

Inter-Departmental Memo

Date August 27, 1984
From H. Clare Moster
Director, Petroleum Branch

The Oil and Natural Gas
Conservation Board

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

Telephone

Subject Whitewater WLA Pool - Suspension of Injection

Chevron Canada Resources Limited, operator of Whitewater Unit No. 1 has applied to suspend water injection into two wells:

Chevron Whitewater 13-16-3-21 (WPM)

Chevron Whitewater 9-17-3-21 (WPM)

Chevron proposes that the wells be temporarily suspended to "conclusively demonstrate termination of flood will not be detrimental to overall economic recovery" and subsequently abandoned.

Recommendation:

It is recommended that Chevron's application to suspend water injection in the Whitewater WL A Pool be approved subject to an expiry date of September 1, 1986.

Discussion:

- Waterflooding was initiated in the subject pool in January 1973 and resulting in an increase in production rate from 155 m³/month at year end 1972 to 325 m³/month in the latter part of 1974. By mid 1976, oil rates had started to decline and were accompanied by increasing water production.

Although production data during the latter stages of the water injection period is quite erratic, a severe decline (17.2%/year) is evident. By comparison, the decline rate calculated from pre 1973 primary production is much less severe (3.9%/year). The waterflood decline has been accompanied by rapidly increasing water production (see Figure 1 attached).

Extrapolation of both primary and waterflood trends to abandonment conditions indicates that ultimate incremental reserves due to waterflooding are probably negligible and possibly even negative. However, it is noted that continued primary production would have extended past the end of the century.

Chevron suggests that the highly stratified nature of the reservoir along with the unfavourable mobility ratio have led to the disappointing results of the waterflood project. The recently submitted results of the 1984 reservoir pressure survey also indicate that injection was probably not effective in maintaining pressure in and sweeping

all parts of the Pool.

Chevron proposes to suspend water injection for a two year period, during which production performance would be evaluated to confirm that termination of pressure maintenance would not be detrimental to ultimate recovery.

It is likely that termination of injection will cause a reduction in water production. This, along with suspension of high pressure water injection, will improve the economics of continued operation of the pool by reducing operating costs and might result in a leveling of the production decline trend.

Subsection 1(3) of Schedule G of Manitoba Revised Regulation M160-R8P provides for suspension of water injection upon approval of the Board.

Conclusions:

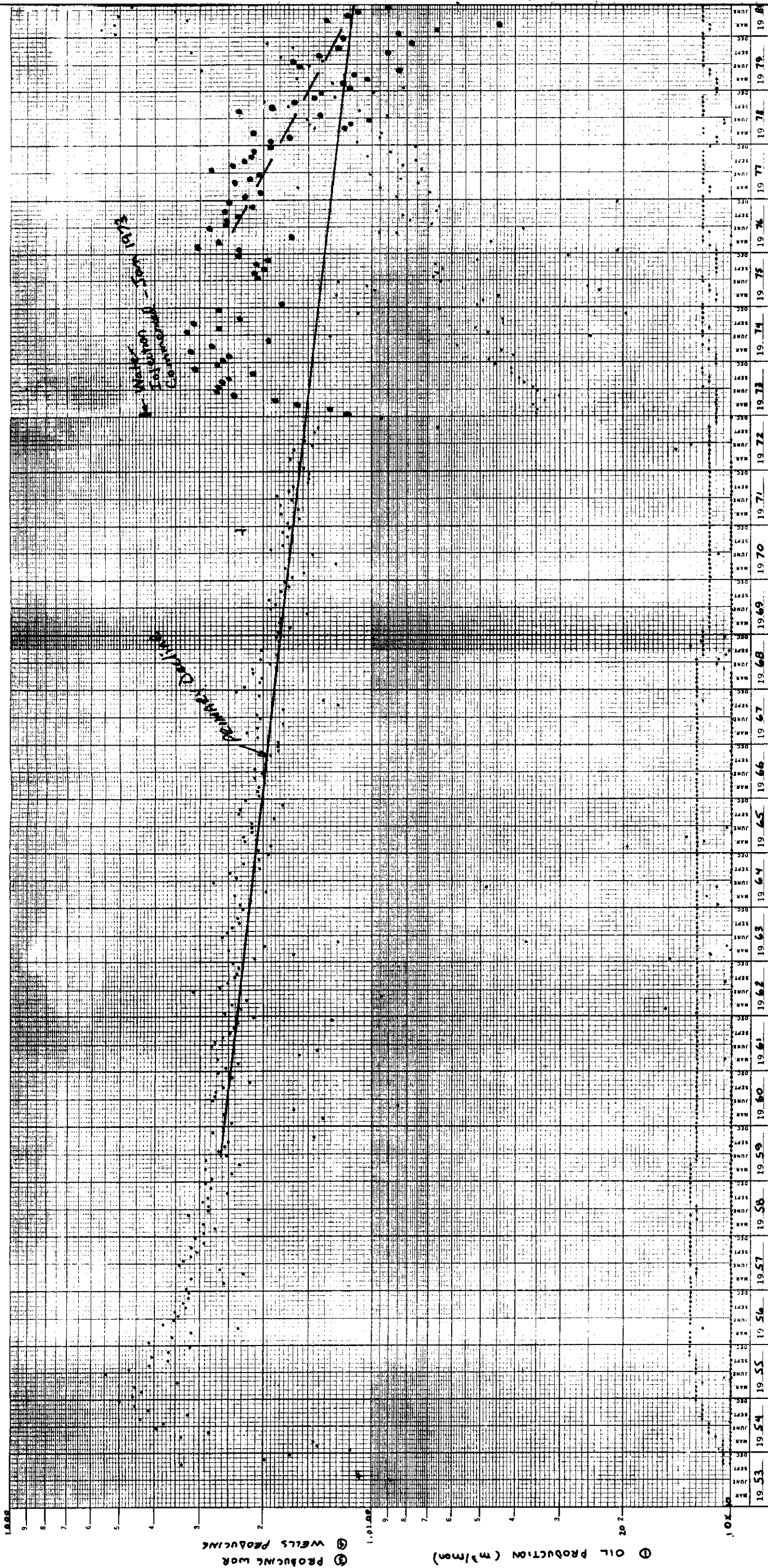
- 1) Waterflooding in the Whitewater WL A Pool has not resulted in incremental reserves.
- 2) Current production is marginal and probably cannot support the operation of a high pressure water injection system.
- 3) Termination of water injection with reduced operating costs is likely to prolong the productive life of the pool and will therefore result in some additional production.

~~Approved by H. A. Moster~~

H. Clare Moster

LRD/lk

FIELD: "MIDDLE" WJW LK A"
POOL: LODGEPOLE WJW LK A"

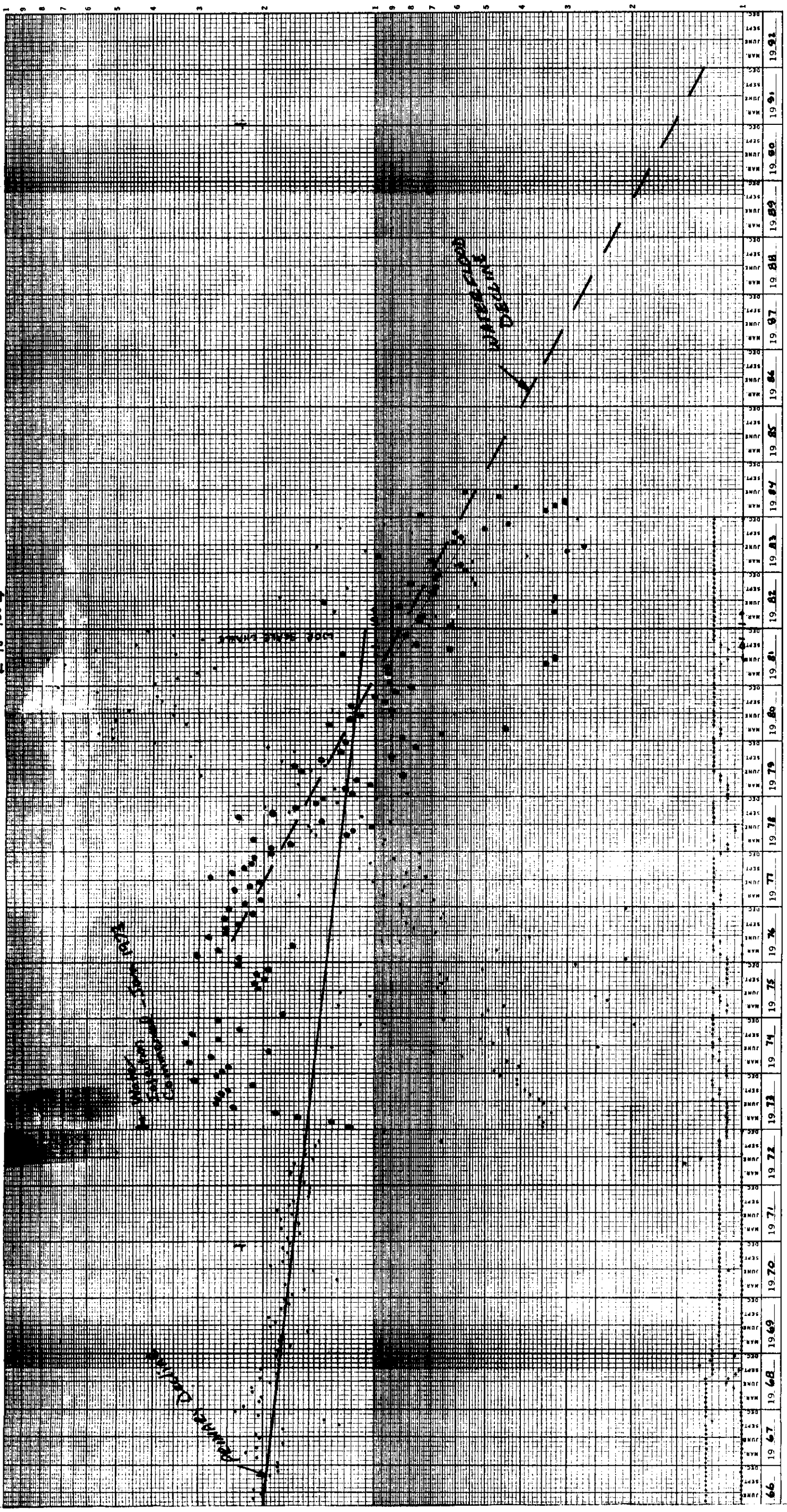


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FIGURE No. 1

Field: Whitewater
Pool: Lodgepole W/Lk "A"

Field: Lodgepole W/Lk "A"



1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
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MANITOBA

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

August 31, 1984

Chevron Canada Resources Limited
Box 100
Virden, Manitoba
R0M 2C0

Attention: Mr. C. G. Folden

Dear Sirs:

Re: Whitewater Unit No. 1 - Suspension of Water Injection

Your application to suspend water injection in the subject Unit is acknowledged.

Pursuant to pressure maintenance rule 1(3) of Schedule G to Manitoba Revised Regulation M160-R8P, you are hereby authorized to suspend water injection into the Whitewater Unit No. 1. The approval for suspension expires on September 1, 1986. Prior to this date, you are requested to submit an analysis of production performance since termination of injection and recommendation to either abandon or reactivate the water injection wells.

Your applications to suspend the individual water injection wells are being processed by the Petroleum Branch.

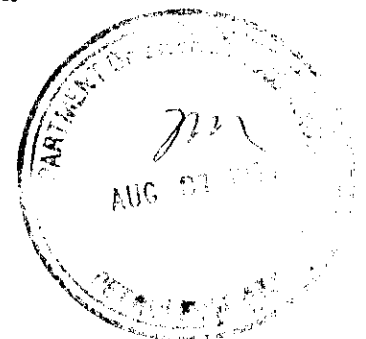
Yours sincerely

THE OIL AND NATURAL GAS
CONSERVATION BOARD

Ian Haugh
Deputy Chairman

LRD/IH/cm

bc: Petroleum Branch





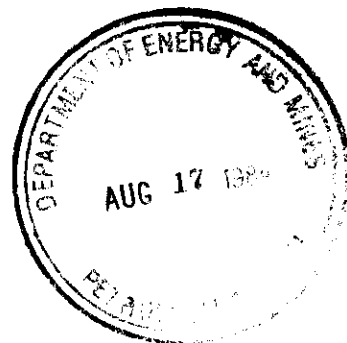
Chevron Canada Resources Limited

Box 100 Virden, Manitoba ROM 2C0

1984-08-10

Province of Manitoba
Dept. of Energy and Mines
Petroleum Branch
555 - 330 Graham Avenue
Winnipeg, Manitoba
R3C 4E3

Attention: Mr. H.C. Moster, P. Eng.
Director, Petroleum Branch



Abandonment of Waterflood Scheme
Whitewater Unit No. 1

Dear Clare:

Initial production rates in this field declined rapidly indicating limited reservoir energy. The rapid decline was followed by a more slower, continuous one indicating limited aquifer support. Primary production was 53 900 m³ oil or 19% of the estimated original oil in place (281 600 m³).

A waterflood injection scheme was initiated in January, 1973 by converting two producers, 13-16 and 9-17, to injectors.

Overall unit production increased from 3.0 to 10.0 m³OPD versus an expected maximum production of 30 m³OPD. Water encroachment began during 1978-1980. Present production is 1.9 m³OPD, 19.9 m³WPD.

Secondary recovery has been 20 400 m³ (7.3%) for a total recovery of 74 300 m³ or 26.3% of the original oil in place. Net voidage is -60 700 m³.

The Whitewater waterflood scheme has not attained its predicted performance for several reasons.

There is a high permeability variation (0.867) which results in early breakthrough in the higher permeability beds. This, along with an adverse mobility ratio resulted in a low waterflood efficiency. Thus, there are large areas of unswept oil, especially in low permeability zones.


The initial waterflood recommendation predicted an average injection rate of 125 m³PD for the two wells combined. The actual injection of the two wells has only been approximately 50 m³PD.

Poor waterflood results and high maintenance costs have resulted in a decision to abandon the waterflood scheme.

The 13-16 injection well is presently shut in with a slow tubing or packer leak. The 9-17 well is still on injection for the purpose of disposing of produced water. **It is Chevron's intention to convert the present 11A-16-3-21 supply well into a disposal well** to reduce disposal pressure and operating costs and to eventually abandon the water injection wells in about two years time when it can be conclusively demonstrated that waterflood termination will not be detrimental to ultimate economic recovery. With reduced operating costs, it is expected that production can be economically maintained for an extended period of time beyond what could be experienced on waterflood.

A separate application will be submitted for conversion of the 11A-16 supply well to disposal.

Yours sincerely,


C. G. Folden, P. Eng.
Area Supervisor
Virden

Whitewater WLA Pool

Primary Decline

$$\begin{aligned}\text{Rate at } 1961.0 &= 247 \text{ m}^3/\text{mon.} & 8.13 \text{ m}^3/\text{d} \\ \text{Rate at } 1973.0 &= 153 \text{ m}^3/\text{mon.} & 5.03 \text{ m}^3/\text{d} \\ t &= 12 \text{ years.}\end{aligned}$$

$$\text{Primary decline rate} = 3.92 \% / \text{year.}$$

Extrapolated Primary Production

1) TO ECONOMICALLY LIMITING RATE

$$\begin{aligned}\text{a) } 40 \text{ m}^3/\text{mon} &= 1.32 \text{ m}^3/\text{d} \\ \text{b) } 30 \text{ m}^3/\text{mon} &0.99 \text{ m}^3/\text{d} \\ \text{c) } 20 \text{ m}^3/\text{mon} &0.66 \text{ m}^3/\text{d}.\end{aligned}$$

$$\begin{aligned}\text{a) } q_i &= 5.03 \text{ m}^3/\text{d} & q_t &= 1.32 \text{ m}^3/\text{d} & A_i &= 3.92 \% / \text{yr.} \\ t &= 33.5 \text{ yrs} & N_p &= 33863.\end{aligned}$$

$$\text{Cum Prod to year end } 1972 = 330,389 \text{ bbl} = 52528 \text{ m}^3.$$

$$\text{TOTAL PRIMARY RESERVE} = 86,391 \text{ m}^3$$

$$\begin{aligned}\text{b) } q_i &= 5.03 & q_t &= 0.99 & A_i &= 3.92 \% / \text{yr.} \\ t &= 40.6 \text{ yr} & N_p &= 36875\end{aligned}$$

$$\text{TOTAL PRIMARY RESERVE} = 89403 \text{ m}^3$$

$$\begin{aligned}\text{c) } q_i &= 5.03 & q_t &= 0.66 & A_i &= 3.92 \\ t &= 50.8 & N_p &= 39887\end{aligned}$$

$$\text{TOTAL PRIMARY RESERVE} = 92415 \text{ m}^3$$

Waterflood decline.

$$\text{Rate at } 1977.0 = 220 \text{ m}^3/\text{mon} = 7.24 \text{ m}^3/\text{d}$$

$$\text{Rate at } 1984.33 = 55 \text{ m}^3/\text{mon.} = 1.81 \text{ m}^3/\text{d}$$

$$t = 7.33 \text{ yrs.}$$

Waterflood decline rate = 17.22%.

Extrapolated water flood production



TO ECONOMICALLY LIMITING OIL RATE

$$1) 40 \text{ m}^3/\text{mon} = 1.32 \text{ m}^3/\text{d}$$

$$2) 30 \text{ m}^3/\text{mon} = 0.99 \text{ m}^3/\text{d}$$

$$3) 20 \text{ m}^3/\text{mon.} = 0.66 \text{ m}^3/\text{d}$$

$$1) t = 1.7 \text{ yrs} \quad N_p = 946 \quad + \text{Cum Prod to Apr 30/84} \\ = 946 + 74444.2 = 75,391 \text{ m}^3$$

$$2) t = 3.2 \text{ yrs} \quad N_p = 1584 \quad = 76028 \text{ m}^3$$

$$3) t = 5.3 \text{ yrs} \quad N_p = 2221 \quad = 76665 \text{ m}^3$$

January 21, 1992

The Oil and Natural Gas
Conservation Board

- Ian Haugh, Chairman
- H. Clare Moster, Deputy Chairman
- Wm. McDonald, Member

FILE
Whitewater Field
Whitewater Unit No. 1
Termination

John N. Fox
Chief Petroleum Engineer
Petroleum Branch

RE: Termination of Whitewater Unit No. 1

The Branch contacted the royalty owners in Whitewater Unit No. 1 and advised them of the implications of terminating the unit. All the unit's royalty owners had no concern with termination of the unit.

RECOMMENDATION:

It is recommended that in accordance with Clause 20.01 of the "Plan for Unit Operation Governing the Unitized Management Operation and Further Development of Whitewater Unit No. 1 - December 15, 1970", the Board approve termination of the unit, effective February 1, 1992. A copy of the proposed Board letter of approval is attached.

ORIGINAL SIGNATURE
JOHN N. FOX

John N. Fox

Approved: ~~John N. Fox~~
L.R. Dubreuil

Approved:

L.R. Dubreuil, Director



The Oil and Natural Gas
Conservation Board

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

(204) 945-3130

January 22, 1992

Mr. R.J. Terlesky
Manager, Units and Joint Ventures
Chevron Canada Resources
500 - 5th Avenue S.W.
Calgary, Alberta
T2P 0L7

Dear Sir:

RE: Termination of Whitewater Unit No. 1

In accordance with Clause 20.01 of the "Plan for Unit Operation Governing the Unitized Management Operation and Further Development of the Whitewater Unit No. 1 - December 15, 1970" ("the Unit Plan"), the Board hereby approves termination of Whitewater Unit No. 1, effective February 1, 1992.

Chevron is reminded of the requirement of Clause 20.05 of the Unit Plan that the royalty owners in the unit be notified of the unit's termination within 30 days of February 1, 1992. Please send the Board a copy of the notice to each royalty owner in the unit.

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

Yours respectfully,

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



Chevron Canada Resources

500 - Fifth Avenue S.W., Calgary, Alberta T2P 0L7
Phone (403) 234-5000 Fax (403) 234-5947

February 7, 1992

R.J. Terlesky
Manager
Units & Joint Ventures
Producing Department

Termination of Whitewater Unit No. 1

**TO: ALL ROYALTY INTEREST HOLDERS
WHITEWATER UNIT NO. 1
(ADDRESS LIST ATTACHED)**

Ladies/Gentlemen:

Please be advised that the Manitoba Oil and Natural Gas Conservation Board has granted approval to terminate the Whitewater Unit No. 1, effective February 1, 1992, as outlined in the attached letter. With only one producing well remaining (12-16-3-21 WPM), the royalty rights on the production will revert to the 12-16 lease, effective February 1, 1992.

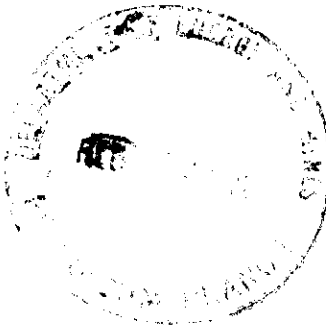
If you have any questions regarding the above, please contact the undersigned at (403) 234-5026.

Yours very truly,

B.J. WASYLIW, Chairman
Operating Committee

BJW/pd
Attach.

cc: L.R. Dubreuil - Manitoba Oil and Natural Gas Conservation Board
R.G. Puchniak - Tundra Oil and Gas Ltd.





The Oil and Natural Gas
Conservation Board

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

(204) 945-3130

January 22, 1992

Mr. R.J. Terlesky
Manager, Units and Joint Ventures
Chevron Canada Resources
500 - 5th Avenue S.W.
Calgary, Alberta
T2P 0L7

Dear Sir:

RE: Termination of Whitewater Unit No. 1

In accordance with Clause 20.01 of the "Plan for Unit Operation Governing the Unitized Management Operation and Further Development of the Whitewater Unit No. 1 - December 15, 1970" ("the Unit Plan"), the Board hereby approves termination of Whitewater Unit No. 1, effective February 1, 1992.

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

Yours respectfully,

A handwritten signature in dark ink, appearing to read 'H. Clare Moster', with a long, sweeping underline.

H. Clare Moster
Deputy Chairman

WHITEWATER UNIT NO. 1
ROYALTY INTEREST OWNERS ADDRESS LIST

Dyck Oil Ltd.
Box 441
Deloraine, Manitoba
R0M 0M0

Great Plains Petroleum Ltd.
715 - 5th Avenue S.W.
Calgary, Alberta
T2P 3E6

Strathallan Minerals Ltd.
Box 787
Boissevain, Manitoba
R0K 0E0

Ellen Emma Wilson
c/o The Canada Trust Company
505 - 3rd Street S.W.
Calgary, Alberta
T2P 2X7