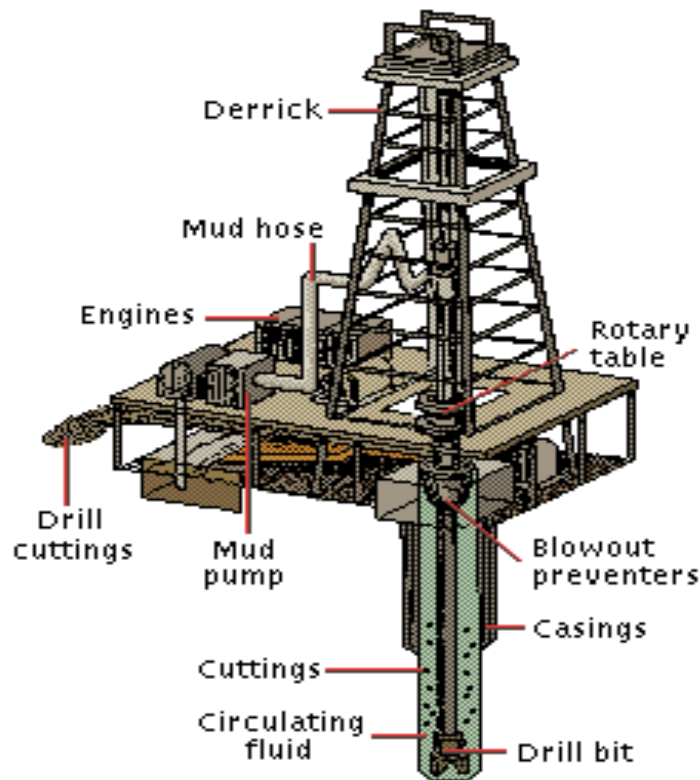




Naftogaz India Pvt. Ltd

EIA Study for Oil & Gas Exploration and Drilling in AA-ONN-2004/4 Block in Assam

Executive Summary



Asian Consulting Engineers Pvt. Ltd., New Delhi

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EXECUTIVE SUMMARY

1. INTRODUCTION

1.1 Introduction

The Consortium of Naftogaz India Pvt. Ltd, Adani Port Infrastructure Pvt. Ltd, Adani Enterprises Ltd, and JAYCEE Plastics Industries Pvt. Ltd signed a Production Sharing Contract (PSC) with Ministry of Petroleum and Natural Gas on 2nd March 2007 for carrying out exploration, development and production of petroleum in Assam. Under the above agreement, the consortium received contract area as Block No. AA-ONN-2004/4, a petroleum exploration licensed (PEL) area in Assam. On behalf of the joint venture partners, Naftogaz plans to drill six exploratory well in the block as per committed work program.

1.2 Objective and Scope of EIA Study

The main objective of this study is to meet the regulatory environmental clearance criteria as well as to ascertain a sustainable development through the assessment of likely impacts due to project related activities on the surrounding environment. The study envisages to assess likely negative impacts and alleviation of these negative impacts, to such extent so as to avoid any harm/ permanent changes in the naturally existing environment.

The scope of the REIA study includes detailed characterization of the existing status of the land, water, air, biological and socio-economic environment within and around the block, identification of the potential environmental impacts of the project, and formulation of an effective Environmental Management Plan (EMP) to prevent, control & mitigate the adverse environmental impacts, and ensuring the environmental compliance. Apart from suggesting mitigation measures to the negative impacts, the report indicates implementation of various positive and enhancement measures as a part of project benefit program to people of the nearby areas.

1.3 Legal Framework

As per the notification S.O. 1533, dated 14th September 2006, the Ministry of Environment and Forests (MoEF), Govt. of India, has made an amendment in the EIA notification and directed that all projects “Offshore and onshore oil and gas exploration, development & production” will require “prior environmental clearance from the central government in the Ministry of Environment and Forest (MoEF) on the recommendations of and Expert Appraisal Committee (EAC) to be constituted by the Central Government for the purpose of this notification”.

Apart from Environmental Clearance, Consent to Establish (NOC) from the State Pollution Control Board and other statutory permissions from concerned state/local authorities are required before commencement of exploration activities in the said area. The standards applicable to oil and gas exploration projects are potted in **Table No. 1**

Table1: Various Standards Applicable to Oil & Gas Exploration Projects

Issues	Applicable Legislation
Hazardous Substances & Wastes	1) The Environment (Protection) Act, 1986, and Rules framed there under <ul style="list-style-type: none"> a) Hazardous Wastes (Management and Handling) Rules, 1989 and amendment Rules 2000 and 2003; b) Guidelines for disposal of solid wastes by Oil Drilling and Gas Extraction industry as notified, vide notification dated GSR 176 (E) April 1996; c) Manufacture Storage and Import of Hazardous Chemicals 1989 and amendment Rules 2000
	2) The Public Liability Insurance Act, 1991 and Rules 1991
	3) Central Motor Vehicles Act, 1988 and Rules, 1989
	4) The Petroleum Act, 1934
Water	5) The Water (Prevention and Control of Pollution) Act, 1974, amended in 1988
	6) The Environment Protection Act, 1986 - Standards for liquid discharge by Oil Drilling and Gas Extraction industry as notified vide notification dated GSR 176 (E) April 1996
Air	7) The Air (Prevention and Control of Pollution) Act, 1981, amended in 1987
	8) The Environment Protection Act, 1986 – Guidelines for discharge for gaseous emissions by Oil Drilling and Gas Extraction industry as notified vide notification dated GSR 176 (E) April 1996
	9) The Environment (Protection) Second Amendment Rules, 2002 – Emission Standards for New Generator Sets
	10) The Factories Act, 1948, amended in 1987
	11) The Motor Vehicles Act, 1938, amended in 1988 and Rules, 1989
Noise	12) The Environment (Protection) Second Amendment Rules, 2002 (Noise Limits for New Generator Sets)
	13) The Noise (Regulation & Control) Rules, 2000
Safety and Protection against Pollution of Environment	14) Oil Mines Regulations, 1984

2. BRIEF PROJECT DESCRIPTION

Block operator plans to drill 6 exploratory wells in the Block AA-ONN-2004/4, to determine the presence of hydrocarbons in a geological formation starting at a depth of about 1700-5000m below ground level. The exploration project envisages selection of drilling locations on the basis of several geoscientific surveys planned in the block. A conduit is to be constructed between the ground surface and the oil reservoir through drilling process using a conventional land rig (electrical). Drilling process includes circulation of drilling fluid or “mud” which is pumped through the drill strings down to the drill bit and returns between the drill pipe –casing annulus up to surface and back into the circulation system after separation of drill cuttings /solids through solids control equipment. The drilling mud will be water based and will be environmental friendly. If sufficient quantity of oil is found during the exploration, then the site will be selected for further operation (i.e. oil extraction).

Other secondary activities associated to the drilling operation includes construction of roads, store houses, site office building, other utility structures, site construction, cementing program, well evaluation (well logging and well testing), rig demobilization, restoration and rehabilitation of the area.

The salient features of the project have been summarized in **Table 2**.

Table2: Salient Features of the Project

Number of Wells	6
Block Area	95 sq km
Ground Elevation	Average 200 m above mean sea level
Depth of each well	Ranges from 1700 m - 5000 m below ground level
Total Estimated Drilling Period for each well	60-90 days
Total Estimated Testing Period for each well	15 days
Type of hydrocarbon expected	Oil and gas
Proposed Drilling Fluid for each well	Water Based Potassium Sulphate System or other Environmental friendly system to be decided at the time of planning for exploratory drilling.
Anticipated Volume of Cuttings for each well	250-750 cu. metres (approximately)

3. BRIEF BASELINE ENVIRONMENTAL STATUS

The study area of EIA study for this project encompasses entire block area. The existing/ baseline environmental set-up of the study area has been studied as described in subsequent sections.

3.1 Topography, Climate and Meteorology

Climate & Meteorology:

The climate of the study area is humid and tropical. A hot and humid pre-monsoon from March to mid May, a prolonged southwest monsoon or rainy season from mid May to September, a pleasant post-monsoon or retreating monsoon from October to November and a cold pleasant winter from December to February are the characteristics of the general climate. Summer runs concurrently with the later part of the pre-monsoon season and continues throughout the monsoon season.

The four climatic seasons viz. pre-monsoon, monsoon, post-monsoon and winter could be considered as comprising of the following months:

Pre-monsoon	:	March, April and May
Monsoon	:	June, July, August and September
Post-monsoon	:	October and November
Winter	:	December, January and February

Sometimes, the monsoon commences in mid-May and ends in mid-September. Therefore, the boundaries between the seasons are not very rigid.

3.2 Air Quality & Noise

Air Quality: Air quality was monitored at eight different locations within the study area for Suspended Particulate Matter (SPM), Respirable Particulate Matter (RPM), Sulphur Dioxide (SO₂), and Oxides of Nitrogen (NO_x). Hydrocarbon (HC) and Volatile Organic Compounds (VOCs) were monitored at five locations. The 24-hourly average SPM level at all monitoring stations varies from 30 µg/m³ at Tokopathar to 65 µg/m³ at Margarett. RPM values at all eight locations are found within the prescribed limits. The analytic result of SO₂ reveals that the concentration of SO₂ is within prescribed standard. NO_x at all eight locations were found to be within permissible limits. Hydrocarbon levels and VOCs at all the monitoring locations are found to be well within the limits.

Noise: Noise intensity at 10 locations within the study area has been collected. Out of these ten locations, nine locations are under residential areas and one location is under commercial area. In residential areas, noise level were found ranging between 31 dB (A) to 63 dB (A) at day time while the noise intensity at night time were recorded as 28 dB (A) to 48 dB (A). In commercial area noise levels were found to be 40-63 dB (A) at day time and 34-49 dB (A) at night time.

3.3 Water Quality and Soil

Surface Water Quality: Surface water quality is analyzed from three different surface water sources within the study area. It is observed from the monitored data that:

- All the water samples have turbidity ranging from 3.2 NTU to 4.5 NTU
- pH of all water samples ranges from 7.3 to 7.6 (within permissible limits)
- Electrical conductivity ranges from 165 mS/cm to 189 mS/cm
- Other inorganic elements in the water are found to be within permissible limits

Ground Water Quality: Ground water quality is analyzed from two different locations within the study area. From the ground water quality data it is observed that:

- Most of the water samples are clear and transparent
- Electrical conductivity values ranges from 134 mS/cm to 146 mS/cm indicating presence of certain quantity of ionic matters in the ground water
- Chloride content ranges from 15.8 mg/L to 17.6 mg/L
- Other inorganic elements in the water are found to be within permissible limit

Soil: Soil quality is analyzed from ten different locations within the study area. The data obtained from analysis of the obtained soil samples reveals that:

- Soil samples are loamy and red grey in colour
- pH of the soils varies from 5.1 to 5.8 showing acidic character
- Water holding capacity of soil samples are found to be 49.4 percent to 57.2 percent
- Organic matters in the soil ranges from 1.54 percent to 1.98 percent
- Other elements in the soil samples are found within satisfactory level

3.4 Land Use

A broad study of the land use in the study area indicates that most of the study area is covered by fallow and agricultural land. Land use pattern of the study area is given in **Table 3**.

Table 3: Land Use Pattern

Land Use	Area (%)
Fallow Land	28.76
Agriculture Land	28.13
Settlement	28.15
Open Land	4.26
Dense Vegetation	6.90
Water Body	3.80

3.5 Flora and Fauna

Agricultural and fallow lands comprises most part of the block. Tea is the major commercial plantation in the area. Upper Dihing reserved forest is located close to the block area. The common tree species observed in the study area are *Gmelina arborea* (Gameri), *Biscofia javanica* (Uriam), *Lagerstroemia parviflora* (Sida), *Delonix regia* (Radhasura), *Bombax ceiba* (Simalu), *Ficus hispida* (Dimaru), *Caeslpinia pulcherima* (Krishnasura), *Tetrameles nudiflora* (Bheleu), *Dipterocarpus macrosorpus* (Hollong), *Terminalia chebula* (Silikha), *Canarium bengalensis* (Dhuna), *Terminalia myricarpa* (Hollokh), *Euclyptus sp.*, *Tactona grandis* (Segun), *Artocarpus intergifolia* (Kathal), *Psidium gujava* (Madhuriam), *Dillenia indica* (Outenga), *Melia azedarch* (Ghoraneem), *Gravelia robusta* (Solver oat),

Wild life in the Upper Dihing reserve forest is rich & varied and mainly comprises of 32 species of mammals and 54 species of birds. There are reports of elephants immigration in the block area due to disturbances in their route in the forest. The other animals found in the study area are *Herpestes edwardsi* (Common mongoose), *Cannomys badius* (Bay bamboo rat), *Bandicota*

bengalensis(Indian mole rat), *Ory ctolagus coniculus*(Rabbit), *Canis familiaris*(Common dog) & *Felis domesticus* (Domestic cat)

3.6 Socio-Economic Profile

2001 census population of Tinsukia district was 1,150,062. Population density of the district is 303 persons per sq km. Literacy rate in the district is 60.95 percent. The SC and ST contribute 2.72 and 5.85 percent respectively of the total population. Sex ratio is 913 females per 1000 males.

The names of villages falling in the block area are Ketetang, Mannogaon, Longgoan, Bansbari, Ulupmani, Khathangpani and Tokopathar. The only town Margherita is located on the SW corner of the block.

The main workers in the region includes cultivators, agricultural labour, those engaged in livestock, fishing, construction, trade and commerce, transport and communication and other services like Government and Semi Government employee. Cultivation is the main source of income in the region and mostly peoples of the area are engaged in various type of cultivation.

4. Proposed Environmental Management Plan

The environmental management/ mitigation measures and net final environmental impacts on various environmental parameters during construction and operation phases have been given in **Table 4**.

Table 4: Proposed Environmental Management Plan

Hazard & Effect(s)	Proposed Mitigation	Required Actions
<p>Land Acquisition</p> <p>Obtain necessary permits for Land acquisition from the state government departments and approvals from Assam State Pollution Control Board for construction & operations.</p>	<ul style="list-style-type: none"> Ensure that all necessary protocols are followed and legal requirements implemented. Ensure that appropriate legal requirements have been met with regard to land occupancy, land ownership or usage rights, notice and compensation, etc. Establish and clearly document all land agreements with owners, users and state authorities and mark out site boundaries. Acquiring necessary approvals from State Pollution control Board in a timely manner 	<ul style="list-style-type: none"> Block operator to initiate interaction with the concerned officials in the government department and Pollution Control Board, prior to release of actual location to identify necessary permits and the approval mechanism. Preliminary site survey to be carried out by Block operator's civil works consultants to mark the road and site requirement on ground. Block operator's Drilling & Permit team to meet the local Pollution Control authorities to apprise them of the plan and to identify and apply for necessary permissions prior to construction phase and prior to drilling phase.
<p>Soil Erosion</p>	<ul style="list-style-type: none"> Minimize the extent of site clearance area, by choosing best layout with 	<ul style="list-style-type: none"> Detailed contour maps of the site to be prepared with big



Hazard & Effect(s)	Proposed Mitigation	Required Actions
	<p>respect to existing topography.</p> <ul style="list-style-type: none"> • Minimize removal of trees at site • Collect topsoil removed during road development/construction, site preparation, etc. and stockpile the same at edge of site to be used to the extent possible for site restoration later. 	<p>trees marked on it to work out the best layout to minimize cut & fill & avoid cutting of trees.</p> <ul style="list-style-type: none"> • To see that arrangement is in place for collection. • Plan to minimize tree cutting prior to site construction and ensure implementation on ground during site construction phase
Habitat Disturbance	<ul style="list-style-type: none"> • Mark out road & site boundaries. • All bulldozer operators and other manual laborers involved in road and site preparation will be trained to strictly confine to their works within the defined site boundaries. • Pits for containment of cuttings and liquid effluents will be dug at site after fencing is in place. 	<ul style="list-style-type: none"> • To ensure that clear boundary marks are in place. • To ensure that integrity of boundary markers is maintained by the workforce at all times. • Ensure that fencing of site is in place prior to cutting of pits at site. • To appoint guards to be stationed at site during construction phase.

Hazard & Effect(s)	Proposed Mitigation	Required Actions
<p>Waste and Effluent Management</p> <p>Poor planning and execution might pose a threat to environment</p> <p>Contamination of rain/storm water run off with rig wash water & waste mud</p> <p>Wastewater & cuttings may contain trace amounts of drill fluid and residual chemicals.</p>	<ul style="list-style-type: none"> Block operator to identify different type of waste anticipated during operations, work out estimated quantities, and lay down procedures for collection, handling, treatment and disposal of each type of waste. Waste Management Plan to be implemented during operations. Detailed drainage design will be developed as a part of the site design. It will be ensured that mud and associated drainage system is isolated from the rain/storm water drainage system. Pits must have adequate capacity to prevent flooding during high rains (maintain free board) and should be fully bunded. All wastewater, which will be generated from washings & spent mud will be contained in HDPE lined (1 mm thick) pits. The wastewater will be treated through flocculation and dilution to achieve SPCB compliance for discharged into a nearby nullah/stream. Cuttings will be dried to maximum extent possible using suitable equipment and will be contained in separate pits. Prepare a comprehensive Oil Spill Contingency Plan (OSCP) to handle all major, moderate & minor spills Keeping all fuels, lubricants and chemicals in well-designed storage facility with regular inventory checking. Used and unused chemicals will be stored in a lined & bunded area. Executing delivery of fuel to drilling site under strict supervision and carrying out refueling operations in an area with impervious flooring and surface drainage with oil interceptor. Use of suitable delivery trucks 	<ul style="list-style-type: none"> Finalizing Waste Management Plan (draft plan given in EMP report) Waste management plan to be implemented during drilling and be made available for inspection at site to all regulatory bodies. Block operator to work with Civil works consultants /contractors to develop detailed drainage system addressing concerns outlined here. Block operator to work out required pit volumes based on maximum case scenario including rainwater. Site design will include adequately sized pits to contain wastewater & also treated water prior to discharge. Finalizing the Oil Spill Contingency Plan (OSCP) Checklist of all drums and containers located within footprint of the storage area Live risk assessment trainings and awareness rising among all workers associated with mock exercises. The lined & bunded area for the diesel tank will have extra space to contain used and unused lubricants in drums.
<p>Fuels, Lubricants and Chemicals Management pose threat of</p>	<ul style="list-style-type: none"> Impervious liners in place for fuel, lubricants storage area. Fuel/lubricant containment & generator area to have drains with oil entrapment provision. 	<ul style="list-style-type: none"> Keeping an inventory of all

Hazard & Effect(s)	Proposed Mitigation	Required Actions
Noise and Vibration	<ul style="list-style-type: none"> • Checklist of all machineries with record of date of procurement, installation and age. • Regular maintenance of all equipments. • Implement good working practices to minimize noise. • Wearing of ear protector when appropriate • Muffled sensory disturbance from the well site to the environmental receptors. it is recommended that 	<ul style="list-style-type: none"> • Inventory of all machineries to be prepared and submitted to Block operator for review. • No machinery running when not required. • Block operator to distribute noise protection equipment and ensure utilization by the work force.
Air Emissions	<ul style="list-style-type: none"> • Operate all equipment within specified design parameters. • Store all dry, dusty material (chemicals, etc.) in sealed containers. • Minimize duration of testing by careful planning. • Minimize emissions during well testing (flaring). • Minimize dust generated from truck movement 	<ul style="list-style-type: none"> • Ensure proper Equipment maintenance • Ensure absence of stockpiles or open containers of dusty materials. • Options for MDT, Open Hole DST to be explored for shorter test include in the plan if found suitable • Effective separation of oil & gas to be achieved and the separated oil will be trucked to nearest refinery and only dry clean gas to be flared. • Watering of roads if required.

Hazard & Effect(s)	Proposed Mitigation	Required Actions
<p>Solid Wastes</p> <p>Wastes will include organic wastes, scrap metal, waste oil & surplus chemicals, sacks, broken wooden pallets, medical wastes etc.</p>	<ul style="list-style-type: none"> • Ensure proper documentation and manifestation of all wastes generated. • Litter and debris not to be discarded at site and to be segregated at a segregation pit on the well site • Non-toxic biodegradable waste to be buried during operations and at decommissioning, ensuring that local water resources are not contaminated in any way. • Bulk supply of materials to be preferred for minimization of packaging wastes. Unused materials to be returned to supplier. • Material such as scrap metal, waste oil & surplus chemicals will be disposed of in a controlled manner through authorized waste contractors. 	<ul style="list-style-type: none"> • Pre operation inspections to ensure waste disposal facilities are in place. • A special segregation pit to have waste types segregated into separate compartment/drums at the well site. • All biodegradable waste at the drilling site is to be collected and disposed off into two small humus pits (each of 2m x 2m x 1.5 m) within the drilling site area away from common use by rig crewmembers. The humus pits are to be covered with soil on daily basis to avoid any odor nuisance due to putrefication and check any contact with the flies or insects.
<p>Non-routine events and accidental releases. (Well kicks, blow out)</p>	<ul style="list-style-type: none"> • Draw up Oil Spill Contingency Plan (OSCP) and Emergency Response Plan (ERP), Well Control Plan & keep it updated. • Maintain state of readiness for quick response including plan awareness, training and regular exercises. • Risk of loss of well control to be minimized through <ul style="list-style-type: none"> i) Proper well design, which will ensure that the hydrostatic weight of mud will overcome formation pressure. ii) Proper drilling program design to ensure selection of properly rated BOP equipment. iii) Ensure that the Block operator's supervision team & Rig contractor's relevant operating personnel are trained to handle well control situations and hold relevant well control training certificates. iv) Ensure advanced detection system is in place and BOP equipment is well maintained. 	<ul style="list-style-type: none"> • Block operator to monitor strict compliance with the provisions of OSCP and ERP & Well Control Plan. • Records of interaction between the management and the work force. Records of training and drills. • Ensure all available offset data is examined for proper design parameters. • Well monitoring equipment to detect influx from reservoir. • Pressure detection service provided by Mud-logging contractor. Blowout preventers tested on installation and routinely. • While at the drilling location, any spill will be reported promptly

Hazard & Effect(s)	Proposed Mitigation	Required Actions
	<ul style="list-style-type: none"> Spill Response (For all spills). Spill kits will be on the drill site to handle spills comprising adsorbents; approved containers for storage and transport of spill wastes, disposable bags, gloves/goggles, etc. 	
Socio-Economic Impacts	<ul style="list-style-type: none"> Ensure no water (surface or ground) contamination occurs from drilling operations Dust emissions on access road to be minimized. All manual labor and other jobs for which local skills are available are recruited from local people. Undertake social welfare projects for the local communities through well thought out CSR strategy. 	<ul style="list-style-type: none"> Implement waste management plan and undertake water quality monitoring before, during and after the operations. Regular monitoring of the access road and deployment of water tankers to minimize dust. Block operator to keep a record of all jobs and provide monthly feedback on jobs provided to locals and others with clear reporting on each job profile. Develop a CSR strategy for the area and implement one social welfare project during each drilling well

5. ENVIRONMENTAL MONITORING PLAN

An environmental monitoring plan is suggested to monitor environmental parameters during pre drilling, drilling and post drilling phase of the project. The Monitoring plan covers components like:

- Air Quality Monitoring
- Noise Monitoring
- Surface and Ground Water Monitoring
- Physical Infrastructure Monitoring
- Natural Resource Monitoring
- Waste Generation inventory
- Oil Spill Monitoring
- Habitat Disturbance Monitoring

The post operational monitoring programme will be under the supervision of the block operator and the Monitoring shall be done by recognized laboratories/institutions/ by block operator.

6. RISK ASSESSMENT AND DISASTER MANAGEMENT

Block operator is committed to maintain high standards for health and safety at all times. However, on rare occasions, an unplanned event can have the potential to jeopardize the safety of the crew and cause environmental damage. Potential non-routine events that may occur whilst drilling the exploratory wells include Well Kicks, Oil Spills including small releases of hydrocarbons, Well Testing Fallout and Well Fire.

Specific procedures and training will be carried out to ensure that the correct action would be taken on the rig in the event of a kick occurring. The operating personnel will be trained for such an eventuality and the key responsible people will be required to hold relevant well control certifications. The rig will be equipped with Blow Out Preventers of suitable ratings while drilling different sections to ensure safety of equipment and personnel in case of a blow out.

Primary control will be achieved by providing sufficient hydrostatic pressure by means of drilling fluid column in the hole to prevent the influx of formation fluid into the well bore. This is called primary well control and it involves the following:

- Drilling fluid (mud) of sufficient gravity to be used.
- Active volume of drilling fluid to be continuously monitored, especially during tripping.

Changes in density, volume and flow rate of drilling fluid from the well bore to be immediately detected and appropriate action to be taken

Precautions will be taken for all kinds of spills.

Block operator has well outlined emergency response and contingency plan to:

- Obtain an early warning of emergency conditions so as to prevent a negative impact on personnel, the environment, and assets
- Safeguard personnel to prevent injuries or loss of life by either protecting personnel from the hazard and/or evacuating them from the facilities
- Minimize the impact of such an event on the environment and the facilities by mitigating the potential for escalation and, where possible, containing the release.

Different staffs will be given different scale of responsibilities to take care during the emergency situation. All care is being taken to avoid any kind of hazard to human health and property, environmental components and local plants and animal species.

7. SITE RESTORATION

After well testing and evaluation, a decision on whether to abandon or develop the well will be taken. If no indications of a commercial quantity of oil are encountered either before or after testing, the well will be declared dry, accordingly plugged and abandoned, and the site restored in line with local regulations and good industry practice. As a minimum, the following steps will be undertaken to restore and rehabilitate the area:

- The wellhead and all casing string will be cut off to a minimum depth of 3 m (10 ft) below ground level.
- All concrete structures will be broken up, and the debris disposed off as per the regulatory requirements.
- All other waste products, solid and liquid, will be disposed of in accordance with the requirements of the EIA and will be treated to render them harmless.
- All fencing and access gates will be removed.
- All pits whose contents would show regulatory compliance for on-site disposal, at the time of site closure, will be backfilled and closed out as per the legal requirements.
- That portion of the access track likely to be of no use for other exploratory wells in the reserved forest will be restored by removing cross drainage structures.
- Waste products, solid and liquid, will be disposed of in accordance with the waste management plan.

8. CONCLUSIONS

The proposed area for exploration drilling is located in Tinsukia district of Assam. The land uses of block mainly consist of agricultural and fallow land. The EIA report is based on detailed study of baseline environmental components viz. air, water, soil, noise, biology and socio-economic. The environmental management plan includes management of air, noise, emission, liquid effluents and solid or hazardous waste treatment and disposal.