EXECUTIVE SUMMARY

Preamble

Pulicat is a historic seashore town and fishing area in Ponneri Taluk of Thiruvallur District, of Tamil Nadu state. Pulicat Lake is a shallow salt water lagoon stretching over a length of about 60 km along the adjacent to the Bay of Bengal coast and is the second largest brackish water lake or lagoon in India next to Chilika Lake of Odisha. The area of the Pulicat Lake in Tamil Nadu is about 15,367 hec.

Purpose of the Project

The purpose of this EIA report is pertaining to the proposed project in detail and to discuss the Environmental Impacts and Mitigation Measures. This EIA report has been prepared to obtain Environmental Clearance (EC) for the proposed Construction of Training Walls for Permanent Stability of Bar Mouth at Pulicat Village, Ponneri Taluk, of Thiruvallur District, Tamil Nadu.

Need for the Project

Due to net northerly littoral drift the formation of sand bars as well as spits and its migration including changes is a common phenomenon along the east coast of Indian coastal area. In response to the changes in sediment transport rates and prevailing weather conditions, the location of the entrance to the lake often changes, regulating in closure of the entrance. This phenomena leads to an adverse effect causing hampering the smooth movement of vessels, as the depth of the channel is reduced.

Location of the Project

Pulicat Lake, which is Pulicate village located in Ponneri Taluk of Tiruvallur District in Tamilnadu. Department of Ocean Engineering, IIT Madras had visited the coastal stretch along with the officials of Department of Fisheries and investigated the site conditions. A stakeholder meeting was also held to understand the requirements of fishermen community.

Objective of the study

- To study and analyze the anticipated impacts of the proposed project on overall baseline environmental and socio economic conditions in its surrounding study area;
- To identify environmental sensitive features within the study area and places of architectural and cultural importance;

- To recommend project specific appropriate preventive and mitigation measures to Minimize pollution, environmental and social disturbances during entire life-cycle period of the project; and
- To adopt suitable environmental management plans, so as to implement and monitor the appropriate mitigate measures

Project Description

Now the bar-mouth is under closure shape due to the sediment transport from the coastal area by the incoming tides and waves. These waves transport coarse sediment into the lake ecosystem near the bar- mouth area.

Site Connectivity

The Project Site is well connected by road, rail and air ways. The project Site is connected with NH 5 Chennai- Guntur road on Western side at a distance of 23 Km. The nearest railway station is Ponneri Railway Station located at 20 Km from the project site on SW direction. The Chennai International Airport is situated at a distance of 57 Km from project site on SW direction

Approach Road

Temporary Approach road is proposed to a length of 5.00Km and a width of 4.50m for conveying the stone from the quarry to site with the following specifications. Supplying and filling with sand and Gravel to a thickness of 0.30m Providing Soling stone to a depth of 0.15m. Providing Coarse aggregate to fill up the voids of soling stone. Providing and Water bound macadam Road layer to a thickness of 0.30m

Technical Description of the Project

In order to facilitate the stabilization of the estuary inlet location as well as to maintain the depth of the channel, a pair of the training walls at the mouth of the lake has been proposed. Two training walls have been proposed to keep the mouth open. The starting and ending of the north and south training wall longitude and latitude is given below.

Proposed Training Walls Location

Particulars	Shoreward start location	Seaward ending
North Training wall	13°27'55.6"N 80°18'58.8"E	13°27'58"N 80°19'4"E
South Training wall	13°27'49"N 80°19'5"E	13°27'52"N 80°19'7"E

Design of Training Wall

The section is designed to be safe up to a water depth of -4.5m CD (Chart Datum). The following section presents the design of a typical rubble mound training wall section at -4.5m CD.

Design water level

Following design data has been adopted for the design of rubble mound training wall section. The mean high water spring (MHWS) is +1.6m above water level as per CD. For the design of the section, MHWS is adopted as maximum water level.

Filter Layer

The filter layer is recommended for a thickness of 300mm with 10mm of weighing 10kg rubble stones following the suggestions of SPM of the order of W/2000 to W/6000. Accordingly, trunk sections have been designed at 1.5m and 4.5m water depth as well as head sections at 1.5m and 4.5m water depth.It is to be stressed that a head section should be formed at the shore anchor location with the dredged level of -1.5m CD.

Design details training wall trunk sections at CD -1.5m & -4.5m

Trunk Section	At 1.5m water depth	At 4.5m water depth
Crest elevation	+4.0m	+4.0m
Crest width	4m	4m
Side Slope (both side)	1: 2	1: 2
Armour Layer	1T to 2T stones of 1.8m thickness	3.5T to 6T stones of 2.5m thickness
Under Layer	---	500kg to 1T stones of 1.2m thickness
Toe Mound	500kg to 1T stones of 2m thickness	500kg to 1T stones of 2m thickness
Core	50kg to 300kg of stones	50kg to 300kg of stones
Filter Layer	10mm-10kg stones of 0.3m thickness	10mm-10kg stones of 0.3m thickness

Design details training wall head sections at CD -1.5m & -4.5m

Trunk Section	At 1.5m water depth	At 4.5m water depth
Crest elevation	+4.0m	+4.0m
Crest width	4m	4m
Side Slope (both side)	1: 2.5	1: 2.5
Armour Layer	1T to 2T stones of 1.8m thickness	3.5T to 6T stones of 2.5m thickness
Under Layer	---	500kg to 1T stones of 1.2m thickness
Toe Mound	500kg to 1T stones of 2m thickness	500kg to 1T stones of 2m thickness
Core	50kg to 300kg of stones	50kg to 300kg of stones
Filter Layer	10mm-10kg stones of 0.3m thickness	10mm-10kg stones of 0.3m thickness

Requirement of Stones

Quantity of stones for construction of North and South Training Wall

Sl. No	Description	Quantity (Tons)
1	Filter Layer (10mm-10kg stone of 0.3mm thick)	16400
2	Toe Mound (500kg-it stones of 2m thick)	27000
3	Core Layer (50kg-300kg of stones)	29200
4	Under Layer (50kg-300kg of stones 1.2 m thick)	9600
5	Armour Layer (3.5t-6t stones of 2.5m thick)	40200
6	Armour Layer (1t-2t stones of 1.8m thick)	5500
Total Quantity of Stones for North & South Wall		**127900**

Groins

The two short groins will be construction to avoid severe erosion of the training wall.

The length of the groins is 50m and width is 4 m.

Dredging

It is proposed to dredge the Channel area from Lake to sea bar mouth to a level of (-) 3.0m and quantity of dredging is**58700 m³**.

Project Cost

The expected project cost for the project is estimated to be around **Rs.2700.00 Lakhs.**

Description of the Environment

Introduction

Baseline Environmental Studies have been conducted to determine the existing status of various Environmental attributes viz., Climatic and Atmospheric conditions, Air, Water, Noise, Soil, Ecological and Socio-Economical environment, prior to setting up of the proposed project. This study would help to undertake corrective mitigation measures for protection of the environment on account of any change deviation of attributes due to activities of the proposed project.

Scope of Baseline Study

The proposed project sites for considered as the study area for the baseline studies. As part of Environmental and Social Impact Assessment, this study was undertaken for a period from July 2019- September 2019. Primary data on Water, Air, Land, Flora, Fauna & Socio-Economic data were collected by a team of Engineers and Scientists. Secondary data was collected from various Departments of State/Central Government Organizations, Semi-Government and Public Sector Organizations.

1	Primary data- Collected from field	Water, Noise, Air, Soil and Flora, Fauna,
2	Secondary data-refers to data was collected from various Departments	Wind Rose data and Social economic

Micro Meteorology

Temperature

The annual mean minimum and maximum temperature are 24.3 ° and 32.9°C respectively. The day time heat is oppressive and the temperature is as high as 41.2°C. The lowest temperature recorded is of the order of 18.1°C.

Rainfall

The average normal rainfall of the Pulicat is 1104 mm. Out of which 52% has been received during North East Monsoon period and 41% has been received during South West Monsoon period.

Relative Humidity

The relative humidity varies between 65 and 85% in the mornings while in the afternoon it varies between 40 and 70%.

Wave Heights

The class interval that has been adopted for the calculations is 0.5m. It is observed from the results that, the most frequently occurring wave height is about 1.0m, with percentage of occurrences of 20 to 35% for the months February, March, April, May, October and December. From the above referred figures, it can also be observed that the most frequently occurring wave height is 1.5m, with percentage of occurrences of 20 to 30% during the months of January and November. The most frequently occurring wave height is 2m with percentage of occurrences between 20 to 25% for the months June to September.

Wave Periods

The monthly distribution of wave periods in terms of the percentage of occurrence derived from the wave atlas. The class interval that has been adopted for the presentation is 1sec. the maximum percentage of occurrence is the waves associated with periods ranging between 5 and 6 seconds.

Wave directions

The monthly distribution of wave directions with respect to geographic north in terms of the percentage of occurrence, obtained from the wave atlas. The class interval that has been adopted for the presentation is 20^0C.

Wind Speed Direction in Project Site

The average wind speed recorded during the study period is about 3.98 m/s respectively. The predominant wind direction was from South and South East. The data generated for wind speed and wind direction is computed to obtain wind rose diagrams for March 2017 to May 2017 of the study area.

Air Environment

To Establish The Existing Baseline Status Of Air Quality A Network of 6 AAQ Sampling Locations Were Selected. The Locations Were Decided On The Basis Of Meteorological Data And The Topography Of The Area.

Observation for AAQ Results

The maximum value (PM_{10}) of 57.8.6µg/m^3 was observed at Pulicat (Near Light House) (AAQ 4). The lower value of 33.9 µg/m^3 was observed at Avurivakkam (AAQ 6). The maximum value ($PM_{2.5}$) of 27.1 µg / m^3 was observed atPulicat (Near Light House) (AAQ4) and minimum value of 14.8 was observed at Avurivakkam (AAQ 6).

The maximum value of SO_2 8.1 µg / m^3 was observed at Pulicat (Near Light House) (AAQ4) and minimum value of BDL (<5) µg / m^3 was observed at Periaveppathur (AAQ5) Avurivakkam (AAQ6) & Annamalicheri (AAQ1). The maximum value for NO_x is 17.6 µg / m^3 and was observed at Pulicat (Near Light House) (AAQ4) and minimum value of 8.9 µg / m^3 was observed at Periaveppathur (AAQ5). However, all the ambient air quality levels are found to be within the CPCB Standards.

Noise Environment

Noise monitoring stations are selected by considering sensitive receptors. Noise monitoring was carried out at 8 locations.

Observations for Noise

Day Time Noise Level:-Noise levels during day time were found to be in the range 53.4 – 47.3 dB (A). The maximum noise level was observed to be 53.4 dB (A) at Pulicat (N3) and a minimum of 47.3 dB (A) was observed at Pakkam (N4). The monitored locations during the Day time are under the prescribed limit.

Night Time Noise Levels: -Noise levels observed to fall in the range 39 – 43.9 dB (A) during the night time. Maximum noise level of 43.9 dB (A) was observed at project site (N1) and a minimum of 39 dB (A) at Pakkam (N4).The monitored locations during the night time are under the prescribed limit.

Water Environment

Ground water resources

The pH of ground water in the study area varies between 7.36 to 7.84 and Conductivity varies from 2100 to 7910 µS/cm.

TDS values were found to be from 1281 to 4650 mg/l and Total Hardness varied from 600 – 1240 mg/l. This indicates that water in the study area were very hard in nature. The Total alkalinity also varies from 300 to 600 mg/L. Sodium and potassium are naturally occurring elements of groundwater as the project site is located in sea. It is one of the major contributors to salinity of water. The concentration of sodium in the studied samples varied from 225 to 1310 mg/l. Potassium varied from 6 – 160 mg/l. Calcium also varies from 130 to 228 mg/L.

The chloride content in the studied area ranged from 410 - 2178 mg/l. The sulphate values were found to be from 90 to 485 mg/l and, fluoride content in the studied area

ranged from 0.63 – 1.71 mg/l. Nitrate content in the ground water is found to be within 5 to 30mg/l in the collected samples.

B) Surface Water

The pH of Surface water in the study area varies from 7.98 to 8.19 and Conductivity varies from 904 to 54700 µS/cm. TDS values were found to be from 511 to 33900 mg/l and Total Hardness varied from 160 – 6400 mg/l. The Total alkalinity also varies from 110 to 280 mg/L. Chloride content is observed in 156 -18632 mg/l. The BOD and COD range is BDL (<2) to 5.8 mg/l and 10-38 mg/l respectively. The concentration of sodium in the studied samples varied from 102 to 7100 mg/l. Potassium varied from 14 – 452 mg/l. Calcium also varies from 32 to 436 mg/L. and Magnesium is 19-1290 mg/l.

Total Coliform count is observed in study area range is 4-3300(MPN/100ml).

E-Coliforms count is observed in study area range is <2-240 (MPN/100ml).

Land Environment

Discussion

The pH indicates that the soils in the study areas are basic in nature, with the pH varying in the range of 7.56 to 8.63. The Electrical Conductivity was observed in the range of 0.101-3.11 mS/cm.

The Nitrogen values are in the range of 180-456 kg/ha indicating that soils have better quantity of Nitrogen levels. The Phosphorous values are in the range of 32.6-51.7 mg/kg indicating that soils have an average Phosphorous level. The Potassium values range between 214– 645kg/ha, which indicate that the soils have better quantity of Potassium. The Organic matter (%) values range between 0.68 –1.96. The soil from the study area shows that they are average fertile.

Biological Environment

The existing Flora and Fauna in the study area is mentioned below. As per Botanical Survey of India records and available published literature pertaining to the study area and current detailed study of project site, no threatened, endangered and rare plant species were observed from the study area.

Details of flora and fauna

Scientific Name	Local Name/English Name
Flora	
Azadirachtaindica	Neem Tree
Prosopisjuliflora	Karuvelammaram
Arecaceae	Palm tree
Ficusreligiosa	Arasamaram
Ficusbenghalensis	Banyan tree
Hibiscus rosa-sinensis	Chembaruthi
Fauna	
Funambulussp	Squirrel
Rattusnorvegicus	Field mouse
Rana hexadactyla	Frog
Rhopalocera	Butterfly
Megalaimamerulinus	Indian Cuckoo
Passer domisticus	House Sparrow
Corvussplendens	Crow

Biodiversity and Fisheries of the lake

The waters of Pulicat Lake are very rich in population diversity and density of planktonic organisms. Summer and pre-monsoon periods are the peak production seasons, followed by post monsoon and lowest during the monsoon.The common plankton forms present in the lake are *Navicula, Pleurosigma, Eucalanus, Acartia, Diaptomus, Pseudodiaptomus, nauplii, andascidian tadpoles* along with larval forms of molluscs and polyehaetes.The bottom macrophytes of the lake consisted mainly of rooted submerged plants like *Halophilaovalis*and filamentous algae like *Chaetomorphaspp, Enteromorphaspp, Ulvaspp, Cladophoraspp, Acetabulariaspp*etc.

Birds Species Visiting Pulicat Lake

S.No	Name Of The family	Common Name	Scientific Name
1	Pelicanidae	Grey pelican (shallow water)	Pelicanus philippensis
2	Phoenicopteridae	Flamingo (shallow water)	Phoenicopterus ruber
3	Scolopacidae	Common sand piper (mud flat) Little stint Stringa totanus Curlew	Tringa hypoleucos Calidris minuta Red shank Numenius arquata
4	Anatidae	Shoveller (deep/shallow water) Spot billed duct Common teal (mud flat)	Anas clypeata Anas poicilorhyncha Anas crecca
5	Rallidae	Common coot (deep water)	Fulica atra
6	Ardeidae	Little egrets Cattle egrets	Egretta garzetta

		(shallow water) Grey heron (shallow water/mud flat) Large egrets Pond heron	Bubulcus ibis Ardea cinerea Ardea elba Ardeola grayil
7	Recurvistridae	Black winged stilt (shallow water/mud flat)	Himantopushimantopus
8	Threskiornithidae	White ibis (deep water / shallow water) Spoon bill (mud flat)	Threskiornis aethiopica Platalea leucorodia
9	Podicepitidae	Little grebe (shallow/deep water)	Tachybaptus ruficollis
10	Charadridae	Little ringed plover (mud flat/shore) Red-Wattled lapwing	Charadrius dubius Vanellus indicus

Socio- Economic Environment

To study the socioeconomic aspects of people in the study area around the project site, the required data has been collected from various secondary sources and supplemented by the primary data. The information on socio-economic aspects of the study area (10 km radius) has been compiled from primary survey as well as from various secondary sources including Census 2011 records, various government and semi-government offices. People around Pulicat Lake are mainly involved in fishing activity. Apart from the Fisheries, agriculture, poultry and labor work provides employment to significant number of villagers in the study area.

Assessment of Impacts and Mitigation Measures

General

Prediction of Impacts is the most important component in the Environmental Impact Assessment studies and it helps in minimizing the adverse impacts on environmental quality during project execution scenario. Several scientific techniques and methodologies are available to predict impacts of developmental activities on physical, ecological and socio-economic environments. Such predictions are superimposed over the baseline (Pre-project) status of environmental quality to derive the ultimate (Post-project) scenario of environmental conditions.

Air Environment

Mitigation Measure for Construction Phase

Minor air quality impacts will be caused by emissions from construction vehicles, equipment and DG sets, and emissions from transportation traffic. The following measures are recommended to control air pollution: Construction equipment and

vehicles will be turned off when not used for extended Periods of time. Unnecessary idling of construction vehicles to be prohibited in the project site. Effective traffic management to be undertaken to avoid significant delays in and around the project area. Water sprinkler for water sprinkling in haul roads and other areas.

Noise Environment

Mitigation Measure for Construction Phase

The contractors will be required to maintain properly functioning equipment and comply with occupational safety and health standards. Vehicles to be equipped with recommended mufflers by the vehicle manufacturer. Staging of construction equipment and unnecessary idling of equipment within noise sensitive areas to be avoided whenever possible. Use of temporary sound fences or barriers to be evaluated.

The nearest residential areas are at a distance of about 2-3 km from the proposed project site. Hence, no adverse impacts are anticipated on noise levels due to the proposed project. Considering the onsite noise levels, it is recommended to provide Personal Protective Equipment (PPE) such as ear muffs, etc. to the construction workers.

Water Environment

Mitigation Measure for Construction Phase

The construction site would be provided with sufficient and suitable toilet facilities (Mobile toilet in construction site and septic tank in labor camp) for workers to maintain proper standards of hygiene.

Land Environment

The identified major direct effects due to dredging includes entrainment of organisms, increased turbidity at the dredging site, fish injury associated with exposure to suspended sediments, decreased dissolved oxygen and fish behavioral effects due to the effects of noise. Environmental windows are used to constrain dredging and disposal operations to specific periods of operation in order to protect sensitive biological resources and their habitats from detrimental effects.

Recommendation for Marine Impact.

At the dredging site itself in addition to the careful planning and execution of the dredging actions, physical barriers can also be employed to prevent the spread of

suspended sediments. These 'barriers' can be erected at or near the dredging site and often consist of silt screens/curtains which control the dispersion of turbid water by diverting the flow under the curtain, thereby minimizing the turbidity in the upper layers of the water column outside the silt curtain. The utilization of a bubble curtain is sometimes considered as an alternative to a silt screen. The upwelling of bubbles from the sea or riverbed to the surface prevents fine sediments from passing across. The light intensity should be reduced and light should be directionally controlled to reduce lighting towards the mud flat.

- Identification of turbidity and noise thresholds to assess fish injury risks
- Supervisory personnel need to perform routine inspection on the vessel.
- An oil spill containment kit would be made available to contain the oil pollution prior to clean.
- More extensive use of multi-season pre and post-dredging biological surveys to assess animal community impacts;
- Incorporation of cumulative effects analysis into all dredging project plans;
- No maintenance or servicing of engine will be allowed in the construction site.
- Regular water sprinkling shall be effected as required to minimize air born dust.
- Working front should be left at the end of the day without debris (Stones)
- Provide proper dust bin for food waste and other domestic solid waste generated by the on-site staff shell be disposal by the authorities.

The contractor should be provided with a dedicated yard on site for storage of stones. Increased use of landscape-scale planning concepts to plan for beneficial uses of projects most suitable to the area's landscape ecology and biotic community and food web relationships. Further analysis and synthesis of the spatial and temporal distribution of fish and shellfish spawning, rearing and migration behaviors. Such an analysis could improve the identification of potential dredging environmental windows and further evaluate the applicability of accepted dredging environmental windows based on best available science.

The site-specific selection of dredging equipment and methods and operational procedures, can mitigate some of the negative direct effects of dredging. For example:

use of a closed or sealed bucket clamshell dredge can be used to minimize the effects of increased turbidity and contain contaminated materials.

EMP Cost

Sl.No	Description	Amount (Rupees in Lakhs)
	Construction Phase	
1	Physical Barriers to prevent the spared of suspended sediment	2
2	Traffic Management Provisions, Informatory Signs and Hoardings	2
3	Safety equipments and measures	2
4	Pollution control measures like water spraying for dust suppression during formation of approach roads	5
5	Environmental Monitoring during pre-construction and construction	7
6	Suitable toilet facilities (Mobile toilet at construction site and septic tank in labor camp)	2
7	Temporary road formation for project site	10
	TOTAL COST / ANNUM	30
	Operation Phase	
1	Environmental Monitoring (Marine Ecology, soil, Air & Noise, Etc.,	8
	TOTAL COST / ANNUM	8

Environmental Monitoring Programme

An environmental monitoring plan provides a delivery mechanism to address the adverse environmental impacts of a project during its execution, to enhance project benefits, and to introduce standards of good practice to be adopted for all project works. An environmental monitoring program is important as it provides useful information and helps to:

Assist in detecting the development of any unwanted environmental situation, and thus, provides opportunities for adopting appropriate control measures, and

Define the responsibilities of the project proponents, contractors and environmental monitors and provides means of effectively communicating environmental issues among them.

Define monitoring mechanism and identify monitoring parameters

Evaluate the performance and effectiveness of mitigation measures proposed in the Environment Management Plan (EMP) and suggest improvements in management plan, if required. Identify training requirement at various levels.

ADDITIONAL STUDIES

Risk Assessment

The proposed Permanent Stability of Bar mouth will encounter risks like any other existing training wall. In order to mitigate and reduce such risks it is proposed to the Department of Fisheries/Contractor and their personnel, during construction period to ensure that HSE (Health Safety and Environment) risks to personnel or assets are minimized.

HSE (Health, Safety and Environment) Management System

In order to ensure an effective HSE it is suggested that proper attention is to be paid to the health and safety of individuals working for construction of training walls as well as the protection of the environment from the environmental impacts associated with construction activities. It is recommended that the construction of training walls should have an HSE policy and perform all work under a formal HSE Management system. This system should be adequately documented within a HSE Manual and be shown to be effective in implementing the aims and objectives of the Permanent Stability-HSE Policy.

Disaster Management Plan

The aim of disaster management is concerned with preventing accidents through good design, operation, maintenance and inspection. In this way, it is possible to reduce the risk of accidents, but it may not be possible to fully eliminate them.

An important element of mitigation is emergency planning i.e. recognizing that accidents are possible, identifying the types of accidents which may occur, assessing the consequences of such accidents and deciding on the emergency procedures, both on-site and off-site, that would need to be implemented in the event of specific type of emergency.

Emergency planning is just one aspect of safety and cannot be considered in isolation. In particular, it is not a substitute for maintaining good standards within Harbor

operations. Before starting to prepare the plan, Harbor Management should ensure that the necessary basic standards and safety precautions are administered.

Emergency plans are likely to be separate for on-site and off-site, but they must be consistent with each other i.e. they must be related to the same assessed emergency conditions. The on-site plan is called Disaster Management Plan (DMP) and the off-site plan is called Emergency Preparedness Plan (EPP).

Project Benefits

Construction of training walls are to provide permanent stability of bar mouth in Pulicat Lake which will give access to fishermen in all seasons of the year. The sea water is mixing with Pulicat lake water (blackish water), providing good environment for production of prawn. Thus, the project would have a significant positive impact on the overall economy of the area.