

EXECUTIVE SUMMARY**1. PROJECT HIGHLIGHTS**

- The block AA-ONN-2002/1 has been allotted by Government of India (GOI) and GOI has signed a Production Sharing Contract (PSC) with a consortium of GAIL (India) Ltd. and Jubilant Oil & Gas Pvt. Ltd. with participating interest of 80 and 20 percent, respectively, under new exploration licensing policy.
- Jubilant Oil & Gas Pvt. Ltd. (JOGPL) is the Operator of the onshore block AA-ONN-2002/1 located in Dhalai, West Tripura and South Tripura districts of Tripura for exploration and production of hydrocarbons.
- The block area of the AA-ONN-2002/1 is 1680 sq. km. and has the following coordinates:

POINTS	LATITUDE (N)	LONGITUDE (E)
A	24°02'35"	91°38'16"
B	23°03'14"	91°40'42"
C	23°06'43"	91°44'25"
D	23°23'02"	91°43'00"
E	23°29'36"	91°53'21"
F	23°48'01"	91°53'07"
G	24°02'09"	91°47'11"
H	24°05'16"	91°47'18"
A	24°02'35"	91°38'16"

- The block and adjoining areas belong to warm perhumid eco-region of north-eastern hills with red and lateritic soils.
- The block area is forested hilly terrain and thinly populated with most of the village/town populated areas lying close to important roads.
- PSC envisages completion of Exploratory/Appraisal Drilling of 15 wells during next 2 years.
- Exploratory/Appraisal drilling and testing of each new well will require nearly 80 to 90 days after drilling location is finalized based on analysis of seismic data and results of testing of 3 exploratory wells currently being drilled.
- In order to meet the requirements of PSC as well as statutory requirement of Prior Environmental Clearance under EIA Notification, 2006. JOGPL is required to carry out an Environmental Impact Assessment (EIA) study in the block and adjoining area to establish present baseline environmental scenario and the likely impact on the same as a result of proposed exploratory/appraisal drilling programme of 15 wells.

- JOGPL appointed Envirotech Consultants Pvt. Ltd., New Delhi, to carry out a Rapid EIA study in the block and adjoining area prior to exploratory/appraisal drilling programme of 15 wells.
- Rapid EIA report is prepared using primary baseline data collected at the site for nearly 5 weeks in winter season (December 14, 2007 to January 16, 2008) and secondary data collected from various sources in public domain as well as the project information provided by JOGPL.
- Mobile rotary drilling rig and associated system will be used for drilling of 15 new exploratory/appraisal wells and water based mud (WBM) will be used as drilling fluid which is intrinsically safe and causes minimum environmental disturbances. Synthetic based mud (SBM) meeting the criteria laid down in EP Act 1986 as amended in August 2005 will also be used when considered necessary. Facilities for production testing will be created close to each exploratory/appraisal well site.

Pollution Sources

- Use of WBM for drilling is very eco-friendly and will cause minimum environmental disturbances due to drilling discharges and discharge of used/wasted WBM.
- Use of SBM meeting the criteria laid down in EP Act 1986 as amended in August 2005 is also proposed when considered necessary.
- Major liquid effluents during drilling and production testing will be drilling discharges, drainage discharges, used/wasted WBM, used/wasted SBM, recovered formation water and domestic waste water.
- Drilling discharges will have rock cuttings of sandstone, shale, etc. Wasted WBM will have bentonite clay, barite, calcium carbonate and other nontoxic ingredients.
- Liquid effluents after treatment in waste water clarification system will be stored in HDPE lined solar evaporation pit.
- Gaseous emissions will be primarily exhaust gases produced from diesel driven power generator for drilling rig operation and DG sets for electric supply for other uses as well as diesel driven vehicles. These exhaust emissions will primarily contain SO₂, NO_x, CO, unburnt hydrocarbons and soot. Dust will also be generated from vehicular movement on unpaved roads in forested areas.
- Formation fluids generated from the exploratory/appraisal wells will be tested at site for establishing the hydrocarbons for production potential of oil/gas.

Pollution Control

- Liquid effluents will be stored in HDPE lined shallow pits constructed near the exploratory drilling location to prevent contamination of ground aquifers.

- Used/wasted SBM will not be discharged in HDPE lined effluent pits and will be given to SBM supplier for reprocessing and reuse.
- On well completion, effluents pits will be filled with drill cuttings and solid debris, covered with HDPE sheet and thick layer of soil to form a small mound with proper slope for rain water drainage.
- Oil containing drill cuttings from SBM/WBM will be centrifuged and, if necessary, bioremediated to reduce/oil content to less than 1% before disposing in HDPE lined drill cutting disposal pit.
- Organic solid wastes including sewage and food left overs generated at temporary camp facilities at the exploratory well site will be disposed off as per approved procedure.
- Exhaust gases from various power generators will be discharged from stacks of appropriate heights for dispersion in a wider area by atmospheric dispersion process and will result in extremely low incremental ground level concentrations of pollutants in nearby forested areas.
- Formation water and associated gas produced during exploratory production testing of oil/gas will be appropriately handled at the well site. Formation water will be treated in formation water clarification system and treated effluents will be stored in HDPE lined solar evaporation pit.
- Treated effluents from solar evaporation pit will be mostly reused in washing and process operations, whereas some of the treated effluents will be lost by solar evaporation while the remaining will be used for dust suppression and gardening at the drill site.
- Plastic and other hazardous wastes, such as, spent batteries, waste oil, etc. will be disposed off as per approved safe procedure.

Project Benefits

- Oil and gas production, if commercially viable, will result in additional revenue generation for State and Central Governments and will assist in providing energy security to the country. It will also generate some employment potential and may lead to infrastructure development of the block area.

3. BASELINE ENVIRONMENTAL CONDITIONS

Physiography and Topography

- The block area is mostly covered with dense mixed mountainous forest ranges along with some thinly populated villages/towns lying mainly along important roads.

Soils

- Soils are mostly deep loamy to clay loam mountain red and lateritic soils having good water holding capacity with relatively low fertility. Soils of flat land in between hillocks is alluvial in nature.

Water Resources and Water Quality

- Surface water is a perennial source of fresh water supply for domestic use and also for supply as tap water in the study area. Khowai, Gumti and Mahuri rivers flow through the block area. Water from well, handpump and tubewell is also used for drinking and domestic purpose.
- The monitored water quality indicates that surface water (river and nullah), ground water (well, handpump and tubewell), tap water and pond water meet desirable limits for potable water and is fit for drinking.

Climatology and Meteorology

- Agartala meteorology observatory is the closest IMD station located at about 37 km west of western boundary of the block.
- April is the hottest month and January is the coldest month with monthly mean maximum and minimum daily temperatures of 34.2 and 22.3⁰C, and 25.7 and 9.8⁰C, respectively.
- Mean relative humidity is highest in July and lowest in March.
- Average annual rainfall is 2178.6 mm. June month alone accounts for nearly 20.9% and December to January months together account for only 3.3% of annual rainfall at Agartala.
- The prevailing winds at 8:30 hour blow from SE-S sector towards NW-N sector during February to September and from N-NE sector towards S-SW sector during November to January. At 17:30 hour, the prevailing winds blow from SE-S sector toward NW-N sector during April to September and NW-N sector towards SE-S sector during November to January.
- Annual average wind speed is 6.2 kmph with April having the highest mean wind speed of 9.7 kmph and November having the lowest mean wind speed of 2.9 kmph.
- Meteorological measurements were carried out at Agartala during winter season (December 14, 2007 to January 16, 2008).

Ambient Air Quality

- National ambient air quality standards for residential rural and other area are always met for SO₂ and NO_x at all six locations but these standards for SPM and RPM are always met only at one location and not at other 5 locations.

Noise

- Ambient noise levels could be measured only for 8 hours during day time due to security reasons. $L_{8\text{hour}}$ day-time values varied in a range of 53.6 to 61.3 dB(A).

Land Use

- Land use distribution as per Census 2001 for the block area villages is as follows: forest area = 66.42%, culturable area = 12.07%, culturable waste area = 5.10% and area not available for cultivation = 16.41%. Irrigated area is only 15.82% of culturable area.

Terrestrial Flora

- Warm per-humid climate with moderate to heavy rainfall support all types of vegetation in the study area.

Terrestrial fauna

- Existence of extensive forest ranges support fairly large variety of wildlife.

Demographic and Socio-Economic

- As per Census 2001, the block area has 110 villages with a total population of 2,53,865 and 2 towns with a total population of 30,466 corresponding to a rural population of 89.29% and urban population of 10.71%. The block has a rural population density of 143 persons/km², sex ratio of 943 and literacy rate of 55.52%
- The study area has 30.98% main workers out of which 38.98% are cultivators, 26.26% are agricultural labourers, 1.60% are household industry workers and rest are other workers.
- Out of 110 villages in the block area, all villages have one or more primary schools, all villages have drinking water facility, 91 villages have pucca approach road, 88 villages have power supply, 48 villages have bus facility and 50 villages have some medical facilities as per 2001 Census.
- There is very little industrial or commercial activity in the study area except for some small industries in and around Agartala.

4. ENVIRONMENTAL IMPACT ASSESSMENT

Topography and Physiography

- Exploratory/appraisal drilling and testing of 15 wells for oil and gas will have no impact on topography and physiography of the area.

Soils

- There will be no impact on soils of the area except for the deposition of rock cuttings, bentonite clay and other non-toxic ingredients of wasted WBM on the beds of HDPE lined effluents pits due to drilling of 15 wells.

Water Resources and Quality

- Khowai, Gumti and Mahuri are perennial rivers and there is no shortage of water in the area due to good rainfall. Water requirement of maximum 45 m³/d to meet drilling operations at each new well for a limited period will be easily met by available water supply sources. There will be no impact on the availability of water for competitive users in the villages of the study areas.
- The construction of HDPE lined shallow effluents pits will ensure that there is no adverse impact on ground water or surface water quality of the block area.

Ambient Air Quality

- Discharge of exhaust gas emissions from diesel powered drilling rig and DG set used for electric supply at drilling site and due to ground flaring of gaseous hydrocarbons produced during exploratory testing of 2 days at each of 15 wells using a properly designed flare pit will ensure that the impact of gaseous pollutants in exhaust emissions is insignificant in surrounding forested area.
- Dust generated due to vehicular movement on unpaved roads will settle quickly and will not cause any dust problem in the area.

Noise

- Selection of equipments and their proper maintenance will ensure that the noise levels at the boundary of well site plinth area does not exceed 75 dB(A) during exploratory/appraisal drilling of 15 wells and this will ensure that there is no impact of drilling on noise levels during day- and night-time in the surrounding village areas, if any.

Land Use

- There will be no impact on land use of the area because total land requirement around each drilling location for drilling is expected to be only about one hectare within the forested block area. However, diversion of this land for industrial activity at the drilling site, cutting of some trees near the drilling site and for approach roads for the movement of heavy vehicles for drilling will be inevitable and prior approval under the Forest Conservation Rules, 2004, will have to be obtained.

Terrestrial Flora and Fauna

- There will be marginal impact on the terrestrial flora and fauna of the area due to exploratory/appraisal drilling programme.

Demographic and Socio-Economic

- The demography of the area will not be affected by temporary presence of nearly 50 to 90 persons during drilling and testing operations for about 2 to 3 months in the area chosen for exploratory drilling of each well.

- No adverse impact can be expected on socio-economic conditions of the area during exploratory/appraisal drilling and testing operations. Slight beneficial impact on job opportunity may be expected because some local persons may get temporary employment as unskilled or semi-skilled workers during the drilling phase.

Conclusions

- The impact due exploratory/appraisal drilling and testing of 15 new wells on various attributes of environment is summarized below:

Environmental Attribute/ Project Activity	Impact
Proposed access cutting	Some cutting of trees may be inevitable
Clearing and timber salvage	Cutting of some trees and salvage of timber will be involved
Wild life and habitat protection	Minor temporary adverse impact upto 500 m from drilling site is likely
Fuel storage and handling	Insignificant impact
Camps and staging	Temporary mobile camp facilities will be used for drilling operations.
Liquid and solid waste disposal	Insignificant temporary localized impact
Cultural and archaeological sites	Not applicable
Selection of drilling sites	15 exploratory/appraisal well sites will be selected based on testing results of 3 exploratory wells currently being drilled.
Terrain stabilization	Not applicable
Protection of fresh water horizons	Drilling effluents will be stored in HDPE lined shallow pits and well casing will protect deeper fresh water horizons.
Blowout prevention plan	Necessary care will be taken during drilling and blowout preventors will be installed at well mouth for any emergency
Flaring during completion and production testing	Separated gases will be properly flared in the suitably designed ground flare pit to minimize adverse impact.
Abandonment of wells	Will be applicable only if commercial production of oil/gas is unviable from any of the exploratory/appraisal well.
Rig dismantling and site completion	Insignificant localized impact in 5 m x 5 m of mast cellar area of drilling rig
Reclamation for abandonment	Not applicable at present
Noise control	Necessary measures will be in use
Debris disposal	Insignificant localized impact
Protection of natural drainage and water flow	Natural drainage will be protected

5. RISK ANALYSIS AND DISASTER MANAGEMENT PLAN

- Occurrence of blowout is the major hazard during drilling. Since only sweet oil and gas is expected in the block area, hazard due to occurrence of H₂S is not likely.
- Adequate fire fighting facilities including portable extinguishers will be deployed and suitable personal protective equipments including breathing masks will be available at the drilling site.
- First aid will be available at each drilling site and a 24 hour standby vehicle (ambulance) will also be available at each site for transport of injured persons to nearest hospital.
- Quantitative risk assessment indicates that three phase separator during exploratory well testing and HSD storage tanks will have **light fire and explosion hazard potential** and **low toxicity hazard potential**.
- On-site disaster management plan is suggested for quick and efficient emergency handling.

6. ENVIRONMENTAL MANAGEMENT PLAN

- Use of water based mud (WBM) is very eco-friendly as a drilling fluid and does not require any elaborate environmental management plan. Production testing for oil and gas at 15 exploratory/appraisal wells will also not require any specific management plan.
- Used/wasted synthetic based mud (SBM) will not be discharged in HDPE lined effluent pit and will be given to SBM supplier for reprocessing and reuse.
- Effluents pits will be shallow and HDPE lined to avoid contamination of ground aquifers.
- Oily drill cutting from SBM/WBM will be centrifuged and, if necessary, bioremediated to reduce oil content to less than 1% before storage in HDPE lined drill cutting disposal pit.
- Cutting of trees should be minimized as far as possible for exploratory drilling plinth area, effluents pits and parking of vehicles as well as for making-passage for the movement of heavy vehicles. Prior permission for the same will be obtained from the concerned authority.
- JOGPL should engage Forest Department officials for compensatory afforestation in case any forest land is diverted for non-forested purpose.
- Personal protective equipments for dust and noise should be used whenever required.
- Killing of birds and animals should be totally avoided by the project workers in the forested area of 15 exploratory/appraisal drilling locations.
- Efforts should be made by JOGPL and its contractors to employ local persons for unskilled and semi-skilled jobs and support activities.
- An appropriate environmental monitoring programme during drilling and testing of wells is recommended.