

**BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL
SOUTHERN BENCH, CHENNAI**

**Original Application No. 199 of 2021(SZ)
& I.A No.96 of 2022 (SZ)**

In the matter of:

Sri. Shankar Narayanan Bala Krishnan & 21 Ors

..... Applicants

Versus

State of Telangana & 9 Ors

.....Respondent(S)

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Place: Chennai

Date: 16.04.2024



H.D. Varalaxmi

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 - 600 054

**A REPORT OF CENTRAL POLLUTION CONTROL BOARD IN COMPLIANCE TO
DIRECTION OF HON'BLE NGT ORDER DATED 01/02/2024 IN ORIGINAL
APPLICATION NO 199 OF 2021 (SZ) & I.A NO 96 OF 2022 (SZ) IN THE MATTER
OF SRI SHANKAR NARAYANA BALA KRISHNA, TELANGANA AND ORS Vs
STATE OF TELANGANA REP BY ITS CHIEF SECRETARY, HYDERABAD AND
ORS)**



**CENTRAL POLLUTION CONTROL BOARD
Parivesh Bhawan, East Arjun Nagar, Delhi-110032**

APRIL, 2024

1.0 BACKGROUND

Hon'ble NGT (SZ) Chennai vide order dated 01.02.2024 in O.A No 199 of 2021 (SZ) & I.A No 96 of 2022 in the matter of Sri Shankar Narayana Bala Krishna, Telangana and Ors Versus State of Telangana, Rep. by its Chief Secretary, Hyderabad & Ors has issued following directions:

“5. Therefore, it would be appropriate for the CPCB to direct the GHMC or the State Pollution Control Board to construct additional collection wells of the leachate for the purpose of treatment which would avoid contamination of downstream water bodies.

6. Besides, the legal and technical aspects, the CPCB had given its observation on the report of the IIT Bombay. Of the 10 Experts engaged by the CPCB to prepare a report, comments had been received only from 5 Experts and the others' reports are awaited. The experts' opinion in this regard is awaited to address the following aspects namely, (i) Environmental and economic benefits of the investment already made, (ii) Net damage (soil, surface & groundwater) that may continue to occur during the capping period, including the time period for which leachate is expected to be generated, (iii) Hydro-geological study to assess the impact of leachate generated on the surface/groundwater bodies and (iv) a detailed assessment of observation made in the report of the IIT Bombay.

11. The leachate that is entered into the downstream water bodies has to be remediated, for which, the CPCB has to furnish a technical report.”

2.0 ACTION TAKEN BY CPCB

I. CPCB to direct the GHMC or the State Pollution Control Board to construct additional collection wells of the leachate for the purpose of treatment which would avoid contamination of downstream water bodies.

In compliance to NGT direction dated 01.02.2024, CPCB directed Telangana State Pollution Control Board (TSPCB) to comply with aforesaid directions of Hon'ble NGT directions and to submit action taken report (ATR) to CPCB within 15 days' time vide letter dated 29.02.2024. on non-receipt of the ATR from TSPCB, once again CPCB addressed reminder letter dated 18.03.2024 to provide requisite ATR within stipulated timeline and to ensure compliance of Hon'ble NGT directions on priority. The copies of the letters dated 29.02.2024 and 18.03.2024 are attached as *Annexures 1 & 2* respectively.

Based on the letters of CPCB, TSPCB issued following directions to Greater Hyderabad Municipal Corporation (GHMC) and submit the compliance report within 7 days on 15.03.2024.

The copy of the direction is enclosed as **Annexure 3**.

1. The facility shall construct additional leachate collection wells for the purpose of treatment which would avoid contamination of downstream water bodies.
2. The facility shall quantify the daily waste dumped in the reclaimed area and how it is treated.
3. The facility shall submit detailed report whether the leachate generated from the fresh waste is allowed to be collected in the same leachate collection wells and adequacy of the same.
4. The facility shall submit the details of the depth from which gas is being tapped, further GHMC shall explore the possibility of going deeper for collecting the gas as recommended by IIT, Bombay.
5. The GHMC shall not allow reclaimed land for capping.
6. The leachate that is entered into the downstream water bodies has to be remediated.

In response to the direction issued by TSPCB, GHMC submitted the status of action taken report on 30.03.2024 (Copy attached as **Annexure -4**), the compliance status is given in table 1;

Table 1: Status of Action/Compliance submitted by GHMC in response to TSPCB directions 15.03.2024

S. No.	Directions issued by TSPCB	Status of action/compliance by GHMC
1	The facility shall construct additional leachate collection wells for the purpose of treatment which would avoid contamination of downstream water bodies.	Environment Protection Training & Research Institute (EPTRI), a quasi-government institution acting as Independent Engineer (IE) for the project since Aug 2010, is monitoring the Integrated Municipal Solid Waste Management Project of Greater Hyderabad Municipal Corporation. The leachate collection system of the capped legacy dump has been developed as per the designs approved by the Environment Protection Training & Research Institute as an independent

		body with technical expertise in the field of environmental monitoring and hence it is adequate.
2	The facility shall quantify the daily waste dumped in the reclaimed area and how it is treated.	In the Financial Year 2023-24 (upto Feb'24), an average of about 7,465 Tons Per Day of MSW received from Greater Hyderabad Municipal Corporation limits is treated and disposed scientifically.
3	The facility shall submit detailed report whether the leachate generated from the fresh waste is allowed to be collected in the same leachate collection wells and adequacy of the same.	No, there is a separate collection network for the leachate generated from fresh waste. The leachate generated during the waste treatment process i.e., from Compost pad, RDF storage, Sanitary landfill, Capped area, MSW pit of WTE is collected through a network of drains and sending to intermediate leachate collection sumps and then into a common leachate collection pond. The leachate thus collected is pretreated at 1000 KLD capacity plant established in the site and then at 600 KLD Stage-I Reverse Osmosis (RO) System. The rejects from Stage I RO is treated in 500 KLD Stage II RO. The rejects from Stage II RO process are treated at the 150 KLD Multi Effect Evaporator- 45 KLD Agitated Thin Film Drier system and thus all the leachate generated from fresh waste is collected separately and treated as per norms. The permeate from RO is used to maintain greenery at the site and the condensate from Multi Effect Evaporator - Agitated Thin Film Drier is used for bottom ash quenching. The reject which is in the form of solid is mixed with RDF and utilized as fuel in the Waste to Energy Plan
4	The facility shall submit the details of the depth from which gas is being tapped, further GHMC shall explore the possibility of going deeper for collecting the gas as recommended by IIT,	Greater Hyderabad Municipal Corporation has dug gas extraction bore holes ranging from a depth of 36m to 12m based on the height of the capped dump from bottom rock profile as

	Bombay.	<p>approved by Environment Protection Training & Research Institute, the IE to the project.</p> <p>The bore wells were drilled into dump based on grid and surface area availability, the base terrain of capped dumpsite is uneven because of the old rock profile.</p> <p>Gas being lighter in nature shall move in the upward directions in the capped dump and shall get collected into the bore wells locate all over the surface area. Hence, the need for drilling deeper till bottom of dump is not required. IIT, Bombay has not given any recommendation in its report for digging deeper borewells</p>
5	The GHMC shall not allow reclaimed land for capping	The reclaimed land is being used to process the Municipal Solid Waste and scientifically dispose the rejects strictly in compliance to the Solid Waste Management Rules, 2016
6	The leachate that is entered into the downstream water bodies has to be remediated.	The leachate/ contaminated storm water in Malkaram natural tank and the buffer/ artificial storage ponds created to prevent overflow of leachate into downstream lakes is being treated. As on 20.03.2024, 57.5 % of the estimated quantity of 8,49,780 KL of the leachate contained in the above said ponds is treated

II. Meeting with expert members in compliance to Hon'ble NGT order dated 01.02.2024

A meeting with expert members was held on March 01, 2024 at 12:30PM through video conference to seek the opinion on the directions of NGT in Para 6 of the order dated 01.02.2024 which states that *“Besides, the legal and technical aspects, the CPCB had given its observation on the report of the IIT Bombay. Of the 10 Experts engaged by the CPCB to prepare a report, comments had been received only from 5 Experts and the others’ reports are awaited. The*

experts' opinion in this regard is awaited to address the following aspects namely,

- (i) *Environmental and economic benefits of the investment already made,*
- (ii) *Net damage (soil, surface & groundwater) that may continue to occur during the capping period, including the time period for which leachate is expected to be generated,*
- (iii) *Hydro-geological study to assess the impact of leachate generated on the surface/groundwater bodies and*
- (iv) *A detailed assessment of observation made in the report of the IIT Bombay”.*

CPCB emailed the Hon'ble NGT order dated 01.02.2024 to all the expert members on 19.02.2024 and requested to send the comments on the above afore said direction. The comments were received only from four expert members and all the members attended the meeting except Ms. Bineesha. During discussion it was pointed out from the members that environmental and economic benefits of the investment cannot be directly estimated as it requires times series data with respect to ground water, air, soil, odour and water at the site and its surroundings. Hence after long deliberations, it was recommended by expert members and concluded that TSPCB shall identify suitable agencies/institutions to carry out a comprehensive study to address the above mentioned points directed by Hon'ble NGT. The copy of the minutes of meeting held on March 01, 2024 along with list of participants is annexed as *Annexure 5*.

III. The leachate that is entered into the downstream water bodies has to be remediated, for which, the CPCB has to furnish a technical report

In the case of O.A no. 06/2012 in the matter of Manoj Mishra Vs Union of India & Ors CPCB submitted a report entitled “*Alternative Treatment Technologies for wastewater treatment in Drains*” during the year 2020, the report was prepared in consultation with expert organizations. Hence, it was decided that same members from expert organization shall be consulted for preparation of a technical report as per NGT direction dated 01.2.2024. CPCB convened a meeting on March 01, 2024 at 3:30PM through video conference with officials of National Environmental Engineering Research Institute (NEERI), Hyderabad Zonal Centre, Institute of Chemical Technology (ICT), Mumbai and Centre for Environment Management of Degraded Ecosystems (CEMDE), University of Delhi for preparation of a technical report on the remediation of the downstream water bodies contaminated with leachate near Jawahar Nagar

dumpsite in Hyderabad.

During the meeting, the analysis results of the cheruvu/lakes were discussed and summarized that the water quality of lakes/ Cheruvu falls in class D, E and B of the Designated Best Use Water Quality Criteria and requires immediate intervention for mitigation of pollution load. In view of the lake water quality, the treatment technologies which have been implemented for remediation of polluted lakes in the country and which can be considered by the concerned State Authorities were also discussed along with case studies and approximate cost for the remediation of the lakes.

Based on the discussion in the meeting and in consultation with expert organization, CPCB prepared a technical report **“REMEDIATION OF WATER BODIES /LAKES”** in compliance to NGT direction dated 01.02.2024 for remediation of downstream water bodies contaminated by leachate. The copy of the report prepared by CPCB is annexed as *Annexure 6*. The conclusion of the report is as below:

- i. The proposed technologies shall be applicable for only lake water remediation.
- ii. Detailed assessment of the aforementioned technologies to be done by the concerned authorities w.r.t techno economic feasibility for identification of best technology for remediation of lakes.
- iii. All sources of contamination of lake water, including contamination of lakes through direct inflow of leachate as well through groundwater contaminated with leachate, to be completely cutoff prior to implementation of the identified technology for remediation of lakes.
- iv. Continual monitoring of water quality of lakes & ponds for physio - chemical, bacteriological and heavy metals parameters to be done by State Pollution Control Board during and post- remediation stage of lake.
- v. Minutes of the meeting to be referred and the concerned organizations viz. National Environmental Engineering Research Institute (NEERI), Hyderabad Zonal Centre, Institute of Chemical Technology (ICT), Mumbai and Centre for Environment Management of Degraded Ecosystems (CEMDE), University of Delhi may be contacted for further information.

3.0 Conclusions:

- i. CPCB addressed a letters to TSPCB directing to comply with Hon'ble NGT (SZ) order dated 01.02.2024 to construct additional collection wells for the purpose of treatment which would avoid contamination of downstream water bodies. In turn TSPCB issued direction to GHMC to comply with aforesaid orders. In response, ***GHMC submitted its reply to the direction stating that existing leachate collection system is adequate since the leachate collection systems are designed, approved and monitored by Environment Protection Training & Research Institute (EPTRI).***
- ii. A meeting was held with expert members to deliberate as directed by Hon'ble NGT in Para 6 of its order dated 01.02.2024 and it was pointed out from the expert members that environmental and economic benefits of the investment cannot be directly estimated as it requires times series data with respect to ground water, air, soil, odour and water at the site and its surroundings. Hence after long deliberations, ***it was recommended by expert members that TSPCB shall identify suitable agencies/institutions to carry out a comprehensive study to address the above mentioned points directed by Hon'ble NGT.***
- iii. CPCB convened a meeting with officials of expert organization such as NEERI, Hyderabad, ICT, Mumbai and CEMDE, University of Delhi for preparation of a technical report on the remediation of the downstream water bodies contaminated with leachate near Jawahar Nagar dumpsite in Hyderabad. After analyzing water quality of the cheruvu/lakes, the treatment technologies which have been implemented for remediation of polluted lakes in the country were discussed along with case studies. Based on the discussion in the meeting and in consultation with expert organization, CPCB prepared a technical report on **“Remediation of Water Bodies /Lakes”** so that concerned State Government Authority/TSPCB can adopt suitable treatment technology by assessing techno economic feasibility for remediation of lakes/cheruvu contaminated by leachate.

H. D. Zhu



केन्द्रीय प्रदूषण नियंत्रण बोर्ड
CENTRAL POLLUTION CONTROL BOARD
पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय, भारत सरकार
MINISTRY OF ENVIRONMENT, FOREST & CLIMATE CHANGE, GOVT. OF INDIA

Hon'ble NGT matter

File No.: CM-13013/19/2021-TECH-RD-CHENNAI-RD
(Chennai)

29/02/2024

To,

The Member Secretary
Telangana State Pollution Control Board
Sanath Nagar Paryavarana Bhavan,
A-3, Industrial Estate, Sanathnagar,
Hyderabad – 500018 (Telangana)
Email: ms-tspcb@telangana.gov.in

Sub: - Hon'ble NGT order issued vide dated 1.2.2024 in O.A No 199 of 2021(SZ) & I.A No 96 of 2022 (SZ) in the matter of Sri Shankar Narayana Bala Krishna Telangana and Ors. Vs State of Telangana Rep by its Chief Secretary, Hyderabad and Ors. – reg

Sir,

Enclosed, please find Hon'ble NGT (SZ) order issued vide dated 01.02.2024 (copy enclosed), wherein, relevant para is reproduced below:

"5. Therefore, it would be appropriate for the CPCB to direct the GHMC or the State Pollution Control Board to construct additional collection wells of the leachate for the purpose of treatment which would avoid contamination of downstream water bodies.

In view of above you are hereby directed to comply with aforementioned Directions of Hon'ble NGT dated 1.2.2024 and submit the action taken to CPCB within 15 days of issue of the letter.

Yours faithfully,

(Divya Sinha)

Director & Divisional Head, UPC-II

Encl: As above

1. The Commissioner
Greater Hyderabad Municipal Corporation (GHMC)
CC Complex, Tank Bund Road
Lower Tank Bund, Hyderabad
E-mail: Lower Tank Bund, Hyderabad
Email: commissionerghmc@gov.in

For information and to ensure compliance of Hon'ble NGT order dated 1.2.2024. Action Taken Report (ATR) be submitted to TSPCB please.

Contd.

'परिवेश भवन' पूर्वी अर्जुन नगर, दिल्ली-110032

Parivesh Bhawan, East Arjun Nagar, New Delhi - 110032

दूरभाष/Tel: 43102030, 22305792, वेबसाइट/Website : www.cpcb.nic.in

-2-

2. **The Regional Director**
Regional Directorate – Chennai
Ambattur Industrial Estate,
Chennai, Tamil Nadu-600058 For information please
3. DH-Law For information please
4. PS to MS For information of the MS, please


(Divya Sinha)

o/c

Item No.05:-

**BEFORE THE NATIONAL GREEN TRIBUNAL
SOUTHERN ZONE, CHENNAI**

(Through Video Conference)

**Original Application No.199 of 2021(SZ) &
I.A. No. 96 of 2022(SZ)**

IN THE MATTER OF:

Sri. Shankar Narayana Bala Krishna
Telangana and Ors.

...Applicant(s)

Versus

State of Telangana,
Rep. by its Chief Secretary
Hyderabad and Ors.

...Respondent(s)

Date of hearing: 01.02.2024.

CORAM:

HON'BLE Smt. JUSTICE PUSHPA SATHYANARAYANA, JUDICIAL MEMBER

HON'BLE Dr. SATYAGOPAL KORLAPATI, EXPERT MEMBER

For Applicant(s): Mr. Sravan Kumar.

For Respondent(s): Mrs. H. Yasmeen Ali for R1, R5, R7, R8.
Mr. Meyappan represented
Mrs. ME. Sarashwathy for R2.
M/s. N. Nathami for R3.
Ms. C.P. Kavitha Renjini represented
Mr. T. Sai Krishnan for R4.
Mr. Om Prakash, Senior Advocate along with
Mr. Jaiharisudhan for R6.
M/s. Ritika Singhal, Avinash Desai,
Shaswant for R9 & R10.

ORDER

1. The learned counsel appearing for the Greater Hyderabad Municipal Corporation (GHMC) referred to the report of the Central Pollution Control Board (CPCB) dated 25.09.2023.
2. The report states that the CPCB has identified 10 Experts in the field of Solid Waste Management and certain recommendations were given. A field inspection of the Jawahar Nagar dumpsite was also held in September 2023 along with the experts and officials from the Telangana State Pollution Control Board as well as the Central Pollution Control Board.
3. The major observation during the field visit is that the solid waste of 12 Million Tonnes accumulated in an area of 339 Acres of land was capped at 125 Acres and the balance of 214 Acres of land was reclaimed. The said 214 Acres which are reclaimed is utilized for the installation and operation of Integrated Solid Waste Management of fresh solid waste generated in the GHMC area. The 125 Acres of land which is capped generates hazardous contamination with the leachate generated from the dumpsite, for which, adequate collection wells should have been constructed.
4. It was also observed that the generation of the leachate from the capped dumpsite was seen by the team and it was flowing to the garland drain for collection of storm water. Though the photographs furnished show the leachate collection system was installed for the collection of the leachate generated at the periphery, it does not appear to be adequate.

5. Therefore, it would be appropriate for the CPCB to direct the GHMC or the State Pollution Control Board to construct additional collection wells of the leachate for the purpose of treatment which would avoid contamination of downstream water bodies.
6. Besides, the legal and technical aspects, the CPCB had given its observation on the report of the IIT Bombay. Of the 10 Experts engaged by the CPCB to prepare a report, comments had been received only from 5 Experts and the others' reports are awaited. The experts' opinion in this regard is awaited to address the following aspects namely, (i) Environmental and economic benefits of the investment already made, (ii) Net damage (soil, surface & groundwater) that may continue to occur during the capping period, including the time period for which leachate is expected to be generated, (iii) Hydro-geological study to assess the impact of leachate generated on the surface/groundwater bodies and (iv) a detailed assessment of observation made in the report of the IIT Bombay.
7. During the hearing, Mr. Srinivas Reddy - Executive Engineer, who appeared on Video Conference, stated that fresh dumping is happening in the balance of the reclaimed land.
8. Surprisingly, the leachate from the fresh waste also is generated which has to be addressed by the GHMC. In this regard, we direct the GHMC to give a detailed report as to (i) how much daily waste is dumped in the reclaimed area and how are they treated, (ii) whether the leachate generated from the fresh waste is

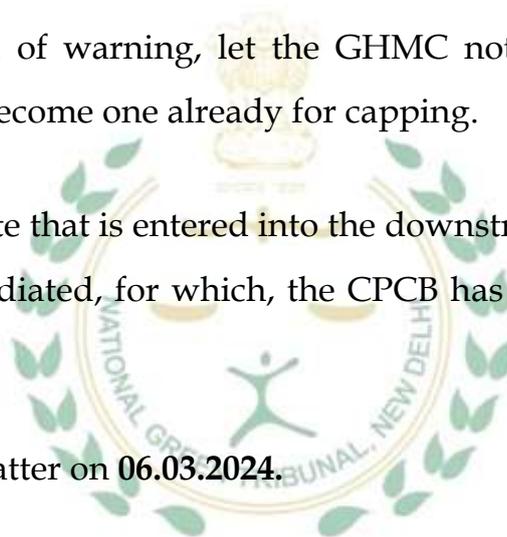
allowed to be collected in the same leachate collection wells and the adequacy of the same.

9. The other major impact of the capping is the leakage of gas. Whether the leakage of gas is generated from the capped area is tapped and utilized. Let the report also state about the depth from which the gas is being tapped and if it is only for a certain distance, let the GHMC also explore the possibility of going deeper for collecting the gas, as had been recommended by the IIT Bombay.

10. As a word of warning, let the GHMC not allow the reclaimed land also become one already for capping.

11. The leachate that is entered into the downstream water bodies has to be remediated, for which, the CPCB has to furnish a technical report.

12. Post the matter on 06.03.2024.



Sd/-

Smt. Justice Pushpa Sathyanarayana, JM

Sd/-

Dr. Satyagopal Korlapati, EM

O.A. No.199/2021(SZ)&
I.A. No.96/2022 (SZ)
01st February, 2024. AD.



केन्द्रीय प्रदूषण नियंत्रण बोर्ड
CENTRAL POLLUTION CONTROL BOARD
पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय, भारत सरकार
MINISTRY OF ENVIRONMENT, FOREST & CLIMATE CHANGE, GOVT. OF INDIA

Hon'ble NGT Matter
Reminder

File No.: CM-13013/19/2021-TECH-RD-CHENNAI-RD(Chennai)

Date: 18/03/2024

To,

The Member Secretary
Telangana State Pollution Control Board
Sanath Nagar Paryavarana Bhavan,
A-3, Industrial Estate, Sanathnagar.
Hyderabad — 500018 (Telangana)
Email: ms-tspcb@telangana.gov.in

Sub: - Hon'ble NGT order issued vide dated 1.2.2.024 in O.A No 199 of 2021(SZ) & I.A No 96 of 2022 (SZ) in the matter of Sri Shankar Narayana Bala Krishna Telangana and Ors. Vs State of Telangana Rep by its Chief Secretary, Hyderabad and Ors. - reg

Ref: - CPCB Letter of even no. CM-13013/19/2021-TECH-RD-CHENNAI-RD(Chennai) dated 29/02/2024

Sir,

This is in reference to CPCB's earlier letter on above mentioned subject wherein you were directed to provide Action Taken Report (ATR) for compliance of Hon'ble NGT direction dated 1.2.2024. Response and ATR on the matter, still has not been received from your office.

It is therefore requested to provide the requisite ATR within the stipulated timeline on priority to ensure compliance of Hon'ble NGT order.

Yours faithfully,

(Divya Sinha)

Director & Divisional Head, UPC-II

Encl: As above

Copy to:

- 1 The Commissioner : For information and to provide ATR
Greater Hyderabad Municipal Corporation to TSPCB.
(GHMC)
CC Complex, Tank Bund Road Tank
E-mail: Lower Tank Bund, Hyderabad
Email: commissioner-ghmc@gov.in

‘परिवेश भवन’ पूर्वी अर्जुन नगर, दिल्ली-110032

Parivesh Bhawan, East Arjun Nagar, New Delhi - 110032

दूरभाष/Tel: 43102030, 22305792, वेबसाईट/Website : www.cpcb.nic.in

-2-

- 2 The Regional Director : For information & follow up with
Regional Directorate — Chennai
Ambattur Industrial Estate,
Chennai, Tamil Nadu-600058
TSPCB, please
- 3 PS to MS : kind information of 'MS' Please.


✓ (Divya Sinha)

o/c



केन्द्रीय प्रदूषण नियंत्रण बोर्ड
CENTRAL POLLUTION CONTROL BOARD
पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय, भारत सरकार
MINISTRY OF ENVIRONMENT, FOREST & CLIMATE CHANGE, GOVT. OF INDIA

Hon'ble NGT matter

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To,

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Email: ms-tspcb@telangana.gov.in

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Sir,

Enclosed, please find Hon'ble NGT (SZ) order issued vide dated 01.02.2024 (copy enclosed), wherein, relevant para is reproduced below:

"5. Therefore, it would be appropriate for the CPCB to direct the GHMC or the State Pollution Control Board to construct additional collection wells of the leachate for the purpose of treatment which would avoid contamination of downstream water bodies.

In view of above you are hereby directed to comply with aforementioned Directions of Hon'ble NGT dated 1.2.2024 and submit the action taken to CPCB within 15 days of issue of the letter.

Yours faithfully,

(Divya Sinha)

Director & Divisional Head, UPC-II

Encl: As above

1. The Commissioner
Greater Hyderabad Municipal Corporation (GHMC)
CC Complex, Tank Bund Road
Lower Tank Bund, Hyderabad
E-mail: Lower Tank Bund, Hyderabad
Email: commissionerghmc@gov.in

For information and to ensure compliance of Hon'ble NGT order dated 1.2.2024. Action Taken Report (ATR) be submitted to TSPCB please.

Contd.

'परिवेश भवन' पूर्वी अर्जुन नगर, दिल्ली-110032

Parivesh Bhawan, East Arjun Nagar, New Delhi - 110032

दूरभाष/Tel: 43102030, 22305792, वेबसाइट/Website : www.cpcb.nic.in

-2-

2. **The Regional Director**
Regional Directorate – Chennai
Ambattur Industrial Estate,
Chennai, Tamil Nadu-600058 For information please
3. DH-Law For information please
4. PS to MS For information of the MS, please


(Divya Sinha)

o/c

Item No.05:-

**BEFORE THE NATIONAL GREEN TRIBUNAL
SOUTHERN ZONE, CHENNAI**

(Through Video Conference)

**Original Application No.199 of 2021(SZ) &
I.A. No. 96 of 2022(SZ)**

IN THE MATTER OF:

Sri. Shankar Narayana Bala Krishna
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...Applicant(s)

Versus

State of Telangana,
Rep. by its Chief Secretary
Hyderabad and Ors.

...Respondent(s)

Date of hearing: 01.02.2024.

CORAM:

HON'BLE Smt. JUSTICE PUSHPA SATHYANARAYANA, JUDICIAL MEMBER

HON'BLE Dr. SATYAGOPAL KORLAPATI, EXPERT MEMBER

For Applicant(s): Mr. Sravan Kumar.

For Respondent(s): Mrs. H. Yasmeen Ali for R1, R5, R7, R8.
Mr. Meyappan represented
Mrs. ME. Sarashwathy for R2.
M/s. N. Nathami for R3.
Ms. C.P. Kavitha Renjini represented
Mr. T. Sai Krishnan for R4.
Mr. Om Prakash, Senior Advocate along with
Mr. Jaiharisudhan for R6.
M/s. Ritika Singhal, Avinash Desai,
Shaswant for R9 & R10.

ORDER

1. The learned counsel appearing for the Greater Hyderabad Municipal Corporation (GHMC) referred to the report of the Central Pollution Control Board (CPCB) dated 25.09.2023.
2. The report states that the CPCB has identified 10 Experts in the field of Solid Waste Management and certain recommendations were given. A field inspection of the Jawahar Nagar dumpsite was also held in September 2023 along with the experts and officials from the Telangana State Pollution Control Board as well as the Central Pollution Control Board.
3. The major observation during the field visit is that the solid waste of 12 Million Tonnes accumulated in an area of 339 Acres of land was capped at 125 Acres and the balance of 214 Acres of land was reclaimed. The said 214 Acres which are reclaimed is utilized for the installation and operation of Integrated Solid Waste Management of fresh solid waste generated in the GHMC area. The 125 Acres of land which is capped generates hazardous contamination with the leachate generated from the dumpsite, for which, adequate collection wells should have been constructed.
4. It was also observed that the generation of the leachate from the capped dumpsite was seen by the team and it was flowing to the garland drain for collection of storm water. Though the photographs furnished show the leachate collection system was installed for the collection of the leachate generated at the periphery, it does not appear to be adequate.

5. Therefore, it would be appropriate for the CPCB to direct the GHMC or the State Pollution Control Board to construct additional collection wells of the leachate for the purpose of treatment which would avoid contamination of downstream water bodies.
6. Besides, the legal and technical aspects, the CPCB had given its observation on the report of the IIT Bombay. Of the 10 Experts engaged by the CPCB to prepare a report, comments had been received only from 5 Experts and the others' reports are awaited. The experts' opinion in this regard is awaited to address the following aspects namely, (i) Environmental and economic benefits of the investment already made, (ii) Net damage (soil, surface & groundwater) that may continue to occur during the capping period, including the time period for which leachate is expected to be generated, (iii) Hydro-geological study to assess the impact of leachate generated on the surface/groundwater bodies and (iv) a detailed assessment of observation made in the report of the IIT Bombay.
7. During the hearing, Mr. Srinivas Reddy - Executive Engineer, who appeared on Video Conference, stated that fresh dumping is happening in the balance of the reclaimed land.
8. Surprisingly, the leachate from the fresh waste also is generated which has to be addressed by the GHMC. In this regard, we direct the GHMC to give a detailed report as to (i) how much daily waste is dumped in the reclaimed area and how are they treated, (ii) whether the leachate generated from the fresh waste is

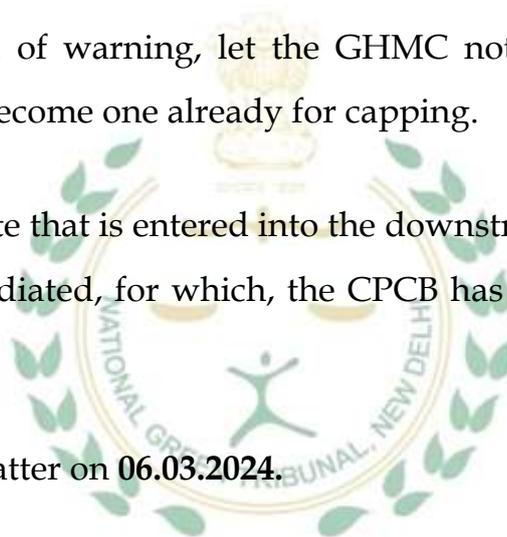
allowed to be collected in the same leachate collection wells and the adequacy of the same.

9. The other major impact of the capping is the leakage of gas. Whether the leakage of gas is generated from the capped area is tapped and utilized. Let the report also state about the depth from which the gas is being tapped and if it is only for a certain distance, let the GHMC also explore the possibility of going deeper for collecting the gas, as had been recommended by the IIT Bombay.

10. As a word of warning, let the GHMC not allow the reclaimed land also become one already for capping.

11. The leachate that is entered into the downstream water bodies has to be remediated, for which, the CPCB has to furnish a technical report.

12. Post the matter on 06.03.2024.



Sd/-

Smt. Justice Pushpa Sathyanarayana, JM

Sd/-

Dr. Satyagopal Korlapati, EM

O.A. No.199/2021(SZ)&
I.A. No.96/2022 (SZ)
01st February, 2024. AD.



TELANGANA STATE POLLUTION CONTROL BOARD

Paryavarana Bhavan, A-III, Industrial Estate,
Sanathnagar, Hyderabad-500 018
Phones : 040-23887500 Fax: 040 – 23887519.

BY REGD. POST WITH ACK. DUE

Order No.MSW-17/TSPCB/MSW/HO/2024-

Dt:15.03.2024

Sub : TSPCB – **M/s. Hyderabad Integrated MSW Ltd., Sy.No.173, Jawaharnagar(V), Shameerpet(M), Medchal-Malkajgiri District** – Hon'ble NGT O.A.No.199 of 2021 (SZ) & I.A No. 96 of 2022 in the matter of Sri Shankar Narayan Bala Krishna Telangana and Ors. Vs State of Telangana Rep by its Chief Secretary, Hyderabad and Ors – **Directions** – Issued – Reg.

Ref : 1. CFO & HWA Order dated 29.09.2023 with validity up to 31.07.2028.
2. Inspection of the facility by CPCB constituted Expert Committee in the month of September 2023.
3. Hon'ble NGT Interim orders dt: 01.02.2024 in OA No. 199 of 2021(SZ) & I.A No. 96 of 2022(SZ).
4. CPCB Lr toms, TSPCB dt: 29.02.2024.

* * * * *

1. M/s. Hyderabad Integrated MSW Ltd., is operating the Municipal Solid Waste Management facility located at Sy.No.173, Jawaharnagar (V), Shameerpet (M), Medchal-Malkajgiri District and engaged in collection, storage, processing and disposal of Municipal Solid Waste.
2. M/s. Hyderabad Integrated MSW Ltd., has obtained renewal of CFO vide order dated 29.09.2023 for RDF Plant (2 X 1200 TPD) – 2400 TPD, Compost Plant (3 X 680 TPD) – 2040 TPD, Bio- Methanization (10 X50 TPD) – 500 TPD, Recycling Complex (Plastic, Paper, Metal, Rubber, Glass etc.) – 600 TPD, Land fill with leachate collection and treatment system - 735 TPD which valid upto 31.07.2028.
3. The CPCB has constituted Expert Committee vide office order dt.30.08.2023 to carry out study on Bio Mining of Legacy Waste of Capped Dumpsite maintained by Greater Hyderabad Municipal Corporation.
4. The Expert Committee has conducted filed inspection of the facility in September 2023 along with the officials from TSPCB and GHMC. CPCB has submitted report dt.25.09.2023 to the Hon'ble NGT on the observations of Expert Committee.
5. The Hon'ble NGT in O.A.No.199 of 2021 (SZ) & I.A No. 96 of 2022 has issued interim order dt.01.02.2024 is as follows:

"Therefore, it would be appropriate for the CPCB to direct the GHMC or the State Pollution Control Board to construct additional collection wells of the leachate for the purpose of treatment which would avoid contamination of downstream water bodies".

6. *The Board hereby issues following directions to your facility to comply with:-*

1. The facility shall construct additional leachate collection wells for the purpose of treatment which would avoid contamination of downstream water bodies.
2. The facility shall quantify the daily waste dumped in the reclaimed area and how it is treated.
3. The facility shall submit detailed report whether the leachate generated from the fresh waste is allowed to be collected in the same leachate collection wells and adequacy of the same.
4. The facility shall submit the details of the depth from which gas is being tapped, further GHMC shall explore the possibility of going deeper for collecting the gas as recommended by IIT, Bombay.

5. The GHMC shall not allow reclaimed land for capping
6. The leachate that is entered into the downstream water bodies has to be remediated.

These directions are being issued in compliance to the Hon'ble NGT interim orders dt: 01.02.2024 in O.A.No.199 of 2021 (SZ) & I.A No. 96 of 2022. You are requested to submit the compliance to the Board within 7 days so as to submit the same to CPCB for further course of action.

**Sd/-
MEMBER SECRETARY**

To

- 1. M/s. Hyderabad Integrated MSW Ltd.,
Sy.No.173, Jawaharnagar (V),
Shameerpet(M), Medchal-Malkajgiri District.**
- 2. The Commissioner, GHMC Hyderabad,
CC Complex, Tank Bund Road,
Lower Tank Bund Hyderabad: 500063**
- 3. The Pri. Secretary to Government,
EFS&T Department, Government of Telangana,
Secretariat, Hyderabad.**
- 4. The Pri. Secreatry MA&UD,
Secretariat Rd, Central Secretariat,
Khairtabad, Hyderabad, 500004.**

// T.C.F.B.O //

Sd/-

Senior Environmental Engineer



From
The Commissioner,
Greater Hyderabad Municipal Corporation,
1st floor, CC Complex,
Lower Tank Bund Road,
Hyderabad.

To
The Member Secretary,
Telangana State Pollution Control Board
Paryavarana Bhavan, A-III, Industrial
Estate, Sanathnagar
Hyderabad 500 018.

Lr. No. SWM /0195/2021/AE-1(SWM)HO

Dt: 30.03.2024

Sir,

- Sub : GHMC- SWM- IMSWM Project- Directions issued by TSPCB in view of orders dated 01.02.2024 of Hon'ble NGT (SZ) in O.A.199 of 2021 and letter from CPCB -Reply submitted- Req. - Reg.
- Ref : Order No.MSW-17/TSPCB/MSW/HD/2024 dated 15.03.2024 from TSPCB

In response to the directions issued by the TSPCB vide reference cited, the following compliance is submitted for taking further necessary action:

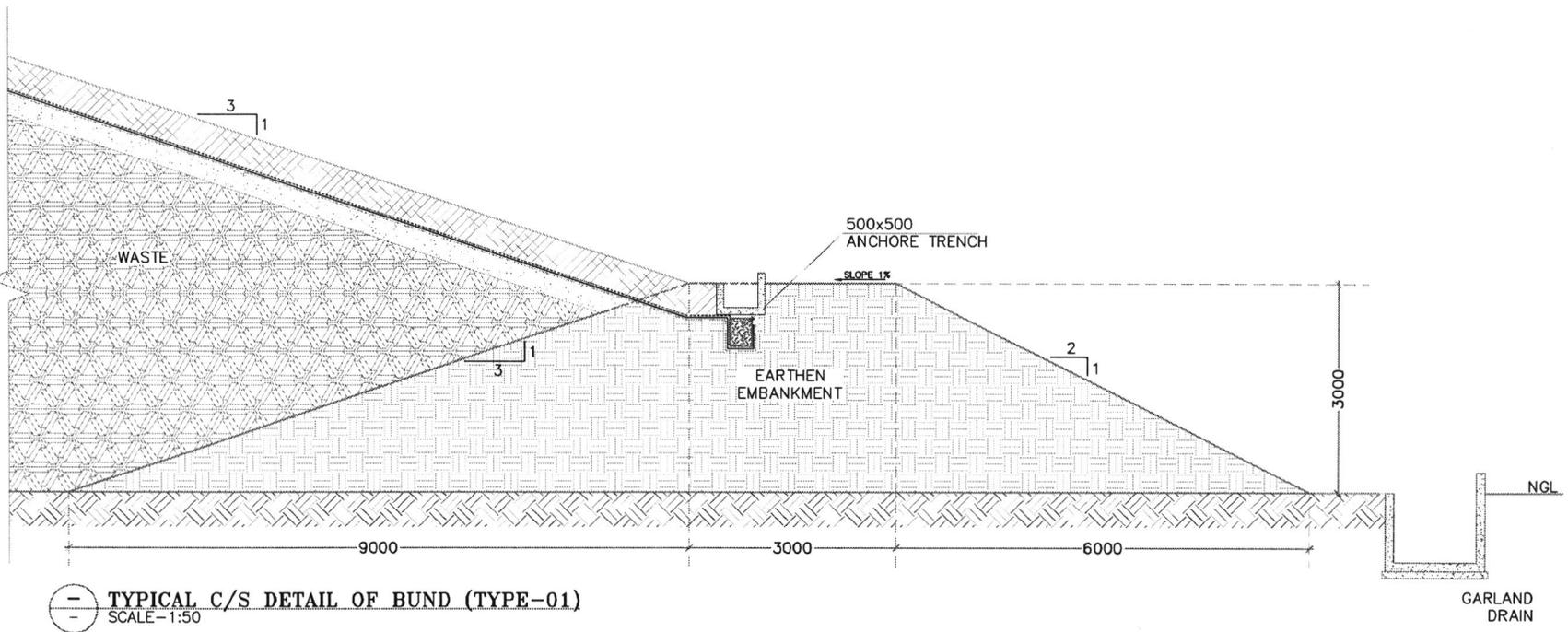
Sl.No.	Subject	Reply
1.	The facility shall construct additional leachate collection wells for the purpose of treatment which would avoid contamination of downstream water bodies.	Environment Protection Training & Research Institute (EPTRI), a quasi government institution acting as Independent Engineer for the project since Aug'2010, is monitoring the Integrated Municipal Solid Waste Management Project of Greater Hyderabad Municipal Corporation. The leachate collection system of the capped legacy dump has been developed as per the designs approved by the Environment Protection Training & Research Institute as an independent body with technical expertise in the field of environmental monitoring and hence it is adequate. The detailed drawing of leachate collection system for capped dump is attached as -Annexure I

2.	The facility shall quantify the daily waste dumped in the reclaimed area and how it is treated.	In the Financial Year 2023-24 (upto Feb'24), an average of about 7,465 Tons Per Day of MSW received from Greater Hyderabad Municipal Corporation limits is treated and disposed scientifically. With respect to the treatment and disposal of fresh waste, the detailed treatment process note of the fresh waste along with photographs is attached as Annexure II
3.	The facility shall submit detailed report whether the leachate generated from the fresh waste is allowed to be collected in the same leachate collection wells and adequacy of the same.	No, there is a separate collection network for the leachate generated from fresh waste. The leachate generated during the waste treatment process i.e., from Compost pad, RDF storage, Sanitary landfill, Capped area, MSW pit of WTE is collected through a network of drains and sending to intermediate leachate collection sumps and then into a common leachate collection pond. The leachate thus collected is pre treated at 1000 kLD capacity plant established in the site and then at 600 kLD Stage-I Reverse Osmosis (RO) System. The rejects from Stage I RO is treated in 500 kLD Stage II RO. The rejects from Stage II RO process are treated at the 150 kLD Multi Effect Evaporator- 45 kLD Agitated Thin Film Drier system and thus all the leachate generated from fresh waste is collected separately and treated as per norms. The permeate from RO is used to maintain greenery at the site and the condensate from Multi Effect Evaporator - Agitated Thin Film Drier is used for bottom ash quenching. The reject which is in the form of solid is mixed with RDF and utilized as fuel in the Waste to Energy Plant (Photographs enclosed as Annexure III).
4.	The facility shall submit the details of the depth from which gas is being tapped, further GHMC shall explore	<ul style="list-style-type: none"> Greater Hyderabad Municipal Corporation has dug gas extraction bore holes ranging from a depth of 36m to 12m based on the height of the capped dump from bottom rock profile as approved by Environment Protection Training & Research Institute,

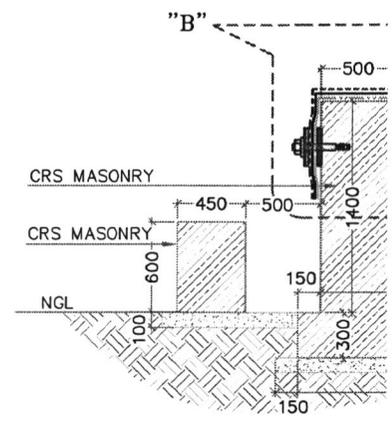
	the possibility of going deeper for collecting the gas as recommended by IIT, Bombay.	<p>the IE to the project.</p> <ul style="list-style-type: none"> • The bore wells were drilled into dump based on grid and surface area availability, the base terrain of capped dumpsite is uneven because of the old rock profile. • Gas being lighter in nature shall move in the upward directions in the capped dump and shall get collected into the bore wells locate all over the surface area. Hence, the need for drilling deeper till bottom of dump is not required. • IIT, Bombay has not given any recommendation in its report for digging deeper borewells
5.	The GHMC shall not allow reclaimed land for capping	The reclaimed land is being used to process the Municipal Solid Waste and scientifically dispose the rejects strictly in compliance to the Solid Waste Management Rules, 2016
6.	The leachate that is entered into the downstream water bodies has to be remediated.	The leachate/ contaminated storm water in Malkaram natural tank and the buffer/ artificial storage ponds created to prevent overflow of leachate into downstream lakes is being treated. As on 20.03.2024, 57.5 % of the estimated quantity of 8,49,780 kL of the leachate contained in the above said ponds is treated (Photographs of the plant is Annexed as Annexure IV).

Encl : as above

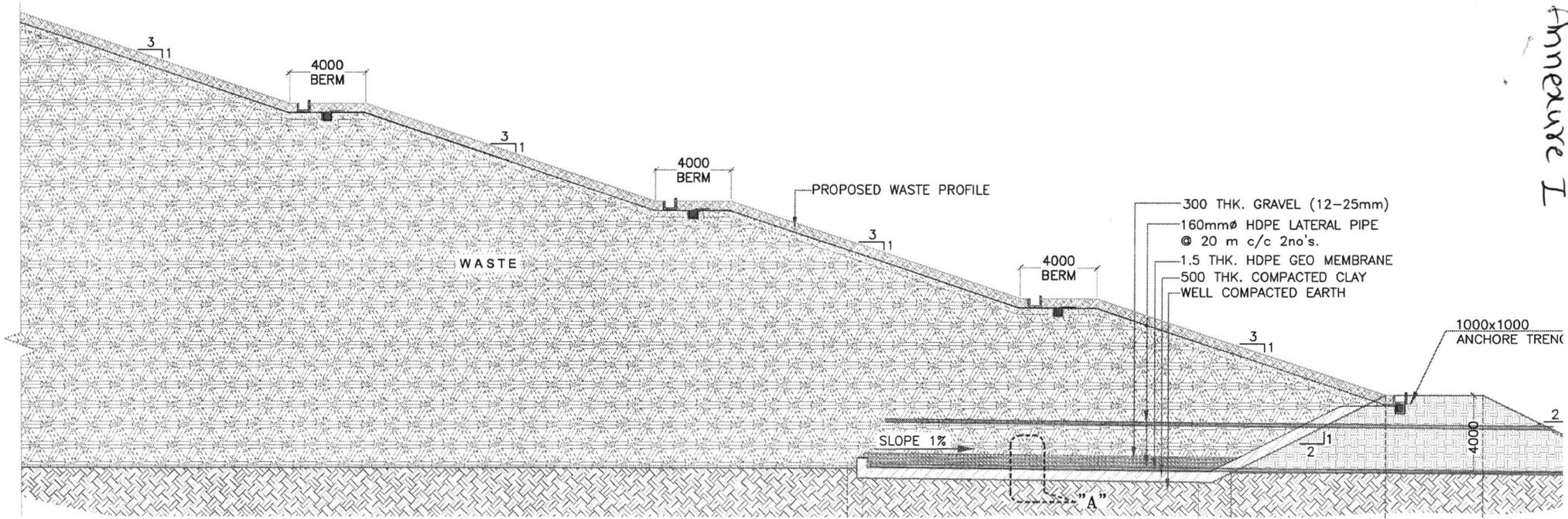

 Commissioner, GHMC

TYPICAL C/S DETAIL OF BUND (TYPE-01)
SCALE-1:50



TYPICAL C/S D
SCALE-1:25



Annexure I

Annexure II

1. Processing of Fresh MSW:

Composting is a Mechanical Biological Treatment (MBT) process that's commonly used to comply with the SWM Rules 2016, of diverting biodegradable municipal solid waste and recyclables from landfill to help protect the environment and reduce the amount of greenhouse gas emitted from dumpsites sites.

The mechanical part which is the physical stage of an MBT process is normally at the front end of the process although it can also play a key role at the back end of the process. The MBT plant can be designed to have further mechanical screening at the end of the process to take out further contaminants and or reduce particle size, especially if the residues are going to be used for a purpose other than landfill. Mechanical separation process include size reduction/shredding of the waste, separation of ferrous and non-ferrous metals, heat/steam treatment and screening and/or size reduction of outputs.

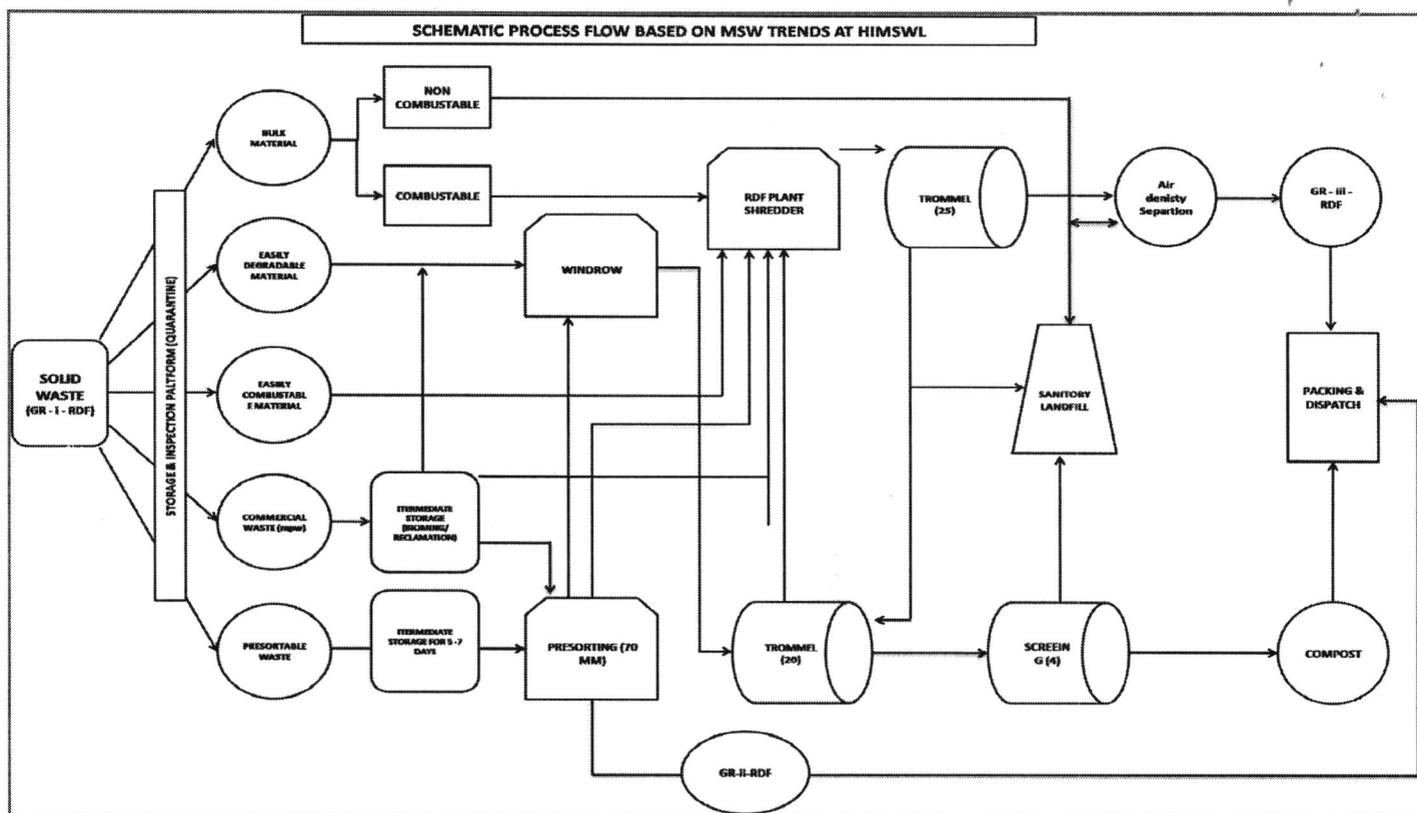
The aim of the mechanical process is that the remaining waste, after the mechanical separation, is the organic-rich fraction or biodegradable fraction which will be ideal for biological treatment.

2. DESIGN OF PROCESSING PLANT

Processing plant includes

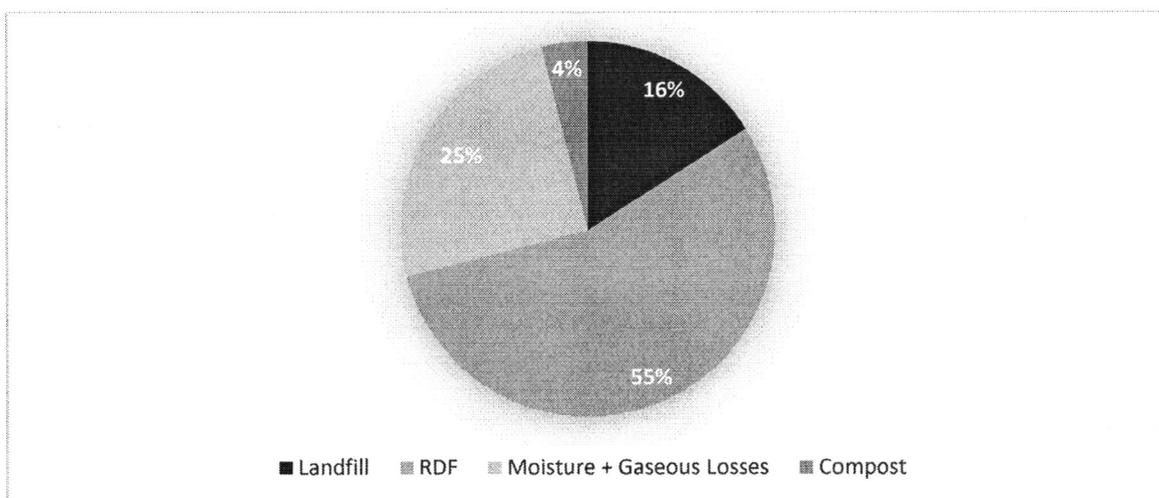
1. Presorting
2. Compost Plant
3. RDF plant

The schematic process flow for the MSW at HiMSW is presented below,



The material balance for the process flow chart is as follows

Components	Qty in Tons	Percentage
Landfill	1280.00	16%
RDF	4400.00	55%
Moisture + Gaseous Losses	2000.00	25%
Compost	320.00	4.0%
	8000.00	100%



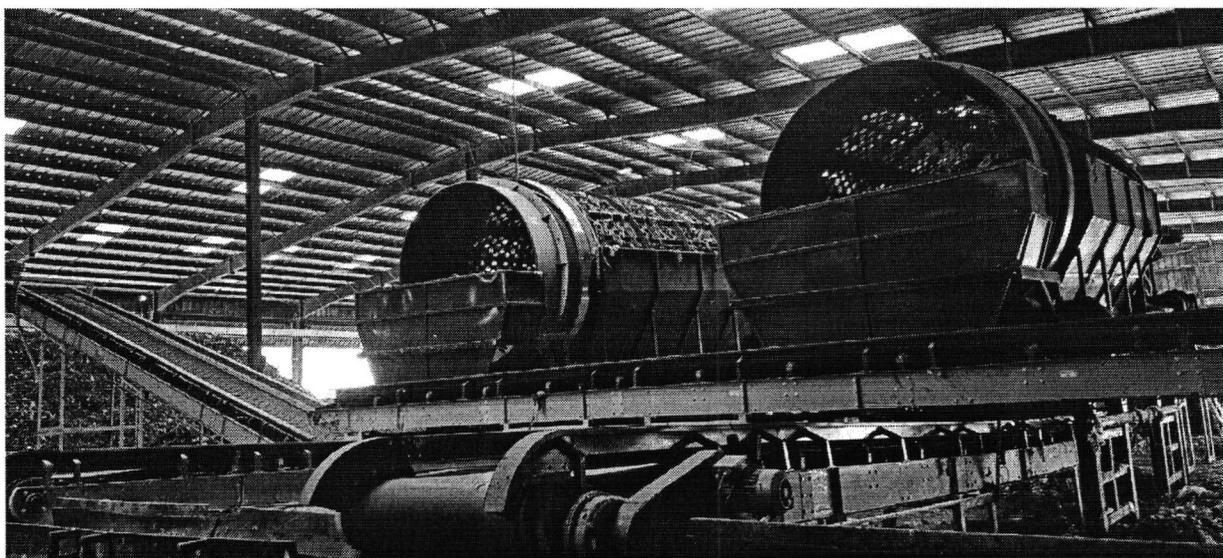
3. OPERATIONS:

Presorting: This section is having mechanical screens with 70mm sorting screen which will segregate the material based on size, the oversized material is called as RDF and it will be used in Waste to Energy plants and Cement industry for co-processing purpose.

RDF Sent to WTE for FY 22-23- 5,38,700 MT and about 43,500 MT of RDF is sent to cement industry for co-processing.

There are (04) Pre-sorting Units established at the site:

1. Presorting Unit –I – 4 Trommels (2000 TPD)
2. Presorting Unit – II – 5 Trommels (2000 TPD)
3. Presorting Unit – III – 8 Trommels (4000 TPD)
4. Presorting Unit –IV – 2 Trommels (1000 TPD)



Presorting

Another presorting unit with better screens called Disc screen (2 no's) for better efficiency will be deployed soon.

Compost operations: The under sized (<70mm) material from presorting section will be sent to windrow aerobic composting for degradation purpose, during this time the EM culture will be applied on windrows for rapid

composting and it will take 25 days for complete composting. This compost operation consists of below units

The Composting Plant consisting of the following:

1. Windrow Composting (Aerobic composting)
2. Pre-Composting
3. Curing /Finishing
4. Blending and Packing Section



Windrows



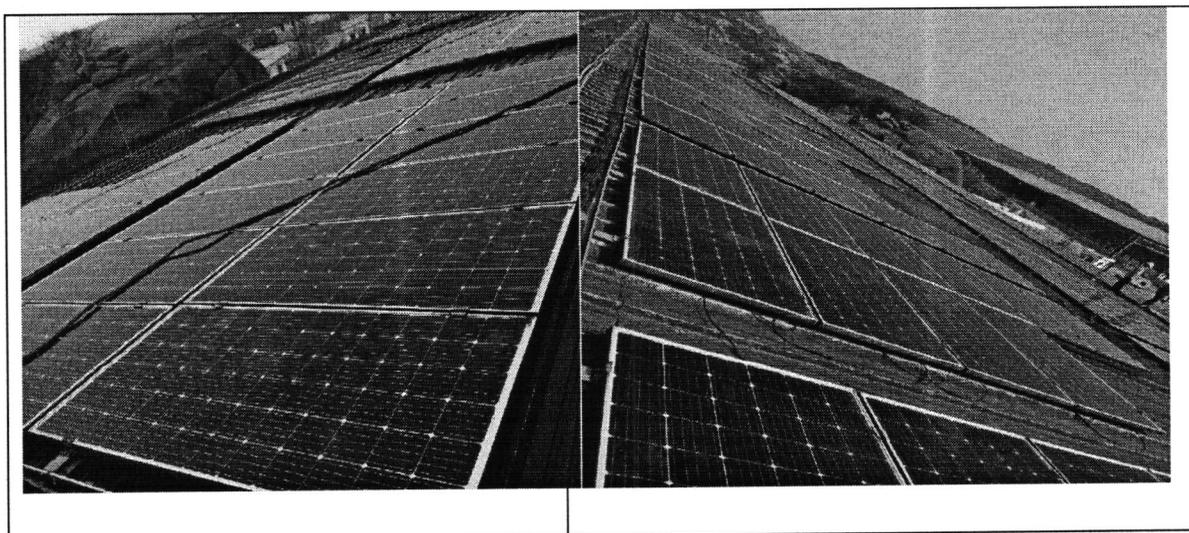
Finishing- compost packing

Leachate Treatment:

A network of drain along the compost plant is connected to leachate collection system. Apart from that, all other sources form landfill and RDF storage units is connected to leachate collection tanks, from the sources all piping network is connected to the leachate treatment plant of 750 KLD where it is treated using Pre-treatment Reverse Osmosis followed by MEE&ATFD

**Renewable Energy:**

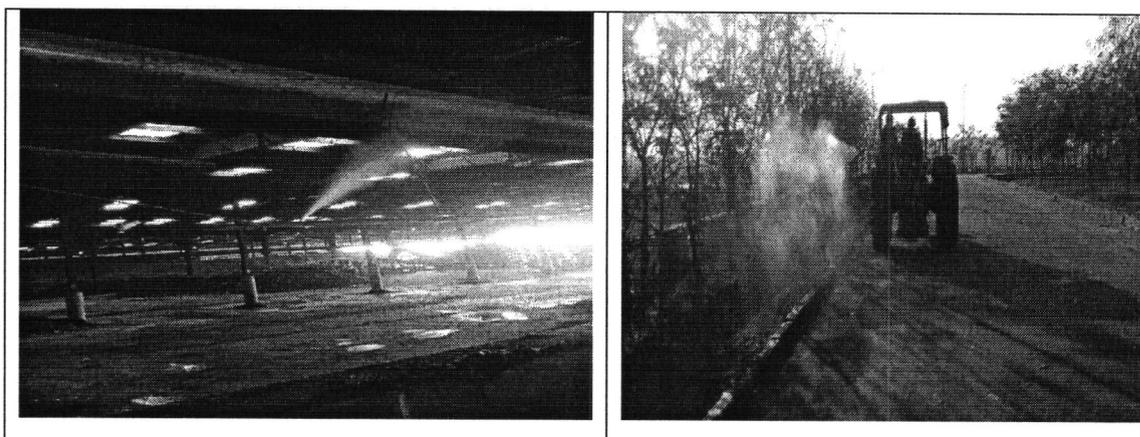
We have commissioned 1st Phase of Solar roof top plant with capacity of 1000 KW in the month of November 2021 and we are using this for captive consumption the FY 22-23 we are replacing almost 24% of our overall power consumption with RE.



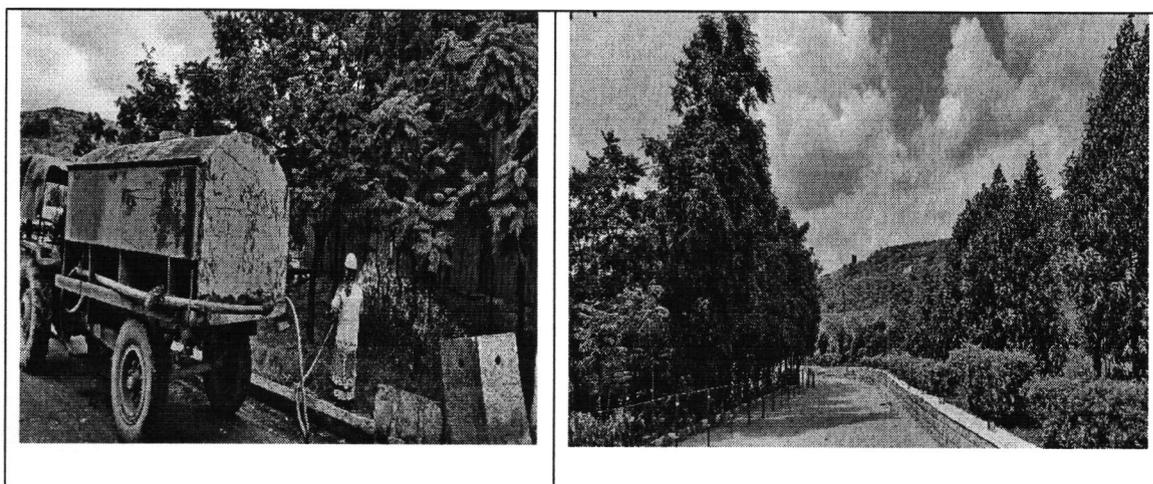
Pollution control measures:

- **Dust suppression** – The internal vehicle movement during waste transportation and process there is high chances of dust generation on roads and process area. For this we are using fine misting system to suppress the dust by using with tractor mounted misting system. We are using recycled water for this dust suppression process.

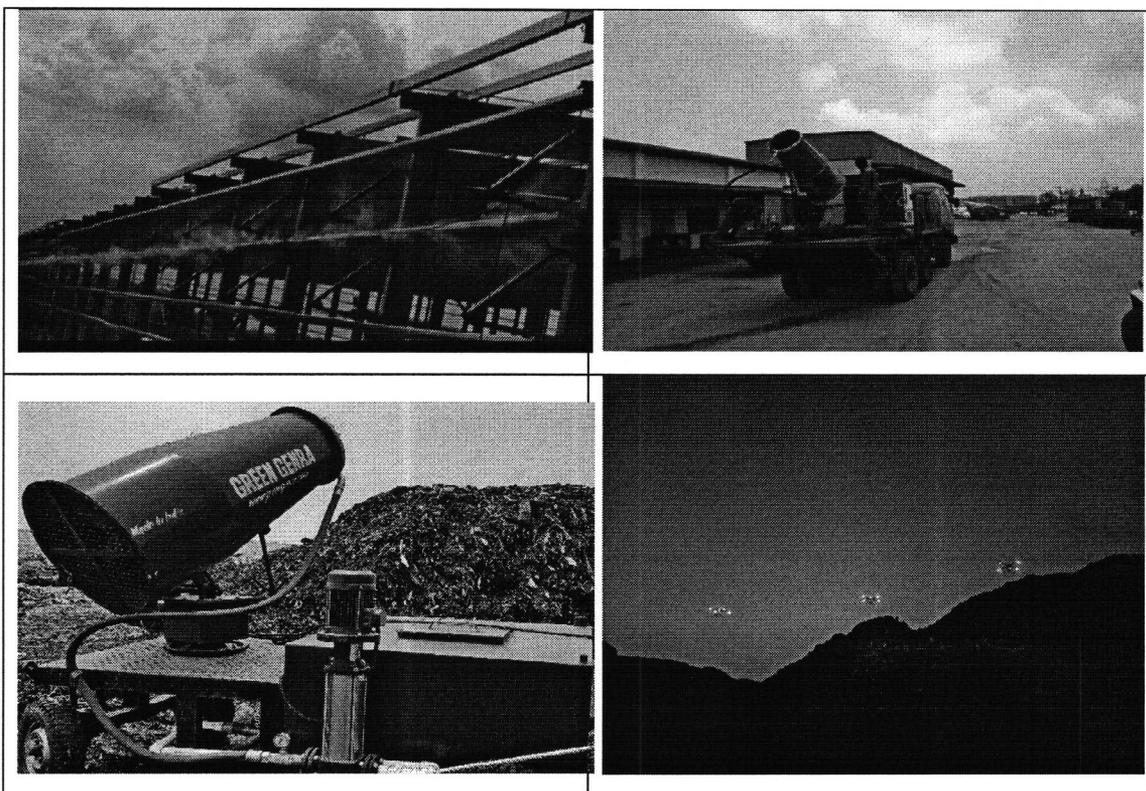
Quantity of sprinkled water (kl/day)	No. of trips per day	Source of water
50	10 trips	Treated waste water



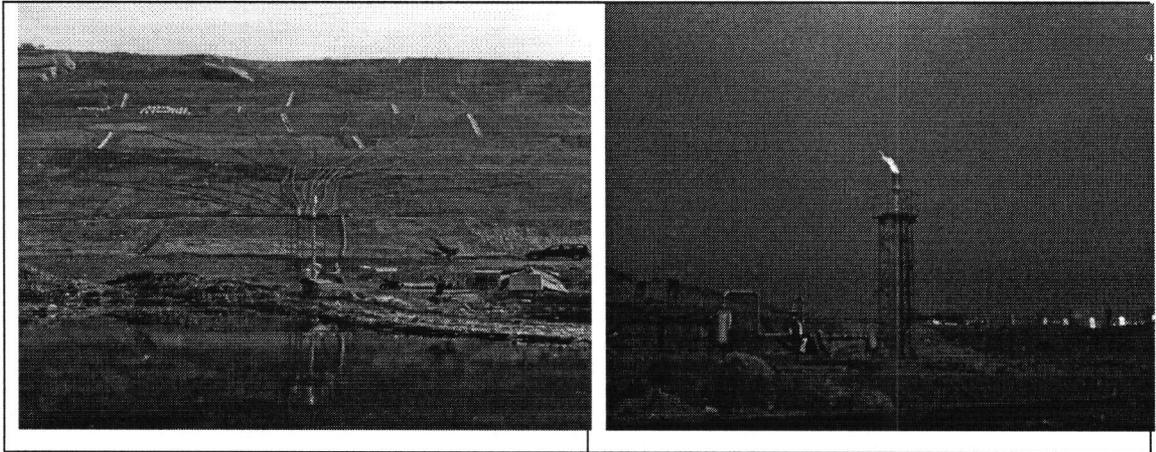
- **Green Belt** – The facility is covered with thick green belt all along the boundary of the facility.



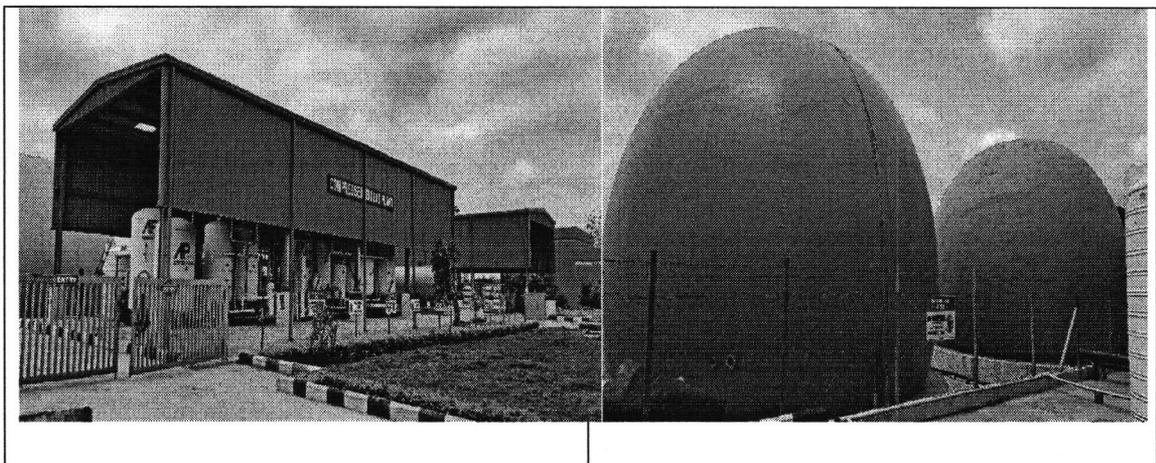
- **Odour control system** – During MSW processing, as per procedure we have to turn the material for composting purpose during which odor emanates for which a suppression system and using odour control Bio-enzymes on waste surface to replace the bad odor causing bacteria is being used. Infrastructure to control the odor is created along the processing facility as a fixed misting system of about 2300 running meter, which will atomize the odor neutralizer in atmosphere. Apart from this Fog Cannons and Drones are also being used for application of odor control Bio-enzyme in active waste handling process area.



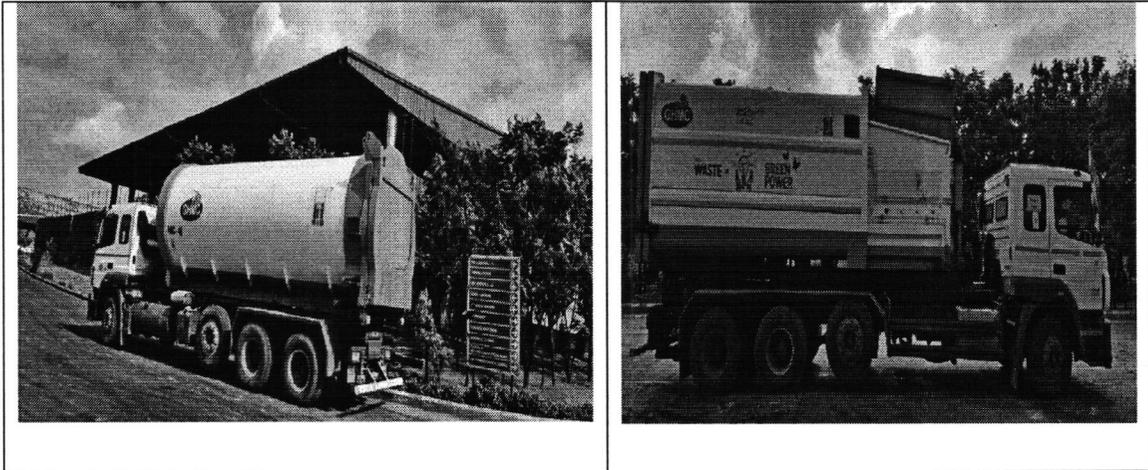
- **Flaring system for LFG** – The facility installed 4 flares for this activity, (03) for capped dump with the capacity of 600 Nm³/hr and another one for scientific landfill with 10Nm³/hr capacity. These flares can capture the gas from the gas vents with the help of blower and flare the gas before to prevent methane gas (greenhouse gas) from escaping to atmosphere.



- **Landfill Gas Purification:** In Continuation to flaring, MPSA system is adopted for purification of landfill gas and is converted to Bio-CNG or alternatively called as compressed biogas. It can be utilized as fuel for vehicles in place of CNG.



- **Vehicle up-gradation** – We have introduced the new fleet in MSW collection system with closed compactors to transport the waste from collection points to the processing facility, with this we are ensuring zero spillage of waste and odor nuisance during our transportation and the waste carrying capacity of each vehicle is almost doubled when compared with Open trucks.



- **Minimization of working Area** – The facility is following the SWM rules and controlling the MSW process open areas and maintains temporary covers to minimize the dust generation.
- **Water pollution control measures:** We are ensuring rain water and process generated leachate do not mix together. We have separate drain network for both and the leachate is treated at the zero liquid discharge leachate treatment plant.
- **Noise pollution control measures:** We are doing regular maintenance of machines, vehicles and other equipment at the facility. Green belt is provided around core activity area, along the roadside and in the facility.

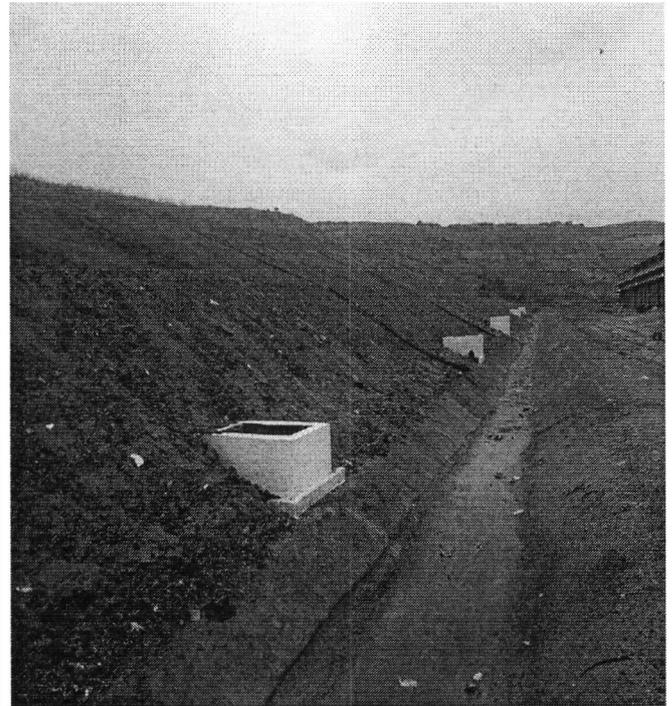
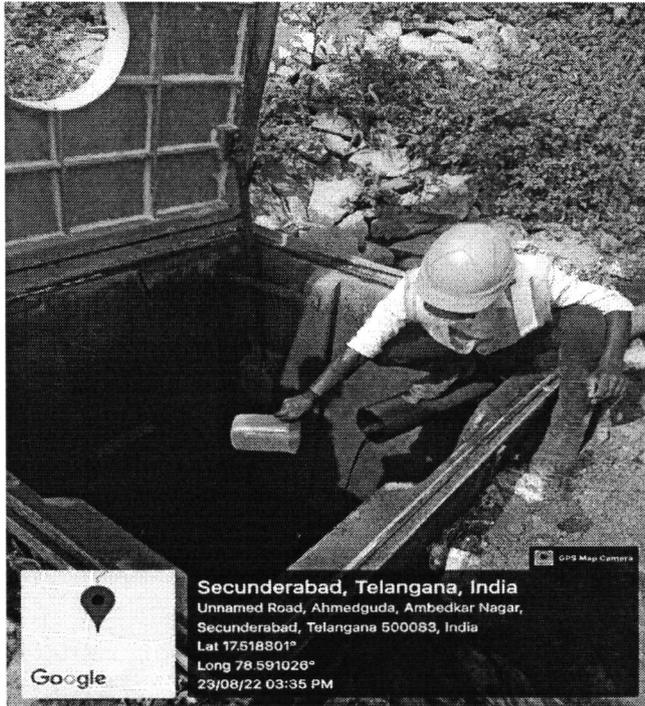
Annexure III



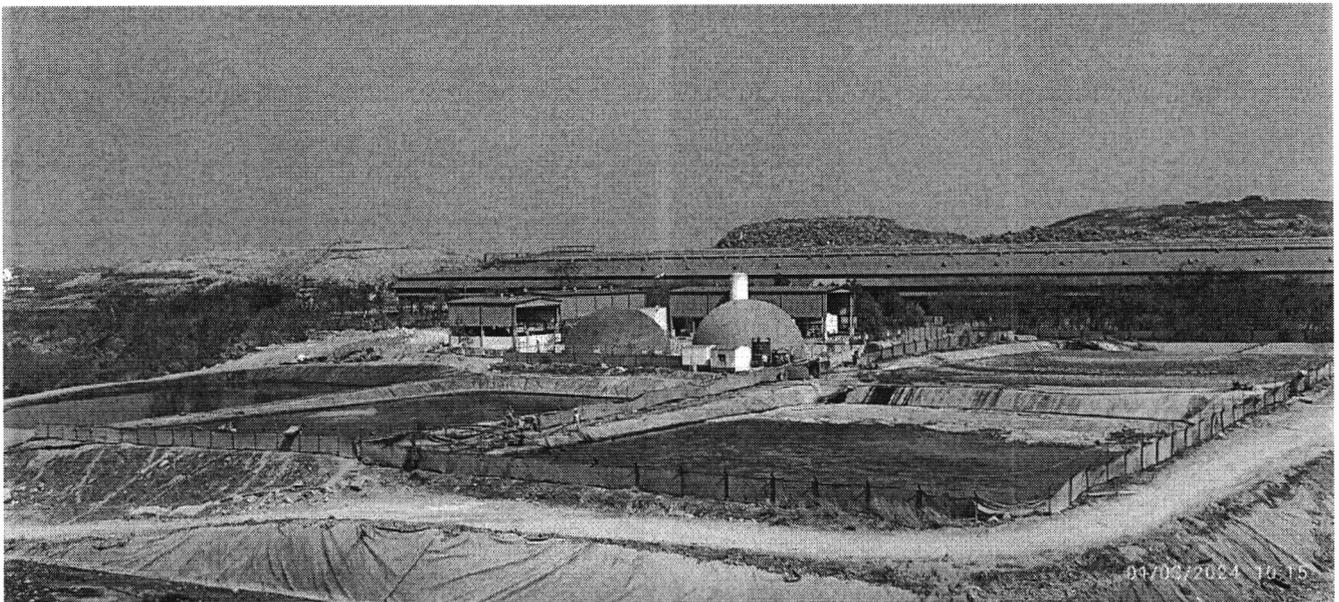
Separate drains (above photos) for collection of leachate generated from fresh waste processing areas such as Pre-sorting, compost plant, RDF storage etc



Leachate drains are connected to pumping ponds (above photograph) for pumping into larger capacity ponds before treatment



Above are separate sumps for collection of legacy leachate generated from capped dump. The leachate collected in these sumps is either pumped or transported through tanker to the below integrated collection sump for storage before treatment.

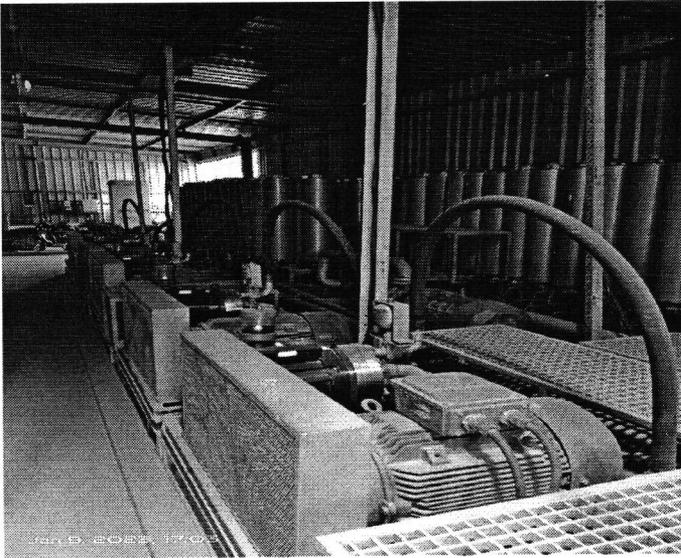


Integrated leachate storage ponds for collection of total quantity of legacy and fresh leachate

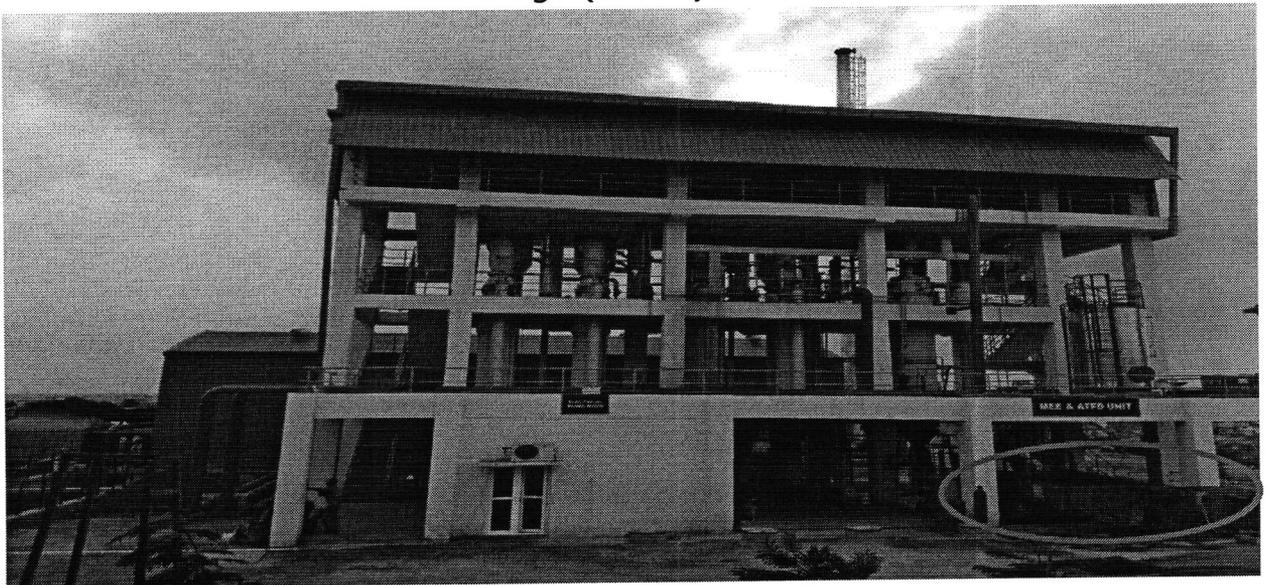
Waste Water Complex- Leachate treatment



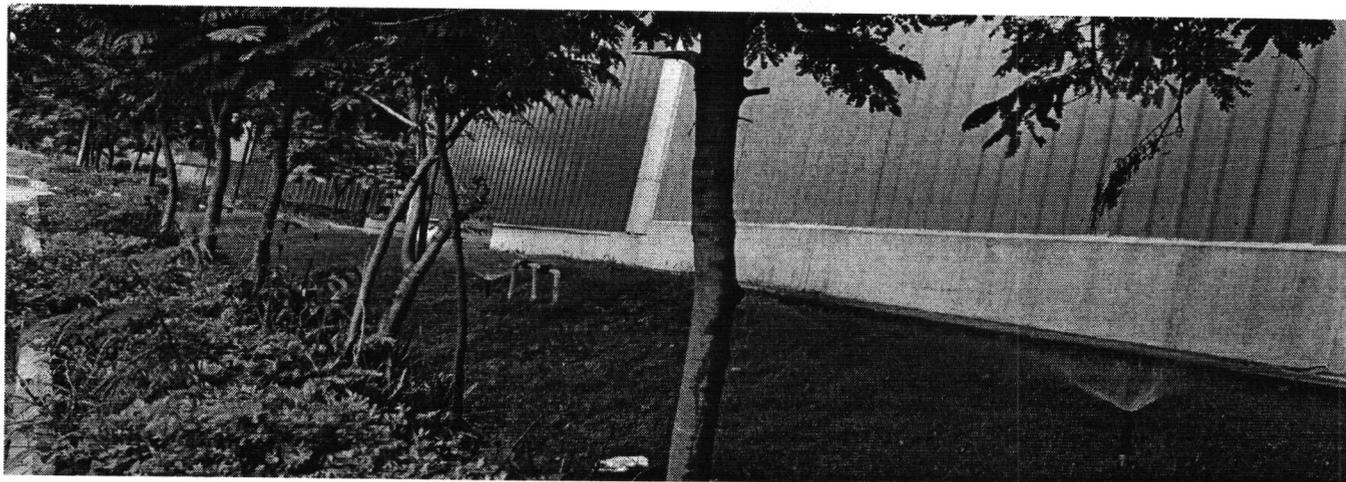
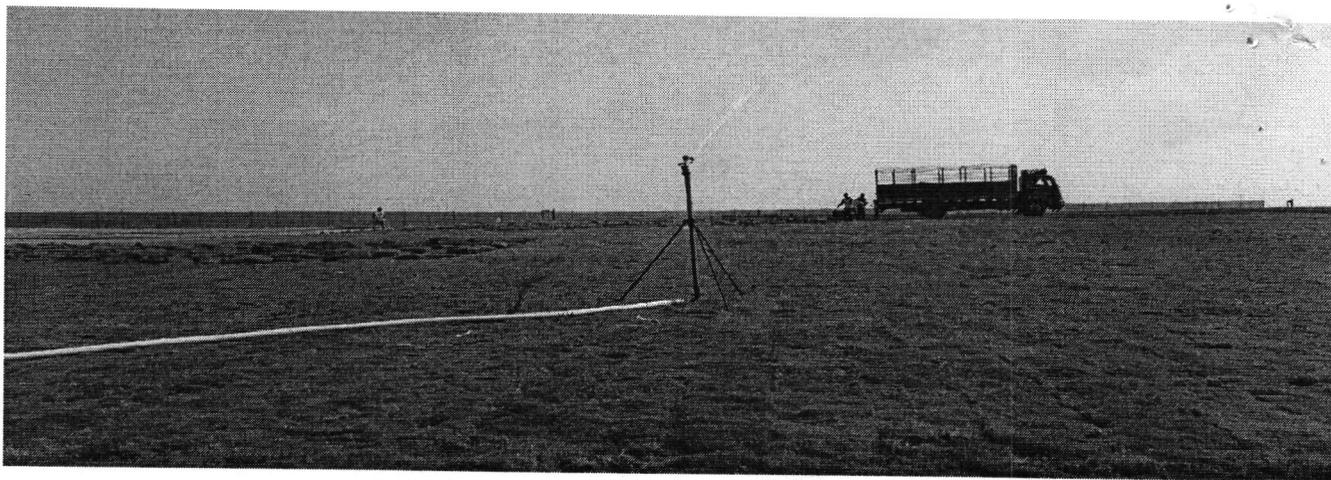
Pretreatment of Leachate (above)



RO Stage (above)



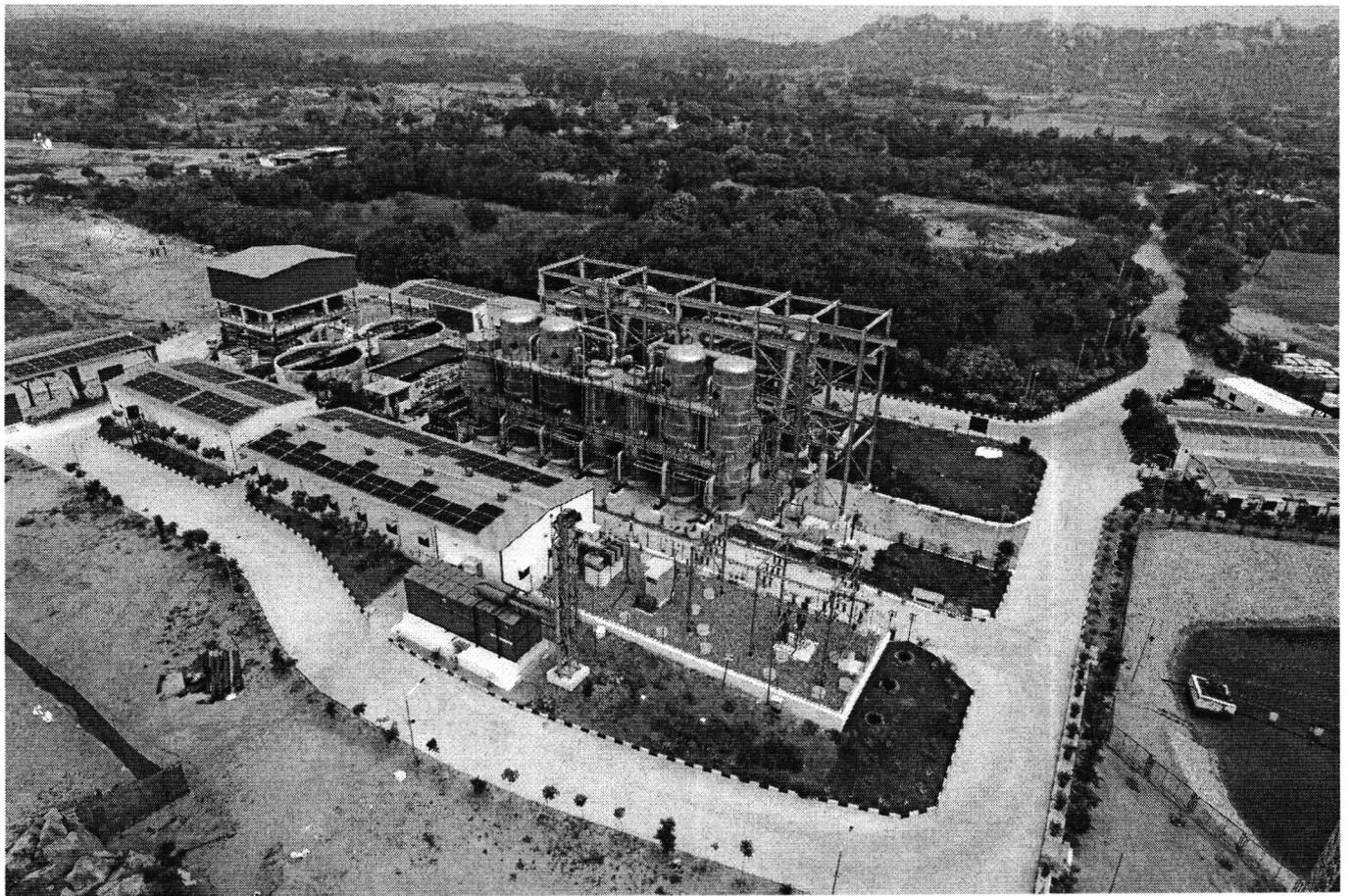
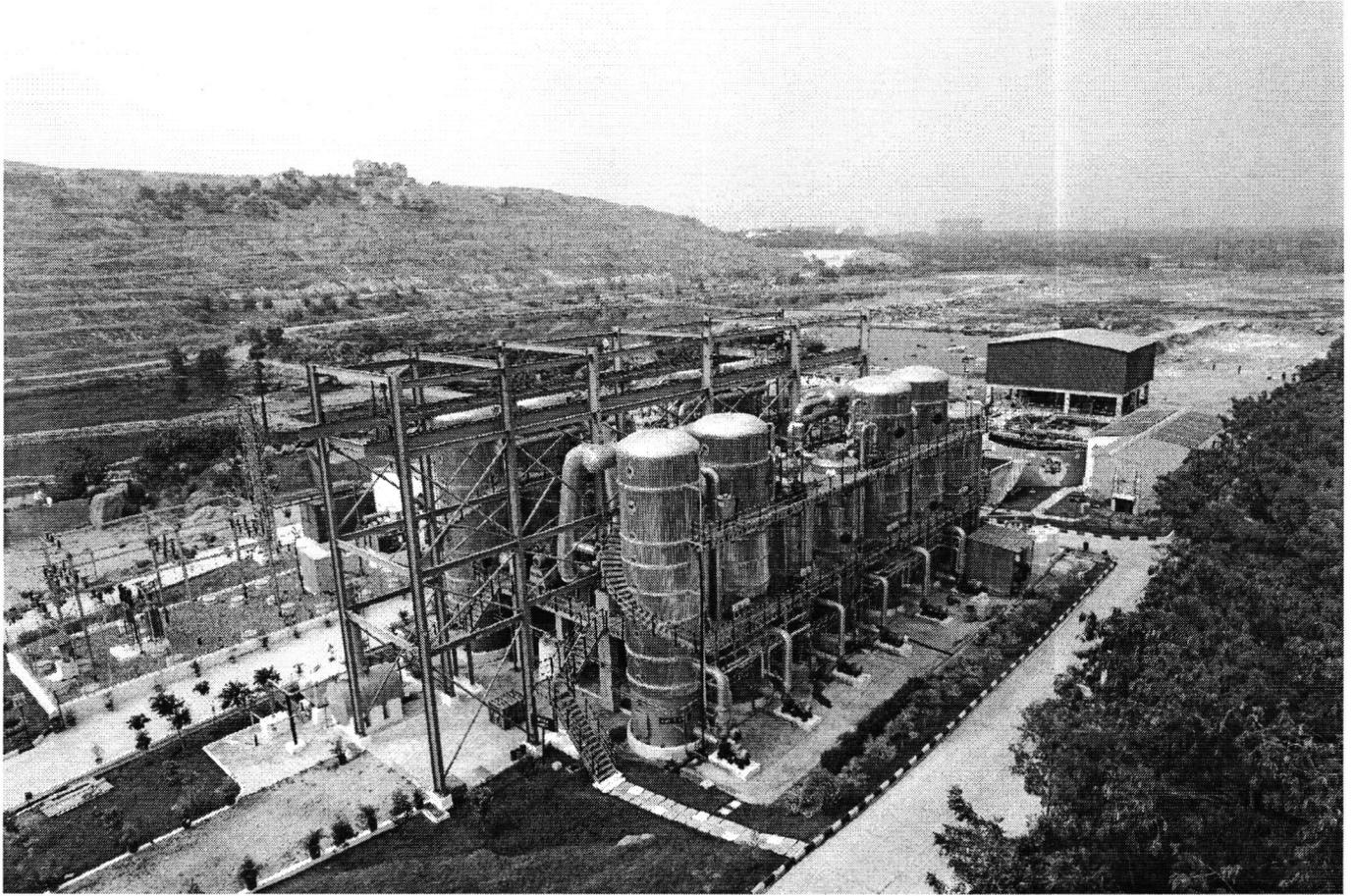
MEE – ATFD & Salts collection (above)



Permeate used for maintaining greenery



Mixing of MEE – ATFD salts (reject) with RDF for disposal in WTE instead of landfill





File No.:CM-13013/19/2021-TECH-RD-CHENNAI-
RD(Chennai)

Date: 04.03.2024

To,

All Expert Members
(As per the list enclosed)

Sub: - Minutes of the Meeting held at 12:30 PM on 01/03/2024 in compliance with the Hon'ble NGT order dated 1.2.2024 in O.A. No. 199 of 2021 (SZ) & I.A. No. 96 of 2022 (SZ) in the matter of Sri Shanker Narayana Bala Krishna Telangana and Ors.

Sir/Madam,

Please find enclosed herewith, Minutes of the Meeting held on 01/03/2024 in compliance with the Hon'ble NGT order dated 1.2.2024 in O.A. No. 199 of 2021 (SZ) & I.A. No. 96 of 2022 (SZ) in the matter of Sr. Shanker Narayana Bala Krishna Telangana and Ors., for your kind information.

Yours faithfully

Divya

(Divya Sinha)

Director & In charge, UPC-II

Copy for Information to: -

1. Member Secretary,
Telangana State Pollution Control Board
Paryavarana Bhavan, A-3, I.E., Sanath
Nagar, Hyderabad - 500 018 : For information &
necessary action, please
2. DH-Law Section : For information, please
3. PS to MS : For information, please

Divya
(Divya Sinha)

‘परिवेश भवन’ पूर्वी अर्जुन नगर, दिल्ली-110032

Parivesh Bhawan, East Arjun Nagar, New Delhi - 110032

दूरभाष/Tel: 43102030, 22305792, वेबसाईट/Website : www.cpcb.nic.in



Central Pollution Control Board
“Parivesh Bhawan”, East Arjun Nagar, Delhi-110032

Minutes of Meeting held at 12.30 PM on 1st March, 2024, in compliance to Hon’ble NGT order dated 01/02/2024 in O. A No. 199 of 2021(SZ) & I.A No 96 of 2022 (SZ) in the matter of Sri Shanker Narayana Bala Krishna Telangana and Ors Vs State of Telangana, Rep by its Chief Secretary, Hyderabad and Ors.

A meeting was held at 12.30 PM on March 01, 2024 through video conferencing with the expert members and CPCB officials in compliance with Hon’ble NGT order dated 01.02.2024. List of participants is attached as **Annexure-I**.

At the outset, Mrs Suniti Parashar Scientist ‘C’, UPC-II div, welcomed the participants and presented the directions of Hon’ble NGT in Para 6 which states that *“Besides the legal and technical aspects, the CPCB had given its observations on the report, comments had been received only from 5 experts and the others reports are awaited. The expert opinion in this regard is awaited to address the following aspects namely:*

- i. Environmental and economic benefits of the investment already made*
- ii. Net damage (Soil, Surface & groundwater) that may continue to occur during the capping period, including the time period for which leachate is expected to be generated.*
- iii. Hydrological study to assess the impact of leachate generated on the surface/groundwater bodies and*
- iv. A detailed assessment of observation made in the report of the IIT Bombay.”*

It was informed that email dated 19th Feb, 2024 was sent to all the expert members inviting comments on the aforementioned points. The comments were received from 4 expert members viz. Dr Rakesh Kumar, erstwhile Director, NEERI, Sh J.B Ravinder, Joint Advisor, MoHUA, Mr Gajanan Kamat, Assistant Manager, Goa Waste Management Corporation, Dr Asad Warsi, Project Consultant IMC, & Director, Eco Pro Env. Services Indore. The latest comments received were discussed in detail and it was pointed out by the members that environmental and economic benefit of the investment cannot be directly estimated as it needs time series data w.r.t Groundwater, air, soil, odour and water at the site and its surroundings.

After a detailed discussion and deliberation on the issue it was recommended that Telangana SPCB shall identify suitable agencies/institutions to carry out a comprehensive study to address the aforementioned points as stated in Hon’ble NGT order para 6.

The meeting ended with a vote of thanks.

Annexure I

List of Participants attended the meeting held on 01/03/2024 in compliance to Hon'ble NGT order dated 1/2/2024 in O.A No 199 of 2021(SZ) & I.A No 96 of 2022 (SZ) in the matter of Sr Shanker Narayana Bala Krishna Telangana and Ors Vs State of Telangana, Rep by its Chief Secretary, Hyderabad and Ors.

A. Expert Members:

SN	Name of Experts	Designation	Organization	Email
1	Sh. J B Ravinder	Joint Adviser (PHEE), MoUHA	Ministry of Housing and Urban Affairs	jb.ravinder@nic.in
2	Sh. P K Khandelwal	Erstwhile Director	Director NTPC-EDMC Waste Solution Ltd	Pradeepkhandelwal100@gmail.com
3	Prof S K Singh	Erstwhile Head of Civil Engineering	VC Rajasthan University	sksinghdce@gmail.com vcoffcertu@yahoo.co.in
4	Dr. Rakesh Kumar	Erstwhile Director NEERI,	CSIR	rakeshkumarneeri@gmail.com rakeshmee@rediffmail.com
5	Dr. P U Asnani,	Chairman	UMC Global	
6	Dr. Asad Warsi	Project Consultant,	Indore Municipal Corporation and Director of Eco Pro Environmental Services	ecopro@rediffmail.com
7	Dr. Anil Kumar	Erstwhile Director	Department of Environment, Government of Delhi	Dr.anilkumardelhi@gmail.com
8	Sh Gajanan Kamat	Assistant Manager	Goa Waste Management Corporation	gwmc.goa@gov.in gajanan.kamat@zerowaste goa.com

B. CPCB Officials

1	Mrs. Divya Sinha	Division Head UPC-II	CPCB	divyasinha.cpcb@gov.in
1	Mrs Poornima B.M	Sc D,	RD-Chennai CPCB	poornima.cpcb@nic.in
2	Mrs Suniti Parashar	Sc C, UPC-II Div	CPCB	suniti.cpcb@gov.in
3	Sh Amit Kumar	Sc B, UPC-II Div	CPCB	amitk22.cpcb@gov.in

A REPORT ON REMEDIATION OF WATER BODIES

(In compliance to direction of Hon'ble NGT order dated 01/02/2024 in Original Application No 199 of 2021 (SZ) & I.A No 96 of 2022 (SZ) in the matter of Sri Shankar Narayana Bala Krishna, Telangana and Ors Vs State of Telangana Rep by its Chief Secretary, Hyderabad and Ors)



CENTRAL POLLUTION CONTROL BOARD
Parivesh Bhawan, East Arjun Nagar, Delhi-110032

MARCH, 2024

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A REPORT ON REMEDIATION OF WATER BODIES /LAKES

1.0 BACKGROUND

Hon'ble NGT vide order dated 1.2.2024 in O.A No 199 of 2021 (SZ) & I.A No 96 of 2022 in the matter of Sri Shankar Narayana Bala Krishna, Telangana and Ors Versus State of Telangana, Rep. by its Chief Secretary, Hyderabad & Ors has issued following directions in Para 11 to CPCB:

“The Leachate that is entered into the downstream water bodies has to be remediated, for which the CPCB has to furnish a technical report”.

The Jawaharnagar dumpsite in Hyderabad in an area of 339 acres has two components, the capped legacy waste in 125 acres of land and integrated solid waste processing facility constructed from the reclaimed land of legacy waste in an area of 214 acres. The capping & integrated solid waste processing plant is operated and maintained by M/s Ramky Enviro Engineer Ltd., under the name M/s Hyderabad Integrated Municipal Solid Waste Management Project (HIMSWMP). Around 12 Million Metric Tonnes of legacy waste is scientifically capped and around 80% of capping process is completed. The leachate generated from the legacy waste has find its way into the Malkaram - II cheruvu which is adjacent to the dumpsite. It is being estimated that around 750 Million Liters of leachate is being accumulated in the pond and the overflow of the lake can join five downstream lakes causing pollution.

M/s HIMSWMP has constructed nine artificial lagoons in the downstream with geosynthetic liner to collect any overflow from the lake during monsoon season. Due to overflow of leachate to the downstream lakes, there were public complaints, protest from the villagers and frequent fish kill incidents. Location showing Jawaharnagar legacy waste dumpsite and ponds and lakes is given in figure 1 below:

of downstream watercourses, and preserve the biodiversity and habitat of the area. Lakes are polluted mainly due to anthropogenic activities. Many of India's freshwater lakes have become polluted to the extent that the water is no longer considered as potable. In case of Malkaram Cheruvu which is contaminated with organic load due to discharge of leachate from dumping site which has not only impacted the lake water quality but also damages the lakes ecosystem resulting in frequent fish kill incidences.

To assess the damage caused to the water quality of concerned lakes & ponds (Cheruvu), CPCB along with officials of Telangana State Pollution Control Board (TSPCB) and Greater Hyderabad Municipal Corporation (GHMC) collected the samples from five lakes/ Cheruvu (Malkaram, Bandlaguda, Chiryala, Dammiguda and Ambedkar Cheruvu) in the catchment area of Jawahar Nagar legacy waste site. Analysis results indicate that lakes water is polluted/contaminated in term of organic load due to leachate flowing from dumping site. On comparison with designated best use water quality criteria stipulated by CPCB, lakes water is even not found fit even for bathing except sample collected from Bandlaguda Cheruvu (Class B) which is located in north eastern side of the legacy waste capped site. Analysis results of samples collected from five lakes during an inspection carried out on Nov 17th 2020 by officials of Regional Directorate (RD) Chennai, TSPCB and GHMC in a VIP reference matter (Inspection report is enclosed as Annexure VI of action taken report submitted by CPCB before Hon'ble NGT in O.A No 606/2018) is given in **Table 1** below:

Table 1: Surface water samples collected from Lake around the legacy waste capped site

Parameters	Unit	Ambedkar Cheruvu (South side of dumpsite)	Dammiguda Cheruvu (South east side)	Chiryala Cheruvu (North side)	Bandlaguda Cheruvu (North east side)	Malkaram Cheruvu (North west side)
pH	-	7.87	7.87	7.92	8.07	8.04
EC	µS/cm	2336	1556	2928	302	806
DO	mg/L	-	5.3	2.7	5.4	5.1
COD	mg/L	220	73	220	12	37
BOD	mg/L	52	15	42	3	6
TSS	mg/L	52	<5	64	<5	<5
TDS	mg/L	1296	945	1592	172	448
Nitrates		39	19	44	10	11
Total	MPN/	>1600	>1600	920	540	430

coliform (TC)	100 ml					
Fecal Coliform (FC)	MPN/100 ml	510	350	350	170	130
CPCB water Quality criteria class		E	D	E	B	D

Designated Best Use Water Quality Criteria is enclosed as **Annexure II**

DO – Dissolved Oxygen, BOD – Bio-Chemical Oxygen Demand, TSS- Total Suspended Solids, TDS –Total Dissolved Solids, EC-Electrical Conductivity, COD-Chemical Oxygen Demand

Analysis results of lake water quality shows BOD is in the range of 3-52 mg/l, COD 12-220 mg/l, TSS <5-64 mg/L and Fecal Coliform from 130-510 MPN/100 ml. Concentration of parameters for comparison of sewage water quality and lakes water quality is given in Table 2 below:

Table 2: Concentration of parameters in sewage water and Lakes water near Jawaharnagar legacy dumpsite

Parameters	Concentration of parameters in absence of drain/outfall (In sewage) *	Water quality of five lakes around the legacy waste capped site (range)
BOD (mg/L)	250	3-52
COD (mg/L)	425	12-220
TSS (mg/L)	375	5-64
TDS (mg/L)	-	172-1296
pH	-	7.87-8.07
Nitrate (mg/L)	5	10-44

* CPHEEO Manual on sewerage and sewage treatment Plants, Part A

4.0 PROPOSED TECHNOLOGY FOR REMEDIATION OF LAKES

Analysis results of water quality of lakes/ Cheruvu shows that lakes are polluted and need immediate intervention for mitigation of pollution load.

CPCB had submitted guideline/report for “*Alternative treatment technologies for wastewater treatment of drains*” prepared in compliance of Hon’ble NGT direction in O.A no. 06/2012 in the matter of Manoj Mishra Vs Union of India & Ors. Further, CPCB had consulted various experts which included NEERI, IIT Roorkee, IT-BHU, ICT-Mumbai, TERI and for preparation of this report. In view of the lake water quality reported in Table 2, following treatment technologies, which have been implemented for remediation of polluted lakes in the country, can be considered by the concerned State Authorities. It may be noted that cost estimates mentioned for proposed technologies are approximate.

A. Remediation by Constructed Wetland System (CWS)

CWS uses principle of Phytoremediation technique. It integrates microbial bioremediation, phytoremediation and root-zone treatment in addition to providing benefits of oxidation pond and physical filters. Figure 2 depicts components of a CWS.

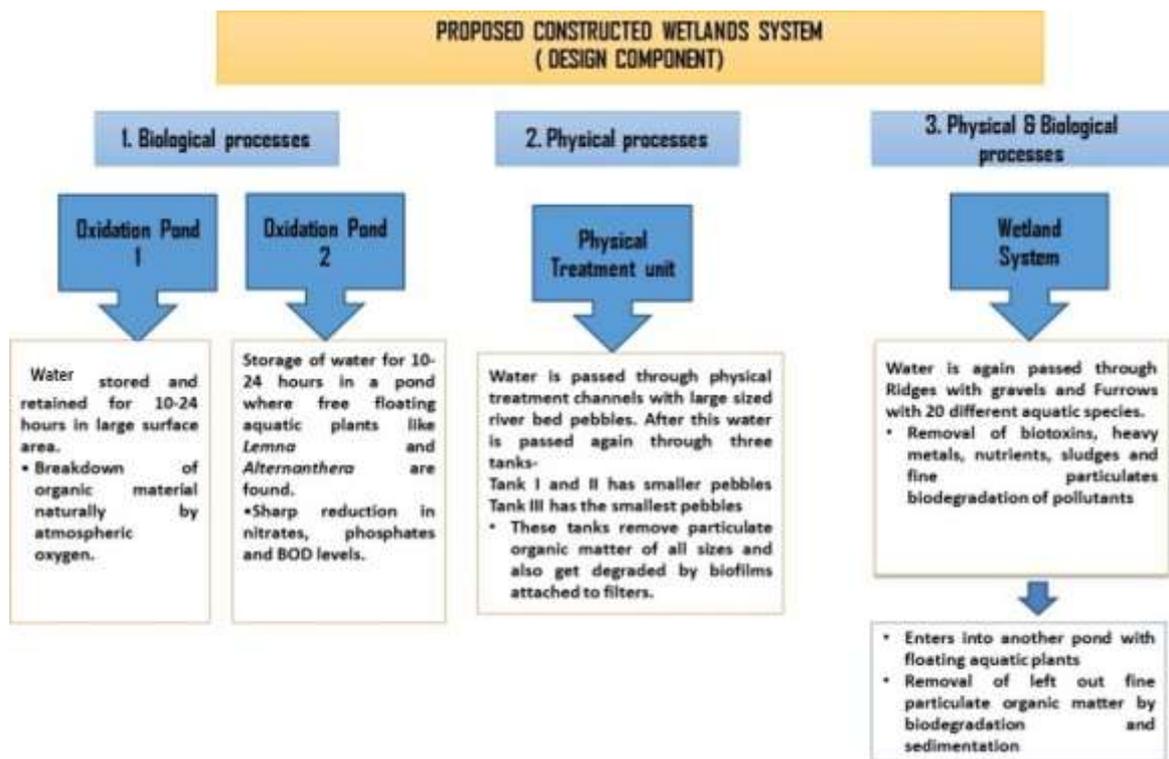


Fig 2: Component of Constructed Wetland System

The length of Constructed Wetland (CWS) and number of units depends on the factors such as topography, flow of water, wastewater quality (BOD, COD, TSS and DO). This system can be installed and operated within short gestation period of around 8-12 months and it treats not only the wastewater but also helps in recharging of ground water. Schematic layout of a CWS system is given in Figure 3 & 4 below:

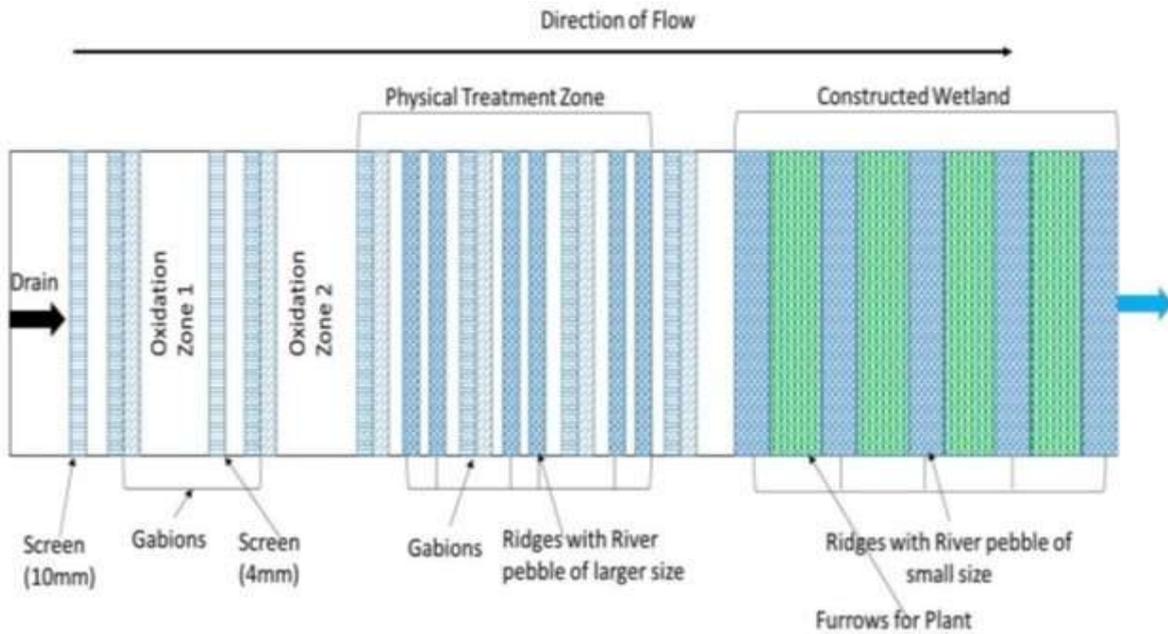


Figure 3: Schematic Layout of *in-situ* Constructed Wetland System

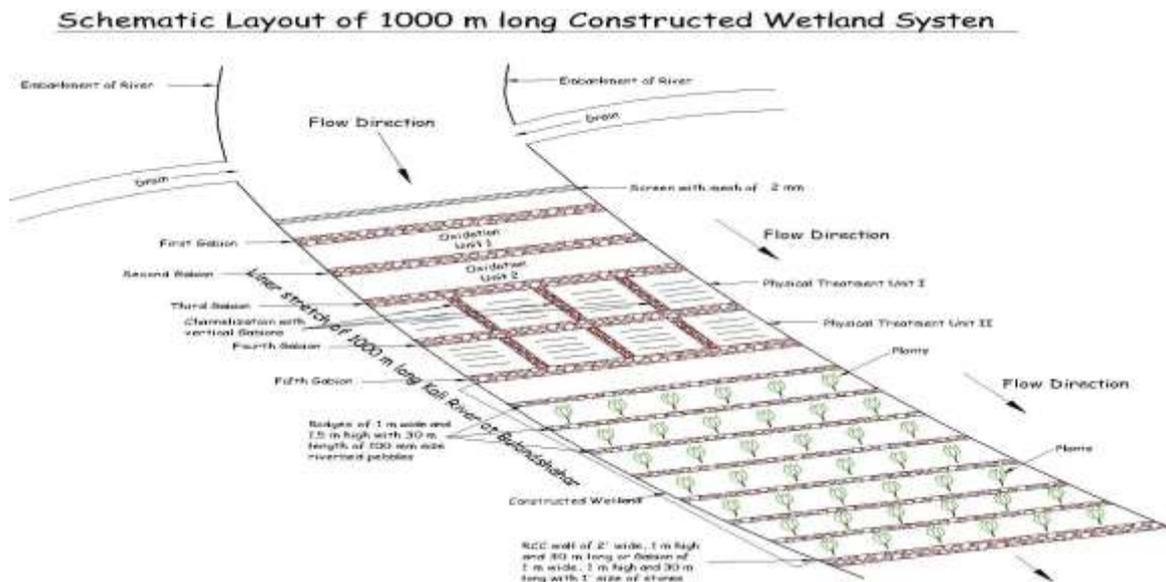


Fig 4: Diagrammatic layout of *in-situ* 1000 m long Constructed Wetland System

Case studies on CWS system:

i. Bioremediation of Neela Hauz Khaas lake, Delhi by Centre for Environmental Management of Degraded Ecosystems (CEMDE), Delhi University in collaboration with DDA established constructed wetland at Neela Hauz near Sanjay Van.

Neela Hauz is a freshwater lake which was slowly dying due to the dumping of waste. To restore the Lake into its original state, the lake was desilted and the desilted material was used for landscaping around the Lake. The raw sewage and raw sewage with treated sewage that used to enter Neela Hauz and then into Sanjay Van and finally to river Yamuna, is treated by passing it through constructed wetland system with zero energy consumption.

It took two years to make it functional with zero energy input. The constructed wetland system converts one million liters of sewage water per day into clean water having BOD less than 4mg/liter per day. Other details are given below:

Cost of Project: Rs 10 Lakhs, Lake is fed by drain of 01 MLD Expected

Outcome: 80 % reduction of BOD

Actual Reduction- 90 % of BOD Project

Started since November,2016

Recurring Activity: Annual harvest of dead biomass and annual cleaning of physical Filters and removal of sludge from oxidation ponds.

Impact: Restored dead Neela Hauz Lake

Current Status: Operating

ii. In-situ Constructed Wetland System at Rajokari Water Body, Kh No. 1234/11. by Irrigation and Flood Control Department, Delhi

Cost of Project: Rs 77.19 Lakhs, Fed

by drain with flow – 600 KLD

Expected Outcome: 80 % reduction of BOD Actual

Reduction- 84 % of BOD

Project Started since November, 2016

Impact: Substantial reduction in BOD concentration

Current Status: Operating

iii. Phytorid Technology developed by CSIR-NEERI for Water Body Rejuvenation Ex-Situ remediation.

Cost of Project: Civil Construction – Rs 2.2 Crore per MLD, O &M- Rs 20 Lakhs per MLD (includes Manpower, Consumables, Electricity, Testing, Contingency and Miscellaneous Items)

Location of Project: Pan-India (300 sites), Largest Plant – 03 MLD Land

Requirement: 1500 m² per MLD

Efficacy: reduction in BOD \leq 10 mg/l, TSS \leq 30 mg/l Current

Status: Operating in Pan-India

B. Remediation through Hydrodynamic cavitation

Hydrodynamic cavitation is a process of generation, growth and collapse of micro-bubbles or cavities in water. The collapse of these bubbles is associated with high energy release. This results in high local temperature and pressure. The local temperature and pressure after a cavity collapse can be of the order of about 5000 K and 10000 atm. Such intense collapse results in physical as well as chemical effects on the water. Firstly, the high temperature and pressure can split a water molecule into hydroxyl radical (\bullet OH), which can oxidize the surrounding pollutant molecules and breaking them into simpler and biodegradable molecules. Additionally, the micro jets produced during the bubble collapse can also break down any solid particles and/or pathogens present in the water.

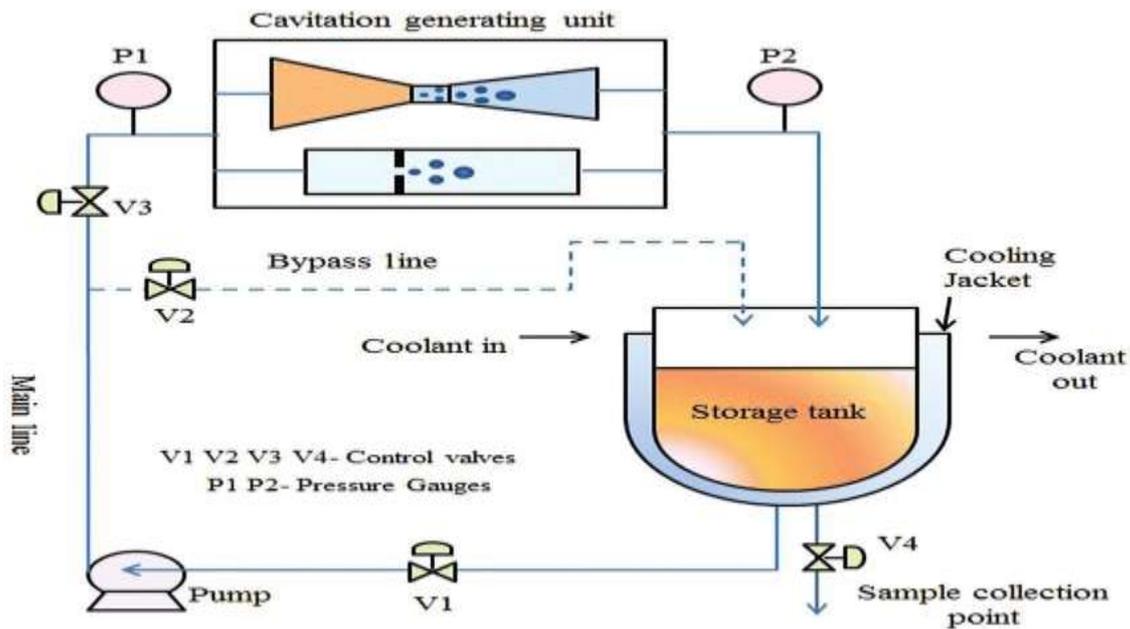


Fig 5: Hydrodynamic Cavitation process

Case Studies on Cavitation technology

i. Rejuvenation of Rankala Lake, Maharashtra

In 2015, Institute of Chemical Technology, Mumbai implemented this technology for rejuvenation of Rankala Lake in city of Kolhapur in Maharashtra. Rankala Lake is made up of 8 quarries with natural aquifers. This lake is used for recreational purposes, for idol immersion during Ganpati Festival etc. The lake also gets polluted due to dumping of local sewage streams and general human littering as well. This has resulted in growth of algae in water, as well as high level of water pollution. The Chemical Oxygen Demand (COD) of the lake was 110 ppm, while the Biochemical Oxygen Demand (BOD) was 40 ppm. Thus, one quarry of about 15-million-liter capacity was selected for installation of the Hydrodynamic Cavitation device for treating the water. The device has treated about 10000-liter water in an hour. The treatment of water using this device resulted in reduction of the algae in water and the water became visually clear. Also, the COD level of the water was found to be reduced to 20-30 ppm while the BOD level was reduced to zero, indicating that the water was well within the allowable levels of pollution.

Additionally, the cost of this treatment was also very low. The treatment cost of this device was calculated to be approximately Rs. 5.84/m³ of water or Rs. 87,600/- for the complete 15 million liters. The Hydrodynamic cavitation set up is shown in Figure 6. Picture showing Rankala lake before and after treatment is given at Figure 7 & 8 below:

Fig 6: Hydrodynamic Cavitation for Remediation of Rankala Lake

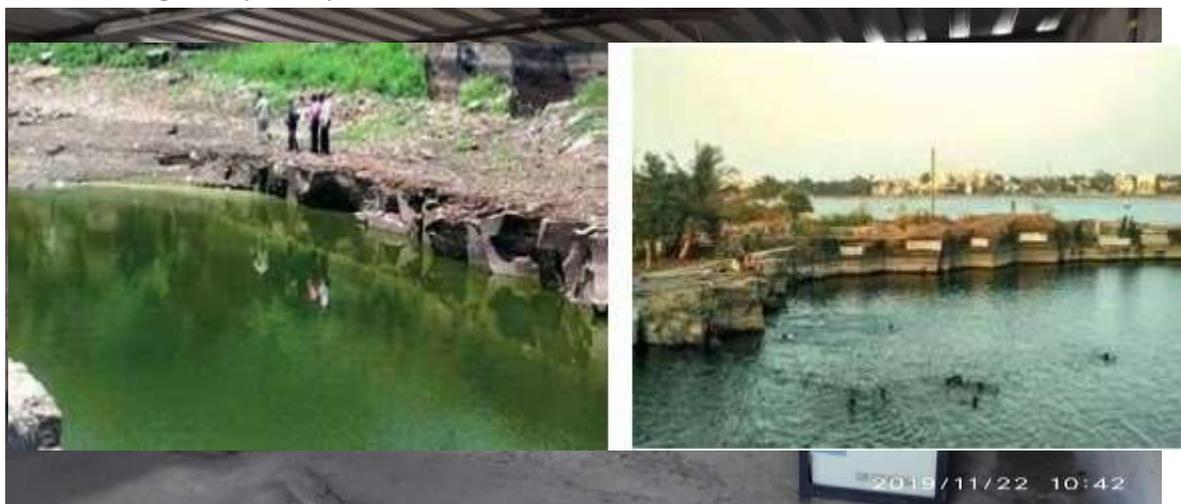


Fig 7: Rankala Lake before treatment

Fig 8: Rankala Lake after treatment

ii. Rejuvenation of Bindusagar Lake, Bhubaneswar, Odisha

Bindusagar Lake is one of the most famous holy places in Bhubaneswar city. It covers an area of 8.9 hectares (22 acres) with a water volume of 21,6000 m³. Institute of Chemical Technology (ICT-IOC Bhubaneswar), in collaboration with Indian Oil Corporation Ltd (IOCL) and Odisha Bridge & Construction Corporation (OB&CC) of Govt. of Odisha, have implemented the hydrodynamic cavitation technology to rejuvenate the Bindusagar lake without using chemicals with primary objective to improve the water quality in terms of reduced COD, BOD, Coliform count etc.

After one year of operation of the Hydrodynamic Cavitation systems, the Chemical Oxygen Demand (COD) of the lake water has reduced from 32 mg/L to about 15-20 mg/L, whereas the Biochemical Oxygen Demand (BOD) has reduced from 20 mg/L to about 2-6 mg/L. This indicates that the treatment has been successful in reducing the impurities in the lake water. Figure 9 shows installation of hydrodynamic cavitation system for cleaning.



Fig 9: Bindusagar Lake before installation of the cleaning project

C. Microbial Bioremediation

Microbial bioremediation involves periodic or continuous dosing of specific microbes, fungi and /or plants and their products (such as enzymes) in adequate quantity to the wastewater mass. The effectiveness of bioremediation depends on both the wastewater characteristics, the microorganisms and products that are used for dosing, the dosing amount, frequency of dosing and the environmental conditions. Microbial bioremediation could be intrinsic (within the lake using natural consortia of microorganisms) or in vitro (using an engineered treatment system). Microorganisms are used to treat mainly the organic matter; small quantity of inorganic materials and metals are also consumed as nutrients. Direct use of enzymes is done in biochemical treatment. Aerobic microbes need less time, whereas anaerobic microbes need more time to degrade the waste. There is recurring cost for maintaining microbial consortia as bio media has to be added in running stream at regular intervals. The microbial composition and doses are usually trade secrets and claims are unverifiable.

5.0 Conclusion

- i. The proposed technologies shall be applicable for only lake water remediation.
- ii. Detailed assessment of the aforementioned technologies to be done by the concerned authorities w.r.t techno economic feasibility for identification of best technology for remediation of lakes.
- iii. All sources of contamination of lake water, including contamination of lakes 1 through direct inflow of leachate as well through groundwater contaminated with leachate, to be completely cutoff prior to implementation of the identified technology for remediation

of lakes.

- iv. Continual monitoring of water quality of lakes & ponds for physio - chemical, bacteriological and heavy metals parameters to be done by State Pollution Control Board during and post- remediation stage of lake.
- v. Minutes of the meeting to be referred and the concerned organizations viz. National Environmental Engineering Research Institute (NEERI), Hyderabad Zonal Centre, Institute of Chemical Technology (ICT), Mumbai and Centre for Environment Management of Degraded Ecosystems (CEMDE), University of Delhi may be contacted for further information.



केन्द्रीय प्रदूषण नियंत्रण बोर्ड
CENTRAL POLLUTION CONTROL BOARD
पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय, भारत सरकार
MINISTRY OF ENVIRONMENT, FOREST & CLIMATE CHANGE, GOVT. OF INDIA

File No.:CM-13013/19/2021-TECH-RD-CHENNAI-
RD(Chennai)

Date: 04.03.2024

To,

All Expert Members
(As per the list enclosed)

Sub: - Minutes of the Meeting held at 03:00 PM on 01/03/2024 in compliance with the Hon'ble NGT order dated 1.2.2024 in O.A. No. 199 of 2021 (SZ) & I.A. No. 96 of 2022 (SZ) in the matter of Sri Shanker Narayana Bala Krishna Telangana and Ors.

Sir/Madam,

Please find enclosed herewith, Minutes of the Meeting held on 01/03/2024 in compliance with the Hon'ble NGT order dated 1.2.2024 in O.A. No. 199 of 2021 (SZ) & I.A. No. 96 of 2022 (SZ) in the matter of Sr. Shanker Narayana Bala Krishna Telangana and Ors., for your kind information.

Yours faithfully

(Divya Sinha)

Director & In charge, UPC-II

Copy for Information to: -

- | | |
|-------------------|---------------------------|
| 1. DH-Law Section | : For information, please |
| 2. PS to MS | : For information, please |

(Divya Sinha)

‘परिवेश भवन’ पूर्वी अर्जुन नगर, दिल्ली-110032

Parivesh Bhawan, East Arjun Nagar, New Delhi - 110032

दूरभाष/Tel: 43102030, 22305792, वेबसाइट/Website : www.cpcb.nic.in



Central Pollution Control Board
Parivesh Bhawan, East Arjun Nagar, Delhi-110032

Minutes of meeting held at 3.00 PM on 1st March, 2024 in compliance to Hon'ble NGT order dated 1.2.2024 in O.A No. 199 of 2021(SZ) & I.A No 96 of 2022 (SZ) in the matter of Sri Shanker Narayana Bala Krishna Telangana and Ors Vs State of Telangana, Rep by its Chief Secretary, Hyderabad and Ors.

A meeting was held on March 1st, 2024 through video conferencing under the Chairpersonship of Mrs Divya Sinha, Director and Divisional Head, UPC-II with the officials of National Environmental Engineering Research Institute (NEERI), Hyderabad Zonal Centre, Institute of Chemical Technology (ICT), Mumbai and Centre for Environment Management of Degraded Ecosystems (CEMDE), University of Delhi and CPCB in above-mentioned NGT matter. List of participants is attached as **Annexure-I**.

At the outset, Mrs. Suniti Parashar, Scientist 'C', UPC-II Div welcomed the participants and apprised about the brief background of the case and direction of Hon'ble NGT as per which CPCB has to furnish a technical report on remediation of water bodies contaminated with leachate near Jawahar Nagar dumpsite in Hyderabad. It was also informed that CPCB has previously submitted a report entitled "**Alternative Treatment Technologies for wastewater treatment in Drains**" during the year 2020 before Hon'ble NGT in O.A no. 06/2012 in the matter of Manoj Mishra Vs Union of India & Ors and the said report was prepared in consultation with expert's organization. It was decided that same experts shall be consulted for preparation of a technical report as per NGT direction dated 1.2.2024 in the present matter.

She also explained the route of contamination in five natural lakes situated in the downstream of the dumpsite. To understand the level of contamination, she presented the water quality of five lakes monitored by Regional Directorate Chennai, Telangana Board and GHMC officials on November 17th, 2020.

Mrs Parashar presented that a draft technical report has been prepared in line with referred CPCB report. The report includes such technologies which are suitable for remediation of lakes. As the water quality of lakes are more or less similar to the characteristics of domestic sewage water, the natural treatment systems could be considered as appropriate. She made a brief presentation on the technologies presently considered in the draft technical report and sought inputs from the expert members. (**Annexure II**).

Mr. Parag Gogate, Professor, Chemical Engg Deptt, ICT, Mumbai, opined that all sources of contamination of lake water, including contamination of lakes through direct

Contd..

-2-

inflow of leachate as well through groundwater contaminated with leachate, to be completely cutoff prior to implementation of the identified technology for remediation of lakes. He informed two case studies for remediation of water bodies through hydrodynamic cavitation technology undertaken by ICT i.e one is Rejuvenation of Rankala Lake, Maharashtra and another is rejuvenation of Bindusagar Lake, at Bhuvneshwar, Odisha.

Dr. Fayaz Kudsar, Biodiversity Expert, CEMDE, University of Delhi agreed that remediation of lakes can be done through constructed wetland system (CWS) which is a natural system and mentioned details on two case studies undertaken in Delhi, one at Neela Hauz khaas Lake and another at Rajokari water Body.

Dr Shaikh Basha, Senior Principal Scientist (NEERI), Hyderabad expressed his views that all sources of contamination of lake water, including contamination of lakes through direct inflow of leachate as well through groundwater contaminated with leachate, to be completely cut off prior to implementation of the identified technology for remediation of lakes. Further, he discussed on lake remediation that desilting of the lakes can be expedited. He also agreed to remediation by constructed wetland system. The Phytorid technology which is developed by NEERI is more suitable for a volume/flow of less than 1 MLD wastewater and beyond 1 MLD, area and cost requirements increases proportionately.

Further, he added that microbial bio remediation has operational issues and is not effective on a long-term basis.

A K Vidyarthi, Division Head WQM-II, added that legacy dumpsite is situated on a rocky surface leading to percolation in the ground water and contamination of surrounding waterbodies through overflow etc. Further, he mentioned that the technologies adopted for remediation should be of less energy and less chemical intensive as large area of water bodies to be remediated. Also, constructed wetland system, waste stabilization ponds and oxidation ponds as suggested by experts could be the possible technologies.

Mrs Divya Sinha deliberated on the issue that techno-economic feasibility to be assessed by the state agency for selection of suitable technology and execution of remediation activity of the lakes.

After detailed discussion meeting was concluded and experts agreed with abovementioned technologies for remediation of lakes.

The meeting ended with a vote of thanks.

List of Participants attended the meeting held on 01/03/2024 in compliance to Hon'ble NGT order dated 1/2/2024 024 in O.A No 199 of 2021(SZ) & I.A No 96 of 2022 (SZ) in the matter of Sr Shanker Narayana Bala Krishna Telangana and Ors Vs State of Telangana, Rep by its Chief Secretary, Hyderabad and Ors.

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3	Dr Faiyaz Khudsar, Biodiversity expert, CEMDE	University of Delhi	faiyazybp@gmail.com
4	Dr. Parag R. Gogate, Professor	Chemical Engg Dept, ICT, Mumbai	pr.gogate@ictmumbai.edu.in
5	Dr Shaikh Basha, Senior Principal Scientist	NEERI, Hyderabad Zonal Centre	--
6	Mrs Poornima B.M, Sc D	RD-Chennai CPCB	poornima.cpcb@nic.in
7	Mrs Suniti Parashar, Sc C, UPC-II Div	CPCB	suniti.cpcb@gov.in
8	Sh Amit Kumar, Sc B, UPC-II Div	CPCB	amitk22.cpcb@gov.in

Designated Best Use Water Quality Criteria

DESIGNATED-BEST-USE	CLASS OF WATER	CRITERIA
Drinking Water Source without conventional treatment but after disinfection	A	<ol style="list-style-type: none"> 1. Total Coliforms Organism MPN/100ml shall be 50 or less 2. pH between 6.5 and 8.5 3. Dissolved Oxygen 6mg/l or more 4. Biochemical Oxygen Demand 5 days 20°C 2mg/l or less
Outdoor bathing (Organised)	B	<ol style="list-style-type: none"> 1. Total Coliforms Organism MPN/100ml shall be 500 or less 2. pH between 6.5 and 8.5 3. Dissolved Oxygen 5mg/l or more 4. Biochemical Oxygen Demand 5 days 20°C 3mg/l or less
Drinking water source after conventional treatment and disinfection	C	<ol style="list-style-type: none"> 1. Total Coliforms Organism MPN/100ml shall be 5000 or less 2. pH between 6 to 9 3. Dissolved Oxygen 4mg/l or more 4. Biochemical Oxygen Demand 5 days 20°C 3mg/l or less
Propagation of Wild life and Fisheries	D	<ol style="list-style-type: none"> 1. pH between 6.5 to 8.5 2. Dissolved Oxygen 4mg/l or more 3. Free Ammonia (as N) 1.2 mg/l or less
Irrigation, Industrial Cooling, Controlled Waste disposal	E	<ol style="list-style-type: none"> 1. pH between 6.0 to 8.5 2. Electrical Conductivity at 25°C micro mhos/cm Max.2250 3. Sodium absorption Ratio Max. 26 4. Boron Max. 2mg/l