

BEFORE THE NATIONAL GREEN TRIBUNAL,
PRINCIPAL BENCH, NEW DELHI

O.A. NO. 477/2022

IN THE MATTER OF:

RAJENDER GANGSARI

.....APPLICANT

VERSUS

STATE OF UTTARAKHAND & ORS.

...RESPONDENTS

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Filed By

New Delhi

Dated: 15.01.2024

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Joint inspection Report of Solid Waste Management Processing Plant, Sheeshambada Dehradun by the committee constituted by "National Green Tribunal, New Delhi (NGT) -- Case No. 477/2022 Gangsari vs. State of Uttarakhand and others Joint inspection Conducted on date 06.06.2023, 15.06.2023 & 16.06.2023 & Action Taken Report by Nagar Nigam Dehradun.

S, No.	Name of the Member/ Department	Observation/ Recommendation by Respective Committee members	Action taken by NND
1	Dr Krishnendu Mondal, Scientist -D & Dr. Vipin Gupta Scientist- B, Ministry of Environment Forest and Climate Change, IRO Dehradun	<ul style="list-style-type: none"> The Sheeshambada Waste Management Plant (SWMP) was found to be in closed proximity to the Assan River during the monitoring by the NGT Committee. During the monitoring, it was observed that there is a wall constructed along the boundary of the SWMP. However, it was also observed that some part of the boundary wall was not properly closed. Hence, during monsoon or in the event of heavy rainfall, there might be chances of overflowing of leachate to the river Assan. It is opined by the committee that the boundary wall of SWMP should be reconstructed/repared immediately to avoid such overflowing of leachate to the river. During the monitoring it was observed by the committee that a leachate treatment mechanism has been established in SWMP. The mechanism includes one CDRO (Circular Disk Reverse Osmosis) and one MEE (Multiple Effective Evaporators) along-with Diesel-fired boiler. The CDRO is with the capacity of 30 KLPD and the MEE with 15 KLPD. The Joint Committee expresses that the above-mentioned CDRO and MEE with such a low capacity are not capable enough to treat the quantum of leachate being generated at the site. Hence, looking at the future, a proper integrated LTP (Leachate Treatment plant) with modern technologies of a capacity of 50 KLPD or more should be installed at SWMP immediately. It was noted by the committee that the drainage 	<ul style="list-style-type: none"> A storm water drain passes through the plant. The boundary wall on North & West side is designed/constructed in such a way that it facilitates the flow of storm water through these opening of the wall. If these opening are closed and water channel is obstructed, it may cause damage to the entire plant. Regular maintenance of this drain is being done and a bund is created along the SLF to prevent the leachate mixing into storm water drain. <p>As a permanent solution to prevent the overflowing of the leachate into this drain, a proposal has been prepared through Irrigation Department to construct a drain / trench (700-m length & 4-m wide) along the wall of SWMP on the outer side to prevent storm water from entering into the plant. The work will start after the monsoon season.</p> <ul style="list-style-type: none"> The existing Leachate Treatment Plant (LTP) comprising of CDRO (30KLPD) & MEE (15KLPD) is being operated for 8 hours per day. It is proposed to optimize the use of LTP by increasing operating hours per day. <p>However, keeping in view the increased quantum of waste (450 TPD) and likely increase in leachate generation and taking cognizance of the recommendation of committee, a techno-feasibility report with financial implication shall be prepared by Nagar Nigam Dehradun and accordingly a proper integrated LTP equipped with modern technologies of suitable capacity shall be established.</p>

		<p>system in the nearby areas of the SWMP is not properly maintained, during the heavy rains the water coming from the forest, passes through SWMP and finally reaches to the river. It is highly recommended to construct a proper drainage network/channel to facilitate and diverting water from nearby catchment areas from the forest to the river without allowing it to pass through the SWMP. However, during the monitoring the District Magistrate of Dehradun has informed that, the District Administration has already sanctioned a civil work to construct a proper garland drain to channelize the storm water coming from nearby forest areas to the Assan River: This work needs to be executed immediately as expressed by the committee.</p>	
		<ul style="list-style-type: none"> • It was informed during the visit that the total quantity of the stored legacy waste is 365173 MT. The committee opined that the municipality should prepare an action plan for disposal of the remaining legacy waste immediately with much faster disposal rate. • It was also informed that, the current maximum capacity of the SWMP is 200 MT per day. However, the current waste generation in Dehradun is approximately 450 MT per day as solid waste. It was also informed that the current waste is being treated by the plant in two shifts, 8 hours each. The Committee expressed that the technology for treating the solid waste in the plant needs to be upgraded immediately by advancing the machinery and technologies of the processing plant at maximum possible capacity. • It has been opined by the committee that the human population of Dehradun district has been increased by many folds in last 10 years and it is even increasing. 	<ul style="list-style-type: none"> • Nagar Nigam Dehradun has submitted a proposal for disposal of Legacy/RDF/mixed waste at the MSWP to the Urban Development Directorate via letter no 2771(H) dated 01-05-2023. • Nagar Nigam Dehradun has submitted a proposal with financial outlay of Rs. 414.18 lakh to the Urban Development Directorate vide letter no 2755(H) dated 28-04-2023, for upgrading and advancing the machineries & technologies by proposing additional 75 mm trommel, 30TPH Bellastic Separator and 25 TPD Shredder for better functioning of the processing plant. • Nagar Nigam Dehradun is also working on following waste management projects to reduce the burden of waste on sheeshambada plant : <ol style="list-style-type: none"> a) Nagar Nigam Dehradun is in discussion will GAIL for setting up of Bio-CNG plant of capacity 100 TPD (land has been identified). b) Creation & Operation of Zero Waste Ward : For this purpose EOI has been floated for selection of operators. Waste from these wards will not go to sheeshambada SWMP. • District Magistrate, Dehradun has constituted a committee for

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	<p>Looking at the future for another three to four decades, the Municipal authority should immediately explore new site for solid waste management of Dehradun District immediately.</p> <p>A. Specific Conditions</p> <p>STIPULATION III: State of the art measures should be adopted for odor control from the plant.</p> <p>STATUS OF COMPLIANCE: Not complied. The project authority needs to adopt some advanced measures to control odor.</p> <p>STIPULATION V: Project proponent shall develop green belt minimum 20 m width all along boundary and at least 30 m away from the river HFL. The setup shall be constructed at least 3 m above the HFL of the river.</p> <p>STATUS OF COMPLIANCE: Green belt has been developed, however it was found partial. Proper three-layered green-belt needs to be developed along the boundary of the project especially towards the river side and land-fills.</p> <p>STIPULATION XI: An onsite Emergency Management plan shall be prepared and implemented.</p> <p>STATUS OF COMPLIANCE: Not complied. Emergency Management Plan especially for fire incidences should be prepared.</p>	<p>identification of alternate land for disposal and processing of waste. A forest land transfer proposal is being prepared.</p> <ul style="list-style-type: none"> • Effective Odour control measures through enzymes spray are being undertaken regularly on daily basis and proper record for the same is being maintained at site. The operator/ agency has been instructed to increase the numbers of air blower in the windrows for better aeration & to reduce foul smell. As per recommendation of committee members option of installing wet scrubbers, carbon filters, or bio filters will be explored and the report for the same will be submitted after feasibility trials. • Initially during 2017 & 2018, green belt with 20m width was developed along the wall of MSWP as per EC norms. However, due to fire, certain portion of the green belt on North and West side of SLF got damaged. • Along with removal of legacy/RDF/mixed waste from the site, as per proposal submitted by Nagar Nigam Dehradun to urban development directorate, plantation work will be done to restore the green belt. • Presently following equipment/firefighting items are placed in plant premise • Borewell at 3 locations (1. Near Sanitary landfill site 2. Near Security room with tank and 3. Near Admin office) have been completed. • 16 fire extinguishers are placed (List Enclosed) • Siren system • 10,000 Litre capacity water tanker • 1 number 4000 L spraying machine • Flexible pipe-500 m • Fire hose pipe installed on compost shed wall <p>Further actions for procurement of fire hydrant is in process.</p> <ul style="list-style-type: none"> • This is duly noted and all recommendation of EMP shall be complied in letter & spirit. Half-yearly compliance report submitted
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		<p>B. General Conditions</p> <p>STIPULATION III: All the recommendation of the EMP shall be complied with letter and spirit. All the mitigation measures submitted in the EIA report shall be prepared in a matrix format and the compliance for each mitigation plan shall be submitted to MoEF& CC along with half yearly compliance report to MoEF& CC-RR.</p> <p>STATUS OF COMPLIANCE: Not complied.</p>	on 26/05/2023.
2	<p>Dr. Rajesh Singh, Scientist-D, Environmental Hydrology Division, National Institute of Hydrology, Roorkee</p>	<ul style="list-style-type: none"> The southwest boundary of the Shishambara Waste Processing Plant is at a distance of around 180 m from the Asan river and the nearest habitation is at a distance of around 200 m from the Northwest boundary of the plant. On the eastern side of the waste processing plant, Zee Himgiri University is located. The undersigned along with other members of the committee constituted by Hon'ble NGT visited the waste processing plant on June 06 & 16, 2023 for the survey and on June 21, 2023, for water sample collection. (Annexure-1) During the plant survey, discharge/ leakage of leachate/wastewater outside plant premises was not observed. A foul odor was observed outside the plant premises, which may be due to the decay of waste in legacy RDF/waste hillock in the plant premises. 	<ul style="list-style-type: none"> The distance of the MSWP from the river is as per MSW Rules 2016 (Schedule 1(vii))
		<ul style="list-style-type: none"> The legacy solid waste/RDF hillock is approx. 15-20 m high. The avg. monthly rainfall from June to September is around 400 mm, which will result in around 10000 m³/month wastewater from the garbage hillock and it is not possible to contain this volume in the 	<ul style="list-style-type: none"> Compost is being stored in the shed. As per the proposal submitted to UDD, a 25-TPH shredder will process RDF as per requirement.

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		<p>premises.</p> <ul style="list-style-type: none"> At present, M/s National Federation of Farmers Procurement, Processing and Retailing Cooperatives of India Ltd. (NACOF) is processing the municipal solid waste received at the premises on the same day and the processed waste fractions (RDF) is transported to M/s Birla Cement, M/s Satna Cement, and M/s Shree Cement Ltd. through the assistance of a third party. Rajasthan. For unfavorable conditions when the RDF waste cannot be transported to the cement factories or machinery breakdown, there must be a provision for a covered area to store the RDF in the plant premises to reduce moisture, odour emission, access by vermin, and waste leaching in case of precipitation. 	
		<ul style="list-style-type: none"> The fire on the hillock was observed to be extinguished. The foul odor was observed in a radius of around 1.5 km. The oxygen supplied in the windrows (Composting unit) was observed to be below the desired levels resulting in foul odor. A concentration of 3.5 ppm dissolved O₂ is healthy for aerobic composting microbes and reduced odor problems. In addition to the increased oxygen for better performance, the periodic turning of windrows should be practiced. If the problem is not resolved by increasing the air (O₂) supply, the option of installing wet scrubbers, carbon filters, or bio filters can be explored after feasibility trials. 	<ul style="list-style-type: none"> Effective Odour control measures through enzymes spray are being undertaken regularly on daily basis and proper record for the same is being maintained at site. The operator/agency has been instructed to increase the numbers of air blower in the windrows for better aeration & to reduce the foul smell. As per recommendation of committee members, option of installing wet scrubbers, carbon filters, or bio filters will be explored, and the report for the same will be submitted after feasibility trials.
		<ul style="list-style-type: none"> Proper provisions for the containment of the leachate generated during the composting process 	<ul style="list-style-type: none"> The existing Leachate Treatment Plant (LTP) Comprising of CDRO (30KLPD) & MEE (15KLDP) is being operated for 8 hours per day.

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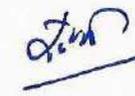
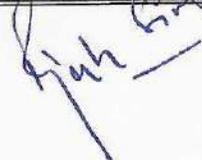
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		<p>and from the stored RDF in the normal operation period have been made on the premises.</p> <ul style="list-style-type: none"> • Around 5 KLD leachate is generated from the composting unit. • A CDRO-based leachate treatment plant of 30 KLD capacity to recover the leachate water for landscaping has been installed and was observed in operation, however, the treated water quality was not meeting the guidelines for land application requiring further improvement in the treatment scheme by including RO system post CDRO after feasibility trials. • Multi-effect evaporation (MEE) system with 15 KLD capacity is installed for treating the RO reject which was observed in operation at the time of visit. • For monitoring the impact of wastewater (leachate) generated from the waste processing plant, a sufficient number of piezometers (≈ 60 ft depth) needs to be installed in the plant premises after consultation with Central Ground Water Board, Dehradun. 	<p>It is proposed to optimize the use of LTP by increasing operating hours per day.</p> <p>However, keeping in view the increased quantum of waste (450 TPD) and likely increase in leachate generation and taking cognizance of the recommendation of committee, a techno-feasibility report with financial implication shall be prepared by the Nagar Nigam Dehradun and accordingly a proper integrated LTP equipped with modern technologies of suitable capacity shall be established.</p>
		<ul style="list-style-type: none"> • The green belt in the plant premises needs to be further developed. Sagwan (<i>Tectona grandis</i>), Neem (<i>Azadirachta indica</i>), Sita Ashok (<i>Saraca asoca</i>), Champa (<i>Plumeria</i>), etc. can be planted on the boundaries of the waste processing plant for beautification. 	<p>As per above..</p>
3	<p>Dr. R.K. Chaturvedi Regional Officer UKPCB</p>	<ul style="list-style-type: none"> • The Nagar Nigam has obtained EC, CTE for establishment of waste processing site. • Last CCA was valid till 31-3-2022, Earlier plant was not complying conditions, therefore complaint case filed against earlier operator under provisions of EP Acts. • Present operator M/s National Federation of 	<ul style="list-style-type: none"> • The service provider M/s NACOF has applied for CTO renewal, application is under process. • As per above regarding leachate management.



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	<p>Farmers Procurement, Processing and Retailing Cooperatives of India Ltd. (NACOF) has applied for CCA renewal, application under process</p> <ul style="list-style-type: none"> • Boundary wall of about 10 ft made around the plant • During the plant survey, discharge/ leakage of leachate/wastewater outside plant premises was not observed. • A natural drain passing inside the plant and meeting in river. During rainy season Leachate generate from Legacy/RDF may casue contamination therefore it is recommended to shift natural drain beyond the boundary wall of plant. 	
	<ul style="list-style-type: none"> • As per inspection of previous joint committee dated 17-10-2022 total 288280 MT RDF and inert stored as The legacy solid waste/RDF hillock is approx. 15-20 m high. • There is no progress to dispose off this legacy waste. • At present, M/s National Federation of Farmers Procurement, Processing and Retailing Cooperatives of India Ltd. (NACOF) is processing the municipal solid waste received at the premises on the same day and the processed waste fractions (RDF) is transported to M/s Birla Cement, M/s Satna Cement, and M/s Shree Cement Ltd. through the assistance of a third party. It was informed during the visit that the total quantity of the generated RDF is 31750.33 MT (RDF) out of which only 1802.77 MT has been processed from December 2022 to May 2023 by the processing of daily waste by NACOF. • NACOF needs to daily disposal of 100% RDF other wise it will be accumulated as earlier. 	As per above





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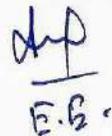


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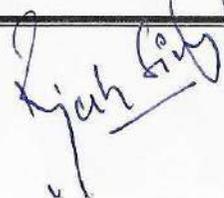


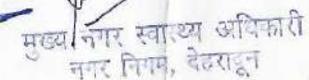
		<ul style="list-style-type: none"> The plant Designed to handle 200TPD MSW and waste is arriving about 450 TPD. Operator has informed that they are running plant in two shift total 16 hr a day. Need to increase capacity of plant by changing modern technologies Proper provisions for the containment of the leachate generated during the composting process and from the stored RDF in the normal operation period have been made on the premises. A CDRO-based leachate treatment plant of 30 KLD capacity to recover the leachate water has been installed along with Multi-effect evaporation (MEE) system with 15 KLD capacity for treatment of the RO reject which was observed in operation at the time of visit. Presently Around 5 KLD leachate is generated in the unit, it will be increase many fold during rains. The capacity of Present Leachate treatment plant is not sufficient to handle. Therefore it is suggested that- <ol style="list-style-type: none"> Nagar Nigam Shall dispose Legacy RDF on priority. Nagar Nigam/NACOF shall install LTP of additional capacity 	
4	Ravi Pandey, SE, Urban Development Directorate, Uttarakhand	<ul style="list-style-type: none"> During the visit it was observed that a leachate treatment mechanism with one CDRO (Circular Disk Reverse Osmosis) and one MEE (Multiple Effective Evaporators) along-with Diesel-fired boiler. The CDRO is with the capacity of 30 KLPD and the MEE with 15 KLPD. It was observed that the above mentioned CDRO and MEE is having a low capacity and proper a proper integrated LTP (Leachate Treatment plant) with modern technologies of a 	



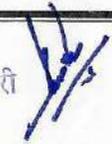


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		<p>capacity of 50 KLPD or more should be installed at SWMP immediately. Existing LTP should also be used for a longer period to treat the generated leachate every day.</p>	
		<ul style="list-style-type: none"> • It was informed that against the total quantity of the stored legacy waste is 31750.33 MT (RDF) out of which only 1802.77 MT has been processed from December 2022 to May 2023. It was informed that an action plan for disposal of the remaining legacy waste has been prepared costing Rs. 20.08 Cr. and it is in the process of approval. • It was also informed that, the current maximum capacity of the SWMP is 200 MT per day. However, the current waste generation in Dehradun is approximately 450 MT per day as solid waste. Presently the current waste is being treated by the plant in two shifts, 8 hours each. It was informed that a expansion plan for the plant costing Rs. 4.14 Cr. has been prepared and it is also in the process of approval. • It is hereby suggested that for the expansion of the plant, nearby land in the west of the plant or any other site should be explore immediatly. • To prevent fire proper "fire extinguisher" system should be installed on priority. 	
		<p>As above</p>	
		<ul style="list-style-type: none"> • Proper scientifically proven system should be fixed and for immediate relief regular enzyme of good standard, regular composting of every day organic waste and proper upkeep of the plant should be maintained. <p>For every day composting, proper enclosure with hot air blower facility is installed in the plant. To</p>	

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		<p style="text-align: center;">370</p> <p>reduce odour in the plant the hot air blower in all the in closure should function properly every day and every enclosure must be cleaned on the periodic basis.</p>	
5	Prof G.V Gopi, Wildlife Institute of India	<p>a) The Shishambara Waste Management Plant (SWMP) is in close proximity to the river by nearly 180m of distance from the south-west corner to the north flank of the River.</p> <p>b) Some parts of the boundary wall of SWMP is kept open. The boundary wall should be completely closed as the leakage of contaminated water can flow in to the adjacent areas and finally in to the river.</p> <p>c) It was noticed that the drainage system in the nearby areas of the SWMP is not properly maintained, during the heavy rains the water coming from the forest, passes through SWMP and finally mixes in the River. It is highly recommended to construct a proper drainage network/channel to facilitate and diverting water from nearby catchment areas from the forest to the river without allowing it to pass through the SWMP. This can mitigate the potential flow of the river and contaminated water unit in the river.</p> <p>d) The established green belt in the plant is observed in the poor condition. Several tree were dried without proper watering, and the green belt all along the periphery on three sides is cluttered with garbage materials. In few areas of the periphery, green belt is missing although the plants in front portion of the SWMP green belt is maintained properly.</p> <p>e) The boundary of the Asan Barrage Bird Sanctuary from the SWMP is approximately 17 km. Although the distance is far but the chances of mixing polluted water in the Asan River are high during the monsoon season or during heavy rains due the inefficient</p>	

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		<p>drainage system in and around the area of the SWMP. We highly recommend the construction of a well-designed drainage network or channel to effectively redirect water from the surrounding catchment areas and from the forest, and directly into the river, bypassing the SWMP</p>	
		<p>Remark:-</p> <ul style="list-style-type: none"> • There is high possibility of leachate following to the neighbouring areas comprising of housing, agriculture field, other industrial establishment such as stone crusher unit and finally in to the river during the heavy rains or monsoon seasons due to open area in the boundary wall. • The Shishambara Waste Management Plant is located at the bank of Asan River. About 23 km of distance from SWMP, the Asan River converges with the Yamuna River. Here a barrage a was constructed in 1967 on the Asan River providing vital support to a large and diverse range of migratory as well as resident water birds. This barrage comes under the Indian protected area network system and recognize as Asan barrage Bird Sancturay, it also recently declared as Ramsar site due presence of some globally threatened species and more than 1% of the bio- geographical populations of two water bird species. • The SWMP may fund a long term study to monitor the effects of pollutants on Asan Conservation Reserve. <p>***Observation & Recommendation of WII report Annexure-8</p>	

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 Wildlife Institute of India
 Dehradun-248001 (Uttarakhand)

List fire extinguishers

Solid Waste Management Processing Plant, Sheeshambada Dehradun		
Fire extinguishers are placed		
S.No	Location	Qty
1	Admin & laboratory Building	2
2	Medical first aid room	1
3	Material Stores Building	2
4	DG Electricity Panel Room	2
5	Vehicle Maintenance & Workshop	1
6	Compost Shed Area	4
7	Weighing Bridge	1
8	Security Room	1
9	Leachate Treatment Plant	2
	Total	16



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Report
on
**Status of Groundwater Quality around
Shishambada Waste Processing Plant, Selakui,
Dehradun**



NATIONAL INSTITUTE OF HYDROLOGY
(An ISO 9001:2015 Institute under DoWR, RD & GR, Ministry of Jal Shakti, GoI)
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July 2023

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CONTRIBUTIONS

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- Additional Chief Secretary, Ministry of Urban Development, GoUK
- Commissioner, Municipal Corporation, Dehradun
- District Magistrate, Dehradun
- Representative of ACS/Principal Secretary, Ministry of Jal Shakti, GoUK
- Representative of National Institute of Hydrology, Roorkee
- Nominee of Wildlife Institute of India, Dehradun
- Representative of, Integrated Regional Office of MoEF&CC

Investigators

- Dr. Rajesh Singh, Sc. D, NIH, Roorkee
- Dr. Vinay Kumar Tyagi, Sc. D, NIH, Roorkee
- Dr. Avinash Khanna, Senior Health Officer, Doon Corporation
- Mr. Uday Pratap Singh, Independent Project Engineer, Processing Plant Shishambada

Supporting Staff

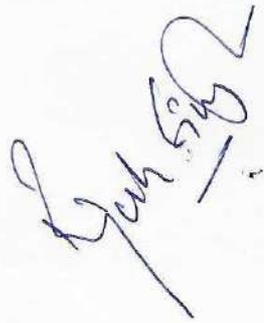
- Dr. Sandeep Singh, Research Scientist, NIH, Roorkee
- Mrs. Bina Prasad, SRA, NIH, Roorkee
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1.0 INTRODUCTION

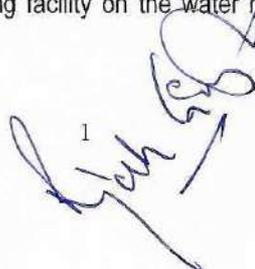
Hon'ble National Green Tribunal (NGT) vide its order dated August 02, 2022 in the matter of OA No. 477 of 2022, Rajender Gangsari Vs State of Uttarakhand & Ors. constituted a joint committee comprising of following members to submit factual and action taken report within two months in accordance to the grievance about illegal establishment of waste processing unit by Municipal Corporation, Dehradun, at Shishambada Selakui Dehradun which is polluting river Aasan, contaminating ground water and causing air pollution in the area posing serious health hazards to the residents of the locality and severely damaging the environment-

- Principal Secretary, Ministry of Urban Development, Government of Uttarakhand,
- Principal Secretary, Ministry of Jal Shakti, Government of Uttarakhand,
- Municipal Corporation, Dehradun,
- State Wet Land Authority,
- Uttarakhand State PCB, and
- District Magistrate, Dehradun

The joint committee submitted its report vide email dated 13.12.2022. Subsequently, Hon'ble NGT constituted a joint committee comprising of following members to look into the grievances of the applicant, verify the factual position, consider the aspects related to environmental impact vide Order dated 25.04.2023.

- Additional Chief Secretary, Ministry of Urban Development, GoUK
- Commissioner, Municipal Corporation, Dehradun
- District Magistrate, Dehradun
- Representative of ACS/Principal Secretary, Ministry of Jal Shakti, GoUK
- Representative of National Institute of Hydrology, Roorkee
- Nominee of Wildlife Institute of India, Dehradun
- Representative of, Integrated Regional Office of MoEF&CC

The members of the committee visited the waste processing plant on June 06, 15, and 16, 2023 for the survey and it was decided that the groundwater and leachate samples need to be analysed to understand the impact of Waste processing facility on the water resources and the efficiency of the

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leachate treatment plant. Accordingly, the water samples were collected from different locations on June 21, 2023 and analyzed in the Water Quality Laboratory of the Institute.

2.0 SAMPLING AND PRESERVATION

The investigation team collected 7 water samples (leachate and groundwater) from the Shishambada waste processing plant and nearby areas (Figure 1) in polyethylene bottles using dip/grab sampling method and preserved by using appropriate reagents as per standard methods (APHA, 2017) (Table 1). The details of the sampling locations are given in Table 2. All glassware and other containers used for trace element analysis were thoroughly cleaned, soaked in 10% nitric acid for 48 h and finally rinsed with de-ionized water several times prior to use. The samples were transported in an ice box to the laboratory and after receipt in the laboratory were preserved in the cold cabinet maintained at ≈ 4 °C till completion of analysis. All the chemicals used for preservation and analysis were of analytical grade (Merck).

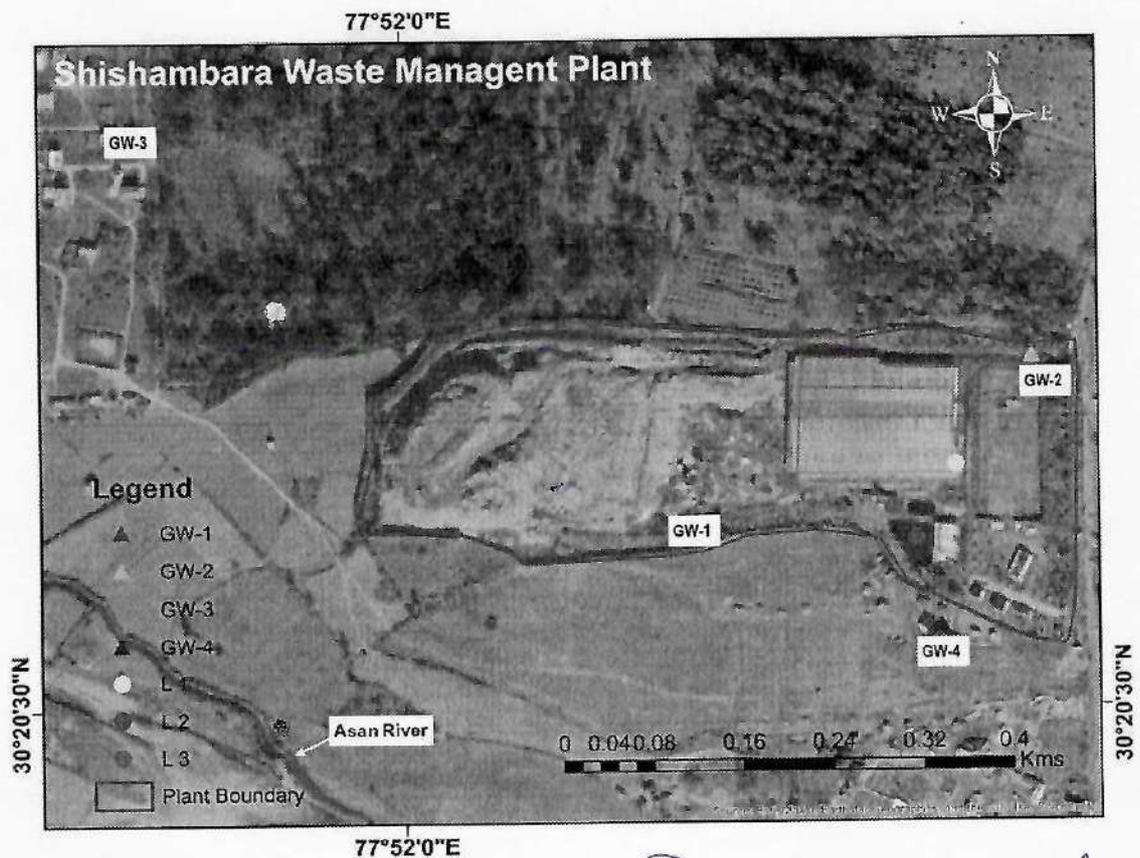


Fig. 1. Sampling Locations

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Table 1. Sample Collection & Handling

Sr. No.	Parameter	Container	Sample Size (ml)	Preservation	Analysis Time
1	pH	--	--	--	Onsite
2	Conductivity	--	--	--	Onsite
3	Major Ions	Plastic bottle	500	Cool, ≈ 4 °C	<2 days
4	Trace Metals	Plastic bottle	100	0.5 ml HNO ₃ Cool, ≈ 4 °C	<2 days
5	Chemical Oxygen Demand (COD)	Plastic bottle	100	0.5 ml H ₂ SO ₄ Cool, ≈ 4 °C	<2 days
6	Biochemical Oxygen Demand (BOD)	Plastic bottle	1000	Cool, ≈ 4 °C	< 6 h
7	Total coliform (TC) & <i>E. Coli</i> (EC)	Sterilized plastic bottle	500	Cool, ≈ 4 °C	< 6 h

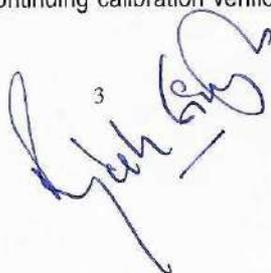
Table 2: Details of Sampling Locations for Surface Water Samples

Sr. No.	Sample ID	Location	Latitude	Longitude
1	L-1	Leachate from Windrows	30°20'36"	77°52'16"
2	L-2	Leachate Pond/ DTRO Feed	30°20'35"	77°52'14"
3	L-3	DTRO Permeate	30°20'35"	77°52'14"
4	GW-1	Borewell – 170 ft	30°20'34"	77°52'08"
5	GW-2	Borewell – 140 ft	30°20'39"	77°52'18"
6	GW-3	Borewell – 120 ft	30°20'44"	77°51'51"
7	GW-4	Handpump – 40 ft	30°20'32"	77°52'15"

3.0 ANALYTICAL METHODOLOGY

The samples were analysed by following the protocol described in 'Standard methods for the examination of water and wastewater (APHA, 2017). The details of analytical methods and equipment used in the study are given in Table 1. The pH and conductivity of the samples were measured in situ with the help of a multi-parameter analyzer (Thermo Scientific Orion Star A329) calibrated in the field before sampling. The major cations (Li, NH₄, Ca, Mg, K, and Na) and anions (F, Cl, NO₃, NO₂, and SO₄) were analyzed using Ion Chromatograph (Metrohm 930 Compact IC Flex) with a conductivity detector and the alkalinity (HCO₃) was determined by the acid titration method (APHA 2017). The trace metals (As, Al, Cr, Cu, Fe, Pb, Mn, Hg, Co, Cd, Ni, Zn, Se, Sr, Be, Th, and U) were analyzed by ICP-MS (Agilent 7850 ICP-MS). The Ion chromatograph and ICP-MS were calibrated for the analyte of interest using certified reference materials (CRMs) traceable to NIST (Merck) and the standards/blank were also run after a periodic interval during the analytical run for the continuing calibration verification (CCV). The analysis run was

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accepted if the percentage recovery in CCV run was within $\pm 10\%$. COD and BOD of the samples were analyzed by Open reflux and Respirometric method respectively (APHA, 2017). The coliforms in the samples were analyzed by enzyme substrate coliform test (APHA, 2017). All the parameters except coliforms were analyzed in triplicate and the coliforms were analyzed in duplicate for quality control.

Table 3.8. Analytical Methods and Equipments used in the Study

Sr. No.	Parameter	Method	Equipment Used	
A. Physicochemical				
1	pH	Electrometric	pH meter - WTW	
2	Electrical Conductivity	Electrometric	Conductivity meter - WTW	
3	Bicarbonate	Titration by H ₂ SO ₄ , APHA 2320B: 2017	Digital Burette	
4	Calcium	Conductivity Method, ISO 14911: 1998: 1998	Ion Chromatograph, Metrohm 930 Compact IC Flex	
5	Magnesium			
6	Sodium			
7	Potassium			
8	Chloride	Conductivity Method, APHA 4110 B: 2017		
9	Fluoride			
10	Nitrate			
11	Sulfate			
12	Phosphate			
B. Trace Metals				
13	Arsenic	Digestion followed by Inductively Coupled Plasma Mass Spectrometry (ICP-MS), APHA 3120B: 2017		ICP-MS, Agilent 7850 ICP-MS
14	Aluminium			
15	Chromium			
16	Manganese			
17	Iron			
18	Cobalt			
19	Nickel			
20	Copper			
21	Zinc			
22	Selenium			
23	Cadmium			
24	Mercury			
25	Lead			
26	Strontium			
27	Beryllium			
28	Thorium			
29	Uranium			
C. Aggregate Organic Constituents				
30	Chemical Oxygen Demand (COD)	Open Reflux Method, APHA 5220B: 2017	--	
31	Biochemical Oxygen Demand (BOD)	Respirometric Method, APHA 5210D: 2017	WTW Oxitop, Incubator	
D. Microbiological Examination				
32	Total coliform (TC)	Enzyme Substrate Test, APHA 9223: 2017	IDEXX Colilert 18, Quantitray/2000, Quantitray Sealer, Incubator, UV-lamp	
33	<i>Escherichia coli</i> (EC)			

4.0 RESULTS & DISCUSSION

4.1 Leachate and Treated Leachate

Table 3: Physico-chemical Characteristics of Leachate Samples

S. No.	Parameters	L-1	L-2	L-3	Effluent Standards
1	pH	7.84	8.66	8.14	5.5-9.0
2	Electrical Conductivity ($\mu\text{S}/\text{cm}$)	10510	10320	3266	-----
3	Ammonium as $\text{NH}_4\text{-N}$ (mg/l)	389.0	166.4	68.5	50
4	Calcium as Ca (mg/l)	312.6	55.0	63.1	-----
5	Magnesium as Mg (mg/l)	171.4	214.6	80.8	-----
6	Sodium as Na (mg/l)	693.1	897.0	243.5	-----
7	Potassium as K (mg/l)	998.4	1282.4	334.0	-----
8	Carbonate as CO_3 (mg/l)	ND	181	ND	-----
9	Bicarbonate as HCO_3 (mg/l)	3922	3274	1179	-----
10	Chloride as Cl (mg/l)	1147	1744	367	-----
11	Fluoride as F (mg/l)	2.4	0.9	0.13	2.0
12	Nitrate as $\text{NO}_3\text{-N}$ (mg/l)	3.5	0.4	0.7	10
13	Nitrite as $\text{NO}_2\text{-N}$ (mg/l)	1.2	ND	ND	-----
14	Sulfate as SO_4 (mg/l)	27.3	24.8	7.6	-----
15	Phosphate as P (mg/l)	12.8	ND	ND	5.0
16	Total Arsenic as As (mg/l)	0.017	0.021	0.006	0.20
17	Aluminium as Al (mg/l)	2.85	0.82	0.37	-----
18	Total Chromium as Cr (mg/l)	0.086	0.054	0.014	2.0
19	Copper as Cu (mg/l)	0.102	0.110	0.117	3.0
20	Iron as Fe (mg/l)	21.66	2.67	0.58	3.0
21	Lead as Pb (mg/l)	0.0489	0.0124	0.013	0.1
22	Manganese as Mn (mg/l)	0.507	0.061	0.026	2.0
23	Mercury as Hg (mg/l)	ND	ND	ND	0.01
24	Cobalt as Co (mg/l)	0.028	0.011	0.003	-----
25	Cadmium as Cd (mg/l)	0.007	0.004	0.003	2.0
26	Nickel as Ni (mg/l)	0.173	0.143	0.040	3.0
27	Zinc as Zn (mg/l)	1.262	0.534	0.375	5.0
28	Selenium as Se (mg/l)	ND	ND	ND	0.05
29	Strontium as Sr (mg/l)	0.658	0.339	0.146	-----
30	Beryllium as Be (mg/l)	ND	ND	ND	-----
31	Thorium as Th (mg/l)	0.002	0.001	0.001	-----
32	Uranium as U (mg/l)	ND	ND	ND	-----
33	BOD (mg/L)	730	500	87	30
34	COD (mg/L)	1840	1300	200	250

The analysis result of the leachate sample from Windrows (L-1) indicates that all the analyzed values except ammonium, fluoride, phosphate, iron, BOD, and COD were in conformity with the effluent standards notified vide G.S.R. 422(E) dated 19.05.1993 under Environment (Protection) Act, 1986 for

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discharge of effluents into inland surface water. A significant reduction in the parameters not in conformity with discharge norms was observed after storage in the leachate collection pit (L-2), possibly due to microbial reactions during long storage and dilution. Treatment of L-2 with DTRO resulted in a significant reduction of all the analyzed parameters resulting in conformity with the effluent standards notified vide G.S.R. 422(E) dated 19.05.1993 under Environment (Protection) Act, 1986 for discharge of effluents into inland surface water, except ammonium and BOD. L-3 is used for landscaping development. The DTRO permeate was also colored (Figure 2) and therefore, the leachate treatment system needs to be improvised by including a pre-treatment system (Chemical precipitation) and a post-treatment system (RO) after feasibility trials.

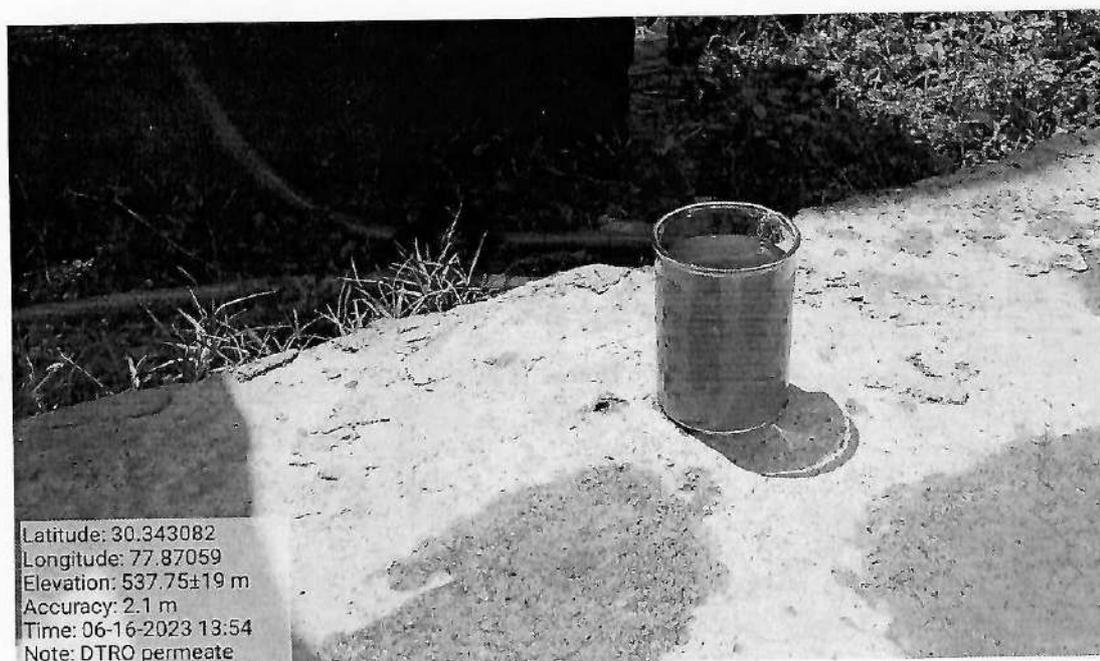


Fig. 2. DTRO Permeate (L-3) sample

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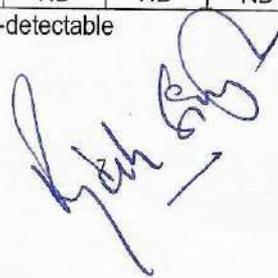
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4.2 Groundwater Samples

Table 4: Physico-chemical and Bacteriological Characteristics of Groundwater Samples

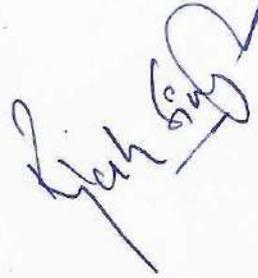
S. No.	Parameters	GW-1	GW-2	GW-3	GW-4	IS 10500:2012 Standard	
						Acceptable	Permissible
1	pH	6.9	6.7	6.4	7.6	6.5-8.5	NR
2	Electrical Conductivity ($\mu\text{S}/\text{cm}$)	239.5	223.3	160.1	559.7	-----	-----
3	Ammonium as $\text{NH}_4\text{-N}$ (mg/l)	0.21	0.20	0.19	0.53	0.03	0.2
4	Calcium as Ca (mg/l)	24.8	23.9	15.1	79.8	75	200
5	Magnesium as Mg (mg/l)	9.0	8.3	5.1	19.9	30	100
6	Sodium as Na (mg/l)	11.9	11.7	12.4	7.7	-----	-----
7	Potassium as K (mg/l)	2.1	1.2	1.0	2.1	-----	-----
8	Carbonate as CO_3 (mg/l)	ND	ND	ND	ND	-----	-----
9	Bicarbonate as HCO_3 (mg/l)	132.7	125.4	88.6	238.4	-----	-----
10	Alkalinity as CaCO_3 (mg/l)	108.8	102.8	72.6	195.4	200	600
11	Chloride as Cl (mg/l)	4.8	2.5	1.8	6.8	250	1000
12	Fluoride as F (mg/l)	0.1	0.1	0.1	0.1	1.0	1.5
13	Nitrate as NO_3 (mg/l)	5.2	4.8	5.3	10.2	45	NR
14	Nitrite as NO_2 (mg/l)	0.05	ND	ND	ND	-----	-----
15	Sulfate as SO_4 (mg/l)	1.5	0.9	1.1	75.6	200	400
16	Phosphate as P (mg/l)	ND	ND	ND	ND	-----	-----
17	Total Arsenic as As (mg/l)	ND	ND	ND	ND	0.01	-----
18	Aluminium as Al (mg/l)	ND	ND	0.001	0.058	0.03	0.2
19	Total Chromium as Cr (mg/l)	ND	ND	ND	0.001	0.05	NR
20	Copper as Cu (mg/l)	ND	0.001	ND	0.011	0.05	1.5
21	Iron as Fe (mg/l)	1.31	ND	3.22	0.25	1.0	NR
22	Lead as Pb (mg/l)	ND	ND	0.001	0.001	0.01	NR
23	Manganese as Mn (mg/l)	0.009	ND	0.014	0.008	0.1	0.3
24	Mercury as Hg (mg/l)	ND	ND	ND	ND	0.001	NR
25	Cobalt as Co (mg/l)	ND	ND	ND	ND	-----	-----
26	Cadmium as Cd (mg/l)	ND	ND	ND	ND	0.003	NR
27	Nickel as Ni (mg/l)	ND	ND	ND	0.001	0.02	NR
28	Zinc as Zn (mg/l)	0.005	0.002	0.469	0.051	5	15
29	Selenium as Se (mg/l)	ND	ND	ND	ND	0.01	NR
30	Strontium as Sr (mg/l)	0.118	0.110	0.091	0.628	-----	-----
31	Beryllium as Be (mg/l)	ND	ND	ND	ND	-----	-----
32	Thorium as Th (mg/l)	ND	ND	ND	ND	-----	-----
33	Uranium as U (mg/l)	ND	ND	ND	ND	0.03	-----
34	BOD (mg/L)	4.3	2.5	3.0	2.0	-----	-----
35	COD (mg/L)	52	6.5	8.0	16	-----	-----
36	Total Coliform (MPN/100 ml)	4	2	2	107.4	ND	ND
37	<i>E. coli</i> (MPN/100 ml)	ND	ND	ND	2	ND	ND

NR: No relaxation; ND: Non-detectable



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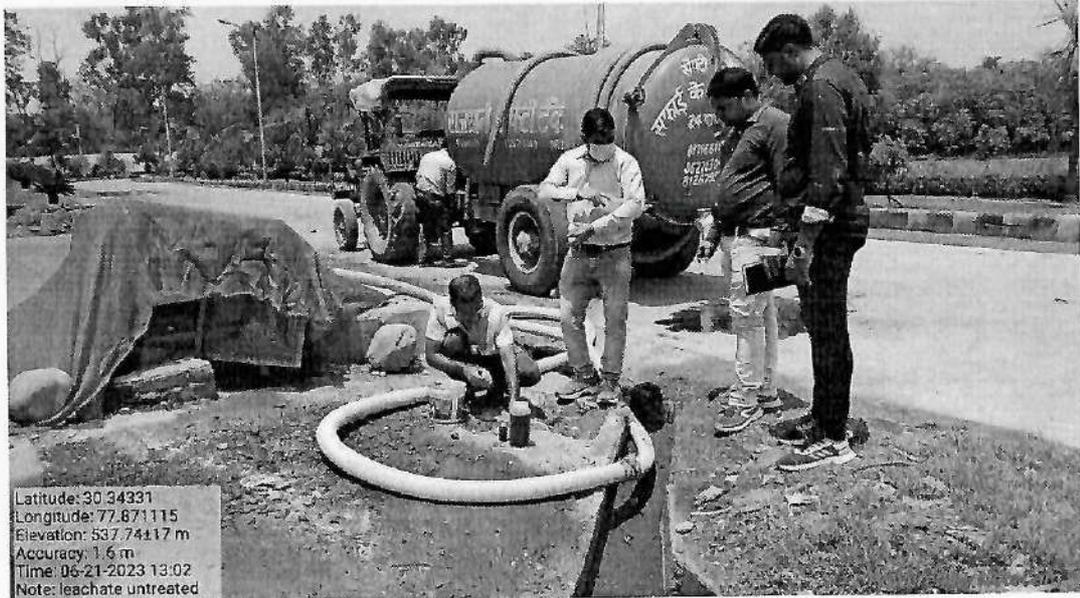
From the above results, it is evident that the values of ammonium concentration in GW-1 and GW-4 samples exceeded the permissible limit prescribed by BIS (2012) for drinking water, and in GW-2 and GW-3 samples the ammonium concentration exceeded the acceptable limit. Further coliforms were detected in all the samples making them non-potable, however, the pathogenic bacteria, E. coli, was present in only the GW-4 sample. Increased concentration of ammonium and COD in samples GW-1 and GW-4 indicates the influence of leachate from the waste processing plant. The influence was more visible in the GW-4 sample which is in between the Asan river and waste processing plant and at a depth of around 40 ft. Moreover, the pollutant concentration is reducing significantly with increase in the depth of groundwater as is evident from the results of GW-1 and GW-4. The groundwater for drinking water purposes near the Shishambada waste processing facility must be drawn from at least 150 ft. depth. The results of this investigation call for a detailed investigation to understand the groundwater movement and probability of mixing leachate into the groundwater of the area. It is also suggested to install a sufficient number of piezometers (≈ 60 ft. depth) in and around the plant premises after consultation with the Central Ground Water Board (CGWB), Dehradun for monitoring the impact of wastewater (leachate) generated from the waste processing plant.



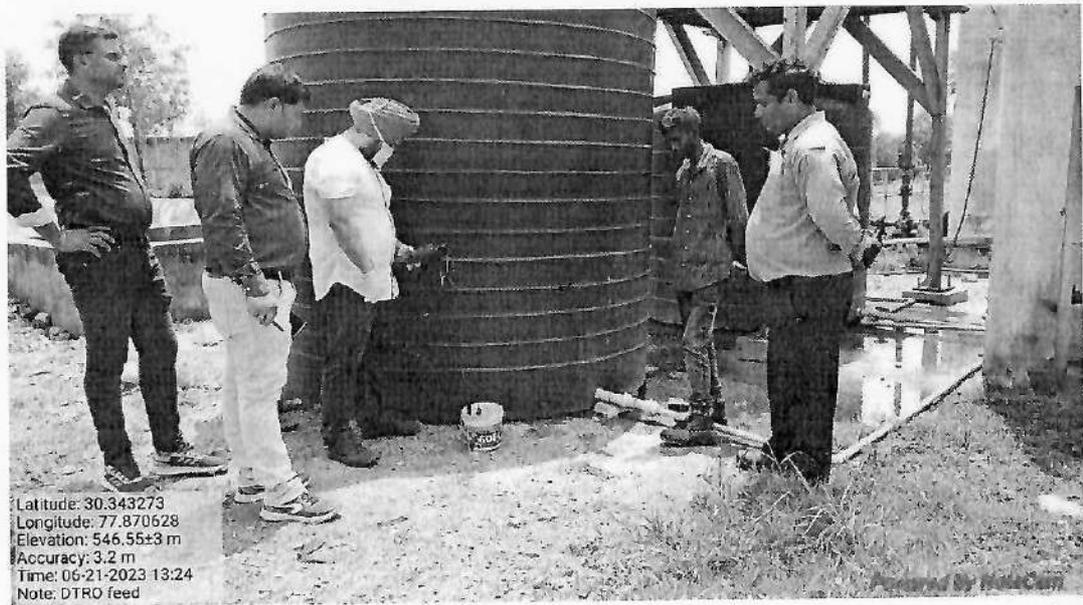
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Annexure – 1

Sample Collection from Shishambada Waste Processing Plant



Slide 1: Leachate from Windrows (L-1)



Slide 2: Leachate Pond/ DTRO Feed (L-2)

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Latitude: 30.343088
 Longitude: 77.870508
 Elevation: 553.6513 m
 Accuracy: 2.1 m
 Time: 06-21-2023 12:56
 Note: treated leachate

Slide 3: DTRO Permeate (L-3)



Latitude: 30.34285
 Longitude: 77.868757
 Elevation: 545.1613 m
 Accuracy: 1.7 m
 Time: 06-21-2023 13:15
 Note: borewell 170 ft

Slide 4: Borewell – 170 ft (GW-1)

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Latitude: 30.344238
 Longitude: 77.871607
 Elevation: 562.03±3 m
 Accuracy: 3.0 m
 Time: 06-21-2023 13:36
 Note: GW 140 ft

Slide 5: Borewell – 140 ft (GW-2)



Latitude: 30.345537
 Longitude: 77.864195
 Elevation: 533.17±4 m
 Accuracy: 1.0 m
 Time: 06-21-2023 13:56
 Note: GW jitendra 120 ft

Slide 6: Borewell – 120 ft (GW-3)

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BEFORE THE NATIONAL GREEN TRIBUNAL,
PRINCIPAL BENCH, NEW DELHI

ORIGINAL APPLICATION No. 477 OF 2022

Rajender Gangsari

Appellant(s)

Versus

State of Uttarakhand

Respondent(s)

VAKALATNAMA

I/We **State of Uttarakhand**, the Appellant(s)/Petitioner(s)/Respondent(s)/intervener(s) of the above Appeal/Petition/ Reference do hereby appoint and retain **MR. KAUSHAL PATI GAUTAM**, Advocate of the Supreme Court to act and appear for me/us in the above matter and to conduct or defend the same and to appear in all proceedings that may be taken in respect of any application connected with the same or any decree or order passed therein, including proceedings in taxation and application for Review, to file and obtain return of documents, to deposit and receive money on my/our behalf in said matter and to represent me/us and to take all necessary steps in the above matter. I/We agree, to ratify all acts done by the aforesaid Advocate in pursuance of the authority.

Dated this the 26 day of October, 2023

ACCEPTED

MR. KAUSHAL PATI GAUTAM,
Additional Advocate General,
Supreme Court of India,
M-11 , Ground Floor,
South Ext. Part-II,
New Delhi-49
Mobile No-9811101934.
E-Mail id-kaushalgautam@gmail.com

(Rajni Shukla)
Addl. Secretary & Addl. L.R.
Government of Uttarakhand
APPELLANTS/PETITIONERS/RESPONDENTS

MEMO OF APPEARANCE

TO,

The Registrar,
National Green Tribunal,
New Delhi.

Sir,

Please enter my appearance in the above mentioned case on behalf of the Petitioner(s)/Respondent(s).

Yours faithfully,

(MR. KAUSHAL PATI GAUTAM)
Advocate for the Petitioner(s)/
Respondent(s)/Appellant(s)
Additional Advocate General