Maximization of Oil Production in the Norne Field C-Segment: Well Placement Comparative Study

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Abstract-Maximum oil production can be obtained with more oil wells, but few optimal numbers of wells in good location reduces economic costs and increase recovery. In this work, The Norne field C-segment reservoir model in Eclipse® software is used to study the effect of well placement. Six producers (while the four injectors remain the same as those of the base case) for two different well placement scenarios, 1 and 2, are located manually after identifying grid blocks with high oil saturation from an updated geological model. Insignificant variation in oil recovery factors, 1.3%, is obtained for the base case and the two scenarios. However, after taking into account the well costs, gas and water injection costs under reasonable economic assumption, the NPV results shows that scenario 2 with the highest NPV is considered to be more favourable.

Keywords—Maximum Oil production, Well placement, Norne field C-Segment, Reservoir Simulation, Oil Recovery, Economic Analysis, Net Present Value.

I. INTRODUCTION

The Norne database in the Center of Integrated Operation in the Petroleum industry at the Norwegian University of Science and Technology (NTNU) has a license limitation but it is readily available for postgraduate research projects. Many academic projects, mostly simulation of chemical EOR processes to improve oil recovery from Norne field, have been carried out at the Center of Integrated Operation in the Petroleum industry at the Norwegian University of Science and Technology (NTNU) by utilizing the Norne database.

However, this work studies the effect of well placement for maximum oil recovery in the Norne Field C-segment. Determining the best location for new wells is a complex problem that depends on Jon Kleppe,

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reservoir and fluid properties, well and surface equipment specifications, and economic criteria. Placing too many wells in oil reservoir is known to have tremendous effect in oil recovery but it has also cause increase in economic cost in the oil industry for many years now. Optimum well placement most of the time is done based on a deterministic (most likely) case. In this sense, the use of reservoir simulation allows the engineer to evaluate different placement scenarios.

A total number of ten wells; six producers and four injectors are placed in each scenario. In order to obtain maximum oil recovery, the producers are placed horizontally while injectors remain the same as those from the base case. The new well placements in the scenarios are identified with the suffix "P-H" for producers and "I-H" for injectors. Simulation results, the total oil produced for wells in each scenario from the start year 1997 to December 2015 are reported.

The Net present values for the three cases are then calculated taking into account the economic costs such as well cost, cost of gas and water injection. Sensitization was done on the oil price (\$25, \$35). The NPV results are discussed and the most economical well placement scenario is thus identified.

II. THE NORNE FIELD AND ITS SIMULATION MODEL

The Norne field, one of the largest discovery on the Norwegian continental shelf in more than a decade with recoverable oil reserves of 450 Mbbl, has four main fault blocks of C, D, E and G segment. The Norne Main Structure (Norne C-, D- and E-segment, discovered in 1991) contains 97% of the oil in place. The Norne field is in Blocks 6008/10 and 6508/10 on a horst block in the southern part of the Nodland II area in the Norwegian Sea. The drainage strategies/drive mechanisms on the field are pressure depletion, gas injection, water injection and combine gas and water injection. Based on the framework, water and gas injection is recommended as the base mechanism for the C-segment field. The rocks within the Norne reservoir are Late Triassic to Middle Jurassic. The current geological model has five reservoir zones-Garn, Not, Ile, Tofte, and Tilje. Oil is found mainly in the Ile and Tofte formations, and gas is found in the Garn formation. The sandstones are at a depth of 2500m to 2700m. The porosity ranges from 25 to 30%, and permeability varies from 20md to 2500md. The data consist of near-, middle-, and far-stack 3Dseismic data acquired in 2001, 2003, and 2004.

The Norne field has been simulated by four different Eclipse black oil models, from oldest to newest [13, 14]. New simulation models are built when significant updates of the geological model are done, or if certain formation needs refinement. The reservoir model used in this work is the 2004 geological model with 3D three-phase full field blackoil model. The Norne full field model consists of 49080 active grid cells. DX & DY range between 80 - 100 m. The Norne C-segment coarsened grid model was separated from the rest of the field by keeping the Csegment coarsened model with 29x49x22 grid blocks active. Water compressibility of 4.67 x 10-5/bar at 277 bars and rock compressibility factor of 4.84 x 10-5/bar are used in the model. The formation volume factor used is 1.038 Rm3/Sm3 and the oil viscosity is 0.318 cp.

III. WORK FLOW

This section explains the base case which is defined as the initial case obtained from Eclipse 100 simulation run from Statoil. The scenarios 1 and 2 are created based on the initial field reservoir conditions (rock and fluid properties) at 1997. New wells are placed manually on high oil saturation on the scenario cases and the results obtained on well placement and oil production will be compared for economic benefit.

A. Base Case

The total number of wells located on the base case is 13, 9 producers and 4 injectors from the simulated model of the field from the duration of 1997 to 2006. More also, the work will predict production until 2015. In the base case the producing well and injection wells used a template name B, D, K and C respectively. Well locations on the base case are based on the following principles [15]:

- Water injectors are located at the flanks of the reservoir

- Gas injectors located at the structural heights of the reservoir.

- Oil producers located between gas and water injectors for delaying gas and water breakthrough.

- Oil producers are located at some distance from major faults to avoid gas inflow.

B. Drilling and Completion Strategy

Three Well; B-2H, D-1H and D-2H, was drilled from the start-up in the C-segment field base case. These give plateau production in 2000. Two producers show good productivity and late gas break through. The last five were drilled continuously form the production start-up with a drilling time of 1-2 years until 2006. The four injectors are locations close to the edge of the simulation model rounding the in centre all the producers. The first injector well C-1H was drilled a year after the stat-up of the field 1997, and follow by the other four injectors all drilled in 1998. The water injection wells has 5.5" and 7" tubing. The injection pressures are dependent on the bottom-hole pressure required to flow the water into the reservoir formation.

The wells are completed in different formations depending on the drainage strategy. The water injectors are perforated below the oil-water contact, and the two gas injectors are perforated in layer one top Garn formation. The vertical production wells are generally perforated in the lle 1, top of Tofte 3 and Tofte. The production wells are completed to delay gas and water breakthrough and to minimize the amount of well interventions required [16].

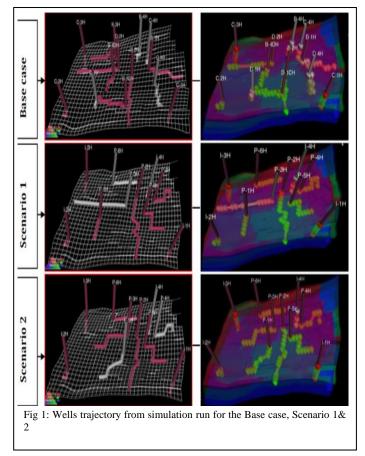
C. Well Placement for Scenario 1 and 2

The objective was to place minimum number of wells to obtain same or higher recovery than the Statoil. A decision was made that 10 new wells will be placed taking well type, location and spacing in to consideration. In new well placement, the suffix "P" is used for producers and "I" is used for the injectors in both scenarios 1 and 2. The flow in the reservoir from the base case shows good recovery on both vertical and horizontal wells but high recovery is achieved with horizontal wells then the vertical wells. Since few wells will be placed to achieve high recovery, slant vertical wells and horizontal will be placed to decrease the drilling and operational cost.

D. Procedure

The base case wells were all removed from the Schedule file and the field was left with no wells accepts general reservoir properties. The flow pattern was studied along with oil/gas water saturation. New schedule files from Eclipse were formed and well placed continuously for each year starting with the P-1H to P-6H wells. First, by using keyword WELOPEN all existing injection wells were stopped and then opened only when observed pressure drop during production which are in both scenarios. Well properties in COMPDAT and WELSPECS keyword were on defaulted except wellbore.

To achieve a successful placement both for Scenario 1 and 2, several numbers of simulation runs was carried out and 6 successful producers, P-1H, P-2H, P-3H, P-4H, P-5H and P-6H, all horizontally placed for Scenario 1, while 4 producers, the remaining 2 producers were left in the same position as in Scenario 1, were placed for Scenario 2. The producer placement and completion are carry out where there is only high oil saturation in the field after studying the direction of flow in the reservoir. The completions were targeted at the lle and the Tofte formations which contain about 80% of the oil in Norne C-Segment.



The location of injection wells depends on the factor such as reservoir structure, injected fluid type, and displacement mechanism. Therefore, all injection wells, I-1H, 1-2H, I-3H, and I-4H, in both scenario cases were left in the same location as in the base case. Injection wells are all vertical with perforation in the bottom for water injection and in the top for gas injection. Some of water injection wells are perforated throughout the reservoir. (See Figure 1 for the Wells trajectory from simulation run for the Base case, Scenario 1& 2 in the Norne Field C-Segment.).

To decrease simulation time restart file for first 9 years of production was made. Then for each case including the base case, additional 9 years of production were simulated using Eclipse® software. Results of simulation were extracted from RSM files and compared between each other. In this part of report cases are compared only by using value of recovery factor. For economic calculation following indexes were extracted with time step of one year: cumulative oil production, cumulative water and gas injected. Description of the scenario cases and recovery factor after additional 9 years of production will be explain in as we go further on this work.

E. Production and injection constraints

A slight variation in Production and injection constraints is used in the simulation cases. For the

base case, maximum oil production rate for each oil producer is 7008 Sm3/day while the maximum oil production rate for each oil producer in scenario 1 and 2 is 8009 Sm3/day. Other production and injection constraints include;

- Maximum oil production rate for each oil producer is 7008 Sm3/day

- Maximum gas injection rate for each gas injector is 2600000 Sm3/day.

- Maximum water injection rate for each water injector is 3760 Sm3/day

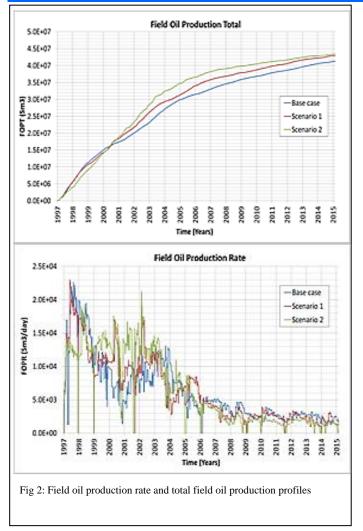
- Maximum water-cut is 95%
- Maximum gas oil-ratio is 15675 Sm3/Sm3
- Maximum bottom-hole pressure is 376 bars
- F. Reservoir Simulation Results and Discussions

The results obtained from simulation on base case field production and the scenario 1 and 2 well placement production and injection are presented and discussed. The results combine the initial production profile of the reservoir from 1997 to 2006 and the expected (forecast) production to 2015. Also the recoverable and unrecoverable reserves are summarised.

a. Oil Production Results

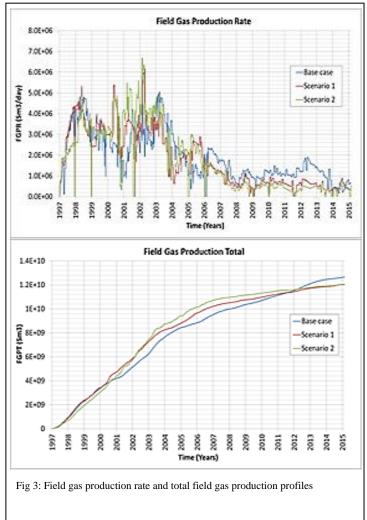
The Oil production in the base case from the year 1997 to 2006 is approximately 31.6 million Sm3. Oil production in case 1 is 34.3 million Sm3 and Scenario 2 is 36.7 million Sm3. Oil production forecast for the base case from 2006 to 2015 is estimated as 9.7 million Sm3. A total of 8.5 million Sm3 of oil is produced in this nine-year period in scenario 1 and 6.5 million Sm3 in scenario 2. The field oil production and the total oil production rate profiles for the three cases can be seen in Figure 2. The cumulative oil production rises from the base case to 41.3 million Sm3. The oil production for scenario case rises to 42.8 and 43.2 million Sm3 in scenario 1 & 2 cases. This shows that there is an increase of 1.5 to 1.9 million Sm3 of oil production for the two cases when compared to the base case.





b. Gas Production Results

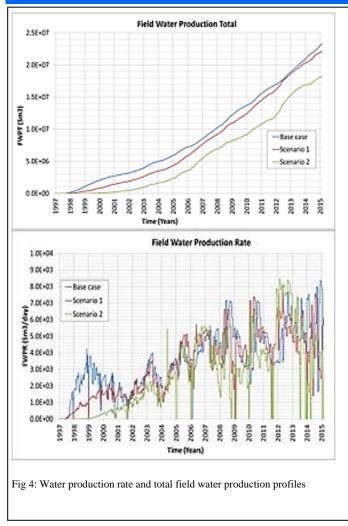
The total volume of gas produced from the base case from 1997 to 2006 is 8.9 billion Sm3. However, the total produced gas for Scenario 1 is 9.7 billion Sm3 and scenario 2 produced 10.2 billion Sm3 of gas. The gas production forecast in the base case from 2006 to 2015 is 8.5 billion Sm3 and 1.8 billion Sm3 for scenario 1 is 2.3 billion Sm3 and 1.8 billion Sm3 for scenario 2 case. The cumulative Gas production from 1997 to 2015 is therefore 12.7 billion Sm3 for the base case and 12.0 billion Sm3 for both Scenario 1 and 2. The production rate and total field gas production profiles can be seen in Figure 3.



c. Water production Results

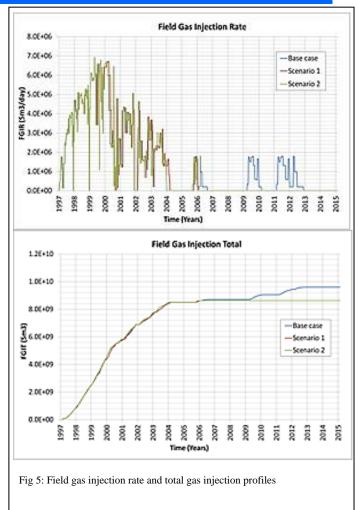
The total water produced from the base case is 7.3 million Sm3. An approximately 6.1 million Sm3 of water is produced in scenario 1 and 3.7 million Sm3 in scenario 2 case. Water production forecast for base case in 2006 to 2015 is 16.0 million Sm3. A total of 15.5 million Sm3 of water is produced in this nine-year period in scenario 1 and 14.1 million Sm3 in scenario 2. The production rate and the total water production profiles from 1997 to 2015 can be seen in Figure 4. The cumulative water production rises from the base case to 23.3 million Sm3. For scenario 1, it rises to 21.6 million Sm3 and 17.8 million Sm3 for scenario 2 case.



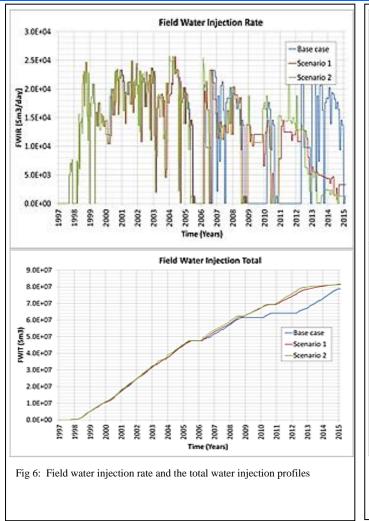


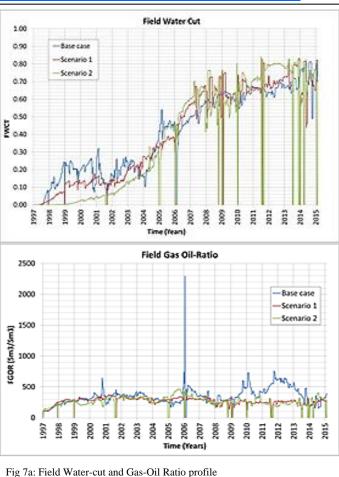
d. Gas injection and water injection

To improve the recovery of oil in the C-segment reservoir, the total volume of 8.63 billion Sm3 gas was injected in the base case and the same volume was also injected in scenario 1 and 2 from 1997 to 2006. From 2006 to 2015, gas injection to maintain pressure in the base case is 10 million Sm3 volume of gas, whereas the gas injection volume for each of the two scenarios are less than 1 million Sm3. Figure 5 presents the gas injection rate and the total field gas injection profiles for the three cases.



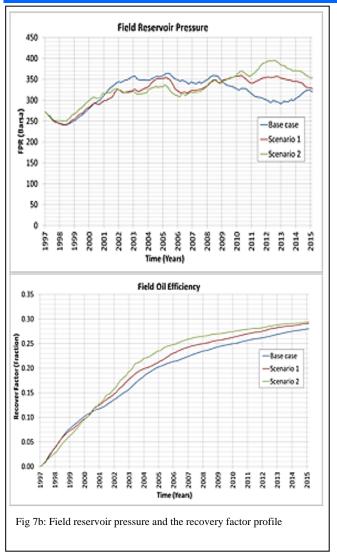
Water injection from 1997 to 2015 in the base case is 79million Sm3. Injected water estimated in scenario 1 & 2 from 1997 to 2015 is 81.2 million Sm3 for each case. Figure 6 shows the water injection rate and the total field water injection profiles for the three cases.





e. Oil Recovery

Oil recovery factor for the base case is 21.4%, Scenario 1 has 23.2% oil recovery factor and Scenario 2 is 24.9%. From 1997 to 2015, the forecasted oil recovery factor for the base case increased to 28.0% while oil recovery factor is 29.0% for scenario1 and 29.3% for scenario 2. (See figure 7a); The field water-cut, GOR. Oil recovery efficiency and the field reservoir pressure profiles for the three scenarios are also presented in figure 7b,



G. Recoverable and Unrecoverable reserves

Originally, oil in-place in the simulations model is estimated as 147 million Sm3 and gas in place as 230 billion Sm3 in 1997. The recoverable oil reserves, the recoverable gas reserves and the unrecoverable reserves for the three cases, from1997 to 2015, are presented in table 1.

	Units			
Description	(Sm³)	Base case	Scenario 1	Scenario 2
Oil in Place, STOIIP	* 10 ⁵	147.6	147.6	147.6
Gas in Place (free & Solution)	* 10 ⁹	229.9	229.9	229.9
Recoverable Oil Reserves	* 10 ⁶	41.4	43.0	43.4
Recoverable Gas Reserves	* 10 ⁹	3.06	3.35	3.37
Unrecoverable Oil reserved	* 10 ⁶	106.2	104.6	104.2

IV. ECONOMIC ANALYSES

A. Net Present Value (NPV)

Present value of money compares the value of a certain amount of money today to the value of that same amount in the future and vice versa, taking into

consideration inflation and returns. Net present value (NPV) is the difference be-tween the present value of cash inflow and the present value of cash outflow. Given an investment opportunity, NPV is used by an organization to analyze the profitability of the project or investment and to make decisions with regards to capital budgeting. It is sensitive to the future cash inflows that an investment or project will yield [17].

Economic Parameter	Cost (USD)
Vertical well	
Cost of drilling a vertical well	17000000
Capital expenditure (CapEx) per vertical well	1700000
Operating Expenditure (OpEx) per vertical well	800000
Horizontal wells	
Cost of drilling a horizontal well	20000000
Capital expenditure (CapEx) per horizontal well	2000000
Operating Expenditure (OpEx) per horizontal well	1000000
Fixed parameters	
Fixed Capital expenditure	200000000
Fixed Operating expenditure per year	5000000
Other operational costs were not taken into cons	ideration:
Cost of Gas injection Per MScf	\$12
Cost of water injection Per Mbbl	\$8
Discount rate	8%
Inflation rate	8%
Oil price	\$25 and \$35

Thus, the objective is to calculate the net present value over the life of the reservoir and this is achieved after generating the results of the reservoir simulation. In carrying out this analysis, a number of assumptions are made. The economic parameters assumed can be seen in Table 2 below.

The calculation of NPV is possible after extracting results to a user friendly Excel Spread sheet program from the simulation output file. Annual oil production, summation of oil produced from the wells in a year for each case, represents a single value. NPV takes more consideration of the economics of the project period, starting with the first year of production 1997-2006 until the forecast production period 2015 (See Table 3).

The base case will be compared with other Scenario case. The NPV formula used is given below;

Formula:

$$NPV = \sum_{t=0}^{n} \left(\frac{CF_t}{(1+d)^t} \right) \tag{1}$$

Where: CFt = Cash Flow of a period "t"

dt = Discount rate for period "t"

n = Last period of economic horizon

Γ

Cash flow is cash inflow minus cash outflow. The main elements required for a cash flow analysis are: Revenue, R= Production x Price, and Expenditure, E = Operating expenditure (OPEX) + capital expenditure (CAPEX). The investment Decision is if NPV > 0, the Project is accepted or NPV < 0, the Project is rejected. This means the project with the highest NPV is favorable.

In any petroleum project, the price of crude oil is very important. Oil prices changing with respect to time, in the fore-casting of oil price, inflation needs to be factored into the estimates. Hence, inflation is used to calculate current price value of 1997 to 2015. The assume oil prices based on 1997 are \$25 as low price, \$35 as high price. The rate of inflation is stated as a percentage. This represents the rate of changes of prices between the current and previous year. Thus, Inflation;

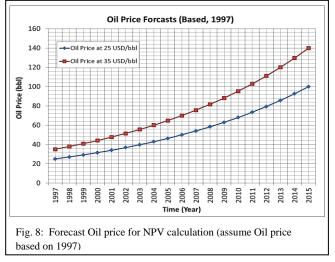
 $I = P_o (1+R)^n (2)$

Where, *I* is an inflation index

Po,Initial oil Price (based on 1997)

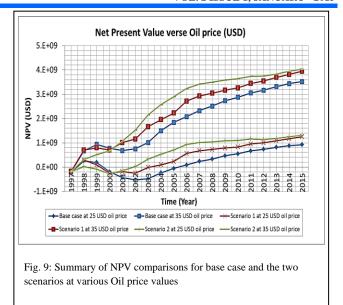
R, inflation rate per annum

n, the number of years



Using the above equation, the result for the forecast oil price is presented in Figure 8.

For economic calculation, the oil production is converted from standard cubic feet (Sm3) to barrel (bbl). The conversion factor is given in table 4. A detailed economic analysis is carried out in excel sheet. Tables 5 through 9 at the Appendix present the cost of gas and water injection, well cost and total expenditure for base case wells and the new well case scenario 1 & 2. NPV calculation for all cases is shown in Tables 10 through 12, lastly NPV results summary for the three cases at different oil price value presented in Table 13. Figure 9 shows the NPV comparisons for the three cases at the price regimes under study.



The Net present value for the three project for the base case, scenario 1 & 2 at low oil price; \$25, slightly high oil price; \$35, is presented below in Table 14.

Present	Oil price at 25	Oil price at 35
Value (PV)	USD (mill)	USD (mill)
Base case	918	3,516
Scenario 1	1,254	3,945
Scenario 2	1,307	4,026

The NPV show values in relative to the oil prices, the higher the oil price, the higher the NPV. Base on economic decision, all cases are considered since there is no negative NPV. However, the NPV for the base case is less when compare to scenario 1 & 2; the NPV of scenario 1 is less than that of scenario 2. The best case is thus scenario 2.

V. CONCLUSION

The Norne field is the largest discovery on the Norwegian continental shelf in more than a decade with recoverable oil reserves of 450 Million bbl, and has four main fault blocks of C, D, E and G segment. Maximum oil production can be obtained with more oil wells, but few optimal numbers of wells in good location reduces economic costs and increase recovery. The Norne field C-segment reservoir model in Eclipse® software is used to study the effect of well placement. Six producers (while the four injectors remain the same as those of the base case) for two different well placement scenarios, 1 and 2, are located manually after identifying grid blocks with high oil saturation.

Oil recovery factor for the base case is 21.4%, Scenario 1 has 23.2% oil recovery factor and Scenario 2 is 24.9%. From 1997 to 2015, the forecasted oil recovery factor for the base case increased to 28.0% while oil recovery factor is 29.0% for scenario1 and 29.3% for scenario 2. The cumulative Gas production from 1997 to 2015 is therefore 12.7 billion Sm3 for the base case and 12.0 billion Sm3 for both Scenario 1 and 2. From 1997 to 2015, the cumulative water production rises from the base case to 23.3 million Sm3. For scenario 1, it rises to 21.6 million Sm3 and 17.8 million Sm3 for scenario 2 case. Water injection from 1997 to 2015 in the base case is 79 million Sm3. Injected water estimated in scenario 1 & 2 from 1997 to 2015 is 81.2 million Sm3 for each case.

From the economic analyses, the NPV for the base case is less when compare to scenario 1 & 2; the NPV of scenario 1 is less than that of scenario 2. The best case is thus scenario 2.

ACKNOWLEDGMENT

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 VI. APPENDIX Norwegian petroleum sector, collective from (1997-2010).

Year Base Scenario Sce	sse Scenario Scenario Scenario 2 Case Scenario 2 Case The Dimensions res.bl/ Reservoir barrel sase 1 2 Case Scenario 2 Three Dimensions Scr Standard cubic 1 33044 6308123 438718 38814585 39871809 2700002 31707308 Standard cubic 1 3201400 4477600 17555079 2015357 28164101 Standard cubic 1 37120 2867970 323072 2415456 18005371 2709097 31762772 14534965 56700 1533690 165740 10697710 31762772 14534965 1000 Stock tank barrel 28020 98710 053500 1506740 10697716 377660 389473 394743 34307 013440 660850 661867 600338 415674 10000 Sr3 287974 34300 03540 77547 358081 378728 377774 3770 677840 5526064 4992813 3987473	(Prod.(Sm [*])	Cum. Oil Prod.(Sm³)	Cum. Oil Prod (Sm³)	Cum. Oil Prod.(bbl)	Cum.Oil Prod.(bbl.)	Cum.Oil Prod.(bbl)	CapE	c Capital f	Expenditure	r	cf	Reservoir cubi	c feet
1987 39337 29336 306413 2417411 194200 192740 NPV Net Present Value scf Standard cubic fr 1996 6139044 6308123 438716 3861486 3967804 2760002 2000 355180 3916340 5530822 2463373 3370753 O Mscf 10000 scf 2002 276720 320460 1332/155 2447355 27709073 Standard cubic fr Mscf 10000 scf 2003 3362030 4113406 502170 3202370 2415465 1000563 175001 1557400 183020 2710801 1551466 1000503 77030 1653800 1517416 3276272 1453495 2705674 183974 165169 911110 530304 167574 163944 1000533 770305 1553800 5717547 453944 557691 183974 1030340 66058 16767 1000533 1000533 770305 173370 167371 167360 10000533 1000534 17	3433 23336 306413 2417481 1242209 127340 33004 6308123 438718 33614866 39678034 7700002 32912 455371 520320782 26433779 33707053 Mscf 1000 scf 358180 396380 4358222 24633779 33707053 o Original stb Standard cubic f 356200 4413450 5021370 24136451 1808417 g o Original stb Stock tank barrel 357120 2867970 3623370 24136451 18089512 2720997 g Gas bbl Barrel Billion Cubic Fee 362200 2557800 1838920 9216101 10099588 1166807 7 1563390 50 Sm30.e. 1000 Sm3 Gas 1.0 Sm30.e. 1000 Sm3 Gas 1.0 Sm30.e. 1000 Sm3 Gas 1.0 Sm30.e. 15m3 Crude Oil 1.5m3 Crude Oil						Scenario 1	Scenario 2	OpEx	Operatin	ig Expendit	ure <i>r</i> e			
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l'able 7a: vells	we	en cost an	id total	expenditur	es for Base	case, Scenar	no 1 & 2	Scenario			and total exper-	nuitures for B	ase case,	
ear of vell lacemen	Ve	ertica V vell + di	apEx. fo ertical w Cost of rilling ertical w	ells Drilli for V and	ngcosts ertical Horizontal	Nos. of Vertical well* OpEx. per Vertical wells (USD)	for Vertical	Year of well Placement	Nos of Horizor	CapEx. for Horizontal wells + Co drilling	Drilling co stof for Vertic and Horiz	osts Horizo al *OpEx zontal Horizo	ntal well Dri . Per co ntal Ve	sts for rtical ar
1997	1		3700000		0000	800000	2800000	4007	2		well wells	wells (orizonta
1998	3		2700000		0000	2400000	2400000	1997 1998	2	42000000 2000000	60700000 54700000			00000
1999	3		2700000		00000	2400000	3400000	1999	1	22000000	74700000			00000
2003	0	17	700000	2370	0000	0	1000000	2003	1	22000000	23700000			00000
2004	0		700000		0000	0	1000000	2003	1	22000000	23700000			00000
2006	1		3700000		0000	800000	800000	2006	Ó	2000000	20700000			0000
Total	8	14	4620000	0 2582	200000		11400000	Total	5	112000000				400000
Number	sof	wells and	Expendi	tures in Scer	nario-1 wells			Sec. 10			Sec. 1			
1997	1		3700000			00000	800000				ures in Scenario-			
1998	1		3700000			300000	3800000	1997	0	2000000	20700000	27		0000
1999	3		2700000			2400000	3400000	1998	3	62000000	80700000			00000
2003	0		700000)	1000000	1999	1	22000000	74700000		1.7	00000
Total	5	91	1800000	1778	00000		9000000	2003 Total	1	22000000 86000000	23700000			00000
umbam		alla and E	un on dit.	rea in Casar	nia Qualla			Total	9	0000000	1//0000	10	90	00000
1997	0		700000	ires in Scena)	1000000	Numbers	ofwells	and Expendit	ures in Scenario-	2wells		
1998	1		3700000			300000	1800000	1997	1	22000000	23700000		0 10	00000
1999	3		2700000			2400000	3400000	1998	1	22000000	40700000	100000	0 18	00000
2001	0		700000)	1000000	1999	1	22000000	74700000			00000
2002	0		700000			5	1000000	2001	1	22000000	23700000			00000
)	1000000	2002	1	22000000	23700000	100000	0 10	00000
	0	1	700000	23/1	0000 0	,	1000000							
2003	0		3200000		200000	,	9200000	2003	1	22000000	23700000			00000
2003 Total	4	78	3200000	2102				2003 Total	6 NP	132000000	21020000 case with Oil F	Price at 25 U	92 SD	00000
2003 Total able 12a	4 a: Ne	71 et Presen NF	t Value	2102 Calculationse Case with	on for Base Oil Price at 2	Case 5 USD	9200000	2003 Total	6 NP Year E	132000000 V for Base (Total xpenditure (CapEx +	21020000	00	92 SD Net Pre	00000 00000 esent
2003 Total able 12a	4 a: Ne ear (7f et Presen NF Cum. Oil Production	t Value V for Bas Oil	2102 Calculatio	on for Base Oil Price at 29 CapEx = Fixed CapEy	Case 5 USD 0 p	9200000 Ex	2003 Total Year	6 NP ¹ fear E	V for Base (Total xpenditure (CapEx + pEx) (USD)	21020000 case with Oil F Cash Flow (USD)	Price at 25 U Present Value (PV) (USD)	92 SD Net Pre Value (esent (USD)
2003 Total able 12a	4 a: Ne ear (7t et Presen NF Cum. Oil	t Value V for Bat Oil Price at 25	2102 Calculationse Case with Revenue	on for Base Oil Price at 29 CapEx = Fixed CapEy + CapEx per	Case 5 USD 6 Fixed OpEx + 0pEx per	9200000 Ex Total Cost of Gas +Water	2003 Total Year Y 1997 0	6 NP fear E O	132000000 V for Base (Total xpenditure (CapEx + pEx) (USD) 79970667	21020000 case with Oil F Cash Flow (USD) -219533642	Price at 25 U: Present Value (PV) (USD)	92 SD Net Pre Value (-219533	esent (USD)
2003 Total able 12a	4 a: Ne ear (7f et Presen NF Cum. Oil Production	t Value V for Bas Oil	2102 Calculationse Case with Revenue	on for Base Oil Price at 29 CapEx = Fixed CapEy	Case 5 USD 6 Fixed OpEx +	9200000 Ex Total Cost of Gas +Water injection	2003 Total Year Y 1997 0 1998 1	6 NP fear E O	V for Base (Total xpenditure (CapEx + pEx) (USD)	21020000 case with Oil F Cash Flow (USD)	Price at 25 U Present Value (PV) (USD)	92 SD Net Pre Value (esent (USD)
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2003 Total able 12a ear Ye	4 a: No	71 et Presen NF Cum. Oil Production	t Value V for Bas Oil Price at 25 (USD/	2102 Calculationse Case with Revenue	on for Base Oil Price at 29 CapEx = Fixed CapEx + CapEx per well + Well	Case 5 USD 7 Fixed OpEx + OpEx per well (USD) 7800000	9200000 Ex Total Cost of Gas +Water injection (USD) 11470667	2003 Total Year Y 1997 0 1998 1	6 NP (ear E 0 2 2 1 5 2 1	13200000 V for Base (Total xpenditure (CapEx + pEx) (USD) 79970667 29313378	21020000 case with Oil F Cash Flow (USD) -219533642 513280431	Price at 25 U: Present Value (PV) (USD) -219533642 475259658	92 SD Net Pro Value (-219533 2557260	esent (USD) 642 016 342
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2003 Total able 12a ear Ye 9997 0 9998 1 9999 2 9000 3 001 4 002 5 000 3 001 4 000 12 000 12 000 11 000 12 000 11 000 12 000 1000 1	4 a: No ear () () () () () () () () () () () () () (74 et Presen NF Cum. Oil Production (bbl) 2417481 38614586 33520788 22865282 13302155 17585079 21111001 24135485 15771043 9216108 10697718 9118110 8174610 5625084	t Value V for Bas Price at 25 (USD/ bbl) 25.0 27.0 29.2 31.5 34.0 36.7 39.7 42.8 46.3 50.0 54.0 58.3 63.0 68.0	2102 Calculation se Case with Revenue (USD) 60437025 1042593809 977466164 720091759 452435872 645956250 837512643 1034099490 729777489 460576063 577389243 531503510 514626453 382452805	200000 on for Base Oil Price at 29 CapEx = Fixed CapEy + CapEx per well + Well cost (USD) 260700000 54700000 0 23700000 0 23700000 0 0 0 0 0 0 0 0 0 0 0	Case 5 USD 6 Fixed OpEx + 7 Fixed OpEx + 0 PEx per well (USD) 7 700000 8 400000 5 000000 5 0000000 5 000000 5 000000 5 000000 5 000000 5 000000 5 000000 5 000000 5 0000000 5 000000 5 0000	9200000 9200000 Ex Total Costof Gas +Water injection (USD) 11470667 467213378 975667363 1202094639 757148007 792647073 732603892 588507110 383964362 143535931 261693923 295948526 170367921 149707488	2003 Total Year 1 1997 0 1998 1 1999 2 2000 3 2001 4 2002 5 2003 6 2004 7 2005 8 2006 9 2008 1 2009 1 2010 1 2011 1	6 Vear E 0 2 1 5 7 5 7 5 7 6 3 3 1 1 5 7 5 7 6 3 3 1 1 1 1 1 1 1 1 1 1 1 1 1	132000000 V for Base (Total xpenditure (CapEx + pEx) (USD) 79970667 29313378 058767363 207094639 62148007 97647073 62303892 18207110 88964382 70035931 66693923 00948526 75367921 54707488 41390953	21020000 case with Oil F Cash Flow (USD) -219533642 513280431 -81301199 -487002879 -309712135 -151690823 75208751 415892379 340813107 290540133 310695320 230554984 339258532 227745317 341899828	200 Price at 25 U: Present Value (PV) (USD) -219533642 475259658 -69702674 -386598587 -227647665 -103238225 47394271 242669209 184130717 145342401 145342401 143912049 98881081 134724231 83741480 116403571	92 SD Net Pro Value (-219533 2557260 1860233 -200575 -428222 -531461 -484066 -241397 -572669 8807546 2319875 3308685 4655928 5493343 6657378	000000 000000 esent (USD) 0642 016 342 2245 9910 135 3864 3655 333 512 593 3324 304 375
2003 Total able 12a ear Ye 997 0 998 1 999 2 000 3 001 4 002 5 003 6 004 7 005 8 006 9 007 10 008 11 009 12 010 13 011 14	4 a: No ear () () 1 2 3 4	74 et Presen NF Cum. Oil Production (bbl) 2417481 38614586 33520788 22865282 13302155 17585079 21111001 24135485 15771043 9216108 10697718 9118110 8174610 5625084 6581667	t Value V for Bas Oil Price at 25 (USD/ bbl) 25.0 27.0 29.2 31.5 34.0 36.7 39.7 42.8 46.3 50.0 54.0 58.3 63.0 68.0 73.4	2102 Calculation se Case with Revenue (USD) 60437025 1042593809 977466164 720091759 452435872 645956250 837512643 1034099490 729777489 460576063 577389243 531503510 514626453 382452805 483290781	200000 an for Base Oil Price at 29 CapEx = Fixed CapEy + CapEx per well + Well cost (USD) 260700000 54700000 0 23700000 0 23700000 0 0 0 0 0 0 0 0 0 0 0	Case 5 USD 5 USD 6 Fixed OpEx + 0 pEx per well (USD) 7800000 7400000 8400000 50000000 50000000 500000000	9200000 9200000 Ex Total Costof Gas +Water injection (USD) 11470667 467213378 975667363 1202094639 975647073 722603892 588507110 383964382 143535931 261693923 295948526 170367921 149707488 136390953	2003 Total Year 1 1997 0 1998 1 1999 2 2000 3 2001 4 2002 5 2003 6 2004 7 2005 8 2006 9 2008 1 2009 1 2010 1 2011 1 2012 1	6 (ear E 0 2 1 5 7 5 7 5 7 6 3 3 1 1 5 7 6 3 3 1 1 1 1 1 1 1 1 1 1 1 1 1	132000000 V for Base (Total xpenditure (CapEx + pEx) (USD) 79970667 29313378 058767363 207094639 62148007 97647073 62303892 18207110 88964382 70035931 66693923 00948526 75367921 54707488 41390953 70776770	21020000 case with Oil F Cash Flow (USD) -219533642 513280431 -81301199 -487002879 -309712135 -151690823 75208751 415892379 340813107 290540133 310695320 230554984 339258532 227745317 341899828 205535748	27rice at 25 U Present Value (PV) (USD) -219533642 475259658 -69702674 -386598587 -227647665 -103238225 47394271 242669209 184130717 145342401 145342401 145342401 145342401 134724231 83741480 116403571 64793440	92 SD Net Pro Value (-219533 2557260 1860233 -200575 -428222 -531461 -484066 -241397 -572669 8807546 2319875 3308685 4655928 5493343 6657378 7305313	000000 000000 eesent (USD) 1642 1642 1642 1644 1655 165 165 165 165 165 165 165 165 16
2003 Total able 12a ////////////////////////////////////	4 a: No ear () () 1 2 3 4 5	71 et Presen NF Cum. Oil Production (bbl) 2417481 38614586 33520788 22865282 13302155 17585079 21111001 24135485 15771043 9216108 10697718 9118110 8174610 5625084 6581667 4745176	t Value V for Bas Oil Price at 25 (USD/ bbl) 25.0 27.0 29.2 31.5 34.0 36.7 39.7 42.8 46.3 50.0 54.0 58.3 63.0 68.0 73.4 79.3	2102 Calculation se Case with Revenue (USD) 60437025 1042593809 977466164 720091759 452435872 645956250 837512643 1034099490 729777489 460576063 577389243 531503510 514626453 382452805 483290781 376312519	200000 an for Base Oil Price at 29 CapEx = Fixed CapEy + CapEx per well + Well cost (USD) 260700000 54700000 0 23700000 0 23700000 0 0 0 0 0 0 0 0 0 0 0	Case 5 USD 5 USD 6 Fixed OpEx + 0 pEx per well (USD) 7800000 7400000 8400000 500000000	9200000 9200000 Ex Total Costof Gas +Water injection (USD) 11470667 467213378 975667363 1202094639 975647073 722603892 588507110 383964382 143535931 261693923 295948526 170367921 149707488 136390953 165776770	2003 Total Year Y 1997 0 1998 1 1999 2 2000 3 2001 4 2002 5 2003 6 2004 7 2005 8 2006 9 2007 1 2008 1 2010 1 2011 1 2012 1 2013 1	6 (ear E 0 2 1 5 7 5 7 6 3 3 1 1 5 7 6 3 3 1 1 1 1 1 1 1 1 1 1 1 1 1	132000000 V for Base (Total xpenditure (CapEx + pEx) (USD) 79970667 29313378 058767363 207094639 62148007 97647073 62303892 18207110 88964382 70035931 66693923 00948526 75367921 54707488 41390953 70776770 70271061	21020000 case with Oil F Cash Flow (USD) -219533642 513280431 -81301199 -487002879 -309712135 -151690823 75208751 415892379 340813107 290540133 310695320 230554984 339258532 227745317 341899828 205535748 281576483	200 Price at 25 U: Present Value (PV) (USD) -219533642 475259658 -69702674 -386598587 -227647665 -103238225 47394271 242669209 184130717 145342401 143912049 98881081 134724231 83741480 116403571 64793440 82189491	92 SD Net Pro Value (-219533 2557260 1860233 -200575 -428222 -531461 -484066 -241397 -572669 8807546 2319875 3308685 4655928 5493343 6657378 7306313 8127208	00000 000000 esent (USD) 6642 016 342 5245 9910 1355 342 542 593 3512 593 3512 593 3624 304 375 593 3624
2003 Total able 12a 'ear Ye 997 0 998 1 999 2 000 3 001 4 002 5 003 6 004 7 005 8 006 9 007 10 008 11 009 12 010 13 011 14 012 15 013 16	4 a: No ear () () 1 2 3 4 5 5 5	74 et Presen NF Cum. Oil Production (bbl) 2417481 38614586 33520788 22865282 13302155 17585079 21111001 24135485 15771043 9216108 10697718 9118110 8174610 5625084 6581667 4745176 6443162	t Value V for Bas Oil Price at 25 (USD/ bbl) 25.0 27.0 29.2 31.5 34.0 36.7 39.7 42.8 46.3 50.0 54.0 58.3 63.0 68.0 73.4 79.3 85.6	2102 Calculation se Case with Revenue (USD) 60437025 1042593809 977466164 720091759 452435872 645956250 837512643 1034099490 729777489 460576063 577389243 531503510 514626453 382452805 483290781 376312519 551847544	200000 an for Base Oil Price at 2! CapEx = Fixed CapEy + CapEx per well + Well cost (USD) 260700000 54700000 0 0 0 23700000 0 23700000 0 0 0 0 0 0 0 0 0 0 0	Case 5 USD 5 USD 7 Fixed OpEx + OpEx per well (USD) 7 800000 7 400000 8 400000 5 000000 5 0000000 5 000000 5 0000000 5 000000 5 000000 5 000000 5 000000 5 000000 5 000000 5 0000000000	9200000 9200000 Ex Total Cost of Gas +Water injection (USD) 11470667 467213378 975667363 1202094639 757148007 792647073 722603892 588507110 383964382 143535931 261693923 295948526 170367921 149707488 136390953 165776770 265271061	2003 Total Year Y 1997 0 1998 1 1999 2 2000 3 2001 4 2002 5 2003 6 2004 7 2005 8 2006 9 2007 1 2008 1 2010 1 2011 1 2012 1 2013 1	6 (ear E 0 2 1 5 7 5 7 6 3 3 1 1 5 7 6 3 3 1 1 1 1 1 1 1 1 1 1 1 1 1	132000000 V for Base (Total xpenditure (CapEx + pEx) (USD) 79970667 29313378 058767363 207094639 62148007 97647073 62303892 18207110 88964382 70035931 66693923 00948526 75367921 54707488 41390953 70776770	21020000 case with Oil F Cash Flow (USD) -219533642 513280431 -81301199 -487002879 -309712135 -151690823 75208751 415892379 340813107 290540133 310695320 230554984 339258532 227745317 341899828 205535748	27rice at 25 U Present Value (PV) (USD) -219533642 475259658 -69702674 -386598587 -227647665 -103238225 47394271 242669209 184130717 145342401 145342401 145342401 145342401 134724231 83741480 116403571 64793440	92 SD Net Pro Value (-219533 2557260 1860233 -200575 -428222 -531461 -484066 -241397 -572669 8807546 2319875 3308685 4655928 5493343 6657378 7305313	00000 000000 esent (USD) 6642 016 342 5245 9910 135 342 5245 9910 135 364 4 6655 338 33 512 593 324 304 375 335 506
2003 Total able 12a ////////////////////////////////////	4 a: No ear () () 1 2 3 4 5 5 7	71 et Presen NF Cum. Oil Production (bbl) 2417481 38614586 33520788 22865282 13302155 17585079 21111001 24135485 15771043 9216108 10697718 9118110 8174610 5625084 6581667 4745176	t Value V for Bas Oil Price at 25 (USD/ bbl) 25.0 27.0 29.2 31.5 34.0 36.7 39.7 42.8 46.3 50.0 54.0 58.3 63.0 68.0 73.4 79.3	2102 Calculation se Case with Revenue (USD) 60437025 1042593809 977466164 720091759 452435872 645956250 837512643 1034099490 729777489 460576063 577389243 531503510 514626453 382452805 483290781 376312519	200000 an for Base Oil Price at 29 CapEx = Fixed CapEy + CapEx per well + Well cost (USD) 260700000 54700000 0 23700000 0 23700000 0 0 0 0 0 0 0 0 0 0 0	Case 5 USD 7 Fixed OpEx + OpEx per well (USD) 7 7800000 7 400000 8 400000 5 5000000 5 50000000 5 50000000000	9200000 9200000 Ex Total Costof Gas +Water injection (USD) 11470667 467213378 975667363 1202094639 975647073 722603892 588507110 383964382 143535931 261693923 295948526 170367921 149707488 136390953 165776770	2003 Total Year Y 1997 0 1998 1 1999 2 2000 3 2001 4 2002 5 2003 6 2004 7 2005 8 2006 9 2008 1 2008 1 2010 1 2011 1 2012 1 2013 1 2014 1	6 NP fear E 0 0 2 1 5 7 5 7 5 7 6 3 1 1 5 7 6 3 1 1 1 1 1 1 1 1 1 1 1 1 1	132000000 V for Base (Total xpenditure (CapEx + pEx) (USD) 79970667 29313378 058767363 207094639 62148007 97647073 62303892 18207110 88964382 70035931 66693923 00948526 75367921 54707488 41390953 70776770 70271061	21020000 case with Oil F Cash Flow (USD) -219533642 513280431 -81301199 -487002879 -309712135 -151690823 75208751 415892379 340813107 290540133 310695320 230554984 339258532 227745317 341899828 205535748 281576483	200 Price at 25 U: Present Value (PV) (USD) -219533642 475259658 -69702674 -386598587 -227647665 -103238225 47394271 242669209 184130717 145342401 143912049 98881081 134724231 83741480 116403571 64793440 82189491	92 SD Net Pro Value (-219533 2557260 1860233 -200575 -428222 -531461 -484066 -241397 -572669 8807546 2319875 3308685 4655928 5493343 6657378 7306313 8127208	000000 000000 esent (USD) 0642 016 342 1245 9910 135 136 4 665 138 33 512 593 324 304 875 315 306 793

ase							'	Year	NPV for Scenario 1 with Oil Price at 25 USD					
		NPV for Scenario 1 with Oil Price at 25 USD							Year	Total	Cash Flow	Present	Net Present	
Year	Year	Cum. Oil Production (bbl)	Oil	Revenue	CapEx = Fixed CapEx + CapEx per well + Well cost (USD)	OpEx				Expenditure (CapEx +	(USD)	Value (PV) (USD)	Value (USD	
			Price at 25	(USD)		Fixed OpEx. + OpEx per well (USD)	+ Total Costo			OpEx) (USD)		(000)		
			(USD/	*			Gas +Water injection	1997	0	237363975	-191233760	-191233760	-191233760	
			bbl)				(USD)	1998	1	557320069	513988477	475915256	284681497	
1997	0	1845209	25.0	46130215	220700000	5800000	10863975	1999	2	1066599263	-231362979	-198356464	86325033	
1998	1	and the state of t	27.0	1071308546	80700000	8800000	467820069	2000	3	1198252192	-422465530	-335366758	-249041725	
1999	2	28643220	29.2	835236283	74700000	8400000	983499263	2001	4	763158553	85355796	62739058	-186302667	
2000	3	24633779	31.5	775786663	0	5000000	1193252192	2002	5	831857694	-91553735	-62309934	-248612601	
2001	4	24947335	34.0	848514350	0	5000000	758158553	2003	6	728096132	373218471	235190945	-13421656	
2002	5	20153537	36.7	740303959	23700000	6000000	802157694	2004	7	591772651	181142013	105694625	92272968	
2003	6	27760601	39.7	1101314603	0	5000000	723096132	2005	8	390695982	246152262	132988408	225261376	
2004	7	18039531	42.8	772914663	0	5000000	586772651	2006	9	141491555	662586487	331458206	556719582	
2005	8	13762772	46.3	636848243	0	5000000	385695982	2007	10	283444210	254204221	117745740	674465322	
2006	9	16089568	50.0	804078042	0	5000000	136491555	2008	11	255607690	114536719	49122836	723588158	
2007	10	9961410	54.0	537648432	0	5000000	278444210	2009	12	240408534	150905087	59926486	783514644	
2008	11	6349944	58.3	370144409	0	5000000	250607690	2010	13	224989982	114474355	42091983	825606627	
2009	12	6215841	63.0	391313620	0	5000000	235408534	2011	14	115905280	361413474	123047208	948653834	
2010	13	4992813	68.0	339464338	0	5000000	219989982	2012	15	219404462	159367257	50239206	998893040	
2011	14	6500338	73.4	477318754	0	5000000	110905280	2013	16	226135769	304243405	88805750	1087698790	
2012	15	4776186	79.3	378771719	0	5000000	214404462	2014	17	109072830	296624085	80168280	1167867070	
2013	16	6192505	85.6	530379174	0	5000000	221135769	2014	18	65775490	345325676	86417415	125428448	
2014 2015	17 18	4385891 4115107	92.5 99.9	405696916 411101165	0	5000000 5000000	104072830 60775490	Total	10	00110490	3226921781	1254284485	1204204400	

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Table 12c: Cont. on Net Present Value Calculation for S	Scenario 2 Case
NPV for Scenario 2 with Oil Price at 25	USD

Vaar	Year	Cum.Oil	Oil	Revenue	CapEr -		Ev	NPV for Scenario 2 with Oil Price at 25 USD						
Year	Tear	Production (bbl)	Price at 25 (USDIb bl)	(USD)	CapEx = Fixed CapEx + CapEx per well + Well cost (USD)	Fixed OpEx - OpEx per well (USD)	Gas +Water injection	ar	Year	Total Expenditure (CapEx + OpEx) (USD)	Cash Flow (USD)	Present Value (PV) (USD)	Net Present Value (USD)	
			2.1		0001(000)	(USD)	(USD)	97	0	242962137	-194778646	-194778646	-194778646	
1997	0	1927340	25.0	48183491	223700000	6000000	13262137	98	1	509942394	235257669	217831175	23052529	
1998	1	27600002	27.0	745200063	40700000	6800000	462442394	99	2	1063454957	-136767990	-117256507	-94203978	
1999	2	31779388	29.2	926686967	74700000	8400000	980354957	00	3	1300125191	-238595704	-189404962	-283608940	
2000	3	33707053	31.5	106152949	0	5000000	1295125191	01	4	748542064	182643918	134248732	-149360208	
2001	4	27377980	34.0	931185982	23700000	6000000	718842064	02	5	784777050	249780670	169996527	20636318	
2002	5	28164104	36.7	1034557719	23700000	6000000	755077050	03	6	763857210	489155311	308250820	328887138	
2003	6	31584417	39.7	1253012520	23700000	6000000	734157210	04	7	645527408	330966700	193115890	522003028	
2004	7	22790997	42.8	976494107	0	5000000	640527408	05	8	341493362	331088167	178876635	700879663	
2005	8	14534995	46.3	672581529	0	5000000	336493362	06	9	130836295	447216213	223719449	924599111	
2006	9	11566807	50.0	578052508	0	5000000	125836295	07	10	323446094	187739017	86959490	1011558602	
2007	10	9471105	54.0	511185112	0	5000000	318446094	08	11	267109332	54453921	23354353	1034912955	
2008	11	5516519	58.3	321563253	0	5000000	262109332	09	12	166302773	112441013	44651873	1079564828	
2009	12	4427720	63.0	278743786	0	5000000	161302773	10	13	217061563	51483779	18930479	1098495307	
2010	13	3949743	68.0	268545342	0	5000000	212061563	11	14	140870038	164359195	55957903	1154453210	
2011	14	4156747	73.4	305229233	0	5000000	135870038	12	15	284062140	-64744371	-20410126	1134043084	
2012	15	2765524	79.3	219317769	0	5000000	279062140	13	16	233076910	145197383	42381732	1176424816	
2013	16	4416586	85.6	378274292	0	5000000	228076910	14	17	57624656	273353929	73879080	1250303895	
2014	17	3578129	92.5	330978585	0	5000000	52624656	15	18	34703896	226153030	56594576	1306898471	
2015	18	2611168	99.9	260856926	0	5000000	29703896	tal			2846403202	1306898471		

Table 13a: Summary of Net Present Value Result for Base case

able 15a.	Summary of Net 11	esent Value Result for Ba	ase case	Table 13b:Cont. on Summary of Net Present Value Result for scenario 1 NPV (USD) for Scenario 1					
	NPV (U	ISD) for Base cas	e	Year Cum.Oil Scenario 1 at 25 Scena					
Year	Cum.Oil	Base case at 25		rear	Prod. (bbl)	USD Oil price	USD Oil price		
	Prod.(bbl)	USD Oil price	USD Oil price	1997	1845209	-191233760	-172781674		
1997	2417481	-219533642	-195358832	1998	39678094	284681497	699914526		
1998	38614586	255726016	666046681	1999	28643220	86325033	787990258		
1999	33520788	186023342	931551882	2000	24633779	-249041725	698961286		
2000	22865282	-200575245	773606117	2001	24947335	-186302667	1011173695		
2001	13302155	-428222910	678980001	2002	20153537	-248612601	1150399135		
2002	17585079	-531461135	751592564	2003	27760601	-13421656	1663196085		
			State and the second second	2004	18039531	92272968	1949286022		
2003	21111001	-484066864	1010096847	2005	13762772	225261376	2219902146		
2004	24135485	-241397655	1494120904	2006	16089568	556719582	2712256036		
2005	15771043	-57266938	1835962049	2007	9961410	674465322	2929615877		
2006	9216108	88075463	2073465530	2008	6349944	723588158	3042238150		
2007	10697718	231987512	2324354754	2009	6215841	783514644	3164323045		
2008	9118110	330868593	2514416933	2010	4992813	825606627	3256343161		
2009	8174610	465592824	2730887262	2011	6500338	948653834	3444393744		
		and the second second second		2012	4776186	998893040	3542394807		
2010	5625084	549334304	2870879583	2013	6192505	1087698790	3693125607		
2011	6581667	665737875	3053099827	2014	4385891	1167867070	3817152799		
2012	4745176	730531315	3165345027	2015	4115107	1254284485	3944721281		
2013	6443162	812720806	3311966133						
2014	5717547	877601793	3434022591						
2015	4176686	918132569	3516320225						

Table 13c: Cont. on Summary of Net Present Value Result for Scenario 2 case

Year	Cum. Oil Prod. (bbl)	Scenario 2 at 25 U SD Oil price	Scenario 2 at 35 USD Oil price
1997	1927340	-194778646	-175505249
1998	27600002	23052529	318325949
1999	31779388	-94203978	518863326
2000	33707053	-283608940	666528897
2001	27377980	-149360208	1074557427
2002	28164104	20636318	1526194993
2003	31584417	328887138	2150289986
2004	22790997	522003028	2571315849
2005	14534995	700879663	2895542433
2006	11566807	924599111	3234929949
2007	9471105	1011558602	3416600486
2008	5516519	1034912955	3495120026
2009	4427720	1079564828	3584049096
2010	3949743	1098495307	3642477001
2011	4156747	1154453210	3740002369
2012	2765524	1134043084	3747247486
2013	4416586	1176424816	3833795082
2014	3578129	1250303895	3943455455
2015	2611168	1306898471	4026161708