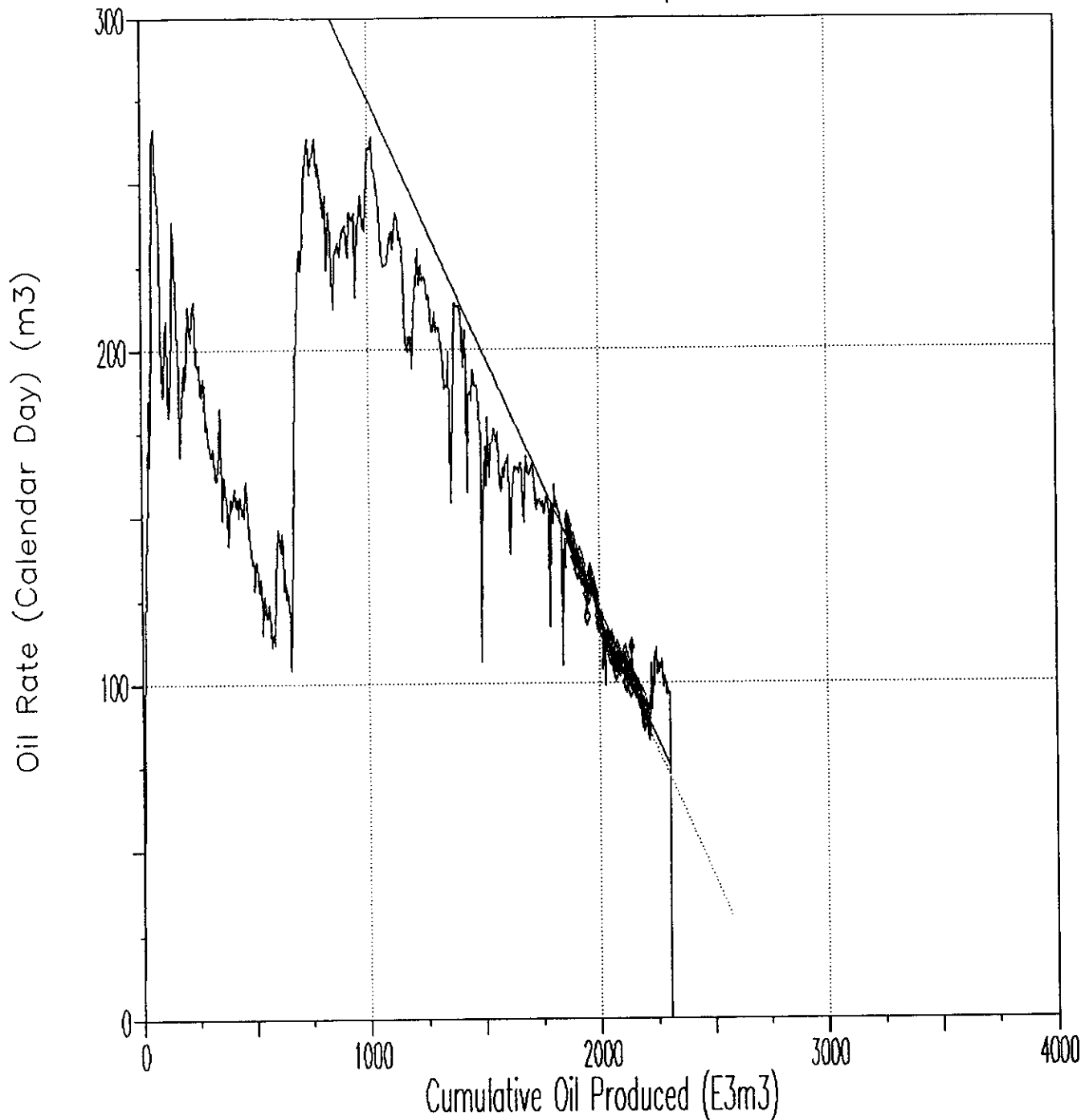
Remaining Reserves: 350.9 E3m³

Total Reserves: 2658.6 E3m³ - At the Economic Limit

○

DWS Mon Jan 31 13:40:54 1994

Viriden Roselea Unit 1 All Wells except 7B-30 and 10B-30



Oil Rate vs Cum. Oil slope: -0.00466207 1/month

Current Oil rate: 85.3 m³/d

Economic Limit: 30.0 m³/d

Cumulative Oil Produced: 2218.2 E3m³

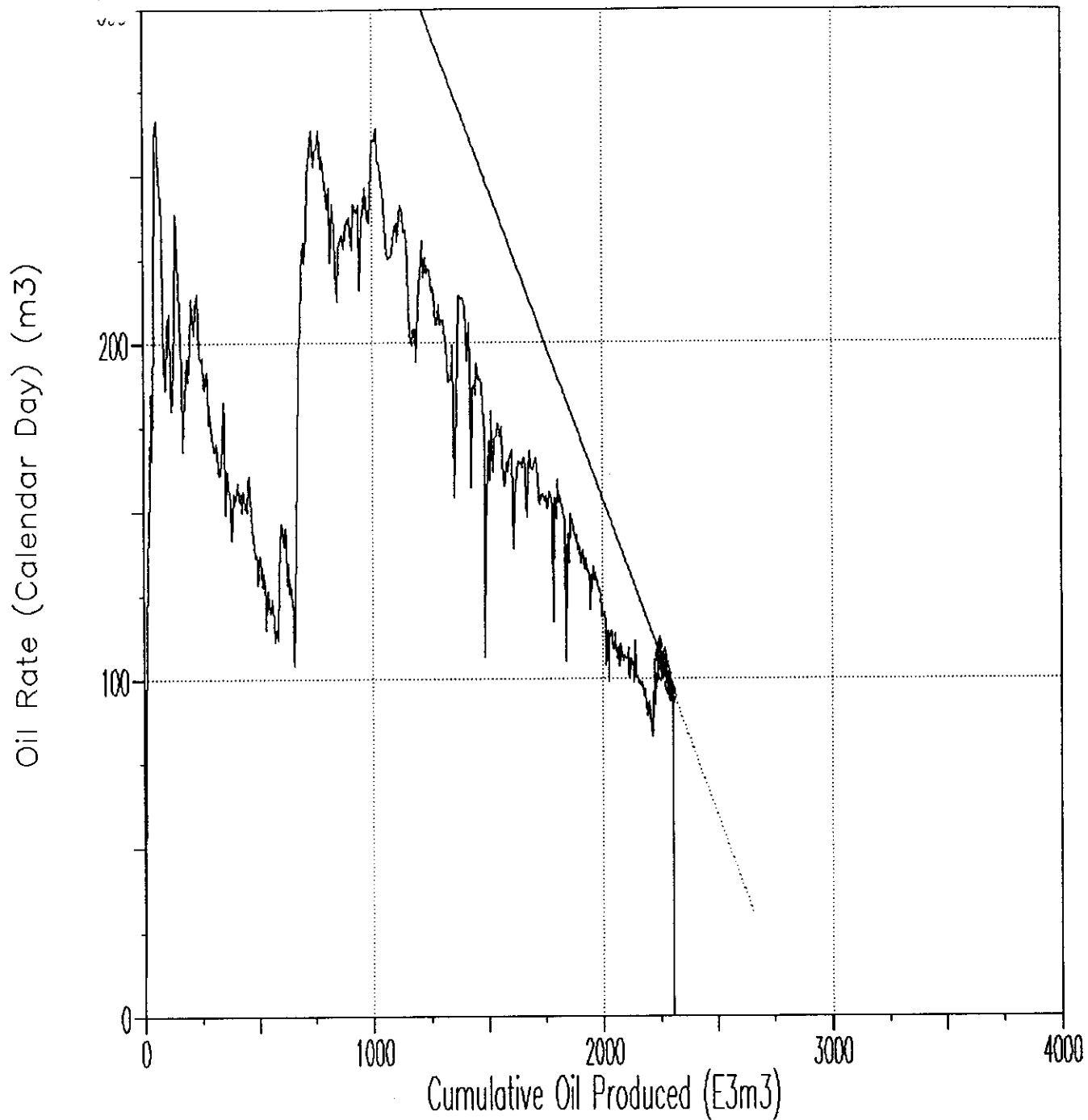
Remaining Reserves: 360.8 E3m³

Total Reserves: 2579.0 E3m³



DWS Mon Jan 31 14:12:48 1994

Viriden Roselea Unit 1 All Wells except 7B-30 and 10B-30



Oil Rate vs Cum. Oil slope: -0.0056599 1/month

Current Oil rate: 95.5 m³/d

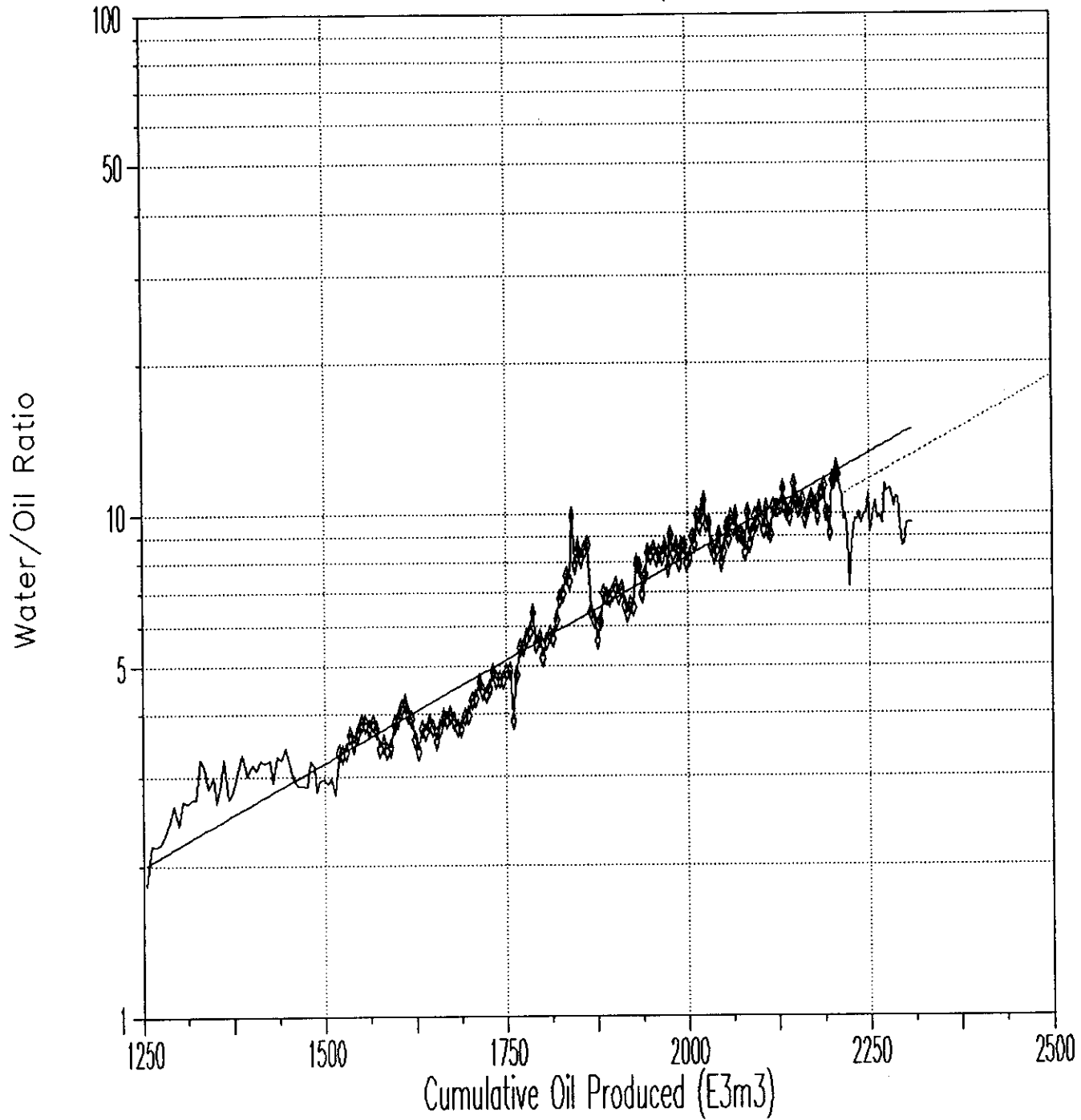
Economic Limit: 30.0 m³/d

Cumulative Oil Produced: 2307.7 E3m³

Remaining Reserves: 352.0 E3m³

Total Reserves: 2659.7 E3m³

Viriden Roselea Unit 1 All Wells except 7B-30 and 10B-30



Slope WOR vs Cum. Oil: 0.00082

Current WOR: 11.0

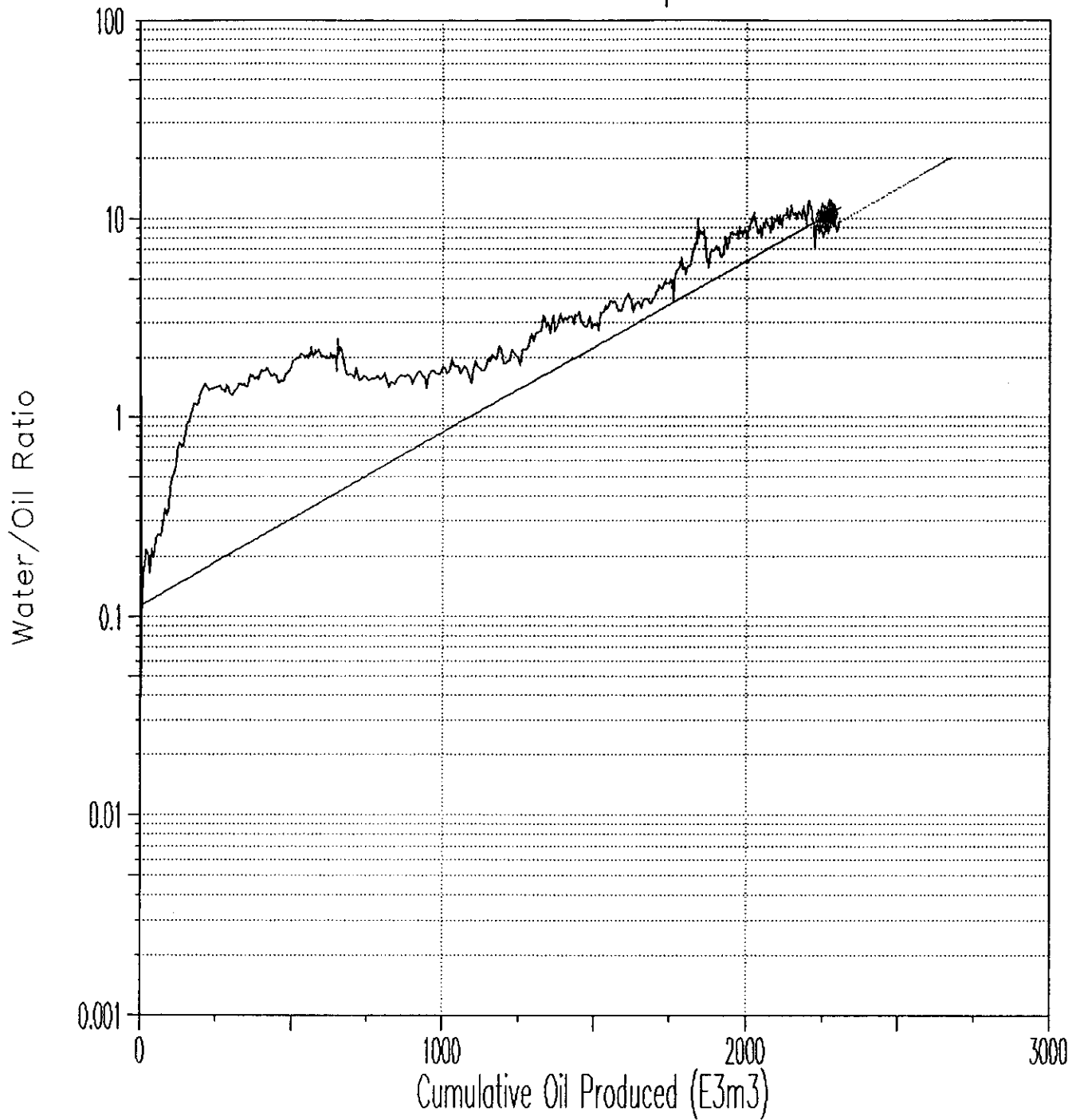
Limiting WOR: 20.0

Cumulative Oil Produced: 2218.0 E3m3

Remaining Reserves: 316.3 E3m3

Total Reserves: 2534.3 E3m3

Viriden Roselea Unit 1 All Wells except 7B-30 and 10B-30



Slope WOR vs Cum. Oil: 0.00086

Current WOR: 9.6

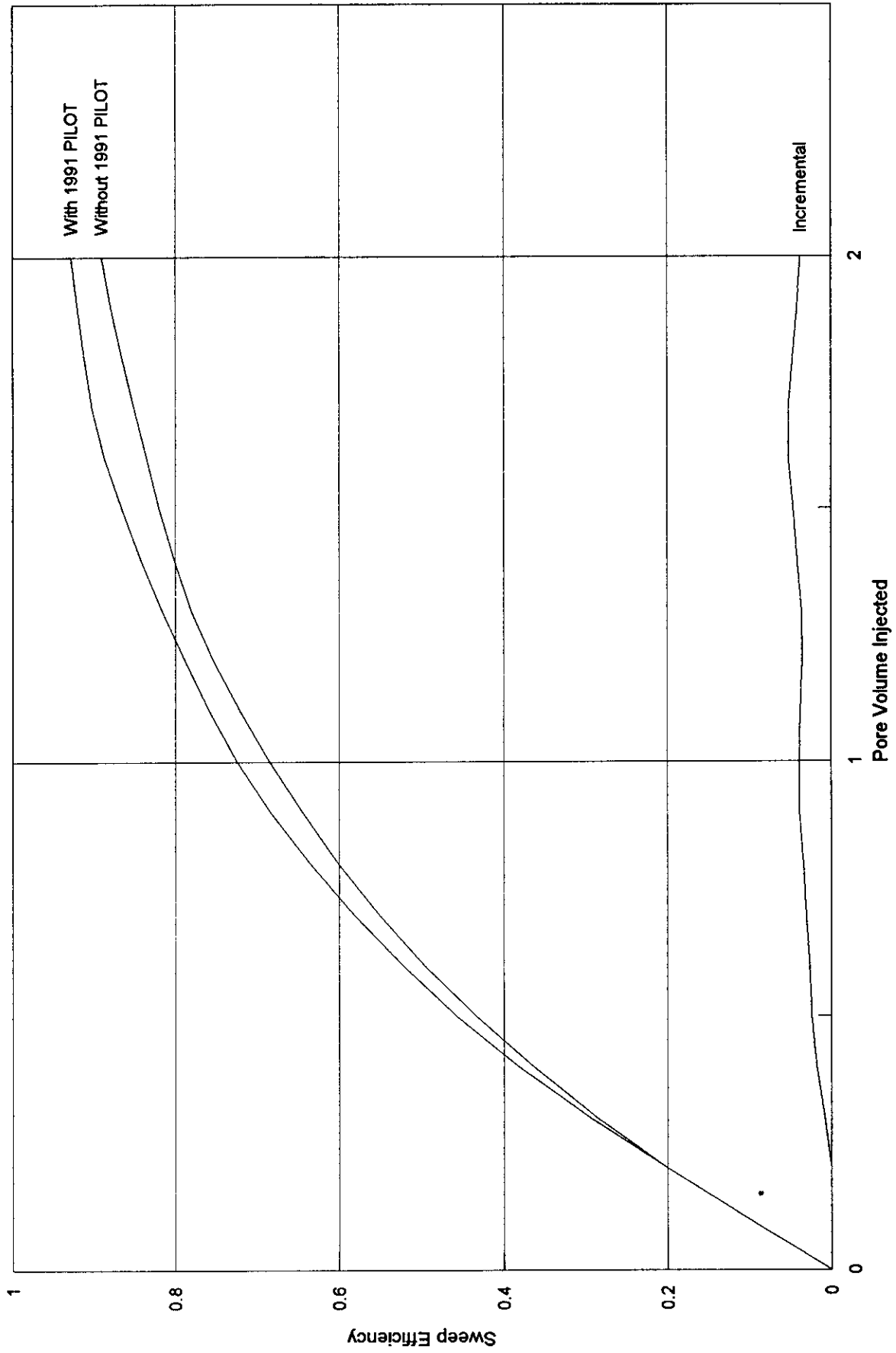
Limiting WOR: 20.0

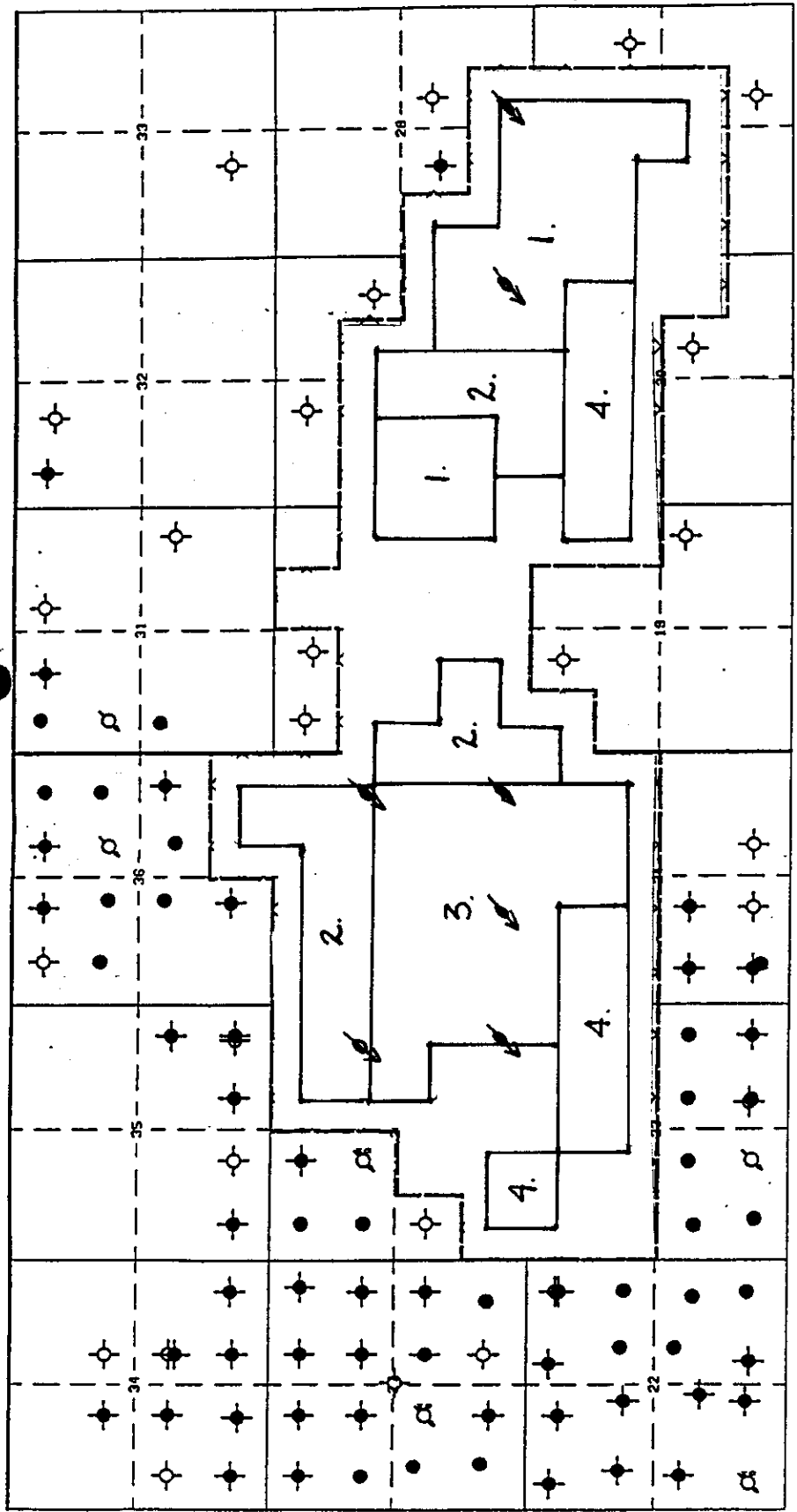
Cumulative Oil Produced: 2308.0 E3m3

Remaining Reserves: 368.6 E3m3

Total Reserves: 2676.6 E3m3

Viriden Roselea Unit 1





T.10

R.26W1M

VIRDEN ROSELEA UNIT 1

R.25W1M

8 HECTARE DRILLING SPACING UNITS

- 1. 1994 Drill
- 2. 1995 Drill
- 3. 1996 Drill
- 4. 1997 Drill
- W.W. Conversion



Date January 21, 1994

Memorandum

To David Tomasson
Chairman
Oil and Natural Gas
Conservation Board

From H. Clare Moster
Deputy Chairman
Oil and Natural Gas
Conservation Board
1111

Subject **CHEVRON'S REDUCED SPACING APPLICATION** Phone
VIRDEN ROSELEA UNIT No. 1

You will probably recall signing a Board Notice related to this application on December 23, 1993.

For your information, attached are copies of further letters which I have signed on behalf of the Board related to this application.

1. Letter to Chevron requesting additional information to enable a more thorough evaluation of this application.
2. Letter to John Fefchuk and Norma Tibbits-Fefchuk in response to a letter from them dated January 7, 1994 (copy attached).

Further processing of this application will continue when Chevron's response is received and if any further concerns are submitted by other interested parties.

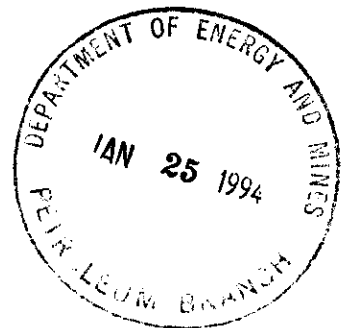
H. Clare Moster

Attachment

cc: L.R. Dubreuil

HCM:p

MemDT124 Doc



First Fold



The Oil and Natural Gas
Conservation Board

555 — 330 Graham Avenue
Winnipeg MB R3C 4E3
CANADA

(204) 945-1111
FAX: (204) 945-0586

January 20, 1994

Mr. John Fefchuk and Ms. Norma Tibbits-Fefchuk
P.O. Box 2142
Virden MB R0M 2C0

Dear Sir and Madam:

Re: Virden Roselea Unit No. 1
Reduced Spacing Application

This letter is to acknowledge receipt of your intervention dated January 7, 1994. The Board has forwarded a copy of your letter to Chevron Canada Resources and asked the company to comment on your concerns.

The Board sends a copy of all reduced spacing applications to the Departments of Rural Development, Agriculture and Environment for comment regarding issues such as land use and environmental impacts. The Board is still awaiting comments from the other Departments.

You will be notified of the Board's position on your intervention prior to final disposition of the application.

If you have any questions, please contact the undersigned or L. R. Dubreuil, Director of Petroleum at 945-1111 and 945-6573, respectively.

Yours respectfully,



H. Clare Moster
Deputy Chairman



The Oil and Natural Gas
Conservation Board

555 — 330 Graham Avenue
Winnipeg MB R3C 4E3
CANADA

(204) 945-1111
FAX: (204) 945-0586

January 20, 1994

Mr. K. G. Matieshin, P.Eng.
Manager, Environment, Safety and Regulations
Chevron Canada Resources
500-5th Avenue SW
Calgary AB T2P 0L7

Dear Mr. Matieshin:

Re: **Virden Roselea Unit No. 1**
Reduced Spacing Application

The Board has completed a preliminary review of your application for approval of reduced 8 ha spacing in Virden Roselea Unit No. 1 (VRU No. 1). Notice of the application has been published in the Virden Empire Advance and sent directly to landowners within the unit and working interest and royalty owners adjacent to the unit. The last day for filing objections to or interventions in the application is January 28, 1994.

In its preliminary review of the application the Board has identified a few areas that require further information, clarification or comment.

1991 VRU No. 1 Reduced Spacing Pilot Analysis

1. Provide decline curve or other analysis used to determine the incremental recoverable reserves of 90 000 m³ for the pilot project. Can any of the production associated with the infill wells be considered accelerated versus incremental production?
2. The original O/W contact in the Cherty in the pilot project area was estimated at -171.6 m subsea. Based on infill log interpretation, the revised O/W contact was picked below -180 m subsea and log-pay was identified in all the infill wells. Explain why wells with log-pay such as 11B-30 produced only water. How extensive is vertical fracturing in the Cherty and Oolites?

1993 Virden Roselea Unit No. 1 Reduced Spacing Project

1. Chevron has estimated the 1993 infill project will recover incremental reserves of 125 000 m³, resulting in an increase in ultimate unit recovery from 34% OOIP to 36% OOIP. Please provide an estimate of OOIP for the 1993 infill project area to allow calculation of incremental recovery within the project area.
2. The Board has reviewed the proposed drilling program using the following information; (1) a reservoir pressure of 8400 - 11 700 kPa based on pressure surveys in 1990 and 1993; and (2) a shut-in wellhead pressure of 4500 - 6000 kPa based on observed shut-in wellhead pressures at A4-29-10-25 and 11B-30-10-25. Based on leak-off test results from 10B-30-10-25, surface casing set at a depth of 250 - 260 m should be adequate to control a kick without the risk of fracturing at the surface casing shoe. However, a mud weight of 1300 kg/m³ will only result in a hydrostatic pressure of 7600 kPa at the Lodgepole, much less than the anticipated reservoir pressure. Please comment on these calculations.
3. Section 56 of the Petroleum Drilling and Production Regulation requires new wells be production tested monthly for the first year and quarterly thereafter. Infill wells in the 1991 project area were tested only 2-3 times the first year and 1-2 times the following year, with some wells going more than 18 months without being tested. How does Chevron propose to comply with the regulatory production testing requirements for existing and future infill wells?

Future Phases of Infill Drilling in VRU No. 1

In the application Chevron makes reference to unit-wide development on 8 ha spacing taking place in several phases. In order to address the appropriateness of unit-wide reduced spacing the Board needs some preliminary details on Chevron's future infill drilling plans.

1. Provide the tentative location and timing of subsequent phases of infill drilling in VRU No. 1 including likely injector conversions.
2. Provide an estimate of the increase in unit productivity and ultimate recovery, if VRU No. 1 is fully developed on 8 ha spacing.
3. Are there any additional production or injection facilities or facility upgrading needed to accommodate unit-wide infill drilling?

4. Provide an estimate of the capital cost for the 1993 infill project and unit-wide infill drilling including costs for drilling and completion, artificial lift, flowlines and production and injection facilities.
5. Provide an estimate of the benefits to the Crown, freehold royalty owners, landowners and the rural municipality from the 1993 infill project and unit-wide infill drilling.
6. What are the factors most likely to make continued infill drilling in VRU No. 1 uneconomic and cause postponement of future phases?
7. Has Chevron reviewed the feasibility of implementing an EOR scheme in VRU No. 1?

Environmental and Land Use Impacts

Within VRU No. 1 there is a mixture of cropland, pasture, forested land, river valleys, residential property and other surface improvements. Infill drilling will have different environmental and land use impacts in each of these areas. The Board is waiting on comments from the Departments of Rural Development, Environment and Agriculture before finalizing its position regarding the siting of infill wells on the various different areas within the unit.

Of particular concern in the 1993 infill project is the siting of the 13B-21, 4B-28 and 4C-28 wells on the eastern slope of the Assiniboine River valley and the 5C-29 and 8A-30 wells near the Assiniboine River. Please provide additional siting information such as aerial photographs showing the proposed access roads, well locations and flowline routes for these wells.

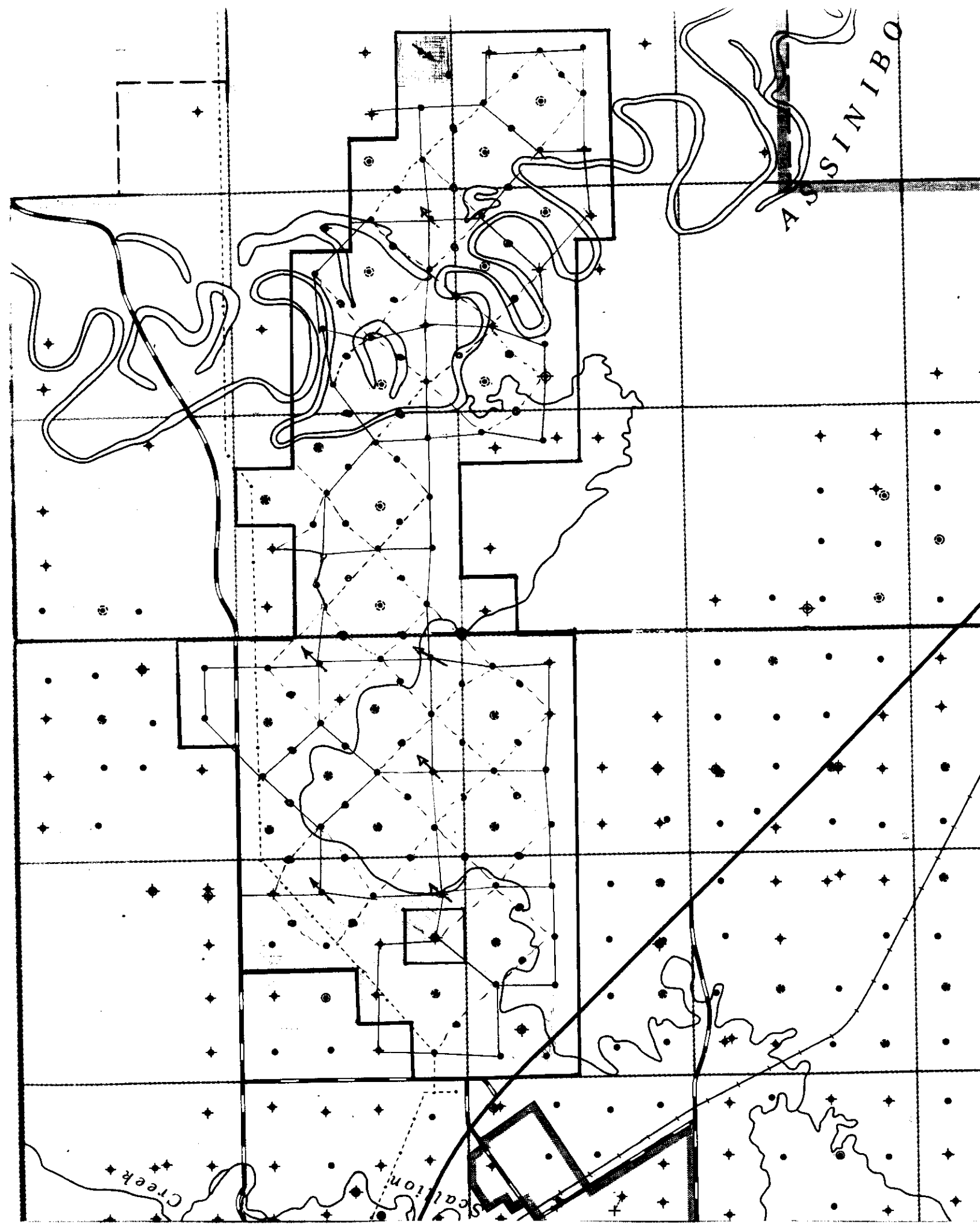
The Board has already received an objection from the landowner in the SE/4 of Section 25-10-26 siting aesthetics and environmental concerns. A copy of the letter of objection is attached. Please comment on infill drilling plans in the SE/4 of Section 25 and the concerns raised by the landowner.

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

Yours respectfully,



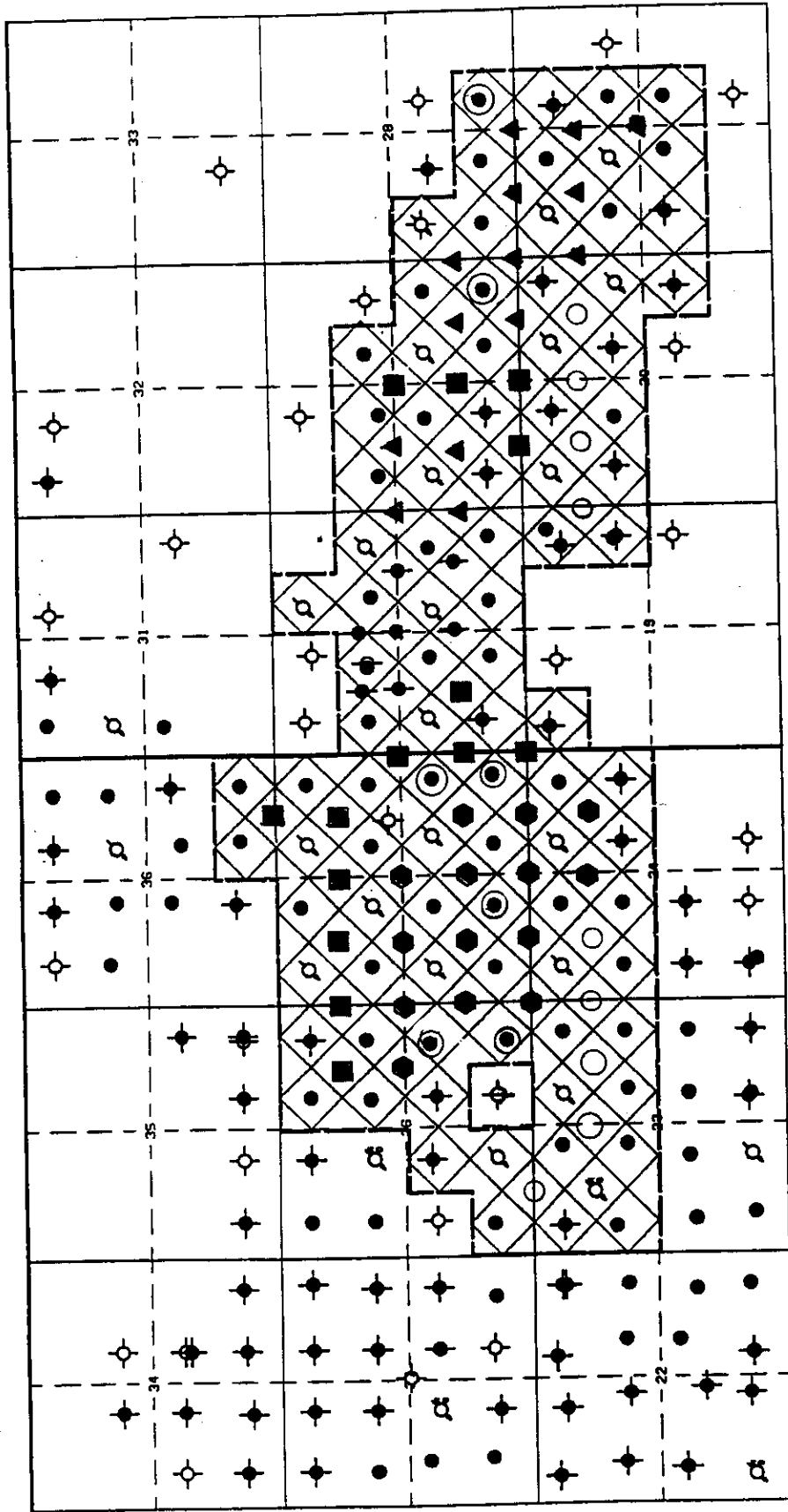
H. Clare Moster, Deputy Chairman



APPENDIX 1

R.25W1M

R.26W1M



T.10

R.25W1M

VIRDEN ROSELEA UNIT 1

8 HECTARE DRILLING SPACING UNITS

T.10

R.26W1M

- 1991 INFILL WELLS
- ▲ 1994 INFILL WELLS
- 1995 INFILL WELLS
- 1996 INFILL WELLS
- ⊙ PROPOSED WIW CONVERSIONS



Memorandum

Date January 19, 1994

To The Oil and Natural Gas
Conservation Board
- David Tomasson, Chairman
- Clare Moster, Deputy Chairman

From John N. Fox
Chief Petroleum Engineer

Subject **Virden Roselea Unit No. 1**
Reduced Spacing Application

Telephone

The Branch has completed its preliminary review of Chevron Canada Resources application for reduced 8 ha spacing in Virden Roselea Unit No. 1 (VRU No. 1).

RECOMMENDATIONS

It is recommended that the Board send Chevron a deficiency letter requesting further information, clarification and comments on the application. A copy of the proposed deficiency letter is attached.

The Board has already received an objection to the application from the landowner in the SE/4 of Section 25-10-26. A copy of the proposed Board letter acknowledging the objection is attached.

DISCUSSION

Chevron's reduced spacing application for VRU No. 1 includes a review of the performance of the company's 1991 VRU No. 1 infill drilling project (Phase 1), a technically supported proposal to drill 14 infill wells and convert two wells to water injection in 1994 (Phase 2) and a cursory environment impact assessment (EIA) of reduced spacing in the unit area.

Phase 1 - Performance Review

In 1991 Chevron drilled 7 infill wells on 8 ha spacing (Board Order No. SU 8) and converted two wells to injection in Section 30-10-25 (see Fig. 1). Section 30 was targeted for the pilot infill drilling project because it met the following criteria, believed necessary by Chevron to recover incremental reserves through infill drilling;

- (a) structurally high,
- (b) moderate to high oil productivity,
- (c) low water-cut, and
- (d) low to moderate depletion.

Table 1 compares the predicted and actual infill well productivity and recoverable reserves for Phase 1. The Branch has reviewed Chevron's estimate of incremental recoverable reserves for Phase 1. It is difficult to accurately determine

First | Fold

incremental reserves with only 2 years of infill well production. Decline curve analysis (see Fig. 2) yields a range of infill well incremental recoverable reserves from 45 700 - 98 500 m³, compared with 90 000 m³ estimated by Chevron. The potential acceleration component associated with infill well production was reviewed by comparing existing wells pre- and post-infill drilling production decline rates (see Fig. 3). With the exception of the 3rd Qu/93, production from the existing wells has continued to decline at pre-infill drilling rates, suggesting the majority of infill well production is incremental reserves.

The completion results for the Phase 1 infill wells confirms the complexity of reservoir interpretation in this multi-layered mature waterflood (see Table 2). Chevron expected the majority (60%) of incremental reserves to be produced from the Cherty. In 3 of the 7 infill wells the Cherty produced only water. Initial production rates varied dramatically from less than 0.5 m³/d from wells encountering swept portions of the reservoir to more than 9 m³/d from wells drilled in unswept areas.

In Phase 1 two wells were converted to injection, 9-30 and 15-30 (see Fig. 1). These wells were converted to provide injection on the northeast flank of the structural high in Section 30, near the unit boundary. These wells currently inject at a combined rate of 50 m³ WPD. In the Phase 1 project area the current and cumulative voidage-replacement ratio is 1.8 m³/m³ and 2.2 m³/m³, respectively, indicating the injection wells have no problem replacing the additional infill well voidage.

It is apparent from Phase 1 that reduced 8 ha spacing in VRU No. 1 will result in the recovery of incremental reserves. It is also apparent that Chevron's understanding of the reservoir and waterflood performance is incomplete. The Branch has some technical questions for Chevron regarding Phase 1 to assist our understanding of the infill well performance.

Phase 2 - Performance Predictions

In this application Chevron has requested reduced 8 ha spacing for the remainder of VRU No. 1. Chevron proposes to drill 14 infill wells and convert 2 wells to injection in Phase 2 (see Fig. 1). Chevron has selected the 14 infill locations using the same criteria used in Phase 1.

The Phase 2 locations can be divided into two distinct groups:

- (a) The 5A-29, 5C-29, 5D-29 and 8A-30 locations are an extension of Phase 1. The wells are located on the same structural high as the Phase 1 infill wells (see Fig. 4). Pressure support for these wells will be primarily from the 5-29 injector with additional support from 9-30. Even with the infill wells, the predicted VRR in the W/2 of Section 29 will be 2.4 m³/m³.

- (b) The remaining 10 infill locations are located on a structural high at the eastern edge of the unit (see Fig. 4). Pressure support will come from existing injectors at 9-20, 14-20, 11-21, 13-21 and 7-29 and proposed injector conversions at 2-28 and 1-29. In order to achieve a VRR=1.0, injection in the above wells will have to increase by 35 m³/d, with most of the additional injection into 11-21 and the two new injectors 2-28 and 1-29.

Chevron has predicted initial productivity for the 14 Phase 2 infill wells will average 2 m³OPD at a 50% water-cut. The wells are estimated to recover incremental reserves of 125 000 m³ or 8930 m³/well. Table 1 compares the Phase 1 results and Phase 2 estimates. Phase 2's lower initial productivity 2.0 m³OPD vs 4.0 m³OPD, is representative of the lower productivity of the existing 16 ha producers in Phase 2 (1.9 m³OPD at a 87.5% water-cut). Initial Phase 2 infill production has been declined by Chevron at the unit average decline rate of 6.7%/year, to determine incremental recoverable reserves for the project. Chevron's productivity and reserves estimates are comparable to the performance of the infill wells in Phase 1.

Chevron has estimated Phase 2 infill production will increase ultimate recovery in VRU No. 1 from 34% to 36% OOIP. However, the company has not provided an estimate of OOIP for Phase 2, to allow calculation of an incremental recovery factor for the project area. ?

Phase 2 - Drilling And Reservoir Evaluation Program

In Phase 1, Chevron set intermediate casing above the Mississippian and completed the infill wells openhole. A 2000 + kg/m³ weighted mud system was used to drill the openhole section. Chevron did not shut-in any injection wells because of a lack of water handling capacity. No kicks or other loss of well control incidents occurred. A leak-off test was conducted at 10B-30-10-25 and a fracture gradient of 23 kPa/m determined.

For Phase 2, Chevron is proposing to set surface casing deeper at a minimum depth of 250 m and case the wells to TD. The company plans to use a 1300 kg/m³ weighted mud system. The Branch has reviewed the drilling program using the following worst case scenario:

- (1) a bottomhole pressure between 8400 - 11700 kPa based on Chevron's 1990 and 1993 pressure survey results, and
- (2) a wellhead flowing pressure of 4500 - 6000 kPa based on shut in wellhead pressures observed at A4-29-10-25 and 11B-30-10-25.

With surface casing set at 250 to 260 m Chevron would be able to control a kick without the risk of fracturing at the surface casing shoe. However, a mud weight of 1300 kg/m^3 will only result in a hydrostatic pressure of 7600 kPa at the Lodgepole, much less than the estimated reservoir pressure of 8400 - 11 700 kPa. Chevron should be asked to comment on its proposed mud system.

As outlined in the application, Chevron's reservoir evaluation program includes:

- (a) selectively completing, stimulating and swabbing individual zones,
- (b) running a reservoir pressure survey on a number of infill wells, and
- (c) using a portable test separator to test infill wells on common flowlines and to production test the remainder of the infill wells at the 1-29-10-25 battery.

Chevron has not included its logging or casing program in the application.

Royalty and production tax calculations depend on a determination of the portion of unit production assigned to the infill wells, as this production is classified as new oil. The regulations require Chevron production test new wells monthly for the first year and then quarterly thereafter. Table 3 shows the production test results for the Phase 1 infill wells. On average the wells were tested 2-3 times in the first year and only 1-2 times the next year. This level of production testing does not permit accurate evaluation of infill well performance and may cause an unrepresentative volume of production to be classified as new oil. Chevron should be asked to comment on its ability to comply with the regulatory production testing requirements. *- compliance?*

Future Phases - Performance Predictions

Chevron has applied for reduced 8 ha spacing for the entire unit. Within VRU Unit No. 1 there are (62) 8 ha drilling locations (see Fig. 1). With Phases 1 and 2 Chevron has drilled or plans to drill 21 infill wells, leaving 41 undrilled 8 ha locations. Chevron's only reference to future infill drilling plans in the application is "Unit wide development to 8 ha spacing is expected to occur in several phases" and "If at any time, continued development becomes uneconomic, Chevron may postpone or cancel further activity within Virden Roselea Unit No. 1".

In order to address the appropriateness of unit-wide reduced spacing, the Branch needs some preliminary details on future infill drilling phases. Chevron should be requested to provide the following information on future phases:

- (a) the tentative location and timing of subsequent phases of infill drilling in VRU No. 1 including proposed injector conversions,
- (b) an estimate of the increase in unit productivity and incremental recoverable reserves, if VRU No. 1 is fully developed on 8 ha spacing,
- (c) any upgrading or additional production or injection facilities needed to accommodate unit-wide infill drilling,
- (d) an estimate of the capital cost of unit-wide infill drilling including drilling, completion, artificial lift, flowline and facilities costs,
- (e) an estimate of the benefits to the Crown, freehold royalty owners, landowners and the rural municipality from unit-wide infill drilling, and
- (f) a discussion of the most likely factors that would make continued infill drilling uneconomic and cause postponement of future phases.

Environmental and Land Use Impacts

Chevron included in the application a cursory environmental impact assessment (EIA) for infill drilling in VRU No. 1. The company proposes to minimize surface disturbance and adverse environmental impacts by:

- (a) using non-built up trails from existing access roads into new locations,
- (b) minimizing the actively used area of the wellsite,
- (c) running electrical power underground where soil conditions permit,
- (d) minimizing bush clearing, detouring water around wellsites and restoring and reseeding locations subject to erosion,
- (e) where soil conditions permit, installing fiberglass flowlines to eliminate leaks caused by corrosion and burying the flowlines 1.2 m deep to minimize frost heave, and
- (f) installing check valves at the headers and high pressure shutdowns on new wells.

The application does not provide any specific well siting or flowline routing details for the Phase 2 infill wells. Of particular concern in Phase 2 are the locations of the 13B-21,

4B-28 and 4C-28 wells on the eastern slope of the Assiniboine River Valley and the 5C-29 and 8A-30 near the banks of the Assiniboine River (see Fig. 5).

Within VRU No. 1 there is a mixture of cropland, pasture, residential and commercial property, forested land, river valleys and ravines. Infill drilling will have different impacts and require different siting conditions based on land use and topography.

The Board has received an objection to the application from the landowner in the SE/4 of Section 25-10-26 (most of the quarter section is forested land along the Gopher Creek ravine) who has concerns regarding the environmental impact and aesthetics of additional drilling and is requesting an EIA be carried out (see attached letter). The proposed Board letter acknowledging the objection is attached.

The Branch is waiting on comments from the other Departments before finalizing its position regarding the siting of infill wells on the various different areas within the unit.

It is recommended at this time to send Chevron a deficiency letter requesting further information, clarification and comment on the issues outlined in this memo. Additional environment and land use impact information may be requested after the Branch has a chance to review the other Department's comments.



John N. Fox

Approved by: 
L.R. Dubreuil, Director

JNF/hw

TABLE 1

PHASE 1 & 2 - PREDICTED AND ACTUAL INFILL WELL PERFORMANCE

	<u>Predicted</u>	Phase 1 <u>Actual</u>	Phase 2 <u>Predicted</u>
No. of Wells Drilled	7	7	14
No. of Wells Converted	2	2	2
Average Initial Productivity (m ³ OPD)	4	3.65	2
Average Initial Water-Cut (%)	60	35.8	50
<u>Incremental Recovery</u>			
Total Recoverable Reserves (10 ³ m ³)	87.3	90	125
Recoverable Reserves/well (m ³)	12471	12857	8929
Incremental Recovery Factor (%OOIP)	3.2*	3.3*	2**

* 3.2% and 3.3% of the OOIP in the project area or 1.1% of the OOIP in the unit

** 2% of the OOIP in VRU No. 1

TABLE 2

PHASE 1 INFILL DRILLING COMPLETION SUMMARY

Well	Completion Results	Current Productivity
7B-30-10-25	<ul style="list-style-type: none"> - plugged back above Cherty - Crinoidal and Sandhill swabbed dry - Oolites swabbed 1 m³/hr 10-15% oil - no selective swabbing after acidizing 	.01 m ³ OPD 99.8% WC
8B-30-10-25	<ul style="list-style-type: none"> - swabbed all zones 0.85 m³/hr, 96% oil SANDHILL & CHERTY 	2.72 m ³ OPD 55.8% WC
8C-30-10-25	<ul style="list-style-type: none"> - plugged back 10 m below top of Cherty - swabbed Crinoidal, Sandhill, Oolites & top of Cherty 1 m³/hr, 10-25% oil SANDHILL & CHERTY 	1.75 m ³ OPD 70.8% WC
10B-30-10-25	<ul style="list-style-type: none"> - plugged back 6 m below top of Cherty - swabbed all zones 0.5 m³/hr, 5% oil 	0.15 m ³ OPD 97.9% WC
10C-30-10-25	<ul style="list-style-type: none"> - Crinoidal swabbed dry - Sandhill swabbed 0.5 m³/hr, 5% oil - Oolites swabbed 1.5 m³/hr, 95% oil - Cherty swabbed 1-2 m³/hr, 50-80% oil PAY IN ALL ZONES 	8.08 m ³ OPD 10.5% WC
11B-30-10-25	<ul style="list-style-type: none"> - well flowed 100% water - plugged back above 4th Oolites - Sandhill flowed 100% water - Crinoidal swabbed dry CHERTY SET ON LOGS - SANDHILL PAY 	SHUT-IN
12D-30-10-25	<ul style="list-style-type: none"> - swabbed Cherty, Oolites & Sandhill, 70-80% oil 	2.13 m ³ OPD 70.4% WC

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TABLE 3

PHASE 1 INFILL WELL PRODUCTION TEST SUMMARY

Well	On Production Date	<u>Production</u>	<u>Test</u>	<u>Results (24 Hrs)</u>
		Oil (m ³)	Water (m ³)	Date
7B-30	91-08-16	4.6	1.9	Aug/91 Initial Production
		0.2	5.2	Oct/91
		0.2	5.3	Jan/92
		0.0	4.8	Jul/93
8B-30	91-08-08	12.9	2.3	Aug/91 Initial Production
		10.3	0.2	Oct/91
		10.4	0.3	Jan/92
		5.3	0.3	May/92
		3.5	3.1	May/93
8C-30	91-08-06	4.4	0.3	Aug/91 Initial Production
		3.6	0.6	Oct/91
		3.6	0.6	Jan/92
		3.1	0.6	Apr/92
		2.2	3.8	Jun/93
10B-30	91-07-11	0.5	6.4	Jul/91 Initial Production
		0.5	4.6	Oct/91
		0.5	4.6	Jan/92
		0.2	6.4	Jun/93
10C-30	91-07-15	13.2	2.6	Jul/91 Initial Production
		8.6	0.2	Oct/91
		8.6	0.2	Jan/92
		10.4	0.6	Mar/93
		9.8	1.5	Sep/93
11B-30	91-07-29	0.1	17.5	Jul/91 Initial Production
		WELL SHUT-IN		
12D-30	91-08-22	2.5	0.1	Aug/91 Initial Production
		1.61	0.7	Oct/91
		1.6	0.7	Jan/92
		2.7	4.5	Sep/93



The Oil and Natural Gas
Conservation Board

555 — 330 Graham Avenue
Winnipeg MB R3C 4E3
CANADA

January 20, 1994

(204) 945-1111
FAX: (204) 945-0586

Mr. K. G. Matieshin, P.Eng.
Manager, Environment, Safety and Regulations
Chevron Canada Resources
500-5th Avenue SW
Calgary AB T2P 0L7

Dear Mr. Matieshin:

Re: Virden Roselea Unit No. 1
Reduced Spacing Application

The Board has completed a preliminary review of your application for approval of reduced 8 ha spacing in Virden Roselea Unit No. 1 (VRU No. 1). Notice of the application has been published in the Virden Empire Advance and sent directly to landowners within the unit and working interest and royalty owners adjacent to the unit. The last day for filing objections to or interventions in the application is January 28, 1994.

In its preliminary review of the application the Board has identified a few areas that require further information, clarification or comment.

1991 VRU No. 1 Reduced Spacing Pilot Analysis

1. Provide decline curve or other analysis used to determine the incremental recoverable reserves of 90 000 m³ for the pilot project. Can any of the production associated with the infill wells be considered accelerated versus incremental production?
2. The original O/W contact in the Cherty in the pilot project area was estimated at -171.6 m subsea. Based on infill log interpretation, the revised O/W contact was picked below -180 m subsea and log-pay was identified in all the infill wells. Explain why wells with log-pay such as 11B-30 produced only water. How extensive is vertical fracturing in the Cherty and Oolites?

1993 Virden Roselea Unit No. 1 Reduced Spacing Project

1. Chevron has estimated the 1993 infill project will recover incremental reserves of 125 000 m³, resulting in an increase in ultimate unit recovery from 34% OOIP to 36% OOIP. Please provide an estimate of OOIP for the 1993 infill project area to allow calculation of incremental recovery within the project area.
2. The Board has reviewed the proposed drilling program using the following information; (1) a reservoir pressure of 8400 - 11 700 kPa based on pressure surveys in 1990 and 1993; and (2) a shut-in wellhead pressure of 4500 - 6000 kPa based on observed shut-in wellhead pressures at A4-29-10-25 and 11B-30-10-25. Based on leak-off test results from 10B-30-10-25, surface casing set at a depth of 250 - 260 m should be adequate to control a kick without the risk of fracturing at the surface casing shoe. However, a mud weight of 1300 kg/m³ will only result in a hydrostatic pressure of 7600 kPa at the Lodgepole, much less than the anticipated reservoir pressure. Please comment on these calculations.
3. Section 56 of the Petroleum Drilling and Production Regulation requires new wells be production tested monthly for the first year and quarterly thereafter. Infill wells in the 1991 project area were tested only 2-3 times the first year and 1-2 times the following year, with some wells going more than 18 months without being tested. How does Chevron propose to comply with the regulatory production testing requirements for existing and future infill wells?

Future Phases of Infill Drilling in VRU No. 1

In the application Chevron makes reference to unit-wide development on 8 ha spacing taking place in several phases. In order to address the appropriateness of unit-wide reduced spacing the Board needs some preliminary details on Chevron's future infill drilling plans.

1. Provide the tentative location and timing of subsequent phases of infill drilling in VRU No. 1 including likely injector conversions.
2. Provide an estimate of the increase in unit productivity and ultimate recovery, if VRU No. 1 is fully developed on 8 ha spacing.
3. Are there any additional production or injection facilities or facility upgrading needed to accommodate unit-wide infill drilling?

4. Provide an estimate of the capital cost for the 1993 infill project and unit-wide infill drilling including costs for drilling and completion, artificial lift, flowlines and production and injection facilities.
5. Provide an estimate of the benefits to the Crown, freehold royalty owners, landowners and the rural municipality from the 1993 infill project and unit-wide infill drilling.
6. What are the factors most likely to make continued infill drilling in VRU No. 1 uneconomic and cause postponement of future phases?
7. Has Chevron reviewed the feasibility of implementing an EOR scheme in VRU No. 1?

Environmental and Land Use Impacts

Within VRU No. 1 there is a mixture of cropland, pasture, forested land, river valleys, residential property and other surface improvements. Infill drilling will have different environmental and land use impacts in each of these areas. The Board is waiting on comments from the Departments of Rural Development, Environment and Agriculture before finalizing its position regarding the siting of infill wells on the various different areas within the unit.

Of particular concern in the 1993 infill project is the siting of the 13B-21, 4B-28 and 4C-28 wells on the eastern slope of the Assiniboine River valley and the 5C-29 and 8A-30 wells near the Assiniboine River. Please provide additional siting information such as aerial photographs showing the proposed access roads, well locations and flowline routes for these wells.

The Board has already received an objection from the landowner in the SE/4 of Section 25-10-26 siting aesthetics and environmental concerns. A copy of the letter of objection is attached. Please comment on infill drilling plans in the SE/4 of Section 25 and the concerns raised by the landowner.

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

Yours respectfully,



H. Clare Moster, Deputy Chairman



the Oil and Natural Gas
Conservation Board

555 — 330 Graham Avenue
Winnipeg MB R3C 4E3
CANADA

(204) 945-1111
FAX: (204) 945-0586

January 20, 1994

Mr. John Fefchuk and Ms. Norma Tibbits-Fefchuk
P.O. Box 2142
Virden MB R0M 2C0

Dear Sir and Madam:

Re: Virden Roselea Unit No. 1
Reduced Spacing Application

This letter is to acknowledge receipt of your intervention dated January 7, 1994. The Board has forwarded a copy of your letter to Chevron Canada Resources and asked the company to comment on your concerns.

The Board sends a copy of all reduced spacing applications to the Departments of Rural Development, Agriculture and Environment for comment regarding issues such as land use and environmental impacts. The Board is still awaiting comments from the other Departments.

You will be notified of the Board's position on your intervention prior to final disposition of the application.

If you have any questions, please contact the undersigned or L. R. Dubreuil, Director of Petroleum at 945-1111 and 945-6573, respectively.

Yours respectfully,

A handwritten signature in black ink, appearing to read "H. Clare Moster". The signature is fluid and cursive, with a long horizontal stroke extending to the right.

H. Clare Moster
Deputy Chairman

17.14

P.O. Box 2142,
Virden, Manitoba,
ROM 2C0.

January 07, 1994

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

ATTENTION: Mr. David Tomasson

Dear Sir:

RE: Notice of Intervention
your letter dated 23 Dec. 1993

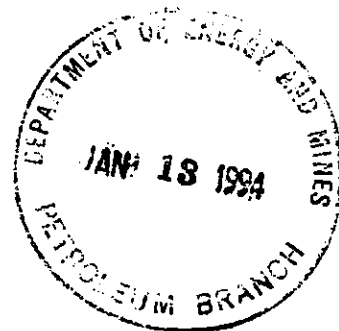
A Landman from Chevron Canada Resources attended our residence on 04 Nov 93, to discuss the referenced special drilling project on and in our immediate area. We own and live on the SE quarter of 25-10-26 WPM. The proposals put forth would probably put drilling and clearing operations within 200 yards (or less) of our house.

Furthermore, we live in a moderately remote area, where our property and adjoining properties form a great refuge and habitat for wildlife, birds, etc. For the most part, our quarter has changed very little since the "Earl of Elphinstone" resided in this region.

We voiced some of our concerns to the Landman, however, we have heard nothing further from Chevron Officers in this regard.

Basically our concerns are as follows:

- 1- Noise pollution during drilling operations and afterwards;
- 2- Closeness to our residence;
- 3- Eyesore - devaluation of property;
- 4- Possible adverse affects to our present water source;
- 5- Adverse affects to the many natural springs of water;
- 6- Wildlife and birds which find refuge in the ravine;
- 7- Nature's garden -- on our property we have identified species of "Closed Gentian" a rare wildflower, plus, two species of Yellow Lady's Slippers;



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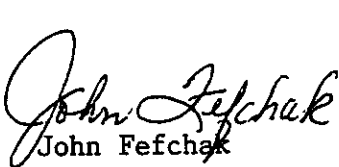
- 8- Oil treatment plants -- presently, we have two of these plants within $\frac{1}{2}$ mile of our residence, and, certainly would not want anymore in the immediate area;
- 9- Additional odour from treatment plants and additional wells;
- 10- Bulldozing of ravine -- destruction of natural landscape.

Generally, I suppose, what we would like to see accomplished is an impact study on the effects of the proposed drilling in this area, for the sake of wildlife and the preservation of wild grasses and wildflowers. An Environmental Study into all our concerns might be an answer.

We might mention that other landowners in this surrounding region are probably in full agreement of this drilling proposal and will voice little or no objections. But, we consider if they were living as near to the situation as we are, they would be expressing concerns as to the water supply, noise and odours also.

We are enclosing an aerial photo of our quarter section showing some existing locations of oil pumps and treater complex. Our residence in the SE quarter is identified by an X within a circle.

Yours truly,


John Fefchak

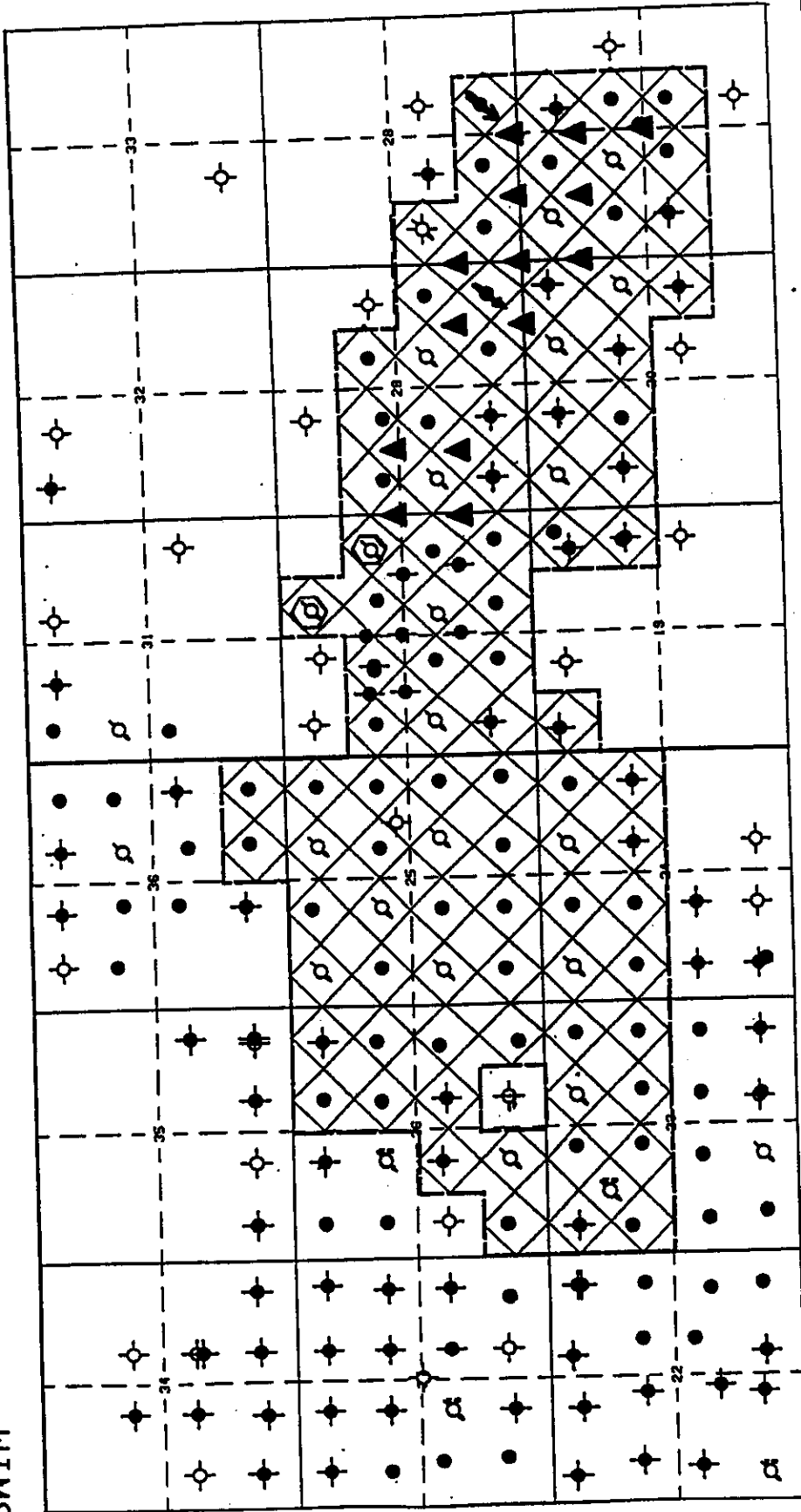

Norma Tibbits-Fefchak

ENCLO.

APPENDIX 1

R.25W1M

R.26W1M



VIRDE ROSELEA UNIT 1

8 HECTARE DRILLING SPACING UNITS

1991 INFILL LOCATIONS 1991 INJECTOR CONVERSIONS

PROPOSED 1994 INFILL LOCATIONS

PROPOSED 1994 INJECTOR CONVERSIONS

Fig. 1

Exponential Decline (Rate vs. Cumulative Oil)

VRU NO. 1 Infill Area Sec. 30-10-25 including 1991 Infill Wells

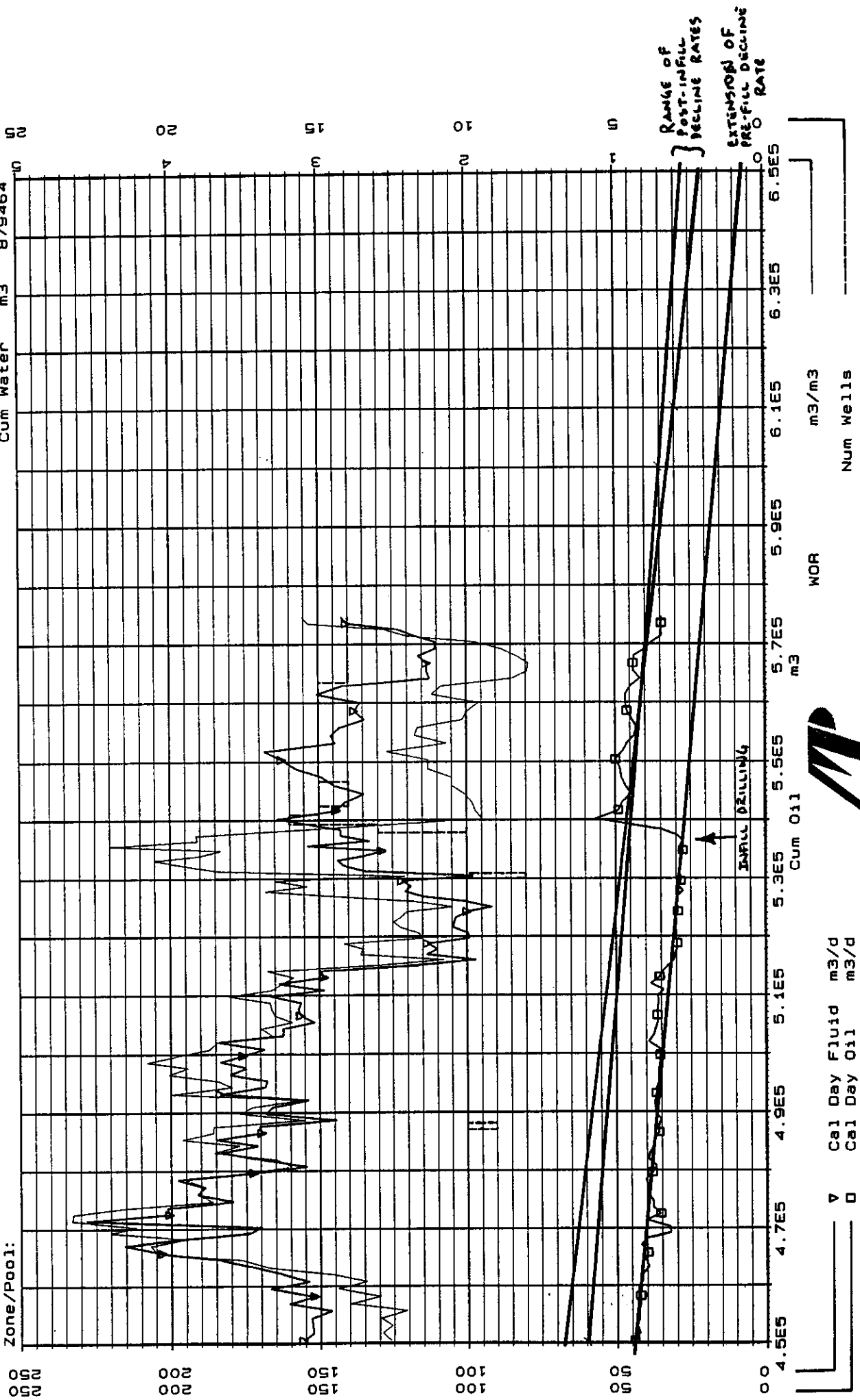
01/12/94 16:13

Type :

Data 5412-9310

Operator :
Field :
Zone/Pool:

Cum Oil m3 574638
Cum Gas E3m3 0
Cum Water m3 879464



Exponential Decline (Rate vs. Cumulative Oil)

VRU No. 1 Infill Area (Old Wells Only)
 Section 30-10-25 EXCLUDING INFILL WELLS

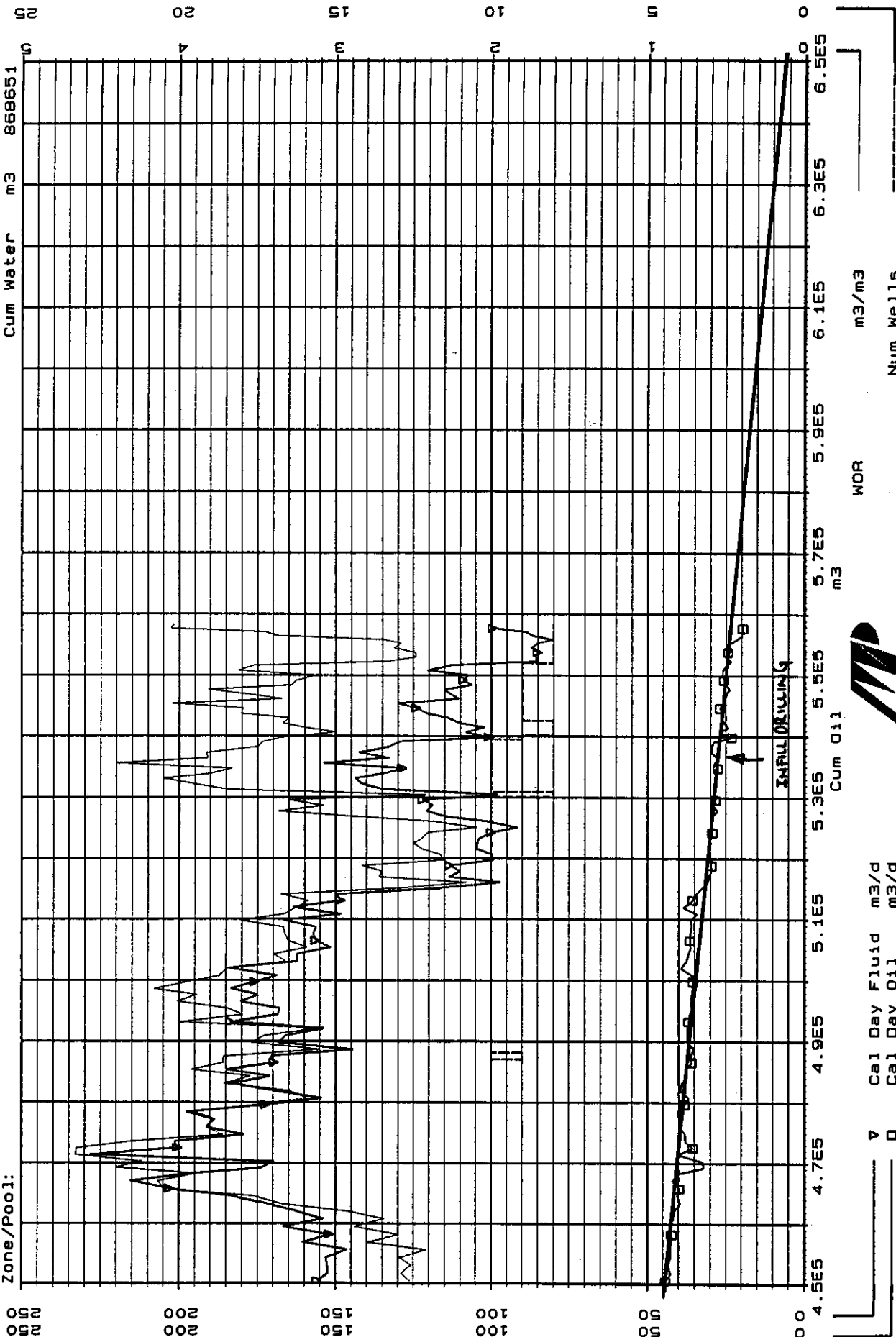
01/12/94 16:14

Data 5412-9310

Operator :
 Field :
 Zone/Pool:

Type :

Cum Oil m3 558302
 Cum Gas E3m3 0
 Cum Water m3 868651



R.25W1M

R.26W1M

APPENDIX 10

T.10

R.25W1M

T.10

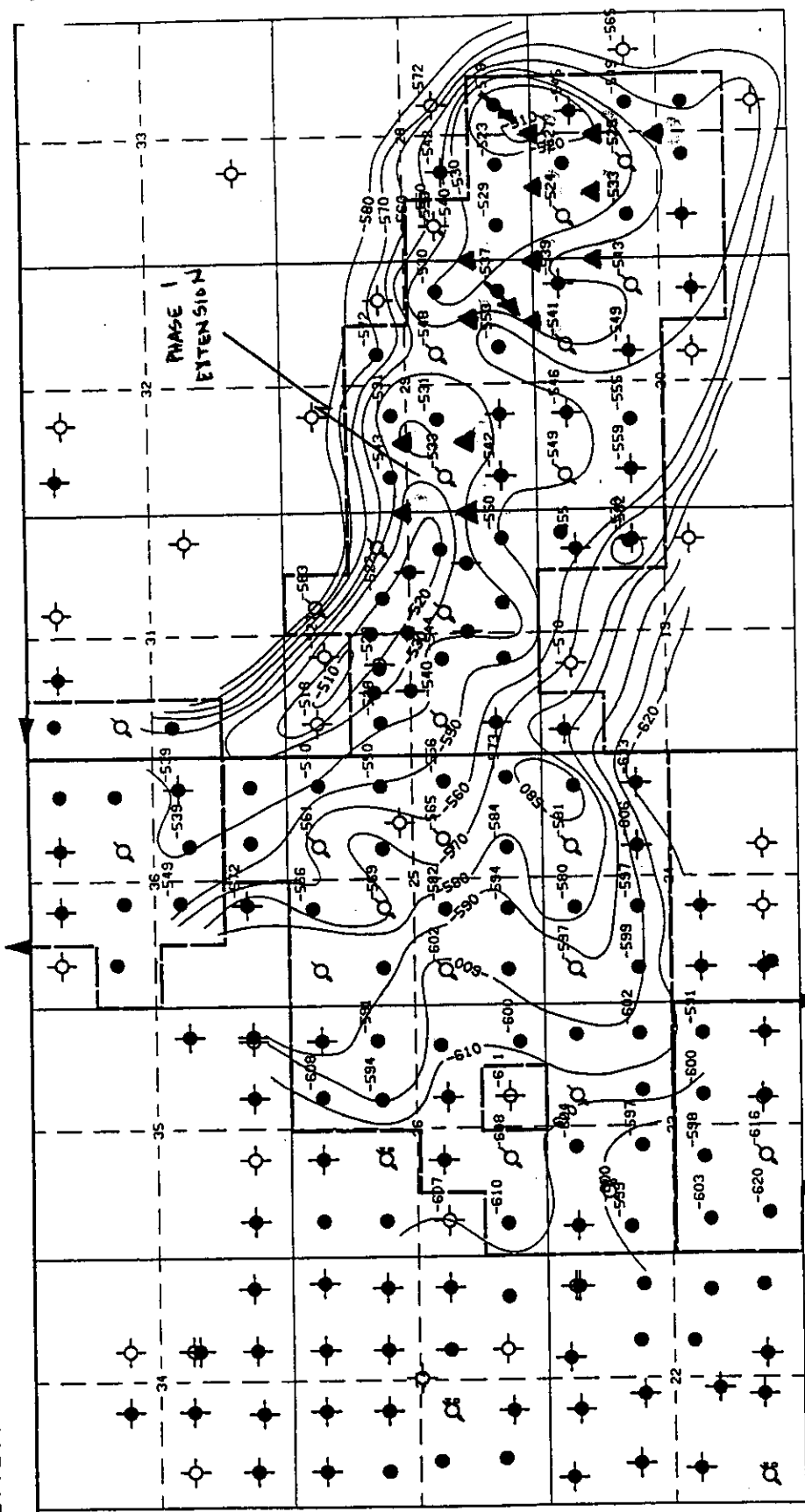
R.26W1M

VIRDEN ROSELEA UNIT 1 STRUCTURE TOP OF CHERTY (meters MSL)

Wells Sealed
SEE SIDE BAR

- 1991 INFILL LOCATIONS
- 1994 PROPOSED INFILL LOCATION
- 1994 PROPOSED INTERIOR CONVERSION

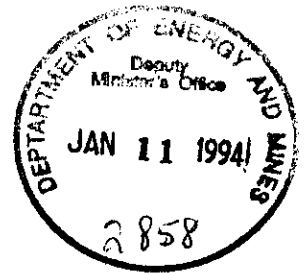
Fig. 4



17.14

P.O. Box 2142,
Virden, Manitoba,
R0M 2C0.

January 07, 1994



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



ATTENTION: Mr. David Tomasson

Dear Sir:

RE: Notice of Intervention
your letter dated 23 Dec. 1993

A Landman from Chevron Canada Resources attended our residence on 04 Nov 93, to discuss the referenced special drilling project on and in our immediate area. We own and live on the SE quarter of 25-10-26 WPM. The proposals put forth would probably put drilling and clearing operations within 200 yards (or less) of our house.

Furthermore, we live in a moderately remote area, where our property and adjoining properties form a great refuge and habitat for wildlife, birds, etc. For the most part, our quarter has changed very little since the "Earl of Elphinstone" resided in this region.

We voiced some of our concerns to the Landman, however, we have heard nothing further from Chevron Officers in this regard.

Basically our concerns are as follows:

- 1- Noise pollution during drilling operations and afterwards;
- 2- Closeness to our residence;
- 3- Eyesore - devaluation of property;
- 4- Possible adverse affects to our present water source;
- 5- Adverse affects to the many natural springs of water;
- 6- Wildlife and birds which find refuge in the ravine;
- 7- Nature's garden -- on our property we have identified species of "Closed Gentian" a rare wildflower, plus, two species of Yellow Lady's Slippers;

PAGE -2-


- 8- Oil treatment plants -- presently, we have two of these plants within $\frac{1}{2}$ mile of our residence, and, certainly would not want anymore in the immediate area;
- 9- Additional odour from treatment plants and additional wells;
- 10- Bulldozing of ravine -- destruction of natural landscape.

Generally, I suppose, what we would like to see accomplished is an impact study on the effects of the proposed drilling in this area, for the sake of wildlife and the preservation of wild grasses and wildflowers. An Environmental Study into all our concerns might be an answer.

We might mention that other landowners in this surrounding region are probably in full agreement of this drilling proposal and will voice little or no objections. But, we consider if they were living as near to the situation as we are, they would be expressing concerns as to the water supply , noise and odours also.

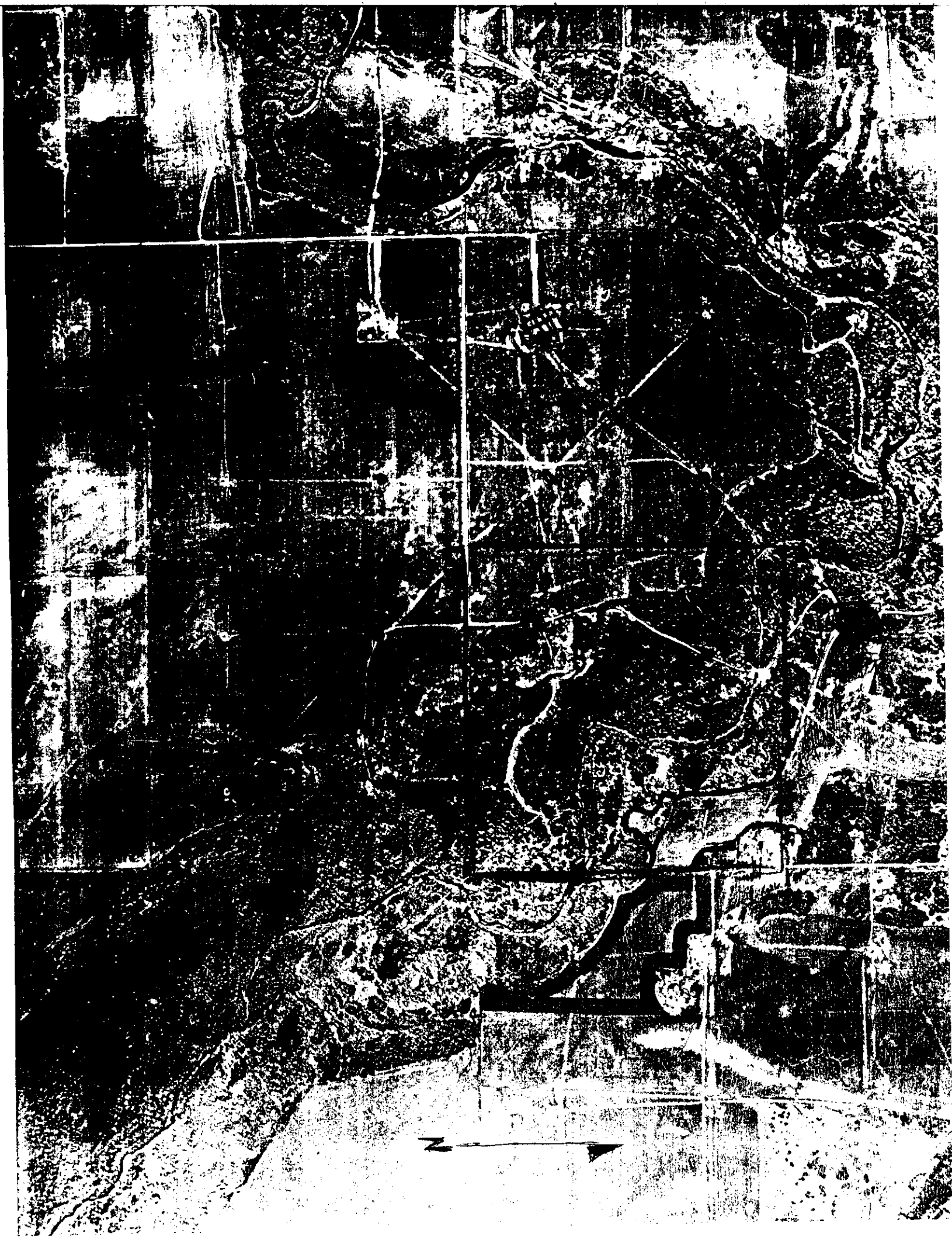
We are enclosing an aerial photo of our quarter section showing some existing locations of oil pumps and treater complex. Our residence in the SE quarter is identified by an X within a circle.

Yours truly,


John Fefchak


Norma Tibbits-Fefchak

ENCLO.



PHASE 2 APPROVAL ONLY

ADVANTAGES

- ① specific & substantiated technical data provided
- ② detailed plans presented
- ③ specific conditions of approval can be set
- ④ future phase are conditional on the success of Phase 2
- ⑤ minimize/eliminate objections from loan officers

DISADVANTAGES

- ① Cheaper has to reapply for subsequent phases
- ② Additional administrative & technical workload for Branch Staff

UNIT APPROVAL

ADVANTAGES

- ① application is dealt with only once is advertising, inter-departmental review, Branch review, Board orders.
- ② easy of administration
- ③ regulatory reform, client friendly

DISADVANTAGES

- ① detailed technical, land use & environment information not provided
- ② condition of Board approval, may not be able to address all future issues

VRU #1 REDUCED SPACING

SURFACE CASING @ 250m WILL WITHSTAND ≈ 820 PSI @ SHOE BASED ON LEAK-OFF TEST PERFORMED @ 10B-30-10-25.

HA-29-10-25 BREAK THROUGH RESULTED IN MAXIMUM WELLHEAD PRESSURE OF 860 PSI AFTER EXTENDED SHUT-IN.

SLOW BLEED OF INJECTORS IN THE AREA WOULDN'T JUSTIFY THEIR SHUT-IN.

MUD WEIGHT OF 1300 Kg/m^3 IS NOT 700 KPa OVERWEIGHT (BASED ON B.H.P. OF 8400 - 11700 KPa).

RECOMMENDATION - MUD WT. BE INCREASED TO $\approx 2000 \text{ Kg/m}^3$
- MAINTAIN MIN. 250m FOR SURF. CSG.
- REQUIRE B.H.P. READINGS ON WELL

December 22, 1993

The Oil and Natural Gas
Conservation Board
- David Tomasson, Chairman
- H. Clare Moster, Deputy Chairman

John N. Fox
Chief Petroleum Engineer
Petroleum Branch
Energy and Mines

**Virden Roselea Unit No. 1
Reduced Spacing Application**

Chevron Canada Resources has applied to reduce spacing in Virden Roselea Unit No. 1 (VRU No. 1) from 16 ha to 8 ha. Chevron proposes to drill as many as 14 infill wells in 1994 and convert two additional wells to water injection.

Recommendations

It is recommended that notice of the application (attached) be published for 2 consecutive weeks in the Virden Empire Advance and sent directly to:

- (a) working interest and royalty owners adjacent to the unit, and
- (b) landowners within the unit.

A copy of the application has been sent to the Departments of Rural Development, Environment and Agriculture for their comments.

The Branch will be preparing a deficiency letter for the Board requesting additional technical and environmental data be filed by Chevron in support of the application.

Discussion

In 1991 the Board approved reduced 8 ha spacing in a portion of VRU No. 1 under Board Order No. SU 8. Chevron drilled seven infill wells and converted two wells to injection in Section 30-10-25 (see Fig.1). Section 30 was targeted by Chevron for the infill pilot project because it met the following criteria:

- (a) structurally high,
- (b) moderate to high oil production,
- (c) low water-cut, and
- (d) low to moderate reservoir depletion.

Overall, Chevron deemed the pilot project a success. Initial infill well productivity (1st 6 months) averaged 3.65 m³/d/well at a water-cut of 35.8%. Current infill well productivity is 2.1 m³/d/well at a 63.8% water-cut compared to average unit production of 1.5 m³/d/well at a 90.3% water-cut. Chevron estimates incremental reserves from the seven infill wells will total 90 x 10³ m³ or 12 850 m³/well.

There is a great degree of variability between producing rates of the infill wells. The 11B-30 well flowed 100% water at a wellhead pressure in excess of 4500 kPa and 10B-30 and 7B-30 had initial productivity of less than 0.5 m³/d. The 10C-30 and 8B-30 wells both had initial productivity in excess of 9 m³/d. The variation in production rates is an indication of the complexity of reservoir interpretation in this multi-layered mature waterflood.

In this application Chevron is requesting spacing within the remainder of the VRU No. 1 be reduced to 8 ha creating an additional 55 infill locations (see Fig.1). The company has tentative plans to drill 14 infill wells in 1994 and convert two wells to water injection (see Fig.1). The 14 infill locations were identified by Chevron using the previously listed criteria. The infill wells are expected to have initial productivity of 2 m³/d/well and recover incremental reserves of 125 x 10³m³ (8929 m³/well). Chevron's initial productivity and incremental reserves estimates are comparable to the results from the 1991 infill pilot project.

Chevron has evaluated horizontal drilling versus drilling vertical infill wells and believes horizontal wells are not economically feasible for the following reasons:

- (a) the increased capital cost - vertical well \$200M vs horizontal well \$600M,
- (b) the risk of uneconomic production if a horizontal well were to encounter water-bearing natural fractures or a swept portion of the reservoir, and
- (c) higher horizontal well servicing costs.

Chevron has submitted an environment impact assessment which sites our regulatory requirements and good oilfield practices and provides little specific information on well siting and the environmental and land use impacts of infill drilling.

Chevron has provided the names and most of the addresses of working interest and royalty owners adjacent to VRU No. 1 and landowners within the unit. Though the application has some technical deficiencies and requires additional environmental and land use impact assessment, these requirements are not major. Therefore it is recommended that notice of the application be published in two consecutive editions of the

Viriden Empire Advance at this time and sent to the working interest and royalty owners adjacent to the unit, landowners within the unit and the Departments of Rural Development, Environment and Agriculture (including a copy of the application). A five-week notice period is recommended due the extent of the application and the holiday season. A copy of the proposed notice is attached.

ORIGINAL SIGNED BY
JOHN N. FOX

John N. Fox

Recommended for Approval: _____
L.R. Dubreuil

JNF/hw

Attached.

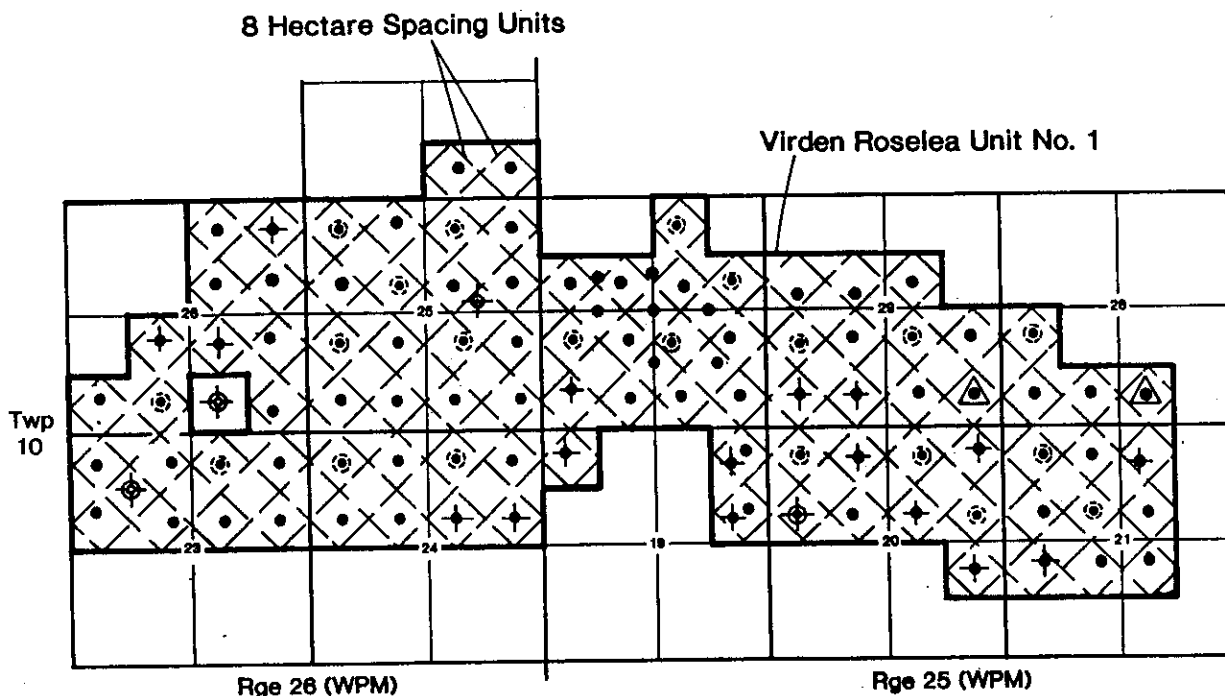


NOTICE

UNDER THE MINES ACT

Chevron Canada Resources, the Unit Operator of Virden Roselea Unit No. 1 ("the unit area") has made application:

- Under Section 20 of the Petroleum Drilling and Production Regulation for approval of special drilling spacing units in the unit area. It is proposed that drilling spacing units would be reduced from 16 hectares (40 acres) to eight hectares (20 acres) in the unit area outlined below. In the application, Chevron indicated the company plans as a first phase to drill a potential 14 wells on eight hectare spacing in 1994.



LEGEND

- | | |
|---------------------------------|---------------------------------|
| ● Oil producer | ✦ Abandoned water supply well |
| ✦ Abandoned oil producer | ⊙ Standing well |
| ⊙ Water Injection well | △ Proposed water injection well |
| ✦ Abandoned water disposal well | |

2. Under Section 64 of the Petroleum Drilling and Production Regulation for approval to convert the following wells to water injection.

Chevron East Virden 2-28-10-25 (WPM)

Chevron East Virden Prov. 1-29-10-25 (WPM)

If no intervention in writing is received by the Board at 555-330 Graham Avenue, Winnipeg, Manitoba, R3C 4E3 on or before January 28, 1994, the Board may approve the application.

Copies of the application may be obtained from:

Chevron Canada Resources
Box 100
Virden MB R0M 2C0
(204) 748-1334

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

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

227 King Street West
Virden, Manitoba
(204) 748-1557

Dated at Winnipeg, this day of , 1993.

David Tomasson
Chairman

December 22, 1993

Bruno Gossen 12714
Senior Policy Planner
Corporate Planning & Business Dev.
Manitoba Rural Development
607 - 800 Portage Ave.

John N. Fox
Chief Petroleum Eng.
Petroleum Branch
Energy & Mines
555-330 Graham Ave

**Virten Roselea Unit No. 1
Application for Reduced Spacing**

Chevron Canada Resources has made application to reduce well spacing from 16 ha to 8 ha in Virten Roselea Unit No. 1 which covers a 1488 ha area, east and slightly north of the Town of Virten.

The project, which requires the approval of the Oil and Natural Gas Conservation Board, involves the drilling of as many as 14 infill wells in 1994 and the conversion of two wells to water injection. Eventually as many as 55 infill wells could be drilled if the application is approved. The area of application includes cultivated, pasture and forested land. A portion of the area of application includes the Assiniboine River valley.

I ask you review the application and provide me with your comments before January 28, 1994 to permit the company time to drill the wells before spring break-up. If you have any questions, please contact me at 945-6574.

**ORIGINAL SIGNED BY
JOHN N. FOX**

John N. Fox

cc: Floyd Phillips, Chief 1003
Terrestrial Quality Management
Manitoba Environment

Ken McGill, Chief 745-2324
Land Utilization & Soil Survey
Soils & Crops Branch
Manitoba Agriculture

- REDUCE SPACING TO 8 ha in VRU #1

- TWO WIW CONVERSIONS 2-28 edge support
1-29 complete inventory 9-30

- 1991 INFILL PROJECT

- SEVEN INFILL WELLS (OH COMPLETION)
- TWO WIW CONVERSIONS 9-30 & 15-30

- INFILL DRILLING TARGET AREA

- STRUCTURALLY HIGH
- MODERATE TO HIGH OIL RATES
- LOW WL
- LOW TO MODERATE DEPLETION

APPENDICES
4-6

11B-30 PRODUCED ONLY WTR

8B-30 8C-30 10C-30 - 8L pay clearly

OTHER (4) WELLS NO CHERY PAY

- IP 3.5 m^3 /well WL 45%

- AREC RES = 90000

- WELLS ENCOUNTERED UNSUBST PAY

- VRU 1

current rec (Jul 193) $2.3 \times 10^6 L^3$ 29% OOIP

predicted with rec res. 34% OOIP (decline analysis, rec. limit 30 m³/d)

PHASE 2 - 14 potential INFILL WELLS, 2 WIW CONVERSIONS

TARGET AREAS SEC 29 & 30
SEC 21 & 28

IP $2 m^3/d$ @ 50% WL

{ low reservoir depletion
compared to unit average }

- Bruce to review drilling precautions, - o/
recent pressure data
- need to know leak-off test results

ENV. & LAND USE IMPACTS

- new segⁿ 1.5m depth of flowline burial
- min. surface disruptions
 - non-built up trails
 - max use of existing access roads

LAND OWNER DISCUSSION - AFFECTED OWNER - PILOT PROJECT?
only

FACILITIES (VIRIDEN INSP & ENG. COMMUNITIES)

1-29 battery upgrade

- portable well testing methodology & frequency

VPU #1

- full infill development (complete 8 ha OSU's)
54+1 wells

responsible for drafting & security classification & clearance

responsible to maintain & performance of PDCS ability to perform security requirements (Sec 1)

discussions approved under Sec 1, 4 PDCS

* - issue to USA regarding sections (1), (3) of 17 & compliance with list of PD issues

* - all of which will be reviewed by new information

- great efforts to determine and as of 2.2.2000 resources and commitment of - not worthwhile

- because of the complexity of the work - option

- establish a small team composed of 1000 - 500 people

- FIC check who is known & has press skeletons

who reports are out of day and project

all data to be collected

- PDCS is a 3.2% team

IP 24 m³/d

Arec. res 125000 m³ (27.001 P)

See 21 ϕ 28 ^{structurally} high in Cherty similar to See 30

- caprock penetrates deeper in eastern portion of reservoir

- pay cut-offs $\phi = 7\%$, $S_w = 50\%$, $k = 1$ md
+ core description indicating staining

- infill wells will develop invert 9-spot pattern

- Chevron plans to recomplete injector to improve the injection profile

- infill wells cased to TD & perf'd

- Cherty main target (76% Arec = 95000 m³)

- Grissold, Sandhill, Oolites 30000 m³ Arec

- no schedule of future infill drilling

- suggest RFT measurements to determine zonal pressure data

- How great an issue is hor. vs. vert. drilling

horizontal wells adv. & disadv. - Chevron's comparison is Middle

- Cherty main target holds itself to hor. drilling
- between two infill wells

- compare REMAINING OIL (APP 8A) WITH
 cumu PROD MAP & WOR MAP
- % recovery MAP
- plot 1991 INFILL PROJECT RESULTS

APPENDIX 9A

- check decline rates Base & Base+Infill case

- LATE WINTER OR RIGHT AFTER BREAK-UP TO
 COMMENCE INFILL DRILLING IN U2U #1

- deepening wells is clearly option to recover incremental reserves 52.4 103³ in 1991 infill project area.
- natural fracturing may allow recovery of OIP in one zone by production from another zone
- pressure data due to be gathered this year.
- confirm production testing of VRU #1 infill wells.
- NOTIFICATION
 - surf. owners, RO & WFO adjacent to VRU #1, Rural Devel., Agric & Env. Dep't Surface Rights Assoc. (?)

Review of VRS #1 1991 Inter Review Report
2nd action of 432-10 (May 15/91)
- ADMINISTRATION

June 2000 VRS #6 1 PM #65

- to achieve:
- 1) slope of some lower valley constructed +
 - 2) soil erosion by
 - (a) minimizing disturbance of natural vegetation
 - (b) construct a contained berm around the wellbore to divert run off water
 - (c) revegetate the wellbore including the berm

- Low required since an undrained plant species may be performed better at

- other measures: bookkeeping well to ensure with requirement

detected drilling program - looking for copy of
chassis engineering plans - the result of a
last release in form of a detailed introduction

*

- on May 19/91 letter from the Board approving
2nd project - this was a request to the committee
to look at some feasibility of collecting and
preserving the past performance data including
collective sampling EFT, public logs (for computer and
public access to the information)

Appendix 4 not there.

5 " "

Appendix 5 no acceleration - demonstrate

11B-30 pay - 100% water why

S.C. at 250m?

No SI of injectors

Map with proposed locations

Aerial photo. or topo map

F/C at 1.2 m Reg requires 1.5 m

- Any wells in the valley Prob of water flows on surface hole?
- Asking for reduced spacing for whole unit but only have consents for phase 2
- Economics - Royalties / tax revenue to the Gov.
- Frequency of well testing?
- Valley side locations Any flora surveys req'd?
- Can we tell who surf owners are?

VRM No. 1 1991 In-fill Drilling Project

In 1991 Chevron drilled 7 in-fill wells and converted two wells to injection in Sec 30-10-25

Sec 30 was targeted as it met the following criteria

A location -> identified using these guidelines

- a. structurally high → targeted in Sec 21
- b. moderate to high oil rate
- c. low water-cut
- d. low to moderate reservoir depletion

- results of the project

initial production 1st 6 mons.	$3.65 \frac{m^3}{d}$ we	$\Delta 90000$
current production (sep/93)	$2.1 \frac{m^3}{d}$ we	(1 well SI)
	63.8% we.	" "
UNIT	$1.52 \frac{m^3}{d}$ we	Sept/93
	90.3% we	

- greater degree variability between producing rates 11B-30 SI after drilling flowed 100% water at a wellhead pressure of in excess of 4500 KPa to and 10B-30 & 7B-30 which produce $< 0.2 \frac{m^3}{d}$ and 10C-30 which produces $8.1 \frac{m^3}{d}$.

- complicated reservoir interpretation - some wells encountered unswept portions of reservoir & other in-fill wells encountered swept by WF

AVERAGE	PHASE II	PRODUCTIVITY
TWO 10 REELS	m^3/d	
6-21	17	
7-21	0.9	
10-21	2.8	
12-21	1.2	
14-21	2.2	
2-28	0.5	
3-28	0.5	
4-28	0.9	
1-29	0.6	
2-29	0.9	
8-29	0.8	

2.4 m^3/d /Well applicable to the 10' wells in
Sec 21, 28 & SE 1/4 of Sec 29

6-29	0.8
11-29	1.2
12-29	0.3
1-30	0.7
23-30	2.7
8-30	1.2
8E-30	1.8
1-30 (NW)	1.3

1.25

m^3/d applicable to the 10' wells
in Sec 29 & SE 1/4 of Sec 29 & SE 1/4 of Sec 30

COMBINED AVERAGE DAILY OIL PRODUCTION FOR WELLS LOCATED IN
PROPOSED PHASE II LEASE AREA IS 1.92 m^3/d

Nov. 30/93

VIRDEN - ROSELEA - GEOLOGY

Lithology is uniform throughout Virden-Roselea area. The four producing zones of the Scallion (Cherty) Lower Virden Member (Subdivided into the Sandhill, First, Second, Third and Fourth Colite lentils), and the Upper Virden (Crinoidal) Member are laterally continuous.

Trapping is controlled primarily by the variation in thickness of the zone of secondary dolomitization and anhydritization at the Mississippian unconformity surface; forming the cap rock in area. This zone varies in thickness approximately from 12 to 18 m.

The Lower Whitewater Lake Member forms an impermeable barrier; precluding ~~any~~ dolomitization of the Virden Member. If the Upper Virden Member is altered, the shaly beds below it form a permeability barrier for the Lower Virden (Colites) and Scallion (Cherty).

The Lower Virden (Colites) are the principal reservoirs at Virden-Roselea. (approx. ^{thickness} up to 15 m) Most thickness is found within the Sandhill lentil. These lentils within the Lower Virden become increasingly argillaceous and bioclastic (poor

in reservoir characteristics) in the northern and western part of Vården Field.

The Upper Vården (Circoidal) Member is fairly uniform in thickness, with local variations in porosity / permeability.

The Routledge Shale is present in the eastern half of the Vården-Roselia area and reaches approximately 24m in thickness.

No completely effective seat seal is present below the reservoir beds in the Vården Field. Although the reservoir beds are underlain by fine-grained limestones of the Scallion Member; these limestones (below the oil-bearing upper part of the Scallion) are water-bearing and provide communication of bottom water to the reservoir beds.

Decline curves vary greatly from well to well in Vården-Roselia, indicated great variations in reservoir performance. These variations are due in part, to ~~varied~~ ^{varied} ~~of communication~~ ^{communication} with bottom water and varied extents of dolomitization of the reservoir beds.

Each of the 8 separate producing zones at Vården-Roselia appear to have different oil-water

-3-

contacts. Determination of these contacts is therefore difficult.

Chevron - infill proposal

1. Chevron likely cannot determine (effectively) accurate oil-water contacts within the production zones at Udden-Rosella due to the complex nature of the reservoir.
2. Because of the variability of the reservoir performance of the individual producing zones, further water flooding is necessary to enhance production.

Questions:

- a) Into what zones will the injection occur?
- b) Does Chevron have any supportive maps to determine the effects of injection if done per zone?
- c) Are there any lithologic boundaries within the producing zones that can be superimposed on to the net pay maps if porosity-permeability pinchouts, etc. over?

- d) How are they going to control water encroachment from the Sealion?
- e) Will the elite reservoir zones ~~be~~ in Section 24 & 25, T. 10, R. 26 WPM and Section 30, T. 10, R. 25 WPM be significantly drained by the proposed infill area?
- f) In the proposed infill area, are they certain that the pay within the Sandhills is separated ~~with~~ from the ~~central~~ part of Urdon-Roselea?

Carol

PHASE - 1 VRR

WITHDRAWALS SEP/93 & YEAR TO DATE

1-30, 2-30, 3-30, 4-30, 5-30, 6-30, 7-30, 8-30, 9-30, 10-30

11-30, 12-30, 1-30, 2-30, 3-30, 4-30, 5-30, 6-30, 7-30, 8-30, 9-30, 10-30, 11-30, 12-30

OIL

WATER

SEP/93	1993	SEP/93	1993
21.5	299.3	321	3079.6
53.9	504.1	321	3005.8
78.2	724.9	232.7	968.3
72.6	808.4	746.6	6208.1
0.3	31.3	160.5	516.1
35.2	351.4	214	1011
81.5	1058.5	103.1	454.2
52.4	645.9	127	599.6
176.7	1920.4	222.5	918.4
4.6	95.7	214	1664.5
242.5	2399.2	28.3	154.3
142.7	1317.3	123.4	516.9
9.4	117.1	957.1	8168.3
638	504.7	151.8	266.1
<u>1035.3</u>	<u>10838.2</u>	<u>3923</u>	<u>27531.2</u>

SEP/93 WIDAGE 1035.3 * 1.06 + 3923 = 5020.4

1993 WIDAGE 10838.2 * 1.06 + 27531.2 = 39020

REPLACEMENT

VRR

SEP/93

9152 m³

1.82

1993 YEAR TO DATE

87047 m³

2.23

PHASE 2 URR CALCULATIONS

WELLS	TRACT FACTOR	PRODUCTION SEP/93		VOIDAGE
		OIL	WATER	
SA-29	1.0	60	60	124
SC-29	0.5	60	60	62
SD-29	1.0	60	60	124
6-29	0.5	24.8	361.4	194
11-29	0.5	35.6	215.7	126.7
12-29	0.5	9.1	198.8	104
8A-30	0.5	60	60	62
				<u>741 m³</u>

* 2 m³OPD 50% uc

S-29 injection 1993 aver. = 1790 m³/Lc
 URR with infill wells 2.4 m³/m³

WELL	TRACT FACTOR	PRODUCTION SEP/93		VOIDAGE/REPLACEMENT
		OIL	WATER	
11-21 WIW	1.0			+ 857
6-21	1.0	51.1	326.4	- 381
7-21	1.0	27	159	- 188
10-21	1.0	23.8	36.3	- 62
11A-21	1.0	60	60	- 124
12-21	0.5	35.1	102.2	- 70
14B-21	0.5	60	60	- 62
14-21	0.5	64.6	528.1	- 298
14A-21	1.0	60	60	- 124
NOTE: 11-21 WIW can inject at 1785 m ³ /month				<u>- 452</u>

PHASE 2 UPR CALCULATIONS

WELL	TRACT FACTOR	PRODUCTION / INJECTION (SEP / 93)		VOIDAGE / REPLACEMENT
		OIL	WTR	
9-20	1.0			+ 312
12-21	0.5	35.1	102.1	- 70
13B-21	0.5	60	60	- 62
				+ 180

13-21	1.0			+ 1081
14B-21	0.5	60	60	- 62
13B-21	0.5	60	60	- 62
3B-28	1.0	60	60	- 124
4B-28	0.5	60	60	- 62
14-21	0.5	64.6	328.1	- 298
4-28	0.5	27.7	415.4	- 222
				+ 251

2-28	to be converted		REQUIRED INJECTIVITY	192 m ³ /d
2B-28	1.0	60	60	- 124
3-28	1.0	162	51.1	- 68
				- 192

1-29	to be converted		REQUIRED INJECTIVITY	829 m ³ /d
4-28	0.5	27.7	415.4	- 222
4B-28	0.5	60	60	- 62
4C-28	1.0	60	60	- 124
1B-29	0.5	60	60	- 62
2-29	1/3	27.7	204.4	- 78
8B-29	0.5	60	60	- 62
8-29	0.5	24.7	412.5	- 219
				- 829



NRU No. 1

T991 Infill Project

7B-30

PBTD @ 602 m above Cherty after swabbing
- selectively acidized Crinoidal
Sandhill
Oolites.

top of Cherty ~~440.4~~^{440.4} - 605 m 164.6 m ss.

oolites swabbed 1 m³/hr 10-15% oil

sandhill swabbed DRY

crinoidal "

- diesel solvent

- 15% HCl 5.3 m³ acid squeeze + diverters (beads)

CURRENT PRODUCTIVITY 0.01 m³/d

120-30-10-25

top of Cherty 432.1 - 590.5 -158.4 m ss

swabbed without stimulation

cherty 70-80 % oil

oolites " " "

sandh. 11 " " "

Cherty description (top 5 m)

f-g intercrystalline \emptyset , pp vuggy \emptyset
abundant brown oil stain, bright yellow fluorescence,
p-f streaming yellow cut flow.

current productivity 2.13 m³/d

11B-30

cased.

top of cherty 430.5 m - 590.7 m. -160.2 m ss

- GTP 4900 kPa when moved on service rig - well flowed 0.5 m³/hr

- selectively acidized

oolites	} 5.5 m ³ 15% HCl
Sandhill	
Crinoidal	

swabbing prior to selective acidizing	{	cherty wet & under high press.	
		oolites	15% OIL
		Sandhill	swabbed dry + 10% OIL poor inflow
		Crinoidal	" "

swabbing after selective acidizing

oolites flowing at

Sandhill 5 m³/hr 10% oil ← communication from below

Crinoidal ~~1.2~~ 1.2 m³/hr 10% oil ←

PBTD above 4th Oolite @ 589

- determine flow 100% when @ 1 m³/hr from = 582 m in Sandhill

- Crinoidal swabbed dry with packer @ 581 m.

SI

USE

8C-30 9 8D-30. as

sample of lithologed variations

8C-30

mud density 2000 - 2040 kg/m^3

- SICP prior to completion 1250 kPa

- prior to acidizing all zones switched 5-15% oil

- plugback to 551.5 m KB & drilled out to 570 m KB (PSTD) just above cherty

- still SICP 500 kPa after plugging back above

- acidized OH, switched 10-25% oil

FINAL SWAB RATE 1 m³/hr 15% oilcurrent productivity 1.75 m³/d

Top of cherty 403.3 - 572

-168.7 m ss

(501)

8B-30

SICP 2.9 MPa prior to completion

- prior to acidizing switched 0.85-2% oil to 96% oil

current productivity 2.72 m³/d

Top of cherty 398.3 - 560

-161.7 m ss

10B-30

SICP - 950 kPa when service rig moved on location

selectively acidized (squeeze)

Cherty 598.1 - 614 $< 1 \text{ m}^3/\text{hr}$ 5% oil

1-4H Oolite 585 - 596 $> 1 \text{ m}^3/\text{hr}$ 5% oil

Sandhill 577 - 580 swabbed dry

Crinoidal 575 - 577.9 swabbed dry

PSTD 604.68 - 6 - below top of Cherty

Reacidized swabbed 0.5 m^3/hr 5% oil

July 192 reacidized using diverter

10C-30

swabbed Cherty 595 - 610.8 poor inflow

selectively acidized Cherty 595.8 - 610.8 1-2 m^3/hr 50-80% oil

Oolite 585.8 - 595.8 1.5 m^3/hr 95% oil

Sandhill 580.8 - 585.8 0.5 m^3/hr 5% oil

Crinoidal 573 - 578 dry

DECLINE CURVE ANALYSIS - PHASE 1

1/ RETAINING RECOVERABLE RESERVES SEC. 30 PRIOR TO INFILL DRILLING

DAILY PRODUCTION VS. CUMULATIVE PRODUCTION

$$Q_+ = \frac{(q_i - q_+) 365}{D}$$

$$\begin{aligned} q_i &= 40 \text{ m}^3/\text{d} & Q_+ &= 470000 \\ q_+ &= 10 \text{ m}^3/\text{d} & Q_+ &= 630000 \end{aligned}$$

$$D = \frac{365 (40 - 10)}{(630000 - 470000)} = .068$$

ULTIMATE RECOVERABLE RESERVES

$$q_i = 10 \text{ m}^3/\text{d}$$

$$q_+ = 10 \text{ wells} \times 0.4 \text{ m}^3/\text{d}$$

$$D = 6.8 \%$$

$$Q_{+i} = 630000$$

$$Q_{tu} = Q_{+i} + 365 \frac{(q_i - q_+)}{D} = 630000 + 365 \frac{(10 - 4)}{.068}$$

$$Q_{tu} = 662206 \text{ m}^3 \quad \left\{ \begin{array}{l} \text{less than } 749 \text{ m}^3 \text{ predict in} \\ \text{Bom's memo dated Apr 25/91} \end{array} \right\}$$

2) RETAINING RECOVERABLE RESERVES SEC. 30 INCLUDING INFILL WELLS

LIMITED INFILL WELL PRODUCTION HISTORY AND
INFERIOR PRODUCTION TESTING MAKE ACCURATE PREDICTIONS
DIFFICULT

a / DECLINE RATE 1 (d_1)

$$\begin{aligned} q_i &= 50 \text{ m}^3/\text{d} & Q_{+i} &= 530000 \\ q_+ &= 30 \text{ m}^3/\text{d} & Q_+ &= 610000 \end{aligned}$$

$$D = \frac{365 (q_i - q_+)}{Q_{+i} - Q_+} = .091 \quad \text{decline rate} = 9.1\% / \text{yr.}$$

DECLINE RATE 2 (d_2)

$$\begin{aligned} q_i &= 55 \text{ m}^3/\text{d} & Q_{+i} &= 480000 \\ q_+ &= 35 \text{ m}^3/\text{d} & Q_+ &= 600000 \end{aligned}$$

$$D = 6.1\% / \text{yr.}$$

DECLINE RATE 3 (d_3) = 6.8% equivalent to pre-infill
drilling decline rate

B/ ULTIMATE RECOVERABLE RESERVES

USING $D_1 = 9.1\%$

$$Q_{+i} = 610000$$

$$q_t = 14 \text{ wells} \times 0.4 \text{ L/D} = 5.6$$

$$q_i = 30 \text{ L/D}$$

$$Q_{tu} = Q_{+i} + \frac{365}{D} (q_i - q_t) = 610000 + \frac{365}{0.091} (30 - 5.6) = 707868$$

USING $D_2 = 6.1\%$

$$q_t = 5.6 \text{ L/D}$$

$$q_i = 35 \text{ L/D}$$

$$Q_{+i} = 600000$$

$$Q_{tu} = 777115 \text{ m}^3$$

USING $D_3 = 6.8\%$

$$q_t = 5.6 \text{ L/D}$$

$$q_i = 40 \text{ L/D}$$

$$Q_{+i} = 515000$$

$$Q_{tu} = 760721 \text{ m}^3$$

B/ INCREMENTAL RECOVERABLE RESERVES FROM INFILL DRILLING

$$D_1 = 9.1\%$$

INCREMENTAL REC. RES.

$$45662 \text{ m}^3$$

$$D_2 = 6.1\%$$

"

"

"

$$114908 \text{ m}^3$$

$$D_3 = 6.8\%$$

"

"

"

$$98514 \text{ m}^3$$

Exponential Decline (Rate vs. Time)

VRU No. 1 Infill Area

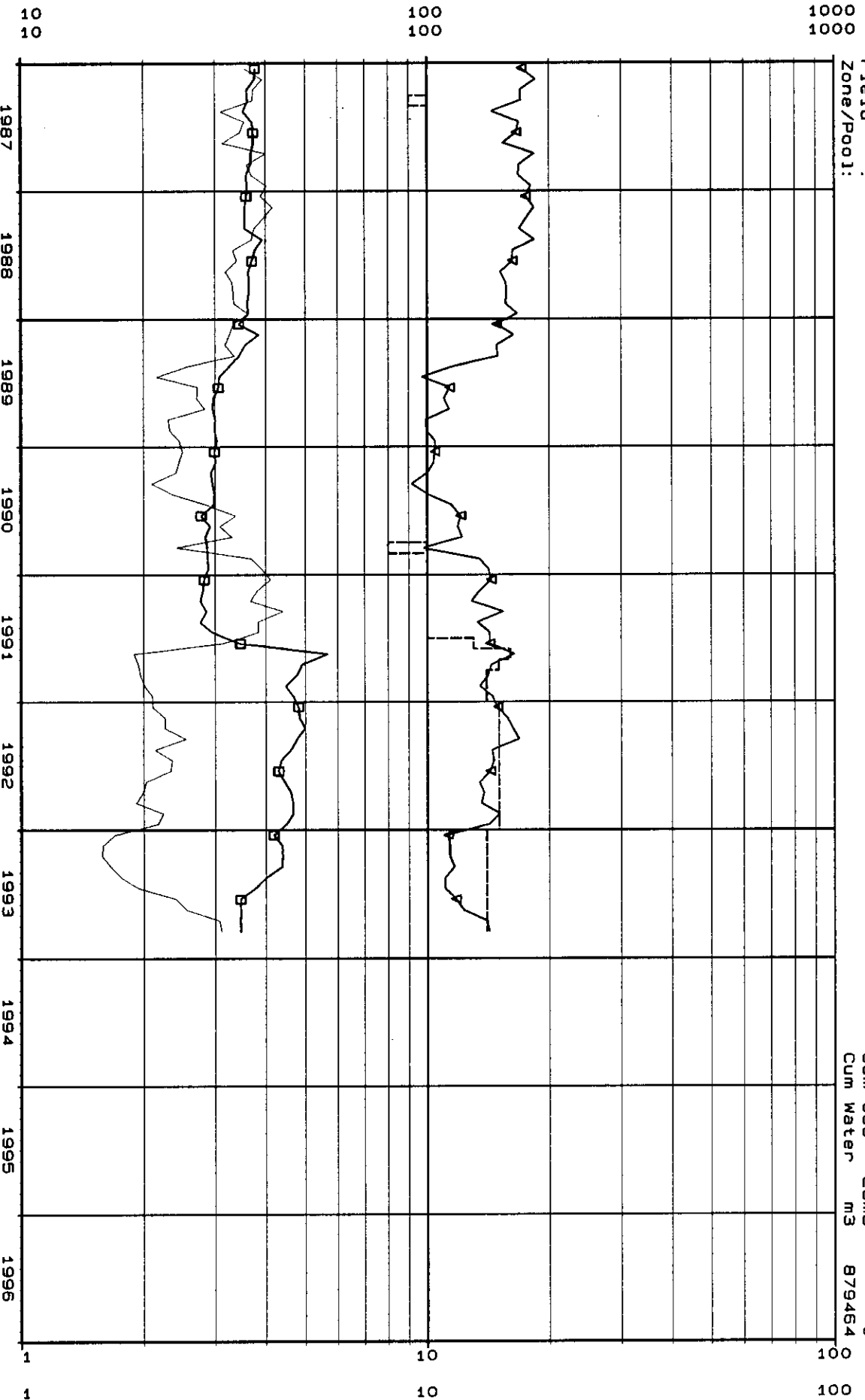
01/12/94 16:23

Data 5412-9310

Operator :
Field :
Zone/Pool :

Type :

Cum Oil m3 574638
Cum Gas E3m3 0
Cum Water m3 879464



Cal Day Fluid m3/d
Cal Day Oil m3/d



WOR

m3/m3
Num Wells

Exponential Decline (Rate vs. Time)

VRU No. 1 Infill Area (Old Wells Only)

01/12/94 16:25

Type :

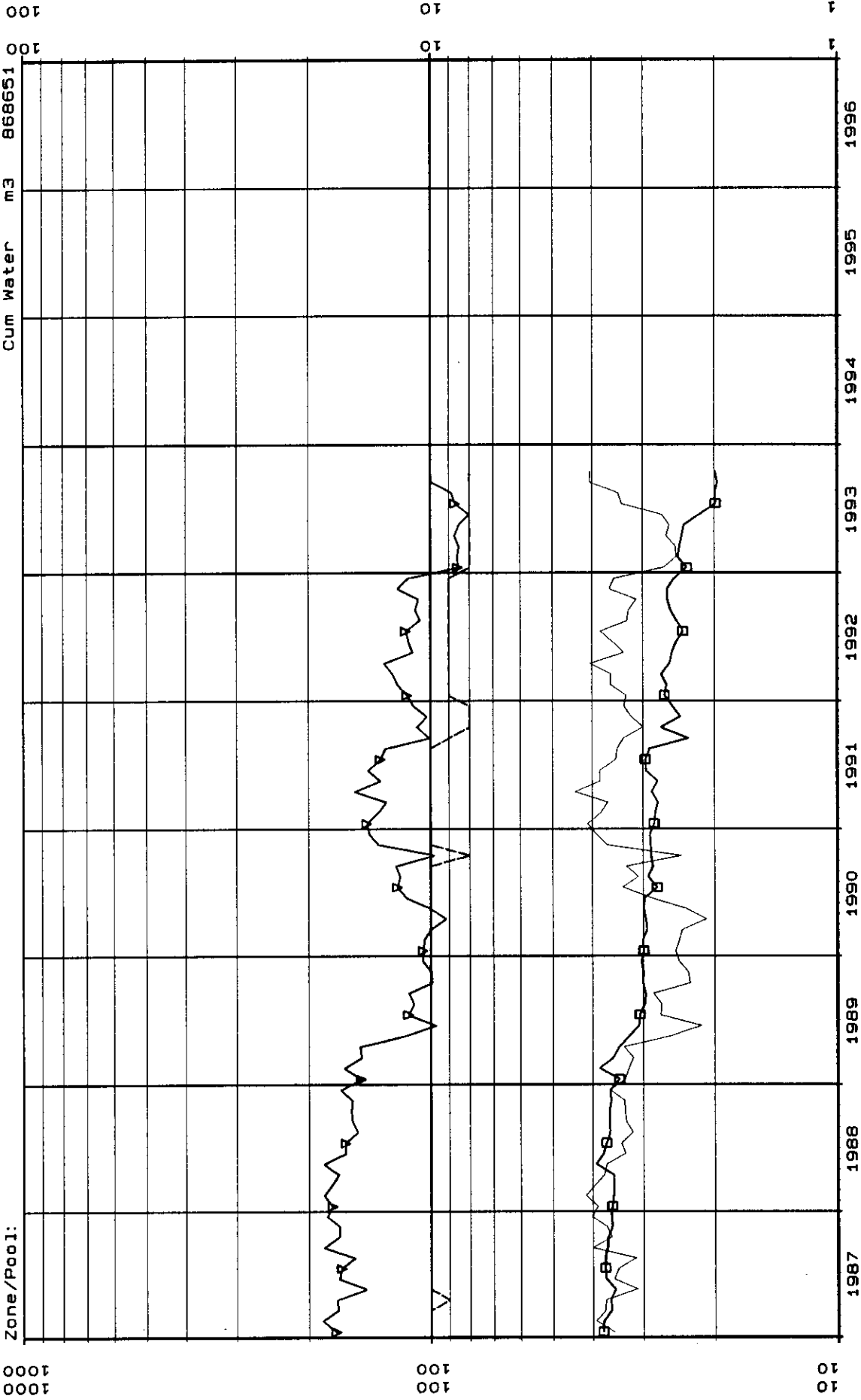
Data 5412-9310

Operator :

Field :

Zone/Pool:

Cum Oil m3 558302
Cum Gas E3m3 0
Cum Water m3 868651



▼ Cal Day Fluid m3/d
□ Cal Day Oil m3/d

WOR

m3/m3
Num Wells



Exponential Decline (Rate vs. Time)

VRU No. 1 Infill Area

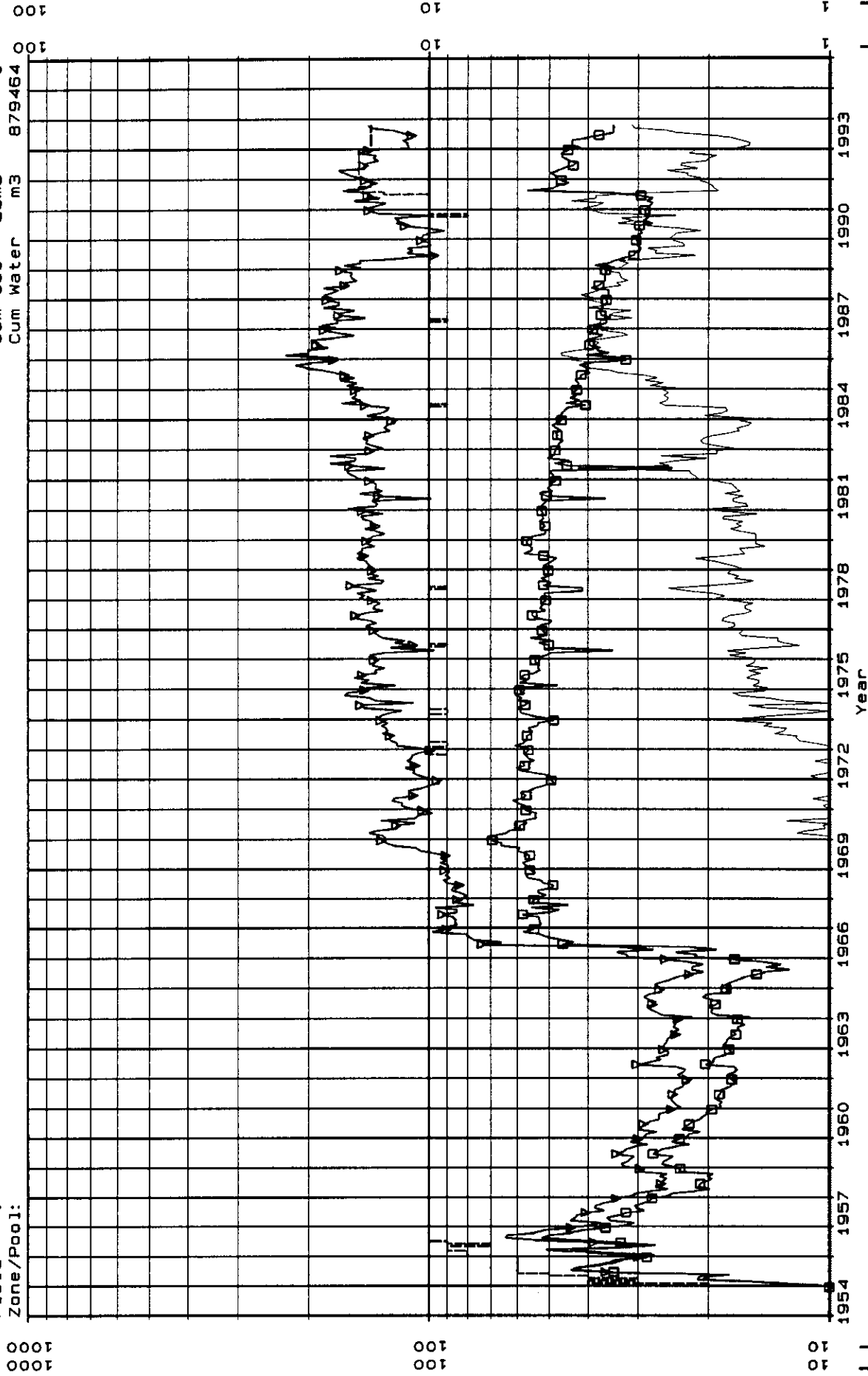
01/12/94 16:20

Data 5412-9310

Operator :
Field :
Zone/Pool:

Type :

Cum Oil m3 574638
Cum Gas E3m3 0
Cum Water m3 879464



WOR
m3/m3
Num Wells

v Cal Day Fluid m3/d
d Cal Day Oil m3/d

Exponential Decline (Rate vs. Time)

VRU No. 1 Infill Area (Old Wells Only)

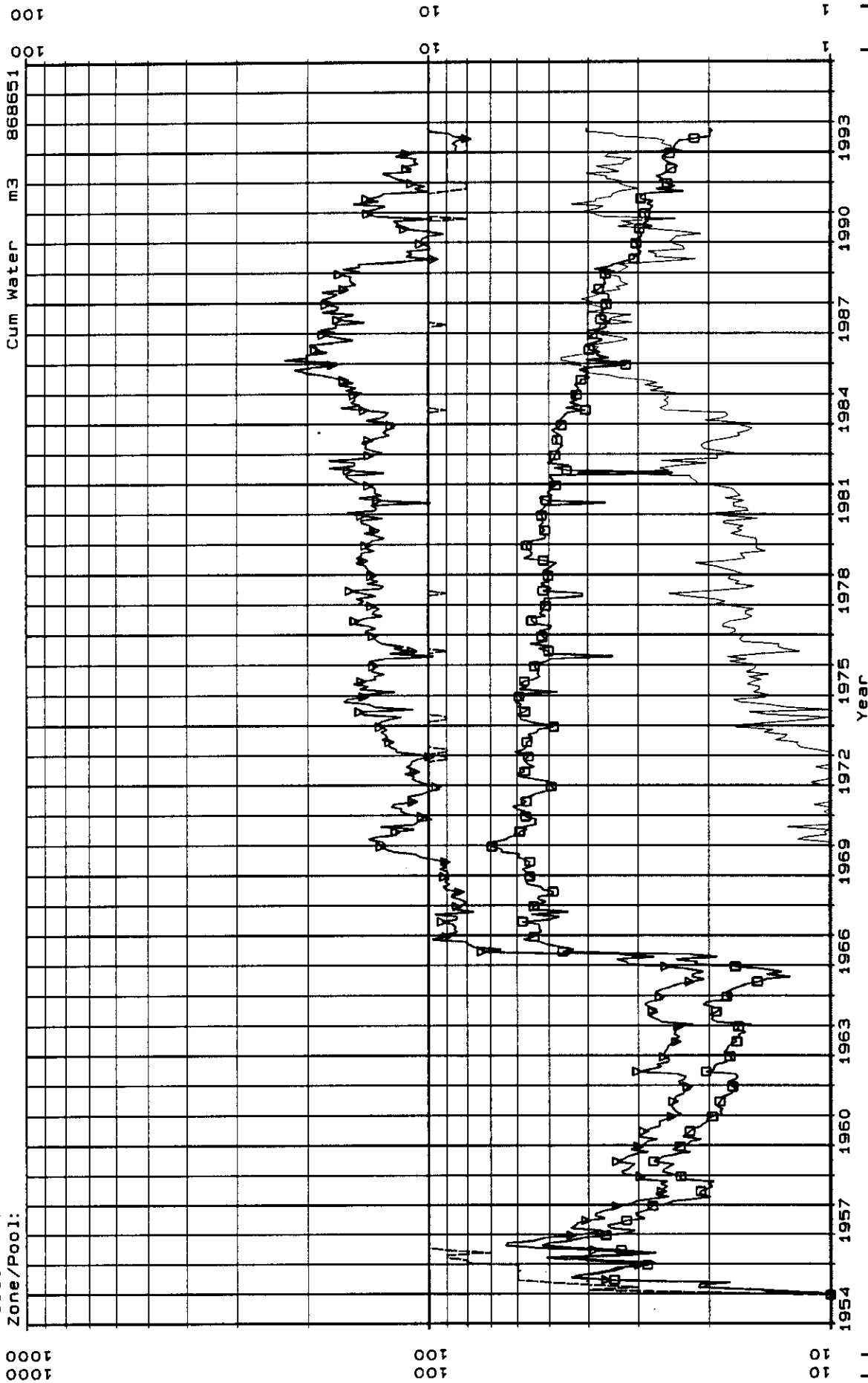
01/12/94 16:16

Type :

Data 5412-9310

```
Operator :
Field :
Zone/Pool:
```

Cum Oil	m3	558302
Cum Gas	E3m3	0
Cum Water	m3	868651



WOR	m3/m3
Num	Wells

Δ	Cal Day	Fluid	m3/d
0	Cal Day	Oil	m3/d

Exponential Decline (Rate vs. Time)

Producing Wells

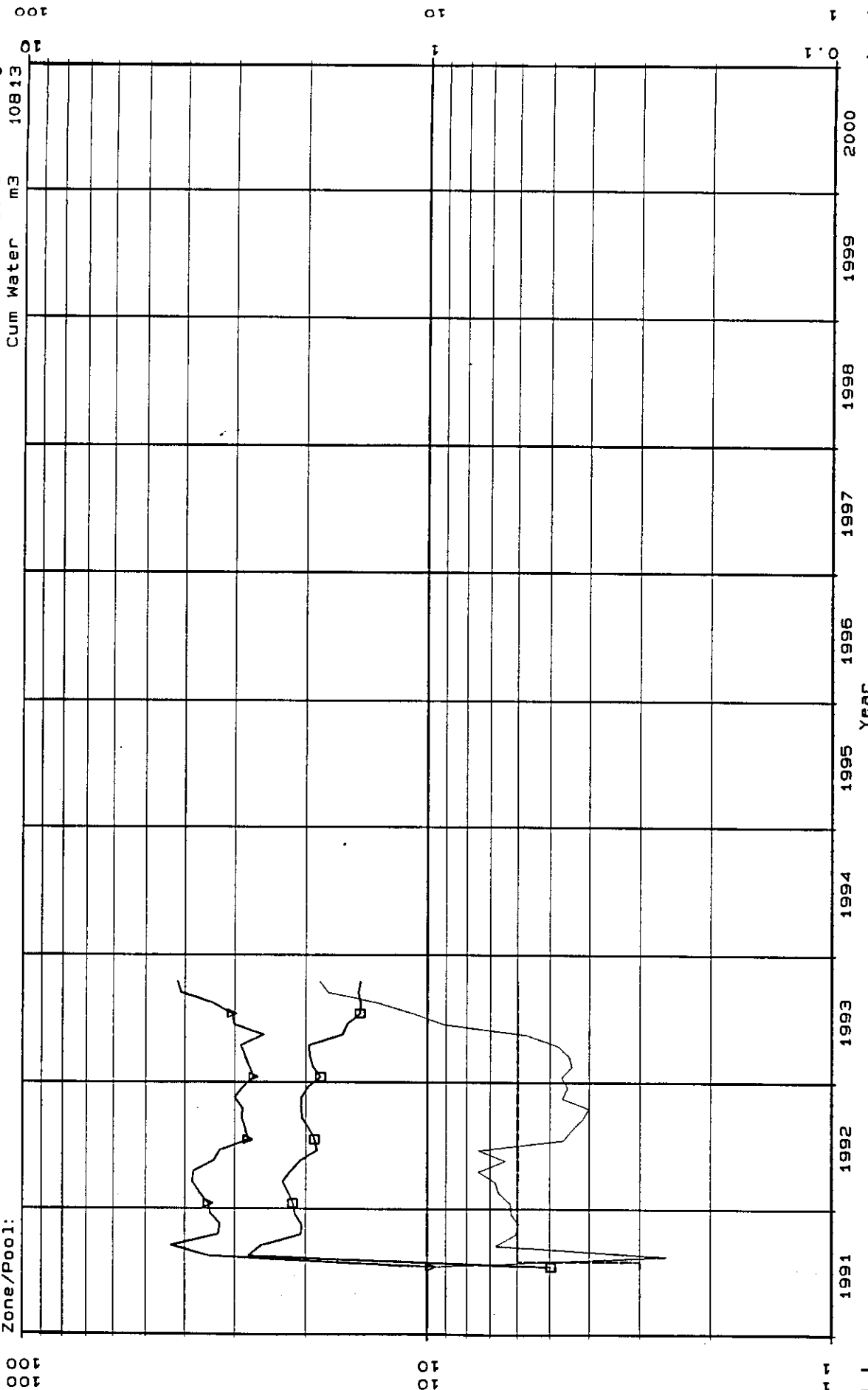
01/13/94 12:04

Date 9107-9310

Type :

Operator :
Field :
Zone/Pool:

Cum Oil m3 16335
Cum Gas E3m3 0
Cum Water m3 10813



WOR

m3/m3

Num Wells

Δ Cal Day Fluid m3/d
□ Cal Day Oil m3/d

Exponential Decline (Rate vs. Cumulative Oil)

Producing Wells

01/13/94 12:07

Type :

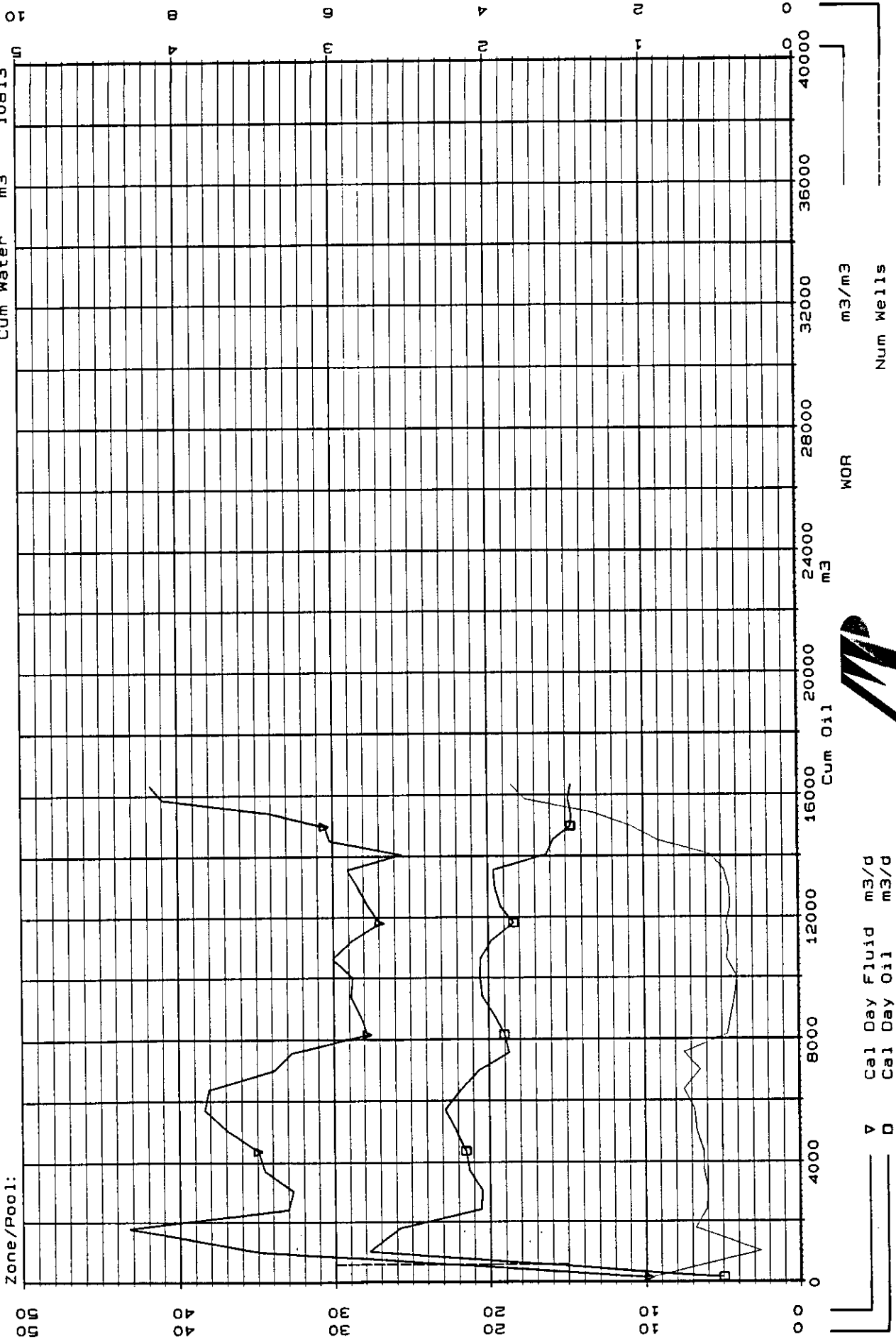
Data 9107-9310

Operator :

Field :

Zone/Pool:

Cum Oil m3 16335
Cum Gas E3m3 0
Cum Water m3 10813



Exponential Decline (Rate vs. Cumulative Oil)

VRU No. 1 Infill Area

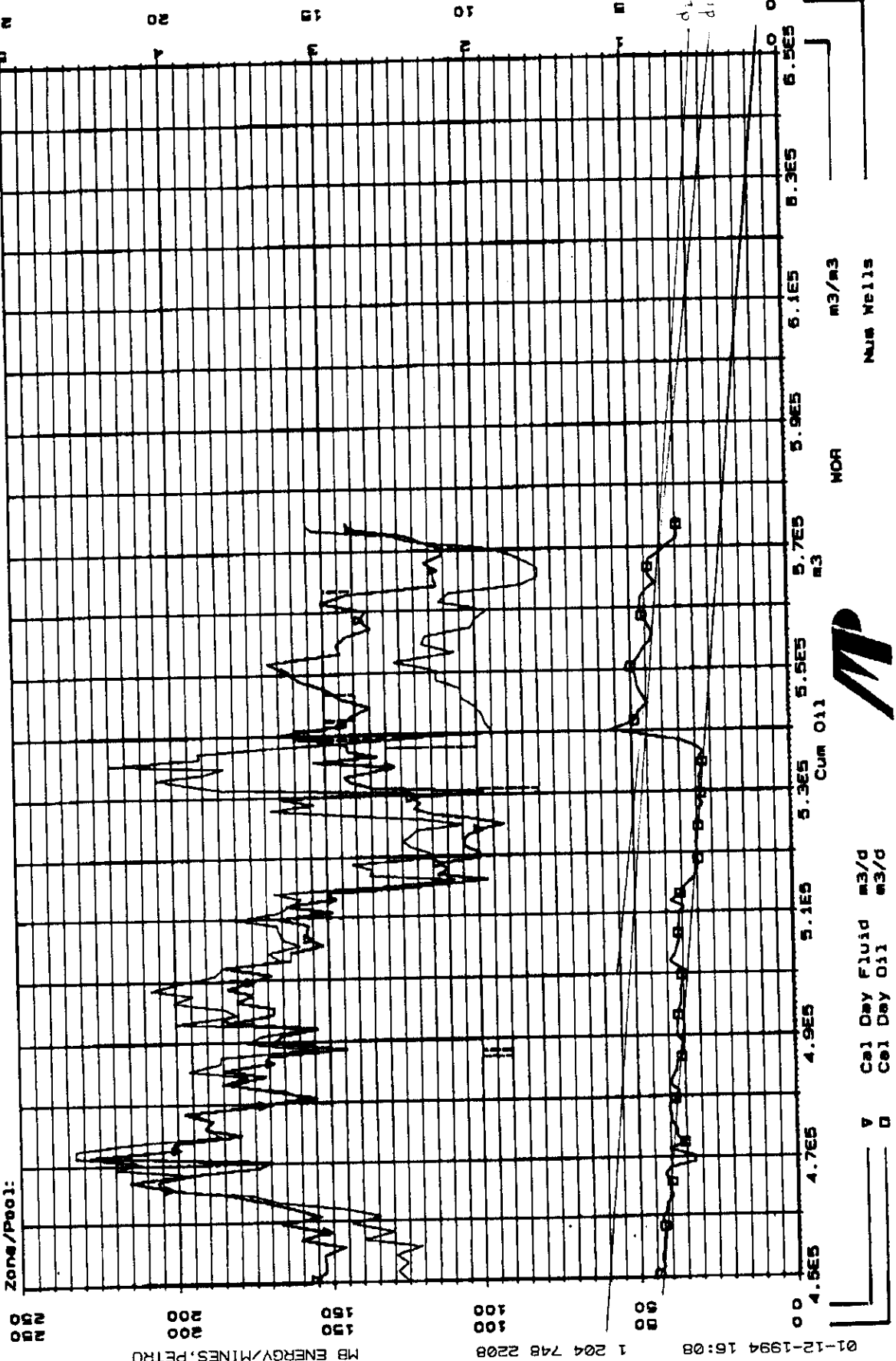
01/12/94 16:13

Type :

Data 5412-9310

Operator :
Field :
Zone/Pool:

Cum Oil m3 574638
Cum Gas E3m3 0
Cum Water m3 878464



Manitoba Energy and Mines Production Database

Exponential Decline (Rate vs. Cumulative Oil)

VRU No. 1 Infill Area (Old Wells Only)

01/12/94 16:14

Data 5412-9310

Operator :
Field :
Zone/Pool:

Type :

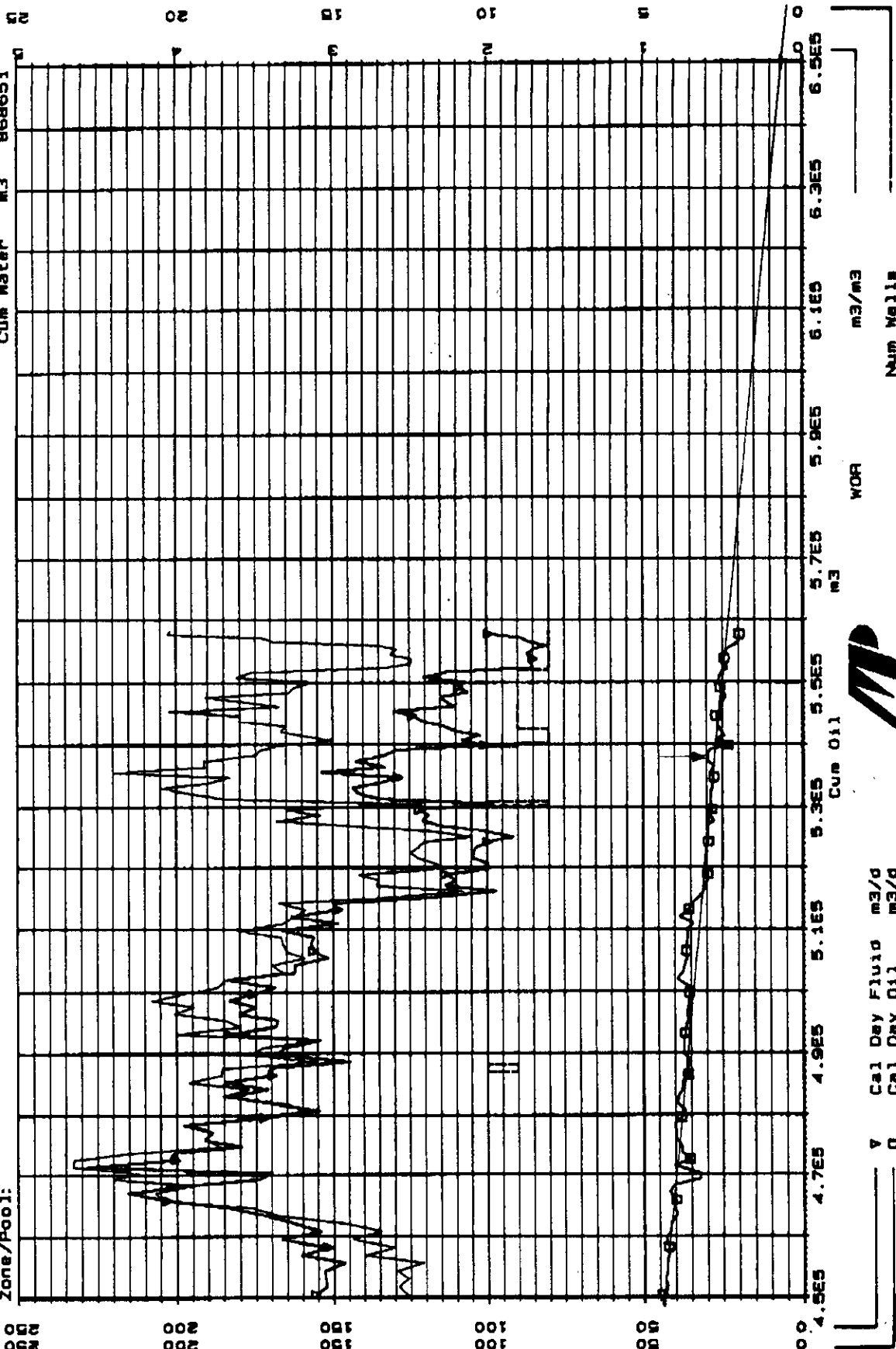
Cum Oil m3 558302
Cum Gas E3m3 0
Cum Water m3 868651

P.04/07

MB ENERGY/MINES, PETRO

1 204 748 2208

01-12-1994 16:07



Exponential Decline (Rate vs. Time)

VRU No. 1 Infill Area (Old Wells Only)

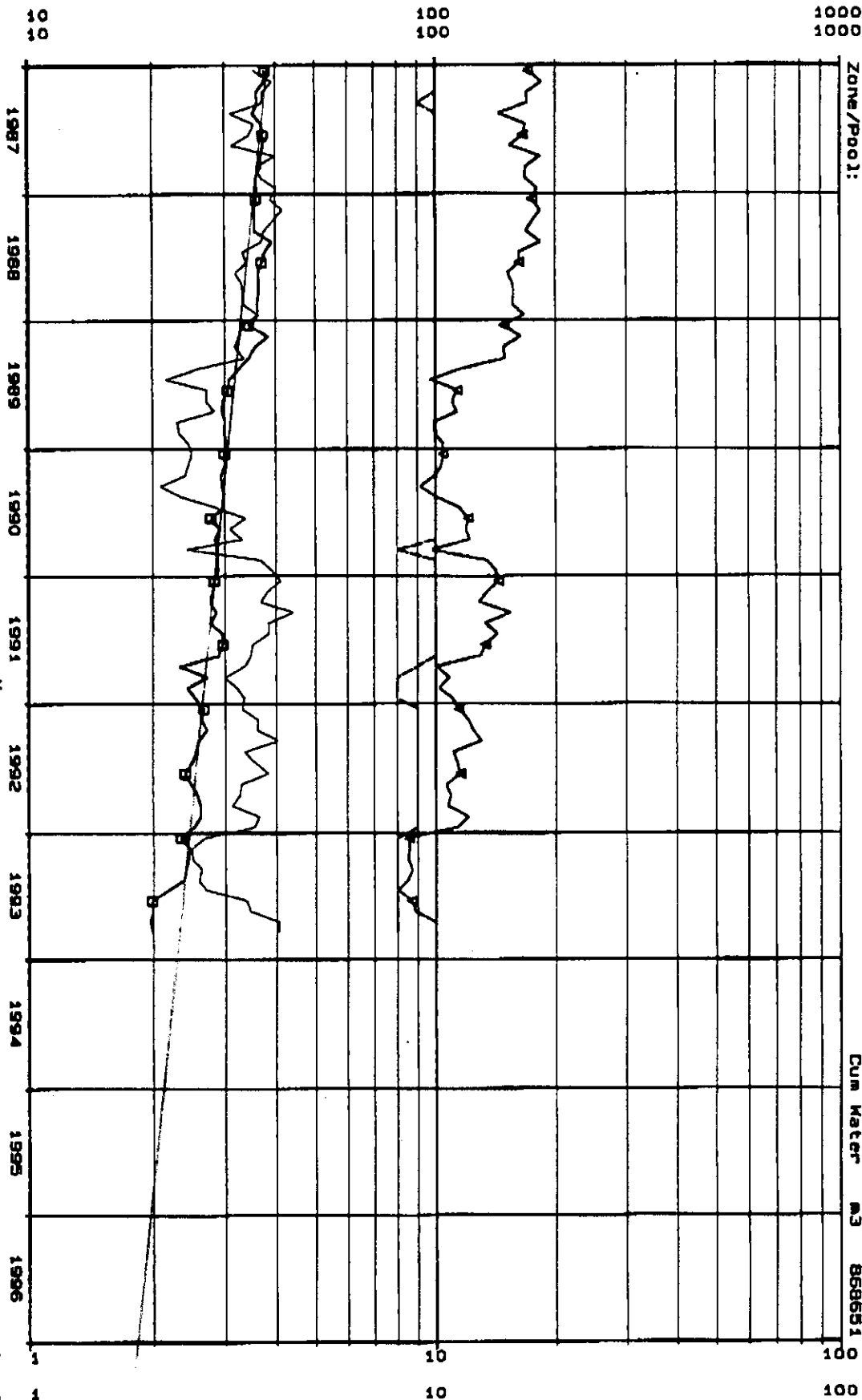
01/12/94 16:25

Type :

Date 5412-9310

Operator :
Field :
Zone/Pool:

Cum Oil m3 558302
Cum Gas m3 0
Cum Water m3 858551



V Oil Day Fluid m3/d
D Gas Day Oil m3/d
W Water Day m3/d



Manitoba Energy and Mines Production Database

Exponential Decline (Rate vs. Time)

VRU No. 1 Infill Area

01/12/94 16:20

Type :

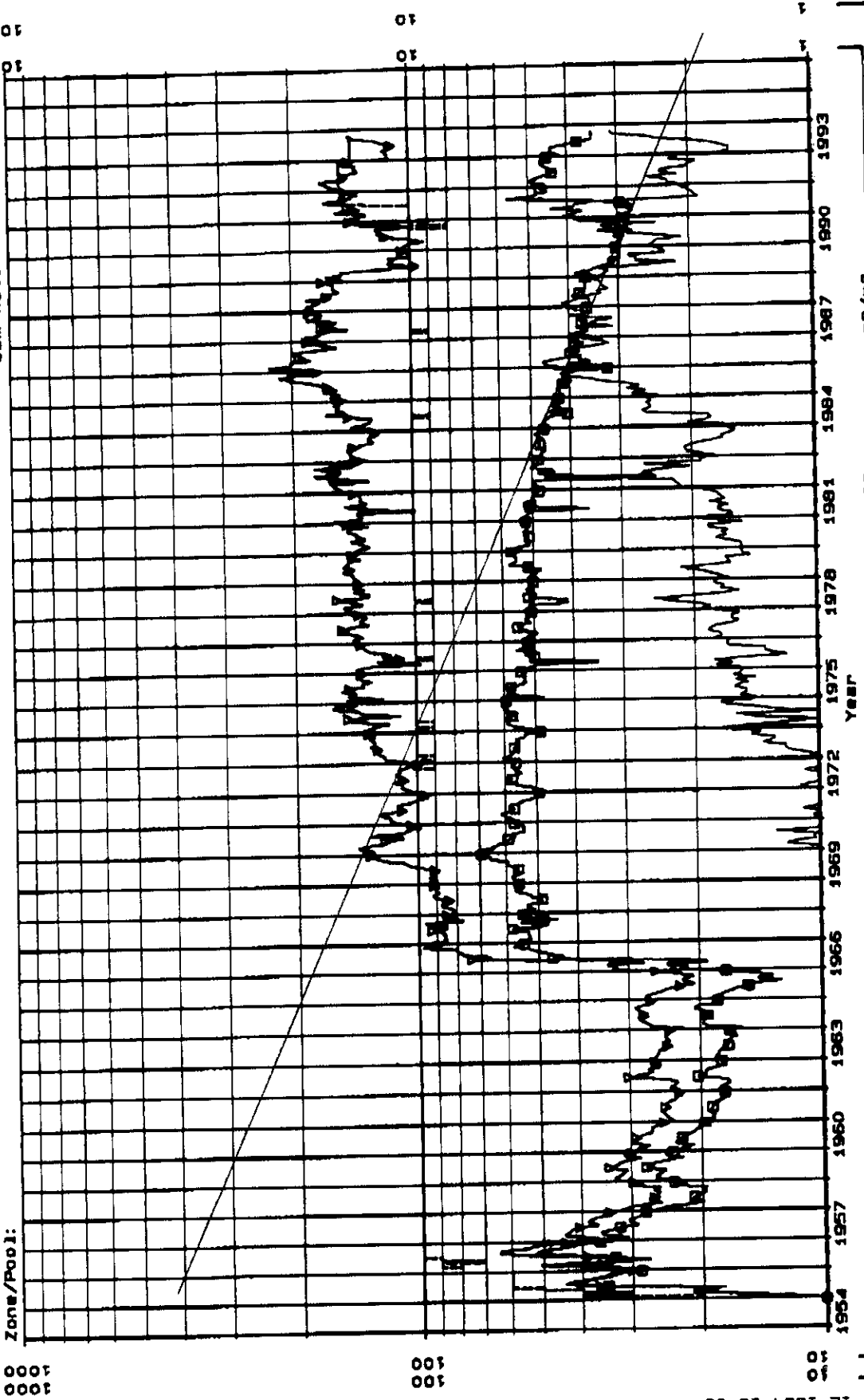
Data 5412-9310

Operator :

Field :

Zone/Pool:

Cum Oil m3 574638
Cum Gas E3m3 0
Cum Water m3 879464



m3/m3
Num Wells

NOR



Cal Day Fluid m3/d
Cal Day Oil m3/d

Manitoba Energy and Mines Production Database

**LODGEPOLE A POOL
05 59A**

VIRDEN FIELD

OIL WATER	Cum. Prod. Dec. 31/92 m ³	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	SEP. Daily m ³	1993 Y.T.D. m ³	Cum. Total m ³
UPTON RESOURCES INC. (Cont.)																
TOTAL OIL	167 411.7		158.8		164.6		163.9		152.2							168 902.7
TOTAL WATER	2 275 213.2		9 636.0		9 912.0		9 403.0		9 625.0							2 364 188.2
NON-UNIT PREVIOUS PRODUCERS	298 982.9															298 982.9
LODGEPOLE A POOL:	3 242 946.6															3 242 946.6
TOTAL OIL	10 729 978.6		9 598.5		10 454.7		10 148.7		10 522.5							10 824 125.3
TOTAL WATER	32 662 311.9		115 445.4		127 385.3		119 536.5		126 595.0							33 788 644.1
		11 014.2		10 891.6		10 661.1		10 627.8		10 227.6					94 146.7	
		135 750.2		124 506.7		130 588.1		129 139.7		117 385.3					1 126 332.2	

**LODGEPOLE B POOL
05 59B**

62 wells including 1 SI

VIRDEN-ROSELEA UNIT #01 (Effective July 1, 1965)

CHEVRON CANADA RESOURCES LIMITED

09-19-10-25	11 898.7	16.2	15.5	17.2	16.4	17.1	27.7	26.8	26.7	25.8	0.86	189.4	12 088.1
	69 150.1	360.0	321.4	353.7	356.1	353.1	251.5	250.1	248.8	267.5		2 762.2	71 912.3
16-19-10-25	11 701.1	2.7	2.6	2.8	2.7	2.8	2.5	2.4	2.4	2.3	0.08	23.2	11 724.3
	43 987.0	94.9	84.8	93.3	93.9	93.4	75.4	75.0	75.9	80.2		766.8	44 753.8
11-20-10-25	17 508.3	9.2	8.5	9.8	9.2	9.4	4.2	2.7	2.7	2.6	0.09	58.3	17 566.6
Fr. Prmv.	128 418.4	73.3	63.4	71.9	72.4	72.2	259.1	318.9	322.4	341.1		1 594.7	130 013.1
06-21-10-25	11 741.8	17.8	15.6	18.2	16.9	18.7	44.2	55.5	50.4	51.1	1.70	288.4	12 030.2
Fr. Prmv.	103 275.7	479.4	434.9	463.1	462.9	455.7	338.1	308.8	307.9	326.4		3 577.2	106 852.9
07-21-10-25	10 951.2	8.9	7.8	9.1	8.4	9.4	23.2	28.4	26.6	27.0	0.90	148.8	11 100.0
	38 168.0	193.2	175.1	186.7	186.4	183.6	157.1	145.4	149.8	159.0		1 536.3	39 704.3
10-21-10-25	11 267.4	29.5	26.1	30.4	28.2	31.2	26.1	26.3	23.9	23.8	0.82	245.5	11 512.9
	16 596.9	72.4	65.7	70.0	70.0	68.9	45.4	35.0	34.9	36.3		498.6	17 095.5
12-21-10-25	19 388.6	74.0	65.0	75.8	70.4	77.9	49.3	38.1	34.5	35.1	1.17	520.1	19 908.7
Fr. Prmv.	33 455.8	138.0	125.2	133.2	133.2	131.1	105.4	96.6	96.4	102.2		1 061.3	34 517.1
14-21-10-25	26 504.4	71.0	62.4	72.7	67.6	74.7	66.5	70.2	63.6	64.6	2.15	613.3	27 117.7
	158 588.1	834.6	757.0	806.4	805.8	793.4	532.0	499.5	497.9	528.1		6 054.7	164 642.8
02-28-10-25	8 440.6	11.8	10.5	12.1	11.3	12.5	14.6	17.5	15.9	16.2	0.54	122.4	8 563.0
	63 076.9	293.1	265.9	283.2	283.0	278.7	191.2	169.1	168.6	178.8		2 111.6	65 188.5
03-28-10-25	14 943.4	23.7	20.7	24.3	22.5	24.9	17.0	17.6	15.9	16.2	0.54	182.8	15 126.2
Prov	23 678.5	100.1	90.7	96.7	96.6	95.1	52.5	48.4	48.2	51.1		679.4	24 357.9
04-28-10-25	18 371.9	23.6	20.7	24.2	22.5	31.4	28.6	30.2	27.3	27.7	0.92	236.2	18 608.1
Prov	66 312.5	279.4	253.5	269.9	269.7	458.8	410.2	392.9	391.6	415.4		3 141.4	69 453.9
01-29-10-25	24 482.3	22.0	19.3	22.4	20.9	21.6	19.1	20.2	18.4	18.6	0.62	182.5	24 664.8
Prov	84 382.7	297.7	268.9	286.6	286.4	278.7	238.3	228.2	227.6	241.3		2 353.7	86 736.4
02-29-10-25	24 331.9	32.3	28.1	33.0	30.7	32.8	28.5	30.2	27.2	27.7	0.92	270.5	24 602.4
Prov	74 370.8	249.4	223.2	239.9	239.7	236.1	201.9	193.3	192.7	204.4		1 980.6	76 351.4
06-29-10-25	27 980.5	41.0	35.9	41.8	38.9	28.7	25.5	26.9	24.4	24.8	0.83	287.9	28 268.4
Prov	80 334.4	486.8	439.8	468.4	468.2	417.3	356.9	341.8	340.8	361.4		3 681.4	84 015.8
08-29-10-25	27 834.4	29.0	25.5	29.7	27.6	29.7	25.5	26.9	24.4	24.7	0.82	243.0	28 077.4
Prov	160 708.8	526.4	475.4	506.5	506.2	488.4	407.4	390.1	388.9	412.5		4 101.8	164 810.6
10-29-10-25	5 225.9	11.9	10.4	12.1	11.2	12.4	4.7	5.0	4.5	4.6	0.15	76.8	5 302.7
Prov	100 296.1	387.9	350.5	373.2	372.9	367.2	318.5	305.1	304.1	322.5		3 101.9	103 398.0
11-29-10-25	14 645.4	23.8	20.8	24.3	22.6	7.2	23.9	37.9	35.0	35.6	1.19	231.1	14 876.5
Prov	31 275.1	190.5	172.1	183.3	183.1	82.0	148.5	200.7	203.5	215.7		1 579.4	32 854.5
12-29-10-25	12 123.4	18.7	16.4	19.1	17.7	12.4	9.4	10.0	9.0	9.1	0.30	121.8	12 245.2
Prov	60 198.7	249.3	225.2	239.9	239.8	230.8	196.3	188.0	187.4	198.8		1 955.5	62 154.2
01-30-10-25	47 856.4	43.2	41.3	45.7	43.6	36.3	23.1	22.4	22.2	21.5	0.72	299.3	48 155.7
	58 537.0	383.7	342.6	377.1	379.7	376.2	301.9	300.1	297.3	321.0		3 079.6	61 616.6

VIRDEN-ROSELEA UNIT #01 (Cont.)

LODGEPOLE B POOL
05 59B

VIRDEN FIELD

OIL WATER	Cum. Prod. Dec. 31/92 m ³	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	SEP. Daily m ³	1993 Y.T.D. m ³	Cum. Total m ³
CHEVRON CANADA RESOURCES LIMITED (Cont.)																
02-30-10-25	46 301.3 87 926.2	67.4 367.9	64.5 328.5	71.3 361.5	68.2 363.9	69.0 362.6	58.0 301.8	56.0 300.0	55.8 298.6	53.9 321.0				1.80	564.1 3 005.8	46 865.4 90 932.0
03-30-10-25	34 144.7 46 385.0	81.0 55.4	77.3 49.4	85.7 54.4	81.7 54.8	83.0 54.5	76.2 44.3	80.7 206.3	81.1 216.5	78.2 232.7				2.61	724.9 968.3	34 869.6 47 353.3
06-30-10-25	110 763.9 133 393.6	99.8 708.0	95.4 632.2	102.2 673.1	100.9 700.5	102.7 700.1	83.0 643.8	75.4 698.0	76.4 705.8	72.6 746.6				2.42	808.4 6 208.1	111 572.3 139 601.7
07B-30-10-25 x	153.9 2 106.2	4.5 28.6	4.3 25.4	4.8 27.7	4.6 28.2	4.7 28.1	4.3 22.7	3.5 43.2	0.3 151.7	0.3 160.5				✓ 0.01	31.3 516.1	185.2 2 622.3
08-30-10-25 Fr. Pmv.	48 889.2 40 866.6	40.5 39.5	38.7 35.4	42.8 38.9	40.9 39.1	41.7 39.2	38.1 202.6	36.5 200.0	37.0 202.3	35.2 214.0				1.17	351.4 1 011.0	49 240.6 41 877.0
08B-30-10-25 x	3 799.0 254.6	140.3 11.6	136.7 10.6	151.3 11.7	144.5 11.7	146.8 15.4	87.6 96.9	84.7 96.4	85.1 96.8	81.5 103.1				✓ 2.72	1 058.5 454.2	4 857.5 708.8
08C-30-10-25 x	1 591.1 447.1	84.5 23.9	80.2 21.2	89.5 23.5	84.7 23.5	87.0 23.6	57.5 117.0	54.9 119.8	55.2 120.1	52.4 127.0				✓ 1.75	645.9 599.6	2 237.0 1 046.7
10-30-10-25	111 019.9 37 385.9	232.6 57.9	220.5 51.1	239.5 55.3	226.5 55.2	239.4 57.1	217.1 45.9	183.6 164.6	184.5 208.6	176.7 222.5				5.89	1 920.4 918.2	112 940.3 38 304.1
10B-30-10-25	248.8 2 953.0	14.0 182.0	13.4 162.6	14.9 178.9	14.2 180.1	14.4 179.9	10.5 164.6	4.8 200.1	4.9 202.3	4.6 214.0				✓ 0.15	95.7 1 664.5	344.5 4 617.5
10C-30-10-25	4 607.5 175.4	269.2 4.0	249.1 3.4	285.5 14.6	284.0 23.4	291.7 23.7	264.5 19.0	255.7 18.9	257.0 19.0	242.5 28.3				✓ 8.08	2 399.2 154.3	7 006.7 329.7
11-30-10-25	72 206.6 34 961.5	145.5 19.9	137.9 17.7	153.8 19.6	145.8 19.6	149.8 19.7	144.5 65.9	148.3 115.4	149.0 115.7	142.7 123.4				4.76	1 317.3 516.9	73 523.9 35 478.4
11B-30-10-25 x	0.1 17.5	— —	— —	— —	— —	— —	— —	— —	— —	— —				✓	— —	0.1 17.5
12-30-10-25	29 427.8 243 730.2	14.0 1000.9	13.1 886.4	14.5 973.0	13.9 982.3	14.2 989.6	12.9 794.7	12.5 790.9	12.6 793.4	9.4 957.1				0.31	117.1 8 168.3	29 544.9 251 898.5
12D-30-10-25 x	845.3 364.3	57.0 16.0	54.2 14.2	60.5 15.6	57.3 15.6	58.8 15.8	49.8 11.8	51.5 12.6	51.8 12.7	63.8 151.8				✓ 2.13	504.7 266.1	1 350.0 630.4
09-23-10-26	10 213.0 107 827.0	13.1 130.0	12.2 137.2	13.1 125.5	12.8 128.7	13.1 126.2	4.4 57.3	3.0 43.2	2.9 41.0	3.0 45.1				0.10	77.6 834.2	10 290.6 108 661.2
10-23-10-26	41 464.0 195 687.3	40.6 934.9	37.8 987.2	40.7 902.7	39.4 926.3	40.7 907.8	39.5 648.6	41.6 582.6	39.9 554.1	39.6 588.7				1.37	359.8 7 032.9	41 823.8 202 720.2
11-23-10-26	37 124.4 93 875.3	74.1 345.5	68.9 364.8	74.2 333.6	71.9 342.2	74.1 335.4	43.2 225.2	45.1 218.5	43.3 208.0	44.6 228.7				1.49	539.4 2 601.9	37 663.8 96 477.2
13-23-10-26	14 986.3 39 670.6	13.2 14.4	12.2 15.1	13.2 14.0	12.8 14.1	13.2 14.0	13.0 15.0	9.3 11.6	8.8 10.9	9.1 12.0				0.30	104.8 121.1	15 091.1 39 791.7
14-23-10-26	21 004.8 93 547.1	45.3 605.3	42.2 639.2	45.4 584.5	44.0 599.8	45.4 587.8	13.7 245.4	14.9 244.5	14.3 232.6	14.7 255.7				0.49	279.9 3 994.8	21 284.7 97 541.9
16-23-10-26	21 027.9 125 964.7	38.2 551.5	35.6 582.3	38.3 532.5	37.1 546.3	38.3 535.5	35.9 506.1	21.4 261.8	20.0 243.0	20.8 269.0				0.72	285.6 4 028.0	21 313.5 129 992.7
11-24-10-26	18 651.3 80 180.6	19.1 79.3	17.7 83.6	19.1 76.5	18.6 78.5	19.1 76.9	21.9 82.3	23.6 78.4	22.9 75.2	23.5 82.8				0.78	185.5 713.5	18 836.8 80 894.1
12-24-10-26	13 610.2 17 219.6	4.7 274.4	4.5 294.5	4.8 269.3	4.6 276.3	4.8 270.8	21.6 349.3	29.5 356.7	28.5 342.1	29.6 379.2				0.99	132.6 2 812.6	13 742.8 20 032.2
14-24-10-26	33 742.4 82 911.6	52.6 389.8	48.9 411.7	52.7 376.4	51.1 386.2	52.6 378.5	42.8 295.6	35.1 207.2	33.9 198.7	34.9 218.5				1.16	404.6 2 862.6	34 147.0 85 774.2
16-24-10-26	50 140.0 149 635.7	75.2 882.3	71.1 947.0	76.5 866.1	74.2 888.5	76.5 870.9	80.9 840.9	79.6 652.8	77.0 625.9	79.2 688.0				2.64	690.2 7 262.4	50 830.2 156 898.1

VIRDEN-ROSELEA UNIT #01 (Cont.)

LODGEPOLE B POOL
05 59B

VIRDEN FIELD

OIL WATER	Cum. Prod. Dec. 31/92 m ³	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	SEP. Daily m ³	1993 Y.T.D. m ³	Cum. Total m ³
CHEVRON CANADA RESOURCES LIMITED (Cont.)																
01-25-10-26	48 741.9 158 757.4	122.8 708.2	122.2 799.9	131.6 731.3	126.5 744.2	130.5 748.8	144.3 872.4	159.6 886.7	154.3 850.2	158.8 934.8				5.29 7 276.5	1 250.6 7 276.5	49 992.5 166 032.9
02-25-10-26	47 465.4 151 873.8	62.0 709.9	57.8 749.6	62.1 685.5	60.3 703.3	51.5 610.4	53.1 718.8	60.9 759.1	59.0 730.0	60.7 802.4				2.02 6 469.0	527.4 6 469.0	47 992.8 158 342.8
03-25-10-26	31 669.3 94 407.2	57.8 348.6	53.7 368.1	57.9 336.6	52.7 312.4	40.4 222.9	45.5 269.2	48.8 265.3	47.4 255.1	48.0 275.8				1.66 2 654.0	452.2 2 654.0	32 121.5 97 061.2
04-25-10-26	24 599.7 187 728.0	27.5 877.9	25.5 927.0	27.5 847.7	26.6 869.7	28.9 786.5	33.2 922.5	35.7 911.7	34.5 874.2	35.5 961.1				1.18 7 978.3	274.9 7 978.3	24 874.6 195 706.3
06-25-10-26	45 529.3 159 278.4	30.1 386.6	28.0 408.3	30.2 373.3	29.3 383.1	32.1 336.0	37.8 368.1	40.7 363.8	39.4 348.9	40.5 383.5				1.35 3 351.6	308.1 3 351.6	45 837.4 162 630.0
08-25-10-26	120 931.3 459 184.1	75.5 2163.8	72.3 1931.9	70.0 1861.3	25.4 713.6	77.8 2139.3	71.1 1731.8	68.2 1709.9	66.8 1673.3	47.2 1508.0				1.57 15 432.9	574.3 15 432.9	121 505.6 474 617.0
09-25-10-26	71 827.0 148 672.4	69.9 656.6	66.7 586.4	73.9 645.3	70.6 649.6	66.8 730.6	56.9 652.1	54.5 643.8	55.2 651.1	52.4 688.7				1.75 5 904.2	566.9 5 904.2	72 393.9 154 576.6
10-25-10-26	63 146.2 102 167.2	53.0 4.0	50.3 3.6	56.2 4.0	53.1 3.9	54.7 4.0	41.5 138.4	83.9 344.2	88.8 366.7	84.3 387.9				2.81 12 567.7	565.8 12 567.7	63 712.0 103 423.9
12-25-10-26	39 042.8 37 424.3	14.3 133.2	13.4 140.5	14.3 128.6	13.9 131.9	14.2 128.2	29.9 58.8	32.1 58.2	31.1 55.7	32.3 61.8				1.08 896.9	195.5 896.9	39 238.3 38 321.2
14-25-10-26	24 358.6 91 802.7	48.5 314.0	46.3 279.5	51.4 308.5	49.1 310.7	50.0 310.4	48.2 234.9	48.7 215.7	49.3 218.1	46.9 230.7				1.56 2 422.5	438.4 2 422.5	24 797.0 94 225.2
16-25-10-26	15 864.6 50 694.4	27.0 122.7	25.9 109.5	28.6 120.5	27.2 121.4	27.8 121.2	23.1 78.2	21.9 75.1	22.2 75.9	21.1 80.2				0.70 904.7	224.8 904.7	16 089.4 51 599.1
01-26-10-26	5 927.5 157 903.2	21.5 1337.4	2.3 163.9	21.6 1291.4	20.5 1302.9	17.8 926.3	13.8 404.3	14.7 399.4	14.2 383.1	14.7 421.2				0.49 6 629.9	141.1 6 629.9	6 068.6 164 533.1
04-26-10-26	19 145.7 13 753.3	3.0 10.5	4.1 16.5	5.6 19.1	7.0 25.1	6.3 19.7	6.0 16.2	6.6 16.3	6.1 14.9	6.5 16.9				0.22 155.2	51.2 155.2	19 196.9 13 908.5
08-26-10-26	38 449.0 1 054 579.9	32.7 7625.0	31.0 6773.1	31.7 6878.4	32.7 7482.5	33.6 7538.5	116.1 5359.2	218.8 4400.9	221.5 4444.4	212.1 4740.5				7.07 55 242.5	930.2 55 242.5	39 379.2 1 109 822.4
09-26-10-26	22 757.3 41 492.9	21.7 8.0	20.7 7.1	23.1 7.9	21.9 7.8	22.4 7.9	19.9 5.1	18.7 3.1	18.8 3.1	18.0 3.3				0.60 53.3	185.2 53.3	22 942.5 41 546.2
10-26-10-26	25 296.7 365 625.3	125.1 4338.9	118.9 3854.0	130.9 4217.7	125.3 4257.9	128.8 4289.7	123.9 3302.7	127.6 3126.1	128.3 3135.7	120.8 3288.9				4.03 33 811.6	1 129.6 33 811.6	26 426.3 399 436.9
15-26-10-26	16 632.4 12 353.1	19.0 8.0	18.1 7.1	20.2 7.8	19.1 7.8	19.6 7.9	21.0 5.7	23.6 5.1	23.7 5.1	22.7 5.4				0.76 59.9	187.0 59.9	16 819.4 12 413.0
01-36-10-26	10 596.1 67 268.8	8.1 174.8	7.8 155.3	8.5 171.1	8.2 172.2	8.3 172.0	19.1 105.1	19.5 100.0	19.7 101.2	18.4 105.2				0.63 1 256.9	117.6 1 256.9	10 713.7 68 525.7
02-36-10-26	12 222.4 111 059.0	13.5 502.4	12.9 448.6	14.3 493.6	13.6 497.0	13.9 496.7	22.5 350.1	21.9 343.8	22.2 347.7	21.1 367.7				0.70 3 847.6	155.9 3 847.6	12 378.3 114 906.6
PREVIOUS PRODUCERS	516 864.4 1 597 595.3															516 864.4 1 597 595.3
VIRDEN-ROSELEA UNIT #01	2 274 228.6 8 075 918.8		2 767.4 29 565.9		2 906.0 30 887.8		2 811.4 25 977.9		2 899.7 24 694.1							2 300 445.3 8 333 856.5
TOTAL OIL		2 969.7		3 078.6		2 997.5		2 952.8		2 833.8					26 216.9	
TOTAL WATER		32 843.6		31 161.5		31 670.8		24 738.7		26 397.4					257 937.7	

VIRDEN-ROSELEA UNIT #02 (Effective July 1, 1966)

CHEVRON CANADA RESOURCES LIMITED

05-31-10-25	4 121.8 19 514.8	7.6 229.5	6.7 217.7	7.6 227.2	7.3 179.7	13.2 174.7	12.4 133.5	12.5 144.5	12.4 175.5	11.8 164.0				0.39 1 646.3	91.5 1 646.3	4 213.3 21 161.1
13-31-10-25	11 276.0 101 683.1	50.5 576.6	44.4 546.7	51.0 570.9	48.4 447.9	56.1 596.2	44.7 403.1	45.7 441.1	45.4 535.7	42.9 500.6				1.43 4 618.8	429.1 4 618.8	11 705.1 106 301.9
06-36-10-26	6 483.2 80 611.6	17.7 824.2	15.7 788.7	17.8 816.1	17.1 645.5	8.6 337.2	5.5 204.9	5.5 220.0	5.5 269.3	5.2 249.7				0.17 4 355.6	98.6 4 355.6	6 581.8 84 967.2
07-36-10-26	24 616.2 109 145.1	12.6 383.4	11.2 363.6	12.8 379.6	12.1 297.8	22.9 352.7	21.7 290.0	21.9 314.0	21.8 381.4	20.5 356.4				0.68 3 118.9	157.5 3 118.9	24 773.7 112 264.0

WATER INJECTION/SALT WATER DISPOSAL

LODGEPOLE A POOL 05 59A

VIRDEN FIELD

Cum. Dis./Inj.
Dec. 31/92
m³

Jan.

Feb.

Mar.

Apr.

May

June

July

Aug.

Sep.

Oct.

Nov.

Dec.

1993
Y.T.D.
m³

Cum.
Total
m³

CORVAIR OILS LTD.

07-19-11-26	1 117 415.9	4082.0	3825.0	4400.0	4060.0	3500.0	3570.0	3615.0	3580.0	3450.0	3625.0		37 707.0	1 155 122.9
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KIWI RESOURCES LTD.

11-08-11-26	866 670.1	10297.0	7999.6	9013.0	9708.2	10730.6	9969.1	10683.2	10662.6	10179.1	10363.7		99 606.1	966 276.2
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RANCHMEN'S RESOURCES LTD.

08-30-11-26	139 884.4	616.0	566.0	607.0	600.0	535.0	601.0	613.0	605.0	581.0	615.0		5 939.0	145 823.4
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SHANNON OILS LIMITED

14-18-11-26	261 843.4	—	—	—	—	—	—	—	—	—	—		—	261 843.4
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UPTON RESOURCES INC.

02-20-11-26	1 299 390.0	9575.0	8695.0	9590.0	9005.0	9165.0	923.0	8685.0	9305.0	9325.0	9885.0		84 153.0	1 383 543.0
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05-21-11-26	273 301.4	1039.0	941.0	1020.0	907.0	1025.0	8480.0	975.0	320.0	—	—		14 707.0	288 008.4
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OPPRATOR TOTAL	1 572 691.4	10 614.0	9 636.0	10 610.0	9 912.0	10 190.0	9 403.0	9 660.0	9 625.0	9 325.0	9 885.0		98 860.0	1 671 551.4
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NON-UNIT ABD.SWD	3 723 721.9													3 723 721.9
LODGEPOLE A	36 142 958.5	114 324.6		127 438.5		121 800.7		119 813.4		131 658.4				37 397 849.8
POOL TOTAL:	134 259.4	123 663.5		131 459.3		128 913.5		121 560.0					1 254 891.3	

LODGEPOLE B POOL 05 59B

VIRDEN-ROSELEA UNIT #01 (Effective July 1, 1965)

CHEVRON CANADA RESOURCES LIMITED

09-20-10-25	161 881.9	483.0	312.0	211.0	136.0	114.0	301.0	290.0	148.0	314.0	496.0		2 805.0	164 686.9
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13-20-10-25	813 229.2	1409.0	1173.0	1253.0	1000.0	640.0	788.0	886.0	918.0	696.0	571.0		9 334.0	822 563.2
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15-20-10-25	678 875.2	690.0	600.0	772.0	936.0	1483.0	1229.0	1097.0	622.0	982.0	918.0		9 329.0	688 204.2
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11-21-10-25	287 852.9	473.0	641.0	747.0	792.0	483.0	454.0	545.0	1107.0	671.0	1785.0		7 698.0	295 550.9
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13-21-10-25	220 708.7	1138.0	1145.0	1111.0	1142.0	1218.0	1175.0	1196.0	347.0	1168.0	1165.0		10 805.0	231 513.7
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05-28-10-25	509 070.0	1353.0	411.0	370.0	437.0	728.0	599.0	492.0	566.0	628.0	510.0		6 094.0	515 164.0
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**WATER INJECTION/SALT WATER DISPOSAL
VIRDEN-ROSELEA UNIT #01 (Cont.)**

**LODGEPOLE B POOL
05 59B**

VIRDEN FIELD

Cum. Dis./Inj.
Dec. 31/92
m³

Jan.

Feb.

Mar.

Apr.

May

June

July

Aug.

Sep.

Oct.

Nov.

Dec.

1993
Y.T.D.
m³

Cum.
Total
m³

CHEVRON CANADA RESOURCES LIMITED (Cont.)

05-29-10-25	830 268.3	1151.0	1558.0	1828.0	2067.0	2061.0	1881.0	1800.0	1989.0	1745.0							16 080.0	846 348.0
07-29-10-25	528 076.8	1375.0	1375.0	1368.0	1348.0	1487.0	851.0	698.0	691.0	888.0							10 081.0	538 157.0
05-30-10-25	1 273 741.0	6489.0	7221.0	6871.0	7682.0	8189.0	7276.0	7235.0	5421.0	6724.0							63 108.0	1 336 849.0
07-30-10-25	422 243.8	887.0	1125.0	925.0	999.0	1065.0	981.0	976.0	948.0	925.0							8 831.0	431 074.0
09-30-10-25 Fr. Prov.	15 845.0	551.0	542.0	556.0	479.0	706.0	588.0	427.0	800.0	637.0							5 286.0	21 131.0
15-30-10-25	27 949.0	1292.0	1321.0	1255.0	1242.0	1173.0	972.0	808.0	893.0	866.0							9 822.0	37 771.0
15-23-10-26	605 873.7	5452.0	3524.0	3803.0	4465.0	4326.0	775.0	648.0	981.0	1293.0							25 267.0	631 140.7
13-24-10-26	773 773.5	2115.0	1213.0	1866.0	1961.0	2146.0	2000.0	1414.0	2214.0	2116.0							17 045.0	790 818.5
15-24-10-26	407 516.5	855.0	577.0	910.0	826.0	828.0	1351.0	1612.0	1516.0	1674.0							10 149.0	417 665.5
05-25-10-26	457 798.6	1283.0	1270.0	1366.0	1207.0	1294.0	1243.0	1292.0	1357.0	852.0							11 164.0	468 962.6
07-25-10-26	747 447.2	1571.0	1559.0	1719.0	1734.0	1911.0	1902.0	2481.0	2212.0	1989.0							17 078.0	764 525.2
11-25-10-26	491 535.7	818.0	495.0	600.0	354.0	248.0	258.0	279.0	364.0	431.0							3 847.0	495 382.7
13-25-10-26	643 550.6	3180.0	3051.0	2853.0	1544.0	1459.0	1451.0	695.0	1539.0	1355.0							17 127.0	660 677.0
15-25-10-26	319 174.3	1228.0	1073.0	1026.0	1103.0	806.1	1395.0	990.0	1264.0	1393.0							10 278.1	329 452.4
03-26-10-26	235 163.0	1440.0	1471.0	1573.0	1633.0	1608.0	1516.0	1202.0	1469.0	1462.0							13 374.0	248 537.0
VIRDEN-ROSELEA UNIT #01 TOTAL	10 451 574.9	35 233.0	31 657.0	32 983.0	33 087.0	33 973.1	28 986.0	27 063.0	27 366.0	28 809.0							279 157.1	10 730 732.0

VIRDEN-ROSELEA UNIT #02 (Effective July 1, 1966)

CHEVRON CANADA RESOURCES LIMITED

12-31-10-25	418 683.9	1627.0	1691.0	1703.0	1387.0	1466.0	471.0	675.0	757.0	838.0							10 615.0	429 298.9
10-36-10-26	1 128 876.9	—	—	—	763.0	2702.0	3157.0	3035.0	3251.0	3307.0							16 215.0	1 145 091.9
04-05-11-25	770 485.5	1653.0	1894.0	1836.0	1155.0	418.0	689.0	881.0	905.0	947.0							10 378.0	780 863.5
10-05-11-25	178 183.0	862.0	608.0	839.0	680.0	1009.0	581.0	613.0	725.0	794.0							6 711.0	184 894.0
12-05-11-25	121 089.7	689.0	641.0	668.0	506.0	724.0	501.0	573.0	514.0	479.0							5 295.0	126 384.7
14-05-11-25	101 897.2	483.0	459.0	449.0	258.0	245.0	217.0	268.0	440.0	417.0							3 236.0	105 133.2
02-06-11-25	1 405 015.8	—	—	—	268.0	553.0	407.0	405.0	2864.0	1397.0							5 894.0	1 410 909.8
08-06-11-25	1 438 625.1	2215.0	2267.0	2402.0	1659.0	1519.0	725.0	975.0	1208.0	1406.0							14 376.0	1 453 001.1
10-06-11-25	881 376.0	2925.0	2716.0	2811.0	1816.0	869.0	550.0	771.0	856.0	769.0							14 083.0	895 459.0