BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL,

SOUTHERN ZONE,CHENNAI

O.A.No.19 OF 2013(SZ)

Meenavargal Membattu Sangam

Vs

The Chief Secretary, Government of Tamil Nadu,Chennai and Ors

With

O.A.No.248/2016(SZ)

Meenava Thanthai K.R.Selvaraj Kumar, Meenavar Nala Sangam

Vs

The State of Tamil Nadu and Ors

With

O.A.No. 224 of 2016(SZ)

Meenava Thanthai K.R.Selvaraj Kumar, Meenavar Nala Sangam

Vs

The State of Tamil Nadu and Ors

COMMON OBJECTIONS/SUBMISSIONS ON BEHALF OF APPLICANT TO THE COMMITTE REPORT DATED 28.10.2020

1. The Applicant submits that an Application No. 19 of 2013 was originally filed before the Hon'ble High Court of Madras in W.P.No.6922 of 2011, raising the alarming issue of discharging untreated hazardous effluents directly into the sea by Respondent No.5 ie. Manali Petro Chemicals Limited (Unit 1 and Unit 2). Thereafter, the matter has been transferred to Hon'ble National Green Tribunal, Southern Zone.
2. The Applicant submits that an Application No.248/2016 and 224/2016 were filed before this Hon'ble Tribunal by raising the issue of discharging untreated hazardous and toxic effluents into

the sea by Respondent Industries ie.Manali Petrochemicals Limited(Unit 1 and Unit 2) and Tamil Nadu Petro Chemicals Limited. At this juncture, it is pertinent to state that MPL-I, MPL-II and TPL are independent and distinct industries.

3. The Applicant submits that the respondent industries are the public limited companies incorporated under the Companies act in the year,1986, which are situated at Manali, Chennai and engaged in the business of Manufacturing Petro Chemical Products ie. Propylene oxide, Propylene Glycol and Polyols, intermediates with applications across a spectrum of industries including those of Pharmaceuticals, Polyurethane, Resin, Fragrances, Food, Refrigeration, Oil Drilling and others.
4. The Applicant submits that the above titled applications have been filed by the Applicant for the aim to protect the coastal eco system of the country that includes shore ecosystems, wetland ecosystems, mangrove ecosystems, mudflat ecosystems, sea grass ecosystems, salt marsh ecosystems and seaweed ecosystems as well as the rights of the fishermen communities and other communities who depends on the coastal area for their livelihood.
5. The Applicant submits that there are 21 fishery hamlets located in and around the Industries and the inhabitants are entirely depend on the sea for their social and economic needs. Further, it is vital to state that the populace living in and around the Industries are fishermen's and the marine organisms are their only source of income. But, it is unfortunate to state that the Respondent industries ie. MPL-I, MPL-II and TPL have deteriorated the quality of sea as well as the growth of marine species by discharging huge amount of untreated hazardous and toxic effluents into the sea.

The aforesaid act has also created a big threat to the coastal ecosystem including the livelihood of the fishermen in the vicinity.

6. The Applicants submits that several representations have been sent to various authorities by the applicants including by the fishermen community raising the serious issue of coastal degradation caused by Respondent Industries. But it is unfortunate and the reasons know to the authorities that no actions have been initiated against the respondent industries for the deliberate and intentional degradation caused to the coastal ecosystem and for the violation of the provisions of CRZ Notification. Such a lackadaisical attitude of the authorities has allowed the industries to degrade the coastal eco system including its species from the year of establishment of Industries ie.1986. With the above facts and the constant violations committed by Respondent Industries, the Applicants have filed the above titled Applications before this Hon'ble Tribunal against the Respondents ie. Manali Petro Chemicals (Unit 1 and Unit 2) and Tamil Nadu Petrochemicals Limited.

7. While this is so, on 30.07.2014, this Hon'ble Tribunal has constituted an expert committee to go into the allegations raised by the applicants and directed to file a report before this Hon'ble Tribunal. In this regard, the Committee has filed a report dated 19.9.2014 along with TNPCB Report of Analysis before this Hon'ble Tribunal by observing the following :

Cooling Tower Water Sump(Before Bio Reactor)-Untreated

MANALI PETRO CHEMICALS- UNIT-I

S.No	Parameters	Unit	1	Permissible level
1.	BOD	Mg/L	**182**	100
2.	COD	Mg/L	**2360**	250

ETP-OUTLET INTO SEA- TREATED

S.No	Parameters	Unit	1	Permissible level
1.	BOD	Mg/L	**92**	100
2.	COD	Mg/L	**1400**	250

Cooling Tower Water Sump(Before Bio Reactor)-Untreated

MANALI PETROCHEMICALS LIMITED - UNIT-II

S.No	Parameters	Unit	1	Permissible level
1.	BOD	Mg/L	**471**	100
2.	COD	Mg/L	**2680**	250

ETP-OUTLET INTO SEA- TREATED

MANALI PETROCHEMICALS LIMITED - UNIT-II

S.No	Parameters	Unit	1	Permissible level
1.	BOD	Mg/L	**220**	100
2.	COD	Mg/L	**2080**	250

REPORT OF ANALYSIS BY TNPCB FROM THE SURFACE AND THE BOTTOM OF SEA AT ABOUT 8M DEPTH OF ABOUT 700 METRE DISTANCE FROM THE SHORE NEAR OUTLET POINT-TREATED

MANALI PETROCHEMICALS LIMITED

S.No	Parameters	Unit	BEFORE SEA-TREATED	FROM THE SURFACE OF SEA FROM 700M FROM THE OUTLET-TREATED	FROM THE BOTTOM OF SEA AT ABOUT 8M DEPTH OF ABOUT 700M FROM THE OUTLET-TREATED
1.	BOD	Mg/L	**52/100**	**16/100**	**22/100**
2.	COD	Mg/L	**880/250**	**320/250**	**560/250**

Report of the Committee dated 19.9.2014 is Annexed as Annexure-I

8. The Applicant submits that the above tabular columns would apparently reveals that the COD and BOD level of treated water observed by the Committee was exorbitant and it is evident that the

respondent Industries have committed an irreversible damage to the coastal eco system.

9. The Applicant further submits ***that the traces of chemicals discharged by respondent Industries was found by the committee even at a distance of 700m meter and a depth of 8m from the shore near outlet point(Evident from the last tabular column).*** The aforesaid observation of the committee would emphasis the gravity of hazardous and toxic effluents discharged by Respondent Industries into the sea. In addition to the above, the aforesaid violation has been unnoticed by the authorities from the inception of respondents Industries, which affected the marine organisms including the livelihood of the fishermen's.

10. The Committee after observing the above irregularities on the functioning of the respondents Industries have stated several short term as well as long term specific recommendations required to be initiated by the respondents Industries for the safety of Environmen. But, it is shock and surprise that the respondent Industries have not adhered to any of the recommendation issued by the committee in the report dated 19.09.2014 filed before this Hon'ble Tribunal.

11. Thereafter, this Hon'ble Tribunal vide order dated 31.03.2016 has directed the Central Pollution Control Board aand Tamil Nadu State Pollution control Board to conduct a joint inspection as per the recommendation of Expert Committee dated 19.09.2014 and file a status report before this Hon'ble Tribunal.

12. For the above order of this Hon'ble Tribunal, the Committee has filed its report dated 2.05.2016 by observing the following:-

REPORT OF ANALYSIS

MANALI PETROCHEMICALS LIMITED - UNIT-I

S.No	Parameters	Inlet	Outlet	Permissible level
1.	BOD	**1463**	**1258**	100
2.	COD	**1744**	**1536**	250

Quote from the Committee Report(Page no.11)

- ***It is also observed that the effluent having BOD of 1258 mg/L, COD of 1744 mg/L was being discharged into marine disposal by violating the prescribed standard of TNPCB(BOD of 100 mg/L and COD of 250 mg/L.***
- ***The overall housekeeping in the ETP was poor.***

REPORT OF ANALYSIS

MANALI PETROCHEMICALS LIMITED - UNIT-II

S.No	Parameters	Inlet	Outlet	Permissible level
1.	BOD	*	**1068**	100
2.	COD	**2960**	**1344**	250

****parameter could not be analysed due to interference during analysis.***

Quote from the Committee Report(Page no.14)

- ***It is also observed that the effluent having BOD of 1068 mg/L, COD of 1344 mg/L was being discharged into marine disposal by violating the prescribed standard of TNPCB(BOD of 100 mg/L and COD of 250 mg/L.***
- ***The overall housekeeping in the ETP was poor.***

REPORT OF ANALYSIS

TAMIL NADU PETROCHEMICALS LIMITED

S.No	Parameters	Inlet	Outlet	Permissible level
1.	BOD	*	**131**	100
2.	COD	**BDL**	**1152**	250

****parameter could not be analysed due to interference during analysis.***

Quote from the Committee Report(Page no.18)

- ***The analysis results found that the COD in the inlet is less than 20 mg/L but in out let COD and BOD found high this may be due to non homogeneuosity in the inlet storage tank. However from the analysis, the effluent having BOD of 131 mg/L, COD of 1152 mg/L was being discharged into marine disposal by violating the prescribed standard of TNPCB(BOD of 100 mg/L and COD of 250 mg/L.***

4.0.Overall finding of Joint Monitoring Team:

a) As per the observations of joint monitoring team, Maintenance and operation of ETPs in MPL-I and II plants are not satisfactory. Since effluents has High TDS, the Existing biological treatment system is not adequate to meet the prescribed standards of disposal.

b) The Analysis results of ETP outlet samples taken from MPL-I and II as well as TPL have shown the High concentration confirms inadequate treatment plant.

d)None of the Industries have installed water level indicators in raw effluent collection tank or in treated effluent storage tanks. Also there is no proper record/log book for accountability of effluent generated, treated and quantity of treated effluent disposed.

Committee Report dated 2.05.2016 is annexed as Annexure-II

Unquote:

13. The Applicant submits that the abovementioned tabular columns as well as the observations of the second committee has also confirms the discharge of untreated hazardous effluents into the sea by Respondent Industries ie. MPL-I, MPL-II and TPL without adhering to the recommendations issued by the First Committee vide report dated 19.09.2014.

14. The Applicant further submits that the second committee vide report dated 02.05.2016 has also stated several recommendations to be complied by Respondent Industries in addition to the recommendations issued by the first committee for the safety of Coastal Environment.

Despite to the above, the Respondent Industries have operated the industries without adhering to the recommendations issued by first and second committee of this Hon'ble Tribunal.

15. With the above non-compliances by the Respondent industries, this Hon'ble Tribunal has once again passed the following order dated 29.07.2016:-

Quote:

"CPCB and TNPCB to effect a fresh joint inspection and find out as to whether the recommendations of the joint committee dated 30.04.2016 have been implemented or not. We make it clear that in the event of joint inspection report reiterating the earlier stand, the Tribunal may take corrective stand against the 5th respondent".

16. The Applicant submits that the joint committee of CPCB and TNPCB has filed a report on Septemeber, 2016 before this Hon'ble Tribunal by observing the following:-

REPORT OF ANALYSIS

MANALI PETROCHEMICALS LIMITED - UNIT-I

S.No	Parameters	Inlet	Outlet	Permissible level
3.	BOD	**900**	**783**	100
4.	COD	**1832**	**1673**	250

REPORT OF ANALYSIS

MANALI PETROCHEMICALS LIMITED - UNIT-II

S.No	Parameters	Inlet	Outlet	Permissible level
1.	BOD	**1900**	**833**	100
2.	COD	**2876**	**1832**	250

- ***With respect to the MPL-II, the Committee observed that iron found slightly exceeding the prescribed standards of Marine disposal***

REPORT OF ANALYSIS

TAMIL NADU PETROCHEMICALS LIMITED

S.No	Parameters	Inlet	Outlet	Permissible level
1.	BOD	**1.0**	**193**	100
2.	COD	**3.0**	**894**	250

Report of the Committee is annexed as Annexure-III

17. The Applicant submits that the above tabular column and observation of the committee has again confirmed that the Respondent Industries ie. MPL-I, MPL-II and TPL have discharging high concentration of Hazardous effluents into the sea without proper treatment. Further, the report of the committee has emphasis that the respondent Industries have failed to adhere with the recommendations issued by the earlier committee for the environmental safety.

18. Thereafter, it is pertinent to mention that due to the deliberate non-compliances of environmental norms, CPCB has issued closure order under sec.5 of the EP Act against the Respondent Industries ie.MPL-I, MPL-II and TPL. Aggrieved by the above order, the Respondents have challenged the closure order of CPCB before this Hon'ble Tribunal and obtained status quo in the above matters.

19. While this is so, after considering the above violations and degradation to the coastal eco system by tRespondent Industries ie.MPL-I, MPL-II and TPL, this Hon'ble Tribunal has passed the following order dated 08.02.2020:

Quote:

25. Before disposing the matter, we feel it appropriate to appoint a Joint Committee comprising of Central Pollution Control Board (CPCB), State Pollution Control Board (SPCB), a senior scientist from National Institute of Ocean Technology (NIOT) and senior scientist dealing with environment engineering (Chemical) from Anna University to inspect the units in question and find out the present status of the functioning of the units namely M/s. Manali Petrochemical Limited and M/s. Tamil Nadu Petrochemical Limited and ascertain as to whether they are maintaining and managing all pollution control mechanism and **whether the discharge of effluent from these industries to sea confirms with the specified norms prescribed by the PCB and the impact of effluents in the sea water and if there is any deficiency found and the sea water quality has not improved, then suggest the remedial measures by which the quality of sea water can be improved and who has to carry out these remedial measures and also assess the environmental compensation against the defaulting units who are**

responsible for polluting sea water by applying "Polluters Pay" principle and submit a report to this Tribunal within a period of three months.

Unquote:

20. The Applicant submits that the committee appointed by this Hon'ble Tribunal vide order dated 08.02.2020 has filed a report dated 28.10.2020 by observing the following:-

REPORT OF ANALYSIS

MANALI PETROCHEMICALS LIMITED - UNIT-I

S.No	Parameters	Inlet	Outlet	Permissible level
1.	BOD	**1053**	**165**	100
2.	COD	**254**	**05**	250

REPORT OF ANALYSIS

MANALI PETROCHEMICALS LIMITED - UNIT-II

S.No	Parameters	Inlet	Outlet	Permissible level
1.	BOD	**1324**	**139**	100
2.	COD	**285**	**3.8**	250

REPORT OF ANALYSIS

TAMIL NADU PETROCHEMICALS LIMITED

S.No	Parameters	Inlet	Outlet	Permissible level
1.	BOD	**626**	**92**	100
2.	COD	**29**	**4.7**	250

Report of the Committee is Annexed as Annexure-IV

21. The Applicant submits that the report of the committee emphasis that they have not conducted proper inspection as per the order of this Hon'ble Tribunal dated 08.02.2020. Further, the report states that ***"in the committee meeting held on 4.03.2020, it was decided to collect samples at the inlet and outlet of ETP's of all four units and requested all units to discharge the treated wastewater at same time. Accordingly, on 06.03.2020 samples were collected at the inlet and outlet of ETP and also instant readings of the flow were noted"***.(Page no.2 of Committee Report).

From the reading of the above lines of the report would reveals that the present committee has alerted the Respondent industries by granting advance notice two days prior to the inspection. Notwithstanding , the above lines of the report also reveals that the committee has not conducted proper inspection by taking independent water sample of each industry, instead, they have taken samples by discharging water of all units at the same time. The aforesaid way of inspection by the committee would not achieve the real intention of the inspection.

22. Without prejudice to the above, the Applicant submits that the present report of the committee does not state the accurate locations of the samples collected by the committee as done by earlier committee appointed by this Hon'ble Tribunal.

- No water sample recorded from cooling tower water sump(Before Bio Reactor)
- No proper samples recorded from ETP inlet and ETP out let
- No proper samples recorded from flow airvent valve near ennore High way
- No water samples from the surface and the bottom of the sea from the outlet point.

23. The Applicant submits that the water samples collected by the earlier committee were always sent to TNPCB and CPCB labs for laboratory analysis. But, it is surprise that the present committee has sent the samples to private Lab named " Glens Innovation Labs Private Limited", despite the CPCB and TNPCB have the adequate laboratory facilities to analysis the water sample of the same.

24. The Applicant submits that the report of the committee in page No.24 has stated that "heavy metals like Arsenic, Nickel, Copper, Chromium, Cadmium, Zinc, Lead, Selenium, Cobalt, Manganese and Mercury were analyzed and the range of the above was found below the detectable limit in most of the stations when compared to previous studies of 2015.. **However, Magnese recorded some quantifiable measure in the bottom water samples.** Therefore, the present report also shows some heavy metals found in the water samples and no recommendation has been recorded by the committee.

25. The Applicant submits that the present report of the committee lacks in several aspects as compared to the earlier committee report.

26. The Applicant submits that the report of the committee from Page Nos.18 to 33 discussed about various substances and its analysis, but they have not stated about the level of specific analysis observed by the concerned Lab as against the standard limit of marine disposal.

27. The Applicant submits that the NIOT has observed the following Para in page No.14 of the Report which would emphasis the level of degradation caused by the respondents ie.MPL-I, MPL-II and TPL to the coastal ecosystem including the livelihood of fishermen's:

Quote:

" NIOT has observed the marine life quality improvement, after dredging activity carried out during Ennore Port Development. Therefore possible means to improve the marine water/life quality shall be suggested based on data".

Unquote:-

From the bare reading of the above would apparently reveals that the degradation done by the respondent industries to the coastal ecosystem has been partially resolved due to the dredging activity of Ennore port development and the remaining hazardous effluents discharged by the industries are still persist in the surface as well as the bottom water of the marine and the same still causes a big threat to the marine organism.

POLLUTER PAY PRINCIPLE NOT CONSIDERED BY THE COMMITTEE:-

28. The Applicant humbly submits that this Hon'ble Tribunal vide order dated 08.02.2020 directed the committee to inspect the units and also to assess environmental compensation against the units who are responsible for polluting sea water by applying the Polluter Pay Principle and directed to file a report before this Hon'ble Tribunal.

29. The Applicant submits that the present report of the committee overlooked the previous violations committed by the Respondent Industries ie.MPL-I, MPL-II and TPL for the deliberate discharge of hazardous effluents into the sea. As this applicant stated earlier, the three reports of the committee appointed by this Hon'ble Tribunal have specifically observed that the respondent Industries have discharged huge quantity of hazardous effluents into the sea without any Treatment. Further, in the present report of the committee has also observed that the violations and the pollutants into the sea are still persisting and the restoration of the coastal needs further study of experts. Therefore, it is humbly prayed that this Hon'ble Tribunal may be pleased to impose environmental compensation on Respondent Industries ie.MPL-I, MPL-II and TPL independently by applying the principle of polluter pays from the year of establishment of Respondent Industries till this day for causing enormous degradation to the sea by inherently discharging the hazardous effluents into the marine by violating the provisions of CRZ Notifications. In addition thereto, the livelihood of the fishermen has also been affected by an unscientific and unauthorised way of operating units by respondents Industries. Therefore, the Applicant humbly prays that this Hon'ble Tribunal may be pleased to impose environmental

compensation on Respondent Industries ie.MPL-I,MPL-II and TPL including damages to the fishermen's in that region.

- In ***M.C. Mehta* v. *Kamal Nath*, [(2002) 3 SCC 653 : AIR 2002 SC 1515.]** the Supreme Court held: "Pollution is a civil wrong. By its very nature, it is a tort committed against the community as a whole. A person, therefore, who is guilty of causing pollution, has to pay damages (compensation) for restoration of the environment and ecology. He has also to pay damages to those who have suffered loss on account of the act of the offender. The powers of this Court under Article 32 are not restricted and it can award damages in a PIL or a writ petition as has been held in a series of decisions. In addition to damages aforesaid, **the person guilty of causing pollution can also be held liable to pay exemplary damages so that it may act as a deterrent for others not to cause pollution in any manner**.
- *In* the case of **Sterlite Industries (India) Ltd. v. Union of India**, (2013) 4 SCC 575: To the effect that compensation must be deterrent having regard to paying capacity and magnitude of the polluter..
- In the case of **Vellore Citizens Welfare Forum Vs. UOI** 1996(5) SCC 647 the Hon'ble Apex court held that the precautionary principles and polluter pays principle were held to be part of the environmental law of the country. It was held that the polluter pays principle means that the absolute liability for harm to the environment extends not only to compensate the victims of pollution but also the

cost of restoring the environmental degradation. Remediation of the damaged environment is part of the process of sustainable development.

- In the case of **Indian Council for Enviro-Legal Action vs. Union of India** 1996(3)SCC212, The Hon'ble Apex Court held that once the activity carried on is hazardous or inherently dangerous, the person carrying on such activity is liable to make good the loss caused to any other person by his activity irrespective of the fact whether he took reasonable care while carrying on his activity. The rule is premised upon the very nature of the activity carried on.

With the above submissions, the Applicant humbly prayed that this Hon'ble Tribunal may be pleased to:

I. Appoint an Expert committee including a member from Central Pollution Control Board and Tamil Nadu Pollution Control Board to inspect the units of Respondents ie.MPL-I, MPL-II and TPL for the allegations in the applications.

II. Direct the CPCB and TNPCB to conduct water sample analysis from their own laboratory, in so far as the present committee sought report of analysis from the private laboratory for the reasons best known to the authorities

III. Direct the Respondent Industries to install suitable technology for zero liquid discharge that will eliminate the disposal of effluents into the sea.

IV. Impose Environmental compensation on Respondent Industries ie. MPL-I, MPL-II and TPL independently by applying polluter pay principle for discharging huge quantity of hazardous effluents into the sea without proper treatment from the date of establishment of the Industries.

V. Impose Environmental compensation for causing degradation to the coastal zone by violating the provisions of CRZ Notifications.

VI. Direct the respondent Industries to pay damages to the fishermen communities in that vicinity.

VII. Pass any orders as this Hon'ble may deem fit and appropriate in the facts and the circumstances of the present case.

Dated at Chennai on this 04th day of July,2021

Filed by

G.STANLY HEBZON SINGH **K.MAGESHWARAN**

COUNSELS FOR APPLICANT

Annexure - I

Report Committee

Report

Inspection Report on

M/s. Meenavargal Membattu Sangam

Vs.

The Government of Tamil Nadu and others

(Application No. 19 of 2013 (SZ)(THC)

(W.P. No. 6922 of 2011, HighCourt of Madras)

Submitted to

THE NATIONAL GREEN TRIBUNAL

SOUTHERN ZONE, CHENNAI

September 2014

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1. Introduction

Complaints have been received from the local fishing communities about the marine pollution by the industries located at Manali area discharging their treated effluent into sea through pipe line. The Hon'ble National Green Tribunal (NGT), South Zone, Chennai for adjudication of the application in the matter of Meeenavargal Membattu Sangam (MMS), Royapuram, Chennai Vs. The state of Govt. of Tamilnadu and others has constituted an expert Committee consisting of two members namely

1. Dr.K.Palanivelu,
   Professor of Environmental Chemistry,
   Centre for Environmental Studies, Anna University,
   Chennai-600 025

and

2. Dr.N.Vedaraman,
   Senior Technical Officer,
   Chemical Engineering Division,
   CLRI, Chennai-600 020,

with a direction to conduct a study vide its letter No. NGT/SZ/application No. 19 of 2013(SZ)(THC)/1204 dated 30-7-2014.

2. **Terms of Reference of the study**

i. To inspect and submit a report regarding methods of treating the effluent in the 5th respondent company, namely M/s. Manali Petro-Chemical Ltd. (MPL), prior to the disposal of the same into the sea in order to ascertain the compliance of the rules and norms by the 5th respondent company.

ii. To assess the present status of the pipelines through which the effluent is disposed of into the sea.

iii. To assess the pollution level in the sea water in the area where the 5th respondent plants effluent is mixing.

iv. To make recommendations for the environmental safety measures keeping in mind the fishermen community in the light of the study findings.

v. To recommend further studies relevant to the issue, if any.

3. Study Approach

The evaluation was based on actual study conducted at the field. The study was conducted on 12-9-2014 and 14-9-2014 to the Manali area with prior intimation to all the concerned. The studies were carried out in the presence of representatives from MPL, MMS and Tamil Nadu pollution Control Board (TNPCB).

The list of participants during the inspection is furnished below.

1. Mr. G. Balasubramanian-MPL
2. Mr. Balaguru, MPL
3. Mr M. R.Thiagarajan, MMS
4. Mr S. Daniel, MMS
5. Mr. S. Rajan, DE, TNPCB
6. Mr. G. Venkatasamy, AE, TNPCB

During the visit on 12-9-2014, M/s.MPL presented their production details and effluent treatment. After discussion, the two plants, MPL -I and MPL-II effluent treatment plants were inspected and inlet and outlet of ETPs samples (Four Numbers) were collected for analysis. Then, the treated effluent carrying pipeline was inspected to see any leak before disposed into the sea.

On 14-9-2014, sea water samples from top and bottom near the mixing point and effluent sample from pipe line before entering sea were collected for analysis (3 samples).

4. M/s. MPL products-Capacity of Plants

The two plants namely MPL-1 and MPL-2 products and by-procucts manufactured annually are given in Table 1 and Table 2 respectively. The main raw materials used are propylene, Chlorine and lime

MPL plant-II

WATER ACT NO : 2808 Renewal dated 11-10-2011
AIR ACT NO : 1156 11-10-2011

EFFLUENT CONSENT QUANTITY UNDER WATER ACT

SEWAGE	:	15 CU.M PER DAY
TRADE EFFLUENT	:	4500 CU.M PER DAY
TOTAL	:	4515 CU.M PER DAY

The units MPL-I & II have applied for renewal of consent to TNPCB.

5. **Water use Details**

a. **MPL Plant- I**

Source of water :- Metro water , MFL RO rejects water, CMWSSB secondary treated sewage water

For Process water: 883.342 M^3/Day
For Cooling water: 291.008 M^3/Day
For Domestic Water: 63.898 M^3/Day

The above quantity excludes 1273.569. m^3 / day of R.O. rejects water from MFL & Kodungaiyur secondary treated sewage water used in PO Plant.

b. **MPL Plant- II**

Source of water: - Metro water , CPCL RO rejects water, CMWSSB secondary treated sewage water

For Process water: 1401.509 M^3/Day
For Cooling water: 290.465 M^3/Day
CPP use (Power Plant) : 135.780 M^3/Day
For Domestic Water: 64.013 M^3/Day

The above quantity excludes 889.095M^3 / day of R.O. rejects water from MFL & Kodungaiyur secondary treated sewage water used in PO Plant.

Table 1 : Annual products manufactured quantity details

Sl.No.	Product	MPL-Plant -1	MPL-Plant -2
1.	Propylene Oxide(PO)	18,000 MT	18,000 MT
2.	Propylene Glycol(PG)	10,000 MT	10,000 MT
3.	Polyols	25,000 MT	25,000 MT

Table 2 :By products manufactured quantity details

Sl.No.	By-Product	MPL Plant- I	MPL Plant- II
1	DICHLOROPROPANE - DCP	3600 MT /Annum	3600 MT/Annum
2	DIPROPYLENE GLYCOL - DPG	1000 MT /Annum	1320 MT/Annum
3	DI PROPYLENE GLYCOL MONOMETHYLE ETHER-DPGMME	460 MT/Annum	-
4	TRIPROPYLENE GLYCOL -TPG	120 MT /Annum	168 MT/Annum

The two plants have obtained consent for existing operation from TNPCB as stated below .

CONSENT VALIDITY FOR WATER ACT AND AIR ACT : **MPL plant-I**
RENEWAL UNDER PROGRESS

WATER ACT NO : 1386 Renewal dated 11-10-2011
AIR ACT NO : 802 Renewal dated 11-10-2011

EFFLUENT CONSENT QUANTITY UNDER WATER ACT

SEWAGE : 15 CU.M PER DAY
TRADE EFFLUENT : 3400 CU.M PER DAY
TOTAL : 3415 CU.M PER DAY

6. **MPL Treatment plant**

Both the units (MPL –I and MPL-II) have established effluent treatment plant(ETP) . The ETPs are having facility to treat Process + sewage wastewater. Process effluent generated from propylene oxide and sewage are pumped to high rate thickener (HRT), where the effluent is concentrated at the bottom of the thickener to the level of 8% solids. The HRT (combination of clarifloculator and thickener) erected and commissioned requires flocculent. Approx 3.7 to 4.5 kg flocculent **(Electro Floc 6050)** used / day. It is dissolved in the flocculent dosing tank and dosed continuously to HRT.

The thickener underflow is taken to the Rotary vacuum filter. The solids are dried on the cloth using vacuum. The dry solids are scrapped by scrapper and discharge into trucks, which is used for brick manufacturing and cement plant industries.

The overflow from the thickener flows to cooling tower and cooled to 40° C and then pumped to bioreactors. The organics (COD and BOD) are expected to reduce below permissible standards of TNPCB using the bacteria and aeration process in the bioreactor. Surface aerators are in operation to maintain the dissolved oxygen level. From bio reactor, treated effluent flows to treated effluent tank. Treated effluent collected in the tank is pumped to the sea through pipe line.

THE FOLLOWING EQUIPMENT IS IN THE ETP PLANT AT MPL-I PLANT

1. Clarifloculator	–	1 No.
2. Thickener	–	1 No.
3. Rotary vacuum drum filter	–	2 Nos.
4. Cooling tower	–	2 Nos.
5. Bio reactors	–	6 Nos.
6. Mass culture tank	–	1 No
7. Nutrient tank	–	2 Nos
8. Treated effluent tank	–	2 Nos
9. Aerator, surface	–	6 Nos.
10. High rate thickener	–	1 No.

The layout of ETP is shown in Fig. 1.

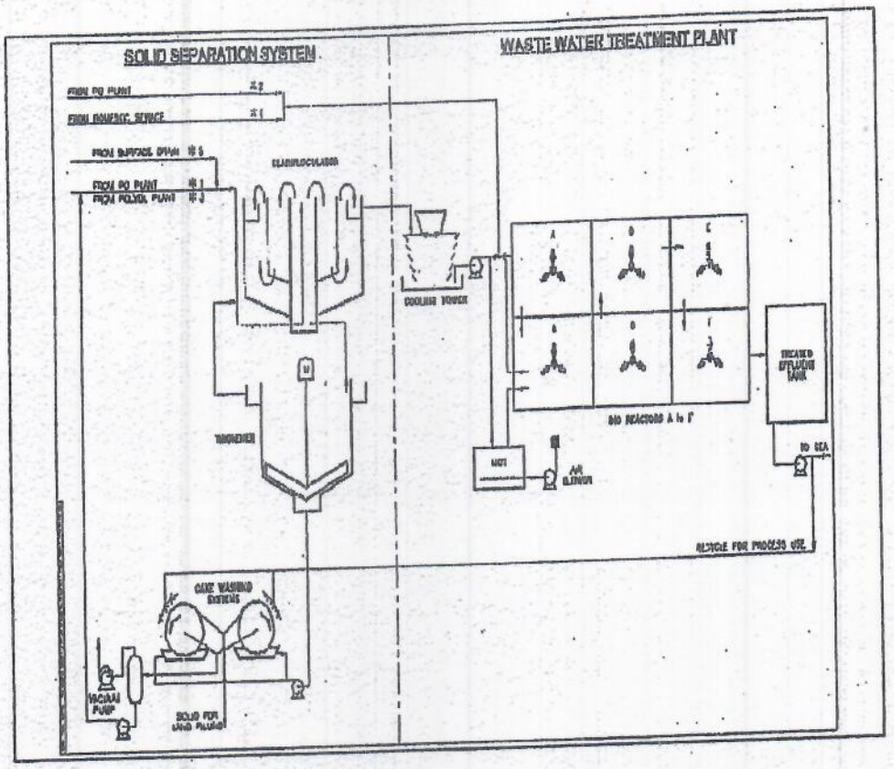
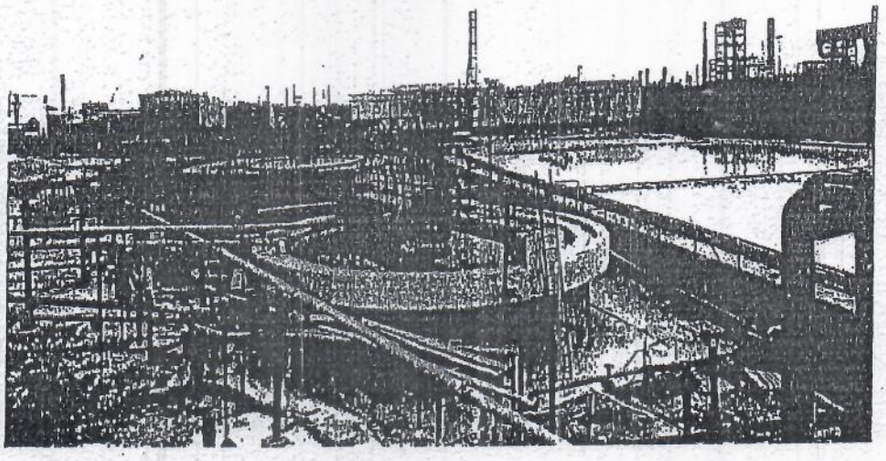
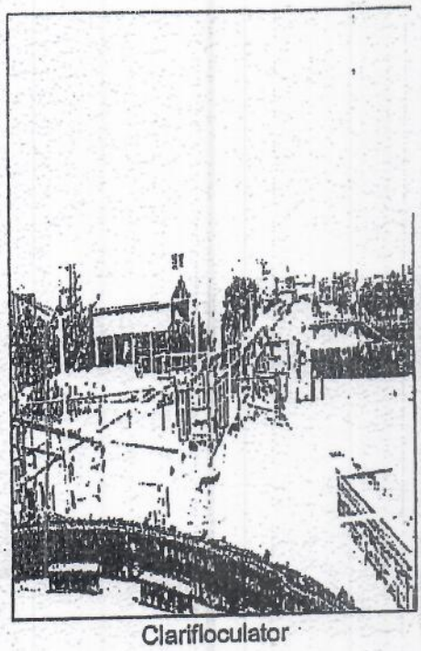


Fig.1 :ETP lay out

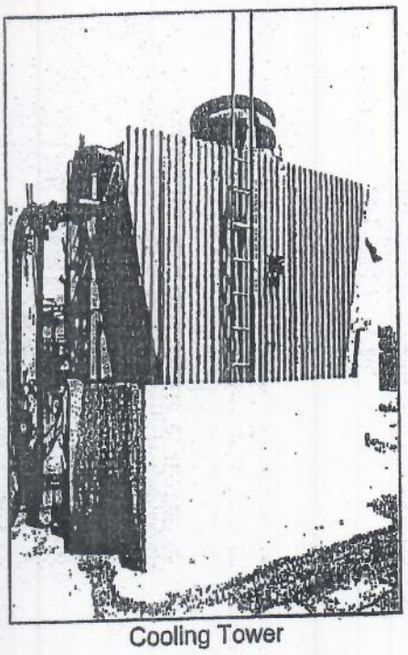
Some of the photographs taken at the MPL-I ETP facility are shown below



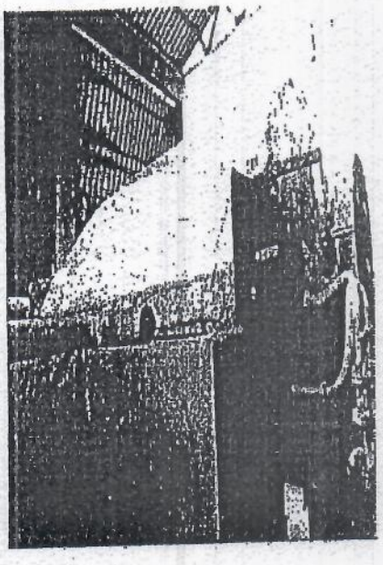
ETP view

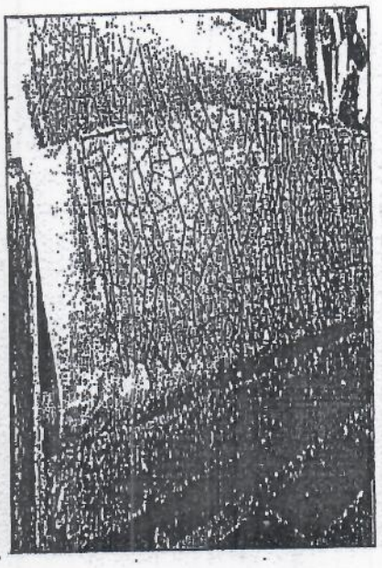


Clarifloculator

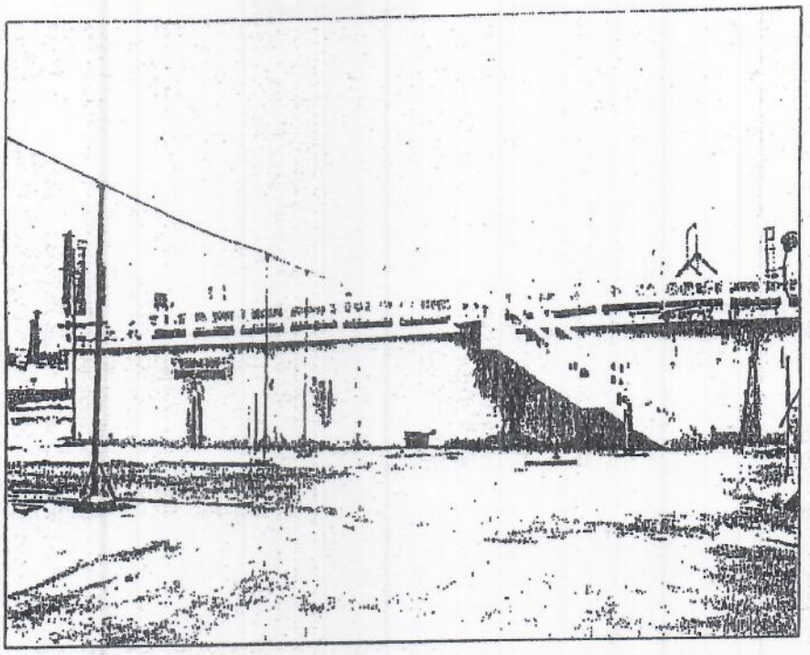


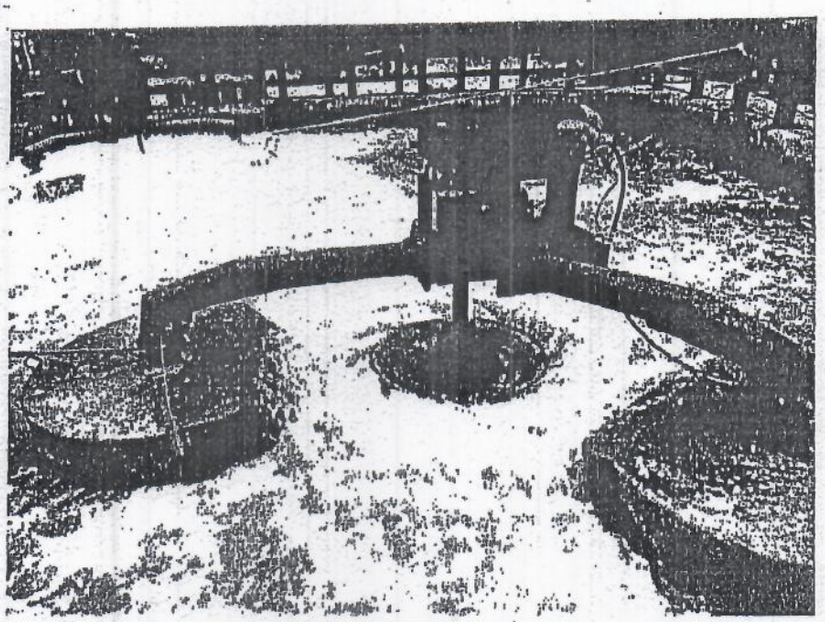
Cooling Tower



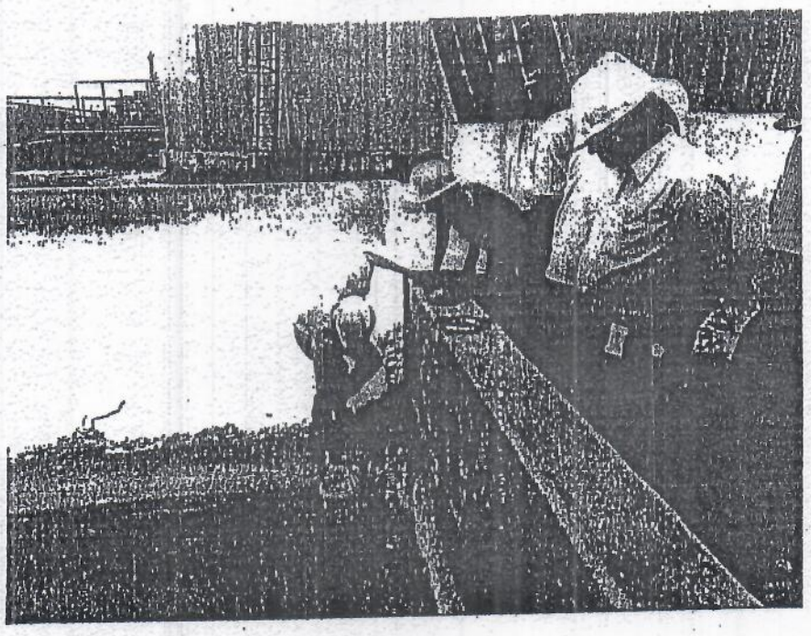


Rotary drum filter





Bio-Reactor



Sample Collection (Raw)

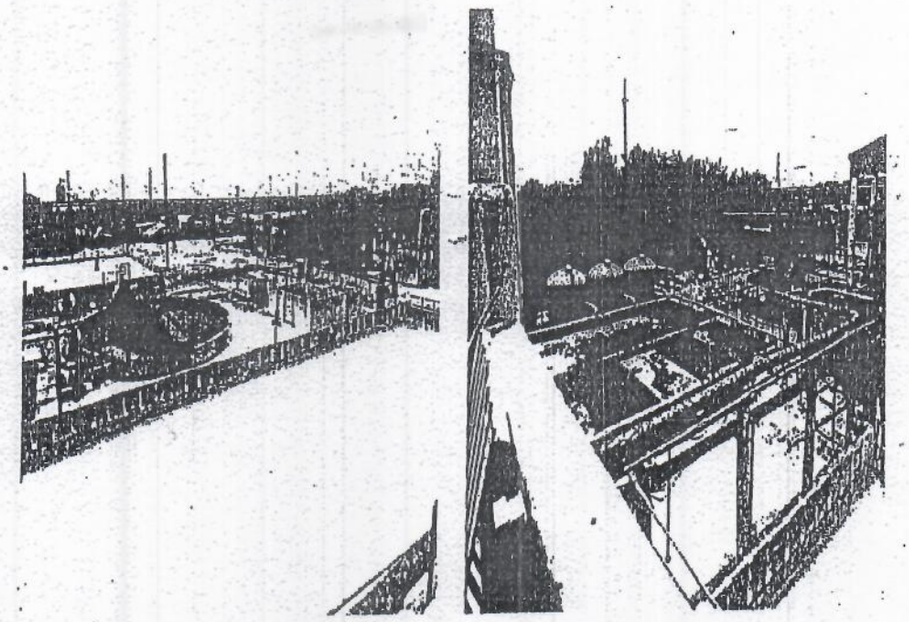
The inlet and the outlet samples of ETP collected during the inspection (12-9-2014) were analyzed by the TNPCB and the results are given in Annexure-I (a&b-NGT1&2). An examination of the results clearly indicates that the present ETP is not able to treat the effluent to the permissible standard with respect to COD below 250 mg/L at MPL-I. Hence, the present ETP facility is not capable of reducing the COD below the TNPCB norms. This should be rectified to meet the compliance immediately.

MPL –II also have similar ETP facility to treat the effluent

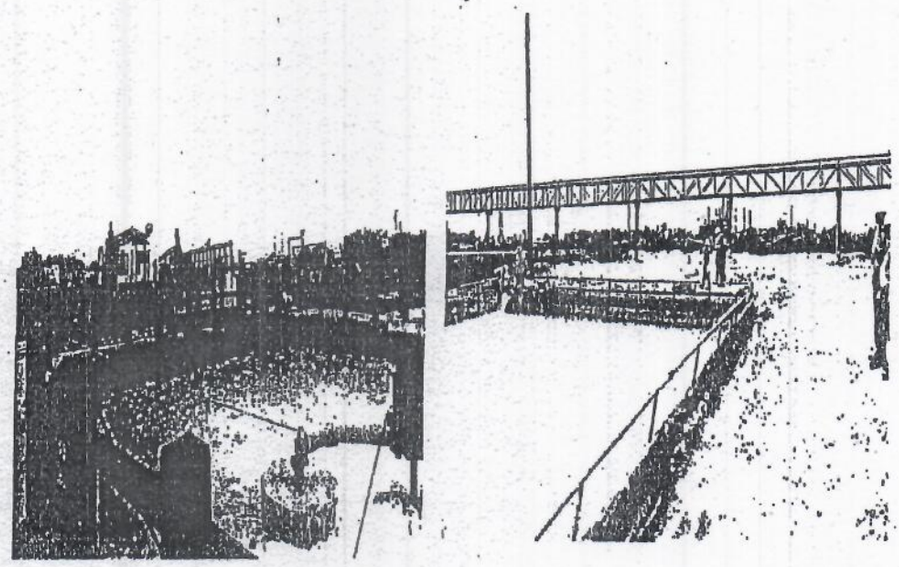
THE FOLLOWING EQUIPMENT IS IN THE ETP PLANT AT MPL PLANT – II

1. High rate thickener – 2 Nos.
2. Rotary vacuum drum filter – 2 Nos.
3. Equalization tank – 3 Nos.
4. Primary, clarifier – 1 No.
5. Aeration tank – 1 No.
6. Treated effluent sump – 1 No.
7. Floating mixer, surface – 3 Nos.
8. Cooling tower. – 2 No.

View of ETP at MP_-II is shown below



ETP view



Aerator

Sample Collection (Treated)

Similarly, the inlet and the outlet samples collected during the inspection were analyzed by the TNPCB and the results are given in Annexure-I (c&d- NGT 3&4) An examination of the results clearly indicates that the present ETP at MPL-II is not able to treat the effluent to the permissible limits with respect to COD below 250 mg/L and BOD below 100. Compared to MPL-I, the performance of ETP in MPL-II is very poor with respect to BOD and COD removal. This should be rectified to meet the compliance immediately.

7 Pipe Line to sea status

The pipeline to sea was laid initially during 1990 to carry the treated effluent. Now due to aging, the MPL replaced the pipe line during 2011. Approximate length of the line is 6.0 kilometers with HDPE material (PE100 GRADE PN6). The drawings (Existing new effluent disposal line, Alignment of pipeline over the sea bed and outfall diffuser port) are given in Annexure-II (a,b,c).

The length details and outfall pipe line are furnished in Table 3 and 4 respectively.

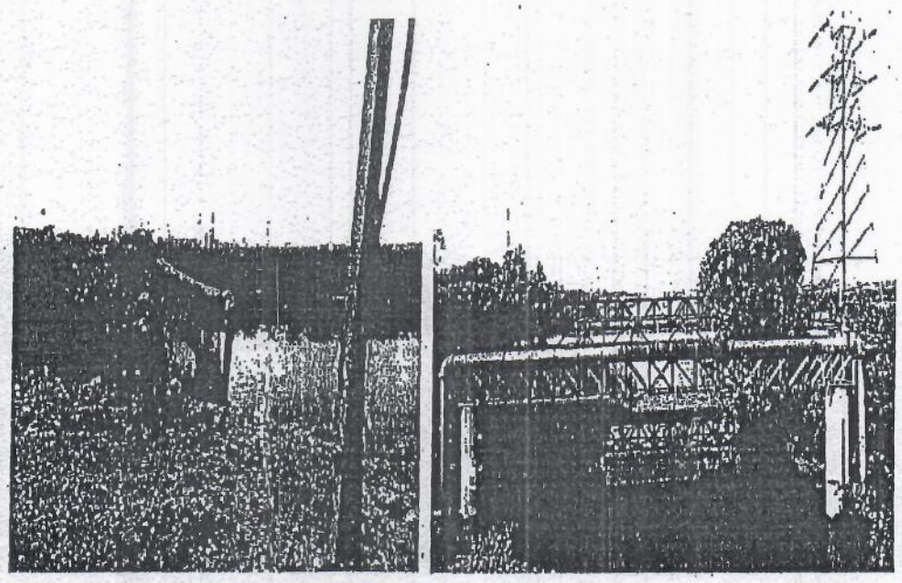
Table.3 : Line Size & Length Detail

Line Size & Length Detail				
Sl.No	From	To	Line size mm od	Length in meters
1	MPL- I	TPL	280	800
2	TPL	SATHYAMOORTHY NAGAR	315	1400
3	SATHYAMOORTHY NAGAR	SEASHORE	400	3700
4	SEASHORE	DIFFUSER	400	700
5	MPL-II	SATHYAMOORTHY NAGAR	280	4000

Table.4 :Details of the Outfall Pipe Line

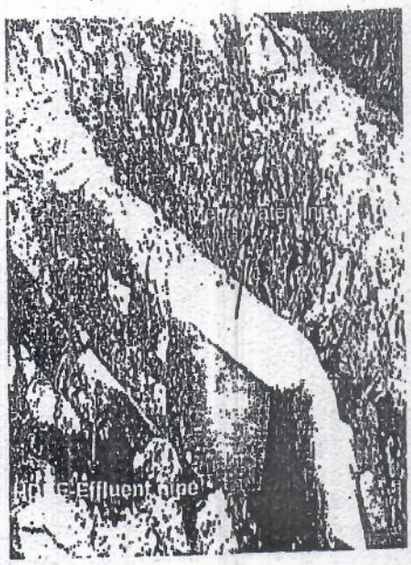
Description	HDPE 10 PE 100	Length (m)
Outfall pipeline off shore	400 mm OD	700
Flow rate	385 m^3/h	---
Water depth level at outfall distance	9.4 m	---

The present condition of the pipe line is shown in the photos below. The line is buried under ground in about 1-3 m depth except where canal water is flowing.

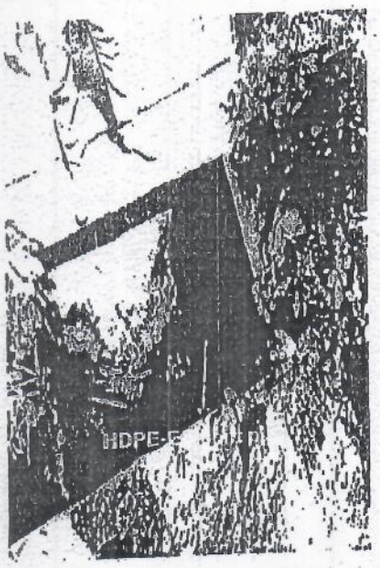


Open pipe line

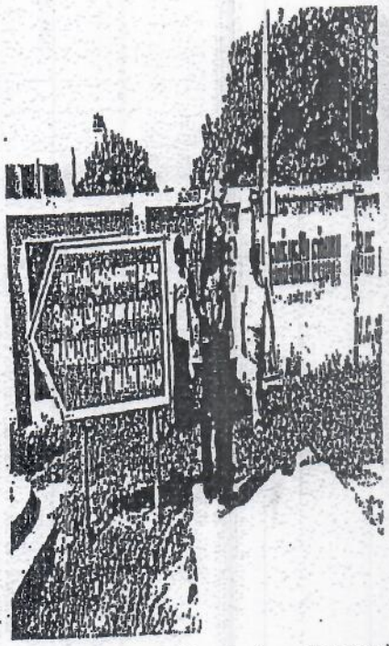
Recently, during laying pipeline for drinking water at one place, it was punctured and the problem is rectified (photo). The condition of the pipe line is now in order.



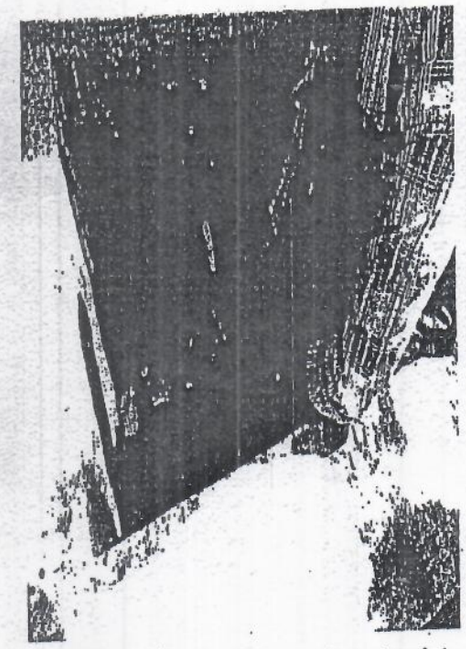
Punctured line rectified



Buried pipe line near canal



Air vent for pipe line before disposal point



Sample collection from air vent point

The combined treated effluent collected from the air vent point (A1 (e-NGT 5) before disposal, COD value was also above the permissible value of 250 mg/L. This clearly indicates that the units connected to the disposal line are not treating their effluent properly for mandatory COD removal.

The diffuser meant for releasing the treated effluent into the sea details are given below .

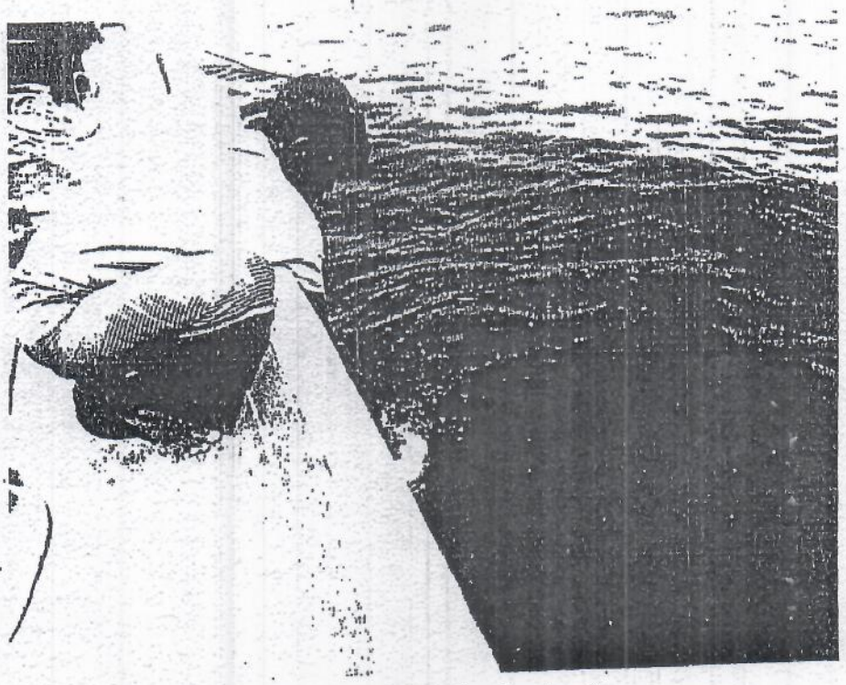
Diffuser Details

Diffuser type	–	Unidirectional
Diffuser endpoint	–	680 m -700 m
Number of openings	–	4
Port /Nozzle diameter	–	0.12 m
Total area of openings	–	0.0301m^2
Discharge velocity	–	2.05 m/s
Total discharge flow rate	–	0.1 m^3/s
Nozzle arrangement	–	Unidirectional without fan
Diffuser alignment angle	–	90 °
Discharge density	–	1005 kg/m^3

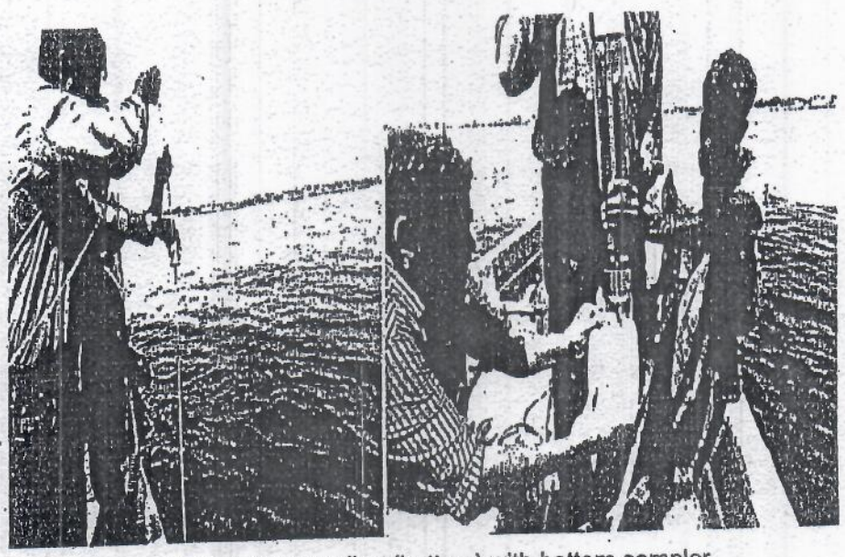
8. Sea water Sampling

Two samples were collected, one from sea surface and another one from 9 m depth with a help of bottom sampler ~ 700 m from shore on 14-9-2014. The sea water samplings are shown in the photos below.

The results are furnished in Annexure –I(e-NGT 6&7). The results show that the bottom sample TDS, COD, chloride and calcium are more than the surface sea water sampled. However, it is difficult to strongly conclude that the observed high value is due to industrial effluent alone or not. Hence, continues monitoring of the sea water in and around the release point may provide more insight about the issue and finding a permanent solution for this problem.



Sea water sampling (surface)



Sea water sampling (bottom) with bottom sampler

9. Recommendations for the environmental safety

Specific

- The units shall have leak detection system and necessary arrangements for immediate repair of the pipe line to avoid soil and ground water contamination.
- Sea water samples to be collected (around mixing point, away from point of mixing and at different depth) once in six months by TNPCB/Ministry of Environment and Forest & Climate Change or by reputed third party organizations in presence of TNPCB officials and analyzed for constituents. Appropriate marine studies to be made including disappearance of marine species, if any, in that zone. This continuous monitoring will provide pollution status of this zone.
- Toxicity studies should be conducted for the combined effluent before the discharge into sea once in six months.
- The MPL units in their process are not using any toxic metals. However, TNPCB may ensure this by analyzing for presence of heavy metals in the treated effluent of units.

General

- As the metro water pipe line and treated effluent pipe line runs close by in some locations, accidental mix up both may led to contamination of drinking water. This may lead to public health problem. Hence, it is recommended to isolate both the pipelines to avoid the problem foresee wherever necessary.
- Pipeline routes may be marked or identified by suitable means for easy identification and follow up.
- Necessary arrangements may be made well in advance to replace the pipe according to its life time to ensure environmental safety
- Open area pipeline (Canals) may be covered with suitable materials to prevent damage

10. Recommendations

Specific

Short Term (within three months)

1. The present ETP established at MPL –I and MPL –II seems to be ineffective in reducing the organics (COD and BOD) to the permissible levels. Efforts should be made at the earliest to improve the proper working of the ETPs or go for better efficient effluent treatment process to achieve the marine discharge standards.
2. The industries should make necessary provisions for the collection of samples from the pipeline after the interconnection point of the treated effluent (down stream point after mixing zone) and near the discharge point. These 3 points (MPL-I & II,TPL (ECH) and Kothari petro chemicals Ltd) and another one before entering sea (near Ramkrihna Nagar) may be covered and locked. One set of key may with the Industry for maintenance and another set with TNPCB for sample collection from these four locations. Monthly samples (surprise) may be collected and tested by TNPCB.

Long term

In the context of sustainable development, the following may be paid attention

1. M/s.MPL (I&II) should make effort to do away with the present Chlorohydrin route and switch to catalytic process of manufacturing PO. As this process is a sustainable one and eliminates the use of hazardous chlorine gas and lime which ultimately end up as waste.
2. M/s MPL (I&II) and other industries should look into possibilities of Zero liquid discharge with suitable technologies like RO to get water and reject for suitable byproduct recovery. This will eliminate the sea disposal of treated effluent.

General

Short Term (within six months)

Appropriate flow meter for liquid effluent discharge that has been installed should be connected to TNPCB care-Air centre and online monitoring meters for parameters like, pH, Temperature, Electrical Conductivity (TDS), COD, BOD, etc., may be installed and this may also be connected to TNPCB at the earliest by all the units.

Member-Expert committee

Dr. N. Vedaraman, M.Sc., Ph.D.,
Senior Technical Officer
Chemical Engineering Division
CSIR - Central Leather Research Institute
Adyar, Chennai - 600 020

29/9/14

Chairman- Expert committee

Dr. K. PALANIVELU, Ph.D.,
Professor
Centre for Environmental Studies
Anna University
Chennai-600 025, India

TAMIL NADU POLLUTION CONTROL BOARD

From	To
Er. S. Rajan, M.E., District Environmental Engineer, Tamilnadu Pollution Control Board, 77A, South Avenue Road, Ambattur Industrial Estate, Chennai-600 058.	The Chairman Expert Committee, CES, Anna University, Chennai-600 025.

Lr. No.DEE/TNPCB/AMB/NGT (SZ) 2014, Dated 22.09.2014

Sir,

Subc - TNPC Board- Expert Committee of NGT (SZ)-Application No: 19 of 2013 (SZ) – ROA of the Samples Collected- Submitted – reg.

Ref: - Expert Committee Visit on 12.09.2014 and 14.09.2014.

*****

With reference to the Expert Committee visit in the area of Manali, it was decided to analyse the samples of trade effluent and samples of sea disposal collected at TNPCB Lab. Accordingly, the Samples collected (7Nos) are analysed by Board Lab and the ROAs of samples are enclosed for taking further necessary action.

Encl: As above,

21.9.14

District Environmental Engineer,
Tamil Nadu Pollution Control Board,
Ambattur

Ata
NGT-MPL-II

TAMIL NADU POLLUTION CONTROL BOARD
DISTRICT ENVIRONMENTAL LABORATORY – MANALI

REPORT OF ANALYSIS

ROA No.163/2014–15 Dated : 19.09.2014

Name of the Sender : DEE/Ambattur
Nature and Number of sample and Time : **One Number of Sample**
Date and Time of Collection : 12.09.2014 at 11.30 AM
Date and Time of Receipt : 12.09.2014 at 5.30 PM
Code No. & Point of Collection : 1. 1 – Cooling Tower Water Sump (Before Bio Reactor) - Untreated

Sl.No.	Parameters	Unit	1
1	pH	Number	9.88
2	Conductivity	µs/cm	73840
3	Total Suspended Solids	mg/L	74
4	Total Dissolved Solids	mg/L	67586
5	Chlorides	mg/L	40000
6	Sulphates	mg/L	648
7	Oils & Grease	mg/L	2.0
8	BOD for 3 days at 27^0C	mg/L	182
9	Chemical Oxygen Demand	mg/L	2360
10	Alkalinity	mg/L	1240
11	Total Chromium	mg/L	<0.01
12	Hexavalent Chromium	mg/L	<0.01
13	Phenolic Compounds	mg/L	<0.01
14	Flouride	mg/L	<0.05
15	Calcium	mg/L	18436
16	Sulphide	mg/L	<1.0

Deputy CSO (L)
DEL, Manali

TAMIL NADU POLLUTION CONTROL BOARD
DISTRICT ENVIRONMENTAL LABORATORY – MANALI

REPORT OF ANALYSIS

ROA No.163/2014-15 Dated : 19.09.2014

Name of the Sender : DEE/Ambattur
Nature and Number of sample and Time : **One Number of Sample**
Date and Time of Collection : 12.09.2014 at 11.40 AM
Date and Time of Receipt : 12.09.2014 at 5.30 PM
Code No. & Point of Collection : 1. 2 – ETP outlet into sea – Treated

Sl.No.	Parameters	Unit	1
1	pH	Number	8.73
2	Conductivity	µs/cm	60960
3	Total Suspended Solids	mg/L	52
4	Total Dissolved Solids	mg/L	53414
5	Chlorides	mg/L	32000
6	Sulphates	mg/L	383
7	Oils & Grease	mg/L	2.0
8	BOD for 3 days at 27^0 C	mg/L	92
9	Chemical Oxygen Demand	mg/L	1400
10	Alkalinity	mg/L	340
11	Total Chromium	mg/L	<0.01
12	Hexavalent Chromium	mg/L	<0.01
13	Phenolic Compounds	mg/L	<0.01
14	Flouride	mg/L	<0.05
15	Calcium	mg/L	13627
16	Sulphide	mg/L	<1.0

Deputy CSO (L)
DEL, Manali

NGT-MPL-II
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TAMIL NADU POLLUTION CONTROL BOARD
DISTRICT ENVIRONMENTAL LABORATORY – MANALI

REPORT OF ANALYSIS

ROA No.163/2014–15 Dated : 19.09.2014

Name of the Sender : DEE/Ambattur
Nature and Number of sample and Time : **One Number of Sample**
Date and Time of Collection : 12.09.2014 at 12.30 PM
Date and Time of Receipt : 12.09.2014 at 5.30 PM
Code No. & Point of Collection : 1. 3 – Cooling Tower Water Sump (Before Bio Reactor) - Untreated

Sl.No.	Parameters	Unit	1
1.	pH	Number	10.18*
2.	Conductivity	µs/cm	63400
3.	Total Suspended Solids	mg/L	82
4.	Total Dissolved Solids	mg/L	56386
5.	Chlorides	mg/L	33500
6.	Sulphates	mg/L	466
7.	Oils & Grease	mg/L	1.6
8.	BOD for 3 days at 27^0 C	mg/L	471
9.	Chemical Oxygen Demand	mg/L	2680
10.	Alkalinity	mg/L	1080
11.	Total Chromium	mg/L	<0.01
12.	Hexavalent Chromium	mg/L	<0.01
13.	Phenolic Compounds	mg/L	<0.01
14.	Flouride	mg/L	<0.05
15.	Calcium	mg/L	16834
16.	Sulphide	mg/L	<1.0

*Alkaline Sample

Deputy CSO (L)
DEL, Manali

ATa
OGT—PAPA—III
4

TAMIL NADU POLLUTION CONTROL BOARD
DISTRICT ENVIRONMENTAL LABORATORY – MANALI

REPORT OF ANALYSIS

ROA No.163/2014–15 Dated : 19.09.2014

Name of the Sender : DEE/Ambattur
Nature and Number of sample and Time : **One Number of Sample**
Date and Time of Collection : 12.09.2014 at 12.40 PM
Date and Time of Receipt : 12.09.2014 at 5.30 PM
Code No. & Point of Collection : 1. 4 – ETP outlet into sea – Treated

Sl.No.	Parameters	Unit	1
1	pH	Number	8.11
2	Conductivity	µs/cm	69840
3	Total Suspended Solids	mg/L	64
4	Total Dissolved Solids	mg/L	64324
5	Chlorides	mg/L	38000
6	Sulphates	mg/L	503
7	Oils & Grease	mg/L	2.0
8	BOD for 3 days at 27^0 C	mg/L	220
9	Chemical Oxygen Demand	mg/L	2080
10	Alkalinity	mg/L	200
11	Total Chromium	mg/L	<0.01
12	Hexavalent Chromium	mg/L	<0.01
13	Phenolic Compounds	mg/L	<0.01
14	Flouride	mg/L	<0.05
15	Calcium	mg/L	16433
16	Sulphide	mg/L	<1.0

19/09/14

Deputy CSO (L)
DEL, Manali

ATo
NGT(6-1)

TAMIL NADU POLLUTION CONTROL BOARD
DISTRICT ENVIRONMENTAL LABORATORY – MANALI

REPORT OF ANALYSIS

ROA No.164/2014–15 Dated : 19.09.2014

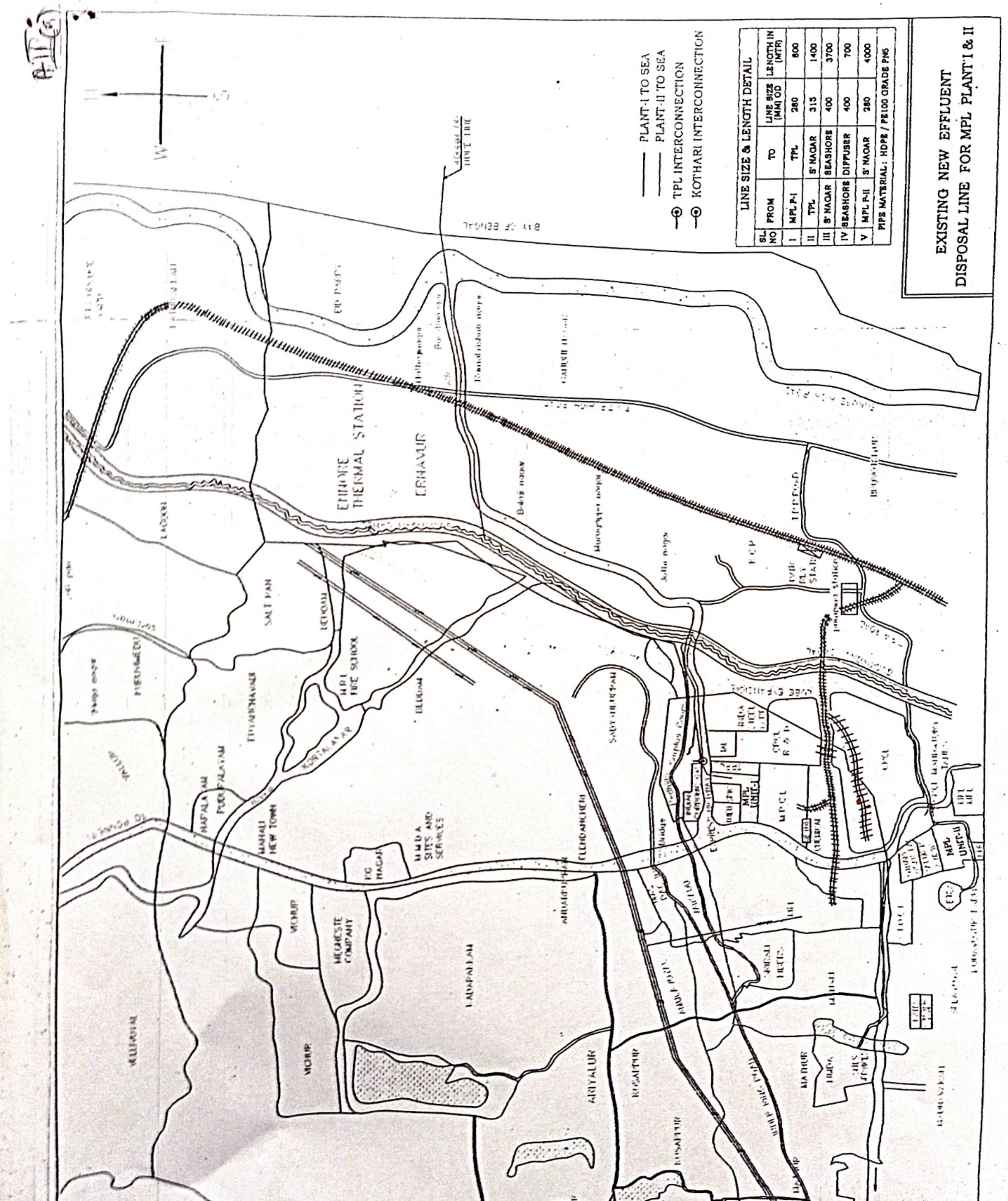
Name of the Sender : DEE/Ambattur
Nature and Number of sample and Time : Three Numbers of Samples
Date and Time of Collection : 14.09.2014 at 11.50 AM
Date and Time of Receipt : 15.09.2014 at 11.00 AM

Code No. & Point of Collection :
1. NGT-5 - Flow Airvent valve near Ennore Highway (Before sea) – Treated
2. NGT-6 - From the surface of the sea at about 700 metre distance from the shore near outlet point - Treated
3. NGT-7 From bottom of the sea at about 8 M depth of about 700 metre distance from the shore near outlet point - Treated

Sl.No.	Parameters	Unit	1	2	3
1.	pH	Number	9.35	7.05	7.02
2.	Conductivity	µs/cm	59720	58180	59580
3.	Total Suspended Solids	mg/L	42	22	36
4.	Total Dissolved Solids	mg/L	54206	45180	52936
5.	Chlorides	mg/L	32000	26500	31000
6.	Sulphates	mg/L	406	540	695
7.	Oils & Grease	mg/L	2.0	1.2	1.2
8.	BOD for 3 days at 27^0C	mg/L	52	16	22
9.	Chemical Oxygen Demand	mg/L	880	320	560
10.	Alkalinity	mg/L	320	160	120
11.	Total Chromium	mg/L	<0.01	<0.01	<0.01
12.	Hexavalent Chromium	mg/L	<0.01	<0.01	<0.01
13.	Phenolic Compounds	mg/L	<0.01	<0.01	<0.01
14.	Flouride	mg/L	<0.05	<0.05	<0.05
15.	Calcium	mg/L	11022	409	417
16.	Sulphide	mg/L	<1.0	<1.0	<1.0

19/09/14

Deputy CSO (L)
DEL, Manali



EXISTING NEW EFFLUENT DISPOSAL LINE FOR MPL PLANT I & II

LINE SIZE & LENGTH DETAIL

SL. NO	FROM	TO	LINE SIZE (MM) OD	LENGTH IN (MTR)
I	MPL P-I	TPL	280	800
II	TPL	S' NAGAR	315	1400
III	S' NAGAR	SEASHORE	400	3700
IV	SEASHORE	DIFFUSER	400	700
V	MPL P-II	S' NAGAR	280	4000

PIPE MATERIAL : HDPE / PE100 GRADE PN6

BY REGD. POST ACK. DUE

BEFORE THE NATIONAL GREEN TRIBUNAL
SOUTHERN ZONE, CHENNAI
[See Rule 15)

Application No.18 of 2013 (SZ)
(W.P. No. 6922 of 2011, Madras High Court)

In the matter of:

1) Meenavargal Membattu Sangam
Represented by its President
Mr. K.R. Selvaraj Kumar
Having office at Old NO. 97/2, New No. 199
S.N. Chetty Street --
Royapuram, Chennai – 600 013.

Applicant / Petitioner in
W.P. No. 6922 of 2011

Versus

1) The Chief Secretary
Government of Tamil Nadu
Secretariat
Chennai – 600 009.

2) The State of Tamil Nadu
Represented by its Secretary to Government
Industries Department
Fort St George
Chennai – 600 009.

3) The District Collector
Thiruvalluvar District
Thiruvallur.

4) The Chairman
Tamil Nadu Pollution Control Board
No. 76, Mount Salai
Guindy, Chennai – 600 032.

5) M/s. Manali Petrochemical Ltd
Having its Principal office at
Ponneri High Road --
Chennai – 600 068.

Respondent(s)/Respondent(s)
In W.P. No. 6922 of 2011

NOTICE BEFORE ADMISSION

Whereas a Writ Petition No. 6922 of 2011filed by the above named Applicant before the High Court of Judicature of Madras praying to issue a writ, order or direction in the nature of the writ of Mandamus directing the respondents No. 1 to 4 to initiate appropriate action against the 5th respondent for disposing the untreated water effluent into the sea thereby polluting the water resources, has been transferred to the National Green Tribunal and whereas the Tribunal has taken the Writ Petition in the Registry as Application No. 19 of 2013 (SZ) for further proceedings, and whereas you have been mentioned as Applicant/Respondents in the Writ Petition:

Notice is hereby given to you to appear before this Tribunal in person or through legal practitioner in this matter on **21.03.2013 at 11 a.m.** in the premises No. 950/1, 2nd and 3rd Floor, Poonamallee High Road, TNPCB Building, Arumbakkam, Chennai – 600 106 and further you are hereby directed to file reply along with supporting documents, if any, on the said date.

Take notice that, in default, the said application will be heard and determined in your absence.

Given under my hand and the seal of the Tribunal, on this, the 27th day of February 2013.

By the order of the Tribunal

(S. Kumar)
Deputy Registrar

Annexure - II

Joint Inspection Report on

M/s Meenavargal Membattu Sangam

Vs

The Government of Tamilnadu and Others

In

Application no.19 of 2013

M.A. No. 173 0f 2015

Submitted to

Before the National Green Tribunal
South Zone, Chennai

Central Pollution Control Board
South Zonal Office, Bengaluru
May 02, 2016

JOINT INSPECTION REPORT OF CENTRAL POLLUTION CONTROL BOARD (CPCB) IN THE MATTER OF APPLICATION NO. 19 OF 2013 (SZ) (THC) & M.A.NO. 173 OF 2015 (SZ), M/s MEENAVARGAL MEMBATTU SANGAM VS THE GOVERNMNET OF TAMILNADU AND OTHERS SUBMITTED BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL, SOUTHERN ZONE, CHENNAI AS PER ORDER DATED MARCH 31, 2016

1.0. Preamble

In the matter of Application no. 19 of 2013 (SZ) (THC) & M.A. No. 173 of 2015 (SZ), M/s Meenavargal Membattu Sangam Vs The Government of Tamilnadu and others, the National Green Tribunal (NGT), South Zone has directed the Central Pollution Control Board (CPCB) vide its order dated March 31, 2016 to "Conduct a joint inspection along with the Tamil Nadu State Pollution Control Board (TNPCB) as per the recommendation of the Expert Committee dated 19.09.2014 and file a status report before this Tribunal by the next hearing i.e. May 02, 2016".

In compliance to above mentioned order, CPCB, South Zonal Office deputed officials and informed to Tamilnadu Pollution Control Board vide letter dated March 07, 2016 **(Annexure -1)** regarding schedule of inspection and also requested to co-ordinate with CPCB team during visit. A team comprising of following officials from CPCB, South Zonal Office, Bengaluru and Tamilnadu Pollution Control Board (TNPCB), District Environmental Engineer Office, Ambattur carried out joint inspection during **April 11-13, 2016** and the entire inspection work was supervised by Mrs. H. D. Varalaxmi, Sr. Env. Engineer, CPCB, Bengaluru.

Central Pollution Control Board, Zonal Office, Bengaluru

1. Mrs. H.D. Varalaxmi, SEE/Sci. D
2. Mr. A. Gnanavelu, Scientist B

Tamil Nadu Pollution Control Board, District Envrionmental Office, Ambattur

1. Mr. D. Vasudevan, DEE
2. Mrs. S. Vasuki, AEE
3. Mr. G. Manivasagan, AE

Representatives from Industries

1. Mr. Balaguru, Safety Officer, MPL
2. Mr. Shanmuganathan, Quality Assurance, MPL
3. Mr. A.R. Ashokkumar, Deputy General Manager, Kothari Petrochemicals
4. Mr. D. Senthilkumar, Director - Operation, TPL
5. Mr. T. Muthukumarasamy, AGM - Operation, TPL
6. Mr. A. Rajkumar, DM – Safety, TPL

2.0. About marine disposal system

During visit, CPCB team obtained first-hand information about existing marine disposal system from Mr. D. Vasudevan, DEE, TNPCB, Ambattur and made preliminary survey of pipeline carrying effluent from different industries viz. M/s Manali Petro Chemicals Ltd., (MPL) Plant - I & II, M/s Tamilnadu Petro Products Ltd – Heavy Chemicals Division (TPL) and M/s Kothari Petrochemicals Ltd., (KPL) to marine out fall and common points where provisions

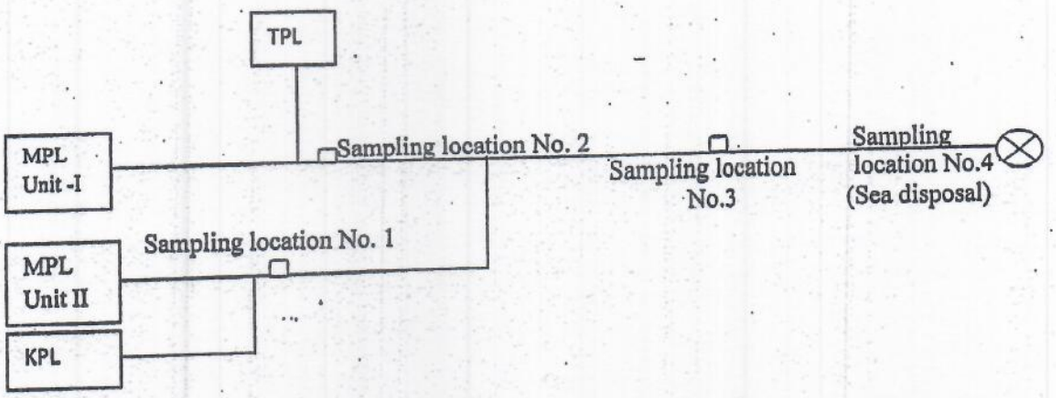
H. D. Vara

D. Vasu

made to collect samples from this pipe line. It was informed that the existing pipeline was laid in the year 2011 and total length of pipeline is 10.6 km (2.2 + 4.0+ 3.7 + 0.7 = 10.6 km) with HDPE material (PE 100 Grade PN6). The details of pipe length and sampling locations are given below in table as well as in line diagram.

Details of Pumping (Discharge) Line

Sl. No.	From	To	Size of pipe (outer dia) in mm	Length of pipe (Meters)
1	MPL – 1	TPL	280	800
2	TPL	Sathyamurthy Nagar	315	1400
3	MPL -2	Sathyamurthy Nagar	280	4000
4	Sathyamurthy Nagar	Seashore	400	3700
5	Seashore	Diffuser	400	700



Pipe Line Diagram showing the Sampling Locations

As per the Hon'ble NGT order, the team collected samples from the discharge line carrying treated effluent into sea disposal at following points to ascertain the quality of effluent discharged into sea:

Sampling location no.	Location Identification	Date and Time of collection	Remarks
1	Inside the MPL – II premises (after confluence of MPL plant –II & KPL plant effluent)	12.04.16 at 15.20 PM	It was informed that no effluent was pumped from KPL, the effluent taken in the point represents the effluent of MPL plant -II only
2	In front of Tamilnadu Petro products Ltd., (after confluence of MPL plant –I effluent and TPL plant effluent)	12.04.16 at 9.50 AM	It was informed that no effluent was pumped from TPL; the effluent taken in the point represents the effluent of MPL plant -I only.
3	Near to junction road of Manali Express highway and Ramakrishna Nagar 3rd main road before sea disposal	12.04.16 at 14.00 PM	After confluence of all 4 units effluent, during sampling no effluent from MPL –I, KPL & TPL being pumped. The effluent taken in the point represents the effluent of both MPL – II only.
4	In the sea (where Marine disposal system exist)	12.04.16 at 16.40 PM	Taken two samples, one from sea surface and other from the 5m depth.

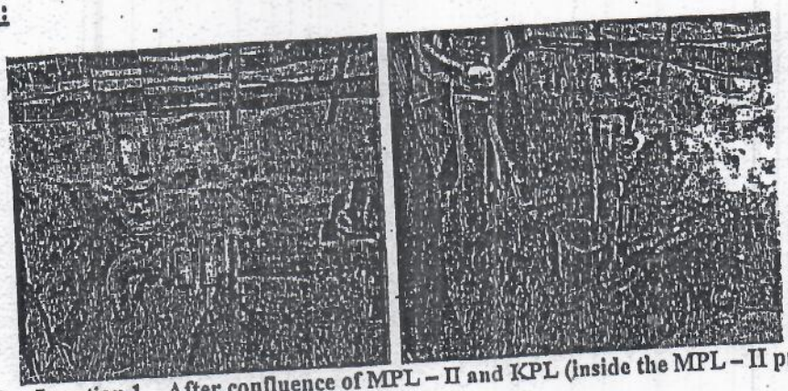
The samples from above mentioned points were collected in the presence of TNPCB officials and industry representatives. The samples were analysed in the CPCB, South Zonal Office Laboratory, Bengaluru & analysis results are tabulated below:

Analysis Results of samples collected at the outlet

Sl. No.	Parameters	Marine disposal standards	Sampling Locations				
			Sampling location 1	Sampling location 2	Sampling location 3	Sampling location 4	
						At surface	At 5m depth
1	pH	5.5 -9.0	6.7	6.8	6.3	7.8	7.9
2	Conductivity (µs/cm)	-	46920	52800	39800	57000	57100
3	Total Suspended Solids (mg/L)	100	104	88	68	BDL	3
4	Total Dissolved Solids (mg/L)	-	27218	34716	26060	37521	37664
5	BOD_3 at 27°C 3days	100	629	1310	656	1.3	2.5
6	COD (mg/L)	250	1102	1728	960	90	150
7	Oil & Grease (mg/L)	20	BDL	BDL	BDL	BDL	BDL
8	Dissolved Oxygen (mg/L)	-	-	-	-	7.4	6.6
9	Alkalinity (mg/L)	-	144	190	196	122	124
10	Calcium (mg/L)	-	8955	11626	8484	440	440
11	Chloride (mg/L)	---	15850	21525	15655	19960	19568
12	Sulphate (mg/L)	-	224	327	209	29.5	28.3
13	Fluoride (mg/L)	15	1.22	1.04	0.38	-	-
14	Hexavalent Chromium (mg/L)	1.0	0.02	0.06	0.02	BDL	BDL
15	Phenol (mg/L)	5.0	BDL	0.01	BDL	BDL	BDL
16	Sulphide (mg/L)	5.0	BDL	BDL	BDL	-	-
17	Cadmium (mg/L)	2.0	BDL	BDL	BDL	BDL	BDL
18	Total Chromium (mg/L)	2.0	BDL	0.7	BDL	BDL	BDL
19	Nickel (mg/L)	5.0	BDL	BDL	BDL	BDL	BDL
20	Lead (mg/L)	1.0	BDL	BDL	BDL	BDL	BDL
21	Zinc (mg/L)	15	BDL	0.13	BDL	BDL	BDL

Field observations and interpretation of analysis results:

Location 1:



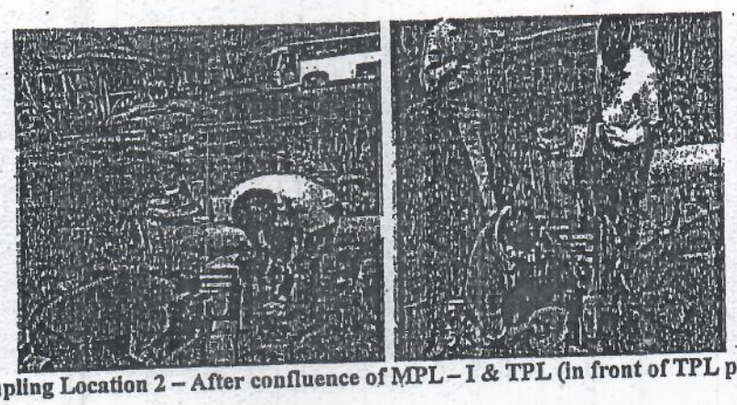
Sampling Location 1 – After confluence of MPL – II and KPL (inside the MPL – II premises)

- During inspection, it was observed that sampling location no. 1 existing inside the premises of M/s Manali Petrochemicals Plant- II is accessible without any interference to the team for collection of sample.
- It was informed, this location represents the effluents from both MPL – II and Kothari petrochemicals and both the plants pumps their effluent simultaneously. ***However, during***

inspection /sampling, no effluent was pumped from Kothari petrochemicals; the effluent collected at this point represents the effluent from MPL –II only.

- From the analysis results, it is observed that ***the concentration of BOD (629 mg/L) exceeding more than 6 folds and COD (1102 mg/L) exceeding 4.4 folds than marine disposal standards).*** Total Chromium and Zinc were found within the norms of marine disposal standards. No traces of heavy metals were found.

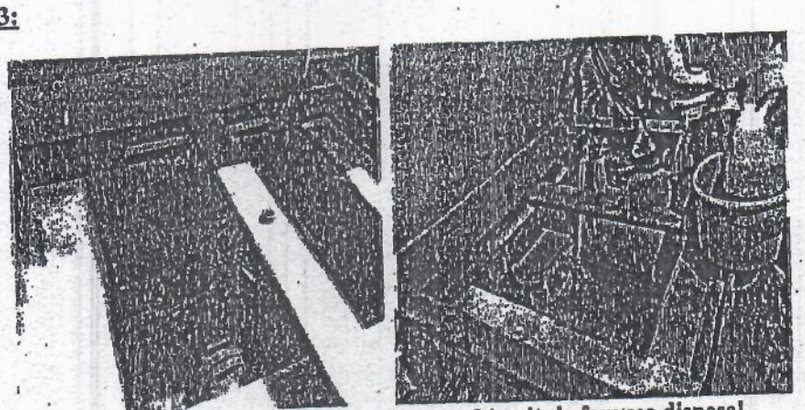
Location 2:



Sampling Location 2 – After confluence of MPL – I & TPL (in front of TPL plant)

- ✓ During inspection, it was observed that sampling location no. 2, located in front of M/s TPL plant found accessible without any interference for collection of samples.
- ✓ It was informed that, this location represents the combination of effluent from MPL – I and M/s TPL plant & both plants pumps their effluent simultaneously. However, during sampling no effluent was pumped from TPL, the effluent collected at this point represents the effluent from MPL –I only.
- ✓ The analysis results reveals that ***the concentration of BOD (1310 mg/L) exceeding more than 13 folds and COD (1728 mg/L) exceeding 6.9 folds than marine disposal standards.*** Total chromium and Zinc concentrations were found within the norms of marine disposal standards.

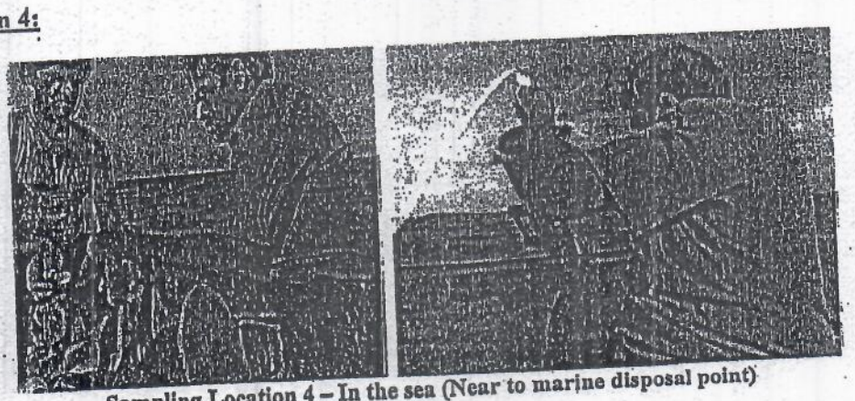
Location 3:



Sampling Location 3: After confluence of 4 units before sea disposal (Junction of Manali Express highway and Ramakrishna Nagar 3rd main road)

- During inspection, it was observed that sampling location no. 3 is located near to junction road of Manali Express Highway and Ramakrishna Nagar 3rd main road before sea disposal. MPL has provided valve before this tapping point; however this valve key was not made available in the field. After informing to MPL, representatives from MPL plant provided the key for opening of valve for collection of sample.
- It was informed that, this location represents the downstream point of confluence of effluents from MPL – I & II, TPL and KPL, in a situation where all four plants are pumping their effluent simultaneously. ***However, during sampling no effluent was pumped from TPL KPL and MPL – I; the effluent collected at this point represents the effluent from MPL – II only.***
- The analysis results reveals that ***the concentration of BOD (656 mg/L) exceeding more than 6 folds and COD (960 mg/L) exceeding 3.8 folds than marine disposal standards.*** No traces of heavy metals were found.

Location 4:



Sampling Location 4 – In the sea (Near to marine disposal point)

- During inspection, team also monitored the marine out fall, however no identification/ floaters were found to trace the exact point of out fall diffuser system. Industry representatives informed that floaters were provided to trace the diffuser and the same have been stolen. As per the information and location traced by the industry representatives, team took two samples in the periphery of out fall system; one is at surface of sea and other one from 5 m depth (it was informed that diffuser is installed at 10 m depth).
- During sample collection, no difference in appearance or colour of water observed in the sea.
- From the analysis results, it is observed that Dissolved Oxygen (7.4 & 6.6 mg/L) at both points of sampling locations observed to be good. No traces of heavy metals were found.

3.0 Status of treatment system provided by industries discharging their effluent into sea through marine disposal system

As per records of TNPCB four industries viz. (i) M/s Manali Petrochemicals Ltd. Plant – I, (ii) M/s Manali Petrochemical Ltd., Plant – II, (iii) M/s Kothari Petrochemicals Ltd and (iv) M/s Tamilnadu Petro Products Ltd., are discharging their treated effluent into sea through marine disposal system. The team visited all four units and obtained required information from the individual units, which are depicted below:

3.1 M/s Manali Petrochemicals Ltd., Plant –I

The industry is engaged in manufacturing of Propylene Oxide (1000 MT/month), Propyline Glycol (520 MT/month), Polyol (500MT/month) and Propylene Glycol Mono Methyl Ether (225 MT/month) and by product of DCP – Dichloro Propane (120 MT/month), Dipropylene Glycol (40 MT/month) and Di Prooylen Glycol MonoMethyle Ether (15 MT/month) by using raw materials viz. Propylene, Chlorine and Lime. During inspection the industry was in operation at full capacity and also poses consent to operate under Water Act 1974 and Air Act 1981 & the *validity of the consents is up to March 31, 2017.*

The industry informed that , they are procuring water from three sources i.e. (i) M/s Madras Fertiliser Ltd. (MFL), (RO reject of 600- 900 m^3/day), (ii) Treated sewage from Kodungaiyur STP (500 - 900 m^3/day).and (iii) Fresh water from Chennai Metro Water Supply (CMWS) (800 -2300 m^3/day). The unit has flow meters to quantify the raw water received from CMWS and not provided flow meter to quantify the effluent generated from different sections and the same is estimated based on the pumping rate. As per the records the water consumption and effluent generated from different sections are as follows;

Sl. No.	Details	Water consumption (m^3/day)	Effluent generation (m^3/day)
1	Manufacturing process	2235	2235
2.	Cooling tower / Utility	300	30
3.	Domestic use	65	15

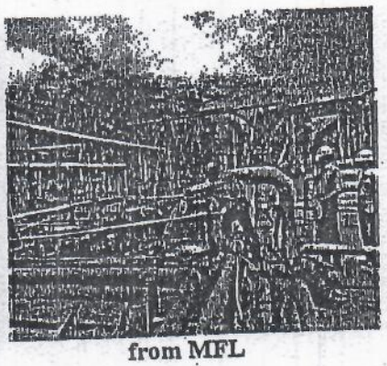
The industry is claiming that its effluent generation is 2265 m^3/day, which is within the consented quantity of 3400 m^3/day needs to be cross checked after installation of flow meters in the respective sections. The unit is having ETP comprising of High rate thickener, rotary drum filter, cooling tower, pH correction tank, six bio reactors and treated effluent tank, the ETP flow diagram is given below:

Sl. No.	Parameters	Raw water Quality used in process		Effluent Quality		Marine disposal
		Treated sewage from STP (Kodungaiyur)	RO reject received from MFL plant	Inlet to ETP	Out let of ETP	
13	Hexavalent Chromium (mg/L)	-	-	BDL	BDL	1.0
14	Phenol (mg/L)	-	-	BDL	0.02	5.0
15	Sulphide (mg/L)	-	-	BDL	BDL	5.0
16	Cadmium (mg/L)	-	-	BDL	BDL	2.0
17	Total Chromium (mg/L)	-	-	BDL	BDL	2.0
18	Nickle (mg/L)	-	-	BDL	BDL	5.0
19	Lead (mg/L)	-	-	BDL	BDL	1.0
20	Zinc (mg/L)	-	-	6.08	1.61	15

3.1.1. Field observations and interpretation of analysis results

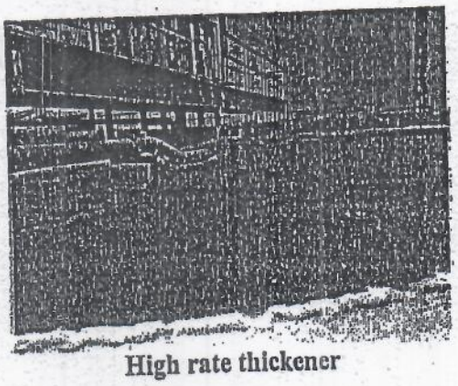
- During inspection it was observed that the industry is receiving raw water from Kodungaiyur STP as well as from RO reject from MFL and having TDS of 3982 & 4192 mg/L respectively.

From Kodungaiyur STP



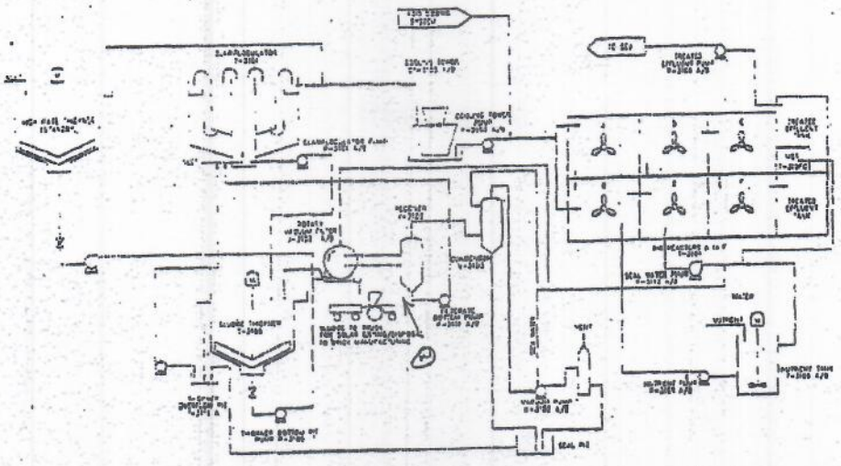
from MFL

- It was observed that the weirs of High rate thickener at the ETP found clogged due to accumulation of lime sludge.



High rate thickener

- Out of six bio reactors, bio-mass found in only one bio reactor where DAP is added and other five bio reactors, no bio- mass was found which indicates the poor operation of bio reactors, the same is explained below. ***The analysis results reveals that the efficiency of ETP was found very less w.r.t BOD (14 %) and COD (11.9%) removal, which indicates the poor operation of bio reactors.***



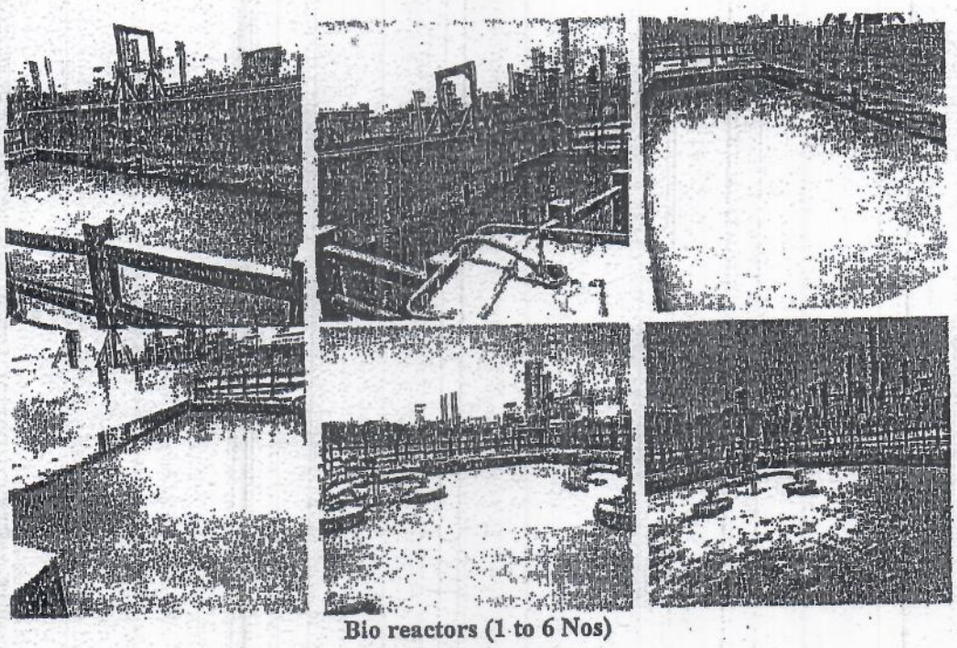
ETP flow Diagram of MPL – I

The effluent from the different sections are taken to high rate thickener to allow to settle the sludge, the settled lime sludge taken to rotary drum filter for dewatering, the over flow from high rate thickener taken to cooling tower to reduce temperature from 70 °C to ambient temperature, after reducing temperature the effluent taken to pH correction tank to reduce pH from 10.5 – 11 to 6.5-8.5. After pH correction the effluent is treated in the bio reactor by adding DAP as a nutrient, then the treated effluent is stored in the treated water tank and the same is pumped to marine outfall pipeline for discharging into sea.

To verify the adequacy of effluent treatment facility the team collected the samples from inlet and outlet of ETP & also collected raw water samples to verify the quality of water used since the industry is claiming that they are using major quantity of water is treated effluent from other sources (MFL and STP). The analysis results of raw water as well as untreated and treated effluent are depicted below:

Analysis Results of Samples collected at M/s Manali Petrochemicals Ltd., Plant –I

Sl. No.	Parameters	Raw water Quality used in process		Effluent Quality		Marine disposal standards
		Treated sewage from STP (Kodungaiyur)	RO reject received from MFL plant	Inlet to ETP	Out let of ETP	
1	pH	7.6	6.8	11.1	6.5	5.5 -9.0
2	Conductivity (µs/cm)	6800	6500	61000	61200	-
3	Total Suspended Solids (mg/L)	BDL	3	3	14	100
4	Total Dissolved Solids (mg/L)	3982	4192	48634	46310	-
5	BOD_3 at 27°C 3days (mg/L)	4.3	18	1463	1258	100
6	COD (mg/L)	67	192	1744	1536	250
7	Oil & Grease (mg/L)	BDL	BDL	BDL	BDL	20
8	Alkalinity (mg/L)	-	-	1292	72	-
9	Calcium (mg/L)	-	-	13669	13669	-
10	Chloride (mg/L)	-	-	24461	25048	-
11	Sulphates (mg/L)	512	444	484	341	-
12	Fluoride (mg/L)	-	-	1.54	1.74	15

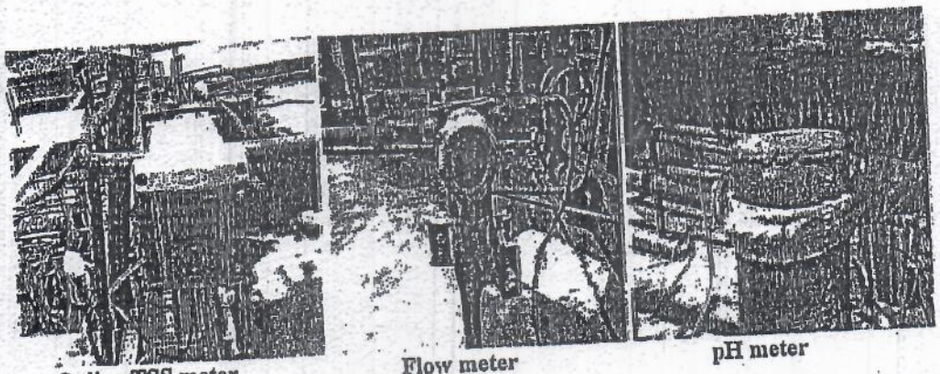


Bio reactors (1 to 6 Nos)

- The treated effluent from bio reactor is stored in treated effluent tank, after attaining required water level in the tank; the treated effluent is pumped to marine disposal system for discharging the same into sea. During inspection very lean flow was observed at out let of bio reactors. The treated effluent tank is shown below. ***No water level indicator is provided in the treated effluent storage tank to assess the quantity of treated effluent stored and pumped to marine disposal system.***

Treated effluent tank

- Online measurement system for flow and pH are installed in the pumping main lines. It was informed that treated effluent pumping is not continuous, whenever it attains required level in the tank, pump will be operated. During inspection no pumping of treated effluent was in operation hence the efficiency and functioning of online monitoring system could not be verified.



Online TSS meter Flow meter pH meter

- ***It is also observed that the effluent having BOD of 1258 mg/L, COD of 1744 mg/L was being discharged into marine disposal by violating the prescribed standards of TNPCB (BOD of 100 mg/L and COD of 250 mg/L).***
- It was informed that the dewatered sludge is sent to brick manufacturing unit.
- ***The overall housekeeping in the ETP was poor.***

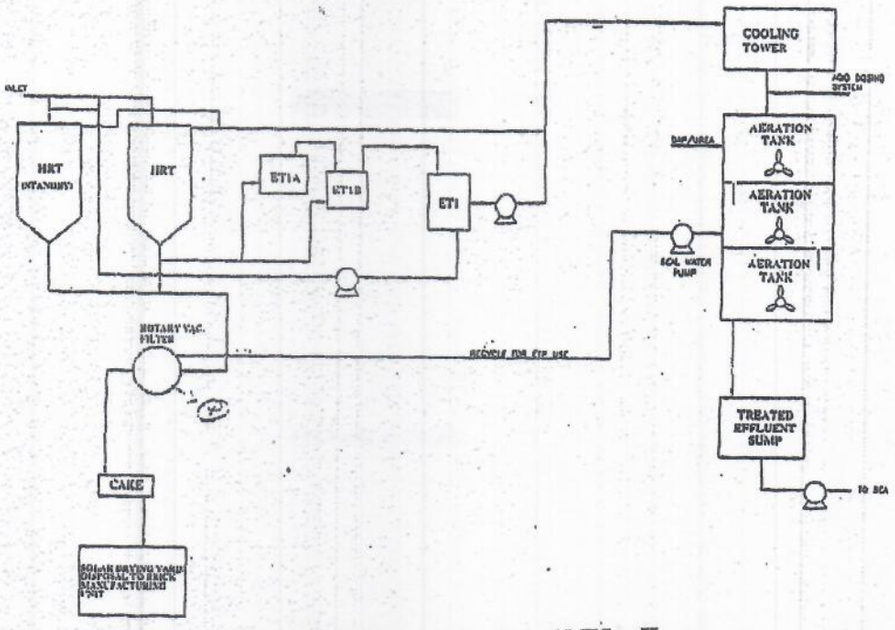
3.2 M/s Manali Petrochemicals Ltd., Plant –II

The industry is engaged in manufacturing of Propylene Oxide (1000 MT/month), Propyline Glycol (650 MT/month) and Polyol (1000MT/month) and by product of DCP – Dichloro Propane (175 MT/month), Dipropylene Glycol (80 MT/month) and Tri Propylene Glycol (10 MT/month) by using raw materials viz. Propylene, Chlorine and Lime. During inspection the industry was in operation at full capacity and also having consent to operate under Water Act 1974 and Air Act 1981, ***the validity of the consents is up to March 31, 2017.***

The industry is procuring water from three sources viz. (i) Chennai Petrochemical Ltd., (RO reject of 200-.500 m^3/day), (ii) Treated effluent from Kodungaiyur STP (460 - 1340 m^3/day) and (iii) Fresh water from Chennai Metro water supply (1050 -1680 m^3/day). The industry is having flow meters to quantify the raw water received from CMWS and has **not provided any flow meter to quantify the effluent generated from different sections;** it is quantified based on the pumping record. As per the records the water consumption and effluent generation from different sections are as follows. The industry is claiming that their effluent generation is 2045 m^3/day which is within the consented quantity of 4500 m^3/day; however it needs to be crossing verified after installation of flow meters in the respective section.

Sl. No.	Details	Water consumption (m^3/day)	Effluent generation (m^3/day)
1	Manufacturing process	2000	2000
2.	Cooling tower / Utility	300	30
3.	Domestic use	65	15

The industry is having ETP, comprising of High rate thickener, rotary drum filter, cooling tower, pH correction tank, three bio reactors and treated effluent tank; the ETP flow diagram is given below:



ETP flow Diagram of MPL – II

The effluent from different sections are taken to high rate thickener to allow to settle the sludge, the settled lime sludge is taken to rotary drum filter for dewatering, the over flow from high rate thickener is taken to cooling tower to reduce temperature from 70 °C to ambient temperature, after reducing temperature the effluent is taken to pH correction tank to reduce pH from 10.5 – 11 to 6.5-8.5. After pH correction the effluent is treated in bio reactor by adding DAP as nutrient, the treated effluent is stored in the treated water tank and the same is pumped to marine pipeline for discharging into sea.

To verify the adequacy of effluent treatment facility, the team collected the samples from inlet and outlet of ETP & also collected the raw water samples to verify the quality of water used; since the industry is claiming that the major quantity of water used is treated effluent from other sources (MFL and STP). The analysis results of raw water as well as untreated and treated effluent are depicted below:

Analysis Results of Samples collected at M/s Manali Petrochemicals Ltd., Plant –II

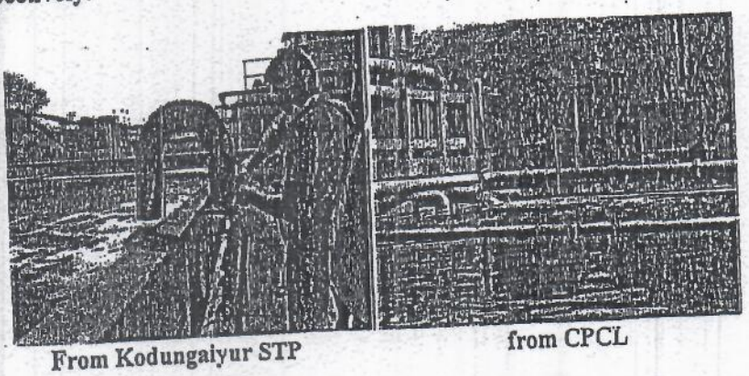
Sl. No.	Parameters	Raw water Quality used in process		Effluent Quality		Marine disposal standards
		Treated sewage from STP (Kodungaiyur)	RO reject received from CPCL plant	Inlet to ETP	Out let of ETP	
1	pH	8	7.2	8.2	7.7	5.5 -9.0
2	Conductivity (µs/cm)	1826	8440	72880	60750	-
3	Total Suspended Solids (mg/L)	3	12	BDL	113	100
4	Total Dissolved Solids (mg/L)	996	5390	43730	41920	-
5	BOD_3 at 27°C 3days (mg/L)	21	22	*	1068	100
6	COD (mg/L)	20	192	2960	1344	250
7	Oil & Grease (mg/L)	BDL	BDL	BDL	BDL	20

Sl. No.	Parameters	Raw water Quality used in process		Effluent Quality		Marine disposal standards
		Treated sewage from STP (Kodungaiyur)	RO reject received from CPCL plant	Inlet to ETP	Out let of ETP	
8	Alkalinity (mg/L)	-	-	60	62	-
9	Calcium (mg/L)	-	-	12883	12726	-
10	Chloride (mg/L)	-	-	23322	23482	-
11	Sulphates (mg/L)	-	-	468	335	-
12	Fluoride (mg/L)	-	-	1.49	1.44	15
13	Hexavalent Chromium (mg/L)	-	-	BDL	0.02	1.0
14	Phenol (mg/L)	-	-	BDL	0.01	5.0
15	Sulphide (mg/L)	-	-	BDL	BDL	5.0
16	Cadmium (mg/L)	-	-	BDL	BDL	2.0
17	Total Chromium (mg/L)	-	-	BDL	BDL	2.0
18	Nickle (mg/L)	-	-	BDL	BDL	5.0
19	Lead (mg/L)	-	-	BDL	BDL	1.0
20	Zinc (mg/L)	-	-	3.31	0.115	15

Note: * Parameter could not be analysed due to interference during analysis

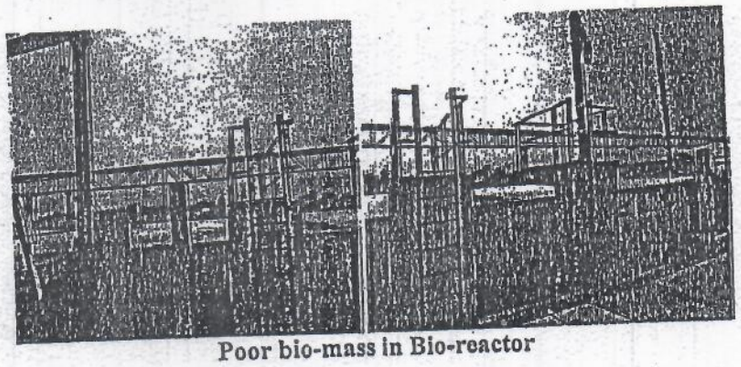
3.2.1 Field Observations of Team and interpretation of analysis results:

- During inspection it was s observed that industry is receiving raw water from Kodungaiyur STP as well as from RO reject from CPCL having TDS of 996 & 5390 mg/L respectively.



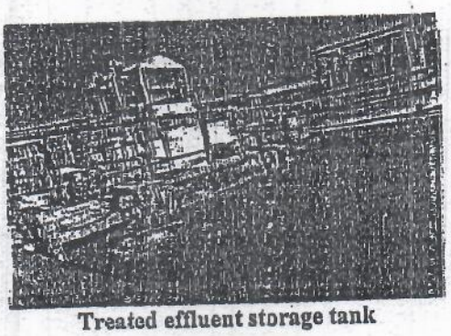
From Kodungaiyur STP from CPCL

- Very poor bio mass is observed in the bio reactor which indicates the poor operation of bio reactor. T*he analysis results reveals that the efficiency of ETP was found less w.r.t COD removal (54.5%) which indicates the poor operation of bio reactors.*



Poor bio-mass in Bio-reactor

- No water level indicator is provided in the treated effluent storage tank to assess the quantity of treated effluent stored and pumped to marine disposal system.



Treated effluent storage tank

- Online measurement system for flow and pH are installed in the pumping main and it was informed that pumping of treated effluent is continuous. Online flow meter display was not visible to verify the same.

On line Flow meter and pH installed to monitor the quality of treated water pumped to marine disposal system

- ***From the analysis results, it is observed that the effluent having BOD of 1068 mg/L and COD of 1344 mg/L is discharged into marine disposal by violating the prescribed standards of TNPCB (BOD of 100 mg/L and COD of 250 mg/L).***
- Hexavalent chromium and Zinc concentrations are found within the norms of marine disposal standards.
- It is informed that the dewatered sludge is sent to brick manufacturing unit.
- ***The overall housekeeping in the ETP is poor.***

3.3 M/s Kothari Petrochemicals Ltd

The industry is engaged in manufacturing of Polybutane (2000 MT/month), Light Polymer (240 MT/month) and by product of dilute caustic (120 MT/month) and Intermediate product of Intermediate polymer (10 MT/month). During inspection the industry was in operation at 80% of consented capacity i.e. at 1700 – 1800 MT/month and also having consent to operate under Water Act 1974 and Air Act 1981, the ***validity of the consents is expired on March 31, 2016.*** It was informed that they have applied for renewal of consent.

The industry informed that they are procuring water from Chennai Metro water supply (400 m^3/day) and partly meeting with its own RO permeate of 120 m^3/day. As per records the water consumption and effluent generation from different section are as follows. The industry is claiming that its effluent generation is 180 m^3/day out of which 150 m^3/day is recovered as RO permeate and the same is utilised as process water and remaining quantity of 30 m^3/day is discharged into sea. The domestic sewage is treated in its STP.

Sl. No.	Details	Water consumption (m^3/day)	Effluent generation (m^3/day)
1	Manufacturing process	110	110
2.	Boiler &Cooling tower/Utility	450	70
3.	Domestic use	32	22

The industry is having ETP, comprising of collection tank, clarifloculator, clear water tank, dual filter media, and Ultra filtration and RO system. The effluent from the different section is collected in collection tank, the effluent from collection tank is taken to chemical dosage tank and allowed for precipitation in clarifloculator, the clarified effluent is treated through dual filter media followed by ultra filtration to reduce suspended solids before feeding to RO system. After treating through RO, 150 m^3/day is recovered as RO permeate and the same is utilised as process water and remaining quantity of 30 m^3/day as RO reject is discharged into sea. To verify the adequacy of effluent treatment facility the team collected the samples from inlet and outlet of ETP. The analysis results of untreated and treated effluent are depicted below:

Analysis Results of Samples collected at M/s Kothari Petrochemicals Ltd

Sl. No.	Parameters in mg/l	Inlet of ETP	Out let of ETP	Marine disposal standards
1	pH	9.7	8.5	5.5 -9.0
2	Conductivity (µs/cm)	2460	917	-
3	Total Suspended Solids (mg/L)	2252	BDL	100
4	Total Dissolved Solids (mg/l)	1276	584	-
5	BOD_3 at 27°C 3days	43	*	100
6	COD (mg/L)	192	BDL	250
7	Oil & Grease (mg/L)	BDL	BDL	20
8	Alkalinity (mg/L)	234	58	-
9	Calcium (mg/L)	35	102	-
10	Chloride (mg/L)	646	157	-
11	Sulphates (mg/L)	169	219	-
12	Fluoride (mg/L)	0.78	0.73	15
13	Hexavalent Chromium (mg/L)	0.1	0.08	1.0
14	Phenol (mg/L)	0.007	BDL	5.0
15	Sulphide (mg/L)	0.27	BDL	5.0
16	Cadmium (mg/L)	-	-	2.0
17	Total Chromium (mg/L)	-	-	2.0
18	Nickle (mg/L)	-	-	5.0
19	Lead (mg/L)	-	-	1.0
20	Zinc (mg/L)	-	-	15

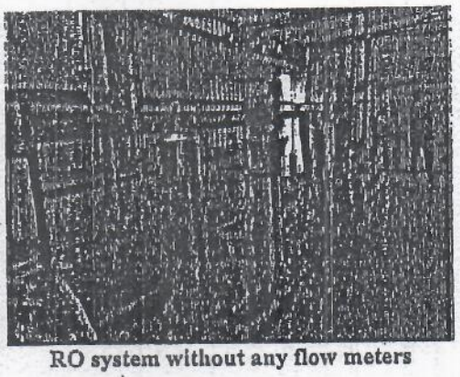
Note: * BOD not carried out; hence the COD is BDL (less than 20 mg/L)

3.3.1 Field Observations of Team and interpretation of analysis results:

- The maintenance of raw effluent collection tank was observed to be very poor; ***TSS (2252 mg/L)***

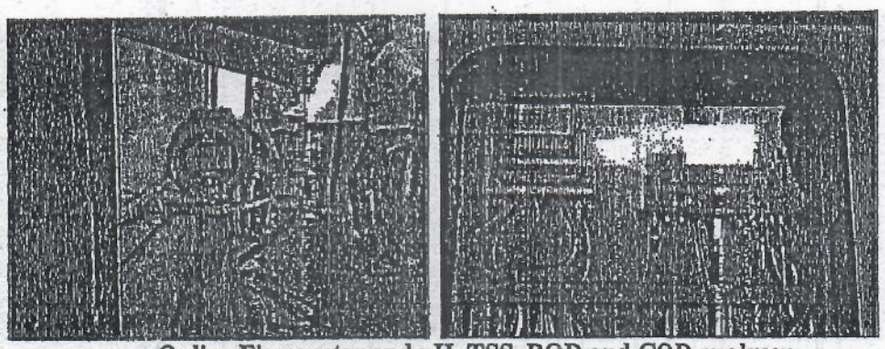
Raw effluent collection tank

- ***No flow meters are installed in RO system to quantify the effluent feed to RO, permeate recovered and RO reject generated.***



RO system without any flow meters

- The industry has installed online flow meter, pH meter and TSS, BOD COD Analyser, and the same is connected to TNPCB / CPCB servers for real time monitoring. The industry was asked to produce on line data but same was not made available to team.



Online Flow meter and pH, TSS, BOD and COD analyser

- It was informed that the RO reject is stored and pumped to marine disposal system when ever required level attains.
- ***The analysis results reveal that the treated effluent (RO reject) pumped to marine disposal system meeting with TNPCB norms w.r.t BOD and COD.***

14.D.2018

3.4 M/s Tamilnadu Petro Products Ltd.

The industry is engaged in manufacturing of Caustic Soda (6875 MT/month), Liquid Chlorinet (4166 MT/month), Hydrochloric Acid (4125 MT/month) and Ammonium Chloride (1788 MT/month) by using Sodium chloride and Ammonia as raw material. During inspection the industry was in operation at 50% of consented capacity and having consent to operate under Water Act 1974 and Air Act 1981. *The validity of the consents had expired on 31.12.2013.* It is informed that ***consent fee is paid to TNPCB every year.***

The industry informed that they are procuring water from Chennai Metro water supply (700 -800 m^3/day). As per records the water consumption and effluent generation from different sections are as follows; and the unit is claiming that its effluent generation is 170 m^3/day against the consented quantity of 310 m^3/day.

Sl. No.	Details	Water consumption (m^3/day)	Effluent generation (m^3/day)
1	Manufacturing process	630	170 (anion and cation regeneration section and Cooling tower & boiler Blow down)
2.	Boiler &Cooling tower/Utility	160	
3.	Domestic use	10	7

The industry is having ETP comprising of collection tank, neutralisation tank and treated effluent collection tank. The effluent from the different section is collected in collection tank, the effluent is neutralised by mixing acidic and alkaline effluent from different section and neutralised effluent is stored in the treated effluent sump (exist in ECH plant) and the same is discharged into sea through marine disposal system.

To verify the adequacy of effluent treatment facility the team collected the samples from inlet and outlet of ETP. The analysis results of untreated and treated effluent are depicted below;

Analysis Results of Samples collected at M/s Tamilnadu Petro Products Ltd

Sl. No	Parameters in mg/l	Inlet of ETP	Out let of ETP	Marine disposal standards
1	pH	10.1	9.5	5.5 -9.0
2	Conductivity (µs/cm)	64850	14600	-
3	Total Suspended Solids (mg/L)	12	04	100
4	Total Dissolved Solids (mg/l)	38252	9730	-
5	BOD_3 at 27°C 3days	*	131	100
6	COD (mg/L)	BDL	1152	250
7	Oil & Grease (mg/L)	BDL	BDL	20
8	Alkalinity (mg/L)	282	58	-
9	Calcium (mg/L)	39	39	-
10	Chloride (mg/L)	21917	5518	-
11	Sulphates (mg/L)	2952	436	-
12	Fluoride (mg/L)	BDL	1.5	15
13	Hexavalent Chromium (mg/L)	0.04	0.1	1.0
14	Phenol (mg/L)	BDL	BDL	5.0
15	Sulphide (mg/L)	BDL	BDL	5.0
16	Cadmium (mg/L)	BDL	BDL	2.0

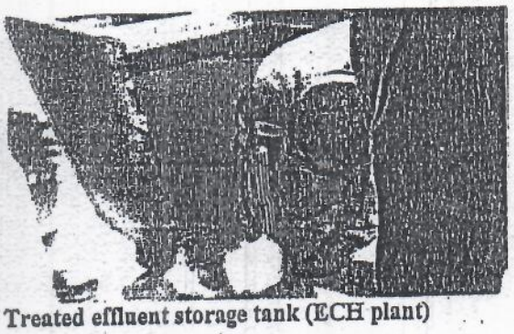
Sl. No	Parameters in mg/l	Inlet of ETP	Out let of ETP	Marine disposal standards
17	Total Chromium (mg/L)	BDL	BDL	2.0
18	Nickle (mg/L)	BDL	BDL	5.0
19	Lead (mg/L)	BDL	BDL	1.0
20	Zinc (mg/L)	2.0	BDL	15

Note: * BOD not carried out; hence the COD is BDL (less than 20 mg/L)

3.4.1 Field observations of team and interpretation of analysis results:

- The industry has not provided separate neutralisation tank; The acidic and alkaline effluent from cation & anion regeneration plant and boiler & Cooling tower blown down are mixed in the collection tank itself, after achieving pH of 6.5-8.5, the effluent is pumped to treated effluent collection tank existing in its sister concerned industry in other premises (M/s TPL, ECH plant).

Collection cum neutralisation tank



Treated effluent storage tank (ECH plant)

- It was informed that they are discharging effluent twice in a week through marine disposal system since effluent quantity (170 m^3/day) is less.

- ***The analysis results reveals that the COD in the inlet is less than 20 mg/l but in out let COD& BOD found high this may be due to non homogeneuosity in the inlet storage tank. However, from the analysis results, effluent having BOD of 131mg/L and COD of 1152 mg/L was discharged into marine disposal by violating the prescribed standards of TNPCB (BOD of 100 mg/L and COD of 250 mg/L).***

- The industry has installed on line flow meter, pH meter & TSS and the same is connected to TNPCB monitoring Centre.

4.0 Overall Findings of Joint Monitoring Team:

(a) As per the observations of joint monitoring team, ***maintenance and operation of ETPs in MPL – I & II plants are not satisfactory. Since effluent has High TDS, the existing biological treatment system is not adequate to meet the prescribed standards of marine disposal.***

(b) The analysis results of ETP outlet samples taken from MPL – I & II as well as TPL have shown the high concentration w.r.t BOD (1258, 1068 & 131 mg/L) and COD (1536,

1344 & 1152 mg/L) **confirms the inadequate treatment system.** As per Expert committee recommendation the industries required to improve treatment facility to achieve the marine discharge standards. The above mentioned analysis results also confirms the same.

(c) None of the industries have planned any fixed schedule of pumping of treated effluent into marine disposal system. On the day of sampling at downstream of confluence point of all four industries (Location 3), there was no discharge from M/s MPL- I, M/s TPL and M/s KPL. This is due to intermittent discharge from each industry.

(d) None of the industries have installed water level indicators in raw effluent collection tank or in treated effluent storage tanks. Also there is no proper record / log book for accountability of effluent generated, treated and quantity of treated effluent disposed.

(e) As per records of industries and based on the analysis results of samples collected , the BOD and COD load discharged into sea are as below;

Parameters	MPL – I	MPL – II	KPL- I	TPL
Quantity of effluent discharged into sea (m^3/day)	2280	2045	30	170
Concentration of BOD in treated effluent (mg/L)	1258	1068	BDL	131
BOD load in kg/day	*2868.24*	*2184.06*	---	*22.27*
Concentration of COD (mg/L)	1536	1344	BDL	1152
COD load.(kg/day)	*3502.08*	*2748.48*	----	*195.84*

From the above table it clearly indicates that MPL – I is discharging effluent around 2280 m^3/day with BOD load of 2868.24 kg/day & COD load of 3502.02 kg/day. Subsequently MPL –II is discharging effluent around 2045 m^3/day with BOD load of 2184.24 kg/day & COD load of 2748.48 kg/day. **From this, it is confirmed that major pollution contribution is from MPL – I & II.**

(f) M/s MPL – I & II have installed online pH, Temperature, and flow meters in the pipeline in which the treated effluent is pumped into marine disposal system and the same is connected to TNPCB monitoring center. The installation of online monitoring system for parameters TSS, BOD & COD is under process.

(g) M/s KPL has installed online monitoring system for pH, TSS, BOD, COD and flow meters in the pipeline in which the treated effluent is pumped into marine disposal system and the same is connected to TNPCB as well as CPCB monitoring center.

(h)M/s TPL has installed online monitoring system for pH & TSS and flow meters in the pipeline in which the treated effluent is pumped into marine disposal system and the same is connected to TNPCB monitoring center.

(i) As per the analysis results of samples of all four industries, hexavalent chromium and zinc found within the prescribed limits and other heavy metals found below detectable limits.

(j) The industries informed that the marine disposal pipeline is inspected manually to verify the leaks if any. The marine pipeline route is marked by putting mile stones in the interval of 400 – 500 mts and these stones are painted with yellow and green colour.

(k) No flow meters are installed in the marine disposal pipe line carrying the treated effluent from four industries to assess the quantity of effluent pumped and quantity of effluent discharged. Since total length of pipe line is 10.6 km and passing below ground level, in case of any leakages in pipe lines, the flow meter give immediate indication and accordingly remedial action can be taken up.

(l) The BOD & COD concentrations observed at different points of marine disposal system are as below;

Name of location / Parameter	Location No. 1 (after confluence of MPL –II and KPL only)	Location No. 2 (after confluence of MPL – I and TPL only)	Location no. 3 (after confluence of all 4 units, before sea disposal)
BOD in mg/ L	629	1310	656
COD in mg/L	1102	1728	960

The results confirm that the effluent discharged is not meeting the marine disposal standards. During sampling at location no. 1, no effluent was pumped from KPL, the sample taken in this location at that particular time was representing the MPL- II effluent, however as per analysis results, the BOD (629 mg/l) & COD (1102 mg/l) concentrations at this point was found much lesser than the MPL-II outlet (BOD – 1068 mg/l & COD – 1344 mg/l) concentrations, this indicates the dilution of effluent which requires further detailed investigations.

At the time of sample collection at Location no 2, no effluent was pumped from TPL, the sample taken in this location represent the MPL – I effluent, as per the analysis results BOD (1258 mg/L) & COD (1536 mg/l) concentration at MPL -I outlet and location no 2 (BOD- 1310 mg/l & COD 1728 mg/l) was found around 5-12 % higher than the MPL –I outlet.

It is observed that during sampling at Location no.3, no effluent was pumped from MPL – I, TPL and KPL, the sample taken from this location represent the MPL – II effluent, as per the analysis result BOD (656 mg/L) & COD (960 mg/l) concentration at Location no. 3 found much lesser than the MPL- II outlet (BOD – 1068 mg/l & COD – 1344 mg/l) concentrations, this also confirms the dilution of effluents which requires the further detailed investigations to find out exact cause.

(m) As per the analysis results of samples taken from three points of marine disposal, cobalt and zinc found within the prescribed limit and other heavy metals found below detectable limit.

(n) As per the expert committee recommendations, industries are required to make necessary arrangement for sample collection and same may be covered and locked. One set of key to be kept with industry for maintenance and another set be available with TNPCB for sample collection.. ***During inspection, team observed that all three common points were accessible without any lock and key arrangements and also the*** sampling location no. 3, situated near to junction road of Manali Express Highway and Ramakrishna Nagar 3rd main road before sea disposal is provided with valve arrangement before tapping point, however this valve key was not made available in the field. After informing to MPL, representatives from MPL provided the key for opening of valve for collecting the sample ***indicates the noncompliance of expert committee recommendation***.

(o) The joint inspection team found very difficult to trace the exact points of diffusers in the sea due to non-availability of any identification or floaters to trace the same. The team travelled around 750 – 850 meters distance from sea shore to inside the sea but found no clear land marks. As per the information and location traced by the industry representatives, the team collected the samples.

(p) During samples collection, no difference in appearance or colour of water found in the sea, the dissolved oxygen found is good (7.4 & 6.6 mg/L).

5.0 Views of Joint monitoring committee w.r.t specific observations made during visit:

i. All industries are required to install flow meters to maintain proper records of water consumption, effluent generation from different section of process along with material balance and water balance and the records needs to be furnished to TNPCB/CPCB during inspection.

ii. Existing ETPs of MPL – I & II and TPL found inadequate, hence it is suggested to take up treatability study to identify the suitable treatment technology to meet the prescribed standards of marine disposal system.

iii. All four industries have to prepare planned schedule of pumping of treated effluent into marine disposal system and to ensure the quality of effluent meeting standards before discharging into sea.

iv. All four industries have to install water level indicators in raw effluent collection tank as well as in treated effluent storage tanks, to assess the quantity of effluent received treated, recycled and discharged into marine disposal system. They have to maintain proper

records / logbook for effluent generated, treated and quantity of treated effluent discharged in to marine disposal system on daily basis.

v. All industries have to install at least three intermediate flow meters in the marine disposal pipeline where provisions are made to collect samples to assess the quantity of effluent pumped and discharged. This will also help in finding of any leaks in the pipeline. These flow meters shall connect to TNPCB/CPCB monitoring center.

vi. All sampling points are found accessible to public and this issue needs to be looked into; these sampling locations have to be provided with lock and key arrangements and one set of key as well as valve operating devices shall be given to TNPCB to access at any point of time.

vii. M/s MPL I & II have to install online BOD, COD analyzer in the marine disposal pipeline and to be connected to TNPCB/ CPCB monitoring center.

viii. The industry shall provide advanced leak detection system along with manual verification for quick identification of leak in the marine disposal pipeline for immediate repair of the same to prevent the soil and ground water contamination in the surrounding area.

ix. A detailed marine study shall be taken up considering the actual quality and quantity of effluent discharged into sea to assess the dilution factor to verify the impact on marine species by an expert agency.

x. The floaters have to be installed to identify the actual point of location of diffusers inside the sea. Without any proper identification it is very difficult to locate exact point of diffuser for collection of samples from disposal points otherwise the samples collected may not be true representative of actual pollution load.

xi. All industries are required to conduct toxicity studies for their effluents and also for combined discharge of effluents. The results shall be submitted to TNPCB including species used for the study to assess the actual situation.

H. D. Varalaxmi

(H.D. Varalaxmi, SEE/Sci. D)
Central Pollution Control Board
South Zonal Office, Bengaluru

D. Vasudevan

(D. Vasudevan, DEE)
Tamilnadu Pollution Control Board
Ambattur, Chennai

Annexure 1

F.No.Tech-/39/legal(NGT)/TN/ZOB/2016-17/76-77 April 7, 2016

To

The Member Secretary
Tamil Nadu Pollution Control Board
No. 76, Mount Salai, Guindy
Chennai - 600032

Subject: M/s Meenavargal Membattu Sangam, Royapuram V/s The Chief Secretary Government of Tamil Nadu and 4 others in the matter of NGT Application no. 19 of 2013(SZ)(THC) and M.A. No. 173 of 2015 (SZ) regarding disappearance of marine species due to discharge of effluent from M/s Manali Petrochemical Ltd.,

Sir,

Please find enclosed herewith a copy of the Hon'ble National Green Tribunal, Southern Zone bench, Chennai, order dated March 21, 2016 in the matter of above cited petition. The contents of the order are self-explanatory. In compliance of above said order, zonal office is deputing a team of officials lead by Smt.H.D.Vasalakumi, SEE for surprise joint monitoring of M/s Manali Petrochemical Ltd., and its marine discharge system during April 11-13, 2016 to verify the pollution control measures taken by the unit before discharging into marine water body. It is therefore requested to depute concerned officer for joint monitoring and to extend necessary co-operation to the team during inspection.

Yours faithfully

S. Suresh 7/4/2016
(S. Suresh)
Zonal Officer

Encl: As above

Copy to:

The District Environmental Engineer,
Tamilnadu Pollution Control Board
77-A, South Avenue road
Ambattur Taluk, Thiruvallur District
Chennai - 600058

With request to depute concerned officer for surprise joint monitoring of the unit please

S. Suresh 7/4/2016
(S. Suresh)
Zonal Officer

O/C

DESPATCHED
No.: 76-77
Date: 7/4/16
Signature:

BEFORE THE NATIONAL GREEN TRIBUNAL (SOUTHERN ZONE) CHENNAI

APPLICATION NO. 19 OF 2013

M.A. No. 173 of 2015

Meenavargal Membattu Sangam

APPLICANT

VERSUS

The Government of Tamilnadu & Others

RESPONDENTS

JOINT INSPECTION REPORT FILED ON BEHALF OF CENTRAL POLLUTION CONTROL BOARD

Advocate D. S. Ekambram

&

Advocate P. Jayalakshmi

COUNSELS FOR CPCB

Annexure - III

CPCB
TNPCB

IInd visit

Joint Inspection Report on

M/s Meenavargal Membattu Sangam

Vs

The Government of Tamilnadu and Others

(Application no.19 of 2013 (SZ) (THC)
(M.A. No. 173 0f 2015 (SZ))

Submitted to

Before the National Green Tribunal
South Zone, Chennai

Central Pollution Control Board
South Zonal Office, Bengaluru
September, 2016

JOINT INSPECTION REPORT OF CENTRAL POLLUTION CONTROL BOARD (CPCB) IN THE MATTER OF APPLICATION NO. 19 OF 2013 (SZ) (THC) & M.A.NO. 173 OF 2015 (SZ), M/s MEENAVARGAL MEMBATTU SANGAM VS THE GOVERNMNET OF TAMILNADU AND OTHERS. SUBMITTED BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL SOUTH ZONE – CHENNAI, AS PER ORDER DATED JULY 29, 2016

1.0. Preamble

In the matter of Application no. 19 of 2013 (SZ) (THC) & M.A. No. 173 of 2015 (SZ), M/s Meenavargal Membattu Sangam Vs The Government of Tamilnadu and others, the National Green Tribunal (NGT), South Zone had directed the Central Pollution Control Board (CPCB) vide its order dated March 31, 2016 to "Conduct a joint inspection along with the Tamil Nadu State Pollution Control Board (TNPCB) as per the recommendation of the Expert Committee dated 19.09.2014 and file a status report before this Tribunal by the next hearing".

In compliance to above mentioned order, CPCB, South Zonal Office inspected and submitted the detailed report on the matter. The matter was heard in NGT, 5th respondent (M/s Manali Petrochemicals Ltd.,) filed reports and informed that "the specific observation made by the Joint monitoring team was rectified and BOD, COD levels has come down". Subsequently, the Hon'ble NGT passed an order dated July 29, 2016 **(Annexure -1)**, directed "***CPCB and TNPCB to effect a fresh joint inspection and find out as to whether the recommendations of the joint inspection report dated 30.04.2016 have been implemented or not. We make it clear that in the event of Joint Inspection Report reiterating the earlier stand, the Tribunal may take a corrective stand against the 5th respondent***".

In compliance to above mentioned order, CPCB, South Zonal Office deputed officials and informed to Tamilnadu Pollution Control Board vide letter dated August 09, 2016 **(Annexure -2)** regarding schedule of inspection and also requested to co-ordinate with CPCB team during visit. The team comprised of following officials from CPCB, South Zonal Office, Bengaluru and Tamilnadu Pollution Control Board (TNPCB), District Environmental Engineer Office, Ambattur carried out joint inspection during **August 17-18, 2016** and the entire inspection work was supervised by Mrs. H. D. Varalaxmi, Sr. Env. Engineer, CPCB, Bengaluru.

Central Pollution Control Board, Zonal Office, Bengaluru

1. Mrs. H.D.Varalaxmi, SEE/Sci. D – Team Leader
2. Dr. B.S. Anupama, Scientist B
3. Mr. A. Gnanavelu, Scientist B

Tamil Nadu Pollution Control Board , District Envrionmental Office, Ambattur

1. Mr. D. Vasudevan, DEE
2. Mr. G. Manivasagan, AE

Representatives from Industries

1. Mr. G.Balasubramanian, Director (works), MPL
2. Mr. Balaguru, Safety Officer, MPL
3. Mr. A.R. Ashokkumar, Deputy General Manager, Kothari Petrochemicals
4. Mr. Kalyana Sundram, Unit Head, TPL
5. Mr. A. Rajkumar, DM – Safety, TPL

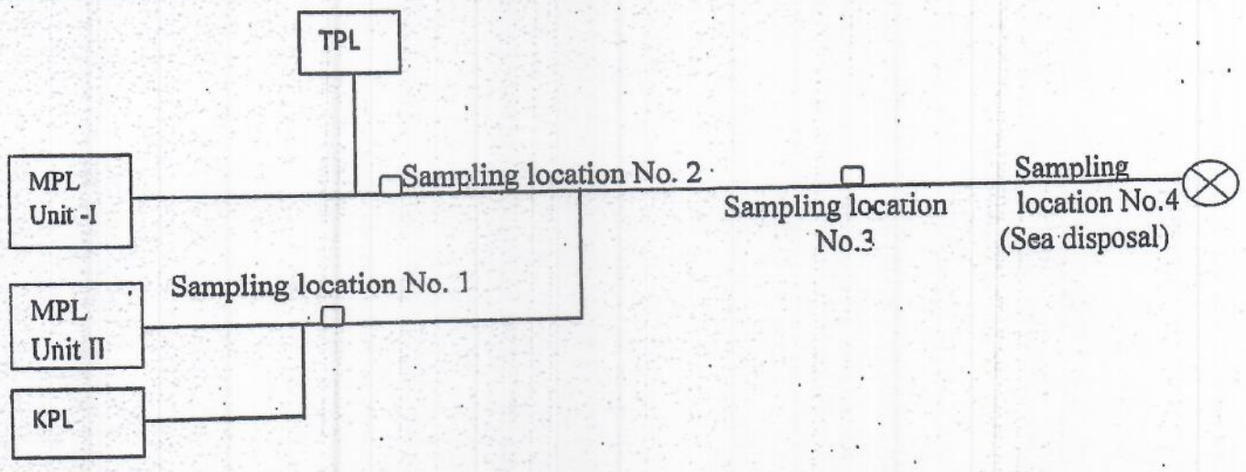
2.0. Field observation about marine disposal system

The joint monitoring team inspected the pipeline which is carrying effluent from different industries viz. M/s Manali Petro Chemicals Ltd. (MPL), P[illegible]

M/s TPL was found discharged into marine disposal system. The details of pipe length and its and sampling locations are given below in table as well as in line diagram.

Details of Pumping (Discharge) Line

Sl. No.	From	To	Size of pipe (outer dia) in mm	Length of pipe (Meter)
1	MPL – 1	TPL	280	800
2	TPL	Sathyamurthy Nagar	315	1400
3	MPL -2	Sathyamurthy Nagar	280	4000
4	Sathyamurthy Nagar	Seashore	400	3700
5	Seashore	Diffuser	400	700



Pipe Line Diagram showing the Sampling Locations

As per the Hon'ble NGT order, the team collected samples from the discharge line which is carrying treated effluent into sea disposal in the following points to ascertain the quality of effluent discharged into sea:

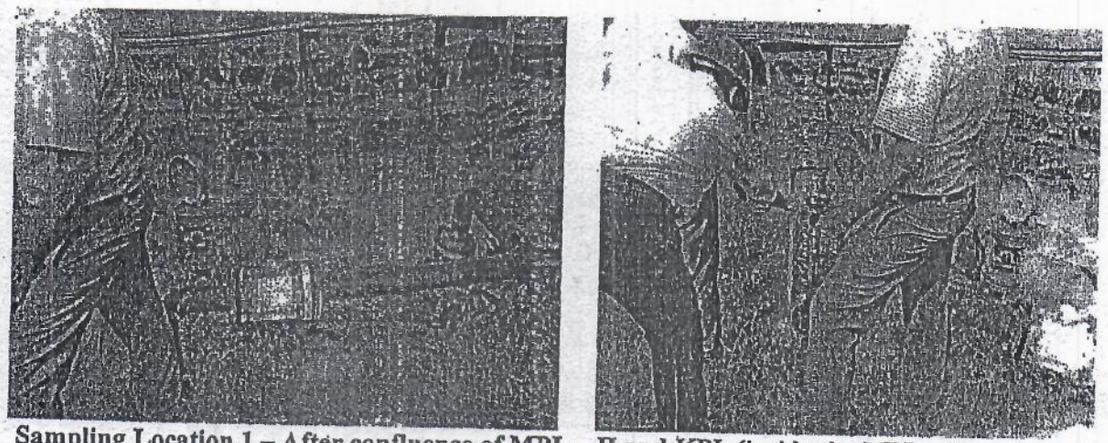
Sampling location no.	Location Identification	Date and Time of collection	Remarks
1	Inside the MPL – II premises (after confluence of MPL plant – II & KPL plant effluent)	17.08.16 at 15.00 PM	No effluent from KPL discharged, the effluent taken in the point represents the effluent of MPL plant -II only.
2	In front of Tamilnadu Petrochemicals (after confluence of MPL plant –I effluent and TPL plant effluent)	17.08.16 at 16.00 PM	No effluent from KPL discharged from TPL, the effluent taken in the point represents the effluent of MPL plant -I only.
3	Near to junction road of Manali Express highway and Ramakrishna Nagar 3rd main road before sea disposal	17.08.16 at 16.30 PM	After confluence of all 4 units effluent, during sampling no effluent from KPL & TPL being pumped. The effluent taken in the point represents the effluent of both MPL I & II.
4	In the sea (where Marine disposal system exist)	18.08.16 at 9.00 AM	Taken two samples, one from sea surface and other from the 5m depth.

The samples from above mentioned points were collected in the presence of TNPCB officials and industry representatives, the collected samples were analysed in the CPCB, South Zonal Office Laboratory, Bengaluru, the analysis results are tabulated below:

Sl. No.	Parameters	Marine disposal standards	Sampling Locations				
			Sampling location 1	Sampling location 2	Sampling location 3	Sampling location 4	
						At surface	At 5m depth
2	Conductivity (µs/cm)	-	53000	44100	46800	52700	57100
3	Total Suspended Solids (mg/L)	100	58	30	14	16	3
4	Total Dissolved Solids (mg/L)	-	38724	31664	32680	37254	37664
5	BOD_3 at 27°C 3days	100	850	650	767	1.4	2.5
6	COD (mg/L)	250	2071	1594	1721	35	150
7	Oil & Grease (mg/L)	20	15.8	7.7	1.7	BDL	BDL
8	Dissolved Oxygen (mg/L)	-	-	-	-	6.3	6.9
9	Alkalinity (mg/L)	-	72	91	78	121.4	120.2
10	Calcium (mg/L)	-	12367	9955	10731	486	527
11	Chloride (mg/L)	---	21868	17856	19324	19617	20400
12	Sulphate (mg/L)	-	343	379	320	2669	2754
13	Fluoride (mg/L)	15	0.69	0.90	0.82	0.93	0.95
14	Hexavalent Chromium (mg/L)	1.0	0.06	0.08	0.06	0.02	0.02
15	Phenol (mg/L)	5.0	0.004	0.009	BDL	BDL	BDL
16	Sulphide (mg/L)	5.0	BDL	BDL	BDL	-	-
17	Copper (mg/L)	3.0	BDL	BDL	BDL	BDL	BDL
18	Cadmium (mg/L)	2.0	BDL	BDL	BDL	BDL	BDL
19	Total Chromium (mg/L)	2.0	0.096	0.084	0.147	0.14	0.224
20	Iron (mg/L)	3.0	1.58	1.38	3.23	2.41	1.98
21	Manganese (mg/L)	2.0	BDL	BDL	BDL	BDL	BDL
22	Nickel (mg/L)	5.0	BDL	BDL	BDL	BDL	BDL
23	Lead (mg/L)	1.0	BDL	BDL	BDL	BDL	BDL
24	Zinc (mg/L)	15	BDL	BDL	BDL	BDL	BDL
25	Cobalt (mg/L)	-	BDL	BDL	BDL	BDL	BDL

Field observations of team and interpretation of analysis results:

Location 1:



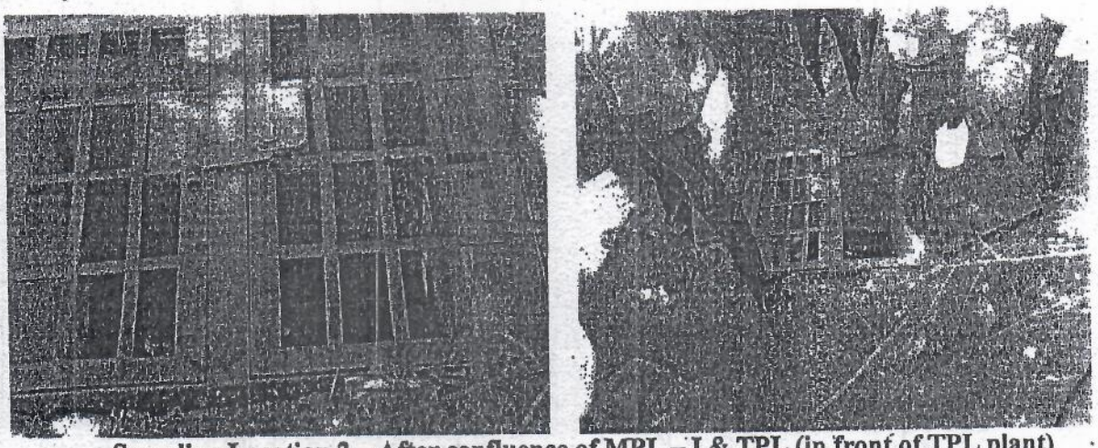
Sampling Location 1 – After confluence of MPL – II and KPL (inside the MPL – II premises)

- During inspection, it was observed that sampling location no. 1 existing inside the premises of M/s Manali Petrochemicals Plant- II found provided ***proper cover with lock and key arrangements in compliance of court order.***

- This sampling point represents after confluence of effluent from MPL – II and KPL in case both plant pumping the[illegible]

disposal standards). Iron and Total Chromium found within the prescribed standards of Marine disposal, no traces of other heavy metals were found.

Location 2:



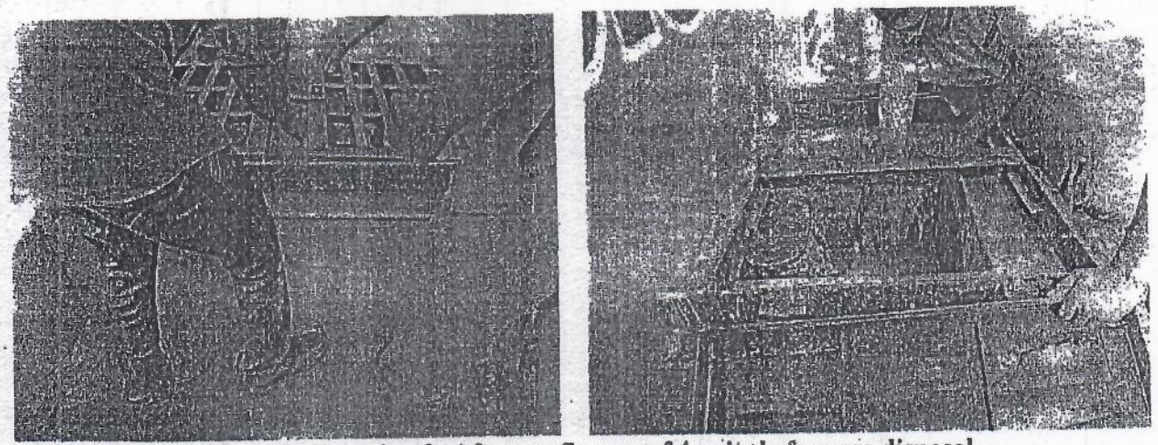
Sampling Location 2 – After confluence of MPL – I & TPL (in front of TPL plant)

- During inspection, it was observed that sampling location no. 2, located in front of M/s TPL plant found provided ***proper cover with lock and key arrangements in compliance of court order.***

- This sampling point represents after confluence of effluent from MPL – I and TPL in case both plant pumping their effluent simultaneously. ***However, during inspection /sampling, no effluent was pumped from M/s TPL; the effluent collected at this point represents the effluent from MPL –I only.***

- From the analysis results reveals that ***the concentration of BOD (650 mg/L) exceeding more than 6.5 folds and COD (1594 mg/L) exceeding 6.3 folds than marine disposal standards. Iron and Total Chromium found within the prescribed standards of Marine disposal, no traces of other heavy metals were found***

Location 3:

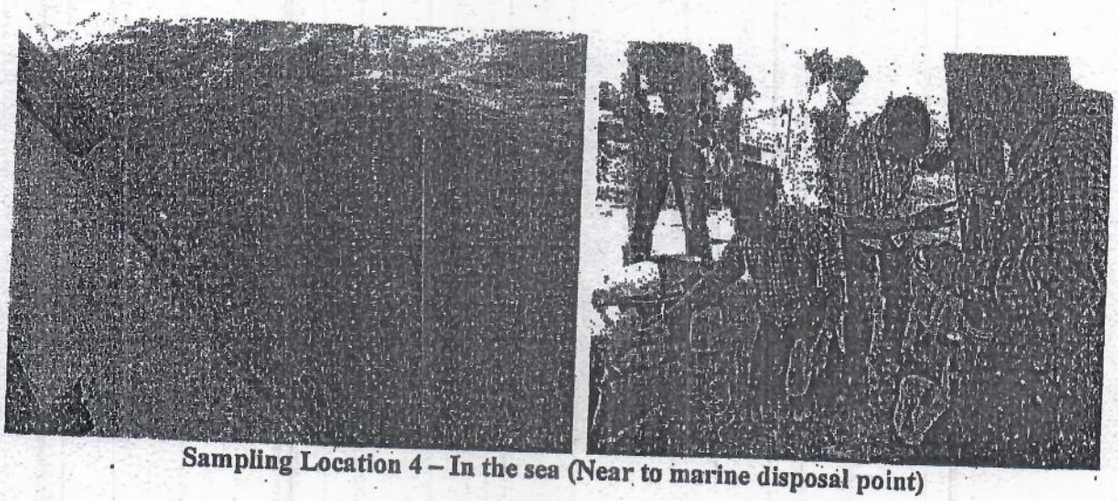


Sampling Location 3: After confluence of 4 units before sea disposal (Junction of Manali Express highway and Ramakrishna Nagar 3rd main road)

- During inspection, it was observed that sampling location no. 3, located near to junction road of Manali Express Highway and Ramakrishna Nagar 3rd main road before sea disposal is found provided ***proper cover with lock and key arrangements in compliance of court order.***

- The analysis results reveals that ***the concentration of BOD (767 mg/L) exceeding more than 7 folds and COD (1721 mg/L) exceeding 6.8 folds than marine disposal standards. Iron and Total Chromium found within the prescribed standards of Marine disposal, no traces of other heavy metals were found.***

Location 4:



Sampling Location 4 – In the sea (Near to marine disposal point)

- During inspection, team also monitored the marine out fall, this time also team observed that no identification/ floaters to trace the exact point of out fall diffuser system. As per the information and location traced by the industry representatives, team taken two samples in the periphery of out fall system, one is surface of sea and other one from 5 m depth (it is informed that diffuser is installed at 10 m depth).

- During sample collection time, **no difference in appearance or colour of water found in the sea.**

- From the analysis results, **it is observed that Dissolved Oxygen (6.3 & 6.9 mg/L) in both points of sampling location found good.** *No traces of heavy metals were found*

3.0 Status of treatment system provided by the industries discharging their effluent into sea through marine disposal system

The team inspected all four industries viz. (i) M/s Manali Petrochemicals Ltd. Plant – I, (ii) M/s Manali Petrochemical Ltd., Plant – II, (iii) M/s Kothari Petrochemicals Ltd and (iv) M/s Tamilnadu Petrochemicals Ltd., discharging their treated effluent into sea through marine disposal system to verify the measures taken to meet the prescribed standards. The observations made w.r.t individual units are as follows:

3.1 M/s Manali Petrochemicals Ltd., Plant –I

The unit is engaged in manufacturing of Propylene Oxide (1000 MT/month), Propyline Glycol (520 MT/month), Polyol (500MT/month) and Propylene Glycol Mono Methyl Ether (225 MT/month) and by product of DCP – Dichloro Propane (120 MT/month), Dipropylene Glycol (40 MT/month) and Di Prooylen Glycol MonoMethyle Ether (15 MT/month) by using raw materials viz. Propylene, Chlorine and Lime. During inspection the unit was in operation at 70-75%l capacity and also poses consent to operate under Water Act 1974 and Air Act 1981, ***the validity of the consents are found up to March 31, 2017***, copy of consent copies are enclosed at **Annexure -3.**

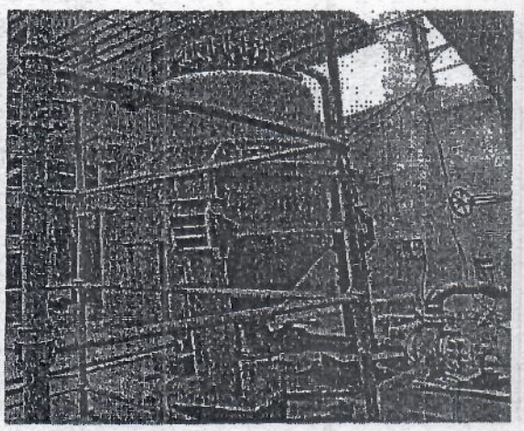
The unit informed that they are procuring water fr...

however they installed flow meter to quantify the effluent taken to bio reactor (Aeration system) and treated effluent pumped and marine disposal system. During inspection the flow meters were found in operation, as per the flow record around 95-100 m^3/hr was taken to bio-reactor and around 100 m^3/hr of treated effluent being discharged into marine disposal system. As per the records of the water received from different sources and effluent generated and taken to ETP are as follows;

Sl. No.	Details	Water consumption (m^3/day)	Effluent generation (m^3/day)
1	Manufacturing process	2052	2052
2.	Cooling tower / Utility	280	30
3.	Domestic use	65	15

The unit is claiming that its effluent generation is 2052 m^3/day, which is within the consented quantity of 2399 m^3/day and the same is cross verified with flow meter installed at inlet to bio- reactor and out let of ETP. The unit has ETP comprising of High rate thickener, rotary drum filter, *pressure sand filter, chemical dosage system, clarifier*, cooling tower, pH correction tank, 6 bio reactors and treated effluent tank, the ETP flow diagram is enclosed at **Annexure 4**.

The effluent from the different section are taken to high rate thickener to allow to settle the sludge, the settled lime sludge being taken to rotary drum filter for dewatering, the over flow from high rate thickener being taken to *pressure sand filter to reduce SS and given , chemical dosage (potassium persulphate) @ 450mg/l to reduce BOD & COD. The overflow from clarified taken* to cooling tower to reduce temperature from 70 °C to ambient temperature, after reducing temperature the effluent being taken to pH correction tank to reduce pH from 10.5 – 11 to 6.5-8.5. After pH correction the effluent is treated in the bio reactor by adding DAP as a nutrient, the treated effluent is stored in the treated water tank and the same is pumped to marine pipeline to discharge into sea.



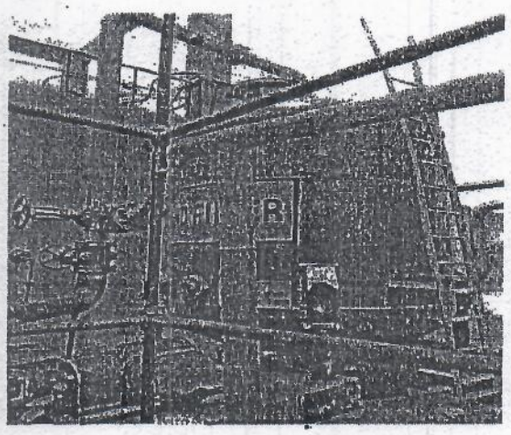
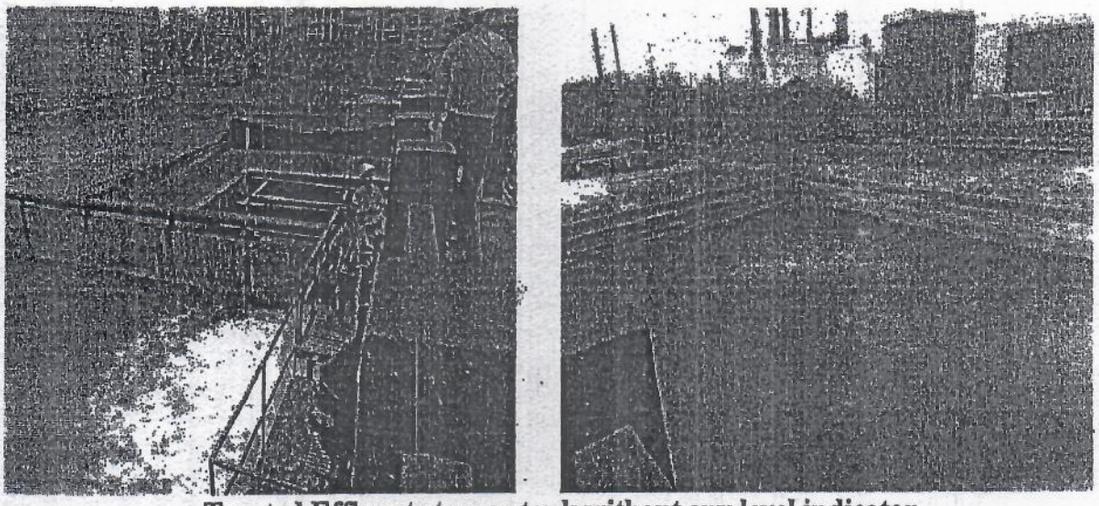


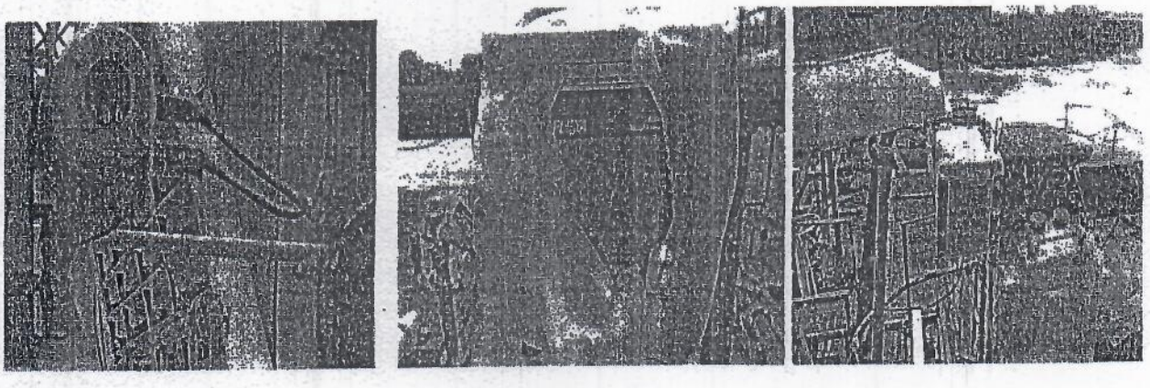
Photo graph showing improvement of housekeeping in ETP premises

- The treated effluent from bio reactor is stored in treated effluent tank, after attaining required water level in the tank; the treated effluent is pumped to marine disposal system for discharging the same into sea. ***No steps taken to provide water level indicator in the treated effluent storage tank to assess the quantity of treated effluent stored and pumped to marine disposal system. During inspection Treated effluent was found pumping into marine disposal system.***



Treated Effluent storage tank without any level indicator

- The unit has installed flow meters to quantify the effluent taken to bio-reactor and to quantify the treated effluent discharged into marine disposal system, the unit also installed online pH TSS meter as well TOC analyser for measuring BOD and COD. During Inspection TOC analyser found under commissioning stage. Except TOC other online monitoring system are connected to TNPCB monitoring system.



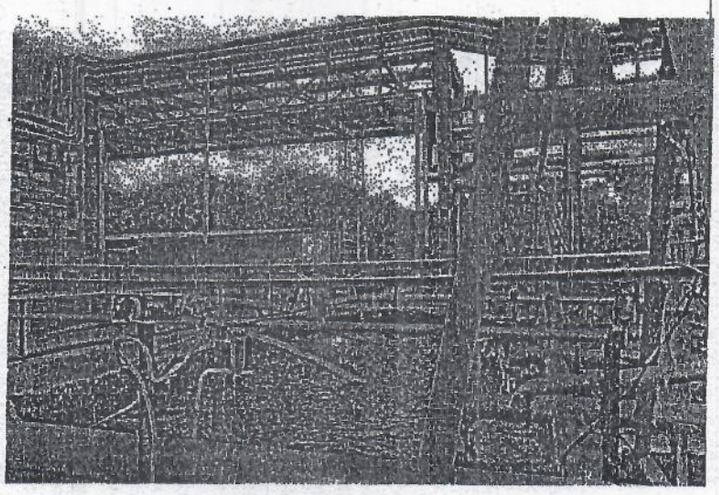
sources (MFL and STP). The analysis results of raw water as well as untreated and treated effluent are depicted below:

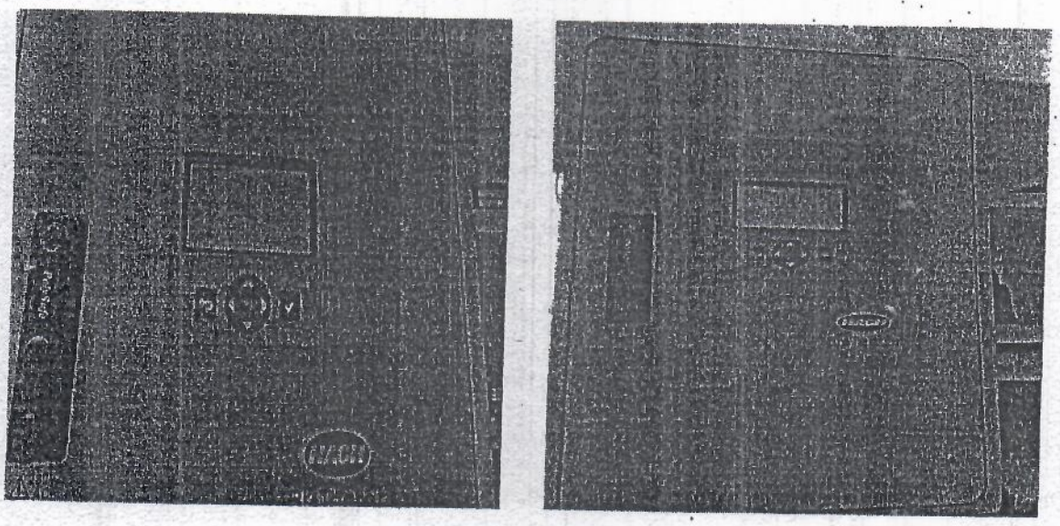
Analysis Results of Samples collected at M/s Manali Petrochemicals Ltd., Plant –I

Sl. No.	Parameters	Raw water Quality used in process		Effluent Quality		Marine disposal standards
		Treated sewage from STP (Kodungaiyur)	RO reject received from MFL plant	Inlet to ETP	Out let of ETP	
1	pH	7.8	7.4	11.5	6.6	5.5 -9.0
2	Conductivity (µs/cm)	2470	5540	54700	39800	-
3	Total Suspended Solids (mg/L)	BDL	BDL	12	10	100
4	Total Dissolved Solids (mg/L)	1482	3718	42036	29558	-
5	BOD_3 at 27°C 3days (mg/L)	15	15	900	783	100
6	COD (mg/L)	52	127	1832	1673	250
7	Oil & Grease (mg/L)	--	--	3.9	2.4	20
8	Alkalinity (mg/L)	361	83	1384	82	-
9	Calcium (mg/L)	-	-	13757	9546	-
10	Chloride (mg/L)	-	-	24363	16878	-
11	Sulphates (mg/L)	--	--	397	313	-
12	Fluoride (mg/L)	-	-	1.10	0.90	15
13	Hexavalent Chromium (mg/L)	-	-	0.08	0.08	1.0
14	Phenol (mg/L)	-	-	0.01	0.01	5.0
15	Sulphide (mg/L)	BDL	BDL	BDL	BDL	5.0
16	Copper (mg/L)	-	-	BDL	BDL	3.0
17	Cadmium (mg/L)	-	-	BDL	BDL	2.0
18	Total Chromium (mg/L)	-	-	BDL	0.084	2.0
19	Iron (mg/L)	-	-	0.68	2.5	3.0
20	Manganese (mg/L)	-	-	BDL	BDL	2.0
21	Nickel (mg/L)	-	-	BDL	BDL	5.0
22	Lead (mg/L)	-	-	BDL	BDL	2.0
23	Zinc (mg/L)	-	-	BDL	0.198	15
24	Cobalt (mg/L)	-	-	BDL	BDL	-

3.1.1. Field observations and interpretation of analysis results

- During inspection it is observed that the unit was receiving raw water from Kodungaiyur STP as well as from RO reject from MFL and having TDS of 1482 & 3712 mg/L respectively.





TOC Analyser for measuring BOD and COD in out let of ETP

- As per the record maintained by the unit, pH and Flow meters are calibrated once in a year. Online TSS meter is installed in 2016 and calibrated at the time of installation.

- ***As per the analysis results of samples taken from the inlet and outlet of ETP reveals the inadequate treatment system. In spite of upgrading treatment system by adding Pressure sand filter and chemical dosage system the efficiency of treatment system found 13% w.r.t BOD removal and 8.6 % w.r.t COD removal which clearly indicates the inadequacy of treatment system.***

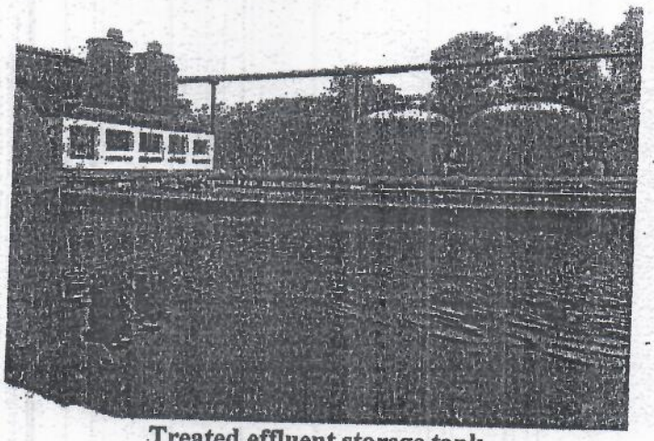
- ***It is also observed that the effluent having BOD of 783 mg/L, COD of 1673 mg/L was being discharged into marine disposal by violating the prescribed standards of TNPCB (BOD of 100 mg/L and COD of 250 mg/L). Iron and Total Chromium found within the prescribed standards of Marine disposal, no traces of other heavy metals were found.***

3.2 M/s Manali Petrochemicals Ltd., Plant –II

The unit is engaged in manufacturing of Propylene Oxide (1000 MT/month), Propyline Glycol (650 MT/month) and Polyol (1000MT/month) and by product of DCP – Dichloro Propane (175 MT/month), Dipropylene Glycol (80 MT/month) and Tri Propylene Glycol (10 MT/month) by using raw materials viz. Propylene, Chlorine and Lime. During inspection the unit was in operation at 70-75% capacity and also poses consent to operate under Water Act 1974 and Air Act 1981, ***the validity of the consents are found up to March 31, 2017***, copy of consent copies are enclosed at **Annexure 5.**

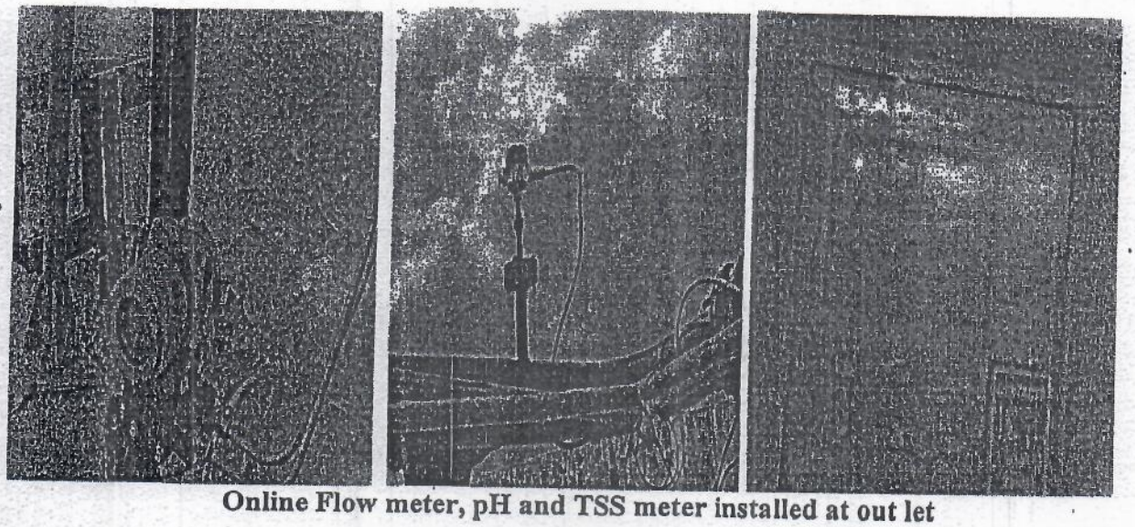
The unit informed that they are procuring water from three sources viz. (i) Chennai Petrochemical Ltd., RO Reject (342 - 503 m^3/day) ((ii) Treated effluent from Kodungaiyur STP (460 - 1030 m^3/day) and (iii) Fresh water from Chennai Metro water supply (1050 -1510 m^3/day). However during inspection no water from CPCL was found received. The unit has flow meters to quantify the raw water received from CMWS, for other two sources no flow meter is installed in their premises to quantify the water received. The unit has not installed flow meter to quantify the effluent generated from different section, however they installed flow meter to quantify the effluent taken to bio reactor (Aeration system) and treated effluent pumped and marine disposal system. During inspection the flow meters were found in operation, as per the flow record, around 83m^3/hr was taken to bio-reactor and around 63 m^3/hr of treated effluent being discharged into marine disposal system. As per the records of the water received from different sources and effluent generated and taken to ETP are as follows;

- The treated effluent from bio reactor is stored in treated effluent tank and the same is pumped to marine disposal system. ***No steps taken to provide water level indicator in the treated effluent storage tank to assess the quantity of treated effluent stored and pumped to marine disposal system. During inspection Treated effluent was found pumping into marine disposal system.***

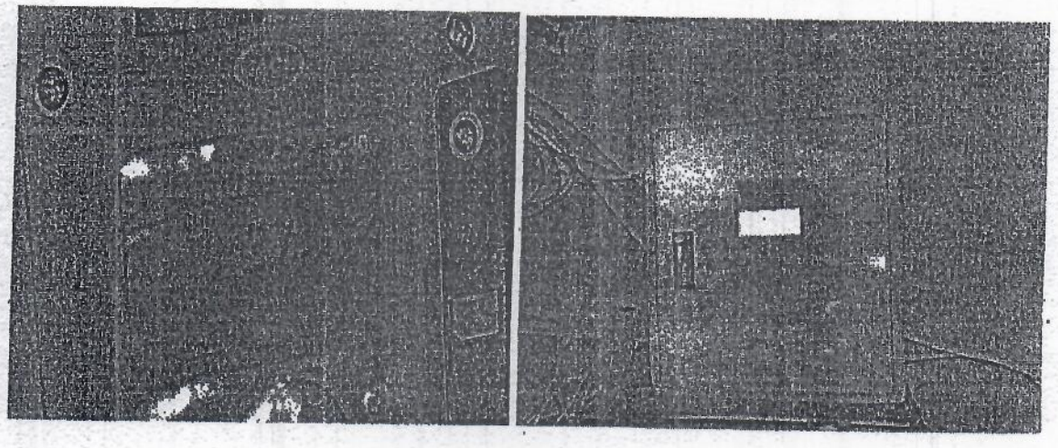


Treated effluent storage tank

- The unit has installed flow meters to quantify the effluent taken to bio-reactor and to quantify the treated effluent discharged into marine disposal system; the unit also installed online pH TSS meter as well as TOC analyser for measuring BOD and COD. During Inspection, TOC analyser found under commissioning stage. Except TOC other online monitoring system are connected to TNPCB monitoring system.

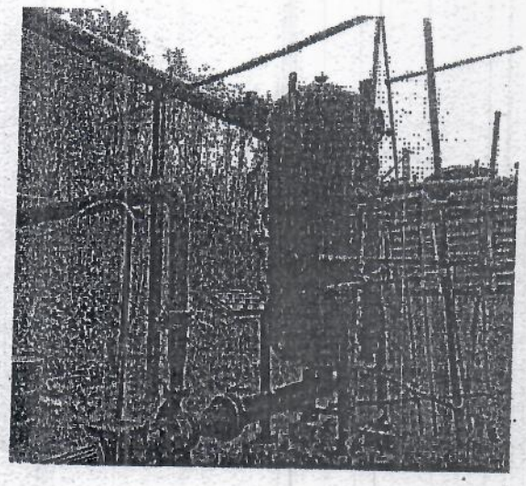


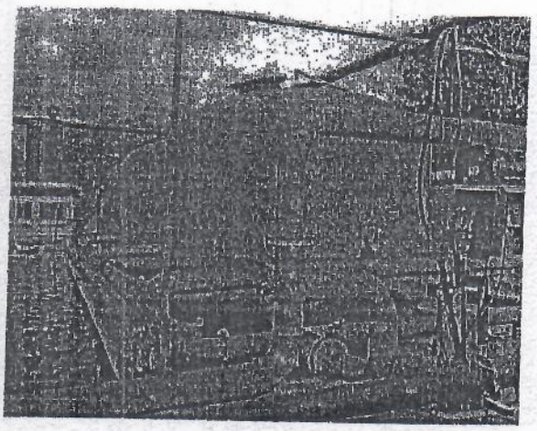
Online Flow meter, pH and TSS meter installed at out let

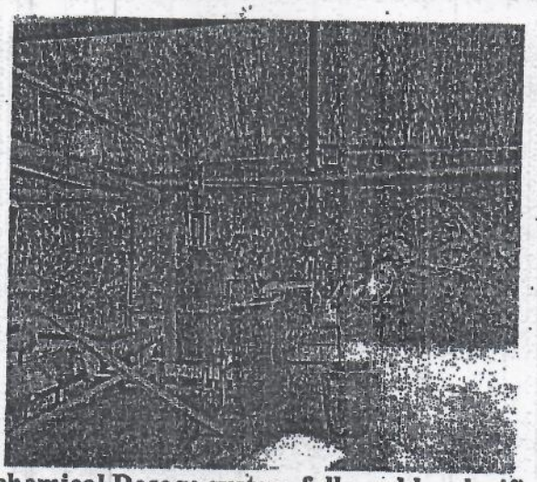


The unit is claiming that its effluent generation is 2090 m^3/day, which is within the consented quantity of 2559 m^3/day and the same is cross verified with flow meter installed at inlet to bio- reactor and out let of ETP. The unit has ETP comprising of High rate thickener, rotary drum filter, *pressure sand filter, chemical dosage system, clarifier*, cooling tower, pH correction tank, 6 bio reactors and treated effluent tank, the ETP flow diagram is enclosed at **Annexure 6.**

The effluent from the different sections are taken to high rate thickener to allow to settle the sludge, the settled lime sludge being taken to rotary drum filter for dewatering, the over flow from high rate thickener is taken to *pressure sand filter to reduce SS and given , chemical dosage (potassium persulphate) @ 450mg/l to reduce BOD &COD. The overflow from clarified is taken* to cooling tower to reduce temperature from 70 °C to ambient temperature, after reducing temperature the effluent is taken to pH correction tank to reduce pH from 10.5 – 11 to 6.5-8.5. After pH correction the effluent is treated in bio reactor by adding DAP as nutrient, the treated effluent is stored in the treated water tank and the same is pumped to marine pipeline to discharge into sea.







Sand filter followed by chemical Dosage system followed by clarifier to reduce Suspended solids and COD

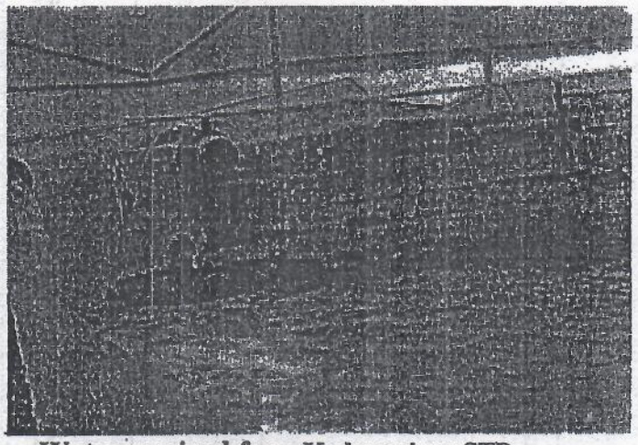
To verify the adequacy of effluent treatment facility, the team collected the samples from inlet and outlet of ETP also collected the raw water samples to verify the quality of water used since the unit claims that they are using major quantity of water is treated effluent from other sources (MFL and STP). The analysis results of raw water as well as untreated and treated effluent are depicted below:

Analysis Results of Samples collected at M/s Manali Petrochemicals Ltd., Plant –II

Sl. No.	Parameters	Raw water Quality used in process	Effluent Quality		Marine disposal standards
		Treated sewage from STP (Kodungaiyur)	Inlet to ETP	Out let of ETP	
2	Conductivity (µs/cm)	1740	54500	51900	-
3	Total Suspended Solids (mg/L)	BDL	18	38	100
4	Total Dissolved Solids (mg/L)	1052	39846	38266	-
5	BOD_3 at 27°C 3days (mg/L)	30	1900	833	100
6	COD (mg/L)	44	2876	1832	250
7	Oil & Grease (mg/L)	--	8.5	8.0	20
8	Alkalinity (mg/L)	302	1150	75	-
9	Calcium (mg/L)		13389	12203	-
10	Chloride (mg/L)	-	23335	22308	-
11	Sulphates (mg/L)	-	169	323	-
12	Fluoride (mg/L)	-	0.75	0.69	15
13	Hexavalent Chromium (mg/L)	-	0.02	0.14	1.0
14	Phenol (mg/L)	-	0.01	0.005	5.0
15	Sulphide (mg/L)	BDL	BDL	BDL	5.0
16	Copper (mg/L)	-	BDL	BDL	3.0
17	Cadmium (mg/L)	-	BDL	BDL	2.0
18	Total Chromium (mg/L)	-	0.12	0.056	2.0
19	Iron (mg/L)	-	1.59	5.8	3.0
20	Manganese (mg/L)	-	BDL	BDL	2.0
21	Nickel (mg/L)	-	BDL	BDL	5.0
22	Lead (mg/L)	-	BDL	BDL	2.0
23	Zinc (mg/L)	-	BDL	BDL	15
24	Cobalt (mg/L)	-	BDL	BDL	-

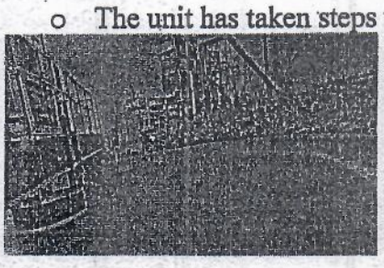
3.2.1 Field Observations of Team and interpretation of analysis results:

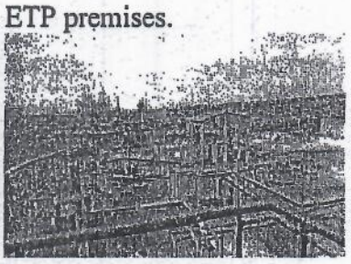
- During inspection it was observed that the unit was receiving raw water from Kodungaiyur STP having TDS of 1053 mg/L.



Water received from Kodungaiyur STP

- The unit has taken steps to improve housekeeping in the ETP premises.





- As per the record maintained by the unit pH and Flow meters are calibrated once in a year. Online TSS meter is installed in January 2016 and calibrated at the time of installation.

- ***As per the analysis results of samples taken from the inlet and outlet of ETP reveals the inadequate treatment system. In spite of upgrading treatment system by adding Pressure sand filter and chemical dosage system the efficiency of treatment system found 56% w.r.t BOD removal and 36.3 % w.r.t COD removal which clearly indicates the inadequacy of treatment system.***

- ***It is also observed that the effluent having BOD of 833 mg/L, COD of 1832 mg/L is discharged into marine disposal by violating the prescribed standards of TNPCB (BOD of 100 mg/L and COD of 250 mg/L). The concentration of Iron found slightly exceeding the prescribed standards of Marine disposal, no traces of other heavy metals were found***

3.3 M/s Kothari Petrochemicals Ltd

The unit is engaged in manufacturing of Polybutane (2000 MT/month), Light Polymer (240 MT/month) and by product of dilute caustic (120 MT/month) and Intermediate product of Intermediate polymer (10 MT/month). ***During inspection the unit was found under annual maintenance shut down since August 14, 2016 and informed that operation will be resumed in last week of August. No effluent found discharged into marine disposal system.***

3.4 M/s Tamilnadu Petro products Ltd., (Heavy Chemicals Division)

The unit is engaged in manufacturing of Caustic Soda (6875 MT/month), Liquid Chlorinet (4166 MT/month), Hydrochloric Acid (4125 MT/month) and Ammonium Chloride (1788 MT/month) by using Sodium chloride and Ammonia as raw material. During inspection the unit was in operation at 50% of consented capacity and also poses consent to operate under Water Act 1974 and Air Act 1981, ***the validity of the consents are found up to March 31, 2017***, copy of consent copies are enclosed at **Annexure -7**.

The unit informed that they are procuring water from Chennai Metro water supply (700 - 800 m^3/day). As per the information provided by the unit water consumption and effluent generated from different section are as follow; and the unit is claiming that their effluent generation is 110 m^3/day against the consented quantity of 310 m^3/day.

Sl. No.	Details	Water consumption (m^3/day)	Effluent generation (m^3/day)
1	Manufacturing process	281.85	75.1
2.	Boiler &Cooling tower/Utility	349.25	35.0
3.	Domestic use	10.95	8.7

The unit has ETP comprising of collection tank, neutralisation tank and treated effluent collection tank. The effluent from the different sections are collected in collection tank, the effluent being neutralised by mixing acidic and alkaline effluent from different section and neutralised effluent is stored in the treated effluent sump (exist in ECH plant) and the same is discharged into sea through marine disposal system.

To verify the adequacy of effluent treatment facility the team collected the samples from inlet and outlet of ETP. The analysis results of untreated and treated effluent are depicted below;

However from the analysis results, effluent having BOD of 193mg/L and COD of 894 mg/L was found stored in the Storage tank which ultimately discharged into marine disposal by violating the prescribed standards of TNPCB (BOD of 100 mg/L and COD of 250 mg/L). The concentration of Iron found slightly exceeding the prescribed standards of Marine disposal, no traces of other heavy metals were found.

- The unit has installed on line flow meter, pH meter & TSS and the same is connected to TNPCB monitoring Centre.

4.0 Summary of Findings of Joint Monitoring Team:

(a) As per the observations of joint monitoring team, MPL –I & II have taken steps to improve housekeeping in the ETP premises. Both units upgraded their ETP by installing additional pressure sand filter to reduce TSS and Chemical dosage system to reduce COD. However, the same was found not full proof treatment system to ***meet the prescribed standards of marine disposal.***

(b) The analysis results of ETP outlet samples taken from MPL – I & II as well as TPL have shown the high concentration w.r.t BOD (783, 767 & 193 mg/L) and COD (1673, 1721 & 894 mg/L) **confirms the inadequate treatment system.**

(c) No steps taken to install flow meters to record water use in the different process as well as to quantify the effluent generated from different process. Also there is no proper record / log book found for accountability of effluent generated, treated and quantity of treated effluent disposed.

(d) As per the information provided by the industries and based on the analysis results of samples taken, the BOD and COD load discharged into sea are as below;

Parameters	MPL – I	MPL – II	TPL
Quantity of effluent discharged into sea (m^3/day)	2052	2090	170
Concentration of BOD in treated effluent (mg/L)	783	767	193
BOD load in kg/day	*1606.7*	*1603*	*32*
Concentration of COD (mg/L)	1673	1721	894
COD load (kg/day)	*3433*	*3597*	*152*

From the above table it clearly indicates that MPL – I is discharging effluent around 2052 m^3/day with BOD load of 1606.7 kg/day & COD load of 3433 kg/day. Subsequently MPL –II is also discharging effluent around 2090 m^3/day with BOD load of 1603 kg/day & COD load of 3597 kg/day. **From this, it is confirmed that major pollution contribution is from MPL – I & II.**

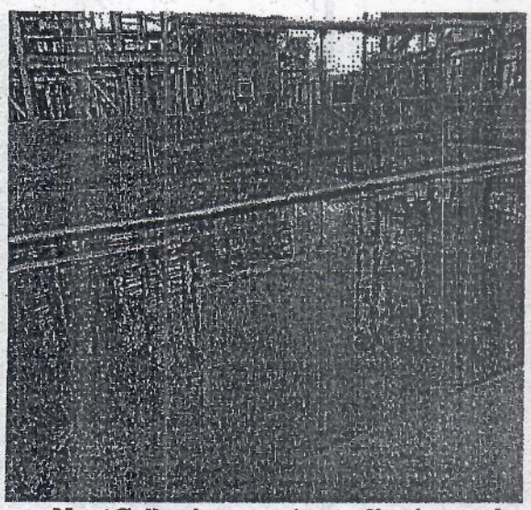
(e) M/s MPL – I & II installed online pH, Temperature, and flow meters in the pipeline in which they are pumping treated effluent into marine disposal system and the same is connected to TNPCB monitoring center. ***Both units have procured TOC analyzer and installed to monitor BOD and COD at out let of ETP and the same was found under stabilization due to High TDS concentration.***

(f) M/s TPL also installed only pH, TSS and flow meters in the pipeline in which they are pumping treated effluent into marine disposal system and the same is connected to TNPCB monitoring center.

Sl. No	Parameters in mg/l	Inlet of ETP	Out let of ETP	Marine disposal standards
2	Conductivity (µs/cm)	23100	65300	-
3	Total Suspended Solids (mg/L)	18	40	100
4	Total Dissolved Solids (mg/l)	12738	45680	-
5	BOD_3 at 27°C 3days	1.0	193	100
6	COD (mg/L)	27	894	250
7	Oil & Grease (mg/L)	3.0	4.3	20
8	Alkalinity (mg/L)	1376	232	-
9	Calcium (mg/L)	1410	2678	-
10	Chloride (mg/L)	6800	26858	-
11	Sulphates (mg/L)	133	877	-
12	Fluoride (mg/L)	0.32	6.3	15
13	Hexavalent Chromium (mg/L)	0.02	0.08	1.0
14	Phenol (mg/L)	BDL	BDL	5.0
15	Sulphide (mg/L)	BDL	BDL	5.0
16	Copper (mg/L)	BDL	BDL	3.0
17	Cadmium (mg/L)	BDL	BDL	2.0
18	Total Chromium (mg/L)	BDL	0.147	2.0
19	Iron (mg/L)	0.462	3.23	3.0
20	Manganese (mg/L)	BDL	BDL	2.0
21	Nickel (mg/L)	0.118	BDL	5.0
22	Lead (mg/L)	BDL	BDL	2.0
23	Zinc (mg/L)	0.126	BDL	15
24	Cobalt (mg/L)	BDL	BDL	-

3.4.1 Field observations of team and interpretation of analysis results:

- The unit has provided new collection cum neutralisation tank to collect acidic and alkaline effluent from cation & anion regeneration plant and boiler & cooling tower blown down. The collection tank has four compartments to facilitate collection from different stream and mixing of effluent proportionality to achieve required pH of 6.5- 8.5. The neutralised effluent is pumped to treated effluent collection tank which is existing in their sister concern unit in other premises (M/s TPL, ECH plant).



New Collection cum neutralisation tank

Treated effluent storage tank (at ECH plant)

- It is informed that they are discharging their effluent twice in a week through marine disposal system since their effluent quantity (170 m^3/day) is less. However during inspection no effluent was found discharged into marine disposal system due to less accumulated quantity.

(h) No steps are taken to install flow meters in the marine disposal pipe line carrying the treated effluent from 4 plants to assess the quantity of effluent pumped from the units and quantity of effluent discharged. Since total length of pipe line works about 10.6 km and passing in the below ground level, in case of any leakages in the pipe lines, flow meter give immediate indication and accordingly remedial action could be taken to arrest the same.

(i) The BOD & COD concentration observed in the different points of marine disposal system are as below;

Name of location / Parameter	Location No. 1 (after confluence of MPL –II and KPL only)	Location No. 2 (after confluence of MPL – I and TPL only)	Location no. 3 (after confluence of all 4 units, before sea disposal)
BOD in mg/ L	850	650	767
COD in mg/L	2071	1594	1721

The above table confirms that the effluent discharged is not meeting with the marine disposal standards. During sampling at location no. 1, no effluent was pumped from KPL due to annual maintenance shutdown, the sample taken in this location was representing the MPL- II effluent, however as per analysis results, the BOD (850 mg/l) & COD (2071 mg/l) concentrations at this point was found slight higher than the MPL-II outlet (BOD – 833 mg/l & COD – 1832 mg/l) concentrations, this variation may be due to time difference in taking of samples.

And also at the time of sample collection at Location no 2, no effluent was pumped from TPL, the sample taken in this location represent the MPL – I effluent, as per the analysis results BOD (783 mg/L) & COD (1673 mg/l) concentration at MPL -I outlet and location no 2 (BOD- 650 mg/l & COD 1594 mg/l) was found around 4-17 % less than the MPL –I outlet, this variation may be due to time difference in taking of samples.

It is observed that during sampling at Location no.3, no effluent was pumped from TPL and KPL, the sample taken from this location represent the MPL – I & II effluents, as per the analysis results of BOD (767 mg/L) & COD (1721 mg/l) concentration as well as quality based on volumetric (BOD – 802 mg/l and COD – 1734mg/L) confirms the combined effect of effluent of both MPL – I & II units.

(j) As per Expert committee recommendations, the unit has provided the proper cover with lock and key arrangements at sampling collection points in the marine disposal pipe line.

(k) The team found difficulty to trace the exact point of diffusers in the sea due to non-availability of any identification or floaters to trace the same. The team travelled around 800- 900 meter distance from sea shore to inside the sea, as per the information and location traced by the industry representatives, the team collected the samples.

(l) During samples collection time, no difference in appearance or colour of water found in the sea, the dissolved oxygen (6.3 & 6.9 mg/L) found was good.

5.0 Status of implementation of recommendations of Joint inspection dated 30.04.2016

Sl. No.	Recommendations of Joint Inspection	Status of Compliance

	and water balance and same to be made available to TNPCB/CPCB during inspection.	Flow meter installed to quantify the effluent taken to bio reactor; however no separate flow meters are installed to measure effluent generated from different section. **Partially Complied**
ii.	Existing ETPs of MPL – I & II and TPL found inadequate, hence it is suggested to take up treatability study to identify the suitable treatment technology to meet the prescribed standards of marine disposal system.	The unit taken up the study through Arts, Science, Technology & Research Academy, Sastra and installed additional pressure sand filter followed by chemical treatment system, However, this treatment technology also found inadequate and fail to meet the prescribed standards of marine disposal. **Not Complied**
iii.	All units to prepare planned schedule of pumping of treated effluent into marine disposal system and to ensure the quality of effluent before discharging into sea.	No steps taken **Not Complied**
iv.	All the units to install water level indicators in raw effluent collection tank as well as in treated effluent storage tanks, to assess the quantity of effluent received treated, recycled and discharged into marine disposal system. Also to maintain proper daily records / logbook for effluent generated, treated and quantity of treated effluent sent to marine disposal system.	No steps taken **Not Complied**
v.	To install at least three intermediate flow meters in the marine disposal pipeline where provisions are made to collect samples to assess the quantity of effluent pumped from the units and quantity of effluent discharged. This also helps to quick identification of any leaks in the pipeline. These flow meters shall connect to TNPCB/CPCB monitoring center.	No steps taken Action Taken **Not Complied**
vi.	All sampling points are found access to public; these sampling locations are kept in lock and key arrangements, one set of key as well as valve operating devices shall be made available to TNPCB to access at any point of time in these points.	All sampling points are provided cover with lock & key arrangements and one set of keys are provided to TNPCB. **Complied**
vii.	To install online BOD, COD analyzer in the marine disposal line and same shall be connected to TNPCB/ CPCB monitoring center	Installed TOC analyzer to measure BOD and COD, the same was found under stabilization and yet connected to TNPCB/ CPB monitoring center. **Partially Complied**

	surrounding area.	
ix.	To take up detailed marine study by considering the actual quality and quantity of effluent discharged to verify the availability of dilution in the sea and its impact on marine species.	No steps taken **Not Complied**
x.	To install proper floaters to trace the pipe line passing in the sea as well as the point of diffuser. Without any identification it is very difficult to locate exact point of diffuser while collecting samples from sea disposal points by TNPCB/CPCB and the same may not be true representative samples.	No steps taken **Not Complied**
xi.	All units are required to conduct toxicity studies for their effluent and also for combined effluents. The results shall be submitted to TNPCB including species used for the study.	No steps taken **Not Complied**

6.0 Suggestion of Joint monitoring team based on the Observations and Findings made during visit:

a. As per the joint monitoring carried out by TNPCB and CPCB during August 17-18, 2016 the unit found ***complied with 6th recommendation only,*** partially complied with 1st and 7th recommendation and not found complied with 2nd, 3rd, 4th , 5th 8th, 9th, 10th & 11th recommendations. However the unit has taken initiatives to implement the 2nd recommendation but the same was not found adequate to meet the prescribed standards of marine disposal.

b. *It is suggested to direct the unit to take immediate action w.r.t non complying recommendations and time bound commitment to implement the above mentioned recommendations of earlier Joint inspection.*

(H.D. Varalaxmi, Sc. D/SEE)
Central Pollution Control Board
South Zonal Office, Bengaluru

(D. Vasudevan, DEE)
Tamilnadu Pollution Control Board
Ambattur, Chennai

List of Enclosures

Sl. No.	Caption of Annexures	Details of Enclosure
1.	Annexure -1	Copy of NGT Court ordr dated July 29, 2016
2.	Annexure - 2	Letter to TNPCB for joint monitoring
3.	Annexure - 3	Consent under Water and Air Act of MPL - I
4.	Annexure – 4	Flow diagram of ETP (MPL- I)
2.	Annexure -5	Consent under Water and Air Act of MPL - II
3.	Annexure -6	Flow diagram of ETP (MPL- II)
4.	Annexure – 7	Consent under Water and Air Act of TPL

BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL
SOUTHERN ZONE, CHENNAI

IN THE MATTER OF:

Original Application No. 19 of 2013 (SZ)

Meenavargal Membattu Sangam ... Applicant

vs

The Chief Secretary, Government of Tamil Nadu, Chennai and Others. ...Respondent(s)

Original Application No. 248/2016 (SZ)

Meenava Thanthai K.R. Selvaraj Kumar, Meenavar Nala Sangam. ... Applicant

vs

The State of Tamil Nadu, Rep.by its Secretary to Government, Chennai and Others

...Respondent(s)

Original Application No. 224 of 2016 (SZ)

Meenava Thanthai K.R. Selvaraj Kumar ... Applicant

vs

The Chief Secretary, Government of Tamil Nadu, Secretariat, Chennai and Others.

... Respondent(s)

Appeal No. 51/2017 (SZ)

M/s. Manali Petrochemicals Limited ... Appellant

vs

The Central Pollution Control Board, New Delhi and Others ... Respondent(s)

Appeal No.52 of 2017 (SZ)

M/s. Manali Petrochemicals Limited ... Appellant

vs

The Central Pollution Control Board, New Delhi and Others. ... Respondent(s)

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03	Annexure I: Analysis Report (Physio Chemical, Heavy Metals)	**36 - 47**
04	Annexure II: Analysis Report (Biological)	**48 - 56**

DEPONENT

S. SURESH
REGIONAL DIRECTOR
CENTRAL POLLUTION CONTROL BOARD
REGIONAL DIRECTORATE (SOUTH)
MIN. OF ENV, FORESTS & CC, GOVT. OF INDIA
BENGALURU - 560 079. MOB : 9480672128

Place : Bengaluru
Date : 28.10.2020

Report of the Joint Committee

(as per Hon'ble Tribunal, Southern Zone, Chennai order dated 08.02.2020, 11.06.2020 & 07.09.2020 in OA nos. 19/2013, 224/2016, 248/2016 and Appeal nos. 51/2017 & 52/2017)

1. Background:

The Honourable National Green Tribunal, Southern Zone, Chennai, in the matter of OA nos. 19/2013, 224/2016, 248/2016 and appeal nos. 51/2017 & 52/2017 directed on 08.02.2020 as;

"..... we feel it appropriate to appoint a joint committee comprising of Central Pollution Control Board, State Pollution Control Board, a senior scientist from National Institute of Ocean Technology (NIOT) and senior scientist dealing with environment engineering (Chemical) from Anna University to inspect the units in question and find out the present status of the functioning of the units namely M/s. Manali Petrochemical Limited and M/s. Tamilnadu Petrochemical limited and ascertain as to whether they are maintaining and managing all pollution control mechanism and whether the discharge of effluent from these industries to sea confirms with the specified norms prescribed by the PCB and the impact of effluents in the sea water and if there is any deficiency found and the sea water quality has not improved, then suggest the remedial measures by which the quality of sea water can be improved and who has to carry out these remedial measures and also assess the environmental compensation against the defaulting units who are responsible for polluting sea water by applying "Polluters Pay" principle and submit a report to this Tribunal within a period of three months.

The remedial measure should contain the short term as well as long term measures to be adopted by the units. They may also consider as to whether the units have complied with the recommendations made by the earlier committee for improvement of the quality of the sea water and if so to what extent that has been complied with and the impact of that compliance in the quality of sea water and if it is not sufficient to suggest more recommendations as a remedial measures to remedy the situation and make the quality of the sea water in conformity with the norms and the time required for completing the remedial measures. They may also conduct a detailed study regarding the effect of contamination caused on the flora and fauna of the aquatic and marine life".

In compliance to the Hon'ble tribunal order, the committee carried out inspection &monitoring of Source Emission, ETP & Marian outfall during March 04 to 06, 2020 and submitted interim report on 11.06.2020 seeking further time to file final report.

Further Hon'ble tribunal in its order dated 11.06.2020, directed as follows;

"5. Under these circumstances, we feel it appropriate to grant two months time to the committee to submit the report along with the remediation measures if any, required on the basis of the Analysis Report and also suggest alternate methods if any, required for noncompliance of certain suggestions and recommendation given for efficient management of pollution control mechanism which they have mentioned in the 'remarks' column of the compliance of recommendation in the interim report.

The committee is directed to submit the report to this Tribunal on or before 7.9.2020"

NIOT requested further time for submission of marine study report, accordingly, CPCB has submitted request seeking further four weeks time for filing the report. Upon the request Hon'ble Tribunal has grant time till 02.11.2020 to the committee to submit the report as directed.

2. Analysis results of the sample collected in individual units:

In the committee meeting held on 4.3.2020, it was decided to collect samples at the inlet and outlet of ETPs of all the four units and requested all units to discharge the treated wastewater at same time. Accordingly, on 6.3.2020 samples were collected at the inlet & outlet of ETP and also instant readings of the flow were noted. The analytical results are given below.

M/s. Manali Petrochemicals Limited, Unit I:

Parameter	**Inlet**	**Outlet**	**Marine disposal standards**
pH	11.5	6.3	5.5-9.0
TSS mg/L	109	60	100
COD mg/L	1053	165	250
BOD mg/L	254	05	100
Fluoride mg/L	1.36	0.82	15
O&G mg/L	--	12.5	20
Hexavalent chromium mg/L	BDL	BDL	1.0
Sulphate mg/L	202	254	1000
Free ammonia (as NH3) mg/L	1.32	NIL	05
Ammonia as N mg/L	1.1	BDL	--
Phenols mg/L	BDL	BDL	5.0
Petroleum hydrocarbons mg/L	--	10.8	--

From the above analysis results, it shows that all the parameters are meeting the prescribed standards. Percent reduction of treatment efficiency in terms of BOD and COD is 98% and 84% respectively.

During the time of sample collection, flow was found to be 88.1cubic meter/ hour. Hence, total amount of treated effluent discharged in to the sea will be 2114 cubic meter/ day. Based on flow, overall BOD load discharged in to the sea will be 10.6 kg/day.

M/s. Manali Petrochemicals Limited, Unit II:

Parameter	**Inlet**	**Outlet**	**Marine disposal standards**
pH	11.4	6.4	5.5-9.0
TSS mg/L	160	66	100
COD mg/L	1324	139	250
BOD mg/L	285	3.8	100
Fluoride mg/L	1.79	0.88	15
O&G mg/L	--	16	20
Hexavalent chromium mg/L	BDL	BDL	1.0
Sulphate mg/L	173	160	1000
Free ammonia (as NH_3) mg/L	1.32	NIL	05
Ammonia as N mg/L	1.1	BDL	--
Phenols mg/L	BDL	0.03	5.0
Petroleum hydrocarbons mg/L	--	12.3	--

From the above analysis results, it shows that all the parameters are meeting the prescribed standards. Percent reduction of treatment efficiency in terms of BOD and COD is 98.5% and 89% respectively.

During the time of sample collection, flow was found to be 95 cubic meter/ hour. Hence, total amount of treated effluent discharged in to the sea will be 2280 cubic meter/ day. Based on flow, overall BOD load discharged in to the sea will be 8.7 kg/day.

M/s. Tamilnadu Petrochemicals Limited:

M/s. Tamilnadu Petrochemicals Limited has three units Epichlorohydrin Plant (ECH), Heavy Chemicals Division (HCD) &Linear Alkyl Benzene Plant (LAB). Earlier M/s TPL was discharging treated effluent from all the plants to marine. At present the treated effluent from HCD & LAB plant is used in the ECH plant process. The treated effluent from ECH is discharged to marine.

Parameter	**Inlet**	**Outlet**	**Marine disposal standards**
pH	11.8	6.8	5.5-9.0
TSS mg/L	91	63	100
COD mg/L	626	92	250
BOD mg/L	29	4.7	100
Fluoride mg/L	1.4	1.02	15
O&G mg/L	--	2.7	20
Hexavalent chromium mg/L	BDL	BDL	1.0
Sulphate mg/L	46.7	41.5	1000
Free ammonia (as NH_3) mg/L	2.4	NIL	05

Ammonia as N mg/L	2.0	1.1	--
Phenols mg/L	BDL	BDL	5.0
Petroleum hydrocarbons mg/L	--	2.3	--

From the above analysis results, it shows that all the parameters are meeting the prescribed standards. Percent reduction of treatment efficiency in terms of BOD and COD is 84% and 85% respectively.

During the time of sample collection, flow was found to be 43.2 cubic meter/ hour. Hence, total amount of treated effluent discharged in to the sea will be 1037 cubic meter/ day. Based on flow, overall BOD load discharged in to the sea will be 4.9 kg/day.

M/s. Kothari Petrochemicals Limited:

Parameter	**Inlet**	**Outlet**	**Marine disposal standards**
pH	8.0	7.2	5.5-9.0
TSS mg/L	09	47	100
COD mg/L	36	150	250
BOD mg/L	03	9.4	100
Fluoride mg/L	0.65	1.05	15
O&G mg/L	--	BDL	20
Hexavalent chromium mg/L	BDL	BDL	1.0
Sulphate mg/L	179	**1739**	**1000**
Free ammonia (as NH_3) mg/L	1.6	1.1	05
Ammonia as N mg/L	21.9	**91.1**	**50**
Phenols mg/L	0.02	BDL	5.0
Petroleum hydrocarbons mg/L	--	BDL	--

From the above analysis results, it shows that except sulphate and ammonical nitrogen, remaining parameters are meeting the prescribed standards. But the sulphate and ammonical nitrogen is found within the limit after confluence of treated effluent from all other industry. Since the unit is discharging RO reject, percent reduction could not be evaluated.

During the time of sample collection, flow was found to be 3.6 cubic meter/ hour. Hence, total amount of treated effluent discharged in to the sea will be 86.4 cubic meter/ day. Based on flow, overall BOD load dumped in to the sea will be 0.8 kg/day.

2.1 Analysis results of the sample collected in pipeline:

All the four units have laid common pipeline of overall length 10.6 km and discharge their treated effluent in to sea. Treated effluent from M/s. Kothari petrochemicals, is mixed with treated effluent of M/s. Manali petrochemicals limited unit II and joins the main pipeline near Sathyamurthynagar. Treated effluent of M/s. Tamilnadu petrochemicals limited is mixed with treated effluent of M/s. Manali petrochemicals limited unit I and treated effluent from all the four units is carried to sea

through dedicated pipeline. The units have made arrangements for sample collection at mixing point of MPL II and KPL and MPL I and TPL and near shore (near to Junction road) before the pipeline enters the sea. In all the junctions, flow meters have been installed to measure the instant flow and cumulative flow.

On 6.3.2020, samples were collected simultaneously from the two junctions and also near to the shore before sea disposal. The results are given below.

Parameter	**After confluence of MPL II and KPL**	**After confluence of MPL I and TPL**	**After confluence of all four units**	**Marine disposal standards**
pH	6.2	6.4	6.4	**5.5-9.0**
SS mg/L	46	76	71	**100**
COD mg/L	93	110	125	**250**
BOD mg/L	3.7	2.3	5.6	**100**
Fluoride mg/L	--	--	0.84	**15**
O&G mg/L	--	--	3.5	**20**
Hexavalent chromium mg/L	--	--	BDL	**1.0**
Sulphate mg/L	--	--	153	**1000**
Free ammonia (as NH_3) mg/L	--	--	NIL	**05**
Ammonia as N mg/L	--	--	6.1	--
Phenols mg/L	--	--	BDL	**5.0**
Petroleum hydrocarbons mg/L	--	--	BDL	--

After confluence of all the four units, cumulative flow was found to be 260 cubic meter/ hour or 6240 cubic meter/day. Based on flow, overall BOD load discharged in to the sea by all the units will be 35 kg/day. From the above analysis results, it shows that, overall the treated effluent from all the four units are meeting the tolerance limit prescribed by TNPCB.

3. Analysis results of Source emission:

Monitoring of source emission in the boilers installed at all the industries were also carried out, the analysis results are shown below with oxygen correction factor.

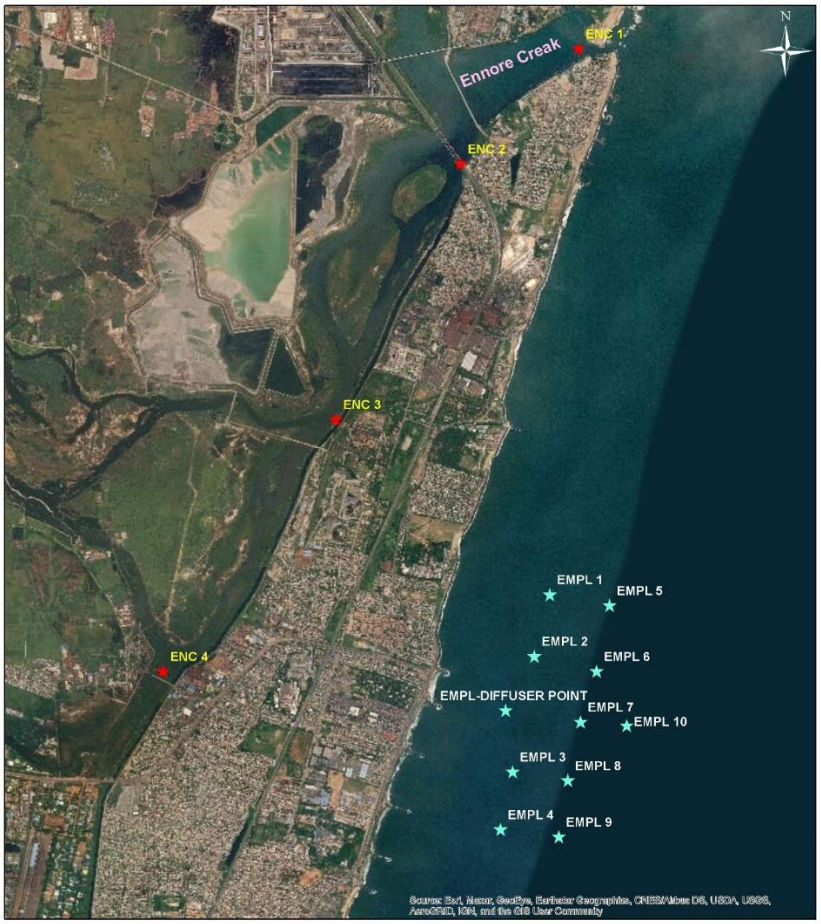
Parameter	**MPL I Boiler**	**Standard (Gas)**	**MPL II Boiler**	**Standard (Oil)**	**KPL CPP Boiler**	**Standard (Rice Husk)**
PM mg/Nm^3	9.1	**10**	76.3	**100**	51.8	**50**
Sulphur dioxide mg/Nm^3	19.2	**50**	111.7	**1700**	53.4	
Oxides of nitrogen mg/Nm^3	94.2	**350**	262.5	**450**	188.6	

Parameter	TPL HCD Boiler	TPL PO Boiler	TPL LAB heater stack	HCl plant	Standard
PM mg/Nm^3	6.7	7.85	9.8	--	**10**
Sulphur dioxide mg/Nm^3	25.3	36.9	27.5	--	**50**
Oxides of nitrogen mg/Nm^3	160	70.7	114.8	--	**350**
Acid mist mg/Nm3	--	--	--	BDL(DL:04)	**35**

The analysis results show that the emissions are within the standard norms except PM of M/s KPL CPP Boiler stack.

4. Summary of Marine Water Quality:

The marine water quality study was carried out through NIOT, Chennai. The report submitted by NIOT is attached as **Annexure A**. The study area consisted of 1 km wide x 2 km long stretch along the Ennore coast to include the near field and far field area of the MPL outfall. The adjoining Ennore creek has also been sampled due to its proximity to the discharge site and possible flushing of its input to the North Chennai coastal waters. The common treated effluent discharge outfall of M/s. MPL, M/s TPL & M/s KPL is located in Ennore coast, East coast of India. The sampling stations were located at 500 m and 1000 m distances along three transects to the north, east and south of outfall.



The results of selected parameters and comparison with previous study records reveal that there are spatial and temporal variations within the study area. Increase in nutrient parameters like nitrate recorded maximum value of 20.4 □mol./l is comparable to values recorded in samples collected during low tide at the Ennore creek during the study (Annexure I: Table 2). The BOD values were also relative to quantities recorded in Ennore creek samples (Annexure I: Table 1). The sediment heavy metal content also recorded higher values than the offshore discharge site indicates the possibility of pollutants input from nearby sources which cannot be ruled out. It is well known that this Ennore creek is traversed by Manali industrial belt and Buckingham canal loaded with industrial, domestic sewage load. Considering the proximity of Ennore creek and its pollutant loading to the coastal waters, there is likely to be the synergistic effect on nutrient loading in the coastal waters off North Chennai due to possible flushing from Ennore Creek. It leads to increase in background concentrations of the study area in addition to sources like Royapuram fisheries harbour, Chennai Port, Royapuram sewage outfall and several other industries discharging in this area, which account for the values recorded during the sampling surveys carried out in March 2020.

The studies on biological characteristics reveal the following:

- The increase in nutrient load reflected in improvement plankton population is corroborated.
- A slight drop in benthic population in the near field of offshore discharge may be attributed to the synergistic effects of various discharges from partner industries sharing the common effluent discharge along Ennore coast. The effect of toxicant on the benthic population in the certain station needs to be studied by whole effluent toxicity bioassay. It warrants detailed long term monitoring studies in the receiving waters (off Chennai coast) as well as at the discharge locations of the various industries.
- All these observations have been validated with the effluent quality of industrial discharge collected by CPCB and are within the discharge limits. Given that the benthos in receiving waters (marine waters are observed to vary; it is suggested to conduct whole effluent toxicity studies. These tests are expected to reveal the influence of other possible chemicals not in the regulatory control, influence the sustainability of marine biota (Fishes, molluscs, etc.).
- The levels of toxic chemicals are found to be within the acceptable levels, and therefore the concentrations of the other chemicals shall have to be reviewed. It is possible that

chlorides used in the processes may be released into the receiving water body. Studies show that chloride concentrations produce corrosion in wastewater pipelines and are likely to inhibit marine biota growth. However, these aspects have to be confirmed only through seasonal, comprehensive field studies over a long period.

5. Environmental Compensation Calculation:

M/s Kothari Petro Chemicals Ltd., exceeded the norms of discharge for the parameter sulphate and Ammonical nitrogen which is 1739 mg/l & 91.1 mg/l against the standard norms 1000 mg/l& 50 mg/l respectively After mixing with other industrial treated effluent, it reaches the standard norms before discharge into sea.

Moreover, the Particulate Emission (PM) of CPP boiler is measured as 51.8 mg/Nm3 against the standard 50 mg/Nm3.

Considering the above, environmental compensation is calculated using Pollution Index Formula (EC = PI * N * R * S * LF)

PI = Pollution Index, RED category industry **(PI = 80)**
R = Rupees Factor **(R = 250)**
S = Scale of Operation, Large Scale **(S = 1.5)**
LF = Location Factor, CEPI Area **(LF = 2)**
N= Number of days, **(N = 40 days)** date of committee sampling 06.03.2020 to date of TNPCB sampling 15.05.2020 (compliance). The industry was not in operation during 24.03.2020 to 23.04.2020 due to COVID19 pandemic situation, so this period was not considered for calculation.

EC = 80 * 40 * 250 * 1.5 * 2 = Rs. 24,00,000 = Rs 24 lakhs.

The interim compensation calculated for the period of 40 days is Rs24 Lakhs.

6. Compliance of Recommendation submitted by Previous Committees/Reports:

Recommendation of the two member expert committee was constituted with Dr. Palanivelu, Anna University, Chennai and Dr. N. Vedharaman, CLRI, Chennai as per order dated 22.7.2014 in O.A. No. 19/2013		**Present Committee View/ Suggestions**
1.	M/s MPL I & II should make effort to do away with the present chlorohydrin route and switch to catalytic process of manufacturing PO. As this process is a sustainable one and eliminates the use of hazardous chlorine gas and lime which ultimately end up as waste.	It is informed that: As per Expert committee advice MPL carried out the study to identify the suitable catalytic process. For this small capacity plant catalytic process technology is not viable. Only available for very high capacity plant (minimum 600 TPD). New The investment for the change of process (large capacity plant) is Rs 4000 Cr and no market scope in India. In the catalytic process pollutant load is higher than present chlorohydrin route. Industry may keep exploring possibilities as suggested by previous committee.
2.	M/s MPL I & II and other industries should look in to possibilities of zero liquid discharge with suitable technologies like RO to get water and reject for suitable by product recovery. This will eliminate the sea disposal of treated effluent.	i) **MPL I & II and TPL (ECH – PO):** A pilot scale study shall be carried out with DISC membrane or any other suitable technology for reducing the discharge of treated effluent in to the sea. ii) Possibilities shall also be explored for achieving complete or Partial ZLD. iii) Possibility of using treated effluent generated from M/s KPL shall be explored by M/s MPL or M/s TPL. So M/s KPL shall take necessary steps in collaboration with M/s MPL or M/s TPL.

3.	Necessary arrangements may be made well in advance to replace the pipe according to its life time to ensure environmental safety.	The effluent line was originally laid and commissioned in the year 1990 and replaced the line in 2011. Pressure & Leak test was carried out through M/s Aquatiq Diving, whereas, the life of the pipeline for replacement is not mentioned.

Summary of NIOT Report (August 2015)	**Present Committee View/ Suggestions**
The results of selected parameters reveal that there is no spatial or temporal variation in the study area. The concentration of metals shows lower values in the offshore location MPL 10, when compared to the other locations. The background concentrations of the study area are significantly high possibly due to the influence of Royapuram fishers harbour, Chennai Port, Royapuram outfall and several other industries discharging in this area. From these results it can be concluded that the study area was moderately polluted, which may be attributed to the several sources. The studies on biological characteristics reveal the following: ➢ The near shore coastal belt shows minor variation in biological characteristics ➢ Various discharges along Ennore coast may induce synergistic effect of toxicant on the benthic population in certain station and in depth studies are warranted. The MPL EIA report does not contain the biological data for comparison. The scope of present short term study is too limited to conclude any discernible trends on the possible impact on environment	It is suggested to carry out continuous study for a period of five years (twice in a year), in which the impact & sources of pollution shall be identified. Accordingly, remedial measures shall be suggested.

Recommendation of Joint Committee Report (CPCB & TNPCB) submitted on May 02, 2016 & September, 2016			
	M/s MPL (Plant I & II)	M/s TPL	M/s KPL
All units are required to install flow meters to maintain proper records of water consumption, effluent generation from different section of process along with material balance and water balance and same to be made available to TNPCB/CPCB during inspection.	Complied	Installed flow meters. But yet to connect inlet flow meter.	Installed flow meters. Presently connected discharge flow meter only. But yet to connect all other flow meters.
To install at least three intermediate flow meters in the marine disposal pipeline where provisions are made to collect samples to assess the quantity of effluent pumped from the units and quantity of effluent discharged. This also helps to quick identification of any leaks in the pipeline. These flow meters shall connect to TNPCB/CPCB monitoring centre.	Flow meters installed in the common sea discharge pipeline are yet to be connected.		
To take up detailed marine study by considering the actual quality and quantity of effluent discharged to verify the availability of dilution in the sea and its impact on marine species.	It is suggested to carry out continuous study for a period of five years (twice in a year). Accordingly, remedial measures shall be suggested.		
All units are required to conduct toxicity studies for their effluent and also for combined effluents. The results shall be submitted to TNPCB including species used for the study.			

7. Conclusion/ Suggestions:

The analysis results of the samples collected during the committee inspection confirms to the discharge norms of the treated effluent into the sea as prescribed by TNPCB. But, Sulphate & Ammonical Nitrogen of M/s Kothari Petrochemical Limited found to be higher than prescribed norms. However, after mixing with other industries treated effluent, sulphate & Ammonical nitrogen value reduces and confirms to norms before discharge into sea.

TNPCB shall direct the industries to submit the compliance report on the following and to take appropriate action as per suggestions made by the committee.

1. M/s Kothari Petrochemicals Ltd., shall be directed to remit the interim compensation of Rs. 24 Lakhs for non-compliance.

2. Short Term:

a) At present, M/s KPL is discharging the RO reject into the Marine, in order to reduce the quantum of marine discharge as well as for use of raw water, possibilities shall be explored by M/s MPL or M/s TPL for utilizing RO reject generated from M/s. KPL in their process.

(Target: One Month)

b) If the RO Reject found suitable for utilization, then the discharge of M/s KPL shall be stopped and sent to M/s MPL or M/s TPL.

(Target: Two Month)

c) Action plan on phase wise revamping of treatment units of the ETP in M/s MPL Unit I and M/s TPL (all three plants HCD, LAB & ECH – PO) shall be submitted, since physical damages found during the visit. Action plan shall be submitted within a month.

(Target: Two Year)

d) Since M/s TPL is reusing the treated effluent generated from HCD & LAB plant in the ECH – PO plant, online flow meters shall be installed at HCD & LAB plant to quantify the utilization of treated effluent. Moreover, the online effluent monitoring system

installed for the parameters pH, TSS, COD, BOD etc. at HCD/LAB plant shall be relocated to the common discharge pipeline after confluence of all treated effluent and installation of display board showing effluent quality to the general public.

(Target: Three Month)

e) In order to assess the sea water quality, Continuous Marine Water Quality Monitoring system shall be installed at discharge point for the parameters Temperature, Conductivity, Salinity, Turbidity and Total Dissolved Solids (TDS), Dissolved Oxygen (DO), pH, Chlorophyll, fluorescent Dissolved Organic Matter (fDOM) and phycoerythrin-a pigment of blue-green algae etc. The recorded data shall be shared to NIOT & TNPCB for assessing the marine quality.

(Target: Six Month)

f) M/s MPL plant I & II and M/s TPL: A pilot scale study shall be carried out with DISC membrane or any other suitable technology for reducing the discharge of treated effluent in to the sea. Possibilities shall also be explored for achieving complete or partial ZLD. Action plan shall be submitted within a month.

(Target: One Year)

g) Calibration of the flow meters installed in the discharge pipeline shall be carried out periodically and ensure no difference in each of the flow meters.

3. Long Term:

NIOT has suggested long term study in both the report (2015 & 2020) to assess the marine water quality and flora & fauna marine life as well as indicated the pollution from other sources also.

So, it is suggested to have a comprehensive impact assessment study to assess the quality of water and biological impacts in the receiving waters which shall cover larger extents (spatial) along the coast and two seasons (pre monsoon / post monsoon). The study area shall cover Ennore Creek, North Chennai Coastal waters from Pulicat to Muthukadu in the South to cover pollution signals during all seasons as there is northerly drift for 8

months and southerly drift for 4 months in a year. Therefore, representative samples shall be analysed to map the variation in space and time.

In order to have a detail study, it is suggested to carry out continuous study for a period of five years (twice in a year), in which the impact & sources of pollution shall be identified. Accordingly, remedial measures shall be suggested.

TNPCB shall provide list of marine outfall units & other source of pollution including source point data of industrial outfalls (including Ennore creek) and others such as municipal discharges, data from Kamarajar port, Chennai port, Fishing harbour etc. TNPCB shall utilise the Environmental Compensation fund for this study and same may be recovered after the polluter identification. The studies can be conducted by national institutes such as NIOT or any other reputed institutes.

NIOT has observed the marine life quality improvement, after dredging activity carried out during Ennore Port development. Therefore, possible means to improve the marine water / life quality shall be suggested based on data.

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Scientist D
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Annexure A

MPL Marine outfall survey report

Description of the study area

The study area consisted of 1 km wide x 2 km long stretch along the Ennore coast to include the near field and far field area of the MPL outfall. The adjoining Ennore creek has also been sampled due to its proximity to the discharge site and possible flushing of its input to the North Chennai coastal waters. M/S.Manali Petrochemicals Ltd. treated effluent discharge outfall is located in Ennore coast, East coast of India. The sampling stations were located at 500m and 1000m distances along three transects to the north, east and south of outfall.

Sampling protocol

Water samples were collected from 10 sampling locations nearby effluent outfall area & 4 stations along the creek with respect to the tidal cycle (Fig.1). The Niskin water sampler was used to collect water samples and transferred to pre-cleaned 2liter polypropylene bottles. Sediment samples were collected using a Van Veen Grab, transferred to clean polythene bags and transported to the laboratory.

The BOD samples were fixed immediately after collection using Winkler's A & B. The collected samples were stored at 4˚C in the icebox for nutrients and other parameters analysis. Samples were stored as per the standard requirement of various water quality parameters and preserved with standard preservatives. Most of the samples require to be preserved in sub-zero conditions on-board immediately after collection.Acid rinsed bottles used to collect the samples for metal analysis and amber bottles used for organic analysis.The collected water samples were analyzed for dissolved oxygen (DO), salinity, nutrients, PHC & heavy metals. Air & Water temperature was measured under field condition using a water quality YSI Probe. The collected water& sediment samples were immediately handed over to CPCB officials located at Manali Petrochemicals LTD, Chennai. After that, samples were transferred to Glens Innovation Labs PVT LTD for laboratory analysis.

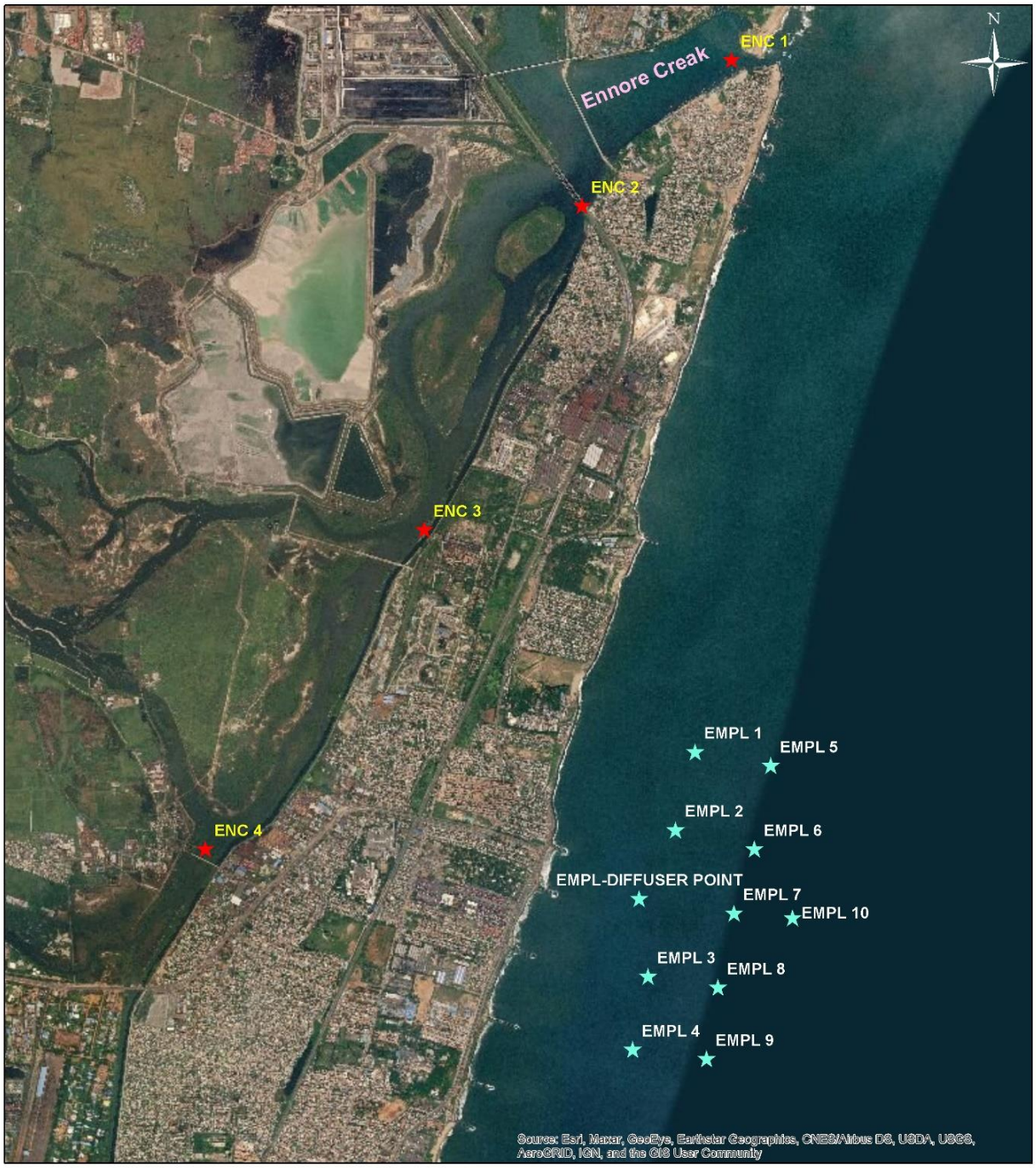

Fig.1 Depicting Sampling locations along with the offshore discharge sites

Table1.The sampling locations near the outfall area of MPL at Ennore coast, East coast of India.

S No	Sampling locations	Longitude and Latitude	Remarks
1	EMPL1	13°11'23.61"N80°19'33.79"E	North of outfall
2	EMPL2	13°11'06.27"N 80°19'29.36"E	Northof outfall
3	EMPL3	13°10'33.68" N80°19'23.03"E	South of outfall
4	EMPL4	13°10'17.42"N 80°19'19.52"E	South of outfall
5	EMPL5	13°11'20.55"N 80°19'51.07"E	Northeast of outfall
6	EMPL6	13°11'02.02"N 80°19'47.35"E	Northeastof outfall
7	EMPL7	13°10'47.74"N 80°19'42.69"E	500m away from outfall area (Eastern side)
8	EMPL8	13°10'31.24"N 80°19'39.03"E	Southeast of outfall
9	EMPL9	13°10'15.38"N 80°19'36.42"E	Southeast of outfall
10	EMPL10	13°10'46.71"N 80°19'56.05"E	1km away from the outfall (Eastern side)
11	ENC 1	13º13'52"N 80º19'48"E	Ennore creek mouth
12	ENC 2	13º13'25"N 80º19'08"E	Near railway bridge
13	ENC 3	13º12'13"N 80º18'32"E	Near to ETPS intake point
14	ENC 4	13º11'02"N 80o17'42"E	Downstream of Ammulvoyal junction

Samples were adequately handled, and all necessary quality assurance and quality control (QA/QC) measures such as preservation, storage, and labelling followed. All sample containers were pre-treated by washing in dilute hydrochloric acid and rinsed with distilled water.

The following sections discuss the present data obtained from laboratory analysis of samples collected during March 2020 and comparison with previous data available with NIOT during the various surveys carried out in the same area during 2015intending to establish any possible trend.

Temperature

Temperatures affect the kinetics of chemical and physical processes such as dissolved oxygen, photosynthesis, metabolic processes and thus controls the water quality characteristics. Seawater temperature measured during the different tidal cycles recorded negligible variation in space and time.

It varied between 28.3 and 29.1^{o}C during the study period. In general, surface temperatures showed minor variations with time of the day. Water temperature is influenced by several factors, such as the intensity of solar radiation, evaporation, and sewage influx.

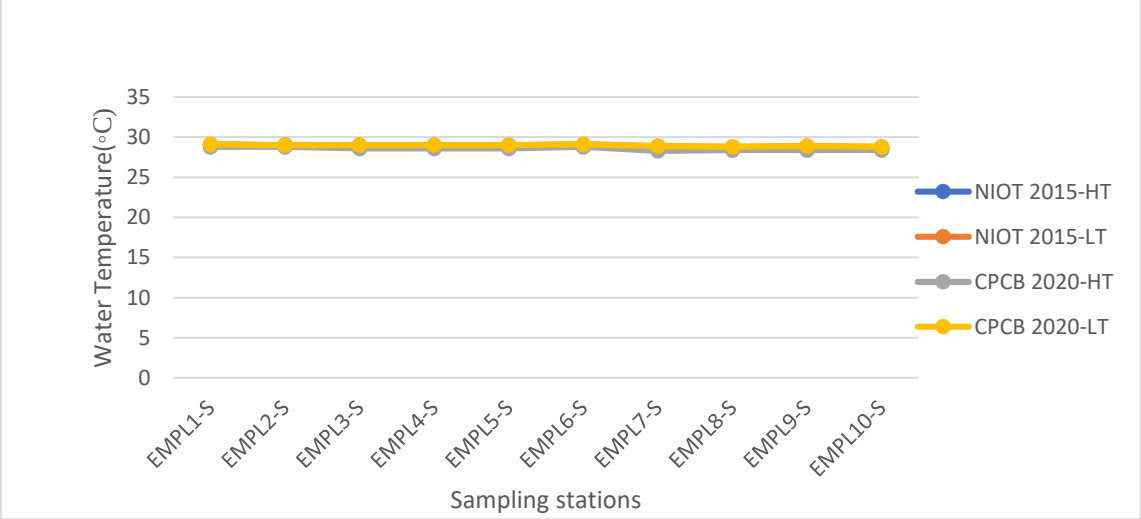

Fig.2 Water temperature variation in the surface waters around MPL offshore discharge

Salinity

Salinity value ranges between 34.9 and 39.4 PSU at coastal waters. The maximum values of 37.9 PSU recorded at surface waters of EMPL8 during low tide with a bottom value of 35.3

PSUmay be a spike of analytical abnormality (outlier value). Further, it needs multiple samples of&in-depth studies to confirm the same.

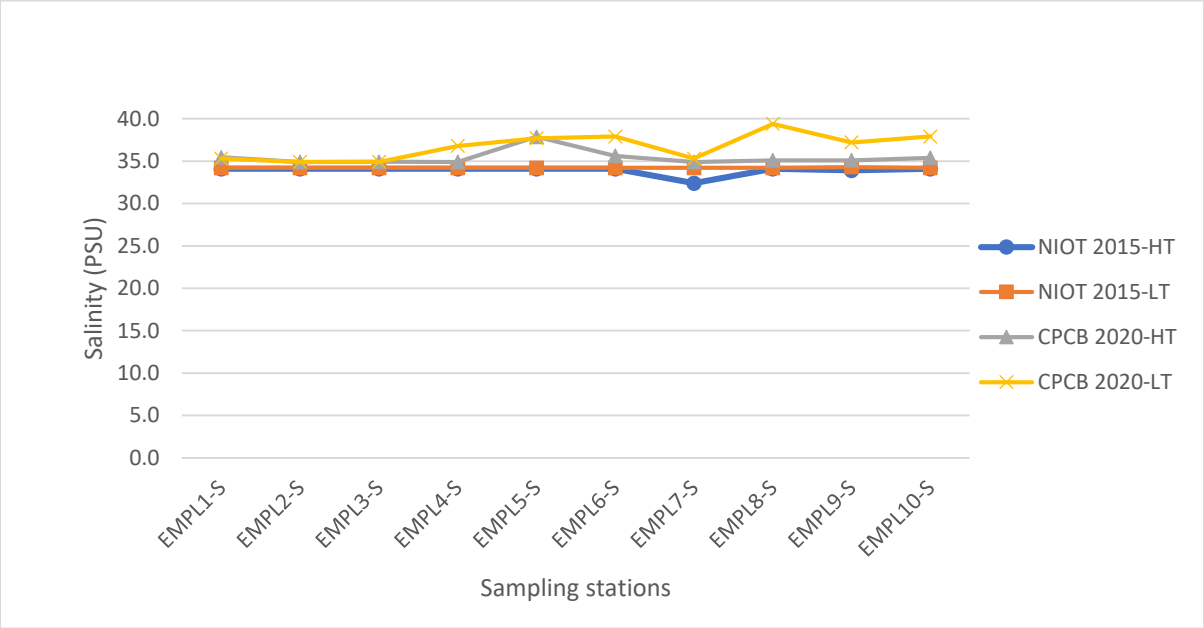

Fig.3 Salinity variationin the surface waters around MPL offshore discharge

pH

The variation of observed pH in the samples ranged between 7.50 and 7.90in the surface waters of the study area. The Observed pH values are within the range of normal coastal waters.

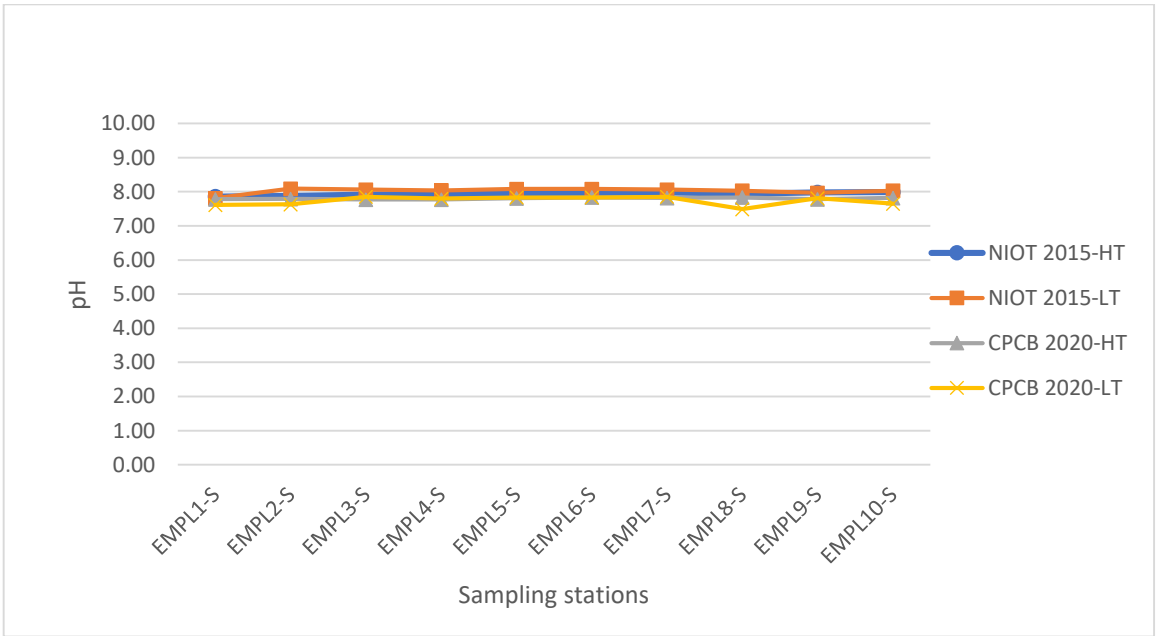

Fig.4 pH variation in the surface waters around MPL offshore discharge

Total Suspended Solids (TSS)

The variation of observed suspended solids is 3.1 to 6.4 mg/l during the study period. Maximum was recorded at EMPL5 during high tide at surface waters, and the bottom water recorded 4.5 mg/l. Reduction in TSS values is observed with compared to 2015 study.

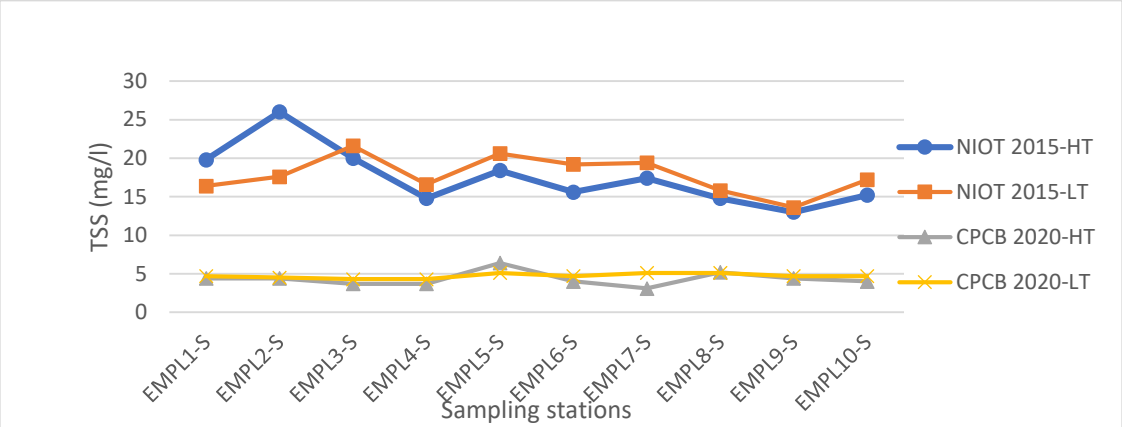

Fig.5 Total suspended solid variationin the surface waters around MPL offshore discharge

Dissolved Oxygen (DO)

Dissolved oxygen in water depends on several factors, some of which are the salinity, temperature, wind velocity, reaeration, organic matter, productivity and the presence of pollutants.

The observed dissolved oxygen ranged between 5.4 to 6.4 mg/l at surface waters. The minimum value was recorded during low tide of EMPL4 station and the bottom water recorded 6.4mg/l. The DO values conform to SeaWater Quality Standards SW I to SW IV prescribed by CPCB.

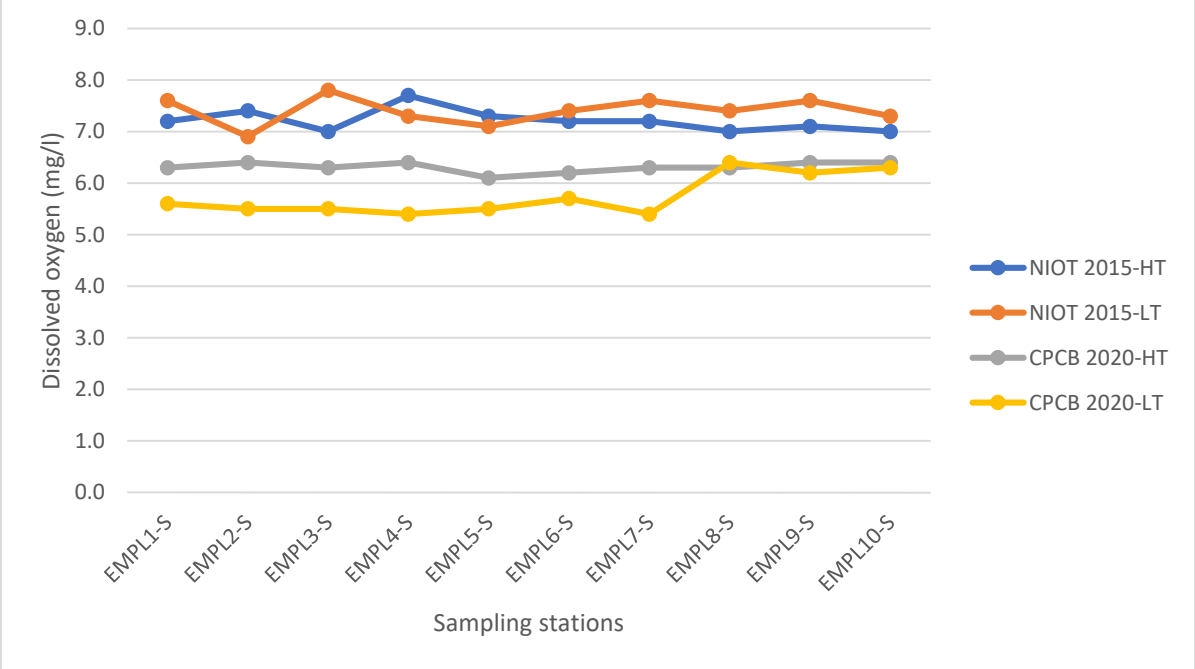

Fig.6 Dissolved oxygen variation in the surface waters around MPL offshore discharge

Biological Oxygen Demand

In general, BOD values in surface water varied between 2.8 to 3.2 mg/l. The bottom water values are lesser than the surface waters. There is a slight increase in BOD levels compared to 2015 levels. However, it is within the limits of SWIV& SWII criteria.

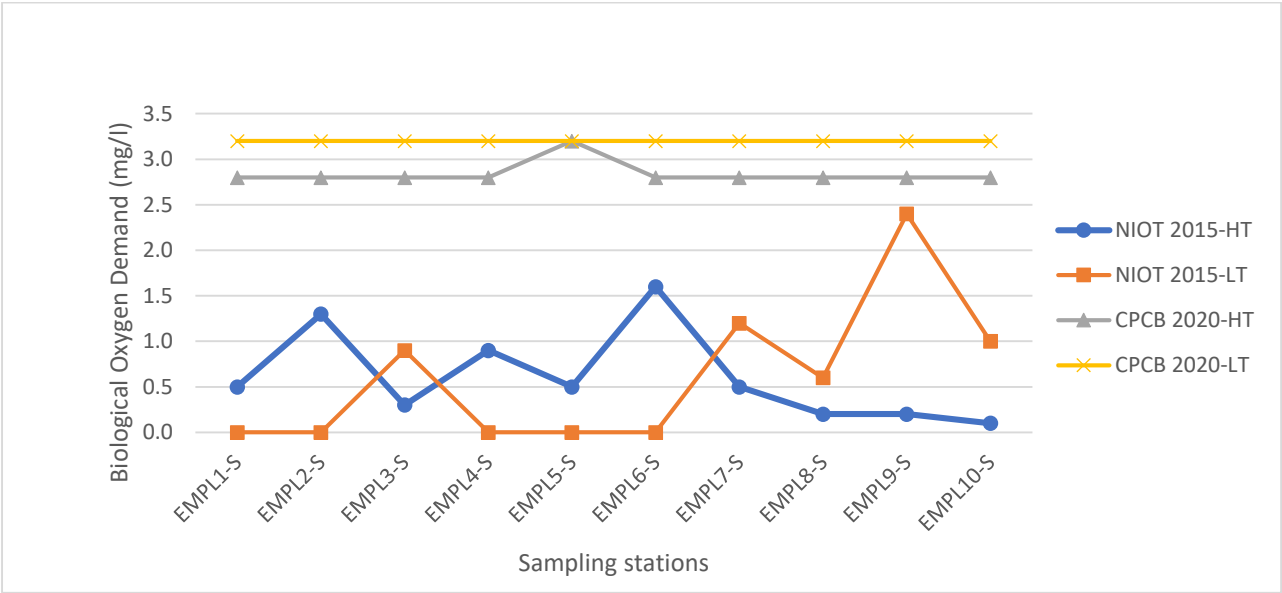

Fig.7 BOD variation in the surface waters around MPL offshore discharge

Nutrients

The water chemistry of the sea is a result of the hydrodynamics and biological activity, which cause variations in nutrient concentrations. Enhanced concentrations generally imply

anthropogenic inputs. Very high concentrations can result in eutrophication, resulting in DO problems.

In general, nutrient concentrations in the seawater are very low;minor increases or decreases can alter primary productivity. The concentration ranges of nutrients are as follows.

a. Ammonia Nitrogen

The ammonia values recorded 2.91 µmol./lat EMPL1 and all the other stations are below the detectable limits. However, the bottom water samples during low tide, all the stations recorded 2.91 µmol./ldespite the values of below detectable quantity in surface waters during this period. The unusual increase in ammoniacal nitrogen values requires detailed studies.

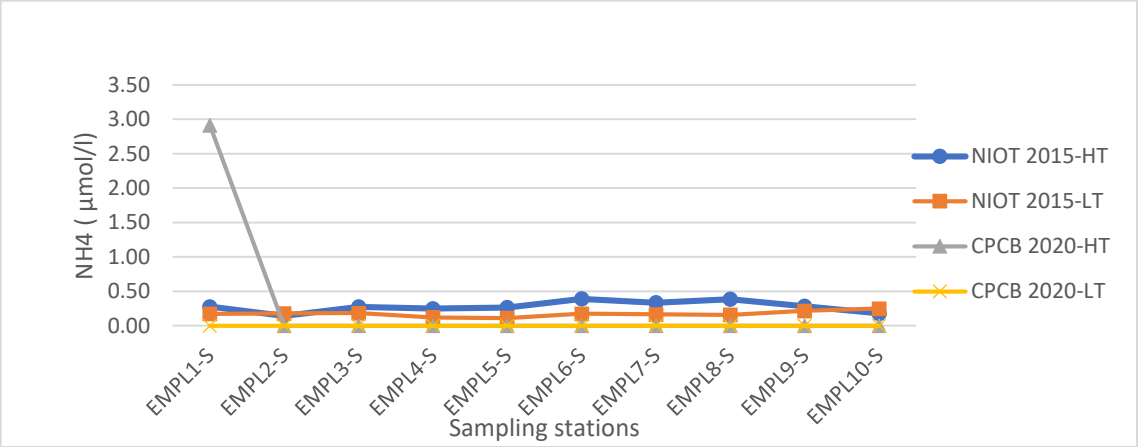

Fig.8Ammoniacal nitrogen variation in the surface waters around MPL offshore discharge

b. Nitrate Nitrogen

Among the three inorganic forms of Nitrogen, Nitrate Nitrogen is likely to be abundant at all stations, as it is thermodynamically the most stable oxidation level of nitrogen in the presence of oxygen in seawater and would accumulate in the sediments if left unutilized by plankton or bacterial decomposition.

In general, Nitrate values varied from10.0to 20.4 µmol./lrecorded during the study period. The maximum value found to be reported at all the stations except EMPL9 at low tide during the study period. However, the bottom water samples recorded 4.9 to 9.9 µmol./l in both the tides. The nitrate values recorded a significant increase when compared to 2015 studies.

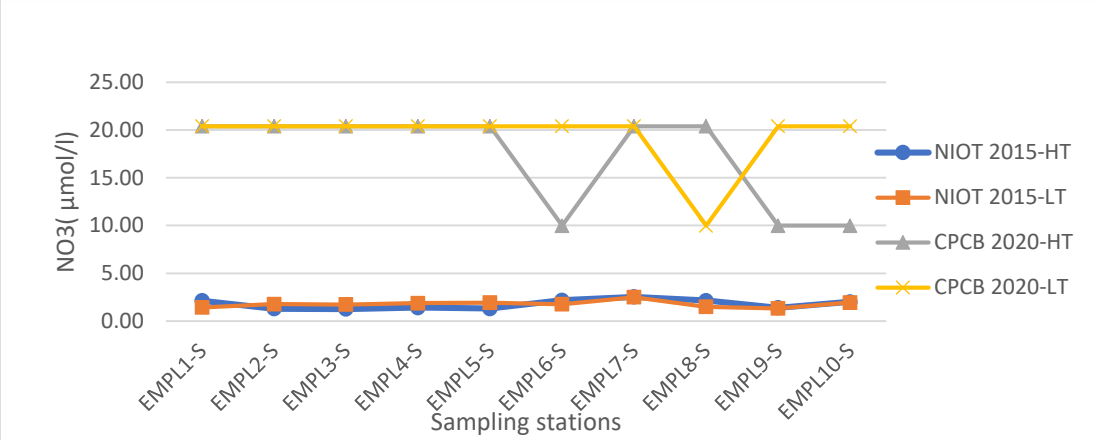

Fig.9 Nitrate nitrogen variation in the surface waters around MPL offshore discharge

c. Nitrite Nitrogen

The transitional Nitrogen product Nitrite varied between 0.04 to 0.67 µmol./l in surface waters during the study period. The maximum value was recorded at EMPL4 and the minimum values in all the stations during low tide. The measured values were comparedwith the previous observations during 2015 by NIOT. Nitrite concentrations recorded a decrease within five years. The same trend of surface water also been documented in bottom waters.

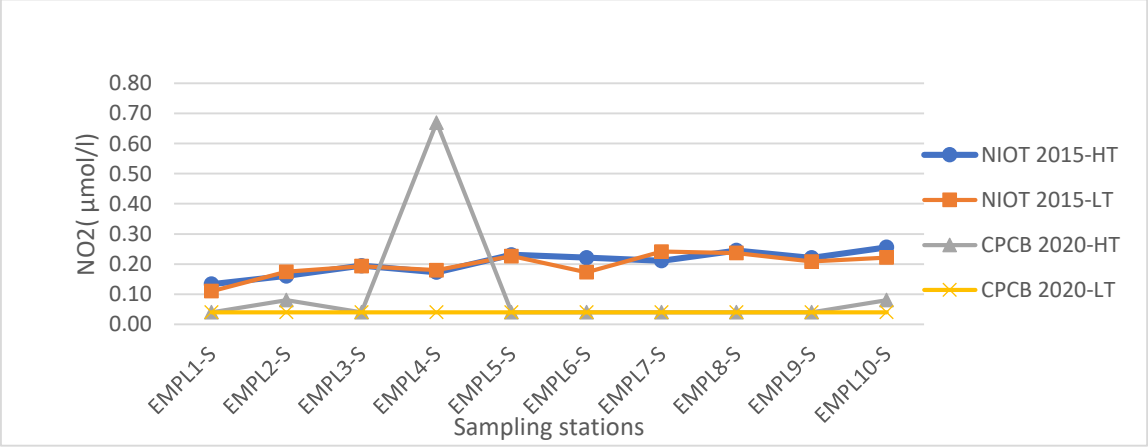

Fig.10 Nitrite nitrogen variation in the surface waters around MPL offshore discharge

d. Phosphate Phosphorous

In general, the Phosphate phosphorous concentrations recorded a constant concentration of 0.21 µmol./l at all the station despite the tidal and depth variation. A manifold decrease in phosphate concentration is observed when compared to 2015 condition.

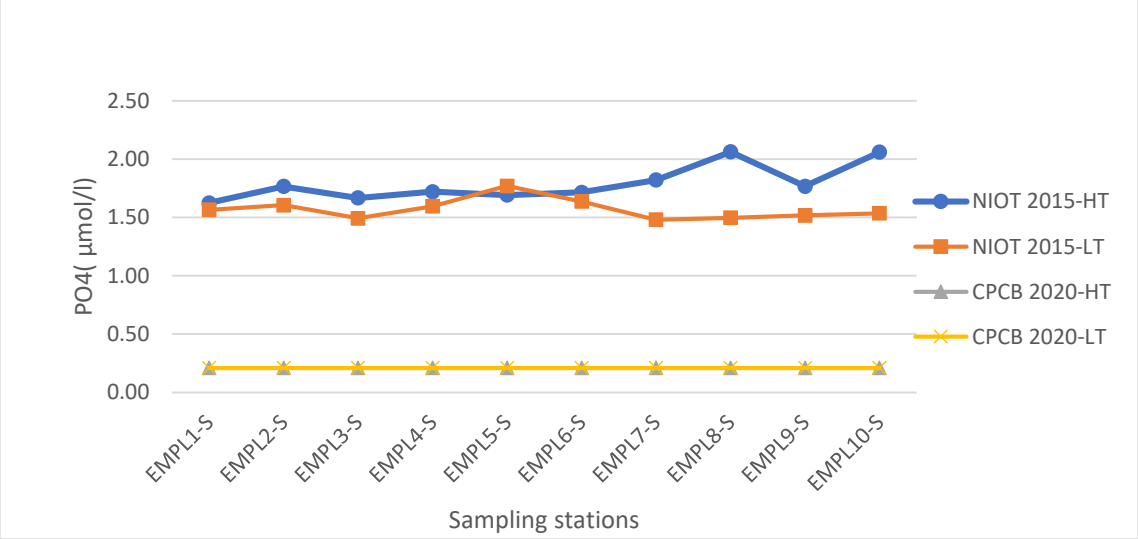

Fig.11Phosphate variation in the surface waters around MPL offshore discharge

Petroleum hydrocarbon (PHC)

Petroleum hydrocarbons are the primary constituents in oil, gasoline, diesel, and a variety of solvents and penetrating oils. Petroleum hydrocarbon residue in the surface water column found to be nil during the survey period. Compared to previous studies, and the present observation recorded many folds decrease in concentration.

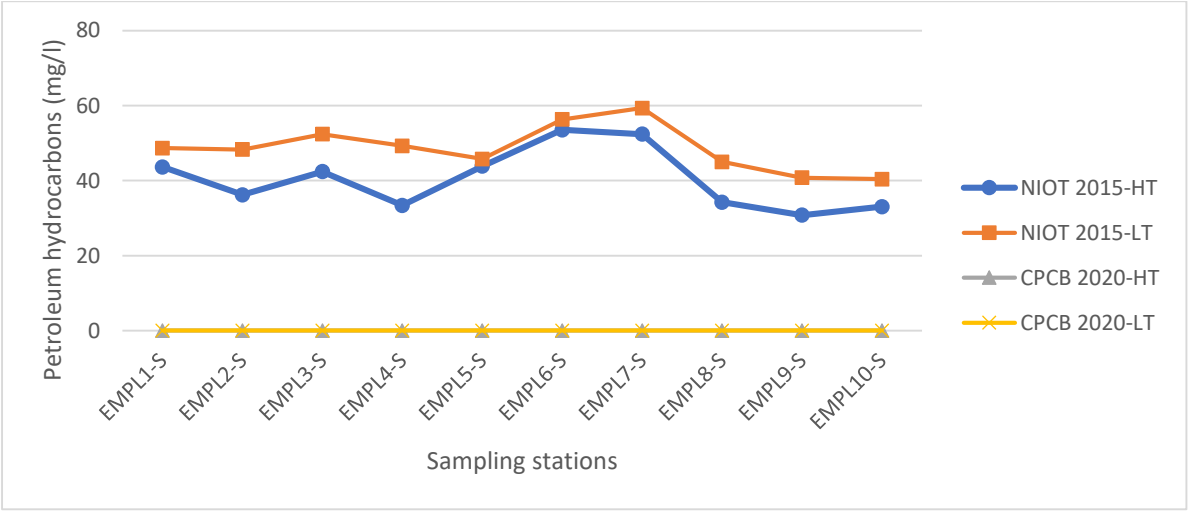

Fig.12 PHC variation in the surface waters around MPL offshore discharge

Heavy Metals

The heavy metals like Arsenic, Nickel, Copper, Chromium, Cadmium, Zinc, Lead, Selenium, Cobalt, Manganese, and Mercury were analyzed in water and sediment. The range ofmetal concentrations is below the detectable limit in most of the stations when compared to previous studies of 2015. However, Manganese recorded some quantifiable measures of Mn

(0.004 to 0.286 µg/l) in the bottom water samples. The results are not showing any trend among the location as well as tides.

SEDIMENTS

Sediments are seafloor materials which eroded from land to ocean through rivers or wind. The constituent ofthe sediments depends upon the local geological condition and other anthropogenic activities. Sediments are major nutrient sources for the aquatic faunas. The present study monitors the quality of marine sediments in the MPL offshore discharge sites along Ennore coast. The selected metals concentrations of sediments are shown in Table(Annexure 1: Table No.5).

The range of Ni (BDL to 3.81µg/g), Co (BDL to 3.09 µg/g), Cu (BDL to 3.18 µg/g), Cd (BDL), Pb(1.47 to 3.70 µg/g), Cr (4.48 to 9.69 µg/g), Hg (BDL to 3.18 µg/g),Fe (2332.74to 5221.67 mg/kg),Mn (11.58 to 50.93 mg/kg) and Zn (3.16 to 12.50 mg/kg) are observed in the sediment. The lower concentrations of most of the metals are found in the location EMPL 9. Thehigher concentration of Ni, Co, Cu, Cd, Cr,Fe atEMPL 5 and Mn at EMPL 9 and Hg atEMPL10are recorded respectively.

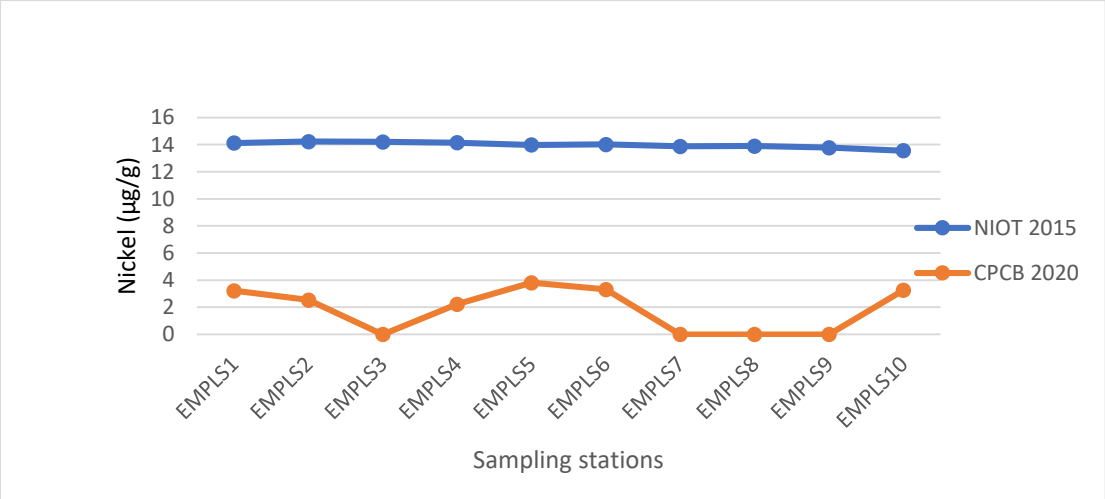

Fig. 13Nickel variation in the seafloor sediments around MPL offshore discharge

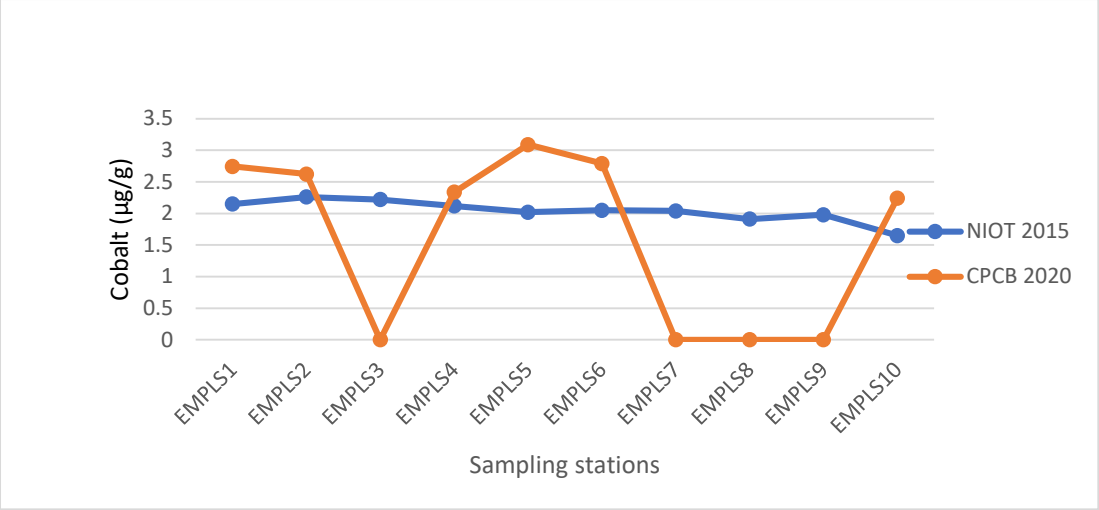

Fig. 14Cobalt variation in the seafloor sediments around MPL offshore

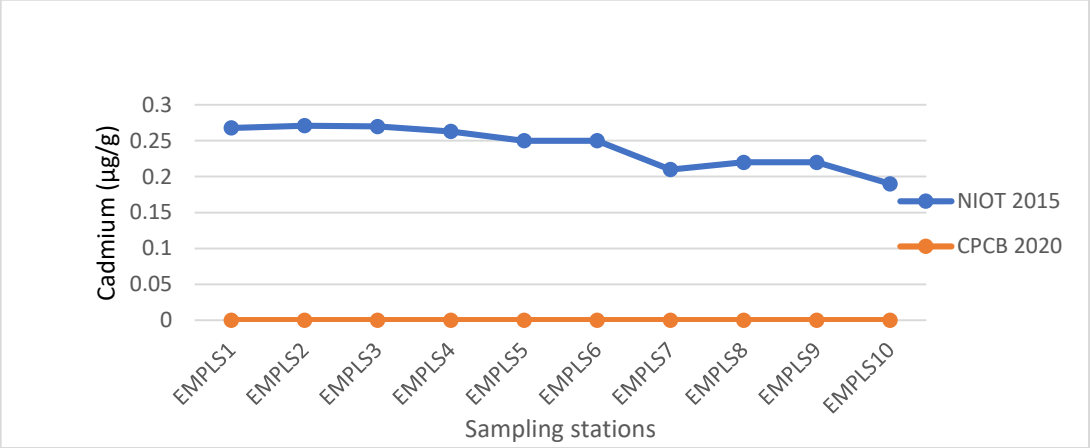

Fig.15Cadmium variationin the seafloor sediments around MPL offshore

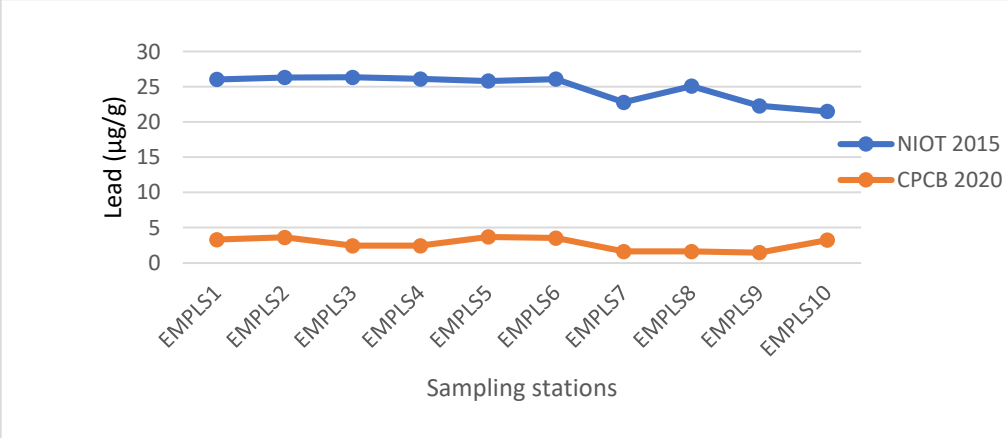

Fig. 16Leadvariation in the seafloor sediments around MPL offshore discharge

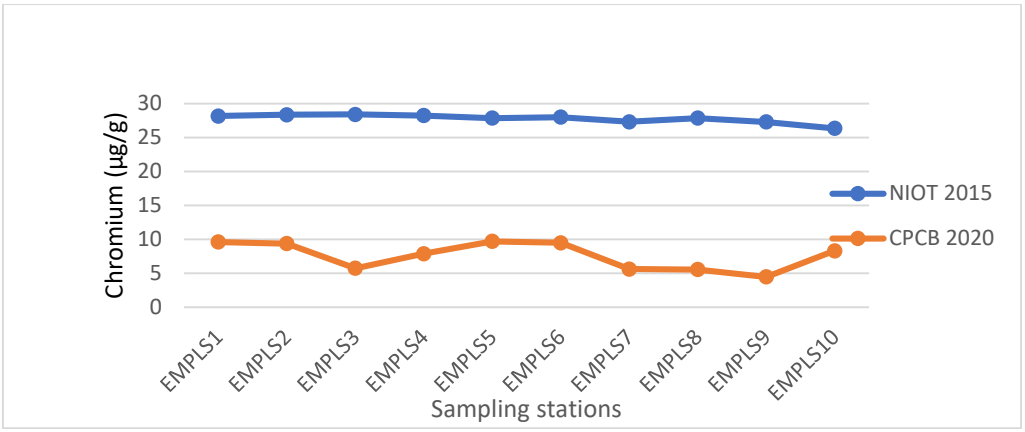

Fig. 17Chromiumvariation in the seafloor sediments around MPL offshore discharge

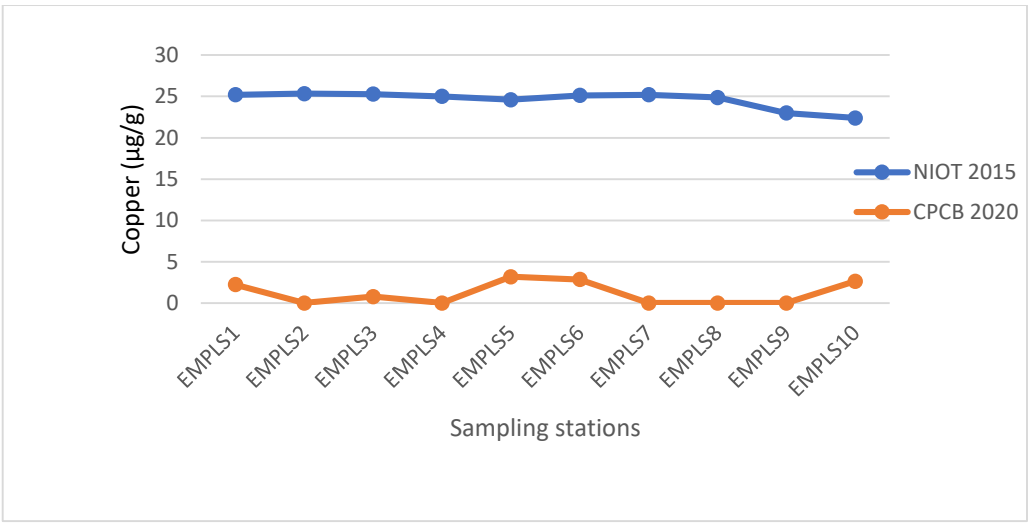

Fig. 18Coppervariation in the seafloor sediments around MPL offshore discharge

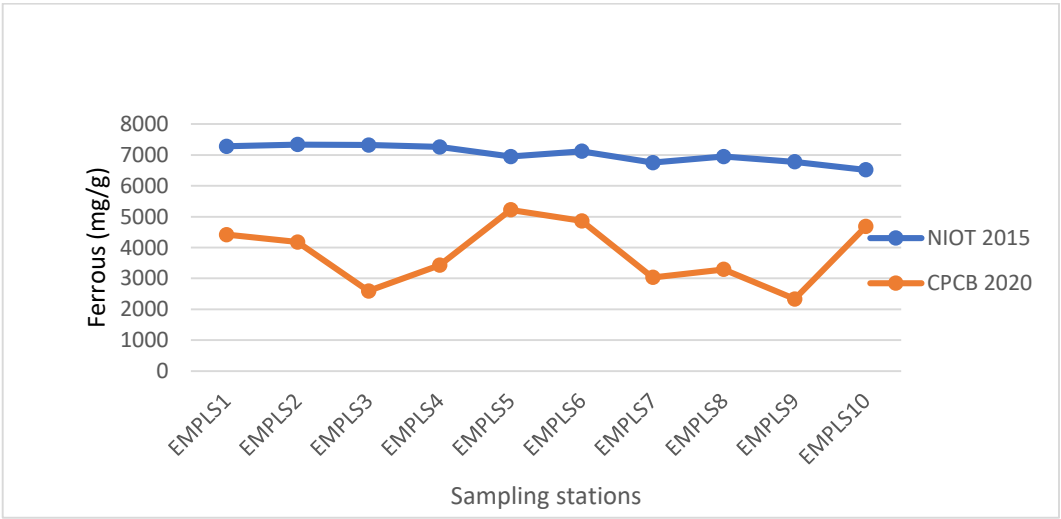

Fig. 19Ferrous variationin the seafloor sediments around MPL offshore discharge

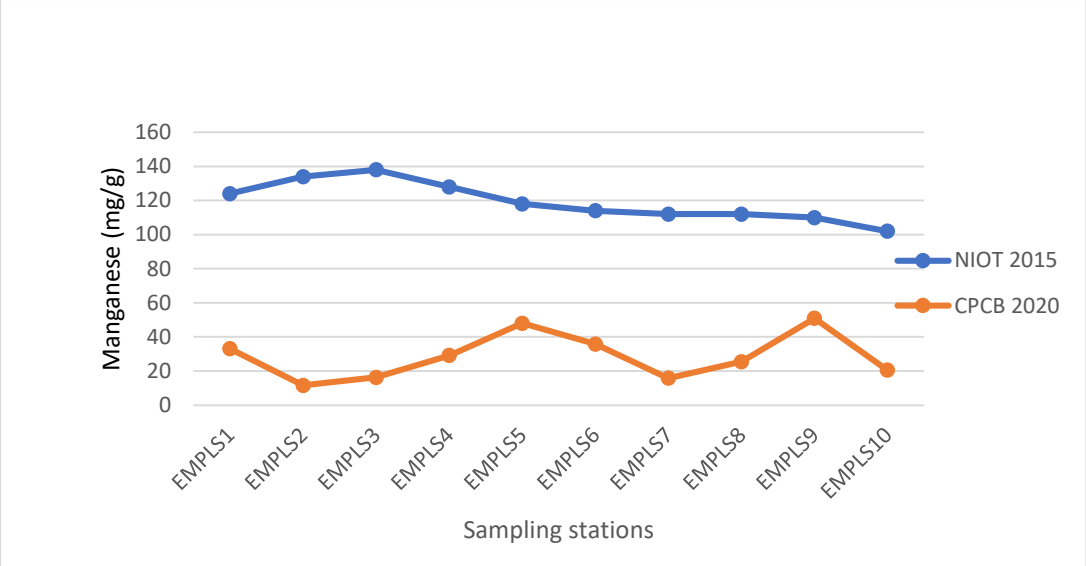

Fig.20 Manganesevariation in the seafloor sediments around MPL offshore

Petroleum hydrocarbon concentration of sediment at all the stations is below detectable levels.

BIOLOGICAL OCEANOGRAPHIC STATUS

Biological analysis in the study area describes the population dynamics of marine lives and their interaction with the surrounding environment in space and time. The current study reveals the status of various planktonic and benthic lives in and around the outfall Appendix- A provides detailed primary data.

BIOLOGICAL DATA COLLECTION

The impact of MPL discharge on biological oceanographic characteristic was studied at 10 locations in the vicinity of the outfall. The surveys were synoptic, carried out over tidal cycles covered within a day. Hydrographic measurements, water and sediment quality were also assessed at the same 10 locations. Impact of the outfall needs to be assessed by comparing the present biological data with the previous NIOT studies during 2015.

BIOTIC ENVIRONMENT

In most aquatic habitats, the three biotic communities are the pelagic community of the open waters, the benthic community living in the bottom deposits and the fringing community where water is shallow. The pelagic community consists of the neutrally buoyant plankton community, and the larger active swimming animals called the nekton.

The benthic community is mostly dependent on the settling organic matter from the water column in the form of live phytoplankton, dead plankton, detritus, faecal pellets etc. The percentage of organic matter reaching the benthos is diminished with increasing depth as the community of planktonic consumers progressively removes sinking material. Thus, the shallower waters have a relatively larger benthic community, as the food supply is high. In too shallow areas, where light penetrates, there is a sharp increase in biomass.

The fringing community in the marine environment depends on the type of substrate and climate. In areas of high wave and current action, the rocky areas may be dominated by algae known as seaweeds that attach to the bottom without roots. Uptake of nutrients takes place over the entire surface. Shores with lesser water movement where sedimentation occurs, tend to have rooted plants, intertidal marshes and seagrass beds. The most critical role of the marine plants is to provide a substrate for vascular, microscopic and macroscopic algae

(periphyton). Besides, they trap sediments and food, providing a habitat for young fish where large predators cannot follow.

The distribution of the various communities is typically classified by the trophic levels in a food chain (or energy chain). Typically, the first level consists of primary producers (phytoplankton). The second level consists of the primary consumers, namely, zooplankton, while the secondary consumers consist of larger animals or nekton. The top of the food chain would be humans. The biotic sampling consisted of evaluating the phytoplankton and zooplankton communities. Sediment samples were analyzed for macrobenthos.

BIOLOGICAL SAMPLING

Chlorophyll, phytoplankton, zooplankton and macrobenthos were measured for assessing the biological characteristics. Niskin water sampler, Plankton nets, and grab samples were utilized for sample collection. Collected samples were preserved in sub-zero condition, formaldehyde and rose bengal dye solution. Standard procedures were used for analysis and quality control. Diversity analysis was carried out to establish the population dynamics along with different stations concerning various time scales based on the location of the effluent discharge point.

PHYTOPLANKTON

Analysis of phytoplankton samples indicate the presence of 20 species phytoplankton and the cell counts ranging from 1826 Nos./L to 5880 Nos./L along the sampling locations EMPL1 to EMPL10. The diatom species *Biddulphia regia* was found to be a major contributor to the total population of phytoplankton. This species belongs to blooming type along the Indian coast. Detailed data table at Annexure-II: Tables 1 to 2.

Among the Phytoplankton *Biddulphia regia, Rhizosolenia imbricate, R. styliformis, Thalassionemanitzschioides, Nitzschia sp., Chaetoceroslaevis, skeletonemacostatum, Chaetocerosdecipiens*, were found to be dominant along the study area. The phytoplankton population density is higher compared to past studies during 2015. The diversity index scores indicated the moderately healthy nature of the environment and recorded a rise in diversity also. It may be attributed to the significant increase in nitrate-nitrogen values(Fig.2.1).

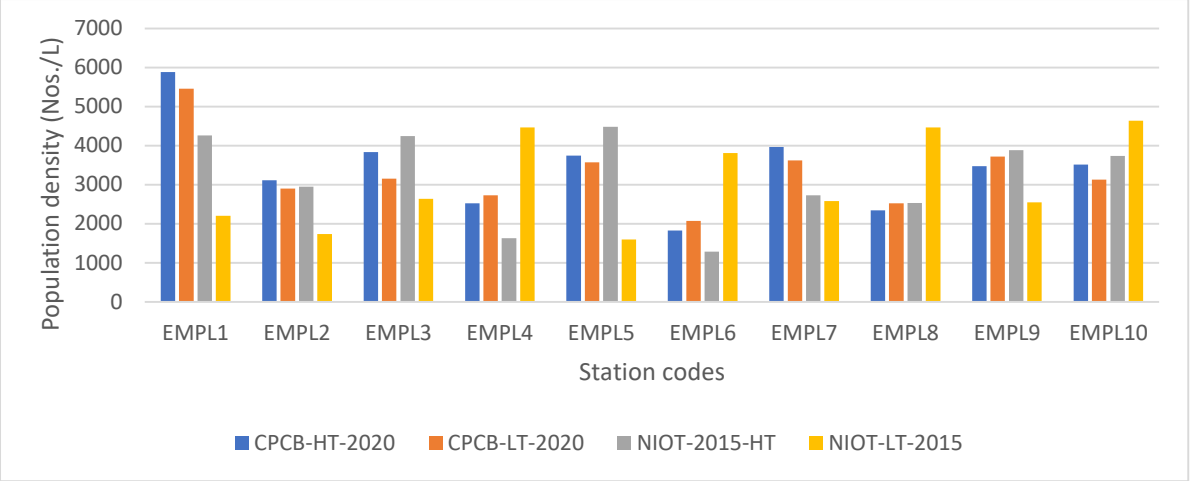

Fig. 21 Phytoplankton population density variation in the surface waters around MPL offshore discharge location during the study period

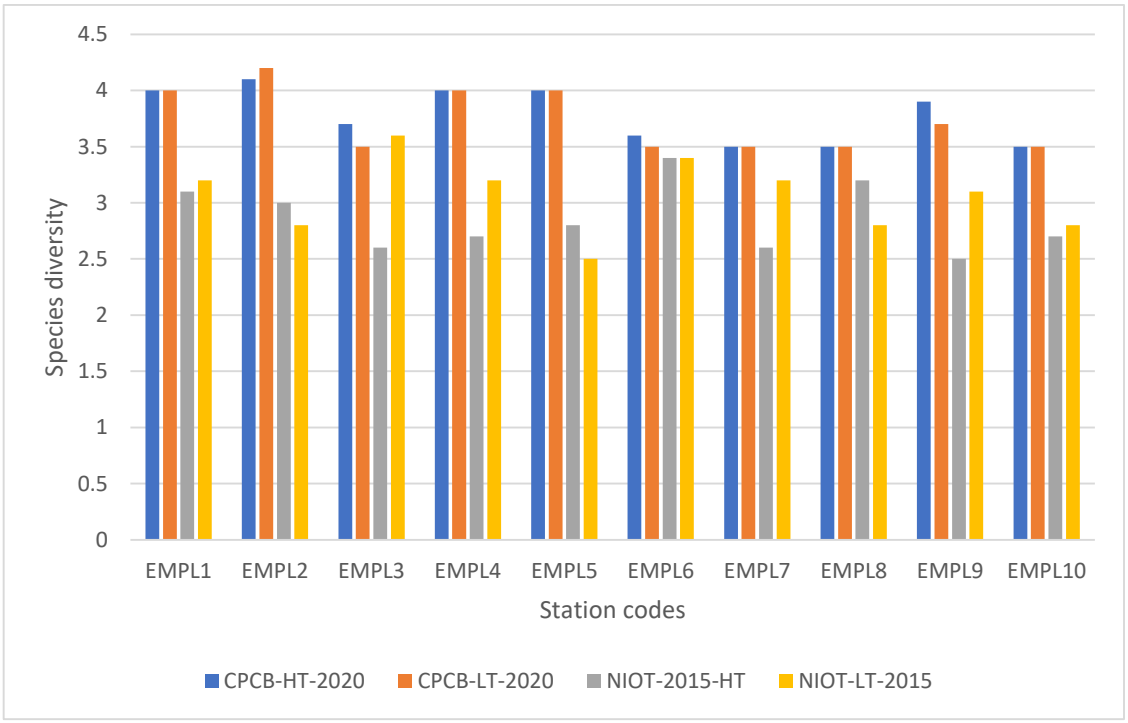

Fig. 22 Phytoplankton species diversity variation in the surface waters around MPL offshore discharge location during the study period

ZOOPLANKTON

Zooplankton is composed of floating organisms, including the larval stages of many economically important species of prawn and fishes. The density of the population varied from 1180 to 3093 Nos./ m^3 during the sampling period between EMPL 1 to EMPL 10. A total number of 13 species were recorded in the coastal waters. *Calanoid*, *Cladocerans*, *Appendicularians*, *Naupli larvae* and fish eggs are the dominant forms of zooplankton

recorded during the survey. A significant increase in zooplankton population at EMPL4 where the Nitrite content recorded a hike in concentration followed by a decrease in phytoplankton population density. It may be attributed to the zooplankton grazing potential. The zooplankton trend does not reflect any abnormalities.

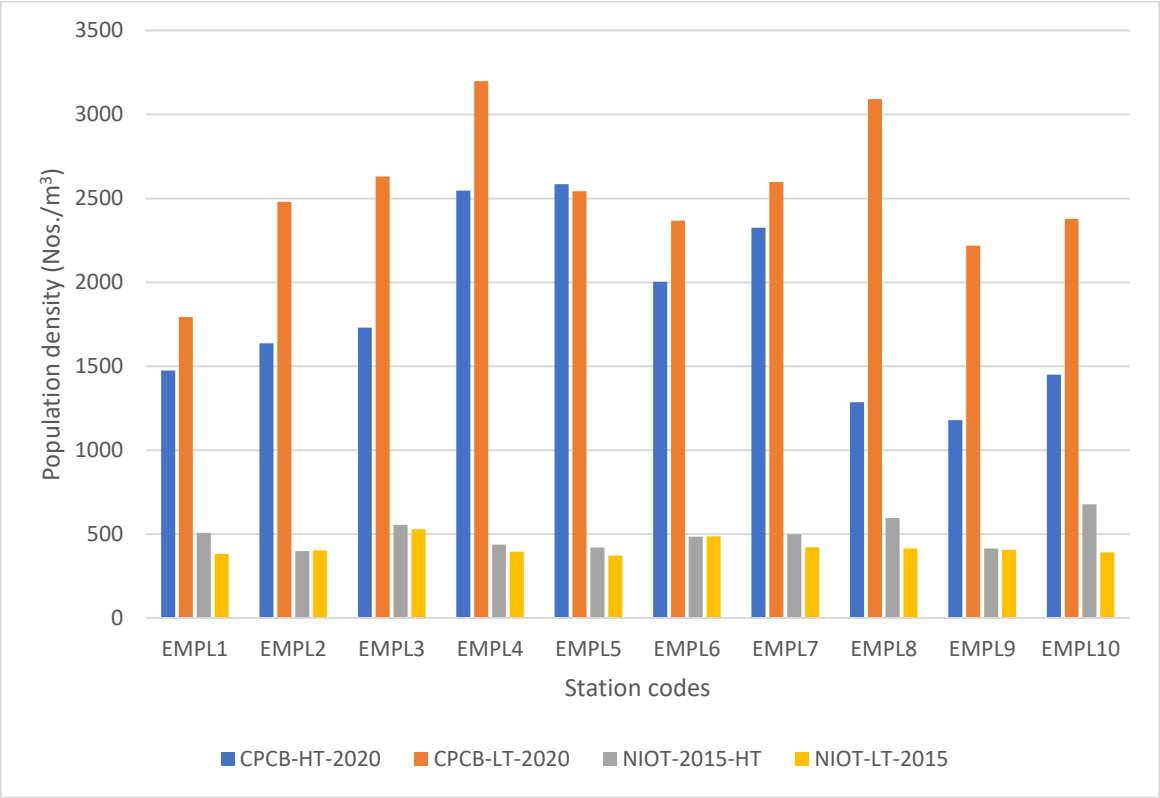

Fig. 23 Zooplankton population density variation in the surface waters around MPL offshore discharge location during the study period

BENTHOS

The subtidal benthic organisms recorded moderate fluctuation of standing stock and diversity. In terms of population, macrobenthos varied between 91 and 329 Nos./m^2. The faunal composition consisted of *Gastropods, Bivalves, Polychaetes, and Nematodes* as the dominant group. The minimum density recorded at EMPL2 and its proximity to the discharge site may be attributed to this drop. The site (EMPL2) located 500m away in the northeastern side of the discharge site. However, 2015 observations also recorded a decline in benthic biota at EMPL7 located 500m away from the discharge site in the southwestern direction. It may be traceable by whole effluent toxicity bioassay studies of USEPA. However, various effluent discharges along the Ennore coastal waters alongwith the MPL discharge needs to be

considered and subdue the effluent specific impact on biosystems along this coast. Hence, further studies are warranted to establish the effect of the discharge site.

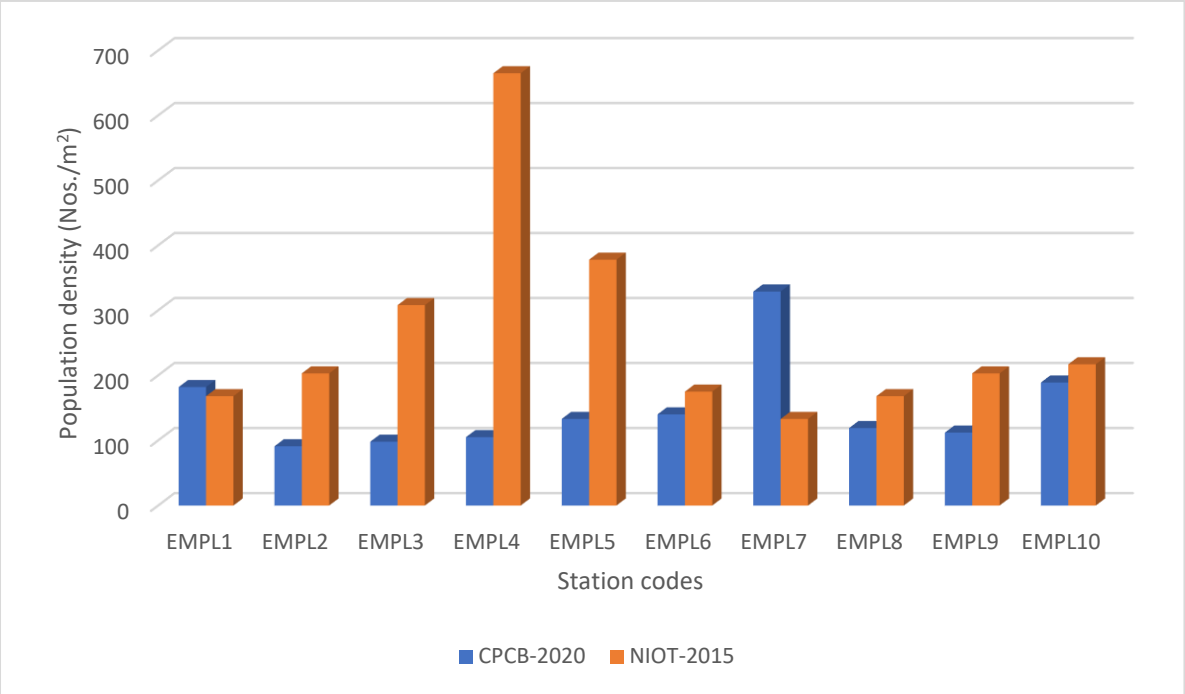

Fig. 24 Benthos population density variation in the sea bottom sediments around MPL offshore discharge location during the study period

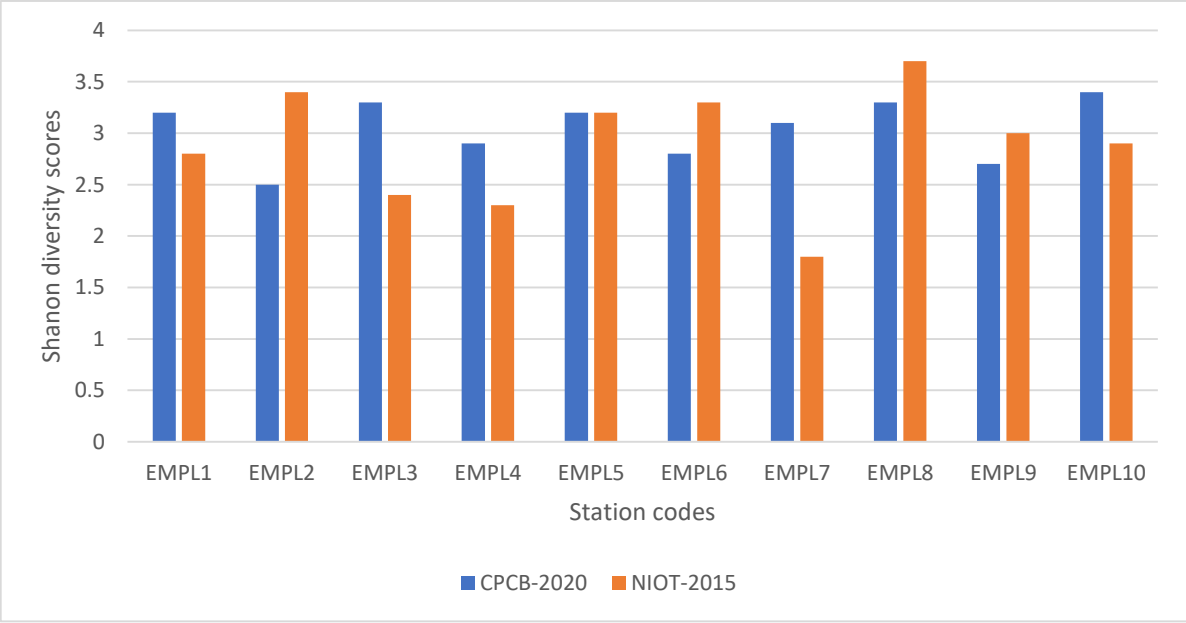

Fig. 25 Benthos population diversity variation in the sea bottom sediments around MPL offshore discharge location during the study period

SUMMARY

The results of selected parameters and comparison with previous study records reveal that there arespatial and temporal variations within the study area.Increase in nutrient parameters like nitrate recorded maximum value of 20.4 □mol./lis comparable to values recorded in samples collected during low tide at the Ennore creek during the study (AnnexureI: Table 2). The BOD values werealso relative to quantities recorded inEnnore creeksamples(Annexure I: Table 1). The sediment heavy metal content also recorded higher values than the offshore discharge site indicates the possibility of pollutants input from nearby sources which cannot be ruled out. It is well known that this Ennore creek is traversed by Manali industrial belt and Buckingham canal loaded with industrial, domestic sewage load. Considering the proximity of Ennore creek and its pollutant loading to the coastal waters, there is likely to bethe synergistic effect on nutrient loading in the coastal waters off North Chennai due to possible flushing from Ennore Creek. It leads to increase in background concentrations of the study area in addition to sources like Royapuram fisheries harbour, Chennai Port, Royapuramsewage outfall and several other industries discharging in this area, which account for the values recorded during the sampling surveys carried out in March 2020.

The values recorded in the receiving waters off North Chennai coastal waters need to be compared with the values of various parameters analyzed in the discharge waters of MPL to reach any conclusion.

The studies on biological characteristics reveal the following:

- The increase in nutrient load reflected in improvement plankton population is corroborated.
- A slight drop in benthic population in the near field of offshore discharge may be attributed to the synergistic effects of various discharges from partner industries sharing the common effluent discharge along Ennore coast. Theeffect of toxicant on the benthic population in the certain station needs to be studied by whole effluent toxicity bioassay. It warrants detailed long term monitoring studies in the receiving waters (off Chennai coast) as well asat the discharge locations of the various industries.
- All these observations have been validated with the effluent quality of industrial discharge collected by CPCB and are within the discharge limits. Given that the benthos in receiving waters (marine waters are observed to vary, it is suggested to conduct whole

effluent toxicity studies. These tests are expected to reveal the influence of other possible chemicals not in the regulatory control, influence the sustainability of marine biota (Fishes, molluscs, etc.).

- The levels of toxic chemicals are found to be within the acceptable levels, and therefore the concentrations of the other chemicals shall have to be reviewed. It is possible that chlorides used in the processes may be released into the receiving water body. Studies show that chloride concentrations produce corrosion in wastewater pipelines and are likely to inhibit marine biota growth. However, these aspects have to be confirmed only through seasonal, comprehensive field studies over a long period.

Annexure I

Table 1 Physico-chemical parameters variation along the MPL offshore discharge site & adjoining Ennore creek

Sample ID as per Glens Innovation Lab record	Report ID	Depth (m)	Tide	Air Temperature (ºC)	Water Temperature (ºC)	pH	DO (mg/L)	BOD (mg/L)	Salinity (PSU)	TSS (mg/L)
EN-S-HT-01	EMPL1-S	0	HT	28.9	28.8	7.78	6.3	2.8	35.5	4.4
EN-S-HT-02	EMPL2-S	0	HT	28.9	28.8	7.79	6.4	2.8	34.9	4.4
EN-S-HT-03	EMPL3-S	0	HT	29.0	28.6	7.77	6.3	2.8	34.9	3.7
EN-S-HT-04	EMPL4-S	0	HT	29.0	28.6	7.77	6.4	2.8	34.9	3.7
EN-S-HT-05	EMPL5-S	0	HT	29.1	28.6	7.81	6.1	3.2	37.9	6.4
EN-S-HT-06	EMPL6-S	0	HT	29.2	28.8	7.83	6.2	2.8	35.6	4.0
EN-S-HT-07	EMPL7-S	0	HT	28.9	28.3	7.82	6.3	2.8	34.9	3.1
EN-S-HT-08	EMPL8-S	0	HT	29.0	28.4	7.83	6.3	2.8	35.1	5.2
EN-S-HT-09	EMPL9-S	0	HT	29.0	28.4	7.78	6.4	2.8	35.1	4.4
EN-S-HT-10	EMPL10-S	0	HT	29.0	28.4	7.82	6.4	2.8	35.4	4.0
EN-B-HT-01	EMPL1-B	9.5	HT	28.9	27.9	7.79	6.4	2.8	37.2	3.2
EN-B-HT-02	EMPL2-B	10.2	HT	28.9	28.0	7.92	5.1	3.2	34.6	5.0
EN-B-HT-03	EMPL3-B	9.5	HT	29.0	28.6	7.69	6.8	2.8	36.3	18.9
EN-B-HT-04	EMPL4-B	9.6	HT	29.0	27.8	7.83	6.8	2.8	36.7	3.2
EN-B-HT-05	EMPL5-B	11.6	HT	29.1	28.6	7.76	6.7	2.8	34.9	4.5
EN-B-HT-06	EMPL6-B	11.6	HT	29.2	28.5	7.69	6.8	2.8	36.7	4.5
EN-B-HT-07	EMPL7-B	11.6	HT	28.9	28.4	7.82	6.8	2.8	35.4	4.5
EN-B-HT-08	EMPL8-B	12.3	HT	29.0	28.1	7.82	6.9	3.2	35.4	4.0
EN-B-HT-09	EMPL9-B	11.5	HT	29.0	28.1	7.93	6.8	2.8	36.8	4.0
EN-B-HT-10	EMPL10-B	12.6	HT	29.0	27.9	7.87	6.8	2.8	35.4	4.5
EN-S-LT-01	EMPL1-S	0	LT	31.1	29.1	7.61	5.6	3.2	35.3	4.7

Sample ID as per Glens Innovation Lab record	Report ID	Depth (m)	Tide	Air Temperature (ºC)	Water Temperature (ºC)	pH	DO (mg/L)	BOD (mg/L)	Salinity (PSU)	TSS (mg/L)
EN-S-LT-02	EMPL2-S	0	LT	30.9	29.0	7.63	5.5	3.2	34.9	4.5
EN-S-LT-03	EMPL3-S	0	LT	31.0	29.0	7.85	5.5	3.2	34.9	4.3
EN-S-LT-04	EMPL4-S	0	LT	30.9	29.0	7.8	5.4	3.2	36.8	4.3
EN-S-LT-05	EMPL5-S	0	LT	31.0	29.0	7.83	5.5	3.2	37.7	5.1
EN-S-LT-06	EMPL6-S	0	LT	31.1	29.1	7.83	5.7	3.2	37.9	4.7
EN-S-LT-07	EMPL7-S	0	LT	30.9	28.9	7.85	5.4	3.2	35.3	5.1
EN-S-LT-08	EMPL8-S	0	LT	30.8	28.8	7.49	6.4	3.2	39.4	5.1
EN-S-LT-09	EMPL9-S	0	LT	30.9	28.9	7.81	6.2	3.2	37.2	4.7
EN-S-LT-10	EMPL10-S	0	LT	30.9	28.8	7.65	6.3	3.2	37.9	4.7
EN-B-LT-01	EMPL1-B	9.5	LT	31.1	28.7	7.84	6.4	2.8	37.9	4.6
EN-B-LT-02	EMPL2-B	10.2	LT	30.9	28.6	7.78	6.4	2.8	34.8	4.0
EN-B-LT-03	EMPL3-B	9.5	LT	31.0	28.4	7.77	6.4	2.8	35.3	3.8
EN-B-LT-04	EMPL4-B	9.6	LT	30.9	28.9	7.76	6.4	3.2	34.9	3.6
EN-B-LT-05	EMPL5-B	11.6	LT	31.0	30.8	7.83	6.1	2.8	34.8	3.2
EN-B-LT-06	EMPL6-B	11.6	LT	31.1	29.0	7.75	6.1	2.8	35.4	2.4
EN-B-LT-07	EMPL7-B	11.6	LT	30.9	29.0	7.76	5.3	3.2	35.4	2.6
EN-B-LT-08	EMPL8-B	12.3	LT	30.8	28.8	7.84	6.3	2.8	35.3	5.3
EN-B-LT-09	EMPL9-B	11.5	LT	30.9	28.6	7.91	6.3	2.8	35.4	2.0
EN-B-LT-10	EMPL10-B	12.6	LT	30.9	28.7	7.86	6.4	2.8	37.2	3.2
ENC-S-HT-01	ENC1-S	0	HT	29.5	29.1	7.84	6.9	2.8	37.9	4.9
ENC-S-HT-02	ENC2-S	0	HT	30.1	29.8	7.58	4.5	3.2	34.6	2.9
ENC-S-HT-03	ENC3-S	0	HT	29.8	29.9	7.63	6.7	2.8	25.2	17.9
ENC-S-HT-04	ENC4-S	0	HT	30.2	30.1	7.86	5.6	3.2	17.1	2.8
ENC-S-LT-01	ENC1-S	0	LT	30.5	30.3	7.93	6.8	2.8	35.4	3.6

Sample ID as per Glens Innovation Lab record	Report ID	Depth (m)	Tide	Air Temperature (°C)	Water Temperature (°C)	pH	DO (mg/L)	BOD (mg/L)	Salinity (PSU)	TSS (mg/L)
ENC-S-LT-02	ENC2-S	0	LT	31.2	31.1	7.62	5.5	3.2	26.8	15.8
ENC-S-LT-03	ENC3-S	0	LT	31.1	31.7	7.76	6.9	2.8	20.2	17.1
ENC-S-LT-04	ENC4-S	0	LT	31.5	31.4	7.42	6.7	3.2	15.4	3.2

Table 2 Nutrient variation along the MPL offshore discharge site & adjoining Ennore creek

Sample ID as per Glens Innovation Lab record	Report ID	Depth (m)	Tide	Ammonia (µmol/L)	Nitrate (µmol/L)	PO4 (µmol/L)	NO2 (µmol/L)
EN-S-HT-01	EMPL1-S	0	HT	2.91	20.4	0.21	0.04
EN-S-HT-02	EMPL2-S	0	HT	BLQ	20.4	0.21	0.08
EN-S-HT-03	EMPL3-S	0	HT	BLQ	20.4	0.21	0.04
EN-S-HT-04	EMPL4-S	0	HT	BLQ	20.4	0.21	0.67
EN-S-HT-05	EMPL5-S	0	HT	BLQ	20.4	0.21	0.04
EN-S-HT-06	EMPL6-S	0	HT	BLQ	9.99	0.21	0.04
EN-S-HT-07	EMPL7-S	0	HT	BLQ	20.4	0.21	0.04
EN-S-HT-08	EMPL8-S	0	HT	BLQ	20.4	0.21	0.04
EN-S-HT-09	EMPL9-S	0	HT	BLQ	9.99	0.21	0.04
EN-S-HT-10	EMPL10-S	0	HT	BLQ	9.99	0.21	0.08
EN-B-HT-01	EMPL1-B	9.5	HT	BLQ	9.99	0.21	0.04
EN-B-HT-02	EMPL2-B	10.2	HT	BLQ	9.99	0.21	0.04
EN-B-HT-03	EMPL3-B	9.5	HT	BLQ	243	0.21	0.04
EN-B-HT-04	EMPL4-B	9.6	HT	BLQ	9.99	0.21	0.04
EN-B-HT-05	EMPL5-B	11.6	HT	BLQ	4.2	0.21	0.04

Sample ID as per Glens Innovation Lab record	Report ID	Depth (m)	Tide	Ammonia (µmol/L)	Nitrate (µmol/L)	PO4 (µmol/L)	NO2 (µmol/L)
EN-B-HT-06	EMPL6-B	11.6	HT	BLQ	9.99	0.21	0.08
EN-B-HT-07	EMPL7-B	11.6	HT	BLQ	9.99	0.21	0.04
EN-B-HT-08	EMPL8-B	12.3	HT	BLQ	9.99	0.21	0.08
EN-B-HT-09	EMPL9-B	11.5	HT	BLQ	9.99	0.21	0.08
EN-B-HT-10	EMPL10-B	12.6	HT	BLQ	9.99	0.21	0.12
EN-S-LT-01	EMPL1-S	0	LT	BLQ	20.4	0.21	0.04
EN-S-LT-02	EMPL2-S	0	LT	BLQ	20.4	0.21	0.04
EN-S-LT-03	EMPL3-S	0	LT	BLQ	20.4	0.21	0.04
EN-S-LT-04	EMPL4-S	0	LT	BLQ	20.4	0.21	0.04
EN-S-LT-05	EMPL5-S	0	LT	BLQ	20.4	0.21	0.04
EN-S-LT-06	EMPL6-S	0	LT	BLQ	20.4	0.21	0.04
EN-S-LT-07	EMPL7-S	0	LT	BLQ	20.4	0.21	0.04
EN-S-LT-08	EMPL8-S	0	LT	BLQ	9.99	0.21	0.04
EN-S-LT-09	EMPL9-S	0	LT	BLQ	20.4	0.21	0.04
EN-S-LT-10	EMPL10-S	0	LT	BLQ	20.4	0.21	0.04
EN-B-LT-01	EMPL1-B	9.5	LT	2.91	9.99	0.21	0.04
EN-B-LT-02	EMPL2-B	10.2	LT	2.91	9.99	0.21	0.04
EN-B-LT-03	EMPL3-B	9.5	LT	2.91	4.2	0.21	0.04
EN-B-LT-04	EMPL4-B	9.6	LT	2.91	4.2	0.21	0.04
EN-B-LT-05	EMPL5-B	11.6	LT	2.91	9.99	0.21	0.04
EN-B-LT-06	EMPL6-B	11.6	LT	2.91	4.2	0.21	0.04
EN-B-LT-07	EMPL7-B	11.6	LT	2.91	4.2	0.21	0.04
EN-B-LT-08	EMPL8-B	12.3	LT	2.91	9.99	0.21	0.04
EN-B-LT-09	EMPL9-B	11.5	LT	2.91	4.2	0.21	0.04
EN-B-LT-10	EMPL10-B	12.6	LT	2.91	4.2	0.21	0.04

Sample ID as per Glens Innovation Lab record	Report ID	Depth (m)	Tide	Ammonia (µmol/L)	Nitrate (µmol/L)	PO4 (µmol/L)	NO2 (µmol/L)
ENC-S-HT-01	ENC1-S	0	HT	5.41	4.2	0.21	0.54
ENC-S-HT-02	ENC2-S	0	HT	2.91	4.2	0.67	1.25
ENC-S-HT-03	ENC3-S	0	HT	50	20.4	1.33	1.29
ENC-S-HT-04	ENC4-S	0	HT	142	20.4	1.75	14.5
ENC-S-LT-01	ENC1-S	0	LT	BLQ	20.4	0.21	0.04
ENC-S-LT-02	ENC2-S	0	LT	55	9.99	1.91	10.7
ENC-S-LT-03	ENC3-S	0	LT	111	20.4	2.1	0.75
ENC-S-LT-04	ENC4-S	0	LT	BLQ	20.4	0.96	2.54

Table 3 Heavy Metals variation along the MPL offshore discharge site & adjoining Ennore creek

Sample ID as per Glens Innovation Lab record	Report ID	Depth (m)	Tide	Arsenic (µg/L)	Nickel (µg/L)	Copper (µg/L)	Chromium (µg/L)	Cadmium (µg/L)	Zinc (µg/L)	Lead (µg/L)	Selenium (µg/L)	Cobalt (µg/L)	Manganese (µg/L)	Mercury (µg/L)
EN-S-HT-01	EMPL1-S	0	HT	BLQ	BLQ	BLQ	BLQ	BLQ	0.034	BLQ	BLQ	BLQ	0.007	BLQ
EN-S-HT-02	EMPL2-S	0	HT	BLQ	BLQ	BLQ	BLQ	BLQ	0.009	BLQ	BLQ	BLQ	0.014	BLQ
EN-S-HT-03	EMPL3-S	0	HT	BLQ	BLQ	BLQ	BLQ	BLQ	0.047	BLQ	BLQ	BLQ	0.014	BLQ
EN-S-HT-04	EMPL4-S	0	HT	BLQ	BLQ	BLQ	BLQ	BLQ	0.004	BLQ	BLQ	BLQ	0.010	BLQ
EN-S-HT-05	EMPL5-S	0	HT	BLQ	BLQ	BLQ	BLQ	BLQ	0.005	BLQ	BLQ	BLQ	0.004	BLQ
EN-S-HT-06	EMPL6-S	0	HT	BLQ	BLQ	BLQ	BLQ	BLQ	0.030	BLQ	BLQ	BLQ	0.006	BLQ
EN-S-HT-07	EMPL7-S	0	HT	BLQ	BLQ	BLQ	BLQ	BLQ	0.004	BLQ	BLQ	BLQ	0.038	BLQ
EN-S-HT-08	EMPL8-S	0	HT	BLQ	BLQ	BLQ	BLQ	BLQ	0.006	BLQ	BLQ	BLQ	0.013	BLQ
EN-S-HT-09	EMPL9-S	0	HT	BLQ	BLQ	BLQ	BLQ	BLQ	0.007	BLQ	BLQ	BLQ	0.005	BLQ
EN-S-HT-10	EMPL10-S	0	HT	BLQ	BLQ	BLQ	BLQ	BLQ	0.007	BLQ	BLQ	BLQ	BLQ	BLQ
EN-B-HT-01	EMPL1-B	9.5	HT	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	0.190	BLQ
EN-B-HT-02	EMPL2-B	10.2	HT	BLQ	0.004	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	0.008	BLQ
EN-B-HT-03	EMPL3-B	9.5	HT	BLQ	0.017	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	0.253	BLQ
EN-B-HT-04	EMPL4-B	9.6	HT	BLQ	0.018	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	0.011	BLQ
EN-B-HT-05	EMPL5-B	11.6	HT	BLQ	0.010	BLQ	2.94	BLQ	0.019	BLQ	BLQ	BLQ	0.286	BLQ
EN-B-HT-06	EMPL6-B	11.6	HT	BLQ	0.017	BLQ	BLQ	BLQ	0.004	BLQ	BLQ	BLQ	0.115	BLQ
EN-B-HT-07	EMPL7-B	11.6	HT	BLQ	0.014	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	0.010	BLQ
EN-B-HT-08	EMPL8-B	12.3	HT	BLQ	0.005	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	0.073	BLQ
EN-B-HT-09	EMPL9-B	11.5	HT	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	0.024	BLQ
EN-B-HT-10	EMPL10-B	12.6	HT	BLQ	0.008	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	0.005	BLQ

Sample ID as per Glens Innovation Lab record	Report ID	Depth (m)	Tide	Arsenic (µg/L)	Nickel (µg/L)	Copper (µg/L)	Chromium (µg/L)	Cadmium (µg/L)	Zinc (µg/L)	Lead (µg/L)	Selenium (µg/L)	Cobalt (µg/L)	Manganese (µg/L)	Mercury (µg/L)
EN-S-LT-01	EMPL1-S	0	LT	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
EN-S-LT-02	EMPL2-S	0	LT	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	0.004	BLQ
EN-S-LT-03	EMPL3-S	0	LT	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
EN-S-LT-04	EMPL4-S	0	LT	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
EN-S-LT-05	EMPL5-S	0	LT	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
EN-S-LT-06	EMPL6-S	0	LT	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
EN-S-LT-07	EMPL7-S	0	LT	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
EN-S-LT-08	EMPL8-S	0	LT	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	0.010	BLQ
EN-S-LT-09	EMPL9-S	0	LT	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	0.006	BLQ
EN-S-LT-10	EMPL10-S	0	LT	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
EN-B-LT-01	EMPL1-B	9.5	LT	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	0.007	BLQ
EN-B-LT-02	EMPL2-B	10.2	LT	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
EN-B-LT-03	EMPL3-B	9.5	LT	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
EN-B-LT-04	EMPL4-B	9.6	LT	BLQ	0.006	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
EN-B-LT-05	EMPL5-B	11.6	LT	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
EN-B-LT-06	EMPL6-B	11.6	LT	BLQ	0.005	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
EN-B-LT-07	EMPL7-B	11.6	LT	BLQ	0.005	BLQ	BLQ	BLQ	0.007	BLQ	BLQ	BLQ	BLQ	BLQ
EN-B-LT-08	EMPL8-B	12.3	LT	BLQ	0.006	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	0.023	BLQ
EN-B-LT-09	EMPL9-B	11.5	LT	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
EN-B-LT-10	EMPL10-B	12.6	LT	BLQ	0.004	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
ENC-S-HT-01	ENC1-S	0	HT	BLQ	0.005	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	0.007	BLQ

Sample ID as per Glens Innovation Lab record	Report ID	Depth (m)	Tide	Arsenic (µg/L)	Nickel (µg/L)	Copper (µg/L)	Chromium (µg/L)	Cadmium (µg/L)	Zinc (µg/L)	Lead (µg/L)	Selenium (µg/L)	Cobalt (µg/L)	Manganese (µg/L)	Mercury (µg/L)
ENC-S-HT-02	ENC2-S	0	HT	BLQ	0.005	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
ENC-S-HT-03	ENC3-S	0	HT	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	0.079	BLQ
ENC-S-HT-04	ENC4-S	0	HT	BLQ	0.007	BLQ	BLQ	BLQ	0.004	BLQ	BLQ	BLQ	0.111	BLQ
ENC-S-LT-01	ENC1-S	0	LT	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
ENC-S-LT-02	ENC2-S	0	LT	BLQ	BLQ	BLQ	BLQ	BLQ	0.005	BLQ	BLQ	BLQ	0.030	BLQ
ENC-S-LT-03	ENC3-S	0	LT	BLQ	0.011	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	0.088	BLQ
ENC-S-LT-04	ENC4-S	0	LT	BLQ	0.009	0.005	BLQ	BLQ	0.015	BLQ	BLQ	BLQ	0.210	BLQ

Table 4 PHC and Faecal Coliform variation along the MPL offshore discharge site & adjoining Ennore creek

Sample ID as per Glens Innovation Lab record	Report ID	Depth (m)	Tide	Petroleum hydrocarbons (mg/L)	Oil & Grease (mg/L)	Total Coliform (MPN/100ml)	Faecal Coliform (MPN/100ml)
EN-S-HT-01	EMPL1-S	0	HT	BLQ	BLQ	23	13
EN-S-HT-02	EMPL2-S	0	HT	BLQ	BLQ	23	8
EN-S-HT-03	EMPL3-S	0	HT	BLQ	BLQ	34	14
EN-S-HT-04	EMPL4-S	0	HT	BLQ	BLQ	60	21
EN-S-HT-05	EMPL5-S	0	HT	BLQ	BLQ	90	22
EN-S-HT-06	EMPL6-S	0	HT	BLQ	BLQ	50	26
EN-S-HT-07	EMPL7-S	0	HT	BLQ	BLQ	27	11
EN-S-HT-08	EMPL8-S	0	HT	BLQ	BLQ	30	17
EN-S-HT-09	EMPL9-S	0	HT	BLQ	BLQ	50	11
EN-S-HT-10	EMPL10-S	0	HT	BLQ	BLQ	50	14
EN-B-HT-01	EMPL1-B	9.5	HT	BLQ	BLQ	40	13
EN-B-HT-02	EMPL2-B	10.2	HT	BLQ	BLQ	50	27
EN-B-HT-03	EMPL3-B	9.5	HT	BLQ	BLQ	60	21
EN-B-HT-04	EMPL4-B	9.6	HT	BLQ	BLQ	60	21
EN-B-HT-05	EMPL5-B	11.6	HT	BLQ	BLQ	50	21
EN-B-HT-06	EMPL6-B	11.6	HT	BLQ	BLQ	60	21
EN-B-HT-07	EMPL7-B	11.6	HT	BLQ	BLQ	30	17
EN-B-HT-08	EMPL8-B	12.3	HT	BLQ	BLQ	33	14
EN-B-HT-09	EMPL9-B	11.5	HT	BLQ	BLQ	34	13
EN-B-HT-10	EMPL10-B	12.6	HT	BLQ	BLQ	50	14
EN-S-LT-01	EMPL1-S	0	LT	BLQ	BLQ	40	8
EN-S-LT-02	EMPL2-S	0	LT	BLQ	BLQ	50	14
EN-S-LT-03	EMPL3-S	0	LT	BLQ	BLQ	50	14

Sample ID as per Glens Innovation Lab record	Report ID	Depth (m)	Tide	Petroleum hydrocarbons (mg/L)	Oil & Grease (mg/L)	Total Coliform (MPN/100ml)	Faecal Coliform (MPN/100ml)
EN-S-LT-04	EMPL4-S	0	LT	BLQ	BLQ	70	26
EN-S-LT-05	EMPL5-S	0	LT	BLQ	BLQ	22	8
EN-S-LT-06	EMPL6-S	0	LT	BLQ	BLQ	33	11
EN-S-LT-07	EMPL7-S	0	LT	BLQ	BLQ	70	26
EN-S-LT-08	EMPL8-S	0	LT	BLQ	BLQ	26	9
EN-S-LT-09	EMPL9-S	0	LT	BLQ	BLQ	34	8
EN-S-LT-10	EMPL10-S	0	LT	BLQ	BLQ	22	8
EN-B-LT-01	EMPL1-B	9.5	LT	BLQ	BLQ	34	13
EN-B-LT-02	EMPL2-B	10.2	LT	BLQ	BLQ	30	17
EN-B-LT-03	EMPL3-B	9.5	LT	BLQ	BLQ	60	14
EN-B-LT-04	EMPL4-B	9.6	LT	BLQ	BLQ	34	13
EN-B-LT-05	EMPL5-B	11.6	LT	BLQ	BLQ	50	13
EN-B-LT-06	EMPL6-B	11.6	LT	BLQ	BLQ	34	17
EN-B-LT-07	EMPL7-B	11.6	LT	BLQ	BLQ	70	14
EN-B-LT-08	EMPL8-B	12.3	LT	BLQ	BLQ	60	26
EN-B-LT-09	EMPL9-B	11.5	LT	BLQ	BLQ	40	17
EN-B-LT-10	EMPL10-B	12.6	LT	BLQ	BLQ	23	8
ENC-S-HT-01	ENC1-S	0	HT	BLQ	BLQ	34	11
ENC-S-HT-02	ENC2-S	0	HT	BLQ	BLQ	33	14
ENC-S-HT-03	ENC3-S	0	HT	BLQ	BLQ	110	30
ENC-S-HT-04	ENC4-S	0	HT	BLQ	BLQ	140	33
ENC-S-LT-01	ENC1-S	0	LT	BLQ	BLQ	34	13
ENC-S-LT-02	ENC2-S	0	LT	BLQ	BLQ	70	14
ENC-S-LT-03	ENC3-S	0	LT	BLQ	BLQ	80	27

Sample ID as per Glens Innovation Lab record	Report ID	Depth (m)	Tide	Petroleum hydrocarbons (mg/L)	Oil & Grease (mg/L)	Total Coliform (MPN/100ml)	Faecal Coliform (MPN/100ml)
ENC-S-LT-04	ENC4-S	0	LT	BLQ	BLQ	90	50

Table 5 Heavy metals, PHC & TOC variation along the MPL offshore discharge site & adjoining Ennore creek

Sample code as per Glens Innovation Lab record	Report ID	Manganese (mg/kg)	Zinc (mg/kg)	Cadmium (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Cobalt (mg/kg)	Nickel (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Iron (mg/kg)	Petroleum hydrocarbons (mg/kg)	TOC (%)
EN20030007-01	EMPLS1	33.12	10.95	BDL	3.30	BDL	2.74	3.21	9.60	2.22	4416.29	BDL	BDL
EN20030007-02	EMPLS2	11.58	8.23	BDL	3.62	BDL	2.62	2.54	9.37	BDL	4180.36	BDL	BDL
EN20030007-03	EMPLS3	16.25	5.09	BDL	2.45	BDL	BDL	BDL	5.75	0.78	2593.85	BDL	BDL
EN20030007-04	EMPLS4	29.17	8.03	BDL	2.45	BDL	2.34	2.23	7.88	BDL	3428.34	BDL	BDL
EN20030007-05	EMPLS5	48.04	12.50	BDL	3.70	BDL	3.09	3.81	9.69	3.18	5221.67	BDL	BDL
EN20030007-06	EMPLS6	35.78	10.28	BDL	3.53	BDL	2.79	3.32	9.49	2.86	4864.51	BDL	BDL
EN20030007-07	EMPLS7	15.81	4.54	BDL	1.62	BDL	BDL	BDL	5.62	BDL	3033.43	BDL	BDL
EN20030007-08	EMPLS8	25.50	4.96	BDL	1.62	BDL	BDL	BDL	5.54	BDL	3290.54	BDL	BDL

Sample code as per Glens Innovation Lab record	Report ID	Manganese (mg/kg)	Zinc (mg/kg)	Cadmium (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Cobalt (mg/kg)	Nickel (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Iron (mg/kg)	Petroleum hydrocarbons (mg/kg)	TOC (%)
EN20030007-09	EMPLS9	50.93	3.16	BDL	1.47	BDL	BDL	BDL	4.48	BDL	2332.74	BDL	BDL
EN20030007-10	EMPLS10	20.56	7.84	BDL	3.24	3.18	2.24	3.26	8.32	2.64	4683.99	BDL	BDL
EN20030007-11	ENCS1	22.92	1607.02	14.23	27.04	BDL	7.14	23.39	75.55	117.76	23947.16	BDL	1.09
EN20030007-12	ENCS2	19.20	1084.73	10.71	19.65	BDL	5.40	17.22	59.18	89.76	19624.39	BDL	0.86
EN20030007-13	ENCS3	14.27	263.74	2.52	7.76	BDL	3.01	6.60	21.68	29.36	7139.08	BDL	0.45
EN20030007-14	ENCS4	BDL	2.70	BDL	0.66	BDL	BDL	BDL	3.55	BDL	1026.54	BDL	BDL

ANNEXURE II

Table 1: Phytoplankton population variation along MPL offshore discharge sites and adjoining Ennore creek system during HT

Station code	Population (No/l)	Faunal Groups	*Percentage of species contribution*
EMPL 1	5880	19	*Biddulphia regia (7.14), Biddulphia sinensis (4.29), Biddulphia mobiliensis (2.86)***,** *Rhizosolenia imbricata (11.43), Rhizosolenia stolterfothii (1.43), Rhizosolenia alata (2.86), Coscinodiscus radiatus (1.43), Ceratium tripos (4.29), Ceratium fusus (7.14), Thalassionema frauenfeldii (4.29), Guinardia flaccida (10.00), Guinardia striata (4.29), Skeletonema costatum (7.14), Leptocylindrus sp (4.29), Asterionella japonica (7.14), Streptotheca thamensis (2.86), Chaetoceros decipiens (5.71), Chaetoceros coarctatus (10.00), & Grammatophora marina (1.43).*
EMPL 2	3108	20	*Biddulphia regia (4.05), Biddulphia sinensis (2.70), Rhizosolenia imbricata (4.05), Rhizosolenia stolterfothii (8.11), Rhizosolenia robusta (5.41), Rhizosolenia bergonii (2.70), Coscinodiscus radiatus (6.76), Ceratium tripos (4.05), Ceratium fusus (9.46), Thalassionema frauenfeldii (5.41), Guinardia flaccida (8.11), Guinardia striata (2.70), Skeletonema costatum (12.16), Asterionella japonica (5.41), Streptotheca thamensis (2.70), Bellerochea malleus (1.35), Chaetoceros decipiens (1.35), Chaetoceros coarctatus (6.76), Grammatophora marina (4.05) & Trichodesmium sp. (2.70).*
EMPL 3	3831	15	*Biddulphia regia (13.89), Rhizosolenia imbricata (3.97), Rhizosolenia stolterfothii (7.94), Rhizosolenia calcar-avis (9.92), Coscinodiscus radiatus (11.90), Coscinodiscus granii (1.98), Ceratium fusus (7.94), Ceratium furca (3.97), Dinophysis caudata (5.30), Thalassionema frauenfeldii (5.95), Guinardia flaccida (3.97), Asterionella japonica (0.48), Streptotheca thamensis (3.97), Skeletonema costatum (3.97), Nitzschia sp (1.78) & Chaetoceros decipiens (9.92).*
EMPL 4	2196	19	*Biddulphia regia (1.64), Biddulphia mobiliensis (8.74), Rhizosolenia imbricata (4.37), Rhizosolenia stolterfothii (3.28), Rhizosolenia alata (7.65), Rhizosolenia robusta (5.46), Rhizosolenia calcar-avis (8.74), Rhizosolenia bergonii (3.28), Coscinodiscus radiates (9.84), Coscinodiscus granii (2.19), Coscinodiscus centralis (4.37), Ceratium tripos (3.28), Ceratium furca (6.56), Ceratium fusus (5.46), Thalassionema frauenfeldii (6.56), Guinardia flaccida (12.02), Skeletonema costatum (2.19), Streptotheca thamensis (1.09), & Chaetoceros decipiens (3.28).*

Station code	**Population (No/l)**	**Faunal Groups**	***Percentage of species contribution***
EMPL 5	3740	20	*Biddulphia regia (14.12), Rhizosolenia imbricata (5.88), Rhizosolenia alata (4.71), Rhizosolenia robusta (8.24), Coscinodiscus centralis (4.71), Coscinodiscus radiatus (7.06), Ceratium fusus (3.53), Thalassionema frauenfeldii (7.06), Guinardia flaccida (4.71), Skeletonema costatum (3.53), Leptocylindrus sp (1.18), Asterionella japonica (2.35), Anabaena sp (1.18), Streptotheca thamensis (2.35), Bellerochea malleus (4.71), Pleurosigma sp (3.53), Nitzschia sp (1.18), Chaetoceros decipiens (7.06), Chaetoceros coarctatus (9.41) & Chaetoceros gracilis (3.53).*
EMPL 6	1826	13	*Biddulphia regia (8.43), Biddulphia sinensis (4.82), Rhizosolenia imbricata (9.64), Coscinodiscus radiatus (12.05), Ceratium tripos (4.82), Ceratium furca (9.64), Thalassionema frauenfeldii (4.82), Guinardia flaccid (9.64), Skeletonema costatum (7.23), Streptotheca thamensis (9.64), Bellerochea malleus (2.41), Chaetoceros decipiens (12.05) & Chaetoceros coarctatus (4.82).*
EMPL 7	3963	13	*Biddulphia mobiliensis (13.12), Rhizosolenia imbricata (9.84), Coscinodiscus granii (6.56), Ceratium tripos (9.84), Ceratium fusus (16.40), Ceratium longiceps (3.23), Thalassionema frauenfeldii (4.92), Guinardia flaccid (3.28), Skeletonema costatum (11.48), Streptotheca thamensis (1.64), Chaetoceros decipiens (4.92), Chaetoceros coarctatus (9.84) & Trichodesmium sp. (4.92).*
EMPL 8	2340	13	*Biddulphia regia (15.56), Biddulphia sinensis (4.44), Rhizosolenia imbricata (8.89), Coscinodiscus radiatus (1.11) Ceratium tripos (4.44), Ceratium furca (8.89), Thalassionema frauenfeldii (4.44), Guinardia flaccida (8.89), Skeletonema costatum (6.67), Streptotheca thamensis (8.89), Nitzschia sp (2.22), Chaetoceros decipiens (11.11), & Chaetoceros coarctatus (4.44).*
EMPL 9	3472	16	*Biddulphia regia (14.52), Biddulphia sinensis (3.23), Rhizosolenia imbricata (6.45), Rhizosolenia calcar-avis (8.06), Coscinodiscus centralis (6.45), Ceratium arcticum (3.23), Ceratium fusus (6.45), Dinophysis caudata (4.84), Dictyocha spp. (3.23), Guinardia flaccida (4.84), Guinardia striata (8.06), Leptocylindrus sp (6.45), Bellerochea malleus (4.84), Pleurosigma sp. (6.45), Nitzschia sp. (4.84) & Chaetoceros decipiens (8.06).*
EMPL 10	3510	13	*Biddulphia regia (1.53), Biddulphia sinensis (9.26), Rhizosolenia imbricata (14.81), Rhizosolenia stolterfothii (5.56), Rhizosolenia alata (3.70), Rhizosolenia calcar-avis (5.56), Dinophysis caudate (3.70), Thalassionema frauenfeldii (3.70), Guinardia flaccida (12.96), Streptotheca thamensis (12.96), Pleurosigma sp (5.56), Chaetoceros decipiens (14.81) & Chaetoceros coarctatus (5.56).*

Station code	Population (No/l)	Faunal Groups	*Percentage of species contribution*
ENC 1	2736	20	*Biddulphia regia (7.02), Rhizosolenia imbricata (5.26), Rhizosolenia stolterfothii (3.51), Rhizosolenia bergonii (1.75), Coscinodiscus radiatus (5.26), Ceratium fusus (5.26), Dinophysis caudata (3.51), Dictyocha spp. (7.02), Guinardia striata (3.51), Skeletonema costatum (8.77), Leptocylindrus sp (7.02), Asterionella japonica (5.26), Anabaena sp (3.51), Streptotheca thamensis (7.02), Bellerochea malleus (3.51), Pleurosigma sp (5.26), Nitzschia sp (7.02), Chaetoceros decipiens (5.26), Chaetoceros gracilis (1.75) & Grammatophora marina (3.51).*
ENC 2	1110	4	*Anabaena sp (24.32), Spirulina sp. (35.14), Scenedesmus dimorphis (21.62) & Pediastrum duplex (18.92).*

Table 2: Phytoplankton population variation along MPL offshore discharge sites and adjoining Ennore creek system during LT

Station code	Population (No/l)	Faunal Groups	*Percentage of species contribution*
MPL 1	5382	18	*Biddulphia regia (8.70), Biddulphia sinensis (2.90), Rhizosolenia imbricata (14.49), Rhizosolenia stolterfothii (4.35), Rhizosolenia alata (7.25), Coscinodiscus radiatus (4.35), Ceratium tripos (5.80), Ceratium fusus (4.35), Thalassionema frauenfeldii (1.45), Guinardia flaccida (5.80), Guinardia striata (2.90), Skeletonema costatum (5.80), Leptocylindrus sp (7.25), Asterionella japonica (4.35), Streptotheca thamensis (5.80), Chaetoceros decipiens (4.35), Chaetoceros coarctatus (5.80), & Grammatophora marina (4.35).*
EMPL 1	3002	18	*Biddulphia mobiliensis (5.06), Rhizosolenia imbricata (2.53), Rhizosolenia stolterfothii (6.33), Rhizosolenia robusta (5.06), Rhizosolenia bergonii (7.59), Coscinodiscus radiatus (6.33), Ceratium tripos (3.80), Ceratium fusus (5.06), Thalassionema frauenfeldii (6.33), Guinardia flaccida (7.59), Guinardia striata (5.06), Skeletonema costatum (1.27), Asterionella japonica (8.86), Streptotheca thamensis (7.59), Chaetoceros decipiens (3.80), Chaetoceros coarctatus (2.53), Grammatophora marina (5.06) & Trichodesmium sp. (6.33).*

Station code	**Population (No/l)**	**Faunal Groups**	***Percentage of species contribution***
EMPL 2	3920	18	*Biddulphia regia (8.93), Biddulphia mobiliensis (5.36), Rhizosolenia imbricata (7.14), Rhizosolenia alata (3.57), Rhizosolenia calcar-avis (7.14), Rhizosolenia bergonii (1.79), Coscinodiscus radiatus (8.93), Coscinodiscus granii (5.36), Ceratium tripos (5.36), Ceratium furca (7.14), Ceratium fusus (3.57), Thalassionema frauenfeldii (3.57), Guinardia flaccida (1.79), Guinardia striata (3.57), Streptotheca thamensis (8.93), Skeletonema costatum (7.14), Chaetoceros coarctatus (3.57), Chaetoceros decipiens (5.36) & Grammatophora marina (1.79).*
EMPL 3	2704	17	*Biddulphia regia (12.50), Biddulphia mobiliensis (8.65), Rhizosolenia imbricata (4.81), Rhizosolenia stolterfothii (1.92), Rhizosolenia robusta (2.88), Rhizosolenia calcar-avis (5.77), Coscinodiscus radiatus (9.62), Coscinodiscus granii (2.88), Coscinodiscus centralis (4.81), Ceratium tripos (4.81), Ceratium furca (6.73), Ceratium fusus (5.77), Thalassionema frauenfeldii (3.85), Guinardia flaccida (13.46), Skeletonema costatum (4.81), Streptotheca thamensis (2.88), & Chaetoceros decipiens (3.85).*
EMPL 4	3570	18	*Biddulphia regia (12.94), Rhizosolenia imbricata (7.06), Rhizosolenia alata (3.53), Rhizosolenia robusta (5.88), Coscinodiscus radiatus (10.59), Ceratium fusus (4.71), Thalassionema frauenfeldii (9.41), Guinardia flaccida (2.53), Skeletonema costatum (3.53), Leptocylindrus sp (2.53), Asterionella japonica (4.71), Streptotheca thamensis (3.53), Bellerochea malleus (2.35), Pleurosigma sp (8.24), Nitzschia sp (3.53), Chaetoceros decipiens (4.71), Chaetoceros coarctatus (7.06) & Chaetoceros gracilis (3.53).*
EMPL 5	2116	13	*Biddulphia regia (13.04), Biddulphia sinensis (8.70), Rhizosolenia imbricata (6.52), Coscinodiscus radiatus (8.70), Coscinodiscus centralis (2.17), Ceratium tripos (6.52), Ceratium furca (8.70), Thalassionema frauenfeldii (2.17), Guinardia flaccid (6.52), Skeletonema costatum (4.35), Bellerochea malleus (10.87), Chaetoceros decipiens (13.04) & Chaetoceros coarctatus (8.70).*
EMPL 6	3886	12	*Biddulphia mobiliensis (14.93), Rhizosolenia imbricata (11.94), Coscinodiscus radiatus (5.97), Ceratium tripos (10.45), Ceratium fusus (8.96), Thalassionema frauenfeldii (5.97), Guinardia flaccid (1.49), Skeletonema costatum (7.46), Streptotheca thamensis (5.97), Chaetoceros decipiens (7.46), Chaetoceros coarctatus (11.94) & Trichodesmium sp. (7.46).*
EMPL 7	2464	12	*Biddulphia regia (18.18), Biddulphia sinensis (2.27), Rhizosolenia imbricata (6.82), Coscinodiscus radiatus (7.95) Ceratium furca (13.64), Thalassionema frauenfeldii (6.82), Guinardia flaccida (5.68), Skeletonema costatum (5.68), Streptotheca thamensis (11.36), Nitzschia sp (4.55), Chaetoceros decipiens (10.23), & Chaetoceros coarctatus (6.82).*

Station code	Population (No/l)	Faunal Groups	*Percentage of species contribution*
EMPL 8	3456	15	*Biddulphia regia (10.94), Biddulphia sinensis (6.25), Rhizosolenia imbricata (7.81), Coscinodiscus centralis (14.06), Ceratium arcticum (6.25), Ceratium fusus (4.69), Thalassionema frauenfeldii (7.81), Guinardia flaccida (1.56), Guinardia striata (3.13), Skeletonema costatum (6.25), Asterionella japonica (4.69), Pleurosigma sp. (7.81), Nitzschia sp. (3.13), Chaetoceros decipiens (6.25) & Chaetoceros coarctatus (9.38).*
EMPL 9	3480	13	*Biddulphia regia (5.00), Rhizosolenia imbricata (16.67), Rhizosolenia stolterfothii (6.67), Rhizosolenia calcar-avis (8.33), Ceratium longiceps (5.00), Dinophysis caudate (6.67), Thalassionema frauenfeldii (1.67), Guinardia flaccida (15.00), Streptotheca thamensis (10.00), Pleurosigma sp (3.33), Chaetoceros decipiens (15.00), Chaetoceros coarctatus (3.33) & Trichodesmium sp. (3.33).*
EMPL 10	2756	15	*Biddulphia regia (5.66), Rhizosolenia imbricata (9.43), Rhizosolenia stolterfothii (5.66), Coscinodiscus radiatus (9.43), Ceratium fusus (9.43), Thalassionema frauenfeldii (1.89), Guinardia flaccida (5.66), Skeletonema costatum (1.89), Asterionella japonica (11.32), Anabaena sp (5.66), Streptotheca thamensis (9.43), Bellerochea malleus (5.66), Pleurosigma sp (1.89), Chaetoceros decipiens (7.55) & Trichodesmium sp. (9.43).*
ENC 2	1064	4	*Anabaena sp (21.05), Spirulina sp. (39.47), Scenedesmus dimorphis (15.79) & Pediastrum duplex (23.68).*

Table 3: Zooplankton population variation along MPL offshore discharge sites and adjoining Ennore creek system during HT

Station code	Population (No/m^3)	Faunal Groups	Major groups (%)
EMPL 1	1476	12	*Calanoid copepods (10.16), Cyclopoid copepods (5.42), Sagitta (3.93), Medusa (1.02), Siphonophores (5.08), Cladocerans (35.57), Mysids (6.78), Brachyuran larvae (2.03), Fish eggs and larvae (3.25), Lucifer (22.02), Polychaete larvae (3.93) & Nauplius (0.81)*
EMPL 2	1638	11	*Calanoid copepods (13.80), Cyclopoid copepods (0.61), Sagitta (2.81), Siphonophores (1.28), Cladocerans (48.35), Appendicularians (1.95), Mysids (8.79), Fish eggs and larvae (0.92), Lucifer (19.54), Polychaete larvae (0.98) & Nauplius (0.98)*

EMPL 3	1731	13	*Calanoid copepods (10.40), Cyclopoid copepods (5.20), Sagitta (7.22), Medusa (1.10), Siphonophores (7.22), Cladocerans (32.93), Appendicularians (6.93), Mysids (1.04), Brachyuran larvae (1.44), Fish eggs and larvae (2.60), Lucifer (21.66), Polychaete larvae (1.44) & Nauplius (0.81)*
EMPL 4	2546	12	*Calanoid copepods (11.00), Cyclopoid copepods (2.08), Sagitta (1.10), Medusa (2.36), Siphonophores (2.55), Cladocerans (40.85), Appendicularians (1.18), Mysids (3.53), Fish eggs and larvae (5.89), Lucifer (21.41), Polychaete larvae (3.34) & Nauplius (4.71)*
EMPL 5	2586	11	*Calanoid copepods (5.08), Cyclopoid copepods (6.03), Sagitta (4.06), Cladocerans (46.40), Appendicularians (1.93), Mysids (3.87), Brachyuran larvae (2.90), Fish eggs and larvae (2.90), Lucifer (17.40), Polychaete larvae (2.90) & Nauplius (5.80)*
EMPL 6	2003	12	*Calanoid copepods (6.14), Cyclopoid copepods (2.15), Sagitta (8.89), Medusa (3.15), Siphonophores (1.05), Cladocerans (37.59), Appendicularians (0.60), Mysids (5.24), Fish eggs and larvae (2.10), Lucifer (26.21), Polychaete larvae (6.14) & Nauplius (0.75)*
EMPL 7	2325	12	*Calanoid copepods (3.53), Cyclopoid copepods (4.65), Sagitta (1.94), Medusa (1.20), Siphonophores (2.49), Cladocerans (52.90), Mysids (9.98), Brachyuran larvae (1.08), Fish eggs and larvae (1.08), Lucifer (15.14), Polychaete larvae (2.49) & Nauplius (3.53)*
EMPL 8	1287	13	*Calanoid copepods (14.69), Cyclopoid copepods (2.18), Sagitta (1.09), Medusa (1.09), Siphonophores (5.59), Cladocerans (40.02), Appendicularians (1.09), Mysids (8.24), Brachyuran larvae (2.10), Fish eggs and larvae (1.09), Lucifer (20.05), Polychaete larvae (1.09) & Nauplius (1.71)*
EMPL 9	1180	12	*Calanoid copepods (7.20), Cyclopoid copepods (6.10), Sagitta (1.53), Medusa (0.76), Siphonophores (3.47), Cladocerans (47.12), Appendicularians (6.10), Mysids (6.44), Fish eggs and larvae (1.69), Lucifer (16.78), Polychaete larvae (1.27) & Nauplius (1.53)*
EMPL 10	1450	11	*Calanoid copepods (10.90), Cyclopoid copepods (2.93), Sagitta (7.59), Medusa (4.69), Siphonophores (9.10), Cladocerans (39.24), Mysids (3.03), Fish eggs and larvae (1.52), Lucifer (10.48), Polychaete larvae (7.59) & Nauplius (3.03)*
ENC 1	630	11	*Calanoid copepods (20.32), Cyclopoid copepods (4.44), Sagitta (1.90), Medusa (0.48), Cladocerans (36.83), Appendicularians (2.22), Mysids (2.38), Fish eggs and larvae (6.83), Lucifer (3.97), Polychaete larvae (12.06) & Nauplius (8.57)*
ENC 2	497	10	*Calanoid copepods (19.72), Cyclopoid copepods (10.46), Medusa (0.40), Cladocerans (41.05), Appendicularians (1.61), Mysids (2.41), Fish eggs and larvae (5.63), Lucifer (3.62), Polychaete larvae (8.05) & Nauplius (7.04)*

Table 4: Zooplankton population variation along MPL offshore discharge sites and adjoining Ennore creek system during LT

Station code	Population (No/m^3)	Faunal Groups	Major groups (%)
EMPL 1	1794	11	*Calanoid copepods (8.03), Cyclopoid copepods (0.89), Medusa (0.89), Siphonophores (3.01), Cladocerans (38.35), Appendicularians (1.78), Mysids (12.19), Fish eggs and larvae (1.74), Lucifer (27.87), Polychaete larvae (1.74) & Nauplius (3.48)*
EMPL 2	2480	12	*Calanoid copepods (8.63), Cyclopoid copepods (0.20), Sagitta (1.39), Medusa (2.78), Siphonophores (1.39), Cladocerans (37.38), Appendicularians (0.48), Mysids (9.73), Fish eggs and larvae (4.17), Lucifer (31.98), Polychaete larvae (1.39) & Nauplius (0.48)*
EMPL 3	2631	10	*Calanoid copepods (3.76), Cyclopoid copepods (2.62), Sagitta (2.20), Cladocerans (47.78), Appendicularians (2.27), Mysids (11.35), Fish eggs and larvae (2.27), Lucifer (24.90), Polychaete larvae (2.27) & Nauplius (0.57)*
EMPL 4	3199	11	*Calanoid copepods (6.31), Cyclopoid copepods (2.56), Sagitta (1.59), Siphonophores (4.78), Cladocerans (61.39), Appendicularians (1.47), Mysids (5.10), Fish eggs and larvae (1.28), Lucifer (13.91), Polychaete larvae (1.03) & Nauplius (0.56)*
EMPL 5	2543	12	*Calanoid copepods (11.84), Cyclopoid copepods (0.98), Harapacticoid (2.91), Medusa (3.97), Siphonophores (5.70), Cladocerans (50.29), Appendicularians (1.30), Mysids (5.27), Fish eggs and larvae (0.71), Lucifer (15.81), Polychaete larvae (0.47) & Nauplius (0.75)*
EMPL 6	2367	12	*Calanoid copepods (6.34), Cyclopoid copepods (3.13), Sagitta (1.35), Medusa (1.31), Siphonophores (3.72), Cladocerans (56.61), Appendicularians (1.86), Mysids (4.06), Fish eggs and larvae (1.31), Lucifer (17.11), Polychaete larvae (2.70) & Nauplius (0.51)*
EMPL 7	2599	11	*Calanoid copepods (20.62), Cyclopoid copepods (0.69), Sagitta (2.46), Siphonophores (3.23), Cladocerans (47.98), Mysids (7.08), Brachyuran larvae (1.61), Fish eggs and larvae (1.73), Lucifer (12.50), Polychaete larvae (1.23) & Nauplius (0.85)*
EMPL 8	3093	12	*Calanoid copepods (15.06), Cyclopoid copepods (2.29), Sagitta (1.33), Medusa (2.29), Siphonophores (2.29), Cladocerans (47.69), Appendicularians (2.29), Mysids (7.25), Fish eggs and larvae (2.29), Lucifer (15.06), Polychaete larvae (1.78) & Nauplius (0.39)*
EMPL 9	2219	12	*Calanoid copepods (13.50), Cyclopoid copepods (1.58), Harapacticoid (0.99) Sagitta (1.44), Medusa (2.43), Siphonophores (0.72), Cladocerans (43.88), Mysids (16.88), Fish eggs and larvae (5.06), Lucifer (8.44), Polychaete larvae (1.69) & Nauplius (3.38)*

EMPL 10	2378	8	*Calanoid copepods (7.69), Cyclopoid copepods (2.56), Medusa (5.13), Siphonophores (2.56), Cladocerans (48.72), Mysids (10.26), Lucifer (20.51) & Nauplius (2.56)*
ENC 1	802	12	*Calanoid copepods (19.45), Cyclopoid copepods (1.50), Harapacticoid (0.50) Sagitta (2.0), Medusa (1.25), Cladocerans (39.40), Appendicularians (1.75), Mysids (2.49), Fish eggs and larvae (7.23), Lucifer (5.49), Polychaete larvae (10.72) & Nauplius (8.23)*
ENC 2	615	11	*Calanoid copepods (17.56), Cyclopoid copepods (0.65), Sagitta (0.81), Medusa (0.81), Cladocerans (46.83), Appendicularians (1.30), Mysids (4.07), Fish eggs and larvae (5.69), Lucifer (7.32), Polychaete larvae (8.46) & Nauplius (6.50)*

Table 5: Benthos population variation along MPL offshore discharge sites and adjoining Ennore creek system during HT

Station code	***Total (Nos./m^2)***	***Percentage of species contribution***
EMPL 1	182	*Tube worm (3.855), Arca sp.(15.38), Anadara granosa (11.54), Meretrix casta (7.69), Donax sp. (23.08), Astarte elliptica (3.85), Meretrix meretrix (15.38), Cerethedia sp. (3.85) & Clithon oualaniense (15.38).*
EMPL 2	91	*Tube worm (7.69), Terebellides sp.(7.69), Angulus tenuis (7.69), Arca sp.(7.69), Anadara granosa (7.69), Meretrix casta (7.69), Donax sp. (15.38), Cerethedia sp. (23.08), Parvanachis obesa (7.69) & Cellena radiata (7.69).*
EMPL 3	98	*Goniada sp.(4.5),Terebellides sp.(2.3), Arca sp.(9.1), Pecten sp.(40.9), Donax sp.(6.8), Meretrix meretrix(2.3), Umbonium vestiarium(27.3), Balanus sp.(2.3),Oliva sp.(4.5).*
EMPL 4	105	*Tube worm (20.00), Terebellides sp. (6.67), Arca sp.(6.67), Anadara granosa (13.33), Donax sp.(13.33), Meretrix meretrix (13.33), Cerethedia sp. (20.00) & Umbonium vestiarium (6.67).*
EMPL 5	133	*Cirratulus cirratus (15.79), Ancistrosyllis sp.(10.53), Tube worm (5.26), Arca sp.(10.53), Anadara granosa(5.26), Donax sp. (10.53), Meretrix meretrix (15.79), Cerethedia sp. (10.53), Umbonium vestiarium (10.53) & Sand Dollar (5.26).*
EMPL 6	140	*Prionospio sp.(5.00), Tube worm (15.00), Angulus tenuis (5.00), Arca sp. (5.00), Anadara granosa (10.00), Donax sp.(15.00), Meretrix meretrix (20.00), Cerethedia sp. (5.00), Umbonium vestiarium(10.00) & Turtella sp. (10.00).*
EMPL 7	329	*Tube worm (6.38), Terebellides sp (4.26), Arca sp. (10.64), Anadara granosa (14.89), Meretrix casta (8.51), Pecten sp. (2.13), Astarte elliptica (4.26), Donax sp. (23.40), Meretrix meretrix (19.15), Cerethedia sp. (2.13) & Umbonium vestiarium (4.26).*
EMPL 8	119	*Tube worm (11.76), Terebellides sp. (5.86), Angulus tenuis (5.88), Arca sp. (5.88), Meretrix casta (11.76), Pecten sp. (5.88), Donax sp.(17.65), Meretrix meretrix (11.76), Cerethedia sp.(11.76), Umbonium vestiarium(5.88) & Oliva sp.(5.88).*

Station code	***Total (Nos./m^2)***	***Percentage of species contribution***
EMPL 9	112	*Terebellides sp. (6.25), Arca sp.(12.50), Anadara granosa (12.50), Meretrix casta (18.75), Donax sp.(31.25), Meretrix meretrix(6.25), Cerethedia sp. (6.25) & Umbonium vestiarium (6.25).*
EMPL 10	189	*Prionospio sp.(3.70), Cirratulus cirratus (3.70), Para heteromastus tenuis (3.70), Tube worm(18.52), Terebellides sp.(7.41), Angulus tenuis (7.41), Arca sp.(7.41), Anadara granosa (11.11), Meretrix casta (14.81), Donax sp.(7.41), Meretrix meretrix(11.11) & Cerethedia sp.(3.70).*
ENC 1	98	*Prionospio sp.(14.29), Angulus tenuis (14.29), Donax sp.(14.29), Meretrix meretrix(14.29), Cerethedia sp.(14.29) & Clithon oualaniense (28.57).*

BEFORE THE NATIONAL GREEN TRIBUNAL (SOUTHERN ZONE) CHENNAI

IN THE MATTER OF:

Original Application No. 19 of 2013 (SZ)

Meenavargal Membattu Sangam ... Applicant

vs

The Chief Secretary, Government of Tamil Nadu, Chennai and Others. ...Respondent(s)

Original Application No. 248/2016 (SZ)

Meenava Thanthai K.R. Selvaraj Kumar, Meenavar Nala Sangam. ... Applicant

vs

The State of Tamil Nadu, Rep.by its Secretary to Government, Chennai and Others

...Respondent(s)

Original Application No. 224 of 2016 (SZ)

Meenava Thanthai K.R. Selvaraj Kumar ... Applicant

vs

The Chief Secretary, Government of Tamil Nadu, Secretariat, Chennai and Others.

... Respondent(s)

Appeal No. 51/2017 (SZ)

M/s. Manali Petrochemicals Limited ... Appellant

vs

The Central Pollution Control Board, New Delhi and Others ... Respondent(s)

Appeal No.52 of 2017 (SZ)

M/s. Manali Petrochemicals Limited ... Appellant

vs

The Central Pollution Control Board, New Delhi and Others. ... Respondent(s)

STATUS REPORT FILED ON BEHALF OF CENTRAL POLLUTION CONTROL BOARD IN COMPLIANCE TO THE HON'BLE TRIBUNAL ORDER DATED MARCH 04, 2021

I, H. D. Varalaxmi, D/o Sh. H.S. Devaiah, Hindu, aged about 51 years and having office at the Regional Directorate – Chennai, Central Pollution Control Board, 2nd Floor, 77-A, Ambattur Industrial Estate, Chennai – 600 058, do hereby solemnly affirm and sincerely state as follows:

2. That I am presently working as Scientist ‘E’ & Regional Director, Regional Directorate - Chennai, Central Pollution Control Board (hereafter called as CPCB) have been authorized to file the status report of M/s Kothari Petrochemical Limited. I am fully conversant with the facts of the case and hence, competent and authorized to depose and swear the present as under:

3. That the Hon’ble National Green Tribunal, Southern Zone Bench, Chennai vide order dated 04.03.2021 has directed CPCB to ascertain as to whether the recommendations has been complied with by the Kothari Petrochemical Companies and submit a current status of the same before the next hearing. The status report is enclosed as Annexure.

DEPONENT

H.D. VARALAXMI, M.Tech
Regional Director
CENTRAL POLLUTION CONTROL BOARD
(MoEF & CC, Govt. of India)
Regional Directorate (Chennai)
2nd Floor, 77-A, South Avenue Road,
Ambattur Industrial Estate, Chennai - 600 058

VERIFICATION

It is verified that the content of this report is based on the observations of the joint committee and nothing has been concealed therein.

Signed and verified on this 18th day of March, 2021 at Chennai

DEPONENT

H.D. VARALAXMI, M.Tech
Regional Director
CENTRAL POLLUTION CONTROL BOARD
(MoEF & CC, Govt. of India)
Regional Directorate (Chennai)
2nd Floor, 77-A, South Avenue Road,
Ambattur Industrial Estate, Chennai - 600 058

COUNSEL FOR CPCB

Status Report of M/s Kothari Petrochemical Limited, Manali

(as per Hon'ble Tribunal, Southern Zone, Chennai order dated 04.03.2021 in OA nos. 19/2013, 224/2016, 248/2016 and Appeal nos. 51/2017 & 52/2017)

1. Background:

The Honourable National Green Tribunal, Southern Zone, Chennai, in the matter of OA nos. 19/2013, 224/2016, 248/2016 and appeal nos. 51/2017 & 52/2017 directed on 04.03.2021 as;

"The Central Pollution Control Board (CPCB) is directed to ascertain as to whether the recommendations has been complied with by the Kothari Petrochemical Companies and submit a current status of the same before the next hearing date."

2. Sampling & Analysis:

In compliance to the Hon'ble tribunal order, the Central Pollution Control Board, Regional Directorate - Chennai has carried out inspection & monitoring of source emission and ETP outlet on March 11, 2021.

i) Third stage RO reject sample (which is being discharged to marian outfall) was collected and analyzed. The analysis report reveals that all parameters meeting the prescribed discharge norms.

Parameters	Outlet	Marine disposal standards
pH	7.4	**5.5-9.0**
TSS mg/L	BDL	**100**
COD mg/L	198	**250**
BOD mg/L	28	**100**
Fluoride mg/L	0.86	**15**
Sulphate mg/L	394	**1000**
Free ammonia (as NH_3) mg/L	1.2	**05**
Ammonia as N mg/L	29.2	**50**
Total Kjeldahl Nitrogen as N	31.4	**100**

(ii) Monitoring of source emission carried out in the stack connected to CPP boiler in which rice husk is used as fuel. The analysis results show that PM emission is within the prescribed limit.

Parameters	CPP Boiler	Standard
PM mg/Nm^3	24.3	**50**
Sulphur dioxide mg/Nm^3	16.6	-
Oxides of nitrogen mg/Nm^3	201	-

3. Status of Recommendations made by Committee:

Recommendations	Status
All units are required to install flow meters to maintain proper records of water consumption, effluent generation from different section of process along with material balance and water balance and same to be made available to TNPCB/CPCB during inspection.	The unit has installed flow meters at Inlet of ETP, RO Feed, RO Reject Stage 1, 2 & 3, RO permeate (combined all stage) and Final discharge point.
From the analysis results, it shows that except sulphate and ammonical nitrogen, remaining parameters are meeting the prescribed standards.	All parameters are meeting the prescribed discharge norms.
The analysis results show that the emissions are within the standard norms except PM of M/s KPL CPP Boiler stack.	PM of CPP boiler is meeting the prescribed norms.
M/s Kothari Petrochemicals Ltd., shall be directed to remit the interim compensation of Rs. 24 Lakhs for non-compliance.	Notice is not issued by TNPCB to remit the compensation of Rs 24 lakhs calculated by the committee.

TNPCB shall be direct to issue notice to the industry, M/s Kothari Petrochemical Limited to remit the environmental compensation of Rs. 24 Lakhs as recommended in the joint committee report.

R. Rajkumar
Scientist D
Central Pollution Control Board
Regional Directorate (Chennai)

BEFORE THE NATIONAL GREEN TRIBUNAL (SOUTHERN ZONE) CHENNAI

Original Application No. 19 of 2013 (SZ)

Meenavargal Membattu Sangam ... Applicant
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Appeal No. 51/2017 (SZ)

M/s. Manali Petrochemicals Limited
... Appellant
vs
The Central Pollution Control Board, New Delhi and Others ... Respondent(s)

Appeal No.52 of 2017 (SZ)

M/s. Manali Petrochemicals Limited
... Appellant
vs
The Central Pollution Control Board, New Delhi and Others. ... Respondent(s)

STATUS REPORT FILED ON BEHALF CENTRAL POLLUTION CONTROL BOARD (CPCB)

Advocate D. S. Ekambaram

COUNSELS FOR CPCB