

# Executive Summary



## **EIA Report for the Proposed Seismic Survey & Exploratory Drilling in Block AA-ONN-2004/3, Assam**



*Prepared for*

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## **Executive Summary**

### **INTRODUCTION**

Essar Oil Limited has been awarded the exploration block AA-ONN-2004/3 by the Ministry of Petroleum & Natural Gas (MoPNG) during sixth round of bidding under the New Exploration Licensing Policy (NELP). The AA-ONN-2004/3 block of EOL covers an area of 1250 sq. km and is located at Dhemaji and Lakhimpur districts (covering the northern portion of the districts) of Assam. The Production Sharing Contract (PSC) for the Block being signed on 2<sup>nd</sup> March 2007 and the Petroleum Exploration License (PEL) effective from 2<sup>nd</sup> May, 2008.

As a part of this project EOL plans to carry out 400 Line Kilometer (LKM) for 2D and 50 Square Kilometer (SKM) for 3D seismic surveys respectively. It also plans to drill about 12 nos. exploratory wells within the block.

SENES India has been engaged to carry out Environmental Impact Assessment (EIA) study for this project including assessing environmental and social impacts for the project and then arriving at a site specific Environment Management Plan (EMP). The study consisted of initial scoping, site visits, environmental monitoring, intensive desk analysis and close consultations with EOL representatives.

### **PROJECT DESCRIPTION & ACTIVITIES**

The seismic survey will be encompassing the following sequential activities viz.

- area / land scouting,
- source point positioning, line clearance,
- short hole drilling & loading of explosives,
- detonation of charged explosives
- Recording of seismic data.
- Seismic data will then be accordingly interpreted to finalize the drilling location for the 12 nos. exploratory wells.

The objective of the exploratory drilling program is to determine potential of commercial hydrocarbon reserves within the block. This activity involves

- well site preparation, strengthening of access roads,
- Well drilling and testing.
- Site closure and decommissioning for wells not indicative of potential hydrocarbon reserves.

An area of 10800 m<sup>2</sup> of land will be required for each well site which will be taken on temporary lease after making necessary payments against lease and crop compensation. Each

exploratory well will be drilled to a target depth of ~ 3000 m using a using a standard land rig. A water-based drilling mud will be utilized during drilling. The drill cuttings will be collected and temporarily stored on-site in HDPE lined pits. Entire drilling waste management will be in accordance with CPCB and Assam Pollution Control Board norms.

### PROJECT UTILITIES & RESOURCE REQUIREMENTS

The power requirement for seismic activities and well site lighting will be met by mobile DG sets of capacity 40 kVA and 125 kVA respectively. Drilling rig is provided with 2 DG sets of 950kVA capacity each of which one is stand by. Nearly about 5 KLD of High Speed Diesel (HSD) required for the operation of DG sets. Water requirement is 49KLD to be sourced from local suppliers. A total of 40 persons to be deployed per shift during drilling phase will be housed onsite in portable quarters equipped with adequate facilities.

### WASTE GENERATION

Approximately 20 m<sup>3</sup> per day of wastewater will generated which is as a result of rig wash and dewatering of spent mud, effluents from washing of drill cuttings, floor washings, pump, seal leakages, spillages will comprise of chemical ingredients of drilling fluid. The solid and hazardous waste likely to be generated during drilling and their disposal is given in **Table 1** below.

**TABLE 1: WASTE STREAMS GENERATED DURING DRILLING AND THEIR DISPOSAL**

Waste Type	Quantity	Characteristics	Disposal
Kitchen Waste	10 – 20 kg per day	Organic waste (Non HW)	Will be stored in compost pits on daily basis.
Drill Cuttings	250 m <sup>3</sup>	Mainly Inert material Consisting of shales, sands and clay; and About 1% of drilling mud. (Non HW)	Drill cuttings are likely to be non-hazardous due to water based mud drilling. However, as per the requirement of HWMH Rules, the cuttings will be washed and contained in cuttings disposal area (HDPE lined collection pit) provided
Drilling Mud (Fluid)	20 m <sup>3</sup>	Barite, Bentonite and Traces of Heavy metals (HW)	The mud will be tested for hazardous contaminants and will be disposed according to HWMH Rules
Acid – Lead Batteries	2 – 3 Batteries per drilling of a well	Lead – Acid (HW)	Will be recycled through the vendors supplying acid – lead batteries as required under the Batteries (Management & Handling) Rules, 2001.
Oily waste-used oil & Waste Oil	0.3 m <sup>3</sup> 5-10 Kg	Used & Waste oil	Will be collected in metal drums kept in secured dyked area & Disposed as per Used oil rules in approved used oil recycling facility

Source: EOL Prefeasibility Report

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## **BASELINE ENVIRONMENTAL STATUS**

To understand the existing physical, biological, socioeconomic environment both primary and secondary data was collected involving stakeholder consultations. The study period for primary data collection was March to May 2010.

### **Climate and Micro Meteorology**

During the study period the ambient temperature recorded is varying from 13.3°C to 32.2°C. Daily relative humidity (RH) was varying from 49% to 98%. A rainfall of 1014 mm was recorded at site during study period. The predominant wind direction was NNW with an average wind speed of 1.33 m/s.

### **Ambient Air Quality**

The ambient air quality was monitored at 10 representative locations of the block. The average 24 hourly PM<sub>10</sub> and PM<sub>2.5</sub> at these locations range from 38.91 to 70.65 µg/m<sup>3</sup> and 12.50 to 18.00 µg/m<sup>3</sup> respectively, average NO<sub>x</sub> values at all locations were in the range from 13.00 to 24.83 µg/m<sup>3</sup>, average ammonia value ranged from 21.75-52.55 µg/m<sup>3</sup> and ozone 2.00-7.00 µg/m<sup>3</sup> all of which is within the limits specified in NAAQS standards under E(P) Act, 1986 for residential areas. The other pollutant (i.e. Sulfur dioxide, CO, methane and non methane hydrocarbon, benzene and benzo (a) pyrene and Heavy metals) concentrations at all the monitoring stations were found to be below detectable limit.

### **Ambient Noise Quality**

The ambient noise was monitored during the study period at 10 locations within the block. The noise level in most of the monitoring locations (except at North Lakhimpur (Max. 70.5 decibels) and Dhemaji (Max. 69.6 decibels)) was found to be within day time noise standards (55 decibels) specified for residential area. However, the night time noise levels in all the sites are within the night time standards specified for residential area (45 decibels).

### **Physiography and Geology**

The area primarily falls within the depositional plains of the River Brahmaputra and its tributaries; whilst the northern boundary of the blocks is close to the Assam Himalayas. The major part of the block comprises of alluvial deposits of the rivers Subansiri, Jadhhol, Ranga and Gai nadi. The geological formation of the area allows the rivers to erode their banks easily and change courses frequently.

### **Hydrogeology**

The block hydrogeology is primarily characterized alluvial sediments of Quaternary Age with depth to water level generally varying from 0 to 5 metres below ground level (m b.g.l). The estimated gross annual dynamic groundwater resource of the Dhemaji district is 1,376.96 million cubic metre (mcm) while net annual ground water draft is 127.73 mcm. Major portion of the block lies in Dhemaji district which is categorized by CGWB under safe category with respect to ground water development.

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## **Ground water Quality**

Ground water samples were collected from shallow tube wells of the five villages comprising of Nagaon, Dulung Forest Camp, Gogamukh, Dhemaji, Phukangaon. The ground water quality is within permissible limits of the potable drinking water standard IS 10500 except for iron at monitoring stations viz. Gogamukh (4.44 mg/l), Dhemaji (4.55 mg/l) and Phukangaon (4.51 mg/l).

## **Surface Water Quality**

Surface water samples from the major rivers within the study area viz. Ranganadi, Subansiri, Jiadhah and Gainadi and also from the Brahmaputra were collected. The water quality of surface water bodies within the block conforms to Class B (outdoor bathing-organized) and Class C (drinking water source after conventional treatment and disinfection) inland surface water quality. The highest total coliform count (2625 MPN/100ml) was recorded from Brahmaputra followed by Jiadhah (1536 MPN/100ml) and Subansiri (1320 MPN/100ml) and Brahmaputra. Moderate coliform count was reported for water samples collected from Gai 55 MPN/100ml and Ranga (53 MPN/100ml) River.

## **Watershed and Drainage**

The block falls in the catchment of Brahmaputra River which flows adjacent to the block from north eastern to the southern and south-western part and receive several large tributaries in Dhemaji and Lakhimpur districts (viz. Subansiri, Ranganadi, Jiadhah/Kumotia, Gai/Sissinadi) flowing through the block area.

## **Land use**

The land-use and land-cover of the study area has been interpreted from the satellite data (LANDSAT Imagery), toposheet of the area, and subsequently by ground truthing during reconnaissance surveys. The block land use shows that majority of the land (59.30%) in the area is used for agriculture purpose with paddy as the primary produce and forest areas cover 14.24% of the block comprising of reserve forests as well as open forests.

## **Soil Quality**

The soil of the block area is mainly characterized by alluvium composed of sand (course to fine) and clay in varying proportions. The soil characteristics in the study area, especially the physical quality and fertility of the soil have been characterized by analyzing the soil samples collected from 10 locations within the exploratory block. The texture of soil samples collected from the monitoring locations was characterized as loamy sand with Phukangaon revealing silty loam soil and Chilagaon showed loamy soil. Large expanses of low-lying land are characterized by heavy clayish soil with high percentages of nitrogen and organic matter. The soil also contained good organic carbon content 0.17-0.68%. The harmful heavy metals lead and chromium were observed to be below detectable limits. Higher  $\text{Ca}^{2+}$  values observed in the samples are indicative of good soil permeability and structure.

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## Traffic Survey

Traffic count survey was conducted at three locations viz. Dhemaji, Gogamukh and North Lakhimpur at the NH-52. The highest daily traffic load (5492) was recorded at Gogamukh along NH-52 followed by North Lakhimpur (5255). The peak vehicular traffic (5698) monitored at the three towns was recorded between 1400 to 1800 hrs while the lowest vehicular traffic load (288) at these stations was recorded between 0100 to 0500 hrs.

## Natural hazards

The study area is located in Zone V as shown in the Bureau of Indian Standards (BIS) 2000 seismic zone map for India. Zone V is defined as region which might encounter earthquakes of maximum intensity. Two major earthquakes of magnitude 8.7 (occurred in 1897) and 8.6 (in 1950).

This region covers one of the heaviest rainfall areas in Assam due to which these areas experience regular annual floods. All the major rivers within the block primarily the Subansiri, Ranga, Jiadhol and Gai nadi are flood prone and inundate the areas in proximity to their stretch almost every year. The highest flood level recorded at Dibrugarh (the station closest to the exploratory block) in Brahmaputra was 106.48 cm (during 1998) which was about 2.24 cm higher than the danger level at that area of 104.24 cm.

## Ecology

There are no declared sensitive ecological habitats within the block. The Jiadhal Reserved Forest (R.F.), Sissi R.F. Kadam R.F, Kakoi R.F., Ranga R. F. and Dulung R.F. belonging to both Dhemaji and Lakhimpur districts are located within or at close proximity to the exploratory block. A wetland area Bordoibam-Beelmukh located within the block about 10 km south of Gogamukh town is earmarked by the Forest Department of Assam for a proposed bird sanctuary. Tree species in these sites are mostly planted and few are natural. These non-forest areas are also suitable for some wild fauna. During the terrestrial plant survey, 140 plant species were recorded, which includes 72 species of trees, 23 species of shrubs, 30 species of herbs, 12 species of climbers and 3 species of orchids

There is also no established migratory route/corridor for mammals in this block. The distance of the corridor from the block boundary is approximately 5 km. Seven species of Schedule I & seven species of Schedule II animals were reported. Out of seven Schedule I species, four species belong to mammals and three species belong to birds. Out of seven Schedule II species, five species belong to mammals and two species belong to reptiles

The major rivers in the block are Subansiri, Jiadhol, Ranga and Gai. There are also numbers of seasonal rivers and *nalas* in both the sides. The survey recorded one species of Schedule I i.e. Dolphin (*Platanista gangetica gangetica*) and two Scheduled II animals *Lutra lutra* & *Varanus bengalensis*. However taking into account the temporary nature of the project, necessary design and planning considerations no significant impact on dolphin habitat is envisaged.

## Socio economic

The study area villages comprise of Dihingia Gaon, Borphukan, Bali Gaon, Baruagaon, Gohaingaon, Moridhal Ghat, Sisibargaon, Lalung Gaon, Pamua Gaon, Kathalguri, Nahabari and Chilagaon of Dhemaji district and Sonari Gaon, Bangali Gaon, Christanbasti , Nagaon, Dulung Forest Reserve, Kadam Bagan, Kakoi Raigarh No. 2, Gagaldubi, Uriamgari, Balijan Gaon, Moidomia, Chowkham Gaon, Nalkata, Hatilung and Chaboti of Lakhimpur district. The average household size for the study area villages was found to be about 5.70. The average sex ratio of 953 recorded for the study area villages is greater than the state average of 935 females per 1000 males. Over 25% of the population in the study area villages belong to scheduled castes and scheduled tribes. Average male and female literacy rate in the study area was recorded at 63.02% and 49.40% respectively.

## ENVIRONMENTAL IMPACT ASSESSMENT

The potential impacts of the project on different components of the environment was systematically identified and evaluated for significance. The principal concerns that emerged are:

### Impact on air Quality

The operation of DG sets during drilling at site will result in the generation of air pollutants viz. PM, NO<sub>x</sub>, SO<sub>x</sub> and CO which may affect the ambient air quality temporarily. In order to predict the ground level concentrations (GLCs) at various distances from the source of the above mentioned pollutants, an air modeling is carried out. The Ground Level Concentrations (GLCs) for all the pollutants in different scenario is given in **Table 2** below. It was found that the air quality impact will be of low significance.

**TABLE 2: PREDICTED GLCS FOR AIR POLLUTANTS CONSIDERING DIFFERENT SCENARIOS**

Scenario	Incremental Concentration (µg/m <sup>3</sup> )	Distance from Well (m)	Direction	Baseline at Dhemaji Town	Predicted GLC
<b>NO<sub>x</sub> (in µg/m<sup>3</sup>)</b>					
950 KVA DG	11.83	949	SE	23.06	34.89
125 KVA DG	1.02	510	SE	23.06	24.08
Test Flaring	1.02	510	SE	23.06	24.08
950 KVA DG + TF	11.95	949	SE	23.06	35.01
125 KVA DG + TF	1.15	906	SE	23.06	24.21
950 KVA + 125 KVA	12.27	949	SE	23.06	35.33
950 KVA + 125 KVA + TF	12.44	1140	SE	23.06	35.50
<b>SO<sub>x</sub> (in µg/m<sup>3</sup>)</b>					
950 KVA DG	2.91	510	SE	0	2.91

Scenario	Incremental Concentration ( $\mu\text{g}/\text{m}^3$ )	Distance from Well (m)	Direction	Baseline at Dhemaji Town	Predicted GLC
125 KVA DG	0.25	949	SE	0	0.25
950 KVA + 125 KVA	2.98	510	SE	0	2.98
<b>CO (in ppm)</b>					
950 KVA DG	14.10	510	SE	0	14.10
125 KVA DG	4.54	949	SE	0	4.54
Test Flaring (TF)	1.27	1140	SE	0	1.27
950 KVA DG + TF	5.66	1140	SE	0	5.66
125 KVA DG + TF	14.13	510	SE	0	14.13
950 KVA + 125 KVA	15.06	1140	SE	0	15.06
950 KVA + 125 KVA + TF	16.33	1140	SE	0	16.33
<b>PM (in <math>\mu\text{g}/\text{m}^3</math>)</b>					
950 KVA DG	1.74	949	SE	101.3	103.04
125 KVA DG	0.37	949	SE	101.3	101.67
950 KVA + 125 KVA	1.86	949	SE	101.3	103.16

### Impact on Noise Quality

Blasting operation of the seismic survey will generate noise and vibration thereby causing local discomfort to the surrounding inhabitants. Studies on environmental impact of short-hole blasting however indicated the record of maximum vibration at a distance of 20m from the blast site with a dominant peak frequency of 56.8 Hz with no adverse impact on community structures observed. Further given the intermittent nature of the activity impact is considered to be of medium significance. The noise generated from drilling rig is considered to be about 95.0 dB(A) at a distance of 10m from the bore hole location. Noise attenuation equations (without any noise barrier) show that the normal attenuated noise at any receptor points located at a distance of about 100 m and 200 m from the fence-line of the rig, will be in the range of about 75.0 dB(A) and 68.9 dB(A) respectively. This control measure will be enough to decrease noise levels near sensitive receptors at 200m to about 56.9 dB (A).

### Impact on Soil Quality

Stripping of top soil will be affecting the soil fertility of the well sites. It is estimated that about 1620 m<sup>3</sup> of top soil will be removed per well site. Specific mitigation measures will be implemented by the proponent to stabilize the top soil to preserve their fertility characteristics during site restoration. The impact is therefore considered to be of medium significance.

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### **Impact on Topography and drainage**

Site preparation involves the raising of the acquired/leased land to about 0.25 m from the ground level it may lead to alteration of onsite micro-drainage pattern. However considering the provision of cross drainage structures viz. culverts etc at road embankments and stream crossings by the proponent to ensure uninterrupted drainage flow the impact is not considered to be of medium significance. Adequate care will be taken by the proponent to restore the site back to its original condition based on the originally existing contours and predominant slope to prevent any such adverse drainage impacts.

### **Impact on Water Quality and Hydrology**

The surface run off from drilling waste (cuttings and drilling mud), hazardous waste (waste oil, used oil etc) and chemical storage areas on open soil is likely to be contaminated leading to the pollution of receiving water bodies viz. natural drainage channels, ponds etc. However taking into account the provision of onsite drainage system and sediment control measures to be implemented by the proponent in compliance with the *CPCB Inland Water Discharge Standards*, the impact is not considered to be of medium significance.

### **Impact on Biological Environment**

The selection of exploratory drilling wells will be considered taking into account the dolphin habitat of Subansiri River. The nearest exploratory well is located at a radial distance of approx 1.5km of the identified dolphin habitat. The proposed activity is a temporary activity and EOL will take necessary measures during the planning and design stage to address any adverse impacts to dolphin habitats, hence the impact is considered to be of medium significance.

### **Impact on Socio economic Environment**

Sites for exploratory wells are likely to be located on agricultural land which is privately owned by the nearby villagers. In all cases, necessary payments will be made against lease/purchase and crop compensation to the concerned land owners. However, adequate measures will be implemented by the project proponent to restore all acquired land to its original condition for wells not indicative of any commercial hydrocarbon reserve.

The project will benefit the people living in the neighboring villages by giving preference to them in relation to direct & indirect employment associated with the various project activities and boosts the local economy. The proposed project will therefore involve the improvement of existing road and/or bridge condition thereby enabling the transportation of drilling rig and ancillary equipment.

### **ENVIRONMENTAL MANAGEMENT PLAN**

Site-specific Environment Management Plans (EMP) has been developed to prevent and mitigate significant adverse impacts and accentuate beneficial impacts will be implemented by EOL for the proposed project. The key mitigation measures specific for each management plan have been discussed in the **Table 3** below:

**TABLE 3: ENVIRONMENTAL MANAGEMENT PLAN & KEY MITIGATION MEASURES**

<b>Sl. No</b>	<b>Environment Management Plan</b>	<b>Key Mitigation Measures</b>
1	Pollution Prevention and Abatement Plan	<ul style="list-style-type: none"><li>• All vehicles, equipment and machinery used for construction will be subjected to preventive maintenance as per manufacturer norms.</li><li>• Test Flaring will be undertaken in accordance with the <i>CPCB Guidelines for Discharge of Gaseous Emissions for Oil &amp; Gas Extraction Industry</i>.</li><li>• Preventive maintenance of DG sets to be undertaken as per manufacturers schedule to ensure compliance with CPCB specified generator exhaust.</li><li>• Installing acoustic enclosures and muffler on engine exhaust of DG sets to ensure compliance with generator noise limits specified by CPCB.</li><li>• Install and maintain effective run-off controls, including silt traps, straw barriers etc so as to minimize erosion.</li><li>• Proper casing and cementing of exploratory well will be done to prevent contamination of sub-surface aquifers.</li></ul>
2	Waste Management Plan	<ul style="list-style-type: none"><li>• Use of low toxicity chemicals for the preparation of drilling fluid.</li><li>• Storage of drill cuttings in impervious HDPE lined pits</li><li>• Disposal will be achieved either through solar evaporation or necessary treatment to comply with the CPCB onshore effluent discharge standard for oil and gas industry.</li><li>• The hazardous waste (waste and used oil) will be managed in accordance with Hazardous Waste (Management, Handling &amp; Transboundary Movement) Rules, 2000.</li></ul>
3	Wild Life Management Plan	<ul style="list-style-type: none"><li>• Selection and finalization of exploratory drilling sites and seismic survey area based on proximity to ecologically sensitive areas viz. migratory route/ corridor, dolphin habitat etc</li><li>• Seismic lines to be designed in a manner to minimize impact on terrestrial and aquatic habitat.</li></ul>
4	Road Safety & Traffic Management Plan	<ul style="list-style-type: none"><li>• Clear signs, flagmen &amp; signal will be set up at major traffic junctions and near sensitive receptors and night time movement of vehicles will be restricted.</li><li>• A Journey Management Plan will be formulated and implemented by the contractor to control construction and operational phase traffic.</li></ul>

Sl. No	Environment Management Plan	Key Mitigation Measures
5	Occupational Health & Safety Management Plan	<ul style="list-style-type: none"> <li>• All machines to be used in the construction will conform to the relevant Indian Standards (IS) codes, will be kept in good working order and properly maintained.</li> <li>• Contractor workers involved in the handling of materials and chemicals will be provided with proper PPEs.</li> <li>• The workplace must be equipped with fire detectors, alarm systems and fire-fighting equipment.</li> <li>• Health problems of the workers should be taken care of by providing basic health care facilities.</li> </ul>
6	Cultural Heritage Management	<ul style="list-style-type: none"> <li>• Cultural and archaeologically important areas within the block will be geographically mapped and communicated to the Contractor.</li> <li>• Consultations will be held with local communities in areas of identified cultural importance prior to the commencement of operations.</li> </ul>
7	Emergency Response Plan	<ul style="list-style-type: none"> <li>• Drilling rig and related equipments to be used for exploratory drilling will conform to international standards specified for such equipment.</li> <li>• Blow-out preventers and related well control equipment shall be installed, operated, maintained and tested generally in accordance with internationally recognized standards.</li> <li>• Appropriate gas and leak detection system will be made available at each of the drilling location.</li> <li>• Adequate fire-fighting equipment shall be provided at each drilling site</li> </ul>

The EMP after intermittent monitoring will adapt future changes in project design, scope for better environment.

### PROJECT INVESTMENTS

The overall cost involved in the seismic and drilling activities within the AA-ONN-2004/3 block is estimated to be about INR 63 crores. About 3 % of the project cost shall be allocated towards environment management.