

10.0 SUMMARY AND CONCLUSIONS

Oil and Natural Gas Corporation Limited (ONGC) proposes to carryout exploratory drilling in on-shore Block AA-ONN-2001/2. The block is located in the NELP Block area of Kolasib & Mamit District, Mizoram.

The NELP block AA-ONN-2001/2 in the state of Mizoram measuring 5340 sqkm was awarded to ONGC-IOC (80% and 20% PI) consortium with ONGC as Operator. After fulfillment of MWP in Phase-I & -II, ONGC entered into phase-III w.e.f 08.04.2013 by relinquishing an area of 1345sqkm as per PSC norms after retaining an area of 2660 sqkm. In current exploratory Phase-III, the Operator ONGC has to drill one well to fulfill MWP commitment. In addition to one MWP well, ONGC proposes to drill additional exploratory wells to assess hydrocarbon potentiality of the entire block.

As per the Environment Impact Assessment (EIA) Notification dated 14th September, 2006, the proposed exploratory drilling project falls under 'Category A' of Activity Type 1(b).

10.1 Location Details of the Project

The block under study falls in district of Kolasib and Mamit, Mizoram. The Block area lies between latitude 23°40'00" & 24°19'30" and longitude 92°16'03.00" & 93°11'19.40". The area has undulating terrain, dense jungles and is almost devoid of approach roads. The three well coordinates are given below:

| Sr. No. | Well Location Identification | Latitude | Longitude |
|---------|------------------------------|----------------|----------------|
| 1 | HOAC | 24° 12' 14.24" | 92° 35' 53.32" |
| 2 | HOAD | 24° 09' 41.42" | 92° 36' 13.31" |
| 3 | BRBAA | 24° 07' 10.08" | 92° 31' 06.77" |

10.2 Importance of the Proposed Project

India is not among the major producers of crude oil, as it doesn't have much oil reserves. Therefore, India generally depends on imports of crude oil from other countries. There is a heavy imbalance between oil production and consumption in India. The Indian government is encouraging exploration and production of oil and gas to a great extent. This would primarily allow India to tap its own resources there by reducing its import bill.

Discovery of viable hydrocarbon reserves in the state can boost the state's economic development to a great extent. The proposed exploration project is thus of immense significance for the state.

10.3 Details of Exploration Drilling Operation

It is proposed to drill exploratory and appraisal wells in the delineated area selected through seismic survey to identify and establish hydrocarbon potential.



The site will be sized to contain all equipment and buildings, storage, workshops, etc. using distances between various rig components in line with existing rules and regulations for the area of operation and the approved standard operating procedures of the drilling contractor. Within the above constraints, the site shall be sized to minimize environmental impact. The approximate area of well site is dependent on the type of drilling equipment deployed which in turn is dictated by the planned depth of drilling.

10.3.1 Infrastructure Requirement

Land Requirement: Minimum land required at each well site during drilling will be 125 m x 125 m, i.e., 1.56 ha (2.5 ha will be acquired). On an average, the land requirement at each well site, including site facilities and camp site is considered as 1.5-2.0 ha. The land will be acquired on a temporary basis and adequate compensation as per the guidelines of local administration will be provided.

Power Requirement: The total power requirement at the drilling site will be 2250 KVA. The power requirement in the drilling site will be catered through Diesel Generator (DG) sets. The power requirement will be met by 3 Nos of 750 KVA DG sets at drilling site. Stand by DG set arrangement of 750 KVA at drilling site will be made.

Water Requirement: Water is basically required for preparing drilling mud and for meeting domestic needs of the campsite. Typically, the water consumption for each well ranges from 25 m³/day for a short period of 4–5 months. However, the drilling and domestic water requirement would depend on the time required to drill the well, which is primarily dependent on the proposed depth.

Man Power: The drill site construction would be done largely employing local labour. At each drill site construction, local employment will be generated for about 25 person/shift of 12 hrs in two shifts.

10.4 **Baseline Environmental Status**

Environmental monitoring has been carried within the entire AA-ONN-2001/2 block, during partly winter and partly pre-monsoon season of the year 2016.

10.4.1 Land Use Studies

The land use pattern of the total AA-ONN-2001/2 block has been studied by District Census Hand Books and satellite images. It is observed that 4.6 % of the land falls under crop land. On the other hand, 80.1 % of land falls under wastelands area. The water bodies contribute about 10.4 % area falls under Reservoir/River etc.

10.4.2 Soil Quality

The soil samples were tested at 10 locations during winter season covering various land uses. It has been observed that the pH of the soil ranged from 7.11 – 8.08 indicating that is slightly alkaline to moderately alkaline in nature. The electrical conductivity was recorded as 118.2 µS/cm to 262.0 µS/cm. The organic



carbon content in the study area observed as 0.53 % to 1.02 %, which the soil falls under average sufficient to more than sufficient. The potassium values ranged between 86.6 to 172.0 kg/ha. The phosphorus values ranged between 13.5 to 88.6 kg/ha. The nitrogen values ranged between 31.5 – 69.7 kg/ha.

10.4.3 Meteorology

On-site monitoring was undertaken for various meteorological variables in order to generate the site-specific data. The data generated is then compared with the meteorological data generated by nearest India Meteorological Department (IMD) stations located at Agartala. The meteorological data generated at the monitoring site when compared with the data recorded at nearest IMD station, it is observed that the data generated at the site is broadly in comparison with regional meteorology, except for minor variations.

10.4.4 Ambient Air Quality

To establish the baseline status of the ambient air quality in the study area, the air quality was monitored at 10 locations during partly winter and partly pre-monsoon season of 2016. Out of the ten locations the minimum and maximum concentration for PM₁₀ and PM_{2.5} were varied between 37.7 to 46.0 µg/m³ and 11.6 to 15.8 µg/m³ respectively during the study period. The concentrations of SO₂ and NO_x were varied between 7.9 to 12.7 µg/m³ and 11.0 to 17.3 µg/m³ respectively. All ambient air quality locations the PM_{2.5} levels recorded are within the prescribed standards for Residential and Industrial areas. The minimum and maximum concentration for total hydrocarbons, methane hydrocarbons and non-methane hydrocarbons during the study period were observed as 101 to 166 µg/m³, 50 to 95 µg/m³ and 40 to 96 µg/m³ respectively

The concentrations of VOCs were below the detectable limits in all the locations during the study period. From the analysis of the monitored data, it infers that the air quality levels in the study area are of fairly good quality and comply with the National Ambient Air Quality Standards.

10.4.5 Water Quality

The baseline water quality status in the region is established by analyzing about 6 ground water samples and 4 surface water samples during study period.

The physico-chemical and biological analysis revealed that most of the parameters in ground water samples are well within the permissible limits when there is no alternative choice as per IS: 10500. The physico-chemical and biological analysis revealed that all the parameters in surface water samples are well within the prescribed limits of IS: 10500 limits.

10.4.6 Ambient Noise Levels

The noise monitoring has been conducted at 10 locations, covering residential, commercial and silence zones in the study area. A review of this data indicates that at all the locations, the noise level was found within the permissible limits of CPCB.

10.4.7 Ecological Environment

An ecological survey in the study area was conducted particularly with reference to the listing of species and assessment of the existing baseline ecological (Terrestrial and Aquatic ecosystem) conditions in the study area. There are no reserved forest and national park present inside the block area.

Dampa Tiger Reserve – Wildlife Sanctuary is located, near the block of BRBAA at about distance of 59.5 Km /SSW direction, covering a large part of Mamit district, in which block study area is covered, is endowed with wide variety of flora and fauna in the area.

10.4.8 Socio-Economic Environment

The configuration of male and female indicates that the males constitute about 49.86% and females to 50.14% of the total population as per 2011 census records. The study area on an average has 1006 females per 1000 males. In the study area, as per 2011 census, 0.17% of the population belongs to Scheduled Castes (SC) and 91.54% to Scheduled Tribes(ST).

The percentage of male literates to the total literates of the study area works out to be 50.13%. The percentage of female literates to the total literates, which is an important indicator for social change, is observed to be 49.87% in the study area as per 2011 census records. Total work participation in the project study areas is 41.78% and the non-workers constitute 58.22% of the total population respectively.

10.5 Impact Assessment

The identification and assessment of impacts over the various environmental attributes in the region due to the proposed exploratory drilling activities in the proposed AA-ONN-2001/2 block are discussed and mitigative measures and environmental management plan for the potential impacts have also been presented.

The duration of construction works including site excavation, preparation and well pad construction is expected to last approximately 4-5 months for each well site.

10.5.1 Impact on Topography and Land Use

Drilling exploratory well is a short duration activity at each drilling location, typically encompassing a period of 4 to 5 months from land acquisition to site abandonment. The impact would therefore be localised, temporary and minimal. Because of the above activities, the topographical structure may change locally. However, considering the small foot print area required during the drilling, only marginal impact due to change in land use is anticipated.

10.5.2 Impact on Climate

Impact on the climatic conditions from the drilling will not be significant. The maximum temperatures of the exit gas from the DG stack and flare stack will be



around 300°C and 400°C respectively. In terms of total emission of green house gases and consequent impact on global warming or on potential for local increase of ambient temperature, considering the quantum of exit gas and the total duration of flow, the impact on the local or global climate will be insignificant.

10.5.3 Impact on Air Quality

The potential sources of air emissions at the well sites will be as follows:

- Dust from earth works (during approach road and site preparation);
- Emissions from DG sets (including noise emission);
- Emissions from possible flaring during well testing; and
- Emissions from vehicles

During the short period of site preparation mechanical shovels and earthmovers will be used for vegetation clearance, cut and fill and other site leveling activities. These activities could generate dust particles which will be mobilized by wind, and deteriorate the ambient air conditions. However, these activities will be only temporary and the impact to ambient air quality would be within the close proximity of well site.

The gaseous emissions from the DG set will be controlled by efficient combustion of fuel in the DG set. The flaring of oil and gas during well testing is a short duration activity (about 14 - 21 days) and will be done within a ground level enclosed pit. Wherever, required special precautions will be taken to minimize the impact on the local environment and habitat.

10.5.4 Impact on Surface Water and Groundwater Quality

Approximately 15-20 m³/day of wastewater and 4 m³/day of sewage would be generated from each well site. Water based non-toxic biodegradable fluids with inhibitive and encapsulative characteristics are proposed to be used as drilling mud for minimizing any long term impact on groundwater quality. Additionally, the drilling mud collection and recirculation pond is lined with impervious layer to prevent seepage and loss of drilling fluid into the subsoil. Further, proper casing installation and cementing of well will ensure least groundwater contact. The clarified wastewater will be treated in packaged treatment plant located at the well sites to meet norms specified by CPCB and MPCB. The sewage will be discharged into septic tanks and then to subsoil through soak pits.

10.5.5 Impact on Noise Levels

During the drilling operation at the well sites, there would be various sources of noise in the area, viz., drilling draw works/rotors, Mud Pumps, Power generators, Vehicular Movement and Cranes and material handling equipment.

The maximum predicted noise level at about 100 m from the boundary of the drill site is about 52.0 dB (A). The ambient noise levels at most of the places in the region are within the CPCB standards. Since, the drilling operations last for only 3 to 4 months at each location, impact of the noise pollution due to the proposed exploratory drilling will be insignificant on the community.

10.5.6 Ecological Impacts

Impact on the ecology of the study area will vary with the proximity of the habitats from the drilling locations. However, the impacts are of temporary nature, which will last only for few months at each drill location during the exploratory drilling activities and will thus allow subsequent recovery after the activities stops.

10.5.7 Demography and Socio-Economics

Although the level of existing communications and support services in the area are considered adequate based on the population density, establishment of the proposed project would further strengthen the road network and access to some of the remote areas with all weather roads would be a distinct beneficial impact. The overall impact is considered to be positive.

Impact on health due to emissions and noise from drilling activity has been assessed to be minimal. In addition employees working at the drill site would be provided protective devices like ear plugs/ear muffs for ensuring minimum impact on human health.

For most potential drilling sites in the Exploration Area, it should be possible to avoid impact on existing arable land. By following the compensation procedures and by observing common courtesy, impacts on existing use and benefit rights holders can be minimized.

The proposed exploration drilling programme is expected to generate local employment in the order of about 25/shift 12 hrs. Unskilled and semi-skilled people, for a period of approximately 3 to 4 months at each drilling site location. While this benefit is small by most standards, it is a significant employment opportunity in the block.

10.6 Environment Management Plan

10.6.1 Removal of Equipment and Materials

In the event if economic quantities of hydrocarbons are found, the well will be suspended with a wellhead in place, but all other equipment and materials will be removed from the site.

All empty drums, wastes, used and unused drilling fluids, fuel and lubricants will be removed from the drilling site. Water supply and effluent discharge hoses and associated equipment will be removed. The access road(s) would be reinstated.

10.6.2 Decommissioning upon Abandonment

In the event that no economic quantities of hydrocarbons are found, a full abandonment plan will be implemented for the drilling sites in accordance with the applicable Indian petroleum regulations.

10.6.3 Atmospheric Emissions

The combustion of diesel for power generation for the drilling and campsite operation results in atmospheric emissions of SO₂, NO_x, CO, Particulates and Hydrocarbons. Flaring during production testing is of 14-21 days duration and atmospheric emissions are marginal.

There will be no sensitive receptors to the emissions of combustion products in the vicinity of the proposed drilling operations apart from the crew of the drilling rig. The impacts caused are therefore, considered to be negligible. Measures to ensure minimal impacts include appropriate management of power generation source to achieve fuel efficiency and therefore reduce emissions and use of low sulphur diesel oil if available. Environmental monitoring is proposed during drilling and well testing to ensure maximum combustion efficiency. Flaring towards any standing vegetation will be avoided. In case if it is inevitable, a suitable barrier will be erected to prevent any vegetation scorching due to direct heat radiation; and prior to flaring, the critical equipment will be thoroughly tested.

10.6.4 Noise Environment

The modeling results show that the noise levels will attenuate to below permissible levels within the drilling site boundary. The Generators will be properly enclosed and the exhausts will be provided with silencers.

10.6.5 Management of Drilling Wastes

The major waste product of a drilling operation is the generation of rock cuttings with residual mud adhering to the drill cuttings and spent drilling fluid. About 250-300 m³ of drill cuttings per well and 15 m³ spent drilling fluid would need to be disposed off.

ONGC proposes to use internationally followed methodologies while drilling either with Water Based Muds (WBM). The volume of drilling fluids used will be optimizing at the design stage by selecting modern drilling engineering technology.

The mud will be reused after its separation from the cuttings. A mud mixing tank will be set up at the drilling site with a collection system so that any spill of chemicals will be collected.

The platform all around the tank on the pedestrian shall be of metal gratings to facilitate walkway as well as to permit the fluid to pass through so that it can be collected in the collection for further reuse / disposal.

The spilled oil may be reused in the mud preparation. At the extent possible reuse the residual drilling fluids in the drilling campaign only the drilling fluid which is not further used can be discarded.

10.6.6 Management of the Solid Wastes

Small amounts of solid wastes will be generated during normal operation at the drilling rig. The wastes will be disposed on compliance with local and national legislations. Spent waste oil to be stored in a secure paved area and disposed to MoEF/ MPCB approved waste oil recyclers. Drill cuttings and sludge from drilling

mud to be buried within the impervious lined pit and covered with soil as part of the site abandonment plan. Biodegradable waste arising from kitchen and canteen activities to be scientifically composted and the bio-manure so generated to be used for green belt development.

10.6.7 Management of Waste Disposal sites within Drill Site

The project proponent will dispose the drill cuttings, drill mud and wastewater generated during the drilling operations into the lined pits of various sizes and undertaking plantation within the drill site particularly on the reclaimed pits.

10.7 Environmental Monitoring Program

A detailed post project monitoring in respect of air, water, soil, landuse, occupational noise, etc. to assess the changes has been evolved covering various phases of project advancement. A network of sampling locations around the operational facilities will be established. The monitoring shall include the compliances to legal and statutory controls imposed on the operation as well as other corporate commitment to responsible environment management. Systems for monitoring resources inputs (energy, chemical use, water, raw materials), equipment and plant performance and waste generations will also be set up. A detailed wastes management plan with monitoring programme will be in place during various phases of activity.

10.8 Risk Assessment and Disaster Management Plan

The hazard potential of oil and gas and estimation of consequences in case of their accidental release during drilling has been identified and risk assessment has been carried out to quantify the extent of damage and suggest recommendations for safety improvement for the proposed facilities. Risk mitigation measures based on MCA analysis and engineering judgments are incorporated in order to improve overall system safety and mitigate the effects of major accidents.

An effective Disaster Management Plan (DMP) to mitigate the risks involved has been prepared. This plan defines the responsibilities and resources available to respond to the different types of emergencies envisaged. Training exercises will be held to ensure that all personnel are familiar with their responsibilities and that communication links are functioning effectively.

10.9 Project Benefits

The proposed exploration program will establish hydrocarbons in the block. The development of the oil field will result in considerable growth of service sector and will also generate new industrial and business opportunities in the area. Small and medium scale industries may be developed as consequence.

The major benefits of the project include reduction of the oil import bill of the nation as well as reduction of the imbalance in oil production and consumption.

The commercial development will also lead to investment in Assam, bringing oil and gas revenues both to the State and to the Central Government. The presence of ONGC in the region will substantially improve the socio-economic conditions of the region.

In Operation phase ONGC require significant work force of non-technical and technical persons. Migration of persons with better education and professional experience will result in increase of population and literacy in the surrounding villages.

10.10 Administrative Aspects

The basis of the operational philosophy is that the activities proposed in oil and gas processing shall be operated in complete compliance with all applicable Laws, Regulations, Standards and Permits, the Production Sharing Contract (PSC), ONGC corporate policies, procedures, specifications, rules, standards and guidelines. In order to achieve this, the proposed drilling sites will be maintained by technically qualified and experienced people. Detailed procedures and plans will be developed for each activity prior to operations start up. All persons on board the drilling rig will be an experienced crew with valid qualifications.

ONGC has a well defined Organization for Environment Management System. ONGC is committed to extend the EMS to its proposed facilities in Assam. The Director (Operations) of the project oversees the total environmental activity on a day-to-day basis. All individual departments are accountable for the environment in and around them and individual departments take prompt action in dealing with environmental issues. The HSE dept is the nodal agency to coordinate and provide necessary services on environmental issues during construction and operation of the project.

10.11 Conclusions

The proposed exploratory drilling project has certain level of marginal impacts on the local environment. However, the proposed project has significant beneficial impact/effects in terms of providing the employment opportunities and various CSR practices to be followed by ONGC. Growth and development, in harmony with the environment, has always been the approach of ONGC.

The conclusions of EIA are:

- The proposed project meets the compliance requirements of various environmental regulations;
- Adoption of environmental friendly Best Management Practices results in minimising the impacts on environment;
- Community impacts of the project will be beneficial, as the project will generate significant economic benefits for the region;
- The post drilling, commercial developmental activities of ONGC can reduce the import burdens of crude oil to the nation; and
- With the effective implementation of the Environment Management Plan (EMP) during the planning, design, construction and operation phases, the development and production project can proceed without significant negative impact on the environment.