

BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL

SOUTHERN ZONE AT CHENNAI

ORIGINAL APPLICATION NO. 213 OF 2015

C.P Senthil,
Flushing Meadows Villa No.4,
Globus Gardens,
Kaikopalayam,
Coimbatore - 641 061

...APPLICANT

V.

1. Tamil Nadu State Pollution Control Board,
Represented by its Chairman,
No.76, Mount Salai, Guindy,
Chennai - 6000032.
2. District Environmental Engineer.
Tamil Nadu Pollution Control Board,
Coimbatore (North),
266, Mettupalayam Road,
Coimbatore - 641 043.
3. Elysium Properties Pvt Ltd,
Rep by its Authorized Representative,
699, Avinashi Road,
Coimbatore - 641 037.

...RESPONDENTS

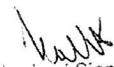
AFFIDAVIT OF COMPLIANCE ON BEHALF OF THE 3RD RESPONDENT

I, G. Karthik Veeramani, son of Gopalakrishnan, the Authorized Representative of the 3rd Respondent herein and having office at 699, Avinashi Road, Coimbatore- 641 037, having now temporarily come down to Chennai, do hereby solemnly affirm and sincerely state as follows;

1. I submit that I am the Authorized Signatory of the 3rd Respondent herein and I am well acquainted with the facts and circumstances of the case.

1

For Elysium Properties India (P) Ltd


Authorized Signatory

2. I submit that the Hon'ble Tribunal vide order dated 22.12.2016 constituted a Joint Committee comprising of the Central Pollution Control Board and the 1st Respondent to inspect the Sewage Treatment Plant constructed by the 3rd Respondent and submit a report. The said committee conducted the inspection on 09.03.2017 and submitted the report before the Hon'ble Tribunal. The Hon'ble Tribunal vide orders dated 16.03.2020 and 17.09.2020 on the consideration of the said report, directed the said Committee to further inspect the said Plant.
3. I sincerely submit that in pursuance to the directions of this Hon'ble Tribunal, the said Committee conducted further inspection on 18.11.2020 and submitted the findings before the Hon'ble Tribunal. The contents of the said report were reflected in the order dated 03.12.2020. The 3rd Respondent filed their Objections to the said Status Report on 11.02.2021 on which date, the present Application was listed for consideration of further Status Report.
4. I humbly submit that the 3rd Respondent in the said Objections to the Status Report dated 11.02.2021, stated that the recommendations of the 1st Respondent failed to consider the specific design utility of the said plant of the 3rd Respondent and that the design of the said plant has been made to ensure operational efficiency and to meet adverse conditions.
5. I further submit that the 3rd Respondent also requested for the presence of a Mechanical Engineer to be present along with the 1st Respondent at the time of inspection of the said plant. Pursuant to which, this Hon'ble Tribunal directed the 1st Respondent *"to consider the question as to whether the assistance of the Mechanical Engineer is required for the purpose of*

suggesting any modification in the existing STP so as to make the STP more conducive to improve its operation to meet the situation”.

6. I sincerely submit that in pursuance to the said order dated 11.02.2021 of this Hon'ble Tribunal, the 1st Respondent issued Letter dated 16.04.2021 instructing the 3rd Respondent to conduct a study of the said plant through either IIT Madras/Centre for Environmental Studies, Anna University or NEERI Chennai.
7. I humbly submit that in pursuance to the said Letter dated 16.04.2021, the 3rd Respondent vide Letter dated 07.06.2021 requested the Indian Institute of Technology, Madras to undertake the study on the operation of the said plant.
8. I sincerely submit that pursuant to which, the Report titled **“Evaluation of the Performance of Sewage Treatment Plant (STP) at Elysium Flushing Meadows”** dated 10.12.2021 by Dr. S. Mathava Kumar, Associate Professor, Environmental & Water Resources Engg. Department of Civil Engineering, Indian Institute of Technology Madras, Chennai- 600 036 is hereby enclosed as **Annexure - A1**.
9. I humbly submit that the said Report dated 10.12.2021 in paragraph 5.3. had concluded that the physical dimensions of the various treatment units existing at present in the said plant are adequate to treat the wastewater generated in Elysium Flushing Meadows. The report also concluded that the effluents coming out of the said plant are meeting all the prescribed parameters as per the initial consent to operate, with the exception of the parameters such as Fecal Coliforms (FC) and total phosphorous to be above the prescribed limits. It is pertinent to state that the said parameters were not part of the initial consent to operate issued by the 3rd Respondent with

the 1st Respondent and that the said modifications will also be duly carried out by the 3rd Respondent.

10. I sincerely submit that the Report dated 10.12.2021 has also made certain recommendations to be carried out by the 3rd Respondent. The said recommendations are minimal operational changes to realize optimum operational efficiency of the said plant which will be duly carried out by the 3rd Respondent.

11. I humbly submit that since the said Report dated 10.12.2021 establishes that the physical dimensions of the said plant are adequate which further establishes that the said plant is constructed as per engineering requirements. I further submit that the same also negates the requirements for augmentation of the plant, induction of coarse bubble diffusers and revamping of clarifiers as stated by the findings of the said Joint Committee dated 09.03.2017 and also reported in the subsequent compliance status dated 18.08.2020, 18.11.2020, 08.02.2021 and 04.08.2021.

12. I sincerely submit that the said Report dated 10.12.2021 clearly establishes that the said plant has been designed adequately and scientifically with the exception for certain operational changes that have developed due to the wear and tear of the said plant from its functioning. The said minimal operational changes will also be duly carried out by the 3rd Respondent with the immediate effect.

Therefore, it is most humbly prayed that this Hon'ble Tribunal may be pleased to consider the Report titled "**Evaluation of the Performance of Sewage Treatment Plant (STP) at Elysium Flushing Meadows**" dated 10.12.2021 by

the Indian Institute of Technology Madras, Chennai- 600 036 and pass appropriate orders.

For Elysium Properties India (P) Ltd.


Authorised Signatory

Solemnly affirmed at Chennai on this the 03rd day of January, 2022 and signed in my presence

BEFORE ME,


ADVOCATE: CHENNAI

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

OA No. 213 of 2015

C.P Senthil

...Applicant

V.

Tamil Nadu State Pollution Control
Board & 2 Ors

...Respondents

AFFIDAVIT OF COMPLIANCE FILED
BY THE 3RD RESPONDENT

M/s. S.V.PRAVIN RATHINAM (Ms.3069/07)

Counsel for the 3rd Respondent

BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL

SOUTHERN ZONE AT CHENNAI

ORIGINAL APPLICATION NO. 213 OF 2015

C.P Senthil,
Flushing Meadows Villa No.4,
Globus Gardens,
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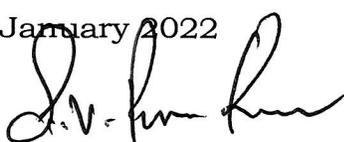
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...RESPONDENTS

INDEX TO TYPED SET OF DOCUMENTS ALONG WITH THE AFFIDAVIT OF COMPLIANCE FILED BY THE 3rd RESPONDENT

S.No.	Date	Description of Document	Pg No
1.	10.12.2021	Report titled <i>Evaluation of the Performance of Sewage Treatment Plant (STP) at Elysium Flushing Meadows</i> by Indian Institute of Technology, Madras – Annexure A1.	1
2.	03.01.2022	E-mail evidencing the dispatch of the Affidavit of Compliance along with the Typed Set of Documents to the Applicant and the 1 st and 2 nd Respondents.	37

Dated at Chennai on this the ^{2nd} 3 day of January 2022


Counsel for the 3rd Respondent

PROJECT REPORT

ON

Evaluation of the performance of Sewage Treatment Plant (STP) at Elysium Flushing Meadows

Project Report Submitted to:
Elysium Properties India (P) Ltd - Flushing Meadows,
699, Avinashi Road, Coimbatore – 641 037,
Tamilnadu, India.

This is to certify that pages 1 to 36 (cover to end) of the
report is prepared based on the findings of the sample
analysis and measurements carried out at Elysium
Flushing Meadows.

S. Mathava Kumar
10/Dec/2021

डॉ. एस. माधव कुमार
Dr. S. MATHAVA KUMAR
आसो प्रोफेसर / Associate Professor
विश्वविद्यालय, Civil Engineering
भारतीय प्रौद्योगिकी संस्थान मद्रास
Chennai - 600 036



Prepared by

Dr. S. Mathava Kumar

Associate Professor,

Environmental & Water Resources Engg.

Department of Civil Engineering

Indian Institute of Technology Madras

Chennai - 600036, India

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CHAPTER 1
INTRODUCTION

1.1 Location

Elysium Flushing Meadows (EFM) is located in Vellanaipatti village that comes under Annur taluk, Coimbatore district. It is located at a distance of 5.5 to 6 km from the Coimbatore international airport. It spreads over a sprawling area of 15 Acres. There are in total 126 individual villas out of which 100 villas are occupied with an average of 4 persons per household. The project was launched in 2012 and it was completed in the year 2014. Fig. 1 shows the location of the study area.

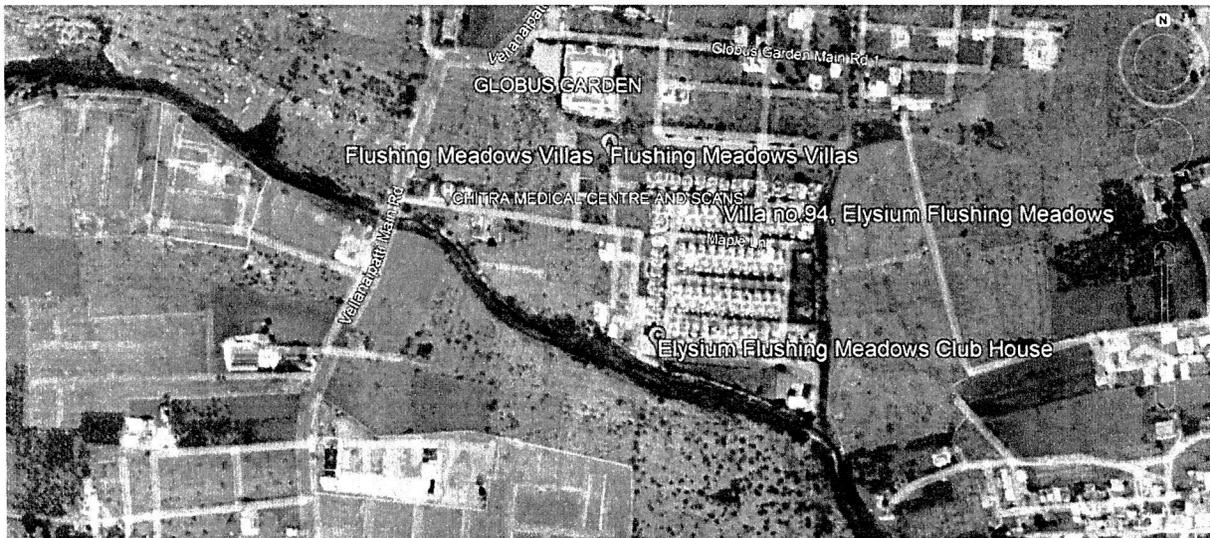


Figure 1. Location map of Elysium Flushing Meadows Clubhouse

1.2 Study area

The sewage treatment plant (STP) is located inside the EFM at latitude of 12.847° and longitude of 79.700° as shown in Fig. 1. Operations of STP commenced from the year 2015 after obtaining consent to operate from Tamil Nadu Pollution Control Board (TNPCB). STP in EFM is an underground structure covered by asbestos cement (AC) sheets on the top as shown in Fig. 2. Adjacent places of STP includes two villas and a playground that are located at a distance of about 100 m from it. Apart from the places mentioned, there is a stream which is running just behind the boundary of EFM. The wastewater reaching the STP is collected through underdrains from all the villas in EFM. The effluent coming out after treatment is used for the purpose of gardening. The operation and maintenance of the plant was given to M/s Eco Green Technologies, Coimbatore from 30th April 2019. The agreement signed between the EFM and M/s Eco Green Technologies is attached in Annexure I.



Figure 2. View of the STP interior in EFM.

1.3 Standards for treated STP effluent for discharge / Land application

TNPCB has prescribed the standards (Source: National Green Tribunal order dated 30.4.2019 in Original Application number 1069/2018) for the STPs for all modes of disposal for different class of cities. The guidelines also suggest to reuse or recycle the treated wastewater to a maximum extent. The standards were given based on the population of the considered region. The standards are provided for pH, biochemical oxygen demand (BOD), chemical oxygen demand (COD), total suspended solids (TSS), total nitrogen (TN), total phosphorus (TP) and fecal coliforms (FC). The prescribed standards are provided in Table 1. In the past, treated STP effluent samples were collected by TNPCB from STP in EFM. Compliance of EFM STP samples done by TNPCB is attached in Annexure II.

Table 1. Standards prescribed by TNPCCB for effluent disposal

Parameters	Standards (Applicable to all mode of disposal)			
	Mega and Metropolitan Cities	Class I Cities	Others	Deep Marine Outfall
pH	5.5 - 9.0	5.5 - 9.0	5.5 - 9.0	5.5 - 9.0
BOD	10	20	30	30
TSS	20	30	50	50
COD	50	100	150	150
TN	10	15	-	-
TP	1.0	1.0	1.0	-
FC	Desirable- 100 Permissible- 230	Desirable- 230 Permissible- 1000	Desirable- 1000 Permissible- 10,000	Desirable- 1000 Permissible- 10,000

Note:

- (i). Mega-Metropolitan Cities have population more than 1 crore, Metropolitan Cities- Population more than 10 Lakhs and Class-1 Population more than 1 Lakh.
- (ii). All values are in mg/l except pH and Fecal Coliform (in MPN/100mL).
- (iii). The study is classified under others category according to TNPCCBs norms.

Central Public Health and Environmental Engineering Organization (CPHEEO) provides the guidelines for operation and maintenance of the STP. It has also prescribed standards for the reuse of treated effluent depending upon the purpose for which it is to be used. The standards were prescribed for toilet flushing, fire protection, vehicle exterior washing, non-contact impoundments, landscaping, horticulture and agriculture. Landscaping, horticulture and agriculture section is further sub-divided into edible and non-edible crops respectively. Since EFM uses the treated water for gardening purpose and has agreed to use part of its treated water for flushing, standards pertaining to non-edible crops and toilet flushing given by CPHEEO are presented in Table 2.

Table 2. Reuse standards prescribed by CPHEEO for non-edible crops and toilet flushing

Parameter	Non-edible gardening standards	Flushing Standards
Temperature	Ambient	Ambient
Color	AA	Colorless
Suspended solids	30	Nil
TDS	2100	2100
pH	6.5-8.3	6.5-8.3
BOD	20	10
COD	30	30
Minimum residual chlorine	1	1
Nitrate nitrogen as N	10	10
Dissolved phosphorous as P	1	5
FC	230	Nil

Note:

- (i). All units are in mg/L except pH, Temperature (°C) and FC (MPN/100 mL).
- (ii). AA- as arising when other parameters are satisfied.
- (iii). A tolerance of 5% is allowable when yearly average values are considered.

CHAPTER 2
SEWAGE TREATMENT PLANT

2.1 Sewage treatment plant

The STP has been designed to treat 125 KLD of sewage. The treatment system is designed to reduce pollutants such as BOD, COD, TSS etc. The proposed scheme of treatment (Fig. 2) in the STP consist of perforated screen, collection tank (flow equalization), aeration tank (secondary biological treatment based on conventional activated sludge process with sludge recirculation). Moreover, the STP was given with a provision of sludge drying beds, pressure sand filter (PSF), activated carbon filter (ACF) and disinfection units. The dimensions of various units of the STP are provided in Table 2.

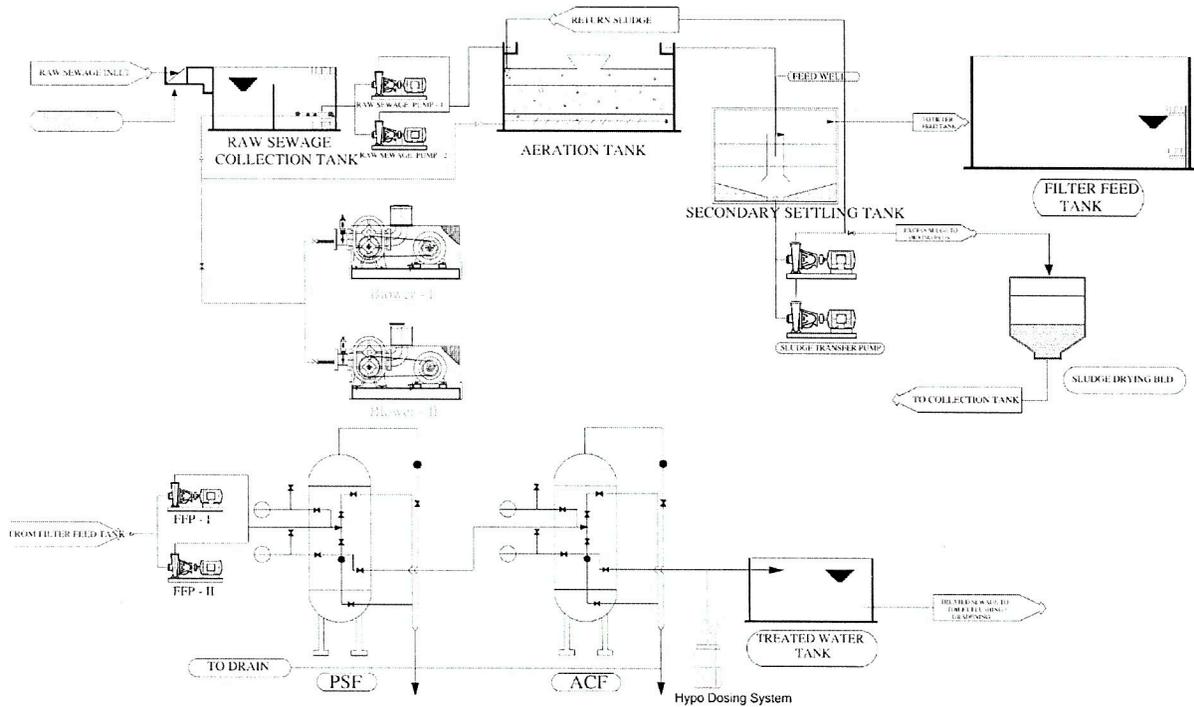


Figure 3. Proposed treatment scheme of the STP at EFM.

The wastewater generated in the villas is collected through underdrains that reach the screening unit. A single perforated screen was separating the floating substances from the raw sewage. Subsequently, this wastewater is directed to flow into a collection sump by gravity. The screened sewage in the collection tank is pumped into the aeration tank by two submersible pumps that has a capacity of 3HP each and operates at a flow rate of 5.5 L/s. The pumped sewage enters the aeration tank provided with surface aeration. The blower capacity used for aeration is around 200 m³/h at a pressure of about 0.5 bar. The water from the aeration tank enters the secondary clarifier where the solid-liquid separation occurs. The clarified water enters the tertiary treatment unit

consisting of PSF and ASF. On the other hand, the biomass from the secondary clarifier is recirculated back to the aeration tank (recirculation ratio = 2) with the help of recirculation pumps with a capacity of 1 HP and at a flow rate of 2.9 L/s (2 nos.).

Table 3. Dimensions of the treatment units in STP

Sl. No.	Description	Type	Length (m)	Breadth (m)	Height (m)	Volume (m ³)
1	Collection Tank	Rectangular Basin	11.5	3.5	3.5	140.9
2	Aeration Tank	Rectangular Basin	7.8	4	4.5	140.4
3	Filter Feed Tank	Rectangular Basin	5.5	3	2.5	41.25
4	Treated Water Tank	Rectangular Basin	4	2.5	2.5	25
			Diameter (m)		Height (m)	Volume (m³)
5	Filters (PSF & ACF)	Cylindrical Basin	0.9		1.8	1.15
6	Secondary Clarifier	Cylindrical Basin	3.5		3	28

Clarified water from the secondary clarifier enters the filter feed tank from which the water is pumped to the PSF and ACF, respectively. There are two filter feed pumps, namely, FFP1 and FFP 2 pumping filter feed outlet to PSF and ACF, respectively. The outlet water from ACF is dosed with a proprietary disinfectant after it enters the effluent holding tank to ensure proper disinfection. The water from the effluent holding tank is reused for gardening inside EFM clubhouse. The color of inlet wastewater was dark-grey and observed to have a foul odor.

2.2 Sample collection

A preliminary site investigation was carried out for fixing the sampling points. Based on the preliminary investigation, 8 sampling points were chosen. Sampling was performed on 28-8-2021. The sampling points are shown in Fig. 4. The samples were collected in 1 L plastic sampling containers. Samples from collection tank, aeration tank and effluent were taken in BOD bottles for BOD determination (Fig. 5a). Apart from sample collection the amount of settleable solids in the aeration tank is also measured by taking a well-mixed sample from the aeration tank (Fig. 5b).

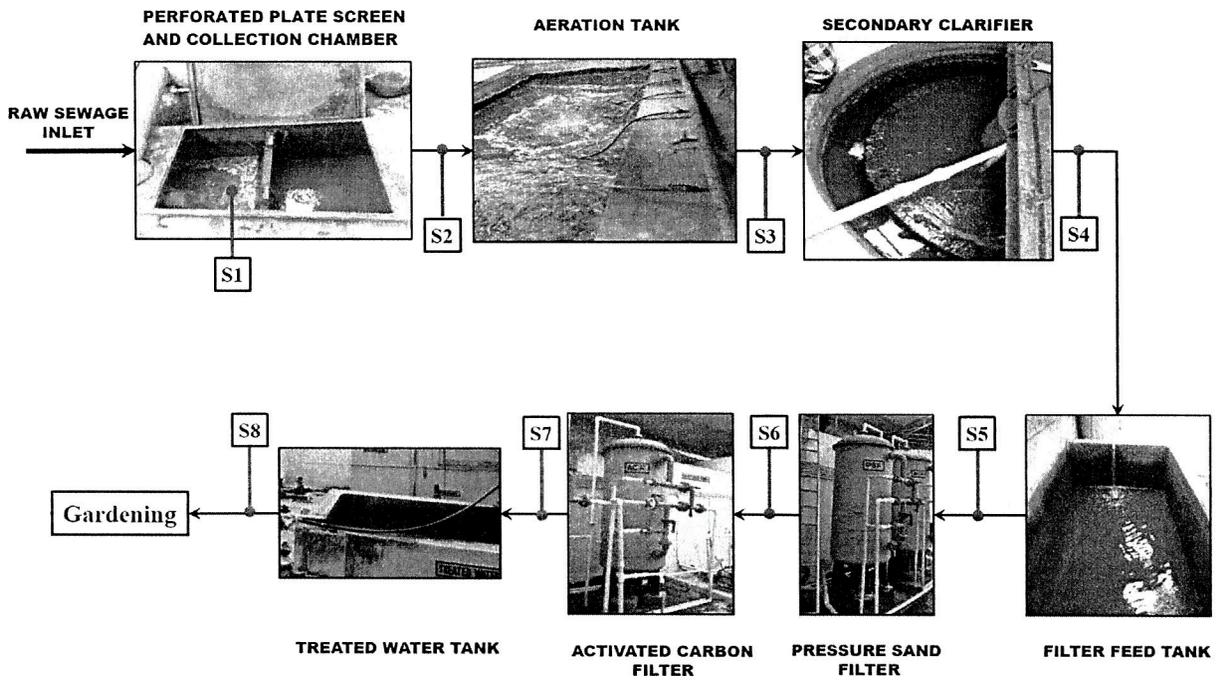


Figure 4. Diagram of the showing the sampling points in the STP of EFM

As soon as the samples were collected, the containers were labelled and transferred to an insulated ice box as shown in Fig. 5c. The ice box was transported to the laboratory in Indian Institute of Technology Madras and the sample containers were stored at 4 °C. Parameters like BOD, COD, MPN were analyzed immediately. Alongside wastewater sample collection, noise monitoring was also carried out at selective places near the STP.

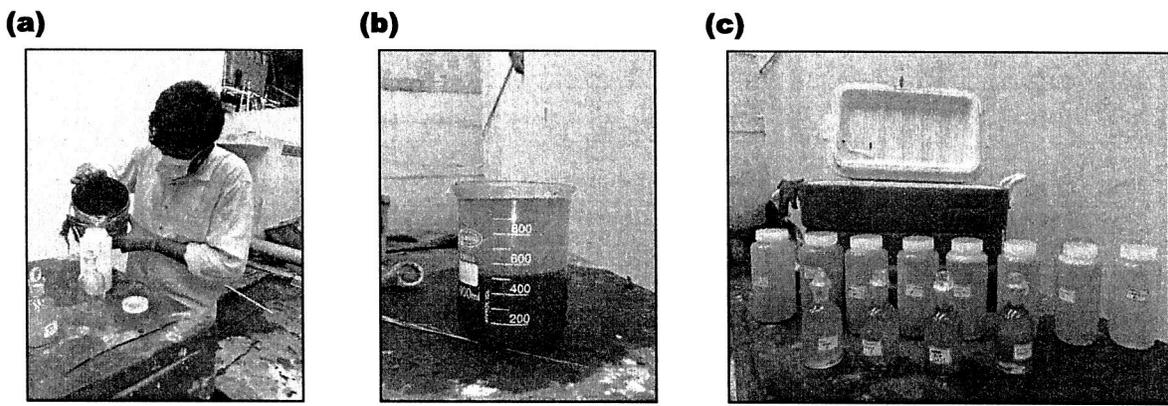


Figure 5. Photographs showing (a) Sample collection (b) Settleable solids in aeration tank and (c) Samples collected from STP.

A second sampling was carried out on 22-9-2021 to cross examine the reliability of results obtained during the first sampling. In the second sampling, samples were collected from screening, collection tank, aeration tank and treated effluent tank.

2.3 Characterization of wastewater

The collected samples were analyzed as per APHA standard methods. Table 3 shows the list of parameters analyzed along with the methods adopted for carrying out the analysis.

Table 4. List of parameters with their method of analysis

Sl. No	Parameter	Code	Methods
1	Colour	Part 2120	Physical
2	Odour	Part 2150	Physical
3	pH	Part 4500- H ⁺	pH meter
4	Electrical Conductivity (EC)	Part 2510 B	Conductivity meter
5	Dissolved oxygen (DO)		DO meter
6	Turbidity	Part 2130 B	Turbidity meter
7	Biochemical oxygen demand (BOD ₃)	Part 5210	Winkler's method
8	Chemical oxygen demand (COD)	Part 2520	Closed reflux
9	Total solids (TS)	Part 2540 B	Gravimetric
10	Total suspended solids (TSS)	Part 2540 D	Gravimetric
11	Total dissolved solids (TDS)	Part 2540 C	Gravimetric
12	Fixed suspended solids (FSS)	Part 2540 E	Gravimetric
13	Fixed dissolved solids (FDS)	Part 2540 E	Gravimetric
14	Total Fixed solids (TFS)	Part 2540 E	Gravimetric
15	Volatile suspended solids (VSS)	Part 2540 E	Gravimetric
16	Volatile dissolved solids (VDS)	Part 2540 E	Gravimetric
17	Total volatile solids (TVS)	Part 2540 E	Gravimetric
18	Sulphates	Part 4500-SO ₄ ⁻	Spectrophotometric
19	Nitrates	Part 4500-NO ₃ ⁻	Spectrophotometric
20	Phosphates	Part 4500-PO ₄ ³⁻	Stannous chloride
21	Chlorides	Part 4500-Cl ⁻	Argentometric Titrimetric
22	Sodium as Na ⁺	Part 3500-Na ⁺	Ion chromatography
23	Ammonia as NH ₃	Part 4500-NH ₄ ⁺	Ion Chromatography
24	Total Coliforms (TC)	Part 9221 B	Multiple tube fermentation
25	Fecal Coliforms (FC)	Part 9221 B	

CHAPTER 3
RESULTS AND DISCUSSION

3.1 Wastewater characteristics

The characteristics of wastewater samples collected at different treatment units of the STP in EFM is presented in Table 5. The results of the second sampling are attached in Annexure III.

Table 5. Characteristics of sewage collected from different treatment units during Sampling 1.

Sl. No	Parameter	S 1	S 2	S 3	S 4	S 5	S 6	S 7	S 8
1	pH	7.12	7.32	7.41	7.35	7.45	7.43	7.43	7.62
2	EC	446	718	735	776	775	778	758	827
3	Turbidity	53.6	262	267	266	44	42.4	49.6	21.9
4	TS	612	1068	1052	1008	748	732	764	740
5	TSS	296	349	348	192	68	68	90	40
6	TDS	316	600	604	648	584	536	556	600
7	COD	339	531	326.4	275.2	93.3	90	82	57.6
8	BOD	150	200	118	227.5	73.6	70.4	41.6	30
9	DO	0.82	0.14	0.91	-	-	-	-	4.02
10	TN	29.5	48.0	51.6	49	52.7	51.0	51.8	52.1
11	Nitrates	1.1	0.6	2.5	2.6	2.7	3.8	2.2	1.9
12	Ammonium	12.5	14	14.2	14.3	14.5	14.2	14.5	11.9
13	Phosphates	3.6	11.6	11.4	11.0	31.5	31.8	33.1	40.8
14	Chlorides	95.6	109.9	119.6	115.0	103.1	109.9	115.3	143.6
15	Sulphates	12.7	52.2	51.1	46.6	38.6	41.5	43.9	46.0
16	Sodium	49	50.2	40.9	44.3	42.6	44.7	45.9	41.3
17	Potassium	7.2	6.9	6.3	7	6.4	5.9	6.4	5.9
18	Calcium	4.1	4.3	3.5	3.5	4.6	4.6	3.6	4.5
19	Magnesium	7.4	6.1	5.9	6.4	6.5	5.9	6.3	5.4
20	Residual Chlorine		BDL				BDL	BDL	BDL
21	TC		>1600						>1600
22	FC		>1600						>1600

* BDL- Below Detection Limit

* All values are in mg/L except pH, EC ($\mu\text{S}/\text{cm}$), Turbidity (NTU), FC and TC (MPN/100 mL)

3.2 Physical parameters

The sample was grey in color as visible from naked eye and odor was found to be offensive in the samples (S1 to S5). From Table 5, it can be observed that the parameters of S1 are comparatively lesser than that of S2. The reason might be that, the aeration provided in the collection tank prevents the settling of suspended solids. The suspended solids might have contributed to the increase in the parameters of S2.

The pH was observed to be neutral varying from 7.1 to 7.6 in the treatment systems. The pH increased slightly (from 7.3 to 7.4) during biological treatment (Fig. 6). The conductivity was almost stable throughout the treatment units except for S8. The increase might be due to leaching of ions from the exhausted filter bed or due to chlorination. However, analysis of residual chlorine did not show any detectable free chlorine in the system after treatment (Table 5). Also, the increase in pH after S7 shows that chlorination has not been done effectively.

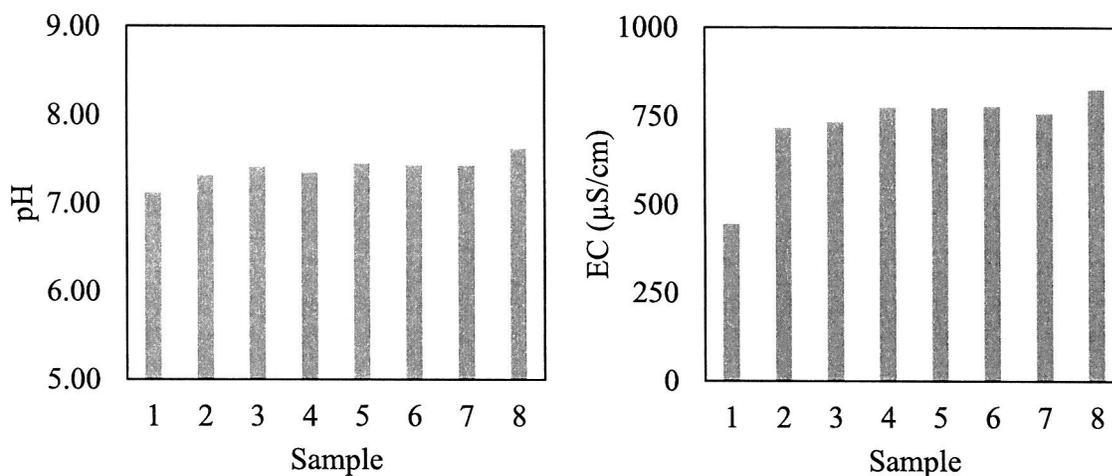


Figure 6. Variation of pH and EC in the collected samples

The turbidity and TSS profiles are shown in Fig. 7. It can be observed that TSS and Turbidity have a similar profile. The TSS in the collection tank, aeration outlet and SST outlet are higher compared to other samples. It can be seen that the filtration holding tank (S4) was able to remove some suspended solids. This might be due to the settling of solids in the detention time provided. Turbidity and TSS were removed effectively in the pressure sand filter (S5).

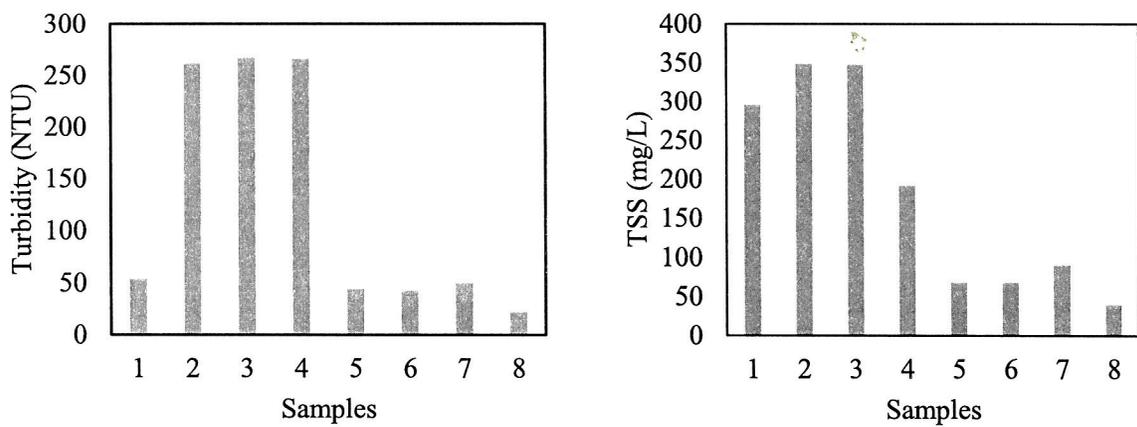


Figure 7. Variation of Turbidity and Total suspended solids in the collected samples

□ Total Solids (TS) ■ Total Suspended Solids (TSS) □ Total Dissolved Solids (TDS)

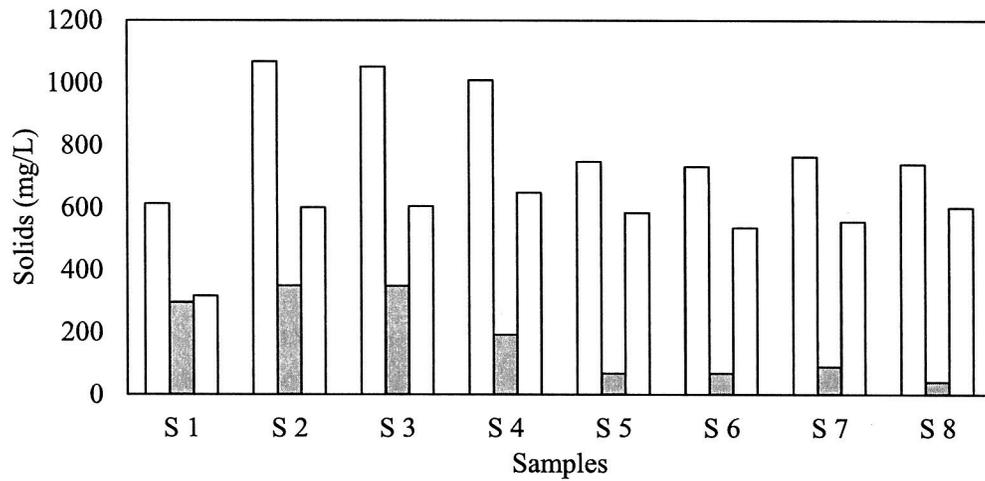


Figure 8. Solids profile (TS, TSS and TDS) for the collected samples

The treatment system is effective in removing suspended solids. However, there is no net dissolved solids (TDS) removal. The removal of suspended solids resulted in the removal of total solids from 1000 mg/L to 740 mg/L. The TDS profile also shows that there is a slight increase in TDS in samples S8. The increase maybe due to either leaching of ions from the saturated filtration unit or due to chlorination. The volatile and fixed solid profiles were analyzed for samples S1, S2 and S8.

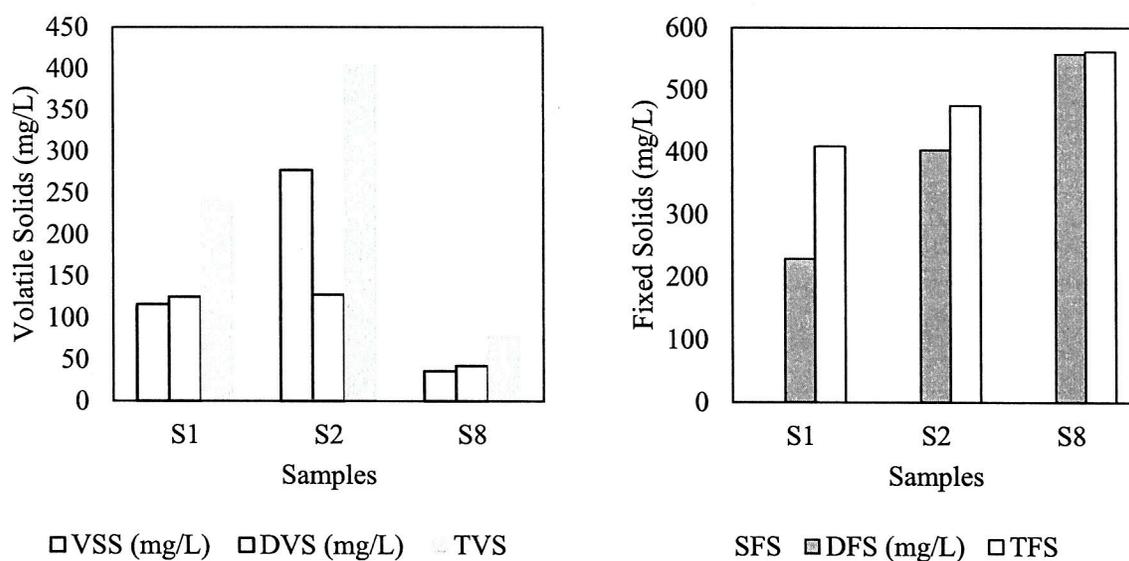


Figure 9. Volatile and Fixed solids profile in the collected samples

From Fig. 9 it can be inferred that the suspended solids constitute the major portion of volatile solids in S1 and S2. The dissolved volatile solids decrease from 127.5 mg/L to 42.5 mg/L in sample 8 as a result of secondary and tertiary treatment units. In contrast to dissolved solids, fixed solids profile is showing an increasing trend from the initial value of 408 mg/L in S1 to 561.5 mg/L in S8, respectively. The reason for this increase is same as that of EC and TDS.

3.3. Chemical Parameters

Variation of bulk organic parameters, cations and anions of the collected samples are discussed in this section. Fig. 10 shows the variation of COD and BOD of the samples collected from different treatment units of STP. The BOD/COD ratio is 0.45 which suggests that the wastewater is suitable for biological treatment. The values of both BOD and COD are getting reduced after the secondary treatment making the ratio 0.36. This shows us that the carbonaceous organic matter is getting removed in the secondary treatment. However, there is an increase in this ratio to 0.82 after secondary clarifier. This may be due to unsettled microbes in the clarified effluent. These unsettled suspended organic matters are removed in the filter feed tank, PSF and ACF that results in the reduction of the BOD and COD (ratio of 0.52) in the final effluent sample (S8).

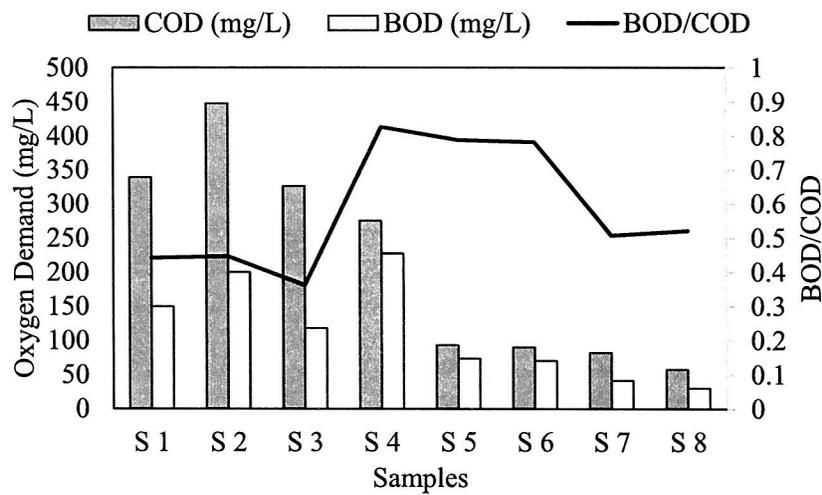


Figure 10. Chemical oxygen demand and Biochemical oxygen demand of the collected samples

Fig. 11 shows the concentration of ammonium, nitrate and total nitrogen concentration of the collected samples. It can be inferred that the ammonium concentration is around 13 mg/L whereas nitrate concentration is 0.6 mg/L for the sample in the collection tank. After secondary treatment most of the ammonium ions in the system should be converted into nitrates. However, in this case the nitrification process is minimal as the nitrate and the ammonium concentrations are almost constant in all the samples collected in different treatment units.

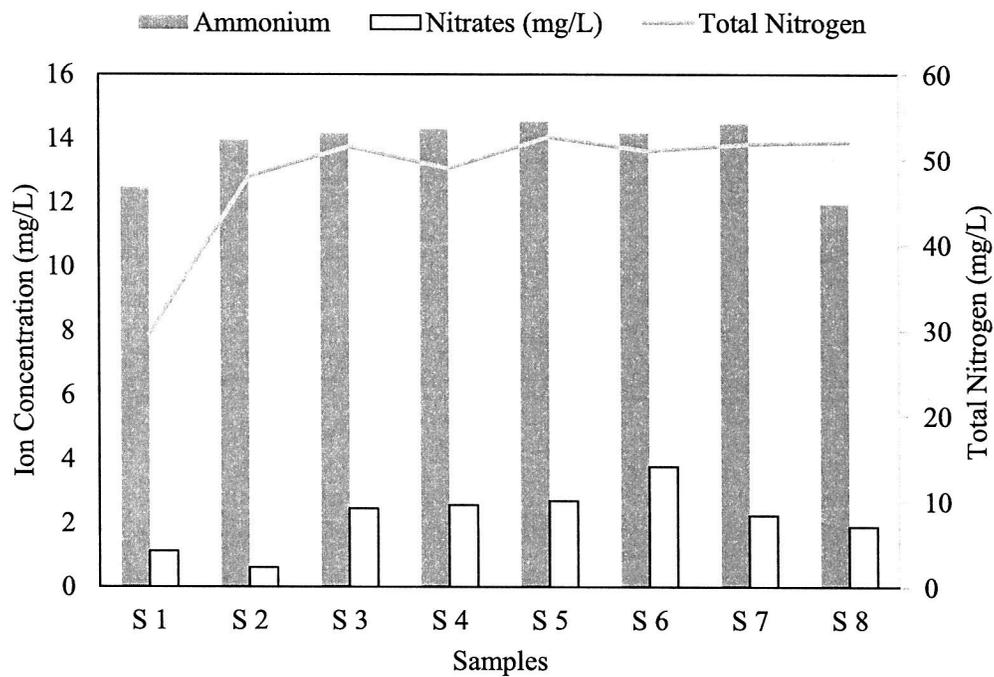


Figure 11. Variation of ammonia, nitrates and total nitrogen in the collected samples

Moreover, it can also be observed that the total nitrogen value is constant throughout the entire treatment scheme. However, there is a reduction in ammonia concentration in S8 from 14.5 mg/L to 12 mg/L owing to chlorination. Therefore, the chlorine added is fully utilized for ammonia oxidation rather than disinfection.

Fig. 12 shows the variation of phosphate and chloride ion concentrations in the collected samples. Phosphate concentration is almost similar for S2, S3 and S4. However, the concentration increased to ~30 mg/L after PSF. It is envisaged that the increase might be due to the leaching of phosphates from the saturated bed of the filter. Chloride ion concentration varied less significantly till S7 and was around 115 mg/L. The concentration of chlorides increased to 144 mg/L in S8 owing to the chlorination process. However, the absence of residual chlorine (Tables 5) and the presence of coliforms in the final effluent infers that the chlorine dosage is not sufficient to carry out complete disinfection.

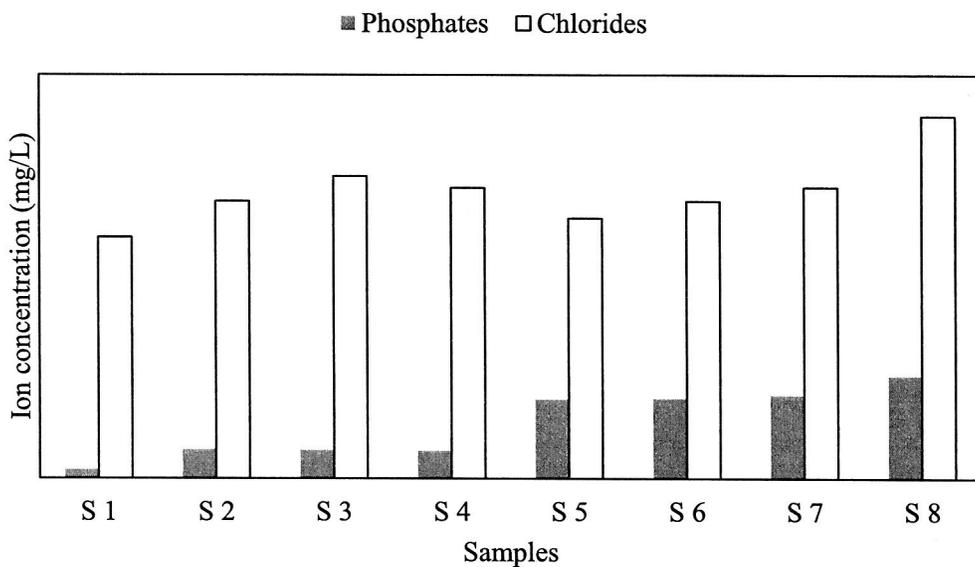


Figure 12. Variation of phosphate and chloride concentrations in the collected samples

CHAPTER 4
NOISE MONITORING

4.1 Instrument used for noise monitoring

The sound levels were monitored using a pocket level sound meter Lutron SL -4030 which has an accuracy of 0.1 dB and can measure up to a maximum value of 130 db. There are two weighting scales namely “A” and “C” in the instrument. Typically, A weighting is used for most of the measurements and B scale weighting is used for the sound measurements from machineries. “A” scale weighting was used for the noise monitoring carried out in this study. Fig. 13 shows the noise meter which was used in this study.

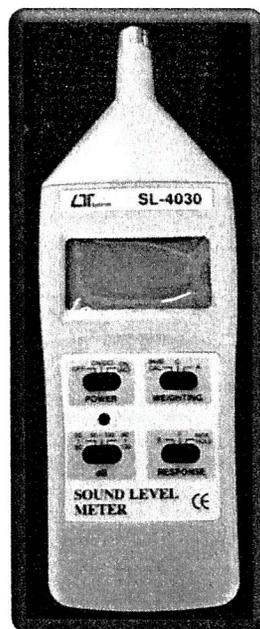


Figure 13. Lutron SL 4030 used for measuring sound levels

4.2 Methodology adopted for noise monitoring

The noise monitoring is carried out by taking sound levels in and around the treatment plant at specific locations and comparing it with the standard values. The places which were closer to the STP were chosen for monitoring considering the fact that these places will be receiving the maximum sound from the STP. Fig. 14 shows the locations chosen for noise monitoring in and around STP in EFM.

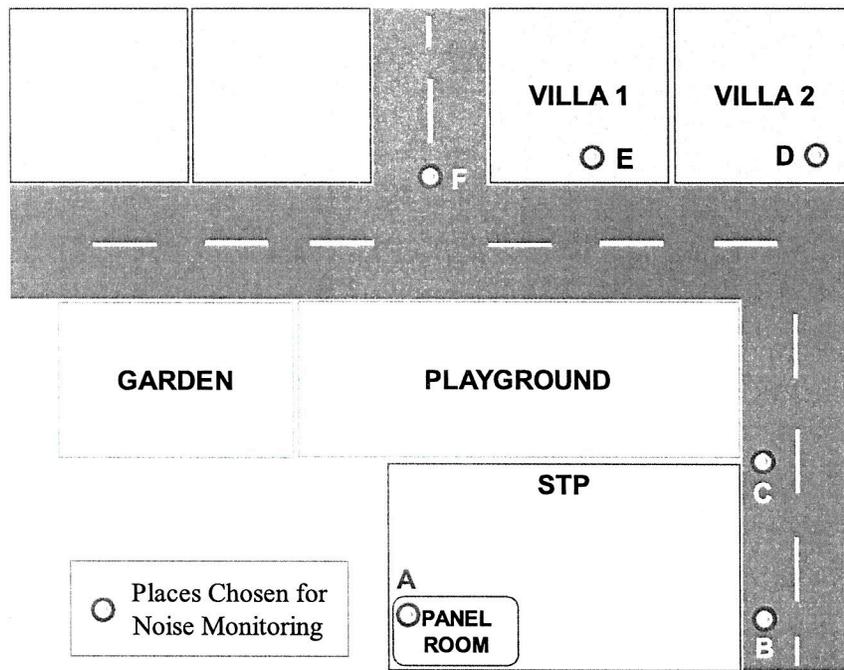


Figure 14. Diagram showing places chosen for noise monitoring

Three different scenarios were considered for noise monitoring and they are as follows:

- Entire plant shutdown (All blowers and pumps are turned off)
- All pumps in operation and blower switched off
- All pumps are switched on and also the blower in operation.

In all the above-mentioned cases, sound values were taken at different locations (Fig. 14). The locations were chosen in such a way that they are very closer to STP since these places will be receiving the maximum sound from the STP. The sound values at chosen locations and comparison with standards prescribed by TNPCB (Ministry of Environment, Forest and Climate Change notification S.O 123 (E) dated 14.2.200) are given in Table 6.

Table 6. Sound levels of chosen locations for noise monitoring at EFM STP

Sl. No.	Scenarios considered for monitoring	Measurement location	Noise level (dB)	Noise standards for residential area (dB)
1	Full-shut down of the plant	Panel room of STP (A)	60-61	-
		STP Entrance (B)	60-61	-
		End of Ground (C)	45-46	55
		Villa 2 (D)	48	55
		Villa 1 (E)	47	55

		T-Junction in housing area near STP (F)	45	55
2	All pumps in operation but blowers OFF	Panel room of STP (A)	89-91	-
		STP Entrance (B)	56	-
		End of Ground (C)	-	55
		Villa 2 (D)	48	55
		Villa 1 (E)	49.1	55
		T-Junction in housing area near STP (F)	49-51	55
3	All pumps in operation and blower are ON	Panel room of STP (A)	90-91	-
		STP Entrance (B)	75-76	-
		End of Ground (C)	59-60	55
		Villa 2 (D)	53	55
		Villa 1 (E)	53	55
		T-Junction in housing area near STP (F)	51.5	55

From Table 6, it can be inferred that the noise levels at the different locations inside the gated community is well within the limits prescribed by TNPCB. Although the sound levels are within the limits in the residential points, the sound values inside the plant were quite high. However, it can be reduced by the use of sound adsorbers or barriers inside the plant. In order to reduce the sound levels blowers with less rotations per minute (rpm) can be used instead of the one with higher rpm. If the above said measure is not giving significant reduction in sound levels, blowers can be replaced with submersible ejectors.

CHAPTER 5
MAJOR OBSERVATIONS AND
RECOMMENDATIONS

5.1 Major Observations

A team from IIT Madras visited the STP of Elysium Flushing Meadows and collected the samples from different units of STP. The following major observations were found out based on field visit and detailed analysis of the STP samples.

- The size of various treatment units adopted in the STP are adequate to treat the wastewater generated in Elysium Flushing Meadows. Therefore, no change in dimensions/sizing of the unit are required for the existing treatment units.
- The pH, BOD, COD and TSS values of the treated wastewater (i.e., effluent from the STP) is below the disposal standards prescribed by TNPCB.
- The Fecal Coliforms (FC) in the treated wastewater was >1600 MPN/100 mL, which is due to insufficient hypochlorite dosage. However, the level of FC is lesser than permissible value of 10,000 MPN/100 mL.
- The treatment units were not effective in achieving the nitrification process and due to which ammonia concentration is almost similar in the inlet and outlet wastewater.
- Phosphate concentration in the treated water is higher than the inlet concentration, which might be because of the leaching of ions from PSF and ACF.
- There were no signs of the usage of sludge drying beds that has to be used for drying the screenings and excessive sludge from ASP.
- The measured noise levels at different residential locations closer to the STP are well within the limits prescribed by TNPCB.

5.2 Recommendations

Based on the overall findings, the following recommendations are given for the improvement of the treated water quality and the overall performance of the STP:

- The conductivity as well as the TDS of the wastewater were increasing after the filtration process, which may be due to the leaching of ions from the PSF and ACF. Therefore, (a) PSF must be maintained properly to sustain the quality of the filtrate, which can be done by making frequent and appropriate backwashing of the filter bed, and (b) ACF should be cleaned chemically or refilled with new adsorbent to maintain the quality of the filtered water.

- Suitable dosage of hypochlorite must be given to the effluent after ACF to maintain the minimum residual chlorine dosage of 1 ppm. A chlorine contact time of 20 to 30 min must be ensured to reduce the level of FC in the STP effluent.
- Although the treated wastewater is meeting majority of the disposal standards, the detailed solids analysis (TSS, TDS, TFS and TVS) along with other parameters revealed that the present treatment plant failed to achieve the CPHEEO standard for gardening. Therefore, along with already suggested measures, appropriate units such as ultrafiltration (UF) should be added in the tail end of the STP to improve the quality of the treated wastewater.
- Electromagnetic flow meter should be installed at the inlet and the outlet of the STP. Moreover, a dedicated book of records for the STP should be maintained.
- Units such as secondary settler, filtration holding tank and effluent tank should be provided with platforms for improving the ease of access for monitoring purpose.
- The scrap/unwanted materials stored in the storage room should be cleared from the instrumentation/panel room, and suitable fire-fighting devices should be equipped within the STP.

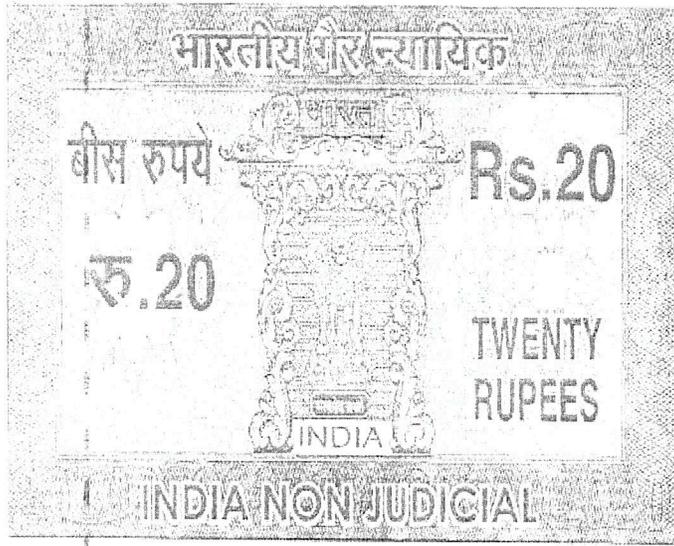
5.3 Conclusions

The physical dimensions of the various treatment units existing at present in the STP are adequate to treat the wastewater generated in Elysium Flushing Meadows. The BOD/COD ratio of the raw/influent wastewater indicates the suitability of the biological process-based treatment scheme adopted in the STP of EFM. Moreover, the effluent coming out of the STP is meeting most of the standards prescribed by TNPCB except FC and total phosphorous. The standards can be met if the recommendations pertaining to chlorination, ACF and PSF are practiced systematically in everyday STP operation. Moreover, the measured noise levels at different residential locations closer to the STP are well within the limits prescribed by TNPCB.

ANNEXURES

Annexure I

Agreement signed between EFM and M/s Eco Green Technologies for the operation and maintenance of STP



2/10/19
 Eco Green Technologies
 Coimbatore
 R. Shanthi
 68AB 620170
 R. SHANTHI
 STAMP VENDOR
 L. No. 1122, R. SUNDAR
 12, 13, 14, 15, 16 STREET
 COIMBATORE, KARNATAKA

AGREEMENT

(Comprehensive operation & maintenance of 125 KLD Sewage Treatment Plant for the year May'2019 - April'2020)

THIS AGREEMENT IS MADE for the Comprehensive operation & maintenance of 125 KLD Sewage Treatment Plant day of April 30th 2019 Between M/s. Eco Green Technologies, Coimbatore - 14. (Hereinafter called the 'CONTRACTOR' which term shall, wherever the context so admits include his heirs, legal representatives and assigns) on the ONE PART and ELYSUIUM PROPERTIES Pvt. Ltd., Coimbatore. (Here-in-after called the 'CLIENT' which expression shall mean the General Manager wherever the context so admits, include its successors in office and assigns) of the OTHER PART.


 EQO GREEN TECHNOLOGIES


 ELYSUIUM PROPERTIES Pvt. Ltd.

The Contractor shall get comprehensive insurance of the Plant on its own, covering all risks.

The Contractor shall be solely responsible for complying /observing all existing laws like Labor, EPF, TNPCB Terms and condition, Safety regulations etc. as amended from time to time.

Force Majeure: In case of any calamity like Earthquake, Lighting, Cyclone, War, Civil disturbance, Riots, Strikes, Lockouts which cause delay /suspension in the operation of the Plant, it shall be considered by appropriate authority for granting time for resuming the operation of the Plant. No other claim, whatsoever will be entertained by the appropriate authority.

All Our Output water Parameters after the treatment would attain as prescribed by the TNPCB.

SCHEDULE-A

Operations and Maintenance (Comprehensive)

List of Plants and Equipments at your site

S. No.	Plant & Equipments	Quantity
1	Sewage Treatment Plant 125 KLD	1

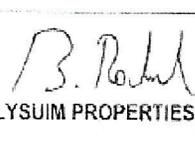
Eco Green Technologies Scope of Service Includes:

1. Regular change of Oil for Air B.ower
2. Service of any sudden brake down of pumps
3. Hypo Dosing for Post Treatment
4. Cleaning of STP Premises
5. Providing of Bio - Culture for maintain ng of MLSS.

**SCHEDULE - B
O & M - Scope of Client**

S. No.	Service Description
1	In case of shutdown in EB/ power cut client will provide alternate power (DG)
2	Reusing of treated Sewage water for gardening.


ECO GREEN TECHNOLOGIES


ELYSIUM PROPERTIES Pvt.Ltd.

Annexure II

TNPCB analysis reports on EFM STP samples in the years 2020 and 2021

UNIT PROCESSES ON 04.08.2021.

11. It is respectfully submitted that the Analysis results of samples collected from various unit processes by the Joint Committee on 04.08.2021 is tabulated below:

Table 2. Analysis results of samples collected from various unit processes.

Parameters	Inlet: sewage collection tank	Aeration tank	Outlet: after dual media filter	Discharge limit
pH	7.76	7.62	7.77	5.5-9.0
TSS (mg/l)	438	1970	10	50

ADDITIONAL ENVIRONMENTAL ENGINEER
TAMIL NADU POLLUTION CONTROL BOARD

BOD (mg/l)	114	37	5	30
COD (mg/l)	288	160	48	150
Fecal Coliforms (MPN/100 ml)	3100	330	9.2	Desirable- 1000 Permissible- 10000
Total Coliforms (MPN/100 ml)	6300	1100	26	-
NH4-N (mg/l)	53.8	35.3	7.3	-
Total Nitrogen (mg/l)	1.86	2.68	3.29	-



TAMILNADU POLLUTION CONTROL BOARD,
ADVANCED ENVIRONMENTAL LABORATORY,
COIMBATORE - 641 030.



19

Accredited Laboratory - (ISO/IEC 17025:2005)

NABL - TC-7025

REPORT OF ANALYSIS

ULR-TC702520000000371F

Report No : 348, 349, 350. Report Date : 04.09.2020.
 Analysis starting Date : 18.08.2020. Analysis Completion date : 04.09.2020.
 Code No & Point of Collection Date of Collection : 18.08.2020.
 1. PR-309 - STP Inlet [Untreated] Date of Receipt : 18.08.2020.
 2. PR-308 - Aeration Tank [Treated] Sample Condition : Sealed
 3. PR-310 - STP Outlet [Treated] Sample Quantity : 2.5 Litres
 Sample Collected and Requested by : Dr.P.R.Ramesh, AE.,
 O/o.The District Env.Engineer
 No.5, Ramasamy Nagar,
 Kavundampalayam (Post),
 Coimbatore - 641 030.

Sl. No	Parameters	Test Method	Unit	Sample-1 PR-309	Sample-2 PR-308	Sample-3 PR-310
1	pH @ 25° C	APHA 23rd Edi.2017 4500 - H'	---	7.23	7.55	7.09
2	Total Suspended Solids	APHA 23rd Edi. 2017 - 2540 - D	mg/l	132	486	10
3	BOD for 3 days @ 27°C	IS 3025 - 1993, Reaff - 2009	mg/l	44	62	<2
4	COD	APHA 23rd Edi.2017 - 5220 - B	mg/l	272	312	8
5	Ammonical Nitrogen	APHA 23rd Edi.2017 - 4500 NH3	mg/l	48.7	42	<2.0

Remarks:

< - Indicates less than minimum detectable limit.

J.E.S.
18/09/2020

for Assistant Director (Lab),
18/09/2020
AEL - TNPCB - CBE.

The test result furnished refers to the sample received. The test report shall not be reproduced anywhere except in full without the written approval of Laboratory
 3rd & 4th Floor, No.5, Ramasamy Nagar, Kavundampalayam, Coimbatore - 641 030.
 Telephone: 0422 - 2440174, Email: deltnpcbche@gmail.com, aeltncbche@gmail.com

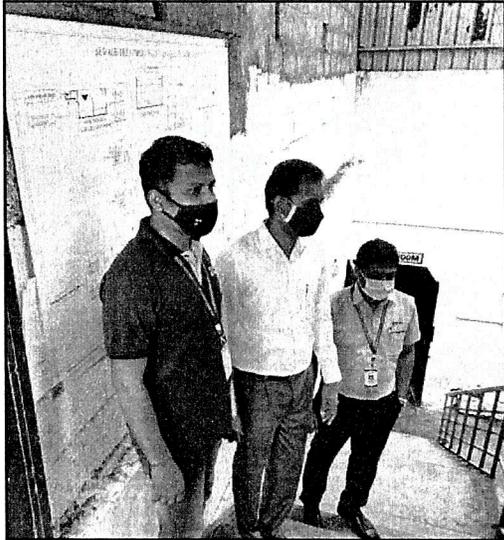
Annexure III**Table A1.** Characteristics of samples collected during second sampling

S. No	Parameter	Before screening	After screening	Aeration tank	Effluent
1.	pH	6.52	6.49	6.73	7.65
2.	EC	586	602	782	1121
3.	Turbidity	67	190	598	7.8
4.	TS	486	954	4880	1143
5.	TSS	89	335	2870	26
6.	VSS	58	321	1830	18
7.	TDS	477	533	2035	1117
8.	DVS	167	133	408	87
9.	DFS	310	400	1627	1031
10.	TVS	224	454	2239	97
11.	SFS	5.3	93	870	8
12.	TFS	262	500	2641	1047
13.	SVS	83	242	2000	18
13.	COD	214	442	3024	24
14.	BOD	93	226	126.3	29.7
16.	TN	32.6	32.6	91.4	27.5
17.	Nitrates	1.03	1.01	2.70	4.52
18.	Ammonium	23.8	36.3	81.6	29.1
19.	Phosphates	13.8	14.7	126.7	7.13
20.	Ca ²⁺	16	32	22.4	128
21.	Mg ²⁺	37.4	24	52.8	32.64
22.	Residual Chlorine	-	-	-	BDL
23.	TC	26x10 ⁶	-	-	7000
24.	FC	26x10 ⁴	-	-	900

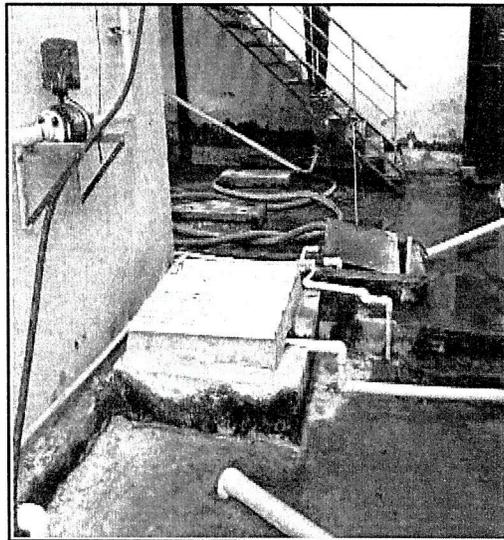
Note: All units are in mg/L except pH, EC ($\mu\text{s}/\text{cm}$), TC (MPN/100 mL) and FC (MPN/100 mL)

Annexure IV

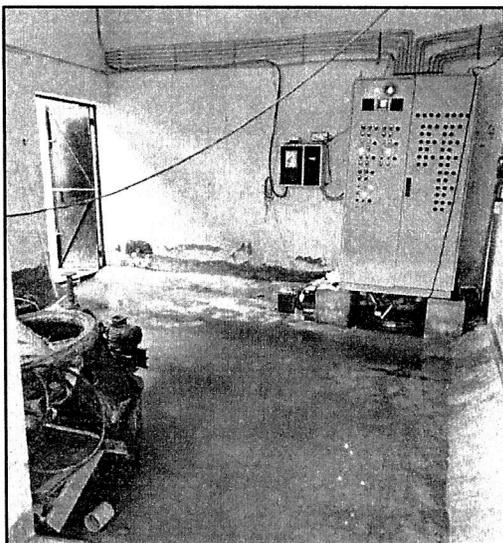
Pictures taken during site visit and sample collection



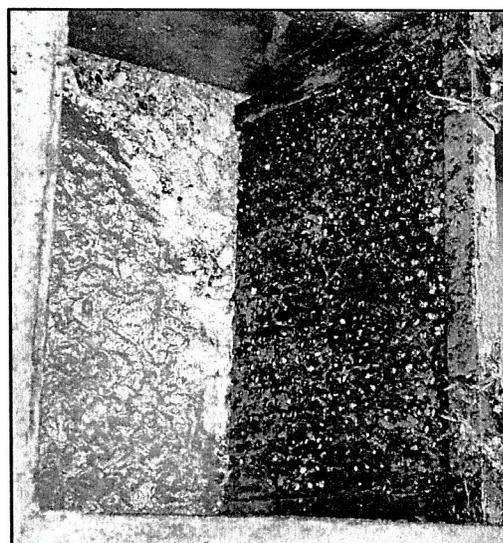
STP ENTRANCE AT EFM



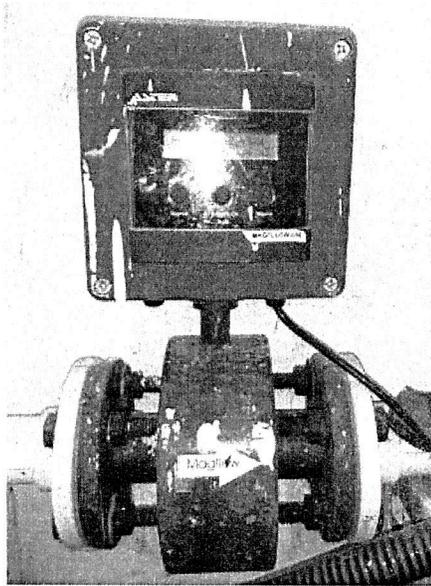
WATER LOGGING INSIDE STP



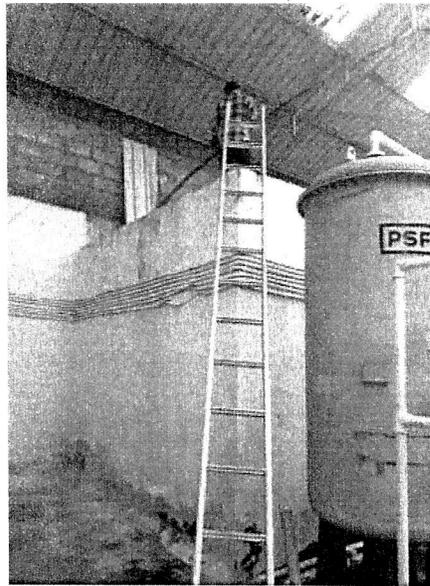
PANEL ROOM IN EFM STP



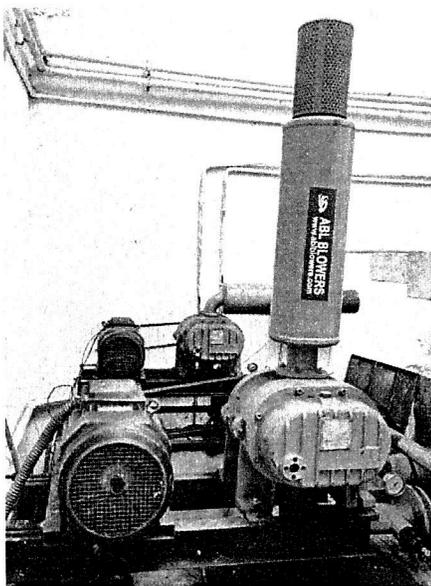
PERFORATED PLATE TYPE SCREEN



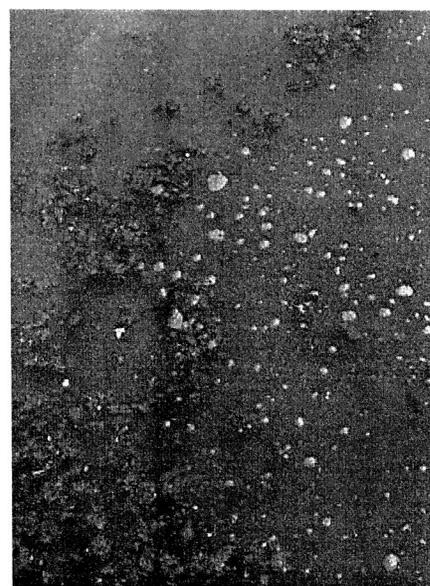
STP INLET FLOW METER



**UNSAFE ACCESS TO FILTER
FEED TANK**



**BLOWER FOR AERATION
TANK**



**SOLIDS IN THE SECONDARY
CLARIFIED EFFLUENT**

SVPR & Co

Admin @ SVPR & Co <admin@svprandco.in>

Affidavit of Compliance filed by the 3rd Respondent_ OA 213 of 2015

Admin @ SVPR & Co <admin@svprandco.in>

3 January 2022 at 15:13

To: elangovanks@rediffmail.com

Cc: sm.kothai@gmail.com, S V Pravin Rathinam <svpr@svprandco.in>, "Josephine Shreela G @ SVPR & Co" <josephineshreela.g@svprandco.in>

Dear Sir/Madam,

I am the Counsel for the 3rd Respondent. Please find attached the Affidavit of Compliance and the Typed Set of Documents filed by the 3rd Respondent. Kindly acknowledge the receipt of the same.

Regards,
SV Pravin Rathinam
Counsel for the 3rd Respondent

 Index to Typed Set of Documents _ OA 213 of 201... Affidavit of Compliance_ OA 213 of 2015_ 03.01.2022.pdf
2929K

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

OA No. 213 of 2015

C.P Senthil

...Applicant

V.

Tamil Nadu State Pollution Control
Board & 2 Ors

...Respondents

**INDEX TO TYPED SET OF
DOCUMENTS FILED BY THE 3RD
RESPONDENT**

M/s. S.V.PRAVIN RATHINAM (Ms.3069/07)

Counsel for the 3rd Respondent