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मुंबई पोर्ट ट्रस्ट  
**MUMBAI PORT TRUST**  
स्थापत्य अभियांत्रिकी विभाग  
**CIVIL ENGINEERING DEPARTMENT**



मुख्य अभियंता  
मुंबई पोर्ट ट्रस्ट  
पोर्ट भवन, शूरजी वल्लभदास मार्ग,  
बेलाई इस्टेट, मुंबई 400 001.  
दूरध्वनी क्र. 6656 4031  
फॅक्स क्र. 2261 3469

No.CE. HF 481C/FB/BI/ 1589

Date: 14 MAR 2016

To  
Shri A.N.Singh,  
Additional Director (IA-III),  
Ministry of Environment, Forests and Climate Change,  
Indira Paryavaran Bhawan, 3<sup>rd</sup> Floor, Vayu Wing  
Jor Bagh Road, Aliganj  
New Delhi – 110 003

Sir,

Sub: 3<sup>rd</sup> Meeting of the Expert Appraisal Committee for Projects related to ALL Ship Breaking yard including Ship breaking unit, Ports and Harbours, Common Municipal Solid Waste Management Facility, Building/ Construction work Infrastructure Development, Coastal Regulation Zone, Building/ Construction Project/ Construction Project, Township and Area Development Projects held on 23.2.2016.

**Agenda No.3.3.14 – Environmental Clearance for Construction of Fifth Oil Berth at Jawahar Dweep, Mumbai by Mumbai Port Trust**

Ref: Minutes of Meeting and compliance thereof

\*\*\*\*\*

This is in continuation of this office letter No.CE.HF.481-C/FB/BI/1527 dated 27.02.2016. The additional information sought by the Learned Committee is enclosed and the clarifications are furnished hereunder :

- (i) As per MSCZMA recommendation, dredging shall be done about 4-5 million m<sup>3</sup>. However, PP informed that quantity of dredging is 6 million m<sup>3</sup>. PP has to confirm the quantity of dredging to be done.

It is confirmed that the capital dredging quantity is about 5 million m<sup>3</sup>

- (ii) The project proponents would clearly specify as to where does the project site fall, as regards to the coastal regulation zones, as certified in the report submitted to this effect.

Please find enclosed the letter issued by IRS Chennai in this regard.

**(iii) Mangroves conservation plan to be submitted.**

The mangroves conservation plan prepared by the consultants is enclosed.

Further, it is to inform that Mumbai Port will be appointing National Institute of Oceanography (NIO) Mumbai, for the marine ecology study of the entire Mumbai harbour. The report is expected by August 2016.

It is also to confirm that NIO, Mumbai, will be appointed as the monitoring agency during the construction period so that the mangrove protection plan is fully implement.

**(iv) Pipeline to be laid 50 m away from the mangroves area. Therefore, revised maps with coordinates for the location especially with reference to mangroves to be submitted.**

The pipeline trestle will be located beyond 50 m from the mangrove. The drawing prepared by IRS, Chennai, showing the revised location is enclosed herewith.

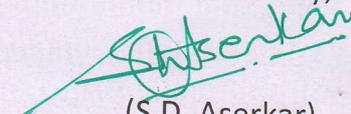
**(v) SCZMA has not recommended the reclamation. Therefore, revised layout map to be submitted.**

The revised lay out prepared by IRS, Chennai, deleting the reclamation and proposing the tankages on piled structure is enclosed herewith.

The project is one of the prestigious project and monitored by the Prime Minister's office. As brought out in our presentation to the Honourable members of the Expert Committee, there will be saving to the tune of Rs. 150 to 170 crores every year to the National Exchequer due to the construction of fifth oil berth. Therefore Mumbai Port has taken advanced action and the civil works and the capital dredging can be commenced immediately after the Environmental clearance is granted by the MoEF.

It is therefore requested that the proposal may be included in the agenda of the meeting of the Expert Committee proposed on 28<sup>th</sup> & 29<sup>th</sup> March 2016 and grant Environmental clearance so that the work can commence in March 2016 and 4 months of fair season can be effectively utilized. This will advance the completion period resulting in huge savings to the National Exchequer.

Yours faithfully,



(S.D. Aserkar)  
Chief Engineer

D.A.: This office letter dt. 27.2.2016,  
Revised CRZ map issued by IRS, Chennai.



**Institute of Remote Sensing**  
(Tamil Nadu State Remote Sensing Applications Centre)  
Anna University, Chennai - 600 025, India

**Prof. S.S. Ramakrishnan, B.E., (Hons), M.Tech., Ph.D.,**  
Professor & Director

Lr. No. IRS/AU/CU/HTL/2016

Date : 25.02.2016

To

The Chief Engineer,  
Mumbai Port Trust,  
Mumbai – 400 001

Sir,

Sub: IRS –AU- Consultancy Work – Demarcation of High Tide Line/Low Tide Line for the sites of proposed projects of Mumbai Port Trust, Mumbai – Regarding.

Ref: Your Lr.No.CE.HF/481C/FB/B1/373 Dated 19.05.2012

With reference to the above, I wish to inform that we have completed the project titled “Demarcation of High Tide Line/Low Tide Line for the sites of proposed projects of Mumbai Port trust, Mumbai” and final maps and reports have been submitted.

Further to the observations made by the Expert Committee for Environmental Clearance for 5<sup>th</sup> Oil Berth at Jawahar Dweep, it is confirmed that

1. The HTL demarcated by IRS corresponds to the HTL shown in the approved CZMP 1991 subject to the generalized error of variation in the scale of mapping, as well as geomorphologic and anthropogenic cause.
2. The sheet nos. 17, 21 and 22 have been revised and map was prepared in 1:4,000 and 1:25,000 scale. The complete proposed 5<sup>th</sup> Oil berth site is classified as CRZ IVA.
3. The Mumbai Port Trust informed that the Reclamation of 13 Hectares proposed earlier for tankages is dropped now and further informed that tankages are now proposed on piles & deck platform.

Thanking you

मुंबई पोर्ट ट्रस्ट	
स्थापत्य अभियांत्रिकी विभाग	
Mumbai Port Trust	
Civil Engineering Deptt.	
प्रकल्प ऑफिस/ Project Office	
फाईल नं./File No.	CEMF/481C/FB/B1
आ.रं.क्र./Inward No.	
दिनांक/Date	2190

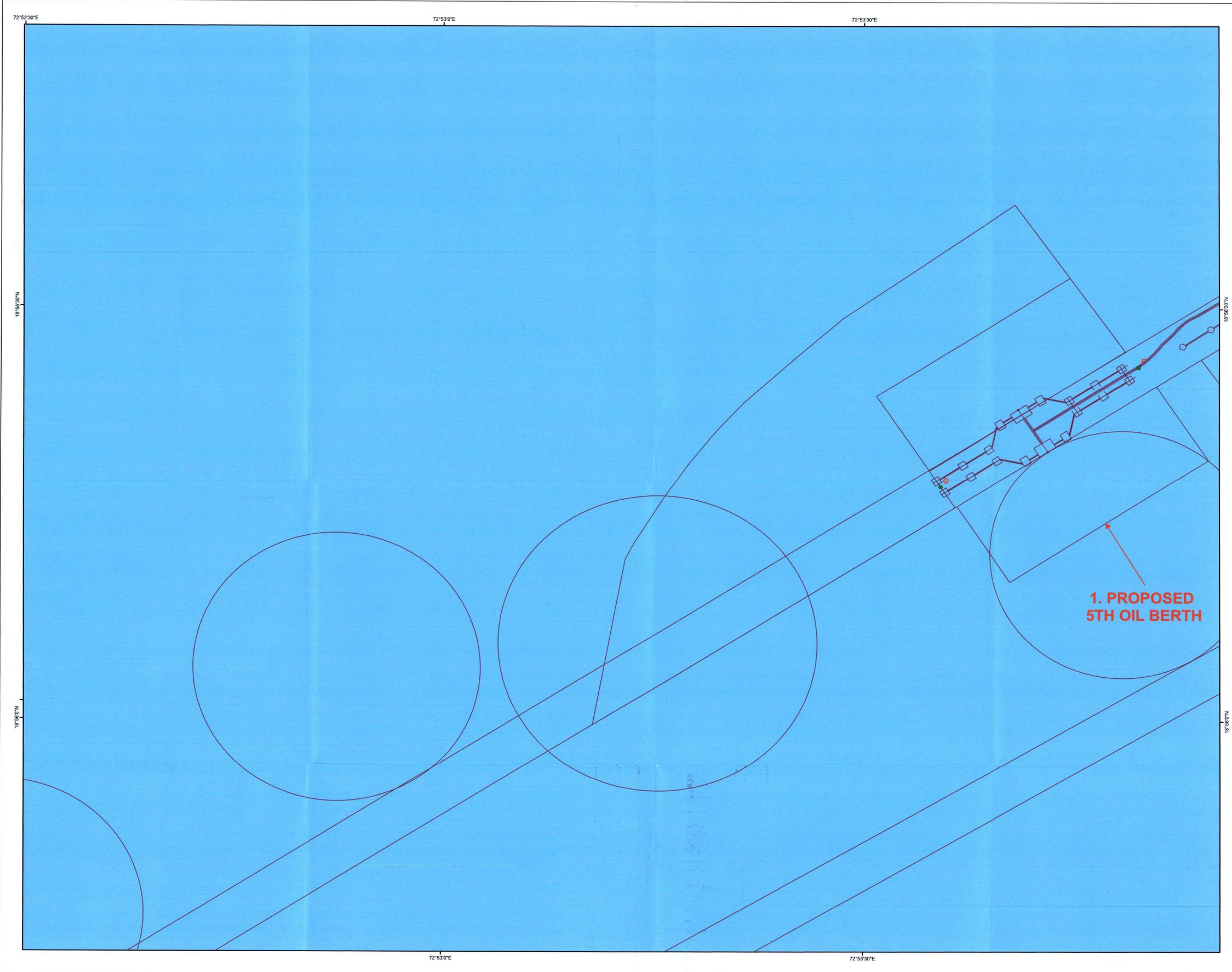
26 FEB 2016

Yours Faithfully

  
DIRECTOR, IRS

Prof. S.S. Ramakrishnan, B.E.(Hons), M.Tech., Ph.D.,  
Director  
Institute of Remote Sensing,  
Anna University, Chennai-600 025.

DEMARCATON OF HIGH TIDE LINE / LOW TIDE LINE FOR THE SITES OF PROPOSED PROJECTS OF MUMBAI PORT TRUST, MUMBAI



**LEGEND**

- ..... LOW TIDE LINE (LTL)
- HIGH TIDE LINE (HTL)
- 100m / CREEK WIDTH FROM HTL
- 200m FROM HTL
- 500m FROM HTL
- MANGROVES (CRZ - IA)
- 50m BUFFER FROM MANGROVES (CRZ - IA)
- MUD FLAT (CRZ - IA)
- CRZ - II
- CRZ - III
- CRZ - IVA
- CRZ - IVB
- PROPERTY BOUNDARY
- ⊙ HTL REFERENCE POINTS

**SOURCE : CLIENT**

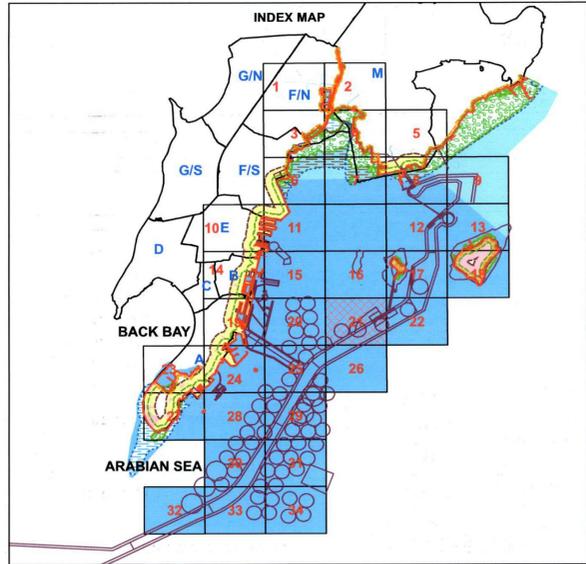
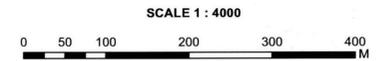
PROJECT SITE

**PROPOSED PROJECTS**

1. FIFTH OIL BERTH
2. TRANSIT SHED AT 16/17 ID
3. TRANSIT SHED AT 4 ID
4. MULTIPURPOSE CARGO BERTH
5. DEVELOPMENT OF BERTHING FACILITIES FOR OFFSHORE SUPPLY VESSELS
6. NEW CRUISE TERMINAL AT GATEWAY OF INDIA

**PROPOSED FIFTH OIL BERTH AT JAWAHAR DWEEP IN WGS84 COORDINATE SYSTEM**

LABEL	LATITUDE	LONGITUDE
A	18° 57' 28.833" N	72° 54' 11.081" E
B	18° 57' 20.058" N	72° 54' 6.085" E
C	18° 57' 4.160" N	72° 54' 3.356" E
D	18° 56' 46.758" N	72° 54' 0.221" E
E	18° 56' 33.221" N	72° 53' 57.949" E
F	18° 56' 25.756" N	72° 53' 49.656" E
G	18° 56' 17.041" N	72° 53' 35.494" E



	PREPARED BY <b>INSTITUTE OF REMOTE SENSING                  ANNA UNIVERSITY                  CHENNAI - 600 025</b>
	FOR <b>MUMBAI PORT TRUST                  PORT HOUSE, SHOORJI VALLABHDAS MARG                  BALLORD ESTATE, MUMBAI - 400 001</b>
PREPARED BY 	
VERIFIED BY 	
APPROVED BY 	<b>Prof. S.S. Ramakrishnan, B.E(Hons), M.Tech, Ph.D.,                  Director                  Institute of Remote Sensing,                  Anna University, Chennai-600 025.</b>

# DEMARCATON OF HIGH TIDE LINE / LOW TIDE LINE FOR THE SITES OF PROPOSED PROJECTS OF MUMBAI PORT TRUST, MUMBAI



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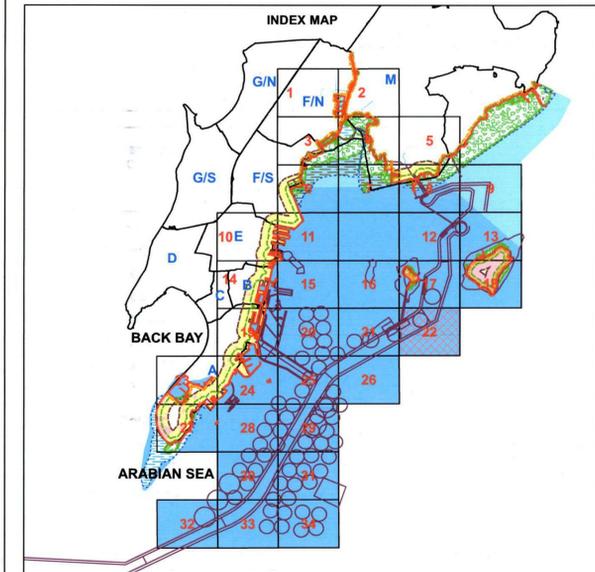
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APPROVED BY	<p></p> <p><b>Prof. S.S. Ramakrishnan</b>, B.E(Inst), M.Tech, Ph.D., Director Institute of Remote Sensing, Anna University, Chennai-600 025,</p>

# DEMARCATON OF HIGH TIDE LINE / LOW TIDE LINE FOR THE SITES OF PROPOSED PROJECTS OF MUMBAI PORT TRUST, MUMBAI



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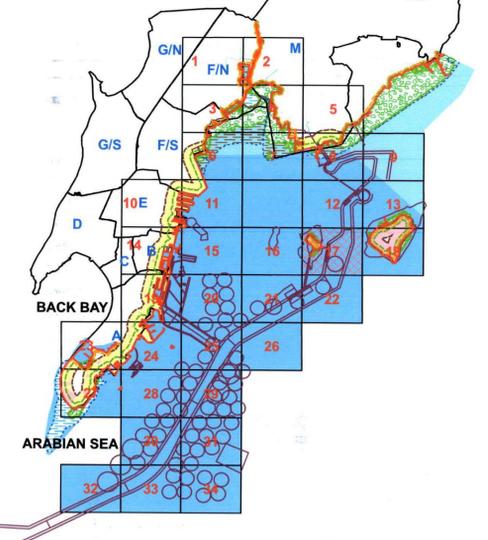
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SCALE 1 : 4000



## INDEX MAP



PREPARED BY  
INSTITUTE OF REMOTE SENSING  
ANNA UNIVERSITY  
CHENNAI - 600 025



FOR  
MUMBAI PORT TRUST  
PORT HOUSE, SHOORJI VALLABHDAS MARG  
BALLORD ESTATE, MUMBAI - 400 001

PREPARED BY

*V. Chinn*

VERIFIED BY

*[Signature]*

APPROVED BY

*[Signature]*

Dr. S.S. Ramakrishnan, B.E.(Hons), M.Tech., Ph.D.,  
Director  
Institute of Remote Sensing,  
Anna University, Chennai-600 025.

## Mangrove Conservation

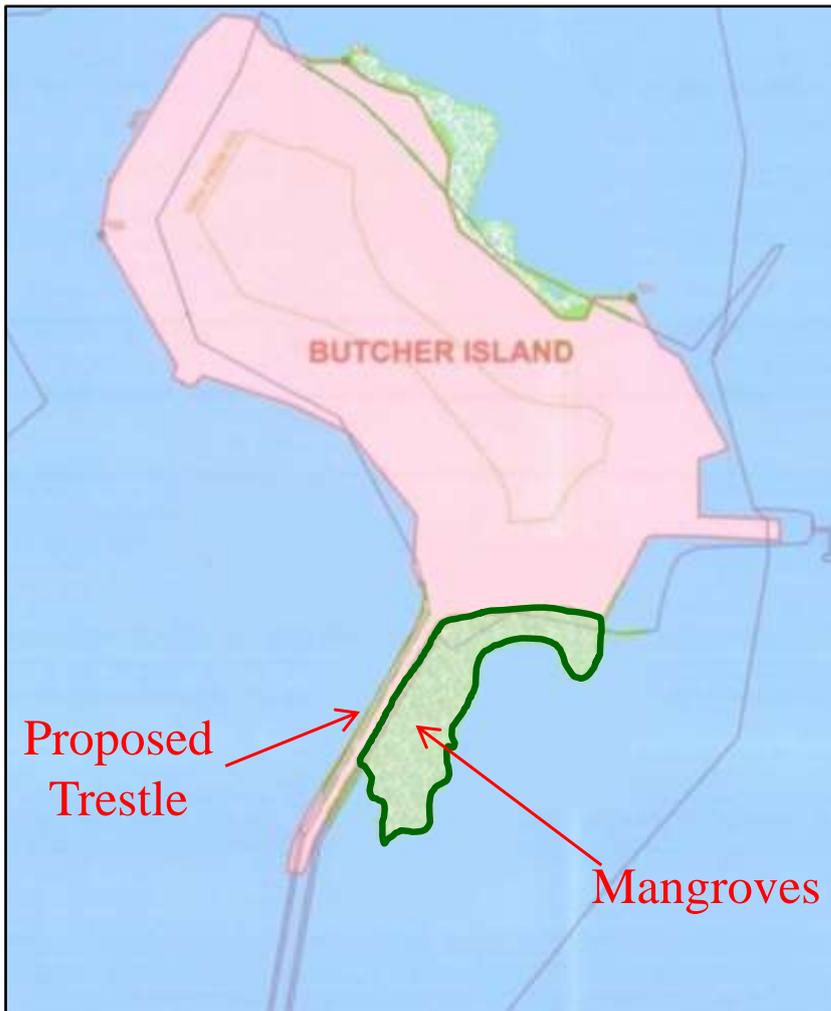
### 1 Preamble

Proposed development for the 5<sup>th</sup> Oil Berth at Mumbai Harbour includes necessary capital dredging, dredge material disposal, construction of an offshore berth and approach trestle connecting the berth to Jawahar Dweep (JD) Island and laying of a submarine pipeline from JD to Pir Pau.

Major activity is involved with construction of the off-shore berth structure which falls completely in the water areas.

An approach trestle is to be developed connecting the berth to JD Island. The length of the trestle is approximately 2.4 km and overall width is 14.9 m (of cross beam; service roadway shall be 4.3 m width). Again, major portion of the trestle is in open waters with no neighbouring areas other than water body. However, towards the end of the trestle connecting to JD, there is a patch of mangrove adjacent to the JD and the proposed trestle. It is to state that the bund for approach to the existing JD 4 berth was constructed in the year 1984. The total length of the contract is 349 m. The mangroves are existing upto a length of 200 to 225 m on the eastern side of the bund. As advised by the Expert Committee and as per the CRZ Notification, 2011, the trestle will be constructed beyond 50 m from the mangrove patch (50 m buffer zone). The details are shown in figure. The proposed trestle will be parallel to this stretch of the mangrove. It may be noted that the existing bund separates the mangrove and proposed area of piling.

Capital Dredging is proposed to be carried out adjacent to the existing navigation area which includes widening of the channel, for turning circle and berthing pocket and anchorage area. The mangrove location from the dredging area is at a minimum distance of about 6 km, the details are shown in figure 3 of the report. The small patch of mangrove is on the east side of the bund and the distance from the berth pocket dredging is about 2 km and the Anchorage area is about 4 km. Since the bund acts as a barrier, there will be less impact due to dredging.



**Figure 1: Mangrove Near JD**

As such proposed development is envisaged to have impacts from 2 main sources – viz: dredging and construction activity (piling, etc.). Dredging activities are likely to have impacts to the marine water quality as well as the marine benthic community. Proposed dredging activities will be carried out by use of a Trailing Suction Hopper Dredger (TSHD). The TSHD is a self-propelled vessel that accumulates the dredged material into its hopper and disposes this material through doors located at the bottom of the vessel's hull at the identified dredge material disposal location. Dredge material disposal will be done at identified dumping location where on-going disposal of dredge material is being carried out. **As such, impacts on mangroves due to dredging and disposal of dredge material are not anticipated.** Construction activities for the trestle at the portion near JD can be envisaged to have impacts on the neighbouring mangroves. It is worthwhile to mention that it may not be possible to avoid all direct impacts on mangroves, marine water quality and the marine benthic community. However, impacts can be minimised as far as possible by adopting appropriate mitigation measures/construction methods.

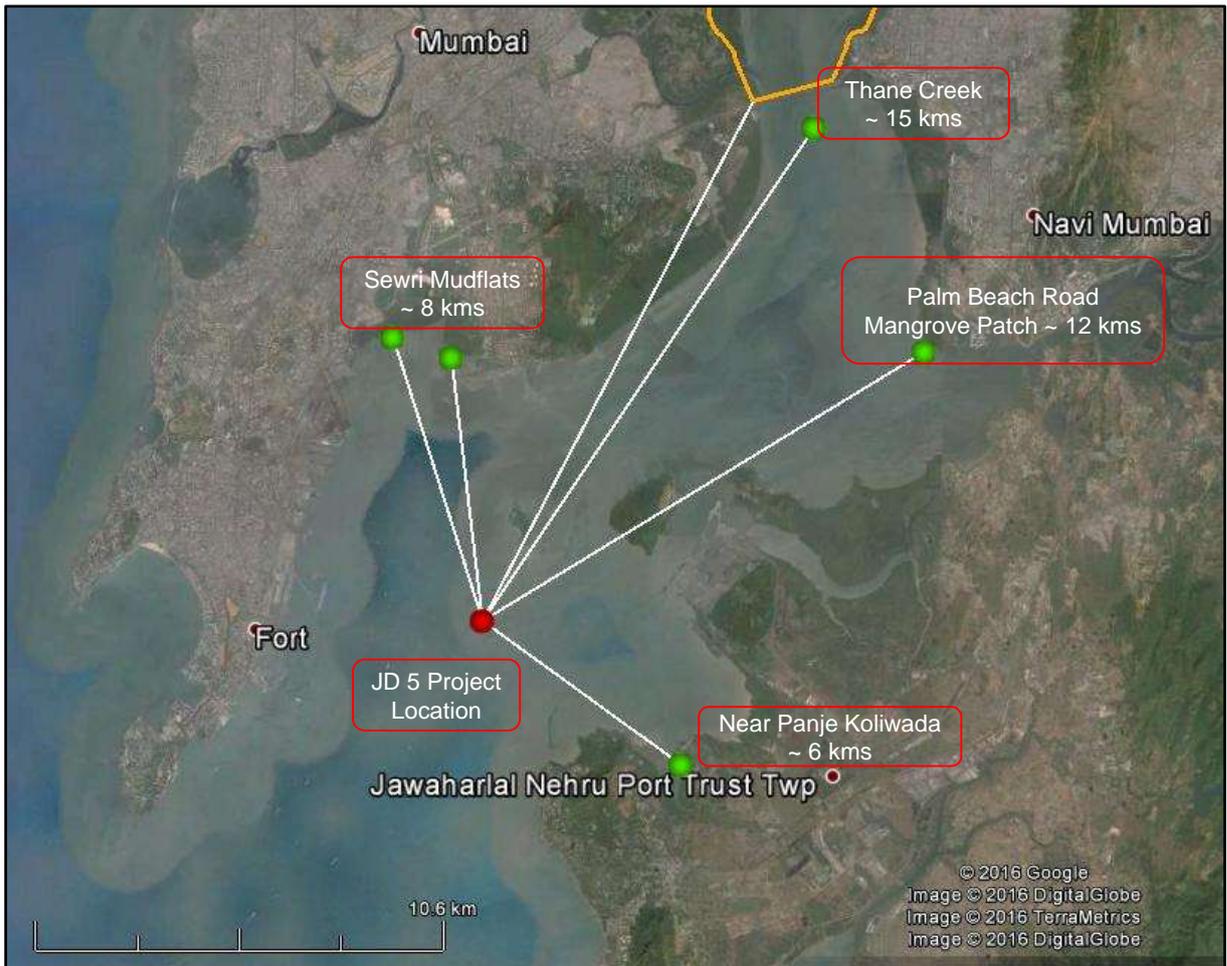
## 2 Ecological Sensitive Areas

- Ecologically sensitive areas like Biosphere Reserves, National Parks, Wildlife Sanctuaries and other protected areas (PA) are not found within 15 km radius of the project site.

- The Thane Creek location in between Vashi and Airoli bridges, harbouring the flamingo populations has been recently declared as a Wildlife Sanctuary for Flamingos by Revenue and Forest Department of Govt. of Maharashtra. The location is ~ 15.5 North East from the project site location.
- The Western Ghats boundary is situated at a distance of 16.5 km in South (Reference: Report of the Western Ghats Ecology Expert Panel Part I).
- The Karnala Bird sanctuary is located at a distance of 20 km in East South East.
- These protected areas are shown in **Figure 2**.
- Mangrove patches are reported within the 15 km radius.
- The 5<sup>th</sup> Oil Berth construction site and major portion of the approach trestle does not contain any Mangroves, Corals/Coral Reefs, Sand Dunes, National Parks, Marine Parks, Sanctuaries, Wildlife Habitats, Biosphere Reserves, Salt Marshes, Turtle Nesting Grounds, Horse Shoe Crabs Habitats, Sea Grass Beds and areas or structures of archaeological importance.
- It is observed that the approach trestle to connect the berth to JD Island near JD has a mangrove patch (~ 22,000 m<sup>2</sup>) adjacent to the proposed trestle location.
- Mangrove areas in vicinity of the project location is shown as **Figure 3**



**Figure 2: Ecological Sensitive Areas around PIA**



**Figure 3: Mangrove Areas**

### 3 Mangrove Conservation/Management

Mangroves are one of the most productive and unique fragile ecosystems of the world. They are salt tolerant plant communities occurring in sheltered coast line areas in the tropical, sub-tropical and intertidal regions of the world such as bays, estuaries, lagoons and creeks. Mangroves provide a wide range of ecological services and economic benefits to mankind and gives direct or indirect livelihood to several of coastal populace. Mangrove forests and estuaries are the breeding and nursery grounds for a number of marine organisms including the commercially important shrimps, crabs and fish species. In India, the mangroves occur on the west coast, east coast and Andaman and Nicobar Islands. Unfortunately, in many places they are highly degraded.

Coastal developments are likely to have impacts on the mangroves. As such it is important for ways to be sought to minimize the impacts of such coastal developments on mangroves. Having a Mangrove Management Plan (MMP) can be very useful for such developmental projects. A MMP will help:

- Monitor the health of mangroves and mangrove habitats
- Identify management strategies and actions to minimize possible impacts to mangroves

### 3.1 Impact Identification and Mitigation Measures

Proposed development of 5<sup>th</sup> Oil Berth at Mumbai Harbour involves construction of an approach trestle. A portion of the trestle near JD falls in the immediate vicinity of a mangrove patch. The impacts on the mangrove due to the construction activity associated with development of the trestle near JD are discussed in below section. The primary source of impact resulting from the construction of the approach trestle is *impacts due to piling activity*. Appropriate mitigation measures to minimise the adverse impacts on the mangroves are also discussed.

#### 3.1.1 Piling

The construction of approach trestle will involve piling activity. Piling is proposed to be carried out by use of bored cast-in-situ concrete piles by use of a permanent liner. The liner will ensure stability of the borehole as the liner is lowered into the seabed. As the liner is lowered, soil material from within will be flushed out and deposited back in the surrounding area of the pile. Thereby the soil will mix and settle back into its same origins. Concrete will be poured into the liner through mechanized systems ensuring complete control on the concreting activities. This will help avoid any discharge of concrete slurry into the waters/mangrove areas. The temporary disturbances will result in the fishes moving away from the area of the piling activities. This will be a short term impact only.

This method of piling will help avoid the use of bentonite slurry as a medium used in some other piling methods to stabilize sides of the boreholes. As such, proposed method will avoid impacts caused due to use of bentonite slurry. Spread of sediments and discharge of slurry into the waters and towards the mangrove areas is not anticipated. Also, cast-in-situ piles eliminates/reduces need for pile driving machinery, thereby reducing noise/vibration impacts. As such, proposed method of construction/piling is not envisaged to cause impacts to the mangroves. Nevertheless, a mangrove monitoring programme will be taken up by MbPT to check for impacts on the mangroves.

##### 3.1.1.1 Mitigation Measures

- Periodic Marine Water and Sediment Quality Monitoring in and around piling areas
- Need for measures such as silt screens as measure to restrict spread of sediments, if any to the mangroves will be looked into based on site conditions at time of piling
- Spills expected during normal construction activities are very less and short term in nature. It will cease upon the completion of construction activities.
- MbPT has in place an approved Oil Spill Response Plan (Tier I – for handling spills upto 700 tonnes).
- Oil spill control equipment such as booms / barriers will be provided for containment and skimmers will be provided for recovery
- MbPT is following the National Oil Spill Disaster Contingency Plan (NOS-DCP); it is approved by the Government of India to combat the pollution arising from oil spillage

#### 3.1.2 Other Piling related Impacts and Mitigation Measures

##### 3.1.2.1 Effects of Noise, Piling on Mangrove & Benthic Communities

Pile driving can generate noise & vibrations that can disturb marine life and disturb bottom sediment increasing water turbidity. While mangroves are not directly affected, noise from pile driving can affect marine mammals.

#### 3.1.2.1.1 Mitigation Measures

- All equipment used for piling must undergo a noise assessment at commencement of the construction work (or when it is first used) and at regular intervals throughout the construction period
- Once construction is completed, the material of the construction will stabilise and cease to be a source of continuing sedimentation to the surrounding coastal waters.
- Pile-driving activities will be managed so that underwater sound increases incrementally during the construction to allow mobile marine fauna in the vicinity the opportunity to move away before sound levels reach maximum
- Impact hammers will be shrouded around the hammer mechanism

#### 3.1.2.2 Modification to Tidal Hydrology and Surface Flows

The construction activities within the intertidal areas generally have the potential to modify tidal flows. Tidal inundation is the dominant recharge mechanism responsible for maintaining the groundwater/soil water conditions required for mangrove growth and survival. Modifications to tidal wetting and drying regimes can potentially impact mangroves such as:

- The decrease in tidal inundation may cause increasing groundwater/soil salinities and this could result in loss of mangroves in marginal fringing environments which have high salinities under natural conditions.

#### 3.1.2.2.1 Mitigation Measures

- Periodic water quality monitoring in/around mangrove areas during construction stage

#### 3.1.2.3 Sediment Burial Effects

Deposition of sediment within mangrove areas has the potential to cause impacts to mangroves if the depositing material accumulates in excess of natural sedimentation rates and to sufficient depths to bury the aerial root system. Sediment burial effects could potentially occur from:

- Uncontained sediments resulting from construction activities entering mangrove areas – burial of pneumatophores (aerial roots)

#### 3.1.2.3.1 Mitigation Measures

The response of different mangrove species to root burial does not appear to be standardized and is likely to be a function of root architecture, tidal range and sediment composition and grain size.

- Proposed piling method using cast-in-situ piles with liners are not envisaged to have sediments/slurry discharge into the waters/ mangrove area
- Also, a bund separates the mangrove area and the area of construction activity/piling
- In addition, need for measures such as silt screens will be looked into based on site conditions

#### 3.1.2.4 Dust Effects

Dust generated from construction activities (construction works, material transport, equipment's, etc.) may settle on mangrove patch and cause temporary debility in mangroves.

#### 3.1.2.4.1 Mitigation Measures

It is expected that accumulation of dust during construction stage will be transient and will tend to be washed away by heavy rainfall. Hence, any impact due to dust accumulation will be temporary. Heavy rainfall tends to wash off the dust on the surface of the leaves and hence the dust due to construction activities will be restricted to that season only.

#### 3.1.2.5 Hydrocarbon Spills or Leakages

Mangroves are sensitive to direct contact from hydrocarbons. Toxic effects due to hydrocarbons can also indirectly affect mangroves through depletion or loss of the associated benthic fauna community. Spills/leaks may occur from various construction activities involved in construction of the approach trestle and the 5<sup>th</sup> Oil Berth.

##### 3.1.2.5.1 Mitigation Measures

- Spills expected during construction activity are very less and short term in nature. It will cease upon the completion of construction activities.
- Spill control measures will be adopted while fuelling barges, workboats, etc.
- Environmental Monitoring Programme comprising of monitoring of marine water quality, marine sediment quality and marine ecology will be in place
- MbPT has in place an approved Oil Spill Response plan and equipment's to contain/remove/disperse oil spills in sea water
- *Awareness will be given to workers about importance of mangroves and their conservation*

## 4 Mangrove Monitoring Programme

The main objective of the Mangrove Conservation/Monitoring Programme shall be to detect impacts and implementing the processes and conditions required to mitigate such changes. To achieve this, focus is placed on parameters that are readily detectable (to provide early warning) and these are linked to the main processes responsible for maintenance of mangrove ecosystems and survival of mangroves (e.g. tidal inundation, sedimentation/erosion, ground/soil water conditions, in particular salinity).

The ecological objectives considered most significant as far as the impact on mangrove flora and fauna concerned are:

- Whether there shall be any reduction in mangrove species diversity?
- Whether there shall be any mangrove habitat loss or fragmentation?
- Whether there shall be any additional risk or threat to the rare or endangered or endemic or threatened (REET) mangrove species?
- Whether there shall be any impairment of ecological functions such as
  - Disruption of food chains,
  - Decline in species population and or
  - Alterations in predator-prey relationships?
- Whether it is possible to attain the global objectives of “no net loss” of biodiversity?

Specific objectives and requirements of the programme are as follows:

- Baseline characterization of mangroves adjacent to the project site to identify the mangrove resource
- Rapid assessment surveillance monitoring of localized impacts (early warning of possible short -term changes)

- Link mangrove community health to the potential site changes associated with the construction activity
- Restoration of degraded and critical mangrove areas if any by planting of suitable species
- Protection measures to keep vigil on possible destruction of mangroves

#### 4.1 Schedule of Monitoring Programme

A network of monitoring sites is to be established in mangroves close to the project site and regular monitoring is to be undertaken covering the following parameters:

- Mangrove surveillance monitoring (canopy density, species composition and density, tree condition, sediment heights, photographs from reference points);
- Shallow groundwater conditions (salinity, depth below ground level (BGL) to water table, pH)
- Sedimentation/erosion monitoring - surveying of ground levels along transects through the mangrove zone.
- The database established for the monitoring data shall be updated periodically to assess the potential variations in the key monitoring parameters since the start of the baseline sampling period.

#### 4.2 Mangrove Distribution Coverage

Impacts from construction and operation of the port facilities on the changes to mangrove distribution will be mapped as needed during the construction and operation phases. The total area of mangroves in Jawahar Dweep are determined by use of surveying and spatially-rectified aerial photography and then analyzed within the GIS (Geographic Information System) to quantify the area of mangrove and loss of mangroves if any during the construction and operational phases. The proposed schedule is presented in **Table 1**.

**Table 1: Mangrove Monitoring Schedule**

Monitoring	Component Objective/Scope	Timing/Frequency
Mapping Distribution and State of Mangroves	<ul style="list-style-type: none"> <li>➤ Baseline mapping of mangroves</li> <li>➤ Map the changes to mangrove distribution that result from the construction activities</li> <li>➤ Assessing areas affected by direct or indirect impacts using GIS environment</li> </ul>	Updated after major Construction activities
Surveillance monitoring	<ul style="list-style-type: none"> <li>➤ Rapid assessment of mangrove health to detect short term and localized changes in tree condition and extent of canopy cover.</li> <li>➤ Monthly visual inspections along the mangrove transects to collect observations and photographs (where appropriate) of mangrove condition.</li> </ul>	Monitor at defined frequency during Construction phase.
Sedimentation / erosion	<ul style="list-style-type: none"> <li>➤ To monitor for potential sedimentation and erosion effects on mangroves that may arise from the presence of the port infrastructure and construction activities</li> <li>➤ Monitoring would consist of RTK (Real Time Kinematic) and GPS surveying of ground levels along transects that extend through the mangrove zone.</li> </ul>	Annual frequency with Contingency plan for additional Survey if required.

### 4.3 Surveillance Monitoring

To detect mangrove health, short-term and/or localized changes in tree condition, extent of canopy cover and other factors a series of mangrove surveillance monitoring sites would be established, integrating the surveyed transects (for sedimentation/erosion monitoring) and groundwater sites. The monitoring information obtained which links potential changes in site conditions to corresponding effects on mangrove health.

During the construction and operational phases the following data will be collected on a defined frequency from each surveillance site:

#### 4.3.1 Canopy Density

- Indicate the percentage of the site occupied by the mid and upper vegetation strata (i.e. foliage cover comprised of leaves and branches).
- This parameter is considered to be a useful indicator of environmental stress as leaf defoliation and leaf growth are sensitive to a wide range of environmental indicators
- Changes in canopy density can therefore provide a measure of mangrove health/condition and associated factors causing changes.
- It is determined using a spherical forestry densiometer to provide estimates of the foliage cover (leaf cover/branch cover) within each of the four subplots formed by the four plot corner markers (1, 2, 3, 4) and the plot centre point. At each of the four subplots, four readings of foliage cover are taken, facing north, east, south and west (total of 16 readings per plot).
- To convert these values to foliage cover (FC), counts are multiplied by 1.04.
- The overall canopy density at each site is calculated as the mean of the readings of foliage cover recorded from each subplot.

#### 4.3.2 Species Composition and Density

- Baseline data collection to characterize mangrove communities that occur at the surveillance sites
- Health of individual trees classified into three categories of tree condition (healthy, unhealthy, dead) as per the criteria outlined in Duke et al. (2005).
- Percentage survivorship and mortality rates can be subsequently calculated.
- The categories are classified as 'healthy' with leaves green, no visible signs of sickness
- The categories are classified as 'unhealthy' with yellowing, wilting leaves, low foliage cover
- The categories are classified as 'dead' - plant dead.

When considering these categories it should be noted that *Avicennia* mangroves, which are the most abundant species in the study area, are well known to defoliate their canopies in response to some form of stress (giving the appearance of being dead) and then subsequently trigger the production of epicormic shoots and new leaves (i.e. coppicing effect).

#### 4.3.3 Sediment Heights

- It is relative to reference points (plot corner markers) to monitor for any potential accumulation of sediment in mangroves or erosion

#### 4.3.4 Visual Recording

- Visual inspections along the mangrove transects on defined frequency to collect observations of mangrove condition.
- Photography and Videography from standard reference points to characterize mangrove condition.

#### 4.4 Monitoring for Sedimentation/Erosion Effects

Monitoring for potential sedimentation and erosion effects in mangrove areas adjacent to the MbPT project site is undertaken by Transect/RTK/GPS surveying of ground levels along transects that extend through the mangrove zone.

- Establishment of baseline ground surface levels by surveyors from the edge of the main mangrove zones adjacent to the project site by transect methods.
- Each transect consists of a series of points where the horizontal position coordinates and ground surface levels were obtained during a baseline survey on the extent of the mangroves.

The transects are periodically re-visited by licensed surveyors and ground surface levels at each survey point are re-surveyed to determine the significant change to ground levels indicating either sediment accumulation or erosion having occurred since the baseline period and presented in GIS environment.

### 5 Impact Mitigation Matrix

The magnitude of an impact reflects:

- The intensity or severity of the impact
- The duration of the impact
- The spatial extent of the impact

Criteria for assessing the magnitude of an impact are provided in **Table 2**.

**Table 2: Magnitude of Impact Categories**

Category	Description
Very High	<ul style="list-style-type: none"> <li>➤ Effect likely to have large impact on community or ecosystem survival and possibly even leading to local extinction or system collapse.</li> <li>➤ Impact is widespread, affecting around 25% or more of a regional ecosystem.</li> <li>➤ Recovery, if possible, is likely to take more than 10 years.</li> </ul>
High	<ul style="list-style-type: none"> <li>➤ Effect likely to have severe negative impact on community or ecosystem survival or health. Impact is regional, affecting approximately 10% of a regional ecosystem.</li> <li>➤ Recovery, if possible, is likely to take from 5 to 10 years.</li> </ul>
Medium	<ul style="list-style-type: none"> <li>➤ Effect will be detectable but not severe; the areal extent of communities may be reduced but unlikely to lead to major changes to population, community or ecosystem survival or health. Impact is local, generally occurring up to 2 km from impact site.</li> <li>➤ Recovery is likely to take from 2 to 5 years.</li> </ul>
Low	<ul style="list-style-type: none"> <li>➤ Effect may be detectable but is small and unlikely to have any material impact.</li> <li>➤ Impact affects immediate surrounds of area of activity and extends for less than 1 km radius.</li> <li>➤ Recovery is rapid - up to 2 years.</li> </ul>
Minimal	<ul style="list-style-type: none"> <li>➤ Effect unlikely to be detectable. Positive</li> <li>➤ Effect is likely to benefit the population, community or ecosystem.</li> </ul>

The impact Mitigation matrix of the mangroves at Jawahar Dweep is presented in **Table 3**.

**Table 3: Impact Mitigation Matrix**

Scenario	Category	Contingency Measures	Remarks	Responsibility
Clearing of mangroves, if any	High	<ul style="list-style-type: none"> <li>➤ Cease clearing in mangrove areas.</li> <li>➤ Confirm losses by survey and re-define construction boundary.</li> <li>➤ Investigate options for rehabilitation of mangroves or compensatory planting</li> <li>➤ Investigate cause of excessive clearing and ensure no further clearing of mangroves occurs.</li> </ul>	There will <b>NOT</b> be any clearance of Mangrove's in the Jawahar Dweep as part of proposed proposal	MbPT, Pollution Control Cell/ / Contractor
Sedimentation in excess of background levels during piling/dredging/construction	Medium	<ul style="list-style-type: none"> <li>➤ Identifies priority sites</li> <li>➤ Identifies status and trends of acreages across the landscape</li> <li>➤ Take immediate short term measures to reduce or cease sediment discharge.</li> <li>➤ Investigate measures to ameliorate impact on affected mangroves.</li> <li>➤ Identify cause and rectify construction processes.</li> <li>➤ Based on site conditions, explore options such as use of a silt screen to enclose the entire construction area up to the designated depth where dredging piling and other construction activities would occur</li> </ul>	<ul style="list-style-type: none"> <li>➤ Institutional monitoring of Targeted restoration</li> <li>➤ A bund separates the mangrove area and area of construction/piling activity</li> <li>➤ Proposed piling method using cast-in-situ piles with liners are not envisaged to have sediments/slurry discharge into the waters/ mangrove area</li> </ul>	
Erosion of Soil	Medium	<ul style="list-style-type: none"> <li>➤ Modify water flowpath causing erosion or reduce flow velocity.</li> <li>➤ Provide physical protection along eroding surface (e.g. matting, rubble or rock armour).</li> </ul>	<ul style="list-style-type: none"> <li>➤ A bund separates the mangrove area and area of construction/piling activity; as such erosion of soil near the mangrove areas are not</li> </ul>	
Hydrocarbon spillage	Medium	<ul style="list-style-type: none"> <li>➤ Take immediate short term measures to reduce impact (contain spill to affected area and recover free hydrocarbons).</li> <li>➤ Review and improve hydrocarbon management</li> </ul>	<ul style="list-style-type: none"> <li>➤ Construction phase EMP will be strictly implemented</li> <li>➤ However, spills are not anticipated during normal</li> </ul>	

Scenario	Category	Contingency Measures	Remarks	Responsibility
		procedures.	construction activities ➤ In addition, MbPT has in place an approved Oil Spill Response Plan (Tier I – for handling spills upto 700 tonnes) ➤ Oil spill control equipment such as booms / barriers will be provided for containment and skimmers will be provided for recovery	
Excessive dust deposition on foliage	Low	➤ Take immediate short term measures to reduce impact (e.g. washing foliage). ➤ Investigate measures to ameliorate impact on affected mangroves. ➤ Review and improve dust control methodologies.	Construction phase EMP will be strictly implemented	

## **6 Environmental Management Actions**

### **6.1 Construction Phase**

The following management actions will be undertaken to avoid/reduce impacts to mangroves during construction activities.

#### **6.1.1 Workforce Management**

MbPT is committed to the philosophy of operating the port facilities in an environmentally acceptable manner. Training of construction personnel will help to ensure that all environmental requirements are understood and followed.

- Environmental awareness training including information on the ecological importance of sensitive mangrove habitats and the measures undertaken to protect mangrove areas will be undertaken for all personnel and subcontractors during their initial induction at Jawahar Dweep.
- Mangrove areas outside of the required disturbance envelope are designated as exclusion areas and access into these areas by workers and machinery will be prohibited so that ecological integrity is maintained

#### **6.1.2 Reporting of Incidents**

A system for reporting incidents that have the potential to affect mangroves will be established. Such incidents would include, but not be limited to, oil/fuel spills, fires, disturbance to mangroves outside the disturbance boundary, unauthorized people gaining access though the site, etc.

#### **6.1.3 Mangrove Monitoring Programme**

MbPT will implement the programme outlined above, at the appropriate stages of the construction phase. A detailed review of data and methodologies will be undertaken at the end of the construction phase and an appropriate monitoring programme for the operations phase will be determined.

### **6.2 Operational Phase**

In consultation with a competent appointed consultant, MbPT will review the plan at the end of the construction phase to determine the requirements for the first three/five years of operations. Where appropriate, the plan will be modified to accommodate the potential risks to mangroves from the operations phase and completed construction phase items will be removed. It is anticipated that the scope and frequency of the monitoring programme will be reduced during the operations phase based on the monitoring analysis during construction phase.

### **6.3 Reporting Schedule**

The methodology, results and findings of the mangrove monitoring programme and any related management actions will be documented as per the following reporting schedule:

- Brief reports after each quarterly survey during construction phase

- Post-construction phase report that summarizes the construction phase monitoring results and identifies the operations phase monitoring and management requirements
- Annual reporting of monitoring status during operation phase

## 7 Financial Layout

MbPT will allot the necessary budgetary provisions for a mangrove conservation action plan as per the need. A tentative budgetary estimate is provided in **Table 4**.

**Table 4: Mangrove conservation budget**

S. No.	Item/Activity	Estimated Cost in INR
1.	Engaging monitoring personal during construction phase	20 Lakhs
2.	Protection of existing mangrove habitat	40 Lakhs
3.	Awareness activities	5 Lakhs
<b>Total</b>		<b>65 Lakhs</b>

## 8 Summary of Conservation Plan

MbPT will develop a rehabilitation plan, if found necessary, which will address mangrove rehabilitation based on the onsite developments. The potential for creating new habitat if there is any degrading of the mangroves will be looked into. The restoration activities will be taken up with the help of Forest Department or reputed agencies in biodiversity conservation as per the need. The restoration activities will be for short terms and long term plans with proper budgetary allocations.

A summary of the mangrove conservation plan is provided as a flow diagram (**Figure 4**) which shows various stages of the mangrove conservation action.

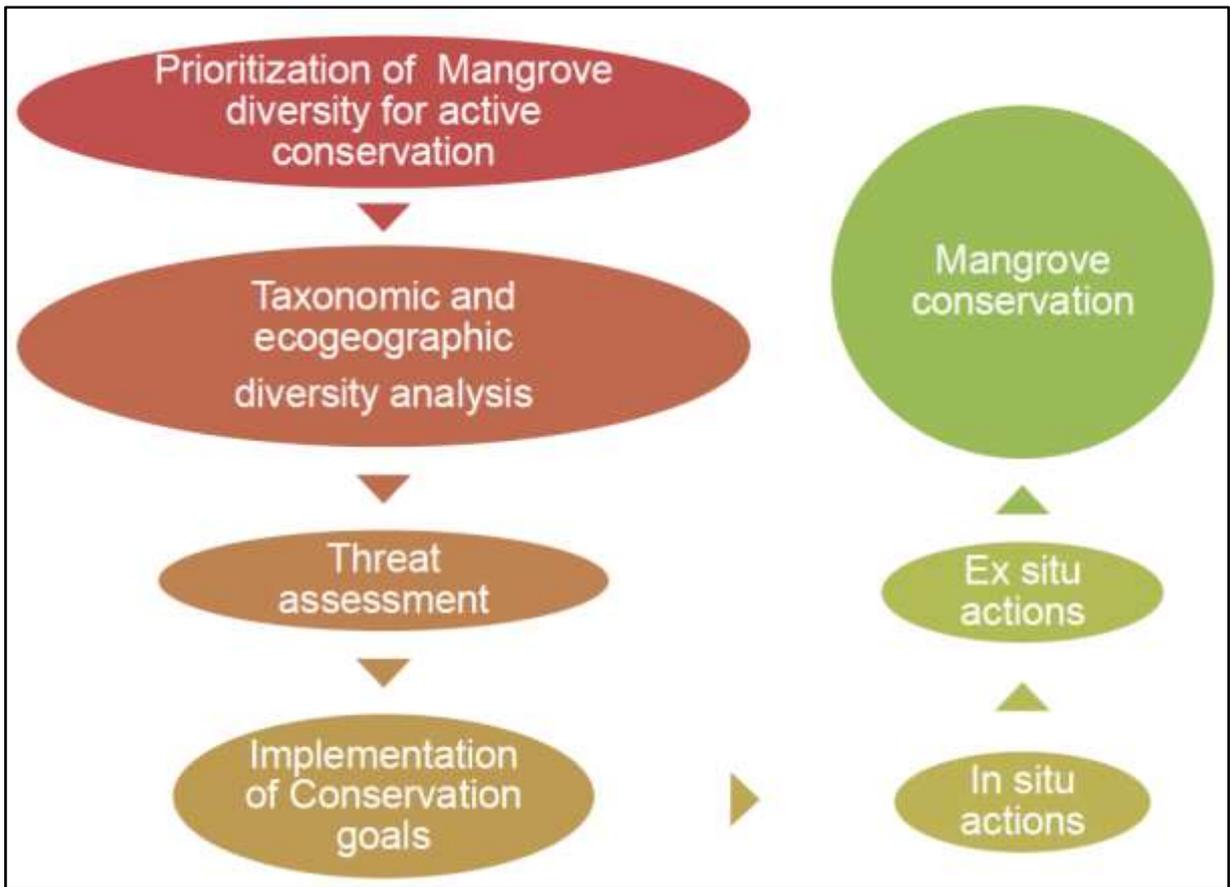


Figure 4: Mangrove Conservation - Flow Diagram

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No.CE. HF 481C/FB/BI/1527

Date: 27.2.2016

To  
Shri A.N.Singh,  
Additional Director (IA-III),  
Ministry of Environment, Forests and Climate Change,  
Indira Paryavaran Bhawan, 3<sup>rd</sup> Floor, Vayu Wing  
Jor Bagh Road, Aliganj  
New Delhi – 110 003

Sir,

Sub: 3<sup>rd</sup> Meeting of the Expert Appraisal Committee for Projects related to ALL Ship Breaking yard including Ship breaking unit, Ports and Harbours, Common Municipal Solid Waste Management Facility, Building/ Construction work Infrastructure Development, Coastal Regulation Zone, Building/ Construction Project/ Construction Project, Township and Area Development Projects held on 23.2.2016.

**Agenda No.3.3.14 – Environmental Clearance for Construction of Fifth Oil Berth at Jawahar Dweep, Mumbai by Mumbai Port Trust**

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At the outset, I would like to thank you and the Hon'ble Members of the Expert Committee for Considering the Project for according Environmental Clearance to the Project. The Committee has sought the clarifications, and the same is as under.

- i) The CRZ Map needs to be modified by IRS, Chennai considering deletion of Reclamation and the report should specifically indicate the CRZ Zone . If required the trestle needs to be shifted.*
- Kindly find enclosed the letter dated 25.2.2016 along with the revised CRZ Map – sheet no. 17/34, 21/34, and 22/34.
  - It is to state that the Bund for approach to the Existing JD 4 berth was constructed in the year 1984. The Total length of Bund is 349 mts.
  - The mangroves are existing upto a length of 200-225 m on the Eastern side of the Bund. There are no mangroves on the western side of the Bund where construction Of Trestle is proposed.
  - It is also to submit that considering the Buffer zone of 50 m, Mumbai port agrees to shift the proposed alignment of trestle beyond the Buffer zone.

- e) The existing bund acts as a barrier to the mangroves and there shall be no effect owing to the construction activity on the other side of the bund.
- f) Even though the existing bund will not be required after the commissioning of the fifth oil berth, MbPT undertakes to retain the bund to protect the existing mangroves.
- g) The co-ordinates showing the alignment of the trestle is specified in CRZ Map.

**(ii) The Dredging Quantity to be confirmed both for the Capital dredging and Maintenance Dredging.**

The Capital Dredging quantity is estimated at around 5 million cum. As regards maintenance dredging it is stated that the siltation of the existing channel in front of the existing 4<sup>th</sup> oil berth is minimal and the dredging is carried out once in 4 years. Since the proposed 5<sup>th</sup> oil berth is 650 m away, it is expected that the siltation is bare minimum as is experienced at 4<sup>th</sup> oil berth. About 0.30 million cum dredging every year is envisaged.

**(iii) The outcome of the Public Hearing to be presented in the Tabular Form:**

The same is furnished herewith please :

Sr. No.	Issues raised in the Public Hearing	Mumbai Port's reply
1.	Collect data of health status of the people in villages in 15 Km radius.	MbPT will arrange health check-up camp every year to local villages. MbPT has handed over 3 residential buildings to TATA Memorial cancer hospital to accommodate visiting patients from far off places.
2.	Educate local people and give employment in the industry. Promote soft skill development activity for local people.	MbPT will consider skill development activity to local unemployed youth through an Authorised training centres.
3.	Take care of aquatic life during construction activity and shall take necessary precaution during oil spill and handling of ship or any accidental discharge of oil.	Dredging activity will be carried out by Trailing Suction Hopper Dredger and hence the turbidity due to dredging activity will be very low. Further, MbPT will appoint a monitoring agency for the sea water quality and the soil survey. MbPT has in place Tier 1 Oil spill Response facility to tackle accidental discharge of oil
4.	MbPT shall allot additional CSR amount for the development of local people.	Though MbPT is not a profit making body, MbPT has already incurred CSR amount and additional amount as requested will be considered and decision taken.

Sr. No.	Issues raised in the Public Hearing	Mumbai Port's reply
5.	Whether 4 <sup>th</sup> oil berth will be demolished after construction of 5 <sup>th</sup> oil berth? Distance between 4 <sup>th</sup> and 5 <sup>th</sup> oil berths?	After commissioning of 5 <sup>th</sup> oil berth, 4 <sup>th</sup> oil berth will be kept as it is and will be used in emergencies only. Distance between 4 <sup>th</sup> and 5 <sup>th</sup> oil berths is 650 mtrs.
6.	For underwater pipeline, what advance features will be installed considering the upcoming technologies? Whether intelligent pigging technology will be adopted?	Pipelines are designed as per International codes and are designed for intelligent pigging standards.
7.	Has MbPT considered additional safety and security measures during construction and operation stages of the berth pipelines considering national threat?	MbPT has employed CISF who will be securing the island 24x7. MbPT will carry out fencing to Jawahar Dweep wherever required and construct boundary road for patrolling of the island. For tank farm oil spill response team and equipment will be provided.
8.	How MbPT is going to carry out material handling on site as the site is surrounded by sea?	All construction material including pre-casted members will be transported through barges from Hay Bunder wharf of MbPT on shore line.
9.	The water requirement is 215 KLD. What is the use of this water and source of water?	Potable water requirement is 150 KLD is provided through existing submarine pipeline from Pirpau jetty. Potable water for drinking and toilet purpose which is about 5 KLD and to the ships on request to the tune of 145 KLD. Water for construction purpose will be well water suitable for construction activity and will be procured by contractors at Hay Bunder and thereafter transported to construction site.
10.	What precautions are taken to control noise pollution during construction activity?	The piling activity will be carried out by rotary drilling activity and necessary safety gear will be provided to workers.
11.	During construction stage, what is the source of power supply?	D.G. sets will be provided by contractor for power supply during construction stage.
12.	What precautions MbPT would take for handling of silt generated during excavation and how the same is disposed off?	Dredging will be carried out by Trailing Suction Hopper Dredger and hence turbidity will be very low. Dredged material will be dumped at designated

		<p>offshore dumping ground DS3 as recommended by CWPRS after conducting specific dispersal model studies. Capacity of DS3 dumping ground is 100 million cum. and dredging quantity under present proposal is 5 million cum.</p>
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**(iv) *What care will be taken to protect the mangrove in the immediate nearby area during construction period:***

As brought out in para 1 above, the mangroves are found on the Eastern side of the bund. The Bund of length of 349 metres was constructed in the year 1984 while constructing the JD 4 berth. The mangroves have developed in the last 10 or 15 years on the eastern side for a distance of about 200-225 metres. The proposed construction of the trestle is on the western side of the bund and there will be no effect on these mangroves due to the construction, since the bund acts as a solid barrier. The capital dredging for the berth and the berth construction is about 2.4 km away from the Mangrove. The capital dredging for the Anchorage is at a distance of about 5 km from the said mangrove site. Thus, it is submitted that there shall be no effect on the mangrove present on the eastern side of the bund due to the construction activity. It is also to state that MbPT has funded Rs. 2.50 crore to Bombay Natural History Society ( BNHS) for planting 20,000 mangrove saplings at Sewri and also study migratory pattern of the flamingoes.

**(v) *The Marine Ecology study for the entire harbour needs to be carried out by MbPT.***

It is to submit here that Mumbai Port has already contacted NIO, Goa and Mumbai Office for carrying out the Ecological study. MbPT would be appointing them for the study. They have stated that they are looking at the data bank so as to decide on additional studies to be carried out for the comprehensive Environmental Management Plan. They have further stated that if they have sufficient data they would require 2 to 3 months to finalise the report and in case additional study needs to be carried out it may take about 5 to 6 months to submit the report.

It is therefore requested that the Marine Ecology study be a part of the post conditions of the Environmental clearance and MbPT undertakes to take the mitigation measures as suggested by the NIO.

It is also to state that MbPT will be appointing experienced Environmental Engineers at the Chief Manager and Manager level shortly and they will monitor the EMP for the Port including the proposed construction project.

(vi) ***Funds be earmarked for the Health check up and Skilled training as suggested by the Public in the Public Hearing :***

Mumbai Port has the full fledged hospital at Wadala and undertakes to carry out the health checkup camp in Mahul Village. The skilled training in the form of computer training will be given through an authorized training centres. MbPT is committed to action above and a fund of Rupees One Crore will be Separately earmarked for the same.

2. The project is one of the prestigious project and monitored by the Prime Minister's office. As brought out in our presentation to the Honourable members of the Expert Committee, there will be saving to the tune of Rs. 150 to 170 crores every year to the National Exchequer due to the construction of fifth oil berth. Therefore Mumbai Port has taken advance action and the civil works and the capital dredging can be commenced immediately after the Environmental clearance is granted by the MoEF. Also, the award within the validity period will eliminate the risk of re-invitation and loss of atleast 4 months.

3. It is therefore requested that the Environmental clearance is granted so that the work can commence in March 2016 and 4 months of fair season can be effectively utilized. This will advance the completion period resulting in huge savings to the National Exchequer.

This issues with the approval of the Chairman, MbPT

Yours faithfully,



(Keshav Sundar)

Dy. Chief Engineer

D.A.: As above .