Executive Summary

INTRODUCTION

The Block AAP-ON-94/1 was first awarded for exploration to Joint Venture Consortium (of HOEC, OIL and IOCL) by the Government of India (GoI) with HOEC as the operator of the Block. Following successful discovery of natural gas in the Dirok Field in the Block the Ministry of Petroleum and Natural Gas (MoPNG) has approved the Dirok discovery as commercial. Currently the consortium is planning to drill development wells, construct a Gas Gathering Station (GGS) and Gas Processing Plant (GPP) for gas processing and associated transportation pipelines. HOEC had submitted Form-1 of the EIA Notification, along with a Draft Terms of Reference (ToR) for EIA study to MoEF. MoEF has issued approved ToR vide letter No. J-11011/245/2014-IA II (I) dated 9th December, 2014. The EIA study comprised of initial scoping & site visit, environmental monitoring & surveys, preparation of draft EIA-EMP report for Public Hearing (PH).

Block Location & Accessibility

The Block AAP-ON-94/1 is located in Assam-Arakan Basin and falls within geologically complex Schuppen Thrust Belt. It is located in Tinsukia District of the State of Assam, NE India. This block covers approximately 305 sq. km area. The geographic location of the block AAP-ON-94/1, Dirok Field is included within the Survey of India’s Topo- Sheet No. 83M/11.

The proposed project activity will be coming within Tinsukia district of Assam and proposed project units i.e. wells, GGS and GPP can be accessed from Digboi town by NH-38 and Margherita-Deomali Road. Dirok Tea Estates internal Road network shall be used as approached road to reach well locations from access road. Major towns near proposed project locations are Digboi, Tinsukia, Margherita, Doom Dooma & Makum.

Digboi railway station is located at distance of approximately 3 km in North from proposed GPP location and approximately 18 km from the existing and proposed wells and proposed GGS locations. Dibrugarh is the nearest airport located at distance of 80 km in North –West direction from Digboi.

Land Lease

For three newly proposed wells and proposed GPP location, HOEC will procure the land from the Dirok Tea Garden on long term lease through private negotiation. Total land requirement for each of the drill sites would be about 2.0 hectares (approx). In the case that the activity on site may get extended beyond the current project schedule, the leases will be renewed from time-to-time. Like each drilling well, land for construction of GPP would also
be taken by HOEC from private land owner on long-term lease. For proposed GPP, agricultural land will be procured on long term lease.

A total of 25 km underground pipeline will be laid alongside existing road. The land for laying the pipeline will be acquired on Right of Use (RoU) basis. Pipeline will be planned within RoU of access roads/high ways with the permission of land owners, local authorities and related government departments. For the stretch of pipeline which will be laid in the forest land of Upper Dihing a forest clearance will be obtained from forest department. The land for laying the underground pipeline will be used under the provisions of the Right of User of Land (Petroleum and Pipelines Act, 1962). About 0.3 km pipeline would be laid beneath the river bed of Burhi Dihing River, for which necessary permission would be obtained.

All the proposed drill sites, GGS and GPP are away from human habitation; therefore resettlement and rehabilitation is not applicable for this project.

**PROJECT ACTIVITIES**

The proposed project activity can be divided in four major activities as described below:

**Drilling Activity**

- **Site selection**: Suitable drilling locations were selected based on the physical (terrain and access) technical suitability and detailed survey on drill site and access road survey.

- **Land acquisition**: Land will be taken through long term lease.

- **Site access road and drill site construction**: Site preparation will involve all activities required to facilitate the operation of the drilling rig and associated equipments and machineries. Construction of site access road will not require and as far as possible, existing roads will be used and widening as well as strengthening of roads will be done if required. Drill site construction shall involve construction of platforms, construction of camp site, construction of storage area and construction of waste pits.

- **Pre-drilling activities, rig mobilization and rigging up**: This process involves transport of rig including auxiliary equipments and assembling of various rig parts and equipment to drill a well.

- **Initial well construction**: Top-hole section will be drilled to a desired depth based on well design. After drilling top-hole section, “Casing” will be done. After running casing, space between hole wall and “Casing” will be cemented. Once each section of the well is completed, the drill string is lifted and protective steel pipe or casing lowered into the well and cemented into place.

- **Drilling of wells**: Wells will be drilled by using a standard land rig or a “Mobile Land Rig” with standard water based drilling fluid treatment system. Additionally, there
will be other ancillary facilities like Drilling mud system, Effluent Treatment Plant (ETP) etc.

- **Testing of wells:** Between the drilling operations for different zones, logging operations are undertaken to provide information on the potential type and quantities of hydrocarbons present in the target formations. Testing facilities will be available at drilling rig for separation of liquid phase and burning of all hydrocarbons during testing. The test flare boom will be located at a distance from the drilling rig.

- **Site closure and decommissioning:** After the wells are put into production demobilisation of drilling rig and associated infrastructure will be initiated. Decommissioning will involve the dismantling of the rig, all associated equipments and the residential camp, and transporting it out of the project area.

- **Site Restoration:** All drill sites after the completion of production activities will be restored back to its near original condition. Depending on the preference of the land owner, land will be returned as it is or reinstated as it was prior to the project activity.

**Gas Gathering Station (GGS)**

The construction of proposed GGS will involve the following steps:

- **Site selection:** The proposed GGS will be located in the Dirok 4 well site premises.

- **Land acquisition:** No new land will be required.

- **Construction of Access Road:** Both access and approach roads are already present.

- **Fencing:** The proposed GGS facility will be duly fenced to a height of about 2 m.

- **Site construction:** For proposed GGS the construction work will entail construction of civil foundation, erection of manifolds, flow line and valve network on approximately 0.06 ha land.

**Gas Processing Plant (GPP)**

The construction of proposed GPP will involve the following activities:

- **Site selection:** It will be constructed near Golai gaon on approximately 6 ha land.

- **Land acquisition:** Will be taken from private owner on long term lease.

- **Construction of access Road:** New approach road of approximately 450 meters length shall be constructed from the existing National Highway to the GPP site.

- **Fencing:** The proposed GPP facility will be duly fenced to a height of about 2 m.

- **Top soil scrapping:** Will be gauged scraped and stored at top soil storage site.

- **Site elevation:** The entire site will be elevated, leveled and compacted based on local topography and high flood level.
Site construction: Construction and development work will be done on approximately 6 ha (300 m X 200 m) for erection of GPP.

**Pipeline Laying**

Two parallel pipelines (High Pressure & Low Pressure) shall be laid to transport the natural gas. The construction details regarding the laying pipeline have been discussed in detail below

- **Designing & planning:** Two group parallel pipelines will be laid from proposed GGS to GPP and from GPP to Kusijan off take point. Total length will be 25 km.
- **Corridor selection:** A detailed route survey will be undertaken
- **Land acquisition:** Pipeline will be underground and are planned with in RoU of access roads/high ways with the permission of land owners, local authorities and related government departments
- **Perimeter fencing:** The temporary work strip will be fenced.
- **Clearing and grading:** The RoU area will then be leveled to the required gradient.
- **Trenching:** Manual methods will be used to dig the trench for laying the pipeline. The pipeline will be generally buried to a minimum depth of 1m.
- **Pipe hauling and fabrication:** Pipe transported to the site on trucks will be offloaded.
- **Bending and welding:** Bending and welding will be done to the appropriate angle to match the vertical and horizontal alignment of the trench.
- **Coating:** High built liquid epoxy coating will be used at bare pipes and weld joints.
- **Hydro-testing:** All pipelines shall be tested in-place after construction.
- **Backfilling:** The pipe trench will be backfilled in the reverse order in which it was excavated.
- **Restoration:** Re-grading of the work strips will be done to reflect the original ground profile.
- **Pipeline warning marks:** Pipeline warning markers will be provided at a fixed distance for future monitoring and line walking purposes.

**Project Utilities and Resource Requirements**

**Power:** Four diesel-engine generators, each with a capacity of 670 KW, will be sufficient for rig operations. Three generators will be used at a time and one will be kept on standby. A 134 KW generator will be made available for lighting at residential camp and other emergency requirements. One 450 KVA DG set will be used for construction and
operation of GGS. Three 670 KW DG set will be used during construction of GPP and 2 (two) 600 KVA captive gas generators will be installed during operation phase of GPP.

**Water:** The total water requirement for the site preparation and construction phase of the project is estimated about 1200 KL per well with an average consumption of 45- 50 KLD. Domestic water requirement will be 6.75 KLD for every 50 site persons deployed. 25 KLD and 5 KLD water will be consumed during construction and operation phase of GGS respectively. Water consumption during GPP construction and operation phase will be 150 KLD and 15 KLD respectively. During decommissioning phase the peak demand of water requirement as estimated would be 10KLD. Water would be sourced from surface water sources.

**Fuel Consumption:** During the drilling phase, the consumption of diesel is estimated to be about 4.5-5 KLD. About 15-20 KLD diesel will be required during the construction of GGS and GPP.

**Manpower:** The site preparation phase of 30 days will employ on an average about 45 to 50 workmen preferably from local settlements. The total number of personnel involved in the drilling activities is expected to be about 50. For Pipeline laying and construction work of GGS and GPP will involve 100-125 persons per day.

**Baseline Environmental Status**

Baseline environmental study of the Dirok Development Field and surrounding area comprised study of physical, biological and socio-economic environment where proposed project activity would be done.

**Study area**

An area with a radius of about 10 km around the center of the proposed wells; 500 m buffer area along the entire stretch of the proposed pipeline route and an area of 2 km around the GPP would also be included under the study area for baseline data collection. While selecting locations for primary monitoring of air, noise, water, soil and meteorology special emphasis is given to receptors that are likely to be impacted by the proposed project. Monitoring stations for air and noise were selected in proximity to the proposed wells, GGS, GPP sites and access roads. Monitoring locations for surface water quality was selected based on the macro and micro watershed and drainage pattern of the area. Soil sample locations were selected based on the landuse-land cover of the study area. Locations of ecological and social surveys were also selected based on receptor locations; in addition, special emphasis is given to areas within 1 km radius of the well sites and access roads.

**Physical Environment**

**Climate and Meteorology**

The Block falls under the humid sub tropical climate zone with warm. Analysis of 2009 IMD data of Dibrugarh showed cool winter season from December to February and April was the
hottest month. The primary survey showed that the predominant wind direction was observed to be from north-west for the study period. The average wind speed for the months was 3.66 km/hr.

**Air Quality**

The ambient air quality representing PM_{10}, PM_{2.5}, Sulfur Dioxide (SO_{2}), and Nitrogen Dioxide (NO_{2}) was monitored at 8 representative locations. All the parameters were found to be in compliance to the National Ambient Air Quality Standards (NAAQS), 2009.

**Noise Quality**

The noise quality was monitored for 24 hours at Eight (8) locations within study area. Noise monitoring was conducted at settlement near to the proposed well locations and access roads. Daytime and nighttime equivalent noise levels varied between 47.8-62.9 dBA and 40.1-59.5dBA respectively. Higher daytime and nighttime equivalent noise levels recorded at Golai III are probably due noise generated from plying of vehicles at NH 38.

**Topography**

Dirok Development Field has a more or less flat topography with elevations ranging between 120-160 m msl.

**Physiography and Geology**

The Block AAP-ON-94/1 lies mainly at the foothills (south) of the first thrust (Naga Thrust) of the Assam-Arakan Fold belt and contains Naga, Margherita and Disang thrust zones. The area developed as a passive margin on the Indian craton from Mesozoic to Oligocene times, facies becoming progressively more marginally marine as the collision of India and Asia developed during the Paleogene.

**Hydrogeology**

The study area is made up of weathered sediment of sand (stone) with pebbles of Pliocene to Pleistocene age and in the west, Surma group of rock sandstone, siltstone and mudstone of early to middle Miocene.

**Groundwater Quality**

Groundwater samples were collected and analyzed as per IS: 10500 from Six (6) locations within the study area. The turbidity value of all six samples has exceeded the acceptable value. However, concentration of chloride, TDS, total hardness, fluoride, heavy metals are within limit stipulated in standard. Iron concentration in one ground water sample has exceeded the drinking water acceptable limit. Low values of total coliform and absence of faecal coliform in the samples reveal absence of biological contamination in the water sample.
Drainage

The study area falls within the catchment of the Burhi Dihing River. Apart from these tributaries, there are numerous perennial and seasonal streams within the Block AAP-ON-94/1 that drains into the Burhi Dihing River. The drainage pattern in this region is dendritic. Few ox-box lakes are also discernable within the study area.

Surface Water Quality

Surface water samples were collected from three surface water sampling locations. BOD values in all the surface water samples were recorded below 2.00 mg/l. Coliform concentration of samples varied from less than 2 MPN /100 lit to 34 MPN/100 ml. Oil and grease was found to be negligible; iron content in all the surface water sample varies from <0.05mg/l to 0.49 mg/l and electrical conductivity values of the samples ranged between 101-228 microsiemens/cm. The channels from which samples were taken and analyzed were primarily used for bathing, cleaning and for catching fish.

Land Use and Land Cover

Forests covers about 61% of the 10km around well cluster. Second largest land use is tea garden areas i.e. 14% land. Agricultural land covers about 11.5% land. About 8.2% of land is used for human settlement. Burhi Dihing along with other streams covers about 3% and water bodies covers about 1.2% of the land. Industrial land, roads & rail line covers 0.4%, 0.6% & 0.1% respectively.

Land use and land cover mapping was done within 500m of land on either side of the pipeline alignment and it showed that about 32% comes under human settlements of Margherita and Digboi town, 29.9% comes under tea garden, agricultural land covers 15%, 12% covered by reserve forest, 2.3 % unclassified forest and 4% industrial land.

Soil Quality

Three soil samples were taken from Dirok Tea Estate. Other two soil samples were collected from forest land near Kusijan off take point and agricultural land near Golai II respectively. The texture of soil samples collected was found to be sandy clay loam, sandy loam, and clay loam respectively. The pH of soil samples varies from 3.62 to 4.82. Available nitrogen content in samples taken from paddy field, tea garden, agricultural land and forest land varies from 91.7 to 419.31 mg/kg. The micronutrient levels observed in the soil samples do not indicate any extraordinary enrichment of metals or contamination from any external sources.

Natural Hazards

The study area lies in Zone V of the Bureau of Indian Standard (BIS) 2000 which might encounter earthquakes of maximum intensity. The well sites, GGS and GPP are not located at flood prone areas.
Biological Environment

Owing to the huge amount of annual rainfall, forest types occurring in this region are primarily of Tropical Evergreen Forest and Tropical Semi-Evergreen Forest. In the northern part of the study area reserve forest of Upper Dehing East and West block falls along with a stretch of unclassified forest. In the southern part of the study area a part of the forested land falls within Dehing Patkai Wildlife Sanctuary, where as major forested lands are within unclassified forests. None of the existing as well as proposed wells as well as GGS is located within the forest land. All the wells and the proposed GGS are located within 2km of the Dehing Patkai Wildlife Sanctuary. The proposed GPP is also not located within forest land and it is also located more the 10 km from the Dehing Patkai Wild Life Sanctuary. In the northern part of the study area, a section of the pipeline of about 5 km will pass through the R.O.U of Digboi Duliajan road. A part of this pipeline falls within the west block of Upper Dehing reserve forest. Though the land is designated as forest land, but presently the area has a rural setup, having no forest cover.

Near the well sites the dominating vegetation in the tea garden area is tea bushes, along with shade trees like *Albizzia* sp. *Casia siamea, Gmelina arborea*. Within the human settlements trees like *Mangifera indica, Aegle marmelos, Delonix regia, Vitex negundo, Areca catechu* is found. Agricultural land will be acquired for the GPP. Other than agricultural plant (paddy) no vegetation is present in the proposed site. As a result no tree cutting will be required for the development of GPP. Most of the area within 2km of the proposed GPP is covered by agricultural field and human settlement. Trees like *Mangifera indica, Aegle marmelos, Delonix regia, Vitex negundo* are mostly found in the human settlement. Tea Garden area also comes within 2km of the proposed GPP. Tea bushes mostly dominate the tea garden landscape along with shade trees like *Albizzia sp. Casia siamea*. Throughout the entire stretch of the pipeline vegetation along the RoU is very low. Few road side plantation trees like *Artocarpus heterophyllus, Delonix regia, Phyllanthus emblica, Ficus religiosa* are found along the RoU. of the road.

The non-forest area and forest area form the habitat within the study area of some endangered and threatened species which are listed in the Schedule I of the Indian Wildlife (Protection) Act, 1972 and amendment in 1991. Secondary information revealed presence of nineteen species of Schedule I animals. Out of nineteen one Schedule I species, nine species belong to mammals; seven species belong to birds and three are reptiles.

The proposed pipeline will pass through the Golai-Powai Elephant Corridor near Golai III village. The Golai-Powai elephant corridor is located in proximity (about 0.1 km) to the proposed GPP, in southern direction. As observed during field survey that there are approximately 110 structures including one two storied hotel, commercial building and automobile show room within the corridor. A part of terminal of IOCL being constructed would also be within the elephant corridor. Consultations with local peoples have revealed that no elephant movement was noticed in this area for last three years.
Socioeconomic Environment

The Dirok Development Field comes within Margherita Block of Tinsukia District in the State of Assam with respect to HOEC’s proposed development activity. 18 villages those are located within 2 km periphery of the proposed well, GPP or GGS in the Dirok Development Field were selected to analyze the socio-economic environment. The population as per 2011 census varied from 443 in Makum Block No. 2 to 3996 in Dirok 1. The average sex ratio of 980 and 935 were recorded in village located near to the well cluster and GPP respectively.

Socioeconomic profile

Average literacy rate of all 18 selected villages of observed as 46.13% which is below the district literacy rate. The highest literacy rate was observed in Makum Assam Tea Co. Drakhast 2 (76.08%). Average male and female literacy rate in the study area was recorded at 53.78% and 38.25%. The total working population in the selected villages varies from 30.53% to 53.30%. The “Other worker” category contribute highest workforce category constituting about 89% of the working population of 18 selected villages.

Socioeconomic Infrastructure

All the villages located in the study area have drinking water facility, medical facilities, educational facilities, electricity for domestic purpose. All the sampled villages do not have market facility. For market place, villages solely depend on urban places or towns or of adjacent areas

IMPACT ASSESSMENT

The potential impact arising due to the construction and operation of the drilling wells, GGS and pipeline on the environment have been identified, characterized and evaluated. The major impacts envisaged due to the realization of the Project is given below:

- Visual Impacts & Aesthetics: Vegetation clearance will be required for proposed project activity. Again during site construction activity, dust will be generated from transport of construction material, machinery and personnel, haphazard dumping of construction waste, domestic waste from labour camp may cause visual and aesthetic impacts. Lighting at project sites may also cause visual impacts.

- Air Quality: Movement of vehicles, operation of construction machinery, road construction/strengthening and other site preparatory activities during construction and drilling at drill sites, GGS, GPP and pipeline construction will cause the generation of air pollutants viz. PM, NOx, SOx and HC in the ambient air near well site facilities which may affect the ambient air quality temporarily. Air pollutants like NOx will also be generated as a result of test flaring.

- Noise Quality: Operation of construction machineries, construction work, pipe laying, movement of heavy vehicles, operation of drilling rig, DG set operation are the activities that will primarily impact the noise quality of the surrounding environment.
• Topography & Drainage: The existing access road to the drill sites has culverts over the channels passing through the road; during road development all such structure will not be disturbed. During site preparation the cutting and filling would be limited and there is no drainage channel within the proposed drill sites, GGS and GPP. Thus no change in the micro-drainage pattern and slope of the areas in the vicinity of the well sites, GGS, GPP and along the access road is expected.

• Water Quality and Hydrogeology: The surface runoff from the drill sites, GGS and GPP may compose of waste fluids or storm water mixed with oil and grease have the potential contaminate streams in the vicinity. In addition produced water from well testing operations and gas separation also have the potential to contaminate the surface water channels.

• Biological Environment: The new wells would require clearance of tree bushes and shade trees. Migratory routes or a corridor of elephant is present in this Block. Noise generated from drilling operations, lighting arrangements and vehicular movement within the drill site is likely to affect the fauna leading them to move away from the project area.

• Socio-Economic Environment: In the proposed project activity, loss of livelihood has not been envisaged. However, disruption of infrastructure, dis-comfort due to dust and noise, influx of people has been anticipated.

• Impact on Community Health & Safety: Community health and safety of inhabitants residing close to the well site, GGS, GPP stand to get affected from frequent heavy vehicular movement along village access roads and due to noise from drilling rig operations, gas processing and transportation.

The beneficial impacts due to the Project are:

• The local people are interested in working for HOEC as unskilled labour; hence employment opportunity will increase.

• Improvement in basic infrastructure for facilitation of the Project that will eventually reap benefits for the local dwellers

ANALYSIS OF ALTERNATIVES

Alternatives were considered with respect to selection of GPP location, pipeline alignment at the time of design and planning for the project. The GGS is proposed at the area of Dirok 4 well within Dirok Tea Estate where the current GPP would be located at agricultural land of Golai. Pipeline alignment passing through minimum length of forestland is also selected.

QUANTITATIVE RISK ASSESSMENT

The quantitative risk assessment has been done to provide a systematic analysis of the major risks associated with development activities in Dirok Block. Oil spills, loss of well
control/blow-out and process leaks constitute the major potential hazards of onshore drilling. Based on Frequency Analysis Method, it has been estimated that the likelihood of a blowout is Occasional/Rare at $5.4 \times 10^{-5}$ per well drilled i.e. the likelihood of its occurrence is “Not likely”. Even on blowout, the probability of ignition is approximately $4.8 \times 10^{-6}$ i.e. negligible.

**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 HOEC for the proposed project. The key mitigation measures specific for each management plan have been discussed in the Table below:

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<th>Key Mitigation Measures</th>
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| 1      | Air Quality Management Plan | - Vehicles delivering raw materials like fine aggregates will be covered to prevent fugitive emissions  
- Storage and handling of construction material and debris to be carefully managed to prevent generation of fugitive dust  
- Sprinkling of water on earthworks, material haulage and transportation routes on a regular basis during construction and decommissioning phase of the new wells and GPP site.  
- Periodic ambient air quality monitoring will be conducted in accordance with the Environment Monitoring Program.  
- Duration of flaring will be minimized by careful planning;  
- High combustion efficiency, smokeless flare/burner will be used at GPP site.  
- Periodic monitoring of DG set stack emission will be carried out in accordance with the Environmental Monitoring Plan to assess compliance with CPCB DG set exhaust standards.  
- Greenbelt will be developed in accordance to “Green Belt Development Plan” along internal roads and boundary of GGS and GPP to prevent any offsite dispersion of air pollutants. The green belt will also be serving as wind abatement system to prevent any generation of wind blow dust onsite. |
| 2      | Noise Management Plan       | - Selection and use of low noise generating equipment equipped with engineering controls viz. mufflers, silencers etc  
- All vehicles utilized in transportation of raw material and personnel will have valid Pollution under Control Certificate (PUC)  
- All high noise generating equipments will be identified and subjected to periodic preventive maintenance.  
- No night time operation of vehicles and construction activities will be undertaken. |
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| 3     | Soil Quality Management Plan | • Drip trays to be used during vehicular/equipment maintenance and during refueling operations.  
• Fuel and lubricant storage areas will be paved and properly bunded. Bunded areas will be designed to accommodate 110% of the volume of spilled material.  
• Spill kits will be made available at all fuel and lubricant storage areas. All spills/leaks contained, reported and cleaned up immediately.  
• The pipeline to be hydrostatically tested in accordance with requirements of “OISD-STD-141- Design & Construction Requirements of Cross Country Hydrocarbon Pipelines” to check for any possible leaks/damages.  
• Periodic monitoring of soil quality monitoring will be conducted in accordance with the Environment Monitoring Program. |
| 4     | Site Closure Plan | • *Waste Management:* clean up the site and remove all waste materials e.g. HDPE liners, any waste material etc. The waste will be dumped in the designated area as per the guidelines of local pollution control board.  
• *Road Restoration:* The fill materials should be removed and restore the site or it may be left for further local community use as per the agreement with community. |
| 5     | Surface Water Quality Management Plan | • Leveling and grading operations will be undertaken with minimal disturbance to the existing contour thereby maintaining the general slope of site.  
• During site preparation and construction, surface water run-off will be channelized through integrated drainage system.  
• Sediment filters and oil-water interceptor will be installed to intercept run-off and remove sediment before it enters water courses.  
• Regular monitoring of surface water quality will be conducted in accordance with the Environment Monitoring Program.  
• Domestic waste water generated from camp area will be treated through septic tank and soak pit. |
| 6     | Ground Water Quality Management Plan | • Water based mud to be used as a drilling fluid for the proposed project  
• Selection of low toxicity chemicals/additives in the preparation of water based mud.  
• Storage and disposal of drill cutting and waste mud to be made in accordance with “Solid & Hazardous Waste Management Plan”  
• Fulfillment of mitigation measures with respect to pipeline corrosion protection, leak detection and periodic supervision in |
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| 7     | Waste Management Plan       | • Barite used in the preparation of drilling fluid shall not contain Hg>1mg/kg and Cd>3mg/kg.  
|       |                             | • Design aspects of the impervious waste disposal pit will be communicated/ shared by HOEC with Assam State Pollution Control Board (ASPCB).  
|       |                             | • The drilling cuttings pit will be bunded and kept covered using tarpaulin sheets during monsoon. |
| 8     | Flare & Illumination Management Plan | • The elevated flare can be replaced by an enclosed ground flare, such as the enclosed ground flare. |
| 9     | Spill Management           | • All chemicals will be stored in designated area. To an extent possible all such areas would away from drainage channels.  
|       |                             | • The flooring of the area would be impervious (paved or HDPE lining) and bunding to be provide on all sides of the chemical storage areas |
| 10    | Greenbelt Management Plan  | • Healthy and established sapling having 1m height should be selected for planting in greenbelt to avoid mortality  
|       |                             | • The tall shrubs and dwarf trees with 3 m spacing between plants and rows is sufficient while medium and tall trees in middle and rear rows are to be planted at a distance of 6-7m and 8-10m apart respectively depending upon the space available. |
| 11    | Wildlife Management Plan   | • Movement of heavy vehicles will be restricted at night time, especially in access road within the forest area as most of the mammals movement occurred during night;  
|       |                             | • Noise Levels at the drill site will be controlled through selection of low noise generating equipment and installation of sufficient engineering controls viz. mufflers, silencers etc.  
|       |                             | • Care would be taken while disposal drill cutting & other drilling waste and discharge of waste water from the drilling site.  
|       |                             | • Proper monitoring of indicator species will be carried out and compared to baseline to understand any negative impacts; |
| 12    | Road Safety & Traffic Management Plan | • The condition of roads and bridges identified for movement of vehicles and drilling rig will be assessed by HOEC to ensure their safe movement.  
|       |                             | • Precautions will be taken by the contractor to avoid damage to the public access routes including highways during vehicular movement.  
<p>|       |                             | • Provide safe and convenient passage for vehicles, pedestrians and livestock to and from side roads and property accesses along defined project routes. |</p>
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<td>• Traffic flows will be scheduled wherever practicable during period of increased commuter movement.</td>
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| 13    | Occupation Health & Safety Management Plan | • All machines to be used in the construction will conform to the relevant Indian Standards (IS) codes, will be kept in good working order, will be regularly inspected and properly maintained as per IS provisions and to the satisfaction of the site Engineer.  
• Hazardous and risky areas, installations, materials, safety measures, emergency exits, etc. shall be appropriately marked.  
• The sewage system for the camp must be properly designed, built and operated so that no health hazard occurs. |
| 14    | Management of Social Issues and Concerns | • Health - arranging mobile health camps including eye camps, School health programmes which includes free dental awareness examination camps and free check-ups of the students etc.  
• Education - Providing assistance to institutions towards purchasing of furniture and required amenities to school, libraries, auditoriums, teacher's common room etc. |

The EMP has been designed with a flexibility so that it can be monitored and adapted to future changes in project design, scope, or the environment and be seamlessly integrated and implemented by HOEC.

**PROJECT COST**

The development of the project which would include well drilling, gas processing and transportation is expected to cost approximately Rs. 325 Crore (54 million US$ taking the conversion rate of INR 60) for. The budget for implementation of the EMP is INR 40.095 Lakh.