

The Director (Environment)
Forests & Environment Department,
Government of Gujarat,
Block No. 14, 8th Floor, Sachivalaya,
Gandhinagar – 382 010
(Fax No.: 079-23252156)

Kind Attn.: Shri Hardik Shah

Subject: Half-yearly Compliance Report with respect to conditions stipulated by Ministry of Environment & Forests, Govt. of India and Department of Forests, Govt. of Gujarat for Expansion of LNG Terminal (Phase-II) at Dahej, District Bharuch in Gulf of Khambhat, Gujarat as on 31st December, 2014

Ref : (a) J-17011/11/2000-IA-III dated 23rd Nov, 2005
(b) ENV-10-2004-117-P dated 28th Dec, 2005

Dear Sir,

The Compliance report as on December 31st, 2014 with respect to conditions stipulated by Ministry of Environment & Forests, Govt. of India and Department of Forests, Govt. of Gujarat for Expansion of LNG Terminal (Phase-II) at Dahej, District Bharuch in Gulf of Khambhat, Gujarat is enclosed.

With regards,


S. Baitalik
Vice President (Projects)

Encl.: As above

Copy to:-

Director,
Ministry of Environment & Forest,
Paryayaran Bhawan,
CGO Complex, Lodhi Road,
New Delhi – 110 003

Joint Director (S)
Ministry of Environment & Forests,
Regional Office, Western Region,
Kendriya Paryavaran Bhavan,
Link Road No. 3,
Bhopal – 462 016

CC to:

- CEO & MD – For kind information, pl.
- Director (Technical)
- President (Technical)
- Sr. V.P. (Projects)
- Vice President (Plant Head)

Half-yearly Compliance Report with respect to conditions stipulated by Ministry of Environment & Forests, Govt. of India and Department of Forests, Govt. of Gujarat for Expansion of LNG Terminal at Dahej as on 31.12.2014

COMPLIANCE REPORT TO THE CONDITION MENTIONED IN MOE&F LETTER NO. J-17011/11/2000-IA-III DATED 23rd NOVEMBER 2005

(A) Specific conditions

- 1) All the conditions stipulated by the Ministry vide Ministry's letter of even number dated 27.12.2000 and also Forest and Environment department, Government of Gujarat vide their letter No.ENV-10-2004-117-P dated 28.07.2005 should be effectively implemented.

Noted.

- 2) All the conditions stipulated by GPCB in their NOC No.PC/BRCH_CCA _611/28337 dated Nil should be effectively implemented.

Noted.

- 3) Quantitative risk analysis of the LNG terminal and associated facilities should be carried out taking into account the worst case scenario and based on formed up engineering design. The report should be submitted within 6 months. The central control room should be located well outside the risk zone.

The Quantitative Risk Analysis (QRA) report for Phase I Project was submitted vide our letter no. PLL/ND/D-7/2K2 dated 18th January 2002.

The Coarse Quantitative Risk Analysis (QRA) report for the entire terminal including the Expansion Facilities submitted vide letter no. PLL/ND/D-7/2K7 dated 8th June 2007. The control room is located outside the risk zone.

- 4) Based on the risk analysis, Disaster Management Plan should be prepared and submitted to this Ministry within 6 months.

Submitted.

- 5) The details of the facilities to be provided by the company to the local population may be furnished within one month.

The details have been provided vide our letter no. PLL/ND/D-7/2K2 dated 18th January 2002.

- 6) The construction material shall be obtained from the approved quarries. In case new quarries need to be opened up, specific approval for the same should be obtained.

Complied during Project Phase.

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- 7) No change in scope of work should be made without prior approval of this Ministry.

Noted. Construction work completed without any change in the scope of work.

- 8) It should be ensured that no project activities including pipeline shall fall within CRZ-I (i).

Complied.

- 9) Expansion of existing service road into Coastal Regulation Zone – I(i) areas is strictly prohibited.

Noted and complied.

- 10) The construction design relating to the project should be reviewed to ensure their safety keeping in view the seismic potential of the area.

Complied during design stage.

- 11) No ground water should be used for the project.

No ground water was used during construction stage.

- 12) The projects proponents should make specific arrangement for rain water harvesting in the project design and the rain water so harvested should be optimally utilized.

The LNG terminal has been set up very near to the coast line at Dahej where water table is very high. Moreover the sea water is brackish in that area. Preliminary investigation indicates that it might not be feasible to carry out rain water harvesting in this area. The process water requirement in LNG terminal at Dahej is NIL. The sanitary waste water is being used for green belt purpose.

- 13) The project proponent will undertake mangrove a forestation in consultation with Forest department, Government of Gujarat in the adjacent area abutting the site. A detailed plan should be worked out in this regard and submitted to this Ministry within 3 months.

Following Mangrove Plantation Completed/under progress along the Gujarat Coast in consultation with GEC & Forest Dept.:

- a. Completed : 850 Hectares (2009-10, 2010-11, 2011-12, 2012-13, 2013-14)
b. Under Progress : 200 Hectares (2014-15) in consultations with Forest Dept.
c. New MoU Signed: PLL has signed MoU with Forest Department to carry out 50 ha. Mangrove Plantation during December, 2014, which is expected to be completed by July, 2015.

- 14) The budget allocated for environment safeguarding measures shall not be diverted for any other purposes.

Noted for Compliance.

Baitalik

(B) GENERAL CONDITION

- 1) Construction of the proposed structures should be undertaken meticulously conforming to the existing central / local rules and regulations including CRZ notification, 1991 & its amendments. All the construction designs / drawings relating to the proposed construction activities must have approvals of the concerned State Government Departments/ Agencies.

Complied.

The construction work was completed for expanding the facilities at Dahej (i.e. Phase II) and necessary approvals obtained. Phase-II was commissioned in April 2009. The Phase I is operational since April 2004.

- 2) The proponent shall ensure that as a result of the proposed constructions, ingress of the saline water into the ground water does not take place. Piezometers shall be installed for regular monitoring for this purpose at appropriate locations on the project site.

Noted & Complied. Ground water quality is being analyzed regularly. During construction, no water was drawn from ground and no ingress of saline water was taking place.

- 3) Handling, manufacturing, storage and transportation of all hazardous chemicals should be carried out in accordance with MSIHC Rules, 1989 and subsequent amendments. All approvals from state and central nodal agencies including OISD, Chief Controller of Explosives, and Chief Inspectorate of Factories must be obtained. A comprehensive contingency plan in collaboration with the concerned authorities must be formulated before commissioning of the project to meet any eventuality in case of an accident.

Complied and the said expansion project was commissioned in April, 2009.

- 4) A well-equipped laboratory with suitable instruments to monitor the quality of air and water shall be set up so as to ensure that the quality of ambient air and water conforms to the prescribed standards. The laboratory will also be equipped with qualified manpower including a marine biologist so that the marine water quality is regularly monitored in order to ensure that the marine life is not adversely affected as a result of implementation of the said project. The quality of ambient air and water shall be monitored periodically in all the seasons and the results should be properly maintained for inspection of the concerned pollution control agencies. The periodic monitoring reports at least once in 6 months must be sent to this Ministry (Regional Office at Bangalore) and SPCB.

Noted for Compliance.

Environment monitoring is being carried out through GPCB approved agencies as per GPCB guidelines. Analytical report is enclosed as Annexure- I.

Dahej, Sea water is not being used for vaporizers or any other purpose. Instead, air heaters using atmospheric air is being used for vaporizing the LNG. Since there is no intake of sea water and out flow of water into the sea, hence it is felt that a marine biologist may not be required.

Maitalik

- 5) Adequate provisions for infrastructure facilities such as water supply, fuel for cooking, sanitation etc. must be provided for the laborers during the construction period in order to avoid damage to the environment. Colonies for the laborers should not be located in the CRZ area.

Complied during construction stage.

- 6) To prevent discharge of sewage and other liquid wastes into the water bodies, adequate system for collection and treatment of the wastes must be provided. No sewage and other liquid wastes without treatment should be allowed to enter into the water bodies.

Complied.

- 7) Appropriate facility should be created for the collection of solid & liquid wastes generated by the barges / vessels and their safe treatment and disposal should be ensured to avoid possible contamination of the water bodies.

Contracts for engaging the vessel stipulate that the vessels comply with these requirements including MARPOL. Besides LNG vessel is berthed for 24 hours only and it is equipped with incinerator and sewage treatment plant.

- 8) The project authorities should take appropriate community development and welfare measures for the villagers in the vicinity of the project site, including drinking water facilities. A separate fund should be allocated for this purpose.

Community development and welfare measures are taken. Village Luwara has been jointly adopted along with another nearby industry, as directed by PCPIR Welfare Society. Separate fund allocated for CSR.

Some of the schemes completed/under progress are Health Center (construction & operation), drainage and provision of street lights at Village Luwara. Rupees 75 lakh contributed to PCPIR Welfare Society. Two ladies from Luwara village sponsored for nursing course at Vidhyadeep Community college, Bharuch. Sponsored construction of Sanitation scheme at village Muller. Active participation in other Government initiated community development programs.

Installed 10 nos. Emergency solar lighting at prominent places in village Luwara. Donated Rs.1 lac for Bharuch District Civic centre development. Participated in Govt. scheme on Kanya Kelvani. Installation of drainage crossings to remove accumulated water at 4 locations within the village Luwara at a cost of Rs. 0.8 lacs. Construction of approach road in village Lakhigaon, Dahej.

PLL has sponsored 'Mataria Talav drinking water project' of the Bharuch Municipality Corporation. This project is for the supply of sweet drinking water from the Narmada River to the residents of Bharuch city. MD&CEO handed over cheque for Rs. 25 Lacs to the Collector, Bharuch on 13/06/2011 and further, PLL added Rs. 20 Lacs for the 'Mataria Talav drinking water project'

Baitalik

PLL installed 50 nos. Emergency solar lighting at prominent places in village Luwara & 10 nos. Emergency solar lighting at prominent places in village Lakhigam of Vagra Taluka in Bharuch District. Provided School Bus to Primary School at Lakhigam Village and also running Primary Health Center at Luvara Village. PLL constructed Bus-stand and extended Gram Panchayat Bhavan building at Luvara Village.

PLL installed 25 Nos. of Solar lights at prominent places in village Lakhigam and Luwara. Contributed Rs. 20 Lakhs in Akshay Patra mid-day meal scheme at villages in and around Dahej location. Also, contributed Rs. 10.00 Lakhs in Gujarat Lion Conservation Society towards procurement of Vehicle.

Primary health services, Gynec health and Pulse Polio campaign (Pakhajan PHC) to Luvara village. PLL supported noble cause of Construction of Storm water drainage at Shravan Chokdi to Jambusar by pass (over bridge) in Bharuch. This project is executed under District Collector office.

Request from CDHO (Chief District Health Officer) was received to participate in various health initiatives. PLL agreed during meeting with DM to provide the ambulance for PHC, Pakhajan Village of Vagra Taluka. PLL is supporting Luvara School for reference books, uniform, school picnic and creating awareness on environment, health, safety and security aspects through various programs regularly, rewarding bright students etc.

Bharuch has problem of solid waste management and garbage disposal. To improve on cleanliness of the town, PLL is supporting initiative of GREEN BHARUCH CLEAN BHARUCH by donating two dumper placer worth Rs. 23.94 Lakh.

Due to delay in recruitment of teachers, primary schools in and around Dahej has 40% teaching staff. To support education by deploying young educated teachers, PLL sponsored 14 teachers in 4 schools of villages of Dahej, Lakhigam and Luvara.

PLL constructed 11 houses of homeless tribes in Luvara village at a cost of 25 Lakh. PLL initiated drive to make Luvara open defecation free by sponsoring toilets for 172 houses at a cost of Rs. 17.2 Lakh.

- 9) The quarrying material required for the construction purposes shall be obtained only from the approved quarries / borrow areas. Adequate safeguard measures shall be taken to ensure that the overburden & rocks at the quarry site do not find their way into water bodies.

Noted and Complied.

Baitalib,

- 10) For employing unskilled, semiskilled and skilled workers for the project, preferences shall be given to local people.

PLL has recruited fair number of local people. For ancillary and support functions as security services, fire fighting, and green belt maintenance etc. PLL is giving preference to local people. Housekeeping contract has been awarded to local Lakhigam village contractor.

- 11) The recommendation made in the environment management plan and Disaster Management Plan, as contained in the EIA and risk analysis reports of the project shall be effectively implemented.

Noted for Compliance.

- 12) A separate environment management cell with suitably qualified staff to carry out various environmental studies/analysis should be set up under the charge of a Senior Executive who will report directly to the Chief Executive of the Company.

Complied. Health, Safety and Environment Management cell exists at site.

- 13) The project affected people, if any should be properly compensated and rehabilitated.

Complied.

- 14) The funds earmarked for environment protection measures should be maintained in the separate account and there should be no diversion of these funds for any other purpose. A year-wise expenditure on environmental safeguards should be reported to the ministry.

Noted for compliance.

Rs. 33.22 Lac spent for development of Green Belt and Mangrove Plantation during the year 2009-10.

Rs. 50 Lac spent for development of Green Belt and Mangrove Plantation during the year 2010-11.

Rs 93.31 Lacs spent for development of Green belt. /Mangrove plantation during the year 2011-2012

Rs. 109.57 Lac spent for development of Green Belt and Mangrove Plantation during the year 2012-13.

Rs. 95.20 Lac spent for development of Green Belt and Mangrove Plantation during the year 2013-14.

Budgeted Rs. 94.48 Lacs for development of Green Belt and Mangrove Plantation during the year 2014-15. Of which, PLL spent Rs. 45.78 lac for development of Green Belt and Mangrove Plantation till 31.12.2014.

Baitalik

- 15) Full support should be extended to the officers of this ministry's regional office at Bhopal and the officers of the central and state pollution control boards by the project proponents during their inspection for monitoring purposes by furnishing full details and action plans including the action taken reports in respect of mitigate measures and other environmental protection activities.

Noted & Agreed.

- 16) In case of deviation or alteration in the project including the implementing agency, a fresh reference should be made to the ministry or modification in the clearance conditions or impositions of new ones for ensuring environmental protection. The project proponents should be responsible for implementing the suggested safeguard measures.

Noted & Agreed.

- 17) The Ministry reserves the right to revoke this clearance, if any of the conditions stipulated are not complied with to the satisfaction of this ministry.

Noted & Agreed.

- 18) This Ministry or any other competent authority may stipulate any additional conditions subsequently, if deemed necessary, for environmental protection, which shall be complied with.

Noted & Agreed.

- 19) The project proponent should advertise at least in two local newspapers widely circulated in the region around the project, one of which shall be in the vernacular language of the locality concerned informing that the project has been accorded environmental clearance and copies of clearance letters are available with the state pollution control board and may also be at web site of the ministry of environment & forest at <http://www.envfor.nic.in>. The advertisement should be made within 7 days from the date of issue of clearance letter and a copy of the same should be forwarded to the Regional office of this Ministry at Bhopal.

Complied.

- 20) The project proponents should 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.

Noted and Complied.

Expansion project is completed and the plant is operational since April, 2009.

Bautalika

Compliance to conditions as conveyed by Department of Forests & Environment, Govt. of Gujarat, Letter No. ENV-10-2004-117-P dated 28th December, 2005

As on 31.12.2014

1. The provisions of CRZ notification of 1991 and subsequent amendments issued from time to time.

Noted

2. The PLL shall obtain necessary permissions from different Government Departments / Agencies before commencing the expansion activities.

The construction work was completed for expanding the facilities at Dahej (i.e. Phase II) and necessary approvals obtained. Phase-II was commissioned in April 2009. The Phase I is operational since April 2004.

3. No effluent or sewage shall be discharged into the sea / creek or in the CRZ area and shall be treated to conform the norms prescribed by the Gujarat Pollution Control Board and would be reused / recycled within the plant premises.

Noted

4. All the recommendations and suggestion given by the NIOT and WAPCOS in their Environment Impact Assessment reports shall be implemented strictly.

Noted.

5. The PLL shall be paid the cost of the external agency that may be appointed by this department for supervision / monitoring of the project activities during construction / operational phases.

Noted.

6. The PLL shall contribute financially for any common study or project that may be proposed by this Department for environmental management / conservation / improvement for the Gulf of Khambhat or for Dahej region.

Agreed.

7. The construction debris and any other type of waste shall not be discharged into the sea / creek or in CRZ areas. The debris shall be removed from construction site immediately after construction is over.

Agreed.

Baitalik

8. The construction camps shall be located outside the CRZ area and the construction labor shall be provided with necessary amenities, including sanitation, water supply and fuel and it shall be ensured that the environmental conditions are not deteriorated by construction labor

Noted & complied.

9. The PLL 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.

Complied.

10. The Gujarat Maritime Board shall initiate for the Vessel Traffic Management system for the Gulf of Khambhat and would work out the modus operandi for cost sharing by the different players in the Gulf including the PLL. The PLL shall contribute for the same as may be decided by the Gujarat Maritime Board.

Gujarat Maritime Board has established VTS System and PLL is complying all norms as per Gujarat Maritime Board.

11. The PLL 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.

Noted.

General Conditions:

12. The ground water shall not be tapped to meet with the water requirements in any case.

Ground Water was not used in construction.

13. The PLL shall take up massive mangrove plantation activities as well as greenbelt development activities in consultation with the Gujarat Institute of Desert Ecology / Forest department.

Following Mangrove Plantation Completed/under progress along the Gujarat Coast in consultation with GEC & Forest Dept.:

Completed : 850 Hectares (2009-10, 2010-11, 2011-12, 2012-13, 2013-14)
Under Progress : 200 Hectares (2014-15) in consultations with Forest Dept.
New MoU Signed : PLL has signed MoU with Forest Department to carry out 50 ha. Mangrove Plantation during December, 2014, which is expected to be completed by July, 2015

Bantali

14. The PLL shall have to contribute financially for taking up the socio-economic upliftment activities in this region in consultation with the Forest and Environment Department and the District Collector / District Development Officer.

Community development and welfare measures are taken. Village Luwara has been jointly adopted along with another nearby industry, as directed by PCPIR Welfare Society. Separate fund allocated for CSR.

Some of the schemes completed/under progress are Health Center (construction & operation), drainage, provision of street lights at Village Luwara. Rupees 75 lakh contributed to PCPIR Welfare Society. Two ladies from Luwara village sponsored for nursing course at Vidhyadeep Community college, Bharuch. Sponsored construction of Sanitation scheme at village Muller. Active participation in other Government initiated community development programs.

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PLL constructed 11hosues of homeless tribes in Luvara village at a cost of 25 Lakh. PLL initiated drive to make Luvara open defecation free by sponsoring toilets for 172 houses at a cost of Rs. 17.2 Lakh.

15. Environmental Audit report indicating the changes, if any with respect to the baseline quality, in the coastal and marine environmental shall be submitted every year.

Noted

16. The PLL shall have to contribute financially to support the National Green Corps Scheme being implemented in Gujarat by the GEER Foundation, Gandhinagar, in consultation with Forests and Environment Department.

Noted.

17. A six monthly report on compliance of the conditions mentioned in this letter shall have to be furnished by the PLL on regular basis to this Department.

Noted for compliance.

18. Any other condition that may be stipulated by this Department from time to time for environmental protection / management purpose shall also have to be complied with by the PLL.

Noted.

Bautalib

ANNEXURE - I

AMBIENT AIR QUALITY STATUS REPORT

All units are in $\mu\text{g}/\text{m}^3$.

Sr.no.	Month	PM10		PM2.5		SOx		NOx		HC as Methane CH ₄	
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
	NAAQ norms	100 $\mu\text{g}/\text{m}^3$		60 $\mu\text{g}/\text{m}^3$		80 $\mu\text{g}/\text{m}^3$		80 $\mu\text{g}/\text{m}^3$		Absent	
1	Jan-14	110.00	158.00			9.50	19.40	18.70	36.90	0	0
2	Feb-14	138.00	178.00	35.80	78.70	6.90	12.40	18.90	30.30	0	0
3	Mar-14	116.00	171.00			7.50	12.10	18.80	29.90	0	0
4	Apr-14	115.00	181.00			8.00	13.50	15.50	31.50	0	0
5	May-14	115.00	175.00			6.50	10.30	14.10	32.50	0	0
6	Jun-14	138.00	196.00			5.90	14.70	18.60	42.70	0	0
7	Jul-14	52.00	81.00	24.00	30.00	9.26	11.40	9.92	12.44	0	0
8	Aug-14	55.00	71.00	23.00	30.00	9.26	13.84	14.54	18.34	0	0
9	Sep-14	31.00	64.00	19.00	28.00	8.49	13.89	13.69	16.49	0	0
10	Oct-14	59.00	70.00	18.00	24.00	10.03	10.08	12.86	16.80	0	0
11	Nov-14	31.00	115.00	10.00	31.00	6.80	17.40	13.60	19.80	0	0
12	Dec-14	34.00	160.00	8.00	69.00	6.90	17.50	6.50	20.20	0	0
	Range	31 - 196		8 - 78.7		5.90 - 19.40		6.50 - 42.70		0 - 0	

Pranav

ANNEXURE - I

STACK EMISSION AIR QUALITY STATUS REPORT

All units are in mg/Nm³.

Sr.no.	Month	GTG			DG SET			FIRE ENGINE		
		SPM	SO _x	NO _x	SPM	SO _x	NO _x	SPM	SO _x	NO _x
	GPCB norms	150	100	50	150	100	50	150	100	50
1	Jan-14	11.30	2.80	22.90				31.80	3.60	16.90
2	Feb-14	BDL	BDL	17.80	16.80	2.00	9.60	32.20	3.10	20.40
3	Mar-14	12.00	1.80	19.50	34.10	2.80	18.00	32.80	3.10	16.40
4	Apr-14	BDL	BDL	15.60	26.40	2.00	14.60			
5	May-14	BDL	BDL	14.99	30.77	2.44	15.29	35.26	2.73	20.07
6	Jun-14	BDL	BDL	17.46	20.60	1.95	20.39			
7	Jul-14	20.00	BDL	6.52						
8	Aug-14	37.00	BDL	5.12				30.00	BDL	4.89
9	Sep-14	44.00	0.30	5.19	49.00	0.30	3.87			
10	Oct-14	28.00	0.30	3.73	37.00	0.30	4.56	33.00	0.30	4.42
11	Nov-14	26.00	BDL	4.20	55.00	BDL	5.40	38.00	BDL	4.70
12	Dec-14	27.00	BDL	4.00	36.00	0.30	4.20	40.00	0.30	3.90
	Range	BDL - 44	BDL - 2.8	3.73 - 22.90	16.80-55	BDL-2.80	3.87-20.39	30-40	BDL-3.60	3.9-20.40

BDL: Means Below Detection Level.

Handwritten signature

ANNEXURE - I

NOISE LEVEL REPORT

Sr.no.	Location	Unit	Limit	Jan-14		Feb-14		Mar-14		Apr-14		May-14		Jun-14		Jul-14		Aug-14		Sep-14		Oct-14		Nov-14		Dec-14	
				L _{day}	L _{night}	L _{day}	L _{night}	L _{day}	L _{night}	L _{day}	L _{night}	L _{day}	L _{night}	L _{day}	L _{night}	L _{day}	L _{night}	L _{day}	L _{night}	L _{day}	L _{night}	L _{day}	L _{night}	L _{day}	L _{night}	L _{day}	L _{night}
1	North	decibel	Day-75 db Night-70db	68.3	48.8	56.8	52.7	63.2	49.8	62.3	62.1	62.3	58.6	59	58.1			55.3	45.5			63.9	61.3	59	59.3	60.8	59.8
2	East	decibel	Day-75 db Night-70db	66.4	53.7	53.7	51.3	59.4	51.5	60.5	59.5	56.2	56.3	54.2			60.4	46.3			61.2	59.4	60.6	61.9	58.8	59.1	
3	West	decibel	Day-75 db Night-70db	64.2	52.3	59.7	54.4	62.4	52.3	63.7	60.3	63.7	57.9	56.3			57.2	48.2			65.7	63.3	59.2	60.1	62.2	65.9	
4	South	decibel	Day-75 db Night-70db	72.2	49.2	58.2	51.6	58.2	50.9	61.2	58.4	61.2	55.5	53.4			56.3	52.1			64.3	62.1	57.6	58.8	58.8	58.6	

Signature

ANNEXURE - I

GROUND WATER QUALITY STATUS REPORT

Sr.no.	Parameter	Unit	Jan-14		May-14		Aug-14		Nov-14		
			GW1	GW2	GW1	GW2	GW1	GW2	GW1	GW2	
1	Temperature	*C	29	29	29	29	31	31	28.5	28.2	
2	PH	-	8.13	8.18	8.39	8.45	7.69	7.73	7.29	7.41	
3	Total Dissolved Solids (TDS)	mg/L	4614	4532	3270	3270					
4	Chlorides as CL	mg/L	1820	1800	1325	1299	2382	1787	2303	1747	
5	Sulphate as SO4	mg/L	97.89	72.13	71.26	52.04	645	1479	487	1526	
6	BOD (3 days @ 27*C)	mg/L	ND*	ND*	ND*	ND*	6	5	7	4	
7	COD	mg/L	26.58	ND*	18.14	ND*	20	16	24	12	
8	Oil & Grease	mg/L	ND*	ND*	ND*	ND*	ND*	ND*	ND*	ND*	
9	Phenolic Compound	mg/L	ND*	ND*	ND*	ND*	ND*	ND*	ND*	ND*	
10	Zinc as Zn	mg/L	0.076	0.082	0.055	0.058	0.1	0.1	0.1	0.1	
11	Total Chromium as Cr+3	mg/L	ND*	ND*	ND*	ND*	ND*	ND*	ND*	ND*	
12	Lead as Pb	mg/L	ND*	ND*	ND*	ND*	0.1	0.1	0.1	0.1	
13	Cyanide as CN	mg/L	ND*	ND*	ND*	ND*	ND*	ND*	ND*	ND*	
14	Flouride as F	mg/L	ND*	ND*	ND*	ND*	0.34	0.49	0.59	0.43	
15	Copper as Cu	mg/L	1.18	1.05	0.86	0.76	0.08	0.08	0.08	0.08	
16	Insecticide	mg/L	ND*	ND*	ND*	ND*	ND*	ND*	ND*	ND*	
17	Pesticide	mg/L	ND*	ND*	ND*	ND*	ND*	ND*	ND*	ND*	
18	Mercury as Hg	mg/L	ND*	ND*	ND*	ND*	ND*	ND*	ND*	ND*	
			ND*: Not detected								

M. Ananthan

Mangrove Plantation (50 ha.) at Nada Coast during 2009-10



Mangrove Plantation (100 ha.) at Ankalva Coast during 2010-11



Mangrove Plantation (200 ha.) at Ankalva Coast during 2011-12



Mangrove Plantation (200 ha) at Ankalva Coast during 2012-13



Mangrove Plantation (100 ha.) at Bhavnagar Coast during 2012-13



Mangrove Plantation (200 ha.) at Bhavnagar Coast during 2013-14



Mangrove Nursery Preparation for 200 ha. Plantation at Bhavnagar Coast
During 2014-15

