

Husky's Response to Board Staff Information Requests for Husky Oil Operations Limited (Husky) Application 1481725

1. Provide a map that shows Husky's interpretation of the region of influence of the gas pools that Husky wants the EUB to shut in.

Husky's Response: Figure IR1-1 illustrates a 3km ROI that has been established by piezometer wells as mentioned in our previous submission.

2. Provide composite well logs (Gamma Ray, Spontaneous Potential, Neutron-Density, and Resistivity) over the Clearwater Formation for all wells within the region of influence as interpreted by Husky. The composite well logs should identify:
 - a) Formation and facies tops;
 - b) All gas pay, water zones, and bitumen pay intervals;
 - c) All perforated and cored intervals;
 - d) Location of piezometers.

(Board Staff note that the logs provided in the cross-sections of Husky's October 3, 2006 submission do not show all gas pay, water zones, and bitumen pay intervals.)

Husky's Response: Attached as Cross Sections A-A' to L-L'. Index map included as Figure IR2-1

3. Provide a map, along with a discussion, that shows the presence of any continuous shales between the gas zones being requested to be shut in and the underlying bitumen.

Husky's Response: Figure IR3-1 is an isopach map of a shale unit below the gas and above the bitumen-bearing sands. (Note that a Clipping Polygon was applied around the data, and prevents contours from extending east and northward beyond the region of interest. The polygon has no impact on contours on the west side.) The unit is generally correlative with CNRL Figure 2.7, (July 4, 2006 Application Numbers 1394112 and 1409180).

The unit is interpreted to be continuous to the east of much of Husky's land. However, as stated in our IR request dated September 5, 2006 (Question 1b), "...it is the cross-cutting relationships between the stratigraphy that control the distribution of sediments, such as placing sand on sand and / or truncating non reservoir muds that are relevant." It is Husky's opinion that the shale unit illustrated in Figure IR3-1 becomes discontinuous by bitumen bearing sands towards the west, and that depletion effects will be transmitted throughout the bitumen reservoir.

- Provide a top water isopach map with fluid contact (gas/water and water/bitumen) values for each well posted on the map.

Husky's Response: Figure IR4-1.

- Provide a tabulation of the pressure data for the gas pools that Husky is requesting the EUB to shut in that includes, by well location, the pressure values, type of tests, date of tests, and shut in times.

Husky's Response:

AEUB Pool ID	UWI	Pressures	Type of Test	Date of Test	Shut-in times
		(kPaa)			(hrs)
Clearwater MU#2	00/06-28-069-04W4M/3	1512	Static Gradient	13-Mar-02	34.5
		1334	Acoustic W.S.	23-Aug-02	18.0
Clearwater MU#2	00/12-04-070-04W4M/2	1842	Static Gradient	09-Feb-99	
		1588	Static Gradient	01-Nov-99	
		1328	Static Gradient	08-Jan-01	
Clearwater MU#2	00/05-16-070-05W4M/2	2079	Static Gradient	13-Mar-02	211.5
Clearwater MU#2	00/05-22-070-05W4M/2	2252	Static Gradient	15-Mar-00	
Clearwater S Pool	00/06-21-070-05W4M/0	2252	Static Gradient	15-Mar-95	
Clearwater G	00/06-20-069-05W4M/0	2616	Static Gradient	22-Jan-91	
		2682	Static Gradient	29-Jan-91	72.4
		2603	Static Gradient	29-Jan-91	70.4
		1860	Static Gradient	20-Dec-97	23.4
		1631	Static Gradient	14-Mar-98	25.6
		1383	Static Gradient	28-Jan-02	24.3
		823	Pressure build up	01-Jan-05	18.0
		812	Static Gradient	01-Jan-05	18.0
Clearwater EE	00/05-13-069-06W4M/0	2472	Static Gradient	13-Jan-99	24.5
		2448	Pressure build up	18-Jan-99	70.8
		2822	Static Gradient	18-Jan-99	70.8
Clearwater CC	02/16-28-068-05W4M/0	2377	Static Gradient	09-Feb-02	170.3
Clearwater DD	00/11-33-068-05W4M/0	2665	Static Gradient	29-Feb-00	213.9
		2523	Single Point	13-Jan-01	

Clearwater Undefined	00/03-11-070-06W4M/2	2245	Static Gradient	26-Mar-06	11.4
Clearwater D	00/05-10-069-04W4M/2	2664	Pressure build up	14-Mar-91	104.0
		2107	Static Gradient	20-Dec-97	
		1357	Static Gradient	28-Jun-98	20.9
		1511	Static Gradient	03-Oct-98	4440.0
		1047	Static Gradient	03-Jan-05	
Clearwater D	03/08-3-069-04W4M/2	2138	Static Gradient	19-Mar-01	
		1934	Acoustic W.S.	15-Oct-01	
		1076	Static Gradient	03-Jan-05	2.8

6. Provide a discussion of the basis for Husky's gas pool mapping, including:

a) The trapping mechanism;

Husky's Response: In Husky's opinion, structural, stratigraphic and bitumen all represent elements of the trapping mechanism.

b) The tolerances for the gas/water and gas/bitumen interfaces used for gas pooling;

Husky's Response: In general, the G/W contact follows structural contours, as shown in Figure IR6b-1 (Top Clearwater sand structure map. Note the pool outlines were modified after new well data was input, and additional wells reviewed.) This is especially evident for Clearwater Undefined (0/03-11-70-06W4/2), Clearwater G, Clearwater CC and DD (here correlated as a single pool, and supported by P/Z data) and Clearwater D. Clearwater MU #2 shows somewhat less relationship to structure contours. The pool illustrates a tilted G/W contact (to the SW), likely reflecting post biodegradation structuring. Clearwater EE does not conform well to the structure contours, and again, likely reflects a tilted G/W contact.

c) The use of pressure data to determine gas pooling.

Husky's Response: Pressure data was found to be only minor use in some of the pools. Clearwater MU #2 is commingled with Grand Rapids production, and therefore pressure data is of no use in isolating the Clearwater reservoir. Pressure data for pools Clearwater CC & DD, Clearwater D, and Clearwater G substantiated the structure mapping. Clearwater EE and Clearwater Undefined have no pressure data.

7. Provide Husky’s estimates of the original gas-in place for the pools Husky is requesting the EUB to shut in, and the parameters used to calculate the original gas in-place.

Husky’s Response: The Original Gas in Place (OGIP) was calculated volumetrically based on the G/W contacts shown in Fig. IR6b-1 and the calculated values as well as the parameters used to calculate these values are shown below.

Pool	area	Volume	Porosity	Sw	Pres	Tres	Tres	Zi	OGIP	P/Z Ult. Rec.
	m2	m3			kPaa	oC	oK		e3M3	e3M3
Clearwater G	4778000	7282748	0.364	0.355	2680	16.0	289.0	0.9452	47692.78	65436
Clearwater CC/DD	6073300	9743343	0.272	0.428	2670	14.0	287.0	0.9446	42446.06	204809
Clearwater D	13320400	36397857	0.299	0.394	2670	13.8	286.8	0.9482	184092	274902
Clearwater EE	1123700	1014901	0.296	0.526	2820	14.0	287.0	0.9482	4195.117	
Clearwater MU #2	70962308	3.4E+08	0.268	0.435	2450	14.0	287.0	0.9494	1316467	
Clearwater Undefined (00/03-11-70-6W4/2)	1503400	1980238	0.326	0.442	2245	13.5	286.5	0.9452	8490.245	

Where the pressure and production data was available for Clearwater zone only (i.e. not commingled with another zone), an expected ultimate recovery for a given pool was calculated from the P/Z graphs as shown in Figures IR7-1 to IR7-5. These numbers are also shown in the table above. Note that in all cases, the volumetric OGIP is lower than the expected gas recovery suggesting that the solution gas from the bitumen zone is being produced. Also note that the Fig. IR3 and Fig. IR-4 indicate that the EUB definition of grouping the three wells in the Clearwater D pool is likely to be correct as the goodness of the fit (R^2 value) improves if the data from the third well is included. However, in both cases the straight lines are not particularly good fits as the data is quite scattered.

8. Provide Husky’s estimates, and the basis for the estimates, of the bitumen in-place and the recoverable bitumen within the region of influence of the gas pools that Husky wants the EUB to shut in.

Husky’s Response: The region of Influence (ROI) has been shown to be at least 3 km in our original submission. Note that ROI based on our revised contour mapping and the pressure depletion observed at the piezometer well 04-06-069-04 W4M would be even larger. On Husky’s land, the 3 km ROI, as illustrated in Figure 1, encompasses the majority of our bitumen resources. The small polygon excluded on the western edge (T69R6W4) represents on the order of 25 million barrels of bitumen in place. The entire 15 sections of our primary development area (Lease Number 7188110343), representing 1.1 billion barrels of bitumen in place, is within the 3 km ROI. Our conservative estimate for the bitumen recovery in the primary development area is 27% with a potential to go as high as 50% if the HSAGD technology works.

9. In Husky's September 5, 2006 submission Husky indicated it wanted 12 gas wells shut in, in addition to the gas wells that CNRL was requesting the EUB to shut in. In Husky's October 3, 2006 application Husky requested the EUB to shut in 10 gas wells instead of 12 gas wells. Why is Husky no longer requesting the shut in of 03/08-03-069-04W4/2 and 00/05-10-069-04W4/2?

Husky's Response: Husky still requests that our original list of wells (Sep. 5, 2006) be shut in. The number wells in addition to those that CNRL asked to be shut in for our application should have been 12 as the Board pointed out. Therefore, the two wells mentioned above should also have been included. A revised list of wells that Husky is requesting to be shut in is shown below. This list is consistent with the identified gas pools and the wells producing from them:

Clearwater Gas Pools	UWI	Licencee
Clearwater MU # 2	00/06-28-069-04W4M/3	EnCana Oil and Gas Co. Ltd.
Clearwater G	00/06-20-069-05W4M/0	EnCana Oil and Gas Co. Ltd.
Clearwater EE	00/05-13-069-06W4M/0	EnCana Oil and Gas Co. Ltd.
Clearwater MU # 2	00/12-04-070-04W4M/2	EnCana Oil and Gas Co. Ltd.
Clearwater CC	02/16-28-068-05 W4M/0	EnCana Oil and Gas Co. Ltd.
Clearwater MU # 2	00/05-16-070-05W4M/2	EnCana Oil and Gas Co. Ltd.
Clearwater DD	00/11-33-068-05 W4M/0	EnCana Oil and Gas Co. Ltd.
Clearwater Undefined	00/03-11-070-06W4M/2	EnCana Oil and Gas Co. Ltd.
Clearwater MU # 2	00/06-21-070-05W4M/0	EnCana Oil and Gas Co. Ltd.
Clearwater MU # 2	00/05-22-070-05W4M/2	EnCana Oil and Gas Co. Ltd.
Clearwater D	00/05-10-069-04W4M/2	EnCana Oil and Gas Co. Ltd.
Clearwater D	03/08-03-069-04W4M/2	EnCana Oil and Gas Co. Ltd.

With respect to the 10 wells listed in Husky's October 3, 2006 application, specify the intervals that Husky wants shut in.

Husky's Response: The list has been updated to 12 wells as indicated above and the interval specific data is shown below:

Well ID	Perforation	Top Depth (mKB)	Base Depth (mKB)
00/03-11-070-06W402	2	437.0	438.0
00/05-10-069-04W402	4	500.3	501.3
00/05-13-069-06W400	3	476.0	480.0
00/05-13-069-06W400	4	468.0	470.0
00/05-16-070-05W402	3	425.0	425.5

00/05-22-070-05W402	2	422.5	423.5
00/06-20-069-05W400	1	445.2	446.5
00/06-21-070-05W400	1	417.0	422.0
00/06-28-069-04W403	1	427.0	430.0
00/06-28-069-04W403	2	423.0	425.0
00/11-33-068-05W400	1	450.5	452.0
00/11-33-068-05W400	2	462.0	463.0
00/12-04-070-04W402	1	427.8	428.3
02/16-28-068-05W400	1	453.5	454.5
02/16-28-068-05W400	2	464.5	465.5
03/08-03-069-04W402	2	495.5	497.5