HSEPL
HPCL SHAPOORJI ENERGY PVT LTD

# HPCL SHAPOORJI ENERGY PVT LTD

Ref. No. HSEPL/MOEFCC/2020/003

Date: 12th June 2020

To,

Director(s)
Ministry of Environment, Forests and Climate Change
Regional Office (WZ)
E – 5, Kendriya Paryavaran Bhawan
E – 5, Arera Colony, Link Road # 3, Ravi Shankar Nagar,
Bhopal – 462 016 (M.P.)

Subject : Submission of six-monthly EC Compliance Report for the period of December 2019 to May 2020.

References : MOEFCC letter F. No. 11-01/2014-IA-III Dated 5th March 2019

Respected Sir(s),

We, HPCL Shapoorji Energy Pvt. Ltd., have proposed to develop LNG storage and re-gasification terminal at village Chhara, Taluka Kodinar, District Gir Somnath, Gujarat.

The Ministry of Environment, Forest and Climate Change granted Environment and CRZ Clearance for Development of LNG storage and re-gasification terminal at village Chhara, Taluka Kodinar, District Gir-Somnath, Gujarat by M/s HPCL Shapoorji Energy Pvt. Ltd., vide letter F. No. 11-01/2014-IA-III dated 5th March 2019.

As directed in the referred letter, we are submitting herewith six-monthly EC compliance report for the period of December 2019 to May 2020 on implementation of various conditions of EC as per clause 10 of EIA notification, 2006 & amended till date.

We hope you will find this in order. We shall look forward for your valuable inputs & advice to make the things better and environmentally suitable.

Thanking you,

Yours faithfully,
For HPCL Shapoorji Energy Private Limited

S. Baitalik
VP – Projects

HPCL Shapoorji Energy Pvt. Ltd.



**Corporate Office** Third Floor - West Wing, Forbes Building, Charanjit Rai Marg, Fort, Mumbai - 400001.

**Registered Office** Venus Amadeus, 301-305, 3rd Floor, Jodhpur Cross Road, Satellite, Ahmedabad - 380015.

**Tel** 022 62796666

**CIN** U40101GJ2013PTC077228

Encl.: EC copy, Compliance Report with relevant Annexures

Copy of EC Compliance Report to:

1) The Secretary, Department of Environment & Forest, Govt. Of Gujarat, Secretariat, Gandhinagar – 382010
2) Central Pollution Control Board, Parivesh Bhavan, Aatmajyoti Ashram Rd, Opp. VMC Ward Office No. 10, Subhanpura, Vadodara, Gujarat 390023
3) Gujarat Pollution Control Board, Paryavaran Bhavan, Opp. Bij Nigam, CHH Road, Sector 10A, Gandhinagar, Gujarat 382010
4) Gujarat Pollution Control Board, Regional Office, 'Pankaj Bungalow', Opp. Saint Anne's Church, Station Road, Junagadh - 362001.

# HPCL Shapoorji Energy Pvt. Ltd.

**Environmental Clearance – Compliance Report**

**Development of LNG Storage and Regasification Terminal at Village Chhara, Taluka Kodinar, District Gir Somnath, Gujarat**

**Period: December 2019 to May 2020**

**F.NO. 11-01/2014-IA-III - EC letter dated 5th March 2019**

**June 2020**

# SIX-MONTHLY COMPLIANCE OF ENVIRONMENTAL CLEARANCE FOR THE PERIOD OF DECEMBER 2019 TO MAY 2020

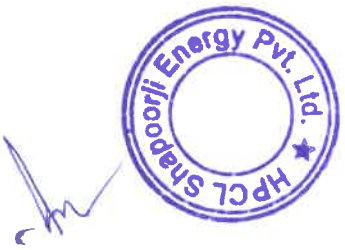
**About Project:**

M/s HPCL Shapoorji Energy Pvt. Ltd. (HSEPL) is developing a 5 MMTPA Greenfield LNG Storage and Regasification Terminal at Village Chhara, District Gir-Somnath, Gujarat. The Chhara LNG Terminal is being developed within Chhara Port.

The Chhara Port is being developed by M/s Simar Port Pvt. Ltd. (SPPL) under Concession Agreement between Gujarat Maritime Board (GMB), Simar Port Pvt. Ltd., and Government of Gujarat.

HSEPL was granted Environmental and CRZ Clearance vide letter F. No. 11-01/2014-IA-III dated 5th March, 2019, for development of LNG storage and Regasification Terminal at Village Chhara Taluka Kodinar, District Gir Somnath, Gujarat.

LNG Terminal site development activities commenced from September 2019. Site grading activities have been completed. Foundation work for Pipe Racks and Equipments are under progress.



## A. Compliance Status on Environmental and CRZ Clearance

| S. No. | Condition | Status | Status of Compliance |
|---|---|---|---|
| A | **Specific Conditions** | | |
| i. | Construction activity shall be carried out strictly according to the provisions of CRZ Notification, 2011. No construction work other than those permitted in Coastal Regulation Zone Notification shall be carried out in Coastal Regulation Zone area. | Being Complied | Construction activity is being carried out according to the provisions of CRZ Notification, 2011.<br><br>No construction work other than those permitted in Coastal Regulation Zone Notification will be carried out in Coastal Regulation Zone area. |
| ii. | All the recommendations and conditions specified by The Gujarat Coastal Zone Management Authority (GCZMA) vide letter no. ENV-10-2016-50-E (T cell) dated February 2, 2017 shall be complied with. | Agreed | Compliance of recommendations are attached as ***Annexure 1*** |
| iii. | The project proponent shall ensure that the project is in consonance with the new CZMP prepared by the State Government under the provisions of the CRZ Notification, 2011. | Agreed to Comply (under process) | IRS certification will be obtained by HSEPL |
| iv. | The Project proponent shall ensure that no creeks or rivers are blocked due to any activities at the project site and free flow of water is maintained. | Complied | There are no creeks or rivers within the proposed port area. |
| v. | Shoreline should not be disturbed due to any activity. Periodical study on shore line changes shall be conducted and mitigation carried out, if necessary. The details shall be submitted along with the six monthly monitoring reports. | Will be complied | Please refer ***Annexure 2***, wherein Simar Port Pvt. Ltd. (SPPL) has given its comments regarding compliance of the condition. |
| vi. | The ground water shall not be tapped within the CRZ areas by the Project Proponent to meet with the water requirement in any case. Monitoring of ground water shall be carried out as per CGWA guidelines. | Being Complied | During construction phase, required water is sourced by tanker from Kodinar and Dewali Villages. Ground water will not be used as water source during construction and operation phase.<br><br>No ground water tapping has been done. Piezometers have been installed in the Project Site.<br><br>Ground water is being monitored, water analysis reports are attached as ***Annexure 3***. |
| vii. | Based on the Comprehensive Marine EIA study done by National Institute of Oceanography (NIO) as submitted with EIA/EMP report, a detailed marine biodiversity management plan shall be prepared on marine, brackish water and fresh water ecology and biodiversity and implemented. The report shall be | Will be Complied | Please refer ***Annexure 2***, wherein Simar Port Pvt. Ltd. (SPPL) has given its comments regarding compliance of the condition. |

| S. No. | Condition | Status | Status of Compliance |
|---|---|---|---|
| | based on a study of the impact of the project activities on the intertidal biotopes, corals and coral communities, molluscs, sea grasses, sea weeds, subtidal habitats, fishes, other marine and aquatic micro, macro and mega flora and fauna including benthos, plankton, turtles, birds etc. as also the productivity. The data collection and impact assessment shall be as per standards survey methods. It will also address to the whales and turtles and the impact of oil spills on the complete spectrum of marine biology. | | |
| viii. | Marine ecology shall be monitored regularly also in terms of sea weeds, sea grasses, mudflats, sand dunes, fisheries, echinoderms, shrimps, turtles, corals, coastal vegetation, mangroves and other marine biodiversity components as part of the management plan. Marine ecology shall be monitored regularly also in terms of all micro, macro and mega floral and faunal components of marine biodiversity. | Will be complied | Please refer ***Annexure 2***, wherein Simar Port Pvt. Ltd. (SPPL) has given its comments regarding compliance of the condition. |
| ix. | Online pollutant monitoring shall be provided as per CPCB guidelines for monitoring particulate matter, SO2, NOx and CO from the stack. HC and CO to be included in the regular AAQ monitoring. | Will be complied | The condition will be complied during operations stage, as the Project is currently in under Construction stage. |
| x. | Apart from Emergency Response Plan as submitted with EIA/EMP report, the project proponents would also draw up and implement a management plan for the prevention of fires due to simultaneous handling of coal and LNG in close vicinity | Will be complied | Emergency Response Plan will be prepared 6 months prior to commencement of commercial operations. |
| xi. | The project proponents will draw up and implement an action plan to watch the interest of the fishing communities, apprehensive of adverse impacts, particularly fisherman communities in the villages of Dhamleg, Muldwaraka, Chhara, Madhwad, Kotrada and Velna. | Will be complied | Please refer ***Annexure 2***, wherein Simar Port Pvt. Ltd. (SPPL) has given its comments regarding compliance of the condition. |
| xii. | Ship movements shall be so regulated that the mangroves of the Madhwad creek, reported to be 7 Kms away from the project site are not adversity affected. | Will be complied | Please refer ***Annexure 2***, wherein Simar Port Pvt. Ltd. (SPPL) has given its comments regarding compliance of the condition. |
| xiii. | Spillage of fuel / engine oil and lubricants from the construction site are a source of organic pollution | Will be complied | During the Project stage adequate measures will be adopted to prevent oil spillage. |

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| S. No. | Condition | Status | Status of Compliance |
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| | which impacts marine life, particularly benthos. This shall be prevented by suitable precautions and also by providing necessary mechanisms to trap the spillage. | | |
| xiv. | Necessary arrangements for the treatment of the effluents and solid wastes must be made and it must be ensured that they conform to the standards laid down by the competent authorities including the Central or State Pollution Control Board and under the Environment (Protection) Act, 1986. | Will be complied | Effluents generation is not envisaged in LNG plant operation.<br>However, HSEPL will adopt suitable mechanism to comply with this condition. HSEPL has received approval from State Pollution Control Board and HSEPL will follow all guidelines for monitoring Environmental conditions. |
| xv. | All the recommendations mentioned in the rapid risk assessment report, disaster management plan and safety guidelines shall be implemented. | Will be complied | All the recommendations mentioned in the rapid risk assessment report, disaster management plan and safety guidelines will be implemented. |
| xvi. | The commitments made during the Public Hearing and recorded in the Minutes shall be complied with letter and spirit. A hard copy of the action taken shall be submitted to the Ministry. | Will be complied | Please refer ***Annexure 2***, wherein Simar Port Pvt. Ltd. (SPPL) has given its comments regarding compliance of the condition. |
| xvii. | Vocational Training shall be included in the CSR. | Will be complied | The Project is currently ~~in~~ under construction stage. CSR activities will be planned upon commencement of commercial operations of the LNG Terminal. |
| xviii. | All the mitigation measures submitted in the EIA report shall be prepared in a matrix format and the compliance for each mitigation plan shall be submitted to the RO, MoEF&CC along with half yearly compliance report. | Will be complied | Currently site preparation is under process, mitigation measures like Covering trucks to prevent dust emission, temporary sanitation facilities and water tanker from nearby villages are being complied.<br><br>All the mitigation measures submitted in the EIA report will be implemented.<br><br>Ambient air quality and Noise level monitoring results for the site are attached as ***Annexure 3.*** |
| xix. | As per the Ministry's Office Memorandum F.No.22-65/2017-IA.III dated 1st May 2018, the project proponent shall prepare and implement Corporate Environment Responsibility (CER) Plan. | Will be complied | Corporate Environment Responsibility (CER) plan shall be prepared and implemented. |
| **B** | **General Conditions** | | |
| i. | Appropriate measures must be taken while undertaking digging activities to avoid any likely degradation of water quality. | Will be complied | Piezometers are installed at site. Ground water quality is being checked on quarterly basis.<br><br>Ground water analysis reports are attached as ***Annexure 3.*** |
| ii. | Full support shall be extended to the officers of this Ministry/ Regional | Agreed | HSEPL will extend full support to the officers of MOEF/ Regional Office |

| S. No. | Condition | Status | Status of Compliance |
|---|---|---|---|
| | Office at Chennai by the project proponent during inspection of the project for monitoring purposes by furnishing full details and action plan including action taken reports in respect of mitigation measures and other environmental protection activities. | | |
| iii. | A six-Monthly monitoring report shall need to be submitted by the project proponents to the Regional Office of this Ministry at Chennai regarding the implementation of the stipulated conditions. | Complied | Six-Monthly monitoring report for period of June 2019 to November 2019 was submitted to the regional office vide letter HSEPL/MOEFCC/2019/002 dated 6th December 2019.<br><br>Six-monthly monitoring report is being submitted to the Ministry and HSEPL will continue to adhere to this provision. |
| iv. | Ministry of Environment, Forest and Climate Change or any other competent authority may stipulate any additional conditions or modify the existing ones, if necessary in the interest of environment and the same shall be complied with. | Agreed | HSEPL acknowledges that MOEF and other competent authority may stipulate additional conditions or modify the existing ones. HSEPL will comply with the conditions as stipulated by MOEF/competent authority. |
| v. | The Ministry reserves the right to revoke this clearance if any of the conditions stipulated are not complied with the satisfaction of the Ministry. | Agreed | |
| vi. | In the event of a change in project profile or change in the implementation agency, a fresh reference shall be made to the Ministry of Environment, Forest and Climate Change. | Agreed | HSEPL will notify MOEF in case of any change in project profile. |
| vii. | The project proponents shall inform the Regional Office as well as the Ministry, the date of financial closure and final approval of the project by the concerned authorities and the date of start of land development work. | Agreed | HSEPL achieved financial closure on 16th March 2020. Common Rupee Loan Agreement was signed between HSEPL and Consortium of six Public Sector Banks led by State Bank of India (SBI). |
| viii. | A copy of the clearance letter shall be marked to concerned Panchayat/local NGO, if any, from whom any suggestion/ representation have been made received while processing the proposal. | Complied | Copies of clearance letters have been submitted to District Development Officer Gir-Somnath, Taluka Development Office of Kodinar and Municipal Corporation Kodinar |
| ix. | A copy of this clearance letter shall also be displayed on the website of the concerned State Pollution Control Board. The Clearance letter shall also be displayed at the Regional Office, District Industries | Complied | Copy of clearance letter has been submitted to Gujarat Pollution Control Board (GPCB) |

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| S. No. | Condition | Status | Status of Compliance |
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| | centre and Collector's Office/ Tehsildar's office for 30 days. | | |
| 4 | All other statutory clearances such as the approvals for storage of diesel from Chief Controller of Explosives, Fire Department, Civil Aviation Department, Forest Conservation Act, 1980 and Wildlife (Protection) Act, 1972 etc. shall be obtained, as applicable by project proponents from the respective competent authorities. | Will be complied | Copies of PESO Clearance letters submitted vide Six-Monthly Report dated 6th December 2019. |
| 5 | The project proponent shall advertise in at least two local Newspapers widely circulated in the region, one of which shall be in the vernacular language informing that the project has been accorded Environmental and CRZ Clearance and copies of clearance letters are available with the State Pollution Control Board and may also be seen on the website of the Ministry of Environment, Forest and Climate Change at http://www.envfor.nic.in. The advertisement should be made within Seven days from the date of receipt of the Clearance letter and a copy of the same should be forwarded to the Regional office of this Ministry at Bhopal. | Complied | Complied. |
| 6 | This clearance is subject to final order of the Hon'ble Supreme Court of India in the matter of Goa Foundation Vs. Union of India in Writ Petition (Civil) No. 460 of 2004 as may be applicable to this project. | Agreed | |
| 7 | Any appeal against this clearance shall lie with the National Green Tribunal, if preferred, within a period of 30 days as prescribed under Section 16 of the National Green Tribunal Act, 2010. | Noted | |
| 8 | Status of compliance to the various stipulated environmental conditions and environmental safeguards will be uploaded by the project proponent in its website. | Will be complied | Company website is under development. Compliance status will be uploaded on the website. |
| 9 | A copy of the clearance letter shall be sent by the proponent to concerned Panchayat, Zilla Parisad/Municipal Corporation, Urban Local Body and the Local NGO, if any, from whom suggestions/representations, if any, were received while processing the proposal. The clearance letter shall | Complied | Complied.<br><br>Copy of clearance submitted to District Development Officer, Gir Somnath, Municipal Corporation, Kodinar, Taluka Development Officer vide letter dated 24/04/19. |

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| S. No. | Condition | Status | Status of Compliance |
|---|---|---|---|
| | also be put on the website of the company by the proponent. | | Copy of clearance letter shall be uploaded on the company website. The Company is in the process of launching the website. |
| 10 | The proponent shall upload the status of compliance of the stipulated Clearance conditions, including results of monitored data on their website and shall update the same periodically. It shall simultaneously be sent to the Regional Office of MoEF&CC, the respective Zonal Office of CPCB and the SPCB. | Will be complied | Company website is under development. Compliance status will be uploaded on the same after launching the website |
| 11 | The project proponenet shall also submit six monthly reports on the status of compliance of the stipulated clearance conditions including results of monitored data (both in hard copy as well as by e-mail) to the respective Regional Office of MoEF&CC, the respective Zonal Office of CPCB and the SPCB. | Complied | Six-Monthly monitoring report for period of June 2019 to November 2019 was submitted to the regional office vide letter HSEPL/MOEFCC/2019/002. |
| 12 | The environmental statement for each financial year ending 31st March in Form-V as is mandated to be submitted by the project proponent to the concerned State Pollution Control Board as prescribed under the Environment (Protection) Rules, 1986, as amended subsequently, shall also be put on the website of the company along with the status of compliance of Clearance conditions and shall also be sent to the respective Regional Office of MoEF&CC by e-mail. | Agreed | Company website is under development. Compliance status will be uploaded on the same after launching the website |
| 13 | The above stipulations would be enforced among others under the provisions of Water (Prevention and Control of Pollution) Act 1974, the Air (Prevention and Control of Pollution) Act 1981, the Environment (Protection) Act, 1986, the Public Liability (Insurance) Act, 1991 and EIA Notification 1994, including the amendments and rules made thereafter. | Agreed | |

## ANNEXURE 1: COMPLIANCE WITH RECOMMENDATIONS OF GCZMA AND PCCF

**CRZ Clearance – Specific Conditions**

**Ref. No. ENV-10-2016-50-E (T-cell) February 2, 2017**

| S. No. | Recommendation | Status | Status of Compliance |
|---|---|---|---|
| 1. | The provisions of the CRZ Notification of 2011 shall be strictly adhered to by M/s SPL. No activity in contradiction to the provisions of the CRZ Notification shall be carried out by M/s HPCLSEPL | Agreed | Please refer ***Annexure 2***, wherein Simar Port Pvt. Ltd. (SPPL) has given its comments regarding compliance of the condition.<br>HSEPL shall ensure that CRZ Notification is strictly adhered to. |
| 2. | The HPCLSEPL shall ensure that adequate numbers of underpasses are provided in road construction to minimize the wildlife conflict and also traffic management plan shall be implemented as per report, in consultation with PCCF(WL) and allocate adequate fund for the same. | Will be complied | Please refer ***Annexure 2***, wherein Simar Port Pvt. Ltd. (SPPL) has given its comments regarding compliance of the condition. |
| 3. | The HSEPL shall ensure that the over bridge is provided with adequate height with ground level, wherever, it is not possible to provide underpasses to minimize the Wildlife conflict, in consultation with PCCF(WL) and allocate adequate fund for the same. | Will be complied | Please refer ***Annexure 2***, wherein Simar Port Pvt. Ltd. (SPPL) has given its comments regarding compliance of the condition. |
| 4. | A Marine Conservation center may be developed at Chhara with objective of educating the people and creating awareness amongst the people for Wildlife conservation. | Will be complied | Please refer ***Annexure 2***, wherein Simar Port Pvt. Ltd. (SPPL) has given its comments regarding compliance of the condition. |
| 5. | The HPCLSEPL shall earmark appropriate fund for the cause of conservation of lion and conflict management with "Lion Conservation Society" on annual basis. | Will be complied | Please refer ***Annexure 2***, wherein Simar Port Pvt. Ltd. (SPPL) has given its comments regarding compliance of the condition. |
| 6. | 100 m green belt shall be developed by the HSEPL outside the hard boundary. i.e after the footprint of layout of the plant, in consultation with Forests Department and maintenance will be done by HPCLSEPL. | Will be complied | Please refer ***Annexure 2***, wherein Simar Port Pvt. Ltd. (SPPL) has given its comments regarding compliance of the condition.<br>PCCF has responded to the SPPL letter no. SPPL/Chhara/80/2019. PCCF letter is attached as ***Annexure 4***. SPPL is in the process of responding to the same. |
| 7. | The HPCLSEPL shall have to comply with all other conditions/ recommendations made by the PCCF (WL) vide his letter No: WLP/32/A/1501-1504/2016-17 dated 02-12-2016. | Will be complied | Compliance with all other conditions/ recommendations made by the PCCF (WL), given in ***Annexure 1 – PCCF Conditions*** |

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| S. No. | Recommendation | Status | Status of Compliance |
|---|---|---|---|
| 8. | The HPCLSEPL shall not start any construction activity without obtaining Environmental Clearance and CRZ clearance from the MoEF&CC, GOI. | Complied | HSEPL has received EC and CRZ clearance for the construction activity vide letter no. F. No. 11-01/2014-IA-III, Dated 5th March, 2019. Construction activity started on June-2019. |
| 9. | All necessary permissions from different Government Departments/agencies shall be obtained by M/s HPCLSEPL before commencing any enabling activities. | Will be complied | All relevant permission obtained and Construction activity commenced in June-2019. |
| 10. | Dredging disposal site may be examined to ensure that it does not adversely affect the region west to the proposed port, which is known for whale shark presence and it shall be based on the 8odelling study done by the an agency of National repute. | Will be complied | Please refer ***Annexure 2***, wherein Simar Port Pvt. Ltd. (SPPL) has given its comments regarding compliance of the condition. |
| 11. | All the recommendations and suggestions given by NEERI Nagpur in their Comprehensive Environment Impact Assessment reports for conservation protection and betterment of environment shall be implemented strictly by M/s HPCLSEPL | Will be complied | Please refer ***Annexure 3*** for Environmental Monotoring Reports. |
| 12. | The construction and operational activities shall be carried out in such a way that there is no negative impact on mangroves, if any, and other important coastal /marine habitats. The construction activities shall be carried out only under the guidance / supervision of the reputed institute / organization. | Complied | As per EIA report by NEERI, there are no mangroves at project site. |
| 13. | M/s HPCLSEPL shall strictly ensure that no creeks or rivers are blocked due to any activity at the site. | Complied | There are no creeks or rivers within the proposed port area. |
| 14. | The construction debris and /or any other type of waste shall not be disposed of into the sea, creek or in the CRZ areas. The debris shall be removed from the construction site immediately after the construction is over. | Agreed, will be Complied | The construction debris will be removed from the construction site immediately after the construction is over. |
| 15. | The construction camps shall be located outside the CRZ area and the construction labour shall be provided with the necessary amenities, including sanitation, water supply and fuel and it shall be ensured that the environmental conditions are not deteriorated by the construction labours. | Agreed, will be complied | The Construction camps are not located in CRZ area. The said camps are provided with necessary amenities. |

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| S. No. | Recommendation | Status | Status of Compliance |
|---|---|---|---|
| 16. | M/s SPL shall prepare and regularly update their Local Oil Spill Contingency and Disaster Management Plan in consonance with the National Oil Spill and Disaster Contingency Plan and shall submit the same to this Department after having it vetted through the Indian Coast Guard. | Will be complied | Please refer ***Annexure 2***, wherein Simar Port Pvt. Ltd. (SPPL) has given its comments regarding compliance of the condition. |
| 17. | M/s HPCLSEPL shall bear the cost of the external agency that may be appointed by this Department for supervision / monitoring of proposed activities and the environmental impacts of the proposed activities. | Will be Complied | HSEPL agrees to bear the cost of external agency. |
| 18. | The groundwater shall not be tapped within the CRZ areas by the SPL to meet with the water requirements in any case. | Complied | No ground water tapping has been done. During construction stage required water is sourced by Tanker from Kodinar and Devli villages. |
| 19. | Massive greenbelt development program including the mangrove plantation in 50 ha. shall be carried out in consultation with the Gujarat Ecology Commission/ Forest Department by M/s HPCLSEPL. | Will be complied | Please refer ***Annexure 2***, wherein Simar Port Pvt. Ltd. (SPPL) has given its comments regarding compliance of the condition. |
| 20. | M/s HPCLSEPL shall have to contribute financially for taking up the socio-economic upliftment activities in this region in consultation with the Forests and Environment Department and the District Collector / District Development Officer. | Will be complied | The Project is currently in construction stage. CSR activities will be planned upon commencement of commercial operations of the LNG Terminal. |
| 21. | A separate budget shall be earmarked for environmental management and socio-economic activities including the greenbelt/ mangrove plantation and details thereof shall be furnished to this Department as well as the MoEF& CC, GOI. The details with respect to the expenditure from this budget head shall also be furnished alongwith the compliance report. | Will be complied | Please refer ***Annexure 2***, wherein Simar Port Pvt. Ltd. (SPPL) has given its comments regarding compliance of the condition. |
| 22. | A separate Environmental Management Cell with qualified personnel shall be created for environmental monitoring and management during construction and operational phases of the project. | - | HSE department/cell are set up by EPC Contractors to ensure strict implementation of stipulated environmental safeguards during Construction stage. During operation stage, HSEPL will setup HSE department to monitor strict implementation. |
| 23. | Environmental Audit report indicating the changes, if any, with respect to the | - | Not applicable to period under review. |



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| S. No. | Recommendation | Status | Status of Compliance |
|---|---|---|---|
| | baseline environmental quality in the coastal and marine environment shall be submitted every year by M/s HPCLSEPL to this Department as well as to the MoEF&CC, GOI. | | Will be complied during operation phase. |
| 24. | A six monthly report on compliance of the conditions mentioned in this letter shall have to be furnished by M/S HPCLSEPL on a regular basis to this Department as well as to the Ministry of Environment, Forests and Climate Change, Government of India | Complied | Six-Monthly monitoring report for period of June 2019 to November 2019 submitted to the regional office vide letter HSEPL/MOEFCC/2019/002 dated 6th December 2019. |
| 25. | Any other condition that may be stipulated by this Department/ Ministry of Environment Forests and Climate Change, Government of India from time to time for environmental protection / management purpose shall also have to be complied with by M/s HPCLSEPL. | Agreed and Will be complied | |
| | **PCCF Conditions** | | |
| 1. | The phase I of project envisaged 5 MTPA (million tonne per annum) of coal which is likely to generate vehicle 400 truck. While phase II envisages that the LNG terminal will be having capacity of 5MMTP A expandable upto 10 MMTP A and this will generate significant traffic of more than 1000 trucks per day during operation. | Will be complied | Please refer ***Annexure 2***, wherein Simar Port Pvt. Ltd. (SPPL) has given its comments regarding compliance of the condition.<br>During operation phase, RLNG will supplied to consumers through pipeline connecting to GSPL Gas Grid. |
| 2. | The road route proposed for phase II has been slightly modified from that in phase-I. The Sarkadi village will now come to the west of the road. The old and new alignment is as shown in annexure 1 of report. The new alignment must be studied and adequate number of underpasses needs to be provided as suggested in EIA Report as well as Lion Conservation Plan. | Will be complied | Please refer ***Annexure 2***, wherein Simar Port Pvt. Ltd. (SPPL) has given its comments regarding compliance of the condition. |
| 3. | During construction phase the movement of material would be through ship & road. The site manager informed that some material of proposed extension (including old one as it is not yet constructed) is to be brought from local quarries. Therefore the road construction with underpasses is must beforehand so that wildlife conflict is minimal. The traffic | Will be complied | Please refer ***Annexure 2***, wherein Simar Port Pvt. Ltd. (SPPL) has given its comments regarding compliance of the condition. |



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| S. No. | Recommendation | Status | Status of Compliance |
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| | management plan as proposed in repost is necessary. | | |
| 4. | The Pipavav Port the lion death due to accident was mainly due to blockage in natural lines. The same should not happen here so elevated section and green belt must be implemented as per recommendations. However, the road construction is being done by R&B department of Government of Gujarat who may not be aware of the conditions. There are no underpasses in section from NH8E to Bawana Pipaliva. SPPL may be asked to ensure that the underpasses are constructed. | Will be complied | Please refer ***Annexure 2***, wherein Simar Port Pvt. Ltd. (SPPL) has given its comments regarding compliance of the condition. |
| 5. | During construction phase the movement of material would be through ship & road. Even though the report & letter gives priority to ship load of material the site manager informed that some material of proposed extension (including old one as it is not yet constructed) is to be brought from local quarries. Therefore the road work with underpasses are necessary so that wildlife conflict is minimal. The traffic management plan as proposed in report is necessary. | Will be complied | Please refer ***Annexure 2***, wherein Simar Port Pvt. Ltd. (SPPL) has given its comments regarding compliance of the condition. |
| 6. | During operational phase the transport LNG and coal is through rails, trucks and LNG pipelines. If the new LPG terminal is proposed then before it gets connected to pipeline may be re-gasified in cylinders and then transported. It may be suggested that the bottling plant should be near the Town to minimize additional truck traffic. It may be recommended that the bottling plant may be outside this area and may be connected through pipe line. The idea of connecting the supply with GSPL grid may be preferred over truck transportation. | Will be complied | Please refer ***Annexure 2***, wherein Simar Port Pvt. Ltd. (SPPL) has given its comments regarding compliance of the condition.<br>During operation phase, RLNG supply will be through pipeline connecting to GSPL Gas Grid. |
| 7. | During operational phase the EIA report suggests that there will be uncontrolled commercial growth that may impact agriculture activities. The report suggests that planning authorities of the region have to come with development strategy to regulate the.land use change in the vicinity of | Will be complied | Please refer ***Annexure 2***, wherein Simar Port Pvt. Ltd. (SPPL) has given its comments regarding compliance of the condition. |



HPCL Shapoorji Energy Pvt. Ltd.

| S. No. | Recommendation | Status | Status of Compliance |
|---|---|---|---|
| | LNG terminal. (EIA Report, section 4.4.3 in Page 4.24). As land use change will also affect lion and its conflict, this may be added in the recommendation. | | |
| 8. | The labour camp during the construction phase would generate significant sewage lad (EIA Report section7.4 page xix). It may be recommended that the community toilets and safety of labourers from wildlife is ensured. | Complied | Community toilet facilities for labor camp including all other safety measures have been established. |
| 9. | The underpasses of adequate number may be provided for proposed rail connectivity (Draft EIA Report fig 2.4 page 2.19) based on study of experts to avoid incidence similar to Pipavav Port. | Will be complied | Please refer ***Annexure 2***, wherein Simar Port Pvt. Ltd. (SPPL) has given its comments regarding compliance of the condition. |
| 10. | The 100m green belt may be clarified to be outside hard boundary, but within land acquired by SPPL. The plantation may be done by Forest Department and tpe maintenance will be done by SPPL as suggested in recommendation. | Will be complied | Please refer ***Annexure 2***, wherein Simar Port Pvt. Ltd. (SPPL) has given its comments regarding compliance of the condition.<br>PCCF has responded to the SPPL letter no. SPPL/Chhara/80/2019. PCCF letter is attached as ***Annexure 4***. SPPL is in the process of responding to the same. |
| 11. | It may be added to recommendations that SPPL should earmark appropriate fund for the cause of conservation of lion and conflict management with "Lion Conservation Society" on annual basis. | Will be complied | Please refer ***Annexure 2***, wherein Simar Port Pvt. Ltd. (SPPL) has given its comments regarding compliance of the condition. |
| 12. | A Marine Conservation center may be developed at Chhara with objective of education and awareness on conservation. | Will be complied | Please refer ***Annexure 2***, wherein Simar Port Pvt. Ltd. (SPPL) has given its comments regarding compliance of the condition. |
| 13. | The SPPL may earmark annual fund to carry out activities mentioned in report. | Will be complied | Please refer ***Annexure 2***, wherein Simar Port Pvt. Ltd. (SPPL) has given its comments regarding compliance of the condition. |

HPCL Shapoorji Energy Pvt. Ltd.

# Annexure 2

# Letter from Simar Port Pvt. Ltd. (SPPL) to HSEPL

Date: 2nd December, 2019

Ref: SPPPL/HSEPL/82/2019

To,
Mr. K.S. Rao
Chief Executive Officer
HPCL Shapoorji Energy Pvt Ltd
3rd Floor, West Wing
Forbes Building, Fort
Mumbai-400001

**Subject**: Scope of Simar Port Pvt. Ltd. in EC & CRZ Compliance of HSEPL

**Reference**: Your letter no. HSEPL/SPPL/2019/031 dated 02nd December 2019

Dear Sir,

In reference to your letter HSEPL/SPPL/2019/031 dated 02nd December 2019, please find point-wise reply by SPPL.

| S.No | Action Point | SPPL Comment |
|---|---|---|
| I | **Compliances under Letter No. F. No. 11-01/2014-IA-III dated 5th March 2019 -Environmental & CRZ Clearance from the Ministry of Environment, Forest and Climate Change, Govt. of India, for development of LNG Storage and Regasification Terminal at village Chhara, Taluka Kodinar, Dist. Gir-Somnath.** | |
| 1) | S. No. (v) - Shoreline should not be disturbed due to any activity. Periodical study on shore line changes shall be conducted and mitigation carried out, if necessary. The details shall be submitted along with the six-monthly monitoring report. | Shoreline will not be disturbed due to any activity. Periodic monitoring will be conducted during operations. |
| 2) | S. No. (vii) - Based on the Comprehensive Marine EIA study done by National Institute of Oceanography (NIO) as submitted with EIA/EMP report, a detailed marine biodiversity management plan shall be prepared on marine, brackish water and fresh water ecology and biodiversity and implemented. The report shall be based on a study of the impact of the project activities on the intertidal biotopes, corals and coral communities, molluscs, sea grasses, sea weeds, subtidal habitats, fishes, other marine and aquatic micro, macro and mega flora and fauna including benthos, plankton, turtles, birds etc. as also the productivity. The data collection and impact assessment shall be as per standards survey methods. It will also address to the whales and turtles and the impact of oil spills on the complete spectrum of marine biology. | SPPL will implement Mitigation measures and EMP as recommended by NIO in March 2015 as per Chapter 7 of EIA report. Mitigation measures are attached as Annexure 1 |
| 3) | S. No. (viii) - Marine ecology shall be monitored regularly also in terms | SPPL will monitor Marine |



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| | | |
|---|---|---|
| | of sea weeds, sea grasses, mudflats, sand dunes, fisheries, echinoderms, shrimps, turtles, corals, coastal vegetation, mangroves and other marine biodiversity components as part of the management plan. Marine ecology shall be monitored regularly also in terms of all micro, macro and mega floral and faunal components of marine biodiversity. | ecology on regular basis during operation phase. |
| 4) | S. No. (xi) - The project proponents will draw up and implement an action plan to watch the interest of the fishing communities, apprehensive of adverse impacts, particularly fisherman communities in the villages of Dhamleg, Muldwaraka, Chhara, Madhwad, Kotrada and Velna. | During operation phase, SPPL will carry out CSR activities to help the fishing community in the area. |
| 5) | S. No. (xii) - Ship movements shall be so regulated that the mangroves of the Madhwad creek, reported to be 7 Kms away from the project site are not adversity affected | Ship movement will be carried out only in the approved approach channel which will not impact mangroves of Madhwad creek which is at a distance of 7 Kms away from the project site. However, same will be reconfirmed during operations phase. |
| 6) | S. No. (xvi) - The commitments made during the Public Hearing and recorded in the Minutes shall be complied with letter and spirit. A hard copy of the action taken shall be submitted to the Ministry. | SPPL will comply with commitments made by SPPL during Public Hearing. |
| II | **Compliances under Letter No. ENV-10-2016-50-E (T cell) dated 2nd February 2017 – CRZ clearance for development from Forests & Environment Department, Govt. of Gujarat, for development of LNG Storage and Regasification Terminal at village Chhara, Taluka Kodinar, Dist. Gir-Somnath.** | |
| 7) | S. No. 1 - The provisions of the CRZ Notification of 2011 shall be strictly adhered to by M/s SPL. No activity in contradiction to the provisions of the CRZ Notification shall be carried out by M/s HPCLSEPL | SPPL will comply with provisions of CRZ Notification of 2011 |
| 8) | S. No. 2 - The HPCLSEPL shall ensure that adequate numbers of underpasses are provided in road construction to minimize the wildlife conflict and also traffic management plan shall be implemented as per report, in consultation with PCCF(WL) and allocate adequate fund for the same. | SPPL has prepared Traffic Management Plan and is in process of taking approval from PPCF for the same. Final port approach road will have adequate number of underpasses. |
| 9) | S. No. 3 - The HPCLSEPL shall ensure that the over bridge is provided with adequate height with ground level, wherever, it is not possible to provide underpasses to minimize the Wildlife conflict, in consultation with PCCF(WL) and allocate adequate fund for the same | SPPL has prepared Traffic Management Plan and is in process of taking approval from PPCF for the same. Final port approach road will have adequate number of underpasses. |
| 10) | S. No. 4 - A Marine Conservation center may be developed at Chhara | SPPL will plan the same during |



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| | | |
|---|---|---|
| | with objective of educating the people and creating awareness amongst the people for Wildlife conservation. | operational phase. |
| 11) | S. No. 5 - The HPCLSEPL shall earmark appropriate fund for the cause of conservation of lion and conflict management with "Lion Conservation Society" on annual basis. | SPPL will earmark appropriate funds as per point no. 26 HSEPL to comply with this point |
| 12) | S. No. 6 - 100 m green belt shall be developed by the HPCLSEPL outside the hard boundary. i.e., after the footprint of layout of the plant, in consultation with Forests Department and maintenance will be done by HPCLSEPL. | SPPL will comply with the same. SPPL has requested forest department for preparing a plan for development of green belt. Green belt will be developed after completion of land acquisition for the port. Letter to PCCF attached as Annexure 2. |
| 13) | S. No. 10 - Dredging disposal site may be examined to ensure that it does not adversely affect the region west to the proposed port, which is known for whale shark presence and it shall be based on the modeling study done by the an agency of National repute. | Dredging material will be disposed off only at approved disposal site by MOEF. |
| 14) | S. No. 16 - M/s SPL shall prepare and regularly update their Local Oil Spill Contingency and Disaster Management Plan in consonance with the National Oil Spill and Disaster Contingency Plan and shall submit the same to this Department after having it vetted through the Indian Coast Guard. | SPPL will prepare Local Oil Spill Contingency and Disaster Management Plan 6 months prior to commencement of operations. It will be prepared in consonance with the National Oil Spill and Disaster Contingency Plan and shall be submitted to Indian Coast Guard for approval. |
| 15) | S. No. 19 - Massive greenbelt development program including the mangrove plantation in 50 ha. shall be carried out in consultation with the Gujarat Ecology Commission/ Forest Department by M/s HPCLSEPL. | SPPL will comply with the same. SPPL has requested forest department for preparing a plan for development of green belt. Green belt will be developed after completion of land acquisition for the port. Mangrove plantation shall be carried out in consultation with Gujarat Ecology Commission/ Forest Department |
| 16) | S. No. 21 - A separate budget shall be earmarked for environmental management and socio-economic activities including the greenbelt I mangrove plantation and details thereof shall be furnished to this | SPPL will carry out green belt development and mangrove plantation. |



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| | | |
|---|---|---|
| | Department as well as the MoEF& CC, GOI. The details with respect to the expenditure from this budget head shall also be furnished alongwith the compliance report. | HSEPL shall carry out environmental management and socio-economic activities. |
| III | **Compliances under Letter No. WLP/32/A/1501-1504/2016-17 dated 2nd December 2016 – Application for CRZ clearance for proposed extension of breakwater for development of greenfield port at Village Chhara, Taluka: Kodinar, District Gir-Somnath.** | |
| 17) | S. No. 1 - The phase I of project envisaged 5 MTPA (million tonne per annum) of coal which is likely to generate vehicle 400 truck. While phase II envisages that the LNG terminal will be having capacity of 5MMTP A expandable upto 10 MMTP A and this will generate significant traffic of more than 1000 trucks per day during operation. | LNG will be evacuated majorly through pipeline hence incremental vehicle movement due to LNG will be minimal. |
| 18) | S. No. 2 - The road route proposed for phase II has been slightly modified from that in phase-I. The Sarkadi village will now come to the west of the road. The old and new alignment is as shown in annexure 1 of report. The new alignment must be studied and adequate number of underpasses needs to be provided as suggested in EIA Report as well as Lion Conservation Plan. | SPPL has prepared Traffic Management Plan and is in process of taking approval from PPCF for the same. Final port approach road will have adequate number of underpasses as per EC conditions. |
| 19) | S. No. 3 - During construction phase the movement of material would be through ship & road. The site manager informed that some material of proposed extension (including old one as it is not yet constructed) is to be brought from local quarries. Therefore, the road construction with underpasses is must beforehand so that wildlife conflict is minimal. The traffic management plan as proposed in repost is necessary. | Land acquisition for final approach road for the port is under progress. Underpasses will be constructed after completion of Land acquisition. |
| 20) | S. No. 4 - The Pipavav Port the lion death due to accident was mainly due to blockage in natural lines. The same should not happen here so elevated section and green belt must be implemented as per recommendations. However, the road construction is being done by R&B department of Government of Gujarat who may not be aware of the conditions. There are no underpasses in section from NH8E to Bawana Pipaliva. SPPL may be asked to ensure that the underpasses are constructed. | SPPL will be constructing underpasses as per Traffic Management Plan after approval of the same by PCCF. SPPL is also developing 100 meter wide green belt in consultation with Gujarat Forest Department. |
| 21) | S. No. 5 - During construction phase the movement of material would be through ship & road. Even though the report & letter gives priority to ship load of material the site manager informed that some material of proposed extension (including old one as it is not yet constructed) is to be brought from local quarries. Therefore, the road work with underpasses are necessary so that wildlife conflict is minimal. The traffic management plan as proposed in report is necessary. | Land acquisition for final approach road for the port is under progress. Underpasses will be constructed after completion of Land acquisition. |
| 22) | S. No. 6 - During operational phase the transport LNG and coal is through rails, trucks and LNG pipelines. If the new LPG terminal is proposed, then before it gets connected to pipeline may be re-gasified in cylinders and then transported. It may be suggested that the bottling plant should be near the Town to minimize additional truck traffic. It may be | No bottling plant will be constructed near the port. |

| | | |
|---|---|---|
| | recommended that the bottling plant may be outside this area and may be connected through pipe line. The idea of connecting the supply with GSPL grid may be preferred over truck transportation. | |
| 23) | S. No. 7 - During operational phase the EIA report suggests that there will be uncontrolled commercial growth that may impact agriculture activities. The report suggests that planning authorities of the region have to come with development strategy to regulate the land use change in the vicinity of LNG terminal. (EIA Report, section 4.4.3 in Page 4.24). As land use change will also affect lion and its conflict, this may be added in the recommendation. | This recommendation was addressed to Additional Chief Secretary, Forest and Environment Department, Govt. of Gujarat.<br>No action required by SPPL |
| 24) | S. No. 9 - The underpasses of adequate number may be provided for proposed rail connectivity (Draft EIA Report fig 2.4 page 2.19) based on study of experts to avoid incidence similar to Pipavav Port. | SPPL is not envisaging rail connectivity in Phase 1. Study by experts will be conducted in coordination with PCCF at the time of route alignment for Rail connectivity. |
| 5) | S. No. 10 - The 100m green belt may be clarified to be outside hard boundary, but within land acquired by SPPL. The plantation may be done by Forest Department and the maintenance will be done by SPPL as suggested in recommendation. | SPPL will comply with the same. SPPL has requested forest department for preparing a plan for development of green belt. Letter attached as Annexure 2. Green belt will be developed after completion of land acquisition for the port. |
| 26) | S. No. 11 - It may be added to recommendations that SPPL should earmark appropriate fund for the cause of conservation of lion and conflict management with "Lion Conservation Society" on annual basis. | SPPL will earmark appropriate funds as per approved Lion Conservation Plan. |
| 27) | S. No. 12 - A Marine Conservation center may be developed at Chhara with objective of education and awareness on conservation. | SPPL will plan the same during operational phase. |
| 28) | S. No 13 - The SPPL may earmark annual fund to carry out activities mentioned in report. | SPPL will comply. |

Thanking You.

Yours truly,
**For Simar Port Private Limited**

**Capt. Nitin Bondre**
**CEO – Ports & Terminals**



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# 5 NUMERICAL MODELING OF FLOW

HPCL in association with Shapoorji Pallonji group is proposing to construct a LNG jetty at Chhara, Dist: Gir Somanath. They came out with two options in designs of breakwater and its marine facilities. As the proposed developments involve construction of a longer breakwater and approach trestle bridge to obtain the suitable draft and a shorter breakwater and approach trestle bridge (Figure 5.1.1).

The flow model is to be run to predict the flow regime changes in the domain due to the development works being undertaken. Sediment transport model will be run to predict the bed level changes due to the proposed development activities. The study of flow conditions is prerequisite to understand the sediment transport. For this, a numerical model - FLOSOFT is applied. This model study predicts the flow regime for the conditions, i.e. as existing (before any of the proposed development activities have been taken up) and after the development (after proposed jetties, dredging / reclamation etc are put in place). SEDSOFT is coupled with FLOSOFT to predict the consequent sediment patterns of erosion and deposition due to the dredging / reclamation / development activities.

## 5.1 Hydrodynamic model

### Basic governing equations

The basic governing equations of flow are solved numerically for simulation of tides and currents in the coastal environments. These equations are formulated based on incompressible flow and vertically integrated hydrostatic distribution since the vertical acceleration of the flow is much smaller than the pressure gradient. After applying these assumptions, the basic governing equations of flow momentum can be written in the conservation form as follows:

### Continuity equation

$$\frac{\partial \eta}{\partial t} + \frac{\partial uH}{\partial x} + \frac{\partial vH}{\partial y} = 0$$

**Momentum equations**

$$\frac{\partial uH}{\partial t}+\frac{\partial u^2H}{\partial x}+\frac{\partial uvH}{\partial y}=fvH-gH\frac{\partial \eta}{\partial x}+H\frac{\partial}{\partial x}\left(K_x\frac{\partial u}{\partial x}\right)+H\frac{\partial}{\partial y}\left(K_y\frac{\partial u}{\partial y}\right)+\tau_{wx}-\tau_{bx}$$

$$\frac{\partial vH}{\partial t}+\frac{\partial vuH}{\partial x}+\frac{\partial v^2H}{\partial y}=-fuH-gH\frac{\partial \eta}{\partial y}+H\frac{\partial}{\partial x}\left(K_x\frac{\partial v}{\partial x}\right)+H\frac{\partial}{\partial y}\left(K_y\frac{\partial v}{\partial y}\right)+\tau_{wy}-\tau_{by}$$

The two depth-averaged momentum equations can be written as where, *t* = time; *x*, *y* are Cartesian co-ordinates; *u* and *v* are depth averaged velocity components in the x and y directions, respectively; *f* = Coriolis parameter; *g* = acceleration due to gravity; *Kx*, *Ky* diffusion coefficients in the x and y directions, respectively; $\eta$ = water elevation with respect to mean sea level, *H* = total water depth at any instant.

**Model description**

Dedicated software Hydrodyn-FLOSOFT & SEDSOFT for prediction of tides and currents and sedimentation processes in the seas and estuaries developed at Environ Software (P) Ltd, Bangalore, based on solving the hydrodynamic equations numerically through coupled way using the present state-of-art of technology has been used.

**Model setup and calibration**

Model studies were carried out for large domain (or global domain). The domain with the existing facilities (before any of the contemplated development) is termed as the domain before development (BD). The study domain incorporating planned facilities covering all the developmental activities envisaged is termed as the domain after development (AD1 for option1 and AD2 for option 2).

This global domain (Figure 5.1.2) was selected between the UTM coordinates of 2265435.7500 N to 2305698.2500 N and 638840.562500 E to 705790.12500 E comprising Muldwaraka and Chhara ports. The general layout of the global domain selected for the study is as shown in Figure 5.1.2 for the before development (BD) condition.

The bathymetry is selected from the recent hydrographic chart incorporating refinements from the bathymetry data for the project area (NHO Chart No 206). The interpolated bathymetric depth contours before development is shown in Figure 5.1.3. The maximum depth observed is around 44.5m in the model domain.

**Bed roughness**

The bottom roughness in the domain varies according to bed sediment grain sizes. The bed consists of various sizes of clay, sand and silt. Depending upon bed configuration and sediment sizes, the $d_{50}$ size contours vary from 0.001 m to 0.005 m. In the present study constant Manning's roughness coefficient is considered. The computational runs have been carried out with different sets of the manning roughness coefficients to get the predicted output of tides and currents in the domain. From the series of computational runs, the Manning coefficient which gives the predicted values of currents and tides matching with the measured values at the calibration point is taken (manning coefficient of 0.15) to be the constant manning coefficient for predicting flow regime in the smaller domain.

**Initial and boundary conditions**

The initial conditions for the model are selected based on still water conditions. The vertical density gradients due to salinity variation have been neglected since the water column is well mixed. Tides are imposed at the open boundary. The input tides imposed for the model boundary is shown in Figure 5.1.4.

**Model calibration**

The sensitivity analysis has been carried out with various sets of variable bed roughness coefficients as explained above, which are the combined effect of $d_{50}$ sediment size and bed configuration in order to calibrate the model with respect to of April 2014 tide and current at Chhara.

Comparisons have been made between the observed and predicted values of water levels and currents at Chhara and are shown in Figures 5.1.5 & Figure 5.1.6 respectively. From the figures, it can be seen that the values match closely and the variation between the model predicted and field measured/observed values is within the acceptable limits. Thus it can be taken as that the model is calibrated and validated.

Using the constant roughness coefficient as selected in the validation, simulation runs have been carried out. The model runs have been carried out for a period of 15 days (April 05 to April 20, 2014) covering both the spring and neap tide conditions to obtain an insight into the basic hydrodynamic behavior of the study domain.

**Modeling of tides and currents**

The model clearly reproduces the tidal variation at various locations all over the study domain. The typical tidal velocities for Peak Flood and Peak Ebb of spring tides for the cases of existing and after development condition have been generated. The results predicted are discussed in detail in the following sections.

The currents during spring tide peak flood conditions, before development and after proposed development option 1 and option 2 are shown in Figure 5.1.7 to Figure 5.1.9. It can be observed that flow is eastward. It can be seen that the maximum current speed at the proposed jetty head location is about 0.8 m/s. There is no significant change in the flow regime as can be inferred from the figures. There is no significant change in the flow regime in the rest of the domain except for a slight change in the current speeds at the break waters in option 1 and option 2 are shown in the Figure 5.1.10 and Figure 5.1.11. The maximum variation in the domain is found at the western end of the proposed breakwater and the magnitude is 0.25 m/s.

The currents during spring peak ebb condition before and after development are shown in Figure 5.1.12 to Figure 5.1.14. Westward flow can be observed from the figures at the proposed jetty head location and currents are

around 0.5 m/s. There is no significant change in the flow regime in the rest of the domain except for a slight change in the current speeds at the breakwater area in option 1 and option 2 as show in the Figure 5.1.15 and Figure 5.1.16. The maximum variation in the model domain is found at western end of proposed breakwater.

**Impact on flow regime and flow circulation**

The model has been run for 15 days continuously for predicting the impact on flow regime and circulation for various hydrodynamic tidal conditions due to the proposed development options. Currents were stored at several location for comparison as shown in the Figure 5.1.17. Figure 5.1.18 shows the currents at different observation points comparing the cases of existing and proposed development option-1. Similarly Figure 5.1.19 shows the currents comparing the cases of existing and development option 2. It can be seen that there is no impact on flow regime due to the proposed development of Jetty facilities in the Chhara but small variation (0.2 m/s) noticed at some localized areas at the jetty areas and around the break water facilities located and the adjoining region (development option-2 & option-1). There is no change in the general flow regime in the rest of the domain. The changes observed in the flow regime are mainly in the current directions which are local and limited to the high water conditions.

## 5.2 Sediment Transport Modeling

**Numerical approach to sediment (cohesive and non-cohesive) transport modeling studies**

This chapter presents the setting up of sediment transport model and simulation of the existing sediment transport conditions for estimating the sediment deposition for various hydrodynamic and oceanographic conditions.

As with the flow modeling described in the previous chapter, a critical step in applying a numerical model for sediment transport is the process of model verification. Whereas data sets against which to calibrate and validate the flow model are relatively straight forward to obtain, collection of data to validate a sediment transport model is typically more difficult. The sediment transport studies are aimed at indicating the likely tendency in the bed levels (i.e. erosion

and/or deposition) as a result of the engineering developments rather than the quantities involved. This approach is, however, still valid for confirming the sediment erosion/deposition at various locations.

The principal aim of these studies was to assess the total (Cohesive and Non-Cohesive) sediment load getting deposited in the study area and to find out any changes in these values due to the proposed development. Accordingly the simulation runs were carried out with a sand/fine silt/mud transport which was appropriate for the conditions in these areas.

**Available data pertaining to the morphological assessment**

Data which was made available in the present study to provide input to the morphological studies comprised the following:

- Bathymetry data for the domain
- Suspended sediment concentration in the ambient sea water
- Bed sediment grain size and settling velocities
- Changes in the depth contours due to the proposed construction of breakwater

This information was used to specify the initial distribution of sand/silt/mud (limiting it to the intertidal areas) in the numerical modeling simulations.

**Sediment transport simulation**

Simulation of sediment transport in the study area (Figure 5.1.2) was carried out with the Hydrodyn-SEDSOFT for various tide conditions of April 2014. Hydrodyn-SEDSOFT is a 2D sediment transport model (Cohesive and non-Cohesive) and predicts the process of erosion, transport and deposition of sediment.

Hydrodyn-SEDSOFT was driven with the neap and spring tide hydrodynamic flow file and using standard parameters which describe the erosion and settling Characteristics of the sediment. Simulation runs were carried by specifying sediment composition in the shallower (intertidal) zones where the tide induced bed shear stress was relatively low.

Following simulation of the sediment transport under existing conditions, the model was adjusted to include the effects of the bathymetry changes etc., due to the proposed development. The simulation runs were carried out for the large domain and the results are separately reported for the Chhara region.

**Sediment erosion scenarios before and after development**

The model predicted values for the rate of erosion for various tidal conditions are discussed below.

The instantaneous rate of erosion for existing, after development option 1 and option 2 in the study domain during spring tide peak flood condition are shown in Figure 5.2.1 to Figure 5.2.3. The maximum rate of instantaneous erosion in the model domain is $3.0x10^{-3}$ $Kgm^{-2}s^{-1}$for the existing condition which slightly increases near break water for option 1 and option 2.

Figure 5.2.4 to Figure 5.2.6 show the instantaneous rate of erosion for existing, after development option 1 and option 2 in the study domain during peak ebb condition. The maximum rate of instantaneous erosion in the model domain is $9.0x10^{-6}$ $Kgm^{-2}s^{-1}$for the existing condition and also increased slightly near break water for option 1 and option 2.

The sediment erosion rates continuously recorded at different observation points set up around the proposed developments in the model run (Figure 5.1.17) are shown in figure 5.2.7 (a), (b) and (c) comparing the cases of existing scenario and option 1. Figure 5.2.8 (a) (b) and (c) compare the changes between existing scenario and option 2.

It can be seen that the change or variation in the erosion rate is very small and order of $10^{-5}$ and is limited to the vicinity of the breakwater edges and in between piles of Jetty (Observation points 5,8,12, 21 and 24 in the case of option 1 and Observation points 5,8,12,21 and 24 in the case of option 2) and no appreciable change observed in the rest of the observation points.

**Sediment deposition before and after development**

The model predicted values for the instantaneous rate of deposition for different tidal conditions are discussed below.

Figures 5.2.9 to 5.2.11 show instantaneous rates of deposition around the proposed developments in the study domain for the existing, after development option 1 and option 2 during neap low water. It can be noticed from the figures that there is no significant change in the instantaneous deposition rates in the domain during neap low water condition. The maximum rate of instantaneous deposition in the model domain in all the three cases is $1.44 \times 10^{-7}$ $Kgm^{-2}s^{-1}$ and found at breakwater and some patches at jetty location.

Figures 5.2.12 to 5.2.14 show the instantaneous rates of deposition for existing scenario, after development option 1 and option 2 in the study domain during high water neap. It can be observed from the figures that there is no significant change in the instantaneous deposition rates in the domain during this period. The maximum rate of instantaneous deposition in the model domain in all the three cases is $2.00 \times 10^{-8}$ $Kgm^{-2}s^{-1}$ and found at western breakwater.

The sediment deposition rates continuously recorded at different observation points set up around the proposed developments in the model run (Figure 5.1.17) are presented in Figure 5.2.15(a), (b) and (c) to compare the erosion trends in existing scenario and option 1. Figure 5.2.16 (a), (b) and (c) compare the changes between development option 2 and the existing condition. It can be seen that the change or variation in the deposition rates is limited to the vicinity of the jetty and near break waters and no significant change was observed in the rest of the domain.

The rates of instantaneous erosion in option 1 & 2 showed an increase near edges of breakwater and shallow waters in upstream direction of the jetty head.

From the figures it can be seen that the impact predicted on flow/sediment dynamics after proposed development is not very significant and also it is limited to localized areas only.

**Morphological changes**

The model has been run continuously for 15 days taking account of neap and spring tide conditions for various seasons and the morphological changes due to erosion and deposition in the domain after the proposed development.

Figure 5.2.17 to 5.2.19 give the bed level variations after 15 days for existing scenario, after development of option 1 and option 2. The erosion /deposition process in the existing scenario indicated a maximum deposition of 5.0 cm over 15 days in the study domain. Figure 5.2.18 and Figure 5.2.19 show the variation in bed level after development with option-1 and noticed that bed level lowered by around 6.5 cm over 15 days simulation at the starting and ending of breakwaters and rest of the domain bed level increases by around 1.3 cm due to deposition. Figure 5.2.20 and Figure 5.2.21 show the difference in bed levels before and after development with Option-1 and Option-2.

The bed level changes computed continuously, from the instantaneous erosion and deposition rates recorded at different observation points set up around the proposed developments in the model run (Figure 5.1.17) are presented in Figure 5.2.22 (a), (b) and (c) to compare the existing and development option-1. Figure 5.2.23 (a), (b) and (c) compare the changes in the scenarios of existing and development option2 over a period of 15 days.

From the figures, it can be inferred that at the observation points 3, 4, 10 and 11 did not show any change in bed levels as compared to the existing scenario.

In the scenario of option 1 of the development which involved a long breakwater with Jetty limited erosion was indicated at the observation points 1, 2, 6,11,13,14,15,21,and 22. A maximum of 10cm erosion was indicated at 13, 14and 15. Depositional trends were observed at observation points 5,

7,8,12,16,17,18 and 23. The maximum deposition of 8-15 cm occurred at the points 23 and 24 situated in the edges of the intertidal mud flats away from the jetty head.

In the scenario of option 2 of the development which involved a short break water and trestle bridge construction trivial erosion was indicated at the observation points 13,14 and 15. A maximum of 10cm erosion was indicated at observation point 14. Depositional trends were observed at observation points 5, 7,8,12,16,17,18 and 23. The maximum deposition of 8-12 cm occurred at the points 23 and situated in the edges of the intertidal mud flats away from the jetty head.

From the above study, it is concluded that the bed level changes are confined to the breakwater and jetty head. Hence the impact of construction of jetty and breakwaters is not expected on the shoreline changes.

## 5.3 Oil Spill Modeling Studies

The prediction of fate and transport of oil spill is playing major role in the oil spill risk assessment study. The spill trajectory is computed based on the resulting forces due to surface water currents and wind speed on the spill. The following sections describe the numerical results of oil spills obtained for various meteorological and tidal conditions and quantification of risks associated with the oil spill.

A dedicated software Hydrodyn-OILSOFT for understating fate and transport of oil spills in the rivers, seas and estuaries has been developed by Environ Software (P) Ltd, Bangalore. The same domain selected for the flow modeling (Hydrodynamic modeling studies) has been selected for the oil spill studies also. The enhanced portion of the model domain selected for the study is shown in Figure 5.3.1 showing the location of the suggested spill points for LNG Vessel.

The modeling was carried out by coupling the oil spill model with the hydrodynamic model. Several runs have been made and results were stored for

every hour. The computational runs were carried for the following scenarios discussed in the following sections.

**Spill locations**

The following spill locations were considered for the present study.

SP1: $20^0$ 42' 44.049" N; $70^0$ 43' 56.444" E

SP2: $20^0$ 42' 04.037" N; $70^0$ 44' 38.067" E

SP3: $20^0$ 43' 38.82" N; $70^0$ 42' 13.067" E

It is considered that LNG cargo vessels contain HSD as fuel. In case of any accident, a fuel of 10 t is dumped in to the sea.

**Oil type**

Studies were carried out for the spills of HSD

The following characteristics of HSD are used in the study:

| | |
|---|---|
| Specific Gravity | : 0.845 |
| Viscosity, cst | : 76 |
| Boiling range, $^0$ C | : 200 - 350 |
| Heat of evaporation, ($10^5$ x J/Kg) | : 4.65 |

**Weather conditions**

Meteorological data: Chhara in Gujarat

Tides: From simulation studies

Atmospheric temperature: $30^0$ C

**Results of Scenarios**

Knowledge of probable movement of an oil slick gives a distinct advantage while planning response strategy. Thus for instance, no major clean-up operation is necessary if the modeling results indicate that the spilled oil would remain at sea thereby sparing the shore ecology. On the contrary, if modeling results are suggestive of shoreward drift of spill and predict that particular ecologically sensitive or important areas would be hit, effective counter measures, such as deployment of booms for containment and recovery of oil by skimmers, can be effectively taken.

**Spills at SP1, SP2 & SP3 locations**

The model has been run for predicting the fate and trajectory of 10t of HSD spill – instantaneous spill of 10 t of HSD separately at the three locations SP1, SP2 and SP3. (Figure 5.3.1). Figure 5.3.2 to Figure 5.3.4 show the oil spill trajectory for the spills at S1 S2 and S3 during the premonsoon and Figure 5.3.5 to 5.3.7 show the oil spill trajectory for the spills at S1 S2 and S3 during the SW Monsoon and Figure 5.3.8 to 5.3.10 show the corresponding trajectories for spills during postmonsoon.

It can be seen that the HSD spills at SP1, SP2, SP3 during premonsoon, monsoon conditions move towards north-northeast due to the prevailing currents and winds and will be reaching the coast within 3 hours. During the Post monsoon the spill at SP1, SP2, SP3 move towards South direction and will not be reaching the coast.

The behavior of slick movement is more or less similar irrespective of quantities of oil spilled. The area of oil spread differs depending on the source quantity. It can be observed from the figures that nearly 15%-20% of oil is lost due to various weathering processes during their travel on sea till they reach the coast/ domain boundary.

Table 5.3.1 gives the oil weathering statistics for the oil spill scenario studied. In case the oil trajectory reaches the shore, the location and the time taken to reach the shore has been depicted in the table. The table also gives the predicted length of the coast affected by the oil spill reaching the shore. The table indicates that the coastline affected during pre and monsoon seasons range from 1 to 2 km in eastern part of the jetty. The spill would reach the coast in the time ranging from 2.5 to 6 hours. During northeast monsoon period, the spill would move offshore.

# 6 POTENTIAL MARINE ENVIRONMENTAL IMPACT FOR LNG TERMINAL

The proposed LNG terminal envisages construction of a jetty with berthing facilities for deep sea ships and associated structures, a breakwater for handling of LNG. The main operation will involve unloading of LNG from a ship and transferring it to cryogenic storage tanks through cryogenic pipelines, regasification of LNG and transporting regasfied LNG to customers through pipelines. Hence, potential adverse impacts on marine ecology can arise during the construction as well as the operational phases of the terminal. However, in this report, the impact of construction LNG Jetty will be studied.

**Construction phase**

Construction of the jetty and associated marine structures in the subtidal and intertidal areas will cause localised destruction of habitats due to physical interference and can also cause certain indirect effects such as changes in stabilised pattern of littoral transport due to modified circulation pattern which may alter the prevailing erosional/accerational trends along the shore. Enhanced level of suspended load due to the dispersion of the bed sediment during piling, dredging, trenching, movement of vessels and machinery etc may result in reduction in photosynthesis.

Ambuja cement jetty is situated at about 11 km from the proposed site. Barges with 4 m draft operate in the region. The mother vessels use the Veraval-Diu channel for their navigation. Since the jetty is sufficiently away from the proposed site, the impact on the coastal water can be neglected.

The construction activities related to construction of piles and the laying the subsea pipeline, apart from causing destruction of the habitats due to physical disturbance, can also cause certain indirect effects such as the changes in the circulation pattern and littoral transport and an increase in turbidity of the water column. These impacts are closely linked with the methodologies adopted for construction and the duration of construction.

Long term erosion/accretion processes associated with these proposed constructions have been studied in section 5.2. Subtle changes along the

shoreline configuration of Muldwaraka -Madwad appears to be negligible due to these developments.

**Physical processes**

The jetty and the approach would be supported on piles allowing adequate flow of water without significant obstruction. Hence the jetty is unlikely to grossly influence circulation in the coastal region as well as the littoral transport to grossly influence the shoreline geometry though the bund may contribute to small local modifications.

**Water quality**

Dredging, trenching, backfilling, rock dumping and pipe laying activities have a high potential to increase the turbidity due to increased rate of dispersal of fine grained bed sediment in the water column. The region already has low levels of suspended load (section 4.3) as bottom is rocky. The DO as well as the BOD levels may potentially be altered and the concentrations of trace pollutant in water could increase because of release of sediment interstitial water exposing the biota to relatively high levels of pollutants if the sediment is inherently contaminated. The discussion under section 4.4 however supports low levels of $C_{org}$ and natural levels of metals in the seafloor sediment. Hence, their dispersion in the water column is unlikely to influence the water quality adversely except for generation of high turbidity. Hence, the overall impact during the construction phase on water quality be localised and minor.

The construction of 1250 m long and 1120 m long jetty would have measurable impacts on the general water quality of the area, partially due to the movement of a large number of vessels involved in the construction/rock dumping and also due to the construction itself. Due to extend period involved in the construction (approximately 33 months), the impacts would prevail over a longer duration.

**Sediment quality**

Construction activities related to dredging, trenching, backfilling and resettling of sediment may lead to changes in sediment may lead to changes in

sediment texture in localised areas particularly along the intertidal segments. However, these changes would be minor and nonconsequential to the overall sediment quality of the area.

**Biological characteristics**

The most likely impact during construction phase would be on the subtidal and the intertidal habitats which could be temporarily destroyed along the pipeline route and other marine structures during to driving of piles, dredging, trenching, rock pumping and pipelaying activities. Moreover, if the dredge spoil spreads over nearby areas under the prevailing high tidal excursion (section 4.2), the biota there would also suffer accordingly. Overall damage in the region however would be localised, temporary and reversible and recovery would be fast once the construction phase is completed. Moreover, the region sustains low density of biotic communities and hence damage to marine biota would be small.

The proposed construction activities related to LNG terminal consisting of jetty and associated pipeline would have both negative and positive impacts on benthic habitats and marine benthos at the construction site. Total number of piles in phase I would be 226x3 and it would be 87x2 in phase II. Each pile dia would be 1.2 m. Hence area that affected by the construction would be 767 $m^2$ in phase I and additional 197 $m^2$ in phase II. The estimated loss of macrobenthos due to proposed activities is given in Table below.

| Phase | Area ($m^2$) | Biomass ($kg/m^2$) | Population ($x10^5$) |
|---|---|---|---|
| Phase 1 | 767 | 5.7 | 8.1 |
| Phase 2 | 963 | 7.2 | 10.1 |

This estimate is based on the prevailing benthic potential discussed in section 4.5. The project would involve a total loss of 5.7 kg (wet wt) of biomass and 8.1 x $10^5$ of population of macrobenthos in phase I. In case of phase II, loss of biomass and population would be 1.4 kg and 2.0x $10^5$ respectively. The major loss of macrobenthos would be due to pipelaying and breakwater construction activities. The intertidal zone affected due to jetty construction is

very small. The loss of macrobenthos at the foot print of the piled structures would be permanent. However, these marine structures would provide additional surface area for selected benthic organisms, like barnacles, to habitat the affected segment. In this way, the available area for settlement of benthos would be 2.5 ha in Phase 1 and additional 0.5 ha in Phase II. The area available for the macrobenthos to grow in the new pile area would be 30 times more as compared to the loss of macrobenthos in the footprint of the piles. The damage to benthos along the pipeline corridor would be temporary and benthos would re-habitate at the affected segment in about 2-3 years after the construction phase. Hence the permanent lose of the benthic habitat due to the project implementation would be minor and would not have any measurable impact on macrobenthic productivity of the region.

**Operational phase**

Possible marine environmental implications during the operational phase are associated with the leakages of LNG during loading and unloading, release of wastes generated by ships as well as at the port terminal and large scale releases of cargo, fuel, chemicals etc due to accident involving ships.

**Ship traffic and accidents**

In well managed ports the leakages during normal operations of pumping are nearly eliminated. However, under certain rare abnormal unloading situations or due to defective components LNG under transport may be spilled. The spilled LNG would quickly evaporate and the impact on marine ecosystem would be insignificant. However, the major fear of such a leakage would be fire/explosion. The leakage of LNG can occur in the following scenarios.

**(a) Leakage in transit**

The leakage of LNG during transit through specially designed tanks are used for running ships machinery and releases to the atmosphere are negligible.

**(b) Collision, grounding**

The LNG is not carried in the ship hold as conventional oil tankers do with liquid cargo. The double walled spheres are mounted on the ship with adequate distance from the hull. In case of a collision the chances of the impact reaching the spheres are rare. Hence, the LNG transport is relatively safer than any other petroleum product.

**(c) LNG pumping**

At the LNG terminal, LNG would be unloaded in liquid form and pumped through pipelines to the cryogenic storage tanks. Before pumping, the LNG would be gassified on ship board regasification terminal and subsequently the natural gas would be pumped through the pipelines. Thus in an event of leakage only natural gas would leak out and spread over the water as a layer between the air-sea interphase. The gas would expand with incorporation of heat from the sea surface and the atmosphere. Hence, a marginal reduction in sea surface temperature over a wider area can result. The LNG layer over the sea surface, however, would be prone to fire. Since regasification of LNG would be done by utilizing heat of industrial water, no cold water discharge to the sea is envisaged.

Accidents due to ship collision and grounding are rare but damage caused can often be serious. Only HSD is considered for assessment since, as said earlier, LNG is unlikely to adversely influence the marine ecology. Major concern during the operational phase of the LNG terminal would be the large releases of LNG and spillages of HSD from the ships fuel holds in case of an accident, that might occur and contaminate the marine environment. Severity of Impacts on the marine ecology due to HSD would depend on the quantity spilled and the location of spill.

The study on oil spill modeling (Section 5.3) indicates that the spill of HSD at terminal site would move offshore during non-monsoonal season while it would reach the eastern coast of Chhara during monsoon. The coastline affected would be ranging from 1 to 2 km.

The traffic of deep sea vessels in the region is confined to the 16 km long navigational from main channel of Muldwaraka and Diu to the proposed LNG jetty. The deep-sea ships visiting the proposed port complex would be using this channel. The LNG terminal is expected to be operational by 2018. The probability of accidents for the following situations are considered.

In terms of number of deep sea ships, the major traffic in the region is due to the proposed HSEPL port. A total traffic of 81 in phase I and 145 in phase II deep-sea ships is expected. This number however excludes coastal vessels such as fishing trawlers, barges, tugs etc, the traffic of which is not substantial in the region. Moreover, accidents involving such vessels would not result in large scale environmental degradation. Since ships visiting Muldwaraka, Veraval, and Diu ports along the western shore of the channel use a different navigational channel, they are not considered for assessing collision and grounding frequencies.

**i) Ship collision frequency**

Frequency of ship collision is governed by the frequency of ship encounter and the probability of a collision, given an encounter. From the records of accidents maintained at several major ports worldwide it has been considered that collision frequency is proportional to the square of the traffic density and is directly proportional to the number of encounters. Causality statistics maintained at UK ports indicate that collisions involving ships account for 7% of all accidents and represent 0.024 for every 1000 ship movements. Assuming that this statistics is applicable to the region and taking movements of 162 in phase I and 290 in phase II of deep-sea vessels the probability of an accident works out to be one in every 257 y for phase I and 142 y for phase II.

**ii) Ship grounding frequency**

Bulk release of cargo can result if ship goes a ground rupturing cargo holds. Channel length and its width are the major factors controlling grounding. The ships are vulnerable to grounding in long and narrow channels particularly those which have several bends. From grounding incidents at several ports it has been considered that the channel length to width ratio gives a good

indication of probability of encountering a grounding obstruction. The grounding frequency increases with increasing length of the channel and decreases with increasing width for a given length.

The grounding frequency may therefore be expressed as

$$GF = K \times L / W$$

Where GF = grounding frequency

L = channel length

W = effective channel width

K = constant (normally taken as $1 \times 10^{-5}$ per movement)

The channel between the 30 m contour to the LNG terminal would have a length of about 16 km and an average width of 0.5 km. Hence, probability of a deep-sea ship grounding at the present traffic level is one in 20 y in phase I and 11 y in phase II.

**Product spillages**

**a) LNG**

Transport of LNG by LNG carriers is considered safe and bulk spillages due to ship accidents are extremely rare. The LNG vessels carry quantities of HSD and FO required to supplement the running of the machinery over the leaked LNG. These holds should be sufficiently separated from hull to avert spillage of the POL products to sea in case of grounding/collision.

However, the spillage of HSD into the sea in case of a LNG ship collision with an oil tanker or a cargo ship cannot be ruled out due to the possibility of damage to the vessel colliding with LNG carrier.

LNG which has a boiling point of $-160^0$ C at atmospheric pressure is a liquified gas stored at low temperature. As the ambient temperature of water is relatively high, LNG would evaporate as soon as it spills out. LNG is very buoyant having a density of 0.45 gm/cc and hence in case a leak occurs under the water, it tends to surface very quickly. The ambient seawater temperature is very high compared to boiling point of LNG and hence it expands. The pressure exerted by 20 m column of seawater is far less than the pressure under which it

has to be kept in liquid state. Hence, the buoyancy would steadily increase as it reaches the surface within a fraction of minute and would spread over a larger area and quickly evaporate. Hence, the impact of LNG spill is negligible in the water column as it would be dispersed over a larger area.

The adverse impact posed by LNG spill would be the reduction of temperature of the surrounding water. With a specific gravity of 0.45, specific heat of 0.5 cal/g and 120 kcal/kg of latent heat, $1m^3$ LNG would need 95625 kcal of heat energy to reach ambient temperature. Whereas, $1m^3$ of seawater at $30^0C$ can supply 4733.7 kcal with reduction in its temperature by $5^0C$. Hence 20 $m^3$ of water would be required to increase the temperature to the $25^0C$ level. Since gassified LNG only will be transported through pipelines latent heat need not be considered. In which case about 10 $m^3$ of seawater would be required for 450 kg of LNG to attain a temperature about $5^0$ less than ambient temperature.

Gassified LNG would quickly surface due to it buoyancy and tend to spread on the surface as a layer between the water surface and over lying atmosphere. Since the specific heat of the overlying atmosphere would be negligible, bulk of the heat be derived from water leading to thermal circulation and the cooled surface water would sink and new water would take its place. Hence, the overall impact on the ecology would be negligible since the temperature of water is unlikely to fall substantially to influence the biota.

# 7 MITIGATION MEASURES & EMP

It is important that certain decisions are taken and implemented beginning with the planning stage itself so that the risk factors during the construction and operational phases are reduced to a minimum to protect the marine ecology from anthropogenic shocks.

**Design considerations**

The design and operating philosophy of the LNG terminal should be "No leak" under normal operating situation which if deviates beyond the preset norms, the pumping should stop automatically till normal conditions are reset. It should be ensured that internationally accepted codes and practices are followed for designing the unloading arms and the pipelines and their compliance should be guaranteed through proper inspection, frequent evaluation and intensive testing of all critical components. Similarly, the vulnerable units such as unloading arms, hoses, fittings, valves, flanges, couplings etc should be rigorously tested and certified for their integrity and reliability.

Spills at jetties are often associated with leakages at hose couplings butterfly valves, hose bursts etc. It is therefore important that the state-of-the-art hoses with break-away couplings both tested above the operating pressure are included in the design. Isolation valves should be provided in the pipeline design.

**Construction Phase**

It is evident from section 4 that the coastal region of Chhara is not ecologically very sensitive and serious marine environmental impacts are unlikely to occur during the construction phase (section 5.1). Nevertheless, certain precautions are warranted to minimize the impacts on the nearshore ecology. Apart from the disturbance caused by the construction process itself, the coastal ecology suffers additional stresses if the construction time is prolonged which invariably the case when executing marine infrastructural projects, if not carefully planned. Hence, the key factors in minimizing adverse impacts would be the reduction in construction period and avoidance of

activities beyond the specified geographical project area which should be kept to a minimum. Hence, as a part of the management strategy, it is important that various activities are well-coordinated and optimized to avoid time over-runs and to complete the project within an agreed time schedule. This would need advance planning and coordination between agencies executing the contracts.

Pretreatment to the pipes such as coating, concreting etc and other fabrication jobs should be undertaken in a yard on land located sufficiently away from the high tide line and the transfer of materials to the site should be through a predecided corridor. Similarly, the movement of construction barges, ships, machinery etc should be restricted to the predecided operational area. However, the region should not be crowded with too many vessels and construction machinery to avoid accidents and subsequent spillages of materials and fuel.

A large number of laborers and other personnel would be involved in the construction phase. Temporary colonies of the work force etc should be established sufficiently away from the high water line and proper sanitation including toilets and bathrooms should be provided to the inhabitants to prevent abuse of the intertidal area. Sewage and other wastes generated in these settlements should not be released to the sea.

The operational noise level should be kept to a minimum particularly in the nearshore region through proper lubrication, muffling and modernization of equipment.

Often after completion of the job work, the contractor vacates the area without undertaking general clean-up etc. It should be ensured that the intertidal and supratidal areas are restored to their contours after the constructions are completed. General clean-up along the corridor adjacent areas and intertidal and subtidal regions should be taken-up and extraneous materials such as drums, sacks, metal scrap, ropes excess sediment, make shift huts and cabins should be cleared from the site.

**Operational Phase**

It is important to identify the risks involved during terminal operations to take adequate measures in the event of an accident. Hence, an integrated comprehensive risk assessment study of the proposed installations should be conducted and finding used to formulate a disaster management plan.

**LNG Handling**

The major concern during operations is the spillage of LNG and HSD due to ship accidents. Although spillage of LNG would not cause serious adverse impact on the marine environment, there would be considerable risk of fire/explosions. It is established beyond doubt that the human factor remains to the cause of about 90% of accidents leading to spillages at terminals. Training people to work safely and efficiently is therefore vital. Mooring officers, pilots, operators and crew of the terminal, shore pumping station and storage tank should be trained adequately in day to day operations as well as handling emergency situations. It must be impressed upon them that each individual engaged in the operation of the terminal has responsibility for safety. Special emergency drills should be conducted under the supervision of an expert terminal operator. Crises exercises should be designed and used in actual drills to ensure readiness of the staff at any given emergency situation.

It must be ensured that clear protocols for operations of integrated set-up of berthing a LNG carrier, connections to the unloading arm, pumping of LNG, operations of valves etc are evolved well advance. Likewise, safety procedures and responses required if an emergency arises should be freely available to the operational staff.

Another consideration in preventing spills is the provision and regular testing of not only emergency shutdown devices but also the components vulnerable to fatigue or failure. Hence, it should be ensured that auto-shut off valves, couplings, unloading arms, pumps, pipelines etc are periodically inspected for their integrity and to guarantee their proper functioning in an emergency. Accurate records of all inspections, unusual findings, actions taken etc must be scrupulously maintained as a part of the overall record system.

Entire pumping operation should be continuously monitored for which state-of-the-art electronic devices should be used and pumping should automatically stop if pre-set optimum conditions are exceeded. Pumping should be commenced only after optimum conditions are reset. Provision for an effective and reliable communication between the LNG carrier and shore terminal should be made to avoid ambiguities and time delays in reacting if abnormal situation arises during pumping.

Adequate technology and machinery should be selected after thorough review to minimize the escapement of cargo during loading/unloading.

Even with a carefully chosen technology, cargo spillage, sometimes, occur at the ports, majority of which are due to human error or negligence. To minimize such accidents, operational protocols and safety procedures should be printed and made freely available to the concerned staff. The employees should be adequately trained to inculcate a high level of competence not only in day to day operations but also during emergency situations. Periodic refresher courses should also be organized to maintain the level of their competence.

**Traffic management**

Large spills are often associated with tanker disasters. Although the probability of a tanker collision off Chhara is not expected, the influence of wave action cannot be neglected. Adequate precautions are necessary to minimize the risks of large spills.

Feasible means of reducing the frequency of ship encounters is to introduce a traffic control scheme such as segregation of lanes with adequate separation distances and constant monitoring either physically or through remote operated instrumentation. The provision of a vessel traffic service and the presence of pilots on tankers would reduce the risks of an accident. Further, adequate navigational aids such a marker buoys should be installed to indicate the channel as well as separation distances. These positions should be clearly marked on navigational charts and made available freely. Sand bars and other

submerged obstacles, rocky outcrops etc in the vicinity also should be marked on the charts.

GMB or any other authority should be identified to plan and implement a programme aimed at safe navigation off Chhara. Under MARPOL 1973-78 discharges from oil from tank washings, ballast, bilge and bunker fuel bottoms by ships to marine environment is prohibited. However, proper surveillance should be introduced to enforce the convention as a part of the overall environment management strategy.

**Wastewater management**

The domestic wastewater and sewage generated at the port terminal should not be released in the region even after treatment. Use of treated wastewater for developing greenery around can be environment friendly solution. Collection and disposal of oily wastes, sewage and garbage from coastal vessels including tugs should also be adequately addressed.

Adequate vigilance is also required to ensure the adherence of ships to MARPOL (1973/78) protocol and related regulations to prevent clandestine releases.

**Oil pollution combating strategy**

Accidental spillage of petroleum and other liquid products occasionally can occur and proper spill response strategy is necessary to minimize impacts on marine environment.

The ship traffic is predicted to increase several folds over the next decade. Since the tankers carrying petroleum products and bulk chemicals is expected to form a significant percentage of the traffic it is necessary to evolve a proper strategy to combat, should an accident occur leading to large spillages. It is therefore desirable to evolve a Oil Spill Disaster Contingency Plan for the Chhara region. This plan should then be integrated with the National OSDCP.

Common practice to fight petroleum spills is to contain the oil by deploying booms and recover the oil-water mixture using skimmers. However, the highly

dynamic coastal environment of the Chhara precludes the use of booms. In rough weather it is generally not feasible to deploy booms to a surround a spill with the intention of collecting it through skimmers since wave action and currents in excess of 0.5 m/s reduce the efficiency of contaminant booms significantly. Furthermore, a floating skimmer tends to suck more water than oil when the sea is rough.

Sorbent booms or pads which cause the lighter hydrocarbons to adhere to the fibre material filling of the boom may be included in the inventory of spill combating equipment since such boom are the only practical means of removing small spills. Such booms have been tested with success in the North Sea and are now being at several oil terminals. Adequate arrangement should also be made to collect the recovered oil-water mixture for subsequent transport to the shore for separation of hydrocarbons and final disposal of the oily residue.

Chemical dispersants are often favoured to disperse hydrocarbons when contaminant and recovery are inefficient. Although various classes of dispersants are available, concentrate or self-mix type are usually favoured. However, it is absolutely essential to test the toxicity of dispersants selected for storage and use by choosing selected sensitive aquatic organisms from the area. It must be realized that the efficiency of dispersants greatly decreases if their application is delayed since they are not effective on high boiling hydrocarbons. Hence, they should be used within 1 h of occurrence of a minor spill. Sometimes it is ecologically beneficial to allow a minor spill of lighter petroleum to weather naturally than spray dispersants.

**Mangrove Afforestation**

Even though mangroves are not present at the vicinity of the proposed LNG jetty, it is suggested to HSEPL to implement afforestation of mangroves in the surrounding regions of Chhara to maintain ecological balance. At the Chhara region, mangrove plantation is not possible as soil and geography of the region is not suitable for the growth of mangroves. Mangroves are present in the Madhwad region in the east. In the west, mangroves are present at

Muldwarka creek. Hence it is suggested that afforestation can be carried out in these regions.

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Sent thru Speed post on 15/11/19

November 15, 2019

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**Sub -** Development of Green Belt Around the Proposed Port Site at Chhara-Sarkhadi by M/S Simar Port Pvt Ltd

**Ref –** Meeting with Capt Bondre, Dr. Vijay Kulkarni and Shri K D Mahida

Sir,

We are developing all weather, multi-cargo, multi-purpose, deep draft greenfield port near Chhara Village, Kodinar Taluka, Gir-Somnath district, Gujarat. We have planned port development in phases. Ministry of Environment, Forests, and Climate Change (MOEFCC) granted environmental and CRZ clearance for Phase I development in January 2014 and for Phase II development in March 2019. A brief note on the background is enclosed to this letter.

In keeping with directions of MOEFCC vide above referred EC letters we plan to develop 100 m wide green belt all along port boundary through Gujarat Forest Department. We plan to commission the proposed port by March 2022. We plan to procure about 1000 acres of land for the port and allot about 100 acres land for green belt. Land procurement progressing well and we plan to complete the same by March 2020.

We wish to submit that there will not be any major source of air pollution in the proposed development and the purpose of green belt is ensuring that change in landscape is in harmony with the surrounding area.

We request you to kindly advise the experts in Forest department to develop techno-commercial proposal for green belt which will be an example for environment friendly development for similar projects.

We have office in Kodinar and my colleagues will be always available to work with Forest Team.

Thanking you.

**For Simar Port Pvt Ltd.**

Simar Port Private Limited

**Capt. Nitin Bondre**
**CEO - Ports & Terminals**

**Simar Port Private Limited**
Corporate Identification No. U35110GJ2008PTC054507
SP Centre, 41/44, Minoo Desai Marg, Colaba, Mumbai 400005, India.
(T) +91 22 67490000 (F) +91 22 67490017 website: www.shapoorjipallonji.com
**Regd. Office:** Venus Amadeus, 301-305, 3rd Floor, Jodhpur Cross Road, Satellite, Ahmedabad - 380 015, Gujarat

Shapoorji Pallonji INFRA

# Annexure 3

# Environmental Monitoring Documents

RETURN COPY

# TOYO ENGINEERING INDIA PRIVATE LIMITED

HCRF Project, HPCL Shapoorji Energy Private Limited,
Village - Chhara, Taluka – Kodinar, District – Gir Somnath, Gujarat

6399-HCRF

M/s. HPCL Shapoorji Energy Private Limited,
Chhara – Kodinar, Gir-Somnath,
Gujarat – 362720

Reference No. : HCRF/TEIPL/HSEPL/EIL/L/S-022
Date : February 28, 2020

| | | | |
|---|---|---|---|
| Kind Attention | | Mr. S. Baitalik – Vice President, | |
| Cc | EIL (PMC) | Mr. Rajesh Minocha - RCM | |
| | TEIPL (Contractor) | Mr. Vikas C. Jain - PM | |
| Reference Document No. | | HCRF-TEIPL-HSEPL-EIL-L-M-0042 dated December 10, 2019<br>HCRF-TEIPL-HSEPL-EIL-L-M-0046 dated December 20, 2019<br>HCRF-TEIPL-HSEPL-EIL-L-M-0053 dated January 10, 2020 | |
| Your Reference No. | | HSEPL-Toyo-Regas-M-L-0027 dated November 5, 2019 | |
| Project | | HCRF – LNG Regasification Facilities at Chhara, Gujarat | |
| Subject | | Submission of Environmental Monitoring Documents for the Month of January, 2020 | |
| Reply Required | | ☐ Yes | ☑ No |

Dear Sir,

With reference to the above, we are hereby submitting the following documents for your information;

1. Ambient Air Quality
2. Noise Level Monitoring
3. Drinking Water

Thanking you and assuring the best services at all time.

Yours truly,

For Toyo Engineering India Private Limited,

Mahavir Singh Beniwal
Resident Construction Manager

Received,
(Ahmad Sd/-)
(HSEPL)
28/02/2020
(17:34 Hrs)

Enclosure : As above

excel enviro tech

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TF-2, Sun House, Nr, Old High Court,
Off. Ashram Road, Ahmedabad - 380009.

# TEST REPORT

| Customer's Name and Address |
|---|
| **M/s. Toyo Engineering India Private Limited.**<br>Survey No. 866-867,<br>Taluka Kodinar, Village:Chhara,<br>Gir somnath, Gujarat-362720 |

| | |
|---|---|
| FORMAT NO. | F/LID/55 |
| REPORT DATE | 29/01/2020 |
| REPORT NO. | EET/202001047 |

| | | | |
|---|---|---|---|
| Description of sample | Noise level Monitoring | Lab ID Code | NM/01/047 |
| Date of sampling | 21/01/2020 | Sampling method | IS 9989 – 1981 RA 2001 |
| Sample collected by | Field Chemist | | |

## RESULT TABLE

| Sr | SAMPLING LOCATION | Unit | Result | |
|---|---|---|---|---|
| | | | Day Time (6 AM – 10 PM) | Night Time (10 PM – 6 AM) |
| 1. | Near REPL Batching Plant | dB (A) | 62.4 | 51.7 |
| 2. | Near Toyo Office | dB (A) | 53.7 | 45.1 |

**Note :**Day Time Norms 75 dB(A)
Night Time Norms 70 dB(A)

| | |
|---|---|
| **Analyzed by** | **Authorized Signatory** |
| Source of Prescribed Norms: Standard Norms | Field remark: |

----------End of The Test Report---------- 

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# TEST REPORT

**Customer's Name and Address**
**M/s. Toyo Engineering India Private Limited.**
Survey No. 866-867,
Taluka Kodinar, Village:Chhara,
Gir somnath, Gujarat-362720

| | |
|---|---|
| REPORT NO. | F/LID/03 |
| REPORT DATE | 29/01/2020 |
| REPORT NO. | EET/202001044 |

| | | | |
|---|---|---|---|
| Description of sample | Drinking Water | Lab ID Code & Sample Location | WE/01/044: Packed Drinking Water |
| Date of sampling | 22/01/2020 | Sampling time | 09:10 to 09:15 |
| | | Sampling method | Grab |
| Sample collected by | Field Chemist | Packing/seal | Satisfactory |
| Quantity and no. of sample/s | 2 liters $4^0$C | Date of starting of test | 23/01/2020 |
| | | Date of completion of test | 29/01/2020 |

## Result Table

| Sr. No. | Parameters | Unit | As per IS:10500 | | Result ( Drinking Water ) | Method of Test |
|---|---|---|---|---|---|---|
| | | | Requirement (Acceptance Limit) | Permissible Limit In The Advance Of Alternate Source | | |
| 1. | pH | mg/l | 6.5-8.5 | No Relaxation | 7.49 | IS 3025 (part-11) – 1983 |
| 2. | Colour (pt. co. scale) in units | Hazen | Max 5 | Max 15 | Nil | IS 3025 (part-4) – 1983 |
| 3. | Odour | mg/l | Agreeable | Agreeable | Unobjectionable | IS 3025 (part-5) – 1983 |
| 4. | Taste | mg/l | Agreeable | Agreeable | Agreeable | IS 3025 (part-7&8) – 1984 |
| 5. | Turbidity in NTU | NTU | Max 1.0 | Max 5.0 | Nil | IS 3025 (part-10) – 1984 |
| 6. | Total Dissolved Solids | mg/l | Max 500 | Max 2000 | 85.6 | IS 3025 (part-16) – 2002 |
| 7. | Suspended Solids | mg/l | Max 1 | Max 200 | Nil | IS 3025 (Part 17):1984 |
| 8. | Total Hardness as $CaCo_3$ | mg/l | Max 200 | Max 600 | 14.0 | IS 3025 (part-21) – 1983 |
| 9. | Calcium as Ca | mg/l | Max 75 | Max 200 | 4.1 | IS 3025 (part-40) – 1991 |
| 10. | Magnesium as Mg | mg/l | Max 30 | Max 100 | 1.0 | IS 3025 (part-46) – 1994 |
| 11. | Chloride | mg/l | Max 250 | Max 1000 | 54.9 | IS 3025 (part-32) – 1988 |
| 12. | Sulphate | mg/l | Max 200 | Max 400 | 2.1 | IS 3025 (part-24) – 1986 |
| 13. | Fluoride | mg/l | Max 1.0 | Max 1.5 | Nil | IS 3025 (part-60) – 2008 |
| 14. | Total Alkalinity | mg/l | Max 200 | Max 600 | 196.2 | IS 3025 (part-23) – 1986 |
| 15. | Iron as Fe | mg/l | Max 0.3 | No Relaxation | Absent | IS 3025 (part-53) – 2003 |
| 16. | Residual free chlorine | mg/l | Min 0.2 | Max 1.0 | Absent | IS 3025 (part-26) – 1986 |
| 17. | Copper as cu | mg/l | Max 0.05 | Max 1.5 | Absent | IS 3025 (part-42) – 1992 |
| 18. | Manganese as Mn | mg/l | Max 0.1 | Max 0.3 | Absent | IS 3025 (part-59) – 2006 |
| 19. | Nitrates | mg/l | Max 45.0 | No Relaxation | 0.11 | IS 3025 (part-34) – 1988 |
| 20. | Phenolic Compound | mg/l | Max 0.001 | Max 0.002 | Absent | IS 3025 (part-43) – 1992 |
| 21. | Mercury as Hg | mg/l | Max 0.001 | No Relaxation | Absent | IS 3025 (part-48) – 1994 |
| 22. | Cadmium as Cd | mg/l | Max 0.003 | No Relaxation | Absent | IS 3025 (part-41) – 1992 |
| 23. | Selenium as Se | mg/l | Max 0.01 | No Relaxation | Absent | IS 3025 (part-53) – 2003 |
| 24. | Arsenic as As | mg/l | Max 0.01 | Max 0.05 | Absent | IS 3025 (part-37) – 1988 |
| 25. | Cyanide as CN | mg/l | Max 0.05 | No Relaxation | Absent | IS 3025 (part-27) – 1986 |
| 26. | Lead as Pb | mg/l | Max 0.01 | No Relaxation | Absent | IS 3025 (part-47) – 1994 |
| 27. | Zinc as Zn | mg/l | Max 5.0 | Max 15.0 | 0.03 | IS 3025 (part-49) – 1994 |
| 28. | Anionic detergents (As MBAS) | mg/l | Max 0.02 | Max 1.0 | Absent | Ann-K of IS:13428:2005 |

----------End of The Test Report---------- 

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Off. Ashram Road, Ahmedabad - 380009.

| | | | | | | |
|---|---|---|---|---|---|---|
| 29. | Chromium as $Cr^{+6}$ | mg/l | Max 0.05 | No Relaxation | Absent | IS 3025 (part-53) – 2003 |
| 30. | Polynuclear aromatic hydrocarbons | mg/l | Max 0.0001 | No Relaxation | Absent | APHA 6440 |
| 31. | Mineral oil | mg/l | Max 0.5 | No Relaxation | Absent | IS 3025 (part-39) – 1991 |
| 32. | Pesticides | mg/l | Max 1 | No Relaxation | Absent | AOAC 990.06 |
| 33. | Aluminum as Al | mg/l | Max 0.03 | Max 0.2 | Absent | IS 3025 (part-55) – 2003 |
| 34. | Boron | mg/l | Max 0.5 | Max 1.0 | Absent | IS 3025 (part-57) – 2005 |
| 35. | Ammonia | mg/l | Max 0.5 | No Relaxation | N.D.(D.L.=0.01) | IS 3025 (part-37) – 1988 |
| 36. | Barium (as Ba) | mg/l | Max 0.7 | No Relaxation | N.D.(D.L.=0.5) | Anx-F of IS: 13428:2005 |
| 37. | Chloramines (as $Cl_2$) | mg/l | Max 4 | No Relaxation | N.D.(D.L.=0.5) | IS 3025 (part-26) – 1986 |
| 38. | Silver (as Ag) | mg/l | Max 0.1 | No Relaxation | N.D.(D.L.=0.005) | Anx-J of IS:13428:2005 |
| 39. | Sulphide (as $H_2S$) | mg/l | Max 0.05 | No Relaxation | N.D.(D.L.=0.01) | IS 3025 (part-29) – 2003 |
| 40. | Molybdenum (as Mo) | mg/l | Max 0.07 | No Relaxation | N.D.(D.L.=0.03) | IS 3025 (part-2) – 1994 |
| 41. | Nickel (as Ni) | mg/l | Max 0.02 | No Relaxation | N.D.(D.L.=0.01) | IS 3025 (part-54) – 2003 |
| 42. | Poly chlorinated biphenyls (PCB) | mg/l | Max 0.0005 | No Relaxation | N.D.(D.L.=0.0001) | APHA 6440 |
| 43. | Total Coliform Bacteria | MPN / 100 ml | 10/100 mL | 10/100 mL | Absent | IS:1622-1981 reaffirmed: 2003 |
| 44. | E. Coliform Bacteria | MPN / 100 ml | 10/100 mL | 10/100 mL | Absent | IS:1622-1981 reaffirmed: 2003 |
| 45. | Pseudomonus | MPN / 100 ml | 10/100 mL | 10/100 mL | Absent | IS:13428-Annx-D: 2005 |
| 46. | Salmonella | MPN / 100 ml | 10/100 mL | 10/100 mL | Absent | IS:15187-2002 |
| 47. | Thermotolerant Coliform | MPN / 100 ml | 10/100 mL | 10/100 mL | Absent | IS:1622-1981 reaffirmed: 2003 |

Note : N.D. : Not Detected , D.L : Detection Limit

**Analyzed by** **Authorized Signatory**

| | |
|---|---|
| Source of Prescribed Norms: as per IS 10500 | Field remark: |

----------End of The Test Report---------- 

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# TEST REPORT

| Customer's Name and Address |
|---|
| **M/s. Toyo Engineering India Private Limited.**<br>Survey No. 866-867,<br>Taluka Kodinar, Village:Chhara,<br>Gir somnath, Gujarat-362720 |

| | |
|---|---|
| FORMAT NO. | F/LID/54 |
| REPORT DATE | 29/01/2020 |
| REPORT NO. | EET/202001046 |

| | | | |
|---|---|---|---|
| Description of sample | Ambient Air Quality | Lab ID Code | AQ/01/046 |
| Date of sampling | 21/01/2020 to 22/01/2020 | Sampling time | 10:50 to 10:50 |
| | | Sampling method | Standard practice |
| Sample collected by | Field Chemist | Date of starting of test | 23/01/2020 |
| Packing/seal | Satisfactory | Date of completion of test | 24/01/2020 |

**RESULT TABLE**

| | | |
|---|---|---|
| Sampling location | REPL Batching Plant | |
| Environmental Conditions | | |
| Temperature | Max:31.2$^0$C | Min:16.9$^0$C |
| Humidity, % | Max:65 | Min:52 |

| Sr | Parameter | Unit | Test method | Result | Prescribe Norms |
|---|---|---|---|---|---|
| 1 | Particulate Matter-2.5, $PM_{2.5}$ | $\mu g/m^3$ | Gravimetric Method | 50.11 | 60 |
| 2 | Particulate Matter-10, $PM_{10}$ | $\mu g/m^3$ | IS 5182 (Part – 23) - 2016 | 86.94 | 100 |
| 3 | $SO_2$ | $\mu g/m^3$ | IS 5182 (Part – 2) – 2001 | 5.63 | 80 |
| 4 | $NO_2$ | $\mu g/m^3$ | IS 5182 (Part – 6) – 1975 | 12.87 | 80 |
| 5 | Carbon Monoxide | $mg/m^3$ | IS 5182 (Part –10) – 1999 | 2.4 | 4.0 |
| 6 | Arsenic | $ng/m^3$ | AAS/ICP Method | Nil | 06 |
| 7 | Nickel | $ng/m^3$ | AAS/ICP Method | Nil | 20 |
| 8 | Lead | $\mu g/m^3$ | AAS/ICP Method | Nil | 1.0 |

**Analyzed by** **Authorized Signatory**

| | |
|---|---|
| Source of Prescribed Norms: National Ambient air Quality | Field remark: |

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# TEST REPORT

| Customer's Name and Address |
|---|
| **M/s. Toyo Engineering India Private Limited.**<br>Survey No. 866-867,<br>Taluka Kodinar, Village:Chhara,<br>Gir somnath, Gujarat-362720 |

| | |
|---|---|
| FORMAT NO. | F/LID/54 |
| REPORT DATE | 29/01/2020 |
| REPORT NO. | EET/202001045 |

| | | | |
|---|---|---|---|
| Description of sample | Ambient Air Quality | Lab ID Code | AQ/01/045 |
| Date of sampling | 21/01/2020 to 22/01/2020 | Sampling time | 10:20 to 10:20 |
| | | Sampling method | Standard practice |
| Sample collected by | Field Chemist | Date of starting of test | 23/01/2020 |
| Packing/seal | Satisfactory | Date of completion of test | 24/01/2020 |

**RESULT TABLE**

| | | |
|---|---|---|
| Sampling location | Near Toyo Office South Side | |
| Environmental Conditions | | |
| Temperature | Max:31.2$^0$C | Min:16.9$^0$C |
| Humidity, % | Max:65 | Min:52 |

| Sr | Parameter | Unit | Test method | Result | Prescribe Norms |
|---|---|---|---|---|---|
| 1 | Particulate Matter-2.5, $PM_{2.5}$ | $\mu g/m^3$ | Gravimetric Method | 55.64 | 60 |
| 2 | Particulate Matter-10, $PM_{10}$ | $\mu g/m^3$ | IS 5182 (Part – 23) - 2016 | 96.14 | 100 |
| 3 | $SO_2$ | $\mu g/m^3$ | IS 5182 (Part – 2) – 2001 | 16.80 | 80 |
| 4 | $NO_2$ | $\mu g/m^3$ | IS 5182 (Part – 6) – 1975 | 35.22 | 80 |
| 5 | Carbon Monoxide | $mg/m^3$ | IS 5182 (Part –10) – 1999 | 3.4 | 4.0 |
| 6 | Arsenic | $ng/m^3$ | AAS/ICP Method | Nil | 06 |
| 7 | Nickel | $ng/m^3$ | AAS/ICP Method | Nil | 20 |
| 8 | Lead | $\mu g/m^3$ | AAS/ICP Method | Nil | 1.0 |

Analyzed by

Authorized Signatory

Source of Prescribed Norms: National Ambient air Quality | Field remark:

----------End of The Test Report---------- 

# TOYO ENGINEERING INDIA PRIVATE LIMITED

RETURN COPY

HCRF Project, HPCL Shapoorji Energy Private Limited,
Village - Chhara, Taluka – Kodinar, District – Gir Somnath, Gujarat

6399-HCRF

M/s. HPCL Shapoorji Energy Private Limited,
Chhara – Kodinar, Gir-Somnath,
Gujarat – 362720

Reference No. : HCRF/TEIPL/HSEPL/EIL/L/S-025
Date : March 3, 2020

| | | | |
|---|---|---|---|
| Kind Attention | | Mr. S. Baitalik – Vice President, | |
| Cc | EIL (PMC) | Mr. Rajesh Minocha - RCM | |
| | TEIPL (Contractor) | Mr. Vikas C. Jain - PM | |
| Reference Document No. | | HCRF-TEIPL-HSEPL-EIL-L-S-022 dated February 28, 2020 | |
| Your Reference No. | | HSEPL-Toyo-Regas-M-L-0027 dated November 5, 2019 | |
| Project | | HCRF – LNG Regasification Facilities at Chhara, Gujarat | |
| Subject | | Submission of Environmental Monitoring Documents for the Month of February, 2020 | |
| Reply Required | | ☐ Yes | ☑ No |

Dear Sir,

With reference to the above, we are hereby submitting the following documents for your information:

1. Ambient Air Quality – 2 Locations
2. Ground Water
3. Noise Level

Thanking you and assuring the best services at all time.

Received one set copy

Yours truly,

For Toyo Engineering India Private Limited,

(G. Yuvaraj Rao)
03-Mar-20

Mahavir Singh Beniwal
Resident Construction Manager

03/03/2020

Enclosure : As above

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# TEST REPORT

| Customer's Name and Address |
|---|
| **M/s. Toyo Engineering India Private Limited.**<br>Survey No. 866-867,<br>Taluka Kodinar, Village:Chhara,<br>Gir somnath, Gujarat-362720 |

| | |
|---|---|
| FORMAT NO. | F/LID/54 |
| REPORT DATE | 28/02/2020 |
| REPORT NO. | EET/202002093 |

| | | | |
|---|---|---|---|
| Description of sample | Ambient Air Quality | Lab ID Code | AQ/02/093 |
| Date of sampling | 19/02/2020 to 20/02/2020 | Sampling time | 10:15 to 10:15 |
| | | Sampling method | Standard practice |
| Sample collected by | Field Chemist | Date of starting of test | 21/02/2020 |
| Packing/seal | Satisfactory | Date of completion of test | 22/02/2020 |

**RESULT TABLE**

| | | |
|---|---|---|
| Sampling location | Near Toyo Office South Side | |
| Environmental Conditions | | |
| Temperature | Max:32.1$^0$C | Min:17.4$^0$C |
| Humidity, % | Max:65 | Min:53 |

| Sr | Parameter | Unit | Test method | Result | Prescribe Norms |
|---|---|---|---|---|---|
| 1 | Particulate Matter-2.5, $PM_{2.5}$ | $\mu g/m^3$ | Gravimetric Method | 51.62 | 60 |
| 2 | Particulate Matter-10, $PM_{10}$ | $\mu g/m^3$ | IS 5182 (Part – 23) - 2016 | 94.02 | 100 |
| 3 | $SO_2$ | $\mu g/m^3$ | IS 5182 (Part – 2) – 2001 | 10.20 | 80 |
| 4 | $NO_2$ | $\mu g/m^3$ | IS 5182 (Part – 6) – 1975 | 28.97 | 80 |
| 5 | Carbon Monoxide | $mg/m^3$ | IS 5182 (Part –10) – 1999 | 3.0 | 4.0 |
| 6 | Arsenic | $ng/m^3$ | AAS/ICP Method | Nil | 06 |
| 7 | Nickel | $ng/m^3$ | AAS/ICP Method | Nil | 20 |
| 8 | Lead | $\mu g/m^3$ | AAS/ICP Method | Nil | 1.0 |
| 9 | Ozone | $\mu g/m^3$ | IS 5182 (Part-09) -1974 | 9.57 | 100 |

**Analyzed by** **Authorized Signatory**

| | |
|---|---|
| Source of Prescribed Norms: National Ambient air Quality | Field remark: |

----------End of The Test Report---------- 

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# TEST REPORT

| Customer's Name and Address |
|---|
| **M/s. Toyo Engineering India Private Limited.**<br>Survey No. 866-867,<br>Taluka Kodinar, Village:Chhara,<br>Gir somnath, Gujarat-362720 |

| | |
|---|---|
| FORMAT NO. | F/LID/54 |
| REPORT DATE | 28/02/2020 |
| REPORT NO. | EET/202002094 |

| | | | |
|---|---|---|---|
| Description of sample | Ambient Air Quality | Lab ID Code | AQ/02/094 |
| Date of sampling | 19/02/2020 to 20/02/2020 | Sampling time | 10:35 to 10:35 |
| | | Sampling method | Standard practice |
| Sample collected by | Field Chemist | Date of starting of test | 21/02/2020 |
| Packing/seal | Satisfactory | Date of completion of test | 22/02/2020 |

**RESULT TABLE**

| | | |
|---|---|---|
| Sampling location | REPL Batching Plant | |
| Environmental Conditions | | |
| Temperature | Max:32.1$^0$C | Min:17.4$^0$C |
| Humidity, % | Max:65 | Min:53 |

| Sr | Parameter | Unit | Test method | Result | Prescribe Norms |
|---|---|---|---|---|---|
| 1 | Particulate Matter-2.5, $PM_{2.5}$ | $\mu g/m^3$ | Gravimetric Method | 47.82 | 60 |
| 2 | Particulate Matter-10, $PM_{10}$ | $\mu g/m^3$ | IS 5182 (Part – 23) - 2016 | 85.63 | 100 |
| 3 | $SO_2$ | $\mu g/m^3$ | IS 5182 (Part – 2) – 2001 | 7.20 | 80 |
| 4 | $NO_2$ | $\mu g/m^3$ | IS 5182 (Part – 6) – 1975 | 20.85 | 80 |
| 5 | Carbon Monoxide | $mg/m^3$ | IS 5182 (Part –10) – 1999 | 3.3 | 4.0 |
| 6 | Arsenic | $ng/m^3$ | AAS/ICP Method | Nil | 06 |
| 7 | Nickel | $ng/m^3$ | AAS/ICP Method | Nil | 20 |
| 8 | Lead | $\mu g/m^3$ | AAS/ICP Method | Nil | 1.0 |
| 9 | Ozone | $\mu g/m^3$ | IS 5182 (Part-09) -1974 | 10.96 | 100 |

**Analyzed by** **Authorized Signatory**

| | |
|---|---|
| Source of Prescribed Norms: National Ambient air Quality | Field remark: |

----------End of The Test Report---------- 

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# TEST REPORT

| Customer's Name and Address |
|---|
| **M/s. Toyo Engineering India Private Limited.**<br>Survey No. 866-867,<br>Taluka Kodinar, Village:Chhara,<br>Gir somnath, Gujarat-362720 |

| | |
|---|---|
| REPORT NO. | F/LID/03 |
| REPORT DATE | 28/02/2020 |
| REPORT NO. | EET/202002095 |

| | | | |
|---|---|---|---|
| Description of sample | Water Sample | Lab ID Code& Sample Location | WE/02/095: Ground Water |
| Date of sampling | 19/02/2020 | Sampling time | 11:00 to 11:10 |
| | | Sampling method | Grab |
| Sample collected by | Field Chemist | Packing/seal | Satisfactory |
| Quantity and no. of sample/s | 2 liters pH <2 $H_2SO_4$ (1 No.)<br>5 liters $4^0C$ | Date of starting of test | 20/02/2020 |
| | | Date of completion of test | 27/02/2020 |

## Result table

| Sr. No. | Parameters | Unit | Requirement (Acceptance Limit) | Permissible Limit In The Advance Of Alternate Source | Result Ground Water | Method of Test |
|---|---|---|---|---|---|---|
| 1. | pH | mg/l | 6.5-8.5 | No Relaxation | 7.01 | IS 3025 (part-11) – 1983 |
| 2. | Colour (pt. co. scale) in units | Hazen | Max 5 | Max 15 | Nil | IS 3025 (part-4) – 1983 |
| 3. | Odour | mg/l | Agreeable | Agreeable | Unobjectionable | IS 3025 (part-5) – 1983 |
| 4. | Taste | mg/l | Agreeable | Agreeable | Agreeable | IS 3025 (part-7&8) – 1984 |
| 5. | Turbidity in NTU | NTU | Max 1.0 | Max 5.0 | 5.6 | IS 3025 (part-10) – 1984 |
| 6. | Total Dissolved Solids | mg/l | Max 500 | Max 2000 | 3137.6 | IS 3025 (part-16) – 2002 |
| 7. | Suspended Solids | mg/l | Max 1 | Max 200 | 6.8 | IS 3025 (Part 17):1984 |
| 8. | Total Hardness as $CaCo_3$ | mg/l | Max 200 | Max 600 | 998.0 | IS 3025 (part-21) – 1983 |
| 9. | Calcium as Ca | mg/l | Max 75 | Max 200 | 207.6 | IS 3025 (part-40) – 1991 |
| 10. | Magnesium as Mg | mg/l | Max 30 | Max 100 | 116.0 | IS 3025 (part-46) – 1994 |
| 11. | Chloride | mg/l | Max 250 | Max 1000 | 2249.3 | IS 3025 (part-32) – 1988 |
| 12. | Sulphate | mg/l | Max 200 | Max 400 | 76.6 | IS 3025 (part-24) – 1986 |
| 13. | Fluoride | mg/l | Max 1.0 | Max 1.5 | 1.25 | IS 3025 (part-60) – 2008 |
| 14. | Total Alkalinity | mg/l | Max 200 | Max 600 | 220.6 | IS 3025 (part-23) – 1986 |
| 15. | Iron as Fe | mg/l | Max 0.3 | No Relaxation | 1.21 | IS 3025 (part-53) – 2003 |
| 16. | Residual free chlorine | mg/l | Min 0.2 | Max 1.0 | Absent | IS 3025 (part-26) – 1986 |
| 17. | Copper as cu | mg/l | Max 0.05 | Max 1.5 | Absent | IS 3025 (part-42) – 1992 |
| 18. | Manganese as Mn | mg/l | Max 0.1 | Max 0.3 | Absent | IS 3025 (part-59) – 2006 |
| 19. | Nitrates | mg/l | Max 45.0 | No Relaxation | 4.8 | IS 3025 (part-34) – 1988 |
| 20. | Phenolic Compound | mg/l | Max 0.001 | Max 0.002 | Absent | IS 3025 (part-43) – 1992 |
| 21. | Mercury as Hg | mg/l | Max 0.001 | No Relaxation | Absent | IS 3025 (part-48) – 1994 |
| 22. | Cadmium as Cd | mg/l | Max 0.003 | No Relaxation | Absent | IS 3025 (part-41) – 1992 |
| 23. | Selenium as Se | mg/l | Max 0.01 | No Relaxation | Absent | IS 3025 (part-53) – 2003 |

----------End of The Test Report---------- 

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TF-2, Sun House, Nr, Old High Court,
Off. Ashram Road, Ahmedabad - 380009.

| Sr. No. | Parameters | Unit | Requirement (Acceptance Limit) | Permissible Limit In The Advance Of Alternate Source | Result | Method of Test |
|---|---|---|---|---|---|---|
| 24. | Arsenic as As | mg/l | Max 0.01 | Max 0.05 | Absent | IS 3025 (part-37) – 1988 |
| 25. | Cyanide as CN | mg/l | Max 0.05 | No Relaxation | Absent | IS 3025 (part-27) – 1986 |
| 26. | Lead as Pb | mg/l | Max 0.01 | No Relaxation | Absent | IS 3025 (part-47) – 1994 |
| 27. | Zinc as Zn | mg/l | Max 5.0 | Max 15.0 | 0.09 | IS 3025 (part-49) – 1994 |
| 28. | Anionic detergents (As MBAS) | mg/l | Max 0.02 | Max 1.0 | Absent | Ann-K of IS:13428:2005 |
| 29. | Chromium as $Cr^{+6}$ | mg/l | Max 0.05 | No Relaxation | Absent | IS 3025 (part-53) – 2003 |
| 30. | Polynuclear aromatic hydrocarbons | mg/l | Max 0.0001 | No Relaxation | Absent | APHA 6440 |
| 31. | Mineral oil | mg/l | Max 0.5 | No Relaxation | Absent | IS 3025 (part-39) – 1991 |
| 32. | Pesticides | mg/l | Max 1 | No Relaxation | Absent | AOAC 990.06 |
| 33. | Aluminum as Al | mg/l | Max 0.03 | Max 0.2 | Absent | IS 3025 (part-55) – 2003 |
| 34. | Boron | mg/l | Max 0.5 | Max 1.0 | 0.05 | IS 3025 (part-57) – 2005 |
| 35. | Ammonia | mg/l | Max 0.5 | No Relaxation | N.D.(D.L.=0.01) | IS 3025 (part-37) – 1988 |
| 36. | Barium (as Ba) | mg/l | Max 0.7 | No Relaxation | N.D.(D.L.=0.5) | Anx-F of IS: 13428:2005 |
| 37. | Chloramines (as $Cl_2$) | mg/l | Max 4 | No Relaxation | N.D.(D.L.=0.5) | IS 3025 (part-26) – 1986 |
| 38. | Silver (as Ag) | mg/l | Max 0.1 | No Relaxation | N.D.(D.L.=0.005) | Anx-J of IS: 13428:2005 |
| 39. | Sulphide (as $H_2S$) | mg/l | Max 0.05 | No Relaxation | N.D.(D.L.=0.01) | IS 3025 (part-29) – 2003 |
| 40. | Molybdenum (as Mo) | mg/l | Max 0.07 | No Relaxation | N.D.(D.L.=0.03) | IS 3025 (part-2) – 1994 |
| 41. | Nickel (as Ni) | mg/l | Max 0.02 | No Relaxation | N.D.(D.L.=0.01) | IS 3025 (part-54) – 2003 |
| 42. | Poly chlorinated biphenyls (PCB) | mg/l | Max 0.0005 | No Relaxation | N.D.(D.L.=0.0001) | APHA 6440 |
| 43. | Total Coliform Bacteria | MPN/ 100 ml | 10/100 mL | 10/100 mL | Absent | IS:1622-1981 reaffirmed: 2003 |
| 44. | E. Coliform Bacteria | MPN/ 100 ml | 10/100 mL | 10/100 mL | Absent | IS:1622-1981 reaffirmed: 2003 |
| 45. | Pseudomonus | MPN/ 100 ml | 10/100 mL | 10/100 mL | Absent | IS:13428-Annx-D: 2005 |
| 46. | Salmonella | MPN/ 100 ml | 10/100 mL | 10/100 mL | Absent | IS:15187-2002 |
| 47. | Thermotolerant Coliform | MPN/ 100 ml | 10/100 mL | 10/100 mL | Absent | IS:1622-1981 reaffirmed: 2003 |

Note : N.D. : Not Detected , D.L : Detection Limit

Analyzed by

Authorized Signatory

Source of Prescribed Norms: NA

Field remark:

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# TEST REPORT

**Customer's Name and Address**
**M/s. Toyo Engineering India Private Limited.**
Survey No. 866-867,
Taluka Kodinar, Village:Chhara,
Gir somnath, Gujarat-362720

| | |
|---|---|
| FORMAT NO. | F/LID/55 |
| REPORT DATE | 28/02/2020 |
| REPORT NO. | EET/202002096 |

| | | | |
|---|---|---|---|
| Description of sample | Noise level Monitoring | Lab ID Code | NM/01/096 |
| Date of sampling | 19/02/2020 | Sampling method | IS 9989 – 1981 RA 2001 |
| Sample collected by | Field Chemist | | |

## RESULT TABLE

| Sr | SAMPLING LOCATION | Unit | Result | |
|---|---|---|---|---|
| | | | Day Time (6 AM – 10 PM) | Night Time (10 PM – 6 AM) |
| 1. | Near REPL Batching plant | dB (A) | 63.9 | 55.4 |
| 2. | Toyo Office Area | dB (A) | 58.2 | 50.1 |

**Note :**Day Time Norms 75 dB(A)
Night Time Norms 70 dB(A)

**Analyzed by** **Authorized Signatory**

| | |
|---|---|
| Source of Prescribed Norms: Standard Norms | Field remark: |

----------End of The Test Report---------- 

# Annexure 4

## Letter from Principal Chief Conservator of Forests (PCCF) to Simar Port Pvt. Ltd. (SPPL)

## (in response to SPPL letter to PCCF attached in Annexure 2)

No. C/Land/T-13/3941-42/2019-20

Office of The Deputy Conservator of Forests
Gir West Division Sardarbag Campus
Junagadh-362001.
Ph.-0285-2631044
E-mail-dcf. gir.west@gmail.com.
Date:-27/01/2020.

By Email

**To,**
The Chief Executive Officer [Ports & Terminals],
Simar Port Private Limited,
SP Centre, 41/44, Minoo-Desai Marg,
Colaba, Mumbai-400005.

**Subj:-** Development of Green Belt Around the Proposed Port Site at Chhara-Sarakhadi by M/s.Simar Port Pvt. Ltd.

**Ref:-** [1]Your Office letter No. SPPL/Chhara/80/2019 dt. 15/11/2019.
[2] C.C.F.W.L.C.O.Junagadh letterNo jmn/t-14/b/8411 dt. 18/01/2020

With reference to the above cited subject and references seeking advice of the Forest department to develop Green Belt. The Gir West Division may advise and help in developing the green belt and the details of the association and role may be discussed further. However, in this regard, kindly provide following details needed to understand the work area.

[1] Color Index map of 1000 acres of project land. [Scale 1: 50,000]

[2] Prepared Lay-out plan of 1000 acres of land . [Scale 1: 50 Mt]

[3] Maps showing the G.P.S. and Survey Number and details of the proposed green belt to be developed. [Scale 1: 40 Mt]

[4] Soft copy of the above all maps [KML File].

The details of mentioned above are needed for understanding the site and viable plantation models. Please contact this office for further clarification.

Deputy Conservator of Forests
Gir West Division Junagadh

c.c.to The Chief Conservator of Forests
Wildlife Circle Junagadh
-For information please.

# Annexure 5

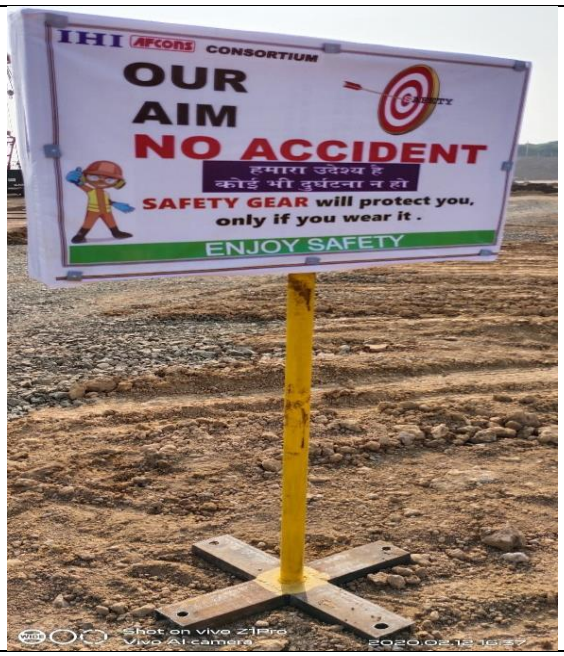
# Construction Site Photographs

Water Sprinkling to control dust

Emergency DG Set at Construction Site

Boundary Fencing at Construction Site


Safety awareness training and meeting at Construction Site




Safety Signboard at Construction Site

Drinking Water at Construction Site


COVID-19 Safety Signboard at Construction Site