

ROUTE SLIP

Mr. E. S. Gamey

M. J. Gobert's Office

FROM

- Date** July 12, 1971.

Subject

Message

DIRECTOR OF MINES

MNR-A-94

Use reverse side if necessary

CHEVRON STANDARD LIMITED

Box 100
Virden, Manitoba
July 8, 1971

The Oil and Gas Conservation Board
Room 1010 Norquay Building
WINNIPEG, Manitoba

Attention: Mr. M. J. Gobert

Dear Sir:

Re: Order No. PML5, Pressure Maintenance
by Water Flooding in the Daly Field

Water injected into the well Chevron Daly WLW 14-1-10-28 during the month of June, 1971 was 7370 barrels at a wellhead pressure of 1240 psig. The maximum injection rate during the month was 383 bbls/day.

Cumulative injection under high pressure conditions to the end of June, 1971 is 24,966 barrels.

There have not been any changes in the production or fluid levels at any of the adjacent producing wells. We propose to operate this pilot scheme within the approved limitations of 1400 psig. and/or 600 bbls./day for another month. ✓

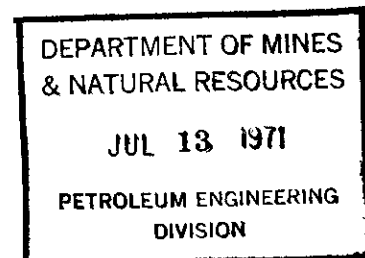
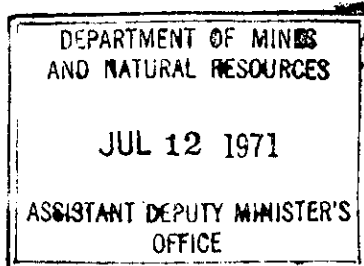
permission in June/71

Yours truly ,

for *G. D. Brown*
L. D. Brown, P. Eng.
Area Supervisor

gc/mc
c.c. Trowell/Scott

X.E. F.S. Gandy - 12/7/71



DEPARTMENT OF MINES AND NATURAL RESOURCES
ROUTE SLIP

DEPARTMENT OF MINES
& NATURAL RESOURCES

TO

FROM

TO

FROM

PETROLEUM ENGINEERING

DIVISION

☐ For your approval or revision

☐ Reply direct with copy to me

☐ Please sign

☐ For your information

☐ Please supply data for my reply

☐ Please return

☐ Please take action

☐ Return with comments and/or recommendations

☐ Please see me

☐ Extracts of minutes for your information and action

☐ Investigate and report

☐ Please phone

☐ Please draft reply for signature of

Date

Subject

Message

I have mailed letters to Mr. Brown and Mr. Frowell and given copy to Mr. Mann. Attached is returned for your files.

MNR-A-94

Use reverse side if necessary

DEPARTMENT OF MINES AND NATURAL RESOURCES
ROUTE SLIP

TO A. S. ROPER

FROM F. S. GAMEY

TO

FROM

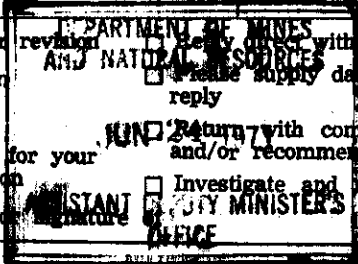
From

NDG

Roper

- ☐ For your approval or revision ☐ Reply direct with copy to me
☐ For your information ☐ Please supply data for my reply
☐ Please take action
☐ Extracts of minutes for your information and action
☐ Please draft reply for signature

- ☐ Please sign
☐ Please return
☐ Please see me
☐ Please phone



Date June 24/71

Subject APPLICATION UNDER

Message

ORDER PM 15

ATTACHED IS SUGGESTED LETTER FOR CHAIRMAN'S SIGNATURE

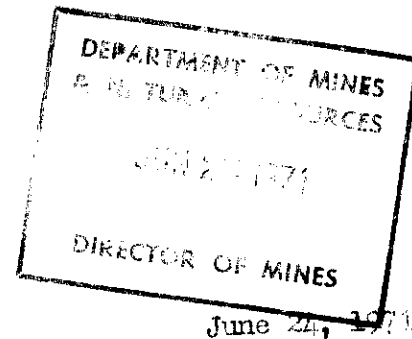
RE: APPLICATION TO INCREASE INJECTION PRESSURES ON
CHEVRON DALY WIW 14-1-10-28

COPY OF APPLICATION AND ORDER IS ATTACHED FOR YOUR
INFORMATION

MNR-A-94

Use reverse side if necessary

W. Winston
J. S. B.



June 24, 1971

Mr. L. D. Brown, Area Supervisor,
Chevron Standard Limited,
Box 100,
Virden, Manitoba.

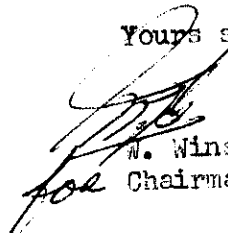
Dear Mr. Brown:

Re: Application to increase injection pressure
Chevron Daly WIW 14-1-10-28
Order No. PM 15

In accordance with Section 2 of the Pressure Maintenance
Rules for the above Order, the Board hereby grants permission to the
operator to:

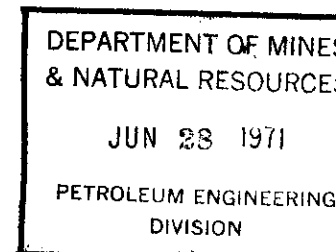
- (1) increase the injection pressure to 1,400
p.s.i.g., for a test period of one (1)
month's duration.

Yours sincerely,


W. Winston Mair,
for Chairman.

FSG/h

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

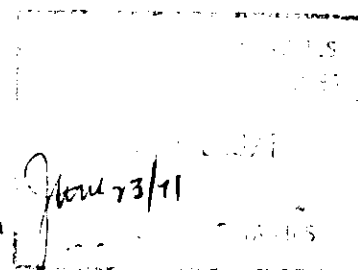




CHEVRON STANDARD LIMITED

Box 100
VIRDEN, Manitoba
June 3, 1971

File: 661.15

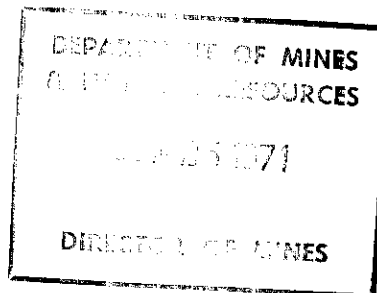


FSG

The Oil and Natural Gas Conservation Board
Room 1010 Norquay Building
WINNIPEG 1, Manitoba

Attention: Mr. M. J. Gobert

Dear Sir:



Re: Order No. PM15, Pressure Maintenance by
Water Flooding in the Daly Field

Water injected into the well Chevron Daly WTW 14-1-10-28 during the month of May was 8,221 barrels at a wellhead pressure of 1275 psi. The maximum rate during the month was 278 bbls./day.

Cumulative injection under high pressure conditions to the end of May is 17,596 bbls.

There has been no change in production or fluid levels in the offsetting producing wells and to date there do not appear to be any detrimental effects that may be attributed to the High Pressure Water Flood.

We would now like to apply for permission to increase the injection pressure to not exceed 1,400 p.s.i.g. with the volume of water to not exceed 600 barrels per day.

7

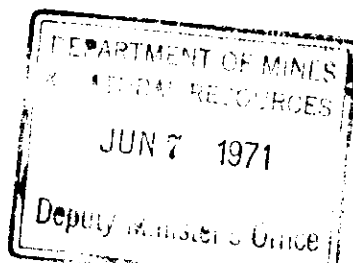
Yours truly,

L. D. Scott, P. Eng.
Area Supervisor

Handwritten:
Please draft
LDR/jl

LDR/jl

cc Trowell/Scott



PRESSURE MAINTENANCE RULES

1. Produced from oil wells in the Daly Field, shall be injected to the Lodgepole formation of the Mississippian Age in the well
Chevron Daly WIW 14 - 1 - 10 - 28
 - (2) The volume of water injected shall not exceed 600 barrels per day, at any time.
 - (3) The injection pressure during the first month of operation of the Pilot High Pressure Water Flood shall not exceed 1,300 p.s.i.g.
 - (4) Chevron Standard Limited shall, following the first month's operation, file with The Oil and Natural Gas Conservation Board, a report of the performance and efficacy of the Pilot High Pressure Water Flood. The report required under this Clause may be subject to any direction, in writing, by the Board.
2. The Board may grant permission to the operator to increase the injection pressure by increments of 100 p.s.i.g., during succeeding test periods of one (1) month's duration; and the requirements of sub-clause 4 of Rule 1 shall apply for each test period.
3. Chevron Standard Limited shall immediately report to the Board any indication of channelling or breakthrough of injected water to producing wells, or any indication of other detrimental effects that may be attributable to the Pilot High Pressure Water Flood.
4. After commencement, the operator shall, subject to any remedial work required to be performed on the water injection well or offsetting oil producing wells, endeavour to maintain continuous injection for not more than three hundred and sixty five (365) consecutive days from the effective date of this Order.
5. Notwithstanding the provisions of Rule 4, the Board may, upon application by the operator, approve the suspension of water injection.
6. This Order shall be effective at the hour of seven o'clock in the forenoon on February 1, 1971.

Oil and Natural Gas Order No. PM 15,
made and passed this 4th day
of January A.D., 1971, at
the City of Winnipeg, in the
Province of Manitoba, by The Oil
and Natural Gas Conservation Board.

Approved:

"Sidney Green"

Sidney Green,
Minister of Mines and Natural Resources.

"J. S. Richards"

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

"M. J. Gobert"

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

Manitoba Regulation 4/71

Being THE OIL AND NATURAL GAS CONSERVATION BOARD

ORDER NO. PM 15

*An Order pertaining to Pressure Maintenance by Water Flooding
DALY FIELD*

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

(Filed January 18, 1971)

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

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

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

AND WHEREAS, the Board, pursuant to Section 62 of "The Mines Act", held a public hearing on March 19 and December 15, 1970, for the purpose of considering a Pilot High Pressure Water Flood in the Daly Field in Manitoba by Chevron Standard Limited.

AND WHEREAS, upon due consideration of the submissions and testimony at the hearing, the Board has found that it is reasonably necessary to conduct a Pilot High Pressure Water Flood in the Daly Field in Manitoba.

NOW THEREFORE, the Board orders:

1. (a) Chevron Standard Limited shall conduct a Pilot High Pressure Water Flood by the injection of water to the Lodgepole formation of the Mississippian Age underlying part of the Daly Field;
- (b) The pressure maintenance operations shall be in accordance with, and subject to, the following rules:

DEPARTMENT OF MINES AND NATURAL RESOURCES
ROUTE SLIP

TO

Mr. J. S. Roper

FROM

M. J. Gobert

TO

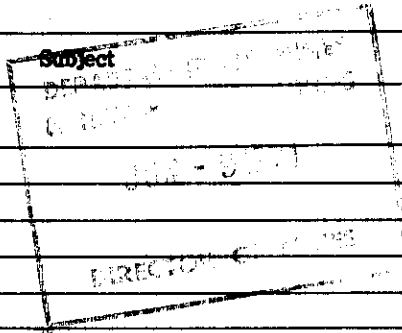
FROM

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| <input type="checkbox"/> For your information | <input type="checkbox"/> Please supply data for my reply | <input type="checkbox"/> Please return |
| <input type="checkbox"/> Please take action | <input type="checkbox"/> Return with comments and/or recommendations | <input type="checkbox"/> Please see me |
| <input type="checkbox"/> Extracts of minutes for your information and action | <input type="checkbox"/> Investigate and report | <input type="checkbox"/> Please phone |
| <input type="checkbox"/> Please draft reply for signature of | | |

Date June 8, 1971.

Message

Please take action.



MNR-A-94

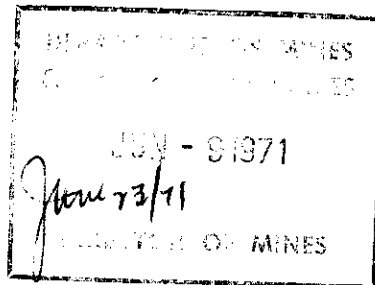
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CHEVRON STANDARD LIMITED

Box 100
VIRDEN, Manitoba
June 3, 1971

File: 661.15



F56

The Oil and Natural Gas Conservation Board
Room 1010 Norquay Building
WINNIPEG 1, Manitoba

Attention: Mr. M. J. Gobert

Dear Sir:

Re: Order No. PM15, Pressure Maintenance by
Water Flooding in the Daly Field

Water injected into the well Chevron Daly WTW 14-1-10-28 during the month of May was 8,221 barrels at a wellhead pressure of 1275 psi. The maximum rate during the month was 278 bbls./day.

Cumulative injection under high pressure conditions to the end of May is 17,596 bbls.

There has been no change in production or fluid levels in the offsetting producing wells and to date there do not appear to be any detrimental effects that may be attributed to the High Pressure Water Flood.

We would now like to apply for permission to increase the injection pressure to not exceed 1,400 p.s.i.g. with the volume of water to not exceed 600 barrels per day.

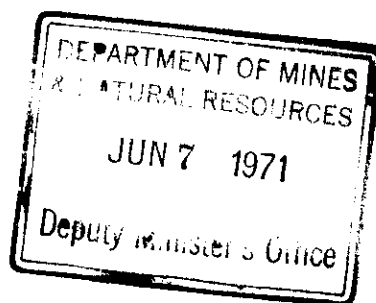
Yours truly,


L. D. BROWN, P. Eng.
Area Supervisor

LDB/j1

cc Trowell/Scott

*Please check.
Please draft.*



PRESSURE MAINTENANCE RULES

1. (1) Water, produced from oil wells in the Daly Field, shall be injected to the Lodgepole formation of the Mississippian Age in the well
Chevron Daly WIW 14-1 - 10 - 28
 - (2) The volume of water injected shall not exceed 600 barrels per day, at any time.
 - (3) The injection pressure during the first month of operation of the Pilot High Pressure Water Flood shall not exceed 1,300 p.s.i.g.
 - (4) Chevron Standard Limited shall, following the first month's operation, file with The Oil and Natural Gas Conservation Board, a report of the performance and efficacy of the Pilot High Pressure Water Flood. The report required under this Clause may be subject to any direction, in writing, by the Board.
2. The Board may grant permission to the operator to increase the injection pressure by increments of 100 p.s.i.g., during succeeding test periods of one (1) month's duration; and the requirements of sub-clause 4 of Rule 1 shall apply for each test period.
3. Chevron Standard Limited shall immediately report to the Board any indication of channelling or breakthrough of injected water to producing wells, or any indication of other detrimental effects that may be attributable to the Pilot High Pressure Water Flood.
4. After commencement, the operator shall, subject to any remedial work required to be performed on the water injection well or offsetting oil producing wells, endeavour to maintain continuous injection for not more than three hundred and sixty-five (365) consecutive days from the effective date of this Order.
5. Notwithstanding the provisions of Rule 4, the Board may, upon application by the operator, approve the suspension of water injection.
6. This Order shall be effective at the hour of seven o'clock in the forenoon on February 1, 1971.

Oil and Natural Gas Order No. PM 15,
made and passed this 4th day
of January A.D., 1971, at
the City of Winnipeg, in the
Province of Manitoba, by The Oil
and Natural Gas Conservation Board.

Approved:

"Sidney Green"

Sidney Green,
Minister of Mines and Natural Resources.

"J. S. Richards"

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

"M. J. Gobert"

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

Manitoba Regulation 4/71

Being THE OIL AND NATURAL GAS CONSERVATION BOARD

ORDER NO. PM 15

*An Order pertaining to Pressure Maintenance by Water Flooding
DALY FIELD*

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

(Filed January 18, 1971)

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

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

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

AND WHEREAS, the Board, pursuant to Section 62 of "The Mines Act", held a public hearing on March 19 and December 15, 1970, for the purpose of considering a Pilot High Pressure Water Flood in the Daly Field in Manitoba by Chevron Standard Limited.

AND WHEREAS, upon due consideration of the submissions and testimony at the hearing, the Board has found that it is reasonably necessary to conduct a Pilot High Pressure Water Flood in the Daly Field in Manitoba.

NOW, THEREFORE, the Board orders:

1. (a) Chevron Standard Limited shall conduct a Pilot High Pressure Water Flood by the injection of water to the Lodgepole formation of the Mississippian Age underlying part of the Daly Field:
- (b) The pressure maintenance operations shall be in accordance with, and subject to, the following rules:

DEPARTMENT OF MINES AND NATURAL RESOURCES

ROUTE SLIP

TO Messrs: J. S. Roper F. S. Ganev	and	FROM M. J. Gobert
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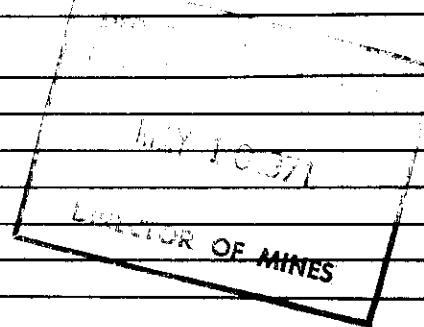
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<input type="checkbox"/> Extracts of minutes for your information and action
<input type="checkbox"/> Please draft reply for signature of | <input type="checkbox"/> Reply direct with copy to me
<input type="checkbox"/> Please supply data for my reply
<input type="checkbox"/> Return with comments and/or recommendations
<input type="checkbox"/> Investigate and report | <input type="checkbox"/> Please sign
<input type="checkbox"/> Please return
<input type="checkbox"/> Please see me
<input type="checkbox"/> Please phone |
|---|--|---|

Date May 7/71

Subject

Message



MNR-A-94

Use reverse side if necessary

*9500
7800*

CHEVRON STANDARD LIMITED

Box 100
VIRDEN, Manitoba
May 6, 1971

File: 661.15

The Oil and Natural Gas Conservation Board
Room 1010 Norquay Building
WINNIPEG1, Manitoba

Attention: Mr. M. J. Gobert

Dear Sir:

Re: Order No. PM15, Pressure Maintenance by
Water Flooding in the Daly Field

The well, Chevron Daly WTW 14-1-10-28, was placed on High Pressure Injection on March 24, 1971. Initial injection was 230 bbl/day at 1230 psi and this was gradually increased to 280 bbl/day at a pressure of 1275 psi where it appears to have stabilized.

A total of 1347 bbls. of water was injected in March and 8,028 bbls during the first full month of April.

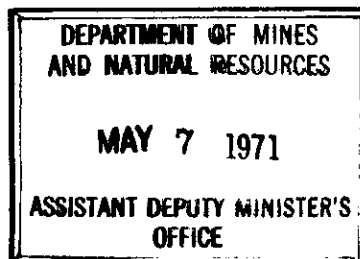
There have not been any noticeable changes in production at any of the adjacent producing wells and we propose to continue at the present maximum pressure limit of 1300 psi for another month.

Yours truly,


L. D. BROWN, P. Eng.
Area Supervisor

LDB/j1

cc Trowell/Borowski



APRIL

December 17, 1970

F. S. Gamay
Reservoir Engineer

M. J. Gobert
Assistant Deputy Minister

High Pressure Flood - Daly Field;

WELL: 14-1-10-28

AGREEMENTS FOR WATERFLOODING ENTERED INTO BY
THE MINISTER OF MINES AND NATURAL RESOURCES

SCHEDULE A

Agreement, dated 15th day of May, 1953, respecting wells
described as Calstan Daly 10-1A, 14-1, 15-1, 16-1,
Calstan Daly Prov. 2-12,
marked as Document No. 8924
Order-in-Council No. 411/57

SCHEDULE B

Agreement, dated 26th day of May, 1956, respecting the
wells described as
Calstan Daly 14-1,
Calstan Daly Prov. 2-12, 3-11, 4-12,
marked as Document No. 51,893
Order-in-Council No. 411/57

No Pressure Maintenance Orders were issued for the Daly Waterflood.

No. 73/58

Memorandum of an order of the Lieutenant-Governor-in-Council, 1958
approved and ordered by His Honour the Lieutenant-Governor on

JAN 14 1958

DEPARTMENT OF MINES
& NATURAL RESOURCES

DIRECTOR OF MINES

The Honourable the Minister of Mines and Natural Resources
having submitted to Council a report setting forth that:

WHEREAS, subsection (1) of Section 68 of "The Mines Act", being Chapter 166 of the Revised Statutes, as the section was enacted by Chapter 45 of the Statutes of Manitoba, 1955, provides as follows:

"68. (1) The Lieutenant-Governor-in-Council may authorize the minister to enter into an agreement for the injection, storage, recycling, or reproduction, in or from an underground formation of any mineral substance or water.";

AND WHEREAS, The California Standard Company has instituted a water flooding programme with a view to securing the most economic recovery of oil and natural gas from certain lands in the Daly Field;

AND WHEREAS, the said water flooding programme necessitated the entering into "Water Flooding Unitization Agreements" which pooled, consolidated, and merged certain oil and natural gas leases issued by the Crown, and other owners of oil and natural gas rights, which were authorized by Order-in-Council No. 411/57;

AND WHEREAS, the Minister of Mines and Natural Resources wishes to enter into a further agreement with the persons who are parties to this agreement;

AND WHEREAS, it is considered that the provisions of the said agreement will result in a better recovery of oil and natural gas from the said lands;

THEREFORE he, the Minister, recommends:

THAT, the Minister of Mines and Natural Resources be authorized to enter into an Agreement, dated the tenth day of February, 1956, respecting the wells described as:

Calstan Daly Province 6-12, and
Calstan Daly 11-12;

and marked Document No. 51,726.

And, upon consideration of the said report and recommendation on the 14th day of January A.D. 19 58 (the Hon. Mr. Greenlay in the Chair), Council having advised that it be done as recommended by the Honourable the Minister of Mines and Natural Resources His Honour the Lieutenant-Governor-in-Council was pleased to approve the said report and recommendation and to order that it be done accordingly.

CERTIFIED to be a true copy

Certified correct document signed by

Deputy Clerk of the Executive Council,
CHARLES PRUD'HOME
as Deputy Clerk of the

Executive Council

This memorandum is furnished

on JAN 17 1958

No. A31/57

Memorandum of an order of the Lieutenant-Governor-in-Council
approved and ordered by His Honour the Lieutenant-Governor on

MAR 19 1957

The Honourable the Minister of Mines and Natural Resources
having submitted to Council a report setting forth that:

WHEREAS subsection (1) of Section 68 of "The Mines Act", being Chapter 100 of the Revised Statutes, as the section was enacted by Chapter 15 of the Statutes of Manitoba, 1955, provides as follows:

"68. (1) The Lieutenant-Governor-in-Council may authorize the minister to enter into an agreement for the injection, storage, recycling, or reproduction, in or from an underground formation, of any mineral substance or water.";

AND WHEREAS The California Standard Company has instituted a water flooding programme with a view to securing the most economic recovery of oil and natural gas from certain lands in the Daly Field;

AND WHEREAS the said water flooding programme, mentioned in Schedules A and B, necessitates the entering into "Water Flooding Unitisation Agreements" which pool, consolidate, and merge certain oil and natural gas leases issued by the Crown, and other owners of oil and natural gas rights;

AND WHEREAS the Minister of Mines and Natural Resources has entered into the agreements, described in the Schedule A hereto, with the persons who are parties to those agreements;

AND WHEREAS the Minister of Mines and Natural Resources wishes to enter into the agreements, mentioned in Schedule B hereto, with the persons who are parties to those agreements;

AND WHEREAS it is considered that the provisions of the said agreements will result in a better recovery of oil and natural gas from the said lands;

AND WHEREAS it is deemed expedient and advisable to confirm and ratify the agreements mentioned in Schedule A hereto, and to authorize the minister to enter into the agreements mentioned in Schedules A and B.

WHEREFORE, the Minister, recommends:

THAT the agreements entered into by the Minister of Mines and Natural Resources, and mentioned in Schedule A, be ratified and confirmed, and that the Minister of Mines and Natural Resources be authorized to enter into the agreements mentioned in Schedules A and B.

And, upon consideration of the said report and recommendation on the 18th day of March A.D. 1957 (the Hon. Mr. Campbell in the Chair), Council having advised that it be done as recommended by the Honourable the Minister of Mines and Natural Resources His Honour the Lieutenant-Governor-in-Council was pleased to approve the said report and recommendation and to order that it be done accordingly.

Certified correct

CERTIFIED to be a true copy

Clerk of the Executive Council

of a document signed by

CHAREL PRUDHOMME

as Deputy Clerk of the

Executive Council

This memorandum is furnished

on

MAR 20 1957

SCHEDULE A

**Agreements for Water Flooding Entered Into
By the Minister of Mines and Natural Resources**

1. Agreement, dated the Fifteenth day of May, 1953,
respecting the wells described as:

Calstan Daly 10-14, 14-1, 15-1, 16-1;
Calstan Daly Prov. 2-12;

and marked "Document No. 8924";
2. Agreement, dated the First day of November, 1954,
respecting the wells described as:

Calstan Daly Prov. 8-11, 4-12, 5-12,
6-12, 12-12;

and marked "Document No. 11,085";
3. Agreement, dated the Seventh day of January, 1956,
respecting the wells described as:

Calstan Daly 1-14, 2-14, 6-14;
Calstan Daly Prov. 6-11, 9-11, 10-11,
11-11, 12-11, 14-11,
15-11, 16-11, 4-13;

and marked "Document No. 12,674";
4. Agreement, dated the Seventh day of January, 1956,
respecting the wells described as:

Calstan Daly 2-14;
Calstan Daly Prov. 14-11, 3-14;

and marked "Document No. 51,649";
5. Agreement, dated the Eleventh day of January, 1956,
respecting the wells described as:

Calstan Daly 13-12;
Calstan Daly Prov. 14-11, 4-13;

and marked "Document No. 51,727".

This is the Schedule " " referred to in
Order-in-Council No. 51,298

[Signature]
Deputy Clerk of the Executive Council

SCHEDULE B

Agreements for Water Flooding Into Which
The Minister of Mines and Natural Resources Wishes to Enter

1. Agreement, dated the Twenty-sixth day of May, 1956,
respecting the wells described as:

Calstan Daly 14-1;
Calstan Daly Prov. 2-12, 3-12, 4-12;

and marked "Document No. 51,298";

2. Agreement, dated the Twenty-first day of December, 1956,
respecting the wells described as:

Calstan Daly 13-1, 16-1;
Calstan Daly Prov. 1-12, 4-12;

and marked "Document No. 52,113".

Proposed BOARD ORDER NO. PM 15
for DALY HIGH PRESSURE PILOT FLOOD

WHEREAS, subsection (9) (d) of Section 62 of "The Mines Act", Chapter M 160, 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 March 19th and December 15th, 1970, for the purpose of considering a ~~Proposed~~ Pilot High Pressure Water Flood in the Daly Field in Manitoba by Chevron Standard Limited.

AND WHEREAS, upon due consideration of the submissions and testimony at the hearing, the Board has found that it is reasonably necessary to conduct a pilot high pressure flood in the Daly Field in Manitoba.

NOW, THEREFORE, the Board orders:

1. (a) Chevron Standard Limited shall conduct a pilot high pressure water flood by the injection of water to the Lodgepole formation of the Mississippian Age underlying part of the Daly Field;
- (b) The pressure maintenance operations shall be in accordance with, and subject to, the following rules:

PRESSURE MAINTENANCE RULES

1. (1) Water, produced from oil wells in the Daly Field, shall be injected to the Lodgepole formation of the Mississippian Age in the well
Chevron Daly WIW 14-1-10-28.
 - (2) The volume of water injected shall not exceed 600 barrels per day, at any time.
 - (3) The injection pressure during the first month of operation of the pilot flood shall not exceed 1,300 p.s.i.g.
 - (4) Chevron Standard Limited shall, following the first month's test period, file with the Oil and Natural Gas Conservation Board, a report of the performance and efficacy of the high pressure pilot flood. The report required under this Clause may be subject to any direction, in writing, by the Board.
2. The Board may grant permission to the operator to increase the injection pressure by an increment of 100 p.s.i.g., during succeeding test periods of one (1) month's duration; and the requirements of sub-clause 4 of Rule 1 shall apply for each test period.

3. Chevron Standard Limited shall immediately report to the Board any indication of channelling or breakthrough of injected water to producing wells, or any indication of other detrimental effects that may be attributable to the high pressure water flood.
4. After commencement, the operator shall, subject to any remedial work required to be performed on the water injection well or offsetting oil producing wells, endeavour to maintain continuous injection for not more than three hundred and sixty-five (365) consecutive days from the effective date of this order.
5. Notwithstanding the provisions of Rule 4, the Board may, upon application by the operator, approved the suspension of water injection.
6. This order shall be effective at the hour of seven o'clock in the forenoon on February 1, 1971.

Proposed BOARD ORDER NO. PM 15
for DALY HIGH PRESSURE PILOT FLOOD

WHEREAS, subsection (9) (d) of Section 62 of "The Mines Act", Chapter M 160, 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 March 19th and December 15th, 1970, for the purpose of considering a ^{Pilot} Proposed High Pressure Water Flood in the Daly Field in Manitoba by Chevron Standard Limited.

AND WHEREAS, upon due consideration of the submissions and testimony at the hearing, the Board has found that it is reasonably necessary to conduct a pilot high pressure flood in the Daly Field in Manitoba.

NOW, THEREFORE, the Board orders:

1. (a) Chevron Standard Limited shall conduct a pilot high pressure water flood by the injection of water to the Lodgepole formation of the Mississippian Age underlying part of the Daly Field;
- (b) The pressure maintenance operations shall be in accordance with, and subject to, the following rules:

PRESSURE MAINTENANCE RULES

1. (1) Water, produced from oil wells in the Daly Field, shall be injected to the Lodgepole formation of the Mississippian Age in the well
Chevron Daly WIW 14-1-10-28.
 - (2) The volume of water injected shall not exceed 600 barrels per day, at any time.
 - (3) The injection pressure during the first month of operation of the pilot flood shall not exceed 1,300 p.s.i.g.
 - (4) Chevron Standard Limited shall, following the first month's test period, file with the Oil and Natural Gas Conservation Board, a report of the performance and efficacy of the high pressure pilot flood. The report required under this Clause may be subject to any direction, in writing, by the Board.
2. The Board may grant permission to the operator to increase the injection pressure by an increment of 100 p.s.i.g., during succeeding test periods of one (1) month's duration; and the requirements of sub-clause 4 of Rule 1 shall apply for each test period.

3. Chevron Standard Limited shall immediately report to the Board any indication of channelling or breakthrough of injected water to producing wells, or any indication of other detrimental effects that may be attributable to the high pressure water flood.
4. After commencement, the operator shall, subject to any remedial work required to be performed on the water injection well or offsetting oil producing wells, endeavour to maintain continuous injection for not more than three hundred and sixty-five (365) consecutive days from the effective date of this order.
5. Notwithstanding the provisions of Rule 4, the Board may, upon application by the operator, approved the suspension of water injection.
6. This order shall be effective at the hour of seven o'clock in the forenoon on February 1, 1971.

INTER - DEPARTMENTAL MEMORANDUM

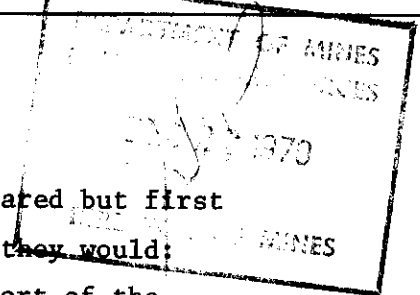


FROM M. J. Gobert,
Senior Assistant Deputy Minister,
Mines and Natural Resources.

DATE December 21, 1970.

TO J. S. Roper,
Director,
Mines Branch.

SUBJECT THE OIL AND MATERIAL GAS CONSERVATION BOARD DALY FIELD - HIGH PRESSURE PILOT FLOOD



I suggest a Pressure Maintenance Order be prepared but first please have Mr. Gamey phone Mr. P. Pisio and ask him if they would:

1. Update the material submitted in support of the application with the latest figures on the Daly Flood and something more recent on the Deer Mountain Flood and;
2. Would it be practical for us in the order to require them to increase the injection pressure by monthly increments of 100 p.s.i. with a production period of one month or more after every increase with a report to us before the next increase.

M. J. Gobert.

*See notes
phone to Pisio - Dec 24/70*

INTER - DEPARTMENTAL MEMORANDUM

FROM F. S. Gamey
Reservoir Engineer



PROVINCE
OF
MANITOBA

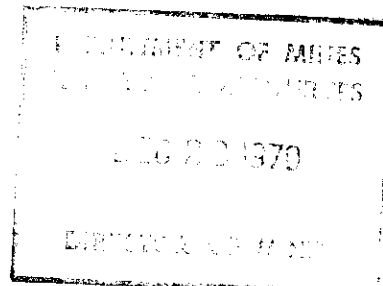
DATE December 17, 1970

TO M. J. Gobert
Assistant Deputy Minister

SUBJECT High Pressure Flood - Daly Field

WELL: 14-1-10-28

AGREEMENTS FOR WATERFLOODING ENTERED INTO BY
THE MINISTER OF MINES AND NATURAL RESOURCES



SCHEDULE A

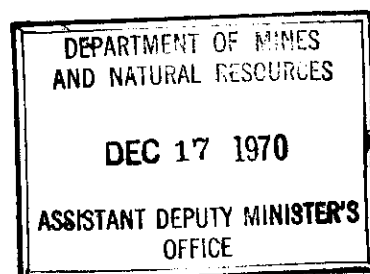
Agreement, dated 15th day of May, 1953, respecting wells
described as Calstan Daly 10-1A, 14-1, 15-1, 16-1,
Calstan Daly Prov. 2-12,
marked as Document No. 8924 - attached
Order-in-Council No. 411/57 - attached

SCHEDULE B

Agreement, dated 26th day of May, 1956, respecting the
wells described as
Calstan Daly 14-1,
Calstan Daly Prov. 2-12, 3-12, 4-12,
marked as Document No. 51,298 - attached
Order-in-Council No. 411/57

No Pressure Maintenance Orders were issued for the Daly Waterflood.

Order No PM.6 - Bralorne Pilot Water Flood - attached.

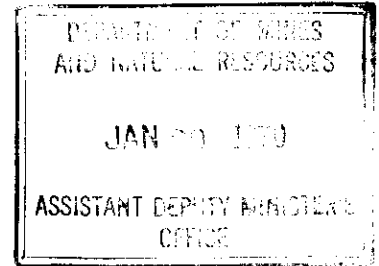




CHEVRON STANDARD LIMITED

400 FIFTH AVENUE S.W., CALGARY 1, ALBERTA

January 27, 1970



Oil and Natural Gas Conservation Board
Department of Mines and Natural Resources
Province of Manitoba
901 Norquay Building
401 York Avenue
Winnipeg 1, Manitoba

Attention: Mr. W. W. Mair, Chairman

Gentlemen:

Under The Mines Act, being Chapter 166 of The Revised Statutes of Manitoba, 1954, and amendments thereto, Chevron Standard Limited hereby applies to the Board for an order allowing the applicant to increase injection pressure above the estimated formation fracture pressure in a certain portion of the Daly Field.

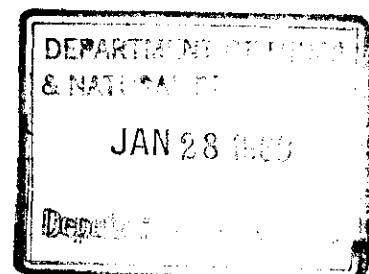
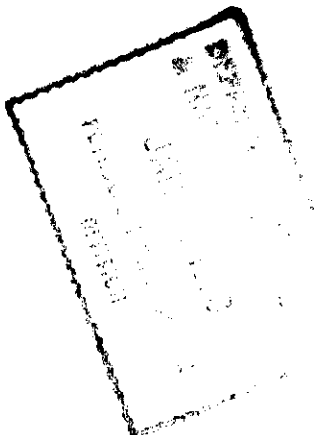
In support of this application we enclose ten copies of "Proposal For Daly High Pressure Waterflood."

An early consideration of our request would be greatly appreciated.

Respectfully submitted,

for *Alvin P. ENG*
J. G. TROWELL
Division Superintendent
Producing Department
Calgary Division

SNB/cs
Encls.



PROPOSAL FOR DALY HIGH PRESSURE WATERFLOOD

The applicant proposes that the portion of the Daly field presently under waterflood be subjected to injection pressures greater than the currently imposed 1,080 psi surface limitation. It is desirable to increase the injection pressure since sufficient quantities of water cannot be injected with current pressure restrictions.

Initially, a pilot scheme using the 14-1-10-28 injection well would be conducted to confirm the feasibility of the project. The injection pressure at the pilot injection well would be increased gradually until a suitable volume of water was being injected. It is possible that pressures in excess of 1,500 psi will be necessary. Upon the completion of a successful test, it is the applicant's intention to expand the scheme to include the entire project.

The Daly waterflood area is shown on Figure 1. From net pay isopachs, it is estimated that the original oil-in-place was 26,000,000 barrels (see Figure 2). The indicated recovery from the present scheme is 4,500,000 barrels for a recovery factor of 17%. Cumulative production to June 30, 1969 was 3,550,000 barrels.

It is estimated that, by increasing the amount of water injected, the ultimate recovery could be increased by 1,500,000 barrels to 6,000,000 barrels to realize a recovery factor of 23%. The applicant submits that there is no indication that exceeding formation fracture pressure will be detrimental to the performance of the waterflood.

Appendix I contains a summary of the performance of the present waterflood.

Appendix II contains details of the applicant's proposed scheme, and reference to other high pressure schemes in existence.

APPENDIX I

REVIEW OF THE PERFORMANCE OF THE EXISTING SCHEME

INTRODUCTION

The Daly waterflood commenced operations in July 1953 as an 80 acre, 5 spot pilot flood. Early increases in production experienced at the central producer, 15-1, and the offset producer, 3-12, led to an expansion of the waterflood in December 1954. Subsequent expansions to the project in 1955, 1956, 1959 and 1961 have increased the area to cover 1960 acres.

GEOLOGY

The Daly field lies on the northeast flank of the Williston basin, about 10 miles west of the town of Virden. The reservoir beds are limestones of the Lodgepole Formation of Mississippian age. Regional dip of these beds is about 30 feet per mile to the southwest in this area, and they are unconformably overlain by the Jurassic Watrous series of Red Beds and anhydrites which form a good seal. Anhydritization from the very evaporitic Watrous seas commonly penetrated the limestones to a depth of 60 or more feet, destroying the reservoir by infilling.

Although there is a structural trough along the east side of the Daly field, with a reversal in the order of 40', the trap is in part stratigraphic, with permeability disappearing along strike. The reservoir beds have been divided into three zones as follows:

1. The First Crinoidal - This unit, immediately underlying the anhydritized zone, is a limestone, crinoidal, in part siliceous, with earthy chert nodules and some brown and maroon shaly interbeds. It is commonly finely crystalline and has irregular poor to good intergranular and fine vuggy porosity. It

is 20' - 30' thick.

2. The Main Crinoidal - This is a limestone with coarse crinoidal bands, and some shaly interbeds. Porosity ranges from poor to good. It is 8' - 15' thick and overlies a shaly unit 10' - 15' thick, which is sometimes known as the Cruickshank shale.
3. The Cruickshank Crinoidal - Another limestone with coarse crinoidal bands and some shaly interbeds. Porosity is patchy and ranges from very poor to good. The zone is 6' - 12' thick.

At the bottom of the Cruickshank Crinoidal is a thick argillaceous limestone and calcareous shale unit called the Shaly Zone. This zone is approximately 200' thick.

Permeability in the field is generally poor and oil saturation is not uniform. Fluid recoveries on drillstem tests were usually small.

HISTORY

The first well drilled in the waterflood area was Chevron Daly 7-12-10-28. It encountered 52' of Mississippian section between the First Crinoidal and the top of the Shaly zone, of which 30' is effective pay.

The most common completion technique in Daly consisted of cementing the casing at the top of the First Crinoidal and sand fracturing the open hole interval. A volume of 10,000 lbs. of sand fed at a rate of 5 - 10 BPM at 1500 - 2500 psi on surface was the most common method of completion. Some other early methods of stimulation included shooting with nitroglycerin, acid fracs and hydra fracs.

Acid treatments of varying size and type met with limited success in attempts to increase production rates. Similar limited success has also been experienced in attempts to improve declining injection rates by acid stimulating injection wells.

Construction of waterflood facilities began in May 1953. In July of that year, water was injected into four wells, 10-1A, 14-1, 16-1 and 2-12, of the initial 80 acre 5 spot. In the fall of 1954, 8-11, 6-12 and 12-12 were converted to water injection wells. In 1955, a major waterflood expansion took place with the drilling out of Section 11 specifically to add to the waterflood operations. Six wells were drilled for water injection, and two producing wells were converted. Several wells were drilled as central producers to complete the 5 spot pattern. Further expansions of the project in 1956, 1959 and 1961 have increased the area to the present 1960 acres.

Waterflood success has been achieved mainly in the areas of the original pilot scheme and the first expansion. Flood response in the region of the second expansion has not been as good as expected, particularly in the Section 11 area.

Wells in this latter area were fractured with large volumes of sand at high feed rates. Injection tests indicated that some fractures may have broken into the Shaly zone. Cement squeezes of the thief zone were attempted in these wells with some initial success; however, most of the wells that had once achieved a water shut off are operating at low efficiencies today.

Injection pressures in Daly stabilized at 1,080 psi after only two to three months of injection. A rapid decline in injection rates was noted. Total water injected into the pilot area declined from 2,000 BWPD to 730 BWPD in a period of 13 months. Presently, only 5 of the 22 injection wells are capable of effective injection

at rates of over 100 BWPD at the 1,080 psi wellhead pressure.

ORIGINAL OIL-IN-PLACE

An attempt was made to establish the amount of oil originally in place in the waterflood area. The total pay isopach is presented as Figure 2.

Many wells in the south and northwest portions of the waterflood area penetrated the entire pay interval and have core analysis data. The net pay isopach drawn through these areas is deemed fairly accurate; however, a northeast to southwest belt through the middle of the waterflood area has virtually no core analysis data. To compound the difficulty in contouring the area, none of the wells penetrated the entire pay interval and few, if any, reliable porosity logs exist. The values assigned to wells in this area are estimates made from logs to which an extrapolated value for unpenetrated pay has been added.

Table I presents a list of reservoir parameters used to calculate the original oil-in-place. These parameters were obtained from interpretation of logs, core analysis, oil base core data, and other miscellaneous sources. Employing this data, the calculated original oil-in-place was established to be 26,000,000 barrels.

ULTIMATE RECOVERABLE OIL

A decrease in the amount of water injected into the producing horizon has resulted in a corresponding decline in production rate. Production in the waterflood area, which averaged 630 BOPD in 1961, has declined to an average of 410 BOPD in 1968. The corresponding decrease in water injected into the "effective" injection wells is 585 BWPD. A substantial production drop has been experienced in the southwest quarter of Section 12, which is the area exhibiting the best performance

to date. The two wells which were each once capable of producing in excess of 100 barrels of oil per day, now have a combined production rate of only 75 barrels per day. Injection into 4 of the 6 offsetting wells is approximately 50 BWPD per well.

Although water is produced in several wells, it is questionable that breakthrough, as such, has occurred in any part of the field. The decline curves for all wells were examined to establish the ultimate recoverable oil. It does not appear that high water production will be an influential factor when the economic limit of 120 BOPD for the existing project is reached in 1979. Indicated ultimate recovery from the waterflood area is 4,500,000 barrels, or 17% of the original oil-in-place. Of this total, 2,115,000 barrels are made up of primary oil and 2,385,000 barrels of secondary oil.

Waterflood studies conducted for the North Virden Scallion and Virden Roselea fields indicate an ultimate recovery of between 28% and 35% of the original oil-in-place. Although the permeability in Daly is lower than the other Virden area fields, the 5 spot waterflood which is in effect in Daly should yield a higher recovery factor than the 17% forecast.

APPENDIX II

DALY HIGH PRESSURE WATERFLOOD

INTRODUCTION

A critical factor influencing the choice of waterflood pattern is allowing for an adequate number of injection wells to best sweep all areas of the field. Low injectivity dictates a dense injection pattern.

In Daly, a 5 spot waterflood pattern was selected because of low permeability in the reservoir. This allows for maximum practical injection because of the close network of injection wells. It now has become evident that, even with this 5 spot pattern, insufficient quantities of water are being injected because of the present injection pressure restrictions. It will, therefore, be necessary to increase the injection pressure to above the formation fracture pressure in order to achieve adequate injectivity.

A. Pilot Waterflood

Location

A good method of confirming the feasibility of a new project is to conduct a small-scale field test. It is proposed that such a pilot test be conducted at 14-1-10-28 to confirm the feasibility of high pressure flooding in this area.

The following were considerations in the selection of 14-1 as the pilot injection well:

1. 14-1 is located in an area where waterflood response has been experienced.

An improvement in production in an area of response will indicate the feasibility of the project in areas of good production, as well as not

discounting the possibility of improvement in poor areas. Conversely, a high pressure flood test conducted in an area of poor response may show no improvement in production which, however, would yield little indication of the feasibility in the better response areas.

2. A spinner survey conducted at 14-1 in September 1956 indicated a uniform distribution of injected water over the entire pay interval at 1,400 psi surface injection pressure.

Objective

The main objective of the pilot test is to determine what production increases occur at higher injection rates and to establish the pressure at which desired quantities of water can be injected. The production in the three offsetting wells will be monitored closely. After reviewing various injection well histories in other projects, where fracture pressure appears to have been exceeded, it may be concluded that a tenfold increase in injectivity is not unlikely. At Daly, a minimum two to threefold increase in injectivity index is the objective.

Procedure

A separate injection facility will be located at 14-1 in order that there would be no disruption in the operation of the present waterflood. It may be possible to use the present injection line for water source; however, it may be necessary to install a water supply line from the 15-1 plant site.

The pilot test will start at pressures that are 100 - 200 psi above the present 1,080 psi injection pressure. The pressure will be increased in

gradual increments until the desired quantity of water can be injected. Although it is anticipated that a twofold increase in the injectivity index may be reached at 1,500 psi, it would be undesirable to impose pressure limitations at the pilot stage.

B. Full-Scale High Pressure Waterflood

Proposal

Currently an average of 1,300 BWPD is being injected into the waterflood area. Three wells, as listed on Table II, are considered ineffective and, therefore, excluded from this total. The amount of secondary oil produced from the area is approximately 300 BOPD. A barrel of injected water has the net effect of contributing 0.23 barrels of oil.

It is desirable to substantially increase the amount of water injected in order to appreciably increase production. If the injectivity index was doubled, the amount of water injected could be increased to 3,260 BWPD. It is anticipated that this volume would be adequate for a satisfactory production increase. A production forecast is presented as Figure 3.

The present injection plant, located at 15-1-10-28, will be used for the high pressure waterflood. It will be necessary to modify the plant in order to house additional equipment, and to cope with higher pressures. Modification of some wellhead equipment may also be necessary. No difficulties are anticipated in the operation of the injection lines. An adequate water supply for the project is currently available, since water production in west Daly is substantially greater than the increased volume required for a high pressure waterflood. A water supply line from west Daly already provides water

to the present project.

Ultimate Recoverable Oil

Because of the decline in injection rates, it has become apparent that the ultimate recovery at Daly will not be in the 28% - 35% range predicted for various other Chevron operated Manitoba waterfloods. As discussed in Appendix I, the ultimate recovery of the present Daly waterflood will be 17% of the original oil-in-place. The main contributing factor to this poor recovery is the injection of inadequate volumes of water due to existing surface pressure limitations.

It is estimated that, by increasing the injection rates, the ultimate recovery can be increased substantially. With other Manitoba floods serving as a guide, it is anticipated that the recovery at Daly can be increased to 23% of the original oil-in-place which represents an additional 1,500,000 barrels of recoverable oil.

C. Review of Other High Pressure Waterfloods

Deer Mountain

The Deer Mountain Unit in Alberta produces from the Swan Hills Formation platform unit of the Beaverhill Lake group at an average depth of 7,600 feet. A pilot waterflood was commenced in October 1965. Enlargements to the original scheme have increased the area to include the present 10 injection wells and 28 producing wells, in a 9 spot waterflood pattern (see Figure 4). All wells were drilled on 160 acre spacing.

To illustrate the effect of increased injection pressure on injection rate,

two injection wells in Deer Mountain Unit No. 1 have been selected. The injection pressure at 4-7-69-8 W5 was increased from 3,000 psi in September 1966 to 3,800 psi in October 1966. The corresponding rise in injectivity index was from 0.06 to 0.22 BWPD/psi, while the injection rate increased from 270 BWPD to 1,000 BWPD. The injection pressure at 4-6-69-8 was increased from 3,000 psi in January 1967 to 3,550 psi in March 1967. This increased the injectivity index fivefold. The injection rate was increased from 70 BWPD to 420 BWPD (see Figures 5 and 6).

An increase in production due to waterflood response has been recorded in most wells. Only two wells, 12-5-69-8 W5 and 12-7-69-8 W5, may have experienced water breakthrough to date (see Figures 7 and 8). Both wells began producing water in April 1967; however, water production ceased within five months. Water production resumed at 12-7 in September 1968. By April 1969 the water cut at this well had increased to 14%. In excess of a twofold increase in production rate has been experienced at the well, beginning about the time that the injection pressure at an offsetting well was increased.

Other High Pressure Floods

The House Mountain waterflood has been designed to operate at 5,000 psi injection pressure. However, because of decreased allowables, a sufficient quantity of water is presently being injected at a pressure below formation fracture pressure.

A pilot high pressure waterflood was conducted at Ebor by Bralorne Petroleum Ltd. during the summer of 1966. The short four-month duration of this pilot scheme was insufficient to conclusively establish the feasibility of the project.

LIST OF TABLES AND FIGURES

Table I	Summary of Reservoir Parameters
Table II	Daly Injection - Below and Above Fracture Pressure
Figure 1	Map of Waterflood Area
Figure 2	Isopach of Net Pay
Figure 3	Production Forecast for High Pressure Flood
Figure 4	Map of Deer Mountain Unit
Figure 5	Injection Well Plot 4-6-69-8 W5
Figure 6	Injection Well Plot 4-7-69-8 W5
Figure 7	Production Well Plot 12-5-69-8 W5
Figure 8	Production Well Plot 12-7-69-8 W5

TABLE I

SUMMARY OF RESERVOIR PARAMETERS

DALY WATERFLOOD AREA

Surface Area	1,960
Average Pay Thickness (Ft.)	28.5'
Reservoir Rock Volume	56,000 Acre-ft.
Average Porosity	10.7%
Average Water Saturation	39.5
Average Initial Oil Saturation	60.5
Formation Volume Factor (Res. Bbls./S.T.B.)	1.08
Original Oil-in-Place (Bbls./Acre-ft.)	465
Original Oil-in-Place (Barrels)	26,000,000
Estimated Recovery Under Present Waterflood	4,500,000
Recovery Factor	17%

TABLE IIDAILY INJECTION - BELOW AND ABOVE FRACTURE PRESSURE

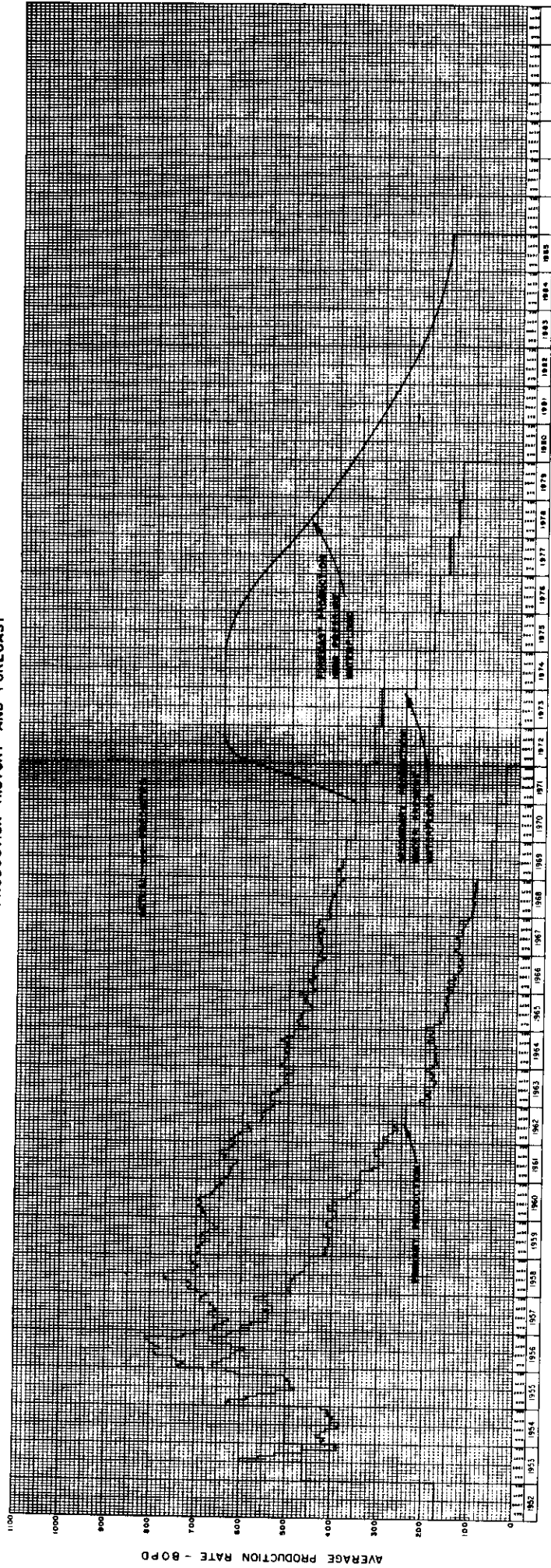
<u>Well</u>	<u>Injection Rate</u> <u>June 1969</u> <u>BWPD</u>	<u>Injectivity Index</u> <u>@ 1,080 psi</u> <u>BWPD/psi</u>	<u>Injectivity Index</u> <u>@ 1,500 psi</u> <u>BWPD/psi</u>	<u>Injection Rate</u> <u>w/Frac. Press.</u> <u>Exceeded</u>
<u>Effective</u>				
12-1-10-28	75	.069	.138	207
14-1-10-28	54	.050	.100	150
16-2-10-28	106	.098	.196	294
2-11-10-28	84	.078	.156	234
8-11-10-28	58	.054	.108	162
14-11-10-28	39	.036	.072	108
2-12-10-28	118	.109	.218	327
4-12-10-28	64	.059	.118	177
6-12-10-28	50	.046	.092	138
8-12-10-28	44	.041	.082	123
10-12-10-28	181	.168	.336	400*
12-12-10-28	51	.047	.094	140
14-12-10-28	250	.234	.268	400*
4-13-10-28	151	.140	.280	400*
Subtotal	1,328			3,260
<u>Ineffective</u>				
16-1-10-28	236			300*
10-11-10-28	249			300*
12-11-10-28	219			300*
Total	2,032			4,160

*Maximum Rate

[illegible]

14-1-10 28

FIGURE 3
DAILY WATER FLOOD
PRODUCTION HISTORY AND FORECAST



Rge. 9

Rge. 8 W. 5 M.

T. 69

T. 68

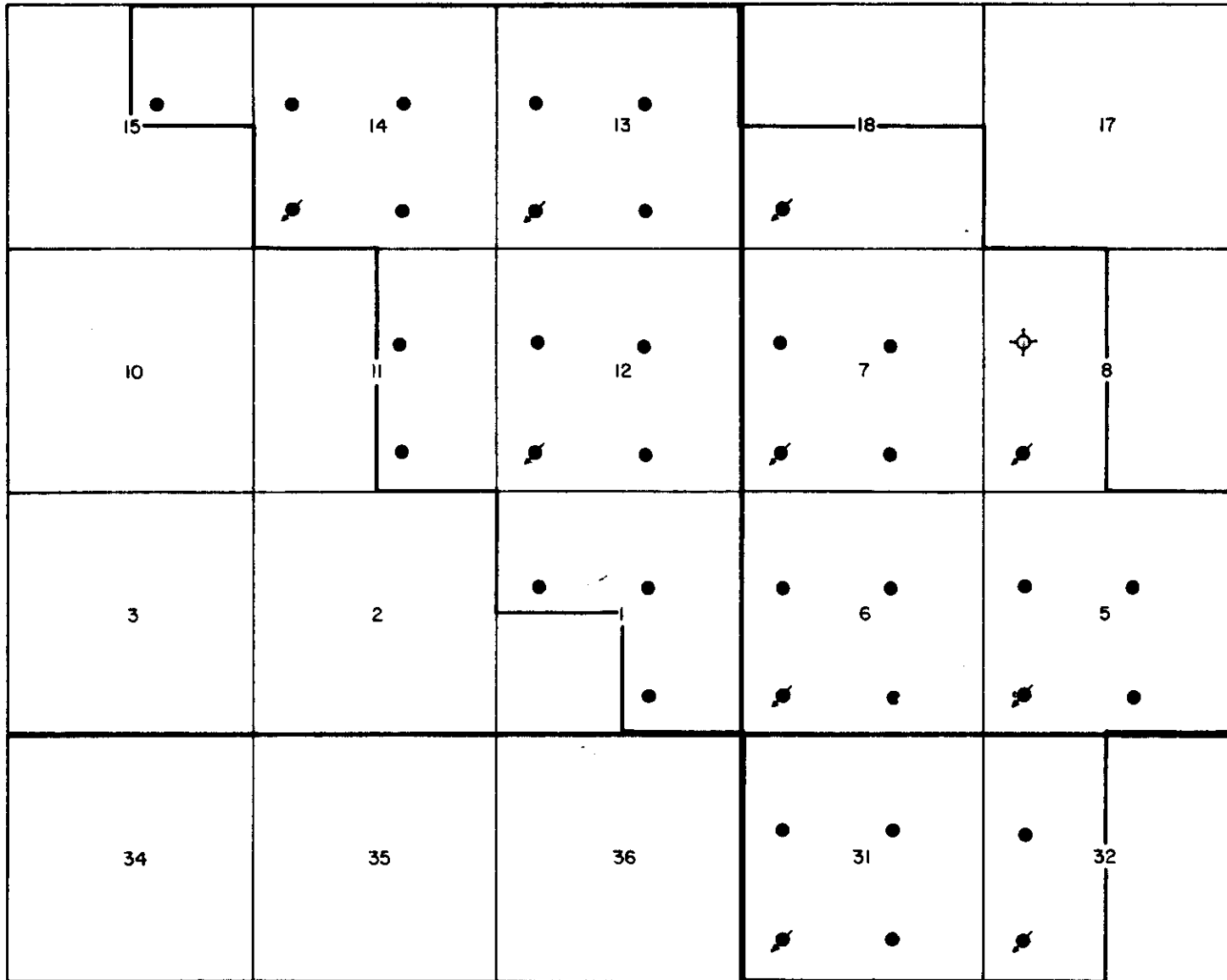
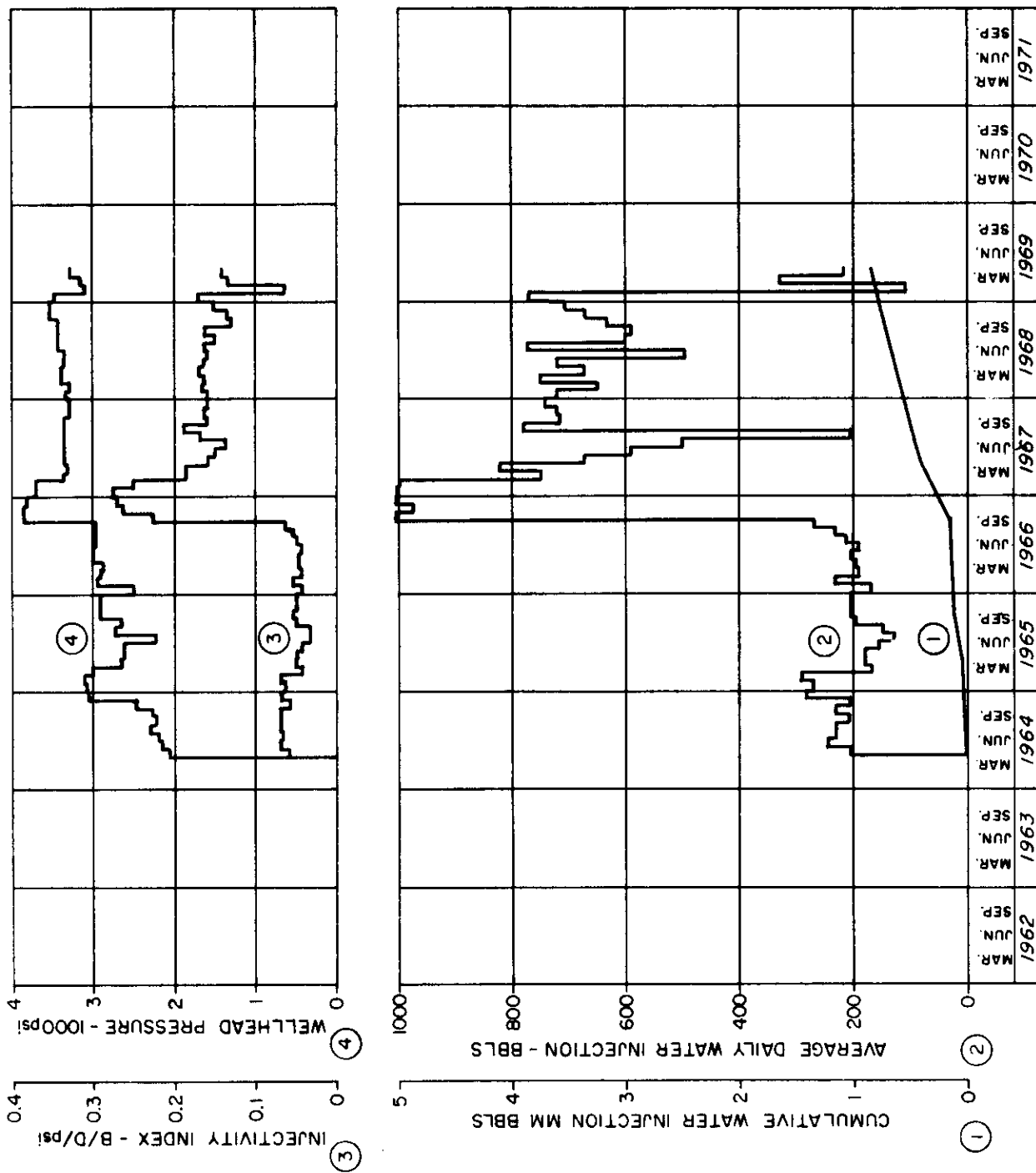


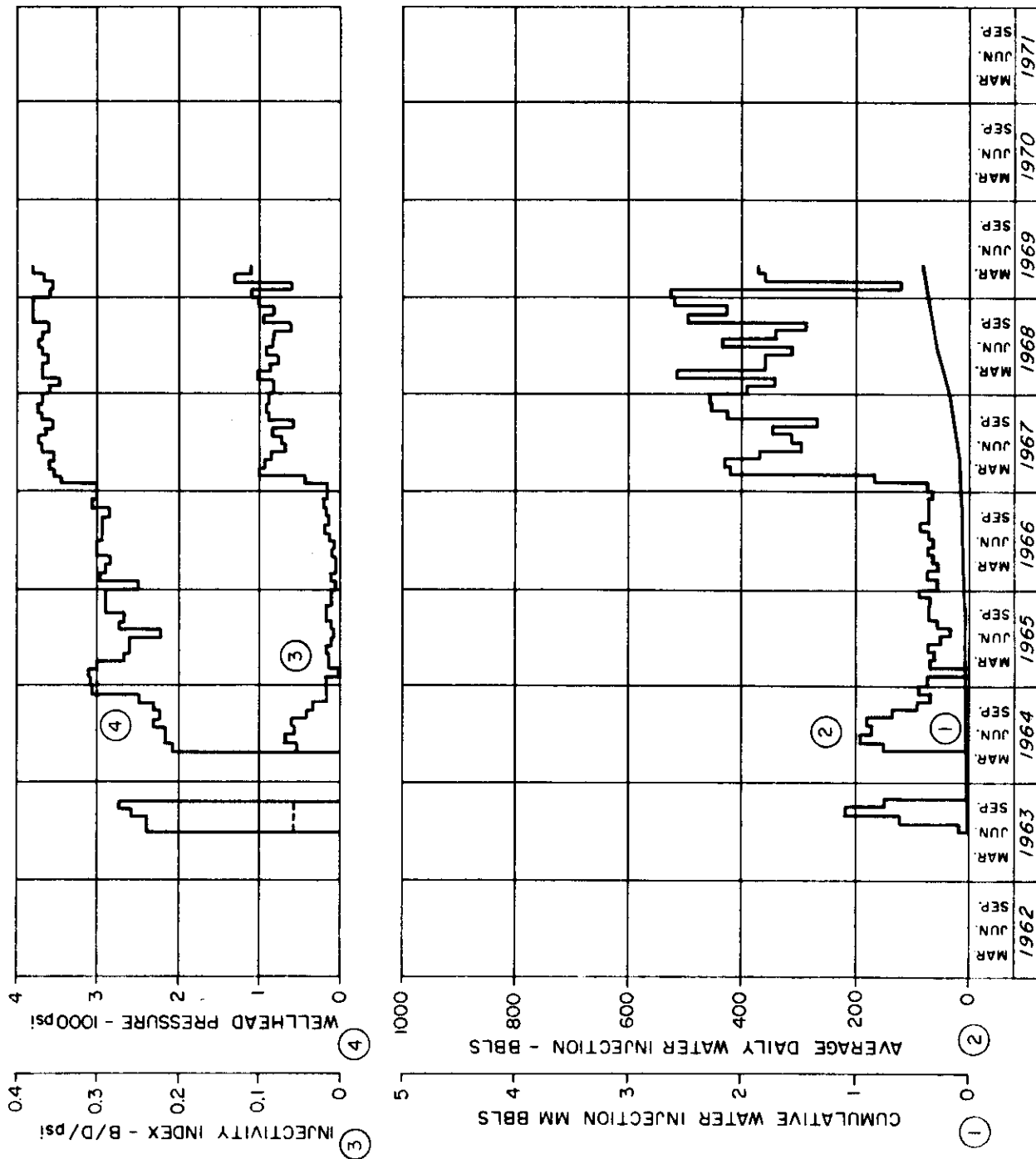
FIGURE 4

DEER MOUNTAIN UNIT

SCALE: 1 1/2 in. = 1 mi.



DEER MOUNTAIN UNIT No.1
INDIVIDUAL WELL INJECTION PERFORMANCE
4 - 7 - 69 - 8 - W5M



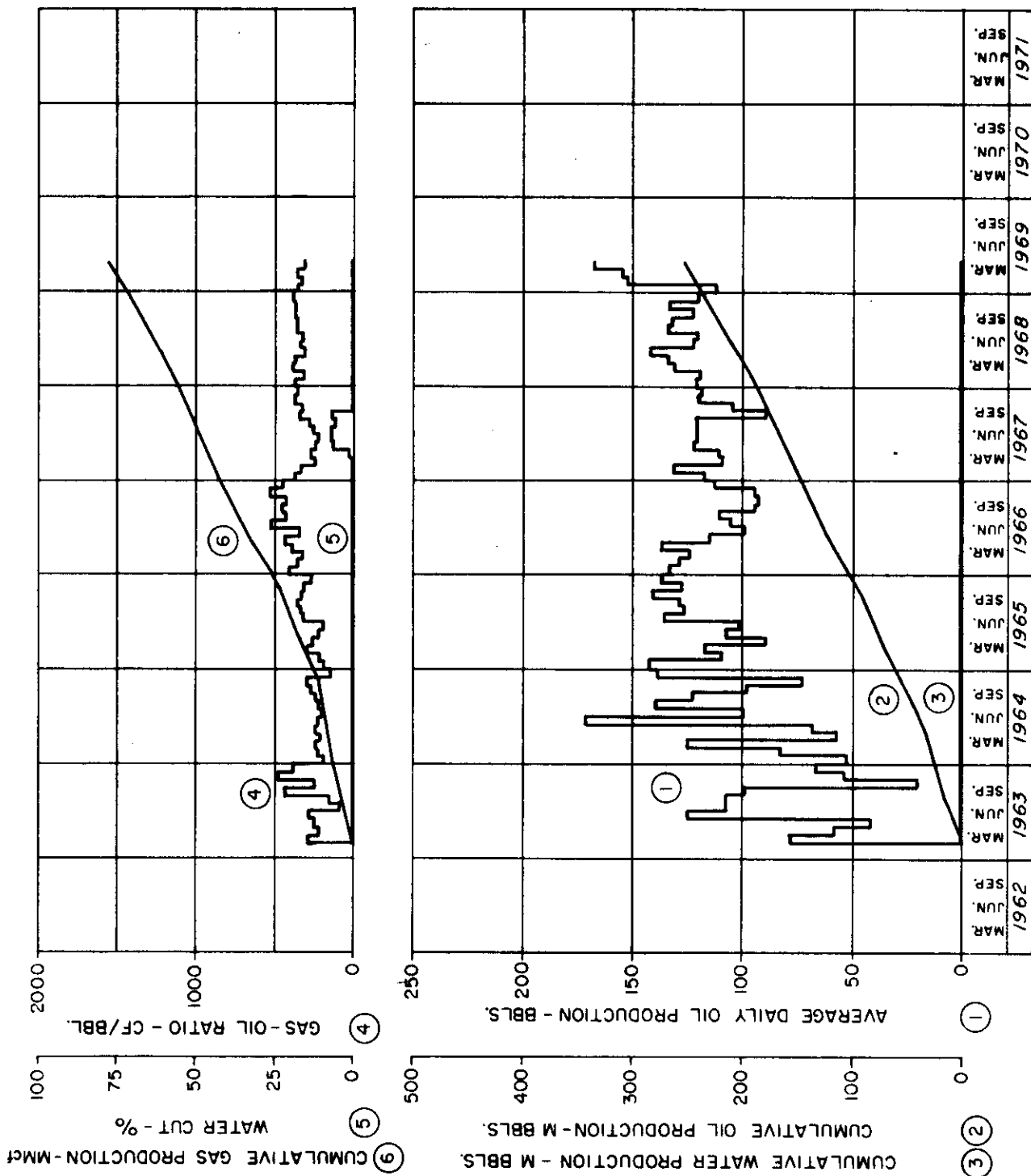


FIGURE 7

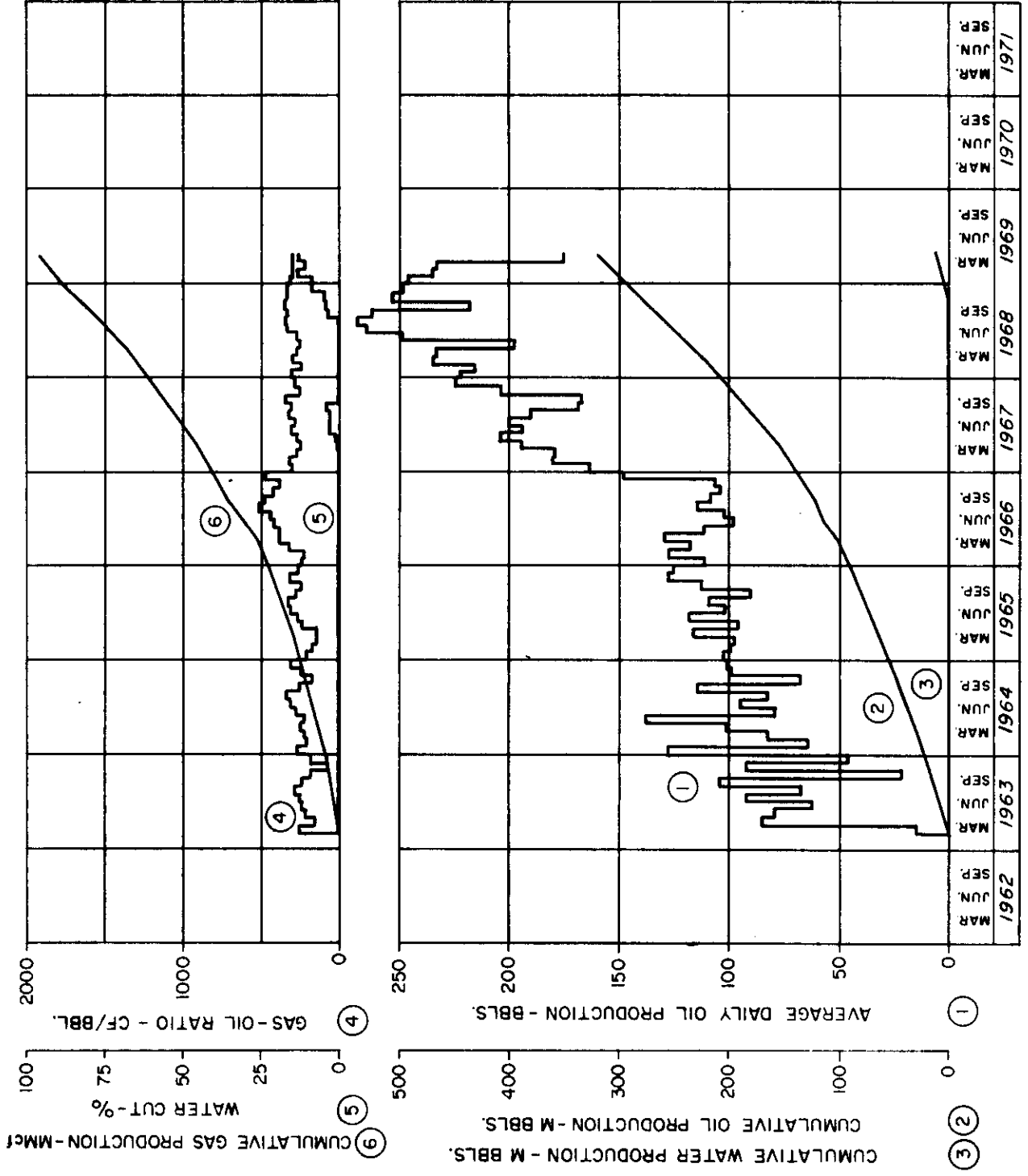


FIGURE 8