

inter-departmental memo

H. C. Mosier,  
Director, Petroleum Branch,  
Mineral Resources Division,  
993 Century Street.

Date MAR 15 1977

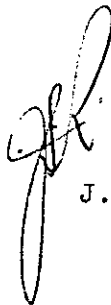
From J. S. Roper,  
Policy Advisor,  
302 Legislative Building.

MARIAN E. <sup>PS 125</sup>  
BILL  
return

Subject WEST BUTLER UNIT NO. 1.

Attached is a copy of Mr. J. Zedde's letter of 77 03 11 plus attachments regarding two proposals for resuming water injection.

1. Please review and analyze the proposals for the Board;
2. Prepare possible counter proposals for the Board;
3. Arrange for discussion of (1) and (2) with the Board on or before April 18th.

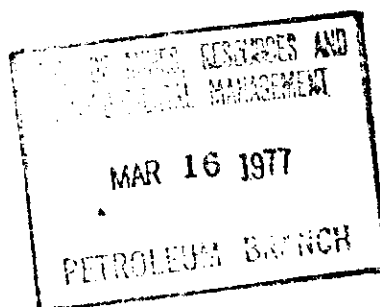


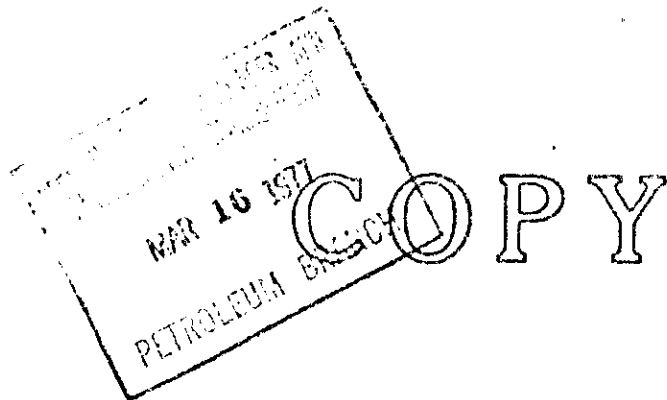
J. S. Roper.

JSR/dw

Attachments.

c.c.: Jas. T. Cawley.  
I. Haugh.





MAR 16 1977

Mr. J. Zedde,  
Vice-President,  
Producing Department,  
Chevron Standard Limited,  
400 - Fifth Avenue S.W.,  
Calgary, Alberta.  
T2P 0L7

Dear Mr. Zedde:

Re: West Butler Unit No. 1.

Your letter of 1977 03 11 submitting two proposals for resuming water injection in the subject Unit is acknowledged.

The Petroleum Branch will be asked to review the proposals and to direct any enquiries to Mr. J. D. Scott.

The Board or the Branch will contact you regarding your invitation to discuss the proposals at a mutually satisfactory time and place following the review.

Yours sincerely,

J. S. Roper,  
Deputy Chairman.

JSR/dw

c.c.: Jas. T. Cavley.  
I. Haugh.  
H. C. Moster.



**Chevron Standard Limited**  
400 - Fifth Ave. S.W., Calgary, Alberta T2P 0L7

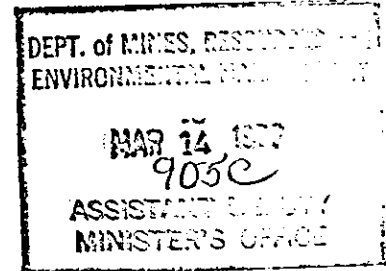
1977-03-11

J. ZEDDE  
Vice-President  
Producing Department

West Butler Unit No. 1

The Oil and Natural Gas Conservation Board  
Department of Mines, Resources and  
Environmental Management  
993 Century Street  
Winnipeg, Manitoba  
R3H 0W4

Attention: Mr. J. S. Roper  
Deputy Chairman



Gentlemen:

In response to Condition <sup>4</sup>/<sub>3</sub> of your letter of 1976-09-14, Chevron Standard Limited hereby submits to the Petroleum Branch for discussion two proposals for resuming water injection. The proposals are as follows:

Proposal 1:

It is proposed that a pilot waterflood be initiated in the West Butler pool as illustrated on Figure 1 attached. The purpose of the proposed pilot is to test and demonstrate the feasibility of waterflooding in the West Butler pool. It is proposed that all costs of the pilot waterflood be paid by Chevron Standard Limited. If the pilot waterflood fails, it is proposed that Chevron Standard Limited be credited the full cost of the pilot project out of its royalty obligations in other Manitoba pools.

Proposal 2:

If the pilot waterflood is successful, further development would proceed on 40 acre spacing as shown on Figure 2 attached. Chevron Standard proposes that the Manitoba Government waive royalties for the West Butler pool until the project investment including the pilot waterflood investment has been paid out.

The technical information for the above proposals is attached as Appendix 1. Any enquiries regarding the technical details should be directed to Mr. J. D. Scott at the letterhead address.

We would like to discuss these proposals with you at your convenience after you have had an opportunity to review them.

Yours very truly,

J. ZEDDE

JDS/njs  
Attach.

## APPENDIX

### WEST BUTLER POOL DEVELOPMENT

#### Introduction

The West Butler pool was discovered in 1955 in the Lodgepole formation by the drilling and testing of the well Chevron West Butler 1-31-9-29. Within four months of discovery of the pool, five additional wells were drilled on 40 acre spacing directly or diagonally offsetting the discovery well. Further development of the pool was curtailed when the rapid decline in production became apparent. The field was unitized and waterflooding commenced in 1972. Water injection was suspended in 1974. The lack of production response was primarily due to insufficient water supply and subsequent insufficient water injection.

#### Geology

The West Butler field produces from limestone and dolomites in the Upper Lodgepole beds of Mississippian age. The top of the Mississippian is an erosional surface (post Mississippian unconformity). Dolomitization below the Mississippian erosional surface has occurred in all wells. Completions have been made in both the dolomite and limestone with no marked difference in the productivity of the wells. The best porosity and permeability appears to occur about 38 to 45 feet below the top of the reservoir, regardless of whether the lithology is dolomite or limestone. The oil-water interface has been estimated at -992 feet based upon drillstem test results and E-log interpretation. The gross pay interval between the top of the Mississippian and the estimated oil-water interface averages 100 to 115 feet over the developed portion of the reservoir.

The limits of the West Butler Pool are still undefined. The seismic map for a horizon near the Bakken formation appears to support a structural interpretation with a domal feature in the field area. The seismic data suggests a productive area of about three or four sections and possibly larger. The drilling of wells for primary production cannot be economically justified and therefore, the pool boundaries have not been delineated.

#### Reservoir Properties

Using a one millidarcy cutoff the average net pay for the West Butler pool is 48.8 feet, the average porosity is 10.8 percent and the average permeability is 11.8 millidarcies. However, for the purposes of evaluating a waterflood project, an additional restriction was imposed upon the net pay. The net pay includes only intervals of 1.5 feet of continuous section having permeabilities greater than one millidarcy. This was done to eliminate isolated thin stringers of permeability which would contribute little to a waterflood project. Using this additional cutoff, the average net pay is 24.7 feet, the average porosity is 10.6 percent and the average permeability is 8.2 millidarcies. Using established reservoir parameters (1), the original oil in place per 40 acre spacing unit is 500,000 STB. Reserve parameters are summarized in Table 1.

### Performance Review

The rapid decline in production rates during primary production is attributed to low reservoir permeability and lack of an effective reservoir drive mechanism. The pool was approaching the end of its productive life on primary production when waterflooding was commenced in 1972. Waterflooding to increase production rates and ultimate recovery offered the only alternative to abandonment of the pool at that time.

The major contributing factor to the lack of success of the waterflood is deemed to be the lack of an adequate water supply for injection purposes. Approximately one third of the reservoir voidage created by preunit and unit production has been replaced by water injection. It is considered unlikely that any response will be evident until at least half of the reservoir voidage is replaced. The second factor contributing to the lack of success of the waterflood is the absence of an injection pattern configuration, i.e., a confined 5-spot injection pattern. The injection of water is largely uncontrolled unless an injection pattern configuration is established. Thus, the success or failure of a waterflood project is difficult to evaluate unless a pattern configuration is developed.

In view of the potential for the West Butler area and the need for adequate testing of production response, the following recommendations are made:

1. An adequate water supply must be developed to provide sufficient water for a waterflood.
2. A pilot 5-spot injection pattern should be developed as shown on Figure 1 to realistically evaluate production response. If production response is adequate, then expansion of the waterflood can be justified.

The above recommendations are the basis for the two following proposals:

#### Proposal No. 1

It is proposed that a pilot waterflood be initiated as illustrated on Figure 1. A water supply well would be drilled to the Devonian zone at an estimated depth of 4230 feet. The Devonian formation has been found to be an excellent source of water supply in the Virden area. Sustained rates of water production of 4000 BWPD have been obtained from the Devonian zone. The water has been found suitable for injection in the Mississippian zones in the Virden Scallion and Virden Roselea pools with little or no water treatment required. Three additional water injection wells would be drilled offsetting the present producer 13-29-9-29 WPM. The existing injector 16-30-9-29 WPM and injection facilities would be used for the pilot waterflood.

The investment required to initiate the pilot waterflood is estimated to be \$619,000. Details of the investment and economics are shown on Table 2. The pilot waterflood economics are substandard even if the pilot

is successful and the central producing well responds at 25 BOPD. In view of the large investment and the risk involved, Chevron Standard Limited would not normally participate in a project of this nature. Therefore, it is proposed, that if the pilot waterflood fails, the full investment should be credited to Chevron Standard out of royalty payments on other Manitoba properties. An evaluation of the pilot waterflood would be required to determine if further development is warranted.

#### Proposal No. 2

If the results of the pilot waterflood indicate that expansion of the waterflood is warranted, drilling and enlarging of the waterflood project would commence. It is postulated that a four section project could develop as illustrated on Figure 2. The Devonian water supply well drilled for the pilot waterflood will be adequate to supply the water requirements for a project of this size. It is estimated that additional investment of \$8,917,000 will be required to complete the four section project. Details of investment and economics are shown on Table 3. Chevron Standard Limited proposes that the royalty be waived until the project fully pays out, i.e., all costs are recovered for the expanded waterflood including the pilot waterflood costs.

#### Summary

The potential of the West Butler Pool warrants further development. It is recognized that a high degree of uncertainty is involved in the waterflooding of the West Butler pool. The main uncertainty is the degree of production response that might be achieved upon waterflooding. Chevron Standard Limited believes that the proposed pilot waterflood project is the best method of evaluating waterflood response. The two proposals offered minimize the investment risks involved to Chevron Standard. The Manitoba Government also benefits through additional royalties if further development of the West Butler pool can be justified.

#### References

- (1) S. N. Borowski, Feasibility of Secondary Recovery - West Butler Field. December 1971. (Part of Application to Waterflood West Butler dated 1972-05-19.)

TABLE 1  
RESERVES PARAMETERS  
WEST BUTLER AREA

Connate Water:	35% (restored state method for 13 cores from well 2-31-9-29 averaged 34.3%)
Reservoir Temperature:	82°F (Drillstem test data)
Original Bottom Hole Pressure:	1050 psig (Drillstem test data)
Saturation Pressure:	220 psig (fluid sample from Daly well 6-32-9-29)
Initial Formation Volume Factor:	1.07 Res. Bbls./STB
Crude Viscosity at 0 psig & 82°F:	5.35 cp
Crude Viscosity at 600 psig & 82°F:	3.48 cp
Gravity of Stock Tank Crude at 60°F:	33 API
Footage Weighted Average Porosity:	1 md cutoff - 10.8% 1 md cutoff and 1.5 feet continuous section - 10.6%
Footage Weighted Average Permeability:	1 md cutoff - 11.4 md 1 md cutoff and 1.5 feet continuous section - 8.2 md
Median Permeability:	4.6 md
Permeability Variation:	0.73
Average Net Pay:	1 md cutoff - 48.8 ft. 1 md cutoff and 1.5 feet continuous section - 24.7 ft.
Original Oil in Place:	= 7756 $\emptyset$ (1 - Sw)/Boi = 7756 x 0.106 (1 - 0.35)/1.07 = 499 STB/Acre Foot
OOIP per 40 Acre Spacing Unit:	= 499 Ah = 499 x 40 x 25 = 500,000 STB

TABLE 1 Cont'd.

OOIP in Present 200 Acre Project:	2,500,000 STB
OOIP in 4 Section Project:	32,000,000 STB
Primary Recovery Factor:	6.4% (decline curve analysis)
Estimated Primary Recovery:	
40 Acre Spacing Unit	32,000 STB
200 Acre Project	160,000 STB
4 Section Project	2,048,000 STB

Waterflood Recovery Factors

Mobility Ratio:	0.50
Displacement Efficiency:	Ed - 34% at Terminal WOR = 25:1
Vertical Coverage Efficiency:	Ev - 88% at Terminal WOR = 25:1
Areal Sweep Efficiency:	Ea - 94%
Waterflood Efficiency:	Ed x Ev x Ea = 28.1%
Estimated Waterflood Recovery:	
Present 200 Acre Project	700,000 STB
4 Section Project	8,990,000 STB
Proposed 80 Acre Pilot Project	280,000 STB

(Data summarized from Reference 1)



TABLE 2  
PILOT WATERFLOOD PROJECT  
WEST BUTLER FIELD

Investment

1977 Investment

3 Injection Wells	\$333,300
Water Source Well	130,900
Water Supply Well Pump	20,000
Power Costs	35,000
Injection Lines	6,600
Sub Total	525,800
Dry Hole Risk Investment	92,800
TOTAL	\$618,600

Assumptions

1. The wellhead price of crude will be \$9.485 per barrel.
2. Waterflood response would be evident after six months injection at a rate of 25 BOPD from the central pilot producing well. Production would remain constant until 140,000 Bbls. of oil are produced. Production would then decline at approximately 9.5 percent per year until 236,000 Bbls. oil are produced. The final production rate would be 9 BOPD. The project life would be 34 years.
3. Old royalty rates would apply with the pilot producing well being allocated one half of its production for royalty purposes. The remaining one-half production will be allocated to offsetting injection wells at the same royalty rate.
4. Injection rates would be 100 BWPD per injector initially. Fill up and production response would be evident after six months.
5. Pilot project operating cost would be \$22,000 per year.

Economics

Three economic evaluations were made as follows:

Case 1 - base case with payment of normal royalties.

Case 2 - no royalties.

Case 3 - payment of normal royalties commences after the project is paid out.

TABLE 2 cont'd

	<u>Case 1</u>	<u>Case 2</u>	<u>Case 3</u>
Project Payout Period - Years	9.8	7.1	7.1
Rate of Return - %	6.5	10.4	8.6
Royalty Barrels - M. Bbls.	36	0	26
Working Interest Barrels - M. Bbls.	200	236	210
Value of Royalty Oil - Undiscounted			
M. \$	339	0	245
Discounted at 10%	114	0	52
Present Worth Profit - M\$			
Discounted at 10%	-84	12	-31
Discounted at 20%	-217	-166	-180

TABLE 3  
EXPANDED WATERFLOOD  
WEST BUTLER FIELD

Investment

1977 Investment

Pilot Waterflood (Table 1)	\$ 618,600
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1978 Investment

15 Injection Wells	1,666,500
15 Producers	1,996,500
Water Plant and Battery	60,000
Injection Lines	61,000
Flow Lines	77,000
Sub Total	3,861,000
Dry Hole Risk Investment	836,000
1978 TOTAL	\$4,697,000

1979 Investment

12 Injection Wells	1,333,000
15 Producers	2,996,000
Injection Lines	61,000
Flow Lines	72,000
Sub Total	3,467,700
Dry Hole Risk Investment	752,400
1979 TOTAL	\$4,220,100

GRAND TOTAL	\$9,535,700
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Assumptions

1. The wellhead price of crude will be \$9.485 per barrel.
2. Development of the expanded waterflood will follow the pilot waterflood. Production rates of 33 BOPD will be sustained until approximately one half of the reserves are recovered. Production will then decline at approximately 7.5 percent per year until 8.3 million barrels of oil are produced. The final production rate will be 7 BOPD per well. The project life will be 34 years.
3. Old royalty rates would apply to production from present unit wells. Production from new wells would be subject to new royalty rates.
4. Injection rates will be sufficient to meet voidage, approximately 35 BWPD per well throughout the life of the project.
5. Operating costs for the fully developed project would be \$270,000 per year.

TABLE 3 cont'd

Economics

Three economic evaluations were made as follows:

Case 1 - base case with payment of normal royalties.

Case 2 - no royalties.

Case 3 - payment of normal royalties commences after the project is paid out.

	<u>Case 1</u>	<u>Case 2</u>	<u>Case 3</u>
Project Payout Period - Years	5.0	4.2	4.2
Rate of Return - %	28.3	38.6	34.5
Royalty Barrels - M. Bbls.	1,254	0	1,060
Working Interest Barrels - M. Bbls.	7,015	8,269	7,209
Value of Royalty Oil -			
Undiscounted - M\$	11,885	0	10,045
Discounted at 10%	4,350	0	3,018
Present Worth Profit - M\$			
Discounted at 10%	6,043	9,741	7,175
Discounted at 20%	1,463	3,372	2,312

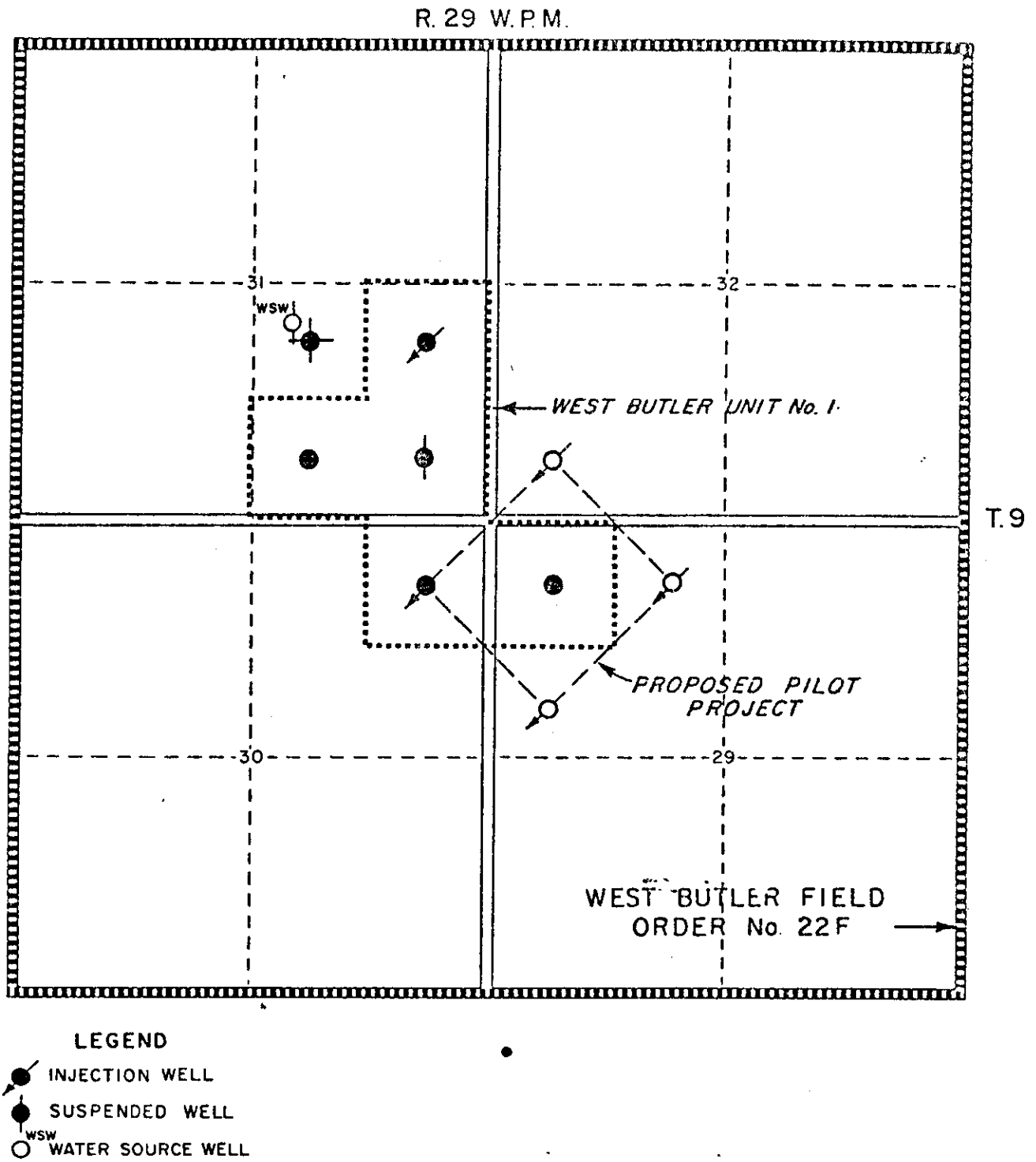


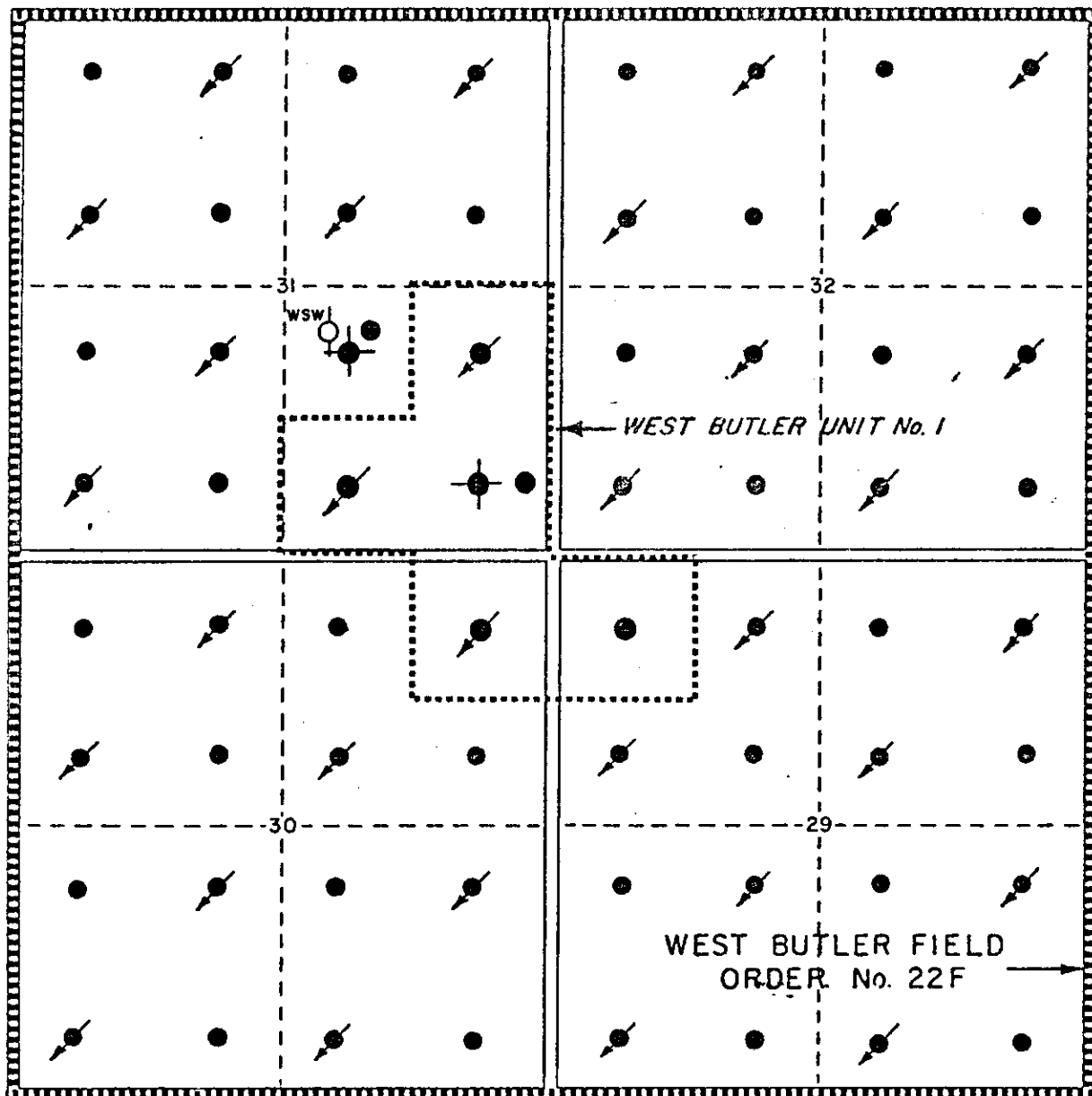
FIGURE 1

DEVELOPMENT OF A PILOT PROJECT

WEST BUTLER FIELD

SCALE: 3" = 1 MILE

R. 29 W.P.M.



T.9

### LEGEND

- INJECTION WELL
- SUSPENDED WELL
- WSW WATER SOURCE WELL

FIGURE 2  
DEVELOPMENT OF A FOUR SECTION PROJECT

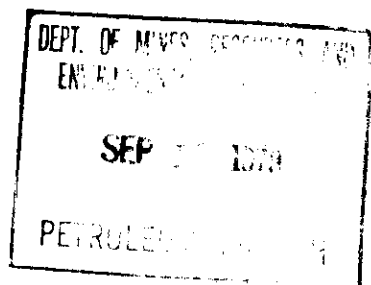
WEST BUTLER FIELD

SCALE: 3" = 1 MILE

CHEVRON STANDARD LTD.  
WEST BUTLER UNIT #1  
WATERFLOOD PROPOSALS

1977-3-11

# COPY



September 19, 1979

Chevron Standard Limited,  
Box 100,  
Virden, Manitoba.  
ROM 2CO

Attention: Mr. G. W. Cruickshank, P. Eng.,  
Chairman, West Butler Unit No. 1.

Dear Sir:

Re: Order No. PM 35,  
West Butler Field. *file*

Receipt of your application dated 1979-09-05 to extend the termination date of the West Butler pilot water flood is acknowledged.

In accordance with Rule 6 of Order-No. PM 35, The Oil and Natural Gas Conservation Board hereby extends the termination date of the subject Order for a further period of 365 days commencing on the ninth day of September, 1979.

Yours sincerely,

ORIGINAL SIGNED BY  
IAN HAUGH

Ian Haugh,  
Deputy Chairman.

HCM/IH/ra

bc: Mr. Paul E. Jarvis, Chairman  
Mr. J. F. Redgwell, Member  
Mr. H. C. Moster  
Virden Office

DATE: September 13, 1979

MANIT  BA

TO: H. Clare Moster

COMMENTS:

Re: Chevron Standard Limited - West  
Butler Unit No. 1 Pilot Waterflood.

FROM: Ian Haugh

Dept.:

Branch:

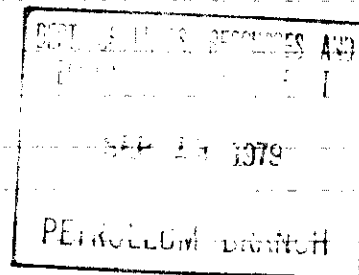
Address:

Telephone:

- ☐ Take action
- ☐ Per your request
- ☐ Call me on this matter
- ☐ Investigate and report
- ☐ For your revision or approval
- ☐ Return with comments or recommendations

- ☐ Circulate
- ☐ See me re attached
- ☐ For your information
- ☐ Supply data for my reply

- ☐ Reply direct with copy to me
- ☒ Draft reply for signature of: Ian Haugh



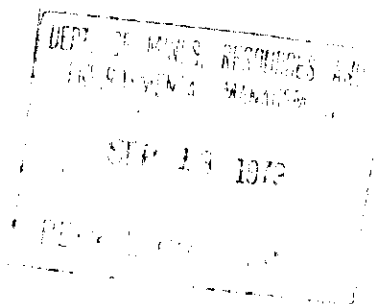




**Chevron Standard Limited**

Box 100 Virden, Manitoba ROM 2C0

1979-09-05



Application for Approval to  
Extend the Termination Date  
of the West Butler Unit No.1  
Pilot Waterflood.

Department of Mines, Resources  
& Environmental Management  
The Oil & Gas Conservation Board  
989 Century Street  
Winnipeg, Manitoba  
R3H 0W4

Attention: Dr. I. Haugh, Deputy Chairman

Gentlemen:

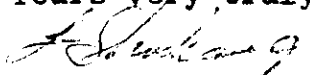
Chevron Standard Limited, as Operator of West Butler Unit No. 1, hereby applies for approval to extend the termination date of West Butler Unit No. 1 Pilot Waterflood for one (1) year in accordance with Subsection 6 of Board Order No. PM 35. The following is submitted in support of this application:

1. Water injection commenced 1978-09-09 in the West Butler Unit No. 1 Pilot Waterflood. No production response is evident to date. This could be due to insufficient void-age replacement and not continuous water injection in the four (4) pilot water injection wells. Cumulative net void-age for the pilot waterflood area to 1979-08-31 is -23 412.0 Res. m<sup>3</sup>. (The annual progress report for the West Butler Unit No. 1 will be forwarded in 1979-10.)

2. A problem was encountered with the 16-30 WIW. Injection pressures of 7 000 - 8 000 kPa were obtained at the injection wells 12-29, 14-29, & 4-32 while the injection pressure at 16-30 was 0 kPa. A cement squeeze was carried out on 16-30 WIW in 1979-05. The well was placed back on injection and the maximum injection pressure obtained was 3 170 kPa when the entire water supply was injected into this well for month 1979-06. This would indicate the water is still entering the aquifer and the rework was unsuccessful. A Radioactive Tracer Survey was run on the 16-30 WIW prior to the rework which indicated the fluid was injecting into the formation below the perforated intervals. It is felt that this well cannot be successfully reworked.
3. The injection pump which was used for the 1st year of the pilot waterflood was found to be inadequate. The maximum discharge pressure obtained was 8 000 kPa and at that pressure continuous mechanical problems were encountered. A new triplex pump has been purchased and is presently being installed. This will allow us to increase the injection pressure to the 12-29, 14-29, & 4-32 WIW by 3 000 - 4 000 kPa if required. By increasing the injection pressure, the volume of water injection in the above mentioned wells should also increase allowing us to make up voidage at an increased rate. The water injected in the 16-30 WIW will be restricted by choking it back.
4. It has also been recommended at this time to stimulate the 1-31 WSW to ensure an adequate water supply for the new triplex injection pump.
5. It is felt another year of injection at increased rates and pressure will give us sufficient time to evaluate the pilot-flood project.

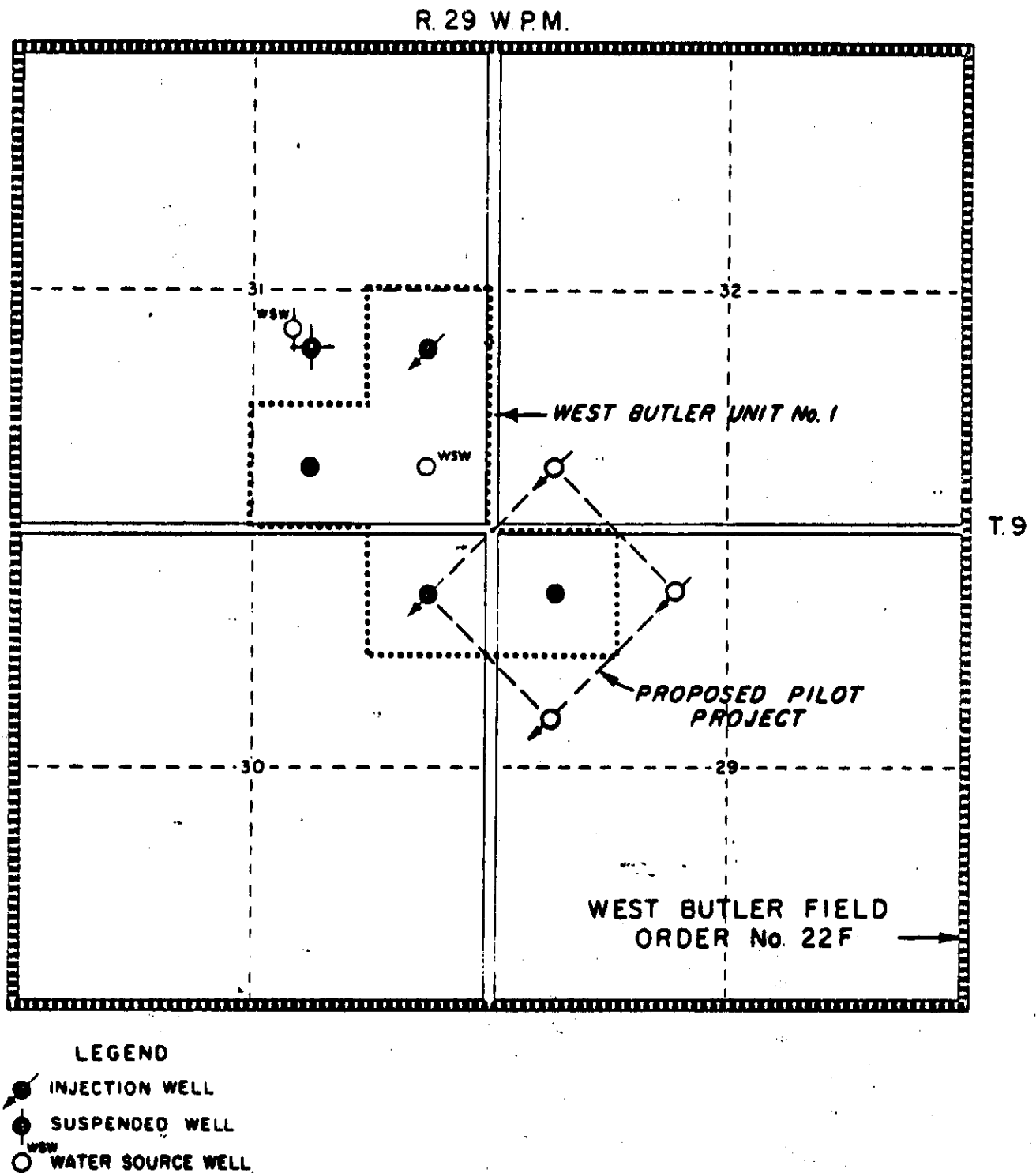
If additional information is required, please contact L. G. Thorhaug at the letterhead address.

Yours very truly,

*(for)*   
G. W. Cruickshank, P. Eng.  
Chairman, West Butler Unit No. 1

LGT/ck

FIGURE 1



DEVELOPMENT OF A PILOT PROJECT  
WEST BUTLER FIELD

SCALE 3" = 1 MILE

JUNE 1, 1978

MICROFILMED

TO \_\_\_\_\_


HERE \_\_\_\_\_

*July 1979*

**THE REGULATIONS ACT**  
**C E R T I F I C A T E**

I, J. S. Roper, Chairman of The Oil and Natural Gas Conservation Board, of Manitoba, hereby certify that the attached Regulation is the original Order: —

- (a) entitled The Oil and Natural Gas Conservation Board Order No. PM 35;
- (b) made pursuant to "The Mines Act";
- (c) made by The Oil and Natural Gas Conservation Board, of Manitoba;
- (d) under date of the 22<sup>nd</sup> day of AUGUST A. D., 1978;
- (e) which Regulation comes into force on the date of filing with the Registrar of Regulations.

  
\_\_\_\_\_  
J. S. Roper,  
Chairman,  
The Oil and Natural Gas  
Conservation Board.

Being

THE OIL AND NATURAL GAS CONSERVATION BOARD

Order No. PM 35

An Order Pertaining to Pressure Maintenance by Water Flooding

WEST BUTLER FIELD

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

(Filed: )

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

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

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

AND WHEREAS, Chevron Standard Limited, has made application to conduct a pilot water flood in parts of Section 29 and Section 32, Township 9, Range 29 WPM, a part of the West Butler Field;

AND WHEREAS, the Board, upon due consideration of the said application, has found that in the interests of oil recovery and conservation, it is advisable to conduct a pilot water flood in the West Butler Field.

NOW, THEREFORE, the Board orders that:

1. (a) Chevron Standard Limited, or its successor (hereinafter called "the operator"), shall conduct a pilot water flood by the injection of Devonian System source water obtained from the well Chevron West Butler WSW 1-31-9-29 WPM, plus any water produced from the wells Chevron West Butler Prov. 13-29-9-29 WPM and Chevron West Butler 2-31-9-29 WPM, to the Members of the Lodgepole Formation of the Mississippian Age underlying the application area.

- (b) The water flood operations shall be in accordance with and subject to the following rules:

PRESSURE MAINTENANCE RULES

1. (1) Produced water shall be injected to the Lodgepole Formation of the Mississippian Age in the wells:

Chevron Butler Prov. WIW 12-29-9-29

Chevron Butler Prov. WIW 14-29-9-29


Chevron Butler Prov. WIW 4-32-9-29


and, from time to time, in such other wells as the Board may direct, or, upon application of the operator, may approve.

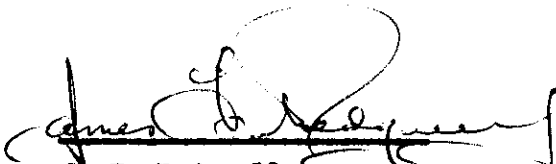
- (2) After commencement, the operator shall, subject to any remedial work required to be performed on any of the wells, endeavor to maintain continuous injection.
- (3) Notwithstanding the provisions of subclause (2) the Board may order, or upon application by the operator may approve, the suspension of water injection.
2. (1) Before water produced from either of the wells Chevron West Butler Prov. 13-29-9-29 WPM or Chevron West Butler 2-31-9-29 WPM is injected, the operator shall carry out such tests as are necessary to determine the original source of such produced water and the suitability or treatment necessary to permit commingled injection of such produced water with the Devonian System source water.
- (2) Before any change is made in the source of water being injected, or upon the request of the Board, the operator shall satisfy the Board as to the source, suitability, and method of treatment of the water to be injected.
3. The operator shall immediately report to the Board any channelling or breakthrough of injected water to producing wells, or any indication of other detrimental effects that may be attributable to pressure maintenance operations.
4. The operator shall, not later than the last day of each month, file with the Petroleum Branch of the Department of Mines, Resources and Environmental Management a report of the quantity, sources and maximum pressure at which water was injected during the preceding month, into the wells referred to in Rule 1 hereof.

5. Unless otherwise authorized in writing by the Board, the operator shall within six weeks of the expiration of each yearly period commencing on the first day of September 1978, during the period this order is in effect, file with the Petroleum Branch a report of the pressure maintenance program during the period, setting out graphically such interpretative information necessary to evaluate the progress, performance and efficacy of the water flood.
6. This order shall terminate 365 days after commencement of injection of water into the wells referred to in subclause (1) of Rule 1, notwithstanding the provisions of subclause (3) of Rule 1; but the Board may, upon submission of an application by the operator to that effect, extend the termination date for a further period, or periods, provided that the Board is satisfied upon due consideration of the application that it is advisable to continue the pilot water flood operations.


Oil and Natural Gas Order No. PM 35,  
made and passed this 22<sup>nd</sup> day of  
AUGUST A.D., 1978 at the City  
of Winnipeg, in the Province of  
Manitoba, by The Oil and Natural  
Gas Conservation Board.

  
J. S. Roper,  
Chairman,  
The Oil and Natural Gas  
Conservation Board.

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

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

Approved:

  
A. Brian Ransom,  
Minister of Mines, Resources  
and Environmental Management.



**MICROFILMED**

**TO .....**

**HERE .....**

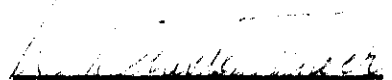
July 1979

THE REGULATIONS ACT

C E R T I F I C A T E

I, W. Winston Mair, Chairman of The Oil and Natural Gas Conservation Board, of Manitoba, hereby certify that the attached Regulation is a true copy of the original Order:—

- (a) entitled The Oil and Natural Gas Conservation Board Order No. PM 21;
- (b) made pursuant to "The Mines Act";
- (c) made by The Oil and Natural Gas Conservation Board, of Manitoba;
- (d) under date of the 12th day of July, A. D., 1972;
- (e) which Regulation comes into force at the hour of seven o'clock in the forenoon, official time, on the first day of September, A. D., 1972.

  
W. Winston Mair,  
Chairman,  
The Oil and Natural Gas  
Conservation Board.

DIRECTOR OF MINES

THE OIL AND NATURAL GAS CONSERVATION BOARD

ORDER NO. PM 21

An Order pertaining to Pressure Maintenance by Water Flooding

WEST BUTLER UNIT NO. 1

Made and passed pursuant to "The Mines Act", Cap. M160, R. S. M., 1970, and amendments thereto, by The Oil and Natural Gas Conservation Board, of Manitoba.

---

WHEREAS, subsection (9)(d) of Section 62 of "The Mines Act", being Chapter M160 of the Revised Statutes of Manitoba, 1970, provides as follows:

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

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

AND WHEREAS, the Board, pursuant to Section 62 of "The Mines Act", held a public hearing on June 21, 1972, for the purpose of considering a Proposal for Pressure Maintenance by Water Flooding within the Unit Area of the West Butler Unit No. 1, by Chevron Standard Limited, on its own behalf, in the West Butler Field in Manitoba.

AND WHEREAS, upon due consideration of the submissions and testimony at the hearing, the Board has found:

- (a) That the pressure maintenance by water flooding of a certain part of the West Butler Field in Manitoba, comprising the Unit Area of the West Butler Unit No. 1, is reasonably necessary to prevent waste, and to increase substantially the recovery of oil;
- (b) That the value of the estimated additional recovery of oil and gas resulting from such operation will exceed the estimated additional cost incidental to the conduct of such operation; and
- (c) That such operation will result in general advantage to the owners of oil and gas rights within the Unit Area.

AND WHEREAS, Unitization Order No. 14 provides for the appointment of Chevron Standard Limited as Unit Operator.

NOW, THEREFORE, the Board orders:

1. (a) The Unit Operator shall conduct pressure maintenance operations by the injection of water to the Members of the Lodgepole Formation of the Mississippian Age underlying the Unit Area;
- (b) The pressure maintenance operations shall be in accordance with, and subject to, the following rules:

PRESSURE MAINTENANCE RULES

1. (1) Water shall be injected to the Lodgepole Formation of the Mississippian Age in the wells

Chevron West Butler Prov. 16-30-9-29

and

Chevron West Butler 8-31-9-29

and, from time to time, in such other wells as the Board may direct, or, upon application of the Unit Operator, may approve;

- (2) After the commencement, the Unit Operator shall, subject to any remedial work required to be performed on the well or wells referred to in this clause, endeavour to maintain continuous injection;
  - (3) Notwithstanding the provisions of subclause (2), the Board may, upon application by the Unit Operator, approve the suspension of water injection, provided the Board is satisfied that the pressure maintenance operation in the Unit Area will not be adversely affected.
2. (1) Before the injection of water is commenced, and from time to time after the commencement of injection, and upon the request of the Board, the Unit Operator shall satisfy the Board as to the source, suitability, and method of treatment of the water to be injected;
  - (2) Before any change is made in the source of water being injected, the Unit Operator shall satisfy the Board as to the suitability of the water to be injected.
3. The Unit Operator shall immediately report to the Board any indication of channelling or break-through of injected water to producing wells, or any indication of other detrimental effects that may be attributable to the pressure maintenance operations.
  4. In the interest of equity and good engineering practice the Board may prescribe from time to time a maximum pressure, or a minimum or a maximum rate, at which water shall be injected in any well in the Unit.
  5. At least annually, unless otherwise directed by the Board, the Unit Operator shall determine the reservoir pressure in the producing wells in the Unit to the satisfaction of the Board.


6. The Unit Operator shall inject water to each well referred to in clause 1 hereof in a manner such that, within five years of the effective date of the Order, a suitable balance is achieved and maintained between water injected to, and fluids withdrawn from, the Unitized Strata.
7. The Unit Operator shall, not later than the twenty-fifth day of each month, file with the Mines Branch a report of the quantity and source of water injected during the preceding month to each well referred to in clause 1 hereof.
8. (1) Unless otherwise authorized in writing by the Board, the Unit Operator shall, within six weeks of the expiration of each yearly period commencing on the first day of January, 1973, file with the Board a report of the progress, performance, and efficacy of the pressure maintenance program during the period;
  - (2) Subject to any direction in writing of the Board to the contrary, a report required by this clause may, at the discretion of the Unit Operator, be in two parts, the first of which parts shall set out graphically and from the commencement of the operation of the pressure maintenance program
    - (a) the daily average rate during each month of oil production of each producing well;
    - (b) the average water-oil ratio during each month of each producing well;
    - (c) the monthly cumulative oil and water production from each producing well;
    - (d) the daily average rate during each month of water injection to each injection well;
    - (e) the daily average water injection pressure during each month at each injection well;
    - (f) the monthly cumulative volume of water injected to each injection well;
    - (g) the average injectivity index during each month, for each water injection well, which index, at the discretion of the Unit Operator, may be determined as
      - (i) the daily injection rate divided by the average injection well-head pressure, or
      - (ii) any similar index that the Board, on the application of the Unit Operator, may approve; and
    - (h) the date and type of any well treatment or work-over which shall be indicated on the graph, and the second of which parts shall contain
      - (a) calculations of the balance during each month between water injected to, and fluids withdrawn from the Unitized Strata,
      - (b) such other interpretative information as the Unit Operator considers necessary to evaluate adequately the progress, performance, and efficacy of the pressure maintenance program, and


4—Order No. PM 21


- (c) an outline of the method actually in use for the quality, control, and treatment of the water, or, where there has been no change in the control or treatment from that outlined in a previous report, a statement to that effect.
- (3) If a report required by this clause is in the form provided for in subclause (2), the Board, at any time, may make the first part of the report available to the public, and, after one year from the end of the period for which the report is made, may make the second part of the report available to the public, and, if the report is not in the form provided for in subclause (2), the Board may make the whole of the report available to the public at any time.
2. This Order shall be effective at the hour of seven o'clock in the forenoon, official time, on the first day of September, A. D., 1972.

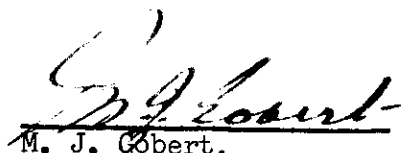
Oil and Natural Gas Order No. PM 21,  
made and passed this 12th day  
of July, A. D., 1972,  
at the City of Winnipeg, in the  
Province of Manitoba, by The Oil  
and Natural Gas Conservation Board.

Approved:

  
Leonard S. Evans,  
Acting Minister of Mines,  
Resources and Environmental  
Management.

  
W. Winston Mair,  
Chairman,  
The Oil and Natural Gas  
Conservation Board.

  
J. S. Roper,  
Deputy Chairman,  
The Oil and Natural Gas  
Conservation Board.

  
M. J. Gobert,  
Member,  
The Oil and Natural Gas  
Conservation Board.

*Yes on West Butler*  
*Mr. Scott*

June 7, 1976

Chevron Standard Company,  
400 - Fifth Avenue S. W.,  
Calgary, Alberta.  
T2P 0T7

Attention: Mr. J. D. Scott, P. Eng.  
Senior Petroleum Engineer

Dear sir:

Re: West Butler Unit No. 1

Further to your letter of May 26, 1976 applying for temporary suspension of water injection in the waterflood scheme of West Butler Unit No. 1, we advise that additional information is required and certain steps must be taken before proceeding further with your application.

Your May 26th letter does not indicate how long the temporary suspension is applied for, nor does it mention any specific plans Chevron intends to follow in the future to insure continuous water injection. Please submit to this office prior to July 15, 1976, a formalized statement indicating:

1. The length of the temporary suspension period applied for.
2. The future plans for this Unit after the expiration of the temporary suspension period.
3. Original and current reservoir pressure.
4. Whether Chevron intends to continue producing from the two wells located on Lcd. 13-29-9-29 and 2-31-9-29 during the suspension period, and the effect of such production on reservoir pressure and on depleting the reservoir to a stage that re-applying water injection will not be successful in the future (i.e. presence of large free gas saturation).
5. Reasons for lack of response to water injection in the subject Unit. It is our understanding that the lack of response was due to insufficient volumes of water injected into the reservoir.
6. Operating costs for the Unit.

A review of our files on West Butler Unit No. 1 indicates that we have received no subsurface pressure data with respect to this Unit since Order No. M. 21 was issued by The Oil and Natural Gas Conservation Board in 1972.

Section 5 of Order No. PM 21 states as follows:

"At least annually, unless otherwise directed by the Board, the Unit Operator shall determine the reservoir pressure in the producing wells in the Unit to the satisfaction of the Board."

This is to advise you of the Petroleum Branch's policy concerning future annual subsurface pressure measurement surveys for the subject Unit.

In future you are requested to submit the details of your proposed subsurface pressure survey program to this office for approval prior to commencing the program. Such submissions should include the wells to be surveyed, the measurement technique to be used and the intended shut-in periods for each well to be surveyed.

After having the program approved and carried out a report must be submitted to the Branch including:

1. The pressure data obtained from the program.
2. An isobaric map of the reservoir based on the data obtained.
3. A discussion of the survey results and pressure distribution in the reservoir.

You are hereby requested to submit to this office prior to July 1st, 1976 your proposed subsurface pressure survey program for 1976 for West Butler Unit No. 1 in accordance with the Regulation and the Branch policy outlined herein.

Yours sincerely,



*for* H. C. Master, P. Eng.,  
Director, Petroleum Branch

JE/jr  
c. c. The Oil and Natural Gas  
Conservation Board  
G. A. Cruickshank  
Virden Office

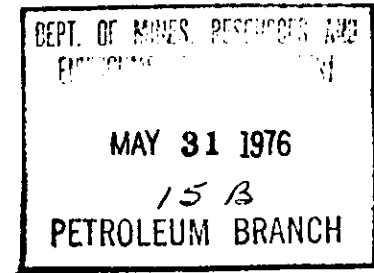




## Chevron Standard Limited

400 - Fifth Ave. S.W., Calgary, Alberta T2P 0L7

May 28, 1976



Department of Mines, Resources, and  
Environmental Management  
Mineral Resources Division  
Province of Manitoba  
993 Century Street  
Winnipeg, Manitoba  
R3H 0W4

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

Gentlemen:

In response to your letter of May 11, 1976 to our Mr. L. C. Zerr, Chevron Standard Limited hereby requests that a temporary suspension of water injection into the wells Chevron West Butler Prov. 16-30-9-29 and Chevron West Butler 8-31-9-29 be approved in accordance with Subclause 3 of Clause 1 under Pressure Maintenance Rules of Order No. PM 21 pertaining to West Butler Unit No. 1.

Injection of water into the subject wells commenced in September 1972. An unsuccessful attempt was made to develop a water supply well in the Ashville zone by redrilling the abandoned well 7-31-9-29. A water source was finally developed by drilling a new well 7A-31-9-29 to the Ashville zone at a depth of 1750 to 1800 feet KB. The water source well has performed unsatisfactorily with sand problems and low productivity in the order of 100 BWPD or less. The injection system was suspended in October 1974 because of high operating costs. At that time the supply well had declined to 80 BWPD which was insufficient to permit continuous injection into both injection wells.

A summary of injection and production is shown on Table 1 attached. A total of 70,074 barrels of water were injected since inception of the waterflood. During the same period of time, production has resulted in total reservoir voidage of 18,238 barrels for a cumulative net voidage of -51,836 reservoir barrels. Therefore, water injection during the life of the project exceeded voidage by a factor of 2.8 as of December 31, 1975. The effect on production rates is at best insignificant and inconclusive.

Incremental operating costs of \$17,000 were incurred by the operation of the water supply system in 1974. Further operation of the present water supply system cannot be economically justified because of its inadequacy and because no response is evident in the project. The cost of an alternate water supply well drilled to the Devonian formation is estimated to be \$167,000.

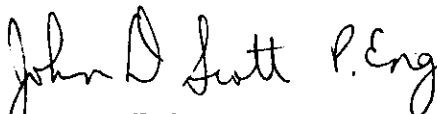
Performance of the project to the time of suspension of injection has not been sufficiently encouraging to justify expansion to a full-fledged 5-spot pilot with a Devonian water supply. Furthermore, the high cost of development of a multiwell waterflood project is submarginal, based upon presently available information. It is possible that, through availability of a cheaper water supply, future crude price increases, new technology, or other occurrence, additional encouragement could be provided to justify further action on our part.

We are, therefore, requesting that temporary suspension of injection be permitted and that the project not be cancelled, in the hope that further action can be initiated within a reasonable time frame.

We submit that temporary suspension of water injection will not decrease recovery nor affect possible future action or recovery inasmuch as an increase in recovery has not been demonstrated by past performance.

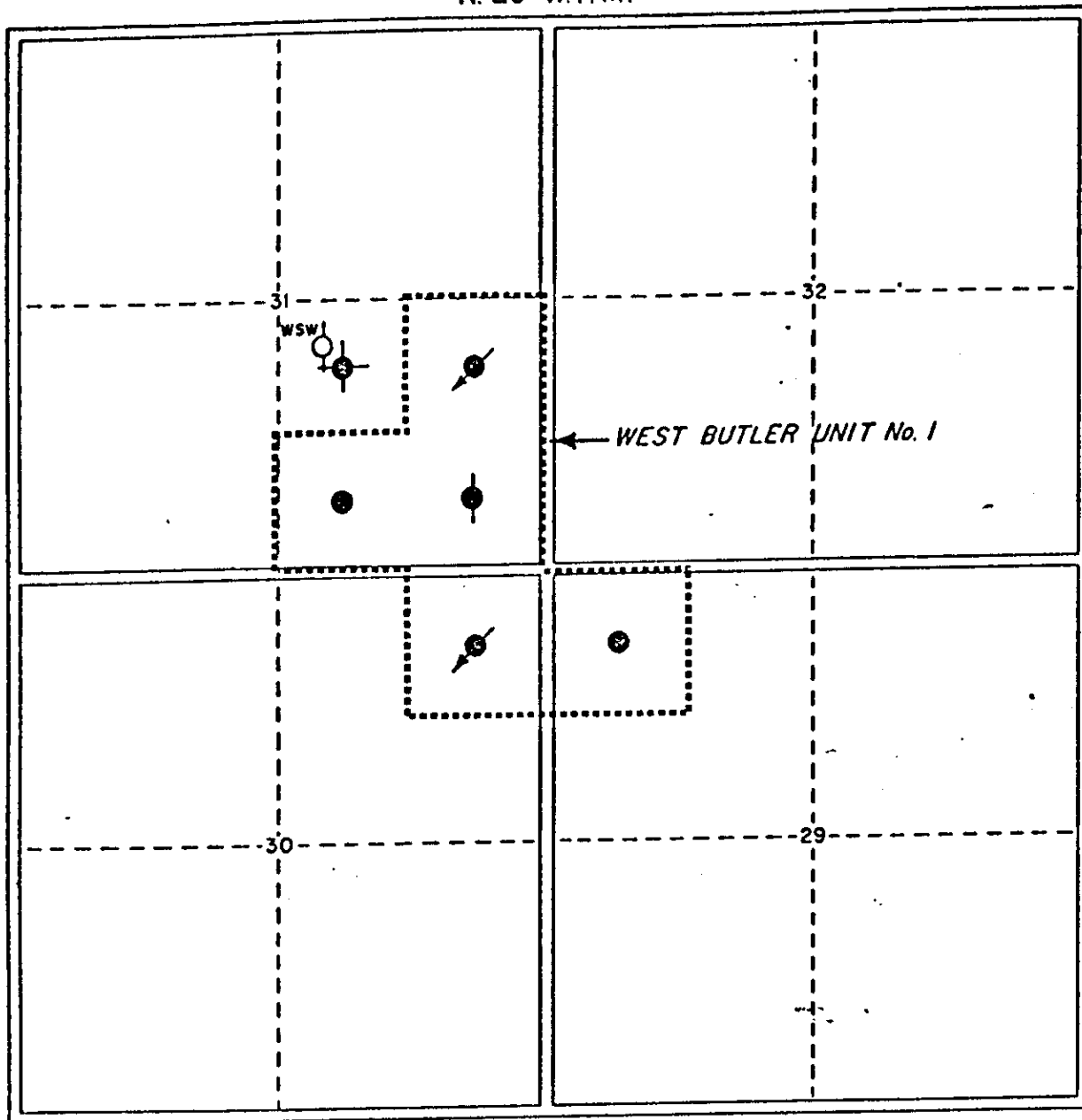
Any enquiries regarding this application should be directed to the attention of Mr. J. D. Scott, P.Eng. at the Company's Calgary address.

Yours very truly,

*for*  P.Eng.  
A. HAMBERG,  
Supervising Engineer  
Reservoir

Attachment

R. 29 W.P.M.



T.9

LEGEND




-  INJECTION WELL
-  SUSPENDED WELL
-  WATER SOURCE WELL

FIGURE 1  
WEST BUTLER UNIT No. 1  
AS OF DECEMBER 31, 1975

SCALE: 5" = 1 MILE

TABLE 3

## WEST BUTLER PRE-UNIT AND POST-UNIT PRODUCTION

Year	Production		Operating Period Months	Average Production Per		Operating Days	Average Production Per Well		Water Injection Bbls.	Total		Cumulative Net Unit Voidage Res. Bbls.
	Oil STB	Water Bbls.		Calendar Days	Calendar Day		Operating Day	Reservoir Voidage Res. Bbls.		Net Reservoir Voidage Res. Bbls.		
1967	5,291	482	11	337	15.7	1,077	4.9					
1968	5,165	349	9	275	18.8	693	7.5					
1969	5,239	375	7	214	24.5	737	7.1					
1970	4,409	448	7	213	20.7	605	7.3					
1971	5,446	425	10	303	18.0	831	6.6					
1972 - First 8 Months	3,363	356	6	184	18.3	530	6.3 (2 wells converted to injection)					
1972 - Last 4 Months	1,155	40	4	122	9.5	244	4.7	9,389		1,275	(8,114)	
1973	3,015	7,603	9	275	11.0	610	4.9	34,551		10,829	(23,722)	(31,836)
1974	2,530	0	6	183	13.8	360	7.0	26,134		2,707	(23,427)	(55,263)
1975	3,203	0	8	245	13.1	432	7.4	0		3,427	3,427	(51,836)



**Chevron Standard Limited**  
400 - Fifth Ave. S.W., Calgary, Alberta T2P 0L7

R. A. Park  
Manager - Production

May 14, 1976

Representative Change  
Operating Committee  
West Butler Unit No. 1

The Oil and Natural Gas Conservation Board  
Province of Manitoba  
310 Legislative Building  
Winnipeg, Manitoba  
R3C 0V8

Attention: Mr. Jas. T. Cawley, Chairman

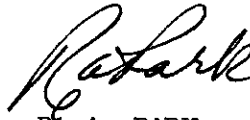
Gentlemen:

We wish to advise you that as of May 1, 1976, the representative of Chevron Standard Limited on the Operating Committee for the subject unit will be:

G. W. Cruickshank  
Chevron Standard Limited  
P.O. Box 100  
Virden, Manitoba  
ROM 2C0

The alternates are Messrs. D. M. Mahura and D. R. Henderson who are located at the letterhead address.

Yours very truly,

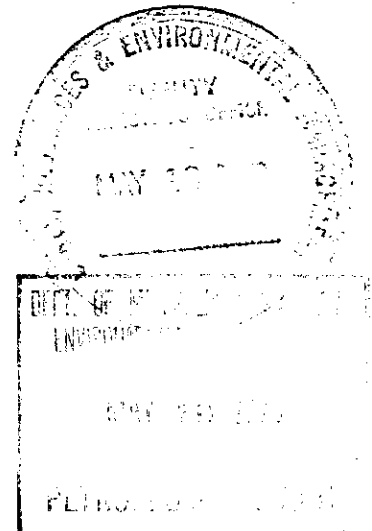
  
R. A. PARK

DRH/gb

cc: Mr. G. W. Cruickshank

cc: J. S. Roper  
I. Haugh  
C. Moster

/ie 76 05 18

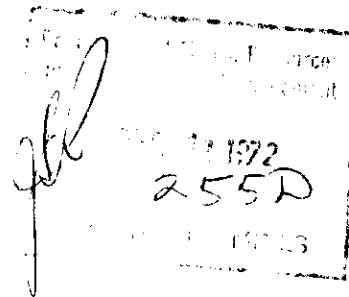




**Chevron Standard Limited**

400 - Fifth Ave. S.W., Calgary, Alberta T2P 0L7

December 8, 1972



*ESG*  
The Oil and Natural Gas Conservation Board  
Department of Mines and Natural Resources  
Province of Manitoba  
901 Norquay Building  
401 York Avenue  
Winnipeg, Manitoba

Attention: Mr. J. S. Roper

Gentlemen:

Please be advised that Chevron Standard Limited hereby designates the following representative and alternate representative to the Operating Committee for West Butler Unit No. 1:

Representative

Mr. L. D. Brown  
Box 100  
Virden, Manitoba  
ROM 2C0

Alternate

Mr. S. N. Borowski  
400 Fifth Avenue S.W.  
Calgary, Alberta  
T2P 0L7

In accordance with Section 5.03 (c) of the "Plan" governing the subject Unit, Chevron Standard Limited is appointed the Unit Operator for West Butler Unit No. 1. As the representative of Chevron Standard Limited, the sole Working Interest Owner in the subject Unit, Mr. L. D. Brown shall act as Chairman of the Operating Committee.

Yours very truly,

L. D. BROWN, Chairman pro tem  
West Butler Unit No. 1  
Operating Committee

JDS cott/lc

R3C OP8

August 25, 1972

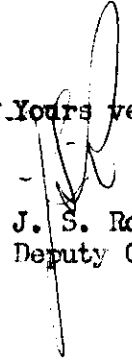
Mr. Lindsey Brown, Area Supervisor  
Chevron Standard Limited  
Box 100  
Virden, Manitoba  
ROM 200

Dear Mr. Brown:

Re: West Butler Unit No. 1

In accordance with Section 5.03 of the "Plan" governing the above Unit, the Board has selected you to act as Chairman pro tem of the organization meeting of the Operating Committee.

Yours very truly,

  
J. S. Roper  
Deputy Chairman

FSG/h

cc: Mr. J. G. Trowell  
Chevron Standard Limited  
400 Fifth Avenue S.W.  
Calgary 1, Alberta

p. c. to: Mr. J. S. Roper.