

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

CIRCUIT BENCH

APPLICATION NO.20 OF 2016(SZ)

Applicant(s)

:: Sri. Santo P.L.,
S/o. P.D Louis
Pellissery House, Edakunni
& Others

Respondents

:: The State of Kerla represented by
the Chief Secretary & Others

Volume – 1

INDEX

Sl No	Description	Page No.
1	Report filed by the Environmental Engineer, Fourth respondent as per the order dated 14/07/2023	1-3

Smrithi

Rema Smrithi VK
Standing counsel for KSPC - R4

Dated this the 23rd day of September, 2023.



Suchitra V
FOURTH RESPONDENT
SUCHITRA. V
Environmental Engineer

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

Application no. OA 20 of 2016 (SZ)

Applicant(s) : Mr. Santo P.L. Thrissur & others

Vs.

Respondents : The State of Kerala & Others

**REPORT FILED BY THE ENVIRONMENTAL ENGINEER,
KERALA STATE POLLUTION CONTROL BOARD, DISTRICT
OFFICE, THRISSUR, THE 4th RESPONDENT**

1. In continuation to the report filed by this respondent it is humbly submitted that the Chairman of the Board conducted a hearing of the 13 respondent industries on 17.08.2023 as requested by the respondent industries in their reply to the notice issued by the Chairman for levying the compensation.
2. In the hearing Board officer informed that the environmental compensation was assessed for the violation during the years 2012-2013. No. of days of violation was calculated from the date of enquiry conducted by the District Office, Thrissur i.e., 23.07.2012 upto 27.04.2013, the date on which District Collector directed to shut down the industries vide order no No. C3-60051/2012 dated 27.04.2013. Copy of the order is attached as **Annexure R4(a)**.
3. The unit representatives informed that all of them are small scale units which are struggling due to financial constraints after the flood in 2018 and Covid outbreak in 2020 and requested to consider reworking or relaxation of the amount of compensation. They informed that as per the Hon'ble High Court order, drinking water was supplied by them to the nearby residents. It was also reported that SIDCO had issued stop memo to these units in February 2013 itself and the units had stopped their operation months before the closure order from the District Collector was issued.
4. The Chairman agreed to consider the matters raised by the representatives on producing proper documental evidences and accordingly the amount towards

the environmental compensation can be reassessed on verification of the documents. The following decisions were taken in the hearing.

- Environmental Compensation for past violation cannot be exempted and shall be remitted as agreed by the unit owners. However based on their request the amount of compensation shall be reassessed.
- Either non- obtainment of Board's consent/pollution from the unit may be considered as violation.
- If the unit produces proper documental evidence for non- operation during the period from the date of shut down as per the stop memo of SIDCO upto the date of closure direction from the District Collector, the said period may be exempted while considering the number of days of violation. (Authentic documents like electricity bill or certificate from SIDCO to the effect that the unit was non operational during the said period may be produced)
- Drinking water supply may be considered as a part of CSR and the expenditure towards the same may be deducted from the amount of compensation on submission of proper records in proof of water supply and the amount incurred.
- The Environmental Engineer, District Office, Thrissur shall file the report before the Honourable NGT informing the outcome of hearing. She shall also forward the same to the Chairman
- The Environmental Engineer, District Office, Thrissur shall verify the aforementioned documents under items (3) and (4) above, rework the Environmental Compensation and shall submit the same with specific recommendations.
- Further action including direction to remit Environmental Compensation shall be taken after examining the revised Environmental Compensation calculation.

Copy of the minutes held on 17.08.2023 is attached as **Annexure R4 (b)**.

5. The Centre for Water Resources Development and Management (CWRDM) was entrusted by the Board for investigations on groundwater contamination in Ollur industrial area. A discussion was conducted with CWRDM regarding the progress of the study on 23.8.2023. Representative of CWRDM informed that they have collected the samples from wells inside the industrial area and nearby the estate and analysed for physiochemical properties. The results of heavy metal analysis shows that limits of Lead (Pb), Nickel (Ni), and Manganese (Mn) are exceeding the drinking water

standards in some of these wells. However lead is seen exceeding the standards in all the wells tested. Further isotopic studies using tracer compounds are to be conducted to fully identify the source of pollution. These studies will be conducted once the tracer compounds are procured from abroad, for which order has been placed. It was also informed that since lead was seen present in all the wells tested including the wells situated further from the area, the geogenic causes also have to be looked into. Copy of the interim report submitted by CWRDM is attached as **Annexure R4(c)**. Inferences submitted by CWRDM vide letter dated 25.08.2023 is attached as **Annexure R4 (d)**.

6. The respondent units have submitted the details called for in the hearing on 7.09.2023. It is humbly submitted that details are being verified and reassessment of the environmental compensation will be duly done and will be leveled as per the order of Chairman.

Dated this the 23rd day of September 2023



A handwritten signature in black ink, appearing to read "Suchitra V.", written over a horizontal line.

FOURTH RESPONDENT

SUCHITRA. V
Environmental Engineer

BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL SOUTHERN ZONE, CHENNAI
CIRCUIT BENCH
APPLICATION NO.20 OF 2016(SZ)

Applicant(s) :: Sri. Santo P.L.,
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Volume – II

INDEX

Sl No	Description	Page No.
1	Annexure R4(a)- Order of District Collector No.C3-60051/2012 dated 27.04.2013	1
2	Annexure R4(b)- Minuities of the hearing conducted in connection with OA No. 20/2016	6
3	Annexure R4(c) – Report of activity submitted by CWRDM	10
4	Annexure R4(d) – Inferences submitted by CWRDM vide letter dated 25.08.2023	15

Dated this the 23rd day of September 2023.




FOURTH RESPONDENT

SUCHITRA. V
Environmental Engineer

ജില്ലാ മജിസ്ട്രേറ്റ്, തൃശ്ശൂരിന്റെ നടപടിക്രമം

(ക്риമിനൽ നടപടി 133/141 പ്രകാരം)

(ഹാജർ : പി.എം. ഫ്രാൻസിസ്, ഐ.എ.എസ്.)



വിഷയം : ഒല്ലൂർ, മേജർ ഇൻഡസ്ട്രിയൽ എസ്റ്റേറ്റിൽ നിന്നുള്ള രാസമലിനീകരണം വ്യവസായ തൂണിറ്റുകൾ നിർമ്മിതി വഴിക്കുന്നത് - സംബന്ധിച്ച്

സൂചന : 1. 26.04.2013ൽ ജില്ലാ കളക്ടറുടെ ചേബറിൽ ചേർന്ന യോഗത്തിലെ തീരുമാനം
2. എൻവയോൺമെന്റ് എഞ്ചിനീയർ, മലിനീകരണ നിയന്ത്രണ ബോർഡ്, തൃശ്ശൂരിന്റെ 27/4/13ലെ PCB/TSR/COM/TSR/2001 നമ്പർ റിപ്പോർട്ട്

ഉത്തരവ് നമ്പർ സി3- 60051/2012 തീയതി : 27.04.2013

സൂചന (1)ൽ മേജർ ഇൻഡസ്ട്രിയൽ എസ്റ്റേറ്റിൽ നിന്നുള്ള രാസമലിനീകരണം സംബന്ധിച്ച പ്രശ്നങ്ങൾ പരിഹരിക്കുന്നതിനായി ഒരു സബ് കമ്മിറ്റി രൂപവത്കരിക്കുകയും, ടി സബ് കമ്മിറ്റി 26.04.2013ൽ തന്നെ വ്യവസായ തൂണിറ്റുകളുടെ മലിനീകരണ നിയന്ത്രണ സംവിധാനങ്ങൾ പരിശോധിക്കുകയുണ്ടായി.

സൂചന (2) ൽ ആയത് സംബന്ധിച്ച പരിശോധനാ റിപ്പോർട്ട് ലഭ്യമായിട്ടുള്ളത്. "Bright & Company" എന്നത് ഒഴികെയുള്ള കമ്പനികളുടെ മലിനീകരണ നിയന്ത്രണ സംവിധാനങ്ങൾ തൃപ്തികരമല്ലെന്നും, ആയതിനാൽ തൃപ്തികരമായ മലിനീകരണ നിയന്ത്രണ സംവിധാനങ്ങൾ ഏർപ്പെടുത്തുന്നതുവരെ കമ്പനികൾ അടച്ചിടുന്നതാകും ഉചിതം എന്ന് അറിയിച്ചിട്ടുള്ളതുമാണ്. അല്ലെങ്കിൽ രാസമലിനൂങ്ങൾ നിറഞ്ഞ് ആ പ്രദേശത്തെ കടിയെടുത്തു ഗൗരവമായി ബാധിക്കുന്നതാണ്.

ഈ സാഹചര്യത്തിൽ മേജർ ഇൻഡസ്ട്രിയൽ എസ്റ്റേറ്റിലെ "Bright & Company" എന്നത് ഒഴികെയുള്ള മറ്റ് കമ്പനികൾ അടച്ചിടുന്നതിന് Cr.Pc. 133/141 പ്രകാരം ഉത്തരവ് നൽകുന്നു.

ഈ ഉത്തരവിൽ എന്തെങ്കിലും ആക്ഷേപ ബോധിപ്പിക്കുമെന്നുണ്ടെങ്കിൽ 10.05.2013 ന് 11.00 മണിക്ക് ജില്ലാ മജിസ്ട്രേറ്റിന്റെ ചേബറിൽ വിചാരണയ്ക്ക് ഹാജരായി ബോധിപ്പിക്കാവുന്നതാണ്.

(ഒപ്പ്)

ജില്ലാ മജിസ്ട്രേറ്റ്, തൃശ്ശൂർ

സ്വീകർത്താവ് :

1. Sri. Joby A.P., M/s. Bee Pee Gold Imitations, Major Industrial Estate, Ollur, Thrissur - 680306
2. Smt. Usha Sasi, M/s Indu Ornaments, Major Industrial Estate, Ollur, Thrissur - 680306
3. Smt. Mini Sajan, M/s Mini Job works, XI/840/I, Major Industrial Estate, Ollur, Thrissur - 680306
4. Sri. Renson, C.R., M/s. Renu Gold Covering, Major Industrial Estate, Ollur, Thrissur - 680306
5. Sri.M.J. Melvin, M/s. DOT Engineering, Major Industrial Estate, Ollur, Thrissur - 680306
6. Sri. K.G. Karuppu Swami, M/s. Rajeshkumar Electro plating, Major Industrial Estate,

Ollur, Thrissur - 680306

7. Smt. Shiji Geevar, M/s. Golden View Plating, Major Industrial Estate, Ollur, Thrissur - 680306
8. Sri. P.V. Sunil, M/s. Two Stars Designs Gold Covering, Major Industrial Estate, Ollur, Thrissur - 680306
9. Sri. Paulson, P.G., M/s. PEE GEE Gold Covering, Major Industrial Estate, Ollur, Thrissur - 680306
10. Sri. Paul Vazhakkala, M/s. St. Joseph Engineering and Gold Works, Major Industrial Estate, Ollur, Thrissur - 680306
11. Sri. Benny, M/s. Anna Plastics Electroplating Works, Industrial Estate, Ollur, Thrissur - 680306
12. Sri. M.J. Olin, M/s. Dash Machineries
13. Sri. Joby Francis, M/s. Pradeeksha Aluminium Polishing Electro Colouring Unit, Major Industrial Estate, Ollur, Thrissur - 680306
14. Sri. Niju Jose, M/s. St. Joseph Colour Coats, Major Industrial Estate, Ollur, Thrissur - 680306
15. Sri. P.V. Sathyan, M/s. United Aluminium Company, Major Industrial Estate, Ollur, Thrissur - 680306
16. Sri. Anto Rappal, M/s. Honest Electro Colouring, Major Industrial Estate, Ollur, Thrissur - 680306
17. Sri. I.J. Raphy, M/s. Three Star Electro Plating, Major Industrial Estate, Ollur, Thrissur - 680306
18. Sri. T.A. Davi, M/s. Bright Precured System No.1, Major Industrial Estate, Ollur, Thrissur - 680306
19. Sri. T.A. George, Managing Partner, Bright Precured System No.2, Major Industrial Estate, Ollur, Thrissur - 680306

പകർപ്പ് :

1. എൻവയറോൺമെന്റ് എഞ്ചിനീയർ, പൊലുഷൻ കൺട്രോൾ ബോർഡ്, തൃശ്ശൂർ
2. സെക്രട്ടറി, തൃശ്ശൂർ കോർപ്പറേഷൻ
3. പൗരസമിതിക്ക്
4. കരുതൽ ഫയൽ

: ഉത്തരവിൻ പ്രകാരം :

അഡീഷണൽ ജില്ലാ മജിസ്ട്രേറ്റ്

esb/29.04.13.

PROCEEDINGS OF DISTRICT MAJISTRATE, THRISSUR**(Cr. P. C 133 / 141)****(Present: P. A. Francis, I.A.S)**

Sub - Chemical pollution from Ollur Major Industrial Estate –Stopping of operation of Industrial units - reg.

Reference :- 1. Decision of the meeting convened on 26/04/2013 at the chamber of District Collector.

2. Letter No PCB/TSR/COM/TSR/2001 dated 27/04/2013 of Environmental Engineer, Kerala State Pollution Control Board, Thrissur.

Order No C-3-600051/2012 dated 27/04/2013

A subcommittee was constituted as per reference cited 1st above to study the chemical pollution problems caused by the Major Industrial Estate and the Committee had inspected the pollution control facilities of the Industrial Units.

The inspection report was furnished as per the reference cited 2nd above and it has been reported that pollution control facilities provided by the companies except M/s Bright & Company are not satisfactory and it is advisable to close down the units till they provide satisfactory pollution control facilities in the units. Otherwise the drinking water source will be seriously affected by the chemical pollutants discharged.

Hence in the above circumstances, it is ordered that all the companies in the Major Industrial Estate, Ollur except M/s Bright & Company shall be closed down.

Any objection in this regard shall be submitted on 10/05/2013 at 11 AM during the trial at the Chamber of District Magistrate

(Signed)

District Magistrate, Thrissur

1. Sri. Joby.A.P., M/s Bee Pee Imitations, Major Industrial Estate, Ollur, Thrissur – 680306
2. Smt. Usha Sasi, M/s Indu Ornaments, Major Industrial Estate, Ollur, Thrissur – 680306
3. Smt. Mini Sajan, M/s Mini Job Works, XI/840/I, Major Industrial Estate, Ollur, Thrissur – 680306
4. Sri. Renson. C.R, M/s Renu Gold Covering, Major Industrial Estate, Ollur, Thrissur – 680306
5. Sri. M.J Melvin, M/s DOT Engineering, Major Industrial Estate, Ollur, Thrissur – 680306
6. Sri. K.G. Karuppu Swami, M/s Rajesh Kumar Electroplating, Major Industrial Estate, Ollur, Thrissur – 680306
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12. Sri. M. J. Obrin, M/s Dash Machineries, Major Industrial Estate, Ollur, Thrissur – 680306
13. Sri. Joby Francis, M/s Pratheeksha Aluminium polishing Electro Colouring Units, Major Industrial Estate, Ollur, Thrissur – 680306

11. Sri. Niju Jose, M/s St. Joseph Colour Coats, Major Industrial Estate, Ollur, Thrissur –
680306

12. Sri. P.V. Sathyan, M/s United Aluminium Company, Major Industrial Estate, Ollur,
Thrissur – 680306

Sri. Anto Rappai, M/s Honest Electro Colouring, Major Industrial Estate, Ollur,
Thrissur – 680306

17. Sri. I.J. Raphy, M/s Three Star Electroplating, Major Industrial Estate, Ollur, Thrissur –
680306

18. Sri. T.A. Davi, M/s Bright Precured System No.1, Major Industrial Estate, Ollur,
Thrissur – 680306

19. T.A. George, Managing Partner, Bright Precured System No.2, Major Industrial Estate,
Ollur, Thrissur – 680306

Copy

1. Environmental engineer, Kerala State Pollution Control Board
2. Secretary , Thrissur Corporation
3. Poursamithi
4. Stock File

As per the order

Additional District Magistrate

☎: General: 0471- 2312910, 2318153, 2318154, 2318155 Chairman: 2318150, Member Secretary: 2318151
e-mail: chn.kspcb@gov.in; ms.kspcb@gov.in FAX: 2318152 web: kspcb.kerala.gov.in

KERALA STATE POLLUTION CONTROL BOARD

കേരള സംസ്ഥാന മലിനീകരണ നിയന്ത്രണ ബോർഡ്

Pattom P.O., Thiruvananthapuram – 695 004

പട്ടം പി.ഒ., തിരുവനന്തപുരം - 695 004



Minutes of hearing conducted in connection with OA.No.20/2016.

Hearing commenced at 11.15 am on 17/08/2023 in the Chamber of Chairman with the Chairman presiding .

The list of participants is given below:-

Sl. No.	Name	Designation & Organisation
1.	Sri.Vijay George	Bright Precured Systems, Ollur
2.	Sri. Anto Rappai	Honest Electro Colouring, Ollur
3.	Sri.I.J.Raphy	Three Star Electroplating Works, Ollur
4.	Sri.Sunil P.V.	Two Star Designs, Ollur
5.	Sri.Joby A.P.	Beepee Gold Imitations, Ollur
6.	Smt.Soumya A.S.	Asst. Environmental Engineer, KSPCB,Thrissur
7.	Smt.Suchithra V.	Environmental Engineer, KSPCB,DO, Thrissur
8.	Sri. Baburajan P.K.	Chief Environmental Engineer, Regional Office, Ernakulam
9	Smt.Ramya G.	Environmental Engineer, Head Office

Member Secretary was also present in the hearing. The Chairman welcomed the participants and requested the Environmental Engineer, District Office, Thrissur to give a brief description of the matter. She informed that a common

complaint against electroplating units in SIDCO Industrial Estate at Ollur dated 16/07/2012 was received from the Edakkunni Poursamithi and enquiry was conducted. At that time, 20 such units were working in the Industrial Estate. In the light of serious complaints, the District Collector constituted a Monitoring Committee and based on the inspection report of the Committee, the District Collector ordered on 27/04/2013 to close down the operation of 19 units until adequate pollution control measures were provided. The units were directed to provide treatment plant with reuse facility and dispose off the sludge at the common hazardous wastes storage and disposal facility at Ambalamedu. Later based upon several inspections of the committee the unit which have complied with the instructions were allowed to restart in 2014. Meanwhile some of the units stopped their operation and only 13 units are now working in the industrial estate. Later in 2016, OA.No.20/2016 was filed before the Honourable NGT by Sri.Santo P.L. and others against the pollution caused by the Industrial units and a Joint Committee was constituted by Honourable NGT. Based on the report the Honourable NGT, vide order dated 20/04/2022, directed the Joint Committee to ascertain the compliance in respect of each of the units and also to ascertain past violation to assess the compensation and to recover the same as per polluter pays principle based on estimated cost of remediation and also taking into account financial capacity of the units. The Joint Committee assessed the amount of compensation and reported to the Head Office. Notice was issued to 12 units based on the recommendation to show cause, if any, for not levying the Environmental Compensation. The units furnished reply to the notice requesting for a personal hearing.

The Chairman then requested the unit representatives to explain their contentions. The unit owners informed that all the units are small scale units which are struggling due to financial constraints after the flood in 2018 and Covid outbreak in 2020. They have requested to waive the compensation. Chairman replied that since violation had already occurred, compensation for the past violation cannot be exempted. Further the unit representatives requested to consider reworking or relaxation of the amount of compensation. They also informed that as per a High Court order, drinking water was supplied by them to the nearby residents. It was also reported that SIDCO had issued stop memo to these units in February 2016 itself and the units had stopped their operation well before the order of the District Collector.

The Environmental Engineer, District Office, Thrissur informed that a few of the units had obtained Board's consent during the said period. Member Secretary and Chief Environmental Engineer, Regional Office, Ernakulam opined that this may be considered while calculating the Environmental Compensation. After examining the contentions raised by the units the following decisions were taken by the Chairman.

1. Environmental Compensation for past violation cannot be exempted and shall be remitted as agreed by the unit owners. However based on their request the amount of compensation shall be reassessed.
2. Either non- obtainment of Board's consent/pollution from the unit may be considered as violation.
3. If the unit produces proper documental evidence for non- operation during the period from the date of shut down as per the stop memo of

SIDCO upto the date of closure direction from the District Collector, the said period may be exempted while considering the number of days of violation. (Authentic documents like electricity bill or certificate from SIDCO to the effect that the unit was non operational during the said period may be produced)

4. Drinking water supply may be considered as a part of CSR and the expenditure towards the same may be deducted from the amount of compensation on submission of proper records in proof of water supply and the amount incurred.
5. The Environmental Engineer, District Office, Thrissur shall file the report before the Honourable NGT informing the outcome of hearing. She shall also forward the same to the Chairman
6. The Environmental Engineer, District Office, Thrissur shall verify the aforementioned documents under items (3) and (4) above, rework the Environmental Compensation and shall submit the same with specific recommendations.
7. Further action including direction to remit Environmental Compensation shall be taken after examining the revised Environmental Compensation calculation.



CHAIRMAN

ANNEXURE - R4(C)

Report of Activity

A team of scientists from CWRDM collected water samples from the industrial area and the wells nearby in addition to the wells monitored by KSPCB. The location of the sampling wells is given in the figure below. Samples were collected according to the relative elevation map prepared after the Total Station survey. The area has general slope towards the South East direction; the northern section near to the boundary is sloping towards North and North West (figure 2).

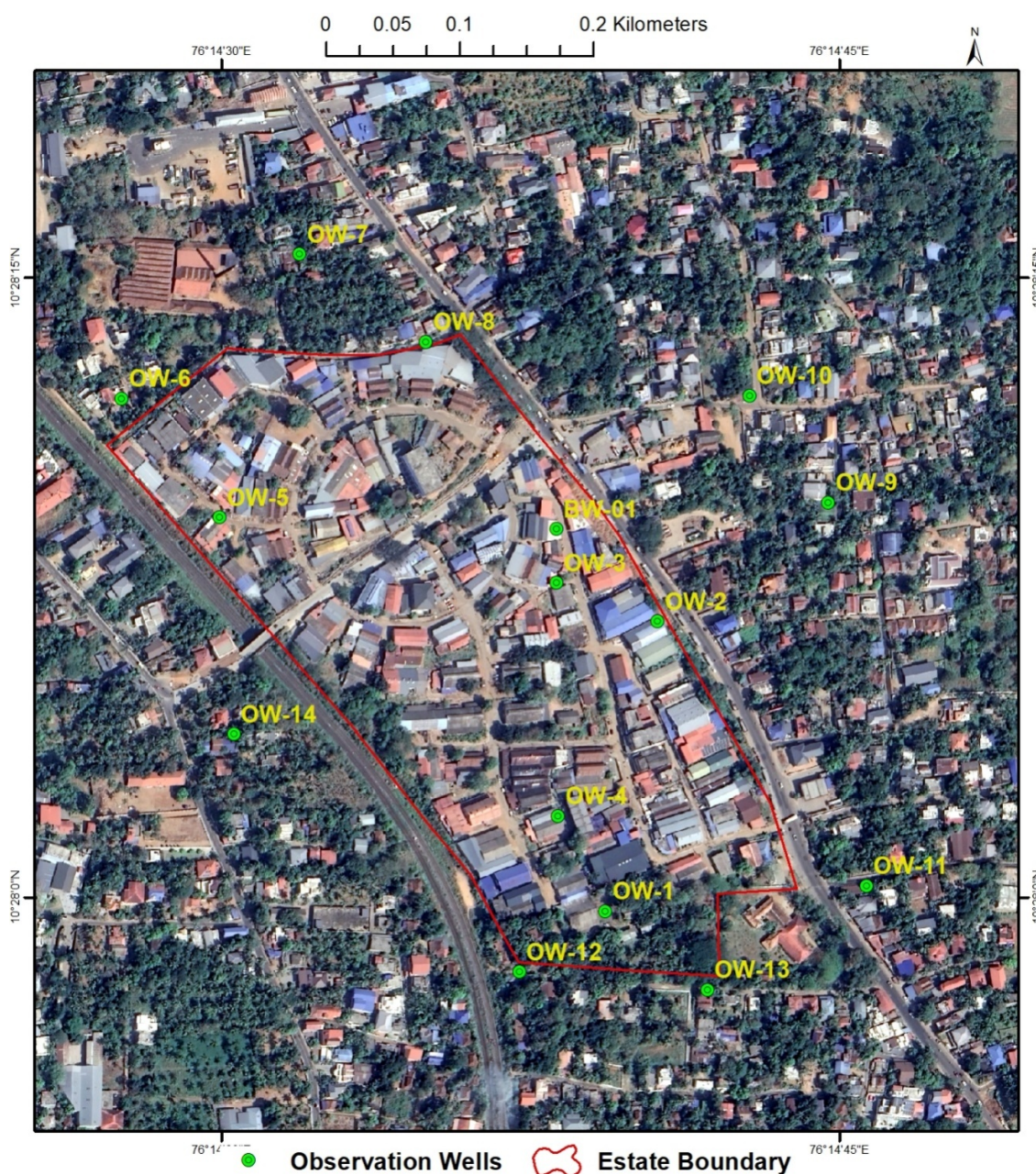


Figure 1 Location of sampled wells in the study area

The details of the sampled wells are provided in Table 1. Shallow groundwater samples were collected from the open dug wells located inside the industrial estate as well as from house hold wells located around the estate.

Well No.	Address	Latitude	Longitude	Well diameter (m)	Total depth (m)	Depth to water level (m)	Use	Seasonal/ Perennial
OW-1	The Kerala Rubbers	10.46657	76.24426	2.45	8.95	7.1	Industrial	Perennial
OW-2	Plot 211	10.46852	76.24461	1.95	11.15	8.52	Industrial	Perennial
BW-1	DOT Engineers Plot 205	10.46914	76.24393	0.15	-	-	Industrial	Perennial
OW-3	Plot 244	10.46878	76.24393	2.4	8.8	7.81	Industrial	Perennial
OW-4	Two Star Designs	10.46721	76.24394	2.6	10.38	8.35	Industrial	Perennial
OW-5	Three Star Electro Plating	10.46922	76.24166	1.85	10.7	8.2	Industrial	Perennial
OW-6	Alappat house	10.47002	76.241	3.58	15	8.55	Domestic	Perennial
OW-7	George Immatti	10.47099	76.2422	2.4	12.08	8.7	Domestic	Perennial
OW-8	PellisseriLuviss	10.4704	76.24305	1.8	11.39	8.98	Domestic	Perennial
OW-9	Unnikrishnan, OttaPathu	10.46932	76.24576	1.9	11.36	6.6	Domestic	Perennial
OW-10	Public Well	10.47004	76.24523	3.1	9.8	5.37	Public	Perennial
OW-11	R.K Nair	10.46674	76.24602	2.25	10.58	5.94	Domestic	Perennial
OW-12	Kaithavalappil	10.46616	76.24368	1.95	9.6	7.25	Domestic	Seasonal
OW-13	Omana Jose, Chittilappilly	10.46604	76.24495	1.9	10.25	6.79	Domestic	Perennial
OW-14	Ainikkal, after rail bridge	10.46776	76.24176	4	12.55	8.2	Domestic	Perennial

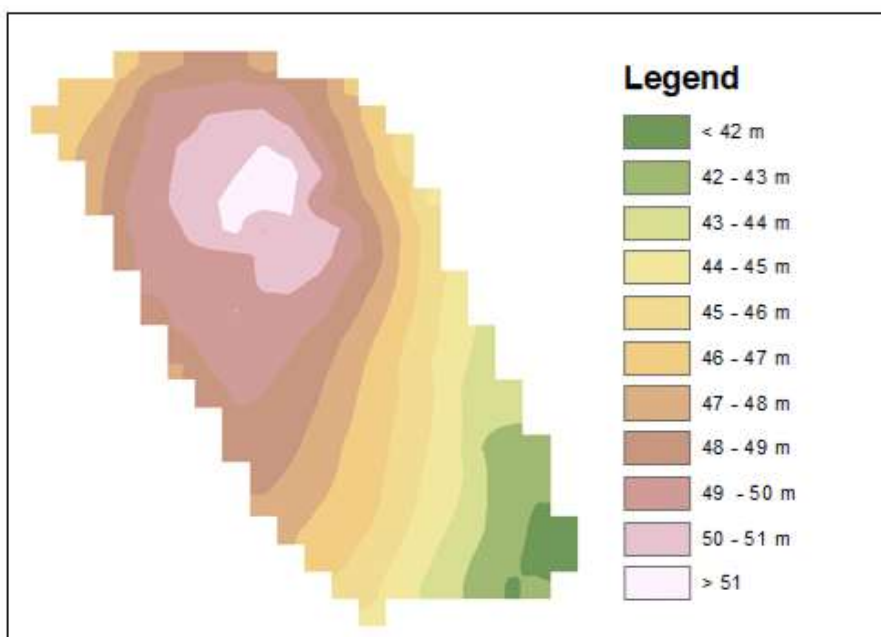


Figure 2 Relative elevation of the industrial estate area of SIDCO, Ollur

Since a few more wells other than those regularly monitored by the PCB were selected, the general water quality as well as heavy metal concentration in these wells were determined and the data is presented in Table 2 and 3.

Table 2 Results of physicochemical analysis of groundwater in the study area

	pH (pH units)	EC ($\mu\text{S}/\text{cm}$)	HCO_3 (mg/l)	Cl (mg/l)	SO_4 (mg/l)	Na (mg/l)	K (mg/l)	Ca (mg/l)	Mg (mg/l)
OW 1	4.9	90	8.4	16.3	0	8	2	5	4
OW 2	5.0	66	16.8	19.2	0	6	1	5	1
OW 3	5.2	43	11.2	16.3	4.4	6	1	3	3
OW 4	5.3	91	8.4	19.2	0	9	1	3	1
OW 5	5.0	259	11.2	22.1	68	20	4	18	7
OW 6	4.6	354	2.8	74.9	22	21	7	26	8
OW 7	5.1	96	8.4	18.3	0	12	2	5	1
OW 8	5.2	208	14.0	30.7	11	22	4	14	0
OW 9	4.9	139	14.0	25.9	0	15	5	3	3
OW 10	4.8	116	5.6	24.0	0	11	2	6	1
OW 11	4.8	158	8.4	19.2	37	9	3	11	6
OW 12	4.9	114	5.6	22.1	0	11	3	5	1
OW 13	4.4	86	2.8	11.5	0	3	5	5	0
OW 14	4.9	198	8.4	41.3	0	22	6	5	4
BW 1	6.5	316	131.9	15.4	51	12	3	46	7
BIS Standard	6.5-8.5	>500	200	250	200	200	200	75	35

Among the physicochemical parameters analyzed, only pH of the open dug well samples inside around the industrial area were lower than the prescribed range of pH by BIS. Other parameters were present in much less concentrations than the limits prescribed for drinking water. However, on analysis of trace elements, Pb was found to be present in all well water more than the prescribed value of 0.01mg/l. Similarly, Ni was also found to be present in higher concentration than the BIS limit of 0.02 mg/l in four wells located inside the industrial estate and three wells of the nearby households. Concentration of Mn was more than the BIS limits in most of the sampled wells, however, only three (OW, OW6 & OW11) exceeded the limit of 0.3 mg/l, which is the acceptable limit for Mn in the absence of any other alternative source. Among the wells used for domestic use, OW6 was found to be contaminated by most of the analyzed trace elements.

Table 3 Results of trace element analysis of groundwater in the study area

	Cu (mg/l)	Mn (mg/l)	Zn (mg/l)	Pb (mg/l)	Ni (mg/l)	Cd (mg/l)
OW 1	BDL	0.14	BDL	0.03	0.11	BDL
OW 2	BDL	0.11	0.01	0.04	0.05	BDL
OW 3	BDL	0.07	BDL	0.05	0.07	BDL
OW 4	BDL	0.02	0.007	0.04	BDL	BDL
OW 5	0.02	0.39	0.13	0.15	0.25	BDL
OW 6	0.08	0.92	4.5	0.23	0.097	BDL
OW 7	BDL	0.04	0.17	0.05	0.01	BDL
OW 8	BDL	0.08	0.08	0.04	BDL	BDL
OW 9	BDL	0.05	0.12	0.06	0.03	BDL
OW 10	BDL	0.08	0.06	0.05	BDL	BDL
OW 11	BDL	0.26	0.26	0.04	0.05	BDL
OW 12	BDL	0.12	BDL	0.06	BDL	BDL
OW 13	0.01	0.14	0.143	0.12	BDL	BDL
OW 14	BDL	0.12	0.096	0.04	BDL	BDL
BW 1	BDL	0.08	BDL	0.05	0.001	BDL
BIS Standard	0.05 (1.5 in the absence of any other source)	0.1 (0.3 in the absence of any other source)	1 (5 in the absence of any other source)	0.01	0.02	0.003

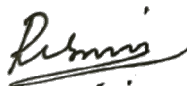
Since the injected tracer studies were also planned in this programme, in order to understand the stable isotopic composition of groundwater in and around the industrial estate, samples were collected following the standard protocols and analyzed using the Continuous Flow Isotope ratio Mass Spectrometer housed at CWRDM. The results of the analyses are given in the table 4 below.

Table 4 Stable Isotopic composition of groundwater in and around the industrial estate

SI No.	SAMPLE ID	$\delta O^{18}(\text{‰})$	$\delta D(\text{‰})$
1	OW1	-4.01	-16.25
2	OW2	-4.03	-8.53
3	OW3	-3.85	-15.45
4	OW4	-3.93	-9.13
5	OW5	-4.31	-9.97
6	OW6	-4.43	-12.56
7	OW7	-4.54	-14.97
8	OW8	-3.39	-10.63
9	OW9	-4.26	-26.38
10	OW10	-3.87	-12.98
11	OW11	-4.09	-9.00
12	OW12	-4.11	-10.99
13	OW13	-4.51	-21.89
14	OW14	-3.09	-25.71
15	BW1	-3.27	-13.83

From the data of stable isotopes, it can be seen that in accordance with the isotopic composition of groundwater in the midland regions of Kerala, δD and $\delta^{18}O$ of the presently studied samples also varied within the limited range of -9.00‰ to -26.38‰ for δD and -3.09‰ to -4.54‰ for $\delta^{18}O$. Compared to oxygen isotopes, enrichment was noticed more in hydrogen isotopes.

Based on the present observations, a rough approximation of the flow pattern of groundwater in the study site can be presumed. There can be two pathways, one from the north to south direction from the highest elevation point, as given in Figure 2. The other one can be towards north on the north western side of the industrial estate. In addition, groundwater table was shallower in the eastern part and gets deeper towards the westwest in the study area. Considering these factors, location for boreholes will be selected and drilling will be started once the tracer compound is procured.



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Dr. Arun P R

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03/03/23

Inferences from the ongoing study

“Investigations on Groundwater Contamination in Ollur Industrial Area, Thrissur District”

Submitted to

The Member Secretary, Kerala State Pollution Control Board, Thiruvananthapuram

These inferences are based on the observations presented in the report of activities submitted on 3rd March 2023. 14 ground water samples were collected and analysed for the study, from the wells located inside and around the Ollur Industrial Estate in Thrissur District.

- Based on the present observations, regarding the flow pattern of groundwater, two pathways can be deduced, one from the north to south direction and the other one can be towards north on the north western side of the industrial estate.
- Among the physicochemical parameters analysed, pH of all sampled wells was invariably lower than the prescribed range of pH by the Bureau of Indian Standards (BIS). Other parameters were within the acceptable limits prescribed for drinking water.
- On analysis of trace elements, Pb was found to be present in all well water more than the prescribed value of 0.01 mg/l.
- Ni was also found to be present in higher concentration than the BIS limit of 0.02 mg/l in four wells located inside the industrial estate and three wells of the nearby households.
- Even though the concentration of Mn was more than the BIS limits in most of the sampled wells, only three exceeded the limit of 0.3 mg/l, which is the acceptable limit for Mn in the absence of any other alternative source.
- Among the wells used for domestic use, one well, in particular, located outside the Industrial area, was found to be contaminated by most of the analyzed trace elements.
- Background values of stable isotopes of water were determined and the amplitude of variation in stable isotopic ratios of the wells were limited, and were on par with that of local precipitation indicating their meteoric origin.
- Tracer studies are also in pipeline, which is possible after procuring the deuterium oxide tracer and the process is going on.
- Possibility of geogenic origin of trace elements have to be examined in the next phase of study.



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25/08/2023

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