



June 29, 1989

Mr. George Marquardt
Manager
Reservoir Development
Canadian Hunter Exploration Ltd.
435 - 4th Avenue S.W.
Calgary, Alberta
T2P 3A8

Dear Mr. Marquardt:

Can-Hunter Brassey Project #1 (02)

PRESSURE MAINTENANCE BY PRODUCED GAS REINJECTION
BRASSEY ARTEX "B" & "D" POOLS

This refers to your application of December 12, 1988, requesting approval under section 116 of the Petroleum and Natural Gas Act of a scheme for production of oil from two Artex pools located in the Brassey field.

My staff has examined the data submitted by Canadian Hunter Exploration Ltd. (Canadian Hunter), including the supplemental data sent on January 10 and May 16, 1989, and the following has been concluded:

1. The pools in question will henceforth be referred to as Brassey Artex "B" and Brassey Artex "D" pools (refer to the enclosed Ministry map).
2. My Ministry agrees with Canadian Hunter that the pools are over-pressured and under-saturated, and that pressure maintenance by gas reinjection is an appropriate reservoir management technique.

This is to advise that, under section 116 of the Petroleum and Natural Gas Act, approval is hereby granted for the produced gas reinjection scheme subject to the following conditions:

1. The project area will comprise those portions of the Artex pools underlying the following lands:

93-P-10: Block "B", Units 80, 90
Block "C", Units 61-62, 71-73,
81-83, 91-93
Block "F", Units 2-4, 12-15,
22-25, 33-36,
43-46, 53-56

*modified
eff Apr 6, 1990*

Township 76, Range 19: partial LSD 15 and
16 - section 35,
partial LSD 13-16 -
section 36

Township 77, Range 19: section 1,
section 2-E 1/2,
section 11-E 1/2,
section 12.

2. All produced gas in excess of that required for lease fuel will be injected into the gas injection wells. *deleted* {All such gas injection will be deducted from produced gas in calculating Gas Oil Ratio (GOR) for oil allowable purposes} Produced gas will be injected in the following wells:

Pool "B": d-13-F, c-34-F, d-93-C and
d-55-F in 93-P-10 and
13-1-77-19W6;

Pool "D": a-82-C/93-P-10;

Additional or alternate injectors or producers may be approved upon application.

3. The project Daily Oil Allowables (DOA) will be as follows:

SUM of Pool "B" (538 m ³ /d) and Pool "D" (66 m ³ /d) allowables	EQUAL TO 604 m ³ /d.
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*modified
eff Apr 6, 1990*

An additional volume of 5200 m³ may be produced before December 31, 1989, for the purposes of testing the Brassey "D" pool.

The project DOA forms 9A are attached. Canadian Hunter is at liberty to apportion monthly production between the two pools in accordance with their engineering judgement, but within the overall Scheme Allowable Constraint specified above.

4. The Allowable specified above will not be subject for review until the following conditions have been met:
- (a) a minimum of six months production has occurred;
 - (b) a minimum of 120,000 m³ of oil has been produced and sold;
 - (c) a field-wide pressure survey has been carried out with a minimum of seven days shut-in time.
5. For purposes of implementing Schedule 2 of the Drilling and Production Regulation, constant C will be set at 254 m³/m³.
6. Average reservoir pressure will be maintained above 31000 Kpa (4500 psi) in Pool "B" and above 28000 Kpa (4000 psi) in Pool "D."
7. Prior to commencement of injection of gas other than Brassey Artex solution gas, approval will be obtained from the Head of the Energy Resources Division.
8. Prior to commencement of gas sales from Brassey Artex "B" and "D" Pools, approval will be obtained from the Head of the Energy Resources Division.
9. An annual progress report will be filed with the Division within sixty (60) days of the end of the report year. This report will contain:
- (a) A graphical representation of pool and well historical production and

injection performance, including oil gas and water production, gas injection and estimated average reservoir pressure;

- (b) The daily average rate, during each month, of the oil production from each producing well and each pool as a whole;
- (c) The average GOR and Water Oil Ratio, during each month, from each producing well and from each pool as a whole;
- (d) The monthly and cumulative gas, oil and water production from each producing well and from each pool as a whole;
- (e) The daily average rate of gas injection during each month, into each injection well and into each pool as a whole;
- (f) The monthly and cumulative volumes of gas injected into each injection well, and into each pool as a whole;
- (g) The weighted average wellhead injection pressure, during each month, for each injection well;
- (h) Details of reservoir pressure surveys made during the report period, together with appropriate isobaric maps and volumetrically-weighted average pool pressures (at least one such survey per year is required in each pool, with adequate areal coverage);
- (i) Monthly and cumulative reservoir withdrawal balance calculations for each pool;
- (j) Details of any workover or well survey and treatment programs carried out during the report period;

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- (k) A general review of operations during the report period together with the latest estimate of oil reserves;
- (l) An annual compositional analysis of a recombined separator inlet fluid sample and a monthly estimate of the Reid Vapour Pressure for the crude oil sold.

The operations of the produced gas reinjection scheme will be subject to periodic review and, as a consequence, the Director, Engineering and Operations, may issue general or specific orders regarding the operation of the scheme.

This approval will not take effect until a Royalty Agreement has been finalized. This approval may be modified by the Director, Engineering and Operations, at a later date if deemed appropriate due to a change in circumstances.

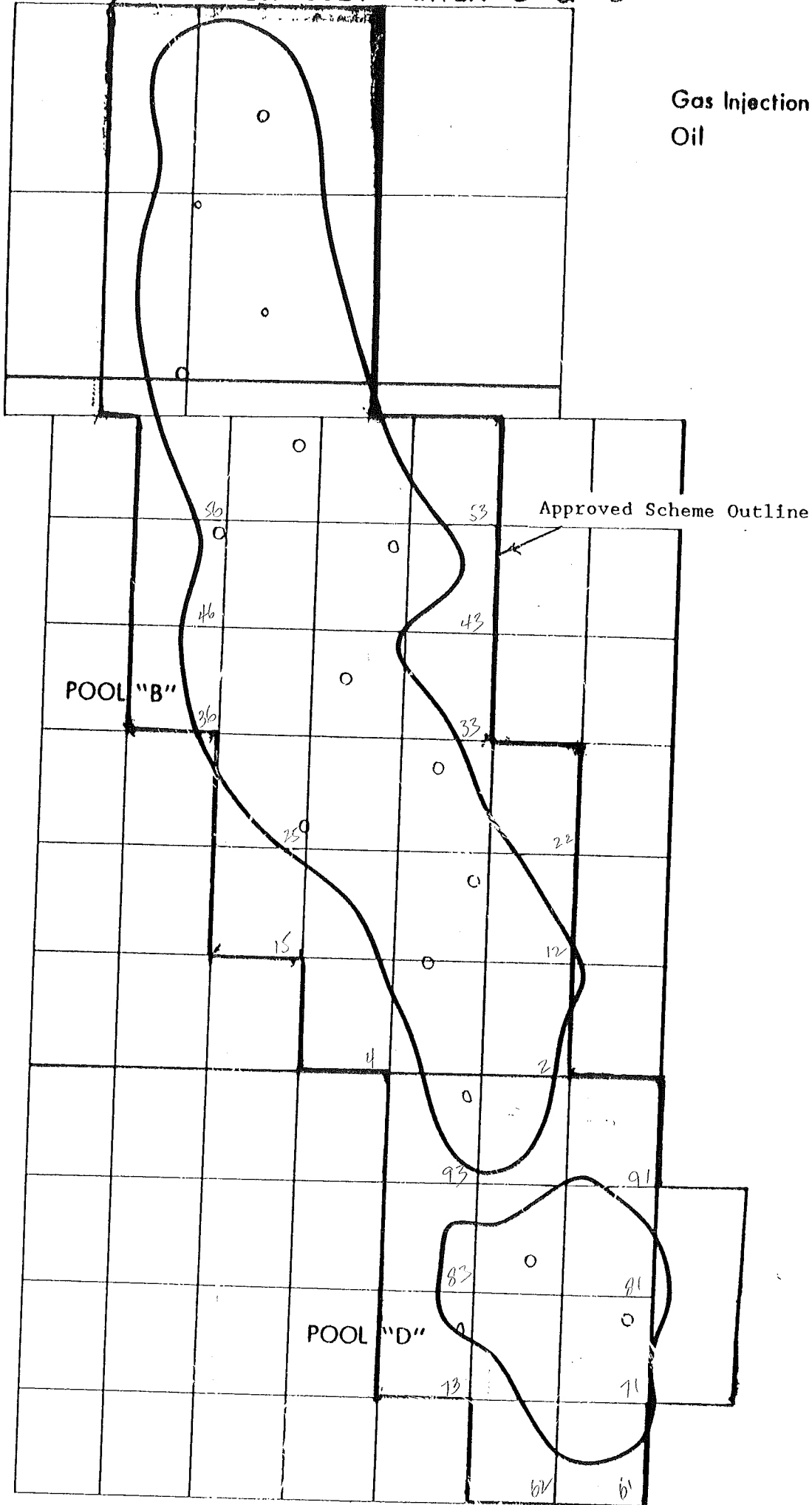
Yours sincerely,

Honourable Jack Davis
Minister

Attachments

Royalty Agreement effective 1989-08-01
J.D.

Gas Injection
Oil





MINISTRY OF ENERGY, MINES AND PETROLEUM RESOURCES
PETROLEUM RESOURCES BRANCH

**APPLICATION FOR
DAILY OIL ALLOWABLE (DOA)
UNIT/PROJECT/LOCATION**

Form to be submitted in duplicate to the Petroleum Resources Branch, Ministry of Mines

Initial Application/Revision No. XXXXXXXXXX

Unit, project, or location name BRASSEY ARTEX 3

Field BRASSEY Pool ARTEX 3

Factors	Numerical Values	Oreton's Calculations		Branch Calculations
		Values Obtained from	Values Used in This Calculation	
Average net pay thickness	7	LOG/CORE	2.43	2.2
Average net porosity	10 net core	"	16.6	16.78
Average permeability	15 per cent	"	1.0	2.558
Average shrinkage	0.75	PVT CALCULATED	0.56	0.56
Recovery factor	20 per cent	"	71	56
Expected uniform rate life	10 years	"	10	10
Total area	A	MAPPING	1850.24	1664.43
$P_{PS} = \left(\frac{I}{10}\right) \left(\frac{100-C}{75}\right) \left(\frac{S}{0.75}\right) =$			1.64	1.628
$P_{RL} = \left(\frac{R}{20}\right) \left(\frac{10}{L}\right) =$			3.55	2.80
$P_A = \left(\frac{A}{31.88}\right) =$			59.59	53.605
$UDO_A = (T) (P_{PS}) (P_{RL}) (P_A) =$			843.05 M ³ /d	538

Deed at Calgary

this day of 19

Signed by (J.H. ANDERSON) Company CANADIAN HUNTER

Position DISTRICT RESERVOIR ENGINEER

(For Branch use only.)

APPROVAL

Daily oil allowable 538.0 m³/d, before gas-oil ratio penalty

Date effective July 1, 1989 Pool Artex "B"

Field Brassey

Dated June 20, 1989

Officer of the Branch



MINISTRY OF ENERGY, MINES AND PETROLEUM RESOURCES
PETROLEUM RESOURCES BRANCH

APPLICATION FOR
DAILY OIL ALLOWABLE (DOA)
UNIT/PROJECT/LOCATION

Form to be submitted in duplicate to the Petroleum Resources Branch, Ministry of Mines

Initial Application/ ~~Renewal~~

Unit, project, or location name BRASSEY ARTEX D

Field BRASSEY Pool ARTEX D

Factors	Nominal Values	Operator Calculations		Branch Calculations
		Values Obtained From	Values Used at This Location	
Average net pay thickness	T	LOG/CORE	2.20	2.2
Average net permeability	I	"	15.3	14.54
Average internal water	C	"	2	2.958
Average shrinkage	S	PVT	0.45	0.53
Recovery factor	R	CALCULATED	74	41
Expected uniform rock life	L		10	10
Total area	A	MAPPING	595.0	340.56
$P_{PS} = \left(\frac{I}{10}\right) \left(\frac{100-C}{75}\right) \left(\frac{S}{0.75}\right) =$			1.20	1.329
$P_{BL} = \left(\frac{R}{20}\right) \left(\frac{10}{L}\right) =$			3.70	2.05
$P_A = \left(\frac{A}{31.05}\right) =$			19.16	10.968
$UDOA = (T) (P_{PS}) (P_{BL}) (P_A) =$			187.15	66

Decred at Calgary this day of 19
Signed by (J.H. ANDERSON) Company CANADIAN HUNTER
Position DISTRICT RESERVOIR ENGINEER

(For Branch use only.)

APPROVAL

Daily oil allowable 66.0 m³/d. before gas-oil ratio penalty.
Date effective July 1, 1989 Pool Artex "D"
Field Brassey
Dated June 20, 1989

Officer of the Branch