1.0 **EXECUTIVE SUMMARY**

Oil and Natural Gas Corporation Limited (ONGC) proposes to carryout exploratory drilling in on-shore Block AA-ONN-2009/3. The block is located in the Teok area of Jorhat, Assam and on the south-western part of main fields of North Assam shelf viz. Rudrasagar, Changmigaon area. The nearest hydrocarbon producing area is Amguri field, which is not with ONGC presently.

The NELP block AA-ONN-2009/3 was awarded to ONGC and OIL (50% PI) along with the operation ship to ONGC by the Government of India (GOI) vide letter no. 0-19018/29/2009-ONG-I (Pt. II) dt.14.06.2010 and PSC was signed on 30.06.2010. The PEL deed of this block was signed on 02.12.2010. The block covers area of 84 sq. kms and falling in the state of Assam.

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). The EIA Report is prepared considering the TOR received from MoEF vide letter No. J-11011/103/2012-IA II (I) dated 13th July, 2012.

The present project proposal deals with exploratory drilling of 3 wells in AA-ONN-2009/3 onshore block covering in Jorhat District, Assam. The exploratory drilling well locations have been identified in Jorhat district based on the basis of 2-D and 3-D seismic study.

The present EIA report describes the proposed exploratory drilling wells identified in block AA-ONN-2009/3 and its impacts and mitigation measures for the same.

1.1 **Project Description**

1.1.1 **Location Details of the Project**

The block under study falls in south western part of established oil fields like Rudrasagar, Changmigaon area. The nearest proven oil field “Amguri” lies in the south-eastern part of the block where 10 wells have been drilled with oil producer from BCS (AMG-1, 2957-60 m AMG-5, 2890-93 & 2881-85 m) O-Tipam (AMG-8A, 1906-16-TS-2, 1922.5-24m, 1790-96m-TS1).

The block area lies between latitude 26°44’00” & 26°49’00” and longitude 94°20’30” & 94°26’00”. Tentative well coordinates are given below:

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Well Location Identification</th>
<th>Latitude &amp; Longitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Teok-A</td>
<td>26° 47' 48.27&quot; N, 94° 23' 39.97&quot; E</td>
</tr>
<tr>
<td>2</td>
<td>Teok-B</td>
<td>26° 44' 37.56&quot; N, 94° 22' 38.75&quot; E</td>
</tr>
<tr>
<td>3</td>
<td>Teok-C</td>
<td>26° 49' 02.35&quot; N, 94° 21' 08.04&quot; E</td>
</tr>
<tr>
<td>4</td>
<td>Teok-D</td>
<td>26° 44' 13.94&quot; N, 94° 22' 11.54&quot; E</td>
</tr>
<tr>
<td>5</td>
<td>Teok-F</td>
<td>26° 45' 26.77&quot; N, 94° 22' 45.02&quot; E</td>
</tr>
<tr>
<td>6</td>
<td>Teok-G</td>
<td>26° 47' 48.50&quot; N, 94° 25' 40.09&quot; E</td>
</tr>
</tbody>
</table>
The Topo map of the block area, depicting the salient features is shown in **Figure-1**. The details of environmental setting of the project block area are given below.

- There is one reserve forests block (Halongapur) and Holongapar Gibbon Wild life sanctuary in the study area.
- The major water bodies in the project block area cover Mudal Jan river, Kakajan river and Dihajan river.
- The project block is connected through National Highways NH-37 and Lohing Railway station and Nakachari Railway station to rest of the region;
- No archaeologically important places are present within project block as per Archaeological Survey of India (ASI) records; and
- The block area falls under Seismic Zone–V as per IS: 1893 (Part-1) 2002.

### 1.1.2 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.

### 1.1.3 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 proposed project intends to identify the presence of hydrocarbon prospects through exploratory drilling and to delineate and quantify hydrocarbon pools in discovered fields through appraisal drilling. The wells will be drilled up to a target depth of about 5000 m by using water-based drilling mud only.
Executive Summary

FIGURE-1
TOPO-MAP OF AA-ONN-2009/3 BLOCK
1.1.4 **Infrastructure Requirement**

**Project Cost**: The estimated cost of the proposed exploratory & development drilling planned to be carried out is Rs. 30-35 Crores per each well.

**Land Requirement**: Minimum land required at each well site during drilling will be 125 m x 125 m, i.e., 1.56 ha. 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 4290 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 1430 KVA DG sets at drilling site. Stand by DG set arrangement of 1430 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 30 m$^3$/day for a short period of 45 to 60 days. 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 20 person/shift of 12 hrs. in two shifts.

1.2 **Description of the Environment**

Environmental baseline data survey has been carried within the entire AA-ONN-2009/3 block, during December 2012 to February 2013, covering winter season.

1.2.1 **Land Use Studies**

The land use pattern of the total AA-ONN-2009/3 block has been studied by District Census Hand Books and satellite images. It is observed that no forest land falls under the block area and 9.61 % of the land falls under cultivable waste land. On the other hand, 70.38 % of land falls under unirrigated area. The area not available for cultivation is about 20.01 % forms the bulk of the land use.

1.2.2 **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 7.2 – 8.1 indicating that is slightly alkaline to moderately alkaline in nature. The electrical conductivity was recorded as 135 μS/cm to 315 μS/cm. The organic carbon content in the study area observed as 0.11 % to 0.28 %, which the soil falls under very less category. The phosphorus values ranged between 35 - 57 kg/ha. The nitrogen values ranged between 20 – 36 kg/ha. The potassium values ranged between 73 - 145 kg/ha.
1.2.3 **Meteorology**

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

1.2.4 **Ambient Air Quality**

To establish the baseline status of the ambient air quality in the study area, the air quality was monitored at 12 locations during winter season of 2012-13. Out of the twelve locations the minimum and maximum concentration for PM$_{10}$ and PM$_{2.5}$ were varied between 39.4 to 49.8 µg/m$^3$ and 12.4 to 16.9 µg/m$^3$ respectively during the study period. The concentrations of SO$_2$ and NOx were varied between 8.2 to 14.5 µg/m$^3$ and 12.8 to 20.2 µg/m$^3$ respectively. The minimum and maximum concentrations for total hydrocarbons, methane hydrocarbons and non-methane hydrocarbons during the study period were observed as 208 to 289 µg/m$^3$, 126 to 159 µg/m$^3$ and 72 to 134 µg/m$^3$ 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.

1.2.5 **Water Quality**

The baseline water quality status in the region is established by analyzing about 7 ground water samples and 3 surface water samples during study period. The physico-chemical and biological analysis revealed that most of the parameters in ground and surface water samples are well within the prescribed limits of IS: 10500 limits.

1.2.6 **Ambient Noise Levels**

The noise monitoring has been conducted at 12 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.

1.2.7 **Ecological Environment**

There are no reserved forest and national park present inside the block area. Hoollongpar wildlife Sanctuary is present at distance of 1.7 km in SSW direction from block boundary. Out of three exploratory drilling wells locations, Teok-C, Teok-A and Teok-G exploratory drilling wells are present at distance of 12.5 km, 10.0 km and 11.6 km respectively from Hoollongpar Gibbon wildlife sanctuary. Gibbons are endangered species, as per wildlife protection act 1972.

During the floristic survey, a total of 128 plant species were recorded which consists of 83 tree species, 23 shrub species, 17 herb species, 4 climbers and 1 parasites were recorded from the study area. The study area mainly consists of moist mixed deciduous and tropical evergreen type of forest. Therefore, biodiversity in this region is good and various types of mammals are found.
Plankton diversity Index for phytoplankton and zooplankton varies from 1.6 to 2.5 and 1.2 to 1.8 respectively. Physico-chemical, biological parameters and diversity index reveals that the studied water bodies are slightly mesotrophic in nature.

1.2.8 Socio-Economic Environment

The configuration of male and female indicates that the males constitute about 50.64% and females to 49.36% of the total population as per 2011 census records. The study area on an average has 975 females per 1000 males. In the study area, as per 2011 census, 0.89 % of the population belongs to Scheduled Castes (SC) and 1.02 % to Scheduled Tribes (ST).

The percentage of literates to total population is 72.98 %. As per census records altogether the main workers works out to be 23.31% of the total population. The marginal workers and non-workers constitute to 20.25% and 56.44 % of the total population respectively.

1.3 Anticipated Environmental Impacts

The identification and assessment of impacts over the various environmental attributes in the region due to the proposed exploratory drilling activities in the project block have been discussed followed by mitigative measures and environmental management plan for the potential impacts due to the proposed project activities.

The proposed exploratory drilling activities will last for 45 to 60 days and hence the impact due to the project are temporary and reversible in nature and will be localised.

1.3.1 Impact on Topography and Land Use

Considering the small foot print area required during the drilling, only marginal impact due to change in land use is anticipated and there is no topographical change is envisaged.

1.3.2 Impact on Climate

Impact on the climatic conditions from the drilling will not be significant. Considering the quantum of exit gas and the short duration of flow, the impact on the local or global climate will be insignificant.

1.3.3 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;
- 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.
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). The dimensions of the typical flaring pit would be approximately 25 m x 10 m x 2 m deep will be used. The setting out of the flare pit will be done in a manner to direct the flame away from any pockets of cultivation / existing green cover. Wherever required, special precautions will be taken to minimize the impact on the local environment and habitat.

1.3.4 Impact on Surface Water and Groundwater Quality

Approximately 15-20 m$^3$/day of wastewater and 8 m$^3$/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 ASPCB. The sewage will be discharged into septic tanks and then to subsoil through soak pits.

1.3.5 Impact on Noise Levels

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 120-150 days at each location, impact of the noise due to the proposed exploratory drilling will be insignificant on the community and will be minimized after 100 m from drilling well site boundary.

1.3.6 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 for few days at each drill location during the exploratory drilling activities and will thus allow subsequent recovery after the activities stops.

1.3.7 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 of 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.

1.4 Environment Management Plan

1.4.1 Removal of Equipment and Materials

After completion of the drilling activities, the well will be capped with a wellhead in place, but all other equipment and materials will be removed from the site. The site would be returned to its original form in most environment friendly manner.

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.

1.4.2 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. The well will be capped and the land would be handed over back to the owners in the original form.

1.4.3 Atmospheric Emissions

The combustion of diesel for power generation for the drilling and campsite operation results in atmospheric emissions of SO$_2$, NO$_x$, CO, Particulates and Hydrocarbons. Flaring during production testing is of 14 to 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. 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.

1.4.4 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.
1.4.5 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 400-500 m$^3$ of drill cuttings per well and 15 m$^3$ spent drilling fluid would need to be disposed off.

ONGC proposes to use internationally followed methodologies while drilling with Water Based Muds (WBM). 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 spilled oil may be reused in the mud preparation. The residual drilling fluids will be reused in the drilling campaign to the maximum extent and the drilling fluid which can not be further used will be discarded as per procedure.

1.4.6 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 will be stored in a secure paved area and disposed to MoEF/ ASPCB 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.

1.4.7 Management of Waste Disposal sites within Drill Site

The project proponent is committed to 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 will be undertaken.

1.5 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 drill site will be established. The monitoring will 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 resource inputs (energy, chemical use, water, raw materials), equipment and waste generation will also be set up. A detailed wastes management plan with monitoring programme will be in place during various phases of activity.

1.6 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.

1.7 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 improves the socio-economic conditions of the region.

The proposed exploration drilling programme is expected to generate local employment in the order of about 20 unskilled and semi-skilled people, for a period of approximately 45 to 60 days at each drilling site location. While this benefit is small by most standards, it is a significant employment opportunity in the block.

1.8 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), 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.

The HSE dept is the nodal agency to coordinate and provide necessary services on environmental issues during construction and operation of the project.

1.9 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 on 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.