

No.

NAME
NOM

NEW FILE

FIELD / POOL

SOURIS Hartney
Girden Lodgepole
A Pool

Waterflood Application.

7 LTH 1 1/2
1 1/2 2 1/2

MARGARET CSERES.
(204) 858-2264
SOURIS HARTNEY WF.

- ① surf. disturbance ✓
- ② notice of application ✓
- ③ unit enlargement

- resistant to change.

Manitoba

CONSERVATION

FILE: Field/Pool
Files



Souris Hartney
Lodestone Virden
A Pool

Waterflood Approval

360-1395 Ellice Ave
Winnipeg MB R3G 3P2
CANADA

PHONE: (204) 945-6577
FAX: (204) 945-0586

August 4, 2000

Jed Sanderson
Tundra Oil and Gas Ltd.
P.O. Box 1960
Virden MB R0M 2C0

Dear Mr. Sanderson:

Re: Souris Hartney Unit No. 1 6-16-6-22 (WPM)
Amended Approval to Convert to Water Injection

In accordance with Clause 1.0 of Waterflood Order No. 9, approval is granted to inject water into the 6-16-6-22 (WPM) well in Souris Hartney Unit No. 1 for a period of six months, August 1, 2000 to January 31, 2001. The temporary approval is granted to allow Tundra the opportunity to evaluate initial waterflood response at producers offsetting the 6-16 well. This approval may be extended for one additional six-month period, if it is determined that the condition of the casing has not significantly deteriorated. Attached is revised Schedule A to Waterflood Order No. 9 listing the approved water injection wells.

As outlined in your letter dated July 20, 2000 and discussed with the Branch the following conditions will apply to temporary water injection at the 6-16-6-22 well:

1. Tundra is to install a high-pressure switch on the annulus that will shut-off injection if the annulus pressure exceeds 1000 kPa.
2. If pressure is observed on the annulus, injection is to be suspended until the well is repaired.
3. The annulus is to be pressure tested prior to commencing injection and every 3 months thereafter. A copy of the pressure test charts are to be submitted to the Waskada District Office.
4. Tundra is to apply before January 31, 2001 for approval to extend injection.

When injection commences at 6-16, the Branch will recalculate the Third Tier EOR Factor (TTEF) for the unit and advise Tundra accordingly.

If you have any questions in respect of this approval please contact John Fox, Chief Petroleum Engineer at (204) 945-6574.

Yours truly,



L. R. Dubreuil
Director



cc: Waskada District Office
Virden District Office
G. Czyzewski, Tundra Oil and Gas Ltd.

Schedule A (Revised – August 4, 2000)

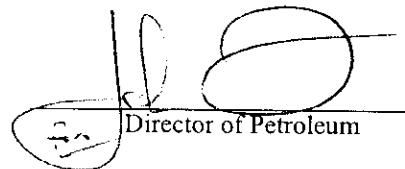
**Waterflood Order No. 9
Souris Hartney Unit No. 1**

Water Injection Wells

Souris Hartney Unit No.1 WIW 2-17-6-22 (WPM)
Souris Hartney Unit No.1 WIW 6-17-6-22 (WPM)
Souris Hartney Unit No.1 WIW 10-17-6-22 (WPM)
Souris Hartney Unit No.1 WIW 6-16-6-22 (WPM)*

*temporary approval expires January 31, 2001

04 - Aug - 00
Date


Director of Petroleum

- repair options
- inj. alternatives
- length of injection
@ 61-16
- originally thought
to be LAm
leak

4-11-6-22 Tundra
to provide plan
for monitoring
annulus (prod.
perforations
leaking)
no annulus press.
test in 1999.

- one year (9 months)
temporary inj.
approval
- quarterly annulus pressure
testing

- traditionally not
allowed inj / sud
wells w/ leaks in
Blainmore

- where do we
establish limit
wnt allowing slow
leak-off

- worst case
scenario (future)
leak gets worse,
cross-flow which
does not result
in annulus pressure
increase

- 1.9" 50-75 L³/d
max inj. limit



FIELD OFFICE: 295 Third Avenue (P.O. Box 1960), Virden, Manitoba R0M 2C0 TEL: (204) 748-3095 FAX: (204) 748-1007

**Manitoba Conservation
Petroleum & Energy
1395 Ellice Ave.
Winnipeg, MB R3G 3P2**

July 5, 2000

Attention: John Fox, Chief Petroleum Engineer

Dear Mr. Fox:

**RE: Application for Approval of Well Operations- Section (47)
Application for Injection Well Conversion- Section (71)
Tundra Souris Hartney 6-16-6-22 W1**

In accordance with Manitoba Oil and Gas Act and Regulations, submitted for your approval are the above-named applications and supported documents.

In support for application to convert the above mentioned well for injection please reference the application made by Tundra Oil and Gas Ltd. for the 6-17-6-22 W1 well in Fall of 1999. A full application was presented at that time with all required components. Additional information will be provided with this application which pertains to the 6-16-6-22 well.

The following information is submitted:

- a) Map of project area is enclosed.
- b) Surface owners:
 - SW-16-6-22 Neil Hunt, General Delivery, Hartney, Manitoba R0M 0X0
 - SE-16-6-22 Mark Hunt, General Delivery, Hartney, Manitoba R0M 0X0
 Mineral Owners:
 - Gibson Oil Ltd. PO Box 245, Hartney, Manitoba, R0M 0X0
 Unit Operators:
 - Tundra Oil and Gas Ltd. 1111-1 Lombard Ave., Winnipeg, Manitoba, R3B 0X4
- c) See included diagram.
- d) Please reference the 6-17-6-22 application.
- e) Copies of the letters to the surface owners along with proof of service are included. In addition, a signed consent form is included from the mineral owners, Gibson Oil Ltd.
- f) Please reference the 6-17-6-22 application.
- g) Please reference the 6-17-6-22 application.
- h) Sections (I) through (V) please reference the 6-17-6-22 application.
 - (vi) **Forecasts:** In the application for 6-17-6-22, prepared by George Czyzewski, two other wells were included as possible locations for injectors. However, all vertical wells in the area were included in the study. The initial two wells were 2-17-6-22 and 10-17-6-22. With the current oil price 2-17-6-22 is now an economic oil producer and would have only partially support 1C-17-6-22 if converted to injection. The 10-17-6-22 well might have prematurely watered out 15-17-6-22 or 3-17-6-22 horizontal wells. Tundra is currently using 4-16-6-22 as an injector for 1C-17-6-22 but to date we have detailed no benefit. The water is moving out of zone. The 6-16-6-22 well was chosen to maximize support to 1C-17-6-22 horizontal well.
 - (vii) And (viii) references 6-17-6-22 application.
 - (ix) **Predictions on recovery:** With 6-16-6-22 converted to an injection well it is anticipated that 1C-17-6-22 will produce an incremental 3% of oil in place.
 - (x) Please reference the 6-17-6-22 application.
 - (xi) The 6-17-6-22 injection well was only put on production in November of 1999. To date there have been no pressure surveys performed on this well.

- i) Convert 8-16-22 as soon as application is granted.
- j) Other:

If there are any questions or further information required regarding this application, please contact the undersigned at 204-748-3095.

Yours truly,

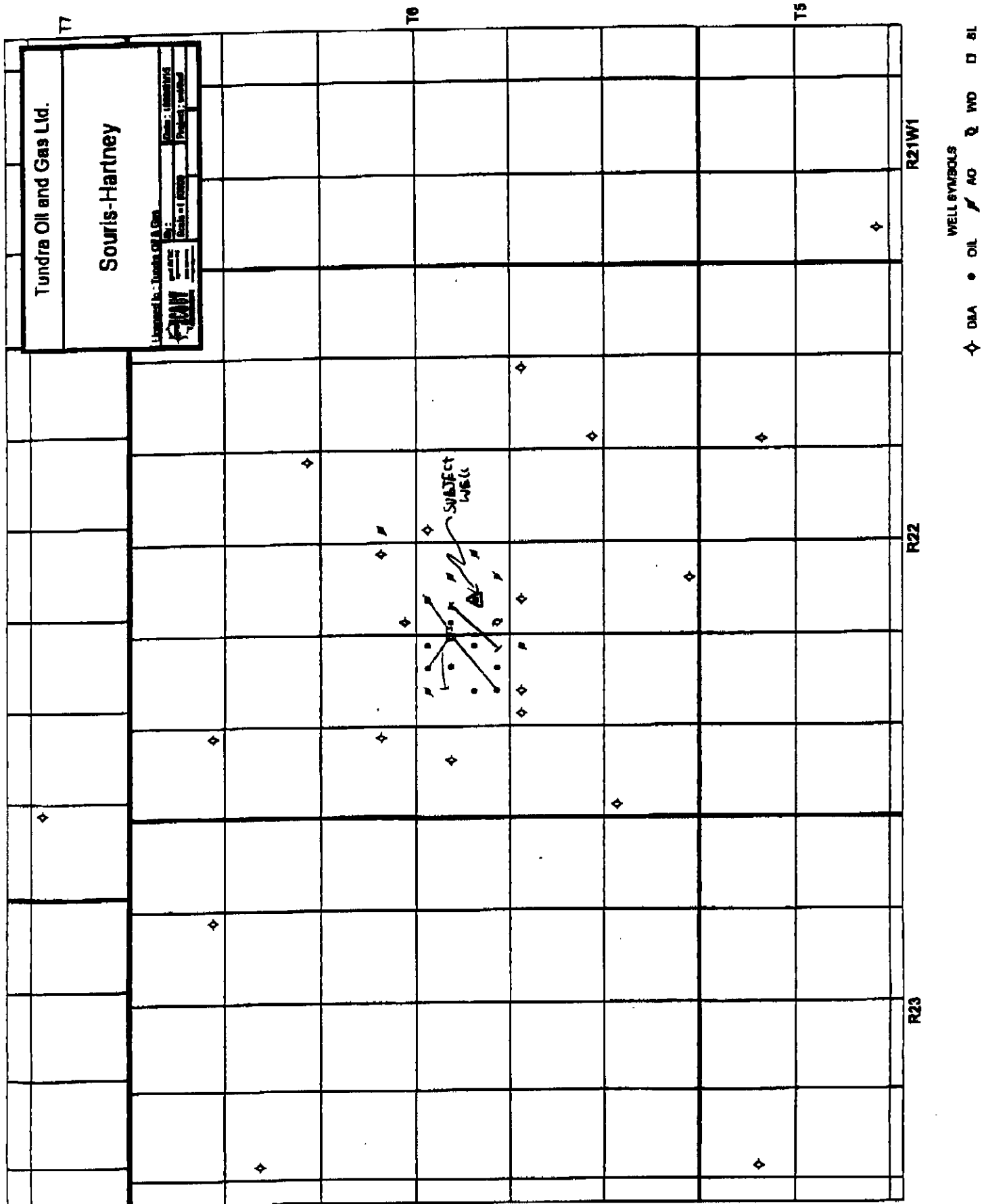


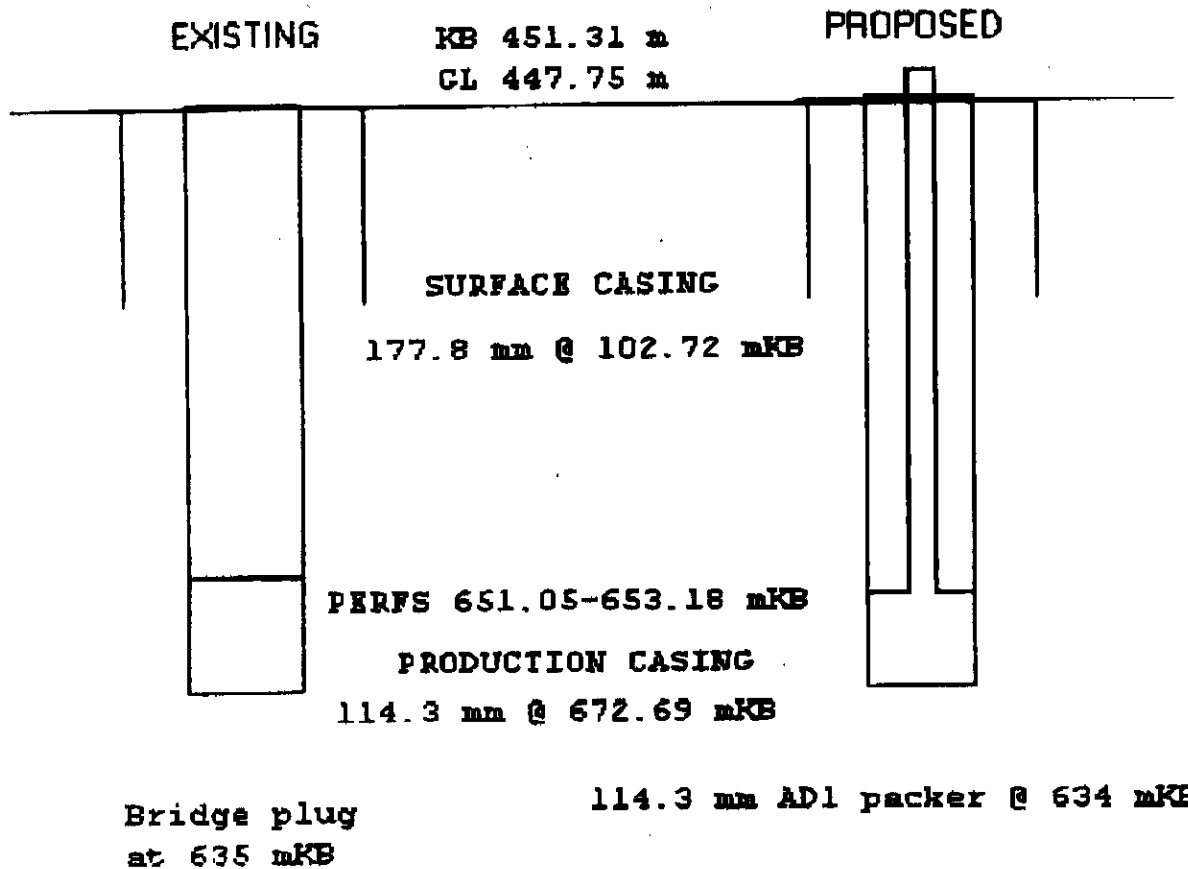
Jennifer Abel, EIT
Production Engineer-In-Training

NE 1/4 - 16-6-22 WPM
KEITH MORDEN (50%)
CON. PERM. TOR. TRUST (50%) } → TUNDRA

FIGURE NO.1

SOURIS HARTNEY FIELD MAP



TUNDRA SOURIS-HARTNEY 6-16-6-22 W1

c)



1111 One Lombard Place, Winnipeg, Manitoba R3B 0X4 TEL: (204) 934-5850 FAX: (204) 934-5820

REGISTERED MAIL

Gibson Oil Ltd.
Box 245
Hartney, MB
R0M 0X0

Attention: Beth Gibson

ATTENTION:
JENNIFER
TOGL VIRDEN

FROM
S. BELLMAN
TOGL WINN

Dear Beth:

RE: MINERAL OWNER CONSENT
Souris Hartney Unit No. 1
Application to Manitoba Conservation Petroleum and Energy Branch
Conversion to a Water Injection Well: TWP 6 RGE 22 W1: SW SEC 16

In accordance with The Oil and Gas Act, Section 71 of the Drilling and Production Regulations, Tundra Oil and Gas Ltd., as operator of the Souris Hartney Unit No. 1 requests your consent for the conversion of the well known as Tundra Souris Hartney Unit No. 1 6-16-6-22W1 well to a Water Injection well. This well was chosen for pressure support in order to increase production to the unit.

As we would like to proceed at the earliest possible date, could you please respond to this request by July 10, 2000.

Please acknowledge receipt of this letter and advise us of your consent to the application by signing the Acknowledgment and Consent below. A self-addressed stamped envelope is enclosed, or you may fax it to me at (204) 934-5820. If you should have inquiries, please call me at (204) 934-5856.

Sincerely,
Tundra Oil and Gas Ltd.

Brad Thlessen
Land Manager

ACKNOWLEDGEMENT AND CONSENT

I hereby consent to the application for converting the 6-16-6-22 well to a water injector.

SIGNATURE Jane Gibson DATE June 28th 2000

Missing: Signed Consent/Report

FIELD OFFICES: (Manitoba & Saskatchewan) P.O. Box 1950, Virden, MB R0M 2C0 TEL: (204) 748-3085 FAX: (204) 748-1007
(Alberta) 301, 12120 - 105 Avenue, Edmonton, AB T5N 0Z2 TEL: (780) 433-2311 FAX: (780) 451-0800



1111 One Lombard Place, Winnipeg, Manitoba R3B 0X4 TEL: (204) 934-5850 FAX: (204) 934-5820

June 27, 2000

Mark Hunt
General Delivery
Hartney, Manitoba
R0M 0X0

R	Registered	Recommandé
	Domestic	Régime intérieur
To	Destinataire	
NAME	MARK HUNT	
ADDRESS	GENERAL DELIVERY	
CITY	HARTNEY	
PROVINCE	MB	
POSTAL CODE	R0M 0X0	

FOR DELIVERY CONFIRMATION	POUR CONFIRMER LA LIVRAISON
20000627	
www.canadapost.ca	
www.manitobapost.ca	
Declared Value Valeur déclarée	78

CUSTOMER RECEIPT

REÇU DU CLIENT

Item No. N° de l'article
78 123 200 545

Dear Mr. Hunt:

RE: NOTICE TO SURFACE OWNER
Souris Hartney Unit No. 1
Application to Manitoba Conservation Petroleum Branch
Conversion to a Water Injection Well: TWP 6 RGE 22 W1: LSD 6 (SE) SEC 16

In accordance with The Oil and Gas Act, Section 71 of the Drilling and Production Regulations, Tundra Oil and Gas Ltd. as operator of Souris Hartney Unit No. 1, is providing notice our application to convert the well known as Tundra Souris Hartney Unit No. 1 6-16-6-22W1 to a Water Injection well.

Should you have any concerns, please contact Mr. John Fox, Chief Petroleum Engineer, Manitoba Conservation at (204) 945-6574.

Sincerely,
TUNDRA OIL AND GAS LTD.

Brad Thiessen
Land Manager

sb

Business Reply Mail 1000000000000

FIELD OFFICES: (Manitoba & Saskatchewan) P.O. Box 1860, Virden, MB R0M 2C0 TEL: (204) 748-3095 FAX: (204) 748-1007
(Alberta) 301, 12120 - 106 Avenue, Edmonton, AB T5N 0Z2 TEL: (780) 453-2311 FAX: (780) 451-0900



1111 One Lombard Place, Winnipeg, Manitoba R3B 0X4 TEL: (204) 934-5850 FAX: (204) 934-5820

REGISTERED MAIL

June 27, 2000

Neil Hunt
General Delivery
Hartney, Manitoba
R0M 0X0

Dear Mr. Hunt

RE: NOTICE TO SURFACE OWNER
Souris Hartney Unit No. 1
Application to Manitoba Conservation Petroleum and Energy Branch
Conversion to a Water Injection Well: TWP 6 RGE 22 LSD 6 (SW) SEC 16:

R	Registered Domestic	Recommandé Régime intérieur
To	Destinataire	
Nom	Nom	
NEIL HUNT		
GENERAL DELIVERY		
Ville	Province	Code postal
HARTNEY	MB	R0M0X0
FOR DELIVERY CONFIRMATION		
POUR CONFIRMER LA LIVRAISON		
1 888 956-8383		
www.cira.ca		
www.postcanada.ca		
Declared Value Valeur déclarée		\$ 5 4.46
Item No.	N° de l'article	
78 123 208 554		

CUSTOMER RECEIPT

REÇU DU CLIENT

In accordance with The Oil and Gas Act, Section 71 of the Drilling and Production Regulations, Tundra Oil and Gas Ltd. as operator of Souris Hartney Unit No. 1, is providing notice our application to convert the well known as Tundra Souris Hartney Unit No. 1 6-16-6-22W1 to a Water Injection well.

Should you have any concerns, please contact Mr. John Fox, Chief Petroleum Engineer, Manitoba Conservation at (204) 845-6574.

Sincerely,
TUNDRA OIL AND GAS LTD.

Brad Thiessen
Brad Thiessen
Land Manager

sb

Document Registered at Service

FIELD OFFICES: (Manitoba & Saskatchewan) P.O. Box 1880, Virden, MB R0M 2C0 TEL: (204) 748-3055 FAX: (204) 748-1007
(Alberta) 301, 12120 - 108 Avenue, Edmonton, AB T5N 0Z3 TEL: (780) 468-8311 FAX: (780) 451-0900

TOTAL P.09

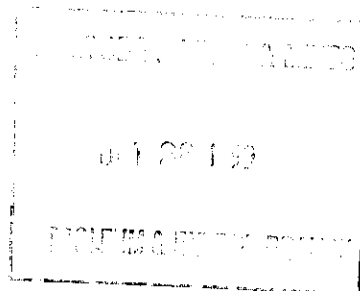
07/05/00 WED 09:10 [TX/RX NO 5271]



1111 One Lombard Place, Winnipeg, Manitoba R3B 0X4 TEL: (204) 934-5850 FAX: (204) 934-5820

October 28, 1999

Manitoba Energy and Mines
Petroleum Branch
360 - 1395 Ellice Avenue
Winnipeg, MB R3G 0G3



Attention: **Mr. J. Fox, P.Eng.**
Chief Petroleum Engineer

Dear John,

RE: **Souris Hartney Unit No.1**
Pressure Maintenance Application

The following information is included in response to your fax dated October 27, 1999 pertaining to the referenced matter.

1) Proposed maximum wellhead injection pressure.

Tundra will operate the three proposed water injection wells at a maximum wellhead injection pressure of 1000 psig (6,895 kPag), in order to stay below the fracture gradient at the desired depth of injection.

2) Injection targets for the three initial patterns and source of make-up water.

Tundra will commence water injection at a rate of 50 m3/day/injector. Make-up injection water will be sourced (if required) either from the Lower Virden or the Whitewater formations to ensure compatibility with Upper Virden formations fluids. The potential water source well will be 12-16-6-22 WPM.

3) Plans for 4-16-6-22 WPM Salt Water Disposal Well

After the three water injection wells are installed, the 4-16-6-22 WPM SWD well will be abandoned.

4) Additional Information

A copy of the Souris Hartney Special Core Study is attached.

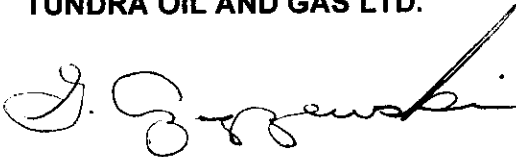
Copies of the most recent pressure buildup tests completed in the field at wells 6-17, 10-17, and 16-17-6-22 WPM are also attached.

The reservoir simulation study used to evaluate the proposed waterflood is a document in excess of 500 pages and we consider it to be proprietary. You are welcome to view the document in our offices or can borrow the study at any time.

Should you have any further questions, please contact me at 934-5853.

Yours truly,

TUNDRA OIL AND GAS LTD.

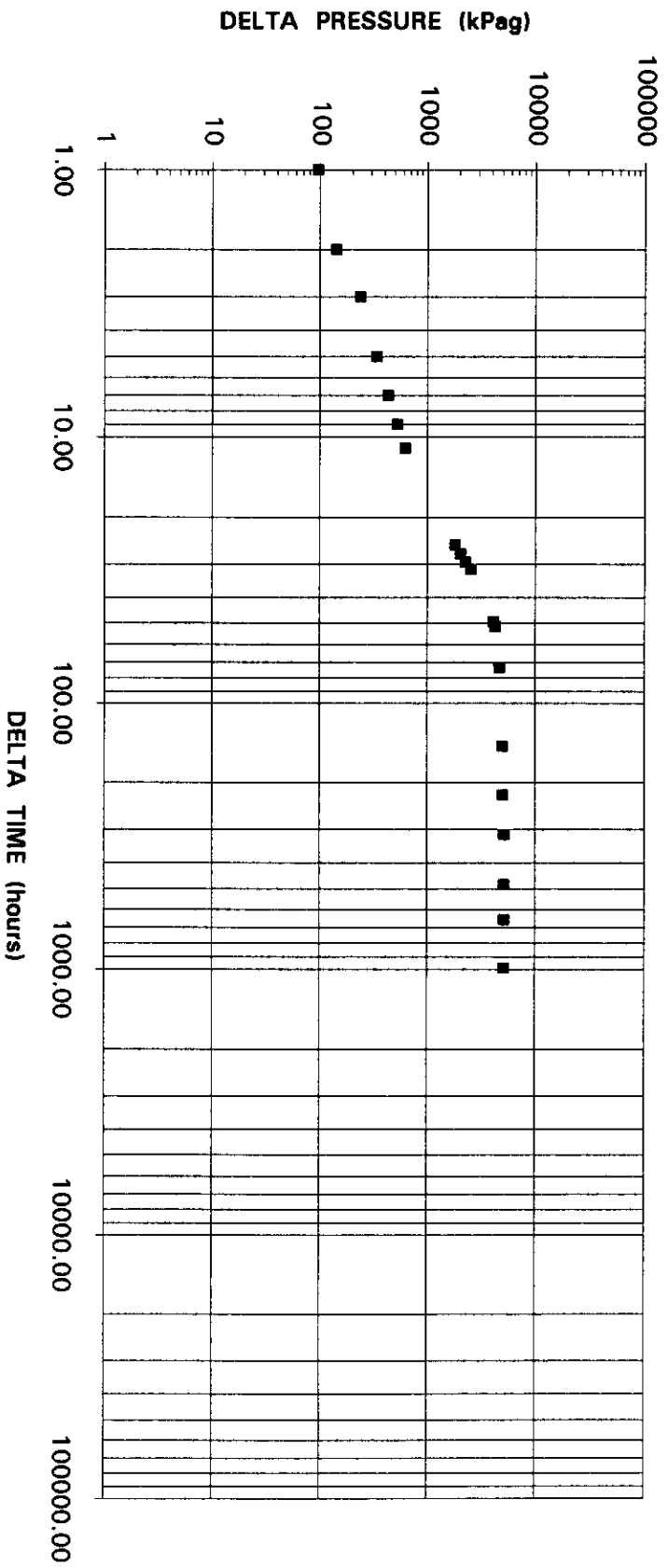
A handwritten signature in black ink, appearing to read 'G. Czyzewski', with a long, sweeping horizontal stroke extending to the right.

George Czyzewski, P.Eng.
General Manager

[illegible]

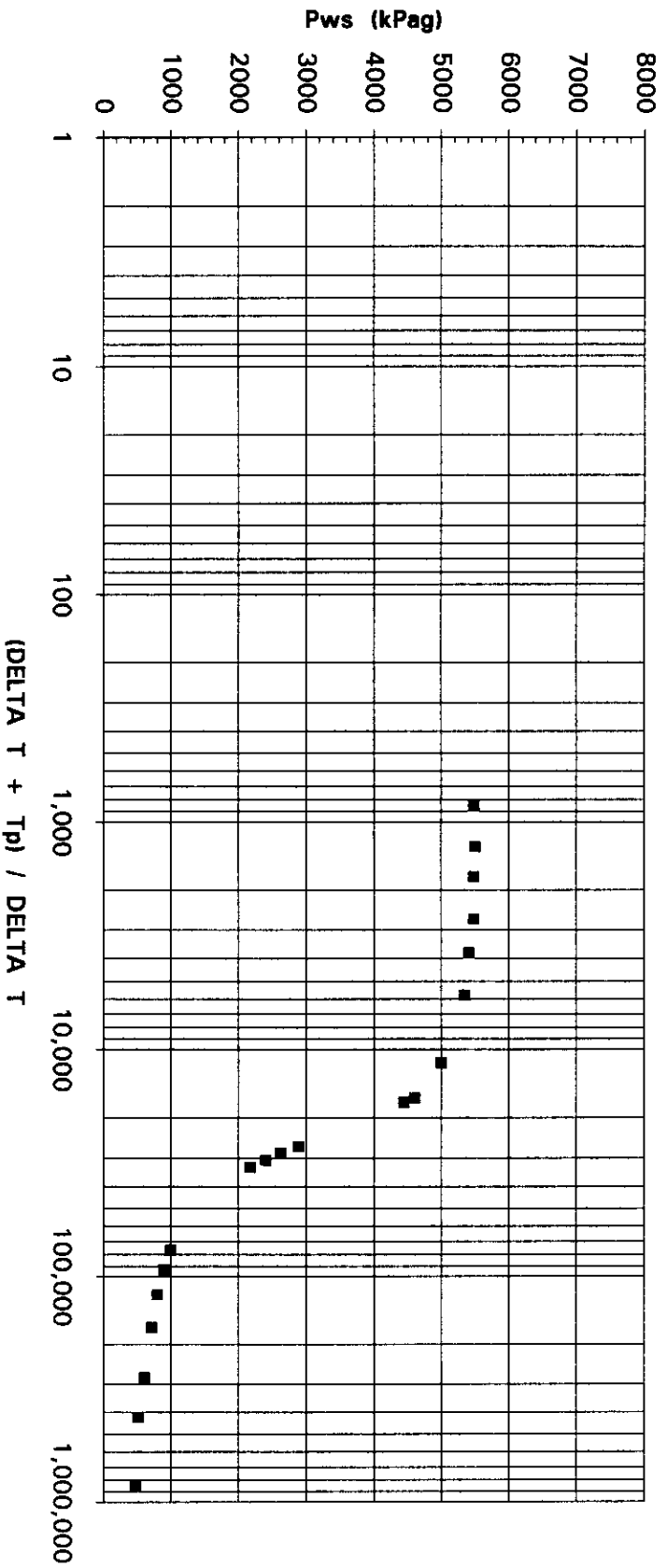
LOG - LOG PLOT PRESSURE BUILDUP WELL 16-17-6-22

Shut-in time = 41 days



HORNER PLOT PRESSURE BUILDUP TEST WELL 16-17-6-22

Shut-in time = 41 days



16-17-6-22

$$\text{OIL GRADIENT} = 0.38 \text{ psi/ft}$$

$$\text{WATER GRADIENT} = 0.44 \text{ psi/ft}$$

gradient

$$= 0.05 \times 0.38 + 0.44 \times 0.95$$

$$= 0.437 \frac{\text{psi}}{\text{ft}}$$

$$= 0.437 \frac{\text{psi}}{\text{ft}} \times 6.895 \frac{\text{kPa}}{\text{psi}} \times \frac{1 \text{ ft}}{0.3048 \text{ m}}$$

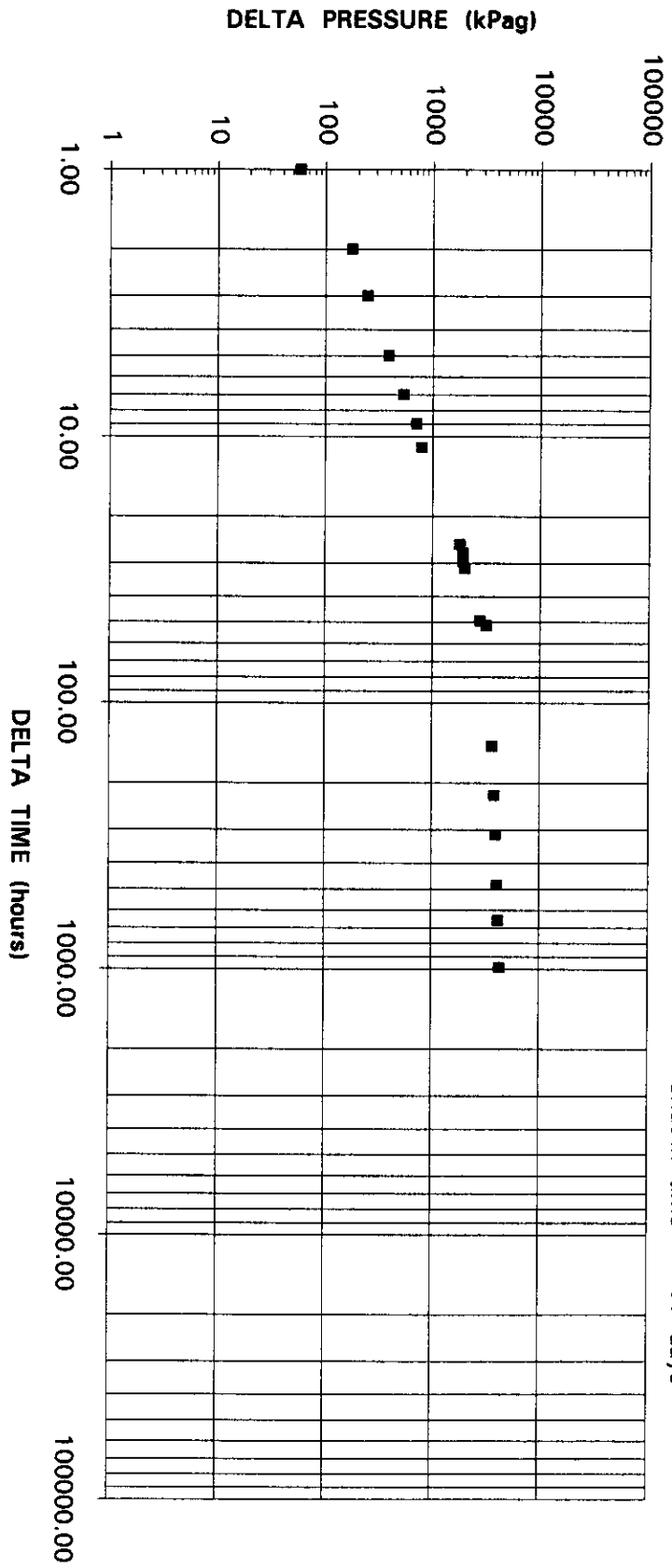
$$= 9.886 \frac{\text{kPa}}{\text{m}}$$

mid-point of interval 650 m.

[illegible]

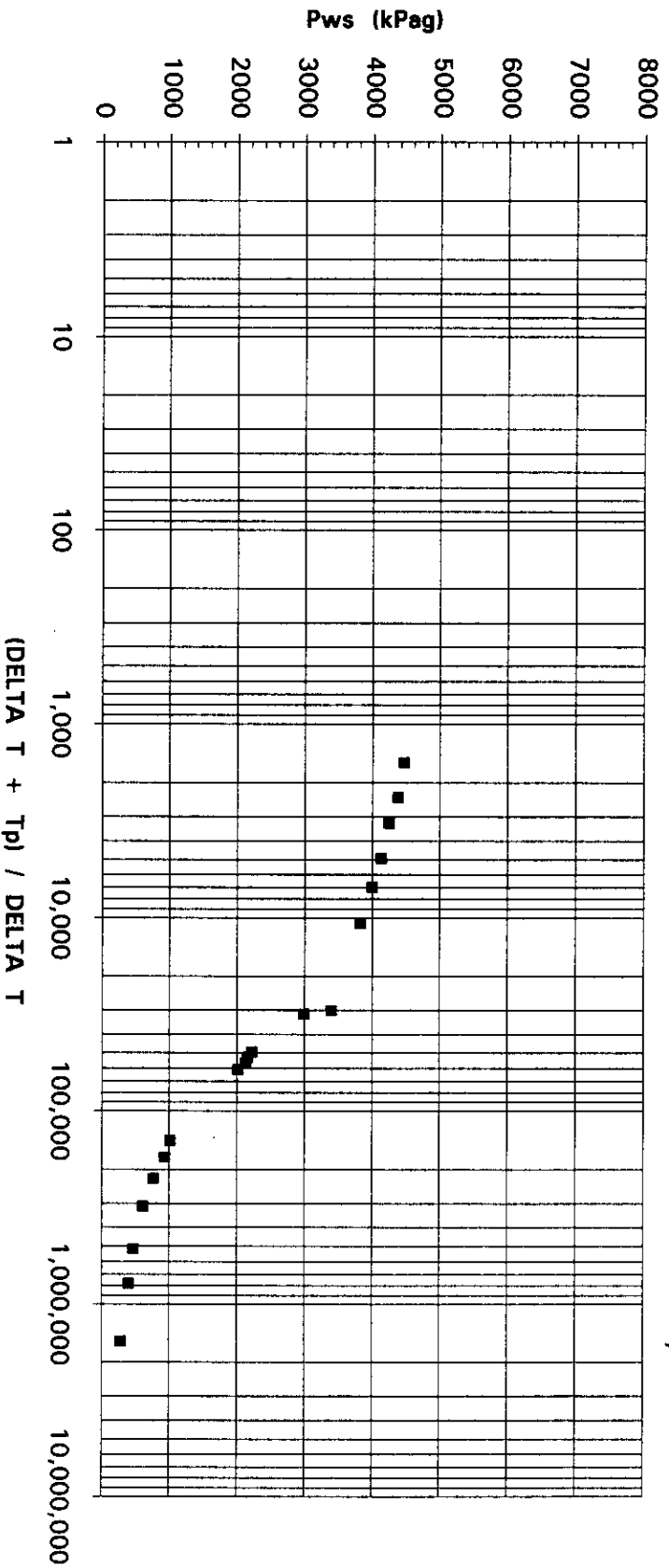
LOG - LOG PLOT PRESSURE BUILDUP TEST WELL 10-17-6-22

Shut-in time = 41 days



HORNER PLOT PRESSURE BUILDUP TEST WELL 10-17-6-22

Shut-in time = 41 days



16-17-6-22

$$\text{oil GRADIENT} = 0.38 \text{ psi/ft}$$

$$\text{WATER GRADIENT} = 0.44 \text{ psi/ft}$$

Gradient

$$= 0.06 \times 0.38 + 0.44 \times 0.34$$

$$= 0.4364 \frac{\text{psi}}{\text{ft}}$$

$$= 0.4364 \frac{\text{psi}}{\text{ft}} \times 6.895 \frac{\text{kPa}}{\text{psi}} \times \frac{1 \text{ ft}}{0.3048}$$

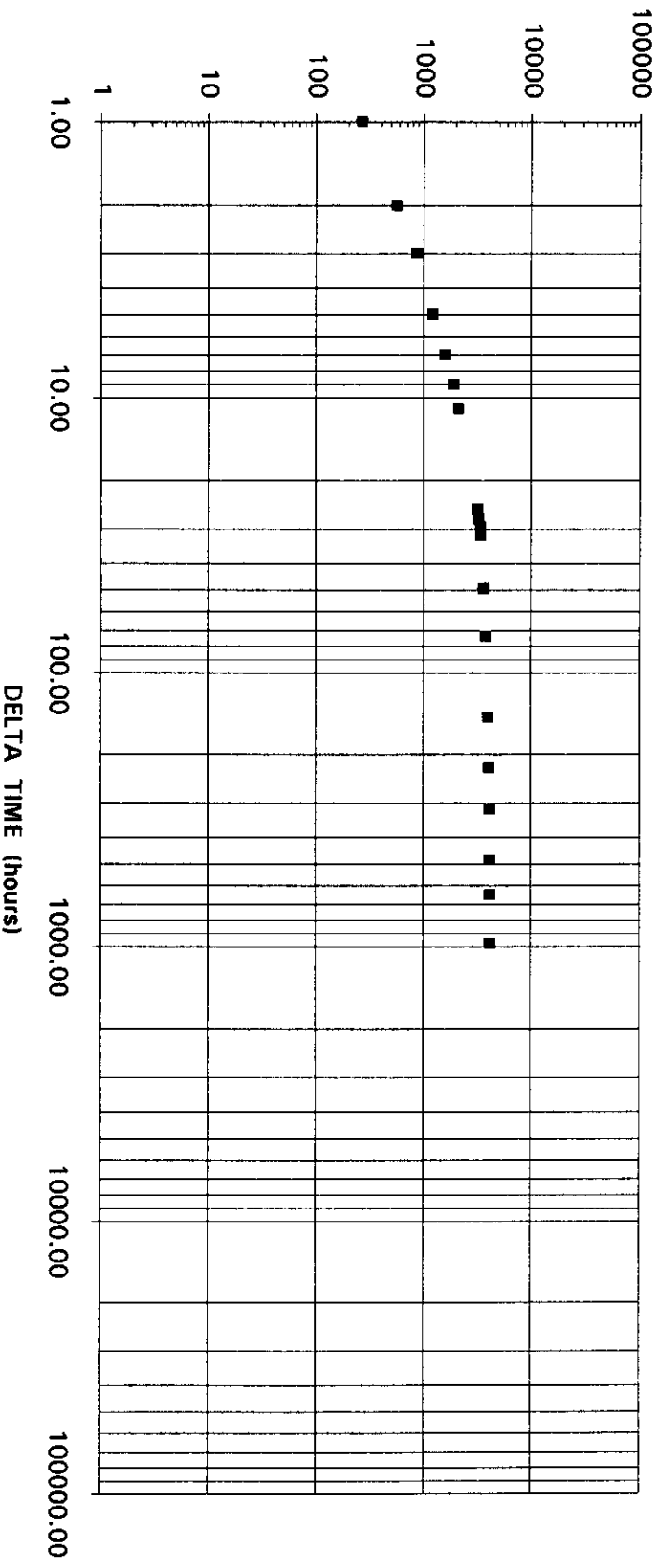
$$= 9.872 \frac{\text{kPa}}{\text{m}}$$

$$\text{mid-point of interval} = 657 \text{ m}$$

[illegible]

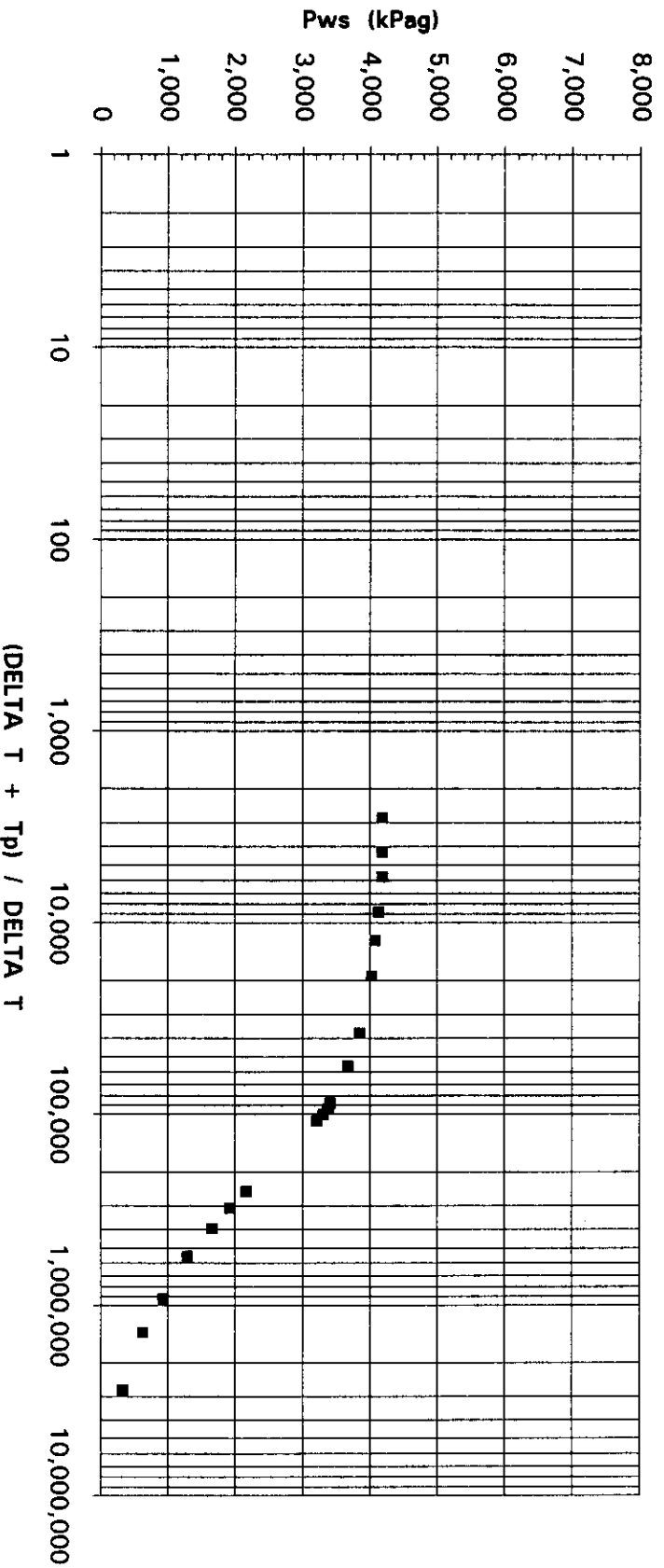
LOG - LOG PLOT PRESSURE BUILDUP WELL 6-17-6-22

Shut-in time = 41 days



HORNER PLOT PRESSURE BUILDUP TEST WELL 6-17-6-22

Shut-in time = 41 days



6-17-6-22

$$\text{OIL GRADIENT} = 0.38 \text{ psi/ft}$$

$$\text{WATER GRADIENT} = 0.44 \text{ psi/ft}$$

Gradient

$$= 0.0246 * 0.38 + 0.44 * 0.9754$$

$$= 0.0093 + 0.4292$$

$$= 0.4385 \frac{\text{ft}}{\text{psi}} * 6.895 \frac{\text{lb}_a}{\text{psi}} * \frac{1 \text{ ft}}{0.3048}$$

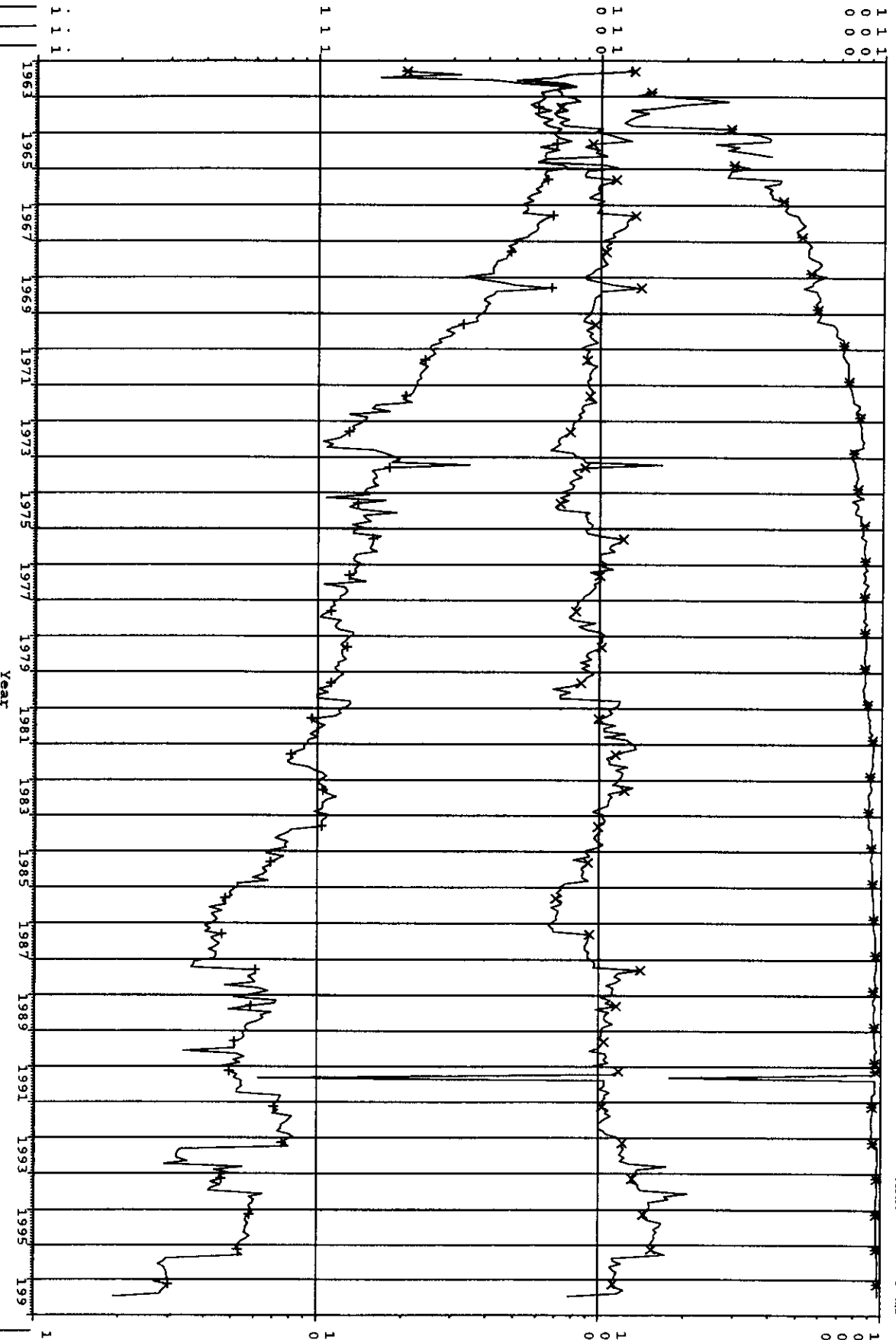
$$= 9.92 \frac{\text{ft}_a}{\text{m}}$$

mud-pot of oil and 653 water

00/06-17-006-22W1/0 (Corvair Souris Hartney 06-17-06-22W1) Data 04/63-06/97

Operator:
Field: 10
Zone: 53A
Type: Unknown
Group: Souris Hartney

Production Cums
Oil: 22261 m3
Gas: 0 E6m3
Water: 95517 m3
Cond: 0 m3



Not Assigned

Production Report

Group : Souris Hartney Well : Corvair Souris Hartney 06-17-06-22W1 : 00/06-17-006-22W1/0 Hist.Data : 04/63-06/97 Operator : Field : 10	Date : November 19, 1997 8:53:40 am User : GEORGE On Prod : 02/09 Status : Unknown Zone : 53A
---	---

Production Data from January, 1997 to June, 1997

Year	Avg Daily Oil m3/d	Water Cut %	Avg Daily Fluid m3/d	Monthly Oil m3	Monthly Water m3	Cum Oil m3
Jan., 1997	0.267738	97.5932	11.1292	8.29987	336.701	22240.4
Feb., 1997	0.299999	97.3339	11.2573	8.39998	306.8	22248.8
Mar., 1997	0.293573	97.4031	11.3098	9.10078	341.5	22257.9
Apr., 1997	0.286674	97.6708	12.3135	8.60021	360.8	22266.5
May., 1997	0.280656	97.6002	11.7002	8.70032	354.001	22275.2
Jun., 1997	0.193341	97.5381	7.85674	5.80022	229.899	22281

[illegible]

[illegible]

[illegible]



October 29, 1999

George Czyzewski, P.Eng.
General Manager
Tundra Oil and Gas Ltd.
1111 One Lombard Place
Winnipeg MB R3B 0X4

Dear Mr. Czyzewski:

**Re: Souris Hartney Unit No. 1
Waterflood Order No. 9**

Your application to conduct waterflood operations in the Souris Hartney Lodgepole Virden A Pool has been approved. Attached is Waterflood Order No. 9 outlining conditions for operation of the waterfloods. Water injection is not to commence until all royalty and working interest owners have executed unit agreements, and the Branch has registered the agreements.

The Branch will be initiating discussions with Tundra shortly on the methodology for determination of third-tier oil attributed to the waterflood.

If you have any questions in respect of this approval, please contact the undersigned at (204) 945-6574.

Yours truly,



John N. Fox, P.Eng.
Chief Petroleum Engineer


cc: Administration
Waskada

**MINISTERIAL ORDER
WATERFLOOD ORDER NO. 9**

**Pertaining to Waterflood Operations
in Souris Hartney Unit No. 1**

- 1.0 The Unit Operator shall conduct waterflood operations by injecting water into the Upper Virden Member of the Lodgepole Formation underlying Souris Hartney Unit No. 1 ("the Unit") through the wells listed in Schedule A. The Director may approve the conversion of additional wells in the Unit to water injection.
- 1.1 Every injection well shall be completed as approved under Section 47 of the Drilling and Production Regulation.
- 1.2 The maximum wellhead pressure at which water may be injected is 7000 kPa.
- 1.3 The Director may, from time to time, establish a maximum or minimum rate at which water may be injected into a well.
- 1.4 The annulus of each injection well shall be pressure tested in accordance with Section 50 of the Drilling and Production Regulation.
- 2.0 The Unit Operator shall conduct an annual survey to determine the level and distribution of reservoir pressure in the Unit. A summary of the results of any pressure surveys conducted during the year are to be included in the annual waterflood progress report required under Section 73 of the Drilling and Production Regulation.
- 2.1 The frequency of pressure surveys may be reduced where the Director is satisfied that more frequent surveys will not assist the Unit Operator in monitoring the effectiveness of the waterflood.
- 2.2 The Unit Operator is responsible for monitoring the effectiveness of the waterflood and for collecting such reservoir data and other information as is necessary to evaluate and optimize waterflood performance.
- 2.3 The Unit Operator is to advise the Petroleum Branch of the suspension of water injection at any well, any indication of channelling or breakthrough of injected water to a producing well or out of zone and any other detrimental effects that may be attributable to the waterflood operations.
- 3.0 The Unit Operator shall file a report of production or injection for each well in the Unit in accordance with Section 120 of the Drilling and Production Regulation.
- 4.0 The Unit Operator shall file an annual waterflood progress report in accordance with Section 73 of the Drilling and Production Regulation.

OCTOBER 29, 1999
Date



Director of Petroleum for
Minister Responsible for The Oil and Gas Act

Schedule A

Souris Hartney Unit No. 1

Water Injection Wells

Souris Hartney Unit No.1 WIW 2-17-6-22 (WPM)

Souris Hartney Unit No.1 WIW 6-17-6-22 (WPM)

Souris Hartney Unit No.1 WIW 10-17-6-22 (WPM)



Memorandum

Date: October 28, 1999

To: Bob Dubreuil
Director
Petroleum & Energy

From: John Fox
Chief Petroleum Engineer

Subject: Souris Hartney Unit No. 1
Waterflood Application

Telephone:

Tundra Oil & Gas has made application to conduct a waterflood in the Souris Hartney A Pool. The Branch published notice of the application in the Deloraine Times & Star and Souris Plaindealer and sent notices directly to the royalty owners and landowners in and within 0.5 km of the area of application. The notice period for objections and interventions expired October 22, 1998. No objections or interventions were received.

Recommendations

It is recommended that Waterflood Order No. 9 be issued approving the waterflood. A copy of the proposed Waterflood Order is attached. The letter of approval to accompany the order advises Tundra that the Branch is reviewing methods for determination of third-tier oil attributed to the waterflood.

Implementation of the waterflood cannot commence until the royalty owners execute, and the Branch registers, the Souris Hartney Unit No. 1 Unit Agreement.

Discussion

The Souris Hartney Lodgepole Virden A Pool was discovered in 1962. The pool was revitalized with the drilling of two horizontal wells in 1993. The A Pool contains 4 producing horizontal wells and 7 non-abandoned vertical wells, only one of which is producing (See Fig. 1). Current production (Aug/99) from the pool is 17.7 m³/d with a water-cut of 86.5%. Figure 2 is a plot of the production history of the A Pool. The impact of horizontal drilling on pool production is quite apparent. Currently 97% of pool production is from the horizontal wells.

Tundra estimates volumetric OOIP in the A Pool of 1,036.2 10³m³. Tundra's estimated primary recovery for the pool is 243.0 10³m³ or 23.5% OOIP based on a harmonic decline (see Fig.2). The pool primary production decline rate is difficult to establish based on the short production history of the horizontal wells and the variation in reservoir withdrawal rates. Using a 10% exponential decline rate the Branch can match Tundra primary recovery, but as shown on Figure 2, the future pool production profiles are drastically different. Using a more conservative exponential decline rate of 15.7%, that is representative of the period late-1995 to early-1997, the Branch estimates primary recovery of 222.1 10³m³ or 21.4% OOIP. The difference in recovery estimates between the Branch and Tundra can be traced to the 1-17-6-22 well, which went on production in

March 1999. Tundra has assigned primary recoverable reserves of $29.0 \times 10^3 \text{ m}^3$ to this well. The Branch on the other hand has assigned primary recoverable reserves of $9.3 \times 10^3 \text{ m}^3$ to the 1-17 horizontal well based on a current production rate of $4.2 \text{ m}^3/\text{d}$ and a 15.7% decline rate.

Cumulative production from the A Pool to August 31, 1999 is $190.5 \times 10^3 \text{ m}^3$, with remaining primary recoverable reserves of $52.5 \times 10^3 \text{ m}^3$ based on Tundra's estimate. Tundra estimates that 87% of the remaining primary recoverable reserves will be recovered from Section 17-6-22W1.

Tundra conducted a reservoir simulation study of the A pool. The A Pool oil-in-place and primary recoverable reserves generated by the simulator were $1145.0 \times 10^3 \text{ m}^3$ and $280 \times 10^3 \text{ m}^3$ (24.5% OOIP), respectively, slightly higher but in good agreement with the volumetric estimate of OOIP and decline curve calculation of recoverable reserves. Several waterflood cases were run to determine the waterflood recovery based on a number of different injector conversion strategies. Tundra is proposing to initially convert the 2-17, 6-17 and 10-17-6-22 wells to water injection (see Fig. 1). Incremental waterflood recovery is estimated to be $42.0 \times 10^3 \text{ m}^3$ or 4.1% OOIP. If the waterflood is successful, the 16-17 and 6-16 wells may be converted to injection creating a line-drive flood in the pool (see Fig. 1). The additional injector conversions are predicted to recover an additional $16.0 \times 10^3 \text{ m}^3$ increasing the incremental waterflood recovery to 5.6% OOIP.

Incremental recoverable reserves attributable to the waterflood qualify as third tier oil. The method the Branch used in the past to define the portion of production that qualifies as incremental recoverable reserves was to establish a historical production decline. Production above the historical production decline qualified for a different vintage of oil, new or third tier, as the case may be. The problem in the A Pool is that there is not an established production decline due to the lack of production history from the horizontal wells. Engineering is currently developing options for the determination of third tier oil attributed to the waterflood. It is suggested that any new methodology be discussed with Tundra and other parties planning new waterfloods such as Progress and Zargon. A proposal should be ready for internal review next week.

Tundra is proposing to unitize the productive portion of the A Pool in preparation for waterflooding. Proposed Souris Hartney Unit No. 1 is shown in Figure 1. Royalty owners have received a copy of the proposed unit agreement and the Branch has answered a number of questions related to unitization. The Crown is not a party to the unit agreement.

Tundra consulted with the Branch on the proposed unit tracts and tract participation formula. The existing 32 ha spacing units in the pool were used as the unit tracts. The tract participation formula is based on the last 90-days production with production from each horizontal well allocated to the unit tracts within its drainage area in accordance with the well's production allocation agreement.

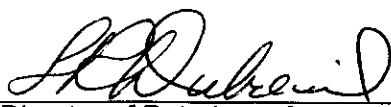
The Branch is satisfied with Tundra's waterflood plans and recommends that Waterflood Order No. 9 (attached) approving waterflood operations in Souris Hartney Unit No.1 be issued. Water injection cannot commence until all royalty and working interest owners have executed the unit agreement, and the Branch has registered the unit agreement.

**MINISTERIAL ORDER
WATERFLOOD ORDER NO. 9**

**Pertaining to Waterflood Operations
in Souris Hartney Unit No. 1**

- 1.0 The Unit Operator shall conduct waterflood operations by injecting water into the Upper Virden Member of the Lodgepole Formation underlying Souris Hartney Unit No. 1 ("the Unit") through the wells listed in Schedule A. The Director may approve the conversion of additional wells in the Unit to water injection.
- 1.1 Every injection well shall be completed as approved under Section 47 of the Drilling and Production Regulation.
- 1.2 The maximum wellhead pressure at which water may be injected is 7000 kPa.
- 1.3 The Director may, from time to time, establish a maximum or minimum rate at which water may be injected into a well.
- 1.4 The annulus of each injection well shall be pressure tested in accordance with Section 50 of the Drilling and Production Regulation.
- 2.0 The Unit Operator shall conduct an annual survey to determine the level and distribution of reservoir pressure in the Unit. A summary of the results of any pressure surveys conducted during the year are to be included in the annual waterflood progress report required under Section 73 of the Drilling and Production Regulation.
- 2.1 The frequency of pressure surveys may be reduced where the Director is satisfied that more frequent surveys will not assist the Unit Operator in monitoring the effectiveness of the waterflood.
- 2.2 The Unit Operator is responsible for monitoring the effectiveness of the waterflood and for collecting such reservoir data and other information as is necessary to evaluate and optimize waterflood performance.
- 2.3 The Unit Operator is to advise the Petroleum Branch of the suspension of water injection at any well, any indication of channelling or breakthrough of injected water to a producing well or out of zone and any other detrimental effects that may be attributable to the waterflood operations.
- 3.0 The Unit Operator shall file a report of production or injection for each well in the Unit in accordance with Section 120 of the Drilling and Production Regulation.
- 4.0 The Unit Operator shall file an annual waterflood progress report in accordance with Section 73 of the Drilling and Production Regulation.

OCTOBER 29, 1999
Date



Director of Petroleum for
Minister Responsible for The Oil and Gas Act

Schedule A

Souris Hartney Unit No. 1

Water Injection Wells

Souris Hartney Unit No.1 WIW 2-17-6-22 (WPM)
Souris Hartney Unit No.1 WIW 6-17-6-22 (WPM)
Souris Hartney Unit No.1 WIW 10-17-6-22 (WPM)

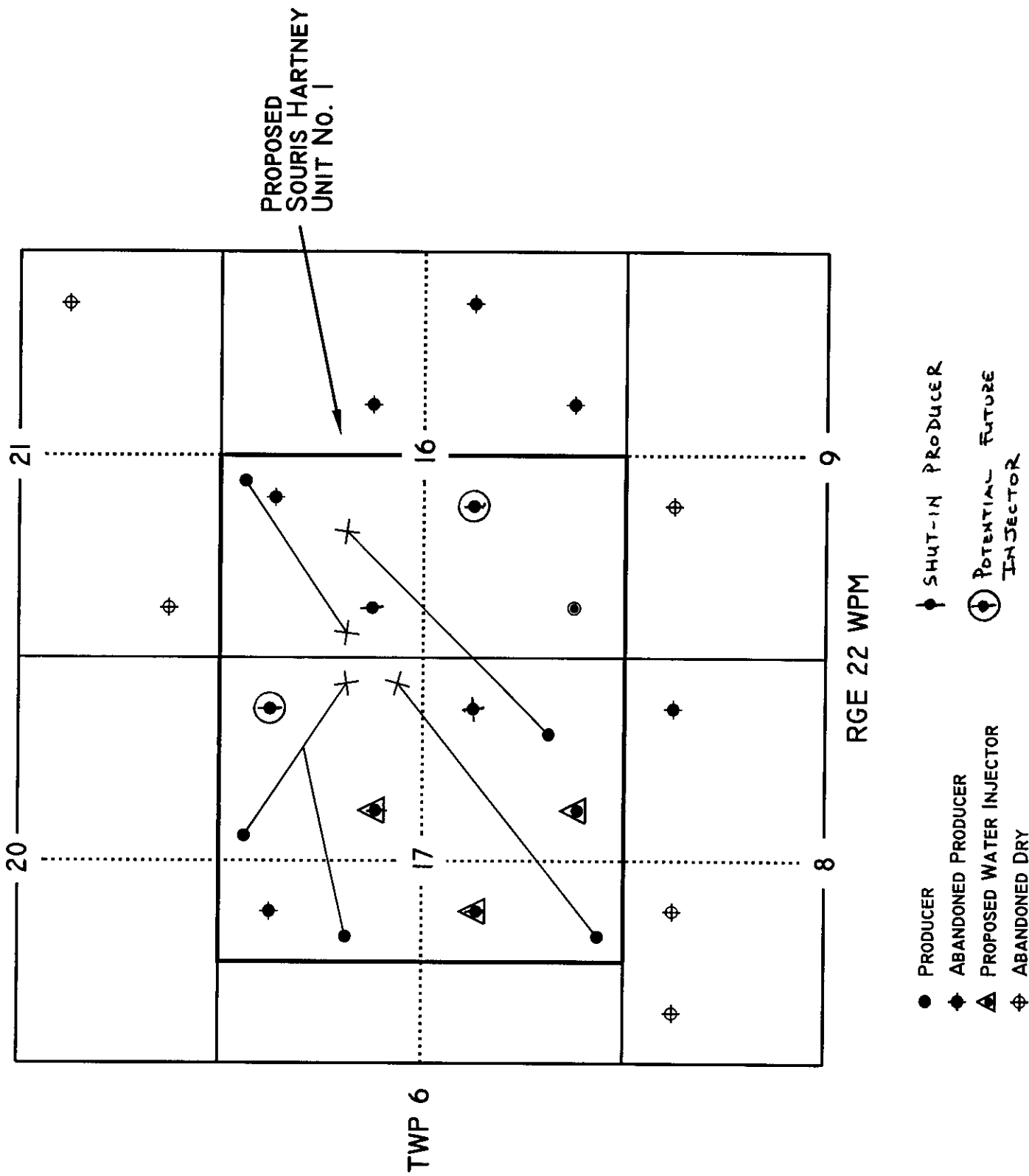


Fig. 1

Operator:

Field:

Zone:

Type: Unknown

Group: Souris Hartney 53A

qi: 17.7 m3/d, Sep, 1999

qf: 1.58531 m3/d, Oct. 2013

di(Exp): 15.66 CTD: 190468 m3

RR: 31579.8 m3 Tot: 222048 m3

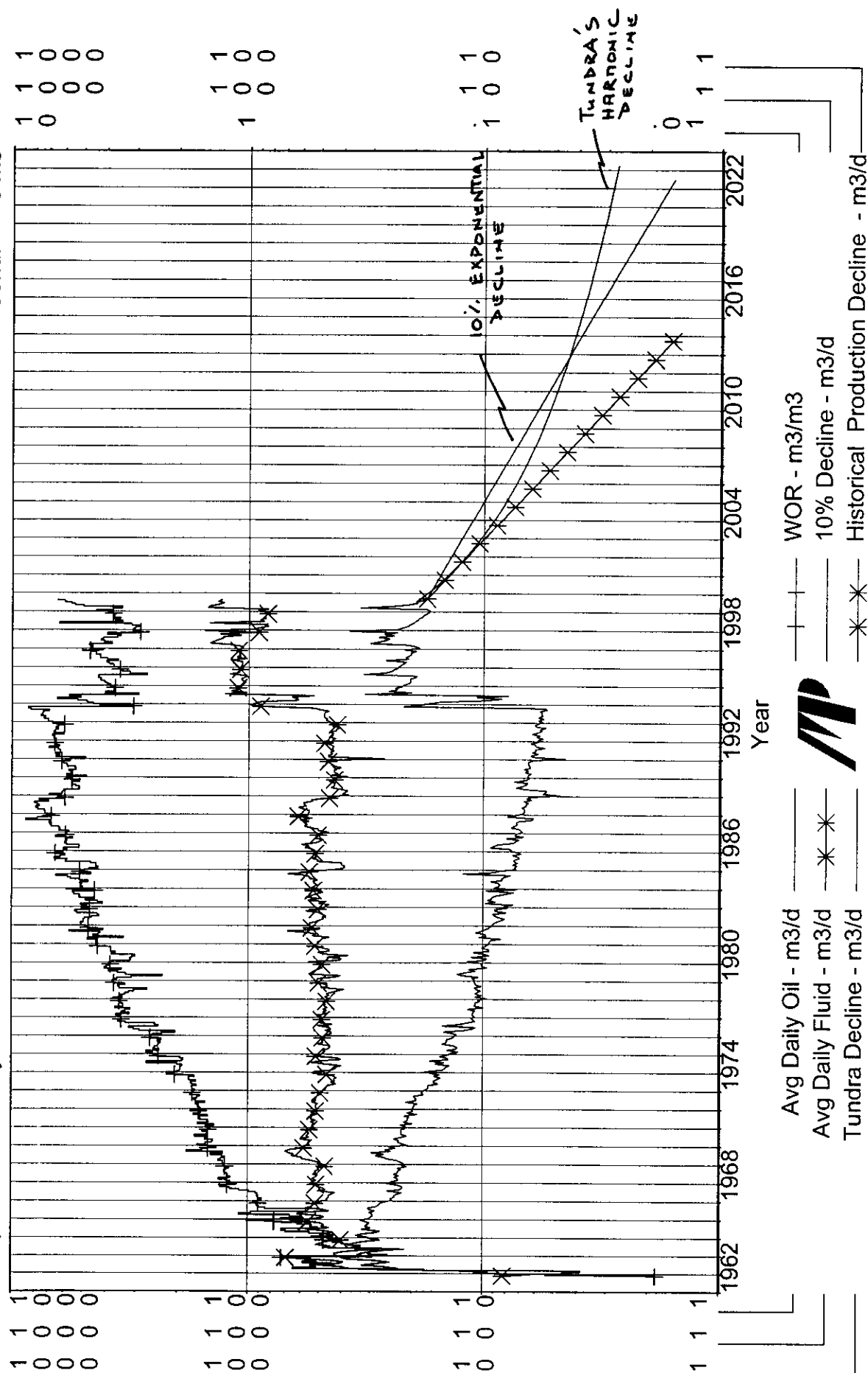
Production Cums

Oil: 190468 m3

Gas: 0 E6m3

Water: 531703 m3

Cond: 0 m3



FAX

Date 27-Oct-99

Number of pages including cover sheet 2

TO: George Czyzewski
Tundra Oil & Gas

Phone

Fax Phone (204) 934-5820

CC:

FROM: John Fox, P.Eng.
Manitoba Energy & Mines
Petroleum & Energy Branch
360, 1395 Ellice Avenue
Winnipeg MB R3G 2P3

Phone 945-6574

Fax Phone 945-0586

e-mail jfox@em.gov.mb.ca

REMARKS: ☐ Urgent ☐ For your review ☐ Reply ASAP ☐ Please Comment

RE: Souris Hartney Waterflood Application

The Branch did not receive any objections to your application to conduct a waterflood in the Souris Hartney Lodgepole Virden A Pool. Prior to issuing the waterflood the requests Tundra submit the following additional information in support of the application:

- (1) the proposed maximum wellhead injection pressure;
- (2) injection targets for the (3) initial patterns and the source of any make-up water the may be required; and
- (3) plans for the 4-16-6-22 disposal well; and
- (4) copies of
 - (a) the complete Hycal Special Core Study, a portion of which is included in Attachment No. 6;
 - (b) the reservoir simulation study used to evaluate the proposed waterflood; and
 - (c) all recent pressure surveys run in the pool.

Incremental recoverable reserves associated with the waterflood will qualify as third tier oil. This means that upon commencement of the waterflood there will be a mix of old, new, holiday and third tier oil produced from the pool. The Branch is currently reviewing methods for determining the volume of production that should qualify for third tier and how the freehold tax calculations for the various vintages of oil will work. When we have completed the

this work the Branch will contact Tundra to discuss its proposal.

If you have any questions in respect of this matter please contact the undersigned.

John Fox

MontrealTrustMontrealTrust
710, 580 - 8th Avenue SW
Calgary, AB T2P 3S8Phone: 403-267-6887
FAX: 403-267-6586
email: ksmith@montrealtrust.com

Facsimile

To: John Fox, Director - Manitoba E & M
 @Fax: 204-945-0586
 From: Kathy Smith
 Date: Tuesday, October 12, 1999 @ 11:55AM
 Re: Notice Under the Oil & Gas Act
 Souris Hartney Oil Field
 Pages: 2, including this page

Mr. Fox:

We are in receipt of Notice that Tundra Oil and Gas has made an application to conduct a waterflood in portions of Sections 16 and 17. Our interest (Montreal Trust/Canada Perm) is in the E 1/2 16 which is not included in this application. Would you be in a position to advise Montreal Trust as to what impact, if any, this application may have on our lands? It is difficult for us to know whether this application has any negative effects on our interest, to which we should be forming an objection. If you would be in a position to discuss this matter with me, please give me a call at 403-267-6887. Thanks.

Kathy

12-OCT-99.

- E/2 16 under lease(?)

- 3 wells drilled. sub-economic production-

2-16 ABD 1963 - 71.6 m³ oil

8-16 ABD 1963 - 189.1 m³ oil

10-16 ABD 1969 - 82.2 m³ oil

- 1st phase of WF, injection in Sec 17, no impact on E/2 Sec 16

- eventual possible scenario, H2NLC wells extend from W/2 Sec 16 into E/2, Tundra may eventually consider extending WF. if successful in Sec 17.

- no "-ve" impact, no basis for objection-

10/12/99 TUE 13:04 [TX/RX NO 7749]

Manitoba



Energy and Mines

Petroleum

 1395 Ellice Avenue Suite 360
 Winnipeg MB R3G 3P2
 CANADA

PH: (204) 945-8577

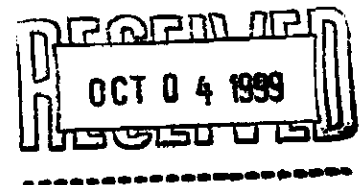
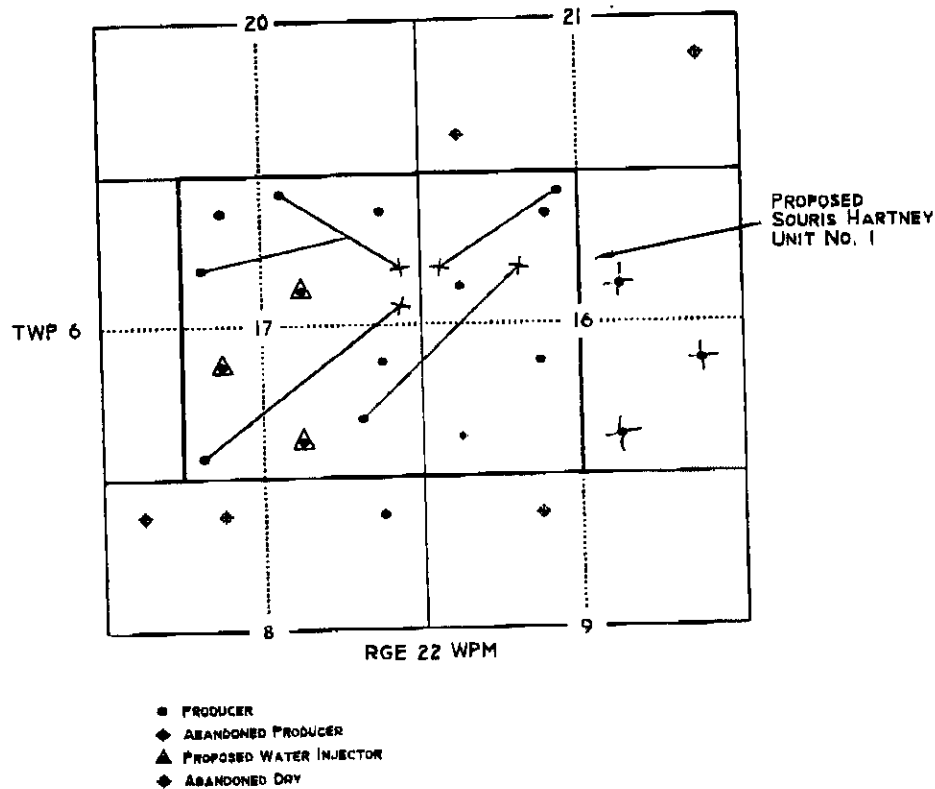
Fax: (204) 945-0586

NOTICE

UNDER THE OIL AND GAS ACT

SOURIS HARTNEY OIL FIELD

Tundra Oil and Gas Ltd. has made application under The Oil and Gas Act to conduct a waterflood in the Lodgepole Formation in the Souris Hartney Virden A Pool shown below.



Manitoba



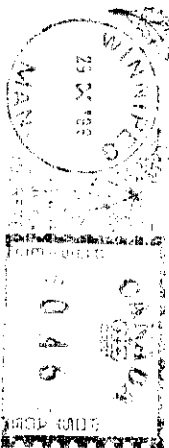
Energy and Mines
Petrolium and Energy Branch
494

1395 Ellice Avenue Suite 360
Winnipeg MB R3G 3P2
CANADA

RETURN TO:
RENOUVEAU L'EXPEDITEUR

<input type="checkbox"/>	Unclaimed
<input type="checkbox"/>	Non réclamé
<input type="checkbox"/>	No such address
<input type="checkbox"/>	Adresse inexistante
<input type="checkbox"/>	Address incomplete
<input type="checkbox"/>	Adresse incomplète
<input checked="" type="checkbox"/>	Moved, Address unknown
	Parti sans l'adresse d'adresse
<input type="checkbox"/>	No such Post Office
	Bureau inexistant
<input type="checkbox"/>	Refused by addressee
	Refusé par le destinataire
<input type="checkbox"/>	Deceased
	Décédé
<input type="checkbox"/>	Unknown
	Inconnu

bn
Lloyd K. McBurney
General Delivery
Hartney MB R0M 0X0



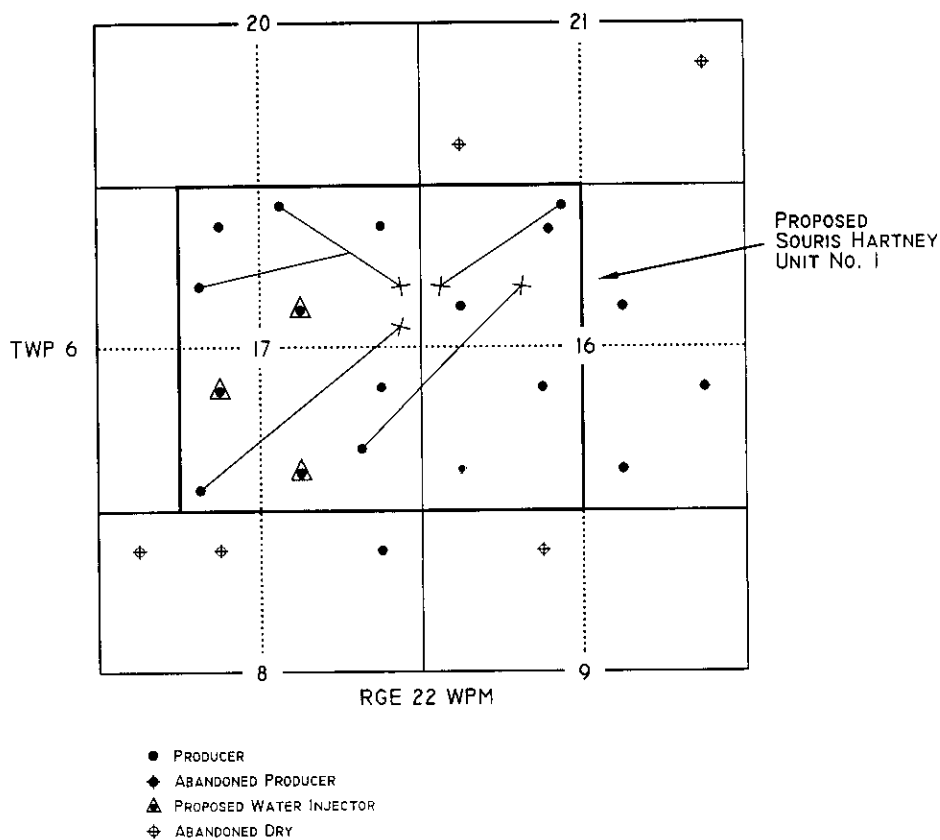


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If no valid objection or intervention is received in writing by the Department of Energy and Mines, Petroleum and Energy Branch, at Suite 360, 1395 Ellice Avenue, Winnipeg, Manitoba R3G 3P2 before October 22, 1999, the Minister may approve the application.

Copies of the application can be obtained from:

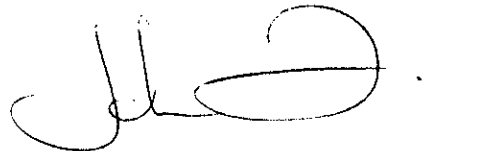
George Czyzewski, P.Eng.
General Manager
Tundra Oil and Gas Ltd.
1111 Lombard Place
Winnipeg, MB R3B 0X4
(204) 934-5850

This application may be viewed at the offices of the Petroleum and Energy Branch:

Suite 360, 1395 Ellice Avenue
Winnipeg, MB R3G 3P2
(204) 945-6577

106 Railway Avenue
Waskada, MB R0M 2E0
(204) 673-2472

Dated at Winnipeg, this 27th day of September, 1999.



J.N. Fox, A/Director
Petroleum and Energy Branch

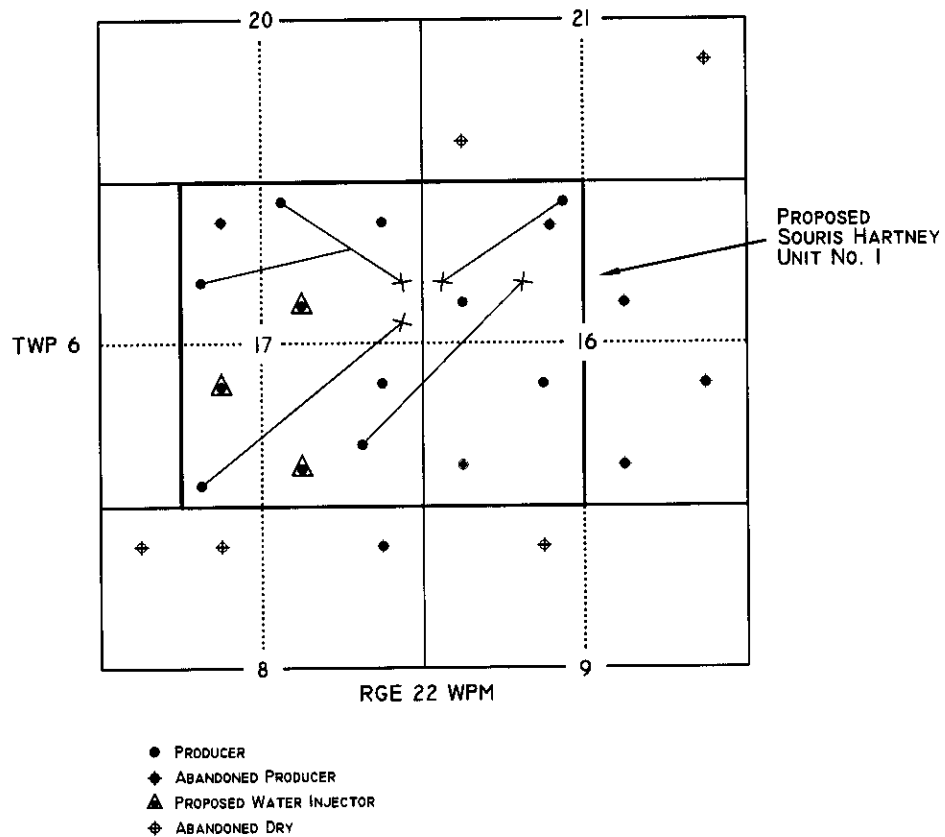


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George Czyzewski, P.Eng.
General Manager
Tundra Oil and Gas Ltd.
1111 Lombard Place
Winnipeg, MB R3B 0X4
(204) 934-5850

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J.N. Fox, A/Director
Petroleum and Energy Branch

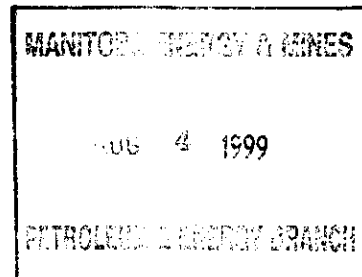


1111 One Lombard Place, Winnipeg, Manitoba R3B 0X4 TEL: (204) 934-5850 FAX: (204) 934-5820

August 3, 1999

Manitoba Energy and Mines
Petroleum Branch
360 - 1395 Ellice Avenue
Winnipeg, MB R3G 0G3

Attention: **Mr. J. Fox, P.Eng.**
Chief Petroleum Engineer



Dear John,

RE: Souris Hartney Unit No. 1
Pressure Maintenance Application

Please find attached two (2) copies of the referenced application to unitize the Upper Virden Pool at Souris Hartney. Tundra would like to commence waterflood operations in the proposed Souris Hartney Unit No. 1 during the fourth quarter of 1999, and any assistance that your office requires in processing the subject application, will be provided by Tundra.

Should you have any questions, I can be reached at 934-5853 for further discussion.

Yours truly,

TUNDRA OIL AND GAS LTD.

A handwritten signature in cursive script, appearing to read "G. Czyzewski".

George Czyzewski, P.Eng.
General Manager

FAX

Date 12-Jul-99

Number of pages including cover sheet 8

TO: George Czyzewski
Tundra Oil & Gas

Phone

Fax Phone

CC:

FROM: John Fox, P.Eng.
Manitoba Energy & Mines
Petroleum & Energy Branch
360, 1395 Ellice Avenue
Winnipeg MB R3G 2P3

Phone 945-6574

Fax Phone 945-0586

e-mail jfox@em.gov.mb.ca

REMARKS: ☐ Urgent ☐ For your review ☐ Reply ASAP ☐ Please Comment

George, the following are my thoughts on your proposed Souris Hartney Unitization:

(a) Horizontal Well Production Allocation – Attached is a table showing the production allocation assigned to each horizontal well. The actual production allocation has in turn been used to calculate the share of current pool production for each spacing unit (see attached figure).

(b) 3rd Tier Production Tax – When the waterflood is implemented a share of production from the unit will qualify for 3rd tier production tax rates according to the following definition:

“third tier oil” means oil that is produced from

c. an old oil well or new oil well that, in the opinion of the director, can reasonably be attributed to an increase in reserves as a result of a project of enhanced recovery implemented under the Act after April 1, 1999.

The Branch uses the historical pool production decline to establish a monthly primary recovery production forecast. In each month any production above the primary recovery production forecast qualifies for 3rd tier. A number of the horizontal wells are still on holiday (see attached HOV Report) and this is factored into the production tax calculation.

(c) Mineral Ownership – According to the Branch's records Section 17 has common mineral owners and the W/2 of Section 16 has common mineral owners. The Branch does not have information on the mineral owners in the E/2 of Section 16. In Section 17, production allocated to the producing 32 ha spacing units in Lsd's 1 & 8, 2 & 7, 3 & 6, 9 & 16, 10 & 15 and 11 & 14 will hold the remaining lands in the section without those lands being included in the unit. The same may apply to the W/2 of Section 16. However it does not apply to the E/2 of Section 16.

TUNDRA SOURIS HARTNEY WATERFLOOD

SECTION 17						
Lic. No.	Surface	Location	LSD's 1&8	LSD's 2&7	LSD's 3&6	LSD's 4&5 LSD's 9&16 LSD's 10 & 15 LSD's 11 & 14 LSD's 12&13
4398	9A-17-6-22	3B-17-6-22 - 513.1 m ³	25.0000% 125.45	25.0000% 125.45	25.0000% 125.45	25.0000% 125.45
4399	9C-17-6-22	Leg 1 -15C-17-6-22 Leg 2 - 11C-17-6-22 1235 m ³				24.2764% 29.95 54.3059% 21.4177% 26.45
4420	12C-16-6-22	14D-16-6-22				
4826	11C-16-6-22	1C-17-6-22 - 768.5	38.8488% 298.48			
	2-17-6-22			100% 32.7		
SECTION 16						
Lic. No.	Surface	Location	LSD's 1&8	LSD's 2&7	LSD's 3&6	LSD's 4&5 LSD's 9&16 LSD's 10 & 15 LSD's 11 & 14 LSD's 12&13
4398	9A-17-6-22	3B-17-6-22				
4399	9C-17-6-22	Leg 1 -15C-17-6-22 Leg 2 - 11C-17-6-22				
4420	12C-16-6-22	14D-16-6-22 - 365.2				50.0000% 152.6
4826	11C-16-6-22	1C-17-6-22			1.8353% 14.1	8.1568% 62.67
					42.9731% 330.16	50.0000% 152.6 8.1860% 62.87

TUNDRA SOURIS HARTNEY WATERFLOOD APPLICATION

TWP 6	13	14	15	16	13	14	15	16
		Tract 10	Tract 9	Tract 8	Tract 4	Tract 3		
	12	11 1.47%	10 3.72%	9 8.79%	12 13.61%	11 13.60%	10	9
	5	6	17 7	8	5	6	16 7	8
		Tract 7	Tract 6	Tract 5	Tract 2	Tract 1		
	4	3 6.94%	2 8.91%	1 23.67%	4 18.31%	3 0.78%	2	1

	Minerals	RGE 22 WPM
	The C. R. Somerville Company Ltd. (1/3)	
	Martha J. Allan (1/3)	
Section 17	James S. Mills (1/3)	
	NW 1/4 & SE 1/4 (per Lic. No. 4399)	
	NE 1/4 & SW 1/4 (per Lic. No. 4398)	
Section 16	T.H. Gibson (Gibson OIIs)	
	W 1/2	

Company/ Location	Licence No.	Field/ Pool Code	Unit	Status	On Production Date	Earned Holiday Volume	Transfer TO Account	Transfer FROM Account	Well Holiday Volume	Holiday Volume Account Balance	Prod for Mar/99	Cum Prod to		Est. Months Remaining	Actual Date		Letter Sent
												Mar 31/99	Vol Remain		Off Holiday	Letter Sent	
TUNDRA OIL AND GAS LTD																	
#05-16-10-28	4317	0159A	n/a	Coop	Oct 22/92	1227.0		273.0	1500.0	-273.0	n/a	1260.9	239.1	(Vol. remain. trans to Marg		5-16-10-28)	
#09-33-02-21	4321	0652B	n/a	Coop	Oct 30/92	1227.0		234.4	1461.4	-507.4	n/a	n/a	0.0		June/96	Letter Nov/95	
#15-20-02-28	4318	0742F	n/a	Coop	Oct 19/92	1227.0	727.0		500.0	219.6	n/a	n/a	0.0		July/93	Letter Sept/93	
#12-11-01-24	4322	9929I	n/a	Coop	Dec 10/92	4822.0	1822.0		3000.0	2041.6	n/a	n/a	0.0		Dec/96	Letter Sept/96	
#15-21-10-29	4331	0160A	1	Coop	Feb 19/93	1507.4	1007.4		500.0	3049.0	n/a	n/a	0.0		July/94	Letter June/94	
#14-14-09-28	4338	0160I	n/a	Coop	Mar 12/93	1507.4		492.6	2000.0	2556.4	n/a	n/a	0.0		Dec/94	Letter Aug/94	
#01-28-10-29	4332	0160A	1	Coop	Mar 9/93	1507.4	1007.4		500.0	3563.8	n/a	n/a	0.0		Dec/94	Letter Jan/95	
#10-20-10-29	4339	0160A	n/a	Coop	Mar 2/93	1516.6	1016.6		500.0	4580.4	n/a	n/a	0.0		March/95	Letter Feb/95	
#16-29-10-29	4334	0160A	n/a	Coop	Mar 14/93	1507.4	807.4		700.0	5387.8	n/a	n/a	0.0		June/94	Letter Jan/94	
#09-03-01-24	4347	9929I	n/a	Coop	Aug 4/93	2029.1	1529.1		500.0	6916.9	n/a	n/a	0.0		Nov/95	Letter July/95	
(6)#06-11-01-24	4348	9929I	n/a	Coop	Aug 7/93	1639.0	1139.0		500.0	8055.9	n/a	389.0		*Mar/96	Letter Nov/95		
#04-14-01-24	4357	9929I	n/a	Coop	Aug 17/93	1845.4			1845.4	8055.9	n/a	n/a	0.0		Oct/96	Letter Aug/96	
#16-22-09-29	3608	0160K	n/a	Reentry	Aug 18/93	0.0		1007.4	1007.4	7048.5	n/a	n/a	0.0		Dec/94	Letter Aug/94	
#01-32-10-29	4382	0160A	n/a	Coop	Oct 12/93	1642.5		857.5	2500.0	6191.0	n/a	n/a	0.0		Dec/95	Letter July/95	
#08-32-10-29	4402	0160A	n/a	Coop	Oct 22/93	1546.9		953.1	2500.0	5237.9	n/a	n/a	0.0		Aug/94	Letter June/94	
#11-14-09-28	4386	0160I	n/a	Coop	Oct 24/93	1546.9		953.1	2500.0	4284.8	n/a	n/a	0.0		Nov/95	Letter July/95	
#12-12-02-21	4416	n/a	n/a	ABD D	n/a	4253.4	4253.4		0.0	8538.2							
#07-18-10-27	4385	0159A/0160J	n/a	Reentry	Oct 4/93	0.0			0.0	8538.2	n/a	n/a	0.0				
#02-32-10-29	4401	0160A	n/a	Coop	Oct 29/93	1546.9	746.9		800.0	9285.1	n/a	n/a	0.0		Apr/95	Letter Jan/95	
#01-08-06-29	4417	0244C	n/a	Coop	Nov 23/93	10000.0			10000.0	9285.1	n/a	n/a	0.0		May/95	Letter Jan/95	
#13-28-10-29	4407	0160A	n/a	Coop	Nov 2/93	1546.9		953.1	2500.0	8332.0	n/a	n/a	0.0		Sept/96	Letter May/96	
#13-14-09-28	4400	0160I	n/a	Reentry	Oct 28/93	0.0		1000.0	1000.0	7332.0	n/a	n/a	0.0		Feb/96	Letter Aug/95	
#15-02-10-29	3519	Conf	n/a	Reentry	Nov 28/93	0.0		50.0	50.0	7282.0	n/a	n/a	0.0		Dec/93	Letter Aug/94	
#07-33-10-29	4431	0160A	n/a	Coop	Dec 31/93	2240.3	440.3		1800.0	7722.3	n/a	n/a	0.0		July/95	Letter Feb/95	
#02-14-09-28	4443	0160I	n/a	Reentry	Mar 18/94	0.0		1800.0	1800.0	5922.3	n/a	n/a	0.0		June/95	Letter Feb/95	
#A09-32-09-25	4495	n/a	n/a	ABD D	n/a	10000.0	10000.0		0.0	15922.3							
#11-33-10-29	4462	0160A	n/a	Coop	Aug 11/94	1270.0		230.0	1500.0	15692.3	n/a	n/a	0.0		May/96	Letter May/96	
#11-15-06-29	4475	0244C	n/a	Coop	July 25/94	1270.0		1230.0	2500.0	14462.3	n/a	n/a	0.0		Sept/95	Letter June/95	
#10-17-10-29	4469	0159T	n/a	Coop	Aug 15/94	2419.1	1219.1		1200.0	15681.4	n/a	565.5	0.0		Abd. Prod.	June 6/95	
#03-33-10-29	4489	0160A	n/a	Coop	Aug 31/94	1422.6		1077.4	2500.0	14604.0	n/a	n/a	0.0		Nov/95	Letter July/95	
#11-29-09-25	4465	0559C	n/a	Coop	Sept 1/94	1341.5		558.5	1900.0	14045.5	n/a	n/a	0.0		Nov/95	Letter July/95	

Company/ Location	Licence No.	Pool Code	Unit	Status	Production Date	Holiday		TO Account	FROM Account	Holiday		Account Balance	Prod for Mar/99	Cum Prod to Mar 31/99		Est. Months		Actual Date Off Holiday	Letter Sent
						Volume	Account			Volume	Account			Vol Remain	Remaining				
TUNDRA OIL AND GAS LTD (cont')																			
#A1-08-06-29	F	0244C	n/a	Coop	Sept 23/94	10000.0				10000.0		14045.5	n/a	n/a	0.0		Sept/95	Letter July/95	
#02-08-06-29	F	0244C	n/a	Coop	Oct 11/94	10000.0				10000.0		14045.5	n/a	n/a	0.0		Sept/95	Letter June/95	
#04-23-09-28	F	0159B/0160I	n/a	Reentry	Oct 12/94	0.0			367.0	367.0		13678.5	n/a	n/a	0.0		April/95	Letter Aug/95	
#03-18-03-28	F	0742B	n/a	Coop	Nov 14/94	10000.0				10000.0		13678.5	n/a	n/a	0.0		Mar/96	Letter Aug/95	
#12-15-06-29	F	0244C	n/a	Coop	Nov 17/94	10000.0				10000.0		13678.5	n/a	n/a	0.0		Aug/97	Letter Aug/95	
#01-33-10-29	F	0160A	2	Coop	Feb 22/95	1362.5			1137.5	2500.0		12541.0	n/a	n/a	0.0		Jan/97	Letter May/97	
#10-14-09-28	C	0160I	n/a	Coop	Mar 8/95	1280.0				1280.0		12541.0	n/a	n/a	0.0		Apr/97	Letter Nov/96	
#08-18-10-27	Fed	0159A	n/a	Coop	Oct 8/92	0.0				0.0		12541.0	n/a	n/a	0.0			Letter Jan/97	
#10-29-05-29	C	n/a	n/a	ABD D	n/a	2034.0	2034.0			0.0		14575.0	n/a	n/a	0.0			Letter July/96	
#11-15-06-29	F	0244C	n/a	Coop	July 31/95	10000.0				10000.0		14575.0	n/a	n/a	0.0		Nov/96		
#11-30-10-29	F	n/a	n/a	ABD D	n/a	2231.8	2231.8			0.0		16806.8	n/a	n/a					
#05-09-11-29	F	n/a	n/a	ABD D	n/a	3304.0	3304.0			0.0		20110.8	n/a	n/a					
#14-10-09-28	C	0159B	n/a	Coop	Aug 18/95	2171.4				2171.4		20110.8	n/a	192.4			Abd. Prod.	July 23/98	
#A06-14-09-28	F	0159B/60I	n/a	Coop	Aug 21/95	1401.2			598.8	2000.0		19512.0	n/a	n/a	0.0		May/97	Letter Mar/97	
#08-17-10-29	F	0160A	n/a	Coop	Aug 28/95	1481.0				1481.0		19512.0	n/a	n/a	0.0		Jan/98	Letter Oct/97	
#07-05-11-29	F	n/a	n/a	ABD D	n/a	2712.3	2712.3			0.0		22224.3	n/a	n/a					
07-11-03-29	C	0743C	n/a	Coop	Sept 14/95	10000.0				10000.0		22224.3	86.1	4266.5	5733.5	66.6		Letter Dec/96	
#03-18-03-28	C	0742B	n/a	Coop	Sept 20/95	10000.0				10000.0		22224.3	n/a	n/a	0.0		Mar/97	Letter Mar/98	
#16-30-09-28	C	0160V	n/a	Reentry	Oct 30/95	0.0			1100.0	1100.0		21124.3	n/a	n/a	0.0		June/98	Letter Oct/97	
#02-17-10-29	F	0159T/60A	n/a	Coop	Jan 29/96	1000.0	480.1			1000.0		21604.4	n/a	n/a	0.0		Dec/97	Letter Oct/97	
#15-28-10-29	F	0160A	n/a	Coop	Feb 22/96	1480.1				1480.1		21604.4	n/a	n/a	0.0		July/98	Letter Jan/98	
#5-33-10-29	F	0160A	n/a	Coop	Feb 12/96	1480.1			1019.9	2500.0		20584.5	n/a	n/a	0.0		Oct/96	Letter July/96	
#11-17-03-28	F	0743B	n/a	Coop	Mar 5/96	10000.0				10000.0		20584.5	n/a	n/a	0.0		July/98	Letter Jan/98	
#(M)15-20-02-28	F	0735D	n/a	Recomp	Mar 1/96	500.0				500.0		20584.5	n/a	350.6			Abd. Prod.	Oct/98	
16-11-09-28	C	0160I	1	Reentry	Mar 23/96	0.0			2500.0	2500.0		18084.5	50.2	2458.3	41.7	0.8	* Apr/99	Letter Feb/99	
1#09-14-02-29	F	0729B	n/a	Coop	Nov 1/93	1928.9				1928.9		18084.5	n/a	79.8	1849.1		Abd. Prod.	Aug/96	
#12-04-03-28	C	0742B	n/a	Coop	July 9/96	1715.4				1715.4		18084.5	n/a	56.6	1658.8		Abd. Prod.	July/97	
2#(M)16-26-09-29	C	0160N	n/a	Reentry	Sept 28/96	500.0				500.0		18084.5	n/a						
3#A14-15-16-29	F	9919A	n/a	Coop	Mar 22/93	1507.4				1507.4		18084.5	n/a						
3#A15-15-16-29	F	n/a	n/a	Standing	n/a	10000.0	9500.0					27584.5	n/a						

Company/ Location	F/C	Licence No.	Field/ Pool Code	Unit	Status	Production On Date	Earned Holiday Volume	Transfer TO Account	Transfer FROM Account	Well Holiday Volume	Holiday		Prod for Mar/99	Cum Prod to Mar 31/99	Vol Remain	Est. Months Remaining	Actual Date Off Holiday	Letter Sent
											Volume	Balance						
TUNDRA OIL AND GAS LTD (cont'd)																		
#01-08-06-29	F	4588	0244C	n/a	Coop	July 26/96	10000.0			10000.0	27584.5		n/a	n/a	0.0		Sept/97	Letter Aug/97
#12-09-06-29	F	4592	0244C	n/a	Coop	Aug 8/96	10000.0			10000.0	27584.5		n/a	n/a	0.0		Sept/97	Letter Jan/97
#05-34-10-29	F	4610	n/a	n/a	ABD D	n/a	752.2	752.2		0.0	28336.7							
#04-05-11-29	F	4594	n/a	n/a	ABD D	n/a	10000.0	10000.0		0.0	38336.7							
#15-28-11-28	F	4595	n/a	n/a	ABD D	n/a	10000.0	10000.0		0.0	48336.7							
#13-29-10-28	C	4609	0159E	n/a	Coop	Sept 18/96	10000.0			10000.0	48336.7		n/a	n/a	0.0		Nov/98	Letter May/98
#(M)05-16-10-28	C	4317	0159A/60X	n/a	Recomp	Nov 8/96	739.1			739.1	48336.7		n/a	211.5	527.6		Abd Prod	July 23/98
#10-11-09-28	C	4644	n/a	n/a	ABD D	n/a	10000.0	10000.0		0.0	58336.7							
13-10-01-24	F	4624	9929I	n/a	Coop	Jan 14/97	2110.9	1110.9		1000.0	59447.6		31.0	918.8	81.2	2.6	*July/99	Letter Apr/99
16-10-01-24	F	4643	9929I	n/a	Coop	Jan 14/97	673.4		826.6	1500.0	58621.0		28.0	964.1	535.9	19.1		
#14-36-10-29	C	4646	n/a	n/a	ABD D	n/a	10000.0	10000.0		0.0	68621.0							
#10-17-03-28	F	4640	0743B	n/a	Coop	Jan 24/97	575.1		1924.9	2500.0	66696.1		n/a	n/a	0.0		Jan/99	Letter Oct/98
06-23-09-28	F	4645	0159B/60I	1	Coop	Feb 3/97	686.0		1314.0	2000.0	65382.1		57.7	1561.7	438.3	7.6		
#07-33-02-28	F	4687	n/a	n/a	ABD D	n/a	1285.7	1285.7		0.0	66667.8							
01-21-01-24	F	4747	9929I	n/a	Coop	Nov 13/97	2676.2			*	66667.8		15.0	299.0	#VALUE!	#VALUE!		
04-15-01-24	F	4763	9929I	n/a	Coop	Nov 25/97	10000.0			10000.0	66667.8		69.6	1077.5	8922.5	128.2		
#03-17-06-22	F	4398	1053A	n/a	Coop	Nov 6/93	10000.0			10000.0	66667.8		n/a	n/a	0.0		Aug/96	Letter May/96
(4)15-17-06-22	F	4399	1053A	n/a	Coop	Nov 17/93	10000.0			10000.0	66667.8		13.0	4911.3	5088.7	391.4		
(4)14-16-06-22	F	4420	1053A	n/a	Coop	Aug 5/95	10000.0			10000.0	66667.8		190.4	8588.6	1411.4	7.4		
(4)06-10-03-28	F	4642	0743E	n/a	Coop	Feb 13/97	1500.0	8500.0		1500.0	75167.8		0.0	453.1	1046.9	#DIV/0!		
01-24-02-29	C	4758	0729B	n/a	Coop	Nov 25/97	966.4		1033.6	2000.0	74134.2		0.0	584.0	1416.0	#DIV/0!		
12-17-03-21	F	4667	0652A	n/a	Coop	Jan 3/98	1685.1			1685.1	74134.2		39.1	569.3	1115.8	28.5		
#05-12-03-29	F	4778	0743C	n/a	Coop	Dec 20/97	10000.0			10000.0	74134.2		n/a	n/a	0.0		Mar/99	Letter Nov/98
(5)04-12-01-24	F	4575	9944F	n/a	Coop	Feb 23/96	1804.2			*	74134.2		0.0	497.1	#VALUE!	#VALUE!		
(5)10-14-01-24	F	4625	9929I	n/a	Coop	June 20/97	2002.4			2002.4	74134.2		39.9	1148.9	853.5	21.4		
3-26-01-21	C	4674	0452B	n/a	Coop	Jan 16/98	10000.0			10000.0	74134.2		376.6	5297.3	4702.7	12.5		
#05-30-10-28	F	4781	0159E	n/a	Coop	Jan 31/98	10000.0			10000.0	74134.2		n/a	n/a	0.0		Nov/98	Letter Aug/98
06-33-10-29	F	4786	0160A	2	Coop	Feb 12/98	10000.0			10000.0	74134.2		210.0	3433.6	6566.4	31.3		

* no allocation to date

holiday volume has been produced

TUNDRA SOURIS HARTNEY WATERFLOOD APPLICATION

TWP 6		13	14	15	16	13	14	15	16
		12	11 1.47%	10 3.72%	9 8.79%	12 13.61%	11 13.60%	10	9
		5	6	17 7	8	5	6	16 7	8
		4	3 6.94%	2 8.91%	1 23.67%	4 18.31%	3 0.78%	2	1

RGE 22 WPM

Minerals

The C. R. Somerville Company Ltd. (1/3)

Martha J. Allan (1/3)

James S. Mills (1/3)

NW 1/4 & SE 1/4 (per Lic. No. 4399)

NE 1/4 & SW 1/4 (per Lic. No. 4398)

T.H. Gibson (Gibson DIt(s)

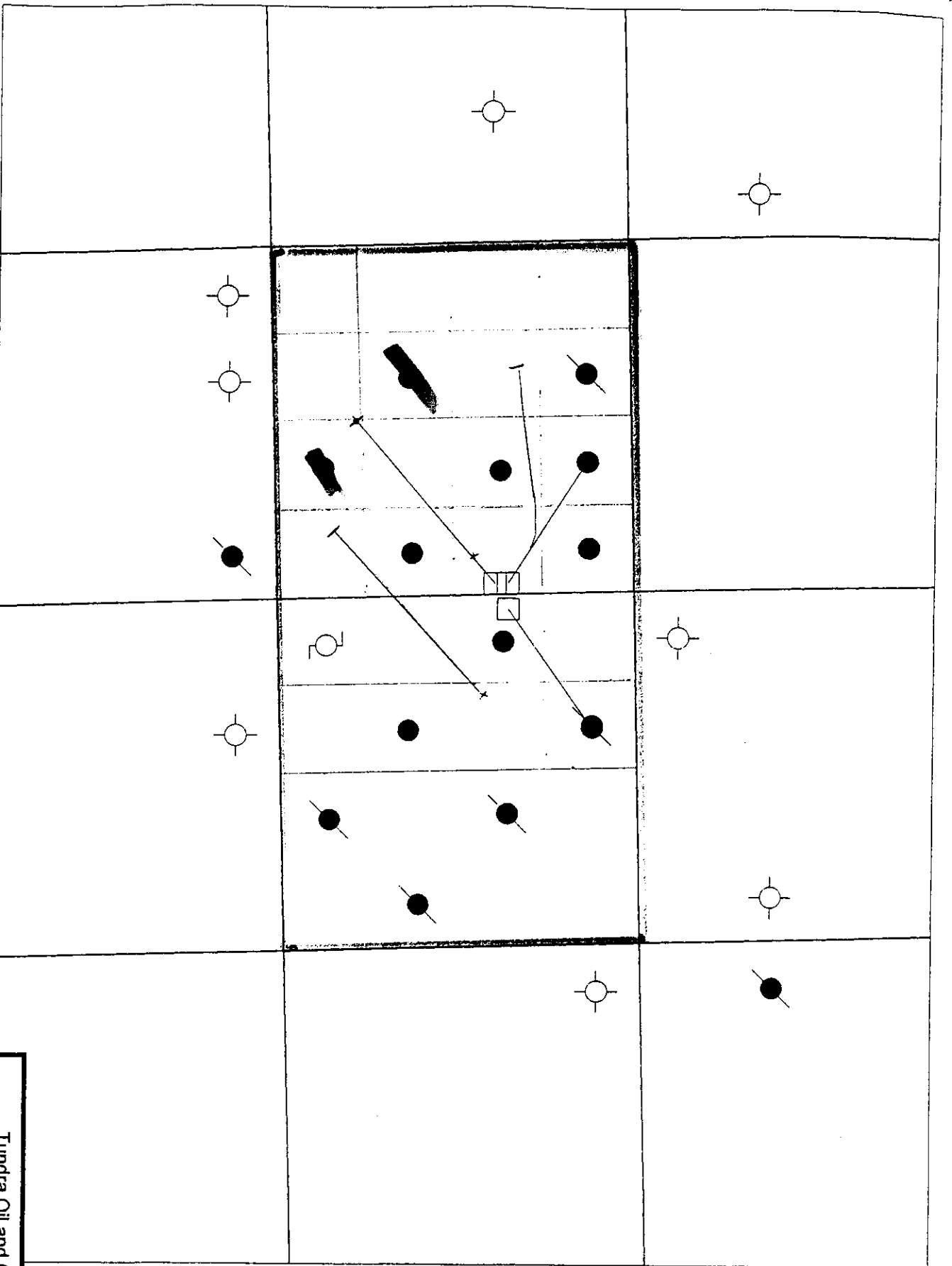
W 1/2

DAN/PAULETTE

TUNDRA IS PLANNING TO
UNITIZE THE SOURS HARTNEY
POOL; IMPLEMENT A WATERFLOOD.

(1) COULD YOU PROVIDE ME WITH
A BREAKDOWN OF PRODUCTION
ALLOCATION FOR EACH OF
THE 4 HENTL WELLS.

WHO OWNS
(2) ~~WHERE~~ IS THE TINDERALS
IN SECTIONS 16 & 17-6-22(WPH).



16

R22W1

WELL SYMBOLS

- OIL
- PTO
- LCT
- HET
- ACZ
- GCH
- RDR
- ASL
- DLA
- UNO
- SIN
- AYS
- DAW
- UNK
- PTO
- SL
- AO
- WD
- WSC
- AIN
- JAA
- PM
- PMS
- PUV
- WA
- AM
- AWD
- CMO
- PIN
- SUS
- STI
- SO
- SWD

Tundra Oil and Gas

Souris-Hartney

Licensed to: Tundra Oil & Gas

By: [Signature]

Date: 10/20/00

Scale: 1"=2500'

Project: Souris-Hartney

TABLE NO.7

UNIT OIL PRODUCTION													
LAST 90 OPERATING DAYS													
Well	W.I. in LSD	Prod.	Days	Prod.	Days	Prod.	Days	Prod.	Days	Prod.	Days	Total Prod.	Last 90 Days
	(%)	(m3)		(m3)		(m3)		(m3)		(m3)		(m3)	
14-16-6-22 Hz	100	67.6	12	147.2	29	150.4	30					365.2	71
1-17-6-22 Hz	100	252.1	12	302.7	29	213.5	30					768.3	71
2-17-6-22	100	5.5	11	12.8	29	13.9	31					32.2	71
3-17-6-22 Hz	100	108.3	12	211	29	194.6	30					513.9	71
15-17-6-22 Hz	100	13	7	61.2	29	49.3	25					123.5	61

TABLE NO.8

TABLE NO.8									
PROPOSED UNIT TRACT FACTORS AND WORKING INTERESTS									
Tract Number	Area (160 Acre Tracts)	Well	Tundra W.L. in Well	Total Operating Days	Total Production	Average Oil Rate per Operating Day	Production Adj. Factor	Tract Factor in Unit	
Tract No.1	SE 1/4 Section 17-6-22	1-17-6-22	100	71	768.3	10.82112676	0.4	0.1685473	
Tract No.1	SE 1/4 Section 17-6-22	2-17-6-22	100	71	32.2	0.45352113	1	0.0176598	
Tract No.1	SE 1/4 Section 17-6-22	3-17-6-22 Hz	100	71	513.9	7.23802817	0.81	0.2282940	
Tract No.2	SW 1/4 Section 17-6-22	3-17-6-22 Hz	100	71	513.9	7.23802817	0.01	0.0028184	
Tract No.3	NE 1/4 Section 17-6-22	3-17-6-22 Hz	100	71	513.9	7.23802817	0.18	0.0507320	
Tract No.3	NE 1/4 Section 17-6-22	15-17-6-22 Hz	100	61	123.5	2.02459016	0.85	0.0670109	
Tract No.4	NW 1/4 Section 17-6-22	15-17-6-22 Hz	100	61	123.5	2.02459016	0.15	0.0118254	
Tract No.5	NW 1/4 Section 16-6-22	1-17-6-22 Hz	100	71	768.3	10.82112676	0.18	0.0758463	
Tract No.5	NW 1/4 Section 16-6-22	14-16-6-22 Hz	100	71	365.2	5.14366197	1	0.2002911	
Tract No.6	SW 1/4 Section 16-6-22	1-17-6-22 Hz	100	71	768.3	10.82112676	0.42	0.1769746	
Tract No.7	NE 1/4 Section 16-6-22	No Well	100	-	-	-	-	0	
Tract No.8	SE 1/4 Section 16-6-22	No Well	100	-	-	-	-	0	
		Total			1,803.1	25.6809300		1.0000000	

TUNDRA OIL AND GAS LTD.


SOURIS HARTNEY UNIT NO.1

SUMMARY OF UNIT TRACT FACTORS

Tract Number	Area	Wells	Oil Production (m3/day)	Tract Factor (%)
Tract No.1	SE1/4 Section 17-6-22	1-17 Hz, 2-17 & 3-17 Hz	10.644775	41.45011654
Tract No.2	SW1/4 Section 17-6-22	3-17-6-22 Hz	0.07238	0.281843387
Tract No.3	NE1/4 Section 17-6-22	3-17 Hz & 15-17 Hz	3.023747	11.77428979
Tract No.4	NW1/4 Section 17-6-22	15-17-6-22 Hz	0.303689	1.182546784
Tract No.5	NW1/4 Section 16-6-22	14-16 Hz & 1-17 Hz	7.091465	27.61374014
Tract No.6	SW1/4 Section 16-6-22	1-17-6-22 Hz	4.544873	17.69746336
Tract No.7	NE1/4 Section 16-6-22	No Well	0	0
Tract No.8	SE1/4 Section 16-6-22	No Well	0	0
TOTAL			25.680929	100.00000000

- SOURIS HARTNEY
WF APPLICATION
Connected Royalty Owner
Addresses

① C.R. Somerset Co. Ltd.

c/o Margaret  CSERES
President
P.O. Box 124
Hartney Ron OXO

② K.M. Atlas Holdings


Martha Prasse

③ Please add. the following
lessor

Marie K. Mills
P.O. Box 176
Hartney Ron OXO

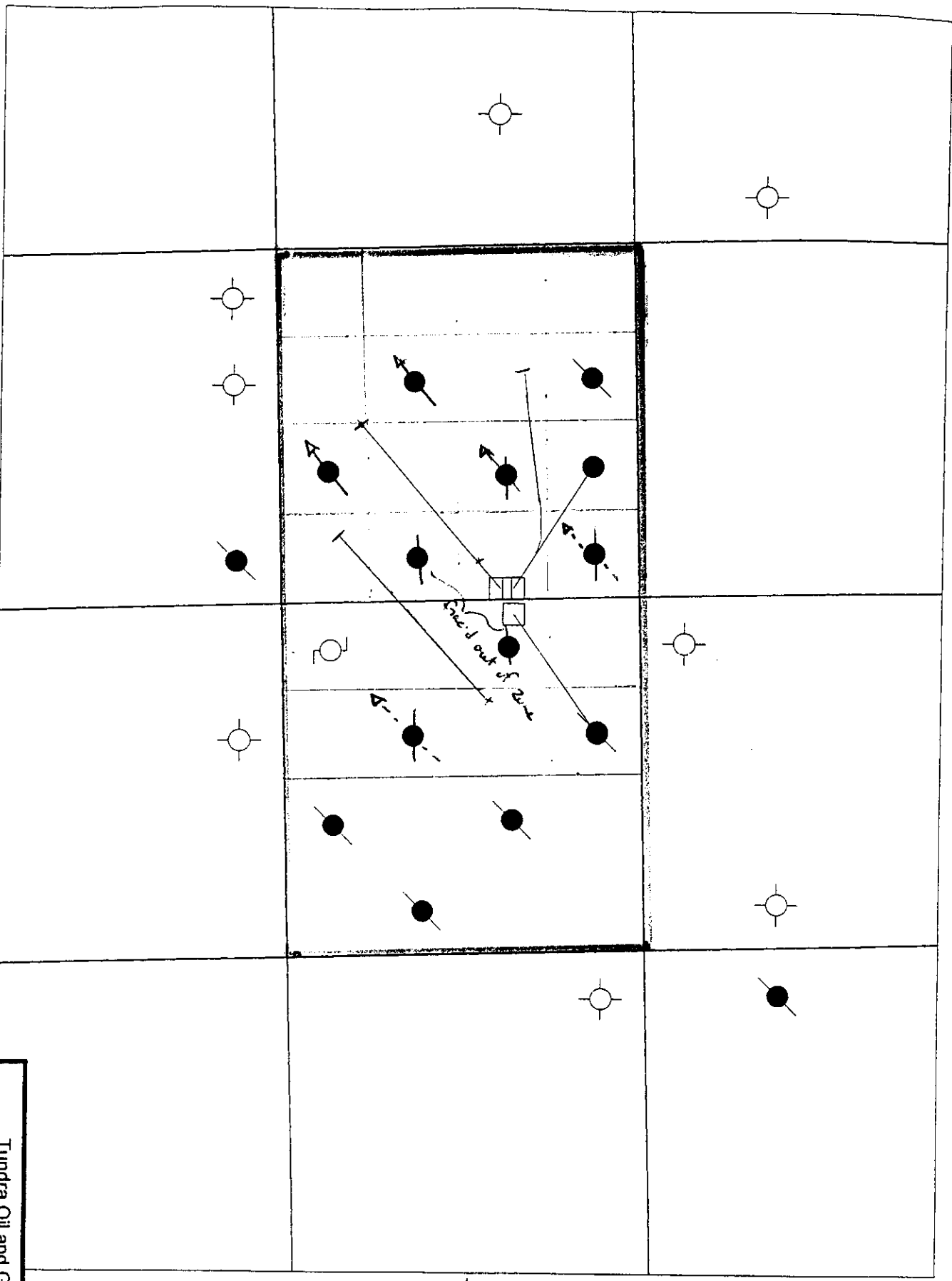
① H2N16 prod' allocat

② HOV status

③  in-kind ownership

④ 3rd tier.

- DRAINAGE UNIT IN UNIT - NO
SUI WITHIN DU IN UNIT - YES
- each SUI comes with it
a prod. volume.



R22W1

WELL SYMBOLS

- ORL
- PTO
- LCT
- HET
- ACZ
- GOR
- BSH
- ROR
- ASL
- DLA
- UNB
- SIN
- AVE
- DAU
- UNB
- D
- SL
- AO
- WND
- WSC
- AIN
- JAA
- PWA
- PWS
- PUV
- W1
- AM
- AMD
- SWS
- DRL
- PGR
- GST
- ADV
- SO
- SWI
- CMO
- PIN
- SUS
- STI
- SO
- SWD

Tundra Oil and Gas	
Souris-Hartney	
Licensed to: Tundra Oil & Gas Project: Souris-Hartney Scale: 1:25000 Date: 1999/07/28 Project: Souris-Hartney	By: [Signature] Date: 1999/07/28 Project: Souris-Hartney

"third tier oil" means oil that is produced from
e. an old oil well or new oil well, that in the opinion of the director, can reasonably be attributed to an increase in reserves as a result of a project of enhanced recovery implemented under the Act after April 1, 1999.

- previously used unit decline rates (existing wells only) to establish 3rd tier oil/new oil
- proposed 1st phase of waterflood will only impact two wells 1-17 & 3-17

TABLE NO.7

UNIT OIL PRODUCTION													
LAST 90 OPERATING DAYS													
Well	W.L. in LSD	Mar-99		Apr-99		May-99		Jun-99		Total Prod.	Last 90 Days		
		Prod.	Days	Prod.	Days	Prod.	Days	Prod.	Days				
	(%)	(m3)		(m3)		(m3)		(m3)		(m3)			
14-16-6-22 Hz	100	67.6	12	147.2	29	150.4	30			365.2	71		
1-17-6-22 Hz	100	252.1	12	302.7	29	213.5	30			768.3	71		
2-17-6-22	100	5.5	11	12.8	29	13.9	31			32.2	71		
3-17-6-22 Hz	100	108.3	12	211	29	194.6	30			513.9	71		
15-17-6-22 Hz	100	13	7	61.2	29	49.3	25			123.5	61		

TABLE NO.8

TABLE NO.8									
PROPOSED UNIT TRACT FACTORS AND WORKING INTERESTS									
Tract Number	Area (160 Acre Tracts)	Well	Tundra W.I. in Well	Total Operating Days	Total Production	Average Oil Rate per Operating Day	Production Adj. Factor	Tract Factor in Unit	
Tract No.1	SE 1/4 Section 17-6-22	1-17-6-22	100	71	768.3	10.82112676	0.4	0.1685473	
Tract No.1	SE 1/4 Section 17-6-22	2-17-6-22	100	71	32.2	0.45352113	1	0.0176598	
Tract No.1	SE 1/4 Section 17-6-22	3-17-6-22 Hz	100	71	513.9	7.23802817	0.81	0.2282940	
Tract No.2	SW 1/4 Section 17-6-22	3-17-6-22 Hz	100	71	513.9	7.23802817	0.01	0.0028184	
Tract No.3	NE 1/4 Section 17-6-22	3-17-6-22 Hz	100	71	513.9	7.23802817	0.18	0.0507320	
Tract No.3	NE 1/4 Section 17-6-22	15-17-6-22 Hz	100	61	123.5	2.02459016	0.85	0.0670109	
Tract No.4	NW 1/4 Section 17-6-22	15-17-6-22 Hz	100	61	123.5	2.02459016	0.15	0.0118254	
Tract No.5	NW 1/4 Section 16-6-22	1-17-6-22 Hz	100	71	768.3	10.82112676	0.18	0.0758463	
Tract No.5	NW 1/4 Section 16-6-22	14-16-6-22 Hz	100	71	365.2	5.14366197	1	0.2002911	
Tract No.6	SW 1/4 Section 16-6-22	1-17-6-22 Hz	100	71	768.3	10.82112676	0.42	0.1769746	
Tract No.7	NE 1/4 Section 16-6-22	No Well	100	-	-	-	-	0	
Tract No.8	SE 1/4 Section 16-6-22	No Well	100	-	-	-	-	0	
Total					1,803.1	25.6809300		1.0000000	

TUNDRA OIL AND GAS LTD.

SOURIS HARTNEY UNIT NO.1

SUMMARY OF UNIT TRACT FACTORS

Tract Number	Area	Wells	Oil Production (m3/day)	Tract Factor (%)
Tract No.1	SE1/4 Section 17-6-22	1-17 Hz, 2-17 & 3-17 Hz	10.644775	41.45011654
Tract No.2	SW1/4 Section 17-6-22	3-17-6-22 Hz	0.07238	0.281843387
Tract No.3	NE1/4 Section 17-6-22	3-17 Hz & 15-17 Hz	3.023747	11.77428979
Tract No.4	NW1/4 Section 17-6-22	15-17-6-22 Hz	0.303689	1.182546784
Tract No.5	NW1/4 Section 16-6-22	14-16 Hz & 1-17 Hz	7.091465	27.61374014
Tract No.6	SW1/4 Section 16-6-22	1-17-6-22 Hz	4.544873	17.69746336
Tract No.7	NE1/4 Section 16-6-22	No Well	0	0
Tract No.8	SE1/4 Section 16-6-22	No Well	0	0
TOTAL			25.680929	100.00000000

→ is 8-17 + ?

SOURIS HARTNEY - WF AOPLN

• JUN/99 - 20 m³/d @ 85% W₂, cum. oil 30-JUN-99 189/68

• 80 ac vt. well spacing, infill drilling with h₂ wells (4)

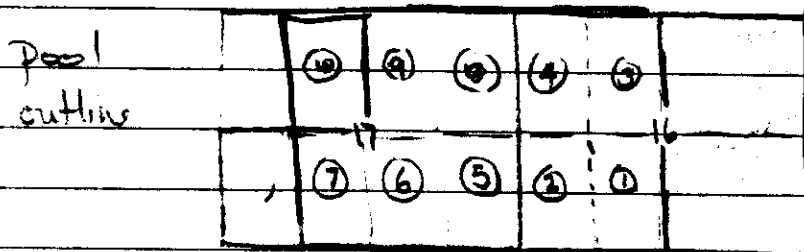
• WF recovery 27.5% OOIP ✓
primary recovery 243,041 m³ (23.5% OOIP)
OOIP = 1,036,153 m³ (volumetric)
of plane

• initial injector 2-17, 6-17 & 10-17, possible conversion 16-17

& 8-16 (line drive configuration) @ a future date

use original 20 ac unit area
with the exception of 16-17
well. the well proposed in location
conversions are as

unitized zone Upper
Virech



future
H₂ drilling potential
2000

• tract participation formula - last 90-days production - for
H₂ wells distributed in accordance with prod allocation
agreement

• engineering study → do we have copy of special core
study, pressure surveys & reservoir simulation (predict WF recovery)
yes included in app'n

RESERVOIR SIMULATION

OOIP	1,145,000 m ³	969,000 m ³ (excluding labels in NW 17 & SE 16)
PRIMARY RES	240,000	
RECOVERY FAC	24.5%	
Δ WF RES	58000 m ³ (see 17 only)	
	unit WF Rec FAC = 27.5%	

- will need to publish notice of WF application -
local papers in Souris & HARTNEY ✓
- who do we send a copy of notice to: landowner in unit area, Ro is \pm within 0.5 km ✓
- Tundra's ult. rec. prediction harmonic decline -- 44.98% - - Fig 3
- proposed injectors are providing support to existing H2 wells. Fig. 5
- unit area includes all producers. Fig 4
- which zone does 4-16 disposal well dispose into
- need to develop 10-yr. primary production forecast; compare with Tundra's data from Figures 3 & 6 & Table 5 assumes no further development
- compare Tundra reservoir parameters (Table 3) with Branch's (see Souris Hartney POF - Klamm & Fox)
- OOIP distribution within unit area

Sec. 16 -	267827 m ³	(35.9%)	46832 (cumulative prod. current rec. = 12.5)
Sec. 17 -	477522 m ³	(64.1%)	141993 (current recovery = 29.77%)
	<u>745349 m³</u>		
- vt well capable of draining 80 acres - Yes based on high recoveries @ 12-16, 2-17, 6-17, 8-17 & 10-17

- ultimate primary rec. unit area.

Sec. 16	unit area - 53719 m ³ (20.1%)	remaining min rec. area 6897 m ³
Sec 17	unit area - 135949 m ³ (39.6%)	46956 m ³
	<u>TOTAL</u>	<u>53843 -</u>

- incremental WF recoverable reserves 42000 m³. based on injection @ 2-17, 6-17 + 10-17

$$3^{rd} \text{ Tier factor} = \frac{\text{incremental WF rec. res.}}{\text{Total rec. res. (primary + WF)}} = \frac{42000}{95,943} = .4382$$

- simulation results add 16-17 injection area 13,000 m³
add 8-16 injection area 3,000 m³

- confirm prod. last 90 operating day - Table 7
- prod. split from Table 7, sec 16 = 23.5%, sec 17 = 76.5%, does not account for H2 well prod. allocation

- confirm tract factors - Table 9 & 10

- vt. well prod dropped dramatically in '96, ^{drop at well as group} { 12-16, 2-17, 6-17, etc }
why - interference from H2 wells, drop in reservoir pressure

- to determine historical production decline, we will probably have to use individual well declines

- special case study WF recovery 60% based on
 $S_{oi} = 52.7\%$, $S_{or} = 21.1\%$, reservoir stimulation
volumetric & areal sweep eff. $\frac{52.7 - 21.1}{52.7} = 60\%$

- max. rec. with 5 injectors = 40.3% (0.01?), volumetric sweep 67.2%

WHAT ARE WE MISSING.

- ✓ injection targets, need for make-up water, possible sources
- ✓ reservoir pressure data
- ✓ copy of complete special case study & reservoir simulation
 - 2 in support of
 - optimum depletion strategy
 - evaluate efficacy of WF
 - enhance info avail.
- max inj. press.
- schedule for future conversions
- plans for 4-16 sand well (which zone is it completed in)

Rem. Rec. Res.

		DECLINE	Q _i	Q ₊
14-16	6887 m ³	22.58%	14.1 (Sep/95)	0.4 (Aug/09)
1-17	28063 m ³			
2-17	658 m ³	7.94%	1.6 (Mar/84)	0.3 (Aug/04)
3-17	13490 m ³	47.9% (Mar)	14.9 (Oct/97)	0.6 (Oct/25)
15-17	4746 m ³	10.4%	2.7 (Mar/95)	0.3 (Sep/15)
total	53844	rem	+ cum. prod - 189168 (30-ann)	

WF Recovery Prediction

CONVERSIONS.

Δ RESERVOIRS (m³)

6-17, 10-17	27000
6-17, 10-17, 16-17	40000
2-17, 6-17, 10-17	42000
2-17, 6-17, 10-17, 16-17	55000
2-17, 6-17, 10-17, 16-17, 6-16, 8-16	58000

Production Report

Group : Souris Hartney 53A
 Well : SourisHartney Ldgepole Virden A
 : 000000103
 Hist.Data : 11/62-08/99
 Operator :
 Field :

Date : 10/27/99 1:39:53 pm
 User : jfox
 On Prod : 01/00
 Status : Unknown
 Zone :

Production Data from January, 1998 to August, 1999

Year	Avg Daily Oil m3/d	Monthly Oil m3	Cum Oil m3	WOR m3/m3	Num Wells
Jan., 1998	23.3458	688.7	179299	3.09075	4
Feb., 1998	22.3229	608.3	179908	3.03715	4
Mar., 1998	21.1548	655.8	180563	2.93702	4
Apr., 1998	20.64	619.2	181183	3.14277	4
May., 1998	20.0323	621	181804	6.32995	4
Jun., 1998	19.62	588.6	182392	3.42457	4
Jul., 1998	19.1871	594.8	182987	3.68645	4
Aug., 1998	18.9463	582.6	183570	3.50257	4
Sep., 1998	18.27	548.1	184118	3.7245	4
Oct., 1998	18.0839	560.6	184678	3.69979	4
Nov., 1998	17.57	527.1	185205	3.76058	4
Dec., 1998	17.1355	531.2	185737	3.93581	4
Jan., 1999	16.9369	470	186207	4.40936	4
Feb., 1999	17.501	459.4	186666	3.76926	4
Mar., 1999	33.5598	750.9	187417	3.44227	5
Apr., 1999	24.4967	734.9	188152	5	5
May., 1999	21.0152	621.7	188774	5.42529	5
Jun., 1999	19.2477	565.4	189339	5.64167	5
Jul., 1999	19.3333	580	189919	5.98897	5
Aug., 1999	17.7129	549.1	190468	6.41249	5

Operator:

Field:

Zone:

Type: Unknown

Group: Souris Hartney 53A

Tundra Decline (Rate-Time)

qi: 61.69 m3/d, Dec, 1996

qf: 2.74692 m3/d, Mar, 2023

di(Har): 44.97 CTD: 190468 m3

RR: 50996.2 m3 Tot: 241464 m3

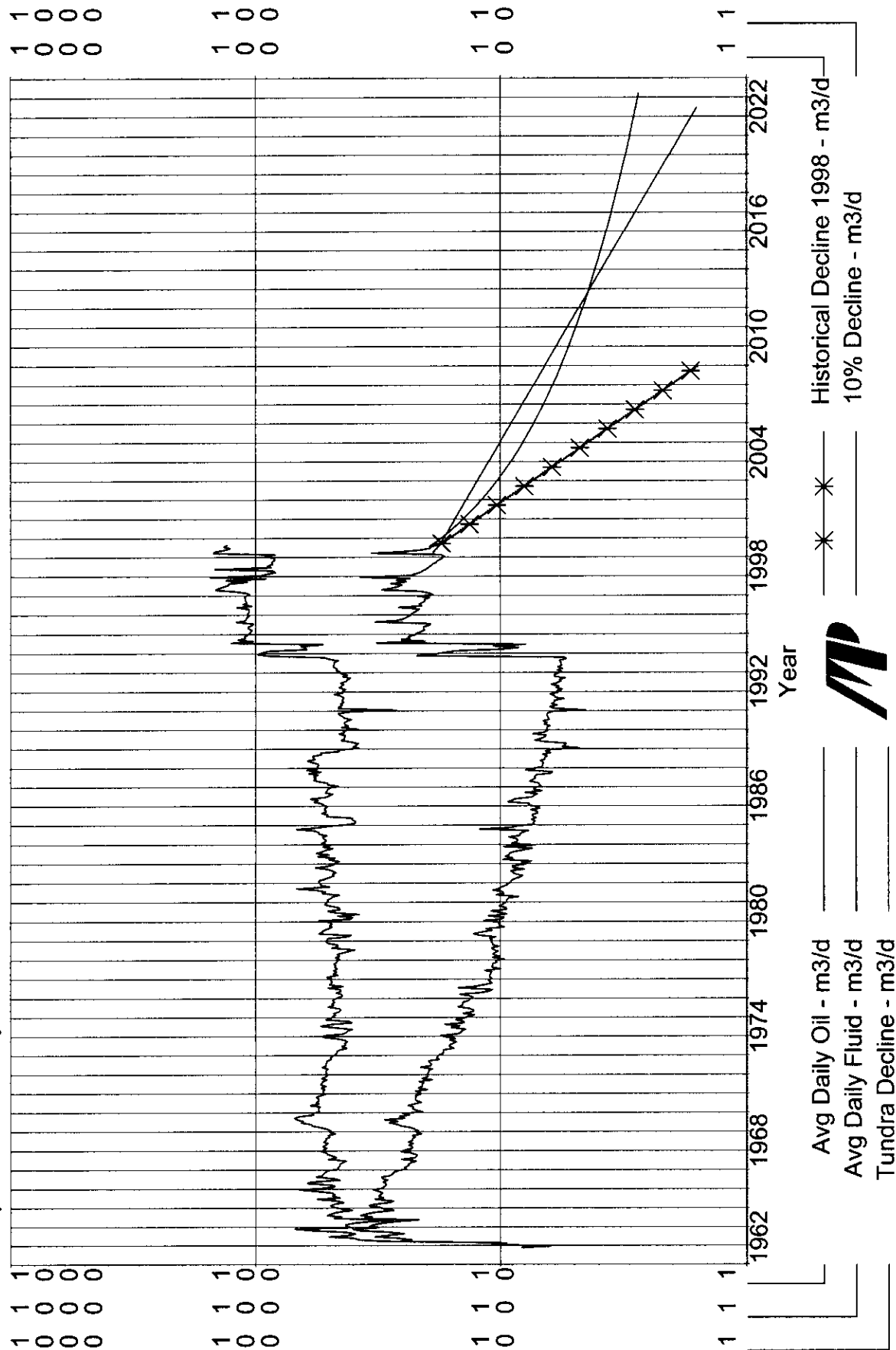
Production Cums

Oil: 190468 m3

Gas: 0 E6m3

Water: 531703 m3

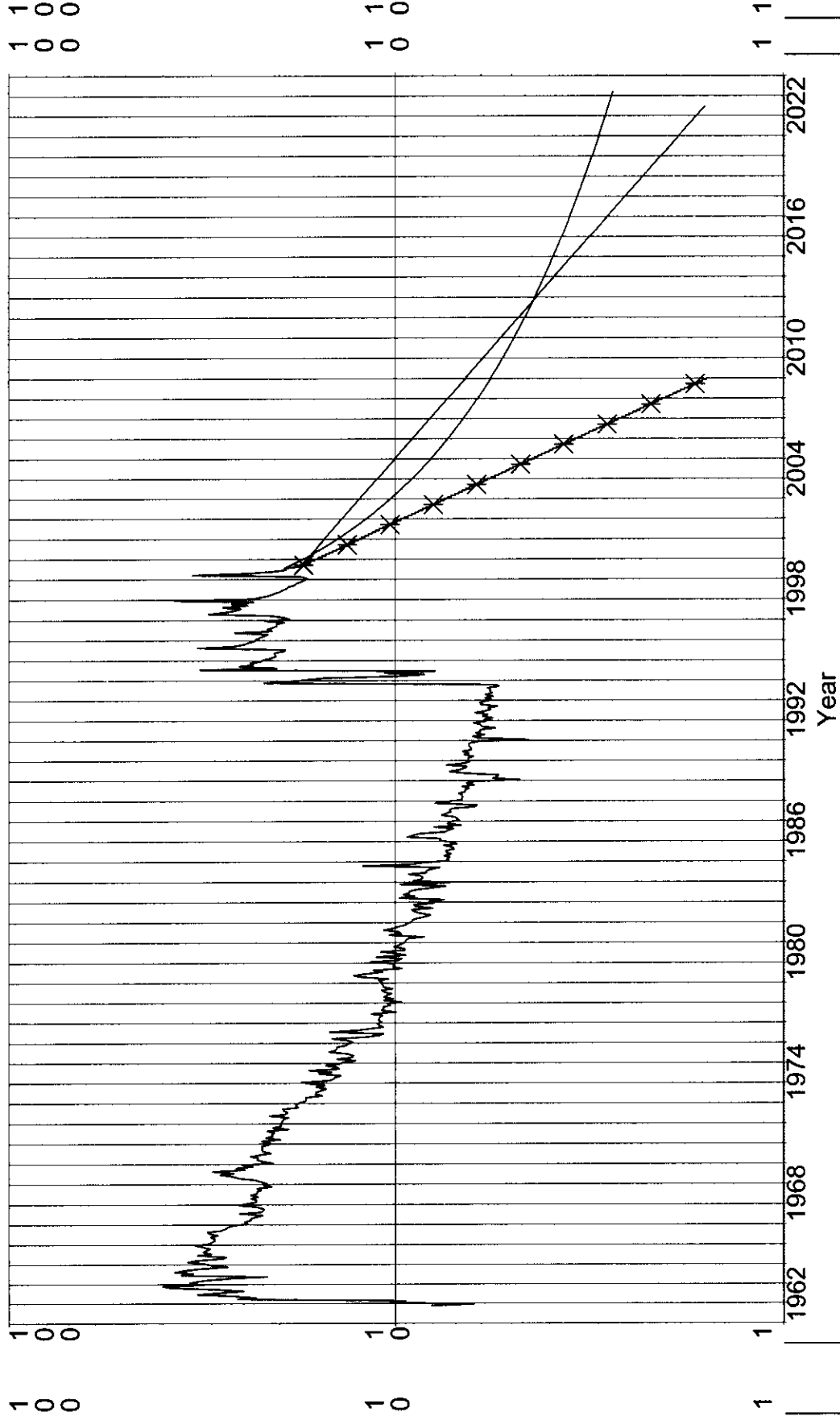
Cond: 0 m3



SourisHartney Ldgepole Virden A Data 11/62-08/99

Operator: 10% Decline (Rate-Time)
 Field: qi: 17.7 m3/d, Sep, 1999
 Zone: qf: 1.59652 m3/d, Jun, 2022
 Type: Unknown di(Exp): 10 CTD: 190468 m3
 Group: Souris Hartney 53A RR: 51138.7 m3 Tot: 241607 m3

Production Cums
 Oil: 190468 m3
 Gas: 0 E6m3
 Water: 531703 m3
 Cond: 0 m3



Avg Daily Oil - m3/d
 Tundra Decline - m3/d
 Historical Decline 1998 - m3/d
 10% Decline - m3/d



SourisHartney Ldgepole Virden A Data 11/62-08/99

Historical Production Decline (Rate-Time)

qi: 17.7 m3/d, Sep, 1999

qf: 1.58531 m3/d, Oct, 2013

di(Exp): 15.66 CTD: 190468 m3

RR: 31579.8 m3 Tot: 222048 m3

Production Cums
Oil: 190468 m3
Gas: 0 E6m3
Water: 531703 m3
Cond: 0 m3

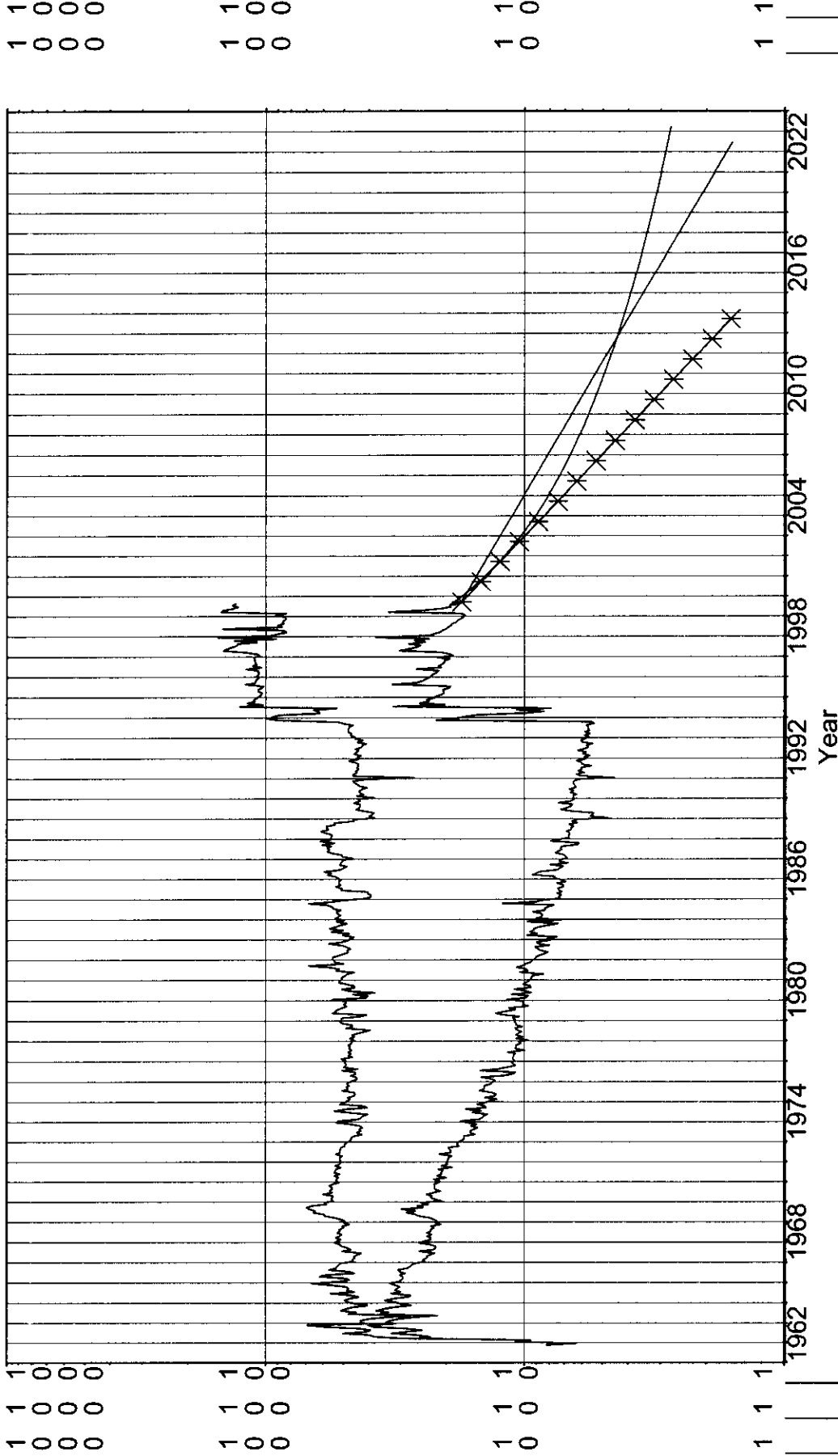
Operator:

Field:

Zone:

Type: Unknown

Group: Souris Hartney 53A



Avg Daily Oil - m3/d

Avg Daily Fluid - m3/d

Tundra Decline - m3/d

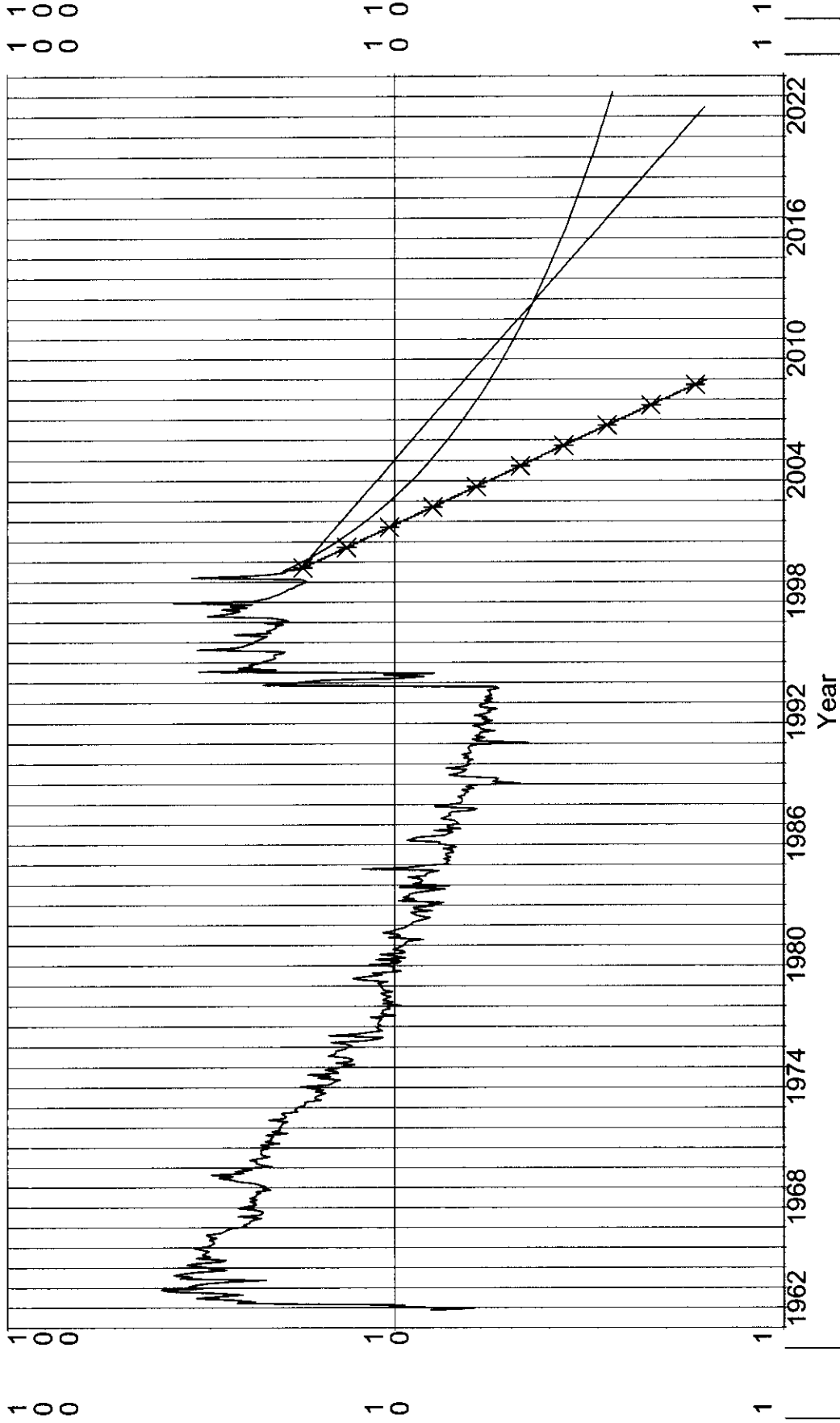


10% Decline - m3/d

* * * Historical Production Decline - m3/d

SourisHartney Ldgepole Virden A Data 11/62-08/99

Operator: _____
 Field: _____
 Zone: _____
 Type: Unknown
 Group: Souris Hartney 53A
 Historical Decline 1998 (Rate-Time)
 qi: 17.7 m3/d, Sep, 1999
 qf: 1.58098 m3/d, Dec, 2008
 di(Exp): 22.78 CTD: 190468 m3
 RR: 21875.8 m3 Tot: 212344 m3
 Production Cums
 Oil: 190468 m3
 Gas: 0 E6m3
 Water: 531703 m3
 Cond: 0 m3



Avg Daily Oil - m3/d _____
 Tundra Decline - m3/d _____
 Historical Decline 1998 - m3/d _____
 10% Decline - m3/d _____



Production Report

Group	: Souris Hartney 53A	Date	: 10/27/99 3:00:37 pm
Well	: SourisHartney Ldgepole Virden A	User	: jfox
	: 000000103		
Hist.Data	: 11/62-08/99	On Prod	: 01/00
Operator	:	Status	: Unknown
Field	:	Zone	:

Production Data from January, 1999 to June, 2022

Year	Historical Decline 1 m3/d	Historical Decline 2 m3/d	Historical Decline 3 m3/d	Avg Daily Oil m3/d
Jan., 1999	22.75%	15.66%	10%	16.9369
Feb., 1999				17.501
Mar., 1999				33.5598
Apr., 1999				24.4967
May., 1999				21.0152
Jun., 1999				19.2477
Jul., 1999				19.3333
Aug., 1999				17.7129
Sep., 1999	17.3226	17.4504	17.5452	
Oct., 1999	16.9534	17.2045	17.3918	
Nov., 1999	16.5921	16.9621	17.2398	
Dec., 1999	16.2385	16.723	17.0891	
Jan., 2000	15.849	16.4423	16.8934	
Feb., 2000	15.5112	16.2106	16.7457	
Mar., 2000	15.1806	15.9821	16.5994	
Apr., 2000	14.8571	15.7569	16.4543	
May., 2000	14.5405	15.5349	16.3104	
Jun., 2000	14.2306	15.3159	16.1678	16.11 m³/d
Jul., 2000	13.9273	15.1001	16.0265	
Aug., 2000	13.6305	14.8873	15.8864	
Sep., 2000	13.34	14.6775	15.7475	
Oct., 2000	13.0557	14.4706	15.6099	
Nov., 2000	12.7774	14.2667	15.4734	
Dec., 2000	12.5051	14.0657	15.3382	
Jan., 2001	12.2721	13.9054	15.2457	
Feb., 2001	12.0106	13.7095	15.1125	
Mar., 2001	11.7546	13.5163	14.9804	
Apr., 2001	11.5041	13.3258	14.8494	
May., 2001	11.2589	13.138	14.7196	
Jun., 2001	11.0189	12.9528	14.5909	14.6 m³/d
Jul., 2001	10.7841	12.7703	14.4634	
Aug., 2001	10.5543	12.5903	14.3369	
Sep., 2001	10.3293	12.4129	14.2116	
Oct., 2001	10.1092	12.238	14.0874	
Nov., 2001	9.89375	12.0655	13.9642	
Dec., 2001	9.68289	11.8955	13.8422	
Jan., 2002	9.47652	11.7278	13.7212	
Feb., 2002	9.27456	11.5626	13.6012	
Mar., 2002	9.0769	11.3996	13.4823	
Apr., 2002	8.88345	11.239	13.3645	
May., 2002	8.69412	11.0806	13.2476	
Jun., 2002	8.50883	10.9244	13.1318	
Jul., 2002	8.32749	10.7705	13.017	
Aug., 2002	8.15001	10.6187	12.9032	

Production Report

Group : Souris Hartney 53A
Well : SourisHartney Ldgepole Virden A
: 000000103

Date : 10/27/99 3:00:37 pm
User : jfox

Production Data from January, 1999 to June, 2022 (cont.)

Year	Historical Decline 1 m3/d	Historical Decline 2 m3/d	Historical Decline 3 m3/d	Avg Daily Oil m3/d
Sep., 2002	7.97631	10.469	12.7905	
Oct., 2002	7.80632	10.3215	12.6786	
Nov., 2002	7.63995	10.1761	12.5678	
Dec., 2002	7.47713	10.0326	12.4579	
Jan., 2003	7.31777	9.89126	12.349	
Feb., 2003	7.16181	9.75187	12.2411	
Mar., 2003	7.00918	9.61444	12.1341	
Apr., 2003	6.8598	9.47895	12.028	
May., 2003	6.7136	9.34536	11.9229	
Jun., 2003	6.57052	9.21366	11.8186	
Jul., 2003	6.43049	9.08382	11.7153	
Aug., 2003	6.29344	8.95581	11.6129	
Sep., 2003	6.15931	8.8296	11.5114	
Oct., 2003	6.02804	8.70516	11.4108	
Nov., 2003	5.89957	8.58249	11.311	
Dec., 2003	5.77384	8.46154	11.2122	
Jan., 2004	5.63534	8.3195	11.0838	
Feb., 2004	5.51524	8.20226	10.9869	
Mar., 2004	5.3977	8.08666	10.8908	
Apr., 2004	5.28266	7.9727	10.7956	
May., 2004	5.17008	7.86035	10.7013	
Jun., 2004	5.05989	7.74957	10.6077	
Jul., 2004	4.95205	7.64036	10.515	
Aug., 2004	4.84651	7.53269	10.4231	
Sep., 2004	4.74322	7.42653	10.332	
Oct., 2004	4.64213	7.32188	10.2416	
Nov., 2004	4.5432	7.21869	10.1521	
Dec., 2004	4.44637	7.11696	10.0634	
Jan., 2005	4.36353	7.03589	10.0027	
Feb., 2005	4.27054	6.93673	9.91529	
Mar., 2005	4.17952	6.83898	9.82861	
Apr., 2005	4.09045	6.7426	9.74269	
May., 2005	4.00327	6.64758	9.65753	
Jun., 2005	3.91795	6.5539	9.5731	
Jul., 2005	3.83445	6.46153	9.48942	
Aug., 2005	3.75273	6.37048	9.40647	
Sep., 2005	3.67275	6.2807	9.32424	
Oct., 2005	3.59448	6.19219	9.24273	
Nov., 2005	3.51787	6.10492	9.16193	
Dec., 2005	3.4429	6.01889	9.08184	
Jan., 2006	3.36952	5.93407	9.00245	
Feb., 2006	3.29771	5.85044	8.92376	
Mar., 2006	3.22743	5.76799	8.84575	
Apr., 2006	3.15864	5.68671	8.76842	
May., 2006	3.09133	5.60657	8.69177	
Jun., 2006	3.02544	5.52756	8.61579	
Jul., 2006	2.96096	5.44966	8.54048	
Aug., 2006	2.89786	5.37286	8.46582	

Production Report

Group : Souris Hartney 53A
Well : SourisHartney Ldgepole Virden A
: 000000103

Date : 10/27/99 3:00:37 pm
User : jfox

Production Data from January, 1999 to June, 2022 (cont.)

Year	Historical Decline 1 m3/d	Historical Decline 2 m3/d	Historical Decline 3 m3/d	Avg Daily Oil m3/d
Sep., 2006	2.8361	5.29714	8.39181	
Oct., 2006	2.77566	5.22249	8.31846	
Nov., 2006	2.7165	5.14889	8.24574	
Dec., 2006	2.6586	5.07633	8.17366	
Jan., 2007	2.60194	5.00479	8.10221	
Feb., 2007	2.54649	4.93426	8.03138	
Mar., 2007	2.49222	4.86473	7.96117	
Apr., 2007	2.4391	4.79617	7.89158	
May., 2007	2.38712	4.72858	7.8226	
Jun., 2007	2.33625	4.66194	7.75421	
Jul., 2007	2.28646	4.59624	7.68643	
Aug., 2007	2.23773	4.53147	7.61924	
Sep., 2007	2.19004	4.46761	7.55263	
Oct., 2007	2.14336	4.40465	7.48661	
Nov., 2007	2.09768	4.34258	7.42117	
Dec., 2007	2.05297	4.28138	7.35629	
Jan., 2008	2.00373	4.20951	7.27206	
Feb., 2008	1.96103	4.15019	7.20849	
Mar., 2008	1.91923	4.0917	7.14548	
Apr., 2008	1.87833	4.03404	7.08302	
May., 2008	1.8383	3.97719	7.0211	
Jun., 2008	1.79912	3.92114	6.95972	
Jul., 2008	1.76078	3.86588	6.89889	
Aug., 2008	1.72325	3.8114	6.83858	
Sep., 2008	1.68652	3.75769	6.7788	
Oct., 2008	1.65058	3.70473	6.71954	
Nov., 2008	1.6154	3.65252	6.6608	
Dec., 2008	1.58098	3.60105	6.60257	
Jan., 2009		3.56003	6.56279	
Feb., 2009		3.50986	6.50542	
Mar., 2009		3.46039	6.44855	
Apr., 2009		3.41163	6.39218	
May., 2009		3.36355	6.3363	
Jun., 2009		3.31615	6.28091	
Jul., 2009		3.26942	6.22601	
Aug., 2009		3.22334	6.17158	
Sep., 2009		3.17792	6.11763	
Oct., 2009		3.13313	6.06416	
Nov., 2009		3.08898	6.01114	
Dec., 2009		3.04545	5.9586	
Jan., 2010		3.00253	5.90651	
Feb., 2010		2.96021	5.85488	
Mar., 2010		2.9185	5.8037	
Apr., 2010		2.87737	5.75296	
May., 2010		2.83682	5.70267	
Jun., 2010		2.79684	5.65282	
Jul., 2010		2.75743	5.60341	
Aug., 2010		2.71857	5.55442	

Production Report

Group : Souris Hartney 53A
 Well : SourisHartney Ldgepole Virden A
 : 000000103

Date : 10/27/99 3:00:37 pm
 User : jfox

Production Data from January, 1999 to June, 2022 (cont.)

Year	Historical Decline 1 m3/d	Historical Decline 2 m3/d	Historical Decline 3 m3/d	Avg Daily Oil m3/d
Sep., 2010		2.68025	5.50587	
Oct., 2010		2.64248	5.45774	
Nov., 2010		2.60524	5.41003	
Dec., 2010		2.56853	5.36274	
Jan., 2011		2.53233	5.31586	
Feb., 2011		2.49664	5.26939	
Mar., 2011		2.46146	5.22333	
Apr., 2011		2.42677	5.17767	
May., 2011		2.39257	5.13241	
Jun., 2011		2.35885	5.08754	
Jul., 2011		2.32561	5.04307	
Aug., 2011		2.29284	4.99898	
Sep., 2011		2.26053	4.95528	
Oct., 2011		2.22867	4.91197	
Nov., 2011		2.19726	4.86903	
Dec., 2011		2.1663	4.82646	
Jan., 2012		2.12993	4.7712	
Feb., 2012		2.09992	4.72949	
Mar., 2012		2.07032	4.68815	
Apr., 2012		2.04115	4.64717	
May., 2012		2.01238	4.60654	
Jun., 2012		1.98402	4.56628	
Jul., 2012		1.95606	4.52636	
Aug., 2012		1.9285	4.48679	
Sep., 2012		1.90132	4.44757	
Oct., 2012		1.87452	4.40869	
Nov., 2012		1.84811	4.37015	
Dec., 2012		1.82206	4.33195	
Jan., 2013		1.80131	4.30585	
Feb., 2013		1.77592	4.26821	
Mar., 2013		1.75089	4.23089	
Apr., 2013		1.72622	4.19391	
May., 2013		1.70189	4.15725	
Jun., 2013		1.67791	4.12091	
Jul., 2013		1.65426	4.08488	
Aug., 2013		1.63095	4.04918	
Sep., 2013		1.60797	4.01378	
Oct., 2013		1.58531	3.97869	
Nov., 2013			3.94391	
Dec., 2013			3.90944	
Jan., 2014			3.87526	
Feb., 2014			3.84138	
Mar., 2014			3.80781	
Apr., 2014			3.77452	
May., 2014			3.74152	
Jun., 2014			3.70882	
Jul., 2014			3.6764	
Aug., 2014			3.64426	

Production Report

Group : Souris Hartney 53A	Date : 10/27/99 3:00:37 pm
Well : SourisHartney Ldgepole Virden A	User : jfox
: 000000103	

Production Data from January, 1999 to June, 2022 (cont.)

Year	Historical Decline 1 m3/d	Historical Decline 2 m3/d	Historical Decline 3 m3/d	Avg Daily Oil m3/d
Sep., 2014			3.6124	
Oct., 2014			3.58082	
Nov., 2014			3.54952	
Dec., 2014			3.51849	
Jan., 2015			3.48774	
Feb., 2015			3.45725	
Mar., 2015			3.42702	
Apr., 2015			3.39707	
May., 2015			3.36737	
Jun., 2015			3.33793	
Jul., 2015			3.30876	
Aug., 2015			3.27983	
Sep., 2015			3.25116	
Oct., 2015			3.22274	
Nov., 2015			3.19457	
Dec., 2015			3.16664	
Jan., 2016			3.13039	
Feb., 2016			3.10302	
Mar., 2016			3.0759	
Apr., 2016			3.04901	
May., 2016			3.02235	
Jun., 2016			2.99593	
Jul., 2016			2.96974	
Aug., 2016			2.94378	
Sep., 2016			2.91805	
Oct., 2016			2.89254	
Nov., 2016			2.86726	
Dec., 2016			2.84219	
Jan., 2017			2.82507	
Feb., 2017			2.80037	
Mar., 2017			2.77589	
Apr., 2017			2.75162	
May., 2017			2.72757	
Jun., 2017			2.70373	
Jul., 2017			2.68009	
Aug., 2017			2.65666	
Sep., 2017			2.63344	
Oct., 2017			2.61042	
Nov., 2017			2.5876	
Dec., 2017			2.56498	
Jan., 2018			2.54256	
Feb., 2018			2.52033	
Mar., 2018			2.4983	
Apr., 2018			2.47646	
May., 2018			2.45481	
Jun., 2018			2.43335	
Jul., 2018			2.41208	
Aug., 2018			2.391	

Production Report

Group : Souris Hartney 53A Date : 10/27/99 3:00:38 pm
Well : SourisHartney Ldgepole Virden A User : jfox
: 000000103

Production Data from January, 1999 to June, 2022 (cont.)

Year	Historical Decline 1 m3/d	Historical Decline 2 m3/d	Historical Decline 3 m3/d	Avg Daily Oil m3/d
Sep., 2018			2.3701	
Oct., 2018			2.34938	
Nov., 2018			2.32884	
Dec., 2018			2.30848	
Jan., 2019			2.2883	
Feb., 2019			2.2683	
Mar., 2019			2.24847	
Apr., 2019			2.22882	
May., 2019			2.20933	
Jun., 2019			2.19002	
Jul., 2019			2.17087	
Aug., 2019			2.1519	
Sep., 2019			2.13309	
Oct., 2019			2.11444	
Nov., 2019			2.09596	
Dec., 2019			2.07763	
Jan., 2020			2.05385	
Feb., 2020			2.03589	
Mar., 2020			2.01809	
Apr., 2020			2.00045	
May., 2020			1.98297	
Jun., 2020			1.96563	
Jul., 2020			1.94845	
Aug., 2020			1.93142	
Sep., 2020			1.91453	
Oct., 2020			1.8978	
Nov., 2020			1.88121	
Dec., 2020			1.86476	
Jan., 2021			1.85353	
Feb., 2021			1.83732	
Mar., 2021			1.82126	
Apr., 2021			1.80534	
May., 2021			1.78956	
Jun., 2021			1.77392	
Jul., 2021			1.75841	
Aug., 2021			1.74304	
Sep., 2021			1.7278	
Oct., 2021			1.7127	
Nov., 2021			1.69772	
Dec., 2021			1.68288	
Jan., 2022			1.66817	
Feb., 2022			1.65359	
Mar., 2022			1.63914	
Apr., 2022			1.62481	
May., 2022			1.6106	
Jun., 2022			1.59652	

SourisHartney Ldgepole Virden A Data 11/62-08/99

Operator:

Field:

Zone:

Type: Unknown

Group: Souris Hartney 53A

Historical Decline 1 (Rate-Time)

qi: 17.7 m3/d, Sep, 1999

qf: 1.58098 m3/d, Dec, 2008

di(Exp): 22.78 CTD: 190468 m3

RR: 21875.8 m3 Tot: 212344 m3

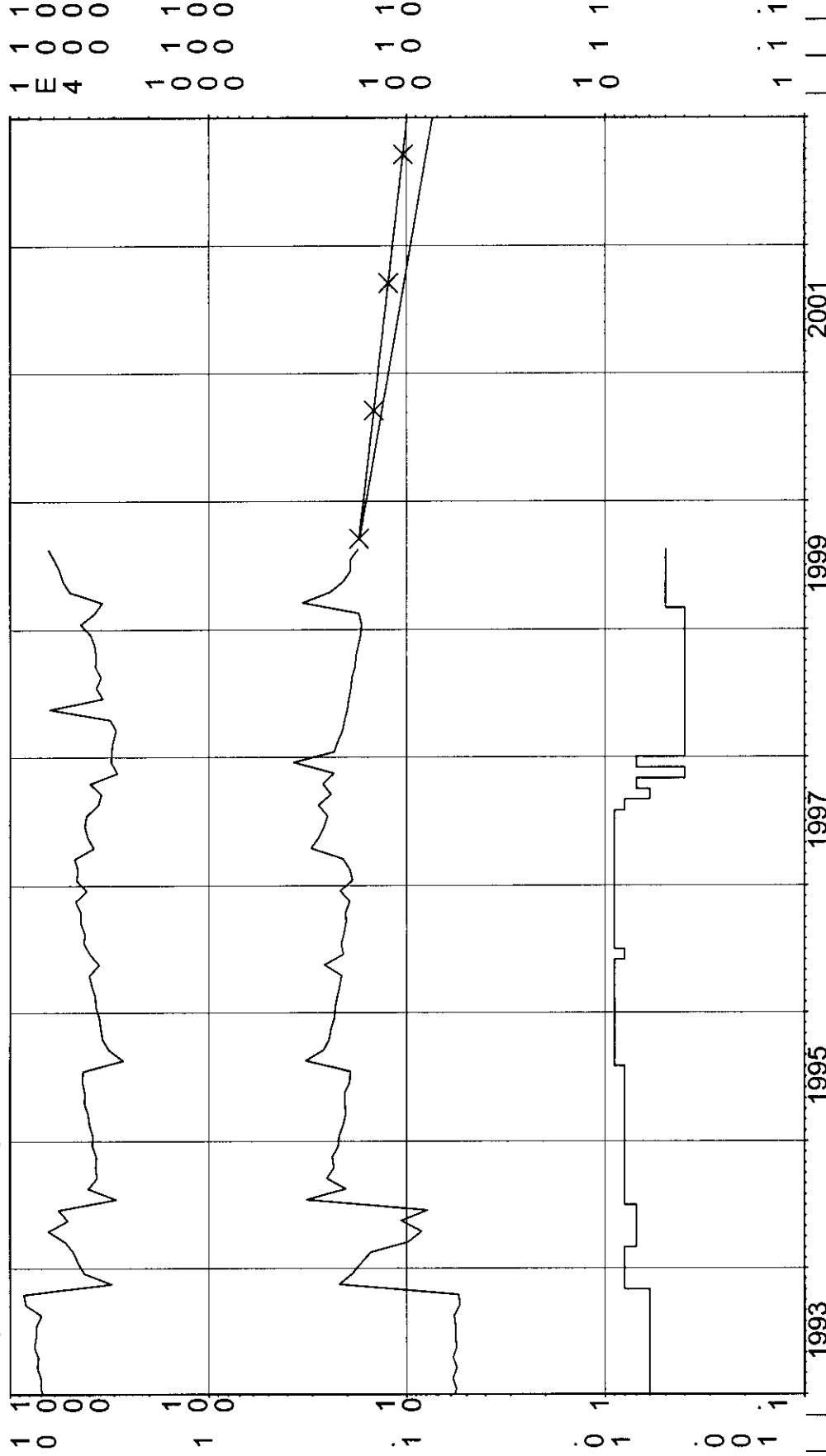
Production Cums

Oil: 190468 m3

Gas: 0 E6m3

Water: 531703 m3

Cond: 0 m3



Year

Avg Daily Oil - m3/d

WOR - m3/m3

Num Wells

Historical Decline 1 - m3/d

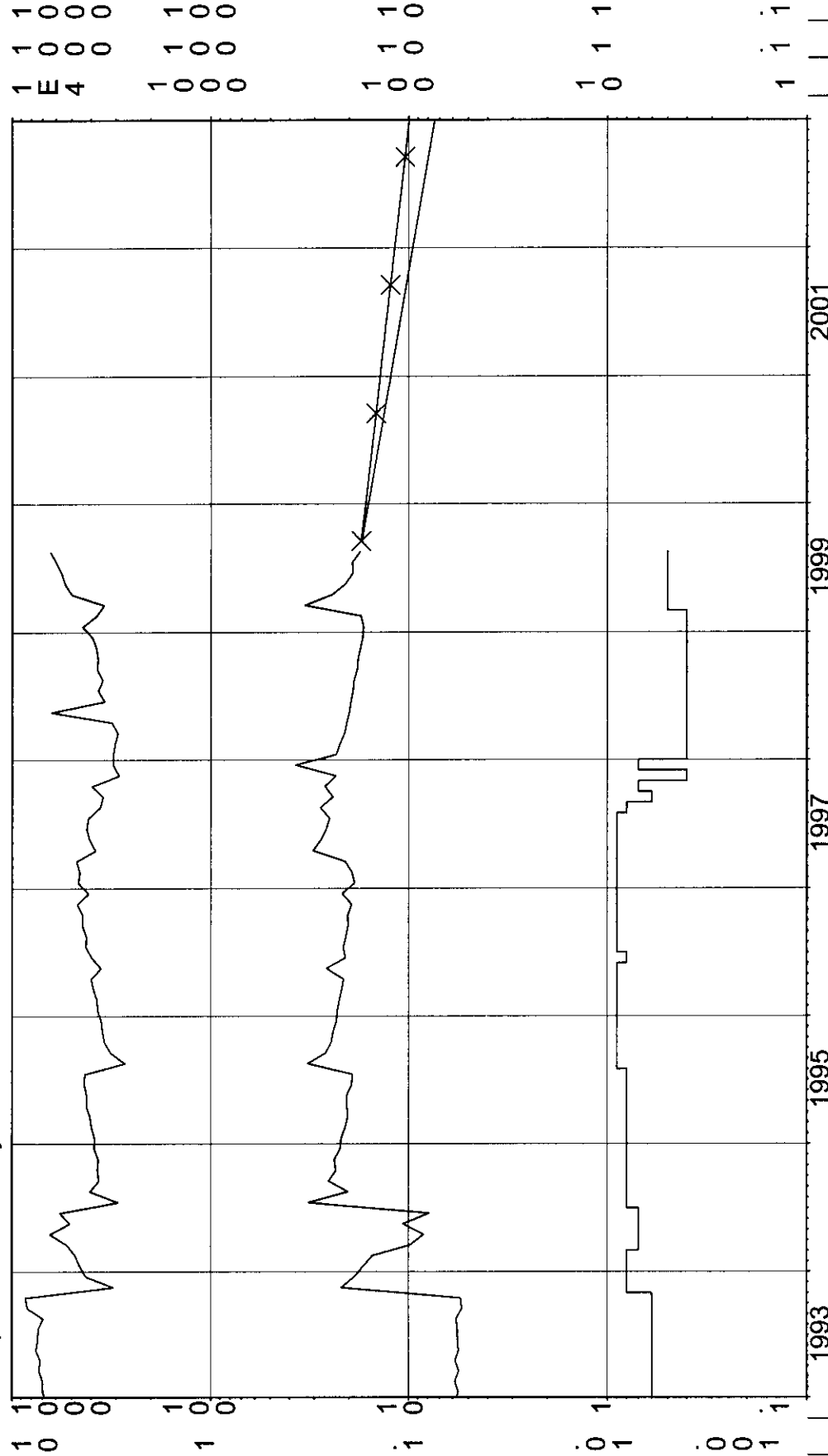
Historical Decline 2 - m3/d



SourisHartney Ldgepole Virden A Data 11/62-08/99

Operator: Historical Decline 2 (Rate-Time)
 Field: qi: 17.7 m3/d, Sep, 1999
 Zone: qf: 1.58531 m3/d, Oct, 2013
 Type: Unknown di(Exp): 15.66 CTD: 190468 m3
 Group: Souris Hartney 53A RR: 31579.8 m3 Tot: 222048 m3

Production Cums
 Oil: 190468 m3
 Gas: 0 E6m3
 Water: 531703 m3
 Cond: 0 m3



Year

1993 1995 1997 1999 2001

Avg Daily Oil - m3/d
 WOR - m3/m3

Num Wells
 Historical Decline 1 - m3/d
 Historical Decline 2 - m3/d



Souris Hartney Horizontal Wells Data 11/93-08/99

98 Reserves (Rate-Time)

qi: 26.4525 m3/d, Apr, 1997

qf: 1.18023 m3/d, Nov, 2008

di(Exp): 23.3796 CTD: 32564.4 m3

RR: 20589.7 m3 Tot: 53154.1 m3

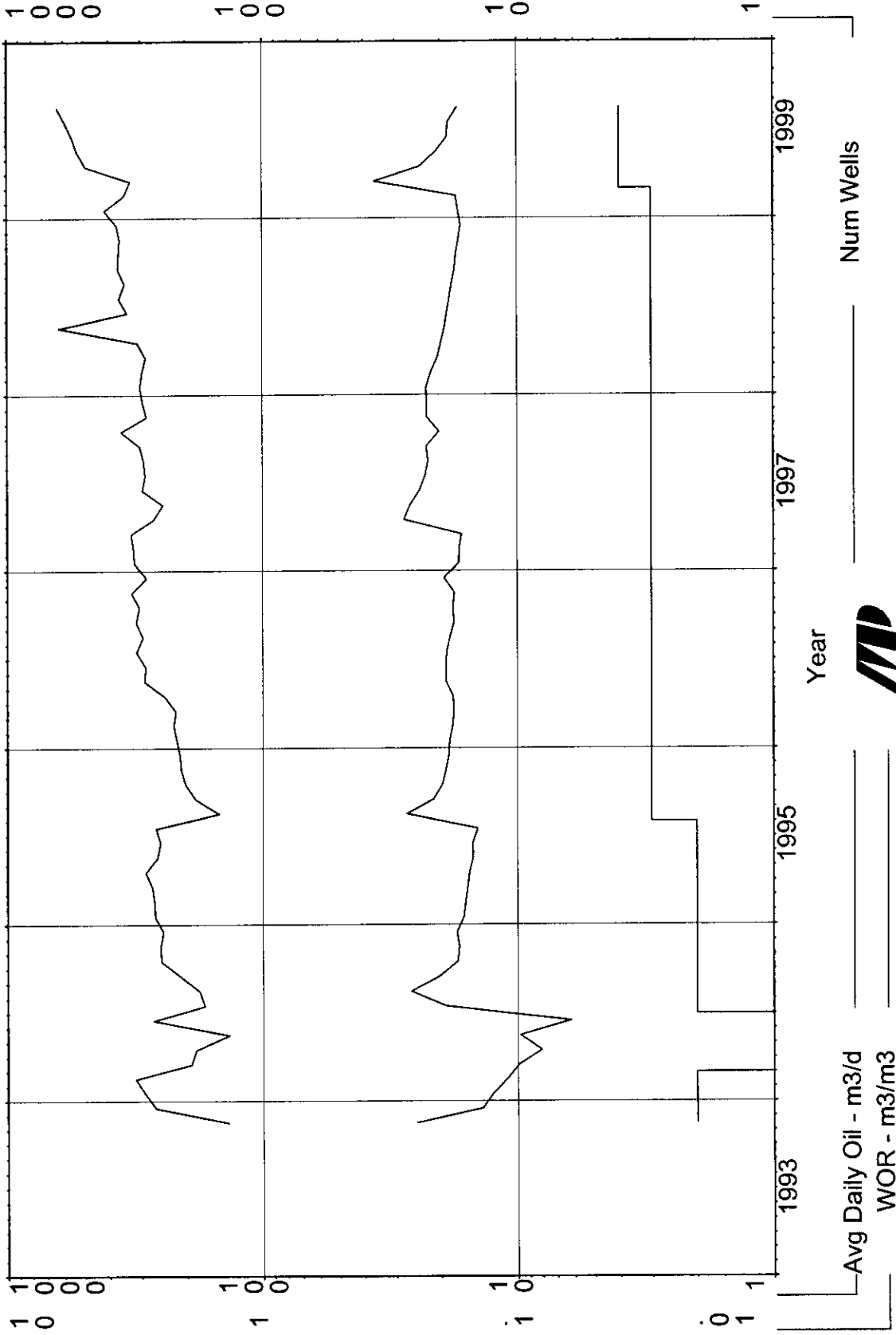
Production Cums

Oil: 37170.9 m3

Gas: 0 E6m3

Water: 114179 m3

Cond: 0 m3



Production Report

Group : Souris Hartney Wells (HZNTL)
 Well : Souris Hartney Horizontal Wells
 : 000000157
 Hist.Data : 11/93-08/99
 Operator :
 Field :

Date : October 27, 1999 1:22:25 pm
 User : jfox
 On Prod : 01/00
 Status : Unknown
 Zone :

Production Data from January, 1998 to August, 1999

Year	Avg Daily Oil m3/d	Monthly Oil m3	Cum Oil m3	WOR m3/m3	Num Wells
Jan., 1998	22.7148	666.3	26365.6	3.01816	3
Feb., 1998	21.7889	588.3	26953.9	2.96651	3
Mar., 1998	20.4871	635.1	27589	2.87183	3
Apr., 1998	19.8733	596.2	28185.2	3.0941	3
May., 1998	19.2258	596	28781.2	6.26107	3
Jun., 1998	18.8333	565	29346.2	3.38761	3
Jul., 1998	18.4161	570.9	29917.1	3.646	3
Aug., 1998	18.0516	559.6	30476.7	3.46569	3
Sep., 1998	17.5367	526.1	31002.8	3.68447	3
Oct., 1998	17.3548	538	31540.8	3.66022	3
Nov., 1998	16.9567	508.7	32049.5	3.62296	3
Dec., 1998	16.6097	514.9	32564.4	3.71373	3
Jan., 1999	16.995	453.2	33017.6	4.14387	3
Feb., 1999	17.3416	445.1	33462.7	3.48573	3
Mar., 1999	36.3111	735.3	34198	3.2924	4
Apr., 1999	24.07	722.1	34920.1	4.90694	4
May., 1999	20.7795	607.8	35527.9	5.30981	4
Jun., 1999	18.7453	548.3	36076.2	5.55207	4
Jul., 1999	18.6281	563.5	36639.7	5.91198	4
Aug., 1999	17.1355	531.2	37170.9	6.34111	4

Production Report

Group : Souris Hartney 53A (Vertical)	Date : October 27, 1999 1:23:38 pm
Well : SourisHartney Lgple Vird A (Ver	User : jfox
: 000000164	
Hist.Data : 11/62-08/99	On Prod : 01/00
Operator :	Status : Abandoned
Field :	Zone :

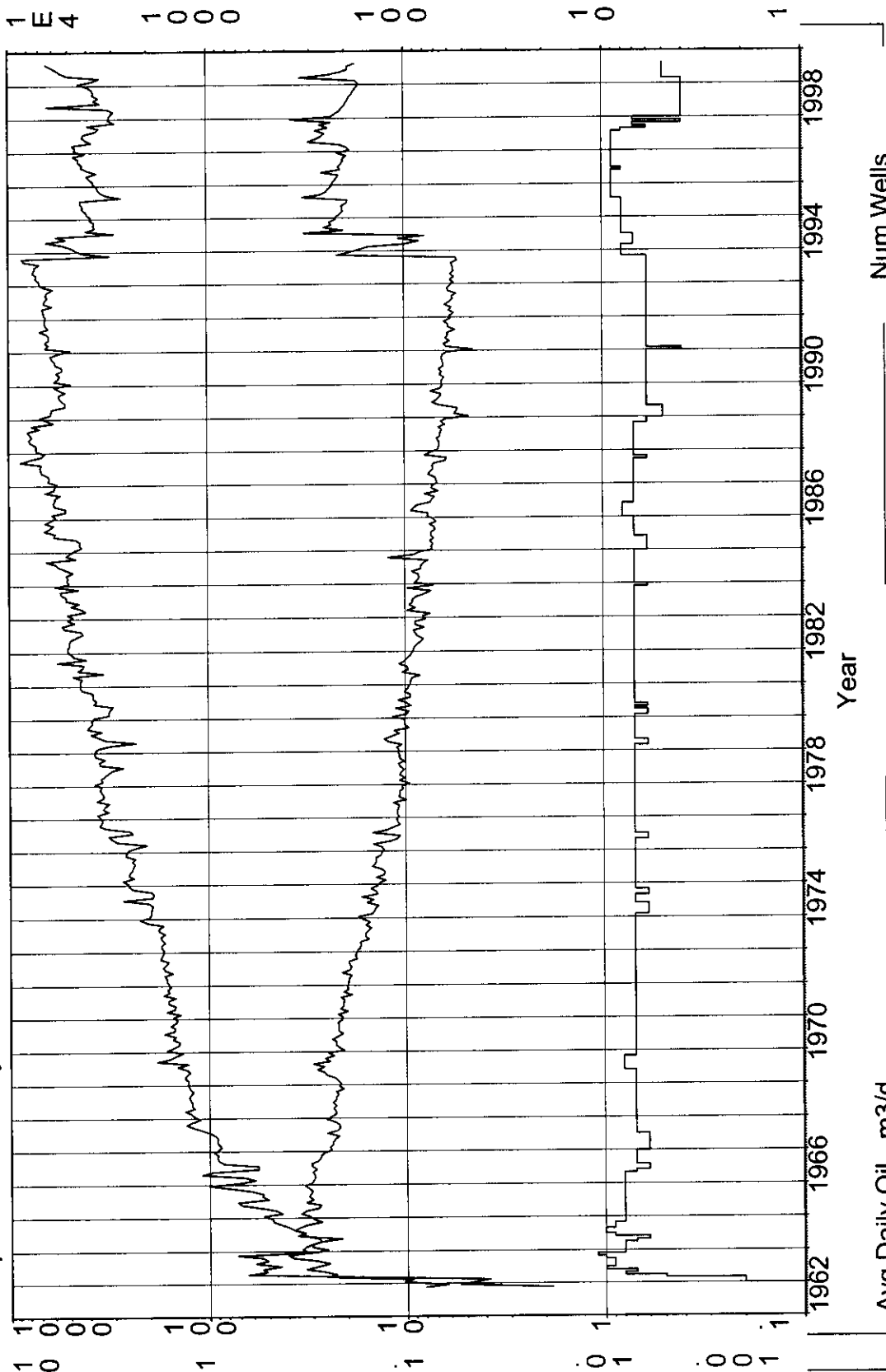
Production Data from January, 1998 to August, 1999

Year	Avg Daily Oil m3/d	Monthly Oil m3	Cum Oil m3	WOR m3/m3	Num Wells
Jan., 1998	0.746667	22.4	152934	5.25	1
Feb., 1998	0.714286	20	152954	5.115	1
Mar., 1998	0.667742	20.7	152974	4.9372	1
Apr., 1998	0.766667	23	152997	4.40435	1
May., 1998	0.806452	25	153022	7.972	1
Jun., 1998	0.786667	23.6	153046	4.30932	1
Jul., 1998	0.770968	23.9	153070	4.65272	1
Aug., 1998	0.766667	23	153093	4.4	1
Sep., 1998	0.733333	22	153115	4.68182	1
Oct., 1998	0.729032	22.6	153138	4.64159	1
Nov., 1998	0.613333	18.4	153156	7.56522	1
Dec., 1998	0.525806	16.3	153172	10.9509	1
Jan., 1999	0.541935	16.8	153189	11.5714	1
Feb., 1999	0.510714	14.3	153203	12.5944	1
Mar., 1999	0.503226	15.6	153219	10.5064	1
Apr., 1999	0.426667	12.8	153232	10.25	1
May., 1999	0.448387	13.9	153246	10.4748	1
Jun., 1999	0.57	17.1	153263	8.51462	1
Jul., 1999	0.568965	16.5	153279	8.61818	1
Aug., 1999	0.577419	17.9	153297	8.53073	1

SourisHartney Ldgepole Virden A Data 11/62-08/99

Operator: 98 Reserves (Rate-Time)
 Field: qi: 29.887 m3/d, May, 1997
 Zone: qf: 1.5668 m3/d, Feb, 2006
 Type: Unknown di(Exp): 28.379 CTD: 185737 m3
 Group: Souris Hartney 53A RR: 16124.2 m3 Tot: 201861 m3

Production Cums
 Oil: 190468 m3
 Gas: 0 E6m3
 Water: 531703 m3
 Cond: 0 m3



Num Wells

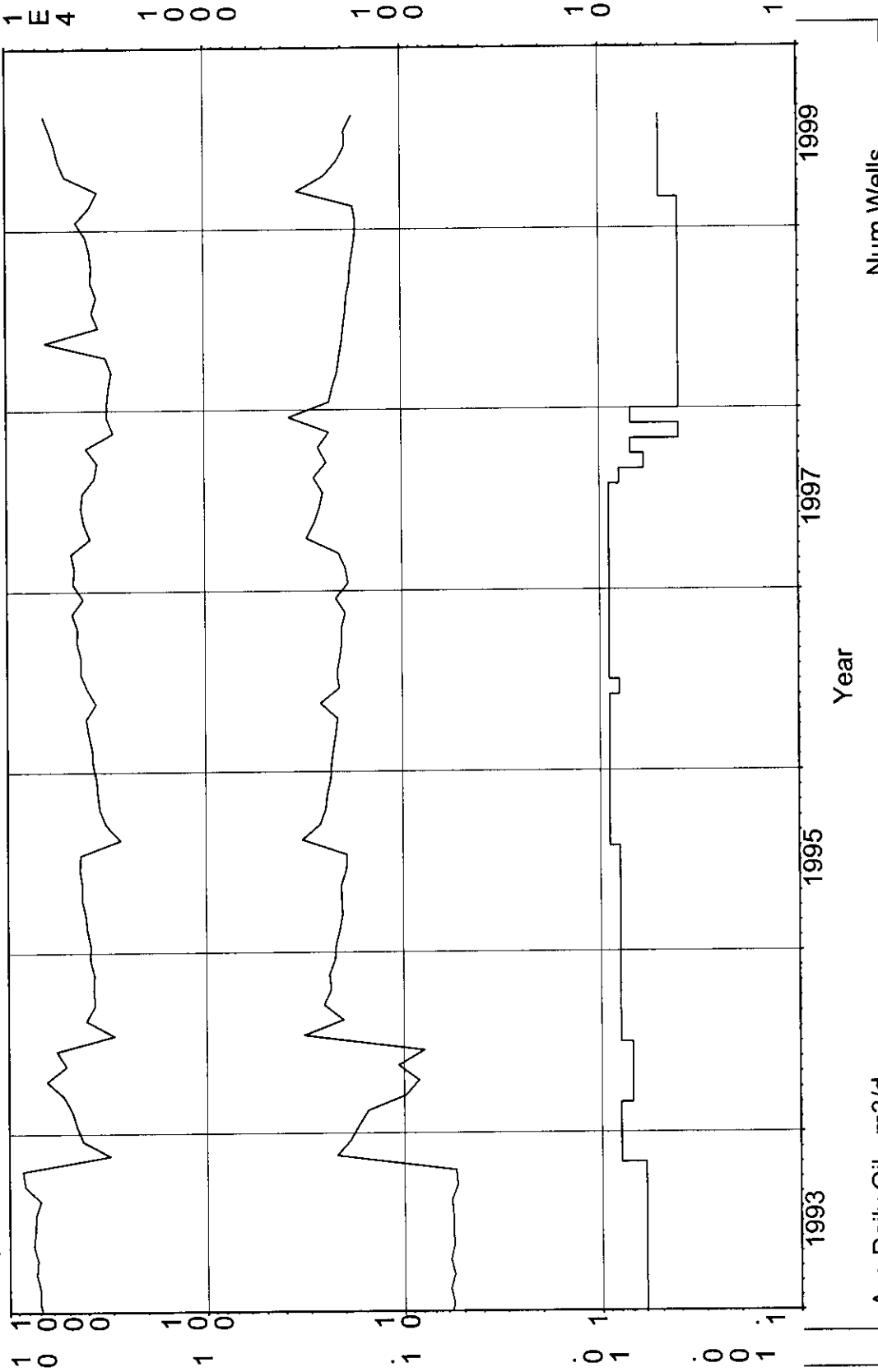


Avg Daily Oil - m3/d
 WOR - m3/m3

SourisHartney Ldgepole Virden A Data 11/62-08/99

Operator: 98 Reserves (Rate-Time)
 Field: qi: 29.887 m3/d, May, 1997
 Zone: qf: 1.5668 m3/d, Feb, 2006
 Type: Unknown di(Exp): 28.379 CTD: 185737 m3
 Group: Souris Hartney 53A RR: 16124.2 m3 Tot: 201861 m3

Production Cums
 Oil: 190468 m3
 Gas: 0 E6m3
 Water: 531703 m3
 Cond: 0 m3



Avg Daily Oil - m3/d
 WOR - m3/m3

Year

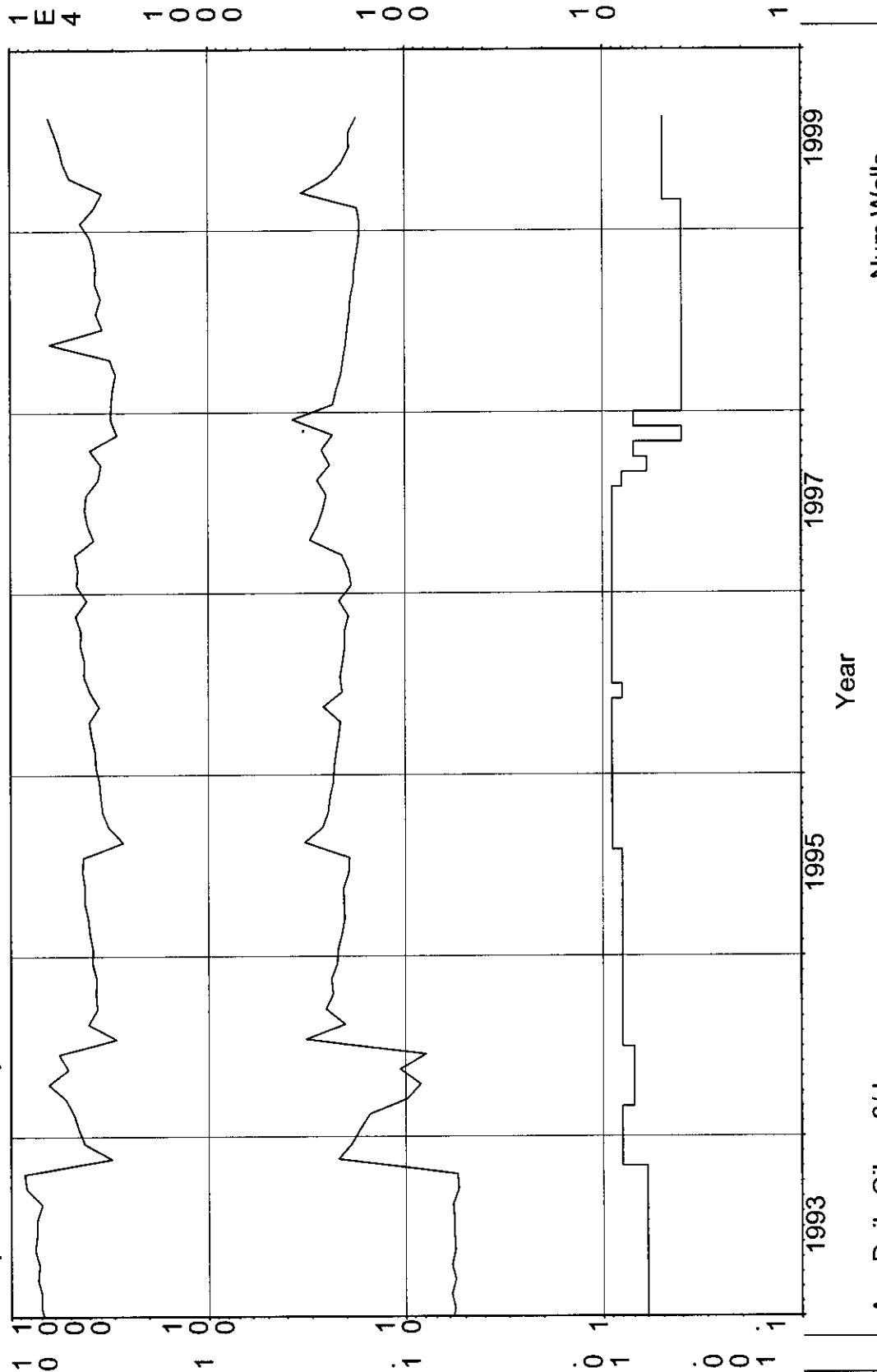


Num Wells

SourisHartney Ldgepole Virden A Data 11/62-08/99

Operator: 98 Reserves (Rate-Time)
 Field: qi: 23.1486 m3/d, Jan, 1998
 Zone: qf: 1.58274 m3/d, Oct, 2006
 Type: Unknown di(Exp): 26.1925 CTD: 190468 m3
 Group: Souris Hartney 53A RR: 14042.5 m3 Tot: 204511 m3

Production Cums
 Oil: 190468 m3
 Gas: 0 E6m3
 Water: 531703 m3
 Cond: 0 m3



Num Wells

Year



Avg Daily Oil - m3/d
 WOR - m3/m3

Tundra Souris Hartney HZNTL 01C-17-06-22W1 (00/01-17-006-22W1/0) Data 03/99-08/99

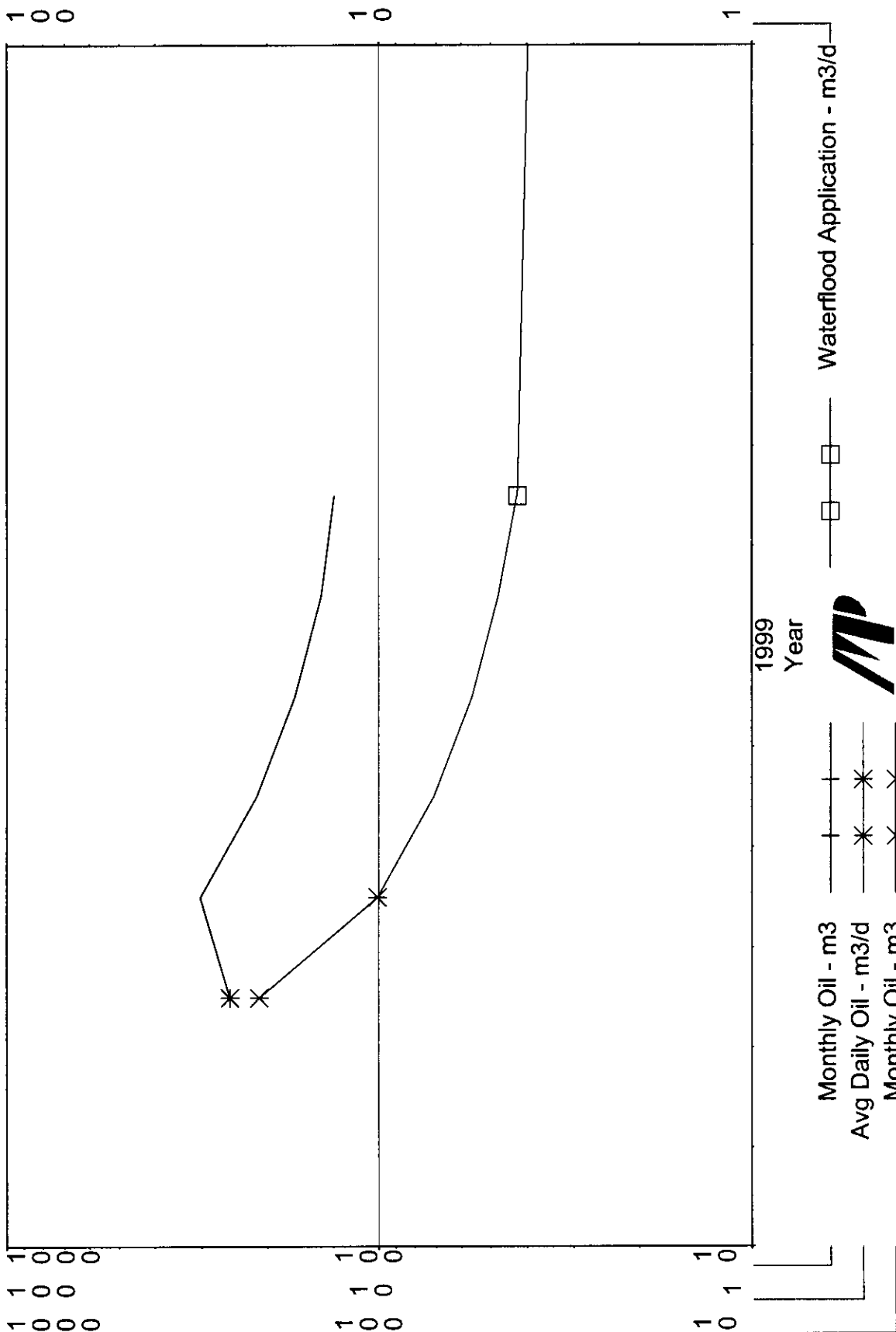
Operator: Waterflood Application (Rate-Time) Production Cums

Field: 10 qi: 4.3 m3/d, Aug, 1999 Oil: 1212 m3

Zone: 53A qf: 0.399244 m3/d, Jun, 2013 Gas: 0 E6m3

Type: Unknown di(Exp): 15.7 CTD: 1212 m3 Water: 7243.5 m3

Group: Souris Hartney Wells (HZNTL) RR: 8104.6 m3 Tot: 9316.6 m3 Cond: 0 m3



Production Report

Group	: Souris Hartney Wells (HZNTL)	Date	: 10/28/99 8:42:06 am
Well	: Tundra Souris Hartney HZNTL 01C-17-06-22W1	User	: jfox
	: 00/01-17-006-22W1/0		
Hist.Data	: 03/99-08/99	On Prod	: 01/00
Operator	:	Status	: Unknown
Field	: 10	Zone	: 53A

Production Data from March, 1999 to August, 1999

Year	Monthly Oil m3	Avg Daily Oil m3/d	WOR m3/m3	Days On days	Cum Oil m3	Avg Daily Fluid m3/d
Mar., 1999	252.1	21.0083	3.50536	12	252.1	94.6593
Apr., 1999	302.7	10.09	4.68351	30	554.8	57.3511
May., 1999	213.5	7.11667	6.01311	30	768.3	49.9131
Jun., 1999	168.4	5.61333	7.23872	30	936.7	46.2491
Jul., 1999	143.3	4.77667	8.48779	30	1080	45.3221
Aug., 1999	132	4.25806	9.26515	31	1212	43.7116

Tundra Souris Hartney HZNTL 01C-17-06-22W1 (00/01-17-006-22W1/0) Data 03/99-08/99

Operator:

Field: 10

Zone: 53A

Type: Unknown

Group: Souris Hartney Wells (HZNTL) RR: 2209.94 m3 Tot: 3421.94 m3

Waterflood Application (Rate-Time)

qi: 8.91425 m3/d, May, 1999

qf: 0.399982 m3/d, Aug, 2005

di(Har): 77.0698 CTD: 1212 m3

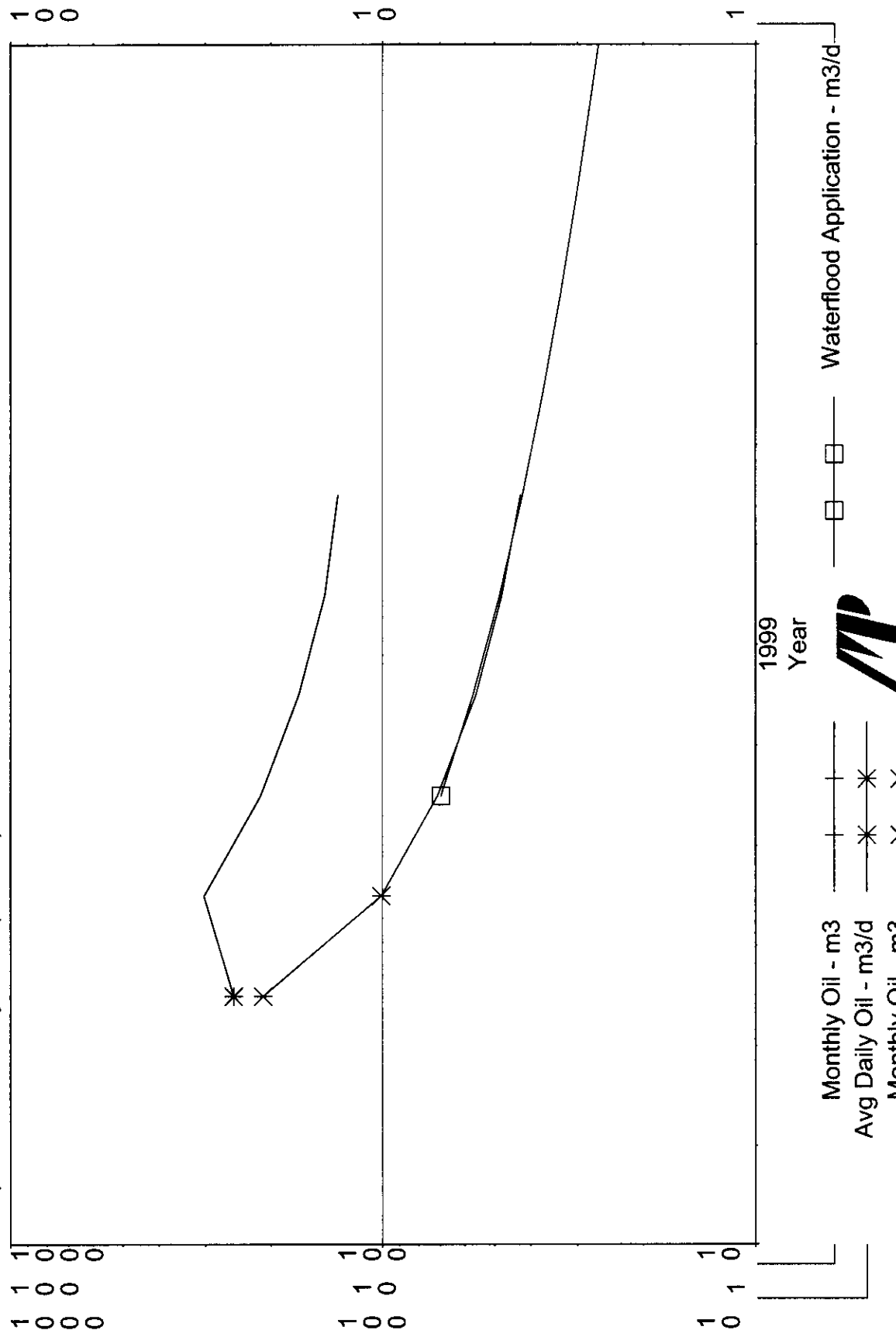
Production Cums

Oil: 1212 m3

Gas: 0 E6m3

Water: 7243.5 m3

Cond: 0 m3



Tundra Souris Hartney HZNTL 03B-17-06-22W1 (00/03-17-006-22W1/0) Data 11/93-08/99

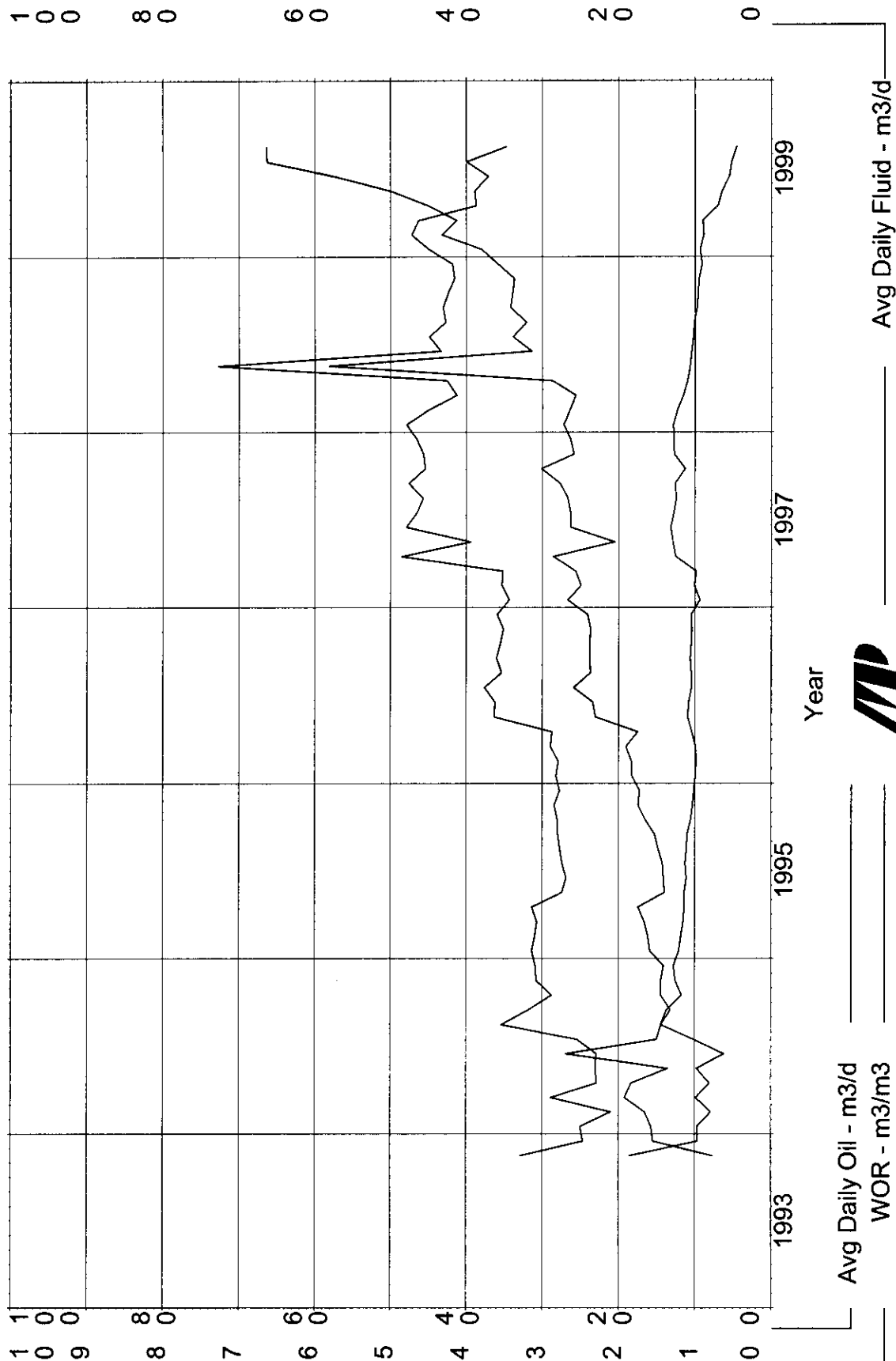
Production Cums

Oil: 21303.7 m3

Gas: 0 E6m3

Water: 52204.5 m3

Cond: 0 m3



Avg Daily Oil - m3/d

WOR - m3/m3

Year



Avg Daily Fluid - m3/d

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Well Production Record

1999

Field 10 Souris Hartney Mineral Rights FREEHOLD
 Pool 53A Lodgepole Virden A
 Unit 0
 Operator 6 Tundra
 UWI 100.15-17-006-22W1.00
 Licence 4399

Month	Days on Production	Oil Produced m 3	Water Produced m 3	Water Injection Disposed m 3
Cumulative Prior	1685.0	4816.2	47617.7	
Jan	28.0	47.6	882.5	
Feb	21.0	34.5	478.0	
Mar	7.0	13.0	382.0	
Apr	30.0	61.2	1175.3	
May	26.0	49.3	970.4	
Jun	30.0	63.4	969.1	
Jul	29.0	89.9	1035.5	
Aug	31.0	91.2	1206.2	
Sep	.0	.0	.0	
Oct	.0	.0	.0	
Nov	.0	.0	.0	
Dec	.0	.0	.0	
Ytd	202.0	450.1	7099.0	
Cum To Date	1887.0	5266.3	54716.7	

Status Date

UWI Status

COOP

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Well Production Record

1999

Field 10 Souris Hartney Mineral Rights FREEHOLD
 Pool 53A Lodgepole Virden A
 Unit 0
 Operator 6 Tundra
 UWI 100.16-17-006-22W1.00
 Licence 1901

Month	Days on Production	Oil Produced m 3	Water Produced m 3	Water Injection Disposed m 3
Cumulative Prior	11557.0	10553.4	86703.2	
Jan	.0	.0	.0	
Feb	.0	.0	.0	
Mar	.0	.0	.0	
Apr	.0	.0	.0	
May	.0	.0	.0	
Jun	.0	.0	.0	
Jul	.0	.0	.0	
Aug	.0	.0	.0	
Sep	.0	.0	.0	
Oct	.0	.0	.0	
Nov	.0	.0	.0	
Dec	.0	.0	.0	
Ytd	.0	.0	.0	
Cum To Date	11557.0	10553.4	86703.2	

Status Date

UWI Status

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Well Production Record

1999

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Field 10 Souris Hartney Mineral Rights FREEHOLD
 Pool 53A Lodgepole Virden A
 Unit 0
 Operator 6 Tundra
 UWI 100.06-16-006-22W1.00
 Licence 1869

Month	Days on Production	Oil Produced m 3	Water Produced m 3	Water Injection Disposed m 3
Cumulative Prior	7444.0	5130.4	56227.5	
Jan	.0	.0	.0	
Feb	.0	.0	.0	
Mar	.0	.0	.0	
Apr	.0	.0	.0	
May	.0	.0	.0	
Jun	.0	.0	.0	
Jul	.0	.0	.0	
Aug	.0	.0	.0	
Sep	.0	.0	.0	
Oct	.0	.0	.0	
Nov	.0	.0	.0	
Dec	.0	.0	.0	
Ytd	.0	.0	.0	
Cum To Date	7444.0	5130.4	56227.5	

Status Date

UWI Status

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Well Production Record

1999

Field 10 Souris Hartney Mineral Rights FREEHOLD
 Pool 53A Lodgepole Virden A
 Unit 0
 Operator 6 Tundra
 UWI 100.12-16-006-22W1.00
 Licence 1922

Month	Days on Production	Oil Produced m 3	Water Produced m 3	Water Injection Disposed m 3
Cumulative Prior	11172.0	32134.1	12658.7	
Jan	.0	.0	.0	
Feb	.0	.0	.0	
Mar	.0	.0	.0	
Apr	.0	.0	.0	
May	.0	.0	.0	
Jun	.0	.0	.0	
Jul	.0	.0	.0	
Aug	.0	.0	.0	
Sep	.0	.0	.0	
Oct	.0	.0	.0	
Nov	.0	.0	.0	
Dec	.0	.0	.0	
Ytd	.0	.0	.0	
Cum To Date	11172.0	32134.1	12658.7	

Status Date

UWI Status

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Well Production Record

1999

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Mineral Rights FREEHOLD

Field 10 Souris Hartney
 Pool 53A Lodgepole Virden A
 Unit 0
 Operator 6 Tundra
 UWI 102.14-16-006-22W1.00
 Licence 4420

Month	Days on Production	Oil Produced m 3	Water Produced m 3	Water Injection Disposed m 3
Cumulative Prior	1221.0	8092.6	4.8	
Jan	24.0	143.4	.0	
Feb	28.0	162.2	.0	
Mar	31.0	190.4	.0	
Apr	30.0	147.2	.0	
May	31.0	150.4	1.0	
Jun	30.0	167.8	3.0	
Jul	31.0	168.0	3.2	
Aug	31.0	166.9	2.3	
Sep	.0	.0	.0	
Oct	.0	.0	.0	
Nov	.0	.0	.0	
Dec	.0	.0	.0	
Ytd	236.0	1296.3	9.5	
Cum To Date	1457.0	9388.9	14.3	

Status Date

UWI Status

COOP

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Well Production Record

1999

Field 10 Souris Hartney Mineral Rights FREEHOLD
 Pool 53A Lodgepole Virden A
 Unit 0
 Operator 6 Tundra
 UWI 100.01-17-006-22W1.00
 Licence 4826

Month	Days on Production	Oil Produced m 3	Water Produced m 3	Water Injection Disposed m 3
Cumulative Prior	.0	.0	.0	
Jan	.0	.0	.0	
Feb	.0	.0	.0	
Mar	12.0	252.1	883.7	
Apr	30.0	302.7	1417.7	
May	30.0	213.5	1283.8	
Jun	30.0	168.4	1219.0	
Jul	30.0	143.3	1216.3	
Aug	31.0	132.0	1223.0	
Sep	.0	.0	.0	
Oct	.0	.0	.0	
Nov	.0	.0	.0	
Dec	.0	.0	.0	
Ytd	163.0	1212.0	7243.5	
Cum To Date	163.0	1212	7243.5	

Status Date

UWI Status

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Well Production Record

1999

Field 10 Souris Hartney Mineral Rights FREEHOLD
 Pool 53A Lodgepole Virden A
 Unit 0
 Operator 6 Tundra
 UWI 100.02-17-006-22W1.00
 Licence 1892

Month	Days on Production	Oil Produced m 3	Water Produced m 3	Water Injection Disposed m 3
Cumulative Prior	12209.0	23299.7	72922.9	
Jan	31.0	16.8	194.4	
Feb	28.0	14.3	180.1	
Mar	31.0	15.6	163.9	
Apr	30.0	12.8	131.2	
May	31.0	13.9	145.6	
Jun	30.0	17.1	145.6	
Jul	29.0	16.5	142.2	
Aug	31.0	17.9	152.7	
Sep	.0	.0	.0	
Oct	.0	.0	.0	
Nov	.0	.0	.0	
Dec	.0	.0	.0	
Ytd	241.0	124.9	1255.7	
Cum To Date	12450.0	23424.6	74178.6	

Status Date

UWI Status

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Well Production Record

1999

Field 10 Souris Hartney Mineral Rights FREEHOLD
 Pool 53A Lodgepole Virden A
 Unit 0
 Operator 6 Tundra
 UWI 100.03-17-006-22W1.00
 Licence 4398

Month	Days on Production	Oil Produced m 3	Water Produced m 3	Water Injection Disposed m 3
Cumulative Prior	1778.0	19655.6	44191.5	
Jan	28.0	262.2	995.5	
Feb	28.0	248.4	1073.5	
Mar	31.0	279.8	1155.2	
Apr	30.0	211.0	950.3	
May	30.0	194.6	972.1	
Jun	27.0	148.7	853.1	
Jul	31.0	162.3	1076.4	
Aug	31.0	141.1	936.9	
Sep	.0	.0	.0	
Oct	.0	.0	.0	
Nov	.0	.0	.0	
Dec	.0	.0	.0	
Ytd	236.0	1648.1	8013.0	
Cum To Date	2014.0	21303.7	52204.5	

Status Date

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Well Production Record

1999

Field 10 Souris Hartney Mineral Rights FREEHOLD
 Pool 53A Lodgepole Virden A
 Unit 0
 Operator 6 Tundra
 UWI 100.06-17-006-22W1.00
 Licence 1882

Month	Days on Production	Oil Produced m 3	Water Produced m 3	Water Injection Disposed m 3
Cumulative Prior	11759.0	22293.9	95991.5	
Jan	.0	.0	.0	
Feb	.0	.0	.0	
Mar	.0	.0	.0	
Apr	.0	.0	.0	
May	.0	.0	.0	
Jun	.0	.0	.0	
Jul	.0	.0	.0	
Aug	.0	.0	.0	
Sep	.0	.0	.0	
Oct	.0	.0	.0	
Nov	.0	.0	.0	
Dec	.0	.0	.0	
Ytd	.0	.0	.0	
Cum To Date	11759.0	22293.9	95991.5	

Status Date

UWI Status

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Well Production Record

1999

Field 10 Souris Hartney Mineral Rights FREEHOLD
 Pool 53A Lodgepole Virden A
 Unit 0
 Operator 6 Tundra
 UWI 100.08-17-006-22W1.00
 Licence 1859

Month	Days on Production	Oil Produced m 3	Water Produced m 3	Water Injection Disposed m 3
Cumulative Prior	11828.0	32620.4	12315.1	
Jan	.0	.0	.0	
Feb	.0	.0	.0	
Mar	.0	.0	.0	
Apr	.0	.0	.0	
May	.0	.0	.0	
Jun	.0	.0	.0	
Jul	.0	.0	.0	
Aug	.0	.0	.0	
Sep	.0	.0	.0	
Oct	.0	.0	.0	
Nov	.0	.0	.0	
Dec	.0	.0	.0	
Ytd	.0	.0	.0	
Cum To Date	11828.0	32620.4	12315.1	

Status Date

UWI Status

ABD P

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Well Production Record

1999

Field 10 Souris Hartney Mineral Rights FREEHOLD
 Pool 53A Lodgepole Virden A
 Unit 0
 Operator 6 Tundra
 UWI 100.10-17-006-22W1.00
 Licence 1877

Month	Days on Production	Oil Produced m 3	Water Produced m 3	Water Injection Disposed m 3
Cumulative Prior	11966.0	25980.7	76219.6	
Jan	.0	.0	.0	
Feb	.0	.0	.0	
Mar	.0	.0	.0	
Apr	.0	.0	.0	
May	.0	.0	.0	
Jun	.0	.0	.0	
Jul	.0	.0	.0	
Aug	.0	.0	.0	
Sep	.0	.0	.0	
Oct	.0	.0	.0	
Nov	.0	.0	.0	
Dec	.0	.0	.0	
Ytd	.0	.0	.0	
Cum To Date	11966.0	25980.7	76219.6	

Status Date

UWI Status

COOP