

ANNEXURE

For

Modernization and Upgradation of Chennai Fishing Harbour , Kasimedu, Chennai

By

M/s Chennai Port Authority

No 1, Rajaji Salai, Chennai - 600001

EIA Consultant



HUBERT ENVIRO CARE SYSTEMS (P) LTD

CHENNAI

November -2023

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THIRU. DEEPAK S. BILGI, I.F.S.
MEMBER SECRETARY

**STATE LEVEL ENVIRONMENT IMPACT
ASSESSMENT AUTHORITY-TAMILNADU**

3rd Floor, Panagal Maaligai,
No.1, Jeenis Road, Saidapet,
Chennai - 600 015.
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TERMS OF REFERENCES (ToR)

Letter No.SEIAA-TN/F.No. 9798/SEAC/7(e)/ToR -1382/2022 dated:07.03.2023

To

M/s. Chennai Port Authority
M/s. Chennai Fishing Harbour Management Committee
3rd Floor,
Old Administrative office,
No.1 Rajaji Saalai.
Chennai – 600 001

Sir,

Sub: SEIAA-TN –Terms of Reference along with Public Hearing (ToR) –Proposed Modernization and Upgradation of Chennai Fishing Harbour, Kasimedu at SF.No. 3483, 3482, 3514, 3515, 3522, 3524, 4321, 4342, 4343, 3457, 348 5, 3464, 3527, 3518 Kasimedu Village Chennai Taluk Chennai District Tamil Nadu by M/s Chennai Port Authority under Schedule S.no. 7(e) of category “B1” – Ports, Harbours, Breakwaters, Dredging– ToR issued – Preparation of EIA Report – Regarding

Ref: 1. Online Proposal No. SIA/TN/INFRA1/411618/2022, dated 21.12.2022
2. Your application for Terms of Reference dated: 06.02.2023
3. Minutes of the 354th SEAC Meeting held on 10.02.2023.
4. Minutes of the 600th SEIAA Meeting held on 07.03.2023.

Kindly refer to your proposal submitted to the State Level Impact Assessment Authority seeking Terms of Reference.

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The proponent, M/s. Chennai Port Authority M/s. Chennai Fishing Harbour Management Committee, submitted application for ToR, for the Proposed Modernization and Upgradation of Chennai Fishing Harbour, Kasimedu at SF.No. 3483, 3482, 3514, 3515, 3522, 3524, 4321, 4342, 4343, 3457, 348 5, 3464, 3527, 3518 Kasimedu Village Chennai Taluk Chennai District Tamil Nadu.

SEAC REMARKS: -

Proposed Modernization and Upgradation of Chennai Fishing Harbour, Kasimedu at SF.No. 3483, 3482, 3514, 3515, 3522, 3524, 4321, 4342, 4343, 3457, 348 5, 3464, 3527, 3518 Kasimedu Village Chennai Taluk Chennai District Tamil Nadu by M/s Chennai Port Authority—for Terms of Reference along with Public Hearing. (SIA/TN/INFRA1/411618/2022, Dated: 21.12.2022)

The proposal was placed in the 354th meeting of SEAC held on 10.02.2023. The project proponent gave detailed presentation. The details of the project furnished by the proponent are available in the website (parivesh.nic.in).

The SEAC noted the following:

1. The Proponent, M/s Chennai Port Authority Proposed Modernization and Upgradation of Chennai Fishing Harbour, Kasimedu at SF.No. 3483, 3482, 3514, 3515, 3522, 3524, 4321, 4342, 4343, 3457, 348 5, 3464, 3527, 3518 Kasimedu Village Chennai Taluk Chennai District Tamil Nadu.
2. The project/activity is covered under Category "B1" of Item 7(e) " Ports, Harbours, Breakwaters, Dredging " of the Schedule to the EIA Notification,2006, as amended.
3. The total land area of the project is 2,42,800 Sq.m which is 59.97 acres. The total area of the Chennai Fishing Harbour is about 7,28,700 Sq.m (180.06 acres).

Based on the presentation made by the proponent and the documents furnished, the SEAC decided to **prescribe ToR for the preparation of EIA report along with conduct of Public Hearing.**

The EIA shall include standard ToR along with the following additional ToR:

1. Necessary supporting documents including land documents, approval from Competent Authority for supply of fresh water, first and latest valid consents of TNPCB for the existing operation shall be furnished.
2. The PP shall furnish project timeline enlisting the proposed activities in chronological order.


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3. The PP shall explore the alternate potable water sources and shall furnish feasibility study report for in-situ desalination plant.
4. The proposed modernisation of fishing harbour by the PP shall conform to state-of-the-art facilities to the sellers and buyers.
5. Lead-free paints shall be used for painting boats/docks.
6. Implications of construction activities on the local ecology shall be detailed.
7. The PP shall furnish detailed plan for providing solar panels as alternate source of energy.
8. PP shall detail environmental priorities of fishing port, environmental policy of the port, environment management cell available at the port and eco-friendly port assessment model.
9. The proponent shall submit the feasibility report by involving the reputed research Institutions such as Ocean Mining & Deep Sea Mining Technology Division, NIOT/Chennai, Dept of Ocean Engineering , IIT Madras on proposed project activity removal of the longstanding & existing Breakwater mound which includes the methodology of removal, Disposal of waste materials, Cost Benefit Analysis, the environmental impacts during the excavation and checking the manoeuvrability studied by reputed Institutions like the Central Water and Power Research Station (CWPRS), Pune.
- 10. The proponent should ensure that the boats are properly maintained and there is no oil spillage. Used oil disposal details shall be furnished.**
11. The proponent should prepare a comprehensive line diagram in which all the facilities to be created should be marked. Then for each facility, the probable effluent generation and waste generation should be indicated with quantity and quality. Finally, the methodology for collection, treatment and reuse/disposal of the liquid and solid waste should be indicated. Specific attention should be paid to the marine discharges.
12. Within 10km radius all the parameters like air, sediment and biology including coastal ecology should be studied in detail.
13. The sampling should be done in grid pattern and every one kilometre the samples (air, water, sediment and biological samples) within the 10km of radius.
14. Heavy metal studies in water and sediments shall be conducted.


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15. The report should include the proposal for proper treatment for waste water generated from the fish handling platforms so as to ensure no pollution to the ground water as well as the sea water from the harbour operation.
16. The study proposal shall include details pertaining to collection, treatment and disposal of solid wastes both municipal and fish waste.
17. The project proponent shall submit a comprehensive monitoring plan for coastal ecology covering coastal ecosystem and riverine system for both construction and operation period. All physical, chemical and biological parameters including plankton, productivity, benthic fauna and flora, fishery, etc shall be covered in monitoring plan. Monitoring during construction period will be on weekly basis and during the operational period on seasonal basis (4 times in a year, for a minimum of 5 years).
18. There should not any damage/ impact on these resources and associated biodiversity. The project proponent shall submit the detailed proposal to implement mangrove afforestation by involving reputed Institution like Annamalai University (Marine Biology Centre) and a detailed plan with budget shall be prepared for Mangrove afforestation and monitoring for a period of minimum 5 years in consultation with the said institution and submit a copy of the same along with the EIA Report. The proponent shall also sign an MOU and submit a copy of the same along with EIA report
19. A study shall be conducted on reputed Institutions like Annamalai University (Marine Biology Department), etc the impact on the proposed modernization of fishing harbouron movement of turtles and other aquatic species.
20. A detail study on impact of oil spillage from the operation of the fishing harbour and its mitigation measures shall be part of EIA study.
21. Impact on the Distortion effects on the proposed modernization of the fishing harbour shall be part of EIA.

7(e): STANDARD TERMS OF REFERENCE FOR CONDUCTING ENVIRONMENT IMPACT ASSESSMENT STUDY FOR PORTS, HARBOURS AND INFORMATION TO BE INCLUDED IN EIA/EMP REPORT

1. Reasons for selecting the site with details of alternate sites examined/rejected/selected on


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- merit with comparative statement and reason/basis for selection. The examination should justify site suitability in terms of environmental angle, resources sustainability associated with selected site as compared to rejected sites. The analysis should include parameters considered along with weightage criteria for short-listing selected site.
2. Details of the land use break-up for the proposed project. Details of land use around 10 km radius of the project site. Examine and submit detail of land use around 10 km radius of the project site and map of the project area and 10 km area from boundary of the proposed/existing project area, delineating project areas notified under the wild life (Protection) Act, 1972/critically polluted areas as identified by the CPCB from time to time/notified eco-sensitive areas/interstate boundaries and international boundaries. Analysis should be made based on latest satellite imagery for land use with raw images.
 3. Submit the present land use and permission required for any conversion such as forest, agriculture etc. land acquisition status, rehabilitation of communities/ villages and present status of such activities.
 4. Examine and submit the water bodies including the seasonal ones within the corridor of impacts along with their status, volumetric capacity, quality likely impacts on them due to the project.
 5. Submit a copy of the contour plan with slopes, drainage pattern of the site and surrounding area
 6. Submit the details of terrain, level with respect to MSL, filling required, source of filling materials and transportation details etc.
 7. Examine road/rail connectivity to the project site and impact on the existing traffic network due to the proposed project/activities. A detailed traffic and transportation study should be made for existing and projected passenger and cargo traffic.
 8. Submit details regarding R&R involved in the project
 9. Submit a copy of layout superimposed on the HTL/LTL map demarcated by an authorized agency on 1:4000 scale along with the recommendation of the SCZMA.
 10. Submit the status of shore line change at the project site
 11. Details of the layout plan including details of channel, breakwaters, dredging, disposal and reclamation.
 12. Details of handling of each cargo, storage, transport along with spillage control, dust


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preventive measures. In case of coal, mineral cargo, details of storage and closed conveyance, dust suppression and prevention filters.

13. Submit the details of fishing activity and likely impacts on the fishing activity due to the project. Specific study on effects of construction activity and pile driving on marine life.

14. Details of oil spill contingency plan.

STANDARD TERMS OF REFERENCE (TOR) FOR EIA/EMP REPORT FOR PROJECTS/ACTIVITIES REQUIRING ENVIRONMENT CLEARANCE

1. Details of bathymetry study.
2. Details of ship tranquillity study.
3. Examine the details of water requirement, impact on competitive user, treatment details, use of treated waste water. Prepare a water balance chart.
4. Details of rainwater harvesting and utilization of rain water.
5. Examine details of Solid waste generation treatment and its disposal.
6. Details of desalination plant and the study for outfall and intake.
7. Examine baseline environmental quality along with projected incremental load due to the proposed project/activities.
8. The air quality monitoring should be carried out according to the notification issued on 16th November, 2009.
9. Examine separately the details for construction and operation phases both for Environmental Management Plan and Environmental Monitoring Plan with cost and parameters.
10. Submit details of a comprehensive Risk Assessment and Disaster Management Plan including emergency evacuation during natural and man-made disasters.
11. Submit details of the trees to be cut including their species and whether it also involves any protected or endangered species. Measures taken to reduce the number of the trees to be removed should be explained in detail. Submit the details of compensatory plantation. Explore the possibilities of relocating the existing trees.
12. Examine the details of afforestation measures indicating land and financial outlay. Landscape plan, green belts and open spaces may be described. A thick green belt should be planned all around the nearest settlement to mitigate noise and vibrations. The identification of species/ plants should be made based on the botanical studies.
13. The Public Hearing should be conducted for the project in accordance with provisions of


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Environmental Impact Assessment Notification, 2006 and the issues raised by the public should be addressed in the Environmental Management Plan. The Public Hearing should be conducted based on the ToR letter issued by the Ministry and not on the basis of Minutes of the Meeting available on the web-site.

14. A detailed draft EIA/EMP report should be prepared in accordance with the above additional TOR and should be submitted to the Ministry in accordance with the Notification.
15. Details of litigation pending against the project, if any, with direction /order passed by any Court of Law against the Project should be given.
16. The cost of the Project (capital cost and recurring cost) as well as the cost towards implementation of EMP should be clearly spelt out.
17. Any further clarification on carrying out the above studies including anticipated impacts due to the project and mitigative measure, project proponent can refer to the model ToR available on Ministry website "<http://moef.nic.in/Manual/Port and harbour>".

SEIAA REMARKS: -

The subject was placed in this 600th meeting of Authority held on 07.03.2023. The Authority noted that the subject was appraised in 354th meeting of SEAC held on 10.02.2023. SEAC has furnished its recommendations for granting Terms of Reference for the preparation of EIA report subject to the conditions stated therein.

The Authority after detailed discussions accepted the recommendations of the SEAC and decided to grant Terms of Reference for the preparation of EIA report along with the following additional ToR:

1. Enlist all the species of fish handled/to be handled in the port.
2. The study proposal shall include impact due to toxic compounds like paints, packaging material, shredded ice etc
3. To elaborate the impact of proposed construction on the population of sea crustaceans such as crabs, molluscs and other life forms.
4. Impact on fresh water quality, underground water and soil environment.
5. To detail the strategy to be adopted for waste reduction at the port.
6. The study proposal shall address the impact of the construction activity on the food cycle/food chain.


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7. The study proposal shall include impacts such as sea warming and acidification including deoxygenation due to the proposed and post construction activity.
8. Steps taken to combat pollution caused by plastics, pesticide etc
9. To detail the safety measures taken to prevent over fishing
10. Impact on invasive species shall be detailed.
11. Study shall include impact on the rights of the local community living near the coastal area.
12. Study shall include impact on the terrestrial, coastal and marine biodiversity, flora and fauna.
13. To detail how the proposed project will influence the blue economy.
14. Strategy to be adopted for raising conservation awareness among local community.
15. To study the impact due to increase in the footfall (fish vendors, public and employees).
16. To detail the method adopted for disposal of biological waste, blood waste, etc
17. To elaborate the measures taken to ensure the safety standard and the health of people working in the area.

A. STANDARD TERMS OF REFERENCE

- 1) Reasons for selecting the site with details of alternate sites examined/rejected/selected on merit with comparative statement and reason/basis for selection. The examination should justify site suitability in terms of environmental angle, resources sustainability associated with selected site as compared to rejected sites. The analysis should include parameters considered along with weight age criteria for short-listing selected site.
- 2) Details of the land use break-up for the proposed project. Details of land use around 10 km radius of the project site. Examine and submit detail of land use around 10 km radius of the project site and map of the project area and 10 km area from boundary of the proposed/existing project area, delineating project areas notified under the wild life (Protection) Act, 1972/critically polluted areas as identified by the CPCB from time to time/notified eco-sensitive areas/interstate boundaries and international boundaries. Analysis should be made based on latest satellite imagery for land use with raw images.
- 3) Submit the present land use and permission required for any conversion such as forest, agriculture etc. land acquisition status, rehabilitation of communities/ villages and present status of such activities.
- 4) Examine and submit the water bodies including the seasonal ones within the corridor of impacts along with their status, volumetric capacity, quality likely impacts on them due to the project.


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- 5) Submit a copy of the contour plan with slopes, drainage pattern of the site and surrounding area
- 6) Submit the details of terrain, level with respect to MSL, filling required, source of filling materials and transportation details etc.
- 7) Examine road/rail connectivity to the project site and impact on the existing traffic network due to the proposed project/activities. A detailed traffic and transportation study should be made for existing and projected passenger and cargo traffic.
- 8) Submit details regarding R&R involved in the project
- 9) Submit a copy of layout superimposed on the HTL/LTL map demarcated by an authorized agency on 1:4000 scale along with the recommendation of the SCZMA.
- 10) Submit the status of shore line change at the project site
- 11) Details of the layout plan including details of channel, breakwaters, dredging, disposal and reclamation.
- 12) Details of handling of each cargo, storage, transport along with spillage control, dust preventive measures. In case of coal, mineral cargo, details of storage and closed conveyance, dust suppression and prevention filters.
- 13) Submit the details of fishing activity and likely impacts on the fishing activity due to the project. Specific study on effects of construction activity and pile driving on marine life.
- 14) Details of oil spill contingency plan.
- 15) Details of bathymetry study.
- 16) Details of ship tranquillity study.
- 17) Examine the details of water requirement, impact on competitive user, treatment details, use of treated waste water. Prepare a water balance chart.
- 18) Details of rainwater harvesting and utilization of rain water.
- 19) Examine details of Solid waste generation treatment and its disposal.
- 20) Details of desalination plant and the study for outfall and intake.
- 21) Examine baseline environmental quality along with projected incremental load due to the proposed project/activities.
- 22) The air quality monitoring should be carried out according to the notification issued on 16th November, 2009.
- 23) Examine separately the details for construction and operation phases both for Environmental Management Plan and Environmental Monitoring Plan with cost and parameters.


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- 24) Submit details of a comprehensive Risk Assessment and Disaster Management Plan including emergency evacuation during natural and man-made disasters
- 25) Submit details of the trees to be cut including their species and whether it also involves any protected or endangered species. Measures taken to reduce the number of the trees to be removed should be explained in detail. Submit the details of compensatory plantation. Explore the possibilities of relocating the existing trees.
- 26) Examine the details of afforestation measures indicating land and financial outlay. Landscape plan, green belts and open spaces may be described. A thick green belt should be planned all around the nearest settlement to mitigate noise and vibrations. The identification of species/plants should be made based on the botanical studies.
- 27) The Public Hearing should be conducted for the project in accordance with provisions of Environmental Impact Assessment Notification, 2006 and the issues raised by the public should be addressed in the Environmental Management Plan. The Public Hearing should be conducted based on the ToR letter issued by the Ministry and not on the basis of Minutes of the Meeting available on the web-site.
- 28) A detailed draft EIA/EMP report should be prepared in accordance with the above additional TOR and should be submitted to the Ministry in accordance with the Notification.
- 29) Details of litigation pending against the project, if any, with direction /order passed by any Court of Law against the Project should be given.
- 30) The cost of the Project (capital cost and recurring cost) as well as the cost towards implementation of EMP should be clearly spelt out.
- 31) Any further clarification on carrying out the above studies including anticipated impacts due to the project and mitigative measure, project proponent can refer to the model ToR available on Ministry website "<http://moef.nic.in/Manual/Port and harbour>".

Besides the above, the below mentioned **general points** are also to be followed:

- a. Executive Summary of the EIA/EMP Report
- b. All documents to be properly referenced with index and continuous page numbering.
- c. Where data are presented in the Report especially in Tables, the period in which the data were collected and the sources should be indicated.


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- d. Project Proponent shall enclose all the analysis/testing reports of water, air, soil, noise etc. using the MoEF&CC/NABL accredited laboratories. All the original analysis/testing reports should be available during appraisal of the Project.
- e. Where the documents provided are in a language other than English, an English translation should be provided.
- f. The Questionnaire for environmental appraisal of mining projects as devised earlier by the Ministry shall also be filled and submitted.
- g. While preparing the EIA report, the instructions for the Proponents and instructions for the Consultants issued by MoEF&CC vide O.M. No. J-11013/41/2006-IA. II(I) dated 4th August, 2009, which are available on the website of this Ministry, should be followed.
- h. Changes, if any made in the basic scope and project parameters (as submitted in Form-I and the PFR for securing the TOR) should be brought to the attention of MoEF&CC with reasons for such changes and permission should be sought, as the TOR may also have to be altered. Post Public Hearing changes in structure and content of the draft EIA/EMP (other than modifications arising out of the P.H. process) will entail conducting the PH again with the revised documentation.
- i. As per the circular no. J-11011/618/2010-IA. II(I) dated 30.5.2012, certified report of the status of compliance of the conditions stipulated in the environment clearance for the existing operations of the project, should be obtained from the Regional Office of Ministry of Environment, Forest and Climate Change, as may be applicable.
- j. The EIA report should also include (i) surface plan of the area indicating contours of main topographic features, drainage and mining area, (ii) geological maps and sections and (iii) sections of the mine pit and external dumps, if any, clearly showing the land features of the adjoining area.
- k. The use of diesel for running the fishing crafts will be a source of oil pollution in the sea water, due to spillages and cleaning activities. The proponent should specifically propose measures for prevention and control of oil pollution.
- l. A STP is part of the infrastructure proposed. The sewage from STP should not be allowed to pollute marine environment especially should not be discharged into the coastal waters.
- m. All solid wastes, municipal as well as non municipal should be properly managed without affecting the marine environment.


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- n. The fish unloading on to the platforms and auctioning halls will be a source of fish waste. This fish waste should be properly collected and managed.
- o. Proposal for strict monitoring during construction and post construction period should be included in the EIA report for assessing the impact of fishing harbor operation by a reputed institution.

In addition to the above, the following shall be furnished:-

The Executive summary of the EIA/EMP report in about 8-10 pages should be prepared incorporating the information on following points:

- 1) Project name and location (Village, District, State, Industrial Estate (if applicable).
- 2) Products and capacities. If expansion proposal then existing products with capacities and reference to earlier EC.
- 3) Requirement of land, raw material, water, power, fuel, with source of supply (Quantitative)
- 4) Process description in brief, specifically indicating the gaseous emission, liquid effluent and solid and hazardous wastes.
- 5) Measures for mitigating the impact on the environment and mode of discharge or disposal.
- 6) Capital cost of the project, estimated time of completion.
- 7) Site selected for the project - Nature of land - Agricultural (single/double crop), barren, Govt/ private land, status of its acquisition, nearby (in 2-3 km.) water body, population, within 10km other industries, forest, eco-sensitive zones, accessibility, (note - in case of industrial estate this information may not be necessary)
- 8) Baseline environmental data - air quality, surface and ground water quality, soil characteristic, flora and fauna, socio-economic condition of the nearby population
- 9) Identification of hazards in handling, processing and storage of hazardous material and safety system provided to mitigate the risk.
- 10) Likely impact of the project on air, water, land, flora-fauna and nearby population
- 11) Emergency preparedness plan in case of natural or in plant emergencies
- 12) Issues raised during public hearing (if applicable) and response given
- 13) CSR plan with proposed expenditure.
- 14) Occupational Health Measures
- 15) Post project monitoring plan


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Besides the above, the below mentioned **general points** should also be followed:-

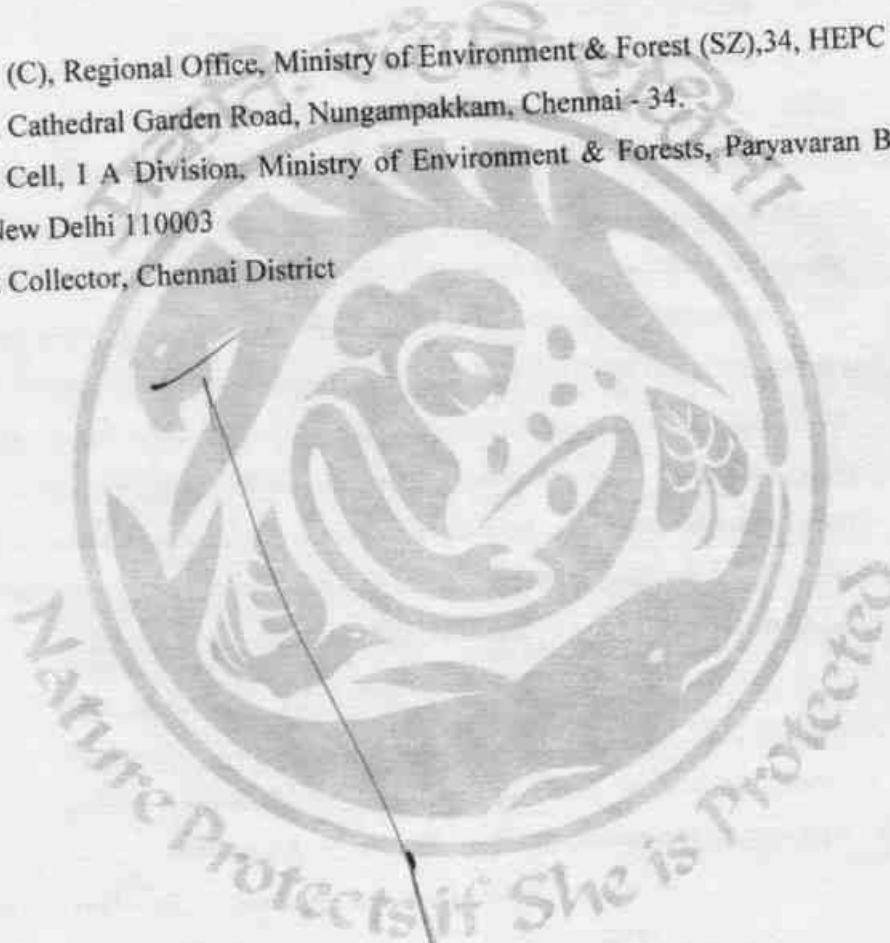
- a. A note confirming compliance of the TOR, with cross referencing of the relevant sections / pages of the EIA report should be provided.
- b. All documents may be properly referenced with index, page numbers and continuous page numbering.
- c. Copy of permission related to Port facility, Desalination plant, wind mill /solar power plant from competent Authority.
- d. Where data are presented in the report especially in tables, the period in which the data were collected and the sources should be indicated.
- e. While preparing the EIA report, the instructions for the proponents and instructions for the consultants issued by MoEF vide O.M. No. J-11013/41/2006-IA.II (I) dated 4th August, 2009, which are available on the website of this Ministry should also be followed.
- f. The consultants involved in the preparation of EIA/EMP report after accreditation with Quality Council of India (QCI)/National Accreditation Board of Education and Training (NABET) would need to include a certificate in this regard in the EIA/EMP reports prepared by them and data provided by other organization/Laboratories including their status of approvals etc. In this regard circular no F. No. J -11013/77/2004-IA-II (I) dated 2nd December, 2009, 18th March 2010, 28th May 2010, 28th June 2010, 31st December 2010 & 30th September 2011 posted on the Ministry's website <http://www.moef.nic.in/> may be referred.
 - After preparing the EIA (as per the generic structure prescribed in Appendix-III of the EIA Notification, 2006) covering the above mentioned points, the proponent will take further necessary action for obtaining environmental clearance in accordance with the procedure prescribed under the EIA Notification, 2006.
 - The final EIA report shall be submitted to the SEIAA, Tamil Nadu for obtaining Environmental Clearance.
 - The TORs prescribed shall be **valid for a period of three years** from the date of issue, for submission of the EIA/EMP report as per OMNo.J-11013/41/2006-IA-II(I)(part) dated 29th August 2017.

The receipt of this letter may be acknowledged.


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Copy to:

1. The Principal Secretary to Government, Environment & Forests Dept, Govt. of Tamil Nadu, Fort St. George, Chennai - 9.
2. The Chairman, Central Pollution Control Board, Parivesh Bhavan, CBD Cum-Office Complex, East Arjun Nagar, New Delhi 110032.s
3. The Member Secretary, Tamil Nadu Pollution Control Board, 76, Mount Salai, Guindy, Chennai- 600 032.
4. The APCCF (C), Regional Office, Ministry of Environment & Forest (SZ),34, HEPC Building, 1st & 2nd Floor, Cathedral Garden Road, Nungampakkam, Chennai - 34.
5. Monitoring Cell, I A Division, Ministry of Environment & Forests, Paryavaran Bhavan, CGO Complex, New Delhi 110003
6. The District Collector, Chennai District
7. Stock File.



[Signature]
MEMBER SECRETARY
SEIAA-TN



THIRU.DEEPAK S. BILGI, I.F.S.
MEMBER SECRETARY

STATE LEVEL ENVIRONMENT IMPACT
ASSESSMENT AUTHORITY-TAMILNADU

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No.1, Jeenis Road, Saidapet,
Chennai - 600 015.
Phone No. 044-24359973
Fax No. 044-24359975

AMENDMENT OF TERMS OF REFERENCE.

Lr. No. SEIAA-TN/F.No.9798/SEAC/7(e)/ToR-1382/2022/Amendment/ dated:06.06.2023

To

M/s. Chennai Port Authority
M/s. Chennai Fishing Harbour
Management Committee 3rd Floor,
Old Administrative office,
No.1 Rajaji Saalai,
Chennai-600 001

Sir/Madam,

Sub: SEIAA - TN – Proposal seeking Amendment of Terms of Reference for the proposed Modernization and Upgradation of Chennai Fishing Harbour, Kasimedu at SF.No. 3483, 3482, 3514, 3515, 3522, 3524, 4321, 4342, 4343, 3457, 348 5, 3464, 3527, 3518 of Kasimedu Village Chennai Taluk Chennai District, Tamil Nadu by M/s Chennai Port Authority - 7(e) of category “B1” – Ports, Harbours, Breakwaters, Dredging Amendment of Terms of Reference (ToR) issued - Regarding.

- Ref:**
1. Earlier ToR issued by SEIAA-TN vide Lr. No. SEIAA-TN/F.No.9798/SEAC/7(e)/ToR-1382/2022 dated 07.03.2023
 2. Online proposal No. SIA/TN/NCP/299942/2023, Dated: 08.05.2023 for Amendment
 3. Hard Copy seeking ToR Amendment submitted dated: 09.05.2023.
 4. Minutes of the 380th meeting of SEAC held on 17.05.2023
 5. Minutes of the 627th meeting of Authority held on 06.06.2023


MEMBER SECRETARY
SEIAA-TN

Terms of Reference was issued to M/s Chennai Port Authority vide this office reference 1st cited above for the proposed Modernization and Upgradation of Chennai Fishing Harbour, Kasimedu at SF.No. 3483, 3482, 3514, 3515, 3522, 3524, 4321, 4342, 4343, 3457, 348 5, 3464, 3527, 3518 Kasimedu Village Chennai Taluk Chennai District, Tamil Nadu.

Now, the project proponent has applied seeking amendment of Terms of Reference vide reference 2nd, & 3rd cited for the proposed project proposal has been modified with the addition of 11 new project components.

SEAC Remarks:

Proposed Modernization and Upgradation of Chennai Fishing Harbour, Kasimedu at SF.No. 3483, 3482, 3514, 3515, 3522, 3524, 4321, 4342, 4343, 3457, 348 5, 3464, 3527, 3518 Kasimedu Village Chennai Taluk Chennai District Tamil Nadu by M/s Chennai Port Authority—for Amendment to Terms of Reference.

The proposal was placed in this 380th meeting of SEAC held on 17.05.2023. The project proponent gave detailed presentation. The details of the project furnished by the proponent are available in the website (parivesh.nic.in).

The SEAC noted the following:

1. The Proponent, M/s Chennai Port Authority has applied seeking amendment to ToR issued for the proposed Modernization and Upgradation of Chennai Fishing Harbour, Kasimedu at SF.No. 3483, 3482, 3514, 3515, 3522, 3524, 4321, 4342, 4343, 3457, 348 5, 3464, 3527, 3518 Kasimedu Village Chennai Taluk Chennai District Tamil Nadu.
2. The project/activity is covered under Category "B1" of Item 7(e) "Fishing Harbour Project" of the Schedule to the EIA Notification,2006, as amended.
3. ToR Lr.No. SEIAA-TN-/F.No.9798/SEAC/7(e)/ToR1382/2022 dated 07.03.2023

4. Amendment requested			
Sl.No.	Project Components	Official ToR	ToR Amendment
1	Built up area	22834.98 Sq.m	36369.99 Sq.m. (Additional)


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2	Project Components	There are total 18 proposed project activities	From the 18 proposed activities, two activities are removed and 9 new project components are added. There are total 25 proposed project activities.
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Initially proposed Activities -Official ToR

S.No	Proposed Structures	L x W (m x m)	Length (m) / Area (sq.m)
1	Boat repair spare parts complex	15 x 15	225
2	Fish handling shed at Trawler Wharf	100 x 27	2700
3	Cleaning, Packaging and Cold storage complex	20 x 10	200
4	Administrative Complex& Centralized control Block with Commercial Complex on the Ground Floor	25 x 15	375
5	Two & Four wheeler parking – 1	45 x 16	720
6	Two & Four wheeler parking – 2	44 x 35	1540
7	Sanitary Complex	10 x 5	50
8	Two-lane peripheral road with storm water drains, cable truff and a pedestrian path including widening and repair of existing road network	1600 x 7.5	12000
9	Ship lifting facility and Boat Repair Yard	2 x 30 x4	240
10	Additional Southern Landing wharf	150 x 8	1200
11	Auction Hall-III	100 x 30	3000
12	Vessel Monitoring and control system at Harbour Entrance	-	25.5
13	Low Level Reservoir	11.2x7.30	81.76
14	Over Head Water Tank	Dia - 6m	28.26
15	Effluent Treatment Plant (ETP)-150 KLD	40.81 x 7.2	293.8



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16	Sewage Treatment Plant (STP)-80 KLD	18.1 x 8.6	155.66
Built Up area			22834.98
17	Dredging		454214
18	Controlled Entry and Exit Arrangements, Elevated Compound wall and 2Nos. of Arched Entrances		1600 m

Final proposed Activities -Amendment ToR

Sl.No	Proposed Structures	LxW (mxm)	Length (m)/Area (sq.m)
1	Boat repair spare parts complex	15x15	225
2	Fish handling shed at Trawler Wharf	100x27	2700
3	Cleaning, Packaging and Cold storage complex	20x10	200
4	Administrative Complex& Centralized control Block with Commercial Complex on the Ground Floor, (G+2)	25x15	375
5	Two & Four wheeler parking-1	45x16	720
6	Two & Four wheeler parking-2	44x35	1540
7	Sanitary Complex	10x5	50
8	Two-lane peripheral road with storm water drains, cable truss and a pedestrian path including widening and repair of existing road network	1600x7.5	12000
9	Ship lifting facility and Boat Repair Yard	76x123	9348
10	Vessel Monitoring and control system at Harbour Entrance	5x5	25
11	Additional Fish Handling Shed at Trawler Wharf	100x27	2700
12	Two nos. of Northern Wharf, supporting with existing structure	50x20.5	1025



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13	Truck Paved parking area facility near proposed two & four wheeler parking no1	(27x35)+(28x35)	1925
14	Providing Two numbers of solar operated with electrical backup fish drying machine (1 Tonne capacity) including civil structure as Pilot Project	11x22	242
15	Two wheeler and Car Parking for administrative and commercial complex and two wheeler parking shed in the Eastern side of the Administrative and commercial complex building	(22x16)+(22x4)	440
16	Net Mending shed at southern side	30x12	360
17	New open shed with Arabian Tent Roofing for fish cutting stalls near retail shops	2x30x5	300
18	Proposed rooms for stacking unsold items in the rear side of fish cutting stall	72x5	360
19	New open shed with Arabian Tent Roofing for prawn sale point	66x20	1320
20	Low Level Reservoir	11.2x7.30	81.76
21	Over Head Water Tank	Dia-6m	28.26
22	Effluent Treatment Plant (ETP)-80 KLD	28.2x11.4	321.48
23	Sewage Treatment Plant (STP)-40 KLD	6.6x12.65	83.49
	Built Up area		36369.99
24	Dredging		454214
25	Controlled Entry and Ext Arrangements, Elevated Compound wall and 2Nos of Arched Entrances		1600


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Based on the presentation made by the proponent and the documents furnished, the SEAC decided to recommend for the grant of amendment to the ToR issued vide Lr.No. SEIAA-TN-/F.No.9798/SEAC/7(e)/ToR1382/2022 dated 07.03.2023 for the preparation of EIA report along with conduct of Public Hearing. The EIA shall include standard ToR along with the following additional ToR:

1. Necessary supporting documents including land documents, approval from Competent Authority for supply of fresh water, first and latest valid consents of TNPCB for the existing operation shall be furnished.
2. **There shall not be any treated/untreated wastewater discharge into the sea water.**
3. The PP shall furnish project timeline enlisting the proposed activities in chronological order.
4. The PP shall explore the alternate potable water sources and shall furnish feasibility study report for in-situ desalination plant.
5. The proposed modernisation of fishing harbour by the PP shall conform to the start -of -art facilities to the sellers and buyers.
6. Lead-free paints shall be used for painting boats/docks.
7. Implications of drilling operations proposed for the project activity shall be detailed.
8. The PP shall furnish detailed plan for providing solar panels as alternate source of energy.
9. PP shall detail environmental priorities of fishing port, environmental policy of the port, environment management cell available at the port and eco-friendly port assessment model.
10. The proponent should ensure that the boats are properly maintained and there is no oil spillage. Used oil disposal details shall be furnished.
11. The proponent should prepare a comprehensive line diagram in which all the facilities to be created should be marked. Then for each facility, the probable effluent generation and waste generation should be indicated with quantity and quality. Finally, the methodology for collection, treatment and reuse/disposal of the liquid and solid waste should be indicated. Specific attention should be paid to the marine discharges.
12. Within 10km radius all the parameters like air, sediment and biology including coastal ecology should be studied in detail.


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13. The sampling should be done in grid pattern and every one kilometre the samples (air, water, sediment and biological samples) within the 10km of radius.
14. Heavy metal studies in water and sediments shall be conducted.
15. The report should include the proposal for proper treatment for waste water generated from the fish handling platforms so as to ensure no pollution to the ground water as well as the sea water from the harbour operation.
16. The study proposal shall include details pertaining to collection, treatment and disposal of solid wastes both municipal and fish waste.
17. The project proponent shall submit a comprehensive monitoring plan for coastal ecology covering coastal ecosystem and riverine system for both construction and operation period. All physical, chemical and biological parameters including plankton, productivity, benthic fauna and flora, fishery, etc shall be covered in monitoring plan. Monitoring during construction period will be on weekly basis and during the operational period on seasonal basis (4 times in a year, for a minimum of 5years).
18. There should not any damage/ impact on these resources and associated biodiversity. The project proponent shall submit the detailed proposal to implement mangrove afforestation by involving reputed Institution like Annamalai University (Marine Biology Centre) and a detailed plan with budget shall be prepared for Mangrove afforestation and monitoring for a period of minimum 5 years in consultation with the said institution and submit a copy of the same along with the EIA Report. The proponent shall also sign an MOU and submit a copy of the same along with EIA report
19. A study shall be conducted on reputed Institutions like Annamalai University (Marine Biology Department), etc the impact on the proposed modernization of fishing harbour on movement of turtles and other aquatic species.
20. A detail study on impact of oil spillage from the operation of the fishing harbour and its mitigation measures shall be part of EIA study.
21. Impact on the Distortion effects on the proposed modernization of the fishing harbour shall be part of EIA.




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SEIAA Remarks:

Proposed Modernization and Upgradation of Chennai Fishing Harbour, Kasimedu at SF.No. 3483, 3482, 3514, 3515, 3522, 3524, 4321, 4342, 4343, 3457, 348 5, 3464, 3527, 3518 Kasimedu Village Chennai Taluk Chennai District Tamil Nadu by M/s Chennai Port Authority-for Amendment to Terms of Reference.

(SIA/TN/INFRA1/411618/2022, Dated: 21.12.2022)

The subject was placed in this 627th meeting of Authority held on 06.06.2023. The Authority noted that the subject was appraised in 380th meeting of SEAC held on 17.05.2023. SEAC has furnished its recommendations for granting amendment to the Terms of Reference issued vide T.O letter dated 07.03.2023 subject to the conditions stated therein.

The Authority after detailed discussions accepted the recommendations of the SEAC and decided to grant amendment to the Terms of Reference issued vide T.O letter dated 07.03.2023 along with the following additional ToR:

1. Enlist all the species of fish handled/to be handled in the port.
2. The study proposal shall include impact due to toxic compounds like paints, packaging material, shredded ice etc
3. To elaborate the impact of proposed construction on the population of sea crustaceans such as crabs, molluscs and other life forms.
4. Impact on fresh water quality, underground water and soil environment.
5. To detail the strategy to be adopted for waste reduction at the port.
6. The study proposal shall address the impact of the construction activity on the food cycle/food chain.
7. The study proposal shall include impacts such as sea warming and acidification including deoxygenation due to the proposed and post construction activity.
8. Steps taken to combat pollution caused by plastics, pesticide etc
9. To detail the safety measures taken to prevent over fishing
10. Impact on invasive species shall be detailed.
11. Study shall include impact on the rights of the local community living near the coastal area.


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SEIAA-TN**

12. Study shall include impact on the terrestrial, coastal and and marine biodiversity, flora and fauna.
13. To detail how the proposed project will influence the blue economy.
14. Strategy to be adopted for raising conservation awareness among local community.
15. To study the impact due to increase in the footfall (fish vendors, public and employees).
16. To detail the method adopted for disposal of biological waste, blood waste, etc
17. To elaborate the measures taken to ensure the safety standard and the health of people working in the area.
18. Implications of construction activities on the local ecology shall be detailed.

All the other Conditions stipulated in the ToR Lr. No.SEIAA-TN/F.No.9798/SEAC/7(e)/ToR-1382/2022 dated 07.03.2023 remain unaltered.


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Copy to:

1. The Additional Chief Secretary to Government, Environment and Forests Department, Tamil Nadu.
2. The Additional Chief Secretary to Government, Industries Department, Tamil Nadu.
3. The Additional Principal Chief Conservator of Forests, Regional Office (SZ), 34, HEPC Building, 1st & 2nd Floor, Cathedral Garden Road, Nungambakkam, Chennai – 34.
4. The Chairman, Central Pollution Control Board, Parivesh Bhawan, CBD-Cum-Office Complex, East Arjun Nagar, New Delhi-110 032.
5. The Chairman, TNPC Board, 76, Mount Salai, Guindy, Chennai-32
6. The District Collector, Chennai District.
7. El Division, Ministry of Environment & Forests, Paryavaran Bhawan, New Delhi Spare.
8. File Copy.


MEMBER SECRETARY
SEIAA-TN

THE FOLLOWING LAND HANDED OVER BY STATE GOVT.(TAMILNADU) TO
CHENNAI PORT TRUST FOR CONSTRUCTION OF FISHING HARBOUR AT
KASIMEDU DURING APRIL-1980(Related record is enclosed).

Sl.	Date of Handing over	Page No	Block No.	Survey No.	Extent of land	Acres	Remarks
1	09.04.1980	1147	51	3483/3	0.0.1740	0.040	
2	09.04.1980	1149	51	3482/3	1.19.0165	2.373	
3	09.04.1980	1151	50	3463/4	1.6.2203	1.703	
4	09.04.1980	1153	50	3463/3	2.0.2340	2.698	
5	09.04.1980	1157	50	3457/1	0.0.1233	0.028	
6	09.04.1980	1159	50	3457/3	0.3.0028	0.165	
7	17.04.1980	1189	51	3483/1	0.2.0960	0.132	
8	17.04.1980	1191	51	3482/1, 3483/1	1.22.2359	2.589	
9	29.04.1980	1193	52	3514	1.12.0722	2.000	
10	do	1195	52	3515	4.14.0126	6.063	
11	do	1197	52	3522	7.02.0953	9.388	
12	do	1199	52	3524 part	5.19.2360	7.713	
13	do	1201	82	4321	19.04.0080	25.346	
14	do	1203	82	4342	0.04.1380	0.252	
15	do	1205	82	4343 part	0.11.0960	0.628	
16	do	1207	50	3457/2	0.0.1045	0.024	
17	do	1209	50	3312/2	0.13.1170	0.743	
18	do	1211	50	3473	1.06.0268	1.549	
19	do	1213	53	3527/2	0.08.0820	0.459	
20	do	1215	52	3485 part	0.08.1040	0.465	
21	do	1217	50	3464/1	1.07.0487	1.719	
22	do	1219	50	3464/2	0.20.1110	1.127	
23	do	1221	51	3483/2	2.00.0445	2.655	
24	do	1223	51	3484/1 part	1.10.1209	1.901	
25	do	1225	51	3484/3	0.14.1684	0.81	
26	do	1227	52	3527/50	0.00.0400	0.009	
27	do	1229	52	3527/51	0.00.0400	0.009	
28	do	1231	52	3527/59	0.00.0400	0.009	
29	do	1233	52	3527/60	0.00.0400	0.009	
30	do	1235	52	3527/68	0.00.0400	0.009	
31	do	1237	52	3527/69	0.00.0400	0.009	
32	do	1239	52	3527/77	0.00.0400	0.009	
33	do	1241	52	3527/78	0.00.0400	0.009	
34	do	1243	52	3527/86	0.00.0400	0.009	
35	do	1245	52	3527/87	0.00.0400	0.009	
36	do	1247	52	3527/95	0.00.0400	0.009	
37	do	1249	52	3527/96	0.00.0400	0.009	
38	do	1251	52	3527/104	0.00.0400	0.009	
39	do	1253	52	3527/105	0.00.0400	0.009	
40	do	1255	52	3527/113	0.00.0400	0.009	
41	do	1257	52	3527/114	0.00.0400	0.009	
42	do	1259	52	3527/117	4.14.0899	6.081	
43	do	1261	52	3518	0.03.0261	0.171	
					Total	78.966	Acres
					(Or)	31.956	Hectre



MANAGING DIRECTOR

CHENNAI METROPOLITAN WATER SUPPLY AND SEWERAGE BOARD

Lr.No CMWSSB/C.E(O&M-I)/FHMC3/22/1995/E/REPLY/2023

Dated 13.04.2023

To
Chennai Fishing Harbour Management Committee
Chennai Port Trust,
Old Administrative Building
3rd Floor
No.1 Rajaji Salai
Chennai 600 001.

Sir

Sub: CMWSSB – Modernization of Fishing Harbour – Request for
issue of in-principle approval – Received – Furnished – Reg.

Ref: Letter of FHMCC3/22/1995/E 20.03.2023.

With reference to the request for issue of in-principle approval for dedicated water and sewage main for Fishing Harbour at Kasimedu, it is to be informed that the CMWSSB shall supply water of 3lakh litres per day by providing dedicated water main from the nearest water distribution stations located at Cemetery road which is 3km away from the proposed location. For sewage disposal, it is requested to provide a modular STP inside your premises.

For kind information

[Signature]
13/4/23
MANAGING DIRECTOR

Category of the Industry :

RED



CONSENT ORDER NO. 2305254267099 DATED: 26/10/2023.

PROCEEDINGS NO.T4/TNPCB/F.3540CHN/RL/CHN/A/2023 DATED: 26/10/2023

SUB: Tamil Nadu Pollution Control Board –CONSENT TO OPERATE –DIRECT -M/s. CHENNAI FISHING HARBOUR , S.F.No. 3312/2, 3457/1, 3457/2, 3457/3, 3463/3, 3463/4, 3464/1, 3464/2, 3473, 3482/1, 3482/3, 3483/1, 3483/2, 3483/3, 3484/1 pt, 3484/3, 3485 pt, 3514, 3515, 3518, 3522, 3524 pt, 3527/2, 3527/50, 3527/51, 3527/59, 3527/60, 3527/68, 3527/69, 3527/77, 3527/78, 3527/86, 3527/87, 3527/95, 3527/96, 3527/104, 3527/105, 3527/113, 3527/114, 3527/117, 4321, 4342, 4343 pt, TONDIARPET PART 4 village Tondiarpet Taluk and Chennai District - Consent for operation of the plant and discharge of emissions under Section 21 of the Air (Prevention and Control of Pollution) Act, 1981 as amended in 1987 (Central Act 14 of 1981) –Issued- Reg.

Ref: 1.CTO direct Application no.54267099 dated 25.09.2023
2.IR.No:F.3540CHN/RL/AE/CHN/2023 dated 11/10/2023
3.Minutes of TSC meeting item no.219-6 dated 18.10.2023

CONSENT TO OPERATE is hereby granted under Section 21 of the Air (Prevention and Control of Pollution) Act, 1981 as amended in 1987 (Central Act 14 of 1981) (hereinafter referred to as “The Act”) and the rules and orders made there under to

Chief Executive Officer
M/s . CHENNAI FISHING HARBOUR
S.F No. 3312/2, 3457/1, 3457/2, 3457/3, 3463/3, 3463/4, 3464/1, 3464/2, 3473, 3482/1, 3482/3, 3483/1, 3483/2, 3483/3, 3484/1 pt, 3484/3, 3485 pt, 3514, 3515, 3518, 3522, 3524 pt, 3527/2, 3527/50, 3527/51, 3527/59, 3527/60, 3527/68, 3527/69, 3527/77, 3527/78, 3527/86, 3527/87, 3527/95, 3527/96, 3527/104, 3527/105, 3527/113, 3527/114, 3527/117, 4321, 4342, 4343 pt
TONDIARPET PART 4 Village
Tondiarpet Taluk
Chennai District.

Authorizing the occupier to operate the industrial plant in the Air Pollution Control Area as notified by the Government and to make discharge of emission from the stacks/chimneys.
This is subject to the provisions of the Act, the rules and the orders made there under and the terms and conditions incorporated under the Special and General conditions stipulated in the Consent Order issued earlier and subject to the special conditions annexed.

This CONSENT is valid for the period ending **March 31, 2024**

For Member Secretary,
Tamil Nadu Pollution Control Board,
Chennai

To
Chief Executive Officer,
M/s.CHENNAI FISHING HARBOUR,
Chennai Fishing Harbour Management Committee,

No 1, Rajaji Salai,
Chennai.

Pin: 600001

Copy to:

- 1.The Commissioner, CHENNAI-Corporation, Tondiarpet Taluk, Chennai District .
- 2. The District Environmental Engineer, Tamil Nadu Pollution Control Board, CHENNAI.
- 3. The JCEE-Monitoring, Tamil Nadu Pollution Control Board, Chennai.
- 4. File

SPECIAL CONDITIONS

1. This consent to operate is valid for operating the facility for the manufacture of products (Col. 2) at the rate (Col. 3) mentioned below. Any change in the products and its quantity has to be brought to the notice of the Board and fresh consent has to be obtained.

Sl. No.	Description	Quantity	Unit
Product Details			
1.	Fishing harbour having water spread area of 48.559 Hecatres and total built-up area of the existing infrastructure facilities of 3.2182 Hectares having Fish handling capacity of	350	Metric Tonnes/ Day

2. This consent to operate is valid for operating the facility with the below mentioned emission/noise sources along with the control measures and/or stack. Any change in the emission source/control measures/change in stack height has to be brought to the notice of the Board and fresh consent/Amendment has to be obtained.

I	Point source emission with stack :			
Stack No.	Point Emission Source	Air pollution Control measures	Stack height from Ground Level in m	Gaseous Discharge in Nm3/hr
II	Fugitive/Noise emission :			
Sl. No.	Fugitive or Noise Emission sources	Type of emission	Control measures	

- 3(a). The emission shall not contain constituents in excess of the tolerance limits as laid down hereunder :

Sl.	Parameter	Unit	Tolerance limits	Stacks
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Annexure enclosed if applicable. :-

- 3.(b) The Ambient Air in the industrial plant area shall not contain constituents in excess of the tolerance limits prescribed below.

Sl. No.	Pollutant	Time Weighted Average	Unit	Tolerance Limits	
				Industrial, Residential, Rural and other area	Ecologically Sensitive Area (notified by Central Govt.)
1.	Sulphur Dioxide (SO2)	Annual 24 hours	microgram/m3 microgram/m3	50 80	20 80
2.	Nitrogen Dioxide (NO2)	Annual 24 hours	microgram/m3 microgram/m3	40 80	30 80
3.	Particulate Matter (Size Less than 10 micro M) or PM10	Annual 24 hours	microgram/m3 microgram/m3	60 100	60 100
4.	Particulate Matter (Size Less than 2.5 micro M) or PM2.5	Annual 24 hours	microgram/m3 microgram/m3	40 60	40 60
5.	Ozone (O3)	Annual 24 hours	8 Hours 1 Hour	100 180	100 180

Sl. No.	Pollutant	Time Weighted Average	Unit	Tolerance Limits	
				Industrial, Residential, Rural and other area	Ecologically Sensitive Area (notified by Central Govt.)
6.	Lead (Pb)	Annual 24 hours	microgram/m3 microgram/m3	0.5 1.0	0.5 1.0
7.	Carbon Monoxide (CO)	8 Hours 1 Hour	miligram/m3 miligram/m3	02 04	02 04
8.	Ammonia (NH3)	Annual 24 hours	microgram/m3 microgram/m3	100 400	100 400
9.	Benzene (C6H6)	Annual	microgram/m3	5	5
10.	Benzo(O) Pyrene (BaP) -particulate phase only	Annual	nanogram/m3	01	01
11.	Arsenic (As)	Annual	nanogram/m3	06	06
12.	Nickel (Ni)	Annual	nanogram/m3	20	20

3(c) The Ambient Noise Level in the industrial plant area shall not exceed the limits prescribed below:

Limits in L.eq.-dB(A)	Day Time	Night Time
ResidentialArea	55	45

- All units of the Air pollution control measures shall be operated efficiently and continuously so as to achieve the standards prescribed in Sl. No.3 above.
- The occupier shall not change or alter quality or quantity or the rate of emission or replace or alter the air pollution control equipment or change the raw material or manufacturing process resulting in change in quality and/or quantity of emissions without the previous written permission of the Board.
- The occupier shall maintain log book regarding the stack monitoring system or operation of the plant or any other particulars for each of the unit operations of air pollution control systems to reflect the working condition which shall be furnished for verification of the Board officials during inspection.
- The occupier shall at his own cost get the samples of emission/air/noise levels collected and analyzed by the TNPC Board Laboratory once in every 6 months/once in a year/periodically for the parameters as prescribed.
- Any upset condition in any of the plants of the factory which is likely to result in increased emissions and result in violation of the standards mentioned in Sl.No.3 shall be reported to the Member Secretary / Joint Chief Environmental Engineer-Monitoring and the concerned District/Assistant Environmental Engineer of the Board by e-mail immediately and subsequently by Post with full details of such upset condition.
- The occupier shall always comply and carryout the order/directions issued by the Board in this Consent Order and from time to time without any negligence. The occupier shall be liable for action as per provisions of the Act in case of non compliance of any order/directions issued.

Special Additional Conditions:

The unit shall obtain No Objection Certificate (NOC) from the Tamil Nadu Bio Diversity Board /National Bio Diversity Authority if the unit is using any Biological resources or knowledge associated thereto as per the provisions of Biological Diversity Act 2002.

The industries shall take all efforts to use and popularize “Mission LiFE” logo and mascot which is available in TNPCB & MoEFCC website. They shall also request their employees to adopt “Mission LiFE” action points and document the same and furnish half yearly report to Board.

Additional Conditions:

1. The unit shall ensure that Ambient Air Quality shall satisfy the AAQ Standards prescribed by the Board.
2. The unit shall adhere to Ambient Noise level standards prescribed by the Board.
3. The unit shall develop green belt within the premises to the maximum possible extent.
4. The unit shall not use “use and throwaway plastics” such as plastic sheets used for food wrapping, spreading on dining table etc., plastic plates, plastic coated tea cups, plastic tumbler, water pouches and packets, plastic straw, plastic carry bag and plastic flags irrespective of thickness, within the industry premises. Instead unit shall encourage use of eco-friendly alternative such as banana leaf, arecanut palmplate, stainless steel, glass, porcelain plates/cups, cloth bag, jute bag etc.
5. The unit shall maintain good housekeeping.

**For Member Secretary,
Tamil Nadu Pollution Control Board,
Chennai**

GENERAL CONDITIONS

1. The occupier shall make an application along with the prescribed consent fee for grant of renewal of consent at least 60 days before the date of expiry of this Consent Order along with all the required particulars ensuring that there is no change in production quantity and emission.
2. This Consent is given by the Board in consideration of the particulars given in the application. Any change or alteration or deviation made in actual practice from the particulars furnished, in the application will also be ground for review/variation/revocation of the Consent Order under Section 21 of the Act.
3. The conditions imposed shall continue in force until revoked under Section 21 of the Act.
4. After the issue of this order, all the 'Consent to Operate' orders issued previously under Air (Prevention and Control of Pollution) Act, 1981 as amended stands defunct.
5. The occupier shall maintain an Inspection Register in the factory so that the inspecting officer shall record the details of the observations and instructions issued to the unit at the time of inspection for adherence.
6. The occupier shall provide and maintain an alternate power supply along with separate energy meter for the Air Pollution Control measures sufficient to ensure continuous operation of all pollution control equipments to ensure compliance.
7. The occupier shall provide all facilities to the Board officials for collection of samples in and around the factory at any time.
8. The applicant shall display the flow diagram of the sources of emission and pollution control systems provided at the site.
9. The liquid effluent arising out of the operation of the air pollution control equipment shall also be treated in a manner and to the satisfaction of standards prescribed by the Board in accordance with the provisions of Water (Prevention and Control of Pollution) Act, 1974 as amended.
10. The air pollution control equipments, location of inspection chambers and sampling port holes shall be made easily accessible at all time.
11. In case of any episodal discharge of emission, the industry shall take immediate action to bring down the emission within the limits prescribed by the Board.
12. If applicable, the occupier has to comply with the provisions of Public Liability Insurance Act, 1991 to provide immediate relief in the event of any hazard to human beings, other living creatures/plants and properties while handling and storage of hazardous substances.
13. The issuance of this consent does not authorize or approve the construction of any physical structures or facilities or the undertaking of any work in any natural watercourse or in Government Poromboke lands.
14. The issuance of this Consent does not convey any property right in either real personal property or any exclusive privileges, nor does it authorize any injury to private property or Government property or any invasion of personal rights nor any infringement of Central, State laws or regulation.
15. The occupier shall forth with keep the Board informed of any accident of unforeseen act or event of any poisonous, noxious or polluting matter or emissions are being discharged into stream or well or air as a result of such discharge, water or air is being polluted.
16. If due to any technological improvements or otherwise the Board is of opinion that all or any of the conditions referred to above requires variation (including the change of any treatment system, either in whole or in part) the Board shall, after giving the applicant an opportunity of being heard, vary all or any of such conditions and thereupon the applicant shall be bound to comply with the conditions as so varied.
17. In case there is any change in the constitution of the management, the occupier of the new management shall file fresh application under Air (Prevention and Control of Pollution) Act, 1981, as amended in Form-I alongwith relevant documents of change of management immediately and get the necessary amendment with renewal of consent order.
18. In case there is any change in the name of the company alone, the occupier shall inform the same with relevant documents immediately and get the necessary amendments for the change of name from the Board.

19. The occupier shall display this consent order granted to him in a prominent place for perusal of the inspecting Officers of this Board.

**For Member Secretary,
Tamil Nadu Pollution Control Board,
Chennai**

Category of the Industry :

RED



CONSENT ORDER NO. 2305154267099 DATED: 26/10/2023.

PROCEEDINGS NO.T4/TNPCB/F.3540CHN/RL/CHN/W/2023 DATED: 26/10/2023

SUB: Tamil Nadu Pollution Control Board –CONSENT TO OPERATE – DIRECT -M/s. CHENNAI FISHING HARBOUR , S.F.No. 3312/2, 3457/1, 3457/2, 3457/3, 3463/3, 3463/4, 3464/1, 3464/2, 3473, 3482/1, 3482/3, 3483/1, 3483/2, 3483/3, 3484/1 pt, 3484/3, 3485 pt, 3514, 3515, 3518, 3522, 3524 pt, 3527/2, 3527/50, 3527/51, 3527/59, 3527/60, 3527/68, 3527/69, 3527/77, 3527/78, 3527/86, 3527/87, 3527/95, 3527/96, 3527/104, 3527/105, 3527/113, 3527/114, 3527/117, 4321, 4342, 4343 pt, TONDIARPET PART 4 village Tondiarpet Taluk and Chennai District - Consent for the operation of the plant and discharge of sewage and/or trade effluent under Section 25 of the Water (Prevention and Control of Pollution) Act, 1974 as amended in 1988 (Central Act 6 of 1974) – Issued- Reg.

Ref: 1.CTO direct Application no.54267099 dated 25.09.2023
2.IR.No:F.3540CHN/RL/AE/CHN/2023 dated 11/10/2023
3.Minutes of TSC meeting item no.219-6 dated 18.10.2023

CONSENT TO OPERATE is hereby granted under Section 25 of the Water (Prevention and Control of Pollution) Act, 1974 as amended in 1988 (Central Act, 6 of 1974) (hereinafter referred to as “The Act”) and the rules and orders made there under to

Chief Executive Officer
M/s . CHENNAI FISHING HARBOUR
S.F No. 3312/2, 3457/1, 3457/2, 3457/3, 3463/3, 3463/4, 3464/1, 3464/2, 3473, 3482/1, 3482/3, 3483/1, 3483/2, 3483/3, 3484/1 pt, 3484/3, 3485 pt, 3514, 3515, 3518, 3522, 3524 pt, 3527/2, 3527/50, 3527/51, 3527/59, 3527/60, 3527/68, 3527/69, 3527/77, 3527/78, 3527/86, 3527/87, 3527/95, 3527/96, 3527/104, 3527/105, 3527/113, 3527/114, 3527/117, 4321, 4342, 4343 pt
TONDIARPET PART 4 Village
Tondiarpet Taluk
Chennai District.

Authorising the occupier to make discharge of sewage and /or trade effluent.

This is subject to the provisions of the Act, the rules and the orders made there under and the terms and conditions incorporated under the Special and General conditions stipulated in the Consent Order issued earlier and subject to the special conditions annexed.

This CONSENT is valid for the period ending **March 31, 2024**

For Member Secretary,
Tamil Nadu Pollution Control Board,
Chennai

To
Chief Executive Officer,
M/s.CHENNAI FISHING HARBOUR,
Chennai Fishing Harbour Management Committee,

No 1, Rajaji Salai,
Chennai.

Pin: 600001

Copy to:

- 1.The Commissioner, CHENNAI-Corporation, Tondiarpet Taluk, Chennai District .
- 2. The District Environmental Engineer, Tamil Nadu Pollution Control Board, CHENNAI.
- 3. The JCEE-Monitoring, Tamil Nadu Pollution Control Board, Chennai.
- 4. File

SPECIAL CONDITIONS

1. This consent to operate is valid for operating the facility for the manufacture of products (Col. 2) at the rate (Col. 3) mentioned below. Any change in the products and its quantity has to be brought to the notice of the Board and fresh consent has to be obtained.

Sl. No.	Description	Quantity	Unit
Product Details			
1.	Fishing harbour having water spread area of 48.559 Hecatres and total built-up area of the existing infrastructure facilities of 3.2182 Hectares having Fish handling capacity of	350	Metric Tonnes/ Day

2. This consent to operate is valid for operating the facility with the below mentioned permitted outlets for the discharge of sewage/trade effluent. Any change in the outlets and the quantity has to be brought to the notice of the Board and fresh consent has to be obtained.

Outlet No.	Description of Outlet	Maximum daily discharge in KLD	Point of disposal
Effluent Type : Sewage			
1.	Sewage	3.8	On Industrys own land
Effluent Type : Trade Effluent			
1.	Trade Effluent	40.0	On land for gardening

3. The effluent discharge shall not contain constituents in excess of the tolerance Limits as laid down hereunder.

Sl. No.	Parameters	Unit	TOLERANCE LIMITS - OUTLETS -Nos				
			Sewage		Trade Effluent		
			1		1		
1.	pH		5.5 to 9		5.5 to 9		
2.	Temperature	oC	-		shall not exceed 5°C above the receiving water temperature		
3.	Particle size of Suspended solids	-	-		shall pass 850 micron IS sieve		
4.	Total Suspended Solids	mg/l	30		100		
5.	Total Dissolved solids (inorganic)	mg/l	-		2100		
6.	Oil & Grease	mg/l	-		10		
7.	Biochemical Oxygen Demand (3 days at 27oC)	mg/l	20		30		
8.	Chemical Oxygen Demand	mg/l	-		250		
9.	Chloride (as Cl)	mg/l	-		1000		
10.	Sulphates (as SO4)	mg/l	-		1000		
11.	Total Residual Chlorine	mg/l	-		1		
12.	Ammonical Nitrogen (as N)	mg/l	-		50		
13.	Total Kjeldahl Nitrogen (as N)	mg/l	-		100		
14.	Free Ammonia (as NH3)	mg/l	-		5		
15.	Arsenic (as As)	mg/l	-		0.2		
16.	Mercury (as Hg)	mg/l	-		0.01		
17.	Lead (as Pb)	mg/l	-		0.1		
18.	Cadmium(as Cd)	mg/l	-		2		
19.	Hexavalent Chromium (as Cr+6)	mg/l	-		0.1`		
20.	Total Chromium (as Cr)	mg/l	-		2		
21.	Copper (as Cu)	mg/l	-		3		
22.	Zinc (as Zn)	mg/l	-		1		
23.	Selenium (as Se)	mg/l	-		0.05		
24.	Nickel (as Ni)	mg/l	-		3		
25.	Boron (as B)	mg/l	-		2		
26.	Percent Sodium	%	-		-		
27.	Residual Sodium Carbonate	mg/l	-		-		
28.	Cyanide (as CN)	mg/l	-		0.2		
29.	Fluoride (as F)	mg/l	-		2		
30.	Dissolved Phosphates(as P)	mg/l	-		5		
31.	Sulphide (as S)	mg/l	-		2		
32.	Pesticides	mg/l	-				
33.	Phenolic Compounds (as C6H5OH)	mg/l	-		1		
34.	Radioactive materials a) Alpha emitters	micro curie/ml	-		10-7		
35.	Radioactive materials b). Beta emitters	micro curie/ml	-		10-6		

36.	Fecal Coliform	MPN/100ml	-		-		
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4. All units of the sewage and Trade effluent treatment plants shall be operated efficiently and continuously so as to achieve the standards prescribed in Sl No.3 above or to achieve the zero liquid discharge of effluent as applicable.
5. The occupier shall maintain the Electro Magnetic Flow Meters/water Meters installed at the inlet of the water supply connection for each of the purposes mentioned below for assessing the quantity of water used and ensuring that such meters are easily accessible for inspection and maintenance and for other purposes of the Act.
 - a. Industrial Cooling, Spraying in mine pits or boiler feed.
 - b. Domestic purpose.
 - c. Process.
6. The occupier shall maintain the Electro Magnetic Flow Meters with computer recording arrangement for measuring the quantity of effluent generated and treated for the monitoring purposes of the Act.
7. Log book for each of the unit operations of ETP have to be maintained to reflect the working condition of ETP along with the readings of the Electro Magnetic Flow Meters installed to assess effluent quantity and the same shall be furnished for verification of the Board officials during inspection.
8. The occupier shall at his own cost get the samples of effluent/surface water/ground water collected in and around the unit by Board officials and analyzed by the TNPC Board Laboratory periodically.
9. Any upset condition in any of the plants of the factory which is, likely to result in increased effluent discharge and result in violation of the standards mentioned in Sl. No.3 above shall be reported to the Member Secretary / Joint Chief Environmental Engineer-Monitoring and the concerned District/Assistant Environmental Engineer of the Board by e-mail immediately and subsequently by Post with full details of such upset condition.
10. The occupier shall always comply and carryout the order/directions issued by the Board in this Consent Order and from time to time without any negligence. The occupier shall be liable for action as per provisions of the Act in case of non compliance of any order/directions issued.
11. The occupier shall develop adequate width of green belt at the rate of 400 numbers of trees per Hectare.
12. The occupier shall provide and maintain rain water harvesting facilities.
13. The occupier shall ensure that there shall not be any discharge of effluent either treated or untreated into storm water drain at any point of time.
14. In the case of zero liquid discharge of effluent units, the occupier shall adhere the following conditions as laid under.
 - i). The occupier shall ensure zero liquid discharge of effluent, thereby no discharge of untreated / treated effluent on land or into any water bodies either inside or outside the premises at any point of time.
 - ii) The occupier shall operate and maintain the Zero liquid discharge treatment components comprising of Primary, Secondary and tertiary treatment systems at all times and ensure that the RO permeate/Evaporator condensate shall be recycled in the process and the final RO reject shall be disposed off with the reject management system ensuring zero liquid discharge of effluents in the premises.
 - iii) The occupier shall operate and maintain the reject management system effectively and recover the salt from the system which shall be reused in the process if reusable or shall be disposed off as ETP sludge.
 - iv) In case of failure to achieve zero discharge of effluents for any reason, the occupier shall stop its production and operations forthwith and shall be reported to the Member Secretary/Joint Chief Environmental Engineer-Monitoring and the concerned District/Assistant Environmental Engineer of the Board by e-mail immediately and subsequently by Post with full details of such upset condition.
 - v) The occupier shall restart the production only after ascertaining that the Zero discharge treatment system can perform effectively for achieving zero discharge of effluents.

Special Additional Conditions:

The unit shall obtain No Objection Certificate (NOC) from the Tamil Nadu Bio Diversity Board /National Bio Diversity Authority if the unit is using any Biological resources or knowledge associated thereto as per the provisions of Biological Diversity Act 2002.

The industries shall take all efforts to use and popularize “Mission LiFE” logo and mascot which is available in TNPCB & MoEFCC website. They shall also request their employees to adopt “Mission LiFE” action points and document the same and furnish half yearly report to Board.

Additional Conditions:

1. The unit shall comply with the provisions of CRZ Notification, 2011.
2. The unit shall comply with the provision of Environment Impact Assessment Notification, 2006.
3. The unit shall dispose the sewage through septic tank followed by soak pit arrangements.
4. The unit shall provide collection, conveyance and Effluent Treatment Plant for the treatment of trade effluent generated from fish handling area including fish market and to commission the same within 3 months time.
5. The unit shall provide sewage treatment plant for the treatment of sewage generated from the harbour premises and to commission the same within 6 months time.
6. The unit shall provide EMFM at the inlet and outlet of ETP so as to access the quantity of trade effluent generated at all times.
7. The unit shall install the OCEMS in the ETP by following the procedure and guidelines for OCEMS 2018 as recommended by CPCB and to carry out periodical calibrations of the same, to ensure continuous and efficient operation.
8. The unit shall establish proper solid waste collection and storage system within the premises for bio degradable and non-bio degradable waste separately.
9. The unit shall collect the damaged fish nets continuously & properly and to ensure the same shall be sent for recycling to the authorized recyclers so as to avoid the haphazard disposal into sea.
10. The unit shall periodically analyze the treated effluent samples through TNPCB lab and furnish the report to the Board.
11. No ground water shall be withdrawn from the unit premises under any circumstances. It has to be ensured that regular monitoring of sea water quality shall be carried out in harbour by Chennai Fishing Harbour Management Committee to ascertain and adverse environmental impact.
12. The unit shall have containment boom facility with skimmer to contain and recover the spillages of hazardous liquid/oil if any.
13. The Chennai Fishing Harbour Management Committee shall ensure that no construction of new boats/breaking of boats is carried out within the harbour premises.
14. All the solid waste dumped within the premises of the fishing harbour shall be collected and disposed as per the rules prescribed in the Solid Waste Management Rules, 2016 & Construction and Demolition Waste Management Rules, 2016 in consultation with the Greater Chennai Corporation.
15. The unit shall provide proper storm water management system within in the premises.
16. The unit shall construct compound wall all around the unit premises after obtaining permission under the CRZ Notification, 2011.
17. The unit shall comply with the provision of Hazardous and other Waste (Management & Transboundry Movement) Rules, 2016.
18. The unit shall obtain Environmental Clearance from competent authority for their expansion projects proposed if any.
19. This consent order shall not be construed as consent of the Tamilnadu Pollution Control Board issued to the any individuals /private units located within the premises of Fishing Harbour.
20. The Chennai Fishing Harbour Management Committee shall ensure that units permitted to operate within the harbour premises /any proposed unit under examination for the grant of permission by the Chennai Fishing Harbour Management Committee shall have valid consent of the Tamilnadu Pollution Control Board.
21. The unit shall maintain good housekeeping.

**For Member Secretary,
Tamil Nadu Pollution Control Board,
Chennai**

GENERAL CONDITIONS

1. The occupier shall make an application along with the prescribed consent fee for grant of renewal of consent at least 60 days before the date of expiry of this Consent Order along with all the required particulars ensuring that there is no change in Production quantity and change in sewage/Trade effluent.
2. This Consent is issued by the Board in consideration of the particulars given in the application. Any change or alteration or deviation made in actual practice from the particulars furnished in the application will also be ground for review/variation/revocation of the Consent Order under Section 27 of the Act and to make such variation as deemed fit for the purpose of the Act.
3. The consent conditions imposed in this order shall continue in force until revoked under Section 27(2) of the Act.
4. After the issue of this order, all the 'Consent to Operate' orders issued previously under Water (Prevention and Control of Pollution) Act, 1974 as amended stands defunct.
5. The occupier shall maintain an Inspection Register in the factory so that the inspecting officer shall record the details of the observations and instructions issued to the unit at the time of inspection for adherence.
6. The occupier shall provide and maintain an alternate power supply along with separate energy meter for the Effluent Treatment Plant sufficient to ensure continuous operation of all pollution control equipments to maintain compliance.
7. The occupier shall provide all facilities to the Board officials for inspection and collection of samples in and around the factory at any time.
8. The occupier shall display the flow diagram of the sources of effluent generation and pollution control systems provided at the ETP site.
9. The solid waste such as sweepings, wastage, package, empty containers, residues, sludge including that from air pollution control equipments collected within the premises of the industrial plant shall be collected in an earmarked area and shall be disposed off properly.
10. The occupier shall collect, treat the solid wastes like food waste, green waste generated from the canteen and convert into organic compost.
11. The occupier shall segregate the Hazardous waste from other solid wastes and comply in accordance with Hazardous Wastes (Management, Handling and Transboundary Movement) Rules, 2008.
12. The occupier shall maintain good house-keeping within the factory premises.
13. All pipes, valves, sewers and drains shall be leak proof. Floor washings shall be admitted into the trade effluent collection system only and shall not be allowed to find their way in storm drains or open areas.
14. The occupier shall ensure that there shall not be any diversion or by-pass of trade effluent on land or into any water sources.
15. The occupier shall ensure that solar Evaporation pans shall be constructed in such a way that the bottom of the solar pan is at least 1 m above the Ground level (if applicable).
16. The occupier shall furnish the following returns in the prescribed formats to the concerned District office regularly.
 - a) Monthly water consumption returns of each of the purposes with water meter readings in Form-I on or before 5th of every month.
 - b) Yearly return on Hazardous wastes generated and accumulated for the period from 1st April to 31st March in Form-4 before the end of the subsequent 30th June of every year (if applicable).
 - c) Yearly Environmental Statement for the period from 1st April to 31st March in Form -V before the end of the subsequent 30th September of every year(if applicable).
17. If applicable, the occupier has to comply with the provisions of Public Liability Insurance Act, 1991 to provide immediate relief in the event of any hazard to human beings, other living creatures/plants and properties while handling and storage of hazardous substances.
18. The issuance of this consent does not authorize or approve the construction of any physical structures or facilities or the undertaking of any work in any natural watercourse or in Government Poromboke lands.
19. The issuance of this Consent does not convey any property right in either real personal property or any exclusive privileges, nor does it authorize any injury to private property or Government property or any invasion of personal rights nor any infringement of Central, State laws or regulation.

20. The occupier shall forth with keep the Board informed of any accident of unforeseen act or event of any poisonous, noxious or polluting matter or emissions are being discharged into stream or well or air as a result of such discharge, water or air is being polluted.
21. If due to any technological improvements or otherwise the Board is of opinion that all or any of the conditions referred to above requires variation (including the change of any treatment system, either in whole or in part) the Board shall, after giving the applicant an opportunity of being heard, vary all or any of such conditions and thereupon the applicant shall be bound to comply with the conditions as so varied.
22. In case there is any change in the constitution of the management, the occupier of the new management shall file fresh application under Water (Prevention and Control of Pollution) Act, 1974, as amended in Form-II alongwith relevant documents of change of management immediately and get the necessary amendment with renewal of consent order.
23. In case there is any change in the name of the company alone, the occupier shall inform the same with relevant documents immediately and get the necessary amendments for the change of name from the Board.
24. The occupier shall display this consent order granted to him in a prominent place for perusal of the inspecting Officers of this Board.

**For Member Secretary,
Tamil Nadu Pollution Control Board,
Chennai**

SEWAGE TREATMENT PLANT - 40 KLD (SBR TYPE)

The Fully automatic Sewage treatment plant with effluent handling capacity 40m³ per day. The entire plant will be constructed in RCC as per the structural & PHE Consultant's drawings. The STP shall be designed as water retaining structures, with necessary chemical dosing as required by the manufacturer's design. All the equipment, piping, pumps, air blowers and electrical panel to be housed in the STP Pump room area. Necessary GI. puddle flange (Hot dipped Galvanized) for inlet, outlet, overflow shall be provided., MS. moving ladders & railing shall be provided. The Plant shall be complete with a central Electrical Power and Control panel fully pre/site wired and with all power and control cables to all pumps and equipment including all instrumentation, level and other controls. The cost will also include any consequential civil work including making foundations for the structure, pumps, blowers, filters, centrifuge etc.

QUALITY OF SEWAGE WATER:

- ✓ BOD5: 250 to 350 Mg / Ltr.
- ✓ COD: 400 to 600 mg / Ltr
- ✓ TSS: 150 to 300 Mg / Ltr
- ✓ PH: 6.5 to 8.5
- ✓ Oil & Grease: 50 - 100 mg / Ltr.
- ✓ E-coli: 10 MPN
- ✓ Total Nitrogen: 40 mg / Ltr.
- ✓ Total Phosphates: 20 - 40 mg / Ltr.
- ✓ TDS: 500 - 800PPM

QUALITY OF TREATED EFFLUENT:

- ✓ BOD5: < 10 Mg / Ltr.
- ✓ COD : 50 Mg / Ltr.
- ✓ TSS < 20 Mg / Ltr.
- ✓ PH: 7.0 to 8.5
- ✓ Oil & Grease - NIL
- ✓ Suspended solids: 0- 10PPM
- ✓ E-coli: Nil
- ✓ TURBIDITY < 2 NTU
- ✓ Residual Cl₂ > 1 PPM

- ✓ AMMONICAL NITROGEN < 5 Mg / Ltr.
- ✓ TOTAL NITROGEN < 10 Mg / Ltr.
- ✓ Total Phosphate < < 2 Mg / Ltr.

The STP shall consist of following units/Tanks with solid plastic rungs in all tanks & Platform for maintenance etc. complete as required:

- a) Bar Screen Chamber
- b) Bar Screen Chamber with grease trap (near admin block)
- c) Equalization tank
- d) Pre-Aeration tank
- e) Aeration tank
- f) Decant valve tank
- g) Decant tank
- h) Sludge Holding tank
- i) Final treated water tank

**PRIMARY TREATMENT - 40.00 CU.M / DAY OPERATING DURATION - 24 HRS
(3 BATCHES OF 8 HOURS EACH)**

Design, Engineering, and preparation of civil/ structural drawings (GFC) and providing all equipment / Piping etc at site, erection testing and commissioning of equipment's/ electricals/ piping for Sewage treatment plant.

Note: Tenderer shall specify flow parameters, reduction of BOD, COD in each stage of treatment in the P & F diagram to meet the treated water parameters as per PCB norms / requirement.

S.S.BAR SCREEN

SS bar screen so as to remove the large sized solid particles present in the sewage water associated with a set of guide angles in SS flat of 5.0 mm thick and 50 mm wide kept inclined at 45 degrees to 60 degrees to the horizontal at 20 mm c/c with one no. hand rack in SS Bar rack fabricated from SS bars shall be provided to cover the width of the screen chamber with a racking arm for manual operation.

Note: Apart from the specification, the Vendor shall fabricate the "BAR SCREEN" as per the approved shop drawings.

Size: 600 mm × 900 mm

GREASE TRAP CHAMBER

Grease trap chambers in 230mm thick brick masonry in cement mortar 1:5. Clear internal dimensions 1500mm x 1200mm constructed over a bed of cement concrete 1:3:6, 150 mm thick 1/2 no. hanging baffle in 50mm thick RCC of suitable size, aluminum perforated tray of size 500 x 400 x 150 (deep) fabricated out of 14 gauge sheet, with 40mm wide top flange supported on all four sides with 40 x 40 MS angle fixed to wall Anchor fasteners plastering inside and outside of chamber with cement mortar 1:3, providing and fixing one No. CI frame & cover size 900 x 600 weighing not less than, 125 Kg and another frame and cover size 600 x 600 weighing not less than 75 Kg providing CI steps at 300mm C/C, vertically at two corners of chamber, painting all CI items and MS items with two coats of bitumastic paint etc., complete, depth of chamber not exceeding 1200mm.

Note: Apart from the specification, the Vendor shall fabricate the "BAR SCREEN" as per the shop drawings approved by the PHE consultant.

Size: 1500 mm × 1200 mm

S.S. BAR SCREEN FOR GREASE TRAP

SS bar screen so as to remove the large sized solid particles present in the sewage water associated with a set of guide angles in SS flat of 5.0 mm thick and 50 mm wide kept inclined at 45 degrees to 60 degrees to the horizontal at 20 mm c/c with one no. hand rack in SS Bar rack fabricated from SS bars shall be provided to cover the width of the screen chamber with a racking arm for manual operation.

Note: Apart from the specification, the Vendor shall fabricate the "BAR SCREEN" as per the approved shop drawings.

Size: 600 mm × 900 mm

RAW SEWAGE PUMPS

Two Nos. (1w + 1sby) submersible type raw sewage water pumps with cutter version to pump sewage from equalization sump to aeration tank at 14.40 cu.m / hr flow rate. The pump shall be coupled to adequate H.P. electrical motor, mounted on a common base frame made

out of SS with necessary bolts, unsaddle and mesh. The pump shall be provided with suitable enclosure with strainer arrangement for the protection of submersible pumps.

The pump shall be suitable for the following requirements:

- ✓ Flow rate - 14.4 cu.m / hr
- ✓ Head - 25 m
- ✓ The rate quoted shall be inclusive of:
- ✓ Earthing for pumps to be included in the quotation.

1 no. pressure gauge 4" dial with valve tee and fittings comprising of the following:

- a) 4" dial with shatter proof glass
- b) Rim - S.S.304
- c) Internal – Brass
- d) Body-S.S.316
- e) Needle valve
- f) Tee fittings.

2 nos. Cast iron lever operated slim seal type butterfly valves of CI body and spheroidal graphite iron disc (SG iron), with nitrile rubber seal, tested to 10 kg / sq.cm Confirming to BS 5155 / MF6 standards and including a set of SS flanges as per BS - 10 table1, including bolts, nuts, SS washers and neoprene rubber gaskets complete etc., on delivery side.

2 nos. slim seal dual flap type check valve with CI body and cast steel disc tested to PN - 10 kg / sq.cm pressure including a set of SS Flanges as per BS - 10 table 1 including bolts, nuts, SS washers and neoprene rubber gaskets complete etc., on delivery side.

Alarm indication with signal in the event of pump failure etc.

Manifold fabricated out of GI 'C' class pipe of suitable diameter on delivery side finished neatly with hot dip galvanizing to 100 microns with flanged end on either sides and collar provision for connectivity of above-mentioned valves.

1 no. ball valve of brass body nickel plated with stainless steel ball, lever operated and tested to 10 kg / sq.cm. pressure including necessary fittings like union, Hex, nipples etc., "BLEED OFF" Line.

FINE BUBBLE AIR DIFFUSERS

Fine bubble diffuser with 90mm dia x 1000mm long with membrane consisting of set of EPDM membranes, SS 304 clips PVC support pipe (10ksc pressure rating), PVC fitting (like elbows, tees, collors etc), nylon rope braided hose of required length with all accessories like couplers, U-clamps, GI brackets etc., to make it retrievable.

COARSE BUBBLE AIR DIFFUSERS

Coarse bubble diffuser with 90 mm dia X 800 mm long fabricated / made out of PVC pipe grid with necessary orifices PVC pipe of 6.0 kg / sq.cm - 10 kg / sq.cm pressure rating with removable deflector to provide clog-free oxygen for aeration tank including SS 304 clips at the end, PVC support pipe(10 ksc pressure rating), PVC fitting(like elbows, tees, collars etc), with 10 mm perforations with 100 mm c/c distance as per the system design and requirement, nylon rope braided hose of required length with all accessories like couplers, clamps etc., to make it retrievable.

AIR BLOWERS

Two No's. (One working + one standby) Rotary Tri Lobe design type air blower for the tanks complete with motors, pulleys, One piece rigid CI casing and side plates, silencer, base plate, Anti-friction bearings, Rotary oil sealings having horizontal configuration. The blower shall be coupled to adequate H.P. electrical motor and shall be mounted on a common base frame fabricated with M.S. ""L"" Angle (epoxy coated) of suitable section with necessary bolts, nuts and with manifold

"

The blower shall be suitable for the following:

Flow rate - 200 Cu.m / hr

Flow Pressure - 0.60 kg / sq. cm

Head - 6 mtr

1 no. pressure gauge 4" dial with valve tee and fittings comprising of the following:

- a) 4" dial with shatter proof glass
- b) Rim - S.S.304
- c) Internal – Brass
- d) Body S.S.316
- e) Needle valve

f) Tee fittings.

Tri Lobe Air blower of 100 cum/hr at 0.50 kg/sq.cm capacity comprising of common base frame, suction filter, suction silencer, non-return, V belt, guard, drive and driven pulleys, pressure gauge, inter connection pipping, discharge silencer, anti-vibration pads including required motor

Motor of suitable capacity for Air blowers to be provided.

2 nos. Cast iron lever operated slim seal type butterfly valves of CI body and spheroidal graphite iron disc (SG iron), with nitrile rubber seal, tested to 10kg / sq.cm Confirming to BS 5155 / MF6 standards and including a set of GI flanges as per BS - 10 table1, including bolts, nuts, GI washers and neoprene rubber gaskets complete etc., on the delivery side.

2 nos. slim seal flap type check valve with CI body and cast steel disc tested to PN - 10 kg / sq.cm pressure including a set of GI Flanges as per BS - 10 table 1 including bolts, nuts, GI washers and neoprene rubber gaskets complete etc., on the delivery side.

Manifold of required dia and numbers made of M.S 'B' class pipe with welded joints and GI / MS flanged joints near valve connectivity, painted neatly with 2 coats of zinc chromate primer and finished neatly with 2 coats of enamel paint of approved color including providing necessary support bracket fabricated out of M.S 'L' angle 40 mm × 40 mm × 5 mm thick with 'U' clamp, washers and check nuts etc., 25 mm dia lever operated ball valves of brass body nickel plated with stainless steel ball, lever operated with gun metal nozzle for connecting rubber hose including necessary GI fittings like elbow, Hex nipples etc. and tested to 10 kg / sq.cm. 25 mm dia flexible braided hose pipe of required length with coupler.

ACOUSTIC ENCLOSURE FOR AIR BLOWERS

Acoustic enclosure for the air blowers with the specification as mentioned below:

Construction: Fabricated out of heavy gauge steel section and its reinforcement with fabricated super structure and necessary support frames.

Type: Bolting type with removable type panels for maintenance/ servicing of air blowers.

Size: Based on the air blowers capacity / size with all-round space for Maintenance.

External Joints: Shall be provided with rubber gaskets to resist weathering.

Acoustic louvers for - Cool air inlet.

Exhaust fans for - Hot air outlet.

Exhaust fans for - Hot air outlet.

Noise level Reduction: less than 40 DB.

DECANTER MECHANISM

Supplying, installing, testing and commissioning of Decanter Mechanism consisting of the following features and specifications:

Features:

- ✓ ON/OFF Control
- ✓ Manual override non-clutch design
- ✓ Irreversible worm gear
- ✓ Visual Mechanical position indicator
- ✓ Enclosure IP-67

Specifications:

Butterfly Valve

Butterfly valve shall be of CI body and epoxy coated ductile iron disc with EPDM liner / a nitrile rubber seal, tested to 10kg sq.cm confirming to BIS standards and including set of SS flanges as per BS table 10 including bolt, nuts, SS washers, neoprene rubber gaskets, etc. complete.

Actuator

Actuator made of die aluminum alloy with PTFE lining keyhole provision or connectivity of Butterfly valve stem, circular handles for manual operation, tested to pressure rating PN-10 and shall have standard cable length of 5m. The enclosure shall be of IP-67(Water proof). The actuator shall be power operated and shall be provided with indicators, manual override, permanently lubricated self-locking worm gear and external surface shall be finished neatly with dry powder coated and shall have built in thermal protection.

SLUDGE TRANSFER PUMPS

Supplying, installing, testing and commissioning of 2 No's. (one working + one standby) monobloc type sludge transfer pump at 2.8 cu.m / hr flow rate. The pump shall be of "self-priming type" The pump shall be coupled to adequate H.P. electrical motor and shall be mounted on a common base frame fabricated with M.S. "L" Angle (epoxy coated) of suitable section with necessary bolts, nuts and with manifold. The pump shall be suitable for pumping the digested sludge.

The pump shall be suitable for the following requirements:

- ✓ Flow rate – 2.80 cu.m / hr
- ✓ Head - 10 - 12 mtr
- ✓ The rate quoted shall be inclusive of:
- ✓ Earthing for pumps to be included in the quotation.

1 no. pressure gauge 4" dial with valve tee and fittings comprising of the following:

- a) 4" dial with shatter proof glass
- b) Rim - S.S.304
- d) Body - S.S.316
- e) Needle valve
- f) Tee fittings.

Two nos. of ball valves of brass body nickel plated with stainless steel ball, lever operated and tested to 10 kg / sq.cm. pressure including necessary fittings like union, Hex, nipples etc., on suction side. Two nos. of ball valves of brass body nickel plated with stainless steel ball, lever operated and tested to 10 kg / sq.cm. pressure including necessary fittings like union, Hex, nipples etc., on delivery side. Two nos. spring operated type gun metal non return valve tested to 10 kg/ sq.cm pressure including necessary fittings like union, Hex, nipples etc., on delivery side. Manifold fabricated out of GI 'B' Class pipe on delivery side and suction side flanged end on either sides and collar provision for connectivity of above-mentioned valves.

CENTRIFUGE SYSTEM - FOR SLUDGE HANDLING

Centrifuge system for handling of sludge generated in STP consisting of the following:

The Centrifuge shall be of batch type provided with 450mm dia x 350mm ht x 10mm th mesh made out of SS 304 including 500mm dia x 400mm ht basket drum fabricated out MS and the inside and outside surface finished neatly with two coats of epoxy paint.

Centrifuge shall be provided with a main drive motor of suitable capacity / rating having 900 - 1000 rpm and connected to a EN-8 shaft made of SS304 with 300 rpm with motor mounting arrangement fabricated out of MS, including proving filter bag of size 50 microns, anti vibration pads etc.

One no of online automatic poly dosing system consisting of automatically operated dosing pump with single molded FRP cylindrical type chemical solution tank of 50 - 100 litres cap, having detachable lids with mound inserts for mounting the dosing pump and stirrer / agitator including one no electronic diaphragm type positive displacement poly propylene (PP) pump for chemical dosing @ 4-12 lph having head of 3-4 mtr with stirrer / agitator made of SS304.

The pump shall be operated on 220V single phase supply and shall be mounted directly on the top of dosing tank. The pump shall be provided with magnetic float switch to trip the dosing pump at low level of chemical in the tank.

The rate quoted shall be inclusive of all the valves, interconnecting piping with necessary fittings like elbows, Tees, unions, couplers, bracket supports, U clamps, base frames etc., complete.

CENTRIFUGE FEED PUMPS

Supplying, installing, testing and commissioning of 2 Nos. (One working + one standby) monobloc type Centrifuge feed pump at 5.4 cu.m / hr flow rate. The pump shall be of "self-priming type" The pump shall be coupled to adequate H.P. electrical motor and shall be mounted on a common base frame fabricated with S.S. "L" Angle (epoxy coated) of suitable section with necessary bolts, nuts and with manifold. The pump shall be suitable for pumping the digested sludge.

The pump shall be suitable for the following requirements:

- ✓ Flow rate - 5.4 cu.m / hr
- ✓ Head - 15 mtr
- ✓ The rate quoted shall be inclusive of:
- ✓ Earthing for pumps to be included in the quotation.

1 no. pressure gauge comprising of:

- a) 4" dial with shatter proof glass
- b) Rim - S.S.304
- c) Internal – Brass
- d) Body - S.S.316
- e) Needle valve
- f) Tee fittings.

Two nos. of ball valves of brass body nickel plated with stainless steel ball, lever operated and tested to 10 kg / sq.cm. pressure including necessary fittings like union, Hex, nipples etc., on the delivery side. Two nos. of spring-operated type gun metal non return valve tested to 10 kg/ sq.cm pressure including necessary fittings like union, Hex, nipples etc., on the delivery side.

Two nos. of ball valves of brass body nickel plated with stainless steel ball, lever operated and tested to 10 kg / sq.cm. pressure including necessary fittings like union, Hex, nipples etc., on the suction side Manifold fabricated out of GI 'B' class pipe on delivery side and suction side with flanged end on either sides and collar provision for connectivity of above-mentioned valves.

**TERTIARY TREATMENT 50.00 CU.M / DAY OPERATING DURATION - 12 HRS
FILTER FEED PUMP**

Two nos. Monobloc type pumps (1W + 1SBY) for pumping primary treated water through sand pressure filter, activated carbon filter etc, and finally to treated water sump. The pump shall be coupled to the adequate H.P. electrical motor and shall be mounted on a common base frame fabricated with MS "L" Angle of suitable section with necessary bolts, nuts and with manifold.

The pump shall be suitable for the following requirements:

- * Flow rate – 3.60 Cu.m / hr
- * Head - 30 m

The rate quoted shall be inclusive of:

- a) Earthing for pumps to be included in the quotation.
- b) 1 no. pressure gauge 4" dial with valve tee and fittings comprising of the following
 - ✓ 4" dial with shatter proof glass
 - ✓ Rim - S.S.304
 - ✓ Internal – Brass
 - ✓ Body - S.S.316
 - ✓ Needle valve
 - ✓ Tee fittings.
- c) 2 nos. of ball valves of brass body nickel plated with stainless steel ball, lever operated and tested to 10 kg / sq.cm. pressure including necessary fittings like union, Hex, nipples etc., on suction side.
- d) 2 nos. of ball valves of brass body nickel plated with stainless steel ball, lever operated and tested to 10 kg / sq.cm. pressure including necessary fittings like union, Hex, nipples etc., on delivery side.
- e) 2 nos. 25 mm dia ball valves of brass body nickel plated with stainless steel ball, lever operated and tested to 10 kg / sq.cm. pressure including necessary fittings like union, Hex, nipples etc., on either side of the manifold for the priming line connectivity.

f) Manifold fabricated out of GI 'B' class pipe of suitable dia on delivery side and suction side finished neatly with hot dip galvanizing to 100 microns with flanged end on either sides and collar provision for connectivity of above-mentioned valves.

MS- SAND PRESSURE FILTER

Sand pressure filter (SPF) for filtration of semi treated water. The filter shall be suitable for 3.60 cu.m /hr flow rate and designed to filter suspended particles / impurities in semi treated water.

The SPF shall be designed for a specific velocity of 8 m³ / hr / sq.m area and the approx. size shall not be less than 800 mm dia

The sand pressure filter unit shall comply with the following technical requirements:

- ✓ Flow rate – 3.60 Cu.m / hr
- ✓ Back wash duration - 15 minutes
- ✓ Filtering Media - Sand/Pebbles
- ✓ Pressure drops across unit. - 0.7Kg/ sq.cm (max)
- ✓ Inlet turbidity - 1.00 as NTU
- ✓ Dia of sand pressure filter unit - 800 mm dia.

Further, the sand pressure filter unit shall comprise of the following:

- ✓ Painting Internal - Two coats of zinc chromate primer followed by two coats of anti-corrosive epoxy paint after sand blasting.
- ✓ Painting external - Two coat of zinc chromate primer and above that a layer of two coats of enamel paint of approved colour to give the finishing.
- ✓ The sand pressure filter vessel shall be fabricated out of MS plate not less than 6 mm thick with dish ends out of 6 mm thick plate
- ✓ The Thickness of the flange plate for manholes shall not be less than 8mm.
- ✓ The Sand Pressure filter shall be fitted with top inlet distribution and bottom collecting system.
- ✓ Pressure gauge with needle valve shall be provided at inlet and outlet of Sand Pressure filter.
- ✓ 450mm dia Side Manhole to be provided.

- ✓ "V-Notch" of suitable size fabricated out of 6 mm MS plate and finished with hot dip galvanizing to 100 microns including marking of flowrates indication for monitoring of backwash of Sand pressure filter.
- ✓ Initial charge of sand and multigrade filtering media as required.
- ✓ Complete set of pressure gauge with needle valve and frontal piping with multiple valve system at inlet, outlet backwash and drain out point etc., with GI 'B' class pipes.

Notes: Inter connecting piping between the filter feed Pumps, PSF, ACF, UF and Softener shall be carried out with GI /MS "B" class pipe with welded joints. The Shell end and Dish end shall be fabricated out of a single sheet only (i.e., without any joints).

MS- ACTIVATED CARBON FILTER (ACF)

Activated carbon filter for filtration and removal of color and odour in semi treated water. The filter shall be suitable for 6.00 cu.m / hr flow rate. The sizing / diameter of ACF shall be designed based on a specific velocity of 8 cu.m / hr / sq.m area and the approximate dia of 800mm. The activated carbon filter unit shall comply with the following technical requirement.

- ✓ Flow rate – 3.60 Cu.m / hr
- ✓ Back wash duration - 15 minutes
- ✓ Painting Internal - Two coats of zinc chromate primer followed by two coats of anti-corrosive epoxy paint after sand blasting.
- ✓ Painting external - Two coat of zinc chromate primer and above that a layer of two coats of enamel paint of approved color to give the finishing.
- ✓ The activated carbon filter vessel shall be fabricated out of MS plate not less than 6mm thick with dish ends out of 6mm thick plate
- ✓ Filtering Media - activated carbon made out of coconut shell.
- ✓ IV Value of Activated Carbon shall be 1000 - 1300
- ✓ Pressure Drop across unit. - 0.7kg / sq.cm (max)
- ✓ Dia of activated carbon filter unit -800 mm dia.

Further the activated carbon filter unit shall comprise the following:

- ✓ The Activated Carbon Filter shall be fitted with inlet distribution and bottom collecting system.
- ✓ Pressure gauge with needle valve shall be provided at inlet and out let of Activated Carbon filter.

- ✓ 450mm dia Side Manhole to be provided.
- ✓ "V-Notch" of suitable size fabricated out of 6 mm MS plate and finished with hot dip galvanizing to 100 microns including marking of flowrates indication for monitoring of backwash of Activated Carbon filter.
- ✓ Initial charge of underbed and carbon media made out of "coconut shell" having IV value of 1000 - 1300.
- ✓ Complete set of pressure gauge with needle valve and frontal piping with multiple valve system at inlet, outlet backwash and drain out point etc., with GI 'B' class pipes.
- ✓ 500mm dia side manhole to be provided.
- ✓ 600mm dia top manhole to be provided.

Notes: Inter connecting piping between the filter feed Pumps, PSF, ACF and Softener shall be carried out with GI /MS "B" class pipe with welded joints. The Shell end and Dish end shall be fabricated out of a single sheet only (i.e, without any joints)."

SOFTENER

Supply, installation, testing and commissioning of softener for the removal of hardness present in the STP semi treated water. The softener shall be suitable for 3.60 Cu.m / hr flow rate and designed to remove hardness causing salts from semi treated water. The softener shall comprise of the following:

a) Softener Vessel

- ✓ The softener vessel shall be fabricated out of SS plate not less then 6mm thick with dish ends out of 6mm thick plate.
- ✓ Painting Internal - Two coats of zinc chromate primer followed by two coats of anti-corrosive epoxy paint after sand blasting.
- ✓ Painting external - Two coat of zinc chromate primer and above that a layer of two coats of enamel paint of approved colour to give the finishing.
- ✓ The filter shall be fitted with top inlet distribution and bottom collecting system.

b) Piping and Valves:

- ✓ One set of GI 'B' class pipes to connect the control valves with the softener unit and regeneration tank up to the inlet point at UG sump.
- ✓ Complete set of frontal piping with multiple valve system with pressure gauge, needle valve and frontal pipe work done with GI 'B' class pipes
- ✓ 450mm dia Side Manhole to be provided.

- ✓ "V-Notch" of suitable size fabricated out of 6 mm MS plate and finished with hot dip galvanizing to 100 microns including marking of flowrates indication for monitoring of rinsing softener
- ✓ Pressure gauge with needle valve shall be provided at inlet and outlet of Softener

c) Regeneration Equipment:

One salt saturator tank for storage and preparation of brine solution having 250 Liters by volume and of approximate size of 750mm dia x 750 mm ht to be provided.

d) Resin Material:

First charge of high-capacity polystyrene bead type cation exchange resin of approved quality. The water testing kit shall also be included. The quantity of resin shall be 400 L for hardness of 500 PPM.

e) Water Meter:

- ✓ A gun metal water flow meter shall be supplied & installed to register the amount of water passed through the softener.
- ✓ Epoxy painting of all equipment, piping, etc., shall be included in the offer.
- ✓ Note: The Shell and Dish End Shall be fabricated out of a single sheet Only(i.e, without any joints).

Design Data

- ✓ Daily requirement / OBR - 40.0 cu.m / day
- ✓ Hardness level at the inlet is minimum 500PPM & at the Outlet shall be less than 50PPM of Softener
- ✓ The Diameter of Softener is 1000mm

Notes: Inter connecting piping between the Pumps and Softener shall be carried out with GI /MS "B" class pipe with welded joints.

ULTRAVIOLET STERILIZER:

Supply, installation, testing and commissioning of the ultraviolet sterilizer suitable for flow rate of 3.60 cu.m / hr. The unit shall be suitable for removing the bacteria in STP treated water.

The unit shall comply with the following technical specifications.

- ✓ The quartz sleeve protection for UV lamp.
- ✓ Unit shall be suitable for a working pressure of 5 sq.cm
- ✓ Mounting brackets to be provided.
- ✓ Suitable for 220V single phase power supply operation.
- ✓ Stainless steel type 304 electropolished purification chamber.
- ✓ Single port providing visual indication of lamp.
- ✓ Wiper assembly to facilitate periodic cleaning of quartz glass
- ✓ Removable flange heads for easy and complete deniably.
- ✓ High intensity UV lamps rated for min. of 7500 hours continuous use.
- ✓ Lamp monitor indicating the function of U.V. lamp.
- ✓ Filter cartridge assembly.
- ✓ Time elapse meter.

CHLORINE DOSER

Online automatic electronic sodium hypo dosing unit with automatically operated dosing pump etc., The unit shall comprise of the following:

- a) One no. single moulded FRP cylindrical type chemical solution tank of 100 litres capacity having detachable lids with moulded inserts for mounting of pumps and stirrer.
- b) One no. Electronic diaphragm type positive displacement pump, for chemical dosing with plastic head. The electronic pump shall be operated on 220V single phase supply and shall be mounted directly on the tank top.
- c) Complete set of pipes, valves and fittings, foot valve magnetic float switch to trip the dosing pump at low level of chemical in the tank.
- d) The free chlorine content in the filtered water shall not be less than 0.5 PPM.
 - Min. Actuating Pressure - 0.3 kg/sq cm
 - Max. Working Pressure - 0.5 kg/sq cm
 - Max. Temperature - 50 degree Centigrade
 - Dosing flow range - As per system requirement
 - Flow - 0 - 20 LPH

- Head - 5 - 6 mtr

ALUM DOSER:

Electronic alum dosing unit with automatically operated dosing pump etc. The unit shall comprise of the following:

- a) One no. single moulded PP cylindrical type chemical solution tank of 100 liters capacity having detachable lids with moulded inserts for mounting of pumps and stirrer.
- b) One no. electronic diaphragm type positive displacement pump, for chemical dosing with plastic head. The electronic pump shall be operated on 220V single phase supply and shall be mounted directly on the tank top.
- c) Complete set of pipes, valves and fittings, foot valve magnetic float switch to trip the dosing pump at low level of chemical in the tank.
- d) The free chlorine content in the filtered water shall not be less than 0.5 PPM.
- e) Concrete bed/pedestals of suitable size and thickness in cement concrete 1:2:4 for mounting the doser base with anchor fastener, bolts and nuts and neatly finished smooth with floating coat of cement mortar.

The pump shall be suitable for the following requirements:

- a) Min. Actuating Pressure - 0.3 kg/sq cm
- b) Max. Working Pressure - 0.5 kg/sq cm
- c) Max. Temperature - 50 degree Centigrade
- d) Dosing flow range- As per system requirement
- e) Head - 5 - 10 mtr

MCC PANEL FOR STP

Combined / common Motor Control Center Panel Board (MCCP) PLC Based with fully automatic console / sensor for all the pumps and panels. The MCC shall be sheet steel fabricated, finished with powder coating of approved color, and of floor mounted, free standing cubicle type with incoming MCCB - Phase indicating lamps, 250Volts voltmeter, 250 amps ammeter, energy meter, phase selector switches, TPNE bus bars and outgoing with MCB's,

starter relays, over load, UV earth fault protection with time delay sequence operator etc. The panel shall have Voltmeter, Ammeter and indicating lamps on the incoming side and only indicating lamps for the pumps on outgoing side to indicate the operation mode. The panel shall be complete in all respects and prior to the supply, fabrication drawing shall be submitted for consultants' approval. Panel shall be fabricated out of 1.5mm thick sheet steel frames and doors with 2mm thick sheet steel.

The Board shall be incorporated with the following: -

INCOMING:

- ✓ 1 no. 160A, TPN, 25KA, MCCB with shunt trip coil, overload and short circuit protection operating handle, all other accessories.
- ✓ 1 no. ELR with CBCT (0-8) A capacity.
- ✓ 1 no. multi data digital meter to read voltage/current/kw/kvar/etc. with suitable CTs/control fuse/LED indications.

OUTGOINGS:

- ✓ 1 set 1.5 kW DOL starters comprising of 16A, TPN MCB, D curve, OL relay, AC3 duty TP power contactors with add on block, illuminated push buttons, Auto / Manual selector switch, timer, Phase, ON, OFF & TRIP LED indications, power & control terminal strips, with necessary electrical interlocking between starters as required at site.
- ✓ 1 set 10.0 kW star delta starters comprising of 25A, TPN MCB, D curve, OL relay, AC3 duty, TP power contactor with add on block, illuminated push buttons, Auto / Manual selector switch, timer, Phase, ON, OFF & TRIP LED indications, with necessary electrical interlocking between starters as required at site.
- ✓ 1 set 1.5 kW DOL starters comprising of 16A, TPN MCB, D curve, OL relay, AC3 duty, TP power contactor with add on block, illuminated push buttons, Auto / Manual selector switch, timer, Phase, ON, OFF & TRIP LED indications, with necessary electrical interlocking between starters as required at site.
- ✓ 1 set 1.0 kW DOL starters comprising of 16A, TPN MCB, D curve, OL relay, AC3 duty TP power contactors with add on block, Illuminated push buttons, Auto / Manual selector switch, timer, Phase, ON, OFF & TRIP LED indications, power & control terminal strips, with necessary electrical interlocking between starters as required at site.

- ✓ 1 set 2.5 kW DOL starters comprising of 16A, TPN MCB,D curve, OL relay, AC3 duty, TP power contactor with add on block, Illuminated push buttons, Auto / Manual selector switch, timer, Phase, ON, OFF & TRIP LED indications, with necessary electrical interlocking between starters as required at site.
- ✓ The Phase busbar shall be 25 x 8 mm. and the Neutral busbar shall be 1Run of 25 x 4 mm.
- ✓ The Earth busbar shall be 2 Runs of 25 x 4 mm. Provided at the top of the Panel.
- ✓ Droppers / Link busbar shall be equal to switch ratings.

EARTHING

- ✓ Earthing for panels, pump, blowers and motors.
- ✓ 10 SWG enameled copper wire with necessary clamps, screws etc.
- ✓ 8 SWG enamelled copper wire with necessary clamps, screws etc.

FABRICATED TYPE CABLE TRAY / SUPPORTS

Supplying, fabricating, erecting and connecting M S angles, M S Flats, M S channels, M S flats as required with necessary fabrication arrangements painted with two coats of red oxide primer paint and two coats of Approved color of enamel paint. The cost shall also includes necessary supports, foundation bolts, etc.,

The rate quoted shall be inclusive of the following:

- a) Earthing for panels, pump, blowers and motors.
- b) Level switches for the necessary pumps.
- c) Cabling between pumps to panel.
- d) MCB
- e) DOL Starter suitable to each feeder.
- f) Single phase preventor for all the pumps mentioned above.
- g) ON / OFF - Indicating lamps.
- h) AUTO / MANUAL - Selector switch for automatic / manual operation.
- i) START / STOP - Push buttons for manual operation.
- j) GI Cable trays - perforated.
- k) GI Earth strip.

l) Necessary earthing cables / wires for the pumps, panels, blowers, motors and termination to the nearest earth pit.

m) Dry run protection arrangement for the following:

- Raw Sewage Pump
- Air Blowers & motors:
- Return Sludge Pumps
- Screw Pumps
- Filter Feed Pumps
- Excess treated water disposal pumps.
- Irrigation water pumps.
- Audio / visual alarm indication in the event of malfunctioning of STP

ELECTROMAGNETIC FLOW METER

Electro Magnetic Flow meter with integral/advanced data logging enclosure made out of die aluminum casting with flanged ends as per ASME B-16.5, having signal output of 4-20mA along with PTFE lining and electrode sensor made of SS316, pressure rating as per PN-10 with digital LCD display with backlit and flow tube material of SS316. Communication protocol shall be of RS-485. The Electro Magnetic Flowmeter shall be provided with standard wire length of 5m. The rate quoted shall be inclusive of necessary GI / MS / PVC flanges on either side with necessary gasket, bolts, nuts with washer etc., for further connectivity.

Notes:

01) Flow meters shall be provided for the permeate water & backwash water.

02) Earthing for the MCCPB, panels, pump, blowers and motors.

03) The feed water for backwash of ACF and SPF shall be tapped from the final treated water outlet.

04) The outlet of backwash water from SPF and ACF shall be taken back / connected to the equalization tank.

05) The quoted rates shall include plant and piping works for the STP consists of interconnecting piping, fittings, valves within the battery limit of the Sewage Treatment Plant MOC of the piping shall be GI 'B' Class

- 06) The quoted rates shall be inclusive of Earthing Works, Instrumentation and Level switches etc complete.
- 07) The consumables and chemicals required for initial start up and till testing and commissioning and handing over of Sewage Treatment Plant shall be borne by the vendor.
- 08) The mechanical ventilation for the plant is not included in the BOQ. The same shall be provided as a separate quote with the BOQ by the vendor.
- 09) The necessary puddle flanges, Manhole covers, PVC rungs shall be indicated in the shop drawings submitted by the vendor and vendor to co-ordinate with the client at the time of installation of the same during the execution of civil works at site.
- 10) All the civil works for the STP, Pump room and the staircase head room for access to the Pump room will be in the scope of the client.
- 11) All the fabrication works interns of maintenance platform and the handrails inside the pump room will be in the scope of the client.
- 12) Plant piping, necessary cabling and earthing to be included in the scope of works of the contractor.
- 13) The quoted rate shall include necessary cabling works from MCC panel to the respective pumps, blowers etc.,
- 14) The quoted rate shall include necessary puddle flanges, PVC sleeves, PVC encapsulated rungs.
- 15) The rate quoted shall be inclusive of necessary earthing for MCC panel, air blowers & for all the pumps covered in this BOQ.
- 16) The vendor shall indicate all types of taxes & duties separately and do not include in this BOQ.

DETAILS OF COMPREHENSIVE OPERATION & MAINTENANCE: -

Our Scope of Work Includes: -

- ✓ Manpower for Operating the Plant – 3nos (24 X 7 Basis)
- ✓ Technical support and Operation guidance to operators.
- ✓ Chemicals & Consumables.
- ✓ Analysing the treated water sample.

- ✓ Monitoring all the Mechanical & Electrical Equipment's.

MAINTENANCE

The Contractor shall also undertake to provide a comprehensive service whereby qualified technicians shall attend to each breakdown as soon as practicable after a breakdown is reported and carry out immediate remedial work at a reasonable speed according to the nature of the breakdown. Any faulty equipment or components shall be quickly replaced.

General Terms & conditions and Scope of work

- 1) The tender is for Comprehensive Annual Maintenance of STP. The firms / agencies/ contractors who wishes to quote are required to visit and examine the whole systems and satisfy themselves before submitting their offer and to apprise themselves about the plant and equipment, accessories and parts of the complete systems.
- 2) LOG-BOOK for recording of parameters related to Sewage Treatment Plant shall be maintained by the firm/ agency /contractor showing the complete maintenance done on the Plant and it should be made available to the Client on a monthly basis.
- 3) Contractor shall provide all necessary consumables, chemicals etc. as required for the complete maintenance as per requirements during the AMC period. All spares parts and materials shall be genuine and of same make and type as installed wherever applicable and a minimum quantity of spares and materials for routine maintenance may be kept at site to minimize time of maintenance. The firm / agency / contractor has to keep all equipments well maintained for the Plant so as to give proper output at all times.
- 4) Tools and equipment required for comprehensive maintenance for the STP accessories etc. shall be provided by the firm /agency /contractor.

- 5) Proper care shall be taken to avoid major breakdown at the plant. In the event of any breakdown, the same will be rectified immediately within 4 hours from the time of reporting of the fault. Similarly, if any breakdown takes place due to negligence of firm/ agency/ contractor, the whole component has to be replaced/ rectified to bring it to the original condition immediately.
- 6) The rates shall be quoted on yearly basis. The rates shall be all inclusive including taxes and duties etc.
- 7) The firm/ agency/ contractor shall fulfill the requirement of various law enforcing agencies / local authorities, such as Pollution control Board, Directorate of Electricity Safety etc by taking their approvals as and when required.
- 8) The firm/ agency/ contractor will be responsible for the safety of their deputed staff during the performance of their duty at site.
- 9) In case any of staff is not found upto the mark and not able to do work properly, he will have to be changed as per the instruction of client and immediately replaced by another qualified staff.
- 10) In case of any problem with the equipment, the firm/agency/contractor shall inform client immediately.
- 11) The firm/ agency/ contractor shall keep the equipment well maintained, neat and clean and adhere to the maintenance schedule of various equipment given in the respective manuals. Upon placement of work order they will prepare the maintenance schedule and discuss the same with the client for its implementation. This may be revised from time to time as per the requirement.

- 12) The firm/agency shall maintain data log including running of all mechanical items and chemical dosing schedule.
- 13) The firm/agency shall operate the filter press as and when required.
- 14) The firm/Agency shall get the treated water tested once in three months from approved Laboratory.
- 15) The firm /Agency shall send a supervisor to check the Plant once a month.
- 16) The firm /Agency shall provide all spare parts for pumps, motors, clarifier, chlorination, electrical panels, fittings/fixtures as required to ensure proper functioning of the Plant.
- 17) Penalty: The firm shall rectify any breakdown within 24 hours failing which penalty for non-performance @ 0.5 % per week of delay subject to a maximum of 10% of the contract price will be imposed and in the event of any damage to the property or life arising out of non-performance, contractor will be solely responsible
- 18) The contractor shall be responsible for proper maintenance of decorum, punctuality,
- 19) The agency/firm/contractor shall provide one skilled person for routine visit within every 15 days.
- 20) The AMC shall include routine and preventive maintenance as also breakdown maintenance if and when required. Maintenance services shall be provided with 24-hour emergency call out service.
- 21) The Contractor shall keep sufficient spare parts during the maintenance period to ensure that replacement work for defect can be carried out immediately. A competent engineer shall be provided to investigate the fundamental cause of a fault temporary quick fix solution will not be accepted.

22) In circumstance such that the Contractor fails to attend the breakdown within four normal working hours after notification of the breakdown and where remedial work is interrupted during normal working hours for purposes other than obtaining replacement parts, the employer reserves the right to order such action as may be necessary to expedite completion of remedial work which shall be at the Contractors expense without abrogation of the Contractors responsibilities.

23) The employer shall at his discretion, take action to recover all losses incurred rising from the failure of the contract to perform the duties either wholly or in part as detailed in this section.

24) The routine maintenance and periodical maintenance of all the equipment under the scope of this tender is to be done. Necessary preventive maintenance, breakdowns if any is to be attended throughout the day, all 7 days a week, with experienced and qualified personnel.

25) The routine operation of all equipment is to be done by the experienced and qualified personnel

INFLUENTFLOWDATA

Sl. No	Parameters	Unit	DesignConcentratio n
1	BiologicalOxygenDemand,BOD	mg/l	1500-3000
2	ChemicalOxygenDemand,COD	mg/l	2500-4000
3	TotalSuspendedSolids,TSS	mg/l	250-500
4	Oil&Grease	mg/l	800-1500
5	pH	mg/l	6.5–8.5
6	TDS	mg/l	2000-4000

TREATEDWATERQUALITY(OUTLETOFMBR)

Sr.No.	Parameters	Unit	DesignConcentrati on
1	BiologicalOxygenDemand,BOD	mg/l	<10
2	ChemicalOxygenDemand,COD	mg/l	<50
3	TotalSuspendedSolids,TSS	mg/l	<20
4	pH		6.5–8.0
5	Oil&Grease	mg/l	nil
6	TDS	mg/l	2000-4000

Flowrate,pressureandtemperaturerequiredattheinletoftheequipment

SlNo	Parameters	Unit	DesignConcentration
1	AverageDesignflowrate	m ³ /day	80
2	Operating Hours	Hrs	24
3	AverageFlow rate	m ³ /hr	3.33
4	InletPressure	Bar	ByGravitytoScreening
5	Temperature	DegC	22– 35*
6	DesignBioreactorTemperature	DegC	22– 35*

PROCESS DESCRIPTION OF SYSTEM

PRE - TREATMENT SYSTEM (SCREENING & OIL GREASE TRAP)

Trash and non-biodegradable solids, such as hair, lint, girt and plastics may foul or damage the membranes, pumps if allowed to pass into the treatment. To enhance the long-term operation and effectiveness of the treatment system recommends an internally fed channel screens with 20mm and 10mm opening with no possibility of bypass or carryover.

Oil and Grease trap is recommended to remove free Oil and grease in the influent. Fat, Oil & Grease (FOG) concentration shall not exceed 150 mg/L of emulsified FOG in the feed with no free oil and less than 10 mg/L of mineral or non-biodegradable oil. Civil construction tank with a baffle wall and slotted oil pipe is provided. Oil Skimmer belt type is used to remove the floating oil of raw sewage

COLLECTION / FLOW EQUALIZATION TANK

The Waste water then flows by gravity into the Collection/Equalization Tank which is provided with submerged aeration system generally to keep the solids in suspension and homogeneous conditions and not to allow anaerobic/septic conditions to set in. Equalization tank shall take care of flow surges and homogenization. Equalization of sewage is essential to make a uniform mixture for further treatment. Raw Sewage Transfer Pump operates with help of level switches.

FINE SCREENING SYSTEM

The Pre-treated effluent is passed to 2mm internally fed screen with mesh openings less than or equal to 2mm and then to Aeration tank. An internally-fed screen with mesh or punched- hole openings less than or equal to 2 mm in diameter with no possibility of bypass or carryover is absolutely required to maintain both membrane warranty, and optimal MBR operation.

AERATION & MBR TANK

Membrane bioreactor (MBR) technology, which combines biological-activated sludge process and membrane filtration has become more popular, abundant, and accepted in recent years for the treatment of many types of wastewaters, whereas the conventional activated sludge (CAS) process cannot cope with either composition of wastewater or fluctuations of wastewater flow rate. MBR technology is also used in cases where demand on the quality of effluent exceeds the capability of CAS. Although MBR capital and operational costs exceed the costs of conventional process, it seems that the upgrade of conventional process occurs even in cases when conventional treatment works well. It can be related with increase of water price and need for water reuse as well as with more stringent regulations on the effluent quality.

A high microorganism population is maintained within the Aeration chamber by recycling part of the settled sludge from Membrane Bioreactor Tank (MBR Tank). Mixed liquor sludge concentration (MLSS) in the range of 6000-12000 mg/l is maintained within the chamber. However, for design purposes an average value of 10000 mg/l has been considered giving certain additional margin of operational flexibility particularly in the winter months.

The mixed effluent from the Aeration Chamber flows into a Membrane Bioreactor Tank (MBR Tank) fitted with Submerged Filtration Membranes where treated final effluent is separated from biological solids. The sludge collected within the MBR Tank is either recycled into the Aeration chamber or part of it is wasted into the Filter press for cake forming. The Clear treated Sewage is collected by Permeate Pumps into a buffer cum chlorine contact tank for Final Disposal or recycle /reuse.

The compressed air will operate pneumatic valve actuators and the air extraction. Compressors to be sized supply air (after pressure regulating valve) to the valve actuators and Ejectors. An installed stand-by pressure regulating valve is recommended to provide the maximum redundancy possible for this component of the design to ensure this system is always functional. Compressed air is required before any of the process equipment can be turned on. On loss of compressed air, the plant will stop processing water.

TREATED WATER TANK

Treated permeate from the Membrane Bio Reactor (MBR) system is discharged to a Permeate storage tank. Then the treated water is taken for further polishing (Disinfection) by Hypo Dosing as per process requirement (Gardening or Flushing purpose)

SLUDGE HOLDING TANK

Settled sludge from MBR Basin is stored in Sludge Sump, for there it is sent to filter press for dewatering and final disposal.

FILTER PRESS

A filter press comprises a set of vertical, juxtaposed recessed plates, presses against each other by hydraulic or manual jacks at one end of the set. The pressure applied to the joint face of each filtering plate must withstand the chamber internal pressure developed by the sludge pumping system. This vertical plate layout forms watertight filtration chambers allowing easy mechanization for the discharge of cakes. Filter clothes finely or tightly meshed are applied to the two grooved surfaces in these plates. Orifices feed the sludge to be filtered under pressure in the filtration chamber. They are usually placed in the centre of the plates allowing a proper distribution of flow, right pressure and better drainage of sludge within the chamber. Solids sludge gradually accumulates in the filtration chamber until the final compacted cake is formed. The filtrate is collected at the back of the filtration support and carried away by internal duct

Sl.No	DESCRIPTION OF SPECIAL MECHANICAL EQUIPMENTSWORKS
1	<u>COARSE BAR SCREEN</u>
	Supplying and fixing of StainlessSteel coarse bar screen for WWTP, The bar screen is a mechanical filter used to remove large objects, such as rags. and plastics, from wastewater. It is part of the primary filtration flow and typically is the first, or preliminary, level of filtration, being installed at the influent to a Sewage treatment plant. They typically consist of a series of vertical Stainless Steel Flat bars between 10mm spacing welded with 25x25 angle frame and suitable handle. size of the screen is 600 mm x 600 mm .
2	<u>FINE BAR SCREEN</u>
	Supplying and fixing of Stainless Steel. Fine bar screen for WWTP, the bar screen is a mechanical filter used to remove large objects, such as rags.and plastics, from

	wastewater. It is part of the primary filtration flow and typically is the first, or preliminary, level of filtration, being installed at the influent to a Sewage treatment plant. They typically consist of a series of vertical Stainless Steel Flat bars between 10mm spacing welded with 25x25 angle frame and suitable handle. size of the screen is 600 mm x 600 mm.
3	<u>ANOXIC MIXERS</u>
	To suit the Anoxic Tank along with Agitator mechanism
	MOC: Shaft SS 306,
	Accessories: Double Shaft, Impellor & Foundation Frame
	Speed: 100 to 1440 RPM
	Motor Make: kirloskar/Shanthi /Equivalent
	Type: Vertical Flange mounted
	Power Rating: 3 Phase
4	<u>RAW EFFLUENT TRANSFER SYSTEMS</u>
	Supplying, fixing and commissioning of raw sewage Transfer pumps to transfer the sewage from Sewage Collection sump to Raw Sewage Collection Tank and pumping capacity of 4 m ³ per hour lifted with 10 meters head meters head kirloskar / equivalent make Coupled type pumps with mechanical seal, power rating of 3 phase 415 volts, 2/ 4 Pole MoUnitbloc Pumps, at rated voltage, 50 Hz, Three Phase A.C power Supplying. Dynamically balanced rotating parts ensuring, minimum vibration during running, Class 'B' / 'F' insulation, automatic air release during priming, prevent overloading and motor burning, Replaceable wearing parts, IP 55. Material of construction of the pumps are in Cast iron body with Cast iron impeller. handling charges and all taxes and duties. As directed by the departmental officers. Inclusive of suction & delivery piping works with control valves, fasteners, flanges, gasket, transport, handling charges and all taxes and duties etc., as directed by the departmental officers.
5	<u>DISC DIFFUSERS FOR COLLECTION TANK</u>
	Supply, Fixing and commissioning of High oxygen transfer efficiency, Low energy consumption due to low headless, Tear resistant precision perforated slits, Long life expectancy, Ideal for lift out systems and high density applications, Perforated across the full effective length on both sides. Perforated across the full effective length on both sides, Can be fitted to circular and square section pipe systems. The diffusers are made up of EPDM membrane material and make of Southern cogen/ equivalent. Size of the Diffusers are 310mm dia . Inclusive of transport, handling charges and all taxes and duties etc., as directed by the departmental officers.
6	<u>TUBULAR AIR DIFFUSERS FOR BIO REACTOR</u>
	Supply, Fixing and commissioning of High oxygen transfer efficiency, Low energy consumption due to low headless, Tear resistant precision perforated slits, Long life expectancy, Ideal for lift out systems and high density applications, Perforated across the full effective length on both sides. Perforated across the full effective length on both sides, Can be fitted to circular and square section pipe systems. The diffusers are made up of EPDM membrane material and make of Southern cogen/ equivalent. Size of the Diffusers are 63mm dia x 600mm long effective length. Inclusive of transport, handling charges and all taxes and duties etc., as directed by the departmental officers.
7	<u>AIR BLOWER SYSTEMS</u>

	Supply, Fixing and commissioning of Twin lobe air blowers with the capacity of 200 m ³ /hr and power rating of 5 HP. The pressure rating 0.4 kg for suitable for 4 m water column. The blowers are need to supplied along with Air Relief Valves Belts, Belt Gaurds, Wafer type Unitn Return Valves. The twin lobe air blowers belong to the category of positive displacement blowers. The blowers consist of a pair of involutes profiled shape blowers. The blowers consist of a pair of involutes profiled shape of 8. lobes / rotors rotating inside an oval shaped casing closed at ends by side plates. One lobe is the driving lobe. which is driven by the external power while the driven lobe is driven by a pair of equal ratio gears. Both the lobes thus rotate at the same speed, But in opposite direction. The blowers delivery will be connected with suitable mild steel epoxy coated B class header lines and lateral lines. The air distribution will be suitable flexible air lines with lifting arrangements and control valves. The blowers are made up of cast iron and the make of Everest /A1/ equivalent. Inclusive of transport, handling charges and all taxes and duties etc., as directed by the Departmental Officers.
8	<u>INDUCTION MOTORS</u>
	Supply, Fixing and commission of squirrel cage induction motor for twin lobe air blowers with the capacity of 5 HP, 1440 rpm, 3phase, 415 volts power rating, F class insulated, TEFC enclosure, IP 55 protected, Bi - directional rotation, continuous duty, foot mounted Kirloskar / Equivalent make Inclusive of transport, handling charges and all taxes and duties etc., as directed by the departmental officers.
9	<u>AIR GRID AND FEEDWELLS</u>
	Fabricating, Supplying, laying and jointing the following Air Grid Arrangement for Distribution of Diffused aeration to Aeration tank from Air Blowers, and Feed well for Tube settler tank
	The Header and Laterals of Air Grid arrangement shall be in approved quality and best variety of pipes with pressure with standing 10 kg/sq.cm and laid properly level to alignment including fixing of required MS/UPVC specials but including cost of such specials, cutting, Welding and threading, including fixing to walls with necessary teakwood plugs clamps and screws making holes in the wall or drilling hole in the roof and making good of the distributed portion in the original condition with necessary brick work and plastering, wherever necessary with necessary scaffolding charges. The pipes to be painted with two coats of good variety and best quality of synthetic enamel paint over coat of red oxide primer etc. Make : Jindal/Finolex/ Equivalent complying with standard specification, (The MS/UPVC pipes shall be got approved by the Executive Engineer before use on works.) Inclusive of transport, handling charges and all taxes and duties etc., as directed by the departmental officers.
10	<u>FAB REACTOR MEDIA</u>
	Supply and fixing of MBBR Media virtually increases the surface area of the aeration tank required for bio-growth which aid in digesting the organic matter useful in the treatment of sewage effluent. The Media provides high surface area per unit volume rendering it more effective, which also comes with a very competitive price. The MBBR media provides large surface area per cubic meter of volume and is highly suitable for attached microbial growth, needed for microbial growth but also for the metabolite production. Bio Pac Media finds widespread application in sewage Treatment. Type : Fluidized Bed Bio Media Material : Virgin PVC Capacity : 100 M ² /M ³ Volume Make : Cooldeck/Equivalent, Inclusive of transport, handling charges and all taxes and duties etc., as directed by the departmental officers.
11	<u>TUBE SETTLER</u>

	Supply and fixing of Tube Settler MediaLess filter backwashing equates to significant operating cost savings for both water and electricity,using tube settlers can be designed of increased flow capability,Flow of sewage the addition of tube settlers,allowable flow capacity by expanding settling capacity and increasing the solids removal rate in Tube Settler tank.Type: CorrugatedSize: 1000 mm VerticalsMOC: PVC Support : MS Channel frame support. Make: Cooldeck / Equivalent,Inclusive of transport,handling charges and all taxes and duties etc., as directed by the departmental officers.
12	<u>RETURN SLUDGE TRANSFER PUMPS</u>
	Supplying, fixing and commissioning of Return Sludge Transfer pumps to transfer the sludge from Tube settler tank to Bio Reactor Tank and pumping capacity of 4 m3 per hour lifted with 10 meters head meters head kirloskar / equivalent make 1 HP Coupled type Self Priming Sludge Handling pumps with mechanical seal, power rating of 3 phase 415 volts, 2/ 4 Pole MoUnitbloc Pumps, at rated voltage, 50 Hz, Three Phase A.C power Supplying.Dynamically balanced rotating parts ensuring, minimum vibration during running, Class 'B'/ 'F' insulation,automatic air release during priming,prevent overloading and motor burning, Replaceable wearing parts, IP 55. Material of construction of the pumps are in Cast iron body with Cast iron impeller. handling charges and all taxes and duties.As directed by the deparmental officers.Inclusive of suction & delivery piping works with control valves, fastners, flanges, gasket, transport, handling charges and all taxes and duties etc., as directed by the deparmental officers.
13	<u>FILTER FEED PUMPS</u>
	Supplying, fixing and commissioning of Filter feed pumps to feed the clarified water from filter feed tank to filtration units for removal TSS and pumping capacity of 4 m3 per hour lifted with 25 meters head meters head kirloskar / equivalent make Coupled type the mono-block pumps with mechanical seal, power rating of 3 phase 415 volts, 2/ 4 Pole MoUnitbloc Pumps, at rated voltage, 50 Hz, Three Phase A.C power Supplying.Dynamically balanced rotating parts ensuring, minimum vibration during running, Class 'B'/ 'F' insulation,automatic air release during priming,prevent overloading and motor burning, Replaceable wearing parts, IP 55. Material of construction of the pumps are in Cast iron body with Cast iron impeller. handling charges and all taxes and duties.As directed by the deparmental officers. Inclusive of suction & delivery piping works with control valves, fastners, flanges, gasket, transport, handling charges and all taxes and duties etc., as directed by the deparmental officers.
14	<u>PRESSURE SAND FILTER</u>
	Supplying, fixing and commissioning of Pressure Sand Filter with following specificationsDesign Pressure : 5.5 kg/cm2 , Working Pressure : 3.0Service flow rate : 4 m3/hour kg/cm2,Back wash flow rate :6 m3/hour,Vessel: The filter vessel is made of high grade rolled steel with stamped top and bottom dished ends welded onto it.The vessels inside and the exterior is painted with rust inhibiting primer and an epoxy paint, for lasting corrosion protection Internal: Top and bottom internal water collection /distribution Piping: Laterals constructed in CS and all frontal piping works constructed in CS/GI Shell thickness : 6mm & Dish end thickness : 6mm Filter media : Graded Pebbles, Silex, Graded filtering Sand. Valves: Diaphragm type, 6 valves SystemAccessories : Frontal Piping, Valves, two Pressure gauges etc,Capacity :6 m3/hr,Size : 600 m Dia x 2000mm HOS,transport, handling charges and all taxes and duties etc., as directed by the deparmental officers.
15	<u>ACTIVATED CARBON FILTER</u>

	Supplying, fixing and commissioning of Activated Carbon Filter with following specifications Design Pressure : 5.5 kg/cm ² , Working Pressure : .0 Service flow rate : 4 m ³ /hour kg/cm ² , Back wash flow rate : 6 m ³ /hour, Vessel: The filter vessel is made of high grade rolled steel with stamped top and bottom dished ends welded onto it. The vessels inside and the exterior is painted with rust inhibiting primer and an epoxy paint, for lasting corrosion protection Internal: Top and bottom internal water collection /distribution Piping: Laterals constructed in CS and all frontal piping works constructed in CS/GI Shell thickness : 6 mm & Dish end thickness : 6mm Filter media : Graded Pebbles, Silex, Graded filtering Sand. Valves: Diaphragm type, 6 valves System Accessories : Frontal Piping, Valves, two Pressure gauges etc, Capacity : 3m ³ /hr, Size : 500 m Dia x 2000mm HOS, transport, handling charges and all taxes and duties etc., as directed by the departmental officers.
17	<u>TREATED WATER TRANSFER PUMPS</u>
	Supplying, fixing and commissioning of Treated sewage Transfer pumps to transfer the Treated sewage from Treated sewage Sewage Collection Tank tank to Gardening and pumping capacity of 4 m ³ per hour lifted with 10 meters head meters head kirloskar / equivalent make 1 HP Coupled type the monoblock pumps with mechanical seal, power rating of 3 phase 415 volts, 2/ 4 Pole MoUnitbloc Pumps, at rated voltage, 50 Hz, Three Phase A.C power Supplying. Dynamically balanced rotating parts ensuring, minimum vibration during running, Class 'B' / 'F' insulation, automatic air release during priming, prevent overloading and motor burning, Replaceable wearing parts, IP 55. Material of construction of the pumps are in Cast iron body with Cast iron impeller. handling charges and all taxes and duties. As directed by the departmental officers. Inclusive of suction & delivery piping works with control valves, fastners, flanges, gasket, transport, handling charges and all taxes and duties etc., as directed by the departmental officers.
16	<u>DISINFECTION SYSTEM</u>
	Supplying, fixing and commissioning of Disinfection system with following specifications Design Pressure : 5.5 kg/cm ² , Working Pressure : 3.0 Service flow rate : 0 TO 6 LPH, Make : Miltonroy/EDose Equivalent, Dosing Tank : 50L Capacity, transport, handling charges and all taxes and duties etc., as directed by the departmental officers.
17	<u>ELECTROMAGNETIC FLOW METER</u>
	Supplying, fixing and commissioning of the Online, Pulsed DC Magnetic flowmeter for measure the inlet Effluent flow of ETP and Treated water Outlet flow. This flowmeter is capable of providing a stable and accurate flow reading, even in demanding application. The flow tube is a fully sealed system, with extra thick PTFE lining for maximum performance. The meter can display the flow rate and also the totalized flow. The 16 character LCD display with backlighting can display alphanumeric characters. All the menu is clearly labeled for easy understanding of the menu. The front cursor type keypad can be used to navigate through the menu system of the flowmeter. Calibrating the flowmeter is done digitally through front keypad. The flowrate unit is programmable. All the required rate conversion is done internally and displayed in a unit that is convenient to process application, make: Frehning/Equivalent, Power Rating: Single Phase, Type : Online Inclusive of transport, handling charges and all taxes and duties etc., as directed by the departmental officers
18	<u>PROCESS DISPLAY & INDIVIDUAL UNITS NAME BOARDS</u>

	Supplying and fixing of Process and Instrumentation Drawing of WWTP, Civil Units and Electro Mechanical units as required size of Display boards ,made of vinyl Material,Inclusive of transport, handling charges and all taxes and duties etc., as directed by the departmental officers
	<u>UPVC PIPING</u>
19	<u>UPVC PIPING AND SPECIALS</u>
	Supplying, laying and jointing the 40,32 mm Dia UPVC pipes (Finolex / Supreme or equivalent) of following approved quality and best variety of pipes with pressure with standing 15 kg/sq.cm and laid properly above ground level to alignment including fixing of required upvc specials and including cost of specials of 40, 32 mm Dia such as union , Elbow, MTA, rubber gasket, reducer etc., cutting and threading, including fixing to walls with necessary teakwood plugs clamps and screws making holes in the wall or drilling hole in the roof and making good of the distributed portion in the original condition with necessary brick work and plastering wherever necessary with necessary scaffolding charges. (The UPVC pipes shall be got approved by the Executive Engineer before use on works.)
20	<u>CONTROL VALVES</u>
	Supplying and fixing in position first quality and approved Gun Metal Gate valve /wheel valve /check valve (Heavy Type) with ISI mark of the following sizes including cost of shellac,thread etc., Including labour for cutting and threading of GI Pipe etc.,Complete Complying with standard Specifications for both internal & External Water Supplying arrangements of 40 mm Dia Gun Metal Valve for Transfer pumps suction & delivery lines .As directed by the departmental officers.
21	<u>COMMISSIONING CHEMICALS</u>
	Supplying of commissioning chemicals for trial run of WWTP for one month as required quantity, inclusive of transport, handling charges and all taxes and duties etc., as directed by the departmental officers
22	<u>MOTOR CONTROL PANEL & ELECTRICAL WORKS</u>
	Motor Control Centre for Proposed equipment
	Type : Fixed combined type with DOL Starters Consists of Incoming feeder with outgoing feeders,Push buttons with Indicator lamp, Overload relays, Contactors, Bus bar of required size, Control cabling
	Overload relays, Contactors, Bus bar of required size, Control cabling
	Make : Power Controls / Equivalent
	(Electrical works from MCC to motors only. .Not included incoming power Supply to WWTP and incoming Earthing)
	<u>RAW EFFLUENT COLLECTION SYSTEM</u>
23	<u>RAW SEWAGE COLECTION SYSTEM</u>
	Supply and fixing of Raw effluent transfer pumps from e-waste water generation source collection pits from various locations to ETP plant collection tank. Providing tow nos of raw effluent transfer pumps cutter pumps. pumping capacity of 2.m3 per hour lifted with 15 meters head meters head kirloskar /CRI/ equivalent make 2.0 HP Vertical type Submersible Cutter version pumps with mechanical seal, power rating of 3 phase 415 volts, 2/ 4 Pole MoUnitbloc Pumps, at rated voltage, 50 Hz, Three Phase A.C power Supplying. Dynamically balanced rotating parts ensuring, minimum vibration during running, Class 'B'/ 'F' insulation,automatic air release during priming,prevent

	overloading and motor burning, Replaceable wearing parts, IP 55. Material of construction of the pumps are in Cast iron body with Cast iron impeller. handling charges and all taxes and duties.As directed by the deparmental officers. Inclusive of fastners, flanges, gasket, transport, handling charges etc., as directed by the deparmental officers.
24	COLLECTION SYSTEM PIPING
	Supply and fixing of UPVC pipes and specials Raw sewage transfer pump pipe line from Admin building area to STP plant Equalisation tank. Supplying, laying and jointing the 50 mm Dia UPVC pipes(Finolex / Supreme or equivalent)of following approved quality and best variety of pipes with pressure with standing 15 kg/sq.cm and laid properly above ground level to alignment including fixing of required upvc specials and including cost of specials 50 mm Dia such as union , Elbow, MTA, rubber gasket, reducer etc.,
25	CONTROL PANEL & CABLING FOR COLLECTION PUMPS
	Supplying and Fixing of Control Panel for Submersible Sewer pumps with Level Controller and Control Cables.The Panel shall be IP 65 Protection for Out Door use.

OIL SPILL RESPONSE & MANAGEMENT PLAN

FOR



CHENNAI FISHING HARBOUR, KASIMEDU

At

Chennai Fishing Harbour, No.1, Rajaji Salai

Village: Kasimedu

Taluk & District: Chennai

State: Tamil Nadu

PREPARED BY



HUBERT ENVIRO CARE SYSTEMS (P) LTD, CHENNAI

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GLOSSARY

AQUATIC:Habitats and ecosystems that exist in bodies of water; refers to both marine and freshwater environments.

BIOAUGMENTATION:The addition of microorganisms to the existing native oil-degrading population; also known as microbial seeding.

BIOREMEDIATION:The act of adding nutrients or microorganisms to the environment to increase the rate at which biodegradation occurs.

BIOSTIMULATION:Also known as nutrient enrichment, the method of adding nutrients such as phosphorus and nitrogen to a contaminated environment to stimulate the growth of the microorganisms capable of biodegradation.

CONTINGENCY PLAN:A document that describes a set of procedures and guidelines for containing and cleaning up oil spills.

DISPERSANTS:Chemicals that are used to break down spilled oil into small droplets

DISPERSION: The spreading of oil on the water's surface and, to a lesser degree, into the water column.

EMULSIFICATION: The formation of a mixture of two liquids, such as oil and water, in which one of the liquids is in the form of fine droplets and is dispersed in the other.

EMULSIONS: A mixture of small droplets of oil and water.

EVAPORATION: The physical change by which any substance is converted from a liquid to a vapor or gas.

FRESHWATER SPILL: An oil spill that occurs in or affects bodies of freshwater, such as lakes and rivers.

HYDROCARBONS: A large class of organic compounds containing only carbon and hydrogen; common in petroleum products and other oils.

OIL: Crude oil and refined petroleum products (motor oils, fuels, lubricants, etc.), as well as vegetable oils, animal fats, and other non-petroleum oils.

SKIMMERS: Devices used to remove oil from the water's surface.

SORBENTS: Substances that take up and hold water or oil; sorbents used in oil spill cleanup are made of oleophilic materials.

SURFACTANT: A substance that breaks oil into small droplets; this helps to increase the surface area of the oil spill, which increases the rate at which the oil can be degraded or weathered into less toxic substances (See dispersant).

WEATHERING: Action of the wind, waves, and water on a substance, such as oil, that leads.

WEIR: An underwater structure that controls the flow of water; weir-type oil skimmers use a dam-like underwater barrier that lets oil flow into the skimmer while holding back the water.

1. INTRODUCTION

Spills have the potential to cause severe environmental damage as well as significant economic and image values for a company. Workers must ensure that any spills are treated with great care, and dealt promptly, to minimize the possibility of any of Oil Spills becoming a major issue. It is very important to place a strong emphasis on avoiding the spills.

Oil Spills endanger public health, imperil drinking water, devastate natural resources, and disrupt the economy.

Products derived from petroleum, such as heating oil and gasoline, provide fuel for our automobiles, heat for our homes, and energy for the machinery used in our industries. Other products derived from petroleum, including plastics and pharmaceuticals, provide us with convenience and help to make our lives more comfortable.

1.1 About Chennai Fishing Harbour

Chennai Fishing Harbour (CFH) is the largest fishing harbour in Tamil Nadu. It is located to the North of the Chennai Port along the Indian peninsular coastline and is sheltered by Northern and Eastern breakwaters. This fishing harbour is also known as Royapuram Fishing Harbour or Kasimedu Fishing Harbour. Chennai Fishing Harbour is habituated by the fishermen community from Chepauk village. The migration of this community to Chennai dates back to the early 18th century.

For the development of fishing harbour at Kasimedu, the State Government (GoTN) handed over 78.97 acres of land area to the Chennai Port (ChPT) and during the development phase, Chennai Port reclaimed an additional area of 17.44 acres from the sea. As per the revenue records, the fishing harbour land is with the State Fisheries Department, Government of Tamil Nadu. At present, the Chennai Fishing Harbour is spread on 24.28 Hectares of land area and contains 48.56 Hectares of water spread area within its breakwaters.

Currently, there are 977 Mechanized Fishing Boats (MFBs) and 1370 Fiber Reinforced Plastic (FRP) boats which take shelter at Chennai Fishing Harbor. The harbour witnesses ingress/egress of 30,000 persons daily for fishing activities or fish-related businesses and handles approximately 500 MT (metric tons) of sea catches daily.

Now the port is proposed to upgrade to:

- Manage and maintain the Fishing Harbour for all-weather use for fishing vessels.
- Provide convenient landing facilities to the fishing crafts.
- Facilitate handling of catches, auctioning, fueling, repairing, etc.

- provide hygienic conditions for the pre-processes, handling of fish to match international standards, and
- Maintain hygienic standards at the international levels in the handling of marine catches.

As a part of this modernisation and upgradation, The proponent has to obtain an Environmental Clearance and this plan will be submitted to the authorities concerned for their perusal and approval.

This plan intends to provide Spill Management Plan for Chennai Fishing Harbour, Kasimedu, located at Chennai Fishing Harbour, No.1, Rajaji Salai, Kasimedu Village, in Chennai Taluk and District, Tamil Nadu.

1.2 Location & Layout

The figure below shows the location of the project.

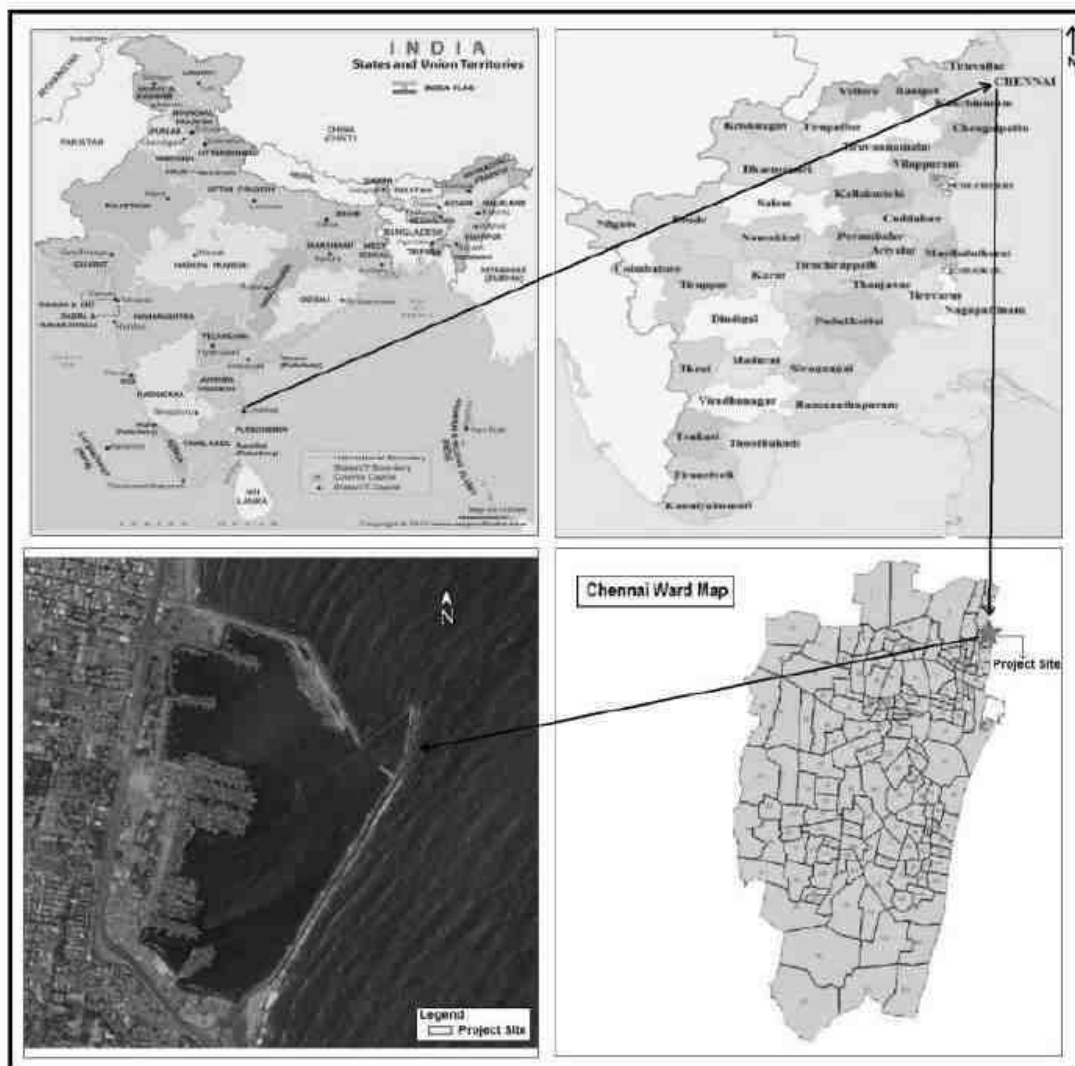


Figure 2.1 : Location of Chennai Fishing Harbour

The figure below shows the layout of Chennai Fishing Harbour with proposed infrastructures.

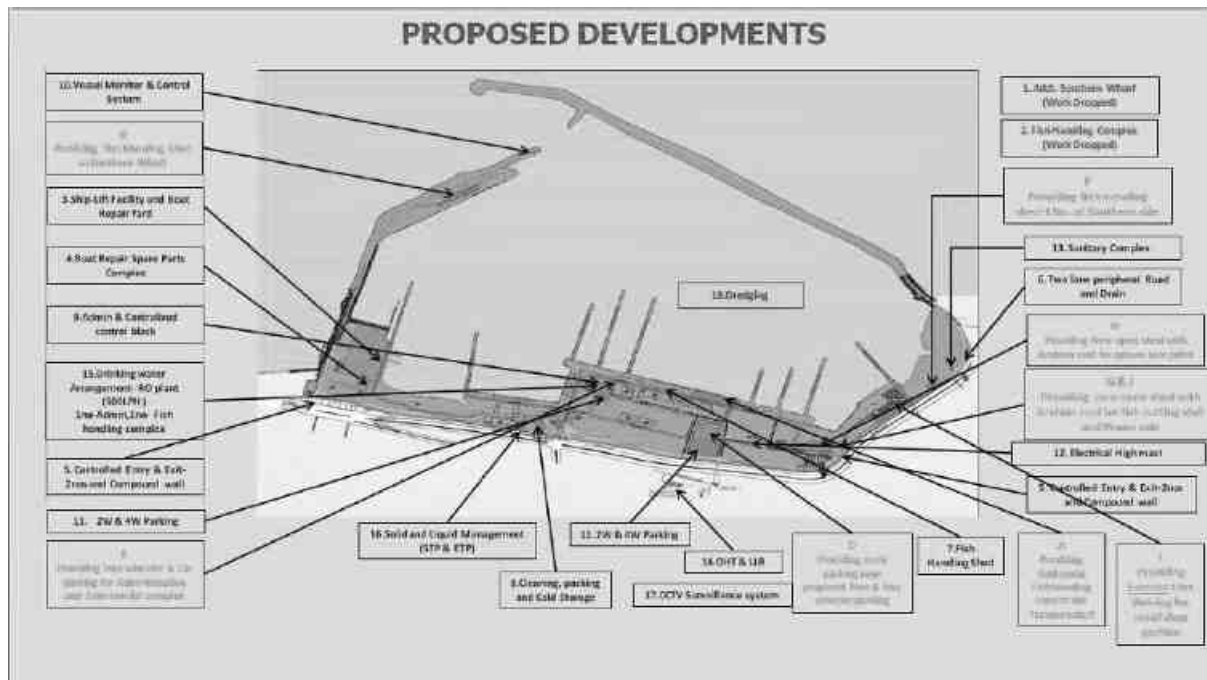


Figure 1.2 Project Layout

It is also informed that there are no storage tanks available in the port and the owners of the boats will be purchase the diesel from local market and will be filled accordingly. The Port Authority has to monitor the filling procedure and do the necessary to avoid any incident of even a minor spillage.

2. OBJECTIVE OF OIL SPILL MANAGEMENT

The Objectives of Spill Managements are:

- In the event of a spill, provide readily accessible emergency information to the clean-up crews, company management and government agencies.
- Comply with the company's environmental and crisis management policies.
- Comply with the national and local regulations and guidelines pertaining to the preparation of Oil Spill Contingency Plan.
- Promote effective and safest way of recovering the Spilled material.
- Minimize the environmental impacts of oil spills to either water or land.
- According to the environmental legislation, facilitate the waste management.

3. PLANNING

Planning is essential to successful spill response operations. Create a response structure that is appropriately scaled to the size of the project. Proper planning need to ensure that:

- Personnel responding to spills must know their respective roles.
- Personnel who respond to spills should manage the spill in a safe manner.
- Spills are dealt with on a timely basis, so the spills should be controlled and cleaned up at a very short span of time as possible.
- The proper mitigation technique should be used.
- The spill and mitigation efforts are well documented and reported.

As a primary part of planning:

- Develop a response plan suited to spill scenarios.
- Document the response plan and ensure that spill responders are familiar with it.
- Solicit suggestions from staff familiar with Oil Spills, Laws & Regulations & Local conditions.
- Review the Response plan on a regular basis.
- It is also a good idea to practice responding to various spill scenarios.

Assign a Spill Team Leader to be a sole contact with the local public during any spill incident. The team leader should assess the potential impact of a spill on the public and have to communicate to the corporate head office & local fire department as required.

4. OIL SPILL RESPONSE PLAN

A high level of oil spill response preparedness is also important. Oil spill response priorities are to:

- Protect human life and property
- shut off the source of the oil spillage
- prevent oil contact on shorelines or sensitive marine and coastal resources
- recover any free oil, where practicable
- rehabilitate any affected shoreline and or marine life
- monitor impacts and recovery
- review oil spill management procedures
- implement corrective action programs as necessary

4.1. PURPOSE OF THE PLAN

This Plan defines the role of Straits in response to oil spills eliminating from or directly associated with the operations. It has the intention of increasing the understanding of the complex but orderly

activity of an oil spill response by defining the roles and activities of key Straits operatives and specifying key objectives and conservation priorities.

4.2.BEHAVIOUR OF SPILLED OIL

Oil or fuel can harm the marine environment by smothering marine life or acting as a toxin to both marine and coastal flora and fauna. It can also bio-accumulate in organisms and thus affect organisms higher in the food chain. Sea animals and birds can be harmed when their feathers or fur are coated with oil. Chemical contaminants within the oil can also impair reproduction for sea animals and birds.

4.3.OIL MOVEMENT

When oil is spilled onto the surface of the sea it spreads very rapidly, and after a few hours the slick will usually also begin to break up and form narrow bands or "windrows" parallel to the wind direction. Within a very short time, therefore, the oil will often be scattered within an area of many square miles with large variations in oil thickness being evident. This is one of the fundamental factors that limits the effectiveness of all at-sea response techniques.

4.4.MAJOR SPILL

The chances of major spillage are less due to the absence of any storage tanks in the port facility. The owners of the boats will be purchasing the diesel from local market and will be filled accordingly. The Port Authority has to monitor the filling procedure and do the necessary to avoid any incident of even a minor spillage.

4.5.MINOR SPILL

Spillage during refueling

Proper arrangements to be done to collect the spilled oil, if any, during the refueling in boats, shown as below:

- Place trays of suitable sizes below the filling point to collect Oil Spills, if any.
- Collect the spill with trays and change the spills into barrels and seal the barrels.
- No oil shall be spilled in sea, at any cost.
- Proper supervision and instruction shall be given to the fishermen, while filling the fuel in their boats.

4.6.FORTUNE OF SPILLED OIL

Natural actions are always at work in aquatic environments. These can reduce the severity of an oil spill and accelerate the recovery of an affected area. Some natural actions include weathering, evaporation, oxidation, biodegradation, and emulsification.

4.6.1. WEATHERING:

Weathering is a series of chemical and physical changes that cause spilled oil to break down and become heavier than water. Wave action may result in natural dispersion, breaking a slick into droplets which are then distributed vertically throughout the water column. These droplets can also form a secondary slick or thin film on the surface of the water.

4.6.2. EVAPORATION:

Occurs when the lighter or more volatile substances within the oil mixture become vapors and leave the surface of the water. This process leaves behind the heavier components of the oil, which may undergo further weathering or may sink to the bottom of the ocean floor. Spills of lighter refined products, such as kerosene and gasoline, contain a high proportion of flammable components known as light ends. These may evaporate within a few hours, causing minimal harm to the aquatic environment. Heavier oils, vegetable oils, and animal fats leave a thicker, more viscous residue. These types of oils are less likely to evaporate.

4.6.3. OXIDATION:

Occurs when oil contacts the water and oxygen combines with the oil hydrocarbons to produce water-soluble compounds. This process affects oil slicks mostly around their edges. Thick slicks may only partially oxidize, forming tar balls. These dense, sticky black spheres may linger in the environment, washing up on shorelines long after a spill.

4.6.4. BIODEGRADATION:

Occurs when microorganisms, such as bacteria, feed on oil hydrocarbons. A wide range of microorganisms is required for a significant degradation of the oil. To sustain biodegradation, nutrients such as nitrogen and phosphorus are sometimes added to the water to encourage the microorganisms to grow and reproduce. Biodegradation tends to work best in warm water environments.

4.6.5. EMULSIFICATION: is the process that forms emulsions, which are mixtures of small droplets of oil and water. Emulsions are formed by wave action, and they greatly hamper weathering and cleanup processes. Two types of emulsions exist: water-in-oil and oil-in-water. Water-in-oil emulsions are frequently called "chocolate mousse," and they are formed when strong wave action causes water to become trapped inside viscous

oil. Chocolate mousse emulsions may linger in the environment for months or even years. Oil and water emulsions cause oil to sink and disappear from the surface, giving the visual illusion that it is gone and the threat to the environment has ended.

These natural actions occur differently in freshwater versus marine environments. Freshwater environmental impacts can be more severe because water movement is minimized in these habitats. In standing water bodies, oil tends to pool and can remain in the environment for long periods of time. In flowing streams and rivers, oil tends to collect on plants and grasses growing on the banks. Oil can also interact with the sediment at the bottom of the freshwater bodies, affecting organisms that live in or feed off of sediments.

4.7.EFFECTS OF OIL ON PLANTS AND ANIMALS

Some toxic substances in an oil spill may evaporate quickly. Therefore, plant, animal, and human exposure to the most toxic substances are reduced with time, and are usually limited to the initial spill area. Although some organisms may be seriously injured or killed very soon after contact with the oil in a spill, nonlethal toxic effects can be more subtle and often longer lasting.

4.7.1. SENSITIVITY OF AQUATIC HABITATS

Aquatic environments are made up of complex interrelations between plant and animal species and their physical environment. Harm to the physical environment will often lead to harm for one or more species in a food chain, which may lead to damage for other species further up the chain. Where an organism spends most of its time—in open water, near coastal areas, or on the shoreline—will determine the effects an oil spill is likely to have on that organism.

Spilled oil and clean-up operations can threaten different types of aquatic habitats, with different results.

CORAL REEFS are important nurseries for shrimp, fish, and other animals as well as recreational attractions for divers. Coral reefs and the aquatic organisms that live within and around them are at risk from exposure to the toxic substances within oil as well as smothering.

EXPOSED SANDY, GRAVEL, OR COBBLE BEACHES are usually cleaned by manual techniques. Although oil can soak into sand and gravel, few organisms live full-time in this habitat, so the risk to animal life or the food chain is less than in other habitats, such as tidal flats.

SALT MARSHES are found in sheltered waters in cold and temperate areas. They host a variety of plant, bird, and mammal life. Marsh vegetation, especially root systems, is easily damaged by fresh light oils.

OTHER STANDING WATER BODIES, such as inland lakes and ponds, are home to a variety of birds, mammals, and fish. The human food chain can be affected by spills in these environments.

4.7.2. SENSITIVITY OF BIRDS AND MAMMALS

An oil spill can harm birds and mammals in several ways: direct physical contact, toxic contamination, destruction of food sources and habitats, and reproductive problems.

PHYSICAL CONTACT– When fur or feathers come into contact with oil, they get matted down. This matting causes fur and feathers to lose their insulating properties, placing animals at risk of freezing to death. For birds, the risk of drowning increases, as the complex structure of their feathers that allows them to float or to fly becomes damaged.

TOXIC CONTAMINATION– Some species are susceptible to the toxic effects of inhaled oil vapors. Oil vapors can cause damage to the animal's central nervous system, liver, and lungs. Animals are also at risk from ingesting oil, which can reduce the animal's ability to eat or digest its food by damaging cells in the intestinal tract.

DESTRUCTION OF FOOD RESOURCES AND HABITATS – Even species which are not directly in contact with oil can be harmed by a spill. Predators that consume contaminated prey can be exposed to oil through ingestion. Because oil contamination gives fish and other animals unpleasant tastes and smells, predators will sometimes refuse to eat their prey and will begin to starve. Sometimes a local population of prey organisms is destroyed, leaving no food resources for predators. Depending on the environmental conditions, the spilled oil may linger in the environment for long periods of time, adding to the detrimental effects. In calm water conditions, oil that interacts with rocks or sediments can remain in the environment indefinitely.

REPRODUCTIVE PROBLEMS – Oil can be transferred from birds' plumage to the eggs they are hatching. Oil can mother eggs by sealing pores in the eggs and preventing gas exchange. Scientists have also observed developmental effects in bird embryos that were exposed to oil. Also, the number of breeding animals and the of nesting habitats can be reduced by the spill. Long-term reproductive problems have also been shown in some studies in animals that have been exposed to oil.

SUMMARY

Spilled Oil immediately begins to move and weather, breaking down and changing its physical and chemical properties. As these processes occur, the oil threatens surface resources and a wide range of subsurface aquatic organisms linked in a complex food chain. Many different types of aquatic habitats exist, with varied sensitivities to the harmful effects of oil contamination and different abilities to recuperate from oil spills. In some areas, habitats and populations can recover quickly. In other environments, however, recovery from persistent or stranded oil may take years. These detrimental effects are caused by both petroleum and non-petroleum oil.

5. MECHANICAL CONTAINMENT AND RECOVERY OF OIL FOLLOWING A SPILL

Two major steps involved in controlling oil spills are containment and recovery. Some of the techniques and equipment that are used to conduct oil spill control efforts.

5.1. CONTAINMENT

When an oil spill occurs on water, it is critical to contain the spill as quickly as possible in order to minimize danger and potential damage to persons, property, and natural resources. Containment equipment is used to restrict the spread of oil and to allow for its recovery, removal, or dispersal. The most common type of equipment used to control the spread of oil is floating barriers, called booms.

5.2. BOOMS

Containment booms are used to control the spread of oil to reduce the possibility of polluting shorelines and other resources, as well as to concentrate oil in thicker surface layers, making recovery easier. In addition, booms may be used to divert and channel oil slicks along desired paths, making them easier to remove from the surface of the water. Although there is a great deal of variation in the design and construction of booms, all generally share four basic characteristics:

- An above-water "freeboard" to contain the oil and to help prevent waves from splashing oil over the top of the boom
- A flotation device
- A below-water skirt to contain the oil and help reduce the amount of oil lost under the boom
- A "longitudinal support," usually a chain or cable running along the bottom of the skirt, that strengthens the boom against wind and wave action; may also serve as a weight or ballast to add stability and help keep the boom upright

Booms can be divided into several basic types. Fence booms have a high freeboard and a flat flotation device, making them least effective in rough water, where wave and wind

action can cause the boom to twist. Round or “curtain” booms have a more circular flotation device and a continuous skirt. They perform well in rough water, but are more difficult to clean and store than fence booms. Non-rigid inflatable booms come in many shapes. They are easy to clean and store, and they perform well in rough seas. However, they tend to be expensive, more complicated to use, and puncture and deflate easily. All boom types are greatly affected by the conditions at sea; the higher the waves swell, the less effective booms become.

It is necessary for stationary booms to be monitored or tended due to changes produced by shifting tides, tidal currents, winds, or other factors that influence water depth and direction and force of motion. People must tend booms around the clock to monitor and adjust the equipment.

Booms can be fixed to a structure, such as a pier or a buoy, or towed behind or alongside one or more vessels. When stationary or moored, the boom is anchored below the water surface.

The forces exerted by currents, waves, and wind may impair the ability of a boom to hold oil. Loss of oil occurring when friction between the water and oil causes droplets of oil to separate from the slick and be pulled under the boom is called entrainment. Currents or tow speeds greater than three-quarters of a knot may cause entrainment. Wind and waves can force oil over the top of the boom’s freeboard or even flatten the boom into the water, causing it to release the contained oil. Mechanical problems and improper mooring can also cause a boom to fail.



FIGURE 5.1 - BOOMS CAN BE USED TO CONTROL THE SPREAD OF OIL.

Once an Oil Spill has been contained, efforts to remove the oil from the water can begin. Three different types of equipment – Booms, Skimmers and Sorbents – are commonly used to recover oil from the surface.

5.3. SKIMMER

A skimmer is a device for recovery of spilled oil from the water's surface. Skimmers may be self-propelled and may be used from shore or operated from vessels. The efficiency of skimmers depends on weather conditions. In moderately rough or choppy water, skimmers tend to recover more water than oil. Three types of skimmers— weir, oleophilic, and suction—are described below. Each type offers advantages and drawbacks, depending on the type of oil being cleaned up, the conditions of the sea during cleanup efforts, and the presence of ice or debris in the water.

5.3.1. WEIR SKIMMERS

Oil floating on top of the water will spill over the dam and be trapped in a well inside, bringing with it as little water as possible. The trapped oil and water mixture can then be pumped out through a pipe or hose to a storage tank for recycling or disposal. These skimmers are prone to becoming jammed and clogged by floating debris.

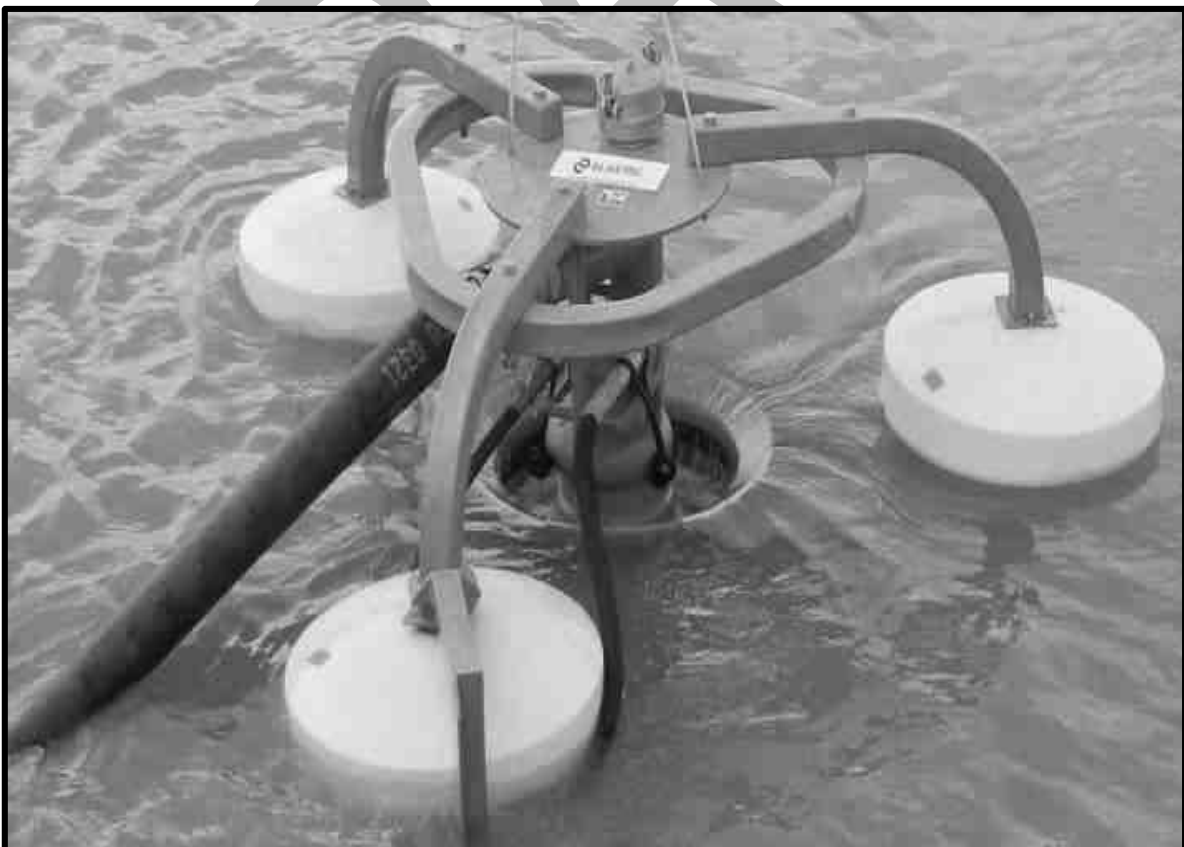


FIGURE 5.1 - WEIR SKIMMERS

5.3.2. OLEOPHILIC (OIL - ATTRACTING)

Oleophilic (oil-attracting) skimmers use belts, disks, or continuous mop chains of oleophilic materials to blot the oil from the water surface. The oil is then squeezed out or scraped off into a recovery tank. Oleophilic skimmers have the advantage of flexibility, allowing them to be used effectively on spills of any thickness. Some types, such as chain or “rope-mop” skimmers, work well on water that is choked with debris or rough ice.

5.3.3. SUCTION SKIMMER

A suction skimmer operates like a household vacuum cleaner. Oil is sucked up through wide floating heads and pumped into storage tanks. Although suction skimmer is generally very efficient, they are vulnerable to becoming clogged by debris and require constant skilled observation. Suction skimmers operate best on smoothwater where oil has collected against a boom or barrier.



FIGURE 5.2 OIL SKIMMERS

5.4. SORBENTS

Sorbents are materials that soak up liquids. They can be used to recover oil through the mechanisms of absorption, adsorption, or both. Absorbents allow oil to penetrate into pore spaces in the material they are made of, while adsorbents attract oil to their surfaces but do not allow it to penetrate into the material. To be useful in combating oil spills, sorbents need to be both oleophilic and hydrophobic (water-repellent). Although they may be used as the sole cleanup method in small spills, sorbents are most often used to remove final traces of oil, or in areas that cannot be reached by skimmers. Once sorbents have been used to recover oil, they must be removed from the water and properly disposed of on land or cleaned for re-use. Any oil that is removed from sorbent materials must also be properly disposed of or recycled.

The following characteristics must be considered when choosing sorbents for cleaning up spills:

RATE OF ABSORPTION—The rate of absorption varies with the thickness of the oil. Light oils are soaked up more quickly than heavy ones.

OIL RETENTION—The weight of recovered oil can cause a sorbent structure to sag and deform. When it is lifted out of the water, it can release oil that is trapped in its pores. During recovery of absorbent materials, lighter, less viscous oil is lost through the pores more easily than heavier, more viscous oil.

EASE OF APPLICATION—Sorbents may be applied to spills manually or mechanically, using blowers or fans. Many natural organic sorbents that exist as loose materials, such as clay and vermiculite, are dusty, difficult to apply in windy conditions, and potentially hazardous if inhaled.

6. SUBSTITUTE ACTIONS FOR OIL SPILLS

Chemical and biological treatment of oil can be used in place of mechanical methods, especially in areas where untreated oil may reach shorelines and sensitive habitats where a cleanup becomes difficult and environmentally damaging. This chapter describes some of the chemical and biological methods that are used by response personnel to contain and clean up oil spills in aquatic environments. Alternative treatment typically involves adding chemical or biological agents to spilled oil and also includes in-situ burning.

6.1. TYPES OF SUBSTANCES USED

Two types of substances commonly used in responding to an oil spill are (1) dispersing agents and (2) biological agents.

6.1.1. DISPERSING AGENTS

Dispersing agents, also called dispersants, are chemicals that contain surfactants, or compounds that act to break liquid substances such as oil into small droplets. In an oil spill, these droplets disperse into the water column, where they are subjected to natural processes—such as wind, waves, and currents—that help to break them down further. This helps to clear oil from the water surface, making it less likely that the oil slick will reach the shoreline.

The effectiveness of a dispersant is determined by the composition of the oil it is being used to treat and the method and rate at which the dispersant is applied. Heavy crude oils do not disperse as well as light- to medium weight oils. Dispersants are most effective when applied immediately following a spill, before the lightest components in the oil have evaporated.

Some countries rely almost exclusively on dispersants to combat oil spills because frequently rough or choppy conditions at sea make mechanical containment and cleanup difficult. Dispersants used today are much less toxic than those used in the past, but few long-term environmental effects tests have been conducted after a dispersant application. The EPA encourages the monitoring of areas that may see increased dispersant use.

These problems are being overcome, however. New technologies that improve the application of dispersants are being designed. The effectiveness of dispersants is being tested in laboratories and in actual spill situations, and the information collected is being used to help design more effective dispersants. In addition, the EPA maintains an authorized list of chemical and biological agents for use on oil spills.

6.1.2. BIOLOGICAL EVENTS

Biological agents are nutrients, enzymes, or microorganisms occur. Biodegradation is a process by which microorganisms such as bacteria, fungi, and yeasts break down complex compounds into simpler products to obtain energy and nutrients.

Biodegradation of oil is a natural process that slowly—over the course of weeks, months, or years—removes oil from the environment. However, rapid removal of spilled oil from shorelines and wetlands may be necessary in order to minimize potential environmental damage to these sensitive habitats.

Bioremediation technologies can help biodegradation processes work faster. Bioremediation refers to the act of adding materials to the environment, such as fertilizers or microorganisms, that will increase the rate at which natural biodegradation

occurs. Furthermore, bioremediation is often used after all mechanical oil recovery methods have been used. Two bioremediation approaches have been used for oil spill cleanups—biostimulation and bioaugmentation.

Biostimulation is the method of adding nutrients such as phosphorus and nitrogen to a contaminated environment to stimulate the growth of the microorganisms that break down oil. Limited supplies of these necessary nutrients usually control the growth of native microorganism populations. When nutrients are added, the native microorganism population can grow rapidly, potentially increasing the rate of biodegradation.

Bioaugmentation is the addition of microorganisms to the existing native oil-degrading population. Sometimes species of bacteria that do not naturally exist in an area will be added to the native population. As with nutrient addition, the purpose of seeding is to increase the population of microorganisms that can biodegrade the spilled oil. This process is seldom needed, however, because hydrocarbon-degrading bacteria exist almost everywhere and non-indigenous species are often unable to compete successfully with native microorganisms.

7. PREPARING FOR OIL SPILLS – CONTINGENCY PLANNING

Once a spill occurs, the best approach for containing and controlling the spill is to respond quickly and in a well-organized manner. A response will be quick and organized if response measures have been planned ahead of time.

7.1. THE ROLE OF CONTINGENCY PLANS

Contingency Plan is like a set of instructions that outlines the steps that should be taken before, during, and after an emergency. A contingency plan looks at all the possibilities of what could go wrong and, “contingent” upon actual events, has the contacts, resource lists, and strategies to assist in the response to the spill.

7.2. ELEMENTS OF CONTINGENCY PLAN

An oil spill contingency plan may appear complicated because it provides many details about the numerous steps required to prepare for and respond to spills. It also covers many different spill scenarios and addresses many different situations that may arise during or after a spill. Despite its complexity, a well-designed contingency plan should be easy to follow. Although they are different in many respects, contingency plans usually have four major elements in common:

- ❖ Hazard identification
- ❖ Vulnerability analysis
- ❖ Risk assessment

❖ Response actions

7.2.1. HAZARD IDENTIFICATION

It is impossible to know when an oil spill is going to happen and how much oil is likely to be spilled. However it is possible to identify where an oil spill can be happened. In Chennai Fishing Harbour, the probability of oil spillage is maximum during the refuelling of boats and other engines using diesel and lubricants.

Different situations can affect the ability of response personnel to contain and clean up an oil spill, such as weather conditions, geographic isolation, and spill size. The following information is usually collected as part of the hazard identification

- ❖ Types of oils frequently used in or handled
- ❖ Locations where oil will usually be filled and the method of filling.
- ❖ Extreme weather conditions that might occur in the area during different times of the year
- ❖ The location of response equipment and personnel trained to use the equipment and respond to the spill

7.2.2. VULNERABILITY ANALYSIS

The vulnerability analysis section of a contingency plan provides information about resources and communities that could be harmed in the event of a spill. This information helps personnel involved in cleaning up a spill make reasonable.

7.2.3. RISK ASSESSMENT

Contingency planners compare the hazard and the vulnerability in a particular location to see the kind of risk that is posed to the environment. The plan then addresses those problems by determining how best to control the spill, how to prevent certain environments from exposure to oil, and what can be done to repair the damage done by the spill.

7.2.4. RESPONSE ACTIONS

Response actions are developed to address the risks that are identified in the risk assessment. A carefully designed contingency plan will describe major actions that need to be taken when a spill occurs. These actions should take place immediately following a spill so as to minimize hazards to human health and the environment. The following response actions should be included in a contingency plan:

- ❖ Getting trained personnel and equipment to the site quickly

- ❖ Defining the size, position, and content of the spill; its direction and speed of movement; and its likelihood of affecting sensitive habitats
- ❖ Ensuring the safety of all response personnel and the public
- ❖ Stopping the flow of oil from the ship, truck, or storage facility, if possible, and preventing ignition
- ❖ Containing the spill to a limited area
- ❖ Removing the oil
- ❖ Disposing of the oil once it has been removed from the water or land

7.3. IMPROVING CONTINGENCY PLAN

After an oil spill has been controlled and cleaned up, should assess the usefulness of their contingency plans. Information gathered during the assessment, such as problems that had not been considered in the original plan and the successes or failures of cleanup techniques used, is used to revise and improve contingency plans. Lessons learned during oil spills and exercises are also shared with other private, state, regional, and federal agencies so that they too may learn from oil spills to improve their contingency plans.

8. ROLES & RESPONSIBILITIES

The duties and responsibilities of the following members should be documented:

- First Person On-Scene the Oil Spills,
- Spill Response Team, and
- Spill Response Team Leader.

8.1. FIRST PERSON ON-SCENE THE OIL SPILLS

- Assess the initial severity of the spill and safety and environmental concerns.
- Identify the source of spill.
- Determine the size of the spill and stop or contain it, if possible.
- Report to the spill response team leader.
- Immediately stop work, transfer or fuelling operations, control all sources of ignition.
- If possible and safe to do so, stop any leak or put out any fire that may be present.
- Prevent the entry of spilled material into water or land, if possible.

8.2. TEAM LEADER

- Ensure all the safety measures are taken for the preservation and protection of human life.
- Identify potential fire hazards and request standby or response from the Fire response team.
- Ensure that source of the spill is secured.
- Notify additional trained spill response team personnel, if required.
- Restrict further operations that may affect with a sustained response to the spilled incident.
- Evaluate the size of the response to be started and make assessments relating to the necessity of calling out response outworkers.
- Implement protective measures and containment procedures to minimize environmental damage.
- Oversee containment, clean-up and restoration operations.

Team leader should also:

1. Establish internal communications (within the organization especially to head office)
2. Liaise with government agencies as required.
3. Establish external communications with local level authorities (act as company contact on local level)
4. Report the spill conditions periodically.
5. Document all possible events, since the occurrence of the spill.

Then the spill team leader should prepare a report and sent it to appropriate authorities as soon as possible:

The report should include the following:

- Name and phone number of the reporter
- Time of spill.
- Time of spill detection.
- Type of product spilled.
- Amount of product spilled.
- Location of spill.
- Source of spill.
- Type of accident – (whether the spill occur due to rupture, collision, overflow or any other reasons)
- The owner of the spilled material and their phone number, if known.
- Whether the spill is still occurring.
- Whether the spill or leaked product is contained or not.
- Wind Velocity, Wind direction & Temperature in the spill occurred area.

8.3. RESPONSE TEAM

- Stop or reduce the discharge, if safe to do so.
- Deploy booms, sorbents and other equipment and materials as required to construct barriers or a ditch to contain a spill on land. Deploy solid flotation boom for spills of non-volatile products on water.
- If possible, prevent access of spilled material to water.
- Deploy additional spill response equipment as directed by the Team Leader, if required.
- Continue clean-up as directed by the Team Leader or until relieved.
- Restore damaged environment and property as directed.

The feasibility of containing and recovering a spill will largely be determined by its location and the rate of the release, spreading, transport and evaporation.

If the spill response team have pre-assembled spill clean-up kits this will expedite response and reduce the total deployment time needed, including:

- Equipment and support material procurement time.
- Personnel mobilization, transit and assembly at spill site time.
- Actual equipment set-up and deployment time.

8.4. INSPECTION TEAM

DURING A SPILL RESPONSE:

Monitor spills throughout the spill response to ensure safety and to direct clean-up efforts. The team should ensure all inspections should be enclosed with written and photographic evidence.

The inspection team should determine:

- Explosive gas concentrations in the atmosphere using an explosion meter.
- Spill movement and behaviour in order to properly direct the responsive efforts.
- Any threats to the safety of people, property and the environment.

AFTER A SPILL HAS BEEN CONTAINED:

Monitor clean-up and restoration activities through regular documented inspection reports.

9. SPILL MANAGEMENT

9.1. SAFETY MEASURES/ WARNINGS:

- Vapours are heavier than air and form easily at high temperatures.

- Empty containers can contain explosive vapours.
- Toxic gases form upon combustion.
- Eye contact causes irritation.
- Inhalation of vapours can cause irritation of the respiratory tract, headache, vomiting, and unconsciousness.

9.2.PRECAUTION:

- Monitor for explosive atmosphere.
- Avoid contact with strong oxidizers.
- Eliminate ignition sources.
- Restrict access and work upwind of spill.

9.3.PERSONAL PROTECTION:

- Always wear impervious, chemical-resistant clothing, gloves, footwear, and goggles
- Nitrile, PVC, and Viton are suitable materials.
- Do not use natural rubber or Neoprene.
- Wear a full-face organic vapour cartridge respirator where oxygen is adequate; otherwise wear a positive-pressure SCBA.

9.4.IF THE SPILL HAPPENS ON LAND:

- Do not flush into ditches or drainage systems.
- Block entry into waterways and contain with earth or other barriers.
- Do not contain spill if there is any chance of igniting vapours.
- Remove small spills with absorbent pads.

9.5.IF THE SPILL HAPPENS ON WATER:

- Contain spill as close to release point as possible.
- Use spill containment boom to concentrate slicks for recovery.
- Do not contain spill if there is any chance of igniting vapours.
- On small spills, use absorbent pads to pick up contained oil.
- On larger spills, obtain and use skimmer on contained slicks.

9.6.IF THE SPILL HAPPENS ON RIVER AND STREAMS:

- Prevent entry into water, if possible, by building a berm or trench.
- Intercept moving slicks in quiet areas using absorbent or non-absorbent booms.
- Do not use absorbent booms/pads in fast currents and turbulent water.

10. RESPONSE STRATEGY

Although each oil spill is different, general common procedures are outlined below:

- 1) Ensure oil spill equipment is in a known and accessible location.
- 2) If a spill occurs, stop or minimise any further spillage. Ensure safety of all personnel. Check for fire and explosion risk. Ensure safety equipment is worn.
- 3) For all spills, deploy absorbents to contain fuel if possible. It may be possible to hold fuel in depressions by using absorbent materials, or by building small dams.
- 4) If possible use pump to remove fuel from ground straight into drums. Ensure that sufficient good quality empty drums are available near the spill site.
- 5) Absorbent pads should be spread on any remaining fuel or oil outside which cannot be pumped or manually removed. Oil soaked absorbents must be picked up and put into plastic bags and/or empty drums.
- 6) Contaminated snow can be stored in drums which have had their tops removed. Allow the snow to melt and decant off fuel.
- 7) Any waste drums containing a mixture of fuel and snow or water are likely to freeze. To prevent drums from splitting, use only those in good conditions. Do not fill completely.
- 8) Drums of recovered fuel/water should be stored on fuel containment mats. IB

10.1. REPORTING

TYPE 1 SPILLS:

An observer/responder to a Type 1 spill less than 10 liters is to prepare a final report should cover the following aspects:

- ❖ **Date and location of spill**
- ❖ **Estimated quantity of fuel lost**
- ❖ **Type of fuel**
- ❖ **Source and cause**
- ❖ **Response action taken**
- ❖ **Evaluation of impact**

TYPE 2 SPILLS:

The Expedition Leader is to prepare a final report on Type 2 spills more than 10 Litre.

The report should describe the following:

- ❖ **Time and date of spill**

- ❖ Estimated quantity of fuel lost
- ❖ Type of fuel
- ❖ Source and cause
- ❖ Location and extent of spill (map)
- ❖ Resources affected
- ❖ Environmental impact
- ❖ Response action taken
- ❖ Stopping or minimising the spill (technical work carried out)
- ❖ Clean-up (techniques used, amount collected)
- ❖ Environmental monitoring (photographs, soil samples)
- ❖ Value of response action
- ❖ Other comments deemed necessary

10.2. RESPONSE POLICY:

The District Oil Spill-Disaster Contingency Plan, integrates three Tiers of contingency planning thereby providing the necessary organizational structure to ensure that the State Government can be kept fully informed of any spill occurrence, monitor the spill response and intervene when required so as to cope with all spills which threaten environment.

10.3. LEGISLATION:

If the oil pollution reaches the shorelines, The responsible person can also be prosecuted under the Environment (Protection) Act 1986, if failed to take action to prevent and mitigate the oil pollution. The legal action can also be taken by the affected parties by instituting a suit in the civil court of damages in tort for civil wrong.

10.4. REPORTING OF THE OIL SPILL:

Any sighting of oil spill in the near shore or shoreline areas is to be intimated to the local Coast Guard office and to the respective Commissioner/ Deputy Commissioner, Greater Chennai Corporation. The Commissioner/Deputy Commissioner, GCC will in-turn intimate all concerned agencies. The Coast Guard shall take measures to identify the polluter through aerial search and through other available means. The Coast Guard is to be requested by the On Scene Commander (OSC) to provide aerial search, aerial assessment to find the extent of spill and classify them, so that appropriate type of tiered response can be undertaken.

10.5. ORGANIZATION FOR RESPONSE

Primarily the response for shoreline protection lies with the state Government through the concerned Deputy Commissioner, who will lead the Oil spill management team as lead On Scene Commander (OSC). The OSC should maintain a system, flexible enough to expand and contracting size of the response organization as required and generally be large enough and sufficiently funded to deal with a pollution incident of a specified size and nature. The OSC should also ensure that proper arrangement is made for prompt gathering and dissemination of real time information to all members of the response organization about actual or threatened pollution. The decision makers in the response organization must be available at all times to receive such information. Adequate communication facilities must therefore exist for transmission of instructions and information, on priority.

10.6. DEPUTY COMMISSIONER – PREVENTIVE MEASURES:

- Ensuring identification of different case scenarios of oil spill disasters on shoreline/coastline w.r.t types of spill, type of shoreline affected, amount of oil spilled, area of spillage, Wind speed & direction, tidal/ current details at each location. As well as possible various remediation measures for respective case scenarios, in consultation with the various oil handling facilities/Port Authorities.
- Gauge the level of preparedness by conducting mock drills, including beach cleaning exercises once a Year, with due records and assessment for further Contingency plan improvement and biannually at the state level involving all major stake holders.
- Keep in readiness and provide suitable man power and equipment for cleaning of beaches affected by oil pollution.
- Maintain updated list of vendors, equipment- area wise, personnel (local/ Govt. or otherwise) capable of assisting at site.

10.6.1. CONTINGENCY MEASURES:

- Confirm and assess a reported incident and declare emergency if required;
- Establish a chain of command & responsibilities and to conduct the planning and strategy meeting.
- To ensure well equipped Emergency Response Centre (ERC) along coastal/riverine areas, at strategic locations in necessary readiness.
- To nominate Dy. OSC for shoreline Supervisor for shoreline cleanup.
- To ensure presence of trained volunteers from NGOs, civic agencies, colleges, general public for clean-up measures, whenever required and to arrange the logistics for clean-up personnel.
- Ensuring appropriate statements/ press releases are issued at predetermined times in a timely manner, to the media/public, as & when required.

- Nominate a Public Relations officer to handle affairs related media, public etc.
- Keep approved vendors for logistics(transport, food distribution to local teams, PPE (Personal Protective Equipment) , portable toilets etc , vendors-equipment- area wise, capable personnel (local/Govt.or otherwise) in readiness
- List of personnel drawn should be medically screened through District Health Officer (DHO) prior to finalization/site allocation to prevent further compromise on health.
- Ensuring recovery of cost and provide relief to affected.
- To ensure all possible assistance to the coordinator of the shoreline cleanup including keeping a Medical & Safety officer readily available, in accordance with the contingency plan.
- To identify, obtain and maintain in readiness, adequate quantity of basic pollution response equipment like defective booms, fence booms, and beach protection booms, spray equipments along with specialized equipment for beach.
- Ensure Animals/birds/plant life experts are readily listed and available for carrying out rescue and cleaning of impacted wildlife.
- To identify safe & appropriately designed places for segregated collection& temporary storage of waste oil and oil contaminated debris through suitable collection containers, and ensure their safe disposal to a registered approved recycler or to authorized incinerators or any other approved method only, at cost to the polluter, if known, in consultation with the State Pollution Control Board
- To provide administrative infrastructure to the agencies assisting in shoreline clean-up.
- Once cleaned, on submission of satisfactory analytical reports by TNPCB, the enforced Plan will be deactivated by declaring closure.
- To brief State, Local & Government officials on the status of response activity till successful closure

10.7. INDIAN COAST GUARD, TAMILNADU- PREVENTIVE MEASURES:

- Assist OSC in identification of different case scenarios of oil spill disasters on shoreline/coastline with respect to types of spill, type of shoreline affected, amount of oil spilled, area of spillage , Wind speed & direction, tidal/ current details at each location, as well as possible various remediation measures for respective case scenario.
- To coordinate and prepare a preparedness plan with the State Environment Department and the Deputy Commissioner concerned to devise shore-line clean-up strategy and shoreline restoration

- To ensure all possible means have been deployed to assure that oil spills and related contaminants (e.g. tarballs) are arrested before it reaches the shoreline, within the 25 kms zone upto a depth of 40 mtrs.

10.7.1. CONTINGENCY MEASURES:

- To mobilize Coast Guards' and other resource agencies/resources to support OSC's action at on shore spill area, including deployment of shoreline protection measures in coastal waters.
- To decide the nature and extent of actions required and to advise the authorities concerned accordingly.
- To carry out first hand assessment regarding the damage and the quantity of oil spilled.
- To provide trajectory predictions for spilled oil, aerial surveillance observations of oil on water or shore and shoreline surveys of oil to determine clean-up priorities, in a timely manner.
- To assist the OSC in conducting a joint natural resource damage assessment with other concerned agencies, with the goal to restore any offshore and coastal resources harmed by the spill.
- To advise & regulate the use of OSD (Oil Spill Dispersants) due to their harmful nature by restricting use only in shoreline depths > 15mtrs, having wind speeds > 25 knots, with strong off shore current movement.
- To seek additional resources from Coast Guard regional headquarters if required.
- To advise the clean-up agencies for the type/ method of clean-up initiative to be undertaken for the environment protection.
- To prepare & maintain a daily Incident Log & Management Report log, during the incident, along with supporting record of all decisions and actions taken by the respective Department, including expenses incurred during the remediation of the said incident. And to submit the same to the OSC.

10.8. TAMILNADU POLLUTION CONTROL BOARD

PREVENTIVE MEASURES:

- To maintain a ready list of Identified and approved
- Authorized waste management facilities /agencies (recyclers/incinerator) for safe disposal of oil contaminated debris and oil waste. In line with the relevant Legislation.
- The identified storage facilities at each ERC site (containers & storage enclosures)
 - (Temporary or otherwise) should be designed as per appropriate safety

measures, that can safely store oil /oil contaminated dirt collected till safely disposed.

- Authorized Hazardous waste transporter, which must submit plans to that effect in line with the Hazardous Waste (Management, Handling & Trans-boundary Movement) Rules 2008 as amended.
- Approved waste disposal methods in absence of waste management facilities, if need arises.
- Have readily available and duly calibrated gas detectors for HC's, VOC's, Benzene, Oxygen monitoring.
- To identify various equipment/field monitoring kits required for monitoring & sample collection during oil spills and keep the same in readiness.
- To identify & make readily available a suitable type of vessel in consultation with On Scene Commander/Coast Guard for carrying necessary equipment for monitoring and sample collection.
- To monitor & establish baseline data for coastline/ shorelines w.r.t.bio remediation of oil contaminated areas, for parameters established by the Board.

10.8.1. CONTINGENCY MEASURES :

- To immediately initiate shoreline monitoring & measurement.
- To take necessary legal action in accordance as mandated in the Environment Protection Act's & Rules 1986 as amended
- To assess environmental damage and provide guidance on necessary remedial measures.
- To assist in restoration measures of the affected shoreline/coastal area as through "polluter pays" principal.
- To coordinate with Dept. of Environment, Coast Guard for issuing notice against the polluter master/owner for clean-up, remediation and recovery of monitoring cost of total affected area.
- To maintain a log and record of all decisions and actions taken by the respective Department, including expenses incurred during the monitoring, analysis, remediation of the said incident, and submit the same to the concerned OSC

10.9. MINISTRY OF ENVIRONMENT AND FOREST, GOVERNMENT OF INDIA:

Functions as coordinating agency for guidance on technical support & scientific research on oil spill remediation till end- of -life

PREVENTIVE MEASURES:

- Determine Policy for usage of dispersant in the shoreline areas and establish guidelines for remediating oil spills moving offshore.

- Approval of the mapping of ecologically sensitive areas and bio sphere reserve along the coastal areas and inland water resources Vis-à-vis effects of oil spill on the local ecosystems.
- Determining the policy for usage of possible permissible bio-remediation measures & follow up action

10.9.1. CONTINGENCY MEASURES:

- To Provide assistance if called for technical and scientific support

10.10.DISTRICT HEALTH OFFICER

PREVENTIVE MEASURES:

- Ensure staff is imparted necessary awareness on possible health concerns during oil spills.
- Ensure ready availability of sufficient number of well-equipped ambulance capable of giving life sustaining support, for transportation of victims to hospitals.
- Ensure ready availability of required medical supplies to impart necessary first aid
- Keep readily available a list of the medical team personnel on standby duty.

10.10.1. CONTINGENCY MEASURES:

To ensure the health of the workers (including contractors, volunteers, NGO's etc) is not compromised during clean up.

Prior to deploying for clean-up operation on beaches/shoreline, DHO should:

1. To carry out health assessments of the workers to establish fitness to work in the required conditions. Baseline health information, collected wherever possible should be linked to fitness requirements and records are to be maintained.
2. To brief workers on the basics of body temperature physiology, hazards related to sunlight and consuming alcohol on the job, the importance of food and water, clothing requirements, the recognition of temperature related symptoms and signs and the potential for other illnesses to impact or intolerance to extremes of heat and cold.
3. Ensure availability of first aid requirements, medical staff emergency medical technicians (EMTs), paramedics, nurses and Physicians and facilities, and medical evacuation (if required), ambulances, and designated first-aiders in the response area.

11. CONCLUSION

EMPPL will support with the emergency preparedness readily available equipment such as Boom and with the support of nearby industries and as Per District Disaster

Management Plan – Tiruvallur District, the plan will be executed and will be ensured by EMPPL.

15.1.INITIAL ANNOUNCEMENT OF AN EMERGENCY

Any untoward incident/emergency has to be reported either by person or through telephone/VHF or by any other means to the Location In-Charge/Security Gate. The Location In-Charge shall act as per Roles & Responsibility.

Fire Chief shall decide the nature of emergency [Level I, II, III] and take appropriate action.

In the event of Emergency, the same will be communicated to all Coordinators. All employees will report to nearest Assembly Points as specified, on hearing the siren or getting the message over telephone/VHF. Maintenance personnel/Contract workmen working with machines also proceed for Assembly point after leaving the machine in safe condition.

Note: The announcement regarding Level I and II Emergency will be made by the Location-in-Charge [Chief Incident Coordinator] or his nominee as information first becomes available on an incident. Maintenance of ERDMP Record

There shall be maintenance of ERDMP records for all kind of emergencies covering near Miss, Level-I, Level-II and Level-III. Organization shall maintain an Incident Record Register for the above purpose and post-disaster documentation like resources deployed, relief, rehabilitation measures and lesson learned to avoid re-occurrence of any such emergency. Head of HSE or any other designated personnel by the CIC/SIC shall be responsible for maintenance of such records.

1. A good public relations program is extremely important in an emergency situation. Inquiries will normally be received from the media, government agencies, local organizations and the general public.
2. This section of the Response Plan shall include a public relations or media plan. It should identify an Information Officer that is well-equipped and trained in media relations.
3. Initial releases shall be restricted to statements of facts such as the name of the installation involved, type and quantity of spill, time of spill, and countermeasure actions being taken. All facts must be stated clearly and consistently to everyone.

Note: Plans shall also be developed to utilize local media and television stations for periodic announcements during an emergency. This shall also assist in reducing rumors and speculation.

15.1.1 RECORDER (RESCUE TEAM HEAD- MANAGER OPERATIONS)

The Recorder responsibility is to maintain an accurate time record of key information received from the incident or emergency location and to record the actions initiated by the site incident controller and for implementing the emergency response actions below:

- To record key incident events/actions on incident status board/display manually or electronically;
- To maintain essential equipment checklist status;
- To ensure all status and information is up to date and correctly displayed;
- To take all necessary recorded material to the alternate ECC room in the event of emergency in main ECC room; and
- To maintain a log book.

15.1.2. COMMUNICATIONS SERVICES

The In-charge (Maintenance) will be the Communications Coordinator. The Communications Coordinator shall ensure the following actions below:

- Ensuring the ECC equipment and systems are maintained to a high standard and remain functional throughout the emergency.
- Ensuring a back-up communication system is available in the event the ECC Room is not available.
- Providing quality and diverse communication systems for use in routine and emergency situations.

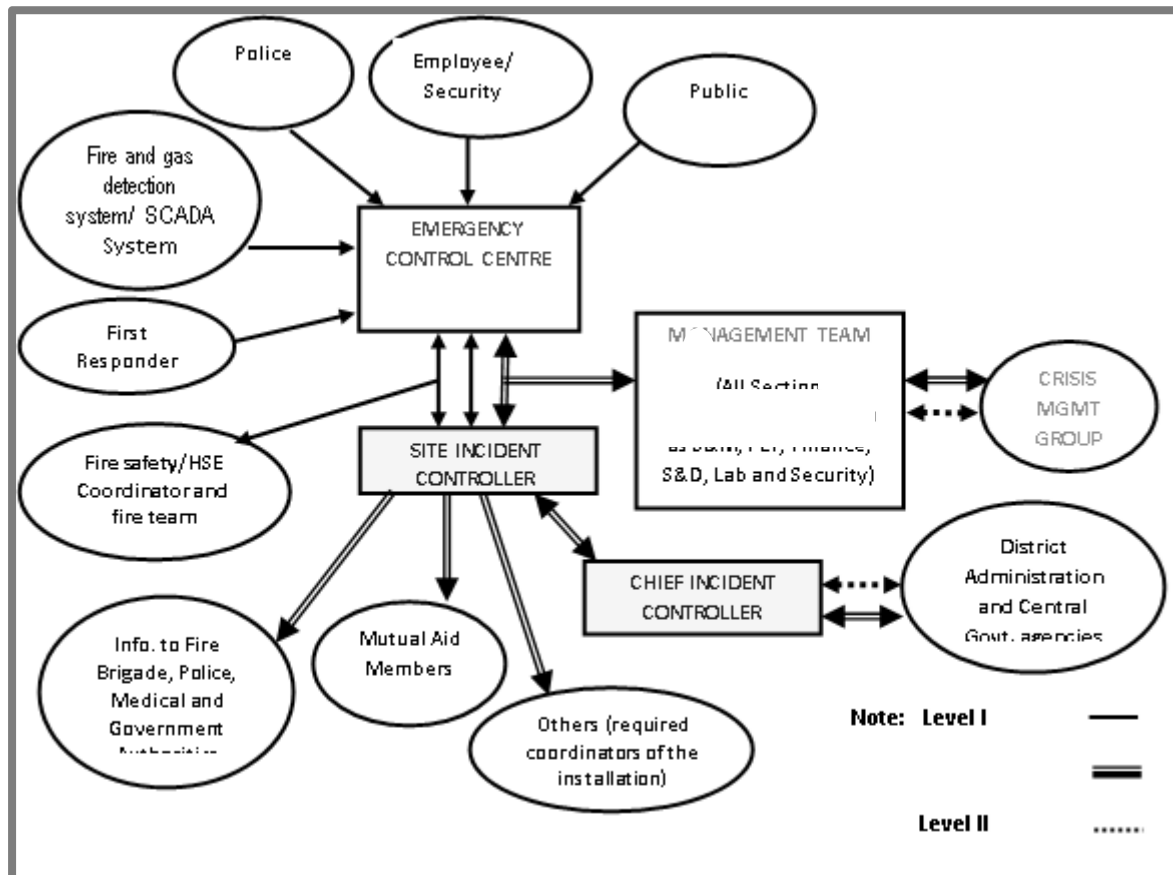
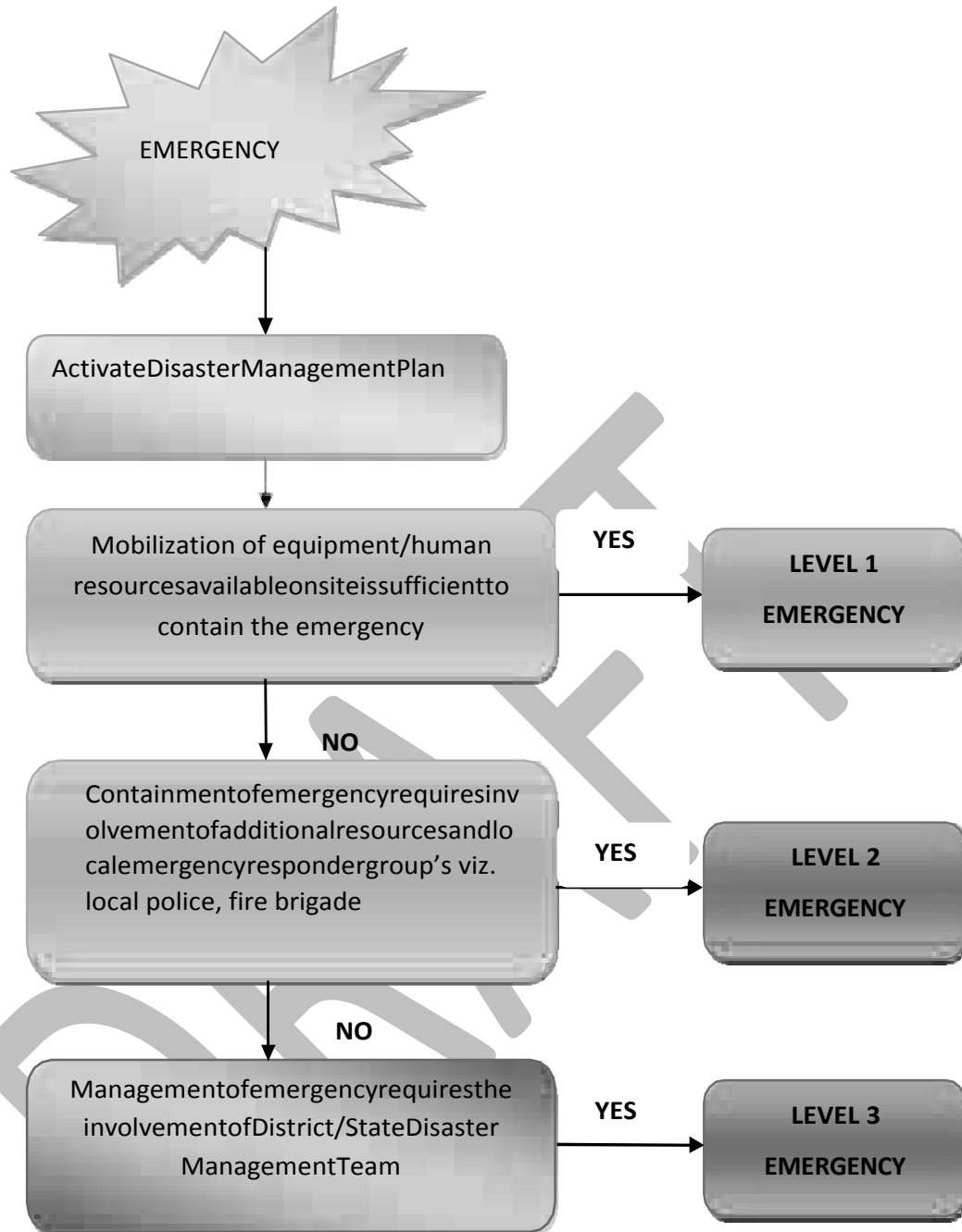


FIGURE 7-1 COMMUNICATION FLOW CHART IN AN EMERGENCY

15.1.3. ROLES AND RESPONSIBILITIES OF PERSONS OTHER THAN EMERGENCY ORGANIZATION TEAM MEMBERS

- Do not venture out for help.
- Be available in the Department till evacuation is called.
- After hearing the Emergency siren, all should stop their work in a safe manner immediately.
- All work permits will be cancelled automatically.
- All should come to Safe Assembly Area (In front of Safety Office).
- While coming to Safe Assemble Area,
 - Do not run, walk brisk.
 - Do not block staircase, use hand rail. Come in a line.
 - Do not obstruct/ block the path to Emergency Organization Team members.
- Do not go back for your belongings.
- Do not use telephone except for emergency purpose.
- Follow instructions of Site Controller in Safe Assemble Area.



1. Notification of Emergency

The notification of any mishap like fire, explosion or toxic release is identified by either sensors or by any person working in the plant. If detection by sensors, alarm system will get activated or if it by a person, he will activate alarm system. As soon as Incident Controller aware of the emergency, he will rush to incident spot and assess the size and nature of emergency and communicate the same to Site Controller.

2. Declaration of Emergency

Site Controller will be the person to decide whether the situation warrants evacuation of the premises or is a localized incident. This individual will be termed as the declarer of emergency.

Once an emergency requiring evacuation has been decided upon by the declarer, the Emergency will be declared by putting on the Emergency Siren.

3. Evacuation of Personnel

All Safety Squad co-ordinators from the Department where the incident has occurred and from other Department will reach earliest to the point of incident. All other people working in the terminal will assemble at designated assembly point i.e., in front of Safety Department after hearing the Emergency Siren. The Emergency co-ordinators will assist in directing the individuals to the assembly point.

4. Accounting of Personnel

The Emergency Co-ordinator, Head Count Person will conduct head count as per particular days attendance record at the assembly point to account for persons working inside the factory and also for visitors / vendors present inside the premises. Information on missing persons will immediately convey to Site Controller.

5. Controlling of Emergency

The Safety Squad member from the affected area and Safety Squad members from other Departments will attempt to control / mitigate the emergency situation under the supervision of Incident Controller and instruction of Site Controller.

6. Arrangements for Medical Treatment

Any person injured in the incident and subsequently, will be treated by Emergency coordinator, First Aider.

First Aid team member will accompany the injured to hospital. In the event of additional medical help, the injured will be shift to recommended Hospital.

7. Information to the Relatives of the Injured

The relatives of injured will be informed by Emergency Coordinator for Hospital, Law & Order. The communications to the relatives of injured will be through telecom or by a messenger. The clear address of availability of the injured person (if hospitalized) will be communicated to his relatives.

8. Information to the Government Authorities

The Emergency Coordinator for Hospital, Law and Order is the person to inform and get help from Fire Station, Police and other Government Hospitals in coordinating with Site Controller.

9. Law & Order

Site Controller will take over and control emergency in coordination with Incident Controller and other Emergency Coordinators.

The General Manager will arrange to send information regarding the incident to the Director of Factories, Government of Tamil Nadu.

10. All Clear Signal

Once Emergency is mitigated, normalcy is restored; head count is matched, then Site Controller will pass an order to Security to wait All Clear Signal.

After hearing the All Clear Signal, all can move to their respective work places to start their normal activities.

11. Security & Police

Security, protection of life & property and traffic control & maintenance of law and order should be taken care of by the police. During an emergency duties and responsibilities of the police may be:

- a) Cordoning of the incident area
- b) Warning public about the hazards
- c) Traffic Control
- d) Assist firefighting services
- e) Assist first-aid medical teams
- f) Assist evacuation and ensure protection of property in evacuated areas.

15.1.4. ALERT ACTION PLAN DURING NON-WORKING HOURS

All the 365 days Fire Hydrant System and Fire alarm systems are kept in active mode, to monitor this technical person and security persons will present round the clock throughout the year to tackle the worst case scenarios, in cases of extreme emergency.

Emergency Action Plan for Emergency during Off-Shift Hours (Including Holidays):

1. Security at Visitor Gate shall also perform duties of Communication, Welfare & Medical, and Material Coordinator in addition to his normal duties till the arrival of the concerned coordinator.
2. The Security in-charge shall act upon depending on the situation till arrival of the concerned coordinators for effective handling of emergency. They shall take care of the safety of personnel, Depot, property etc. Safe operating procedures which are already in practice shall be followed.
3. All other non-essential personnel whose roles are not defined in the action plan shall assemble at assembly points and wait for further instruction from Control Room.

FIRE/VAPOUR CLOUD EXPLOSION/EMERGENCY

1. First responder is operator or maintenance worker who on discovering fire / explosion / product leak shall inform to immediate officer or CIC.
2. Try to extinguish or contain fire with help of nearest available fire extinguisher, water hydrant, Water Cum Foam Monitors without endangering himself.
3. Immediately notify control room using VHF, confirm location, type & extent of emergency, number of injured, if any and nature of injuries, name of reporter etc.
4. Control room/ operator shall inform to Location In-charge who shall take charge to deal with emergency.
5. Security coordinator shall carry out rescue operations at site and control of personnel to those required for emergency control.
6. Fire Chief shall rush to site with members of Emergency Management team and take action to mitigate / contain emergency.
7. All coordinators shall be at respective duty stations and obey instructions from Fire Chief.
8. Fire chief will assume full responsibility of emergency action plan. He shall take decision regarding level of emergency, start of Emergency Control Centre (ECC).
9. Fire chief shall take necessary emergency control measures till situation is brought under control. He shall initiate actions & decisions regarding:
 - a. Operation & maintenance
 - b. Emergency Shut-down
 - c. Evacuation of personnel
 - d. Medical assistance to injured
 - e. Assistance from mutual aid members and external agencies.
 - f. Escalation of emergency & reporting incident to district authorities
 - g. Communication & assistance to affected public

Regional Deputy Commissioner,
61, Basin Bridge Road,
Old Washermenpet,
Chennai- 600 021

The Chairperson,
Chennai Fishing Harbour Management
Committee,
Chennai Port Trust,
Old Administrative Building 3rd floor,
No. 1, Rajaji Salai,
Chennai - 600 001.

Z.O.IV.C.No.B2/012467/2022

Date : 05.12.22

Sub : Greater Chennai Corporation - Dn - 43 - Clearing of
Garbages inside Chennai Fishing harbor at First and
Second main road - Request to remit the Garbage
clearing charges to GCC - Reg

Ref : 1. The ChairPerson, Chennai Fishing Harbour
Management Committee, Chennai - 600 001.

In the reference cited above, the Fishing Harbour Management
Committee has requested to bestow the Personal attention and instruct the
GCC employee to empty the customised bins at First and Second Main Road of
Fishing Harbour at regular interval viz. Once in two days for dustbin in second
main road and once in a week to dust bin provided in first main road.

In this connection meeting was conducted by the Fishing Harbour
Management Committee held on 19.12.2022 and discussed about cleaning of
garbage inside Fishing Harbour in Dn - 43, Zone - 04.

On discussion with the SWM dept, it was suggested to dispose of
garbage at Fishing Harbour to collect the dry waste at the rate of Rs. 1000/-
per MT for Govt agencies. The Garbage generated at Fishing Harbour is 1.0 MT
per day and hence rate works out per year is 1MT per day @ Rs. 1000/- per
MT for 365 days : Rs. 3,65,000/-.

Since action is being initiated to clear the Garbages at Fishing Harbour
from 23.12.2022 onwards.

Hence it is requested to remit the Garbage clearing charges
Rs. 3,65,000/- for one year from 23.12.2022 to 22.12.2023 to Greater Chennai
Corporation at the earliest.

5.12.22
10/11



Regional Deputy Commissioner
(North)

Phone: 044-2536 2358

044-2536 2309

044-2536 2551

Website : www.chennaiport.gov.in

Email : chennaifishingharbour@gmail.com

ACKNOWLEDGEMENT



CHENNAI PORT TRUST
Old Administrative Bldg.
3rd Floor,
No. 1, Rajaji Salai,
Chennai - 600 001.

CHENNAI FISHING HARBOUR MANAGEMENT COMMITTEE

FHMC2/5163/2006/E

To

The Regional Dy. Commissioner,
Greater Chennai Corporation, North
No.62, Basin Bridge Road,
Old washermenpet,
Chennai 600 021



Dt.: /0 .2 2023

Sir,

Sub.: FHMC – Clearing of garbages inside Chennai Fishing Harbour from customized bins kept at first and second main road – Remittance of garbage clearing charges for a period of one year – Forwarding of cheque for Rs.3,65,000/- - Reg.

Ref.: Letter No.Z.O.IV.C.No.B2/012467/2022 dt.05.01.2023 from Regional Dy. Commissioner, Zone IV, GCC.

Kind attention is invited to the letter cited at reference wherein it was requested to remit the garbage clearing charges of Rs.3,65,000/- for the period of one year from 23.12.2022 to 22.12.2023 to GCC for emptying garbage from customized bins kept at 1st, 2nd and 3rd main roads, Cross road and EMRIP service road on daily basis in Kasimedu Fishing Harbour.

Based on the above, a cheque No.324030 dt.07.02.2022 from Indian Bank, Harbour Branch, Chennai for an amount of Rs.3,65,000/- is forwarded herewith.

Kindly acknowledge the receipt of the above cheque.

Thanking You,

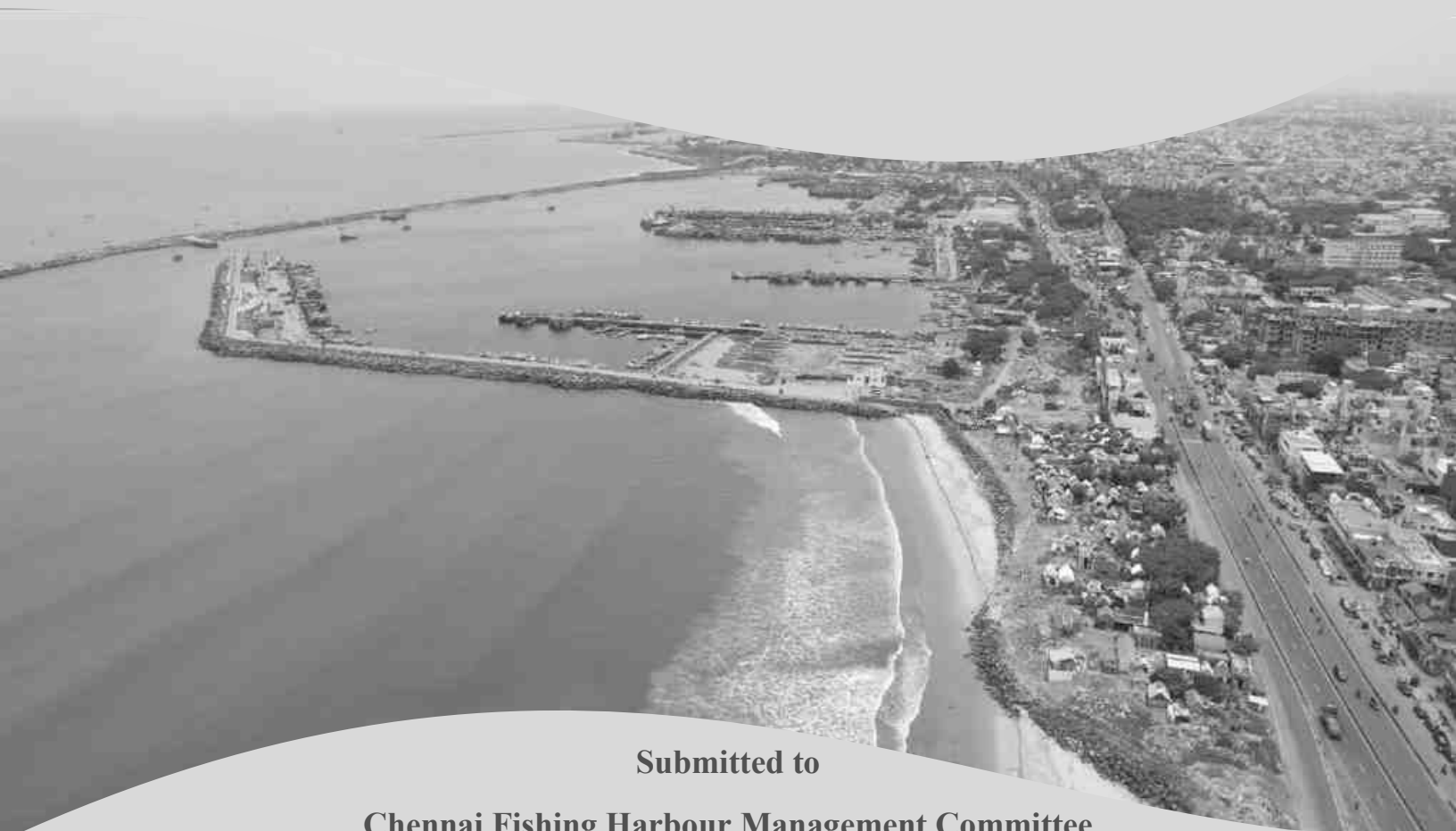
Yours faithfully,

MS/CEO(FH)
10.2.23

Encl.: Cheque for an amount of Rs.3,65,000/-

REPORT ON

**Feasibility of Mangrove Afforestation and Impact of Proposed
Modernization of Chennai Fishing Harbour on the Movement of
Turtles and other Aquatic Species**



Submitted to

**Chennai Fishing Harbour Management Committee
Indian Port Rail & Ropeway Corporation Ltd.**



Submitted by

**National Centre for Coastal Research, Chennai
&
Indian National Centre for Ocean Information Services, Hyderabad
Ministry of Earth Sciences
Government of India**



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1. Background

Marine fisheries play an important role in the socio-economy of coastal communities in many countries. India with 2 million sq. Km of Exclusive Economic Zone (EEZ), has an estimated fisheries potential of 4.41 million tonnes. India's marine fish production for 2021-22 was 41.48 lakh tonnes. The fishery production contributes to around 1.2% of India's Gross Domestic Product (GDP).

The state of Tamil Nadu with 9.4% of the total EEZ of India, is one of the major marine fish producing state of the country. Tamil Nadu with 5.95 lakh tonnes of marine fish production ranked third in 2021-22 among the coastal states of the country. Since 1950s, Tamil Nadu had a rapid growth in the fishery sector with introduction of new fishing vessels, methods, gear, and development of infrastructure. Currently, the infrastructure facilities include 6 major fishing harbours, 3 medium fishing harbours, and 300 fish landing centres. The marine fishery supports the livelihood of 13 lakh marine fisher population in 600 fishing villages through 5,803 mechanised and 41,337 traditional fishing crafts.

As the fishery sector has become the fastest growing sector in the country, development of new infrastructure and enhancing the existing ones to support this accelerated growth in the marine fishery has been initiated by the Central (Pradhan Mantri Matsya Sampada Yojana (PMMSY), Sagarmala initiative and Blue revolution) and State Government initiatives. The Chennai Fishing Harbour (CFH) is the largest fishing harbour in the state with facilities for sheltering around 2000 fishing boats, hosting 30,000 persons (buyers, laborer and vendors) daily and handling 500 MT of fish catch daily. The current port facility has its limitation as the infrastructure is old and unhygienic. The CFH is one of the five major fishing harbour proposed to be developed as "Hubs of Economic Activity".

In view of this, application for environment and coastal zone management clearance was submitted by the Indian Port Rail & Ropeway Corporation Ltd. to the appropriate authorities for the modernization and upgradation of the CFH. Among the terms of reference issued by the State Expert Appraisal Committee (SEAC), a study

report on damage/impact on the resources and associated biodiversity for mangrove afforestation and impact on movement of turtle and aquatic species at CFH has to be obtained. In this regard, the Chennai Fishing Harbour Management Committee requested the National Centre for Coastal Research (NCCR), Ministry of Earth Sciences to take-up the study.

2. Proposed Modernization and Upgradation of CFH

The fishing harbour is equipped with various pre- and post-harvest facilities. The major facilities include western trawler wharf with six finger jetties, northern berthing wharf, beach landing area for FRP boats, auction halls, retail sheds, ice factories, parking area, net mending sheds, fuel stations, toilet facilities, shops and stores and an administrative block.

The proposed development work entails the modernization and upgradation of basic essential requirements, construction of new berthing facilities and strengthening post-harvest infrastructure. The following modifications has been proposed to modernize the infrastructure and upgrading existing facilities at the Chennai Fishing Harbour

- Water facilities (drinking and tap water), drainage infrastructure
- Sanitation, Solid and liquid waste management
- Roads and lighting arrangements
- Fish landing wharf and modern fish handling complex
- Idling wharf, sheds, fish processing and storage facilities
- Boat repair facility

3. Objectives

The following are the objectives of the present study-

- (1) To study the currents status of the mangrove habitats based on field survey and using advanced tools like remote sensing.
- (2) Identification of the mangrove species for afforestation based on field and literature survey

- (3) To develop a mangrove afforestation plan based on the current status of the mangroves in the proposed site
- (4) Marine biodiversity study of the proposed site
- (5) The impact of proposed modernization of fishing harbor on turtle movement and other aquatic species.

4. Study Area

The Chennai Fishing Harbour (CFH) also known as the Royapuram Fishing Harbour/Kasimedu Fishing Harbour is located ($13^{\circ} 07' N$ and $80^{\circ} 17' East$) to the North of the Chennai Port (Figure 1). It is sheltered by Northern and Eastern breakwaters. It is spread on 24.28 ha of land area and contains 48.56 ha of water spread area within its breakwaters. The CFH is managed and operated by the Fishing Harbour Management Committee (FHMC).



Figure 1: Location of sampling sites at Chennai fishing harbour.

5. Methodology

An expert committee was consulted before conducting the survey. Mangrove survey and turtle nesting sites information was conducted based on the recommendation of the expert member committee. Water quality and biodiversity samples were collected based on standard protocols. Figure 2 presents the methodology followed during the present study.

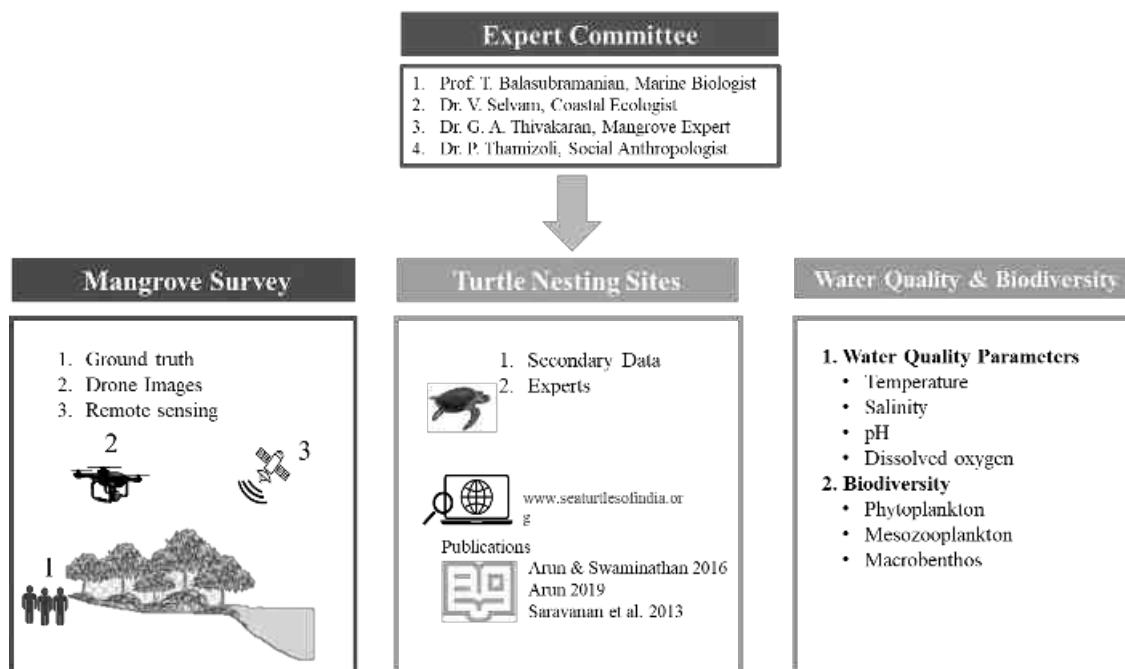


Figure 2: Flow chart of the methodology followed during the present study.

5.1. Field Sampling

Field sampling was conducted on 2nd August 2023 at three sites inside the harbour area (Figure 1-3). The sites represented the north (S 1), central (S 2) and south (S 3) sectors of the harbour. Water samples were collected with Niskin sampler for physico-chemical variables (temperature, salinity, pH, and dissolved oxygen) and phytoplankton diversity. Mesozooplankton samples were collected using a bongo net and macroenthos samples using van Veen grab sampler at all the three sites. Samples were collected, processed and analyzed using standard protocols.



Figure 3: Sampling for water quality and biodiversity at Chennai fishing harbour.

5.2. Survey of Mangroves

The methodology incorporated information on both current and historic distribution of mangroves in the study area. Current distribution of mangroves in the study area were carried out using three approaches (1) ground truth survey (2) drone images and (3) remote sensing. The presence of mangroves in and around the CFH was mapped using google earth imagery. The drone images were also used to verify the present status of proposed project boundary. It covered an area of 7.9 km² with an altitude of 250 m. The presence of mangroves was also verified by temporal analysis of satellite images for the last four decades. The Landsat 5 TM (30 m resolution) was used for 1990, 2000 & 2010 and for 2023 was verified using Sentinel 2A (10 m resolution) satellite images.

5.3. Turtle nesting sites

Data for turtle nesting sites were collected from secondary data and experts work/group working on turtles along the Tamil Nadu coast (Arun and Swaminathan 2016; Arun 2019; Saravanan et al. 2013; www.seaturtlesofindia.org).

6. Results and Discussion

6.1. Water Quality

Surface water samples were collected from three sites inside the CFH to determine the spatial distribution of physio-chemical parameters. Strong stratification of salinity was observed in the northern part of the fishing harbour with salinity of 34 psu while at the central and southern part was 17 and 28 psu, respectively. Dissolved oxygen was found to be higher in the entire region with the values ranging between 6.19 mg/l and 7.82 mg/l. Higher pH values were observed near the central sector (8.049), whereas low pH values were observed in the northern sector (7.942). Lack of strong circulation and tidal flushing inside the harbour leads to the accumulation of litter (macro) and organic loads in the northern sector of harbour.

6.2. Biodiversity

Phytoplankton communities

A total of 22 phytoplankton species belonging to Bacillariophyceae and Dinophyceae were identified from the samples collected. Of these, diatoms were found to be dominant (20 species) especially species such as *Skeletonema costatum*, *Thalassiosira* sp., *Guinardia* sp., and *Rhizosolenia* sp. Dinophyceae was represented by two genera viz., *Protoperdinium* sp. and *Gonyaulax* sp. (Figure 4).

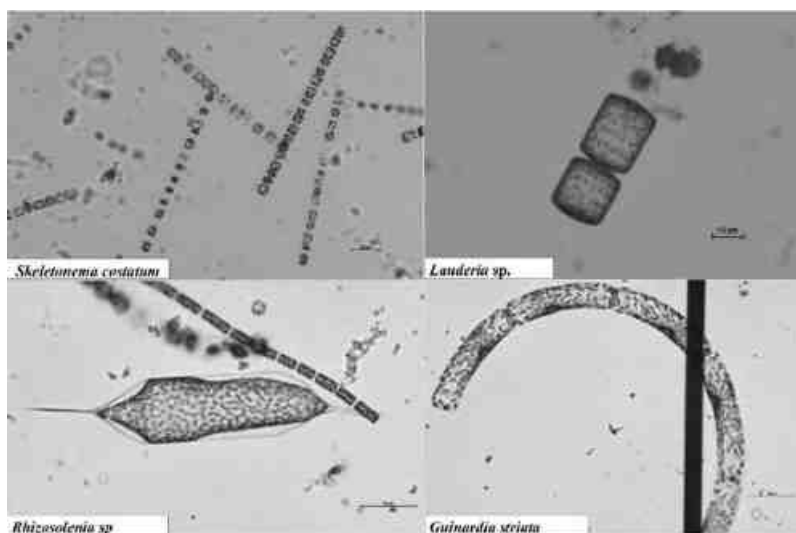


Figure 4: Light microscope image showing dominant phytoplankton species at Chennai fishing harbour.

Mesozooplankton communities

A total of 31 mesozooplankton organisms were identified. The predominant species among the samples were Crustacean nauplii, followed by *Oikopleura* spp. (Appendicularia). Copepods were also abundant in the samples, with notable contributions from *Oithona* spp., *Paracalanus* spp., and *Acrocalanus* spp. (Figure 5). Comparatively, the northern sector of the harbor exhibited higher diversity with 28 species identified, compared to the central and southern sectors, which had 25 and 21 species, respectively.

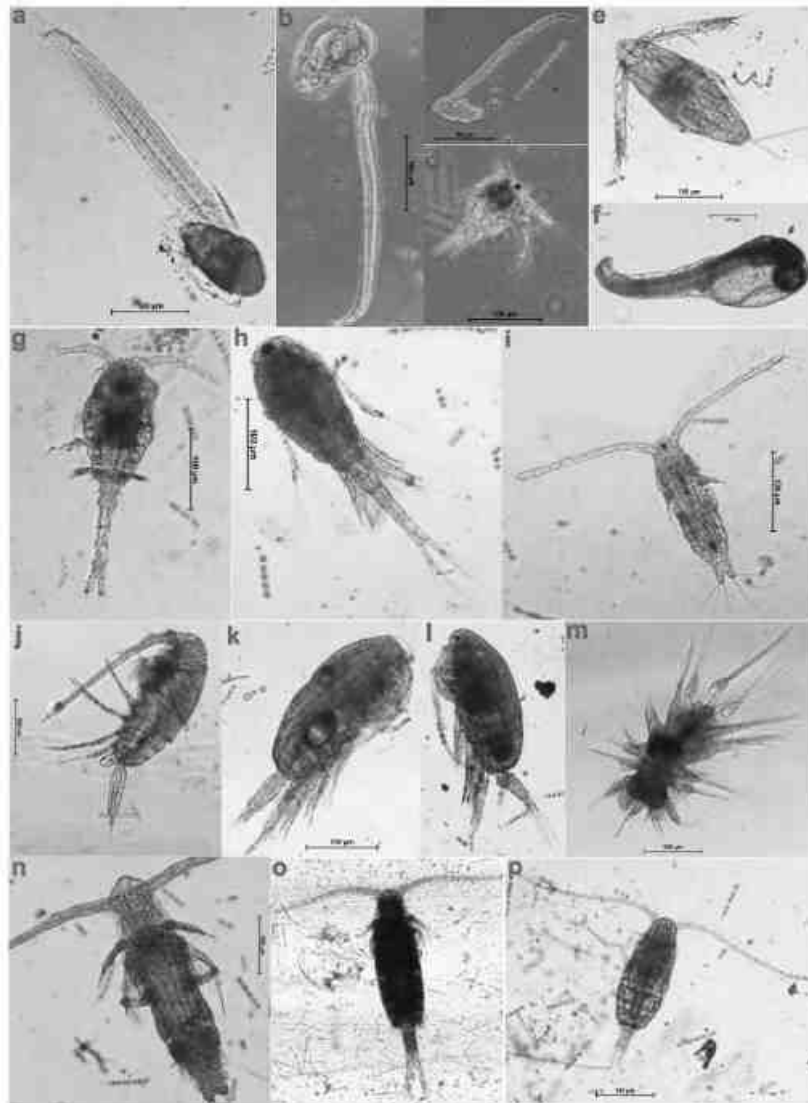


Figure 5: Mesozooplankton identified at Chennai fishing harbour a-c *Oikopleura* spp.; d- crustacean nauplii; e- Cladoceran; f- fish larvae; g-h *Oithona* spp.; i- *Acartia* sp.; j- *Calanus* sp.; k- *Acrocalanus* sp.; l- *Acrocalanus gibber*; m- Polychaete larvae; n- *Subeucalanus* sp.; o- *Centropages* sp.; p- *Paracalanus* sp.

Macrobenthic communities

The macrobenthic community of CFH was represented by only three groups - polychaetes, amphipods and oligochaetes. Polychaetes were the dominant fauna contributing 61% of the population (Figure 6). Seven species of polychaetes were identified, of which *Aglaophamus* sp. was the dominant species (Figure 7). Gammaridean amphipods was the second major contributor to the macrobenthic community. Among the three sites, the southern and central sectors had only a single polychaete species (*Aglaophamus* sp.) while the northern sector was comparatively diverse. Oligochaetes and amphipods were represented only in the northern sector. The highest abundance was recorded at the northern sector (544 ind. m⁻²) and lowest in southern sector (20 ind. m⁻²).

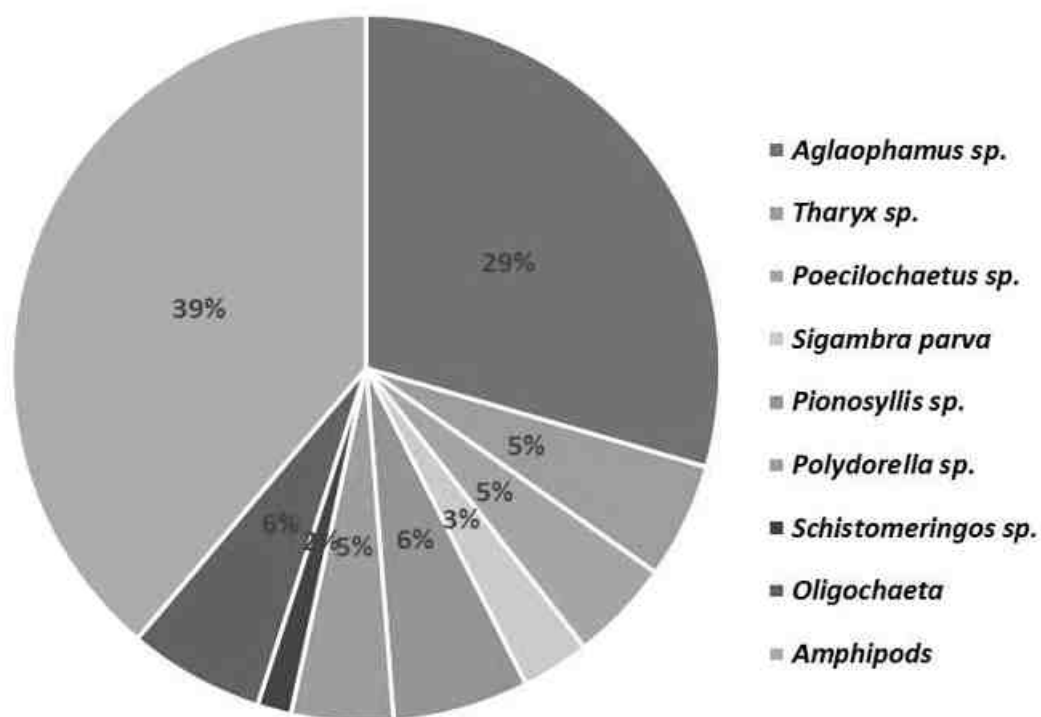


Figure 6: Percentage composition of macrobenthic taxa in the Chennai fishing harbour

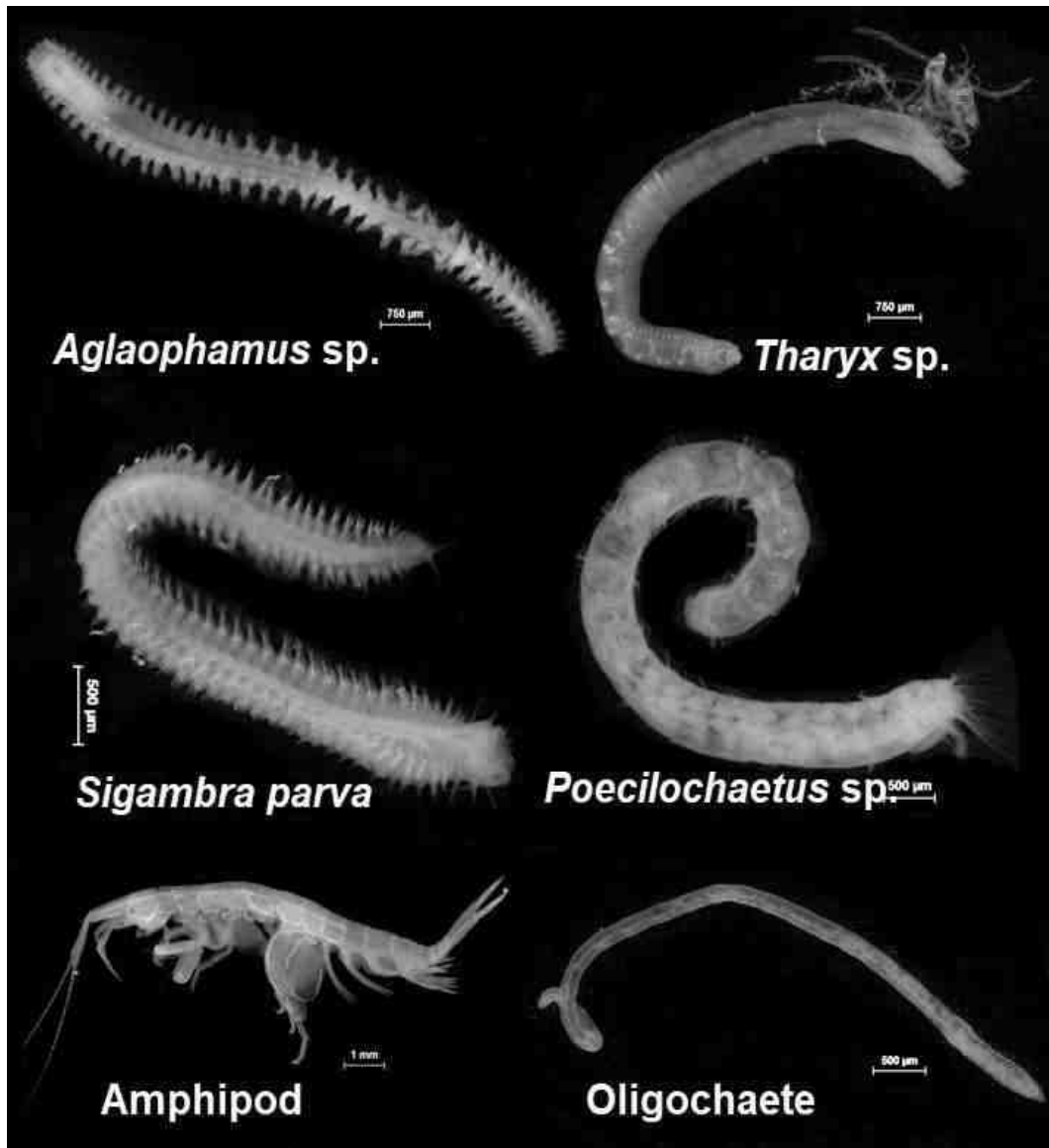


Figure 7: Macroinvertebrate taxa observed at the Chennai fishing harbour.

Mangroves

Mangroves are a taxonomically diverse group of tree, shrub, and fern species that grow in anoxic and saline organic rich soils on sheltered, tropical coasts. Mangroves have some of the highest reported net primary productivity of any ecosystem on the planet, and their loss leads to rapid build-up of acid sulfides in the soil, increased shoreline erosion and sedimentation, and collapse of intertidal food webs and inshore fisheries (Ellison and Farnsworth, 2001).

The following hydrological and sediment conditions determine the distribution of mangroves (Selvam et al. 2019)

- Degree of protection against high-energy waves
- Quantity and duration of freshwater flow and sediment supply
- Larger tidal amplitude and
- Gently sloping coastal topography

In Tamil Nadu, major mangrove wetlands are found at Pichavaram (Cuddalore) and Muthupet region in Thiruvarur-Thanjavur districts (Selvam et al. 2004). Patches of mangroves also occur along the Palk Bay, particularly in the Devipattinam region, islands of the Gulf of Mannar, Muthupet, Chatram and Tuticorin. The mangroves of Tamil Nadu are represented by 14 true mangrove species and 10 associated floral species (Selvam et al. 2004). *Avicennia officinalis* L., *Avicennia marina* (Forssk.) Vierh, *Bruguiera cylindrica* (L.) Blume, *Excoecaria agallocha* L., *Lumnitzera racemosa* Willd., *Ceriops decandra* (Griff.) W.Theob, *Aegiceras corniculatum* (L.) Blanco are the common species of mangroves reported from Tamil Nadu.

Based on the satellite images, mangroves are located in Kosasthalaiyar river, Ennore creek and Adyar estuary, which are located 5.5 km north and 12.5 km south, respectively of CFH (Figure 8). The mangrove vegetation cover in Ennore creek is 70 ha and Adyar estuary it is 48 ha and is dominated by *Avicennia marina* (Purvaja & Ramesh 2000). Further, temporal analysis of decadal satellite images from 1990 also indicates absence of mangroves within the harbour vicinity (Figure 8).

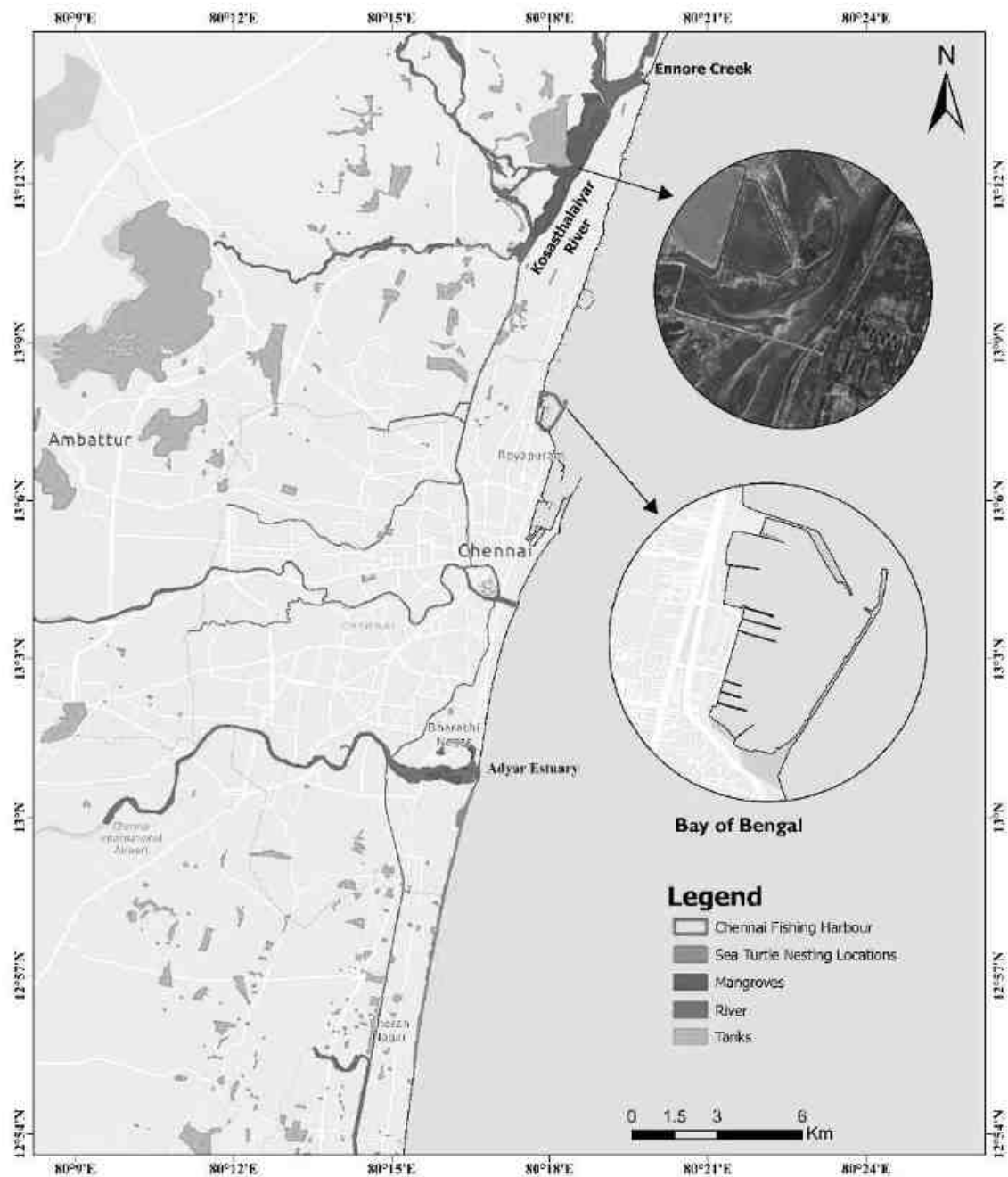


Figure 8: Map showing the Chennai fishing harbour, mangroves and Sea turtle nesting sites.

Mangrove Plantation

Mangroves provide provisioning services (e.g., wood and food), cultural ecosystem services (e.g., recreation, aesthetic appeal and spiritual values) and regulating ecosystem services including coastal protection, pollutant assimilation, macroclimate regulation, mitigation of global climatic change through carbon storage and sequestration (Millenium Ecosystem Assessment, 2005; Adame et al., 2018). However, increased pressures such as reclamation, aquaculture and coastal development, resulted in the decline of mangroves forests area worldwide.

Many countries became increasingly aware of the importance of mangrove forest and initiated mangrove restoration projects, unfortunately, most mangrove restoration projects were a failure.

One of the major reasons for failure was selection of unsuitable site for mangrove restoration. Furthermore, afforestation in areas with no historical distribution of mangroves is not advised.

The observations during the present study using an integrated approach of historical and current data indicates the absence of mangroves within CFH (Figure 7 and 8). Mangrove patches were observed 5.5 km north and 12.5 km south of the CFH, influenced by riverine runoff (Figure 9).

Further, the CFH is also not potential site for plantation of mangroves. As evident from Figure 10, the intertidal areas around the CFH are narrow and has unsuitable environmental conditions, which includes absence of river runoff and unfavorable sediment (predominantly sand), which makes the area unfit for successful mangrove plantation.

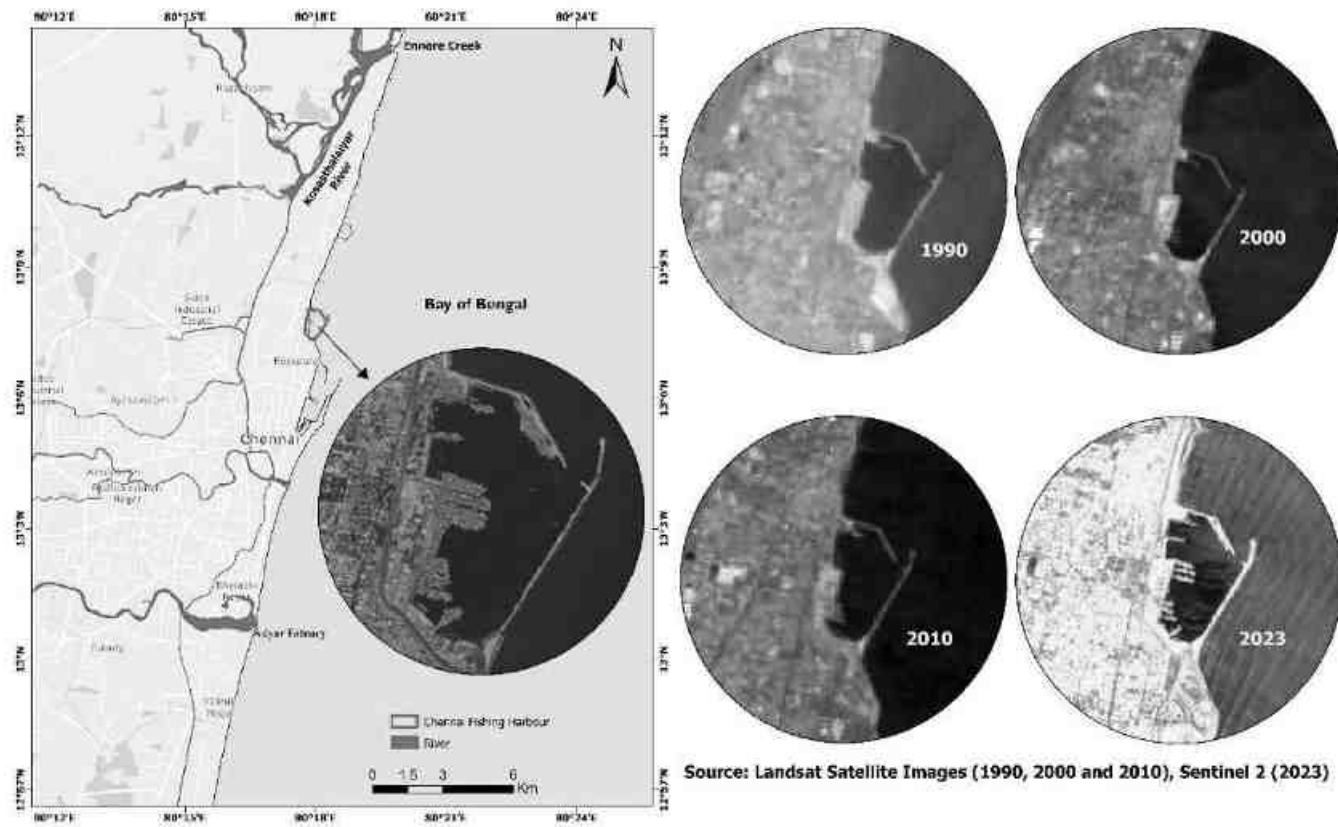


Figure 9: Decadal satellite images of Chennai fishing harbour.



North-South view



North view of harbour from Northern Jetty



South North view



Birds eye view



Trawler Wharf & Boat standing area



East -West view

Figure 10: Drone images of Chennai fishing harbour

Impact of modernization of fishing harbor on turtle movement and other aquatic species

The most common species of turtles along the Tamil Nadu coast are *Lepidochelys olivacea* Eschscholtz, 1829 (Olive Ridley) and the green turtle, *Chelonia mydas* (Linnaeus, 1758). Coastal areas with long stretches of sandy beach are favorable nesting habitats for sea turtles. Olive Ridley turtles usually nest on open and wide beaches and on sand bars at river mouths. Sandy beaches are considered suitable for turtle nesting, and rocky beaches, swamps and areas of development as unsuitable. In northern Tamil Nadu, nesting by Olive Ridley turtles has been reported along the stretch from the mouth of the Adyar River, Chennai to Kalpakkam in the south (Valliapan & Whitaker 1974; Shanker 1995; Shanker 2003). The nearest sea turtle nesting site is at Besant Nagar to Neelankarai, coastal stretch, which is located 13 km south from the CFH (Figure 8). Therefore, the modernization and upgradation of CFH will not have an impact on the turtle movement.

7. Pollution Management

During the field survey, floating litter was observed in the coastal waters (Figure 11) and also in sediment samples collected at CFH. Floating litter contribute considerably to the transport of non-indigenous marine species thereby threatening marine biodiversity and the food web.



Figure 11: Litter accumulation, Northern Jetty, Chennai fishing harbour

As mentioned in the DPR, absence of waste management, big piles of waste can be observed inside the harbour. The proposed modernization in CFH include the development of a solid and liquid waste disposal mechanism including the aggregation and disposal of the waste, which will ensure a clean and sustainable environment inside and around the fishing harbour.

As harbour and ports are one of the major sources of marine pollution including litter, they could play a strategic role in the remediation and prevention of plastic pollution in the long term. The major objective of the UN Marine litter action plan for ports and harbours is “to reduce the amount of marine litter ending up in the sea. In order to do so, the current waste management system in ports and harbours will be revised considering the specific needs to collect also items and wastes that often end up in the sea as marine litter (like abandoned fishing gear). Also pilot and demonstration actions will be carried out in order to test the effectiveness of the planned changes. One of the main target groups to address are the coastal fishermen” Along with land-based sources of litter, Abandoned, Lost or Discarded Fishing Gear comprise a substantial amount of global marine plastic pollution. Lost fishing gears threaten the coastal and marine wildlife, entangling marine turtles, dugong, and other marine organisms. Fishing gear enter the seas for a variety of reasons, including but not limited to stored gear being washed overboard, gear being lost or abandoned during fishing operations and nets or net repairs being discarded while at sea.

The following recommendations are suggested for reducing litter leakage from harbour to the marine environment-

- Raising awareness among the communities on the impact of litter on marine environment, which will consequently affect the fishery.
- Collection centre for the waste fishing gears and developing and adopting techniques for recycling of these gears.
- Stop the disposal of oil and other pollutants, and fish waste in the harbour waters.

8. Summary & Conclusions

An integrated approach was used for studying the environmental parameters and biodiversity of the Chennai Fishing harbor. Satellite, drone images and ground truth survey indicate absence of mangroves in the study area. Mangroves are present 5.5 km and 13.5 km, north and south, respectively of the Chennai Fishing harbor. Based on the observations, we conclude that since mangroves were historically absent in the site and environmental conditions are unfavourable, plantation of mangroves is not recommended.

The closest turtle nesting site is located 13 km south, in the Besant Nagar -Neelankarai coastal stretch. Therefore, developmental activities in the Chennai Fishing harbour will have no influence on the turtle nesting sites.

As marine litter was observed during the field, recommendations have been suggested to improve marine litter management at Chennai Fishing harbor which is one of the major objectives of UN SDG 14 target and the aim of “Swachh Sagar Surakshit” campaign of the Government of India.

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Submitted by
National Centre for Coastal Research, Chennai
&
Indian National Centre for Ocean Information Services,
Hyderabad
Ministry of Earth Sciences
Government of India



CHENNAI FISHING HARBOUR DRONE AND BATHYMETRY SURVEY REPORT



PROJECT OWNER:



CHENNAI PORT AUTHORITY (ChPA)

CLIENT:



INDIAN PORT RAIL & ROPEWAY CORPORATION LTD.

PROJECT CONSULTANT:



CHERALATHAN ASSOCIATES

SURVEY CONSULTANT:



PRIME MERIDIAN SURVEYS PRIVATE LIMITED

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1. INTRODUCTION

In the view of economic development of fishery community, Government of India proposed to upgrade and modernize the selected Fishing Harbours. The Chennai Fishing Harbour in Kasimedu (**Fig. 1**) is one among them, proposed for upgradation and modernization. The project is owned by Chennai Port Authority (ChPA) and M/s. Indian Port Rail & Ropeway Corporation Ltd., (IPRCL) has been appointed as Project Monitoring Agency (PMA). M/s. Cheralathan Associates has been appointed by IPRCL as Architectural and Engineering services consultant. In connection to the Architectural and Engineering services, it is mandatory to carry out Topographic Survey through Drone, Total Station & DGPS and Bathymetry survey to ascertain the dredging quantity.

Chennai Fishing Harbour (CFH) is the largest fishing harbour in Tamil Nadu. It is located to the North of the Chennai Port along the Indian peninsular coastline and is sheltered by Northern and Eastern breakwaters. This fishing harbour is also known as Royapuram Fishing Harbour or Kasimedu Fishing Harbour. At present, the Chennai Fishing Harbour is spread on 24.28 Hectares of land area and contains 48.56 Hectares of water spread area within its breakwaters.

The topographic survey for the proposed site was conducted from 30th May 2022 to 01st June 2022 by the survey consultant M/s. Prime Meridian Surveys Pvt. Ltd., The hydrographic survey was conducted from 17th June 2022 to 21st June 2022. The report provides details of the studies carried out during the survey.

2. SCOPE

Perform a complete Photogrammetry, Bathymetry and oceanography survey for the existing sea floor and marine data for designing, as outlined herein on the enclosures and in the furnished CADD data. Purpose of this survey is to obtain design data for preparation of the plans for the subject project.

1. Detailed topographic survey demarcated area covering natural and man-made features (Above Ground level) using Drone/UAV
2. Transferring of level from GTS Bench Mark to site and connecting all triangulation points for vertical control using Digital level
3. Detailed Topographic survey demarcated area covering natural and man-made features which involves linear, polygon and points like, roads, railway line, flyover, building, utilities etc. (Above Ground level using Total Station
4. Detailed Topographic survey along the Compound Wall for a width of 30m ROW and taking L. Section at 25 m interval and 3m interval at transverse direction
5. Conducting Bathymetry Survey at water stagnation area at 10m interval using Eco – sounding (Calibration by Bar-Check) with DGPS.

3. FIELD SURVEY

3.1 LOCATION

The Study area is shown in **Fig. 1**. The Chennai Fishing Harbour located in Kasimedu, Royapuram.



Fig 1. Aerial view of site

4. EQUIPMENTS USED FOR FIELD DATA COLLECTION

4.1. LIST OF EQUIPMENT:

✓ Trimble DGPS and Accessories	-	2 Nos
✓ LEICA Digital Level	-	1 No.
✓ Unmanned Aerial Vehicle/ Drone	-	1 No
✓ Bathy 500	-	1 No
✓ Hemisphere DGPS	-	1 No
✓ Hypack Survey Software		

5. METHODOLOGY

The work shall be performed broadly in the following order:

- ***Preliminary meeting, collection of Data and Reconnaissance Survey***

During the preliminary meeting with IPRCL officials on 17th May 2022, it is requested to facilitate and co-ordinate for location of primary and secondary Ground Control Points by Triangulation. The data such as area map, Control points (x, y) & GTS benchmarks (z), chart datum, hydraulic particulars if any etc. collected from ChPA and IPRCL.

- ***Fixing of Primary (PSCP) and Secondary Survey Control Points (SSCP)***

Before commencing the Survey, Primary Survey Control Points (PSCP) and SSCP marked by Triangulation Network, wherever required to suit the site conditions which were identified using DGPS. The control points are marked with yellow enamel paint and sequentially numbered on permanent structures at site for PSCPs will be engraved on permanent monument and SSCP's fixed using Neil and washer wherever required as per the site condition

Digital photographs of PSCP & SSCP points taken from various directions. The measurements from identifiable and permanent features nearest to the point also taken and furnished for approval by the competent authority for commencing the DGPS survey.

The PSCP and SSCP shall be established at such a location so that it may not be disturbed by local people. Also, these points shall be established in such a way that further surveys can be carried out in the same coordinate system.

- ***Observation of PSCP, SSCP and TSCP by DGPS survey***

Once the marking of PSCP and fixing of SSCP are completed in the field, the DGPS survey commenced using differential GPS with multi frequency receivers by static method. The observation by DGPS at the PSCP were done for a period of 3 hours for tracking the signals from the satellite and also receive signals from the satellite for a minimum period of 1 hour for PSCPs. DGPS network shall be in the form of well-formed network of triangulation and is closed and fixing of SSCP with minimum 45 minutes observation in linear method. The raw data in Receiver Independent Exchange Format (RINEX) format (9 decimal places in degrees for Latitude and Longitude) shall be post-processed with network adjustment based on the Survey of India coordinate system (Geographic) in ITRF2008/ WGS 84 as a datum and UTM as a projection with specified semi major axis, semi minor axis and flattening 1/f values calculated and coordinates will be submitted. The triangles were well formed and preferably not too acute nor obtuse, with sufficient redundancy so that a base line could be confirmed by observations from multiple control points. The accuracy of network adjustment will be 1: 2, 00,000.

The survey carried out with reference to ITRF/WGS84 and UTM co- ordinate system.

GPS field survey conducted with unobstructed view of the sky for at least 15 degrees or greater above the horizon.

- ***Precise Leveling***

After completion of DGPS and Total Station survey, control leveling carried out connecting all the PSCP, SSCP and Traverse Points. For the purpose of height control, Survey of India Benchmarks/Reference Bench mark used for starting and closing of level lines.

A closed circuit leveling will be run connecting all the control points. Maximum length of each loop will not be more than 2 kms. Temporary bench mark also established on permanent structures within the project area. Digital Level Instrument used for leveling. Fore sight and back sight distances will be equal. All leveling data and calculation work done in the Excel Package of computer. The closing error on a level circuit not exceed $6\sqrt{K}$ in mm, where K is distance in km.

The closing error shall be distributed to all the Benchmarks in network. In case the closing error is more than the above-specified limit, the control leveling shall be repeated. The levels will be connected with Chart Datum.

Approach and Methodology Bathymetry Survey

Hydrographic is the science of marine surveying that determines the position of points and objects on the globe's surface and also depths of the sea. In the 1920s the technology of hydrographic changed when they found possible way to measure depths. There are many instruments have been designed to achieve better standard of surveying. With that advanced instruments, surveyor able to perform better and simple data acquisition of observation in surveying and at the same time achieve better accuracy in their observations.

According to Lister (2010), hydrographic survey involves the gathering of data about a particular area of water. This has been usually carried out to confirm that it is safe for boats to navigate and to identify any potential dangers. Some of the measurements which has been taken in consideration while doing hydrographic survey are tides, currents and waves. Other than that, typical hydrographic surveys are carried out for the purpose of navigation and other surveys differ from it in terms of techniques used and the final desired output. For instance, bathymetric surveys are aimed at collecting depth data.

Hydrographic Surveys Process

Procedures using global positioning system (GPS) equipment, survey-grade echo sounder, and processing software, a bathymetric survey will be completed and formed the basis for determination of area/capacity and generation of a bathymetric map of Marine Esplanade Area. Consistency in data-collection and processing procedures is important in producing accurate and reliable results. Data-collection and processing procedures used to produce an area/capacity table and bathymetric map are described in the following sections.

Survey Planning

Survey planning generally covers a wide range of activities from the development of an idea for a survey within the Project Area, to the detailed planning and organization of a surveying boat to fulfil a practical task. It covers inter departmental liaison at Government level, diplomatic cooperation and the allocation of numerous expensive resources. It also covers prioritization of resources and day to day running of a survey boat employed on surveying task. Survey planning involves blending of these activities into a coherent pattern aimed at the achievement of a specific task.

A hydrographic survey begins long before actual data collection starts. Some elements, which must be decided (As already done in the previous part of the report are:

Exact area of the survey.

Type of survey (reconnaissance or standard) and scale to meet standards of chart to be produced.

Scope of the survey

Platforms available (Boat)

Support work required (aerial or satellite photography, geodetics).

Limiting factors (budget, political or operational constraints, positioning systems limitations, logistics).

Once these issues are decided, all information available in the survey area is reviewed. This includes aerial photography, satellite data, topographic maps, geodetic information, Back Water Level/MWL information, and anything else affecting the survey. Team Strategist will normally undertake this strategic planning of surveys in cooperation with other organizations and, from this, Projects Instructions / Hydrographic Instructions (HIs) will be compiled by the Hydrographer and issued for compliance. Details provided in Project Instructions will include some or all of the following, depending on the type of survey required:

Survey limits.

Data requirement and resolution.

Method of positional control, together with the accuracy expected.

Use to be made of sonar.

How the survey report is to be rendered and target date if appropriate.

Horizontal datum, projection and grid to be used.

Before Survey

Reference points from the nearest PSCP/SSCP near the survey area.

Using GPS Controller, to start the work. This equipment can help to connect between rover and base. Base located at the land while base at the boat.

During Survey:

The procedures of this measurement will be as:

A base station must be established first in order to synchronize the known coordinates to the echo sounder. This observation will be done for 1 hour.

The instruments will be then set up on board such as GPS with radio link as a rover, echo sounder, laptop that already installed with Hydrographic Survey software. After that, the measurement can be made. The interval between sounding line will be approx. 5m. The data will be collected every 1 sec in each sounding line. So, every 1 sec depth and position will be

collected in this measurement and 5m interval in transverse direction. These procedures are for pre survey.

Finally, data for pre and post survey will then be processed and used to produce plan and the X-section Data for the Surveyed site.

Survey planning begins by determining the accuracy requirements and the products to be produced, and then choosing the appropriate interval for survey transects that are oriented perpendicular to the long axis of the site as shown in the Fig 2. Raw and Edited Data

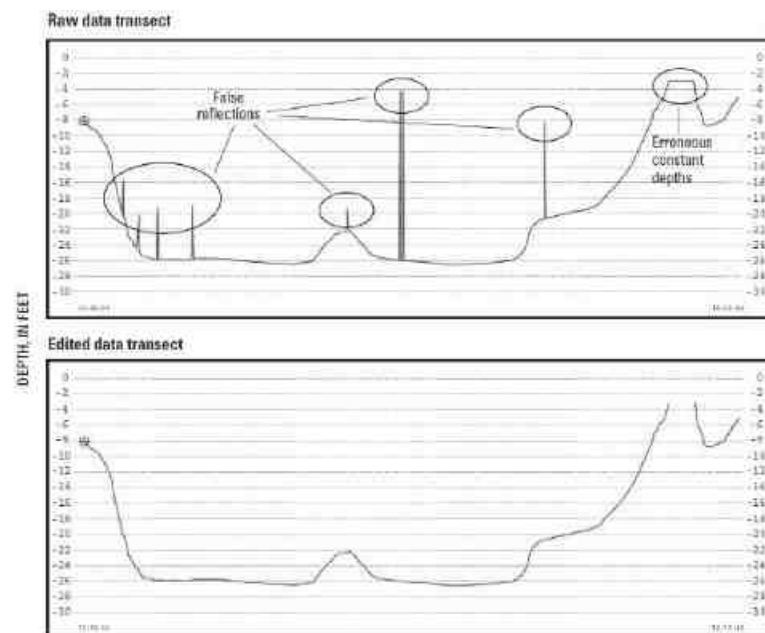


Fig 2. Raw and Edited Data

Data, such as the Bankline/Shoreline, topographic maps will be compiled for use in the Auto CADD/GIS, which will be used to build the base maps used by survey crews. Digital files simplify the planning process and allow for more accurate time and personnel estimates for the survey. Depending on the desired products and accuracy, transect spacing is computed to be a certain percentage of the cross-sectional width of the site. A minimum transect interval will be considered as per the field feasibility because of the practicality of maintaining boat position along the planned transect during the survey.

Hydrographic Position Control (Horizontal and Vertical)

Horizontal and vertical control points will be established using a survey-grade differentially-corrected GPS and real-time kinematic (RTK) surveying techniques (hereafter referred to as RTK GPS). The RTK GPS positioning uses at least two GPS receivers: a reference (base) receiver and one or more rover receivers. Horizontal and vertical position accuracy for the data collected with the survey-grade GPS equipment will be verified by recording differentially-corrected GPS positions with the reference (base) receiver set up on a known geodetic control point used as shown in figure below. Marks are set at the project area to establish a reference datum and allow the determination of water-surface elevation at the time of the survey.

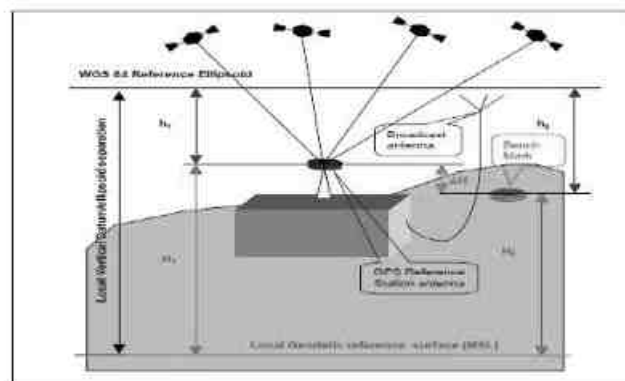


Fig 3. Geodetic Point for Survey Reference

RTK Technique

In this study, RTK technique will be used during data acquisition. For this technique, Water Level reading will be collected simultaneously with depth. It seems a latest technique in hydrographic survey. RTK requires the use of a reliable link between the base station and survey vessel. A radio link typically is used for marine applications as it provides a robust link with low latency of correctors. Cellular links have not proven to be as reliable and typically have too much correction latency for a tightly coupled inertial solution.

There are many advantages using this RTK-GPS technique. GPS is more cost-effective in long term planning. Even though the GPS receiver quite expensive compare other survey equipment's but in long-term costing it is worthwhile because can be used either for land or hydrographic survey. In addition, RTK-GPS technique faster in order to complete the survey works than conventional method. This is because the Water Level reading will add up simultaneously in depth reading in the Hydrographic Survey software.

Moreover, using GPS, the survey work does not need addition equipment. For instance, using total station additional equipment needed is prism in order to make measurement. Besides that, using this technique the hydrographic survey does not need more people to complete the task. It will reduce number of labour needed. Other than that, using this RTK-GPS method is more accurate compare conventional method. Using conventional method hydrographer needs to read Water Level value manually in specific time range. It is obviously will give some error because tide pole being used and also can contribute human error. RTK-GPS technique provides real-time water levels that can be used for colour swath coverage relative to datum.

Furthermore, field operations to perform a GPS static control survey are relatively efficient and can generally be performed by one person per receiver. GPS is particularly effective for establishing primary control networks as compared with conventional surveys because inter visibility is not required between adjacent stations. This technique using carrier phase accuracy while DGPS using code phase. RTK procedures allow for the movement of a GPS receiver after the initial integer ambiguity (i.e., whole number of wavelengths) between satellites and receiver has been resolved.

Echo-Sounder Data Collection

A survey-grade echo sounder with a suitable frequency transducer will be used to measure water depths which is Bathy- 500DF Echo sounder: The Bathy- 500DF Echosounder is an electronic hydrographic survey instrument used for measuring depths with precision chart recordings and digital data output manufactured by SyQuest Incorporated, USA.

The Bathy-500 echo sounding systems are based on the principle that when a sound signal is sent into the water it will be reflected back when it strikes an object. The Bathy-500 is technologically sophisticated,

We will be selecting the suitable transducers with a suitable frequency which depends on the depth of the water in the channel. Generally, for echo sounding a draft of 1.0 meter is required to navigate the boat in the channel or else we will use Land Survey techniques using Total Station /Drone to find the depth of the water/ exposed bed of the Sea. An echo sounder measures water depth by measuring the time interval required for ultrasonic waves to travel, at a known velocity, from a known point (vessel) to a reflecting surface (sea bottom) and then return. A minimum depth limitation exists when the reflecting surface is too close to the echo-sounder faces, which for this survey will approximately 0.75 M. For accurate surveying, sound velocity must be determined and entered into the echo sounder. Sound velocity in water is dependent upon the salinity, temperature, and depth.

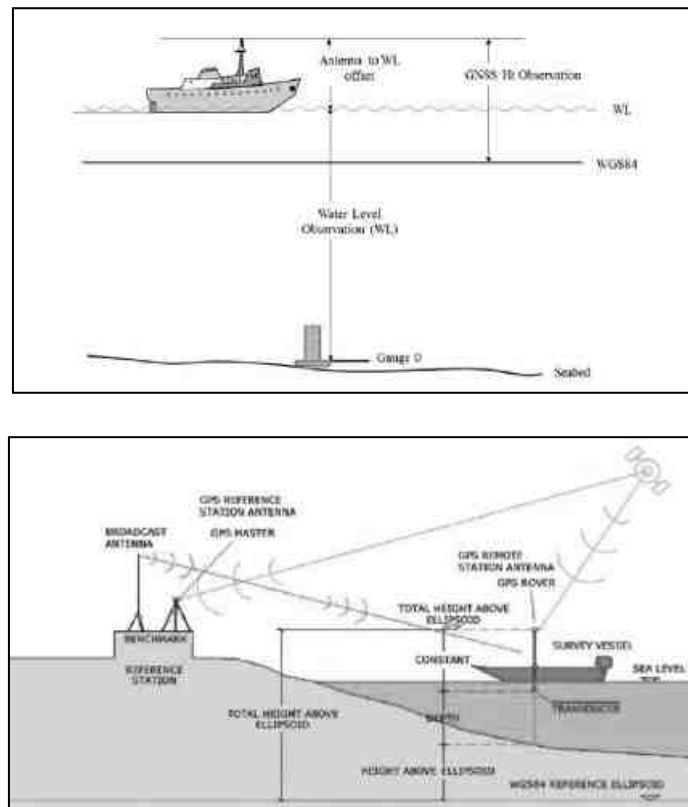


Fig 3. Boat collecting the Data for Depth

For back water, salinity and the shallow depths typically encountered are not major factors affecting sound speed). Before surveying, the echo sounder will be calibrated to ensure accurate depth soundings. Horizontal coordinates of the depth values collected from the echo sounder will be collected using a differential GPS receiver (DGPS), but not using RTK techniques. The DGPS antenna will be mounted directly above the echo sounder or at a suitable fixed location on the Boat. The DGPS receiver uses a differential correction signal transmitted from permanent reference bases distributed across the country. The horizontal spacing of the depth data is dependent on the ping rate of the echo sounder and the speed of the boat. The ping rate will be kept at a suitable pings per second and the boat speed will be kept under 1 KM/hr (Kilometre per hour), resulting in a horizontal spacing of the depth data will be 5m. In addition to digitally recording the data, the signals representing the depth values will be recorded in using the hydrographic software directly connected to the echo sounder and DGPS using some junction box hardware. To determine if the horizontal coordinates are collected and stored for the correct depth value, the DGPS latency will be computed. Latency is the time difference or lag between the time positioning data are received and the time the computed / processed position reaches the data logging module and is time tagged. Latency typically results in a negative along-track spatial displacement of the depth value. While surveying at slow speeds, this displacement will be small. The latency is computed by measuring the along-track displacement of soundings from coincident lines run in opposite directions over a steep slope. The latency delay for our equipment will be of approx. 0.3 -0.7 seconds. It actually depends on the sediment, turbidity and the composition of the water at the time of the survey. The boat speed during our survey made the displacement small enough to be considered within the horizontal accuracy of our DGPS system and a correction need not to be applied. However, a latency test needs will be performed before each survey and the latency correction will be applied. Coordinates and depth values are collected along predetermined transects /survey lines established during the survey setup. Computer software will be used to manage the sequential

collection of transect data and to monitor data collection along the transect path. Additional data will be collected where features such as bluffs, creek channels, depressions, and submerged ridges/mounds are present in the echo-sounder data, or where present on topographic maps.

Data Processing:

Echo-sounder and target-point data will be processed using hydrographic software. All data will be compiled into Auto CAD /GIS software (ArcGIS / QGIS). GIS software is a collection of software packages that allow data editing and attribution, data display and review of data, data processing, generation of interpolated data, and map-product creation. Horizontal and vertical control, land-survey data, echo-sounder depth data, target points, field notes and sketches, photographs, aerial photography, and topographic map data will be used to generate, validate, and edit the bathy-metric surface.

Echo-Sounder and Target-Point Data Processing:

The water-surface elevation is computed from the reference points that will be established using the Triangulation & Fixing of Benchmarks for horizontal and vertical control points by measuring from reference points to water surface. Using hydrographic software, echo-sounder and target-point depth data are converted to bottom elevations by subtracting the depth from the back water-surface elevation during the survey period. Raw transect data are reviewed by plotting bottom elevation in relation to transect length. Fish, trees, limbs, and other submerged objects can cause false reflections in the transect data. When the water depth is less than the minimum measurable distance, erroneous constant depths also get recorded, which are generally removed after identifying those points or areas. These data are removed and the resulting transects data are saved as an edited transects.

The bathymetry survey will be carried out using Bathy 500DFportable shallow water Echo sounder supported by RTK Position and tide and HYPACK Data collection and

processing software. The survey will be carried out using a suitable survey vessel equipped with compass, communication system and safety gears.

Actual Field Execution

The easurement has been defined in a way that all the references shall be taken from the PSCP/SSCPs. which are connected to Datum WGS 84 and UTM projection as defined in earlier sections. For site Cross Section Survey, the measurement is carried out in two modes, viz. RTK, and Echo-sounder and RTK. Following points shall be adequately taken care while conducting the survey:

Reference for Level or Depth Control to Cross Section Survey is provided by DGPS Base stations fixed during Traversing and Triangulation survey, at higher ground levels well above MWL.

In near shore, where the depth was less than 1.0 meters, direct method has been applied using either Total Station or UAV/Drone. Under this method, staff gauge and ranging rods attached with Prism or RTK-DGPS to measure the depths.

In the off-shore having more than 1.0 meters of depth, the X-section survey has been conducted using the Echo-sounder connected with DGPS in RTK. While using the Echo-sounder, the instrument has been first calibrated on the bank and then taken in water for measurement.

6. RESULTS

6.1. TOPOGRAPHIC SURVEY – DRONE/TOTAL SATION/DGPS

The results observed in the topographic survey via Drone, Total Station and DGPS (Fig.4) are shown below.

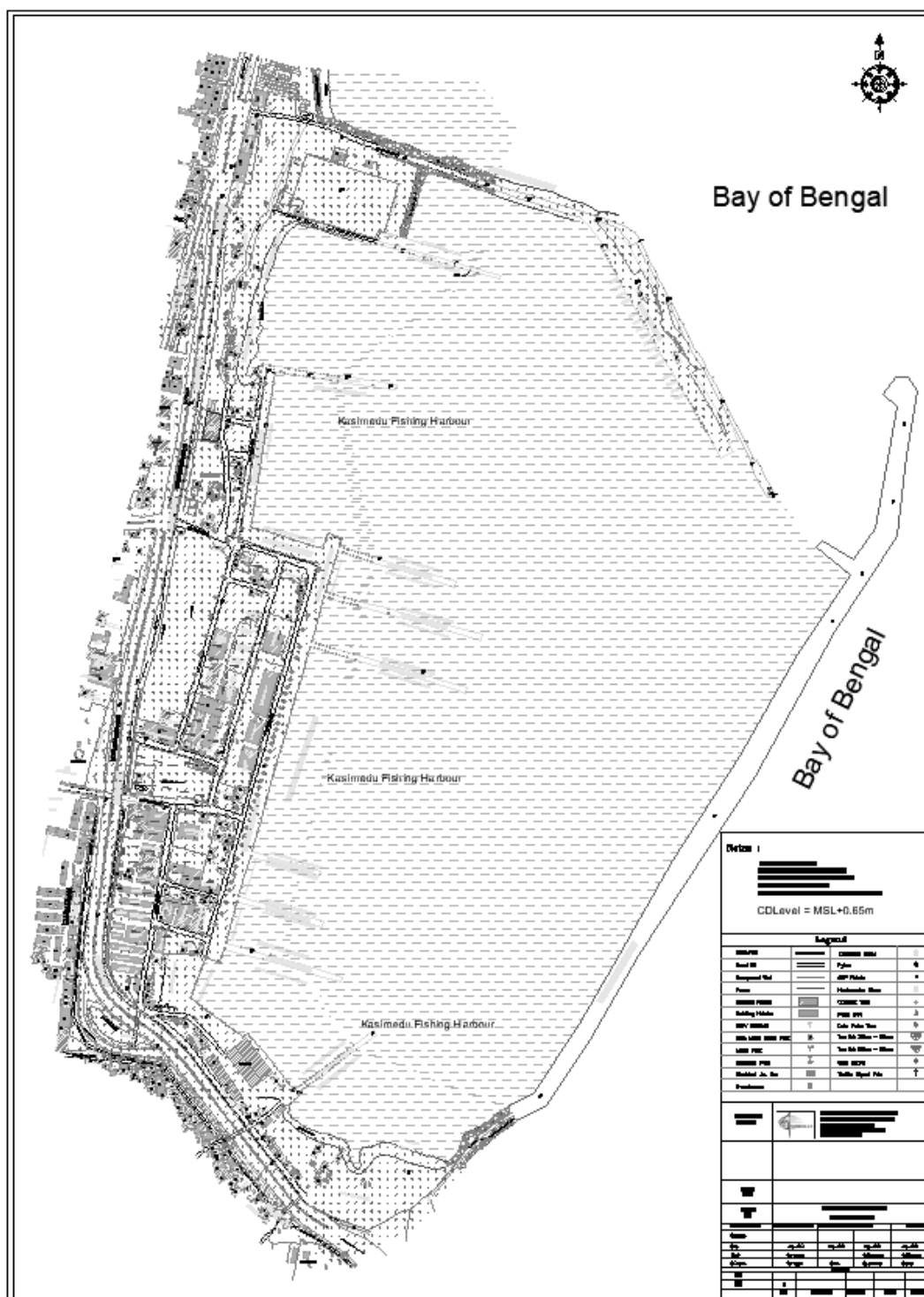
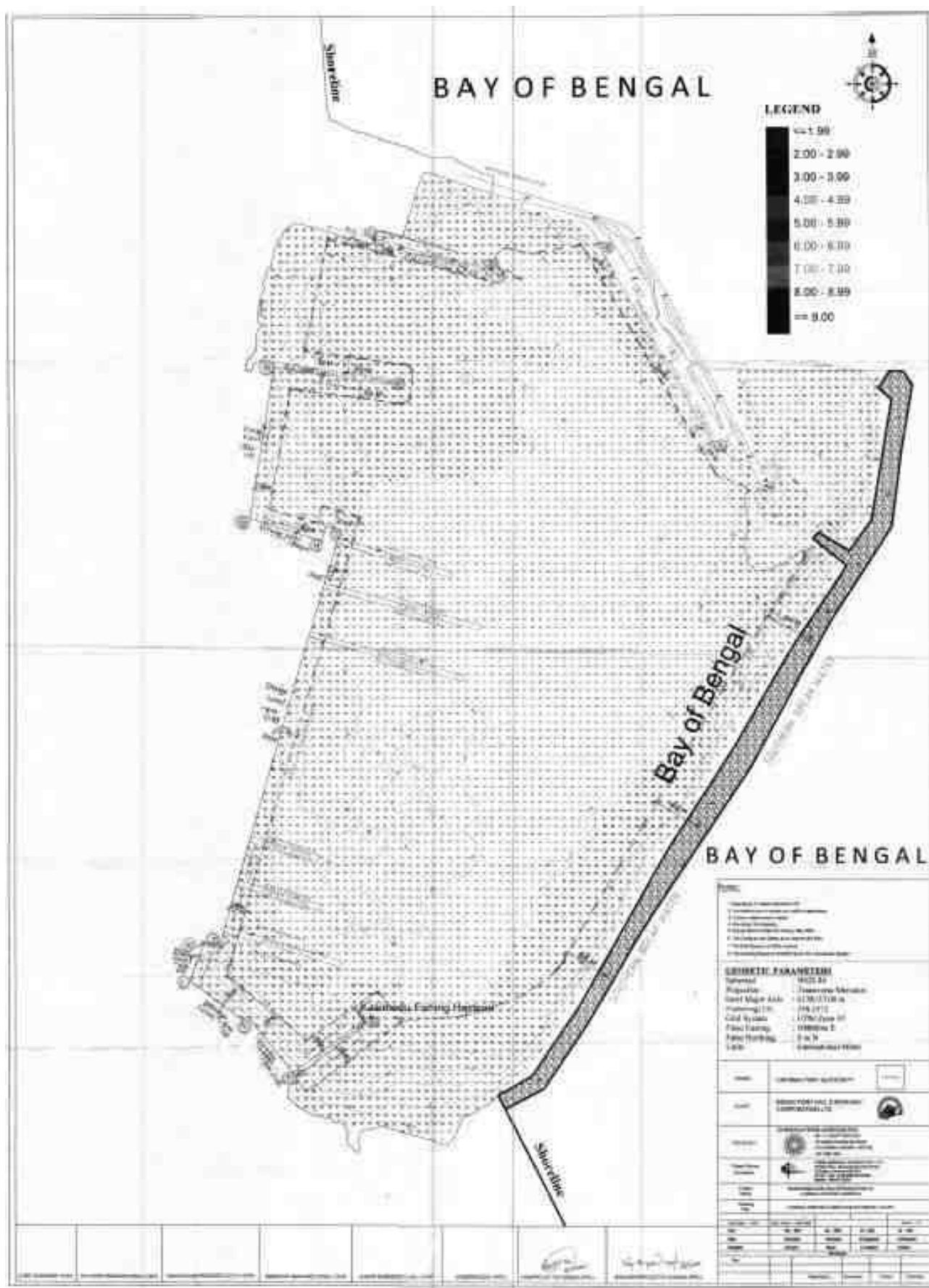


Fig 4. Overall Layout with CD Levels

6.2. HYDROGRAPHIC SURVEY – BATHYMETRY

The bathymetry map (**Fig.5**) and the dredging quantities (**Fig.6**) calculated with the respective design depths details received from Chennai Port Authority (**Fig.7**) are detailed below. The total estimated dredging quantity is 8.95 lakhs cubic meter.



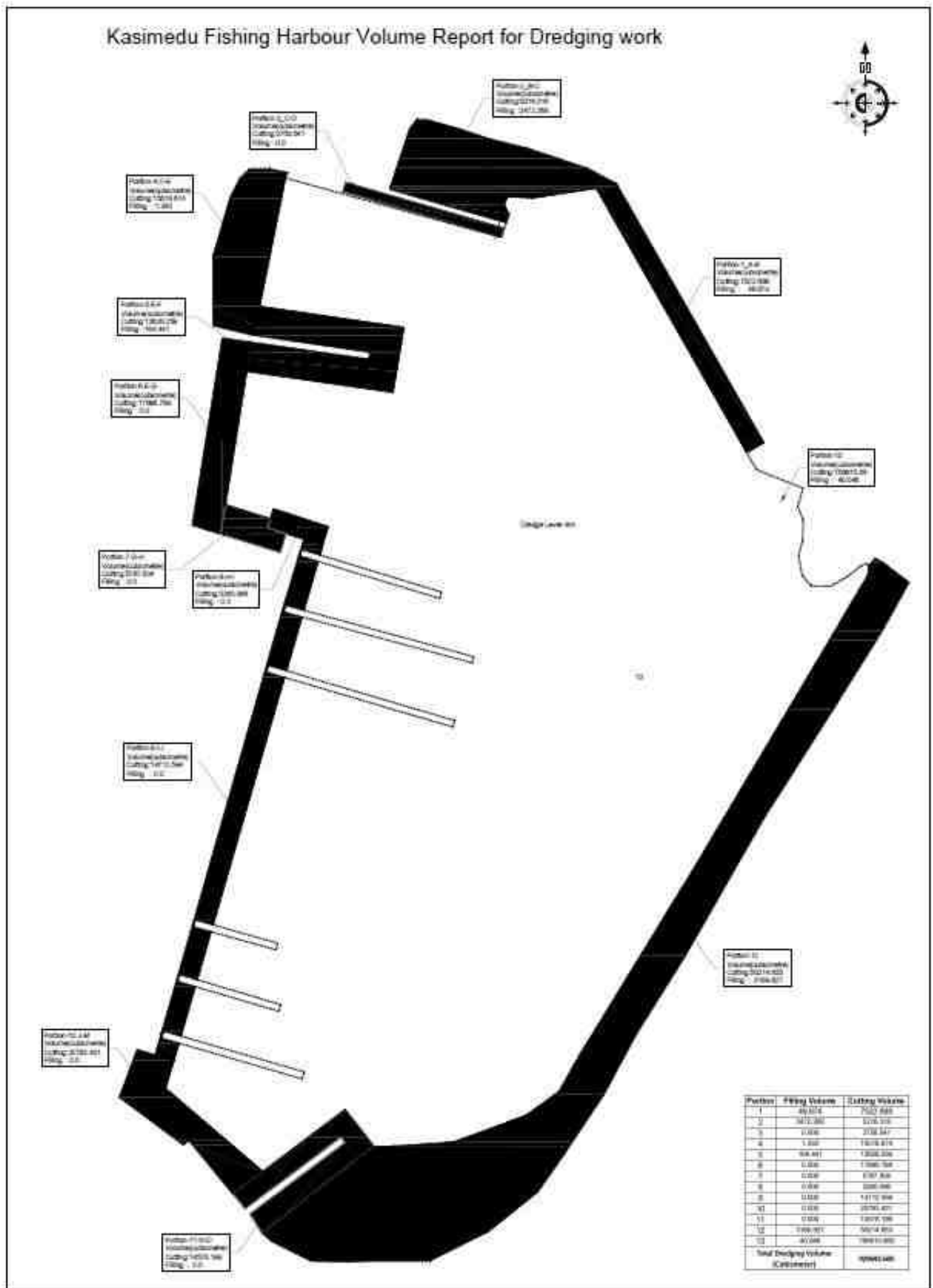
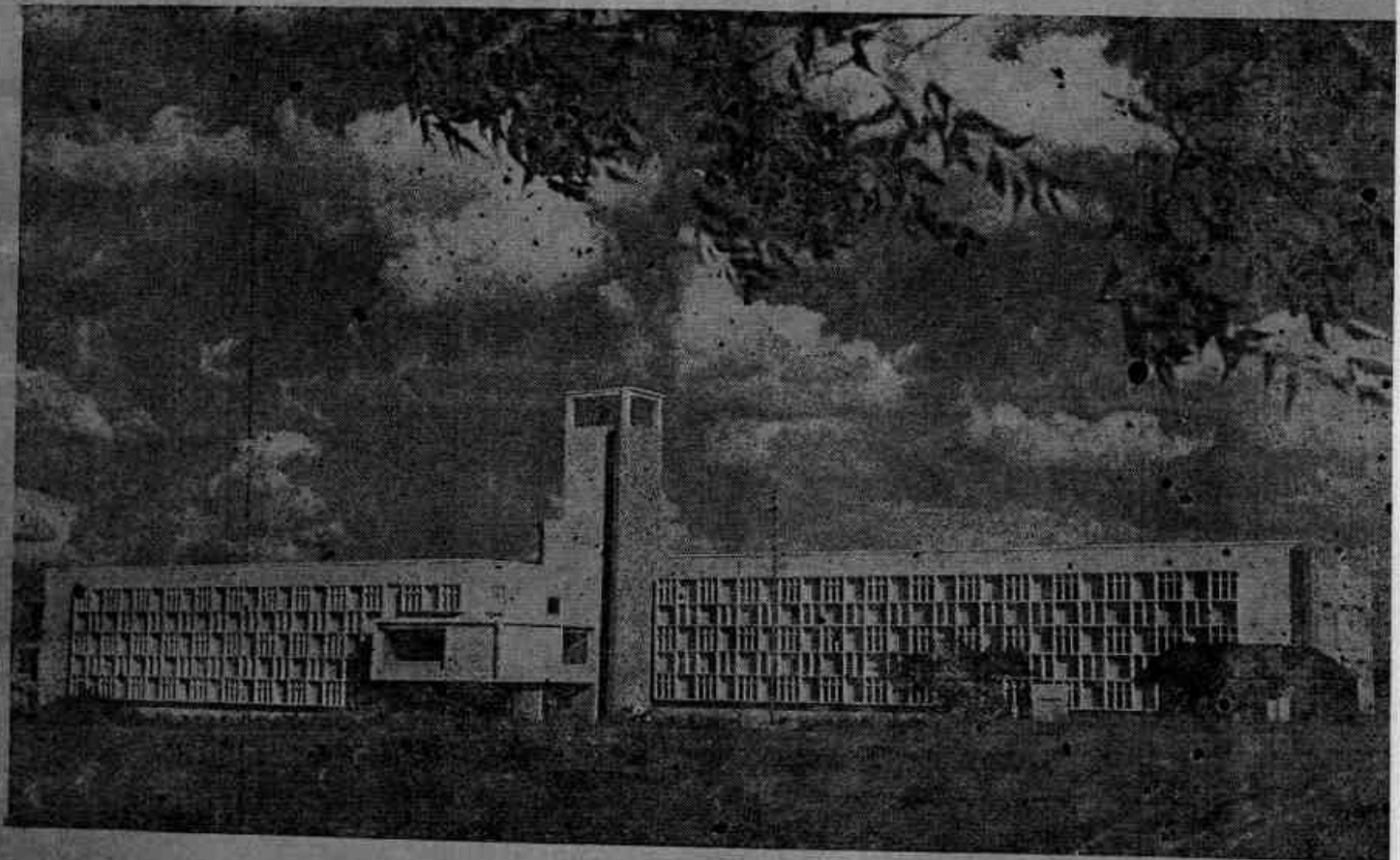


Fig 7. Dredging Quantity



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SPECIFIC NOTE NO. 1521

DATE 20 NOV 1975

DIRECTOR : P. C. SAXENA

SPECIFIC NOTE NO. 1521 DATED 20 NOV 1975

HYDRAULIC MODEL STUDIES WITH THE MODIFIED
LAYOUT OF THE FISHERIES HARBOUR AT MADRAS.

1. Introduction:

A fisheries harbour is under construction at Madras, north of the main harbour complex, in the Cassimode Bay. The layout of the fisheries harbour was finalised after extensive hydraulic model studies at the Central Water & Power Research Station, Pune. These studies were conducted in a three-dimensional wave model reproducing waves approaching from 65° and 145° bearing, being the predominant wave directions at this location during the NE and SW monsoons respectively. The results of these studies have been reported in Specific Note No. 1310 of 16-3-73.

Subsequently the Chief Engineer, Madras Port Trust vide his letter No. J1/23390/67/E dated 24-7-75 furnished a modified layout for the fisheries harbour, the modifications being based on the recommendations of Prof. Brunn, an expert in the field of Coastal Engineering. Essentially the modification shows a rotation of the eastern part of the north breakwater (Fig. 1 gives the comparison of the original and revised layouts). Some modifications in the lengths of the landing and outfitting quays have been suggested. The Chief Engineer desired that the modified layout be examined from the tranquillity point of view.

Accordingly wave model studies were conducted in a 1:150 scale geometrically similar, rigid bed wave model accommodating the whole harbour complex consisting of the main harbour, the Bharathi Dock and the fisheries harbour. The results of these studies are reported in this note.

2. External Wave Simulation:

2.1 Waves approaching from 145° are fully protected by the eastern breakwater. The disturbance entering the harbour would further be governed mainly by the waves approaching from 65° bearing. Accordingly, as in the earlier studies, waves approaching from 65° having the following heights and periods were reproduced during the present studies:

...2...

Wave height (m)	Wave period (sec)
2.45	8 and 14
3.65	8 and 14
4.90	8, 10, 12, 14 and 16

3. Tranquillity Limits:

3.1 The tranquillity limits set down before for the worst possible wave conditions viz. 4.90 m high waves from 65° bearing are

Berths - 0.30 m ✓
Mooring area - 0.45 m ✓

4. Model Studies:

4.1 Studies were conducted with different wave heights from 65° bearing with waves of 2.45, 3.65 and 4.90 m. Observations for wave disturbances were made at several locations in the basin shown in Fig. 1. The observations are summarised in Table 1. It would be seen from this table that the disturbances within the harbour basin are well within the tranquillity limits prescribed above.

5. Conclusions:

5.1 The studies indicated that the modified layout meets the tranquillity requirements adequately for waves upto 4.9 m height approaching from 65° bearing.

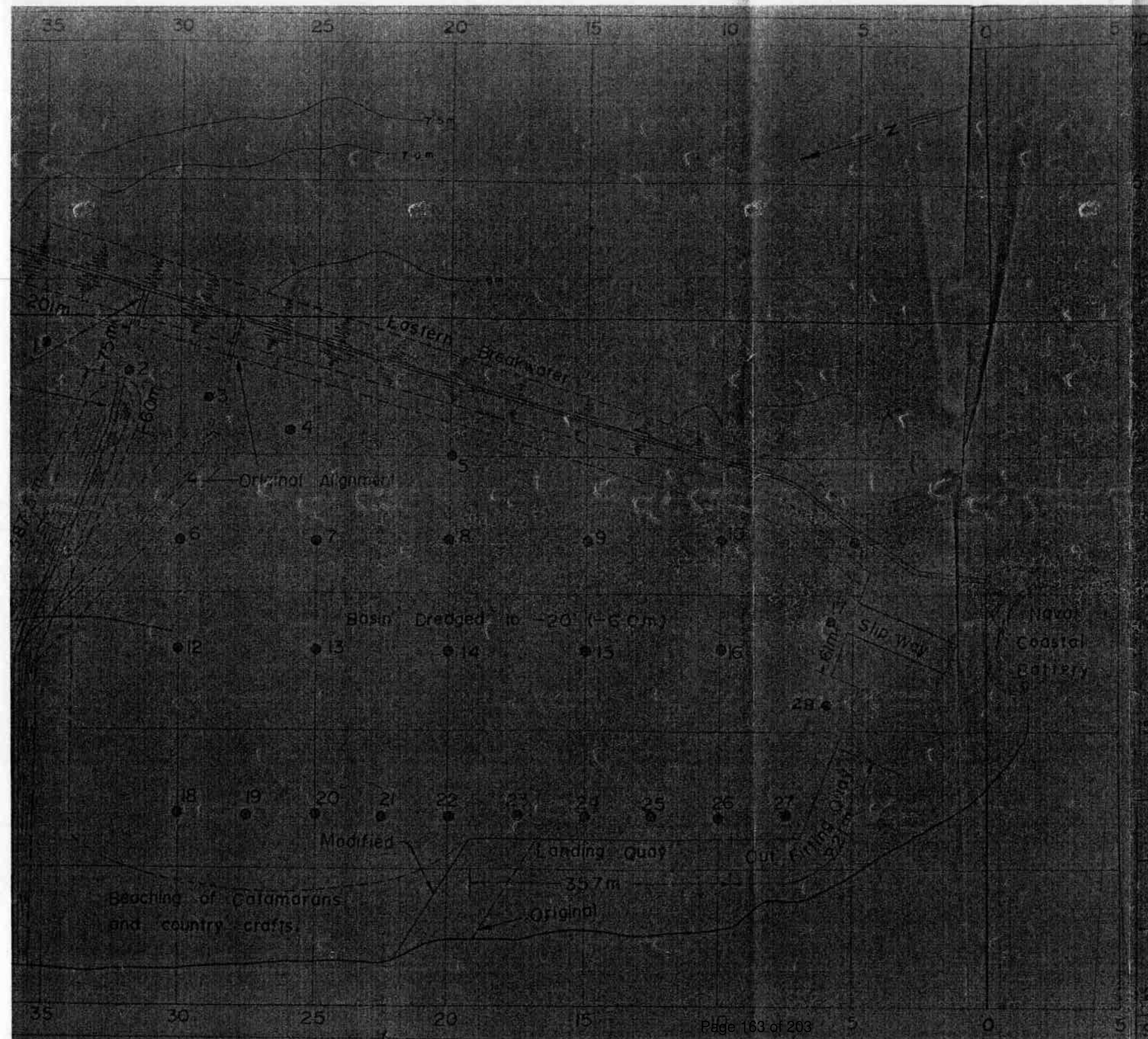
Table I

FISHERIES HARBOUR PROJECT AT MADRAS

Wave disturbance at various locations in the harbour for waves approaching from 65° bearing.

Location	2.45 m		3.65 m				4.90 m		
	8	14	8	14	8	10	12	14	16
1	1.30	1.40	1.95	1.90	3.10	3.00	3.05	2.95	3.10
2	0.90	0.80	1.35	1.40	2.20	2.15	2.25	2.20	2.10
3	0.55	0.50	0.85	0.80	1.20	1.25	1.15	1.20	1.10
4	0.30	0.30	0.55	0.50	0.75	0.70	0.75	0.70	0.70
5	0.20	0.25	0.35	0.35	0.45	0.40	0.40	0.40	0.45
6	0.20	0.15	0.25	0.30	0.30	0.30	0.30	0.30	0.40
7	0.15	0.20	0.25	0.30	0.45	0.40	0.40	0.40	0.35
8	0.20	0.25	0.30	0.35	0.40	0.50	0.50	0.45	0.40
9	0.20	0.20	0.25	0.25	0.30	0.35	0.40	0.35	0.40
10	0.15	0.15	0.20	0.20	0.25	0.25	0.30	0.25	0.25
11	0.15	0.15	0.15	0.20	0.20	0.20	0.20	0.15	0.20
12	0.15	0.15	0.15	0.20	0.20	0.25	0.20	0.20	0.20
13	0.15	0.15	0.20	0.20	0.25	0.30	0.25	0.25	0.30
14	0.15	0.15	0.20	0.25	0.30	0.30	0.30	0.35	0.35
15	0.20	0.15	0.15	0.20	0.35	0.30	0.30	0.30	0.35
16	0.20	0.20	0.25	0.25	0.30	0.30	0.35	0.30	0.25
17	0.15	0.15	0.20	0.20	0.30	0.30	0.35	0.30	0.35
18	0.10	0.15	0.15	0.20	0.25	0.20	0.25	0.25	0.20
19	0.15	0.15	0.20	0.20	0.20	0.25	0.25	0.20	0.25
20	0.15	0.15	0.15	0.20	0.20	0.20	0.20	0.25	0.25
21	0.15	0.15	0.15	0.20	0.20	0.25	0.20	0.20	0.25
22	0.15	0.15	0.20	0.20	0.25	0.25	0.20	0.25	0.20
23	0.10	0.15	0.15	0.20	0.30	0.25	0.30	0.30	0.25
24	0.20	0.15	0.20	0.20	0.30	0.30	0.30	0.25	0.30
25	0.15	0.15	0.20	0.20	0.30	0.25	0.30	0.30	0.30
26	0.15	0.15	0.20	0.25	0.30	0.35	0.25	0.30	0.30
27	0.20	0.15	0.20	0.20	0.25	0.25	0.30	0.25	0.30
28	0.20	0.15	0.20	0.20	0.30	0.30	0.25	0.30	0.25

Note : Locations of wave observations are shown in figure.



REMARKS—

1) The layout is as per Drawing No. PDC/D-35/75 showing General Layout suggested by Pratt Investment survey of Fishing Harbour Under Chief Engineer's letter No D.D. No. J1/23390/67/ Dt 24.7.1975.

2) * Location of wave observation

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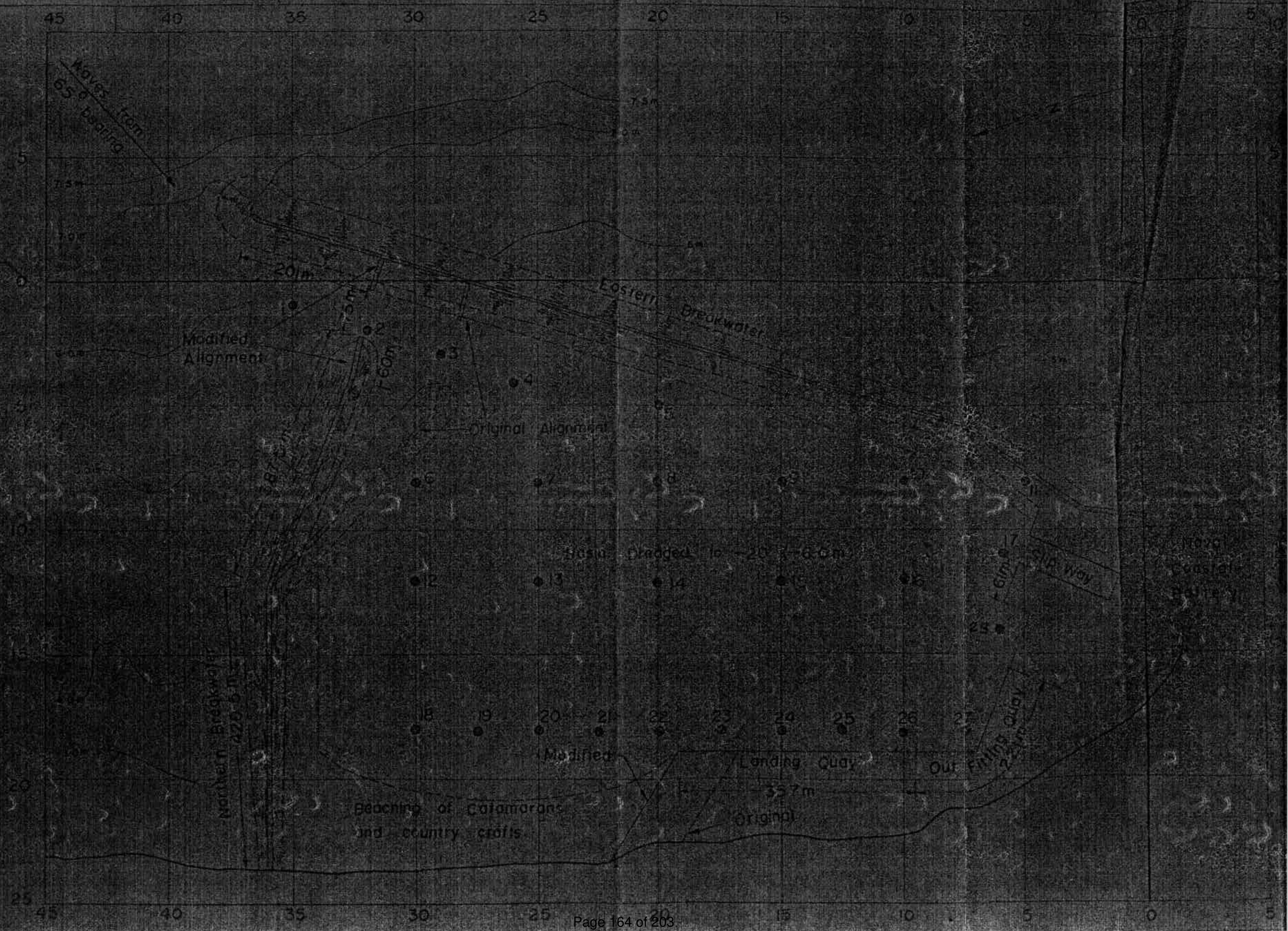
MODEL STUDIES FOR THE
FISHERIES HARBOUR AT MADRAS

1) ORIGINAL AND MODIFIED ALIGNMENTS
OF NORTH BREAKWATER

2) LOCATIONS OF WAVE OBSERVATIONS

Scale 1/4800

Fig. 1





**RISK ASSESSMENT REPORT & DIASTER
MANAGEMENT PLAN**

FOR

**Modernization and Upgradation of Chennai
Fishing Harbour**

Kasimedu, Chennai.

By

M/s Chennai Port Authority

At

Chennai Fishing Harbour

No 1, Rajaji Salai, Chennai - 600001

PREPARED BY



HUBERT ENVIRO CARE SYSTEMS PVT LTD.

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1. DEFINITIONS

i. HAZARD

A source or a situation with a potential for harm in terms of human injury or ill health, damage to property, damage to the environment or a combination of these. The different kinds of hazards are:

1. Physical hazards.
2. Mechanical hazards.
3. Chemical hazard.
4. Biological hazard.
5. Ergonomic hazard.
6. Psychosocial hazards

- **PHYSICAL HAZARDS:** These are the most common hazards and they include extremes of temperature, ionizing or non-ionizing radiation, excessive noise, electrical exposure, working from heights, and unguarded machinery.
- **MECHANICAL HAZARDS:** These are usually created by machinery, often with protruding and moving parts. In a construction site mechanical hazards are found in machines like concrete mixers, bending equipments, trolleys, hoisting lifts, cranes etc.
- **CHEMICAL HAZARDS:** These appear when a worker is exposed to chemicals in the workplace. Some are safer than others, but for workers who are more sensitive to chemicals, even common solutions can cause illness, skin irritation, or breathing problems.
- **BIOLOGICAL HAZARDS:** These include the viruses, bacteria, fungus, parasites, and any living organism that can infect or transmit diseases to human beings.
- **ERGONOMIC HAZARDS:** Including considerations of the total physiological demands of the job upon the worker, even beyond productivity, health, and safety.
- **PSYCHOSOCIAL HAZARDS:** These may arise from a variety of psychosocial factors that workers may find to be unsatisfactory, frustrating, or demoralizing.

ii. HAZARD CONTROL: A hazard control process is to protect workers from exposure to a substance or system, the training and the procedures required to monitor worker exposure and their health to hazards such as chemicals, materials or substance, or other types of hazards such as noise and vibration.

iii. HAZARD IDENTIFICATION: Hazard identification is part of the process used to evaluate if any particular situation, item, thing, etc. may have the potential to cause harm. The term often used to describe the full process is risk assessment:

- Identify hazards and risk factors that have the potential to cause harm (hazard identification).

- Analyse and evaluate the risk associated with that hazard (risk analysis, and risk evaluation).
- Determine appropriate ways to eliminate the hazard, or control the risk when the hazard cannot be eliminated (risk control)

iv. RISK: Combination of the likelihood of an occurrence of a hazardous event with specified period or in specified circumstances and the severity of injury or damage to the health of people, property, environment or any combination of these caused by the event. In mathematical term, risk can be calculated by the equation:

$$\text{Risk} = \text{Likelihood} \times \text{Severity}$$

Where,

- **LIKELIHOOD** - an event likely to occur within the specific period or in specified circumstances.
- **SEVERITY** - outcome from an event such as severity of injury or health of people, or damage to property, or insult to environment, or any combination of those caused by the event.

2. INTRODUCTION

Hazard Identification and Risk Assessment (HIRA) is carried out for identification of undesirable events that can lead to incident, the analysis of hazard of this undesirable event, magnitude and likelihood of harmful effects. It is widely accepted within industry in general that the various techniques of risk assessment contribute greatly toward improvements in the safety of complex operations and equipment.

The objective of this work of hazards and risk analysis is to identify and analyze hazards, the event sequences leading to hazards and the risk associated with hazardous events.

3. HIRA PROCESS



Figure 1 – HIRA Process

Hazard identification consists of four steps:

1. Hazard identification
2. Risk Assessment
3. Risk Analysis
4. Monitor and Review

3.1. HAZARD IDENTIFICATION

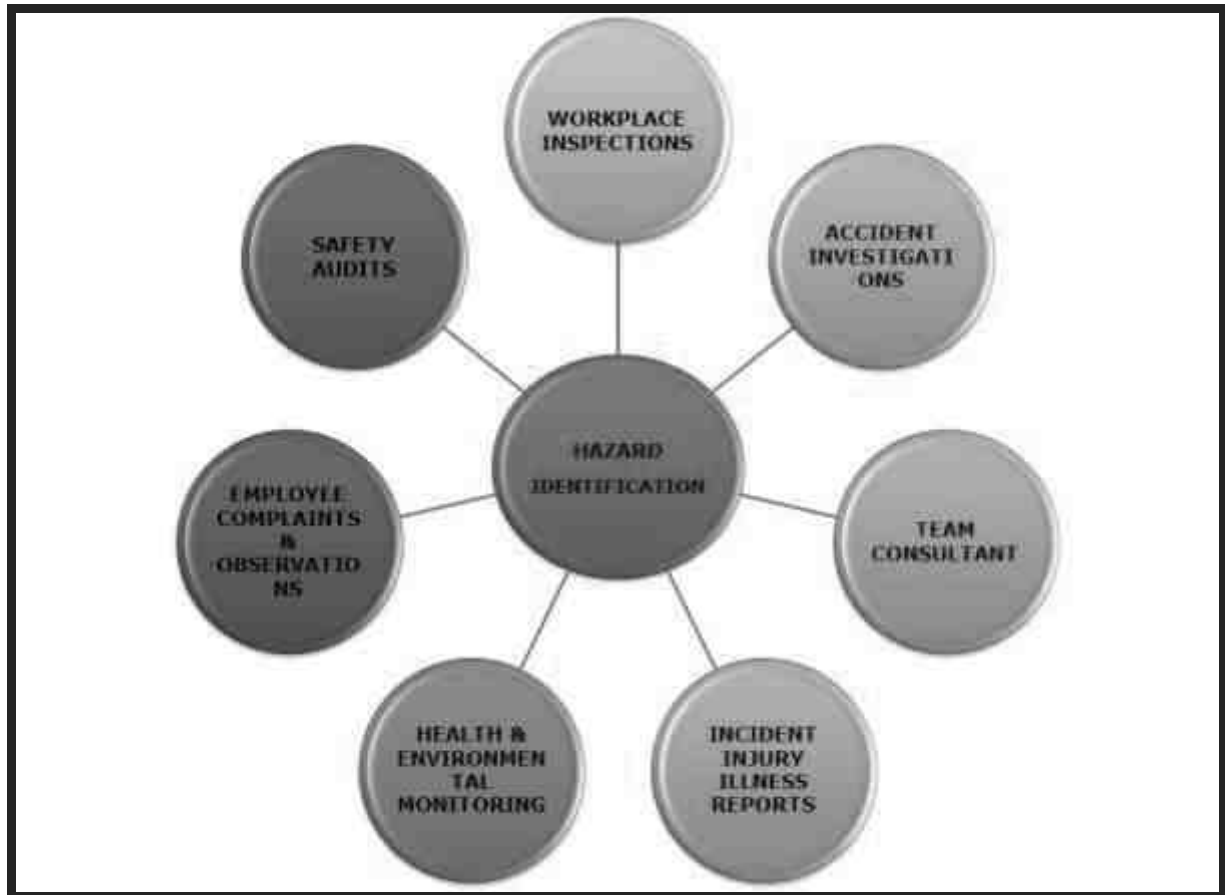


Figure 2– Hazard Identification

Work domicile hazards can be notorious in a number of ways. Checks /Inspection provide a system of distinguishing hazardous conditions so that those conditions can be corrected. The data collected while performing inspections will be used to identify hazards and barriers to working safely and in an environmentally protective manner so that they can be addressed such as procedure changes or purchasing different PPE. The data also will be tracked as a protective measure of acceptable HSE behaviour on the site. Reports and safe work observation information will be shared with employees at toolbox safety meetings.

3.2. RISK ASSESSMENT

Generally, risk assessment is estimating; what are the chances (probability) of an accident happening, and if it does happen, what are the chances that someone will be hurt, What will be the extent of equipment or environmental damage, and how bad will it

be (severity) The level of risk is dependent on the exposure to the hazard and the probability and consequences of an event occurring.

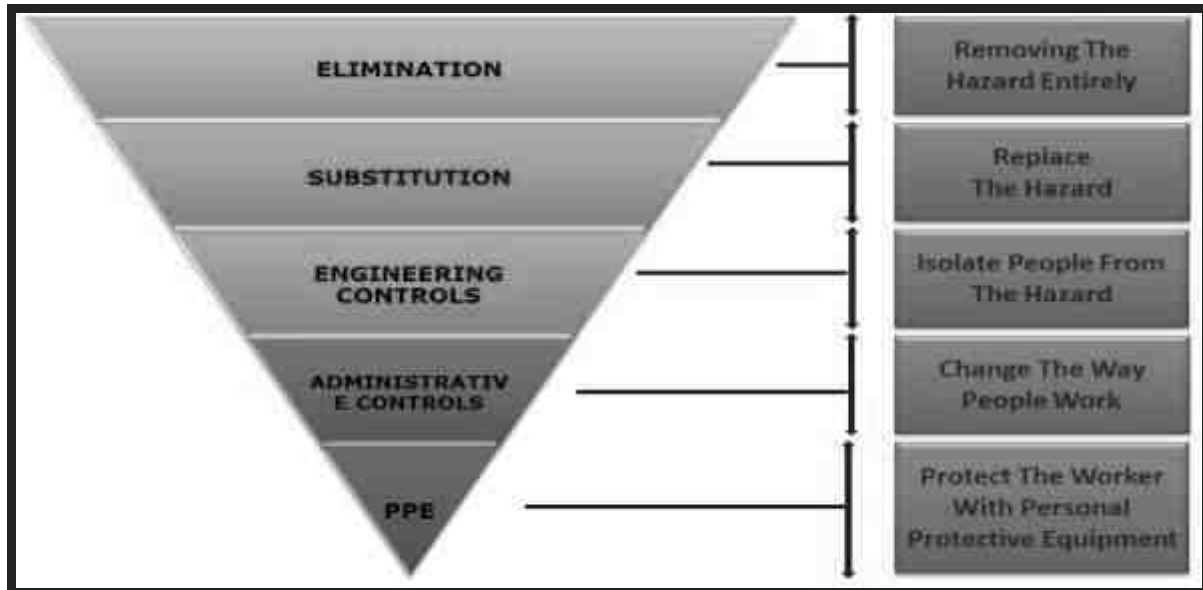


Figure 3: Risk Assessment

i. STEPS IN RISK ASSESSMENT

Carrying out risk assessment in a construction site is much more important to prevent the incidents occurring from it. The following steps can be considered as general measures to carry out the HIRA study.

1. Initiating the HIRA
2. Identify the hazard
3. Identify all parties affected by the hazard and determine how they can be affected
4. Evaluate or assess the risk

INITIATING THE HIRA:

A number of approaches can be adopted to perform the HIRA. When a hazard is identified, the first option should always be to eliminate it first. The approaches to risk assessment at work which are used are normally based upon:

- Observation of the workplace environment (e.g. means of access, conditions of floors, machinery safety, dust and fumes, temperature, lighting, noise etc.)
- Identification of the tasks performed in the construction site.
- Consideration of risks involved in each task carried out at the workplace (evaluation of risks from the different tasks).
- Observation of work in progress (check that procedures are as laid down or predicted, and that there are no other risks arising).
- Consideration of patterns of work (to assess exposure to hazards).

- Consideration of external factors that could affect the workplace (e.g. weather consideration for outdoor workers).
- Review of psychological, social and physical factors which might contribute to stress at work, how they interact together and with other factors in the workplace organization and environment.
- Consideration of organization to maintain conditions, including safeguards (e.g. that systems are in place to assess risks from new plant, materials and so on to update information on risks).

Once the desired HIRA approach is selected the following data has to be entered by the assessor.

- 1. Date:** Enter the date on which the assessment form is carried out. The assessment must be valid on that day, and subsequent days, unless circumstances change.
- 2. Assessed by:** Insert the name, designation and signature of the person who carries out the assessment. In the case of a team the names, designations and signatures of all the team members are required.
- 3. Checked by:** Checking has to be done by a person who is capable of assessing the work done by the competent person. The checker will normally be a line manager, supervisor, principal investigator, etc. Checking will be a mandatory one for risk assessment.
- 4. Validated by:** It is generally used for scenarios involving high risk, E.g.- where complex calculations have to be validated by another "independent" person who is competent to do so, or where the control measure is a strict permit-to-work procedure requiring thorough preparation of a workplace. The valuator should also be a competent engineer or professional with expertise in the task being considered. Examples of where validation is required include designs for pressure vessels, load-bearing equipment, lifting equipment carrying personnel or items over populated areas, and similar situations.
- 5. Location:** Insert details of the location where the assessment activity has been carried out. E.g. building, floor, room or laboratory etc.
- 6. Task / premises:** Insert a brief summary of the task, e.g. typical office activities such as filing, DSE work, lifting and moving small objects, use of misc. electrical equipment. Or, research work [title] involving the use of typical laboratory hardware, including fume cupboards, hot plates, ovens, analysis equipment, flammable solvents, etc.
- 7. Activity:** All the activities covered in assessment should be entered here. The number of rows is unlimited, although how many are used for one assessment

will depend on how the task / premises is sub-divided. For laboratory work, activities in one particular lab or for one particular work might include; use of gas cylinders, use of fume cupboard, use of computer or other electrical equipment, use of lab ovens, hot plates or heaters, use of substances hazardous to health etc.

IDENTIFY THE HAZARDS

Identifying the risks is by far the most important element of the risk assessment process and should be performed in a systematic manner. The gathering and analysis of information is an essential task before the risk assessment can start. This would normally be conducted by the safety practitioner or person responsible for health and safety and it is one of his more important duties. The person should access the databases on the business to assess the types and major underlying causes of past accidents and incidents. It is advisable to also review accident reports and investigations together with other records such as those maintained by engineering staff, log books and audit reports. Externally, he or she may be able to gather information from government and industry organizations or from publications and databases.

If the hazard identification is not carried out carefully, the subsequent analysis of risk and the development of risk control measures become pointless. The identification of hazards is not only an essential part of the risk assessment process, but also acts very effectively to change the way people think, causing them to act more safely and so become more proactive in hazard awareness. When you work in a place every day it is easy to overlook some hazards. There are many methodologies to identify the hazards. Some of them are listed below.

- Observation–Have a walkthrough completely around the workplace to carefully identify all the hazards involved in the routine activity of the site.
- Communication – Have a communication with the employees who is involved in a particular work. Because the employee who is working in that area will have a better understanding and knows much about the process which might not be known to safety person.
- Information – Refer to the “manufacturers” instructions or MSDS for chemicals. They can be very helpful in identify the hidden hazards and will be helpful in evaluation.
- Records – Have a look at your incident and sickness records – these often help to identify the less obvious hazards.

Visit relevant Websites to gain information. Internet is a valuable means of gathering international data. All this data needs to be accumulated and converted into a

useful format to prepare the team who undertakes risk assessment. Consultation with the workplace health and safety committee and representatives. Brainstorm ideas and group under appropriate risk headings. Consider the effects on people (staff, students and other people), information, physical assets and finances, reputation. Write the final list onto the table (risk assessment summary). Data from health surveillance program. Consulting with subject matter experts or consultants.

IDENTIFYING AFFECTED PARTIES

Next we need to identify who can be harmed from the hazards. That doesn't mean listing everyone by name, but rather identifying groups of people. In each case, identify how they might be harmed, e.g. what type of injury or ill health might occur.

- Some workers might be more vulnerable like new and young workers, new or expectant mothers and people with disabilities, lone workers.
- Some person will not be there on site for long time but still be exposed to hazard. They are Cleaners, visitors, contractors, maintenance workers etc.
- Members of the public, if they could be hurt by your activities.

EVALUATE OR ACCESS THE RISK

Once the risk and affected persons have been identified, next step is to access the risk to protect the people from harm. There must be a defined risk rating to access the identified risk.

RISK RATING

One of the most simplistic forms of risk assessment is to rate the remaining risk as high, medium or low, depending on how likely the activity is to cause harm and how serious that harm might be. This is called "Risk rating".

LEVEL OF RISK

Low risk: It is most unlikely that harm would arise under the controlled conditions listed, and even if exposure occurred, the injury would be relatively slight.

Moderate risk: These types of risks are ones that could cause issues, but that there is still a lower chance that they will cause your work to fail. It is more likely that harm might actually occur and the outcome could be more serious. Minor injury is a typical example for this kind of risk.

High and extreme risk: These are the risks that take the highest priority. They can cause your work to fail, and you need to plan for these risks ahead of time. If injury is

likely to arise and that injury might be serious like broken bones, trip to the hospital, loss of consciousness, or even a fatality.

Numerical scores are given to the different elements (e.g. consequence, exposure, likelihood) of risks and these scores are added or multiplied to get a rating for the risk.

ELEMENTS OF RISK

Probability: Risk probability, or likelihood, is the possibility of a risk event occurring. The likelihood can be expressed in both a qualitative and quantitative manner. The likelihood is the probability of loss when a sub-standard act occurs or sub-standard condition exists.

The likelihood should be based on the worst case scenario, ranging from a remote possibility to the inevitable. Factors affecting the likelihood include:

- Number of times the situation occurs
- Location of the hazard
- Duration of the exposure
- Environmental conditions
- Competence of the people involved

CONSEQUENCES

Consequences are the expected severity. The severity is expressed in terms of the effect on the person, whether injury or ill health, and ranging from minor injury to death. The risks are clearly higher if an accident is likely to result in serious injury or death.

ii. RISK ANALYSIS

Once the hazard has been identified, it is necessary to assess what risk they pose to employees in the workplace. In this way we can establish a measure of the risk and determine what priority they should have for corrective actions. The risk assessment step is that part of the process that assesses the probability and consequences of hazard that have been identified. Once we have estimated the probability and consequences for each hazard then we can allocate it a priority for corrective action.

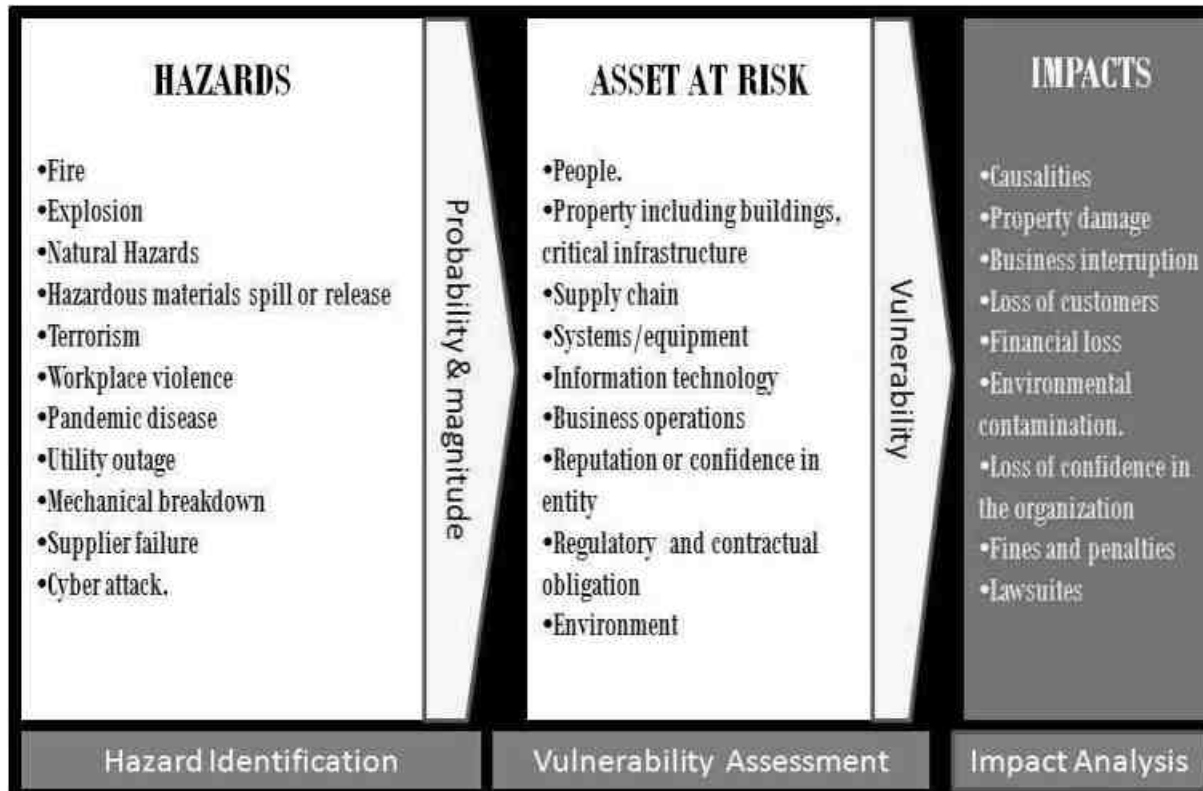


Figure 4: Risk Analysis

The risk analysis determined the frequency and potential impact of hazards on business operations, community, associated stakeholders, related infrastructure, and the environment. Historical occurrences, changing circumstances, outside influences and similar occurrences happening elsewhere are examined when analysing risks.

FREQUENCY:

HIRA should not be considered as a very complex assessment tool, but a kind of risk assessment which will reflect the identification of potential hazards which will result in a seriously emergency condition. There may be few hazards which do not have a long historical background and their frequencies must be estimated with the available source only. Level of impact will be different for different hazards. Impacts can be generally classified into different types as follows:

1. Human impact
2. Property impact.
3. Business impact
4. Critical infrastructure impact.
5. Environmental impact.



Figure 5: Impacts

Human impact: This includes the factors which have direct effect on human health including fatalities, injuries or evacuations.

Property impact: Any form of direct effect of an incident over any building infrastructure or any other form of property.

Business impact: Any kind of negative impact on the business due to a particular incident or scenario.

Critical infrastructural impact: Any kind of impact on network of institution, systems, services and processes that meets vital human needs due to any kind of incidents. It is further divided into damage to critical facilities and damage to lifelines.

Environmental impact: This describes the negative effect of environment including soil, water and air due to the impact of any incident.

iii. REVIEW & MONITOR

There is a necessity for regular monitoring and updation of HIRA as per the scheduled frequency. This is important as there will be new hazards developing from the existing processes and there should be regular monitoring of all the identified hazards.

CONTROL MEASURES

In this stage the recommendations and corrective measures are implemented to control the risk. Availability and suitable measures are applied to control and mitigate the risk.

HIERARCHY OF CONTROL

1. Elimination: The process of completely eliminating the toxic and hazardous process in order to mitigate the risk.
2. Substitution: Substituting the existing process with a low risk and less hazardous material to reduce the consequence.
3. Engineering control: Process of removing the potential hazards by re-engineering the job carried out by people. Modifying the existing by installing guards, physical barriers, enclosure, automation and isolation
4. Administrative controls: Usage of organisational control measures to hazards by changing the behaviour of people by carrying out job rotations, limiting the time of exposure.
5. Personal Protective Equipments: PPE's are the last line of defence to control any type of hazard. PPE's doesn't eliminate the hazard completely but provide a protection to employees.

EVALUATION

This is an important step in checking whether the applied control measures actually reduce the potential hazards which has been initially identified in the HIRA. It may also involve repetition of the process.

3.3. HAZARDS IN THE CONSTRUCTION SITE

In a construction site hazards can be continuously present through the work time of labours, which can be fatal. The various reason triggering to the hazards are working at height, working on an unsupported beam, underground trench work without appropriate safety measures, the workers may be hit by the moving machineries, exposure to dust, chemicals etc.

The routine operations carried out in the construction site include:

1. Excavation work
2. Scaffolding work
3. Material handling
4. Hoisting work
5. Working at height.
6. Electrical work.
7. Underwater construction activity.

EXCAVATION WORK

Excavation is one of the most hazardous activities carried out in the construction site. There are high chances of fatalities in the trenching Work if there is lack of safety precaution. All the excavation activity deeper than 1.25 metres must be shored or battered. If the depth of the trench is more than 2 meters it should be guarded by guard rails or barriers to prevent the erosion of soil into the trench. Care should be taken to know the presence of underground cables or pipes in the excavation area to avoid any incidents by damaging them.

The movement of vehicles near the excavation work should be taken extra care as there are high chances of collapsing of the soil. There should be inspection of the trenches on a daily basis in the construction site and the stability of the shoring/guardrails must be ensured.

SCAFFOLDING WORK

Scaffolding is a temporary structure installed in any construction site to elevate or carry the workers during construction or maintenance activity. These structures are made up of steel, timber or bamboo. The scaffolding consists of horizontal and transverse members called as ledgers. Transverse cross bracing method is also used for erecting the scaffolds. The same process of erection of temporary structures should be followed for erecting scaffolds. The stability of the entire scaffolding depends on the strength of each member in the scaffolds. In case of defects in one of the member in scaffolding can lead to the collapse of the entire structure and can cause fatal incident. Daily inspection of the scaffolding structures should be ensured by a competent person.

The modern scaffolding structures are made up of steel braces and are pre-fabricated in convenient units. They are much safer and will give better stability on the platforms. While working on the scaffolding platform all the workers should adhere to PPE's such as full body harness, safety belts etc. to avoid any catastrophic incidents.

MATERIAL HANDLING

Handling of materials is an essential process in the construction sites which involves the movement of construction materials from place to place. Workers are continuously exposed to hazards arising from the material handling equipment. Different types of cranes used in the construction site are

- i. Portable cranes
- ii. Tower cranes

Several cases of accidents have been reported involving the cranes and most of the cases can be avoided by following the safe operating methods.

Some of the safety to be followed during crane operation are listed below:

- The maximum load carrying capacity of the crane should be clearly estimated and ensured during every activity.
- Maximum safe load indicator must be fitted with the crane.
- The operation of crane should always be carried on a strong base platform.
- The loads and dead weights should be fitted properly on the equipment.
- There should be a well-trained signal man to give commands to the operator.
- The ropes, hooks, chains, slings used in the equipment should be regularly inspected and checked for worn outs. If any deviation found, then it should be replaced immediately.
- The crane operator should be familiar with the operating procedure of the particular equipment and should follow the Safe Operating Procedures.
- While using the mobile cranes extra care to be taken to prevent the overturning of the crane.
- Ground inspection should be done before installing the crane.
- The outer trigger of the crane should be completely extended and the minimum distance should be 1 metre from any excavation or trench hole.
- The crane should not be operated in case of high winds.
- High reflective jackets should be worn by the rigger always.
- Barricading should be done in the swinging radius of the crane and unauthorised entry should be prevented.
- There should be at least two taglines used for controlling the swinging of the load.
- No man movement is allowed under the suspended load of the equipment.

Regular inspection of cranes is important. The following points should be taken care while inspecting the cranes.

- There should a valid lifting work permit obtained.
- Operator third party & license.
- Safety certificate and fire extinguishers of the crane.
- Anti-tube block/limit switch (it will stop the function of crane hook once it touches and it will prevent from hook from hitting to top boom pulley).
- Safety latch of a main and auxiliary hook.
- PPE of working crew especially leather gloves for rigger and safety harness.
- Safety latch of a main and auxiliary hook.
- Check for any leakages in the hydraulic oil.

- Check for the position of outriggers and mates.
- Safety latches should be checked in main and auxiliary hook.
- The cabin of the crane should be visible even from a blind spot.
- Limit switches should be examined.

HOISTING WORK

Hoists are used to move heavy objects and equipment. As the hoists consist of various components, failure of any one component can lead to disastrous accidents. It requires regular inspection and monitoring. Even if a small damage found in the hoisting equipment during inspection, it should not be used.

The hoist inspections should cover the following aspects:

- The hooks on all blocks, including snatch blocks, must have proper safety latches and it should be in good working condition.
- All hooks on hoisting equipment should be free of cracks and damage.
- There should be clear identification of the maximum load carrying capacity in every equipment.
- Electric cables and wiring of electrical equipment's should be intact and no damages to be found on the wiring.
- Equipment shall be fitted with appropriate safety devices.

There should be some mandatory safety measures followed during the hoisting operation which are listed as follows:

- There should not be any man movement beneath the hoisting equipment.
- The hoisting area should be completely barricaded and signage's should be placed.
- There should not be any unauthorised man movement inside the hoisting area.
- The load should never exceed the maximum load capacity of the equipment.
- Never stand or walk beneath a hoisting equipment.
- Wear gloves, helmets and other personal protective equipment's when working with hoists and cables all the time.
- There should be regular inspection of the hoists.
- The integrity and stability of loads shall be verified before lifting.
- Once the work is done, the rig should be hoisted down and secured properly.
- When the load hoist is at floor level or its lowest level, ensure that at least two turns of rope remain on the drum.
- Be prepared to stop operations immediately if signalled by the safety watch or another person.

- Ensure that the hoist is directly above a load before picking up. This keeps hoist from becoming stressed.
- Hoisting at poor angles might result in injury to the people and also damages the hoist.
- Make sure that there is no high voltage electrical cable running within 6 metres of hoisting area.
- In case of hoisting activity to be carried out near the electrical lines, there should be electrical clearance certificate obtained from electrical supervisor.

CRANE BARGES & FLOATING DERRICKS

- Floating cranes are generally used for lifting heavy construction materials and machines. There should be regular inspection of the cranes before usage.
- The load rating of a floating crane/derrick shall be the maximum working loads at various radii as determined by the manufacturer or qualified person considering list and trim for each installation.
- The load rating shall specifically reflect the: design standard; machine trim; machine list; and dynamic/environmental loadings anticipated for the operational envelope of the floating crane/derrick or auxiliary shipboard crane.
- The load rating of the crane should be suitable to the type of construction activity performed in the site.
- The load rating is dependent upon the structural competence of the crane or derrick, rope strength, hoist capacity, structural attachment to the floating platform, and stability and freeboard of the floating platform.
- When deck loads are to be carried while lifting, the situation shall be analyzed for modified ratings.
- When mounted on barges or pontoons, the rated loads and radii of land cranes and derricks shall be modified as recommended by the manufacturer or qualified person. The modification shall be evaluated by the qualified person specific to the floating platform mounting the crane.

FORKLIFT OPERATION

Fork Lifts are very commonly used in construction sites for movement of heavier construction materials and stacking them at heights. The following measures should be available for each forklift equipment.

- Daily checklist to be maintained.
- Proper inspection and Annual Maintenance Cost should be available.
- Reverse alarm should be fitted in the equipment.

- Spotlights should be fitted on the equipment.
- Load test certification should be available for the equipment.

While using the forklifts in a construction site, the following safety measures must be followed and adhered by the employees:

- Never walk, stand or work under the elevated portion of a fork lift even the fork is not loaded with material.
- Ensure that the fork lift has overhead barriers to protect the operator from falling objects from an elevated height while loading or unloading.
- Only authorised persons are allowed to operate the equipment.
- There should not be lifting of employees on the fork.
- Always wear the seat belt while operating the machine.
- Unless there is material on the forks, it should in lowered condition while in movement.
- The load carried should not exceed the maximum carrying capacity of the equipment.
- Do not operate a fork lift in an area with hazardous concentrations of acetylene, butadiene, hydrogen, ethylene or diethyl ether, or other explosive environment.
- Do not load a forklift while the equipment is in motion.
- The centre of gravity of the equipment must be maintained always while carrying the loads.
- While carrying the loads adjust the fork according to gain stability of the equipment.
- Make sure that you travel with loads at the proper height. A stable clearance height is usually 4 to 6 inches at the tips and 2 inches at the heels of the fork blades.
- When preparing to leave the equipment unattended, lower the mast, neutralize the controls, shut the power off, and set the brakes.
- If the load is oversized and blocking the pathway, drive the equipment in backward direction and donot try to look over the load.
- Do not raise or lower the load while travelling
- Have clear visibility of the work area and ensure you have enough clearance when raising, loading, and operating a forklift
- Be aware of other vehicles in the work area.
- Use horns at cross aisles and obstructed areas
- Watch for pedestrians and observe the speed limit while movement.
- Always keep a safe distance from the ramp edges and platform.

WORKING AT HEIGHT

Ladders are one of the most popular items used in the construction sites for working at heights. However, if there is improper usage the ladder can take many lives off. The following safe methods should be adopted while operating ladders:

- Always have a three-point contact while climbing on the ladder.
- Always have a firm grip on the ladder and keep a good balance.
- Make sure the climbing and gripping surfaces are clean and free of oil, grease, and other slip hazards
- Make sure that your shoes are clean of any substances which could cause you to slip
- Use the ladder at a correct angle and make sure it's secured
- Make sure you use your ladder on firm and level surfaces
- There should be always one person on a ladder.
- Only use ladders for their designed purpose.
- Do not lean out from the ladder in any direction.
- If you have a fear of height doesnot climb on a ladder.
- In case the ladder is found defective never use it.
- Do not carry objects that could cause loss of balance.

ELECTRICAL WORK

Electricity can cause great damage to both people working in the construction sites and property. Almost every construction work is associated with electrical hazards as most of the construction equipment's uses electricity for their operation. Contact with the electric current can trigger other incidents, like slips, trips or falls from ladders or other elevated platforms and injuring other persons. Electrical shocks or flashes can cause serious injuries such as burns. Electric shock may also cause the victim to stop breathing and nerve centres may be temporarily paralyzed.

In case of high voltage shocks it may lead to fatal incident. Apart from human injuries like shock, burns or falls, another major hazard is the situation in which an electrical fire or explosion may occur. Fires and explosions due to electricity generally cause extensive property & equipment damage. The hazards causing electrical failure are as follows:

1. Voltage fluctuation
2. Loose connection of wires
3. Usage of damaged or faulty appliance.
4. Use of extension chords for high voltage equipment's.

5. Downed powerlines

Electrical Fires often start when an overloaded circuit becomes overheated – igniting the insulation around the wires. If cords and cables are frayed or worn out, bare wires might touch each other, thus causing a short circuit that could spark a fire. If any faulty or malfunctioning equipment is found during inspection, it must be removed immediately. And maintenance activity must be carried out. Necessary training must be provided to workers in monitoring the electrical equipment's and replacing the faulty ones. Make sure that the workers at the construction site understand the importance of electrical safety. All the workers must be able to recognize that abusing or misusing electrical equipment is an invitation to an accident. The management should take necessary actions in ensuring that all the employees are provided with necessary Personal Protective equipment's to get prevention from the electrical hazards.

UNDERWATER DIVING WORK

The employer shall develop and maintain a safe practice manual, and make it available at the dive location for each dive team member. The employer shall keep a record of each dive. The record shall contain the diver's name, his or her supervisor's name, date, time, location, type of dive (scuba, mixed gas, surface supply), underwater and surface conditions, and maximum depth and bottom time.

Each dive team member shall have the experience or training necessary to perform assigned tasks safely. Each dive team member shall be briefed on the tasks, safety procedures, unusual hazards or environmental conditions, and modifications made to the operating procedures. The dive shall be terminated when a diver requests it, the diver fails to respond correctly, communication is lost, or when the diver begins to use the reserve breathing gas.

HEALTH RISKS IN DIVING

COMPRESSION & DECOMPRESSION

The bends, also called decompression sickness. This is a condition where a diver rises too quickly. Nitrogen that is in his body, from breathing compressed air, needs time to leave the body. If this is not allowed then the diver can experience the bends. The only cure for this is a decompression chamber, which must be present whenever scuba work is being done. Warning signs are; sore joints, itchy skin, vision and hearing difficulty, paralysis, and death.

The best way to prevent decompression sickness is to avoid diving too deep, do not stay deep above the recommended time, ascend slowly with regular stops along the way, and limiting number of dives per day.

Nitrogen Narcosis

This is an affect similar to alcohol intoxication. This condition is caused because more gases are breathed, while underwater, from the oxygen supply. Because of the greater pressure, these gases are absorbed into the body easier than at sea level.

Oxygen Toxicity

This is a condition where higher levels of oxygen are breathed. This has an affect on the body, and can result in; disorientation, trouble breathing, trouble with vision, lung damage, seizures, and death.

SAFETY PRECAUTIONS TO BE CONSIDERED

- Only certified divers should be allowed to carry out the job.
- Proper site specific training should be provided to all the divers.
- Check working condition of equipment.
- Plan the dive: time, depth, work to be done and stick to the plan.
- Never dive alone. Always have at least one partner that you will stay close to.
- Site should have rescue plan in place for divers.
- Know where the nearest decompression chamber is located and how to get help.
- Descend slowly.
- Ascend slowly with the scheduled breaks.
- Monitor air supply regularly during the entire dive.

ASSESSING THE IDENTIFIED RISKS

Risk can be presented in variety of ways to communicate the results of analysis to make decision on risk control. For risk analysis that uses likelihood and severity in qualitative method, presenting result in a risk matrix is a very effective way of communicating the distribution of the risk throughout a plant and area in a workplace.

In mathematical term, risk can be calculated by the equation:

$$\text{Risk} = \text{Likelihood} \times \text{Severity}$$

- The probability and consequence is assigned in terms of risk matrix defines by a particular organisation.
- Generally, most companies use risk matrix scale from 1-25 on a matrix scale
- Whereas in the matrix scale 1 represents low level risk and 25 refers to high level risks.

Probability	Severity				
1	1	2	3	4	5
2	2	4	6	8	10
3	3	6	9	12	15
4	4	8	12	16	20
5	5	10	15	20	25
15-25	Extreme Risk (E)		Activity should not proceed in current form without adequate control measures.		
8 - 12	High Risk (H)		Activity should be modified to include remedial planning and action		
4 - 6	Moderate Risk (M)		Activity can operate subject to management and/or modification		
1 - 3	Low Risk (L)		No action required, unless escalation of risk is possible.		

Figure 6: Risk Matrix

CONTROL MEASURES

Control is the elimination or inactivation of a hazard in a manner such that the hazard does not pose a risk to workers who have to enter into an area or work on equipment in the course of scheduled work. This method is often referred to as applying engineering controls. If this does not work, hazards can often be controlled along the path to the worker, between the source and the worker. This method can be referred to as applying administrative controls. If this is not possible, hazards must be controlled at the level of the worker through the use of personal protective equipment (PPE), although this is the least desirable control.

- 1. Elimination:** Getting rid of a hazardous job, tool, process, machine or substance is perhaps the best way of protecting workers.
- 2. Substitution:** Carrying out the same process in a less hazardous manner. For example: Instead of using a high vibrating drilling machine which has higher ergonomic hazards, a low power machine can be substituted for carrying out the same job.
- 3. Engineering Control:** A hazard can be blocked before it reaches workers. For example, special curtains can prevent eye injuries from welding arc radiation. Proper equipment guarding will protect workers from contacting moving parts.
- 4. Administrative control:** Workers can be required to use standardized safety practices. The employer is expected to ensure that workers follow these practices. Work procedures must be periodically reviewed with workers and updated. Initial training on safe work procedure to be given to the workers. Job rotations and other procedures can reduce the time that workers are exposed to a hazard. For example, workers can be rotated through jobs requiring repetitive tendon and muscle movements to prevent cumulative trauma injuries. Noisy processes can be scheduled when no one is in the workplace.
- 5. Personal Protective Equipment's:** Personal protective equipment means any equipment which is intended to be worn or held by a person at work and which protects him against one or more risks to his health or safety and any additional accessory designed to meet that objective. Personal protective equipment means any equipment which is intended to be worn or held by a person at work and which protects him against one or more risks to his health or safety and any additional accessory designed to meet that objective.

HIRA SHEET

Table 1:HIRA

S.No	Activity	Sub-Activity	Hazard	Consequence	Existing risk			C	Existing /Required Controls	Residual risk			C
					P	S	R			P	S	R	
Construction Phase													
1	Construction of the Port platforms and ship bays	Commuting in site by workers and external visitors	Chances of getting hit by the vehicles	Could lead to human injury which may be minor/major	2	5	10	H	Most suitable entrance/exit location determined from Traffic Management plan / Site layout plan	1	5	5	M
									Adequate warning signage erected				
									Good visibility allowing vehicles entering / exiting site				
									Entrance well maintained, kept clean, level and trip free				
			Damage to vehicle and property	2	5	10	H	Good visibility allowing vehicles entering / exiting site	1	5	5	M	
				Hit by the heavy machines and constructions materials	Injury to person	2	5	10	H	Adequate warning signage to be erected	1	5	5
		Damage to vehicle and property	2		5	10	H	Good visibility allowing vehicles entering / exiting site	1	5	5	M	
			Construction material and machines handling	Exposure to heavy load & sharp objects	Can cause major Injury to body	4	3	12	H	Proper guarding to be provided in the machines	1	3	3
		Adequate training to be provided											
		Provide proper PPE's											
		Exposure to dust, noise		Hearing impairment, breathing problems	4	3	12	H	Adequate training to be provided	1	3	3	L
									Provide masks , cut resistant gloves to workers				
		Welding activity	Exposed to High voltage electricity	Electrocution, Burn and Welder exposure to flash	4	5	20	E	Grounding to be provided to welding equipment	1	5	5	M
									Implementation of permit system like hot work permit				
Proper PPE's to be provided to the workers													
Exposure of the workers to Ultraviolet and infrared rays, generated from the welding activity	Can lead to vision deficiency diseases if exposed continuously		4	5	20	E	Googles should be provided to workers	1	5	5	M		
Chemical Hazards: Welding fumes, inert	Respiratory problems		4	5	20	E	provide adequate PPE's to workers	1	5	5	M		

			gases and gas mixtures	Environmental exposure, damage to wildlife and surrounding, greenhouse effect	4	5	20	E	Use proper containment measures to reduce the fumes exposures to environment	1	5	5	M
		Metal Sheet Jobs like Cutting, sizing rolling and grinding	Generation of noise, particulate matter	Musculoskeletal disorders	3	3	9	H	Proper use of PPEs Use of mobile enclosures Regular maintenance of the equipment Scheduling noisy work from various fabrication work activities into a particular part of the shift Posting of proper signage Administrative controls like job rotation of the employees Proper maintenance of the tools/equipments Periodical training given to the employees	1	3	3	L
		Material handling & metal preparation	Generation of particulate matter	Health and environmental Impacts Increasing Noise Level Musculoskeletal disorders	3	3	9	H	Unloading of raw material to a paved area is recommended. Use of proper handling equipment Postures, movements and forces known to be associated with MSD should be eliminated from the workplace where possible No employee should be required to routinely work above their shoulder height, below their knees or at full reach distance To accommodate different people and tasks, workstations should be quick and easy to adjust Usage of proper material handling equipment like forklifts/ ergonomically designed well-maintained trolley or roller trolley	1	3	3	L

			Generation of fire sparks during cutting, welding, grinding and other machining processes	Can cause burn injury to the workers involved in activity	4	3	12	H	Flame proofing clothing and other PPE's should be provided to the workers to avoid fire injuries.	1	3	3	L
		Hoisting & Lifting activity	Fall of heavy objects from height	Can lead to fatality and damage to property	4	5	20	E	Providing training to the workers, Use of proper PPE's,	1	5	5	M
			malfunctioning of the components of cranes and barges		4	5	20	E	Should have regular inspection and periodic maintenance plan	1	5	5	M
			Unauthorised operation of the cranes & barges		4	5	20	E	should employ only authorised operators to operate the hoisting equipments	1	5	5	M
		Working at height	Exposure to strong winds	Can cause slippage from height which in turn can cause major injury	4	4	16	E	Provide proper certified safety harness, proper training	1	4	4	L
			Fall of heavy objects from height	Injury to person, can lead to death	4	4	16	H	1.Avoid the risk of dropped objects by securing tools and equipment. 2.Safety harnesses fall arrestor and climbers helmet, to be worn. Step ladders not to be used outside modules, on gratings, etc.	1	4	4	M
			Fear of height	Can cause slippage from height which in turn can cause major injury					Trained persons only be allowed to work at heights				
			Malfunctioning of safety harness	Can cause slippage from height which in turn can cause major injury					Regular maintenance should be carried out				
		Underwater construction work	Poor visibility under water	Injury to body by exposure to sharp objects	4	5	20	E	Only authorised divers allowed to carry out the diving work Provide appropriate safety PPE's, goggles and torches	1	5	5	M
			Exposure to vulnerable marine animals	Injury to body	3	5	15	H	Only authorised divers allowed to carry out the diving work	1	5	5	M
			Loss of stability of harness	Chances of drowning under water	4	5	20	H	Regular Inspection should be carried out	1	5	5	M
			Spillage of hazardous chemicals into oceans	Contamination of ocean & threat to aquatic life	4	5	20	E	Material management should be available and trained divers should be allowed to carryout the work	1	5	5	M
			Disposal of construction waste into ocean	Contamination of ocean & threat to aquatic life	4	5	20	E	Proper waste management procedure should be available in place	1	5	5	M
			Malfunctioning of Breathing apparatus	Death of person	4	5	20	E	Regular Inspection and maintenance should be carried out	1	5	5	M

		Use of Diesel Generator	Exposure to high voltage electricity	Electrocution	4	5	20	E	Grounding to be provided to generator	1	5	5	M
									Proper PPE's to be provided to the workers				M
			Environmental exposure,	damage to wildlife and surrounding, greenhouse effect	4	5	20	E	Use proper containment measures to reduce the fumes exposures to environment	1	5	5	M
		Material handling- forklift operation	Carrying high load	Chances of toppling down causing loss of life and property	4	5	20	E	SOP's should be followed and should be loaded less than the maximum load	1	5	5	M
			Sliding/skidding on inclined surface						Only authorised and experienced operators should be allowed to carryout the activity				
			Pedestrian collision						Safety briefing should be provided to all workers in site				
			Falling of loads from height						Only allowed load should be carried on equipment				
			Exposure to electricity						Proper PPE's should be used while working on electrical equipment				
		Painting activity	Exposure to chemical vapours	Respiratory problems	3	3	9	H	Proper PPE's to be provided to the workers	1	3	3	L
			Exposure to body parts with chemicals	Irritation and skin diseases	4	3	12	H	Proper PPE's to be provided to the workers	1	3	3	L
		Excavation/Trenching activity	Collapsing of trenches	Injury to body and death`	4	5	20	E	Proper barricading should be provided	1	5	5	M
			Exposure to vibrating equipments	Chances of permanent disabilities	3	5	15	H	Proper PPE's to be provided to the workers	1	5	5	M
			Fall of equipments into the trenching site	Can lead to damage to property and life	3	4	12	H	Barricading should be provided at the trenching site.	1	4	4	M
			Presence of poisonous gases/ low level of oxygen	Can cause respiratory issues and even to death.	5	5	25	E	Trenches and excavation should be inspected before entering	1	5	5	M
									Confined space work permit should be obtained				
		Electrical activity	Exposure to high voltage electricity	Leads to Electrocution and death	4	5	20	E	Grounding to be provided to generator	1	5	5	M
									Proper PPE's to be provided to the workers				
			Slips trips and falls due to wires	Causes minor or major injury to body	4	4	16	E	Wires management should be proper in construction sites	1	4	4	M
		Scaffolding	Toppling of scaffoldings due to improper erection	Fatality	4	5	20	E	The scaffolding must be placed in stable and even surface	1	5	5	M

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									Shower and eye wash facility shall				
									Workers must wear proper PPEs such as mask, gloves, goggles with side shield and coveralls				
		Exposure to heat	Fires and explosion	4	5	20	E	Proper firefighting system shall be in place.	1	4	4	M	
								Plan of the works with safe distance areas, escape routes, assembly points					
								Proper storage facilities should be provided					
								List of key personnel and their telephone numbers should be available					
	Placing of cofferdam blocks	Installing the cofferdam over an uneven surface on the ocean floor`	Can cause collapse of structure which lead to death of a person	3	5	15	E	Proper place should be selected to place the shoring and inspection should be carried out	1	5	5	M	
													Shoring should always be placed on a even surface.
		Leakage in the cofferdam block						Shoring equipments should be well tested before installing					

*P- Probability S-Severity R-Risk C-Category

ENVIRONMENTAL RISK ASSESSMENT

Table 2: EIA

Activities	Environmental Risk	Nature	Significance				Residual Impacts, after mitigation			
			NS	Small	Mod	Major	NS	Small	Mod	Major
Construction Phase										
Construction of Material storage and handling	1. Generation of Particulate Matter and other pollutants due to metal fabrication. 2. Generation of noise and vibration 3. Chances of soil contamination 4. Generation of waste water	Temp			✓			✓		
Construction of off shore structures on piles. <input type="checkbox"/> Use of pile drivers, boring	1. Generation of Particulate Matter 2. Generation of noise and vibration	Temp				✓		✓		

Activities	Environmental Risk	Nature	Significance				Residual Impacts, after mitigation			
			NS	Small	Mod	Major	NS	Small	Mod	Major
equipment, power tools	3. Marine Water Quality <input type="checkbox"/> Diffusion from concrete works in water <input type="checkbox"/> Suspension of sediments in water leads to an increase in the level of suspended solids (SS) and the concentration of organic matter <input type="checkbox"/> Turbidity 4. Marine ecology <input type="checkbox"/> Changes in Dissolved Oxygen <input type="checkbox"/> Removal of benthic Communities associated with Bottom Sediments <input type="checkbox"/> Smothering effect due to settling of sediments <input type="checkbox"/> Obstruction of the natural flow of water. 6. Changes in Seabed profile									
<input type="checkbox"/> Piling is proposed to be carried out by use of bored cast-in-situ concrete piles by use of a permanent liner by rotary drilling.										
Impact on Marine Environment due to: <ul style="list-style-type: none"> Dredging Construction Material Handling/transportation of construction material Construction of offshore structures on piles Trenching of subsea pipelines Waste water disposal to sea 	Disturbance to bottom sediments and/or destruction of spawning grounds, sediment sediment-resuspension. Use of pile drivers, boring equipment, power tools, change in suspended solids and turbidity are expected due to these activities. Piling is proposed to be carried out by use of bored cast-in-situ concrete piles by use of permanent liner by rotary drilling. The structures being built on piles will not obstruct or block the natural flow of water in the area. During Trenching, there will be change in turbidity and TSS during the trenching or subsea pipeline. Modern technologies to minimise the turbidity issues will be used. No waste water will be discharged to the marine environment, hence no impacts on marine environment due to the waste water generation.	Temp			✓			✓		

4. DISASTER MANAGEMENT PLAN

A disaster in the construction site has potential to cause serious injuries or loss of life or extensive damage to the property. In such cases sometimes outside agencies are required to call for help in handling the situation. The causative factors like equipment failure, human error, earthquake, sabotage etc. will normally manifest in various forms viz. Fire and Structure collapse etc.

Despite best design and layout of office, safe operating procedures and various preventive measures the possibility of a disaster cannot be totally ruled out. During this event timely and organized action must be taken to control the situation and to minimize the damage or loss to the office, human beings and environment. Hence the need of a proper "Emergency Preparedness and Response Plan (EPRP)". Such plan gives the guidelines for employees, contractors, transporters and Visitors etc. The EPRP not only defines the responsibilities but also inform about prompt rescue / evacuation / co-ordination operations and some more.

4.1. EMERGENCIES

An emergency is a situation, which may lead to or cause a large-scale damage or destruction to life or property or environment within or outside the site. Sometimes the Emergency results into uncontrollable situations and leads towards disaster. Such an unexpected severe situation may be too great for the normal workforce in the area within.

i. Emergencies related to Safety, Health & Environment:

- OIL SPILL
- Fire.
- Electrical fire/short circuiting.
- Natural calamities.
- Structural collapse.
- Medical Emergency.

4.2. ACTION PLAN TO VARIOUS EMERGENCIES

4.2.1. OIL Spill

It has high potential to directly cause damage to the marine organisms. Some toxic substances in an oil spill may evaporate quickly. Some organisms may be seriously injured or killed very soon after contact with the oil in a spill, nonlethal toxic effects can be more subtle and often longer lasting. For example, aquatic life on reefs and shorelines is at risk of being smothered by oil that washes ashore. It can also be poisoned slowly by long-term exposure to oil trapped in shallow water or on beaches. Both petroleum and

non-petroleum oil can affect the environment surrounding an oil spill. All types of oil share chemical and physical properties that produce similar effects on the environment. In some cases, non-petroleum oil spills can produce more harmful effects than petroleum oil spills.

A. CONTAINMENT PROCEDURES FOR MARINE SPILL

When an oil spill occurs on water, it is critical to contain the spill as quickly as possible in order to minimize danger and potential damage to persons, property, and natural resources. Containment equipment is used to restrict the spread of oil and to allow for its recovery, removal, or dispersal. The most common type of equipment used to control the spread of oil is floating barriers, called booms.

I. BOOMS

Containment booms are used to control the spread of oil to reduce the possibility of polluting shorelines and other resources, as well as to concentrate oil in thicker surface layers, making recovery easier. In addition, booms may be used to divert and channel oil slicks along desired paths, making them easier to remove from the surface of the water. Although there is a great deal of variation in the design and construction of booms, all generally share four basic characteristics:

- An above-water "freeboard" to contain the oil and to help prevent waves from splashing oil over the top of the boom
- A flotation device
- A below-water skirt to contain the oil and help reduce the amount of oil lost under the boom
- A "longitudinal support," usually a chain or cable running along the bottom of the skirt, that strengthens the boom against wind and wave action; may also serve as a weight or ballast to add stability and help keep the boom upright

II. SKIMMERS

A skimmer is a device for recovery of spilled oil from the water's surface. Skimmers may be self-propelled and may be used from shore or operated from vessels. The efficiency of skimmers depends on weather conditions. In moderately rough or choppy water, skimmers tend to recover more water than oil. Three types of skimmers— weir, oleophilic, and suction—are described below. Each type offers advantages and drawbacks, depending on the type of oil being cleaned up, the conditions of the sea during cleanup efforts, and the presence of ice or debris in the water.

Weir skimmers use a dam or enclosure positioned at the oil/water interface. Oil floating on top of the water will spill over the dam and be trapped in a well inside, bringing with it as little water as possible. The trapped oil and water mixture can then be pumped out through a pipe or hose to a storage tank for recycling or disposal. These skimmers are prone to becoming jammed and clogged by floating debris.

III. SORBENTS

Sorbents are materials that soak up liquids. They can be used to recover oil through the mechanisms of absorption, adsorption, or both. Absorbents allow oil to penetrate into pore spaces in the material they are made of, while adsorbents attract oil to their surfaces but do not allow it to penetrate into the material. To be useful in combating oil spills, sorbents need to be both oleophilic and hydrophobic (water repellent). Although they may be used as the sole clean-up method in small spills, sorbents are most often used to remove final traces of oil, or in areas that cannot be reached by skimmers. Once sorbents have been used to recover oil, they must be removed from the water and properly disposed of on land or cleaned for re-use. Any oil that is removed from sorbent materials must also be properly disposed of or recycled. Sorbents can be divided into three basic categories: natural organic, natural inorganic, and synthetic.

Natural organic sorbents include peat moss, straw, hay, sawdust, ground corn cobs, feathers, and other carbon-based products. They are relatively inexpensive and usually readily available. Organic sorbents can soak up from 3 to 15 times their weight in oil, but they do present some disadvantages. Some organic sorbents tend to soak up water as well as oil, causing them to sink. Many organic sorbents are loose particles, such as sawdust, and are difficult to collect after they are spread on the water. Adding flotation devices, such as empty drums attached to sorbent bales of hay, can help to overcome the sinking problem, and wrapping loose particles in mesh will aid in collection.

Natural inorganic sorbents include clay, perlite, vermiculite, glass, wool, sand, and volcanic ash. They can absorb from 4 to 20 times their weight in oil. Inorganic substances, like organic substances, are inexpensive and readily available in large quantities.

Synthetic sorbents include man-made materials that are similar to plastics, such as polyurethane, polyethylene, and nylon fibers. Most synthetic sorbents can absorb as much as 70 times their weight in oil, and some types can be cleaned and reused several times. Synthetic sorbents that cannot be cleaned after they are used can present

difficulties because they must be stored temporarily until they can be disposed of properly. The following characteristics must be considered when choosing sorbents for cleaning up spills:

- Rate of absorption—The rate of absorption varies with the thickness of the oil. Light oils are soaked up more quickly than heavy ones.
- Oil retention—The weight of recovered oil can cause a sorbent structure to sag and deform. When it is lifted out of the water, it can release oil that is trapped in its pores. During recovery of absorbent materials, lighter, less viscous oil is lost through the pores more easily than heavier, more viscous oil.
- Ease of application—Sorbents may be applied to spills manually or mechanically, using blowers or fans. Many natural organic sorbents that exist as loose materials, such as clay and vermiculite, are dusty, difficult to apply in windy conditions, and potentially hazardous if inhaled

4.2.2. FIRE

In case of any fire incident the following steps are to be followed by the site occupants:

- Be concerned about your own safety as well as that of others.
- Inform others by verbal signal: "FIRE, FIRE, FIRE".
- If the fire is controllable by nearby fire extinguishing equipment and you know firefighting, control the fire without undue personal risk.
- Shut off the electrical supply quickly.
- Use fire hydrant system point located nearer to the affected area.
- If you can't extinguish it alone, activate the fire alarm/MCP and get help.
- Inform to Safety and security team-nearest helpdesk
- Inform to manager and site controller
- Make certain you know your escape route and assembly point/safe place.
- Do not panic.
- People not involved in firefighting operation directly, should quickly move through emergency exit routes & assemble at nearest emergency assembly point/safe place.
- For any other assistance – Call emergency number.

4.2.3. ELECTRICAL FIRE

In case of any electrical fire occurred due to short circuiting or any other reason the following procedure needs to be followed by the occupants:

- Switch off the main switch.
- Activate the fire alarm/MCP and get help.
- Before using a fire extinguisher make sure that it is not outdated, and it is of Carbon dioxide type.
- Don't use water to extinguish the fire if the main line is live.
- Inform to site controller/location Head
- Make certain you know your escape route and assembly point/safe place.
- Do not panic. Inform Utility or security person
- Inform to Admin and site controller
- Make certain you know your escape route and assembly point/safe place.
- Do not panic.
- For any other assistance call emergency number.

4.2.4. GAS FIRES

If a cylinder has caught on fire OR is in close proximity to a fire than the following actions shall be taken:

- Evacuate the area 100m around the fire
- Inform those within 100-300m from the fire that a gas cylinder is involved in the fire
- Call the fire brigade and inform them of the fires location and gas(es) involved.
- Inform your gas supplier of the incident as the cylinder integrity will have been compromised.
- Do not attempt to fight the fires

4.2.5. NATURAL CALAMITIES

In case any natural disaster like earthquake the following procedure should be followed by the occupants:

a) When earthquake is felt:

- Take a safe position
- Keep away from walls, building, and electric pole/wires as there are chances of collapsing.
- Keep away from electric wires and poles which may trigger electricity.

b) After the earthquake:

- There can be more such jerks immediately hence go to open space.
- Do not touch electric wires.
- Don not go near the cracked flooring as they may get collapsed .
- Do not go near partially collapsed buildings.
- Keep roads clear for traffic.

c) In case of flood:

- Be ready to evacuate as directed by the Emergency Coordinator.
- Follow the recommended primary or secondary evacuation routes.
- Climb to high ground and stay there.
- Avoid walking or driving through flood water.
- For further help contact emergency.

d) Post cyclone measures:

- You should remain in the shelter until informed that you can return to your home.
- You must get inoculated against diseases immediately.
- Strictly avoid any loose and dangling wires from lamp posts.
- If you have to drive, do drive carefully.
- Clear debris from your premises immediately.
- Report the correct losses to appropriate authorities

e) In case of tsunami

- Move immediately to higher ground,
- Do not wait for a tsunami warning to be announced.
- Stay away from rivers and streams that lead to the ocean as you would stay away from the beach and ocean if there is a tsunami.
- A regional tsunami from a local earthquake could strike some areas before a tsunami warning could be announced.
- Tsunamis generated in distant locations will generally give people enough time to move to higher ground. For locally-generated tsunamis, where you might feel the ground shake, you may only have a few minutes to move to higher ground.
- High, multi-story, reinforced concrete hotels are located in many low-lying coastal areas. The upper floors of these hotels can provide a safe place to find refuge should there be a tsunami warning and you cannot move quickly inland to higher ground.

- Homes and small buildings located in low-lying coastal areas are not designed to withstand tsunami impacts. Do not stay in these structures should there be a tsunami warning.
- Offshore reefs and shallow areas may help break the force of tsunami waves, but large and dangerous wave can still be a threat to coastal residents in these areas.
- Staying away from all low-lying areas is the safest advice when there is a tsunami warning.

4.2.6. STRUCTURAL COLLAPSE

- Raising the emergency signal.
- Evacuate the site immediately and assemble at Assembly point/safe place
- Isolate & Barricade if necessary.
- Head count to be taken by the security or emergency response team.
- Rescue Operation to be carried out in case of missing personals.
- Hospitalize the victims in case of injury.

4.2.7. MEDICAL EMERGENCY

- Provide information to Emergency Response Team immediately.
- Provide the necessary first aid treatment.
- In case of critical emergency, move injured person to hospital
- Local legal requirement to be carried out.
- Information to be given to branch manager.