

# **Pre-Feasibility Report for Development Drilling in PY-1 Offshore Oil & Gas Block.**

**Proposed Drilling of 8 additional development wells at PY-1 field at  
Cauvery Basin, Tamil Nadu, India**



**Project Proponent:**



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**November 2017**



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at PY-1 field in Cauvery Basin, Tamil Nadu, India**

**M/s Hindustan Oil Exploration Company Limited**

*Document Reference : IND.BH.41.17.0295/HSR*

*Revision: Final, Rev01, dated 7/11/2017*

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## A. REVIEW AND REVISION HISTORY

History of revisions of the present report:

Rev	Date	Modifications
Rev. 00 Draft	27-10-2017	Preliminary draft PFR Report for client Review
Rev. 01 Final	07-11-2017	Final Pre Feasibility Report

**Table I: History of the Revisions**

### Document No. **IND.BH.41.17.0295/HSR, Rev. 01, Final**

REV	DATE	DESCRIPTION	REVIEW-1	REVIEW-2	APPROVAL
Rev. 01 Final	07-11-2017	Final Pre Feasibility Report	K. Sandhya	G. Janaki Ram (HOEC)	E Shyam Sundar
Rev. 00 Draft	27-10-2017	For Customer Review	K. Sandhya	E Shyam Sundar	E Shyam Sundar

This Report has been prepared by Bhagavathi Ana Labs Private Limited on behalf of and for the use of the Customer with due consideration and skill as per our general terms and conditions of business and terms of agreement with the Customer.

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## 1 EXECUTIVE SUMMARY

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HOEC, incorporated in 1983, was the first private company in India to enter into field of oil and gas exploration. HOEC's operational activities commenced in 1991 with the Government of India announcing the fourth round of exploration bidding for private sector participation. The Company has a participating interest in nine oil / gas fields in India (in Cambay basin, Cauvery basin, Assam Arakan basin) which are at various stages of E&P life cycle i.e. exploration, development and production.

The PY-1 Field was originally discovered by ONGC in 1980. The Block is located offshore at a location 18 km due East of the town of Porto Novo and 30 km southeast of the town of Cuddalore. The block area is well connected by sea through Karaikal and Cuddalore port, through air by Chennai airport and helipad at Pondicherry. Under the pre-NELP regime, the PY1 Field was awarded to HOEC under a PSC with the Govt. of India.

As part of the environmental clearance (EC) process, the following ECs have already been secured for drilling of 2 offshore exploratory wells, drilling of 3 offshore producer wells, construction of PY1 platform, laying and hook-up of above wells through 14" subsea pipeline from PY1 platform to landfall point & onshore pipeline to gas processing plant, onshore terminal, gas processing @90 MMSCFD (million standard cubic foot per day) and oil & condensate Processing @ 1600 BPD (Barrels per Day). CRZ Clearance for laying of a pipeline from PY-I offshore Platform to the Onshore Gas Processing Plant at Village Pilliaperumalnattur Tharangamballi in Nagapatnam District vide File No. 11-103/2009-IA-III dated 1<sup>st</sup> April 2010. EC obtained for one drilling well in PY-I dated 12<sup>th</sup> October 2011 and EC obtained for Drilling of One Infill Development Well Pluto in Offshore oil & Gas Block PY-1, Cauvery Basin, Off the Coast of Tamil Nadu dated 7<sup>th</sup> June 2013.

Till date the following activities have been completed: drilling of 3 offshore development wells, construction of PY1 platform, laying and hook-up of above wells through 14" subsea pipeline from PY1 platform to landfall point & onshore pipeline to gas processing plant, construction of onshore terminal, gas processing @ 90 MMSCFD and oil & condensate processing @1600 BPD.

Production from the field commenced in 2009, gas from the Field is sold to GAIL, a public sector undertaking which in turn transmits the gas to end users like power plants etc. Owing to the decline in production due to natural depletion drilling of eight wells are proposed. The proposed project entails drilling eight wells from the existing platform to offset the loss of production from existing wells. The hydrocarbon production from the proposed infill well will reduce the demand supply gap of the country and state to some extent.

Drilling will be carried out by Mobile Offshore Drilling Unit (MODU) – Jack up Rig, which may last for 45-60 days. The approximate cost of the project would be about ~ 260 Crores; about 85-100 personnel will stay onboard at rig site during the drilling operation. Water Based Mud and Synthetic Based Mud are the essential raw materials required during drilling operation, material required at drilling site will be transported by authorized transporter through supply vessel from nearby port.

Water will be required for various purposes during drilling operation and will be ~69.15 KLD water will be procured from town through supply vessels or produced on board from a de salination plant. Total power required to operate the rig would be ~3750 KW, which would be met through the DG sets on board, consumption of HSD in the DG sets is expected to be ~6-9 KLD.

Various solid wastes generated during the drilling campaign would include drill cuttings, cardboard, papers, scrap metal, wood and packaging material, oil and oil contaminated wastes, contaminated containers and packaging materials, plastic and other wastes. All air emissions, liquid and solid wastes will be handled as per the applicable norms of the MoEF&CC, CPCB, TNPCB, and MARPOL, as relevant.

Critical analysis of the existing socio-economic profile of the area vis-à-vis its scenario with proposed project activities identifies the following:

- Due to decline in production from existing three wells on account of natural depletion; it is proposed to drill 8 additional development wells and connect them to the existing unmanned platform to offset the decline in production without increasing approved production levels in PY-1 field, Cauvery Basin. This drilling programme shall offset the loss of gas production

- Due to the replenishment of hydrocarbon production to the earlier levels, long-term employment opportunities already generated by the existing project would be sustained. Besides, the project will help in contributing to the ongoing efforts of the Government to meet the demand of crude oil and gas from domestic sources and thereby also help in saving foreign exchange reserves.
- The proposed activities shall generate indirect employment in the region due to the requirement of workers in supply of raw material, auxiliary and ancillary works, which would marginally improve the economic status of the people.
- Further the additional benefits from the down stream units such as power plants also add value to the society.

Thus, it can be concluded on a positive note the proposed activities by HOEC will have overall beneficial impact and will continue to benefit the local community.

**TABLE 1 : SIGNIFICANT FEATURES**

S .No	Description	Details
1.	Name of the Project	Development Drilling in PY-1 Offshore Oil & Gas Block. Drilling of 8 additional development wells in the offshore Block PY-1 field of Cauvery Basin
2.	Location	Offshore Oil & Gas Block, PY-1 Field, off coast of Tamil Nadu in Cauvery Basin of Bay of Bengal
3.	Proposed project activities	Drilling of 08 additional offshore development wells by using Jack-up Rig and connect them to the existing unmanned platform and subsea pipeline in PY-1 Oil & Gas Block field.
4.	Total Water requirement & Source	Water requirement ~69.15 KLD water will be procured from town through supply vessels or produced on board from a de salination plant.
5.	Manpower	100 people during drilling
6.	Estimated Cost of Project	Capital cost – 260 Crores
7.	Sensitivity	Pichavaram Mangrove Forest 13 Km,s W Velloor River are at a distance 11.2 km's W Uppanar River Back Waters 25 Km's SW Port Nova 13 km's W Tranquebar 47km's S Pennaiyar River 25km's Cuddalore Port 23.3 Km's NW Kolidam River 20 Km's SW Gadilam River 18.0 Km's NW

## 2.0 INTRODUCTION OF THE PROJECT AND BACKGROUND INFORMATION

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### 2.1 Identification of the Project and Project Proponent

Hindustan Oil Exploration Company ('HOEC') was incorporated in 1983 for taking up Exploration and Production (E&P) activities. HOEC was the first private company in India to enter into field of oil and gas exploration. HOEC's operational activities commenced in 1991 with the Government of India announcing the fourth round of exploration bidding with private sector participation.

The PY-1 Field was originally discovered by ONGC in 1980. The nearest block boundary commences, at a location 18 km due East, offshore of the town of Porto Novo and 30 km southeast of the town of Cuddalore.

In October 2003, HOEC was designated as the Operator of PY-1 Field and formulated a development plan in November 2004, which was duly approved by the Directorate General of Hydrocarbons (DGH) in January 2005. It was predicted that the basement gas reserves, based on the minimum development case as approved by DGH in the revised development plan, are 146 billion cubic feet (bcf).

HOEC has a participating interest in nine oil / gas fields in India (in Cambay basin, Cauvery basin, Assam Arakan basin and Rajasthan basin) which are in varying stages of E & P life cycle i.e. exploration, development and production.

HOEC is a publicly listed company, being traded on the National / Bombay Stock Exchanges.

This Pre-feasibility Report is based on proven production technology, market demand, site suitability with respect to environmental norms, available infrastructure and economic viability of the project.

## 2.2 Brief Description of Nature of Project

The proposed projects are Drilling of 8 additional development wells and connect them to the existing unmanned platform and subsea pipeline to offset the decline in production without increasing approved production levels in PY-1 field, Cauvery Basin.

## 2.3 Need for the Project and its Importance to the Country

India's demand for petroleum products is growing at a rapid rate, having virtually doubled from 30 million tonnes in 1980-81 to about 70 million tonnes in 1995-96 to 155 million tonnes in 2006-07. The oil and gas sector is among the six core industries in India and plays a major role in influencing decision making for all the other important sections of the economy. In June 2015, total crude oil imports were valued at US\$ 8.7 billion. In FY14, imports accounted for more than 80 per cent of the country's total oil demand. With India developing gas-fired power stations, consumption is up more than 160 per cent since 1995. Gas consumption is likely to expand at a Compound Annual Growth Rate (CAGR) of 21 per cent during FY08-17. With a view to meeting this growing demand, the new hydrocarbon policy aims at encouraging investments in oil/gas exploration and production. Current projections for demand and supply indicate that the level of self-sufficiency is likely to decline to about 30% over the next few years. Substantial efforts are, therefore, necessary to boost the level of exploration activity in the country so that new reservoirs can be identified to significantly enhance production of crude oil and gas in the years to come. India today remains one of the least explored regions with oil well density per thousand sq. km being among the lowest. It is also evident that large amounts of capital investments are necessary if exploration efforts are to be substantially augmented. It is therefore required to attract both the national as well as, private sector oil companies to invest in this critical area. With this background, a New Exploration Licensing Policy (NELP) was formulated by the government in 1997-98 to provide a level playing field in which all parties could compete on equal terms for the award of exploration acreage.

In the coming time, exploration for oil & gas in critical areas will be based on social, cultural, environmental, recreational, economic, legal, national and international needs and would invite development of innovative and supporting technologies for clean

operations. Hence this project of Developmental Wells will help in establishing the oil/gas prospects in the Block for commercial recovery, which is a need of the country for its economic development. It is expected that the proposed development drilling activities lead to augment the production of hydrocarbons, in the present scenario of growing demand of oil and gas in the country

Prime Minister Mr. Narendra Modi insists to bring down its import dependence on oil and gas to 67 per cent of its requirement by 2022 thus bringing scope for additional discovery of oil & gas exploration.

The proposed project entails drilling eight wells in the PY-1 field to maintain the required level of hydrocarbon production, (at least 90 MMSCFD) which is lesser than the level of permitted hydrocarbon production as per the Environmental Clearance (EC) received from MoEF, as mentioned earlier.

Due to the replenishment of hydrocarbon production to the earlier levels, long-term employment opportunities already generated by the existing project would be sustained. Besides, the project will help in contributing to the ongoing efforts of the Government to meet the demand of crude oil and gas from domestic sources and thereby also help in saving foreign exchange resource.

Further the additional benefits from the down stream units such as power plants also add value to the society.

## 2.4 Demand Supply Gap

In 1997–98, the New Exploration Licensing Policy (NELP) was envisaged to fill the ever-increasing gap between India's gas demand and supply. India's economic growth is closely related to energy demand; therefore the need for oil and gas is projected to grow more, thereby making the sector quite conducive for investment.

## 2.5 Export Possibility

The Oil & Gas produced will be utilised for domestic purpose only.

## 2.6 Domestic/Export Markets

All produced crude oil can be refined in India and sold locally. In case of gas, it would be fed through the existing pipeline within the state of Tamil Nadu.

## 2.7 Employment Generation

Direct Employment during drilling the well at each location will be 100 people and indirect employment will be 75. During production direct employment will be 25 and indirect employment will be 50

### 3.0 PROJECT DESCRIPTION

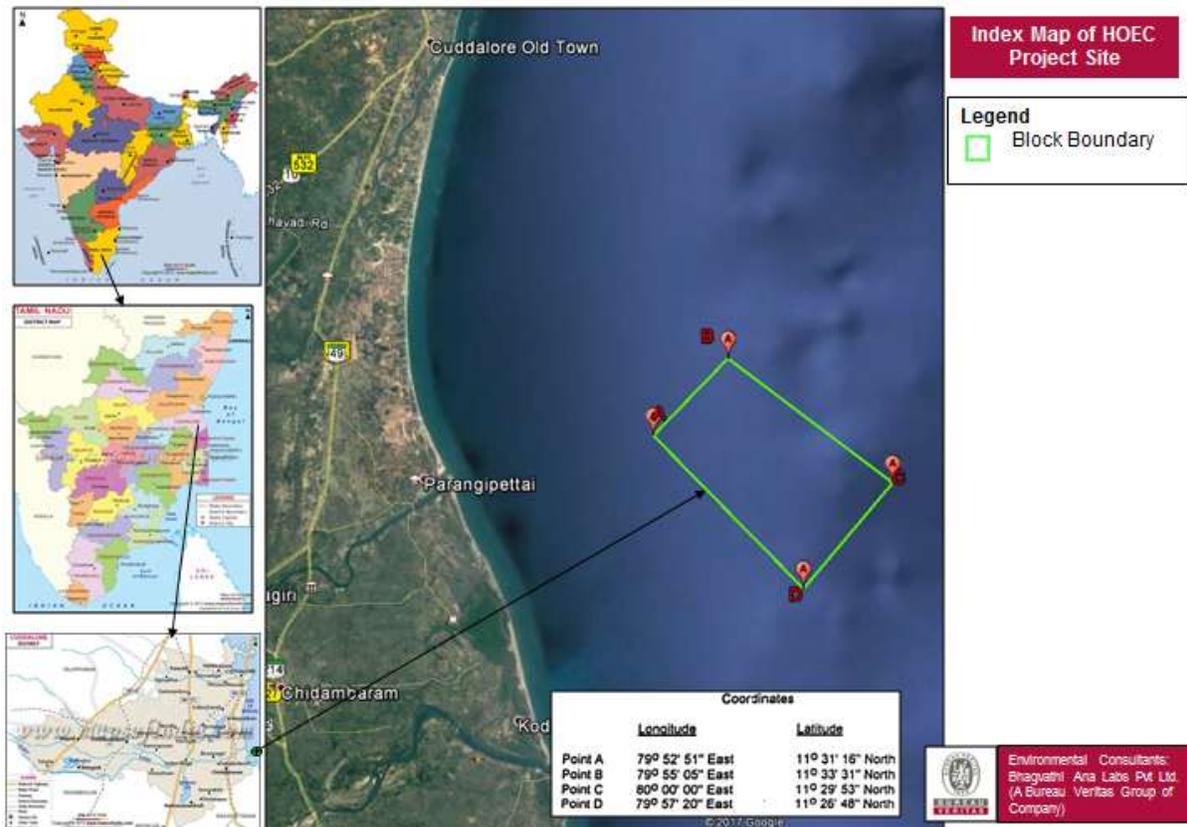
#### 3.1 Type of Project Including Interlinked and Interdependent Projects

Hydrocarbons discovered from the well will be transferred to the onshore terminal for which EC has already been received.

#### 3.2 Location of the Project

The activity will be carried out in Cauvery Basin (Offshore) in Bay of Bengal, Tamil Nadu India. Index Map is provided as Figure 1. The coordinates of the block Boundary are provided in Table 2. Eight Additional Well Locations are provided as Figure 2 and Well coordinates are provided in Table 3

**FIGURE 1: INDEX MAP OF THE PROJECT SITE**



**TABLE 2 : BLOCK BOUNDARIES**

Point	Latitude	Longitude
A	11° 31' 16" N	79° 52' 51" E
B	11° 33' 31" N	79° 55' 05" E
C	11° 29' 53" N	80° 00' 00" E
D	11° 26' 48" N	79° 57' 20" E

**TABLE 3 : WELL COORDINATES**

S.NO	Well	Latitude	Longitude
1	Development Well 1	11°30'57.0551"N	79°56'2.0229"E
2	Development Well 2	11°29'32.7620"N	79°55'41.8469"E
3	Development Well 3	11°30'2.8189"N	79°55'6.2479"E
4	Development Well 4	11°29'16.0580"N	79°55'12.2171"E
5	Development Well 5	11°28'42.8890"N	79°57'15.0205"E
6	Development Well 6	11°31'35.8657"N	79°56'48.6720"E
7	Development Well 7	11°31'03.8112"N	79°54'06.4523"E
8	Development Well 8	11°31'28.5111"N	79°54'42.2105"E

### 3.3 Details of Alternate Site

No alternate site has been examined, since PY-1 Field has been awarded to HOEC by Government of India (GoI) under a Production Sharing Contract (PSC) for exploration, development and production of hydrocarbon reserves within the Field.

This is an existing field, with Four previous ECs and CRZ clearance already in place for different aspects of the project including production. Further, the purpose of the project is to maintain sanctioned hydrocarbon production levels and the development wells shall be drilled from the existing platform.

Further, the current location has been selected for drilling the additional development well since:

- The location does not exhibit sensitive ecological characteristics, and has been given Environmental Clearance by the MoEF on three previous occasions (for the exploratory and development phases),
- The purpose of the project is to maintain existing hydrocarbon production levels near the existing production wells, and
- The presence of commercially proven hydrocarbon reserves is confirmed.

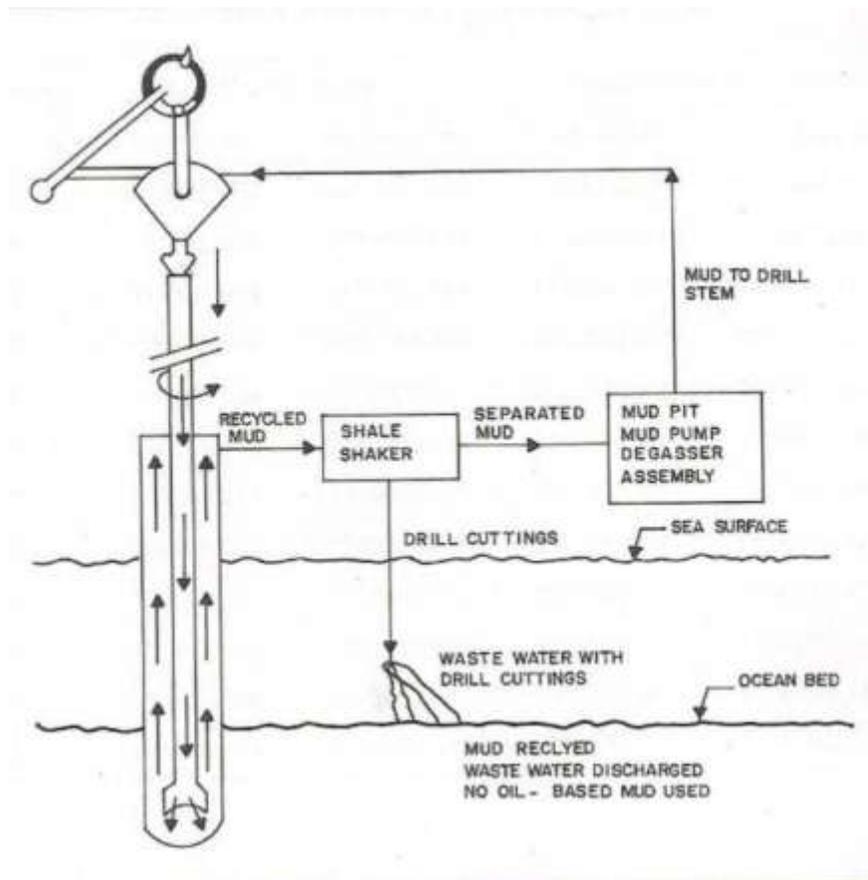
### 3.4 Size or Magnitude of Operation

The proposed production will be limited to Drilling of 8 additional development wells and connect them to the existing unmanned platform to offset the decline in production without increasing approved production levels in PY-1 field, Cauvery Basin.

### 3.5 Project Description with Process Details

The proposed production will be limited to Drilling of 8 additional development wells and connect them to the existing unmanned platform and subsea pipeline to offset the decline in production without increasing approved production levels in PY-1 field, Cauvery Basin. Schematic diagram showing drilling process in offshore drilling rig is provided in Figure 2.

**FIGURE 2: SCHEMATIC DIAGRAM SHOWING DRILLING PROCESS IN OFFSHORE DRILLING RIG**



### Drilling Activity

Drilling will be carried out by Mobile Offshore Drilling Unit (MODU) – Jack up Rig. The details of a typical jack up rig are given in

TABLE 4. Actual specifications may vary, slightly.

**TABLE 4: DETAILS OF TYPICAL JACK-UP RIG**

Sr. No	Description	Details
1	Dimension	246 ft x 218ft x 25 ft
2	Accommodation	90 to 100 persons
3	Max. Operating Depth	Drilling Depth – 3000 m, Water Depth 10 to 75m
4	Volumetric Capacity	Drilling Water – 5000 Bbls Potable Water – 600 Bbls Dry Bulk Storage – 5,500 Cu. ft. (cement/barite) Liquid mud- 1,800 Bbls Dry Sack Storage 2000 to 3000 Sacks
5	Power	3 to 6 Diesel Generator of total 5000 HP/3750KW, 4 DG sets will be working during operation while other 2 DG sets will be kept standby Total Fuel Consumption per day would be 6 to 9 KL depending upon the power requirement
6	Pollution Control Equipment	Sewage treatment plant designed to meet the MARPOL regulation exist in every drilling rig
7	Other Equipment	Communication equipment Life saving / safety equipment Fire-fighting equipment and Navigation equipment

The drilling rig and vessels will be de-mobilized after completion of the drilling campaign. It is expected that each well may take around 45 to 60 days for drilling, reservoir testing and suspension under normal condition.

### Drilling Plan at PY-1 Well Location

It is anticipated that the well to be drilled in the PY-1 Block will target depths of ~1750 m vertical depth and ~3000 m measured depth. The tentative drilling program is shown in TABLE 6.

The process of drilling activity and the sequence of drilling operations are as following:

1. To start with, a 30" casing called 'conductor casing' will be pile driven from the rig into the seabed to adequate depth to provide a conduit between the rig and seafloor for drilling operations to proceed.
2. The rotating drill bit, suspended by a metal tube called the 'Drill String' will be passed through this conductor casing to the seabed.
3. The initial part of the well or top hole will be drilled and then lined with metal casing, which is cemented in place. The drilling will be continued with a smaller bit to create a hole of smaller diameter, which will then be cased and cemented with metal casing. The operation will be continued in this way till the reservoir is reached.

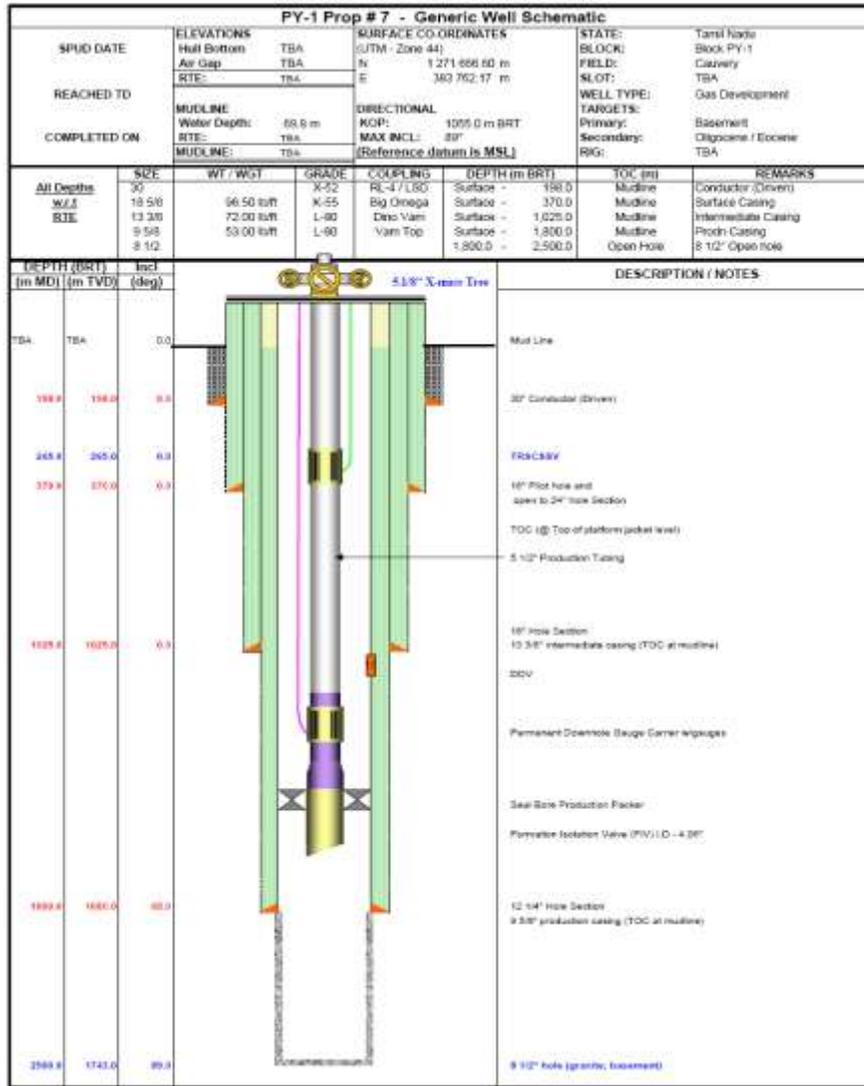
In the PY-1 development well, typically a 24" hole will be drilled followed by 18<sup>5/8</sup>" casing, then a 16" hole will be drilled followed by 13<sup>3/8</sup>" casing, then 12<sup>1/4</sup>" hole will be drilled followed by a 9<sup>5/8</sup>" casing and finally a 8<sup>1/2</sup>" hole will be drilled into the reservoir followed by a 7<sup>1/2</sup>" casing. The drilling plan for the proposed well locations is given in Table 5.

**TABLE 5: DRILLING PLAN AT PROPOSED WELL LOCATIONS IN PY-1 BLOCK**

Casing	Diameter	Depth (m)
Conductor	30"	Up to 198 m MD
Surface Casing	18 <sup>5/8</sup> "	Up to 370 m MD
Intermediate Casing 1	13 3/8"	Up to 1025 m MD
Intermediate Casing 2	9 5/8"	Up to 1800 m MD
Production Casing	7 <sup>1/2</sup> "	Up to 2500 m MD

However, it is to be noted that the casing size and depth can only be firmed up just before the commencement of the drilling program and therefore the details given in TABLE 5 are only indicative. Hence, there may be minor variation with respect to actual casing and cementing thickness. A well bore schematic is given as Figure 3, provided overleaf.

**FIGURE 3: TYPICAL WELL BORE SCHEMATIC DIAGRAM**



Standard operating and maintenance procedure will be in place to control the well test procedure and flaring operations during well testing.

### 3.6 Raw Material Required along with Estimated Quantity

Drilling mud used during the proposed drilling activity includes additives for providing viscosity, lubrication, and well bore stability, etc. HOEC plans to use an environment friendly mud system, which is non-toxic and non-hazardous, for the drilling campaign. Water Based Mud (WBM) will be used for the top & reservoir sections while Synthetic Based Mud (SBM) may be used for other sections..

### Drilling Mud Additives

A variety of additives will be used in drilling fluids that perform various functions during the proposed drilling program. The components of drilling mud required to drill a typical 2,500 m well along with their function are given in TABLE 6 and Table 7. However, the exact amounts of their use are dependent on the nature of the well, stratigraphy and geology of the region.

**TABLE 6: COMPONENTS OF WATER BASED DRILLING MUD**

Raw Material	Function	Quantity (Max.) Required per Well, MT
Bentonite	For viscosity and fluid loss control	100.0
Caustic soda	pH controller, increase alkalinity	2.0
Soda ash	Calcium reducer	1.0
Xanthum gum	For primary viscosity	2.5
Potassium chloride	For potassium ions and borehole stability	50.0
Sodium chloride	For potassium ions and borehole stability	200.0
Barite	Weighting agent	250.0

**TABLE 7: COMPONENTS OF SYNTHETIC BASED DRILLING MUD**

Raw Material	Function	Quantity (Max.) Required per Well
Barite	Weighting agent	500 MT
Calcium Chloride	Salinity, Water phase	90 MT
Viscosifier	Polyanionic Cellulose for fluid loss control & supplementary viscosity	12 MT
Primary Emulsifier	Emulsification	25 KL
Secondary Emulsifier	Emulsification	20 KL
Lime	Alkalinity Control	25 MT
Synthetic base Fluid	Non-aqueous phase	5000 BBLS

### Means of Transportation of Drilling Mud Chemicals

During drilling program the material required at the drill rig will be transported by the authorized transporters through supply vessels.

### 3.7 Resource Optimization/ Recycle and Reuse

The following hierarchy is followed for waste management with an ultimate aim of “Zero Waste”.

- Resource Conservation
- Elimination of Waste Streams
- Minimizing Waste
- Reuse of Wastes
- Recycle of Wastes
- Treatment and Disposal for making wastes harmless

Wash water generated from cleaning of equipment’s will be re-used back into the process. Produced water will be stored and sent to MOEF&CC and TNPCB Authorities Agency for recycling.

### 3.8 Availability of Water and its Source

Water will be sourced from an on-board desalination plant and from a nearby town through supply vessels. Water requirement for drilling is given in Table 8.

**TABLE 8: DETAILS OF WATER CONSUMPTION**

S. No.	Purpose	Water Required during Drilling Period Per Well, KLD	Remarks
1.	Process / mud preparation	35.0	-
2.	Drinking	0.65	@ 6.5 lt./head/day, assuming 100 persons
3.	Fire-fighting	10.0	-
4.	Sanitation	13.5	@ 135 lt./head/day for 100 persons staying at site in mobilized rig set
5.	Others (for e.g. deck cleaning)	10.0	-
<b>Total (KLD)</b>		<b>69.15</b>	Water will be procured from town through supply vessels or produced on-board from a desalination plant.

### 3.8.1 Power Requirement

The drilling process requires movement of the drill bit and string through the draw works which require power. The power requirement of the drilling rig (~3750 KW) will be met by using the Diesel Generator (DG) sets onboard. High Speed Diesel (HSD) will be used to run drilling rig and DG sets during operation. Consumption of HSD is expected to be ~6-9 KLD.

### 3.9 Quantity of Wastes to be Generated (Liquid and Solid) and Scheme for their Management Disposal.

#### Solid Waste Management

The drilling rig system to be employed for drilling will be equipped for the separation of drill cuttings and solids materials from the drilling fluid. The drill cuttings cut by the drill bit, will be removed from the fluid by the shale shakers (vibrating screens) and centrifuges and transferred to the cuttings containment area. Once the drilling fluid / mud have been cleaned, it will be returned to the fluid tank and pumped down the drill string again.

#### Types of Solid Waste

Various solid wastes generated during the drilling campaign would include drill cuttings, cardboard, papers, scrap metal, wood and packaging material, oil and oil contaminated wastes, contaminated containers and packaging materials, plastic and other wastes.

#### Quantity of Waste

The quantity of waste generated would be as per Table 9.

**TABLE 9: QUANTITY OF WASTE GENERATED**

S. No.	Category	Quantity for 1 well
1.	Drill cutting	450 m <sup>3</sup>
2.	Cardboard, paper	0.1 MT
3.	Scrap metal	3.0 MT
4.	Wood and packaging material	0.2 MT
5.	Oil and oily wastes	2.0 – 3.0 MT
6.	Contaminated containers and packaging materials	0.5 MT

S. No.	Category	Quantity for 1 well
7.	Plastic and other wastes	1.0 MT
8.	Kitchen Waste	150KG

### Method of Handling and Disposal

The general method of handling and disposal of solid wastes will be as follows:

- Drill cuttings will be separated from the mud and shale shaker using a fine mesh and washed. Washed drill cuttings will be discharged at the well location as per stipulated norms.
- General wastes, scrap metal and wood will be segregated and brought back to the shore for appropriate disposal.
- All plastic / paper waste will be collected and brought back to the shore for disposal to scrap dealers.
- Waste lubricants and hydraulic oils generated from the equipment onboard will be brought back to the shore in a drum and disposed off to authorized waste recyclers.
- Containers of oil and other materials will be brought back and sold to TNPCB / CPCB authorized recyclers.

### Liquid Waste Management

#### Sewage

The drilling rigs / vessels will be fitted with onboard sewage treatment plants to meet the discharge effluent quality to MARPOL (Annex IV: Regulations for the Prevention of Pollution by Sewage from Ships) convention requirements.

#### Effluent

The drilling mud will be recycled and maintained in good condition throughout the operation to restrict the wastages. The non-hazardous, spent drilling mud (WBM) will be discharged into the sea as per norms. The toxicity of 96 hours LC50 (>30,000 mg/litre) will be ensured during the disposal of the unusable portion of the mud. The offshore discharge will be carried out intermittently at an average rate of 50 bbl / hour, to ensure proper dilution and dispersion without any adverse impact on the marine environment.

The synthetic base drilling mud will be recycled and re-used to the maximum extent possible, for future drilling. The SBM used will comply with the toxicity limits prescribed by MoEF. At the end of the drilling campaign, SBM will be brought to the shore for disposal to an authorized TSDF.

## 4.0 SITE ANALYSIS

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### 4.1 Connectivity

The block area is well connected by sea and air through followings.

- Port: Karaikal & Cuddalore
- Airport / Helipad: Chennai, and alternately at Pondicherry (helipad only)
- Roads leading to the Port: NH – 45 A.

### 4.2 Land Form, Land Use and Land Ownership

The total block area is 173 km<sup>2</sup>, which is entirely off the coast of Tamil Nadu in Bay of Bengal. Water bodies (including area under CRZ Notification 2011) cover the entire study area (i.e. area 10 km around the Block). The entire block is licensed to HOEC for development of hydrocarbons by the Gol

### 4.3 Topography along with Map

The entire block area is off the coast of Tamil Nadu in Bay of Bengal. The bathymetry varies from 40 m to 250 m over the entire block; however depth of sea at drilling platform is 69 meter.

### 4.4 Existing Land Use Pattern

The entire block area is off the coast of Tamil Nadu in Bay of Bengal. The entire land use is marine / sea. The area comes under the CRZ notification 2011.

### 4.5 Existing Infrastructure

Existing infrastructure consists of the following facilities:

- Port: Karaikal, for transfer of equipment using vessel, to the drilling rig. The port will be the nodal point for loading and unloading of materials onto the vessel
- Port: Cuddalore, alternate location for transfer of equipment

- Airport / Helipad: Chennai, and alternatively at Pondicherry
- Roads leading to the Port: NH – 45 A, which is not congested, and is sufficient to carry any loads required for the project to the port

#### 4.6 Soil Classification

Not Applicable as the entire block is in coast of Tamil Nadu in Bay of Bengal.

#### 4.7 Climatic Data from Secondary Sources

Information provided in this Section is data collected for IMD Cuddalore and based on 30-year, long term weather data (1980-2010) collected from IMD's Climatological Tables.

##### Temperature

The winter season starts from December and continues till the end of February. January is the coolest month of the season recording a mean daily minimum temperature of 20.50C. Both the night and day temperatures increase rapidly during the onset of the pre-monsoon season from March to May. During pre-monsoon season, the mean maximum temperature (May) is observed to be 36.10C. The mean maximum temperature in the monsoon season (June – October) is observed to be 36.80C in June. The mean maximum temperature for the post-monsoon season (October 15 – November 30) is observed to be ~31.50C in October.

##### Wind

Generally, lights to moderate winds prevail throughout the year. Winds are stronger winds in the early monsoon period. Winds are light and variable in the post-monsoon and winter during the morning hours. While during the afternoon hours the winds are slightly stronger. The winds change gradually in the pre-monsoon months and by May they are predominantly from southwest in the morning and southeast in the evening. From August – October, the southeast winds dominate.

### Rainfall

The average annual rainfall is observed to be 1378.1 mm. The monsoon sets in the month of June and continues till mid-November. The maximum amount of rainfall (383.5 mm) is observed in the month of November.

### Humidity

Morning humidity is maximum in the late monsoon and early winter months is 84% (November - January). The lowest morning humidity is in June at 65%. The lowest evening humidity is observed to be in the Month of July (64%) whilst the maximum evening humidity is observed to be in the month of October at 77%.

## 4.8 Social Infrastructure Available

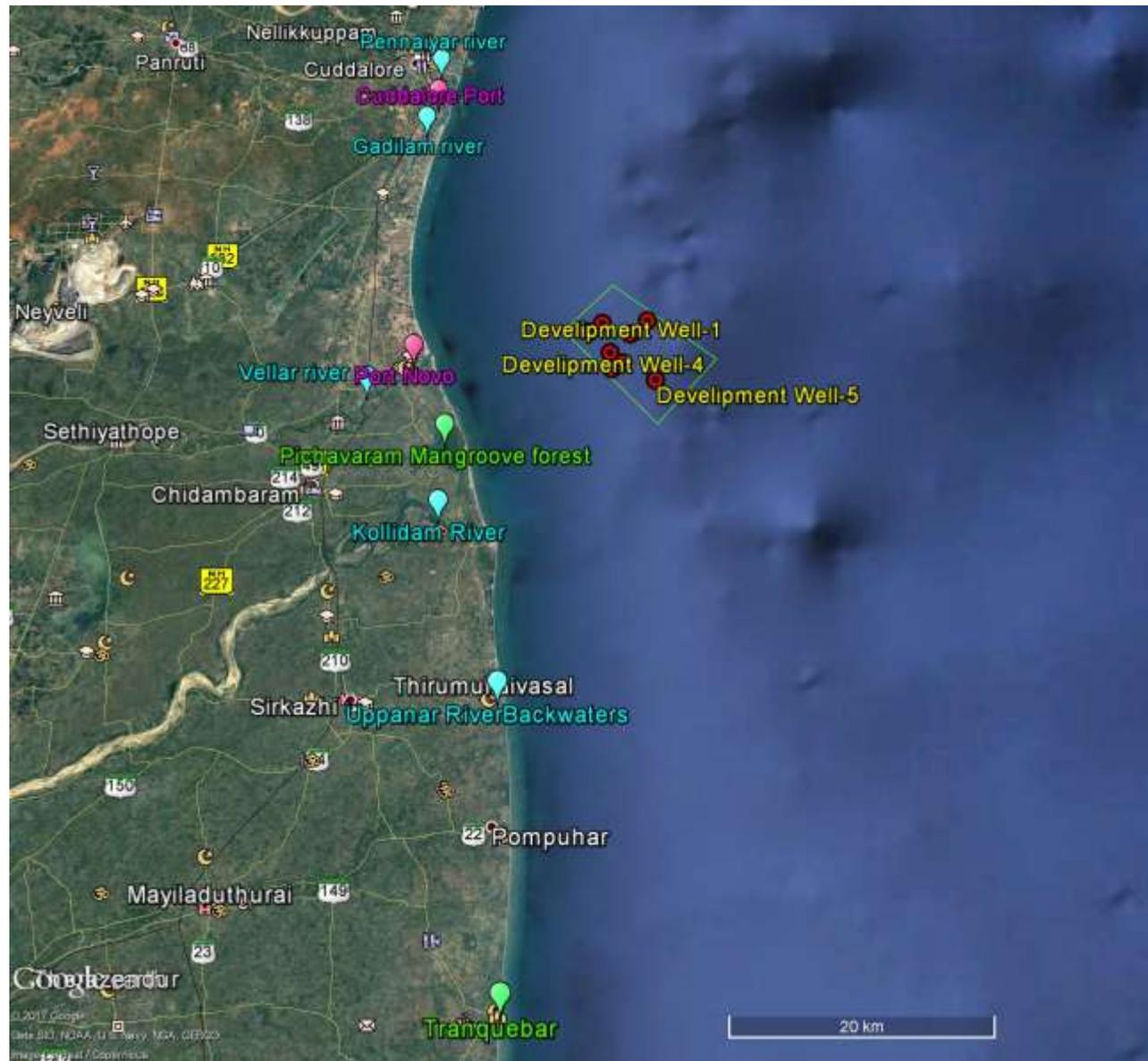
The project entails a very short duration, drilling activity, on the sea. Consequently, provision of social infrastructure is limited to the 90-100 persons staying on the rig for up to 60 days. Considering the same, the following social amenities are provided on the rig as per international standards:

- A small clinic is available with a registered medical practitioner in attendance
- A dedicated recreational area
- A canteen facility for personnel on board the rig

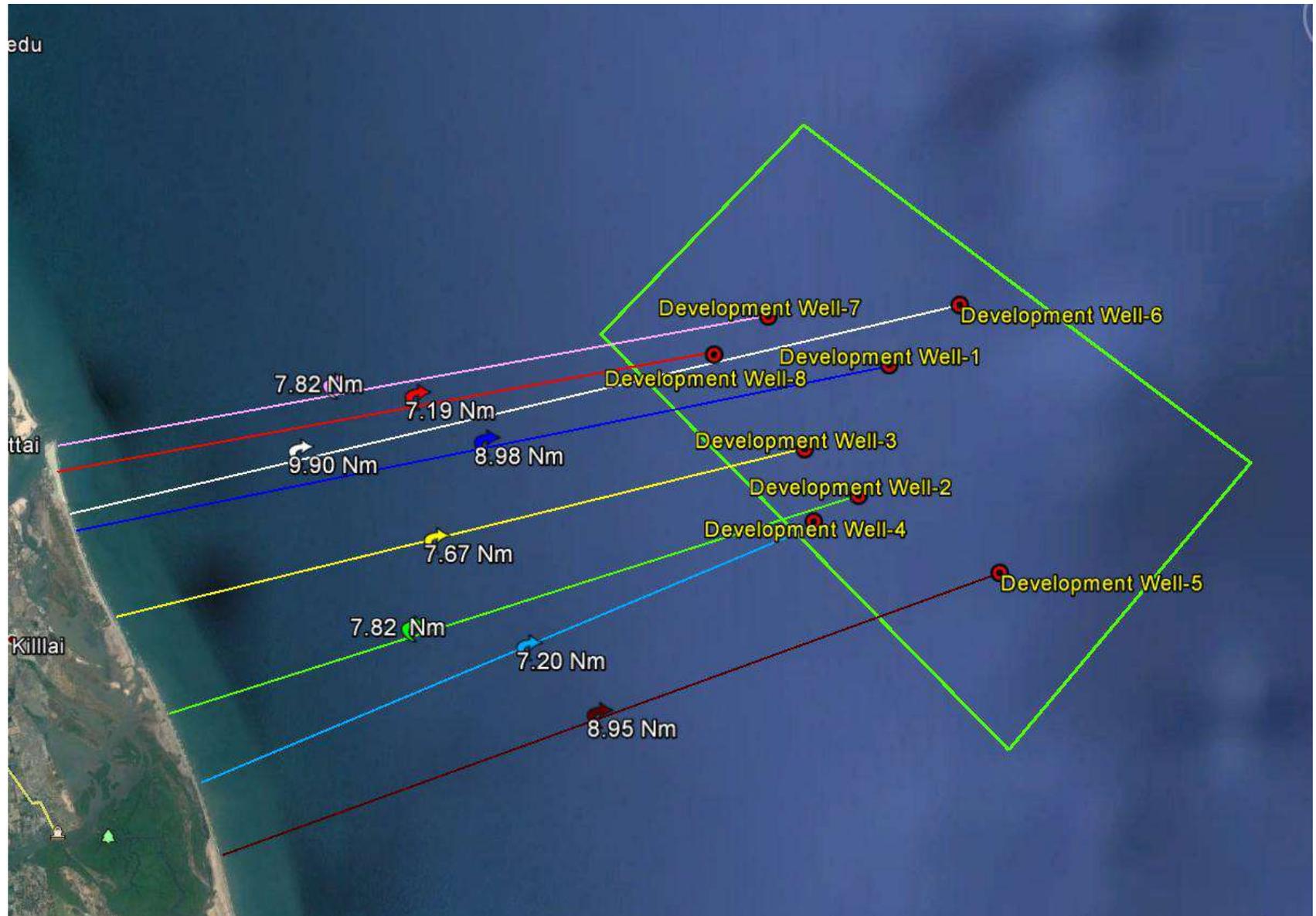
## 4.9 Sensitivity of the site

The sensitivity of the site is having the following things at proximity. Map is Provided as Figure 4. Well distances from shore is provided as Figure 5. CRZ Map is provided as Figure 6.

- Pichavaram Mangrove Forest 13 Km,s W
- Velloor River are at a distance 11.2 km's W
- Uppanar River Back Waters 25 Km's SW
- Port Nova 13 km's W
- Tranquebar 47km's S
- Pennaiyar River 25km's
- Cuddalore Port 23.3 Km's NW
- Kolidam River 20 Km's SW
- Gadilam River 18.0 Km's NW



**FIGURE 4: SENSITIVITY MAP**



**FIGURE 5: WELL DISTANCES FROM SHORE (in Nautical Miles)**



FIGURE 6: CRZ MAP

## 5.0 PLANNING BRIEF

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### 5.1 Planning Concept

- Type of Industry: Oil and Gas Exploration and Production
- Facilities: Drilling rig, drilling platform
- Transportation: through vessel and helicopter to and from the drilling rig
- Town and Country Planning Development Authority Classification: not applicable, since this is an offshore drilling project

### 5.2 Population Projection

There will be an increase of 100 people on the proposed area due to the drilling wells.

### 5.3 Land Use Planning

Not applicable since the project entails drilling of eight development well for a short duration.

### 5.4 Assessment of Infrastructure Demand (Physical & Social)

Existing infrastructure is adequate and with respect to the proposed project, consists of the following facilities:

- Port: Karaikal, for transfer of equipment using vessel, to the drilling rig. The port will be the nodal point for loading and unloading of materials onto the vessel
- Port: Cuddalore, alternate location for transfer of equipment
- Airport / Helipad: Chennai, and alternately at Pondicherry (helipad only)
- Roads leading to the Port: NH – 45 A, which is not congested, and is sufficient to carry any loads required for the project

## 5.5 Amenities/Facilities

The project entails drilling of eight development well in PY-1 Block, in coast of Tamil Nadu, no amenities or facilities are available within the study area of proposed project since it is entire lies in a marine area; however villages and towns near the shore have fairly good infrastructure and communication facilities.

## 6.0 PROPOSED INFRASTRUCTURE

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### 6.1 Industrial Area (Processing Area)

Not applicable since the project entails drilling of eight development well for a short duration.

### 6.2 Residential Area (Non – Processing Area)

Not applicable. Accommodation for the duration of the drilling would be provided on the rig.

### 6.3 Greenbelt

Not applicable. Accommodation for the duration of the drilling would be provided on the rig.

### 6.4 Social Infrastructure

The project entails a very short duration, drilling activity, on the sea. Consequently, provision of social infrastructure is limited to the 90-100 persons staying on the rig for up to 60 days. Considering the same, the following social amenities are provided on the rig as per international standards:

- A small clinic is available with a registered medical practitioner in attendance
- A dedicated recreational area
- A canteen facility for personnel on board the rig

### 6.5 Connectivity

Air and sea connectivity will be provided in the form of a helicopter and vessel stationed at the drilling rig. In the normal course, the helicopter will be used to transport personnel whilst the vessel would be used to transport materials.

**6.6 Drinking Water Management**

Provided in Section 3.8.

**6.6 Sewerage System**

Provided in Section 3.9.

**6.7 Drilling Waste Management**

All hazardous wastes shall be securely stored, under a shed for eventual transportation to the authorized TSDF, the solid domestic waste shall be stored within the premises temporarily and then sent to common solid waste disposal facility.

**6.7 Solid Waste Management**

Provided in Section 3.9.

**6.8 Power Requirement Supply and Source**

Provided in Section 3.8.

## 7.0 REHABILITATION AND RESETTLEMENT PLAN

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No rehabilitation and resettlement is either required or proposed for the project, considering the project involves drilling of eight wells in the existing offshore platform, off the coast of Southeast India.

## **8.0 PROJECT SCHEDULE AND COST ESTIMATES**

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### **8.1 Likely Start Date and Completion**

01st March 2018 and end date by August 2020

### **8.2 Estimated Project Cost**

The cost of the project is 260 Crores.

## 9.0 ANALYSIS OF PROPOSAL

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### 9.1 Financial and Social Benefits with special emphasis on the benefit to the local people including tribal population if any in the area

Critical analysis of the existing socio-economic profile of the area vis-à-vis its scenario with proposed project activities identifies the following:

- Due to decline in production from existing three wells on account of natural depletion; it is proposed to drill Eight wells from the existing offshore platform. This drilling program shall offset the loss of gas production
- Due to the replenishment of hydrocarbon production to the earlier levels, long-term employment opportunities already generated by the existing project would be sustained. Besides, the project will help in contributing to the ongoing efforts of the Government to meet the demand of crude oil and gas from domestic sources and thereby also help in saving foreign exchange resource.
- The proposed activities shall generate indirect employment in the region due to the requirement of workers in supply of raw material, auxiliary and ancillary works, which would marginally improve the economic status of the people.
- Further the additional benefits from the down stream units such as power plants also add value to the society.

Thus, it can be concluded on a positive note the proposed activities by HOEC will have overall beneficial impact and will continue to benefit the local community.