EXECUTIVE SUMMARY

ENVIRONMENTAL IMPACT ASSESSMENT STUDY FOR PROPOSED 9 MMTPA CAUVERY BASIN REFINERY AT NAGAPATTINAM, TAMIL NADU

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CPCL

CHENNAI PETROLEUM CORPORATION LIMITED

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इंजीनियर्स इंडिया लिमिटेड
(भारत सरकार का उपक्रम)
ENGINEERS INDIA LIMITED
(A Govt. of India Undertaking)

1.0 EXECUTIVE SUMMARY

The Executive Summary covers the following topics in brief:

1. Project Description
2. Description of Environment
3. Anticipated Environmental Impacts and Mitigation measures
4. Environmental Monitoring Program
5. Environment Management Plan
6. Additional studies
7. Project Benefits

1.1 PROJECT DESCRIPTION

Chennai Petroleum Corporation Limited (CPCL), a group company of Indian Oil Corporation Limited (IOCL) has planned to set up a grass root refinery of capacity 9 MMTPA in the land comprising of Panangudi, Narimanam, Gopurajapuram and Pattinacherry villages after dismantling the existing 1 MMTPA Cauvery Basin Refinery located in the land of Panangudi, Narimanam and Uthamacholapuram villages, Nagapattinam district, Tamil Nadu.

This new refinery which will produce the fuels of BS-VI specifications will be able to meet the growing demands of fuels in southern region and nearby location.

As part of the proposed setting up of the new refinery it is also planned to have a new dedicated SPM and Subsea Pipeline, which can be connected to Karaikal Port and proposed Cauvery Basin Refinery at Nagapattinam. Other than the above, a new dedicated Desalination plant, its intake and outfall offshore pipelines, onshore product pipelines are also envisaged as part for the project.

Total area requirement for Cauvery Basin Refinery is 1338.29 acres in Tamil Nadu and 6.33 acres in Karaikal region in Puducherry (for Pipeline corridor). The existing refinery area is 618.29 acres. Balance land of 726.33 acres (720 acres in TN & 6.33 acres in Karaikal) is under acquisition by CPCL. The estimated capital cost for the proposed project is Rs. 37540.44 Crores. The proposed project of is expected to be mechanically completed in 42 months from the Zero date (after receipt of Environmental Clearance).

As per the Ministry of Environment, Forests and Climate Change (MoEFCC), New Delhi, any new project or modernization or expansion project need to have an Environmental Clearance from MoEFCC. In accordance with this, CPCL has decided to conduct Environmental Impact Assessment (EIA) study. Based on the TOR, three months (12 weeks) non-monsoon baseline data of March-May, 2018 was collected and analyzed.

M/s CPCL has entrusted M/s Engineers India Limited (EIL) to carry out environment impact assessment study and preparation of environmental management plan for various environmental components of the proposed project. EIL is an accredited consultant for carrying out EIA studies by Quality Council of India for Petroleum refining industry [Sl. no. 4(a), Category A] as per 2006 EIA Notification].

1.1.1 Process Unit Description

The proposed process facilities with capacities as part of 9 MMTPA Cauvery Basin Refinery project are described below:

Table 1.1: Process Unit Capacities

Sl.No.	Process Units	Capacity KTPA
1	Crude Unit/ Vacuum Unit	9000
2	Naphtha Hydrotreater (NHT)	1500
3	Isomerisation Unit (ISOM)	570
4	Continuous Catalytic Regeneration Reformer Unit (CCR)	625
5	Diesel Hydrotreater (DHDT)	4500
6	VGO Hydrotreater Unit (VGO HDT)	3000
7	Indmax Fluidised Catalytic Cracker Unit (Indmax FCCU)	2673
8	Indmax Gasoline Desulphurisation Unit(Indmax GDS)	700
9	Octamax Unit	110
10	PolyPropylene UNIT (PPU)	475X1.15
11	Delayed Coker Unit (DCU)	2500
12	Hydrogen Plant	78
13	Sulfur Block	2 X 144
14	Straight Run (SR) LPG Treating Unit	255
15	Cracked LPG Treating Unit	1300
16	Fuel Gas and SR LPG Amine Treating Unit	Matching

Other associated facilities like Crude oil storage tanks, Intermediate product storage tanks, final product storage tanks, Utilities, various treatment plants will also come up inside the 9 MMTPA Refinery Complex.

As part of the proposed CBR project, it is also planned to have a new and dedicated Single Point Mooring (SPM) and Subsea Pipelines, which can be connected to the a new Crude Oil Terminal at CBR. The proposed SPM facility will be installed at approximately 19.5 km off Nagapattinam coast & the corresponding LFP has been proposed close to existing CPCL existing Jetty area.

Pipeline route options has been worked out for a total of 18 (Eighteen) nos. of pipeline i.e. 02 nos. of Crude Oil pipelines from SPM to Refinery through LFP, 8 nos. of product pipelines from CBR to Karaikal Port, 5 nos. of return pipelines from Karaikal Port to CBR, 02 nos. of raw water pipeline from Sea to refinery and one reject pipeline from CBR to Sea (with discharge at approximate 1m water depth location within sea). Pipeline sizes shall vary from 16” to 42” for Product pipelines, 48” for Crude Oil pipeline & 36”/ 60” for Raw Water pipelines.

The product pipelines shall run in 60 m common corridor from CBR to Karaikal Port with the crude oil, Raw Water and Reject Pipelines. Fom Karaikal Port to LFP, 5 nos. of pipeline (2 crude, 2 water intake and 1 reject) will run in 20 m common corridor.

The proposed SPM facility will be installed at approximately 19.5 km off Nagapattinam coast at an approximate depth of 32 m. The proposed crude oil pipelines system consists of 2 Nos. x 48" subsea pipelines from the PLEM underneath the proposed new CALM Buoy to the landfall point (LFP). Onshore pipeline network has been worked out for a total of 18 (Eighteen) nos. of pipeline i.e. 02 nos. of Crude Oil pipelines from SPM to refinery, 8 nos. of product pipeline from CBR to Karaikal Port, 5 nos. of pipeline from Karaikal Port to CBR, 02 nos. of water intake pipeline from sea to CBR and 01 no. of reject water pipeline.

1.2 EXISTING ENVIRONMENTAL STATUS

The description of the existing environmental status of the study area is summarized here. Baseline environmental data for Ambient air, Water, Soil, Noise, Traffic, Socio-economical and Biological environments have been collected for the period of March-May, 2018.

1.2.1 Air Environment

The Ambient Air Quality survey has been carried out at Five (5) locations within the study zone. Measurement of the actual, PM_{10}, $PM_{2.5}$, SO_2, NO_2, CO, HC (Methane and Non Methane Hydrocarbons) levels help to understand the existing environmental scenario.

PM_{10} (Particulate Matter)

During the monitoring period, it has been observed that the average values of PM_{10} for all the monitoring stations ranging from 46.0 to 78.0 µg/m^3 .The lowest value was observed as 46.0 µg/m^3 at Panangudi and the highest value was observed as 78.0 µg/m^3 at Panangudi. It can be observed that the 98th percentile values of all locations are well within the prescribed limits (NAAQS standard) of 100 µg/m^3.

$PM_{2.5}$ (Particulate Matter)

During the monitoring period, it has been observed that the average values of $PM_{2.5}$ for all the monitoring stations ranging from 24.0 to 46.0 µg/m^3. The lowest value was observed as 24.0 at Narimanam and the highest value was observed as 46.0 µg/m^3 Panangudi. The prime sources of $PM_{2.5}$ contribution are nearby industries as well as local domestic activities associated with residential areas, traffic or local construction. It can be observed that the 98th percentile values of all locations were found well below the standard value of 60 µg/m^3 for residential/rural areas of National Ambient Air Quality Standard.

SOx (Sulphur Dioxide)

During the monitoring period, the average concentration of SO_2 is ranging from 5.0 to 10.1 µg/m^3. The lowest value recorded was 5.0 µg/m^3 at Palaiyar and the highest value was 10.0 µg/m^3 at Thithachery. The 98th percentile values were found well below the standard (NAAQS standard) of 80 µg/m^3 for residential/rural areas.

NOx (Nitrogen Dioxide)

During the monitoring period, the average NO_2 concentration was within the ranging from 8.0 to 16.0 µg/m^3. The lowest value was observed as 8.0 µg/m^3 at Palaiyar and the highest value was observed as 16 µg/m^3 at Panangudi, which indicate the local

fluctuations in the vicinity and the industries at the site. The 98th percentile values at various stations were found within the prescribed limits (NAAQS standard) of 80 µg/m^3.

CO (Carbon Monoxide)

The average concentrations of CO ranging from 0.42 to 1.23 mg/m^3. Averaging the concentrations for the 5 stations showed, had the highest average (AM) concentration with 1.23 mg/m^3 at Thithachery. However these concentrations are still well within the prescribed standards (NAAQS standard) of 2.0 mg/m^3.

Hydrocarbons

Methane Hydrocarbons average concentrations values ranging from 0.11 to 1.74 ppm. Averaging the concentrations for the 5 stations showed, the highest and lowest average concentrations.

1.2.2 Water Environment:

In order to establish the status of water quality of the study area, 12 water samples (6 nos. Ground water and 6 nos. Surface water) were collected and analyzed for Physico-Chemical characteristics. The surface water source also includes 2 nos. sea water sample locations.

Ground Water Quality: The pH of the ground water samples varying from 7.18 to 8.02. Total dissolved solids (TDS) were found to be in the range of 402 to 692 mg/l. Hardness concentration was ranging from 222 to 378 mg/l for ground water samples. Chloride concentration were found to be in the range of 60 to 182 mg/l. Sulphates concentration was found to be in the range of 26 to 87 mg/l. Most of the sampled parameters are within prescribed IS 10500 limit.

Surface Water Quality: The pH of the surface water samples varying from 7.78 to 8.16. Total dissolved solids (TDS) were found to be in the range of 652 to 38858 mg/l. DO was observed in the range of 5.5 to 7.0 mg/l. Chloride concentration were found to be in the range of 164 to 22900 mg/l. Sulphates concentration was found to be in the range of 110 to 216 mg/l. BOD concentration were found to be in the range of 6 to 12 mg/l. COD concentration were found to be in the range of 18 to 39 mg/l. All surface water parameters in all samples (except the sea water samples) are well within the IS 2296 limit values.

1.2.3 Noise Environment:

Noise levels were monitored at 8 different locations within the study area. All the noise monitoring stations are located in the commercial areas. The ambient noise limit for residential area as per the noise pollution regulations is 65 dB and 55 dB in day time and night time respectively. Noise levels during day time were 52.4-64.4 dB and during night time was 40.2-55.6 dB. Noise levels measured at these places mostly (except one value) reported to be below the stipulated noise standards for commercial areas.

1.2.4 Soil Environment:

Soil samples were collected from 8 locations within the study area out of which one location falls within the proposed site area. The analysis results show that soil is basic in nature as pH value ranges from 6.94 to 7.82 with organic matter 1.08 % to 1.42 %. The concentration of Nitrogen, Phosphorus and Potassium has been found to be in good amount in the soil samples. Soil texture is clay to Sandy Loam.

1.2.5 Biological Environment:

The area falling under the 10 km radial distance is surrounded by both aquatic and terrestrial ecosystems. The study area is devoid of officially designated forest areas. Patches of littoral highly denuded and degraded coastal grass and scrub with occasional trees could be seen adjoining shoreline in some sections. The, remnant littoral forests trees is constituted of Thespesia populnea, Lannea coromandelica, Ficus religiosa, Ficus hispida, Calophyllum inophyllum, Morinda coreia, Syzygium cumini, Pongamia pinnata, Azadirachta indica, Borassus flabellifer, Vitex negundo, and Pandanus odoratissimus. In most areas, the natural forests are largely replaced by casuarinas, cashew (Anacardium occidentale) and coconut plantations. Other horticultural species including the palm (Borassus flabellifer) and a variety of fruit trees including jack.

The terrestrial as well as the aquatic habitats of the study area are highly modified man made habitats with only few patches of degraded natural habitats. Wildlife in these manmade habitats is those which are resilient to the human activities. Among mammals only few small carnivore such as terrestrial rodents (Tatera indica), have been reported. Among herpetofauna, Flapshell turtle (Lissemyspunctata), water snakes (Xenocrophispiscator, Cerberus rhyncops and Atretium schistosum), Dog-faced water snake (Cerberus rhynchops), and frogs (Bufo melanostictus, Polypedates maculatus, Hoplobatrachus crassus, Hoplobatrachus tigerinus, Euphlyctis cyanophlyctis, Euphlyctis hexadactylus, Limnonectes limnocharis, Microhyla ornata, Ramanella variegata, Kaloula taprobanica and Tomopternarolandae) have been reported. Waterfowl (storks, herons and egrets) were the most common birds in the backwater estuaries.

As per Ministry of Environment, Forest and Climate Change Notifications and local forest notifications, there are no wildlife/bird sanctuaries/national parks/ biospheres in 10-km radius from plant site.

1.2.6 Socio-economic conditions:

The socioeconomic aspects of the study area are assessed using Primary and Secondary data. Secondary data was also collected from published sources like, census data of 2011. The 10 km radius area falls under Nagapattinam district of Tamil Nadu and Karaikal district of Puducherry. The total population within 10 km radius of the plant as per 2011 census is 355983. SC population was about 20-50 % of total population and ST Population was <5 % of total population. Total workers were 35% of total population.

1.3 ANTICIPATED ENVIRONMENTAL IMPACTS

The environmental impacts associated with the proposed project during construction and operational phases of the project on various environmental components have been identified and are given in **Table 1.2**.

Table 1.2: Impact Identification Matrix

	Physical				Biological		Socio-economic	
Activities	**Ambient air quality**	**Ground / surface water (quantity / quality)**	**Ambient noise**	**Land (land use, topography & drainage, soil)**	**Flora**	**Fauna**	**Livelihood & occupation**	**Infrastructure**
CONSTRUCTION PHASE								
Site preparation	*		*	*	*	*	*	
Civil works	*		*			*		
Heavy equipment operations			*					
Disposal of construction wastes				*				
Generation/disposal of sewerage		*		*				
Transportation of materials	*		*					
OPERATION PHASE								
Commissioning of Process units, utilities and offsite	*	*	*					
Product handling and storage	*							
Emissions &Waste management – Air, liquid and solid waste	*	*		*				

Impacts have been assessed considering spatial, temporal, intensity and vulnerability scales and its overall significance value is given in Table 1.3.

Table 1.3: Impact Assessment Summary

Environmental component		**Construction**	**Operation**
Air		Low	Medium
Water	Consumption of Raw Water	Low	Medium
	Generation of Effluent	Low	Low
Land	Land use & Topography	Low	-
	Soil Quality	Low	Low
Noise		Low	Low
Biological		Low	Low
Socio-Economic		Low	Low

1.4 ENVIRONMENTAL IMPACT ASSESSMENT AND MITIGATION MEASURES

1.4.1 AIR ENVIRONMENT

Construction Phase

Impacts (Significance - Low)

- Dust will be generated from earth-moving, grading and civil works, and movement of vehicles on unpaved roads.
- PM, CO, NOx, & SO_2 will be generated from operation of diesel sets and diesel engines of machineries and vehicles.

Mitigation Measures

- Ensuring preventive maintenance of vehicles and equipment.
- Ensuring vehicles with valid Pollution under Control certificates are used.
- Implementing dust control activities such as water sprinkling on unpaved sites.
- Controlling vehicle speed on site

Operation Phase

Impacts (Significance - Medium)

The total SO_2 emission from refinery will be 22.3 TPD. The SO_2 GLC (maximum 24 hr Ground Level Concentration) due to operation of proposed is predicted as 41.3 μg/m3. Maximum 98 Percentile Baseline Value (within 10 km radius) is 9.72 μg/m3. The resultant SO_2 with ambient air quality concentration is estimated as 51.02 $\mu g/m^3$ which is well within the standard limits for 24 hourly average for industrial area i.e. 80 $\mu g/m^3$.

The NO_2 GLC (maximum 24 hr Ground Level Concentration) due to operation of proposed is predicted as 35 μg/m3. Maximum 98 Percentile Baseline Value (within 10 km radius) is 15.08 μg/m3. The resultant NO_2 ambient air quality concentration is estimated as 50.58 μg/m3 which is less than which is well within the standard limits for 24 hourly average for industrial area i.e. 80 $\mu g/m^3$.

Mitigation measures

- Ensuring preventive maintenance of equipment.
- Regular monitoring of air polluting concentrations.

1.4.2 WATER ENVIRONMENT

Construction Phase

Impacts (Significance – Low)

- The effluent streams will be generated regularly that will comprise of Sewage, grey water from site area and washing water for vehicle and equipment maintenance area.

Mitigation Measures

- Monitoring water usage at work sites to prevent wastage.

Operation Phase

Impacts (Significance – Medium)

- For proposed project, source of raw water will be desalinated water from Desalination Plant located inside the CBR complex. Total Raw water demand for the project is estimated to be 3300 m3/hr which will be met from desalinated sea water.

- A new Effluent Treatment Plant is envisaged for treating liquid effluents (550 m3/h) generated in refinery complex. The effluent generated inside the complex includes Oily Effluent streams, spent caustic and sanitary effluent. Treated ETP effluents shall be recycled through RO plant and reused as DM water. Desalination plant reject water (5563 m3/h; TDS: 63700 ppm) along with treated ETP effluent (360 m3/h) shall be disposed off to sea.

Mitigation Measures

- All effluents will be treated & recycled. Reject of desalination plant shall be disposed off to sea after meeting requisite disposal standard.

1.4.3 NOISE ENVIRONMENT

Construction Phase

Impacts (Significance – Low)

- Noise generation due to operation of heavy equipment and machinery, movement of heavy vehicles in site preparation and civil works.

Mitigation Measures

- Ensuring preventive maintenance of equipments and vehicles.

Operation Phase

Impacts (Significance – Low)

Noise level measurements were carried out in day and night times at numerous locations around the existing operating units within the refinery. No additional impact is envisaged.

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Mitigation Measures

- Avoiding continuous (more than 8 hrs) exposure of workers to high noise areas.
- Provision of ear muffs at the high noise areas
- Ensuring preventive maintenance of equipment.

1.4.4 LAND ENVIRONMENT

Construction Phase

Impacts (Significance – Low)

- Generation of debris/construction material, but being the modifications limited to existing area, the generation of such waste shall be minimal.

Mitigation Measures

- Restricting all construction activities inside the project boundary.
- Ensuring any material resulting from clearing and grading should not be deposited on approach roads, streams or ditches, which may hinder the passage and/or natural water drainage.
- Developing project specific waste management plan and hazardous material handling plan for the construction phase.

Operation Phase

Impacts (Significance – Low)

- There will be primarily four types of solid wastes generated: Spent Catalysts, ETP Sludges, General Solid Wastes and Tank Bottom Sludge.

Mitigation Measures

- Some of the spent catalysts will be sent back to the original supplier for reprocessing. The other catalysts are normally sent to a secured landfill.
- The oily sludge from ETP will be sent to secured landfill. The bio sludge will be reused as manure.
- Approximately 1500 MT/year of non-hazardous, non-recyclable solid waste consisting of waste refractory, spent insulation, decoking solid waste from CDU/VDU, used filter cartridges, spent charcoal, spent clay and sand will be generated. These wastes will be disposed off in landfill.
- For Tank Bottom Sludge 'Tank form management system' will be adopted. The tank bottom sludge will be bio-remediated or disposed off in landfill.
- A secured land fill facility is envisaged inside the complex for temporary handling/storage purpose and after that hazardous wastes shall be disposed off in nearby authorized landfill facility.

1.4.5 BIOLOGICAL ENVIRONMENT

Construction Phase

Impacts (Significance –Low)

- The impact of construction activities on fauna will be insignificant due to proposed construction activities are within proposed plant.

Mitigation Measures:

- Closing of trenches as soon as possible of construction.
- Prevent littering of work sites with wastes, especially plastic and hazardous waste.
- Training of drivers to maintain speed limits.
- Development of green belt during construction phase.

Operation Phase

Impacts (Significance – Low)

- The impacts due to proposed project activities during operation phase shall be insignificant due to minimal additional air emissions.

Mitigation measures

- Maintain the greenbelt already developed

1.4.6 SOCIO-ECONOMIC ENVIRONMENT

Construction Phase

Impacts (Significance – Low)

- Generation of temporary employment of very substantial number of personnel. The average temporary manpower requirement will be 500 people during first year and 1500 people during next two years.
- Transport requirements will arise during the construction phase due to the movement of both the personnel and materials.

- An impact on basic necessities like shelter, food, water, sanitation and medical facilities for the temporary workers and truck drivers.
- The majority of skilled and unskilled laborers are available in the impact area itself, the incremental effect on housing during the construction phase will be minimal.

Mitigation measures

- Conducting awareness programs for workers.
- Determining safe, legal load limits of all bridges and roads that will be used by heavy vehicles and machinery.
- Determining allowable traffic patterns in the affected area throughout the work week will be made based on community use, include a consideration of the large turning.
- Providing prior notice to affected parties when their access will be blocked, even temporarily.
- Preventing use of drugs and alcohol in project-sites.
- Preventing possession of firearms by project-personnel, except those responsible for security.

Operation Phase

Impacts (Significance – Low)

- Employment generation, effects on transport and other basic infrastructure.
- Employment of approximately 304 persons directly and around 1000 persons indirectly is envisaged during operation phase.
- Transport requirements will arise due to the movement of both the personnel and materials.

Mitigation measures

- Extending reach of CSR/CER Program.
- Monitoring speed and route of project-related vehicles.

1.5 ENVIRONMENTAL MANAGEMENT PLAN AND MONITORING PROGRAM

Considering all measures suggested above, cost is worked out for implementation of environmental management plan and is given in **table 1.4 & 1.5**. The total estimated budget for implementation of EMP is worked out as Rs. 16290 Lakhs towards capital cost and Rs. 195 Lakhs towards recurring cost per annum.

Table 1.4: BUDGET OF ENVIRONMENTAL MANAGEMENT PLAN (Capital Cost)

Sl. No.	Activity	Amount allocated
		(Rupees in Lakhs)
1.0	**Air Environment**	
1.1	Plantation Activities (Trees and Shrubs)	**300.0**
1.2	Air quality monitoring	**30.0**
1.3	Online Air Quality Analysers	**500.0**
2.0	**Noise Environment**	
2.1	Additional Plantation Activities	Included in 1.1
2.2	Audiometric tests	**10.0**
3.0	**Water Environment**	
3.1	Rain water Harvesting pits	**100.0**
3.2	New Packaged STP	**100.0**

3.3	ETP and Recycle Plant	**15000.0**
4.0	**Land Environment**	
4.1	Additional Plantation Activities	Included in 1.1
4.2	Solid waste management	**50.0**
5.0	**Biological Environment**	
5.1	Additional Plantation Activities	Included in 1.1
6.0	**Marine Environment**	
6.1	Shoreline monitoring & Oil spill management	**200**
	Budget for EMP (Capital Cost)	**16290.0**

Table 1.5: BUDGET OF ENVIRONMENTAL MANAGEMENT PLAN (Recurring Cost per Annum)

Sl. No.	Activity	Amount allocated
		(Rupees in Lakhs)
1.0	**Air Environment**	
1.1	Additional Plantation Activities (Trees and Shrubs)	**30.0**
1.2	Air quality monitoring	**20.0**
1.3	Online Air Quality Analysers	**20.0**
2.0	**Noise Environment**	
2.1	Additional Plantation Activities	Included in 1.1
2.2	Audiometric tests	**1.0**
3.0	**Water Environment**	
3.1	Rain water Harvesting pits	**5.0**
3.2	Additional storage tank for treated wastewater and distribution network	**5.0**
3.3	Maintenance of ETP & STP	**50.0**
4.0	**Land Environment**	
4.1	Additional Plantation Activities	Included in 1.1
4.2	Solid waste management	**4.0**
5.0	**Biological Environment**	
5.1	Additional Plantation Activities	Included in 1.1
6.0	**Marine Environment**	
6.1	Shoreline monitoring & Oil spill management	**60**
	Budget for EMP (Recurring Cost per Annum)	**195.0**

An area of 33.5 % (i.e. 436.5 acres) of the total plot area (of 1303 acres) will be earmarked for green cover/belt development. EIL has made a detailed greenbelt plan and suggested plant species for plantation purpose. CPCL will plant and look after the planted species taking suggestions of appropriate consultant for greenbelt development.

1.6 ADDITIONAL STUDIES

1.6.1 RAPID RISK ASSESSMENT (RRA)

RRA study evaluates the consequences of potential failure scenarios, assess extent of damages, based on damage criteria's and suggest suitable measures for mitigating the Hazard.

RRA involves identification of various potential hazards & credible or reasonably believable failure scenarios for various units based on their frequency of occurrence & resulting consequence. Basically two types of scenarios are identified spanning across various process facilities; Cases with high chance of occurrence but having low consequence, e.g., Instrument Tapping Failure and cases with low chance of occurrence but having high consequence, e.g., Catastrophic Rupture of Pressure Vessels / Large Hole on the outlet of Pressure Vessels. Effect zones for various outcomes of failure scenarios (Flash Fire, Jet Fire, Pool Fire, Blast overpressure, toxic release, etc.) are studied and identified in terms of distances on plot plan. Based on effect zones, measures for mitigation of the hazard/risk are suggested.

1.6.1.1 Major Observations & Recommendations:

The detailed consequence analysis of release of hydrocarbon in case of major credible scenarios are modeled in terms of release rate, dispersion, flammability and toxic characteristics, which have been discussed in detail in the report. The major findings and recommendations arising out of the Rapid Risk Analysis study are summarized below:

- Consequence modeling of various credible scenarios for CDU/VDU Block is carried out and it is observed that the Cooling Towers present on the eastern side of the unit & adjacent MS Block unit may get affected from Radiation & Explosion effects emanating from the unit, depending upon the prevalent wind conditions & ignition source encountered at the time of release.

  It is recommended to install Fire & Gas detectors at suitable location within the unit. Utilize Low frequency failure scenarios such as 50 mm leak scenarios for preparation of Emergency Response & Disaster Management Plan.

- Flammable & Toxic failure scenarios are modeled for NHT, CCR & ISOM and their Explosion, Radiation & Toxic effects are studied. It is observed that the adjacent Tank Farm, CDU/VDU, SRR-2 and S/S-2 may get affected on account of leakage scenarios (Explosion & Radiation effects) from these units, depending upon the equipment location in the unit and prevalent weather conditions at the time of release. Moreover, H_2S, Benzene & Toluene IDLH (Immediately Dangerous to Life or Health) concentration from toxic failure scenarios may also affect operators present in these plants and may extend up to CDU/VDU, Offsite area, SRR-2, S/S-2, SRR-1, S/S-1 and S/S-11. In the event of 20 mm leak from NHT stripper reflux pump, the IDLH concentration of H_2S may reach up to 217 m leak source and it may cross Refinery compound wall towards North West side depending upon the prevalent weather conditions at the time of release and equipment locations within unit.

It is recommended to maintain at least 217 m distance between NHT Stripper Reflux Pump and Refinery Compound Wall while finalizing equipment layout during detailed engineering stage.

It is recommended to make SRR-2 & SRR-1 positive pressurized with HC, H_2S detectors at inlet of HVAC duct which shall close inlet damper on actuation of HC/H_2S detector.

It is also recommended to install Fire & Gas (Flammable & Toxic) detectors at strategic locations within these units along with remotely operated isolation valves for inventory isolation in the event of any leakage. Utilize low frequency failure scenarios such as 50 mm leak *scenarios for preparation of Emergency Response & Disaster Management Plan.*

- Flammable & Toxic failure scenarios are modeled for the DHDT Unit, it is observed that affect zones arising out of the high & low frequency credible scenarios for HP & Toxic sections of the DHDT shall cross the unit B/Ls and may affect the nearby VGO HDT, INDMAX GDS, LPG Treating Unit (Train II), Offsite area, OMS Control Room 6, SRR-4, S/S-4, SRR-5 and S/S-5 depending upon the prevalent weather conditions at the time of release and equipment locations within unit.

  It is recommended to make OMS Control Room 6, SRR-4 and SRR-5 positive pressurized with HC & H_2S detectors at inlet of HVAC duct which shall close inlet damper on actuation of HC/H_2S detector.

  It is recommended to install Fire & Gas (Flammable & Toxic) detectors at strategic locations within unit along with remotely operated isolation valves for inventory isolation in the event of any leakage. Utilize low frequency failure scenarios such as 50 mm leak scenarios for preparation of Emergency Response & Disaster Management Plan.

- Various credible leak scenarios are modeled for the VGO-HDT unit and it is observed that Radiation, Explosion & Toxic effect zones may cross the B/Ls of the unit. H_2S IDLH concentration in the event of 20 mm Leak at LPG Product Pump discharge circuit may affect nearby DHDT, INDMAX GDS, INDMAX, OCTAMAX, CDU/VDU, MS Block, LPG Treating Unit (Train II), Offsite area , OMS Control Room 6, OMS Control Room 5, SRR-1, S/S-1, SRR-4, S/S-4, SRR-3, S/S-3, SRR-5, S/S-5, SRR-2 & S/S-2 and it may cross Refinery compound wall depending upon the equipment location & prevalent weather conditions at the time of the release.

It is recommended to maintain at least 450 m distance between LPG product pump and Refinery Compound Wall while finalizing equipment layout during detailed engineering stage.

It is recommended to make OMS Control Room 6, OMS Control Room 5, SRR-1, SRR-2, SRR-3, SRR-4 and SRR-5 positive pressurized with HC & H_2S detectors at inlet of HVAC duct which shall close inlet damper on actuation of HC/H_2S detector.

It is recommended to install Fire & Gas (Flammable & Toxic) detectors at strategic locations within the unit along with remotely operated isolation valves for inventory

isolation in the event of any leakage. Utilize low frequency failure scenarios such as 50 mm leak scenarios for preparation of Emergency Response & Disaster Management Plan.

- Toxic Scenarios are modeled for the SRU / ARU(1 & 2)/ SWS (1&2) and it is observed that the H2S IDLH concentration may cross the unit's B/Ls and affect the nearby facilities and personnel present, depending upon the prevalent weather conditions at the time of the release.

  Hence, it is recommended to install Toxic gas detectors at strategic locations within the unit along with remotely operated isolation valves for inventory isolation in the event of any leakage. The outcomes of these scenarios to be also utilized for preparation of Emergency Response & Disaster Management Plan.

- Flammable scenarios are modeled for PPU and it is observed that the hazard effect zone may cross the unit's B/L and may affect the nearby facilities depending upon the prevalent weather conditions at the time of the release.

  Hence it is recommended to install HC gas detectors at strategic locations within the unit.

- Various credible Flammable & Toxic failure scenarios are modeled for the DCU and it is observed that Radiation & Explosion effect zones may cross the unit's B/L and may affect Control Room-8 (Circulating Fluidized Bed Combustion Boiler), Control Room-3 (Air & N2 Plant) and SRR-6 (DCU & PPU). H_2S IDLH concentration in the event of 20 mm Leak at WGC discharge, Stripper Charge Pump and LPG Product Pump discharge circuit may affect HGU, CFBC, PPU, Polymer Lab, PP Ware House, Cooling Tower, Air & N2 Plant, SRR-1, S/S-6, SRR-8, S/S-7, S/S-16, SRR-6, Control Room-3 (Air & N2 Plant), Control Room-8 (CFBC) and it may cross the Refinery Compound Wall, depending upon the operating conditions, prevalent weather conditions at the time of release.

  Hence it is recommended to relocate DCU unit or toxic handling section of DCU in such a way that the IDLH contours of H_2S are contained within the facility.

  Hence it is recommended to relocate the Control Room-8 (CFBC), Control Room-3 (Air & N2 Plant) to alternate safe location to safeguard the persons. Ensure that SRR--6 (DCU & PPU) shall be made blast resistant.

  It is recommended to make Control Room-8 (CFBC), Control Room-3 (Air & N2 Plant), Polymer Lab, SRR-1, SRR-8 and SRR-6 (DCU & PPU) positive pressurized with HC & H_2S detectors at inlet of HVAC duct which shall close inlet damper on actuation of HC/H_2S detector.

  It is also recommended to install Fire & Gas (Flammable & Toxic) detectors at strategic locations within the unit along with remotely operated isolation valves for inventory isolation in the event of any leakage. Utilize low frequency failure scenarios such as 50 mm leak scenarios for preparation of Emergency Response & Disaster Management Plan.

- Credible Failure scenarios are modeled for the INDMAX FCC unit and it is observed that affect zones (Flammable & Explosion) arising out of the high & low frequency credible scenarios may cross the unit B/Ls and may affect the nearby units, depending upon the prevalent weather conditions at the time of release and equipment locations within unit.

  It is recommended to install Fire & Gas detectors at suitable location within the unit. Utilize Low frequency failure scenarios such as 50 mm leak scenarios for preparation of Emergency Response & Disaster Management Plan.

- Flammable scenarios are modeled for Hydrogen Generation Unit (HGU), it is observed that the consequence outcomes for the Naphtha handling section of the unit may cross the unit's B/L and affect the nearby offsite area and CFBC, depending upon equipment location & prevalent weather conditions at the time of the release.

  It is recommended to install Fire & Gas detectors at suitable location within the unit. Utilize Low frequency failure scenarios such as 50 mm leak scenarios for preparation of Emergency Response & Disaster Management Plan.

- Various credible leak scenarios are modeled for the INDMAX GDS unit and it is observed that Radiation, Explosion & Toxic effect zones may cross the B/Ls of the unit. Benzene IDLH concentration in the event of 20 mm Leak at MCN Splitter Reflux Pump discharge circuit may affect nearby DHDT, VGO HDT, LPG Treating Unit (Train II), Offsite area, OMS Control Room 5, SRR-4, SRR-5, S/S-5, SRR-2 depending upon the equipment location & prevalent weather conditions at the time of the release.

  It is recommended to make OMS Control Room 5, SRR-2, SRR-4 and SRR-5 positive pressurized with HC detectors at inlet of HVAC duct which shall close inlet damper on actuation of HC/H_2S detector.

  It is recommended to install Fire & Gas detectors at strategic locations within the unit along with remotely operated isolation valves for inventory isolation in the event of any leakage. Utilize low frequency failure scenarios such as 50 mm leak scenarios for preparation of Emergency Response & Disaster Management Plan.

- Credible Flammable & Toxic scenarios are modeled for the LPG Amine Treating Unit and it is observed that the hazard effect zone may cross the unit's B/L and may affect the nearby facilities depending upon the prevalent weather conditions at the time of the release.

  Hence it is recommended to install HC/H_2S gas detectors at strategic locations within the unit.

- Flammable scenarios are modeled for the LPG Treating Unit (Train I & II) and it is observed that the hazard effect zone may cross the unit's B/L and may affect the nearby facilities depending upon the prevalent weather conditions at the time of the release.

  Hence it is recommended to install HC gas detectors at strategic locations within the unit.

- Toxic scenarios are modeled for the FGTU unit and it is observed that the H_2S IDLH concentration may cross the unit's B/L and affect the nearby CDU/VDU, MS block, CWTP, Offsite area, S/S-2, S/S-1, SRR-1, MCR-1, S/S-8 and SRR-9 depending upon the prevalent weather conditions at the time of the release.

  It is recommended to make SRR-1, MCR-1, and SRR-9 positive pressurized with HC & H_2S detectors at inlet of HVAC duct which shall close inlet damper on actuation of HC/H_2S detector.

  It is also recommended to install Toxic gas detectors at strategic locations within the unit.

- Credible Failure scenarios are modeled for the OCTAMAX unit and it is observed that affect zones (Flammable & Explosion) arising out of the high & low frequency credible scenarios may cross the unit B/Ls and may affect the nearby units, depending upon the prevalent weather conditions at the time of release and equipment locations within unit.

  It is recommended to install Fire & Gas detectors at suitable location within the unit. Utilize Low frequency failure scenarios such as 50 mm leak scenarios for preparation of Emergency Response & Disaster Management Plan.

- Flammable failure scenarios are modeled for the hydrocarbon Pumps in the Offsite and it is observed that Radiation & Explosion effects may affect the nearby Storage Tanks.

  Hence it is recommended to provide the Fire & Gas detectors at strategic locations in the Offsite pump houses with adequate fire protection system for tankages & pump houses.

- Tank on fire case modeled for storage tanks and it is observed that the Radiation effects may affect the nearby storage tanks and flare trestle. In case of tank on fire in TF-16, TF-18, TF-20, TF-9, and TF-12, 8 kW/m2 radiations from one tank may affect next immediate Tank located in the same tank TF and, possibly resulting in their failure.

  Hence it is recommended to increase the distance between TF-8 dyke wall and supports of Flare trestle further by 15m to prevent damage of flare trestle supports due to any accidental pool fire in TF-8 dyke.

  It is recommended to increase the inter distance between the tanks located TF-16, TF-18, TF-20, TF-9, and TF-12 or provide adequate fire fighting protective devices to prevent further escalation.

- Credible Failure scenarios are modeled for Pipeline Terminal and it is observed that affect zones (Flammable & Explosion) arising out of the high & low frequency credible scenarios may affect SRR-16, S/S-20, depending upon the prevalent weather conditions at the time of release and equipment locations within unit.

Hence it is recommended to make SRR-16 blast resistant building. It is recommended to install Fire & Gas detectors at suitable location within the terminal. Utilize Low frequency failure scenarios such as 50 mm leak scenarios for preparation of Emergency Response & Disaster Management Plan.

- Credible Failure scenarios are modeled for LFP and it is observed that affect zones (Flammable & Explosion) arising out of the high & low frequency credible scenarios may cross the facility B/Ls and may affect the nearby population and temple, depending upon the prevalent weather conditions at the time of release and equipment locations within unit.

  Hence it is recommended to locate the Booster Pump discharge & associated facility such that hazard distance of 128 m is not reaching to the populated area in the village and nearby temple.

  It is recommended to install Fire & Gas detectors at suitable location within the facility with provision for isolating inventory in case of detection of any leakage. Utilize Low frequency failure scenarios such as 50 mm leak scenarios for preparation of Emergency Response & Disaster Management Plan.

- In case of 20 mm leak of MS from pipeline, it is observed that LFL may reach up to a distance of 95 m from leak source. However, this appears to have a very low likelihood of occurrence as far as the pipeline under study is considered, since it will run underground all over its length. The major contribution of pipeline leaks can be attributed to third-party interference – digging, ploughing or tampering.

  It is advisable to maintain at least 95 m distance from any nearby habitation / village / any other manned facility along the pipeline route.

  In view of this; it is therefore recommended that regular inspections be undertaken in the vicinity of the pipeline, along its length, so that all third party activity in the area may be obviated or curtailed before harm ensues from the same.

  The major contribution of pipeline ruptures or large holes (50mm) can be attributed to third-party interference – digging, ploughing or tampering. Though the possibility of rupture of a pipeline is remote, but the consequence distances are high. Regular inspection of the pipeline is the sole way to forestall such a problem. And also it is recommended to include the scenario of pipeline rupture/ large hole scenarios in disaster management plan.

- Various credible scenarios are modeled for Karaikal Port Terminal and it is observed that the hazard effect zone may cross the terminal B/L and may affect the nearby facilities depending upon the prevalent weather conditions at the time of the release. In case of 20 mm leak from MS pipeline, it is observed that the 5 & 3 psi blast wave may reach up to a distance of 104 m and 113 m respectively from leak source.

  Hence it is recommended to maintain a buffer zone of 113 from Terminal pipeline and associated equipments. Safety distances to be reverified based upon finalized plot plan during detail engineering.

It is recommended to install Fire & Gas detectors at suitable location within the facility with provision for isolating inventory in case of detection of any leakage. Utilize Low frequency failure scenarios such as 50 mm leak scenarios for preparation of Emergency Response & Disaster Management Plan.

General Recommendations

- ✓ Detailed Quantitative Risk Analysis needs to be carried out for entire facility for overall risk assessment.
- ✓ No Operator Cabin to be located inside battery limits of units. Detailed QRA required to be carried out prior to fixing the location of any Operator Cabin in the close vicinity of Process units.
- ✓ For positively pressurized building, both Hydrocarbon & Toxic detectors need to be placed at suction duct of HVAC. HVAC to be tripped automatically in event of the detection of any Hydrocarbon / toxic material by detector.
- ✓ In order to prevent secondary incident arising from any failure scenario, it is recommended that sprinklers and other protective devices provided on the tanks to be regularly checked to ensure that they are functional.
- ✓ Proper checking of contract people for Smoking or Inflammable materials to be ensured at entry gates to avoid presence of any unidentified source of ignition.
- ✓ It shall be ensured that all the vehicles entering the plant shall be provided with spark arrestors at the exhaust.
- ✓ The critical operating steps shall be displayed on the board near the location where applicable.
- ✓ Mock drills to be organized at organization level to ensure preparation of the personnel's working in premises for handling any hazardous situation.
- ✓ Active fire protection system shall be provided throughout the plant for preventing escalation of fire.
- ✓ Recommended to use portable HC/H_2S detector during sampling and maintenance etc.
- ✓ It is recommended for usage of safer oxidizing agents (Chlorine free) in Cooling Water circuit.
  - ✓ Line patrolling: Line patrolling is a visual inspection of the pipeline along the whole of its length. It involves verification of:
  - General condition of the pipeline.
  - Any breaches and soil erosion along the route of the pipeline, especially earth washed out at road and channel crossings.
  - Growth of vegetation, which needs to be curtailed to ensure the free movement of vehicles to attend to any incident.
  - All digging, ploughing and dredging in the vicinity of the pipeline, which may damage the pipeline.
  - General condition of the cathodic protection at various locations.

Mitigating Measures

Mitigating measures are those measures in place to minimize the loss of containment event and, hazards arising out of Loss of containment. These include:

- ✓ Early detection of an undesirable event (HC/ toxic leak, Flame etc.) and development of subsequent quick isolation mechanism.
- ✓ Measures for controlling / minimization of Ignition sources inside the operating area.
- ✓ Active and Passive Fire Protection for critical equipment's and major structures
- ✓ Effective Emergency Response plans to be in place

Ignition Control

- ✓ Ignition control will reduce the likelihood of fire events. This is the key for reducing the risk within facilities processing flammable materials. As part of mitigation measure it is strongly recommended to consider minimization of the traffic movement in the vicinity of operating area.

Escape Routes

- ✓ Ensure sufficient escape routes from the site are available to allow redundancy in escape from all areas.
- ✓ Ensure sufficient number of windsocks throughout the site to ensure visibility from all locations. This will enable people to escape upwind or crosswind from flammable / toxic releases.
- ✓ Provide sign boards marking emergency/safe roads to be taken during any exigencies.

Preventive Maintenance for Critical Equipment

- ✓ In order to reduce the failure frequency of critical equipment, the following are recommended:

a. High head pumps and Compressors, which are in flammable/ toxic services, are needed to be identified.
   i. Their seals, instruments and accessories are to be monitored closely
   ii. A detailed preventive maintenance plan to be prepared and followed.

b. High inventory vessels whose rupture may lead to massive consequences are needed to be identified and following to be ensured:
   i. Monitoring of vessel internals during shut down.
   ii. A detailed preventive maintenance plan to be prepared and followed.
   iii. Emergency inventory isolation valves shall be provided for vessel/column having large inventory and containing flammable/ toxic compound.

1.6.2 MARINE IMPACT ASSESSMENT (MIA) STUDY

As part of this proposed project, it has also planned to setup following associated facilities:

i) Single Point Mooring (SPM)
ii) Pipeline End Manifold (PLEM)
iii) Subsea pipeline connected to PLEM
iv) Desalination Plant with intake and outfall pipeline

Single Point Mooring connected with offshore pipelines and Pipeline End Manifold to facilitate Crude Oil Import and product evacuation. In order to meet the water requirement for the proposed unit, a desalination plant of 79.2 MLD capacity with seawater intake and brine reject outfall is also proposed.

Single Point Mooring (SPM) and Pipeline End Manifold (PLEM) is proposed in Bay of Bengal at 20 km offshore at water depth of about 32 m CD for handling VLCC (Very Large Crude Carrier). Through crude oil transfer system, cargo will be transported to PLEM. PLEM connected with subsea pipelines will transfer the crude oil to crude oil tanks in Refinery.

In order to meet the water requirement for the new refinery unit, Sea Water Reverse Osmosis (SWRO) Desalination plant of 79.2 MLD capacity with intake and outfall pipeline is also planned.

Development of these facilities requires prior Coastal Zone Regulation (CRZ) and Environmental Clearance (EC) from TNCZMA (Tamil Nadu Coastal Zone Management Authority), PCZMA (Puducherry Coastal Zone Management Authority) and MoEFCC respectively. In order to meet this statutory requirement, Marine Environmental Impact Assessment study has been taken up by Indomer Coastal Hydraulics (P) Ltd., Chennai.

Field studies were undertaken during January 2019 representing the post monsoon. Marine EIA and EMP studies carried out during January 2019 (Post monsoon) for the proposed development of Single Point Mooring, Pipeline End Manifold, Subsea pipelines and Desalination Plant.

1.6.2.1 Description of the Marine Environment

The baseline data on marine environment had been collected in January 2019. The seawater samples, seabed sediment samples and biological parameters were collected covering 15 km project radius. Also, sampling close to SPM location (22 km offshore) has been carried out. The water quality parameters were analyzed in Indomer in-house laboratory, Chennai which is accredited by National Accreditation Board for Laboratory (NABL). The following parameters were studied:

Physical parameters: Wind, Waves, Tides, Currents, Bathymetry, Rainfall and Storm.

Water quality parameters: Color, Temperature, pH, Salinity, Turbidity, Total Suspended Solids, Total Dissolved Solids, Dissolved Oxygen, Bio-Chemical Oxygen Demand, Ammonia-N, Nitrite-N, Nitrate-N, Total Nitrogen, Phosphorous, Chloride, Sulphate, Fluoride, Cadmium, Chromium, Lead, Mercury, Selenium, Phenolic Compounds, Oil & Grease and Total Petroleum Hydrocarbons.

Sediment quality parameters: Sediment structure, Total Phosphorous, Total organic carbon, Total Nitrogen, Total Phosphorous, Calcium carbonate, Cadmium, Chromium, Lead, Mercury, Phenol and Total Petroleum Hydrocarbon.

Marine ecology and biodiversity: *Plankton, Benthos, Microbial population, Coastal vegetation, Seaweeds and Sea grasses, Mangroves, Coral reefs, Protected area, Crustacea, Mollusce, Marine mammals, Turtles, Endangered species and Fisheries.*

1.6.2.2 Impact Assessment and Mitigation Measures

The construction and operation phase of these activities will influence marine and surrounding environment. The anticipated impacts and mitigation measure for the project activities during construction and operation phases are discussed in this section. Some of the impacts are temporary and localized and some impacts have permanent effect on marine environment. The impacts have been assessed for the proposed marine activities assuming that the pollution due to existing activities and nearby sources has already been covered under baseline environment monitoring. Due to construction and operation of aforesaid facilities the impacts are anticipated on marine environment. The impacts during construction are expected on marine environment from activities such as piling and trenching. Various impacts during the construction and operation phase of the project on marine environment have been identified and the mitigation measures are suggested.

Impacts are identified with respect to two stages of the project. They are:
a) Construction phase
b) Operation phase

Proposed Mitigation Measures

Mitigation measures are suggested based on the identification and prediction of impacts. Mathematical modelling study has been conducted to predict the impact on the marine environment due to discharge of concentrated brine. In order to verify the efficacy of the implemented mitigation measures and there on to modify them if necessary, the post project monitoring becomes inevitable. The post project monitoring program is an equally important aspect in Environmental Management Plan (EMP). A continuous review of post project monitoring program shall be conducted by the Environment Management Cell (EMC) to identify the effectiveness of mitigation measures suggested.

1.6.3 COASTAL REGULATION ZONE (CRZ) STUDY

Institute of Remote Sensing- Anna University, Chennai has carried out CRZ study to identify the High Tide Line (HTL), Low Tide Line (LTL) and Coastal Regulation Zone (CRZ) within 7km radius around the project site identified for the expansion of Cauvery Basin Refinery Project of CPCL at Nagapattinam, Nagapattinam District, Tamil Nadu. The satellite imagery of the project area was interpreted for topographic and geomorphic features in the vicinity of the proposed project site. The proposed site falls in the vicinity of Bay of Bengal, creeks and channels which are tidally influenced by Bay of Bengal. The proposed project site falls within administrative boundary of Nagapattinam Town as per client and falls inside CRZ as per Approved CZMP prepared by NCSCM, Chennai and published by TNCZMA. The cadastral maps of Nagapattinam Town and surrounding villages falling within 7km radius around project site, Nagapattinam Taluka, Nagapattinam District, Tamil Nadu were used as the Base Map. IRS, an agency authorized by MOEFCC, Government of India for demarcation of HTL, LTL has conducted required field surveys and measurements for demarcation of CRZ during 11-12th June 2018. Based on the geomorphology and topography in the vicinity of project area, HTL indicated on Approved CZMP published as per CRZ Notification 2011 has

been identified and traced in the field by Kinematic GNSS survey. LTL has also been identified on ground based bathymetry and geomorphic conditions of the project area. The HTL, LTL, ecologically sensitive areas indicated in CZMP along with setback lines as per CRZ Notification 2019 were superimposed on to geo-referenced cadastral map to prepare a local level CRZ map at 1:4,000. The boundary of project area as provided by the client was superimposed on the CRZ map.

The proposed pipeline of M/s CPCL at Nagapattinam Town, Nagapattinam District, Tamil Nadu falls inside Bay of Bengal, 500m setback line from HTL of Bay of Bengal, 100m/width of creek setback line from HTL of creeks and tidal influenced inland water bodies as per Approved CZMP prepared by NCSCM, Chennai as per CRZ Notification 2011. Hence the proposed expansion activities of CPCL falls in CRZ IVA, CRZ IB, CRZ II, CRZ III, CRZ IV B and Non-CRZ area as indicated in the CRZ Map.

1.7 PROJECT BENEFITS

1.7.1 Economic Benefit

The setting up of the new 9 MMTPA refinery project at CBR will:

a) Improve availability of petroleum products in the region meeting the future energy requirements of Tamil Nadu & Puducherry UT.
b) Create employment to a minimum of 1000 persons during operation directly and indirectly.
c) Will boost industrial growth in the area as the refinery require many supporting services.
d) Will encourage investment in downstream Petrochemical sector.
e) Apart from yielding revenue to the state exchequer, shall improve the living standards of the people living around Nagapattinam and Karaikal districts.

1.7.2 Environmental Benefits

The environmental benefits resulting from the new refinery are:

a) The increased production of LPG from the new refinery will eliminate the usage of fuels like firewood & kerosene which causes alarming household pollution and adversely affects the health of Women & children.
b) The production of BS-VI MS & Diesel (10 ppm sulphur) from the new refinery shall bring down sulphur by 5 times from the current BS-IV levels (50 ppm sulphur) – this is an 80 percent reduction which makes it extremely clean.
c) The green belt developed as part of the project is beneficial in many ways such as conservation of bio-diversity, retention of soil moisture, recharge of groundwater and moderation of micro-climate.
d) The green belt/ cover of the refinery will also help in containment of pollution in human environment besides acting as a carbon sink. Certain species of plants can absorb pollutants while others thrive in the polluted atmosphere.
e) Improvement of aesthetics is also enhanced with the presence of greenery throughout the refinery.

1.7.3 Socio-Economic Development

The proposed project would generate some direct and indirect employment opportunities during construction and operation phases, which will benefit the local people. A significant nos. of manpower is required during construction and operation. Local skilled and unskilled labour will be provided employment during construction and operation phase. Improvement in the overall socio-economic status of the vicinity of project area, in the thematic areas of health, education, livelihood and infrastructure is expected.

Social Development is an important component of any project taken by CPCL. An understanding of society is essential in helping people meet their social needs - food, water, shelter, health, knowledge, skills and physical and emotional security. How people define such needs and the priority and value give to them varies tremendously, not only from one country to another, but between different groups of people. A starting point for establishing appropriate and sustainable social services should be an analysis of how individuals, families and communities organise themselves in society to meet their needs as they define them. These facts have been already been noticed by CPCL and some are being focused while carrying out the development programmes in nearby areas. This project will also result in overall environmental quality improvement in this region.

1.8 CORPORATE ENVIRONMENT RESPONSIBILITY

Various CER activities will be carried out by CPCL in the vicinity of proposed CBR plant area with budget during next 5 years. The budget for CER is Rs. 46.9 Crores (0.125% of total project cost in line with MoEFCC notification vide F.No.22-65/2017-IA.III; dated: 01.05.2018) and the budget break up over years is given in **Table 1.6.**

Table 1.6: Details of CER Budget

S. No.	Particulars	Amount (in Rs. Crores)				
		2020-21	2021-22	2022-23	2023-24	2024-25
1	CER Budget	9.38	9.38	9.38	9.38	9.38

The above funds will be spent in various CER activities like Solar Lighting/Solar pump (Irrigation) system, Drinking Water Facilities, greenbelt development, Air quality monitoring in surrounding area etc.