ELAI JUSTIFICATION

ELAI: The location ELAI is proposed to be drilled upto 2500m(TVD-SS) targeting Sylhet , Kopili (P)&Basement (S).The EL-1 structure is already estimated at Sylhet and Kopili (KSD) levels. The KSD (Kopili) sand was not tested. Based on the log characteristics it has been estimated in PS category. As it is envisaged that a trap may not be skipped or under filled along the charging path when the corresponding up dip and down dip traps have already filled up to respective spill/ leak points. Thus, explains the hydrocarbon prospectivity of the prospect ELAI, which lies in a favourable position along the East Lakhibari high separated from the existing EL-1 structure by a narrow roughly E-W trending low. It is envisaged to tag the Basement fractures. This fractured Basement part is seen juxtaposed against the oil-bearing Sylhet formation of the adjoining downthrown PL-1 block. The location envisages an IOIP of **1.2 MMtoe** of oil.

MUNINDRA DAS
GM (D)
I/C LAQ
ONGC, JORHAT

GOVERNMENT OF ASSAM
MINES AND MINERALS DEPARTMENT
DISPUR, GUWAHATI -6.

NO.PEM.99/2015/51 Dated Dispur, the 14th Feb/2017

From : Shri G.S.Panesar, ACS
Joint Secretary to the Government of Assam,
Mines and Minerals Department,
Dispur, Guwahati -6.

To : Shri C. Mahapatra
ED-Basin Manger A & AA
Basin, ONGC, Cinnamara,
Jorhat-785704

Sub : Grant of Petroleum Mining Lease for East Lakhibari Extension over an area of 49.00 Sq.Km in Golaghat District to Oil & Natural Gas Corporation Ltd.

Ref : A&AAB/JRT/BMG/East Lakhibari Extension PML/2014/066-67, dated 21-05-2014.

Sir,

I am directed to to invite a reference to the letter cited above, and say to that the Governor of Assam is pleased to grant Petroleum Mining Lease (PML) under rule 5(i) (ii) with Rule 12 of the Petroleum & Natural Gas Rules ,1959 (as amended to from time to time) to Oil & Natural Gas Corporation Ltd. over an area of 49.00 Sq. Km for East Lakhibari Extension in Golaghat Dist. Assam falling within the Golaghat Dist. for production of Crude Oil and Natural Gas for a period of 7 (Seven) years with effect from the date of issue of the order in pursuance of Govt. of India letter F.No.0-12012/45/2004-ONG-II dtd. 10-10-2013 conveying their approval for grant of PML forEast Lakhibari Extension in Golaghat Dist.

The grant of PML is subject to the observance and condition laid down in the PML Deed to be executed between the Govt. of Assam and ONGC. The grant of PML is also subject to the terms and conditions as per Annexure- A is enclosed herewith.

You are therefore, requested to fulfill all the conditions as required before the execution of PML Deed without delay.

The receipt of the letter may pleased be acknowledged.

Yours faithfully,

16-2-17

Joint Secretary to the Government of Assam
Mines and Minerals Department,
Dispur, Guwahati-6.

Memo.NO.PEM. 99/2015/51-A Dated Dispur, the 14th Feb/2017

Copy to:-

1. The Under Secretary to the Govt. of India, Ministry of Petroleum & Natural Gas, New Delhi Shastri Bhawan, New Delhi with reference to his letter F.No.0-12012/45/2004-ONG-II dtd. 10-10-2013.
2. The Director, Geology & Mining, Assam, Kahilipara, Guwahati-19. She is requested to prepare the draft PML Deed and execute the same with ONGC Ltd. in corporating and updating the relevant clauses of terms and condition as necessitated with recent development with intimation to this Department at an early date. This has the reference to her letter No.GM/MM/88-N/2902, dated 29-12-2016.
3. The Deputy Commissioner,Golaghat District, Assam for information and necessary action.
4. The Principal Chief Conservator of Forest, Assam, Rehabari, Guwahati-8 for information and necessary action.

By order etc.

Joint Secretary to the Government of Assam,
Mines & Minerals Department,

ANNEXURE-A

TERMS & CONDITIONS

1. The lease shall be in respect of Crude Oil and Natural Gas.

2. The lease shall be valid for a period of 7 (Seven) years with effect from the date of issue of the order
3. The lease shall be subject to the provisions of Oil Fields (Regulation and Development) Act 1948 (53Of 1948) and the Petroleum & Natural Gas (P &NG) Rules, 1959 made thereunder as amended from time to time .

4. Royalty on Crude Oil Natural Gas and Condensate shall be payable by the lessee as per such rates as may be fixed from time to time by the Central Government in consultation with the State Government . The royalty shall be payable on monthly basis and shall be payable by the last day of the month succeeding the period in respect of which it is payable.

5. The lessee shall, as soon as possible, provide the Central Government or its designated agency, free of cost, all data earlier obtained or to be obtained as a result of petroleum operations under the lease as specified in Rules 19 (C) of the P & NG Rules, 1959, as amended from time to time.

6. Necessary approval from the Competent Authority should be obtained for the Reserve Forest Area (if any) falling in the leased area.

7. If international companies or foreigners are entrusted with the task, the lessee may get security vetting of these companies through the appropriate Government agencies with the help of this Ministry. The lessee shall also seek prior clearance from the Ministry of Home Affairs and Ministry of Defense with the full particular of foreign employees under intimation to this Ministry.

8. The lessee shall issue identity cards to each of the employees. The system of checking identity cards of personnel will have to strictly enforced.

9. Security to its employees both at the project sites and en-route in insurgency affected areas will be the responsibility of the lessee.

10. The lessee shall allow Government authorities to enter and inspect area for security check-ups, if necessary.

11. Lessee shall not employ any foreign national surreptitiously in the areas along the border.

12. No ground/aerial survey of the Defense VAS/VPs are permitted. Aerial survey, if any, would be governed by the provisions of the Ministry of Defense letter No.18(8)/82/-D(GS111) dated January 31st , 1989.

13. Air force areas falling within the zones earmarked for delineation should be avoided.

14. For work in close vicinity of Indian Air Force units/installations and visits to these installations, if any, specific permission of Air Headquarters should be obtained.

15. Any work within 500 m of the perimeter of the Air Force Station should be intimated to Air Force authorities at least 10days before commencement of the activities.

16. No obstruction shall be erected higher than 15 metres within 5km radius of Air Force, Air Fields and construction of any high mast/towers shall be carried out in consultation with the Air Force authorities.

17. Lessee should execute a separate lease deed in respect of such other covenants, terms and conditions as per the prescribed format.

18. In case the production of Oil/Gas ceases permanently from the field, the DGH and Ministry may be informed immediately.

GOVERNMENT OF ASSAM
MINES AND MINERALS DEPARTMENT
DISPUR, GUWAHATI -6.

NO.PEM.116/2015/46 Dated Dispur, the 20th Dec.,2016.

From : Shri G.S.Panesar, ACS
Joint Secretary to the Government of Assam,
Mines and Minerals Department,
Dispur, Guwahati -6.

To : Shri M. Ayyadurai,
ED-Basin Manger A & AA
Basin, ONGC, Cinnamara,
Jorhat-785704

Sub : Grant of Petroleum Mining Lease to Oil & Natural Gas Corporation Ltd. for Kalyanpur in Golaghat District, Assam, measuring 40.00 Sq.Km.

Ref : No.AAAB/JRT/BMG/Kalyanpur-PML/2007, dated 13-07-2007.

Sir,

I am directed to to invite a reference to the letter cited above, and say that the Governor of Assam is pleased to grant Petroleum Mining Lease (PML) under rule 5(i) (ii) with Rule 12 of the Petroleum & Natural Gas Rules , 1959 (as amended from time to time) to Oil & Natural Gas Corporation Ltd. over an area of 40.00 Sq.Km. for Kalyanpur in Golaghat District, Assam for production of Crude Oil and Natural Gas for a period of 20 (twenty) years from 13-04-2007 to 12-04-2027 in pursuance of Govt. of India's letter F.No.0-12012/143/2007 ONG-III, dtd. 9th Oct., 2012 conveying their approval for grant of PML for Kalyanpur in Golaghat District.

The grant of PML is subject to the observance and conditions laid down in the PML Deed to be executed between the Govt. of Assam and ONGC. The grant of PML is also subject to the terms and conditions as per **Annexure "A"** enclosed herewith.

You are therefore, requested to fulfill all the conditions as required before the execution of PML Deed without delay.

The receipt of the letter may pleased be acknowledged.

Yours faithfully,

20-12-16

Joint Secretary to the Government of Assam
Mines and Minerals Department,
Dispur, Guwahati-6.

Memo.NO.PEM. 116/2015/46-A Dated Dispur, the 20th Dec.,2016.d

Copy to :-

1. The Under Secretary to the Govt. of India, Ministry of Petroleum & Natural Gas, New Delhi Shastri Bhawan, New Delhi with reference to his letter F.No.0-12012/143/2007 ONG-III, dtd. 9th Oct., 2012.
2. The Director, Geology & Mining, Assam, Kahilipara, Guwahati-19. She is requested to prepare the draft PML Deed and execute the same with ONGC Ltd. incorporating and updating the relevant clauses of terms and conditions as necessitated with recent development with intimation to this Department at an early date. This has the reference to her letter No.GM/MM/88-Y/2421, dtd. 06/12/2016.
3. The Deputy Commissioner, Golaghat District, Assam for information and necessary action.
4. The Principal Chief Conservator of Forest, Assam, Rehabari, Guwahati-8 for information and necessary action.

By order etc.

Joint Secretary to the Government of Assam,
Mines & Minerals Department,
Dispur, Guwahati-6

21/12/16

ANNEXURE-A

TERMS & CONDITIONS

1. The lease shall be in respect of Crude Oil and Natural Gas.

2. The lease shall be valid for a period of 20 (twenty) years from 13-04-2007 to 12-04-2027.

3. The lease shall be subject to the provisions of the Oil Fields (Regulation and Development) Act 1948 (530 of 1948) and the Petroleum & Natural Gas (P &NG) Rules. 1959 made thereunder as amended from time to time .

4. Royalty on Crude Oil &Natural Gas and Condensate shall be payable by the lessee as per such rates as may be fixed from time to time by the Central Government in consultation with the State Government . The royalty shall be payable on monthly basis and shall be payable by the last day of the month succeeding the period in respect of which it is payable.

5. The lessee shall, as soon as possible, provide the Central Government or its designated agency, free of cost, all data earlier obtained or to be obtained as a result of petroleum operations under the lease as specified in Rules 19 (C) of the P & NG Rules, 1959, as amended from time to time.

6. Necessary approval from the Competent Authority should be obtained for the Reserve Forest Area (if any) falling in the leased area.

7. If international companies or foreigners are entrusted with the task, the lessee may get security vetting of these companies through the appropriate Government agencies with the help of this Ministry. The lessee shall also seek prior clearance from the Ministry of Home Affairs and Ministry of Defense with the full particular of foreign employees under intimation to this Ministry.

8. The lessee shall issue identity cards to each of the employees. The system of checking identity cards of personnel will have to strictly enforced.

9. Security to its employees both at the project sites and en-route in insurgency affected areas will be the responsibility of the lessee.

10. The lessee shall allow Government authorities to enter and inspect area for security check-ups, if necessary.

11. Lessee shall not employ any foreign national surreptitiously in the areas along the border.

12. No ground/aerial survey of the Defense VAS/VPs is permitted. Aerial survey, if any, would be governed by the provisions of the Ministry of Defense letter No.18(8)/82/-D(GS111) dated January 31st , 1989.

13. Air force areas falling within the zones earmarked for delineation should be avoided.

14. For work in close vicinity of Indian Air Force units/installations and visits to these installations, if any, specific permission of Air Headquarters should be obtained.

15. Any work within 500 m of the perimeter of the Air Force Station should be intimated to Air Force authorities at least 10 days before commencement of the activities.

16. No obstruction shall be erected higher than 15 meters within 5km radius of Air Force, Air Fields and construction of any high mast/towers shall be carried out in consultation with the Air Force authorities.

17. Lessee shall execute a separate lease deed in respect of such other covenants, terms and conditions as per the prescribed format.

18. In case the production of Oil/Gas ceases permanently from the field, the DGH and Ministry may be informed immediately.

MJAA JUSTIFICATION

MJAA: The location with a projected in-place accretion of 4.46 MMt of oil for Barail & 2.11MMt of oil for Mid. Bokabil, is to chase the Barail (primary) and Mid Bokabil (secondary) plays in Kalyanpur area. It has a target depth of 2600m from MSL and it is to be drilled vertically. The prospect lies SW of MP-1 which is separated by a prominent basinward hading normal fault which is continuing down south resulting the Kasomarigaon oil field. This location falls on the hanging wall side of a major NE-SW trending longitudinal fault, hading SE along which Kalyanpur Field is located. The ENE-WSW trending antithetic fault to the major fault is responsible for the pop-up feature for Lower-Mid. Bokabil section in Kalyanpur prospect. The Barail section is juxtaposed with the Kopili sediments in the upthrown side. At this location a pronounced erosional cut giving rise to a geomorphic high or in other words a remnant feature for Barail. The dominant argillaceous section of Kopili will act as a trap and the clay gounge along the fault plane will seal the fault restricting the updip migration of oil and gas. As the prospect lies between producing fields of East Lakhibari and Kasomarigaon Fields, it is evident that it is located in the hydrocarbon migration path. This proposed location RMJ-1 falls in the center of distributary channel connecting to Lobe–III&IV of Mid. Bokabil.

MUNINDRA DAS
GM (D)
I/C LAQ
ONGC, JORHAT

KHBK JUSTIFICATION

KHBK: The location KHBK is located in the western part of the Khoraghat main field. It is targeted to be drilled upto 3130(TVD-SS). Bokabil, Barail and Sylhet plays are well established on the footwall-side of the west hading NE-SW trending normal fault. On the basis of extensive pay-level horizon mapping and fault interpretation, there exists a suitable entrapment (fault closure) for the Bokabil new pay on the foot-wall side of the east-hading fault. In addition to Bokabil objective, the location is suitably placed to target Sylhet and Kopili as well. Seismo-geological cross-section along the proposed location and well KH#43 shows the structural- stratigraphic entrapment and lateral juxtaposition of Bokabil pay against Bokabil shales and structural entrapment of Kopili and Sylhet reservoirs. The location envisages an IOIP **0.53MMtoe** of oil on success.

TECHNO-ECONOMIC ANALYSIS LOCATIONS KHBK

Location: BKH-6						
Play	**Bokabil**			**Kopili**		
Parameters	Min	M. Likely	Max	Min	M. Likely	Max
Area (Sq. km)	0.04	0.14	0.21	0.2	0.27	0.35
Net Pay (m)	13.7	19	26	5	6	11
Effective Porosity (%)	20	21.5	25	15	19	20
So (%)	40	55	65	43	49	50
FVF	1.2	1.3	1.35	1.1	1.1	1.1
API or Sp.gr of Oil	0.8431	0.8684	0.8729	0.82	0.82	0.82
RF (%)	15	25	30	20	20	20
Location: BKH-6						
Play	**Sylhet**			-		
Parameters	Min	M. Likely	Max	-	-	-
Area (Sq. km)	0.22	0.32	0.44	-	-	-
Net Pay (m)	7.88	10.5	11	-	-	-
Effective Porosity (%)	15	16	17	-	-	-
So (%)	53	55	58	-	-	-
FVF	1.23	1.24	1.25	-	-	-
API or Sp.gr of Oil	0.8283	0.8369	0.8375	-	-	-
RF (%)	20	20	20	-	-	-

Anticipated estimated volumes for the proposed locations

Prospect	Pay	Probability	Inplace (MMt/MMbl)	Reserves (MMt/MMbl)	Total OIIP (MMT/ MMbl)	Total Reserves (MMt/M Mbl)	Area (Sq Km)	Net Pay (m)	HC Saturation %
		P90	0.12/0.87	0.03/0.19			0.081	16.9	46
	Bokabil	**Mean**	**0.21/1.47**	**0.05/0.34**			**0.13**	**20.5**	**53.4**
		P10	0.30/2.10	0.07/0.50			0.175	23.7	60.2
		P90	0.09/0.72	0.02/0.14			0.232	5.8	45
BKH-6	**Kopili**	**Mean**	**0.13/0.97**	**0.03/0.19**	**0.53/ 3.87**	**0.12/0. 82**	**0.273**	**7.3**	**47.4**
		P10	0.17/1.27	0.03/0.25			0.315	9.2	49.2
		P90	0.15/1.15	0.03/0.23			0.266	8.8	54
	Sylhet	**Mean**	**0.19/1.43**	**0.04/0.29**			**0.327**	**9.8**	**55.3**
		P10	0.23/1.74	0.05/0.35			0.388	10.6	56.8

BLOCK		
LOCATION	**BKH-6**	
PLAY	Bokabil, Kopili & Sylhet	
HC TYPE	OIL	
Probability of Success % (POS)	35	
AREA (Sq.Km.)	0.73	
PROPOSED TD (MD- m)	3130	
INPLACE VOLUMES (MMBBL)	3.87	
RESERVES (MMBBL)	0.82	
PRODUCTION PROFILE		
PEAK WELL FLOW (M3/d)	50	
PLATEAU RATE (FIELD) (MBBL/d)	0.41	
YEARS TO PLATEAU	1	
PLATEAU DURATION (Years)	2	
FIELD PRODUCING LIFE (Years)	6	
EXPLRN/APPRAISAL/ENGINEERING		
NO. OF EXPL+APP WELLS	1+1	
TOTAL NO. OF PRODUCERS	0	
EXPORT OPTION (PL/TANKER)	Pipe line	
PIPELINE LENGTH (km)	1	
DEVELOPMENT CONCEPT	WELLPAD GROUP TO EXISTING MAIN PRODUCTION FACILITY	
COST ASSUMPTIOS	WELL COST: Rs. 112000 per metre (EXPL) & Rs. 80000 per metre (DEV). Pipeline cost: Rs.35lakh/km	
EXCHANGE RATE	Rs. 69 / USD	

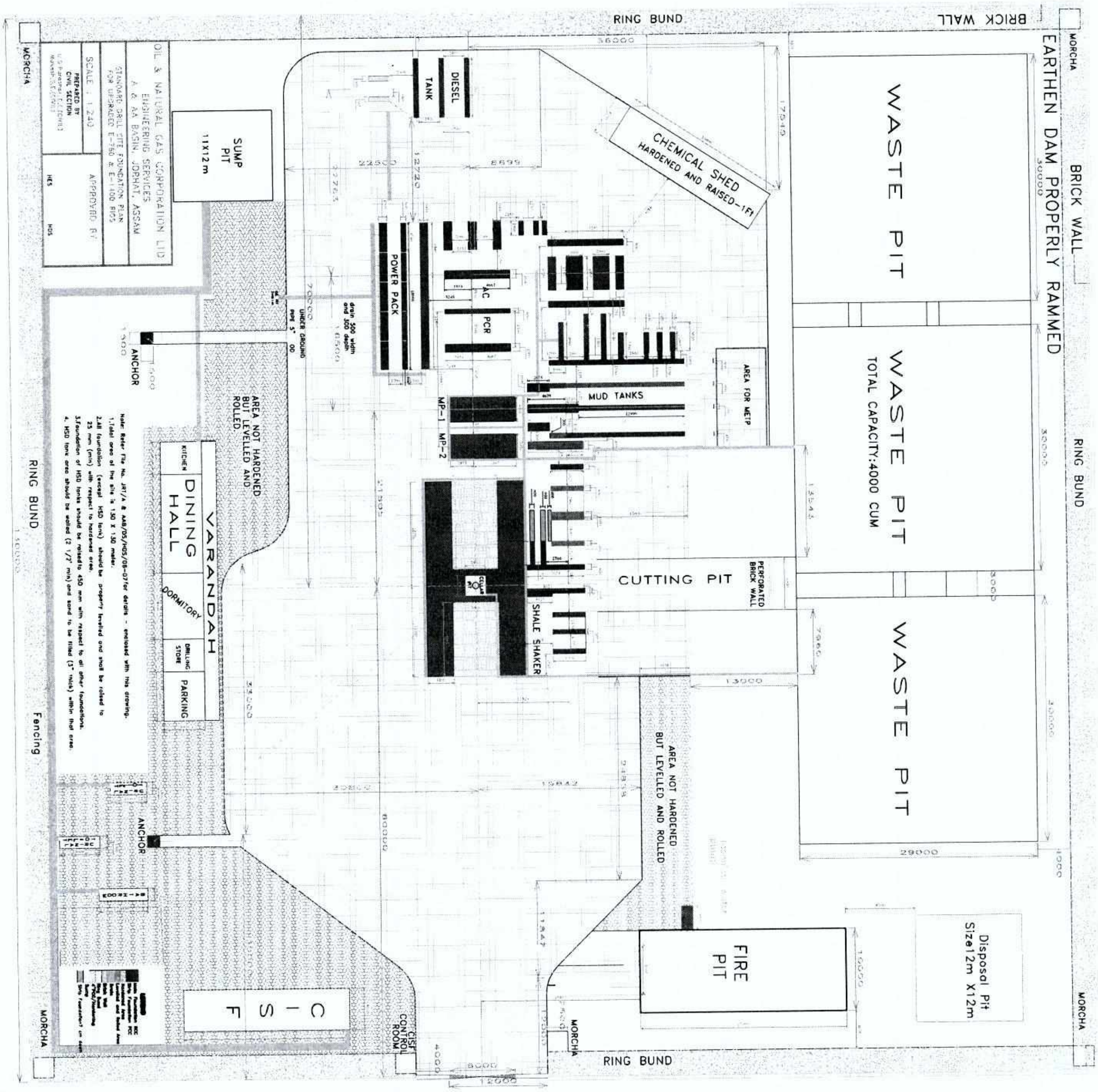
PROSPECT		BKH-6	
PLAY		Bokabil, Kopili & Sylhet	
Estimated Reserves	MMBBL	0.82	
Estimated Expenditures			
Operating Expenses	$MM	2.99	
Exploration Capital	$MM	5.24	
Development Capital	$MM	3.42	
Life cycle cost	$MM	11.65	
Average Price	$/BBL	65	
Unit Operating Expenses	$/BBL	3.56	
Unit Exploration Capital	$/BBL	12.48	
Unit Development Capital	$/BBL	4.07	
Unit Life cycle cost	$/BBL	20.11	
Producing Life	Years	6.58	
Project Life	Years	7	
IRR	%	**39.78**	
NPV @ 0%	$MM	12.05	
NPV @ 5%	$MM	8.79	
NPV @ 8%	$MM	7.25	
NPV @ 10%	$MM	6.35	
NPV @ 12%	$MM	5.56	
NPV @ 14%	$MM	4.84	
Risk Analysis			
Risk Money	$MM	**5.24**	
Discovery Probability	%	37	
EMV @ 0%	$MM	1.16	
EMV @5%	$MM	0.18	
TE VIABILITY		**Viable**	

SENSITIVITY ANALYSIS								
BKH-6								
PLAY:	Bokabil, Kopili & Sylhet							
SENSITIVITY ON OIL PRICE								
VARIATION		-30%	-20%	-10%	0	10%	20%	30%
OIL PRICE	$/BBL	45.5	52	58.5	65	71.5	78	84.5
NPV @ 12%	MM$	0.94	2.48	4.02	5.56	7.09	8.63	10.17
NPV @ 14%	MM$	0.5	1.95	3.4	4.84	6.28	7.73	9.17
IRR	%	16.71	24.37	32	39.78	47.75	55.82	64.33
SENSITIVITY ON CAPEX								
VARIATION		-30%	-20%	-10%	0	10%	20%	30%
NPV @ 12%	MM$	8.11	7.27	6.41	5.56	4.7	3.84	2.98
NPV @ 14%	MM$	7.35	6.53	5.68	4.84	4	3.15	2.31
IRR	%	71.86	58.45	47.96	39.78	33.25	27.87	23.39
SENSITIVITY ON OPEX								
VARIATION		-30%	-20%	-10%	0	10%	20%	30%
NPV @ 12%	MM$	5.93	5.81	5.68	5.56	5.43	5.3	5.18
NPV @ 14%	MM$	5.19	5.07	4.96	4.84	4.72	4.61	4.49
IRR	%	41.59	40.99	40.39	39.78	39.25	38.64	38.04

As per proposal of KHBK (BKH-6)

23/2/2021

Rakesh Nautiyal
GM (GP) - AM, UAS
ONGC, A & AAB, Jorhat



MUNINDRA DAS
GM (D)
I/C LAQ
ONGC, JORHAT