Inspection Report of Trident Complex of M/s Trident Limited, Mansa Road, Village-Dhaula, District Barnala, Punjab in pursuant to Hon'ble NGT Order in the matter of O.A. No. 682 of 2019 titled as Beant Singh Bajwa, President, National Anti-corruption Council vs State of Punjab & Ors.

1.0 BACKGROUND

A complaint was filed in the Hon'ble National Green Tribunal by Sh. Beant Singh Bajwa, President, National Anti-corruption Council against M/s Trident Unit in which, it was mentioned that chemical water is being discharged in the drain by the said unit. The Hon'ble National Green Tribunal had directed the Board to look into the matter, take appropriate action in accordance with law and furnish a factual and action taken report to this Tribunal.

Accordingly, after verifying the contents of the complaint in the industrial unit, a report was filed by the Board in the Hon'ble National Green Tribunal. The Hon'ble National Green Tribunal, vide its order, dated 04.12.2019 directed as follows:

> ***"A report has been furnished by the State PCB finding certain deficiencies and also finding unit complaint in certain respects. There is, however, nothing mentioned about extraction of ground water. We are of the view that a fresh independent and comprehensive inspection is necessary to ascertain the factual situation as the report furnished is not adequate in all the relevant facts, which needs to be studied.***
>
> ***Accordingly, we direct fresh inspection by joint Committee of CPCB, State PCB and District Magistrate, Barnala. The State PCB will be the nodal agency for coordination and compliance.***
>
> ***The report may be furnished by 31.01.2020 by e-mail at judicial.ngt@gov.in A copy of this order be sent to CPCB, State PCB and District Magistrate, Barnala by e-mail for compliance.***
>
> ***List again on 03.03.2020."***

2.0 RECOMMENDATIONS OF JOINT COMMITTEE

In compliance to Hon'ble NGT order, the joint committee had undertaken inspection and monitoring of the Complex during 21-23 Feb, 2020 and a report was filed on 29.02.2020 by the joint Committee with following recommendations:-

1. An in depth study for Environmental Audit may be undertaken particularly in respect for Captive Power Plant, Paper & Towel Division to assess the status for compliance of environment norms / standards. The finding(s) and recommendation(s) of study may be incorporated in the consents issued by PPCB for effectively compliance. This study on

Environment Audit be undertaken in consultation with CPCB either by PPCB or through an institute / consultant having technical expertise in the relevant field.

2. M/s Trident Ltd. shall submit a detailed action plan for compliance of condition stipulated by PPCB through its consent orders, dated 10/02/2012 and 30/05/2013, wherein the industry was to install Reverse Osmosis System followed by Multiple Effect Evaporator in its Home Textile Division (HTD) This should be accomplished before 30th June 2020; as mandated by PPCB. The industry shall also submit time bound action plan by 15th March, 2020 for installation of agitated Thin Film Dryer (ATFD) for the effective handling of MEE reject.

   M/s Trident Ltd. [Paper & Chemical Division] (PCD) shall also gradually reduce water consumption and thus effluent generation. The entire treated effluent to be properly utilize on land for plantation / irrigation purpose. The industry should adopt scientific method for utilization of treated water within the complex. An action plan in this regard shall also be submitted by M/s Trident Ltd. to PPCB on or before June 2020 detailing pipe network, land use, watering depth and type /age of plants etc. Having implemented the above, further two years from now i.e. by June 2022. M/s Trident Ltd. shall get its treated water utilized to nearby farmers for irrigations purpose.

3. M/s Trident Ltd. shall undertake a performance study of ETPs provided for its PCD. The industry shall undertake necessary project on its raw material washing stream, which nearly contributes to 30% of the total ETP load. The industry shall also submit a time bound action plan to PPCB on or before 15th March 2020 for removal of non-biodegradable COD. The industry will also submit time bound action plan by 30th April 2020 for removing of colour from its treated effluent going into the drain.

4. The trend analysis of historically data, recorded from Online Continuous Effluent Monitoring System (OCEMS) exhibits that the discharge from M/s Trident Ltd. remains within compliance zone. If such is the case then let M/s Trident Ltd. shall make all efforts to reuse treated effluent back to production process, resulting conservation of water owing to less withdrawal of ground water or canal water. Besides, the reuse of treated effluent into the production process will affect efficiency of ETP as the treatment system would receive high concentration of BOD and COD. An action plan in order to reuse its treated water not impacting the TDS of the final treated effluent to be shared with PPCB by 30th June 2020.

5. The industry has provided pipe network for distribution of treated trade effluent on the plantation area, however, it was observed that certain patches of plantation was flooded with water and some patches were found completely dry because, the industry is uniformly

distributing treated trade effluent to all cells of plantation area irrespective of the age of plants in that cell. The industry, therefore, is required to provide proper irrigation network for optimum utilization of treated wastewater. The industry shall also provide electromagnetic flow meter at the outlet of each cell of plantation making more effective utilization of treated effluent.

6. The industry is not achieving the emission standards of 75 mg/Nm^3 from the stack of Chemical Recovery Plant (II) and Energy Section. The detail of monitoring carried out by the Board is shown below in the table for ready reference. However, the industry was given opportunity of personal hearing before Chairman of PPCB on 07.01.2020, wherein one of the decision of that the industry shall submit the detailed proposal w.r.t. up gradation of its existing APCDs to achieve the stack emission standard of 75 mg/Nm^3 within 03 months alongwith PERT chart for installation and commissioning of the same.

Analysis Results of Stack Emissions of PCD

Sr. No.	Sample Identification	Parameters	Results (mg/Nm^3)
1	Stack of CRP-I after APCD	Particulate Matter	82
1	Stack of CRP-II after APCD	Particulate Matter	80
3	Stack of Energy Section APCD	Particulate Matter	98

7. The industry (M/s Trident Ltd) will conduct detailed study for monitoring the ground water quality across the Dhanaula drain in order to evaluate the impact of its treated water discharged onto drain and submit the report by 30th April, 2020.

8. The concept of 'Zero Liquid Discharge' be considered as minimal discharge of effluent particularly from the industrial sectors reported upon. According to mechanics of fluids (more precisely thermodynamics) that a continuous operation bound to generate 'rejects', and/or 'blow down' and /or 'bleed', due to process entropy, despite of whatever technology adopted. Punjab Pollution Control Board, therefore, has to examine what minimum disposal of effluent be permitted to M/s Trident Ltd. considering the production technology, scale of operation and utilization capacity. A copy of the report filed in the Hon'ble NGT by the Joint Committee is annexed as **Annexure-I** for ready reference.

The Hon'ble NGT considered the report filed by the Joint Committee and vide dated 24.06.2020 passed orders, operating part of which is reproduced as under:

"We are of the view that recommendations need to be acted upon, if not already done, as the timelines suggested have already expired and further action is not known. Necessary studies may be got conducted. The State PCB may ensure further remedial action by the industry in the light of the

observations quoted above. The joint Committee may verify compliance by coordinating with such other institution as may be found necessary and further compliance report may be filed in the matter by the joint Committee which may be coordinated by the State PCB within three months from today by e-mail at judicial-ngt@gov.in (preferably in the form of searchable/OCR PDF and not image PDF. The matter was listed for further consideration on 03.12.2020, which was further adjourned to 08.02.2021."

In compliance to the orders of the Hon'ble NGT, the work for environment audit of M/s Trident Ltd. (Towel Division) and M/s Trident Ltd. (Paper division), in consultation with CPCB, was awarded to National Institute of Technology (NIT), Jalandhar and Central Pulp & Paper Research Institute (CPPRI), Saharanpur vide Board's letter no. 4235 and 4231 dated 29/12/2020, respectively. A copy of the said work orders are annexed as **Annexure-II** for ready reference.

It is mentioned here that as per the terms & conditions of the work order, the institutes were supposed to submit an environment audit reports within 02 months from the date of award of the work i.e. by 28/02/2021.

In order to execute the work in the industry, a meeting was taken by Regional Director, CPCB, Chandigarh, with expert agencies namely CPPRI, Saharanpur & NIT Jalandhar, Officers of PPCB and representatives of the industry on 03.02.2021 at M/s Trident Complex, Dhaula, Barnala. The representative of the industry made a presentation w.r.t. compliance of Joint Committee recommendations filed before the Hon'ble NGT in its report dated 29.02.2021. He further informed to the Joint Committee that the industry had already undertaken the performance study of its ETP of PCD from Thapar Institute and submitted the same to PPCB vide letter no. Trident/PCD/2020/66 dated 08.12.2020 along with the action plan with time lines for all the proposed recommendations. The industry has also got conducted the groundwater study from a third party namely M/s Cholamandalam MS Risk Services Ltd., Chennai.

Thereafter, it was decided by Joint Committee that both the expert agencies shall start an environment audit of the industries at the earliest and thereafter finalize and submit the report in consultation with PPCB and CPCB along with recommendations.

But, both the institute could not submit the reports within the stipulated period. Accordingly, Board vide its letter no. 708 dated 05.02.2021 had requested the Hon'ble NGT to grant some more time to submit the final reports.

Thereafter, the PPCB had continuously perused both the expert agencies to submit the environment audit reports of the above mentioned industrial units. However, the

said expert agencies showed their inability to submit the environment audit reports within stipulated time as the institutes were closed due to pandemic COVID-19 situation. Due to non-submission of environment audit reports by the expert agencies, the Joint Committee could not visited the industrial unit to verify the compliances made by the industrial units. Accordingly, the Hon'ble NGT was requested vide Board's letter no. 2651 dated 16.06.2021 and vide letter no. 4378 dated 28.07.2021 to grant more time for the final submission of the report of Joint Committee. The case was heard by the Hon'ble NGT on 29.07.2021 through video conference and passed the orders vide dated 29.07.2021, operative part of which is reproduced as under:-

> ***"Faced with the above, further time is sought for ensuring compliance. In view of long unexplained delay on the part of the State PCB in complying with the orders of this Tribunal, we impose cost of Rs. 1 lakh which may be deposited with CPCB within one month which will be personal responsibility of the Member Secretary, PCB. State PCB is free to recover the same from the erring officers. We further direct the State PCB to now ensure compliance and file compliance report. The industry may achieve suggested water consumption/ minimisation steps, reduction in generation of effluents, following proper ferti-irrigation plan, to be duly monitored and compliant with emission standards. SPCB may also clarify on dual mode of disposal system consented - on land and in Dhanaula drain and mechanism for monitoring standards with two different systems of disposal. The PCB may assess compensation for violations till required pollution control devices are set up and ensure that no environmental degradation takes place. The State PCB to put the industrial unit to notice of proceedings before the Tribunal so that it has an opportunity to show cause before the Tribunal as to why the Tribunal should not take coercive measures in the matter for its continuing failure. The registry may also send notice by email to the said unit".***

In compliance to the orders of the Hon'ble NGT, cost of Rs. 1.0 lac imposed by the Hon'ble NGT had been deposited to CPCB as per following details:-

Beneficiary name	:	CPCB-NGT-EC75
Account no.	:	532702010009078, Union Bank of India, I.P. Extension Branch
IFSC Code	:	UBIN0553271

Thereafter, both the expert agencies namely NIT Jalandhar & CPPRI Saharanpur have submitted the draft environment audit reports on 15.06.2021 & 19.07.2021 respectively and the same were reviewed by the Joint Committee in the meeting held on 09.09.2021. After incorporating the suggestion of the Joint Committee, the NIT Jalandhar & CPPRI Saharanpur has submitted final environment study reports on 01.10.2021 and 06.10.2021 to the Board respectively. Accordingly, the study reports were reviewed by the Joint Committee under the Chairmanship of Deputy Commissioner, Barnala on 18.10.2021. Thereafter, a team of following officers undertook the inspection of the complex on 18.10.2021:-

1. Shri Kumar Saurabh Raj, IAS, Dy. Commissioner, Barnala
2. Shri Amit Bembi, IAS, Additional Dy. Commissioner, Barnala
3. Shri Gurnam Singh, Regional Director, CPCB, Chandigarh
4. Shri Rajeev Sharma, Senior Environmental Engineer, PPCB, Zonal Office-II, Patiala
5. Shri Rajeev Gupta, Environmental Engineer, PPCB, Regional Office, Sangrur
6. Shri Vipan Kumar, Assistant Environmental Engineer, PPCB, Regional Office, Sangrur

3.0 COMPLIANCE REPORT

During visit, the representative of the industry made a presentation before the Joint Committee w.r.t. compliances of recommendations of the Joint Committee filed before Hon'ble NGT in its report dated 29.02.2020. The industry was asked by the Joint Committee to provide updated point wise compliance status report supported by relevant documents. Accordingly, the industry submitted the written compliance report to the Joint Committee vide its letter no. TRIDENT/2021/ 08 dated 20.10.2021, which is annexed as **Annexure-III.** The point-wise compliances of recommendations of Joint Committee made by the industry and verified by the Joint Committee is as under:-

Sr. No.	Recommendations of Joint Committee	Status verified by the Joint Committee
1.	An in depth study for Environmental Audit may be undertaken particularly in respect for Captive Power Plant, Paper & Towel Division to assess the status for compliance of environment norms / standards. The finding(s) and recommendation(s) of study may be incorporated in the consents issued	The CPPRI Saharanpur and NIT Jalandhar have carried out environment audit of M/s Trident Ltd. (PCD) and M/s Trident Ltd. (HTD). An environment audit submitted by above expert agencies alongwith recommendations is annexed as **Annexure-IV** and **Annexure-V**, respectively. The industries have

	by PPCB for effectively compliance. This study on Environment Audit be undertaken in consultation with CPCB either by PPCB or through an institute / consultant having technical expertise in the relevant field.	submitted action plan along with time lines to comply with the recommendations of the expert agencies same is annexed as **Annexure-VI.**
2.	M/s Trident Ltd. Shall submit a detailed action plan for compliance of condition stipulated by PPCB through its consent order, dated 10/02/2012 and 30/05/2013, wherein the industry was to install Reverse Osmosis System followed by Multiple Effect Evaporator in its H.T.D. This should be accomplished before 30th June 2020; as mandated by PPCB. The industry shall also submit time bound action plan by 15th March, 2020 for installation of agitated Thin Film Dryer (ATFD) for the effective handling of MEE reject.	The industry had installed the first module of R.O system of 2500 KLD alongwith MEE in April, 2014 at the cost of Rs. 33.0 crores. The industry had made efforts to install remaining modules of RO followed by MEE to make the unit ZLD, but, due to technological challenges and limitations, the industry could not make the unit ZLD with the installation of RO system followed by MEE. Over a period of time, the performance of system declined and ultimately the industry had to abandon the project in 2018. Thereafter, the industry acting on the advice of NEERI had submitted a revised proposal to upgrade the existing ZLD system of 2500 KLD by adopting MBR Technology at an additional cost of Rs. 12.5 crores. Purchase order was placed to M/s Hydrotech Engineering SRL, Italy. As per the industry, partial equipment has been received and delivery of the remaining equipment is pending. The

		industry could not install the MBR in stipulated period due to lockdown and other restrictions imposed by international administrations, Central / State Governments due to COVID-19 pandemic. Now, the industry has given an alternate proposal and made commitment during the personal hearing held on 30.4.2021 to divert its treated trade effluent from drain to the plantation area to stop the 100% discharge into Dhanula Drain by December, 2021. The industry has already purchased additional land of 51.5 acres to develop plantation for utilization of treated trade effluent onto land for plantation. The industry has already done eucalyptus plantation in 32.0 acres of land and remaining 19.5 acres of land is yet to be developed by the industry. The project is expected to be completed by December, 2021 and the industry will start using treated trade effluent onto land for plantation instead of discharging into Dhanaula drain. Average production for the last five years of the industry is to the tune of 77.3 TPD against the consented quantity of 120 TPD by the Board. The industry is discharging its treated trade effluent @

		2313 KLD into Dhanaula drain against a permitted quantity of 6702 KLD by the Board.
	M/s Trident Ltd. (PCD) shall also gradually reduce water consumption and thus effluent generation. The entire treated effluent to be properly utilize on land for plantation / irrigation purpose. The industry should adopt scientific method for utilization of treated water within the complex. An action plan in this regard shall also be submitted by M/s Trident Ltd. to PPCB on or before June 2020 detailing pipe network, land use, watering depth and type /age of plants etc.	**M/s Trident Ltd. (PCD) :-** The Industry had been granted permission by the Board to discharge 8700 KLD of treated trade effluent into drain and 12800 KLD onto land for plantation. Present the average quantity of treated water discharged into drain is 6214 KLD. The industry has already reduced the consumption of fresh water from 59.95 m^3 / ton of paper in year 2013 to 46 m3 / ton of paper in year 2020 against norm of 50 m^3/Ton as stipulated under charter for water re-cycling and pollution prevention i.e. there is a reduction of about 22 %. The industry in order to supply its treated water to farmers, has got the permission from the Drainage Department for laying of pipe network across the drain. Further, the industry has submitted an Action Plan for utilization of entire treated trade effluent onto land for irrigation / plantation by June 2022 by the farmers / industry, which is annexed as **Annexure-VII**.
	Having implemented the above, further two years from now i.e. by	The industry has developed planation in an area of about 165 acres within its

	June 2022. M/s Trident Ltd. shall gets its treated water utilized to nearby farmers for irrigations purpose.	premises to utilize treated trade effluent partially onto land for plantation. During visit, it was seen that the industry has provided 5 no. sub meters in the plantation area to monitor the utilization of treated trade effluent onto land for plantation effectively. Further, the industry has also submitted the wastewater management irrigation plan for utilization of treated trade effluent and same is annexed as **Annexure-VIII**.
3.	M/s Trident Ltd. shall undertake a performance study of ETPs provided for its PCD. The industry shall undertake necessary project on its raw material washing stream which nearly contributes to 30% of the total ETP load. The industry shall also submit a time bound action plan to PPCB on or before 15th March 2020 for removal of non-biodegradable COD.	M/s Trident Ltd. has already undertaken the performance study of its ETP of PCD from Thapar Institute. A copy of study report submitted by the institute is annexed as **Annexure-IX.** The institute had given certain recommendations which had already been complied with by the industry, which has also been verified by the Joint Committee during visit. The compliance report of recommendations of Thapar Institute made by the industry is annexed as **Annexure-X**. M/s Trident Ltd. (PCD) has already installed and commissioned Dissolved Air Flotation (DAF) with screw press technology project to remove non-biodegradable COD so that pollution load caused from washing steam on the

		ETP can be reduced. The data showing before and after DAF is annexed as **Annexure-XI.** The perusal of said data reveals that there is a reduction in COD to the tune of 30.3% with the installation of DAF with screw press technology project.
	The industry will also submit time bound action plan by 30th April 2020 for removing of colour from its treated effluent going into the drain.	The industry has already given the project to Thapar Institute to conduct a pilot study for the removal of color from its treated trade effluent. The industry has submitted the interim report of the institute in this regard which is annexed as **Annexure-XII**. The industry has submitted that the final report of the pilot study project will be submitted to the Board by December 2021.
4.	The trend analysis of historically data, recorded from OCEMS exhibits that the discharge from M/s Trident Ltd. remains within compliance zone. If such is the case then let M/s Trident Ltd. shall make all efforts to reuse treated effluent back to production process, resulting conservation of water owing to less withdrawal of ground water or canal water. Besides, the reuse of treated effluent into the production process will affect efficiency of ETP as the	The industry has informed to the Joint Committee that it is difficult to reuse treated trade effluent into its production process due to increase in TDS level, which deteriorates the quality of paper and high concentration of TDS level at the final outlet of ETP. However, the industry is utilizing its treated water/ RO reject generated from RO system installed with energy section for different purposes i.e. cooling tower, coal dust suppression, ash quenching etc. which do not have/negligible impact on the TDS of

	treatment system would receive high concentration of BOD and COD. An action plan in order to reuse its treated water not impacting the TDS of the final treated effluent to be shared with PPCB by 30th June 2020.	the treated water.
5.	The industry has provided pipe network for distribution of treated trade effluent on the plantation area, however, it was observed that certain patches of plantation was flooded with water and some patches were found completely dry because, the industry is uniformly distributing treated trade effluent to all cells of plantation area irrespective of the age of plants in that cell. The industry, therefore, is required to provide proper irrigation network for optimum utilization of treated wastewater. The industry shall also provide electromagnetic flow meter at the outlet of each cell of plantation making more effective utilization of treated effluent.	**M/s Trident Ltd. (PCD)** The industry has already developed planation in an area of about 165 acres within its premises to utilize treated trade effluent partially onto land for plantation. During visit, it was seen that the industry has divided its plantation area into different pockets and are provided with electromagnetic flow meters to monitor the utilization of treated trade effluent onto land for plantation uniformly and effectively. **M/s Trident Ltd. (HTD)** The industry has already developed plantation in an area of about 80 acres within its premises to utilize treated trade effluent onto land for plantation. During visit, it was seen that the industry has divided its plantation area into different pockets and provided flow meters to monitor the utilization of treated trade effluent onto land for plantation uniformly and effectively. The day wise roaster to utilize treated trade effluent onto land for plantation

<table>
<tr><td></td><td></td><td>in different pockets has also been prepared by the industry for both the units to utilize treated trade effluent uniformly.</td></tr>
<tr><td>6.</td><td>The industry is not achieving the emission standards of 75 mg/Nm3 from the stack of Chemical Recovery Plant (II) and Energy Section. However, the industry was given opportunity of personal hearing before Hon'ble Chairman of PPCB on 07.01.2020, wherein one of the decision of that the industry shall submit the detailed proposal w.r.t. upgradation of its existing APCDs to achieve the stack emission standard of 75 mg/Nm3 within 03 months alongwith PERT chart for installation and commissioning of the same.
Analysis Results of Stack Emissions of PCD
<table>
<tr><th>Sr. No.</th><th>Sample Identification</th><th>Parameters</th><th>Results (mg/Nm^3)</th></tr>
<tr><td>1</td><td>Stack of CRP-II after APCD</td><td>Particulate Matter</td><td>80</td></tr>
<tr><td>2</td><td>Stack of CRP-I after APCD</td><td>Particulate Matter</td><td>82</td></tr>
<tr><td>3</td><td>Stack of Energy Section APCD</td><td>Particulate Matter</td><td>98</td></tr>
</table></td><td>The industry is not achieving the emission norms of 75 mg/Nm^3 as per stipulation of Environment Clearance granted by MoEF & CC. The industry already been directed by the Board to upgrade its existing APCDs so as to achieve the norm of 75 mg/Nm^3. In this regard, the industry had earlier submitted proposal alongwith time lines for the up gradation of existing APCDs as per following:-
Recovery 1- 30.09.2021
Recovery 2- 30.11.2021
Co-generation plant 2 & 3 – 15.05.2021
Thereafter, the industry vide letter dated 27.04.2021 had informed that technical offers from three suppliers on Electro Static Precipitator (ESP) up-gradation have been received and the progress has been hampered due to prevailing pandemic scenario. The industry requested to extend the target time lines to September 2022.
Now, the industry has submitted that the up-gradation of existing APCD of captive boiler will be completed by 25.11.2021 and the up-gradation of remaining APCDs will be completed by</td></tr>
</table>

		September, 2022. A copy of the orders placed by the industry is annexed as **Annexure-XIII.** However, as per the monitoring carried out by the Board from time to time, the average value of SPM of the samples collected from the stack of boiler furnaces for the period of 2019-21 varies from 91.2 mg/Nm^3 to 111 mg/Nm^3. Also, as per the stack emission monitoring carried out by the CPPRI on 26.02.2021, 13.03.2021 and 08.04.2021, the average value of SPM of sample collected from stack of CRP-I, CRP-II and boiler of capacity 130 TPH was found to be 87 mg/Nm^3, 75 mg/Nm^3 and 116 mg/Nm^3, respectively. In this regard, the SPCB has served a notice upon the industry on 24.09.2021 & the industry has submitted the reply to the notice on 19.10.2021 and same is under consideration of the Board.
7.	The industry (M/s Trident Ltd) will conduct detailed study for monitoring of the ground water quality across the Dhanaula drain in order to evaluate the impact of its treated water discharged onto drain and submit the report by 30th April, 2020.	M/s Trident Ltd has already the got monitoring of ground water carried out cross the Dhanaula drain from M/s Cholamandalam MS Risk Services Ltd., Chennai. A copy of report is annexed as **Annexure-XIV.** Based on samples collected by the agency, following conclusions were made. • pH in the groundwater samples collected was reported in the range

		of 7.1 to 8.0 which is within the acceptable range as per drinking water standards published by IS 10500:2012. Whereas the pH in soil was found to be more alkaline in the entire region. • TDS in the samples collected from the existing bore wells were recorded to be in the range of 524 to 1276 mg/l. The TDS levels in groundwater from the samples collected is a regional phenomenon and is in line with the published regional level data. The groundwater's Salinity as NaCl is in-line with TDS which contributes to 50% to 60%. Similarly, the electrical conductivity in the soil is also high and depicting regional scenario which reflects the equivalent salinity as NaCl in soil. • Total hardness in the samples collected from the existing borewells was recorded to be in the range of 140 to 595 mg/l. • Minor traces of nutrients and Heavy metal were found in the groundwater and soil samples collected but the impact is totally insignificant. It is also mentioned here that ground water monitoring had also been carried out by CPPRI Saharanpur, Punjab Bio

		Technology Incubator, Mohali and by Joint Committee during earlier visit on 23.02.2020. The results of ground water samples carried out by above institutes have been compared and annexed as **Annexure–XV**. CPPRI, Saharanpur in its Environment Audit report has concluded that ground water quality at the selected locations is also satisfactory in context of the specified norms indicating that no adverse impact of mill ground water quality.
8.	The concept of 'Zero Liquid Discharge' be considered as minimal discharge of effluent particularly from the industrial sectors reported upon. According to mechanics of fluids (more precisely thermodynamics) that a continuous operation bound to generate 'rejects', and/or 'blowdown' and /or 'bleed', due to process entropy, despite of whatever technology adopted. Punjab Pollution Control Board, therefore, has to examine what minimum disposal of effluent be permitted to M/s Trident Ltd. considering the production technology, scale of operation and utilization capacity.	**M/s Trident Ltd. (HTD)** Average production for the last five years of the industry is to the tune of 77.3 TPD against the consented quantity of 120 TPD. The industry is discharging its treated trade effluent @ 2313 KLD into Dhanaula drain against a permitted quantity of 6702 KLD by the Board. The industry has developed additional land of 32.0 acres and assured that it will stop discharging effluent of HTD unit into Dhanaula drain by December,2021. **M/s Trident Ltd. (PCD)** The Industry had been granted permission by the Board to discharge 8700 KLD of treated trade effluent onto drain and 12800 KLD onto land for plantation. At present, the average

		value of treated water, being discharged into drain is 6214 KLD i.e. about 28.5% less than the permission granted by the Board. The industry has already reduced the consumption of fresh water from 59.95 m^3 / ton of paper in year 2013 to 46 m^3 / ton of paper in year 2020 against norm of 50 m^3/Ton as stipulated under charter for water re-cycling and pollution prevention i.e. there is a reduction of about 22 %. In order to give its treated water to farmers, the industry has on 16.08.2021 got the permission from the Drainage Department for laying of pipe network across the drain. The industry has also submitted an Action Plan for utilization of entire treated trade effluent onto land for irrigation / plantation by June 2022 by the farmers / industry.

The industry namely M/s Trident Ltd. (PCD) had been issued notice for the violations of the provisions of the Water (Prevention & Control of Pollution) Act, 1974 & the Air (Prevention & Control of Pollution) Act, 1981 vide Board's letter no. 3294 dated 24.09.2021 with an opportunity of to file its reply within 15 days from the date of issuance of this notice. The industry namely M/s Trident Ltd. (HTD) had also been issued notice for the violations of the provisions of the Water (Prevention & Control of Pollution) Act, 1974 vide Punjab Pollution Control Board letter no. 3296 dated 24.09.2021 with an opportunity of to file its reply within 15 days from the date of issuance of this notice. The industry has submitted reply of above mentioned notices to the State Pollution Control Board which is reported to be under consideration of the Board.

From the above mentioned status report on recommendations of Joint Committee, it is evident that the industry is compliant with most of the recommendations / submitted action plan alongwith timelines. However, the industry is not complying with recommendation no. 2 & 6 of Joint Committee. Also, State Pollution Control Board should file its action taken report to the Hon'ble NGT separately in compliance of directions issued vide orders dated 29.07.2021.

Rajeev Gupta	**Gurnam Singh**	**Rajeev Sharma**	**Kumar Saurabh Raj, IAS**
Environmental Engineer,	**Regional Director,**	**Sr Environmental Engineer,**	**Dy. Commissioner,**
PPCB, RO, Sangrur	**CPCB, Chandigarh**	**PPCB, Patiala**	**Barnala**

Annexure-1

Inspection Report of Trident Complex of M/s Trident Limited, Mansa Road, Village-Dhaula, District Barnala, Punjab in pursuant to Hon'ble NGT Order in the matter of O.A. No. 682 of 2019 (Beant Singh Bajwa, President, National Anti-Corruption Council vs State of Punjab & Ors)

BACKGROUND

The Hon'ble National Green Tribunal, vide its order, dated 04.12.2019 directed as follows:

> ***"A report has been furnished by the State PCB finding certain deficiencies and also finding unit compliant in certain respects. There is, however, nothing mentioned about extraction of ground water. We are of the view that a fresh independent and comprehensive inspection is necessary to ascertain the factual situation as the report furnished is not adequate in all the relevant facts which needs to be studied.***
> ***Accordingly, we direct fresh inspection by joint Committee of CPCB, State PCB and District Magistrate, Barnala. The State PCB will be the nodal agency for coordination and compliance.***
> ***The report may be furnished by 31.01.2020 by e-mail at judicial.ngt@gov.in***
> ***A copy of this order be sent to CPCB, State PCB and District Magistrate, Barnala by e-mail for compliance.***
> ***List again on 03.03.2020."***

In pursuant to above, a Committee comprising following members is constituted:

1. Shri T. P. S. Phoolka, IAS, Dy. Commissioner, Barnala
2. Shri Rajeev Sharma, Sr. Environmental Engineer, Punjab Pollution Control Board, Patiala
3. Shri Suneel Dave, Additional Director, Central Pollution Control Board, Delhi

The Committee has undertaken inspection and monitoring of the complex during 21-23 February, 2020 alongwith other officers listed hereunder:

On behalf of District Magistrate, Barnala

i) Sh. Gagandeep Singh, District Revenue Officer, Barnala
ii) Sh. Harbans Singh, Tehsildar, Barnala

On behalf of Punjab Pollution Control Board (PPCB)

i) Er. Harjeet Singh, Environmental Engineer, PPCB, Sangrur
ii) Er. Ramandeep Singh Sidhu, Asst. Environmental Engineer, PPCB, Sangrur.
iii) Sh. Janak Raj, Asst. Scientific Officer, PPCB, Patiala
iv) Sh. Shankarjeet Singh, Jr. Scientific Officer, PPCB Patiala
v) Sh. Dalvir Singh, Jr. Scientific Officer, Patiala

GENERAL

01. The Trident Complex at Mansa Road, Village-Dhaula, District Barnala, Punjab is housing industrial units of M/s Trident Ltd. as per the details hereunder:

Sr. No.	Name of Unit	Division	Product	Category
1	Trident Ltd.	Paper & Chemical Division	Writing and Printing Paper	Paper
2	Trident Ltd.	Home Textile Division	Terry Towel	Textile
3	Lotus Processor Pvt. Ltd.	-	Dyed Fabric	Dyeing
4	Lotus Texpark Ltd	-	Dyed Fabric	Dyeing
5	Lotus Integrated Texpark Ltd.	Weaving Unit	Terry Towel	Weaving
6	Satyam Home Furnishing Pvt. Ltd.	-	Packing Material Packaging	General
7	Lotus Integrated Texpark Ltd.	Melange Unit	Yarn (Cotton and Blended)	Textile
8	Creative Line Cotspin Pvt. Ltd.	Garment Unit	Terry Towels and Bath Robs	Textile
9	Trident Ltd.		Sulphuric Acid	Chemical

02. Out of above said 9 industrial units operating in Trident Complex, the units at Sr. No. 5, 6, 7 and 8 are considered to be dry units and generate no trade effluent or process emissions, and whereas unit at Sr. No. 9 generates process emission which are being scrubbed. The units at Sr. no. 3 and 4 are engaged in Fibre and Fabric dyeing and therefore generate effluents that are sent to effluent treatment plant of units at Sr. No. 2, namely M/s Trident Ltd. (HTD), whereas the steam requirement for these two dyeing units is met from the boilers attached with unit at Sr. no. 1, namely M/s Trident Ltd. (PCD).

03. Thus, units at Sr. No. 1 and 2, are major industrial units engaged in production of (i) Paper & Chemicals, and (ii) Home Textile Products. These two industrial units in the complex are responsible for major chunk of effluents and emissions generation. This report, therefore remains focussed on operation and performance of effluent treatment plant and emission control system installed by these two units to articulate factual status on what (effluent, emission, hazardous wastes and solid wastes) is discharged / disposed of by the said industrial unit.

04. All industrial units of the complex are having consent to operate under The Water Act, 1974 and The Air Act, 1981 and have interlinkages of sharing the utilities such as power generation, steam utilization, raw water consumption and effluent/waste treatment & disposal mentioned in the documents issued by central / state authority.

05. The Paper & Chemicals Division (PCD) of M/s Trident Ltd. is consented to produce Writing & Printing Paper @ 415 Tonnes Per Day using wheat straw and hard wood and additional 35 TPD using Bleached Pulp. Whereas, Home Textile Division (HTD) of M/s Trident Ltd. is consented to produce Terry Towels @ 100 TPD, Dyed Yarn @ 20 TPD by using Cotton Yarn and Processed Chemicals. The consents to operate issued by Punjab Pollution Control Board are valid upto 31/03/2020 (Annexure I & II) in case of Paper & Chemical Division and upto 31/03/2020 (Annexure III & IV) in case of Home Textile Division under The Water Act, 1974 and The Air Act, 1981 respectively.

06. The raw water requirement of industrial complex is met from Irrigation Canal 25,000 kilo litre per day (kld) and Ground water 13,260 kld. Central Ground Water Authority, vide letter, dated 12/07/2018 has renewed no objection certificate (valid up to 05/07/2023) to the effect of allowing the withdrawal of 6,168 kld ground water through 7 (seven) tube wells; provided that M/s Trident Ltd. (PCD) shall continue to implement ground water recharge measures for augmenting the ground water resources of area (Annexure-V). The ground water is abstracted only during the shut period of canal water.

Further, Central Ground Water Authority, vide letter, dated 12/07/2018 has renewed no objection certificate (valid up to 05/07/2023) to the effect of allowing the withdrawal of 7,092 kld ground water through 5 (five) tube wells; provided that M/s Trident Ltd. (HTD) shall continue to implement ground water recharge measures for augmenting the ground water resources of area (Annexure-VI).

07. The permission has also been accorded, vide letter, dated 03.02.2003 to Trident Complex by Irrigation Works, Punjab to discharge its treated effluent from Paper & Chemical Division and Terry Towels Division into Dhanaula Drain subject to meeting the prescribed norms/standards (Annexure-VII).

08. In accordance to the original consent, dated 23/07/2012 under The Water Act, 1974 issued by PPCB, M/s Trident Ltd. (PCD) [the industry] was to discharge treated trade effluents to tune of 8,700 kld into the drain (Dhanaula) and 12,800 kld on land for plantation and the effluents discharged through the outlet shall conform to the standards notified. While discharging effluent into drain, the industry shall ensue that no water pollution problem is created in the area. Further, the industry shall plant (minimum three) suitable varieties of trees of the density required for plantation purposes to utilize 12,800 kld effluent on land of 160 acres inside the industrial premises.

09. Whereas the original consent (date of issue 23/07/2010, date of expiry 27/01/2011) under The Water Act, 1974 issued by PPCB, M/s Trident Ltd. (HTD) was permitted to discharge treated trade effluent to tune of 6,702 KLD into drain (Dhanaula) and 3,000 kld on land for plantation. This consent was later renewed (date of issue 10/02/2012 and date of expiry 17/04/2013).

10. Considering the above, the industry i.e. M/s Trident Ltd. (HTD) was asked through revalidated, consent dated 30/05/2013 issued by PPCB and was directed to commission Reverse Osmosis System and Multiple Effect Evaporators as mandated. The industry had installed Reverse Osmosis System of capacity 2500 KLD alongwith MEE in year 2014 with an investment of Rs. 33 crores. However, because of technological limitations the performance of Reverse Osmosis System got reduced year by year. Therefore, the industry had discarded Reverse Osmosis System.

11 M/s Trident Ltd. (PCD) is having consent (date of issue 23/07/2012 date of expiry 22/01/2013) issued by PPCB under The Air Act, 1981. Wherein 07 (seven sources of emissions identified as hereunder:

i) Boiler (FBC) of capacity – 12 tph
ii) Boiler (FBC) of capacity 50 tph
iii) Co-generation boiler (FBC) of capacity – 130 tph
iv) Co-generation boiler (FBC) of capacity – 130 tph
v) Recovery boiler of capacity – 20 tph
vi) Recovery boiler of capacity – 50 tph
vii) Lime kiln of capacity – 200 tpd

This consent has been revalidated through the orders and extended upto 31/03/2020 vide order, dated 20/01/2016. It has been asked to ensure that no air pollution problem is created due to discharge of emission from the industry. Further, adequacy and efficacy of Air Pollution Control Devices shall be such that emissions discharged from the industry conform the norms/ standards notified.

12. Whereas, M/s Trident Ltd (HTD) has been consented under Air (Prevention & Control of Pollution) Act, 1981 vide order (date of issue 23.07.2010 date of expiry 22.01.2011) and revalidated / extended vide orders dated 15/03/2013 and 27/04/2016 with no specific sources of emission.

OBSERVATIONS:-

01. M/s Trident Ltd. (PCD) has provided effluent treatment plant based on aerobic treatment technology for low COD concentration which comprises unit operation of primary clarification, aeration, secondary clarification and collection before the treated effluent is disposed into drain or on land, whereas high COD concentration effluent is sent to anaerobic treatment comprises unit operation of bio-clarifier and sludge blanket reactor before getting mixed with low COD concentration stream to reduce ETP load.

02. The effluent samples collected from inlet and outlet of ETP (PCD) leading to disposal on land and into drain, conform the standards notified. Sodium Absorption Ratio (SAR) and Absorbable Organic Halides (AOx) also found to be at desirable level in the discharge.

Table: 1

Analysis Results of Samples from ETP (PCD)

Sr. No	Parameters	Inlet to ETP (Paper Machine-1)	Inlet to ETP (Paper Machine-2 + washings)	Pipe Leading to Plantation	Channel Leading to Drain	Outfall into Drain
1	pH	11.5	6.4	7.9	7.84	7.85
2	Total Suspended Solids (mg/l)	2610	514	34	34	37
3	Total Dissolved Solids (mg/l)	1178	2305	2017	2029	2080
4	Chemical Oxygen Demand (mg/l)	2060	1310	244	248	276
5	Bio-chemical Oxygen Demand (mg/l)	630	410	26	26	28
6	Sodium Absorption Ratio			6.32	6.56	6.08
7	AOx (kg / tonne of paper produced)			0.1339	0.0897	0.0886

03. M/s Trident Ltd. (HTD) has installed effluent treatment plant for its dyeing waste water containing screen, biological reactors based on activated sludge process, secondary clarifier and filtration system. As directed by PPCB, the industry had installed Reverse Osmosis System of capacity 2500 KLD alongwith MEE in year 2014 with an investment of Rs. 33 crores. However, because of technological limitations the performance of Reverse Osmosis System got reduced year by year. Therefore, the industry had discarded Reverse Osmosis System. Currently, as directed by PPCB the industry has submitted International supply agreement, PERT Chart for completion of project by 30th June, 2020, dispatch document of equipment from Italy, proof of payment made for installation of Reverse Osmosis System with latest MBR technology.

04. The analysis results, of effluent samples from inlet and outlet of ETP (HTD) leading to disposal into drain, indicate conformity with standards notified.

Table: 2

Analysis Results of Samples from ETP (HTD)

Sr. No.	Parameters	Inlet to ETP	Outlet from ETP	Outfall into Drain
1	pH	10.1	8.13	8.08
2	Total Suspended Solid (mg/l)	240	19	22
3	Total Dissolved Solid (mg/l)	4410	1663	1660
4	Chemical Oxygen Demand (mg/l)	1312	60	66
5	Bio Chemical Oxygen Demand (mg/l)	325	10	11
6	Ammonical Nitrogen (mg/l)	BDL	0.63	0.49
7	Phenolic Compound (mg/l)	BDL	BDL	BDL
8	Total Chromium (mg/l)	BDL	BDL	BDL
9	Sulphide (mg/l)	1.6	1.0	1.0

Table: 3

Analysis Results of Samples for Drain Water Quality Monitoring

Sr. no.	Parameters	Upstream (approx. 100 m from discharge point of M/s Trident Ltd.) of Dhanula Drain	From outfall into drain (PCD)	From outfall into drain (HTD)	D0wnstream (approx. 100 m from the discharge point of M/s Trident Ltd,) of Dhanula drain
1	pH	7.5	7.85	8.08	7.7
2	Total Suspended Solids (mg/l)	171	37	22	34
3	Total Dissolved Solids (mg/l)	875	2080	1660	1640
4	Chemical Oxygen Demand (mg/l)	160	276	66	140
5	Bio-chemical Oxygen Demand (mg/l)	33	28	11	24
6	Sulphide (mg/l)	1.2	-	1.0	1.0
7	Ammonical Nitrogen as N (mg/l)	1.4	-	0.49	0.6
8	Total Chrome (mg/l)	0.12	-	BDL	BDL
9	Oil & Grease (mg/l)	BDL	-	BDL	BDL
10	Phenolic Compound (mg/l)	BDL	-	BDL	BDL
11	Sodium Absorption Ratio	2.63	6.08	15.67	8.18
12	Residual Sodium Carbonate (meq/l)	5.9	-	-	0.5

Table: 4

Analysis Results of Samples for Ground Water Quality Monitoring

Sr. No.	Parameter	New Sidhu BKO Fathegarh Channa	Trident Complex, Dhaula (Tubewell No. 1)	Gobind Haveli, Mansa Road, Dhaula
1	pH	7.8	7.9	7.4
2	Chemical Oxygen Demand (mg/l)	BDL	BDL	BDL
3	Bio-chemical Oxygen Demand (mg/l)	BDL	BDL	BDL
4	Total Suspended Solids (mg/l)	BDL	BDL	BDL
5	Total Dissolved Solids (mg/l)	596	891	998
6	Chloride (mg/l)	106	178	114
7	Sulphate (mg/l)	58	160	168
8	Sulphide (mg/l)	BDL	BDL	BDL
9	Ammonical Nitrogen (mg/l)	BDL	BDL	BDL
10	Total Hardness (mg/l)	280	285	354
11	Sodium Absorption Ratio	4.68	5.83	5.55

05. The TDS level in ground water from the sample collected is a regional phenomenon and is in line with published regional data. All other parameters such as pH, COD, BOD, TSS are within permissible norms.

06. M/s Trident Ltd. has 160 acres' land for plantation where PCD effluent is disposed and an additional 48.5 acres' land for plantation where HTD effluent is disposed. The data from Online Continuous Effluent Monitoring System (OCEMS) installed at the outlets of ETP(s) indicate that pH, TSS, COD and BOD are in conformity with the standards notified. Sodium Absorption Ratio (SAR) and Absorbable Organic Halides (AOx) is being monitored on periodic basis by manual testing. The OCEMS data available on servers of PPCB / CPCB which indicate discharge from M/s Trident Ltd. (PCD) are remained in compliance with the standards notified for that parameters which could be monitored through OCEMS.

RECOMMENDATIONS:-

1. An in depth study for Environmental Audit may be undertaken particularly in respect for Captive Power Plant, Paper & Towel Division to assess the status for compliance of environment norms/ standards. The finding(s) and recommendation(s) of study may be incorporated in the consents issued by PPCB for effectively compliance. This study on Environment Audit be undertaken in consultation with CPCB either by PPCB or through an institute/ consultant having technical expertise in the relevant field.

2. M/s Trident Ltd shall submit a detailed action plan for compliance of condition stipulated by PPCB through its consent orders, dated 10/02/2012 and 30/05/2013, wherein the industry was to install Reverse Osmosis System followed by Multiple Effect Evaporator in its H.T.D. This should be accomplished before 30th June 2020; as mandated by PPCB. The industry shall also submit time bound action plan by 15th March, 2020 for installation of Agitated Thin Film Dryer (ATFD) for the effective handling of MEE reject.

   M/s Trident Ltd (PCD) shall also gradually reduce water consumption and thus effluent generation. The entire treated effluent to be properly utilize on land for plantation / irrigation purpose. The industry should adopt scientific method for utilization of its treated water onto land plantation within its premises to maximize the utilization of treated water within the complex. An action plan in this regard shall also be submitted by M/s Trident Ltd. to PPCB on or before June 2020 detailing pipe network, land use, watering depth and type / age of plants etc. Having implemented the above, further two years from now i.e. by June 2022. M/s Trident Ltd. shall gets its treated water utilized to nearby farmers for irrigations purpose.

3. M/s Trident Ltd shall undertake a performance study of ETPs provided for its PCD. The industry shall undertake necessary project on its raw material washing stream which nearly contributes to 30% of the total ETP Load. The industry shall also submit a time bound action plan to PPCB on or before 15th March 2020 for removal of non-biodegradable COD. The industry will also submit time bound action plan by 30th April, 2020 for removing of colour from its treated effluent going into the drain.

4. The trend analysis of historically data, recorded from OCEMS exhibits that the discharge from M/s Trident Ltd. remains within compliance zone. If such is the case then let M/s Trident Ltd. shall make all efforts to reuse treated effluent back to production process, resulting in conservation of water owing to less withdrawal of ground water or canal water. Besides, the reuse of treated effluent into the production process will affect efficiency of ETP as the treatment system would receive high concentration of BOD and COD. An action plan in order to reuse its treated water not impacting the TDS of the final treated effluent to be shared with PPCB, by 30th June, 2020.

5. The industry has provided pipe network for distribution of treated trade effluent on the plantation area, however, it was observed that certain patches of plantation was flooded with water and some patches were found completely dry because, the industry is uniformly distributing treated trade effluent to all cells of plantation area irrespective of the age of plants in that cell. The industry, therefore, is required to provide proper irrigation network for optimum utilization of treated waste water. The industry shall also provide electromagnetic flow meter at the outlet of each cell of plantation making more effective utilization of treated effluent.

6. The industry is not achieving the emission standards of 75 mg/Nm^3 from the stack of Chemical Recovery Plant (II) and Energy Section. However, the industry was given opportunity of personal hearing before Hon'ble Chairman of PPCB on 07.01.2020, wherein one of the decision of that the industry shall submit the detailed proposal w.r.t. upgradation of its existing APCDs to achieve the stack emission standard of 75 mg/Nm^3 within 03 months alongwith PERT chart for installation and commissioning of the same.

Table: 5

Analysis Results of Stack Emissions of PCD

Sr. No.	Sample Identification	Parameters	Results (mg/Nm^3)	Prescribed norms as per EC
1	Stack of CRP-II after APCD	Particulate Matter	80	75
2	Stack of CRP-I after APCD	Particulate Matter	82	150
3	Stack of Energy Section APCD	Particulate Matter	98	75

7. The industry (M/s Trident Ltd) will conduct detailed study for monitoring the ground water quality across the Dhanaula Drain in order to evaluate the impact of its treated water discharge unto Drain and submit the report by 30th April, 2020.

8. The concept of `Zero Liquid Discharged` be considered as minimal discharge of effluent, particularly from the industrial sectors reported upon. According to mechanics of fluids (more precisely thermodynamics) that a continuous operation bound to generate `rejects`, and / or `blowdown` and / or `bleed` due to process entropy, despite of whatever technology adopted. Punjab Pollution Control Board, therefore, has to examine what minimal disposal of effluent be permitted to M/s Trident Ltd. considering the production technology, scale of operation and utilization capacity.

(Suneel Dave)
Additional. Director
CPCB Delhi

(Rajeev Sharma)
Sr. Environmental Engineer
PPCB, Patiala

(T.P.S. Phoolka, IAS)
Dy. Commissioner
Barnala

Annexure-II

ਪੰਜਾਬ ਪ੍ਰਦੂਸ਼ਣ ਕੰਟਰੋਲ ਬੋਰਡ
PUNJAB POLLUTION CONTROL BOARD

No. 4231 Dated. 29-12-2020

To

The Director,
Central Pulp & Paper Research Institute (CPPRI)
Post Box no. 174, Paper Mill Road,
Himmat Nagar, Saharnpur- 247001.

Subject: Environment Audit of M/s Trident Ltd., (Paper & Chemicals Division) vill. Dhaula, Tehsil & Distt Barnala.

This is in the reference to the proposal submitted by the institute on the subject cited matter.

The proposal regarding environment audit of M/s Trident Ltd., (Paper & Chemicals Division) has been accepted in principle by the Central Pollution Control Board, New Delhi. You are hereby, awarded the assignment/work to conduct the environment audit of M/s Trident Ltd (Paper & Chemicals Division).

Scope of the work of the assignment shall be as agreed upon and submitted in your proposal which is reproduced as under:

1. Study of Environmental Management system and Assessment of Status of compliance of Environmental Norms /Standards by the industry.
2. Monitoring/sampling of wastewater, ground water stack emission and ambient air quality (Note: CPPRI does not have facility for soil sampling and analysis)
3. Material Balance, water balance, Production process involved in Generation of waste water, emission, Hazardous wastes, Conservation Measures, Technologies Adopted etc.
4. Study shall also cover the observations and recommendations made in the joint visit report filed before Hon'ble NGT which has already been conveyed to the institute by the Board.

ਵਾਤਾਵਰਣ ਭਵਨ, ਨਾਭਾ ਰੋਡ, ਪਟਿਆਲਾ - 147001
Vatavaran Bhawan, Nabha Road, Patiala - 147001
Phone : Chairman. : 0175-2215793, Member Secretary : 0175-2215802 (O), 2215636 (FAX)
Website : www.ppcb.gov.in | E-Mail : chairmanppcb@yahoo.in | mspcb@gmail.com

Particulars of job work

1. Performance Evaluation of ETP at M/S Trident Limited (Paper and Chemical Div.) (One 24 hrs. composite sampling at ETP Inlet & Outlet, Pipe leading to Plantation & Channel leading to drain and Outfall into Drain) Parameters to be analyzed pH, TSS, TDS, COD, BOD, Color, SAR, AOX(in Effluent MLSS and MLVSS (in anaerobic sludge)
2. Performance Evaluation of Anaerobic Treatment System (One 24 hrs. composite sampling at bioreactor Inlet & Outlet) Parameters to be analyzed pH, BOD (in Effluent) and VSS, Organic/ Inorganic (in anaerobic sludge)
3. Upstream & Down Stream Sample Collection and analysis of following parameters BOD, Color, SAR & AOX
4. Ground Water collection from following location :
   - New Sidhu Fathegarh Chanan, Trident Complex Dhaula (Tube well 1) Gobind Haveli , Mansa Road , Dhaula and analysis of following parameters
   - pH, TSS TDS, COD, BOD, Chlori, Sulphate, Sulphide, Ammonical nitrogen, Total hardness and SAR
5. Stack Monitoring at Outlet of Pollution Control Devices of
   Boiler FBC capacity) 12 TPH, Boiler FBC 50 TPH, Cogeneration Boiler (FBC) 130 TPH, Cogeneration Boiler (FBC) 130 TPH, Recovery Boiler 20 TPH, Recovery Boiler 50 TPH, Lime Kiln 50 TPH
6. Ambient Air Monitoring at 3 points (to be decided in consultation with Punjab Pollution Control Board)
7. Water Audit & Material Balance

Duration & Time line:

- Total Duration of the Job Work: 2 months.
- No of Visits: 3 (1 preliminary + 2 detailed visits)

1. Preliminary Visit for, inspection of points for stack monitoring, ETP and ground water collection, discussion etc. (2 days at mill site days of travel: Total Days=4)
2. Detailed Visit (2) for I week duration (excluding days of travel: Total days 7) for ETP Performance Evaluation etc. and Air Pollution Monitoring.

Budgetary details & conditions of payment:

- Consultancy charges for Environmental Audit as per scope of including Boarding & lodging and travelling charges Rs. 10,00,000/-
- Add CST @ 18.0 % Rs. 1,80,000/-
- Net Charges Rs. 11,80,000/-Eleven lacs & eighty thousands only)
- Mode of payment through RTGS/DD drawn in favor of CPPRI, Saharanpur

Representative of PPCB:

Environmental Engineer, Regional Office, Sangrur will be representing Punjab Pollution Control Board during the study period.

Note:

Please refer general terms and conditions attached with this order as Annexure-I.

Member Secretary

Endst No. 4232 **Dated** 29-12-2020

A copy of the above is forwarded to the Member Secretary, Central Pollution Control Board, Parivesh Bhawan, East Arjun Nagar, Delhi- 110032 for information with reference to CPCB email dated 04.12.2020.

Member Secretary

Endst No. 4233 **Dated** 29-12-2020

A copy of the above is forwarded to the Environmental Engineer, Punjab Pollution Control Board, Regional Office, Sangrur for coordinating with institute as well industry and ensuring compliance.

Member Secretary

Endst No. 4234 **Dated** 29-12-2020

A copy of the above is forwarded to M/s Trident Ltd., (Paper & Chemicals Division) vill. Dhaula, Tehsil & Distt Barnala for immediate necessary compliance.

Member Secretary

General Terms & conditions **(Annexure-I)**

1. The entire cost shall be borne by the industry namely M/s Trident ltd. (Paper & Chemicals Division) vill. Dhaula, Tehsil & Distt Barnala.
2. The following necessary supporting facilities and services will also be provided by the industry namely M/s Trident Ltd., (Paper & Chemicals Division) vill. Dhaula, Tehsil & Distt. Barnala at the time of sampling and field visits:
   a) Local conveyance and transportation.
   b) Labor and man power support including maintenance, electrical & other logistics.
   c) Boarding and lodging at the site.
3. The industry M/s Trident Ltd., (Paper & Chemicals Division) vill. Dhaula, Tehsil & Distt Barnala shall appoint a coordinator for facilitating the data, information collection, process details & facts related to the study to be undertaking.
4. Any additional study or sampling as per site conditions/ requirements shall be carried out in consultation with PPCB & CPCB with additional cost to be agreed upon between the two parties.
5. Reports immediately after each visit made by the team shall be submitted to PPCB & CPCB for reviewing the task assigned. The reports shall be submitted to ensure satisfactory & timely completion of the work awarded and also to ensure that task assigned are in progress and in the right direction to achieve the objectives derived from the NGT order.
6. Safety: It shall be the responsibility of the personnel deployed to take all adequate safety measures and to use personal protective equipment's. Safety compliances shall be strictly followed as per safety norms.
7. Dispute resolution: In the event of any dispute, this order is subject to the jurisdiction of Patiala courts only. The decision of Chairman of Punjab Pollution Control Board will be final and binding on you for any contractual dispute.

8. Punjab Pollution Control Board reserves the right to terminate the agreement and get the works executed through some other agency at your risk & cost, if institute fails to execute the assigned works within stipulate timelines and to satisfaction of the Board.

Order Acceptance: Kindly acknowledge receipt of this order and confirm your acceptance of the same by signing and returning one copy to Punjab Pollution Control Board, Vatavara Bhawan, Nabha Road, Patiala.

Annexure - II

ਪੰਜਾਬ ਪ੍ਰਦੂਸ਼ਣ ਕੰਟਰੋਲ ਬੋਰਡ
PUNJAB POLLUTION CONTROL BOARD

No. 4235 Dated. 29-12-2020

To

The Director,
Dr. B.R Ambedkar National Institute of Technology,
G.T Road, Bye-pass,
Jalandhar.

Subject: Environment Audit of M/s Trident Ltd., (Towel Division) vill. Dhaula, Tehsil & Distt Barnala.

This is in the reference to the proposal submitted by the institute on the subject cited matter.

The proposal regarding environment audit of M/s Trident Ltd., (Towel Division) has been accepted in principle by the Central Pollution Control Board, New Delhi.

You are hereby, awarded the assignment/work to conduct the environment audit of M/s Trident Ltd (Towel Division).

Scope of the work of the assignment shall be as agreed upon and submitted in your proposal which is reproduced as under:

1. Review of compliance status with regards to Environment Clearance as well as Consent to operate granted to the industry.
2. Review of Form V environmental audit statement for the last year.
3. Audit of the current EMS and regulatory compliance mechanism.
4. Sampling and monitoring of the influent and effluent parameters viz pH, TSS, TDS, COD, BOD, Metals, Sulphide, Phenolic compound, Color, Turbidity etc. as per requirement.
5. Analyses and interpretation of the testing results by the Audit team.
6. Evaluation of the adequacy and performance of ETP.
7. Performance evaluation of the major operations of the ETP.
8. Evaluation of the manufacturing process in respect to effluent generation.
9. Evaluation of wastewater and effluent disposal practices.
10. Material balance, water balance, conservation measures & technologies adopted etc.

ਵਾਤਾਵਰਣ ਭਵਨ, ਨਾਭਾ ਰੋਡ, ਪਟਿਆਲਾ – 147001
Vatavaran Bhawan, Nabha Road, Patiala - 147001
Phone : Chairman. : 0175-2215793, Member Secretary : 0175-2215802 (O), 2215636 (FAX)
Website : www.ppcb.gov.in | E-Mail : chairmanppcb@yahoo.in | msppcb@gmail.com |

11. Study shall also cover the observations and recommendations made in the joint visit report filed before Hon'ble NGT already conveyed to the institute by the Board.
12. Submission of the report of observations and recommendations of the environmental audit.

Duration & Time line:

The final report shall be submitted by the institute within two months from the award of the work.

Cost and Terms & Conditions of payment:

1. Consolidated amount of Rs. 6.15 lakh + 18% GST as applicable (Rupees Six Lakh Fifteen Thousand only plus GST as applicable) = Rs. 7,25,700/- (Rupees Seven Lakhs Twenty-Five Thousand and Seven Hundred Only)
2. 40 % of the total payment advance and 30 % of the total payment after completion of field assignment & sampling and balance 30 % upon submission of final report.

Representative of PPCB:

Environmental Engineer, Regional Office, Sangrur will be representing Punjab Pollution Control Board during the study period.

Note:

Please refer general terms and conditions attached with this order as Annexure-I.

Member Secretary

Endst No. 4236 **Dated** 29-12-2020

A copy of the above is forwarded to the Member Secretary, Central Pollution Control Board, Parivesh Bhawan, East Arjun Nagar, Delhi- 110032 for information with reference to CPCB email dated 04.12.2020.

Member Secretary

Endst No. 4237 **Dated** 29-12-2020

A copy of the above is forwarded to the Environmental Engineer, Punjab Pollution Control Board, Regional Office, Sangrur for coordinating with institute as well industry and ensuring compliance.

Member Secretary

Endst No. 4230 **Dated** 29-12-2020

A copy of the above is forwarded to M/s Trident Ltd., (Towel Division) vill. Dhaula, Tehsil & Distt Barnala for immediate necessary compliance.

Member Secretary
29.12.2020

General Terms & conditions **(Annexure-I)**

1. The entire cost shall be borne by the industry namely M/s Trident ltd. (Towel Division) vill. Dhaula, Tehsil & Distt Barnala.
2. The following necessary supporting facilities and services will also be provided by the industry namely M/s Trident Ltd., (Towel Division) vill. Dhaula, Tehsil & Distt Barnala at the time of sampling and field visits:
   a) Local conveyance and transportation.
   b) Labor and man power support including maintenance, electrical & other logistics.
   c) Boarding and lodging at the site.
3. The industry M/s Trident Ltd., (Towel Division) vill. Dhaula, Tehsil & Distt Barnala shall appoint a coordinator for facilitating the data, information collection, process details & facts related to the study to be undertaking.
4. Any additional study or sampling as per site conditions/ requirements shall be carried out in consultation with PPCB & CPCB at an additional cost to be agreed upon between the two parties.
5. Reports immediately after each visit made by the team shall be submitted to PPCB & CPCB for reviewing the task assigned. The reports shall be submitted to ensure satisfactory & timely completion of the work awarded and also to ensure that task assigned are in progress and in the right direction to achieve the objectives derived from the NGT order.
6. Safety: It shall be the responsibility of the personnel deployed to take all adequate safety measures and to use personal protective equipment's. Safety compliances shall be strictly followed as per safety norms.
7. Dispute resolution: In the event of any dispute, this order is subject to the jurisdiction of Patiala courts only. The decision of Chairman of Punjab Pollution Control Board will be final and binding on you for any contractual dispute.

8. Punjab Pollution Control Board reserves the right to terminate the agreement and get the works executed through some other agency at your risk & cost, if institute fails to execute the assigned works within stipulate timelines and to satisfaction of the Board.

Order Acceptance: Kindly acknowledge receipt of this order and confirm your acceptance of the same by signing and returning one copy to Punjab Pollution Control Board, Vatavara Bhawan, Nabha Road, Patiala.

TRIDENT/2021/08
20.10.2021

To,

The Joint Committee,

Subject: Compliance documents for the recommendations of the joint committee reference their visit at M/s Trident limited Dated 18 Oct'21.

Respected Sir,

This is in reference to the recommendation by the joint committee to carry out In depth environmental audit for Paper and Towel division to access the status for compliance norms/standards.

The Compliance of the recommendations of the joint committee is attached as below :

Sr No	Recommendations	Compliance status
1	An in-depth study for Environmental Audit may be undertaken particularly in respect for Captive Power Plant, Paper & Towel Division to assess the status for compliance of environment norms/standards. The finding(s) and recommendation (s) of study may be incorporated in the consents issued by PPCB for effective compliance. This study on Environment Audit be undertaken in consultation with CPCB either by PPCB or through an institute/ consultant having technical expertise in the relevant field.	An in-depth study for Environmental Audit has duly been conducted for the Towel Division of the Company by National Institute of Technology, Jalandhar & in respect of Pulp & Paper Division of the Company by Central Pulp & Paper Institute, Saharanpur. The report has since been submitted to the Board, and which fact also finds mentions in the order dated 29.7.2021 passed the Hon'ble NGT, New Delhi. The Industry has already started working on the recommendations of the Audit report and has prepared time bound action

		plan for the same which is attached as **Annexure 1**
2	M/s Trident Limited shall submit a detailed action plan for compliance of condition stipulated by PPCB through its consent orders dated 10.02.2012 and 30.05.2013, wherein the industry was to install Reverse Osmosis System followed by Multiple Effect Evaporator in its H.T.D. This should be accomplished before 30th June 2020; as mandated by PPCB. The industry shall also submit time bound action plan by 15th March 2020 for installation of Agitated Thin Film Dryer (ATFD) for the effective handling of MEE reject.	The industry (HTD) had informed the Board vide Letter No. Trident/2020/24 dated 31.03.2020 that the industry would not be in a position to complete the project to install Reverse Osmosis System followed by Multiple Effect Evaporator in its towel division. within the given timelines due to the lock down and other restraints and restrictions imposed by the Central Government and the State government in order to curtail the spread of COVID-19 and had sought support of the Board to keep the project in abeyance till the situation becomes conducive to the upgradation. Further, the Industry would like to apprise the Board that it has already made a payment of Rs 2.94 crores for obtaining the delivery of the equipment from M/s Hydrotech Engineering s.r.l, for the completion of the Project The industry has already received the partial equipment and the delivery of the balance equipment is pending due to the pandemic scenario. I As communicated & committed for stoppage of 100 % effluent discharge onto drain ,during the personal hearing dated 30 April 2021 and as per proceedings dated 7 May 2021, The industry had already procured additional land to utilize its 100 % treated water onto plantation area at the existing running capacity and will ensure that there may be no discharge of treated water into drain post Dec 2021.

		The order for Piping Distribution network has already been placed and Order Copy of Piping & Accessories is attached as **Annexure 2 .** Action Plan to stop 100 % effluent onto drain for the same is attached as **Annexure 3 .**
	M/s Trident Ltd (PCD) shall also gradually reduce water consumption and thus effluent generation. The entire treated effluent to be properly utilized on land for plantation / irrigation purpose. The industry should adopt scientific method for utilization of its treated water onto land plantation within its premises to maximize the utilization of treated water within the complex.	The industry (PCD) has gradually reduced its water consumption and thus the effluent generation through an improved production system. The Industry has already achieved the water consumption long term objective given by CPCB for Pulp & Paper Industry of 50 m3/T. The Industry is presently running at a water consumption of 46 m3/T by adopting several water conservation measures. Copy of Water Charter Target & List of Measures along with its water consumption figures is attached as **Annexure 4.**
	An action plan in this regard shall also be submitted by M/s Trident Ltd. to PPCB on or before June 2020 detailing pipe network, land use, watering depth and type / age of plants etc.	The industry has adopted scientific methods for utilization of its treated water onto plantation within its premises to maximize the utilization of treated water within the complex. Action Plan detailing pipe network, land use, watering depth and type / age of plants etc is attached as **Annexure 5.**

	Having implemented the above, further two years from now i.e. by June 2022. M/s Trident Ltd. shall get its treated water utilized to nearby farmers for irrigation purpose.	The industry is further adopting scientific methods (Karnal Technology) for utilization of its treated water onto land plantation within its premises to maximize the utilization of treated water within the complex. Action Plan for utilization of all treated water is attached as **Annexure 6.**
3	M/s Trident Ltd shall undertake a performance study of ETPs provided for its PCD.	The industry (PCD) has already undertaken the performance study of its ETP of PCD from Thapar Institute. The report has since been submitted to the Board vide letter no. Trident/PCD/2020/66 dated 08.12.2020 along with the timely action plan for all the proposed recommendations. All the recommendations given in the study conducted by Thapar Institute have been duly completed. Completion Status of all recommendations is attached as **Annexure 7**
	The industry shall undertake necessary project on its raw material washing stream which nearly contributes to 30% of the total ETP Load. The industry shall also submit a time bound action plan to	The industry has completed the project on its raw material washing stream which nearly contributed to 30% of the total ETP Load by adopting the latest DAF and screw press technology with the total

	PPCB on or before 15th March 2020 for removal of non-biodegradable COD. The industry will also submit time bound action plan by 30th April 2020 for removing of color from its treated effluent going into the drain.	investment of nearly INR 10.50 crore. Industry has already commissioned the project for the removal of non-biodegradable COD & same is successfully implemented. Pictures of the project area along with the data is attached as **Annexure 8.** The industry has explored different technologies for the removal of color from its pulp and paper effluent going to drain and has also collaborated with the Department of Energy and Environment at Thapar Institute to conduct a pilot study for the removal of color. MOU Copy for Collaberation of Color Removal Project with Thapar Institute is attached as **Annexure 9.** The institute has undertaken the project for achieving the purpose and will share the report by Dec 2021. Meanwhile an interim report of the study for color removal is attached as **Annexure 10.**
4	The trend analysis of historically data, recorded from OCEMS exhibits that the discharge from M/s Trident Limited remains within compliance zone. If such is the case then M/s Trident Limited shall make all efforts to reuse treated effluent back to production process, resulting in conservation of water owing to less withdrawal of ground water or canal water. Besides, the reuse of treated effluent into the production process will affect efficiency of ETP as the treatment	The industry has achieved water consumption level lesser than 50 m3/T and further working on this. The industry has implemented project for reducing the water consumption which will not impact the TDS. The recovery of energy RO plant has been increased from 76% to 84.5% thereby reducing water consumption to an extent of 300-350 M^3/day. Copy of the Membranes Order is attached as **Annexure 11.**

	system would receive high concentration of BOD and COD. An action plan in order to reuse its treated water not impacting the TDS of the final treated effluent to be shared with PPCB by 30th June 2020.	
5	The industry has provided pipe network for distribution of treated trade effluent on the plantation area; however, it was observed that certain patches of plantation was flooded with water and some patches were found completely dry because the industry is uniformly distributing treated trade effluent to all cells of plantation area irrespective of the age of plants in that cell. The industry, therefore, is required to provide proper irrigation network for optimum utilization of treated wastewater. The industry shall also provide electromagnetic flow meter at the outlet of each cell of plantation making more effective utilization of treated effluent.	The industry has improved distribution of treated trade effluent on the plantation area and provided proper irrigation network for optimum utilization of treated wastewater. Roster for Waste water distribution has been developed and implemented . Further Industry would like to submit that industry has already installed the Electromagnetic flow meter at the outlet of each cell of plantation. Pictures of the additional Meters installed for the submetering along with its PO Copy is attached as **Annexure 12.**
6	The industry is not achieving the emission standards of 75 mg/Nm^3 from the stack of Chemical Recovery Plant (II) and Energy Section. However, the industry was given opportunity of personal hearing before Hon'ble Chairman of PPCB on 07.01.2020, wherein one of the decisions of that the industry shall submit the detailed proposal w.r.t. upgradation of its existing APCDs to achieve the stack emission standard of 75 mg/Nm^3 within 3 months along with PERT chart for installation and commissioning of the same.	The Industry (PCD) has consistently been achieving the existing PCB prescribed standards of 150 mg/Nm3 the per the latest test reports dated **11.05.2021.** Copy of the latest test report done by PCB is attached as **Annexure 13**. The latest sampling was conducted on 21 Sep 2021, the report of which is awaited. These standards of emission conform to the prescribed standards specified and stipulated in the consents granted to the industry from time to time. The latest consent dated 24 May 2021 also specifies the prescribed maximum limit of SPM to

		the extent of 150 mg/Nm3. However, since a recommendation has been made to reduce the said emission to the max. limit of 75 mg/Nm3, the Industry had submitted the action plan for the achievement of stack emission standard of 75 mg/Nm3 by Sep 2021. The Industry has now sought time till Sep 2022 for the achieving the revised standards, as the finalization of ESP project has been unavoidably delayed on account of pandemic scenario in year 2020-21 resulting in a complete shut down and slowing of all industry during this period. The Industry has already placed the order for HF Controller to reduce the emissions of its thermal power plant stack to achieve the new recommended value of 75 mg/Nm3. The commissioning of the same will be completed by **25 Nov 2021**. Order Copy of the HF Controller is attached as **Annexure 14.** The Industry is in the final stages of commercial negotiation for its new ESP for Recovery Boiler and conducting industrial visit to evaluate and validate the technical performance of the new ESP suppliers. Technical Comparison of the new ESP is attached as **Annexure 15.** The new delivery period of the ESP for installation and commission is about 10 months.
7	The Industry (M/s Trident Ltd) will conduct detailed study for monitoring the ground water quality across the Dhanaula Drain in order to evaluate the	Industry has conducted the ground water study & the outcome of the study has been submitted to the Board vide letter

	impact of its treated water discharge onto Drain and submit the report by 30th April, 2020.	dated 27 April 2020. Copy of the report is attached as **Annexure 16.**
8	The concept of 'Zero Liquid Discharged' be considered as minimal discharge of effluent, particularly from the industrial sectors reported upon. According to mechanics of fluids (more precisely thermodynamics) that a continuous operation bound to generate 'rejects', and / or 'blowdown' and / or bleed due to process entropy, despite of whatever technology adopted. Punjab Pollution Control Board, therefore, has to examine what minimal disposal of effluent be permitted to M/s Trident Limited considering the production technology, scale of operation and utilization capacity."	The Industry is continuously working for minimum discharge of effluent and is continuously reducing its discharge. The Industry is also working on maximum utilization of its treated water onto plantation area and reducing its effluent disposal through alternate routes of ZLD also as suggested by CPCB. Guidelines of CPCB for alternate routes other than ZLD through utilization onto plantation/irrigation is attached as **Annexure 17.** The Industry is further continously working on reducing its water consumption and effluent generation for minimal discharge of effluent .

The Industry further submit that the efforts being done were appreciated by the National Institutes. Further, the industry has noted and started working on all the recommendations given in Environment Audit conducted by CPPRI, Saharanpur.

The Industry can assure a complete and effective compliance of all the recommendations, as per the experts and to the extent feasible, that it shall comply with any other suggestions for further improvement.

Thanking you,
Yours faithfully
For Trident Limited

[Sarvjeet Singh]
Factory Manager

RECOMMENDATIONS OF NIT AFTER ENVIRONMENT AUDIT – TOWEL DIVISION

S No.	RECOMMENDATION	ACTION PLAN	TIME LINE
1	Despite the fact that the treated effluent is complying the regulations of the statutory body, the discharge of the coloured effluent may cause aesthetical unpleasantness. Moreover, it is highly objectionable to the general public. So,in the current scenario, the emphasis should be given to develop more efficient microbial mass for de-colorization of effluent in the activated sludge process. A further study may be conducted from the Central/State government institutes of national importance such as IITS, NITS etc. to assess the application of microbial consortia/dedicated pure culture/tertiary treatment for de-colorization of the effluent.	The collaboration with national institute for the color study will be done before 31 Oct 2021	31 Oct'21
2	The raw water requirement of the HTD is mainly met from the withdrawal of groundwater. As per test reports of the groundwater, it contains a high level of TDS(900-1000 mg/l). The high level of TDS in raw water would ultimately lead to higher TDS in the treated effluent affecting its quality for plantation and drainage. The replacement of the source of water from groundwater to other source with better quality of water (such as surface water) could help in further reduction of pollutant load of the treated effluent.	Indutry will develop the infrastructure for utilization of canal water in home textile & make an action plan along with irrigation department to get the addtional canal water	15-Jun-22

RECOMMENDATIONS OF NIT AFTER ENVIRONMENT AUDIT – TOWEL DIVISION

S No.	RECOMMENDATION	ACTION PLAN	TIME LINE
3	In the absence of RO & MEE system, the other safe ways of disposal of effluent should be explored. The HTD is currently disposing only 3000 KLD of its treated effluent onto 48.5 acres of land for plantation. The industry should look into the possibility of enhancement of the plantation area (land requirement, type of plant, piping network, watering depth etc.) for more utilization of the treated effluent for plantation in an effective manner to eventually achieve zero liquid discharge (ZLD) to the drain. The option of providing some portion of the treated effluent to nearby farmers for irrigation of the cash crops should also be given a thought. Further, a detailed hydrogeological study of the area around the industry should be conducted from the Central/State government institutes of national importance such as IITS, NITS and NIH etc. on yearly basis to know the impact and footprints of the industrial effluent (used for plantation) onto the groundwater and soil of the locality. The hydrogeological study would also suggest effective remedial measures to meet any adverse impact of the use of the industrial effluent on the aquifers and soil, if any.	The Industry is in process for procurement of additional land & 100 % utilization of treated water onto plantation will be completed by Dec'21 at the present plant utilization capacity . The industry has already conducted hydrogeological study to access the impact and footprints of industrial effluent.	31-Dec-21

RECOMMENDATIONS BY CPPRI AFTER ENVIRONMENT AUDIT – PAPER DIVISION

S No.	RECOMMENDATION	ACTION PLAN	TIME LINE	CAPEX (Rs cr)
1	The mill has adopted several water conservation strategies to reduce the freshwater consumption. The level of mill's freshwater consumption is similar to contemporary agro based writing and printing paper mills. However, looking into the reported freshwater consumption benchmarks, the mill has still a scope to reduce freshwater consumption by further 3-4 m^3/t paper and mill may explore areas for the same, for example 100% utilization of foul condensate in pulp mill can help in reducing water consumption by 1m^3/t paper while installation of disc filter at PM1 can facilitate reduction in freshwater consumption by 1.5 -2.0 m^3/t paper	Utilization of foul condensate in Pulp Mill & more back water in Pulp Mill .	28-Dec-21	
2	The mill is advised to have sub monitoring of its treated effluent being utilized in its plantation area to have proper water balance.	Completed	Completed	
3	The mill may explore installation of appropriate technology for the recovery of white rejects (centri cleaner rejects) coming from paper machine for further improving performance of the ETP.	Installation of 2 No. Disc Filters against existing Vibratory Screens to increase the capture Suspended Solids efficiency from existing 40 % to > 80 %	10-Nov-21	

RECOMMENDATIONS BY CPPRI AFTER ENVIRONMENT AUDIT – PAPER DIVISION

S No.	RECOMMENDATION	ACTION PLAN	TIME LINE	CAPEX (Rs cr)
4	The mill needs to immediately upgrade / retrofit the existing UASB reactor as the mill is not able to utilize the biogas generated as the gas collection and distribution system have corroded developing leakages. This is resulting in an estimated loss of Rs 60-70 lakhs/ annum.	Purchase order will be placed by 20 Dec 21 .The new system will be made functional by 28 Aug 2022	28-Aug-22	4.7
5	The mill may should reduce the suspended soild level in primary clarifier overflow through use of coagulants and flocculants to further improve the performance of existing ETP.	Usage of cogulants and floculants	20-Oct-21	
6	The mill may install a coagulation and flocculation system before primary clarifier to improve its performance.	Installation of Coagulation-flocculation Project	15-Dec-21	0.68

RECOMMENDATIONS BY CPPRI AFTER ENVIRONMENT AUDIT – PAPER DIVISION

S No.	RECOMMENDATION	ACTION PLAN	TIME LINE	Capex (Rs Cr)
7	The mill is advised to make a proper boundary of existing equalization tank and make provision of air supply for homogenizing the effluent.	The industry will take necessary steps for proper boundary by 20 Feb 22 and provision of air supply system in equalization tank by 20 Jun 2022.	20-Feb-22 & 20 Jun-22	0.1
8	The mill is advised to install poly disc filter (PDF) at Paper Machine 1 also for increased fibre recovery and reuse/ recycled of paper machine backwater.	The industry will explore the recycling technology for the paper machine -1 effluent for the recovery and reuse of paper machine backwater this will be complted by 30 Oct'22.	30-Oct-22	3.0
9	The treated effluent quality meets the stipulated norms. However, the mill needs to adopt appropriate technology to reduce the colour.	Collaboration with Thapar has been done . Study will be completed in Dec 21.	30 Dec 21	
10	The mill is advised to get the OCEMS at final discharge and ESP outlet calibrated on periodical basis.	Same will be implemented on immediate basis and report will be shared by 30 Oct 2021	Completed	

RECOMMENDATIONS BY CPPRI AFTER ENVIRONMENT AUDIT – PAPER DIVISION

S No.	RECOMMENDATION	ACTION PLAN	TIME LINE	Capex (Rs Cr)
11	The SPM level in the stack emissions are lower than stipulated norms of 150 mg/Nm^3. However, in context of the EC norms of 75 mg / Nm^3 for SPM, the mill need to look into optimization of its boiler operation / ESP operation or Upgrade ESPs to comply with the new norms.	Commercial negotiation is under progress. New ESP will be installed for Rec 2 by 30 Sept 2022. Delivery Period of New ESP is 10 months . For energy ESP, we will install HF controller to reduce its SPM levels to 75 mg/Nm3 by 30 Nov 2021.	30-Nov-21 30-Sep-22	12
12	Though the mill has appropriate facilities and trained & experienced manpower for environmental monitoring and analysis the mill may get quarterly / half yearly/ yearly environmental monitoring done from a third party / independent institution.	Yearly monitoring will be implemented before 30 Nov'21	30 Nov'21	

Dear Sir/ Madam ,

Annexure-2 (Industry)

We are pleased to place the Purchase Order no. 9000111591 on your esteemed organization as per the terms & conditions agreed upon.

Any discrepancy regarding the acceptance of Purchase order including the terms and conditions mentioned therein is to be intimated to the Company within 24 hours of its receipt.

In case, no communication intimating any discrepancy is received by the Company in writing with in 24 hours of the receipt of Purchase Order, the Purchase Order shall be considered to have been accepted by you.

We would also request you to kindly share the progress of the said order on weekly / monthly basis with the under mentioned Email Id

Thanking You

For Trident Limited

E-212, KITCHLU NAGAR, LUDHIANA 141001
Contact No. : 9878999481
Email : jasbirpurchase@tridentindia.com
Purchase Team .

TRIDENTGROUP

Trident Limited - P&C
Mansa Road,Dhaula
BARNALA, (PUNJAB)
PURCHASE ORDER

Vendor 741045
Mogli Labs India Private Limited
WHSViksun tower , Ground Floor, adjace
LUDHIANA
141008
Country India
Vendor GSTIN No. 03AAJCM7312H1ZO

Ship To
Trident - Dhaula Paper 1
Mansa Road,Dhaula
BARNALA, (PUNJAB)
BARNALA
148107

Mobile 9878999481
jasbirpurchase@tridentindia.com

Bill To
Trident Limited - P&C
Mansa Road,Dhaula
BARNALA, (PUNJAB)
148107

Mobile 9878999481
jasbirpurchase@tridentindia.com

PO Number	9000111591	**Dated**	28.09.2021
Our Ref.	13760	**Currency**	INR
Your Ref.	offer		

PO Status :- Valid/Approved
Quality Certificate :- Required

S.No.	Item Code Item Description Sale Order PO Number/ Week Code	UOM/ Brand	Order Qty.	Basic Rate	Discount	PKG-FWD	HSN/SAC	CGST/SGST/IGST/ C.Cess	Coal Cess	Item Value	Cancellation Date	Plant
00001	706120128 BOX-FLUSH-KF0600H-HENSEL	NOS/ HENSEL	10.000	562.38 INR/ 1 NOS	0.00 0.00	0.00 0.00	8501.53.90	9.00 /9.00 /0.00 1,012.28	0.00	6,636.08	25.12.2021	TP01 PAPER-1
00002	706120128 BOX-FLUSH-KF0600H-HENSEL	NOS/ HENSEL	15.000	562.38 INR/ 1 NOS	0.00 0.00	0.00 0.00	8501.53.90	9.00 /9.00 /0.00 1,518.42	0.00	9,954.12	25.12.2021	TP02 PAPER-2
00003	706120128 BOX-FLUSH-KF0600H-HENSEL	NOS/ HENSEL	10.000	562.38 INR/ 1 NOS	0.00 0.00	0.00 0.00	8501.53.90	9.00 /9.00 /0.00 1,012.28	0.00	6,636.08	25.12.2021	TP02 PAPER-2
00004	706120134 BOX-JUNCTN-DK 0404 B ,5TB-HENSEL	NOS/ HENSEL	30.000	373.21 INR/ 1 NOS	0.00 0.00	0.00 0.00	8501.53.90	9.00 /9.00 /0.00 2,015.34	0.00	13,211.64	25.12.2021	TP02 PAPER-2

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00005	706120134 BOX-JUNCTN-DK 0404 B ,5TB-HENSEL	NOS/ HENSEL	30.000	373.21 INR/ 1 NOS	0.00 0.00	0.00 0.00	8501.53.90	9.00 /9.00 /0.00 2,015.34	0.00	13,211.64	25.12.2021	TP14 RECOVERY
00007	706120134 BOX-JUNCTN-DK 0404 B ,5TB-HENSEL	NOS/ HENSEL	30.000	373.21 INR/ 1 NOS	0.00 0.00	0.00 0.00	8501.53.90	9.00 /9.00 /0.00 2,015.34	0.00	13,211.64	25.12.2021	TP13 PULP MILL
00008	706120134 BOX-JUNCTN-DK 0404 B ,5TB-HENSEL	NOS/ HENSEL	10.000	373.21 INR/ 1 NOS	0.00 0.00	0.00 0.00	8501.53.90	9.00 /9.00 /0.00 671.78	0.00	4,403.88	25.12.2021	TP12 CHEMICAL
00009	818010181 PIPE-MS-150NB-C-ERW	M/ JINDAL	300.000	1,540.25 INR/ 1 M	0.00 0.00	0.00 0.00	7304.19.10	9.00 /9.00 /0.00 83,173.50	0.00	545,248.50	15.11.2021	TP15 UTILITY

TRIDENTGROUP

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PO Number	9000111591	**Dated**	28.09.2021
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S.No.	Item Code Item Description Sale Order PO Number/ Week Code	UOM/ Brand	Order Qty.	Basic Rate	Discount	PKG-FWD	HSN/SAC	CGST/SGST/IGST/ C.Cess	Coal Cess	Item Value	Cancellation Date	Plant
00012	818010021 PIPE-SS316-15NB-40SCH-ERW-C	M/ JINDAL	36.000	484.80 INR/ 1 M	0.00 0.00	0.00 0.00	7306.19.11	9.00 /9.00 /0.00 3,141.50	0.00	20,594.30	15.11.2021	TP13 PULP MILL
00014	818020102 BEND-SHORT-SS304-2"-40SCH-90D-SMLS	NOS/ FABRIC	3.000	226.24 INR/ 1 NOS	0.00 0.00	0.00 0.00	7307.29.10	0.00 /0.00 /0.00 0.00	0.00	678.72	15.11.2021	TP02 PAPER-2
00011	818020284 BEND-LONG-MS-150MM-C-90°-ERW	NOS/ FABRIC	10.000	730.00 INR/ 1 NOS	0.00 0.00	0.00 0.00	7306.19.11	9.00 /9.00 /0.00 1,314.00	0.00	8,614.00	15.11.2021	TP15 UTILITY
00010	818060078 MS LOOSE FLANGE(RF)150NB 150#ANSI B16.5	NOS/ FABRIC	10.000	790.00 INR/ 1 NOS	0.00 0.00	0.00 0.00	7306.19.11	9.00 /9.00 /0.00 1,422.00	0.00	9,322.00	15.11.2021	TP15 UTILITY

TRIDENTGROUP

Trident Limited - P&C
Mansa Road,Dhaula
BARNALA, (PUNJAB)
PURCHASE ORDER

Vendor 741045 Mogli Labs India Private Limited WHSViksun tower , Ground Floor, adjace LUDHIANA 141008 **Country** India **Vendor GSTIN No.** 03AAJCM7312H1ZO	**Ship To** Trident - Dhaula Paper 1 Mansa Road,Dhaula BARNALA, (PUNJAB) BARNALA 148107 **Mobile** 9878999481 jasbirpurchase@tridentindia.com	**Bill To** Trident Limited - P&C Mansa Road,Dhaula BARNALA, (PUNJAB) 148107 **Mobile** 9878999481 jasbirpurchase@tridentindia.com	**PO Number** 9000111591 **Dated** 28.09.2021 **Our Ref.** 13760 **Currency** INR **Your Ref.** offer **PO Status** :- Valid/Approved **Quality Certificate** :- Required

S.No.	Item Code Item Description Sale Order PO Number/ Week Code	UOM/ Brand	Order Qty.	Basic Rate	Discount	PKG-FWD	HSN/SAC	CGST/SGST/IGST/ C.Cess	Coal Cess	Item Value	Cancellation Date	Plant
00013	818100268 REDCR-CONC.ERW-SS304-SCH10-300MM-150MM	NOS/ FABRIC	1.000	1,345.00 INR/ 1 NOS	0.00 0.00	0.00 0.00	7307.00.00	9.00 /9.00 /0.00 242.10	0.00	1,587.10	15.11.2021	TP13 PULP MILL

Total Value 653,309.70 INR

Total Value:INR SIX LAKH FIFTY THREE THOUSAND THREE HUNDRED NINE Rupees SEVENTY Paise

TRIDENTGROUP

Trident Limited - P&C
Mansa Road,Dhaula
BARNALA, (PUNJAB)
PURCHASE ORDER

Vendor 741045
Mogli Labs India Private Limited
WHSViksun tower , Ground Floor, adjace
LUDHIANA
141008
Country India
Vendor GSTIN No. 03AAJCM7312H1ZO

Ship To
Trident - Dhaula Paper 1
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BARNALA, (PUNJAB)
BARNALA
148107

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jasbirpurchase@tridentindia.com

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PO Number	9000111591	**Dated**	28.09.2021
Our Ref.	13760	**Currency**	INR
Your Ref.	offer		

PO Status :- Valid/Approved
Quality Certificate :- Required

Price Basis: EXW BATHINDA **Freight :** F **Special Instruction**

Payment Terms: Due Net in 30 Days **Octroi:** As per Documentary Evidence

Transportation Mode: By AIR /RAIL /SEA /COURIER /ROAD **Transit Insurance** TO BE ARRANGED BY US.

The consignment shall be accepted only if accompanied by Original Invoice for Buyer and Duplicate for Transporter failing which the consignment shall be returned at your risk and cost .

Terms and Conditions As mentioned overleaf
Cancellation Date As above

Our Banker: State Bank of India, Industrial Finance Branch,Golden tower, Dholewal Chowk, Ludhiana

GSTIN No.. 03AABCA4139J1Z0

This is computer generated Purchase Order.Hence requires no signature.

Trident Limited - P&C
Mansa Road,Dhaula
BARNALA, (PUNJAB)
PURCHASE ORDER

Vendor 741045 Mogli Labs India Private Limited WHSViksun tower , Ground Floor, adjace LUDHIANA 141008 **Country** India **Vendor GSTIN No.** 03AAJCM7312H1ZO	**Ship To** Trident - Dhaula Paper 1 Mansa Road,Dhaula BARNALA, (PUNJAB) BARNALA 148107 **Mobile** 9878999481 jasbirpurchase@tridentindia.com	**Bill To** Trident Limited - P&C Mansa Road,Dhaula BARNALA, (PUNJAB) 148107 **Mobile** 9878999481 jasbirpurchase@tridentindia.com	**PO Number**	9000111591	**Dated**	28.09.2021
			Our Ref.	13760	**Currency**	INR
			Your Ref.	offer		
			PO Status :- Valid/Approved **Quality Certificate** :- Required			

S.No.	Item Code Item Description	Master Inspection Characteristics(MIC)	Upper Specification Limit	UOM	Target Specification Limit

TRIDENTGROUP

Trident Limited - P&C
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BARNALA, (PUNJAB)
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Our Ref.	13760	**Currency**	INR
Your Ref.	offer		

PO Status :- Valid/Approved
Quality Certificate :- Required

S.No.	Item Code Item Description	Mat. Classification	PO Material Text
00001	706120128 BOX-FLUSH-KF0600H-HENSEL	Standard	
00002	706120128 BOX-FLUSH-KF0600H-HENSEL	Standard	
00003	706120128 BOX-FLUSH-KF0600H-HENSEL	Standard	
00004	706120134 BOX-JUNCTN-DK 0404 B ,5TB-HENSEL	Standard	
00005	706120134 BOX-JUNCTN-DK 0404 B ,5TB-HENSEL	Standard	
00007	706120134 BOX-JUNCTN-DK 0404 B ,5TB-HENSEL	Standard	
00008	706120134 BOX-JUNCTN-DK 0404 B ,5TB-HENSEL	Standard	
00009	818010181 PIPE-MS-150NB-C-ERW	Standard	
00012	818010021 PIPE-SS316-15NB-40SCH-ERW-C	Customize	
00014	818020102 BEND-SHORT-SS304-2"-40SCH-90D-SMLS	Standard	
00011	818020284 BEND-LONG-MS-150MM-C-90°-ERW	Standard	

TRIDENTGROUP

Trident Limited - P&C
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			Our Ref.	13760	**Currency**	INR
			Your Ref.	offer		
			PO Status :- Valid/Approved **Quality Certificate** :- Required			

S.No.	Item Code Item Description	Mat. Classification	PO Material Text
00010	818060078 MS LOOSE FLANGE(RF)150NB 150#ANSI B16.5	On the Shelf	
00013	818100268 REDCR-CONC.ERW-SS304-SCH10-300MM-150MM	Customize	

TRIDENTGROUP

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PO Number	9000111591	**Dated**	28.09.2021
Our Ref.	13760	**Currency**	INR
Your Ref.	offer		

PO Status :- Valid/Approved
Quality Certificate :- Required

DELIVERY SCHEDULE

S.NO	Item Code Item Description	UOM	PO Qty	Scheduled Date	Sch Qty	Delivered Qty	Open Qty as on 20.10.2021	Contract No	Remaining Contract Value/Qty
00001	706120128 BOX-FLUSH-KF0600H-HENSEL	NOS	10.000	25.12.2021	10.000	0.000	10.000		0.00
00002	706120128 BOX-FLUSH-KF0600H-HENSEL	NOS	15.000	25.12.2021	15.000	0.000	15.000		0.00
00003	706120128 BOX-FLUSH-KF0600H-HENSEL	NOS	10.000	25.12.2021	10.000	0.000	10.000		0.00
00004	706120134 BOX-JUNCTN-DK 0404 B ,5TB-HENSEL	NOS	30.000	25.12.2021	30.000	0.000	30.000		0.00
00005	706120134 BOX-JUNCTN-DK 0404 B ,5TB-HENSEL	NOS	30.000	25.12.2021	30.000	0.000	30.000		0.00
00007	706120134 BOX-JUNCTN-DK 0404 B ,5TB-HENSEL	NOS	30.000	25.12.2021	30.000	0.000	30.000		0.00
00008	706120134 BOX-JUNCTN-DK 0404 B ,5TB-HENSEL	NOS	10.000	25.12.2021	10.000	0.000	10.000		0.00
00009	818010181 PIPE-MS-150NB-C-ERW	M	300.000	15.11.2021	300.000	294.980	5.020		0.00
00012	818010021 PIPE-SS316-15NB-40SCH-ERW-C	M	36.000	15.11.2021	36.000	36.000	0.000		0.00
00014	818020102 BEND-SHORT-SS304-2"-40SCH-90D-SMLS	NOS	3.000	15.11.2021	3.000	3.000	0.000		0.00

TRIDENTGROUP

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PO Number	9000111591	**Dated**	28.09.2021
Our Ref.	13760	**Currency**	INR
Your Ref.	offer		

PO Status :- Valid/Approved
Quality Certificate :- Required

S.NO	Item Code Item Description	UOM	PO Qty	Scheduled Date	Sch Qty	Delivered Qty	Open Qty as on 20.10.2021	Contract No	Remaining Contract Value/Qty
00011	818020284 BEND-LONG-MS-150MM-C-90°-ERW	NOS	10.000	15.11.2021	10.000	10.000	0.000		0.00
00010	818060078 MS LOOSE FLANGE(RF)150NB 150#ANSI B16.5	NOS	10.000	15.11.2021	10.000	10.000	0.000		0.00
00013	818100268 REDCR-CONC.ERW-SS304-SCH10-300MM-150MM	NOS	1.000	15.11.2021	1.000	1.000	0.000		0.00

Terms and Conditions

This Purchase Order is subject to all terms, conditions and specifications hereinafter set forth and acceptance of order by the Seller shall be deemed to be an agreement that the order is subject to all of said terms, conditions and specifications.

General

Non Acceptance of Purchase order with its terms and conditions is to be intimated to the Purchaser within 24 hours of its receipt, else the same shall be assumed to be accepted at the discretion of the Purchaser. No deviation to this order shall be honoured unless authorized in writing.
Purchase Order number, material code and GST IN of the Purchaser should be mentioned on each and every invoice. An invoice should not have more than 8 line items in it. Different Invoice should be raised for different Purchase Orders issued by the Purchaser.
The Seller shall be responsible for mentioning the correct details in the invoice, including HSN and GST rate of goods supplied to the Purchaser.
The Seller represents and warrants that it shall comply with the Laws pertaining to GST and other applicable indirect taxes and the requirements therein. The Seller shall be liable for all losses and damages suffered by the Purchaser due to any action or omission or mistake of the Seller.
The Seller shall unconditionally submit its account statement on Quarterly basis for reconciliation.
Weights / quantities as recorded by the Purchaser shall be final and binding on the Seller.
This Purchase Order shall not be amended, modified, altered or changed in any way except by writing executed by a duly authorized representative of the Purchaser.
Any other terms & conditions of the Seller mentioned on its Bills,Invoices, e-mails or any other documents shall not be binding on the Purchaser unless accepted in writing by the Authorized Representative of the Purchaser.
The Seller shall not disclose any confidential information pertaining to the Purchaser's business to any third party.
Neither party shall be entitled to assign the rights, interests and obligations without the previous written consent of the other Party.
The Seller shall not offer, solicit or accept an advantage in connection with the procurement of this Purchase Order. Failure to comply with this clause or any act of offering, soliciting or accepting advantage committed by the Seller shall, without affecting the liability of Seller for such failure and act, result in this Purchase Order being invalidated. For the purpose of this clause, Seller shall include its directors, partners, relatives, agents, associates, employees, servants and sub-consultants.
'Advantage' for this purpose shall mean any gift, loan, fee, reward or commission, any valuable security, office, employment, agreement, loan payment/waiver/discharge, bribe of any kind to Government/other officials, any other service or favour or any offer, undertaking or promise, whether conditional or unconditional, of such advantage.
The Seller or its directors, partners, relatives, associates, employees, agents and/ or sub-consultants shall not trade, directly or indirectly, in the shares of the Company during the currency and six months post expiry of this Purchase Order.

Delivery

The material shall be carefully and properly packed for movement by sea/rail/road transport to withstand damages on account of inclement weather, rough handling etc.
The material shall have to be delivered on the date of delivery specified in this Purchase Order. Decision for acceptance/rejection of material on the dates other than that specified in the Purchase Order along with the liquidated damages shall be at the sole discretion of the Purchaser.
The Seller shall not have any right to terminate the Purchase Order. However, the Purchaser reserves the right to cancel any unshipped portion at any time without assigning any reason.
All costs incurred in procurement of material from other source in the event of failure to supply the material on the scheduled date / rejection as per the terms of Purchase Order shall be to Seller's account and at the sole discretion of the Purchaser.
The price mentioned in the Purchase Order is inclusive of packing and handling charges unless otherwise stated therein.
Seller shall share the progress of the order on weekly basis in writing.
If delivery of the material mentioned in the Order occurs later than time specified and provided such delay is neither the result of force majeure nor the result of circumstances for which the Purchaser is responsible, the Purchaser shall be entitled to damages of 0.5% per week or part thereof subject to the maximum of 5% of the Contract price. For purpose of computing damages in the event of delay in delivery of the material, mere despatch of the material within the agreed date of delivery which are not in accordance with the specifications/standards, or found unacceptable by Purchaser would not amount to delivery within the agreed delivery date.

Inspection and Testing

Complete Test / Inspection reports from an approved source / as generated and certified by the Seller should be submitted along with the supply of material. Test reports generated by the Purchaser shall be binding on the Seller and no disputes whatsoever shall be entertained in this regard. Charges for testing, if any, shall be to the Seller's account and the decision to get the same inspected by any third party shall be at the sole discretion of the Purchaser.
Material must conform to all the specifications as specified in the Purchase Order. Any non-conformity identified during any later stage shall be treated as breach of contract and the Seller shall be liable to any penalties imposed at the sole discretion of the Purchaser.

Terms of payment

Original GST invoice should invariably accompany the material failing which the material may be rejected at the sole discretion of the Purchaser.
In the event of denial of input tax credit to the Purchaser on account of any negligence, erroneous or incorrect reporting, non payment of taxes or any other non-compliance made by the Seller in relation to the GST Law, the Purchaser shall be entitled to recover such loss from the Seller along with Interest @18% per annum.
Advances shall be released against submission of Advance Bank Guarantee of equivalent amount. All Advance and Performance Bank guarantee(s) shall be accepted only if they are in Purchaser's format and issued by the Banks recommended by the Purchaser unless otherwise agreed in writing.
Payment other than advances shall be made as specified in the terms and conditions of the Purchase Order and submission of all required documents.
Forms / Permits / Declarations shall be submitted as per the applicable laws/statute.
The prices under this Order shall remain firm until completion of the Contract

Intellectual property/Warranty, Inspection and Liability

Material supplied by the Seller pursuant to this Purchase Order should not infringe any third party intellectual property rights and the Seller further undertakes to indemnify the Purchaser against all claims for infringements of third party patents and/or other intellectual property rights by material supplied under this Purchase Order.
Material supplied by the Seller pursuant to the Purchase Order should have clean title in favour of the Seller before shipment to the Purchaser. Should there be any dispute to the ownership of the material,the Seller would be liable to make good for the costs incurred by the Purchaser to defend the title and the loss of profits due to its inability to use the subjected material, over and above the costs already paid to the Seller.
In the event of any breach of obligations mentioned in the Purchase Order by the Seller, the Purchaser shall be entitled to incidental and consequential damages including loss of profit. The Seller agrees to indemnify and hold the Purchaser, its customers and users of its products, harmless against any suits, damage or claim or any other expense resulting from a breach or alleged breach of the Seller's obligations including warranty, pursuant hereto. The Purchaser shall have the right to invoke the Performance Bank Guarantee submitted by the Seller for recovering the Liquidated damages.
All goods supplied shall be under an unconditional guarantee of 12 months from the date of commissioning / 18 months from the date of receipt (whichever is earlier) unless specified differently in the Purchase Order.
The Purchaser shall have the right for shop floor rejections even if the material has been accepted on delivery.
All costs (inclusive of taxes & duties) incurred by the Purchaser on account of rejections, despatch/warranty failures of material supplied under this Purchase Order shall be to Supplier's account.

Applicable law and Jurisdiction of Courts

Any dispute, controversy, differences or question arising out of, in relation to or incidental to this Purchase Order or the breach, termination or invalidity thereof shall be referred for arbitration to be governed in accordance with the Arbitration and Conciliation Act, 1996. Accordingly, the purchaser will nominate sole Arbitrator to settle any dispute, controversy, differences or question arising out of, in relation to or incidental to this Purchase Order or the breach, termination or invalidity thereof. The place of arbitration shall be in Barnala, Punjab, India and language of proceedings shall be English. Expenses of the arbitration proceeding shall be jointly shared by the parties.This Purchase order shall be governed by and construed in accordancewith the laws of India, and the parties agree to submit themselves tothe exclusive jurisdiction of the Courts at Barnala, India only. Further, where any material is imported under this Purchase Order, the laws applicable under the Indian statute would govern the resolution of conflicts.
This Purchase Order supersedes any/and/all other oral or written communications or other commitments between the parties with respect to its subject matter except the agreement executed between the parties and contains all of the covenants, terms and conditions agreed between the parties with respect thereto. Wherein an agreement is also executed between the parties on the same subject matter thereto with the terms, conditions and specifications, the Purchase Order shall become the part of the agreement. However, in case of any conflict in the terms, conditions, specifications mentioned in the agreement and the Purchase Order, the terms, conditions, specifications mentioned in the agreement shall prevail.
Each party hereto acknowledges that, except as set forth herein, neither party nor any one on behalf of either party has made any representations, inducements, promises or agreements, orally or otherwise,respecting the subject matter of this Agreement and/or Purchase Order.

Documents required to be attached with invoice.

1. Tax Invoice in original
2. Tax Invoice (Duplicate) in original
3. Quality certificate,

ANNEXURE 3 : Installation of RO & MEE (Zero Effluent Discharge Onto Drain – HTD Division)

1. The Industry has installed RO plant followed by MEE plant in year 2014 for waste water recycling with total expenditure of INR 33 crores (OEM RO- Euromec-10.84 crores , OEM MEE Ketav Consultant- 5.88 crores).

2. Industry had faced the technology failure after 1 year of the plant commissioning & apprise the status to the board. After inputs taken from the NEERI & Environmental consultant Mr Silvano Stroti recommendation was considered to upgrade the existing plant with improved technology i.e. MBR technology.

3. The Industry placed the order for the new technology MBR plant having cost of 2.94 crores (The plant was delivered at site in March 2020).

4. The industry (HTD) had informed the Board vide Letter No. Trident/2020/24 dated 31.03.2020 that the industry would not be in a position to complete the project to install Reverse Osmosis System followed by Multiple Effect Evaporator in its towel division. within the given timelines due to the lock down and other restraints and restrictions imposed by the Central Government and the State government in order to curtail the spread of COVID-19 and had sought support of the Board to keep the project in abeyance till the situation becomes conducive to the upgradation.

5. As communicated & committed during the personal hearing dated 30 April 2021 and as per proceedings dated 7 May 2021, The industry is in the process for the procurement of additional land to utilize its 100 % treated water onto plantation area at the existing running capacity and will ensure that there may be no discharge of treated water into drain post Dec 2021.

Action Plan for Zero Effluent onto Drain is attached as follows :

Sr. No.	Description	UOM	Consented	Actual
1	Production	TPD	120.0	69.9
2	Total Effluent Generation	KLD	9702	6147
3	Treated water to Plantation	KLD	3000	3395
	Treated water to Drain	KLD	6702	2752
4				
5	Available Land for Plantation	Acre	-	48.5
6	Extra Land required to stop all treated water onto drain	Acre	-	32.4

The Industry has already procured and developed the additional 32.4 Acre land and ensure that the pipe line distribution work is completed in 30 Oct 21and no treated water from Home Textile division goes to drain after 5 Nov 2021.

Charter for Water Recycling & Pollution Prevention in Pulp & Paper Industries

(Specific to Ganga River Basin States)





A.K.Vidyarthi
Additional Director
Central Pollution Control Board
Delhi

April, 2015

Fresh Water Consumption Norms (m^3/t of product)

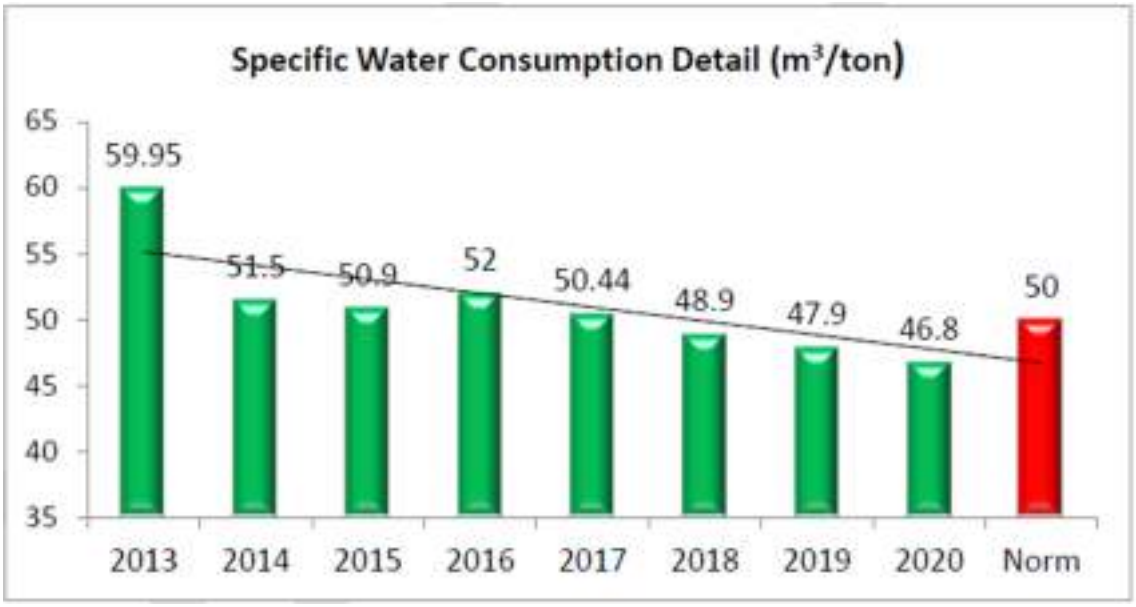
Category	Short Term Objectives	Long Term Goals
A1: Wood Based Pulp & Paper Mills producing bleached grades of chemical pulps, papers, paperboards & newsprint	**60**	**50**
A2: Wood Based Pulp & Paper Mills producing unbleached grades of chemical pulps, papers and paperboards	**40**	**25**
B1: Agro Based Pulp & Paper Mills producing bleached grades of chemical pulps, papers, paperboards & newsprint	**60**	**50**
B2: Agro Based Pulp & Paper Mills producing unbleached grades of papers and paperboards	**40**	**25**
C1: RCF & Market Pulp Based Paper Mills producing bleached grades of papers, paperboards & newsprint	**20**	**15**
C2: RCF & Market Pulp Based Paper Mills producing unbleached grades of papers and paperboards	**15**	**10**
D : RCF & Market Pulp Based Specialty Paper Mills#	**60**	**50**

Notes:

1. Short and Long Term norms become applicable 1yr, and 2 yrs respectively, from the date of notification of Charter. Long Term norms will be reviewed after 18 months.
2. "**#**" applies to mills that manufacture **only** specialty papers
3. "tpd" refers to Air-Dry (ADt) for pulp; Saleable weight for paper.
4. Not applicable to mills at ZLD

Paper Business

Trident Paper division has already achieved its long-term target of specific water consumption in Paper business of 50 m3 /T by executing different projects.



Sr. No.	Year	Water Consumption	Paper Production	Specific Water Consumption
	UOM	KLD	TPD	Ltr/Kg
1	CY-2017	21054	417	50.4
2	CY-2018	20384	417	48.9
3	CY-2019	19963	417	47.9
4	CY-2020	16942	362	46.8

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Month wise Water consumption Data for calendar year 2020 is attached as follows :

Month	Water Consumption	Production	Specific Water
UOM	KLD	TPD	Ltr/Kg
January-20	19787	409	48.4
February-20	18272	413	44.2
March-20	14686	316	46.5
April-20	5727	60	94.8
May-20	17234	339	50.8
June-20	17567	406	43.2
July-20	17582	399	44.0
August-20	19854	392	50.7
Sept-20	19289	405	47.7
October-20	18575	406	45.8
November-20	17836	395	45.1
December-20	16899	404	41.8

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Average	**16942**	**362**	**46.8**

The industry has further taken projects to reduce its water consumption which is attached as follows:

The mill has adopted certain water conservation measures namely:

- **Automation of water treatment plant for optimum water consumption in various process operations.**
- **Installation of flow meter in various distribution pipelines as well as secondary clarifier outlet.**
- **Installation of Wet Wash Clarifier to reuse the clarified wet washings to maximum extent.**
- **Carrying out of straw fibre line operations at high consistency (less water consumption)**
- **Adoption of twin roll press for reduced water consumption in pulp washing.**
- **Adoption of poly disc filter for reuse / recycling of paper machine back water into paper machine.**
- **Optimisation of shower nozzle diameter on paper machine.**
- **Utilisation of black liquor secondary condensate from chemical recovery in raw material washing in SFL and lime mud washing.**
- **Utilisation of treated effluent for irrigation / land application.**

The plant has implemented additional measures for water conservation during 2020-21 which has further reduced the freshwater consumption.

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S. No.	Water Conservation Measures	Impact on Fresh water Consumption
1	Reuse of sealing water in wet wash in SFL	Reduction in fresh water consumption from 17.98 m^3/ t of bleached pulp to 16.18m^3 /t of bleached pulp in SFL Total Saving : 400 m^3 /day
2	Reduction of number of water showers in press section	
3	Use of Treated Effluent for preparation of Lime Slurry at ETP	Total Saving : 50 m^3 /day
4	Reuse of sealing water for bleaching, digester and washing area in WFL	Reduction in fresh water consumption from 7.6 m^3/ t of bleached pulp to 7.2 m^3/t of bleached pulp in WFL Total Saving : 50 m^3 /day
5	Replacement of RO Membranes in Power House	Total Saving : 270 m^3 /day
6	Increase in Cycle of Concentration (CoC) based upon hardness values.	Reduction in fresh water consumption by 75 m^3 /day in cooling tower of cogeneration plant
	Total Fresh Water Saving	**875 m^3 / day**

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Due to its continuous efforts, the industry was also rewarded in water and waste management company within the Excellence Reward in Paper Business by Confederation of Indian Industry.

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STANDARD OPERATING PROCEDURE					TRIDENTGROUP™
BUSINESS/ UNIT	SUSTAINABILITY	**LOCATION**	PUNJAB	**MACHINE NAME/PROCESS NAME**	WASTE WATER MANAGEMENT
PROCESS :	IRRIGATION MANAGEMENT PLAN				

Annexure -2 – Action plan detailing pipe network, land use, watering depth and type / age of plants etc.

WASTE WATER MANAGEMENT IRRIGATION PLAN

TRIDENTGROUP™

TRIDENT GROUP
BARNALA

PREPARED BY	DOCUMENT NO	PAGE 1 OF 20
AJAY KUMAR	SUS/PB/IRRIGATION -01	
APPROVED BY	ISSUE DATE	REVISION NO./ REVISION DATE
RAJAT MONGA	10/03/2021	-

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EFFLUENT GENERATION DATA

PRESENT SCENARIO

S NO	DESCRIPTION	UOM	HTO	PCO	TOTAL
1	TOTAL EFFLUENT GENERATION	KLD	5146 5	19000	25146.5
2	TREATED WATER INTO PLANTATON	KLD	3395	13200	16595 0
3	TOTAL AREA OF PLANTATION	ACRE	48.5	165	213.5
4	EFFLUENT CONSUMPTION	KL/ACRE	70.00	80 00	75 00
5	UTILZATON OF TREATED WATER ONTO PLANTATION	%	55 2	69.5	66 0

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PLANTATION LAYOUT



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ZONE WISE PLANTATION AREA

PAPER PLANTATION AREA (ACRES)

ZONE	TOTAL
ZONE 1	5
ZONE 2	40
ZONE 3	16
ZONE 4	5
ZONE 5	10
ZONE 6	15
ZONE 7	8
ZONE 8	14
ZONE 9	6
ZONE 10	2
ZONE 11	2
ZONE 12	10
ZONE 13	2
ZONE 14	4
ZONE 15	2
ZONE 16	2
ZONE 17	3
ZONE 18	2
ZONE 19	3
ZONE 20	5
ZONE 21	9
TOTAL AREA	**165**

TOWEL PLANTATION AREA (ACRES)

ZONE	TOTAL
ZONE 1	4
ZONE 2	14
ZONE 3	3
ZONE 4	1.5
ZONE 5	3
ZONE 6	12
ZONE 7	2.5
ZONE 8	2.5
ZONE 9	6
TOTAL AREA	**48.5**

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ZONE WISE PLANTATION AGE

PAPER PLANTATION AREA (YEAR)

ZONE	TOTAL	AGE (YEARS)
ZONE 1	2020	1
ZONE 2	2019	2
ZONE 3	2010	11
ZONE 4	2008	13
ZONE 5	2021	0 9
ZONE 6	2010	11
ZONE 7	2019	2
ZONE 8	2021	0
ZONE 9	2020	1
ZONE 10	2010	11
ZONE 11	2021	0 9
ZONE 12	2020	1
ZONE 13	2010	11
ZONE 14	2009	12
ZONE 15	2014	7
ZONE 16	2010	11
ZONE 17	2010	11
ZONE 18	2010	11
ZONE 19	2012	9
ZONE 20	2021	0.9
ZONE 21	2019	2

TOWEL PLANTATION AREA (YEAR)

ZONE	TOTAL	AGE (YEARS)
ZONE 1	2021	0.8
ZONE 2	2010	11
ZONE 3	2021	0 8
ZONE 4	2021	0.8
ZONE 5	2020	1
ZONE 6	2019	2
ZONE 7	2009	12
ZONE 8	2020	1
ZONE 9	2021	0 8

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ZONE WISE IRRIGATION PLAN

PAPER PLANTATION AREA (AREA-WISE)

ZONE	TOTAL	AREA (ACRES)	TOTAL	MAX. WATER FLOW @ 80m3/acre
	ZONE 2A	20		
	ZONE 4	5		
	ZONE 10	2		
AREA 1	ZONE 13	2	46	3680
	ZONE 19	3		
	ZONE 20	5		
	ZONE 21	9		
	ZONE 1	5		
AREA 2	ZONE 9	6	13	1040
	ZONE 18	2		
AREA 3	ZONE 17	3	3	240
	ZONE 2B	20		
	ZONE 12	10		
	ZONE 3	16		
AREA 4	ZONE 6	15	87	6960
	ZONE 7	8		
	ZONE 8	14		
	ZONE 15	2		
	ZONE 16	2		
AREA 5	ZONE 14	4	4	320
AREA 6	ZONE 5	10	12	960
	ZONE 11	2		
TOTAL			165	13200

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ZONE WISE IRRIGATION PLAN

TOWEL PLANTATION AREA (AREA-WISE)

ZONE	TOTAL	AREA (ACRES)	TOTAL	MAX. WATER FLOW @ 70m3/acre
	ZONE 1	4		
	ZONE 2	14		
	ZONE 3	3		
AREA 1			31	2170
	ZONE 4	1.5		
	ZONE 7	2.5		
	ZONE 9	5		
	ZONE 5	3		
AREA 2			15	1050
	ZONE 6	12		
AREA 3	ZONE 8	2.5	2.5	175
TOTAL		48.5	48.5	3395

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ELECTROMAGNETIC FLOW METER RECORD -PLANTATION-PAPER ZONE

Date	Main Meter			Meter-1 (Area-1)			Meter-2 (Area-2)			Meter-3 (Area-3)			Meter-4 (Area-4)			Area-5			Meter-5 (Area-6)		
	Initial Reading	Final Reading	Flow (KLD)	Initial Reading	Final Reading	Flow (KLD)	Initial Reading	Final Reading	Flow (KLD)	Initial Reading	Final Reading	Flow (KLD)	Initial Reading	Final Reading	Flow (KLD)	Initial Reading	Final Reading	Flow (KLD)	Initial Reading	Final Reading	Flow (KLD)
Target			12500			3450			515			215			6525			380			360
1-Sep	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3300	[illegible]	[illegible]	500	[illegible]	[illegible]	100	970	6240	5280	170	530	230	730	1240	960
2-Sep	[illegible]	[illegible]	[illegible]	20.0	[illegible]	2860	[illegible]	[illegible]	800	[illegible]	[illegible]	80	[illegible]	[illegible]	6960	182	550	370	1.0.9	1960	854
3-Sep	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3300	[illegible]	[illegible]	560	[illegible]	[illegible]	200	[illegible]	[illegible]	6240	552	1100	250	1250	2250	346
4-Sep	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3020	[illegible]	[illegible]	800	[illegible]	[illegible]	100	[illegible]	[illegible]	6000	900	[illegible]	260	[illegible]	[illegible]	440
5-Sep	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3100	[illegible]	[illegible]	800	[illegible]	[illegible]	210	[illegible]	[illegible]	6960	[illegible]	[illegible]	280	[illegible]	[illegible]	260
6-Sep	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3360	[illegible]	[illegible]	400	[illegible]	[illegible]	100	[illegible]	[illegible]	6420	[illegible]	[illegible]	180	[illegible]	[illegible]	460
7-Sep	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3250	[illegible]	[illegible]	350	[illegible]	[illegible]	200	[illegible]	[illegible]	6360	[illegible]	[illegible]	260	[illegible]	[illegible]	300
8-Sep	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3150	[illegible]	[illegible]	450	[illegible]	[illegible]	210	[illegible]	[illegible]	5760	[illegible]	[illegible]	180	[illegible]	[illegible]	304
9-Sep	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3250	[illegible]	[illegible]	500	[illegible]	[illegible]	220	[illegible]	[illegible]	6240	[illegible]	[illegible]	260	[illegible]	[illegible]	304
10-Sep	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3990	[illegible]	[illegible]	600	[illegible]	[illegible]	150	[illegible]	[illegible]	6840	[illegible]	[illegible]	352	[illegible]	[illegible]	750
11-Sep	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3310	[illegible]	[illegible]	550	[illegible]	[illegible]	200	[illegible]	[illegible]	6510	[illegible]	[illegible]	247	[illegible]	[illegible]	750
12-Sep	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3350	[illegible]	[illegible]	800	[illegible]	[illegible]	150	[illegible]	[illegible]	6240	[illegible]	[illegible]	206	[illegible]	[illegible]	950
13-Sep	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3360	[illegible]	[illegible]	900	[illegible]	[illegible]	150	[illegible]	[illegible]	6360	[illegible]	[illegible]	260	[illegible]	[illegible]	870
14-Sep	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3250	[illegible]	[illegible]	400	[illegible]	[illegible]	200	[illegible]	[illegible]	6360	[illegible]	[illegible]	260	[illegible]	[illegible]	700
15-Sep	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3160	[illegible]	[illegible]	800	[illegible]	[illegible]	150	[illegible]	[illegible]	6210	[illegible]	[illegible]	220	[illegible]	[illegible]	750
16-Sep	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3240	[illegible]	[illegible]	450	[illegible]	[illegible]	210	[illegible]	[illegible]	6270	[illegible]	[illegible]	250	[illegible]	[illegible]	360
17-Sep	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3310	[illegible]	[illegible]	500	[illegible]	[illegible]	100	[illegible]	[illegible]	5820	[illegible]	[illegible]	200	[illegible]	[illegible]	750
18-Sep	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3160	[illegible]	[illegible]	800	[illegible]	[illegible]	210	[illegible]	[illegible]	6420	[illegible]	[illegible]	220	[illegible]	[illegible]	950
19-Sep	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3160	[illegible]	[illegible]	550	[illegible]	[illegible]	200	[illegible]	[illegible]	5760	[illegible]	[illegible]	180	[illegible]	[illegible]	304
20-Sep	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3160	[illegible]	[illegible]	800	[illegible]	[illegible]	150	[illegible]	[illegible]	6360	[illegible]	[illegible]	220	[illegible]	[illegible]	750
21-Sep	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3160	[illegible]	[illegible]	800	[illegible]	[illegible]	150	[illegible]	[illegible]	6360	[illegible]	[illegible]	260	[illegible]	[illegible]	950
22-Sep	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3160	[illegible]	[illegible]	800	[illegible]	[illegible]	150	[illegible]	[illegible]	6360	[illegible]	[illegible]	260	[illegible]	[illegible]	950
23-Sep	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3160	[illegible]	[illegible]	800	[illegible]	[illegible]	150	[illegible]	[illegible]	6360	[illegible]	[illegible]	260	[illegible]	[illegible]	950
Average			[illegible]			3264			597			157			5709			257			707



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HTD PLANTATION WATER DISTRIBUTION

DATE	ELECTROMAGNECTIC FLOW METER-1 (AREA-1)			ELECTROMAGNECTIC FLOW METER-2 (AREA-2)			ELECTROMAGNECTIC FLOW METER-3 (AREA-3)			TOTAL FLOW TO PLANTATION
	INITIAL READING	FINAL READING	TOTAL FLOW (KLD)	INITIAL READING	FINAL READING	TOTAL FLOW (KLD)	INITIAL READING	FINAL READING	TOTAL FLOW (KLD)	K_D
01-09-2021	71257	72705	1448	55788	57615	1825	5968	7002	34	3311
02-09-2021	72705	74167	1462	57615	59218	1603	7002	7047	45	3110
03-09-2021	74167	75678	1512	59218	60906	1688	7047	7145	98	3298
04-09-2021	75678	77164	1486	60906	62520	1614	7145	7211	66	3166
05-09-2021	77164	78689	1485	62520	64225	1705	7211	7234	23	3133
06-09-2021	78689	80320	1451	64225	65878	1653	7234	7322	44	3192
07-09-2021	80320	81593	1273	65875	67733	1858	7322	7403	81	3209
08-09-2021	81293	82439	1146	67733	69748	2015	7403	7454	51	3212
09-09-2021	82439	83854	1415	69748	71453	1705	7454	7542	88	3209
10-09-2021	83854	85192	1339	71453	73238	1785	7542	7593	51	3175
11-09-2021	85193	86487	1294	73235	74974	1739	7593	7661	68	3118
12-09-2021	86487	87923	1436	74974	76616	1642	7661	7772	91	3169





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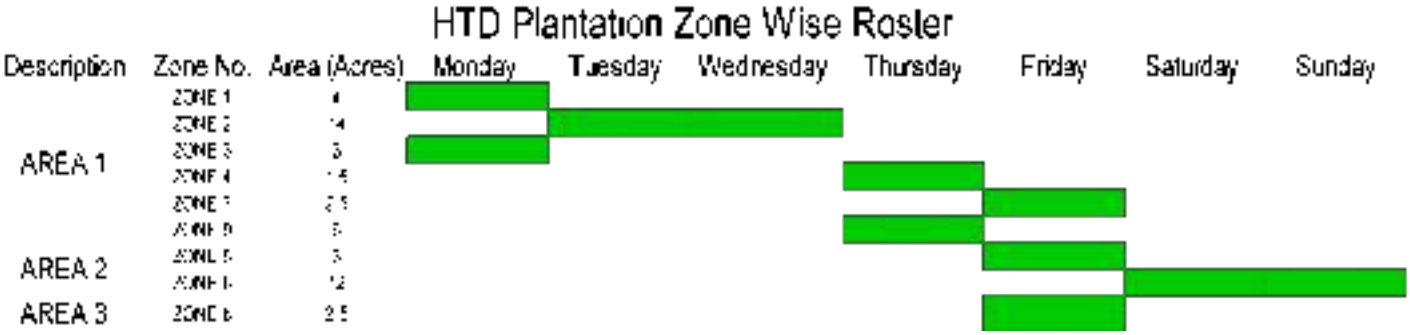
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PCD Plantation Zone Wise Roster

Description	Zone No	Area (Acres)	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
	ZONE 2A	20							
	ZONE 4	5							
	ZONE 10	2							
AREA 1	ZONE 13	2							
	ZONE 19	3							
	ZONE 20	5							
	ZONE 21	9							
	ZONE 1	5							
AREA 2	ZONE 9	6							
	ZONE 18	2							
AREA 3	ZONE 17	3							
	ZONE 2B	20							
	ZONE 12	10							
	ZONE 3	16							
AREA 4	ZONE 6	15							
	ZONE 7	8							
	ZONE 8	14							
	ZONE 15	2							
	ZONE 16	2							
AREA 5	ZONE 14	4							
AREA 6	ZONE 5	10							
	ZONE 11	2							

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INFRASTRUCTURE AVAILABLE

S.NO.	DESCRIPTION	UOM	QUANTITY
1	TRACTOR	NOS	2
2	TROLLEY	NOS	1
3	HARROW	NOS	2
4	ROTAVATOR	NOS	1
5	TOOLKIT	NOS	10
6	SPRAYER PUMP	NOS	4

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Name:
Salary Code:

IRRIGATION CHECKLIST

Deptt
Month:

POINTS OF CONCERN/ ACTIVITIES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
ZONE WISE INSPECTION FOR PLANTATION																
ZONE WISE WATER DISTRIBUTION																
MANPOWER DEPLOYED AS PER ROSTER																
WILD GROWTH/GRASS REMOVAL																
CHECKING FOR THE FLOODING/WATER ACCUMLATION																
CHECKING FOR THE MACHINERY																
TOOL KIT AVAILABILITY																

SUPERVISOR SIGNATURE

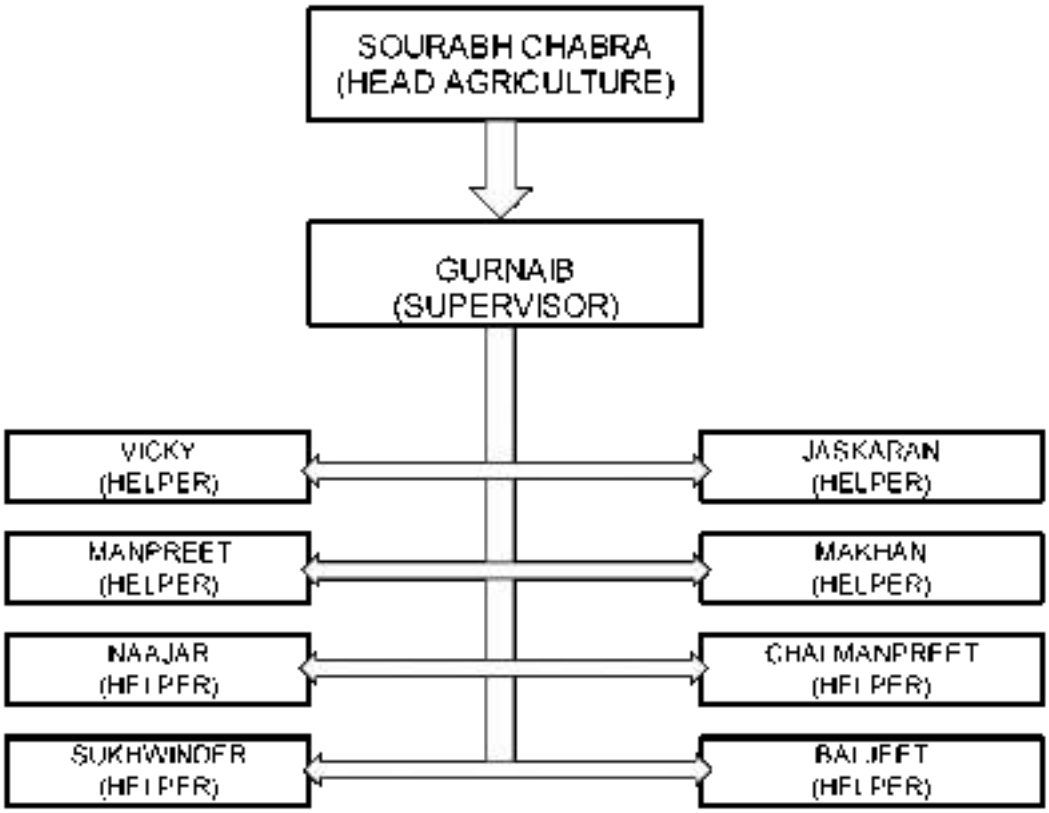
POINTS OF CONCERN/ ACTIVITIES	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
ZONE WISE INSPECTION FOR PLANTATION															
ZONE WISE WATER DISTRIBUTION															
MANPOWER DEPLOYED AS PER ROSTER															
WILD GROWTH/GRASS REMOVAL															
CHECKING FOR THE FLOODING/WATER ACCUMLATION															
CHECKING FOR THE MACHINERY															
TOOL KIT AVAILABILITY															

SUPERVISOR SIGNATURE

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TEAM MATRIX



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GLIMPSE OF PLANTATION AREA









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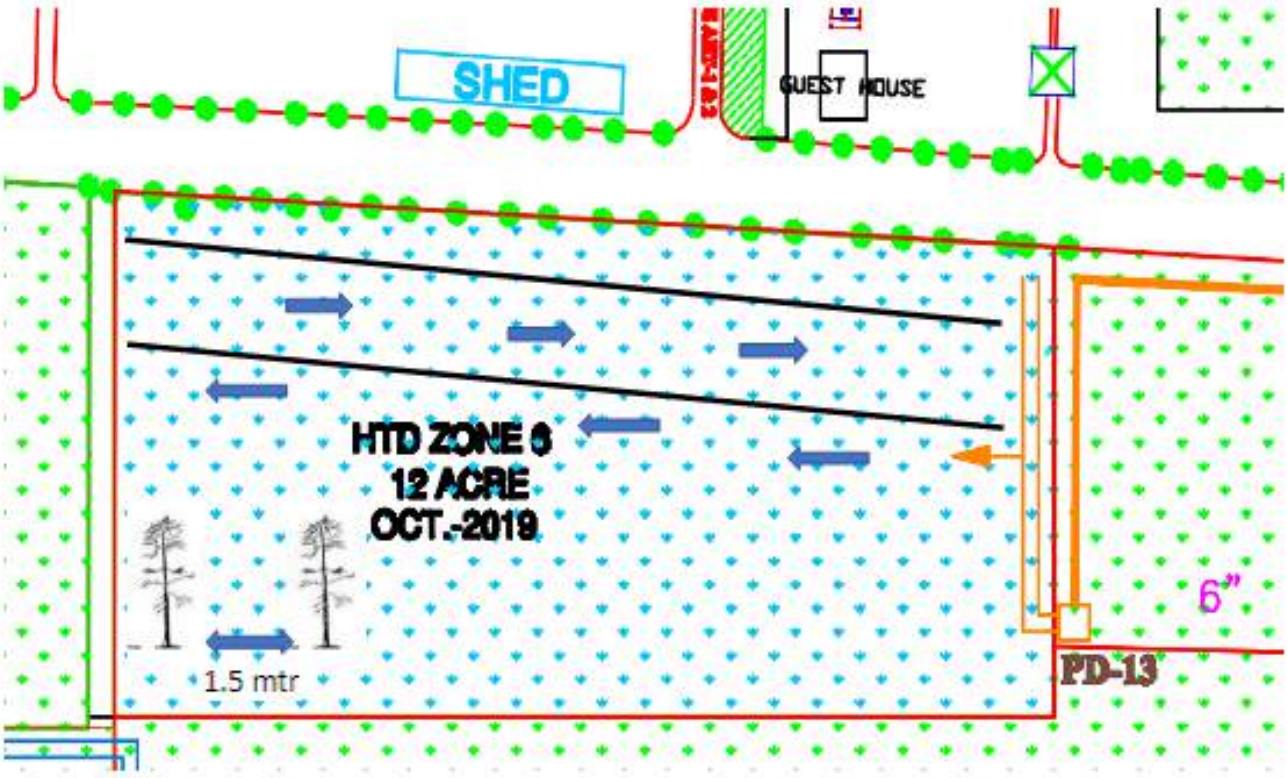
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IRRIGATION PROCESS



Ridges	
Wide	1 meter
High	50 cm

Furrow	
Wide	2 meter

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EFFLUENT GENERATION & PROPSED CONSUMPTION PLAN

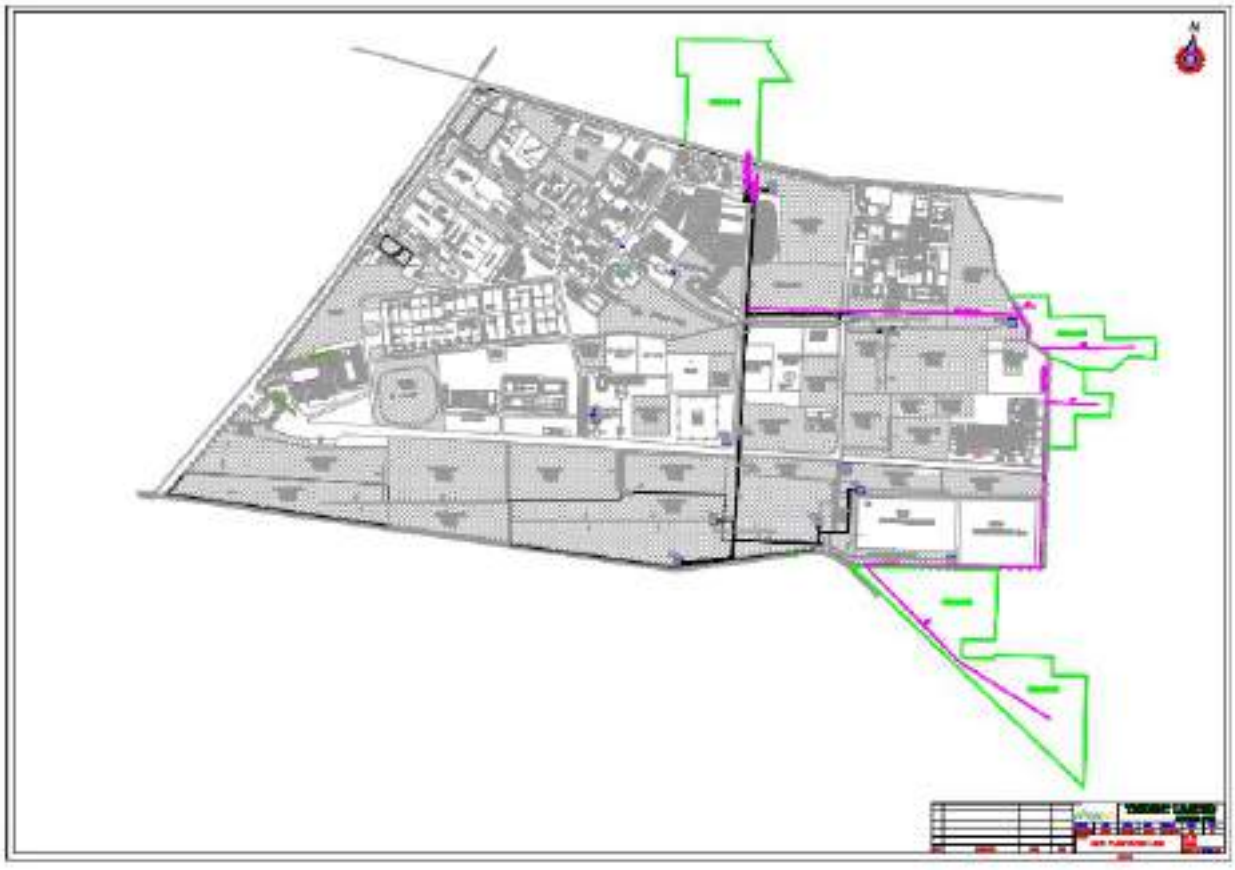
PROPOSED SCENARIO

S NO.	DESCRIPTION	UOM	HTD	PCD	TOTAL
1	TOTAL EFFLUENT GENERATION	KLD	6500	19000	25500
2	TREATED WATER INTO PLANTATION	KLD	6500	19000	25500
3	TOTAL AREA OF PLANTATION REQUIRED	ACRE	93	237 5	330
4	EXISTING LAND	ACRE	49 5	165	214
5	NEW LAND REQUIRED	ACRE	44	72.5	117
6	EFFLUENT CONSUMPTION	KL/ACRE	70	80	80
5	UTILIZATION OF TREATED WATER ONTO PLANTATION	%	100.0	100 0	100.0

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ADDITIONAL LAND LAYOUT AND PIPING



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STANDARD OPERATING PROCEDURE					TRIDENTGROUP
BUSINESS/ UNIT	PAPER CHEMICAL DIVISION	**LOCATION**	PUNJAB	**MACHINE NAME/PROCESS NAME**	WASTE WATER DRAIN
PROCESS :	TREATED WATER UTILIZATION 100% BY FARMERS				

ACTION PLAN FOR UTILIZATION OF ALL TREATED WATER BY FARMERS BY JUNE 2022

Trident Paper is utilize its 67% of treated water into existing developed plantation land and discharge only less than 33% treated water into permitted drain.

Submitted the details and timelines to zero discharge in permitted drain.

Sr. No.	Month	Total Water	Water in Drain	Water in Plantation
	UOM	KLD	KLD	KLD
1	Jan-21	15337	4150	11187
2	Feb-21	15976	5568	10408
3	Mar-21	15975	5468	10507
4	Apr-21	15462	5524	9938
5	May-21	15395	5336	10059
6	Jun-21	15517	5345	10172
7	Jul-21	15482	5397	10085
8	Aug-21	16003	5400	10603
9	Sep-21	16012	5507	10505
10	**Average**	**15688**	**5299**	**10510**

11	Land required for utilize drain water for plantation	Acre	66

Sr. No.	Activity Description	UOM	Jan-22	Mar-22	May-22	Jun-22
1	Agreement with farmers and laying of pipeline & ordering of pipeline	Acre	21	18		27
2	Approval from drain department for laying the pipe parallel to the drain				Completion	
3	Laying of pipeline to additional land/farmers land and agreement with farmers					Completion

Sophisticated Analytical Instruments Laboratories Society *(Registered as Society with Registrar of Firms & Societies, Punjab, Chandigarh)*
Thapar Technology Campus, Bhadson Road, Patiala-147 004 (India)

Performance Study of ETP Plant of Paper Chemical Division (PCD) Trident Limited, Barnala, Punjab

Prepared by:
Dr. Raj Kumar Gupta
Professor, Department of Chemical Engineering, TIET, Patiala
On behalf of:
Sophisticated Analytical Instrument Laboratories
Thapar Technology Campus, Patiala, Punjab

Recommendations

Based on the above study the following action point are recommended to be undertaken to improve the performance of the waste water treatment plant:

1. BOD to COD ratio at USBR inlet is 0.2, which is on lower side. This ratio may be improved by reducing the COD, i.e., the COD caused by suspended particles. It is recommended to install a suitable unit operation for the removal of this COD. This will help in improving the efficiency of the USBR. Also, the sludge that will be generated in the separation system may be sold or burned as boiler fuel.
2. Food to Biomass (F/M) ratio in the aeration tank 1 (AT1) is 0.56, which is on the higher side. It should be kept less than 0.4. It is recommended that the total inlet flow be split into two parts. One part of the flow should be sent to AT1 and the other part be sent to AT2.
3. Oxygen being supplied in AT1 based on the current F/M ratio is less. After the flow diversion to AT2, the quantity of oxygen supplied will become adequate.
4. Food to Biomass (F/M) ratio in the aeration tank 2 (AT2) is 0.06, which is on the lower side. For better performance of the system, it is recommended to keep this ratio above 0.1. The action suggested at point no. 3, would also help in improving the F/M ratio of AT2.
5. The recommendation for action point 4 would lead to higher demand of oxygen in AT2. A suitable system for the increased oxygen demand should be put in place in AT2.
6. It is further recommended that a suitable arrangement for the online measurement of the dissolved oxygen (DO) should be installed for continuous monitoring of oxygen levels in AT1 and AT2.

Dr. R. K. GUPTA
Professor
Department of Chemical Engineering
Thapar Institute of Engineering

Back

S No.	Recommendations of Thapar Study to improve ETP performance	Action Point	Status
1.	BOD to COD Ratio at USBR inlet is 0.2 , which is on lower side . This ratio may be improved by reducing the COD, i.e., the COD caused by suspended particles. It is recommended to install a suitable unit operation for the removal of this COD. This will help in improving the efficiency of the USBR. Also, the sludge that will be generated in the separation system may be sold or burned as boiler fuel.	The industry has just recently installed and commissioned suitable technology including DAF and Screw Press for the removal of COD caused by suspended particles to improve the efficiency of USBR. This was also a joint committee recommendation point which has been completed . The biomass generated from this system is being utilized in boiler as a biomass fuel also resulting in carbon foot print reduction .	Complied
2	Food to Biomass (F/M) ratio in the aeration tank 1 (AT1) is 0.56, which is on the higher side. It should be kept less that 0.4. It is recommended that the total inlet flow be split into two parts. One part of the flow should be sent to AT1 and the other part be sent to AT2.	The industry will install a pipeline along with valves to divert the inlet flow into Aeration Tank 2 to reduce the ratio from 0.56 to < 0.4 . This will be completed by 5 Feb 2021.	Complied
3	Oxygen being supplied in AT1 based on the current F/M ratio is less. After the flow diversion to AT2, the quantity of oxygen supply will become adequate.	This point will be closed after the completion of action of S No. 2	Complied
4	Food to Biomass (F/M) ratio in the aeration tank 2 (AT2) is 0.06, which is on the lower side. For better performance of the system, it is recommended to keep the ration above 0.1. The action suggested at point no. 3, would also help in improving the F/M ratio of AT2.	This point will be closed after the completion of action of S No. 2	Complied
5	The recommendation of action point 4 would lead to higher demand of oxygen in AT2. A suitable system for the increased oxygen demand should be put in place in AT2.	The industry will install new advanced aerators with high oxygen transfer efficiency (2.2 Kg/kwh from existing 1.0 Kg/Kwh) . The total investment of the project is 248 Lacs and this will be installed , commissioned and stabilized by 20 Feb .	Complied.
6	It is further recommended that a suitable arrangement for the online measurement of the dissolved oxygen (DO) should be installed for continuous monitoring of oxygen levels in AT1 and AT2.	The industry will install online measurement of the dissolved oxygen for continuous monitoring of oxygen levels in AT1 and AT2 .	Complied

ENCLOSURES FOR RECOMMENDATIONS OF THAPAR INSTITUTE

1. REMOVAL OF NON DEGRADABLE COD





Wet Wash load reduction details By Installation of DAF				
Sr. No.	Month	UASB inlet COD (Before Installation of DAF) (in PPM)	Month	UASB inlet COD (After installation of DAF) (in PPM)
1	May-20	5087	Nov-20	3627
2	Jun-20	5604	Dec-20	3846
3	Jul-20	5769	Jan-21	3876
4	Aug-20	6065	Feb-21	3914
5	Sep-20	5896	Mar-21	4539
6	Average	5684	Average	3960.4
7	Reduction of COD load		%	30.3

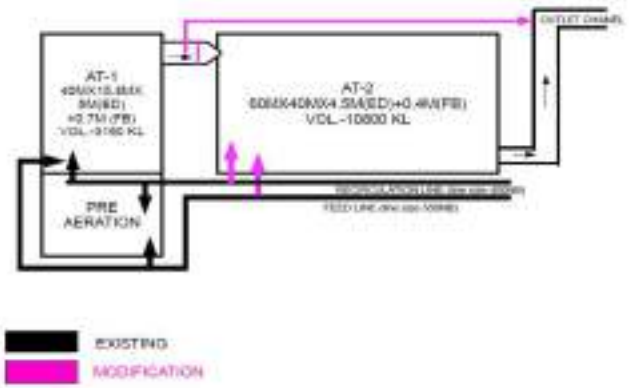
2. INSTALLATION OF ADVANCED AERATORS







3. AERATION TANK OPERATION FROM SERIES TO PARALLEL





4. INSTALLATION OF ONLINE D.O SENSOR



STORY OF INNOVATIVE PROJECTS AT ETP

In the journey of innovative projects we recently did the projects in area of ETP with the below main objectives:

- To reduce the ETP inlet load by recovery of biomass from washing effluent through adoption of DAF & Screw Press technology.

The above projects were implemented in collaboration with Krofta India, Bellmer Germany.

The projects were completed by the hard efforts of all respective team members including civil, process, electrical, mechanical, instrumentation and administration.

The implementations of projects have given following advantages:

a) Reduction in load to ETP.
b) Recovery of Biomass and usage as co incineration fuel.
c) Reduction in GHG Emissions (Carbon foot print).

The implantation of above projects has motivated the team.
Pictures of DAF & Screw press is as follows





Wet Wash load reduction details By Installation of DAF				
Sr. No.	Month	UASB inlet COD (Before Installation of DAF) (in PPM)	Month	UASB inlet COD (After Installation of DAF) (in PPM)
1	05/20	5087	11/20	3627
2	06/20	5604	12/20	3846
3	07/20	5769	01/21	3876
4	08/20	6065	02/21	3914
5	09/20	5896	03/21	4539
6	Average	5684	Average	3960.4
7	Reduction of COD load		%	30.3

Fwd: Submission of Project Proposal : Color Removal : Pilot Study

RAJAT MONGA <rajatmonga@tridentindia.com>
Thu 21/10/2021 10:47
To: AJAY MOLIYA <Ajaymoliya@tridentindia.com>

Get Outlook for iOS

From: RAJAT MONGA <rajatmonga@tridentindia.com>
Sent: Tuesday, February 23, 2021 12:55:48 PM
To: registrar@thapar.edu <registrar@thapar.edu>
Cc: SOURAV CHOUDHARY <SouravChoudhary@tridentindia.com>; Anoop Kumar <anoop.kumar@thapar.edu>
Subject: Re: Submission of Project Proposal : Color Removal : Pilot Study

Dear Sir,

This is in reference to the project proposal related to the removal of color from our treated ETP Effluent.

We would like to be associated with your prestigious institute for conducting feasibility analysis on the new technological adoption for removal of color.

We have discussed with Dr Anoop Verma Department of Energy and Environment and allocated this project for conducting this study .

The details of payment of 4.48 Lacs as mentioned in the proposal will be shared in the subsequent mail .

You are requested to please accept our confirmation for the same and work with us.

Thanks & Regards



Rajat Monga
DC | Sustainability Pb
Sustainability Pb
Dhaula

Corporate Address:

TRIDENTGROUP™
E-212 Kitchlu Nagar, Ludhiana - 141001 , Fax : +91 161 5039900
Mob. +91-+919878997508 | Toll Free No.1800-180-2999 (Extn. 2708)
| rajatmonga@tridentindia.com
Visit us at http://www.tridentindia.com

From: Anoop Kumar <anoop.kumar@thapar.edu>
Sent: Sunday, February 14, 2021 11:46 AM
To: RAJAT MONGA <rajatmonga@tridentindia.com>
Subject: Re: Submission of Project Proposal

EXTERNAL EMAIL:** Treat hyperlinks and attachments in this email with caution

Dear Mr Rajat
Hope you are doing well. As requested, I have sent the required details for transferring the funds to thapar account. Kindly confirm me once you execute the transfer (reference number), so that we can claim that amount in our project.
As requested, Kindly mail one acceptance letter to the Registrar (registrar@thapar.edu) with cc to me also.
The requested details are as follows (once again with GSTIN number also):
GSTIN: 03AAAAT4247P1Z9
Pan :AAAA T4247P
TAN :PTLT10043F
Account holder name: Registrar, TIET
Looking forward to hearing from you soon
Best regards

Dr. Anoop Verma
Associate Professor,
School of Energy and Environment
Thapar Institute of Engineering and Technology, Patiala-147004
email: anoop.kumar@thapar.edu, anoop_tiet@yahoo.co.in
Ph: 09815654776(M)
http://scholar.google.co.in/citations?user=HZHZGVUAAAAJ&hl=en
https://orcid.org/0000-0003-2818-6348

On Sat, Feb 13, 2021 at 1:09 PM RAJAT MONGA <rajatmonga@tridentindia.com> wrote:

> Dear Mr Anoop,
>
> Greetings from the Trident!!
>
> We need to know some more details to process the payment as per information received from our accounts team.
>
> GST No.
> PAN No.
> Bank Account Holder Name
>
> ---
>
> **From:** Anoop Kumar <anoop.kumar@thapar.edu>
> **Sent:** Sunday, February 7, 2021 2:16 PM
> **To:** RAJAT MONGA <rajatmonga@tridentindia.com>
> **Cc:** SOURAV CHOUDHARY <SouravChoudhary@tridentindia.com>
> **Subject:** Re: Submission of Project Proposal
>
> ***EXTERNAL EMAIL:** Treat hyperlinks and attachments in this email with caution***
>
> Dear Mr. Rajat
> Really nice to hear from you. Thanks for accepting our proposal to collaborate with your organization on study and piloting on colour removal of pulp and paper Treated Effluent. We are looking forward to working on this project and have fruitful collaboration with your industry for this problem.

Now to proceed further, you are kindly requested to mail an **acceptance letter to Registrar TIET** (registrar@thapar.edu) mentioning all the details with cc to me. This acceptance letter may contain our past discussion on the industry problem during your visit and submission of concept note by me. Kindly mention the title of the project and sanctioned amount in that letter.
For transferring the **project amount**, the details of the bank account of Thapar are attached herewith for your reference.
In case of any clarification, please do not hesitate to contact me.
Best Regards

Dr. Anoop Verma
Associate Professor,
School of Energy and Environment
Thapar Institute of Engineering and Technology, Patiala-147004
email: anoop.kumar@thapar.edu, anoop_tiet@yahoo.co.in
Ph: 09815654776(M)
http://scholar.google.co.in/citations?user=HZHZGVUAAAAJ&hl=en
https://orcid.org/0000-0003-2818-6348

On Sat, Feb 6, 2021 at 12:59 PM RAJAT MONGA <rajatmonga@tridentindia.com> wrote:

> Dear Mr Anoop ,
>
> Thank you for submitting us the proposal .
>
> We would like to collaborate for this study and piloting on colour removal of Paper Treated Effluent based on the case note submitted .
>
> We would also request you kindly submit us the details how can we process the payment .
>
> Thanks & Regards
>
> 
>
> Rajat Monga
> DC | Sustainability Pb
> Sustainability Pb
> Dhaula
>
> Corporate Address:
>
> TRIDENTGROUP™
> E-212 Kitchlu Nagar, Ludhiana - 141001 , Fax : +91 161 5039900
> Mob. +91-+919878997508 | Toll Free No.1800-180-2999 (Extn. 2708)
> | rajatmonga@tridentindia.com
> Visit us at http://www.tridentindia.com
>
> ---
>
> **From:** Anoop Kumar <anoop.kumar@thapar.edu>
> **Sent:** 26 January 2021 22:20
> **To:** RAJAT MONGA <rajatmonga@tridentindia.com>
> **Subject:** Submission of Project Proposal

EXTERNAL EMAIL:** Treat hyperlinks and attachments in this email with caution

Dear Mr. Rajat
Hope you are doing well. This is regarding your request and our subsequent discussion on the project proposal related to removal of color from the treated effluent at Thapar Institute. It was a really nice discussion with you and as agreed upon, I am attaching the brief concept note along with financial requirements for your perusal. Kindly go through it and let me know if some information is required from my side.
Looking forward to hearing from you soon
Best Regards
Dr. Anoop Verma
Associate Professor,
School of Energy and Environment
Thapar Institute of Engineering and Technology, Patiala-147004
email: anoop.kumar@thapar.edu, anoop_tiet@yahoo.co.in
Ph: 09815654776(M)
http://scholar.google.co.in/citations?user=HZHZGVUAAAAJ&hl=en
https://orcid.org/0000-0003-2818-6348
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****

********** Our Vision: Inspired by Challenge, we will add value to life, and together, prosper globally. Our Values: To provide Customer Satisfaction, through Teamwork, based on Honesty & Integrity, for Continuous Growth & Development. ********** DISCLAIMER - tridentindia.com ********** The information transmitted is intended only for the person or entity to which it is addressed and may contain confidential and /or privileged material. Any review, retransmission, dissemination or other use of, or taking of any action in reliance upon, this information by persons or entities other than the intended recipient is prohibited. If you are not the intended recipient, please contact the sender and delete the material from any computer.
****

Feasibility of using Advanced Oxidation Processes (AOPs) as pre or post treatment option for treating industry waste water: An approach towards reuse of treated trade effluent for the industry

Submitted by:

Dr. Anoop Verma

Associate Professor and Head

School of Energy and Environment

Thapar Institute of Engineering and Technology, Patiala.

1. Scope of work:

There is wider demand and scope for industries to approach Zero Liquid Discharge (ZLD) using appropriate technologies. Accordingly, ZLD industries will need to develop a technology which can treat their own wastewater so as to recycle and reuse the same. Especially when we talk about Pulp and Paper (P&P) industry a fastest growing sector around the world which highly demands freshwater utilization for their processes. P&P industry using best technologies for treating their waste water but presence of colour in their wastewater even after secondary treatment restrict any further applications. The methods used for colour removal, as per the technology available so far, are quite expensive and less efficient. Hence certain technological interventions need to be successfully implemented in different stages of industrial treatment system for colour removal.

2. Proposed technology:

With deliberation to the industry, Thapar team proposes the technology to remove the colour from various possible sections of the industry.

To cover the former mentioned drawbacks our study will try to incorporate two processes i.e. advance treatment techniques as dual technology to efficiently overcome the problem of industry, and the plus point of our technology is zero sludge or waste generation as it converts the organic contaminants to simple water and carbon dioxide. Best efforts would be made to integrate the in-situ dual effect (photocatalysis and photo-Fenton) at various stages of the selected pulp and paper making industry. Photocatalysis is considered an effective system for the mineralization of many organics through the generation of HO• and $O_2^{\bullet -}$ radical, reducing the organic load of effluents as this technology converts the harmful substances to water and carbon dioxide which are non-toxic. The principle of photocatalysis involves the initial absorption of photons with energy equal to or greater than the bandgap energy of the semiconductor, leading to the formation of electrons and holes (Sujatha et. al., 2020). In photo-Fenton when the system is irradiated with UV or visible light, the photo-reduction of ferric to ferrous ions is promoted concomitantly with the generation of additional HO• (Romero et. al., 2016). These two technologies have shown their proficiency in removing colour or treating wastewater of the P&P (Kumar et. al., 2011) industry as well as the textile industry (Tian et. al., 2020). The proposed study attempts to incorporate the in-situ dual processes (Photocatalysis and photo-Fenton) in fixed-mode to visualize its feasibility to

treat different streams of P&P industry. The study also incorporates the idea of circular economy by using waste materials in fabrication of composite to make it more cost effective.

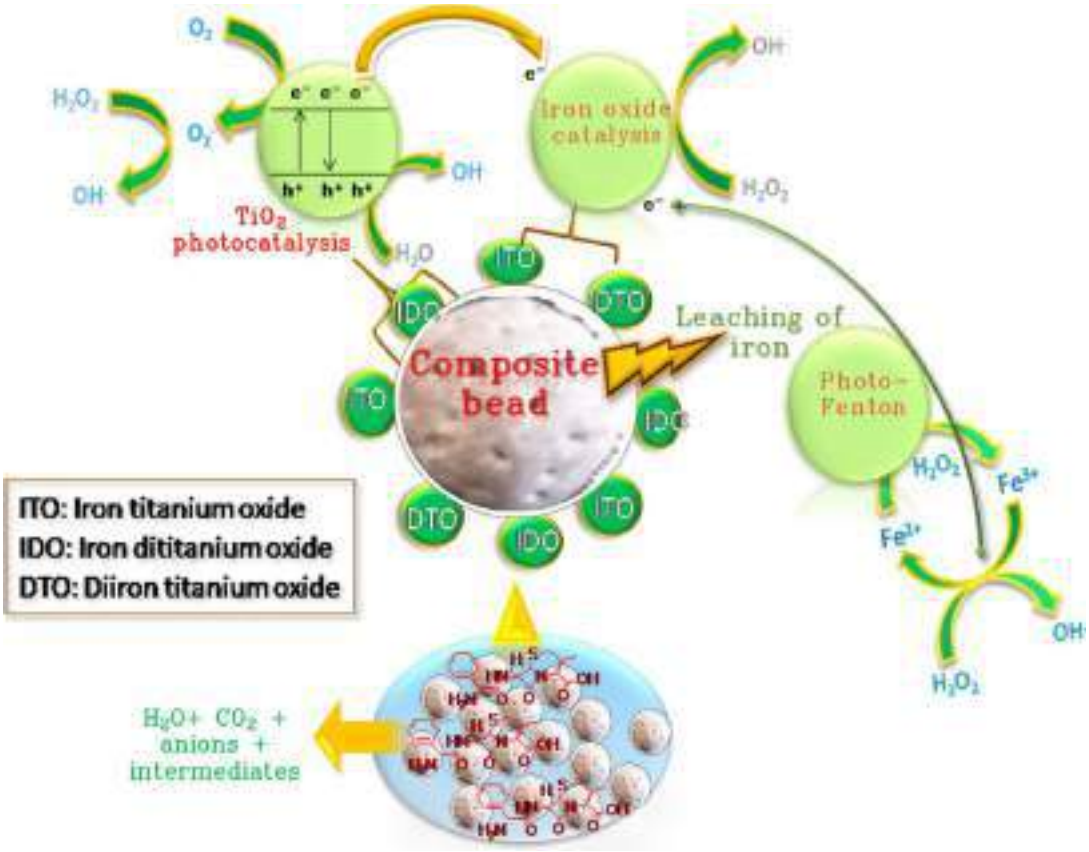


Fig. 1 Concept of in-situ dual effect of both photocatalysis and photo-Fenton.

Fig. 2 shows targeted streams to be worked upon. To start with, we have worked on the final stream i.e. O/L. Presently we have optimized the batch scale study and came up with some delightful outcome as results of colour removal. Fig. 3 depicts the graph of % colour from the selected stream. Fig. 4 shows initial and final absorbance of the untreated and treated sample using UV-vis spectrophotometer. The decrement in UV region of final sample shows the effective removal of the colour of final stream which is also clearly visible in the solutions in testubes.

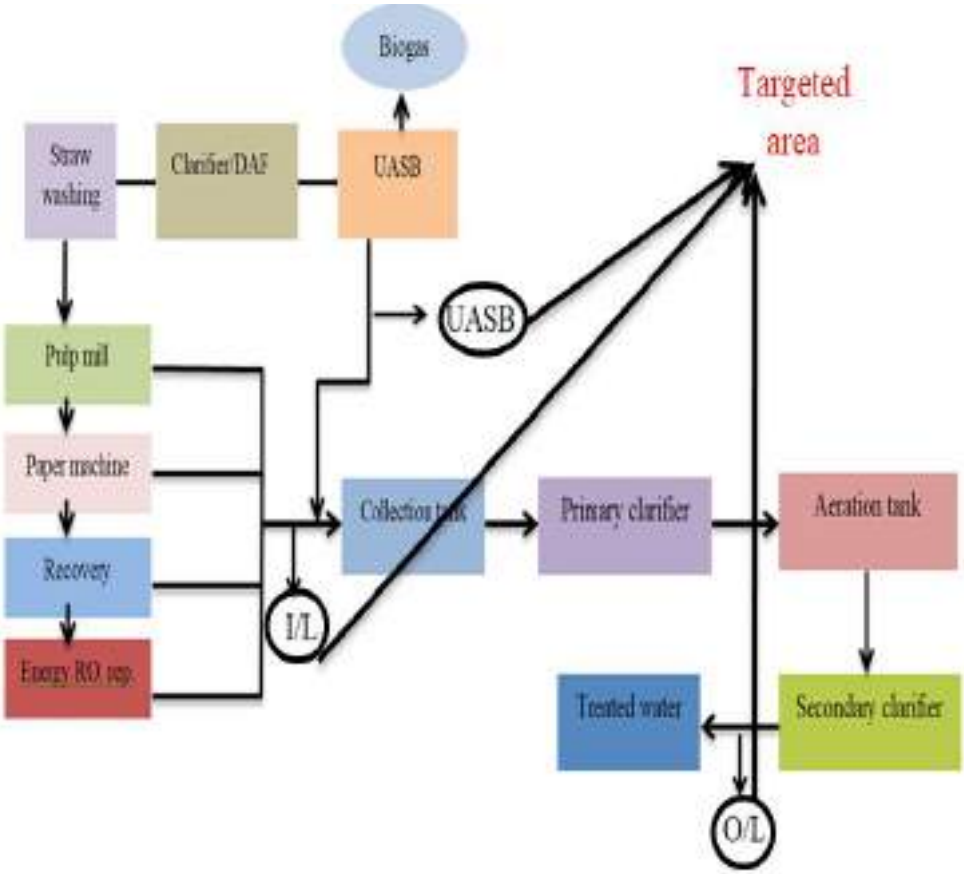


Fig. 2: Targeted streams of industry

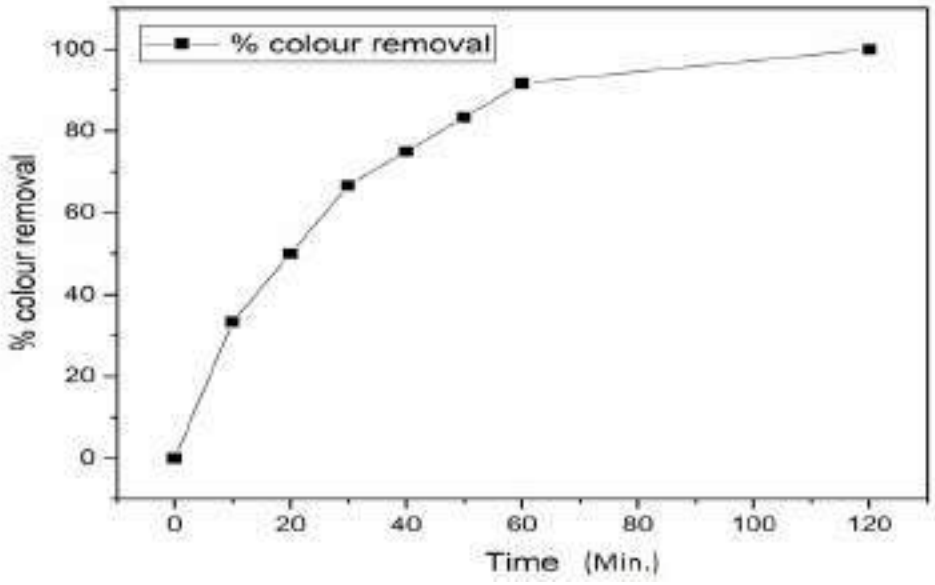


Fig.3: Graph of % colour removal with respect to time of treatment.

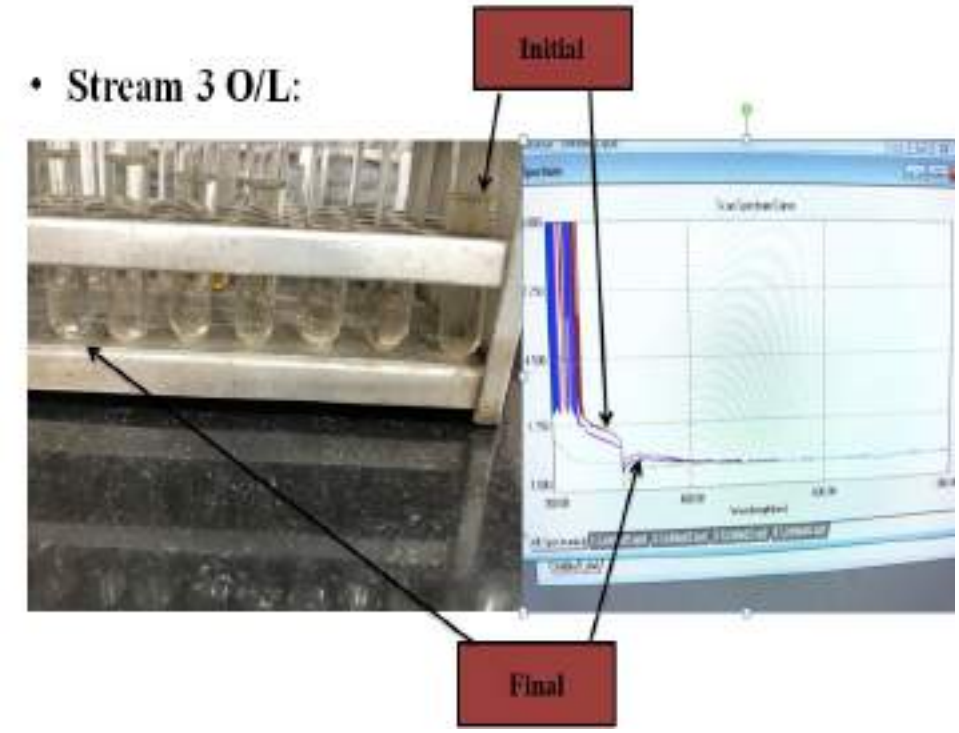


Fig.4: Spectroscopic analysis of O/L after treatment.

3. **Future plans:**
   - Currently we are working on final effluent but in near future we will start optimization studies and hit and trials on other streams i.e. UASB and I/L as well.
   - Further testing and process optimization will be done by varying factors like catalyst dose, time, oxidant dose, pH etc.
   - Best efforts would also be made to study dual effect in once through process using fixed bed reactors. Furthermore, this study will try to increase the process economics and will suggest the suitable steps to be taken to the concerned industry for further applications.

Annexure-11

Dear Sir/ Madam ,

We are pleased to place the Purchase Order no. 7600006838 on your esteemed organization as per the terms & conditions agreed upon.

Any discrepancy regarding the acceptance of Purchase order including the terms and conditions mentioned therein is to be intimated to the Company within 24 hours of its receipt.

In case, no communication intimating any discrepancy is received by the Company in writing with in 24 hours of the receipt of Purchase Order, the Purchase Order shall be considered to have been accepted by you.

We would also request you to kindly share the progress of the said order on weekly / monthly basis with the under mentioned Email Id

Thanking You

For Trident Limited

E-212, KITCHLU NAGAR, LUDHIANA 141001
Contact No. : 9878999481
Email : jasbirpurchase@tridentindia.com
Purchase Team .

TRIDENTGROUP

Trident Limited - Energy
P&C Division,Mansa Road
Dhaula, Barnala (Punjab)
PURCHASE ORDER

Vendor 850275
JAY WATER MANAGEMENT PVT LTD
239,GROUND FLOOR,PATPARGANJ INDUSTR
DELHI
110092
Country India
Vendor GSTIN No. 07AABCJ6770C1ZP

Ship To
TL - Dhaula Energy 2
P&C Division,Mansa Road
Dhaula, Barnala (Punjab)
BARNALA
148107

Mobile 9878999481
jasbirpurchase@tridentindia.com

Bill To
Trident Limited - (Paper & Chemical Division)
Mansa Road, Dhaula
BARANALA (PUNJAB)
148101

Mobile 9878999481
jasbirpurchase@tridentindia.com

PO Number	7600006838	**Dated**	30.10.2020
Our Ref.	13760	**Currency**	INR
Your Ref.	offer		

PO Status :- Valid/Approved
Quality Certificate :- Required

S.No.	Item Code Item Description Sale Order PO Number/ Week Code	UOM/ Brand	Order Qty.	Basic Rate	Discount	PKG-FWD	HSN/SAC	CGST/SGST/IGST/ C.Cess	Coal Cess	Item Value	Cancellation Date	Plant
00001	811010280 MEMBRN FILTR-POLYAMD-0.001MIC-40"-8"-ROU TORAY MEMBRANES TM720D-400	NOS/ TORAY	72.000	26,500.00 INR/ 1 NOS	0.00 0.00	0.00 0.00	8421.99.00	0.00 /0.00 /18.00 343,440.00	0.00	2,251,440.00	25.11.2020	TE02 ENERGY-2

Total Value 2,251,440.00 INR

Total Value:INR TWENTY TWO LAKH FIFTY ONE THOUSAND FOUR HUNDRED FORTY Rupees

TRIDENTGROUP

Trident Limited - Energy
P&C Division,Mansa Road
Dhaula, Barnala (Punjab)
PURCHASE ORDER

Vendor 850275
JAY WATER MANAGEMENT PVT LTD
239,GROUND FLOOR,PATPARGANJ INDUSTR
DELHI
110092
Country India
Vendor GSTIN No. 07AABCJ6770C1ZP

Ship To
TL - Dhaula Energy 2
P&C Division,Mansa Road
Dhaula, Barnala (Punjab)
BARNALA
148107

Mobile 9878999481
jasbirpurchase@tridentindia.com

Bill To
Trident Limited - (Paper & Chemical Division)
Mansa Road, Dhaula
BARANALA (PUNJAB)
148101

Mobile 9878999481
jasbirpurchase@tridentindia.com

PO Number	7600006838	**Dated**	30.10.2020
Our Ref.	13760	**Currency**	INR
Your Ref.	offer		

PO Status :- Valid/Approved
Quality Certificate :- Required

Price Basis: EXW DELHI **Freight :** F **Special Instruction**

Payment Terms: Due Net in 30 Days **Octroi:** As per Documentary Evidence

Transportation Mode: By AIR /RAIL /SEA /COURIER /ROAD **Transit Insurance** TO BE ARRANGED BY US.

The consignment shall be accepted only if accompanied by Original Invoice for Buyer and Duplicate for Transporter failing which the consignment shall be returned at your risk and cost .

Terms and Conditions As mentioned overleaf
Cancellation Date As above

Our Banker: State Bank of India, Industrial Finance Branch,Golden tower, Dholewal Chowk, Ludhiana

GSTIN No.. 03AABCA4139J1Z0

This is computer generated Purchase Order.Hence requires no signature.

TRIDENTGROUP

Trident Limited - Energy
P&C Division,Mansa Road
Dhaula, Barnala (Punjab)
PURCHASE ORDER

Vendor 850275 JAY WATER MANAGEMENT PVT LTD 239,GROUND FLOOR,PATPARGANJ INDUSTR DELHI 110092 **Country** India **Vendor GSTIN No.** 07AABCJ6770C1ZP	**Ship To** TL - Dhaula Energy 2 P&C Division,Mansa Road Dhaula, Barnala (Punjab) BARNALA 148107 **Mobile** 9878999481 jasbirpurchase@tridentindia.com	**Bill To** Trident Limited - (Paper & Chemical Division) Mansa Road, Dhaula BARANALA (PUNJAB) 148101 **Mobile** 9878999481 jasbirpurchase@tridentindia.com	**PO Number**	7600006838	**Dated**	30.10.2020
			Our Ref.	13760	**Currency**	INR
			Your Ref.	offer		
			PO Status :- Valid/Approved **Quality Certificate** :- Required			

S.No.	Item Code Item Description	Master Inspection Characteristics(MIC)	Upper Specification Limit	UOM	Target Specification Limit

TRIDENTGROUP

Trident Limited - Energy
P&C Division,Mansa Road
Dhaula, Barnala (Punjab)
PURCHASE ORDER

Vendor 850275 JAY WATER MANAGEMENT PVT LTD 239,GROUND FLOOR,PATPARGANJ INDUSTR DELHI 110092 **Country** India **Vendor GSTIN No.** 07AABCJ6770C1ZP	**Ship To** TL - Dhaula Energy 2 P&C Division,Mansa Road Dhaula, Barnala (Punjab) BARNALA 148107 **Mobile** 9878999481 jasbirpurchase@tridentindia.com	**Bill To** Trident Limited - (Paper & Chemical Division) Mansa Road, Dhaula BARANALA (PUNJAB) 148101 **Mobile** 9878999481 jasbirpurchase@tridentindia.com	**PO Number**	7600006838	**Dated**	30.10.2020
			Our Ref.	13760	**Currency**	INR
			Your Ref.	offer		
			PO Status :- Valid/Approved **Quality Certificate** :- Required			

S.No.	Item Code Item Description	Mat. Classification	PO Material Text
00001	811010280 MEMBRN FILTR-POLYAMD-0.001MIC-40"-8"-ROU	Standard	

TRIDENTGROUP

Trident Limited - Energy
P&C Division,Mansa Road
Dhaula, Barnala (Punjab)
PURCHASE ORDER

Vendor 850275 JAY WATER MANAGEMENT PVT LTD 239,GROUND FLOOR,PATPARGANJ INDUSTR DELHI 110092 **Country** India **Vendor GSTIN No.** 07AABCJ6770C1ZP	**Ship To** TL - Dhaula Energy 2 P&C Division,Mansa Road Dhaula, Barnala (Punjab) BARNALA 148107 **Mobile** 9878999481 jasbirpurchase@tridentindia.com	**Bill To** Trident Limited - (Paper & Chemical Division) Mansa Road, Dhaula BARANALA (PUNJAB) 148101 **Mobile** 9878999481 jasbirpurchase@tridentindia.com	**PO Number**	7600006838	**Dated**	30.10.2020
			Our Ref.	13760	**Currency**	INR
			Your Ref.	offer		
			PO Status :- Valid/Approved **Quality Certificate** :- Required			

DELIVERY SCHEDULE

S.NO	Item Code Item Description	UOM	PO Qty	Scheduled Date	Sch Qty	Delivered Qty	Open Qty as on 09.10.2021	Contract No	Remaining Contract Value/Qty
00001	811010280 MEMBRN FILTR-POLYAMD-0.001MIC-40"-8"-ROU	NOS	72.000	25.11.2020	72.000	72.000	0.000		0.00

Terms and Conditions

This Purchase Order is subject to all terms, conditions and specifications hereinafter set forth and acceptance of order by the Seller shall be deemed to be an agreement that the order is subject to all of said terms, conditions and specifications.

General

Non Acceptance of Purchase order with its terms and conditions is to be intimated to the Purchaser within 24 hours of its receipt, else the same shall be assumed to be accepted at the discretion of the Purchaser. No deviation to this order shall be honoured unless authorized in writing.
Purchase Order number, material code and GST IN of the Purchaser should be mentioned on each and every invoice. An invoice should not have more than 8 line items in it. Different Invoice should be raised for different Purchase Orders issued by the Purchaser.
The Seller shall be responsible for mentioning the correct details in the invoice, including HSN and GST rate of goods supplied to the Purchaser.
The Seller represents and warrants that it shall comply with the Laws pertaining to GST and other applicable indirect taxes and the requirements therein. The Seller shall be liable for all losses and damages suffered by the Purchaser due to any action or omission or mistake of the Seller.
The Seller shall unconditionally submit its account statement on Quarterly basis for reconciliation.
Weights / quantities as recorded by the Purchaser shall be final and binding on the Seller.
This Purchase Order shall not be amended, modified, altered or changed in any way except by writing executed by a duly authorized representative of the Purchaser.
Any other terms & conditions of the Seller mentioned on its Bills,Invoices, e-mails or any other documents shall not be binding on the Purchaser unless accepted in writing by the Authorized Representative of the Purchaser.
The Seller shall not disclose any confidential information pertaining to the Purchaser's business to any third party.
Neither party shall be entitled to assign the rights, interests and obligations without the previous written consent of the other Party.
The Seller shall not offer, solicit or accept an advantage in connection with the procurement of this Purchase Order. Failure to comply with this clause or any act of offering, soliciting or accepting advantage committed by the Seller shall, without affecting the liability of Seller for such failure and act, result in this Purchase Order being invalidated. For the purpose of this clause, Seller shall include its directors, partners, relatives, agents, associates, employees, servants and sub-consultants.
'Advantage' for this purpose shall mean any gift, loan, fee, reward or commission, any valuable security, office, employment, agreement, loan payment/waiver/discharge, bribe of any kind to Government/other officials, any other service or favour or any offer, undertaking or promise, whether conditional or unconditional, of such advantage.
The Seller or its directors, partners, relatives, associates, employees, agents and/ or sub-consultants shall not trade, directly or indirectly, in the shares of the Company during the currency and six months post expiry of this Purchase Order.

Delivery

The material shall be carefully and properly packed for movement by sea/rail/road transport to withstand damages on account of inclement weather, rough handling etc.
The material shall have to be delivered on the date of delivery specified in this Purchase Order. Decision for acceptance/rejection of material on the dates other than that specified in the Purchase Order along with the liquidated damages shall be at the sole discretion of the Purchaser.
The Seller shall not have any right to terminate the Purchase Order. However, the Purchaser reserves the right to cancel any unshipped portion at any time without assigning any reason.
All costs incurred in procurement of material from other source in the event of failure to supply the material on the scheduled date / rejection as per the terms of Purchase Order shall be to Seller's account and at the sole discretion of the Purchaser.
The price mentioned in the Purchase Order is inclusive of packing and handling charges unless otherwise stated therein.
Seller shall share the progress of the order on weekly basis in writing.
If delivery of the material mentioned in the Order occurs later than time specified and provided such delay is neither the result of force majeure nor the result of circumstances for which the Purchaser is responsible, the Purchaser shall be entitled to damages of 0.5% per week or part thereof subject to the maximum of 5% of the Contract price. For purpose of computing damages in the event of delay in delivery of the material, mere despatch of the material within the agreed date of delivery which are not in accordance with the specifications/standards, or found unacceptable by Purchaser would not amount to delivery within the agreed delivery date.

Inspection and Testing

Complete Test / Inspection reports from an approved source / as generated and certified by the Seller should be submitted along with the supply of material. Test reports generated by the Purchaser shall be binding on the Seller and no disputes whatsoever shall be entertained in this regard. Charges for testing, if any, shall be to the Seller's account and the decision to get the same inspected by any third party shall be at the sole discretion of the Purchaser.
Material must conform to all the specifications as specified in the Purchase Order. Any non-conformity identified during any later stage shall be treated as breach of contract and the Seller shall be liable to any penalties imposed at the sole discretion of the Purchaser.

Terms of payment

Original GST invoice should invariably accompany the material failing which the material may be rejected at the sole discretion of the Purchaser.
In the event of denial of input tax credit to the Purchaser on account of any negligence, erroneous or incorrect reporting, non payment of taxes or any other non-compliance made by the Seller in relation to the GST Law, the Purchaser shall be entitled to recover such loss from the Seller along with Interest @18% per annum.
Advances shall be released against submission of Advance Bank Guarantee of equivalent amount. All Advance and Performance Bank guarantee(s) shall be accepted only if they are in Purchaser's format and issued by the Banks recommended by the Purchaser unless otherwise agreed in writing.
Payment other than advances shall be made as specified in the terms and conditions of the Purchase Order and submission of all required documents.
Forms / Permits / Declarations shall be submitted as per the applicable laws/statute.
The prices under this Order shall remain firm until completion of the Contract

Intellectual property/Warranty, Inspection and Liability

Material supplied by the Seller pursuant to this Purchase Order should not infringe any third party intellectual property rights and the Seller further undertakes to indemnify the Purchaser against all claims for infringements of third party patents and/or other intellectual property rights by material supplied under this Purchase Order.
Material supplied by the Seller pursuant to the Purchase Order should have clean title in favour of the Seller before shipment to the Purchaser. Should there be any dispute to the ownership of the material,the Seller would be liable to make good for the costs incurred by the Purchaser to defend the title and the loss of profits due to its inability to use the subjected material, over and above the costs already paid to the Seller.
In the event of any breach of obligations mentioned in the Purchase Order by the Seller, the Purchaser shall be entitled to incidental and consequential damages including loss of profit. The Seller agrees to indemnify and hold the Purchaser, its customers and users of its products, harmless against any suits, damage or claim or any other expense resulting from a breach or alleged breach of the Seller's obligations including warranty, pursuant hereto. The Purchaser shall have the right to invoke the Performance Bank Guarantee submitted by the Seller for recovering the Liquidated damages.
All goods supplied shall be under an unconditional guarantee of 12 months from the date of commissioning / 18 months from the date of receipt (whichever is earlier) unless specified differently in the Purchase Order.
The Purchaser shall have the right for shop floor rejections even if the material has been accepted on delivery.
All costs (inclusive of taxes & duties) incurred by the Purchaser on account of rejections, despatch/warranty failures of material supplied under this Purchase Order shall be to Supplier's account.

Applicable law and Jurisdiction of Courts

Any dispute, controversy, differences or question arising out of, in relation to or incidental to this Purchase Order or the breach, termination or invalidity thereof shall be referred for arbitration to be governed in accordance with the Arbitration and Conciliation Act, 1996. Accordingly, the purchaser will nominate sole Arbitrator to settle any dispute, controversy, differences or question arising out of, in relation to or incidental to this Purchase Order or the breach, termination or invalidity thereof. The place of arbitration shall be in Barnala, Punjab, India and language of proceedings shall be English. Expenses of the arbitration proceeding shall be jointly shared by the parties.This Purchase order shall be governed by and construed in accordancewith the laws of India, and the parties agree to submit themselves tothe exclusive jurisdiction of the Courts at Barnala, India only. Further, where any material is imported under this Purchase Order, the laws applicable under the Indian statute would govern the resolution of conflicts.
This Purchase Order supersedes any/and/all other oral or written communications or other commitments between the parties with respect to its subject matter except the agreement executed between the parties and contains all of the covenants, terms and conditions agreed between the parties with respect thereto. Wherein an agreement is also executed between the parties on the same subject matter thereto with the terms, conditions and specifications, the Purchase Order shall become the part of the agreement. However, in case of any conflict in the terms, conditions, specifications mentioned in the agreement and the Purchase Order, the terms, conditions, specifications mentioned in the agreement shall prevail.
Each party hereto acknowledges that, except as set forth herein, neither party nor any one on behalf of either party has made any representations, inducements, promises or agreements, orally or otherwise,respecting the subject matter of this Agreement and/or Purchase Order.

Documents required to be attached with invoice.

1. Tax Invoice in original
2. Tax Invoice (Duplicate) in original
3. Quality certificate,

Dear Sir/ Madam ,

Annexure-12 (Industry)

We are pleased to place the Purchase Order no. 7600006816 on your esteemed organization as per the terms & conditions agreed upon.

Any discrepancy regarding the acceptance of Purchase order including the terms and conditions mentioned therein is to be intimated to the Company within 24 hours of its receipt.

In case, no communication intimating any discrepancy is received by the Company in writing with in 24 hours of the receipt of Purchase Order, the Purchase Order shall be considered to have been accepted by you.

We would also request you to kindly share the progress of the said order on weekly / monthly basis with the under mentioned Email Id

Thanking You

For Trident Limited

E-212, KITCHLU NAGAR, LUDHIANA 141001
Contact No. : 9878999481
Email : jasbirpurchase@tridentindia.com
Purchase Team .

TRIDENTGROUP

Trident Limited - P&C
Mansa Road,Dhaula
BARNALA, (PUNJAB)
PURCHASE ORDER

Vendor 740022
ALPHA ENGINEERING & SYSTEMS
A - 2, 2ND FLOOR, RAJOURI GARDEN
NEW DELHI
110027
Country India
Vendor GSTIN No. 07AAEPA1177G1Z5

Ship To
Trident-Dhaula (Utility)
Mansa Road,Dhaula
BARNALA, (PUNJAB)
BARNALA
148107

Mobile 9878999481
jasbirpurchase@tridentindia.com

Bill To
Trident Limited - P&C
Mansa Road,Dhaula
BARNALA, (PUNJAB)
148107

Mobile 9878999481
jasbirpurchase@tridentindia.com

PO Number	7600006816	**Dated**	23.10.2020
Our Ref.	13760	**Currency**	INR
Your Ref.	offer		

PO Status :- Valid/Approved
Quality Certificate :- Required

S.No.	Item Code Item Description Sale Order PO Number/ Week Code	UOM/ Brand	Order Qty.	Basic Rate	Discount	PKG-FWD	HSN/SAC	CGST/SGST/IGST/ C.Cess	Coal Cess	Item Value	Cancellation Date	Plant
00002	701010146 MAGNETIC FLOWMETER,6",MODEL:6410,ADEPT	NOS/ ADEPT	1.000	71,800.00 INR/ 1 NOS	25.00- 17,950.00-	0.00 0.00	9026.80.90	0.00 /0.00 /18.00 9,693.00	0.00	63,543.00	25.12.2020	TP15 UTILITY
00001	701010147 MAGNETIC FLOWMETER,8",MODEL:6410,ADEPT	NOS/ ADEPT	4.000	109,600.00 INR/ 1 NOS	25.00- 109,600.00-	0.00 0.00	9031.49.90	0.00 /0.00 /18.00 59,184.00	0.00	387,984.00	25.12.2020	TP15 UTILITY

Total Value 451,527.00 INR

Total Value:INR FOUR LAKH FIFTY ONE THOUSAND FIVE HUNDRED TWENTY SEVEN Rupees

TRIDENTGROUP

Trident Limited - P&C
Mansa Road,Dhaula
BARNALA, (PUNJAB)
PURCHASE ORDER

Vendor 740022
ALPHA ENGINEERING & SYSTEMS
A - 2, 2ND FLOOR, RAJOURI GARDEN
NEW DELHI
110027
Country India
Vendor GSTIN No. 07AAEPA1177G1Z5

Ship To
Trident-Dhaula (Utility)
Mansa Road,Dhaula
BARNALA, (PUNJAB)
BARNALA
148107

Mobile 9878999481
jasbirpurchase@tridentindia.com

Bill To
Trident Limited - P&C
Mansa Road,Dhaula
BARNALA, (PUNJAB)
148107

Mobile 9878999481
jasbirpurchase@tridentindia.com

PO Number	7600006816	**Dated**	23.10.2020
Our Ref.	13760	**Currency**	INR
Your Ref.	offer		

PO Status :- Valid/Approved
Quality Certificate :- Required

Price Basis: EXW DELHI **Freight :** F **Special Instruction** Magflow Meter with Integral Display

Payment Terms: Due Net in 45 Days **Octroi:** As per Documentary Evidence

Transportation Mode: By AIR /RAIL /SEA /COURIER /ROAD **Transit Insurance** TO BE ARRANGED BY US.

The consignment shall be accepted only if accompanied by Original Invoice for Buyer and Duplicate for Transporter failing which the consignment shall be returned at your risk and cost .

Terms and Conditions As mentioned overleaf
Cancellation Date As above

Our Banker: State Bank of India, Industrial Finance Branch,Golden tower, Dholewal Chowk, Ludhiana

GSTIN No.. 03AABCA4139J1Z0

This is computer generated Purchase Order.Hence requires no signature.

TRIDENTGROUP

Trident Limited - P&C
Mansa Road,Dhaula
BARNALA, (PUNJAB)
PURCHASE ORDER

Vendor 740022 ALPHA ENGINEERING & SYSTEMS A - 2, 2ND FLOOR, RAJOURI GARDEN NEW DELHI 110027 **Country** India **Vendor GSTIN No.** 07AAEPA1177G1Z5	**Ship To** Trident-Dhaula (Utility) Mansa Road,Dhaula BARNALA, (PUNJAB) BARNALA 148107 **Mobile** 9878999481 jasbirpurchase@tridentindia.com	**Bill To** Trident Limited - P&C Mansa Road,Dhaula BARNALA, (PUNJAB) 148107 **Mobile** 9878999481 jasbirpurchase@tridentindia.com	**PO Number**	7600006816	**Dated**	23.10.2020
			Our Ref.	13760	**Currency**	INR
			Your Ref.	offer		
			PO Status :- Valid/Approved **Quality Certificate** :- Required			

S.No.	Item Code Item Description	Master Inspection Characteristics(MIC)	Upper Specification Limit	UOM	Target Specification Limit

TRIDENTGROUP

Trident Limited - P&C
Mansa Road,Dhaula
BARNALA, (PUNJAB)
PURCHASE ORDER

Vendor 740022 ALPHA ENGINEERING & SYSTEMS A - 2, 2ND FLOOR, RAJOURI GARDEN NEW DELHI 110027 **Country** India **Vendor GSTIN No.** 07AAEPA1177G1Z5	**Ship To** Trident-Dhaula (Utility) Mansa Road,Dhaula BARNALA, (PUNJAB) BARNALA 148107 **Mobile** 9878999481 jasbirpurchase@tridentindia.com	**Bill To** Trident Limited - P&C Mansa Road,Dhaula BARNALA, (PUNJAB) 148107 **Mobile** 9878999481 jasbirpurchase@tridentindia.com	**PO Number**	7600006816	**Dated**	23.10.2020
			Our Ref.	13760	**Currency**	INR
			Your Ref.	offer		
			PO Status :- Valid/Approved **Quality Certificate** :- Required			

S.No.	Item Code Item Description	Mat. Classification	PO Material Text
00002	701010146 MAGNETIC FLOWMETER,6",MODEL:6410,ADEPT	Standard	
00001	701010147 MAGNETIC FLOWMETER,8",MODEL:6410,ADEPT	Standard	

Trident Limited - P&C
Mansa Road,Dhaula
BARNALA, (PUNJAB)
PURCHASE ORDER

Vendor 740022 ALPHA ENGINEERING & SYSTEMS A - 2, 2ND FLOOR, RAJOURI GARDEN NEW DELHI 110027 **Country** India **Vendor GSTIN No.** 07AAEPA1177G1Z5	**Ship To** Trident-Dhaula (Utility) Mansa Road,Dhaula BARNALA, (PUNJAB) BARNALA 148107 **Mobile** 9878999481 jasbirpurchase@tridentindia.com	**Bill To** Trident Limited - P&C Mansa Road,Dhaula BARNALA, (PUNJAB) 148107 **Mobile** 9878999481 jasbirpurchase@tridentindia.com	**PO Number**	7600006816	**Dated**	23.10.2020
			Our Ref.	13760	**Currency**	INR
			Your Ref.	offer		
			PO Status :- Valid/Approved **Quality Certificate** :- Required			

DELIVERY SCHEDULE

S.NO	Item Code Item Description	UOM	PO Qty	Scheduled Date	Sch Qty	Delivered Qty	Open Qty as on 08.10.2021	Contract No	Remaining Contract Value/Qty
00002	701010146 MAGNETIC FLOWMETER,6",MODEL:6410,ADEPT	NOS	1.000	25.12.2020	1.000	1.000	0.000		0.00
00001	701010147 MAGNETIC FLOWMETER,8",MODEL:6410,ADEPT	NOS	4.000	25.12.2020	4.000	4.000	0.000		0.00

Terms and Conditions

This Purchase Order is subject to all terms, conditions and specifications hereinafter set forth and acceptance of order by the Seller shall be deemed to be an agreement that the order is subject to all of said terms, conditions and specifications.

General

Non Acceptance of Purchase order with its terms and conditions is to be intimated to the Purchaser within 24 hours of its receipt, else the same shall be assumed to be accepted at the discretion of the Purchaser. No deviation to this order shall be honoured unless authorized in writing.
Purchase Order number, material code and GST IN of the Purchaser should be mentioned on each and every invoice. An invoice should not have more than 8 line items in it. Different Invoice should be raised for different Purchase Orders issued by the Purchaser.
The Seller shall be responsible for mentioning the correct details in the invoice, including HSN and GST rate of goods supplied to the Purchaser.
The Seller represents and warrants that it shall comply with the Laws pertaining to GST and other applicable indirect taxes and the requirements therein. The Seller shall be liable for all losses and damages suffered by the Purchaser due to any action or omission or mistake of the Seller.
The Seller shall unconditionally submit its account statement on Quarterly basis for reconciliation.
Weights / quantities as recorded by the Purchaser shall be final and binding on the Seller.
This Purchase Order shall not be amended, modified, altered or changed in any way except by writing executed by a duly authorized representative of the Purchaser.
Any other terms & conditions of the Seller mentioned on its Bills,Invoices, e-mails or any other documents shall not be binding on the Purchaser unless accepted in writing by the Authorized Representative of the Purchaser.
The Seller shall not disclose any confidential information pertaining to the Purchaser's business to any third party.
Neither party shall be entitled to assign the rights, interests and obligations without the previous written consent of the other Party.
The Seller shall not offer, solicit or accept an advantage in connection with the procurement of this Purchase Order. Failure to comply with this clause or any act of offering, soliciting or accepting advantage committed by the Seller shall, without affecting the liability of Seller for such failure and act, result in this Purchase Order being invalidated. For the purpose of this clause, Seller shall include its directors, partners, relatives, agents, associates, employees, servants and sub-consultants.
'Advantage' for this purpose shall mean any gift, loan, fee, reward or commission, any valuable security, office, employment, agreement, loan payment/waiver/discharge, bribe of any kind to Government/other officials, any other service or favour or any offer, undertaking or promise, whether conditional or unconditional, of such advantage.
The Seller or its directors, partners, relatives, associates, employees, agents and/ or sub-consultants shall not trade, directly or indirectly, in the shares of the Company during the currency and six months post expiry of this Purchase Order.

Delivery

The material shall be carefully and properly packed for movement by sea/rail/road transport to withstand damages on account of inclement weather, rough handling etc.
The material shall have to be delivered on the date of delivery specified in this Purchase Order. Decision for acceptance/rejection of material on the dates other than that specified in the Purchase Order along with the liquidated damages shall be at the sole discretion of the Purchaser.
The Seller shall not have any right to terminate the Purchase Order. However, the Purchaser reserves the right to cancel any unshipped portion at any time without assigning any reason.
All costs incurred in procurement of material from other source in the event of failure to supply the material on the scheduled date / rejection as per the terms of Purchase Order shall be to Seller's account and at the sole discretion of the Purchaser.
The price mentioned in the Purchase Order is inclusive of packing and handling charges unless otherwise stated therein.
Seller shall share the progress of the order on weekly basis in writing.
If delivery of the material mentioned in the Order occurs later than time specified and provided such delay is neither the result of force majeure nor the result of circumstances for which the Purchaser is responsible, the Purchaser shall be entitled to damages of 0.5% per week or part thereof subject to the maximum of 5% of the Contract price. For purpose of computing damages in the event of delay in delivery of the material, mere despatch of the material within the agreed date of delivery which are not in accordance with the specifications/standards, or found unacceptable by Purchaser would not amount to delivery within the agreed delivery date.

Inspection and Testing

Complete Test / Inspection reports from an approved source / as generated and certified by the Seller should be submitted along with the supply of material. Test reports generated by the Purchaser shall be binding on the Seller and no disputes whatsoever shall be entertained in this regard. Charges for testing, if any, shall be to the Seller's account and the decision to get the same inspected by any third party shall be at the sole discretion of the Purchaser.
Material must conform to all the specifications as specified in the Purchase Order. Any non-conformity identified during any later stage shall be treated as breach of contract and the Seller shall be liable to any penalties imposed at the sole discretion of the Purchaser.

Terms of payment

Original GST invoice should invariably accompany the material failing which the material may be rejected at the sole discretion of the Purchaser.
In the event of denial of input tax credit to the Purchaser on account of any negligence, erroneous or incorrect reporting, non payment of taxes or any other non-compliance made by the Seller in relation to the GST Law, the Purchaser shall be entitled to recover such loss from the Seller along with Interest @18% per annum.
Advances shall be released against submission of Advance Bank Guarantee of equivalent amount. All Advance and Performance Bank guarantee(s) shall be accepted only if they are in Purchaser's format and issued by the Banks recommended by the Purchaser unless otherwise agreed in writing.
Payment other than advances shall be made as specified in the terms and conditions of the Purchase Order and submission of all required documents.
Forms / Permits / Declarations shall be submitted as per the applicable laws/statute.
The prices under this Order shall remain firm until completion of the Contract

Intellectual property/Warranty, Inspection and Liability

Material supplied by the Seller pursuant to this Purchase Order should not infringe any third party intellectual property rights and the Seller further undertakes to indemnify the Purchaser against all claims for infringements of third party patents and/or other intellectual property rights by material supplied under this Purchase Order.
Material supplied by the Seller pursuant to the Purchase Order should have clean title in favour of the Seller before shipment to the Purchaser. Should there be any dispute to the ownership of the material,the Seller would be liable to make good for the costs incurred by the Purchaser to defend the title and the loss of profits due to its inability to use the subjected material, over and above the costs already paid to the Seller.
In the event of any breach of obligations mentioned in the Purchase Order by the Seller, the Purchaser shall be entitled to incidental and consequential damages including loss of profit. The Seller agrees to indemnify and hold the Purchaser, its customers and users of its products, harmless against any suits, damage or claim or any other expense resulting from a breach or alleged breach of the Seller's obligations including warranty, pursuant hereto. The Purchaser shall have the right to invoke the Performance Bank Guarantee submitted by the Seller for recovering the Liquidated damages.
All goods supplied shall be under an unconditional guarantee of 12 months from the date of commissioning / 18 months from the date of receipt (whichever is earlier) unless specified differently in the Purchase Order.
The Purchaser shall have the right for shop floor rejections even if the material has been accepted on delivery.
All costs (inclusive of taxes & duties) incurred by the Purchaser on account of rejections, despatch/warranty failures of material supplied under this Purchase Order shall be to Supplier's account.

Applicable law and Jurisdiction of Courts

Any dispute, controversy, differences or question arising out of, in relation to or incidental to this Purchase Order or the breach, termination or invalidity thereof shall be referred for arbitration to be governed in accordance with the Arbitration and Conciliation Act, 1996. Accordingly, the purchaser will nominate sole Arbitrator to settle any dispute, controversy, differences or question arising out of, in relation to or incidental to this Purchase Order or the breach, termination or invalidity thereof. The place of arbitration shall be in Barnala, Punjab, India and language of proceedings shall be English. Expenses of the arbitration proceeding shall be jointly shared by the parties.This Purchase order shall be governed by and construed in accordancewith the laws of India, and the parties agree to submit themselves tothe exclusive jurisdiction of the Courts at Barnala, India only. Further, where any material is imported under this Purchase Order, the laws applicable under the Indian statute would govern the resolution of conflicts.
This Purchase Order supersedes any/and/all other oral or written communications or other commitments between the parties with respect to its subject matter except the agreement executed between the parties and contains all of the covenants, terms and conditions agreed between the parties with respect thereto. Wherein an agreement is also executed between the parties on the same subject matter thereto with the terms, conditions and specifications, the Purchase Order shall become the part of the agreement. However, in case of any conflict in the terms, conditions, specifications mentioned in the agreement and the Purchase Order, the terms, conditions, specifications mentioned in the agreement shall prevail.
Each party hereto acknowledges that, except as set forth herein, neither party nor any one on behalf of either party has made any representations, inducements, promises or agreements, orally or otherwise,respecting the subject matter of this Agreement and/or Purchase Order.

Documents required to be attached with invoice.

1. Tax Invoice in original
2. Tax Invoice (Duplicate) in original
3. Quality certificate,

Dear Sir/ Madam ,

We are pleased to place the Purchase Order no. 7600006909 on your esteemed organization as per the terms & conditions agreed upon.

Any discrepancy regarding the acceptance of Purchase order including the terms and conditions mentioned therein is to be intimated to the Company within 24 hours of its receipt.

In case, no communication intimating any discrepancy is received by the Company in writing with in 24 hours of the receipt of Purchase Order, the Purchase Order shall be considered to have been accepted by you.

We would also request you to kindly share the progress of the said order on weekly / monthly basis with the under mentioned Email Id

Thanking You

For Trident Limited

E-212, KITCHLU NAGAR, LUDHIANA 141001
Contact No. : 9878999147
Email : ishneetkaur@tridentindia.com
Purchase Team .

TRIDENTGROUP

Trident Limited - Towel
Mansa Road, Dhaula
BARNALA (PUNJAB)
PURCHASE ORDER

Vendor 741067
ELETTA INSTRUMENTATION INDIA PRIVATE LIMITED
CRPOFFICE NO.5,7TH FLOOR, TOWER-A
NOIDA
201301
Country India
Vendor GSTIN No. 09AABCE4836E1ZR

Ship To
TL Dhaula Towel 2
Mansa Road, Dhaula
BARNALA (PUNJAB)
BARNALA
148107

Mobile 9878999147
ishneetkaur@tridentindia.com

Bill To
Trident Limited - Towel
Mansa Road, Dhaula
BARNALA (PUNJAB)
148107

Mobile 9878999147
ishneetkaur@tridentindia.com

PO Number	7600006909	**Dated**	20.11.2020
Our Ref.	70228	**Currency**	INR
Your Ref.	email		

PO Status :- Valid/Approved
Quality Certificate :- Required

S.No.	Item Code Item Description Sale Order PO Number/ Week Code	UOM/ Brand	Order Qty.	Basic Rate	Discount	PKG-FWD	HSN/SAC	CGST/SGST/IGST/ C.Cess	Coal Cess	Item Value	Cancellation Date	Plant
00001	701010781 MEASURE-10"-53-1767M3/HR-ELEC MAG FLOWME WITH MATING FLANGES	NOS/ ELETTA	1.000	109,620.00 INR/ 1 NOS	0.00 0.00	0.00 0.00	8424.90.00	0.00 /0.00 /18.00 19,731.60	0.00	129,351.60	30.12.2020	TT02 THT-2
00002	701010782 MEASURE-8"-34-1131M3/HR-ELEC MAG FLOWMET WITH MATING FLANGES	NOS/ ELETTA	1.000	87,500.00 INR/ 1 NOS	0.00 0.00	0.00 0.00	8424.90.00	0.00 /0.00 /18.00 15,750.00	0.00	103,250.00	30.12.2020	TT02 THT-2
00003	701010783 MEASURE-4"-8-283M3/HR-ELEC MAG FLOWMETER WITH MATING FLANGES	NOS/ ELETTA	1.000	60,480.00 INR/ 1 NOS	0.00 0.00	0.00 0.00	8424.90.00	0.00 /0.00 /18.00 10,886.40	0.00	71,366.40	30.12.2020	TT02 THT-2

Total Value 303,968.00 INR

Total Value:INR THREE LAKH THREE THOUSAND NINE HUNDRED SIXTY EIGHT Rupees

Trident Limited - Towel
Mansa Road, Dhaula
BARNALA (PUNJAB)
PURCHASE ORDER

Vendor 741067 ELETTA INSTRUMENTATION INDIA PRIVATE LIMITED CRPOFFICE NO.5,7TH FLOOR, TOWER-A NOIDA 201301 **Country** India **Vendor GSTIN No.** 09AABCE4836E1ZR	**Ship To** TL Dhaula Towel 2 Mansa Road, Dhaula BARNALA (PUNJAB) BARNALA 148107 **Mobile** 9878999147 ishneetkaur@tridentindia.com	**Bill To** Trident Limited - Towel Mansa Road, Dhaula BARNALA (PUNJAB) 148107 **Mobile** 9878999147 ishneetkaur@tridentindia.com	**PO Number**	7600006909	**Dated**	20.11.2020
			Our Ref.	70228	**Currency**	INR
			Your Ref.	email		
			PO Status :- Valid/Approved **Quality Certificate** :- Required			

Price Basis: FOR BARNALA **Freight:** F **Special Instruction** Installation on FOC basis

Payment Terms: Due Net in 30 Days **Octroi:** As per Documentary Evidence

Transportation Mode: By AIR /RAIL /SEA /COURIER /ROAD **Transit Insurance** TO BE ARRANGED BY SUPPLIER

The consignment shall be accepted only if accompanied by Original Invoice for Buyer and Duplicate for Transporter failing which the consignment shall be returned at your risk and cost .

Terms and Conditions As mentioned overleaf
Cancellation Date As above

Our Banker: State Bank of India, Industrial Finance Branch,Golden tower, Dholewal Chowk, Ludhiana

GSTIN No.. 03AABCA4139J1Z0

This is computer generated Purchase Order.Hence requires no signature.

Trident Limited - Towel
Mansa Road, Dhaula
BARNALA (PUNJAB)
PURCHASE ORDER

Vendor 741067 ELETTA INSTRUMENTATION INDIA PRIVATE LIMITED CRPOFFICE NO.5,7TH FLOOR, TOWER-A NOIDA 201301 **Country** India **Vendor GSTIN No.** 09AABCE4836E1ZR	**Ship To** TL Dhaula Towel 2 Mansa Road, Dhaula BARNALA (PUNJAB) BARNALA 148107 **Mobile** 9878999147 ishneetkaur@tridentindia.com	**Bill To** Trident Limited - Towel Mansa Road, Dhaula BARNALA (PUNJAB) 148107 **Mobile** 9878999147 ishneetkaur@tridentindia.com	**PO Number**	7600006909	**Dated**	20.11.2020
			Our Ref.	70228	**Currency**	INR
			Your Ref.	email		
			PO Status :- Valid/Approved **Quality Certificate** :- Required			

S.No.	Item Code Item Description	Master Inspection Characteristics(MIC)	Upper Specification Limit	UOM	Target Specification Limit

Trident Limited - Towel
Mansa Road, Dhaula
BARNALA (PUNJAB)
PURCHASE ORDER

Vendor 741067 ELETTA INSTRUMENTATION INDIA PRIVATE LIMITED CRPOFFICE NO.5,7TH FLOOR, TOWER-A NOIDA 201301 **Country** India **Vendor GSTIN No.** 09AABCE4836E1ZR	**Ship To** TL Dhaula Towel 2 Mansa Road, Dhaula BARNALA (PUNJAB) BARNALA 148107 **Mobile** 9878999147 ishneetkaur@tridentindia.com	**Bill To** Trident Limited - Towel Mansa Road, Dhaula BARNALA (PUNJAB) 148107 **Mobile** 9878999147 ishneetkaur@tridentindia.com	**PO Number**	7600006909	**Dated**	20.11.2020
			Our Ref.	70228	**Currency**	INR
			Your Ref.	email		
			PO Status :- Valid/Approved **Quality Certificate** :- Required			

S.No.	Item Code Item Description	Mat. Classification	PO Material Text
00001	701010781 MEASURE-10"-53-1767M3/HR-ELEC MAG FLOWME	Standard	
00002	701010782 MEASURE-8"-34-1131M3/HR-ELEC MAG FLOWMET	Standard	
00003	701010783 MEASURE-4"-8-283M3/HR-ELEC MAG FLOWMETER	Standard	

TRIDENTGROUP

Trident Limited - Towel
Mansa Road, Dhaula
BARNALA (PUNJAB)
PURCHASE ORDER

Vendor 741067
ELETTA INSTRUMENTATION INDIA PRIVATE LIMITED
CRPOFFICE NO.5,7TH FLOOR, TOWER-A
NOIDA
201301
Country India
Vendor GSTIN No. 09AABCE4836E1ZR

Ship To
TL Dhaula Towel 2
Mansa Road, Dhaula
BARNALA (PUNJAB)
BARNALA
148107

Mobile 9878999147
ishneetkaur@tridentindia.com

Bill To
Trident Limited - Towel
Mansa Road, Dhaula
BARNALA (PUNJAB)
148107

Mobile 9878999147
ishneetkaur@tridentindia.com

PO Number	7600006909	**Dated**	20.11.2020
Our Ref.	70228	**Currency**	INR
Your Ref.	email		

PO Status :- Valid/Approved
Quality Certificate :- Required

DELIVERY SCHEDULE

S.NO	Item Code Item Description	UOM	PO Qty	Scheduled Date	Sch Qty	Delivered Qty	Open Qty as on 20.10.2021	Contract No	Remaining Contract Value/Qty
00001	701010781 MEASURE-10"-53-1767M3/HR-ELEC MAG FLOWME	NOS	1.000	30.12.2020	1.000	1.000	0.000		0.00
00002	701010782 MEASURE-8"-34-1131M3/HR-ELEC MAG FLOWMET	NOS	1.000	30.12.2020	1.000	1.000	0.000		0.00
00003	701010783 MEASURE-4"-8-283M3/HR-ELEC MAG FLOWMETER	NOS	1.000	30.12.2020	1.000	1.000	0.000		0.00

Terms and Conditions

This Purchase Order is subject to all terms, conditions and specifications hereinafter set forth and acceptance of order by the Seller shall be deemed to be an agreement that the order is subject to all of said terms, conditions and specifications.

General

Non Acceptance of Purchase order with its terms and conditions is to be intimated to the Purchaser within 24 hours of its receipt, else the same shall be assumed to be accepted at the discretion of the Purchaser. No deviation to this order shall be honoured unless authorized in writing.
Purchase Order number, material code and GST IN of the Purchaser should be mentioned on each and every invoice. An invoice should not have more than 8 line items in it. Different Invoice should be raised for different Purchase Orders issued by the Purchaser.
The Seller shall be responsible for mentioning the correct details in the invoice, including HSN and GST rate of goods supplied to the Purchaser.
The Seller represents and warrants that it shall comply with the Laws pertaining to GST and other applicable indirect taxes and the requirements therein. The Seller shall be liable for all losses and damages suffered by the Purchaser due to any action or omission or mistake of the Seller.
The Seller shall unconditionally submit its account statement on Quarterly basis for reconciliation.
Weights / quantities as recorded by the Purchaser shall be final and binding on the Seller.
This Purchase Order shall not be amended, modified, altered or changed in any way except by writing executed by a duly authorized representative of the Purchaser.
Any other terms & conditions of the Seller mentioned on its Bills,Invoices, e-mails or any other documents shall not be binding on the Purchaser unless accepted in writing by the Authorized Representative of the Purchaser.
The Seller shall not disclose any confidential information pertaining to the Purchaser's business to any third party.
Neither party shall be entitled to assign the rights, interests and obligations without the previous written consent of the other Party.
The Seller shall not offer, solicit or accept an advantage in connection with the procurement of this Purchase Order. Failure to comply with this clause or any act of offering, soliciting or accepting advantage committed by the Seller shall, without affecting the liability of Seller for such failure and act, result in this Purchase Order being invalidated. For the purpose of this clause, Seller shall include its directors, partners, relatives, agents, associates, employees, servants and sub-consultants.
'Advantage' for this purpose shall mean any gift, loan, fee, reward or commission, any valuable security, office, employment, agreement, loan payment/waiver/discharge, bribe of any kind to Government/other officials, any other service or favour or any offer, undertaking or promise, whether conditional or unconditional, of such advantage.
The Seller or its directors, partners, relatives, associates, employees, agents and/ or sub-consultants shall not trade, directly or indirectly, in the shares of the Company during the currency and six months post expiry of this Purchase Order.

Delivery

The material shall be carefully and properly packed for movement by sea/rail/road transport to withstand damages on account of inclement weather, rough handling etc.
The material shall have to be delivered on the date of delivery specified in this Purchase Order. Decision for acceptance/rejection of material on the dates other than that specified in the Purchase Order along with the liquidated damages shall be at the sole discretion of the Purchaser.
The Seller shall not have any right to terminate the Purchase Order. However, the Purchaser reserves the right to cancel any unshipped portion at any time without assigning any reason.
All costs incurred in procurement of material from other source in the event of failure to supply the material on the scheduled date / rejection as per the terms of Purchase Order shall be to Seller's account and at the sole discretion of the Purchaser.
The price mentioned in the Purchase Order is inclusive of packing and handling charges unless otherwise stated therein.
Seller shall share the progress of the order on weekly basis in writing.
If delivery of the material mentioned in the Order occurs later than time specified and provided such delay is neither the result of force majeure nor the result of circumstances for which the Purchaser is responsible, the Purchaser shall be entitled to damages of 0.5% per week or part thereof subject to the maximum of 5% of the Contract price. For purpose of computing damages in the event of delay in delivery of the material, mere despatch of the material within the agreed date of delivery which are not in accordance with the specifications/standards, or found unacceptable by Purchaser would not amount to delivery within the agreed delivery date.

Inspection and Testing

Complete Test / Inspection reports from an approved source / as generated and certified by the Seller should be submitted along with the supply of material. Test reports generated by the Purchaser shall be binding on the Seller and no disputes whatsoever shall be entertained in this regard. Charges for testing, if any, shall be to the Seller's account and the decision to get the same inspected by any third party shall be at the sole discretion of the Purchaser.
Material must conform to all the specifications as specified in the Purchase Order. Any non-conformity identified during any later stage shall be treated as breach of contract and the Seller shall be liable to any penalties imposed at the sole discretion of the Purchaser.

Terms of payment

Original GST invoice should invariably accompany the material failing which the material may be rejected at the sole discretion of the Purchaser.
In the event of denial of input tax credit to the Purchaser on account of any negligence, erroneous or incorrect reporting, non payment of taxes or any other non-compliance made by the Seller in relation to the GST Law, the Purchaser shall be entitled to recover such loss from the Seller along with Interest @18% per annum.
Advances shall be released against submission of Advance Bank Guarantee of equivalent amount. All Advance and Performance Bank guarantee(s) shall be accepted only if they are in Purchaser's format and issued by the Banks recommended by the Purchaser unless otherwise agreed in writing.
Payment other than advances shall be made as specified in the terms and conditions of the Purchase Order and submission of all required documents.
Forms / Permits / Declarations shall be submitted as per the applicable laws/statute.
The prices under this Order shall remain firm until completion of the Contract

Intellectual property/Warranty, Inspection and Liability

Material supplied by the Seller pursuant to this Purchase Order should not infringe any third party intellectual property rights and the Seller further undertakes to indemnify the Purchaser against all claims for infringements of third party patents and/or other intellectual property rights by material supplied under this Purchase Order.
Material supplied by the Seller pursuant to the Purchase Order should have clean title in favour of the Seller before shipment to the Purchaser. Should there be any dispute to the ownership of the material,the Seller would be liable to make good for the costs incurred by the Purchaser to defend the title and the loss of profits due to its inability to use the subjected material, over and above the costs already paid to the Seller.
In the event of any breach of obligations mentioned in the Purchase Order by the Seller, the Purchaser shall be entitled to incidental and consequential damages including loss of profit. The Seller agrees to indemnify and hold the Purchaser, its customers and users of its products, harmless against any suits, damage or claim or any other expense resulting from a breach or alleged breach of the Seller's obligations including warranty, pursuant hereto. The Purchaser shall have the right to invoke the Performance Bank Guarantee submitted by the Seller for recovering the Liquidated damages.
All goods supplied shall be under an unconditional guarantee of 12 months from the date of commissioning / 18 months from the date of receipt (whichever is earlier) unless specified differently in the Purchase Order.
The Purchaser shall have the right for shop floor rejections even if the material has been accepted on delivery.
All costs (inclusive of taxes & duties) incurred by the Purchaser on account of rejections, despatch/warranty failures of material supplied under this Purchase Order shall be to Supplier's account.

Applicable law and Jurisdiction of Courts

Any dispute, controversy, differences or question arising out of, in relation to or incidental to this Purchase Order or the breach, termination or invalidity thereof shall be referred for arbitration to be governed in accordance with the Arbitration and Conciliation Act, 1996. Accordingly, the purchaser will nominate sole Arbitrator to settle any dispute, controversy, differences or question arising out of, in relation to or incidental to this Purchase Order or the breach, termination or invalidity thereof. The place of arbitration shall be in Barnala, Punjab, India and language of proceedings shall be English. Expenses of the arbitration proceeding shall be jointly shared by the parties.This Purchase order shall be governed by and construed in accordancewith the laws of India, and the parties agree to submit themselves tothe exclusive jurisdiction of the Courts at Barnala, India only. Further, where any material is imported under this Purchase Order, the laws applicable under the Indian statute would govern the resolution of conflicts.
This Purchase Order supersedes any/and/all other oral or written communications or other commitments between the parties with respect to its subject matter except the agreement executed between the parties and contains all of the covenants, terms and conditions agreed between the parties with respect thereto. Wherein an agreement is also executed between the parties on the same subject matter thereto with the terms, conditions and specifications, the Purchase Order shall become the part of the agreement. However, in case of any conflict in the terms, conditions, specifications mentioned in the agreement and the Purchase Order, the terms, conditions, specifications mentioned in the agreement shall prevail.
Each party hereto acknowledges that, except as set forth herein, neither party nor any one on behalf of either party has made any representations, inducements, promises or agreements, orally or otherwise,respecting the subject matter of this Agreement and/or Purchase Order.

Documents required to be attached with invoice.

1. Tax Invoice in original
2. Tax Invoice (Duplicate) in original
3. Quality certificate,

PUNJAB POLLUTION CONTROL BOARD
HEAD OFFICE AIR LAB. VATAVARAN BHAWAN, PATIALA

Web: www.ppcb.gov.in
E-mail:- ppcbairlab@gmail.com
Ph:- 0175-2302392

1. Laboratory Sample No.	93-94/ H.O.Lab./Air/Monitoring/2020-21
2. Name of Industry	M/s Trident Ltd. (PCD), Mansa Road, Dhaula, Distt. Barnala.
3 Name of Sample collecting Officer	Er. Vipin Kumar AEE and Dr. Sonam Dogra, SA
4. Designation of authorizing Test	EE, RO, Sangrur
5. Type of Sample	Stack Emission
6. Date &Time of Sample collection	30.04.2021
7. Date &Time of Sample receipt in Lab.	03.05.2021
8. Point of Sample collection	Details as Given Below

Results

Point of sample Collection	Parameter	Results	Prescribed Standards
Port Hole on stack after APCD of Chemical recovery plant–II	Particulate Matter	83 mg/Nm^3	150 mg/Nm^3
Port Hole on stack after APCD of 2 no Boilers of Cap. 130 TPH each	Particulate Matter	86 mg/Nm^3 at 12% CO_2	150 mg/Nm^3 at 12% CO_2

Note: If any, stringent limits/specific standard has been prescribed time to time by MoEF&CC, CPCB and PPCB, then stringent limits/specific standard would prevail subject to clarification from the concerned Regional office

Rupinder 5/5/2021
for **Scientific Officer**

Endst. No: 1/28385 **Dt.** 11/5/2021

A copy of the above is forwarded to the following for information and necessary action:-
1. The Chief Environmental Engineer, Punjab Pollution Control Board (Air), Jalandhar
2. The Senior Environmental Engineer, Punjab Pollution Control Board, Zonal Office-II Patiala
3. The Environmental Engineer, Punjab Pollution Control Board, Regional Office, Sangrur

Rupinder 5/5/2021
for **Scientific Officer**

Annexure-14 (Industry)

Dear Sir/ Madam ,

We are pleased to place the Purchase Order no. 7600007938 on your esteemed organization as per the terms & conditions agreed upon.

Any discrepancy regarding the acceptance of Purchase order including the terms and conditions mentioned therein is to be intimated to the Company within 24 hours of its receipt.

In case, no communication intimating any discrepancy is received by the Company in writing with in 24 hours of the receipt of Purchase Order, the Purchase Order shall be considered to have been accepted by you.

We would also request you to kindly share the progress of the said order on weekly / monthly basis with the under mentioned Email Id

Thanking You

For Trident Limited

E-212, KITCHLU NAGAR, LUDHIANA 141001
Contact No. : 9878999481
Email : jasbirpurchase@tridentindia.com
Purchase Team .

TRIDENTGROUP

Trident Limited - Energy
P&C Division,Mansa Road
Dhaula, Barnala (Punjab)
PURCHASE ORDER

Vendor 740059
ADOR POWERTRON LIMITED
PLOT NO -51, D-II BLOCK, RAM NAGAR
PUNE
411019
Country India
Vendor GSTIN No. 27AABCA5150B1ZA

Ship To
TL - Dhaula Energy 2
P&C Division,Mansa Road
Dhaula, Barnala (Punjab)
BARNALA
148107

Mobile 9878999481
jasbirpurchase@tridentindia.com

Bill To
Trident Limited - (Paper & Chemical Division)
Mansa Road, Dhaula
BARANALA (PUNJAB)
148101

Mobile 9878999481
jasbirpurchase@tridentindia.com

PO Number	7600007938	**Dated**	25.08.2021
Our Ref.	13760	**Currency**	INR
Your Ref.	offer		

PO Status :- Invalid/Unapproved
Quality Certificate :- Required

S.No.	Item Code / Item Description / Sale Order / PO Number/ Week Code	UOM/ Brand	Order Qty.	Basic Rate	Discount	PKG-FWD	HSN/SAC	CGST/SGST/IGST/ C.Cess	Coal Cess	Item Value	Cancellation Date	Plant
00001	877015676 CONVENTIONAL PANEL PRECICON R CONT. ADOR	NOS/ ADOR	1.000	303,000.00 INR/ 1 NOS	0.00 0.00	0.00 0.00	8541.40.90	0.00 /0.00 /18.00 54,540.00	0.00	357,540.00	25.12.2021	TE02 ENERGY-2
00002	877015618 IGBT BASED HFPS CONTROL PANEL ESP	NOS/ ADOR	2.000	1,262,500.00 INR/ 1 NOS	0.00 0.00	0.00 0.00	8548.10.90	0.00 /0.00 /18.00 454,500.00	0.00	2,979,500.00	25.12.2021	TE02 ENERGY-2

Total Value 3,337,040.00 INR

Total Value INR THIRTY THREE LAKH THIRTY SEVEN THOUSAND FORTY Rupees

TRIDENTGROUP

Trident Limited - Energy
P&C Division,Mansa Road
Dhaula, Barnala (Punjab)
PURCHASE ORDER

PO Number	7600007938	**Dated**	25.08.2021
Our Ref.	13760	**Currency**	INR
Your Ref.	offer		

Vendor 740059
ADOR POWERTRON LIMITED
PLOT NO -51, D-II BLOCK, RAM NAGAR
PUNE
411019
Country India
Vendor GSTIN No. 27AABCA5150B1ZA

Ship To
TL - Dhaula Energy 2
P&C Division,Mansa Road
Dhaula, Barnala (Punjab)
BARNALA
148107

Mobile 9878999481
jasbirpurchase@tridentindia.com

Bill To
Trident Limited - (Paper & Chemical Division)
Mansa Road, Dhaula
BARANALA (PUNJAB)
148101

Mobile 9878999481
jasbirpurchase@tridentindia.com

PO Status :- Invalid/Unapproved
Quality Certificate :- Required

Price Basis: EXW PUNE

Freight : F

Special Instruction 1) 90% against COD with 100% GST. 2) 10% PBG valid for 1 year 3) PBG will release subject to minimum emission reduction of more than 40% from current level.

Payment Terms: Payable in 2 partial amounts

Octroi: As per Documentary Evidence

Transportation Mode: By AIR /RAIL /SEA /COURIER /ROAD

Transit Insurance TO BE ARRANGED BY US.

The consignment shall be accepted only if accompanied by Original Invoice for Buyer and Duplicate for Transporter failing which the consignment shall be returned at your risk and cost .

Terms and Conditions As mentioned overleaf
Cancellation Date As above

Our Banker: State Bank of India, Industrial Finance Branch,Golden tower, Dholewal Chowk, Ludhiana

GSTIN No.. 03AABCA4139J1Z0

This is computer generated Purchase Order.Hence requires no signature.

TRIDENTGROUP

Trident Limited - Energy
P&C Division,Mansa Road
Dhaula, Barnala (Punjab)
PURCHASE ORDER

Vendor 740059 ADOR POWERTRON LIMITED PLOT NO -51, D-II BLOCK, RAM NAGAR PUNE 411019 **Country** India **Vendor GSTIN No.** 27AABCA5150B1ZA	**Ship To** TL - Dhaula Energy 2 P&C Division,Mansa Road Dhaula, Barnala (Punjab) BARNALA 148107 **Mobile** 9878999481 jasbirpurchase@tridentindia.com	**Bill To** Trident Limited - (Paper & Chemical Division) Mansa Road, Dhaula BARANALA (PUNJAB) 148101 **Mobile** 9878999481 jasbirpurchase@tridentindia.com	**PO Number**	7600007938	**Dated**	25.08.2021
			Our Ref.	13760	**Currency**	INR
			Your Ref.	offer		
			PO Status :- Invalid/Unapproved **Quality Certificate** :- Required			

S.No.	Item Code Item Description	Master Inspection Characteristics(MIC)	Upper Specification Limit	UOM	Target Specification Limit

TRIDENTGROUP

Trident Limited - Energy
P&C Division,Mansa Road
Dhaula, Barnala (Punjab)
PURCHASE ORDER

Vendor 740059 ADOR POWERTRON LIMITED PLOT NO -51, D-II BLOCK, RAM NAGAR PUNE 411019 **Country** India **Vendor GSTIN No.** 27AABCA5150B1ZA	**Ship To** TL - Dhaula Energy 2 P&C Division,Mansa Road Dhaula, Barnala (Punjab) BARNALA 148107 **Mobile** 9878999481 jasbirpurchase@tridentindia.com	**Bill To** Trident Limited - (Paper & Chemical Division) Mansa Road, Dhaula BARANALA (PUNJAB) 148101 **Mobile** 9878999481 jasbirpurchase@tridentindia.com	**PO Number** 7600007938 **Dated** 25.08.2021 **Our Ref.** 13760 **Currency** INR **Your Ref.** offer **PO Status** :- Invalid/Unapproved **Quality Certificate** :- Required

S.No.	Item Code Item Description	Mat. Classification	PO Material Text
00001	877015676 CONVENTIONAL PANEL PRECICON R CONT. ADOR	Standard	
00002	877015618 IGBT BASED HFPS CONTROL PANEL ESP	Customize	

TRIDENTGROUP

Trident Limited - Energy
P&C Division,Mansa Road
Dhaula, Barnala (Punjab)
PURCHASE ORDER

Vendor 740059 ADOR POWERTRON LIMITED PLOT NO -51, D-II BLOCK, RAM NAGAR PUNE 411019 **Country** India **Vendor GSTIN No.** 27AABCA5150B1ZA	**Ship To** TL - Dhaula Energy 2 P&C Division,Mansa Road Dhaula, Barnala (Punjab) BARNALA 148107 **Mobile** 9878999481 jasbirpurchase@tridentindia.com	**Bill To** Trident Limited - (Paper & Chemical Division) Mansa Road, Dhaula BARANALA (PUNJAB) 148101 **Mobile** 9878999481 jasbirpurchase@tridentindia.com	**PO Number** 7600007938 **Dated** 25.08.2021 **Our Ref.** 13760 **Currency** INR **Your Ref.** offer **PO Status** :- Invalid/Unapproved **Quality Certificate** :- Required

DELIVERY SCHEDULE

S.NO	Item Code Item Description	UOM	PO Qty	Scheduled Date	Sch Qty	Delivered Qty	Open Qty as on 25.08.2021	Contract No	Remaining Contract Value/Qty
00001	877015676 CONVENTIONAL PANEL PRECICON R CONT. ADOR	NOS	1.000	25.12.2021	1.000	0.000	1.000		0.00
00002	877015618 IGBT BASED HFPS CONTROL PANEL ESP	NOS	2.000	25.12.2021	2.000	0.000	2.000		0.00

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'Advantage' for this purpose shall mean any gift, loan, fee, reward or commission, any valuable security, office, employment, agreement, loan payment/waiver/discharge, bribe of any kind to Government/other officials, any other service or favour or any offer, undertaking or promise, whether conditional or unconditional, of such advantage.
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Original GST Invoice should invariably accompany the material failing which the material may be rejected at the sole discretion of the Purchaser.
In the event of denial of input tax credit to the Purchaser on account of any negligence, erroneous or incorrect reporting, non payment of taxes or any other non-compliance made by the Seller in relation to the GST Law, the Purchaser shall be entitled to recover such loss from the Seller along with Interest @18% per annum.
Advances shall be released against submission of Advance Bank Guarantee of equivalent amount. All Advance and Performance Bank guarantee(s) shall be accepted only if they are in Purchaser's format and issued by the Banks recommended by the Purchaser unless otherwise agreed in writing.
Payment other than advances shall be made as specified in the terms and conditions of the Purchase Order and submission of all required documents.
Forms / Permits / Declarations shall be submitted as per the applicable laws/statute.
The prices under this Order shall remain firm until completion of the Contract

Intellectual property/Warranty, Inspection and Liability

Material supplied by the Seller pursuant to this Purchase Order should not infringe any third party intellectual property rights and the Seller further undertakes to indemnify the Purchaser against all claims for infringements of third party patents and/or other intellectual property rights by material supplied under this Purchase Order.
Material supplied by the Seller pursuant to the Purchase Order should have clean title in favour of the Seller before shipment to the Purchaser. Should there be any dispute to the ownership of the material,the Seller would be liable to make good for the costs incurred by the Purchaser to defend the title and the loss of profits due to its inability to use the subjected material, over and above the costs already paid to the Seller.
In the event of any breach of obligations mentioned in the Purchase Order by the Seller, the Purchaser shall be entitled to incidental and consequential damages including loss of profit. The Seller agrees to indemnify and hold the Purchaser, its customers and users of its products, harmless against any suits, damage or claim or any other expense resulting from a breach or alleged breach of the Seller's obligations including warranty, pursuant hereto. The Purchaser shall have the right to invoke the Performance Bank Guarantee submitted by the Seller for recovering the Liquidated damages.
All goods supplied shall be under an unconditional guarantee of 12 months from the date of commissioning / 18 months from the date of receipt (whichever is earlier) unless specified differently in the Purchase Order.
The Purchaser shall have the right for shop floor rejections even if the material has been accepted on delivery.
All costs (inclusive of taxes & duties) incurred by the Purchaser on account of rejections, despatch/warranty failures of material supplied under this Purchase Order shall be to Supplier's account.

Applicable law and Jurisdiction of Courts

Any dispute, controversy, differences or question arising out of, in relation to or incidental to this Purchase Order or the breach, termination or invalidity thereof shall be referred for arbitration to be governed in accordance with the Arbitration and Conciliation Act, 1996. Accordingly, the purchaser will nominate sole Arbitrator to settle any dispute, controversy, differences or question arising out of, in relation to or incidental to this Purchase Order or the breach, termination or invalidity thereof. The place of arbitration shall be in Barnala, Punjab, India and language of proceedings shall be English. Expenses of the arbitration proceeding shall be jointly shared by the parties.This Purchase order shall be governed by and construed in accordancewith the laws of India, and the parties agree to submit themselves tothe exclusive jurisdiction of the Courts at Barnala, India only. Further, where any material is imported under this Purchase Order, the laws applicable under the Indian statute would govern the resolution of conflicts.
This Purchase Order supersedes any/and/all other oral or written communications or other commitments between the parties with respect to its subject matter except the agreement executed between the parties and contains all of the covenants, terms and conditions agreed between the parties with respect thereto. Wherein an agreement is also executed between the parties on the same subject matter thereto with the terms, conditions and specifications, the Purchase Order shall become the part of the agreement. However, in case of any conflict in the terms, conditions, specifications mentioned in the agreement and the Purchase Order, the terms, conditions, specifications mentioned in the agreement shall prevail.
Each party hereto acknowledges that, except as set forth herein, neither party nor any one on behalf of either party has made any representations, inducements, promises or agreements, orally or otherwise,respecting the subject matter of this Agreement and/or Purchase Order.

Documents required to be attached with invoice.

1. Tax Invoice in original
2. Tax Invoice (Duplicate) in original
3. Quality certificate,

TECHNICAL PARTICULARS	*UOM*	*M/s FLS Smidth 70% MCR -DESIGN Proposal: 9814168-1-ver.2a*	*M/s GE Power 70% MCR- DESIGN Offer Ref.: 1401113*	*M/s Hamon 70% MCR- DESIGN Proposal ref : P1943334 Revision : 02*
OPERATING CONDITIONS				
No. of chambers	Pcs	1	1	1
Bus sections in operation		All		4
Bus sections in operation, total		5	3	4
Gas volume to precipitator @ 3 % O2 dry	Nm^3/s	16.2	16.18	16.18
Gas volume to precipitator @ 3 % O2 dry	m3/Hr	103855		148300
Operating temperature	Deg C	190	190	180-190
Operating pressure	Pa	-2157	-2156	-2157.463
Operating pressure	mm of WC	-220	-220	-220
Water content	%	27.6		26.7
Dew Point (water)	Deg C	66		Estimated 20 Deg C Above flue gas temperatureLater
Raw gas dust loading @ 3 vol%O2	$g/Nm^3,D$	25		25
Altitude above sea level	Mtr	224		224
Atmospheric pressure	mm Hg	739		739
PRECIPITATOR DESIGN DATA				
Effective cross section	m2	38.3		45.12
Gas velocity	m/s	0.75	Operating : 0.45 Design : 0.63	0.64
Retention time	sec.	23.2	Operating : 23.2 Design : 16.6	21.39
Total specific collecting area	m2/m3/sec	152.34	Operating : 110.5 Design : 154.9	142
W - Deutsch particle migration velocity	cm/s	4.23		4.52
ESTIMATED PERFORMANCE				
Dust Emission @ 3 vol%O2	$mg/Nm^3,D$	40	≤40	40
Efficiency.	%	99.84	Operating : 99.88 Design : 99.84	99.84
Emitted dust in outlet of filter	Kg/h	2		2
Collected dust in hopper	Kg/h	1050		1065
Power consumption of High Voltage supply (at guaranteed conditions)	kW	80		
Pressure drop over the precipitator (guaranteed)	Pa	250		245
MECHANICAL DESIGN DATA				
Casing design temperature.	Deg C	250		200
Casing design pressure, max. static	mm of WC	-300		-300
Specific Weight of Dust in Hopper	t/m3	0.4	150 kg/m3 for dead load	0.15
Specific Weight of Dust for transport calculation	t/m3	0.2		0.4
Wind load calculated according to:				
wind velocity pressure	kN/m2	1.5	47 m/Sec	2.007
Snow load	kN/m2	0.8	N.A.	2
Live load, roof	kN/m2	2	3500 Pa	500
Live load, access facilities	kN/m2	3	250 kg/m2	1000
Earthquake zone	UBC	2b	Zone-IV	Zone - IV
Standards for Steel profiles	EN, GB, JIS, ASTM or equivalent	EN, GB, JIS, ASTM or equivalent	IS:808	ASTM A36 / IS 2062
Strength calculation of casing		FLS Standard		IS:800
Strength calculation of supporting structure		FLS Standard		ANSI 13th Ed
Mechanical Design		FLS Standard		IS:800 / IS 875 / Equivalent
ELECTRICAL DESIGN DATA				
Mains voltageV	VAC	400-660	415	415
Mains voltage tolerance%	%	± 5%	± 10%	0.05
Mains frequencyHz	Hz	50/60	50 Hz ± 5%	50
Control voltage in control cubicles, VAC	VAC	230	230	230
Ambient temperature, max/min °C	Deg C	40/0	50	45°C /10°C

Electrical Design		FLS Standard		As per IEC
Electrical components - according to		FLS Standard		As per IEC
PRECIPITATOR DATA				
Chambers offered	PCS	1	1	1
Seriel fields per chamber	PCS	5	3	4
Bus sections per chamber, field no: 1 / 2 / 3 / 4 / 5	PCS	1/1/1/1/1	1/1/,1	1
Number of ducts per chamber, field no: 1 / 2 / 3 / 4 / 5	PCS	17/17/17/17/17	One chamber	1
Effective length of field no: 1 / 2 / 3 / 4 /	Mtr	3.5/3.5/3.5/3.5/3.5	3.5/3.5/3.5	3.4
Width of fields per chamber, field no: 1 / 2 / 3 / 4 / 5	Mtr	5.1	5.7/5.7/5.7	4.8/4.8/4.8/4.8
Effective height	Mtr	7.5	8	9.4
Aspect ratio (effective length / effective height)		2.33	3	1.45
Total Projected Collecting area per Chamber	m2	4388	Not used in GE design	4107.72
Total Active Collecting area per Chamber	m2	5748	3192	4107.72
ESP CASING (one chamber)				
Structural frames, Concrete	Type	E	Concrete	Concrete
Bottom hoppers	Type	Flat bottom concrete	Flat bottom	Trough Arrangement with conveyor
Inlet transition piece	Type	Upper		
/rapping of inlet transition bottom		Yes	Yes	2 Nos (Common for both conr and GD screen)
/ adjustable gas distribution screens, inlet	Pcs	2	Fixed GD screen with adjustable baffles	2
/rapping of inlet gas distribution screens		Yes	Yes	2 Nos (Common for both conr and GD screen)
Outlet transition piece	Type	Bottom		
/rapping of outlet transition bottom		Yes	No	1 Nos (Common for both conr and GD screen)
/adjustable gas distribution screens, outlet	Pcs	1	Fixed	1
/rapping of outlet gas distribution screens		Yes	No	1 Nos (Common for both conr and GD screen)
platework In & Outlet; mild steel, plate thickness	mm	5	Funnel 6 mm, IS:2062, Grade-A	5
Set of insulator and connection boxes, supp. for T/R	Type	FLS		8 sets per ESP
Inspection doors	Type	FLS		Manual
SUPPORTING STRUCTURE (one chamber)				
Support for precipitator	Type	Slide bearing		Slide bearing
ACCESS FACILITIES				
Set of standard access facilities	Design	FLS/DIN		1 Set with RCC and Steel construction
/Stairs from ground to platform, height	Mtr	0		Yes considered
/Platform for inspection doors in casing, length	Mtr	21.5		Yes considered
/Stairs from platform to roof, height	Mtr	8.4		Yes considered
/Railing around roof, length	Mtr	55.5		Yes considered
INSULATION AND CLADDING				
Thermal insulation material consisting of :				LRB Mineral wool with cladding sheet
mineral wool, fittings and cover plate	m2	1220		Yes considered
Cladding: 19mm corrugated alu/galvanized Steel plate - thickness	mm	0.7		0.6 mm aluminium cladding
or plane alu/galvanized steel plate - thickness	mm	0.9/1		0.6 mm aluminium cladding
Insulation for Casing (exclusive roof), thickness	mm	100		Yes considered
Insulation for Roof (excl. embossed plate),	mm	100		Yes considered
Insulation for Bottom hopper, thickness	mm	100		Yes considered - 75 mm thick

Insulation for Inlet, thickness	mm	100		Yes considered - 75 mm thick
Insulation for Outlet, thickness	mm	100		Yes considered - 75 mm thick
COLLECTING SYSTEM (one chamber)				
Collecting systems, field no: 1 / 2 / 3 / 4 / 5	Pcs	1/1/1/1/1	To be defined after detailed Engg.	Field 1 to 4
Collecting plates with attachment	Type	H500	G profile	G-OPZEL
MOC		Alu killed MS Steel	CRCA, IS:513, Grade-D	Corten Steel
spare plates for erection.	Pcs	5	Not Envisaged.	1% of Installed Quantity of 1 ESP
plate height	Mtr	7.5	8 (nominal)	7
plate width	Mtr	0.5	0.5 (nominal)	0.48
plate thickness	mm	1.25	1.5	1.2
Total Projected Collecting area	m2	6225	Not used in GE design	
Total Active Collecting Area.	m2	8155	3192	4107.72
Projected col. area, field no: 1 / 2 / 3 / 4 / 5	m2	877.5/877.5/877.5/877.5/877.5	Not used in GE design	1026.93
Duct spacing field no: 1 / 2 / 3 / 4 / 5	mm	300/300/300/300/300		300/300/300
Collecting plates, field no: 1 / 2 / 3 / 4 / 5	Pcs	124/124/124/124/124	To be defined after detailed Engg.	120/120/120
Drop hammers, field no: 1 / 2 / 3 / 4 / 5	Pcs	36/36/36/36/36	20 NOS. TUMBLING HAMMER /Field	42/42/42
Drive units for rapping, incl. gear motor	Type	Roof Mounted	Side drive	N.A.
DISCHARGE SYSTEM (one chamber)				
Discharge frame systems, field no: 1 / 2 / 3 / 4 / 5	Pcs	1/1/1/1/1	19/Field	72 Nos. per field
/discharge frame system	Type	Rigid	Rigid Frame	Rigid Pipe and spike
Discharge electrodes	Type	Pin	Rigid type (Multipeak)	Rigid Pipe and spike
electrodes per chamber in field no: 1 / 2 / 3 / 4 / 5	Pcs	115/115/115/115/115	To be defined after detailed Engg.	72 Nos. per field
Tube MOC			IS:5429	Carbon / IS 2062
spare electrodes for erection	Pcs	10	Not Envisaged.	1% of Installed Quantity of 1 ESP
/electrode length	Mtr	6.8	To be defined after detailed Engg	9.4
/electrode layers	Pcs	1	To be defined after detailed Engg	Single
/ electrode per plate	Pcs	1	To be defined after detailed Engg	1 per Opzel
Mast Electrodes	Type	Pin	Not applicable	
electrodes per chamber in field no: 1 / 2 / 3 / 4 / 5	Pcs	2/2/2/2/2	Not applicable	N.A.
Tube MOC		EN 10305-3 1993 – E220-CR2-S3	Not applicable	N.A.
spare electrodes for erection	Pcs		Not applicable	N.A.
/electrode length	Mtr	6.8	Not applicable	N.A.
/electrode layers	Pcs	1	Not applicable	N.A.
Internal drop hammer rapping system	Yes/No	Included	Not applicable	Yes MIGI Type rapping system
Number of discharge rapping system per field	Pcs	1	Not applicable	4 Sets per field
Drop hammers for Discharge system	Pcs	90	Not applicable	4 Sets per field
Set of electrode frames, bearing bridges, rotary hammer shafts, guide plates, walkways and upper spacer for coll. plates	Pcs	5	Not applicable	N.A.
Drive units for rapping, incl. gearmotors	Type	Roof mounted	Not applicable	N.A.
Cast parts, comprising chain tightener,pinwheels, links, split bearings and the like	Pcs	20	Not applicable	N.A.
HIGH VOLTAGE EQUIPMENT (one chamber)				
High voltage supply for field no: 1 / 2 / 3 / 4 / 5	Pcs	3ϕT/R / 3ϕT/R / 3ϕT/R / 3ϕT/R / 3ϕT/R	1ϕT/R / 1ϕT/R / 1ϕT/R	1ϕT/R / 1ϕT/R / 1ϕT/R
DC SUPPLY BY				
DC Supply by	Pcs	5	TR set	4
number of DC-supply in field no: 1 / 2 / 3 / 4 / 5	Pcs	1/1/1/1/1	3	1
size of DC-supply for field no: 1 / 2 / 3 / 4 / 5	kV (Peak)	100/100/100/100/100	90/90/90	110/110/110
size of DC-supply for field no: 1 / 2 / 3 / 4 / 5	mA (Avg)	600/700/800/800/800	575/575/575	600/600/600
specific DC-current in field no: 1 / 2 / 3 / 4 / 5	mA/m2	0.68/0.8/0.91/0.91/0.91	0.54	0.72
TR Control Panel IP class	IP	IP21	IP31	Hermetically Sealed
MCC protection class	Type		IP54	As per OEM standard

/color			TR set – RAL 5012, TR panel & PMCC – RAL 7032,	Yes
/alarms for oil temperature and pressure	Yes/no	Included	Yes	Yes considered, Strick type
Grounding equipment for TR-sets at access doors	Type	FLS	Earthing rod	
Electrical accessories, comprising:				
/Thyristor switching elements	Type	FLS	Firing /triggering command from ESP controller	IGBT based controller and SCR based controller
/Connections on high voltage side			Through Bus duct	Through HV pipe connection
Insulator sets comprising:				
/ support insulators, conical	Pcs	20	12	4 nos / Field
/ insulator shafts for discharge rapping system	Pcs	10	3	4 nos / Field
/ lead through insulators in trunking	Pcs	10	3	NA
Earthing rods and warning signs	Set	10	1	Yes 1 lot considered per ESP
CONTROL & ELECTRICAL EQUIPMENT (one chamber)				
Controller	Type	PIACS Microcomputer controller, with automatic intermittent energization facility for T/R-sets type FLS	Microprocessor controller EPIC-III integrated with rapping programmer	International standard Precicon controller is considered
/programmable control for rapping gear motors	Type	Yes	Yes	Micro controller based
/control for heating elements	Type	FLS	Through thermostat for support insulator	Thermostatically Controlled
/signal for Central Control room.	Std	4-20 mA	Over modbus TCP-IP/OPC protocol	Shall be provided as appliable
/Energy Management Control System	Yes/No	Optional	Yes, if opacity meter feedback is connected through 4-20 mA signal.	Yes
/ terminal for input of CO alarm	Yes/No	Optional	External configurable DI is available	Yes
/terminal for aut. change of operating status	Yes/No	Optional		Yes
/serial communication to CCS (GATEWAY)	Yes/No	Included	Over modbus TCP-IP/OPC protocol	Yes
/standard Protocol for Serial Communication		Modbus RTU	Ethernet	RS485
GENERAL STANDARDS FOR ELECTRICAL EQUIPMENT				
Motors:				For Seal air fan motor
motor standard	IEC		IE 1	As per IEC
motor type		Squirrel Cage,Norm Motors	Squirrel Cage,Norm Motors	SQIM
insulation class		F utilised to B	F utilised to B	Class F
protection class		IP 54	IP 55	IP 54
Cubicles:				
/internal control voltage	VAC	230	230 V AC	230
/lamp voltage	VDC	24	Later during detail engineering	220
/protection class		IP 21	IP54	45 Max
/ forced cooling of cubicles		Optional	Not required	
Instruments:				
/protection class		IP65	Later during detail engineering	IP 31 for Indoor, IP 54 for Outdoor
Access to High Voltage carrying Equipment/Parts				
Key interlocking	Type	Serv Trayvou or Similar	Mechanical castle key	Mechanical
ESTIMATED POWER CONSUMPTION				
Total power use for T/R sets	kW	89	Will be finalized after detailed Engg.	Refer Electrical Load List
Total power use of heaters	kW	37.5	16	Refer Electrical Load List
Total power use for rapping motors	kW	1.2	2.59	Refer Electrical Load List

Total power use of dust transport	kW	4.9	Will be finalized after detailed Engg.	Refer Electrical Load List
Total Power for Purge Air kW 2.0	kW	2	Will be finalized after detailed Engg.	Refer Electrical Load List
Scrapper conveyor	kW		Will be finalized after detailed Engg.	15
Drag chain conveyor	kW		Will be finalized after detailed Engg.	3.7
RAV	kW		Will be finalized after detailed Engg.	3.7
Total estimated Power Consumption	kW	135	18.59	22.4
SURFACE TREATMENT FOR PARTS DELIVERED				
Collecting plates	Type	Oil Coated		St.3/Tectyl 506 / Equivalent
Discharge electrodes	Type	Oil Coated		St.3/Tectyl 506 / Equivalent
Other internal parts	Program	Transport Primed		Transport Primed
/degree of cleaning (SIS 055900	Type	St.2		SA 2.5
/primer		40		
External parts to be covered by insulation	Program	Transport Primed		Transport Primed
/degree of cleaning (SIS 055900	Type	St.2		
/primer		40		Primer: 2 Coats of red oxide primer (50 microns total DFT)
External parts not to be covered by insul.	Program	III		
/degree of cleaning (SIS 055900	Type	Sa 2.5		Sa 2.5
/primer	my	100		Primer: 2 Coats of red oxide primer (50
/ finish painting	my	60		microns total DFT)
				ESP Inlet and Outlet hoods (Corten steel)
			Outer roof has been included(Chequered plate IS-3502 and MS IS:2062 Gr A)	ESP Hot-roof and cold-roof arrangement (Corten steel)
		Inspection doors included	Inspection door included	ESP Quick opening doors (Corten Steel)
		Rapping system for distribution screen,supporting rod etc have been included	ESP internal including electrodes, suspension and steadying frames, rapping shafts,anvils have been included.	ESP internals of Corten steel including electrodes, suspension and steadying frames, rapping shafts,anvils and baffles.
		Gas distribution devices with support accessories.	Gas distribution devices with support accessories.	Gas distribution devices with support accessories.
		Rapping system for collecting electrode, discharge electrodes & inlet gas distribution devices	Rapping system for collecting electrode, discharge electrodes & inlet gas distribution devices	Rapping system for collecting electrode, discharge electrodes & inlet gas distribution devices
		Rapping motors for collecting electrode, discharge electrodes & inlet gas distribution devices	Rapping motors for collecting electrode, discharge electrodes & inlet gas distribution devices	Rapping motors for collecting electrode, discharge electrodes & inlet gas distribution devices
		Insulators included	Insulators as required by HRC India design.	Insulators as required by HRC India design.
			Bus duct has been included. But no mention of T-R oil trays	HV bus-duct and T-R oil trays
		Key interlocking	Mechanical key safety interlocks system.	Mechanical key safety interlocks system.
		Slide bearings included	ESP support bearings has been included.	Fixed and slide bearings

SCOPE OF SUPPLY		Detail engineering only for Stairways and gangways inlcuded ,Sun roof structrue for TR Set(Detail Engg),Steel supported outer roof will be fabricated and supplied by Ms FLS.	Staircase & Platform from Ground Level to Casing bottom floor level platform and to ESP roof top has also been included.	Access steel structures including platform and staircase from floor level to ESP roof with galvanized gratings and stair steps.
		Weather enclosure, detail engg will be done by Ms FLS	Not given	Weather enclosure for ESP
		Electical hoist & trolley included in Trident scope,Maintenance structure with monorail detail engg included in the scope	Monorail with electric hoist Included	Maintenance structure with monorail inlcuded
		Inlet & outlet expansion joints - Nonmetallic Type - Only detail engineering included in the scope.	Inlet & outlet expansion joints - Nonmetallic Type	Inlet & outlet expansion joints - Nonmetallic Type
		Not mentioned	ESP Inlet DTPA dampers	ESP Inlet DTPA dampers
		Not mentioned	ESP Outlet DTPA dampers	ESP Outlet DTPA dampers
				Rotary valve for ash conveyor outlet
		Scraper, incl. gear motor and VFD,Drag chain, incl. gear motor has been included in the scope	Scrapper Conveyor & Drag Chain Conveyor	Scrapper Conveyor & Drag Chain Conveyor
			Not Given	Graph alloy bearings for Scrapper Conveyor
		Basic engg for Thermal insulation & cladding of ESP inlcuded in the scope	Not included in the scope.	Thermal insulation & cladding of ESP
			Not given	Modification in upstream and downstream ductwork with supports
		Not included in the scope.	Not included in the scope.	Induced draft fan inlcuded in the scope
EXCLUSIONS(SCOPE OF SUPPLY/WORK)		1.Any other Power, Control & Instrument Cable 2.All Civil work. 3.Finish Painting 4.Erection, Commissioning, PG Testing, supervisor. 5.Power & control of dust transport system (Scrapper, drag chain & RAV). 6.Lightning and lightning of ESP 7.Dust Conveying below Rorary air lock valve 8.Electric hoist & trolley (Capacity-2.0 T) for T/R set. 9.Earthing system including ground pit 10.Casing Frames - Concrete 11.Platework, casing - Concrete 12.Flat Bottom Hopper - Concrete 13. Mechanical erection and Electrical ertection. 14.Instruments, controllers, cables or electrical erection for central control	1.Civil works including all civil engineering, grouting, minor work, foundation, control room, MCC room. • Structural engineering including structural work except specified in our scope of supply • ID fan, motor, VFD & accessories. • Dust handling system / conveyor beyond rotary air lock. • Fabrication drawing preparation & supply of Stack, Duct & duct support • PLC/DCS & its programming, HMI, engineering station, SCADA, laptop/desktop, UPS with backup etc	1. Civil work 2.ESP casings and casing columns(Corten steel) 3.Ash Mixing tank with Agitator 4.AMT transfer Pump

Performance Guarantee		IS 11255 Part 1 & 3 EN 13284-1:2002 Stationary source emissions - Determination of low range mass concentration of dust. (In-stack standard for emissions < 40 mg/Nm3 - Case 1) ASME Power Test Code PTC 27 and the requirements of Environmental Protection and it has been given subject to certain provisions and has been mentioned clearly in the offer	***Performance guarantee condition has been given but couldnot find the value .***	When the equipment covered by this proposal is operated at the design conditions given in Section 5 of this proposal, HRC India guarantees ESP outlet emission as: <50 mg/Nm³ dry gas (Guaranteed with all fields in service, subject to inlet conditions furnished and under steady state of operation

Annexure-16 (Industry)

Soil and Groundwater Quality Assessment

at

Dhanuala Drain, Barnala



Prepared for:

Trident Ltd. and Lotus Integrated Texpark Ltd.

Dhaula Complex, Mansa Road, Barnala, Punjab, 148101

Prepared by:

Cholamandalam MS Risk Services Limited

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December 2019

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Client:	Trident Ltd. and Lotus Integrated Texpark Ltd.	
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Annexure I: Laboratory Analytical Test Reports for Groundwater samples

Annexure II: Laboratory Analytical Test Reports for Soil samples

List of Abbreviation

BDL	:	Below Detectable Limits
BGL	:	Below Ground Level
BIS	:	Bureau of Indian Standards
CGWB	:	Central Ground Water Board
CMSRSL	:	Cholamandalam MS Risk Services Limited
CPCB	:	Central Pollution Control Board
DEM	:	Digital Elevation Model
EIA	:	Environmental Impact Assessment
ICAR	:	Indian Council of Agricultural Research
IS	:	Indian Standards
MOEF&CC	:	Ministry of Environment and Forests & Climate Change
MSL	:	Mean Sea Level
NABET	:	National Accreditation Board for Education and Training

EXECUTIVE SUMMARY

M/s Trident Ltd. and Lotus Integrated Texpark Ltd. are operating an integrated Agro-based paper mill and a textile division respectively in Dhaula Complex, Mansa Road, Barnala, Punjab, 148101. In regards to the notice issued by the Punjab Pollution Control Board, Trident Group has approached Cholamandalam MS Risk Services Limited (CMSRSL), a NABET accredited EIA consulting organization to undertake the groundwater quality assessment along the drain located adjacent to the existing plant in Barnala.

The study team had a detailed site reconnaissance and walkthrough along the drain and collected the samples as mentioned above from Dec 3, 2019, to Dec 6, 2019.

To understand the regional scenario of land details in terms of physiography, elevation profile in the region, groundwater flow direction in the aquifer, etc. the published data by the central groundwater board has been collected. Similarly, the regional level soil and groundwater quality have been studied based on the information collected from published technical and scientific documents.

Based on the collected information regarding groundwater survey and exploration data published by CGWB for Barnala block, the groundwater flow direction in the area was evaluated to be towards the west. The land elevation slope in the area is also in line with the flow direction.

The Water level as per the published EIA report in the region ranges from 8.72m to 23.89m bgl during the pre-monsoon period and 9.95 m to 25.41 m bgl during the post-monsoon period. The seasonal fluctuation varies from 1.05 m to 5.32 m in the study area. The long-term fluctuation trend indicates an average fall of 0.65m/year. Barnala block is categorized as an Over Exploited Zone by CGWB.

Based on the details obtained from during the assessment, the utilisation of treated wastewater for irrigation is in the order of 150 m^3 per Ha per day which is in line with the loading rates recommended for the soil texture (for loamy and sandy loamy soil type: 110 to 225 m^3/Ha/day) as per the notification of MoEF&CC published on 14 Jan, 2016.

For the purpose of this assessment, the soil and groundwater samples have been collected (i) Along the Dhanuala drain (less than 100m from the Drain), (ii) at the upgradient locations to map the baseline background levels and (iii) at the onsite irrigation area. Groundwater samples were collected from the existing private borewells which were drilled up to the deeper aquifer which are in use.

- pH in the groundwater samples collected was reported in the range of 7.1 to 8.0 which is within the acceptable range as per drinking water standards published by IS 10500:2012. Whereas the pH in soil was found to be more alkaline in the entire region.
- TDS in the samples collected from the existing borewells were recorded to be in the range of 524 to 1276 mg/l. The TDS levels in groundwater from the samples collected is a regional phenomenon and is in line with the published regional level data. The groundwater's Salinity as NaCl is in-line with TDS which contributes to 50% to 60%. Similarly, the electrical conductivity in the soil is also high and depicting regional scenario which reflects the equivalent salinity as NaCl in soil.
- Total hardness in the samples collected from the existing borewells was recorded to be in the range of 140 to 595 mg/l.
- Minor traces of nutrients and Heavy metal were found in the groundwater and soil samples collected but the impact is totally insignificant.

1. INTRODUCTION

Groundwater is a valuable natural resource, being both an important source of water supply and a major component of the water cycle. The groundwater quality in the overall country has undergone a tremendous change over the past decade. Groundwater in shallow aquifers generally contains calcium bicarbonate, mixed type and other types including sodium chloride water near the coastal areas. Similarly, the quality in deeper aquifers also varies from place to place and is generally found suitable for common uses. The main groundwater quality problems in India include due to inland salinity, coastal salinity, fluorides, nitrates, heavy metals including arsenic, iron, etc.

Irrigation through tube wells is well-practiced in Punjab due to the limited availability of canal waters (surface water). Such practices were well established due to the initiative and enterprise of the individual farmers and have spread up to more than 75% of the total agricultural land in the state is depending on the groundwater. Punjab is one of the successful states in the country in terms of agricultural aspects based upon the use of groundwater for irrigation. The quality of groundwater in the state has been characterized by Geogenic contamination and anthropogenic contamination including agricultural activities, animal waste disposals, industrial discharges and urban pollution due to municipal wastes.

M/s Trident Ltd. and Lotus Integrated Texpark Ltd. (part of Trident Group companies- hereafter referred to as Trident Group) are operating an integrated Agro-based paper mill and a textile division respectively in Dhaula Complex, Mansa Road, Barnala, Punjab, 148101. In regards to the notice issued by the Punjab Pollution Control Board, Trident Group has approached Cholamandalam MS Risk Services Limited (CMSRSL), a NABET accredited EIA consulting organization to undertake the groundwater quality assessment along the drain located adjacent to the existing plant in Barnala.

2. ABOUT THE CONSULTING ORGANISATION

Cholamandalam MS Risk Services Limited (CMSRSL) is a 50:50 joint venture between USD $3.14 Billion Murugappa Group, India and Mitsui Sumitomo Insurance Group, Japan and has a technical collaboration with InterRisk, a group company of Mitsui Sumitomo Insurance Group.

Established in the year 1994, Cholamandalam MS Risk Services is a Chennai based Risk Consulting Company offering comprehensive Risk management & Engineering solutions in the field of Safety, Health and Environment. The company has pioneered many innovative and specialized services catering to the needs of Asian & European markets for the last 15 years. The organization has successfully executed more than 2000 projects (Domestic/International) which not only helped its

clients maintain compliance but also optimize their EHS performance and set new benchmarks. Cholamandalam MS Risk Services, an ISO 9001:2008 company, is a certified "Environment Impact Assessment" Consultant organization by NABET EIA Accreditation committee, a constituent of the Quality Council of India. The company has a well-established experience in safety and environmental studies in India and overseas over the last decade.

3. METHODOLOGY ADOPTED FOR THE STUDY

The soil and groundwater quality assessment in the area has been carried out by adopting the below study methodology:

- The groundwater survey and exploration data published by CGWB for the Barnala block are collected and utilized to map the groundwater flow direction in the aquifer.
- Based on the satellite and topographical maps of the region, the natural drains and canals will be mapped.
- A basic review of the wastewater utilization for irrigation has been done.
- A thorough walkthrough along the Dhanuala drain (approx. 10 km stretch) especially where the industrial wastewater and sewage is being discharged.
- The below sampling program has been adopted for the soil and groundwater assessment:
    - Collection of soil samples at 1m depth along the Dhanuala drain covering the upstream to the plant discharges, near the plant discharge and downstream to the plant discharges.
    - Similarly, the groundwater samples are collected from the existing borewells along the Dhanuala drain (not more than 100m away from the drain) covering the upstream to the plant discharges, near the plant discharge and downstream to the plant discharges.
    - Collection of groundwater samples from the existing borewells and the soil samples from the onsite irrigation area where treated wastewater is being utilized.
    - Collection of groundwater samples from the existing borewells and the soil samples at 5 to 6 km away (upgradient as per the aquifer flow direction) to map the background baseline conditions in terms of soil and groundwater quality.
    - All the soil samples were analyzed for the necessary analytes including pH, electrical conductivity, salinity, total organic carbon, available Phosphorous, total nitrogen, heavy metals, total petroleum hydrocarbons, pesticides and lignin. The analytical data is compared with ICAR and other standards for soil quality.

- Similarly, the groundwater samples were analyzed for the necessary analytes such as pH, electrical conductivity, total dissolved solids, salinity, dissolved oxygen (DO), biological oxygen demand (BOD), chemical oxygen demand (COD), total hardness, essential nutrients (NPK), total petroleum hydrocarbons, heavy metals, pesticides etc. the analytical data is compared with CPCB standards for drinking water to check its compliance.

- Based on the analytical data, the contamination profile is developed depicting as two-dimensional contours or graphical representation for the critical parameters. The long term published groundwater quality data is utilized for mapping the regional level quality profile.

The study team had a detailed site reconnaissance and walkthrough along the drain and collected the samples as mentioned above from Dec 3, 2019 to Dec 6, 2019.

4. OVERALL SOIL AND GROUNDWATER SCENARIO IN BARNALA REGION

4.1. Study area and Geographical details

Trident group's paper manufacturing division and integrated textile park are located in Dhanuala Complex, Mansa Road, Barnala District in the state of Punjab. Based on the Central Ground Water Board (CGWB) published block-wise groundwater resource assessment, 2017, all the three blocks in Barnala district is categorized as *overexploited* in terms of groundwater extraction. The geographical boundary of the study is limited to the plant area and area along the drain where the industrial wastewater is discharged. Hence the primary data of soil and groundwater has been collected from the area which is discussed further in detail. The published regional level quality data has also been collected and presented in the report.

The location map is presented in **Figure 4.1** and **Figure 4.2**. The plant is surrounded by a natural drain named Dhanuala drain (marked as a blue line) along the northern boundary passing from East to West. The Dhanuala drain is joining the Lisarna drain in the west at 8 km downstream from the plant. The plant including the paper division and textile division is spread to an extent of approx. 220 Ha in which approx. 85 Ha is the irrigation area where the treated wastewater (of 12,800 m^3/day) is being used. Whereas, the treated wastewater quantity of 8,700 m^3/day is being discharged to Dhanuala drain. Thus, utilisation of treated wastewater for irrigation is in the order of 150 m^3 per Ha per day which is in line with the loading rates recommended for the soil texture (for loamy and sandy loamy soil type: 110 to 225 m^3/Ha/day) as per the notification of MoEF&CC published on 14 Jan, 2016.

Figure 4.1: Location map 1



- *Plant Boundary is marked as Yellow line*
- *Onsite irrigation area is marked as green area*
- *Adjacent Dhanula drain is shown as a blue line and the flow direction in the drain is from East to West*
-

Figure 4.2: Location map 2



- *Plant Boundary is marked as Yellow line. Red circle radius: 3km (from the approx. center of the plant)*
- *Onsite irrigation area is marked as green area*
- *Adjacent Dhanuala drain is shown as a blue line. The flow direction in Dhanuala drain is from East to West*
- *Lisarna drain where the Dhanuala drain is joining is shown as a Purple line. The flow direction in the Lisarna drain is from Northeast to Southwest.*

4.2. Land Details

Based on details collected from the published EIA report in 2016, the elevation of the land in the buffer zone (10km from the plant boundary) varies from 196 m above msl in the southwestern to 285 m above msl in the northeast. The elevation of the land in the core zone (5km) varies from 198 m above msl in the southwestern to 250 m above msl in the northeast. Hence it is evident as per the ground elevation that the upgradient is towards east and the downgradient is towards west from the plant site. The Physiography and DEM are shown in **Figure 4.3**, **Figure 4.4** and **Figure 4.5** respectively.

According to the Watershed Atlas of India, the study area of 10km forms part of Lower Sutlej Sub-Basin below Bhakra Dam and is shared by SLJL010 watershed. There is no well-defined material drainage system in the area. Two main drains pass through the area – Upper Lisarna Nala in the northwest and Dhanaula Drain in the central part. The drainage with the watershed boundary is presented in **Figure 4.6**.

The overall land use of a 10 km radius area reveals the dominance of agriculture land (88.55%) followed by built-up land (9.48%), wasteland (1.17%) and water bodies (0.80%). The Level I and Level II land-use landcover maps are presented in **Figure 4.7** and **Figure 4.8**.

Figure 4.3: Physiography of the Study Area (10KM from the plant boundary)

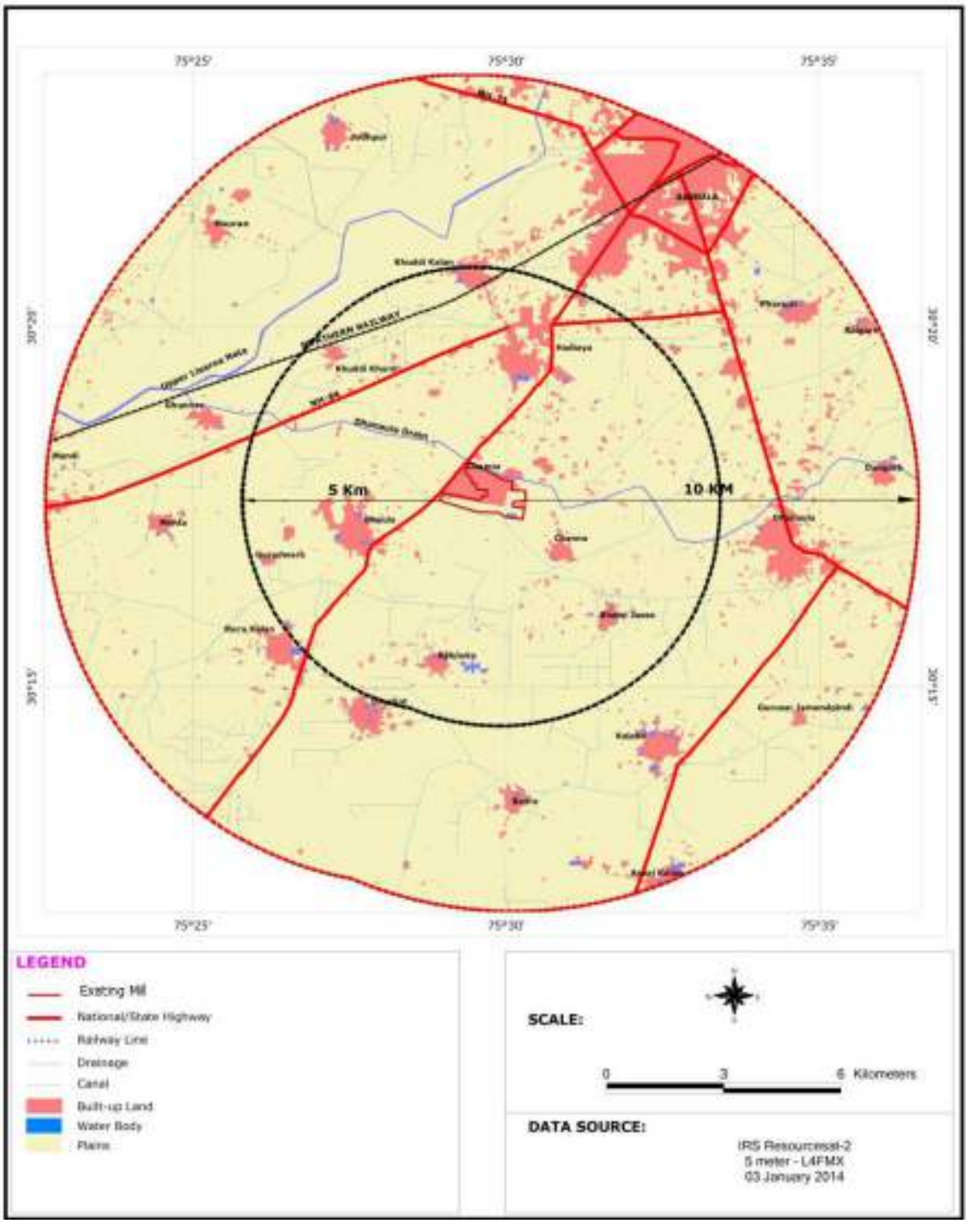


Figure 4.4: Digital Elevation Model of the Study Area (10KM from the plant boundary)

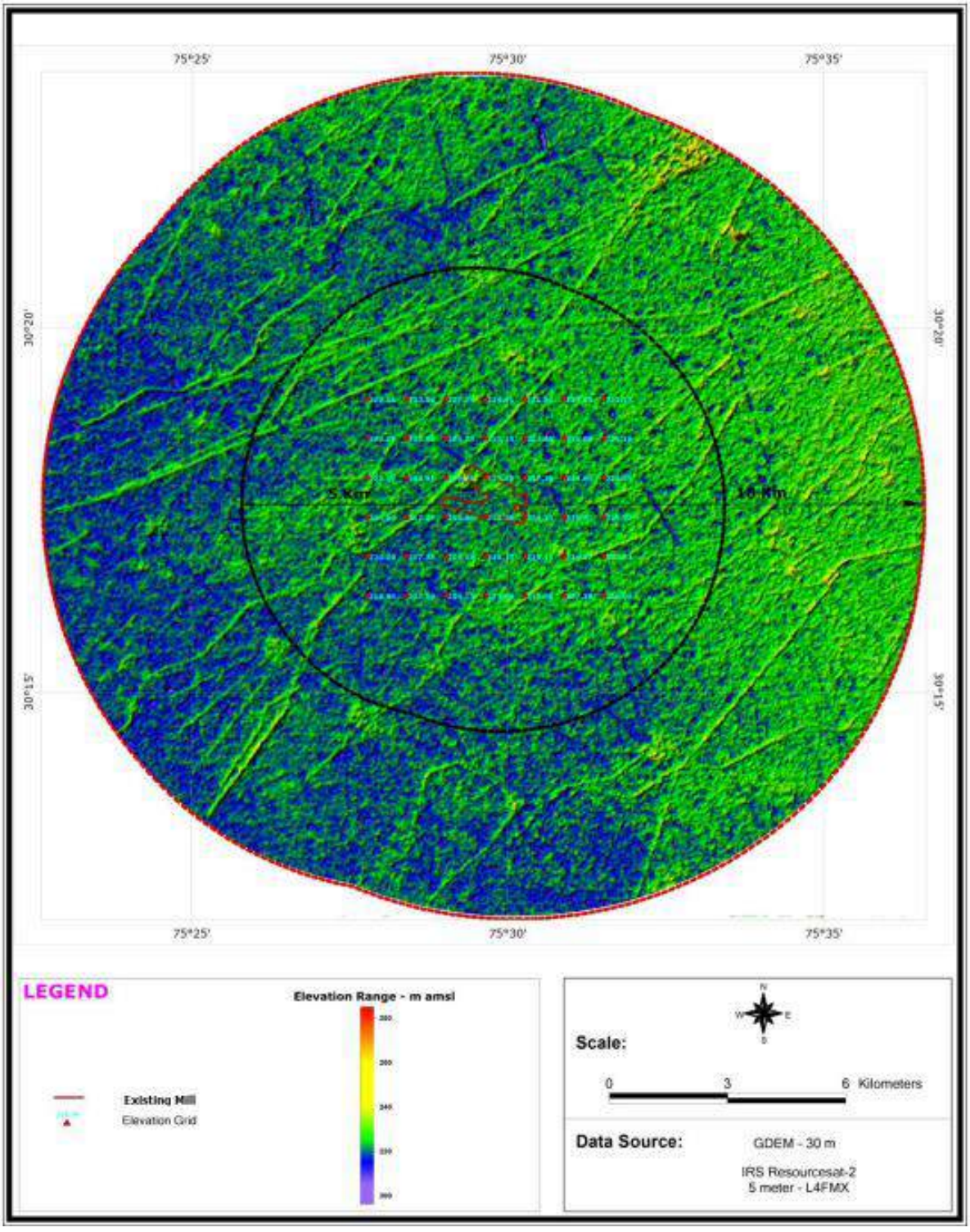


Figure 4.5: Digital Elevation Model of the Study Area (5KM from the plant boundary)

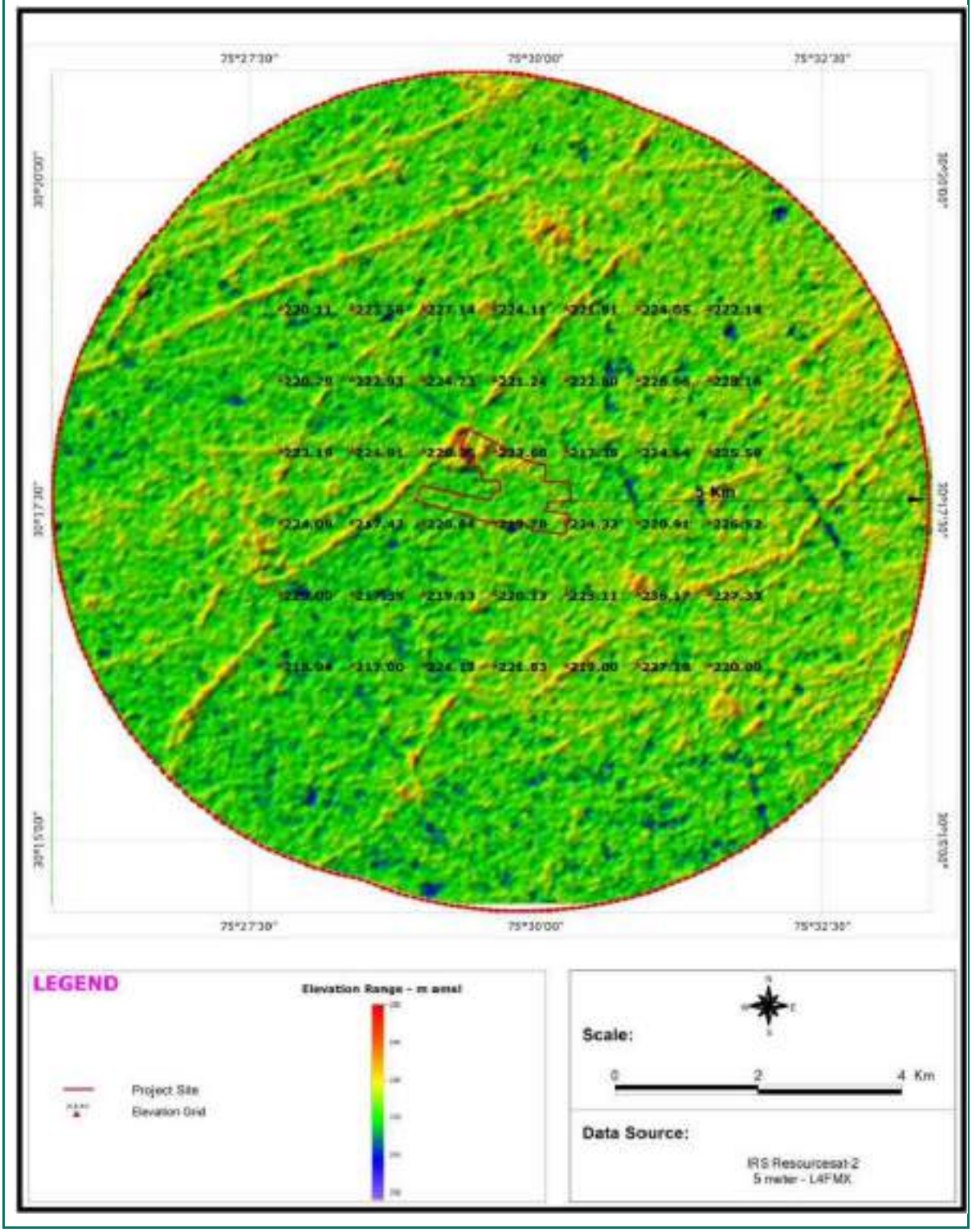


Figure 4.6: Drainage and Water Bodies in the Study Area (10KM from the plant boundary)

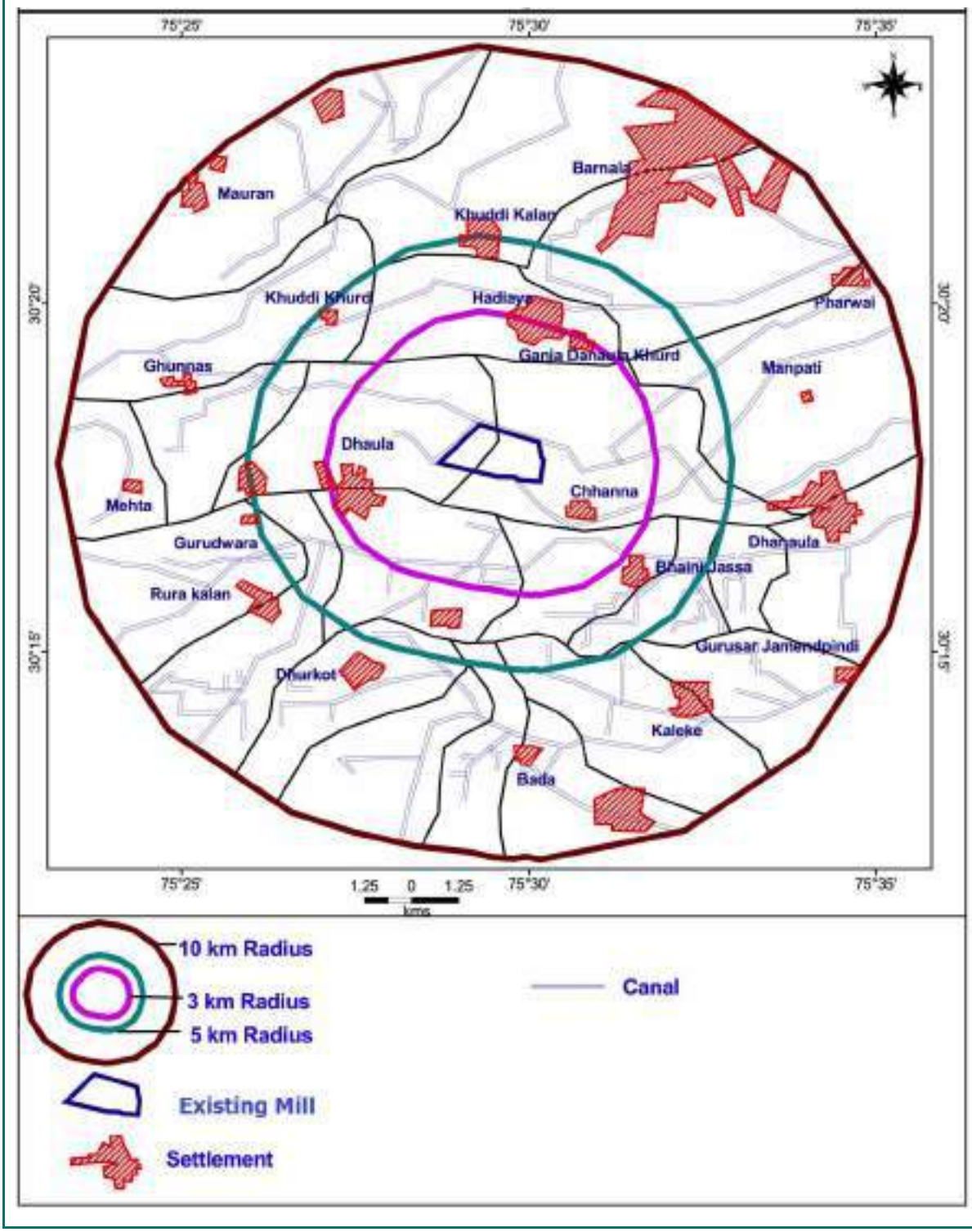


Figure 4.7: Level I Land use and Landcover in the Study Area (10KM from the plant boundary)

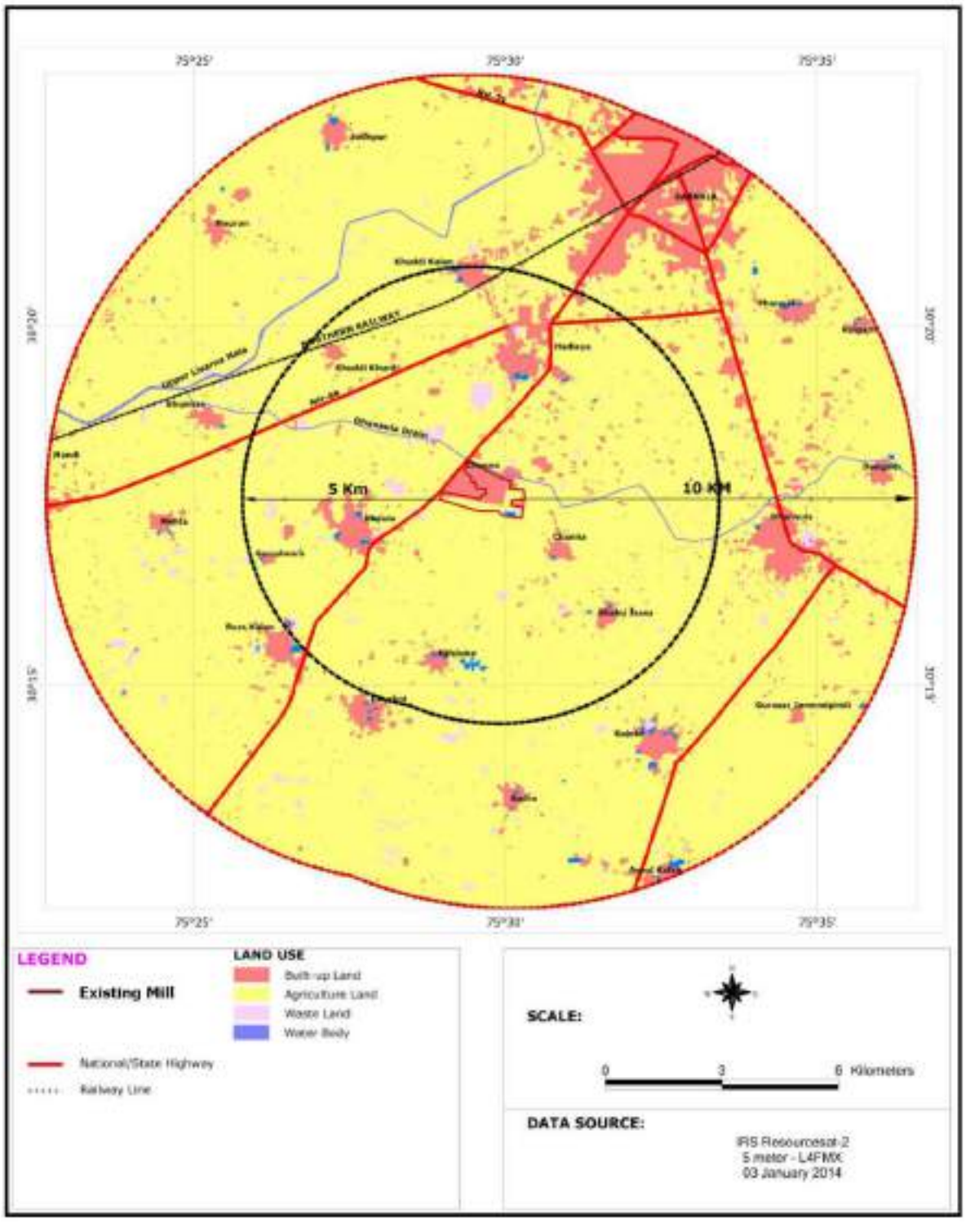
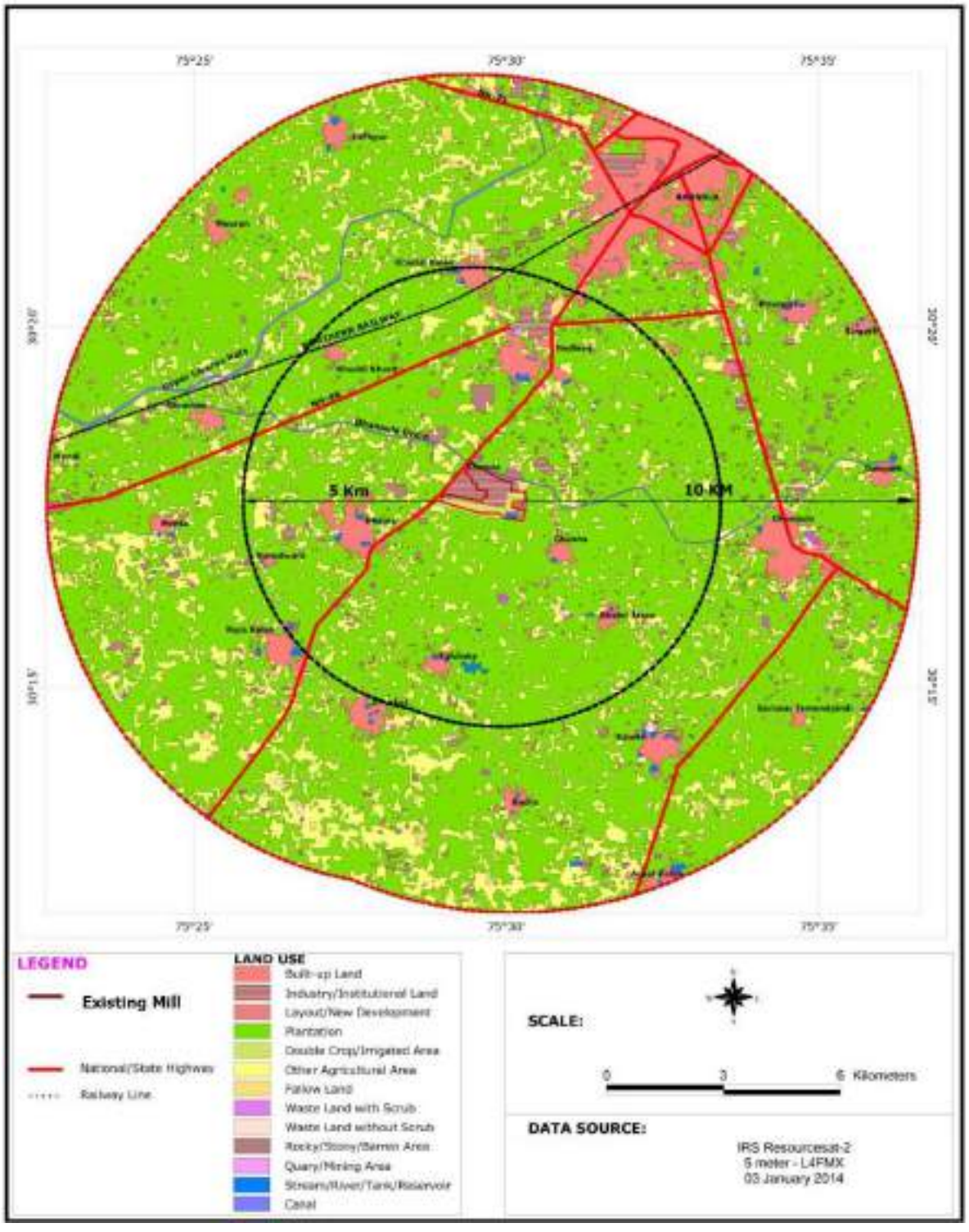


Figure 4.8: Level II Land use and Landcover in the Study Area (10KM from the plant boundary)



4.3. Geology and Soil Type

Based on details collected from the published EIA report in 2016, geologically the area is covered by the Sedimentary formation of the Quaternary area. The region is underlined by Grey micaceous, fine to coarse-grained sand, silt and clay (Active flood plain), Cyclic sequence of grey micaceous sand silt and clay (Older flood plain deposit and Multicyclic sequence of brown to grey silt, clay and kankar and reddish-brown to grey sand (older alluvial plain). The geology of the area (10km radius from the plant boundary) is given in **Figure 4.9**.

The landforms / geomorphic units and structures such as fractures, fissures and faults have been interpreted from the satellite image. All the landform / geomorphic units and structures occurring in the study area are mapped. The geomorphology and structures of the area play a vital role in identifying the groundwater potential zones. Two geomorphic units namely Dune complex, Alluvial plain older – under canal command in the study area. The following geomorphic units have been interpreted.

1) Dune Complex

2) Alluvial plain older – under canal command

Dune complex and the Alluvial plain older are good in groundwater occurrence and movement. However, the Dune complex is very good as this unit completely comprised of sand. Alluvial plan older under canal command is clay and silt dominant. The percolation rate is comparatively low in this unit. The existing mill site area is located in Alluvial Plain older under canal command. The Geomorphology of the study area is presented in **Figure 4.10**.

Prominent types of soil in the district are coarse loamy calcareous soils, fine loamy calcareous soils and a thin layer of sandy over loamy soils presents western and southern parts of the district. In the study area more specifically, Coarse loamy over sandy soils, Moderate flooding sandy soils are observed. Soil classification of the area is given in **Figure 4.11.**

Figure 4.9: Geology of the Study Area (10KM from the plant boundary is marked as a circle)

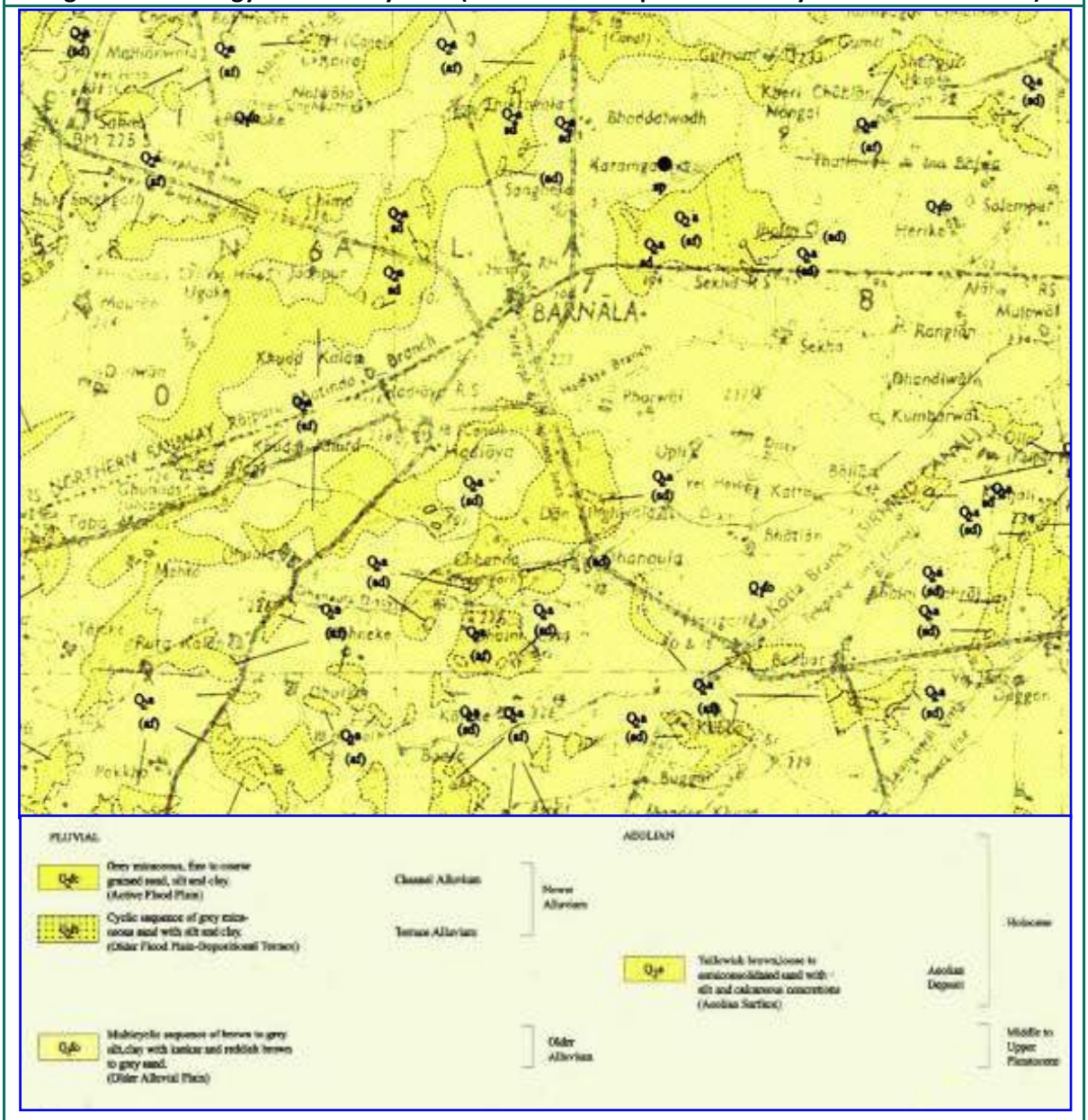


Figure 4.10: Geomorphology of the Study Area (10KM from the plant boundary)

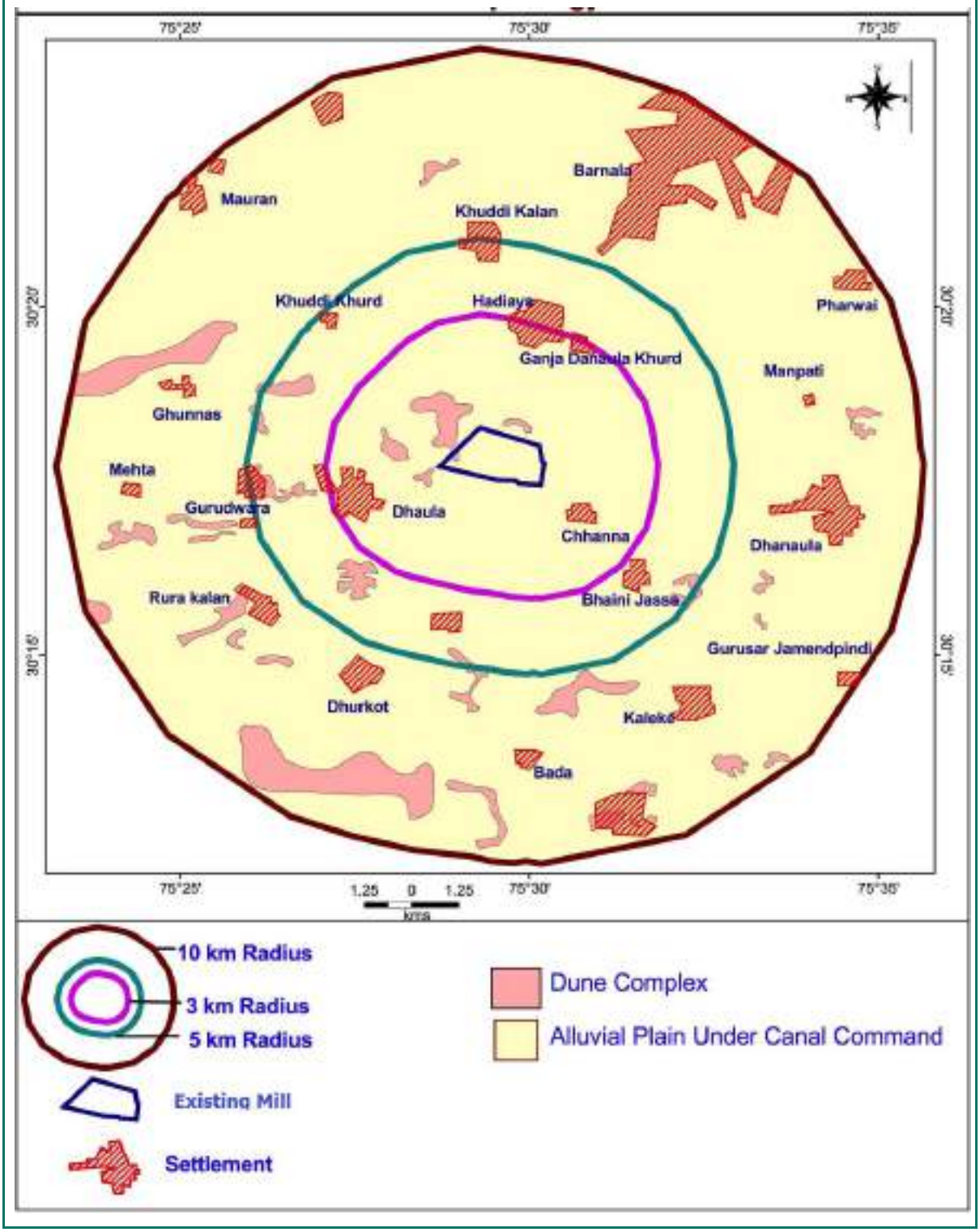
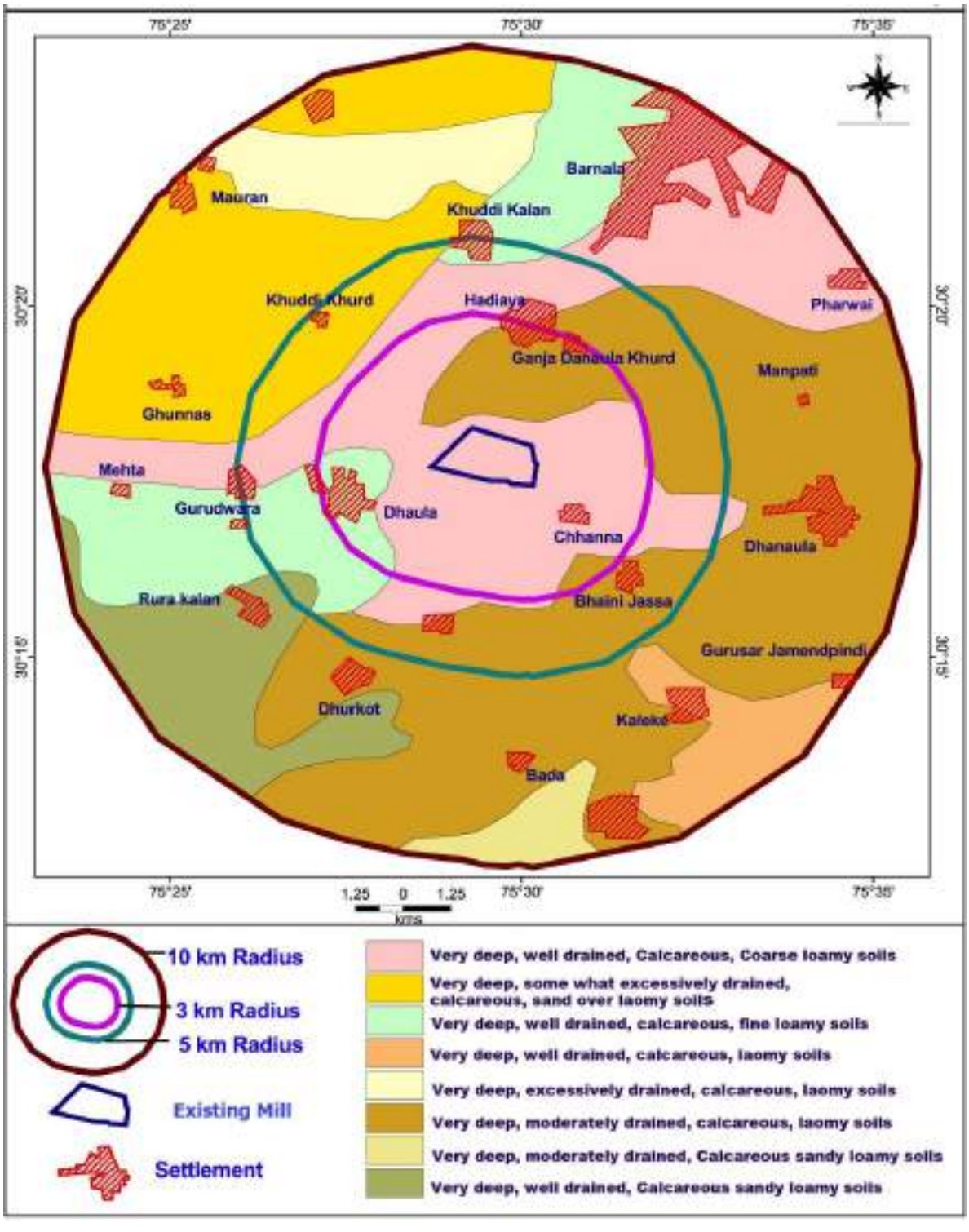


Figure 4.11: Soil classification of the Study Area (10KM from the plant boundary)



4.4. Hydrogeology

Based on details collected from the published EIA report in 2016, there are around 23 watersheds within the study area of 10km radius from the plant which covers an aerial extent of 328.38 Sq.Km. Watersheds within a 10Km radius from the mill are given in **Figure 4.12**.

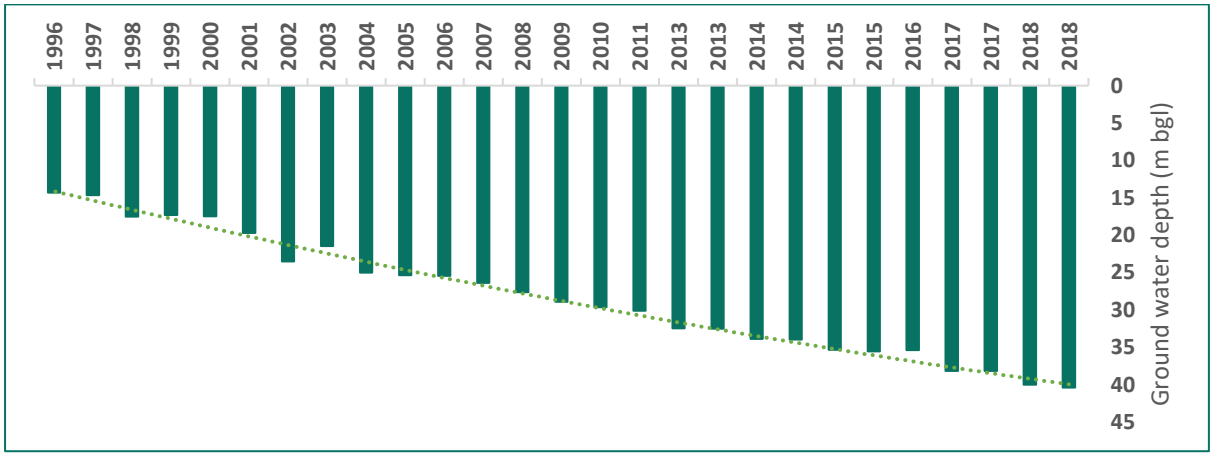
The district is occupied by Indo-Gangetic alluvial plain of Quaternary age and falls in Ghaggar sub-basin. The groundwater occurs in alluvium formations comprising fine to coarse sand which forms the potential aquifers. In the shallow aquifers up to 50m bgl groundwater occurs under unconfined /water table conditions whereas in deeper aquifers semi-confined /confined conditions exist.

Water level Behaviour- as per the published EIA report, the depth to the water level in the region ranges from 8.72 m to 23.89 m bgl during the pre-monsoon period and 9.95 m to 25.41m bgl during post-monsoon period. The seasonal fluctuation varies from 1.05 m to 5.32 m in the study area. The long-term fluctuation trend indicates an average fall of 0.65m/year. The hydrogeology map of the district is given in **Figure 4.13.**

As per the details published by Central Ground Water Board, the Barnala block is categorized as an Over Exploited Zone. The groundwater potential and the categorization of blocks is given in **Figure 4.14**. The regional groundwater levels vary between 15 to 27 m bgl which is in line with the above and the yield of the wells varies between 1000 to 4000 liters per minute. Groundwater level contour is presented in **Figure 4.15.**

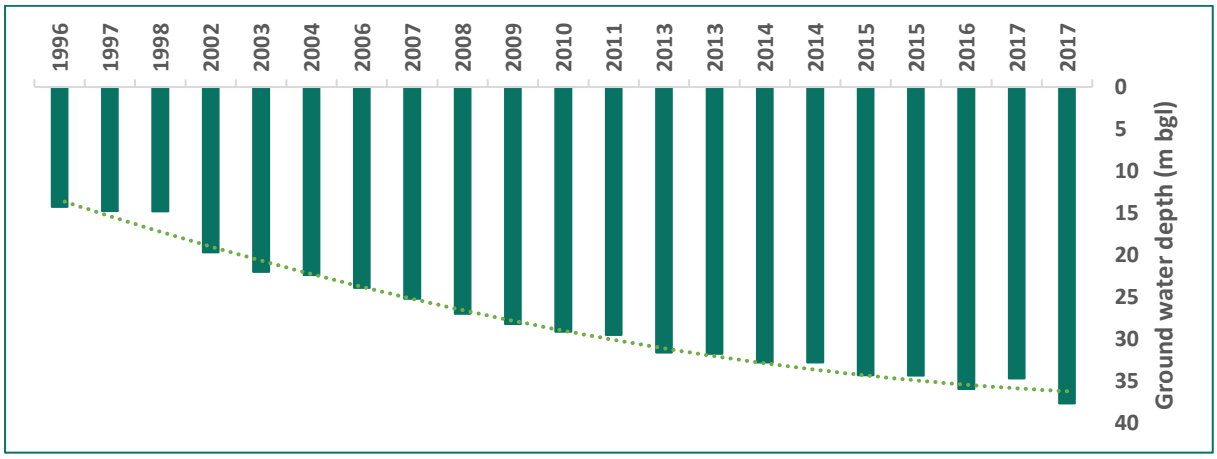
The published data on the historical trend of groundwater depth at the nearest CGWB maintained tube well located in Barnala town during monsoon and pre-monsoon is presented below:

Historical trend of groundwater depth in the region during monsoon



Source: Central Ground Water Board

Historical trend of groundwater depth in the region during pre-monsoon



Source: Central Ground Water Board

Over the past 22 years, the groundwater depth has been increased to an extent of approx. 26.1m during monsoon and 23.4m during pre-monsoon which could be due to the extensive utilization of groundwater for irrigation and improved urbanization in the region.

As per the published EIA report in 2016, the soil lithology reveals that the porosity of the soil is 46.82% and the Texture is Sandy clay. The porosity indicates that the infiltration rate of the soil is moderate. The groundwater table contour depicts that the flow is towards the west direction in both the seasons which is in line with the land elevation profile. The hydraulic gradient in the mill site is moderate and has been observed as 4.8 m/Km in pre-monsoon and 3.9 m/Km in post-monsoon. It is also noticed groundwater trough and mound in isolated pockets of the study area which indicates the convergent and divergent flow of groundwater. The groundwater table constructed for the study area is presented in **Figure 16** and **Figure 17**.

Figure 4.12: Water Shed of the Study Area (10KM from the plant boundary)

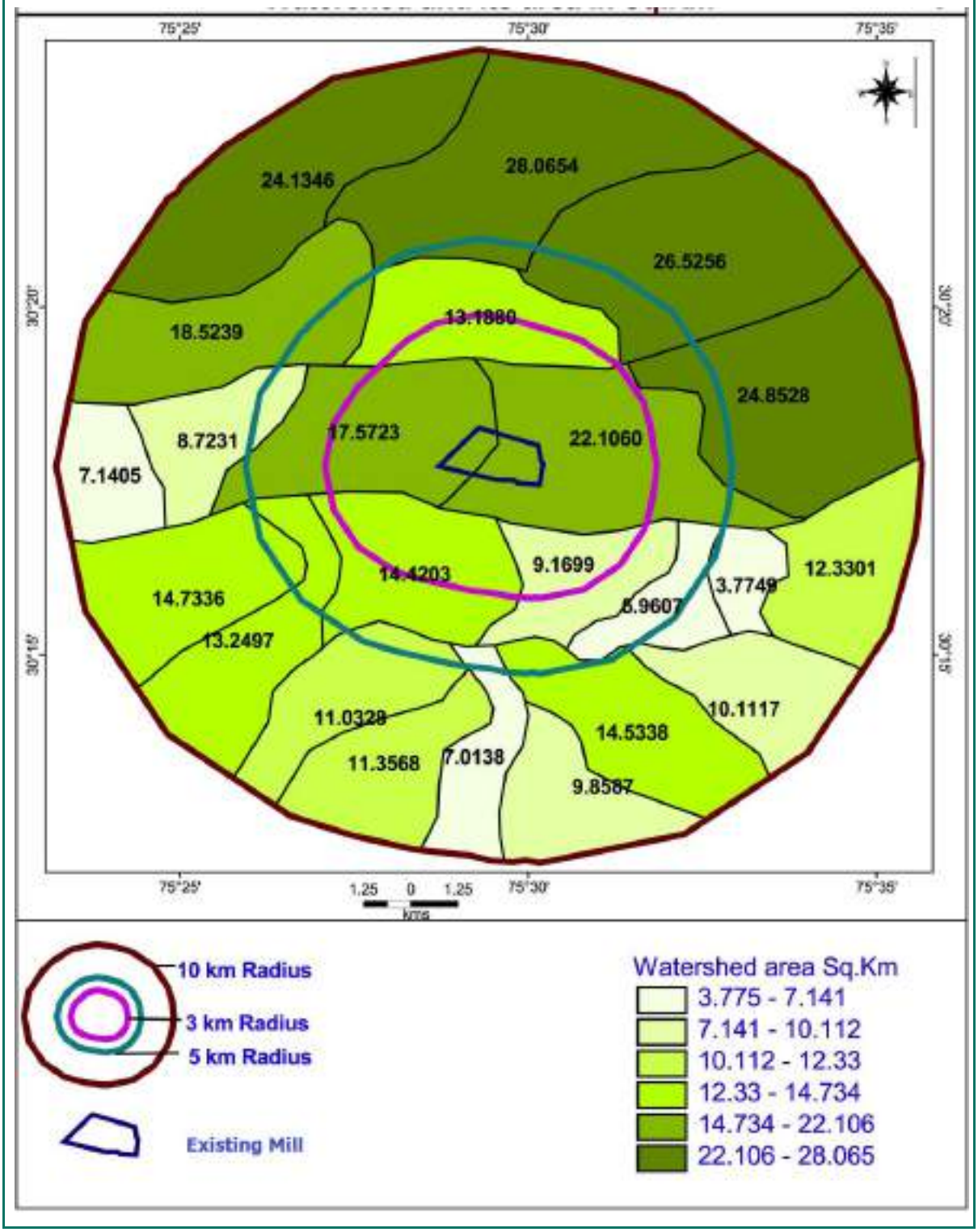


Figure 4.13: Hydrogeology map of the Area

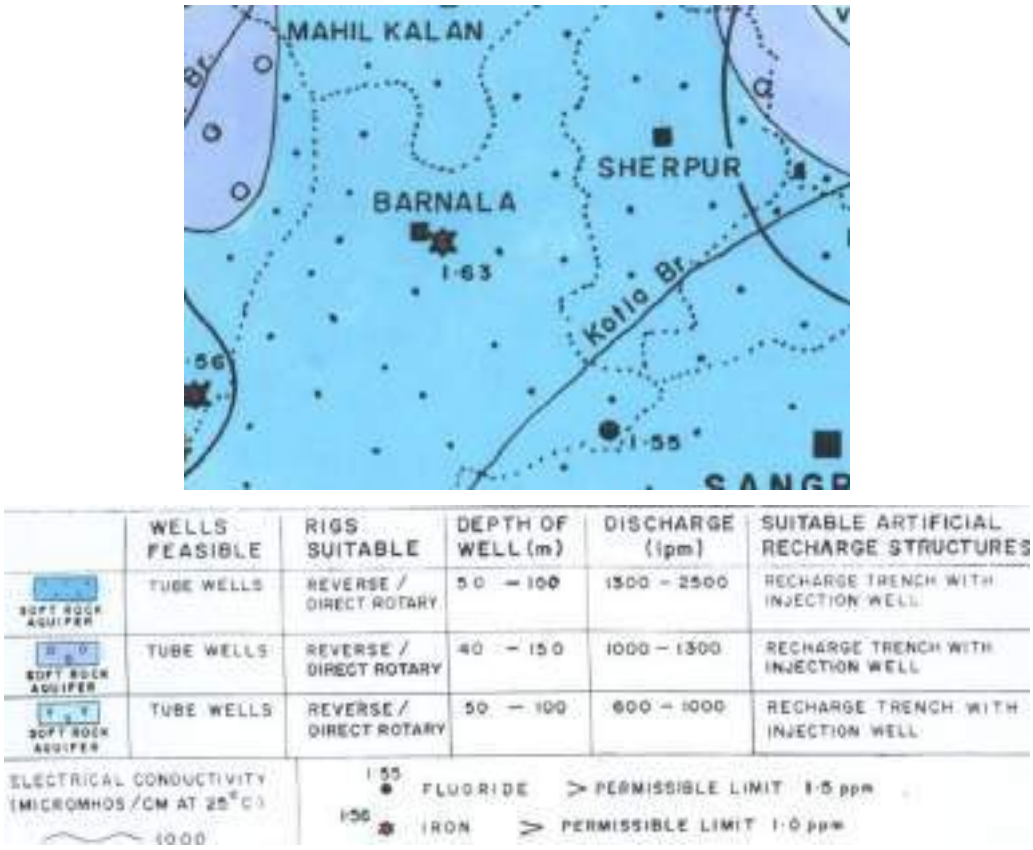


Figure 4.14: Groundwater potential and the categorization of Blocks in the Area

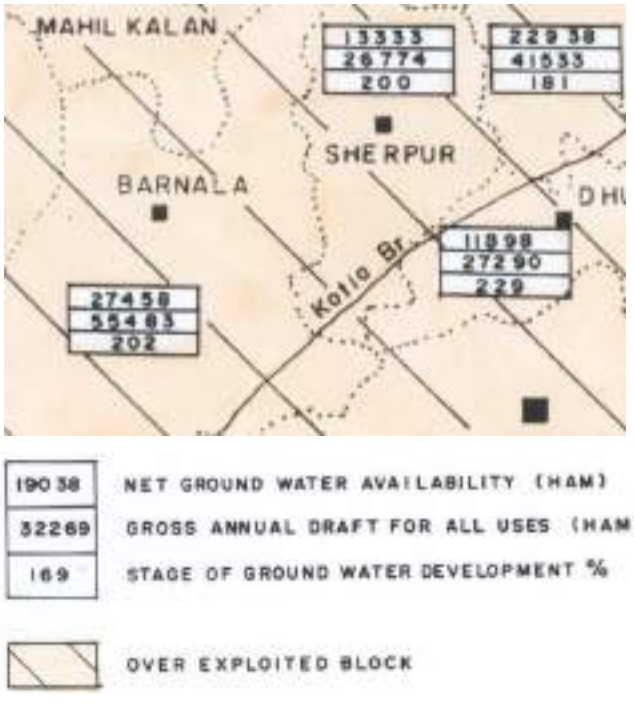


Figure 4.15: Groundwater level contour of the Study Area (10KM from the plant boundary)

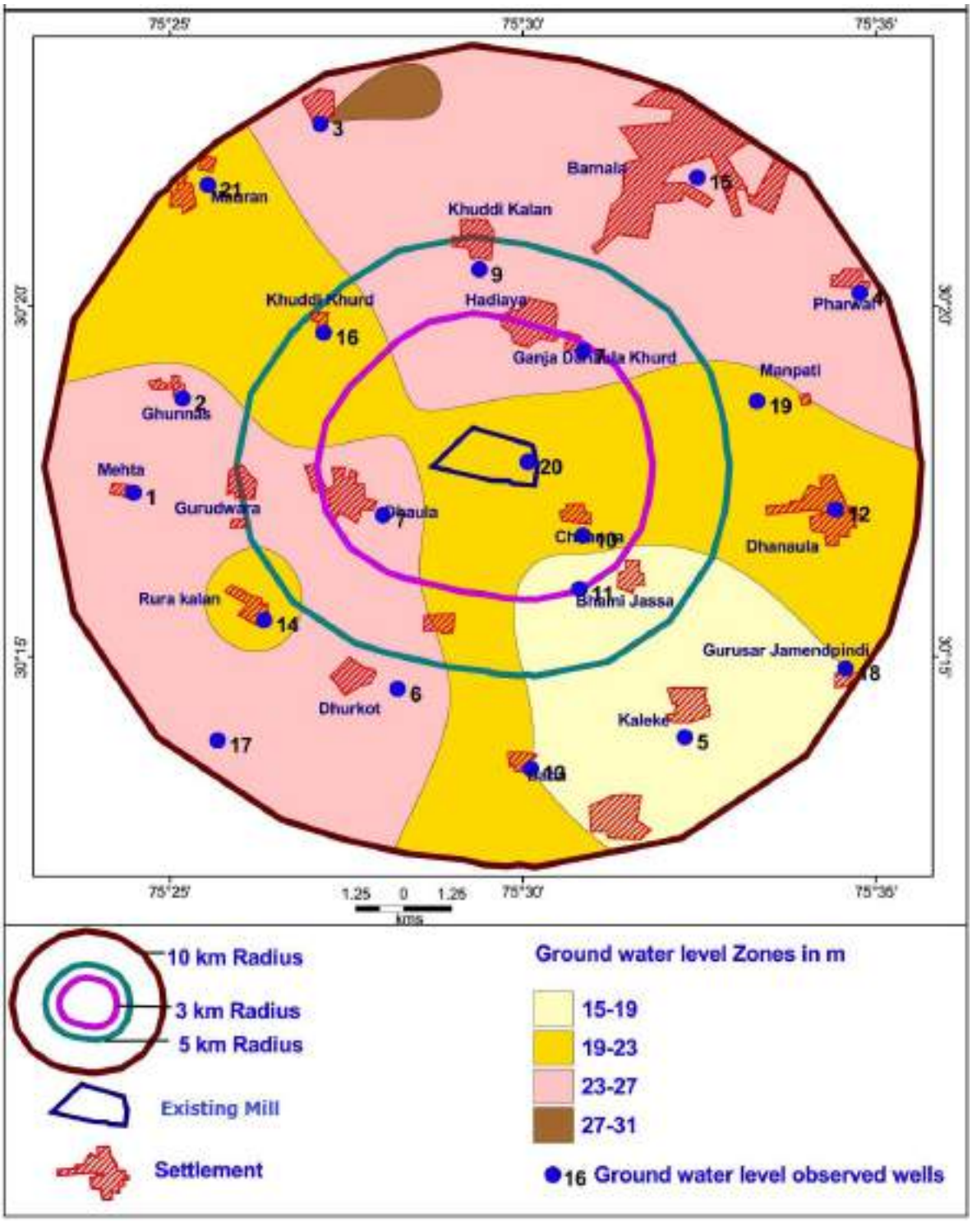


Figure 4.16: Groundwater table and hydraulic gradient during Pre-Monsoon (10KM from the plant boundary)

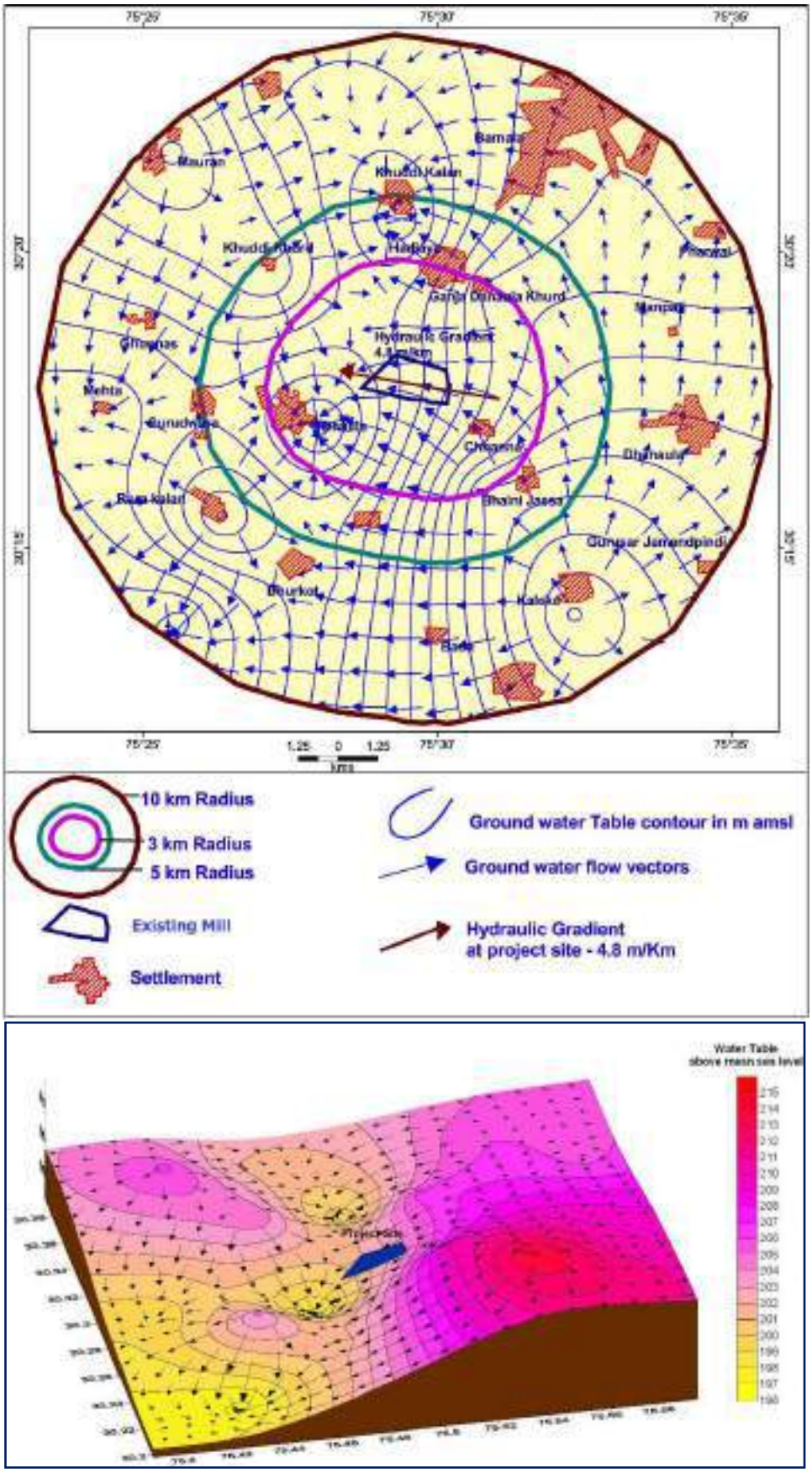
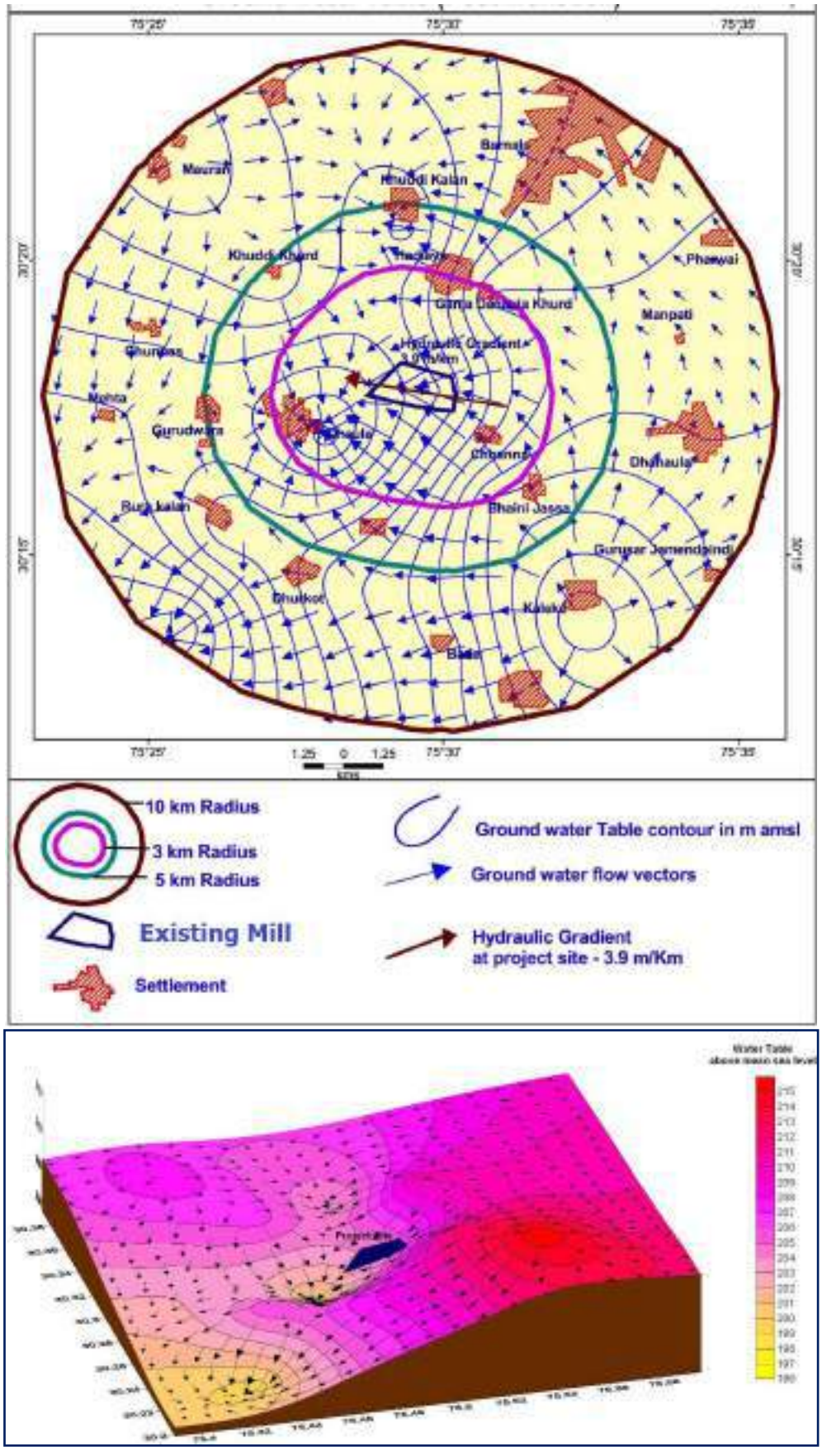


Figure 4.17: Groundwater table and hydraulic gradient during Post-Monsoon (10KM from the plant boundary)



5. SOIL AND GROUNDWATER QUALITY IN THE REGION

5.1. Published Information on Soil and Groundwater Quality in the Region

Based on the quality data published by Central Ground Water Board, Ministry of water resources, Govt. of India, the groundwater in the district is generally alkaline in nature. The chemical quality data from the shallow and deep aquifers indicate that all major cations (Ca, Mg, Na, and K) and anions (CO_3, HCO_3, Cl, SO_4) are within the permissible limits set by BIS, 2012. The physical parameters such as electrical conductivity show a wide variation from 827 µS/cm in the southern and northern part to 1140 µS/cm in the central part of the district particularly where the existing mill is location. It was also concluded that since all the physical and chemical parameters are below the permissible limit prescribed by BIS and the groundwater in the area is suitable for drinking purposes.

As per the data published by Water Resource Information System under the central water commission, the groundwater quality in the Barnala block (Coordinates of the well: 30.3583, 75.5583) was being recorded during 2015 and 2016. The summary of the quality data is below:

The average electrical conductivity was recorded was about 915 µmhos/cm which indicates that approx. total dissolved solids concentration is 450 to 500 mg/l. Thus, the regional level of groundwater quality in terms of TDS is moderate. The average pH recorded was about 8.8 which is also slightly exceeding the acceptable limit for drinking water. Hence the tendency to scale is significantly high.

The average *Sodium Adsorption Ratio (SAR)* value of 5.17 and *Residual Sodium Carbonate (RSC)* value of 3.73 has been recorded which indicates the SAR is below the permissible limit of 10 while the RSC value is slightly above the prescribed limit of 2.5 for the agricultural purpose. SAR is an indicator of the suitability of water used for agricultural purposes and also a standard diagnostic parameter for the sodicity hazard of soil. Whereas the RSC is an indicator for alkalinity hazard of soil and it can be inferred that the entire region has the tendency to exhibit higher pH in the soil.

5.2. Soil and Groundwater Quality – Primary Data

For the purpose of this assessment, the soil and groundwater samples have been collected from the below areas. The groundwater samples collected are from the existing private borewells which were drilled up to the deeper aquifer. There are no open wells located in the area.

I. ***Samples along the Dhanuala drain (less than 100m from the Drain)-***

- Upstream with respective to the plant discharge point
- Near the plant discharge point

- Downstream with respective to the plant discharge point

II. Samples to map the baseline background levels

- Upgradient location with respect to the groundwater flow direction (Southeast to the plant)
- Cross gradient location with respect to the groundwater flow direction (Southwest to the plant)

III. Samples within the onsite irrigation area

The location details for the above-mentioned soil and groundwater sampling points are given in **Table 5.1** and **Table 5.2** respectively. The location maps are presented in **Figure 5.1** and **Figure 5.2**.

The analytical data of soil and groundwater samples are summarized and presented in **Table 5.3** and **Table 5.4** respectively. The laboratory test reports are attached as **Annexure** of this report.

Table 5.1: Groundwater Sampling location details

Code	Location Description	Latitude	Longitude
GW1	Along the drain - Upstream of Dhanuala from plant	*30.295647°*	*75.510133°*
GW2	Along the drain - Upstream of Dhanuala from plant	*30.293611°*	*75.520917°*
GW3	Baseline background Location (Upgradient as per groundwater flow direction)	*30.273278°*	*75.525667°*
GW4	Baseline background Location (Upgradient as per groundwater flow direction)	*30.269889°*	*75.529806°*
GW5	Along the drain – Near the plant	*30.303547°*	*75.491189°*
GW6	Along the drain – Downstream of Dhanuala from plant	*30.306944°*	*75.480528°*
GW7	Along the drain – Downstream of Dhanuala from plant	*30.307833°*	*75.474722°*
GW8	Along the drain – Downstream of Dhanuala from plant	*30.314167°*	*75.429583°*
GW9	Along the drain – Downstream of Dhanuala from plant	*30.316199°*	*75.418556°*
GW10	Baseline background Location (the Nearest village in the South)	*30.283539°*	*75.465386°*
GW11	Within the onsite irrigation area	*30.297722°*	*75.486056°*
GW12	Within the onsite irrigation area	*30.290187°*	*75.499296°*

Table 5.2: Soil Sampling location details

Code	Location Description	Latitude	Longitude
S1	Along the drain - Upstream of Dhanuala from plant	*30.297361°*	*75.510417°*

S2	Along the drain - Upstream of Dhanuala from plant	*30.293611°*	*75.520917°*
S3	Baseline background Location (Upgradient as per groundwater flow direction)	*30.273278°*	*75.525667°*
S4	Baseline background Location (Upgradient as per groundwater flow direction)	*30.269889°*	*75.529806°*
S5	Along the drain – Near the plant	*30.300357°*	*75.497876°*
S6	Along the drain – Downstream of Dhanuala from plant	*30.307833°*	*75.474722°*
S7	Along the drain – Downstream of Dhanuala from plant	*30.313606°*	*75.429431°*
S8	Along the drain – Downstream of Dhanuala from plant	*30.316173°*	*75.418771°*
S9	Within the onsite irrigation area	*30.297722°*	*75.486053°*
S10	Within the onsite irrigation area	*30.295487°*	*75.489771°*
S11	Within the onsite irrigation area	*30.290632°*	*75.499480°*

Figure 5.1: Locations of Groundwater Sampling

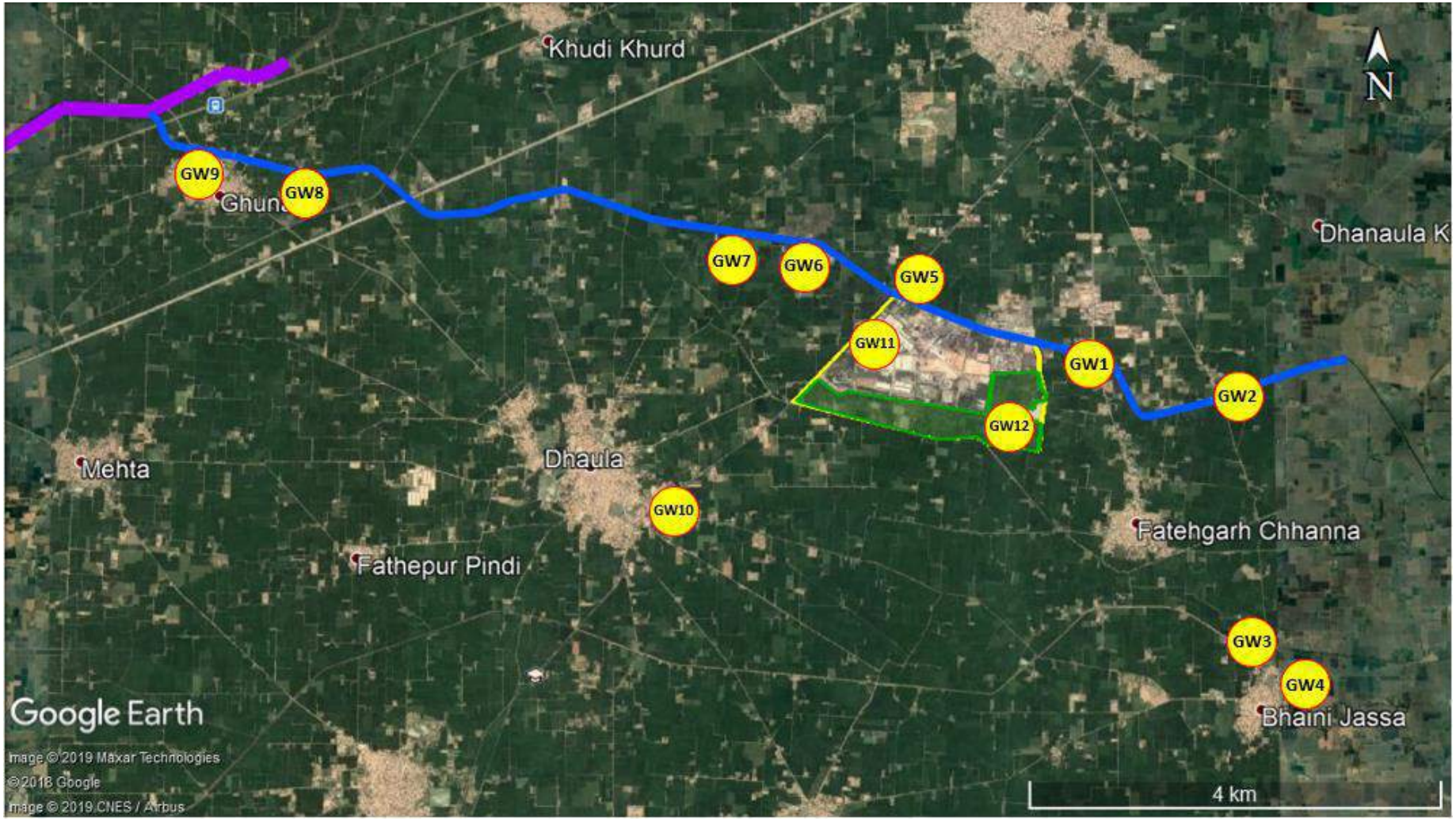


Figure 5.2: Locations of Soil Sampling

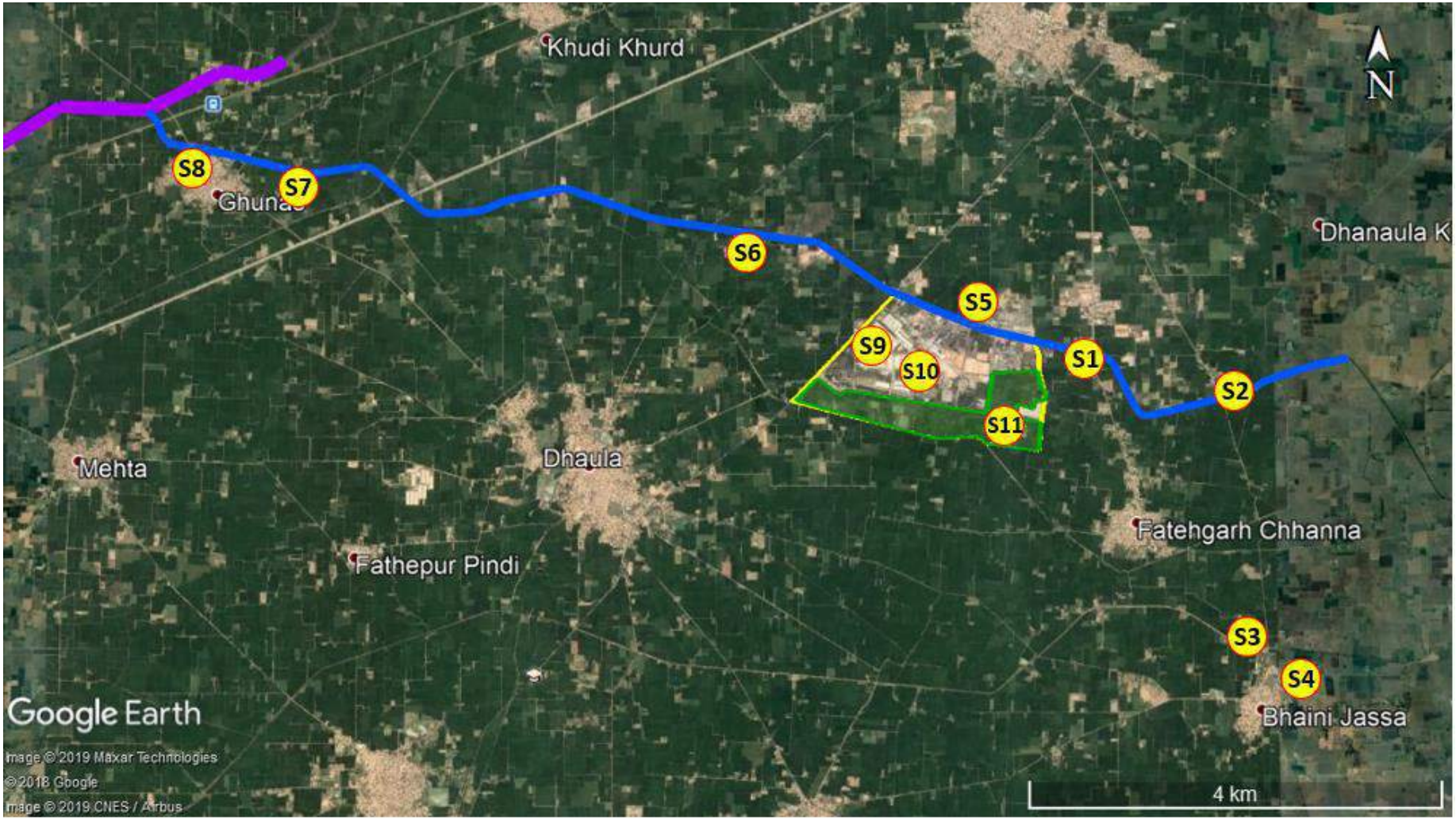


Figure 5.3: Photographs of Soil and Groundwater Sampling



Table 5.3: Summary of Groundwater Analytical results

S. No.	Parameters	Units	Detection Limit	Along Dhanuala Drain							Within the onsite irrigation area		Background baseline locations			Dutch Standards	
				Upstream		Near the Plant	Downstream										
				GW-1	GW-2	GW-5	GW-6	GW-7	GW-8	GW-9	GW-11	GW-12	GW-3	GW-4	GW-10	Target Values	Intervention Values
1	pH			7.64	7.98	7.47	7.14	7.63	7.52	7.46	7.39	7.62	7.71	7.77	7.59		
2	Total Dissolved Solids	mg/l		874	894	1060	1276	876	784	1062	1222	942	524	558	676		
3	Electrical Conductivity	µmhos/cm		1409	1444	1710	2060	1411	1265	1716	1971	1523	846	901	1092		
4	Total Hardness (as $CaCO_3$)	mg/l		260	220	265	595	310	305	375	380	285	145	140	180		
5	Chemical Oxygen Demand (COD)	mg/l	4	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*		
6	BOD at 27ºC for 3 days	mg/l	2	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*		
7	Dissolved Oxygen	mg/l		7.4	7.4	7.5	7.4	7.4	7.4	7.4	7.5	7.4	7.4	7.5	7.4		
8	Salinity (as NaCl)	mg/l		588.05	666.83	658.7	518.42	424.39	257.68	579.03	738.5	502.16	220.83	376.36	439.13		
9	Nitrogen (as N)	mg/l	0.3	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*		
10	Phosphorus (as P)	mg/l	0.2	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*		
11	Potassium (as K)	mg/l		7.09	6.78	7.35	8.27	8.08	7.46	7.4	7.3	6.65	4.91	5.09	5.55		
12	Aluminium (as Al)	mg/l	0.005	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	0.16	*bdl*	*bdl*	*bdl*		
13	Barium (as Ba)	mg/l	0.005	0.065	0.044	0.1	0.083	0.078	0.058	0.062	0.058	0.069	0.041	0.031	0.035	0.05	0.625
14	Copper (as Cu)	mg/l	0.005	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	0.008	*bdl*	*bdl*	*bdl*	0.015	0.075
15	Iron (as Fe)	mg/l	0.05	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	0.13	0.056	0.94	*bdl*	*bdl*	*bdl*		
16	Manganese (as Mn)	mg/l	0.005	*bdl*	*bdl*	*bdl*	0.038	*bdl*	*bdl*	*bdl*	0.008	0.03	*bdl*	*bdl*	0.009		
17	Selenium (as Se)	mg/l	0.005	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	0.00007	0.16
18	Silver (as Ag)	mg/l	0.005	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	-	0.04
19	Zinc (as Zn)	mg/l	0.02	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	0.025	*bdl*	0.12	*bdl*	*bdl*	*bdl*	0.065	0.8
20	Molybdenum (as Mo)	mg/l	0.005	0.006	0.008	*bdl*	*bdl*	0.011	*bdl*	*bdl*	0.006	0.006	0.014	0.028	0.007	0.005	0.3
21	Cadmium (as Cd)	mg/l	0.02	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	0.0004	0.006
22	Lead (as Pb)	mg/l	0.005	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	0.015	0.075

23	Mercury (as Hg)	mg/l	0.0005	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	0.00005	0.0003
24	Nickel (as Ni)	mg/l	0.005	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	0.015	0.075
25	Total Arsenic (as As)	mg/l	0.005	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	0.01	0.06
26	Total Chromium (as Cr)	mg/l	0.005	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	0.001	0.03
27	Polychlorinated biphenyl (PCB)	µg/l	0.05	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	0.01	0.01
28	Polynuclear Aromatic hydrocarbons (PAH)	µg/l	0.05	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*		
29	Residual Pesticides	µg/l	0.01	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*		

	Detected values
	Below detectable levels
	Values exceeding the Dutch Target values
	Values exceeding the Dutch Intervention values

Table 5.4: Summary of Soil Analytical results

S. No.	Parameters	Units	Detection Limit	Along Dhanuala Drain						Within the onsite irrigation area			Background baseline locations		Dutch Standards	
				Upstream		Near the Plant	Downstream									
				S-1	S-2	S-5	S-6	S-7	S-8	S-9	S-10	S-11	S-3	S-4	Target Values	Intervention Values
1	pH			8.72	8.86	8.39	9.23	8.49	9.05	8.98	9.25	8.95	8.62	8.68		
2	Electrical conductivity	µmhos/cm		220	259	280	119	116	148	108	258	164	279	155	**2000***	
3	Organic Matter	% wt/wt		0.7	0.49	0.49	0.68	0.85	0.63	0.42	0.5	0.54	1.01	0.62		
4	Available Phosphorus (as P)	% wt/wt		0.083	0.101	0.054	0.063	0.08	0.091	0.069	0.033	0.054	0.083	0.056		
5	Total Nitrogen (as N)	% wt/wt		0.08	0.21	0.16	0.043	0.065	0.046	0.074	0.047	0.05	0.05	0.09		
6	Oil & Grease	% wt/wt		*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*		
7	Salinity (as Nacl)	% wt/wt		0.09	0.12	0.1	0.17	0.17	0.11	0.1	0.12	0.13	0.11	0.14		
8	Moisture	% wt/wt		13.95	13.25	10.31	9.64	13.39	10.41	1.89	5.21	2.83	10.47	11.48		
9	Cadmium (as Cd)	mg/kg	1	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	**0.8**	**12**
10	Zinc (as Zn)	mg/kg	1	42.33	50.22	35.33	33.47	34.83	32.34	19.19	39.73	55.32	43.16	74.56	**140**	**720**
11	Total Chromium (as Cr)	mg/kg	1	22.16	30.19	21.24	18.66	17.56	16.07	10.42	14.23	13.92	21.06	19.79	**100**	**380**
12	Nickel (as Ni)	mg/kg	1	14.31	23.6	13.08	9.04	9.41	5.39	*bdl*	6.52	6.82	13.47	12.59	**35**	**210**
13	Total Arsenic (as As)	mg/kg	1	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	**29**	**55**
14	Mercury (as Hg)	mg/kg	1	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	**0.3**	**10**
15	Copper (as Cu)	mg/kg	1	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	**36**	**190**
16	Lead (as Pb)	mg/kg	1	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	3.95	3.95	*bdl*	*bdl*	**85**	**530**
17	Polychlorinated biphenyl (PCB)	mg/kg	0.05	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	**0.02**	**1**
18	Polynuclear aromatic hydrocarbons (PAH)	mg/kg	0.05	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	**1**	**40**

** Acceptable limit as per Indian counsel of Agricultural research*

	Detected values
	Below Detectable Levels (*bdl*)
	Values exceeding the Dutch Target values
	Values exceeding the Dutch Intervention values

5.3. Summary of Groundwater Quality

pH:

pH may not have a direct impact but one of the important water quality parameters as the lower pH water is more likely to be corrosive and higher pH is water tends to scale. Based on the laboratory test results, the pH of the samples collected is in the range of 7.1 to 8.0 which is within the acceptable range as per drinking water standards published by IS 10500:2012.

Total Dissolved Solids:

The palatability of water with a total dissolved solids (TDS) level of less than about 500 mg/l is an acceptable limit for drinking purposes as per Indian standards. Considering the regional scenario of groundwater quality, the TDS levels in the district are likely to exceed 500 mg/l. Based on the laboratory results, the TDS in the samples collected from the existing borewells was recorded to be in the range of 524 to 1276 mg/l. The contour map is presented in **Figure 5.4** and the graphical representation is presented in **Figure 5.5**.

It can be inferred from the analytical data that the background baseline concentrations of TDS are reported in the range of 524 mg/l to 675 mg/l which is in line with the regional groundwater quality. The TDS concentration along the drain is in the range of 784 mg/l to 1276 mg/l and precisely varying from 874 mg/l to 894 mg/l in the upstream of drain from plant discharge, around 1060 mg/l near the plant discharge and from 784 mg/l to 1276 mg/l in the downstream of drain from plant discharge. The TDS concentration ranging from 942 mg/l to 1222 mg/l is recorded from the samples collected within the onsite irrigation. Based on the TDS level mapping, it can be inferred that the TDS levels in the groundwater is a regional phenomenon and is in line with the published regional level data.

Figure 5.4: TDS Concentration Contour Map

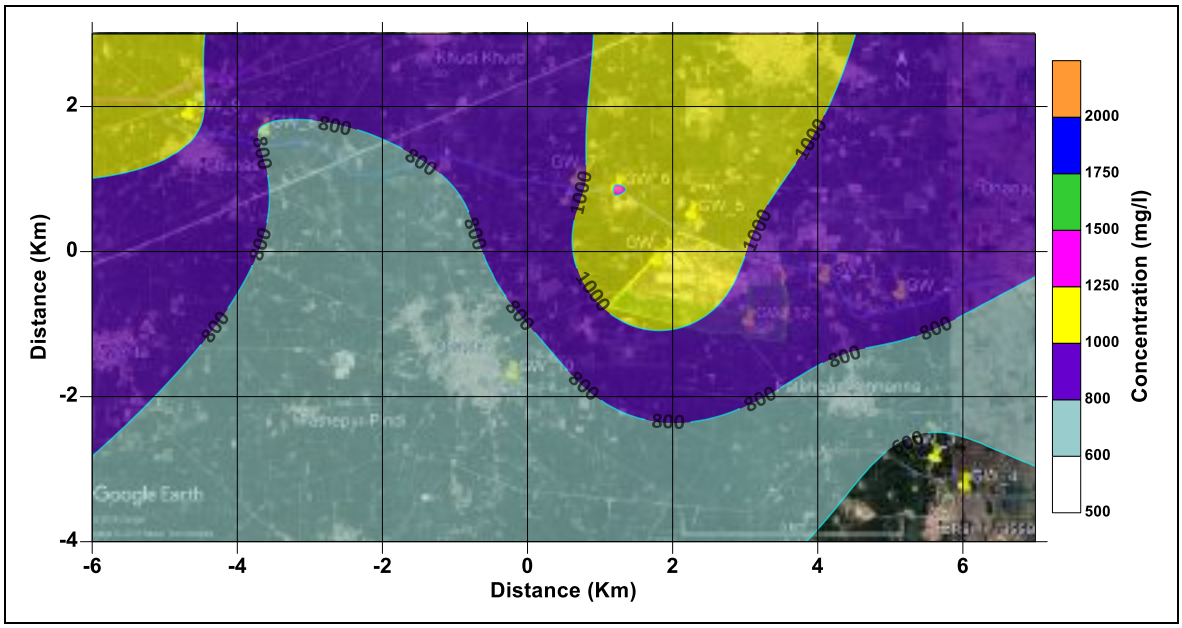
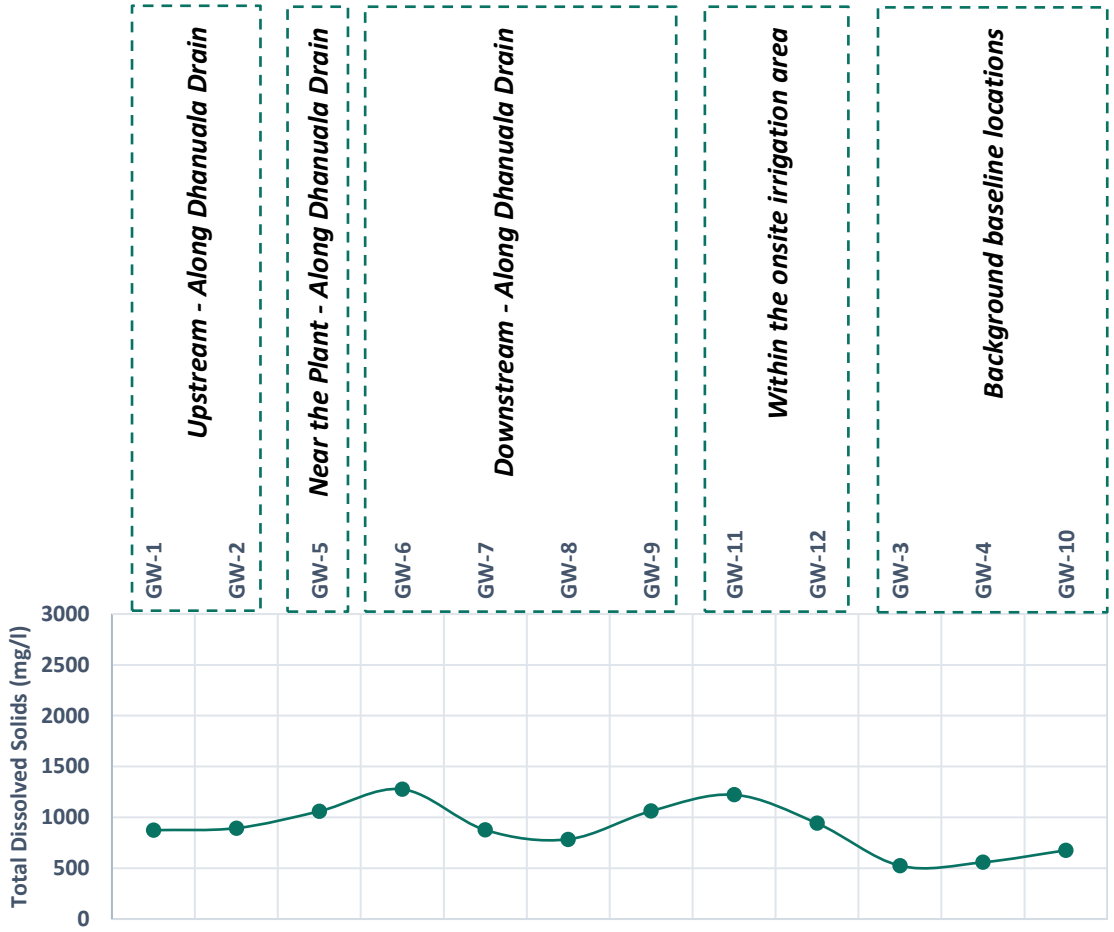


Figure 5.5: TDS Concentration in the Groundwater Samples Collected



Total Hardness:

Depending on the other parameters such as pH and alkalinity, hardness can cause increased scaling and corrosion tendencies. General guidelines for classification of waters are: 0 to 60 mg/l is classified as soft, 60 to 120 mg/l as moderately hard 120 to 180 mg/l as hard and more than 180 mg/l as very hard.

The water with a total hardness of less than 200 mg/l is an acceptable limit for drinking purposes as per Indian standards. Based on the laboratory results, the total hardness in the samples collected from the existing borewells was recorded to be in the range of 140 to 595 mg/l. The contour map is presented in **Figure 5.6** and the graphical representation is presented in **Figure 5.7**.

It can be inferred from the analytical data that the background baseline concentrations of hardness are reported in the range of 140 mg/l to 180 mg/l which is classified as moderately hard to hard but acceptable for drinking purposes as per Indian standards. The hardness concentration along the drain is in the range of 220 mg/l to 595 mg/l and precisely varying from 220 mg/l to 260 mg/l in the upstream of drain from plant discharge, around 265 mg/l near the plant discharge and from 305 mg/l to 595 mg/l in the downstream of drain from plant discharge. The hardness concentrations ranging from 285

mg/l to 380 mg/l are recorded from the samples collected within the onsite irrigation. Based on the hardness level mapping, it can be inferred that hardness is apparent at the plant site and exhibiting to be the local phenomenon and drastically diluted in the surrounding areas.

Figure 5.6: Hardness in Groundwater Contour Map

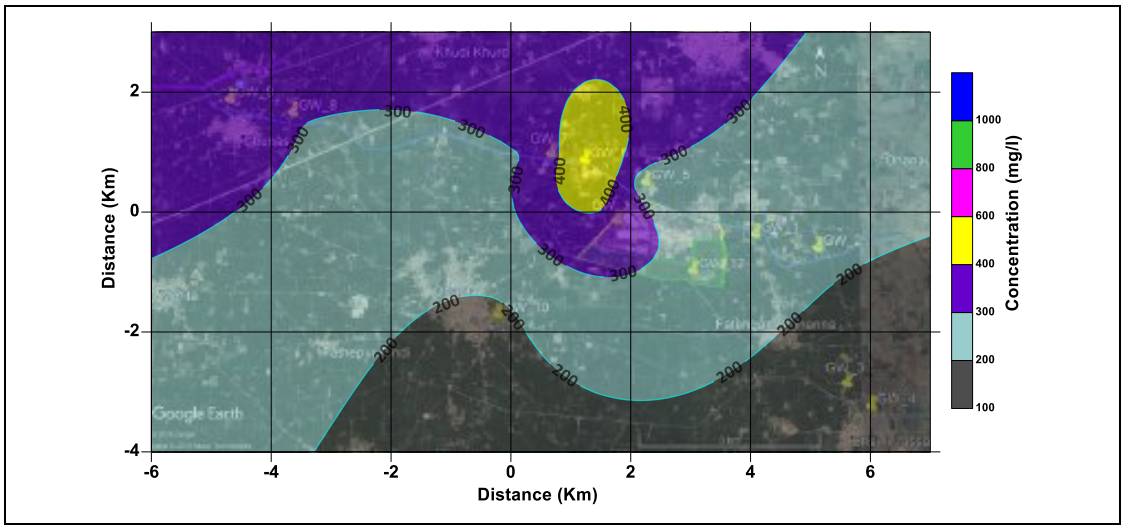
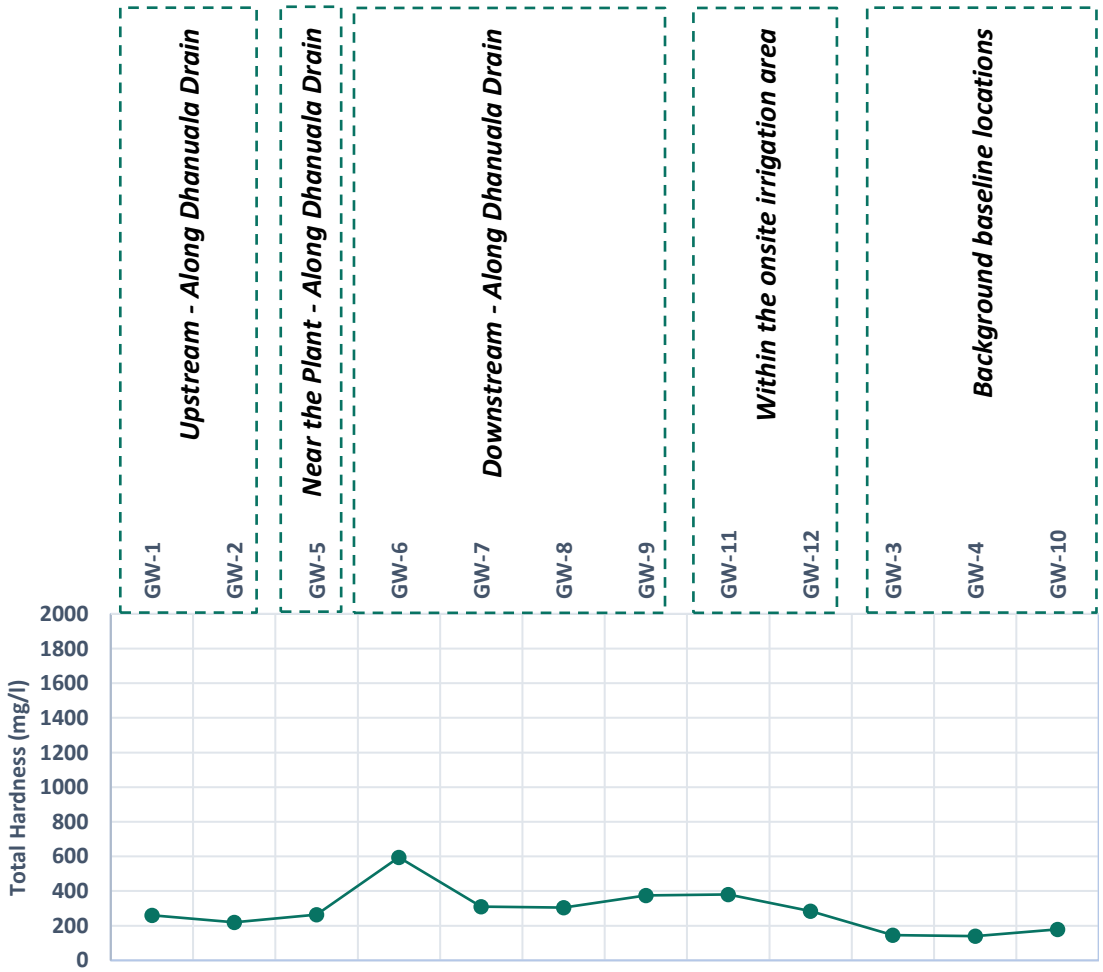


Figure 5.7: Hardness in the Groundwater Samples Collected



COD and BOD:

The chemical oxygen demand and biological oxygen demand concentrations do not exhibit or insignificant or below the detectable limits from the groundwater samples collected. Hence, it is evident that no direct ingression of industrial wastewaters or domestic sewages into the groundwater is envisaged.

Salinity:

In general, the Inland salinity in groundwater is prevalent mainly in the arid and semi-arid regions of various states including Punjab which is also reflected in terms of TDS concentration in the region. The salinity as NaCl concentrations in the groundwater samples collected is in the range of 220 mg/l to 739 mg/l. The contour map is presented in **Figure 5.8** and the graphical representation is presented in **Figure 5.9**.

There are no drinking water standards particularly for Salinity as NaCl. But higher concentrations of salinity in agricultural water impacts on plant growth and yield.

It can be inferred from the analytical data that the background baseline concentrations of salinity as NaCl are reported in the range of 220 mg/l to 439 mg/l. Whereas it is in the range of 258 mg/l to 667 mg/l and precisely varying from 588 mg/l to 667 mg/l in the upstream of drain from plant discharge, around 659 mg/l near the plant discharge and from 257 mg/l to 579 mg/l in the downstream of drain from plant discharge. The salinity as NaCl concentrations ranging from 502 mg/l to 739 mg/l is recorded from the samples collected within the onsite irrigation borewells. Based on the salinity level mapping, it can be inferred that it is a regional phenomenon.

Figure 5.8: Salinity as NaCl in Groundwater Contour Map

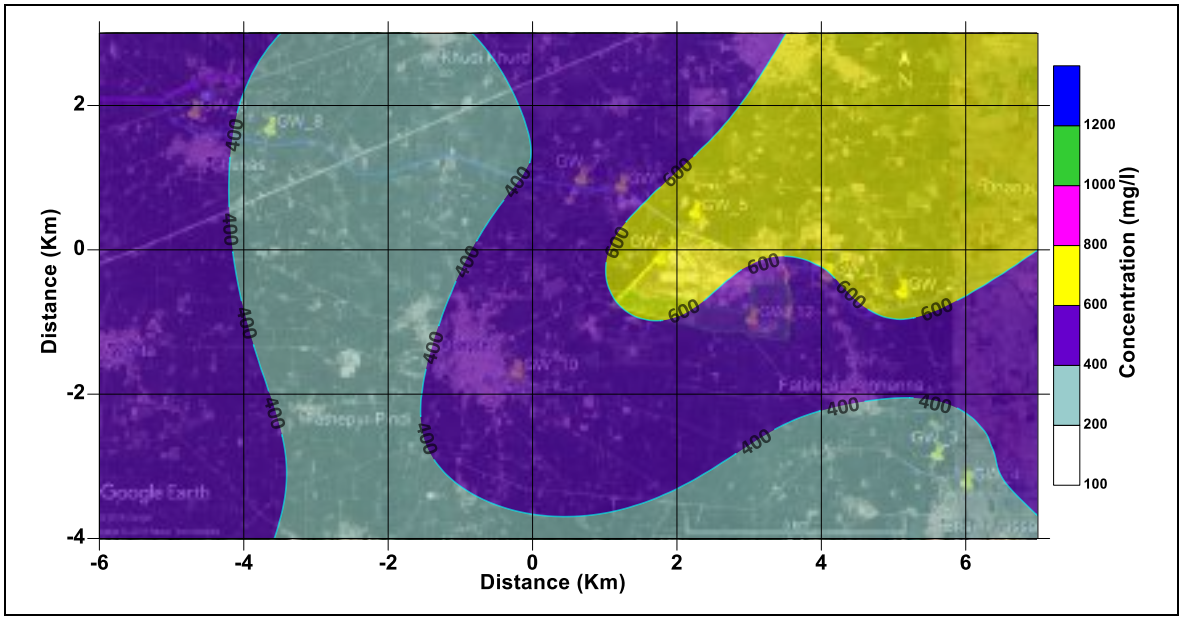
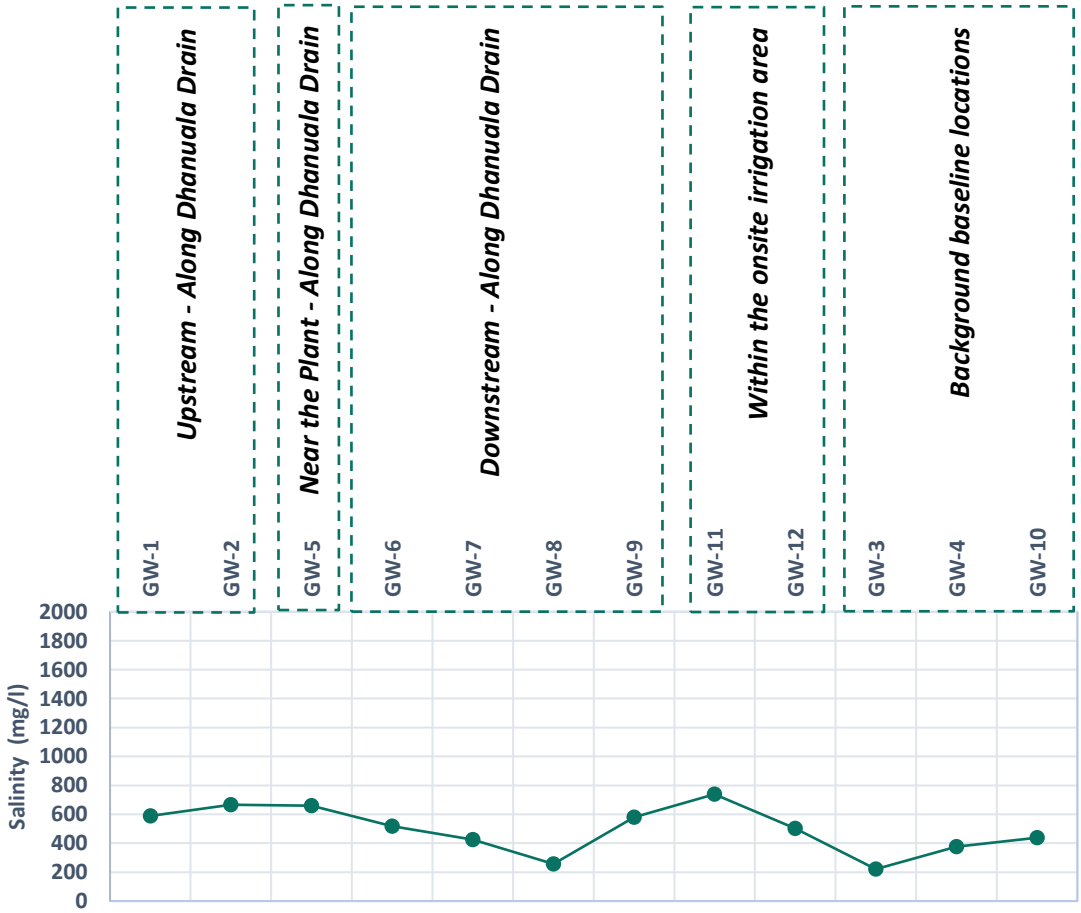


Figure 5.9: Salinity as NaCl in the Groundwater Samples Collected



Nutrients (NPK):

Nitrogen, Phosphorous, and Potassium are three primary nutrients that play an important role in agriculture for plant nutrition. Based on the analytical results of groundwater water samples collected, both nitrogen and phosphorous are concentrations do not exhibit or insignificant or below the detectable limits. Whereas, the potassium is varying in the range of 4.9 mg/l to 8.3 mg/l. There are no specific limiting concentrations for drinking water requirement whereas potassium is one of the primary nutrients for agriculture.

Heavy Metals:

The analytical results of groundwater samples collected and analyzed for Heavy metals concentrations were found to be below the intervention values as per Dutch International Standards. Hence, the groundwater in this region is not contaminated to the level of remediation and no further assessment and delineation of heavy metals contamination in the groundwater are necessarily required. Whereas, comparing the concentrations with the drinking water acceptable limits published by Indian Standards inferences that Aluminium, Iron and Manganese concentrations in the groundwater samples collected from borewell located in onsite irrigation land.

5.3. Summary of Soil Quality

The soil samples collected at various locations mentioned above were analyzed for 18 parameters. The values were then compared with the standard soil classification from the Handbook of Agriculture, Indian Council of Agricultural Research, New Delhi, 2012 to understand the suitability for agriculture and Dutch standards to evaluate the contamination if any.

pH:

The pH of the soil was found to be in the range of 8.39 to 9.25. pH above 7 is normally classified as alkaline and the high values of alkalinity. The pH in soil could be due to nitrogen-rich fertilizers in the soil. However, the alkaline soils could contribute to the growth of the plants rather than the acidic soils.

Electrical Conductivity:

The electrical conductivity of the soil was found to be in the range of 108 µmhos/cm to 280 µmhos/cm which could be a regional phenomenon and may be attributed to the use of fertilizers or could be due to the salinity intrusion in groundwater.

Organic Content & Total Nitrogen:

The organic content in the soil ranged from 0.42% wt/wt to 1.01% wt/wt. This could be due to the potential release of the nitrogen in the soil. The total nitrogen in the soil was found in the range of 0.043% wt/wt to 0.21% wt/wt. A typical agricultural soil would contain 0.10% to 0.15% N and hence the soil can be considered good for crop growth in terms of total nitrogen.

Available Phosphorus:

The available phosphorus in the soil was found between 0.033% wt/wt and 0.101% wt/wt. The cool, wet soils show low values of phosphorus. High values of available phosphorus will induce excessive plant growth due to the supply of essential primary nutrients. The phosphorus values could be increased by the use of phosphorus-rich fertilizers.

Salinity:

The salinity as NaCl in soil was found to be in the range of 0.09% wt/wt to 0.17% wt/wt. Since sodium does not contribute to the growth of the plants, its significance is less. Excessive sodium levels could be attributed to the irrigation waters which is the groundwater in this region.

Moisture:

The moisture in the soil samples was found to be between 1.89 % wt/wt and 13.95 % wt/wt. The higher moisture content implies that the water holding capacity of the soil is more and hence it is good for plant growth.

Zinc:

The values of Zinc ranged from 19.19 mg/kg to 74.56 mg/kg. These were found to be less than the target/Intervention values as per the Dutch Intervention Standards. This shows that the soil is not contaminated and non-toxic. Since the concentration of zinc is found to be moderate, the levels are found to be good for plant growth.

Total Chromium:

The values of Total chromium in the soil was in the range of 10.42 mg/kg to 30.19 mg/kg. This means that the soil is not contaminated. High values of chromium could be toxic.

Nickel:

The values of Nickel were found to be between 5.39 mg/kg and 23.6 mg/kg. The high content of nickel in the soil will cause toxicity. Since the values were found to be less than 35 mg/kg, it acts as a good source of nutrients that could be transferred as an important element in the diet of the human being.

Lead:

The lead values were found to Below Detection Limit (BDL) at all the locations except at the onsite irrigation areas where the traces were found.

All the other parameters such as Oil & grease, Cadmium, Total Arsenic, Mercury, Copper, Polychlorinated biphenyl (PCB) and Polynuclear aromatic hydrocarbons (PAH) were found to be Below Detection Limit (BDL) in all the soil samples collected.

6. SUMMARY AND CONCLUSIONS

The summary of soil and groundwater quality assessment carried out in the area is presented below:

- Based on the collected information regarding groundwater survey and exploration data published by CGWB for Barnala block, the groundwater flow direction in the area was evaluated to be towards the west. The land elevation slope in the area is also in line with the flow direction.
- The Water level as per the published EIA report in the region ranges from 8.72m to 23.89m bgl during the pre-monsoon period and 9.95 m to 25.41 m bgl during the post-monsoon

period. The seasonal fluctuation varies from 1.05 m to 5.32 m in the study area. The long-term fluctuation trend indicates the average fall of 0.65m/year. Barnala block is categorized as an Over Exploited Zone by CGWB.

- Based on the details obtained from during the assessment, the utilisation of treated wastewater for irrigation is in the order of 150 m^3 per Ha per day which is in line with the loading rates recommended for the soil texture (for loamy and sandy loamy soil type: 110 to 225 m^3/Ha/day) as per the notification of MoEF&CC published on 14 Jan, 2016.
- For the purpose of this assessment, the soil and groundwater samples have been collected (i) Along the Dhanuala drain (less than 100m from the Drain), (ii) at the upgradient locations to map the baseline background levels and (iii) at the onsite irrigation area. Groundwater samples were collected from the existing private borewells which were drilled up to the deeper aquifer which are in use.
    - pH in the groundwater samples collected was reported in the range of 7.1 to 8.0 which is within the acceptable range as per drinking water standards published by IS 10500:2012. Whereas the pH in soil was found to be more alkaline in the entire region.
    - TDS in the samples collected from the existing borewells were recorded to be in the range of 524 to 1276 mg/l. The TDS levels in groundwater from the samples collected is a regional phenomenon and is in line with the published regional level data. The groundwater's Salinity as NaCl is in-line with TDS which contributes to 50% to 60%. Similarly, the electrical conductivity in the soil is also high and depicting regional scenario which reflects the equivalent salinity as NaCl in soil.
    - Total hardness in the samples collected from the existing borewells was recorded to be in the range of 140 to 595 mg/l.
    - Minor traces of nutrients and Heavy metal were found in the groundwater and soil samples collected but the impact is totally insignificant.

***

Annexure I

Laboratory Analytical Test Reports for Groundwater Samples

Annexure II

Laboratory Analytical Test Reports for Soil Samples

Guidelines
for
Utilisation of Treated Effluent in Irrigation

CENTRAL POLLUTION CONTROL BOARD
(Ministry of Environment, Forest & Climate Change)
'Parivesh Bhawan', East Arjun Nagar,
Delhi- 110 032

September 2019

Guidelines for Utilisation of Treated Effluent in Irrigation

1.0 Background

The Hon'ble National Green Tribunal (NGT), Principal Bench, New Delhi, vide order dated 24.05.2019 in the matter of O.A. No. 348/2017, Shailesh Singh Vs Al-Dua Food Processing Pvt. Ltd., issued the following directions to CPCB:

"*..We may add that no industry can be permitted to dispose treated effluents on land for irrigation, plantation or horticulture/gardening by prescribing standards applicable without assessment of adequate availability of land and impacts of such disposal on agricultural / crops /plants and the recipient ground water. Impact of precipitation levels also needs consideration while granting such approvals. ZLD needs to be considered with respect to use of effluents in the industrial processes not in terms of its disposal on land or farm. Therefore, the CPCB needs to look into this aspect with the help of experts and issue appropriate guidelines in this regard. This aspect may also be covered in the report to be submitted in the present case...*"

CPCB, constituted an Expert Group, comprising of members from Indian Institute of Technology (IIT), Delhi, National Environmental Engineering Research Institute (NEERI), Delhi and Central Pollution Control Board (CPCB), Delhi, to lay down guidelines as directed by the Hon'ble NGT. The Expert Group in its two meetings held on 7.8.2019 and 23.09.2019, discussed the issues thoroughly and finalised the **"Guidelines for Utilisation of Treated Effluent in Irrigation"** as given in the following paragraphs/sections.

2.0 Introduction

Zero Liquid Discharge (ZLD) implies that the industries are not discharging any effluent, either on the land or in the water body or at any other place i.e. recycling the same in the process entirely without releasing any effluent.

ZLD accomplishment may need physical & chemical treatment, followed by biological system to remove organic load. The treated effluents can be then subjected for concentration and evaporation. The concentration method quite often involves the adoption of Reverse Osmosis (RO) and Nano Filtration (NF) methods. The evaporation methods involve drying/evaporation of effluent in multi effect evaporators (MEE).

Adopting ZLD practices may not be feasible in many cases in view of techno-economical reasons. However, the industries should still to be encouraged for

recycling and reuse of waste water as far as practicable in order to minimize the fresh water consumption and discharge of waste water into the environment. The treated waste water of an industry may also be utilised for irrigation. This type of utilisation/application is considered an efficient approach for managing/conserving water resources, compensating water shortages caused by seasonality or the irregular availability of water sources for irrigation throughout the year.

The possible risks of wastewater usage in agriculture may range from changes to physico-chemical and micro-biological properties of soils to impact on human health. In unfavorable economic conditions, the search for alternative irrigation sources, such as the use of untreated or inadequately treated wastewater may result in risk factors. Thus, it is necessary to ensure the beneficial aspects of this practice before application of treated wastewater in irrigation.

3.0 Guidelines for Utilisation of Effluent in Irrigation

(i) The industry should engage an agricultural scientist or tie-up with an agricultural university or institute for advice on the utilization or the rate of application of the effluent for irrigation considering the agro-climatic conditions.

(ii) As seasons and the sowing periods of the crops put restrictions on the utilisation of effluent for irrigation, the industry should prepare a comprehensive Irrigation Management Plan (IMP), which should include the following, in consultation with the agricultural scientist or agriculture university/institute and submit to SPCBs/PCCs which should verify the same while issuing Consent to the industry:

a. Areas to be covered under irrigation.
b. Survey/plot (khasra) numbers of land and their area covered in the scheme.
c. Written agreement with the farmers to bring their land under the scheme.
d. The quantity of effluent to be used in different periods of the year and crop-wise.
e. The treated effluent distribution system and arrangement for low/no demand period.
f. Agronomic plan for effective utilisation of land.

iii. The treated effluent should meet the norms prescribed for irrigation under Environment (Protection) Rules, 1986/Consent. The effluent should also conform to Total Dissolved Solid (TDS)- 2100 mg/l and Sodium Adsorption Ratio (SAR)- preferably less than 18 but not more than 26, depending on soil/crop type, besides meeting any other parameters suggested by agricultural scientist or agricultural university/institute in the IMP.

iv. Meeting the prescribed norms shall not be the only criteria for use of treated waste water in irrigation, the requirement of water for irrigation will also be a limiting condition and this depends upon various factors, as follow:

   a. **Crop:** This is the main subject determining the water requirement, such as, paddy crops (in general) need more water than trees.
   b. **Climate:** In tropical and subtropical climate especially in arid regions, irrigation frequency is higher. However, in slightly moist conditions the frequency decreases.
   c. **Irrigation type:** There are various irrigation types, namely, flood irrigation, sprinkler, rain gun, drip irrigation, etc., which influences the water requirement for irrigation.
   d. **Soil condition:** The various soil types, such as loam, clay, sandy, clay loam, sandy loam etc., determine the crop types and also alters the irrigation system thus determining the water requirement.
   e. **Soil permeability:** The soil permeability, which is also known as water conductivity of the soil, determines the water retention capacity. This determines the cultivable crops, which in turn determines the water requirement for irrigation.
   f. **Total Salt Concentration:** Total salt concentration (for all practical purposes, the total dissolved solids) is one of the most important agricultural water quality parameters. The plant growth, crop yield and quality of produce are affected by the total dissolved salts in the irrigation water.

v. The command area for effluent utilisation should be as near as feasible to the industry in order to facilitate easy monitoring and effective control. The industry should construct a distribution network of impervious conduits to cover the irrigated area.

vi. The industry should construct impervious lined storage tank of minimum 15 days capacity for storage of treated effluent during low/no demand, based on the Irrigation Management Plan.

vii. The treated effluent should be analysed regularly, say after every 15 days. The effluent samples should be taken at the point from where the effluent is discharged for irrigation.

viii. The physico-chemical characteristics of the soil under irrigation with treated effluent, should be monitored twice in a year to assess conditions in summer and post monsoon seasons, in order to determine the deterioration of soil quality.

ix. Similarly, the groundwater quality should also be monitored twice in a year. Samples should be collected from the first water bearing strata from existing hand pumps or by installing the same for sampling purpose only. The sampling points should be uniformly spread in the command area and near effluent storage area.

x. The industry should carry out the analysis of various prescribed effluent/soil/ground water quality parameters from the NABL/EPA/ SPCBs/PCCs recognised/accredited laboratories.

xi. Reports regarding compliance of effluent quality standards and status of soil and ground water quality shall be submitted to SPCBs/PCCs twice in a year, in first week of January and July.

xii. In case of observation of any deterioration of the soil and groundwater quality parameters in the assessment by agricultural scientist or agricultural university/institute, the application of effluent should be stopped immediately and the industry should inform the SPCB, accordingly. The industry shall be solely responsible for reclaiming the soil and water quality at their cost in the affected area.

****

Annexure-IV

केन्द्रीय लुग्दी एवं कागज अनुसंधान संस्थान
Central Pulp & Paper Research Institute
An autonomous organisation under the administrative control of
Ministry of Commerce & Industry, Govt. Of India
(Registered under Societies Act)

CPPRI/EMD/PCIV/PCPB/Trident Env Audit /2021

6.10.2021

To

The Member Secretary

Punjab Pollution Control Board

Patiala (Punjab)

Sub: Submission of Report on Environmental Audit of Trident Ltd (PCD), Village Dhaula, Barnala, Punjab

Dear Sir,

This refers to your communication no 4231 dated 29.12.2020, regarding above mentioned subject

In the same reference, please find enclosed herewith the **Report** titled **Environmental Audit of Trident Ltd , Village Dhaula, Barnala Punjab** , for your kind perusal .

Thanking You

Yours sincerely

(Dr M.K. Gupta)
Director Incharge

Encl: As Above

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REPORT

Environmental Audit

At

Trident Limited

(Paper & Chemicals Division)
Village- Dhaula, Mansa Road, Barnala, Punjab



Prepared By

Central Pulp & Paper Research Institute
Saharanpur, (U.P.), India

October, 2021

REPORT

Environmental Audit

At

Trident Limited

(Paper & Chemicals Division)
Village- Dhaula, Mansa Road, Barnala, Punjab

Prepared By

Central Pulp & Paper Research Institute
Saharanpur, (U.P.), India

October, 2021

Acknowledgement

At the outset, CPPRI acknowledge with thanks, **Chairman & Member Secretary, Punjab Pollution Control Board (PPCB), Patiala** for awarding the Environmental Audit Study to CPPRI.

The cooperation extended by **Shri Sunil Dave & Shri Gurnam Singh, CPCB Regional Directorate, Chandigarh, Shri Rajeev Sharma, Senior Environmental Engineer, PPCB, Patiala & Shri Rajeev Gupta, Environmental Engineer, Regional Office, PPCB, Sangrur**, is also sincerely acknowledged.

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Chapter 1

INTRODUCTION

Chapter 1
INTRODUCTION

1.0 ABOUT TRIDENT LTD

Trident group is a vibrant group comprising of an Agro / Wood Paper manufacturing Paper Unit i.e. **Trident Ltd – Paper & Chemical Div (PCD)**, Textile division i.e. **Terry Towel Division (TTD),** which is one among the top five (5) global terry towel giants and **Colour Textile Limited (CTL)** one of the largest producers of yarn in India. In addition, Trident Group has a **Sulphuric Acid Plant (SAP).** Established in 1993, Trident Ltd – Paper & Chemical division **(Fig 1.1)** is an agro residue based pulp and paper mill located at Village Dhaula, District Barnala, Punjab. **The mill is an ISO 9001:2008, OHSAS 18001:2007, ISO 14001:2004 and FSC certified integrated pulp and paper mill.**



Fig 1.1 Main Gate of Trident Ltd (PCD), Village Dhaula, District Barnala

Trident group has been recipient of several national and international awards in area of Corporate Governance , Quality, Innovation, Sustainability etc namely :

- **FICCI Water Award 2021**
- **17th National Award for Excellence in Energy Management 2016**
- **National Award for Excellence in Water Management 2016**
- **National Energy Conservation Award in 2014**
- **Innovation Award for the year 2010 from JC Pennay**
- **Best supplier of the year Award on 2010 from IKEA**
- **Sustainability Award for the year 2009 and 2010 from IKEA**
- **Home Quality Award – Best supplier of the year in 2006 and 2009 from JC Penney**
- **ICSI National Award For Excellence In Corporate Governance in 2006**
- **International Supplier Award of the year in 2001, 2003, 2005 and 2006 from Wal-Mart USA**

The spatial coordinates of the site are **Latitude 30.29783** and **Longitude 75.4928444.** The unit is located at around 175 km from State Capital **Chandigarh** and 0.6 km away from **State Highway -13 and 7 km from National Highway – 7 .**

The existing plant has total land area of **405 acres**, including 210 acres of vacant spaces, covered with greenery & plantations using treated effluent. A general summary of the site location is indicated in **Table 1.1** and a map of 10 km area around the plant is indicated in **Fig 1.2** & **Goggle Map** is indicated in **Fig 1.3.**

M/s Endeavour

Table 1.1 Summary of the Plant Site

S.No.	Particulars	Details
1	Location:	
	Village	Dhaula
	District	Barnala
	State	Punjab
2	Latitude	30°17"57'N
3	Longitude	75° 29"32'E
4	Elevation above mean sea level (MSL)	224 m
5	Climatic conditions as per IMD	Annual Max. Temp :43.5°C Annual Min. Temp : 7.8°C Annual total rainfall: 686.mm
6	Present land use at the project site	Uncultivable land within the premises of existingplant
7	Nearest Highway/Road	State Highway -13 – 600m National Highway 7 : 7km
8	Defence installations	Nil within 10 km radius
9	Nearest railway station	Barnala (12 km)
10	Nearest airport/air strip	Chandigarh (175 km)
11	Nearest village	Dhaula (5 km)
12	Nearest town	Barnala(10 km)
13	Nearest river	Nil in 10 km radius
14	Hills/valleys	Nil in 10 km radius
15	Archaeologically important places	Nil in 10 km radius
16	Nearest place of Tourist/ Religious importance	Nil in 10 km radius

17	Ecologically sensitive areas (National Parks/Wildlife sanctuaries/ bio-sphere reserves)	Nil in 10 km radius
18	Reserved/ Protected forests within 10 kmradius	Nil in 10 km radius
19	List of Major Polluting Industries	A pharmaceutical unit - IOCL Pharmaceuticals located in upstream
20	Topography of the plant site	The area forms a part of Indo-Gangetic alluvial plain and is more or less flat
21	Nature of soil	Sandy and sandy loam

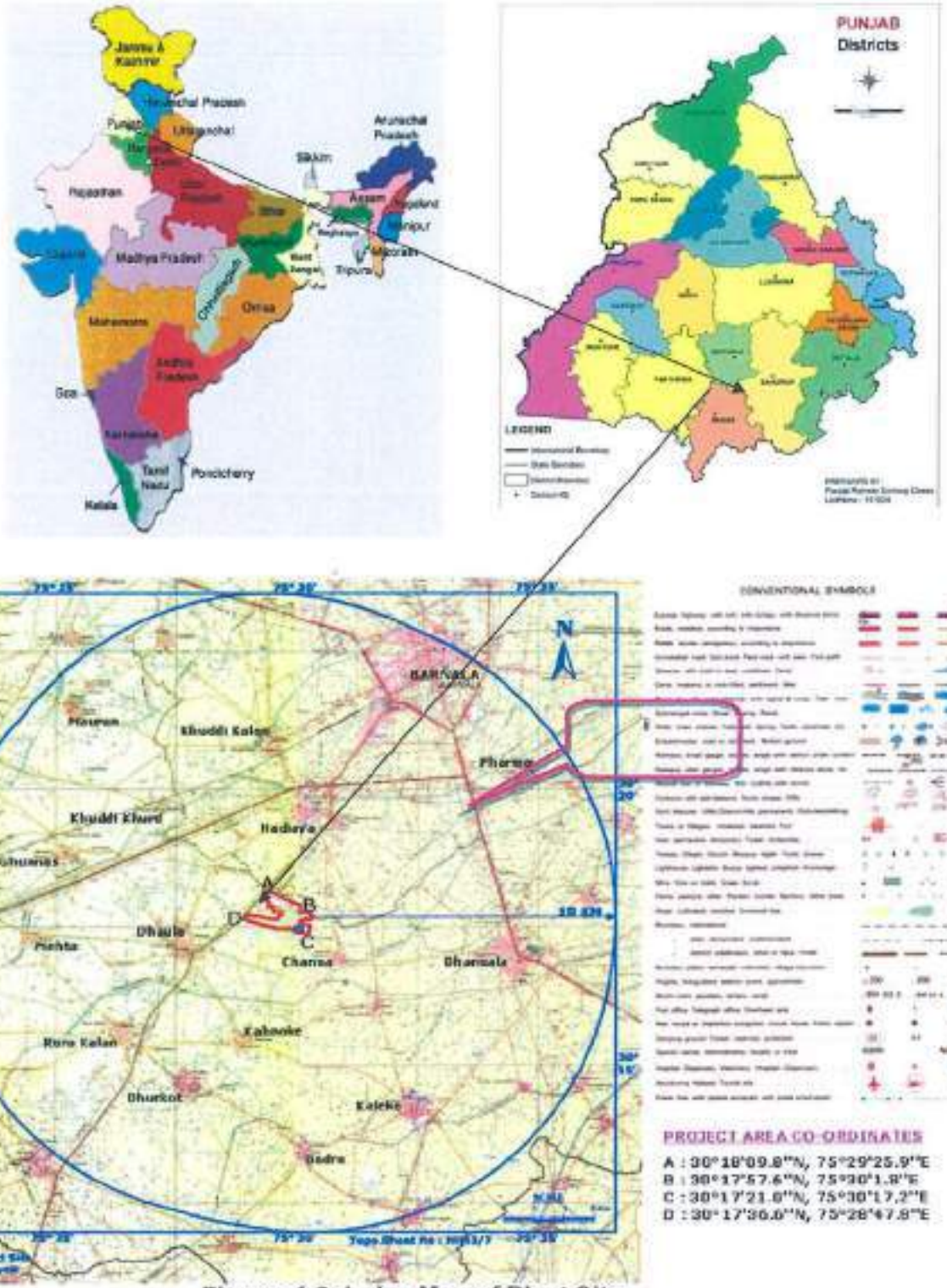


Figure- 1.2: Index Map of Plant Site



Fig 1.3 Goggle Map of Trident Ltd

As indicated in the maps the surroundings of the plant site are mostly agricultural land. The nearest village, **Dhaula,** is about 5 km from the plant and the nearest bus route, viz. the State Highway SH-13, is reachable at 0.5 km and the railway network about 12 km. There is no stream crossing the plant site. **Uppli canal** is about 30 km away from the plant . This area is not falling into the forest land and there is no eco-sensitive zone.

Trident Limited is engaged in production of **writing and printing paper** with installed production capacity of **415 tpd**. The plant uses a mixed fiber furnish of **wheat straw (65%) and hardwood (35%)** . The plant has two fiberlines namely **Wheat Straw based i.e. Straw Fiber Line (SFL) having 225 tpd pulp production capacity** and **Wood based fiberline (WFL) having 125 tpd pulp production capacity** .

1.2 CONSENTS TO OPEARTE

The following documents related to consent under **Water (Prevention & Control of Pollution) Act 1974 , Air(Prevention & Control of Pollution) Act 1981 , Authorization under Hazardous and Other Wastes (Management & Transboundary Movement Rules) 2016 Hazardous Waste & NOC from Central Ground Water Authority for Ground Water withdrawal** were available during the visit to the plant :

S.No	Consent to Operate Under	Validity Up to	Reference
1	Water (Prevention & Control of Pollution) Act 1974	31.3.2021	Annexure – I
2	Air (Prevention & Control of Pollution) Act 1981	31.3.2021	Annexure –II
3	Hazardous and Other Wastes (Management and Transboundary Movement) Rules 2016	31.3.2021	Annexure –III
4	NOC from CGWA for Ground Water Withdrawl	05.07.2023	Annexure –IV
5.	Agreement for Bulk Supply of Water from Uppli Distributary for Industrial Purpose	-	Annexure – V

1.3 BACKGROUND & OBJECTIVE OF THE STUDY

The **Hon'ble National Green Tribunal (NGT)** in the matter of **682 of 2019** titled as **Beant Singh Bajwa , President National Anti Corruption Council v/s State of Punjab.** NGT vide its order dated 4.12.2019 constituted a Joint Committee of **Central Pollution Control Board (CPCB) , Punjab State Pollution Control Board (PPCB)** and **District Administration Barnala** for inspection and submission of the

report .The Joint Committee submitted its report to NGT on 29.2.2021 In accordance to the recommendations of the Joint Committee the Punjab State Pollution Control Board has availed the services of **Central Pulp & Paper Research Institute , Saharanpur** for carrying out the environmental audit of Trident Ltd - Paper & Chemical Div (PCD) as per following scope of work.

1.4 SCOPE OF WORK

The mutually agreed scope of the work includes :

- Study of Environmental Management System and Assessment of Status of Compliance of Environmental Norms / Standards by the Industry.
- Monitoring / sampling of waste water , ground water stack emissions, and ambient air quality
- Material Balance , Water Balance , Production Process Involved in Generation of Waste Water , emissions , Hazardous wastes , Conservation Measures , Technologies Adopted etc .
- Study shall also cover the observations and recommendations made in the joint visit report filed before Hon'ble NGT.

1.5 METHODOLOGY

The methodology adopted for environmental audit study is as under :

- Sampling and analysis of effluent quality at various stages of treatment in the Effluent Treatment Plant (ETP) of Trident Limited (PCD)
- Performance Evaluation of Existing ETP
- Performance Evaluation of Anaerobic Treatment System

- Upstream & Down Stream Sample Collection and analysis
- Sampling and analysis of Ground Water collected from 3 locations namely :

– New Sidhu Fathegarh , Chanan ,
– Trident Complex Dhaual (Tube well 1)
– Gobind Haveli , Mansa Road , Dhaula

- Monitoring of Ambient Air Quality (PM_{10} , $PM_{2.5}$, SO_2 and NO_2) at

– Reservoir Area
– Girls Hostel
– Old Guest House

- Emission(Stack) Monitoring (PM , SO_2 , NO_X and H_2S) at :

– Boiler FBC 12 tph
– Boiler FBC 50 tph
– Cogeneration Boiler (FBC) 130 tph
– Cogeneration Boiler (FBC) 130 tph
– Recovery Boiler 20 tph
– Recovery Boiler 50 tph
– Lime Kiln 50 tph

- Assessment of Water & Material Consumption and compilation of Water & Material Balance

1.6 CHRONOLOGY OF STUDY UNDERTAKEN

The chronology of the study undertaken by CPPRI is as under :

Date	Particulars of Visit to Plant
3.2.2021	Kick off meeting of CPPRI Scientists with officials of CPCB, Regional Directorate, Chandigarh , Punjab State Pollution Control Board & representtaive of Trident Ltd .
24.02.2021 to 03.03.2021	First Visit (Preliminary Visit) to Plant for : • Primary / Secondary Data Collection • Performance monitoring of ETP by composite sampling of effluents from various units of ETP including collection of upstream & down stream samples • Monitoring of Ambient Air Quality at three locations • Stack Emission monitoring of 4 stacks • Collection of ground water from 3 locations
12.03.2021 to 16.03.2021	Second Visit to Plant for : • Performance monitoring of ETP by composite sampling of effluents from various units of ETP including collection of upstream & down stream samples

	• Monitoring of Ambient Air Quality at three locations • Stack Emission monitoring of 4 stacks • Collection of ground water from 3 locations
8.4.2021 – 11.4.2021	Third Visit to Plant for : • Performance monitoring of ETP by composite sampling of effluents from various units of ETP including collection of upstream & down stream samples • Monitoring of Ambient Air Quality at three locations • Stack Emission monitoring of 4 stacks • Collection of ground water from 3 locations • Water Balance & Material Balance

This report is based on the data and information collected / provided by the Trident Ltd., and environmental monitoring and analysis of the environmental samples collected (waste water and air samples).

M/s P. Enclave

Chapter 2

PROCESS OPERATIONS AT TRIDENT LTD (PCD) - BRIEF SUMMARY

Chapter 2
PROCESS OPERATIONS AT TRIDENT LIMITED (PCD) – BRIEF SUMMARY

The plant uses mixed fiber furnish employing **Wheat Straw and Hard Wood** and has two fiberlines namely **Straw Fibeline (SFL)** and **Wood Fiberline (WFL).** The general pulp and paper making process employed by Trident Ltd (PCD) , Barnala is depicted in **Fig 2.1.**

2.1 Straw Fiberline (SFL)

SFL plant is designed to produce 225 MT per day bleached pulp from wheat straw. The major process operations involved are summarised under :

Raw Material Preparation

The plant employs **dedusting** and **wet washing (wash beaters) Fig 2.2 & 2.3** for cleaning of wheat straw for removal of recalcitrant like silica as well as potassium and chloride to improve the pulp quality as well as black liquor quality generated during pulping which otherwise causes problem in chemical recovery boiler.

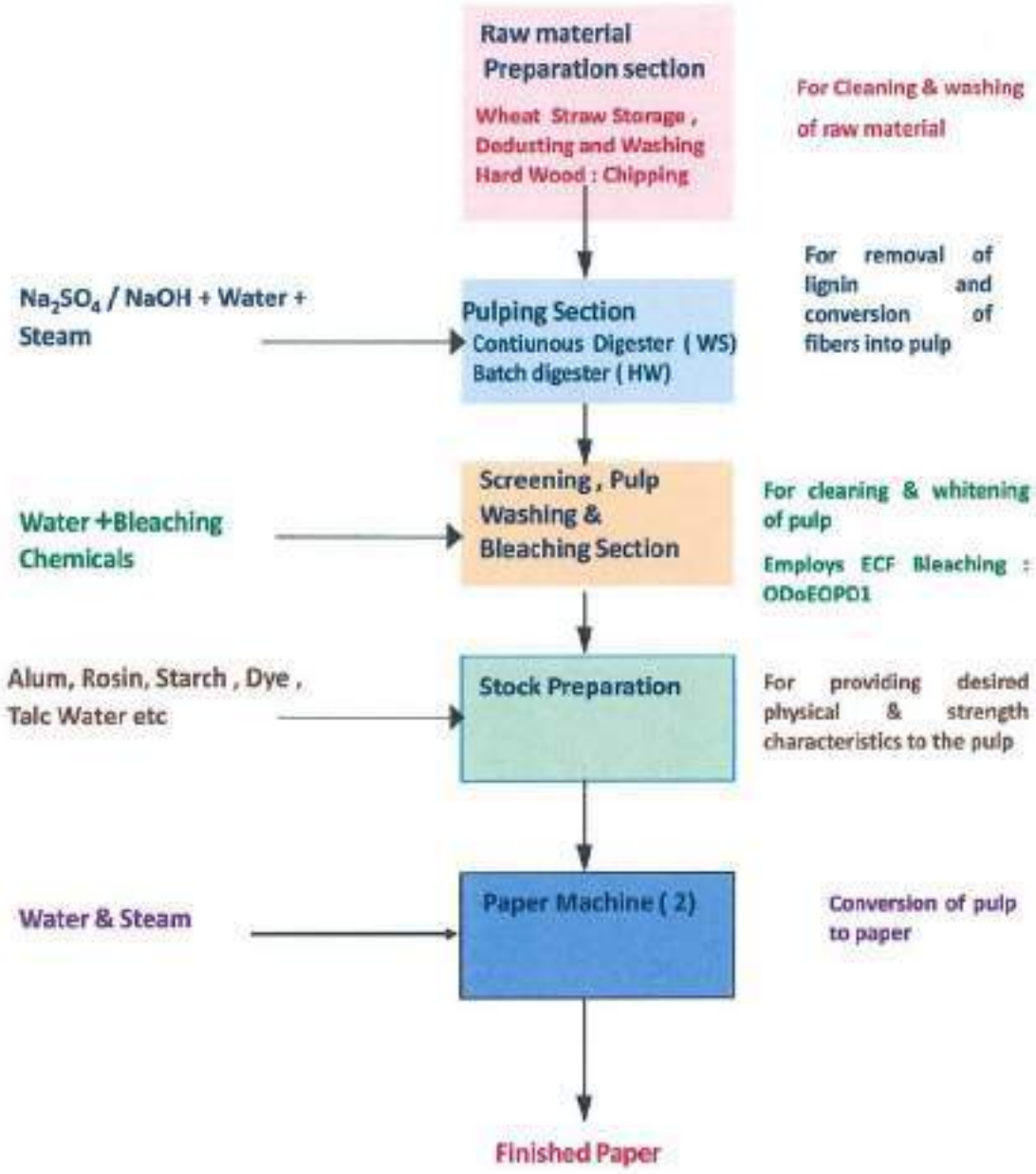


Fig 2.1 Pulp & Paper Making Process at Trident Ltd (PCD)



Fig 2.2 Unloading of Wheat Straw



Fig 2.3 Wheat Straw Washing

Pulping

The plant has installed a 225 BD TPD bleached pulp production capacity wheat straw pulping street with continuous digester, twin roll press , oxygen delignification and chlorine dioxide bleaching. The washed wheat straws sent to cooking section, comprising of two (2) continuous digesters, each of 125

TPD capacity. **(Fig 2.4)** The cooking is carried out at a pressure of 7.2 kg /cm^2 pressure and temperature of 165 °C using 12% NaOH.



Fig 2.4 Continuous Digesters

Pulp Washing & Oxygen Delignification

The cooked pulp is blown to the blow tank **(Fig 2.5)** and then pumped through a **Delta Knotter (K4)** to remove uncooked material. The rejects are passed through a junk trap and later washed in the **Johnson screen** where fibres are recovered.The recovered fibers are pumped back to the blow tank and the rejects are collected in a suitable vessel and dumped.



Fig 2.5 Blow Tank

The accept from the Delta Knotter is washed in a **Vacuum Filter (Fig 2.6)** and then pumped to the **Twin Roll Press.(Fig 2.7)** followed by a second washing through another vacuum filter and twin roll press **(Fig 2.8)** , via screening plant. The pulp leaving the final twin roll press is diluted to ~12%

(alkali is added in the stand pipe) and pumped through a mixer into the **oxygen reactor (Fig 2.9).**



Fig 2.6 Pulp Washers



Fig 2.7 Twin Roll Press



Fig. 2.8 Pre ODL Press



Fig 2.9 Oxygen Reactor

From the reactor, the pulp is blown to the **MC storage tower**. The MC storage tower has a residence time of approximately 6 hours (390 min at 12% pulp consistency).The oxygen delignified pulp is then diluted and washed on one twin roll press (**Fig 2.10**) . The filtrate is used as wash liquor on the press prior to the oxygen stage. The discharge consistency from the press is around 30%. The pulp is diluted with hot water having temperature > 75°C.



Fig 2.10 Post ODL Press

Pulp Bleaching

Post pulp washing the unbleached pulp is bleached using $D_oE_{op}D1$ **(Elemental Chlorine Free Bleaching) sequence.** The D0 and D1 stages are upflow towers with a tower scraper at the top (discharge). The Eo stage consists of one pressurized reactor and blow down tank (**Fig 2.11 & Fig 2.12).**



Fig 2.11 D_0EO_P D_1 Reactors



Fig 2.12 DoE_{OP} D_1 Press

Hard Wood Fiberline

The hardwood fiberlineplant has 125 TPD production capacity. The major raw material usod in hard wood fiberline are eucalyptus, poplar bamboo and veener chips (**Fig 2.13)**



Fig 2.13 Hardwood Storage Yard

The hardwood fiberline has a chipper house with drum chipper with four fly knives of capacity 25 tph for chipping of hard wood (**Fig 2.14**) The drum chipper has . The chips produced are screened through an ocotogonal screen while the veener chips are screened through a rectangular screen . The hole size of the screen is 8 .0 mm.

The chips are stored in a **Chip Silo** (150 MT storage capacity). The stored chips are then cooked in three (3) **stationary digesters** (**Fig 2.15),** each of capacity 120 m^3 and raw material loading per digester is around **26.8 MT** while the cooking cycle is around **6.25 hours.**



Fig 2.14 Chipper House

The cooked pulp is blown into **blow tank (capacity 400 m^3) (Fig 2.16)** followed by **Knotter Screen** & **Pressure Screen (Fig 2.17 & 2.18)**. The screened pulp is washed through **4 stage Brown Stock Washers (Fig 2.19)** followed by **Oxygen Delignification** and D_o E_{OP}D 1 stage bleaching sequence.

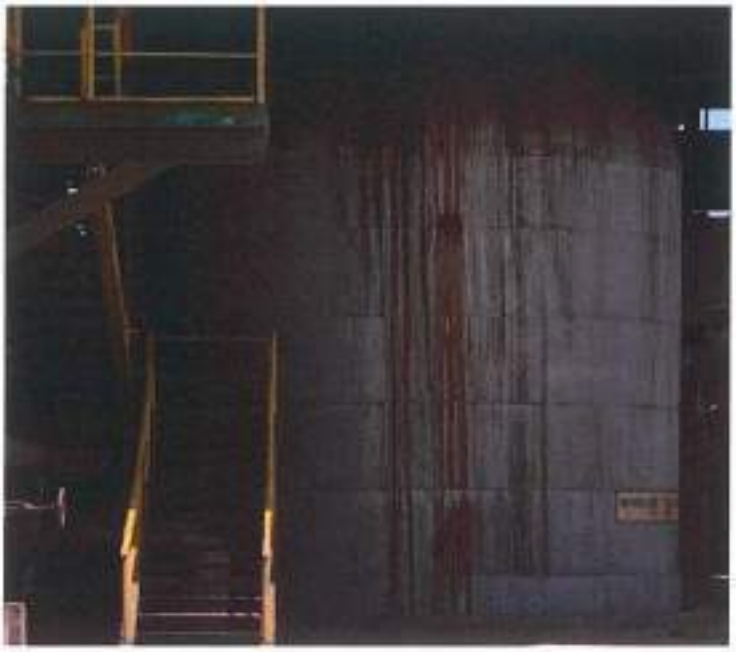


Fig 2.15 Hardwood Stationary Digester



Fig 2.16HW Street Blow Tank



Fig 2.17 Pressure Screen



Fig 2.18 Knotter Screen



Fig 2.19 Brown Stock Washer

The pulp obtained at various washing and bleaching stages are shown in **Fig 2.20**



Fig 2.20 Unbleached & Bleached Pulp Sample at Different Washing & Bleaching Stages

Stock Preparation & Paper Making

Pulp is conditioned in the stock preparation section for bondage to form sheet. The pulp received from pulp mill is passed through a series of refiners for fibrillation and then the required additives viz. **fillers, dyes, whitening agents, resin and alum** are added to impart functional properties such as opacity, reflectance, shade and water resistance. The final blended stock is pumped to paper machine chest.

The blended stock in very dilute suspension is allowed to flow from Head Box and spread on a moving wire part where water is drained and fibre binds together to form a wet web. The wet paper web is pressed, dried and wound.

Paper Machine

The mill has two **Paper Machine** namely :

Paper Machine No 1

This is designed for a maximum operating speed of 350 mpm, The paper machine is a fourdrinier type having bi-nip press with separate III press, followed by twenty five (25) drying cylinders in the dryer section, three nip , four – roll calendar stack and pope type reel (**Fig 2.21**).



Figure 2.21 Paper Machine 1

Paper Machine No 2

This is designed for a maximum operating speed of 750 mpm. This is a fourdrinier machine with top wire forming section, tri nip press section, followed by thirty two (32) drying cylinders in pre-dryer section, pre-metered size press, twelve (12) drying cylinders in post-dryer section, single hard nip calender stack, and a pope type reel. The electrical drive design speed of the PM is 900 mpm.(**Fig 2.22)**



Fig 2.22 Paper Machine 2

The plant has installed a poly disc filter (**Fig 2.23**) at PM 2 to recover the fiber from back water and reuse the filtrate back into the paper machine . This helsp in reducing the pollution load to ETP as well as aid in reducing fresh water consumption at paper machine.



Fig 2.23 Poly Disc Filter

The Flow sheet of Paper Machine No 1 & Paper Machine 2 are depicted in **Flg 2.24 & Flg 2.25**

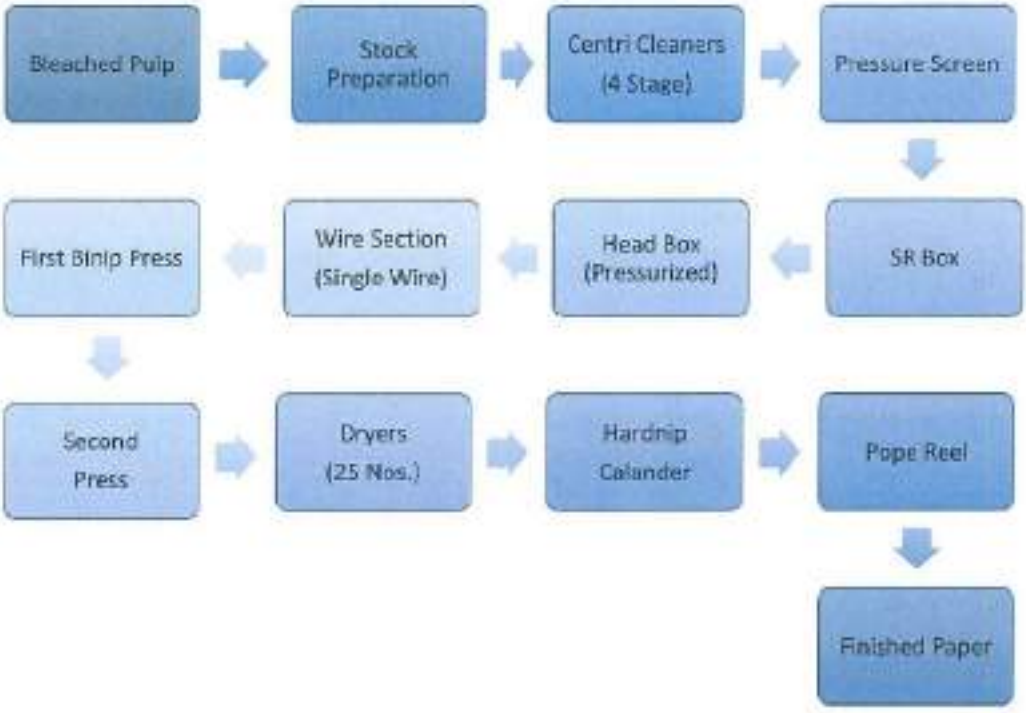


Fig 2.24 Flow Diagram of Paper Machine No 1 at Trident Limited

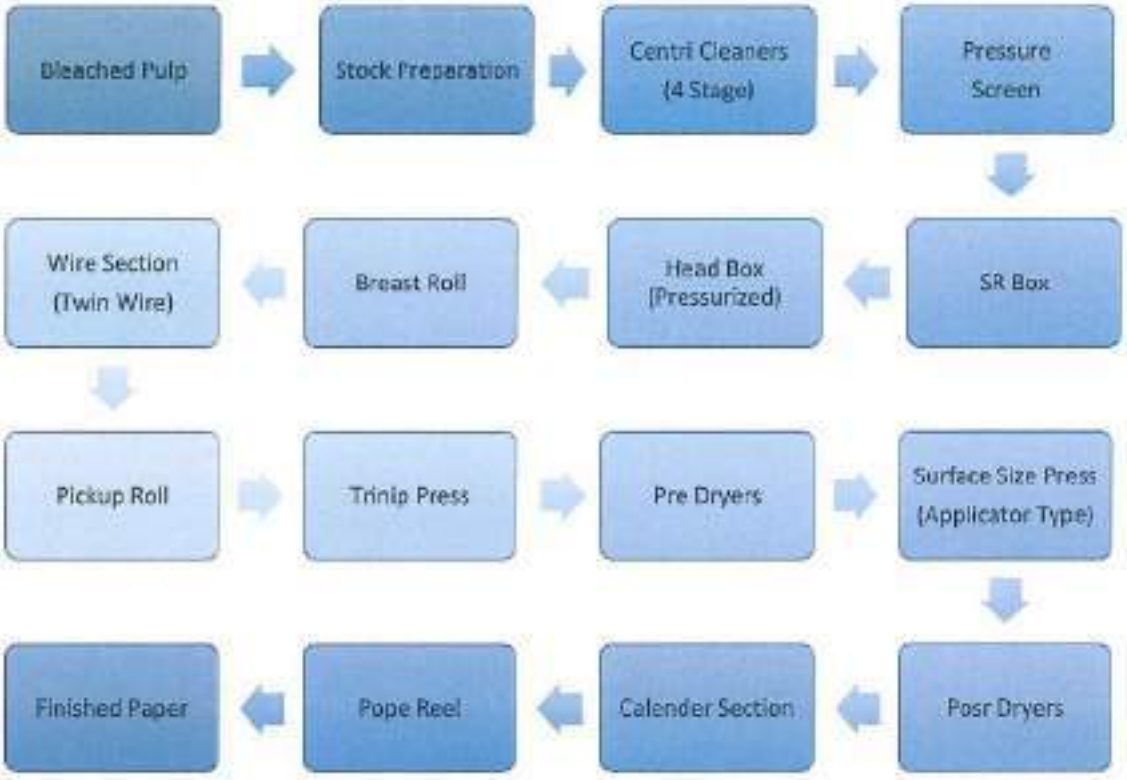


Fig 2.25 Flow Diagram of Paper Machine No 2 at Trident Limited

The Process Flow Diagram of Straw Fiberline & Hardwood Fiberline are given in **Fig 2.26 & Fig 2.27** respectively

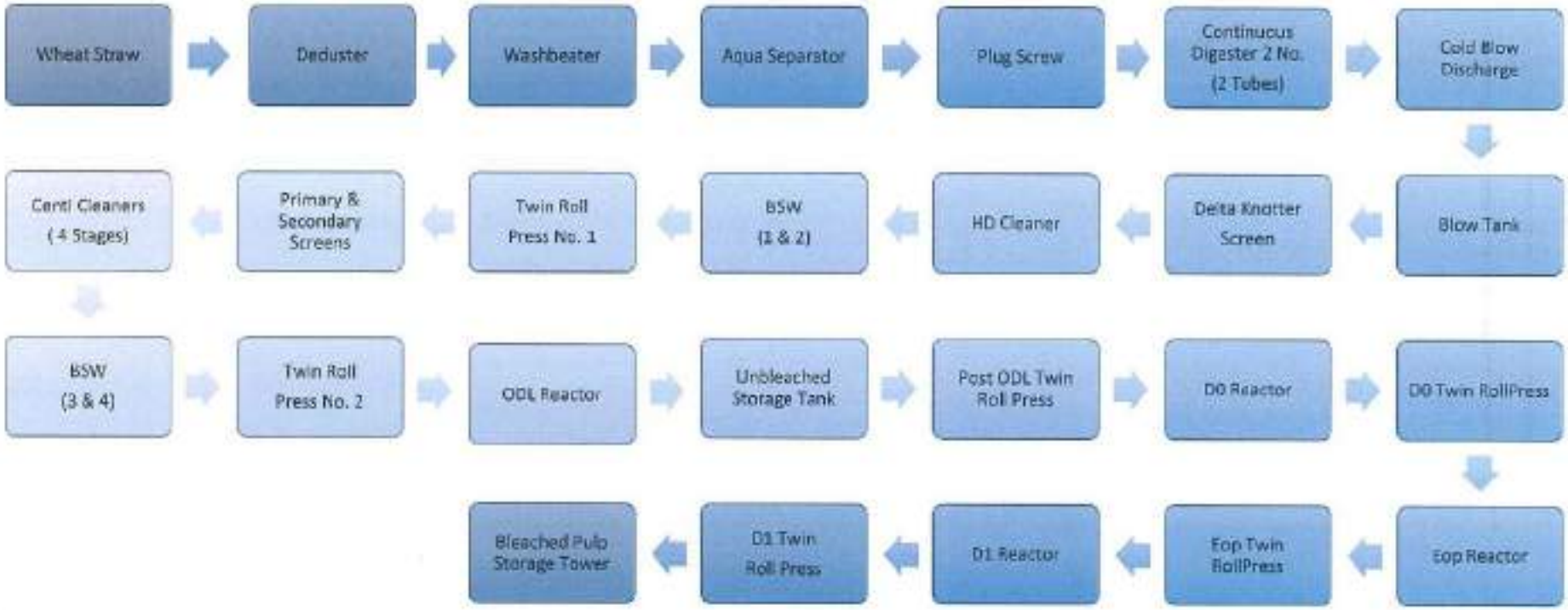


Fig. 2.26 Straw Fiberline Process Flow Diagram at Trident Limited

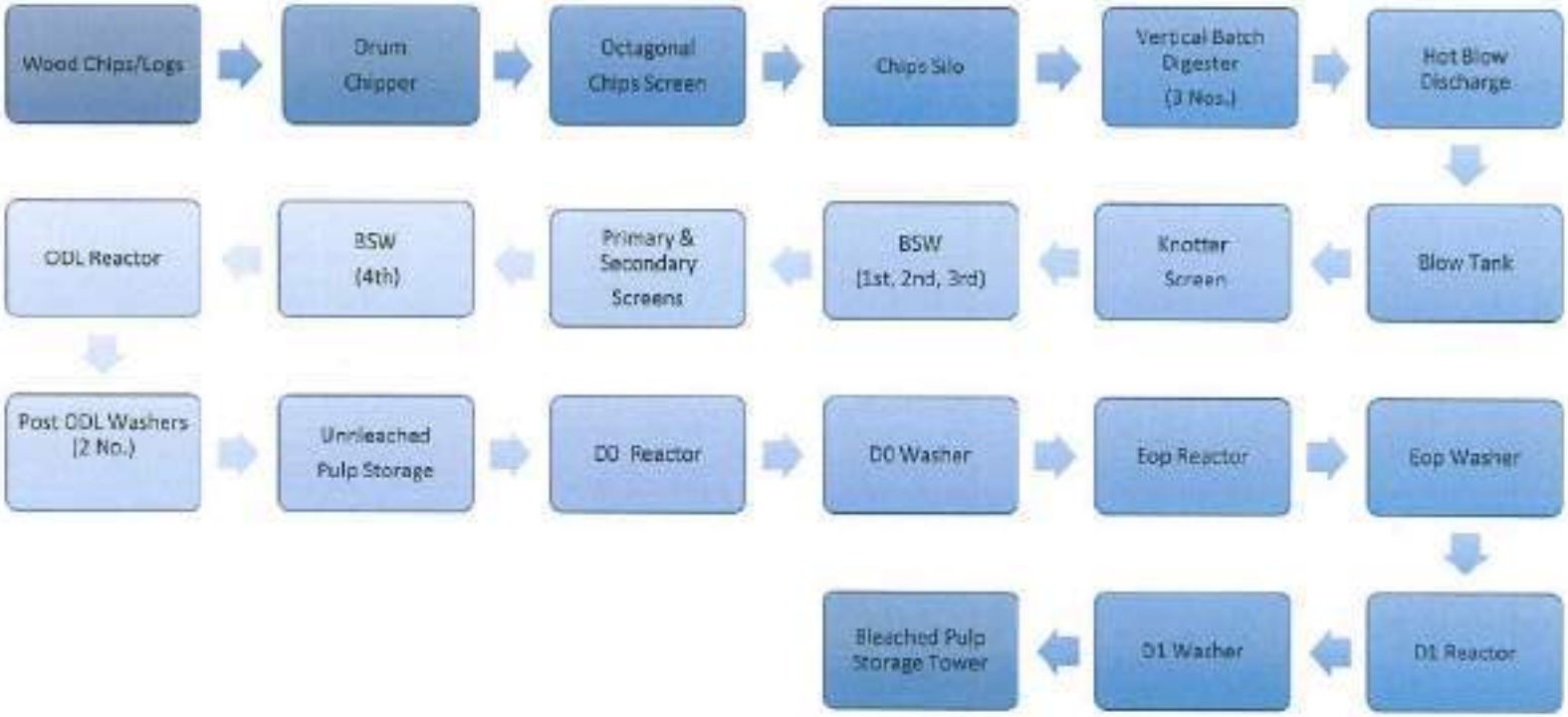


Fig. 2.27 Hardwood Fiberline Process Flow Diagram at Trident Limited

Chemical Recovery Plant

The plant has two (2) streets of multiple effect evaporators, as well as two (2) chemical recovery boilers, having a combined firing capacity 565 tpd of black liquor per day. The designed water evaporation capacities of evaporators are indicated in **Table 2.1**

The plant employs two stage recausticising process to reduce silica for effective lime kiln operation .The chemical recovery plant is depicted in **Fig 2.28** and the process of chemical recovery is schematically indicated in **Fig 2.29 & 2.30 .**

Table 2.1 : Design Water Evaporation Capacity of Evaporators

Supplier	Designed Capacity , tph	Solids Concentration , %	Steam Economy
ENMAS	175	65	6.05
PAS Engineering	65	50	6.00



Fig 2.28 Chemical Recovery System at Trident Limited

The capacity of the **existing recausticising plant** is 110 TPD as Na_2O. The capacity of the **lime kiln** is 140 TPD .However at the time of visit the lime kiln was not in operation.

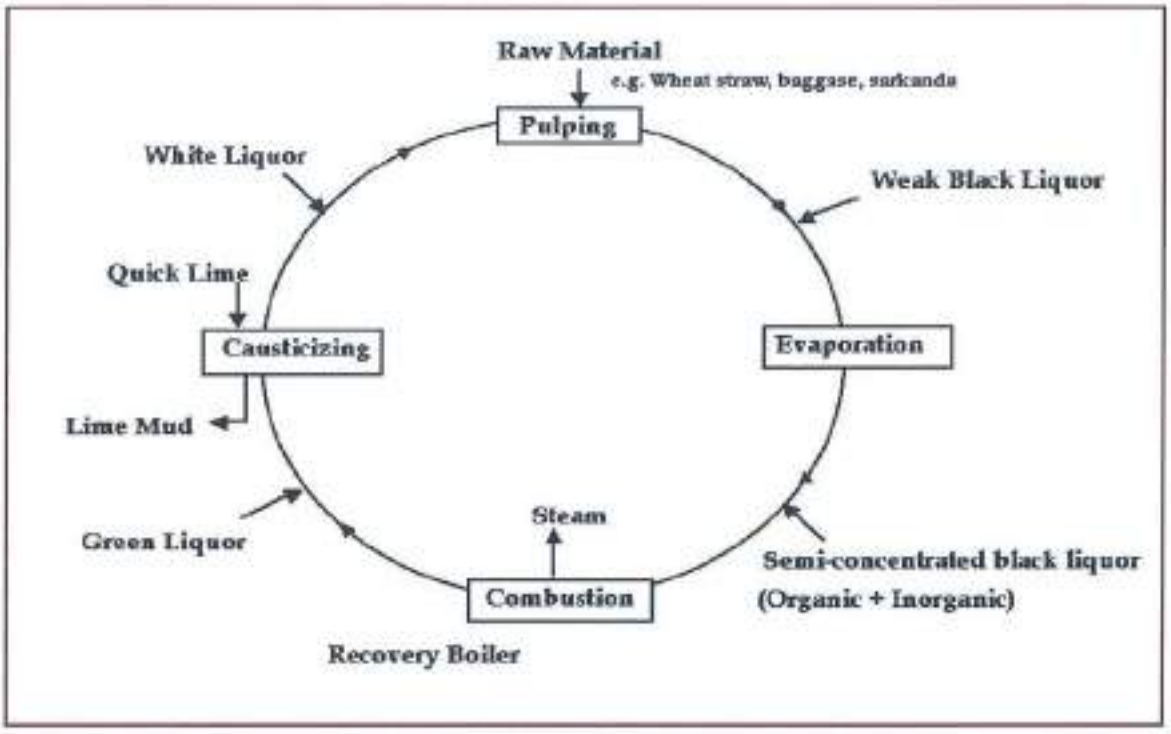


Fig 2.29 Chemical Recovery System

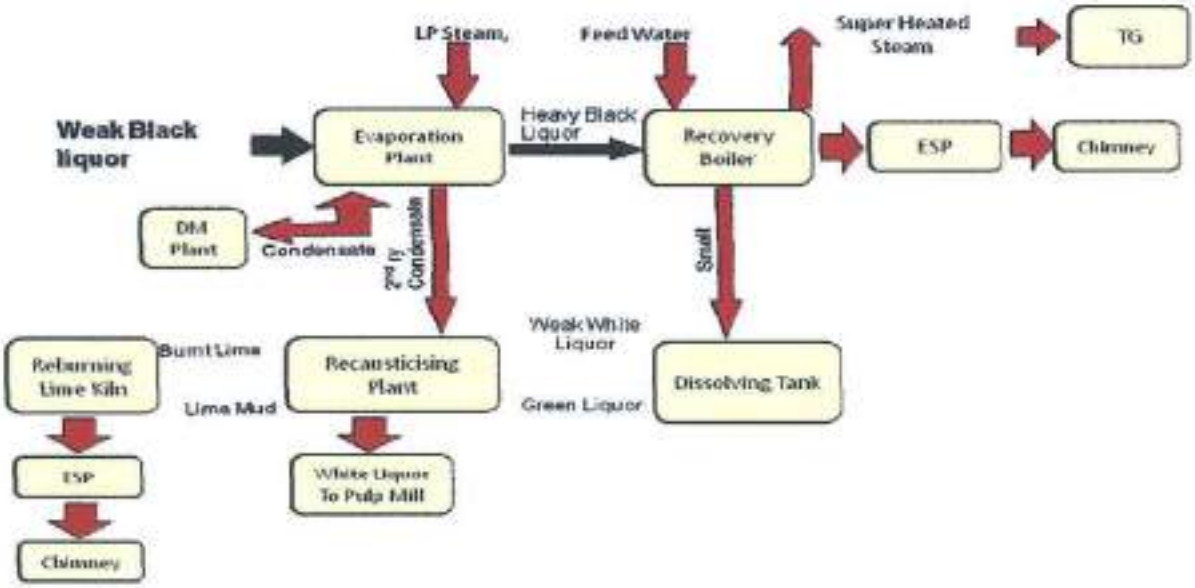


Fig 2.30 Schematic Diagram of Chemical Recovery System at Trident Limited

Chapter 3

PERFORMANCE EVALUATION OF EFFLUENT TREATMENT PLANT

Chapter 3
PERFORMANCE EVALUATION OF EFFLUENT TREATMENT PLANT

The Trident Ltd – PCD has an exhaustive effluent treatment plant comprising of **anaerobic** and **aerobic treatment system** for treatment of waste water generated by pulp & paper mill. The details of ETP are as under:

3.1 Wastewater Generation

The wastewater generated by the plant is categorized into two streams i.e.:

- **High Pollution Load stream mainly from the Wheat Straw Washing**
- **Low Pollution Load stream comprising effluent from the Pulp mill, Chemical Recovery Plant, Paper Machine And Utilities Area**

3.1.1 High Pollution Load Wastewater Stream- Treatment

The waste water from wheat straw washing and having high COD after screening enters **Equalisation Tank**. The waste water from equalisation tank is sent to **Dissolved Air Floatation (DAF) Feed Tank** from where it is pumped into **DAF (Fig 3.1 , 3.2 , 3. 3 & 3.4)**. DAF works by producing a stream of micro fine bubbles that attach to solids and lift them to the surface, where they can be removed by a surface scraping mechanism. Most of the sandy and suspended particles in the effluent are recovered / separated in the DAF.



Fig 3.1 DAF Feed Tank



Fig 3.2 Dissolved Air Floatation



Fig 3.3 DAF – Removal of Suspended Particles through Scrapper Mechanism



Fig 3.4 DAF Outlet



Fig 3.5 DAF Inlet & Outlet Tank

The DAF filtrate is taken to buffer tank (**Fig 3.6**) for maintaining pH as well as addition of macro nutrients and micro nutrients . The waste water from buffer tank is pumped into **Upward Anaerobic Sludge Blanket (UASB) (Fig 3.2)** reactor where the effluent is treated anaerobically along with added advantage of co -generation of **bio gas (methane gas)** . The anaerobically treated effluent is mixed with the low pollution load stream in the new drain.



Fig 3.6 Buffer Tank

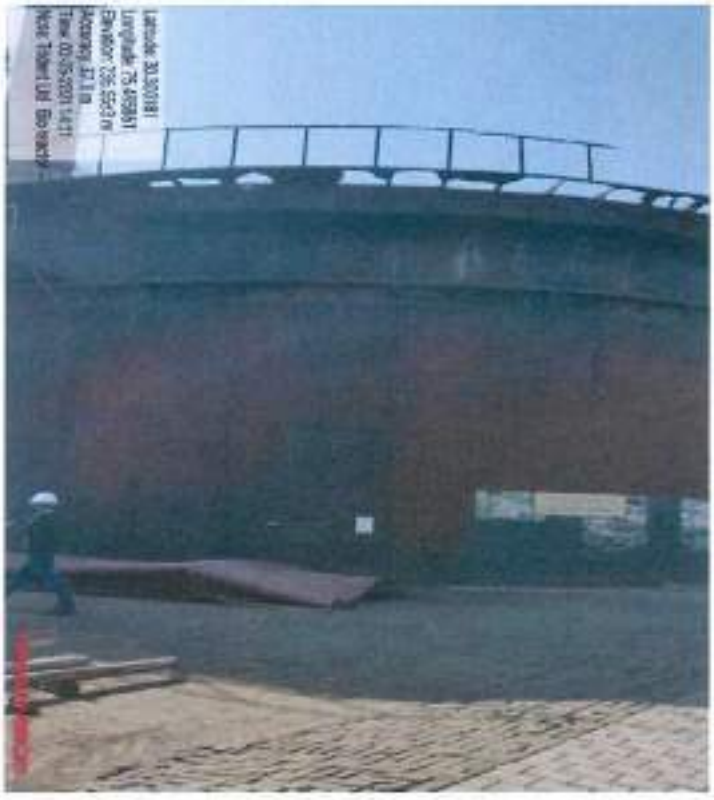


Fig 3.7 UASB Bioreactor

Sludge from DAF reactor is collected in **sludge collection tank (Fig 3.8)** and dewatered along with excess secondary sludge from conventional ETP in **Bellmar Screw Press (Fig 3.9 & Fig 3.10)** where 50% dryness of sludge is achieved by applying high torque mechanism. The recovered sludge is used as fuel in Boiler . The layout of the Biomethnaation Plant is indicated in **Fig 3.11**



Fig 3.8 Sludge Collection Tank



Fig 3.9 Bellmer Screw Press for Sludge Dewatering



Fig 3.10 Dewatered Sludge

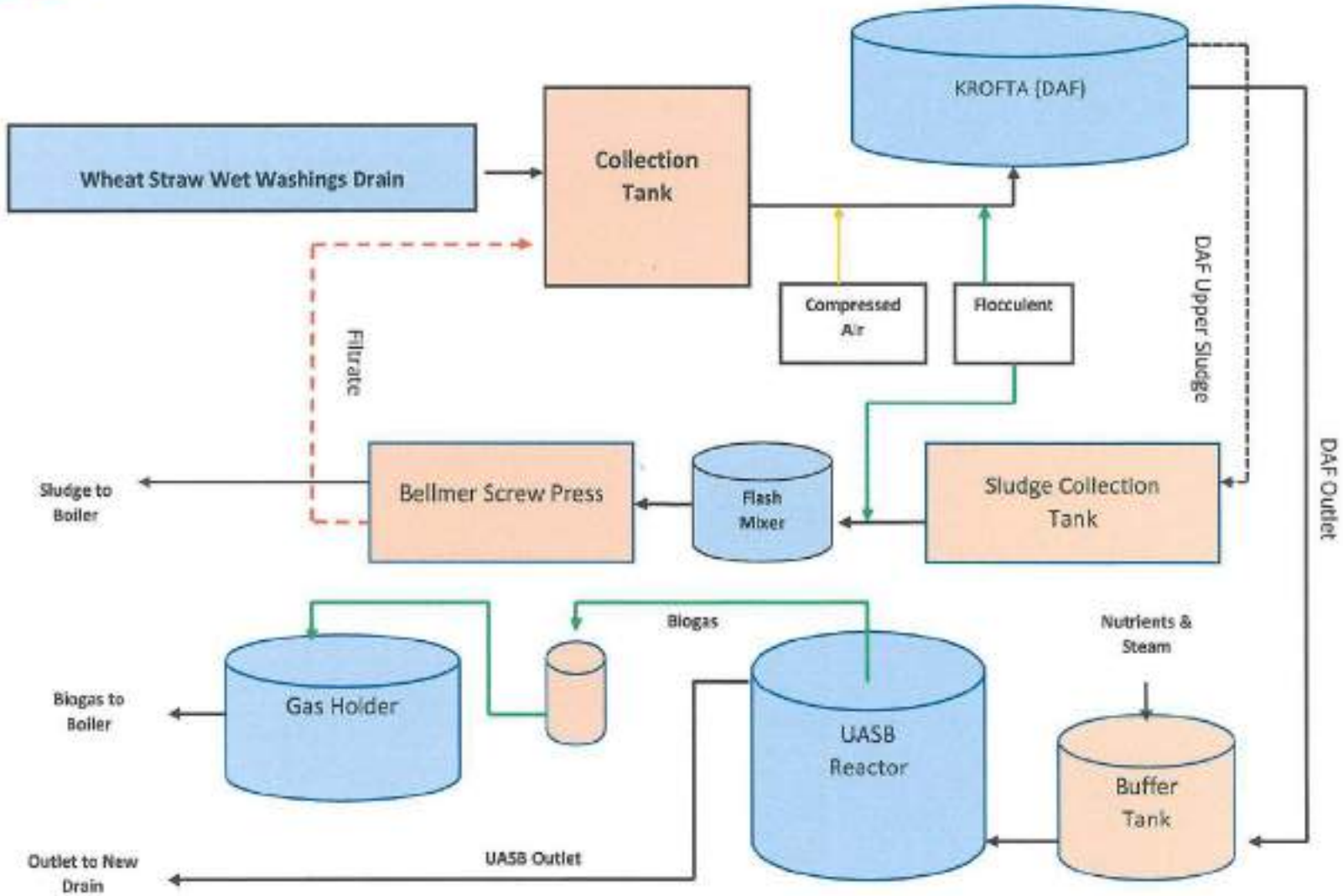


Fig.3.11 Layout of Biomethanation Plant at Trident Limited

The design specifications of various units of High Pollution Load Effluent Treatment System are indicated in **Table 3.1.**

Table 3.1 Design Specifications of High Pollution Load ETP

S No	Unit	Dimensions m	Volume (m^3)
1	Equalization tank	45 x 22x 3.5	3567
2	DAF	12m Ø x 3.5 SWD	400
3	Buffer Tank	-	380
4	UASB Reactor	26 m Ø x 8 m	4253
5	Gas Holder	-	198

The design specification of UASB Reactor are :

- **Volume - 4253 m^3 (26 m Dia X 8 SWD)**
- **Inlet Flow – 5000 KLD**
- **Inlet COD – 4500 ppm**
- **Inlet Load – 22500 Kg/Day**
- **COD Removal Efficiency – 65%**
- **Methane Generation – 6288 Kg/Day**

3.1.2 Low Pollution Load Wastewater Stream

Wastewater generated from pulp mill, paper machines, power boilers and recovery boilers having low COD which is first collected in a **collection tank** followed by **Equalization Tank (Fig 3.12)** and subsequently **Primary Clarifier No 1 (Fig 3.13)** and **Primary Clarifier No 2. (Fig 3.14 & 3.15)** for removal of suspended solids.



Fig 3.12 Collection Tank



Fig 3.13 EqualizationTank

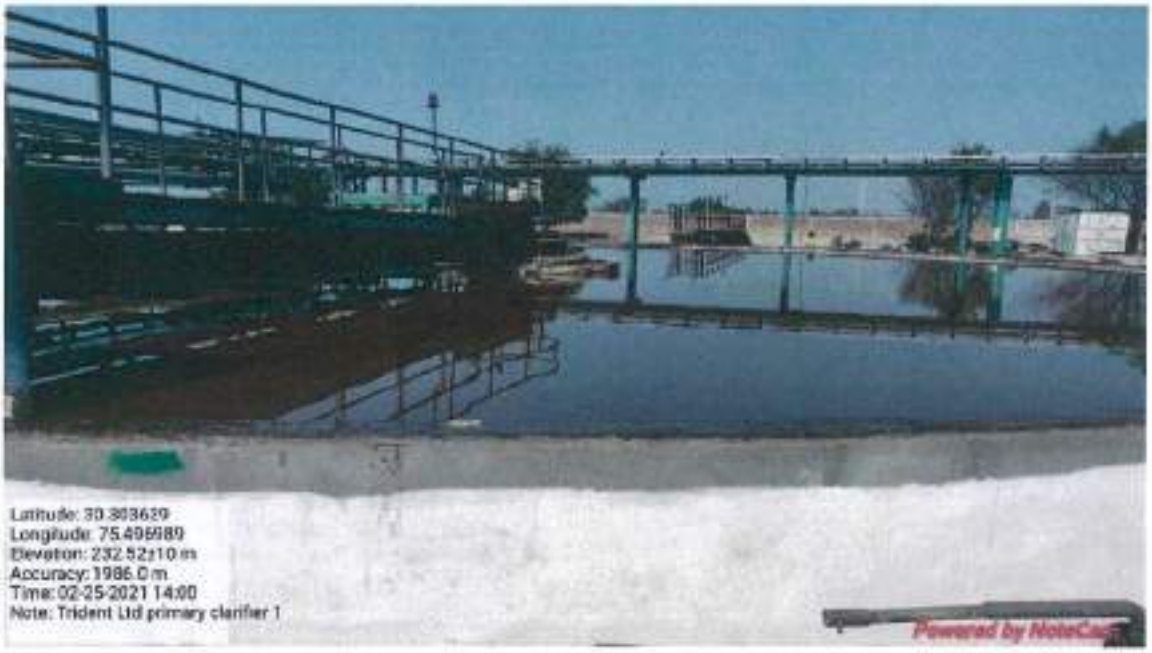


Fig 3.14 Primary Clarifier - 1



Fig 3.15 Primary Clarifier -2

On site polymer manufacturing and addition facility is available to improve performance of Primary Clarifiers (**Fig 3.16**)



Fig 3.16 On site Polymer Preparation Facility

After clarification, the waste water is pumped to **Aeration Tanks 1and 2 (Fig 3.17)** The Aeration Tank-1 is equipped with **3 x 50 HP surface aerators** and **1 x 25 HP floating aerator** as well as **air liquidie system (Fig 3.18)** while Aeration Tank-2 is provided with **5 triton aerators** each equipped with **10 HP blower of 950 m^3/hr air discharge capacity** and **50 HP propeller** to maintain the dissolved oxygen level required for proper metabolic activity of microbial culture. **(Fig 3.17).**



Fig 3.17 Aeration tank



Fig 3.18 Air Liquide System

The overflow of wastewater from aeration tank goes into secondary clarifier **(Fig3.19)** for settling of biomass.



Fig 3.19 Secondary Clarifier

Around 12800 KLD of treated wastewater from the secondary clarifier outlet **(Fig 3.20)** is used for irrigation and the balance 8700 KLD is discharged into Dhabula drain **(Fig 3.21 (Discharge) , 3.22 (Upstream) & Fig 3.23 Downstream))**



Fig 3.20 Secondary Clarifier Outlet



Fig 3.21 Discharge into Dhaubla Drain



Fig 3.22 Dhaubla Drain Up stream



Fig 3.23 Dhaubla Drain Down Stream

The plant has installed **OCEMS (Fig 3.24)** for monitoring the treated effluent quality which is linked to CPCB / PCPB Server. Separate flow meter have been installed for monitoring quantity of treated effluent used for irrigation **(Fig 3.25)** and discharged **(Fig 3.26)**.



Fig 3.24 OCEMS



Fig 3.25 Flowmeter for Treated Effluent Used for Irrigation



Fig 3.26 Flowmeter for Treated Effluent Discharged into Drain

The **fibre rich primary clarifier sludge** after dewatering through **Wire Press** is sold to board makers. The agreement with board making units is Indicated in **Annexure V** .The excess secondary sludge is dewatered along with DAF sludge through Bellmer Press and burnt in boiler.

The schematic diagram of ETP is given in **Fig 3.27** and dimensions are indicated in **Table 3.2.**

Tabble 3.2 Design Specification of ETP

S.No.	Unit	Dimensions m	Volume m^3
1	Collection Pit	70 x70 x 4.5	22000
2	Primary Clarifier-1	24.8 m dia x 3m SWD	1448
3	Primary Clarifier 2	31.92 m dia x 3m SWD	412
4	Aeration Tank I & 2	40 x15.8 x5 60x40x4.5	14400
5	Secondary Clarifier	42 m Dia x 3.5 mSWD	4847

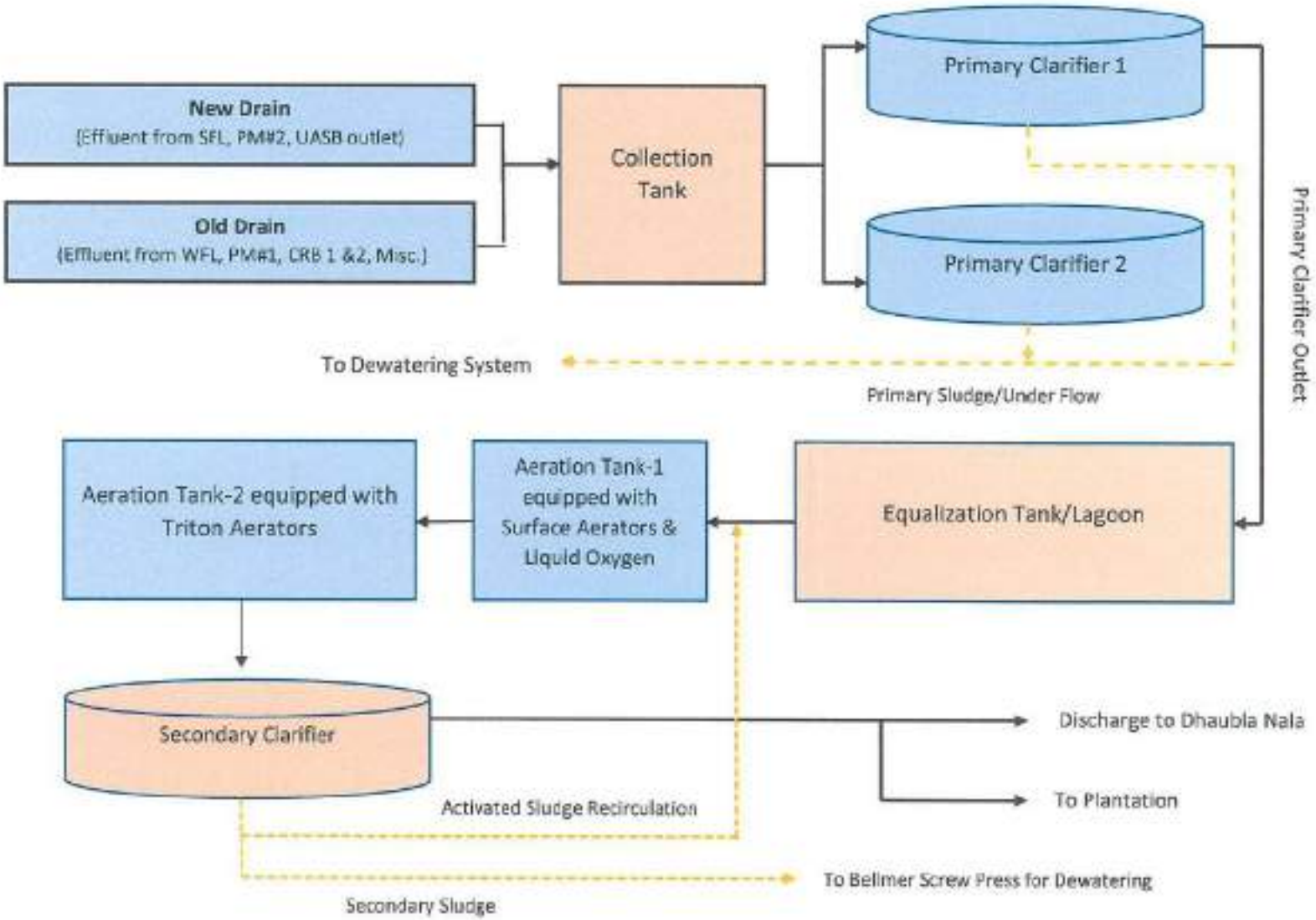


Fig 3.27 Schematic Diagram of Effluent Treatment Plant at Trident Ltd

3.2. Performance Evaluation of ETP

3.2.1 Characterisation of Effluent Streams

The performance efficiency of the existing ETP was evaluated through 24 hours composite sampling and analysis of effluents collected at oulet of various units of ETP during the three visits to the plant. The samples were analysed in accordance to BIS & APHA Test Methods. The analysis results of samples collected are given in **Tables 3.3 - 3.17.**

Table 3.3 Characteristics of Wheat Straw Washings

S. No.	Parameters	Sample Collected on 02.03.2021	Sample Collected on 15.03.2021	Sample Collected on 10.04.2021	Average Value
1.	pH	6.34	6.54	6.51	**6.46**
2.	TSS, mg/l	2029	2679	2464	**2391**
3.	TDS, mg/l	5411	5751	5008	**5390**
4.	COD, mg/l	5072	5504	4842	**5139**
5.	BOD, mg/l	2143	2419	2298	**2287**

Table 3.4 Characteristics of Old Drain Effluent

S. No.	Parameters	Sample Collected on 02.03.2021	Sample Collected on 15.03.2021	Sample Collected on 10.04.2021	Average Value
1.	pH	6.21	6.58	6.77	**6.52**
2.	TSS, mg/l	1378	1505	1644	**1509**
3.	TDS, mg/l	2167	1827	1998	**1997**
4.	COD, mg/l	1229	1430	1248	**1302**
5.	BOD, mg/l	459	542	704	**568**

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Table 3.5 (a) Characteristics of DAF Inlet

S. No.	Parameters	Sample Collected on 02.03.2021	Sample Collected on 15.03.2021	Sample Collected on 10.04.2021	Average Value
1.	pH	6.26	6.52	6.49	**6.42**
2.	TSS, mg/l	3056	2487	2655	**2733**
3.	TDS, mg/l	5081	4950	5380	**5137**
4.	COD, mg/l	5364	5128	5520	**5337**
5.	BOD, mg/l	2660	2390	2755	**2602**

Table 3.5 (b) Characteristics of DAF Outlet

S. No.	Parameters	Sample Collected on 02.03.2021	Sample Collected on 15.03.2021	Sample Collected on 10.04.2021	Average Value
1.	pH	6.10	7.10	6.86	**6.69**
2.	TSS, mg/l	497	545	602	**548**
3.	TDS, mg/l	5190	5224	5496	**5303**
4.	COD, mg/l	3920	3604	4013	**3846**
5.	BOD, mg/l	1825	1585	1955	**1788**

Table 3.6 Characteristics of UASB Inlet

S. No.	Parameters	Sample Collected on 02.03.2021	Sample Collected on 15.03.2021	Sample Collected on 10.04.2021	Average Value
1.	pH	6.64	7.20	6.81	**6.82**
2.	TSS, mg/l	444	589	555	**529**
3.	TDS, mg/l	5376	5098	5577	**5350**
4.	COD, mg/l	3820	3711	4105	**3879**
5.	BOD, mg/l	1926	1688	2022	**1878**

Table 3.7 Characteristics of UASB Outlet

S. No.	Parameters	Sample Collected on 02.03.2021	Sample Collected on 15.03.2021	Sample Collected on 10.04.2021	Average Value
1.	pH	7.39	7.53	7.58	**7.50**
2.	TSS, mg/l	328	366	455	**383**
3.	TDS, mg/l	3066	2981	3240	**3096**
4.	COD, mg/l	1216	1355	1516	**1362**
5.	BOD, mg/l	309	277	348	**311**

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Table 3.8 Characteristics of New Drain

S. No.	Parameters	Sample Collected on 02.03.2021	Sample Collected on 15.03.2021	Sample Collected on 10.04.2021	Average Value
1.	pH	5.93	6.53	6.65	**6.37**
2.	TSS, mg/l	1263	1545	1744	**1517**
3.	TDS, mg/l	2356	2146	2188	**2353**
4.	COD, mg/l	1977	2116	1834	**1976**
5.	BOD, mg/l	929	831	392	**817**

Table 3.9 Characteristics of Collection Tank (Primary Clarifier 1 & 2 Inlet)

S. No.	Parameters	Sample Collected on 02.03.2021	Sample Collected on 15.03.2021	Sample Collected on 10.04.2021	Average Value
1.	pH, mg/l	6.25	7.00	6.7	**6.65**
2.	TSS, mg/l	1208	1394	1468	**1357**
3.	TDS, mg/l	2306	1987	2085	**2126**
4.	COD, mg/l	1288	1166	1240	**1231**
5.	BOD, mg/l	575	544	633	**584**

Table 3.10 Characteristics of Primary Clarifier 1 Overflow

S. No.	Parameters	Sample Collected on 02.03.2021	Sample Collected on 15.03.2021	Sample Collected on 10.04.2021	Average Value
1.	pH	6.71	6.98	6.73	**6.81**
2.	TSS, mg/l	190	141	166	**166**
3.	TDS, mg/l	1955	1744	2016	**1905**
4.	COD, mg/l	876	907	894	**892**
5.	BOD, mg/l	324	287	304	**305**

Table 3.11 Characteristics of Primary Clarifier 2 Overflow

S. No.	Parameters	Sample Collected on 02.03.2021	Sample Collected on 15.03.2021	Sample Collected on 10.04.2021	Average Value
1.	pH	6.63	7.05	6.69	**6.79**
2.	TSS, mg/l	156	141	186	**161**
3.	TDS, mg/l	1710	2070	1894	**1891**
4.	COD, mg/l	825	882	840	**849**
5.	BOD, mg/l	339	352	293	**328**

Table 3.12 Characteristics of Equalization Tank

S. No.	Parameters	Sample Collected on 02.03.2021	Sample Collected on 15.03.2021	Sample Collected on 10.04.2021	Average Value
1.	pH	6.63	6.99	6.75	**6.79**
2.	TSS, mg/l	123	138	155	**139**
3.	TDS, mg/l	1852	1965	1688	**1835**
4.	COD, mg/l	878	846	739	**821**
5.	BOD, mg/l	345	326	274	**315**

Table 3.13 Characteristics of Inlet to Aeration Tank

S. No.	Parameters	Sample Collected on 02.03.2021	Sample Collected on 15.03.2021	Sample Collected on 10.04.2021	Average Value
1.	pH	6.75	7.00	6.82	**6.86**
2.	TSS, mg/l	96	112	107	**105**
3.	TDS, mg/l	1833	2010	1713	**1852**
4.	COD, mg/l	857	878	860	**865**
5.	BOD, mg/l	313	340	305	**318**

Table 3.14 Characteristics of Secondary Overflow

S. No.	Parameters	Sample Collected on 02.03.2021	Sample Collected on 15.03.2021	Sample Collected on 10.04.2021	Average Value
1.	pH	7.52	7.68	7.65	**7.62**
2.	TSS, mg/l	15	17	22	**24**
3.	TDS, mg/l	1581	1711	1676	**1656**
4.	COD, mg/l	232	201	224	**221**
5.	BOD, mg/l	19	23	14	**18.7**
6.	Color (PCU)	867	735	843	**815**

Table 3.15 Characteristics of Treated Effluent Used for Plantation / Irrigation

S. No.	Parameters	Sample Collected on 02.03.2021	Sample Collected on 15.03.2021	Sample Collected on 10.04.2021	Average Value
1.	pH	7.56	7.59	7.62	**7.59**
2.	TSS, mg/l	17	18	19	**18**
3.	TDS, mg/l	1592	1744	1701	**1679**
4.	COD, mg/l	227	214	229	**223**
5.	BOD, mg/l	18	22	17	**19**
6.	Color (PCU)	891	723	856	**823**

Table 3.16 Characteristics of Outlet to Drain

S. No.	Parameters	1st Sampling 02.03.2021	2nd Sampling 15.03.2021	3rd Sampling 10.04.2021	Average Value
1.	pH	7.51	7.70	7.68	**7.63**
2.	TSS, mg/l	20	18	25	**21**
3.	TDS, mg/l	1605	1786	1596	**1662**
4.	COD, mg/l	223	206	220	**216**
5.	BOD, mg/l	18	21	23	**21**
6.	Color (PCU)	875	703	827	**802**

Table 3.17 Characteristics of Outfall into Drain

S. No.	Parameters	1st Sampling 02.03.2021	2nd Sampling 15.03.2021	3rd Sampling 10.04.2021	Average Value
1.	pH	7.51	7.57	7.64	**7.61**
2.	TSS, mg/l	27	24	25	**25.3**
3.	TDS, mg/l	1633	1744	1655	**1677**
4.	COD, mg/l	214	219	224	**219**
5.	BOD, mg/l	19	21	16	**19**
6.	Color (PCU)	854	740	821	**805**

M/s L2 Enviro

The analysis of Mixed Liquor Suspended Solids / Mixed Liquor Volatile Suspended Solids was also carried out to assess the quantity of biomass available in the aeration tank . The results are indicated in **Table 3.18.**

Table 3.18 MLSS & MLVSS Level in Aeration Tank

S. No.	Parameters	1st Sampling 02.03.2021	2nd Sampling 15.03.2021	3rd Sampling 10.04.2021	Average Value
1.	MLSS, mg/l	3365	3941	2988	**3431**
2.	MLVSS, mg/l	2264	2632	2044	**2313**

3.2.2 Performance Evaluation of Existing Effluent Treatment System

Based on the analysis of the effluent samples collected the performance of the various units and overall performance of ETP was evaluated

(a) Biomethanation Plant

The performance of the units of biomethanation plant i.e. Krofta (DAF) and UASB reactor as well as Overall Performance of biomethanation plant was assessed based on the analysis of composite samples collected & analysed . The results are indicated in **Table 3.19 – 3.21.**

Table 3.19 Performance of Krofta (DAF)

Parameter	DAF Inlet	DAF Outlet	Reduction, %
pH	6.42	6.69	--
TSS, mg/l	2733	548	80
COD, mg/l	5337	3846	28
BOD, mg/l	2602	1788	31

Table 3.20 Performance of UASB Reactor

Parameter	UASB Reactor Inlet	UASB Reactor Outlet	Reduction, %
pH	6.82	7.50	--
COD, mg/l	3879	1362	65
BOD, mg/l	1879	311	83

Table 3.21 The Overall Performance of Wet Washings Treatment System (DAF + UASB Reactor)

Parameter	DAF Inlet	UASB Outlet	Reduction, %
pH	6.42	7.50	--
TSS, mg/l	2733	383	86
COD, mg/l	5337	1362	75
BOD, mg/l	2602	311	88

(b) ETP Based on Activated Sludge Process (ASP)

The performance of various units of existing Effluent Treatment Plant (ETP) i.e. Primary Clarifiers and Secondary Biological System as well as Overall Performance of ETP based on ASP was assessed based on the samples collected & analysed. The results are indicated in **Table 3.22 – 3.25**

Table 3.22 Performance of Primary Clarifier-1

Parameter	PC-1 Inlet	PC-1 Outlet	Reduction, %
pH	6.65	6.81	--
TSS, mg/l	1357	166	88
COD, mg/l	1231	892	27
BOD, mg/l	584	305	48

Table 3.23 Performance of Primary Clarifier-2

Parameter	PC-2 Inlet	PC-2 Outlet	Reduction, %
pH	6.65	6.79	--
TSS, mg/l	1356	161	88
COD, mg/l	1231	849	31
BOD, mg/l	584	328	44

Table 3.24 Performance of Secondary Treatment System

(Aeration Tank + Secondary Clarifier)

Parameter	Inlet to Aeration Tank	SC Outlet	Reduction, %
pH	6.86	7.62	--
COD, mg/l	885	221	**75**
BOD, mg/l	318	19	**94**

Table 3.25 The Overall Performance of Effluent Treatment Plant (ETP) based on Activated Sludge Process (ASP)

Parameter	Primary Clarifier Inlet	Secondary Clarifier (Final Discharge)	Reduction, %
pH	6.65	7.62	--
TSS, mg/l	1357	24	**98**
COD, mg/l	1231	221	**82**
BOD, mg/l	584	19	**97**

The treated effluent characteristics were compared with respect to relevant standards as per Environment (Protection) Rules, 1986 for Large Pulp and Paper Mills for the wastewater discharge as indicated in **Table 3.26**

Table 3.26 Treated Effluent Characteristics v/s Wastewater Discharge Standards

S. No	Parameter	Value / Analysis Results	Standards
1	Flow (Total Waste Water Discharged) Large pulp and paper mill	36 m^3/tonne of paper produced of paper	200 m^3/tonne of paper produced
2	pH	7.62	7.0-8.5
3	Suspended Solids	24 mg/l	< 50 mg/l
4	BOD at 27°C for 3 days	19 mg/l	< 30 mg/l
5	COD	221 mg/l	< 350 mg/l
6	Color , PCU	815 PCU	-
7	Absorbable Organic Halogens (AOX)	0.25 kg / t paper	< 1 kg/ tonne of product

Chapter 4

AIR MONITORING

Chapter - 4
AIR MONITORING

4.1 Ambient Air Quality Monitoring

Ambient Air Quality Monitoring was carried out thrice as per standard procedures at following three locations viz:

(1) Reservoir Area

(2) Girls Hostel and

(3) Old Guest House

The particulate matter sampling was carried out for 24 hours while gaseous sampling was carried out for around 4 hours . The IS standard followed for Ambient Air Monitoring are as under:

- **IS 5182 (Part 23): 2006 (Reaffirmed 2012) = Methods for Measurement of Air Pollution Part 23 Respirable Suspended particulate Mateer (PM 10) Cyclonic Flow Technique.**
- **IS 5182 (Part 24) : 2019 - Methods for Measurement of Air Pollution Part 24 Fine Particulate Matter ($PM_{2.5}$).**
- **IS 5182 (Part 2) - Methods for Measurement of Air Pollution Part 2 Sulphur Dioxide.**
- **IS 5182 (Part 6) - Methods for Measurement of Air Pollution Part 6 Oxides of Nitrogen**

4.2 Ambient Air Quality Monitoring Results

As per scope of the work the Ambient Air Quality Monitoring was carried out for **PM_{10} & $PM_{2.5}$, SO_2** and **NO_X**. on **February 25, 2021, March 13, 2021 and April 8 , 2021.** The result of the Ambient Air Quality Monitoring are indicated in **Table 4.1- 4.4**

Table 4.1 Results of Ambient Air Quality Monitoring at Reservoir

S. No.	Parameters	Sampling on 25.02.2021	Sampling on 13.03.2021	Sampling on 08.04.2021	Average
1.	$PM_{2.5}$, µg/m^3	44	52	39	**45**
2.	PM_{10} , µg/m^3	66	55	74	**65**
3.	SO_2 , µg/m^3	16.4	10.5	14.5	**13.8**
4.	NO_2 , µg/m^3	18.3	15.4	20.7	**18.1**

Table 4.2 Results of Ambient Air Quality Monitoring at Girls Hostel

S. No.	Parameters	Sampling on 25.02.2021	Sampling on 13.03.2021	Sampling on 08.04.2021	Average
1.	$PM_{2.5}$, µg/m^3	33	38	46	**39**
2.	PM_{10} , µg/m^3	89	75	93	**86**
3.	SO_2 , µg/m^3	14.4	13.7	16.3	**14.8**
4.	NO_2 , µg/m^3	19.6	22.3	14.5	**18.7**

Table 4.3 Results of Ambient Air Quality Monitoring at Guest House-Administration Block

S. No.	Parameters	Sampling on 25.02.2021	Sampling on 13.03.2021	Sampling on 08.04.2021	Average
1.	$PM_{2.5}$, µg/m^3	55	46	37	46
2.	PM_{10}, µg/m^3	83	87	92	87
3.	SO_2, µg/m^3	12.1	11.4	19.8	14.4
4.	NO_2, µg/m^3	25.3	19.8	15.6	20.3

Table 4.4 Summarised Ambient Air Quality Monitoring Results

S. No.	Parameters	Water Reservoir	Girls Hostel	Old Guest House-Admin	National Ambient Air Quality Standards
1.	$PM_{2.5}$, µg/m^3	45	39	46	60
2.	PM_{10}, µg/m^3	65	86	87	100
3.	SO_2, µg/m^3	13.8	14.8	14.4	80
4.	NO_2, µg/m^3	18.1	18.7	20.3	80

As indicated the concentration of the pollutants are reported to be well within the National Ambient Air Quality Norms .

4.3 Stack Emission Monitoring

The major stack emissions sources include stacks attached to boilers (power & chemical recovery boilers) and lime kiln. **Electrostatic Precipitator (ESP)** are provided with the stacks to control particulate matter emissions. The Sulphuric Acid Plant (SAP) has a scrubber as air pollution control device to control SO_x emissions. The various stationary sources are as under :

1. **FBC Boiler 12TPH Capacity,**
2. **FBC Boiler 50 TPH Capacity ,**
3. **FBC Cogeneration Boiler 130 TPH,**
4. **FBC Cogeneration Boiler 130TPH,**
5. **Recovery Boiler 20TPH,**
6. **Recovery Boiler 50TPH**
7. **Lime Kiln 50TPH**
8. **Sulphuric Acid Plant equipped with wet scrubber**

However , at the time of visit low capacity power boilers i.e 12 TPH & 50 TPH were not in operation As per mill submission these boilers are not in use and have been kept as standby. Similarly the lime kiln was also not operational during the visit. As such stack monitoring was carried out for following four sources :

1. **Cogeneration Boiler (FBC) 130TPH (Fig 4.1)**
2. **Cogeneration Boiler (FBC) 130TPH (Fig 4.1)**
3. **Recovery Boiler 20TPH (Fig 4.2)**
4. **Recovery Boiler 50TPH(Fig 4.3)**
5. **Sulphuric Acid Plant equipped with wet scrubber(Fig 4.4)**



Fig 4.1 Stack of Recovery Boiler 20 tph



Fig 4.2 Stack of Recovery Boiler 50 tph



Fig 4.3 Stack of Co-generation Boiler (FBC) 2x 130 TPH



Fig 4.4Stack of Sulphuric Acid Plant

The steam requirement of the mill is met by the captive power boilers and chemical recovery boilers after extracting power from turbo generator. The First Cogeneration Boiler (FBC) 130 TPH and Second Cogeneration Boiler (FBC) 130TPH have a common stack. All the boiler stack are attached with Electrostatic Precipitator (ESP) to control particulate matter.

The stacks detail are given in **Table 4.5**

Table 4.5 Stack Details

S, No	Source	Control equipment	Stack Height m	Stack Diameter m
1	FBC Boiler 12TPH Capacity,	ESP	55	1.4
2	FBC Boiler 50 TPH Capacity	ESP	70	2.0
3	Cogeneration Boiler (FBC) 130TPH (2)	ESP	88	3.5
4	Recovery Boiler 20TPH,	ESP	55	1.5
5	Recovery Boiler 50TPH	ESP	70	2.0
6	Lime Kiln	ESP	50	1.5
7	Sulphuric Acid Plant	Wet Scrubber	55	1.15

As per scope of the work the Stack Monitoring was carried out thrice for Particulate Matter, SO_2 , NOx & H_2S at combined ESP outlet of First Cogeneration Boiler (FBC) 130 TPH, Second Cogeneration Boiler (FBC) 130TPH, ESP outlet of Recovery Boiler 20TPH and Recovery Boiler 50TPH as well as at Sulphuric Acid Plant during the visit to the mill from **February 24 – March 3, 2021, March 12- 16 , 2021 and April 8 - 11, 2021 ,**

2021. The stack emission monitoring was conducted using following methods :

- **IS: 11255 (Part-1) 1985 (Reaffirmed 2019) : Methods for Measurement of Emissions from Stationary Sources - Particulate Matter.**
- **IS: 11255 (Part-2) 1985 (Reaffirmed 2019): Methods for Measurement of Emissions From Stationary Sources - Sulphur Dioxide.**
- **IS: 11255 (Part-7) 2005 (Reaffirmed 2012) : Methods for Measurement of Emission from Stationary Sources - Oxides Of Nitrogen**
- **IS: 11255 (Part-4) 2006 (Reaffirmed 2012) :** Methods for Measurement of Emission from Stationary Sources - Hydrogen Sulphide and Carbon Disulphide
- **IS: 13270 (Reaffirmed 2019):Test for Gases by Orsat and Chromatographic Methods**

The result of the Stack Monitoring are indicated in **Table 4.6 - 4.4**

Table 4.6 Stack Monitoring of Co-generation Power Boiler-2 & 3

(A) Power & Steam Generation Capacity

Power Generation Capacity	Boiler-2 Boiler-3	20 MW 20 MW
Steam Generation Capacity	Boiler-2 Boiler-3	130 TPH 130 TPH

(B) Operating Conditions during Sampling

Particulars	Sampling on 26.02.2021	Sampling on 13.03.2021	Sampling on 8.04.2021
Boiler-2			
TG Load, MW	13.66	13.25	15.42
Steam Flow, TPH	90.3	93.3	95.3

Boiler-3				
TG Load, MW		13.53	14.4	13.35
Steam Flow, TPH		90.9	91.4	113.5
ESP-2				
Current, mV	Field-1	120	90	90
	Field-2	30	30	30
	Field-3	30	30	30
Voltage, kV	Field-1	39.9	36.1	38
	Field-2	45.6	51.3	49.4
	Field-3	49.4	43.7	47.5
ESP-3				
Current, mA	Field-1	120	120	120
	Field-2	60	90	90
	Field-3	30	30	30
Voltage, kV	Field-1	38	30.4	39.9
	Field-2	24.7	19	20.9
	Field-3	39.9	39.9	34.2

(C) Test Results

S. No.	Parameters	Sampling on 26.02.2021	Sampling on 13.03.2021	Sampling on 8.04.2021	Avg. Value	Emission Norms
5.	SPM, mg/Nm^3	129	102	117	**116**	**150**
6.	SO_2, mg/Nm^3	9.8	16.4	11.3	**12.5**	-
7.	NO_x, mg/Nm^3	46.8	50.3	37.5	**44.9**	-
8.	H_2S, mg/Nm^3	BDL	BDL	BDL	**BDL**	-

Note : Cogeneration Boiler 2& 3 have Common Stack

Table 4.7 Stack Monitoring of Chemical Recovery Boiler-1

(A) Black Liquor Solis Firing capacity & Steam Flow Capacity

Black Liquor Solids Firing Capacity, TPH	6.88 (165 TPD)
Steam Flow Capacity, TPH	20 (480 TPD)

(B) Operating Conditions during Sampling

Particulars		Sampling on 26.02.2021	Sampling on 13.03.2021	Sampling on 8.04.2021
Liquor Solids Firing, TPD		6.25	6.25	6.25
Steam Flow, TPH		18	18	18
Current, mA	Field-1	60	60	60
	Field-2	224	224	224
Voltage, kV	Field-1	45.9	52.7	51
	Field-2	55.1	55.1	57

(C) Test Results

S. No.	Parameters	Sampling on 26.02.2021	Sampling on 13.03.2021	Sampling on 8.04.2021	Avg. Value	Emission Norm
1.	SPM, mg/Nm^3	87	79	95	**87**	**150**
2.	SO_2, mg/Nm^3	6.7	5.9	4.8	**5.8**	-
3.	NO_x, mg/Nm^3	23.2	29.4	17.2	**23.3**	-
4.	H_2S, mg/Nm^3	1.5	0.7	1.2	1.1	-

Table 4.8 Stack Monitoring of Chemical Recovery Boiler-2

(A) Black Liquor Solis Firing capacity & Steam Flow Capacity

Black Liquor Solids Firing Capacity, TPH	16.67 (400 TPD)
Steam Flow Capacity, TPH	54 (1296 TPD)

(B) Operating Conditions during Sampling

Particulars		Sampling on 26.02.2021	Sampling on 13.03.2021	Sampling on 8.04.2021
Liquor Solids Firing, TPH		15.5	15.9	16.1
Steam Flow, TPH		45	46.1	46.7
Current, mA				
	Field-1	29.7	30.7	27.7
	Field-2	354.9	344.9	359.9
	Field-3	600	580	620
Voltage, kV				
	Field-1	65.5	59.5	65.5
	Field-2	73	67	77
	Field-3	58.3	55.3	60.3

(C) Test Results

S. No.	Parameters	Sampling on 26.02.2021	Sampling on 13.03.2021	Sampling on 8.04.2021	Avg. Value	Emission Norm
1.	SPM, mg/Nm^3	75	84	67	**75**	**150**
2.	SO_2, mg/Nm^3	10.2	8.6	11.6	**10**	-
3.	NO_x, mg/Nm^3	39.4	31.5	25.1	**32**	-
4.	H_2S, mg/Nm^3	2.3	3.4	1.9	**2.5**	-

Table 4.9 Monitoring of SO_2 of Sulphuric Acid Plant (SAP)

(A) Production Capacity

Sulphuric Acid Production Capacity	300 TPD
Production during Sampling	290 – 300 TPD

(B) Test Results

S. No.	Parameters	Sampling on 26.02.2021	Sampling on 13.03.2021	Sampling on 8.04.2021	Avg.	Emission Norm
1.	SO_2, mg/Nm^3	371	297	316	**328**	**600**

Chapter 5

GROUND WATER SAMPLING & ANALYSIS

Chapter - 5
GROUNDWATER SAMPLING & ANALYSIS

5.1 Ground Water Sampling Points

As per scope of work, ground water samples were collected from the borewell / tubewell at following three locations and analysed to see the impact (if any) of treated effluent on ground water quality. The measured values were compared with drinking water standards.

Ground water samples were collected at following points as per scope of study :

- **New Sidhu Fatehgarh Chanan (Fig 5.1)**
- **Trident Complex Dhaula-Tube Well 1 (Fig 5.2)**
- **Gobind Haveli, Mansa Road, Dhaula (Fig 5.3)**



Fig 5.1 Ground Water Sampling Location at New Sidhu Fatehgarh Chanan



Fig 5. 2 Trident Complex, Dhaula (Tube Well-1)



Fig 5.3 Gobind Haveli, Mansa Road, Dhaula

The Google Maps of Ground Water Sampling Points is indicated in **Fig 5.4**



Fig 5.4 Google Maps of Ground Water Sampling Points

5.2 Characterisation of Ground Water

Three sampling of ground water samples were carried out on on March 2, 2021,March 15,2021 & April 10,2021. The depth of the borewell at New Sidhu Fatehgarh Chanan,Gobind Haveli, Mansa Road, and Trident Complex Dhaula-Tube Well 1 is around 140 feet . The sample of ground water were preserved as per standard procedure and sealed . The samples were analysed as per Indian Standard (IS) test methods. The analysis results of ground water samples collected are indicated in **Table 5.1.-5.3**

Table 5. 1 Characterisation of Ground Water Collected at New Sidhu Fathehgard Chanan

S. No.	Parameters	Sampling on 02.03.2021	Sampling on 15.03.2021	Sampling on 10.04.2021	Average
1.	pH	7.43	7.51	7.48	7.47
2.	TSS, mg/l	BDL	BDL	BDL	BDL
3.	TDS, mg/l	383	377	403	388
4.	COD, mg/l	BDL	BDL	BDL	BDL
5.	BOD, mg/l	BDL	BDL	BDL	BDL
6.	Chloride (as Cl), mg/l	80	93	84	86
7.	Sulphate (as SO_4), mg/l	58	59	63	60
8.	Sulphide (as H_2S), mg/l	BDL	BDL	BDL	BDL
9.	Ammonia as (a total ammonia-N) mg/l	0.07	0.06	0.06	0.06
10.	Total Hardness (as $CaCO_3$), mg/l	171	166	176	171
11.	Sodium Absorption Ratio (SAR)	2.53	2.41	2.84	2.59

M/s L. Endeavour

Table 5.2 Characterisation of Ground Water Collected at Gobind Haveli, Mansa Road, Dhaula

S. No.	Parameters	Sampling on 02.03.2021	Sampling on 15.03.2021	Sampling on 10.04.2021	Average
1.	pH	7.23	7.29	7.18	7.23
2.	TSS, mg/l	BDL	BDL	BDL	BDL
3.	TDS, mg/l	429	427	416	424
4.	COD, mg/l	BDL	BDL	BDL	BDL
5.	BOD, mg/l	BDL	BDL	BDL	BDL
6.	Chloride (as Cl), mg/l	139	127	135	134
7.	Sulphate (as SO_4), mg/l	87	94	96	92
8.	Sulphide (as H_2S), mg/l	0.01	0.01	0.01	0.01
9.	Ammonia as (a total ammonia-N) mg/l	0.13	0.09	0.16	0.13
10.	Total Hardness (as $CaCO_3$), mg/l	227	236	224	229
11.	Sodium Absorption Ratio (SAR)	6.51	5.89	5.95	6.12

Table 5.3 Characterisation of Ground Water Collected at. Trident Complex, Dhaula (Tube Well-1)

S. No.	Parameters	Sampling on 02.03.2021	Sampling on 15.03.2021	Sampling on 10.04.2021	Average
1.	pH	7.63	7.58	7.71	7.64
2.	TSS, mg/l	Nil	Nil	Nil	Nil
3.	TDS, mg/l	440	425	428	431
4.	COD, mg/l	Nil	Nil	Nil	Nil
5.	BOD, mg/l	Nil	Nil	Nil	Nil
6.	Chloride (as Cl), mg/l	138	149	156	148
7.	Sulphate (as SO_4), mg/l	75	81	90	82
8.	Sulphide (as H_2S), mg/l	0.01	0.01	0.01	0.01
9.	Ammonia as (a total ammonia-N) mg/l	0.18	0.21	0.19	0.19
10.	Total Hardness (as $CaCO_3$), mg/l	226	237	218	227
11.	Sodium Absorption Ratio (SAR)	5.15	5.42	4.77	5.11

Table 5.3 Average Characteristics of Ground Water Collected at Selected Sites In and around

S. No.	Parameters	New Sidhu Fathehgard Chanan	Gobind Haveli, Mansa Road, Dhaula	Trident Complex, (Tube Well-1)	Requirement (Acceptable Limit)	Test Method Used
1.	pH	7.47	7.23	7.64	6.5-8.5	IS 3025 (Part 11)
2.	TSS, mg/l	Nil	Nil	Nil	--	IS 3025 (Part 17)
3.	TDS, mg/l	388	424	431	500	IS 3025 (Part 16)
4.	COD, mg/l	NIL	Nil	Nil	--	IS 3025 (Part 44)
5.	BOD, mg/l	NIL	Nil	Nil	--	IS 3025 (Part 58)
6.	Chloride (as Cl), mg/l	86	134	148	250	IS 3025 (Part 32)
7.	Sulphate (as SO_4), mg/l	60	92	82	200	IS 3025 (Part 24)
8.	Sulphide (as H_2S), mg/l	Nil	0.01	0.01	0.05	IS 3025 (Part 29)
9.	Ammonia as (a total ammonia-N) mg/l	0.06	0.13	0.19	0.5	IS 3025 (Part 34)
10.	Total Hardness (as $CaCO_3$), mg/l	171	229	227	200	IS 3025 (Part 21)
11.	Sodium Absorption Ratio (SAR)	2.59	6.12	5.11	--	By Calculation

Chapter 6

MATERIAL & WATER BALANCE

CHAPTER 6
MATERIAL & WATER BALANCE

The assessment & estimation of pulp yield, total water requirement, freshwater consumption, back water usage and effluent generation has been carried out based on pulp consistency maintained in different sections. The tentative material &water balance of Straw Fibre Line (SFL), Wood Fibre Line (WFL), Chemical Recovery and Cogeneration Power Plant is estimated as follows:

6.1 Material & Water Balance- Straw Fibre Line (SFL)

6.1.1 Material Balance- SFL (Consolidated)

Input			Output		
Sr. No.	Description	TPD	Sr. No.	Description	TPD
i.	Wheat Straw (BD)	**535**	i.	Dust Separated from Deduster @ 3 % of Wheat Straw	16.05
ii.	White Liquor (700 m^3 @ 11.4 % solids)	79.8	ii.	Dust Separated from Wet Washing System @ 2 % of Wheat Straw	10.7
			iii.	Rejects Separated from Knotter Screen and HD Cleaner @ 1.5 % of Cooked Pulp	3.625
			iv.	Rejects Separated from Pressure Screens and Centri-Cleaners @ 0.5 % of Cooked Pulp	1.208
			v.	Shrinkage loss during Bleaching @ 5 % of Unbleached Pulp	11.842
			vi.	Solids in Weak Black Liquor Generated (3150 TPD Weak Black Liquor @ 11 % Solids)	346.5
			vii.	**Bleached Pulp Produced**	**225**
	Total	**614.8**		**Total**	**614.925**

6.1.2 Water & Material Balance- SFL (Section Wise)

6.1.2.1 Section: Wheat Straw Dry Cleaning (Dedusting)

Input		Output	
Description	**TPD**	**Description**	**TPD**
Wheat Straw (BD)	535	Wheat Straw after Dry Cleaning	518.95
		Dust Separated from Deduster @ 3.0 % of Wheat Straw	**16.05**
Total	**535**	**Total**	**535**

6.1.2.2 Section: Wheat Straw Wet Washing @ 3 % Consistency

Inputs (TPD)		Outputs (TPD)	
Description	**TPD**	**Description**	**TPD**
Wheat Straw after Dry Cleaning (BD)	518.95	Wheat Straw after Wet Washing	508.25
Moisture Carryover with Wheat Straw @ 8 %	45.126	Dust Separated from Wet washing System @ 2.0 % of Wheat Straw	10.7
Black Liquor Secondary Condensate	2085	Water carryover with washed wheat straw @ 40 % dryness	762.375
Wet Washing Clarifier Overflow	14017.008	Wet Washing Clarifier Overflow to Wash Beater	**14017.008**
Fresh Water	**632.249**	Wet Washing Clarifier Underflow to ETP	2000
Total	**17298.333**	**Total**	**17298.333**

6.1.2.3 Section: Wheat Straw Pulping, Cold Blowing & Pulp Washing

a. Wheat Straw Pulping (Bath Ratio= 1:3.5)

Input		Output	
Description	**TPD**	**Description**	**TPD**
Washed Wheat Straw	508.25	Cooked Pulp @ 45 %	241.676
Water Carryover with Washed Wheat Straw	762.375	Spent liquor	2045.449
White Liquor (Active Alkali as NaOH- 100 gpl)	700		
LP Steam to Digester	316.5		
Total	**2287.125**	**Total**	**2287.125**

b. Section: Pulp Cold Blowing (Consistency: 4 %)

Inputs		Outputs	
Description	**TPD**	**Description**	**TPD**
Cooked Pulp	241.676	Cooked Pulp	241.676
Spent liquor	2045.449	Liquor in Blow Tank	5800.224
BSW (1&2) Filtrate for Dilution	3754.775		
Total	**6041.9**	**Total**	**6041.9**

c. Section: Knott Screening & High Density Cleaning (Consistency: 2.5 %)

Input		Output	
Description	**TPD**	**Description**	**TPD**
Cooked Pulp	241.676	Pulp after Knot Screen & HD cleaner	238.051
Liquor in Blow Tank	5800.224	Rejects from Knot Screen & HD cleaner	3.625
BSW (1&2) Filtrate for Dilution	3625.14	Liquor with Pulp	9425.364
Total	**9667.04**	**Total**	**9667.04**

d. Section: Brown Stock Washers-1 & 2 (Dry End Cy. 11 %)

Input		Output	
Description	**TPD**	**Description**	**TPD**
Pulp after Knot Screen & HD Cleaner	238.051	Pulp after BSW (1 &2)	238.051
Liquor with Pulp	9425.364	Water with Pulp after BSW (1 &2)	1926.049
Twin Roll Press-1 Filtrate in Spray Showers	1248.519	Liquor to BSW (1 & 2) Filtrate Tank	7379.915
BSW (3&4) Filtrate in Spray Showers	1782.081	Liquor to BSW (1 & 2) Filtrate Tank (Chemical Recovery System)	3150
Total	**12694.015**	**Total**	**12694.015**

e. **Section: Twin Roll Press-1 (Dry End Cy: 26 %)**

Inputs		Outputs	
Description	**TPD**	**Description**	**TPD**
Pulp after BSW (1 &2)	238.051	Pulp after Twin Roll Press-1	238.051
Water Carryover with Pulp after BSW (1&2)	1926.049	Water with Pulp after Twin Roll Press	677.530
		Liquor to Twin Roll Press-1 Filtrate Tank	1248.519
Total	**2164.1**	**Total**	**2164.1**

f. **Section: Primary & Secondary Screening followed by Centri-cleaning (Cy.: 2.5 %)**

Inputs		Outputs	
Description	**TPD**	**Description**	**TPD**
Pulp after Twin Roll Press-1	238.051	Pulp after Screening & Cleaning	236.843
Water Carryover with Pulp after Twin Roll Press-1	677.530	Rejects from Pressure Screens & Centri-cleaners	1.208
BSW (3&4) Filtrate for Dilution	8606.459	Liquor with Pulp	9283.989
Total	**9522.04**	**Total**	**9522.04**

g. **Section: Brown Stock Washers-3 & 4 (Dry End Cy. 11 %)**

Inputs		Outputs	
Description	**TPD**	**Description**	**TPD**
Pulp after Screening & Cleaning	236.843	Pulp after BSW (1 &2)	236.843
Liquor with Pulp	9283.989	Water with Pulp after BSW (3 &4)	1916.275
Twin Roll Press -2 Filtrate in Spray Showers	1242.183	Liquor to BSW (3 & 4) Filtrate Tank	10368.54
Twin Roll Press -3 Filtrate in Spray Showers	1778.643		
Total	**12541.658**	**Total**	**12541.658**

h. Section: Twin Roll Press-2 (Dry End Cy: 26 %)

Input		Output	
Description	**TPD**	**Description**	**TPD**
Pulp after BSW (3 &4)	236.843	Pulp after Twin Roll Press-2	236.843
Water Carryover with Pulp after BSW (3&4)	1916.275	Water with Pulp after Twin Roll Press-2	674.092
		Liquor to Twin Roll Press -2 Filtrate Tank	1242.183
Total	**2153.118**	**Total**	**2153.118**

i. Section: ODL Reactor and Twin Roll Press-3 (Dry End Cy: 26 %)

Inputs		Outputs	
Description	**TPD**	**Description**	**TPD**
Pulp after Twin Roll Press-2	236.843	Pulp after Twin Roll Press	236.843
Water Carryover with Pulp after Twin Roll Press-2	674.092	Water with Pulp after Twin Roll Press-3	674.092
Fresh Water for Dilution	1778.643	Liquor to Twin Roll Press-3 Filtrate Tank	1778.643
Total	**2689.578**	**Total**	**2689.578**

6.1.2.4 Section: Bleaching

a) D_0 Stage (D_0 Reactor + Twin Roll Press-4)

Wet End Consistency: 8 %, Dry End Consistency: 26 %,

Inputs		Outputs	
Description	**TPD**	**Description**	**TPD**
Unbleached Pulp	236.843	Pulp after D_0 Stage	234.474
Water Carryover with Unbleached Pulp	674.092	Water with D_0 Stage Pulp	667.348
Chlorine Di Oxide (ClO_2)- 9.2 gpl @ 10.8 kg per tonne of bleached pulp	264.13	D_0 Twin Roll Press-4 Filtrate	1785.472
D_0 Filtrate for Dilution	1785.472	D_0 Twin Roll Press-4 Filtrate (to ETP)	993.243
Fresh Water in Spray Shower	720		
Total	**3680.537**	**Total**	**3680.537**

b) E_{op} Stage (F_{op} Reactor + Twin Roll Press-5)

Wet End Consistency: 8 %, Dry End Consistency: 26 %

Inputs		Outputs	
Description	**TPD**	**Description**	**TPD**
Pulp after D_n Stage	234.474	Pulp after E_{op} Stage	229.737
Water Carryover with D_n Stage pulp	667.348	Water with E_{op} Stage Pulp	653.866
Sodium Hydroxide (NaOH) @ 15 kg per tonne of bleached pulp	3.375	E_{oo} Twin Roll Press-5 Filtrate (Reused)	2026.561
Hydrogen Peroxide (H_2O_2)-50 % @ 11.3 kg per tonne of bleached pulp	2.542	E_{op} Twin Roll Press-5 Filtrate (to ETP)	620.761
E_{op} Filtrate for Dilution	2026.561		
Fresh Water in Spray Shower	600		
Total	**3530.925**	**Total**	**3530.925**

c) D_1 Stage (D_1 Reactor + Twin Roll Press-6)

Wet End Consistency: 8 %, Dry End Consistency: 26 %,

Inputs		Outputs	
Description	**TPD**	**Description**	**TPD**
Pulp after E_{op} Stage	229.737	Pulp after D_1 Stage	225
Water Carryover with E_{op} Stage Pulp	653.866	Water with D_1 Stage Pulp	640.384
Chlorine Di Oxide (ClO_2)- 9.2 gpl @ 7.2 kg per tonne of bleached pulp	176.09	D_1 Twin Roll Press-6 Filtrate (Reused)	1812.019
D_1 Filtrate for Dilution	1812.019	D_1 Twin Roll Press-6 Filtrate (Sent to ETP)	694.309
Fresh Water in Spray Shower	500		
Total	**3371.712**	**Total**	**3371.712**

M/s E-Alloy

6.2 Material & Water Balance- Wood Fibre Line (WFL)

6.2.1 Material Balance- WFL (Consolidated)

Input			Output		
Sr. No.	Description	TPD	Sr. No.	Description	TPD
i.	**Wood Chips** (75 % Veneer Chips & 25% Logs Chips)	144.5	i.	Dust Separated from Chip Screen @ 2.5 % of Wood Chips	3.613
ii.	White Liquor (351 m^3 @ 11.4 % Solids)	40	ii.	Rejects Separated from Knotter Screen @ 1.5 % of Cooked Pulp	1.047
iii.	Weak Black Liquor (50 m^3 @ 16.5 % Solids)	8.3	iii.	Rejects Separated from Primary & Secondary Screens @ 0.5 % of Cooked Pulp	0.349
			iv.	Shrinkage loss during Bleaching @ 5.0 % of Unbleached Pulp	3.421
			v.	Solids in Weak Black Liquor Generated (724 TPD weak black liquor @ 16.5 % solids)	119.5
			vi.	**Bleached Pulp Produced**	65
	Total	192.8		**Total**	192.93

6.2.2 Material and Water Balance-Wood Fibre Line (WFL)

6.2.2.1 Section: Octagonal Screen (Chips Screening)

Input		Output	
Description	**TPD**	**Description**	**TPD**
Wood Chips (75 % Veneer Chips & 25 % Log Chips)	144.5	Screened Wood Chips	140.887
		Dust Separated from Chip Screen @ 2.5 % of Wood Chips	3.613
Total	**144.5**	**Total**	**144.5**

6.2.2.2 Section: Vertical Batch Digesters (Wood Pulping, Bath Ratio ~ 1:3.5)

Input		Output	
Description	**TPD**	**Description**	**TPD**
Screened Wood Chips	140.887	Cooked Pulp	69.817
Moisture Carryover with Wood Chips @ 40 %	93.925	Spent liquor	565.995
White Liquor	351		
Weak Black Liquor (BSW-1 Filtrate)	50		
Total	**635.812**	**Total**	**635.812**

6.2.2.3 Section: Blow Tank with Heat Recovery System (Hot Blowing)

Inputs		Outputs	
Description	**TPD**	**Description**	**TPD**
Cooked Pulp	69.817	Cooked Pulp	69.817
Spent liquor	565.995	Spent liquor	547.995
		Blow Tank Vapor Condensate	18
Total	**635.812**	**Total**	**635.812**

6.2.2.4 Section: Knotter Screen (Pulp Screening) - Cy: 2.5 %

Inputs		Outputs	
Description	**TPD**	**Description**	**TPD**
Cooked Pulp	69.817	Pulp after Knotter Screen	68.77
Spent liquor	547.995	Knotter Screen Rejects @ 1.5 % of Cooked Pulp	1.047
BSW-1 Filtrate for Dilution	2174.868	Liquor with Pulp	2722.863
Total	**2792.68**	**Total**	**2792.68**

6.2.2.5 Section: Pulp Washing

a) Brown Stock Washer-1 (Dry End Cy. 11 %)

Inputs		Outputs	
Description	**TPD**	**Description**	**TPD**
Pulp after Knotter Screen	68.77	Pulp after BSW-1	68.77
Liquor with Pulp	2722.863	Water with Pulp	556.412
BSW-2 Filtrate in Spray Showers	782.417	BSW-1 Filtrate (Reused)	2224.868
		BSW-1 Filtrate (to Chemical Recovery System)	724
Total	**3574.05**	**Total**	**3574.05**

b) Brown Stock Washer-2 (Wet End Cy: 2.0 %, Dry End Cy: 11 %)

Inputs		Outputs	
Description	**TPD**	**Description**	**TPD**
Pulp after BSW-1	68.77	Pulp after BSW-2	68.77
Water with Pulp	556.412	Water with Pulp	556.412
BSW-2 Filtrate for Dilution	2030.901	BSW-2 Filtrate	2813.318
BSW-3 Filtrate in Spray Showers	782.417		
Total	**3438.5**	**Total**	**3438.5**

c) Brown Stock Washer-3 (Wet End Cy: 2.0 %, Dry End Cy: 11 %)

Inputs		Outputs	
Description	**TPD**	**Description**	**TPD**
Pulp after BSW-2	68.77	Pulp after BSW-3	68.77
Water with Pulp	556.412	Water with Pulp	556.412
BSW-3 Filtrate for Dilution	2030.901	BSW-3 Filtrate	2813.318
BSW-4 Filtrate in Spray Showers	**782.417**		
Total	**3438.5**	**Total**	**3438.5**

d) Primary & Secondary Pressure Screens- Cy: 2.5 %

Inputs		Outputs	
Description	**TPD**	**Description**	**TPD**
Pulp after BSW-3	68.77	Pulp after Pressure Screens	68.421
Water with Pulp	556.412	Rejects @ 0.5 % of Cooked Pulp	0.349
BSW-4 Filtrate for Dilution	2125.618	Liquor with Pulp	2682.03
Total	**2750.8**	**Total**	**2750.8**

e) Brown Stock Washer-4 (Dry End Cy: 11 %)

Inputs		Outputs	
Description	**TPD**	**Description**	**TPD**
Pulp after Pressure Screens	68.421	Pulp after BSW-4	68.421
Liquor with Pulp	2682.03	Water with Pulp after BSW-4	553.588
ODL Washer-1 Filtrate in Spray Shower	779.593	BSW-4 Filtrate	2908.035
Total	**3530.044**	**Total**	**3530.044**

6.2.2.6 Section: Oxygen Delignification (ODL)

a) ODL Reactor (Cy. 8.0 %)

Inputs		Outputs	
Description	**TPD**	**Description**	**TPD**
Pulp after BSW-4	68.421	Pulp in ODL Reactor	68.421
Water with Pulp after BSW-4	553.588	Liquor with Pulp in ODL Reactor	787.621

Caustic as NaOH @ 12 kg/tone of Bleached Pulp	0.78		
ODL Washer-1 Filtrate for Dilution	233.253		
Total	**856.042**	**Total**	**856.042**

b) **ODL Washer-1 (Wet End Cy.: 1.75 %, Dry End Cy: 10.5 %)**

Inputs		Outputs	
Description	**TPD**	**Description**	**TPD**
Pulp in ODL Reactor	68.421	Pulp after ODL Washer-1	68.421
Liquor with Pulp in ODL Reactor	787.621	Water with Pulp after ODL Washer-1	583.207
ODL Washer-1 Filtrate for Dilution	3053.729	ODL Washer-1 Filtrate	4066.575
ODL Washer-2 Filtrate in Spray Showers	808.432		
Total	**4718.203**	**Total**	**4718.203**

c) **ODL Washer-2 (Wet End Cy.: 1.75 %, Dry End Cy: 10.5 %)**

Inputs		Outputs	
Description	**TPD**	**Description**	**TPD**
Pulp after ODL Washer-1	68.421	Pulp after ODL Washer-2 (Unbleached Pulp)	68.421
Water with Pulp after ODL Washer-1	583.207	Water with Pulp after ODL Washer-2	583.207
ODL Washer-2 Filtrate for Dilution	3258.143	ODL Washer-2 Filtrate	4066.575
Fresh Water in Spray Showers	808.432		
Total	**4718.203**	**Total**	**4718.203**

6.2.2.7 Section: Pulp Bleaching

a) D_0 Reactor (Cy. 7.5 %)

Inputs		Outputs	
Description	**TPD**	**Description**	**TPD**
Unbleached Pulp	68.421	Pulp in D_0 Reactor	68.421
Water with Unbleached Pulp	583.207	Water with Pulp in D_0 Reactor	945.595
Sulphuric Acid (H_2SO_4)-98 % @ 8 kg/tone of Bleached Pulp	0.531		
Chlorine Di Oxide (ClO_2)- 9.2 gpl @ 16 kg/tone of bleached pulp	113.04		
D_0 Washer Filtrate for Dilution	248.817		
Total	**1014.016**	**Total**	**1014.016**

b) D_0 Washer (Wet End Cy.: 2.25 %, Dry End Cy: 10.5 %)

Inputs		Outputs	
Description	**TPD**	**Description**	**TPD**
Pulp in D_0 Reactor	68.421	Pulp after D_0 Stage	67.737
Water with Pulp in D_0 Reactor	945.595	Water with Pulp after D_0 Stage	577.377
D_0 Washer Filtrate for Dilution	2026.917	D_0 Washer Filtrate (Reused)	2275.734
Fresh Water in Spray Showers	540	D_0 Washer Filtrate (to ETP)	660.065
Total	**3580.933**	**Total**	**3580.933**

c) E_{op} Reactor (Cy. 8.5 %)

Inputs		Outputs	
Description	**TPD**	**Description**	**TPD**
Pulp after D_0 Stage	67.737	Pulp in E_{op} Reactor	67.737
Water with D_0 Stage pulp	577.377	Liquor with Pulp in E_{op} Reactor	729.169
Sodium Hydroxide (NaOH)-Solid @ 20 kg/tone of Bleached Pulp	1.3		
Hydrogen Peroxide (H_2O_2)- 60 % @ 12 kg/tone of Bleached Pulp	1.3		
LP Steam @ 0.120 tone/tone of	7.8		

Bleached Pulp			
E_{op} Washer Filtrate for Dilution	141.392		
Total	**796.906**	**Total**	**796.906**

d) **E_{op} Washer (Wet End Cy.: 1.75 %, Dry End Cy: 12 %)**

Inputs		Outputs	
Description	**TPD**	**Description**	**TPD**
Pulp in E_{op} Reactor	67.737	Pulp after E_{op} Stage	66.368
Liquor with Pulp in E_{op} Reactor	729.169	Water with Pulp after E_{op} Stage	486.699
E_{op} Washer Filtrate for Dilution	2623.78	E_{op} Washer Filtrate (Reused)	2765.172
D1 Washer Filtrate in Spray Showers	450	E_{op} Washer Filtrate (to ETP)	772.447
Fresh Water in Spray Showers	220		
Total	**4090.686**	**Total**	**4090.686**

e) **D_1 Reactor (Cy. 7.5 %)**

Inputs		Outputs	
Description	**TPD**	**Description**	**TPD**
Pulp after E_{op} Stage	66.368	Pulp in D_1 Reactor	66.368
Water with Pulp after E_{op} Stage	486.699	Water with Pulp in D_1 Reactor	840.869
Sulphuric Acid (H_2SO_4)- 98 % @ 2.5 kg/tone of Bleached Pulp	0.166		
Chlorine Di Oxide (ClO_2)- 9.2 gpl @ 3.5 kg/tone of bleached pulp	24.7		
D_1 Washer Filtrate for Dilution	329.204		
Total	**907.237**	**Total**	**907.237**

f) **D_1 Washer (Wet End Cy.: 1.75 %, Dry End Cy: 11 %)**

Inputs		Outputs	
Description	**TPD**	**Description**	**TPD**
Pulp in D_1 Reactor	66.368	Pulp after D_1 Stage (Bleached Pulp)	65
Water with Pulp in D_1 Reactor	840.869	Water with Unbleached Pulp	525.909

D_1 Washer Filtrate for Dilution	2435.22	D_1 Washer Filtrate	2764.424
Paper Machine Backwater in Spray Showers	450	D_1 Washer Filtrate (Sent to ETP)	687.124
Fresh Water in Spray Showers	250		
Total	**4042.457**	**Total**	**4042.457**

6.3 Water & Material Balance: Multi Effect Evaporators & Chemical Recovery 1 & 2

6.3.1 Section: Multi Effect Evaporators (Black Liquor Evaporation)

Inputs (TPD)		Outputs (TPD)	
Description	**TPD**	**Description**	**TPD**
Weak Black Liquor from Straw Fibre Line (SFL) @ 11 % Solids	3150	Semi Concentrated Black Liquor (SCBL) @ 55 % Solids	300
Weak Black Liquor from Wood Fibre Line (WFL) @ 16.5 % Solids	724	Heavy Black Liquor (HBL) @ 69 % Solids	436
Weak White Liquor from Mud Washer-1 for Maintaining RAA	144	Steam Primary Condensate	482
Evaporator Body Washings	50	Steam Loss	53
LP Steam @ 1 tone per 6.2 tone of water evaporation	535	Black Liquor Secondary Condensate	3260
		Black Liquor Foul Condensate	72
Total	**4603**	**Total**	**4603**

6.3.2 Chemical Recovery-1

6.3.2.1 Section: Recovery Furnace (Semi Concentrated Black Liquor Firing)

Inputs (TPD)		Outputs (TPD)	
Description	**TPD**	**Description**	**TPD**
Semi Concentrated Black Liquor (SCBL) @ 55 % Solids	300	Smelt Produced @ 35 % of Solids	58
		Organic Matter Burnt @ 65 % of Solids	107
		Water Evaporated	135
Total	**300**	**Total**	**300**

6.3.2.2 Section: Smelt Dissolve Tank (Green Liquor Generation)

Inputs (TPD)		Outputs (TPD)	
Description	**TPD**	**Description**	**TPD**
Smelt from recovery furnace	58	Green Liquor Produced	479
Weak White Liquor (Mud Washer-1 Overflow) for Dissolving Smelt	421		
Total	**479**	**Total**	**479**

6.3.2.3 Section: Rotary Slaker, Caustisizers and Clarifier

Inputs (TPD)		Outputs (TPD)	
Description	**TPD**	**Description**	**TPD**
Green Liquor	479	White Liquor Clarifier Overflow (White Liquor)	***398***
LP Steam for Maintaining Temp	29	White Liquor Clarifier Underflow (Lime Mud)	138
Quick Lime of 80 % Purity	30	Rejects from Slaker (Grits)	2
Total	**538**	**Total**	**538**

6.3.2.4 Section: Lime Mud Washer-1 (Dilution Factor 1:4)

Inputs (TPD)		Outputs (TPD)	
Description	**TPD**	**Description**	**TPD**
White Liquor Clarifier Underflow	138	Mud Washer-1 Overflow (Weak White Liquor)	421
Mud Washer-2 Overflow for Dilution	432	Mud Washer-1 Underflow	149
Total	**570**	**Total**	**570**

6.3.2.5 Section: Lime Mud Washer-2 (Dilution Factor 1:4)

Inputs (TPD)		Outputs (TPD)	
Description	**TPD**	**Description**	**TPD**
Mud Washer-1 Underflow	149	Mud Washer-2 Overflow	432
Lime Mud Thickener Filtrate for Dilution	424	Mud Washer-2 Underflow	141
Total	**573**	**Total**	**573**

6.3.2.6 Section: Lime Mud Drum Filter

Inputs (TPD)		Outputs (TPD)	
Description	**TPD**	**Description**	**TPD**
Mud Washer-2 Underflow	141	Lime Mud after Thickening	46
Black Liquor Secondary Condensate for Dilution	76	Moisture Carryover with Lime Mud @ 50 %	46
Black Liquor Secondary Condensate in Spray Showers	299	Lime Mud Thickener Filtrate	424
Total	**516**	**Total**	**516**

6.3.3 Chemical Recovery-2

6.3.3.1 Section: Recovery Furnace (Liquor Solids Firing)

Inputs (TPD)		Outputs (TPD)	
Description	**TPD**	**Description**	**TPD**
Heavy Black Liquor (HBL) @ 69 % Solids	436	Smelt Produced @ 35 % of Solids	105
		Organic Matter Burnt @ 65 % of Solids	196
		Water Evaporated	135
Total	**436**	**Total**	**436**

6.3.3.2 Section: Recovery Furnace (Green Liquor Generation)

Inputs (TPD)		Outputs (TPD)	
Description	**TPD**	**Description**	**TPD**
Smelt from Recovery Furnace	105	Green Liquor Produced	876
Weak White Liquor (Mud Washer Filtrate-1) for Dissolving Smelt	771		
Total	**876**	**Total**	**876**

6.3.3.3 Section: Slaker, Caustisizers and Clarifier

Input (TPD)		Output (TPD)	
Description	**TPD**	**Description**	**TPD**
Green Liquor	876	White Liquor Clarifier Overflow (White Liquor)	653
LP Steam for Maintaining Temp	10	White Liquor Clarifier Underflow (Lime Mud)	282

Quick Lime of 80 % Purity	54	Rejects from Slaker (Grits)	5
Total	**940**	**Total**	**940**

6.3.3.4 Section: Lime Mud Washer-1

Inputs (TPD)		Outputs (TPD)	
Description	**TPD**	**Description**	**TPD**
White Liquor Clarifier Underflow	282	Mud Washer-1 Overflow (Weak White Liquor)	915
Mud Washer-2 Overflow for Dilution	875	Mud Washer-1 Underflow	242
Total	**1157**	**Total**	**1157**

6.3.3.5 Section: Lime Mud Washer-2

Inputs (TPD)		Outputs (TPD)	
Description	**TPD**	**Description**	**TPD**
Mud Washer-1 Underflow	242	Mud Washer-2 Overflow	875
Lime Mud Thickener Filtrate for Dilution	897	Mud Washer-2 Underflow	264
Total	**1139**	**Total**	**1139**

6.3.3.6 Section: Lime Mud Filter (Disc Filter)

Inputs (TPD)		Outputs (TPD)	
Description	**TPD**	**Description**	**TPD**
Mud Washer-2 Underflow	264	Lime Mud after Thickening	83.5
Black Liquor Secondary Condensate for Dilution	116	Moisture Carryover with Lime Mud @ 50 %	83.5
Black Liquor Secondary Condensate in Spray Showers	684	Lime Mud Thickener Filtrate	897
Total	**1064**	**Total**	**1064**

6.3.3.7 Section: Recovery Furnace 1 & 2 (Steam Generation)

Input (TPD)		Output (TPD)	
Description	**TPD**	**Description**	**TPD**
LP Steam Primary Condensate from Evaporators	481	Steam Generation from Recovery Boiler-1 @ 16.5 TPH	396
DM/RO Water from Energy	633	Steam Generation from Recovery	828

Section		Boiler-2 @ 34.5 TPH	
LP Steam for Increasing DM/RO Water Temperature	117	Steam Vent Off from Deaerator	7
Fresh Water/Raw Water	1450	Evaporation from Cooling Tower	850
		Cooling Tower Blow Down (To ETP)	300
		Pumps Cooling & Sealing Back water (To ETP)	300
Total	**2681**	**Total**	**2681**

6.4 Water & Material Balance: Paper Machine-1

Input		Output	
Description	**TPD**	**Description**	**TPD**
Pulp	109	Paper Produced	**155**
Water With Pulp	2616	Paper Machine Back Water to Silo Tank (Reused)	12579
Chemicals & Additives	46	Water Evaporated From Paper Machine (Inlet Dryness: 42 %)	206
Fresh Water in Chemical Preparation	150	Moisture Carry Over with Paper (Moisture: 5 %)	8
Paper Machine Back Water	12579	Paper Machine Excess Back Water	4141
Fresh Water Used in Showers and Cooling & Sealing System	1589		
Total	**17089**	**Total**	**17089**

6.5 Water & Material Balance: Paper Machine-2

Input		Output	
Description	**TPD**	**Description**	**TPD**
Pulp	181	Paper Produced	**260**
Water With Pulp	4344	Paper Machine Back Water to Silo Tank (Reused)	21116
Chemical & Additives	79	Water Evaporated From Paper Machine (Inlet Dryness: 41 %)	374
Fresh Water in Chemical Preparation	280	Moisture Carry Over with Paper (Moisture: 5 %)	13
Paper Machine Back Water	21116	Paper Machine Excess Back Water	7037
Fresh Water Used in Showers and Cooling & Sealing System	2800		
Total	**28800**	**Total**	**28800**

6.6 Water Balance: ClO_2 Plant

Input		Output	
Description	**TPD**	**Description**	**TPD**
Sodium Chlorate	9.57	ClO_2	6.0
H_2SO_4	4.71	Water carryover with ClO_2 Solution	646
Other Chemicals	1.08	Na_2SO_4	5.58
Fresh Water	642		
Total	**657.58**	**Total**	**657.58**

6.7 Water Balance: Energy (Cogeneration Power Boiler 2 & 3)

Input		Output	
Description	**m^3/day**	**Description**	**m^3/day**
Raw Water/Fresh Water	3900	RO/DM Water	1585
Fresh Water as Hot Water from Sulphuric Acid Plant (SAP)	240	RO/DM Plant Rejects	730
		Boiler Blow Down	95
		Cooling Tower Evaporation	1280
		Cooling Tower Blow Down	250
		Pumps Gland Cooling	50
		Ash Cooling System	100
		Ash Compressor Cooling	50
Total	**4140**	**Total**	**4140**

From the Water Balance & Material Balance study carried out , the estimated fresh water consumption in various process operations is summarized in **Table 6.1.**

Table 6.1 Total Fresh Water Consumption-Section Wise

Sr. No.	Section	Water Consumption, m^3/day
1.	Wet Washing-SFL	632
2.	Pulp Washing-SFL	1778
3.	Pulp Bleaching- SFL	1820
4.	Pulp Washing- WFL	808
5.	Pulp Bleaching-WFL	1010
6.	Paper Machine #1	1739
7.	Paper Machine#2	3080
8.	Chemical Recovery 1 & 2	1450
9.	ClO_2 Plant	642
10.	Cogeneration Power Boilers 2 & 3	4140
11.	ETP & Fire Hydrant	300
12.	Water Losses (Uncountable)	750
	Total Fresh Water Consumption, m^3/day	**18149**

Chapter 7

OBSERVATIONS

Chapter 7
OBSERVATIONS

Based on the information and data provided by Trident Ltd - PCD , field visit to the plant, results of the ETP Performance Evaluation, Ambient Air Monitoring , Stack Emission Monitoring , Ground Water Monitoring, Material and Water Balance Study, following observations were made regarding Technological & Environmental Status of Trident Limited - PCD.

7.1 General Observations

- The Trident Ltd – PCD is an agro based integrated pulp and paper plant producing Writing & Printing grade of paper using mixed furnish of agro residue (Wheat Straw) & Hard Wood .

- The fiber furnish varies depending on end product specifications. In general the plant uses agro residues and wood pulp in ratio of **75% & 25 % respectively.**

- In the 10 km area around the plant there are no reported River Bodies, Hills / Valleys, Archaeological Sites, Ecologically Sensitive Sites (National Park , Sanctuary , Bio reserves , Reserved Forests etc.) , Tourist or Religious Towns or Sites etc.

- The land surrounding the plant are mostly agricultural land. The nearest village, Dhaula, is about 5 km from the plant .

- The plant has 1132 direct employees and 358 contractual persons.

- The plant uses agro residues (wheat straw) and hard woods (Eucalyptus, Popular, Bamboo, Veneer Chips).

- The existing installed production capacity of the plant is **415 tpd** of writing and printing paper and the bleached pulp production is around **225 tpd (agro residue pulp)** and **65 tpd (hardwood pulp).**

- The major comparative features of both fiberline are as under:

Particulars	Straw Fiber Line (SFL)	Wood Fiber Line (WFL)
Cooking	Continuous Digester	Batch Digester
Pulp Washing	Presses & Vacuum Washers	Vacuum Washers
Pulp Bleaching	DoEopD1	DoEopD1
Specific Fresh Water Consumption , m^3 / t pulp	16-18	30-32
Effluent Generation , m^3 / t pulp	13-15	26-28

- The use of agro residues and wood (sourced from local farmers) for paper making is sustainable as it addresses the issue of burning of agro waste by the farmers there by leading to air pollution as well as helps in providing revenue generation for the farmers and thus improving the rural economy.

7.2 Adoption of State of Art Technologies

- The plant is pioneer among agro based pulp & paper mills in adopting some state of art energy efficient and environment friendly technologies like :

– **Continuous Digester** for raw material pulping which is energy efficient and provides improved pulp quality ,

– **Oxygen delignification** which helps in reducing the kappa no by around 40% thus reducing consumption of chemicals in bleaching process and consequently results in decreased pollution load.

- **Elemental Chlorine Free Bleaching (DoEopD1)** which generates significantly less pollution load compared to conventional chlorine based bleaching sequence.

- The plant has installed **poly disc filter** for fiber recovery from paper machine back water (fiber recovery rate >90%) and reuses /recycles back water back into paper machine. This helps in reduction in significant amount of fresh water consumption in paper making and consequently less pollution load (Total Suspended Solids) to ETP .

- The plant has upgraded its Packaging and Converting Section with latest equipment including **auto reel cutting, auto reel wrapping and auto sheeting** to get perfect finish product.

- **Upward Anaerobic Sludge Blanket (UASB) Technology** for treatment of high pollution load stream generated from wet washing of agro residues has been installed.The major advantage of the technology is reduction in pollution load along with cogeneration of biogas. The anaerobic treatment can be considered as a pretreatment of high pollution load raw material washing stream which is post treated through conventional ETP based on activated sludge process along with other effluent streams.

- **Bellmer Sludge Screw Press** is a state of art sludge dewatering system to achieve sludge dryness up to 50 - 60 % which helps in improved handling as well as disposal including burning in boiler .

- The plant has **Conventional Chemical Recovery Systems including multi effect evaporators, two recovery boilers** for incineration of black liquor along with **two recausticisation plants** and a **lime kiln** for calcination of lime sludge.

- The Chemical recovery **Evaporators** are designed for high solids (50-69 %) with higher steam economy (6.0 -6.5).

- The plant has ESP installed at all the stationary sources for control of particulate matter except for **Sulphuric Acid Plant** (which is equipped with **wet scrubber** for control of SO_2 emissions) These include :
  - **Boiler FBC Capacity 12TPH,**
  - **Boiler FBC 50 TPH,**
  - **Cogeneration Boiler (FBC) 130 TPH,**
  - **Cogeneration Boiler (FBC) 130TPH,**
  - **Recovery Boiler 20TPH,**
  - **Recovery Boiler 50TPH**
  - **Lime Kiln 50TPH**

7.3 Fresh Water Consumption

- The plant sources its water from **Uppli canal**. The canal water is collected in the **reservoir** of storage capacity **420000 KL (Fig 7.1)** and then sent for treatment. The reservoir's storage capacity is adequate to meet the fresh water requirement of the mill during shut down period of the Uppli Canal. The daily canal water drawl record for the period December **2020 – May 2021** is indicated in **Annexure VII (a), (b), (c), (d), (e)** and **(f).**



Fig 7.1 Reservoir at Trident Ltd

- From the raw water reservoir, water is pumped to the plant with the help of **Vertical Turbine pumps**, from where it flows by gravity to water storage tank in water treatment plant for removal of silt/dust present in canal water.
- To address the issue of frequent changes in pressure of paper mill water which lead to water and power loss during low water demand , the mill has synchronized the pressure with VFD using pressure transmitter **(Fig 7.2 – 7.4)** which has resulted in reduction of power consumption in pumping by 3% and water consumption by 5%.



Fig 7.2 PT Installed at clarified water header



Fig 7.3 Pump RPM variation in auto mode



Fig 7.4 Controller installed for communication from PT to VFD

- As informed the use of bore well is nil or minimal after construction of reservoir even during the period when the canal water is shut.

- Flow meter have been installed on , distribution line from reservoir as well as bore well to monitor the fresh water consumption. Log book for fresh water consumption in various process operations is maintained.

- The mill has 7 tube wells (**Tube well No 6 , 7, 8, 9 ,10 ,11,12)** but as per the records for **December 2020- May 2021 (Annexure – VIII (a) , (b) (c), (d), (e) and (f)** <u>no water abstraction is made from these tube wells.</u>

- With adoption of cleaner production technologies and increased reuse / recycling of back water the plant I has been able to reduce fresh water consumption **from 60 m^3 / t paper** in 2013 to **46.8 m^3 / t paper** in 2020 i.e. a reduction of about 22% . The water consumption trends during last seven years (2013- 2020) as per data provided by the mill is indicated in **Fig 7.5**

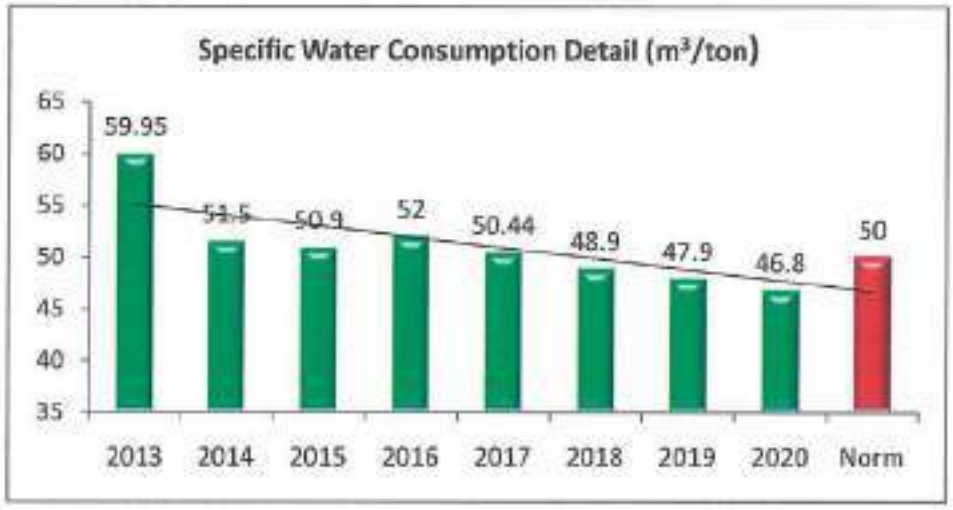


Fig 7.5 Fresh Water Consumption Trends at Trident Ltd (2018 -2020)

- The status of water consumption with respect to other contemporary agro based pulp and paper mills producing writing and printing grade of paper is indicated in **Table 7.1.**

Table 7.1 Comparative Fresh Water Consumption of Various Agro Based Paper Mills Producing Writing & Printing Grade of Paper

Name of the Mill	Fresh Water Consumption, m^3 / t paper
Trident Ltd – PCD , Barnala	47
Other Similar Category Mills	44 - 50

- As indicated the fresh water consumption of the plant is relatively in similar range as compared to contemporary other agro based mills producing writing and printing grade of paper and is well within the norms stipulated under Charter for Water Recycling & Pollution Prevention.

- However, the plant has still a scope to reduce fresh water consumption by further **3 - 4 m^3 / t paper** and it may explore areas for the same.

- Based on the data provided by the plant the material and water balance has been carried out which justifies the fresh water consumption of the mill. Water balance estimation is an important tool to assess the current status of water consumption of the plant.
- The mill has adopted certain water conservation measures namely :

– **Automation of water treatment plant for optimum water consumption in various process operations.**

– **Installation of flow meter in various distribution pipe lines as well as secondary clarifier outlet.**

– **Installation of Wet Wash Clarifier to reuse the clarified wet washings to maximum extent.**

– **Carrying out of straw fiberline operations at high consistency (less water consumption)**

- **Adoption of twin roll press for reduced water consumption in pulp washing.**
- **Adoption of poly disc filter for reuse / recycling of paper machine back water into paper machine.**
- **Optimisation of shower nozzle diameter on paper machine.**
- **Utilisation of black liquor secondary condensate from chemical recovery in raw material washing in SFL and lime mud washing.**
- **Utilisation of treated effluent for irrigation / land application.**

- As indicated in **Table 7.2**, and **Fig 7.6** in last one year **(2020-2021)** The plant has implemented additional measures for water conservation durinf 2020-21 which has further reduced the fresh water consumption . The measures taken are detailed in **Table 7.2** and the fresh water consumption over the last 3 years is depicted in **Fig 7.6** resulted in reduction in fresh water consumption.

Table 7.2 Water Conservation Measures Trident Ltd (2020-21)

S. No.	Water Conservation Measures	Impact on Fresh water Consumption
1	Reuse of sealing water in wet wash in SFL	Reduction in fresh water consumption from 17.98 m^3/ t of bleached pulp to 16.18m^3/t of bleached pulp in SFL Total Saving : 400 m^3 /day
2	Reduction of number of water showers in press section	
3	Use of Treated Effluent for preparation of Lime Slurry at ETP	Total Saving : 50 m^3 /day
4	Reuse of sealing water for bleaching, digester and washing area in WFL	Reduction in fresh water consumption from 7.6 m^3/ t of bleached pulp to 7.2 m^3/t of bleached pulp in WFL Total Saving : 50 m^3 /day
5	Replacement of RO Membranes in Power House	Total Saving : 270 m^3 /day
6	Increase in Cycle of Concentration (CoC) based upon hardness values.	Reduction in fresh water consumption by 75 m^3 /day in cooling tower of cogeneration plant
	Total Fresh Water Saving	**845 m^3 / day**

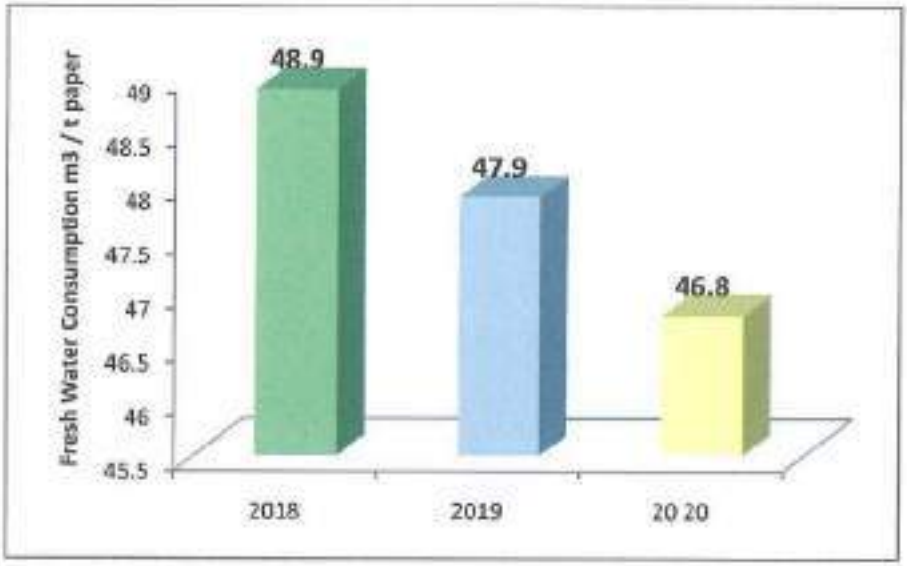


Fig 7.6 Fresh water Consumption in Last 3 years

7.4 Effluent Treatment System

- The plant and its ETP were operational at the time of all the three visits
- As per data and records provided by the plant , the average waste water discharge is around **15300 m^3 / day (37 m^3 / t paper)**
- The plant has a full -fledged Effluent Treatment Plant comprising of **Biomethanation Plant & Activated Sludge Process** to treat the plant effluent.
- The **biomethanation plant** is based on **UASB technology** for treatment of high pollution load stream of raw material washings. The treatment of raw material washing through biomethanation plant helps in reduction of the pollution load being treated through existing ETP thus further facilitate in improving the performance of existing ETP along with cogeneration of biogas which is used as fuel in boiler.

- The anaerobically treated high pollution load stream is further treated along with low pollution load stream through conventional ETP based on activated sludge process.

- The mill has sufficient aeration facility comprising of **Liquid Oxygen. Mechanical Aerators (3) and Floating Aerators (1)** in **Aeration Tank-1** and **Triton Aerators (5)** in **Aeration Tank 2.**

- **Real Time Online Continuous Environmental Monitoring System (OCEMS)** and **flow meter** at the discharge point is available and was found to be operational at the time of the visit .

- **MLSS (2900 - 4000 mg/l)** and **DO (1.5 -2.0 mg/l)** has been found to be adequate in the aeration tank during the visits.

- The performance of **biomethanation plant** with respect to pollution parameters have been evaluated and is summarised as under :

– The performance of DAF as indicated in **Fig 7.7** appears to be satisfactory in context of **over 80% reduction in TSS.**

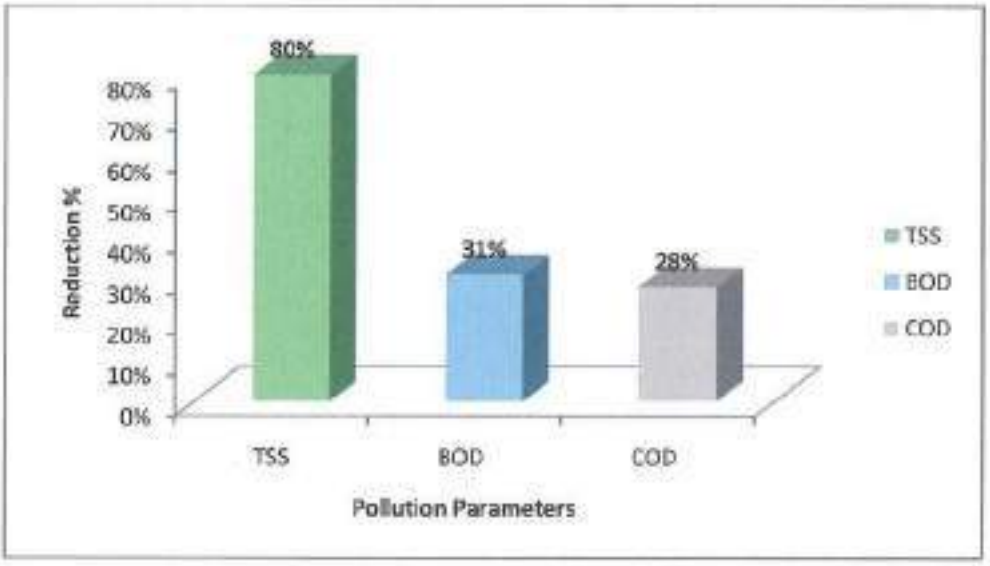


Fig 7.7 Performance of Dissolved Air Floatation

- The performance of UASB reactor w.r.t. reduction in COD & BOD is indicated in **Fig 7.8**

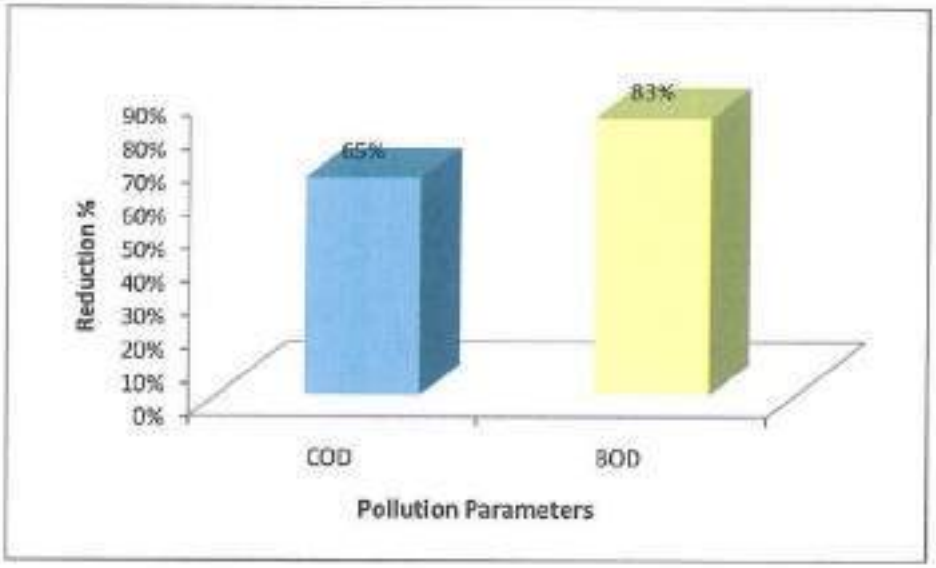


Fig 7.8 COD & BOD Reduction in UASB reactor

- The plant is not able to utilise the biogas generated as the gas collection and distribution system has corroded developing leakages.The bioreactor needs to be retrofitted and upgraded fior optimal utilisation of biogas generated.

- However the level of TSS in DAF outlet is > 500 mg/l which has scope to be reduced further to improve performance of biomethanation plant .

- The overall performance of biomethnataion plant with respect to pollution reduction appear to be satisfactory with TSS , COD and BOD reduction of 80 %, 75% and 88 % respectively. **(Fig 7.9)**

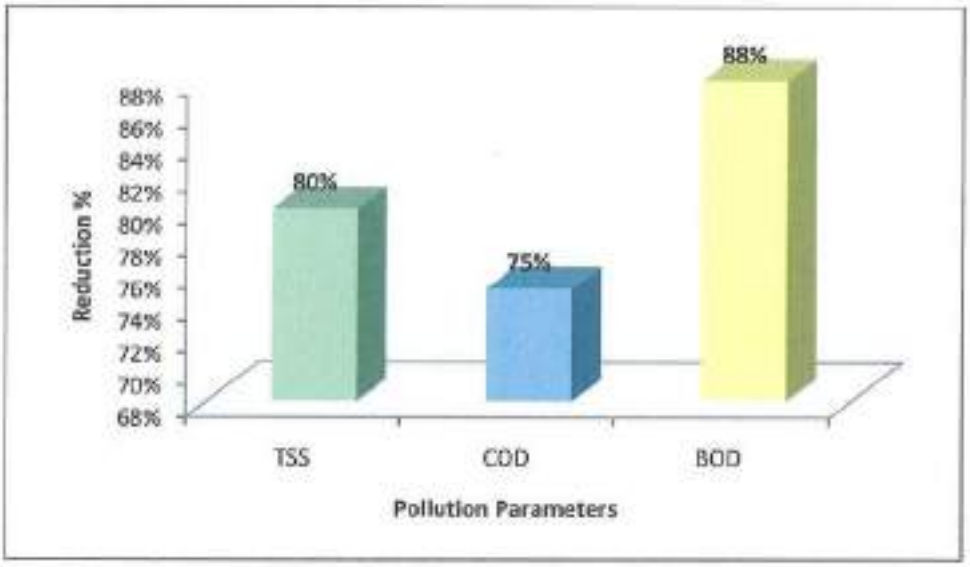


Fig 7.9 Overall Performance of UASB Reactor

- The UASB reactor facilitates reduction in high pollution load stream of wheat straw washings and is post treated with other low pollution load streams through conventional ETP.
- The performance of ETP based on ASP with respect to pollution load reduction has been evaluated and summarised as under:

– The performance of **Primary Clarifier I & II** is satisfactory in terms of reduction in TSS **(Fig 7. 10)**

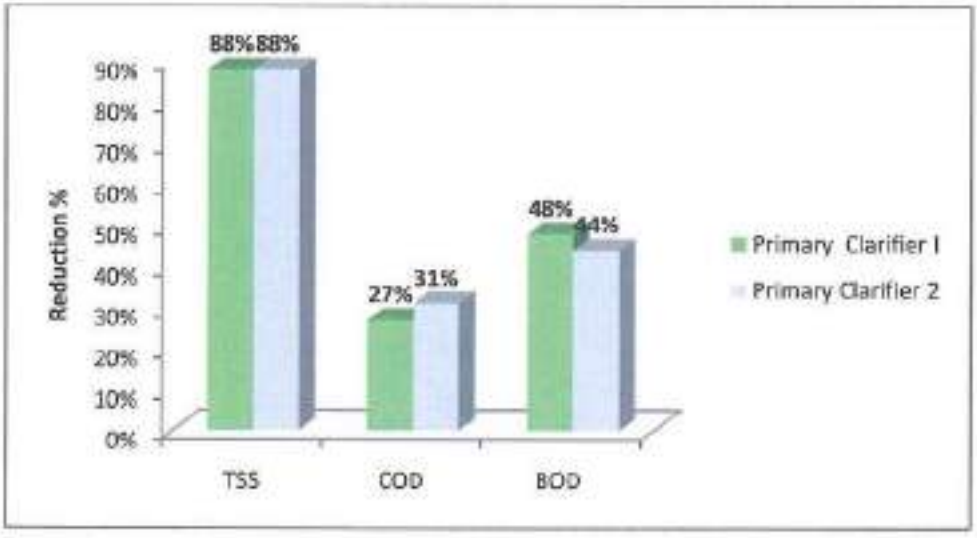


Fig 7.10 Performance of Primary Clarifier 1 & 2

- Post Clarification the Effluent is subjected to **aeration** followed by Secondary **Clarification**. The aeration tank is provided with exhaustive aeration as indicated in **Table 7.3.**

Table 7.3 Aeration Provided in Aeration Tank

1	**Aeration Tank 1**	- Liquid Oxygen – 250 Kg/hr - Mechanical Aerators (3) in 26 KW each - Floating Aerators (1) 18 KW
2	**Aeration Tank 2**	- Surface Aerator (Triton 2.0) (5), 37 KW each with air blower of 7.5 KW and air flow of 950 m^3/ hr each

- The performance of Secondary Treatment (Aeration Tank + secondary Clarifier) appears to be satisfactory in terms of reduction in COD & BOD **(Fig 7.11).**

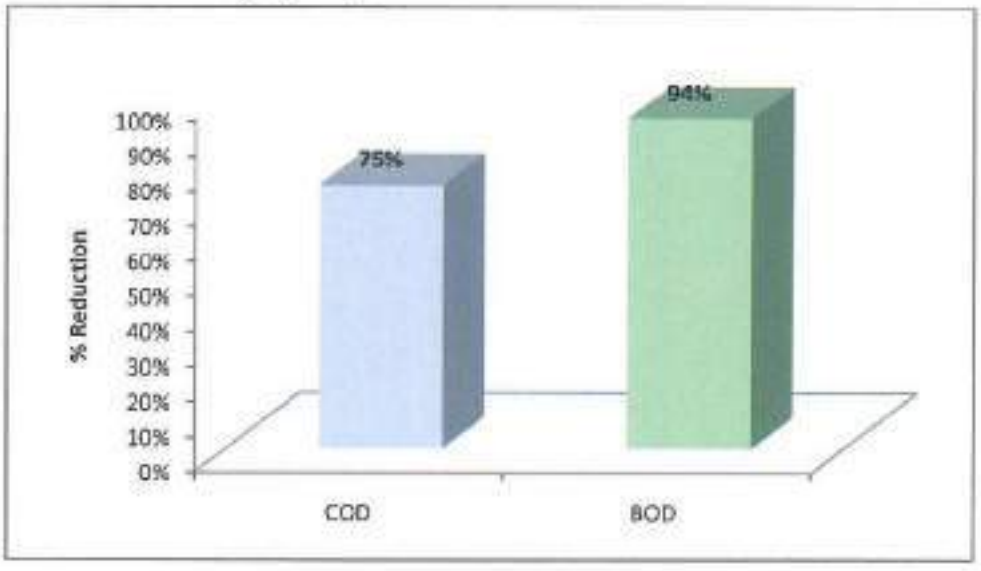


Fig 7.11 Performance of Aeration Tank & Secondary Clarifier

- The overall performance of ETP is indicated in **Fig 7.12**

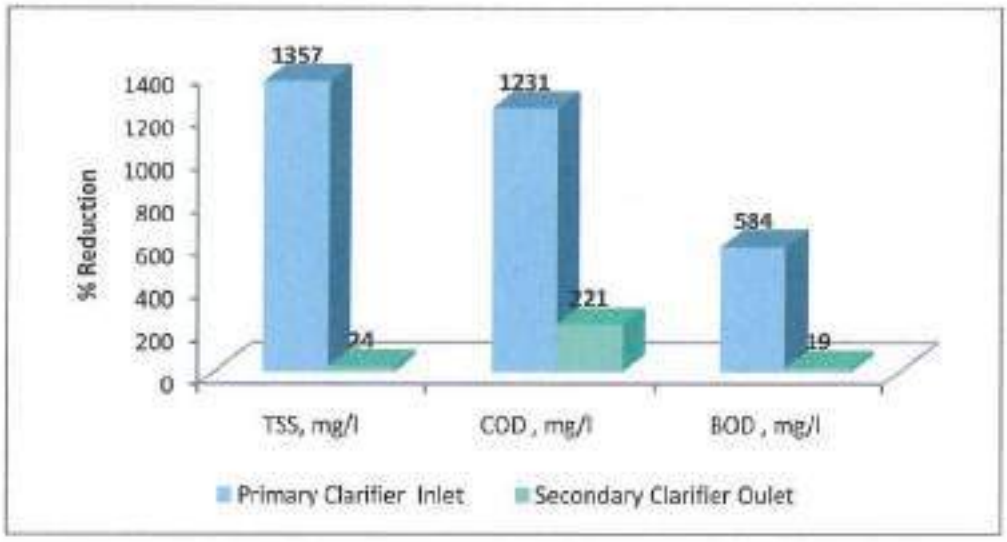


Fig 7.12 Overall Performance of Existing ETP at Trident Ltd

- As indicated in **Fig 7.12** around 98 % reduction in TSS, 82% reduction in COD and 97% reduction in BOD has been found in the study.

- As indicated in **Fig 7.12** existing ETP is adequate to achieve the existing discharge norms **(Table 7.4)**

Table 7.4 Trident Secondary Clarifier Outlet v/s Discharge Norms

Parameters	Secondary Clarifier Outlet	Discharge Norms
pH	7.62	6.5-8.5
TSS , mg/ l	24	50
TDS, mg/l	1656	-
COD mg/l	221	350
BOD , mg.l	19	30
Color PCU	815	-
AOX, mg/l	6.7 (0.25 kg/ t paper)	<1.0 kg/ t paper

- The quality of treated effluent samples from Secondary Clarifier , effluent used for Irrigation , Outlet to Drain and Outfall to drain was also evaluated to check any discrepancy or bypass , the results are summarised in **Table 7.5.**

Table 7.5 Comparative Characteristics of Secondary Overflow / Treated Effluent Used for Irrigation / Outlet to Drain / Outfall into Drain

S. No.	Parameters	Secondary Clarifier Overflow	Treated Effluent Used for Irrigation	Outlet to Drain	Outfall to Drain
1.	pH	7.62	7.59	7.63	7.61
2.	TSS, mg/l	24	18	21	25.3
3.	TDS, mg/l	1656	1679	1662	1677
4.	COD, mg/l	221	223	216	219
5.	BOD, mg/l	19	19	21	19
6.	Color (PCU)	815	823	802	805

- The ETP effluent Inlet records for **December 2020- May 2021** are annexed as **Annexure – IX (a), (b) (c), (d), (e) and (f).**
- Treated wastewater is being used for green cover and irrigation applications in or outside plant area also .
- The volume of treated effluent used for irrigation varies as per requirement.
- As per records of the plant for the period of **December 2020 – May 2021**, the total treated effluent generated **(Annexure IX (a) , (b) , (c) , (d), (e)** and **(f)**) around **26.51%, 27.05%, 34.85%** treated effluent is discharged to drain while the rest is used for irrigation **(Annexure X (a), (b) , (c) , (d), (e)** and **(f)**)

- The Upstream and Downstream results of Dhaula Drain collected during the three samplings are indicated in **Table 7.6** and **Table 7.7.** The comparative average values are summarised in **Table 7.8**

Table 7.6 Characteristics of Upstream Effluent Sample of Dhanaula Drain

S. No.	Parameters	1st Sampling 02.03.2021	2nd Sampling 15.03.2021	3rd Sampling 10.04.2021	Average Value
1	pH	7.27	7.62	7.09	**7.33**
2	TSS, mg/l	158	258	97	**171**
3	TDS, mg/l	1512	1711	1379	**1534**
4	COD, mg/l	203	238	184	**208**
5	BOD, mg/l	126	137	108	**124**
6	Colour, PCU	160	170	150	**160**
7	AOX, mg/l	3.21	2.46	1.85	**2.51**
8	SAR	1.17	1.90	2.03	**1.7**

Table 7.7 Characteristics of Downstream Effluent Sample of Dhanaula Drain

S. No.	Parameters	1st Sampling 02.03.2021	2nd Sampling 15.03.2021	3rd Sampling 10.04.2021	Average Value
1	pH	7.19	7.27	7.50	**7.32**
2	TSS, mg/l	171	244	123	**179**
3	TDS, mg/l	1239	1544	1156	**1313**
4	COD, mg/l	393	355	244	**331**
5	BOD, mg/l	114	95	87	**99**
6	Colour, PCU	230	220	190	**213**
7	AOX, mg/l	3.46	2.73	2.65	**2.94**
8	SAR	3.39	3.65	4.12	**3.72**

Table 7.8 Average Characteristics Upstream & Downstream Effluent Sample

S. No.	Parameters	Upstream	Downstream
1	pH	7.33	7.32
2	TSS, mg/l	171	179
3	TDS, mg/l	1534	1313
4	COD, mg/l	208	331
5	BOD, mg/l	124	99
6	Colour, PCU	160	213
7	AOX, mg/l	2.51	2.94
8	SAR	1.7	3.72

- Sodium Absorption Ratio (SAR), a critical water quality parameter for evaluating suitability for irrigation is well below 10 in treated effluent used for irrigation **(Table 7.5)** as well as Upstream & Downstream **(Table 7.8)** indicating its suitability for irrigation .

- Into the Dhanaula drain the treated waste water from a near by **pharmaceutical unit - IOCL Pharmaceuticals** located in upstream as well as the untreated municipal sewage from nearby villages is also discharged.

- As per the plant and Pollution Control Board the entire treated wastewater discharged into drain is utilized by local farmers for irrigation needs. The SAR value of downstream indicates its suitability for irrigation.

- The plant is advised to regularly monitor the upstream and downstream quality of the drain.

- The plant also needs to monitor the impact of utilization of treated wastewater for irrigation on ground water and soil quality periodically.

7.5 Solid Waste Generation & Management

- The quantity of major solid waste generated by the plant and method of disposal adopted is summarised in **Table 7.9 :**

Table 7.9 Solid Waste Generated in Trident Ltd.

S.No.	Source	Quantity tpd * (Approx)	Method of Disposal
1	Straw dry dust	20	Used as Fuel in Boiler
2	Straw wet dust	60	Used as Fuel in Boiler
3	Wood saw dust	5	Used as Fuel in Boiler
4	Primary Clarifier Sludge	15	Sold To Authorized Board Mill
5	Wet wash Sludge & Secondary Sludge	15	Used as Fuel in Boiler
6	Lime Mud	145	Incineration in Rotary Lime Kiln to recover quick lime
7	Fly Ash	220	Sold to Cement Industry

**BD basis*

- The Primary sludge from ETP is dewatered through belt press and sold to board manufacturers

- The plant has made contractual agreements with board manufacturers **Annexure XI (a) , (b) , (c) , (d) and (e)** for disposal of ETP sludge (dewatered through belt press)

- The secondary sludge along with wet washing DAF sludge is dewatered through high consistency Bellmer press and is burnt in the boiler

- The quantity of bellmer press sludge burnt in boiler during December 2020- May 2021 is annexed as **Annexure XII**

M.P.C. Enclosure

- The characteristics of dewatered sludge is indicated in **Table 7.10**

Table 7.10 Characteristics of ETP sludge

S.No	Parameters	Primary sludge	Bellmer Press Sludge (secondary sludge along with wet washing DAF sludge)
1	Moisture , %	5.0	5. 2
2	Organic %*	69	61
3.	Inorganic %*	31	39
4.	AOX , mg/ kg*	187	81

** OD basis*

- The mill is advised to maintain log books of quantity of ETP sludge sold. The mill is maintaining the record of this sludge in **Form 3** and also sharing the record to PPCB through **Form 4** on annual basis.

- The Lime sludge generated during causticisation of green liquor is incinerated in lime kiln. The regenerated lime is again used for causticisation. The plant has installed one lime kiln of 140 tpd capacity based on furnace oil as a fuel.

- The log book indicating quantity of lime sludge generated and incinerated in lime during December 2020 – May 2021 is indicated in **Annexure XIII.**

- Around 220 tpd flyash is generated in the mill from power boilers.

- The mill has an MoU up to 2022 with Ultra Tech Cement for utilisation of flyash for cement making and the details of the ash being lifted is indicated in **Annexure XIV.**

7.6 Ground Water Quality

- The ground water samples were collected from three sampling sites **namely New Sidhu Fathehgard Chanan** (around a distance of 1500 Meters from mill premises) , **Gobind Haveli, Mansa Road, Dhaula and Trident Complex Tube well 1** (around a distance of 100 m from mill premises) . The results are indicated in **Table 5.3.**

- However as per advice of the Joint Committee during the meeting held on 9.9.2021 at PPCB , Patiala a fresh set of ground water samples from same sources were analysed the results of which are indicated in are given in **Table 7.11** :

Table 7.11 Retesting of Ground Water Quality of Trident Ltd.

S. No.	Parameters	New Sidhu Fathehgard Chanan	Gobind Haveli, Mansa Road, Dhaula	Trident Complex, (Tube Well-1)	Requirement (Acceptable Limit) IS 10500: 2012
1.	pH	7.7	7.9	7.7	6.5-8.5
2.	TSS, mg/l	Nil	Nil	Nil	--
3.	TDS, mg/l	646	665	759	500
4.	Chloride (as Cl), mg/l	178	173	203	250
5.	Sulphate (as SO_4), mg/l	64	88	94	200
6.	Sulphide (as H_2S), mg/l	Nil	Nil	Nil	0.05
7.	Ammonia as (a total ammonia-N) mg/l	0.06	0.10	0.21	0.5
8.	Total Hardness (as $CaCO_3$), mg/l	262	252	291	200
9.	Sodium Absorption Ratio (SAR)	3.2	3.0	3.8	--

- As indicated the TDS level seems to be higher than the prescribed norms. The rest ground water parameters are within the prescribed norms .

- Within 10 km radius of the plant site no major industrial pollutant source has been observed, **except a pharmaceutical unit IOCL Pharmaceuticals, agriculture area runoff and domestic wastewater /sewage** . Constituent like hardness which is present more than the desirable limit, is a common

constituent which is naturally present in the groundwater in the study area by the contribution of geological formation.

7.7 Stack Emission Monitoring

- The plant has implemented various air quality management programs and the stack emission test reports confirm that emissionsfrom stacks comply with stipulated standards.

- Electrostatic Precipitators (ESP) have been installed for control of Particulate Matter (PM) emissions from Power boilers, chemical recovery boilers and lime kiln.

- Monitoring of emissions from stacks of Cogeneration boiler 1& 2, Chemical recovery Boiler 1 & Chemical Boiler 2 indicate Particulate Matter emissions well below 150 mg/Nm^3 as against the stipulated standards of 150 mg/Nm^3 **(Fig 7.14 -7.16)**

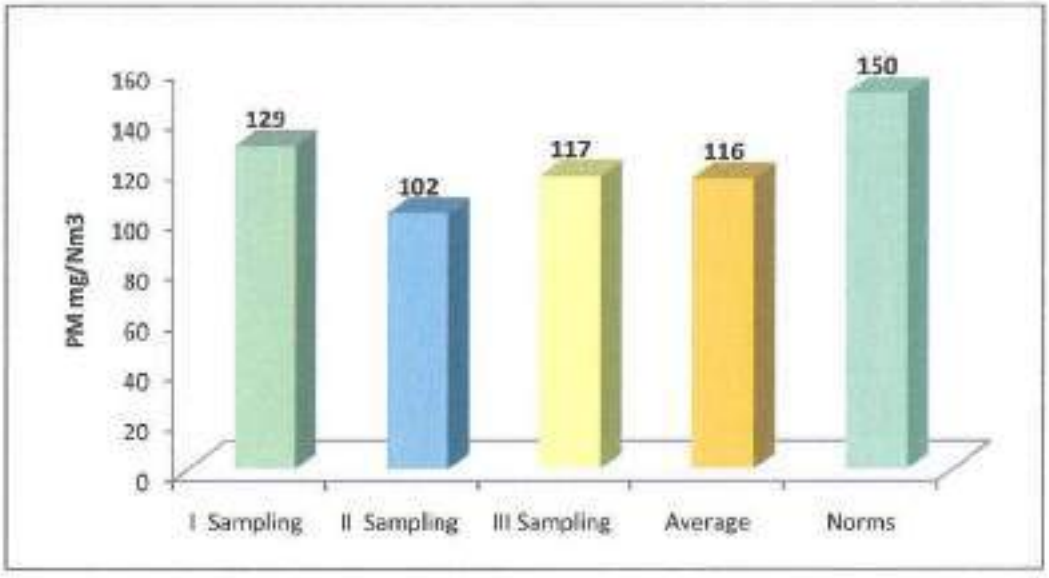


Fig 7.13 PM Emissions from Stack of Cogeneration Boiler 2 &3

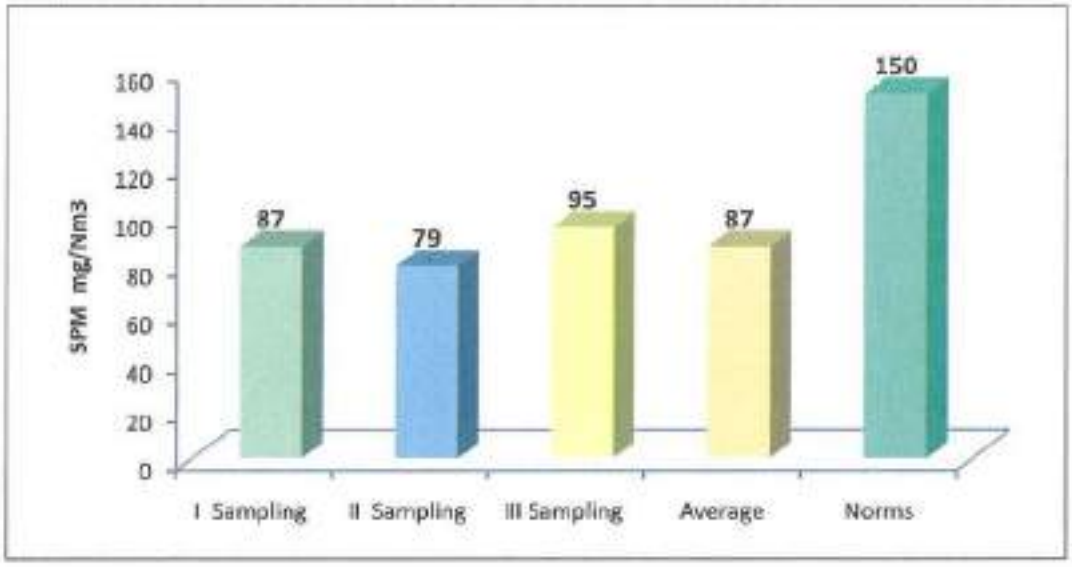


Fig 7.14 PM Emissions from Stack of Chemical Recovery Boiler 1

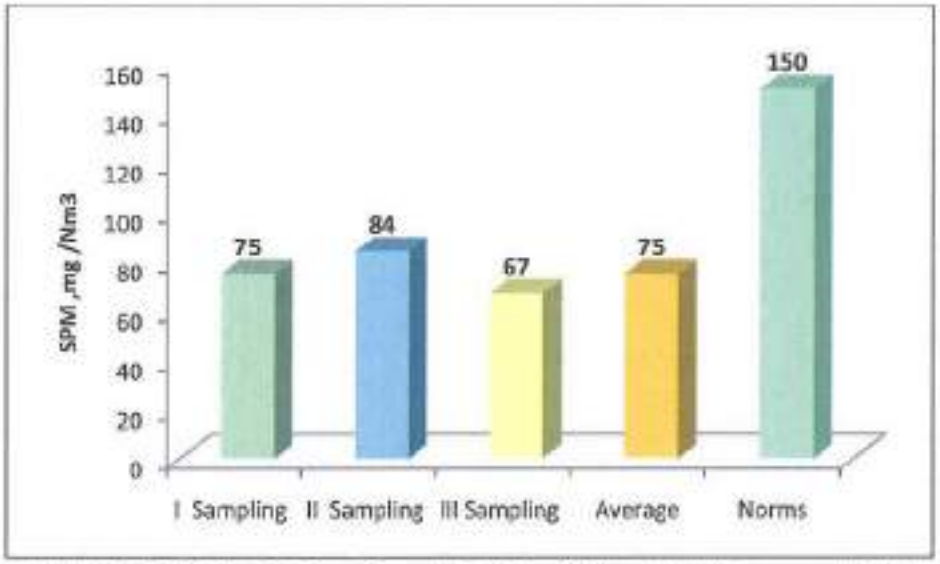


Fig 7.15 PM Emissions from Stack of Chemical Recovery Boiler 2

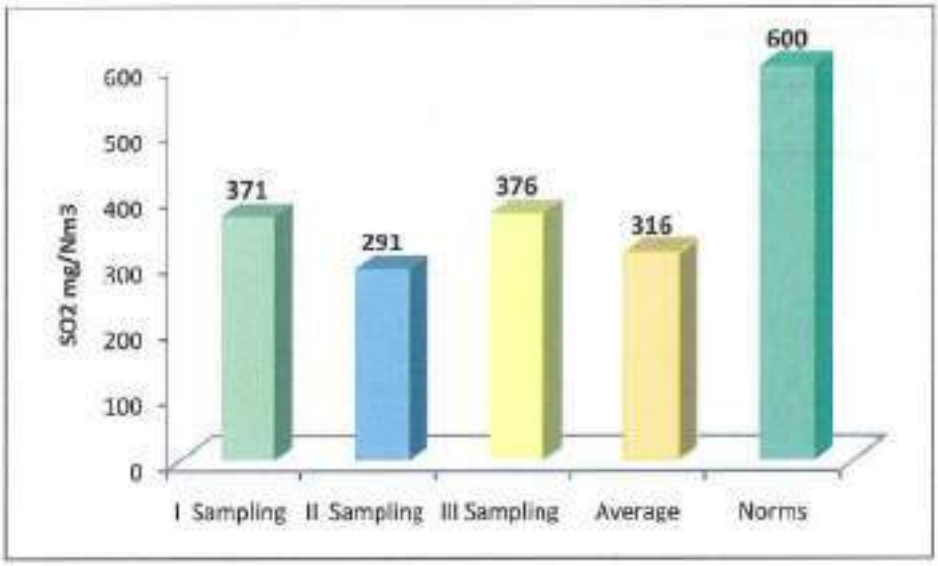


Fig 7.16 Sulphur Dioxide Emissions from SAP Plant

- Sufficient stack height has been provided as per the stack height norms stipulated by CPCB for wider dispersal of pollutants.
- Continuous online stack emission monitoring unit have been installed to monitor Particulate Matter at all the stacks
- Provision of water sprinkling system at raw material storage yard and coal yard has been provided to control dust suspension of coal yard .
- The plant is not using kraft pulping hence there is no odorous emissions (mercaptans).

7.8 Ambient Air Monitoring

- Ambient Air Quality Monitoring was carried out on different three days following standard procedures at three locations namely : , **Reservoir Area , Girls Hostel and Old Guest House.**
- $PM_{2.5}$, PM_{10} SO_2 and NO_2 were monitored at all the three locations.Sampling for PM_{10} & $PM_{2.5}$ was carried out for 24 hours while gaseous sampling was carried out for 4 hours.

- The results of the PM_{10} and $PM_{2.5}$ monitoring are indicated in **Fig 7.17 – 7.22.**

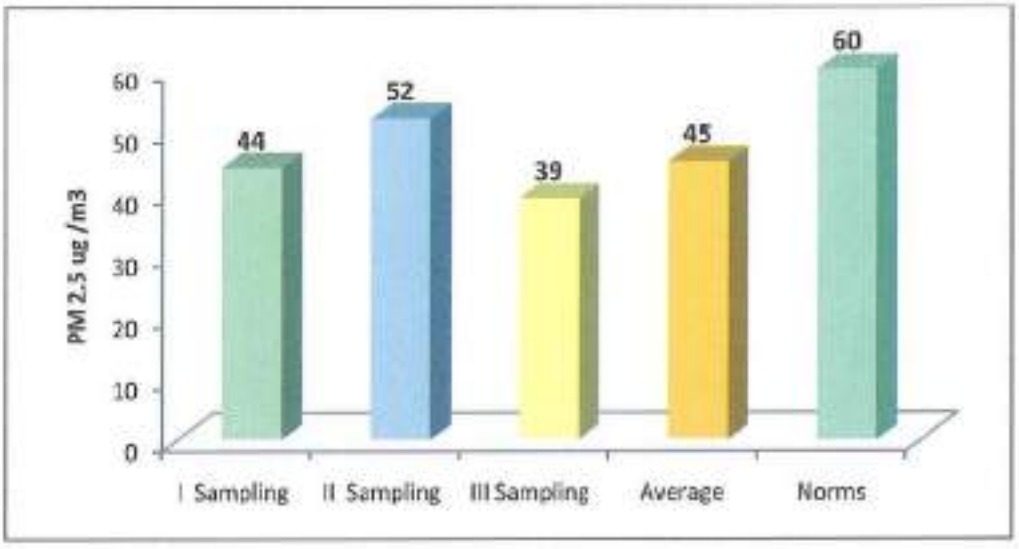


Fig 7.17 $PM_{2.5}$ Level at Reservoir

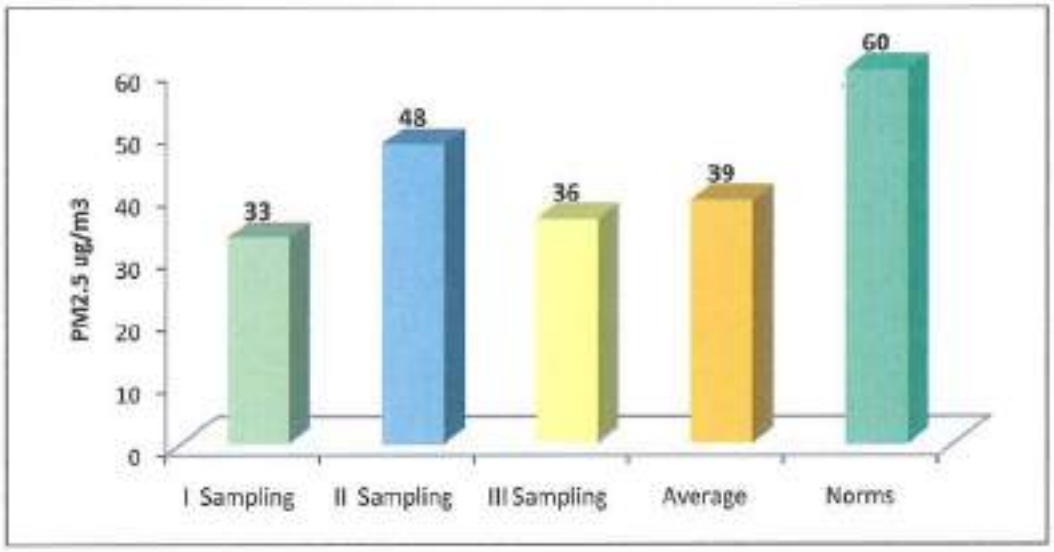


Fig 7.18 $PM_{2.5}$ Level at Girls Hostel

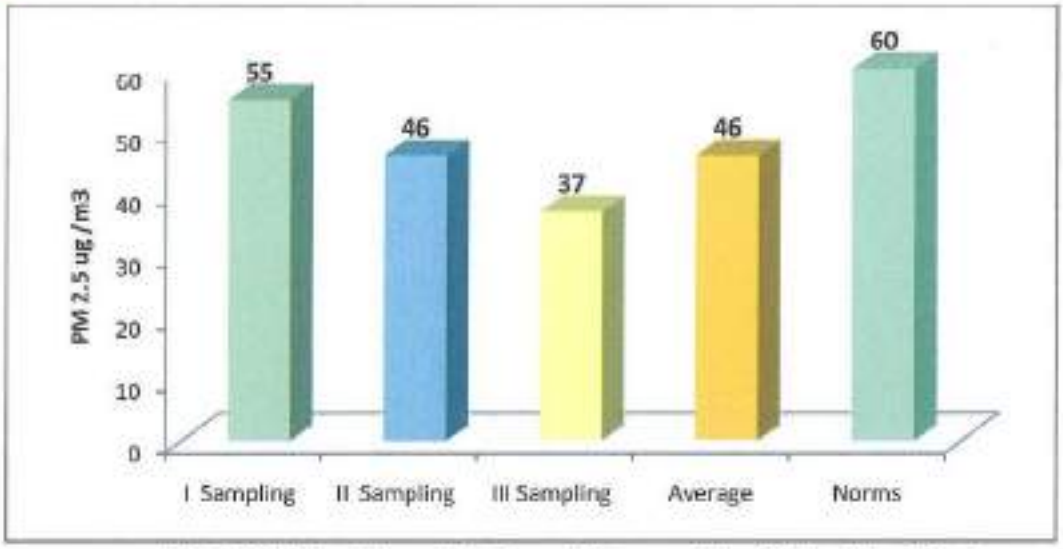


Fig 7.19 $PM_{2.5}$ Level at Guest House-Administration Block

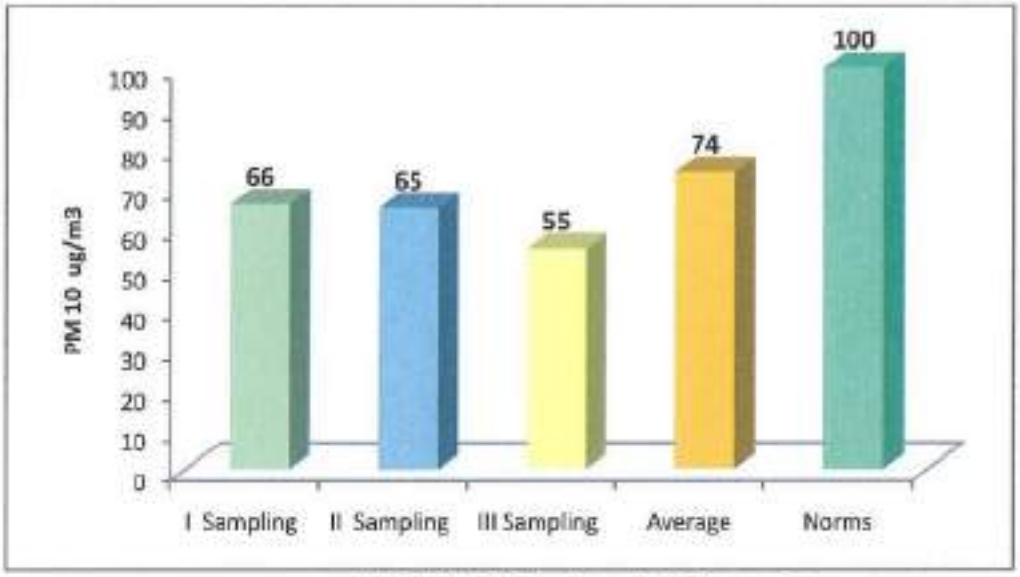


Fig 7.20 PM_{10} Level at Reservoir

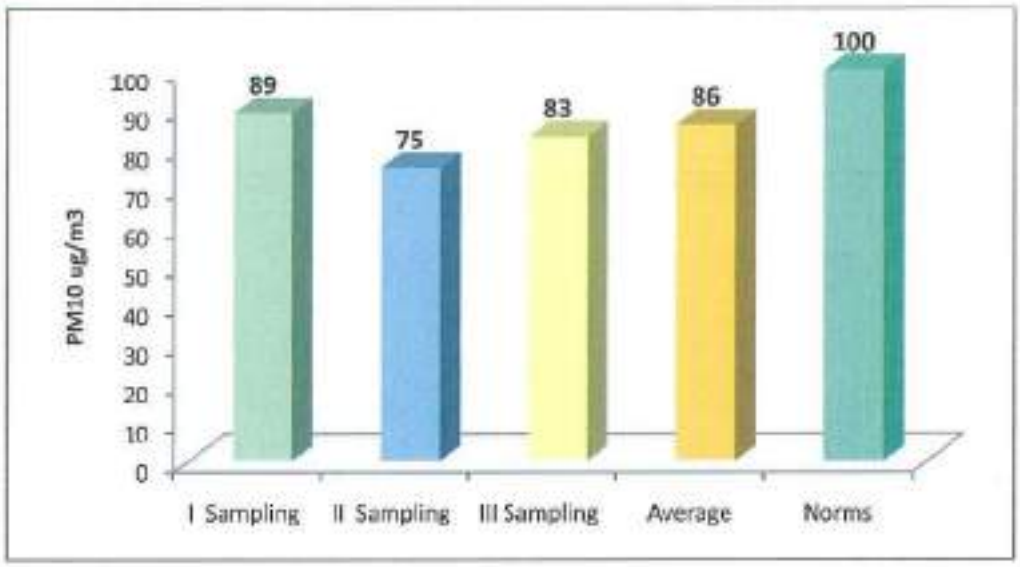


Fig 7.21 PM_{10} Level at Girls Hostel

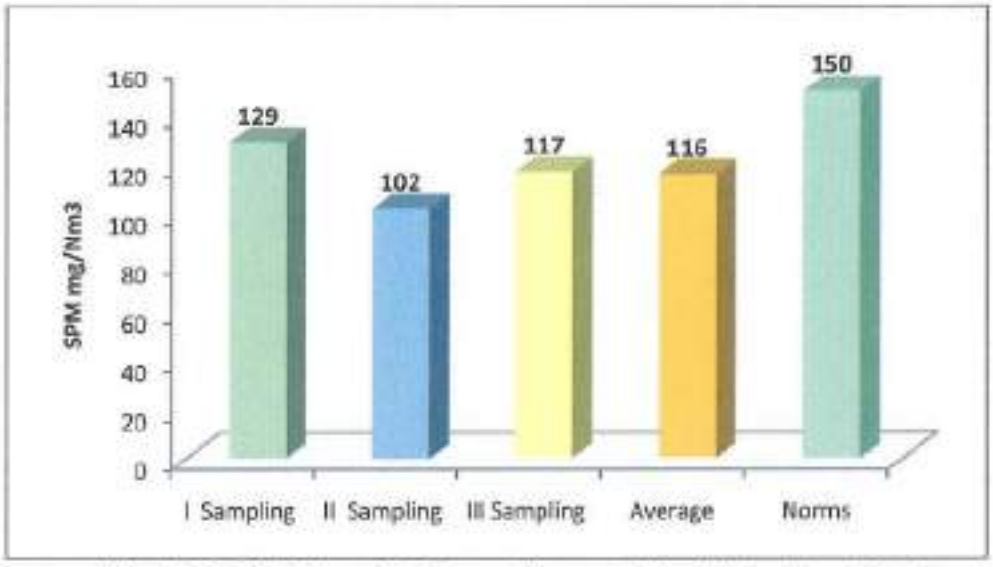


Fig 7.22 PM_{10} Level at Guest House-Administration Block

- The results indicate the monitored values are well within the stipulated norms , This may be attributed to better control of fugitive emissions from plant operations and resuspension of road dust , better management of stock piles, regular cleaning of plant roads , effective operation of boilers and their air pollution control systems and extensive green belt around the mill .

- Extensive plantation has been done under green cover development for the existing plant. Green cover has been developed and well maintained along the internal roads and mill area. The mill has made elaborate arrangement in developing green cover inside the mill.

7.9 Material & Water Balance Studies

- The material and water balance study was carried out for **Straw Fibre Line (SFL), Wood Fibre Line (WFL), Chemical Recovery System and Paper Machines** on the basis of pulp consistency maintained in different sections/processes.

- The material and water balance studies were aimed towards assessment & confirmation of reported pulp yield, paper production, total water requirement, freshwater consumption, back water usage , effluent generation etc

- The study results are in close agreement to the reported figures pulp yield, paper production, total water requirement, freshwater consumption, back water usage , effluent generation etc

7.10 Hazardous Waste Management

- The Hazardous Waste generated in the mill include Process Sludge (ETP sludge & Centricleaner Sludge) ,used Oil & HDPE Drums and Plastic Bags.

- The details of consented quantity of HW generation and disposal to authorized parties by the mill during Dec 2020 to May 2021 is indicated in **Table 7.12**

Table 7.12 Hazardous Waste Generated at Trident Ltd

S.No	Physical form with description	Chemical Form	UOM	Total Quantity	Total Quantity	Consent Limit

Table 7.12 Hazardous Waste Generated at Trident Ltd

S.No	Physical form with description	Chemical Form	UOM	Total Quantity Generated	Total Quantity Disposed	Consent Limit
1	Process sludge (32.3) (ETP Sludge + Centri- cleaner sludge)	Fibre, Sand, Fines	TPD	9.04	9.04	15 TPD
2	Liquid- Spent Oil (Cat 5.1)	Oil	Litres	1500	1400	8200 LPA
3	Solid – HDPE Drums+ Plastic bag (cat 33.1)	Drums	Nos	6719	6619	24000 Nos/Year

- The **Form 3** for maintaining record of hazardous waste generated at the mill for the period December 2020 - May 2021 is indicated in **Annexure –XV.**
- The mode of disposal of Hazardous Waste is indicated in **Table 7.13**

Table 7.13 Disposal of Hazardous Waste

Name & Address of the Consignee of package	Mode of packing of the waste for transportation	Mode of the transportation to site of disposal	Date of Transportation
Aggarwal Industries, Gori Shankar Mix Board, Hem Raj Mix Board, Shiv Shakti, Shri Ganesh Mix Board.	In Trolleys	By Vehicle	01st Dec'20 to 31st May'21
Lucky Steel Works and Mahavir Plastic	HDPE Drums	By Vehicle	01st Dec'20 to 31st May'21
Satkar Oil Company	Drums	By Vehicle	01st Dec'20 to 31st May'21

- As indicated above the used oil is stored into drums in specified restricted area and so are the HDPE drums (**Fig 7.23**)



Fig 7.23 Storage of Used Oil & HDPE Drums

7.11 Others

- The plant has well developed laboratory at ETP with trained staff and equipments for regular analysis of pH ,TSS, TDS, COD , BOD , Color , MLSS, DO etc.

- Daily records of canal water drawl, inlet to ETP, treated water discharged & used for irrigation, analysis of effluent samples at various stages of ETP are maintained.

- The plant has a well dedicated Environmental Management Cell to take care of the pollution related aspects.

- The plant appears to have sound management practices, which may help in mitigating green house gases and sequestration of carbon, expanding the plantations for improving the soil moisture conservation measures and planting species of Subabul and Casuarina contributing to the improvement of soil nutrient status of marginal lands.

7.10 Compliance of EC Conditions

The compliance of EC conditions made by the mill is summarised as under :

S. No.	Condition	Status/Remarks
1.	The gaseous emissions from various process units shall conform to the standards prescribed from time to time. The State Board may specify more stringent standards for the relevant parameters keeping in view the nature of the industry, its size and location. At no time, the emission level shall go beyond the prescribed standards. In the event of failure of any pollution control system (s) adopted by the unit, the respective unit should not be restarted until the control measures are rectified to achieve the desired efficiency. Ambient air quality should be regularly monitored and records maintained and report submitted to the Ministry/CPCB/Punjab Pollution Control Board once in six months.	The monitoring studies ESP outlet emissions of Cogeneration boiler 1& 2, Chemical recovery Boiler 1 & Chemical Boiler 2 indicate concentrations below prescribed standards of 150 mg/Nm^3 As per plant the state board also periodically carrys out stack monitoring. The latest test report from PPCB as provided by the mill is annexed as **Annexure XVI (A)** The plant has installed **Real Time Particualte Monitoring System** from Xylem-Germany on all the 3 stacks for continuous SPM data monitoring which is connected to CPCB server. Ambient Air Quality monitoring results were also found to be well within the stipulated norms during the period of study. Ambient air quality is also monitored on by the plant

		periodically through NABL accredited laboratory. Latest report of the same dated 5.7.21 is attached is **Annexure XVI (B).**
2.	The company shall adopt environmentally friendly Element Chlorine Free (ECF) pulp bleaching process. As reflected in the EIA/EMP, oxygen delignification plant, advanced new conditions continuous cooking system. Multi-fuel firing lime kiln and spill liquor recovery system shall be installed to reduce the colour of the effluent at source.	The plant is using ECF bleaching sequence for pulp bleaching
3.	The company shall install new Chemical Recovery Boiler (CRB). The new power boilers for the co-generation power plant, recovery boiler and lime kiln shall be equipped with ESP. The particulate emissions from the stacks shall not exceed 75 mg/Nm^3. The efficiency of ESP shall be 99.9%.	The plant has installed the Electro Static Precipitators (ESP) to achieve the prescribed norms by the PPCB of 150 mg/Nm^3. As per plant it has sought time from PPCB for achievement of norms till Sep 2022
4.	The effluent generation shall not exceed 21500 m3/d. The effluent shall be treated in the ETP. As per the commitment given to the Ministry, the company shall practice activated sludge process with extended aeration for the waste water treatment. The quality of the treated effluent shall conform to the prescribed standards. The treated effluent shall be used for irrigation. The quality of the treated effluent shall be measured regularly and report submitted to the Ministry and its Regional Office at Chandigarh.	As per records provided by the plant as well as study carried out the volume of effluent generated is below 21500 m^3/day & treated effluent parameters are within per prescribed norms. Effluent quality report is being submitted by the plant on monthly basis. as Monthly performance report to regional PCPB, Sangrur **(Annexure XVI C)** The plant has developed the plantation area of 165 acrs where treated effluent is being utilized for the irrigation process. The quality of treated effluent is periodically monitored by PPCB **(Annexure XVI D)**

5.	About 152 TPD of boiler ash will be generated, which shall be sold to the cement manufacturers. Lime sludge (40 TPD) from the first stage recausticising plant shall be sold to cement manufactures and from 2nd stage recausticising plant (120TPD) shall be recycled in the lime kiln.About17.03 TPD of lime grits from stackers shall be generated and sent to cement kiln. Organic sludge (24 TPD) from waste water treatment plant shall be fired in boilers.	**Not under Scope of Study** As per plant : The plant has an MoU with Ultratech Cement for disposal of Fly ash **(Annexure – XIV)** Lime Sludge is reburnt in Lime Kiln **(Annexure- XIII)** Bellmer Press Sludge is burnt in boilers.**(Annexure - XII)**
6.	As per the recommendations made in the Charter on Corporate Responsibility for Environmental Protection (CREP), the company shall undertake measures for discharge of AOX less than 1.5 kg/tone of paper within two years and 1.0 kg/ton of paper in 5 years. The waste water discharge per ton of paper shall be less than 59 m3/tone of paper.	The plant has undertaken measures like ODL / ECF bleaching) to reduce the discharge of AOX less than 1.5kg/MT of paper. The analysis of final discharge sample collected during the study also confirms that present discharge of AOX is within the prescribed norms. The waste water discharge is less than the prescribed norms of 59 m^3/MT of the paper A test report provided by the plant for AOX determination in Final discharge is also annexed as **Annexure – XVI (E)**
7	Green belt shall be raised in an area of 44 ha. to mitigate the effects of fugitive emissions all around the plant in as per the CPCB guidelines.	**Not under Scope of Study**

	The company shall procure additional area of 170 ha. for irrigation.	However as per plant submission has already developed the Green Belt to utilize the treated water onto irrigation area. The company utilizes around 70% of treated water onto irrigation within premises and remaining treated water is discharged to outside drain meeting the prescribed standards. The plant has got a detailed soil study conducted by Cholamandalam MS Risk Services Ltd to evaluate the irrigation area required for the utilization of treated water. As per the Report, area required for the irrigation should be between 110m^3 to 225m^3 per hectare per day.
8	The company shall undertake rainwater harvesting measures to recharge the ground Water.	**Not under Scope of Study** However as per plant it has installed rainwater harvesting pits to recharge ground water. Also the industry has enhanced its canal water storage capacity i.e. reservoir capacity in order to minimize ground water abstraction

	General Conditions	
S. No.	Condition	Status/Remarks
1.	The project authorities must strictly adhere to the stipulations made by Punjab Pollution Control Board and the State Government.	As per the plant submission it is committed to strictly adhere to the stipulations made by Punjab pollution Control Board and the State Government.
2.	No further expansion or modernization in the plant should be carried out without prior approval of the Ministry of Environment and Forests. In case of deviations or alterations in the project proposal from those submitted to this Ministry for clearance, a fresh reference shall be made to the Ministry to assess the adequacy of conditions imposed and to add additional environmental protection measures required, if any.	As per plant it is committed that no furthur expansion and modernization in the plant shall be carried out without prior approval of MoEF.
3.	Proper house-keeping and cleanliness must be maintained within and outside the Plant.	Good House keeping and cleanliness are being maintained within and outside the mill
4.	The overall noise level in and around the plant area should be kept well within the standards (85 dBA) by providing noise control measures including acoustic hoods, silencers, enclosures etc. on all sources of noise generation. The ambient noise levels should conform to the standards prescribed under EPA Rules, 1989 viz. 75 dBA (day time) and 70 dBA (night time)	**Not Under Scope of the Study** However as per mill the Ambient noise level testing being done after every 6 months by external NABL accredited laboratory. Report of the same is attached for the reference as **Annexure XVI (F)**
5.	Occupational health surveillance program should be undertaken as regular exercise for all the employees, specially for those engaged in handling hazardous substances. The first aid facilities in the occupational health center should be strengthened and the medical records of each employee should be maintained separately.	**Not Under Scope of the Study** However as per plant the Medical test are being carried out periodically. Report of the same is attached for the reference as **Annexure XVI (G) .**

6.	The project proponent shall also comply with all the environmental protection measures and safeguards recommended in the EIA/EMP report.	**Not Under Scope of the Study** However as per plant it has met and implemented environmental protection measures and safegaurds recommended in the EIA/EMP report.
7.	The implementation of the project vis-¯¤-vis environmental action plans shall be monitored by Ministry's Regional Office at Chandigarh/SPCB/CPCB. A six monthly compliance status report shall be submitted to monitoring agencies.	As per plant the six monthly compliance report is regularly submitted to monitoring agencies. Last report was submitted vide letter number TRIDENT/PCD/2021/25 dated 1.6.2021.**(Annexure XVI (H))**
8.	Adequate provisions for infrastructure facilities such as water supply, fuel, sanitation etc. shall be ensured for construction workers during the construction phase so as to avoid felling of trees and pollution of water and the surroundings.	**Not Under Scope of the Study** However as per plant submission adequate provisions for infrastructure facilities such as water supply, fuel, sanitation etc. will be ensured for construction workers duringthe construction phase so as to avoid felling of trees and pollution of water and the surroundings

M.P.Pollution Control Committee

9	The project proponent shall have a scheme for social upliftment in the surrounding villages with reference to contribution in road construction, education, establishment of health centers, sanitation facilities, drinking water supply, community awareness and employment to local people whenever and wherever possible both for technical and non-technical jobs.	**Not Under Scope of the Study** However as per plant submission it is committed towards the upliftment of the surrounding villages and establishments. CSR glimpse & initiatives are annexed as (**Annexure XVI (I)**)
10	A separate Environmental Management Cell equipped with full fledged laboratory facilities to carry out the various Environmental Management and Monitoring functions should be set up under the control of Senior Executive.	The plant has dedicated Environmental Management Cell equipped with its own laboratory to test effluent parameters on daily basis.(**Annexure J**)
11	The project authorities will provide adequate funds both recurring and non-recurring to implement the conditions stipulated by the Ministry of Environment and Forests as well as the State Government along with the implementation schedule for all the conditions stipulated herein. The funds so provided should not be diverted for any other purposes.	**Not Under Scope of Study** However as per plant submission it is committed that the funds provided by the Project Authorities will not be diverted for any other purposes
12	Six monthly status report on the project vis-¯¤-vis implementation of environmental measures should be submitted to this Ministry (Regional Office, Chandigarh/CPCB/SPCB.	As per plant the condition is being complied
13	The Project proponent should inform to the public that the project has been accorded Environmental Clearance by the Ministry and copies of the clearance letter are available with the State Pollution Control Board/Committee and may also be seen at Website of the Minisry of Environmet and Forest at http://www.envfor.nic.in. This should be advertised within seven days from the date of issue of the clearance letter at least in two local newspaper that are widely circulated in the region of which one shall be in the vernacular language of	As per plant the condition is being complied

	the locality concerened and a copy ofthe same should be forwarded to the Regional office.	
14	The Project Authorities should inform the Regional Office as well as the Ministry, the date of financial closure and final approval of the project by the concerned authorities and the date of commencing the land development work.	As per plant the condition is being complied

Chapter 8

CONCLUSIONS

&

RECOMMENDATIONS

Chapter 8
CONCLUSIONS & RECOMMENDATIONS

Based on the information, primary and secondary data collected from the plant, environmental monitoring studies carried out related to performance evaluation of exiting biomenthanation plant and effluent treatment plant , monitoring of ambient air quality and stack emissions, analysis of the environmental samples collected (waste water , ground water and air samples), material and water balance study, CPPRI has following conclusions and recommendations to make.

8.1 Conclusions

- **Trident Ltd – Paper & Chemical Div (PCD)**, is contributing significantly in terms of growth and development of the regional economy procuring the agro residues (wheat straw) , ecualpyptus and poplar from the local farmers as well as providing direct and indirect employment to the local people.

- With an objective to achieve environmental compliance and sustainability Trident Ltd (PCD) has adopted **various state of art cleaner technologies for improving product quality, reduction in fresh water consumption and consequently waste water discharge and pollution load** and is **utilizing maximum possible treated effluent back into the process as well as for land application, installed Electrostatic Precipitators as air pollution control devices , OCEMS at Final Discharge Outlet and ESP outlet for 24X 7 monitoring of quality of treated effluent discharged into the drain and utilized for irrigation as well as at stacks to monitor the level of particulates emitted from the boilers.**

- The plant has adopted cleaner production technologies like **continuous digester, twin roll press , oxygen delignification and chlorine dioxide**

bleaching, UASB reactor , chemical recovery system etc . These technologies have significantly contributed in reducing the environmental footprint including water footprint of the plant .

- The plant 's approach of segregation the effluent streams into high pollution load stream and low pollution load stream and treating the former through anaerobic treatment followed by post treatment through conventional aerobic treatment based on activated sludge process has significantly contributed to satisfactory performance of ETP in terms of reduction in pollution load and achieving environmental compliance.

- The plant has provided flow meters at all the major pipelines , borewell , final discharge etc which helps in monitoring and optimizing the fresh water consumption.

- Except TDS , the other parameters analysed in ground water are within specified norms .The plant is advised to regularly monitor the quality of treated effluent

- The quality of treated effluent has been found in compliance with the prescribed discharge norms.

- The quality of treated effluent (specially SAR) is suitable for land application of treated effluent.

Recommendations

- The plant has adopted several water conservation strategies to reduce the fresh water consumption. The level of mill's fresh water consumption is similar to contemporary agro based writing and printing paper mills. However looking into the reported fresh water consumption bench marks, the mill has still a scope to reduce fresh water consumption by further **3 - 4 m^3 / t paper** and mill may explore areas for the same. For example 100 % utilization of foul condensate in pulp mill can help in reducing water consumption by 1 m^3 / t paper while installation of disc

filter at PM1 can facilitate reduction in fresh water consumption by 1.5 -2.0 m^3 / t paper

- The plant is advised to have sub monitoring of its treated effluent being utilized in its plantation area to have proper water balance.

- The plant may explore installation of appropriate technology for the recovery of white rejects (centricleaner rejects) coming from paper machine for further improving performance of the ETP.

- The plant needs to immediately upgrade / retrofit the existing UASB reactor as the mill is not able to utilize the biogas generated as the gas collection and distribution system have corroded developing leakages .This is resulting in an estimated loss of Rs 60-70 Lakhs/ annum.

- The plant should reduce the suspended solids level in primary clarifier overflow through use of coagulants and flocculants to further improve the performance of existing ETP.

- The plant may install a coagulation and flocculation system before primary clarifier to improve its performance .

- The plant is advised to make a proper boundary of existing equalization tank and make provision of air supply for homogenizing the effluent.

- The plant is advised to install poly disc filter (PDF) at Paper Machine 1 also for increased fiber recovery and reuse / recycled of paper machine backwater.

- The treated effluent quality meets the stipulated norms. However the plant needs to adopt appropriate technology to reduce the colour.

- The plant is advised to get the OCEMS at final discharge and at stack calibrated on periodical basis.

- The PM level in the stack emissions are lower than stipulated norms of 150 mg / Nm^3. However in context of the EC norms of 75 mg / Nm^3 for PM, the plant need to look into optimization of its boiler operation / ESP operation or upgrade ESP or adopt appropriate air pollution control device to comply with the new norms.

- Though the mill has appropriate facilities and trained & experienced manpower for environmental monitoring and analysis the mill may get quarterly / half yearly / yearly environmental monitoring done from a third party / independent institution.

Note:

- ***This is purely a technical opinion based on data and information provided by the mill & collection, monitoring and analysis of environmental samples carried out by CPPRI. Trident Ltd – PCD will be responsible in case of any discrepancy in information provided related to paper production, water consumption, waste water discharge, ETP design specifications, environmental management or in any other information / data which has been used in preparation of this report.***

6/10/2021

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डा० एम० के० गुप्ता/Dr. M. K. Gupta
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केन्द्रीय लुग्दी एवं कागज अनुसंधान संस्थान
Central Pulp & Paper Research Institute
सहारनपुर/Saharanpur - 247001 (U.P.)

Annexure – I

PUNJAB POLLUTION CONTROL BOARD

Zonal Office-II, Vatavaran Bhawan, Nabha Road, Patiala - 147001.

Website- www.pprbgov.in

Office Dispatch No : Registered/Speed Post Date:

Industry Registration ID: *R12BAR25545* Application No : *15176466*

To,

Deepak Nando
Trident Complex, Raikot Road
Barnala,Barnala-148101

Subject: Renewal of consent no. CTOW/Renewal/BAR/2020/12540450 dated 30/06/2020 granted under the provisions of the Water (Prevention and Control of Pollution) Act, 1974.

1. Particulars of Consent to Operate under Water Act, 1974 granted to the industry

Consent to Operate Certificate No.	*CTOW/Renewal/BAR/2021/15176466*
Date of issue :	*24/05/2021*
Date of expiry :	*31/10/2021*
Certificate Type :	*Renewal*
Previous CTO No. & Validity :	*CTOW/Renewal/BAR/2020/12540450 From:30/06/2020 To:31/03/2021*

2. Particulars of the Industry

Name & Designation of the Applicant	*Mr.rajat Monga, (President-sustainability Plt)*
Address of Industrial premises	*Trident Ltd (pcd), Trident Complex, Mansa-road, Vill-dhanla, Barnala,Barnala-148101*
Capital Investment of the Industry	*12164.31 lakhs*
Category of Industry	*Red*
Type of Industry	*Pulp & Paper*
Scale of the Industry	*Large*
Office District	*Barnala*

This is with reference to the request made by the industry for renewal of consent granted by the Board under the Water (Prevention & Control of Pollution) Act, 1974.

The renewal of consent to operate granted to the industry vide no. R16BARCTOW3373045 dated 20/01/2016 valid upto 31/03/2020, extended upto 31/03/2021 vide letter no. 1848 dated 01/07/2020 under the Water (Prevention & Control of Pollution) Act, 1974 is hereby further renewed upto 31/10/2021 with the same conditions as mentioned therein and following specific conditions:

1. The consent to operate will be reviewed based on the recommendations of the Joint Committee constituted by Hon'ble NGT in the matter of OA No. 682/2019 filed by Sh. Beant Singh Bajwa, President, National Anti-corruption Council as well as the order passed by the Hon'ble NGT in the said case.

2. The industry shall strictly comply with the decisions of personal hearing taken by the Chairman of the Board held on 17.12.2013 regarding production capacity i.e. the production capacity for manufacturing of paper will be restricted to 415 TPD if no purchased bleached pulp is used and additional production of paper @ 35 TPD from the purchased bleached pulp, the requirement of which is about 24 TPD. The record shall be submitted by the industry to the Board on monthly basis.

3. The industry shall follow the procedure as prescribed in MoEF&CC notification No. S.O.980(E) dated 2.3.2021 regarding no increase in pollution load in case the industry wants to go for change in production of paper beyond the quantities allowed as per Environmental Clearance granted to the industry by MoEF& CC vide No. J-11011/52/2005 IA-II (I) dated 7.11.2005.

All other contents shall remain unchanged. This letter shall remain appended with the consent no. R16BARCTOW3373045 dated 20/01/2016 valid upto 31/03/2020 issued to the industry and its subsequent extension(s) issued from time to time under the Water (Prevention & Control of Pollution) Act, 1974.

24/05/2021

(Om Parkash)
Environmental Engineer
For & on behalf
of
(Punjab Pollution Control Board)

Endst. No.: Dated:

A copy of the above is forwarded to the following for information and necessary action please:
The Environmental Engineer, Punjab Pollution Control Board, Regional Office, Sangrur. He is requested to carryout the monitoring of the industry as per protocol, ensure compliance to be made by the industry and submit monthly progress to the Head Office by 5th of every following month.

24/05/2021

(Om Parkash)
Environmental Engineer
For & on behalf
of
(Punjab Pollution Control Board)

PUNJAB POLLUTION CONTROL BOARD

Zonal office-II, Vatavaran Bhawan, Nabha Road, Patiala

Website- www.ppcb.gov.in

Office Dispatch No : | Registered/Speed Post | Date:

Industry Registration ID: *R12D/IR23543* | Application No : *12540450*

To,

Deepak Nanda
Trident Complex, Rajkot Road
Barnala,Barnala-148101

Subject: **Renewal of consent to operate granted vide no. R16BARCTOW3373065 dated 20.01.2016 granted under the provisions of the Water (Prevention & Control of Pollution) Act, 1974 – M/s Trident Ltd (PCO), Trident Complex, Mansa Road, Village Dhaula, Distt. Barnala.**

1. Particulars of Consent to Operate under Water Act, 1974 granted to the industry

Consent to Operate Certificate No.	*CTOW Renewal/BAR/2020 12540450*
Date of Issue :	*30/06/2020*
Date of expiry :	*31/03/2021*
Certificate Type :	*Renewal*
Previous CTO No. & Validity :	*R16BARCTOW3373065* *From: 20/01/2016 To: 31/03/2020*

2. Particulars of the Industry

Name & Designation of the Applicant	*Mr. rajan Mongia, (President-sustainability Plt)*
Address of Industrial premises	*Trident Ltd (pcd),* *Trident Complex, Mansa-road, Village-dhaula,* *Barnala,Barnala-148101*
Capital Investment of the Industry	*110893.5 lakhs*
Category of Industry	*Red*
Type of Industry	*Pulp & Paper*
Scale of the Industry	*Large*
Office District	*Barnala*

For Trident Limited

Authorised Signatory

This is with reference to the request made by the industry for renewal of consent granted by the Board under the Water (Prevention & Control of Pollution) Act, 1974.

The validity of consent to operate granted to the industry vide no. R16BARCTOW3373045 dated 20.01.2016 valid upto 31.03.2020 under the Water (Prevention & Control of Pollution) Act, 1974, is hereby further extended upto 31.03.2021 with the same terms & following additional conditions that:

1. The industry shall comply with the recommendations of Joint Committee.
2. The industry shall submit the action plan within timelines for implementation of each recommendations of the joint committee, Environment Clearance and decisions of personal hearing given by the Chairman of the Board within 7 days to the Board and assure the implementation of the same within two months from the date of orders. Further, the industry shall submit the weekly compliance of the recommendations of the joint committee to the Board.

All other consents shall remain unchanged. This letter be appended with the original consent no. R16BARCTOW3373045 dated 20.01.2016 issued to the industry and subsequent extension (s) from time to time under the Water (Prevention & Control of Pollution) Act, 1974.

(Rajeev Gupta)
Environmental Engineer
For & on behalf
of
(Punjab Pollution Control Board)

Endst. No.: Dated:

A copy of the above is forwarded to the following for information and necessary action please:

Environmental Engineer, Regional Office, Sangrur

(Rajeev Gupta)
Environmental Engineer
For & on behalf
of
(Punjab Pollution Control Board)

For Trident Limited

Authorised Signatory

This is computer generated document from OCMMS of PPCB

Trident Ltd (Unit: Trident Complex, Nemol road, Village Barnala Rurka, Tehsil:

PUNJAB POLLUTION CONTROL BOARD

Zonal Office-II, Vatavaran Bhawan, Nabha Road, Patiala.

Website - www.ppcb.gov.in

Industry ID:R16BARCTOW3373045

No: R16BARCTOW3373045 -322 Registered Date: 20/01/2016

20-1-16

To

M/s Trident ltd (pcd)
Trident complex, monsa-road, vill-
dhaula
148101
Barnala
Barnala

Subject:- **Extension in validity of consent to operate an outlet u/s 25 of the Water (Prevention & Control of Pollution) Act, 1974.**

Reference :R16BARCTOW3373045 **Application No. :3373045** **Dated :20/01/2016**

This has reference to your request for extension in the validity of consent granted by the Board to operate an outlet of u/s 25 of the Water (Prevention & Control of Pollution) Act, 1974.

The validity of consent granted to M/s Trident Limited(Paper Division), Vill. Dhaula, Monga Road, Tehsil & Distt. Barnala to operate an outlet of u/s 25 of the Water (Prevention & Control of Pollution) Act, 1974, vide no. SEE(ZP- II)/SCR/WPC/2012-13/V-(399)/V-518 dated 23/07/2012 valid upto 22/01/2013 and extended upto 22.01.2016, is hereby further extended upto 31.03.2020 with the same terms & conditions as mentioned in the consent granted to the industry vide Board's letter no. 4058 dated 23.07.2012 and subsequent extension vide letter no. 538 dt. 28.01.2013.

This letter may be appended with the original consent no. SEE(ZP - II)/SCR/WPC/2012-13/V-(399)/V-518 dated 23/07/2012, issued to the industry under the said Act, vide Board's letter no. 4058 dated 23/07/2012 and 538 dt. 28.01.2013.

20/1/16

for and on behalf of the
Punjab Pollution Control Board

Endst. No. _____ Dated _____

A copy of the above is forwarded to the Environmental Engineer, Punjab Pollution Control Board, Regional Office, Sangrur for information and necessary action.

for and on behalf of the
Punjab Pollution Control Board

For Trident Limited

Authorised Signatory

ਪੰਜਾਬ ਪ੍ਰਦੂਸ਼ਣ ਰੋਕਥਾਮ ਬੋਰਡ
ਜ਼ੋਨਲ ਦਫ਼ਤਰ-2, ਰੇਲਵੇਜ਼ ਰਸ਼ਡ, ਨਾਭਾ ਰੋਡ, ਪਟਿਆਲਾ
Ph. (0175) 2216431 Fax 0175-2216431

ਨੰਬਰ: 532 ਮਿਤੀ: 26-1-2015

Registered

To

M/s Trident Ltd. (Paper Division)
Village Dhuala
Distt. Barnala

Sub: **Extension in validity of consent to operate an outlet u/s 25 of Water (Prevention & Control of Pollution) Act, 1974.**

This has reference to your request for extension in the validity of consent granted by the Board to operate an outlet u/s 25 of the Water (Prevention & Control of Pollution) Act, 1974.

The validity of consent granted to M/s Trident Ltd. (Paper Division), Village Dhuala, Distt. Barnala to operate an outlet u/s 25 of the Water (Prevention & Control of Pollution) Act, 1974, vide no. PPCB/F-II/BNL/PC/2013-13/V-(PP)/V516 dated 23/7/2013, which was valid upto 22/1/2015, is hereby further extended upto 22/1/2015 with the same terms & conditions as mentioned in the consent granted to the industry vide Board's letter no. 4068 dated 23/7/2013 alongwith following additional conditions:

1. The industry will develop 5 acres of land (in addition to 160 acres of land already developed) for utilisation of additional 350 KLD of treated trade effluent on land for plantation purposes, within one month.
2. The industry will install ETP for the treatment of its domestic effluent, within three months.
3. The industry will improve the house-keeping near the ETP / boiler sections by providing metalled roads, within three months.
4. The industry shall manufacture additional writing & printing paper @ 75 TPD out of 450 TPD by optimum utilization of existing facilities and by use of bleached pulp purchased from market as raw material and will not manufacture any additional pulp in its existing premises and also maintain the record of the purchased bleached pulp.
5. The industry shall comply with the conditions of the environmental clearance granted by Ministry of Environment and Forests, Govt. of India vide no. J-11011/52/2006 IA-II(I) dated 7/11/2008 and environmental clearance granted by CSA vide no. CSA/04/A-60/9060 dated 4/10/2004 in totality during this consent period.

For Trident Limited

Authorised Signatory

ਪੰਜਾਬ ਪ੍ਰਦੂਸ਼ਣ ਰੋਕਥਾਮ ਬੋਰਡ
ਜ਼ੋਨਲ ਦਫ਼ਤਰ-2, ਪਾਤਸ਼ਾਹੀ ਮਾਲ, ਨਾਭਾ ਰੋਡ, ਪਟਿਆਲਾ
ਫੋਨ (0175) - 2305222
ਫੈਕਸ (0175) - 2305222

ਪੱਤਰ ਨੰ. [illegible]

ਮਿਤੀ 25.7.12

REGISTERED

To

M/s Trident Ltd. (Paper Division)
Village Dhaula,
Distt. Barnala

Sub: Varied consent to operate an outlet u/s 25 of the Water (Prevention & Control of Pollution) Act, 1974.

Enclosed, please find herewith the varied consent no. SEE(2P-II)/SCR/WPC/2012-13/V(399)/V-518 dated 25/7/2012 granted by the Board under Water (Prevention & Control of Pollution) Act, 1974.

DA/As above

For Senior Env. Engineer
Zonal Office-II, Patiala

Endst. No. **Dated**

A copy of the above is forwarded to the Environmental Engineer, Punjab Pollution Control Board, Regional Office, Sangrur for information & necessary action.
DA/ As above

For Senior Env. Engineer
Zonal Office-II, Patiala

For Trident Limited

Authorised Signatory

PUNJAB POLLUTION CONTROL BOARD

Zonal Office-II, Vatavaran Bhawan, Rajpura Road, Patiala.

No. BEE(ZP-II)/SGR/WPC/2012-13/V-[399]/V-S18 Date of Issue : 23/07/2012

Date of expiry: 22/01/2013

Name of the Occupier : Sh. Deepak Narula

Scale of the Industry : Large

Consent Fee Details : Rs. 8 lacs vide R.No. 63/3136 dated 10/2/2012
Rs. 23 lacs vide R.No. 37/3137 dated 2/3/2012

Product & Capacity :
1. Writing & Printing Paper @ 375 TPD by using agro waste as raw material
2. Writing & Printing Paper @ 75 TPD by using bleached pulp as raw material (by optimum utilization of exiting facilities).
3. Captive power plant of capacity 49.4 MW.

Sub:- **Varied consent to operate an outlet u/s 25 of the Water (Prevention & Control of Pollution) Act, 1974 for discharge of effluents arising out of premises of M/s Trident Ltd. (Paper Division), Village Dhanla, Distt. Barnala**

This has reference to your application for consent of the Board to operate an outlet to discharge the effluents u/s 25 of the Water (Prevention & Control of Pollution) Act, 1974. You are, hereby, authorised to discharge the effluent(s) arising out of your premises subject to the following conditions:-

1. **This consent letter will supersede the earlier consent to operate of the Board granted to the industry under Water (Prevention & Control of Pollution) Act, 1974 vide no. SGR/WPC/2009/V-399 dated 27/2/2009, which was valid upto 26/8/2009 and the validity of which was extended upto 22/10/2012 vide Board's letter no. 3172 dated 12/6/2012.**

2. This consent is not valid for getting power load from the Punjab State Power Corporation Ltd. or for getting loan from the financial institutions.

3. The consent is issued for the discharge of effluents as per details given below from the premises of the industry through the out-let(s) authorised by the Board:

S.N	Description	Quantity in KLD	Mode of final disposal
1.	Trade Effluent	8,700	After treatment, In Dhanaula drain
		12,800	After treatment, Onto land for plantation
2.	Domestic Effluent	128	After treatment, Onto land for plantation

4. The effluent discharged through the authorised outlet shall conform to the standards prescribed by the Ministry of Environment & Forests, Govt. of India, for such type of industries.

5. The industry shall regularly operate and maintain the Effluent Treatment Plant to ensure that the treated trade effluent conforms to the standards laid down by the Board for such type of industries.

For Trident Limited

Authorised Signatory

/ discharges and the industry shall get its effluent samples analysed from the Board to assess the adequacy of treatment system.

4. The entire cooling water generated by the industry shall be re-circulated. The industry shall not discharge any cooling water without the prior written permission of the Board.

5. The industry shall make necessary and adequate arrangements to hold back the effluent in case of failure of re-circulation system.

6. The industry shall comply with the following stipulations;

a. The industry shall apply for renewal of consent atleast two months before expiry of the consent.

b) The issuance of this consent does not convey any property right in either real or personal property, or any exclusive privileges, nor does it authorise any injury to private property or any invasion of personal rights, nor any infringement of Central, State or Local Laws or Regulations.

c) The consent does not authorise or approve the construction of any physical structures or facilities for undertaking of any work in any natural water course.

d) Nothing in this consent shall be deemed to preclude the institution of any legal action nor relieve the applicant from any responsibilities, liabilities or penalties to which the applicant is or may be subjected under this or any other Act.

e) During the period beginning from the date of issuance and the date of expiration of this consent, the applicant shall not discharge floating solids or visible foam.

7. Any amendments/revisions made by the Board in the tolerance limits for discharges shall be applicable in the industry from the date of such amendments/revisions.

8. The authorised outlet and mode of disposal shall not be changed without the prior written permission of the Board.

9. The industry shall not use any un-authorised outlet(s) for discharging effluents from its premises.

10. The industry shall not change or alter the manufacturing processes so as to change the quality and/ or quantity of the effluents generated without the written permission of the Board.

11. Any upset conditions in the plant/plants of the factory, which is likely to result in increased effluent and/or result in violation of the standards laid down by the Ministry of Environment & Forests, Govt. of India / Punjab Pollution Control Board shall be reported to the Environmental Engineer, Punjab Pollution Control Board, Regional Office, Sangrur through fax under intimation to the Board failing which any stoppage and upset conditions that come to the notice of the Board/its officers, will be deemed to be intentional violation of the conditions of consent.

14. All underground water retaining structures shall be lined with an impervious layer, so as to avoid seepage and contamination of sub soil/water.

15. The industry shall install electromagnetic flow meters on all the tubewells so as to measure the quantity of ground water abstracted.

16. The industry shall plant minimum of three suitable varieties of trees at the density not less than 1000 trees per hectare all around the periphery of the industrial premises.

17. The industry shall provide terminal manhole(s) at the end of final collection system and a manhole upstream of final outlet [illegible]

For Tride Ltd.

Authorised Signatory

iii. Register showing the record of chemicals to be used for the treatment of effluent in the effluent treatment plant.

32. The industry shall put up display board indicating Environment data at its main gate.

33. The industry will lay fixed pipeline for distribution of treated trade effluent in the plantation area.

34. The industry shall submit a certificate yearly to the effect that no addition / modification / expansion has been carried out during the consent period.

35. The industry shall submit a copy of balance sheet as well as certificate from its Chartered Accountant every year, showing gross value (undepreciated) of its fixed assets.

36. The industry shall obtain the Authorization of the Board under the Hazardous Waste (Management, Handling & Transboundary Movement) Rules, 2008.

37. The industry shall comply with the conditions of the Environmental Clearance granted by MOEF vide No. J-11011/52/2005 IA-II(I) dated 7/11/2005 and environmental clearance granted by CSA vide no. CSA/(M)/A 60/9060 dated 4/10/2004 in totality during this consent period.

38. The industry will discharge maximum 21,500 KLD treated trade effluent out of which 8700 KLD treated trade effluent will be discharged into Dhanauta Drain and 12,800 KLD treated trade effluent will be discharged onto land for plantation purposes in an area of 160 acres inside the industrial premises.

39. The industry will continue to explore the possibility of arranging additional land for plantation so that discharge into drain can further be reduced.

40. The industry shall manufacture additional writing & printing paper to the TPD out of 450 TPD by optimum utilization of existing facilities and by use of bleached pulp purchased from market as raw material and will not manufacture any additional pulp in its existing process and also maintain the record of the purchased bleached pulp.

41. The industry will improve the functioning of its Effluent Treatment Plant with ASPM, Clean Technology by 31/10/2012, as per the proposal submitted to the Board, so as to consistently achieve the effluent standards prescribed by the Board for such type of industries at all the times.

42. The industry will stick to the production capacity vis-a-vis discharge mentioned in this consent and will not increase the same without the prior written permission of the Board.

43. This consent for expanded capacity has been granted for a trial period of 6 months only and the validity of the same shall be extended only after receipt of concurrence from Ministry of Environment & Forests, GOI, New Delhi.

44. The Board reserves the right to revoke this consent to operate at any time, in case the industry is found violating any of the conditions of this consent or / or the provisions of Water (Prevention & Control of Pollution) Act, 1974 as amended from time to time.

For Senior Env. Engineer
Zonal Office, Yamuna Nagar

For Tri-Star Boards Limited

Authorised Signatory

Annexure – II

Annexure-II

PUNJAB POLLUTION CONTROL BOARD

Zonal Office-II, Vatavaran Bhawan, Nabha Road, Patiala - 147001.

Website: www.ppcb.gov.in

Office Dispatch No : Registered/Speed Post Date:

Industry Registration ID: *RI3BAR25545* Application No : *15176391*

To,

Mr.rajat Monga
Trident Complex, Rajkot Road
Barnala,Barnala-148101

Subject: Renewal of consent no. CTOA/Renewal/BAR/2020/12540409 dated 30/06/2020 granted under the provisions of the Air (Prevention and Control of Pollution) Act, 1981.

1. Particulars of Consent to Operate under Air Act, 1981 granted to the industry

Consent to Operate Certificate No.	*CTOA/Renewal/BAR/2021/15176391*
Date of issue :	*24/05/2021*
Date of expiry :	*31/10/2021*
Certificate Type :	*Renewal*
Previous CTO No. & Validity :	*CTOA/Renewal/BAR/2020/12540409 From:30/06/2020 To:31/03/2021*

2. Particulars of the Industry

Name & Designation of the Applicant	*Mr.rajat Monga, (President-sustainability PB)*
Address of Industrial premises	*Trident Ltd (pcd), Trident Complex, Mauna-road, Vill-dhanla. Barnala,Barnala-148101*
Capital Investment of the Industry	*121641.31 lakhs*
Category of Industry	*Red*
Type of Industry	*Pulp & Paper*
Scale of the Industry	*Large*
Office District	*Barnala*

This is with reference to the request made by the industry for renewal of consent granted by the Board under the Air (Prevention & Control of Pollution) Act, 1981.

The renewal of consent to operate granted to the industry vide no. R16BARCTOA3371425 dated 20/01/2016 valid upto 31/03/2020, extended upto 31/03/2021 vide letter no. 1830 dated 01/07/2020 under the Air (Prevention & Control of Pollution) Act, 1981 is hereby further renewed upto 31/10/2021 with the same conditions as mentioned therein and following specific conditions:

1. The consent to operate will be reviewed based on the recommendations of the Joint Committee constituted by Hon'ble NGT in the matter of OA No. 682/2019 filed by Sh. Bant Singh Bajwa, President, National Anti-corruption Council as well as the order passed by the Hon'ble NGT in the said case.

2. The industry shall strictly comply with the decisions of personal hearing taken by the Chairman of the Board held on 17.12.2013 regarding production capacity i.e. the production capacity for manufacturing of paper will be restricted to 415 TPD if no purchased bleached pulp is used and additional production of paper @ 35 TPD from the purchased bleached pulp, the requirement of which is about 24 TPD. The record shall be submitted by the industry to the Board on monthly basis.

3. The industry shall follow the procedure as prescribed in MoEF&CC notification No. S.O.980(E) dated 2.3.2021 regarding no increase in pollution load in case the industry wants to go for change in production of paper beyond the quantities allowed as per Environmental Clearance granted to the industry by MoEF& CC vide No. J-11011/52/2005-IA-II (I) dated 7.11.2005.

All other contents shall remain unchanged. This letter shall remain appended with the consent no. R16BARCTOA3371425 dated 20/01/2016 valid upto 31/03/2020 issued to the industry and its subsequent extension(s) issued from time to time under the Air (Prevention & Control of Pollution) Act, 1981.

24/09/2021

(Om Parkash)
Environmental Engineer
For & on behalf
of
(Punjab Pollution Control Board)

Endst. No.: Dated:

A copy of the above is forwarded to the following for information and necessary action please:

The Environmental Engineer, Punjab Pollution Control Board, Regional Office, Sangrur. He is requested to carryout the monitoring of the industry as per protocol, ensure compliance to be made by the industry and submit monthly progress to the Head Office by 5th of every following month.

24/09/2021

(Om Parkash)
Environmental Engineer
For & on behalf

PUNJAB POLLUTION CONTROL BOARD

Zonal office-II, Vatavaran Bhawan, Nabha Road, Patiala

Website- www.ppcb.gov.in

Office Dispatch No : Registered/Speed Post Date:

Industry Registration ID: *RIED/IR2554S* Application No : *1254040*

To,

Mr.rajiv Monga
Trident Complex, Bathot Road
Barnala,Barnala-148101

Subject: Renewal of consent to operate granted vide no. RIEDARCTOA33J1425 dated 20.01.2016 granted under the provisions of the Air (Prevention & Control of Pollution) Act, 1981 – M/s Trident Ltd (PCD), Trident Complex, Mansa Road, Village Dhanla, Distt. Barnala

1. Particulars of Consent to Operate under Air Act, 1981 granted to the Industry

Consent to Operate Certificate No.	*CTOA/Renewal/BAR/2020 1254040*
Date of issue :	*30/06/2020*
Date of expiry :	*31/03/2021*
Certificate Type :	*Renewal*
Previous CTO No. & Validity :	*RIEB-IRCTOA33J1425 From 20/01/2016 To 31/03/2020*

2. Particulars of the Industry

Name & Designation of the Applicant	*Mr rajiv Monga (President-sustainability Plt)*
Address of industrial premises	*Trident Ltd (pcd), Trident Complex, Mansa-road, Vill-dhanla, Barnala,Barnala-148101*
Capital Investment of the Industry	*119891.5 lakhs*
Category of Industry	*Red*
Type of Industry	*Pulp & Paper*
Scale of the Industry	*Large*
Office District	*Barnala*

For Trident Limited

Authorised Signatory

This is computer generated document from CTOA/HE by PPCB

This is with reference to the request made by the industry for renewal of consent granted by the Board under the Air (Prevention & Control of Pollution) Act, 1981.

The validity of consent to operate granted to the industry vide no. R16BARCTOA3371425 dated 20.01.2016 valid upto 31.03.2020 under the Air (Prevention & Control of Pollution) Act, 1981, is hereby further extended upto 31.03.2021 with the same terms & conditions and following additional conditions that :

1. The industry shall comply with the recommendations of Joint Committee.
2. The industry shall submit the action plan within timelines for implementation of each recommendations of the joint committee, Environment Clearance and decisions of personal hearing given by the Chairman of the Board within 7 days to the Board and ensure the implementations of the same within two months from the date of orders. Further, the industry shall submit the weekly compliance of the recommendations of the Joint committee to the Board.

All other contents shall remain unchanged. This letter be appended with the original consent no. R16BARCTOA3371425 dated 20.01.2016 issued to the industry and subsequent extension (s) issued from time to time under the Air (Prevention & Control of Pollution) Act, 1981

Dated:

(Rajeev Gupta)
Environmental Engineer
For & on behalf
of
(Punjab Pollution Control Board)

Endst. No.:

Dated:

A copy of the above is forwarded to the following for information and necessary action please:

Environmental Engineer, Regional Office, Sangrur

Dated:

(Rajeev Gupta)
Environmental Engineer
For & on behalf
of
(Punjab Pollution Control Board)

For Trident Limited

Authorised Signatory

"This is computer generated document from OCMMS by PPCB"

Trident Ltd. (unit-I), Trident Complex, Amloh road, Malerkotla, Barnala-Barnala-148001

Page 2

PUNJAB POLLUTION CONTROL BOARD

Zonal Office-II, Vatavaran Bhawan, Patiala Road, Patiala
Website: www.ppcb.gov.in

Industry ID:R16BAR25345

No:R16BARCTOA3371425 -324 Registered Date:20/01/2016
20.1.16

To

M/s Trident ltd (pcd)
Trident complex, mansa-road, vill-dhaula
Barnala
148101
Tehsil: Barnala
District: Barnala

Subject:- Extension in validity of consent to operate an industrial plant u/s 21 of the Air (Prevention & Control of Pollution) Act, 1981.

Reference :R16BARCTOA3371425 Application No :3371425 Date :20/01/2016

This has reference to your request for extension in the validity of consent granted by the Board to operate an industrial plant u/s 21 of the Air (Prevention & Control of Pollution) Act, 1981.

The validity of consent granted to M/s Trident Limited(Paper Division), Vill. Dhaula, Mansa Road, Tehsil & Distt. Barnala to operate an industrial plant u/s 21 of the Air (Prevention & Control of Pollution) Act, 1981 vide no. SEE(ZP- II)/SGR/APC/2012-13/V-(371)/V-413 dated 23/07/2012 valid upto 22/01/2013 and extended upto 22.01.2016, is hereby further extended upto 31.03.2020 with the same terms & conditions as mentioned in the consent granted to the industry vide Board's letter no. 4056 dated 23.07.2012 and subsequent extension vide letter no. 536 dt. 28.01.2013

This letter may be appended with the original consent no. SEE(ZP- II)/SGR/APC/2012-13/V-(371)/V-413 dated 23/07/2012, issued to the industry under the said Act, vide Board's letter no. 4056 dated 23/07/2012 and 536 dt. 28.01.2013.

20/1/16

for and on behalf of the
Punjab Pollution Control Board

Endst. No. _____ Dated _____

A copy of the above is forwarded to the Environmental Engineer, Punjab Pollution Control Board, Regional Office, Sangrur for information and necessary action.

for and on behalf of the
Punjab Pollution Control Board

For Trident Limited

Authorised Signatory

ਪੰਜਾਬ ਪ੍ਰਦੂਸ਼ਣ ਰੋਕਥਾਮ ਬੋਰਡ
ਜ਼ਿਲਾ ਦਫ਼ਤਰ-2, ਵਾਤਾਵਰਣ ਭਵਨ, ਫੇਜ਼ 8, ਮੋਹਾਲੀ, ਪੰਜਾਬ

ਫੋਨ ਨੰ. 0172-2548322

ਫੈਕਸ ਨੰ. 0172-2548323

ਪੱਤਰ ਨੰ. ...5314

ਮਿਤੀ 28-12-2013

Registered

To

M/s Trident Ltd. (Paper Division)
Village Dhaula,
Distt. Barnala

Sub: Extension in validity of consent to operate an industrial plant u/s 21 of the Air (Prevention & Control of Pollution) Act, 1981.

This has reference to your request for extension in the validity of consent granted by the Board to operate an industrial plant u/s 21 of the Air (Prevention & Control of Pollution) Act, 1981.

The validity of consent granted to M/s Trident Ltd. (Paper Division), Village Dhaula, Distt. Barnala to operate an industrial plant u/s 21 of the Air (Prevention & Control of Pollution) Act, 1981, vide no. SDE(ZP-II)/BGR/APC/2012-13/V-(371)V-413 dated 23/7/2012, which was valid upto 22/1/2013, is hereby further extended upto 22/1/2018 with the same terms & conditions as mentioned in the consent granted to the industry vide Board's letter no. 4056 dated 23/7/2012 alongwith following additional conditions:

1. The industry will install online SPM monitor at all the stacks, within two months.
2. The industry will also install ambient air quality monitoring station in the Trident Complex, within two months.
3. The industry will take requisite and adequate steps for control of dust emissions generated from wheat straw cleaning process, within three months.
4. The industry shall manufacture additional writing & printing paper @ 75 TPD out of 450 TPD by optimum utilization of existing facilities and by use of bleached pulp purchased from market as raw material and will not manufacture any additional pulp in its existing premises and also maintain the record of the purchased bleached pulp.
5. The industry shall comply with the conditions of the environmental clearance granted by Ministry of Environment and Forests, Govt. of India vide no. J-11011/82/2005 IA-II(I) dated 7/11/2005 and environmental clearance granted by CSA vide no. CSA/09/A-60/9060 dated 4/10/2004 in totality during this consent period.
6. The industry will obtain Environmental Clearance from the Ministry of Environment and Forests, Govt. of India, New Delhi for the

For Trident Limited

Authorised Signatory

ਪੰਜਾਬ ਪ੍ਰਦੂਸ਼ਣ ਰੋਕਥਾਮ ਬੋਰਡ
ਜ਼ੋਨਲ ਦਫ਼ਤਰ-II, ਵਾਤਾਵਰਣ ਭਵਨ, ਨਾਭਾ ਰੋਡ, ਪਟਿਆਲਾ
ਫੋਨ (ਦਫ਼ਤਰ) 0175-2306232 ਫੈਕਸ 0175-2306232

ਨੰਬਰ 4252 ਮਿਤੀ 23.7.12

REGISTERED

To

M/s Trident Ltd. (Paper Division)
Village Dhaula,
Distt. Barnala

Sub: Varied consent to operate an industrial plant u/s 21 of the Air (Prevention & Control of Pollution) Act, 1981.

Enclosed, please find herewith the varied consent no. SEE(ZP-II)/SGR/APC/2012-13/V(371)/V-413 dated 23/7/2012 granted by the Board under Air (Prevention & Control of Pollution) Act, 1981.

DA/As above.

23/7/12

For Senior Env. Engineer
Zonal Office-II, Patiala

Endst. No. **Dated**

A copy of the above is forwarded to the Environmental Engineer, Punjab Pollution Control Board, Regional Office, Sangrur for information & necessary action.
DA / As above

For Senior Env. Engineer
Zonal Office-II, Patiala

For Trident Limited
Authorised Signatory

Steam Generating capacity of Boiler	Required particulate matter	
	A.	B.
	Area upto 5 Km from the periphery of class-I and class-II town	Other than 'A'
Less than 2 ton/hr.	800 mg/Nm³	1200 mg/Nm³
2 ton/hr. to 10 ton/hr.	500 mg/Nm³	1000 mg/Nm³
Above 10 ton/hr. to 15 ton/hr.	350 mg/Nm³	500 mg/Nm³
Above 15 ton/hr.	150 mg/Nm³	150 mg/Nm³

A - emissions normalised to 12% carbon dioxide.

The industry shall discharge all gases through a stack of minimum height as specified in the following standards laid down by the Board.

Stack height for boiler plants

Steam Generating Capacity	Stack heights	
Less than 2 ton/hr.	9 metres	or 2/3 times the height of neighbouring building whichever is more.
More than 2 ton/hr. to 5 ton/hr.	12 metres	
More than 5 ton/hr. to 10 ton/hr.	15 metres	
More than 10 ton/hr. to 15 ton/hr.	18 metres	
More than 15 ton/hr. to 20 ton/hr.	21 metres	
More than 20 ton/hr. to 25 ton/hr	24 metres	
More than 25 ton/hr. to 30 ton/hr.	27 metres	
More than 30 ton/hr.	30 metres	

or using the formula

$$H = 14\ Q_1^{0.3}$$

or

$$H = 74\ Q_2^{0.27}$$

where Q_1 = Quantity of SO_2 in Kg/hr.

Q_2 = Quantity of particulate matter in Ton/day.

For industrial furnaces and kilns, the criteria for selection of stack height should be based on fuel used for the corresponding steam generation.

7. The industry will not install any DG set in its premises without the prior written permission of the Board.

8. The industry shall burn rice husk as fuel only in fluidised bed combustion system.

9. The industry shall not consume any fuel except coal / CNG / rice husk / black liquor for burning purpose without the prior written permission of the Board.

10. The industry will install the separate energy meter for running pollution control devices and monthly reading may be sent to the Board by the fifth of the following month.

11. The industry shall provide port holes, platforms and/or other necessary facilities as may be required for collecting the samples of emissions from any chimney, flue or duct or any other outlet.

Specifications of the port-holes shall be as under:-

a) The sampling ports shall be provided at atleast 8 times chimney diameter down stream and 2 times up stream from the flow disturbance. For a rectangular cross section the

for Tarsem Limited

Authorised Signatory

27. The industry shall ensure that no air pollution problem or public nuisance is created in the area due to discharge of emissions from the industry.

28. The adequacy and efficacy of the Air Pollution Control Devices will be the entire responsibility of the industry.

29. The industry shall obtain cover under the Public Liability Insurance Act, 1991.

30. The industry shall submit an on site emergency plan approved by the Chief Inspector of Factories, Punjab.

31. The pollution control devices shall be interlocked with the manufacturing process of the industry.

32. The industry shall put up display board indicating Environment data at the main entrance gate.

33. The industry shall submit a certificate yearly to the effect that no addition/ modification has been carried out during previous year.

34. The industry shall submit balance sheet yearly showing undepreciated fixed assets during previous financial year.

35. The industry will stick to the production capacity mentioned in this consent and will not increase the same without the prior written permission of the Board.

36. The industry shall dispose off its boiler ash in an environmentally sound manner.

37. The industry shall manufacture additional writing & printing paper [illegible] out of 450 TPD by optimum utilization of existing facilities [illegible] use of bleached pulp purchased from market as raw material [illegible] will not manufacture any additional pulp in its existing premises and also maintain the record of the purchased bleached pulp.

38. The industry shall comply with the conditions of the Environmental Clearance granted by MOEF vide No. J-11011/52/2005 IA-II(I) dated 7/11/2005 and environmental clearance granted by CSA vide no CSA/04/A-80/9060 dated 4/10/2004 in totality during this consent period.

39. The industry will not dispose off its coal ash / rice husk ash illegally outside its premises and maintain the record for disposal of its coal ash with M/s Gujarat Ambuja Cement Ltd. and M/s Tuna [illegible].

40. This consent for expanded capacity has been granted for a trial period of 6 months only and the validity of the same would be extended only after receipt of concurrence from Ministry of Environment & Forests, GOI, New Delhi.

41. The Board reserves the right to revoke this consent to operate granted to the industry at any time, in case the industry is found violating any of the conditions of this consent and/or the provisions of the Air (Prevention & Control of Pollution) Act, 1981 as amended from time to time.

For Senior Env. Engineer
Zonal Office-II, Patiala

For Trident Limited

Authorised Signatory

Annexure – III

Annexure- III

PUNJAB POLLUTION CONTROL BOARD

Zonal Office-II, Vatavaran Bhawan, Nabha Road, Patiala

Website:- www.ppcb.gov.in

Office Dispatch No : Registered/Speed Post Date:

Industry Registration ID : *R12B4R25545* Application No : *12544222*

To,

Deepak Nanda
Trident Complex, Raikot Road
Barnala,BARNALA-148101

Subject: Renewal of Authorization for operating a facility for Collection, Generation, Storage, Disposal, of Hazardous Wastes as per the Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016.

1. Particulars of Authorization granted to the Industry

Authorization No	*HWMargent/BAR/2020/12544222*
Previous Authorization No	*HWM/Fresh/BAR/2019/0676674*
Date of Issue :	*01/07/2020*
Date of expiry :	*31/03/2021*
Previous Authorization Date of Issue :	*13/07/2019*
Previous Authorization Date of Expiry :	*31/03/2020*
Authorization Type :	renew

2. Particulars of the Industry

Name & Designation of the Applicant	*Mr.Rajat Monga, (President-Sustainability Pb)*
Address of Industrial premises	*Trident ltd (pcd).* *Trident complex, mansa road, vill-dhuri,* *Barnala, Barnala-148101*
Capital Investment of the Industry	*119893.5 lakhs*
Category of Industry	*Red*
Type of Industry	*Pulp & Paper*
Scale of the Industry	*Large*
Office District	*Barnala*

For Trident Limited

Authorised Signatory

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Trident ltd (pcd), Trident complex, mansa road, vill-dhuri, Barnala, Barnala-148101

Page

3. Particulars of Wastes

Category of Hazardous Waste as per the Schedules I,II and III of these rules	Authorised mode of disposal or recycling or utilisation or co-processing, etc	Quantity (ton/annum)
Schedule I 5.1-Used or spent oil	Generation , Collection , Storage , Transportation , Disposal	8.2 KL/Annum
Schedule I 32.3-Process sludge containing adsorbable organic halides(AOX)	Generation , Collection , Storage , Transportation , Disposal	15 Ton/Day
Schedule I 33.1-Empty barrels/containers/liners contaminated with hazardous chemicals /wastes	Generation , Collection , Storage , Transportation , Disposal	24000 Number/Annum

4. The authorisation is subject to the general and specific conditions as appended with the Authorization.



11/03/2019

(Rajeev Gupta)
Environmental Engineer
For & on behalf
of
(Punjab Pollution Control Board)

Endst. No.: Dated:

A copy of the above is forwarded to the following for information and necessary action please:
Environment Engineer, Regional Office, Sangrur



13/3/2019

(Rajeev Gupta)
Environmental Engineer

"This is computer generated document from OCMMS by PPCB" Authorised Signatory
Trident Ref (Ref), Trident complex, mansarwal, Ghaziabad, Uttar Pradesh, 201001

For & on behalf
of
(Punjab Pollution Control Board)

For Trident Limited

Authorised Signatory

PUNJAB POLLUTION CONTROL BOARD

Zonal Office-II, Vatavaran Bhawan, Nabha Road, Patiala

Website:- www.ppcb.gov.in

Office Dispatch No : Registered/Speed Post Date:

Industry Registration ID : *R12BA0235A5* Application No : *9676674*

To,

Deepak Nanda
Trident Complex, Ralkot Road
Barnala,BARNALA-148101

Subject: Fresh Authorization for operating a facility for Collection, Generation, Storage, Transportation, Disposal, of Hazardous Wastes as per the Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016 .

Deepak Nanda of Trident ltd (pcd) is hereby granted an authorisation based on the enclosed signed inspection report for Collection, Generation, Storage, Transportation, Disposal, on the premises situated at Trident complex, mansa-road, vill-dhaula, Barnala, Barnala-148101

1. Particulars of Authorization granted to the Industry

Authorization No	*HWM/Fresh/BAR/2019/9676674*
Date of Issue :	*13/02/2019*
Date of expiry :	*31/03/2020*
Authorization Type :	*Fresh*

2. Particulars of the Industry

Name & Designation of the Applicant	*Mr. Rajat Monga, (President-Sustainability Fb)*
Address of Industrial premises	*Trident ltd (pcd), Trident complex, mansa-road, vill-dhaula Barnala,Barnala-148101*
Capital Investment of the Industry	*119184.57 lakhs*
Category of Industry	*Red*
Type of Industry	*Pulp & Paper*
Scale of the Industry	*Large*
Office District	*Barnala*

For Trident Limited

Authorised Signatory

3. Terms and Conditions:

This is with reference to the request made by the industry for extension in the validity of authorization granted under the Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016.

The validity of authorization granted to the industry vide no. HWM/Fresh/BAR/2019/9676674 dated 13.07.2019 valid upto 31.03.2020 under the Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016 is hereby, extended upto 31.03.2021 with the same terms & conditions as mentioned therein and additional condition that the industry will provide adequate storage facility of sufficient capacity for the storage of hazardous waste of category no. 33.1 of schedule-I at least for 3 months.

All other contents shall remain unchanged. This letter be appended with the original authorization no. HWM/Fresh/BAR/2019/9676674 dated 13.07.2019 issued to the industry under the Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016 and subsequent extension (s).

(Rajeev Gupta)
Environmental Engineer
For & on behalf
of
(Punjab Pollution Control Board)

Endst. No.: Dated:

A copy of the above is forwarded to the following for information and necessary action please:

Environmental Engineer, Regional Office, Sangrur

(Rajeev Gupta)
Environmental Engineer
For & on behalf
of
(Punjab Pollution Control Board)

For Trident Limited

Authorised Signatory

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TERMS AND CONDITIONS

A. GENERAL CONDITIONS

1. The authorised person shall comply with the provisions of the Environment (Protection) Act, 1986, and the rules made there under.
2. The authorisation or its renewal shall be produced for inspection at the request of an officer authorised by the State Pollution Control Board.
3. The person authorised shall not rent, lend, sell, transfer or otherwise transport the hazardous and other wastes except what is permitted through this authorisation.
4. Any unauthorised change in personnel, equipment or working conditions as mentioned in the application by the person authorised shall constitutes a breach of this authorization.
5. The person authorised shall implement Emergency Response Procedure (ERP) for which this authorisation is being granted considering all site specific possible scenarios such as spillages, leakages, fire etc. and their possible impacts and also carry out mock drill in this regard at regular interval of time.
6. The person authorised shall comply with the provisions outlined in the Central Pollution Control Board guidelines on ‘Implementing Liabilities for Environmental Damages due to Handling and Disposal of Hazardous Waste and Penalty’.
7. It is the duty of the authorised person to take prior permission of the State Pollution Control Board to close down the facility.
8. The imported hazardous and other wastes shall be fully insured for transit as well as for any accidental occurrence and its clean-up operation.
9. The record of consumption and fate of the imported hazardous and other wastes shall be maintained.
10. The hazardous and other waste which gets generated during recycling or reuse or recovery or pre-processing or utilisation of imported hazardous or other wastes shall be treated and disposed of as per specific conditions of authorisation.
11. The importer or exporter shall bear the cost of import or export and mitigation of damages if any.
12. An application for the renewal of an authorisation shall be made as laid down under these Rules.
13. Any other conditions for compliance as per the Guidelines issued by the Ministry of Environment, Forest and Climate Change or Central Pollution Control Board from time to time.
14. Annual return shall be filed by June 30th for the period ending 31st March of the year.

B. SPECIFIC CONDITIONS

For Trident Limited

Authorised Signatory

1. The industry will provide storage facility of sufficient capacity for category no. 33.1 to store for a period at least for 03 months.
2. The industry will maintain the record of manifest issued after lifting of hazardous waste in ETP Sludge and copy will be submitted to the Board regularly.
3. The industry shall handle the Hazardous Waste(s) strictly in accordance with the provisions of the Hazardous & Other Wastes (Management and Transboundary Movement) Rules, 2016 and guidelines issued by Central Pollution Control Board - Ministry of Environment & Forests and Climate Change, New Delhi.
4. The occupier generating hazardous waste/operator of a facility for collection and storage of hazardous waste shall maintain records of such operations in Form-3.
5. The occupier-operator of a facility shall send annual returns to the Board in form-4 on or before 30th day of the June following to the financial year to which that return relates.
6. The Authorized person shall report, about the accident which occurs at the hazardous waste storage/treatment site immediately to the Board
7. An occupier who is generating hazardous waste shall store his waste category wise on site in environmentally sound manner till its treatment
8. An occupier /generator shall not store hazardous wastes in open ground. It must be stored in an isolated site away from plant operational area.
9. The storage tank/container of the hazardous wastes should be in good condition and made of/or lined with an appropriate material which does not react with the waste contained in it and can withstand the physical and environmental conditions during storage and handling.
10. The occupier generating hazardous waste shall mark each container holding hazardous waste with the marking "HAZARDOUS WASTE" both in English and Punjabi.
11. The storage area should be fenced properly and a sign Board indicating "DANGER" and 'HAZARDOUS WASTE' sign & nature of the waste shall be placed at storage site
12. The occupier generating hazardous waste shall provide the required safety devices like safety mask, goggles, hand-gloves, gum boots etc to the workers for handling the hazardous waste. The occupier shall impart training to the personnel/workers for handling and storage of hazardous wastes.
13. There should be sufficient & efficient provisions to avoid water ground water contamination from waste storage of hazardous wastes
14. The occupier shall be responsible for any damage of life/or property during storage of his waste and will obtain Public Liability Insurance, wherever applicable
15. The occupier and operator of a facility also be liable to reinstate or restore damaged or destroyed elements of the environment at his cost, failing which the occupier or the operator of a facility, as the case may be, shall be liable to pay the entire cost of remediation or restoration and pay in advance an amount equal to the cost estimated by the State Pollution Control Board.
16. The industry shall take steps wherever feasible, for reduction in hazardous waste generated or recycled or reused.
17. The industry shall display on the data outside the main factory gate on display Board of size (6ft. * 4ft.) on quantity and nature of hazardous chemicals being used in the plant, water & air pollution and hazardous waste generated within factory premises.
18. Non compatible hazardous waste and material shall not be mixed in the same storage container.
19. The occupier of the transport facility shall ensure that the hazardous waste are shifted in the container in a manner suitable for handling storage and transport and the labelling and packaging shall be easily visible and able to withstand physical condition and climatic factors.
20. Packaging, Labelling of Used/Waste oil shall be in accordance with the provisions of the rules made by the Central Government under the Motor Vehicles Act, 1988 and other guidelines issued from time to time.
21. All hazardous waste container shall be provided with a general label as given in Form-8.
22. No transporter shall accept hazardous waste from any occupier for disposal unless, it is accompanied by five copies of the manifest (Form-9) as per the colour codes. The transporter shall give a copy of the manifest signed the dispatch to the occupier and retain the remaining four copies to be used as prescribed in sub-rule (5).
23. The occupier shall provide the transporter of seven copies of the manifest as per the colour code indicated below and all the copies shall be signed by the occupier :
Copy 1(White). Forwarded to the Punjab Pollution Control Board by the Occupier
Copy 2(Light Yellow) Signed by the Transporter and received by the Occupier
Copy 3(Pink). Retained by the Operator of facility
Copy 4(Orange). Returned to the Transporter by the operator of facility after accepting waste.
Copy 5(Green). Forward to Punjab Pollution control Board by the operator of facility after disposal.
Copy 6(Blue). returned to the occupier by the operator of facility after disposal.
Copy 7(Grey). To be sent by the operator of the facility to the Punjab Pollution Control Board of the occupier in case the occupier is in another state.

For Trident Limited

Authorised Signatory

24. The occupier shall provide the transporter with relevant information in form to regarding the hazardous

Annexure – IV

Annexure-IV

Regional Director

भारत सरकार
केन्द्रीय भूमि जल प्राधिकरण
जल संसाधन, नदी विकास
और गंगा संरक्षण मंत्रालय

Government of India
Central Ground Water Authority
Ministry of Water Resources,
River Development & Ganga Rejuvenation

CGWA/IND/Proj/2018-311-R

No.21-4(95)/NWR/CGWA/2007- 1430

Dated:- 12 JUL 2018

To

M/s Trident Ltd., (Paper Division)
Mansa Road, Village Dhaula, Block Barnala,
District Barnala, Punjab - 148101

Sub:- Renewal of NOC for ground water withdrawal to M/s Trident Ltd., (Paper Division) in respect of their existing Paper Manufacturing unit located at Village Dhaula, Block & District Barnala, Punjab - reg.

Refer to your application dated 13/04/2018 on the above cited subject. Based on recommendations of Regional Director, Central Ground Water Board, North Western Region, Chandigarh vide their office letter No 4(172)A-PB/TRIDENT(PCD)/NWR/SS&I/2017 dated 04/06/2018, and further deliberations on the subject, the renewal of NOC issued vide this office letter of even no. dated 30/04/2015 is hereby accorded to M/s Trident Ltd., (Paper Division) in respect of their existing Paper Manufacturing unit located at Village Dhaula, Block & District Barnala, Punjab. The renewed NOC is valid from 06/07/2018 to 05/07/2023 and subject to the following conditions:-

1. The firm may continue to abstract 6,168 cu.m/day (not exceeding 22,61,320 cu.m/year) ground water through seven (7) existing tube wells only. No additional ground water abstraction structures shall be constructed for this purpose without prior approval of the CGWA.
2. All the wells shall remain fitted with digital water meters by the firm at its own cost and monitoring of monthly ground water abstraction data of each well shall be recorded in a log book.
3. M/s Trident Ltd., (Paper Division), shall, continue to implement ground water recharge measures to the tune of 46,95,730 m^3/year for augmenting the ground water resources of the area. Firm shall also undertake periodic maintenance of recharge structures at its own cost.
4. The firm shall install two (2) additional piezometers for monthly ground water level monitoring. The firm shall install digital water level recorders on all the three (3) piezometers and telemetry system on one of the piezometers. The firm shall share the user ID and password of the telemetry system with the Regional Director, Central Ground Water Board, North Western Region, Chandigarh.
5. The ground water quality shall be monitored once in a year during pre monsoon period.

16/11, Jamnagar House, Mansingh Road, New Delhi-110011 Phone : (011) 23383561 Fax : 23382051, 23386743
Website: www.cgwa.noc.gov.in

भारत सुरक्षित जल - सुन्दर सुरक्षित कल

CONSERVE WATER - SAVE LIFE

For Trident Limited

Authorised Signatory

Scanned with CamScanner

Annexure – V

Annexure- V

No. 3013 ff /Sam Dt. 3417 /05.

To

The Business Head,
Abhishek Industry Ltd.,
Trident Group
Dhavla (Tehsil
Sanawad Distt. Khargone.

Sub:- Agreement for contract for bulk supplies of water from Upli disty. for industrial purpose.

Please find enclosed herewith the photo xerox copy of Agreement for contract for bulk supplies of water from Upli disty. for Industrial purpose. This is for your information.

Executive Engineer,
Sanawad Divn.,
Sanawad

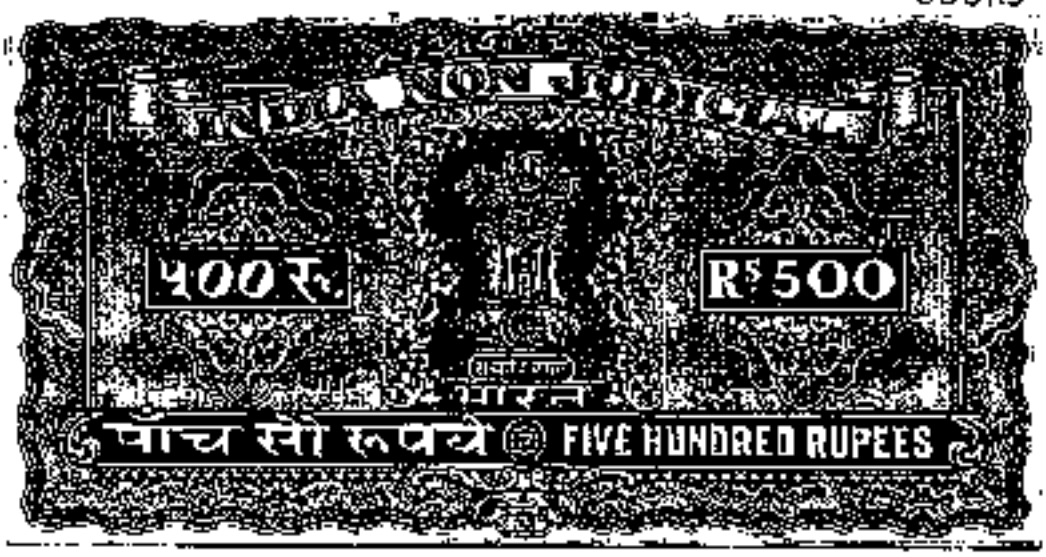
Encl:-
As above.

CC:- To Sub-Divisional Officer, Barwaha Sub-Divn.,
Barwaha for information.

For Trident Limited

Authorised Signatory

500Rs



AGREEMENT

Agreement for contract for bulk supplies of water from Uppli distributary's for industrial purpose.

Agreement entered into 6th day of May 2005, between the Govt. of Punjab acting at present through the Executive Engineer Sangrur Division I.D.Sangrur and here is after on behave of himself and his successor called the supplier on one part and direct /Vice president Abhishek Industries Limited, Trident Group, Sanghera, Barnala, Distt. Sangrur and here and after on behalf of himself, his executors, administrators & representatives called the consumer on the other part.

Whereas the supplier has agreed to supply and the consumer has agreed to take/pump canal water after relegging from the said outlet situated at RD 93490/R of Uppli distributary's of taking from Kotla Branch from RD 144660/R in Distt.Sangrur.subject to stipulation between the parties as follows:-

For Trident Limited

Authorised Signatory

For Trident Limited

Authorised Signatory

1. The Supplier subject to provision of clause (2) agrees to supply water from the said outlet or any other outlet along the canal, which under full supply conditions in the canal is designed to discharge 0.22 cusec at the outlet head but this supply will be subject to the conditions laid-down in section 32 of northern India canal and drainage Act VIII of 1873 as amended. This has been allowed by Punjab Govt. Memo No. 14/21/98-5 Irr (5) 6572 dated 07.01.1999 from the chief Engineer Canals Irrigation Department Punjab, Chandigarh.

2. The Supplier may stop or reduce the supply of water to the outlet such stoppage or reduction should be allowed only after prior notice of 30 days, when ever and so long as it is necessary to stop or reduce such supply of water for the purpose of executing any work order by competent authority for regulating the proper flow of water under his control or maintaining the establishment course of irrigation or extension there of. The consumer shall not be entitled to any compensation / remission of the charges here after specified in respect of losses rising from such stoppage or reduction by failure, stoppage / reduction of water by reason of any cause beyond the control of supplier. Every supply of canal water to which this contract does not apply shall be deemed to be given on the rules and subject to the conditions prescribed by northern India Canal & Drainage Act, VIII of 1873 as amended with the rules and notification there under applicable to this Punjab Distributary's and for the purpose of the section of the said act, the consumer should be deemed to be occupiers.

3. The consumer may stop drawl of the water in case it is not needed with 7 days prior intimation to suppliers authority. Further consumer may reduce the consumption / drawl of water through the outlet based on his actual requirements with an advance notice / information one day and consumer will pay to the supplier on the actual consumptions / drawl the water. The amount @ Rs. 32 /for 2500 Cft. Of the water (Rs. Thirty two for two thousand five hundred cft.) The bulk supply rate of canal water is as per Govt. of Punjab notification No. 10/22/94-Irr (2) / 10490 dated 13.05.2000 The rate for bulk supply can be increased and decreased as per instructions issued by Punjab Govt., time to time.

4. The supplier will adjust the outlet which show or from which can be calculated, this in a simple manner to be explained to the consumer, the discharge of water delivered by the outlet at any time and this fixation of outlet according to sanctioned design shall be the sole measure of the water supplied.

5. Payment shall be made by company / firm with in 30 days from the date of receipt of the bill from the Punjab irrigation dept. By the quantity of water supplied and if such payment is not so made, the Executive Engineer may refuse to allow any further supply of water after giving one months prior notice in writing.

For Trident Limited

Authorised Signatory

6. Should the consumer consider that the discharge of outlet under full supply condition is less by more than ten percent as specified in clause (1) when the provision of clause (2) is not in operation, and as measured in the manner written, the supplier shall check the discharge within period of Seven days, provided that during said period there shall have been no interruption of supply under the provision of clause (2). The supplier shall inform the consumers the result of the check. Should the supplier be satisfied that the discharge of the outlet is defective to the extent referred to the beginning of this clause, he shall cause the defect to be removed within a further period of 15 days.

7. Should the supplier be satisfied at any time that the discharge for the outlet under full supply condition is in excess by more than the 10 percent of the specified in clause (1), the supplier may, after giving 10 days previous notice to the consumer in writing, cause the outlet to be adjusted to give the correct discharge.

8. Provided that the consumer shall not be entitled to any compensation or remission of the charge due under clause (5) on account of shortage in supply vide clause (5) and similarly the supplier shall not be entitled to extra charge in respect of excess supply vide clause (6).

9. The consumers shall not be entitled to claim any remission of the charge due under clause on account of such failure or stoppage of supply of water or from causes mentioned under rule 20-(1-B) of the canal Act.

10. Section 54 of the Northern Indian Canal and Drainage Act No. VIII of 1873 as amended with mist -13 under this Act shall not apply so long as this agreement is in force. However in the event of water being taken after the expiry of this agreement, it shall be deemed to have been taken under the said Act, rules and notified action made there under, which shall forthwith apply unless and until a fresh agreement has been duly executed.

11. No permanent structure shall be constructed at the supply Head without the approval of the competent authority of Punjab Irrigation Department and all works within the area of the Department shall be constructed by the Deptt. at the cost of the company Tirpa.

For Trident Limited

Authorised Signatory

12. If any question difference or objection whatsoever shall arise in anyway connected with or arising out of this instrument within the meaning or out of operation of any part there of or with regard to any rights , duties liabilities of either party under this agreement , then the decision of any such matter as here in before provided for and has been so decided , including whether it has been finally decided accordingly or whether the agreement shall be terminated or has been rightly terminated and as regards the rights and obligation of the parties as the result of such termination, shall be referred for arbitration should be conducted as per the provision of Arbitration & conciliation Act , 1996 and his decision shall be final and binding on the parties concerned.

In witness the parties here to , with there respective hands, put their signatures on this 6th day of May' 2005.

Supplier

Executive Engineer
Sangrur Division I.B.
Sangrur.

Customer

Manjit Tara
Business Head
Abhishek Industries Limited
Trident Group , Village Dhoula,
Teh. Barnala, Distt. Sangrur (PB).

WITNESSES:

1. ~~Sub Divisional Officer,~~
~~Sanaur Sub Division~~

2. LADDA

WITNESSES

1. G. D. Nadhra

2.

For Trident Limited

Authorised Signatory

Annexure – VI

ANNEXURE VI

Subject : Hon'ble NGT Order in the matter of O.A. No. 682 of 2019 (Beant Singh Bajwa, President, National Anti-corruption Council vs State of Punjab & Ors)

INDEX

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1	Inspection Report of Trident Complex of M/s Trident Limited, Mansa Road, Village-Dhaula, District Barnala	1-9
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4	Annexure – III (Latest Consent to operate under Water Act,1974 issued by Punjab Pollution Control Board vide letter dated 30.03.2019, in case of M/s Trident Limited, Home Textile Division).	12-14
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8	Annexure – VII (Permission accorded, vide letter, dated 03.02.2003 to Trident Complex by Irrigation Works, Punjab to discharge its treated effluent from Paper & Chemical Division and Terry Towels Division into Dhanauda Drain).	26

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Inspection Report of Trident Complex of M/s Trident Limited, Mansa Road, Village-Dhaula, District Barnala, Punjab in pursuant to Hon'ble NGT Order in the matter of O.A. No. 662 of 2019 (Beant Singh Bajwa, President, National Anti-Corruption Council vs State of Punjab & Ors)

BACKGROUND

The Hon'ble National Green Tribunal, vide its order, dated 04.12.2019 directed as follows:

> *"A report has been furnished by the State PCB finding certain deficiencies and also finding unit compliant in certain respects. There is, however, nothing mentioned about extraction of ground water. We are of the view that a fresh independent and comprehensive inspection is necessary to ascertain the factual situation as the report furnished is not adequate in all the relevant facts which needs to be studied.*
> *Accordingly, we direct fresh inspection by joint Committee of CPCB, State PCB and District Magistrate, Barnala. The State PCB will be the nodal agency for coordination and compliance.*
> *The report may be furnished by 31.01.2020 by e-mail at judicial.ngt@gov.in*
> *A copy of this order be sent to CPCB, State PCB and District Magistrate, Barnala by e-mail for compliance.*
> *List again on 03.03.2020."*

In pursuant to above, a Committee comprising following members is constituted:

1. Shri T. P. S. Phoolka, IAS, Dy. Commissioner, Barnala
2. Shri Rajeev Sharma, Sr. Environmental Engineer, Punjab Pollution Control Board, Patiala
3. Shri Suneel Dave, Additional Director, Central Pollution Control Board, Delhi

The Committee has undertaken inspection and monitoring of the complex during 21-23 February, 2020 alongwith other officers listed hereunder:

On behalf of District Magistrate, Barnala
i) Sh. Gagandeep Singh, District Revenue Officer, Barnala
ii) Sh. Harbans Singh, Tehsildar, Barnala

On behalf of Punjab Pollution Control Board (PPCB):
i) Er. Harjeet Singh, Environmental Engineer, PPCB, Sangrur
ii) Er. Ramandeep Singh Sidhu, Asst. Environmental Engineer, PPCB, Sangrur.
iii) Sh. Janak Raj, Asst. Scientific Officer, PPCB, Patiala
iv) Sh. Shankarjeet Singh, Jr. Scientific Officer, PPCB Patiala
v) Sh. Dalvir Singh, Jr. Scientific Officer, Patiala

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GENERAL

01. The Trident Complex at Mandi Road, Village-Dhaula, District Barnala, Punjab is housing industrial units of M/s Trident Ltd. as per the details hereunder:

Sr. No.	Name of Unit	Division	Product	Category
1	Trident Ltd.	Paper & Chemical Division	Writing and Printing Paper	Paper
2	Trident Ltd.	Home Textile Division	Terry Towel	Textile
3	Lotus Processor Pvt. Ltd.	-	Dyed Fabric	Dyeing
4	Lotus Texpark Ltd	-	Dyed Fabric	Dyeing
5	Lotus Integrated Texpark Ltd.	Weaving Unit	Terry Towel	Weaving
6	Satyam Home Furnishing Pvt. Ltd.	-	Packing Material Packaging	General
7	Lotus Integrated Texpark Ltd.	Melange Unit	Yarn (Cotton and Blended)	Textile
8	Creative Line Colspin Pvt. Ltd.	Garment Unit	Terry Towels and Bath Robe	Textile
9	Trident Ltd.		Sulphuric Acid	Chemical

02. Out of above said 9 industrial units operating in Trident Complex, the units at Sr. No. 5, 6, 7 and 8 are considered to be dry units and generate no trade effluent or process emissions, and whereas unit at Sr. No. 9 generates process emission which are being scrubbed. The units at Sr. no. 3 and 4 are engaged in Fibre and Fabric dyeing and therefore generate effluents that are sent to effluent treatment plant of units at Sr. No. 2, namely M/s Trident Ltd. (HTD), whereas the steam requirement for these two dyeing units is met from the boilers attached with unit at Sr. no. 1, namely M/s Trident Ltd. (PCD).

03. Thus, units at Sr. No. 1 and 2, are major industrial units engaged in production of (i) Paper & Chemicals, and (ii) Home Textile Products. These two industrial units in the complex are responsible for major chunk of effluents and emissions generation. This report, therefore remains focussed on operation and performance of effluent treatment plant and emission control system installed by these two units to articulate factual status on what (effluent, emission, hazardous wastes and solid wastes) is discharged / disposed of by the said industrial unit.

04. All industrial units of the complex are having consent to operate under The Water Act, 1974 and The Air Act, 1981 and have interlinkages of sharing the utilities such as power generation, steam utilization, raw water consumption and effluent/waste treatment & disposal mentioned in the documents issued by central / state authority.

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05. The Paper & Chemicals Division (PCD) of M/s Trident Ltd. is consented to produce Writing & Printing Paper @ 415 Tonnes Per Day using wheat straw and hard wood and additional 35 TPD using Bleached Pulp. Whereas, Home Textile Division (HTD) of M/s Trident Ltd. is consented to produce Terry Towels @ 100 TPD, Dyed Yarn @ 20 TPD by using Cotton Yarn and Processed Chemicals. The consents to operate issued by Punjab Pollution Control Board are valid upto 31/03/2020 (Annexure I & II) in case of Paper & Chemical Division and upto 31/03/2020 (Annexure III & IV) in case of Home Textile Division under The Water Act, 1974 and The Air Act, 1981 respectively.

06. The raw water requirement of industrial complex is met from Irrigation Canal 25,000 kilo litre per day (kld) and Ground water 13,260 kld. Central Ground Water Authority, vide letter, dated 12/07/2018 has renewed no objection certificate (valid up to 05/07/2023) to the effect of allowing the withdrawal of 6,168 kld ground water through 7 (seven) tube wells; provided that M/s Trident Ltd. (PCD) shall continue to implement ground water recharge measures for augmenting the ground water resources of area (Annexure-V). The ground water is abstracted only during the shut period of canal water.

Further, Central Ground Water Authority, vide letter, dated 12/07/2018 has renewed no objection certificate (valid up to 05/07/2023) to the effect of allowing the withdrawal of 7,092 kld ground water through 5 (five) tube wells; provided that M/s Trident Ltd. (HTD) shall continue to implement ground water recharge measures for augmenting the ground water resources of area (Annexure-VI).

07. The permission has also been accorded, vide letter, dated 03.02.2003 to Trident Complex by Irrigation Works, Punjab to discharge its treated effluent from Paper & Chemical Division and Terry Towels Division into Dhanaula Drain subject to meeting the prescribed norms/standards (Annexure-VII).

08. In accordance to the original consent, dated 23/07/2012 under The Water Act, 1974 issued by PPCB, M/s Trident Ltd. (PCD) [the industry] was to discharge treated trade effluents to tune of 8,700 kld into the drain (Dhanaula) and 12,800 kld on land for plantation and the effluents discharged through the outlet shall conform to the standards notified. While discharging effluent into drain, the industry shall ensure that no water pollution problem is created in the area. Further, the industry shall plant (minimum three) suitable varieties of trees of the density required for plantation purposes to utilize 12,800 kld effluent on land of 160 acres inside the industrial premises.

09. Whereas the original consent (date of issue 23/07/2010, date of expiry 27/01/2011) under The Water Act, 1974 issued by PPCB, M/s Trident Ltd. (HTD) was permitted to discharge treated trade effluent to tune of 6,702 KLD into drain (Dhanaula) and 3,000 kld on land for plantation. This consent was later renewed (date of issue 10/02/2012 and date of expiry 17/04/2013).

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10. Considering the above, the industry i.e. M/s Trident Ltd. (HTD) was asked through revalidated consent dated 30/03/2013 issued by PPCB and was directed to commission Reverse Osmosis System and Multiple Effect Evaporators as mandated. The industry had installed Reverse Osmosis System of capacity 2500 KLD alongwith MEE in year 2014 with an investment of Rs. 33 crores. However, because of technological limitations the performance of Reverse Osmosis System got reduced year by year. Therefore, the industry had discarded Reverse Osmosis System.

11 M/s Trident Ltd. (PCD) is having consent (date of issue 23/07/2012 date of expiry 22/01/2013) issued by PPCB under The Air Act, 1981. Wherein 07 (seven sources of emissions identified as hereunder:

i) Boiler (FBC) of capacity – 12 tph
ii) Boiler (FBC) of capacity 50 tph
iii) Co-generation boiler (FBC) of capacity – 130 tph
iv) Co-generation boiler (FBC) of capacity – 130 tph
v) Recovery boiler of capacity 20 tph
vi) Recovery boiler of capacity – 50 tph
vii) Lime kiln of capacity – 200 tpd

This consent has been revalidated through the orders and extended upto 31/03/2020 vide order, dated 20/01/2016. It has been asked to ensure that no air pollution problem is created due to discharge of emission from the industry. Further, adequacy and efficacy of Air Pollution Control Devices shall be such that emissions discharged from the industry conform the norms/ standards notified.

12. Whereas, M/s Trident Ltd (HTD) has been consented under Air (Prevention & Control of Pollution) Act, 1981 vide order (date of issue 23.07.2010 date of expiry 22.01.2011) and revalidated / extended vide orders dated 15/03/2013 and 27/04/2016 with no specific sources of emission.

OBSERVATIONS:-

01. M/s Trident Ltd. (PCD) has provided effluent treatment plant based on aerobic treatment technology for low COD concentration which comprises unit operation of primary clarification, aeration, secondary clarification and collection before the treated effluent is disposed into drain or on land, whereas high COD concentration effluent is sent to anaerobic treatment comprises unit operation of bio-clarifier and sludge blanket reactor before getting mixed with low COD concentration stream to reduce ETP load.

02. The effluent samples collected from inlet and outlet of ETP (PCD) leading to disposal on land and into drain, conform the standards notified. Sodium Absorption Ratio (SAR) and Absorbable Organic Halides (AOx) also found to be at desirable level in the discharge.

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Table: 1
Analysis Results of Samples from ETP (PCD)

Sr. No	Parameters	Inlet to ETP (Paper Machine-1)	Inlet to ETP (Paper Machine-2 + washing)	Pipe Leading to Pantoon	Channel Leading to Drain	Outfall into Drain
1	pH	11.5	8.4	7.9	7.84	7.85
2	Total Suspended Solids (mg/l)	2010	510	34	34	37
3	Total Dissolved Solids (mg/l)	1170	2305	2017	2029	2030
4	Chemical Oxygen Demand (mg/l)	2300	1210	244	248	276
5	Bio-chemical Oxygen Demand (mg/l)	630	410	26	26	26
6	Sodium Absorption Ratio			6.32	6.56	6.08
7	AOx (kg / tonne of paper produced)			0.1339	0.0997	0.0886

03. M/s Trident Ltd. (HTD) has installed effluent treatment plant for its dyeing waste water containing screen, biological reactors based on activated sludge process, secondary clarifier and filration system. As directed by PPCB, the industry had installed Reverse Osmosis System of capacity 2500 KLD alongwith MEE in year 2014 with an investment of Rs. 33 crores. However, because of technological limitations the performance of Reverse Osmosis System got reduced year by year. Therefore, the industry had discarded Reverse Osmosis System. Currently, as directed by PPCB the industry has submitted International supply agreement, PERT Chart for completion of project by 30th June, 2020, dispatch document of equipment from Italy, proof of payment made for installation of Reverse Osmosis System with latest MBR technology.

04. The analysis results, of effluent samples from inlet and outlet of ETP (HTD) leading to disposal into drain, indicate conformity with standards notified.

Table: 2
Analysis Results of Samples from ETP (HTD)

Sr. No.	Parameters	Inlet to ETP	Outlet from ETP	Outfall into Drain
1	pH	10.1	8.13	8.05
2	Total Suspended Solid (mg/l)	240	19	22
3	Total Dissolved Solid (mg/l)	4410	1653	1660
4	Chemical Oxygen Demand (mg/l)	1312	80	90
5	Bio Chemical Oxygen Demand (mg/l)	325	10	11
6	Ammonical Nitrogen (mg/l)	BDL	0.63	0.49
7	Phenolic Compound (mg/l)	BDL	BDL	BDL
8	Total Chromium (mg/l)	BDL	BDL	BDL
9	Sulphide (mg/l)	1.6	1.0	1.0

5/9

Table: 3

Analysis Results of Samples for Drain Water Quality Monitoring

Sr. no.	Parameters	Upstream (approx. 100 m from discharge point of M/s Trident Ltd.) of Dhanula Drain	From outfall into drain (PCD)	From outfall into drain (HTDI)	Downstream (approx. 100 m from the discharge point of M/s Trident Ltd.) of Dhanula drain
1	pH	7.5	7.85	8.08	7.7
2	Total Suspended Solids (mg/l)	171	37	72	34
3	Total Dissolved Solids (mg/l)	675	2080	1660	1640
4	Chemical Oxygen Demand (mg/l)	160	276	65	140
5	Bio-chemical Oxygen Demand (mg/l)	33	28	11	24
6	Sulphide (mg/l)	1.2		1.0	1.0
7	Ammonical Nitrogen as N (mg/l)	1.4	-	0.49	0.6
8	Total Chrome (mg/l)	0.12	-	BDL	BDL
9	Oil & Grease (mg/l)	BDL	-	BDL	BDL
10	Phenolic Compound (mg/l)	BDL	-	BDL	BDL
11	Sodium Absorption Ratio	2.63	6.08	15.67	8.18
12	Residual Sodium Carbonate (meq/l)	0.9	-	-	0.5

Table: 4

Analysis Results of Samples for Ground Water Quality Monitoring

Sr. No.	Parameter	New Sidhu BKO Fathegarh Channa	Trident Complex, Dhaula (Tubewell No. 1)	Gobind Havali, Mansa Road, Dhaula
1	pH	7.8	7.9	7.4
2	Chemical Oxygen Demand (mg/l)	BDL	BDL	BDL
3	Bio-chemical Oxygen Demand (mg/l)	BDL	BDL	BDL
4	Total Suspended Solids (mg/l)	BDL	BDL	BDL
5	Total Dissolved Solids (mg/l)	596	891	998
6	Chloride (mg/l)	108	178	114
7	Sulphate (mg/l)	89	180	168
8	Sulphide (mg/l)	BDL	BDL	BDL
9	Ammonical Nitrogen (mg/l)	BDL	BDL	BDL
10	Total Hardness (mg/l)	280	285	354
11	Sodium Absorption Ratio	4.68	5.83	5.65

6/9

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05. The TDS level in ground water from the sample collected is a regional phenomenon and is in line with published regional data. All other parameters such as pH, COD, BOD, TSS are within permissible norms

06. M/s Trident Ltd. has 160 acres' land for plantation where PCD effluent is disposed and an additional 16.6 acres' land for plantation where HTD effluent is disposed. The data from Online Continuous Effluent Monitoring System (OCEMS) installed at the outlets of ETP(s) indicate that pH, TSS, COD and BOD are in conformity with the standards notified. Sodium Absorption Ratio (SAR) and Absorbable Organic Halides (AOx) is being monitored on periodic basis by manual testing. The OCEMS data available on servers of PPCB / CPCB which indicate discharge from M/s Trident Ltd. (PCD) are remained in compliance with the standards notified for that parameters which could be monitored through OCEMS.

RECOMMENDATIONS:-

1. An in depth study for Environmental Audit may be undertaken particularly in respect for Captive Power Plant, Paper & Towel Division to assess the status for compliance of environment norms/ standards. The finding(s) and recommendation(s) of study may be incorporated in the consents issued by PPCB for effectively compliance. This study on Environment Audit be undertaken in consultation with CPCB either by PPCB or through an institute/ consultant having technical expertise in the relevant field.

2. M/s Trident Ltd shall submit a detailed action plan for compliance of condition stipulated by PPCB through its consent orders, dated 10/02/2012 and 30/05/2013, wherein the industry was to install Reverse Osmosis System followed by Multiple Effect Evaporator in its H.T.D. This should be accomplished before 30th June 2020; as mandated by PPCB. The industry shall also submit time bound action plan by 15th March, 2020 for installation of Agitated Thin Film Dryer (ATFD) for the effective handling of MEE reject.

   M/s Trident Ltd (PCD) shall also gradually reduce water consumption and thus effluent generation. The entire treated effluent to be properly utilize on land for plantation / irrigation purpose. The industry should adopt scientific method for utilization of its treated water onto land plantation within its premises to maximize the utilization of treated water within the complex. An action plan in this regard shall also be submitted by M/s Trident Ltd. to PPCB on or before June 2020 detailing pipe network, land use, watering depth and type / age of plants etc. Having implemented the above, further two years from now i.e. by June 2022, M/s Trident Ltd. shall gets its treated water utilized to nearby farmers for irrigations purpose.

3. M/s Trident Ltd shall undertake a performance study of ETPs provided for its PCD. The inddistry shall undertake necessary project on its raw material washing stream which nearly contributes to 30% of the total ETP Load. The industry shall also submit a time bound action plan to PPCB on or before 15th March 2020 for removal of non-biodegradable COD. The Industry will also submit time bound action plan by 30th April, 2020 for removing of colour from its treated effluent going into the drain.

7/7

4. The trend analysis of historically data, recorded from OCEMS exhibits that the discharge from M/s Trident Ltd. remains within compliance zone. If such is the case then let M/s Trident Ltd. shall make all efforts to reuse treated effluent back to production process, resulting in conservation of water owing to less withdrawal of ground water or canal water. Besides, the reuse of treated effluent into the production process will affect efficiency of ETP as the treatment system would receive high concentration of BOD and COD. An action plan in order to reuse its treated water not impacting the TDS of the final treated effluent to be shared with PPCB, by 30th June, 2020.

5. The industry has provided pipe network for distribution of treated trade effluent on the plantation area, however, it was observed that certain patches of plantation was flooded with water and some patches were found completely dry because, the industry is uniformly distributing treated trade effluent to all cells of plantation area irrespective of the age of plants in that cell. The industry, therefore, is required to provide proper irrigation network for optimum utilization of treated waste water. The industry shall also provide electromagnetic flow meter at the outlet of each cell of plantation making more effective utilization of treated effluent.

6. The industry is not achieving the emission standards of 75 mg/Nm^3 from the stack of Chemical Recovery Plant (II) and Energy Section. However, the industry was given opportunity of personal hearing before Hon'ble Chairman of PPCB on 07.01.2020, wherein one of the decision of that the industry shall submit the detailed proposal w.r.t. upgradation of its existing APCDs to achieve the stack emission standard of 75 mg/Nm^3 within 03 months alongwith PERT chart for installation and commissioning of the same.

Table: 6
Analysis Results of Stack Emissions of PCD

Sr. No.	Sample Identification	Parameters	Results (mg/Nm^3)	Prescribed norms as per EC
1	Stack of CRP-II after APCD	Particulate Matter	80	75
2	Stack of CRP-I after APCD	Particulate Matter	82	150
3	Stack of Energy Section APCD	Particulate Matter	98	75

7. The industry (M/s Trident Ltd) will conduct detailed study for monitoring the ground water quality across the Dhanaula Drain in order to evaluate the impact of its treated water discharge onto Drain and submit the report by 30th April, 2020.

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3. The concept of 'Zero Liquid Discharged' be considered as minimal discharge of effluent, particularly from the industrial sectors reported upon. According to mechanics of fluids (more precisely thermodynamics) that a continuous operation bound to generate 'rejects', and / or 'blowdown' and / or 'bleed' due to process entropy, despite of whatever technology adopted. Punjab Pollution Control Board, therefore, has to examine what minimal disposal of effluent be permitted to M/s Trident Ltd. considering the production technology, scale of operation and utilization capacity.

(Sunil Dave)
Additional. Director
CPCB Delhi

(Rajeev Sharma)
Sr. Environmental Engineer
PPCB, Patiala

(T.P.S. Phoolka, IAS)
Dy. Commissioner
Barnala

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Annexure – VII

CANAL INTAKE DEC 2020					TRIDENTGROUP
BUSINESS UNIT	TPSC	LOCATION	DHAKA	MACHINE NAME/PROCESS NAME	TPSC BUDINGS
PROCESS :	WTP				

Canal Water Analysis Report-Dec 2020

Date	Intial reading	Final reading	TOTAL
1-Dec	9482074	9482074	0
2-Dec	9482074	9482074	0
3-Dec	9482074	9482074	0
4-Dec	9482074	9482074	0
5-Dec	9482074	9482074	0
6-Dec	9482074	9482074	0
7-Dec	9482074	9482074	0
8-Dec	9482074	9482074	0
9-Dec	9482074	9482074	0
10-Dec	9482074	9482074	0
11-Dec	9482074	9516663	34589
12-Dec	9516663	9554162	37499
13-Dec	9554162	9595134	40972
14-Dec	9595134	9631622	36488
15-Dec	9631622	9652038	20416
16-Dec	9652038	9673985	21947
17-Dec	9673985	9709651	35666
18-Dec	9709651	9746779	37128
19-Dec	9746779	9784900	38121
20-Dec	9784900	9822783	37883
21-Dec	9822783	9861908	39125
22-Dec	9861908	9903165	41257
23-Dec	9903165	9943147	39982
24-Dec	9943147	9983720	40573
25-Dec	9983720	10023087	39367
26-Dec	10023087	10064089	41002
27-Dec	10064089	10103933	39844
28-Dec	10103933	10142345	38412
29-Dec	10142345	10182603	40258
30-Dec	10182603	10211056	28453
31-Dec	10211056	10250312	39256
Average			24782

For Trident Group

Authorised Signatory

Annexure VI(b)

CANAL INTAKE JAN 2021					TRIDENT GROUP
BUSINESS UNIT	TPEC	LOCATION	DHAKLA	MACHINE NAME/PROCESS NAME	TPEC BUSINESS
PROCESS :	WTP				

Canal Water Analysis Report-Jan 2021

Date	Initial Reading	Final Reading	TOTAL
1-Jan	10250912	10288767	38455
2-Jan	10288767	10323954	35187
3-Jan	10323954	10354247	30293
4-Jan	10354247	10393504	39257
5-Jan	10393504	10434532	41028
6-Jan	10434532	10474258	39726
7-Jan	10474258	10511905	37647
8-Jan	10511905	10546818	34913
9-Jan	10546818	10585287	38469
10-Jan	10585287	10620416	35129
11-Jan	10620416	10661903	41487
12-Jan	10661903	10702160	40257
13-Jan	10702160	10741188	39028
14-Jan	10741188	10781114	39926
15-Jan	10781114	10814391	33277
16-Jan	10814391	10833919	19528
17-Jan	10833919	10857407	23488
18-Jan	10857407	10897192	39785
19-Jan	10897192	10934378	37186
20-Jan	10934378	10974032	39654
21-Jan	10974032	11012390	38358
22-Jan	11012390	11053724	41334
23-Jan	11053724	11094120	40396
24-Jan	11094120	11135110	40990
25-Jan	11135110	11172903	37793
26-Jan	11172903	11212816	39913
27-Jan	11212816	11250443	37627
28-Jan	11250443	11286369	35926
29-Jan	11286369	11321725	35356
30-Jan	11321725	11352640	30915
31-Jan	11352640	11391570	38930
Average			36815

For Trident Limited

Authorised Signatory

ANNEXURE VI(C)

CANAL INTAKE FEB 2021					TRIDENTGROUP
BUSINESS UNIT	TPED	LOCATION	CHALA	MACHINE NAME/PROCESS NAME	TRICOGNIZANCE
PROCESS	WTP				

Canal Water Analysis Report-FEB 2021

Date	INTIAL READING	FINAL READING	TOTAL
1-Feb	11391570	11430190	38620
2-Feb	11430190	11470405	40215
3-Feb	11470405	11499824	29419
4-Feb	11499824	11531122	31298
5-Feb	11531122	11570227	39105
6-Feb	11570227	11570227	0
7-Feb	11570227	11570227	0
8-Feb	11570227	11570227	0
9-Feb	11570227	11570227	0
10-Feb	11570227	11570227	0
11-Feb	11570227	11570227	0
12-Feb	11570227	11570227	0
13-Feb	11570227	11570227	0
14-Feb	11570227	11570227	0
15-Feb	11570227	11570227	0
16-Feb	11570227	11570227	0
17-Feb	11570227	11570227	0
18-Feb	11570227	11570227	0
19-Feb	11570227	11611481	41254
20-Feb	11611481	11649957	38476
21-Feb	11649957	11688086	38129
22-Feb	11688086	11726073	37987
23-Feb	11726073	11766571	40498
24-Feb	11766571	11806112	39541
25-Feb	11806112	11845236	39124
26-Feb	11845236	11885895	40659
27-Feb	11885895	11921642	35747
28-Feb	11921642	11957644	36002
	Average		20217

For Trident Limited

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Annexure VII (d)

CANAL INTAKE MAR 2021					TRIDENT GROUP
BUSINESS/ UNIT	TPEC	LOCATION	DHAULA	MACHINE NAME/PROCESS NAME	TPEC BUSINESS
PROCESS:	WTP				

Canal Water Analysis Report – Mar 2021

Date	INTIAL READING	FINAL READING	TOTAL
01-Mar	11957644	11989848	32204
02-Mar	11989848	12034064	44215
03-Mar	12034064	12075159	41095
04-Mar	12075159	12101851	26692
05-Mar	12101851	12128542	26692
06-Mar	12128542	12150078	21536
07-Mar	12150078	12191173	41095
08-Mar	12191173	12235388	44215
09-Mar	12235388	12262080	26692
10-Mar	12262080	12294285	32204
11-Mar	12294285	12320977	26692
12-Mar	12320977	12378408	57432
13-Mar	12378408	12413496	35087
14-Mar	12413496	12432595	19099
15-Mar	12432595	12456663	24068
16-Mar	12456663	12491750	35087
17-Mar	12491750	12523955	32204
18-Mar	12523955	12559042	35087
19-Mar	12559042	12594130	35087
20-Mar	12594130	12623535	29405
21-Mar	12623535	12664630	41095
22-Mar	12664630	12708845	44215
23-Mar	12708845	12759525	50680
24-Mar	12759525	12781060	21536
25-Mar	12781060	12816148	35087
26-Mar	12816148	12848952	32204
27-Mar	12848952	12889447	41095
28-Mar	12889447	12924534	35087
29-Mar	12924534	12956739	32204
30-Mar	12956739	12986144	29405
31-Mar	12986144	13027239	41095
Average			34503

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VII
Annexure (B)

CANAL INTAKE APR 2021					TRIDENT GROUP
BUSINESS UNIT	TPEC	LOCATION	DHAULA	MACHINE NAME/PROCESS NAME	TPEC BUSINESS
PROCESS :	WTP				

Canal Water Analysis Report – Apr 2021			
Date	INTIAL READING	FINAL READING	TOTAL
01-Apr	13027239	13069884	42645
02-Apr	13069884	13096575	26691
03-Apr	13096575	13139220	42645
04-Apr	13139220	13177271	38051
05-Apr	13177271	13218366	41095
06-Apr	13218366	13261011	42645
07-Apr	13261011	13286379	25368
08-Apr	13286379	13327473	41094
09-Apr	13327473	13359677	32204
10-Apr	13359677	13394764	35087
11-Apr	13394764	13432816	38052
12-Apr	13432816	13471633	38817
13-Apr	13471633	13480142	8509
14-Apr	13480142	13480142	0
15-Apr	13480142	13480142	0
16-Apr	13480142	13480142	0
17-Apr	13480142	13480142	0
18-Apr	13480142	13480142	0
19-Apr	13480142	13480142	0
20-Apr	13480142	13480142	0
21-Apr	13480142	13480142	0
22-Apr	13480142	13480142	0
23-Apr	13480142	13480142	0
24-Apr	13480142	13480142	0
25-Apr	13480142	13480142	0
26-Apr	13480142	13506832	26690
27-Apr	13480142	13533522	26690
28-Apr	13506832	13552621	19099
29-Apr	13533522	13571720	19099
30-Apr	13552621	Average	18149

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Annexure (4)

CANAL INTAKE MAY 2021					TRIDENT GROUP
BUSINESS/ UNIT	TPEC	LOCATION	DHAULA	MACHINE NAME/PROCESS NAME	TPEC BUSINESS
PROCESS :	WTP				

Canal Water Analysis Report – May 2021

Date	INTIAL READING	FINAL READING	TOTAL
01-May	13571720	13594509	22789
02-May	13594509	13621200	26691
03-May	13621200	13649237	28037
04-May	13649237	13681441	32204
05-May	13681441	13712235	30794
06-May	13712235	13741640	29405
07-May	13741640	13776727	35087
08-May	13776727	13804764	28037
09-May	13804764	13838399	33635
10-May	13838399	13866436	28037
11-May	13866436	13891804	25368
12-May	13891804	13924008	32204
13-May	13924008	13956212	32204
14-May	13956212	13989847	33635
15-May	13989847	14022051	32204
16-May	14022051	14050088	28037
17-May	14050088	14080882	30794
18-May	14080882	14113086	32204
19-May	14113086	14149645	36559
20-May	14149645	14189208	39563
21-May	14189208	14230302	41094
22-May	14230302	14271393	41091
23-May	14271393	14311340	39947
24-May	14311340	14312184	844
25-May	14312184	14312184	0
26-May	14312184	14312184	0
27-May	14312184	14312184	0
28-May	14312184	14340221	28037
29-May	14340221	14375308	35087
30-May	14375308	14396843	21535
31-May	14396843	14396843	0
Average			26617

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Annexure – VIII

ANNEXURE VIII(A)

TUBEWELL WATER ABSTRACTION RECORD					/// TRIDENT GROUP
BUSINESS UNIT	PCD-WTP	LOCATION	PCD-WTP	MACHINE NAME/PROCESS NAME	TUBEWELL NO. 6
PROCESS :	RAW WATER TREATMENT PLANT - PAPER DIVISION				

Month: December Year: 2020

Date	Initial Reading	Final Reading	Total (m³)	SMR Supervisor Signature
1	356884	356884	0	
2	356884	356884	0	
3	356884	356884	0	
4	356884	356884	0	
5	356884	356884	0	
6	356884	356884	0	
7	356884	356884	0	
8	356884	356884	0	
9	356884	356884	0	
10	356884	356884	0	
11	356884	356884	0	
12	356884	356884	0	
13	356884	356884	0	
14	356884	356884	0	
15	356884	356884	0	
16	356884	356884	0	
17	356884	356884	0	
18	356884	356884	0	
19	356884	356884	0	
20	356884	356884	0	
21	356884	356884	0	
22	356884	356884	0	
23	356884	356884	0	
24	356884	356884	0	
25	356884	356884	0	
26	356884	356884	0	
27	356884	356884	0	
28	356884	356884	0	
29	356884	356884	0	
30	356884	356884	0	
31	356884	356884	0	

For Tride it Waste :

Authorised Signatory

TUBEWELL WATER ABSTRACTION RECORD					TRIDENT GROUP
BUSINESS/UNIT	PCD-WTP	LOCATION	PCD-WTP	MACHINE NAME/PROCESS NAME	TUBEWELL NO. 7
PROCESS :	RAW WATER TREATMENT PLANT - PAPER DIVISION				

Month: December Year: 2020

Date	Initial Reading	Final Reading	Total (m³)	Shift Supervisor Signature
1	529638	529638	0	
2	529638	529638	0	
3	529638	529638	0	
4	529638	529638	0	
5	529638	529638	0	
6	529638	529638	0	
7	529638	529638	0	
8	529638	529638	0	
9	529638	529638	0	
10	529638	529638	0	
11	529638	529638	0	
12	529638	529638	0	
13	529638	529638	0	
14	529638	529638	0	
15	529638	529638	0	
16	529638	529638	0	
17	529638	529638	0	
18	529638	529638	0	
19	529638	529638	0	
20	529638	529638	0	
21	529638	529638	0	
22	529638	529638	0	
23	529638	529638	0	
24	529638	529638	0	
25	529638	529638	0	
26	529638	529638	0	
27	529638	529638	0	
28	529638	529638	0	
29	529638	529638	0	
30	529638	529638	0	
31	529638	529638	0	

For Trident Limited

HOD's Signature:

Authorized Signatory

TUBEWELL WATER ABSTRACTION RECORD

TRIDENT GROUP

BUSINESS UNIT	PCD-WTP	LOCATION	PCD-WTP	MACHINE NAME/PROCESS NAME	TUBEWELL NO. 8
PROCESS :	RAW WATER TREATMENT PLANT - PAPER DIVISION				

Year: 2016

Month: December

Date	Initial Reading	Final Reading	Total (m³)	Shift Supervisor Signature
1	1614016	1614016	0	
2	1614016	1614016	0	
3	1614016	1614016	0	
4	1614016	1614016	0	
5	1614016	1614016	0	
6	1614016	1614016	0	
7	1614016	1614016	0	
8	1614016	1614016	0	
9	1614016	1614016	0	
10	1614016	1614016	0	
11	1614016	1614016	0	
12	1614016	1614016	0	
13	1614016	1614016	0	
14	1614016	1614016	0	
15	1614016	1614016	0	
16	1614016	1614016	0	
17	1614016	1614016	0	
18	1614016	1614016	0	
19	1614016	1614016	0	
20	1614016	1614016	0	
21	1614016	1614016	0	
22	1614016	1614016	0	
23	1614016	1614016	0	
24	1614016	1614016	0	
25	1614016	1614016	0	
26	1614016	1614016	0	
27	1614016	1614016	0	
28	1614016	1614016	0	
29	1614016	1614016	0	
30	1614016	1614016	0	
31	1614016	1614016	0	

For Trident [illegible]

100% Signature:

Authorised Signatory

TUBEWELL WATER ABSTRACTION REVIEW

BUSINESS/ UNIT	PCD-WTP	LOCATION	PCD-WTP	MACHINE NAME/PROCESS NAME	TUBEWELL NO. 8
PROCESS :	RAW WATER TREATMENT PLANT - PAPER DIVISION				

Month: December Year: 2022

Date	Initial Reading	Final Reading	Total (m³)	Shift Supervisor Signature
1	484330	484330	0	
2	484330	484330	0	
3	484330	484330	0	
4	484330	484330	0	
5	484330	484330	0	
6	484330	484330	0	
7	484330	484330	0	
8	484330	484330	0	
9	484330	484330	0	
10	484330	484330	0	
11	484330	484330	0	
12	484330	484330	0	
13	484330	484330	0	
14	484330	484330	0	
15	484330	484330	0	
16	484330	484330	0	
17	484330	484330	0	
18	484330	484330	0	
19	484330	484330	0	
20	484330	484330	0	
21	484330	484330	0	
22	484330	484330	0	
23	484330	484330	0	
24	484330	484330	0	
25	484330	484330	0	
26	484330	484330	0	
27	484330	484330	0	
28	484330	484330	0	
29	484330	484330	0	
30	484330	484330	0	
31	484330	484330	0	

For Tride

Authorised Signatory

HOD's Signature:

TUBEWELL WATER ABSTRACTION RECORD					TRIDENT GROUP
BUSINESS UNIT	PDD-WTP	LOCATION	PDD-WTP	MACHINE NAME/PROCESS NAME	TUBEWELL NO. 19
PROCESS :	RAW WATER TREATMENT PLANT - PAPER DIVISION				

Month: December Year: 2020

Date	Initial Reading	Final Reading	Total (m³)	EHS Supervisor Signature
1	368932	368932	0	
2	368932	368932	0	
3	368932	368932	0	
4	368932	368932	0	
5	368932	368932	0	
6	368932	368932	0	
7	368932	368932	0	
8	368932	368932	0	
9	368932	368932	0	
10	368932	368932	0	
11	368932	368932	0	
12	368932	368932	0	
13	368932	368932	0	
14	368932	368932	0	
15	368932	368932	0	
16	368932	368932	0	
17	368932	368932	0	
18	368932	368932	2	
19	368932	368932	0	
20	368932	368932	0	
21	368932	368932	0	
22	368932	368932	0	
23	368932	368932	0	
24	368932	368932	0	
25	368932	368932	0	
26	368932	368932	0	
27	368932	368932	0	
28	368932	368932	0	
29	368932	368932	0	
30	368932	368932	0	
31	368932	368932	0	

For Tride nt Limited

HOD's Signature:

TUBEWELL WATER ABSTRACTION RECORD					/// TRIDENT GROUP
BUSINESS/UNIT	PCD-WTP	LOCATION	PCD-WTP	MACHINE NAME/PROCESS NAME	TUBEWELL NO. 11
PROCESS :	RAW WATER TREATMENT PLANT - PAPER DIVISION				

Month: December Year: 2012

Date	Initial Reading	Final Reading	Total (m³)	Shift Supervisor Signature
1	164310	164310	0	
2	164310	164310	0	
3	164310	164310	0	
4	164310	164310	0	
5	164310	164310	0	
6	164310	164310	0	
7	164310	164310	0	
8	164310	164310	0	
9	164310	164310	0	
10	164310	164310	0	
11	164310	164310	0	
12	164310	164310	0	
13	164310	164310	0	
14	164310	164310	0	
15	164310	164310	0	
16	164310	164310	0	
17	164310	164310	0	
18	164310	164310	0	
19	164310	164310	0	
20	164310	164310	0	
21	164310	164310	0	
22	164310	164310	0	
23	164310	164310	0	
24	164310	164310	0	
25	164310	164310	0	
26	164310	164310	0	
27	164310	164310	0	
28	164310	164310	0	
29	164310	164310	0	
30	164310	164310	0	
31	164310	164310	0	

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TUBEWELL WATER ABSTRACTION RECORD					TRIDENT GROUP
BUSINESS/UNIT	PCD-WTP	LOCATION	PCD-WTP	MACHINE NAME/PROCESS NAME	TUBEWELL NO. 12
PROCESS :	RAW WATER TREATMENT PLANT - PAPER DIVISION				

Month: December Year: 2020

Date	Initial Reading	Final Reading	Total (m^3)	Shift Supervisor Signature
1	92897.8	92897.8	0	
2	92897.8	92897.8	0	
3	92897.8	92897.8	0	
4	92897.8	92897.8	0	
5	92897.8	92897.8	0	
6	92897.8	92897.8	0	
7	92897.8	92897.8	0	
8	92897.8	92897.8	0	
9	92897.8	92897.8	0	
10	92897.8	92897.8	0	
11	92897.8	92897.8	0	
12	92897.8	92897.8	0	
13	92897.8	92897.8	0	
14	92897.8	92897.8	0	
15	92897.8	92897.8	0	
16	92897.8	92897.8	0	
17	92897.8	92897.8	0	
18	92897.8	92897.8	0	
19	92897.8	92897.8	0	
20	92897.8	92897.8	0	
21	92897.8	92897.8	0	
22	92897.8	92897.8	0	
23	92897.8	92897.8	0	
24	92897.8	92897.8	0	
25	92897.8	92897.8	0	
26	92897.8	92897.8	0	
27	92897.8	92897.8	0	
28	92897.8	92897.8	0	
29	92897.8	92897.8	0	
30	92897.8	92897.8	0	
31	92897.8	92897.8	0	

For Trident Limited.

Authorised Signatory

HOD's Signature:

ANNEXURE VIII(b)

TUBEWELL WATER ABSTRACTION RECORD					TRIDENT GROUP
BUSINESS/UNIT	PCD-WTP	LOCATION	PCD-WTP	MACHINE NAME/PROCESS NAME	TUBEWELL NO. 6
PROCESS :	RAW WATER TREATMENT PLANT - PAPER DIVISION				

Month: January Year: 2011

Date	Initial Reading	Final Reading	Total (m³)	SWR Supervisor Signature
1	356884	356884	0	
2	356884	356884	0	
3	356884	356884	0	
4	356884	356884	0	
5	356884	356884	0	
6	356884	356884	0	
7	356884	356884	0	
8	356884	356884	0	
9	356884	356884	0	
10	356884	356884	0	
11	356884	356884	0	
12	356884	356884	0	
13	356884	356884	0	
14	356884	356884	0	
15	356884	356884	0	
16	356884	356884	0	
17	356884	356884	0	
18	356884	356884	0	
19	356884	356884	0	
20	356884	356884	0	
21	356884	356884	0	
22	356884	356884	0	
23	356884	356884	0	
24	356884	356884	0	
25	356884	356884	0	
26	356884	356884	0	
27	356884	356884	0	
28	356884	356884	0	
29	356884	356884	0	
30	356884	356884	0	
31	356884	356884	0	

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HOD's Signature:

TUBEWELL WATER ABSTRACTION RECORD

TRIDENT GROUP

BUSINESS/UNIT	PCD-WTP	LOCATION	PCD-WTP	MACHINE NAME/PROCESS NAME	TUBEWELL NO. 7
PROCESS:	RAW WATER TREATMENT PLANT -PAPER DIVISION				

Month: January Year: 2021

Date	Initial Reading	Final Reading	Total (m^3)	Shift Supervisor Signature
1	528638	528638	0	
2	528638	528638	0	
3	528638	528638	0	
4	528638	528638	0	
5	528638	528638	0	
6	528638	528638	0	
7	528638	528638	0	
8	528638	528638	0	
9	528638	528638	0	
10	528638	528638	0	
11	528638	528638	0	
12	528638	528638	0	
13	528638	528638	0	
14	528638	528638	0	
15	528638	528638	0	
16	528638	528638	0	
17	528638	528638	0	
18	528638	528638	0	
19	528638	528638	0	
20	528638	528638	0	
21	528638	528638	0	
22	528638	528638	0	
23	528638	528638	0	
24	528638	528638	0	
25	528638	528638	0	
26	528638	528638	0	
27	528638	528638	0	
28	528638	528638	0	
29	528638	528638	0	
30	528638	528638	0	
31	528638	528638	0	

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HOD's Signature

TUBEWELL WATER ABSTRACTION RECORD

BUSINESS UNIT	PCD-WTP	LOCATION	PCD-WTP	MACHINE NAME/PROCESS NAME	TUBEWELL NO. 8
PROCESS :	RAW WATER TREATMENT PLANT - PAPER DIVISION				

Month: January Year: 2020

Date	Initial Reading	Final Reading	Total (m^3)	SWR Supervisor Signature
1	1044010	1044010	0	
2	1044010	1044010	0	
3	1044010	1044010	0	
4	1044010	1044010	0	
5	1044010	1044010	0	
6	1044010	1044010	0	
7	1044010	1044010	0	
8	1044010	1044010	0	
9	1044010	1044010	0	
10	1044010	1044010	0	
11	1044010	1044010	0	
12	1044010	1044010	0	
13	1044010	1044010	0	
14	1044010	1044010	0	
15	1044010	1044010	0	
16	1044010	1044010	0	
17	1044010	1044010	0	
18	1044010	1044010	0	
19	1044010	1044010	0	
20	1044010	1044010	0	
21	1044010	1044010	0	
22	1044010	1044010	0	
23	1044010	1044010	0	
24	1044010	1044010	0	
25	1044010	1044010	0	
26	1044010	1044010	0	
27	1044010	1044010	0	
28	1044010	1044010	0	
29	1044010	1044010	0	
30	1044010	1044010	0	
31	1044010	1044010	0	

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HOD's Signature:

TUBEWELL WATER ABSTRACTION RECORD					TRIDENT GROUP
BUSINESS/UNIT	PCD-WTP	LOCATION	PCD-WTP	MACHINE NAME/PROCESS NAME	TUBEWELL NO. 9
PROCESS :	RAW WATER TREATMENT PLANT - PAPER DIVISION				

Month: January Year: 2021

Date	Initial Reading	Final Reading	Total (m^3)	Shift Supervisor Signature
1	484330	484330	0	
2	484330	484330	0	
3	484330	484330	0	
4	484330	484330	0	
5	484330	484330	0	
6	484330	484330	0	
7	484330	484330	0	
8	484330	484330	0	
9	484330	484330	0	
10	484330	484330	0	
11	484330	484330	0	
12	484330	484330	0	
13	484330	484330	0	
14	484330	484330	0	
15	484330	484330	0	
16	484330	484330	0	
17	484330	484330	0	
18	484330	484330	0	
19	484330	484330	0	
20	484330	484330	0	
21	484330	484330	0	
22	484330	484330	0	
23	484330	484330	0	
24	484330	484330	0	
25	484330	484330	0	
26	484330	484330	0	
27	484330	484330	0	
28	484330	484330	0	
29	484330	484330	0	
30	484330	484330	0	
31	484330	484330	0	

For Trident Limited

Authorised Signatory

HOD's Signature:

TUBEWELL WATER ABSTRACTION RECORD

TRIDENT GROUP

BUSINESS/ UNIT	PCD-WTP	LOCATION	PCD-WTP	MACHINE NAME/PROCESS NAME	TUBEWELL NO. 10
PROCESS :	RAW WATER TREATMENT PLANT - PAPER DIVISION				

Month: January Year: 2021

Date	Initial Reading	Final Reading	Total (m^3)	Shift Supervisor Signature
1	816392	816888	0	
2	816892	816892	0	
3	816892	816892	0	
4	816892	816892	0	
5	816892	816892	0	
6	816892	816892	0	
7	816892	816892	0	
8	816892	816892	0	
9	816892	816892	0	
10	816892	816892	0	
11	816892	816892	0	
12	816892	816892	0	
13	816892	816892	0	
14	816892	816892	0	
15	816892	816892	0	
16	816892	816892	0	
17	816892	816892	0	
18	816892	816892	0	
19	816892	816892	0	
20	816892	816892	0	
21	816892	816892	0	
22	816892	816892	0	
23	816892	816892	0	
24	816892	816892	0	
25	816892	816892	0	
26	816892	816892	0	
27	816892	816892	0	
28	816892	816892	0	
29	816892	816892	0	
30	816892	816892	0	
31	816892	816892	0	

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HOD's Signature:

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TUBEWELL WATER ABSTRACTION RECORD					/// TRIDENT GROUP
BUSINESS/UNIT	POD-WTP	LOCATION	POD-WTP	MACHINE NAME/PROCESS NAME	TUBEWELL NO. 11
PROCESS :	RAW WATER TREATMENT PLANT - PAPER DIVISION				

Month: January Year: 2021

Date	Initial Reading	Final Reading	Total (m³)	Shift Supervisor Signature
1	164310	164310	0	
2	164310	164310	0	
3	164310	164310	0	
4	164310	164310	0	
5	164310	164310	0	
6	164310	164310	0	
7	164310	164310	0	
8	164310	164310	0	
9	164310	164310	0	
10	164310	164310	0	
11	164310	164310	0	
12	164310	164310	0	
13	164310	164310	0	
14	164310	164310	0	
15	164310	164310	0	
16	164310	164310	0	
17	164310	164310	0	
18	164310	164310	0	
19	164310	164310	0	
20	164310	164310	0	
21	164310	164310	0	
22	164310	164310	0	
23	164310	164310	0	
24	164310	164310	0	
25	164310	164310	0	
26	164310	164310	0	
27	164310	164310	0	
28	164310	164310	0	
29	164310	164310	0	
30	164310	164310	0	
31	164310	164310	0	

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Author's Signature:

Authorised Signatory

TUBEWELL WATER ABSTRACTION RECORD					TRIDENT GROUP
BUSINESS/ UNIT	PCD-WTP	LOCATION	PCD-WTP	MACHINE NAME/PROCESS NAME	TUBEWELL NO. 12
PROCESS :	RAW WATER TREATMENT PLANT - PAPER DIVISION				

Month: January Year: 2021

Date	Initial Reading	Final Reading	Total (m³)	Shift Supervisor Signature
1	9244938	9245938	0	
2	9245938	9246938	0	
3	9246938	9246938	0	
4	9246938	9246938	0	
5	9246938	9246938	0	
6	9246938	9246938	0	
7	9246938	9246938	0	
8	9246938	9246938	0	
9	9246938	9246938	0	
10	9246938	9246938	0	
11	9246938	9246938	0	
12	9246938	9246938	0	
13	9246938	9246938	0	
14	9246938	9246938	0	
15	9246938	9246938	0	
16	9246938	9246938	0	
17	9246938	9246938	0	
18	9246938	9246938	0	
19	9246938	9246938	0	
20	9246938	9246938	0	
21	9246938	9246938	0	
22	9246938	9246938	0	
23	9246938	9246938	0	
24	9246938	9246938	0	
25	9246938	9246938	0	
26	9246938	9246938	0	
27	9246938	9246938	0	
28	9246938	9246938	0	
29	9246938	9246938	0	
30	9246938	9246938	0	
31	9246938	9246938	0	

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Annexure VIII(C)

TUBEWELL WATER ABSTRACTION RECORD

TRIDENT GROUP

BUSINESS/ UNIT	PCD-WTP	LOCATION	PCD-WTP	MACHINE NAME/PROCESS NAME	TUBEWELL NO. 06
PROCESS :	RAW WATER TREATMENT PLANT - PAPER DIVISION				

Year: [illegible]

Month: [illegible]

Date	Initial Reading	Final Reading	Total (m³)	Shift Supervisor Signature
1	[illegible]	[illegible]	0	
2	[illegible]	[illegible]	0	
3	[illegible]	[illegible]	0	
4	[illegible]	[illegible]	0	
5	[illegible]	[illegible]	0	
6	[illegible]	[illegible]	0	
7	[illegible]	[illegible]	0	
8	[illegible]	[illegible]	0	
9	[illegible]	[illegible]	0	
10	[illegible]	[illegible]	0	
11	[illegible]	[illegible]	0	
12	[illegible]	[illegible]	0	
13	[illegible]	[illegible]	0	
14	[illegible]	[illegible]	0	
15	[illegible]	[illegible]	0	
16	[illegible]	[illegible]	0	
17	[illegible]	[illegible]	0	
18	[illegible]	[illegible]	0	
19	[illegible]	[illegible]	0	
20	[illegible]	[illegible]	0	
21	[illegible]	[illegible]	0	
22	[illegible]	[illegible]	0	
23	[illegible]	[illegible]	0	
24	[illegible]	[illegible]	0	
25	[illegible]	[illegible]	0	
26	[illegible]	[illegible]	0	
27	[illegible]	[illegible]	0	
28	[illegible]	[illegible]	0	

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TUBEWELL WATER ABSTRACTION RECORD					TRIDENT GROUP
BUSINESS UNIT	PCD-WTP	LOCATION	PCD-WTP	MACHINE NAME/PROCESS NAME	TUBEWELL NO. 7
PROCESS :	RAW WATER TREATMENT PLANT - PAPER DIVISION				

Month: February Year: 2021

Date	Initial Reading	Final Reading	Total (m^3)	Shift Supervisor Signature
1	520679	520678	0	
2	520679	520678	0	
3	520678	520679	0	
4	520679	520678	0	
5	520678	520678	0	
6	520678	520678	0	
7	520678	520678	0	
8	520678	520678	0	
9	520678	520678	0	
10	520679	520678	0	
11	520679	520679	0	
12	520679	520678	0	
13	520678	520678	0	
14	520679	520678	0	
15	520679	520678	0	
16	520678	520678	0	
17	520678	520679	0	
18	520678	520678	0	
19	520678	520678	0	
20	520679	520679	0	
21	520679	520679	0	
22	520678	520679	0	
23	520678	520679	0	
24	520678	520678	0	
25	520678	520678	0	
26	520678	520678	0	
27	520678	520678	0	
28	520678	520678	0	
29				
30				
31				

Authorised Signatory

HOD's Signature:

TUBEWELL WATER ABSTRACTION RECORD

TRIDENT GROUP

BUSINESS/ UNIT	PCD-WTP	LOCATION	PCD-WTP	MACHINE NAME/PROCESS NAME	TUBEWELL NO. 8
PROCESS :	RAW WATER TREATMENT PLANT - PAPER DIVISION				

Month: February Year: 2021

Date	Initial Reading	Final Reading	Total (m³)	Shift Supervisor Signature
1	10[illegible]0	10[illegible]0	0	
2	10[illegible]0	10[illegible]0	0	
3	10[illegible]0	10[illegible]0	0	
4	10[illegible]0	10[illegible]0	0	
5	10[illegible]0	10[illegible]0	0	
6	10[illegible]0	10[illegible]0	0	
7	10[illegible]0	10[illegible]0	0	
8	10[illegible]0	10[illegible]0	0	
9	10[illegible]0	10[illegible]0	0	
10	10[illegible]0	10[illegible]0	0	
11	10[illegible]0	10[illegible]0	0	
12	10[illegible]0	10[illegible]0	0	
13	10[illegible]0	10[illegible]0	0	
14	10[illegible]0	10[illegible]0	0	
15	10[illegible]0	10[illegible]0	0	
16	10[illegible]0	10[illegible]0	0	
17	10[illegible]0	10[illegible]0	0	
18	10[illegible]0	10[illegible]0	0	
19	10[illegible]0	10[illegible]0	0	
20	10[illegible]0	10[illegible]0	0	
21	10[illegible]0	10[illegible]0	0	
22	10[illegible]0	10[illegible]0	0	
23	10[illegible]0	10[illegible]0	0	
24	10[illegible]0	10[illegible]0	0	
25	10[illegible]0	10[illegible]0	0	
26	10[illegible]0	10[illegible]0	0	
27	10[illegible]0	10[illegible]0	0	
28	10[illegible]0	10[illegible]0	0	
29				
30				
31				

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Authorized Signatory

HOD's Signature:

TUBEWELL WATER ABSTRACTION RECORD					TRIDENT GROUP
BUSINESS UNIT	PCD/WTP	LOCATION	PCD/WTP	MACHINE NAME/PROCESS NAME	TUBEWELL NO 9
PROCESS :	RAW WATER TREATMENT PLANT - PAPER DIVISION				

Month: February Year: 2021

Date	Initial Reading	Final Reading	Total (m³)	EMR Supervisor Signature
1	48[illegible]3	48[illegible]3	0	
2	48[illegible]3	48[illegible]3	0	
3	48[illegible]3	48[illegible]3	0	
4	48[illegible]3	48[illegible]3	0	
5	48[illegible]3	48[illegible]3	0	
6	48[illegible]3	48[illegible]3	0	
7	48[illegible]3	48[illegible]3	0	
8	48[illegible]3	48[illegible]3	0	
9	48[illegible]3	48[illegible]3	0	
10	48[illegible]3	48[illegible]3	0	
11	48[illegible]3	48[illegible]3	0	
12	48[illegible]3	48[illegible]3	0	
13	48[illegible]3	48[illegible]3	0	
14	48[illegible]3	48[illegible]3	0	
15	48[illegible]3	48[illegible]3	0	
16	48[illegible]3	48[illegible]3	0	
17	48[illegible]3	48[illegible]3	0	
18	48[illegible]3	48[illegible]3	0	
19	48[illegible]3	48[illegible]3	0	
20	48[illegible]3	48[illegible]3	0	
21	48[illegible]3	48[illegible]3	0	
22	48[illegible]3	48[illegible]3	0	
23	48[illegible]3	48[illegible]3	0	
24	48[illegible]3	48[illegible]3	0	
25	48[illegible]3	48[illegible]3	0	
26	48[illegible]3	48[illegible]3	0	
27	48[illegible]3	48[illegible]3	0	
28	48[illegible]3	48[illegible]3	0	
29				
30				
31				

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NOD's Signature:

TUBEWELL WATER ABSTRACTION RECORD					TRIDENT GROUP
BUSINESS UNIT	PCD-WTP	LOCATION	PCD-WTP	MACHINE NAME/PROCESS NAME	TUBEWELL NO. 10
PROCESS :	RAW WATER TREATMENT PLANT - PAPER DIVISION				

Month: February Year: 2021

Date	Initial Reading	Final Reading	Total (m³)	SMR Supervisor Signature
1	[illegible]	[illegible]	0	
2	[illegible]	[illegible]	0	
3	[illegible]	[illegible]	0	
4	[illegible]	[illegible]	0	
5	[illegible]	[illegible]	0	
6	[illegible]	[illegible]	0	
7	[illegible]	[illegible]	0	
8	[illegible]	[illegible]	0	
9	[illegible]	[illegible]	0	
10	[illegible]	[illegible]	0	
11	[illegible]	[illegible]	0	
12	[illegible]	[illegible]	0	
13	[illegible]	[illegible]	0	
14	[illegible]	[illegible]	0	
15	[illegible]	[illegible]	0	
16	[illegible]	[illegible]	0	
17	[illegible]	[illegible]	0	
18	[illegible]	[illegible]	0	
19	[illegible]	[illegible]	0	
20	[illegible]	[illegible]	0	
21	[illegible]	[illegible]	0	
22	[illegible]	[illegible]	0	
23	[illegible]	[illegible]	0	
24	[illegible]	[illegible]	0	
25	[illegible]	[illegible]	0	
26	[illegible]	[illegible]	0	
27	[illegible]	[illegible]	0	
28	[illegible]	[illegible]	0	
29	-			
30				
31				

For Tride it Limited

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TUBEWELL WATER ABSTRACTION RECORD					/// TRIDENT GROUP
BUSINESS/UNIT	PCD-WTP	LOCATION	PCD-WTP	MACHINE (M&E)/PROCESS NAME	TUBEWELL NO. 11
PROCESS :	RAW WATER TREATMENT PLANT - PAPER DIVISION				

Month: February Year: 2021

Date	Initial Reading	Final Reading	Total (m^3)	SHR Supervisor Signature
1	164310	164310	0	
2	164310	164310	0	
3	164310	164310	0	
4	164310	164310	0	
5	164310	164310	0	
6	164310	164310	0	
7	164310	164310	0	
8	164310	164310	0	
9	164310	164310	0	
10	164310	164310	0	
11	164310	164310	0	
12	164310	164310	0	
13	164310	164310	0	
14	164310	164310	0	
15	164310	164310	0	
16	164310	164310	0	
17	164310	164310	0	
18	164310	164310	0	
19	164310	164310	0	
20	164310	164310	0	
21	164310	164310	0	
22	164310	164310	0	
23	164310	164310	0	
24	164310	164310	0	
25	164310	164310	0	
26	164310	164310	0	
27	164310	164310	0	
28	164310	164310	0	
29				
30				
31				

For Tride-it Division

Authorised Signatory

SOD's Signature:

TUBEWELL WATER ABSTRACTION RECORD					TRIDENT GROUP
BUSINESS/ UNIT	PCD-WTP	LOCATION	PCD-WTP	MACHINE NAME/PROCESS NAME	TUBEWELL NO. 12
PROCESS :	RAW WATER TREATMENT PLANT - PAPER DIVISION				

Month: February Year: 2021

Date	Initial Reading	Final Reading	Total (m^3)	Shift Supervisor Signature
1	928938	928938	0	
2	928938	928938	0	
3	928938	928938	0	
4	928938	928938	0	
5	928938	928938	0	
6	928938	928938	0	
7	928938	928938	0	
8	928938	928938	0	
9	928938	928938	0	
10	928938	928938	0	
11	928938	928938	0	
12	928938	928938	0	
13	928938	928938	0	
14	928938	928938	0	
15	928938	928938	0	
16	928938	928938	0	
17	928938	928938	0	
18	928938	928938	0	
19	928938	928938	0	
20	928938	928938	0	
21	928938	928938	0	
22	928938	928938	0	
23	928938	928938	0	
24	928938	928938	0	
25	928938	928938	0	
26	928938	928938	0	
27	928938	928938	0	
28	928938	928938	0	
29				
30				
31				

For Indeit Limited

Authorised Signatory
Name & Signature:

Annexure- VIII(d)

TUBEWELL WATER ABSTRACTION RECORD

TRIDENT GROUP

BUSINESS UNIT	PCD-WTP	LOCATION	PCD-WTP	MACHINE NAME/PROCESS NAME	TUBEWELL NO .08
PROCESS:	RAW WATER TREATMENT PLANT - PAPER DIVISION				

Year: March

Month: April

Date	Initial Reading	Final Reading	Total (m^3)	Shift Supervisor Signature
1	356884	356884	0	
2	356884	356884	0	
3	356884	356884	0	
4	356884	356884	0	
5	356884	356884	0	
6	356884	356884	0	
7	356884	356884	0	
8	356884	356884	0	
9	356884	356884	0	
10	356884	356884	0	
11	356884	356884	0	
12	356884	356884	0	
13	356884	356884	0	
14	356884	356884	0	
15	356884	356884	0	
16	356884	356884	0	
17	356884	356884	0	
18	356884	356884	0	
19	356884	356884	0	
20	356884	356884	0	
21	356884	356884	0	
22	356884	356884	0	
23	356884	356884	0	
24	356884	356884	0	
25	356884	356884	0	
26	356884	356884	0	
27	356884	356884	0	
28	356884	356884	0	
29	356884	356884	0	
30	356884	356884	0	
31	356884	356884	0	

HOD's Signature:

TUBEWELL WATER ABSTRACTION RECORD					TRIDENT GROUP
BUSINESS UNIT	PCD-WTP	LOCATION	PCD-WTP	MACHINE NAME/PROCESS NAME	TUBEWELL NO. 07
PROCESS:	RAW WATER TREATMENT PLANT - PAPER DIVISION				

Year: [illegible] Month: [illegible]

Date	Initial Reading	Final Reading	Total [m³]	Shift Supervisor Signature
1	[illegible]	[illegible]	0	
2	[illegible]	[illegible]	0	
3	[illegible]	[illegible]	0	
4	[illegible]	[illegible]	0	
5	[illegible]	[illegible]	0	
6	[illegible]	[illegible]	0	
7	[illegible]	[illegible]	0	
8	[illegible]	[illegible]	0	
9	[illegible]	[illegible]	0	
10	[illegible]	[illegible]	0	
11	[illegible]	[illegible]	0	
12	[illegible]	[illegible]	0	
13	[illegible]	[illegible]	0	
14	[illegible]	[illegible]	0	
15	[illegible]	[illegible]	0	
16	[illegible]	[illegible]	0	
17	[illegible]	[illegible]	0	
18	[illegible]	[illegible]	0	
19	[illegible]	[illegible]	0	
20	[illegible]	[illegible]	0	
21	[illegible]	[illegible]	0	
22	[illegible]	[illegible]	0	
23	[illegible]	[illegible]	0	
24	[illegible]	[illegible]	0	
25	[illegible]	[illegible]	0	
26	[illegible]	[illegible]	0	
27	[illegible]	[illegible]	0	
28	[illegible]	[illegible]	0	
29	[illegible]	[illegible]	0	
30	[illegible]	[illegible]	0	
31	[illegible]	[illegible]	0	

HOD's Signature: [illegible]

TUBEWELL WATER ABSTRACTION RECORD

TRIDENT GROUP

BUSINESS/ UNIT	PCD-WTP	LOCATION	PCD-WTP	MACHINE NAME/PROCESS NAME	TUBEWELL NO. 06
PROCESS :	RAW WATER TREATMENT PLANT - PAPER DIVISION				

Year: 2024

Month: April

Date	Initial Reading	Final Reading	Total (m³)	Shift Supervisor Signature
1	1040010	1040010	0	
2	1040010	1040010	0	
3	1040010	1040010	0	
4	1040010	1040010	0	
5	1040010	1040010	0	
6	1040010	1040010	0	
7	1040010	1040010	0	
8	1040010	1040010	0	
9	1040010	1040010	0	
10	1040010	1040010	0	
11	1040010	1040010	0	
12	1040010	1040010	0	
13	1040010	1040010	0	
14	1040010	1040010	0	
15	1040010	1040010	0	
16	1040010	1040010	0	
17	1040010	1040010	0	
18	1040010	1040010	0	
19	1040010	1040010	0	
20	1040010	1040010	0	
21	1040010	1040010	0	
22	1040010	1040010	0	
23	1040010	1040010	0	
24	1040010	1040010	0	
25	1040010	1040010	0	
26	1040010	1040010	0	
27	1040010	1040010	0	
28	1040010	1040010	0	
29	1040010	1040010	0	
30	1040010	1040010	0	
31	1040010	1040010	0	

HOD's Signature: _____

TUBEWELL WATER ABSTRACTION RECORD					TRIDENT GROUP
BUSINESS UNIT	PCD-WTP	LOCATION	PCD-WTP	MACHINE NAME/PROCESS NAME	TUBEWELL NO. 09
PROCESS :	RAW WATER TREATMENT PLANT - PAPER DIVISION				

Year: 2022 Month: April

Date	Initial Reading	Final Reading	Total (m³)	Shift Supervisor Signature
1	484330	484330	0	
2	484330	484330	0	
3	484330	484330	0	
4	484330	484330	0	
5	484330	484330	0	
6	484330	484330	0	
7	484330	484330	0	
8	484330	484330	0	
9	484330	484330	0	
10	484330	484330	0	
11	484330	484330	0	
12	484330	484330	0	
13	484330	484330	0	
14	484330	484330	0	
15	484330	484330	0	
16	484330	484330	0	
17	484330	484330	0	
18	484330	484330	0	
19	484330	484330	0	
20	484330	484330	0	
21	484330	484330	0	
22	484330	484330	0	
23	484330	484330	0	
24	484330	484330	0	
25	484330	484330	0	
26	484330	484330	0	
27	484330	484330	0	
28	484330	484330	0	
29	484330	484330	0	
30	484330	484330	0	
31	484330	484330	0	

HOD's Signature:

TUBEWELL WATER ABSTRACTION RECORD					TRIDENT GROUP
BUSINESS/ UNIT	PCD-WTP	LOCATION	PCD-WTP	MACHINE NAME/PROCESS NAME	TUBEWELL NO. 10
PROCESS :	RAW WATER TREATMENT PLANT - PAPER DIVISION				

Year: 2024 Month: June

Date	Initial Reading	Final Reading	Total (m^3)	Shift Supervisor Signature
1	268211	268211	0	
2	268211	268211	0	
3	268288	268288	0	
4	268382	268382	0	
5	268388	268388	0	
6	268382	268382	0	
7	268382	268382	0	
8	268382	268382	0	
9	268388	268388	0	
10	269291	269291	0	
11	269291	269291	0	
12	269292	269292	0	
13	269338	269338	0	
14	269338	269338	0	
15	269378	269378	0	
16	269378	269378	0	
17	269378	269378	0	
18	269378	269378	0	
19	269378	269378	0	
20	269378	269378	0	
21	269378	269378	0	
22	269378	269378	0	
23	269378	269378	0	
24	269378	269378	0	
25	269378	269378	0	
26	269378	269378	0	
27	269378	269378	0	
28	269378	269378	0	
29	269378	269378	0	
30	269378	269378	0	
31	269311	269311	0	

HOD's Signature:

TUBEWELL WATER ABSTRACTION RECORD					TRIDENT GROUP
BUSINESS UNIT	PCD-WTP	LOCATION	PCD-WTP	MACHINE NAME/PROCESS NAME	TUBEWELL NO. 11
PROCESS :	RAW WATER TREATMENT PLANT - PAPER DIVISION				

Year: 2024 Month: JULY

Date	Initial Reading	Final Reading	Total (m^3)	Shift Supervisor Signature
1	164310	164310	0	
2	164310	164310	0	
3	164310	164310	0	
4	164310	164310	0	
5	164310	164310	0	
6	164310	164310	0	
7	164310	164310	0	
8	164310	164310	0	
9	164310	164310	0	
10	164310	164310	0	
11	164310	164310	0	
12	164310	164310	0	
13	164310	164310	0	
14	164310	164310	0	
15	164310	164310	0	
16	164310	164310	0	
17	164310	164310	0	
18	164310	164310	0	
19	164310	164310	0	
20	164310	164310	0	
21	164310	164310	0	
22	164310	164310	0	
23	164310	164310	0	
24	164310	164310	0	
25	164310	164310	0	
26	164310	164310	0	
27	164310	164310	0	
28	164310	164310	0	
29	164310	164310	0	
30	164310	164310	0	
31	164310	164310	0	

HOD's Signature:

TUBEWELL WATER ABSTRACTION RECORD					TRIDENT GROUP
BUSINESS UNIT	PCD-WTP	LOCATION	PCD-WTP	MACHINE NAME/PROCESS NAME	TUBEWELL NO. 12
PROCESS:	RAW WATER TREATMENT PLANT - PAPER DIVISION				

Year: _____ Month: _____

Date	Initial Reading	Final Reading	Total (m³)	Shift Supervisor Signature
1	9[illegible]32	9[illegible]32	0	
2	9[illegible]32	9[illegible]32	0	
3	9[illegible]32	9[illegible]32	0	
4	9[illegible]32	9[illegible]32	0	
5	9[illegible]32	9[illegible]32	0	
6	9[illegible]32	9[illegible]32	0	
7	9[illegible]32	9[illegible]32	0	
8	9[illegible]32	9[illegible]32	0	
9	9[illegible]32	9[illegible]32	0	
10	9[illegible]32	9[illegible]32	0	
11	9[illegible]32	9[illegible]32	0	
12	9[illegible]32	9[illegible]32	0	
13	9[illegible]32	9[illegible]32	0	
14	9[illegible]32	9[illegible]32	0	
15	9[illegible]32	9[illegible]32	0	
16	9[illegible]32	9[illegible]32	0	
17	9[illegible]32	9[illegible]32	0	
18	9[illegible]32	9[illegible]32	0	
19	9[illegible]32	9[illegible]32	0	
20	9[illegible]32	9[illegible]32	0	
21	9[illegible]32	9[illegible]32	0	
22	9[illegible]32	9[illegible]32	0	
23	9[illegible]32	9[illegible]32	0	
24	9[illegible]32	9[illegible]32	0	
25	9[illegible]32	9[illegible]32	0	
26	9[illegible]32	9[illegible]32	0	
27	9[illegible]32	9[illegible]32	0	
28	9[illegible]32	9[illegible]32	0	
29	9[illegible]32	9[illegible]32	0	
30	9[illegible]32	9[illegible]32	0	
31	9[illegible]32	9[illegible]32	0	

HOD's Signature: _____

Annexure - VIII (e)

TUBEWELL WATER ABSTRACTION RECORD					/// TRIDENT GROUP
BUSINESS/ UNIT	PCD-WTP	LOCATION	PCD-WTP	MACHINE NAME/PROCESS NAME	TUBEWELL NO. 05
PROCESS :	RAW WATER TREATMENT PLANT - PAPER DIVISION				

Year: APRIL Month: 2024

Date	Initial Reading	Final Reading	Total (m³)	Shift Supervisor Signature
1	756884	756884	0	
2	756884	756884	0	
3	756884	756884	0	
4	756884	756884	0	
5	756884	756884	0	
6	756884	756884	0	
7	756884	756884	0	
8	756884	756884	0	
9	756884	756884	0	
10	756884	756884	0	
11	756884	756884	0	
12	756884	756884	0	
13	756884	756884	0	
14	756884	756884	0	
15	756884	756884	0	
16	756884	756884	0	
17	756884	756884	0	
18	756884	756884	0	
19	756884	756884	0	
20	756884	756884	0	
21	756884	756884	0	
22	756884	756884	0	
23	756884	756884	0	
24	756884	756884	0	
25	756884	756884	0	
26	756884	756884	0	
27	756884	756884	0	
28	756884	756884	0	
29	756884	756884	0	
30	756884	756884	0	
31				

HOD's Signature:

TUBEWELL WATER ABSTRACTION RECORD					TRIDENT GROUP
BUSINESS/UNIT	PCD-WTP	LOCATION	PCD-WTP	MACHINE NAME/PROCESS NAME	TUBEWELL NO. 07
PROCESS:	RAW WATER TREATMENT PLANT - PAPER DIVISION				

Year: APRIL Month: 2021

Date	Initial Reading	Final Reading	Total (m^3)	Shift Supervisor Signature
1	577638	577638	0	
2	577638	577638	0	
3	577638	577638	0	
4	577638	577638	0	
5	577638	577638	0	
6	577638	577638	0	
7	577638	577638	0	
8	577638	577638	0	
9	577638	577638	0	
10	577638	577638	0	
11	577638	577638	0	
12	577638	577638	0	
13	577638	577638	0	
14	577638	577638	0	
15	577638	577638	0	
16	577638	577638	0	
17	577638	577638	0	
18	577638	577638	0	
19	577638	577638	0	
20	577638	577638	0	
21	577638	577638	0	
22	577638	577638	0	
23	577638	577638	0	
24	577638	577638	0	
25	577638	577638	0	
26	577638	577638	0	
27	577638	577638	0	
28	577638	577638	0	
29	577638	577638	0	
30	577638	577638	0	
31				

HOD's Signature:

TUBEWELL WATER ABSTRACTION RECORD					/// TRIDENT GROUP
BUSINESS/ UNIT	PCD-WTP	LOCATION	PCD-WTP	MACHINE NAME/PROCESS NAME	TUBEWELL NO. 08
PROCESS :	RAW WATER TREATMENT PLANT - PAPER DIVISION				

Year: APRIL Month: 2021

Date	Initial Reading	Final Reading	Total (m³)	Shift Supervisor Signature
1	1040010	1040010	0	
2	1040010	1040010	0	
3	1040010	1040010	0	
4	1040010	1040010	0	
5	1040010	1040010	0	
6	1040010	1040010	0	
7	1040010	1040010	0	
8	1040010	1040010	0	
9	1040010	1040010	0	
10	1040010	1040010	0	
11	1040010	1040010	0	
12	1040010	1040010	0	
13	1040010	1040010	0	
14	1040010	1040010	0	
15	1040010	1040010	0	
16	1040010	1040010	0	
17	1040010	1040010	0	
18	1040010	1040010	0	
19	1040010	1040010	0	
20	1040010	1040010	0	
21	1040010	1040010	0	
22	1040010	1040010	0	
23	1040010	1040010	0	
24	1040010	1040010	0	
25	1040010	1040010	0	
26	1040010	1040010	0	
27	1040010	1040010	0	
28	1040010	1040010	0	
29	1040010	1040010	0	
30	1040010	1040010	0	
31				

HOD's Signature:

TUBEWELL WATER ABSTRACTION RECORD					TRIDENT GROUP
BUSINESS/ UNIT	PCD-WTP	LOCATION	PCD-WTP	MACHINE NAME/PROCESS NAME	TUBEWELL NO. 09
PROCESS :	RAW WATER TREATMENT PLANT - PAPER DIVISION				

Year: 2021 Month: July

Date	Initial Reading	Final Reading	Total (m³)	Shift Supervisor Signature
1	4841370	4841370	0	
2	4841370	4841370	0	
3	4841370	4841370	0	
4	4841370	4841370	0	
5	4841370	4841370	0	
6	4841370	4841370	0	
7	4841370	4841370	0	
8	4841370	4841370	0	
9	4841370	4841370	0	
10	4841370	4841370	0	
11	4841370	4841370	0	
12	4841370	4841370	0	
13	4841370	4841370	0	
14	4841370	4841370	0	
15	4841370	4841370	0	
16	4841370	4841370	0	
17	4841370	4841370	0	
18	4841370	4841370	0	
19	4841370	4841370	0	
20	4841370	4841370	0	
21	4841370	4841370	0	
22	4841370	4841370	0	
23	4841370	4841370	0	
24	4841370	4841370	0	
25	4841370	4841370	0	
26	4841370	4841370	0	
27	4841370	4841370	0	
28	4841370	4841370	0	
29	4841370	4841370	0	
30	4841370	4841370	0	
31				

HOD's Signature:

TUBEWELL WATER ABSTRACTION RECORD					/// TRIDENT GROUP
BUSINESS UNIT	PCD-WTP	LOCATION	PCD-WTP	MACHINE NAME/PROCESS NAME	TUBEWELL NO.-10
PROCESS :	RAW WATER TREATMENT PLANT - PAPER DIVISION				

Year: APRIL Month: 2021

Date	Initial Reading	Final Reading	Total (m³)	Shift Supervisor Signature
1	269292	269292	0	
2	269292	269292	0	
3	269292	269292	0	
4	269292	269292	0	
5	269292	269292	0	
6	269292	269292	0	
7	269292	269292	0	
8	269292	269292	0	
9	269292	269292	0	
10	269292	269292	0	
11	269292	269292	0	
12	269292	269292	0	
13	269292	269292	0	
14	269292	269292	0	
15	269292	269292	0	
16	269292	269292	0	
17	269292	269292	0	
18	269292	269292	0	
19	269292	269292	0	
20	269292	269292	0	
21	269292	269292	0	
22	269292	269292	0	
23	269292	269292	0	
24	269292	269292	0	
25	269292	269292	0	
26	269292	269292	0	
27	269292	269292	0	
28	269292	269292	0	
29	269292	269292	0	
30	269292	269292	0	
31				

HOD's Signature:

TUBEWELL WATER ABSTRACTION RECORD					TRIDENT GROUP
BUSINESS UNIT	PCD-WTP	LOCATION	PCD-WTP	MACHINE NAME/PROCESS NAME	TUBEWELL NO. 11
PROCESS :	RAW WATER TREATMENT PLANT - PAPER DIVISION				

Year: APRIL Month: 2021

Date	Initial Reading	Final Reading	Total (m^3)	Shift Supervisor Signature
1	164310	164310	0	
2	164310	164310	0	
3	164310	164310	0	
4	164310	164310	0	
5	164310	164310	0	
6	164310	164310	0	
7	164310	164310	0	
8	164310	164310	0	
9	164310	164310	0	
10	164310	164310	0	
11	164310	164310	0	
12	164310	164310	0	
13	164310	164310	0	
14	164310	164310	0	
15	164310	164310	0	
16	164310	164310	0	
17	164310	164310	0	
18	164310	164310	0	
19	164310	164310	0	
20	164310	164310	0	
21	164310	164310	0	
22	164310	164310	0	
23	164310	164310	0	
24	164310	164310	0	
25	164310	164310	0	
26	164310	164310	0	
27	164310	164310	0	
28	164310	164310	0	
29	164310	164310	0	
30	164310	164310	0	
31				

HOD's Signature:

TUBEWELL WATER ABSTRACTION RECORD					/// TRIDENT GROUP
BUSINESS UNIT	POD-WTP	LOCATION	POD-WTP	MACHINE NAME/PROCESS NAME	TUBEWELL NO. 12
PROCESS	RAW WATER TREATMENT PLANT - PAPER DIVISION				

Year: APRIL Month: 2021

Date	Initial Reading	Final Reading	Total (m^3)	Shift Supervisor Signature
1	972932	972932	0	
2	972932	972932	0	
3	972932	972932	0	
4	972932	972932	0	
5	972932	972932	0	
6	972932	972932	0	
7	972932	972932	0	
8	972932	972932	0	
9	972932	972932	0	
10	972932	972932	0	
11	972932	972932	0	
12	972932	972932	0	
13	972932	972032	0	
14	972932	972932	0	
15	972932	972932	0	
16	972932	972932	0	
17	972932	972932	0	
18	972932	972932	0	
19	972932	972932	0	
20	972932	972932	0	
21	972932	972932	0	
22	972932	972932	0	
23	972932	972932	0	
24	972932	972932	0	
25	972932	972932	0	
26	972932	972932	0	
27	972932	972932	0	
28	972932	972932	0	
29	972932	972932	0	
30	972932	972932	0	
31				

HOD's Signature:

Annexure VIII (H)

TUBEWELL WATER ABSTRACTION RECORD | TRIDENT GROUP

BUSINESS/ UNIT	PCD-WTP	LOCATION	PCD-WTP	MACHINE NAME/PROCESS NAME	TUBEWELL NO. 06
PROCESS:	RAW WATER TREATMENT PLANT - PAPER DIVISION				

Year: 2021 Month: May

Date	Initial Reading	Final Reading	Total (m³)	Shift Supervisor Signature
1	356984	356984	0	
2	356984	356984	0	
3	356984	356984	0	
4	356984	356984	0	
5	356984	356984	0	
6	356984	356984	0	
7	356984	356984	0	
8	356984	356984	0	
9	356984	356984	0	
10	356984	356984	0	
11	356984	356984	0	
12	356984	356984	0	
13	356984	356984	0	
14	356984	356984	0	
15	356984	356984	0	
16	356984	356984	0	
17	356984	356984	0	
18	356984	356984	0	
19	356984	356984	0	
20	356984	356984	0	
21	356984	356984	0	
22	356984	356984	0	
23	356984	356984	0	
24	356984	356984	0	
25	356984	356984	0	
26	356984	356984	0	
27	356984	356984	0	
28	356984	356984	0	
29	356984	356984	0	
30	356984	356984	0	
31	356984	356984	0	

TUBEWELL WATER ABSTRACTION RECORD					TRIDENT GROUP
BUSINESS/ UNIT	POD-WTP	LOCATION	POD-WTP	MACHINE NAME/PROCESS NAME	TUBEWELL NO. 07
PROCESS :	RAW WATER TREATMENT PLANT - PAPER DIVISION				

Year: 2021 Month: [illegible]

Date	Initial Reading	Final Reading	Total (m³)	Shift Supervisor Signature
1	[illegible]	[illegible]	0	
2	[illegible]	[illegible]	0	
3	[illegible]	[illegible]	0	
4	[illegible]	[illegible]	0	
5	[illegible]	[illegible]	0	
6	[illegible]	[illegible]	0	
7	[illegible]	[illegible]	0	
8	[illegible]	[illegible]	0	
9	[illegible]	[illegible]	0	
10	[illegible]	[illegible]	0	
11	[illegible]	[illegible]	0	
12	[illegible]	[illegible]	0	
13	[illegible]	[illegible]	0	
14	[illegible]	[illegible]	0	
15	[illegible]	[illegible]	0	
16	[illegible]	[illegible]	0	
17	[illegible]	[illegible]	0	
18	[illegible]	[illegible]	0	
19	[illegible]	[illegible]	0	
20	[illegible]	[illegible]	0	
21	[illegible]	[illegible]	0	
22	[illegible]	[illegible]	0	
23	[illegible]	[illegible]	0	
24	[illegible]	[illegible]	0	
25	[illegible]	[illegible]	0	
26	[illegible]	[illegible]	0	
27	[illegible]	[illegible]	0	
28	[illegible]	[illegible]	0	
29	[illegible]	[illegible]	0	
30	[illegible]	[illegible]	0	
31	[illegible]	[illegible]	0	

HOD's Signature: _____

TUBEWELL WATER ABSTRACTION RECORD					TRIDENT GROUP
BUSINESS/ UNIT	PCD-WTP	LOCATION	PCD-WTP	MACHINE NAME/PROCESS NAME	TUBEWELL NO. 08
PROCESS :	RAW WATER TREATMENT PLANT - PAPER DIVISION				

Year: 2021 Month:

Date	Initial Reading	Final Reading	Total (m^3)	Shift Supervisor Signature
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				

TUBEWELL WATER ABSTRACTION RECORD					TRIDENT GROUP
BUSINESS/ UNIT	PCD-WTP	LOCATION	PCD-WTP	MACHINE NAME/PROCESS NAME	TUBEWELL NO. 09
PROCESS :	RAW WATER TREATMENT PLANT - PAPER DIVISION				

Year: 2021 Month: March

Date	Initial Reading	Final Reading	Total (m³)	Shift Supervisor Signature
1	48x730	48x730	0	
2	48x730	48x730	0	
3	48x730	48x730	0	
4	48x730	48x730	0	
5	48x730	48x730	0	
6	48x730	48x730	0	
7	48x730	48x730	0	
8	48x730	48x730	0	
9	48x730	48x730	0	
10	48x730	48x730	0	
11	48x730	48x730	0	
12	48x730	48x730	0	
13	48x730	48x730	0	
14	48x730	48x730	0	
15	48x730	48x730	0	
16	48x730	48x730	0	
17	48x730	48x730	0	
18	48x730	48x730	0	
19	48x730	48x730	0	
20	48x730	48x730	0	
21	48x730	48x730	0	
22	48x730	48x730	0	
23	48x730	48x730	0	
24	48x730	48x730	0	
25	48x730	48x730	0	
26	48x730	48x730	0	
27	48x730	48x730	0	
28	48x730	48x730	0	
29	48x730	48x730	0	
30	48x730	48x730	0	
31	48x730	48x730	0	

HOD's Signature:

TUBEWELL WATER ABSTRACTION RECORD					TRIDENT GROUP
BUSINESS/ UNIT	PCD-WTP	LOCATION	PCD-WTP	MACHINE NAME/PROCESS NAME	TUBEWELL NO. 16
PROCESS	RAW WATER TREATMENT PLANT - PAPER DIVISION				

Year: ٢٠٢١ Month: ٢٠٢١

Date	Initial Reading	Final Reading	Total (m³)	Shift Supervisor Signature
1	٢٦٢٥٧١	٢٦٢٥٧٦	٥	
2	٢٦٢٥٧٦	٢٦٢٥٧٨	٥	
3	٢٦٢٥٧٨	٢٦٢٥٨٦	٥	
4	٢٦٢٥٨٦	٢٦٢٥٩٦	٥	
5	٢٦٢٥٩٦	٢٦٢٦٠٦	٥	
6	٢٦٢٦٠٦	٢٦٢٦١٦	٥	
7	٢٦٢٦١٦	٢٦٢٦٢٦	٥	
8	٢٦٢٦٢٦	٢٦٢٦٣٦	٥	
9	٢٦٢٦٣٦	٢٦٢٦٤٦	٥	
10	٢٦٢٦٤٦	٢٦٢٦٥٦	٥	
11	٢٦٢٦٥٦	٢٦٢٦٦٦	٥	
12	٢٦٢٦٦٦	٢٦٢٦٧٦	٥	
13	٢٦٢٦٧٦	٢٦٢٦٨٦	٥	
14	٢٦٢٦٨٦	٢٦٢٦٩٦	٥	
15	٢٦٢٦٩٦	٢٦٢٧٠٦	٥	
16	٢٦٢٧٠٦	٢٦٢٧١٦	٥	
17	٢٦٢٧١٦	٢٦٢٧٢٦	٥	
18	٢٦٢٧٢٦	٢٦٢٧٣٦	٥	
19	٢٦٢٧٣٦	٢٦٢٧٤٦	٥	
20	٢٦٢٧٤٦	٢٦٢٧٥٦	٥	
21	٢٦٢٧٥٦	٢٦٢٧٦٦	٥	
22	٢٦٢٧٦٦	٢٦٢٧٧٦	٥	
23	٢٦٢٧٧٦	٢٦٢٧٨٦	٥	
24	٢٦٢٧٨٦	٢٦٢٧٩٦	٥	
25	٢٦٢٧٩٦	٢٦٢٨٠٦	٥	
26	٢٦٢٨٠٦	٢٦٢٨١٦	٥	
27	٢٦٢٨١٦	٢٦٢٨٢٦	٥	
28	٢٦٢٨٢٦	٢٦٢٨٣٦	٥	
29	٢٦٢٨٣٦	٢٦٢٨٤٦	٥	
30	٢٦٢٨٤٦	٢٦٢٨٥٦	٥	
31	٢٦٢٨٥٦	٢٦٢٨٦٦	٥	

HOD's Signature:

TUBEWELL WATER ABSTRACTION RECORD					TRIDENT GROUP
BUSINESS/ UNIT	PCD-WTP	LOCATION	PCD-WTP	MACHINE NAME/PROCESS NAME	TUBEWELL NO. 11
PROCESS:	RAW WATER TREATMENT PLANT - PAPER DIVISION				

Year: 2024 Month: May

Date	Initial Reading	Final Reading	Total (m³)	Shift Supervisor Signature
1	164710	164710	0	
2	164710	164710	0	
3	164710	164710	0	
4	164710	164710	0	
5	164710	164710	0	
6	164710	164710	0	
7	164710	164710	0	
8	164710	164710	0	
9	164710	164710	0	
10	164710	164710	0	
11	164710	164710	0	
12	164710	164710	0	
13	164710	164710	0	
14	164710	164710	0	
15	164710	164710	0	
16	164710	164710	0	
17	164710	164710	0	
18	164710	164710	0	
19	164710	164710	0	
20	164710	164710	0	
21	164710	164710	0	
22	164710	164710	0	
23	164710	164710	0	
24	164710	164710	0	
25	164710	164710	0	
26	164710	164710	0	
27	164710	164710	0	
28	164710	164710	0	
29	164710	164710	0	
30	164710	164710	0	
31	164710	164710	0	

HOD's Signature:

YUBEWELL WATER ABSTRACTION RECORD					/// TRIDENT GROUP
BUSINESS UNIT	PCD-WTP	LOCATION	PCD-WTP	MACHINE NAME/PROCESS NAME	TUBEWELL NO. 12
PROCESS :	RAW WATER TREATMENT PLANT - PAPER DIVISION				

Year: 2021 Month: May

Date	Initial Reading	Final Reading	Total (m^3)	Shift Supervisor Signature
1	923972	923972	0	
2	923972	923972	0	
3	923972	923972	0	
4	923972	923972	0	
5	923972	923972	0	
6	923972	923972	0	
7	923972	923972	0	
8	923972	923972	0	
9	923972	923972	0	
10	923972	923972	0	
11	923972	923972	0	
12	923972	923972	0	
13	923972	923972	0	
14	923972	923972	0	
15	923972	923972	0	
16	923972	923972	0	
17	923972	923972	0	
18	923972	923972	0	
19	923972	923972	0	
20	923972	923972	0	
21	923972	923972	0	
22	923972	923972	0	
23	923972	923972	0	
24	923972	923972	0	
25	923972	923972	0	
26	923972	923972	0	
27	923972	923972	0	
28	923972	923972	0	
29	923972	923972	0	
30	923972	923972	0	
31	923972	923972	0	

HOD's Signature:

Annexure – IX

ANNEXURE II (A)

ETP INLET RECORD DEC 2020					TRIDENT GROUP
BUSINESS/ UNIT	TPEC	LOCATION	DHALLA	MACHINE NAME/PROCESS NAME	TPEC BUSINESS
PROCESS :	ETP				

Dec-20

Date	INLET		
	Initial Reading	Final Reading	Flow
1-Dec	11428851	11444274	15423
2-Dec	11444274	11460216	15942
3-Dec	11460216	11475585	15369
4-Dec	11475585	11491226	15641
5-Dec	11491226	11506910	15684
6-Dec	11506910	11522781	15871
7-Dec	11522781	11538702	15921
8-Dec	11538702	11554477	15775
9-Dec	11554477	11569966	15489
10-Dec	11569966	11584967	15001
11-Dec	11584967	11599920	14953
12-Dec	11599920	11615134	15214
13 Dec	11615134	11630000	14866
14-Dec	11630000	11644259	14259
15-Dec	11644259	11659495	15236
16-Dec	11659495	11675482	15987
17-Dec	11675482	11690484	15002
18-Dec	11690484	11705446	14962
19-Dec	11705446	11720774	15328
20-Dec	11720774	11735530	14756
21-Dec	11735530	11750897	15367
22-Dec	11750897	11766861	15964
23-Dec	11766861	11782863	16002
24-Dec	11782863	11797714	14851
25-Dec	11797714	11812978	15264
26-Dec	11812978	11827974	14996
27-Dec	11827974	11843271	15297
28-Dec	11843271	11859254	15983
29-Dec	11859254	11873520	14266
30-Dec	11873520	11888887	15367
31-Dec	11873520	11889017	15497
		AVERAGE	15339.77
		TOTAL	475533

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ANNEXURE IX (b)

ETP INLET RECORD JAN 2021					TRIDENTGROUP
BUSINESS UNIT	TPEC	LOCATION	DHAULA	MACHINE NAME/PROCESS NAME	TPEC BUSINESS
PROCESS	ETP				

Jan-21

Date	INLET		
	Initial Reading	Final Reading	Flow
1-Jan	11889017	11905019	16002
2-Jan	11905019	11920862	15843
3-Jan	11920862	11936093	15231
4-Jan	11936093	11951334	15241
5-Jan	11951334	11966919	15585
6-Jan	11966919	11982704	15785
7-Jan	11982704	11998689	15985
8-Jan	11998689	12014569	15880
9-Jan	12014569	12029981	15412
10-Jan	12029981	12044991	15010
11-Jan	12044991	12060093	15102
12-Jan	12060093	12075296	15203
13-Jan	12075296	12090282	14986
14-Jan	12090282	12105492	15210
15-Jan	12105492	12120913	15421
16-Jan	12120913	12136381	15468
17-Jan	12136381	12151781	15400
18-Jan	12151781	12166782	15001
19-Jan	12166782	12182024	15242
20-Jan	12182024	12196891	14867
21-Jan	12196891	12211915	15024
22-Jan	12211915	12226174	14259
23-Jan	12226174	12242141	15967
24-Jan	12242141	12256404	14263
25-Jan	12256404	12271220	14816
26-Jan	12271220	12286604	15384
27-Jan	12286604	12302601	15997
28-Jan	12302601	12318457	15856
29-Jan	12318457	12333882	15425
30-Jan	12333882	12349508	15626
31-Jan	12333882	12348851	14969
		AVERAGE	15337.42
		TOTAL	475460

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ANNEXURE IX (C)

ETP INLET RECORD FEB 2021					TRIDENTGROUP
BUSINESS/ UNIT	TPEC	LOCATION	DHAULA	MACHINE NAME/PROCESS NAME	TPEC BUSINESS
PROCESS :	ETP				

Feb-21

Date	INLET		
	Initial Reading	Final Reading	Flow
1-Feb	12348851	12364975	16124
2-Feb	12364975	12380961	15986
3-Feb	12380961	12397176	16215
4-Feb	12397176	12413144	15968
5-Feb	12413144	12429354	16210
6-Feb	12429354	12445777	16423
7-Feb	12445777	12461997	16220
8-Feb	12461997	12478420	16423
9-Feb	12478420	12494831	16411
10-Feb	12494831	12510723	15892
11-Feb	12510723	12525969	15246
12-Feb	12525969	12542089	16120
13-Feb	12542089	12558319	16230
14-Feb	12558319	12574559	16240
15-Feb	12574559	12590541	15982
16-Feb	12590541	12606326	15785
17-Feb	12606326	12621970	15644
18-Feb	12621970	12637711	15741
19-Feb	12637711	12653234	15523
20-Feb	12653234	12669234	16000
21-Feb	12669234	12685220	15986
22-Feb	12685220	12701084	15864
23-Feb	12701084	12716768	15684
24-Feb	12716768	12732998	16230
25-Feb	12732998	12748827	15829
26-Feb	12748827	12764737	15910
27-Feb	12764737	12780579	15842
28-Feb	12780579	12796177	15598
		AVERAGE	15975.93
		TOTAL	447326

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Annexure- IX(d)

TRIDENT

ETP INLET RECORD

BUSINESS/UNIT	PAPER	LOCATION	PCD-ETP	PROCESS	EFFLUENT TREATMENT

MONTH MARCH YEAR 2021

DATE	INTIAL READING	FINAL READING	TOTAL (m3)
1	12896733	12811866	15689
2	12811866	12828922	15481
3	12828922	12843773	15841
4	12843773	12858658	15925
5	12858658	12875009	16451
6	12875009	12890995	15986
7	12890995	12906693	15698
8	12906693	12922478	15785
9	12922478	12938467	15989
10	12938467	12954091	15624
11	12954091	12970091	16001
12	12970092	12986513	16426
13	12986513	13002613	16097
14	13002613	13018347	15849
15	13018347	13034359	16012
16	13034359	13050662	16303
17	13050663	13066210	15110
18	13066213	13082815	16008
19	13082815	13098819	16004
20	13098819	13114824	16005
21	13114824	13130829	16005
22	13130829	13146827	16098
23	13146827	13162961	16134
24	13162961	13179202	16241
25	13179202	13195198	15996
26	13195198	13211124	15926
27	13211124	13227026	15902
28	13227026	13243150	16124
29	13243150	13259291	16141
30	13259291	13276126	16835
31	13276126	13291409	15284

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Annexure- IX(d)

✓✓TRIDENT

ETP INLET RECORD

BUSINESS/UNIT	PAPER	LOCATION	PCO-ETP	PROCESS	EFFLUENT TREATMENT

MONTH APRIL YEAR 2021

DATE	INTIAL READING	FINAL READING	TOTAL (m3)
1	13291409	13307391	15982
2	13307391	13323234	15843
3	13323234	13338465	15231
4	13338465	13353706	15241
5	13353706	13369349	15643
6	13369349	13385134	15785
7	13385134	13401119	15985
8	13401119	13416999	15880
9	13416999	13432411	15412
10	13432411	13447421	15010
11	13447421	13462523	15102
12	13462523	13477726	15203
13	13477726	13493712	15986
14	13493712	13508922	15210
15	13508922	13524343	15421
16	13524343	13539811	15468
17	13539811	13555211	15400
18	13555211	13570212	15001
19	13570212	13585454	15242
20	13585454	13600417	14963
21	13600417	13616240	15823
22	13616240	13631399	15159
23	13631399	13647066	15667
24	13647066	13662329	15263
25	13662329	13677145	14816
26	13677145	13692529	15384
27	13692529	13708526	15997
28	13708526	13724382	15856
29	13724382	13739807	15425
30	13739807	13755219	15412
31			

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Annexure – IX (f)

TRIDENT

ETP INLET RECORD

BUSINESS/UNIT	PAPER	LOCATION	PCD-ETP	PROCESS	EFFLUENT TREATMENT

MONTH May

YEAR 2021

DATE	INTIAL READING	FINAL READING	TOTAL (m3)
1	13855369	13920695	16426
2	13920695	13986678	15983
3	13986678	14051506	14968
4	14051506	14117499	15984
5	14117499	14183600	16101
6	14183600	14249087	15487
7	14249087	14314709	15622
8	14314709	14380695	15986
9	14380695	14446606	15911
10	14446606	14511942	16336
11	14511942	14578590	15948
12	14578590	14643883	15293
13	14643883	14709309	15426
14	14709309	14775232	14969
15	14775232	14839713	15481
16	14839713	14905482	16524
17	14905482	14971906	16424
18	14971906	15037096	15190
19	15037096	15104291	15931
20	15104291	15170499	15911
21	15170499	15237989	15986
22	15237989	15304229	15849
23	15304229	15369696	15919
24	15369696	15435960	15864
25	15435960	15501857	15897
26	15501857	15567556	15912
27	15567556	15633997	15912
28	15633997	15699426	15929
29	15699426	15765195	15769
30	15765195	15831299	15874
31	15831299	15897805	15936

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Annexure – X

ANNEXURE 7 of

DRAIN & PLANTATION RECORD DEC 2020					TRIDENTGROUP
BUSINESS/ UNIT	TPEC	LOCATION	CHAMLA	MACHINE NAME/PROCESS NAME	TPEC BUSINESS
PROCESS	ETP				

Dec-20

Date	DRAIN			PLANTATION		
	Initial Reading	Final Reading	Flow	Initial Reading	Final Reading	Flow
1-Dec	11412783	11416993	4210	13706532	13717745	11213
2-Dec	11416993	11421864	4871	13717745	13728816	11071
3-Dec	11421864	11426379	4515	13728816	13739670	10854
4-Dec	11426379	11430948	4569	13739670	13750742	11072
5-Dec	11430948	11435191	4243	13750742	13762183	11441
6-Dec	11435191	11439347	4156	13762183	13773898	11715
7-Dec	11439347	11443706	4359	13773898	13785460	11562
8-Dec	11443706	11448465	4759	13785460	13796476	11016
9-Dec	11448465	11452814	4349	13796476	13807616	11140
10-Dec	11452814	11456815	4001	13807616	13818616	11000
11-Dec	11456815	11460780	3965	13818616	13829604	10988
12-Dec	11460780	11464792	4012	13829604	13840806	11202
13-Dec	11464792	11468790	3998	13840806	13851674	10868
14-Dec	11468790	11472916	4126	13851674	13861807	10133
15-Dec	11472916	11476768	3852	13861807	13873191	11384
16-Dec	11476768	11480736	3968	13873191	13885210	12019
17-Dec	11480736	11484861	4125	13885210	13896087	10877
18-Dec	11484861	11488312	3451	13896087	13907598	11511
19-Dec	11488312	11492341	4029	13907598	13918897	11299
20-Dec	11492341	11495999	3658	13918897	13929995	11098
21-Dec	11495999	11500124	4125	13929995	13941237	11242
22-Dec	11500124	11504489	4365	13941237	13952836	11599
23-Dec	11504489	11509313	4824	13952836	13964014	11178
24-Dec	11509313	11512581	3268	13964014	13975597	11583
25-Dec	11512581	11516130	3549	13975597	13987312	11715
26-Dec	11516130	11520091	3961	13987312	13998347	11035
27-Dec	11520091	11523345	3254	13998347	14010390	12043
28-Dec	11523345	11527357	4012	14010390	14022361	11971
29-Dec	11527357	11530735	3378	14022361	14033249	10888
30-Dec	11530735	11534900	4165	14033249	14044451	11202
31-Dec	11530735	11534692	3957	14044451	14055991	11540
		AVERAGE	4066.90		AVERAGE	11272.87
		TOTAL	126074		TOTAL	349459

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ANNEXURE - 8 (b)

DRAIN & PLANTATION RECORD JAN 2021					TRIDENTGROUP
BUSINESS UNIT	TPEC	LOCATION	DHAKLA	MACHINE NAME/PROCESS NAME	TPEC BUSINESS
PROCESS :	ETP				

Jan-21

Date	DRAIN			PLANTATION		
	Initial Reading	Final Reading	Flow	Initial Reading	Final Reading	Flow
1-Jan	11534692	11538812	4120	14055991	14067873	11882
2-Jan	11538812	11543703	4891	14067873	14078825	10952
3-Jan	11543703	11548118	4415	14078825	14089641	10816
4-Jan	11548118	11552243	4125	24089641	14100757	11116
5-Jan	11552243	11556453	4210	14100757	14112132	11375
6-Jan	11556453	11560603	4150	14112132	14123767	11635
7-Jan	11560603	11564872	4269	14123767	14135483	11716
8-Jan	11564872	11569434	4562	14135483	14146801	11318
9-Jan	11569434	11573649	4215	14146801	14157998	11197
10-Jan	11573649	11577649	4000	14157998	14169008	11010
11-Jan	11577649	11581651	4002	14169008	14180108	11100
12-Jan	11581651	11585669	4018	14180108	14191293	11185
13-Jan	11585669	11589879	4210	14191293	14202069	10776
14-Jan	11589879	11594004	4125	14202069	14213154	11085
15-Jan	11594004	11597990	3986	14213154	14224589	11435
16-Jan	11597990	11602102	4112	14224589	14235945	11356
17-Jan	11602102	11606317	4215	14235945	14247130	11185
18-Jan	11606317	11610338	4021	14247130	14258110	10980
19-Jan	11610338	11614458	4120	14258110	14269232	11122
20-Jan	11614458	11618545	4087	14269232	14280012	10780
21-Jan	11618545	11622656	4111	14280012	14290925	10913
22-Jan	11622686	11626982	4226	14290925	14300958	10033
23-Jan	11626882	11630730	3848	14300958	14313077	12119
24-Jan	11630730	11634752	4022	14313077	14323318	10241
25-Jan	11634752	11638706	3954	14323318	14334180	10862
26-Jan	11638706	11643000	4294	14334180	14345270	11090
27-Jan	11643000	11647105	4105	14345270	14357162	11892
28-Jan	11647105	11651370	4265	14357162	14368753	11591
29-Jan	11651370	11655382	4012	14368753	14380166	11413
30-Jan	11655382	11659388	4006	14380166	14391786	11620
31-Jan	11659388	11663344	3956	14391786	14402799	11013
		AVERAGE	4150.06		AVERAGE	11187.35
		TOTAL	128652		TOTAL	346808

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ANNEXURE X (c)

DRAIN & PLANTATION RECORD FEB 2021					TRIDENT GROUP
BUSINESS UNIT	TPEC	LOCATION	CHALLA	MACHINE NAME/PROCESS NAME	TPEC BUSINESS
PROCESS :	STP				

Feb-21

Date	DRAIN			PLANTATION		
	Initial Reading	Final Reading	Flow	Initial Reading	Final Reading	Flow
1-Feb	11663344	11668843	5499	14402799	14413424	10625
2-Feb	11668843	11674412	5569	14413424	14423841	10417
3-Feb	11674412	11679532	5120	14423841	14434936	11095
4-Feb	11679532	11684892	5360	14434936	14445544	10608
5-Feb	11684892	11690354	5462	14445544	14456292	10748
6-Feb	11690354	11695836	5482	14456292	14467233	10941
7-Feb	11695836	11701457	5621	14467233	14477832	10599
8-Feb	11701457	11706777	5320	14477832	14488935	11103
9-Feb	11706777	11712419	5642	14488935	14499704	10769
10-Feb	11712419	11717929	5510	14499704	14510086	10382
11-Feb	11717929	11723139	5210	14510086	14520122	10036
12-Feb	11723139	11728837	5698	14520122	14530544	10422
13-Feb	11728837	11734649	5812	14530544	14540962	10418
14-Feb	11734649	11740341	5692	14540962	14551510	10548
15-Feb	11740041	11745937	5596	14551510	14561896	10386
16-Feb	11745937	11751579	5642	14561896	14572039	10143
17-Feb	11751579	11757219	5640	14572039	14582043	10004
18-Feb	11757219	11762969	5750	14582043	14592034	9991
19-Feb	11762969	11768560	5591	14592034	14601966	9932
20-Feb	11768560	11774439	5879	14601966	14612087	10121
21-Feb	11774439	11780137	5698	14612087	14622375	10288
22-Feb	11780137	11785661	5524	14622375	14632715	10340
23-Feb	11785661	11791359	5698	14632715	14642701	9986
24-Feb	11791359	11796879	5520	14642701	14653411	10710
25-Feb	11796879	11802427	5548	14653411	14663692	10281
26-Feb	11802427	11808125	5698	14663692	14673904	10212
27-Feb	11808125	11813614	5489	14673904	14684257	10353
28-Feb	11813614	11819255	5641	14684257	14694214	9957
		AVERAGE	5568.25		AVERAGE	9400.48
		TOTAL	155911		TOTAL	291415

For Trident Limited

Authorised Signatory

Annexure X(d)

TREATED EFFLUENT DISCHARGE RECORD

TRIDENT GROUP

BUSINESS UNIT	PCD-ETP	LOCATION	PCD-ETP	MACHINE NAME/PROCESS NAME	EFFLUENT TREATMENT PLANT
PROCESS :	EFFLUENT TREATMENT- PAPER DIVISION				

MONTH: March YEAR: 2021

	Plantation Meter (A)			Drain Meter (B)			Total (A+B) (m³)
DATE	Initial Reading	Final Reading	Total (m³)	Initial Reading	Final Reading	Total (m³)	
01	14694014	14706684	12670	11819255	11824765	5510	18180
02	14706684	14721907	15223	11824765	11830181	5416	20639
03	14721567	14732570	10503	11830981	11836865	5884	16387
04	14732570	14743570	11000	11836865	11842299	5434	16434
05	14743570	14754479	10909	11842299	11847819	5520	16429
06	14754479	14765384	10905	11847819	11853316	5497	16402
07	14765384	14776753	10286	11853316	11858688	5372	15658
08	14776753	14787590	10837	11858688	11864193	5505	16342
09	14787590	14798100	10510	11864193	11867659	5466	15976
10	14788100	14798203	10103	11867659	11873180	5521	15624
11	14798203	14808707	10504	11873180	11878677	5497	16001
12	14808707	14819211	10504	11878677	11884098	5421	15925
13	14819211	14829463	10252	11884098	11889343	5245	15497
14	14829463	14841102	10639	11889343	11894553	5210	15849
15	14841102	14851767	10665	11894553	11900104	5551	16216
16	14851767	14862367	10600	11900104	11905622	5518	16118
17	14862367	14873867	11500	11905622	11911442	5820	17320
18	14873867	14883740	09873	11911442	11916619	5177	15050
19	14883740	14893886	10146	11916619	11922875	5256	15402
20	14893886	14904883	10997	11922875	11928282	5407	16404
21	14904883	14914699	09816	11928282	11933732	5450	15266
22	14914699	14925283	10584	11933732	11939256	5524	16108
23	14925283	14935861	10578	11939256	11944798	5542	16120
24	14935861	14946486	10625	11944798	11950308	5510	16135
25	14946486	14957046	10560	11950308	11955738	5430	15990
26	14957046	14967846	10800	11955738	11961286	5548	16348
27	14967846	14978395	10549	11961286	11966782	5496	16045
28	14978395	14988421	10026	11966782	11972193	5411	15437
29	14988421	14999142	10721	11972193	11977540	5347	16068
30	14999142	15009869	10727	11977540	11982908	5368	16095
31	15009869	15019944	10075	11982908	11988453	5545	15620

(Shift Supervisor Signature)

(HOD Signature)

Annexure X(e)

TREATED EFFLUENT DISCHARGE RECORD

TRIDENT GROUP

BUSINESS/ UNIT	PCD-ETP	LOCATION	PCD-ETP	MACHINE NAME/PROCESS NAME	EFFLUENT TREATMENT PLANT
PROCESS:	EFFLUENT TREATMENT- PAPER DIVISION				

MONTH: APRIL YEAR: 2004

	Plantation Meter (A)			Drain Meter (B)			Total (A+B) (m³)
DATE	Initial Reading	Final Reading	Total (m³)	Initial Reading	Final Reading	Total (m³)	
01	15019944	15030227	10283	11988757	11994456	5699	15982
02	15030227	15040509	10282	11994456	12000017	5561	15843
03	15040509	15050520	10011	12000017	12005257	5240	15251
04	15050520	15060601	10081	12005237	12010397	5160	15241
05	15060601	15070978	10377	12010397	12015663	5266	15643
06	15070978	15081281	10303	12015663	12021145	5482	15785
07	15081281	15091645	10364	12021145	12026766	5621	15985
08	15091645	15102205	10560	12026766	12032086	5320	15880
09	15102205	15111975	9770	12032086	12037728	5642	15412
10	15111975	15121675	9700	12037728	12043038	5310	15010
11	15121675	15131567	9892	12043038	12048248	5210	15102
12	15131567	15141172	9605	12048248	12053846	5598	15203
13	15141172	15151346	10174	12053846	12059658	5812	15986
14	15151346	15160864	9518	12059658	12065350	5692	15210
15	15160864	15170689	9825	12065350	12070946	5596	15421
16	15170689	15180515	9826	12070946	12076588	5642	15468
17	15180515	15190275	9760	12076588	12082228	5640	15400
18	15190275	15199526	9251	12082228	12087978	5750	15001
19	15199526	15209177	9652	12087978	12093569	5591	15243
20	15209177	15218161	9084	12093569	12099448	5879	14963
21	15218261	15228386	10125	12099448	12105146	5698	15823
22	15228386	15238021	9635	12105146	12110670	5524	15159
23	15238021	15247990	9969	12110670	12116368	5698	15667
24	15247990	15257733	9743	12116368	12121888	5520	15263
25	15257733	15267001	9268	12121888	12127436	5548	14816
26	15267001	15276687	9686	12127436	12133134	5698	15384
27	15276687	15287195	10508	12133134	12138623	5489	15997
28	15287195	15297838	10643	12138623	12143836	5213	15856
29	15297838	15308144	10306	12143836	12148955	5119	15425
30	15308144	15318688	10544	12148955	12154439	5484	15962
31							

(Shift Supervisor Signature)

(HOD Signature)

Annexure X (v)

TREATED EFFLUENT DISCHARGE RECORD

TRIDENT GROUP

BUSINESS/ UNIT	PCD-ETP	LOCATION	PCD ETP	MACHINE NAME/PROCESS NAME	EFFLUENT TREATMENT PLANT
PROCESS:	EFFLUENT TREATMENT-PAPER DIVISION				

MONTH: May YEAR: 2021

DATE	Plantation Meter (A)			Drain Meter (B)			Total (A+B) (m³)
	Initial Reading	Final Reading	Total (m³)	Initial Reading	Final Reading	Total (m³)	
1	15718682	15728782	1010	12154499	12159425	4926	15936
2	15728782	15738889	10107	12159425	12164340	4915	15022
3	15738889	15748545	9656	12164340	12168262	3922	13578
4	15748545	15758898	10353	12168262	12173543	5281	15634
5	15758898	15768999	10101	12173543	12178603	5060	15161
6	15768999	15778992	9993	12178603	12183521	4918	14911
7	15778992	15788990	9998	12183521	12188446	4925	14923
8	15788990	15798960	9970	12188446	12193382	4936	14906
9	15798960	15808852	9892	12193382	12198210	4828	14720
10	15808852	15818803	9951	12198210	12203041	4831	14782
11	15818803	15828800	9997	12203041	12207918	4877	14874
12	15828800	15838802	10002	12207918	12212812	4894	14896
13	15838802	15848796	9994	12212812	12217707	4895	14889
14	15848796	15858698	9902	12217707	12222496	4789	14691
15	15858698	15868701	10003	12222496	12227393	4897	14900
16	15868701	15878684	9983	12227393	12232265	4872	14855
17	15878684	15888719	10035	12232265	12237199	4934	14969
18	15888719	15898782	10063	12237199	12242015	4816	14879
19	15898782	15908672	9890	12242015	12246941	4926	14816
20	15908672	15918668	9996	12246941	12251789	4848	14844
21	15918668	15928719	10051	12251789	12256701	4912	14963
22	15928719	15938782	10063	12256701	12261623	4922	14985
23	15938782	15948865	10083	12261623	12266487	4864	14947
24	15948865	15958965	10100	12266487	12271352	4865	14965
25	15958965	15968963	9998	12271352	12276228	4876	14874
26	15968963	15978960	10097	12276228	12281098	4870	14967
27	15978960	15988961	10001	12281098	12285968	4870	14871
28	15988961	15998973	10012	12285968	12290840	4872	14884
29	15998973	16008960	9987	12290840	12295711	4871	14858
30	16008960	16018961	10001	12295711	12300580	4869	14870
31	16018961	16028969	10008	12300580	12305469	4889	14897

(HOD Signature)

Annexure – XI

ANNEXURE P (a)

TRIDENT
Excellence in nature

CONTRACT

This Contract is made on this day of 01st day of February, 2021 between Trident Limited, a company incorporated under the Companies Act, 1956 and having its Registered Office at Trident Group, Sanghera 148001, India (hereinafter referred to as First Party) (which expression shall, unless it be repugnant to the subject or context thereof, include its successors and assigns) of ONE PART and M/s Goel Shankar Mix Boards, having its Office at Kishangarh Road, Gallada pur Bareta-15 [illegible] (hereinafter referred to as Second Party which expression shall, unless it be repugnant to the subject or context thereof, include its successors and assigns) of SECOND PART.

Whereas Trident Limited is a manufacturing company engaged in manufacturing of Paper, Towels etc., which in the process of manufacturing, generates certain type of sludge, which needs to be disposed off in an effective and efficient manner so as to prevent environmental hazards.

1. SCOPE OF WORKS

M/s Goel Shankar Mix Boards has offered to Purchase Centricleaner & ETP sludge (hereinafter referred to as "Material") from Trident. And Trident has agreed to sell the same to Second Party subject to conditions contained in this Contract.

The Second Party shall purchase the above mentioned material on 'as it where is basis' for the duration, the Second Party shall lift minimum 150 MT of Centricleaner sludge and minimum 30 MT of ETP sludge per month.

2 CONSIDERATION AND TERMS OF PAYMENT

The Second Party shall pay as per rates mentioned below.

No.	Material	Rate (in Rs.) per MT
1	Centricleaner sludge	1400/-
2	ETP sludge	1350/-

All the rates are exclusive of all taxes. GST and all other taxes / charges shall be borne by Second Party. Rates are Ex-Works, Trident Limited, Bhatinda.

All the payments shall be made by Second Party in cash in Advance before taking delivery of the material. The Second Party shall be solely and exclusively liable for payment of all taxes, duties, levies and for all necessary Tax Compliances including but not limited to GST and any other New Tax, on or in connection with the services by the Second Party to the First Party as hereunder in accordance with this Contract. The First Party shall not be liable or bear any liability thereafter. In event, of any claim, penalty or Penalty levied on or incurred by the Second Party due to above Non-Compliance and Non-payment of applicable taxes and duties. The Second Party shall indemnify and keep indemnifying the First Party from and against all such claims including any tax input credits denied to the First Party by Tax department due to any Non-Compliance by the Second Party. TRIDENT Group

Trident Limited
Sanghera-148 001

For Trident Limited

Authorised Signatory

3 GENERAL TERMS & CONDITIONS

3.1 The second party will lift whole the Material generated and shall keep all the site clear

3.2 The entire Material should be lifted within specified period of time.

3.3 The material lifted by the Second Party should be used for manufacturing process and should not be recycled.

3.4 The property in the said material shall vest in First party upon its loading / lifting.

3.5 First Party can enter into sale agreement with one or more parties simultaneously at its own sole discretion.

3.6 First Party reserves the right to sell only such material as are finally approved by it.

3.7 Second party agrees to lift the entire quantity of material, as per the contract price specified in consideration clause and without any selection of the material as the sale is specifically on "As is where is basis".

3.8 None of the Second party's agent / workmen shall be allowed to enter the factory without prior permission of the First party. Second party shall submit the names of its workers required to work inside for collection and loading etc. of material. These workers shall be issued temporary gate passes to work inside the premises. No one to be allowed inside the premises without proper gate pass.

3.9 Second party shall take all necessary precautions and safety measures applicable under all Laws and Rules.

3.10 All statutory liabilities for the second party workman under Workmen Compensation Act, Rules and other Industrial Laws as applicable from time to time shall be borne by the second party.

3.11 The Second Party should have/obtain authorization from PPCB for Management, handling & transportation of Hazardous Waste. The Second Party shall arrange and provide Manifest form No.10 duly signed & Stamped.

3.12 The Second party will have to deposit Rs. 4,12,500/- as interest free security deposit at the time of signing off the contract, which shall be refunded without interest upon successful expiry of Contract Period. In case Second Party leave/terminate/breach of any terms and conditions of this Contract, the security shall be forfeited and party may be even blacklisted or

The Second Party shall submit performance Bank Guarantee of Rs. 4,12,500/- as per the format provided by the Company having a validity of one year from the date of contract with an additional claim period of 60 days from the date of expiry of the Contract. In case the Second Party fails to observe any terms & condition of this Contract, First Party reserves the right to invoke the Bank Guarantee.

3.13 The Second party will lift /clear material from on daily basis the Company to avoid any jamming /plant running/production. If Second party fails to lift the minimum quantity of material as specified in clause 1 as per instructions given by the representative of the Company, First party has right to sell the same to any

Trident Limited
Authorised Signatory

Trident Limited
Sanghera-148 India

other party. First party shall charge for the material and removal charges from the Second party if the Second party fails to lift the material.

3.14 Second party shall arrange for the loading & transportation of the material. The charges for the same shall be borne by the Second party itself before movement of the material outside the factory premises.

3.15 Second party shall be solely responsible for compliances with provisions relating to payment of Minimum Wages, Provident Fund, Employee State Insurance, and any compensation payable to workmen employed by it under Workmen Compensation Act and any other State & Central Govt. Act/Rules as applicable from time to time.

3.16 The material shall be lifted by the Second party as per the frequency mentioned. First party shall have full authority to amend the frequency of lifting which shall be intimated to the Second party, the Second party shall pick the material as per the amended frequency. In case material is not lifted as per the said frequency First party reserves the right to impose penalty Rs. 5000/- delay per vehicle or forfeit the security amount.

3.17 The Commercial, resources etc shall, however, be revisited at the end of every quarter.

3.18 The Second Party should have/obtain authorization from PPCB for Management, handling & transportation of Hazardous Waste. The Second Party shall arrange and provide Manifest form No. 10 duly signed & Stamped

3.19 The second Party shall ensure 100% availability of drivers during loading (24 hours) of Sludge vehicles.

3.20 Quantity of sludge is based on average generation of last 12 months.

3.21 The second party shall ensure free space in trolley at the time of loading and no jamming at outlet valve.

4. TENURE

The contract shall be valid from 01.02.2021 to 31.01.2022 unless it is terminated as per the Termination Clause and shall be renewable with mutual consent.

5. TERMINATION

First Party can terminate the Contract at any time without any prior notice and without any compensation and at its sole discretion. However, the obligations and payments under the Contract are to be made by the Second party, for any projects / services delivered before any termination.

6. THIRD PARTY LIABILITY

For Trident Limited

It is agreed between the parties that the First Party shall not be liable for any claims, damages, and suits, legal proceedings filed by the third party for the acts / omissions of the Second party in respect of any matter related to or concerning the business of the Second party. The First Party or its Directors or officials shall not be held responsible and made party to any such suit, complaint or any legal proceedings related to or in respect of any of the matters of the third party in connection with this Contract.

Trident Limited
Sanghera, India

3

7 INDEMNITY

The Second party shall indemnify and keep indemnified First Party, from and against all actions, suits and proceedings by the third party for the acts/omissions of the Second party and all costs, charges, expenses, losses or damages which may incurred or suffered in respect of any matter related to or concerning the business of the Second party or of any of the matters of the third party in connection with this Contract.

8. ANTI BRIBERY

The Second Party hereby undertake that, at the date of the entering into force of the Contract, has not offered, promised, given, authorized, solicited or accepted any undue pecuniary or other advantage of any kind (or implied that they will or might do any such thing at any time in the future) in any way connected with the Contract and that the Second Party have taken reasonable measures to prevent any other third parties, from doing so. Failure to comply with this clause or any act of offering, soliciting or accepting advantage committed by the Second Party shall, without affecting its liability for such failure and act, result in this contact being invalidated.

9. PROHIBITION OF INSIDER TRADING

You or your employees, associates, etc. shall not trade, directly or indirectly, in the shares of Trident Limited during the currency of this Contract or during six months post expiry of this Contract.

10. ARBITRATION

In the event that the dispute does not get amicably resolved within a period of thirty days, the matter shall be subject to arbitration. The arbitration proceedings shall be conducted by the sole arbitrator, to be appointed by the Company. The arbitration shall be conducted in accordance with the Arbitration and Conciliation Act, 1996, as amended and including the rules made thereunder. The tribunal shall consist of three arbitrators, one appointed by each party and the third arbitrator (i.e. the presiding arbitrator) appointed by the two arbitrators so appointed. The seat/place of arbitration as well as the venue of arbitration shall be Barnala, India. Further, the language to be used in arbitration shall be English.

11. JURISDICTION

That it is expressly agreed that this Contract shall be governed by the laws of India and any dispute, difference or claim which may arise between the First Party and the Second party in connection with the performance of this Contract or the rights and obligations of the parties hereto shall be only under the jurisdiction of the law courts of the city of Barnala.

For Trident Limited

Authorised Signatory

Trident Limited
Sanghera-148101, India

IN WITNESS WHEREOF, the parties hereto have executed this Contract on the day and the year herein above first written.

Thanking You,

For Trident Limited

TRIDENT GROUP
Trident Limited
Sangrur 148101, India

(Authorised Signatory)

Witness

Accepted

For M/s Gori Shanker Mix Boards

M/S. GAURI SHANKER MIX BOARDS

(Authorised Signatory)

M/S. GOURI SHANKER MIX BOARD

Prop./Manager

Witness

For Shri Ganesh Mix Board

Partner

For Trident Limited

Authorised Signatory

Annexure XII(b)

2021/NPB7/Pollutes/4596

TRIDENT
Excellence in nature

CONTRACT

This Contract is made on this day of 01st day of February, 2021 between Trident Limited, a Company incorporated under the Companies Act, 1956 and having its Registered Office at Trident Group, Sangrera 148101, India (hereinafter referred to as First Party/ Trident which expression shall, unless it be repugnant to the subject or context thereof, include its successors and assigns) of ONE PART and M/s Shri Ganesh Mix Boards, having its Office at Kishangarh Road, Bahadarpur Bareta-151501, Punjab, India(hereinafter referred to as Second Party which expression shall, unless it be repugnant to the subject or context thereof, include its successors and assigns) of SECOND PART.

Whereas Trident Limited is a manufacturing company engaged in manufacturing of Paper, towel etc., which in the process of manufacturing generates certain type of sludge, which needs to be disposed off in an effective and efficient manner so as to prevent environmental hazards.

1. SCOPE OF WORK:

M/s Shri Ganesh Mix Boards has offered to Purchase Centricleaner & ETP sludge (hereinafter referred to as "Material") from Trident and Trident has agreed to sell the [illegible]

The Second Party shall purchase the above mentioned material on "as it where is basis". Subject to generation, the Second Party shall lift minimum 150 MT of Centricleaner sludge and minimum 150 MT of ETP sludge per month.

2. CONSIDERATION AND TERMS OF PAYMENT

The Second Party shall pay as per rates mentioned below.

Sr. No.	Material	Rate (in Rs.) per MT
1	Centricleaner sludge	1600/-
2	ETP sludge	1150/-

Above rates are exclusive of all taxes. GST and all other taxes / charges shall be borne by Second party. Rates are Ex-Works, Trident Limited, Dhaula.

All the payments shall be made by Second Party in cash in Advance before lifting of the material. The Second Party shall be solely and exclusively liable for payment of all taxes, duties, levies and for all necessary Tax Compliances including but not limited to GST and any other New Tax, on or in connection with the services by the Second Party to the First Party under and in accordance with this Contract. The First Party shall not be liable or responsible therefore, in event, of any claim, penalty or liability levied on or incurred by the Second Party due to above Non-Compliance and Non-Payment of applicable Taxes and duties. The Second Party shall indemnify and keep indemnifying the First Party from and against all such claims including any tax input credits denials to the First Party by Tax department due to any Non-Compliance by the Second Party.

For Trident Limited
Sangrera-148101, India
Authorised Signatory

For Shri Ganesh Mix Boards

Trident Limited, Regd. Office: [illegible]

3. GENERAL TERMS & CONDITIONS

3.1 The second party will lift whole the Material generated and shall keep all the pits clear.

3.2 The entire Material should be lifted within specified period of time.

3.3 The material lifted by the Second Party should be used for manufacturing process and should not be recycled.

3.4 The property in the said material shall vest in First party upon its loading / lifting.

3.5 First Party can enter into sale agreement with one or more parties simultaneously at its own sole discretion.

3.6 First Party reserves the right to sell only such materia. as are finally approved by it.

3.7 Second party agrees to lift the entire quantity of material, as per the contract price specified in consideration clause and without any selection of the material as the sale is specifically on "As is where is basis".

3.8 None of the Second party's agent / workmen shall be allowed to enter the factory without prior permission of the First party. Second party shall submit the names of its workers required to work inside for collection and loading etc. of material. These workers shall be issued temporary gate passes to work inside the premises. No one to be allowed inside the premises without proper gate pass.

3.9 Second party shall take all necessary precautions and safety measures applicable under all Laws and Rules.

3.10 All statutory liabilities for the second party workman under Workman Compensation Act, Rules and other Industrial Laws as applicable from time to time shall be borne by the second party.

3.11 The Second Party should have/obtain authorization from PPCB for Management, handling & transportation of Hazardous Waste. The Second Party shall arrange and provide Manifest form No.10 duly signed & Stamped.

3.12 The Second party will have to deposit Rs. 4,12,500/- as interest free security deposit at the time of signing off the contract, which shall be refunded without interest upon successful expiry of Contract Period. In case Second Party leave/terminate/breach of any terms and conditions of this Contract, the security shall be forfeited and party may be even blacklisted ur

The Second Party shall submit performance Bank Guarantee of Rs. 4,12,500/- as per the format provided by the Company having a validity of one year from the date of contract with an additional claim period of 60 days from the date of expiry of the Contract. In case the Second Party fails to observe any terms & condition of this Contract, First Party reserves the right to invoke the Bank Guarantee.

3.13 The Second party will lift /clear material from on daily basis the whole quantity to avoid any jamming /plant running/production. If Second party fails to lift the minimum quantity of material as specified in clause 1 as per instructions given by the representative of the Company, First party has right to sell the same to any

For Shri Ganesh Mix Boards

For Trident Limited

Trident Limited
Sangrur-148 001, India

Authorised Signatory

other party. First party shall charge for the material and removal charges from the Second party if the Second party fails to lift the material.

3.14 Second party shall arrange for the loading & transportation of the material. The charges for the same shall be borne by the Second party itself before movement of the material outside the factory premises.

3.15 Second party shall be solely responsible for compliances with provisions relating to payment of Minimum Wages, Provident Fund, Employee State Insurance, and any compensation payable to workmen employed by it under Workmen Compensation Act and any other State & Central Govt. Act/Rules as applicable from time to time.

3.16 The material shall be lifted by the Second party as per the frequency mentioned. First party shall have full authority to amend the frequency of lifting which shall be intimated to the Second party, the Second party shall pick the material as per the amended frequency. In case material is not lifted as per the said frequency First party reserves the right to impose penalty Rs. 5000/- delay per vehicle or forfeit the security amount.

3.17 The Commercial, resources etc shall, however, be revisited at the end of every quarter.

3.18 The Second Party should have/obtain authorization from PPCB for Management, handling & transportation of Hazardous Waste. The Second Party shall arrange and provide Manifest form No.10 duly signed & Stamped

3.19 The second Party shall ensure 100% availability of drivers during loading (24 hours) of Sludge vehicles.

3.20 Quantity of sludge is based on average generation of last 12 months.

3.21 The second party shall ensure free space in trolley at the time of loading and no jamming at outlet valve.

For Shri Ganesh Mix Boards

4. TENURE

The contract shall be valid from 01.02.2021 to 31.01.2022 unless it is terminated as per the Termination Clause and shall be renewable with mutual consent.

5. TERMINATION

First Party can terminate the Contract at any time without any prior notice and without any compensation and at its sole discretion. However, the obligations and payments under the Contract are to be made by the Second party, for any projects / services defined, before any termination.

6. THIRD PARTY LIABILITY

It is agreed between the parties that the First Party shall not be liable for any claims, damages, and suits, legal proceedings filed by the third party for the acts / omissions of the Second party in respect of any matter related to or concerning the business of the Second party. The First Party or its Directors or officials shall not be held responsible and made party to any such suit, complaint or any legal proceedings related to or in respect of any of the matters of the third party in connection with this Contract.

For Shri Ganesh Mix Boards

Partner

TRIDENT Group
Trident Limited
Sangrur-148101, India

For Trident Limited

Authorised Signatory

7. INDEMNITY

The Second party shall indemnify and keep indemnified First Party, from and against all actions, suits and proceedings by the third party for the acts/omissions of the Second party and all costs, charges, expenses, losses or damages which may incurred or suffered in respect of any matter related to or concerning the business of the Second party or of any of the matters of the third party in connection with this Contract.

8. ANTI BRIBERY

The Second Party hereby undertake that, at the date of the entering into force of the Contract, has not offered, promised, given, authorized, solicited or accepted any undue pecuniary or other advantage of any kind (or implied that they will or might do any such thing at any time in the future) in any way connected with the Contract and that the Second Party have taken reasonable measures to prevent any other third parties, from doing so. Failure to comply with this clause or any act of offering, soliciting or accepting advantage committed by the Second Party shall, without affecting its liability for such failure and act, result in this contact being invalidated.

9. PROHIBITION OF INSIDER TRADING

You or your employees, associates, etc. shall not trade, directly or indirectly, in the shares of Trident Limited during the currency of this Conract or during six months post expiry of this Contract.

10. ARBITRATION

That any dispute, difference or question arising out of, in relation to or incidental to this Contract shall be referred the sole arbitrator to be appointed by Trident Limited. The language for the proceedings shall be English and the venue shall be Barnala, Punjab.

11. JURISDICTION

That it is expressly agreed that this Contract shall be governed by the laws of India and any dispute, difference or claim which may arise between the First Party and the Second party in connection with the performance of this Contract or the rights and obligations of the parties hereto shall be only under the jurisdiction of the law courts of the city of Barnala.

IN WITNESS WHEREOF, the parties hereto have executed this Contract on the day and the year herein above first written.

Thanking You,

For Trident Limited

TRIDENT GROUP
Trident Limited
Sanghera
Authorised Signatory

Witness

PRO

Accepted
For M/s Shri Ganesh Atta Boards

(Authorised Signatory)

For Shri Ganesh Atta Boards
Partner

Witness
For Trident Limited
Authorised Signatory

ANNEXURE [illegible]

2021/NRJ/R/OTHERS/4595

TRIDENT
Excellence in nature

CONTRACT

This Contract is made on this day of 01st day of February,2021 between Trident Limited, a Company incorporated under the Companies Act, 1956 and having its Registered Office at Trident Complex, Rajkot Road, Barnala, (hereinafter referred to as First Party/ Trident which expression shall, unless it be repugnant to the subject or context thereof, include its successors and assigns) of ONE PART and M/s Hem Raj Mix Board Mills having its Office at Budhlada Road , Bareta, Bareta-151501, Punjab (hereinafter referred to as Second Party which expression shall, unless it be repugnant to the subject or context thereof, include its successors and assigns) of SECOND PART.

Whereas Trident Limited is a manufacturing company engaged in manufacturing of Paper, towel etc., which in the process of manufacturing generates certain type of sludge, which needs to be disposed off in an effective and efficient manner so as to prevent environmental hazards.

1. SCOPE OF WORK:

   Hem Raj Mix Board Mills has offered to Purchase ETP sludge(hereinafter referred to as "Material") from Trident and Trident has agreed to sell the same on terms and conditions contained in this contract.

   The Second Party shall purchase the above mentioned material on "as it where is basis". Subject to generation, the Second Party shall lift minimum 300 MT of ETP sludge per month.

2. CONSIDERATION AND TERMS OF PAYMENT

   The Second Party shall pay as per rates mentioned below.

Sr. No.	Material	UOM	Rate (in Rs.)
1	ETP sludge	Rs/MT	1150/-

Above rates are exclusive of all taxes. GST and all other taxes / charges shall be borne by Second party. Rates are Ex-Works, Trident Limited, Dhaulo.

All the payments shall be made by Second Party in cash in Advance before lifting of the material. The Second Party shall be solely and exclusively liable for payment of all taxes, duties, levies and for all necessary Tax Compliances including but not limited to GST and any other New Tax, on or in connection with the services by the Second Party to the First Party under and in accordance with this contract. The First Party shall not be liable or responsible therefore, in event, of any claim, penalty or liability levied on or incurred by the Second Party due to above Non-Compliance and Non-Payment of applicable Taxes and duties. The Second Party shall indemnify and keep indemnifying the First Party from and against all such claims including any tax input credits denials to the First Party by Tax department due to any Non-Compliance by the Second Party.

For Hem Raj Mix Board Mills

PRO?

TRIDENT GROUP
Trident Limited
Sanghera 148001, India

For Trident Limited

Authorised Signatory

3. GENERAL TERMS & CONDITIONS

3.1 The second party will lift whole the Material generated and shall keep all the pits clear.

3.2 The entire Material should be lifted within specified period of time.

3.3 The material lifted by the Second Party should be used for manufacturing process and should not be recycled.

3.4 The property in the said material shall vest in First party upon its loading / lifting.

3.5 First Party can enter into sale agreement with one or more parties simultaneously at its own sole discretion.

3.6 First Party reserves the right to sell only such material as are finally approved by it.

3.7 Second party agrees to lift the entire quantity of material, as per the contract price specified in consideration clause and without any selection of the material as the sale in specifically on "As is where is basis".

3.8 None of the Second party's agent / workmen shall be allowed to enter the factory without prior permission of the First party. Second party shall submit the names of its workers required to work inside for collection and loading etc. of material. These workers shall be issued temporary gate passes to work inside the premises. No one to be allowed inside the premises without proper gate pass.

3.9 Second party shall take all necessary precautions and safety measures applicable under all Laws and Rules.

3.10 All statutory liabilities for the second party workman under Workman Compensation Act, Rules and other Industrial Laws as applicable from time to time shall be borne by the second party.

3.11 The Second Party should have/obtain authorization from PPCB for Management, handling & transportation of Hazardous Waste. The Second Party shall arrange and provide Manifest form No.10 duly signed & Stamped.

3.12 The Second party will have to deposit Rs. 3,45,000/- as interest free security deposit at the time of signing off the contract, which shall be refunded without interest upon successful expiry of Contract Period. In case Second Party leave/terminate/breach of any terms and conditions of this Contract, the security shall be forfeited; or

The Second Party shall submit performance Bank Guarantee of Rs. 3,45,000/- as per the format provided by the Company having a validity of one year from the date of contract with an additional claim period of 60 days from the date of expiry of the Contract. In case the Second Party fails to observe any terms & condition of this contract, First Party reserves the right to invoke the Bank Guarantee.

3.13 The Second party will lift /clear material from on daily basis the whole quantity to avoid any jamming /plant running/production. If Second party fails to lift the minimum quantity of material as specified in clause-1-as-per instructions given by the representative of the Company, First party has right to sell the same to any other party. First party shall charge for the material and removal charges from the

For Hem Raj Mix Board Mills

Trident Laboratories Limited

Sangrera

Authorised Signatory

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Second party if the Second party fails to lift the material and said charges shall be recovered from the security amount security amount deposited by first party.

3.14 Second party shall arrange for the loading & transportation of the material. The charges for the same shall be borne by the Second party itself before movement of the material outside the factory premises.

3.15 Second party shall be solely responsible for compliances with provisions relating to payment of Minimum Wages, Provident Fund, Employee State Insurance, and any compensation payable to workmen employed by it under Workmen Compensation Act and any other State & Central Govt. Act/Rules as applicable from time to time.

3.16 The material shall be lifted by the Second party as per the frequency mentioned. First party shall have full authority to amend the frequency of lifting which shall be intimated to the Second party, the Second party shall pick the material as per the amended frequency. In case material is not lifted as per the said frequency First party reserves the right to impose penalty Rs. 5000/- delay per vehicle or forfait the security amount.

3.17 The Commercial, resources etc. shall, however, be revisited at the end of every quarter.

3.18 The Second Party should have/obtain authorization from PPCB for Management, handling & transportation of Hazardous Waste. The Second Party shall arrange and provide Manifest form No.10 duly signed & Stamped

3.19 Any loss to Company due to delay in lifting of material will be recovered from the customer as per the loss assessment by the respective process owner or HOD of Department.

3.20 The Second Party must ensure that the maximum time of holding the vehicle inside the Company premises after loading will be 24 Hours.

3.21 The quantity of sludge is based on average generation of last 12 months.

3.22 The second party shall ensure 100% availability of drivers during loading(24 Hours) of sludge vehicles

3.23 The second party shall ensure free space in trolley at the time of loading & no jamming at outlet valve.

4. TENURE

The contract shall be valid from 01.02.2021 to 31.01.2022 unless it is terminated as per the Termination Clause and shall be renewable with mutual consent.

5. TERMINATION

First Party can terminate the Contract at any time without any prior notice and without any compensation and at its sole discretion. However, the obligations and payments under the Contract are to be made by the Second party, for any projects / services defined, before any termination.

For Hem Rai Mix Board P'Ltd

Chairman

For Trident Limited

Trident Limited
Sanghera-141001, Punjab

Authorised Signatory

6. **THIRD PARTY LIABILITY**

It is agreed between the parties that the First Party shall not be liable for any claims, damages, and suits, legal proceedings filed by the third party for the acts / omissions of the Second party in respect of any matter related to or concerning the business of the Second party. The First Party or its Directors or officials shall not be held responsible and made party to any such suit, complaint or any legal proceedings related to or in respect of any of the matters of the third party in connection with this Contract.

Any losses/ damages will be borne by the contractor as per mutual assessment with company or its representative.

7. **INDEMNITY**

The Second party shall indemnify and keep indemnified First Party, from and against all actions, suits and proceedings by the third party for the acts/omissions of the Second party and all costs, charges, expenses, losses or damages which may incurred or suffered in respect of any matter related to or concerning the business of the Second party or of any of the matters of the third party in connection with this Contract.

8. **ANTI BRIBERY**

The Second Party hereby undertake that, at the date of the entering into force of the Contract, has not offered, promised, given, authorized, solicited or accepted any undue pecuniary or other advantage of any kind (or implied that they will or might do any such thing at any time in the future) in any way connected with the Contract and that the Second Party have taken reasonable measures to prevent any other third parties, from doing so. Failure to comply with this clause or any act of offering, soliciting or accepting advantage committed by the Second Party shall, without affecting its liability for such failure and act, result in this contact being invalidated.

9. **PROHIBITSON OF INSIDER TRADING**

You or your employees, associates, etc. shall not trade, directly or indirectly, in the shares of Trident Limited during the currency of this contract or during six months post expiry of this contract.

10. **ARBITRATION**

In the event that the dispute does not get amicably resolved within a period of thirty days, the matter shall be subject to arbitration. The arbitration proceedings shall be conducted by the sole arbitrator, to be appointed by the Company. The arbitration shall be conducted in accordance with the Arbitration and Conciliation Act, 1996, as amended and including the rules made thereunder. The tribunal shall consist of three arbitrators, one appointed by each party and the third arbitrator (i.e. the presiding arbitrator) appointed by the two arbitrators so appointed. The seat/place of arbitration as well as the venue of arbitration shall be Barnala, India. Further, the language to be used in arbitration shall be English.

11. **JURISDICTION**

That it is expressly agreed that this Contract shall be governed by the laws of India and any dispute, difference or claim which may arise between the First Party and the Second party

For Trident Limited

Authorised Signatory

For Hem Raj Mix Board Mills

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Trident Limited
Sanghera-141 401, India

in connection with the performance of this Contract or the rights and obligations of the parties hereto shall be only under the jurisdiction of the law courts of the city of Barnala.

IN WITNESS WHEREOF, the parties hereto have executed this Contract on the day and the year herein above first written.

Thanking You,

For Trident Limited

Witness

(Authorised Signatory)

Accepted

For Hem Raj Mix Board Mills

Witness

(Authorised Signatory)

For Trident Limited

Authorised Signatory

For Hem Raj Mix Board Mills

PROP.

ANNEXURE (H)

2021/NPRJ/PC/OTHERS/4597

TRIDENT
Excellence in nature

C-21, Focal Point Extn. Tel/Fax: 01628-263190 Ludhiana-141010, India
Tel: +91-161-5075111 Fax: +91-161-2604690 E-mail: investor@trident.in

CONTRACT

This Contract is made on this day of 01st day of February,2021 between Trident Limited, a Company incorporated under the Companies Act, 1956 and having its Registered Office at Trident Complex, Rajkot Road, Barnala, (hereinafter referred to as First Party/ Trident which expression shall, unless it be repugnant to the subject or context thereof, include its successors and assigns) of ONE PART and M/s Aggarwal Industries having its Office at Kishangarh Road, Bahadarpur Barata-151501 (hereinafter referred to as Second Party which expression shall, unless it be repugnant to the subject or context thereof, include its successors and assigns) of SECOND PART.

Whereas Trident Limited is a manufacturing company engaged in manufacturing of Paper, towel etc., which in the process of manufacturing, generates certain type of sludge, which needs to be disposed off in an effective and efficient manner so as to prevent environmental hazards.

1. SCOPE OF WORK:

Shakti Board Mill has offered to Purchase ETP sludge(hereinafter referred to as "Material") from Trident and Trident has agreed to sell the same on terms and conditions contained in this contract.

The Second Party shall purchase the above mentioned material on "as it where is basis". Subject to generation, the Second Party shall lift minimum 300 MT of ETP sludge per month.

2. CONSIDERATION AND TERMS OF PAYMENT

The Second Party shall pay as per rates mentioned below.

Sr. No.	Material	UOM	Rate (in Rs.)
1	ETP sludge	RS/MT	1150/-

Above rates are exclusive of all taxes. GST and all other taxes / charges shall be borne by Second party. Rates are Ex-Works, Trident Limited, Dhaula.

All the payments shall be made by Second Party in cash in Advance before lifting of the material. The Second Party shall be solely and exclusively liable for payment of all taxes, duties, levies and for all necessary Tax Compliances including but not limited to GST and any other New Tax, on or in connection with the services by the Second Party to the First Party under and in accordance with this contract. The First Party shall not be liable or responsible therefore, in event, of any claim, penalty or liability levied on or incurred by the Second Party due to above Non-Compliance and Non-Payment of applicable Taxes and duties. The Second Party shall indemnify and keep indemnifying the First Party from and against all such claims including any tax input credits denials to the First Party by Tax department due to any Non-Compliance by the Second Party.

For Trident Limited

Authorised Signatory

TRIDENT GROUP
Trident Limited
Sangrur-148001, India

For Aggarwal Industries

Partner

3. GENERAL TERMS & CONDITIONS

3.1 The second party will lift whole the Material generated and shall keep all the pits clear.

3.2 The entire Material should be lifted within specified period of time.

3.3 The material lifted by the Second Party should be used for manufacturing process and should not be recycled.

3.4 The property in the said material shall vest in First party upon its loading / lifting.

3.5 First Party can enter into sale agreement with one or more parties simultaneously at its own sole discretion.

3.6 First Party reserves the right to sell only such material as are finally approved by it.

3.7 Second party agrees to lift the entire quantity of material, as per the contract price specified in consideration clause and without any selection of the material as the sale in specifically on "As is where is basis".

3.8 None of the Second party's agent / workmen shall be allowed to enter the factory without prior permission of the First party. Second party shall submit the names of its workers required to work inside for collection and loading etc. of material. These workers shall be issued tempocary gate passes to work inside the premises. No one to be allowed inside the premises without proper gate pass.

3.9 Second party shall take all necessary precautions and safety measures applicable under all Laws and Rules.

3.10 All statutory liabilities for the second party workman under Workman Compensation Act, Rules and other industrial Laws as applicable from time to time shall be borne by the second party.

3.11 The Second Party should have/obtain authorization from PPCB for Management, handling & transportation of Hazardous Waste. The Second Party shall arrange and provide Manifest form No.10 duly signed & Stamped.

3.12 The Second party will have to deposit Rs. 3,45,000/- as interest free security deposit at the time of signing off the contract, which shall be refunded without interest upon successful expiry of Contract Period. In case Second Party leave/terminate/breach of any terms and conditions of this Contract, the security shall be forfeited; or

The Second Party shall submit performance Bank Guarantee of Rs. 3,45,000/- as per the format provided by the Company having a validity of one year from the date of contract with an additional claim period of 60 days from the date of expiry of the Contract. In case the Second Party fails to observe any terms & condition of this contract, First Party reserves the right to invoke the Bank Guarantee.

3.13 The Second party will lift /clear material from on daily basis the whole quantity to avoid any jamming /plant running/production. If Second party fails to lift the minimum quantity of material as specified in clause 1 as per instructions given by the representative of the Company, First party has right to sell the same to any other party. First party shall charge for the-material and removal charges from

For: Trident Limited

TRIDENT GROUP
Trident Limited
Sangrur-148101 (INDIA)

Authorised Signatory

Second party if the Second party fails to lift the material and said charges shall be recovered from the security amount security amount deposited by first party.

3.14 Second party shall arrange for the loading & transportation of the material. The charges for the same shall be borne by the Second party itself before movement of the material outside the factory premises.

3.15 Second party shall be solely responsible for compliances with provisions relating to payment of Minimum Wages, Provident Fund, Employee State Insurance, and any compensation payable to workmen employed by it under Workmen Compensation Act and any other State & Central Govt. Act/Rules as applicable from time to time.

3.16 The material shall be lifted by the Second party as per the frequency mentioned. First party shall have full authority to amend the frequency of lifting which shall be intimated to the Second party, the Second party shall pick the material as per the amended frequency. In case material is not lifted as per the said frequency First party reserves the right to impose penalty Rs. 5000/- delay per vehicle or forfeit the security amount.

3.17 The Commercial, resources etc. shall, however, be revisited at the end of every quarter.

3.18 The Second Party should have/obtain authorization from PPCB for Management, handling & transportation of Hazardous Waste. The Second Party shall arrange and provide Manifest form No.10 duly signed & Stamped

3.19 Any loss to Company due to delay in lifting of material will be recovered from the customer as per the loss assessment by the respective process owner or HOD of Department.

3.20 The Second Party must ensure that the maximum time of holding the vehicle inside the Company premises after loading will be 24 Hours.

3.21 The quantity of sludge is based on average generation of last 12 months.

3.22 The second party shall ensure 100% availability of drivers during loading(24 Hours) of sludge vehicles

3.23 The second party shall ensure free space in trolley at the time of loading & no jamming at outlet valve.

4. **TENURE**

The contract shall be valid from 01.02.2021 to 31.01.2022 unless it is terminated as per the Termination Clause and shall be renewable with mutual consent.

5. **TERMINATION**

First Party can terminate the Contract at any time without any prior notice and without any compensation and at its sole discretion. However, the obligations and payments under the Contract are to be made by the Second party, for any projects / services defined, before any termination.

For Trident Limited

Authorised Signatory

TRIDENT GROUP
Trident Limited
Sanghera-148101, India

6. THIRD PARTY LIABILITY

It is agreed between the parties that the First Party shall not be liable for any claims, damages, and suits, legal proceedings filed by the third party for the acts / omissions of the Second party in respect of any matter related to or concerning the business of the Second party. The First Party or its Directors or officials shall not be held responsible and made party to any such suit, complaint or any legal proceedings related to or in respect of any of the matters of the third party in connection with this Contract.

Any losses/ damages will be borne by the contractor as per mutual assessment with company or its representative.

7. INDEMNITY

The Second party shall indemnify and keep indemnified First Party, from and against all actions, suits and proceedings by the third party for the acts/omissions of the Second party and all costs, charges, expenses, losses or damages which may incurred or suffered in respect of any matter related to or concerning the business of the Second party or of any of the matters of the third party in connection with this Contract.

8. ANTI BRIBERY

The Second Party hereby undertake that, at the date of the entering into force of the Contract, has not offered, promised, given, authorized, solicited or accepted any undue pecuniary or other advantage of any kind (or implied that they will or might do any such thing at any time in the future) in any way connected with the Contract and that the Second Party have taken reasonable measures to prevent any other third parties, from doing so. Failure to comply with this clause or any act of offering, soliciting or accepting advantage committed by the Second Party shall, without affecting its liability for such failure and act, result in this contact being invalidated.

9. PROHIBITION OF INSIDER TRADING

You or your employees, associates, etc. shall not trade, directly or indirectly, in the shares of Trident Limited during the currency of this contract or during six months post expiry of this contract.

10. ARBITRATION

In the event that the dispute does not get amicably resolved within a period of thirty days, the matter shall be subject to arbitration. The arbitration proceedings shall be conducted by the sole arbitrator, to be appointed by the Company. The arbitration shall be conducted in accordance with the Arbitration and Conciliation Act, 1996, as amended and including the rules made thereunder. The tribunal shall consist of three arbitrators. One appointed by each party and the third arbitrator (i.e. the presiding arbitrator) appointed by the two arbitrators so appointed. The seat/place of arbitration as well as the venue of arbitration shall be Barnala, India. Further, the language to be used in arbitration shall be English.

For Trident Limited

Authorised Signatory

11. JURISDICTION

That it is expressly agreed that this Contract shall be governed by the laws of India and the First Party and the Second party dispute, difference or claim which may arise between

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Trident Limited
Sandhara-148 101, INDIA

in connection with the performance of this Contract or the rights and obligations of the parties hereto shall be only under the jurisdiction of the law courts of the city of Barnala.

IN WITNESS WHEREOF, the parties hereto have executed this Contract on the day and the year herein above first written.

Thanking You,

For Trident Limited

TRIDENT GROUP
Trident Limited
Barnala-148101, India
(Authorised Signatory)

Witness

For Hem Raj Mls Board Mi Is

PROP

Accepted

For Aggarwal Industries

(Authorised Signatory)

Witness

For Trident Limited

Authorised Signatory

Annexure 12(e)

TRIDENT
Excellence in Nature

CONTRACT

This Contract is made on this day of 13th day of February, 2021 between Trident Limited, a Company incorporated under the Companies Act, 1956 and having its Registered Office at Trident Complex, Rajkot Road, Barnala, (hereinafter referred to as First Party/ Trident which expression shall, unless it be repugnant to the subject or context thereof, include its successors and assigns) of ONE PART and M/s Shiv Shakti Mix Boards having its Office at Kishangarh Road, Bahadarpur, Barnala-151501, Punjab (hereinafter referred to as Second Party which expression shall, unless it be repugnant to the subject or context thereof, include its successors and assigns) of SECOND PART.

Whereas Trident Limited is a manufacturing company engaged in manufacturing of Paper, towel etc., which in the process of manufacturing generates certain type of sludge, which needs to be disposed off in an effective and efficient manner so as to prevent environmental hazards.

1. SCOPE OF WORK:

   M/s Shakti Mix Boards has offered to Purchase ETP sludge (hereinafter referred to as "Material") from Trident and Trident has agreed to sell the same on terms and conditions contained in this contract.

   The Second Party shall purchase the above mentioned material on "as is where is basis" subject to generation, the Second Party shall lift minimum 240 MT of ETP sludge per month.

2. CONSIDERATION AND TERMS OF PAYMENT

   The Second Party shall pay as per rates mentioned below.

Sr. No.	Material	UOM	Rate (in Rs.)
1	ETP sludge	Rs/MT	1150

   Above rates are exclusive of all taxes, GST and all other taxes / charges shall be borne by Second party. Rates are Ex-Works, Trident Limited, Dhuri.

   All the payments shall be made by Second Party in cash in Advance before lifting of the material. The Second Party shall be solely and exclusively liable for payment of all taxes, duties, levies and for all necessary Tax Compliances including but not limited to GST and any other New Tax, on or in connection with the services by the Second Party to the First Party under and in accordance with this contract. The First Party shall not be liable or responsible therefore, in event, of any claim, penalty or liability levied on or incurred by the Second Party due to above Non-Compliance and Non-Payment of applicable Taxes and duties. The Second Party shall indemnify and keep indemnifying the First Party from and against all such claims including any tax input credits denials to the First Party by Tax department due to any Non Compliance by the Second Party.

For Trident Limited

Authorised Signatory

3. GENERAL TERMS & CONDITIONS

3.1 The second party will lift/ whole the Material generated and shall keep all the pits clear.

3.2 The scrap Material should be lifted within specified period of time.

3.3 The material lifted by the Second Party should be used for manufacturing process and should not be recycled

3.4 The property in the said material shall vest in First party upon its loading / lifting

3.5 First Party can enter into sale agreement with one or more parties simultaneously at its own sole discretion.

3.6 First Party reserves the right to sell only such material as are finally approved by it.

3.7 Second party agrees to lift the entire quantity of material, as per the contract price specified in consideration clause and without any selection of the material as the sale is specifically on "as is where is basis".

3.8 None of the Second party's agent / workmen shall be allowed to enter the factory without prior permission of the First party. Second party shall submit the names of its workers required to work inside for collection and loading etc. of material. These workers shall be issued temporary gate passes to work inside the premises. No one to be allowed inside the premises without proper gate pass.

3.9 Second party shall take all necessary precautions and safety measures applicable under all Laws and Rules.

3.10 All statutory liabilities for the second party workman under Workmen Compensation Act, Rules and other Industrial laws as applicable from time to time shall be borne by the second party.

3.11 The Second Party should have/obtain authorization from PPCB for management handling & transportation of Hazardous Waste. The Second Party shall arrange and provide Manifest form No.10 duly signed & Stamped.

3.12 The Second party will have to deposit Rs. 2,76,000/- as interest free security deposit at the time of signing of the contract, which shall be refunded without interest upon successful expiry of Contract Period in case Second Party leave/terminate/breach of any terms and conditions of this Contract, the security shall be forfeited; or

The Second Party shall submit performance Bank Guarantee of Rs. 2,76,000/- as per the format provided by the Company having a validity of one year from the date of contract with an additional claim period of 60 days from the date of expiry of the Contract. In case the Second Party fails to observe any terms & condition of this contract, First Party reserves the right to invoke the Bank Guarantee

3.13 The Second party will lift /clear material from on daily basis the whole quantity to avoid any jamming /plant running/production. If Second party fails to lift the minimum quantity of material as specified in clause 1 as per instructions given by the representative of the Company, First party has right to sell the same to any other party. First party shall charge for the material and removal charges from the

For Trident Limited

Authorised Signatory

Second party if the Second party fails so lift the material and said charges shall be recovered from the security amount, security amount deposited by first party.

3.14 Second party shall arrange for the loading & transportation of the material. The charges for the same shall be borne by the Second party even before movement of the material outside the factory premises.

3.15 Second party shall be solely responsible for compliances with provisions relating to payment of Minimum Wages, Provident Fund, Employee State Insurance, and any compensation payable to workmen employed by it under Workmen Compensation Act and any other State & Central Govt. Act /Rules as applicable from time to time.

3.16 The material shall be lifted by the Second party as per the frequency mentioned. First party shall have full authority to amend the frequency of lifting which shall be intimated to the Second party, the Second party shall pick the material as per the amended frequency. In case material is not lifted as per the said frequency First party reserves the right to impose penalty Rs. 5000/- delay per vehicle or forfeit the security amount.

3.17 The Commercial, resources etc. shall, however, be revisited at the end of every quarter.

3.18 The Second Party should have/obtain authorization from PPCB for Management handling & transportation of Hazardous Waste. The Second Party shall arrange and provide Manifest form No. 10 duly signed & Stamped

3.19 Any loss to Company due to delay in lifting of material will be recovered from the customer as per the loss assessment by the respective process owner or HOD or Department.

3.20 The Second Party must ensure that the maximum time of holding the vehicle inside the Company premises after loading will be 24 Hours.

3.21 The quantity of sludge is based on average generation of last 12 months.

3.22 The second party shall ensure 100% availability of drivers during loading (24 Hours) of sludge vehicles.

3.23 The second party shall ensure free space in clollity at the time of loading & no jamming at outlet valve.

4. TENURE

The contract shall be valid from 12.02.2021 to 31.01.2022 unless it is terminated as per the Termination Clause and shall be renewable with mutual consent.

5. TERMINATION

First Party can terminate the Contract at any time without any prior notice and without any compensation and at its sole discretion. However, the obligations and payments under the Contract are to be made by the Second party, for any projects services defined before any termination.

For Shiv Shakti [illegible]

Sole Prop./Partner

For Trident Limited

Authorised Signatory

6. THIRD PARTY LIABILITY

It is agreed between the parties that the First Party shall not be liable for any claims, damages, and suits, legal proceedings filed by the third party for the acts / omissions of the Second party in respect of any matter related to or concerning the business of the Second party. The First Party or its Directors or officials shall not be held responsible and made party to any such suit, complaint or any legal proceedings related to or in respect of any of the matters of the third party in connection with this Contract.

Any losses damages will be borne by the contractor as per mutual assessment with company or its representative.

7. INDEMNITY

The Second party shall indemnify and keep indemnified First Party, from and against all actions, suits and proceedings by the third party for the acts/omissions of the Second party and all costs, charges, expenses, losses or damages which may incurred or suffered in respect of any matter related to or concerning the business of the Second party or of any of the matters of the third party in connection with this Contract.

8. ANTI BRIBERY

The Second Party hereby undertake that, at the date of the entering into force of the Contract, has not offered, promised, given, authorized, solicited or accepted any undue pecuniary or other advantage of any kind (or implied that they will or might do any such thing at any time in the future) in any way connected with the Contract and that the Second Party have taken reasonable measures to prevent any other third parties from doing so. Failure to comply with this clause or any act of offering, soliciting or accepting advantage committed by the Second Party shall, without affecting its liability for such failure and act, result in this contact being invalidated.

9. PROHIBITION OF INSIDER TRADING

You or your employees, associates, etc. shall not trade, directly or indirectly, in the shares of Trident Limited during the currency of this contract or during six months post expiry of this contract.

10. ARBITRATION

In the event that the dispute does not get amicably resolved within a period of thirty days, the matter shall be subject to arbitration. The arbitration proceedings shall be conducted by the sole arbitrator, to be appointed by the Company. The arbitration shall be conducted in accordance with the Arbitration and Conciliation Act, 1996, as amended and including the rules made thereunder. The tribunal shall consist of three arbitrators, one appointed by each party and the third arbitrator (i.e. the presiding arbitrator) appointed by the two arbitrators so appointed. The seat/place of arbitration as well as the venue of arbitration shall be Barnala, India. Further, the language to be used in arbitration shall be English.

11. JURISDICTION

That it is expressly agreed that this Contract shall be governed by the laws of India and any dispute, difference or claim which may arise between the First Party and the Second Party

For Shiv Shakti Min. Board

Authorised Signatory

Chief Prod. Manager

In connection with the performance of this Contract all the rights and obligations of the parties hereto shall be only under the jurisdiction of the law courts of the city of Barisal.

IN WITNESS WHEREOF, the parties hereto have executed this Contract on the day and the year herein above first written.

Thanking you.

For Trident Limited

(Authorised Signatory)

Witness for Shiv Shakti Boards
CHARAN DAS SUTHAR
Gali no 12
BARETA

Accepted

For Shiv Shakti Mix Boards

(Authorised signatory)

Witness for Trident Limited
Gurbaksh Singh
66, Nasseri Enclave,
Ludhiana

For Trident Limited

Authorised Signatory

Annexure – XII

Bellmer Press Sludge Sent to Boiler – Dec 2020			TRIDENT
Sr. No.	Date	UOM	Quantity
1	22.12.2020	MT	17
2	23.12.2020	MT	2
3	23.12.2020	MT	2
4	24.12.2020	MT	6
5	25.12.2020	MT	1
6	31.12.2020	MT	5

Annexure-XII(b)

Ballmer Press Sludge Sent to Boiler – Jan 2021 TRIDENT

Sr No.	Date	UOM	Quantity
1	04.01.2021	MT	4.6
2	09.01.2021	MT	4.3
3	11.01.2021	MT	12.8
4	12.01.2021	MT	4.3
5	13.01.2021	MT	2.1
6	14.01.2021	MT	6.4
7	16.01.2021	MT	12.8
8	18.01.2021	MT	10.7
9	19.01.2021	MT	14.9
10	20.01.2021	MT	8.5
11	21.01.2021	MT	8.5
12	22.01.2021	MT	5.3
13	23.01.2021	MT	6.4
14	25.01.2021	MT	19.2
15	28.01.2021	MT	19.2
16	29.01.2021	MT	6.4
17	31.01.2021	MT	10.2

Bellmer Press Sludge Sent to Boiler – Feb 2021 TRIDENT

Sr. No.	Date	UOM	Quantity
1	01.02.2021	MT	9.1
2	02.02.2021	MT	10.9
3	03.02.2021	MT	10.9
4	04.02.2021	MT	10.9
5	05.02.2021	MT	12.7
6	06.02.2021	MT	8.2
7	08.02.2021	MT	16.3
8	09.02.2021	MT	10.9
9	10.02.2021	MT	12.7
10	11.02.2021	MT	12.7
11	12.02.2021	MT	10.9
12	13.02.2021	MT	10.9
13	14.02.2021	MT	10.9
14	15.02.2021	MT	13.6
15	16.02.2021	MT	10.9
16	17.02.2021	MT	10.9
17	18.02.2021	MT	10.0
18	19.02.2021	MT	10.9
19	20.02.2021	MT	7.2
20	21.02.2021	MT	9.5
21	22.02.2021	MT	9.5
22	23.02.2021	MT	17.2
23	27.02.2021	MT	17.2
24	28.02.2021	MT	12.7

Bellmer Press Sludge Sent to Boiler – Mar 2021 TRIDENT

Sr. No.	Date	UOM	Quantity
1	01.03.2021	MT	13.9
2	02.03.2021	MT	12.9
3	03.03.2021	MT	13.9
4	04.03.2021	MT	13.9
5	05.03.2021	MT	14.9
6	06.03.2021	MT	10.9
7	07.03.2021	MT	13.9
8	08.03.2021	MT	10.9
9	09.03.2021	MT	10.9
10	10.03.2021	MT	13.9
11	11.03.2021	MT	17.9
12	12.03.2021	MT	12.9
13	13.03.2021	MT	13.9
14	14.03.2021	MT	4.0
15	15.03.2021	MT	11.9
16	17.03.2021	MT	9.9
17	18.03.2021	MT	4.0
18	19.03.2021	MT	12.9
19	20.03.2021	MT	15.9
20	21.03.2021	MT	19.9
21	22.03.2021	MT	17.9
22	23.03.2021	MT	13.9
23	24.03.2021	MT	15.9
24	25.03.2021	MT	13.9
25	26.03.2021	MT	15.9
26	27.03.2021	MT	16.9
27	28.03.2021	MT	17.9
28	29.03.2021	MT	13.9
29	30.03 2021	MT	13.9
30	31.03.2021	MT	17.9

Annexure- XII (d)

Bellmer Press Sludge Sent to Boiler- Apr 2021 TRIDENT

Sr. No.	Date	UOM	Quantity
1	01.04.2021	MT	17.6
2	02.04.2021	MT	16.6
3	03.04.2021	MT	13.7
4	04.04.2021	MT	15.6
5	05.04.2021	MT	15.6
6	06.04.2021	MT	13.7
7	07.04.2021	MT	10.2
8	08.04.2021	MT	10.7
9	09.04.2021	MT	13.7
10	10.04.2021	MT	13.7
11	11.04.2021	MT	17.6
12	12.04.2021	MT	17.6
13	13.04.2021	MT	15.6
14	14.04.2021	MT	15.6
15	15.04.2021	MT	15.6
16	16.04.2021	MT	14.6
17	17.04.2021	MT	17.6
18	18.04.2021	MT	13.7
19	19.04.2021	MT	13.7
20	20.04.2021	MT	16.6
21	21.04.2021	MT	15.6
22	22.04.2021	MT	17.1
23	23.04.2021	MT	15.6
24	24.04.2021	MT	16.6
25	25.04.2021	MT	13.7
26	26.04.2021	MT	14.6
27	27.04.2021	MT	11.7
28	28.04.2021	MT	12.7
29	29.04.2021	MT	12.7
30	30.04.2021	MT	10.7

Annexure XII (E)

Bellmer Press Sludge Sent to Boiler- May 2021 TRIDENT

Sr. No.	Date	UOM	Quantity
1	01.05.2021	MT	17.7
2	03.05.2021	MT	16.7
3	04.05.2021	MT	13.7
4	05.05.2021	MT	15.7
5	06.05.2021	MT	16.7
6	07.05.2021	MT	16.7
7	08.05.2021	MT	14.7
8	09.05.2021	MT	15.7
9	11.05.2021	MT	16.7
10	11.05.2021	MT	15.7
11	12.05.2021	MT	16.7
12	13.05.2021	MT	16.7
13	14.05.2021	MT	16.7
14	15.05.2021	MT	14.7
15	16.05.2021	MT	6.9
16	17.05.2021	MT	16.7
17	18.05.2021	MT	17.7
18	19.05.2021	MT	18.7
19	20.05.2021	MT	18.7
20	21.05.2021	MT	5.9
21	22.05.2021	MT	3.9
22	23.05.2021	MT	16.7
23	24.05.2021	MT	3.9
24	25.05.2021	MT	6.9
25	29.05.2021	MT	6.9

Annexure – XIII

Annexure – XIII (9)

Lime Kiln logbook – December 2020

TRIDENT GROUP

Date	Speed of Lime Kiln (RPM)	Lime Stone Feed Rate (TPH)	ESP Inlet Flue Gas Temperature (Deg Cent)	Furnace Oil Flow Rate (Lit/Hr)	Furnace oil pressure (Kg/cm2)	ID fan speed (RPM)	Kiln Inlet draft (mmWC)	Kiln Lime Production (MT/Day)	Lime Stone Consumption (MT/Day)	Lime Sludge Consumption on Dry Basis (MT/Day)	Furnace Oil Consumption (KL/Day)	Comments if any
1 Dec 20	0.69	1.9	242	565	8.2	512	-16	77.00	53.13	96.25	13.32	Plant running ok, FO pump linkage attended
2 Dec 20	0.65	2.1	238	565	7.9	510	-15	79.50	32.47	94.38	13.80	Plant running normal, Lubrication activity done, Belt conveyor alignment done
3 Dec 20	0.69	1.9	234	570	8	515	-16	76.40	32.85	95.50	13.68	Plant running normal, Crusher size adjustment done, jamming in BC cleared
4 Dec 20	0.68	1.8	235	570	8	520	-14	74.50	32.84	98.13	13.68	Plant stoppage started to attend the refractory
5 Dec 20	0.68	2.1	239	565	7.9	515	-17	76.00	32.88	95.00	13.56	Plant middle shut
6 Dec 20												Plant Shut
7 Dec 20												Plant Shut
8 Dec 20												Plant Shut
9 Dec 20												Plant Shut
10 Dec 20	0.64	2.0	236	575	8	510	-17	75.50	32.47	94.38	13.80	Plant Start up done
11 Dec 20	0.69	2.0	238	570	8	510	-15	77.00	33.11	96.25	13.68	Plant ok, sludge feeding problem resolved
12 Dec 20	0.70	2.0	237	575	7.9	505	-17	75.50	32.47	94.38	13.80	Plant running normal
13 Dec 20	0.70	1.9	235	570	8	510	-16	73.80	30.59	94.75	13.68	Plant running normal, Crusher size adjustment done, jamming in BC cleared
14 Dec 20	0.69	2.0	238	580	8	515	-17	76.20	32.77	95.25	13.92	Plant was ok, all lubrication and CUM done
15 Dec 20	0.68	2.1	239	570	7.6	510	-17	76.80	33.02	96.00	13.68	Plant was ok, plaver belt joint repair done
16 Dec 20	0.70	2.0	236	570	7.8	520	-17	76.10	32.77	96.13	13.68	Plant running ok, bag filter area cleaning done
17 Dec 20	0.68	2.0	234	580	8.1	508	-15	74.00	31.81	96.00	13.92	Plant ok, all cleaning done, MF water leakage attended bucket rollers
18 Dec 20	0.69	1.9	232	560	8.2	512	-16	77.20	33.29	96.50	13.44	Plant running ok, dirt separator done
19 Dec 20	0.65	1.9	238	565	7.9	515	-15	76.00	32.68	95.00	13.32	Plant running ok, lubrication activities done
20 Dec 20	0.66	1.9	234	565	8	510	-15	75.40	32.41	94.25	13.56	Plant running normal, BC I he leakage attended clamp provided
21 Dec 20	0.70	2.0	235	570	8.1	508	-14	78.00	33.68	97.00	13.68	Plant running ok, All cleaning activities done
22 Dec 20	0.68	2.1	239	565	8	509	-17	78.70	33.65	94.63	13.56	Plant running ok, conveyor alignment done
23 Dec 20	0.69	2.5	231	570	7.6	510	-16	75.40	32.42	94.25	13.68	Plant ok, sludge feeding problem resolved
24 Dec 20	0.69	2.6	236	565	7.9	502	-17	76.80	32.84	96.26	13.56	Plant running normal, Crusher size adjustment done, jamming in BC cleared
25 Dec 20	0.70	1.9	234	575	7.9	505	-14	77.00	33.11	96.25	13.80	Plant was ok, all lubrication and CUM done
26 Dec 20	0.64	1.9	234	560	7.8	505	-17	76.20	32.81	96.38	13.44	Plant was ok, plaver belt joint repair done
27 Dec 20	0.70	2.0	239	575	8	510	-17	76.50	32.97	94.38	13.80	Plant running ok, bag filter area cleaning done
28 Dec 20	0.69	2.1	232	570	7.7	510	-15	77.40	33.11	96.76	13.68	Plant running, ful load, crusher size adjustment done
29 Dec 20	0.70	2.9	238	580	7.9	505	-17	75.50	32.47	94.38	13.92	Plant was ok, all lubrication and CUM done
30 Dec 20	0.68	2.0	235	570	8	520	-16	74.70	32.98	95.88	13.68	Plant running ok, Lime stone hopper vibrator tripping problem resolved
31 Dec 20	0.69	1.9	239	570	8	510	-17	77.00	33.11	96.25	13.68	Plant was ok, all lubrication and CUM done
Average	0.69	2.31	235	569	7.9	510	-16	76.33	32.74	95.17	13.45	

SARVJEET SINGH

For Trident Limited

Authorised Signatory

Annexure - XIII (B)

Lime Kiln Logbook – January 2021

TRIDENT GROUP

Date	Speed of Lime Kiln (RPM)	Lime Stone Feed Rate (TPH)	ESP Inlet Flue Gas Temperature (Deg Cent)	Furnace OH Flame Status (AP/RP)	Furnace oil pressure (Kg/cm2)	ID fan speed (RPM)	Kiln Inlet draft (mmWC)	Kiln Lime Production (mt/Day)	Lime Stone Consumption (mt/Day)	Lime Sludge Consumption as Dry Basis (MT/Day)	Furnace Oil Consumption (KL/Day)	Comments if any
1 Jan 21	0.68	2.0	231	575	7.8	510	-15	77.10	93.50	91.50	13.66	Plant was ok, all lubrication and CUR done, mill water accumulation cleared
2 Jan 21	0.69	2.1	235	575	7.9	508	-17	75.50	92.47	94.38	13.80	Plant was ok, stone belt joint repair done
3 Jan 21	0.68	2.1	234	570	7.9	510	-15	78.60	92.58	95.79	13.65	Plant running ok, bag filter area cleaning done, firing going normal
4 Jan 21	0.69	2.2	234	580	7.8	501	-16	75.40	92.42	91.35	13.92	Plant ok, all cleaning done, mill water leaks prevented, belt idler rollers
5 Jan 21	0.69	2.0	233	580	7.9	508	-15	74.50	92.04	95.13	13.44	Plant running ok, oil sampling done, oil leakage stopped
6 Jan 21	0.68	2.1	232	580	8.0	511	-15	75.70	92.66	94.62	13.44	Plant running normal, FO line flange leakage rectified
7 Jan 21	0.69	2.0	235	585	8.2	511	-14	75.40	92.42	94.25	13.32	Plant running ok, All cleaning activities done
8 Jan 21	0.68	2.0	234	585	7.8	510	-15	76.00	92.68	95.00	13.98	Plant running ok, conveyor belt jam cleared
9 Jan 21	0.69	1.9	235	570	8	509	-14	75.50	92.47	94.38	13.98	Plant ok, sludge feeding problem resolved
10 Jan 21	0.67	2.1	236	566	7.9	508	-17	76.00	91.48	95.00	13.56	Plant running normal, Dresser gas adjustment done, jamming in oil cleared
11 Jan 21	0.69	2.0	235	570	7.9	510	-15	77.20	93.20	96.50	13.68	Plant was ok, all lubrication and CUR done, sludge cleared
12 Jan 21	0.68	2.0	234	570	8	510	-15	75.50	92.47	94.38	13.68	Plant was ok, stone belt joint repair done
13 Jan 21	0.69	2.1	231	580	7.9	506	-17	76.40	92.42	94.25	13.92	Plant running ok, bag filter area cleaning done, solenoid problem resolved
14 Jan 21	0.68	2.1	232	599	8	508	-15	78.50	92.00	98.13	13.44	Plant running, Dia head, crusher size adjustment done
15 Jan 21	0.69	2.0	237	560	7.9	512	-16	75.70	92.66	94.88	13.92	Plant was ok, all lubrication and CUR done
16 Jan 21	0.70	2.1	234	566	7.9	509	-15	75.40	92.42	94.25	13.44	Plant stoppage started to attend the roller problem
17 Jan 21	0.69	2.1	232	560	8.1	509	-15	75.40	92.68	95.00	13.82	Plant shutdown
18 Jan 21	0.65	1.9	231	565	8.1	510	-16	76.00				Plant Start
19 Jan 21												Plant Start
20 Jan 21												Plant Start
21 Jan 21												Plant Start up done
22 Jan 21	0.70	2.1	232	570	7.8	512	-17	75.70	92.55	94.63	13.68	Plant running ok, All cleaning activities shifted to scrap area
23 Jan 21	0.69	2.1	233	570	7.9	512	-16	75.40	92.42	94.25	13.68	Plant running normal all preventive activities going on
24 Jan 21	0.69	2.0	230	580	7.8	510	-15	76.00	92.68	95.00	13.92	Plant ok, sludge feeding problem resolved
25 Jan 21	0.70	1.9	227	560	7.9	509	-17	75.50	92.47	94.38	13.44	Plant running normal, Crusher Dia adjustment done, jamming in oil cleared
26 Jan 21	0.69	1.9	234	566	8.1	508	-15	76.00	92.68	95.00	13.44	Plant running ok, bag filter area cleaning done
27 Jan 21	0.69	2.0	230	565	8.2	512	-16	77.30	93.69	95.50	13.92	Plant running, Dia head, crusher size adjustment done, jamming cleared
28 Jan 21	0.70	2.1	232	565	7.9	512	-15	76.80	92.47	94.50	13.98	Plant was ok, all lubrication and CUR done
29 Jan 21	0.69	2.0	231	570	8	510	-15	75.40	92.42	94.25	13.68	Plant running ok, Lime stone hoppet vibrator tripping problem resolved
30 Jan 21	0.68	2.0	228	565	8.2	509	-14	74.50	92.04	93.13	13.56	Plant was ok, all lubrication and CUR done
31 Jan 21	0.69	1.9	233	565	7.8	508	-17	75.70	92.77	94.63	13.56	
Average	0.69	2.04	231	574	7.9	509	-16	75.72	92.96	94.65	13.68	

SARVJEET SINGH

For Trident Limited

Authorised Signatory

Annexure. XIII(C)

Lime Kiln Logbook – February 2021

TRIDENT GROUP

Date	Speed of Lime Kiln (RPM)	Lime Stone Feed Rate (TPH)	ESP outlet Flue Gas Temperature (Deg Cent)	Furnace Oil Flow Rate (Lac/Hr)	Furnace oil pressure (Kg/cm²)	ID fan speed (RPM)	Kiln level depth (meter)	Kiln Lime Production (MT/Day)	Lime Stone Consumption (MT/Day)	Lime Sludge Consumption on Dry Basis (MT/Day)	Furnace Oil Consumption (KL/Day)	Comments if any
01 Feb 21	0.68	2.1	230	550	8.9	508	-11	75.10	32.31	89.00	13.70	Plant running normal, FO line flange leakage observed
2 Feb 21	0.69	2.0	232	560	7.7	510	-15	76.00	32.68	90.00	13.48	Plant running ok
3 Feb 21	0.68	1.9	234	560	7.8	514	-16	77.50	33.93	90.68	13.44	Plant running ok, conveyor alignment done, cleaning done
4 Feb 21	0.68	1.9	232	575	7.8	510	-17	78.60	32.85	90.50	13.80	Plant ok, sludge feeding problem resolved, now ok
5 Feb 21	0.69	2.1	232	570	7.8	506	-15	79.50	32.90	91.69	13.68	Plant running normal
6 Feb 21	0.69	2.1	235	565	7.9	507	-15	77.50	33.24	89.69	13.54	Plant was ok, all lubrication and CLRI done, paddle cleaned
7 Feb 21	0.68	2.1	233	550	7.7	507	-16	78.90	32.64	94.89	13.20	Plant was ok, stone belt joint repair done
8 Feb 21	0.69	2.1	233	560	7.8	506	-17	79.80	32.59	94.75	13.96	Plant running ok, bag filter area cleaning done, powder removed
9 Feb 21	0.70	2.0	231	570	8.5	510	-17	76.10	32.71	85.13	13.66	Plant running, Tail load, crusher size adjustment done, now ok
10 Feb 21	0.68	2.0	234	560	8.1	508	-15	76.00	32.68	90.00	13.44	Plant was ok, all lubrication and CLRI done
11 Feb 21	0.69	2.0	232	560	8.2	512	-16	77.20	33.29	90.50	13.44	Plant running ok, Lime stone hopper vibrator crippling problem resolved
12 Feb 21	0.68	2.1	234	555	7.9	517	-15	75.50	32.47	94.58	13.86	Plant was ok, all lubrication and CLRI done
13 Feb 21	0.69	2.2	234	565	8	520	-15	76.40	32.42	94.25	13.56	Plant running ok, hopper gate adjustment done
14 Feb 21	0.68	2.0	235	570	8.1	509	-14	74.50	32.09	92.12	13.68	Plant running normal, FO line leakage arrested, clamp provided
15 Feb 21	0.68	2.2	233	565	7.8	509	-17	75.30	32.55	94.69	13.56	Plant evening ok, All cleaning activities done, product qty slightly lowered
16 Feb 21	0.70	2.0	234	570	7.8	510	-17	76.90	33.22	95.19	13.68	Plant running ok, conveyor alignment done
17 Feb 21	0.68	2.0	233	560	8.2	512	-16	77.20	33.20	96.50	13.44	Plant ok, sludge feeding problem resolved
18 Feb 21	0.68	2.1	232	555	7.9	512	-15	76.40	32.47	94.36	13.32	Plant running normal, Crusher size adjustment done, jamming in SS removed
19 Feb 21	0.68	2.2	234	565	8	509	-15	77.40	32.43	94.25	13.56	Plant was ok, all lubrications and CLRI done
20 Feb 21	0.69	2.2	234	570	8.1	507+	14	74.50	32.04	93.18	13.68	Plant jaw ok, stone belt joint repair done
21 Feb 22	0.61	1.7	210	480	7.7	499	-12	65.00	27.95	87.35	11.52	Plant load decreasing for preheat start
22 Feb 21	0.60	1.2	180	305	7.5	510	-10	34.00	15.05	43.75	7.42	Plant much slow
23 Feb 21												Plant Shut
24 Feb 21												Plant Shut
25 Feb 21												Plant Shut
26 Feb 21												Plant Shut
27 Feb 21												Plant Shut
28 Feb 21												
Average	0.67	2.01	227	546	7.9	509	-15	73.62	31.46	91.63	13.13	

For Trident Limited

Authorised Signatory

Annexure – XIII (d)

Lime Kiln Logbook – March 2021

TRIDENTGROUP

Date	Speed of Lime Kiln (RPM)	Lime Stone Feed Rate (TPH)	ESP Inlet Flue Gas Temperature (Deg Cent)	Furnace Oil Flow Rate (Ltr/Hr)	Furnace oil pressure (Kg/cm2)	ID fan speed (RPM)	kiln inlet draft (mmWCP	Kiln Lime Production (MT/Day)	Lime Stone Consumption (MT/Day)	Lime Sludge Consumption on Dry Basis (MT/Day)	Furnace Oil Consumption (KL/Day)	Comments if any
1 Mar 21												Plant Shutt
2 Mar 21												Plant Shut
3 Mar 21												Plant Shut
4 Mar 21												Plant Start up Done
5 Mar 21	0.40	0.6	150	505	7	490	-10	0.00	5.00	20.00	7.32	Plant running ok, Bag filter area cleaning done, feeding going normal
6 Mar 21	0.55	1.2	200	450	7.2	480	-12	36.00	15.06	43.75	10.80	Plant ok, all cleaning done, nut wiper leakage attended Stabilized
7 Mar 21	0.66	1.8	250	550	7.8	505	-15	65.00	27.95	81.25	13.20	Plant running ok, all activities done, oil leakage attended
8 Mar 21	0.69	2.1	230	565	7.9	507	-15	77.50	33.24	96.63	13.56	Plant running ok, lubrication activities done
9 Mar 21	0.68	2.1	235	550	7.7	507	-16	75.50	32.64	94.88	13.20	Plant in side shut due to breakdown
10 Mar 21	0.50	1.2	190	350	7.2	480	-12	36.00	15.06	43.75	8.40	Plant Shut
11 Mar 21												Plant Shut
12 Mar 21												Plant Shut
13 Mar 21												Plant Shut
14 Mar 21												Plant Shut
15 Mar 21												Plant Start up done
16 Mar 21	0.43	0.7	160	380	7.5	440	-10	0.00	6.00	21.00	6.70	Plant ok, sludge feeding problem resolved
17 Mar 21	0.56	1.9	200	440	7.8	470	-13	60.00	27.25	90.00	10.56	Plant running normal, Cracker size adjustment done, Jamming in BF cleared
18 Mar 21	0.68	2.1	235	550	7.7	507	-15	75.50	32.64	94.88	13.20	Plant was ok, all lubrication and CUR done, stuckle cleared
19 Mar 21	0.70	2.1	235	570	7.8	520	-17	76.10	32.92	95.13	13.68	Plant was ok, stone belt joint repair done.
20 Mar 21	0.69	2.0	234	565	8	515	-15	74.00	31.82	92.50	13.56	Plant running ok, Bag filter area cleaning done, solenoid problem resolved
21 Mar 21	0.68	1.9	235	570	8.1	509	-14	69.50	32.09	93.13	13.68	Plant running, full load, crusher size adjustment done
22 Mar 21	0.70	2.1	231	570	7.8	510	-17	76.10	32.72	95.13	13.68	Plant was ok, all lubrication and CUR done
23 Mar 21	0.68	2.1	234	560	8.2	508	-15	75.00	32.68	95.00	13.44	Plant running ok, Lime stone hopper vibrator tripping problem resolved
24 Mar 21	0.69	2.0	232	565	8.3	511	-16	75.50	32.47	94.38	13.32	Plant was ok, all lubrication and CUR done
25 Mar 21	0.68	2.1	233	554	7.9	512	-15	73.40	32.42	94.25	13.56	Plant running ok, lubrication activities done
26 Mar 21	0.69	2.0	234	565	8	510	-15	75.40	32.04	93.13	13.68	Plant running normal, FO line leakage attended, clamp provided
27 Mar 21	0.68	1.9	235	570	8.1	509	-14	74.50	32.47	94.38	13.32	Plant running ok, All cleaning activities done, product and dust removed
28 Mar 21	0.68	2.1	233	555	7.9	512	-15	75.50	32.47	94.38	13.56	Plant running ok, conveyor support angle done
29 Mar 21	0.69	2.0	234	565	8	510	-13	75.40	32.42	94.25	13.68	Plant ok, sludge feeding problem resolved
30 Mar 21	0.69	1.9	235	570	8.1	509	-14	74.50	32.04	93.13	13.56	Plant running ok, lubrication activities done
31 Mar 21	0.68	2.1	233	565	7.8	509	-17	70.00	30.10	87.50	13.56	
Average	0.64	1.78	226	539	7.6	499	-14	61.42	27.43	80.34	12.49	

SARVJEET SINGH

For Trident Limited

Authorized Signatory

Annexure- XIII (B)

Lime Kiln Logbook – April 2021

TRIDENTGROUP

Date	Speed of Lime Kiln (RPM)	Lime Stone Feed Rate (TPH)	ESP inlet Flue Gas Temperature (Deg Cels)	Furnace Oil Flow Rate (Ltr/hr)	Furnace oil pressure (Kg/cm2)	ID fan speed (RPM)	Kiln inlet draft (mmWC)	Kiln Lime Production (MT/Day)	Lime Stone Consumption (MT/day)	Lime Stone Consumption on Dry Basis (MT/Day)	Furnace Oil Consumption (KL/Day)	Comments if any
1 Apr 21	0.68	2.1	232	580	7.9	510	-12	76.50	32.90	98.68	13.44	Plant running full load, crusher size adjustment done
2 Apr 21	0.70	1.9	294	590	7.8	510	-13	78.20	32.77	95.25	23.20	Plant was ok, all lubrication and CLRI done
3 Apr 21	0.70	1.8	234	570	7.9	506	-15	77.20	33.10	96.50	23.00	Plant running ok, Lime stone hopper vibrator tripping problem resolved
4 Apr 21	0.68	2.1	297	580	7.8	510	-17	75.50	32.47	94.38	13.44	Plant was ok, all lubrication and CLRI done
5 Apr 21	0.60	1.8	209	470	7.5	510	-11	80.00	25.80	75.00	11.28	Plant load decreasing for planned shut
6 Apr 21	0.40	1.2	185	315	7.5	460	-9	40.00	17.20	50.00	7.56	Plant made shut
7 Apr 21												Plant Shut
8 Apr 21												Plant Shut
9 Apr 21												Plant Shut
10 Apr 21												Plant Shut
11 Apr 21												Plant Shut
12 Apr 21												Plant Shut
13 Apr 21	0.48	0.7	180	350	7.9	490	-10	0.00	6.00	21.00	8.40	Plant Start up Done
14 Apr 21	0.56	1.3	200	480	7.5	490	-13	40.00	17.20	50.00	10.56	Plant was ok, stone belt joint repair done
15 Apr 21	0.69	2.0	284	565	8	510	-15	77.00	30.96	90.00	13.50	Plant running ok, Bag filter area cleaning done
16 Apr 21	0.68	1.9	235	570	8.1	509	-14	76.50	32.04	93.33	13.68	Plant running full load, crusher size adjustment done
17 Apr 21	0.68	2.1	283	565	7.9	512	-15	75.50	32.47	94.38	13.92	Plant was ok, all lubrication and CLRI done
18 Apr 21	0.69	2.0	234	565	8	510	-15	77.40	32.42	94.25	13.56	Plant running ok, Lime stone hopper vibrator tripping problem resolved
19 Apr 21	0.68	1.9	285	570	8.1	509	-14	76.50	32.04	93.33	13.68	Plant was ok, all lubrication and CLRI done
20 Apr 21	0.68	2.1	295	565	7.8	508	-17	76.50	32.55	94.83	13.56	Plant was ok, stone belt joint repair done
21 Apr 21	0.69	2.2	291	570	7.7	510	-16	78.40	32.42	94.25	13.68	Plant running ok, Bag filter area cleaning done
22 Apr 21	0.69	2.0	235	565	7.8	502	-17	78.50	32.84	95.75	13.56	Plant running ok, Bag filter area cleaning done
23 Apr 21	0.69	2.0	284	565	8	510	-15	77.40	32.42	94.25	13.56	Plant running full load, crusher size adjustment done
24 Apr 21	0.68	1.9	295	570	8.1	509	-14	76.50	32.04	93.33	13.68	Plant was ok, all lubrication and CLRI done
25 Apr 21	0.68	2.1	285	565	7.8	509	-17	75.70	32.55	94.63	13.56	Plant running ok, Lime stone hopper vibrator tripping problem resolved
26 Apr 21	0.69	2.2	291	570	7.7	510	-16	77.40	32.42	94.25	13.68	Plant was ok, all lubrication and CLRI done
27 Apr 21	0.69	2.0	283	565	7.9	502	-17	78.50	32.84	95.75	13.56	Plant was ok, stone belt joint repair done
28 Apr 21	0.68	2.1	284	575	8	506	-14	77.00	33.11	96.25	13.80	Plant running ok, Bag filter area cleaning done
29 Apr 21	0.68	2.1	285	565	7.9	512	-15	75.50	32.47	94.38	13.92	Plant was ok, all lubrication and CLRI done
30 Apr 21	0.69	2.0	284	565	8	510	-15	77.40	32.42	94.25	13.56	Plant was ok, all lubrication and CLRI done
Average	0.66	1.89	257	526	7.8	503	-14	68.71	29.80	86.84	13.07	

SARVJEET SINGH

For Tridents Limited

Authorised Signatory

Annexure – XIII (+)

Lime Kiln Logbook – May 2021

Date	Speed of Lime Kiln (RPM)	Lime Stone Feed Rate (TPH)	ESP Inlet Flue Gas Temperature (Deg C)	Furnace Oil Flow Rate (Lac/Hr)	Furnace oil pressure (Kg/cm2)	ID fan speed (RPM)	Kiln inlet draft (mmWC)	Kiln Lime Production (MT/Day)	Lime Stone Consumption (MT/Day)	Lime Sludge Consumption on Dry Basis (MT/Day)	Furnace Oil Consumption (KL/Day)	Comments if any
1 May 21	0.65	1.9	232	570	8	509	-14	775.50	31.47	94.38	13.68	Plant running ok, all activities done
2 May 21	0.69	2.1	229	565	7.7	509	-17	76.00	32.68	99.00	13.56	Plant running ok, lubrication activities done
3 May 21	0.69	1.9	235	570	7.9	510	-16	77.20	32.20	96.60	13.68	Plant running normal, FO line leakages attended, clamp provided
4 May 21	0.68	1.9	237	570	8	510	-15	75.50	32.47	94.20	13.68	Plant running ok, all cleaning activities done
5 May 21	0.69	20	238	580	7.9	505	-14	75.40	32.42	94.25	13.93	Plant running ok, conveyor alignment done
6 May 21	0.60	2.1	232	560	8	508	-15	74.50	32.04	93.13	13.44	Plant ok, sludge feeding problem resolved
7 May 21	0.69	2.0	237	560	7.9	512	-16	75.70	32.55	94.63	13.44	Plant running normal, Crusher size adjustment done, jamming to BE cleared
8 May 21	0.70	2.1	234	565	7.9	509	-15	78.70	32.5%	54.63	13.32	Plant was ok, all lubrication and CUM done
9 May 21	0.68	2.1	232	580	8.1	509	-15	75.40	32.42	94.25	13.44	Plant was ok, Screw belt joint repair done
10 May 21	0.69	2.0	230	555	8.2	510	-14	76.00	32.68	95.00	13.57	Plant running ok, Bag filter area cleaning done
11 May 21	0.68	2.2	232	560	8.1	508	-15	75.40	32.42	94.25	13.44	Plant running, deflood, crusher size adjustment done
12 May 21	0.69	2.0	233	555	8.2	510	-14	76.00	32.68	95.00	13.32	Plant was ok, all lubrication and CUM done
13 May 21	0.68	2.1	234	565	7.9	510	-17	75.50	32.47	94.38	13.56	Plant stoppage attended for refractory repair
14 May 21	0.70	2.0	235	570	8	505	-15	76.00	32.68	95.00	13.69	Plant made start
15 May 21												Plant Shut
16 May 21												Plant Shut
17 May 21												Plant Shut
18 May 21												Plant Shut
19 May 21												Plant Shut
20 May 21												Plant Shut
21 May 21	0.69	2.0	232	555	8.2	512	-16	77.20	33.20	96.50	13.32	Plant Start up done
22 May 21	0.70	2.1	233	565	7.9	512	-15	75.50	32.47	94.38	13.56	Plant ok, all flange leakage attended
23 May 21	0.69	2.0	234	570	8	510	-15	75.40	32.42	94.25	13.68	Plant running normal, Crusher size adjustment done, jamming in BE cleared
24 May 21	0.68	2.0	232	580	7.9	510	-15	76.00	32.68	95.00	13.92	Plant ok, all cleaning done, roll water leakage attended beside rollers
25 May 21	0.70	2.1	230	570	7.8	511	-17	75.70	32.55	94.63	13.68	Plant running ok, all lubrication done
26 May 21	0.69	2.1	231	570	7.7	512	-16	75.40	32.42	94.25	13.68	Plant running ok, Kiln coupling greasing done
27 May 21	0.69	2.0	232	580	7.9	510	-15	76.00	32.68	95.00	13.92	Plant running normal, FO line leakages attended, clamp provided
28 May 21	0.70	1.9	237	560	7.9	509	-17	75.50	32.47	94.38	13.44	Plant running full load, crusher size adjustment done
29 May 21	0.68	1.9	236	560	8.1	508	-15	76.00	32.68	95.00	13.44	Plant was ok, all lubrication and CUM done
30 May 21	0.68	2.0	235	565	8.1	509	-14	74.58	32.04	93.13	13.56	Plant running ok, Lime stone hopper vibrator tripping problem resolved
31 May 21	0.69	1.9	233	566	7.8	509	-17	75.70	32.55	94.63	13.56	Plant was ok, all lubrication and CUM done
Average	0.69	2.05	233	568	8.0	510	-15	75.71	32.55	94.64	13.57	

For Trident Limited.

Authorised Signatory

SURVEET SINGH

Annexure – XIV

Annexure - XIV(e)

2020/NPRJ/NNN/TEI/MOU/4393

TRIDENT
Excellence in nature

Trident Limited, Regd. Office : Trident Group, Sangrana - 148 101, India
Tel. +91 161 5037999
Fax +91 161 5037998
Visit us at www.trident.in

MEMORANDUM OF UNDERSTANDING

THIS MEMORANDUM OF UNDERSTANDING (MOU) is entered into at Barnala this 09th day of September, 2020 BY AND BETWEEN:

Trident Limited, a company registered under Companies Act, 1956 and having its Registered office situated at Trident Group, Sanghera - 148 101, India (hereinafter referred to as "Trident" which expression shall, unless excluded by or repugnant to the context, be deemed to include its successors and assigns) of the one part

and

Ultratech Cement Limited, having its office situated at VPO Pandiyana, Nalagarh, Solan-174101, Himachal Pradesh(hereinafter referred to as "Ultratech", which expression shall, unless excluded by or repugnant to the context, be deemed to include its successors and assigns) of the other part.

WHEREAS the "Trident" has a Captive Power Plant and generates electricity for captive use at Trident Complex, Mansa Road, Dhaula, Barnala which in the process of generation of power generates fly ash, which needs to be used scientifically in an effective and efficient manner so as to prevent environmental hazards.

AND WHEREAS the "Ultratech" is engaged in the business of manufacturing cement and other related activities and provides services for lifting fly ash.

Whereas "Trident" have, in order to scientifically use fly ash generated by Captive Power Plant on regular basis, has approached "Ultratech" to lift the fly ash generated from ESP to use as a raw material in cement manufacturing and the "Ultratech" has agreed to lift the fly ash generated from ESP.

AND WHEREAS "Trident" has assured regular avability of dry fly ash from the its ESP at its Site and "Ultratech" shall lift the dry fly ash and transport at their own cost through its authorized transporter with whom "Ultratech" will enter into a separate agreement.

AND WHEREAS "Ultratech" desires to utilize the quantity of fly ash from the project of the "Trident", necessary infrastructure facilities for dry fly ash collection and evacuation system will be developed by "Trident" at their site.

AND WHEREAS both the parties to the present MOU viz. "Trident" and "Ultratech" are desirous of recording the terms and conditions agreed between the parties.

TRIDENT GROUP
Trident Limited
Sanghera 148101 India

ULTRATECH CEMENT LTD.
BAGHERI
174101
Bagheri Cement Works

NOW THIS MOU WITNESSTN AND IT IS HEREBY AGREED AND DECLARE THAT:

1. "Ultratech" agrees to lift the entire fly ash gererated from ESP barring unforeseen situations and routine break down/ shut down maintenance. In such cases, either party ensures to give information to other party within reasonable time.

2. "Ultratech" agrees to lift fly ash for the period from September 01, 2020 to August 31, 2022 and shall pay to "Trident" Rs. 0.01/- per MT.

   Above rates are exclusive of all taxes. GST and all other taxes / charges shall be borne by Ultratech. Rates are Ex-Works, Trident Limited, Dhaula.

   All the payments shall be made by Ultratech in cash in Advance before lifting of the fly ash. Ultratech shall be solely and exclusively liable for payment of all taxes, duties, levies and for all necessary Tax Compliances including but not limited to GST and any other New Tax, on or in connection with the services by the Ultratech to the Trident under and in accordance with this Agreement. Trident shall not be liable or responsible therefore, in event, of any claim, penalty or liability levied on or incurred by the Ultratech due to above Non-Compliance and Non-Payment of applicable Taxes and duties. Ultratech shall indemnify and keep indemnifying Trident from and against all such claims including any tax input credits denials to the First Party by Tax department due to any Non-Compliance by the Ultratech.

3 "Ultratech" agrees to lift the quantity of fly ash from the site of the "Trident" as per quality conditions agreed.

4 "Ultratech" shall ensure that the transporter shall register its tankers/trucks with the Security Section of "Trident" while entering and leaving the power station premises to ensure that tankers/ trucks of "Ultratech" containing only ash enter/leave power station premises. The outward movement gate passes shall be issued by authorized representative of "Trident".

5 "Trident" shall allow movement of labour for the purpose of lifting the fly ash to be employed by the contractor/Transporter engaged by "Ultratech" and also movement of trucks etc. subject to security restrictions as imposed by "Trident". from time to time for the safety and security of "Trident". The contractor/Transporter engaged by "Ultratech" shall ensure that no labour below the age of 18 year is deployed and the deployed labour maintain the decorum of "Trident".

6 Any taxes, duties, levies, cess as imposed by Central, State or any local government Agency applicable to the disposal/utilization of dry fly ash shall be borne by "Ultratech"

7 "Ultratech" will ensure lifting of fly ash by its own means from "Trident" premises on daily basis throughout the year barring unforeseen situation, annual shutdown and routine/break down maintenance

TRIDENT GROUP
Trident Limited
Sunam-148101, India

8 Both "Ultratech" and "Trident" agree to follow all applicable rules, regulations, norms, safety measures, insurance in respect to their own personnel, materials, machinery etc. as laid down by State/Central government Departments/Agencies.

9 Both the "Trident" and "Ultratech" hereby undertakes to ensure supply and lifting of fly ash irrespective of the disputes if any arising with the transporters/workmen of contractors engaged by them.

10 Both the parties shall at all times maintain and keep secret and confidential any knowhow, figures, information, trade secrets, data or confidential documents in written/verbal form, obtained during the course of business relationship with the other party which either party have or may acquire from time to time relating to business of the other party, to any person(s)/ authority/ organization /statutory body without written permission of the other party. Either party shall take such steps and precautions as may be necessary to preserve and protect any proprietary information from publication, reproduction, communication or other unauthorized disclosure to the third parties. The terms of this clause shall survive termination of this Agreement.

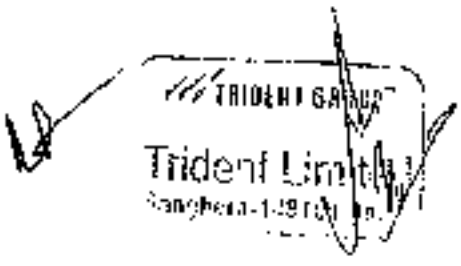
11 "Ultratech" will ensure that transportation of fly ash from premises of "Trident" to the consumption point of "Ultratech" is free of any environmental nuisance.

12 Force Majeure

The obligations of "Trident" and of "Ultratech" under this MOU shall remain suspended and neither of them shall be entitled to claim compensation from the other for any loss or damage caused by such suspension whether total or partial if and to the extent that either "Trident" or "Ultratech" is unable to perform its obligations under this MOU:

a) by reason of strike, lock out or retrenchment or workmen cessation or restriction or go slow policy of work by workmen (whether it be workmen employed by "Trident" or "Ultratech" or by any other person, firm, company or authority) and whether such strike, lock out, retrenchment, cessation or restriction or go slow policy of work by workmen has the effect of stopping or restricting the supply of material required by "Ultratech" at or otherwise impending or delaying the carrying out of the obligations of the parties to this MOU;

b) by reason of fire, break down or accident to machinery, climatic disability, shortages, riots, disturbance, war or warlike situation, instruction or restrictions imposed by Government Act or Legislature or whether authority or acts of war or of enemies of the state or of any other cause whatsoever whether or not of the same nature as the foregoing, beyond the control of "Trident" or "Ultratech"





13 Arbitration and Jurisdiction

Any dispute, difference or question arising out of, in relation to or incidental to this MOU shall be referred the sole arbitrator to be appointed by Trident Limited. The language for the proceedings shall be English and the venue shall be Barnala, Punjab.

It is expressly agreed that this MOU shall be governed by the laws of India and any dispute, difference or claim which may arise between the parties in connection with the performance of this MOU or the rights and obligations of the parties hereto shall be only under the jurisdiction of the law courts of the city of Barnala.

14 Effective Date:

This MOU shall come into force with effective from the date of execution of this MOU and shall remain valid till 31st August,2022.

15 Any amendment, modification, alteration or change in the MOU can only be made in writing duly signed by the authorized representatives "Trident" and "Ultratech" and shall form part of this MOU.

16 The original of this MOU shall be kept with "Trident" and the duplicate of the same shall be with "Ultratech"

17 Prevention of bribery

"Ultratech" hereby undertakes that, at the date of the entering into force of this MOU, itself, its directors, partners, officers or employees have not offered, promised, given, authorized, solicited or accepted any undue pecuniary or other advantage of any kind (or implied that they will or might do any such thing at any time in the future) in any way connected with the MOU and that it has taken reasonable measures to prevent subcontractors, agents or any other third parties, from doing so. Failure to comply with this clause or any act of offering, soliciting or accepting advantage committed by the "Ultratech" or by an employee, agent or sub- Contractor of the "Ultratech" shall, without affecting the "Ultratech" liability for such failure and act, result in this MOU being invalidated.

18 Prohibition of insider trading

"Ultratech" or his relatives, associates, employees, agents and/ or sub-Contractor shall not trade, directly or indirectly, in the shares of Trident Limited during the currency of this MOU or during six months post expiry of this MOU.

TRIDENT GROUP
Trident Limited
Barnala-148101 India

IN WITNESS WHEREOF "Ultratech" & "Trident" hereto have caused this MOU to be executed the day, month and year first above written.

SIGNED BY
For and on behalf of
TRIDENT LIMITED

(Authorized Signatory)

IN THE PRESENCE OF

Shankar Rao
S/o Nagesh Kadam,
Ludhiana

SIGNED BY
For and on behalf of
ULTRATECH CEMENT LIMITED

(Authorised Signatory)

IN THE PRESENCE OF

Raman MUNEEJA
Sr. Manager F&C
BALHERI CEMENT WORKS

Annexure – XIV(b)

Fly Ash Data

Fly Ash details sent to Cement Industry			✓✓TRIDENT
Sr. No.	Date	UOM	Quantity
1	Dec-20	MT	6229
2	Jan-21	MT	5334
3	Feb-21	MT	6848
4	Mar-21	MT	6472
5	Apr-21	MT	4897
6	May-21	MT	5301
Monthly Average		MT	5847

Annexure – XV

Annexure-XV (a)

FOR MAINTAINING RECORDS OF HAZARDOUS WASTE AT THE FACILITY

FORM 3

[See rule 9(1)]

Details for the month of Dec'20

1. Name & Address of the occupier or operator of the facility : M/s Trident Ltd (PCD), Mansa road, Dhaula Barnala(Pb).
2. Date of issuance of authorization and its reference no.: 01.07.2020 & HWM/renew/BAR/2020/12544222
3. Description of hazardous waste :

S.No	Physical form with description	Chemical Form	UOM	Total Quantity Generated	Total Quantity Disposed	Closing Balance	Consent Limit
1	Process sludge (32.3) (ETP Sludge + centricleaner sludge)	Fiber, Sand, Fines	Tons	(367.335+ 37.38) (404.71)	404.71	0	15 TPD
2	Liquid- Spent Oil (Cat 5.1)	Oil	Liters	700	0	1400	8200 LPA
3	Solid - HDPE Drums+ Plastic bags(cat 33.3)	Drums	Nos	1549	1549	0	24000 Nos/Year

4. Description of storage and treatment of hazardous waste:

S.No	Physical form with description	Method of Storage	Method of treatment of Hazardous waste
1	Process sludge (32.3) (ETP Sludge + centricleaner sludge)	Not Stores	Recyclable
2	Liquid- Spent Oil (Cat 5.1)	In Drums	Recyclable
3	Solid – HDPE Drums+ Plastic bags(cat 33.1)	Under Shed	Recyclable

5. Detail of transportation of Hazardous Waste:

Name & Address of the Consignee of package	Mode of packing of the waste for transportation	Mode of the transportation to site of disposal	Date of Transportation
Mapson Board, Shri Guru Kirpa , Shiv Sakti paper board , Birla Paper Product , Sant Nbc, Gempet Paper Board ,RK Gram udyog	In Trolleys	By Vehicle	01st Dec'20 to 31st Dec'20.
Barrel Supply & Lucky Steel	HDPE Drums	By Vehicle	02.12.2020,05.12.2020,1 0.12.2020,18.12.2020,22 .12.2020,24.12.2020 and 30.12.2020

6. Detail of Disposal of Hazardous Waste :

Date of Disposal	Concentration of Hazardous constituents in the final waste form	Site of disposal (Identify the location on the relevant layout drawing for reference)	Method of Disposal	Persons involved in the Disposal
NA	NA	NA	NA	NA

7. Data of Environmental Surveillance:

Date of Measurement	Analysis of ground water			Analysis of Soil Samples			Analysis of Air samples		Analysis of any other sample
	Location of Sampling	Depth of Sampling	Data	Location of Sampling	Depth of Sampling	Data	Location of Sampling	DATA	
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

8. Details of Hazardous waste reused or recycled :

Date	Total Quantity of hazardous waste generated	Details of Hazardous waste Minimization activity	Material Received	Final Quantity of Waste Generated	Net Reduction in generation quantity & percentage
NA	NA	NA	NA	NA	-

Date : 04/01/2022

Place : Dhaula

Sarvjeet Singh

Sarvjeet Singh
Factory Manager
Trident Ltd.(Paper & Chemical Division)

Annexure - XV (b)

FOR MAINTAINING RECORDS OF HAZARDOUS WASTE AT THE FACILITY

FORM 3

[See rule 9(1)]

Details for the month of Jan'21

1. Name & Address of the occupier or operator of the facility : M/s Trident ltd.(PCD), Mansa road, Dhuriа,Sarmala(Pb).
2. Date of issuance of authorization and its reference no.: 01.07.2020 & MWM/renew/BAR/2020/12544222
3. Description of hazardous waste :

S.No	Physical form with description	Disposal Form	UOM	Total Quantity Generated	Total Quantity Disposed	Closing Balance	Consent Limit
1	Process sludge (32.3) (ETP Sludge + centrecleaner sludge)	Fiber, Sand, Fines	Tons	(354.322+ 29.62) (383.942)	383.942	0	15 TPD
2	Liquid- Spent Oil (Cat 5.1)	Oil	Liters	100	0	600	8200 LPA
3	Solid – HDPE Drums+ Plastic bags(cat 33.1)	Drums	Nos.	1244	1244	0	24000 Nos/Year

4. Description of storage and treatment of hazardous waste:

S.NO	Physical form with description	Method of Storage	Method of treatment of hazardous waste
1	Process sludge (32.3) (ETP Sludge + centrecleaner sludge)	Not Stored	Recyclable
2	Liquid- Spent Oil (Cat 5.1)	In Drums	Recyclable
3	Solid – HDPE Drums+ Plastic bags(cat 33.1)	Under Shed	Recyclable

5. Detail of transportation of Hazardous Waste:

Name & Address of the Consignee of package	Mode of packing of the waste for transportation	Mode of the transportation to site of disposal	Date of Transportation
Meron Board, Shri Guru Kripa , Shiv Shkti paper board , Girba Paper Product , Sant Milk, Gospel Paper Board ,RK Gitam udyog	In Trolleys	By Vehicle	01st Jan'21 to 31st Jan'21.
Barrel Supply & Lucky Steel	HDPE Drums	By Vehicle	06,07,15,21,25 & 30.01.2021

6. Detail of Disposal of Hazardous Waste :

Date of Disposal	Concentration of Hazardous constituents in the final waste form	Site of disposal (Identify the location on the relevant layout drawing for reference)	Method of Disposal	Persons involved in the Disposal
NA	NA	NA	NA	NA

7. Data of Environmental Surveillance:

Date of Measurement	Analysis of ground water			Analysis of Soil Samples			Analysis of Air samples		Analysis of any other sample
	Location of Sampling	Depth of Sampling	Data	Location of Sampling	Depth of Sampling	Data	Location of Sampling	DATA	
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

8. Details of Hazardous waste reused or recycled :

Date	Total Quantity of hazardous waste generated	Details of Hazardous waste Minimization activity	Material Received	Final Quantity of Waste Generated	Net Reduction in generation quantity & percentage
NA	NA	NA	NA	NA	

Sarvjeet Singh

Date : 04/02/2023

Sarvjeet Singh
Factory Manager
Trident Ltd.(Paper & Chemical Division)

Place : Dhaula

Annexure- XV

FOR MAINTAINING RECORDS OF HAZARDOUS WASTE AT THE FACILITY

FORM 3

[See rule 9(1)]

Details for the month of Feb'21

1. Name & Address of the occupier or operator of the facility : M/s Trident ltd(PCD), Mansa road, Dhaula,Barnala(Pb).
2. Date of issuance of authorization and its reference no.: 08.07.2020 & HWM/renew/BAR/2020/12544022
3. Description of hazardous waste :

S.No	Physical form with description	Chemical Form	UOM	Total Quantity Generated	Total Quantity Disposed	Closing Balance	Consent Limit
1	Process sludge (32.3) (ETP Sludge + centrifuge sludge)	Fiber, Sand, - Fines	Tons	(135.36+ 26.91) (166.26)	166.26	0	35 TPD
2	Liquid- Spent Oil (Cat 5.1)	Oil	Liters	300	1400**	400	8200 LPA
3	Sgbd – HDPE Drums+ Plastic bags(cat 33.1)	Drums	Nos	863	763	100	24000 Nos/Year

4. Description of storage and treatment of hazardous waste:

S.No	Physical form with description	Method of Storage	Method of treatment of hazardous waste
1	Process sludge (32.3) (ETP Sludge + centrifuge sludge)	Not Stores	Recyclable
2	Liquid- Spent Oil (Cat 5.1)	In Drums	Recyclable
3	Solid – HDPE Drums+ Plastic bags(cat 33.1)	Under Shed	Recyclable

5. Detail of transportation of Hazardous Waste:

Name & Address of the Consignee of package	Mode of packing of the waste for transportation	Mode of the transportation to site of disposal	Date of Transportation
Aggarwal Industries, Gori Shankar Mfr Board, Hem Raj Mfr Board, Maruti Board Mills, Meron Board, Sant Mfr Board, Shiv Shakti, Shiv Sakti Paper Mills, Shri ganesh Mfr Board.	In Trolleys	By Vehicle	01st Feb'21 to 28th Feb'21
Satlaj Oil company	Drums	By Vehicle	01st Feb'21 to 28th Feb'21
Barrel Supply & Lucky Steel	HDPE Drums	By Vehicle	08.06.13.19 & 24.02.2021

6. Detail of Disposal of Hazardous Waste :

Date of Disposal	Concentration of Hazardous constituents in the final waste form	Site of disposal (Identify the location on the relevant layout drawing for reference)	Method of Disposal	Persons involved in the Disposal
NA	NA	NA	NA	NA

7. Data of Environmental Surveillance:

Date of Measurement	Analysis of ground water			Analysis of Soil Samples			Analysis of Air samples		Analysis of any other sample
	Location of Sampling	Depth of Sampling	Data	Location of Sampling	Depth of Sampling	Data	Location of Sampling	DATA	
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

8. Details of Hazardous waste reused or recycled :

Date	Total Quantity of hazardous waste generated	Details of Hazardous waste Minimization activity	Material Received	Final Quantity of Waste Generated	Net Reduction in generation quantity & percentage
NA	NA	NA	NA	NA	

Sarmeet Singh

Sarmeet Singh
Factory Manager
Trident Ltd.(Paper & Chemical Division)

Date : 04/03/2021

Place : Dhaula

Annexure-XV (d)

FOR MAINTAINING RECORDS OF HAZARDOUS WASTE AT THE FACILITY

FORM 3

[See rule 9(1)]

Details for the month of Mar'21

1. Name & Address of the occupier or operator of the facility : M/s Trident ltd.(PCD), Mansa road, Dhuri, Barnala(Pb).
2. Date of issuance of authorisation and its reference No.: 01.07.2020 & HWM/renew/BAR/2020/1254222
3. Description of hazardous waste :

S.No	Physical form with description	Chemical Form	UOM	Total Quantity Generated	Total Quantity Disposed	Closing Balance	Consent Limit
1	Process sludge (32.3) (ETP Sludge + centricleaner sludge)	Fiber, Sand, Fines	Tons	(181.77+ 47.33) [229.10]	229.10	0	15 TPD
2	Liquid- Spent Oil (Cat 5.1)	Oil	Liters	300	0	700	8200 LPA
3	Solid – HDPE Drums+ Plastic bags(cat 33.1)	Drums	Nos	1090	1090	100	20000 Nos/Year

4. Description of storage and treatment of hazardous waste:

S.No	Physical form with description	Method of Storage	Method of treatment of hazardous waste
1	Process sludge (32.3) (ETP Sludge + centricleaner sludge)	Not Stored	Recyclable
2	Liquid- Spent Oil (Cat 5.1)	In Drums	Recyclable
3	Solid – HDPE Drums+ Plastic bags(cat 33.1)	Under Shed	Recyclable

5. Detail of transportation of Hazardous Waste:

Name & Address of the Consignee of package	Mode of packing of the waste for transportation	Mode of the transportation to site of disposal	Date of Transportation
Agarwal Industries, Gori Shanker Mix Board, Hem Raj Mix Board, Maruti Board Mills, Mohan Board, Sant Mix Board, Shiv Shakti, Shiv Shakti Paper Mills, Shri ganesh Mix Board.	In Trolleys	By Vehicle	01st Mar'21 to 31st Mar'21
Barrel Supply & Lucky Steel	HDPE Drums	By Vehicle	01.03.2021,04.03.2021,10.03.2021,15.03.2021,19.03.2021,27.03.2021 and 31.03.2021

6. Detail of Disposal of Hazardous Waste :

Date of Disposal	Concentration of Hazardous constituents in the final waste form	Site of disposal (Identify the location on the relevant layout drawing for reference)	Method of Disposal	Persons involved in the Disposal
NA	NA	NA	NA	NA

7. Data of Environmental Surveillance:

Date of Measurement	Analysis of ground water			Analysis of Soil Samples			Analysis of Air Samples		Analysis of any other sample
	Location of Sampling	Depth of Sampling	Data	Location of Sampling	Depth of Sampling	Data	Location of Sampling	DATA	
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

8. Details of Hazardous waste reused or recycled :

Date	Total Quantity of hazardous waste generated	Details of Hazardous waste Minimization activity	Material Received	Final Quantity of Waste Generated	Net Reduction in generation quantity & percentage
NA	NA	NA	NA	NA	

Date : 03/04/2021

Place : Dhaula

Sarvjeet Singh
Factory Manager
Trident Ltd.(Paper & Chemical Division)

Annexure XV(e)

FOR MAINTAINING RECORDS OF HAZARDOUS WASTE AT THE FACILITY

FORM 3

[See rule 9(1)]

Details for the month of Apr'21

1. Name & Address of the occupier or operator of the facility : M/s Trident ltd.(PCD), Mansa road, Dhuela,Barnala(Pb).
2. Date of issuance of authorization and its reference no.: 01.07.2020 & HWM/renew/BAR/2020/12544222
3. Description of hazardous waste :

S.No	Physical form with description	Chemical Form	UOM	Total Quantity Generated	Total Quantity Disposed	Closing Balance	Consent Limit
1	Process sludge (32.3) (ETP Sludge + centricleaner sludge)	Paper, Sand, Fines	Tons	[181.77+ 47.93) [229.10]	229.10	0	15 TPD
2	Liquid- Spent Oil (Cat 5.1)	Oil	Liters	0	0	200	8200 LPA
3	Solid – HDPE Drums+ Plastic bags(cat 33.1)	Drums	Nos	1030	1030	100	24000 Nos/Year

4. Description of storage and treatment of hazardous waste:

S.No	Physical form with description	Method of Storage	Method of treatment of hazardous waste
1	Process sludge (32.3) (ETP Sludge + centricleaner sludge)	Not Stores	Recyclable
2	Liquid- Spent Oil (Cat 5.1)	In Drums	Recyclable
3	Solid – HDPE Drums+ Plastic bags(cat 33.1)	Under Shed	Recyclable

5. Detail of transportation of Hazardous Waste:

Name & Address of the Consignee of package	Mode of packing of the waste for transportation	Mode of the transportation to site of disposal	Date of Transportation
Agarwal Industries, Gori Shankar Mix Board, Hem Raj Mix Board, Maruti Board Mills, Mohan Board, Sant Mix Board, Shiv Shakti, Shiv Sakti Paper Mills, Shri ganesh Mix Board.	In Trolleys	By Vehicle	01st Apr'21 to 30th Apr'21
Barnel Supply & Lucky Steel	HDPE Drums	By Vehicle	07,12, 14, 19, 24, & 28.04.'21

6. Detail of Disposal of Hazardous Waste:

Date of Disposal	Concentration of Hazardous constituents in the final waste form	Site of disposal [Identify the location on the relevant layout drawing for reference]	Method of Disposal	Persons involved in the Disposal
NA	NA -	NA	NA	NA

Annexure IX-e

7. Data of Environmental Surveillance:-

Date of Measurement	Analysis of ground water			Analysis of Soil Samples			Analysis of Air samples		Analysis of any other sample
	Location of Sampling	Depth of Sampling	Data	Location of Sampling	Depth of Sampling	Data	Location of Sampling	DATA	
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

8. Details of Hazardous waste reused or recycled :

Date	Total Quantity of hazardous waste generated	Details of Hazardous waste Minimization activity	Material Received	Final Quantity of Waste Generated	Net Reduction in generation quantity & percentage
NA	NA	NA	NA	NA	

Sanjeet Singh

Sanjeet Singh
Factory Manager
Trident Ltd.(Paper & Chemical Division)

Date : 04/05/2021

Place :Dhaula

Annexure – XV(f)

FOR MAINTAINING RECORDS OF HAZARDOUS WASTE AT THE FACILITY

FORM 3

[See rule 9(1)]

Details for the month of May'21

1. Name & Address of the occupier or operator of the facility : M/s Trident Ltd.(PCD), Mansa road, Dhaula,Barnala(Pb).
2. Date of issuance of authorization and its reference no.: 01.07.2020 & HSMA/renew/BAR/2020/12544/22
3. Description of hazardous waste :

S.No	Physical form with description	Chemical* Form	UOM	Total Quantity Generated	Total Quantity Disposed	Closing Balance	Consent Limit
1	Process sludge (32.3) (ETP Sludge + centricleaner sludge)	Fiber, Sand, Fines	Tons	(175.43+ 40.21) (215.55)	215.55	0	15 TPD
2	Liquid- Spent Oil (Cat 5.1)	Oil	Liters	100	0	800	9200 LPA
3	Solid – HDPE Drums+ Plastic bags(Cat 33.1)	Drums+	Nos	1009	1203	0	24000 Nos/Year

4. Description of storage and treatment of hazardous waste:

S.No	Physical form with description	Method of Storage	Method of treatment of hazardous waste
1	Process sludge (32.3) (ETP Sludge + centricleaner sludge)	Not Stores	Recyclable
2	Liquid- Spent Oil (Cat 5.1)	In Drums	Recyclable
3	Solid – HDPE Drums+ Plastic bags(cat 33.1)	Under Shed	Recyclable

5. Detail of transportation of Hazardous Waste:

Name & Address of the Consignee of package	Mode of packing of the waste for transportation	Mode of the transportation to site of disposal	Date of Transportation
Agrawal Industries, Gori Shankar Mix Board, Hem Raj Mix Board, Maruti Board Mills, Manan Board, Sant Mix Board, Shiv Shakti, Shiv Sakti Paper Mills, Shri ganesh Mix Board.	In Trolleys	By Vehicle	01st May'21 to 31st May'21
Sara Steel,Barrel Exports & Lucky Steel	HDPE Drums	By Vehicle	03,07,14,20,28.05.2021.

6. Detail of Disposal of Hazardous Waste :

Date of Disposal	Concentration of Hazardous constituents in the final waste form	Site of disposal (Identify the location on the relevant layout drawing for reference)	Method of Disposal	Persons involved in the Disposal
NA	NA	NA	NA	NA

7. Data of Environmental Surveillance:

Date of Measurement	analysis of ground water			Analysis of Soil Samples			Analysis of Air samples		Analysis of any other sample
	Location of Sampling	Depth of Sampling	Data	Location of Sampling	Depth of Sampling	Data	Location of Sampling	DATA	
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

8. Details of Hazardous waste reused or recycled :

Date	Total Quantity of hazardous waste generated	Details of Hazardous waste Minimization activity	Material Received	Final Quantity of Waste Generated	Net Reduction in generation quantity & percentage
NA	NA	NA	NA	NA	

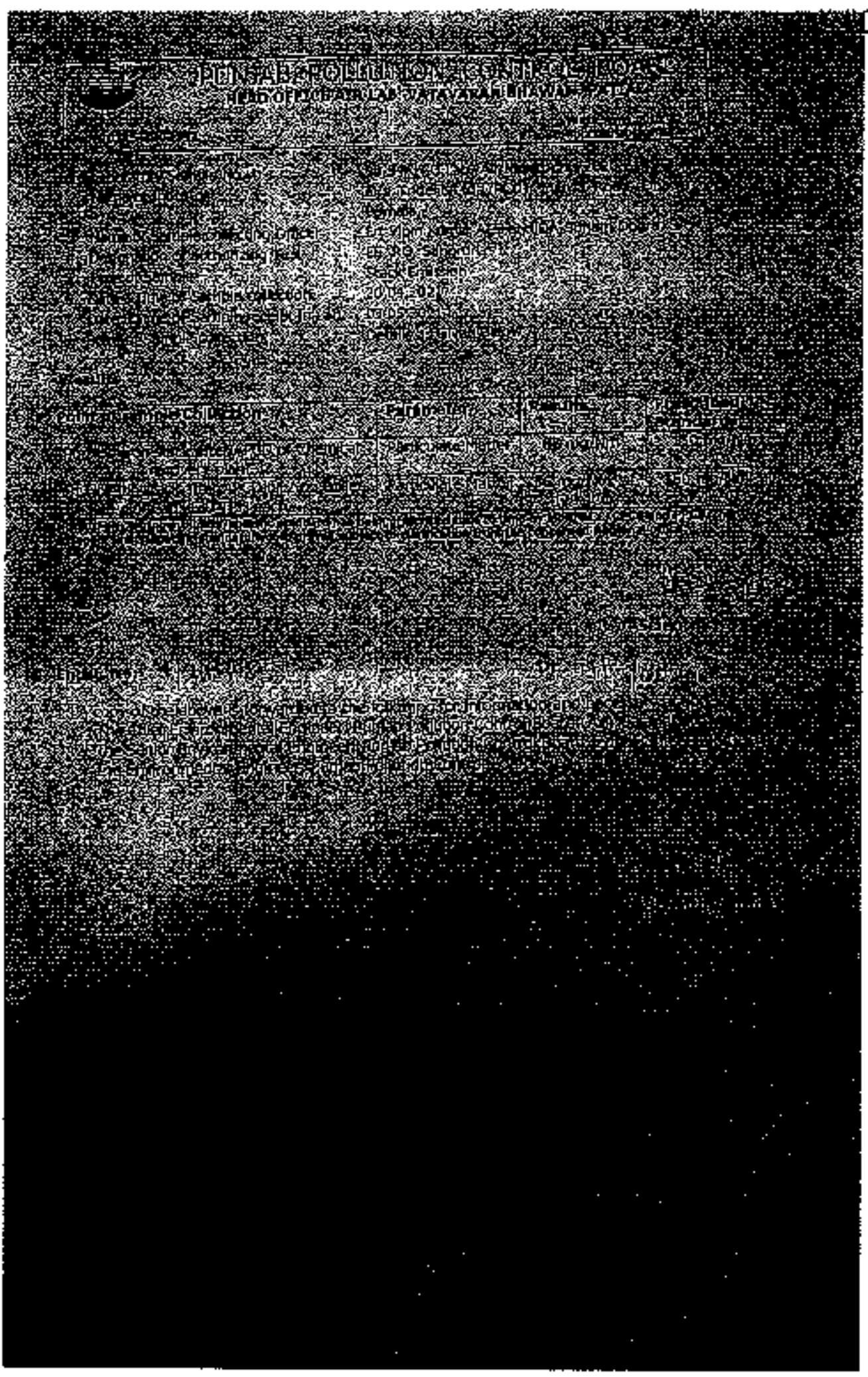
Sanjeet Singh

Date : 01/06/2023

Sanjeet Singh
Factory Manager
Trident Ltd.(Paper & Chemical Division)

Place : Dhaula

Annexure – XVI



Annexure - XVI (8)

Eco Laboratories & Consultants Pvt. Ltd.

CIN : U74140PB2011PTC034739

TEST REPORT

TC-7477

ULR No. : TC747721000E040005F		Test Report No. :	EL3005219NA007
Type of Sample : Ambient Air Quality		Date of Reporting :	05/07/2021
Customer	Trident Limited Paper & Chemical Division Mansa Road, Dhaula, Barnala, Punjab	Work Order No. & Date	9990023537 Dt.: 15/06/2021
		Customer reference No. (if any)	NA
Sampling Protocol	IS:5182 and CPCB Air Manual Volume-I (NAAQMS/36/2012-13) / CPCBNAAQS-2009	Mode of Collection of Sample	Sampling by laboratory
Date of Sampling	29/06/2021	Date of Receipt of Sample	30/06/2021
Sampling Location	Near Rice Husk Yard	Period of Analysis	30/06/2021 To 05/07/2021
Testing Protocol	IS:5182 and CPCB Air Manual Volume-I (NAAQMS/36/2012-13) / CPCBNAAQS-2009	Environmental Conditions	Clear sky
Testing Location	Site Testing & Permanent Facility		

RESULTS

I-Chemical Testing

1. Atmospheric Pollution (Ambient Air)

S.No.	Test Parameter	Unit	Result	Standard	Method
1	Respirable Suspended Particulate Matter (as PM10)	µg/m³	68	100	IS: 5182 (Part-23)
2	Particulate Matter (as PM2.5)	µg/m³	51	60	Lab SOP: EL/SOP/AAQ/01, Issue No. 03, Jan 01
3	Sulphur Dioxide (as SO2)	µg/m³	12	80	IS: 5182 (Part-2)
4	Nitrogen Dioxide (as NO2)	µg/m³	25	80	IS: 5182 (Part-6)
5	Ammonia (as NH3)	µg/m³	20	400	Lab SOP: EL/SOP/AAQ/02, Issue No. -03, Jan 01
6	Ozone (as O3)	µg/m³	27	180	IS: 5182 (Part-9)
7	Carbon Monoxide (as CO)	mg/m³	0.89	04	IS: 5182 (Part-10), NDIR Method
8	Lead (as Pb)	µg/m³	BDL(DL0.04)	01	IS: 5182 (Part-22)
9	Arsenic (as As)	ng/m³	BDL(DL1)	06	Lab SOP: EL/SOP/AAQ/04, Issue No. -03, Jan 01
10	Nickel (as Ni)	ng/m³	BDL(DL10)	20	Lab SOP: EL/SOP/AAQ/04, Issue No. -03, Jan 01
11	Benzo-a-Pyrene (as B(a)P), Particulate Phase Only	ng/m³	BDL(DL1)	01	IS: 5182 (Part-12)

Remarks : NA

OTHER INFORMATION

Abbreviation : ULR: Unique Lab Report, BDL: Below Detection Level, NA: Not Applicable

Terms & Conditions : Please refer terms and conditions on backside of Test Report (Page-3)

End of Report

Checked by QA

Dr Raj Singh
Authorized Signatory-Chemical

Format No.: F/7.8.3/AAQ/01-04.21-09 Rev 04

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Eco Laboratories & Consultants Pvt. Ltd.

CIN : U74140PB2011PTC034739

TEST REPORT

ULR No. : NA		Test Report No. :	EL300621NA007/A
Type of Sample : Ambient Air Quality		Date of Reporting :	05/07/2021
Customer	Trident Limited Paper & Chemical Division Mansa Road, Dhaula, Barnala, Punjab	Work Order No. & Date	9990023517 Dt.: 15/06/2021
		Customer reference No. (If any)	NA
Sampling Protocol	IS:5182 and CPCB Air Manual Volume-I (NAAQMS/36/2012-13) / CPCBNAAQS-2009	Mode of Collection of Sample	Sampling by Laboratory
Date of Sampling	29/06/2021	Date of Receipt of Sample	30/06/2021
Sampling location	Near Rice Husk Yard	Period of Analysis	30/06/2021 To 05/07/2021
Testing Protocol	IS:5182 and CPCB Air Manual Volume-I (NAAQMS/36/2012-13) / CPCBNAAQS-2009	Environmental Conditions	Clear sky
Testing Location	Site Testing & Permanent Facility		

RESULTS

I-Chemical Testing

1. Atmospheric Pollution (Ambient Air)

S.No.	Test Parameter	Unit	Result	Standard	Method
1	Benzene (as C6H6)	µg/m³	BDL(DLS)	05	IS: 5182 (Part-11)

Remarks : This test report is the part of Test Report No.EL300621NA007

OTHER INFORMATION

Abbreviation : ULR: Unique Lab Report, BDL: Below Detection Level, NA: Not Applicable

Terms & Conditions : Please refer terms and conditions on backside of Test Report (Page-1)

End of Report

Checked by QA

Dr Rai Singh
Authorized Signatory-Chemical

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Eco Laboratories & Consultants Pvt. Ltd.

CIN : U74140PB2011PTC034739

TEST REPORT

TC-7477

ULR No. :	TC747721000004001F	Test Report No. :	EL300621NA008
Type of Sample :	Ambient Air Quality	Date of Reporting :	05/07/2021
Customer	Trident Limited Paper & Chemical Division Mansa Road, Dhuala, Barnala, Punjab	Work Order No. & Date	9990023517 Dt : 15/06/2021
		Customer reference No. (If any)	NA
Sampling Protocol	IS:5182 and CPCB Air Manual Volume-I (NAAQMS/36/2012-13) / CPCBNAAQS-2009	Mode of Collection of Sample	Sampling by laboratory
Date of Sampling	29/06/2021	Date of Receipt of Sample	30/06/2021
Sampling Location	Near ETP Secondary Clarifier Area	Period of Analysis	30/06/2021 To 05/07/2021
Testing Protocol	IS:5182 and CPCB Air Manual Volume-I (NAAQMS/36/2012-13) / CPCBNAAQS-2009	Environmental Conditions	Clear sky
Testing Location	Site Testing & Permanent Facility		

RESULTS

I-Chemical Testing

1. Atmospheric Pollution (Ambient Air)

S.No.	Test Parameter	Unit	Result	Standard	Method
1	Respirable Suspended Particulate Matter (as PM10)	µg/m³	81	100	IS: 5182 (Part-23)
2	Particulate Matter (as PM2.5)	µg/m³	40	60	Lab SOP: EL/SOP/AAQ/01, Issue No. 03, Jan 01
3	Sulphur Dioxide (as SO2)	µg/m³	13	80	IS: 5182 (Part-2)
4	Nitrogen Dioxide (as NO2)	µg/m³	27	80	IS: 5182 (Part-6)
5	Ammonia (as NH3)	µg/m³	20	400	Lab SOP: EL/SOP/AAQ/02, Issue No. -03, Jan 01
6	Ozone (as O3)	µg/m³	35	180	IS: 5182 (Part-9)
7	Carbon Monoxide (as CO)	mg/m³	0.66	04	IS: 5182 (Part-10), NDIR Method
8	Lead (as Pb)	µg/m³	BDL(DL:0.01)	01	IS: 5182 (Part-22)
9	Arsenic (as As)	ng/m³	BDL(DL1)	06	Lab SOP: EL/SOP/AAQ/04, Issue No. -03, Jan 01
10	Nickel (as Ni)	ng/m³	BDL(DL10)	20	Lab SOP: EL/SOP/AAQ/04, Issue No. -03, Jan 01
11	Benzo-a-Pyrene (as B[a]P), Particulate Phase Only	ng/m³	BDL(DL1)	01	IS: 5182 (Part-12)

Remarks : NA

OTHER INFORMATION

Abbreviation : ULR: Unique Lab Report, BDL: Below Detection Level, NA: Not Applicable

Terms & Conditions : Please refer terms and conditions on backside of Test Report (Page-2)

End of Report

Checked by QA

Dr Rai Singh
Authorized Signatory-Chemical

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Eco Laboratories & Consultants Pvt. Ltd.

CIN : U74140PB2011PTC034739

TEST REPORT

ULR No. : NA		Test Report No. :	EL300621NA008/A
Type of Sample : Ambient Air Quality		Date of Reporting :	05/07/2021
Customer	Trident Limited Paper & Chemical Division Mansa Road, Ghouli, Barnala, Punjab	Work Order No. & Date	9990023517 Dt.: 25/06/2021
		Customer reference No. (If any)	NA
Sampling Protocol	IS:5182 and CPCB Air Manual Volume-I (NAAQMS/36/2012-13) / CPCBNAAQS-2009	Mode of Collection of Sample	Sampling by laboratory
Date of Sampling	29/06/2021	Date of Receipt of Sample	30/06/2021
Sampling Location	Near ETP Secondary Clarifier Area	Period of Analysis	30/06/2021 To 05/07/2021
Testing Protocol	IS:5182 and CPCB Air Manual Volume-I (NAAQMS/36/2012-13) / CPCBNAAQS-2009	Environmental Conditions	Clear sky
Testing Location	Site Testing & Permanent Facility		

RESULTS

I-Chemical Testing

1- Atmospheric Pollution (Ambient Air)

S.No.	Test Parameter	Unit	Result	Standard	Method
1	Benzene (as C6H6)	µg/m³	BDL(DL5)	05	IS: 5182 (Part:-11)

Remarks : This test report is the part of Test Report No.EL300621NA008

OTHER INFORMATION

Abbreviation : ULR: Unique Lab Report, BDL: Below Detection Level, NA: Not Applicable

Terms & Conditions : Please refer terms and conditions on backside of Test Report (Page-1)

End of Report

Checked by QA

Dr Raj Singh
Authorized Signatory-Chemical

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Eco Laboratories & Consultants Pvt. Ltd.

CIN : U74140PB201 PTC034790

TEST REPORT

TC-1477

ULR No. : TC747721U000000002F		Test Report No. :	EL30062INA009
Type of Sample : Ambient Air Quality		Date of Reporting :	05/07/2021
Customer	Trident Limited Paper & Chemical Division Adress Road, Dhaula, Barnala, Punjab	Work Order No. & Date	9990023517 Dt.: 15/06/2021
		Customer reference No. (If any)	NA
Sampling Protocol	IS:5182 and CPCB Air Manual Volume-I (NAAQMS/36/2012-13) / CPCBNAAQS-2009	Mode of Collection of Sample	Sampling by laboratory
Date of Sampling	29/06/2021	Date of Receipt of Sample	30/06/2021
Sampling Location	Near Admin Guest House	Period of Analysis	30/06/2021 To 05/07/2021
Testing Protocol	IS:5182 and CPCB Air Manual Volume-I (NAAQMS/36/2012-13) / CPCBNAAQS-2009	Environmental Conditions	Clear sky
Testing Location	Site Testing & Permanent Facility		

RESULTS

I-Chemical Testing

1. Atmospheric Pollution (Ambient Air)

S.No.	Test Parameter	Unit	Result	Standard	Method
1	Respirable Suspended Particulate Matter (as PM10)	µg/m³	73	100	IS: 5182 (Part-23)
2	Particulate Matter (as PM2.5)	µg/m³	43	60	Lab SOP: EL/SOP/AAQ/01, Issue No. 03, Jan 01
3	Sulphur Dioxide (as SO2)	µg/m³	10	80	IS: 5182 (Part-2)
4	Nitrogen Dioxide (as NO2)	µg/m³	21	80	IS: 5182 (Part-6)
5	Ammonia (as NH3)	µg/m³	18	400	Lab SOP: EL/SOP/AAQ/02, Issue No -03, Jan 01
6	Ozone (as O3)	µg/m³	35	180	IS: 5182 (Part-9)
7	Carbon Monoxide (as CO)	mg/m³	0.60	04	IS: 5182 (Part-10), NDIR Method
8	Lead (as Pb)	µg/m³	BDL(DL0.04)	01	IS: 5182 (Part-22)
9	Arsenic (as As)	ng/m³	BDL(DL1)	06	Lab SOP: EL/SOP/AAQ/04, Issue No. -03, Jan 01
10	Nickel (as Ni)	ng/m³	BDL(DL10)	20	Lab SOP: EL/SOP/AAQ/04, Issue No. -03, Jan 01
11	Benzo-a-Pyrene (as B(a)P), Particulate Phase Only	ng/m³	BDL(DL1)	01	IS: 5182 (Part-12)

Remarks : NA

OTHER INFORMATION

Abbreviation : ULR: Unique Lab Report, BDL: Below Detection Level, NA: Not Applicable

Terms & Conditions : Please refer terms and conditions on backside of Test Report (Page-1)

End of Report

Checked by QA

Dr Raj Singh
Authorized Signatory-Chemical

EGO BHAWAN E-207, Industrial Area, Phase VIII-B (Sector-74), Mohali (Punjab) 160071

0172-4616225 9781303109 consulteco@yahoo.com | ecolab@ecoparyavaran.org www.ecoparyavaran.org

Eco Laboratories & Consultants Pvt. Ltd.

CIN : U74140PB2011PTC034739

TEST REPORT

ULR No. : NA		Test Report No. :	EL300621NA009/A
Type of Sample : Ambient Air Quality		Date of Reporting :	05/07/2021
Customer	Trident Limited Paper & Chemical Division Morisa Road, Dhaulu, Barnala, Punjab	Work Order No. & Date	9590023517 Dt.: 15/06/2021
		Customer reference No. (if any)	NA
Sampling Protocol	IS:5182 and CPCB Air Manual Volume-I (NAAQMS/36/2012-13) / CPCBNAAQS-2009	Mode of Collection of Sample	Sampling by laboratory
Date of Sampling	29/06/2021	Date of Receipt of Sample	30/06/2021
Sampling Location	Near Admin Guest House	Period of Analysis	30/06/2021 To 05/07/2021
Testing Protocol	IS:5182 and CPCB Air Manual Volume-I (NAAQMS/36/2012-13) / CPCBNAAQS-2009	Environmental Conditions	Clear sky
Testing Location	Site Testing & Permanent Facility		

RESULTS

I-Chemical Testing

1. Atmospheric Pollution (Ambient Air)

S.No.	Test Parameter	Unit	Result	Standard	Method
1	Benzene (as C6H6)	µg/m³	BDL (DLS)	05	IS: 5182 (Part-11)

Remarks : This test report is the part of Test Report No.EL300621NA009

OTHER INFORMATION

Abbreviation : ULR: Unique Lab Report, BDL: Below Detection Level, NA: Not Applicable

Terms & Conditions : Please refer terms and conditions on backside of Test Report (Page-1)

End of Report

Checked by QA

Dr Raj Singh
Authorized Signatory Chemist

ECO BHAWAN E-207, Industrial Area, Phase VIII-B (Sector-74), Mohali (Punjab) 160071

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Annexure- XVI(C)

TRIDENTGROUP™
Excellence in nature

I-213, Malwa Nagar
Gulabewala (Dist)
Punjab, India
Tele: +91 [illegible]
Fax: +91 [illegible]
Web: [illegible]

TRIDENT/PCD/2021/39
04/09/2021

To

The Environmental Engineer
Punjab Pollution control Board
Industrial Focal Point
Sunam Road, Sangrur (Punjab)

Subject: Monthly Progress report regarding area developed for plantation as per vailed consent u/s 25/26 of the water (Prevention and control of Pollution) Act 1974.

Dear Sir

We are thankful for extending the Vailed consent u/s 25/26 of the water (Prevention and control of Pollution) Act 1974 vide Boards letter no 4058, Dt -23/07/12 to Trident Limited (PCD).

Please find the monthly report for August – 2021.

Treated Effluent Discharge			Power Consumption (KWH/Day)	Paper Production (MT/Day)	Expected pulp quantity (MT)	Power consumption of APCD (ESP) KVAH/Day	Treated Effluent Parameters			
To Drain (KLD)	To Plantation (KLD)	Total (KLD)					COD (ppm)	BOD (ppm)	TSS (ppm)	pH
5400	10603	16003	18522.8	414.4	Nil	2490	219	21	26	7.53

Thanking You

Yours Faithfully
For Trident Limited
(Paper & Chemical Division)

SARVJEET SINGH (Digitally signed by SARVJEET SINGH)

[Sarvjeet Singh]
Factory Manager

16/9/21

Annexure XVI (D)

PUNJAB POLLUTION CONTROL BOARD VATAVARAN BHAVAN,
NABHA ROAD, PATIALA
WATER ANALYSIS REPORT

1. Laboratory Sample No	E 3961 3968/H O Lab Monitoring/2021
2. ULR No.	ULR-TC701518000000D3219
3. Name of Industry	M/s Trident Ltd (PCD), Village Dhaudo, Distt. Barnala
4. Name of Sample collecting Officer	Er. Vipan Kumar, AEE
5. Designation of the officer authorizing Test	Environmental Engineer Regional Office, Sangrur
6. Type of Sample	Grab
7. Date & Time of Sample collection	30.04.2021
8. Date & Time of Sample receipt in Lab	01.05.2021
9. Period of Analysis	01.05.2021 to 17.5.2021
10. Test Methods	As per relevant parts of IS:3025/Sec 1to22 & Methods of APHA

1981
3/5/2021

Results

Sr. No.	Parameters	Inlet of ETP	Outlet leading to plantation	Outlet leading to drain	Aeration Tank-I	Aeration Tank-II	General Standards as per EPA
1	pH	6.6	7.6	7.7			5.0-8.5
2	Total Suspended Solids mg/l	144	33	48			50
3	Chemical Oxygen Demand mg/l	680	130	138			250
4	Bio-chemical Oxygen Demand mg/l	118	16	18			30
5	SAR		7.8	8.2			
6	Mixed Liquid Suspended Solids mg/l				2890	4250	
7	Mixed Liquid Volatile Suspended Solids mg/l				2200	2480	

Remarks: As prescribed parameters are as per EPA Standards. However, if any stringent standard have been imposed by the Board, the same shall prevail.
Note: BDL means below detectable limit

---End of Report---

Scientific Officer
19/5/21
Dt. 19/5/2021

Endst. No: 11734-36

A copy of the above is forwarded to the:-
1. The Chief Environment Engineer, Punjab Pollution Control Board, Ludhiana
2. The Senior Environment Engineer, Punjab Pollution Cont ol Board, Zonal Office-II, Patiala
3. The Environment Engineer, Punjab Pollution Cont ol Board, Regional Office, Sangrur.

Asstt. Scientific Officer
19/5/21

Accept
नवी दाखिल
19/5

Annexure – XVI (E)

Sophisticated Analytical Instruments Laboratories Society *(Registered as Society with Registrar of Firms & Societies Punjab, Chandigarh)*
Thapar Technology Campus, Bhadson Road, Patiala-147 004 (India)

TEST REPORT

Test Report No.:	NN/20-21/131	Date	30.09.2020
Service No	NN/20-21/131 (01)	Customer's Ref.	Sample submitted by PPCB RO Sangrur dtd 17.09.2020 (Ref letter no. SPL-1/SqR/M dtd 17.09.2020)

Customer's name and address:
M/s Trident Ltd
(Paper &Chemical Division), Village Dhaula
Tehsil & Distt Barnala

Sample Description	Effluent
Condition of the sample received	O.K.
Customer's sample identification No. (if any)	As described below
Quantity/number of samples	Two litre / Two
Sampling Procedure (if any)	–
Test parameters	AOX
Standard/Specification/Method followed	ISO: 9562 1989 (E)
Deviations (if any)	--
Documents constituting this report (if any)	–

Date of Receipt of Job	Date of Completion of Job	Total Number of Pages
17.09.2020	28.09.2020	1

TEST RESULTS

S. No.	Parameter	Test Method	Unit	Results	
				01 PCB (OP)	02 (OD-5)
1.	AOX	ISO: 9562 1989 (E)	mg/l	2.66	3.07

.....End of the report.....

M .Agarwal
Technical Manager
(Authorized Signatory)
SAI/FM/CSC-11

Annexure- XVI (F)

Idma Laboratories Limited

(A Government Approved Test House)

MOEF/CPCB/SPCB/State Pollution Boards/Drug & Cosmetic Act/ISO 9001: 14001: 18001 Certified

TEST REPORT

Ref. No. IL/D- 6947	Date 02-01-21	Lab No. 261220/I-E-067		Page No. 1/1
Customer	Trident Limited (Paper & Chemical Division) Mansa Road, Vill- Dhaula Tehsil- Tapa Distt- Barnala-148101 Punjab			
Type of Sample	NOISE LEVEL (AMBIENT)			
Customer's Description of Sample	NOISE LEVEL (AMBIENT)			
Quantity	01 No.			
Packing, Markings	Instrument at Site			
Mode of Collection of Sample	Sampling by Laboratories			
Work Order No.	9990021414		Dated	16/12/2020
Date of Receipt of Sample	26/12/2020			
Period of Analysis	26/12/2020 To 02/01/2021			
Sampling Team Idma	Idma Representative Team		Client	Mr.Gurpreet Sharma
Sampling Location	Near Husk Area			
Visual Observation	N/A			
Date of Sampling	23/12/2020			
Date of Reporting	02/01/2021			
Sampling Protocol	CPCB			
Testing Protocol	EPA/CPCB			

RESULTS

S.No.	Test Parameter	Units	Results	Limits, Day	Test Method
	CHEMICAL DISCIPLINE (Ambient Noise Levels)	-	-	-	
1	Leq	dB(A)	56.6	Max 75	EPA Guidline Manual July 2008
2	Lnight	dB(A)	46.4	Max 70	EPA Guidline Manual July 2008

End of Report

Analyst

For Idma Laboratories Limited

Authorised Signatory

Idma Laboratories Limited

(A Government Approved Test House)

MOEF/BIS/FSSAI/State Pollution Boards/Drug & Cosmetic Act/ISO 9001; 14001; 18001 Certified

TEST REPORT

Ref. No. ILD- [illegible]	Date	[illegible]	Lab No. 261220N-E-068	Page No. 1/1
Customer	Trident Limited (Paper & Chemical Division) Mansa Road, Vill- Dhaula Tehsil- Tapa Distt: Barnala-148101 Punjab			
Type of Sample	NOISE LEVEL (AMBIENT)			
Customer's Description of Sample	NOISE LEVEL (AMBIENT)			
Quantity	01 No			
Packing, Markings	Instrument at Site			
Mode of Collection of Sample	Sampling by Laboratories			
Work Order No.	8000021414	Dated	15/12/2020	
Date of Receipt of Sample	28/12/2020			
Period of Analysis	28/12/2020 To 02/01/2021			
Sampling Team Idma	Idma Representative Team	Client	Mr.Gurpreet Sharma	
Sampling Location	Near ETP Secondary Clarified			
Visual Observation	N/A			
Date of Sampling	23/12/2020			
Date of Reporting	02/01/2021			
Sampling Protocol	CPCB			
Testing Protocol	EPA/CPCB			

RESULTS

S.No.	Test Parameter	Units	Results	Limits, Day	Test Method
	CHEMICAL DISCIPLINE (Ambient Noise Levels)	-	-		-
1	Lday	dB(A)	52.4	Max 75	EPA Guiding Manual July 2008
2	Lnight	dB(A)	48	Max 70	EPA Guiding Manual July 2008

"End of Report"

Analyst

For Idma Laboratories Limited

Authorised Signatory

Idma Laboratories Limited

(A Government Approved Test House)

MOEF/BIS/FSSAI/State Pollution Boards/Drug & Cosmetic Act/ISO 9001: 14001: 18001 Certified

TEST REPORT

Ref. No. IL/D- 19114 A	Date 02.01.21	Lab No. 201220N-E-069		Page No. 1/1
Customer	Trident Limited (Paper & Chemical Division) Mansa Road, Vill- Dhaula Tehsil- Tapa Distt. Barnala-148101 Punjab			
Type of Sample	NOISE LEVEL (AMBIENT)			
Customer's Description of Sample	NOISE LEVEL (AMBIENT)			
Quantity	01 No.			
Packing, Markings	Instrument at Site			
Mode of Collection of Sample	Sampling by Laboratories			
Work Order No.	9950021414		Dated	15/12/2020
Date of Receipt of Sample	26/12/2020			
Period of Analysis	26/12/2020 To 02/01/2021			
Sampling Team Idma	Idma Representative Team		Client	Mr.Gurpreet Sharma
Sampling Location	Near Admin Guest House			
Visual Observation	N/A			
Date of Sampling	23/12/2020			
Date of Reporting	02/01/2021			
Sampling Protocol	CPCB			
Testing Protocol	EPA/CPCB			

RESULTS

S.No	Test Parameter	Units	Results	Limits, Day	Test Method
	CHEMICAL DISCIPLINE (Ambient Noise Levels)	-	-	-	-
1	Lday	dB(A)	51.4	Max 75	EPA Guidline Manual July 2008
2	Lnight	dB(A)	46.6	Max 70	EPA Guidline Manual July 2008

"End of Report"

Analyst

For Idma Laboratories Limited

Authorised Signatory

Idma Laboratories Limited

(A Government Approved Test House)

MOEF/BIS/ISSA/UState Pollution Boards/Drug & Cosmetic Act/ISO 9001: 14001: 18001 Certified

TEST REPORT

Ref. No. IL/D- 1515	Date 02-01-21	Lab No. 201220N-E-070		Page No. 1/1
Customer	Trident Limited (Paper & Chemical Division) Mansa Road, Vill- Chauka Tehsil- Tapa Distt: Barnala-148101 Punjab			
Type of Sample	NOISE LEVEL (AMBIENT)			
Customer's Description of Sample	NOISE LEVEL (AMBIENT)			
Quantity	01 No			
Packing, Markings	Instrument at Site			
Mode of Collection of Sample	Sampling by Laboratories			
Work Order No.	9900021414		Dated	15/12/2020
Date of Receipt of Sample	28/12/2020			
Period of Analysis	26/12/2020 To 02/01/2021			
Sampling Team /dma	Idma Representative Team		Client	Mr.Gurpreet Sharma
Sampling Location	Recovery-1, Boiler			
Visual Observation	N/A			
Date of Sampling	23/12/2020			
Date of Reporting	02/01/2021			
Sampling Protocol	CPCB			
Testing Protocol	EPA/CPCB			

RESULTS

S.No.	Test Parameter	Units	Results	Limits, Day	Test Method
	CHEMICAL DISCIPLINE (Ambient Noise Levels)	-	-	-	-
1	Lmax	dB(A)	80.8	-	EPA Guidline Manual July 2008
2	Lmin	dB(A)	73.8	-	EPA Guidline Manual July 2008
3	Leq	dB(A)	71.8	Max 90	EPA Guidline Manual July 2008

"End of Report"

Analyst

For Idma Laboratories Limited

Authorized Signatory

Idma Laboratories Limited

(A Government Approved Test House)

MOEF/BIS/FSSAI/State Pollution Boards/Drug & Cosmetic Act/ISO 9001: 14001; 18001 Certified

TEST REPORT

Ref. No. ILD- 19151	Date 02-01-21	Lab No.	251220N-E-071	Page No. 1/1
Customer	Trident Limited (Paper & Chemical Division) Mansa Road, Vill- Dhaula Tehsil- Tapa Distt: Barnala-148101 Punjab			
Type of Sample	NOISE LEVEL (AMBIENT)			
Customer's Description of Sample	NOISE LEVEL (AMBIENT)			
Quantity	01 No.			
Packing, Markings	Instrument at Site			
Mode of Collection of Sample	Sampling by Laboratories			
Work Order No.	9000021414	Dated	16/12/2020	
Date of Receipt of Sample	26/12/2020			
Period of Analysis	28/12/2020 To 02/01/2021			
Sampling Team Idma	Idma Representative Team	Client	Mr.Gurpreet Sharma	
Sampling Location	Recovery-2, Boiler			
Visual Observation	N/A			
Date of Sampling	23/12/2020			
Date of Reporting	02/01/2021			
Sampling Protocol	CPCB			
Testing Protocol	EPA/CPCB			

RESULTS

S.No.	Test Parameter	Units	Results	Limits, Dec	Test Method
	CHEMICAL DISCIPLINE (Ambient Noise Levels)	-	-	-	-
1	Lmax	dB(A)	80.2	-	EPA Guidline Manual July 2008
2	Lmin	dB(A)	74.7	-	EPA Guidline Manual July 2008
3	Leq	dB(A)	77.3	Max. 90	EPA Guidline Manual July 2008

"End of Report"

Analyst

For Idma Laboratories Limited

Authorised Signatory

Idma Laboratories Limited

(A Government Approved Test House)

MOEF|BIS|FSSAI|State Pollution Boards|Drug & Cosmetic Act|ISO 9001: 14001; 18001 Certified

TEST REPORT

Ref. No. IL/D- 19152	Date	02.01.21	Lab No. 261220N-E-072	Page No. 1/1
Customer	Trident Limited (Paper & Chemical Division) Mansa Road, Vill- Dhaula Tehsil- Tapa Distt: Barnala-148101 Punjab			
Type of Sample	NOISE LEVEL (AMBIENT)			
Customer's Description of Sample	NOISE LEVEL (AMBIENT)			
Quantity	01 No.			
Packing, Markings	Instrument at Site			
Mode of Collection of Sample	Sampling by Laboratories			
Work Order No.	9990021414	Dated	15/12/2020	
Date of Receipt of Sample	26/12/2020			
Period of Analysis	26/12/2020 To 02/01/2021			
Sampling Team Idma	Idma Representative Team	Client	Mr.Gurpreet Sharma	
Sampling Location	Energy-1, Turbine Floor			
Visual Observation	N/A			
Date of Sampling	23/12/2020			
Date of Reporting	02/01/2021			
Sampling Protocol	CPCB			
Testing Protocol	EPA/CPCB			

RESULTS

S.No.	Test Parameter	Units	Results	Limits, Day	Test Method
	CHEMICAL DISCIPLINE (Ambient Noise Levels)	-	-	-	-
1	Lmax	dB(A)	79.3	-	EPA Guidline Manual July 2008
2	Lmin	dB(A)	74.9	-	EPA Guidline Manual July 2008
3	Leq	dB(A)	78.8	Max. 90	EPA Guidline Manual July 2008

End of Report

Analyst

For Idma Laboratories Limited

Authorised Signatory

Turn Overleaf

Idma Laboratories Limited

(A Government Approved Test House)

MOEF/RSPCB/SSAI/State Pollution Board/Drug & Cosmetic Act/ISO 9001; 14001; 18001 Certified

TEST REPORT

Ref. No. IL/D- 1913	Date	[illegible]	Lab No.	2612200-E-072	Page No. 1/1
Customer	Trident Limited (Paper & Chemical Division) Manso Road, Vill- Dhaula Tehsil- Tapa Distt: Barnala-148101 Punjab			
Type of Sample	NOISE LEVEL (AMBIENT)			
Customer's Description of Sample	NOISE LEVEL (AMBIENT)			
Quantity	01 No.			
Packing, Markings	Instrument at Site			
Mode of Collection of Sample	Sampling by Laboratories			
Work Order No.	9990021414	Dated	15/12/2020	
Date of Receipt of Sample	26/12/2020			
Period of Analysis	26/12/2020 To 02/01/2021			
Sampling Team Idma	Idma Representative Team	Client	Mr.Gurpreet Sharma	
Sampling Location	Compressor House			
Visual Observation	N/A			
Date of Sampling	23/12/2020			
Date of Reporting	02/01/2021			
Sampling Protocol	CPCB			
Testing Protocol	EPA/CPCB			

RESULTS

S.No.	Test Parameter	Units	Results	Limits, Day	Test Method
	CHEMICAL DISCIPLINE (Ambient Noise Levels)	-	-	-	-
1	Lmax	dB(A)	83.8	-	EPA Guidline Manual July 2008
2	Lmin	dB(A)	50.2	-	EPA Guidline Manual July 2008
3	Leq	dB(A)	61.7	Max. 90	EPA Guidline Manual July 2008

"End of Report"

Analyst

For Idma Laboratories Limited

Authorised Signatory

Idma Laboratories Limited

(A Government Approved Test House)

MOEF/BIS/FSSAI/State Pollution Boards/Drug & Cosmetic Act/ISO 9001: 14001: 18001 Certified

TEST REPORT

Ref. No. IL/D- 19154	Date	02-01-21	Lab No. 26122014-E-074	Page No. 1/1
Customer	Trident Limited (Paper & Chemical Division) Mansa Road, Vill- Dhaula Tehsil- Tapa Distt. Barnala-148107 Punjab			
Type of Sample	NOISE LEVEL (AMBIENT)			
Customer's Description of Sample	NOISE LEVEL (AMBIENT)			
Quantity	01 No.			
Packing, Markings	Instrument at Site			
Mode of Collection of Sample	Sampling by Laboratories			
Work Order No.	9990021414	Dated	15/12/2020	
Date of Receipt of Sample	26/12/2020			
Period of Analysis	26/12/2020 To 02/01/2021			
Sampling Team Idma	Idma Representative Team	Client	Mr.Gurpreet Sharma	
Sampling Location	Chipper Area			
Visual Observation	N/A			
Date of Sampling	29/12/2020			
Date of Reporting	02/01/2021			
Sampling Protocol	CPCB			
Testing Protocol	EPA/CPCB			

RESULTS

S.No.	Test Parameter	Units	Results	Limits, Day	Test Method
	CHEMICAL DISCIPLINE (Ambient Noise Levels)	-	-	-	-
1	Lmax	dB(A)	70.2	-	EPA Guidline Manual July 2008
2	Lmin	dB(A)	60.9	-	EPA Guidline Manual July 2008
3	Leq	dB(A)	66.5	Max. 90	EPA Guidline Manual July 2008

"End of Report"

Analyst

For Idma Laboratories Limited

Authorised Signatory

Idma Laboratories Limited

(A Government Approved Test House)

MOEF&CC/FSSAI/State Pollution Boards/Drug & Cosmetic Act/ISO 9001: 14001; 18001 Certified

TEST REPORT

Ref. No. IL/D- 19155	Date	01-01-21	Lab No.	2612201N-E-075	Page No. 1/1
Customer	Trident Limited (Paper & Chemical Division) Malrna Road, Vill- Dhaula Tehsil- Tapa Distt. Barnala-148101 Punjab				
Type of Sample	NOISE LEVEL (AMBIENT)				
Customer's Description of Sample	NOISE LEVEL (AMBIENT)				
Quantity	01 No.				
Packing, Markings	Instrument at Site				
Mode of Collection of Sample	Sampling by Laboratories				
Work Order No.	8990021414		Dated	15/12/2020	
Date of Receipt of Sample	26/12/2020				
Period of Analysis	26/12/2020 To 02/01/2021				
Sampling Team Idma	Idma Representative Team		Client	Mr.Gurpreet Sharma	
Sampling Location	Energy-2, Turbine Floor				
Visual Observation	NA				
Date of Sampling	23/12/2020				
Date of Reporting	02/01/2021				
Sampling Protocol	CPCB				
Testing Protocol	EPA/CPCB				

RESULTS

S.No.	Test Parameter	Units	Results	Limits, Day	Test Method
	CHEMICAL DISCIPLINE (Ambient Noise Levels)	-	-	-	-
1	Lmax	dB(A)	83.3	-	EPA Guidline Manual July 2009
2	Lmin	dB(A)	76.7	-	EPA Guidline Manual July 2009
3	Leq	dB(A)	79.8	Max. 90	EPA Guidline Manual July 2009

"End of Report"

Analyst

For Idma Laboratories Limited

Authorized Signatory

Idma Laboratories Limited

(A Government Approved Test House)

MOEF/BIS/FSSAI/USEPA Pollution Boards/Drug & Cosmetic Act/AS9 9001; 14001; 18001 Certified

TEST REPORT

Ref. No. ILD- 19158	Date 02.01.21	Lab No. 2612200N-E-078	Page No. 1/1
Customer	Trident Limited (Paper & Chemical Division) Mansa Road, Vill- Dhuola Tehsil- Tapa Distt. Barnala-148101 Punjab		
Type of Sample	NOISE LEVEL (AMBIENT)		
Customer's Description of Sample	NOISE LEVEL (AMBIENT)		
Quantity	01 No.		
Packing, Markings	Instrument at Site		
Mode of Collection of Sample	Sampling by Laboratories		
Work Order No.	9990021414	Dated	15/12/2020
Date of Receipt of Sample	26/12/2020		
Period of Analysis	26/12/2020 To 02/01/2021		
Sampling Team Idma	Idma Representative Team	Client	Mr.Gurpreet Sharma
Sampling Location	PM-1, Finishing Floor		
Visual Observation	N/A		
Date of Sampling	23/12/2020		
Date of Reporting	02/01/2021		
Sampling Protocol	CPCB		
Testing Protocol	EPA/CPCB		

RESULTS

S.No.	Test Parameter	Units	Results	Limits, Day	Test Method
	CHEMICAL DISCIPLINE (Ambient Noise Levels)	-	-	-	-
1	Lmax	dB(A)	72.9	-	EPA Guidline Manual July 2008
2	Lmin	dB(A)	68.2	-	EPA Guidline Manual July 2008
3	Leq	dB(A)	71.0	Max. 90	EPA Guidline Manual July 2008

"End of Report"

Analyst

For Idma Laboratories Limited

Authorized Signatory

Idma Laboratories Limited

(A Government Approved Test House)

MOEF/BIS/FSSAI/State Pollution Boards/Drug & Cosmetic Act/ISO 9001: 14001: 18001 Certified

TEST REPORT

Ref. No. IL/D- 15172	Date	[illegible]	Lab No. 261220N-E-077	Page No. 1/1
Customer	Trident Limited (Paper & Chemical Division) Mansa Road, Vill- Dhaula Tehsil- Tapa Distt Barnala-148101 Punjab			
Type of Sample	NOISE LEVEL (AMBIENT)			
Customer's Description of Sample	NOISE LEVEL (AMBIENT)			
Quantity	01 No.			
Packing, Markings	Instrument at Site			
Mode of Collection of Sample	Sampling by Laboratories			
Work Order No.	9990021414	Dated	15/12/2020	
Date of Receipt of Sample	26/12/2020			
Period of Analysis	26/12/2020 To 02/01/2021			
Sampling Team Idma	Idma Representative Team	Client	Mr.Gurpreet Sharma	
Sampling Location	P&F2, Finishing Floor			
Visual Observation	N/A			
Date of Sampling	23/12/2020			
Date of Reporting	02/01/2021			
Sampling Protocol	CPCB			
Testing Protocol	EPA/CPCB			

RESULTS

S.No	Test Parameter	Units	Results	Limits, Day	Test Method
	CHEMICAL DISCIPLINE (Ambient Noise Levels)	-	-	-	-
1	Lmax	dB(A)	73.7	-	EPA Guidline Manual July 2008
2	Lmin	dB(A)	69.7	-	EPA Guidline Manual July 2008
3	Leq	dB(A)	71.6	Max. 90	EPA Guidline Manual July 2008

"End of Report"

Analyst

For Idma Laboratories Limited

Authorized Signatory

Idma Corporate Park, 391, Industrial Area, Phase-I, Panchkula, Haryana.
Tel. No. : 0172-5064827, 5064830 Website : www.idmagroup.co.in
E-mail : testing@idmagroup.co.in E-mail : support@idmagroup.co.in

Turn Overleaf

Idma Laboratories Limited

(A Government Approved Test House)

MOEF/BIS/FSSAI/State Pollution Board/Drug & Cosmetic Act/ISO 9001, 14001, 18001 Certified

TEST REPORT

Ref. No. ILD- 19157	Date	[illegible]	Lab No. 261220N-E-078	Page No. 1/1
Customer	Trident Limited (Paper & Chemical Division) Manse Road, Vill- Dhaula Tehsil- Tapa Distt- Barnala-148101 Punjab			
Type of Sample	NOISE LEVEL (AMBIENT)			
Customer's Description of Sample	NOISE LEVEL (AMBIENT)			
Quantity	01 No.			
Packing, Markings	Instrument at Site			
Mode of Collection of Sample	Sampling by Laboratories			
Work Order No.	9400021414	Dated	15/12/2020	
Date of Receipt of Sample	28/12/2020			
Period of Analysis	26/12/2020 To 02/01/2021			
Sampling Team Idma	Idma Representative Team	Client	Mr.Gurpreet Sharma	
Sampling Location	CPS (Winder 1K2)			
Visual Observation	N/A			
Date of Sampling	23/12/2020			
Date of Reporting	02/01/2021			
Sampling Protocol	CPCB			
Testing Protocol	EPA/CPCB			

RESULTS

S.No.	Test Parameter	Units	Results	Limits, Day	Test Method
	CHEMICAL DISCIPLINE (Ambient Noise Levels)	-	-	-	-
1	Lmax	dB(A)	74.0	-	EPA Guidline Manual July 2008
2	Lmin	dB(A)	72.4	-	EPA Guidline Manual July 2008
3	Leq	dB(A)	73.3	Max. 90	EPA Guidline Manual July 2008

"End of Report"

Analyst

For Idma Laboratories Limited

Authorized Signatory

Idma Laboratories Limited

(A Government Approved Test House)

MOEF/BIS/FSSAI/Sole Pollution Board/Drug & Cosmetic Act/ISO 9001: 14001: 18001 Certified

TEST REPORT

Ref. No. ILD- 19159	Date 02-01-21	Lab No. 2612204/I-E-079		Page No. 1/1
Customer	Trident Limited (Paper & Chemical Division) Manesa Road, Vill- Dhaulu Tehsil- Tapa Distt: Barnala-148101 Punjab			
Type of Sample	NOISE LEVEL (AMBIENT)			
Customer's Description of Sample	NOISE LEVEL (AMBIENT)			
Quantity	01 No.			
Packing, Markings	Instrument at Site			
Mode of Collection of Sample	Sampling by Laboratories			
Work Order No.	9993021414	Dated	15/12/2020	
Date of Receipt of Sample	26/12/2020			
Period of Analysis	28/12/2020 To 02/01/2021			
Sampling Team Idma	Idma Representative Team	Client	Mr.Gurpreet Sharma	
Sampling Location	SFL (12Mtr.) Floor			
Visual Observation	N/A			
Date of Sampling	23/12/2020			
Date of Reporting	02/01/2021			
Sampling Protocol	CPCB			
Testing Protocol	EPA/CPCB			

RESULTS

S.No.	Test Parameter	Units	Results	Limits, Day	Test Method
	CHEMICAL DISCIPLINE (Ambient Noise Levels)	-	-	-	
1	Lmax	dB(A)	73.6	-	EPA Guidline Manual July 2008
2	Lmin	dB(A)	68.8	-	EPA Guidline Manual July 2008
3	Leq	dB(A)	71.3	Max. 90	EPA Guidline Manual July 2008

"End of Report"

Analyst

For Idma Laboratories Limited

Authorized Signatory

Idma Laboratories Limited

(A Government Approved Test House)

MOEF/BIS/FSSAI/State Pollution Board's/Drug & Cosmetic Act/ISO 9001: 14001: 18001 Certified

TEST REPORT

Ref. No. ILD- 19160	Date	02-01-21	Lab No. 261220N-E-080	Page No. 1/1
Customer	Trident Limited (Paper & Chemical Division) Malerkotla Road, Vill- Chauma Tehsil- Tapa Distt: Barnala-148101 Punjab			
Type of Sample	NOISE LEVEL (AMBIENT)			
Customer's Description of Sample	NOISE LEVEL (AMBIENT)			
Quantity	01 No.			
Packing, Markings	Instrument at Site			
Mode of Collection of Sample	Sampling by Laboratories			
Work Order No.	9990021414	Dated	15/12/2020	
Date of Receipt of Sample	26/12/2020			
Period of Analysis	26/12/2020 To 02/01/2021			
Sampling Team Idma	Idma Representative Team	Client	Mr.Gurpreet Sharma	
Sampling Location	SFL - (0 Mtr.) Floor			
Visual Observation	N/A			
Date of Sampling	23/12/2020			
Date of Reporting	02/01/2021			
Sampling Protocol	CPCB			
Testing Protocol	EPA/CPCB			

RESULTS

S.No.	Test Parameter	Units	Results	Limits, Day	Test Method
	CHEMICAL DISCIPLINE (Ambient Noise Levels)	-	-	-	-
1	Lmax	dB(A)	74.4	-	EPA Guidline Manual July 2008
2	Lmin	dB(A)	70.8	-	EPA Guidline Manual July 2008
3	Leq	dB(A)	72.8	Max. 80	EPA Guidline Manual July 2008

"End of Report"

Analyst

For Idma Laboratories Limited

Authorized Signatory

Idma Laboratories Limited

(A Government Approved Test House)

MOEF/BIS/FSSAI/State Pollution Boards/Drug & Cosmetic Act/ISO 9001: 14001; 10001 Certified

TEST REPORT

Ref. No. IL/D- 19161	Date 02-01-21	Lab No. 2612201-E-001		Page No. 1/1
Customer	Trident Limited (Paper & Chemical Division) Mansa Road, Vill- Dhaula Tehsil- Yapa Distt: Barnala-148101 Punjab			
Type of Sample	NOISE LEVEL (AMBIENT)			
Customer's Description of Sample	NOISE LEVEL (AMBIENT)			
Quantity	01 No.			
Packing, Markings	Instrument at Site			
Mode of Collection of Sample	Sampling by Laboratories			
Work Order No.	99900021414		Dated	15/12/2020
Date of Receipt of Sample	26/12/2020			
Period of Analysis	26/12/2020 To 02/01/2021			
Sampling Team Idma	Idma Representative Team		Client	Mr.Gurpreet Sharma
Sampling Location	SAP Near Workshop			
Visual Observation	N/A			
Date of Sampling	23/12/2020			
Date of Reporting	02/01/2021			
Sampling Protocol	CPCB			
Testing Protocol	EPA/CPCB			

RESULTS

S.No.	Test Parameter	Units	Results	Limits, Day	Test Method
	CHEMICAL DISCIPLINE (Ambient Noise Levels)	-	-	-	-
1	Lmax	dB(A)	72.4	-	EPA Guidline Manual July 2008
2	Lmin	dB(A)	64.8	-	EPA Guidline Manual July 2008
3	Leq	dB(A)	67.9	Max. 90	EPA Guidline Manual July 2008
4	CPCB Limits in dB(A) Leq (Silence area)	dB(A)		Day - 50	EPA Guidline Manual July 2008

"End of Report"

Analyst

For Idma Laboratories Limited

Authorized Signatory

Annexure – XVI (G)

(29)

TRIDENT LIMITED

MEDICAL EXAMINATION PERFORMA

Date: 7/11/20



Reg No. [illegible]

Name: Aman Ahasan
Age: 26
Father's Name: Vishwa Bandhu
Blood Group: A+

Unit: Baddi
Category of Post: Sahayak/US
Single/Married: Single

GENERAL PHYSICAL EXAMINATION

Weight: 70.6 Kg
Height: 5'10"
BMI: 22 Kg/m²
Anaemia:
Jaundice:
Cynosis: Absent
Varicocele:

B.P.: 110/80 mm/Hg
Pulse: 99/min
Respiration: 12/min
Temperature: 97.7 °F
SPO2: 98%
Oral Hygiene: ok

ABDOMEN

Liver: N
Spleen: N
Other Palpable Mass: NO
Breast Exa.

Hernial Sites: N
Hydrocele: N

CHEST

Lungs: N
Inspiration: 97cm

Heart: N
Expiration: 95cm

CENTRAL NERVOUS SYSTEM & PSYCHO ANALYSIS

Vision: R/E 6/6 L/E 6/6

Colour Vision: (N)

Skin: (N)

I.D. Mark: Scar Mark on (C) Knee

Investigations:

Haemoglobin:
Urine for Albumin & Sugar:
ECG (If required)
X-Ray Chest: (If required)

Signature: [illegible] Singh
Medical Examination Officer
MBBS
Reg No. 49035

Fit/Unfit for Present Job:

Scanned by CamScanner

TRIDENT LIMITED

MEDICAL EXAMINATION PERFORMA

Date: 11-11-2020

Name: Amit Mahtar
Age: 47
Father's Name: S.L. Avinash Chandra Mahtar
Blood Group: O+ve

Unit: Paper-2
Category of Post: - IL3.
Single/Married: Married



GENERAL PHYSICAL EXAMINATION

Weight: 95 kg
Height: 178 cm
BMI: 29.92 kg/m²
Anaemia:
Jaundice: No
Cynosis:
Varicocele: (N)

B.P.: 138/92 mmHg
Pulse: 79/min
Respiration: 17/min
Temperature
SPO2 99%
Oral Hygiene OK

ABDOMEN

Liver: WNL
Spleen:
Other Palpable Mass
Breast Exa.

Hernial Sites:
Hydrocele: (N)

CHEST

Lungs: (N)
Inspiration: 90 cm

Heart: (N)
Expiration: 85 cm

CENTRAL NERVOUS SYSTEM & PSYCHOANALYSIS

Vision: R/E 6/6 L/E 6/6

Colour Vision: (N)

Skin: (N)

I.D. Mark Scar Mark on Nose

Investigations:

Haemoglobin:
Urine for Albumin & Sugar:
ECG(If required)
X-Ray Chest: (If required)

Signature of Medical Officer
Name: Surgeon Lieutenant Commander
Reg No. 49035

Fit/Unfit for Present Job:

Scanned by CamScanner

TRIDENT LIMITED

MEDICAL EXAMINATION PERFORMA

Date: 16/11/2020

Name: Nikhil Kumar (7174)
Age: 26
Father's Name: Sumer Pal Singh
Blood Group: B+ve

Unit: Paper Sustainability
Category of Post:
Single/Married: Single



GENERAL PHYSICAL EXAMINATION

Weight: 66 kg
Height: 173 cm
BMI: 22.05 kg/m²
Anaemia:
Jaundice: N/A
Cynosis: N/A
Varicocele: (N)

B.P.: 112/76 mmHg
Pulse: 83/min
Respiration: 12-14/min
Temperature 98.3.
SPO2 99%
Oral Hygiene OK

ABDOMEN

Liver:
Spleen: WNL
Other Palpable Mass
Brest Exa.

Hernial Sites:
Hydrocele: (N)

CHEST

Lungs: (N)
Inspiration: 90cm

Heart: (N)
Expiration: 85cm

CENTRAL NERVOUS SYSTEM & PSYCHO ANALYSIS

Vision: R/E 6/6 L/E 6/6

Colour Vision: (N)

Skin: (N)

I.D. Mark: 1) Burn mark on (R) leg.

Investigations:

Signature of Medical Officer
16/11/20
Dr. SHAILY GUPTA
M.B.B.S.
Regd. No. [illegible]

Haemoglobin:
Urine for Albumin & Sugar:
ECG (if required)
X-Ray Chest: (if required)

Fit/Unfit for Present Job: Fit on PIC

Scanned by CamScanner

TRIDENT LIMITED

MEDICAL EXAMINATION PERFORMA

Date: 12.11.2020.

Name: Vijay Kumar Nain
Age: 46 years
Father's Name: Gopal Krishan
Blood Group: B+ve

Unit: PPR.
Category of Post:
Single/Married:



GENERAL PHYSICAL EXAMINATION

Weight: 78 KG
Height: 164 cm
BMI: 29 kg/m2
Anaemia:
Jaundice: Absent
Cynosis:
Varicocele: No

B.P.: 140/84 mm Hg
Pulse: 67/min
Respiration: 12-16
Temperature: 97.7°F
SPO2: 99%
Oral Hygiene: Gd

Dr. Gyn
Regn

ABDOMEN

Liver: NAD
Spleen:
Other Palpable Mass: No
~~Breast Era.~~

Hernial Sites:
Hydrocele: No

CHEST

Lungs: N
Inspiration: 107 cm

Heart: N
Expiration: 105 cm.

CENTRAL NERVOUS SYSTEM & PSYCHOANALYSIS

Vision: R/E 6/6 L/E 6/6

Colour Vision: N

Skin: N

I.D. Mark: mole on forehead

Investigations:

Haemoglobin:
Urine for Albumin & Sugar:
ECG (If required)
X-Ray Chest: (If required)

Signature of Examining Medical Officer
MBBS
Reg No. 49055

Fit/Unfit for Present Job:

Scanned by CamScanner

TRIDENT LIMITED

MEDICAL EXAMINATION PERFORMA

Date: 17-11-2020.

Name: Rajesh Kumar
Age: 51
Father's Name: Munshi Lal
Blood Group: O+VE

Unit: PPR
Category of Post:
Single/Married:



GENERAL PHYSICAL EXAMINATION

Weight: 52 kg
Height: 170 cm
BMI: 17.99 kg/m²
Anaemia:
Jaundice: NIL
Cyanosis:
Varicocele: (N)

B.P.: 130/80 mm Hg
Pulse: 74/min
Respiration: 12-14/min
Temperature 98.1
SPO2 99%
Oral Hygiene OK

Dr. S. [illegible]
Reg. No. 28[illegible]

ABDOMEN

Liver:
Spleen: NAD
Other Palpable Mass
Breast Exa.

Hernial Sites:
Hydrocele: (N)

CHEST

Lungs: (N)
Inspiration: Normal

Heart: (N)
Expiration: Normal

CENTRAL NERVOUS SYSTEM & PSYCHO ANALYSIS

Vision: RVE 6/6 LVE 6/6

Colour Vision: (N)

Skin (N)

I.D. Mark Cut Mark on (R) leg.

Investigations:

Signature of Medical Officer
17/11/20
Dr. [illegible]
Reg. No. 28[illegible]

Haemoglobin:
Urine for Albumin & Sugar:
ECG (If required)
X-Ray Chest: (If required)

Fit/Unfit for Present Job: Fit on PE

Scanned by CamScanner

TRIDENT LIMITED

MEDICAL EXAMINATION PERFORMA

Date: 9/11/2020

(18) (28)

Name: Jagtish Singh
Age: 32
Father's Name: Jagtar Singh
Blood Group: B+ve

Unit: PTR
Category of Post:
Single/Married:



GENERAL PHYSICAL EXAMINATION

Weight: 67 Kg
Height: 170 cm
BMI: 21.9 Kg/m2
Anaemia:
Jaundice:
Cynosis:
Varicocele:

B.P.: 110/70 mmHg
Pulse: 78
Respiration: 12-16
Temperature 97.7 F
SPO2 97%
Oral Hygiene Gd

Dr. Gurvinder Singh
Medical Officer
M B B S
Reg No. 49035

ABDOMEN

Liver:
Spleen:
Other Palpable Mass
Breast Exa.

Hernial Sites:
Hydrocele:

CHEST

Lungs:
Inspiration:

Heart:
Expiration:

CENTRAL NERVOUS SYSTEM & PSYCHOANALYSIS

Vision: R/E 6/6 L/E 6/6

Colour Vision:

Skin:

I.D. Mark: Cut mark on chin.

Investigations:

Signature of Medical Officer
Dr. Gurvinder Singh
Medical Officer
M B B S
Reg No. 49035

Haemoglobin:
Urine for Albumin & Sugar:
ECG (If required)
X-Ray Chest: (If required)

Fit/Unfit for Present Job:

Scanned by CamScanner

TRIDENT LIMITED

MEDICAL EXAMINATION PERFORMA

Date: 9/4/22

Name: Rajat Kumar Singla
Age: 26 years
Father's Name: Rajinder Singla
Blood Group: A+ve.

Unit: Rdp
Category of Post: Kg-3
Single/Married: Single



Reg No. 49035

GENERAL PHYSICAL EXAMINATION

Weight: 60 Kg
Height: 175 cm
BMI: 19.59 Kg/m²
Anaemia:
Jaundice: No
Cynosis:
Varicocele: ✓

B.P.: 120/80 mm/Hg
Pulse: 74/min
Respiration: 18/min
Temperature 98.1 Dr. C
SPO2 99%.
Oral Hygiene OK

ABDOMEN

Liver:
Spleen: WNL
Other Palpable Mass
Breast Exa.

Hernial Sites:
Hydrocele: ✓

CHEST

Lungs: ✓
Inspiration: 90 cm

Heart: ✓
Expiration: 85 cm

CENTRAL NERVOUS SYSTEM & PSYCHO ANALYSIS

Vision: R/E 6/6 L/E 6/6

Colour Vision: C B (Colour Blind).

Skin: ✓

I.D. Mark

Mole on ✓ Inguinal region

Investigations:

Signature of Medical Officer
Gurvinder Singh
Medical Officer
M.D.B.S.
Reg No. 49035

Haemoglobin:
Urine for Albumin & Sugar:
ECG (If required)
X-Ray Chest: (If required)

Fit/Unfit for Present Job:

Can work in areas where Colour Differentiation is not required.

Scanned by CamScanner

TRIDENT GROUP

TRIDENT LIMITED

MEDICAL EXAMINATION PERFORMA

Date: 07/11/24

Name: Mohit
Age: 34
Father's Name: Vijay Kumar
Blood Group: O+

Unit: Recovery 2
Category of Post: JC-3
Single/Married: Married



Reg No. 49035

GENERAL PHYSICAL EXAMINATION

Weight: 73 Kg
Height: 172 cm
BMI: 24.65 Kg/m2
Anaemia:
Jaundice: NO
Cyanosis:
Varicocele:

B.P.: 130/90 mmHg
Pulse: 76
Respiration: 12-14/m
Temperature 98 F
SPO2 99%
Oral Hygiene ok

ABDOMEN

Liver: Nil
Spleen: Nil
Other Palpable Mass
Breast Exa.

Hernial Sites
Hydrocele: No

CHEST

Lungs: Cl
Inspiration: 100 cm

Heart: RR
Expiration: 95 cm

CENTRAL NERVOUS SYSTEM & PSYCHO ANALYSIS

Vision: R/E 6/6 L/E 6/6

Colour Vision: N

Skin: C

I.D. Mark: Scar Mark on Left Shoulder

Investigations:

Signature of Medical Officer
Name: Dr. Sunil Singh
Designation: Medical Officer
MBBS
Reg No. 49035

Haemoglobin:
Urine for Albumin & Sugar:
ECG (If required)
X-Ray Chest: (If required)

Fit/Unfit for Present Job:

Scanned by CamScanner

TRIDENT LIMITED

MEDICAL EXAMINATION PERFORMA

Date: 05/11/2020

Name: PANEET KUMAR
Age: 30 yrs
Father's Name: Roshan Lal
Blood Group: O+ve

Unit: Pulp
Category of Post: T1256
Single/Married:



Reg No. [illegible]

GENERAL PHYSICAL EXAMINATION

Weight: 72 kg
Height: 166 cm
BMI: 26.1 kg/m²
Anaemia: Absent
Jaundice: Absent
Cynosis: Absent
Varicocele:

B.P.: 120/80 mmHg
Pulse: 76 Per/m
Respiration: 12-14 Per
Temperature: Norm
SPO2 99%
Oral Hygiene: Ok

ABDOMEN

Liver: Normal
Spleen: Normal
Other Palpable Mass: Nil
Breast Exa.

Hernial Sites: Nil
Hydrocele: Nil

CHEST

Lungs: Clear
Inspiration: 86 cm
Expiration: 84 cm

Heart: Normal

CENTRAL NERVOUS SYSTEM & PSYCHOANALYSIS: Nil

Vision: R/E 6/6 L/E 6/6

Colour Vision: Normal

Skin: Normal

I.D. Mark: Mole on forehead

Investigations:

Haemoglobin:
Urine for Albumin & Sugar:
ECG (if required)
X-Ray Chest: (if required)

Signature of Medical Officer
Gurmeet Singh
Medical Officer
M B B S
Reg No. 43035

Fit/Unfit for Present Job:

Scanned by CamScanner

TRIDENT LIMITED

MEDICAL EXAMINATION PERFORMA

Date: 27-Nov-2020

Name: SHYAM SUNDER
Age: 27
Father's Name: JAI RAM
Blood Group: O+

Unit: PULP MILL CHOPPER
Category of Post: III
Single/Married: Single



Dr. Gurvinder Singh
Medical Officer
MBBS
Reg No. 49035

GENERAL PHYSICAL EXAMINATION

Weight: 65
Height: 5'5" (163 cm)
BMI: 24.45 Kg/m²
Anaemia: Absent
Jaundice:
Cyanosis:
Varicocele:

B.P.: 136/82 mm/g
Pulse: 98
Respiration: 12/4m
Temperature: 98.1°F
SPO2: 99%
Oral Hygiene: Ok

ABDOMEN

Liver: Well
Spleen:
Other Palpable Mass: NO
Breast Exa.

Hernial Sites: N
Hydrocele:

CHEST

Lungs: N
Inspiration: 96 cm
Expiration: 94 cm

Head: N

CENTRAL NERVOUS SYSTEM & PSYCHO ANALYSIS

Vision: R/E 6/6 L/E 6/6

Colour Vision: N

Skin: N

I.D. Mark: Mole on back of Nose.

Investigations:

Haemoglobin:
Urine for Albumin & Sugar:
ECG (if required)
X-Ray Chest: (if required)

Signature of Medical Officer
Dr. Gurvinder Singh
Medical Officer
MBBS
Reg No. 49035

Fit/Unfit for Present Job:

Scanned by CamScanner

TRIDENT LIMITED

MEDICAL EXAMINATION PERFORMA

Date: 29/10/2020

Name: NAVIN BACHHAPRASAD SHAH
Age: 34Y
Father's Name: S. BACHHAPRASAD SHAH
Blood Group: B+ve
Unit: ENERGY
Category of Post:
Single/Married:



Reg No.

GENERAL PHYSICAL EXAMINATION

Weight: 77kg
Height: 179cm
BMI: 24.04 Kg/m2
Anaemia:
Jaundice:
Cyanosis: NO
Varicocele:

B.P.: 119/87 mmHg
Pulse: 87/m
Respiration: 12-14/m
Temperature: 97.6°F
SPO2: 99
Oral Hygiene: Ok

ABDOMEN

Liver:
Spleen: None
Other Palpable Mass: NP
Breast Exa.

Hernial Sites:
Hydrocele: NO

CHEST

Lungs: CAE
Inspiration: BBA

Heart: CAE
Expiration: BBA

CENTRAL NERVOUS SYSTEM & PSYCHOANALYSIS NAD

Vision: R/E 6/6 L/E 6/6

Colour Vision: Normal

Skin: NAD

I.D. Mark: Mole on upper lip.

Investigations:

Haemoglobin:
Urine for Albumin & Sugar:
ECG (If required)
X-Ray Chest: (If required)

Signature of Medical Officer
Dr. Vinayak Singh
Medical Officer MBBS
Reg No. 49035

Fit/Unfit for Present Job:

Scanned by CamScanner

TRIDENT

TRIDENT LIMITED

MEDICAL EXAMINATION PERFORMA

Date: 21/10/20

Name: MANOJ ASWAL
Age: 29
Father's Name: SH. GIAN SINGH
Blood Group: O+ve

Unit: REC/ETP - MECH
Category of Post: EN-3
Single/Married: SINGLE



REG NO.

GENERAL PHYSICAL EXAMINATION

Weight: 65kg
Height: 166 cms
BMI: 23.5 kg/m².
Anaemia:
Jaundice: NO
Cyanosis:
Varicocele:

B.P.: 135/87 mm of Hg
Pulse: 94 /min
Respiration:
Temperature: 97.4°F
SPO2: 98
Oral Hygiene: Ok

ABDOMEN

Liver: NAD
Spleen:
Other Palpable Mass: NIL
Breast Exa.

Hernial Sites: NIL
Hydrocele:

CHEST

Lungs: NAD
Inspiration: 87 cm

Heart: NAD
Expiration: 82 cm

CENTRAL NERVOUS SYSTEM & PSYCHOANALYSIS NAD

Vision: R/E 6/6 U/E 6/6

Colour Vision: Colour Blind.

Skin: NAD

I.D. Mark: Mole on Forehead

Investigations:

Haemoglobin:
Urine for Albumin & Sugar:
ECG (If required)
X-Ray Chest: (If required)

Signature of Medical Officer
Dr. Gurvinder Singh
Medical Officer
MBBS
Reg No. 49035

Fit/Unfit for Present Job: Can work in areas where colour differentiation is not required.

Scanned by CamScanner

TRIDENT

TRIDENT LIMITED

MEDICAL EXAMINATION PERFORMA

Date: 29/10/20

Name: ADITI KUMAR
Age: 369
Father's Name: VIJAY KUMAR
Blood Group: A+ve

Unit: TPL CCPPA 2
Category of Post: - KY-3
Single/Married:



Reg No.-

GENERAL PHYSICAL EXAMINATION

Weight: 78 Kg
Height: 186 cm
BMI: 22.54 kg/m2
Anaemia:
Jaundice:
Cyanosis: NO
Varicocele:

B.P.: 145/88 mmHg
Pulse: 74/m
Respiration: 12-14/m
Temperature: 96.3 F
SPO2: 98
Oral Hygiene: ok

ABDOMEN

Liver: WNL
Spleen:
Other Palpable Mass: NO
Breast Exa.

Hernial Sites:
Hydrocele: NO

CHEST

Lungs: NAD
Inspiration: 85 cm

Heart: NAD
Expiration: 80 cm

CENTRAL NERVOUS SYSTEM & PSYCHO ANALYSIS NAD

Vision: R/E 6/6 L/E 6/6

Colour Vision: normal

Skin:

I.D. Mark: Scar Mark on anterior side of Neck

Investigations:

Signature of Medical Officer
Dr. Satinder Singh
Medical Officer
MBBS
Reg No. 49056

Haemoglobin:
Urine for Albumin & Sugar:
ECG (If required)
X-Ray Chest: (If required)

Fit/Unfit for Present Job:

Scanned by CamScanner

TRIDENT

TRIDENT LIMITED
MEDICAL EXAMINATION PERFORMA

Date: 29/10/2020

Name: VIKASH KUMAR CHAUDHARY
Age: 29
Father's Name: DINESH CHAUDHARY
Blood Group: B+ve

Unit: Recovery (TPEC)
Category of Post: KY-3
Single/Married: Single



GENERAL PHYSICAL EXAMINATION
Weight: 90 Kg
Height: 180cm
BMI: 27.7kg/m2
Anaemia:
Jaundice:
Cynosis: NO
Varicocele:

B.P.: 117/81 mmHg
Pulse: 96/m
Respiration: 12-14/m
Temperature: 97.7°F
SPO2: 98
Oral Hygiene: Ok

ABDOMEN
Liver: WNL
Spleen:
Other Palpable Mass: O
Breast Exa.

Hernial Sites:
Hydrocele: O

CHEST
Lungs: O
Inspiration: 90 cm

Heart: O
Expiration: 85 cm

CENTRAL NERVOUS SYSTEM & PSYCHO ANALYSIS: WNL

Vision: R/E 6/6 L/E 6/6 Colour Vision: Normal

Skin: O

I.D. Mark: Scar Mark on O Index finger.

Investigations:

Signature of Medical Officer
Dr. Jitender Singh
Medical Officer MBBS
Reg No 49435

Haemoglobin:
Urine for Albumin & Sugar:
ECG (If required)
X-Ray Chest: (If required)

Fit/Unfit for Present Job:

Scanned by CamScanner

TRIDENT LIMITED

MEDICAL EXAMINATION PERFORMA

Date: 20/12/2020

Name: HARBHAJAN
Age: 23
Father's Name: PARSA RAM
Blood Group: O+

Unit: EMERY
Category of Post:
Single/Married



B.P.: 130/90 mm of Hg
Pulse: 61
Respiration: 12 /min
Temperature: 99 F
SPO2 99%
Oral Hygiene OK

Reg No. [illegible]

GENERAL PHYSICAL EXAMINATION

Weight: 68 Kg
Height: 175
BMI: 22.2 Kg/m²
Anaemia:
Jaundice:
Cyanosis: NO
Varicocele:

ABDOMEN

Liver:
Spleen: NAD
Other Palpable Mass
Breast Exa

Hernial Sites:
Hydrocele: NIL

CHEST

Lungs: (N)
Inspiration: 100 cm

Heart: (N)
Expiration: 95 cm

CENTRAL NERVOUS SYSTEM & PSYCHO ANALYSIS

Vision: R/E 6/6 U/E 6/6 Colour Vision: (N).

Skin: (N)

I.D.Mark (R) left side chest

Investigations:

Signature of Medical Officer
Dr. Surinder Singh
Medical Officer
MBBS
Reg No. 49035

Haemoglobin:
Urine for Albumin & Sugar:
ECG (If required)
X-Ray Chest: (If required)

Fit/Unfit for Present Job:

Scanned by CamScanner

Annexure-XVI (H)

TRIDENT GROUP™
Being different is normal

I-212, Nitchu Nagar
Ludhiana – 141001
Punjab, India

Tel: +91 161 5029999
Fax: +91 161 5038010
Web: tridentindia.com

TRIDENT/PCD/2021/25
01 June 2021

To
The Director(s)
Monitoring Cell, MOEF&CC,
Northern Regional Office,
Bays no. 24-25, Sector 31A,
Dakshin Marg, Chandigarh - 160030

Sub : Six Monthly Environmental Monitoring Report of M/s Trident Limited (Formerly Abhishek Industries Ltd.), Village- Dhaula, District - Barnala, Punjab for the period of October 2020 to March 2021.

Dear Sir

In continuation of Environmental clearance vide your Letter No. J-11011/52/2005 IA-II(I), dated. 08.11.2005 for our Paper Unit, we are submitting here with Six monthly report on the status on compliance of stipulated environmental conditions is attached as Annexure I.

The Annexures to the detailed compliance report is attached as under:

S.No.	Description	Annexure no.
1	Stack Emission Report	A
2	Ambient Air Quality Report	B
3	Monthly PPCB Report	C
4	PPCB Testing Report	D
5	ADR Report	E
6	Noise Level Testing Report	F
7	Staff Medical Test Report	G
8	CSR Activities Report	H

You are requested to take the same on record.

Thanking You,

Yours faithfully
For Trident Limited (PCD)
(Formerly Abhishek Industries Limited)

SARVJEET SINGH Digitally signed by Sarvjeet Singh
Date: 2021.06.04 19:21:14 +05:30

(Sarvjeet Singh)
Factory Manager

01/06/2021

TL/2021/007715

TRIDENT GROUP™
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G-212, Ardee Nagar
Ludhiana - 141001
Punjab, India

Tel: +91 161 5039999
Fax: +91 161 5033001
Visit: tridentindia.com

CC:
The Director
Monitoring Cell
Ministry of Environment, Forests & Climate Change,
Indira Paryavaran Bhawan, Jorbagh Road, Aliganj, New Delhi – 110003

01/06/2021

TL/2021/509710

Trident Limited, Regd. Office: Trident Group, Sangrana – 248 001, India
CIN: L17111PB1990PLC010287
corp@tridentindia.com

Annexure- XVI (I)

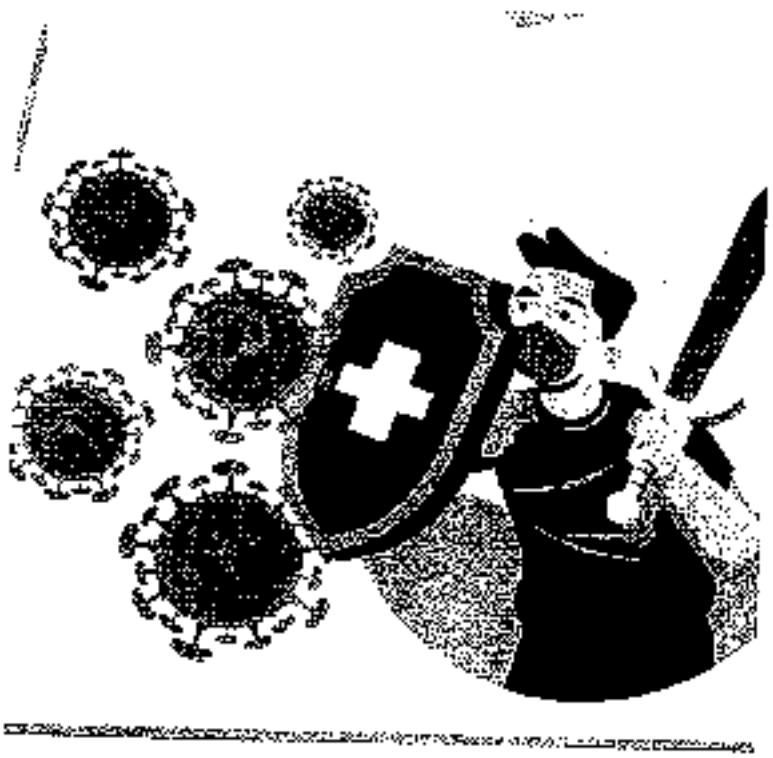
TRIDENTGROUP

TRIDENT LIMITED

CSR

During Toughest times for Humanity

CSR Action Points during Covid Times



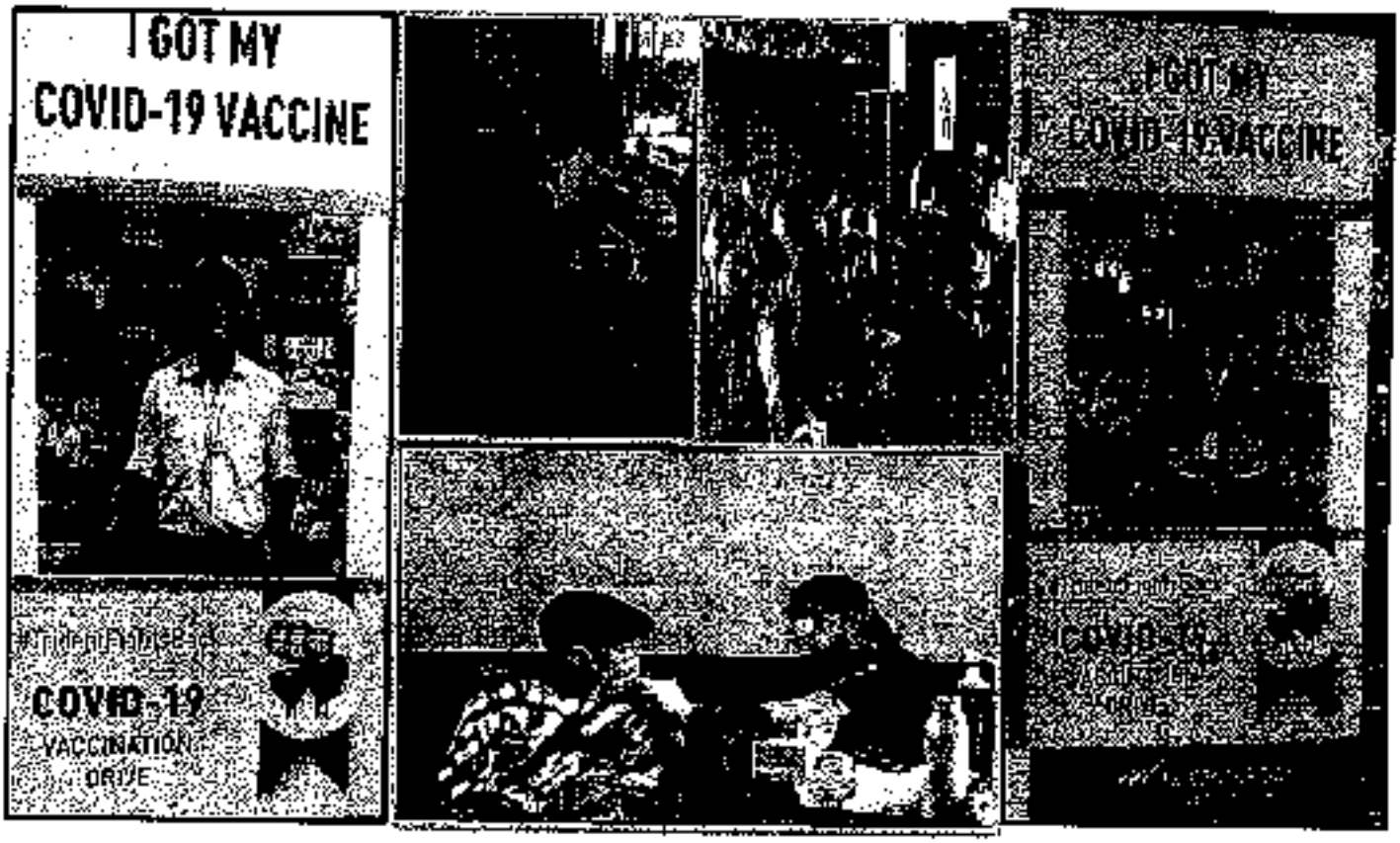




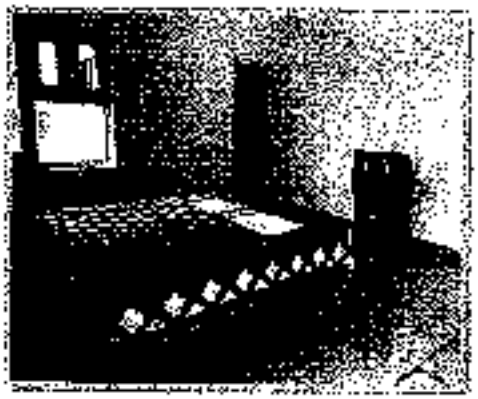
- Testing & Vaccination
- Front-Line Warriors of COVID
- Mask Distribution
- COVID Care Centre
- Skill Development
- Essential Kit Distribution
- Awareness
- CSR with partnering with Goodera

Covid Testing & Vvaccination Camps





COVID Care Centre – Quarantine Facility





- The facility opposite Sanghera plant ready with all necessary amenities and recreational facilities for members who will require support in case of any emergency.

Volunteers on Wheel Reaching out to Covid Patients

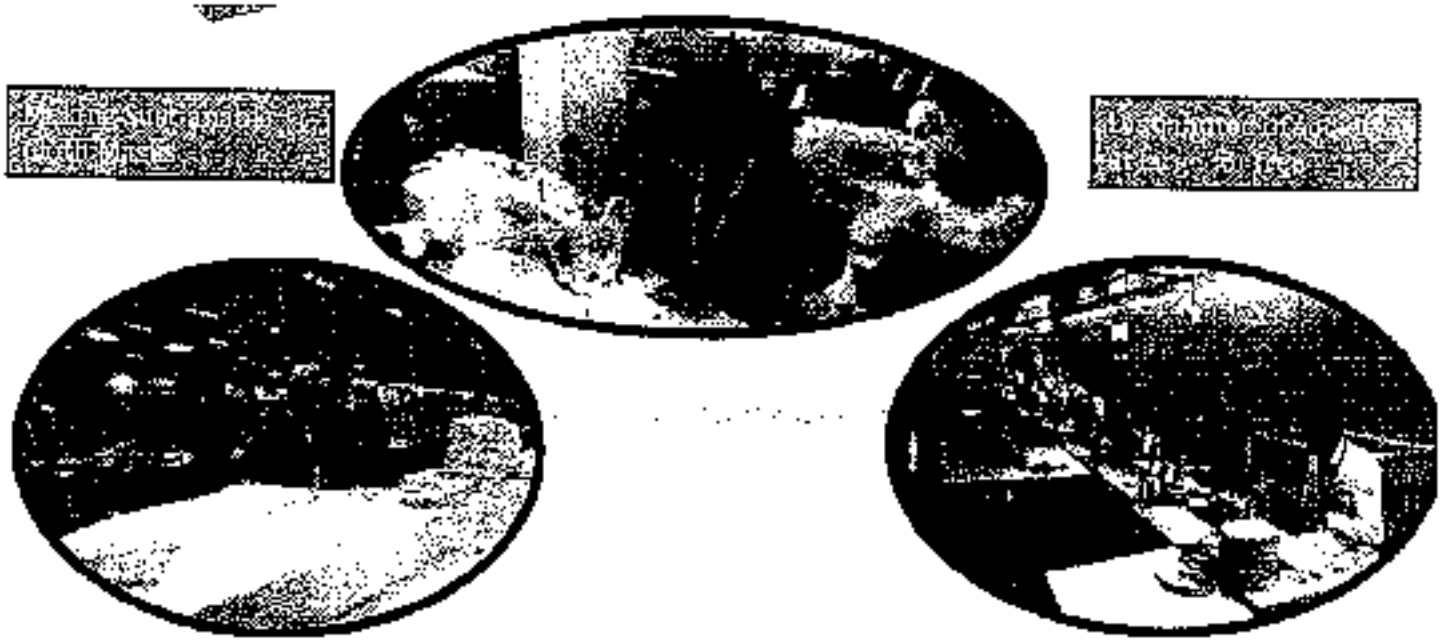




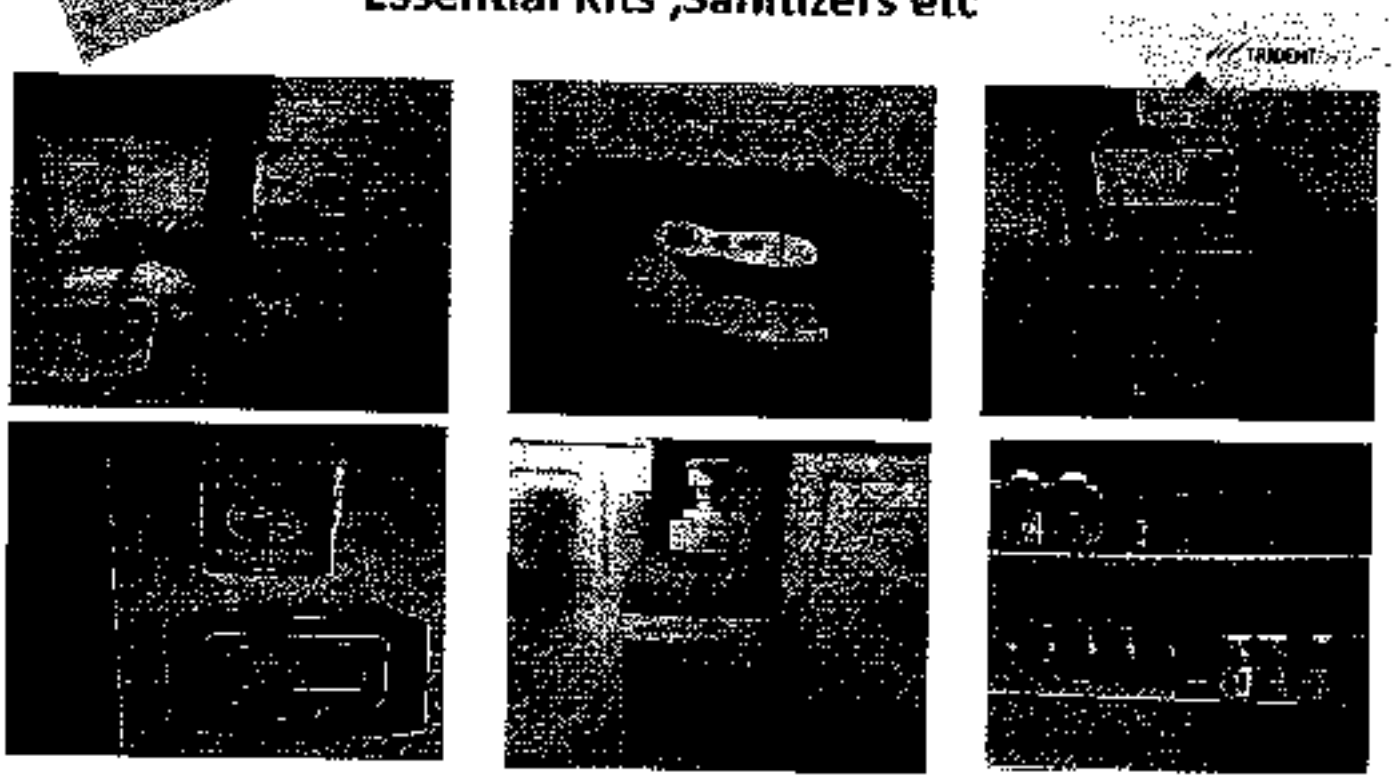
Our Volunteer on Wheels reaching out to people in need of essentials and essential kits

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Mask Making & Distribution



Regular Distribution of Immunity Boosters , Essential Kits ,Sanitizers etc



Fund Raisers and Essential/PPE Kit distribution

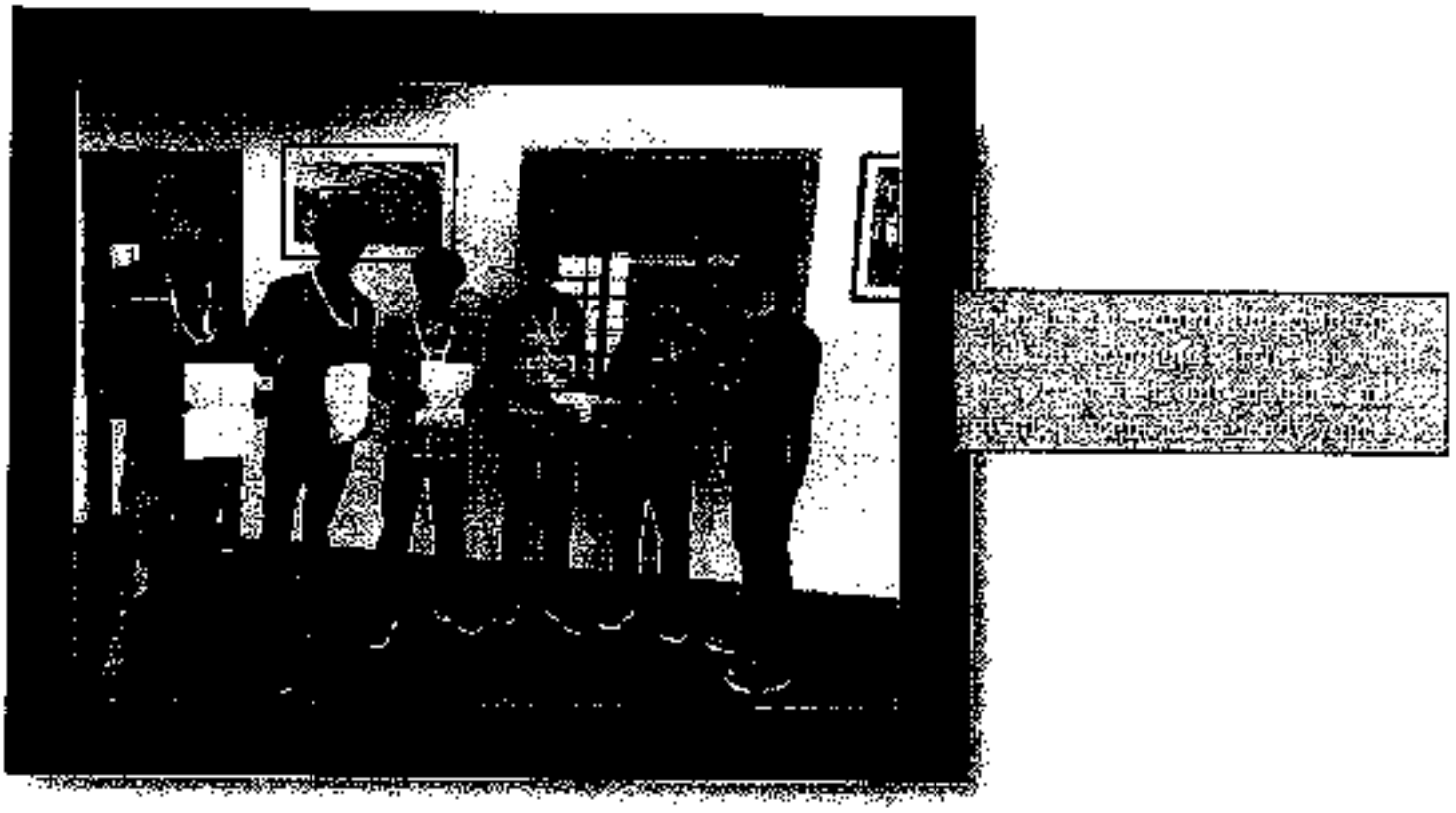


"A single act of kindness throws out roots in all directions, and the roots spring up and make new trees." ♡



Distribution of Touch Free Taps etc for city





Classroom Series and On Job Training under Skill Development for school drop out and derailed youth to bring them back to mainstream



Initiatives Taken for Employees as well



SANITIZATION IN COMMON AREAS



COUNSELLING OF MEMBERS



FACE SHIELDS IN ESSENTIALSERVICES



TOUCH FREE TAPS



PARTITION ON TABLES IN CANTEEN



FLOOR MARKING

Our Initiatives



- Yoga and health training session conducted at Karmayogi Hostel- 150 members participation.
- Virtual Health and Nutrition Sessions for creating awareness

CSR Activities in partnership with GOODERA



Volunteers Hours Funds Raised Causes

15 schools and 6 shelter homes impacted

Over 10 events between Oct 2020 - January 2021

- Encouraged and appreciated the contribution of our CoVID-19 warriors
- Recorded audiobooks and edutainment videos for kids
- Coached young women on soft-skills and helped them to set goals
- Learned sign language, a language spoken by 1.5 million people
- Mentored children on the importance of decision making and first-aid
- Ensured that our environment is sustainable through kitchen gardening

Shoutout & Testimonials

Shoutout from Nonprofit Partner

It was a wonderful experience working with Trident volunteers during the sign language workshop in the month of October. They were very positive and enthusiastic during the session and most of the volunteers were quick learners too!"

Shrivatsa Srinivasan, Sense International India

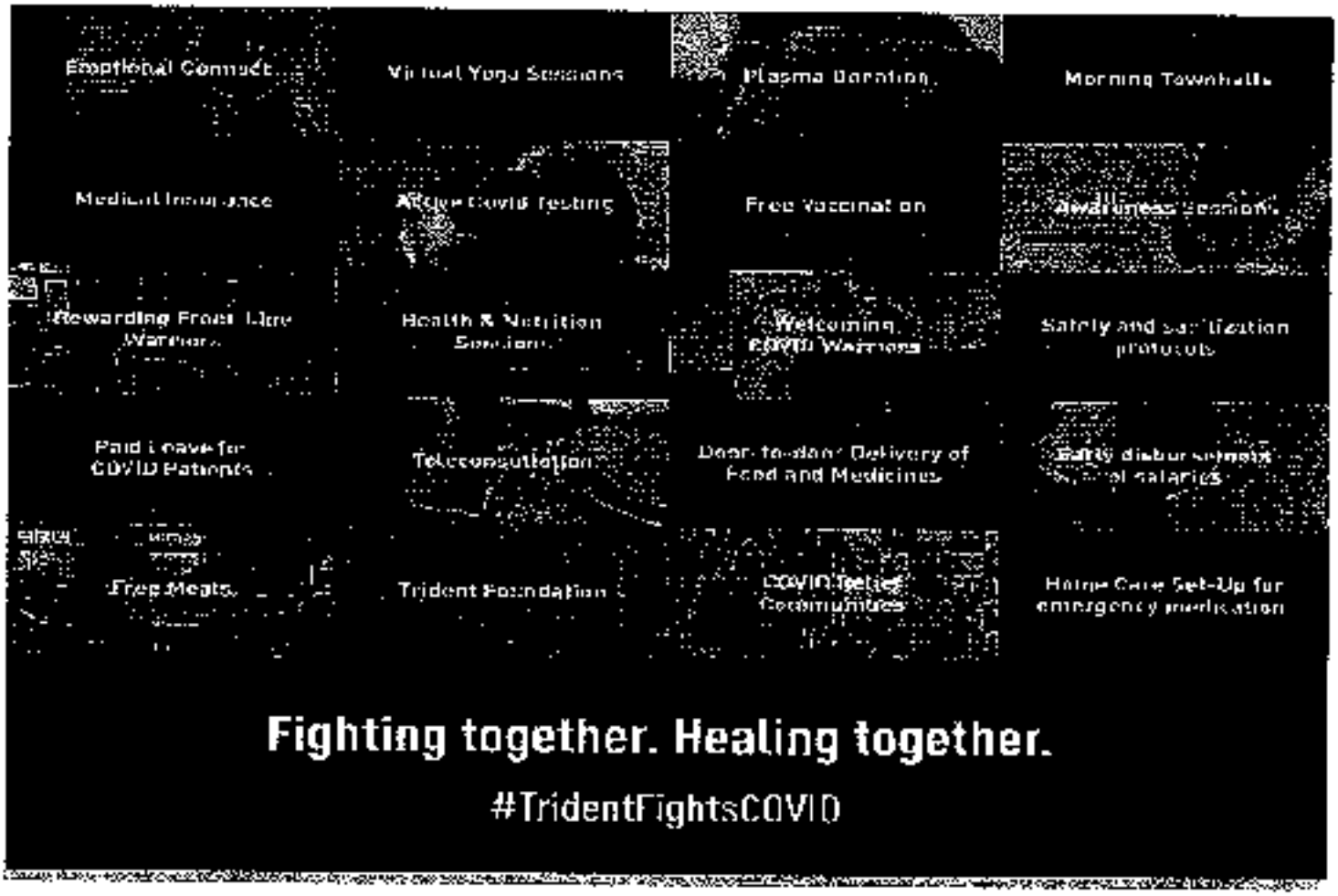
"Happy to announce that the 11 audiobook recordings for Being Jigyaasu, from volunteers at Trident on several topics on STEM will be distributed by the organization to the 15 networks of schools and NGO partners they support, reaching out to as many as 7562 underprivileged children pan India." Rajat Agarwal, Being Jigyaasu

Volunteer Testimonials

"Amazing experience! Kudos to the team for their innovative ways through online volunteering." Rubon Bhargava

"I loved the fun event. It was refreshingly interactive & had great content "
Francis Alapatt

Nice to hear about such a great organization, which is really creating an impact. Great work guys." Reewa Gautam



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HR DISTINCTION AWARDS
2021, 7TH EDITION
THIS IS TO CERTIFY THAT
TRIDENT GROUP
HAS BEEN AWARDED
PLATINUM AWARD
IN THE CATEGORY
MOST INNOVATIVE COVID RESPONSE
in HR Distinction Awards 2021 held on 06.05.2021
PRESIDENT
www.hrdawards.in

TRIDENTGROUP

THANK YOU

WE WILL FIGHT CORONA TOGETHER



Annexure - XVII(J)

STANDARD OPERATING PROCEDURE	TRIDENT

EMS STRUCTURE SUSTAINABILITY



PREPARED BY	DOCUMENT NO	PAGE 1 OF 1
*STRICTLY CONFIDENTIAL	*STRICTLY CONFIDENTIAL	
APPROVED BY	ISSUE DATE	REVISION NO / REVISION DATE
*STRICTLY CONFIDENTIAL	01/09/2021	-

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Annexure-V

Dr B R AMBEDKAR NATIONAL INSTITUTE OF TECHNOLOGY JALANDHAR
G T Road Bye Pass, Jalandhar-144011, Punjab (India)
(An Institute of National Importance under Ministry of Education, Govt. of India)

NITJ/CH/2021/C005-1 Dt. 01-10-2021

To
Member Secretary
Punjab Pollution Control Board
Patiala

CEE(B) BEE-ZP-2 11/10/2021

Subject: Environment Audit of M/s Trident Ltd (Towel Division) Vill. Dhaula, Tehsil & Distt Barnala

13-X-21 EE ZP-I

Dear Sir,

This is in reference to your letter No. 4235 dated 29-12-2020 regarding Environment Audit of M/s Trident Ltd (Towel Division) Vill. Dhaula, Tehsil & Distt Barnala. Please find attached with this letter the desired audit report for your kind perusal. The audit has been carried out on the basis of a number of visits to the industry, parametric testing, interactions with the industry personnel, data and other related documents provided by the industry and PPCB.

Best regards,

Dr NN Pandhare
Assistant Professor
Department of Chemical Engg.

Dr JK Ratan
Associate Professor
Department of Chemical Engg.

NITJ/CH/2021/C005-1

Dt. 01-10-2021

Report

on

Environment Audit of M/s Trident Ltd (Towel Division) Vill. Dhaula, Tehsil & Distt Barnala

Submitted by

Dr B R Ambedkar National Institute of Technology
Jalandhar-144011, Punjab, India
(An Institute of National Importance under Ministry of Education, Govt. of India)

1. M/s Trident Ltd

Trident Ltd is the flagship company of one of the leading global conglomerates, Trident Group. From its humble beginnings in 1990 as a solitary yarn and paper manufacturer, the company became one of the largest integrated home textile manufacturers in the world. The company manufactures a wide variety of yarns, bed & bath linen, paper, chemicals and captive power. Trident operates its state-of-the-art manufacturing facilities at Barnala in Punjab and Budhni in Madhya Pradesh, catering to both local and international markets. Being one of the largest exporters of home textiles, Trident has built longstanding relationships with leading global retailers and fashion houses across US, UK, Italy, France, Japan and Australia. The company possesses one of the largest product portfolios of high- quality yarns, sophisticated bath and bed linen and eco-friendly paper with a strong clientele in around 100 countries across the globe.

2. Home Textile Division (HTD)

The Home Textile Division (HTD) of M/s Trident Limited is located at Dhaula village, District Barnala, Punjab within the coordinates 30°17"49' latitude and 75°29"16'E longitude. The plant is operating with capacity of 100TPD of Terry Towel and 20 TPD of Yarn Dyeing. The main raw material consumed in the process is cotton yarn. The final products are terry towel and dyed yarn. The process consumption of the fresh water is almost 70 m^3/ton of the product.



Google map layout of the HTD

3. Process Description

- **Yarn Store:-**

As raw material, the yarn cones are procured and stored in the Yarn Store for further process.

- **Post Spinning (TFO):-**

Here single yarn is converted into two i.e. "Two for One" (TFO).

- **Preparatory (Direct/sectional raping):-**

Here Yarn cone is converted into pile ground beam for next process.

- **Sizing:-**

Strengthening of yarn is done hare.

- **Weaving (Dobby/Jacquard):-**

In this step the towel is created and the desired design is obtained.

- **Grey Folding:-**

Here stock creation and issuance, PPC planning is done.

- **Fabric/yarn dyeing washing:-**

Bleaching and dyeing is done here in dying machine for desired colour. This is a process of adding colour to textile products like fibers, yarns, and fabrics. Dyeing is normally done in a special solution containing dyes and particular chemical material.

- **Drying:-**

Towels are dried up in drying machine and removing of moisture is performed here.

- **Size Matching:-**

Size matching is done by Stenter Machine. The steps are as below:-

Length Cutting:- Cutting the towel length wise.

Length Humming:-Stitching the towel length wise.

Cross Cutting:- Cutting the towel width wise.

Stitching:- Stitching the towel width wise.

- **Inspection:-**

Quality of the product is checked here.

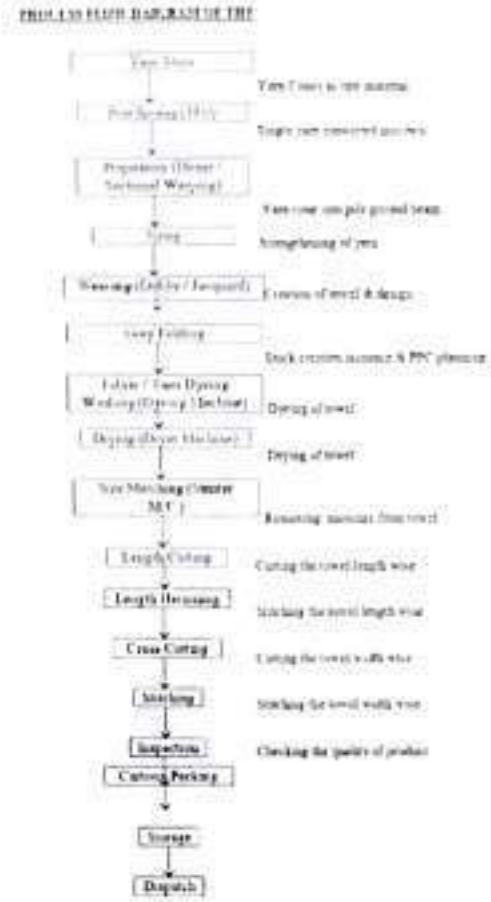
- **Storage:-**

Final product is stored.

- **Dispatch:-**

Product is prepared for dispatch.

4. Process Flow Sheet

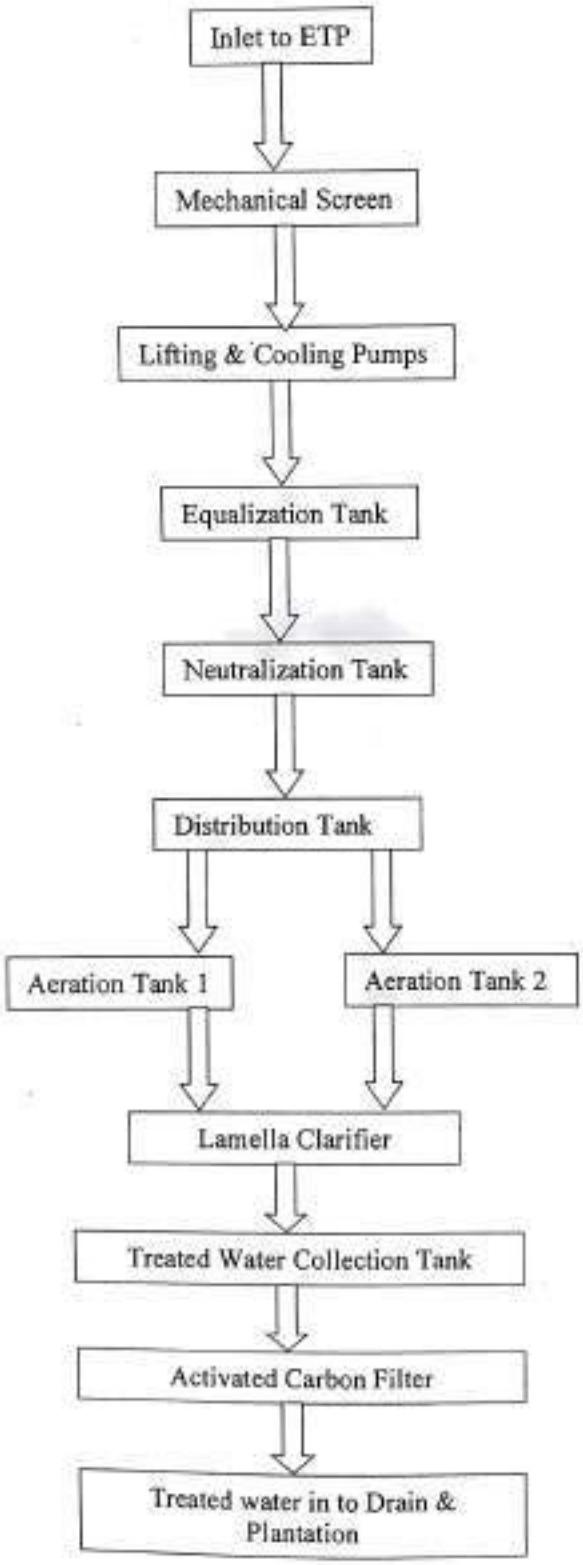


5. Effluent Treatment Plant

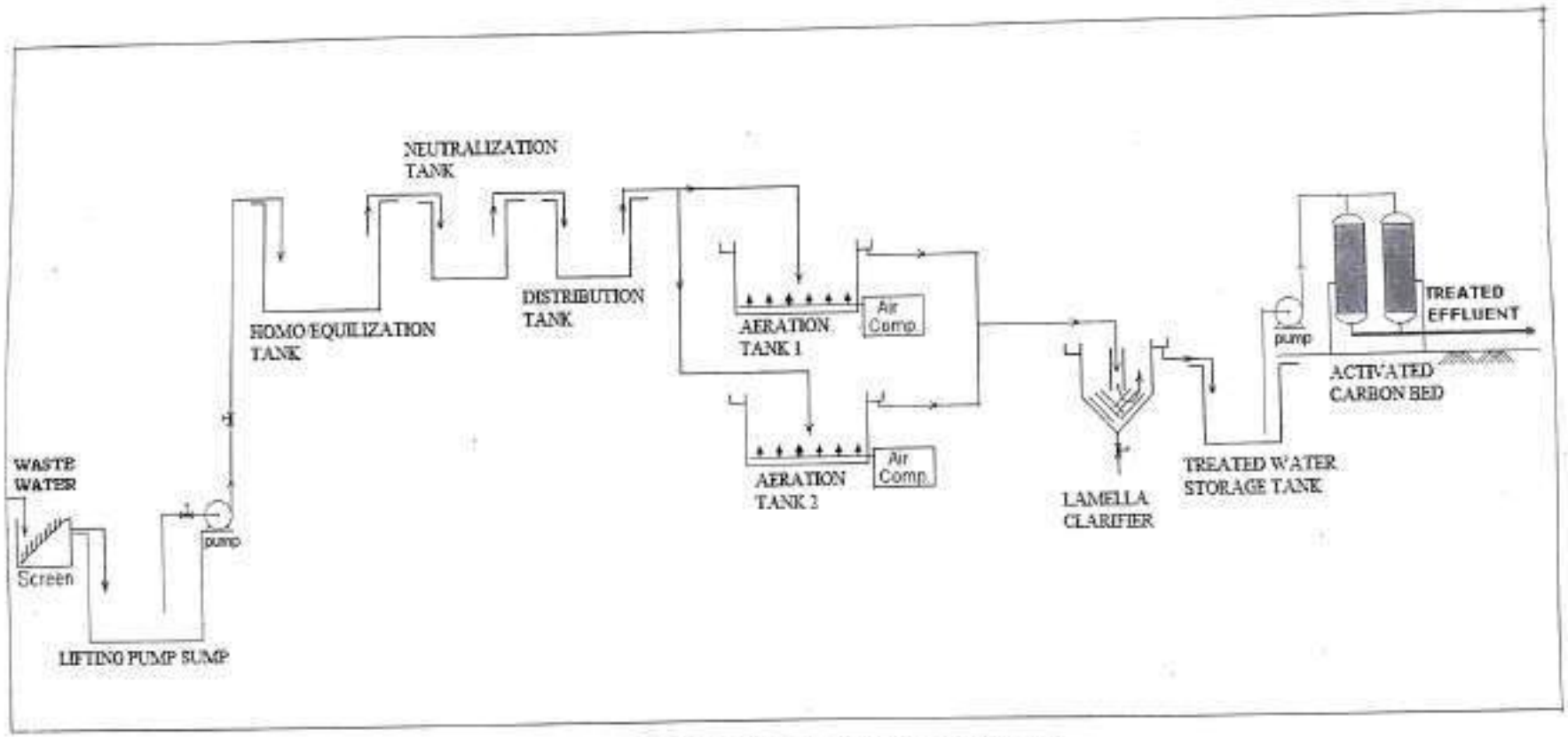
The raw effluent from the process section of HTD is brought to an equalization tank through mechanical screen for arresting the suspended solids. The equalization tank is equipped with diffusers for homogenization of the quantity and quality of the effluent for secondary treatment. From the equalization tank, the effluent is sent to Neutralization tank, where sulfuric acid dosing is done to normalize the pH (7 to 7.5) for proper feeding to activated sludge process. The effluent is then continuously brought to distribution tank. The Distribution Tank distributes the effluent to aeration tanks, where biological degradation takes place as per the activated sludge process system. Aerobic micro-organisms oxidize soluble organics under continuous aeration by diffused aerators. Adequate population of micro-organisms is maintained and stabilized effluent from aeration tank flows to Lamella clarifier, where

microbial mass (bio-sludge) is separated from the effluent under the action of gravity and is recycled back to aeration tanks. The excess sludge from Lamella clarifier is transferred to filter press through thickener tank. The treated effluent is discharged to drain and for plantation after passing through activated carbon beds.

TREATMENT FLOW DIAGRAM



SCHEMATIC DIAGRAM OF EXISTING ETP CURRENTLY IN OPERATION



SCHEMATIC DIAGRAM OF EFFLUENT TREATMENT PLANT

6. Details of Treatment Units at ETP

S No.	Name of unit	Shape	Quantity	Capacity (KL)
1.	Equalization Tank	Carousal	01	12,500
2.	Aeration Tank	Carousal	02*	15,000
3.	Clarifier	-	01	900
4.	Activated Carbon Filter	-	04	-
5	Thickener	-	01	500

* There are total 03 Aeration Tanks of capacity 7500 KL each. However, only 02 Aeration Tanks were on use on the day of visit.

7. Sampling and Testing of Effluent Parameters

The audit team visited the unit during March 11-12, 2021, and performed the sampling from strategic points for testing of various effluent parameters during the three different shifts of the production process. The data for few parameters such as pH, Dissolved Oxygen (DO) and Temperature were recorded at the time of sample collection, while rest of the parameters such as TDS, TSS, Chlorine, SO_4, Free Cl, NO_3, PO_4, COD, BOD, MLSS, TSS, MLVSS and Color were tested at the institutional facility. The results of the testing are presented in Tables 1, 2 and 3. The inflow rate of the effluent on the day of visit was observed to be 3600 KLD, however, ETP is designed for an effluent flow rate of 12500 KLD. The ETP was running almost at one-third of its capacity.



Visit to manufacturing area



Testing of sample at ETP inlet



Survey of Aeration Tanks



Testing of sample at plantation area

Table 1: Analysis Results of Samples at various units of ETP (Shift A – 4:00pm to 12:00 am)

S. No.	Sampling point	Temp. (°C)	pH	TDS (mg/l)	TSS (mg/l)	COD (mg/l)	BOD (mg/l)	PO_4 (mg/l)	Cl (mg/l)	SO_4 (mg/l)	Free Cl (mg/l)	NO_3 (mg/l)	MLSS (mg/l)	Total Solid (mg/l)	MLVSS (mg/l)
1	Entry of Screen	29	9.00	1888.0	75.0	1106.56	360.0	3.5	421.72	53.2	<6.83	2.12	-	1963.0	-
2	Exit from Screen	29	8.9	1699.0	78.0	1086.80	366.0	3.62	429.52	49.2	<6.83	2.40	-	1777.0	-
3	Equalization tank	27	8.7	1724.0	74.0	1106.56	348.0	3.92	437.34	46.0	<6.83	1.92	-	1798.0	-
4	Neutralization tank Outlet	29	6.7	1700.0	71.0	1126.32	384.0	3.84	406.1	46.0	<6.83	2.50	-	1771.0	-
5	Aeration tank - 1	-	-	-	-	-	-	-	-	-	-	-	720.0	-	580.0
6	Aeration tank - 2	-	-	-	-	-	-	-	-	-	-	-	685.0	-	545.0
7	Inlet of Lamella Clarifier	27	7.60	1929.0	-	93.20	40.0	7.33	619.96	40.2	<6.83	7.15	-	-	-
8	Outlet of Lamella Clarifier	28	7.6	1850.0	14.6	85.0	35.0	5.28	640.39	36.0	<6.83	7.25	-	2075.0	-
9	Treated Water Collection Tank	28	7.70	1901.0	16.0	69.16	12.0	1.94	632.58	32.8	<6.38	10.00	-	2017.00	-
10	Outlet of Activated Carbon Bed	27	7.8	1950.0	11.60	59.28	11.0	2.05	663.82	31.2	<6.38	9.60	-	2101.0	-

Table 2: Analysis Results of Samples at various units of ETP (Shift B – 12:00am to 08:00 am)

S. No.	Sampling point	Temp. (°C)	pH	TDS (mg/l)	TSS (mg/l)	COD (mg/l)	BOD (mg/l)	PO_4 (mg/l)	Cl (mg/l)	SO_4 (mg/l)	Free Cl (mg/l)	NO_3 (mg/l)	MLSS (mg/l)	Total Solid (mg/l)	MLVSS (mg/l)
1	Entry of Screen	38	9.60	2180.0	46.0	988.00	456.0	4.05	437.34	56.5	<6.83	2.80	-	2226.0	-
2	Exit from Screen	37	9.2	1619.0	48.0	1040.69	462.0	5.1	476.39	50.0	<6.83	4.20	-	1667.0	-
3	Equalization tank	37	9.2	1645.0	54.0	1040.69	360.0	5.22	468.58	38.8	<6.83	3.92	-	1699.0	-
4	Neutralization tank Outlet	33.3	8.7	1638.0	48.0	1040.69	210.0	4.62	421.72	38.0	<6.83	3.14	-	1686.0	-
5	Aeration tank - 1	-	-	-	-	-	-	-	-	-	-	-	1864.0	-	1480.0
6	Aeration tank - 2	-	-	-	-	-	-	-	-	-	-	-	1750.0	-	1430.0
7	Inlet of Lamella Clarifier	32	7.33	1780.0	2103.0	64.40	13.0	8.66	595.53	30.8	<6.38	7.60	-	3883.0	-
8	Outlet of Lamella Clarifier	32	7.4	1960.0	16.0	59.28	11.0	2.40	609.15	24.4	<6.83	8.10	-	1976.0	-
9	Treated Water Collection Tank	33	7.5	2040.0	14.0	59.28	11.0	2.21	632.58	26.8	<6.38	8.40	-	2054.00	-
10	Outlet of Activated Carbon Bed	27	7.4	2050.0	11.6	69.16	12.0	2.51	640.39	21.8	<6.38	8.60	-	2061.0	-

Table 3: Analysis Results of Samples at various units of ETP (Shift C – 08:00am to 04:00 pm)

S No.	Sampling point	Temp. (°C)	pH	TDS (mg/l)	TSS (mg/l)	COD (mg/l)	BOD (mg/l)	PO_4 (mg/l)	Cl (mg/l)	SO_4 (mg/l)	Free Cl (mg/l)	NO_3 (mg/l)	MLSS (mg/l)	Total Solid (mg/l)	MLVSS (mg/l)	Colour (PCU)
1	Entry of Screen	41	10.0	2132.5	42.0	1007.60	388.00	3.38	452.96	55.2	<6.83	4.00	-	2175	-	-
2	Exit from Screen	37	9.9	1690.0	48.0	916.00	356.00	3.62	460.77	53.6	<6.83	3.90	-	1738	-	-
3	Equalization tank	36	9.8	1721.0	44.0	1319.04	404.00	4.03	468.58	48.8	<6.83	4.02	-	1765	-	-
4	Neutralization tank Outlet	27	8.0	1725.0	56.0	952.64	288.00	3.66	468.58	34.0	<6.83	3.82	-	1781	-	-
5	Aeration tank - 1	-	-	-	-	-	-	-	-	-	-	-	1222.0	-	980.0	-
6	Aeration tank - 2	-	-	-	-	-	-	-	-	-	-	-	1180.0	-	920.0	-
7	Inlet of Lamella Clarifier	33	7.38	1839.0	68.0	84.56	13.0	3.96	632.58	30.6	<6.83	4.40	-	1907	-	-
8	Outlet of Lamella Clarifier	33	7.3	1820.0	10.6	73.28	12.00	3.85	632.58	28.0	<6.83	3.48	-	1995	-	-
9	Treated Water Collection Tank	35	7.6	1910.0	10.0	73.28	14.00	2.62	656.01	32.2	<6.38	3.76	-	2020	-	-
10	Outlet of Activated Carbon Bed	27	7.6	1940.0	10.0	109.92	15.00	2.55	663.82	36.0	<6.38	3.52	-	2050	-	-
11	Final Outlet for Plantation	27	7.6	1905.0	<10.0	73.28	13.00	2.43	632.58	37.2	<6.38	3.42		1910		88
12	Final outlet to drain	26	7.7	1930.0	10.2	91.60	14.00	2.18	640.39	33.0	<6.38	3.52		1995		84

8. Operational Conditions Observed in Aeration Tanks

Sr.No.	Operational Parameters	Average Value	
		ForAerationtank-1	ForAerationtank-2
1	DO	4.1	4.2
2	MLSS	1268.66	1205.0
3	MLVSS	1013.3	965.0
4	F/M	0.08	

9. Air Requirement of Aeration Tanks

Maximum BOD removed in currently operated ETP = 350 mg/l (as per test data)

Flow rate of effluent = 3600 KLD

O_2 requirement per kg of BOD removed = 1.2 kg

Hence O_2 to be transferred = 3600× 350 /1000 × 1.2 = 1512 kg/day

Method of Aeration = Fine Bubble Diffuser

SOTE (Standard O_2 Transfer Efficiency for submerged diffused aeration system) = 20 - 25%

Hence O_2 required 1512/0.20 = 7560 kg/day.

Assuming alpha Factor (Ratio of SOTE in clean water to effluent water) = 0.8 and

Another alpha Factor (Factor for fouling of diffusers) = 0.8

Oxygen requirement = 11,812 kg/day

Considering oxygen in the atmospheric air = 23.2%

Air Requirement = 50,915 kg/day

Considering specific gravity of air at 50°C =0.8 kg/m³

Air requirement = 63,645 m³/day = 2652 m³/h

Allowing 15% extra air,

Air requirement = 3050 m³/h

10. F/M Ratio Calculations

Effluent flow rate = 3600 KLD

BOD = 350 mg/l

MLVSS = 1013 mg/l

Volume of aeration tanks = 15000 KL

F/M ratio = $(3600 \times 0.35)/(15000 \times 1.03) = 0.08$

F/M = 0.08

11. Adequacy of ETP

Effluent samples from various treatment stages of the ETP were collected and analyzed as per standard methods of IS/APHA, so as to determine existing performance and adequacy of ETP with respect to current influent flow and composition. The quantitative analysis of effluent at various treatment stages and aeration tanks are reported in **Table 4.**

Table 4: Adequacy of existing ETP

Treatment Stage	Design Criteria	Current Status	Remarks
Hydraulic Flow	12500KLD	3600KLD	Working at its one third capacity of hydraulic flow. It can still accommodate more influent in ETP or can use part of the constructed units as has been done in aeration tank.
COD Load in Equalization tank	15000kg/day	4158kg/day	Working almost at its one third of designed capacity. Further organic load can be accommodated in ETP.
Effluent COD	1200mg/l	1155mg/l	Current COD of the effluent is within range of its design capacity.
Effluent TDS	------	1600-1800 mg/l	Input design criteria are not available
HRT of Equalization Tank	30h.	83h.	Increase in hydraulic retention time with continuous mixing arrangement (coarse diffusers) favors efficient flow and pollutant equalization and ultimately prevents shock loading of secondary system. However, part of the equalization tank may be used as suggested above.
Aeration Tank1 Aeration Tank 2 (parallely in operation)	---	AT1 DO= 4.1mg/l AT2 DO = 4.2 mg/l	DO level in Aeration Tanks is more than adequate for effective biodegradation of organics.
	---	MLSS 700 - 1800 mg/l	The microbial population is insufficient and thus unable to degrade organics in short duration. However, prolong retention time in aeration tank actually produced the desired result.
	---	MLVSS 700 - 1500 mg/l	There is insignificant mass of active microbes in aeration tank and this affects biodegradation rate. The recycled sludge amount needs to be increased
	---	F/M 0.07 - 0.08	Food to microorganisms ratio is in the lower range. Hence high rate of biodegradation may require outside source of nutrients and food in the form of DAP, Urea etc.
	HRT 54 h	HRT 100h Considering two aeration tanks currently used parallelly of volume 7500 KL.	Better removal of organics in aeration tank due to prolong retention period. The high HRT may lead to more consumption of electrical energy and time for the desired results.

Lamella Clarifier	HRT 2.16 h	HRT 6 h	Prolong detention in the clarifier favors sludge rising and poor sludge settlement due to de-nitrification and anaerobic biodegradation. It also favors sulphide and ammonia formation in effluent leading to order problem.
Carbon filter	---	84-88 PCU	Used to remove colour and odour. But it is required to improve its functioning to give minimum color to the effluent. The need for replacement and regeneration of carbon may be looked into.

12. Efficacy of ETP

All grab effluent samples from various treatment stages of the ETP were collected and analyzed as per standard methods of IS/APHA, so as to determine existing performance of ETP with respect to specific parameters of each treatment units. The qualitative composition of effluent (TSS, TDS, COD and BOD) is compared at various treatment stages along with their treatment efficiency and reported in **Table 5.**

Table 5: Efficacy of existing ETP

Para-meter	Raw Effluent at entry of screen	Equalization Tank inlet	% Reduc-tion	Neutralization tank outlet/ Aeration tank inlet.	Lamella clarifier outlet	% Reduction	Activated Carbon bed outlet	% Reduction	% Overall Reduction
TDS	2066.8	1697	17.91	1688	1876.7	-11.17	2060	-9.76	0.33
TSS	54.3	57.3	-5.5	58.3	13.7	76.5	11.0	19.7	79.74
COD	1034.0	1155.43	-11.74	1040.0	72.5	93.02	79.45	-9.58	92.31
BOD	401.0	370.0	7.73	294.0	19.0	93.53	12.6	33.68	96.85

Note: All values are in mg/l while reduction is in percentage.

The treatment performance at various stages is as under:

Overall Reduction in Existing ETP is as follows

Overall reduction in COD of the effluent = 92.3 %

Overall reduction in BOD of the effluent = 96.8%.

14.0 Compliance Audit

The compliance audit report has been developed based on the review of plant records made available to auditors during the site visit, interaction with facility resource personnel, and limited walk through of the facility. The objective of the compliance audit was to assess the compliance status of the environmental regulatory requirements prescribed in the permits and permissions obtained by Home Textile Division (HTD) of M/s Trident Limited at Dhaula complex, Barnala, Punjab. The compliance audit report presents the summary of environmental regulatory requirements for HTD and its respective compliance status.

14.1 Overview of the HTD

The HTD is located at Dhaula village, District Barnala, Punjab within the coordinates 30°17"49' latitude and 75°29"16'E longitude. The plant is operating with capacity of 100TPD of Terry Towel and 20 TPD of Yarn Dyeing. The raw material consumed in the process is cotton yarn.

SNo.	Description	Units	Capacity	Remarks
1	**Products**			
1.1	Terry Towel	TPD	100	In both the processes, waste water is generated during the dyeing operation.
1.2	Dyed Yarn	TPD	20	
2	**Water and Wastewater**			
2.1	Groundwater	m^3/day	7092	NOC from CGWA is obtained for the withdrawal of groundwater from 5 tubewells
2.2	Specific water consumption	m^3/T of product	69.42	As per Form-V 2019-2020
2.3	Water consumption	m^3/day	5520	Process: 5236 Cooling:10 Domestic: 274
2.4	Wastewater treatment plant capacity	m^3/day	12500	Wastewater is treated using equalization, neutralization, activated sludge process, lamella clarifier, activated carbon
2.5	Wastewater disposal permission	m^3/day	6702	After treatment into Dhanaula drain
		m^3/day	3000	After treatment onto land for plantation on 48.5 acres

14.3 List of documents and records reviewed for audit

The following documents were presented by the plant for reviewing:

Consent to Operate (CTO) under Air (Prevention and Control of Pollution) Act, 1981 and the subsequent renewals
Consent to Operate(CTO) under Water (Prevention and Control of Pollution) Act, 1974 and the subsequent renewals
Form V, Environmental Statement of last year
Latest six monthly Environmental Compliance submitted by HTD to PPCB
Authorization from CGWA (Central Ground Water Authority) for withdrawal of groundwater and subsequent renewal of No Objection Certificate (NOC)
Test reports of Groundwater quality and ETP treated wastewater by external laboratory
PPCB test report of wastewater (Inlet and Outlet)
Online treated effluent discharge quality data linked to CPCB server
Form-III and Form-IV records
Authorization for Hazardous Waste Management
Test report of Ambient Air Quality Monitoring at the facility
Stack emission test reports from external laboratory

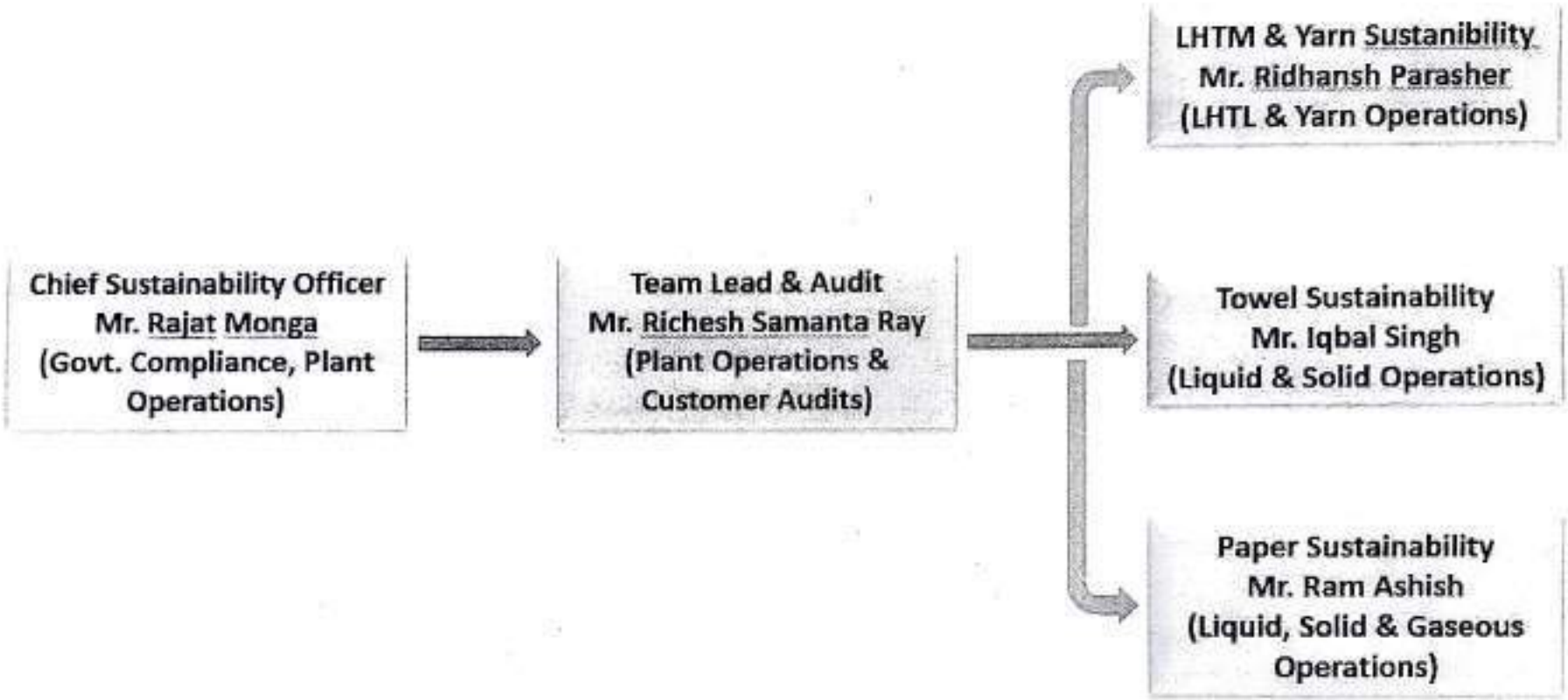
14.4 Section Visited

A walkthrough survey and field inspection was carried out covering the following areas of the HTD unit:

S.No	Section	Survey/Inspectiom
1	Raw material section	• Raw material handling • Solid waste management system at place • Firefighting systems
2	Production area	• Two for one • Weaving section • Loom section • Sizing area • Dyeing area • Final product packing area

3	Dye storage section	• Shelf for storage of different dyes • Shelf for storage for dye chemicals
4	ETP	• RO & MEE systems • Log books maintenance at ETP area with regards to usage of chemicals, quality of water, running of pumps etc. • Sludge management system • Manholes at final outlets and outside the premises for sampling of treated wastewater • Environmental laboratory for daily monitoring of treated wastewater
5	Wastewater discharge point area	• Outlet discharge point into Dhanaula drain and onto the plantation area • Pipelines used for channeling the treated wastewater for irrigation • Continuous Wastewater Quality Monitoring System (CWQMS) • Availability of CCTV cameras near the discharge point
6	Hazardous waste storage facility	• Waste storage area conditions, whether roofed, concrete land etc. • Labelling of hazardous waste stored in the facility • Secondary containment facilities for used oil etc.
7	Solid waste storage area	• Waste storage area conditions whether segregated as per solid waste rules 2016 • Labelling of waste stored in the facility

EMS STRUCTURE



14.5 Compliance status against CTO under Water (Prevention and Control of Pollution Act), 1974

Consent to Operate an Outlet u/s 25 of Water (Prevention and Control of Pollution Act), 1974 issued on 10th February 2012

Condition No:	Description	Status	Remarks
1	This consent is valid only for the manufacturing of terry towel @ 100 TPD and dyed yarn @ 20 TPD	Complied	
2	This consent is not valid for getting power load from the Punjab State Electricity Board or for getting loan from the financial institutions.	Agreed	
3	The consent is issued for the discharge of effluents as per details given below from the premises of the industry through the out-let(s) authorized by the Board:	Complied	Log books of flow of wastewater to drain and plantation are maintained. Digital flow meters are also installed.

S. N	Description	Quantity m^3/day		Mode of final disposal
1	Trade Effluent	3000	Including effluent of M/s Lotus Integrated Texpark Ltd.	After treatment, onto land for plantation After treatment,

			6720		into drain		
	2	Domestic Effluent	40		After treatment, onto land for plantation		
4	The effluent discharged through the authorized outlet shall conform to the industry specific standards prescribed by the Board / Ministry of Environment & Forest, Govt. of India for such discharges into inland surface waters.					Complied	Testing data by plant and PPCB is maintained
5	The industry shall regularly operate and maintain the Effluent Treatment Plant to ensure that the treated trade effluent conforms to the standards laid down by the Board for such type of industries / discharges and the industry shall get its effluent samples analyzed from the Board to assess the adequacy of treatment systems.					Complied	PPCB reports are available
6	The industry will conserve the use of water in the manufacturing plant.					Complied	
7	The industry will ensure that the quantity of trade effluent from both units M/s Trident Ltd., (TTD) and M/s Lotus Integrated 8Texpark Ltd. shall not exceed beyond 9702 KLD					Complied	
8	The industry shall comply with the following stipulations; a) The industry shall apply for renewal of consent atleast two months before expiry of the consent. b) The issuance of this consent does not convey any property right in either					Complied & Agreed	

	real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of Central, State or Local Laws or Regulations. c) The consent does not authorize or approve the construction of any physical structures or facilities for undertaking of any work in any natural watercourse. d) Nothing in this consent shall be deemed to preclude the institution of any legal action nor relieve the applicant from any responsibilities, liabilities or penalties to which the applicant is or may be subjected under this or any other Act. e) During the period beginning from the date of issuance and the date of expiration of this consent, the applicant shall not discharge floating solids or visible foam.		
9	Any amendments / revisions made by the Board in the tolerance limits for discharges shall be applicable to the industry- from the date of such amendments/revisions.	Complied	
10	The authorized outlet and mode of disposal shall not be changed without the prior written permission of the Board.	Complied	
11	The industry shall not use any unauthorized out-let(s) for discharging effluents form its premises.	Complied	
12	The industry shall not change or alter the manufacturing process(es) so as to	Complied	Environmental Statement

	change the quality and/or quantity of the effluents generated without the written permission of the Board.		Form-V was referred
13	Any upset conditions in the plant/plants of the factory, which is likely to result in increased effluent and/or result in violation of the standards laid down by the Board shall be reported to the Environmental Engineer, Punjab Pollution Control Board, Regional Office, Sangrur through fax under intimation to the Board failing which any stoppage and upset conditions that come to the notice of the Board / its officers,- will be deemed to be intentional violation of the conditions of consent.	Complied	HTD has not received any notice under section-5 of EPA as per data from HTD and PPCB
14	All underground water retaining structures shall be lined with an impervious layer so as to avoid seepage and contamination of sub-soil/water.	Complied	RCC water tanks are used.
15	The industry shall provide terminal manhole(s) at the end of each collection system and upstream of final outlet(s) out of the premises of the industry for measurement of flow and for taking samples.	Complied	
16	The responsibility to monitor the effluent discharged from the authorized outlet and to maintain a record of the same rests with the industry. The Board shall only test check the accuracy of these reports for which the industry shall deposit the samples collection and testing fee with the Board as and when required.	Complied	The composite samples of ETP are analyzed in the in-house laboratory
17	The industry shall for the purpose of measuring and recording the quantity of water consumed and effluent discharged, affix meters of such standards and at such places as approved by the Environmental Engineer, Punjab Pollution	Complied	The industry has fixed water meters to record the water consumption. Also, the

	Control Board, Regional Office, Sangrur.		industry has detailed water balance chart.
18	Solids, sludge, dirt, silt or other pollutants separated from or resulting from treatment of intake of supply water prior to use by the applicant shall be disposed off in such a manner so as to prevent any pollutant, from such materials from entering any such water. Any live fish, shell fish or animals collected or trapped as a result of intake water screening or treatment may be returned to water body habitat	Complied	The HTD does not source water from any natural canal. Groundwater withdrawal only
19	The diversion or bypass of any discharge from facilities utilized by the applicant to maintain compliance with the terms and conditions of this consent is prohibited except. i) Where unavoidable to prevent loss of life or some property damage or ii) Where excessive storm drainage or run off would damage facilities necessary for compliance with terms and conditions of this consent. The applicant shall immediately notify the consent issuing authority in writing of each such diversion or bye-pass in accordance with the procedure specified above for	Complied	No such incidence reported as per documents presented by HTD and PPCB
20	The industry shall make proper disposal of the effluent so as to ensure that no stagnation occurs inside and outside the industrial premises during rainy season and no demand period.	Complied	Arrangement for storage of effluent in 12500 KL Equalization Tank. The Drain cleaning is done yearly to

			avoid stagnation of treated waste water
21	The industry shall plant minimum of three suitable varieties of trees at the density of not less than 1000 trees per hectare all along the boundary of the industrial premises.	Complied	However, an account of number, quality, age and damage of trees should be maintained.
22	The industry shall ensure that the effluent discharged by it is toxicity free.	Complied	Bureau Veritas reports for non-toxicity of the effluent were shown by the Industry.
23	The industry shall not irrigate the vegetable crops with the treated effluents which are used /consumed as raw.	Agreed	
24	The industry shall construct proper outlet(s) in the receiving body to the satisfaction of the Board to ensure adequate dispersion of effluent.	Complied	Only one outlet is available
25	The industry shall make necessary and adequate arrangements to hold back the effluent in case of failure of Effluent Treatment Plant.	Complied	Arrangement for storage of effluent in 12500 KL Equalization Tank.
26	The industry will submit the monthly readings of the separate energy meter for running effluent treatment, plant to the Board by the fifth of the following month.	Complied	Monthly report is not submitted to PPCB
27	The industry shall get performance study of Effluent Treatment Plant carried out 4 times in a year from Board's Lab / Board's Approved Lab and submit the	Complied	PPCB periodically visits and takes samples. The results are

	report to the Board.		satisfactory.
28	The trade effluent as well as domestic effluent of M/s Lotus Integrated Texpark Ltd. will be treated in the existing ETP of M/s Trident Ltd. (TTD), Village Dhaula, District Barnala.	Complied	
29	In case the treated effluent sample do not meet with prescribed standards for such discharges, both the industries contributing to ETP shall be responsible for the same and shall be liable for action under the provisions of the Water (Prevention & Control of Pollution) Act, 1974.	Agreed	
30	The adequacy and efficacy of the Effluent Treatment Plant will be the responsibility of both industries i.e. M/s Trident Ltd (TTD) and M/s Lotus Integrated Texpark Ltd. Vill. Dhaula, District Barnala.	Agreed	Adequacy and efficacy study should be carried out from Centrally/State funded institutes/universities on yearly basis
31	The industry will install electromagnetic flow meters at the outlets into drain and onto land for plantation and maintain the record of the said meters on daily basis.	Complied	Electromagnetic flow meters available at ETP and outlet for plantation.
32	The industry shall put up display board indicating Environment data as per Performa enclosed at the main entrance gate.	Complied	Display board at the main entrance was reviewed
33	The industry shall submit a certificate yearly to the effect that no addition / modification has been carried out during previous year.	Partially complied	Although, Industry has balance statements of the assets showing no addition to the

			plant, However, a certificate to the effect that no addition/modification has been carried out needs to be submitted yearly.
34	The industry shall submit balance sheet yearly showing undepreciated fixed assets during previous financial year.	Complied	Document was available
35	The industry will submit a revised proposal to the Board of 4 no. modules of 2500 KLD each for installation of R.O. system alongwith MEE, within four days, for achieving zero liquid discharge of its trade effluent into Dhanaula Drain.	Partially Complied	The industry has installed RO system of capacity 2500 KLD alongwith MEE in the year 2014 with an investment of 33 crores as per information available from PPCB. However, because of technological limitations the performance of the RO system got reduced year by year, and finally it was discarded
36	The first module of 2500 KLD capacity should be installed by December, 2012, which shall decrease the discharge of trade effluent into Dhanaula Drain by 2500 KLD. The remaining 3 modules should be installed by June, 2014 for achieving	Partially Complied	The industry has installed RO system of capacity 2500 KLD alongwith MEE in the year

	zero liquid discharge of its trade effluent into Dhanaula Drain by June, 2014.		2014 with an investment of 33 crores as per information available from PPCB. However, because of technological limitations the performance of the RO system got reduced year by year, and finally it was discarded
37	The Board reserves the right to revoke the consent granted to the industry at any time in case the industry is found violating any of the conditions of the consent under Water (Prevention & Control of Pollution) Act, 1974 as amended time to time.	Agreed	

Consent to operate an outlet u/s 25 of the Water (Prevention & Control of Pollution) Act, 1974 with certificate number COTW/Renewal/BAR/2019/9672223 Date of Issue 30-03-2019 Date of Expiry 31-03-2020

Condition No:	Description	Status	Remarks
1	The industry shall submit monthly compliance/status report to Regional Office, Sangrur and Zonal Office-2, Patiala and the progress shall be reviewed at Hon'ble Chairman level on quarterly basis	Complied	Monthly compliance statements available

2	The industry will install /commission RO system followed by MEE by 31-12-2019 and further consent shall be extended after the installation of the same	Partially Complied	The industry has installed RO system of capacity 2500 KLD alongwith MEE in the year 2014 with an investment of 33 crores as per information available from PPCB. However, because of technological limitations the performance of the RO system got reduced year by year, and finally it was discarded
3	The industry shall regularly operate and maintain its ETP so as to achieve the prescribed standards for such discharges and shall ensure the compliance conditions of consent at all the times	Complied	ETP log books and test reports of PPCB available
4	The industry will take all the necessary steps to ensure that the treated effluent discharge onto land for plantation is properly and uniformly distributed in the entire plantation area through proper distribution system	Complied	Distribution system Layout presented
5	The industry shall comply with the decisions of personal hearing which was given to the industry from time to time by the Competent Authority of the Board	Complied	
6	The industry shall make efforts to utilize its maximum quantity of treated effluent onto land for plantation and remaining quantity shall only be discharged	Complied	

	into drain		

Consent to operate an outlet u/s 25 of the Water (Prevention & Control of Pollution) Act. 1974 with certificate number CTOW/Renewal/BAR/2020/12537642 Date of Issue 30/06/2020 Date of Expiry 31/03/2021

Condition No:	Description	Status	Remarks
1	The industry shall comply with the recommendations of the Joint committee	Complied	The present report is the outcome of the recommendations of the joint committee
2	The industry shall submit the action plan within timelines for implementation of each recommendation of the joint committee and decisions of personal hearing given by the Chairman of the Board within 7 days to the Board and ensure the implementations of the same within two months from the date of orders. Further, the industry shall submit the weekly compliance of the recommendations of the joint committee to the Board.	Complied	Document produced

14.6 Compliance status against CTO under Air (Prevention and Control of Pollution Act), 1981

Varied consent to operate an industrial plant u/s 21 of the Air (Prevention and Control of Pollution Act), 1981 No. SEE(ZP-II)SGR/APC/2010-2011/V(325)239 dated 23/07/2010			
Condition No:	**Description**	**Status**	**Remarks**
1	This consent letter will supersede the earlier consent issued vide no. SGR/APC/2006/V-325 dated 11/01/2002, the validity of which was extended upto 10/02/2012.	Agreed	
2	This consent is valid only for the manufacturing of terry towel @ 100 TPD and dyed @ 20TPD.	Complied	
3	This consent is not valid for getting power load from Punjab State Electricity Board or for getting loan from the financial institutions.	Agreed	
4	The industry shall apply for renewal of consent atleast two months before expiry of the consent.	Complied	Application was presented by the industry
5	The industry shall ensure that at any time the emissions do not exceed the emission standards laid down by the Board from time to time.	Complied	The emissions are regularly monitored and test reports for DG set from NABL accredited Laboratory were shown.

6	The industry shall discharge all gases through a stack of minimum height as specified in the following standards laid down by the Board. Stack height for diesel generating sets: Capacity of diesel-generating set — Height of the Stack 0-50 KVA — Height of the building + 1.5 m 50-100 KVA — -do- — +2.0 m 100-150 KVA — -do- — +2.5 m 150-200 KVA — -do- — +3.0 m 200-250 KVA — -do- — +3.5 m 250-300 KVA — -do- — +3.5 m For higher KVA rating, Stack height H (in meter) shall be worked and according to the formula: $H = h + 0.2 (KVA)^{0.3}$ Where h = height of the building in meters where the generator set is installed	Complied	DG (1000 KVA) set is provided with a stack of adequate height for the emissions.

7	Without prior written permission of the Board and without installation of Acoustic Enclosure (canopy) around it, which the industry will install within 2 months.	Complied	Acoustic enclosure (canopy) provided
8	The industry shall not consume any fuel except HSD in its DG set for burning purpose without the prior written permission of the Board.	Complied	The fuel utilized for DG set is HSD only.
9	The industry shall not install any boiler/furnace, and steam will be taken by the industry from its sister concerns.	Complied	The steam is taken from sister concern power plant
10	The industry shall provide port-holes, platforms and/or other necessary facilities as may be required for collecting the samples of emissions from any chimney, flue, duct or any outlet/outlets. Specifications of the port -holes shall be as under:- i) The sampling ports shall be provided at atleast 8 times chimney diameter downstream and 2 times upstream from the flow disturbance. For a rectangular cross section the equivalent diameter (De) shall be calculated from the following equation to determine upstream, downstre.tm distance:- De = 2 LW/(L+W) where L= length in m, W = Width in m ii) The sampling port shall be 7 to 10 cm in diameter.	Complied	Platform for DG stack is provided at approximately 4m height and the port hole of 1.5 inch diameter is provided for carrying out sampling
11	The industry shall comply with any other conditions laid down or directions issued in due course by the Board under the provisions of the Air (Prevention &	Agreed	

	Control of Pollution) Act, 1981.		
12	Nothing in the consent shall be deemed to neither preclude the institution of a legal action nor relieve the applicant from any responsibilities, liabilities or penalties to which the applicant is or may be subjected to under this or any other Act.	Agreed	
13	The industry shall plant minimum of three suitable varieties of trees at the density of not less than 1000 trees per hectare all along the boundary of the industrial premises.	Complied	However, an account of number, quality, age and damage of trees should be maintained.
14	Any amendments/revisions made by the Board in the emission/stack height standards shall be applicable to the industry from the date of such amendment/revision.	Agreed	
15	The existing control equipment shall be altered or replaced in accordance with the direction of the Board, and no control equipment or chimney shall be altered or as the case may be erected or re-erected except with the previous approval of the Board.	Complied	No control equipment proposed for DG Set
16	The industry shall not discharge any fugitive emissions. All gases shall he emitted through a slack of suitable height, as per the norms fixed by the Board from time to time.	Complied	DG set is provided with a stack of adequate height for the emissions
17	The industry shall provide adequate arrangements for fighting the accidental leakages/discharge of any air pollutant/gas/ liquids from the vessel mechanical	Complied	Emergency plan was presented by Industry

	equipments etc. which are likely to cause environment pollution.		
18	The industry shall ensure that no air pollution or public nuisance is created in the area due to discharge of emissions from the project	Complied	Acoustic enclosure with canopy is provided to control the noise and Stack is provided for decreasing the fugitive emissions of DG set to Public
19	The adequacy and efficacy of the air pollution control devices will be the entire responsibility of the industry.	NA	No air pollution control device is proposed for DG set
20	The industry shall obtain cover under the Public Liability Insurance Act, 1991.	Complied	
21	The industry shall submit onsite emergency plan approved by the Chief Inspector of Factories, Punjab.	Complied	
22	The industry shall obtain the authorization of Board under the Hazardous Waste (Management, Handling and Transboundary Movement) Rules, 2008.	Complied	
23	The pollution control devices shall be interlocked with the manufacturing process of the industry.	NA	No air pollution control device is proposed for DG set
24	The industry shall get performance study of air pollution control devices carried out twice every year from Board's Lab.	NA	No air pollution control device is proposed for DG set
25	The industry shall put up display board indicating Environmental data as per performa enclosed at the main entrance gate.	Complied	
26	The industry shall submit a certificate yearly to the effect that no addition/ modification has been carried out during previous year.	Partially complied	Although, Industry has balance statements of the assets

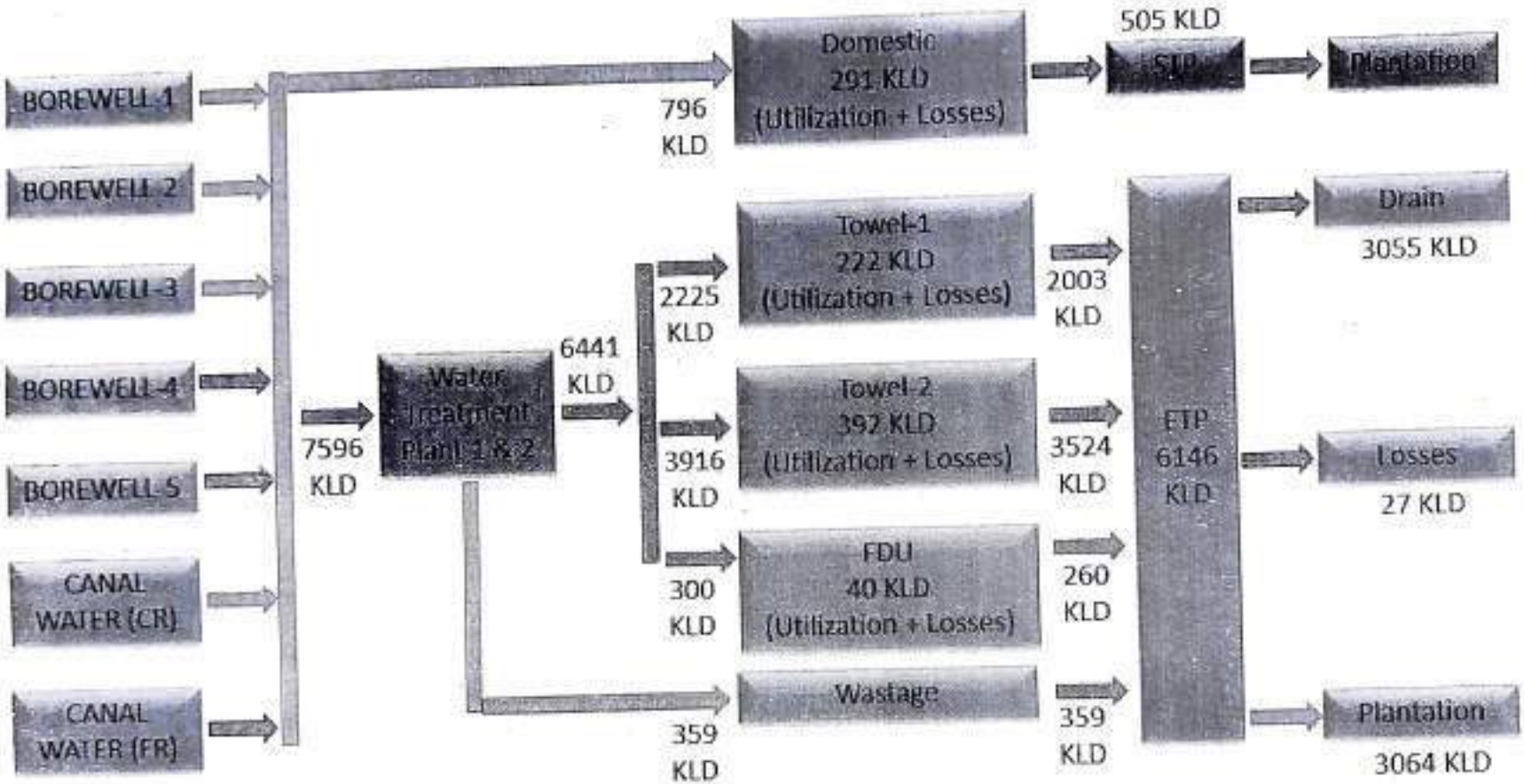
			showing no addition to the plant, However, a certificate to the effect that no addition/modification has been carried out needs to be submitted yearly.
27	The industry shall submit balance sheet yearly showing undepreciated fixed assets during previous financial year.	Complied	The document was shown
28	The industry shall get conducted performance study of the pollution control equipment installed from the Board during the trial period of the consent being granted and shall submit results lo the Board before further extension of the consent is considered.	NA	No air pollution control device is proposed for DG set
29	The Board reserves the right to revoke the consent granted to the industry at any time in case the industry is found violating any of the conditions of the consent under Air (Prevention A. Control of Pollution! Act 1M81 as amended from time to time.	Agreed	

14. 7 Compliance status against groundwater drawl permission granted for the facility

NOC obtained for groundwater withdrawal from Central Ground Water Authority (CGWA) dated July 12, 2018			
Condition No:	**Description**	**Status**	**Remarks**
1	The firm may continue to abstract 7,092 cu.m/day (not exceeding 25,88,580 cu.m/year) ground water through five (5) existing tube wells only. No additional ground water abstraction structures shall be constructed for this purpose without prior approval of the CGWA	Complied	Five exiting tubewells.
2	All the wells shall remain fitted with digital water meters by the firm at its own cost and monitoring of monthly ground water abstraction data of each well shall be recorded in a log book.	Complied	Tubewells are provided with digital water meter, and log book were shown
3	M/s Trident Ltd., (Terry Towel Division), shall, continue to implement ground water recharge measures to the tune of 33,36,130 m3/year for augmenting the ground water resources of the area. Firm shall also undertake periodic maintenance of recharge structures at its own cost.	Complied	Rain water harvesting report is available.
4	The firm shall install two (2) additional piezometers for monthly ground water level monitoring. The firm shall install digital water level recorders on all the three (3) piezometers and telemetry system on one of the piezometers. The firm shall share the user ID and password of the telemetry system with the Regional Director, Central Ground Water Board, North Western Region, Chandigarh.	Complied	HTD has installed piezometers at 3 locations and all are provided with telemetry

5	The ground water quality shall be monitored once in a year during pre-monsoon period.	Complied	Test results are provided as annexure to the compliance report submitted to CGWA
6	The ground water monitoring data in respect of S. No. 2, 4 & 5 shall be submitted to the Regional Director, Central Ground Water Board, North Western Region, Chandigarh on regular basis at least once in a year.	Complied	The compliance report is submitted to CGWA
7	The firm shall ensure proper recycling and reuse of waste water after adequate treatment.	Complied	
8	Action taken report in respect of S.N o. 1 to 7 shall be submitted to CGWA within one year period.	Complied	
9	The NOC is liable to be cancelled in case of non-compliance of any of the conditions as mentioned in S. No. 1 to 8.	Agreed	
10	This NOC is subject to prevailing Central/State Government rules/laws or Court orders related to construction of tubewell/ground water withdrawal/construction of recharge or conservation structures/discharge of effluents or any such matter as applicable.	Agreed	
11	This NOC does not absolve the applicant / proponent of his obligation / requirement to obtain other statutory and administrative clearances from other statutory and administrative authorities.	Agreed	
12	The NOC does not imply that other statutory / administrative clearances shall be granted to the project by the concerned authorities. Such authorities would consider NOC.	Agreed	

15. Water Balance



*The daily average for the month of August 2021 is used for the preparation of water balance as per records produced by the industry which is subjected to verification by PPCB.

16. Material Balance

The material balance of the Home Textile division 1 and 2 has been done based on the daily average for the month of August 2021. The material balances for HTD-1, HTD-2 and combined (HTD-1 + HTD-2) are listed in the following tables. The waste water generated in HTD-1 and HTD-2 were 2003 and 3524 KLD. The total waste water generated for the month of August 2021 was 5527 KLD. The details of material balance are provided below in tabular form as per records shown by the industry, which are subjected to be verified by PPCB officials.

16.1 Home Textile Division-1

Sr. No.	Description	Input	Output
1	Soft Water Consumption	2225 KLD	0 KLD
2	Steam Consumption	163 TPD	0 TPD
3	Condensate		106 TPD
4	Dyes & Chemical	4.79 TPD	
5	Raw Material	25.59 TPD	
6	Finished Product		23.03 TPD
7	Wastage		2.56 TPD
8	Dyes & Chemical carry forward		0.48 TPD
9	Waste Water		2003 KLD
10	Waste Load in effluent (Organic & inorganic)		4.31 TPD
11	Losses		279.55 KLD
12	**Total**	**2418.38 KLD**	**2418.38 KLD**

16.2 Home Textile Division-2

Sr. No.	Description	Input	Output
1	Soft Water Consumption	3916 KLD	0 KLD
2	Steam Consumption	301 TPD	0 TPD
3	Condensate		196 TPD

4	Dyes & Chemical	7.18 TPD	
5	Raw Material	38.38 TPD	
6	Finished Product		34.54 TPD
7	Wastage		3.84 TPD
8	Dyes & Chemical carry forward		0.72 TPD
9	Waste Water		3524 KLD
10	Waste Load in effluent (Organic & inorganic)		6.46 TPD
11	Losses		496.95 KLD
12	**Total**	**4262.56 KLD**	**4262.56 KLD**

16.3 Home Textile Division (Division 1 and 2)

Sr. No.	Description	Input	Output
1	Soft Water Consumption	6141 KLD	0 KLD
2	Steam Consumption	464 TPD	0 TPD
3	Condensate		302 TPD
4	Dyes & Chemical	11.97 TPD	
5	Raw Material	63.97 TPD	
6	Finished Product		57.57 TPD
7	Wastage		6.40 TPD
8	Dyes & Chemical carry forward		1.20 TPD
9	Waste Water		5527 KLD
10	Waste Load in effluent (Organic & inorganic)		10.77 TPD
11	Losses		776.50 KLD
12	**Total**	**6680.94 KLD**	**6680.94 KLD**

17. Waste Water and Effluent Disposal Practices

As per records and log books shown by the industry, 3055 KLD of treated water is disposed into Drain, and 3064 KLD of treated water is utilized for irrigation of Plantation area. A land of 48.5 Acre is earmarked for irrigation of plantation using treated water from ETP of Home Textile Division. The ridge and furrow method of irrigation is being followed to water the plants. The plantation area is divided into three sub-areas, and electromagnetic flowmeters have been installed on inlet of each sub-area to measure the quantity of treated water being used for plantation. The sub-areas are further divided into nine zones for effective irrigation, and these nine zones have been indicated on the plant layout. The details of plantation area, plant age, irrigation plan, team and infrastructure available are provided below in tabular form as per records shown by the industry, which are subjected to be verified by PPCB officials.

17.1 Effluent Generation Data

Sr. No.	Description	Amount of water
1	Treated Water to Drain	3055 KLD
2	Treated Water to Plantation	3064 KLD
3	Total Area of Plantation	48.5 Acre
4	Effluent Consumption	63.18 KL/Acre

17.2 Zone Wise Plantation Area

Zone	Area
Zone-1	4 Acres
Zone-2	14 Acres
Zone-3	3 Acres
Zone-4	1.5 Acres
Zone-5	3 Acres
Zone-6	12 Acres
Zone-7	2.5 Acres
Zone-8	2.5 Acres
Zone-9	6 Acres
Total	48.5 Acres

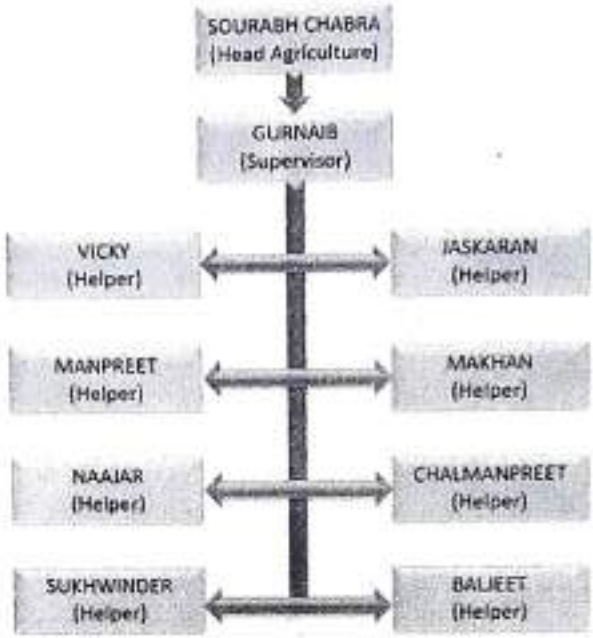
17.3 Zone Wise Plantation Age

Zone	Year of Plantation	Age
Zone-1	2021	0.8 years
Zone-2	2010	11 years
Zone-3	2021	0.8 years
Zone-4	2021	0.8 years
Zone-5	2020	1 years
Zone-6	2019	2 years
Zone-7	2009	12 years
Zone-8	2020	1 years
Zone-9	2021	0.8 years

17.4 Zone Wise Irrigation Plan

	Zone	Area	Total	Max Water Flow @ 70 m^3/Acre
Area-1	Zone 1	4 Acres	31 Acres	2170 m^3
	Zone 2	14 Acres		
	Zone 3	3 Acres		
	Zone 4	1.5 Acres		
	Zone 7	2.5 Acres		
	Zone 9	6 Acres		
Area-2	Zone 5	3 Acres	15 Acres	1050 m^3
	Zone 6	12 Acres		
Area-3	Zone 8	2.5 Acres	2.5 Acres	175 m^3
	Total Area	48.5 Acres	48.5 Acres	3395 m^3

17.5 Irrigation Team



17.6 Infrastructure Available

Sr. No.	Description	Quantity
1	Tractor	2
2	Trolley	1
3	Harrow	2
4	Rotavator	1
5	Toolkit	10
6	Sprayer Pump	4

15.7 Glimpses of the Plantation Area









17.8 Conservation Measures and Technologies for Water Saving.

The industry planned the following technologies for saving water in future.

S.N	Activities	Year of Implementation	Water Saving	Calculations	Water Saving LTD	Total Savings LT/DAY @60MT	Yearly Savings (KL) AT 60MT/DAY
1	Optimization in After treatment Reduction in wash-off Steps in Heavy Dark shades by doing single soaping instead of double in dark to heavy dark shades	2021	5000LT/MT	10% OF 60MT per day production ie. 6Mt	30000	135000	49275
2	Bioscouring process in a set of shades for saving one bath filling in pretreatment. Successful Trials already run in action burgandy and set in Ikea Flodan shades now exploring in bulk order of Action Dark grey	2021	5000LT/MT	3MT PER DAY AVERAGE	15000		
3	Use of Avitera Dyes in Dark and Medium shade depth to reduce water bath consumption Running DP shades to be develop for Avitera dy	2021	5000LT/MT	30% OF 60MT per day production ie. 18Mt	90000 LT		

The following water conservation projects have been undertaken by the industry in the past to save the water.

Sr. No.	Activities	Year	Annual Water Savings m^3
1	Elimination of 2 baths by combining Bio wash with Dyeing Process in combi Process	2015-16	22173
2	Introduced new concept of bioscouring to reduce one bath in pale and dull shades.	2016-17	8400
3	Introduce new concept of Avitera Dyes having high exhaustion (over 90 %) to reduce soaping temperature above 60 deg followed by next bath of neutralization.	2016-17	16800
4	Reduction in sampling tank Volume from 200L to 10L to save steam and water.	2017-18	684
5	Elimination of 1 bath of cold water in white shade.	2017-18	11086
6	Reducing raw water consumption of Girls hostel from 450 KLD to 150 KLD.	2018-19	109500

18. Observations and Recommendations

18.1 Observations

1. The Home Textile Division (HTD) has fairly a well-equipped ETP for processing the textile effluent, and it is working satisfactorily to reduce the BOD load of the effluent to about 94%. There is no chemical treatment adopted to reduce the pollutant load. Since the pollutant load of the effluent is not so high and the final treated effluent characteristics discharged from ETP are well within the limit set by statutory body, there is no need for chemical treatment because the excess use of chemicals requires high cost and results into difficult solid waste and sludge management.
2. The ETP was designed on the basis of 12500 KLD of effluent, but the current effluent discharge was observed to be 3600 KLD on the day of visit. The major player for the satisfactory operation of the ETP is the extended aeration period provided to the effluent, although the process parameters like MLSS, MLVSS and F/M are not found to be in the optimum range for the perfect operation of the activated sludge process.
3. If the effluent quantity is not upto the ETP designed value, the current discharged quantity should be run in a reduced capacity of the ETP (using a part of the ETP) to save space & running cost, and to maintain the process parameters in an optimum fashion. The remaining part of the ETP may be utilized for a particular process effluent having higher pollutant load and which requires longer residence time.
4. The result of the testing data shows that the final discharged effluent has some amount of color, which cannot be removed fully either by activated sludge process or activated carbon bed used as a tertiary treatment. The carbon bed should be cleaned properly, and it should be regenerated or replaced as and when required.
5. The air requirement was calculated to be 3050 m^3/h. The ETP has 04 numbers of air blowers with capacity of 3750 m^3/h each. Therefore, the air blowers should be used judiciously as per requirement to save the electrical cost.
6. The maximum MLSS was found to be around 1800 mg/l. It should be around 3000 mg/l for optimum working of the ETP as far as quality of effluent and consumption of energy & time is concerned. Therefore, it requires an increase in the amount of

recycled biomass.

7. The F/M ratio was found to be 0.08, which is on the lower side of the desired range of 0.05-3.0 for optimum working. The F/M ratio may be enhanced by outside source of nutrient such as Urea, DAP etc.

8. The Hydraulic Residence Time (HRT) in the Aeration Tanks was found to be 100 h, while the designed criteria is 54 h. The high HRT may lead to more consumption of electrical energy and time for the desired results. So, only the required capacity of the aeration tanks should be used, whenever the discharged effluent is low in quantity.

9. The HRT in Lamella clarifier was found to be 6 h, which should be around 2.5 h as per design criteria. The prolonged detention in the clarifier may favour sludge rising and poor sludge settlement due to de-nitrification and anaerobic biodegradation. It may also cause odor problems.

18.2 Recommendations

10. Despite the fact that the treated effluent is complying the regulations of the statutory body, the discharge of the colored effluent may cause aesthetical unpleasantness. Moreover, it is highly objectionable to the general public. So, in the current scenario, the emphasis should be given to develop more efficient microbial mass for decolorization of effluent in the activated sludge process. A further study may be conducted from the Central/State government institutes of national importance such as IITs, NITs etc to assess the application of microbial consortia/dedicated pure culture and tertiary treatment/AOPs for decolorization of the effluent.

11. The raw water requirement of the HTD is mainly met from the withdrawal of groundwater. As per test reports of the groundwater, it contains a high level of TDS (900-1000 mg/l). The high level of TDS in raw water would ultimately lead to higher TDS in the treated effluent affecting its quality for plantation and drainage. The replacement of the source of water from groundwater to other source with better quality of water (such as surface water) could help in further reduction of pollutant load of the treated effluent.

12. In the absence of RO & MEE system, the other safe ways of disposal of effluent should be explored. The HTD is currently disposing only 3000 KLD of its treated

effluent onto 48.5 acres of land for plantation. The industry should look into the possibility of enhancement of the plantation area (land requirement, type of plants, piping network, watering depth etc) for more utilization of the treated effluent for plantation in an effective manner to eventually achieve zero liquid discharge (ZLD) to the drain. The option of providing some portion of the treated effluent to nearby farmers for irrigation of the cash crops should also be given a thought. Further, a detailed hydrogeological study of the area around the industry should be conducted from the Central/State government institutes of national importance such as IITs, NITs and NIH etc on yearly basis to know the impact and footprints of the industrial effluent (used for plantation) onto the groundwater and soil of the locality. The hydrogeological study would also suggest effective remedial measures to meet any adverse impact of the use of the industrial effluent on the aquifers and soil, if any.

ANNEXURES

14.5, A 1

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Punjab, India

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Visit: tridentindia.com

TRIDENT/HTD/2019/47
05.11.2019

To
The Senior Environmental Engineer
Punjab Pollution control Board
Zonal Office -2 Nabha Road Patiala,

Subject: Compliance report of 'Consent to operate' under Water (Prevention & Control) Act,1974 granted to Trident Limited (HTD).

Dear Sir,

This is in reference to-Consent to Operate No. CTOW/Renewal/BAR/2019/9672223 dated 30.03.2019 granted to Trident Limited (HTD), Trident Complex, Mansa Road, Dhaula, Barnala -148107.

As required, the compliance status of Condition mentioned below is given hereunder:

1. The Industry shall submit monthly compliance/ status report to Regional Office, Sangrur and Zonal Office-2, Patiala and the progress shall be reviewed at Hon'ble Chairman level on quarterly basis.

   As already informed vide our letter No. TRIDENT/HTD/2019/42 dated 04.10.2019, the Industry has entered into a contract with Hydrotech Engineering s.r.l, a Company incorporated and existing under the laws of Italy on 7th September, 2019 for the supply of a two-side stream immersed capillary ultrafiltration membranes trains for the tertiary filtration of a biologically pre-treated textile effluent with a net capacity of 2100 m3/day, delivery of which is expected in March, 2020.

   The erection & commissioning of the two-side stream immersed capillary ultrafiltration membranes trains for the tertiary filtration of a biologically pre-treated textile effluent shall commence once the equipment is delivered at site.

Keeping in view of the above, we request you to kindly take on record the compliances made by the Industry in regard to consent no.CTOW/Renewal/BAR/2019/9672223 dated 30.03.2019 issued by your good office.

Thanking you
Yours faithfully,
For Trident Limited (HTD)

Received
7.11.19

(Rajat Monga)
President (Sustainability -PD)

Encl.: As Above.

PUNJAB POLLUTION CONTROL BOARD VATAVARAN BHAVAN,
NABHA ROAD, PATIALA
WATER ANALYSIS REPORT

1. Laboratory Sample No
2. HWRS No.
3. Name of Industry
4. Name of Sample collecting Officer,
   Designation of the officer authorizing for
5. Type of Sample
   Date & Time of Sample collected
6. Date & Time of Sample received in Lab
7. Period of Analysis
8. Test Method

1. Water Pollution Lab Mohindergarh/2021
2. HWRS/2021/SW/HWI/0215
3. M/s Tarkesh Ltd (HWI) Village Dhanda Dear Rewari
4. Sh. Vipan Kumar, AEE
   Environmental Engineer, Regional Office, Sangrur
5. 08.10.2021
   08.10.2021
6. 09.10.2021
7. As per relevant part of P. H. W. (M. & H.) Rules
8. Methods of APHA

Results

Sr. No.	Parameters	Inlet of ETP	Outlet leading to plantation	Outlet leading to drain	Aeration Tank-I	Aeration Tank-II	General Standards as per EPA
1	pH	9.4	7.8	7.9			6-9
2	Total Suspended Solids mg/l	62	15	19			100
3	Total Dissolved Solids mg/l	1980	1548	1560			2100
4	Chemical Oxygen Demand mg/l	360	61	53			250
5	Biochemical Oxygen Demand mg/l	110	13	15			30
6	Colour	240	80	70			
7	Sulphide mg/l	1.2	BDL	BDL			2
8	SAR	-	9.6	9.5			
9	Total Chrome mg/l	BDL	BDL	BDL			2
10	Ammonical Nitrogen mg/l	12.8	2.6	3.0			50
11	Oil & Grease mg/l	1.2	BDL	BDL			10
12	Phenolic Compound mg/l	BDL	BDL	BDL			1
13	Mixed Liquid Suspended Solids mg/l				3010	3460	
14	Mixed Liquid Volatile Suspended Solids mg/l				2260	2540	

Remarks: 1. the prescribed standards are EPA Standards for disposal into public sewer. However, if any stringent standards have been prescribed by the Board, the same shall prevail
2. BDL means below method detection limit

--End of Report--

Sd/- [illegible]
Scientific Officer
(Dr. [illegible])
10/5/2021

Endst. No. 11749-51

A copy of the above is forwarded to:-
1. The Chief Environment Engineer, Punjab Pollution Control Board, Ludhiana
2. The Senior Environment Engineer, Punjab Pollution Control Board, Zonal Office-II, Patiala
3. The Environment Engineer, Punjab Pollution Control Board, Regional Office, Sangrur

Asst. Scientific Officer
10/5/2021

Rajasthan Unit
Annual

Form 4
[See rules 5 (7) and 21 (2)]

Financial Year 2020-21

FORM FOR FILING ANNUAL RETURNS
BY THE OCCUPIER OR OPERATOR OF FACILITY

1	Name and address of the generator/ operator of facility	M/s Trident Limited (Home Textile Division) Address : Mansa Road , Village- Dhaula Teh - Tapa, Distt - Barnala, PUNJAB
2	Name of the authorised person and full address with telephone and fax number	Mr Lovelish Goyal, Factory Manager , Home Textile Division. M/s Trident Limited Mansa Road Village Dhaula ,Barnala Pb , Tel : 91- 9878999365 Fax : 91- 1615039900 lovelishgoyal@tridentindia.com

3 Description of hazardous wastes

Type	Physical Form	Category
Spent oil	Liquid	5.1
DG Filter	Solid	5.2
Oil Soaked Chindi	Solid	5.2
Asbestos Sheet	Solid	15.2
ETP Sludge	Sludge	34.3
HDPE Drums &Plastic Bags	Solid	33.1
Spent Carbon	Solid	35.3

4 Quantity of hazardous wastes generation

Type	Category	UOM	Opening Stock (01.04.2020)	Generation	Closing Stock (31.03.2021)
Spent Oil	5.1	Liters	310	1240	150
DG Filter	5.2	Nos	0	0	0
Oil Soaked Chindi	5.2	MT	0.63	0.67	0.35
Asbestos Sheet	15.2	MT	1.4	1.5	1.55
ETP Sludge	35.3	MT	0.366	3.469	1.975
HDPE Drums &Plastic Bags	33.1	MT	2	62.9	0
Suspended Carbon	36.2	MT	0	0	0

5	Description of Storage	Designated Storage Shed With proper roof & floor
6	Description of Treatment	Send to authorized recycler

7 Details of Transportation:

Mode of Transportation: By road through truck..

Mode of Packing: Spent Oil in Drums & sludge filled in HDPE Bags.

Hazardous Waste Description	Transportation Date	Quantity Transported	Authorized Party Details
Spent oil	25.06.2020	1200	M/s Satkar oil
	30.12.2020	200	M/s Satkar oil
HDPE Drums & Plastic Bags	28.04.2020	1.23	Lucky Steel Barrel Supply Sara Steel
	11,18 & 25.05.2020	3.37	
	19 & 26.06.2020	2.34	
	11,20 & 25.07.2020	4.51	
		6.61	
	07 & 29.09.2020	5.01	
	06,12,20,21,26 & 30.10.2020	7.44	

			10,17,& 25.11.2020	3.6	
			01,12,16 & 31.12.2020	4.84	
			02,11,12,14,19,27,& 28.01.2021	8.14	
			01,04,11,15,25,26 & 27.02.2021	9.14	
			06,10,12,13,15,20,23 ,24 & 30.03.2021	8.67	
		ETP Sludge	08.10.2020	2.26	Ramky Enviro Engineer Limited
		Oil Soaked Chindi	08.10.2020	0.95	Ramky Enviro Engineer Limited
		Asbestos Sheet	08.10.2020	1.35	Ramky Enviro Engineer Limited
8	Details of disposal of hazardous and other waste	Hazardous Waste Description	Category	Quantity to Recycler/Disposed	Authorized Party Details
		Spent oil (Ltrs)	5.1	1400	M/s Satkar oil
		HDPE Drums & Plastic Bags (MT)	33.1	64.90	M/s Barrel Supply Co. & Lucky Steel Works
		ETP Sludge (MT)	35.3	2.26	Ramky Enviro Engineer Limited
		Oil Soaked Chindi (MT)	5.2	0.950	Ramky Enviro Engineer Limited
		Asbestos Sheet (MT)	15.2	1.35	Ramky Enviro Engineer Limited

Date: 31.05.2021

Place: Dhaula

Signature

lovelish goyal

Lovelish Goyal
Factory Manager
Trident Ltd.(HTD)

FOR MAINTAINING RECORDS OF HAZARDOUS WASTE AT THE FACILITY

FORM 3

[See rule 9(1)]

Details for the month of **Mar'21**

1. Name & Address of the occupier or operator of the facility ; M/s Trident ltd.(Home Textile Division), Mansa road, Dhaula,Barnla(Pb).
2. Date of issuance of authorization and its reference no.: 12.01.2018 & HWM/fresh/BAR/2018/G669575
3. **Description of hazardous waste :**

S.No	Physical form with description	UOM	Total Quantity Generated	Total Quantity Disposed	Closing Balance	Consent Limit per Annum
1	Liquid- Spent Oil (Cat 5.1)	Liters	0	0	150	2000
2	Solid - DG Filter (Cat 5.2)	Nos	0	0	0	100
3	Solid - Oil Soaked Chindi (Cat 5.2)	Ton	0	0.0	0.35	1.2
4	Soil – Asbestos Sheet (Cat 15.2)	Ton	1.5	0	1.55	7.5
5	Solid- Chemical Sludge (Cat 35.3)	Ton	0.500	0	1.575	7.3
6	Solid – HDPE Drums+ Plastic bags(cat 33.1)	Ton	8.67	8.67	0	212
7	Solid – Spent Carbon (Cat 36.2)	Ton	0	0	0	7

4. Description of storage and treatment of hazardous waste:

S.No	Physical form with description	Method of Storage	Method of treatment of hazardous waste
1	Liquid- Spent Oil (Cat 5.1)	In Drums	Recyclable
2	Solid - DG Filter (Cat 5.2)	In HDPE Bags	Incinerable
3	Solid - Oil Soaked Chindi (Cat 5.2)	In HDPE Bags	Incinerable
4	Soil – Asbestos Sheet (Cat 15.2)	In Wooden Box	Land Fill
5	Solid- Chemical Sludge (Cat 35.3)	In HDPE Bags	Land Fill
6	Solid – HDPE Drums+ Plastic bags(cat 33.1)	Under Covered Shed	Recyclable
7	Solid – Spent Carbon (Cat 36.2)	In HDPE Bags	Land Fill

5. Detail of transportation of Hazardous Waste:

Name & Address of the Consignee of package	Mode of packing of the waste for transportation	Mode of the transportation to site of disposal	Date of Transportation
Lucky Steel and barrel Supply Co.x	HDPE Drums	By Vehicles	06.03.2021,10.03.2021,12.03.2021,13.03.2021,16.03.2021,20.03.2021,23.03.2021,24.03.2021 and 30.03.2021

6. Detail of Disposal of Hazardous Waste :

Date of Disposal	Concentration of Hazardous constituents in the final waste form	Site of disposal (identify the location on the relevant layout drawing for reference)	Method of Disposal	Persons involved in the Disposal
NA	NA	NA	NA	NA

7. Data of Environmental Surveillance:

Date of Measurement	Analysis of ground water			Analysis of Soil Samples			Analysis of Air samples		Analysis of any other sample
	Location of Sampling	Depth of Sampling	Data	Location of Sampling	Depth of Sampling	Data	Location of Sampling	DATA	
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

8. Details of Hazardous waste reused or recycled :

Date	Total Quantity of hazardous waste generated	Details of Hazardous waste Minimization activity	Material Received	Final Quantity of Waste Generated	Net Reduction in generation quantity & percentage
NA	NA	NA	NA	NA	

Date : 03/04/2021

Place : Dhaula

Lovelish Goyal
Factory Manger
Trident Ltd.(Home textile Divison)

lovelish goyal

Form - V

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Punjab, India

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TRIDENT/HTD/2020/39
29.09.2020

To

Environmental Engineer
Punjab Pollution Control Board
Regional Office
Industrial Focal Point
Sangrur

Subject: Submission of Form V (Annual Environmental Statement) for the financial year 2019-20 prescribed under rule 14 of the environment (Protection) Rule 1986.

Dear Sir

We are enclosing herewith the Annual Environmental Statement prescribed under Rule 14 of the Environment (Protection), Rule 1986 is attached herewith as Annexure A.

We further state that the Environmental Statement for the financial year ending the 31st March,2020 is being filed by M/s Trident Limited (Home Textile Division), Mansa Road Barnala.

You are requested to kindly take the documents on record and acknowledge the receipt of the same

Thanking You

Yours Faithfully
For Trident Limited (HTD)

[Lavalish Goyal]
Factory Manager

30/9/2020

Annual Environmental Statement

Form - V

M/s Trident Limited (HTD)

Financial year 2019-20

Part - A

1. Name & address of the owner/occupier of the industry operation or process :
   Mr. Deepak Nanda
   M/S Trident limited (Home Textile Division),
   Mansa Road, Village-Dhaula, Barnala Punjab
2. Industry Category: Large (Red)
3. Production category: Terry Towel & Dyed yarn
4. Year of establishment: 1997
5. Date of last environmental statement submitted: 24.09.2019

Part - B

Water and Raw Material Consumption

1. Water consumption in m^3/day
   a) Process: 5236
   b) Colling: 10
   c) Domestic: 274

Sr. No.	Name of Products	Process water consumption per unit of products	
		During financial year 2018-19.	During financial year 2019-20
1	Terry Towel	72.60 m3/Ton	69.42 m3/Ton
2	Dyed Yarn		

2. Raw Material consumption

Sr. No.	Name of Raw Material	Name of Products	Raw material consumption per unit of products	
			During financial year 2018-19	During financial year 2019-20
1	Yarn	Terry Towel	24999.0	23412
2		Dyed Yarn		

**Industry may use codes if disclosing details of raw material would violate contractual obligations, otherwise all industries have to name the raw material used.*

Annual Environmental Statement
Form - V
M/s Trident Limited (HTD)
Financial year 2019-20

Part - A

1. Name & address of the owner/occupier of the industry operation or process :
   Mr. Deepak Nanda
   M/S Trident limited (Home Textile Division),
   Mansa Road, Village-Dhaula, Barnala Punjab
2. Industry Category: Large (Red)
3. Production category: Terry Towel & Dyed yarn
4. Year of establishment: 1997
5. Date of last environmental statement submitted: 24.09.2019

Part - B

Water and Raw Material Consumption

1. Water consumption in m^3/day
   a) Process: 5236
   b) Colling: 10
   c) Domestic: 274

Sr. No.	Name of Products	Process water consumption per unit of products	
		During financial year 2018-19.	During financial year 2019-20
1	Terry Towel	72.60 m3/Ton	69.42 m3/Ton
2	Dyed Yarn		

2. Raw Material consumption

Sr. No.	Name of Raw Material	Name of Products	Raw material consumption per unit of products	
			During financial year 2018-19	During financial year 2019-20
1	Yarn	Terry Towel	24999.0	23412
2		Dyed Yarn		

**Industry may use codes if disclosing details of raw material would violate contractual obligations, otherwise all industries have to name the raw material used.*

Part - C
Pollution discharged to environment/unit of output
(Parameters as specified in the consent issued)

Sr. No.	Pollutants	Quantity of Pollutants discharged (mass/day)		Concentration of Pollutants discharged (mass/volume)		Percentage of variation from prescribed standards with reasons
1	Air (DG Set)	------		%CO2	-	All the parameters are within standard limit. Ref.:Testing done by External NABL approved Lab in December-2019
				SO2	1.29 g/Kw-hr	
				NO2	2.72 g/Kw-hr	
				PM	0.10 g/Kw-hr	
				CO	1.68 g/Kw-hr	
2	Water	pH	8.08	pH	8.08	All the parameters are an average of testing done by PPCB in January 2020. Parameter are within standard limit.
		TSS	49.54 kg/Day	TSS	22 mg/l	
		COD	148.63 kg/Day	COD	66 mg/l	
		BOD	24.77 kg/Day	BOD	11 mg/l	
		O & G	BDL	O & G	BDL	

Part - D
Hazardous Wastes

	Hazardous waste Source	Hazardous waste name	Total Quantity During FY 2018-19	Total Quantity During FY 2019-20
1	From Process	Spent Oil (5.1)	420 Liters	410 Ltrs
		Oil soaked Rags/Chindi (5.2)	0.25 MT	2.07 MT
		Asbestos sheet (15.2)	0	6.78 MT
		HDPE Drum & Plastic bags (33.3)	79.46 MT	62.96 MT
2	From Pollution Control Facilities	ETP Sludge	3.93 MT	3.76 MT

Part - E
Solid Wastes

Sr. No.	Waste Source	Waste name (Non Hazardous)	Total Quantity (MT)	
			During financial year (2018-19)	
1	From Process	Waste Yarn and towel cutting	1155.84	1058.531
		Metal Scrap	27.69	69.36
		Wooden Scrap	9.34	23.35
		Paper Board/Gutta Scrap	812.16	549.27
		Plastic/Rubber/Nylon Scrap/Polythene scrap	160.26	120.02
		Glass Scrap	0	0
2	From Pollution Control Facilities	Nil	Nil	Nil
3	Quantity recycled or re-utilized with in the unit	Waste Yarn and towel cuttings + Paper Board/Gutta Scrap	1968 MT	1607.80 MT

Part – F

Please specify the characteristics (in terms of concentration and quantum) of hazardous as well as solid wastes and Indicated disposal practice adopted for both these categories of wastes.

Part – G

Impact of the pollution abatement measures taken on conservation of natural resources and on the cost of production.

1. Conducting Environmental Trainings to the concerned persons.
2. Spill containment tray for chemical storage.
3. Steam and Water consumption reduction drive.
4. Creating environment awareness training programs among all cadre team members.
5. Diversion of Domestic effluent to STP from ETP
6. To reduce specific power consumption of Towel ETP by installation of VFD on blowers.

Part – H

Additional measure/investment proposal for environmental protection abatement of pollution, prevention of pollution.
1. Installation of latest technology centrifugal compressor to save 3lac kw per month. 2. Introduction of canal water in towel business to reduce chemical consumption at WTP. 3. Implementation of identified water conservation projects in order to reduce specific waster consumption.

Part – I

Miscellaneous: *Any other particulars in respect of environmental protection and abatement of pollution.*
1. Plantation of trees inside the company premises and nearby villages on Environment day, Earth day and Green Day. 2. Adoption of 10 Villages to enhance green environment. 13000 Nos of trees planted. 2. Rain Harvesting System. 3. Increase in A Grade production there reduction in re working. 4. Energy conservation drive. 5. World Environment Day celebration. 6. Green Day Celebration. 7. Conducting environmental trainings to bring awareness among the team members.

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Excellence in nature

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Trident/HTD/2021/09
03/04/2021

Trident Limited [Home Textile Division]
ETP Performance Report

To
Environmental Engineer
Regional Office
Punjab Pollution Control Board
Industrial Focal Point
Sunam Road, Sangrur (Pb).

Month:- Mar'21

Subject - Submission of Effluent Quality parameters, Water source meters, ETP Inlet/Outlet meters, Piezometers record as per water consent

Dear Sir,
Please find attached ETP Quality parameters for the month of Mar'2021.

Sr No	Description	PPCB Norms	UoM	Avg. ETP Parameters
1	pH	6.5-8.5	-	7.90
2	C.O.D	<250	ppm	128.00
3	B.O.D	<30	ppm	9.53
4	T.S.S	<100	Ppm	14.58
5	Power used	NA	Kwh	220819

We would like to submit Water source meters, ETP Inlet/Outlet meters, Piezometers record for March 2021

	Description	UoM	Initial Reading	Final Reading	Consumption
	Borewell 1	m3	35680	39270	3590
	Borewell 2	m3	1452493	1495092	42599
	Borewell 3	m3	73447	73447	-
	Borewell 4	m3	164248	166404	2156
	Borewell 5	m3	-	26695	26695
	Inlet to ETP	m3	6253795	6451586	197791
	Outlet RO	m3	-	-	0
	Outlet of ETP	m3	6839408	7036210	196802
	Outlet Plantation	m3	1239228	1336314	97086
	Outlet Drain	m3	-	-	99716
	Piezometer 1	mtr	-	-	40.2
	Piezometer 2	mtr	-	-	40.1
12	Piezometer 3	Mtr	-	-	40.2
	Energy meter	Mwh	5059.4023	5280.2243	220.819

Design parameters

TECHNICAL PARAMETRES OF EFFLUENT TREATMENT PLANT
TRIDENT HOME TEXTILES

S.No.	Description	UOM	Value
1	Inlet Flow Design	KLD	10000
2	Inlet COD - Design	ppm	<1500
3	Inlet BOD - Design	ppm	<600
4	No. of Homo Tank	No.	1
5	Shape of Homo tank	Shape	Carousal
6	Volume of Homo tank	kl	12500
7	Min. Retention time in Homo Tank	Hrs	30
8	No. Of Aeration tank	No.	3
9	Shape of Aeration Tank	Shape	Carousal
10	Volume of Aearation tank	Kl	22500
11	Min. Retention time Aeration Tank	Hrs	54
12	No. of Clarifier	No.	1
13	Volume of Clarifier	Kl	900
14	No. of Thickner	No.	1
15	Volume of Thickner	kl	500
16	No. of Filter Press	No.	2
17	No. of ACF	No.	4
18	Treated Water COD	ppm	<200
19	Treated Water BOD	ppm	<30
20	Treated Water PH	NA	7-8.5

7500 L / To
Total

EQUIPMENT DETAILS OF EFFLUENT TREATMENT PLANT
TRIDENT HOME TEXTILES

// TRIDENT

S.No.	Description	Function	Quantity	Capacity Each
1	Mechanical Screen	This is Used to remove the suspended solids from the effluent	1	800m3/hr max.0.37 kw
2	Lifting Pumps	Pumps are Used to transfer Effluent to the homogenization tanks	5 4+1	208m3/hr 0.7 bar .5.6 kw
3	Feeding Pumps	Pumps are used to transfer the Effluent From Homogenization tanks to distribution tank	4 3+1	208m3/hr 0.7 bar .5.6 kw
4	Recycling pumps	Pumps are used to transfer the settled clarifier biomass to distribution tank.	4 3+1	208m3/hr 0.7 bar .5.6 kw
5	Ejector Pumps	Pumps are used to transfer air to homogenization tank for pre-aeration	3	16kg/hr O2-5.5 kw
6	Flow Maker	These are used to agitate Effluent and the biomass in the tanks for proper mixing	12	2822N-36 RPM- 4KW
7	Sulphuric Acid Dosing Pumps	These are used to dose the sulphuric acid in the neutralization tank for pH correction	2 1+1	476lph,16Bar-0.55KW
8	Air Blowers	These are used to supply air to the aeration tank through diffuser	5 4+1	3750m3/hr,0.7Bar,132KW
9	Scrapping Rodge	This equipment scraps the settled biomass into the recycling pit and does not allow septic condition	1	D-12m,V-2.0m/min-0.37Kw
10	Disk Membrane Diffuser	Diffusers supply air to the aeration tanks to maintain dissolved oxygen concentration	4752	3.5m3/hr/Diffuser
11	Mist Cooling Pumps	Pumps are used to reduce the inlet temperature of plant for better biological growth.	3	150m3/hr,2Bar,15.5KW
12	Disposal Pumps	Pumps are used to transfer treated water to the plantation and drain	3 2+1	239m3/hr,2Bar,18.5KW
13	Filter Press	This is used to dewater the excess sludge from the thickner tank.	2	15m3/hr
14	Filter Press Feed Pumps	Pumps are used to transfer the feed from thickner to the filter press	2	15m3/hr,6Bar,5.5 KW

3x3 - 9 in AW 3 in eq

Advanced Environmental Technology

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ABHISHEK INDUSTRIES (TRIDENT) LTD.

Terry Towel Division, Mansa ROad

VPO: Dhaula, Barnala, Distt. Sangrur (Punjab)

- INDIA -

ATTN: Mr. Rajinder Gupta, Managing Director

Biological wastewater treatment plant - Flow 12,500 m³/day, C.O.D. 1.250 mg/l

Date: 3rd March 2004
Offer No.: MP- IND/ 066/ 03

SIMEM S.R.L Environmental Division
Eng. Massimiliano Previdi
(Managing Director)

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WASTEWATER TREATMENT PLANT

THE PLANTS SUGGESTED BY **SIMEM S.R.L.** ALLOW AN OPTIMUM REDUCTION OF THE CONTAMINATION CONTAINED IN WASTE WATER AND THE TRANSFORMATION OF THIS CONTAMINATION INTO CHEMICAL ELEMENTS NOT DANGEROUS TO THE ENVIRONMENTAND HUMAN LIFE.

1 BIOLOGICAL TREATMENT

The biological technology allows transforming the organic and inorganic contamination, contained in waste water, into carbon dioxide and water. This is achieved by injecting oxygen into the water, thereby making possible the survival of the bacteria necessary to complete this process.

1.1 AIM OF THE TREATMENT

The biological treatment has for objective the removal of the pollutant substances in the wastewater.

The biological technology presents the following advantages:

- Minimum plant operational costs
- Working stability of the plant and its capacity to adapt to the variations of quality and quantities of pollution.
- Management easiness and minimum manpower requested.
- Minimisation of solid waste in outlet and non toxicity of the same

1.2 DESCRIPTION OF THE PROCESS

1.2.1 Steps of the plant

WATER LINE

- Initial Lifting
- Screening unit
- Storage and homogenizing
- Neutralization
- Nutrient salt dosing
- Biological oxidation

SLUDGE LINE

- Sludge re-circulation and excess sludge extraction
- Excess sludge extraction
- Thickening of excess sludge

1.2.2 Water line - Description of each step

1.2.2.1 *Initial lifting*

The row liquors coming from the factory are collected, through a collector, in a tank of initial lifting. It is located at a lower level than the liquors contained in the storage and homogenisation tank, for this reason it is necessary to lift and transfer liquors by means of pumps.

The switch on and the switch off of pumps are driven by limit-switches which are positioned in a specific way in order to maintain the liquor level under the height of drainage points of the factory.

Inside of the tank is installed a switch with a high alarm level.

Usually pumps are dimensioned in order to have the capacity to transfer peak of flows which are even twice of the nominal flow per hour of the plant, and the lifting tank Warrantees such storage in order to assure a lasting working of pumps.

1.2.2.2 *Screening equipment*

It has the purpose of separating coarse and medium-fine solids at the inlet, avoiding thus their sedimentation in the next stages and clogging of the equipment (pumps, mixers etc.)

There are several models of screens, depending on the type of plant: rotary drum, arch with brushes, arch with comb, static, cascade, disk, step, coclea etc.

In all cases the screen is made of stainless steel and however in material, suited to be constantly in contact with water without suffering corrosion.

The solids are separated from the water and forwarded to special containers, which must be emptied periodically.

The cleaning of the screening surface is automatic and continuous and it is done by brushes, combs or counter current pressured water jets. Pre-set time switches or level sensors control the screening equipment.

In the case of static screens, cleaning occurs manually.

1.2.2.3 *Storage and homogenizing*

The quality and quantity of water discharged during the day is not constant. The flow rate and the quality depend on the type of work and rate of work happening throughout the day.

To feed a biological plant it is necessary to homogenize the water. The water has to result constant from the point of view of quantity and quality. This is in order to grant the bacteria a constant feeding (necessary for their survival) with consequently high performances in the abatement of polluted substances.

Furthermore it will be necessary to first collect the water and then dose it into the biological plant in a constant way in order to avoid hydraulic problems in different parts of the plant that might compromise its proper functioning.

Inside of the homogenizing tank it will also be important to oxygenate lightly the effluent just to transform the conditions from anaerobic to aerobic, so to create the ideal habitat for bacteria.

The oxygenation of effluents is also important because it prevents smells which are usual in effluents in anaerobic condition.

1.2.2.4 *Neutralization*

A neutralization step takes place because of the wide pH range in the wastewater.

The biological oxidation needs a neutral or slightly alkaline pH value. Neutralization is carried out automatically by adding soda or acid, depending on the characteristics of the wastewater, by dosing pumps and a pH meter equipped with alarm signal controls.

The pumps take the reagents from storage tanks of a suitable capacity.

Their start is automatic and set to provide for a pH value between 7 and 8.

The pH measurement is carried out by a glass made probe, equipped with potentiometer, easy to change in case of failure or wear.

1.2.2.5 *Nutrient salts feeding*

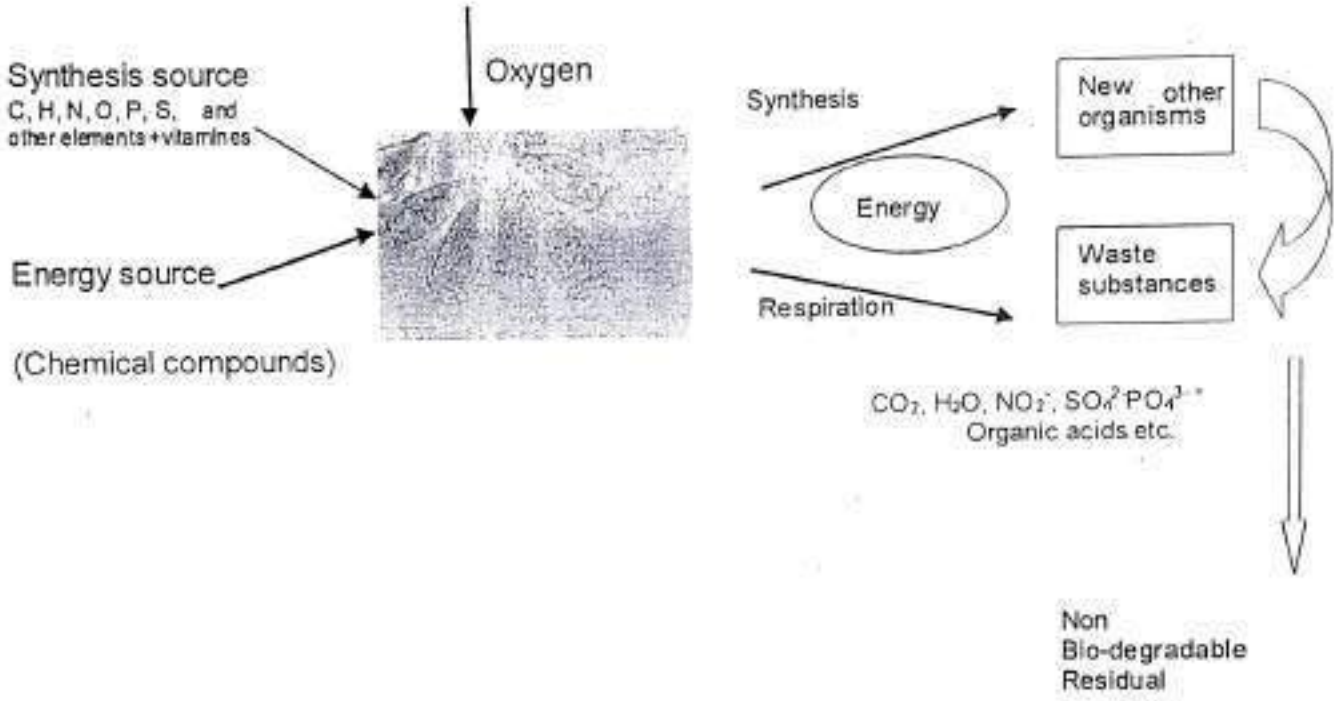
In some cases wastewater discharged from industries doesn't have the right composition of nutrients which are required for the survival of bacteria

For this reason it is necessary to install a plant for dosing those nutrients which if lacking would cause many problems to the survival of bacteria. This plant is the same used during the start-up period and during holiday (periods in which the industry is not working).

1.2.3 *Biological oxidation*

It is the "*heart*" of the plant.

The Oxidation Tank is where all transforming phenomena of pollution contained in the waste water takes place, thanks to bacteria and micro-organisms.



Bacteria in the course of their life they grow and multiply themselves. This is possible through two processes: the energetic and the synthesis one.

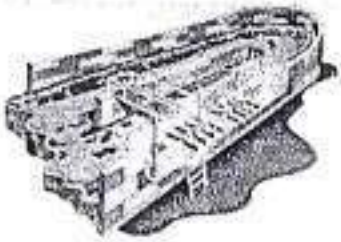
In the wastewater treatment plants both are used. The oxidation of a part of the organic substance furnishes energy, while the remaining part is used as feeding substance.

In the synthesis process the polluted materials removed constitute new organic matter of bacteria, while with the energetic process are obtained stabilized final materials such as: H_2O, CO_2, NO_2, etc.

WE CAN SIMPLY SAY THAT BACTERIA FEEDS ON POLLUTED SUBSTANCES CONTAINED IN THE WATER DISCHARGED FROM THE INDUSTRY, AND TRANSFORM THESE IN SUBSTANCES WHICH ARE NOT DANGEROUS FOR ENVIRONMENT SUCH AS: CO2, H2O AND ENERGY

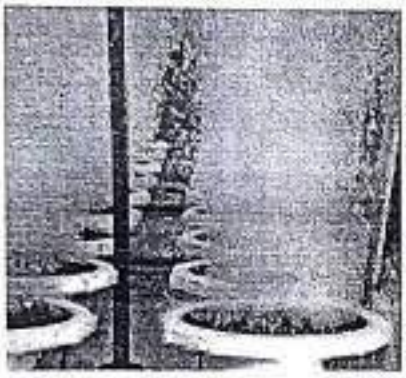
So the oxygen supply has a big importance for the survival of Bacteria and for the transforming processes.

This is also the phase where the running costs of the whole plant are mostly concentrated.



The system permits high performances of the oxygen transfer in particular if supported by mixers that improve the contact time between micro air-bubbles.

Carousel



The best way to supply oxygen inside the tank, is by installing on the bottom, diffusers that produce micro air-bubbles furnished through blowers.

Diffusers

The system permits high performances in the oxygen transfer in particular if supported by mixers that improve the contact time between micro air-bubbles.

The quantity of air supplied, is automatically controlled by a dissolved oxygen-meter which is positioned inside of the oxidation tank and drives the blowers permitting to furnish the exact quantity of oxygen required by increasing or reducing the rated power of blowers.

1.2.3.1 Clarifier with plastic media

The aerated mixture in the oxidation tank is forwarded, in consequence of gravity, to the clarifier. The clarifier is a tank that, in particular conditions of quietness, allows the settlement of the sludge flocks with a consequently good separation between clean water and sludge (bacteria).

The sludge flocks settled on the floor are collected again in the oxidation tank.

The clean water which is in the surface, comes out of the clarifier with the parameters as indicated in the chart at chapter 2.

Instead of the traditional static circular or longitudinal shaped decanters, sometimes a more compact and efficient decanter such as a lamella clarifier elements can be a better choice for the sedimentation of solids in wastewater.

The flexible elements are a sequence of plane or corrugated overlapping plates, which run parallel to each other inside a frame and are arranged in metallic or concrete tanks.

In order to provide for a good sedimentation of solids, the plate interceptor elements are inclined, so that the plates form a 60° angle with the horizontal plane.

When the wastewater flows through the plate lamellar pack, all the suspended particles of the water are immediately intercepted and settled on the surface of the flexible elements, avoiding in this way to be swept away by the main stream of water, which flows through the flexible elements from the bottom to the top.

Due to the gravity effect, all the particles settled on the surface of the plates reach the lower part of the sink where the plate interceptor elements are installed. Here, they arrange themselves in strata and grow thick. Afterwards, they will be extracted by means of pipes and valves.

The advantage of plate interceptor elements sedimentation is that they are remarkable space savers.

Compared to the traditional decanters where the sedimentation surface is as large as the decanter surface, the working sedimentation surface is given, in our project, by the projection of the horizontal plane of the plates forming the plate interceptor elements, which means a space reduction of about 90%.

1.2.4 Sludge line - Description of each step

1.2.4.1 Re-circulation sludge pumping station

The sludge re - circulation is a very important plant stage.

It works 24 hours a day and it is needed to extract sludge settled on the decanter floor to put it in again in the oxidation tank.

Usually this operation is made by means of submersible pumps at low speed (to avoid breaking the sludge flock) with a specific design of impeller that avoids the obstruction.

1.2.4.2 Sludge extraction

The extraction of excess sludge from the plant derives from the necessity to maintain a constant concentration of bacteria, once the right working conditions are reached.

The quantity of excess sludge to be removed, is equal to the mass of suspended solids and is produced in consequence of the growth of bacteria due to the flocculation phenomena.

1.2.4.3 Thickening of excess sludge

To reduce the quantity of water contained in sludge in order to permit the settlement, a static tank with vertical flow called *thickener* is used, it permits to increase the dry substance from 1% till max. 3%.

To improve the thickening of sludge 0,4 ppm of cationic polyelectrolyte is usually dosed.

The water so decanted returns inside the biological plant.

The thickened sludge extracted from the floor is sent directly at dismalting or alternatively is further thickened by means of a filter-press in order to improve the dry content till 25% and make it become solid.

Filter press is not the scope of this offer.

2 BIOLOGICAL TREATMENT PLANT - DESIGN DATA

2.1 PLANT CHARACTERISTICS

BIOLOGICAL TREATMENT

Net flow	12500	m^3/day
Flow rate	520	m^3/h
Daily discharging hours	24	h
C.O.D. mean	1 200	mg/l
C.O.D. daily	15000	kg/day
B.O.D.$_5$ mean	500	mg/l
B.O.D.$_5$ daily	5000	kg/day
Temperature	50-55	°C
pH	11.00	
Site elevation	206	a.s.l.
Receiving water body	River or recovery	
Power supply	415 V / 50 Hz	
Storage tank qty. – existing	1	
Total storage tank volume	12500	m^3
Oxidation tanks qty.	3	
Total oxidation volume	22500	m^3
Organic load factor	0,08	Kg.B.O.D./Kg. SSMA day
Biological Clarifiers qty.	1	
Dimension	10x10x6h	mt.
Oxygen transfer rate	653	kg/h
Total rated power	596,60	Kw
Total input power	287,57	Kw
Energy consumption	0,65	kWh/m^3
Standard quality required	see the following pages	

2.2 INLET WASTEWATER CHARACTERISTICS

The wastewater to be treated is coming out from an industrial process, such as:

- Dyeing cotton yarn and fabrics for Terry Towel.

Following chemicals are used in the aforesaid process:

- Soap, softener, sodium sulphate, hydrogen peroxide, sodium hydrosulphite, sodium hypochlorite, caustic soda, direct, reactive, dispersed, acid dye, etc.

They are remarkably bio - degradable and so they justify the choice of the biological activated sludge plant.

Analysis on water coming from similar industries gives the following characteristic parameters:

INLET PARAMETERS	BIOLOGICAL TREATMENT	UNITS
BOD_5 (Min/Mean/Max)	450-500-600	mg/l
COD (Min/Mean/Max)	900-1000-1200	mg/l
pH	10-12	
Temperature	50-55	°C
Suspended solids	200-300	mg/l
Sedimented solids	0-5	ml/l
Total nitrogen (TKN)	60-70	mg/l
Ammonia (NH3)	30-40	mg/l
Phosphorus	5-10	mg/l
Surfactants	30-40	mg/l

The plant is dimensioned on the base of the a.m. data that will have to be strictly observed during controls of depuration efficiency

2.3 OUTLET WASTEWATER CHARACTERISTICS

OUTLET PARAMETERS	BIOLOGICAL TREATMENT	UNITS
B.O.D.$_5$ (Mean)	< 30	mg/l
C.O.D. (Mean)	< 250	mg/l
Temperature	35-40	°C
pH	7,5	
Suspended solids	20-40	mg/l
Sedimented solids	Traces	ml/l
Total nitrogen (TKN)	6-12	mg/l
Ammonia (NH3)	4-8	mg/l
Phosphorous	3-5	mg/l
Surfactants	0,5-2	mg/l

THE VALUES OF THE OUTLET WATER PARAMETERS WILL BE WITHIN THE FORESEEN LIMITS FROM THE CURRENT RULES, DONE EXCEPTION FOR THE CHLORIDES AND SULPHATES. THAT IS VALID IF THE PLANT HAS BEEN REALIZED CORRECTLY IN EVERY PART AND THAT THE VALUES OF THE PARAMETERS OF INLET WATER ARE ALWAYS THOSE EXPECTED IN PLANNING PHASE.

Following chemical reagents will be used during the treatment of the water:

- acid for pH neutralization (always used)
- antifoam (vegetable kind) to control foam in the oxidation tank (occasional)
- phosphorus nutrient salts (occasional)
- high molecular weight, organic cationic polyelectrolyte for thickening (always used)

THE EXCESS SLUDGE MUST BE THICKENED AND TREATED WITH PHYSICAL METHODS IN ORDER TO SEPARATE WATER, WHICH MUST BE RECYCLED IN THE PLANT TO BE PURIFIED. THE FINAL PRODUCT IS SLUDGE WITH HIGH DRY SUBSTANCE CONTENT, DESTINED TO THE DRAINING BY THE CUSTOMER

3 INCLUSIONS

Besides equipment and accessories aforesaid price **is including:**

- Transport of equipment and accessories to destination port CIF Nhava Sheva, ICD Ludhiana.
- Supervision of assembly by our Engineer. (Continuous or discontinuous control by our technicians on site and from our premises, during installation of mechanical, hydraulic and electric equipment, during the entire construction phase.)
- Commissioning, plant test and plant start-up by our Engineer.
- Assembly and installation of all hydraulic, mechanical and electric equipment.
- Drawings for wiring and connection of the electro mechanical parts *.
- Lay out for civil works *.
- Mechanical drawings for carpentry and its assembly *.
- Modem for connecting the electric switchboard to Italy or to your office.
- Instruction of managing and supervising personnel of the plant as well as informative support to the customer during the execution of the works in order to carry out the very same in a proper way.
- Manuals (1 copy on paper or CD ROM - In English language).

(*) 2 copies on paper, 1 copy on CD ROM; the language can be chosen among English, Spanish or Italian.

4 EXCLUSIONS

Aforesaid price **Is excluding:**

- Any license fee and /or custom duties.
- Use materials for install (as like welding electrodes, cutting disk and similar).
- Both reinforced and not reinforced concrete civil works as well as earthworks like embankment and excavation as well as study of the soil.
- Electric line to the switchboard.
- Waste water supply from the process to the plant and from clarifier to final discharge (see supply limits) and to recovery plant.
- Supply and installation of the grounding connections of electrical uses.
- Supply and assembly of all overflow or drainage pipes, internal service sewers, cable ducts, PVC flexible pipes for the chemical reagents, PVC pipes for sludge transport from the oxidation tank to the clarifier and from the clarifier to the sludge recycling tank.
- Treated water supply to the process
- Supply and placing of the flexible sheath for electrical supply of the central column of the clarifier (these pipes are indicated and marked in our drawings)
- Any construction approval from local Authorities.
- Supply of any hoisting and/or laying equipment (cranes, forklift, etc.) both truck mounted or not.
- Lyophilised bacteria and chemicals for start - up operations.
- Plant and service room lighting.
- Telephone line.
- Construction site fencing.
- Any further item not described in the offer.

5 WARRANTEE

The warrantee is sub-divided in the following items:

5.1 EQUIPMENT AND ACCESSORIES QUALITY WARRANTEE

- SIMEM S.r.l. Warrantees that all equipment and accessories are free of defects in material and workmanship, provided that the plant is running and managed as per the instructions by SIMEM S.r.l. (The Warrantee falls off in case the in the manual indicated maintenance will not be carried out.)
- The validity of the above Warrantee lasts for **12 (twelve)** months from the date of plant start – up; this period can not exceed **24 (Twenty)** months from customer's receipt of notification that the ordered equipment and accessories are ready to be delivered.
- All costs pertinent to the transport of the items under Warrantee will be at the customer's charge.
- It is understood that, if in the course of a reparation under Warrantee, the manufacturer should find damage, due to improper use or negligence, the Warrantee will fall off.

ELECTRIC MOTORS AND ALL ELECTRIC EQUIPMENT AND ACCESSORIES ARE VALID FOR WARRANTEE UPTO 12 MONTHS.

5.2 OPERATION WARRANTEE

5.2.1 Outlet Water Characteristics

SIMEM S.r.l. Warrantees that the outlet WWTP water parameters will be at least those described at page 16 of present offer, provided that the plant has been built in proper way and that the inlet water design parameters will not exceed 5 % of those foreseen in phase of designing.

5.2.2 Plant Running Costs

SIMEM S.r.l. Warrantees the plant running costs as per the enclosed tables.

If the chemical physical values of the water at the inlet exceed of indicated values of the tables, which regard aforesaid water, the Warrantee will fall off.

6 PRICE AND PAYMENT TERMS

6.1 PRICE

As equipment and accessories are packed and delivered C.I.F. Mumbai ICD– Ludhiana India. The following prices are excluding any import license fee and/or taxes of the final destination country.

Biological **wastewater treatment plant - Flow 10.000 m³/day :**

Euro 650,000.00

Installation/Commissioning Charges **Rs. 500,000.00**

Sodium Sulphate Brine Recovery Plant - Flow 24 m³/day:

Euro 50,000.00

Grand Total **Euro 700,000.00**

+ Rs. 500,000.00

7 TERMS OF PAYMENT

10% Advance by T/T remittance in favour of SIMEM, Italy
Balance 90% by Confirmed Irrevocable L/C with payment to be released as under:
70% against shipping documents
10% against installation Certificate (not later than 6 months from shipment date)
10% against Final Acceptance Certificate (not later than 6 months from shipment date)
against Performance Bank Guarantee from SIMEM for 25% of contract value (Euro 175,000) valid for 18 Months from the date of advance or 12 moths from the date of commissioning

Our bank details our as follows:

BANCO POPOLARE DI VERONA E NOVARA
Agenzia di Minerbe (VR)
CIN C- ABI 5188 – CAB 59560 – C/C N. 17678
IBAN: IT 28 C 0518859560000000017678

Abhishek Industries Ltd

SIMEM S.r.l.

Stamp

Massimiliano Previdi

Authorized Signature

_____

_____

8 GENERAL TERMS OF SALE

8.1 VALIDITY TERMS

10 days from present offer date.

8.2 PLACE OF DELIVERY

C.I.F. Nhava Sheva ICD Ludhiana - India

8.3 DELIVERY/SHIPMENT

Civil drawing to be despatched within 15 days of receipt of advance payment.

Shipment on board within 90 days of receipt of advance payment subject to L/C receipt 45 days prior to shipment and inspection certificate receipt 10 days prior to shipment.

8.4 FORESEEN FINISHING TERM

4-6 weeks transit /custom clearance time;

1 ½ - 2 months for commissioning and installation,

8.5 SUPPLY LIMITS

As marked on attached drawings

ANY MODIFICATION OR VARIATION ON ITEMS OF THE SUPPLY WILL BE QUOTED AND NEGOTIATED BEFORE ABOVE MODIFICATION OR VARIATION WILL BE PERFORMED.

8.6 SPECIFIC STATEMENT

It is stated that part of the supplied equipment and accessories, e.g. pipes, bolts and nuts, screws, cables etc., are shipped in greater quantities when required for the plant installation, in order to avoid, during the assembly, any shortage of those items which are rare to find locally.

After delivery in your hands of the completely installed plant, all left over items remain property of SIMEM S.r.l.

The Customer shall take care of the preservation in a proper way of the above-mentioned items till SIMEM S.r.l. will collect all or part of them, or leave them at the Customer's disposal.

MOREOVER WE INFORM YOU THAT UPON SEPARATED OFFER AND NEGOTIATION SIMEM S.R.L. COULD PROVIDE FOR A CONTINUOUS TECHNICAL ASSISTANCE TO THE CUSTOMER, IN ORDER TO HAVE A CORRECT PLANT MANAGEMENT. SCHEDULED SITE INSPECTIONS AND DISCHARGE WATER ANALYSIS WILL BE PERFORMED. ALL PROCESS STAGES WILL BE CONTROLLED DURING THE ABOVE-MENTIONED INSPECTION AND THE STAFF WILL BE INFORMED ABOUT ANY VARIATION OR PROCESS MODIFICATION.

8.7 LIEN

The plant remains property of SIMEM S.r.l. until the complete fulfilment of the by the client assumed obligation.

8.8 CONTRACT RESOLUTION CLAUSE

Non payment-in-full by the established date in the contract, or of an instalment of the amount in the event that instalment payment has been decided, will give SIMEM S.r.l. the right to declare the contract null and void and to keep as a penalty the from the client received sum to date, without prejudice to their right to compensation for additional damages and for the defaulting client under obligation, to return the plant.

8.9 TESTING AND ACCEPTANCE OF THE PLANT

In the event the client refuses to participate in the verification of the plant or to accept the plant and if SIMEM S.r.l. does not consider as justified this refusal of the client, the testing of the plant will be executed by a technician designated by the contracting parties, or designated by the presiding judge of the Court of Law in Verona (Italy) in the event that an agreement could not be reached, on request of the more diligent party and giving notice to the other.

The judgement of the testing technician, thus designated, on the correspondence or less of the plant to that established in the contract, will be binding for the parties as a contractual estimate.

8.10 TRANSPORT

The plant parts and machinery will be shipped at the client's risk even if forwarded at charge or by means of SIMEM S.r.l.

8.11 APPLICABLE LAWS AND THE COMPETENT COURT OF LAW

This contract is subject to the Italian Law; any controversy will subject to the Court of Law of Verona (Italy), to whom exclusive jurisdiction has been attributed by mutual consent.

VENDOR LIST

TYPE OF MACHINERY	MANUFACTURER	COUNTRY
Brush Automatic Screen	Simem/Cosme	Italy
Lifting Pump	Grundfos	Finland
Ejecting Pump	Grundfos	Finland
Blower	Robuschi	Italy
Diffuser	EDI	USA
Pipe Line - Stainless Steel AISI 304	Simem	Italy
Carpentry	Simem	Italy
Scraping Bridge	Simem	Italy
Switchboard	Simem	Italy
PLC	Siemens	Germany

PUNJAB POLLUTION CONTROL BOARD
VATAVARAN BHAWAN, PATIALA

No. EE (HWM) /2012/ 5201C Regd. Dated 17-12-12

To

M/s Trident Ltd. (TTD),
Mansa Road, Village Dhaula,
Distt. Barnala.

Subject: **Authorization for operation of a facility for collection, storage and disposal of hazardous wastes generated M/s Trident Ltd.(TTD), Mansa Road, Village Dhaula; Distt. Barnala under Rule 5 of the Environment (Protection) Act, 1986.**

1

(a)	Number of authorization	:	HMC/SGR /2012-17/R-2444
(b)	Date of issue	:	13/12/2012
(c)	Date of Expiry	:	12/12/2017
(d)	Category of hazardous wastes	:	5.1,5.2,15.2,21.2, 33.3,34.3 & 35.3 Of Schedule-I of Hazardous Wastes (Management, Handling & Transboundary Movement) Rules, 2008
(e)	Quantity of hazardous wastes	:	5.1 = 2 KL/year 5.2 = 100 Nos./Year and 1.2 TPA 15.2 =7.5 TPA 21.2 =100 Nos/Year 33.3 =212 TPA 34.3 = 7.3 TPA 35.3 = 7 TPA
(f)	Scale	:	Large

2 Sh Chander Punaini of M/s Trident Ltd.(TTD), is hereby granted an authorization to operate a facility for collection and storage of hazardous waste in the premises situated at, Village Dhaula, Distt. Barnala.

3. The authorization is granted to operate a facility for collection, storage and disposal of hazardous wastes.
4. The industry will dispose off its hazardous waste to authorized recycler as per the Hazardous Wastes (Management, Handling & Transboundary Movement) Rules, 2008.
5. The industry shall apply for renewal of Authorization two months before the expiry of this authorization.
6. The Authorization is subject to the conditions as attached and such conditions as may be specified in the rules for the time being in force under the Environment (Protection) Act 1986.
7. The industry shall maintain the record with respect to its Hazardous Waste category of 33.3, store the same in environmentally sound manner and will give the same to registered recycler having valid authorization of the Board.
8. The industry shall shift its already generated Hazardous Waste category of 5.1 to registered recycler having valid authorization of the Board.

Environmental Engineer (HWM)

Endst. No.HWM/2012/_____ Dated

A copy of the above is forwarded to the Environmental Engineer, Punjab Pollution Control Board, Regional Office, Sangrur for information.

Environmental Engineer (HWM)

TERMS AND CONDITIONS OF AUTHORIZATION

1. The authorized person shall comply with the provisions of the Environment (Protection) Act 1986 and the Rules made there under.
2. The authorization or its renewal shall be produced for inspection at the request of an officer authorized by the Board.
3. The person authorized shall not rent, lend, sell, dispose, transfer or transport the hazardous wastes to other place without obtaining the prior permission of the Board.
4. Any unauthorized change in personnel, equipment and working conditions as mentioned in the application by the person authorized shall constitute a breach of his authorization.
5. It is the duty of the authorized person to take prior permission of the State Pollution Control Board to close down the facility.
6. An application for the renewal of an Authorization shall be made as laid down under these Rules.
7. The occupier generating hazardous waste/operator of a facility for collection and storage of hazardous waste shall maintain records of such operations in Form-3
8. The occupier/operator of a facility shall send annual returns to the Board in Form-4 on or before 30th day of June following to the financial year to which that return relates.
9. The Authorized Person shall report, about the accident which occurs at the hazardous waste storage/treatment site immediately to Board.
10. An occupier who is generating hazardous waste shall store his waste category wise on site in environmentally sound manner till its treatment.
11. An occupier/generator shall not store hazardous wastes in open ground. It must be stored in an isolated site away from plant operational area.
12. The storage tank/container of the hazardous waste should be in good condition and made of (or lined with) an appropriate material which does not react with the waste contained in it and can withstand the physical and environmental conditions during storage and handling.
13. The occupier generating hazardous waste shall mark each container holding hazardous waste with the marking "HAZARDOUS WASTE" both in English and Punjabi.
14. The storage area should be fenced properly and a sign Board indicating "DANGER" and 'HAZARDOUS WASTE' sign & nature of the waste shall be placed at storage site
15. The occupier generating hazardous waste shall provide the required safety devices like safety mask, goggles, hand-gloves, gum boots etc to the workers for handling the hazardous waste. The occupier shall impart training to the personnel/workers for handling and storage of hazardous wastes.
16. There should be sufficient & efficient provisions to avoid under ground water contamination from waste storage operations. The quality of ground water where the waste has been stored shall be monitored by the industry.
17. The occupier shall be responsible for any damage of life/or property during storage of his waste and will obtain Public Liability Insurance, wherever applicable
18. The occupier and operator of a facility shall also be liable to reinstate or restore damaged or destroyed elements of the environment at his cost, failing which the occupier or the operator of a facility, as the case may be, shall be liable to pay the entire cost of remediation or restoration and pay in advance an amount equal to the cost estimated by the State Pollution Control Board.
19. The industry shall take steps wherever feasible, for reduction in hazardous waste generated or recycled or reused.
20. The industry shall display on line data outside the main factory gate on display Board of size (6ft x 4ft) on quantity and nature of hazardous chemicals being used in the plant, Water & Air emissions and hazardous waste generated within the factory premises.
21. The industry shall handle the hazardous waste strictly in accordance with the provisions of Hazardous Wastes (Management, Handling & Transboundary Movement) Rules, 2008 and guidelines issued by Central Pollution Control Board/ Ministry of Environment & Forests, New Delhi.
22. Non compatible hazardous waste and material shall not be mixed in the same storage container
23. The occupier who is generating hazardous waste shall draw an emergency plan for on site storage of hazardous waste inside its premises.
24. The industry will dispose off its hazardous waste authorized recycler as per Hazardous Wastes (Management, Handling & Transboundary Movement) Rules, 2008.
25. The occupier of the transport facility shall ensure that the hazardous waste are shifted in the container in a manner suitable for handling storage and transport and the labeling and packaging shall be easily visible and able to withstand physical condition and climatic factors.

26. Packaging, Labeling of Used /waste oil shall be in accordance with the provisions of the rules made by the Central Government under the Motor Vehicles Act, 1988 and other guidelines issued from time to time.
27. All hazardous waste chamber shall be provided with a general label as given in Form-8.
28. No transporter shall accept hazardous waste from any occupier for disposal unless. It is accompanies by five copies of the manifest (form-9) as per the colour codes. The transporter shall give a copy of the manifest signed the dated in the occupier and retain the remaining four copies to be sued as prescribed in sub-rule(5).
29. The occupier shall provide the transporter of six copies of the manifest as per the colour code indicated below:-

Copy 1 (White)	Forwarded to the Punjab Pollution Control Board by the Occupier.
Copy 2(Light Yellow)	Signed by the Transporter and retained by the Occupier
Copy 3(Pink)	Retained by the Operator of a facility.
Copy 4(Orange)	Returned to the Transporter by the operator of facility after accepting waste.
Copy 5(Green)	Forward to Punjab Pollution Control Board. By the operator of facility after disposal
Copy 6(Blue)	Returned to the Occupier by the operator of facility after disposal.

30. The occupier shall obtain necessary No Objection Certificate from State Pollution Council Board in the respective states involved in case of any inter and intra State Transport of hazardous waste .
31. The occupier shall provide the transporter with relevant information in the Form-10, regarding the hazardous nature of the wastes and measures to be taken incase of an emergency.
32. The transporter shall transport the hazardous waste only in the vehicles authorized for transportation of hazardous waste.
33. The person authorized for transportation of hazardous waste shall prior permission of the Board to close down the transportation facility.
34. The authorization is subject to the conditions mentioned above and also to such conditions as specified in the Hazardous waste (Management & Handling) Rules as amended from time to time framed under the Environment (Protection) Act 1986.

Environmental Engineer (HWM)

Annexure-III

PUNJAB POLLUTION CONTROL BOARD

Zonal Office-2, Vatavaran Bhawan, Nabha Road, Patiala - 147001

Website- www.ppcb.gov.in

Office Dispatch No : Registered/Speed Post Date:

Industry Registration ID: R12R1822182 Application No : 9672223

To,

Deepak Nanda
Trident Complex, Rajpur Road,sangehra
Barnala,Barnala-148101

Subject: Renewal of consent to operate an outlet u/s 25 of the Water (Prevention & Control of Pollution) Act, 1974.

1. Particulars of Consent to Operate under Water Act, 1974 granted to the Industry

Consent to Operate Certificate No.	CTOW/Renewal/BAR/2019/9672223
Date of issue :	30/03/2019
Date of expiry :	31/03/2020
Certificate Type :	Renewal
Previous CTO No. & Validity :	CTOW/Renewal/BAR/2018/7219447 From:31/03/2018 To:31/03/2019

2. Particulars of the Industry

Name & Designation of the Applicant	Mr.Rajat Monga (President-Sustainability Plt)
Address of Industrial premises	Trident ltd (hwf) Trident complex, mansa-road, vill-dhandi, Barnala,Barnala-148107
Capital Investment of the Industry	157010.38 lakhs
Category of Industry	Red
Type of Industry	Other
Scale of the Industry	Large
Office District	Barnala

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Annexure-IV

Trident Ltd (Hsd), Trident complex, mansa-road, vill-dhuula, Barnala Barnala

PUNJAB POLLUTION CONTROL BOARD

Zonal Office-II, Vatavaran Bhawan, Nabha Road, Patiala.

Website:- www.ppcb.gov.in

Industry ID:R12BARR22182

No:R16BARCTOA3718123 -1831 Registered Date:27/04/2016

To

M/s Trident ltd (htd)
Trident complex, mansa-road, vill-dhuula
Barnala
148107
Tehsil: Barnala
District: Barnala

Subject:- Extension in validity of consent to operate an industrial plant u/s 21 of the Air (Prevention & Control of Pollution) Act, 1981.

21 of TAP Act

Reference :R16BARCTOA3718123 Application No :3718123 Date :27/04/2016

This has reference to your request for extension in the validity of consent granted by the Board to operate an industrial plant u/s 21 of the Air (Prevention & Control of Pollution) Act, 1981.

The validity of consent granted to the industry to operate an industrial plant u/s 21 of the Air (Prevention & Control of Pollution) Act, 1981, vide no. SEE/ZP-II/SGR/2010-11/V(325)239 dated. 23/07/2010 having validity upto 06/04/2013, transferred in the name of M/s. Trident Ltd. (TTD) vide letter no. 3487 dated. 03/10/2011 and extended upto 06/04/2016, is hereby further extended upto 31.03.2021 in the name of M/s. Trident Ltd., Home Towel Division (HTD) with the same terms & conditions as mentioned in the consent granted to the industry vide Board's letter no. 1581 dated. 15/03/2013.

same terms & conditions

This letter be appended with the consent issued to the industry under the said Act and subsequent extensions thereof.

27/4/16

for and on behalf of
Punjab Pollution Control Board

Endst. No. _____ Dated _____

A copy of the above is forwarded to the Environmental Engineer, Punjab Pollution Control Board, Regional Office, Sangrur for information.

for and on behalf of
Punjab Pollution Control Board.

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Regional Director

भारत सरकार Annexure-V
केन्द्रीय भूमि जल प्राधिकरण
जल संसाधन, नदी विकास
और गंगा संरक्षण मंत्रालय

Government of India
Central Ground Water Authority
Ministry of Water Resources,
River Development & Ganga Rejuvenatio

CGWA/IND/Proj/2018-311-R

No.21-4(85)/NWR/CGWA/2007- 1430

Dated:- 12 JUL 2018

To

M/s Trident Ltd., (Paper Division)
Mansa Road, Village Dhaula, Block Barnala,
District Barnala, Punjab - 148101

Sub:- Renewal of NOC for ground water withdrawal to M/s Trident Ltd., (Paper Division) in respect of their existing Paper Manufacturing unit located at Village Dhaula, Block & District Barnala, Punjab - reg.

Refer to your application dated 13/04/2018 on the above cited subject. Based on recommendations of Regional Director, Central Ground Water Board, North Western Region, Chandigarh vide their office letter No. 4(172)A-PB/TRIDENT(PCD)/NWR/S&I/2017 dated 04/06/2018, and further deliberations on the subject, the renewal of NOC issued vide this office letter of even no. dated 30/04/2015 is hereby accorded to M/s Trident Ltd., (Paper Division) in respect of their existing Paper Manufacturing unit located at Village Dhaula, Block & District Barnala, Punjab. The renewed NOC is valid from 06/07/2018 to 05/07/2023 and subject to the following conditions:-

1. The firm may continue to abstract 6,168 cu.m/day (not exceeding 22,51,320 cu.m/year) ground water through seven (7) existing tube wells only. No additional ground water abstraction structures shall be constructed for this purpose without prior approval of the CGWA.
2. All the wells shall remain fitted with digital water meters by the firm at its own cost and monitoring of monthly ground water abstraction data of each well shall be recorded in a log book.
3. M/s Trident Ltd., (Paper Division), shall, continue to implement ground water recharge measures to the tune of 46,96,730 m^3/year for augmenting the ground water resources of the area. Firm shall also undertake periodic maintenance of recharge structures at its own cost.
4. The firm shall install two (2) additional piezometers for monthly ground water level monitoring. The firm shall install digital water level recorders on all the three (3) piezometers and telemetry system on one of the piezometers. The firm shall share the user ID and password of the telemetry system with the Regional Director, Central Ground Water Board, North Western Region, Chandigarh.
5. The ground water quality shall be monitored once in a year during pre monsoon period.

-16-

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6. The ground water monitoring data in respect of S. No. 2, 4 & 5 shall be submitted to the Regional Director, Central Ground Water Board, North Western Region, Chandigarh on regular basis at least once in a year.
7. The firm shall ensure proper recycling and reuse of waste water after adequate treatment.
8. Action taken report in respect of S.N o. 1 to 7 shall be submitted to CGWA within one year period.
9. The NOC is liable to be cancelled in case of non-compliance of any of the conditions as mentioned in S. No. 1 to 8.
10. This NOC is subject to prevalling Central/State Government rules/laws or Court orders related to construction of tubewell/ground water withdrawal/construction of recharge or conservation structures/discharge of effluents or any such matter as applicable.
11. This NOC does not absolve the applicant / proponent of his obligation / requirement to obtain other statutory and administrative clearances from other statutory and administrative authorities.
12. The NOC does not imply that other statutory / administrative clearances shall be granted to the project by the concerned authorities. Such authorities would consider the project on merits and be taking decisions independently of the NOC.

Regional Director

Copy to:

1. The Member Secretary, Punjab State Pollution Control Board, Vatavaran Bhawan, Patiala, Punjab with a request to ensure that the conditions mentioned in the NOC are complied by the firm in consultation with the Deputy Commissioner, District Barnala, Punjab.
2. The Deputy Commissioner (Revenue), District Barnala, Punjab for necessary action.
3. The Regional Director, Central Ground Water Board, North Western Region Chandigarh. This has reference to your recommendation dated 04/06/2018.
4. Guard File 2018-19.

Regional Directo

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Annexure-VI

Regional Director

भारत सरकार
केन्द्रीय भूमि जल प्राधिकरण
जल संसाधन, नदी विकास
और गंगा संरक्षण मंत्रालय

Government of India
Central Ground Water Authority
Ministry of Water Resources,
River Development & Ganga Rejuvenatic

CGWA/IND/Proj/2018-310-R

No.21-4(169)/NWR/CGWA/2008- 1487 Dated:- 12 JUL 2018

To

M/s Trident Ltd., (Terry Towel Division)
Mansa Road, Village Dhaula, Block Barnala,
District Barnala, Punjab - 148101

Sub:- Renewal of NOC for ground water withdrawal to M/s Trident Ltd., (Terry Towel Division) in respect of their existing Terry Towel and Dyed Yarn Manufacturing unit located at Village Dhaula, Block & District Barnala, Punjab - reg.

Refer to your application dated 23/03/2018 on the above cited subject. Based on recommendations of Regional Director, Central Ground Water Board, North Western Region, Chandigarh vide their office letter No. 4(172)A-PB/TRIDENT(HTD)/NWR/S&I/2017-698 dated 04/06/2018, and further deliberations on the subject, the renewal of NOC issued vide this office letter of even no. dated 30/04/2015 is hereby accorded to M/s Trident Ltd., (Terry Towel Division) in respect of their existing Terry Towel and Dyed Yarn Manufacturing unit located at Village Dhaula, Block & District Barnala, Punjab. The renewed NOC is valid from 06/07/2018 to 05/07/2023 and subject to the following conditions:-

1. The firm may continue to abstract 7,092 cu.m/day (not exceeding 25,88,580 cu.m/year) ground water through five (5) existing tube wells only. No additional ground water abstraction structures shall be constructed for this purpose without prior approval of the CGWA.
2. All the wells shall remain fitted with digital water meters by the firm at its own cost and monitoring of monthly ground water abstraction data of each well shall be recorded in a log book.
3. M/s Trident Ltd., (Terry Towel Division), shall, continue to implement ground water recharge measures to the tune of 33,36,130 m^3/year for augmenting the ground water resources of the area. Firm shall also undertake periodic maintenance of recharge structures at its own cost.
4. The firm shall install two (2) additional piezometers for monthly ground water level monitoring. The firm shall install digital water level recorders on all the three (3) piezometers and telemetry system on one of the piezometers. The firm shall share the user ID and password of the telemetry system with the Regional Director, Central Ground Water Board, North Western Region, Chandigarh.

18/11 Jamnagar House, Mansingh Road, New Delhi-110011

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5. The ground water quality shall be monitored once in a year during pre monsoon period.
6. The ground water monitoring data in respect of S. No. 2, 4 & 5 shall be submitted to the Regional Director, Central Ground Water Board, North Western Region, Chandigarh on regular basis at least once in a year.
7. The firm shall ensure proper recycling and reuse of waste water after adequate treatment.
8. Action taken report in respect of S.N o. 1 to 7 shall be submitted to CGWA within one year period.
9. The NOC is liable to be cancelled in case of non-compliance of any of the conditions as mentioned in S. No. 1 to 8.
10. This NOC is subject to prevailing Central/State Government rules/laws or Court orders related to construction of tubewell/ground water withdrawal/construction of recharge or conservation structures/discharge of effluents or any such matter as applicable.
11. This NOC does not absolve the applicant / proponent of his obligation / requirement to obtain other statutory and administrative clearances from other statutory and administrative authorities.
12. The NOC does not imply that other statutory / administrative clearances shall be granted to the project by the concerned authorities. Such authorities would consider the project on merits and be taking decisions independently of the NOC.

Regional Director

Copy to:

1. The Member Secretary, Punjab State Pollution Control Board, Vatavaran Bhawan, Patiala, Punjab **with a request to ensure that the conditions mentioned in the NOC are complied by the firm in consultation with the Deputy Commissioner, District Barnala, Punjab.**
2. The Deputy Commissioner (Revenue), District Barnala, Punjab for necessary action.
3. The Regional Director, Central Ground Water Board, North Western Region, Chandigarh. This has reference to your recommendation dated 04/06/2018.
4. Guard File 2018-19.

Regional Director

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Annexure-VII

GOVT. OF PUNJAB
DEPARTMENT OF IRRIGATION
(IRRIGATION WORKS BRANCH)

To

The Chief Engineer/Drainage,
Irrigation Works, Punjab,
Chandigarh.

Memo No:- 2/7/02-IW(5)/
Dated; Chd; the

Subj:- Request for grant of permission to put treated effluen into Dhanaula Drain.

Reference your letter No. 568/4Floods/2003 dated 23.1.2003 on the subject citen above.

2. Sanction is hereby accorded to allow the firm namely M/s Abhishek Industries ltd. (Paper & Chemical Division and Terr Towel Devision) Trident Complex, Sanghera, Barnala(Pb.) to put the treated effluent in the Dhanaula Drain subject to the condition imposed by Punjab Polution Control Board. It is also made clear that if complication of any kind, will arise, the Government can withdraw its decision. The concerned firm may be made abundantly clear that the effluent treated plant would run efficiently and kept as prescibed norms/standards of P.P.C.B. from time to time.

sd/--
UNDER SECRETARY IRRIGATION

Endst.No. 2/7/02-IW(5)/2154 Dated; Chd; the 3-2-2003

A copy is forwarded to the M/s Abhishek Industries ltd. Trident Complex, Sanghera, Barnala(Pb.) for information.

Sham Lal Sharma
UNDER SECRETARY IRRIGATION

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No. 3073 SP /3-W Dt. 24/X /05.

To

The Business Head,
Abhishek Industry Ltd.,
Trident Group
Dhaula (Tehsil
Barnwal Distt. Sangrur.

Sub:- Agreement for contract for bulk supplies of water from Upli disty. for industrial purpo

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Please find enclosed herewith the photo stat copy of Agreement for contract for bulk supplies of water from Upli disty. for Industrial purpose. This is for your information.

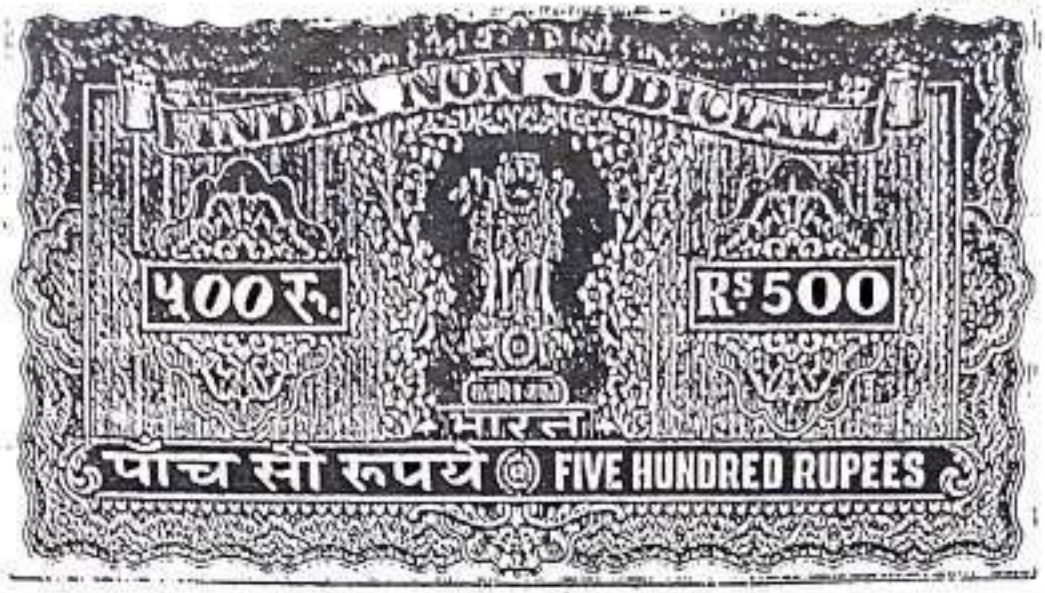
Executive Engineer,
Sangrur Divn.I.D.
Sangrur.

RA/
As above.

CC:- To Sub-Divisional Officer, Harigarh Sub-Divn.I.D. Harigarh for information.

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500Rs



AGREEMENT

Agreement for contract for bulk supplies of water from Uppli distributary's for Industrial purpose.

Agreement entered into 6th day of May' 2005, between the Govt. of Punjab acting at present through the Executive Engineer Sangrur Division I.D.Sangrur and here is after on behave of himself and his successor called the supplier on one part and direct /Vice president Abhishek Industries Limited, Trident Group, Sanghera, Bamala, Distt. Sangrur and here and after on behalf of himself, his executors, administrators & representatives called the consumer on the other part.

Whereas the supplier has agreed to supply and the consumer has agreed to take/pump canal water after releasing from the said outlet situated at RD 93490/R of Uppli distributary's of taking from Kotla Branch from RD 144650/R in Distt.Sangrur.Subject to stipulation between the parties as follows:-

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Sammpati Rai Rehan
BARNALA

1. The Supplier subject to provision of clause (2) agrees to supply water from the said outlet or any other outlet along the canal, which under full supply conditions in the said is designed to discharge 10.22 cusec at the outlet head but this supply will be subject to the conditions laid down in section 32 of northern India canal and drainage Act VIII of 1873 as amended. This has been allowed by Punjab Govt. Memo No. 11/23/98-8 No (5) 6522 dated 07.04.1999 from the chief Engineer Canals Irrigation Department Punjab, Chandigarh.

2. The Supplier may stop or reduce the supply of water to the outlet such stoppage or reduction should be allowed only after prior notice of 30 days, when ever and so long as it is necessary to stop or reduce such supply of water for the purpose of executing any work order by competent authority for regulating the proper flow of water under his control or maintaining the establishment course of irrigation or extension there of. The consumer shall not be entitled to any compensation / remission of the charges here after specified in respect of losses rising from such stoppage or reduction by failure, stoppage / reduction of water by reason of any cause beyond the control of supplier. Every supply of canal water to which this contract does not apply shall be deemed to be given at the rates and subject to the conditions prescribed by northern India Canal & Drainage Act, VIII of 1873 as amended with the rules and notification there under applicable to this Uppli Distributary's and for the purpose of the section of the said act, the consumer should be deemed to be occupiers.

3. The consumer may stop drawl of the water in case it is not needed with 7 days prior intimation to suppliers authority. Further consumer may reduce the consumption / drawl of water through the outlet based on his actual requirement with an advance notice / information one day and consumer will pay to the supplier on the actual consumption / drawl the water. The amount @ Rs. 32 for 2500 Cft. Of the water (Rs. Thirty two for two thousand five hundred cft.) The bulk supply rate of canal water is as per Govt. of Punjab notification No 10/22/94-Iw (2) / 10440 dated 13.05.2003 The rate for bulk supply can be increased and decreased as per instructions issued by Punjab Govt., time to time.

4. The supplier will adjust the outlet which show or from which can be calculated, this in a simple manner to be explained to the consumer, the discharge of water delivered by the outlet at any time and this fixation of outlet according to sanctioned design shall be the sole measure of the water supplied.

5. Payment shall be made by company / firm with in 30 days from the date of receipt of the bill from the Punjab Irrigation dept. for the quantity of water supplied and if such payment is not so made, the Executive Engineer may refuse to allow any further supply of water after giving one months prior notices in writing.

6 Should the consumer consider that the discharge of outlet under full supply condition is less by more then ten percent as specified in clause (1) when the provision of clause (2) is not in operation, and as measured in the manner written, the supplier shall check the discharge within period of Seven days, provided that during said period there shall have been no interruption of supply under the provision of clause (2). The supplier shall inform the consumers the result of the check. Should the supplier be satisfied that the discharge of the outlet is deficit to the extent referred to the beginning of this clause, he shall cause the defect to be removed within a further period of 15 days.

7 Should the supplier be satisfied at any time that the discharge for the outlet under full supply condition is in excess by more than the 10 percent of the specified in clause (1), the supplier may, after giving 10 days previous notice to the consumer in writing, cause the outlet to be adjusted to give the correct discharge.

8 Provided that the consumer shall not be entitled to any compensation or remission of the charge due under clause (3) on account of shortage in supply vide clause (5) and similarly the supplier shall not be entitled to extra charge in respect of excess supply vide clause (6).

9. The consumers shall not be entitled to claim any remission of the charge due under clause on account of such failure or stoppage of supply of water or from causes mentioned under rule 20-II-IV of the canal Act.

10 Section (34) of the Northern India Canal and Drainage Act No. VIII of 1873 as amended with rule -33 under this Act shall not apply so long as this agreement is in force. However in the event of water being taken after the expiry of this agreement, it shall be deemed to have been taken under the said act, rules and notified action made there under, which shall forthwith apply unless and until a fresh agreement has been duly executed.

11. No permanent structure shall be constructed at the supply Head without the approval of the competent authority of Punjab Irrigation Department and all works within the area of the Department shall be constructed by the Deptt,at the cost of the company firm.

12. If any question difference or objection whatsoever shall arise in anyway connected with or arising out of this instrument within the meaning or out of operation of any part there of or with regard to any rights , duties liabilities of either party under this agreement , then the decision of any such matter as here in before provided for and has been so decided , including whether it has been finally decided accordingly or whether the agreement shall be terminated or has been rightly terminated and as regards the rights and obligation of the parties as the result of such termination, shall be referred for arbitration should be conducted as per the provision of Arbitration & conciliation Act , 1996 and his decision shall be final and binding on the parties concerned.

In witness the parties here to , with there respective hands, put their signature on this 6th day of May' 2005.

Supplier

Executive Engineer,
Sangrur Division I.D.
Sangrur.

Consumer

Manjit Tara
Business Head
Abhishek Industries Limited
Trident Group , Village Dhaula.
Tehl. Barnala, Distt. Sangrur (PB).

WITNESSES:

1. Sub Divisional Officer, Canal Sub Division LADDA

2.

WITNESSES:

1. G. D. Nathani

2.

Annexure-II

Trident ltd (ped),Trident complex, mansa-road, vill-dhaula, Barnala,Barnala

PUNJAB POLLUTION CONTROL BOARD

Zonal Office-II, Vasundra Bhawan, Nabha Road, Patiala

Website: www.ppcb.gov.in

Industry ID:R12BAR25545

No:R16BARCTOA3371425 -324 Registered Date:20/01/2016

21.1.16

To

M/s Trident ltd (ped)
Trident complex, mansa-road, vill-dhaula
Barnala
148101
Tehsil: Barnala
District: Barnala

Subject:- **Extension in validity of consent to operate an industrial plant u/s 21 of the Air (Prevention & Control of Pollution) Act, 1981.**

Reference :R16BARCTOA3371425 **Application No :3371425** **Date :20/01/2016**

This has reference to your request for extension in the validity of consent granted by the Board to operate an industrial plant u/s 21 of the Air (Prevention & Control of Pollution) Act, 1981.

The validity of consent granted to M/s Trident Limited(Paper Divison), Vill. Dhaula, Mansa Road, Tehsil & Distt. Barnala to operate an industrial plant u/s 21 of the Air (Prevention & Control of Pollution) Act, 1981 vide no. SEE(ZP- II)/SGR/APC/2012-13/V-(371)/V-413 dated 23/07/2012 valid upto 22/01/2013 and extended upto 22.01.2016, is hereby further extended upto 31.03.2020 with the same terms & conditions as mentioned in the consent granted to the industry vide Board's letter no. 4056 dated 23.07.2012 and subsequent extension vide letter no. 536 dt. 28.01.2013.

This letter may be appended with the original consent no. SEE(ZP- II)/SGR/APC/2012-13/V-(371)/V-413 dated 23/07/2012, issued to the industry under the said Act, vide Board's letter no. 4056 dated 23/07/2012 and 536 dt. 28.01.2013.

20/1/16.

for and on behalf of the
Punjab Pollution Control Board

Endst. No. _____ Dated _____

A copy of the above is forwarded to the Environmental Engineer, Punjab Pollution Control Board, Regional Office, Sangrur for information and necessary action.

for and on behalf of the
Punjab Pollution Control Board

PUNJAB POLLUTION CONTROL BOARD

Zonal Office-II, Vatavaran Bhawan, Nabha Road, Patiala.

Website:- www.ppcb.gov.in

Industry ID:R16BAR25545

No: R16BARCTOW3373045 -322. Registered

Date: 20/01/2016
21.1.16

To

M/s Trident ltd (ped)
Trident complex, mansa-road, vill-
dhaula
148101
Barnala
Barnala

Subject:- **Extension in validity of consent to operate an outlet u/s 25 of the Water (Prevention & Control of Pollution) Act, 1974.**

Reference :R16BARCTOW3373045 Application No. :3373045 Dated :20/01/2016

This has reference to your request for extension in the validity of consent granted by the Board to operate an outlet of u/s 25 of the Water (Prevention & Control of Pollution) Act, 1974.

The validity of consent granted to M/s Trident Limited(Paper Divison), Vill. Dhaula, Mansa Road, Tehsil & Distt. Barnala to operate an outlet of u/s 25 of the Water (Prevention & Control of Pollution) Act, 1974, vide no. SEE(ZP- II)/SGR/WPC/2012-13/V-(399)/V--518 dated 23/07/2012 valid upto 22/01/2013 and extended upto 22.01.2016, is hereby further extended upto 31.03.2020 with the same terms & conditions as mentioned in the consent granted to the industry vide Board's letter no. 4058 dated 23.07.2012 and subsequent extension vide letter no. 538 dt. 28.01.2013.

This letter may be appended with the original consent no. SEE(ZP- II)/SGR/WPC/2012-13/V-(399)/V-518 dated 23/07/2012, issued to the industry under the said Act, vide Board's letter no. 4058 dated 23/07/2012 and 538 dt. 28.01.2013.

20/1/16.

for and on behalf of the
Punjab Pollution Control Board

Endst. No. _____ Dated _____

A copy of the above is forwarded to the Environmental Engineer, Punjab Pollution Control Board, Regional Office, Sangrur for information and necessary action.

for and on behalf of the
Punjab Pollution Control Board

TRIDENT

Being different is normal

TRIDENT/2019-20/NWR/
14.01.2020

The Regional Director,
Govt. of India
Central Ground Water Board,
North Western Region,
Bhujal Bhawan, Plot No. 3-0,
Sector 27-A,Madhya Marg,
CHANDIGARH-160019

Sub : Submission of Compliance Report in respect of conditions laid down by Central Ground Water Authority in respect to the Home Textiles Division of the Company

Dear Sir,

This has reference to your letter No. CGWA/IND/PROJ/2018-310-R dated 12.07.2018 on the subject cited above.

As required, we are hereby submitting herewith the compliance status as on 31 December 2019 in respect to the conditions laid down by the Central Ground Water Authority while granting the NOC for abstraction of ground water pertaining to the Home Textiles Division of the Company.
This is for your information & records.

Yours faithfully
For Trident Limited
(Home Textile Division)

(Rajat Monga)
Head - Sustainability

Encl:
1.) Annexure-A – Annual Compliance Report
2.) Annexure-1 – Raw Water Abstraction Report
3.) Annexure-2 – Quantum of Recharged Water
4.) Annexure-3 – Ground Water Level
5.) Annexure- 4 – Water Analysis Report (Pre Monsoon)
6.) Annexure- 5 -Treated Waste Water Summary
7.) Annexure- 6 – Effluent Performance Report

C.G.W.B., N.W.R., Chandigarh 20/02/2020

TRIDENT LIMITED (HOME TEXTILE DIVISION) -
VILLAGE – DHAULA, DISTT. - BARNALA
SUB – REPORT – ANNUAL COMPLIANCE REPORT 2019 FOR CGWA

ANNEXURE A

APPROVAL BY GOVT. OF INDIA CENTRAL GROUND WATER AUTHORITY VIDE LETTER NO. CGWA/NOC/ER/01/2018/310 R

S No.	Conditions	Compliances
1	The firm may continue to abstract 7092 m3/day (not exceeding 25,89,580 m3/year) of ground water through existing five (5) tube wells only. No additional ground water abstraction structure to be constructed for the purpose without prior approval of the CGWA	The industry withdraws ground water from the existing tube wells, as presented by Ground water Authority, which is well within the permitted quantum. The Monthly reports of abstraction of Ground water is attached as Annexure-1. No additional abstraction structure exists/has been constructed.
2	All the wells shall remain fitted with digital water meter by the firm at its own cost and monitoring of monthly ground water abstraction data of each well shall be recorded in Log book	The industry has installed digital water flow meters in the pipelines of each ground water abstraction structure and recording daily basis.
3	M/s Trident Limited, (Terry Towel Division) shall continue to implement proved water recharge measures to the tune of 33,36,130 m^3/Year for augmenting the ground water resources of the area. Firm shall also undertake periodic maintenance of recharge structure at its own cost.	The industry has already made the rain water recharge structure within the premises. The industry is recharging ground water upto the mentioned quantum which is attached as Annexure 2
4	The firm shall install two (2) additional Piezometers for monthly ground water level monitoring. The firm shall install digital water level recorder on all the three (3) Piezometers and telemetry system on one of the piezometers. The firm shall share the user ID and Password of the telemetry system with the Regional Director, Central Ground Water Board, North Western Region Chandigarh.	The industry has installed Digital water level recorders with telemetry System for monitoring of Ground water levels. The Report for Ground water level for all three Piezometers is attached as Annexure 3.
5	The ground water quality shall be monitored once in a year during pre monsoon period.	The industry is monitoring ground water quality during pre monsoon season from NABL accredited Laboratories. Pre Monsoon report is attached as Annexure 4
6	The ground water monitoring data in respect to S. No 2, 4 & 5 shall be submitted to Regional Director, Central Ground Water Board, North Western Region Chandigarh on regular basis at least once in a year.	Report is being submitted regularly & we will comply with the same
7	The firm shall ensure proper recycling and reuse of waste water and its full utilization after adequate treatment.	We had commissioned Sewerage Treatment Plant (STP) where proper treatment of the sewerage water is carried out whereby its treated water is used in plantation area. Summary of treated waste water is attached as Annexure 5
8	Action Taken report in respect of S No. 1 to 7 may be submitted to CGWA within one year period.	The present action taken report is being submitted We will comply to all points S no 1 to 7 as per the directions

RAW WATER ABSTRACTION REPORT

ANNEXURE 1

S No.	Month	Total Water abstraction	UOM
1	Jan-19	219617	KL/month
2	Feb-19	198389	KL/month
3	Mar-19	217044	KL/month
4	Apr-19	212538	KL/month
5	May-19	212799	KL/month
6	Jun-19	196619	KL/month
7	Jul-19	190639	KL/month
8	Aug-19	95188	KL/month
9	Sep-19	110627	KL/month
10	Oct-19	195139	KL/month
11	Nov-19	128563	KL/month
12	Dec-19	105933	KL/month
Total Abstraction		2083095	KL/Annum
Total Abstraction		5707	KL/Day

Format for Artificial Recharge proposal inside and outside the Trident Ltd (IITD)

Sr. No	Description of Conditions	Compliance Status
Within the Premises		
	Details of Area may be taken from application and unit should be taken as square meter(m^2) as per application.	102080 m^2
	Annual Rainfall of the district may be taken from revenue record/from IMD website	635.9 mm
	Rainfall unit be taken as meter.	0.635 m
	Annual Runoff generated may be calculated for determining the quantum of rainfall available for recharge.	102080 X 0.6359 X0.9 58421.4 m^3
	Runoff Coefficient may be taken for different type of areas as per following details: (a) Rooftop area - 0.80 to 0.90 (b) Paved/Road area - 0.60 to 0.70 (c) Open/ Greenbelt area - 0.10 to 0.20	Complied
	Annual runoff generated within the premises of project may be calculated as Area (in sq.m) * Runoff Coefficient * Rainfall(in m)	102080 X 0.6359 X0.9 58421.4 m^3
	Hourly Rainfall generated may be taken from intensity of rainfall as mentioned on IMD website; in general for Punjab and Haryana 25 to 30 mm/hr Rainfall may be taken.	Complied
	Then Hourly Runoff generated within the premises may be calculated as Area* Coefficient*Intensity of rainfall (i.e. 0.025 to 0.03 m for Punjab/Haryana)	102080X 0.9 X 0.025 = 2294.3 m^3
	From the quantum of Hourly rainfall generated rainfall number of AR structures to be constructed within the premises may be designed.	3
	Quantum of Rainwater through Individual Recharge structure should also be calculated.	Recharge from 1 well; 0.005* 3600* 24 = 432m³/day
	For example: A recharge pit (Rectangular for this case) have 3 components (free board part, gravel filled part and recharge well part). (I) Volume of water within free board will be = length * breath * depth (II) Gravel filled part will be (volume of water within the pore spaces of sand, gravel filled part) = length * breath * depth *0.35 (this is the porosity) (III) Recharge well through which ground water recharge may be done within Shallow aquifer; for this intake capacity of recharge well may be tested in field. In general intake capacity of recharge well may be taken as 5 to 10 LPS (i.e., 18 to 36m^3/hr) depending upon the hydrogeology. Therefore, total volume to be Recharge through a RWH structure will be – (I) + (II) + (III) Now no. of Recharge structure to be constructed within the premises will be Hourly Rainfall generated within the premises, as mentioned in point no. (9) Divided by point no. (11) (Quantity of water recharge as shown in calculation for individual RWH structure).	(i) 512 m^3 (ii) 575 m^3 (iii) 1296 m^3 (i) + (ii) + (iii) 2186 m^3 i.e 787890 m^3/year
	For design of the structure cgwa.gov.in website may be referred.	Complied

Top of Basin = 32m X 32m
Bottom of Basin = 28m X 28m
Depth of Basin = 3m
Free Board = 0.5m
Volume of water within free board will be = length * breath * depth = 32 X 32 X 0.5 = 512
Capacity of recharge basin = 30 X 30 X 2.5 = 2250 m^3

Filteration Rate = 5cm/Hr = 0.05 Meter/Hr

Gravel filled part will be (volume of water within the pure space of sand, gravel filled part) length * breadth * depth * 0.35

30 X 30 X 1.2 X 0.35 = 378 m³

Total Filteration = 30 X 30 X 0.05 X 24 = 1080 m³/day

Short Fall = 2294-1080 = 1214 m³/day

Recharge through 1 Well = 0.05 X 3600 X 24 = 432 m³/day

No. of recharge well required = 1214/432 ~ 3

Recharge well through which ground water recharge = 432 X 3 = 1296 m³

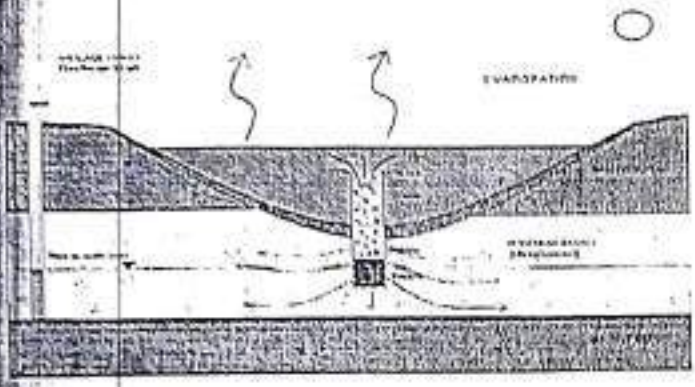
B. Outside the Premises

1	Suitable pond may be adopted in the villages / if sufficient space is available within the premises new pond may be constructed or any building premises may be adopted within the same assessment unit. For this NOC/agreement should be obtained from the proprietor of the building.	Complied
2	NOC/agreement from Sarpanch/Panchayet regarding pond adoption may be taken by the industries. Dimension of the pond should also me mentioned in NOC. Preferably it should be geotagged. Dimension of the pond should be clearly mentioned in NOC by Sarpanch.	NOC has been already submitted and details have been described in point no. (06)
3	Depth of pond may be enhanced to accommodate more water for Harvesting.	Complied
4	Catchment area of the pond may be taken from map	Complied
5	Rainfall from catchment area will flow towards to pond and fill the pond.	Complied
6	A general calculation is given in following table for runoff computation	

SR.NO	Village	Block	Area of the pond (in meter)	Enhanced Depth or Depth of the pond (in meter)	Volume of the pond (in cubic meter)	Catchment Area (in square meter calculated from the outside area of the pond)	Runoff generated from catchment area (Area*Coefficient*Rainfall(in meter annually))	Total water harvested in pond annually (Volume of the pond*No. of fillings in a year)
1	Pakho Kalan	Barnala	14040.0	3.3	46800	6209584.1	592301.2	592301.2
2	Pirtha Patti	Barnala	12657.1	4.7	59066.67	6149865.4	586604.9	586604.9
3	Rure ke kalan	Barnala	12885.7	4.7	60133.33	10471370.9	998811.7	998811.7
4	Dilaspur pindi Dhaula	Barnala	12866.7	4.0	51466.67	5799873.1	553220.9	553220.9
5	Fatehpur Pindi Dhaula	Barnala	10114.3	4.7	47200	5760873.9	549501.0	549501.0
6	Harvilaye	Barnala	25625.0	5.3	136666.7	6824850.7	650988.4	650988.4
7	Sekha	Barnala	12060.5	5.7	73733.33	11449749.4	1092134.4	1092134.4
								5021562.5

	Therefore quantity of recharge may be calculated only taking the volume of pond and numbers of fillings. Total water harvested = Total Water to be filled in the pond annually.	5021562.5 m³/year
	For pond recharge, if shallow aquifer exist within a depth of 5-10 meter, then recharge shaft may be inserted at the bottom of the pond or recharge well may be inserted when depth of sand zone occurs in more than 10 meter depth.	Complied

	As per GEC 97 norms regarding GW resource assessment seepage from tanks and ponds may be taken as 1.4 mm/day over the average water spread area.	Complied
	Design may be referred from cgwb.gov.in website.	Complied
	Village waste water should not be allowed to be filled in the pond.	Complied



RECHARGE VOLUME CALCULATION - HTD

Business	UoM	HTD
Total Water Generation	KLD	7091
No. of Days	Days	350
Total Water Generation	KL/Annum	2481999
Recharge Volume Requirement	KL/Annum	4963999

GROUND WATER LEVEL RECORD (Jan 2019 - Dec 2019)

ANNEXURE 3

S No.	Month	Date	Piezometer 1	Piezometer 2	Piezometer 3
1	Jan-19	10.01.19	37.40	37.80	37.90
2	Jan-19	23.01.19	37.50	37.80	37.90
3	Feb-19	12.02.19	37.60	37.90	38.20
4	Feb-19	26.02.19	37.80	38.00	38.20
5	Mar-19	12.03.19	37.90	38.10	38.30
6	Mar-19	26.03.19	38.00	38.20	38.30
7	Apr-19	14.04.19	38.10	38.20	38.40
8	Apr-19	27.04.19	38.10	38.30	38.50
9	May-19	15.05.19	38.10	38.40	38.60
10	May-19	28.05.19	38.20	38.30	38.70
11	Jun-19	16.06.19	38.20	38.40	38.90
12	Jun-19	29.06.19	38.40	38.80	39.10
13	Jul-19	14.07.19	38.60	38.90	39.20
14	Jul-19	27.07.19	38.90	38.90	39.20
15	Aug-19	17.08.19	39.00	39.00	39.40
16	Aug-19	28.08.19	39.20	39.10	39.40
17	Sep-19	10.09.19	39.20	39.20	39.60
18	Sep-19	26.09.19	39.40	39.10	39.40
19	Oct-19	10.10.19	39.55	39.20	39.60
20	Oct-19	25.10.19	39.75	39.20	39.80
21	Nov-19	12.11.19	40.07	40.34	40.00
22	Nov-19	28.11.19	39.76	39.93	40.77
23	Dec-19	16.12.19	39.49	39.62	40.46
24	Dec-19	27.12.19	39.41	39.49	40.31

Idma Laboratories Limited

(A Government Approved Test House)

NABL (TC-0207) MOEF/CPCB/SPCBs/State Pollution Boards/Mfg & Cosmetic Act/ISO 9001: 14001, 18001 Certified

TEST REPORT

Ref. No. IL/D. 3051	Date 29-06-19	Lab No. 1406188-FO 818		Page No. 1/3
Customer	Trident Limited (Home Textile Division) Mansa Road,Dhandu Ramtalai, Punjab Punjab			
Type of Sample	Raw Water			
Customer's Description of Sample	Raw Water			
Quantity	3 Ltr. + 250 ml			
Packing, Markings, Seal & Quantity	Plastic Can & Glass Bottle			
Mode of Collection of Sample	Sampling By Laboratories			
Work Order No.	0990014480		Dated	21/05/2019
Date of Receipt of Sample	14/06/2019			
Period of Analysis	14/06/2019 To 20/06/2019			
Sampling Team Idma	Mr. Shalul Singh & Team		Client	Mr. Gurpreet
Sampling Location	Bonswal Water			
Visual Observation	N/A			
Date of Sampling	13/06/2019			
Date of Reporting	20/06/2019			
Sampling Protocol	IS: 3025-1987 & IL/MD/SOP/034			
Testing Protocol	IS 10500:2012 Amdt 1			

RESULTS

S.No.	Test Parameter	Units	Results	Requirements		Test Methods
				Acceptable Limit (Max)	Permissible Limit (Max)	
A	Chemical Testing, Water					
1	Color	Hazen	<1	5	15	IS 3025 (P-4) 1983 (RA 2017)
2	Odour	Qualitative	Agreeable	Agreeable	Agreeable	IS 3025 (P-5) 1983 (RA 2017)
3	pH	-	7.4	6.5-8.5	No Relaxation	IS 3025 (P-11) 1983 (RA 2017)
4	Alkalinity as CaCO3	mg/L	108	200	600	IS 3025 (P-23) 1986 (RA 2014)
5	Urea	mg/L	BLQ (LOQ 0.02)	0.5	1.0	IS 3025 (Part 67) 2005(RA 2017)
6	Calcium as Ca	mg/L	40	75	200	IS 3025 (P-40) 1991 (RA 2014) EDTA Method
7	Cyanide CN	mg/L	BLQ (LOQ 0.02)	0.05	No Relaxation	IS 3025 (P-27) 1988 (RA 2014)
8	Fluoride as F	mg/L	0.8	1	1.5	APHA 4500 D 23rd Edition, 2017 SPADNS Method
9	Hardness Total (as CaCO3)	mg/L	116	200	600	IS 3025 (P-21) 2009(RA 2014) EDTA Method
10	Nitrogen (Nitrate) NO3	mg/L	0.41	45	No Relaxation	IS 3025 (P-34) 1988 (RA 2014)
11	Phenolic Compounds as C6H5OH	mg/L	BLQ (LOQ 0.001)	0.001	0.002	IS 3025 (P-43) 1992 (RA 2014) 4 Aminoantipyrine Method

Idma Corporate Park, 301, Industrial Area, Phase-I, Panchkula, Haryana
Tel. No. : 0172- 5004027, 5004030
Website : www.idmagroup.co.in E-mail : testing@idmagroup.co.in

Page 1 of 3

TEST REPORT

Ref. No. IL/-3051 | Date 29.06.17 | Lab No. 1405191-FD-01(i) |

S.No.	Test Parameter	Units	Results	Requirements		Test Methods
				Acceptable Limit (Max)	Permissible Limit (Max)	
12	Total Dissolved Solids	mg/L	1120	500	2000	IS 3025 (P-16) 1984 (RA 2017)
13	Sulphate as SO4	mg/L	18	200	400	IS 3025 (P-24) 1986 (RA 2019) Turbidity Method
14	Surfactants (Anionic as MBAS)	mg/L	BLQ (LOQ 0.02)	0.2	1.0	Annexure K IS 13428:2005 & APHA 5540C 23rd Edition, 2017
15	Turbidity	NTU	<1	1	5	IS 3025 (P-10) 1984 (RA 2017) Nephelometric Method
16	Taste	Qualitative	Agreeable	Agreeable	Agreeable	IS 3025 (Pt. 8) 1984
17	Ammonia	mg/L	BLQ (LOQ 0.1)	0.5	No Relaxation	IS 3025 (P-34) 1988(RA 2014)
18	Chloramines	mg/L	BLQ (LOQ 0.1)	4.0	No Relaxation	IS: 3025 (P-26)-1986(RA 2014)
19	Mineral oil	mg/L	BLQ (LOQ 0.1)	0.5	No Relaxation	IS:3025 Cl 0.0(P-39)1991(RA 2014)
20	Sulphide	mg/L		0.05	No Relaxation	IS: 3025 (P-29) 1986(RA 2014)
21	Chromium (Hexavalent)	mg/L	BLQ (LOQ 0.001)	-	-	IS 3025 (P-52) 2003(RA 2014)
22	Cadmium	mg/L	BLQ (LOQ 0.001)	0.003	No Relaxation	IS:3025 (P-41) 1992 (RA 2014), Direct AAS Method
23	Copper as Cu	mg/L	BLQ (LOQ 0.001)	0.05	1.5	IS:3025 (P-42) 1992 (RA 2014)(Direct/ A Air Flame AAS Method
24	Iron as Fe	mg/L	BLQ (LOQ 0.001)	0.3	No Relaxation	IS 3025 : Part 53 : 2003(RA 2014)
25	Lead as Pb	mg/L	BLQ (LOQ 0.001)	0.01	No Relaxation	IS 3025 (P-47)1992 (RA 2014)(Direct/Extract A-Air Flame AAS Method
26	Manganese as Mn	mg/L	BLQ (LOQ 0.001)	0.1	0.3	IS 3025 (P-47)1992 (RA 2014)Direct/Extract A-Air Flame AAS Method 31110/C
27	Nickel as Ni	mg/L	BLQ (LOQ 0.001)	0.02	No Relaxation	IS 3025 : Part 54 : 2003(RA 2014)
28	Zinc as Zn	mg/L	BLQ (LOQ 0.001)	5	15	IS 3025 (P-49) 1994 (RA 2014)
29	Aluminum	mg/L	BLQ (LOQ 0.001)	0.03	0.2	IS 3025 (Pt. 55)2003 (RA 2014)
30	Barium	mg/L	BLQ (LOQ 0.001)	0.7	No Relaxation	Id : 13428 Annexure - P/ IS 3025 (P-55)2003(RA 2014)
31	Selenium	mg/L	BLQ (LOQ 0.001)	0.01	No Relaxation	IS 3025(P-56)2003(RA 2014)by AAS /ICP
32	Silver	mg/L	BLQ (LOQ 0.001)	0.1	No Relaxation	IS 3025(P-57)2003(RA 2014)by AAS /ICP
33	Mercury	mg/L	BLQ (LOQ 0.001)	0.001	No Relaxation	IS:3025(P-48)1994(RA 2014)by AAS /ICP
34	Magnesium as Mg	mg/L	10	30	100	IS:3025 (P-46) 1994 (RA 2014)/ISO EA Method Orthodo ton Method
35	Total Arsenic	mg/L	BLQ (LOQ 0.001)	0.01	0.05	IS 3025 (P-37)1988(RA 2014) by AAS /ICP

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TEST REPORT

Ref. No. ILD-3051 | Date 29.06.19 | Lab No. 140619L-FD-010 | Page No. 3/3

S.No.	Test Parameter	Units	Results	Requirements		Test Methods
				Acceptable Limit (Max)	Permissible Limit (Max)	
B	Biological Testing (Water)	-		-	-	-
1	E. coli	/100ml	Absent	Shall not be detectable in any 100ml sample	-	IS 15185: 2016
2	Total Coliform Bacteria	/100ml	Absent	Shall not be detectable in any 100ml sample	-	IS 15185: 2016

Opinion : The Test Report Pertains to the Sample, as received from the customer.

The received sample was tested as per request letter.

*Parameter not covered under our scope of NABL Accreditation.

End of Report

For Idma Laboratories Limited

Authorised Signatory

Idma Corporate Park, 301, Industrial Area, Phase-I, Panchkula, Haryana.
Tel. No. : 0172- 5004027, 5004030
Website : www.idmagroup.co.in E-mail : testing@idmagroup.co.in

Turn Overleaf

SUMMARY TREATED WASTE WATER(Jan - 2019 to Dec 2019)

ANNEXURE 5

S.No.	Month	Treated Waste Water (KLD)			
		Onto Drain	Onto Plantation	Onto Recycling	Total
1	Jan-19	2742	2869	865	6509
2	Feb-19	2904	2862	907	6708
3	Mar-19	2861	2845	917	6657
4	Apr-19	3026	2832	899	6791
5	May-19	2094	2779	883	5785
6	Jun-19	2479	2712	936	6158
7	Jul-19	2763	2562	857	6214
8	Aug-19	2530	2718	787	6065
9	Sep-19	2520	2876	711	6138
10	Oct-19	1856	2880	903	5668
11	Nov-19	1771	2388	961	5146
12	Dec-19	1925	2756	748	5456
Average		2455.92	2756.58	864.50	6107.92

EFFLUENT PERFORMANCE REPORT (Jan - 2019 to Dec 2019)

ANNEXURE 6

S.No.	Month	Average treated water parameters			
		PH	COD(mg/ltr)	BOD(mg/ltr)	TSS(mg/ltr)
1	Jan-19	8.05	118.10	10.10	20.35
2	Feb-19	7.99	97.43	9.06	13.68
3	Mar-19	8.07	99.74	9.18	14.70
4	Apr-19	8.03	114.66	13.66	19.93
5	May-19	7.97	105.68	8.87	18.13
6	Jun-19	7.94	110.93	8.84	16.93
7	Jul-19	8.01	112.90	9.21	17.77
8	Aug-19	7.90	124.50	13.60	21.70
9	Sep-19	8.30	129.70	10.60	22.20
10	Oct-19	8.04	136.60	9.60	21.70
11	Nov-19	7.99	121.90	9.80	19.10
12	Dec-19	7.89	139.70	10.80	26.50
	Average	8.02	117.65	10.28	19.39
	Prescribed Value from the Board(PPCB)	6.5-8.5	<250	<30	<100

Idma Laboratories Limited

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TEST REPORT

Ref. No. IL/D- 19005	Date	02.01.21	Lab No.	301220N-E-040	Page No. 1/2
Customer	Trident Limited (Home Textile Division) Mansa Road,Dhaula Barnala, Punjab Punjab				
Type of Sample	Stack Emission (DG)				
Customer's Description of Sample	Stack Emission (DG)				
Quantity	01 No.				
Packing, Markings	Thimble Packed in Polythene Pouch				
Mode of Collection of Sample	Sampling By Laboratories				
Work Order No.	9990021438		Dated	15/12/2020	
Date of Receipt of Sample	30/12/2020				
Period of Analysis	30/12/2020 To 02/01/2021				
Sampling Team Idma	Idma Representative Team		Client	Mr. Gurpreet	
Sampling Location	Dertizag 2202279 (1000 KVA)				
Visual Observation	N/A				
Date of Sampling	26/12/2020				
Date of Reporting	02/01/2021				
Sampling Protocol	IS:11255				
Testing Protocol	CPCB				

RESULTS

S.No.	Test Parameter	Units	Results	Specifications	Test Method
	CHEMICAL TESTING (Stack emission)	-	-	-	-
	GENERAL INFORMATIONS:	-	-	-	-
	Stack Height	Meters	13	-	-
2	Stack dia	Meters	0.15	-	-
	Ambient Temperature	°C	10	-	-
	Stack Temperature	°C	183	-	-
	Velocity	m/s	11.8	-	-
6	Type of Fuel	-	HSD	-	-
	Sampling Flow rate	LPM	10	-	-
8	Sampling Time	Minutes	30	-	-
	Volumetric Flow rate	Nm³/hr	525.6	-	-
	PARAMETERS:	-	-	-	-
	PM	mg /Nm³	60.7	Max. 75	USEPA Method 5
11	CO	mg /Nm³	94.1	Max.150	USEPA Method 10,10A
	NOx	mg /Nm³	126.5	Max.710	USEPA Method 7C
	SO2	mg /Nm³	74.7	-	USEPA Method 6C

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TEST REPORT

Ref. No. IL/D-19005	Date	02.01.21	Lab No.	301220N-E-040	Page No. 2/2

S.No.	Test Parameter	Units	Results	Specifications	Test Method
	Total Hydro Carbons	mg/m³	27.0	Max. 100	USEPA Method 25A

End of Report

Analyst

For Idma Laboratories Limited

Authorised Signatory

EMERGENCY ACTION PLAN HTD-ETP

BUSINESS	HTD	LOCATION	DHAULA	MACHINE NAME/PROCESS NAME	ZERO LIQUID DISCHARGE (ETP)
PROCESS	EFFLUENT TREATMENT PLANT				

EMERGENCY ACTION PLAN OF HTD-ETP

Sr. No.	EVENT/SITUATION	ACTION TO BE TAKEN
1	ELECTRICAL POWER FAILURE OF ETP	CALL ELECTRICIAN (9878999749) /SHIFT ENGINEERS AND TAKE BACK FEED POWER SUPPLY FORM MCC ROOM OF DE-DUSTER AREA, AND INFORM TO HOD
2	BLOWER SUDEN SHUTDOWN	ALL FEED PUMPS HAS TO BE STOPPED, INFORM TO SHIFT ENGINEER /ELECTRICAL TEAM. FEED PUMP TO BE START ONE BY ONE AFTER RECTIFICATION OF BLOWER.
3	HOMO TANK LEVEL HIGHER THAN 5.5 METER	FEEDING AND AIR SUPPLY (IF REQUIRED) TO BE INCREASED BASED UPON EXISTING LOAD AND MAINTAINING SAME QUALITY PARAMETERS.
4	SUBMERSING OF SCREEN GEAR BOX & MOTOR	THE LEVEL OF THE SCREEN CHAMBER HAS TO BE DECREASED BY MANUAL SCRAPPING AND MOTOR HAS TO BE REMOVED IMMEDIATLY. REPLACE MOTOR WITH SPARE MOTOR AND START SCREENING MECHANISM AGAIN.
5	FAILURE OF AUTOMATION OF DISPOSAL PUMPS	INFORM TO SHIFT ENGINEER/ELECTRICIAN AND TILL RECTIFICATION OF AUTOMATION SAME NEEDS TO BE MONITORED IN MANUAL MODE.
6	LEAKAGE IN SULPHURIC ACID LINE DURING ACID UNLOADING	ACID UNLOADING PUMP HAS TO BE STOPPED IMMEDIATELY , LIME OR WATER TO BE USED OVERTHE SPILLAGE AREA IN ORDER TO NEUTRALIZE IT
7	FAILURE IN LIFTING PUMPS	INFORM SHIFT ENGINEER/HOD . IMMEDIATE STOPPAGE OF THE EFFLUENT TRANSFER PUMP FROM HTD-2 HEAT RECOVERY UNIT BY CONTACTING AT (9878999893), ALSO EFFLUENT TRANSFER PUMP HAS TO BE STOPPED FROM HTD-1 EFFLUENT COLLECTION TANK. APART FROM LIFTING PUMPS WE HAVE MIST COOLING SYSTEM IN PLACE WHICH CAN LIFT EFFLUENT IF ALL LIFTING PUMPS REPT

PREPARED BY	DOCUMENT NO
RAM ASHISH	ISSUE ITEM/SUBITEM - II
APPROVED BY	ISSUE DATE/REVISION NO/REVISION DATE
SOURAV CHOUDHARY	

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TEST REPORT

Ref. No. IL/D-4[8](9	Date	01-07-20	Lab No.	250620L-ED-138	Page No. 1/2
Customer	Trident Limited (Home Textile Division) Mansa Road,Dhaula Bamala, Punjab Punjab				
Type of Sample	Ground Water				
Customer's Description of Sample	Ground Water				
Quantity	5 Ltr. /250 ml				
Packing, Markings, Seal & Quantity	Plastic Can & Glass Bottle				
Mode of Collection of Sample	Sampling By Laboratories				
Work Order No.	9990019300		Dated	08/06/2020	
Date of Receipt of Sample	25/06/2020				
Period of Analysis	25/06/2020 To 30/06/2020				
Sampling Team Idma	Mr. Shakti Singh & Team		Client	Mr. Gurpreet	
Sampling Location	Borewell No-1				
Visual Observation	N/A				
Date of Sampling	24/06/2020				
Date of Reporting	30/06/2020				
Sampling Protocol	IS:3025-1987 & IL/MB/SOP/034				
Testing Protocol	IS: 10500:2012 Amdt 1 & 2				

RESULTS

S.No.	Test Parameter	Units	Results	Requirements		Test Methods
				Acceptable Limit (Max)	Permissible Limit (Max)	
	Chemical Testing (Water)	-	-	-	-	-
1	Color	Hazen	<5	Max. 5	Max. 15	IS 3025 (P-4) 1983 (RA 2017)
2	Odour	Qualitative	Agreeable	Agreeable	Agreeable	IS3025 (P-5)1983 (RA 2017)
3	pH	-	7.28	6.5-8.5	No Relaxation	IS 3025 (P-11) 1983 (RA 2017)
4	Alkalinity as CaCO3	mg/L	309	Max. 200	Max. 600	IS 3025 (P-23) 1986 (RA 2014)
5	Boron	mg/L	<0.001	Max. 0.5	Max. 1.0	IS 3025 Part 57 2005(RA 2017)
6	Calcium as Ca	mg/L	66.7	Max. 75	Max. 200	IS 3025 (P-40) 1991 (RA 2014) EDTA Method
7	Cyanide CN	mg/L	<0.001	Max. 0.05	No Relaxation	IS3025 (P-27) 1986 (RA 2014)
8	Fluoride as F	mg/L	0.76	Max. 1	Max. 1.5	IS: 3025 (P-60) 2008(RA 2017)
9	Hardness Total (as CaCO3)	mg/L	246	Max. 200	Max. 600	IS 3025 (P-21) 2009(RA 2014) EDTA Method
10	Nitrogen (Nitrate) NO3	mg/L	2.5	Max. 45	No Relaxation	IS 3025 (P-34) 1988 (RA 2014)
11	Phenolic Compounds as C6H5OH	mg/L	<0.0001	Max. 0.001	Max. 0.002	IS3025 (P-43) 1992 (RA 2014) 4-Aminoantipyrine Method
12	Total Dissolved Solids	mg/L	993	Max. 500	Max. 2000	IS 3025 (P-16) 1984 (RA 2017)
13	Suphate as SO4	mg/L	21.5	Max. 200	Max. 400	IS 3025 (P-24) 1986 (RA 2014) Turbidity Method

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TEST REPORT

Ref. No. ILD- 4021	Date	01-07-20	Lab No.	250620L-ED-140	Page No. 1/2
Customer	Trident Limited (Home Textile Division) Mansa Road,Dhaula Barnala, Punjab Punjab				
Type of Sample	Ground Water				
Customer's Description of Sample	Ground Water				
Quantity	5 Ltr.+250 ml				
Packing, Markings, Seal & Quantity	Plastic Can & Glass Bottle				
Mode of Collection of Sample	Sampling By Laboratories				
Work Order No.	9990019300		Dated	09/06/2020	
Date of Receipt of Sample	25/06/2020				
Period of Analysis	25/06/2020 To 30/06/2020				
Sampling Team Idma	Mr. Shakti Singh & Team		Client	Mr. Gurpreet	
Sampling Location	Borewell No-3				
Visual Observation	N/A				
Date of Sampling	24/06/2020				
Date of Reporting	30/06/2020				
Sampling Protocol	IS:3025-1987 & IL/MB/SOP/034				
Testing Protocol	IS: 10500.2012 Amdt 1 & 2				

RESULTS

S.No.	Test Parameter	Units	Results	Requirements		Test Methods
				Acceptable Limit (Max)	Permissible Limit (Max)	
	Chemical Testing (Water)	-	-	-	-	-
1	Color	Hazen	<5	Max. 5	Max. 15	IS 3025 (P-4) 1983 (RA 2017)
2	Odour	Qualitative	Agreeable	Agreeable	Agreeable	IS3025 (P-5)1983 (RA 2017)
3	pH	-	7.84	6.5-8.5	No Relaxation	IS 3025 (P-11) 1983 (RA 2017)
4	Alkalinity as CaCO3	mg/L	324	Max. 200	Max. 600	IS 3025 (P-23) 1986 (RA 2014)
5	Boron	mg/L	<0.001	Max. 0.5	Max. 1.0	IS 3025 : Part 57 : 2005(RA 2017)
6	Calcium as Ca	mg/L	69.2	Max. 75	Max. 200	IS 3025 (P-40) 1991 (RA 2014) EDTA Method
7	Cyanide CN	mg/L	<0.001	Max. 0.05	No Relaxation	IS3025 (P-27) 1986 (RA 2014)
8	Fluoride as F	mg/L	0.21	Max. 1	Max. 1.5	IS: 3025 (P-60) 2008(RA 2013)
9	Hardness Total (as CaCO3)	mg/L	232	Max. 200	Max. 600	IS 3025 (P-21):2009(RA 2014) EDTA Method
10	Nitrogen (Nitrate) NO3	mg/L	3.4	Max. 45	No Relaxation	IS 3025 (P-34) 1988 (RA 2014)
11	Phenolic Compounds as C6H5OH	mg/L	<0.0001	Max. 0.001	Max. 0.002	IS3025 (P-43) 1992 (RA 2014) 4-Aminoantipyrine Method
12	Total Dissolved Solids	mg/L	993	Max. 500	Max. 2000	IS 3025 (P-16) 1984 (RA 2017)
13	Sulphate as SO4	mg/L	27.8	Max. 200	Max. 400	IS 3025 (P-24) 1986 (RA2014) Turbidity Method

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TEST REPORT

Ref. No. ILD- 4021	Date 01-07-20	Lab No. 250620L-ED-140	Page No. 2/2

S.No.	Test Parameter	Units	Results	Requirements		Test Methods
				Acceptable Limit (Max)	Permissible Limit (Max)	
14	Surfactants (Anionic as MBAS)	mg/L	<0.01	Max. 0.2	Max. 1.0	Annexure K IS 13428:2005 & APHA 5540C 23rd Edition, 2017
15	Turbidity	NTU	<1	Max. 1	Max. 5	IS 3025 (P-10)1984 (RA 2017) Nephelometric Method
16	Taste	Qualitative	Agreeable	Agreeable	Agreeable	IS 3025 (Pt. 8) 1984
17	Ammonia	mg/L	<0.1	Max. 0.5	No Relaxation	IS : 3025 (P-34),1988(RA 2014)
18	Chloramines	mg/L	0.09	Max. 4.0	No Relaxation	IS: 3025 (P- 26)-1986(RA 2014)
19	Mineral oil	mg/L	<0.01	Max. 0.5	No Relaxation	IS 3025 Cl 6.0(P-39)1991(RA 2014)
20	Sulphide	mg/l	<0.001	Max. 0.05	No Relaxation	IS: 3025 (P-29) 1986(RA 2014)
21	Chromium (Hexavalent)	mg/L	<0.001	-		IS 3025 (P-52) 2003(RA 2014)
22	Cadmium	mg/L	<0.001	Max. 0.003	No Relaxation	IS 3025 (P-41) 1992 (RA 2014)Direct AAS Method
23	Copper as Cu	mg/L	<0.001	Max. 0.05	1.5	IS 3025 (P-42) 1992 (RA 2014)Direct/ A-Ac Flame AAS Method
24	Iron as Fe	mg/L	0.17	Max. 1.0	No Relaxation	IS 3025 : Part 53 : 2003(RA 2014)
25	Lead as Pb	mg/L	<0.001	Max. 0.01	No Relaxation	IS 3025 (P-47)1992 (RA 2014)Direct/Extract A-Ac Flame AAS Method
26	Manganese as Mn	mg/L	<0.001	Max. 0.1	0.3	IS 3025 (P-47)1992 (RA 2014)Direct/extract A-Ac Flame AAS Method 3111BC Direct/Extract
27	Nickel as Ni	mg/L	<0.001	Max. 0.02	No Relaxation	IS 3025 : Part 54 : 2003(RA 2014)
28	Zinc as Zn	mg/L	0.21	Max. 5	15	IS 3025 (P-49) 1994 (RA 2014)
29	Aluminium	mg/L	<0.001	Max. 0.03	0.2	IS 3025 (Pt. 55) 2003 (RA 2014)
30	Barium	mg/L	<0.001	Max. 0.7	No Relaxation	IS : 13428 Annexure - F of IS 3025 (P-65)2005(RA 2014)
31	Selenium	mg/L	<0.001	Max. 0.01	No Relaxation	IS 3025(P-56)2003(RA 2014)by AAS/ICP
32	Silver	mg/L	<0.001	Max. 0.1	No Relaxation	IS 13428(Anx-J)2005(RA 2014)by AAS/ICP
33	Mercury	mg/L	<0.0001	Max. 0.001	No Relaxation	IS 3025(P-48) 1994(RA 2014)by AAS/ICP
34	Magnesium as Mg	mg/L	17.1	Max. 30	Max. 100	IS 3025 (P-46) 1994 (RA 2014)@EDTA Method Calculation Method
35	Total Arsenic	mg/L	<0.001	Max. 0.01	No Relaxation	IS 3025 (Part 37) 2003(RA 2014)by AAS/ICP
36	E. coli	/100ml	Absent	Shall not be detectable in any 100ml sample	--	IS 15185: 2016
37	Total Coliform Bacteria	/100ml	Absent	Shall not be detectable in any 100ml sample	--	IS 15185: 2016

End of Report

For Idma Laboratories Limited

Authorised Signatory

Idma Laboratories Limited

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NABL ITC 8207| MOEF|BIS|FSSAI|State Pollution Boards|Drug & Cosmetic Act|ISO 9001: 14001, 18001 Certified

TEST REPORT

Ref. No. IL/D-4622	Date 01.07.20	Lab No.	250620L-ED-141	Page No. 1/2
Customer	Trident Limited (Home Textile Division) Mansa Road,Dhaula Barnala, Punjab Punjab			
Type of Sample	Ground Water			
Customer's Description of Sample	Ground Water			
Quantity	5 Ltr +250 ml			
Packing, Markings, Seal & Quantity	Plastic Can & Glass Bottle			
Mode of Collection of Sample	Sampling By Laboratories			
Work Order No	[illegible]	Dated	[illegible]	
Date of Receipt of Sample	25/06/2020			
Period of Analysis	25/06/2020 To 30/06/2020			
Sampling Team Idma	Mr. Shakti Singh & Team	Client	Mr. Gurpreet	
Sampling Location	Borewell No-4			
Visual Observation	N/A			
Date of Sampling	24/06/2020			
Date of Reporting	30/06/2020			
Sampling Protocol	IS:3025-1987 & IL/MB/SOP/034			
Testing Protocol	IS: 10500:2012 Amdt 1 & 2			

RESULTS

S.No.	Test Parameter	Units	Results	Requirements		Test Methods
				Acceptable Limit (Max)	Permissible Limit (Max)	
	Chemical Testing (Water)					
1	Color	Hazen	<5	Max. 5	Max. 15	IS 3025 (P-4) 1983 (RA 2017)
2	Odour	Qualitative	Agreeable	Agreeable	Agreeable	IS3025 (P-5)1983 (RA 2017)
3	pH	-	7.62	6.5-8.5	No Relaxation	IS 3025 (P-11) 1983 (RA 2017)
4	Alkalinity as CaCO3	mg/L	305	Max. 200	Max. 600	IS 3025 (P-23) 1986 (RA 2014)
5	Boron	mg/L	<0.001	Max. 0.5	Max. 1.0	IS 3025 : Part 57 : 2005(RA 2017)
6	Calcium as Ca	mg/L	66.8	Max. 75	Max. 200	IS 3025 (P-40) 1991 (RA 2014) EDTA Method
7	Cyanide CN	mg/L	<0.001	Max. 0.05	No Relaxation	IS3025 (P-27) 1986 (RA 2014)
8	Fluoride as F	mg/L	0.20	Max. 1	Max. 1.5	IS: 3025 (P-60) 2008(RA 2013)
9	Hardness Total (as CaCO3)	mg/L	259	Max. 200	Max. 600	IS 3025 (P-21) 2009(RA 2014) EDTA Method
10	Nitrogen (Nitrate) NO3	mg/L	2.0	Max. 45	No Relaxation	IS 3025 (P-34) 1988 (RA 2014)
11	Phenolic Compounds as C6H5OH	mg/L	<0.001	Max. 0.001	Max. 0.002	IS3025 (P-43) 1992 (RA 2014) 4-Aminoantipyrine Method
12	Total Dissolved Solids	mg/L	946	Max. 500	Max. 2000	IS 3025 (P-16) 1984 (RA 2017)
13	Sulphate as SO4	mg/L	26.3	Max. 200	Max. 400	IS 3025 (P-24) 1986 (RA 2014) Turbidity Method

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TEST REPORT

Ref. No. IUD- 4022	Date	01.07.20	Lab No.	2500201-ED-141	Page No. 2/2

S.No.	Test Parameter	Units	Results	Requirements		Test Methods
				Acceptable Limit (Max)	Permissible Limit (Max)	
14	Surfactants (Anionic as MBAS)	mg/L	<0.01	Max. 0.2	Max. 1.0	Annexure-K IS: 13428:2005 & APHA 'A' 4500 22nd Edition, 2017
15	Turbidity	NTU	<1	Max. 1	Max. 5	IS 3025 (P: 10)1984 (RA 2017) Nephelometric Method
16	Taste	Qualitative	Agreeable	Agreeable	Agreeable	IS 3025 (P: 8) 1984
17	Ammonia	mg/l	<0.1	Max. 0.5	No Relaxation	IS : 3025 (P-34) 1988 (RA 2014)
18	Chloramines	mg/L	0.21	Max. 4.0	No Relaxation	IS : 3025 (P: 26)-1986(RA 2014)
19	Mineral oil	mg/L	<0.01	Max. 0.5	No Relaxation	IS:3025 Cl 6.6(P:39)1991(RA 2014)
20	Sulphide	mg/L	<0.001	Max. 0.05	No Relaxation	IS: 3025 (P:29) 1986 RA 2014)
21	Chromium (Hexavalent)	mg/L	<0.001	-	-	IS 3025 (P-52) 2003(RA 2014)
22	Cadmium	mg/L	<0.001	Max. 0.003	No Relaxation	IS:3025 (P-41) 1992 (RA 2014),Direct AAS Method
23	Copper as Cu	mg/L	<0.001	Max. 0.05	1.5	IS:3025 (P-42) 1992 (RA 2014)Direct A-Ac Flame AAS Method
24	Iron as Fe	mg/L	0.15	Max. 1.0	No Relaxation	IS 3025 Part 53 2003(RA 2014)
25	Lead as Pb	mg/L	<0.001	Max. 0.01	No Relaxation	IS 3025 (P-47)1992 (RA 2014) by (Direct A-Ac Flame AAS Method
26	Manganese as Mn	mg/L	<0.001	Max. 0.1	0.3	IS 3025 (P-47)1992 (RA 2014) by (Direct A-Ac Flame AAS Method 1,10 Phenanthroline)
27	Nickel as Ni	mg/L	<0.001	Max. 0.02	No Relaxation	IS 3025 : Part 54 2003(RA 2014)
28	Zinc as Zn	mg/L	0.23	Max. 5	15	IS 3025 (P-49) 1994 (RA 2014)
29	Aluminum	mg/L	<0.001	Max. 0.03	0.2	IS 3025 (Pt. 55) 2003 (RA 2014)
30	Barium	mg/L	<0.001	Max. 0.7	No Relaxation	IS : 13428 Annexure - F of IS 3025 (P-05)2005(RA 2014)
31	Selenium	mg/L	<0.001	Max. 0.01	No Relaxation	IS 3025(P-56)2003(RA 2014)by AAS HGP
32	Silver	mg/L	<0.001	Max. 0.1	No Relaxation	IS:13428(Ax-J)2005(RA 2014)by AAS HGP
33	Mercury	mg/L	<0.0001	Max. 0.001	No Relaxation	IS:3025(P-48)1994(RA 2014)by AAS HGP
34	Magnesium as Mg	mg/L	17.4	Max. 30	Max. 100	IS3025 (P:46) 1994 (RA 2014)EDTA Method Calculation Method
35	Total Arsenic	mg/L	<0.001	Max. 0.01	No Relaxation	IS 3025 (Part 37) 1988(RA 2014) by AAS HGP
36	E. coli	/100ml	Absent	Shall not be detectable in any 100ml sample	-	IS 15185: 2016
37	Total Coliform Bacteria	/100ml	Absent	Shall not be detectable in any 100ml sample		IS 15185: 2016

End of Report

For Idma Laboratories Limited

Analyst

Authorized Signatory

Idma Laboratories Limited

(A Government Approved Test House)

NABL (TC-8207) MOEF/BIS/FSSAI/State Pollution Boards/Drug & Cosmetic Act/ISO 9001: 14001: 18001 Certified

TEST REPORT

Ref. No. IL/D-4(023	Date	01.07.20	Lab No.	250620L-EQ-142	Page No. 1/2
Customer	Trident Limited (Home Textile Division) Mansa Road, Dhuola Barnala Punjab Punjab				
Type of Sample	Ground Water				
Customer's Description of Sample	Ground Water				
Quantity	5 Ltr. / 250 ml				
Packing, Markings, Seal & Quantity	Plastic Can & Glass Bottle				
Mode of Collection of Sample	Sampling By Laboratories				
Work Order No	9990019300		Dated	09/06/2020	
Date of Receipt of Sample	25/06/2020				
Period of Analysis	25/06/2020 To 30/06/2020				
Sampling Team Idma	Mr. Shakti Singh & Team		Client	Mr. Gurpreet	
Sampling Location	Borewell No-5				
Visual Observation	N/A				
Date of Sampling	24/06/2020				
Date of Reporting	30/06/2020				
Sampling Protocol	IS:3025-1987 & IL/MB/SOP/034				
Testing Protocol	IS: 10500:2012 Amdt 1 & 2				

RESULTS

S.No.	Test Parameter	Units	Results	Requirements		Test Methods
				Acceptable Limit (Max)	Permissible Limit (Max)	
	Chemical Testing (Water)	-	-	-	-	-
1	Color	Hazen	<5	Max. 5	Max. 15	IS 3025 (P-4) 1983 (RA 2017)
2	Odour	Qualitative	Agreeable	Agreeable	Agreeable	IS3025 (P-5)1983 (RA 2017)
3	pH	-	7.51	6.5-8.5	No Relaxation	IS 3025 (P-11) 1983 (RA 2017)
4	Alkalinity as CaCO3	mg/L	322	Max. 200	Max. 600	IS 3025 (P-23) 1986 (RA 2014)
5	Boron	mg/L	<0.001	Max. 0.5	Max. 1.0	IS 3025: Part 57 : 2005(RA 2017)
6	Calcium as Ca	mg/L	59.7	Max. 75	Max. 200	IS 3025 (P-40) 1991 (RA 2014) EDTA Method
7	Cyanide CN	mg/L	<0.001	Max. 0.05	No Relaxation	IS3025 (P-27) 1986 (RA 2014)
8	Fluoride as F	mg/L	0.18	Max. 1	Max. 1.5	IS: 3025 (P-60) 2008(RA 2013)
9	Hardness Total (as CaCO3)	mg/L	241	Max. 200	Max. 600	IS 3025 (P-21) 2009(RA 2014) EDTA Method
10	Nitrogen (Nitrate) NO3	mg/L	2.84	Max. 45	No Relaxation	IS 3025 (P-34) 1988 (RA 2014)
11	Phenolic Compounds as C6H5OH	mg/L	<0.0001	Max. 0.001	Max. 0.002	IS3025 (P-43) 1992 (RA 2014) 4-Aminoantipyrine Method
12	Total Dissolved Solids	mg/L	982	Max. 500	Max. 2000	IS 3025 (P-16) 1984 (RA 2017)
13	Sulphate as SO4	mg/L	20.7	Max. 200	Max. 400	IS 3025 (P-24) 1986 (RA 2014) Turbidity Method

Turn Overleaf

Idma Laboratories Limited

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TEST REPORT

Ref. No. IL/D- 1359 & 37	Date 02.01.21	Lab No. 3012/20NL/023		Page No. 1/1
Customer	Trident Limited (Home Textile Division) Mansa Road,Dhanda Barnala, Punjab Punjab			
Name of Sample	Ambient Air			
Customer's Description of Sample	Ambient Air			
Quantity	1 No.			
Packing, Markings	Filter Paper Packed in Polythene Pouch			
Mode of Collection of Sample	Sampling By Laboratories			
Work Order No.	9098021438	Dated	17/12/2020	
Date of Receipt of Sample	30/12/2020			
Period of Analysis	30/12/2020 To 02/01/2021			
Sampling Team Idma	Idma Representative Team	Client	Mr. Gurjeet	
Testing Location	Talwandi Sabo Home Textile Division			
Visual Observation	N/A			
Date of Sampling	28/12/2020			
Date of Reporting	02/01/2021			
Testing Protocol	IS: 5182			
Sampling Protocol	NAAQS			

RESULTS

S.No.	Test Parameter	Units	Results	Specification	Test Method
	CHEMICAL TESTING (Ambient air)				
	PM10	µg/m³	70.5	Max. 100	NAAQMS/36/2012-13(Gravimetric method)
	SO2	µg/m³	30.1	Max. 80	NAAQMS/36/2012-13(Improved West & Gaeke method)
	NO2	µg/m³	20.4	Max. 80	NAAQMS/36/2012-13(Modified Jacob & Hochheiser method)
	NH3	µg/m³	31.7	Max. 400	NAAQMS/36/2012-13(Indophenol method)
	PM2.5	µg/m³	43.4	Max. 60	NAAQMS/36/2012-13(Gravimetric method)
	CO	mg/m³	0.41	Max. 2	NAAQMS/36/2012-13 & IS 5182 Part 10:1999
	Ozone	µg/m³	23	Max. 100	NAAQMS/36/2012-13(Chemical method)
	Benzene	µg/m³	<0.8	Max. 5	NAAQMS/36/2012-13(GC method)
	Benzo-a-Pyrene(BaP)- Particulate phase	ng/m³	Not Detected	Max. 1	NAAQMS/36/2012-13(GC method)
	Arsenic	ng/m³	Not Detected	Max. 6	NAAQMS/36/2012-13(AAS method)
	Nickel	ng/m³	Not Detected	Max. 20	NAAQMS/36/2012-13(AAS method)
	Lead	µg/m³	<0.1	Max. 1	NAAQMS/36/2012-13(AAS method)

End of Report

Analyst

For Idma Lab Validation Limited

Authorized Signatory

Idma Laboratories Limited

(A Government Approved Test House)

NABL (TC 8207) MOEF(BIS)-SSA(State Pollution Boards/Drug & Cosmetic Act)ISO 9001, 14001, 18001 Certified

TEST REPORT

Ref. No. IL/D- 4(e)19	Date	01.07.20	Lab No.	2506301-FD-138	Page No. 2/2

S.No.	Test Parameter	Units	Results	Requirements		Test Methods
				Acceptable Limit (Max)	Permissible Limit (Max)	
14	Surfactants (Anionic as MBAS)	mg/L	<0.001	Max. 0.2	Max. 1.0	Annexure B IS 13428:2005 & APHA 5540C,23rd Edition, 2017
15	Turbidity	NTU	<1	Max. 1	Max. 5	IS 3025 (P 10):1984 (RA 2017) Nephelometric Method
16	Taste	Qualitative	Agreeable	Agreeable	Agreeable	IS 3025 (P 8):1984
17	Ammonia	mg/l	<0.01	Max. 0.5	No Relaxation	IS 3025 (P 34):1988 (RA 2014)
18	Chlorides	mg/L	0.11	Max. 4.0	No Relaxation	IS 3025 (P 32):1988 (RA 2014)
19	Residual cl	mg/l	<0.01	Min. 0.5	No Relaxation	IS 10500:2012 (RA 2018)
20	Sulphide	mg/L	<0.001	Max. 0.05	No Relaxation	IS 3025 (P 29):1986 (RA 2014)
21	Chromium (Hexavalent)	mg/L	<0.001			IS 3025 (P 52):2003 (RA 2014)
22	Cadmium	mg/L	<0.001	Max. 0.003	No Relaxation	IS 3025 (P 41):1992 (RA 2014) Direct AAS Method
23	Copper as Cu	mg/L	<0.001	Max. 0.05	1.5	IS 3025 (P 42):1992 (RA 2014) Direct/ A-Ac Flame AAS Method
24	Iron as Fe	mg/L	0.13	Max. 1.0	No Relaxation	IS 3025 : Part 53 : 2003 (RA 2014)
25	Lead as Pb	mg/L	<0.001	Max. 0.01	No Relaxation	IS 3025 (P 47):1992 (RA 2014) Direct/Extract A-Ac Flame AAS Method
26	Manganese as Mn	mg/L	<0.001	Max. 0.1	0.3	IS 3025 (P 47):1992 (RA 2014) Direct/Extract A-Ac Flame AAS Method, 21st ED, Clause 3.4.16
27	Nickel as Ni	mg/L	<0.001	Max. 0.02	No Relaxation	IS 3025 : Part 54 : 2003 (RA 2014)
28	Zinc as Zn	mg/L	0.14	Max. 5	15	IS 3025 (P 49):1994 (RA 2014)
29	Aluminum	mg/L	<0.001	Max. 0.03	0.2	IS 3025 (P 55):2003 (RA 2014)
30	Barium	mg/l	<0.001	Max. 0.7	No Relaxation	IS 13428 Annexure - F IS 3025 (P 88):2009 (RA 2014)
31	Selenium	mg/L	<0.001	Max. 0.01	No Relaxation	IS 3025(P 56):2003(RA 2014)by AAS Hyd
32	Silver	mg/L	<0.001	Max. 0.1	No Relaxation	IS 13428(Anx. B)2005(RA 2014)by AAS Hyd
33	Mercury	mg/L	<0.0001	Max. 0.001	No Relaxation	IS 3025(P 48):1994(RA 2014)by AAS Hyd
34	Magnesium as Mg	mg/L	14.7	Max. 30	Max. 100	IS 3025 (P 46):1994 (RA 2014) EDTA Titrimetric Calculation Method
35	Total Arsenic	mg/L	<0.001	Max. 0.01	No Relaxation	IS 3025 (Part 37):2009(RA 2014) by AAS Hyd
36	E. coli	/100ml	Absent	Shall not be detectable in any 100ml sample		IS 15185: 2016
37	Total Coliform Bacteria	/100ml	Absent	Shall not be detectable in any 100ml sample		IS 15185: 2016

End of Report

For Idma Laboratories Limited

Authorised Signatory

Analyst

TEST REPORT

Technical Report	(6720)289-0049	October 26, 2020
Date Received	October 15, 2020	Page 1 of 22

Factory Company Name:	TRIDENT LIMITED
Factory Address:	MANSA ROAD, DHAULA, BARNALA, PUNJAB-148107
Project No.:	/
Client Reference No.:	/
Sampling Method:	1001) Incoming water – Grab 1002) Raw Wastewater – 6 hours - Time – weighted Composite 1003) Treated Wastewater – 6 hours - Time – weighted Composite
Sample Pick Up Date:	October 13, 2020
Wastewater Discharge to:	Sewage or Drainage
On-Site Effluent Treatment Plant (ETP):	YES
Discharge Type:	Direct Discharge
Off-site ETP name (if applicable):	/
Off-site ETP address (if applicable):	/
Test Period:	October 15, 2020 to October 26, 2020

Sample Description:

1001) Colorless liquid – Incoming water
1002) Light Brown color liquid – Raw Wastewater
1003) Colorless liquid - Treated Wastewater

REMARK

If there are questions or concerns on this report, please contact the following persons:

General enquiry and invoicing	amit.roy@in.bureauveritas.com 0120-4368216/205/267
Technical enquiry-Chemical	ramesh.kumar@in.bureauveritas.com 0120-4768264/265/249/277

This report shown the test result of the auxiliary chemical and/or raw material samples, which collected during particular factory audit. The results of this report shall not be used for any regulatory compliance purposes.

- The sampling is agreed with client.

BUREAU VERITAS CONSUMER PRODUCTS SERVICES (INDIA) PVT. LTD.

SIGNATORIES

RAHUL SRIVASTAVA
(Manager – Analytical)

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Executive Summary

1A) Conventional Parameters	1001	1002	1003
Temperature	NR	NR	□
TSS			□
COD			□
Total-N			□
pH Value			□
Color [m^{-1}] (436nm; 525nm; 620nm)			□
BOD5			□
Ammonium-N			□
Total-P			□
AOX			□
Oil and Grease			□
Phenol			□
Coliform			□
Persistent Foam			□
ANIONS - Cyanide			□
ANIONS - Sulfide			□
ANIONS – Sulfite			□
1B) Conventional Parameters - METALS	NR	□	□

Note / Key :

- □ – Meet Foundational Limit / Meet discharge license criteria
- ■ – Exceeding Foundational Limit / Exceeding discharge license criteria
- NR – Not Requested / Not required

ZDHC MRSL Substances	1001	1002	1003
2A) APs and APEOs	NR	u	u
2B) Chlorobenzenes and Chlorotoluenes	NR	u	u
2C) Chlorophenols	NR	u	u
2D) Azo Dyes	NR	u	u
2E) Carcinogenic Dyes	NR	u	u
2F) Disperse Dyes	NR	u	u
2G) Flame Retardants	NR	u	u
2H) Glycols	NR	u	u
2I) Halogenated Solvents	NR	u	u
2J) Organotin Compounds	NR	u	u
2K) Perfluorinated and Polyfluorinated Chemicals	NR	u	u
2L) Phthalates	NR	u	u
2M) Poly Aromatic Hydrocarbons	NR	u	u
2N) Volatile Organic Compounds	NR	u	u

Note / Key :

- • – Detected
- u – Not Detected
- NR – Not Requested
- N/A – Not Applicable

Objective

The environment samples were tested for below parameters:

1A) Conventional Parameters
1B) Conventional Parameters – METALS
2A) APs and APEOs
2B) Chlorobenzenes and Chlorotoluenes
2C) Chlorophenols
2D) Azo Dyes
2E) Carcinogenic Dyes
2F) Disperse Dyes
2G) Flame Retardants
2H) Glycols
2I) Halogenated Solvents
2J) Organotin Compounds
2K) Perfluorinated and Polyfluorinated Chemicals
2L) Phthalates
2M) Poly Aromatic Hydrocarbons
2N) Volatile Organic Compounds

Sampling Plan

Ideally, three environment samples were sampled per factory, including 1) Incoming water, 2) Discharged Wastewater (raw wastewater) and 3) Discharged Wastewater (treated wastewater). Total number of sample collected will be depended on the actual factory facilities and manufacturing processes.

Method of sampling used is time-weighted composite grab samples (agreed with client.). Composite sampling shall be performed for no less than six hours, with no more than one hour between discrete samples. Each discrete sample shall be of equal volume. Wastewater and freshwater samples should, as much as possible, be collected simultaneously, during the time that PU is in normal operation. The sampling shall aim to analyse the snapshot of water quality characteristics of the operating PU. Under no circumstance shall samples be taken during times when the production process is not running or the wastewater is diluted due to heavy rainfall, etc.

Remark :

- Sampling proceedure is with reference to below standards:
  1) South Australia EPA Guidelines (June 2007), Regulatory Monitoring and Testing Water and Wastewater Sampling.
  2) Australia EPA (Victoria) Guideline (June 2009), Sampling and Analysis of Waters, Wastewaters, Soils and Wastes.
  3) ISO 5667-3:2003, Water Quality - Sampling - Part 3: Guidance on the Preservation and Handling of Water Samples.
  4) ASTM D3976-92 (Reapproved 2010), Standard Practice for Preparation of Sediment Samples for Chemical Analysis.
- Field data records are attached in Appendix B.

Test Result

1A) Conventional Parameters

Temperature

Test Method : Measurement by thermometer

Tested Item(s)	Result	Unit	Conclusion
1003	29 (Progressive)	deg. C	DATA

Note:

deg. C = degree Celsius (°C)
Foundational Limit: ▲15 / max. 35°C; Progressive Limit: ▲10 / max. 30°C; Aspirational Limit: ▲5 / max. 35°

Total Suspended Solids (TSS)

Test Method : APHA 2540D

Tested Item(s)	Result	Unit	Conclusion
1003	10 (Progressive)	mg/L	DATA

Note:

mg/L = milligram per liter
Foundational Limit: 50 mg/L; Progressive Limit: 15 mg/L; Aspirational Limit: 5 mg/L

Chemical Oxygen Demand (COD)

Test Method : APHA 5220D

Tested Item(s)	Result	Unit	Conclusion
1003	65 (Progressive)	mg/L	DATA

Note:

mg/L = milligram per liter
Foundational Limit: 150 mg/L; Progressive Limit: 80 mg/L; Aspirational Limit: 40 mg/L

Total Nitrogen (Total-N)

Test Method : APHA 4500-Norg-B

Tested Item(s)	Result	Unit	Conclusion
1003	1.96 (Aspirational)	mg/L	DATA

Note:

mg/L = milligram per liter
Foundational Limit: 20 mg/L; Progressive Limit: 10 mg/L; Aspirational Limit: 5 mg/L

pH Value

Test Method : Reference to ISO 10523

-	Unit	Result
Test Item(s)	-	1003
Parameter	-	-
Temp. of sample	deg. C	29
pH value of sample	-	7.9
Conclusion	-	DATA

Note:

Temp. = Temperature deg. C = degree Celsius (°C)
Limit: 6 – 9

Color [m^{-1}] (430nm; 525nm; 620nm)

Test Method : With reference to ISO 7887-B

Tested Item(s)	Result	Unit	Conclusion
1003	3.2;1.9;1.3 (Progressive)		DATA

Note:

Foundational Limit: 7;5;3 m^{-1}; Progressive Limit: 5;3;2 m^{-1}; Aspirational Limit: 2;1;1 m^{-1}

Biochemical Oxygen Demand (BOD5)

Test Method : APHA 5210B

Tested Item(s)	Result	Unit	Conclusion
1003	11 (Progressive)	mg/L	DATA

Note:

mg/L = milligram per liter
Foundational Limit: 30 mg/L; Progressive Limit: 15 mg/L; Aspirational Limit: 5 mg/L

Ammonia Nitrogen

Test Method : APHA 4500 NH3-C

Tested Item(s)	Result	Unit	Conclusion
1003	1.5 (Foundational)	mg/L	DATA

Note:

mg/L = milligram per liter
Foundational Limit: 10 mg/L; Progressive Limit: 1 mg/L; Aspirational Limit: 0.5 mg/L

Total Phosphorus (Total-P)

Test Method : APHA 4500P-D

Tested Item(s)	Result	Unit	Conclusion
1003	0.23 (Progressive)	mg/l	DATA

Note:

mg/L = milligram per liter
Foundational Limit: 3 mg/L; Progressive Limit: 0.5 mg/L ; Aspirational Limit: 0.1 mg/l

Adsorbable Organic Halogen (AOX)

Test Method : Reference to ISO 9562

Tested Item(s)	Result	Unit	Conclusion
1003	0.13 (Aspirational)	mg/l	DATA

Note:

mg/L = milligram per liter
Foundational Limit: 5 mg/L; Progressive Limit: 1 mg/L; Aspirational Limit: 0.1 mg/l

Oil and Grease

Test Method : Reference to ISO 9377-2/ APHA 5520-B

Tested Item(s)	Result	Unit	Conclusion
1003	<0.5 (Aspirational)	mg/L	DATA

Note:

mg/L = milligram per liter
Foundational Limit: 10 mg/L; Progressive Limit: 2 mg/L; Aspirational Limit: 0.5 mg/l

Phenol

Test Method : APHA 5530 C

Tested Item(s)	Result	Unit	Conclusion
1003	<0.001 (Aspirational)	mg/L	DATA

Note:

mg/L = milligram per liter
Foundational Limit: 0.5 mg/L; Progressive Limit: 0.01 mg/L ; Aspirational Limit: 0.001 mg/l

Coliform

Test Method : Reference to ISO 9308-1

Tested Item(s)	Result	Unit	Conclusion
1003	8 (Aspirational)	bacteria/ 100 mL	DATA

Note:

bacteria/100 ml = bacteria per 100 milliliters
Foundational Limit: 400 / 100 ml; Progressive Limit: 100 / 100 ml; Aspirational Limit: 25 / 100 ml

Foam

Test Method : Visual

Tested Item(s)	Result	Unit	Conclusion
1003	No foam	-	DATA

ANIONS - Sulfide

Test Method : APHA 4500 S^{2-} F

Tested Item(s)	Result	Unit	Conclusion
1003	<0,01 (Aspirational)	mg/L	DATA

Note:

mg/L = milligram per liter
Foundational Limit: 0.5 mg/L; Progressive Limit: 0.05 mg/L; Aspirational Limit: 0.01 mg/l

ANIONS - Sulfite

Test Method : Reference to ISO 10304-3/ APHA 4500 SO_3^{2-} B

Tested Item(s)	Result	Unit	Conclusion
1003	<0,2 (Aspirational)	mg/L	DATA

Note:

mg/L = milligram per liter
Foundational Limit: 2 mg/L; Progressive Limit: 0.5 mg/L; Aspirational Limit: 0.2 mg/l.

IB) Conventional Parameters - METALS Raw water Inlet Outlet

Heavy Metals	1001 (µg/L)	1002 (µg/L)	1003 (µg/L)
Antimony(Sb) *Foundational Limit: 100 µg/L;* *Progressive Limit: 50 µg/L;* *Aspirational Limit: 10 µg/L*	NR	ND (Aspirational)	ND (Aspirational)
Chromium(Cr), total *Foundational Limit: 200 µg/L;* *Progressive Limit: 100 µg/L;* *Aspirational Limit: 50 µg/L*	NR	4 (Aspirational)	3 (Aspirational)
Cobalt(Co) *Foundational Limit: 50 µg/L;* *Progressive Limit: 20 µg/L;* *Aspirational Limit: 10 µg/L*	NR	ND (Aspirational)	ND (Aspirational)
Copper(Cu) *Foundational Limit: 1000 µg/L;* *Progressive Limit: 500 µg/L;* *Aspirational Limit: 250 µg/L*	NR	31 (Aspirational)	10 (Aspirational)
Nickel (Ni) *Foundational Limit: 200 µg/L;* *Progressive Limit: 100 µg/L;* *Aspirational Limit: 50 µg/L*	NR	2 (Aspirational)	ND (Aspirational)
Silver (Ag) *Foundational Limit: 100 µg/L;* *Progressive Limit: 50 µg/L;* *Aspirational Limit: 5 µg/L*	NR	89 (Foundational)	11 (Aspirational)
Zinc(Zn) *Foundational Limit: 5000 µg/L;* *Progressive Limit: 1000 µg/L;* *Aspirational Limit: 500 µg/L*	NR	57 (Aspirational)	31 (Aspirational)
Arsenic (As) *Foundational Limit: 50 µg/L;* *Progressive Limit: 10 µg/L;* *Aspirational Limit: 5 µg/L*	NR	ND (Aspirational)	ND (Aspirational)
Cadmium(Cd) *Foundational Limit: 100 µg/L;* *Progressive Limit: 50 µg/L;* *Aspirational Limit: 10 µg/L*	NR	ND (Aspirational)	ND (Aspirational)
Lead(Pb) *Foundational Limit: 100 µg/L;* *Progressive Limit: 50 µg/L;* *Aspirational Limit: 10 µg/L*	NR	ND (Aspirational)	ND (Aspirational)
Mercury (Hg) *Foundational Limit: 10 µg/L;* *Progressive Limit: 5 µg/L;* *Aspirational Limit: 1 µg/L*	NR	ND (Aspirational)	ND (Aspirational)
Chromium VI(CrVI) *Foundational Limit: 50 µg/L;* *Progressive Limit: 5 µg/L;* *Aspirational Limit: 1 µg/L*	NR	ND (Aspirational)	ND (Aspirational)
Cyanide(CN-) *Foundational Limit: 200 µg/L;* *Progressive Limit: 100 µg/L;* *Aspirational Limit: 50 µg/L*	NR	ND (Aspirational)	ND (Aspirational)

Others Priority Chemical Groups

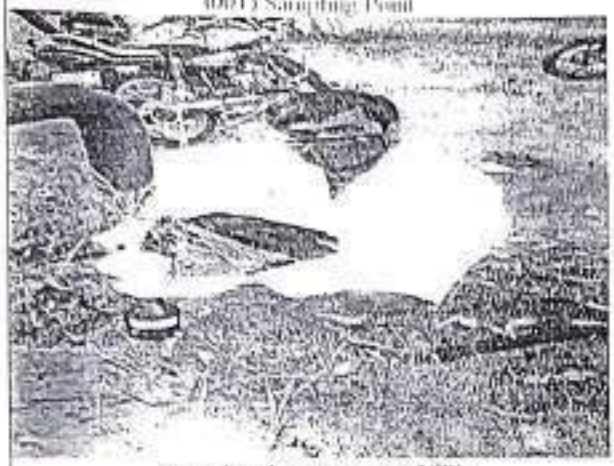
	1001 (ng/L)	1002 (ng/L)	1003 (ng/kg)
2A) APs and APEOs	NR	ND	ND
2B) Chlorobenzenes and Chlorotoluenes	NR	ND	ND
2C) Chlorophenols	NR	ND	ND
2D) Azo Dyes	NR	ND	ND
2E) Carcinogenic Dyes	NR	ND	ND
2F) Disperse Dyes	NR	ND	ND
2G) Flame Retardants	NR	ND	ND
2H) Glycols	NR	ND	ND
2I) Halogenated Solvents	NR	ND	ND
2J) Organotin Compounds	NR	ND	ND
2K) Perfluorinated and Polyfluorinated Chemicals	NR	ND	ND
2L) Phthalates	NR	ND	ND
2M) Poly Aromatic Hydrocarbons	NR	ND	ND
2N) Volatile Organic Compounds	NR	ND	ND

Remark :

- Test method, reporting limit and list of chemical are summarized in tables of Appendix A.
- ND = Not detected (Please refer to reporting limit shown in Appendix A.)
- All results are in ppb as unit.
- ppm = parts per million; ppb = parts per billion

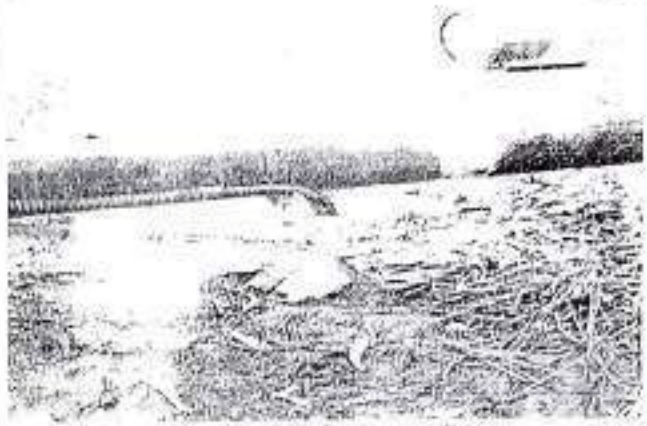
APPENDIX A - Photo of the Sample/ Sampling Location

[0001] Sampling Point



Sampling location as per GPS
(North 29.4781751, East 75.4159836)

[0001] Sampling Point Surrounding Environment



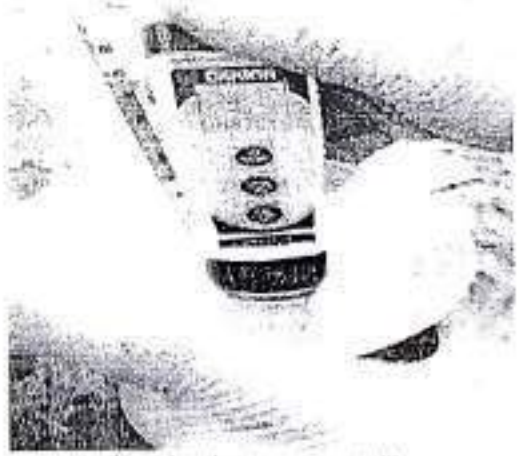
Sampling location as per GPS
(North 29.4781751, East 75.4159836)

[0001] All sampled bottles with label



Sampling location as per GPS
(North 29.4781751, East 75.4159836)

[0001] pH Value



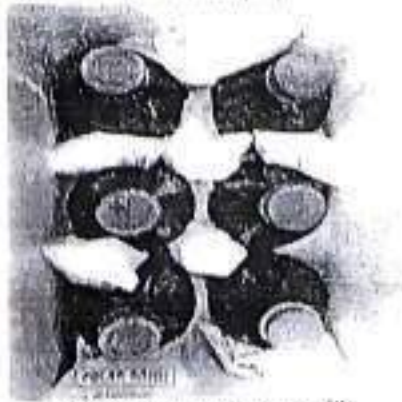
Sampling location as per GPS
(North 29.4781751, East 75.4159836)

[0001] Sample for Phthalate Testing



Sampling location as per GPS
(North 29.4781751, East 75.4159836)

[0001] Packaging



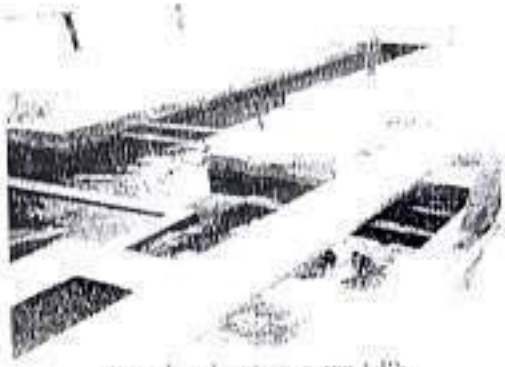
Sampling location as per GPS
(North 29.4781751, East 75.4159836)

IB02) Sampling Point



Sampling location as per GPS
(North 29.4781751, East 75.31598836)

IB02) Sampling Point Surrounding Environment



Sampling location as per GPS
(North 29.4781751, East 75.31598836)

IB02) All sampled bottles with label



Sampling location as per GPS
(North 29.4781751, East 75.31598836)

IB02) pH Value



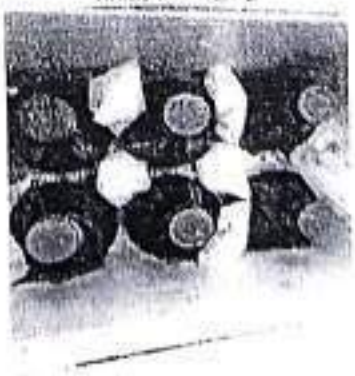
Sampling location as per GPS
(North 29.4781751, East 75.31598836)

IB02) Sample for Phthalate Testing



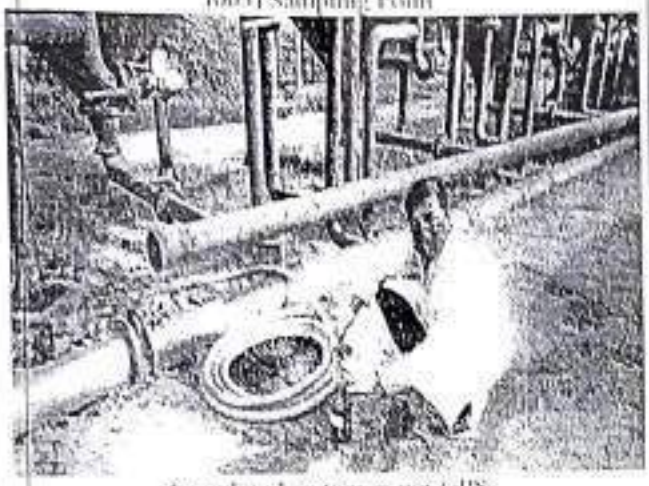
Sampling location as per GPS
(North 29.4781751, East 75.31598836)

IB02) Packaging



Sampling location as per GPS
(North 29.4781751, East 75.31598836)

IMG-1 Sampling Point



Sampling location as per GPS
(North 39.178154, East -78.341598836)

IMG-2 Sampling Point Surrounding Environment



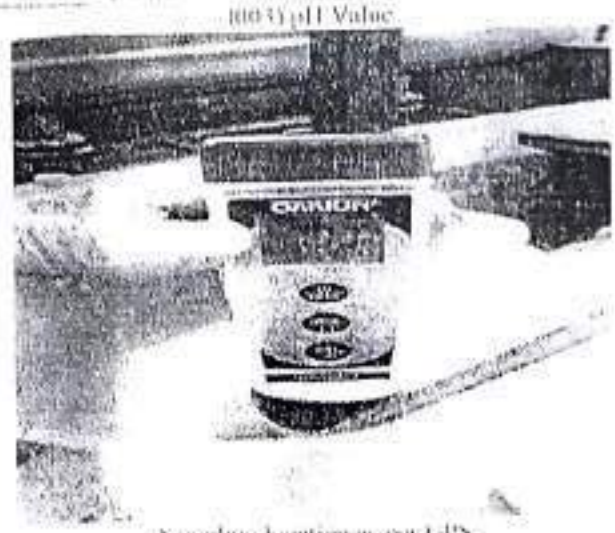
Sampling location as per GPS
(North 39.178154, East -78.341598836)

IMG-3 All sampled bottles with label



Sampling location as per GPS
(North 39.178154, East -78.341598836)

IMG-4 pH Value



Sampling location as per GPS
(North 39.178154, East -78.341598836)

IMG-5 Sample for Phthalate Testing



Sampling location as per GPS
(North 39.178154, East -78.341598836)

IMG-6 Packaging



Sampling location as per GPS
(North 39.178154, East -78.341598836)

APPENDIX B

Group	Analyte	CAS No.	Reporting Limit (mg/kg)		Reference Method
2A. Alkylphenol (AP) and Alkylphenol Ethoxylates (APEOs): including all isomers	Nonylphenol NP, mixed isomers	Various (incl. 104-40-5, 11066-49-2, 25154-52-3, 84852-15-3)	5	0.2	NP/OP: ISO 18857-2 (modified dichloromethane extraction) or ASTM D7065 GC/MS or LC/MS(-MS)
	Octylphenol OP, mixed isomers	Various (incl. 140-66-9, 1806-26-4, 27193-28-8)	5	0.2	
	Octylphenol ethoxylates (OPEO)	Various (incl. 9002-93-1 9036-19-5, 68987-90-6)	5	0.2	OPEO/NPEO: ISO18857-2 or ASTM D7065 GC/MS, GC/MS or LC/MS(-MS) for n=1-21 APEO 1-18
	Nonylphenol ethoxylates (NPEO)	Various (inc. 9016-45-9, 26027-38-3, 37205-87-1, 68412-54-4, 127087-87-0)	5	0.2	
2B. Chlorobenzenes and Chlorotoluenes	Monochlorobenzene	108-90-7	0.2	0.1	USEPA 8260B,8270D, Dichloromethane extraction followed by GC/MS
	1,2-Dichlorobenzene	95-50-1	0.2	0.1	
	1,3-Dichlorobenzene	541-73-1	0.2	0.1	
	1,4-Dichlorobenzene	106-46-7	0.2	0.1	
	1,2,3-Trichlorobenzene	87-61-6	0.2	0.1	
	1,2,4-Trichlorobenzene	120-82-1	0.2	0.1	
	1,3,5-Trichlorobenzene	108-70-3	0.2	0.1	
	1,2,3,4-Tetrachlorobenzene	634-66-2	0.2	0.1	
	1,2,3,5-Tetrachlorobenzene	634-90-2	0.2	0.1	
	1,2,4,5-Tetrachlorobenzene	95-94-3	0.2	0.1	
	Pentachlorobenzene	608-93-5	0.2	0.1	
	Hexachlorobenzene	118-74-1	0.2	0.1	
	2-Chlorotoluene	95-49-8	0.2	0.1	
	3-Chlorotoluene	108-41-8	0.2	0.1	
	4-Chlorotoluene	106-43-4	0.2	0.1	
	2,3-Dichlorotoluene	32768-54-0	0.2	0.1	
	2,4-Dichlorotoluene	95-73-8	0.2	0.1	
	2,5-Dichlorotoluene	19398-61-9	0.2	0.1	
	2,6-Dichlorotoluene	118-69-4	0.2	0.1	
	3,4-Dichlorotoluene	95-75-0	0.2	0.1	
	3,5-Dichlorotoluene	25186-47-4	0.2	0.1	
	2,3,4-Trichlorotoluene	7359-72-0	0.2	0.1	
	2,3,6-Trichlorotoluene	2077-46-5	0.2	0.1	
	2,4,5-Trichlorotoluene	6639-30-1	0.2	0.1	
	2,4,6-Trichlorotoluene	23749-65-7	0.2	0.1	
	3,4,5-Trichlorotoluene	21472-86-6	0.2	0.1	
	2,3,4,5-Tetrachlorotoluene	76057-12-0	0.2	0.1	
	2,3,5,6-Tetrachlorotoluene	29733-70-8	0.2	0.1	
	2,3,4,6-Tetrachlorotoluene	875-40-1	0.2	0.1	
	Pentachlorotoluene	877-11-2	0.2	0.1	
2C. Chlorophenols	2-Chlorophenol	95-57-8	0.5	0.025	USEPA 8270 D Solvent extraction, derivatisation with KOH, acetic anhydride followed by GC/MS
	3-Chlorophenol	108-43-0	0.5	0.025	
	4-Chlorophenol	106-48-9	0.5	0.025	
	2,3-Dichlorophenol	576-24-9	0.5	0.025	
	2,4-Dichlorophenol	120-83-2	0.5	0.025	
	2,5-Dichlorophenol	583-78-8	0.5	0.025	
	2,6-Dichlorophenol	87-65-0	0.5	0.025	
	3,4-Dichlorophenol	95-77-2	0.5	0.025	
	3,5-Dichlorophenol	591-35-5	0.5	0.025	
	2,3,4-Trichlorophenol	15950-66-0	0.5	0.025	

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Group	Substance (Target parameter)	CAS-No.	Limit of Quantification (LOQ)		Analytical Method
			mg/kg	%	
	2,3,5-Trichlorophenol	933-78-8	0.5	0.025	
	2,3,6-Trichlorophenol	933-75-5	0.5	0.025	
	2,4,5-Trichlorophenol	95-95-4	0.5	0.025	
	2,4,6-Trichlorophenol	88-06-2	0.5	0.025	
	3,4,5-Trichlorophenol	609-19-8	0.5	0.025	
	2,3,4,5-Tetrachlorophenol	4901-51-3	0.5	0.025	
	2,3,4,6-Tetrachlorophenol	58-90-2	0.5	0.025	
	2,3,5,6-Tetrachlorophenol	935-95-5	0.5	0.025	
	Pentachlorophenol (PCP)	87-86-5	0.5	0.025	
20. Dyes - Azo (Forming Restricted Amines)	4,4'-Methylene-bis-(2-chloro-aniline)	101-14-4	0.1	0.1	EN 14362-1 Reduction step with Sodiumdithionite solvent extraction GC/MS or LC/MS
	4,4'-methylenedianiline	101-77-9	0.1	0.1	
	4,4'-Oxydianiline	101-80-4	0.1	0.1	
	4-Chloroaniline	106-47-8	0.1	0.1	
	3,3'-Dimethoxybenzidine	119-90-4	0.1	0.1	
	3,3'-Dimethylbenzidine	119-93-7	0.1	0.1	
	6-methoxy-m-toluidine (p-Cresidine)	120-71-8	0.1	0.1	
	2,4,5-Trimethylaniline	137-17-7	0.1	0.1	
	4,4'-Thiodianiline	139-65-1	0.1	0.1	
	4-Aminoazobenzene	60-09-3	0.1	0.1	
	4-Methoxy-m-phenylenediamine	615-05-4	0.1	0.1	
	4,4'-Methylene-di-o-toluidine	838-88-0	0.1	0.1	
	2,6-Xylidine	87-62-7	0.1	0.1	
	o-Anisidine	90-04-0	0.1	0.1	
	2-Naphthylamine	91-59-8	0.1	0.1	
	3,3'-Dichlorobenzidine	91-94-1	0.1	0.1	
	4-Aminodiphenyl	92-67-1	0.1	0.1	
	Benzidine	92-87-5	0.1	0.1	
	o-Toluidine	95-53-4	0.1	0.1	
	2,4-Xylidine	95-68-1	0.1	0.1	
	4-Chloro-o-toluidine	95-69-2	0.1	0.1	
	4-Methyl-m-phenylenediamine	95-80-7	0.1	0.1	
	o-Aminoazotoluene	97-56-3	0.1	0.1	
	5-nitro-o-toluidine	99-55-8	0.1	0.1	
21. Dyes-Carcinogenic or Equivalent Concern	C.I. Direct Black 38	1937-37-7	500	1	Liquid Extraction LC/MS
	C.I. Direct Blue 6	2602-46-2	500	1	
	C.I. Acid Red 26	3761-53-3	500	1	
	C.I. Basic Red 9	569-61-9	500	1	
	C.I. Direct Red 28	573-58-0	500	1	
	C.I. Basic Violet 14	632-99-5	500	1	
	C.I. Disperse Blue 1	2475-45-8	500	1	
	C.I. Disperse Blue 3	2475-46-9	500	1	
	C.I. Basic Blue 26 (with Michler's Ketone < 0.1%)	2580-56-5	500	1	
	C.I. Basic Green 4 (malachite green chloride)	569-64-2	500	1	
	C.I. Basic Green 4 (malachite green oxalate)	2437-29-8	500	1	
	C.I. Basic Green 4(malachite green)	10309-95-2	500	1	
	Disperse Orange 11	82-28-0	500	1	
22. Dyes-disperse (Sensitizing)	Disperse Yellow 1	119-15-3	50	1	Liquid Extraction LC/MS
	Disperse Blue 102	12222-97-8	50	1	
	Disperse Blue 106	12223-01-7	50	1	

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Group	Analyte	CAS			
	Disperse Yellow 39	12236-29-2	50	1	
	Disperse Orange 37/59/76	13301-61-6	50	1	
	Disperse Brown 1	23355-64-8	50	1	
	Disperse Orange 1	2581-69-3	50	1	
	Disperse Yellow 3	2832-40-8	50	1	
	Disperse Red 11	2872-48-2	50	1	
	Disperse Red 1	2872-52-8	50	1	
	Disperse Red 17	3179-89-3	50	1	
	Disperse Blue 7	3179-90-6	50	1	
	Disperse Blue 26	3860-63-7	50	1	
	Disperse Yellow 49	54824-37-2	50	1	
	Disperse Blue 35	12222-75-2	50	1	
	Disperse Blue 124	61951-51-7	50	1	
	Disperse Yellow 9	6373-73-5	50	1	
	Disperse Orange 3	730-40-5	50	1	
	Disperse Blue 35	56524-77-7	50	1	
20. Flame Retardants	Tris(2-chloroethyl) phosphate (TCEP)	115-96-8	5	1	ISO 22032, USEPA527 and USEPA8321B, Dichloromethane extraction GC/MS or LC/MS(-MS)
	Decabromodiphenyl ether (DecaBDE)	1163-19-5	5	1	
	Tris(2,3-dibromopropyl) phosphate (TRIS/TDBPP)	126-72-7	5	1	
	Pentabromodiphenyl ether (PentaBDE)	32534-81-9	5	1	
	Octabromodiphenyl ether (OctaBDE)	32536-52-0	5	1	
	Bis(2,3-dibromopropyl) phosphate (BIS/BDBPP)	5412-25-9	5	1	
	Tris(aziridinyl)-phosphineoxide (TEPA)	545-55-1	5	1	
	Polybrominbiphenyls (PBBs)	59536-65-1	5	1	
	Tetrabrombisphenol A (TBBPA)	79-94-7	5	1	
	Hexabromocyclododecane (HBCDD)	1194-65-6	5	1	
	2,2-Bis(brommomethyl)-1,3-propanediol (BBMP)	1196-90-0	5	1	
	Tris(1,3-dichloro-isopropyl) phosphate (TDCP)	13674-87-8	5	1	
	Short chain chlorinated paraffins (SCCPs) (C10-C13)	85535-84-8	5	1	
21. Glycols	Bis(2-methoxyethyl)-ether	111-96-6	50	5	US EPA 8270 Liquid Extraction LC/MS
	2-ethoxyethanol	110-80-5	50	5	
	2-ethoxyethyl acetate	111-15-9	50	5	
	Ethylene glycol dimethyl ether	110-71-4	50	5	
	2-methoxyethanol	109-86-4	50	5	
	2-methoxyethylacetate	110-49-6	50	5	
	2-methoxypropylacetate	70657-70-4	50	5	
	Triethylene glycol dimethyl ether	112-49-2	50	5	
22. Halogenated Solvents	1,2-Dichloroethane	107-06-2	1	1	US EPA 8260D Headspace GC/MS or Purge and Trap GC/MS
	Methylene Chloride	75-09-2	1	1	
	Trichloroethylene	79-01-6	1	1	
	Tetrachloroethylene	127-18-4	1	1	
23. Organotin	Mono-, di- and tri-	Multiple	0.01	0.1	ISO 17353

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Group	Substance (Testing parameter)	CAS No.	Reporting limit		Name of the testing method
			Wastewater (µg/L)	Sludge (mg/kg) (dry)	
Compounds	methyltin derivatives				Derivatisation with NaBH(C2H5) GC/MS
	Mono-, di- and tri-butyltin derivatives	Multiple	0.01	0.1	
	Mono-, di- and tri-phenyltin derivatives	Multiple	0.01	0.1	
	Mono-, di- and tri-octyltin derivatives	Multiple	0.01	0.1	
	Monomethyltin	Multiple	0.01	0.1	
	Dimethyltin	Multiple	0.01	0.1	
	Trimethyltin	Multiple	0.01	0.1	
	Monobutyltin	Multiple	0.01	0.1	
	Dibutyltin	Multiple	0.01	0.1	
	Tributyltin	Multiple	0.01	0.1	
	Monophenyltin	Multiple	0.01	0.1	
	Diphenyltin	Multiple	0.01	0.1	
	Triphenyltin	Multiple	0.01	0.1	
	Monooctyltin	Multiple	0.01	0.1	
	Dioctyltin	Multiple	0.01	0.1	
	Trioctyltin	Multiple	0.01	0.1	
2K. Perfluorinated and Polyfluorinated Chemicals (PFCs)	Perfluorooctanesulfonic acid (PFOS)	355-46-4 ,432-50-7	0.01	0.05	DIN 38407-42 (modified) Ionic PFC Concentration or direct injection, LC/MS(-MS) Non-ionic PFC (FTOH) derivatisation with acetic anhydrid, followed by GC-MS
	Perfluoro-n-octanoic acid (PFOA)	335-67-1	0.01	0.05	
	Perfluorobutanesulfonic acid (PFBS)	29420-49-3, 29420-43-3	0.01	0.05	
	Perfluoro-n-hexanoic acid (PFHxA)	307-24-4	0.01	0.05	
	8:2 FTOH	678-39-7	1	0.5	
	6:2 FTOH	647-42-7	1	0.5	
2L. Phthalates (including all other esthers of phthalic acid)	Di-2-ethylhexyl phthalate (DEHP)	117-81-7	10	1	US EPA 8270D, ISO 18856 Dichloromethane extraction GC/MS
	Dimethoxyethyl phthalate (DMEP)	117-82-8	10	1	
	Di-n-octyl phthalate (DNOP)	117-84-0	10	1	
	Di-iso-decyl phthalate (DIDP)	26761-40-0	10	1	
	Di-iso-nonyl phthalate (DINP)	28553-12-0	10	1	
	Di-n-hexyl phthalate (DnHP)	84-75-3	10	1	
	Dibutyl phthalate (DBP)	84-74-2	10	1	
	Butyl benzyl phthalate (BBP)	85-68-7	10	1	
	Dinonyl phthalate (DNP)	84-76-4	10	1	
	Diethyl phthalate (DEP)	84-66-2	10	1	
	Di-n-propyl phthalate (DPRP)	131-16-8	10	1	
	Di-iso-butyl phthalate (DIBP)	84-69-5	10	1	
	Di-cyclohexyl phthalate (DCHP)	84-61-7	10	1	
	Di-iso-octyl phthalate (DIOP)	27554-26-3	10	1	
	1,2-benzenedicarboxylic acid, di-C7-11-branched and linear alkyl esters (DHNUP)	68515-42-4	10	1	
	1,2-benzenedicarboxylic	71888-89-6	10	1	

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Group	Substance (Testing parameter)	CAS No.	Reporting Limit Wastewater (mg/L)	Reporting Limit Wastewater (mg/L)	Name of the testing method
	acid, sh-C6-8-branched alkyl esters, C7-rich (DIHP)				
2M. Poly Aromatic Hydrocarbons (PAHs)	Benzo[a]pyrene (BaP)	50-32-8	1	1	DIN 38407-39 Solvent extraction GC/MS
	Anthracene	120-12-7	1	1	
	Pyrene	129-00-0	1	1	
	Benzo[ghi]perylene	191-24-2	1	1	
	Benzo[e]pyrene	192-97-2	1	1	
	Indeno[1,2,3-cd]pyrene	193-39-5	1	1	
	Benzo[j]fluoranthene	205-82-3	1	1	
	Benzo[b]fluoranthene	205-99-2	1	1	
	Fluoranthene	206-44-0	1	1	
	Benzo[k]fluoranthene	207-08-9	1	1	
	Acenaphthylene	208-96-8	1	1	
	Chrysene	218-01-9	1	1	
	Dibenz[a,h]anthracene	53-70-3	1	1	
	Benzo[a]anthracene	56-55-3	1	1	
	Acenaphthene	83-32-9	1	1	
	Phenanthrene	85-01-8	1	1	
	Fluorene	86-73-7	1	1	
	Naphthalene	91-20-3	1	1	
2N. Volatile Organic Compound (VOCs)	Benzene	71-43-2	1	0.1	ISO 11423-1 Headspace- or Purge-and-Trap-GC/MS
	Xylene	1330-20-7	1	0.1	
	o-cresol	95-48-7	1	0.1	
	p-cresol	106-44-5	1	0.1	
	m-cresol	108-39-4	1	0.1	
1A. Conventional Parameters	Temperature	–	N/A	N/A	Apply the standard methods that best apply to the region (ISO, EU, US, China), please refer to ZDHC Wastewater Guidelines for more details on the testing method and the levels (Foundational, Progressive, and Aspirational)
	TSS	–	N/A	N/A	
	COD	–	N/A	N/A	
	Total-N	–	N/A	N/A	
	pH	–	N/A	N/A	
	Color [m^{-1}] (436nm; 525nm; 620nm)	–	N/A	N/A	
	BOD5	–	N/A	N/A	
	Ammonium-N	–	N/A	N/A	
	Total-P	–	N/A	N/A	
	AoX	–	N/A	N/A	
	Oil and Grease	–	N/A	N/A	
	Phenol	–	N/A	N/A	
	Coliform(bacteria/100ml)	–	N/A	N/A	
	Persistent Foam	--	Not visible	Not visible	A sample With reference to APHA 4500 CN- H,I,C&I and followed by UV and Vis
	Substance (Testing parameter)	**CAS No.**	**Wastewater (mg/L) (Option)**	**Wastewater (mg/L) (Option)**	
	ANIONS				
	Cyanide(CN-)	Various (incl. 57-12-5)	0.02	0.5	
	Sulfide	–	N/A	N/A	
	Sulfite	–	N/A	N/A	

Group	Substance (Testing parameter)	CAS No.	Reporting Limit Wastewater (mg/L) (option)	Reporting Limit Wastewater (mg/L) (option)	Name of the testing method
1B. Conventional Parameters - METALS	Antimony (Sb)	7440-36-0	0.001	N/A	Various Acid Digestion with ICP analysis
	Chromium(Cr), total	7440-47-3	0.001	N/A	
	Cobalt(Co)	7440-48-4	0.001	N/A	

Group	Substance (Testing parameter)	CAS No.	Report Limit		Method Description
	Copper(Cu)	7440-50-8	0.001	N/A	please refer to ZDHC Wastewater Guidelines for more details on the testing method and the levels (Foundational, Progressive, and Aspirational). Cr(VI): Various Solvent extraction and derivatisation followed by UV analysis
	Nickel (Ni)	7440-02-0	0.001	N/A	
	Silver (Ag)	7440-22-4	0.001	N/A	
	Zinc(Zn)	7440-66-6	0.001	N/A	
	Arsenic (As)	7440-38-2	0.001	1	
	Cadmium(Cd)	7440-43-9	0.0001	1	
	Chromium VI(CrVI)	18540-29-9	0.001	1	
	Lead(Pb)	7439-92-1	0.001	1	
	Mercury (Hg)	7439-97-6	0.00005	0.1	

Note / Key :

ppm = part(s) per million; ppb = part(s) per billion
U. S. EPA = United States Environmental Protection Agency
APHA = American Public Health Association

The opinions of this PDF file is in accordance with the original issued report on information provided

TRIDENTGROUP™
Excellence in nature

To

The Environmental Engineer
Punjab Pollution control Board
Industrial Focal Point
Sunam Road, Sangrur (Punjab)

Subject: Declaration of Asset value of the company as on March 31, 2020

Dear Sir,

In accordance with the terms and conditions of authorization for consent under Air and Water Act enclosing herewith the certificate issued by Shiv Satish & Associates Chartered Accountants regarding value of the company M/S Trident Limited (Home Textile Division) as on 31.03.2020

This is for your information and records please

Thanking You

Yours Faithfully
For Trident Limited(HTD)

Lovelish Goyal
Factory Manager

lovelish goyal

e No.....

Date

TO WHOM IT MAY CONCERN

This is to certify that Gross Block of Fixed Assets as on 31.03.2020 as per the books of accounts of 'M/s Trident Limited' (Home Textile Division 1&2- Dhandra) having Regd. Office at Raikot Road, Sanghera, Barnala is as follows:

Particulars	Amount (Rs. in Lakhs)
Land Freehold	2,827.53
Buildings	10,046.91
Plant & Machinery	55,691.74
Furniture & Fixture	310.72
Office Equipment	303.03
Computers	419.27
Vehicles	87.80
Intangible Assets	6,641.35
Total	76,375.85

(Rupees: Seven Hundred Sixty Three Crore Seventy Five Lakh and Eight Thousand Only)

Important Note: The above clarification is compiled from the information and relevant documentary evidence only shown to us.

FOR SHIV SATISH & ASSOCIATES
(CHARTERED ACCOUNTANTS)
FRN: 025153N

CA SATISH KAPOOR
PARTNER
M.NO. 500278
DATE: 15.07.2020
PLACE: LUDHIANA

TRIDENT™

Being different is normal

E-212, Khasla Nagar
Ludhiana 141003
Punjab

TRIDENT/HTD/CA/2019/01
Date:18.06.2019

To

The Environmental Engineer
Punjab Pollution control Board
Industrial Focal Point
Sunam Road, Sangrur (Punjab)

Subject: Declaration of Asset value of the company as on March 31, 2019

Dear Sir,

In accordance with the terms and conditions of authorization for consent under Air and water Act , we are enclosing herewith the certificate issued by Shiv Satish & Associates Chartered Accountants certifying asset value of the company M/S Trident Limited (Home Textile Division) as on 31.03.2019.

This is for your information and records please

Thanking You

Yours Faithfully
For Trident Limited(HTD).

Rajat Monga
President
Sustainability

ਸੀਨੀਅਰ ਸਹਾਇਕ
ਪ੍ਰਸਾਰ ਪ੍ਰਦੂਸ਼ਣ ਰੋਕਥਾਮ ਬੋਰਡ
ਦੁਨਰੀ ਜਲਦਾਨ ਸੰਗਰੂਰ

Shiv Satish & Associates

Chartered Accountants

Mob.:- +91 98155-29[illegible]
+91 98109-184[illegible]

Ref No.....

Date..26/06/2019.....

TO WHOM SO EVER IT MAY CONCERN

This is to certify that Gross Block of fixed assets as on 31.03.2019 as per the books of accounts of M/s Trident Limited, (Home Textile Division 1&2- Dhaula) having its Regd. Office at Raikot Road, Sanghera, Barnala is as follows

Particulars	Amount(Rs.In Lacs)
Land Freehold	2,875.03
Buildings	9,968.64
Plant & Machinery	55,592.24
Furniture & Fixture	265.03
Office Equipment	288.87
Computers	442.00
Vehicles	72.10
Intangible Assets	6,654.19
Total	76,158.10

(Rupees: Seven Hundred Sixty One Crores Fifty Eight Lacs and Ten Thousand Only)

Important Note: The above certification is based on the relevant extracts of books of accounts, information and other relevant documentary evidence as shown to us.

FOR SHIV SATISH & ASSOCIATES
CHARTERED ACCOUNTANTS

CA SATISH KAPOOR
PARTNER

DATE: 26.06.2019
PLACE: LUDHIANA
UDIN: 19500278AAAAG[illegible]697

B-34,10005/06, Karter Avenue, Halbowal Kalan, Ludhiana- 141001
353, Vijay Vihar, Near Sector 30, Gurgaon-122001
E-mail: satishkapoor_ca@yahoo.co.in

Date	Inlet Meter Reading		Total Inlet Flow (KL)	Outlet Meter Reading		Total Outlet Flow (KL)	Treatment Plant Meter Reading		Total Treated Water to Plantation (KL)	Total Treated Water to Drain (KL)	Treated Water to RO Plant (KL)	Remarks (if any)
	Initial	Final		Initial	Final		Initial	Final				

TRIDENT

DAILY ANALYSIS TEST MATRIX FOR HTD-ETP

Date: 5 - 9

S.No.	DESCRIPTION	SAMPLE COLLECTION TIME	QUANTITY FOR COD	TEMPERATURE	pH	TSS	COD	BOD	COLOR
		ETP OUTLET NORMS		35°C	6.5 - 8.5	100 PPM	250 PPM	30 PPM	
1	HTD 1	9:00 AM	5 ML	41.8	8.10				
2	HTD 2	9:00 AM	5 ML	45.8	8.64				
3	HTD 3								
4	ETP INLET	9:00 AM	5 ML	37.6	8.43	10			
5	ETP OUTLET	9:00 AM	2.5 ML	34.6	7.94	15			

S.No.	LOCATION	INITIAL WEIGHT	FINAL WEIGHT	DIFFERENCE	MLSS	SSV	SVI	EMPTY CRUCIBLE	FINAL CRUCIBLE	DIFFERENCE	MLVSS
1	OXI 1	101	2.342	1.839	1839	150	81.6				
2	OXI 2	101	2.342	1.232	1232	150	81.8				
3	OXI 3										

COD REFLUXING TIME	2 HR
MLSS HEATING TIME	2 HR
MLVSS HEATING TIME	2 HR

COD TITRATION RESULTS	
BLANK	3.1
HTD 1	
HTD 2	
HTD 3	
ETP INLET	
ETP OUTLET	15.6

BOD TITRATION RESULTS	
BLANK	6.8
ETP INLET	3.2
ETP OUTLET	10.0

BOD INCUBATION STARTING TIME		
SAMPLES	BOTTLE NO	% SAMPLE
BLANK	1	
ETP INLET	2	
ETP OUTLET	3	

LAB TECHNICIAN SIGNATURE

LAB HEAD SIGNATURE

HOD SIGNATURE

PUNJAB POLLUTION CONTROL BOARD

Application form for obtaining 'Consent to establish' (NOC)/'Consent to Operate' u/s 25/26 of the Water (Prevention & Control of Pollution) Act, 1974 and u/s 21 of the Air(Prevention & Control of Pollution) Act, 1981/Authorization under Rule 6 (1) of the Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016.

Industry ID :- R12BAR22182
Application ID :- 14891706

From:

Trident Ltd (HTD)
Trident Complex, Mansa-Road, Vill-Dhaula
BARNALA
BARNALA

To

The Member Secretary,
Punjab Pollution Control Board,
Patiala.

We hereby, apply for obtaining,

(i) **'Consent to establish' (NOC) under the provisions of the Water(Prevention & Control of Pollution) Act, 1974 and Air (Prevention & Control of Pollution) Act, 1981.**

(ii) **'Consent to operate' u/s 25/26 of the Water(Prevention & Control of Pollution) Act, 1974.**

✓ (iii) **'Consent to operate' u/s 21 of the Air(Prevention & Control of Pollution)Act,1981.**

(iv) **Authorization under Rule 6 (1) of the Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016.**

1. The detailed information pertaining to my/our industry/project is given in the Annexure I to this form attached herewith.

2. I/We undertake to furnish any further information sought by the Board from time to time in connection with this applicantion.

3. I/We undertake to obtain revised/varied/fresh consent as the case may be, in case there is any change in the process/product/effluents/hazardous waste etc. before the aforesaid change is affected.

PART-A: GENERAL INFORMATION:

1.	Name & Address of the Industry	:	Trident Ltd (HTD) Trident Complex, Mansa-Road, Vill-Dhaula BARNALA,BARNALA
2.	Name & Designation of the Applicant	:	Mr.Rajat Monga/President-Sustainability Pb
3.	(i) Name(s) and Designation of the Occupier	:	Deepak Nanda/Mananging Director
	(ii) Name(s) and Designation of the Director(s)/ Partner(s)/ Proprietor	:	Mr. Deepak Nanda (Managing Director & Vice Chairman), Regd. Office - Trident ltd, Raikot Road, Sangehra,deepaknanda@tridentindia.com,161-5039999 (ext - 7111)
	(iii) Name(s) of person(s) authorized to sign the application form. (Please attach self attested copy of resolution/certificate)	:	Deepak Nanda
	(iv) Ownership of Industry	:	Private Limited Company
4.	Communication Details(Telephone No./Fax No./e-mail etc.)	:	161-5039999 161-5039900 deepaknanda@tridentindia.com
5.	Address of Correspondence	:	Trident Complex, Raikot Road,sangehra, Barnala, Barnala, 148101
6.	Total investment of the industry/project		
	(i) Total cost of the industry/project(in Lacs)	:	76375.85
	(ii) Cost of Plant & Machinery(in Lacs)	:	55691.74
7.	(i) Scale of the Industry(Large/Medium/Small)	:	Large
	(ii) Category/Type of the Industry	:	RED / Other
8.	Name and address of the City/Town/Village/Plot/Khasra/Patwari Halka No. with PIN code where the project site is located	:	Trident Complex, Mansa-Road, Vill-Dhaula Barnala Pin - 148107
9.	(i) Total Land area of the industry/project (in square meters)	:	315247
	(ii) Built up area of the project(to be mentioned in case of construction/area development projects only) (in square meters)	:	118978
10.	Whether the site of the industry/project is located within or outside the municipal limits (please attach a certificate from the M.C. in this regard)	:	Outside M.C. limit

18. (a) Total No. of Workers including officials working in industry : 3000

(b) No. of Workers and officials residing in the industrial permises: : 371

(c) Total population to be served,
(i) during construction phase :

(ii)during operation phase :

(To be mentioned in case of construction/area development projects only)

19. Whether the indusrty/project:

(i) is covered under the Environment Impact Assessment (EIA) Notification dated 14.9.2006 as amended from time to time or not and if yes, the status of obtaining environment clearance from MoEF/State Level Environment Impact Assessment Authority : NO /

(ii) is covered under the 1st Schedule of Factories Act, 1948 or not if yes, the status of obtaining site clearance from SCA-cum-SAC : NO /

(iii) is covered under Press Note-17 (1984 series) or not and if yes, the status of obtaining the environmental from SCA-cum-SAC : NO /

20. Whether the industry has the complete machinery for which it had obtained 'consent to establish'(NOC) from the Board or not and if not, the details thereof. (To be filled up in case of 'consent to operate' cases only : NO /

Last Consent Details:

Sr No.	Application Type	Application For	Consent No	Consent For	Date of Issue	Valid Upto
1	CTO	Renew	CTOW/Renewal/BAR/2020/12637642	Water	30/06/2020	31/03/2021
2	CTO	Renew	R16BARCTOA3718123	Air	27/04/2016	31/03/2021

Sr. No.	Source of Generation of Solid Waste		Nature/Type of solid waste	Quantity of Solid Waste generated/to be generated per day	Mode of Disposal
1	From Manufacturing Process	Metric Tonnes/Day	Towel Cutting	0.295	Sold to Third Party
2	From Maintenance Work	Metric Tonnes/Day	Metal Scrap	0.045	Sold to Third Party
3	From Packing of Equipments & Raw Material	Metric Tonnes/Day	Plastic/Rubber/Nylon/Polythine Scrap	0.297	Sold to Third Party
4	From Packing Material	Metric Tonnes/Day	Wooden Scrap,Paper Board ,Gatta Scrap	2.047	Sold to Third Party
5	Civil Construction Work	Metric Tonnes/Day	Glass Scrap	0	Sold to Third Party

) Process Emissions:

r. No.	Process	Parameters	Conc. of pollutants		Units
			Untreated	Treated	
----------NIL----------					

Power consumption details of Air Pollution Control devices: :

(i) Total power load to Air Pollution Control Devices(in KW) : 0

(ii) Average daily power consumption on Air Pollution Control Devices(i.e. no. of units consumed per hr.& per day) : 0

14-S, 10

O/o Executive Engineer, Drainage cum Mining Division, Sangrur

Phone & Fax No: 01676-234086 E-mail: xendrainage_sng@yahoo.in

No 3234-35/ 103-W Dated 26/4/2021

From

Executive Engineer
Drainage cum Mining Division
Sangrur

To

Managing Director,
Trident Group
Mansa Road, Village Dhaula, Distt Barnala

Subject : **Cleaning of Drains by Companies under "Corporate Social Responsibility" (CSR).**

Ref : **This office letter No. 474 / 103-W Dated 23.01.2020**
CP-132/103W P-7

In reference to the above cited subject, You are directed to initiate the cleaning of drains under CSR before flood season 2021. The estimate for cleaning of various drains (like Dhanaula drain which is adjacent to your company office) may be obtained from this office and the final bill after necessary cleaning under the supervision of the staff of this office will be certified by this office & the payment may be made to the concernd agencies by you based upon that. This expenditure may be charged under CSR.

You are requested to initiate the matter immediately so that work may be completed before rainy season.

(Er. Gagandeep Singh Gill)
Executive Engineer
Drainage cum Mining Division
Sangrur

Endst. No. 3234-35 **/103-W** **Dated** 26/4 **/2021**

Copy of above is forwarded to Superintending Engineer, Drainage cum Mining Circle Patiala for information and further neccessary action please.

(Er. Gagandeep Singh Gill)
Executive Engineer
Drainage cum Mining Division
Sangrur

MATERIAL SAFETY DATA SHEET - SULPHURIC ACID

IDENTIFICATION OF THE PRODUCT AND THE COMPANY

Identification of the Product
Designation
Trade name
Commonly used synonyms Sulphuric acid
CAS Number: 7664-93-9
EINECS Number: 231-639-5
EINECS Name Sulphuric acid
Molecular formula H2SO4

Company Address
Trident Limited,
Trident Complex, Sanghera-148101
Barnala, Punjab
Works :
Trident Limited,
VPO - Dhaula,
Mansa Road, BARNALA, Punjab

Phone: 0161 - 5038888 Extn. 2217
Fax : 0161 - 5038800
Toll Free No: 1800 180 2999

Emergency calls

Company : Trident Limited, Dhaula,
Telephone No.: +91-161- 5038888

Toll Free No: 1800 180 2999

COMPOSITION/INFORMATION ON INGREDIENTS

Nature of ingredients and concentration
Aqueous solution containing: 98 % H2SO4

Classification
Corrosive according to EEC classification.

HAZARDS IDENTIFICATION

Human Health
Sulphuric Acid is highly corrosive to all parts of the body. Its vapours are corrosive to the respiratory tract and can cause fluid build-up on the lung (pulmonary Œdema) which could prove fatal.

1) Skin Contact: Liquid splashes may cause severe burns.
2) Eye Contact: May cause severe burns. May cause prolonged and permanent damage.
3) Ingestion: Will immediately cause severe corrosion of and damage to the gastro-intestinal tract.
4) Inhalation: Vapour is severely irritant to the respiratory tract. Fluid build up on the lung (pulmonary Œdema) may occur up to 48 hours after exposure and could prove fatal.

5) Long term effects: Occupational exposure to strong inorganic acid mists containing sulphuric acid has been associated with an increased incidence of cancer of the larynx (the voice box) and, to a lesser extent, the lung.

Environment
Sulphuric acid is harmful to aquatic life

Other
Oxidizing agent, may assist combustion. Can react violently if in contact with water. Highly reactive with metals and organic materials.

FIRST AID MEASURES

Product
Speed is essential. In all cases, obtain medical attention.

Skin Contact
1) Drench with water and remove contaminated clothing and wash or shower the affected skin with plenty of water.
2) Obtain immediate medical attention.

Eye Contact
1) Immediately irrigate the eyes with eyewash solution or clean water for at least 10 minutes.
2) Continue irrigation until medical attention can be obtained.
3) Hold eyelids open during flushing.

Ingestion
1) Do not induce vomiting.
2) If the person is conscious, wash out mouth with water and give 2 or 3 glasses of water or milk to drink.
3) Immediately transport the patient to hospital.

Inhalation
1) Move the injured person to fresh air at once.
2) Keep the patient warm and at rest.
3) Administer oxygen if a competent person is available.
4) Perform artificial respiration, if breathing has stopped or shows sign of failing.
5) Obtain immediate medical attention.

Further medical advice
Following exposure the patient should be kept under medical review for at least 48 hours as delayed pulmonary Œdema may develop.

FIRE FIGHTING MEASURES

Non-flammable. Oxidizing agent, may assist combustion.

Suitable extinguishing media
1) Dry powder.
2) Water spray should be used to cool containers.
3) Suitable extinguishing media for the combustible substance: water.

specific hazards if product is involved in a Fire

1) Not combustible, but many reactions may cause Fire and explosion.
2) Release of toxic gases (oxides of sulphur) from decomposition and hydrogen from reaction with metals.
3) A self contained breathing apparatus and full protective clothing should be worn in Fire conditions.

ACCIDENTAL RELEASE MEASURES

Personal precautions
1) Put on protective equipment before entering danger area. (See Section 8.)
2) Ventilate area of the spill or leak.

Environmental precautions
1) Take care to avoid the contamination of watercourses and drains.
2) Inform appropriate authority in case of accidental contamination of watercourses.

Methods for cleaning
1) Swill away small spillage with copious quantities of water.
2) Contain large spillage with sand or earth as necessary.
3) Neutralise cautiously with soda ash or lime (risk of heat generation and splashing acid) and recover for disposal.

HANDLING AND STORAGE

Handling
1) Wear eye and hand protection when handling small quantities.
2) Provide adequate ventilation.
3) When diluting, always add acid to water, not water to acid.
4) Wear full protective equipment where there is a risk of leaks or splashes.
5) Avoid inhalation of high concentration of mists.

Storage
1) Store in cool, well ventilated area.
2) Keep away from combustible materials, reducing agents, strong bases, metals.
3) The bung or stopper on steel drums must be opened at periodic intervals to release hydrogen.
4) Do not permit smoking or the use of naked lights.

EXPOSURE CONTROL / PERSONAL PROTECTION

Occupational exposure limits
1) ACGIH recommended values (1995-96):
2) TLV / TWA: 1mg / m3
3) TLV-STEL: 3mg / m3.

Precautionary and engineering measures
1) Local exhaust ventilation.
2) Provide safety showers and eye washing facility at any location where skin or eye contact can occur.

Personal Protection
1) Wear suitable breathing apparatus if exposure levels exceed the recommended limits.
2) Wear acid resistant gloves, apron, footwear and protective clothing.
3) Use chemical safety goggles or full face shield.

STABILITY AND REACTIVITY

Stability
The product is stable under normal conditions of storage, handling and use.

Conditions to avoid
High temperatures.

Materials to avoid
1) Combustible substances, reducing agents, strong bases.
2) Above 60% the solution is a strong oxidant, reacts with many organic compounds and attacks clothing.
3) The substance is a strong acid, reacts violently with bases and is corrosive.
4) Attacks base metals (except lead) giving off hydrogen.

Hazardous reactions/decomposition products
Sulphur dioxide, sulphur trioxide and hydrogen gases evolved.

TOXICOLOGICAL INFORMATION

General
Sulphuric acid is highly corrosive to all parts of the body.

Toxicity Data
1) Skin Contact Pain, severe burns.
Prolonged or repeated exposure to diluted solutions may cause dermatitis.
2) Eye Contact Immediate pain, severe burns, permanent corneal damage which may result in blindness.
3) Inhalation Mists and vapours may cause sore throat, coughing, shortness of breath, laboured breathing.
4) Over-exposure may cause lung Œdema.
5) Prolonged or repeated exposures to mists or vapours of sulphuric acid may cause erosion and discolouration of teeth, chronic irritation of the nose, throat and bronchial tubes.

6) Ingestion Pain and severe burning in the mouth and throat and damage to gastro-intestinal tract.

Other Data
The WHO International Agency for Research on Cancer (IARC) have concluded that occupational exposure to strong inorganic acid mists containing sulphuric acid is carcinogenic to man, causing cancer of the larynx (the voice box) and, to a lesser extent, the lung. Although no direct link has been established between exposure to sulphuric acid, itself, and cancer in man, exposure to any mist or aerosol during the use of this product should be avoided and, in any case, keep exposures below the occupational exposure limit for sulphuric acid.

ECOLOGICAL INFORMATION

Mobility
Soluble in water.

Persistence/Degradability
1) Unlikely to cause harmful effects.
2) Remains indefinitely in the environment as sulphate.

Bio-accumulation
The product has low potential of bio-accumulation.

Ecotoxicity
Sulphuric acid is harmful to aquatic life even in low concentration.

DISPOSAL CONSIDERATIONS

General
Sulphuric acid should be disposed of in accordance with local and national legislation.

TRANSPORT INFORMATION

UN classification
Class 8, Corrosive Substances; UN No 1830.

Details
ADR/RID: Class 8, Item 1(b), Label: 8, Packaging Group II.
IMDG: Class 8, Label: 8, Packaging Group II.

RECOMMENDATIONS OF NIT AFTER ENVIRONMENT AUDIT – TOWEL DIVISION

S No.	RECOMMENDATION	ACTION PLAN	TIME LINE
1	Despite the fact that the treated effluent is complying the regulations of the statutory body, the discharge of the coloured effluent may cause aesthetical unpleasantness. Moreover, it is highly objectionable to the general public. So,in the current scenario, the emphasis should be given to develop more efficient microbial mass for de-colorization of effluent in the activated sludge process. A further study may be conducted from the Central/State government institutes of national importance such as IITS, NITS etc. to assess the application of microbial consortia/dedicated pure culture/tertiary treatment for de-colorization of the effluent.	The collaboration with national institute for the color study will be done before 31 Oct 2021	31 Oct'21
2	The raw water requirement of the HTD is mainly met from the withdrawal of groundwater. As per test reports of the groundwater, it contains a high level of TDS(900-1000 mg/l). The high level of TDS in raw water would ultimately lead to higher TDS in the treated effluent affecting its quality for plantation and drainage. The replacement of the source of water from groundwater to other source with better quality of water (such as surface water) could help in further reduction of pollutant load of the treated effluent.	Indutry will develop the infrastructure for utilization of canal water in home textile & make an action plan along with irrigation department to get the addtional canal water	15-Jun-22

RECOMMENDATIONS OF NIT AFTER ENVIRONMENT AUDIT – TOWEL DIVISION

S No.	RECOMMENDATION	ACTION PLAN	TIME LINE
3	In the absence of RO & MEE system, the other safe ways of disposal of effluent should be explored. The HTD is currently disposing only 3000 KLD of its treated effluent onto 48.5 acres of land for plantation. The industry should look into the possibility of enhancement of the plantation area (land requirement, type of plant, piping network, watering depth etc.) for more utilization of the treated effluent for plantation in an effective manner to eventually achieve zero liquid discharge (ZLD) to the drain. The option of providing some portion of the treated effluent to nearby farmers for irrigation of the cash crops should also be given a thought. Further, a detailed hydrogeological study of the area around the industry should be conducted from the Central/State government institutes of national importance such as IITS, NITS and NIH etc. on yearly basis to know the impact and footprints of the industrial effluent (used for plantation) onto the groundwater and soil of the locality. The hydrogeological study would also suggest effective remedial measures to meet any adverse impact of the use of the industrial effluent on the aquifers and soil, if any.	The Industry is in process for procurement of additional land & 100 % utilization of treated water onto plantation will be completed by Dec'21 at the present plant utilization capacity . The industry has already conducted hydrogeological study to access the impact and footprints of industrial effluent.	31-Dec-21

RECOMMENDATIONS BY CPPRI AFTER ENVIRONMENT AUDIT – PAPER DIVISION

S No.	RECOMMENDATION	ACTION PLAN	TIME LINE	CAPEX (Rs cr)
1	The mill has adopted several water conservation strategies to reduce the freshwater consumption. The level of mill's freshwater consumption is similar to contemporary agro based writing and printing paper mills. However, looking into the reported freshwater consumption benchmarks, the mill has still a scope to reduce freshwater consumption by further 3-4 m^3/t paper and mill may explore areas for the same, for example 100% utilization of foul condensate in pulp mill can help in reducing water consumption by 1m^3/t paper while installation of disc filter at PM1 can facilitate reduction in freshwater consumption by 1.5 -2.0 m^3/t paper	Utilization of foul condensate in Pulp Mill & more back water in Pulp Mill .	28-Dec-21	
2	The mill is advised to have sub monitoring of its treated effluent being utilized in its plantation area to have proper water balance.	Completed	Completed	
3	The mill may explore installation of appropriate technology for the recovery of white rejects (centri cleaner rejects) coming from paper machine for further improving performance of the ETP.	Installation of 2 No. Disc Filters against existing Vibratory Screens to increase the capture Suspended Solids efficiency from existing 40 % to > 80 %	10-Nov-21	

RECOMMENDATIONS BY CPPRI AFTER ENVIRONMENT AUDIT – PAPER DIVISION

S No.	RECOMMENDATION	ACTION PLAN	TIME LINE	CAPEX (Rs cr)
4	The mill needs to immediately upgrade / retrofit the existing UASB reactor as the mill is not able to utilize the biogas generated as the gas collection and distribution system have corroded developing leakages. This is resulting in an estimated loss of Rs 60-70 lakhs/ annum.	Purchase order will be placed by 20 Dec 21 .The new system will be made functional by 28 Aug 2022	28-Aug-22	4.7
5	The mill may should reduce the suspended soild level in primary clarifier overflow through use of coagulants and flocculants to further improve the performance of existing ETP.	Usage of cogulants and floculants	20-Oct-21	
6	The mill may install a coagulation and flocculation system before primary clarifier to improve its performance.	Installation of Coagulation-flocculation Project	15-Dec-21	0.68

RECOMMENDATIONS BY CPPRI AFTER ENVIRONMENT AUDIT – PAPER DIVISION

S No.	RECOMMENDATION	ACTION PLAN	TIME LINE	Capex (Rs Cr)
7	The mill is advised to make a proper boundary of existing equalization tank and make provision of air supply for homogenizing the effluent.	The industry will take necessary steps for proper boundary by 20 Feb 22 and provision of air supply system in equalization tank by 20 Jun 2022.	20-Feb-22 & 20 Jun-22	0.1
8	The mill is advised to install poly disc filter (PDF) at Paper Machine 1 also for increased fibre recovery and reuse/ recycled of paper machine backwater.	The industry will explore the recycling technology for the paper machine -1 effluent for the recovery and reuse of paper machine backwater this will be complted by 30 Oct'22.	30-Oct-22	3.0
9	The treated effluent quality meets the stipulated norms. However, the mill needs to adopt appropriate technology to reduce the colour.	Collaboration with Thapar has been done . Study will be completed in Dec 21.	30 Dec 21	
10	The mill is advised to get the OCEMS at final discharge and ESP outlet calibrated on periodical basis.	Same will be implemented on immediate basis and report will be shared by 30 Oct 2021	Completed	

RECOMMENDATIONS BY CPPRI AFTER ENVIRONMENT AUDIT – PAPER DIVISION

S No.	RECOMMENDATION	ACTION PLAN	TIME LINE	Capex (Rs Cr)
11	The SPM level in the stack emissions are lower than stipulated norms of 150 mg/Nm^3. However, in context of the EC norms of 75 mg / Nm^3 for SPM, the mill need to look into optimization of its boiler operation / ESP operation or Upgrade ESPs to comply with the new norms.	Commercial negotiation is under progress. New ESP will be installed for Rec 2 by 30 Sept 2022. Delivery Period of New ESP is 10 months . For energy ESP, we will install HF controller to reduce its SPM levels to 75 mg/Nm3 by 30 Nov 2021.	30-Nov-21 30-Sep-22	12
12	Though the mill has appropriate facilities and trained & experienced manpower for environmental monitoring and analysis the mill may get quarterly / half yearly/ yearly environmental monitoring done from a third party / independent institution.	Yearly monitoring will be implemented before 30 Nov'21	30 Nov'21	

STANDARD OPERATING PROCEDURE					TRIDENTGROUP™
BUSINESS/ UNIT	PAPER CHEMICAL DIVISION	**LOCATION**	PUNJAB	**MACHINE NAME/PROCESS NAME**	WASTE WATER DRAIN
PROCESS :	TREATED WATER UTILIZATION 100% BY FARMERS				

ACTION PLAN FOR UTILIZATION OF ALL TREATED WATER BY FARMERS BY JUNE 2022

Trident Paper is utilize its 67% of treated water into existing developed plantation land and discharge only less than 33% treated water into permitted drain.

Submitted the details and timelines to zero discharge in permitted drain.

Sr. No.	Month	Total Water	Water in Drain	Water in Plantation
	UOM	KLD	KLD	KLD
1	Jan-21	15337	4150	11187
2	Feb-21	15976	5568	10408
3	Mar-21	15975	5468	10507
4	Apr-21	15462	5524	9938
5	May-21	15395	5336	10059
6	Jun-21	15517	5345	10172
7	Jul-21	15482	5397	10085
8	Aug-21	16003	5400	10603
9	Sep-21	16012	5507	10505
10	**Average**	**15688**	**5299**	**10510**

11	Land required for utilize drain water for plantation	Acre	66

Sr. No.	Activity Description	UOM	Jan-22	Mar-22	May-22	Jun-22
1	Agreement with farmers and laying of pipeline & ordering of pipeline	Acre	21	18		27
2	Approval from drain department for laying the pipe parallel to the drain				Completion	
3	Laying of pipeline to additional land/farmers land and agreement with farmers					Completion

STANDARD OPERATING PROCEDURE					TRIDENTGROUP™
BUSINESS/ UNIT	SUSTAINABILITY	**LOCATION**	PUNJAB	**MACHINE NAME/PROCESS NAME**	WASTE WATER MANAGEMENT
PROCESS :	IRRIGATION MANAGEMENT PLAN				

Annexure -2 – Action plan detailing pipe network, land use, watering depth and type / age of plants etc.

WASTE WATER MANAGEMENT IRRIGATION PLAN

TRIDENTGROUP™

TRIDENT GROUP
BARNALA

PREPARED BY	DOCUMENT NO	PAGE 1 OF 20
AJAY KUMAR	SUS/PB/IRRIGATION -01	
APPROVED BY	ISSUE DATE	REVISION NO./ REVISION DATE
RAJAT MONGA	10/03/2021	-

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2. Plantation layout
3. Zone wise plantation area
4. Zone wise plant age
5. Zone wise water flow
6. EMF metering
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8. Infrastructure available
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10. Team matrix
11. Plantation Images PCD
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13. Irrigation process
14. Proposed Plan
15. Additional land layout & piping.

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EFFLUENT GENERATION DATA

PRESENT SCENARIO

S NO	DESCRIPTION	UOM	HTO	PCO	TOTAL
1	TOTAL EFFLUENT GENERATION	KLD	5146 5	19000	25146.5
2	TREATED WATER INTO PLANTATON	KLD	3395	13200	16595 0
3	TOTAL AREA OF PLANTATION	ACRE	48.5	165	213.5
4	EFFLUENT CONSUMPTION	KL/ACRE	70.00	80 00	75 00
5	UTILZATON OF TREATED WATER ONTO PLANTATION	%	55 2	69.5	66 0

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PLANTATION LAYOUT



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ZONE WISE PLANTATION AREA

PAPER PLANTATION AREA (ACRES)

ZONE	TOTAL
ZONE 1	5
ZONE 2	40
ZONE 3	16
ZONE 4	5
ZONE 5	10
ZONE 6	15
ZONE 7	8
ZONE 8	14
ZONE 9	6
ZONE 10	2
ZONE 11	2
ZONE 12	10
ZONE 13	2
ZONE 14	4
ZONE 15	2
ZONE 16	2
ZONE 17	3
ZONE 18	2
ZONE 19	3
ZONE 20	5
ZONE 21	9
TOTAL AREA	**165**

TOWEL PLANTATION AREA (ACRES)

ZONE	TOTAL
ZONE 1	4
ZONE 2	14
ZONE 3	3
ZONE 4	1.5
ZONE 5	3
ZONE 6	12
ZONE 7	2.5
ZONE 8	2.5
ZONE 9	6
TOTAL AREA	**48.5**

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ZONE WISE PLANTATION AGE

PAPER PLANTATION AREA (YEAR)

ZONE	TOTAL	AGE (YEARS)
ZONE 1	2020	1
ZONE 2	2019	2
ZONE 3	2010	11
ZONE 4	2008	13
ZONE 5	2021	0 9
ZONE 6	2010	11
ZONE 7	2019	2
ZONE 8	2021	0
ZONE 9	2020	1
ZONE 10	2010	11
ZONE 11	2021	0 9
ZONE 12	2020	1
ZONE 13	2010	11
ZONE 14	2009	12
ZONE 15	2014	7
ZONE 16	2010	11
ZONE 17	2010	11
ZONE 18	2010	11
ZONE 19	2012	9
ZONE 20	2021	0.9
ZONE 21	2019	2

TOWEL PLANTATION AREA (YEAR)

ZONE	TOTAL	AGE (YEARS)
ZONE 1	2021	0.8
ZONE 2	2010	11
ZONE 3	2021	0 8
ZONE 4	2021	0.8
ZONE 5	2020	1
ZONE 6	2019	2
ZONE 7	2009	12
ZONE 8	2020	1
ZONE 9	2021	0 8

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ZONE WISE IRRIGATION PLAN

PAPER PLANTATION AREA (AREA-WISE)

ZONE	TOTAL	AREA (ACRES)	TOTAL	MAX. WATER FLOW @ 80m3/acre
	ZONE 2A	20		
	ZONE 4	5		
	ZONE 10	2		
AREA 1	ZONE 13	2	46	3680
	ZONE 19	3		
	ZONE 20	5		
	ZONE 21	9		
	ZONE 1	5		
AREA 2	ZONE 9	6	13	1040
	ZONE 18	2		
AREA 3	ZONE 17	3	3	240
	ZONE 2B	20		
	ZONE 12	10		
	ZONE 3	16		
AREA 4	ZONE 6	15	87	6960
	ZONE 7	8		
	ZONE 8	14		
	ZONE 15	2		
	ZONE 16	2		
AREA 5	ZONE 14	4	4	320
AREA 6	ZONE 5	10	12	960
	ZONE 11	2		
TOTAL			165	13200

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ZONE WISE IRRIGATION PLAN

TOWEL PLANTATION AREA (AREA-WISE)

ZONE	TOTAL	AREA (ACRES)	TOTAL	MAX. WATER FLOW @ 70m3/acre
	ZONE 1	4		
	ZONE 2	14		
	ZONE 3	3		
AREA 1			31	2170
	ZONE 4	1.5		
	ZONE 7	2.5		
	ZONE 9	5		
	ZONE 5	3		
AREA 2			15	1050
	ZONE 6	12		
AREA 3	ZONE 8	2.5	2.5	175
TOTAL		48.5	48.5	3395

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ELECTROMAGNETIC FLOW METER RECORD -PLANTATION-PAPER ZONE

Date	Main Meter			Meter-1 (Area-1)			Meter-2 (Area-2)			Meter-3 (Area-3)			Meter-4 (Area-4)			Area-5			Meter-5 (Area-6)		
	Initial Reading	Final Reading	Flow (KLD)	Initial Reading	Final Reading	Flow (KLD)	Initial Reading	Final Reading	Flow (KLD)	Initial Reading	Final Reading	Flow (KLD)	Initial Reading	Final Reading	Flow (KLD)	Initial Reading	Final Reading	Flow (KLD)	Initial Reading	Final Reading	Flow (KLD)
Target			12500			3450			515			215			6525			380			360
1-Sep	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3300	[illegible]	[illegible]	500	[illegible]	[illegible]	100	970	6240	5280	170	530	230	730	1240	960
2-Sep	[illegible]	[illegible]	[illegible]	20.0	[illegible]	2860	[illegible]	[illegible]	800	[illegible]	[illegible]	80	[illegible]	[illegible]	6960	182	550	370	1.0.9	1960	854
3-Sep	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3300	[illegible]	[illegible]	560	[illegible]	[illegible]	200	[illegible]	[illegible]	6240	552	1100	250	1250	2250	346
4-Sep	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3020	[illegible]	[illegible]	800	[illegible]	[illegible]	100	[illegible]	[illegible]	6000	900	[illegible]	260	[illegible]	[illegible]	440
5-Sep	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3100	[illegible]	[illegible]	800	[illegible]	[illegible]	210	[illegible]	[illegible]	6960	[illegible]	[illegible]	280	[illegible]	[illegible]	260
6-Sep	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3360	[illegible]	[illegible]	400	[illegible]	[illegible]	100	[illegible]	[illegible]	6420	[illegible]	[illegible]	180	[illegible]	[illegible]	460
7-Sep	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3250	[illegible]	[illegible]	350	[illegible]	[illegible]	200	[illegible]	[illegible]	6360	[illegible]	[illegible]	260	[illegible]	[illegible]	300
8-Sep	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3150	[illegible]	[illegible]	450	[illegible]	[illegible]	210	[illegible]	[illegible]	5760	[illegible]	[illegible]	180	[illegible]	[illegible]	304
9-Sep	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3250	[illegible]	[illegible]	500	[illegible]	[illegible]	220	[illegible]	[illegible]	6240	[illegible]	[illegible]	260	[illegible]	[illegible]	304
10-Sep	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3990	[illegible]	[illegible]	600	[illegible]	[illegible]	150	[illegible]	[illegible]	6840	[illegible]	[illegible]	352	[illegible]	[illegible]	750
11-Sep	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3310	[illegible]	[illegible]	550	[illegible]	[illegible]	200	[illegible]	[illegible]	6510	[illegible]	[illegible]	247	[illegible]	[illegible]	750
12-Sep	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3350	[illegible]	[illegible]	800	[illegible]	[illegible]	150	[illegible]	[illegible]	6240	[illegible]	[illegible]	206	[illegible]	[illegible]	950
13-Sep	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3360	[illegible]	[illegible]	900	[illegible]	[illegible]	150	[illegible]	[illegible]	6360	[illegible]	[illegible]	260	[illegible]	[illegible]	870
14-Sep	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3250	[illegible]	[illegible]	400	[illegible]	[illegible]	200	[illegible]	[illegible]	6360	[illegible]	[illegible]	260	[illegible]	[illegible]	700
15-Sep	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3160	[illegible]	[illegible]	800	[illegible]	[illegible]	150	[illegible]	[illegible]	6210	[illegible]	[illegible]	220	[illegible]	[illegible]	750
16-Sep	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3240	[illegible]	[illegible]	450	[illegible]	[illegible]	210	[illegible]	[illegible]	6270	[illegible]	[illegible]	250	[illegible]	[illegible]	360
17-Sep	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3310	[illegible]	[illegible]	500	[illegible]	[illegible]	100	[illegible]	[illegible]	5820	[illegible]	[illegible]	200	[illegible]	[illegible]	750
18-Sep	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3160	[illegible]	[illegible]	800	[illegible]	[illegible]	210	[illegible]	[illegible]	6420	[illegible]	[illegible]	220	[illegible]	[illegible]	950
19-Sep	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3160	[illegible]	[illegible]	550	[illegible]	[illegible]	200	[illegible]	[illegible]	5760	[illegible]	[illegible]	180	[illegible]	[illegible]	304
20-Sep	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3160	[illegible]	[illegible]	800	[illegible]	[illegible]	150	[illegible]	[illegible]	6360	[illegible]	[illegible]	220	[illegible]	[illegible]	750
21-Sep	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3160	[illegible]	[illegible]	800	[illegible]	[illegible]	150	[illegible]	[illegible]	6360	[illegible]	[illegible]	260	[illegible]	[illegible]	950
22-Sep	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3160	[illegible]	[illegible]	800	[illegible]	[illegible]	150	[illegible]	[illegible]	6360	[illegible]	[illegible]	260	[illegible]	[illegible]	950
23-Sep	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3160	[illegible]	[illegible]	800	[illegible]	[illegible]	150	[illegible]	[illegible]	6360	[illegible]	[illegible]	260	[illegible]	[illegible]	950
Average			[illegible]			3264			597			157			5709			257			707



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HTD PLANTATION WATER DISTRIBUTION

DATE	ELECTROMAGNECTIC FLOW METER-1 (AREA-1)			ELECTROMAGNECTIC FLOW METER-2 (AREA-2)			ELECTROMAGNECTIC FLOW METER-3 (AREA-3)			TOTAL FLOW TO PLANTATION
	INITIAL READING	FINAL READING	TOTAL FLOW (KLD)	INITIAL READING	FINAL READING	TOTAL FLOW (KLD)	INITIAL READING	FINAL READING	TOTAL FLOW (KLD)	K_D
01-09-2021	71257	72705	1448	55788	57615	1825	5968	7002	34	3311
02-09-2021	72705	74167	1462	57615	59218	1603	7002	7047	45	3110
03-09-2021	74167	75678	1512	59218	60906	1688	7047	7145	98	3298
04-09-2021	75678	77164	1486	60906	62520	1614	7145	7211	66	3166
05-09-2021	77164	78689	1485	62520	64225	1705	7211	7234	23	3133
06-09-2021	78689	80320	1451	64225	65878	1653	7234	7322	44	3192
07-09-2021	80320	81593	1273	65875	67733	1858	7322	7403	81	3209
08-09-2021	81293	82439	1146	67733	69748	2015	7403	7454	51	3212
09-09-2021	82439	83854	1415	69748	71453	1705	7454	7542	88	3209
10-09-2021	83854	85192	1339	71453	73238	1785	7542	7593	51	3175
11-09-2021	85193	86487	1294	73235	74974	1739	7593	7661	68	3118
12-09-2021	86487	87923	1436	74974	76616	1642	7661	7772	91	3169





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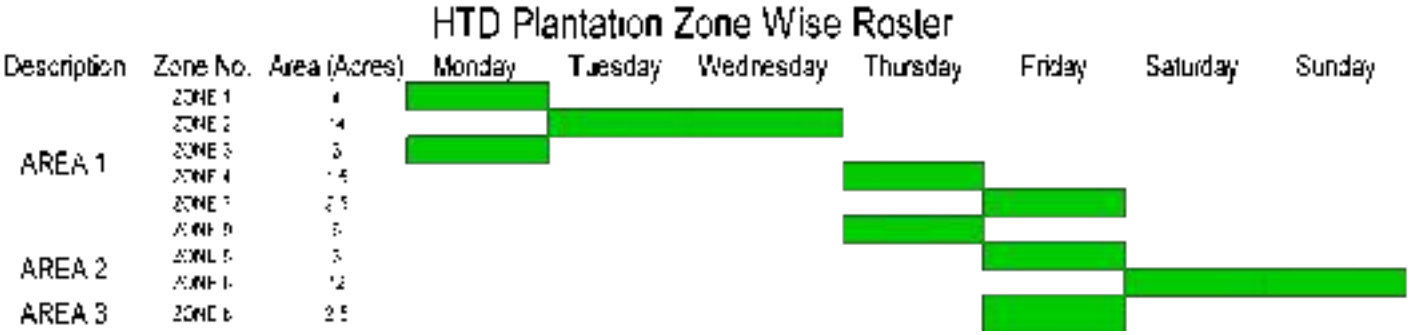
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PCD Plantation Zone Wise Roster

Description	Zone No	Area (Acres)	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
	ZONE 2A	20							
	ZONE 4	5							
	ZONE 10	2							
AREA 1	ZONE 13	2							
	ZONE 19	3							
	ZONE 20	5							
	ZONE 21	9							
	ZONE 1	5							
AREA 2	ZONE 9	6							
	ZONE 18	2							
AREA 3	ZONE 17	3							
	ZONE 2B	20							
	ZONE 12	10							
	ZONE 3	16							
AREA 4	ZONE 6	15							
	ZONE 7	8							
	ZONE 8	14							
	ZONE 15	2							
	ZONE 16	2							
AREA 5	ZONE 14	4							
AREA 6	ZONE 5	10							
	ZONE 11	2							

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INFRASTRUCTURE AVAILABLE

S.NO.	DESCRIPTION	UOM	QUANTITY
1	TRACTOR	NOS	2
2	TROLLEY	NOS	1
3	HARROW	NOS	2
4	ROTAVATOR	NOS	1
5	TOOLKIT	NOS	10
6	SPRAYER PUMP	NOS	4

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Name:
Salary Code:

IRRIGATION CHECKLIST

Deptt
Month:

POINTS OF CONCERN/ ACTIVITIES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
ZONE WISE INSPECTION FOR PLANTATION																
ZONE WISE WATER DISTRIBUTION																
MANPOWER DEPLOYED AS PER ROSTER																
WILD GROWTH/GRASS REMOVAL																
CHECKING FOR THE FLOODING/WATER ACCUMLATION																
CHECKING FOR THE MACHINERY																
TOOL KIT AVAILABILITY																

SUPERVISOR SIGNATURE

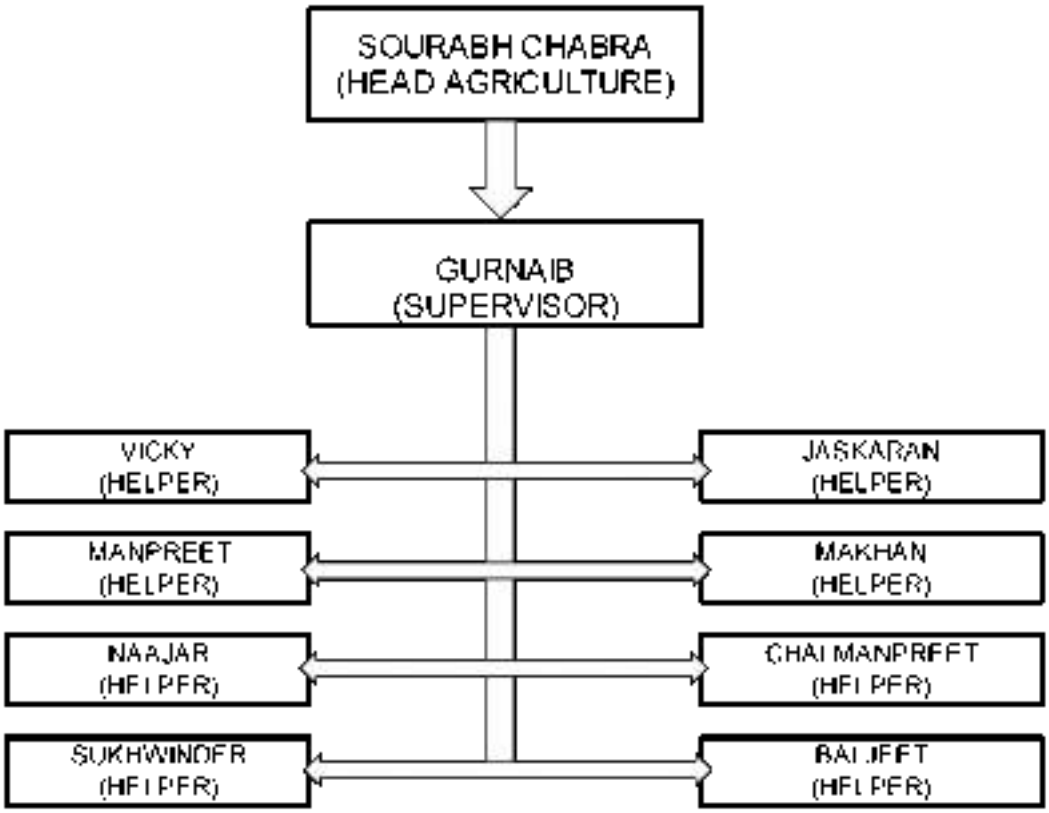
POINTS OF CONCERN/ ACTIVITIES	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
ZONE WISE INSPECTION FOR PLANTATION															
ZONE WISE WATER DISTRIBUTION															
MANPOWER DEPLOYED AS PER ROSTER															
WILD GROWTH/GRASS REMOVAL															
CHECKING FOR THE FLOODING/WATER ACCUMLATION															
CHECKING FOR THE MACHINERY															
TOOL KIT AVAILABILITY															

SUPERVISOR SIGNATURE

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TEAM MATRIX



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GLIMPSE OF PLANTATION AREA









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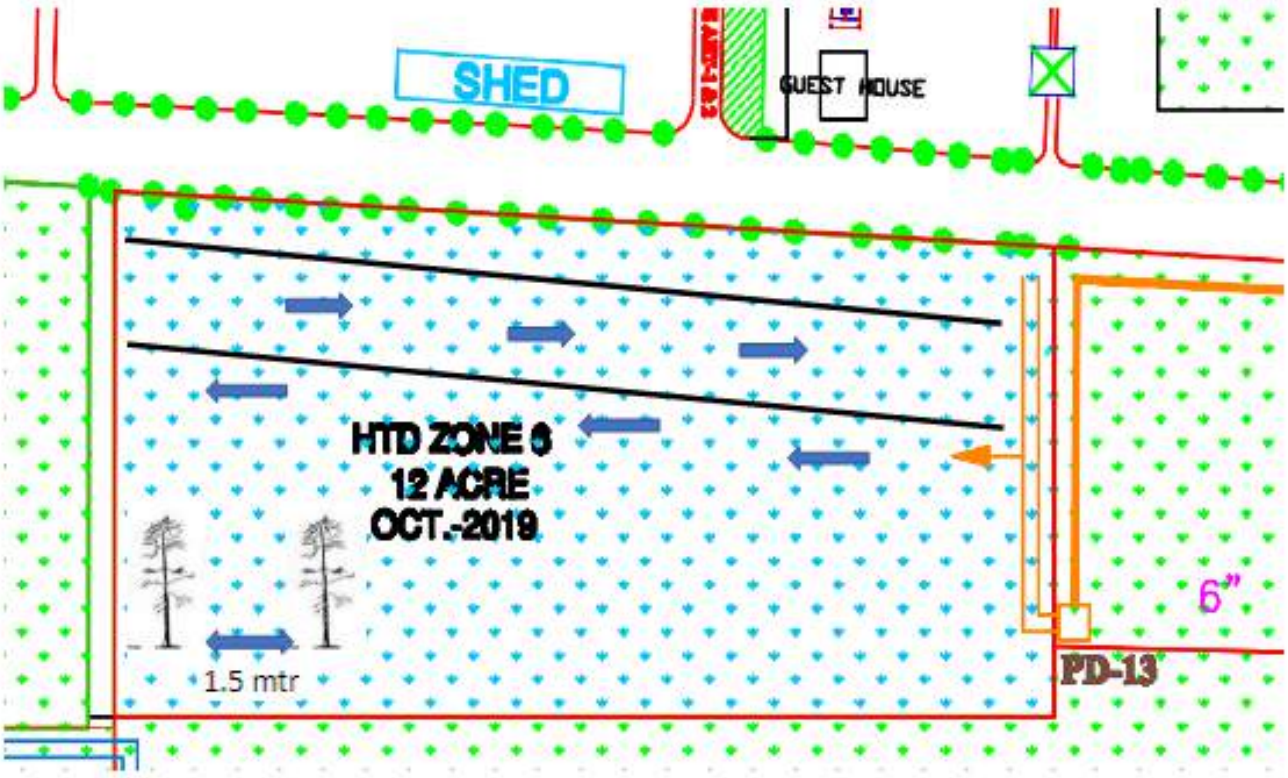
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IRRIGATION PROCESS



Ridges	
Wide	1 meter
High	50 cm

Furrow	
Wide	2 meter

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EFFLUENT GENERATION & PROPSED CONSUMPTION PLAN

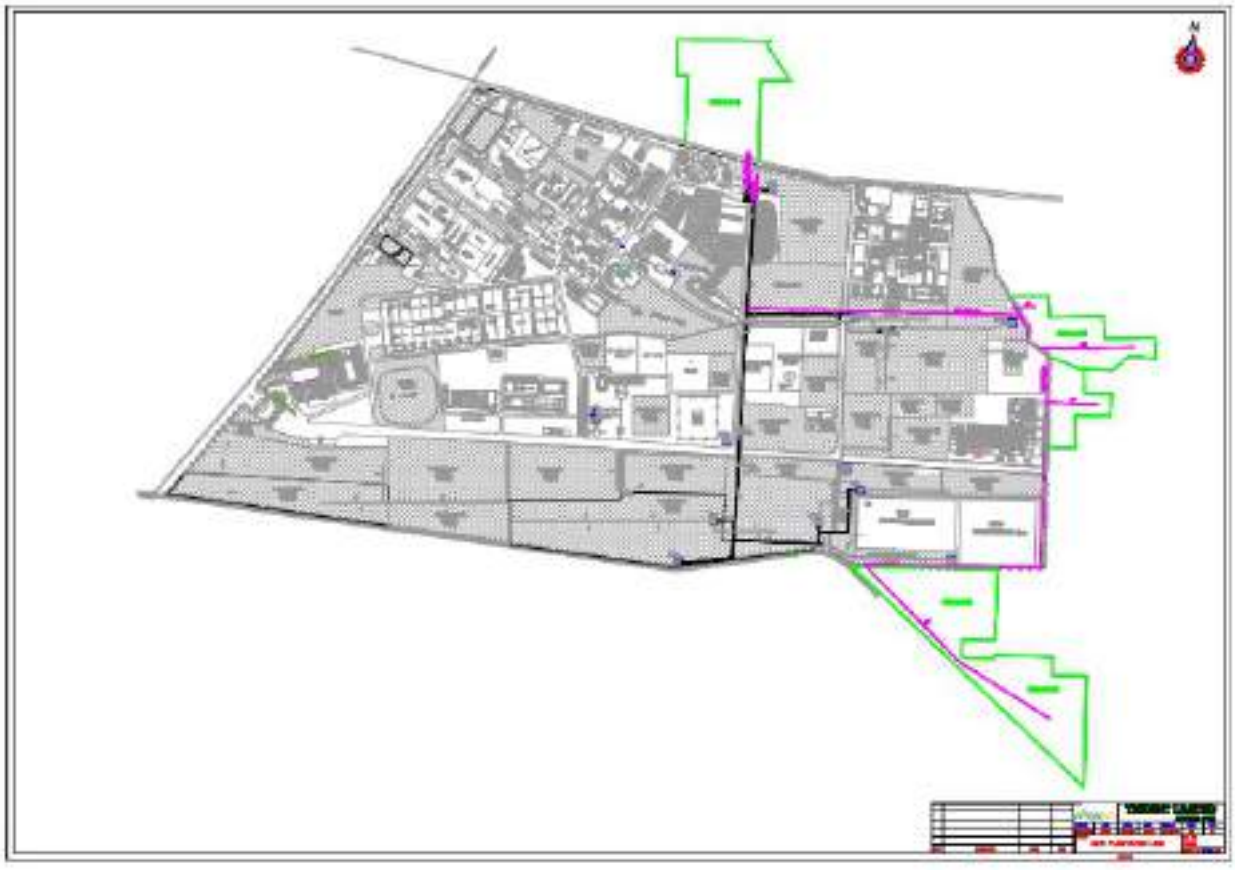
PROPOSED SCENARIO

S NO.	DESCRIPTION	UOM	HTD	PCD	TOTAL
1	TOTAL EFFLUENT GENERATION	KLD	6500	19000	25500
2	TREATED WATER INTO PLANTATION	KLD	6500	19000	25500
3	TOTAL AREA OF PLANTATION REQUIRED	ACRE	93	237 5	330
4	EXISTING LAND	ACRE	49 5	165	214
5	NEW LAND REQUIRED	ACRE	44	72.5	117
6	EFFLUENT CONSUMPTION	KL/ACRE	70	80	80
5	UTILIZATION OF TREATED WATER ONTO PLANTATION	%	100.0	100 0	100.0

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ADDITIONAL LAND LAYOUT AND PIPING



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Thapar Technology Campus, Bhadson Road, Patiala-147 004 (India)

Annexure-IX

Performance Study of ETP Plant of Paper Chemical Division (PCD) Trident Limited, Barnala, Punjab

Prepared by:
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On behalf of:
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1. Introduction

Trident Group

Trident group is a dynamic and continuously growing group, having a textile division, Terry Towel Division (TTD), which is one among the top five (5) global terry towel giants, agro/wood paper manufacturing unit, Trident Ltd., Paper Division (TLPD) and Colour Textile Limited (CTL) one of the largest producers of yarn in India. In addition, Trident Group has a Sulphuric Acid Plant (SAP). Trident group today is a USD 1 billion enterprise with an employee head account of more than 10,000 and providing indirect employment to 20,000 people.

Project Location

The proposed project facilities will be installed within the existing mill premises as adequate land is available within the existing plant. TLPD is located at Dhaula village, Barnala District in Punjab state. The site is located at the intersection of latitude 30°17' 57"N and longitude 75°29' 32" E. The site is about 175 km from Chandigarh the state capital and at about 7 km from the National Highway.

Mill site Location (Existing Mill)

TLPD is located at Dhaula village, Barnala District in Punjab state. Index map of the Mill site (Existing Mill) Shown in **Figure 1,1**. Google map showing mill site is shown in **Figure 1.2**

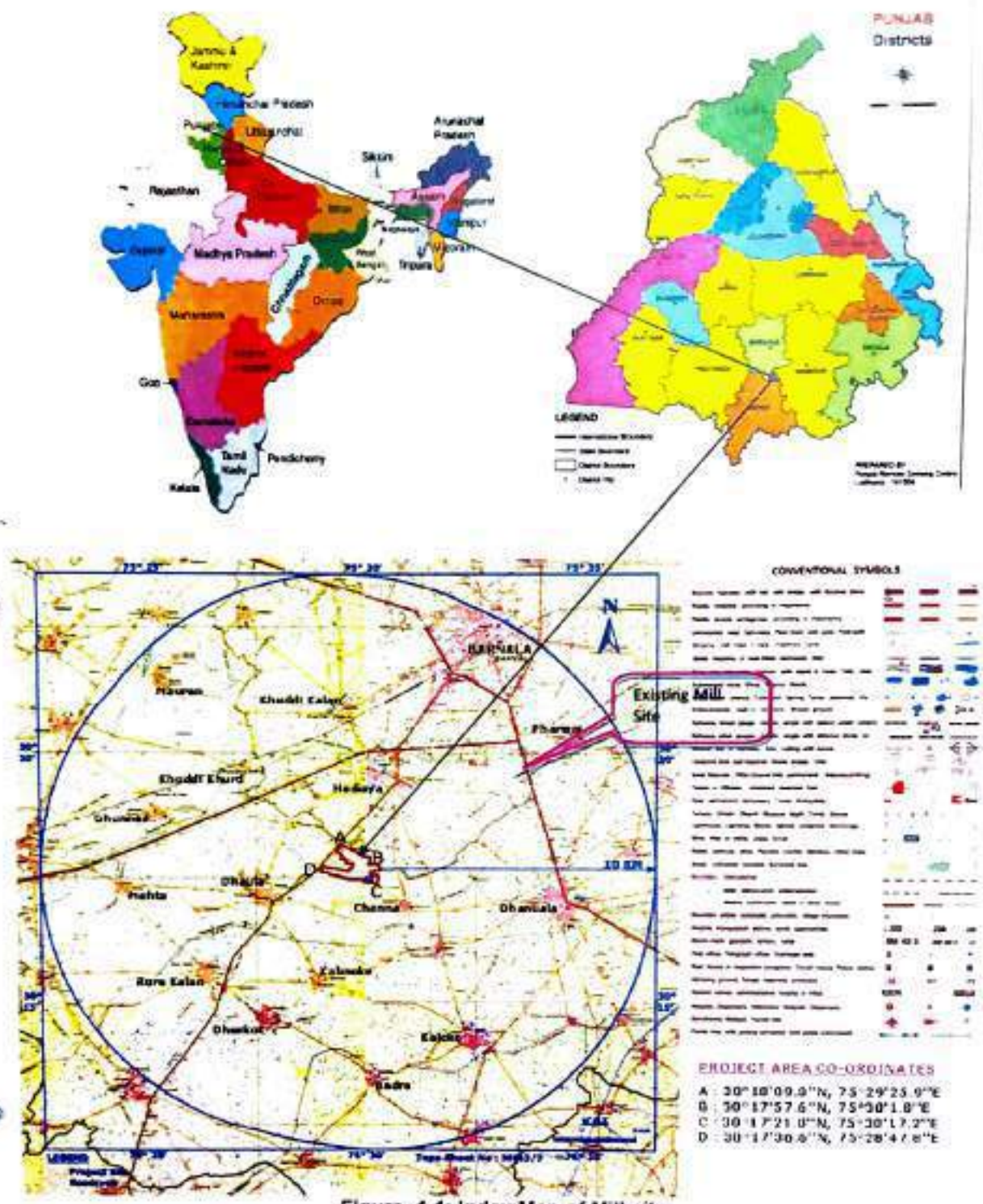


Figure- 1.1: Index Map of Mill site



Figure- 1.2: Google Map showing Existing Mill Site

Environmental Setting of the Study Area

The details of environmental setting around the proposed expansion site are given in the following table:

S.No.	Particulars	Details
1	Location:	
	Village	Dhaula
	District	Barnala
	State	Punjab
2	Latitude	30°17"57'N
3	Longitude	75° 29"32'E
4	Elevation above mean sea level (MSL)	224 M

5	Climatic conditions as per IMD	Annual Max. Temp :43.5°C Annual Min. Temp : 7.8°C Annual total rainfall :686.3mm
6	Present land use at the mill site	Open spaces within the existing plant/Mill
7	Nearest Highway/Road	State Highway -13 - 600 m
8	Defence installations	Nil within 10 km radius
9	Nearest railway station	Barnala (12 .0 km)
10	Nearest airport/air strip	Chandigarh (175 km)
11	Nearest village	Dhaula (5 km)
12	Nearest town	Barnala(10 km)
13	Nearest river	Nil in 10 km radius
14	Hills/valleys	Nil in 10 km radius
15	Archaeologically important places	Nil in 10 km radius
16	Nearest place of Tourist/ Religious importance	Nil in 10 km radius
17	Ecologically sensitive areas (National Parks /Wildlife sanctuaries / bio-sphere reserves)	Nil in 10 km radius
18	Reserved/ Protected forests within 10 km radius	Nil in 10 km radius
19	List of Major Polluting Industries	There are no major industries in the study area.
20	Topography of the plant site	Fully developed existing industrial area as per the Punjab State Government GO. Dated 22nd March 2011.
21	Nature of soil	Sandy and sandy loam

2. Process Description of the Existing facilities

The brief description of the existing process is given below

Raw Material Preparation

Straw Pulp Mill

The new wheat straw pulping plant was supplied by METSO. The plant's rated capacity is 225 BD tpd bleached pulp. The raw material, wheat straw, after dedusting and sand removal, is sent to cooking section, consisting of two (2) continuous digesters, each of 125 tpd capacity. After cooking, the pulp is blown to the blow tank.

From the blow tank, the pulp is pumped through a Delta Knotter (K4) to remove larger impurities and uncooked material to protect the washing equipment. The reject is passed through a junk trap before it is washed in the Johnson screen. In the Johnson screen, fibres are recovered and pumped back to the blow tank. The reject is then collected in a suitable vessel and dumped.

The accept from the Delta Knotter is washed in the first vacuum filter and then pumped to the first twin roll press. After this, the pulp is passed to the secondvacuum filter and the second press, via screening plant. The pulp leaving the final twin roll press is diluted to ~12% (alkali is added in the stand pipe) and pumped through a mixer to the oxygen reactor.

From the reactor, the pulp is blown to the MC storage tower. The MC storage tower has a residence time of approximately 6 hours (390 min at 12% pulp consistency).The oxygen delignified pulp is then discharged evenly with a tower scraper (SA-D450), diluted in the bottom of the tower and washed on one twin roll press. The filtrate is used as wash liquor on the press prior to the oxygen stage. The discharge consistency from the press is 30%. The pulp is diluted with hot water of > 75°C.

Bleaching Sequence of Wheat Straw

In the bleach plant, most of the coloured residual lignin is removed by bleaching to give the pulp brightness high enough for its final use. This is done in three stages (ECF sequence):

- D0 Chlorine dioxide 100% in the first stage
- EOP Oxygen reinforced alkaline extraction; there is an option to add peroxide in this stage
- D1 Chlorine dioxide
- The D0 and D1 stages are upflow towers with a tower scraper at the top (discharge). The Eop stage consists of one pressurised reactor and blow down tank.

Hard Wood Pulp Mill

The hardwood pulping plant has a chipper house, three (3) stationary digesters, each of capacity 120 m^3 including ODL stage at the end of washing stage and D0 , EOP, D 1 stage bleaching sequence with one (1) additional D-stage filter and a new screening plant. The production capacity of this plant is 65 tpd.

Pulp Mill

Pulp Making

Pulp is produced from cellulosic raw materials like wood, rice straw, wheat straw. These raw materials contain, in addition to cellulose and hemi-cellulose, a significant amount of lignin, which binds the cellulosic fibres. In pulping, the cellulosic fibre is separated from the surrounding lignin, either by mechanical or chemical means. Removal of lignin is further accomplished by oxygen delignification.

Pulp Bleaching

Conventionally, the cooked unbleached pulp is brown in colour, due to the presence of residual lignin and chemicals. In order to obtain good brightness of paper, the pulp is bleached using strong oxidants like oxygen, chlorine dioxide, NaOH, hydrogen

peroxide, etc. The aim is to obtain good brightness without degradation or loss of cellulosic fibre. The utilisation of elemental chlorine is dispensed with, in recent new installations, by way of a change over to chlorine dioxide/ozone.

Paper Machine

Stock Preparation

Pulp is conditioned in the stock preparation section for bondage to form sheet. The pulp received from pulp mill is passed through a series of refiners for fibrillation and then the required additives viz. fillers, dyes, whitening agents,rosin and alum are added. These are added to impart functional properties to the final paper such as opacity, reflectance, shade and water resistance. The final blended stock is pumped to paper machine chest.

Paper Making

The blended stock in very dilute suspension is allowed to flow and spread on a moving wire where water is drained and fibre binds together to form a wet web. The wet paper web is then pressed, dried and wound. Papermaking is purely mechanical in nature and the variations exist only in the design of the paper machine.

Paper Machine # 1

Paper Machine #1 (PM #1), installed in 1993, was supplied by MECHANO – Paper Machine, Kolkata.

PM #1, designed for a maximum operating speed of 350 mpm, is a fourdrinier type paper machine with bi-nip press with separate III press, followed by twenty five (25) drying cylinders in the dryer section, three nip four – roll calendar stack and pope type reel.

Paper Machine #2

Paper Machine #2, (PM #2) installed in 2008, was supplied by ALLIMAND, France.

PM #2, designed for a maximum operating speed of 750 mpm, is a fourdrinier with top wire forming section, tri nip press section, followed by thirty two (32) drying cylinders in pre-dryer section, pre-metered size press, twelve (12) drying cylinders in post-dryer section, single hard nip calender stack, and a pope type reel. The electrical drive design speed of the PM is 900 mpm.

Chemical Recovery Plant

The system will feature adoption of modern technology to reduce the operating cost, environmental compliance and to maintain uniform quality of outputs.

Evaporation Plant

TLPD has two (2) streets of multiple effect evaporators, supplied by PAS and ENMAS Andritz.

Chemical Recovery Boilers

TLPD has two (2) chemical recovery boilers, having a combined capacity of firing 565 tpd black liquor per day supplied by ENMAS.

Recausticising Plant

Originally, the recausticising plant was supplied by Swetha Engineering, and has recently been upgraded by GL&V. Capacity of the existing recausticising plant is 110 as Na_2O.

Existing Water Sources and Requirement

Uppli canal and ground water are being used in the existing plant. Fresh water from Uppli canal, which is 30 km away, is drawn through a channel in to the existing Mill premises and stored in raw water storage reservoir. From the raw water reservoir, water is pumped to overhead tank, from where it flows by gravity to water storage tank in water treatment plant.

3. Wastewater Treatment Plant (WWTP)

Based on their origin and characteristics, the waste water generated is mainly categorized into two streams i.e., high COD stream mainly from the straw washing and the low COD stream from the Pulp mill, Chemical recovery plant, Paper machine and Utilities area.

3.1 WWTP Process Description

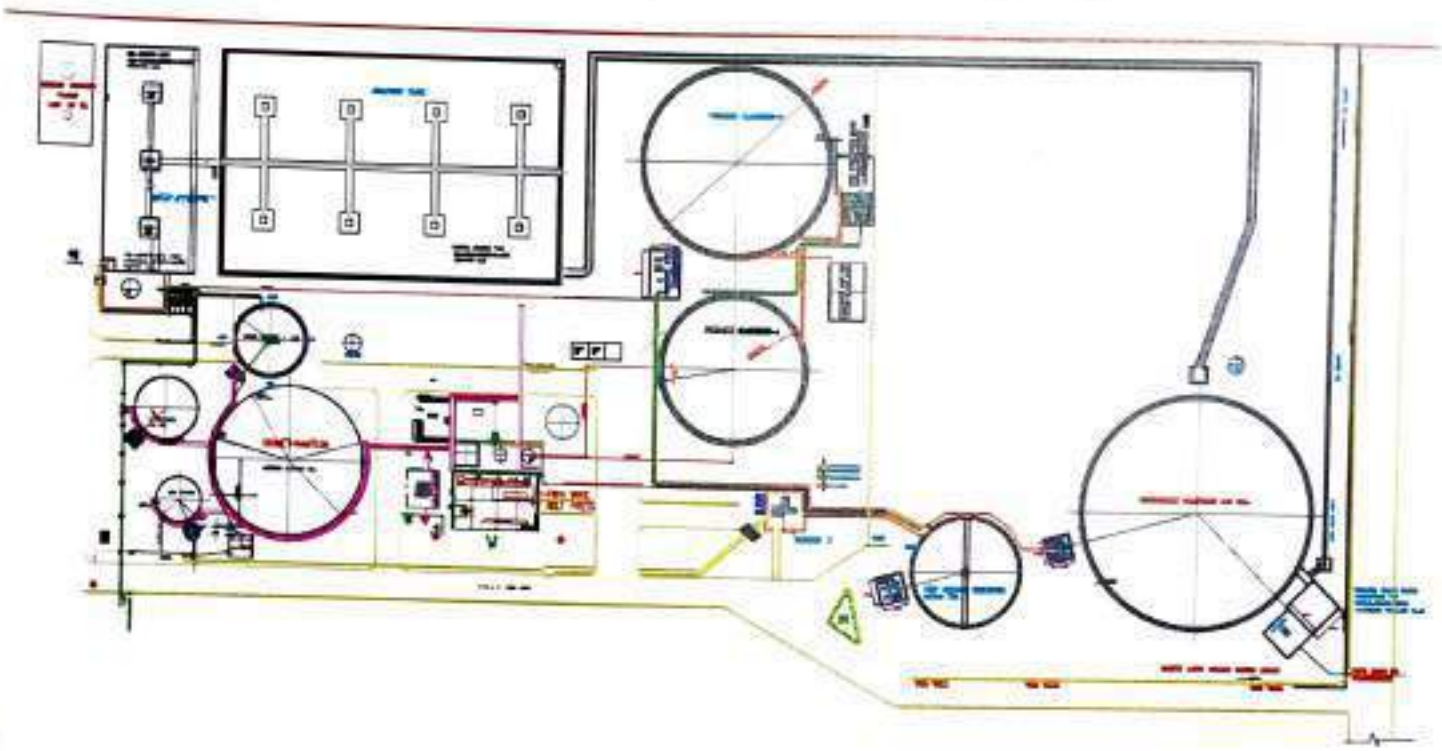
High COD wastewater stream

The waste water generated from wheat straw washing has high COD. This waste water stream enters the screen chamber and then to equalisation tank. The waste water from equalisation tank is pumped to bioclarifier. The clarifier overflow is taken to buffer tank for maintaining pH. The waste water from buffer tank is pumped to anaerobic digester (UASB) for generation of methane gas. The overflow of UASB reactor goes to pre aeration tank and then flows to main aeration tank.

Low COD wastewater stream

Waste water generated from pulp mill, paper machines, power boilers and recovery boilers has low COD and this is collected in a collection tank and pumped to primary clarifier #1 and primary clarifier #2. After clarification, the waste water is pumped to aeration tanks 1and 2 for BOD, COD reduction. The aeration tanks are equipped with eleven (8+3) 50 HP surface aerators, two (2) floating aerators each having a capacity of 30 HP. Additionally, oxygen is supplied to aeration tank #1 by air liquide system to take care of any fluctuation in COD and to meet the standards. The overflow of wastewater from aeration tank goes to secondary clarifier for settling of biomass. The treated wastewater from the outlet of secondary clarifier water is pumped for irrigation purpose.

Layout of ETP Plant of Paper Chemical Division (PCD)

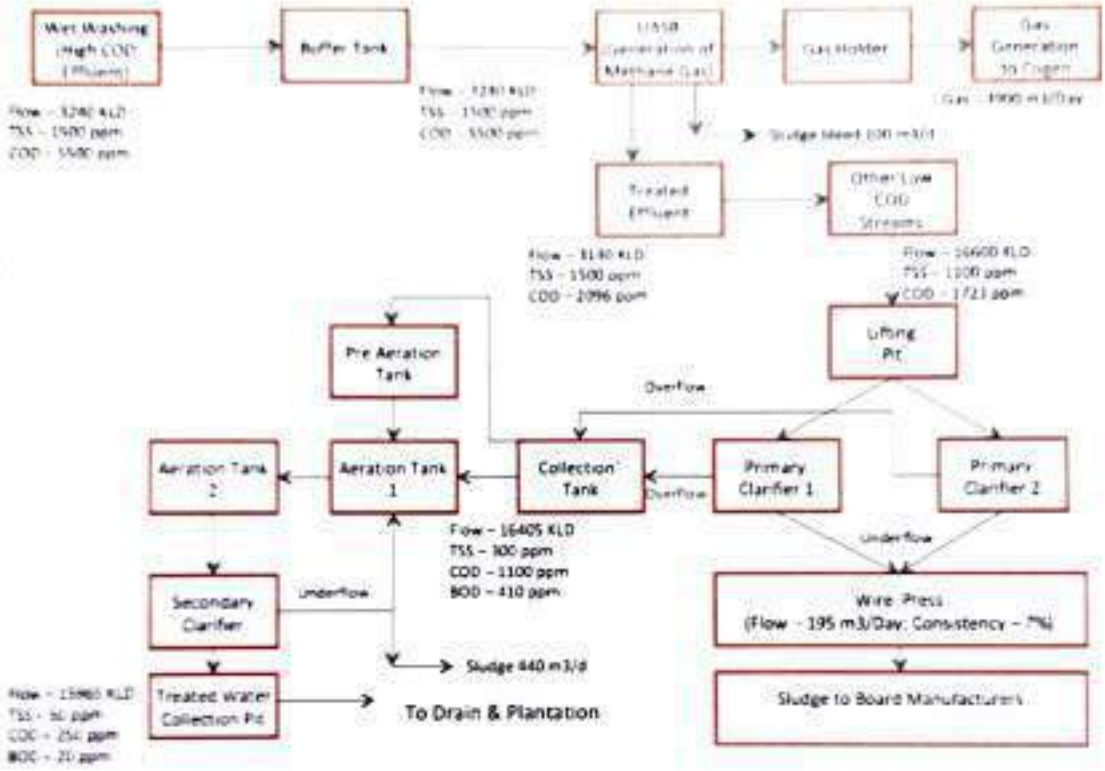


4. Scope of the Present Study

- Material balance of input load including COD load and TSS load
- Checking of Existing design parameters for adequacy of operation
- Recommendations of action to enhance the existing ETP performance

5. Material Balance Calculations & Design Adequacy

Trident Industries Limited, Barnala, provided the data (annexure 1 & 2) used for preparing this report. The industry uses a combined treatment system comprising of aerobic and anaerobic treatment processes for the effluent treatment.



Effluent Treatment Process Flow-sheet

Anaerobic Treatment

Upflow Sludge Bed Reactor:

The high COD effluent from the wet washing stream is subjected to the aerobic treatment in an Upflow Sludge Bed Reactor (USBR).

Data:

Parameter	Value	Units
Flow inlet	3240	m^3/day
Sludge Bleed	100	m^3/day
Flow out	3140	m^3/day
Volume of USBR	4250	m^3

Influent Flow in = 3240 m^3/day

Sludge bleed = 100 m^3/day

Biogas Generated = 4900 m^3/day (65% Methane)

COD balance

COD out with bleed (accumulated COD)

= COD in – COD converted to Bio Gas out out – COD out with effluent

= 17820 - 9100 – 6581

= 2139 kg/day

% COD removed = 63%

Volumetric Hydraulic Load $= Q/V$

$$\frac{Q}{V} = \frac{3240}{4250}$$

$$= 0.76 \frac{m^3_{influent}}{m^3 day}$$

Hydraulic residence time (HRT) = 1/D

= 1/5 hour

Organic Loading Rate (Lv) $= \frac{Q \cdot S}{M}$

$= \frac{3240 \times 5.5}{29920}$

$= 0.6$ kgCOD/kgVS

Organic Load Removed (OLR) = 17820 – 6581 = 11239 kg/day

$$\frac{m^3 gas}{kg\,OLR} = \frac{4900}{11239} = 0.435$$

BOD to COD ratio in USBR Feed = $\frac{1100}{5500} = 0.2$ (Remark: Ratio is low)

Remarks

- The reactor size is adequate to handle the effluent load
- *BOD/COD ratio in USBR feed is low needs to be improved*
- The bleed from USBR is sent for filtration, the filtrate is sent to Primary Clarifier, and the sludge (7.32 MT) is sold

Aerobic Treatment

The aerobic treatment system consists of primary clarification followed by activated sludge treatment process. The two aerated tank are connected in series followed by a secondary clarifier.

Primary Clarification:

Data:

Clarifier 1		
Parameter	**Value**	**Units**
Flow in	6640	m^3/day
Coagulant dose (polyelectrolyte)	0.67	ppm
Sludge to wire press	78	m^3/day
Volume of clarifier 1	1448	m^3

Flow out = Flow in – Sludge out

= 6640 -78

= 6562 m^3/day

Mean Residence Time (Clarifier 1)

$$= \frac{1448 \times 0.9}{6640}$$

= **4.7 hour**

Data:

Clarifier 2		
Parameter	**Value**	**Units**
Flow in	9960	m^3/day
Sludge to wire press (7% solids)	117	m^3/day
Coagulant dose (polyelectrolyte)	0.67	ppm
Volume of clarifier 2	2412	m^3

Flow out = Flow in – Sludge out

= 9960 -117

= 9843 m^3/day

Mean Residence Time (Clarifier 2)

$$= \frac{2412 \times 0.9}{9960}$$

= **5.2 hour**

% TSS removal (In clarification process):

$$= \frac{16600 \times 1.1 - 16405 \times 0.3}{16600 \times 1.1}$$

= 73%

% COD removal (In clarification process):

$$= \frac{16600 \times 1.723 - 16405 \times 1.051}{16600 \times 1.723}$$

= 39.7%

Remarks:

- As per the calculated MRT, the sizes of the clarifiers are adequate to handle the effluent load.
- The filtrate from the wire press is recycled, and the sludge (46.27 MT) is sold.

Activated Sludge Process:

In this process, the two aerated tanks (AT1 & AT2) are connected in series followed by a secondary clarifier.

Aeration Tank 1 (AT1):

Data:

Parameter	Value	Units
Flow in	16405	m^3/day
BOD in	410	ppm
BOD out	100	ppm
O_2 dose	282	kg/hr
Volume of AT1	3160	m^3

Total flow In = Flow from collection tank + Recycle flow

= 16405 + 13200 = 29605 m^3/day

Hydraulic Residence Time (HRT) $= \frac{3160 \times 0.9}{29605}$

= **2.3 hour** (Remark: HRT is low)

BOD removed = 16405×0.41 + 13200×0.02 – 29605×0.1

= 4030 kg/day

Solids (MLSS) in AT1 = 5.6×3160×0.9 = 15926 kg

Biomass (MLVSS) in AT1 = 15924×0.8 = 12740 kg

Food/Biomass ratio in AT1 $= \frac{F}{M} = \frac{6990}{12740}$

= **0.55** (Remark: F/M is high)

Oxygen required in AT1:

For calculated F/M ratio (0.55), O_2 required

$= 4030 \times 2.6$

$= 10478$ kg/day

$=$ **437 kg/hour**

O_2 being supplied to AT1 $= 282$ kg/hour

Remarks:

- HRT of AT1 is low should be around 4 hours, the F/M ratio is high as calculated above as 0.55. It should be less than, 0.4.
- Oxygen being supplied is less as per the calculate F/M ratio.

Aeration Tank 2 (AT2):

Data:

Parameter	Value	Units
Flow in	29605	m^3/day
BOD in	100	ppm
O_2 dose	122	kg/hr
Volume of AT2	10800	m^3

Total flow in $= 29605$ m^3/day

Hydraulic Residence Time (HRT) $= \dfrac{10800 \times 0.9}{29605}$

$=$ **7.8 hour** (Remark: HRT is high)

BOD removed = 29605×0.1 - 29605×0.02

= 2368 kg/day

Solids (MLSS) in AT2 = 5.7×10800×0.9 = 55404 kg

Biomass (MLVSS) in AT2 = 55404×0.8 = 44323 kg

Food/Biomass ratio in AT1 $= \frac{F}{M} = \frac{2960}{44323}$

= **0.067** (Remark: F/M is low)

Oxygen required in AT2:

For calculated F/M ratio (0.067), O_2 required

= 2368×1.2

= 2842 kg/day

= **119 kg/hour**

O_2 being supplied to AT2 = 122 kg/hour

Sludge Age of Aeration System $= \frac{15926 \times 0.8 + 55404 \times 0.8}{5280 \times 0.8 + 638 \times 0.8}$

= **12 days**

Remarks:

- HRT of AT2 is high, it should be around 5 hours, the F/M ratio is low, should be around 0.3.
- Oxygen being supplied is adequate as per the calculated F/M ratio.
- Combined capacity of the aeration tanks (AT1 & AT2) is sufficient to handle the effluent load.

Secondary Clarifier:

Data:

Parameter	Value	Units
Flow in	29605	m^3/day
BOD in	20	ppm
Recycle flow (1.2% solids)	13200	m^3/day
Volume	4846	m^3

Mean Residence Time (MRT) = $\frac{4846}{29605}$

= **3.93 hour**

Sludge to filter = 440 m^3/day

Treated effluent out = Flow in – Recycle flow – Reject flow

= 29605 -13200 - 440

= 15965 m^3/day

Remarks:

- As per the calculated MRT, volume of the secondary clarifier is adequate to handle the effluent load.

Recommendations

Based on the above study the following action point are recommended to be undertaken to improve the performance of the waste water treatment plant:

1. BOD to COD ratio at USBR inlet is 0.2, which is on lower side. This ratio may be improved by reducing the COD, i.e., the COD caused by suspended particles. It is recommended to install a suitable unit operation for the removal of this COD. This will help in improving the efficiency of the USBR. Also, the sludge that will be generated in the separation system may be sold or burned as boiler fuel.
2. Food to Biomass (F/M) ratio in the aeration tank 1 (AT1) is 0.56, which is on the higher side. It should be kept less than 0.4. It is recommended that the total inlet flow be split into two parts. One part of the flow should be sent to AT1 and the other part be sent to AT2.
3. Oxygen being supplied in AT1 based on the current F/M ratio is less. After the flow diversion to AT2, the quantity of oxygen supplied will become adequate.
4. Food to Biomass (F/M) ratio in the aeration tank 2 (AT2) is 0.06, which is on the lower side. For better performance of the system, it is recommended to keep this ratio above 0.1. The action suggested at point no. 3, would also help in improving the F/M ratio of AT2.
5. The recommendation for action point 4 would lead to higher demand of oxygen in AT2. A suitable system for the increased oxygen demand should be put in place in AT2.
6. It is further recommended that a suitable arrangement for the online measurement of the dissolved oxygen (DO) should be installed for continuous monitoring of oxygen levels in AT1 and AT2.

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Annexure 1

Section	Streams/parameter	Flow	TSS	COD	BOD	PH
	Units	M^3/day	ppm	ppm	ppm	-
Bio reactor	Inflow	3240	1500	5500	1100	7.5
	Outflow	3240	1500	2096	385	7.4
	Bio gas	4900 m^3/day				
Primary clarifier-1	Inflow	6640	1100	1723	700	7.3
	Outflow	6562	300	1051	410	7.4
Primary clarifier-2	Inflow	9960	1100	1723	700	7.3
	Outflow	9843	300	1051	410	7.4
Primary clarifier's	Chemical dosing	Yes	Anionic poly (0.67 ppm)			
Aeration tank-1	Inflow	16405	300	1051	410	7.7
	Outflow	29605	5500-6000 (MLSS)	450	100	7.8
Aeration tank-2	Inflow	29605	5500-6000 (MLSS)	450	100	7.8
	Outflow	29605	5500-6000 (MLSS)	250	20	7.9
Secondary clarifier	Inflow	29605	5500-6000 (MLSS)	250	20	7.9
	Outflow	15965	30-40	200-250	15-20	7.5-8.2

Rajat Monga
RAJAT MONGA

Annexure 2

S.No.	Section	Dimensions	Working Volume (m3)
1	Bio Clarifier	12m dia X 3.5 m H	400
2	Buffer Tank	8 m Dia X 4 m H	200
3	UASB Reactor	26 m dia X 8 m H	4253
4	Primary Clarifier 1	24.8 m dia X 3 m H	1448
5	Primary Clarifier 2	31.92 m dia X 3 m H	2412
6	Aeration Tank 1	40 m X 15.8 m X 5 m	3160
7	Aeration Tank 2	60 m X 40 m X 4.5 m	10800
8	Secondary Clarifier	42 m dia X 3.5 m H	4846

processes

MDPI

Review

Approaches in Design of Laboratory-Scale UASB Reactors

Yehor Pererva , Charles D. Miller and Ronald C. Sims *

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check for updates

Abstract: Up-flow Anaerobic Sludge Blanket (UASB) reactors are popular tools in wastewater treatment systems due to the ability to work with high feed rates and wastes with high concentration of organic contaminants. While full-scale industrial applications of UASB reactors are developed and described in the available literature, laboratory-scale designs utilized for treatability testing are not well described. The majority of published studies do not describe the laboratory UASB construction details or do use reactors that already had developed a trophic network in microbial consortia under laboratory environment and therefore are more stable. The absence of defined guidelines for geometry design, selection of materials, construction, operation rules, and, especially, the start-up conditions, significantly hamper researchers who desire to conduct treatability testing using UASB reactors in laboratory scale. In this article, we compiled and analyzed the information available in the refereed literature concerning UASB reactors used in laboratory environment, where information on geometry and/or operational conditions were provided in detail. We utilized the information available in the literature and the experience gained in our laboratory (Sustainable Waste to Bioproducts Engineering Center) to suggest a unified operation flowchart and for design, construction, operation, and monitoring for a laboratory-scale UASB reactors.

Keywords: up-flow anaerobic sludge blanket reactors; anaerobic digestion; laboratory-scale experiment

1. Introduction

Up-flow Anaerobic Sludge Blanket (UASB) reactor is an anaerobic digester for wastewater treatment, and its operational concept can be described as a vertical up-flow pumping of liquid substrate, including wastewater or growth media, through a layer of anaerobic sludge [1–6]. Microbial consortia inside the sludge layer consume digestible components as substrate and decompose them into smaller chemical compounds [7]. Within the scope of a wastewater treatment, the goal of anaerobic digestion is a complete mineralization of organic compounds combined with the production of biogas for the purpose of energy recovery.

A distinguishing feature of UASB reactors is the formation of microbial conglomerates, where the metabolic product of one microbial group is a consumable substrate for another microbial group [8]. Such microbial conglomerates grow into spherical or bean-shaped granules over time [9–13]. The sizes of granules may vary, but typically are reported in the range 0.5 to 6 mm, where longer operation leads to larger sizes [14–16]. Granulation of sludge is promoted by the presence of microorganisms that are able to produce and secrete Exocellular Polymeric Substances (EPS) [17]. The term "EPS" includes multiple types of compounds, which serve as a glue to agglomerate microorganisms together and to add some mechanical strength to a granule [18].

A combination of developing trophic microbial connections and mechanical cementation with EPS, results in higher resilience of larger granules to sudden changes of operation conditions including a change in pH, temperature mode failure, substrate switch or inconsistency of a substrate strength and content, feeding rate fluctuations, etc. [19,20]. In some cases, granules can be disrupted due to hydrodynamic forces or inner gas pressure into several smaller fragments [12,21,22] which become cores for the formation of new granules [23].

The traditional concept of a UASB reactor, as suggested by Lettinga [10,11,24–26], is represented in Figure 1a. The substrate is pumped to a reactor through the distribution system into a bottom layer of anaerobic sludge. Equally distributed in normal cross-section of the reactor, the substrate is pushed through the sludge layer (called a "digestion zone") creating a vertical up-flow. This process is concurrent with the decomposition of organic compounds of substrate and a formation of gaseous products. Besides feeding the reactor, the continuous vertical up-flow of substrate prevents the sludge layer from clogging, keeping it afloat. However, the up-flow does wash out the unattached biomass (microorganisms, that did not start to form flocs) and small flocs/granules. The liquid part above the sludge layer (called "settling zone") serves as a vertical settler and/or coagulation column to initiate the biomass and solids retention process before the actual separation. The separation process occurs in the compartment called Gas–Liquid–Solids separator (GLSS, a.k.a. three-phase separator). GLSS is traditionally located on top of the reactor column and it starts with a baffle-shaped structure in its bottom part, which serves the purpose of collecting and re-directing the gas bubbles to the main gas collection part and preventing gas bubbles from escaping with effluent.

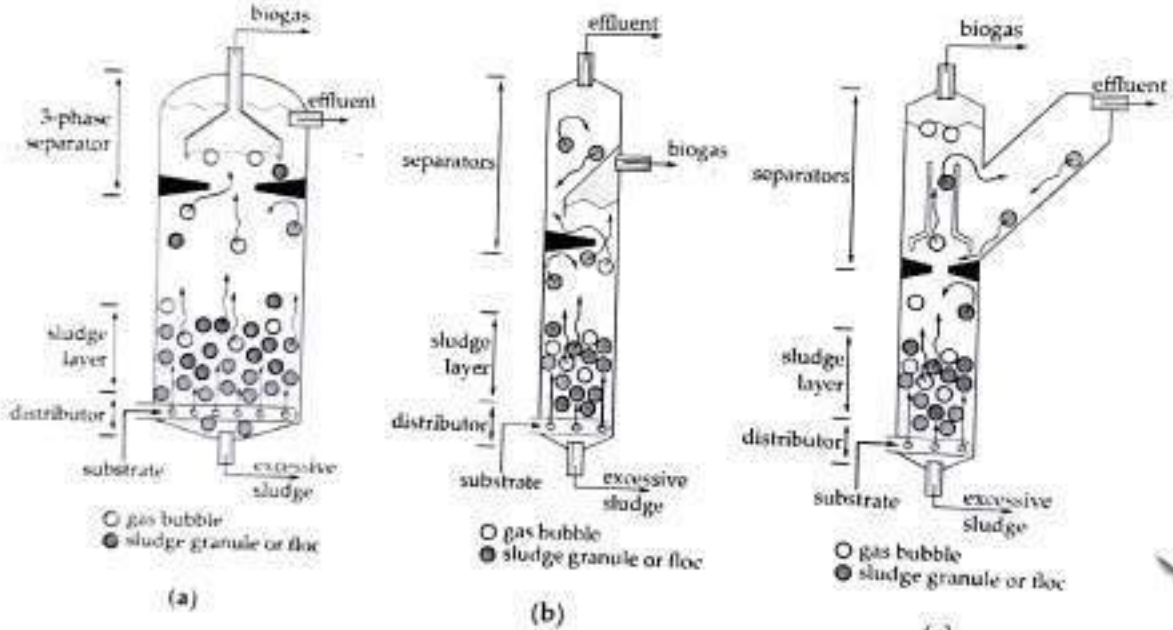


Figure 1. Operational concept of traditional Up-flow Anaerobic Sludge Blanket (UASB) reactors: (**a**) traditional; (**b**) with modified gas collector; and (**c**) Y-shaped.

The construction concept of the GLSS is shown in Figure 1a, where it's implemented via narrowing the outlet of the reaction tube with baffles. Such baffles are typically referred to as "deflectors" or "collar". The side effect of narrowing the reaction tube outlet is a creation of local velocity gradient (velocity shear), which slightly enhances the formation of granulated particles, their separation from liquid and settling back to the bottom of the reactor. Above the baffles, the GLSS contains the gas collecting structure, where the cross-section looks like a flipped upside-down funnel. In some studies, this funnel is replaced by a tubular structure with diameter larger than the distance between baffles [27,28]. The liquid is forced to flow through the space in between the lower edge of the gas collector and the baffles, to go around the funnel and leave the reactor at the effluent port.

Other existing modifications of GLSS in laboratory-scale reactors can improve the higher solids retention time, such as installing a high rate settler in headspace [29] or modification of three-phase separators [30].

In addition to the operational concept of the UASB reactor shown in Figure 1a, the same authors [11] also describe UASB reactor with a modified gas collector, which is demonstrated in Figure 1b. However, some studies [31] call such a modification of the Up-flow Anaerobic Sludge Baffled Reactor (UASBR). It may also contain the inner mechanical agitation device to prevent foam formation in the gas collecting area [32]. Recently, the Y-shaped variation of UASB reactor also became popular and is depictured in Figure 1c. In the case of the Y-shaped reactor, the GLSS is split into two individual separators: one separator is used to separate gas from the liquid and collect it directly at the top of a main tube, whereas a second collector is a sidearm tube that serves as an inclined settler for separating solids from liquid (similar to a Lamella clarifier). Use of a funnel-shaped gas-collecting element becomes optional in such case, since it serves only the purpose of preventing gas flow to an effluent side-arm.

Considering the concepts described, the optimization goal of a laboratory scale UASB reactor operation is to achieve better performance, where optimization targets for UASB performance include the following:

- Higher removal of contaminants;
- Higher biogas production rate;
- Shortening of adaptation period; and
- Resilience (robustness) of sludge.

To achieve some of those optimizations, the classical UASB concept can be combined with other types of reactors, resulting in a range of composite reactors. Some modifications are found in the literature and are presented in Table 1. This table represents options, where another reactor type is incorporated into the UASB itself, but not a sequence of two consecutive reactors.

Table 1. Existing hybrid versions of UASB reactors.

Unit to Incorporate into UASB	Resulting Reactor Name	Purpose of Incorporation	Reference
Electrolysis cell	Up-flow Anaerobic BioElectroChemical reactor (UABE)	Increase the methane production via partial capture of dissolved carbon dioxide	[33–36]
Anaerobic Filter	UASB-AF Anaerobic hybrid reactor (AHR)	Increase retention of solids inside of a reactor and prevent washout of active biomass	[37] [14,31,38,39]
Lamella settler	No Name	Increase solids retention time (SRT)	[40]

In a holistic view, the purpose of UASB reactor optimization is to keep the microorganisms in a stage of maximum substrate consumption and active growth. However, from an operational perspective, the optimization of UASB functioning is achievable via adjusting operational parameters, including, but not limited to:

- Organic Loading Rate (OLR) and Hydraulic Retention Time (HRT);
- Recycle ratio of effluent;
- Regulation of pH;
- Retention of biomass; and
- Granulation enhancement.

Despite the long history since the invention and description of the UASB concept by Lettinga et al. [41] and increasing its application in industry, UASB laboratory scale reactors used for treatability studies are highly variable with regard to terminology, design, construction, and operation

processes. This lack of uniformity leads to different results regarding water quality indicators, for example, Chemical Oxygen Demand (COD), as well as bioenergy production, for example for biomethane and biohydrogen. There is a lack of uniformity with regard to the guidelines for operation of laboratory scale conditions, which is highlighted in this manuscript and recommendation are provided for making UASB laboratory studies and results more uniform with results more transferrable among laboratories and more useful for scale up activities. These lack of uniformity with laboratory scale UASB reactors is addressed in this study and guidelines are provided for increasing the uniformity so that results are comparable across different laboratories and are also more meaningful for scale up applications of the UASB reactor process.

2. Review of Existing Solutions across Various Published Works

Despite a large number of available publications on wastewater treatment involving UASB reactors, a majority of the studies only briefly mentions constructional concepts of the reactor, and dimensional parameters are mentioned even more rarely. We collected available information on physical dimensions among existing studies in Table 2, while Table 3 shows the geometry of either hybrid reactors or where UASB reactors are installed in series with any other reactor. While building those tables we focused on the geometry of the reactor and operational conditions including substrate strength expressed as COD, Biological Oxygen Demand (BOD), etc.; loading rates; volume of reactor; and effluent recycling rates. The type of the substrate used in reported studies is provided for reference purpose only. Where Table 2 does not contain the geometric or operational parameter means that such value was not specified in the reference. Also, Tables 2 and 3 do not provide calculations based on available geometry. All information provided there is information stated in referenced publications, nothing was added. The only modifications were made to units (for COD, BOD, etc.) where they were unified across all publications.

As we can see from Tables 2 and 3, there is no uniformity in parameters of operating the UASB reactor and, and what is in our opinion even more important, information on the start-up of a laboratory UASB reactor. Such inconsistency may complicate the interpretation of results as well as the accuracy and successfulness of an experiment in general. On the larger scale, it also complicates the comparison of results obtained by different laboratories, which creates problems for feasibility studies, if the literature is the primary source of information. To be more precise, in case of a failure, incomplete information does not allow an interpretation of the data and to trace-back the reason for failure, such as unadopted inoculum or its insufficient amount, problem of biomass washout due to the geometry, problematic substrate properties, or wrong OLR or recycle ratio. Inconsistent reporting units (like OLR calculated as per total volume of reactor or per volume of digestion zone) may also harm the attempt to reproduce results of one laboratory in another one, or wrong implementation of a procedure.

Among the inconsistencies found across the studies, we also see terminology problem in the use of terms 'sludge blanket' and 'sludge bed'. The controversy of the terms is in that fact that they are:

- used interchangeably (equally)
- 'sludge bed' refers to a layer of sludge at the bottom, where it is concentrated and visually seems to be a packed layer, while 'sludge blanket' refers to a part of the reactor where sludge is swimming as flocs above the 'sludge bed'
- 'sludge bed' refers to a bottom layer of sludge, and uses 'transition zone' instead of a 'sludge blanket'

Below, in Table 4, we attempted to systematize all parameters we were able to identify in the publications reviewed. Information in Table 4 does not intend criticize, but instead the intent is to generalize and categorize information from publications referenced above.

Table 2. Overview of available information of UASB reactors used in laboratory studies.

#	Substrate	Operating Conditions	Used Type of Reactor, Material, Inoculum, and Seeding	Constructional Geometry	Reference
1.	Hydrous ethanol vinasse COD: 121,000 $\frac{mg}{L}$ pH: 4 Ethanol: 21,007 $\frac{mg}{L}$ Acetic acid: 2237 $\frac{mg}{L}$ Propionic acid: 4304 $\frac{mg}{L}$	HRT: 6 … 15 *days* OLR: 7.27 … 22.16 $\frac{kgCOD}{m^3 \cdot day}$ Start-up OLR: Days 1–6: 0.34 $\frac{kgCOD}{m^3 \cdot day}$ with synthetic wastewater Days 7–8: 5.9 $\frac{kgCOD}{m^3 \cdot day}$ with substrate	*Type*: Figure 1b with added extra high rate settler above gas collecting part *Material*: Acrylic *Inoculum*: taken from already functioning UASB reactor treating vinasse of banana waster.	Cylindrical part diameter: 11 cm Cylindrical part height: 35 cm Settler basement square side: 17 cm Settler height: 21 cm Settler is installed on top of cylindrical part. Settler plates incline: 45° Operational Volume: 3 L No sampling ports	[29]
2.	Distillery Spentwash pH: 3.8 … 4.2 COD: 122,000 $\frac{mg}{L}$ TS: 121,020 $\frac{mg}{L}$	HRT: 10 days OLR: 11.75 $\frac{kgCOD}{m^3 \cdot day}$	*Type*: Figure 1a *Material*: Acrylic *Inoculum*: Laboratory enriched sludge from ongoing reactor by cow dung slurry. *Seeding*: Seeding by filling the 50% of volume with sludge mixture and multiple dilution by wastewater sample.	Digestion zone: 10 × 10 × 98 cm Transition zone: 10 × 10 × 6 cm GLS zone: 19.2 × 19.2 × 25 cm Digester volume: 16.75 L Settler volume: 7.15 L GLS opening angle: 53 °C 8 sampling ports with 10 cm spacing	[42,43]
3.	Spent wash of distillery plant COD: 90,000 … 100,000 $\frac{mg}{L}$ BOD: 30,000 … 50,000 $\frac{mg}{L}$ pH: 3.5 … 4.5	pH is adjusted to 6.5 … 7.5 with lime ($Ca(OH)_2$) Dilution of substrate applied OLR: 5.63 … 9.5 $\frac{kgCOD}{m^3 \cdot day}$ Temperature: 36 … 40 °C Suggests to adjust the ratio COD:N:P as 300:5:1 with urea and diammonium phosphate	*Type*: Figure 1a *Material*: Acrylic *Inoculum*: active sludge from anaerobic reactor *Inoculation*: 3 L of sludge per reactor	Operational Volume: 10 L Tube I: 11.7 cm Full height: 97 cm Digestion Zone: 78 cm Several sampling ports as 5, 19, and 57 cm levels Extra Sludge washing port Deflectors angle: 55 °C GLS opening angle: 55 °C	[44]
4.	Municipal sewage	Temperature: 9 … 32 °C HRT: 6 h OLR: 2.4 $\frac{kgCOD}{m^3 \cdot day}$	*Type*: Figure 1a Pre-existing functioning UASB reactor	Full Volume: 1148 L Height: 4 m	[45]
5.	Synthetic wastewater based on unbleached pulp mill COD: 1400 $\frac{mg}{L}$ pH: 6.3 … 8.3	Temperature: 30 ± 1°C HRT: 30 h	*Type*: Figure 1b *Inoculum*: granulated sludge from UASB reactor treating poultry slaughterhouse effluent	Total volume: 15 L Digestion compartment: ID: 15 cm Height: 52 cm Settler cylindrical and conical compartment: ID: 15 cm Height: 30 cm	[46]

Table 2. *Cont.*

#	Substrate	Operating Conditions	Used Type of Reactor, Material, Inoculum, and Seeding	Constructional Geometry	Reference
6.	Vanderbilt mineral medium with tetrachloroethylene COD: 3500 $\frac{mg}{L}$	Temperature: 35 ± 2 °C OLR: 10.5 $\frac{gCOD}{m^3 \cdot day}$ HRT: 0.4 day	*Type*: Figure 1a *Material*: Stainless steel *Inoculant*: Flocculent anaerobic biomass from anaerobic Continuous Stirring-Tank Reactor (CSTR) *Seeding*: 350 mL of sludge, equal to 8 g/L of TSS	Total Volume: 2 Liters ID: 9 cm Total Height: 100 cm GLS height: 15 cm Equipped with 5 sampling ports and inner heater	[47]
7.	Municipal sewage COD: 97 … 196 $\frac{mg}{L}$ pH: 6.8 … 7.2	Ambient temperature: 24 … 28 °C	*Type*: Figure 1a *Material*: Acrylic Sheets	Total volume: 62 L Total height: 270 cm Non-cylindrical form Sludge bed: height: 80 cm Square cross-section: 16 cm Gas collector slope: 60°	[48]
8.	Municipal landfill leachate COD: 1.5 … 3.2 $\frac{g}{L}$ pH: 6.5 … 7.0	Ambient temperature: 13–23 °C OLR: 1.2 … 4 $\frac{kgCOD}{m^3 \cdot day}$ HRT: 35 … 15 h Added $NaHCO_3$ as 0.5 g/L for neutralization purpose and no extra pH adjustment was done Recycle ratio: 3.5:1 Reports escape of methane with effluent	*Type*: Figure 1a *Material*: Stainless steel with PVC tubing and insulated with poly-urethane sheets *Inoculum*: Mesophilic anaerobic sludge from sewage treatment plant	Height: 295 cm Diameter: 13.5 GLS height: 50 cm Total Volume: 40 L Recycle ratio: 3.5:1 (feed to recycle) 2 sampling ports Contained the heater	[49]
9.	Grey water from sewer pipe COD: 647 … 681 $\frac{mg}{L}$	HRT: 8 … 20 h Ambient temperature: 14 … 24.5 °C	*Type*: Figure 1a *Material*: not specified *Inoculum*: sludge from anaerobic digester treating primary and secondary sludge	Full volume: 7 L Diameter: 7 cm Total height: 200 cm GLS height: 50 cm Reactor sludge filling: 100 cm	[50]
10.	Municipal wastewater COD: 672 … 698 $\frac{mg}{L}$	HRT: 2.4 … 4 h Temperature: set of reactors operating in range 12 … 25 °C as water bath made of PVC pipe Ø30 cm	*Type*: Figure 1c *Material*: PVC *Inoculum*: not specified	Full volume: 25 L Height: 1.35 m ID: 15 cm Inclined arm angle: 45° 4 sampling ports	[51]
11.	Sanitary waste + aerated filter effluent COD: 351 ± 166 $\frac{mg}{L}$	HRT: 6 h Experiment duration of 120 days	*Type*: Figure 1a *Material*: not specified, but either PVC or PMMA, based on provided images *Inoculum*: not specified	Cylindrical (tubular) shape Full volume: 7.8 L Total height: 60 cm Diameter: 14.8 cm 2 sampling ports GLSS opening angle: ~60° Height from top to baffles: 15 cm	[52]

Table 2. *Cont.*

#	Substrate	Operating Conditions	Used Type of Reactor, Material, Inoculum, and Seeding	Constructional Geometry	Reference
12.	Municipal wastewater COD: 176 … 224 $\frac{mg}{L}$	Temperature: 20 … 28 °C HRT: 3 h OLR: 0.014 $\frac{kgCOD}{L\cdot day}$ or 0.009 $\frac{kgVS}{L\cdot day}$	*Type*: Figure 1a *Material*: Not specified Already existing and functioning reactors	Total Height: 3.85 m Total volume: 2.5 m^3 3 sampling ports Separate preheater of substrate before inlet point	[13]
13.	Sugar cane vinasse COD: 19,220 $\frac{mg}{L}$ sCOD: 15,300 $\frac{mg}{L}$ pH: 5.2	Temperature: 22 ± 3 °C OLR: 0.5 … 32.4 $\frac{kgCOD}{m^3\cdot day}$ Up-flow velocities: 0.008 … 0.292 $\frac{m}{h}$ HRT: 33.33 … 0.86 days Recycling ratio: 1:3 Added 0.3 g $NaHCO_3$ per 1 g of COD to adjust the pH and alkalinity.	*Type*: Figure 1c *Material*: PVC *Inoculum*: Granular sludge from UASB treating poultry slaughterhouse *Seeding*: 60 L of granular sludge of VVS content 37 g/L	Total volume: 120 L Reaction zone volume: 60 L Total height: 4 m Reaction Zone Height: 2 m Diameter: 19.5 mm 8 sampling ports	[53]
14.	Mix of domestic waste with molasses (0.5:785 mix ratio) COD: 6597 $\frac{mg}{l}$ BOD: 3197 $\frac{mg}{L}$ TSS: 4500 $\frac{mg}{L}$	OLR: 6 $\frac{kgCOD}{m^3\cdot day}$ (1.5 start-up) Temperature: 15 … 25 °C HRT: 10–12 h Vertical velocity: 0.5–0.7 m/h	*Type*: Figure 1a *Material*: UPVC Pre-existing reactors	Diameter: 25 cm Height: 2 m 4 sampling ports Volume: 98 L	[54]
15.	Pre-digested chicken manure pH: ~8.0 COD: 807 ± 215 $\frac{mg}{L}$ sCOD: 295 ± 46 $\frac{mg}{L}$	Feed rate; 500 mL/day/reactor + dilution with tap water HRT: 13 days Semi-continuous operation	*Type*: Figure 1a *Material*: plexiglass *Inoculum*: sludge for internal circulation reactor treating paper/cardboard industry waste *Seeding*: 1.3 L sludge per reactor (20% of working volume)	Digestion zone height: 1 m Diameter: 90 mm Volume: 6.5 L Extra sampling ports	[55]
16.	Synthetic wastewater with butyrate as a main substrate pH: 6.0–6.5 COD: 2100–15,500 $\frac{mg}{L}$	Temperature: 37 °C OLR: 4–83 $\frac{kgCOD}{m^3\cdot day}$ HRT: 12.5–4.5 With water-jacket pH: 7.1–7.9 by addition of $NaHCO_3$	*Type*: Figure 1a *Inoculum*: flocculant sludge from anaerobic sludge digester, partially granulated in pilot-scale reactor for 2 month growing on sucrose *Seeding*: 1.5 L of adapted sludge per reactor	Digestion zone height: 50 cm Digestion zone diameter: 8.4 cm Digestion zone volume = 2.8 L Settler zone height: 25 cm Settler zone diameter: 11.4 cm Settler zone volume: 2.0 L 5 sampling ports	[27]

Table 2. *Cont.*

#	Substrate	Operating Conditions	Used Type of Reactor, Material, Inoculum, and Seeding	Constructional Geometry	Reference
17.	Synthetic wastewater COD: 6000–20,000 $\frac{mg}{L}$ pH: 7.1–7.8 (caused by buffers in WW)	HRT at beginning: 12–1.8 h OLR: 18–260 $\frac{kgCOD}{m^3 \cdot day}$ Increasing OLR by 50% after each achieving of removal rate of 80% Preheating of substrate: 37 °C Alkalinity spiked with $NaHCO_3$ Volumetric loads calculated per digestion zone volume only	*Type*: Figure 1a *Inoculum*: anaerobic digester treating municipal wastewater *Seeding*: 6.5 L of inoculum (1.% VSS and 1.3 TSS)	Volume: 8.5 L Digestion (+ 5 L of GLS) Digestion zone ID: 104 mm Digestion zone H: 1000 mm GLS: ID 144 mm GLS: H 300 mm 7 evenly distributed sampling ports	[56]
18.	Municipal sewage pH: 4.4 COD: 531 $\frac{mg}{L}$ BOD: 359 $\frac{mg}{L}$	Temperature: 25 … 35 (ambient) Feed rate: 28 L/day Up-flow velocity: 0.116 m/h OLR: 1.062 $\frac{kgCOD}{m^3 \cdot day}$ pH adjusted with NaOH up to 6.7 ± 0.1 Reported granulation on 20th day for main experiment.	*Type*: Figure 1a *Material*: Glass sheets *Inoculum*: adjusted cow dung manure Inoculum adaptation: 9 L of inoculum + 1 L of nutrients, grow for 120 days growing on sucrose with $(NH_4)_2HPO_4$. Remove undigested residuals via filtering through the 3 mm mesh. *Seeding*: 4 L of filtered sludge from adaptation per reactor	Working volume: 14 L Length to height ration: 1:14 Height: 140 cm (it is not cylindrical) Length of base: 10 cm Area of reactor: 100 cm^2	[57]
19.	Distillery effluent from fermentation-based vitamin C production plant COD: 6000 … 38,000 $\frac{mg}{L}$ BOD_5: 2000 … 14,000 $\frac{mg}{L}$ pH: 4.5–6.2	35 ± 2 °C (constant temperature room) OLR: 6 … 11.8 $\frac{kgCOD}{m^3 \cdot day}$ Upflow velocity: 0.52 m/h HRT < 10 h 252 days of total experiment 100 days of start-up Adjusted COD:N:P as 300–600:5:1 with urea and KH_2PO_4 pH adjusted with NaOH up to 7.2	*Type*: Figure 1a *Material*: stainless steel *Inoculum*: sludge (VSS 31.0 g/L) from anaerobic digester treating the municipal wastewater	Active volume: 2.3 m^3 Height: 5.90 m Inner diameter: 0.8 m Conical shape of bottom 5 sampling ports Recycle line active	[58]
20.	High-strength distillery wastewater pH: 3.42–5.84 TS: 31,520–126,240 $\frac{mg}{L}$ TSS: 1040–26,640 $\frac{mg}{L}$ COD: 68,000–100,000 $\frac{mg}{L}$ BOD: 21,600–35,000 $\frac{mg}{L}$	HRT: 4 … 2d Temperature: 37 °C with water jacket OLR: 15.34 $\frac{kgCOD}{m^3 \cdot day}$ Experiment duration: 635 days Start-up: 65 days with HRT: 47.11 h	*Type*: Figure 1a *Material*: borosilicate glass *Inoculum*: the sludge from UASBR treating distillery wastewater *Seeding*: ~30% of reactor volume	Inner diameter: 92.1 mm Total Height: 79.6 cm Digestion zone: 59.97 cm Digestion volume: 5 L Water jacket ID: 132.10 mm Sampling ports: 6 GLSS opening angle: 70° (flipped funnel)	[59]

Table 2. *Cont.*

#	Substrate	Operating Conditions	Used Type of Reactor, Material, Inoculum, and Seeding	Constructional Geometry	Reference
21.	Distillery wastewater COD: 107,000 $\frac{mg}{L}$ TOC: 39,200 $\frac{mg}{L}$	Temperature: 37 °C Flow rate: 2.2 … 3.3 L/d Recycle: 50% of influent flow $NaHCO_3$ added as 3 g/L to adjust pH to 7 OLR: up to 3 $\frac{kgTOC}{m^3 \cdot day}$	*Type*: Figure 1a *Seeding*: 500 mL of inoculum per reactor, + 3 L of glucose-based synthetic wastewater and nutrients, including Ca^{2+} and PO_4^{3-} to stimulate granulation	Total Height: 1.35 m Fluidization part volume: 3 L Fluidization part H: 1.05 m Fluidization part ID: 5.9 cm Settling part volume: 3 L	[28]
22.	Cane molasses vinasse COD: 10 $\frac{g}{L}$ pH: 4.1 COD: 120 $\frac{g}{L}$ BOD: 30 $\frac{g}{L}$ TS: 100 $\frac{g}{L}$ TS: 50 $\frac{g}{L}$	Temperature: 55 °C with water jacket OLR: up to 28 $\frac{kgCOD}{m^3 \cdot day}$ Experiment duration: 430 days Added 5 g/L of $NaHCO_3$ to maintain 7.3 pH all-over experiment.	*Type*: Figure 1b with extra settler above gas collector *Material*: Stainless steel *Inoculum*: sludge (12 g VS/L) from suspended growth type digester treating distillery wastewater *Seeding*: 87 L of sludge per reactor	Volume: 140 L (126 L digestion + extra for GLSS) Digestion par: 20 cm ID × 4 m height Solids separator was made of inclined plates: 60°	[60]
23.	Wastewater with high corn-starch content pH: 6.8–7.9 COD: 3000–75,000 $\frac{mg}{L}$	Temperature: 37 °C with pre-heater HRT: 24–12 h and OLR: 3 … 150 $\frac{kgCOD}{m^3 \cdot day}$ Experiment duration: 510 days OLR is calculated on the volume of digestion zone only. pH adjusted with $NaHCO_3$ equal to COD, but < 8 g/L to prevent toxicity of Na^+. Reports pH of effluent as 6.8 at the highest OLR	*Type*: Figure 1a *Inoculum*: Sludge from anaerobic digester treating sewage wastewater *Seeding*: 6.5 L of sludge per reactor	Volume: 8.5 L of digestion zone + 5.0 L GLSS Digestion ID: 104 mm Digestion Height: 1000 mm GLS ID: 144 mm GLS Height: 300 mm	[61]
24.	Recycled paper mill wastewater pH: 7.4 COD: 5330.5 $\frac{mg}{L}$ TS: 32.99 $\frac{g}{L}$ VS: 27.28 $\frac{g}{L}$	Temperature: 37 ± 2 °C with helix heat exchanger Feed: 0.5–4.5 l/h, increment by 0.5 l/d OLR: 1–10 $\frac{kgCOD}{m^3 \cdot day}$ Load calculations per digestion zone!	*Type*:Figure 1a *Inoculum*: sludge from full-scale UASB *Seeding*: 25 L of sludge per reactor	Volume: 70 L (digestion zone: 53 L) Height: 1 m (30 cm of which is GLS) Diameter: 30 cm	[62]

Table 2. *Cont.*

#	Substrate	Operating Conditions	Used Type of Reactor, Material, Inoculum, and Seeding	Constructional Geometry	Reference
25.	Distillery wastewater COD: 40.389 $\frac{g}{L}$ pH: 3.2 … 3.8	Flowrate: 18 L/d Vertical up-flow velocity: 0.0925 $\frac{m}{h}$ HRT: 15.6 h ORL: 53.75 $\frac{kgCOD}{m^3 \cdot day}$ (digestion zone) pH: 6.7 ± 0.1 with NaOH Extra mixing pump inside of reactor	*Type*: Figure 1a *Material*: PVC *Inoculum*: 18 L of cow dung and 2 L of substrate and aged for 3 weeks and filtered through 3 mm mesh.	ID: 10.16 cm (4in) Height: 142.24 cm (56 in) + 14.2 cm of GLSS Effective volume: 15.4 L D: H ratio: 1:14 5 sample ports Gas collection funnel opening angle: 55°	[63]
26.	Vinasse cane alcohol wastewater pH 4.03 … 4.44 COD: 57.59 … 128.63 $\frac{g}{L}$ TS: 17.85 … 113.98 $\frac{g}{L}$ VS: 11.81 … 58.11 $\frac{g}{L}$	Temperature: 35 ± 2 °C OLR: varied 1 … 6 $\frac{kgCOD}{m^3 \cdot day}$ HRT: 109 … 25 days Up-flow velocity: 2 … 3 $\frac{m}{h}$ Biogas cleaned with 3N NaOH solution	*Type*: Figure 1a *Material*: Glass *Inoculum*: sludge from wastewater treatment plant treating mix of urban and industrial wastewater *Seeding*: 600 mL of inoculum resulting in 10.63 g VS/L in reactor	Digestion part: 53 cm H × 7.5 cm ID Digestion part volume: 2.3 L 6 sampling ports	[64]
27.	Distiller's grains wastewater COD 16,500–22,520 $\frac{mg}{L}$ pH 3.3–4.3 VFA: 3000–3600 $\frac{mg}{L}$ VSS 190–640 $\frac{mg}{L}$	pH: ~7 with $NaHCO_3$ OLR: 3.2 … 48.3 $\frac{kgCOD}{m^3 \cdot day}$ (33.3 was optimal) No reactor heater, the substrate was preheated to 37 °C before entering the reactor Start-up OLR: Linear increase from 0.42 to 5.6 $\frac{kgCOD}{m^3 \cdot day}$ for 27 days	*Type*: Figure 1a with second level of gas collectors as on Figure 1b *Material*: acrylic Inoculum: Sludge from mesophilic anaerobic digester in sewage treatment plant *Seeding*: Seeded with 5.2 L of sludge with VSS content of 12.3 g/L, degassed by auto-incubation at 37 °C for three weeks.	6 sampling ports with spacing of 20 cm in between. Inner diameter of Tube: 8.2 cm Height: 190 cm (total), 155 cm (reaction zone) Total volume: 8.18 L Inner diameter of GLS: 14 cm OD of gas harvesting funnel: 10 cm Funnel opening angle (60°) Duration of experiment: 420 days	[65]

Table 3. Information on UASB modifications of multi-step reactors involving UASB.

#	Substrate	Operating Conditions	Type, Material, Inoculum, Seeding	Geometry	Reference
1.	Distillery spent wash pH: 4 … 4.5 COD: 80,000 … 12,000 $\frac{mg}{L}$ TS: 60,000 … 85,000 $\frac{mg}{L}$ BOD_5: 35,000 … 45,000 $\frac{mg}{L}$	Temperature: 20 … 40 °C (ambient) pH: ~7 with $NaHCO_3$ Substrate COD:N:P as 100:5:1 with NaH_2PO_4 and Urea OLR: 1.0 … 8.0 $\frac{kgCOD}{m^3 \cdot day}$ (start-up), 36 $\frac{kgCOD}{m^3 \cdot day}$ HRT: 6 … 48 h Observed granulation at day 50.	Type: Figure 1a with packing materials. So called Hybrid UASB reactor Material: PMMA Inoculum: flocculent sludge from anaerobic digester of sewage treatment plant Seeding: sieved through 1 mm mesh, loaded as 15 g VSS/L (2.5 L per reactor)	Operational liquid volume—5 L (45 cm of total height) Diameter: 10 cm Overall height: 77 cm GLS separator was replaced with packing, taking 19 cm of total height (volume 1.5 L)	[14]
2.	Tannery wastewater COD: 8600 … 14,100 $\frac{mg}{L}$ pH: 2.8 … 3.7	Temperature: 17 … 38 °C (ambient) Substrate was diluted to COD value of 5400 … 9400 $\frac{mg}{L}$ Experiment duration of 52 weeks Equalization tank (600 L) prior to 1st stage UASB Start-p OLR: 24 *h* HRT: 5 … 24 *h*	Type: two reactors as Figure 1a in line Material: UPVC	Volume: 94 L Total height: 325 cm Digestion zone height: 240 cm Tube ID: 20 cm 5 sampling ports every 55 cm Funnel overlap on baffles: 1.5 cm per side	[15]
3.	Molasses-based ethanol distillery wastewater	HRT: 70 h, treating as 2nd stage after CSTR Feed flow: 3.4 L/d Temperature: ambient	Type: Figure 1a	Digestion Volume: 10 L Digestion ID: 0.08 m Digestion Height: 1.5 m	[17]

Table 4. Summary of the geometry and operational parameters for existing UASB reactor designs.

Criteria	Options/Area of Application/Observations
Height	No constraints on height. The smallest found reactor was 30 cm tall, the largest as above 4 m. Perhaps, limited only by the available space in a laboratory.
Volume	Small volumes are 0.5, 0.75, 1, and 2–2.4 L. Larger volumes of 14 and 55 L were also found. Usually, reactors with volume greater than 1 m^3 are referred as pilot-scale.
Height: Diameter (H:D) ratio	Since the substrate has an up-flow velocity, the reaction part of UASB reactor in some degree functions as a sedimentation or coagulation column, where ratio H:D should help preventing the biomass washout [19].
	This parameter is very rarely reported, and reporting of it can be confusing due to not clear geometry reference. There are reports of H:D ratio as a diameter of a reactor to either a total height of a reactor or to the height of a reactor without GLS. We see reasonable to calculate it as a diameter of reactor to the height without GLSS, since the goal of GLSS is to create a chamber for gas capture above the reaction tube of a reactor. From review studies, such ratio for majority of cases is in range from 8 to 14. However, there are also extreme cases as 3.5 or 23.
Construction material	For small volumes (up to couple liters): Borosilicate glass For small and medium sizes: PVC and PMMA For pilot scale: Stainless steel.
Gas–Solid–Liquid Separator (GLSS, Three-Phase Separator)	The particular design varies with the concept of the reactor itself, and options can be split into: Implementation of baffles Gas collection For tubular reactor designs, the deflectors are typically made as an O-rings with a triangular cross-section. For rectangular reactors, a series of inclined baffles are installed to narrow a main liquid flow. For smaller reactors, baffles are sometimes omitted, probably, because it's difficult to implement those in smaller volumes. Another case when deflectors were noticed to be omitted is when GLSS is represented by a separate part (either tube or funnel), wider than the major reaction tube, and a diameter of a gas collector is close to a diameter of a reaction tube. Gas collector is usually represented by a flipped upside-down funnel for smaller reactors. For larger ones, it can be a separate compartment. Y-shaped reactors do not have any specific structure inside.
Heating	Among the reviewed designs the following heating systems were noticed: Heating pads or tapes Water jacket No heating Inner heaters (helix shaped) Water jacket is the most common option for smaller designs but it complicates the placement/insertion of sensors (like pH, ORP, temperature, etc.) into a reactor. Larger reactors usually use heating pads or a combination of heating pads with thermal insulation material.
Temperature ranges	Mesophilic: 35 ± 2 °C or 37 ± 1 °C Thermophilic: 55 ± 1 °C Ambient temperature Ambient temperature with thermostat to prevent overcooling
Inoculum material	No constraints: Granular or flocculated sludge from another UASB Non-granulated anaerobic or active sludge Adjusted inoculum from non-sludge sources, like animal manure
Seeding (inoculating)	Across the reviewed studies, this was the most inconsistent parameter, which was not even always reported. The process was reported as: (a) filling reactor with raw sludge up to a certain percentage of height; (b) volumetric load of sludge per reactor, sometimes mentioning its VSS and/or TSS equivalent; and (c) final concentration of sludge in reactor as TSS or VSS. Also, few studies suggested to sieve the sludge through 1–3 mm mesh to remove any undigested particulate or residuals before seeding.

Table 4. *Cont.*

Criteria	Options/Area of Application/Observations
Substrate preparation, feeding and pH management	Few studies considered the adjustment of substrate based on ratio COD:N:P. However, the final ratio does not match across publications and varies for COD parameter 300–6000:5:1. Surprisingly, no-one mentioned adjusting the C:N ratio, which is recommended for anaerobic treatment in general. Only one publication mentioned the addition of compounds to stimulate granulation.
Substrate pH management	Researchers use either pH adjustment in substrate directly or pumping pH adjusting solution to the reactor. Used adjusting compounds are either hydroxides or bicarbonates. Interesting fact: addition of 0.5–3 g of $NaHCO_3$ per 1 L of substrate was sufficient to maintain a stable effluent pH around 7. In some extreme cases 8 g per 1 L of substrate were sufficient to work with OLR 150 $\frac{kgCOD}{m^3day}$
OLR and HRT	HRT and OLR are interdependent values and both are optimization points in research. Researchers aim to increase OLR and decrease HRT. These parameters are points of inconsistent reporting: Some sources report OLR and HRT as referred to the total volume of the reactor (both reaction tube and GLSS) Some sources report OLR and HRT as referred to the volume of the reactor without the volume of GLSS Higher limit for OLR is not specified, since it depends on chemical composition of influent wastewater and its strength.
Substrate distribution system	Typically is not reported, but where it is mentioned it's either: a circular tube with evenly distributed outlet holes and an inlet from the side through the wall of reactor an inlet into conical-shaped bottom of reactor a side inlet through the wall into bottom compartment with inclined bottom

3. Discussion

Studies, involving the UASB trials, are usually purposed for: (a) treatability testing and energy recovery estimation; (b) microbiology studies on changes in microbial consortia during adaptation to new substrates or long-term operation for further modeling of trophic network; or (c) toxicity and granulation process studies. In the scope of this manuscript, we would like to identify the common needs of such research and point out the differences, where it is important. Here, we would like to focus on experimental aspects, which are needed to pay attention to, while designing the reactors and its infrastructure.

3.1. *Volume of Reactor*

The first thing that affects the final volume of a designed reactor is the available amount of sample/substrate. Some samples of substrates are available in very limited quantities due to the policies of supplier companies or may be a subject of special regulations preventing the dumping of effluent to a sewer (Ex. industrial wastewater). Depending on the complexity of substrate and potential inhibitory effects, the reactor start-up period might occupy a substantial period up to 120 days [14,57,59,65,68], thus the volume of a reactor should allow to utilize the available sample volume for both start-up period and experiment duration.

3.2. *Material of the Reactor*

Due to the specifics of laboratory studies, the reactor needs to be constructed with the feature to visually inspect the content. It allows one to: (a) confirm the fact of granulation and (b) inspect the foam or scum formation, etc. This significantly narrows the selection choice of materials, limiting it to (a) polymethyl methacrylate (a.k.a., PMMA, Plexiglas, Perspex, acrylic glass), (b) borosilicate glass, and (c) clear polyvinyl chloride. Each of the mentioned materials can be used, and in our opinion it is more of a question of budget and available stock parts. We compare pros and cons of each material in Table 5.

Table 5. Comparison of materials used for UASB reactors in various studies.

Material	Pros	Cons
PMMA	Less expensive than glass Almost no film formation (unless scratched) Optically clear, may have some UV protective coating Stronger that glass Machinable with mechanical tools (CNC/lathe/mill/drill) Cracks can be fixed with either solvent treatment, epoxy or UV-curable resin in short time frame	Needs machining equipment If sterilization is needed: consider chemical sterilization Easily scratchable
Glass	Optically clear Non-UV degradable, chemically inert (under conditions of AD) Washable Autoclavable	Expensive In case of cracks becomes sensitive to vibrations and not usable Requires specialist (glass blower) to build or repair/fix Fragile
PVC	Clear, but not optically. Has blueish color Machinable, but melts easily Relatively cheap and available on the market, has a wide set of existing fittings for quick assembly	Degrades over time, becomes fragile Non-UV-stable, becomes yellowish over long-term expose to light containing UV spectrum (sunlight) Microorganisms form biofilm on its surface

Borosilicate glass is an excellent option if used for studies with sterile cultures, since it can be autoclaved. However, in the author's opinion, the ideal reactor must be manufactured of stainless steel and be featured with an inspection window, a water jacket and multiple sampling ports. Such a design would be chemically resistant under conditions of anaerobic digestion, autoclavable, and meet multiple research needs. However, such construction complicates the customization and should be done for optimized and fully tested design after confirmation of its efficiency. The authors currently use PMMA due to machinability of this material, its transparency, and stability under conditions of anaerobic digestion (AD).

3.3. *Heating of Reactor*

Heating of reactor under laboratory conditions is defined by: (a) actual need for heating and (b) necessity of sampling the content of reactor and location of sampling. If no sampling of reactor content is needed, the water jacket would be the most suitable option. Otherwise, sampling ports complicate the construction of water jacket. Without a water jacket, consider: (a) use of heating tapes or flexible heating pads or (b) preheating of substrate and thermal insulation of reactor to keep the temperature.

Heating tape on the outer surface of PMMA or PVC reactor is not recommended, since it could cause local damage, when the contact point of wall material and heating tape is locally overheated, causing melting or other types of damage. Our laboratory experienced problems with heating tapes even under mesophilic conditions. The reactor that got damaged, was controlled by thermostat with an external submergible temperature sensor. The damage consisted of the tape melting through the wall of the reactor causing leakage. Thus, we moved to a water jacket in our projects.

Perhaps, the use of heating pads would be more secure due to a larger area of contact and, hence, more uniform heating. Extra uniformity may be added by use of heat-transfer pastes, but they will decrease the observability of the process in reactors. However, it is still a viable option when there is a need for the presence of sampling ports on various levels or there is no way to implement a water jacket due to other reasons.

3.4. *Inoculum: Preparation, Adaptation, and Seeding*

While the granulated anaerobic sludge is the desirable inoculum, authors fully realize the probability of a situation when researchers do not have a source for granulated sludge. In such a case, the manure sample of animal origin could be a source of methanogenic microbial consortia, and referenced studies [27,42,43,57,63,65] suggest self-digestion of such sample or mixing it with a substrate and conditioning for up to 3 weeks. The presence of methanogenic microorganisms is

required for the generation of methane, but not every manure contains methanogens. The most typical confirmed cases of manure containing methanogens are cattle and swine manures. The presence of methanogenic bacteria could be confirmed by conducting specific methanogenic activity test [69,70], which is very close in technique to a popular Bio-Methane potential (BMP) test [71], but conducted on a nutrient media containing acetate as the only source of carbon [72].

Some studies suggest the sieving of inoculum through a 1–3 mm mesh to remove undigested or large inert material. It is reasonable, if the inoculum originated from manure, since manure samples may contain some animal bedding, or sewage wastewater treatment facility, which may contain hair, etc. However, if the sample originated from an industrial wastewater treating facility, such sieving could be optional, especially if sludge is already granulated and granules are large. Also, the effect of exposing sludge or granules to air during the sieving is not clear. Perhaps, the sieving process should be done in anaerobic chamber.

The seeding of reactor must be calculated and expressed as Volatile Suspended Solids (VSS), introduced with the inoculum, per working volume of reactor according to [73,74] and seeding should be in the range 10 to 20 $\frac{kgVSS}{m^3}$, (however, it also could be up to 25$\frac{kgVSS}{m^3}$) [10]. Inoculum should be analyzed for Total Solids, (TS), Volatile Solids (VS), Total Suspended Solids (TSS), and Volatile Suspended Solids (VSS) since sludge is also characterized by VS:TS and VSS:TSS ratio, as criteria of alive biomass if condition of sludge is tracked over time [75] and ratio VSS:TSS of sludge in range of 0.7 to 0.85 is likely to cause granulation [59]. The recommended method for solids content analysis is specified in Standard Methods 2540 [76].

3.5. Substrate Adjustment

Before any adjustments is done to a substrate, the treatability can be roughly characterized by the ratio BOD_5:COD, which is referred to as a biodegradability index (BI) [77,78]. For municipal raw wastewater BI is usually in the range 0.4 to 0.8 [79,80] and it is considered to indicate good treatability. Greater index means better bio-treatability and pretreatment can increase the value of BI [81,82]. Estimation of sample degradability based on BOD_5:COD is inconsistent, but can be generalized as: (a) highly bio-treatable if greater than 0.5; (b) bio-treatable if greater than 0.3; and (c) not bio-treatable when lower than 0.2 [81–85].

One of the primary adjustments for substrate is the C:N ratio [86] by mass, with the optimum in the range 25 to 30 [87–89] or 20 to 30 [90] and higher temperature ranges require higher C:N ratio. However, it also could be a substrate-specific optimization parameter [91–93]. Some authors also consider C:P ratio for methanogens between 16:1 and 75:1 [94,95] as optimal, while C:N:P ratio is considered to be favorable in the range 400:5:1 to 100:28:6 [95,96]. Some inconsistence to in attempt to meet those ranges may come from measurement techniques, where various authors use either: (a) elemental analyzers [97] or (b) total carbon and Total Kjeldahl Nitrogen (TKN) [90]. Across referenced in this manuscript studies, following compounds were used to correct ratio: KH_2PO_4, NaH_2PO_4, $CO(NH_2)_2$ (urea or carbamide), and $NH_4H_2PO_4$.

Individual studies stated the need to account for sulphur [98], and report C:N:P:S ratio as 600:15:5:3 to be the optimal for methanization [99]. Perhaps, such increase of considered elements is reasonable, since elemental composition of anaerobic biomass is reported as $C_5H_7O_2NP_{0.06}S_{0.1}$ according to [100–102], but not yet widely used in anaerobic digestion studies.

The ratio of COD:N:P of 250:5:1 is generally suggested for anaerobic treatment [103–105], however, some variation exist between 900:5:1.7 and 150:5:1 [104,106,107] and could be even 300:1:0.1 [108]. Other studies recommend 300:5:1 as start-up conditions specifically for UASB [75,96,109,110]. Important to mention, that "N" in such proportion refers to the total nitrogen [108]

pH adjustment for methanogenic bacteria should bring the pH in the optimal range 6.8 to 7.5, while outside of the 5 to 8.5 range, methanogenesis is fully suppressed [111–113]. However, for anaerobic digester the range of 6.8 to 7.2 is recommended, due to widely used in wastewater

treatment lime as pH adjusting chemical [114]. Across referenced studies we noticed NaOH and $NaHCO_3$ as widely usable compounds to adjust pH, however, the choice is wider [1–3].

3.6. Granulation Stimulation

If granulation enhancement is needed, the Ca^{2+} in concentration 100–200 mg/L of substrate can be added [116], or even 150 ... 300 mg/L at the start-up [117,118]. The role of calcium in granulation process is not clear, but it is assumed to form precipitates with carbonate and phosphate [21,119]. Use of Mg^{2+} is not recommended, since it causes disaggregation of granules [120], even though it is expected to precipitate as $MgNH_4PO_4$ [10]. Normally, granulation should be observed within 4–6 weeks after the start of the experiment [73].

3.7. Start-up Feeding

The original research of [73] recommends the OLR as 0.05 ... 0.10 $\frac{kg_{COD}}{kg_{sludge\ VSS} \times day}$ for the start-up period and increasing of OLR after achieving the removal rate of at least 80%, however, the increment values are not specified. The expression of COD load per VSS of sludge per day is called "sludge load", but in studies OLR is usually reported as $\frac{kg_{COD}}{m^3 \times day}$, which is called "space load". Based on the previously suggested inoculum seeding as 10 ... 20 $\frac{kg_{VSS}}{m^3}$, the start-up space load should be in range 0.5 ... 2 $\frac{kg_{COD}}{m^3 \times day}$, however exact calculation based on the loaded VSS of inoculum must be done. The vertical velocity of the substrate is suggested not to exceed 0.5 ... 1 $\frac{m}{h}$ [10] in general, but minimal values are not reported and no details were found for the start-up period.

3.8. Infrastructure of UASB Reactor

Based on our experience and referenced here studies, we want to suggest a unified operational process flow diagram as in Figure 2, where we would like to emphasize several aspects.

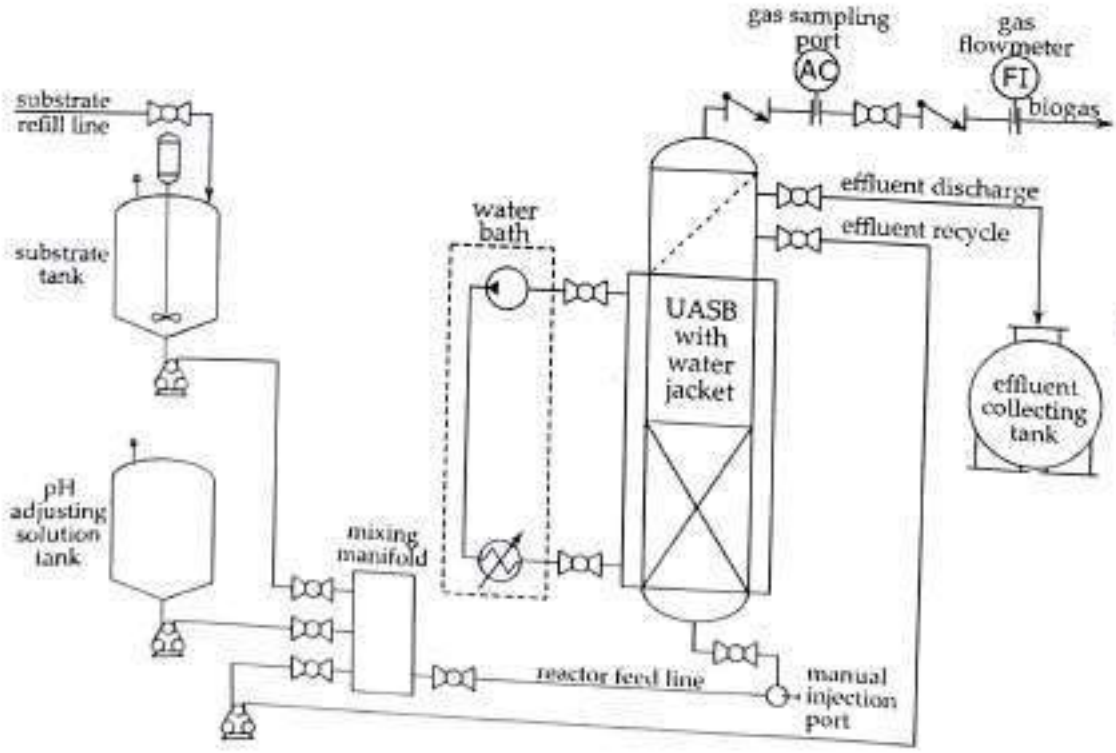


Figure 2. Recommended flowchart of UASB infrastructure set-up.

3.8.1. pH Adjusting and Alkalinity

As mentioned above, the composition of pH adjusting solution is a point of choice [115], but, regardless, the solution should be pumped directly into the reactor feeding line (the mixing manifold on schematic of Figure 2).

Otherwise there is a potential for growth of competitive microorganisms in the substrate feeding tank, leading to chemical changes of substrate. The concentration of pH adjusting solution should be balanced based on: (1) daily amount of solution needed to pump (pumps may have lower limit of pumping speed) and (2) minimizing substrate dilution. The interim decision could be to use concentrated solution that is pumped and dosed on a timer, if calculated flowrates are below the limits of a pump. High concentrations of pH adjusting solutions can be chemically aggressive. To prevent the contact between the substrate and parts of pumping mechanism, the peristaltic pumps are recommended for use.

Referenced here studies dissolve or add 0.5–3 g of $NaHCO_3$ per 1 L of substrate and achieve the stable pH in favorable methanogenic range. However, there are more general suggestions to maintain the ratio between alkalinity of substrate (expressed as $CaCO_3$) and its COD as 1.2–1.6 $\frac{g\ CaCO_3}{g\ COD}$ [121]. This value can be used as a reference to calculate the dosage portions and intensity for pH adjusting solution, but should be optimized later [122] downwards. Methanogenesis could occur until ratio of 0.8 $\frac{g\ CaCO_3}{g\ COD}$ with some extreme cases of 0.3 $\frac{g\ CaCO_3}{g\ COD}$, but lower values should inhibit methanogenesis and stimulate the formation of hydrogen [123,124].

Another reference value for regulation of alkalinity is ratio of Volatile Fatty Acids (VFA) to Total Alkalinity (TA). Industrial guidelines [114] recommends the ratio VFA:TA to be below 0.35 and consider the value below 0.25 as best for anaerobic digesters, and below 0.15 as safe against pH changes in substrate. The VFA should be expressed as equivalent concentration of acetic acid in $\frac{mg}{L}$ and TA as equivalent of $CaCO_3$ in $\frac{mg}{L}$. The determination of alkalinity by titration is described in Standard methods 2320 [76], as well as appropriate methods for VFA with gas chromatography is covered by Standard methods 5560. However, there were attempts to substitute VFA determination by titration [125–127], to avoid using of gas chromatograph.

3.8.2. Feeding and Recycling

The feeding of reactor, based on OLR and HRT is the point of optimization targeting the maximum achievable loads, however, the [10] recommends to limit the vertical velocity of liquid depending on the type of sludge and type of waste:

- Granular sludge + soluble wastewater: 3 $\frac{m}{h}$ continuous, up to 6 $\frac{m}{h}$ peak for a couple of hours per day;
- Granular sludge + partially insoluble water: 1–1.25 $\frac{m}{h}$, up to 2 $\frac{m}{h}$ peak for a couple of hours per day; and
- Flocculent sludge: 0.5 $\frac{m}{h}$ continuous, up to 2 $\frac{m}{h}$ peak.

After sludge matured and granulated, the flow could be increased by 50%. In the case of insufficient vertical velocity and to prevent clogging, the recycle line can be used to manage it and (a) to dilute substrate with treated wastewater, (b) to reuse of alkalinity [28], or (c) enhance the granulation by increasing the vertical up-flow [128].

Important remark: effluent recycle port must be separate and located below the effluent discharge port. It is made to prevent back-pumping of air from the effluent discharge line. In our laboratory set-up, we used the flow splitters on effluent port to obtain a recycle line, and we noticed some gas bubbles in it.

3.8.3. Manual Injection Port

A manual injection is strongly recommended and is purposed for:

- urgent (emergency) injection of solution for managing pH, coagulation/flocculation, or granulation agent problems;
- testing an enhancement of inoculant via injection of specific microbial culture(s); and
- sampling of substrate which is supplied to a reactor after all mixing procedures.

3.8.4. Biogas Collection and Counting

Notice the installed one-way valves in the gas line in Figure 2.

Check valves are important to prevent the back flow of gas and there are several reasons for that particular phenomenon:

- drop of the ambient temperature and, consequently, gas compression in gas lines according to the combined gas law;
- at the beginning of UASB operation, when substrate gradually fills the reactor and gas tubes have residual air. The oxygen from residual air is consumed and thus the volume shrinks.

Any of those reasons can lead to one of the two undesirable consequences:

- ingress of liquid from reactor to a gas line, which potentially grabs the foam and clogs the pipeline.
- if water displacement gas counter is used: backflow of liquid from counter back to a reactor.

Important clarification is to use check valves with low cracking pressure. 'Cracking pressure' is a pressure value when check valve starts opening (passing gas through itself) and this pressure (converted into inches of water column) must be taken into consideration when designing the gas separator, specifically, the height and the level difference between gas collecting part and the effluent release port. Usage of valve with high cracking pressure result in need to build tall GLSS, increasing the material needed to build reactor and its dead volume.

We also want to stress that the gas counter working on the water displacement principle is the only option for raw biogas. There are gas counters working on heat transfer principle (similar to thermal conductivity detectors of gas chromatographs), which seem to be cheaper options, but they should not be used. Those counters can be calibrated for gas flow with constant content only, which is not a case for biogas. However, they can be theoretically applied if biogas was stripped with alkaline solution to remove acidic gasses (carbon dioxide, hydrogen sulfide, etc.) and assumed to be upgraded to bio-methane. We do not recommend the use of that.

3.9. Tracking Operational Parameters

The exact set of trackable parameters depend on the purpose of a particular study, but for general cases, we listed those parameters in Table 6.

Table 6. Minimal list of parameters for tracking during UASB experiments.

Parameter	Measurement For	Used For
COD	Influent	Calculate the degradability rate of substrate
	Effluent	Calculate corrected OLR
		Reference for energy yield calculation and substrate utilization rate
pH	Influent	Estimation how favorable are conditions for methanogenesis
	Effluent	Tracking the changes of substrate
	Reactor entrance	The actual pH value in a sludge layer if recycle line is used
Gas	Yield volume	Estimation of yield per unit of substrate
	Content	Calculation of energy recovery
		Balancing COD on biomass growth
Flowrate	Feed rate	Calculation of OLR, HRT, up-flow velocity
	Recycle rate	

These parameters are already enough to calculate the main operational parameters specified in Table 7 [10,91,129,130]:

Table 7. Main operational parameters of UASB.

Parameter	Equation	
Substrate utilization rate	$U = \frac{COD_{influent} - COD_{effluent}}{HRT \times VSS_{sludge\ in\ reactor}}$	(1)
Removal efficiency	$E = \frac{COD_{influent} - COD_{effluent}}{COD_{influent}} \times 100\%$	(2)
Hydraulic retention time (HRT)	$\theta = \frac{working\ volume\ of\ reactor}{volumetric\ flowrate\ of\ influent}$	(3)
Organic Loading rate (space load)	$OLR_{space} = \frac{volumetric\ flowrate\ of\ influent \times COD_{influent}}{working\ volume\ of\ reactor}$	(4)
Organic loading rate (sludge load)	$OLR_{sludge} = \frac{volumetric\ flowrate\ of\ influent \times COD_{influent}}{volatile\ suspended\ solids\ of\ sludge\ in\ reactor}$	(5)
Up-flow velocity	$v = \frac{influent\ flowrate + recycle\ flowrate + adjusting\ flowrate}{area\ of\ horizontal\ crossection\ of\ reactor}$	(6)

In addition, the track of biogas composition during the UASB experiments, the total gas yield and methane yield should be logged. Mentioned above parameters for logging and calculations on their basis do provide a basic understanding of ongoing process inside of UASB reactors, while interpretation of calculations result are not the scope of this manuscript to avoid swelling of it. However authors feel also a need to mention, that if some deeper understanding of chemical process or COD balancing is needed, other researchers [59,131–133] suggest calculation of what part of metabolism is presented by certain process according to the equations, collected in Table 8:

Table 8. Equations for metabolic ratios estimation.

Parameter	Equation	
Hydrolysis	$H = \frac{COD_{CH_4} + sCOD_{effluent} - sCOD_{influent}}{COD_{influent} - sCOD_{influent}} \times 100\%$	(7)
Acidification	$A = \frac{COD_{CH_4} + COD_{VFA-effluent} - COD_{VFA-influent}}{COD_{influent} - COD_{VFA-influent}} \times 100\%$	(8)
Methanogenesis	$M = \frac{COD_{CH_4}}{COD_{influent}} \times 100\%$	(9)
COD mass balance	$COD_{influent} = COD_{accumulated} + COD_{biogas} + COD_{effluent}$	(10)

Other parameters, not included here, belong to some partial cases of UASB experiments and are subjects of individual consideration. Examples for a category of such specialized studies could be effects of salinity or metal ions on the process inside of UASB, which would require extra electrical conductivity, ion-selective electrodes, or other quantitative measurements for both influent and effluent [134,135]. If the study is dedicated to toxicity or biodegradation of particular compound, the appropriate assay tests for that compound or its metabolites should be added [136,137], etc.

5. Conclusions

With this article we would like to draw the researcher's focus towards the need to report in their publications more information on materials and methods, including specifically sketches/operational flowcharts, seeding conditions, inoculum sources and pre-treatments, and all adjustments to the substrate and feeding equipment. The consideration and addition of these details will help to facilitate a strong scientific and engineering community with comparable research results and conditions. Such detailed data and methods reporting will also significantly propel modeling studies that aim to realistically predict bioreactor behavior in various process conditions.

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Abbreviations

AD	Anaerobic Digestion	sCOD	Soluble COD
BOD	Biological Oxygen Demand	SRT	Solids Retention Time
COD	Chemical Oxygen Demand	TA	Total Alkalinity
CSTR	Continuous Stirred-Tank Reactor	TKN	Total Kjeldahl Nitrogen
EPS	Exocellular Polymeric Substances	TOC	Total Organic Carbon
GLSS	Gas–Liquid–Solids Separator	TS	Total Solids
HRT	Hydraulic Retention Time	TSS	Total Suspended Solids
ID	Inner diameter	UASB	Up-flow Anaerobic Sludge Blanket
OD	Outer diameter	UPVC	Unplasticized Polyvinyl Chloride
OLR	Organic Loading Rate	VFA	Volatile Fatty Acids
PMMA	Polymethyl methacrylate	VS	Volatile Solids
PVC	PolyVinyl Chloride	VSS	Volatile Suspended Solids

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Original Research Paper

An integrated approach to explore UASB reactors for energy recycling in pulp and paper industry: a case study in Brazil

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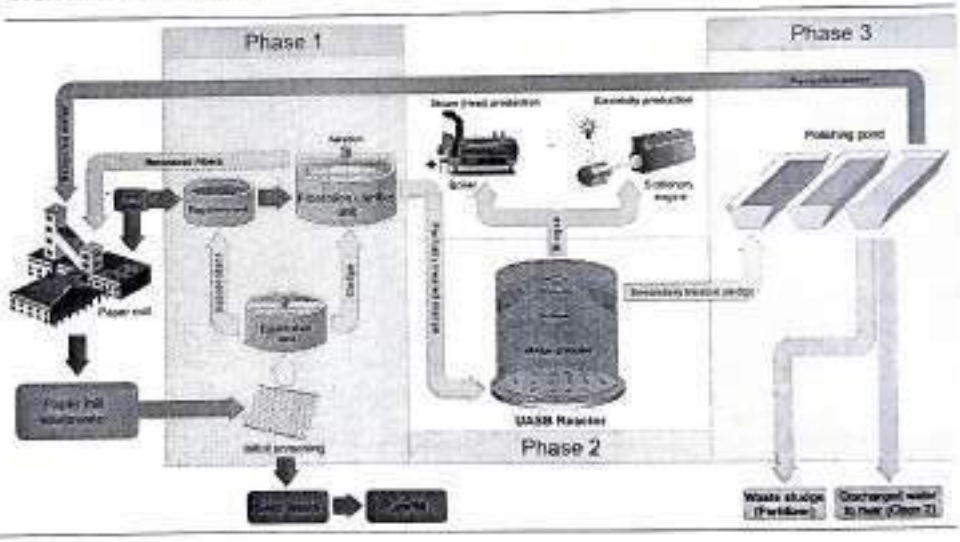
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HIGHLIGHTS

- Conceptual "systemic" biorefinery framework for simultaneous wastewater treatment and bioenergy/biomaterial recovery was developed.
- UASB reactor-based biorefinery was found efficient in addressing the environmental concerns faced by the pulp and paper industry.
- Investment required for UASB reactors would be minor accounting for only 6.8% of the mill's annual sales.
- Nationwide implementation of the proposed biorefinery could avoid national GHG emissions by 1.06 $\times 10^3$ CO_{2eq} tons.
- Biogas burning in stationary engines can avoid USD 2.88 Millions in electric energy charge.

GRAPHICAL ABSTRACT



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ABSTRACT

Brazil is currently focused on its energy matrix transition in favor of increasing of the share of renewable energy carriers for both enhanced energy security and mitigation of greenhouse gas emissions. In this context, the country's pulp and paper industry whose different wastes streams are not generally explored, could play a critical role. Accordingly, the main objective of this work is to develop a conceptual 'systemic' biorefinery framework integrating the treatment of pulp and paper mill wastewater using upflow anaerobic sludge blanket (UASB) reactor with energy recovery through biogas production and its conversion into heat and power in stationary engines and boilers, respectively. Based on the results obtained through the present case study, it was revealed that the adoption of UASB reactors by the paper mill industry could properly addresses the environmental concerns faced while could contribute to the national agenda favoring an increasing share of renewable energies in the country's energy matrix. The financial analysis showed that the investment required for the implementation of UASB reactors within a biorefinery platform would be minor vs. the investment in the whole mill and would be returned in 6.4 yr with a high return on investment even when operated at half of operational capacity. Moreover, through the developed UASB reactor-based biorefinery, the Brazilian pulp and paper industry as a whole could avoid 1.06 $\times 10^3$ CO_{2eq} tons, effectively contributing to the decarbonization of the country's economy.

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1. Introduction

Bioenergy produced from biological resources and different biomasses, rich in carbon structures, including wood and agricultural wastes can be exploited for the production of heat, electricity, or fuels, contributing to the global decarbonization. In the developing countries, the large scale adoption of energy recycling strategies for several industrial wastewaters and residues is still a challenge when compared to the developed countries which have already embraced technological solutions to properly deal with byproducts, i.e., side products derived from the processing of the main products and wastes (dos Santos et al., 2018). Energy matrix transition in the developing countries such as Brazil, lacks an effective strategy to valorize wastewaters and residues through energy recycling while there is a huge dependence on fossil fuels (57% of the total domestic energy supply) as well as on hydro and thermoelectric energies (65.2% and 27.8% of the domestic electricity supply including renewable and non-renewable sources, respectively) (EPE, 2018). Meanwhile, there are great opportunities for biomass-to-energy scenarios from several resources in Brazil (Wellle, 2017).

Brazilian efforts to increase the production and use of renewable energy carriers were strongly accelerated after the 21st Conference of the Parties to the United Nations Framework Convention on Climate Change (COP 21) and after the establishment of RenovaBio - a state policy that aims to draw up a joint strategy to recognize the strategic role of all types of bioenergies in the Brazilian energy matrix, both for energy security and for mitigation of greenhouse gas (GHG) emissions purposes (MME, 2018a). At the COP 21, Brazil committed to reduce its GHG emissions to 37% and 43% less than its 2005 baseline by 2025 and 2030, respectively (MMA, 2018).

The challenge extends to the Brazilian wood-based industry, including pulp and paper production, which is locally important and contributes more than 6% of the National Industrial Gross Domestic Product (IBÁ, 2017). In this industry, wastewater sludge, produced in high quantities, is difficult to handle because of its high water content (55 to 85%) and low dewaterability properties (Foekel, 2010; Bayr, 2014; Berni et al., 2014). Pulp and paper mill wastewater usually contains inks, dyes, very high levels of biochemical oxygen demand (BOD) (20 to 40 mg/L) and chemical oxygen demand (COD) (300 to 500 mg/L) due to the presence of lignin and its derivatives, chlorinated compounds, suspended solids (mainly fibers), fatty acids, tannins, resin acids, Sulphur and Sulphur compounds, etc. (Ali and Sreekrishnan, 2001; Souza, 2008). The discharge of insufficiently treated wastewater into rivers or other water streams could lead to serious negative effects on the aquatic life, flora and fauna located in the vicinity of such facilities. While on the other hand, the discharge of this wastewater in domestic wastewater treatment systems also requires additional steps for proper compliance with the country's standards. Thereby, development and implementation of effective solutions to ensure effluent organic matter removal before any discharge activities are necessary (Kesalkar et al., 2012). Moreover, in Brazil, pulp and paper industry effluents are not usually destined to generate energy and even in the presence of wastewater treatment facilities, the resulting biogas is generally flared.

In light of the above-mentioned challenges and to more effectively address them, the adoption of more efficient technologies for simultaneous organic matter removal and energy generation seems essential. Anaerobic digestion (AD), the biological degradation of organic matters, results in the production of biogas generally containing methane (50–75%), carbon dioxide (25–50%), hydrogen (5–10%), nitrogen (1–2%), and traces of hydrogen sulfide (Meghanathi et al., 2013) and has been widely adopted worldwide for sewage sludge treatment. However, the dissemination of this technology for industrial effluents faces limitations in terms of anaerobic reactors' configuration and operating conditions to ensure their feasibility for large scale applications. The upflow anaerobic sludge blanket (UASB) reactor, among other types of anaerobic reactors, has been adopted by the pulp and paper industry globally since the 1980's when its main weakness, i.e., hydraulic retention time (HRT), was overcome (Khan et al., 2011; Kamali et al., 2016; Isola et al., 2018). The biogas produced through the AD can be converted into bioenergy by means of combined heat and power systems.

In fact, AD in the pulp and paper industry began in the 1970s with the first system being an anaerobic lagoon type and subsequently, UASB reactors emerged in the 1980s. In the 1990s, real-scale anaerobic treatment predominated the treatment of effluents generated in the pulp mills around the world (Savant et al., 2006). Brazil presents a leading role in the utilization of UASB reactors and is home to the largest park of anaerobic reactors in the world for sewage treatment ( ). Nevertheless, UASB reactors are yet to be disseminated in the paper and pulp industry in Brazil. This could be ascribed to the fact that there are limited studies on integrated biorefineries in the pulp and paper industry, as well as, on their economic and environmental assessments clearly presenting their advantages.

Notwithstanding, Brazilian biogas market is still in its development phase, but growing steadily. The Brazilian National Policy on Solid Residues (PNRS), approved by Law 12.350/2010 (Brasil, 2010) and planned to be fully enforced by the end of 2022, should further help with the expansion of biogas plants, even those designed for wastewater treatment. The PNRS's goal is to avoid and prevent the generation of solid residues by promoting sustainability, increasing recycling and proper final disposal while sharing responsibilities with the whole society, namely government, producers, sellers, and consumers (Esparta, 2016). The Brazilian National Electric Energy Agency (ANEEL) only holds the records of electricity-generating biogas plants connected to the national grid. Given the large size of the Brazilian territory, collection of information on the biogas plants not registered at the ANEEL would demand a major effort. In Brazil, there are 22 biogas power plants connected to the national grid. The majority of these plants are installed on agricultural areas processing residues and at landfills (Persson and Baxter, 2015). The ANEEL is also responsible for the regulatory aspects of the electricity sector and has the power to decide and encourage research & development projects in the main areas of social interest including those related to wider and better use of nonconventional energy resources such as the ones derived from liquid effluents (ANEEL, 2008; MME, 2018a). According to the ANEEL, biomass is considered as one of the alternatives for diversification of the Brazilian energy matrix, thereby reducing dependence on fossil fuels.

From the economic perspective, the use of clean and low-cost fuels such as the electrical and thermal energy generated from biogas is of significance. In light of that, distributed generation is currently seen as the solution to existing problems while offering benefits including reliability, high power quality, and more environmentally friendly features. Therefore, future electrical power grids tend to be decentralized and to include a large number of small- and medium-sized distributed plants (Ramos et al., 2014). Overall, important systemic aspects, i.e., economic, social, and environmental ones, should be considered for biomass-to-energy projects (Novato and Lacerda, 2017).

The main objective of this work is to develop a conceptual 'systemic' framework for engineering of a biorefinery, based on the data obtained from a study case, coupled to a wastewater treatment plant in a pulp and paper mill. The developed framework includes a UASB reactor for secondary wastewater treatment and subsequently, biogas energy recovery in boilers for thermal power (TP) and electrical power (EP) generation.

2. Materials and Methods

2.1. Case study: an industrial paper mill in the state of São Paulo (Brazil)

The case study includes a paper mill located in the state of São Paulo, Brazil, which has invested USD 3.4 million in an advanced wastewater treatment system from 2004 to 2014. The paper mill considered in the study is set for the production of white top line (WTL) or newsprint only. The hourly production capacity of the paper mill, i.e., 12.9 ton/h WTL or newsprint could be computed according to Equation 1 considering paper grade/weight of 150 g/m², velocity of paper machine (PM) of 550 m/min, and sheet width of 2.6 m. For each ton of WTL or newsprint produced, 30 m³ of water is consumed.

$$Production\left(\frac{Kg}{h}\right) = \frac{\left[velocity\ of\ PM\left(\frac{m}{min}\right) \times paper\ weight\left(\frac{g}{m^2}\right) \times sheet\ width\ (m) \times 60\ (min)\right]}{1000} \quad \text{Eq. (1)}$$

The advanced wastewater treatment facility consists of three different parts. The primary treatment consists in an equalization tank and an effluent

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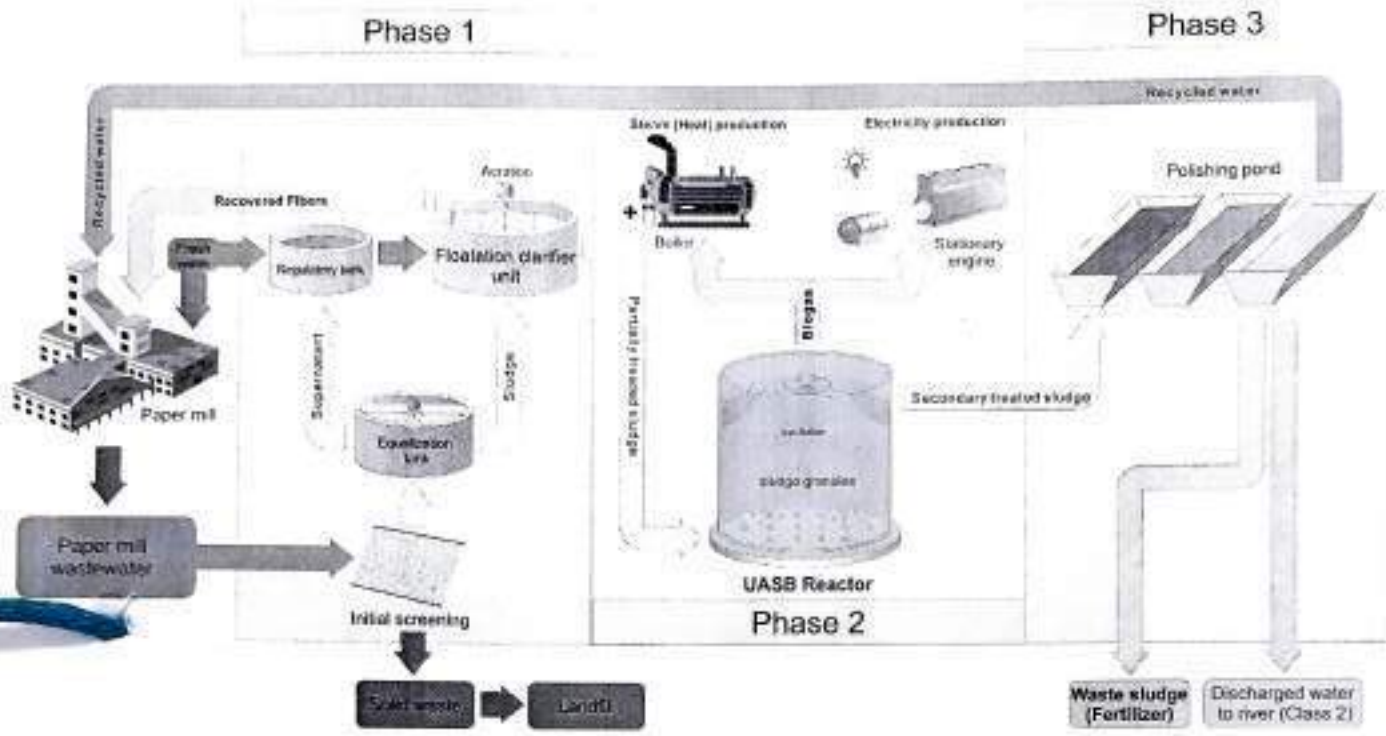


Fig. 1. The biorefinery framework including an advanced wastewater treatment system developed for a paper mill industry located in the state of São Paulo, Brazil.

flotation system. The secondary treatment consists of UASB reactors (UASB 1 and 2). The first UASB reactor was incorporated into the existing effluent treatment system at the mill in 2004. In 2014, a second UASB reactor was incorporated. Finally, the tertiary treatment is performed in an aerobic polishing pond. The advanced wastewater treatment system including different parts/streams involved is presented in Figure 1. More specifically, the first part is a conventional aerobic treatment system including primary settling and sludge digestion after treatment. The second part is a combined AD consisting of two UASB reactors, i.e., the beating heart of the developed biorefinery, where the generated biogas is directed to a boiler (to produce steam for heating) and a stationary engine (for electricity generation). The third part is an additional sludge digestion post-treatment including a polishing pond. At this stage, contaminants are removed in accordance with the environmental [illegible] ring the possibility of using the treated effluent as reuse water in the paper and pulp production stage. Furthermore, the UASB reactor bottom sludge could be applied as soil fertilizer or could be further processed by pyrolysis to produce biochar which can be used as soil conditioner (Buller et al., 2014; Elkhalifa, 2019) and activated carbon (Alhashimi, 2017).

The integration of the processes presented here can be classified as a biorefinery. The use of biogas to generate heat and power could contribute to decreased consumption of natural gas (NG) in the plant while reducing the plant's overall CO_2 emissions.

2.2. Advanced wastewater treatment system: phases and their description

The energy value of biogas was determined by the average concentration of methane, which has the lower heating value (LHV) of 35.59 MJ/Nm³ (Salomon and Lora, 2009). The primary equipment commonly employed to use biogas as fuel to produce electricity are internal combustion engines, mainly because of the costs of acquisition, operation, and maintenance. The generated biogas (with 70% of methane) can be readily used as fuel in the generators located in paper mills as most of existing engines are operated on NG. Nevertheless, in order to select an appropriate size of the generator, the following parameters should be considered: i) efficiency of the engine generator; ii) calorific value of biogas; and iii) generation plant working time, and iv) daily availability of biogas in the unit (m^3/d). The two routes considered as biogas destination within the biorefinery framework are presented in Figure 1.

2.3. Biogas production

The pH of UASB reactors was measured as 6.7 to 7.8 while the temperature was kept at 30 °C (mesophilic reactor). Moreover, the sediment residue (SR) was measures at 100 mL/L. Under such conditions, the organic loading rate (OLR) of the UASB system could be obtained using Equation 2:

$$OLR = Reactor\ Net\ Volume\ \left(\frac{m^3}{d}\right) \times COD\ \left(\frac{kg\ COD}{m^3}\right) \quad \text{Eq. (2)}$$

Considering 0.3 m^3 of methane gas (CH_4)/kg organic load removed (Tokian et al., 2003), as well as an annual average COD removal efficiency of 80% as measured throughout this case study, the volume of biogas generated (Q) could be calculated as follows.

$$Q_{CH4} = 0.8 \times OLR\ \left(\frac{kg\ COD}{d}\right) \times 0.3\ \left(\frac{m^3}{kg\ COD\ removed\ (OLR)}\right) \quad \text{Eq. (3)}$$

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As the biogas produced herein has an average CH_4 content of 70%, biogas production could be obtained by Equation 4.

$$Q_{biogas} = \frac{Q_{CH4}}{0.70} \quad \text{Eq. (4)}$$

2.4. Potential of electricity generation by using biogas-fed stationary engine

The electricity generation (EG) from a stationary engine fed by biogas can be calculated according to Equation 5 (Tsanchi-pyrahe, 2004; Lobato et al., 2012).

$$EG = Q_{biogas} \times LCV_{CH4} \times C_m \times n_e \times n_g \times F_c \quad \text{Eq. (5)}$$

where,

EG - Electricity generation potential (MJ/d);
Q_{biogas} - Amount of biogas (m^3/d);
LCV - Lower calorific value of methane (MJ/m^3);
C_m - Percentage of methane in biogas (%);
n_e - Engine efficiency (%);
n_g - Generator efficiency (%);
F_c - Correction factor due to uncertainties (%). This factor takes into account the losses in the pipes, mechanical couplings, the presence of other gases not fully quantified, and other factors that lead to losses in the final energy generated.

The values of the parameters are presented in Table 1.

Table 1.
Values of the parameters required to obtain electricity generation (EG) potential through using a stationary engine fed by biogas.

LCV (MJ/m^3)	n_e (%)	C_m (%)	n_g (%)	F_c (%)
35.59	34	70	95	90

2.5. Potential of heat generation by using biogas-fed boiler

The use of biogas for the sole purpose of heat generation is simpler than electricity generation and less complex requirements should be observed.

The total energy produced (EP) per day could be calculated using the following Equation 6.

$$EP = Q_{biogas} \times C_m \times LCV_{CH4} \quad \text{Eq. (6)}$$

where,

EP - Energy produced (MJ/d);
Q_{biogas} - Amount of biogas (m^3/d);
C_m - Percentage of methane in biogas (%);
LCV - Lower calorific value of methane (MJ/m^3).

2.6. Avoided emissions by using biogas

2.6.1. Avoided GHG emissions due to electricity generation ($AGHG_{EG}$)

The avoided GHG emissions through electricity generation ($AGHG_{EG}$) by burning the biogas produced in a stationary engine were obtained according to Equation 7. The parameters were based on the data provided by the Brazilian Ministry of Science, Technology, Innovation, and Communication (MCTIC, 2018). For the emission factor attributed to the favorable impact of the electricity generated by using biogas, the average value of the GHG emissions recorded throughout the 2018 was considered (Table S1). The resulting emission factor indicating the reduction in GHG emissions in response to using biogas vs. NG was 0.0786 ton CO_2eq/MWh.

$$AGHG_{EG} = 0.0786 \times EG \times T \quad \text{Eq. (7)}$$

where, EG is the electricity generated converted to MWh and T is the time of operation of the plant during the year (h).

2.6.2. Avoided GHG emissions due to heat generation ($AGHG_{HG}$)

To calculate the avoided GHG emissions due to heat generation ($AGHG_{HG}$) by using biogas, it was assumed that the total volume of biogas produced would be burned in the existing boiler as a renewable substitute for the Brazilian NG. Accordingly, the avoided emissions would be the amount of tons CO_{2eq} emitted through using the NG in the boiler multiplied by an emission factor (Eq. 8) (ECOPART, 2007).

$$AGHG_{EG} = 0.056 \times HG \times T \quad \text{Eq. (8)}$$

where, 0.056 is the emission factor in tons of CO_{2eq}/GJ, HG is the heat generated by burning all of the biogas produced in the year 2018, and T is the time of operation (h) (i.e., 4,350 h).

2.7. Avoided costs by using biogas

2.7.1. Avoided cost due to electricity generation (AC_{EG})

When biogas is used for electricity generation, part of the power needed for the paper mill operation could be replaced and an avoided cost could be calculated.

The price of electric power was computed using the report by the Brazilian Electrical Energy Trade Chamber (CCEE, 2018) considering the following specifications: annual data for the Southeast region of Brazil (case study location) throughout the year 2018 for the heavy-demand electricity sector (Table S2). The mean value computed was 74.30 USD/MWh. The avoided cost as a result of electricity generation using biogas was calculated by Equation 9.

$$AC_{EG} = 74.30 \times EG \times T \quad \text{Eq. (9)}$$

where, EG is the electricity generation potential converted to MW (see Eq. 5, Section 2.4) and T is the time of operation for the plant throughout the year (h), i.e., 4,350 h corresponding to the real operation of the advanced wastewater treatment system (i.e., 50% of its whole capacity) in the study case.

2.7.2 Avoided costs due to heat generation (AC_{HG})

The avoided costs as a result of NG replacement by biogas is calculated by considering the volume of NG replaced according to data from the Mines and Energy Ministry (MME, 2018b). The plant consumes 150 m^3 NG/ton paper produced which is equivalent to 526.5 m^3 NG/h. For such a magnitude of consumption, according to Comgás (a Brazilian gas supplier), the variable cost is 0.38 USD/m^3 (Table 3) (Comgás, 2019).

According to the Mines and Energy Ministry, the LHV of the NG consumed is 36.84 MJ/kg, or 27.26 MJ/m^3, assuming the stated density of 0.74 kg/m^3 (MME, 2018b). Hence, the avoided costs through using [illegible] for heat generation (AC_{HG}) were obtained by using Equation 10.

$$AC_{HG} = Volumetric\ Cost_{NG} \times \frac{NG \times T}{LHV_{NG}} \quad \text{Eq. (10)}$$

where, HG is the heat generated by biogas, T is the time of operation and LHV_{NG} is the lower heating value of NG (see Supplementary file for more information on emissions and prices).

2.8. Financial analysis

Economic and financial analysis could reveal the viability, stability, and profitability indicators of a project under investigation. Balance sheets, assets and resources information, net income and cash flow statements, etc. are some of the necessary information required to obtain the above-mentioned indicators in order to support decision making processes. Financial analysis focuses on the business profitability and provides

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information to potential investors, while the economic analysis deals with public profitability of the project and is linked to opportunity costs.

In this case study, a financial analysis was performed considering two profitability indicators (a) and (b) for risk assessment along with the classic payback (c) (Blank and Tarquin, 2012).

(a) Profit margin, the ratio of net incomes and revenues (net profits over sales). This measures the percentage of sales incorporating into company's earnings.
(b) Return on assets (ROA) indicating the profitability (relative to the total assets). This is calculated as annual earnings over total assets.
(c) Payback is the period (yr) required to exhaust the original investment.

The analysis was carried out considering the mean paper price in the market (450 USD /ton paper) as well as the following financial parameters:

- UASB Acquisition Cost = USD 3.4 million
- Financing Period = 120 months (10 yr)
- Payment = Main Stream + Interest Rate
- Interest Rate = Financing cost + Bank Spread + Financial Agent
- Spread Interest Rate = 9.25 %/yr
- Financing Cost = Long Term Interest Rate = 6.85 %/yr
- Bank Spread = 1.40 %/yr
- Financial Agent Spread = 1.00 %/yr
- Depreciation Horizon for UASB = 25 yr (financial depreciation rate of 3%)
- [illegible]Assets = 10% of Acquisition Cost (payment rate in installments fund, on intangible assets of 3%).

The financial analysis carried out here did not consider the avoided costs related to biogas energy recovery in feedback loops for the boiler and stationary engine. More information on the calculations are provided in Supplementary file.

3. Results and Discussion

3.1. Technical results

The present case study was devoted to develop a conceptual 'systemic' biorefinery framework developed for a paper mill located in São Paulo state, Brazil. The elements of this biorefinery included an advanced three-phased wastewater treatment plant to simultaneously treat pulp and paper mill wastewater and produce biogas using AD (UASB reactors) biogas coupled to energy recovery in boilers for thermal (TP) and electricity generation (EP) (Fig. 1). Other advantageous features of this biorefinery included water and fiber recycling as well as production of agriculture fertilizer as another value-added product. The technical-analytical parameters calculated for the developed biorefinery, i.e., OLR, amount of Methane produced (Q_{CH4}), amount of biogas produced (Q_{biogas}), electricity generation (EG), and energy produced (EP) (Table 2).

Table 2.
The [illegible]al parameters calculated for the developed biorefinery in the pulp and paper [illegible] energy recovery through biogas production (Eqs. 1 to 6).

Parameter	Value	Unit
OLR- Organic loading rate	12,960	kgCOD/d
Q_{CH4}- Amount of methane	3,110	m³/d
Q_{biogas}- Amount of biogas	4,443	m³/d
EG- Electricity generation	32,178.25	MJ/d
EP- Energy produced	8.94	MWh/d

The volume of paper mill wastewater introduced into the primary treatment facility is 9,288 m³/d and the volume of effluent transferred to the UASBs reactor is 7,200 m³/d. The difference of 2,088 m³/d is returned to the pulp preparation and paper machine. The measured efficiency of the first phase of the treatment stands at approximately 20% resulting an effluent with a COD of approximately 1,950 mg/L (annual mean value, Table 3). With an HRT 16 h in the UASB reactors, the COD is reduced to as low as an annual average value of 295 mg/L corresponding to an approximate efficiency of 85% (considering the UASB influent organic load). In another word, a significant reduction in COD was obtained through the USAB-based anaerobic treatment of the wastewater, even at the high OLR of 12,960 kg COD/d and short HRT of 16 h employed.

Table 3.
Chemical organic demand (COD) (mg/L) of the effluents leaving different phases of the advanced wastewater treatment implemented within the developed pulp and paper biorefinery throughout the case study (2018).

Month (2018)	Pulp and paper wastewater	Pahse 1	Phase 2	Phase 3
		Effluent leaving the flotation clarifier unit	Effluent leaving the UASBs	Effluent leaving the polishing pond
January	2,672	2,139	321	289
February	3,520	2,816	422	380
March	2,260	1,808	271	244
May	2,305	1,844	277	249
June	2,064	1,651	248	223
July	2,786	2,229	334	301
August	2,150	1,720	258	232
September	2,331	1,865	280	252
October	2,387	1,910	286	258
November	2,230	1,784	268	241
December	2,290	1,832	275	247

During the third phase of treatment (i.e., polishing pond), the COD is further reduced to 265 mg/L (by 10% considering the influent of this phase). It should be noted that the Brazilian legislation discharge limit for COD of the final treated wastewater is less than 340 mg/L. Therefore, the discharge water obtained through the present advanced wastewater treatment system meets the national requirement. It should be noted that the secondary sludge (i.e., the sludge produced at the third phase of the treatment) should be concentrated as much as possible to ensure the highest COD and suspended solids removal (Mahmood and Elliott, 2006).

Brazil has two specific laws for the release of industrial and domestic effluents into water bodies, a federal one (MMA, 2011) and a more strict one for the state of São Paulo (CETESB, 1976). The Federal law establishes that the maximum BOD allowed for discharged water is 120 mg/L, and that this limit can only be achieved using treatment systems with a minimum BOD removal efficiency of 60% (MMA, 2011). Moreover, there is another standard in the state of São Paulo requiring the BOD_5 at 20 °C of discharge water to be lower than 60 mg/L, and this limit could be achieved by wastewater treatment systems capable of reducing the organic load by at least 80%. It should be noted that these standards are used as a basis for licensing new industrial activities and are the reference for Environmental Impact Assessment (EIA) studies (Von Sperling, 2016).

The results of this study were in line with those of Meyer and Edwards (2014) who argued that the COD removal rate in real-scale reactors varies between 30 to 90% with the highest COD removal rates recorded for the condensate flows from chemical pulp (75 to 90%) and paper mill effluent (60 to 80%). The high COD removal efficiency of the developed advanced wastewater treatment system herein could be well attributed to the integration of the high performance UASB reactors with the upstream primary treatment (flotation clarifier unit) and the downstream treatment using the polishing pond. In a study, Zhang et al. (2012) compared five different scenarios for wastewater treatment of pulp and paper industry including primary treatment, anaerobic digestion (UASB), sequential batch reactor treatment and oxidation ditch reactor, anaerobic/anoxic process, and

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membrane technologies. They claimed that the most favorable results could be obtained through integrating these processes.

3.2. Avoided GHG emissions

Integration of the processes within a biorefinery framework could lead to the generation of a number of value-added products resulting in an enhanced economic viability of the whole process (Chematur, 2010). More specifically, energy recovery was maximized in the present study through biogas production from paper and pulp wastewater and its conversion into heat and power as two possible routes. Moreover, the water footprint of the overall system was improved. Nevertheless, to ensure the sustainability of a developed biorefinery, thorough economic and environmental assessments should be performed (Loizidou et al., 2015).

The internal combustion engine which was already in use in the paper mill to produce electricity was modified to burn biogas while burning biogas in boilers was also considered to generate steam (heat). From the data obtained on biogas volume produced (Q_{biogas}) and its potential for EG and HG, the avoided emissions for both alternatives were separately obtained. The emissions avoided through the substitution of NG with biogas for heat generation were considerably higher than the values recorded for biogas conversion into electricity route (Table 4). Considering the emission factor for pulp and paper industry in Brazil, i.e., 0.33 ton CO_{2eq}/ton of pulp and paper (MCTIC, 2017) and the country's pulp and paper production, i.e., 19.5 and 10.5 millions tons, respectively (IBA, 2017), the emissions of the whole sector could be estimated at 9.9×10^6 ton CO_{2eq}/yr. Considering the avoided emissions obtained per ton of paper produced in the present study and the paper production of 10.5 millions tons, the substitution of NG by biogas could avoid more than 1.06×10^3 ton CO_{2eq}/yr.

Table 4.
Avoided emissions and costs through replacing natural gas with biogas for heat and electricity generation.

Parameter	Electricity generation (EG)	Heat generation (HG)
Avoided emissions (tCO_{2eq}/yr)	127.0	1,125.5
Avoided costs (Million USD/yr)	2.89	8.28

3.3. Avoided costs and financial results

From the economic perspective, although both alternative routes result in avoiding the use of conventional energy sources (i.e., grid electricity and NG), the avoided costs attributed to the replacement of electrical energy from biogas are ten-fold higher than the costs avoided through replacing NG by biogas. It should be noted that when computing the avoided costs, the country's energy matrix and the seasonality of energy supply (depending on rainfall regime) as well as the fact that the country relies on thermoelectric energy to fulfill national needs in the dry seasons of the year were also considered. Thermoelectric energy is more expensive than hydroelectric energy and its cost is reflected in the mean market energy price considered here (dos Santos et al., 2016).

Based on the financial analysis and considering only the investment on the two UASB reactors with 50% working capacity, the payback on these units for the investigated paper mill plant in full time operation would be 6.4 yr while the ROA of the whole plant following UASB reactors acquisition would be 14%. The profit margin could be estimated at 35% taking into account both the paper mill original investment and the costs associate with the UASB reactors acquisition. The investment on the UASB reactors accounts for only 6.8% of the annual sales while contributes 19.8% of the operational profit with the depreciation period of 25 yr. This shows that the investment on the UASB reactors would not impose a significant financial burden. It should be highlighted that the average ROA for Brazilian pulp and paper mill industry stands at 18% while the average profit margin is 38%. Accordingly, the results of the present case study reveal that the investment required for the implementation of UASB reactors in the paper mill industry would be minimal while it could bring along significant benefits through avoiding GHG emission and by energy recovery.

4. Conclusions

Paper industry generates a large amount of liquid and solid effluents originating from the production process involved. These waste streams could be valorized by generating a range of biomaterials and bioenergy carriers. The findings of the present study clearly indicated that the adoption of UASB reactors by the paper mill industries could assist with effectively addressing environmental concerns faced by the industry while could simultaneously contribute to the energy matrix transition in favor of more renewable energy resources.

In addition, the financial analysis conducted herein proved that considering the investment in UASB reactors constitutes a minor fraction of the whole paper mill investment. Moreover, this investment in UASB reactors even when the reactors are used using at half of their operational capacity, would be expected to be returned with a short period of time 6.4 yr) with a high ORI. Moreover, through the implementation of the developed UASB reactor-based biorefinery, the Brazilian paper industry as a whole could avoid 1.06×10^3 ton CO_{2eq}/yr, contributing to the decarbonization of the country's economy.

Given the promising features of the presented biorefinery in terms of the production of various bioenergy carriers and biomaterials, regulations and policies at various levels of the government must be adapted to facilitate the implementation of the technology while take into consideration its social, environmental, and economic impacts.

Acknowledgements

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Supplementary file

Table S1.
Emission factors attributed to the favorable impact of the electricity generated by using biogas throughout the year 2018.

2017	2018											
December	January	February	March	April	May	June	July	August	September	October	November	December
0.0892	0.0640	0.0605	0.0655	0.0525	0.0607	0.0915	0.1076	0.1181	0.1182	0.0802	0.0366	—

Source: Brazilian Science, Technology, Innovation and Communications Ministry (MCTIC, 2019).

Table S2.
The price of electric power considering the following specifications; annual data for the Southeast region of Brazil (case study location) throughout 2018 for the heavy demand electricity sector.

Month	Week	Price of electric power (USD/MWh)			Month	Week	Price of electric power (USD/MWh)		
		Heavy	Medium	Light			Heavy	Medium	Light
1	1	50.26	50.26	49.14	7	1	128.22	128.22	128.22
1	2	45.29	45.29	44.04	7	2	128.22	128.22	128.22
1	3	41.98	41.98	40.27	7	3	128.22	128.22	128.22
1	4	50.15	50.15	46.85	7	4	128.22	128.22	128.22
2	1	45.64	45.64	42.30	8	1	128.22	128.22	128.22
2	2	46.56	46.56	43.74	8	2	128.22	128.22	128.22
2	3	43.91	43.91	42.41	8	3	128.22	128.22	128.22
2	4	54.27	54.27	52.13	8	4	128.22	128.22	128.22
3	1	52.01	52.01	49.96	8	5	128.22	128.22	128.22
3	2	57.25	57.25	55.60	9	1	125.11	125.11	121.21
3	3	60.67	60.67	58.56	9	2	127.95	127.95	122.46
3	4	56.31	56.31	54.65	9	3	127.02	127.02	120.91
3	5	59.08	59.08	56.61	9	4	113.43	113.43	109.91
4	1	10.19	10.19	10.19	10	1	98.90	98.90	96.66
4	2	22.24	22.24	20.29	10	2	83.25	83.25	81.80
4	3	31.81	31.81	29.99	10	3	69.79	69.79	66.52
4	4	35.21	35.21	33.26	10	4	59.08	59.08	56.94
5	1	56.51	56.47	53.17	11	1	36.46	36.46	35.72
5	2	79.40	79.40	74.60	11	2	38.46	38.46	37.35
5	3	84.72	84.72	79.60	11	3	30.94	30.94	30.28
5	4	88.43	88.43	83.10	11	4	30.64	30.64	29.57
6	1	106.34	106.34	96.60	11	5	25.81	25.81	25.12
6	2	116.13	116.13	104.55	12	1	15.08	15.08	14.81
6	3	122.41	121.83	116.21	12	2	16.86	16.86	16.66
6	4	123.31	123.31	117.66	12	3	20.35	20.35	19.63
6	5	128.22	128.22	128.22	12	4	22.37	22.37	21.82

Source: Brazilian Electrical Energy Trade Chamber (CCEE, 2019).

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Table S3.
Cost of natural gas for the industrial sector in Brazil, proportional to the consumption volume per month.

Prices for industrial sector		Prices (excluding commercial national tax) [A]
Class	Volume m³/month	Variable – USD/m³
1	Until 50.000,00 m³	0.540
2	50.000,01 to 300.000,00 m³	0.390
3	300.000,01 to 500.000,00 m³	0.362
4	500.000,01 to 1.000.000,00 m³	0.358
5	1.000.000,01 to 2.000.000,00 m³	0.352
6	> 2.000.000,00 m³	0.340

[A] Brazilian commercial tax acronym is *ICMS*, which is charged on all goods and services that circulate.
Source: COMGAS (2019).

Financial analysis supplementary information

Financial Resources

Full Paper Mill Equipment = USD 50,155,200.00
UASB Acquisition Cost = USD 3,400,000.00
Financing Time = 10 yr
Payment = Main stream + Interest rate
Interest Rate = Financing Cost + BNDES Spread + Financial Agent Spread
Interest rate = 9.25%a.a.
Financing Cost = Long Term Interest Rate (LTIR) = 6.85%a.a.
BNDES Spread = 1.40%a.a.
Financial Agent Spread = 1.00 %a.a.

Payment (main stream) = USD 340,000.00/yr
Payment (interest) = USD 31,450.00/yr

Depreciation fund - on Permanent Assets

Rate = 3%a.a (Brazilian usual rate)
Permanent Assets = USD 3,400,000.00
Depreciation Period for UASB =25 yr
Depreciation Fund = USD 4,080.00/yr

Payment in installments fund - on Intangible Assets

Rate = 3%a.a (Authors assumption)
Intangible Assets = 10% of acquisition cost (Authors assumption)
Intangible Assets = USD 340,000.00
Payment in installments fund = USD 10,200.00/yr

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POLYELECTROLYTE TREATMENT – AN APPROACH FOR WATER QUALITY IMPROVEMENT

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ABSTRACT

Contamination of industrial water by suspended materials such as mud, dirt, turbidity, organic matter and decaying vegetation can be a serious operational problem besides reducing its aesthetic quality. The clarity of water is affected due to overloading of the clarifier and during the rainy season when turbidity is high. The operational problems encountered during alum and lime treatment programme and the improvement of clarification of raw water by using diallyl dimethyl ammonium chloride (DADMAC), a hetero-ally-cyclic organic polymer are discussed. This paper discusses the chemistry of coagulation and benefits of polyelectrolytes. Treatment recommendations and dosage of polyelectrolyte are discussed in terms of an overall system approach. The use of this organic polymer could improve the overall efficiency of raw water treatment plant with increased throughput, reduced plant maintenance and better water quality. The replacement of alum treatment is cost effective with a substantial cost savings of 25 to 30%. © 1999 IAWQ Published by Elsevier Science Ltd. All rights reserved.

KEYWORDS

Alum; coagulation; colloids; polyelectrolyte; polymer; turbidity.

INTRODUCTION

Water, nature's magic elixir which supports immense and diversified forms of life can also be so corrosive that it can disintegrate the toughest metal. As a chemical it is unique and incredibly stable. The water in the form of vapour in the cloud is quite pure, but as the rain falls through the atmosphere, it gathers dust and gases. Then when it reaches the earth it picks up impurities from the ground. Hence the surface supplies contain suspended matter eroded from river banks, such as mud, dirt and turbidity. In addition they contain dissolved mineral matter, leached from earth and rocks, and organic matter and colour from sewage, trade wastes, and decaying vegetation. Thus, its physical and chemical characteristics are extremely complicated.

Water interweaves its magic into every facet of extensive use as a cooling agent, boiler feed, general services such as drinking, and flushing in chemical industries and power stations, the thermal as well as the nuclear. Although water from a particular source may be acceptable for the purpose of drinking, certain impurities, both dissolved and suspended, present in it must be removed by suitable pretreatment procedures so that it is acceptable for specific use in chemical and power industries.

The limits on the amounts of impurities (tolerances) in the water used for various industries depend on the end use. In general, the harmful effects arising due to suspended particles or water impurities may be classified as deposits or scales formed in steam generators and other heat exchanging equipment which acts

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as insulation, preventing efficient heat transfer and causing steam generator tube failure through overheating of metal. Poor quality boiler steam contains impurities that foul steam, using equipment such as turbines and decrease their efficiency. Moreover, under-deposit corrosion of boilers, heaters and other metal containers and piping cause costly plant shutdowns and make water unsuitable for drinking and other purposes because of objectionable tastes and odours or bacterial contamination. The type of treatment to be adopted depends not only on the nature of suspended particles present in the water and the end use to which it will be put to, but also on the capital and operational costs of the treatment.

Even though various methods of removing the impurities from raw water are in vogue, clarification of raw water by methods of coagulation and settling is an important step in industrial pretreatment programmes. Coagulation is induced by adding chemicals (coagulants) to the water, which agglomerate the finally divided suspended solids into masses that settle more readily.

Water treatment process used initially at NAPS

Narora Atomic Power Station (NAPS), Narora, is situated on the bank of the river "Ganga", in the district of Bulandsahar, Uttar Pradesh, and receives the raw water from upstream of the river for the cooling of various process equipments.

The raw water treatment plant at Narora Atomic Power Station (NAPS) handles 70-120 million litres per day (MLD) of raw water contaminated with suspended material resulting from colloidal clay, soil, organic matter, decaying vegetation etc. Such large quantities of water are treated by two clariflocculators. Clarification of raw water by the use of metal coagulants such as alum was in practice during the period from 1985 to 1990. The raw water of the river Ganga during the peak monsoon season used to reach a turbidity level of 1000 to 1200 NTU and silt in the range of 2000 to 5000 ppm (Fig.1).

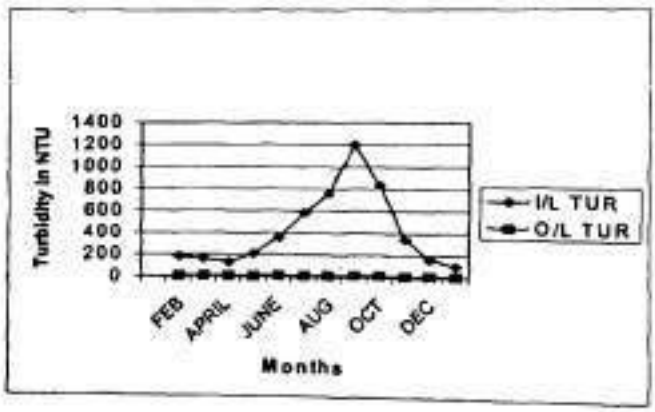


Figure 1. Variation of the turbidity in clariflocculator inlet and outlet.

Even though alum was used as the coagulant for the clarification of raw water it had its own limitations. Over the years, a number of operational problems were encountered with conventional treatment of alum and lime in the raw water treatment plant at NAPS, particularly during the peak monsoon season with the turbidity level of 1000 to 1200 NTU which called for the addition of high dosages of alum and lime in the range of 80-100 ppm to keep the turbidity level in the range of 10 to 20 NTU in the clarified water. As the metal coagulant is particularly sensitive towards pH and alkalinity, it was difficult to maintain the pH of treated water at an optimum level during high turbidity ingress resulting in poor clarification.

In addition to the above problems included; increase in total hardness and sulphate concentrations in the treated water, handling of around 4 to 6 tonnes of alum per day, generation of voluminous sludge which called for frequent desludging and caused increased wastage of water, frequent failures of mechanical scrapers due to the heavy load of voluminous sludge, increase in frequency of filter backwash, carry-over of aluminium (reported to cause Alzheimer disease - a form of senility) in treated water in the range of 0.2 to

0.5 ppm resulting in the fouling of ion-exchanger units, and the requirement of large storage space for chemicals.

The above mentioned problems were reduced considerably by the use of long-chained, charged synthetic polymer called polyelectrolyte.

General mechanism of coagulation and flocculation

Coagulation of suspended colloids depends on the nature of the particle, its ionic charge and concentration. The ionic charge plays a major role in agglomeration to form a larger particle. All particles carry an electrical charge on their surfaces, the sign and intensity of which depend on the nature and on the chemistry of the aqueous suspending medium. In general, aqueous suspensions at pH=4 and above carry a negative charge whereas the positively charged suspensions occur in aqueous suspensions at pH lower than 4 or particularly in stronger acids. This primary charge may result from the charged groups within the particle's surface due to discontinuity in the crystal lattice leaving an excess of +ve/-ve constituents on the surface, or may be gained by adsorption of a layer of ions from the surrounding medium. Alternatively, ions may be lost from the surface into the aqueous phase leaving an unsatisfied charge on the surface, or charged ions may be adsorbed from the aqueous phase. A solid or turbid particle as a whole cannot have a net charge, so that the charge that a given particle may possess must be counter-balanced by ions of opposite charges in the solution phase. This need for electroneutrality results in an electric double layer at the interface between solid and water consisting of both the charged particles. Thus, an equivalent excess of counter-ions of appropriate charge accumulates in the water near the surface of the particle. These counter-ions are attracted electrostatically and concentrated in the interfacial region. They are rather loosely held and may diffuse [illegible] response to thermal agitation, and are easily replaced by other ions. These competing forces (electrical attraction and diffusion) spread the charge over a diffused layer such that the concentration of counter-ions is greatest at the interface and gradually decreases with distance from the interface. When the water contains a high concentration of ions the diffuse layer would obviously be compacted. It would thus occupy a smaller volume and would extend less far into solution.

Because of the primary charge on the particles, an electrostatic potential exists between the surface of the particle and the bulk of the solution. The charge is maximum at the particle's surface and decreases with distance from the surface. When two similar colloidal particles with similar primary positive charges approach each other, their diffuse layers begin to interact. As they come closer, the similar primary charges they possess results in repulsive forces. The closer the particles approach the stronger the repulsive force. Thus the negative charge on particles prevents their agglomeration due to the electrostatic repulsion. The way to cause agglomeration of such colloidal particles is to destabilise the suspended solids by neutralising negative charges and bringing these particles to form larger particles by the process called coagulation and flocculation.

These phenomena of coagulation and flocculation are effectively dealt with by the use of organic polymers called polyelectrolytes. The spectacular contribution of the polyelectrolyte family of compounds in raw water treatment programmes overcomes the various operational difficulties imposed by metal coagulants such as alum or aluminium sulphate.

EXPERIMENTAL SIMULATION STUDIES

As the jar test simulates the type of mixing and settling conditions found in a clarification plant, a simulation [illegible] establishing the effectiveness of the polyelectrolyte treatment was carried out. The coagulants were measured separately into six beakers of one litre capacity each containing the 500 ml raw water with the turbidity level of 1200 NTU in such a way that the concentrations of polyelectrolyte in respective samples were 0.2, 0.4, 0.6, 0.8, 1.2 and 1.5 ppm. The samples were agitated for a period of 20 minutes by the paddle arrangement provided in the jar test apparatus. After the flocculation at very low stirring speed of 10 to 15 rotations per minute for about five minutes, the samples were examined after an established time period of 30 minutes. The supernatants of all the six samples were examined and tested for turbidity. Similarly the jar test was done in raw water of turbidity of 1200 NTU with the polyelectrolyte concentration of 1.2, 1.5, 2.0 and 2.5 ppm.

Implementation of polyelectrolyte treatment in the plant

The alum treatment programme was discontinued. The polyelectrolyte treatment programme was implemented. The average quantity of raw water handled was 96 MLD. During the entire period of the treatment programme, the turbidity level in the raw water was in the range of 50 NTU to 1200 NTU. After establishing the optimum polyelectrolyte dose with respect to the various raw water turbidity levels, polyelectrolyte dosing was done accordingly by the metering pump arrangement at the suction of raw water pumps. The polyelectrolyte concentration with respect to the above raw water turbidity level was of the order of 0.2 to 1.5 ppm.

RESULTS AND DISCUSSION

Clarification results are sensitive to chemical dosage, mixing energy and length of mixing. The addition of coagulant with high energy mixing to disperse it in the water could help to promote increased frequency of collisions. The jar test experiments indicated that in the slow mix period, floc building proceeds until the floc becomes bigger in size. After a slow mixing period of five minutes, the turbidity in the supernatant liquid was found to be in the acceptable range of 5 to 10 NTU and the polyelectrolyte dose was established to be 0.2, 0.4, 0.6, 0.8, 1.2 and 1.5 ppm with respect to the turbidity range of 20-50, 50-150, 150-300, 300-500, 500-800 and 800-1200 NTU (Fig. 2).

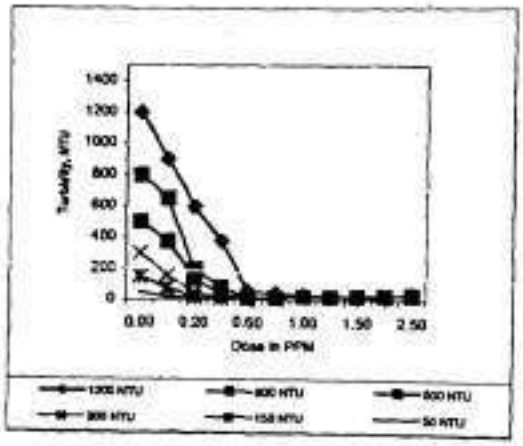


Figure 2. Optimization of polyelectrolyte dose.

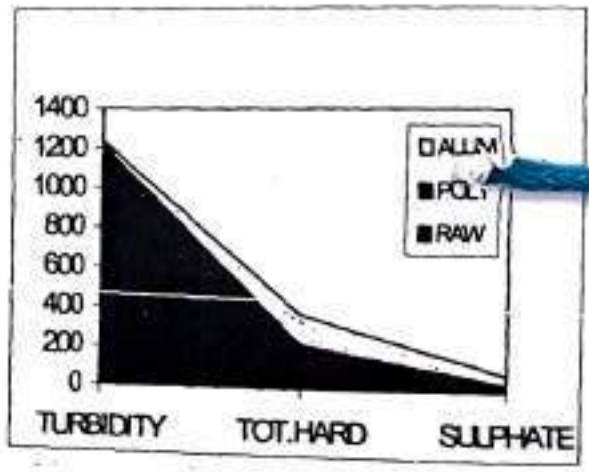


Figure 3. Variation in ionic load.

Polyelectrolyte concentration in the range of 0.2 to 1.5 ppm for raw water turbidity between 50 to 1200 NTU gave an average turbidity of 16.0 NTU in clarified water, which is well within the acceptable limits prescribed by NAPS. Floc formation was excellent in the clarifier within 10 to 15 minutes of polyelectrolyte addition. The flocs formed were dense and compact. With the maximum turbidity level of 1200 NTU, the alum dose requirement was 75 ppm against the polyelectrolyte dose of 1.5 ppm. Hence the handling of such a large amount of alum is eliminated. As compared to alum, the sludge generated during the polyelectrolyte treatment was 40 to 60% less in volume, hence problems related to frequent maintenance of mechanical scrapers and sludge disposal system were significantly reduced. During the peak monsoon season, the reduction of pH and alkalinity in the treated water, which resulted due to the addition of higher amounts of alum and lime was overcome by the use of polyelectrolyte.

As alum and lime addition increases the ionic load, viz. sulphate, aluminium and total hardness (Fig. 3), in treated water, the use of polyelectrolyte eliminated the additional ionic load and fouling of ion exchangers and improved the service hours between two successive regenerations. Moreover, the concentration of aluminium in recirculating condenser cooling water and the discharged plant water could be controlled well within the stipulated limits.

As the polyelectrolyte is a liquid product and completely miscible in water, preparation of the solution was easy and there was no need of a separate chemical preparation tank. The polyelectrolyte solution could be fed directly into the inlet channel of pump suction by the metering pump arrangement. Hence the sophisticated dosing of alum and lime addition system and its costly maintenance could also be avoided. The merits and effectiveness could eliminate the alum and lime treatment.

CONCLUSION

The replacement of alum treatment with polyelectrolyte treatment is cost-effective. The use of this organic polymer not only improved the overall efficiency of the clariflocculators in the raw water treatment plant with increased throughput and better quality of water, but also eliminated the handling of solid chemicals such as alum and lime with a substantial cost savings of 25% to 30%. The maintenance of equipment was also substantially reduced.

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Sophisticated Analytical Instruments Laboratories Society *(Registered as Society with Registrar of Firms & Societies, Punjab, Chandigarh)*
Thapar Technology Campus, Bhadson Road, Patiala-147 004 (India)

Performance Study of ETP Plant of Paper Chemical Division (PCD) Trident Limited, Barnala, Punjab

Prepared by:
Dr. Raj Kumar Gupta
Professor, Department of Chemical Engineering, TIET, Patiala
On behalf of:
Sophisticated Analytical Instrument Laboratories

Recommendations

Based on the above study the following action point are recommended to be undertaken to improve the performance of the waste water treatment plant:

1. BOD to COD ratio at USBR inlet is 0.2, which is on lower side. This ratio may be improved by reducing the COD, i.e., the COD caused by suspended particles. It is recommended to install a suitable unit operation for the removal of this COD. This will help in improving the efficiency of the USBR. Also, the sludge that will be generated in the separation system may be sold or burned as boiler fuel.
2. Food to Biomass (F/M) ratio in the aeration tank 1 (AT1) is 0.56, which is on the higher side. It should be kept less than 0.4. It is recommended that the total inlet flow be split into two parts. One part of the flow should be sent to AT1 and the other part be sent to AT2.
3. Oxygen being supplied in AT1 based on the current F/M ratio is less. After the flow diversion to AT2, the quantity of oxygen supplied will become adequate.
4. Food to Biomass (F/M) ratio in the aeration tank 2 (AT2) is 0.06, which is on the lower side. For better performance of the system, it is recommended to keep this ratio above 0.1. The action suggested at point no. 3, would also help in improving the F/M ratio of AT2.
5. The recommendation for action point 4 would lead to higher demand of oxygen in AT2. A suitable system for the increased oxygen demand should be put in place in AT2.
6. It is further recommended that a suitable arrangement for the online measurement of the dissolved oxygen (DO) should be installed for continuous monitoring of oxygen levels in AT1 and AT2.

Dr. R. K. GUPTA
Professor
Department of Chemical Engineering
Thapar Institute of Engineering

Back

S No.	Recommendations of Thapar Study to improve ETP performance	Action Point	Status
1.	BOD to COD Ratio at USBR inlet is 0.2 , which is on lower side . This ratio may be improved by reducing the COD, i.e., the COD caused by suspended particles. It is recommended to install a suitable unit operation for the removal of this COD. This will help in improving the efficiency of the USBR. Also, the sludge that will be generated in the separation system may be sold or burned as boiler fuel.	The industry has just recently installed and commissioned suitable technology including DAF and Screw Press for the removal of COD caused by suspended particles to improve the efficiency of USBR. This was also a joint committee recommendation point which has been completed . The biomass generated from this system is being utilized in boiler as a biomass fuel also resulting in carbon foot print reduction .	Complied
2	Food to Biomass (F/M) ratio in the aeration tank 1 (AT1) is 0.56, which is on the higher side. It should be kept less that 0.4. It is recommended that the total inlet flow be split into two parts. One part of the flow should be sent to AT1 and the other part be sent to AT2.	The industry will install a pipeline along with valves to divert the inlet flow into Aeration Tank 2 to reduce the ratio from 0.56 to < 0.4 . This will be completed by 5 Feb 2021.	Complied
3	Oxygen being supplied in AT1 based on the current F/M ratio is less. After the flow diversion to AT2, the quantity of oxygen supply will become adequate.	This point will be closed after the completion of action of S No. 2	Complied
4	Food to Biomass (F/M) ratio in the aeration tank 2 (AT2) is 0.06, which is on the lower side. For better performance of the system, it is recommended to keep the ration above 0.1. The action suggested at point no. 3, would also help in improving the F/M ratio of AT2.	This point will be closed after the completion of action of S No. 2	Complied
5	The recommendation of action point 4 would lead to higher demand of oxygen in AT2. A suitable system for the increased oxygen demand should be put in place in AT2.	The industry will install new advanced aerators with high oxygen transfer efficiency (2.2 Kg/kwh from existing 1.0 Kg/Kwh) . The total investment of the project is 248 Lacs and this will be installed , commissioned and stabilized by 20 Feb .	Complied.
6	It is further recommended that a suitable arrangement for the online measurement of the dissolved oxygen (DO) should be installed for continuous monitoring of oxygen levels in AT1 and AT2.	The industry will install online measurement of the dissolved oxygen for continuous monitoring of oxygen levels in AT1 and AT2 .	Complied

ENCLOSURES FOR RECOMMENDATIONS OF THAPAR INSTITUTE

1. REMOVAL OF NON DEGRADABLE COD





Wet Wash load reduction details By Installation of DAF				
Sr. No.	Month	UASB inlet COD (Before Installation of DAF) (in PPM)	Month	UASB inlet COD (After installation of DAF) (in PPM)
1	May-20	5087	Nov-20	3627
2	Jun-20	5604	Dec-20	3846
3	Jul-20	5769	Jan-21	3876
4	Aug-20	6065	Feb-21	3914
5	Sep-20	5896	Mar-21	4539
6	Average	5684	Average	3960.4
7	Reduction of COD load		%	30.3

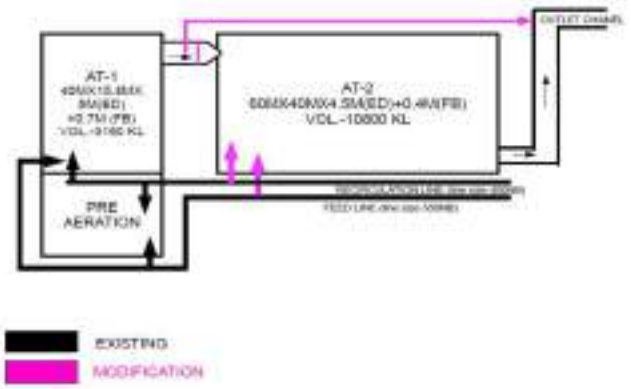
2. INSTALLATION OF ADVANCED AERATORS







3. AERATION TANK OPERATION FROM SERIES TO PARALLEL





4. INSTALLATION OF ONLINE D.O SENSOR



STORY OF INNOVATIVE PROJECTS AT ETP

In the journey of innovative projects we recently did the projects in area of ETP with the below main objectives:

- To reduce the ETP inlet load by recovery of biomass from washing effluent through adoption of DAF & Screw Press technology.

The above projects were implemented in collaboration with Krofta India, Bellmer Germany.

The projects were completed by the hard efforts of all respective team members including civil, process, electrical, mechanical, instrumentation and administration.

The implementations of projects have given following advantages:

a) Reduction in load to ETP.
b) Recovery of Biomass and usage as co incineration fuel.
c) Reduction in GHG Emissions (Carbon foot print).

The implantation of above projects has motivated the team.
Pictures of DAF & Screw press is as follows





Wet Wash load reduction details By Installation of DAF				
Sr. No.	Month	UASB inlet COD (Before Installation of DAF) (in PPM)	Month	UASB inlet COD (After Installation of DAF) (in PPM)
1	05/20	5087	11/20	3627
2	06/20	5604	12/20	3846
3	07/20	5769	01/21	3876
4	08/20	6065	02/21	3914
5	09/20	5896	03/21	4539
6	Average	5684	Average	3960.4
7	Reduction of COD load		%	30.3

Feasibility of using Advanced Oxidation Processes (AOPs) as pre or post treatment option for treating industry waste water: An approach towards reuse of treated trade effluent for the industry



Submitted by:

Dr. Anoop Verma

Associate Professor and Head

School of Energy and Environment

Thapar Institute of Engineering and Technology, Patiala.

1. Scope of work:

There is wider demand and scope for industries to approach Zero Liquid Discharge (ZLD) using appropriate technologies. Accordingly, ZLD industries will need to develop a technology which can treat their own wastewater so as to recycle and reuse the same. Especially when we talk about Pulp and Paper (P&P) industry a fastest growing sector around the world which highly demands freshwater utilization for their processes. P&P industry using best technologies for treating their waste water but presence of colour in their wastewater even after secondary treatment restrict any further applications. The methods used for colour removal, as per the technology available so far, are quite expensive and less efficient. Hence certain technological interventions need to be successfully implemented in different stages of industrial treatment system for colour removal.

2. Proposed technology:

With deliberation to the industry, Thapar team proposes the technology to remove the colour from various possible sections of the industry.

To cover the former mentioned drawbacks our study will try to incorporate two processes i.e. advance treatment techniques as dual technology to efficiently overcome the problem of industry, and the plus point of our technology is zero sludge or waste generation as it converts the organic contaminants to simple water and carbon dioxide. Best efforts would be made to integrate the in-situ dual effect (photocatalysis and photo-Fenton) at various stages of the selected pulp and paper making industry. Photocatalysis is considered an effective system for the mineralization of many organics through the generation of HO• and $O_2^{\bullet -}$ radical, reducing the organic load of effluents as this technology converts the harmful substances to water and carbon dioxide which are non-toxic. The principle of photocatalysis involves the initial absorption of photons with energy equal to or greater than the bandgap energy of the semiconductor, leading to the formation of electrons and holes (Sujatha et. al., 2020). In photo-Fenton when the system is irradiated with UV or visible light, the photo-reduction of ferric to ferrous ions is promoted concomitantly with the generation of additional HO• (Romero et. al., 2016). These two technologies have shown their proficiency in removing colour or treating wastewater of the P&P (Kumar et. al., 2011) industry as well as the textile industry (Tian et. al., 2020). The proposed study attempts to incorporate the in-situ dual processes (Photocatalysis and photo-Fenton) in fixed-mode to visualize its feasibility to

treat different streams of P&P industry. The study also incorporates the idea of circular economy by using waste materials in fabrication of composite to make it more cost effective.

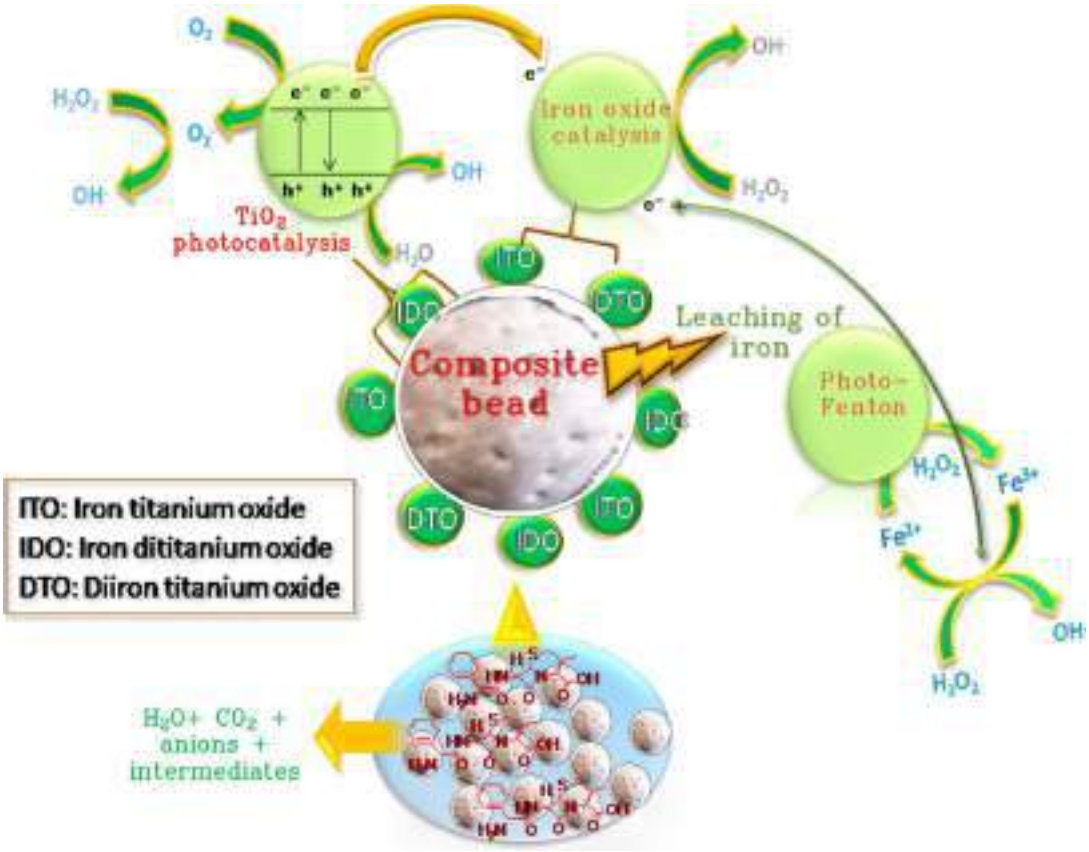


Fig. 1 Concept of in-situ dual effect of both photocatalysis and photo-Fenton.

Fig. 2 shows targeted streams to be worked upon. To start with, we have worked on the final stream i.e. O/L. Presently we have optimized the batch scale study and came up with some delightful outcome as results of colour removal. Fig. 3 depicts the graph of % colour from the selected stream. Fig. 4 shows initial and final absorbance of the untreated and treated sample using UV-vis spectrophotometer. The decrement in UV region of final sample shows the effective removal of the colour of final stream which is also clearly visible in the solutions in testubes.

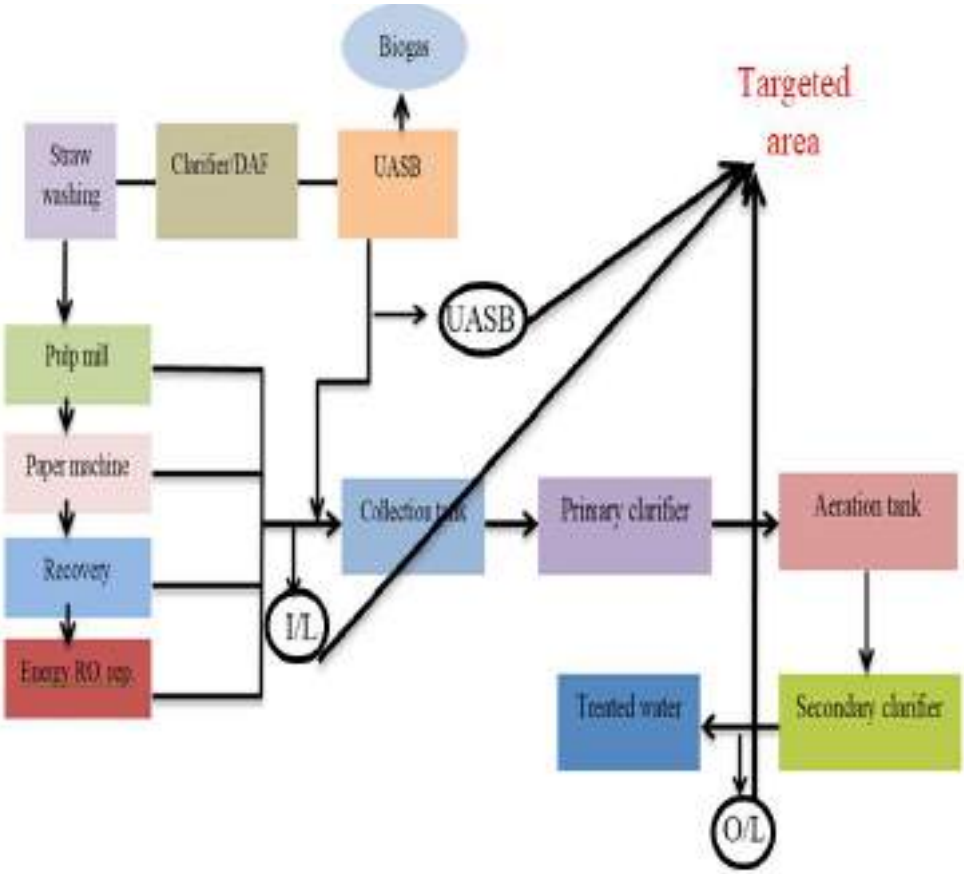


Fig. 2: Targeted streams of industry

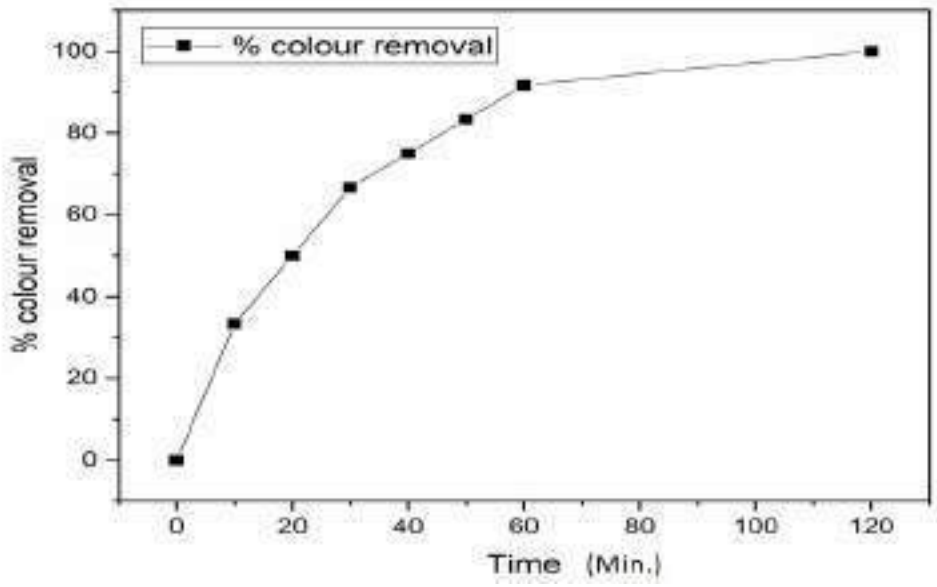


Fig.3: Graph of % colour removal with respect to time of treatment.

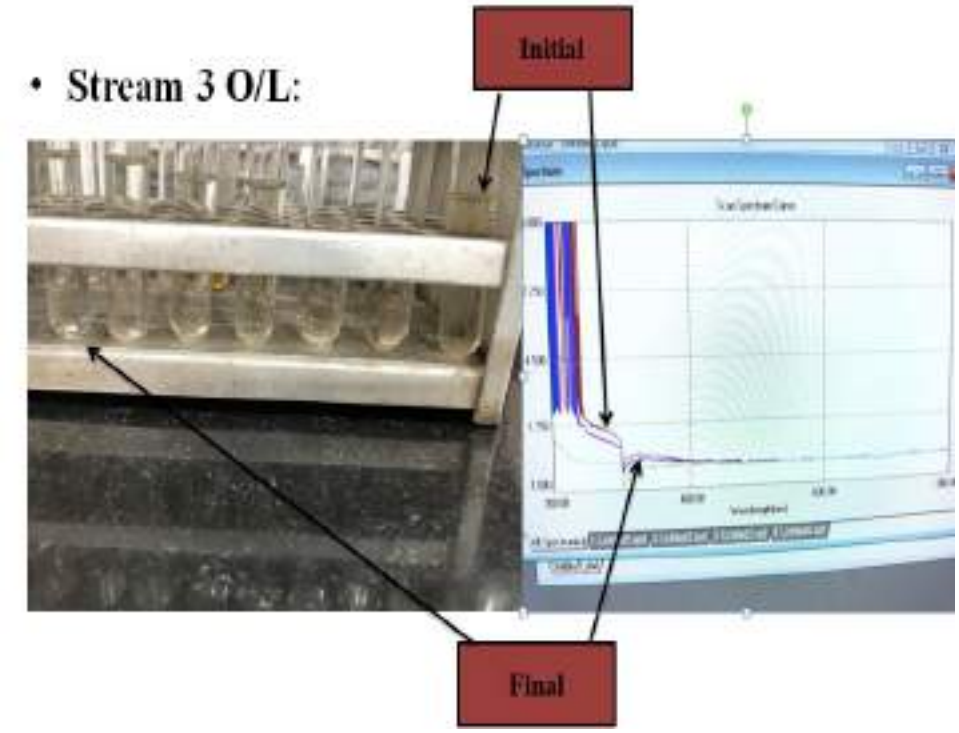


Fig.4: Spectroscopic analysis of O/L after treatment.

3. **Future plans:**
   - Currently we are working on final effluent but in near future we will start optimization studies and hit and trials on other streams i.e. UASB and I/L as well.
   - Further testing and process optimization will be done by varying factors like catalyst dose, time, oxidant dose, pH etc.
   - Best efforts would also be made to study dual effect in once through process using fixed bed reactors. Furthermore, this study will try to increase the process economics and will suggest the suitable steps to be taken to the concerned industry for further applications.

Annexure-XIII

Dear Sir/ Madam ,

We are pleased to place the Purchase Order no. 7600007938 on your esteemed organization as per the terms & conditions agreed upon.

Any discrepancy regarding the acceptance of Purchase order including the terms and conditions mentioned therein is to be intimated to the Company within 24 hours of its receipt.

In case, no communication intimating any discrepancy is received by the Company in writing with in 24 hours of the receipt of Purchase Order, the Purchase Order shall be considered to have been accepted by you.

We would also request you to kindly share the progress of the said order on weekly / monthly basis with the under mentioned Email Id

Thanking You

For Trident Limited



E-212, KITCHLU NAGAR, LUDHIANA 141001
Contact No. : 9878999481
Email : jasbirpurchase@tridentindia.com
Purchase Team .

TRIDENTGROUP

Trident Limited - Energy
P&C Division,Mansa Road
Dhaula, Barnala (Punjab)
PURCHASE ORDER

Vendor 740059
ADOR POWERTRON LIMITED
PLOT NO -51, D-II BLOCK, RAM NAGAR
PUNE
411019
Country India
Vendor GSTIN No. 27AABCA5150B1ZA

Ship To
TL - Dhaula Energy 2
P&C Division,Mansa Road
Dhaula, Barnala (Punjab)
BARNALA
148107

Mobile 9878999481
jasbirpurchase@tridentindia.com

Bill To
Trident Limited - (Paper & Chemical Division)
Mansa Road, Dhaula
BARANALA (PUNJAB)
148101

Mobile 9878999481
jasbirpurchase@tridentindia.com

PO Number	7600007938	**Dated**	25.08.2021
Our Ref.	13760	**Currency**	INR
Your Ref.	offer		

PO Status :- Invalid/Unapproved
Quality Certificate :- Required

S.No.	Item Code Item Description Sale Order PO Number/ Week Code	UOM/ Brand	Order Qty.	Basic Rate	Discount	PKG-FWD	HSN/SAC	CGST/SGST/IGST/ C.Cess	Coal Cess	Item Value	Cancellation Date	Plant
00001	877015676 CONVENTIONAL PANEL PRECICON R CONT. ADOR	NOS/ ADOR	1.000	303,000.00 INR/ 1 NOS	0.00 0.00	0.00 0.00	8541.40.90	0.00 /0.00 /18.00 54,540.00	0.00	357,540.00	25.12.2021	TE02 ENERGY-2
00002	877015618 IGBT BASED HFPS CONTROL PANEL ESP	NOS/ ADOR	2.000	1,262,500.00 INR/ 1 NOS	0.00 0.00	0.00 0.00	8548.10.90	0.00 /0.00 /18.00 454,500.00	0.00	2,979,500.00	25.12.2021	TE02 ENERGY-2

Total Value 3,337,040.00 INR

Total Value INR THIRTY THREE LAKH THIRTY SEVEN THOUSAND FORTY Rupees

TRIDENTGROUP

Trident Limited - Energy
P&C Division,Mansa Road
Dhaula, Barnala (Punjab)
PURCHASE ORDER

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148101

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PO Status :- Invalid/Unapproved
Quality Certificate :- Required

Price Basis: EXW PUNE

Freight : F

Special Instruction 1) 90% against COD with 100% GST. 2) 10% PBG valid for 1 year 3) PBG will release subject to minimum emission reduction of more than 40% from current level.

Payment Terms: Payable in 2 partial amounts

Octroi: As per Documentary Evidence

Transportation Mode: By AIR /RAIL /SEA /COURIER /ROAD

Transit Insurance TO BE ARRANGED BY US.

The consignment shall be accepted only if accompanied by Original Invoice for Buyer and Duplicate for Transporter failing which the consignment shall be returned at your risk and cost .

Terms and Conditions As mentioned overleaf
Cancellation Date As above

Our Banker: State Bank of India, Industrial Finance Branch,Golden tower, Dholewal Chowk, Ludhiana

GSTIN No.. 03AABCA4139J1Z0

This is computer generated Purchase Order.Hence requires no signature.

TRIDENTGROUP

Trident Limited - Energy
P&C Division,Mansa Road
Dhaula, Barnala (Punjab)
PURCHASE ORDER

Vendor 740059 ADOR POWERTRON LIMITED PLOT NO -51, D-II BLOCK, RAM NAGAR PUNE 411019 **Country** India **Vendor GSTIN No.** 27AABCA5150B1ZA	**Ship To** TL - Dhaula Energy 2 P&C Division,Mansa Road Dhaula, Barnala (Punjab) BARNALA 148107 **Mobile** 9878999481 jasbirpurchase@tridentindia.com	**Bill To** Trident Limited - (Paper & Chemical Division) Mansa Road, Dhaula BARANALA (PUNJAB) 148101 **Mobile** 9878999481 jasbirpurchase@tridentindia.com	**PO Number**	7600007938	**Dated**	25.08.2021
			Our Ref.	13760	**Currency**	INR
			Your Ref.	offer		
			PO Status :- Invalid/Unapproved **Quality Certificate** :- Required			

S.No.	Item Code Item Description	Master Inspection Characteristics(MIC)	Upper Specification Limit	UOM	Target Specification Limit

TRIDENTGROUP

Trident Limited - Energy
P&C Division,Mansa Road
Dhaula, Barnala (Punjab)
PURCHASE ORDER

Vendor 740059 ADOR POWERTRON LIMITED PLOT NO -51, D-II BLOCK, RAM NAGAR PUNE 411019 **Country** India **Vendor GSTIN No.** 27AABCA5150B1ZA	**Ship To** TL - Dhaula Energy 2 P&C Division,Mansa Road Dhaula, Barnala (Punjab) BARNALA 148107 **Mobile** 9878999481 jasbirpurchase@tridentindia.com	**Bill To** Trident Limited - (Paper & Chemical Division) Mansa Road, Dhaula BARANALA (PUNJAB) 148101 **Mobile** 9878999481 jasbirpurchase@tridentindia.com	**PO Number** 7600007938 **Dated** 25.08.2021 **Our Ref.** 13760 **Currency** INR **Your Ref.** offer **PO Status** :- Invalid/Unapproved **Quality Certificate** :- Required

S.No.	Item Code Item Description	Mat. Classification	PO Material Text
00001	877015676 CONVENTIONAL PANEL PRECICON R CONT. ADOR	Standard	
00002	877015618 IGBT BASED HFPS CONTROL PANEL ESP	Customize	

TRIDENTGROUP

Trident Limited - Energy
P&C Division,Mansa Road
Dhaula, Barnala (Punjab)
PURCHASE ORDER

Vendor 740059
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PO Number	7600007938	**Dated**	25.08.2021
Our Ref.	13760	**Currency**	INR
Your Ref.	offer		

PO Status :- Invalid/Unapproved
Quality Certificate :- Required

DELIVERY SCHEDULE

S.NO	Item Code Item Description	UOM	PO Qty	Scheduled Date	Sch Qty	Delivered Qty	Open Qty as on 25.08.2021	Contract No	Remaining Contract Value/Qty
00001	877015676 CONVENTIONAL PANEL PRECICON R CONT. ADOR	NOS	1.000	25.12.2021	1.000	0.000	1.000		0.00
00002	877015618 IGBT BASED HFPS CONTROL PANEL ESP	NOS	2.000	25.12.2021	2.000	0.000	2.000		0.00

Terms and Conditions

This Purchase Order is subject to all terms, conditions and specifications hereinafter set forth and acceptance of order by the Seller shall be deemed to be an agreement that the order is subject to all of said terms, conditions and specifications.

General

Non Acceptance of Purchase order with its terms and conditions is to be intimated to the Purchaser within 24 hours of its receipt, else the same shall be assumed to be accepted at the discretion of the Purchaser. No deviation to this order shall be honoured unless authorized in writing.
Purchase Order number, material code and GST IN of the Purchaser should be mentioned on each and every invoice. An invoice should not have more than 8 line items in it. Different Invoice should be raised for different Purchase Orders issued by the Purchaser.
The Seller shall be responsible for mentioning the correct details in the invoice, including HSN and GST rate of goods supplied to the Purchaser.
The Seller represents and warrants that it shall comply with the Laws pertaining to GST and other applicable indirect taxes and the requirements therein. The Seller shall be liable for all losses and damages suffered by the Purchaser due to any action or omission or mistake of the Seller.
The Seller shall unconditionally submit its account statement on Quarterly basis for reconciliation.
Weights / quantities as recorded by the Purchaser shall be final and binding on the Seller.
This Purchase Order shall not be amended, modified, altered or changed in any way except by writing executed by a duly authorized representative of the Purchaser.
Any other terms & conditions of the Seller mentioned on its Bills,Invoices, e-mails or any other documents shall not be binding on the Purchaser unless accepted in writing by the Authorized Representative of the Purchaser.
The Seller shall not disclose any confidential information pertaining to the Purchaser's business to any third party.
Neither party shall be entitled to assign the rights, interests and obligations without the previous written consent of the other Party.
The Seller shall not offer, solicit or accept an advantage in connection with the procurement of this Purchase Order. Failure to comply with this clause or any act of offering, soliciting or accepting advantage committed by the Seller shall, without affecting the liability of Seller for such failure and act, result in this Purchase Order being invalidated. For the purpose of this clause, Seller shall include its directors, partners, relatives, agents, associates, employees, servants and sub-consultants.
'Advantage' for this purpose shall mean any gift, loan, fee, reward or commission, any valuable security, office, employment, agreement, loan payment/waiver/discharge, bribe of any kind to Government/other officials, any other service or favour or any offer, undertaking or promise, whether conditional or unconditional, of such advantage.
The Seller or its directors, partners, relatives, associates, employees, agents and/ or sub-consultants shall not trade, directly or indirectly, in the shares of the Company during the currency and six months post expiry of this Purchase Order.

Delivery

The material shall be carefully and properly packed for movement by sea/rail/road transport to withstand damages on account of inclement weather, rough handling etc.
The material shall have to be delivered on the date of delivery specified in this Purchase Order. Decision for acceptance/rejection of material on the dates other than that specified in the Purchase Order along with the liquidated damages shall be at the sole discretion of the Purchaser.
The Seller shall not have any right to terminate the Purchase Order. However, the Purchaser reserves the right to cancel any unshipped portion at any time without assigning any reason.
All costs incurred in procurement of material from other source in the event of failure to supply the material on the scheduled date / rejection as per the terms of Purchase Order shall be to Seller's account and at the sole discretion of the Purchaser.
The price mentioned in the Purchase Order is inclusive of packing and handling charges unless otherwise stated therein.
Seller shall share the progress of the order on weekly basis in writing.
If delivery of the material mentioned in the Order occurs later than time specified and provided such delay is neither the result of force majeure nor the result of circumstances for which the Purchaser is responsible, the Purchaser shall be entitled to damages of 0.5% per week or part thereof subject to the maximum of 5% of the Contract price. For purpose of computing damages in the event of delay in delivery of the material, mere despatch of the material within the agreed date of delivery which are not in accordance with the specifications/standards, or found unacceptable by Purchaser would not amount to delivery within the agreed delivery date.

Inspection and Testing

Complete Test / Inspection reports from an approved source / as generated and certified by the Seller should be submitted along with the supply of material. Test reports generated by the Purchaser shall be binding on the Seller and no disputes whatsoever shall be entertained in this regard. Charges for testing, if any, shall be to the Seller's account and the decision to get the same inspected by any third party shall be at the sole discretion of the Purchaser.
Material must conform to all the specifications as specified in the Purchase Order. Any non-conformity identified during any later stage shall be treated as breach of contract and the Seller shall be liable to any penalties imposed at the sole discretion of the Purchaser.

Terms of payment

Original GST Invoice should invariably accompany the material failing which the material may be rejected at the sole discretion of the Purchaser.
In the event of denial of input tax credit to the Purchaser on account of any negligence, erroneous or incorrect reporting, non payment of taxes or any other non-compliance made by the Seller in relation to the GST Law, the Purchaser shall be entitled to recover such loss from the Seller along with Interest @18% per annum.
Advances shall be released against submission of Advance Bank Guarantee of equivalent amount. All Advance and Performance Bank guarantee(s) shall be accepted only if they are in Purchaser's format and issued by the Banks recommended by the Purchaser unless otherwise agreed in writing.
Payment other than advances shall be made as specified in the terms and conditions of the Purchase Order and submission of all required documents.
Forms / Permits / Declarations shall be submitted as per the applicable laws/statute.
The prices under this Order shall remain firm until completion of the Contract

Intellectual property/Warranty, Inspection and Liability

Material supplied by the Seller pursuant to this Purchase Order should not infringe any third party intellectual property rights and the Seller further undertakes to indemnify the Purchaser against all claims for infringements of third party patents and/or other intellectual property rights by material supplied under this Purchase Order.
Material supplied by the Seller pursuant to the Purchase Order should have clean title in favour of the Seller before shipment to the Purchaser. Should there be any dispute to the ownership of the material,the Seller would be liable to make good for the costs incurred by the Purchaser to defend the title and the loss of profits due to its inability to use the subjected material, over and above the costs already paid to the Seller.
In the event of any breach of obligations mentioned in the Purchase Order by the Seller, the Purchaser shall be entitled to incidental and consequential damages including loss of profit. The Seller agrees to indemnify and hold the Purchaser, its customers and users of its products, harmless against any suits, damage or claim or any other expense resulting from a breach or alleged breach of the Seller's obligations including warranty, pursuant hereto. The Purchaser shall have the right to invoke the Performance Bank Guarantee submitted by the Seller for recovering the Liquidated damages.
All goods supplied shall be under an unconditional guarantee of 12 months from the date of commissioning / 18 months from the date of receipt (whichever is earlier) unless specified differently in the Purchase Order.
The Purchaser shall have the right for shop floor rejections even if the material has been accepted on delivery.
All costs (inclusive of taxes & duties) incurred by the Purchaser on account of rejections, despatch/warranty failures of material supplied under this Purchase Order shall be to Supplier's account.

Applicable law and Jurisdiction of Courts

Any dispute, controversy, differences or question arising out of, in relation to or incidental to this Purchase Order or the breach, termination or invalidity thereof shall be referred for arbitration to be governed in accordance with the Arbitration and Conciliation Act, 1996. Accordingly, the purchaser will nominate sole Arbitrator to settle any dispute, controversy, differences or question arising out of, in relation to or incidental to this Purchase Order or the breach, termination or invalidity thereof. The place of arbitration shall be in Barnala, Punjab, India and language of proceedings shall be English. Expenses of the arbitration proceeding shall be jointly shared by the parties.This Purchase order shall be governed by and construed in accordancewith the laws of India, and the parties agree to submit themselves tothe exclusive jurisdiction of the Courts at Barnala, India only. Further, where any material is imported under this Purchase Order, the laws applicable under the Indian statute would govern the resolution of conflicts.
This Purchase Order supersedes any/and/all other oral or written communications or other commitments between the parties with respect to its subject matter except the agreement executed between the parties and contains all of the covenants, terms and conditions agreed between the parties with respect thereto. Wherein an agreement is also executed between the parties on the same subject matter thereto with the terms, conditions and specifications, the Purchase Order shall become the part of the agreement. However, in case of any conflict in the terms, conditions, specifications mentioned in the agreement and the Purchase Order, the terms, conditions, specifications mentioned in the agreement shall prevail.
Each party hereto acknowledges that, except as set forth herein, neither party nor any one on behalf of either party has made any representations, inducements, promises or agreements, orally or otherwise,respecting the subject matter of this Agreement and/or Purchase Order.

Documents required to be attached with invoice.

1. Tax Invoice in original
2. Tax Invoice (Duplicate) in original
3. Quality certificate,

Annexure-XIV

Soil and Groundwater Quality Assessment

at

Dhanuala Drain, Barnala



Prepared for:

Trident Ltd. and Lotus Integrated Texpark Ltd.

Dhaula Complex, Mansa Road, Barnala, Punjab, 148101

Prepared by:

Cholamandalam MS Risk Services Limited

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List of Abbreviation

BDL	:	Below Detectable Limits
BGL	:	Below Ground Level
BIS	:	Bureau of Indian Standards
CGWB	:	Central Ground Water Board
CMSRSL	:	Cholamandalam MS Risk Services Limited
CPCB	:	Central Pollution Control Board
DEM	:	Digital Elevation Model
EIA	:	Environmental Impact Assessment
ICAR	:	Indian Council of Agricultural Research
IS	:	Indian Standards
MOEF&CC	:	Ministry of Environment and Forests & Climate Change
MSL	:	Mean Sea Level
NABET	:	National Accreditation Board for Education and Training

EXECUTIVE SUMMARY

M/s Trident Ltd. and Lotus Integrated Texpark Ltd. are operating an integrated Agro-based paper mill and a textile division respectively in Dhaula Complex, Mansa Road, Barnala, Punjab, 148101. In regards to the notice issued by the Punjab Pollution Control Board, Trident Group has approached Cholamandalam MS Risk Services Limited (CMSRSL), a NABET accredited EIA consulting organization to undertake the groundwater quality assessment along the drain located adjacent to the existing plant in Barnala.

The study team had a detailed site reconnaissance and walkthrough along the drain and collected the samples as mentioned above from Dec 3, 2019, to Dec 6, 2019.

To understand the regional scenario of land details in terms of physiography, elevation profile in the region, groundwater flow direction in the aquifer, etc. the published data by the central groundwater board has been collected. Similarly, the regional level soil and groundwater quality have been studied based on the information collected from published technical and scientific documents.

Based on the collected information regarding groundwater survey and exploration data published by CGWB for Barnala block, the groundwater flow direction in the area was evaluated to be towards the west. The land elevation slope in the area is also in line with the flow direction.

The Water level as per the published EIA report in the region ranges from 8.72m to 23.89m bgl during the pre-monsoon period and 9.95 m to 25.41 m bgl during the post-monsoon period. The seasonal fluctuation varies from 1.05 m to 5.32 m in the study area. The long-term fluctuation trend indicates an average fall of 0.65m/year. Barnala block is categorized as an Over Exploited Zone by CGWB.

Based on the details obtained from during the assessment, the utilisation of treated wastewater for irrigation is in the order of 150 m^3 per Ha per day which is in line with the loading rates recommended for the soil texture (for loamy and sandy loamy soil type: 110 to 225 m^3/Ha/day) as per the notification of MoEF&CC published on 14 Jan, 2016.

For the purpose of this assessment, the soil and groundwater samples have been collected (i) Along the Dhanuala drain (less than 100m from the Drain), (ii) at the upgradient locations to map the baseline background levels and (iii) at the onsite irrigation area. Groundwater samples were collected from the existing private borewells which were drilled up to the deeper aquifer which are in use.

- pH in the groundwater samples collected was reported in the range of 7.1 to 8.0 which is within the acceptable range as per drinking water standards published by IS 10500:2012. Whereas the pH in soil was found to be more alkaline in the entire region.
- TDS in the samples collected from the existing borewells were recorded to be in the range of 524 to 1276 mg/l. The TDS levels in groundwater from the samples collected is a regional phenomenon and is in line with the published regional level data. The groundwater's Salinity as NaCl is in-line with TDS which contributes to 50% to 60%. Similarly, the electrical conductivity in the soil is also high and depicting regional scenario which reflects the equivalent salinity as NaCl in soil.
- Total hardness in the samples collected from the existing borewells was recorded to be in the range of 140 to 595 mg/l.
- Minor traces of nutrients and Heavy metal were found in the groundwater and soil samples collected but the impact is totally insignificant.

1. INTRODUCTION

Groundwater is a valuable natural resource, being both an important source of water supply and a major component of the water cycle. The groundwater quality in the overall country has undergone a tremendous change over the past decade. Groundwater in shallow aquifers generally contains calcium bicarbonate, mixed type and other types including sodium chloride water near the coastal areas. Similarly, the quality in deeper aquifers also varies from place to place and is generally found suitable for common uses. The main groundwater quality problems in India include due to inland salinity, coastal salinity, fluorides, nitrates, heavy metals including arsenic, iron, etc.

Irrigation through tube wells is well-practiced in Punjab due to the limited availability of canal waters (surface water). Such practices were well established due to the initiative and enterprise of the individual farmers and have spread up to more than 75% of the total agricultural land in the state is depending on the groundwater. Punjab is one of the successful states in the country in terms of agricultural aspects based upon the use of groundwater for irrigation. The quality of groundwater in the state has been characterized by Geogenic contamination and anthropogenic contamination including agricultural activities, animal waste disposals, industrial discharges and urban pollution due to municipal wastes.

M/s Trident Ltd. and Lotus Integrated Texpark Ltd. (part of Trident Group companies- hereafter referred to as Trident Group) are operating an integrated Agro-based paper mill and a textile division respectively in Dhaula Complex, Mansa Road, Barnala, Punjab, 148101. In regards to the notice issued by the Punjab Pollution Control Board, Trident Group has approached Cholamandalam MS Risk Services Limited (CMSRSL), a NABET accredited EIA consulting organization to undertake the groundwater quality assessment along the drain located adjacent to the existing plant in Barnala.

2. ABOUT THE CONSULTING ORGANISATION

Cholamandalam MS Risk Services Limited (CMSRSL) is a 50:50 joint venture between USD $3.14 Billion Murugappa Group, India and Mitsui Sumitomo Insurance Group, Japan and has a technical collaboration with InterRisk, a group company of Mitsui Sumitomo Insurance Group.

Established in the year 1994, Cholamandalam MS Risk Services is a Chennai based Risk Consulting Company offering comprehensive Risk management & Engineering solutions in the field of Safety, Health and Environment. The company has pioneered many innovative and specialized services catering to the needs of Asian & European markets for the last 15 years. The organization has successfully executed more than 2000 projects (Domestic/International) which not only helped its

clients maintain compliance but also optimize their EHS performance and set new benchmarks. Cholamandalam MS Risk Services, an ISO 9001:2008 company, is a certified "Environment Impact Assessment" Consultant organization by NABET EIA Accreditation committee, a constituent of the Quality Council of India. The company has a well-established experience in safety and environmental studies in India and overseas over the last decade.

3. METHODOLOGY ADOPTED FOR THE STUDY

The soil and groundwater quality assessment in the area has been carried out by adopting the below study methodology:

- The groundwater survey and exploration data published by CGWB for the Barnala block are collected and utilized to map the groundwater flow direction in the aquifer.
- Based on the satellite and topographical maps of the region, the natural drains and canals will be mapped.
- A basic review of the wastewater utilization for irrigation has been done.
- A thorough walkthrough along the Dhanuala drain (approx. 10 km stretch) especially where the industrial wastewater and sewage is being discharged.
- The below sampling program has been adopted for the soil and groundwater assessment:
    - Collection of soil samples at 1m depth along the Dhanuala drain covering the upstream to the plant discharges, near the plant discharge and downstream to the plant discharges.
    - Similarly, the groundwater samples are collected from the existing borewells along the Dhanuala drain (not more than 100m away from the drain) covering the upstream to the plant discharges, near the plant discharge and downstream to the plant discharges.
    - Collection of groundwater samples from the existing borewells and the soil samples from the onsite irrigation area where treated wastewater is being utilized.
    - Collection of groundwater samples from the existing borewells and the soil samples at 5 to 6 km away (upgradient as per the aquifer flow direction) to map the background baseline conditions in terms of soil and groundwater quality.
    - All the soil samples were analyzed for the necessary analytes including pH, electrical conductivity, salinity, total organic carbon, available Phosphorous, total nitrogen, heavy metals, total petroleum hydrocarbons, pesticides and lignin. The analytical data is compared with ICAR and other standards for soil quality.

- Similarly, the groundwater samples were analyzed for the necessary analytes such as pH, electrical conductivity, total dissolved solids, salinity, dissolved oxygen (DO), biological oxygen demand (BOD), chemical oxygen demand (COD), total hardness, essential nutrients (NPK), total petroleum hydrocarbons, heavy metals, pesticides etc. the analytical data is compared with CPCB standards for drinking water to check its compliance.

- Based on the analytical data, the contamination profile is developed depicting as two-dimensional contours or graphical representation for the critical parameters. The long term published groundwater quality data is utilized for mapping the regional level quality profile.

The study team had a detailed site reconnaissance and walkthrough along the drain and collected the samples as mentioned above from Dec 3, 2019 to Dec 6, 2019.

4. OVERALL SOIL AND GROUNDWATER SCENARIO IN BARNALA REGION

4.1. Study area and Geographical details

Trident group's paper manufacturing division and integrated textile park are located in Dhanuala Complex, Mansa Road, Barnala District in the state of Punjab. Based on the Central Ground Water Board (CGWB) published block-wise groundwater resource assessment, 2017, all the three blocks in Barnala district is categorized as *overexploited* in terms of groundwater extraction. The geographical boundary of the study is limited to the plant area and area along the drain where the industrial wastewater is discharged. Hence the primary data of soil and groundwater has been collected from the area which is discussed further in detail. The published regional level quality data has also been collected and presented in the report.

The location map is presented in **Figure 4.1** and **Figure 4.2**. The plant is surrounded by a natural drain named Dhanuala drain (marked as a blue line) along the northern boundary passing from East to West. The Dhanuala drain is joining the Lisarna drain in the west at 8 km downstream from the plant. The plant including the paper division and textile division is spread to an extent of approx. 220 Ha in which approx. 85 Ha is the irrigation area where the treated wastewater (of 12,800 m^3/day) is being used. Whereas, the treated wastewater quantity of 8,700 m^3/day is being discharged to Dhanuala drain. Thus, utilisation of treated wastewater for irrigation is in the order of 150 m^3 per Ha per day which is in line with the loading rates recommended for the soil texture (for loamy and sandy loamy soil type: 110 to 225 m^3/Ha/day) as per the notification of MoEF&CC published on 14 Jan, 2016.

Figure 4.1: Location map 1



- *Plant Boundary is marked as Yellow line*
- *Onsite irrigation area is marked as green area*
- *Adjacent Dhanula drain is shown as a blue line and the flow direction in the drain is from East to West*
-

Figure 4.2: Location map 2



- *Plant Boundary is marked as Yellow line. Red circle radius: 3km (from the approx. center of the plant)*
- *Onsite irrigation area is marked as green area*
- *Adjacent Dhanuala drain is shown as a blue line. The flow direction in Dhanuala drain is from East to West*
- *Lisarna drain where the Dhanuala drain is joining is shown as a Purple line. The flow direction in the Lisarna drain is from Northeast to Southwest.*

4.2. Land Details

Based on details collected from the published EIA report in 2016, the elevation of the land in the buffer zone (10km from the plant boundary) varies from 196 m above msl in the southwestern to 285 m above msl in the northeast. The elevation of the land in the core zone (5km) varies from 198 m above msl in the southwestern to 250 m above msl in the northeast. Hence it is evident as per the ground elevation that the upgradient is towards east and the downgradient is towards west from the plant site. The Physiography and DEM are shown in **Figure 4.3**, **Figure 4.4** and **Figure 4.5** respectively.

According to the Watershed Atlas of India, the study area of 10km forms part of Lower Sutlej Sub-Basin below Bhakra Dam and is shared by SLJL010 watershed. There is no well-defined material drainage system in the area. Two main drains pass through the area – Upper Lisarna Nala in the northwest and Dhanaula Drain in the central part. The drainage with the watershed boundary is presented in **Figure 4.6**.

The overall land use of a 10 km radius area reveals the dominance of agriculture land (88.55%) followed by built-up land (9.48%), wasteland (1.17%) and water bodies (0.80%). The Level I and Level II land-use landcover maps are presented in **Figure 4.7** and **Figure 4.8**.

Figure 4.3: Physiography of the Study Area (10KM from the plant boundary)

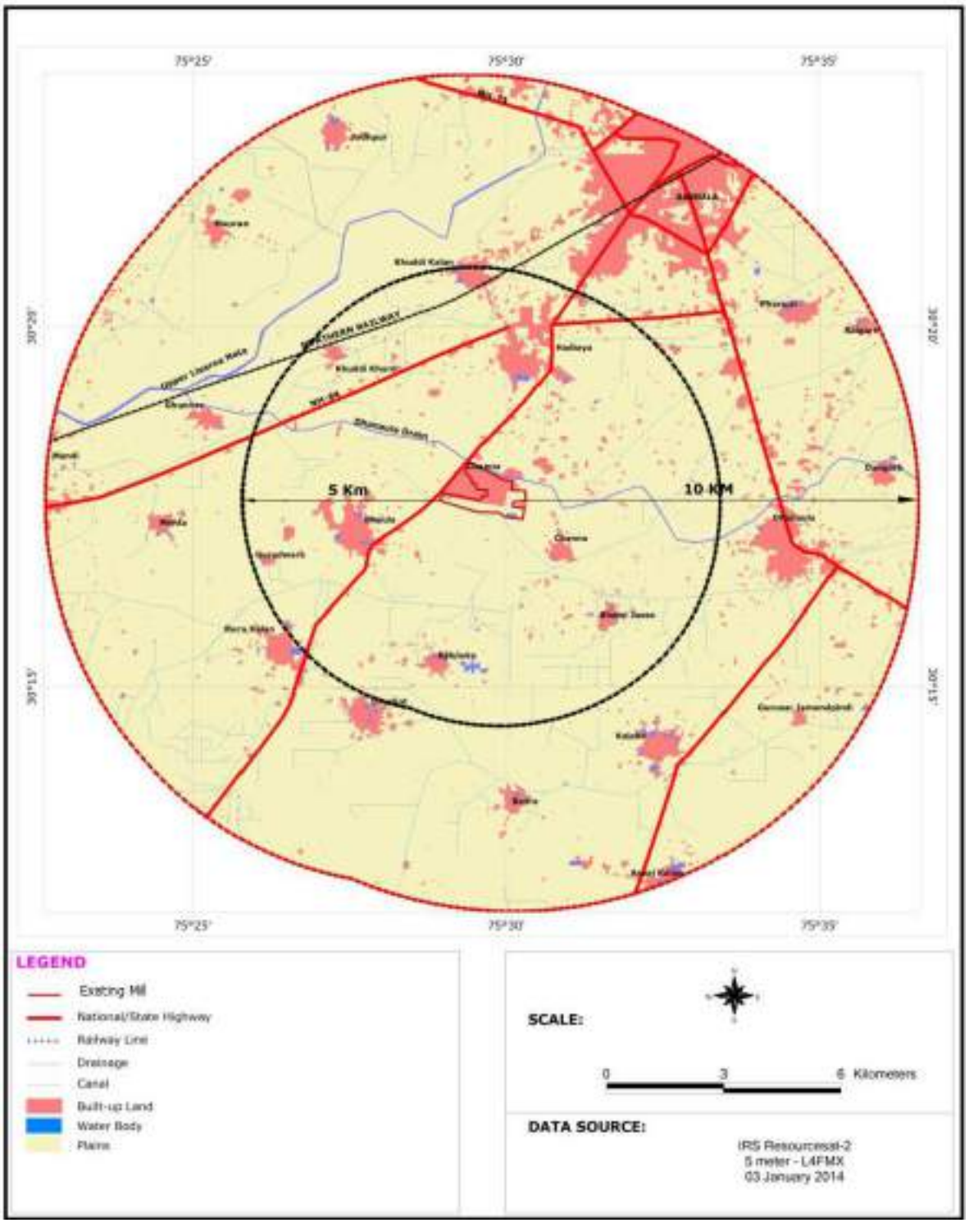


Figure 4.4: Digital Elevation Model of the Study Area (10KM from the plant boundary)

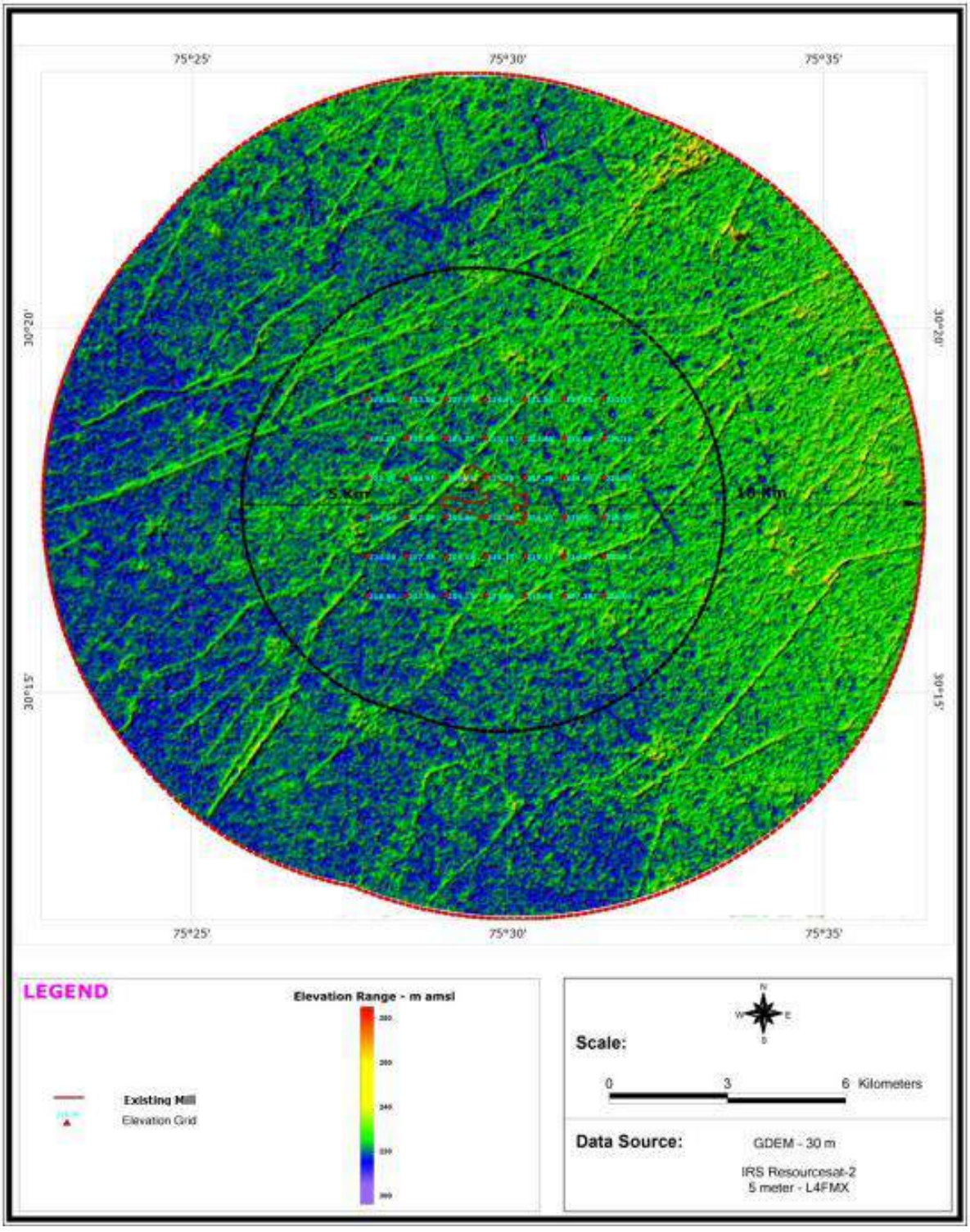


Figure 4.5: Digital Elevation Model of the Study Area (5KM from the plant boundary)

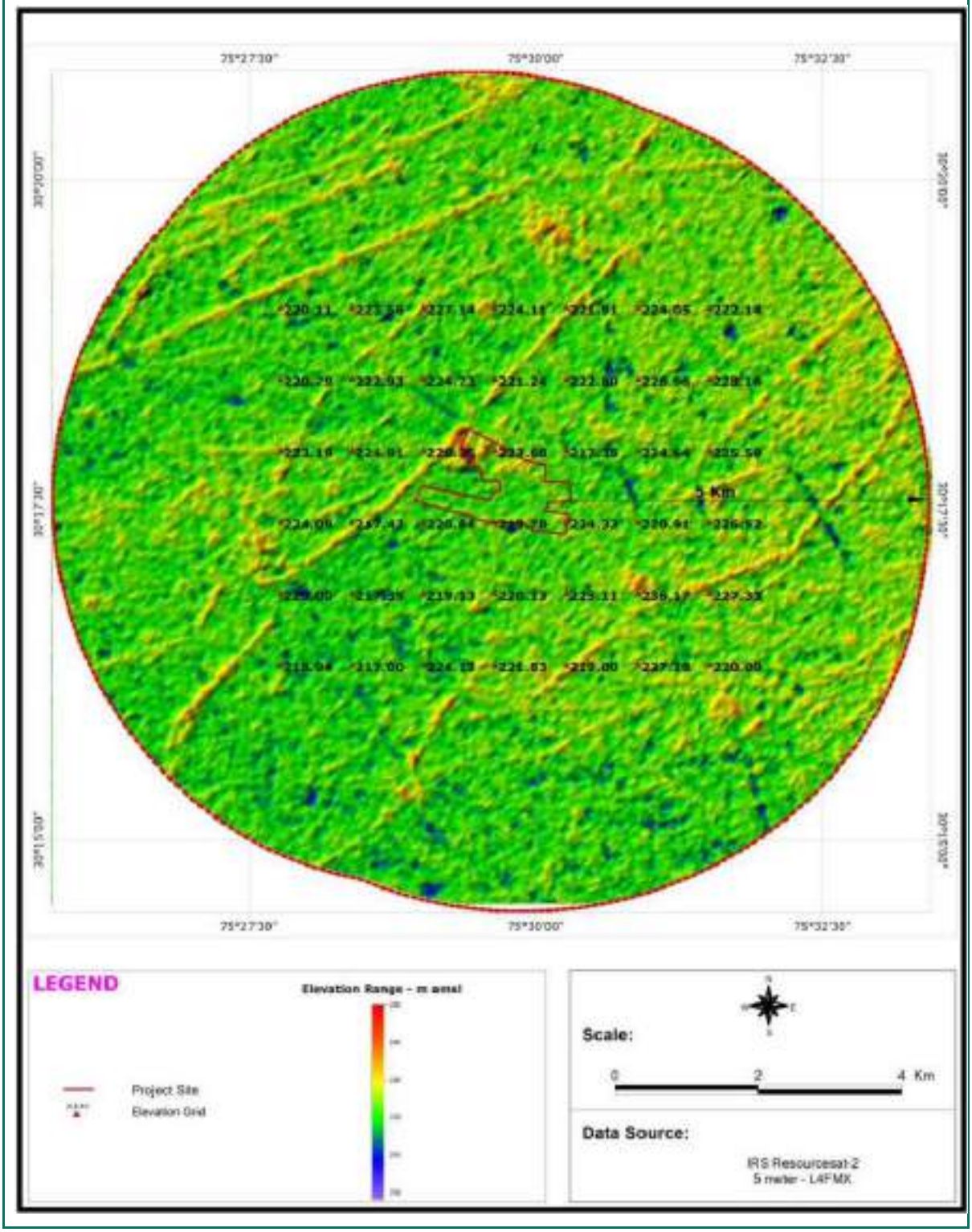


Figure 4.6: Drainage and Water Bodies in the Study Area (10KM from the plant boundary)

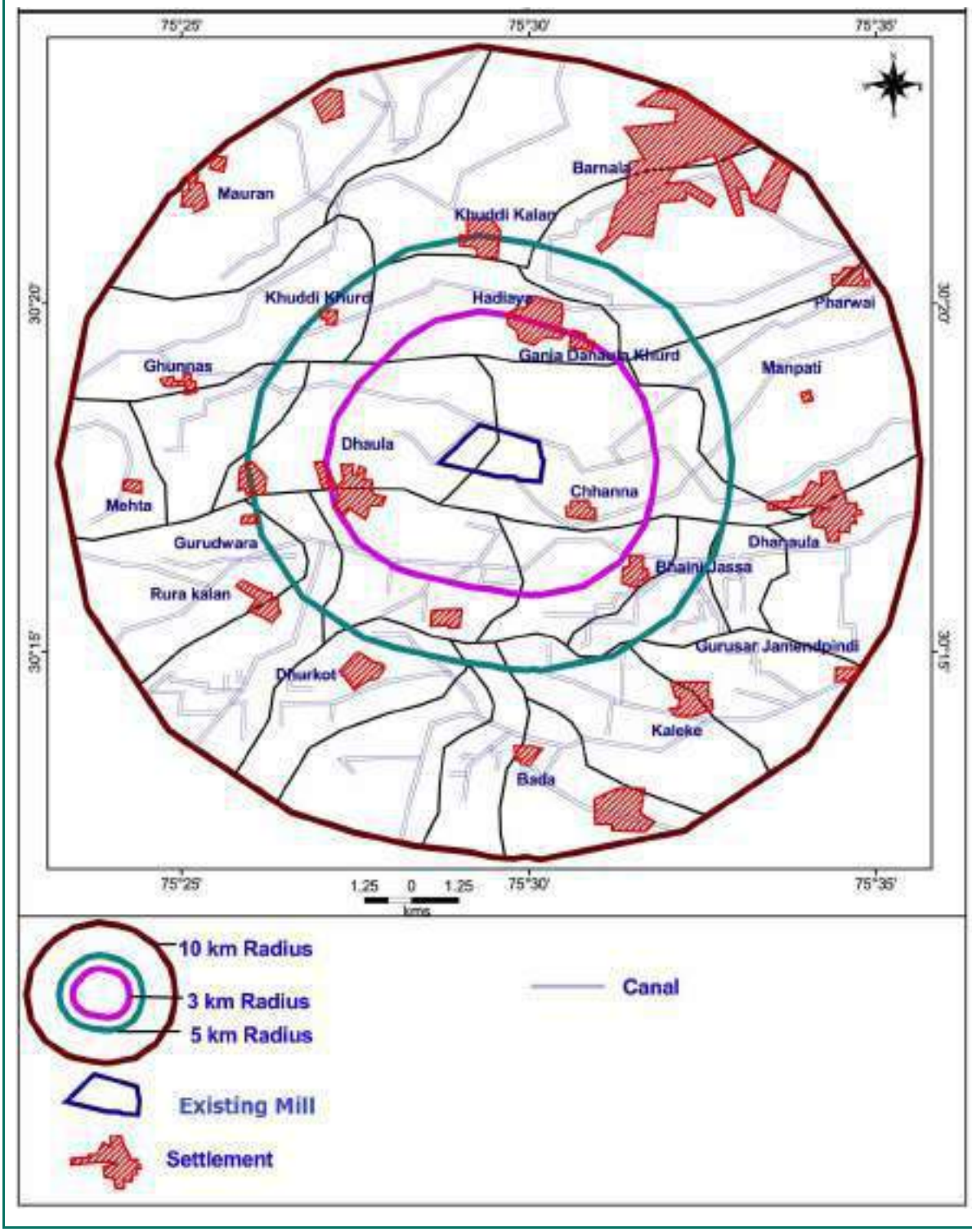


Figure 4.7: Level I Land use and Landcover in the Study Area (10KM from the plant boundary)

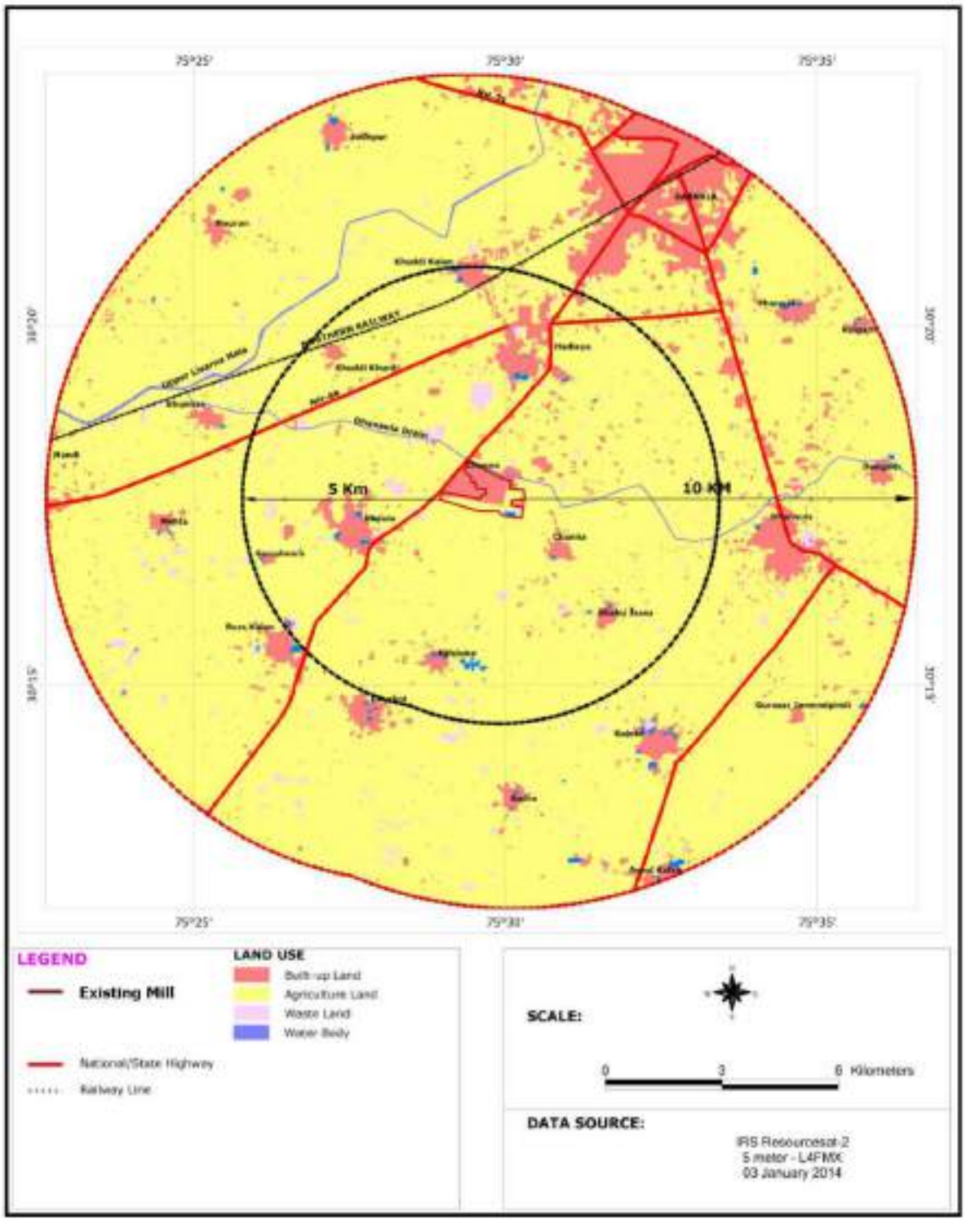
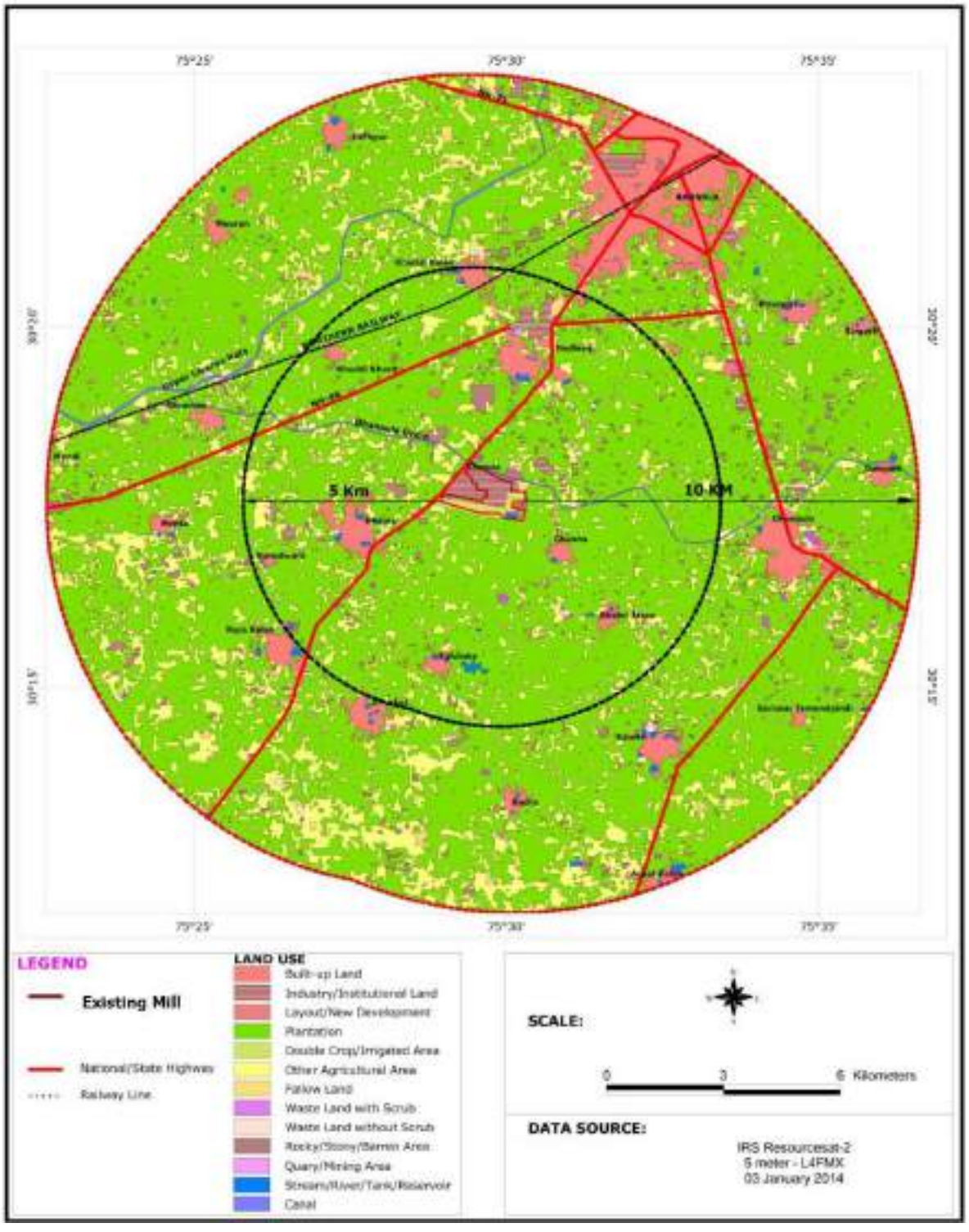


Figure 4.8: Level II Land use and Landcover in the Study Area (10KM from the plant boundary)



4.3. Geology and Soil Type

Based on details collected from the published EIA report in 2016, geologically the area is covered by the Sedimentary formation of the Quaternary area. The region is underlined by Grey micaceous, fine to coarse-grained sand, silt and clay (Active flood plain), Cyclic sequence of grey micaceous sand silt and clay (Older flood plain deposit and Multicyclic sequence of brown to grey silt, clay and kankar and reddish-brown to grey sand (older alluvial plain). The geology of the area (10km radius from the plant boundary) is given in **Figure 4.9**.

The landforms / geomorphic units and structures such as fractures, fissures and faults have been interpreted from the satellite image. All the landform / geomorphic units and structures occurring in the study area are mapped. The geomorphology and structures of the area play a vital role in identifying the groundwater potential zones. Two geomorphic units namely Dune complex, Alluvial plain older – under canal command in the study area. The following geomorphic units have been interpreted.

1) Dune Complex

2) Alluvial plain older – under canal command

Dune complex and the Alluvial plain older are good in groundwater occurrence and movement. However, the Dune complex is very good as this unit completely comprised of sand. Alluvial plan older under canal command is clay and silt dominant. The percolation rate is comparatively low in this unit. The existing mill site area is located in Alluvial Plain older under canal command. The Geomorphology of the study area is presented in **Figure 4.10**.

Prominent types of soil in the district are coarse loamy calcareous soils, fine loamy calcareous soils and a thin layer of sandy over loamy soils presents western and southern parts of the district. In the study area more specifically, Coarse loamy over sandy soils, Moderate flooding sandy soils are observed. Soil classification of the area is given in **Figure 4.11.**

Figure 4.9: Geology of the Study Area (10KM from the plant boundary is marked as a circle)

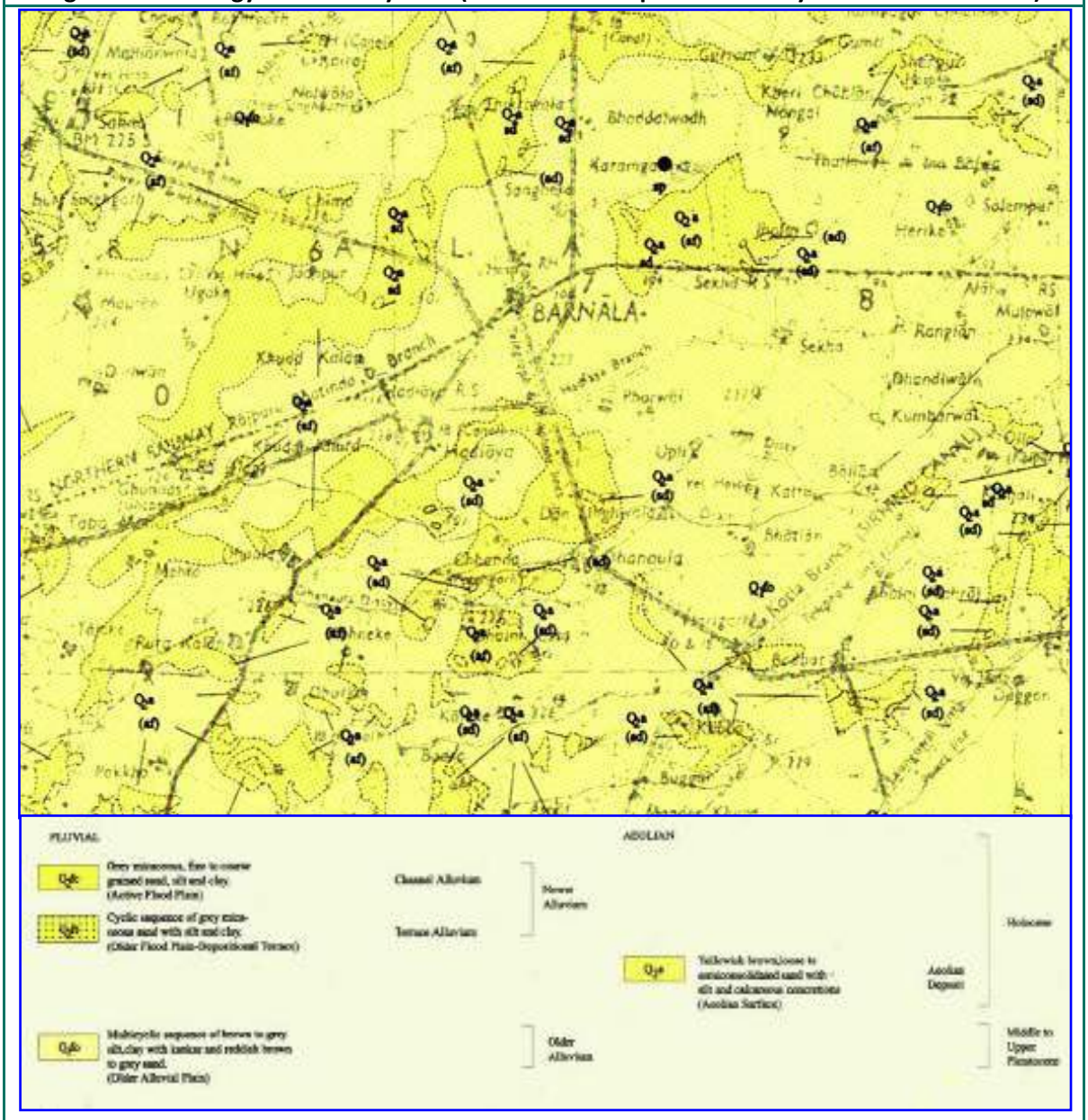


Figure 4.10: Geomorphology of the Study Area (10KM from the plant boundary)

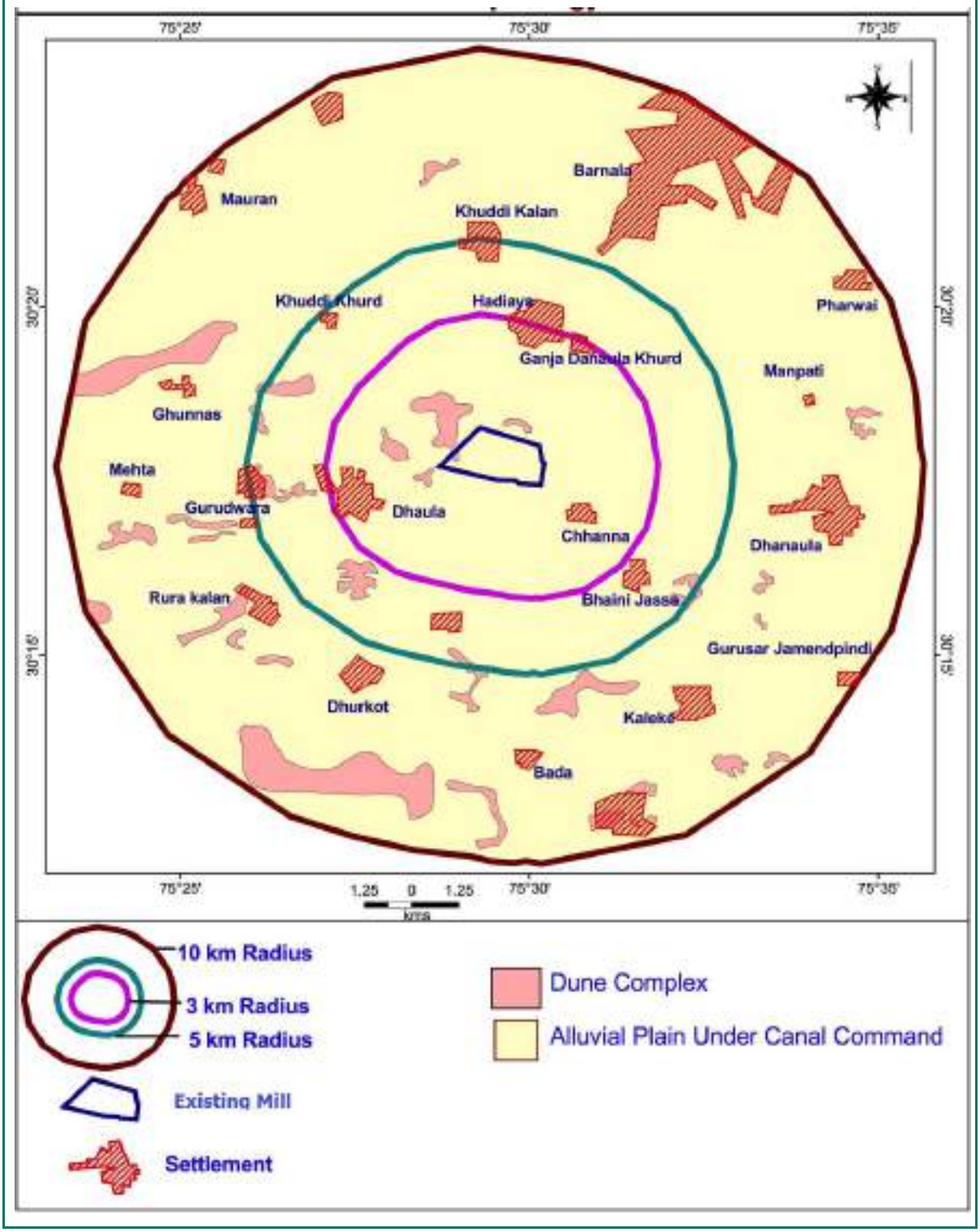
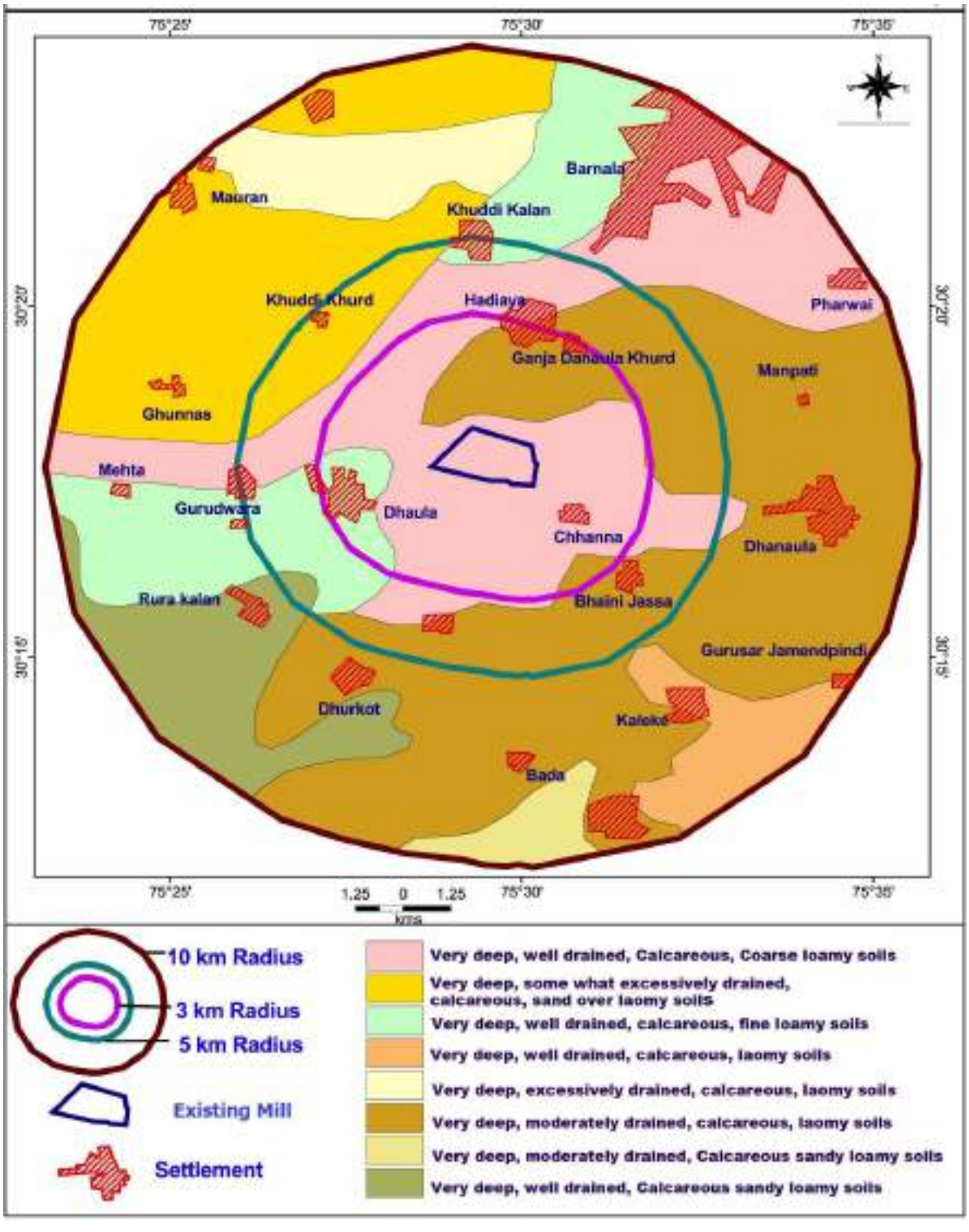


Figure 4.11: Soil classification of the Study Area (10KM from the plant boundary)



4.4. Hydrogeology

Based on details collected from the published EIA report in 2016, there are around 23 watersheds within the study area of 10km radius from the plant which covers an aerial extent of 328.38 Sq.Km. Watersheds within a 10Km radius from the mill are given in **Figure 4.12**.

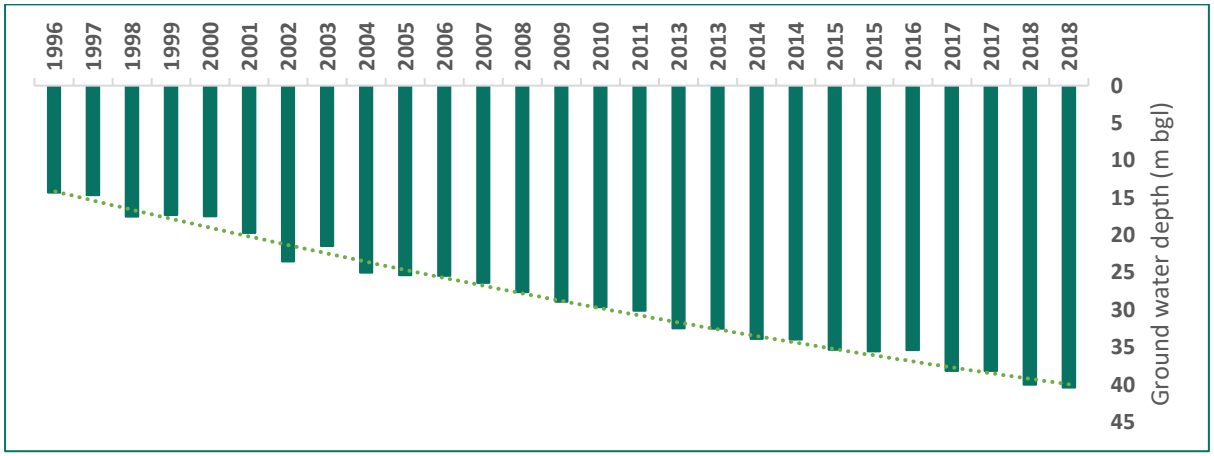
The district is occupied by Indo-Gangetic alluvial plain of Quaternary age and falls in Ghaggar sub-basin. The groundwater occurs in alluvium formations comprising fine to coarse sand which forms the potential aquifers. In the shallow aquifers up to 50m bgl groundwater occurs under unconfined /water table conditions whereas in deeper aquifers semi-confined /confined conditions exist.

Water level Behaviour- as per the published EIA report, the depth to the water level in the region ranges from 8.72 m to 23.89 m bgl during the pre-monsoon period and 9.95 m to 25.41m bgl during post-monsoon period. The seasonal fluctuation varies from 1.05 m to 5.32 m in the study area. The long-term fluctuation trend indicates an average fall of 0.65m/year. The hydrogeology map of the district is given in **Figure 4.13.**

As per the details published by Central Ground Water Board, the Barnala block is categorized as an Over Exploited Zone. The groundwater potential and the categorization of blocks is given in **Figure 4.14**. The regional groundwater levels vary between 15 to 27 m bgl which is in line with the above and the yield of the wells varies between 1000 to 4000 liters per minute. Groundwater level contour is presented in **Figure 4.15.**

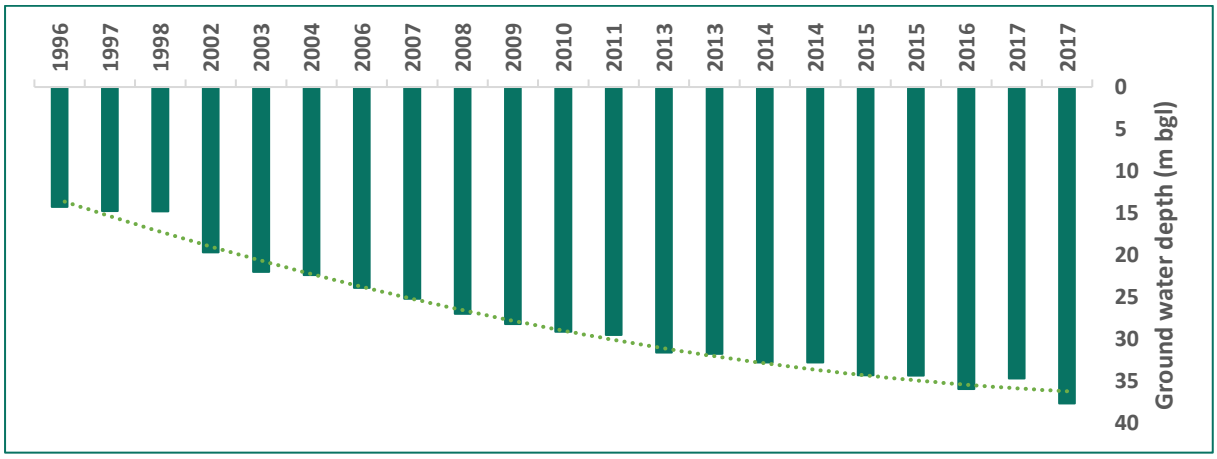
The published data on the historical trend of groundwater depth at the nearest CGWB maintained tube well located in Barnala town during monsoon and pre-monsoon is presented below:

Historical trend of groundwater depth in the region during monsoon



Source: Central Ground Water Board

Historical trend of groundwater depth in the region during pre-monsoon



Source: Central Ground Water Board

Over the past 22 years, the groundwater depth has been increased to an extent of approx. 26.1m during monsoon and 23.4m during pre-monsoon which could be due to the extensive utilization of groundwater for irrigation and improved urbanization in the region.

As per the published EIA report in 2016, the soil lithology reveals that the porosity of the soil is 46.82% and the Texture is Sandy clay. The porosity indicates that the infiltration rate of the soil is moderate. The groundwater table contour depicts that the flow is towards the west direction in both the seasons which is in line with the land elevation profile. The hydraulic gradient in the mill site is moderate and has been observed as 4.8 m/Km in pre-monsoon and 3.9 m/Km in post-monsoon. It is also noticed groundwater trough and mound in isolated pockets of the study area which indicates the convergent and divergent flow of groundwater. The groundwater table constructed for the study area is presented in **Figure 16** and **Figure 17**.

Figure 4.12: Water Shed of the Study Area (10KM from the plant boundary)

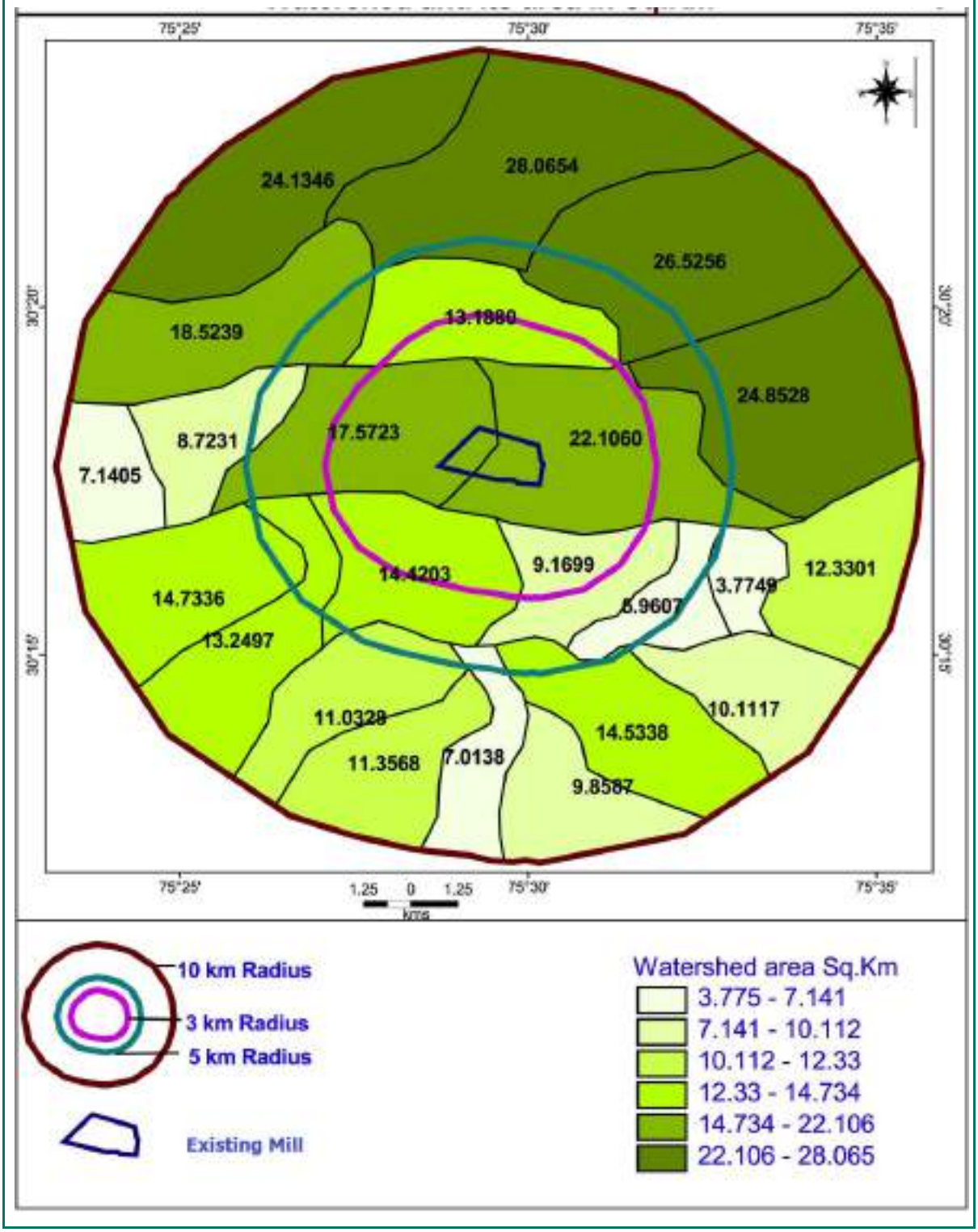


Figure 4.13: Hydrogeology map of the Area

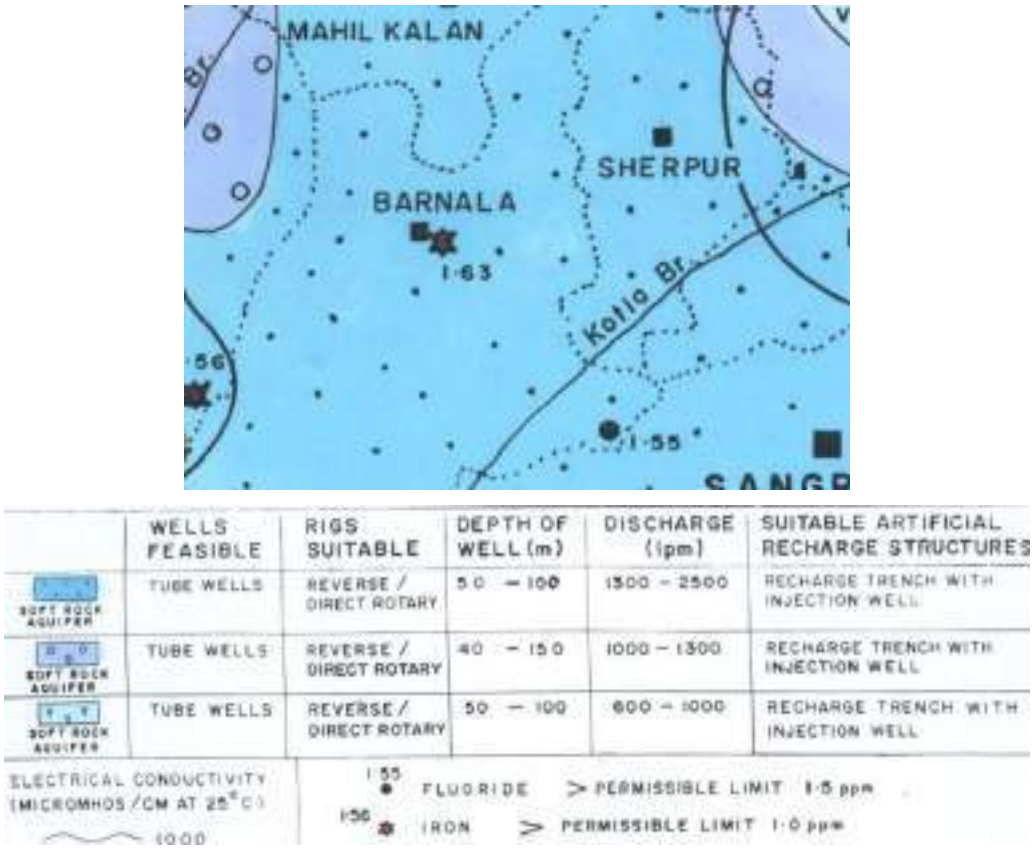


Figure 4.14: Groundwater potential and the categorization of Blocks in the Area

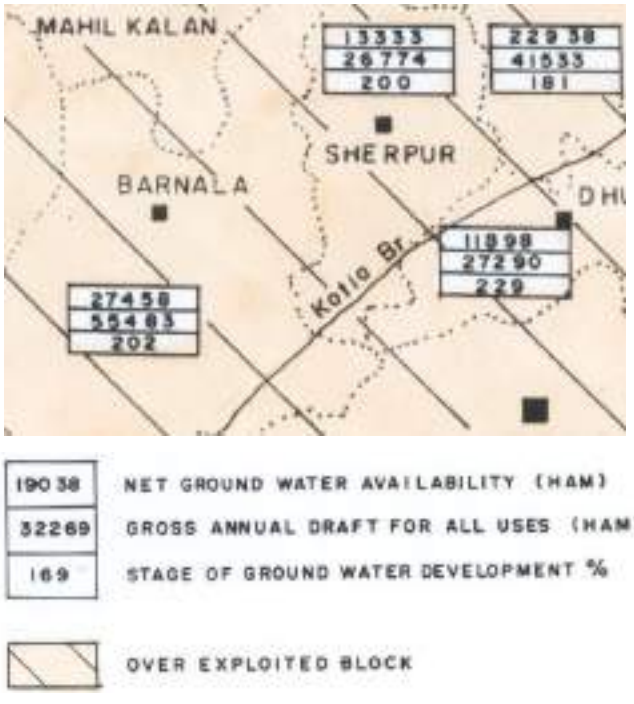


Figure 4.15: Groundwater level contour of the Study Area (10KM from the plant boundary)

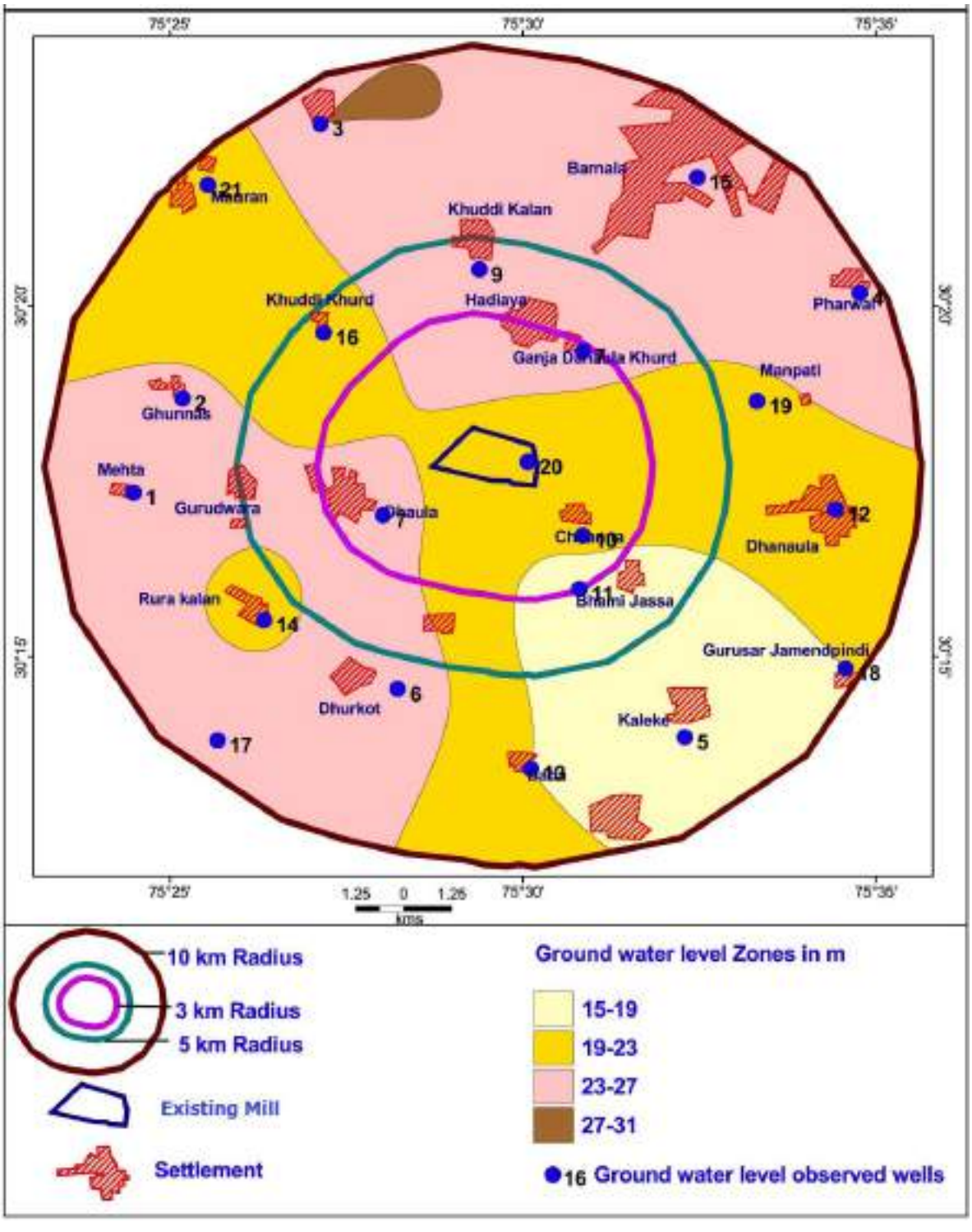


Figure 4.16: Groundwater table and hydraulic gradient during Pre-Monsoon (10KM from the plant boundary)

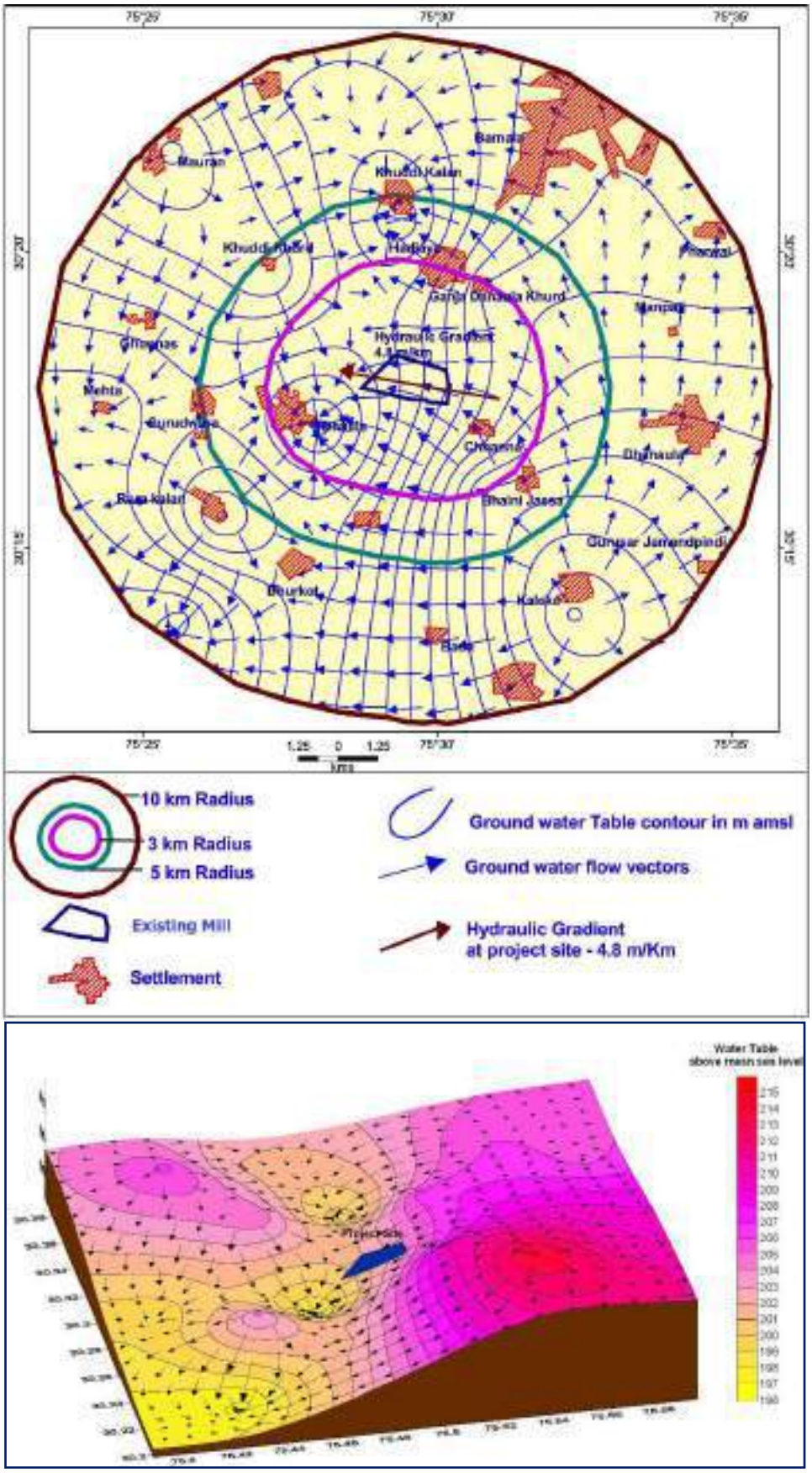
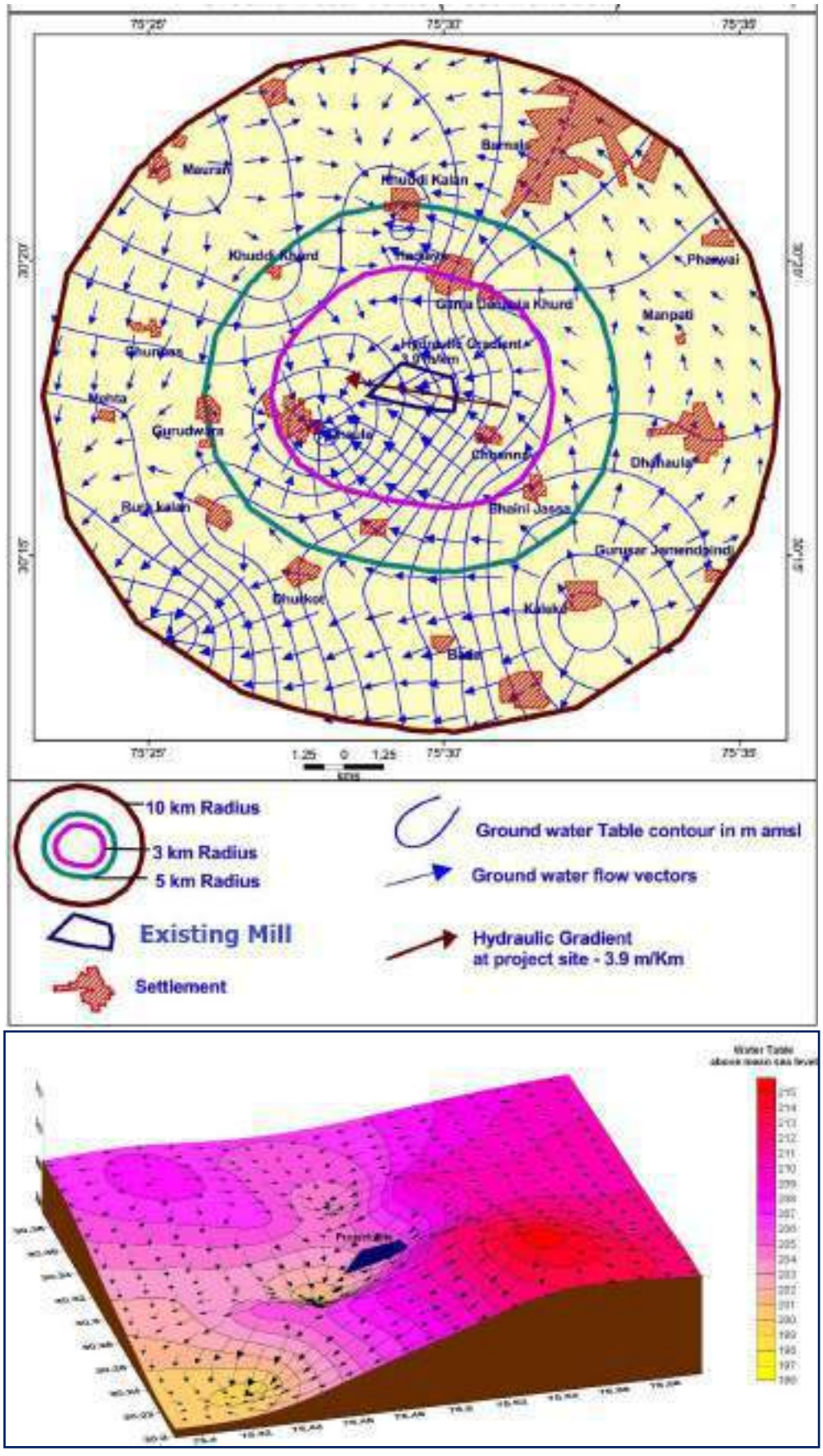


Figure 4.17: Groundwater table and hydraulic gradient during Post-Monsoon (10KM from the plant boundary)



5. SOIL AND GROUNDWATER QUALITY IN THE REGION

5.1. Published Information on Soil and Groundwater Quality in the Region

Based on the quality data published by Central Ground Water Board, Ministry of water resources, Govt. of India, the groundwater in the district is generally alkaline in nature. The chemical quality data from the shallow and deep aquifers indicate that all major cations (Ca, Mg, Na, and K) and anions (CO_3, HCO_3, Cl, SO_4) are within the permissible limits set by BIS, 2012. The physical parameters such as electrical conductivity show a wide variation from 827 µS/cm in the southern and northern part to 1140 µS/cm in the central part of the district particularly where the existing mill is location. It was also concluded that since all the physical and chemical parameters are below the permissible limit prescribed by BIS and the groundwater in the area is suitable for drinking purposes.

As per the data published by Water Resource Information System under the central water commission, the groundwater quality in the Barnala block (Coordinates of the well: 30.3583, 75.5583) was being recorded during 2015 and 2016. The summary of the quality data is below:

The average electrical conductivity was recorded was about 915 µmhos/cm which indicates that approx. total dissolved solids concentration is 450 to 500 mg/l. Thus, the regional level of groundwater quality in terms of TDS is moderate. The average pH recorded was about 8.8 which is also slightly exceeding the acceptable limit for drinking water. Hence the tendency to scale is significantly high.

The average *Sodium Adsorption Ratio (SAR)* value of 5.17 and *Residual Sodium Carbonate (RSC)* value of 3.73 has been recorded which indicates the SAR is below the permissible limit of 10 while the RSC value is slightly above the prescribed limit of 2.5 for the agricultural purpose. SAR is an indicator of the suitability of water used for agricultural purposes and also a standard diagnostic parameter for the sodicity hazard of soil. Whereas the RSC is an indicator for alkalinity hazard of soil and it can be inferred that the entire region has the tendency to exhibit higher pH in the soil.

5.2. Soil and Groundwater Quality – Primary Data

For the purpose of this assessment, the soil and groundwater samples have been collected from the below areas. The groundwater samples collected are from the existing private borewells which were drilled up to the deeper aquifer. There are no open wells located in the area.

I. ***Samples along the Dhanuala drain (less than 100m from the Drain)-***

- Upstream with respective to the plant discharge point
- Near the plant discharge point

- Downstream with respective to the plant discharge point

II. Samples to map the baseline background levels

- Upgradient location with respect to the groundwater flow direction (Southeast to the plant)
- Cross gradient location with respect to the groundwater flow direction (Southwest to the plant)

III. Samples within the onsite irrigation area

The location details for the above-mentioned soil and groundwater sampling points are given in **Table 5.1** and **Table 5.2** respectively. The location maps are presented in **Figure 5.1** and **Figure 5.2**.

The analytical data of soil and groundwater samples are summarized and presented in **Table 5.3** and **Table 5.4** respectively. The laboratory test reports are attached as **Annexure** of this report.

Table 5.1: Groundwater Sampling location details

Code	Location Description	Latitude	Longitude
GW1	Along the drain - Upstream of Dhanuala from plant	*30.295647°*	*75.510133°*
GW2	Along the drain - Upstream of Dhanuala from plant	*30.293611°*	*75.520917°*
GW3	Baseline background Location (Upgradient as per groundwater flow direction)	*30.273278°*	*75.525667°*
GW4	Baseline background Location (Upgradient as per groundwater flow direction)	*30.269889°*	*75.529806°*
GW5	Along the drain – Near the plant	*30.303547°*	*75.491189°*
GW6	Along the drain – Downstream of Dhanuala from plant	*30.306944°*	*75.480528°*
GW7	Along the drain – Downstream of Dhanuala from plant	*30.307833°*	*75.474722°*
GW8	Along the drain – Downstream of Dhanuala from plant	*30.314167°*	*75.429583°*
GW9	Along the drain – Downstream of Dhanuala from plant	*30.316199°*	*75.418556°*
GW10	Baseline background Location (the Nearest village in the South)	*30.283539°*	*75.465386°*
GW11	Within the onsite irrigation area	*30.297722°*	*75.486056°*
GW12	Within the onsite irrigation area	*30.290187°*	*75.499296°*

Table 5.2: Soil Sampling location details

Code	Location Description	Latitude	Longitude
S1	Along the drain - Upstream of Dhanuala from plant	*30.297361°*	*75.510417°*

S2	Along the drain - Upstream of Dhanuala from plant	*30.293611°*	*75.520917°*
S3	Baseline background Location (Upgradient as per groundwater flow direction)	*30.273278°*	*75.525667°*
S4	Baseline background Location (Upgradient as per groundwater flow direction)	*30.269889°*	*75.529806°*
S5	Along the drain – Near the plant	*30.300357°*	*75.497876°*
S6	Along the drain – Downstream of Dhanuala from plant	*30.307833°*	*75.474722°*
S7	Along the drain – Downstream of Dhanuala from plant	*30.313606°*	*75.429431°*
S8	Along the drain – Downstream of Dhanuala from plant	*30.316173°*	*75.418771°*
S9	Within the onsite irrigation area	*30.297722°*	*75.486053°*
S10	Within the onsite irrigation area	*30.295487°*	*75.489771°*
S11	Within the onsite irrigation area	*30.290632°*	*75.499480°*

Figure 5.1: Locations of Groundwater Sampling

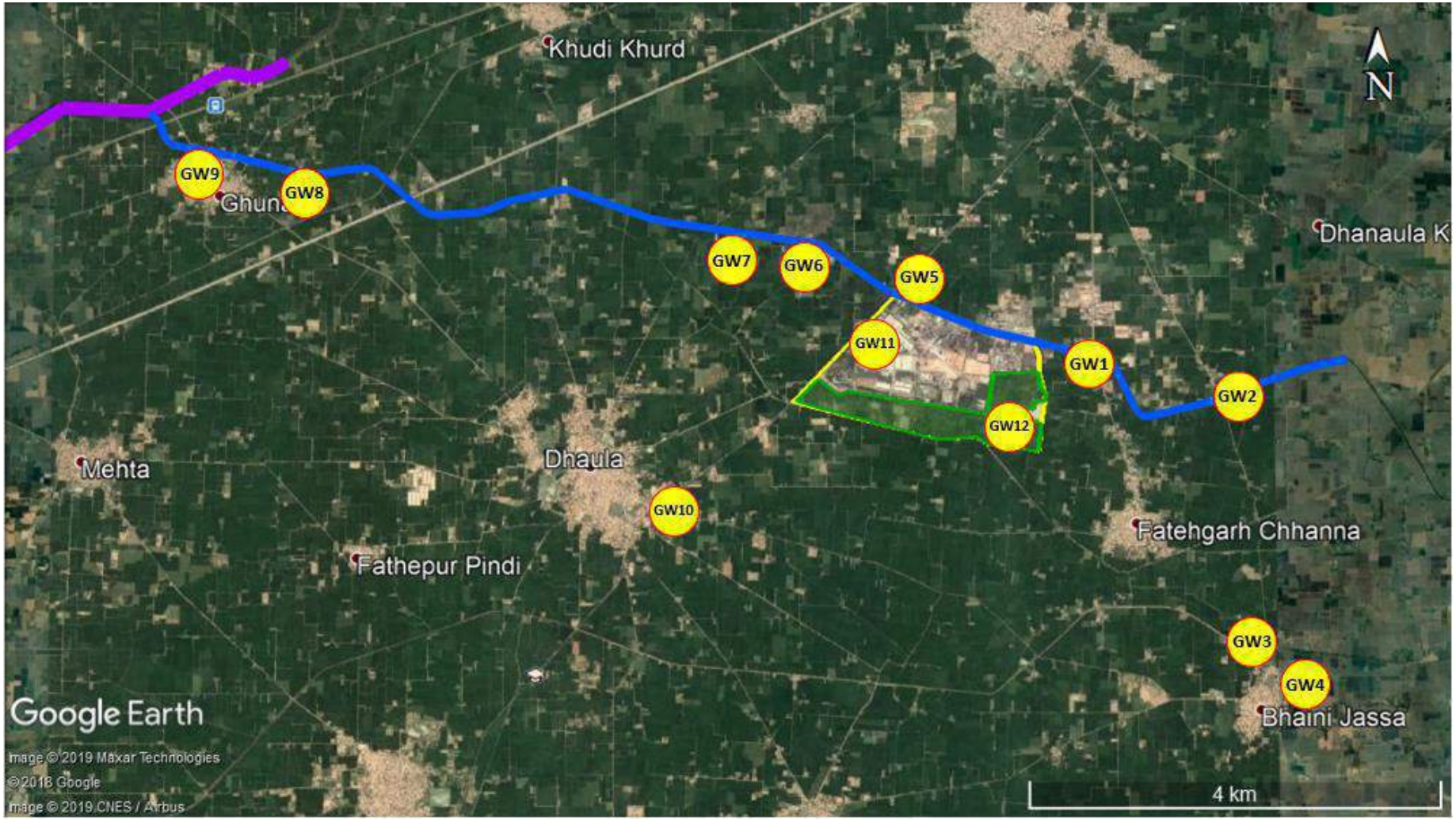


Figure 5.2: Locations of Soil Sampling

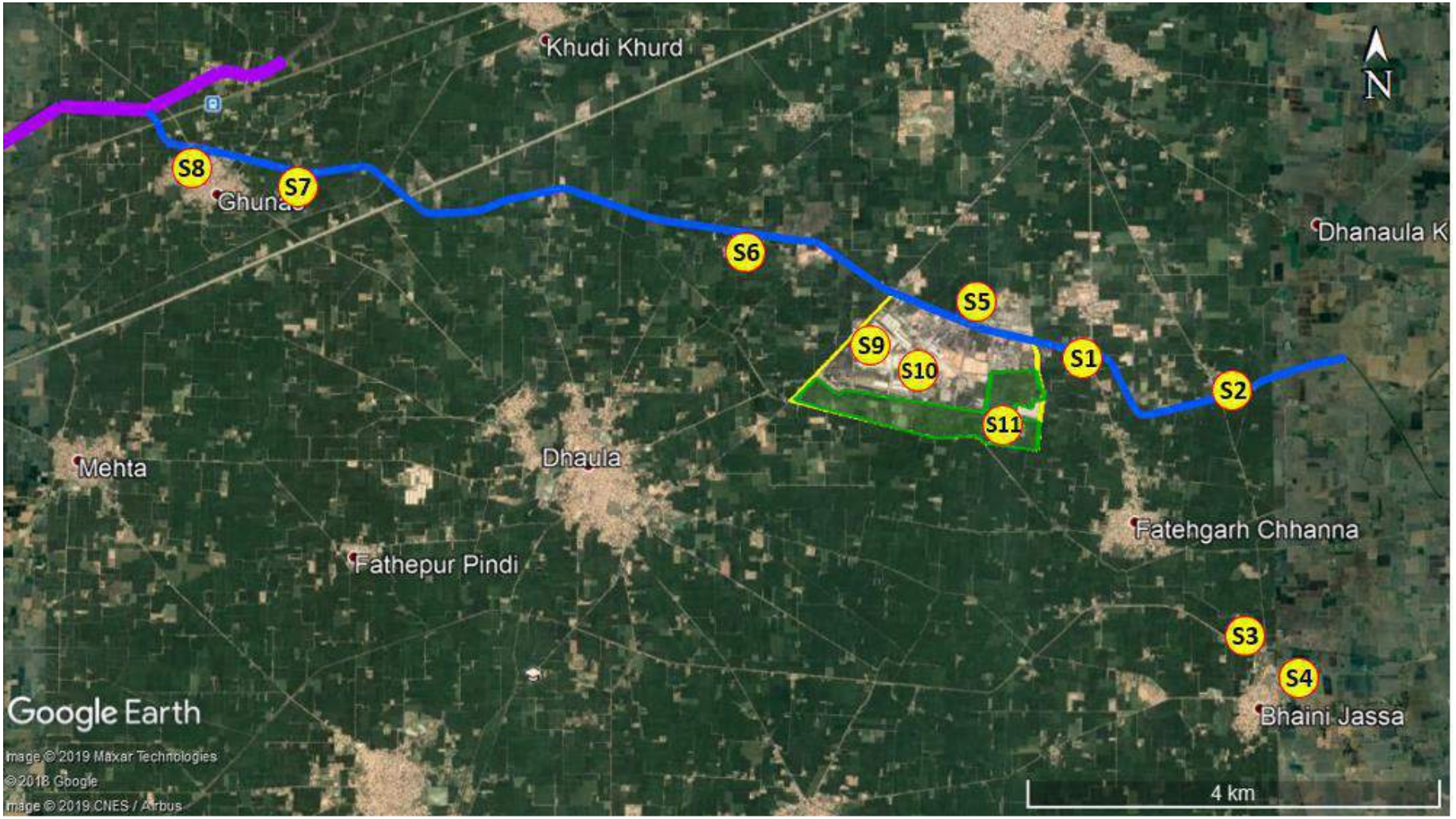


Figure 5.3: Photographs of Soil and Groundwater Sampling



Table 5.3: Summary of Groundwater Analytical results

S. No.	Parameters	Units	Detection Limit	Along Dhanuala Drain							Within the onsite irrigation area		Background baseline locations			Dutch Standards	
				Upstream		Near the Plant	Downstream										
				GW-1	GW-2	GW-5	GW-6	GW-7	GW-8	GW-9	GW-11	GW-12	GW-3	GW-4	GW-10	Target Values	Intervention Values
1	pH			7.64	7.98	7.47	7.14	7.63	7.52	7.46	7.39	7.62	7.71	7.77	7.59		
2	Total Dissolved Solids	mg/l		874	894	1060	1276	876	784	1062	1222	942	524	558	676		
3	Electrical Conductivity	µmhos/cm		1409	1444	1710	2060	1411	1265	1716	1971	1523	846	901	1092		
4	Total Hardness (as $CaCO_3$)	mg/l		260	220	265	595	310	305	375	380	285	145	140	180		
5	Chemical Oxygen Demand (COD)	mg/l	4	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*		
6	BOD at 27ºC for 3 days	mg/l	2	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*		
7	Dissolved Oxygen	mg/l		7.4	7.4	7.5	7.4	7.4	7.4	7.4	7.5	7.4	7.4	7.5	7.4		
8	Salinity (as NaCl)	mg/l		588.05	666.83	658.7	518.42	424.39	257.68	579.03	738.5	502.16	220.83	376.36	439.13		
9	Nitrogen (as N)	mg/l	0.3	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*		
10	Phosphorus (as P)	mg/l	0.2	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*		
11	Potassium (as K)	mg/l		7.09	6.78	7.35	8.27	8.08	7.46	7.4	7.3	6.65	4.91	5.09	5.55		
12	Aluminium (as Al)	mg/l	0.005	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	0.16	*bdl*	*bdl*	*bdl*		
13	Barium (as Ba)	mg/l	0.005	0.065	0.044	0.1	0.083	0.078	0.058	0.062	0.058	0.069	0.041	0.031	0.035	0.05	0.625
14	Copper (as Cu)	mg/l	0.005	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	0.008	*bdl*	*bdl*	*bdl*	0.015	0.075
15	Iron (as Fe)	mg/l	0.05	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	0.13	0.056	0.94	*bdl*	*bdl*	*bdl*		
16	Manganese (as Mn)	mg/l	0.005	*bdl*	*bdl*	*bdl*	0.038	*bdl*	*bdl*	*bdl*	0.008	0.03	*bdl*	*bdl*	0.009		
17	Selenium (as Se)	mg/l	0.005	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	0.00007	0.16
18	Silver (as Ag)	mg/l	0.005	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	-	0.04
19	Zinc (as Zn)	mg/l	0.02	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	0.025	*bdl*	0.12	*bdl*	*bdl*	*bdl*	0.065	0.8
20	Molybdenum (as Mo)	mg/l	0.005	0.006	0.008	*bdl*	*bdl*	0.011	*bdl*	*bdl*	0.006	0.006	0.014	0.028	0.007	0.005	0.3
21	Cadmium (as Cd)	mg/l	0.02	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	0.0004	0.006
22	Lead (as Pb)	mg/l	0.005	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	0.015	0.075

23	Mercury (as Hg)	mg/l	0.0005	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	0.00005	0.0003
24	Nickel (as Ni)	mg/l	0.005	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	0.015	0.075
25	Total Arsenic (as As)	mg/l	0.005	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	0.01	0.06
26	Total Chromium (as Cr)	mg/l	0.005	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	0.001	0.03
27	Polychlorinated biphenyl (PCB)	µg/l	0.05	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	0.01	0.01
28	Polynuclear Aromatic hydrocarbons (PAH)	µg/l	0.05	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*		
29	Residual Pesticides	µg/l	0.01	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*		

	Detected values
	Below detectable levels
	Values exceeding the Dutch Target values
	Values exceeding the Dutch Intervention values

Table 5.4: Summary of Soil Analytical results

S. No.	Parameters	Units	Detection Limit	Along Dhanuala Drain						Within the onsite irrigation area			Background baseline locations		Dutch Standards	
				Upstream		Near the Plant	Downstream									
				S-1	S-2	S-5	S-6	S-7	S-8	S-9	S-10	S-11	S-3	S-4	Target Values	Intervention Values
1	pH			8.72	8.86	8.39	9.23	8.49	9.05	8.98	9.25	8.95	8.62	8.68		
2	Electrical conductivity	µmhos/cm		220	259	280	119	116	148	108	258	164	279	155	**2000***	
3	Organic Matter	% wt/wt		0.7	0.49	0.49	0.68	0.85	0.63	0.42	0.5	0.54	1.01	0.62		
4	Available Phosphorus (as P)	% wt/wt		0.083	0.101	0.054	0.063	0.08	0.091	0.069	0.033	0.054	0.083	0.056		
5	Total Nitrogen (as N)	% wt/wt		0.08	0.21	0.16	0.043	0.065	0.046	0.074	0.047	0.05	0.05	0.09		
6	Oil & Grease	% wt/wt		*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*		
7	Salinity (as Nacl)	% wt/wt		0.09	0.12	0.1	0.17	0.17	0.11	0.1	0.12	0.13	0.11	0.14		
8	Moisture	% wt/wt		13.95	13.25	10.31	9.64	13.39	10.41	1.89	5.21	2.83	10.47	11.48		
9	Cadmium (as Cd)	mg/kg	1	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	**0.8**	**12**
10	Zinc (as Zn)	mg/kg	1	42.33	50.22	35.33	33.47	34.83	32.34	19.19	39.73	55.32	43.16	74.56	**140**	**720**
11	Total Chromium (as Cr)	mg/kg	1	22.16	30.19	21.24	18.66	17.56	16.07	10.42	14.23	13.92	21.06	19.79	**100**	**380**
12	Nickel (as Ni)	mg/kg	1	14.31	23.6	13.08	9.04	9.41	5.39	*bdl*	6.52	6.82	13.47	12.59	**35**	**210**
13	Total Arsenic (as As)	mg/kg	1	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	**29**	**55**
14	Mercury (as Hg)	mg/kg	1	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	**0.3**	**10**
15	Copper (as Cu)	mg/kg	1	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	**36**	**190**
16	Lead (as Pb)	mg/kg	1	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	3.95	3.95	*bdl*	*bdl*	**85**	**530**
17	Polychlorinated biphenyl (PCB)	mg/kg	0.05	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	**0.02**	**1**
18	Polynuclear aromatic hydrocarbons (PAH)	mg/kg	0.05	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	*bdl*	**1**	**40**

** Acceptable limit as per Indian counsel of Agricultural research*

	Detected values
	Below Detectable Levels (*bdl*)
	Values exceeding the Dutch Target values
	Values exceeding the Dutch Intervention values

5.3. Summary of Groundwater Quality

pH:

pH may not have a direct impact but one of the important water quality parameters as the lower pH water is more likely to be corrosive and higher pH is water tends to scale. Based on the laboratory test results, the pH of the samples collected is in the range of 7.1 to 8.0 which is within the acceptable range as per drinking water standards published by IS 10500:2012.

Total Dissolved Solids:

The palatability of water with a total dissolved solids (TDS) level of less than about 500 mg/l is an acceptable limit for drinking purposes as per Indian standards. Considering the regional scenario of groundwater quality, the TDS levels in the district are likely to exceed 500 mg/l. Based on the laboratory results, the TDS in the samples collected from the existing borewells was recorded to be in the range of 524 to 1276 mg/l. The contour map is presented in **Figure 5.4** and the graphical representation is presented in **Figure 5.5**.

It can be inferred from the analytical data that the background baseline concentrations of TDS are reported in the range of 524 mg/l to 675 mg/l which is in line with the regional groundwater quality. The TDS concentration along the drain is in the range of 784 mg/l to 1276 mg/l and precisely varying from 874 mg/l to 894 mg/l in the upstream of drain from plant discharge, around 1060 mg/l near the plant discharge and from 784 mg/l to 1276 mg/l in the downstream of drain from plant discharge. The TDS concentration ranging from 942 mg/l to 1222 mg/l is recorded from the samples collected within the onsite irrigation. Based on the TDS level mapping, it can be inferred that the TDS levels in the groundwater is a regional phenomenon and is in line with the published regional level data.

Figure 5.4: TDS Concentration Contour Map

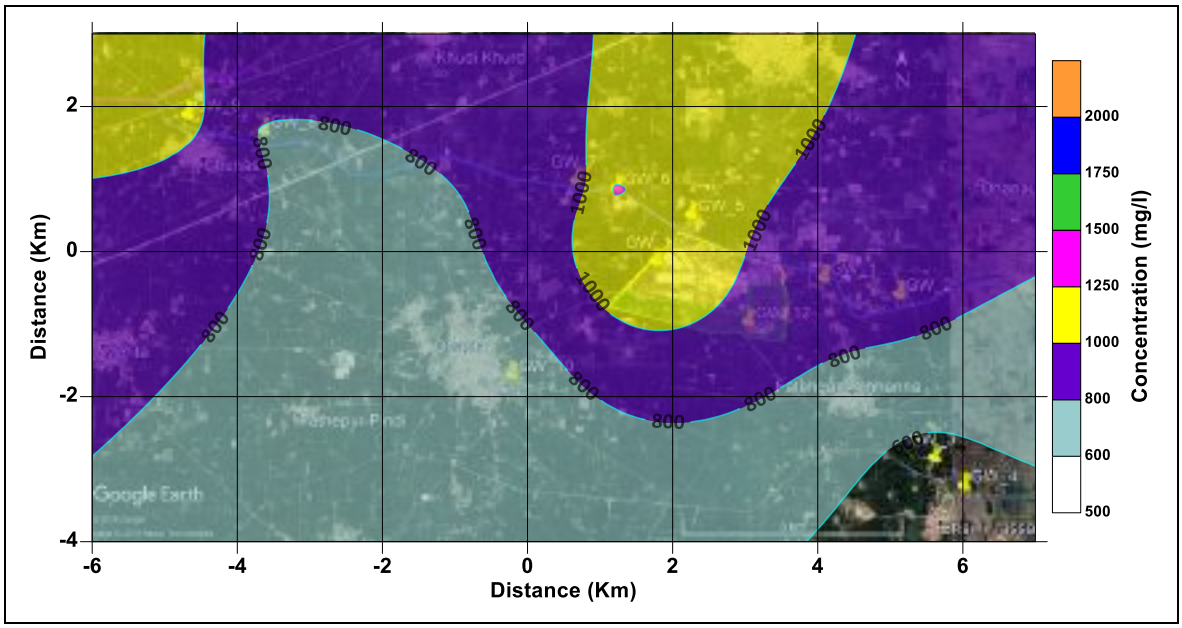
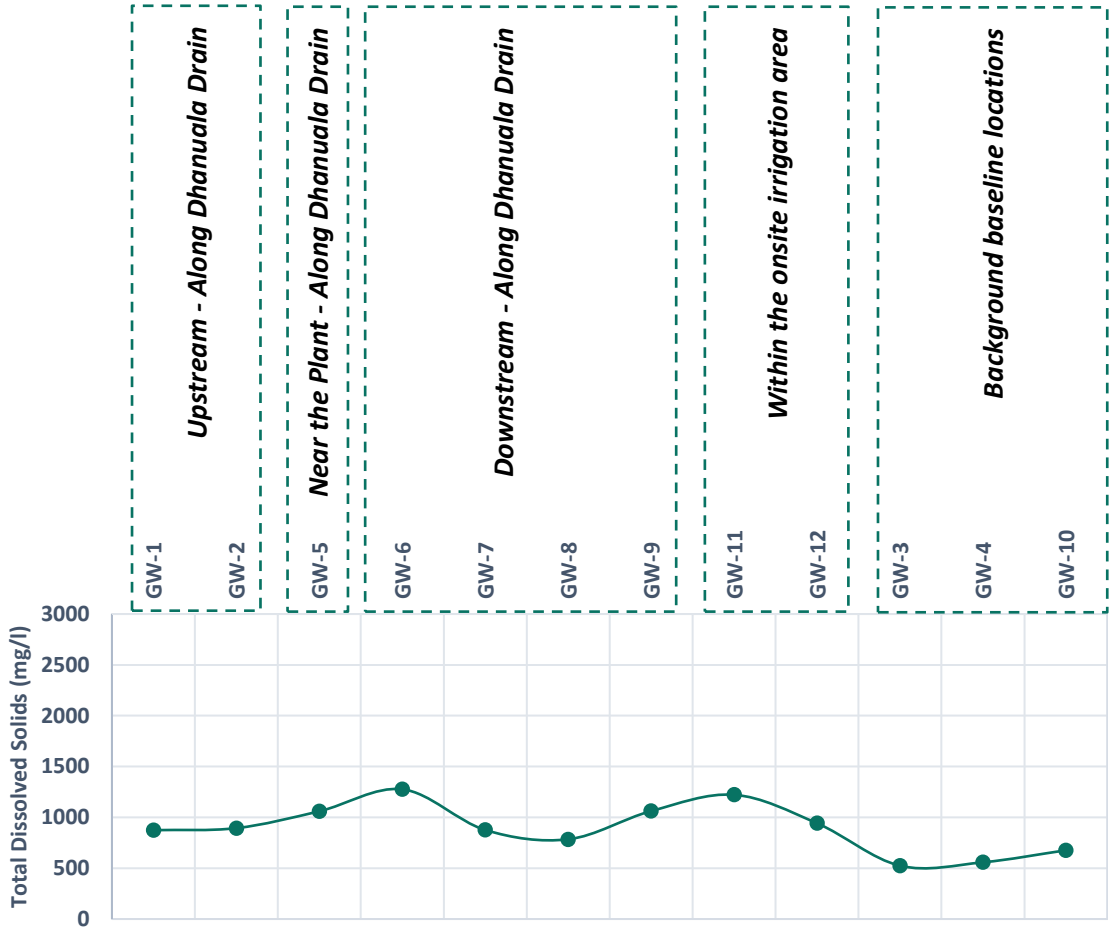


Figure 5.5: TDS Concentration in the Groundwater Samples Collected



Total Hardness:

Depending on the other parameters such as pH and alkalinity, hardness can cause increased scaling and corrosion tendencies. General guidelines for classification of waters are: 0 to 60 mg/l is classified as soft, 60 to 120 mg/l as moderately hard 120 to 180 mg/l as hard and more than 180 mg/l as very hard.

The water with a total hardness of less than 200 mg/l is an acceptable limit for drinking purposes as per Indian standards. Based on the laboratory results, the total hardness in the samples collected from the existing borewells was recorded to be in the range of 140 to 595 mg/l. The contour map is presented in **Figure 5.6** and the graphical representation is presented in **Figure 5.7**.

It can be inferred from the analytical data that the background baseline concentrations of hardness are reported in the range of 140 mg/l to 180 mg/l which is classified as moderately hard to hard but acceptable for drinking purposes as per Indian standards. The hardness concentration along the drain is in the range of 220 mg/l to 595 mg/l and precisely varying from 220 mg/l to 260 mg/l in the upstream of drain from plant discharge, around 265 mg/l near the plant discharge and from 305 mg/l to 595 mg/l in the downstream of drain from plant discharge. The hardness concentrations ranging from 285

mg/l to 380 mg/l are recorded from the samples collected within the onsite irrigation. Based on the hardness level mapping, it can be inferred that hardness is apparent at the plant site and exhibiting to be the local phenomenon and drastically diluted in the surrounding areas.

Figure 5.6: Hardness in Groundwater Contour Map

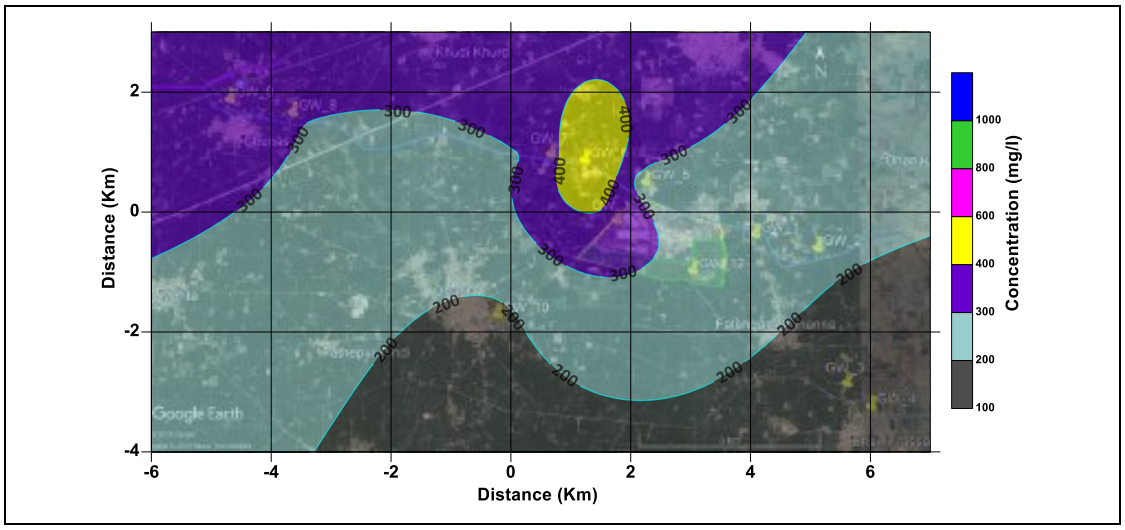
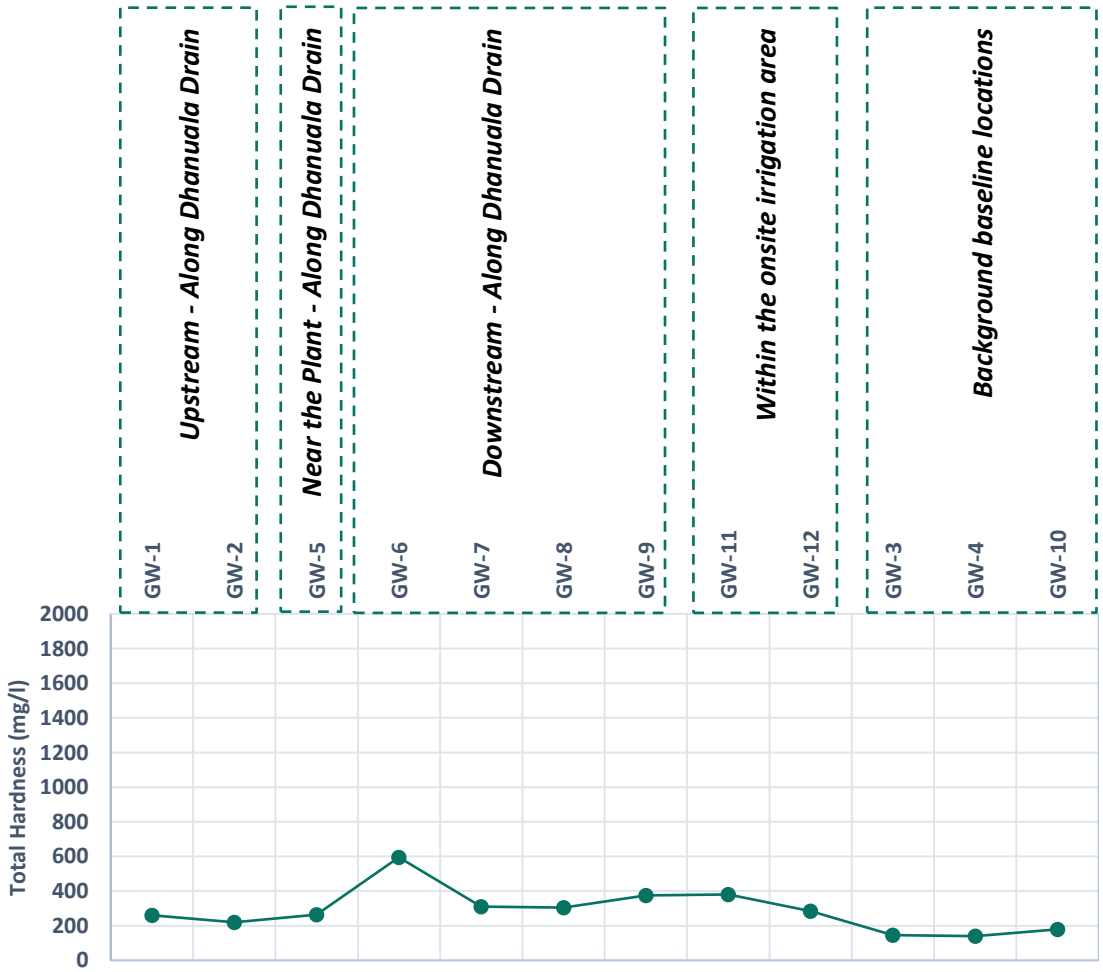


Figure 5.7: Hardness in the Groundwater Samples Collected



COD and BOD:

The chemical oxygen demand and biological oxygen demand concentrations do not exhibit or insignificant or below the detectable limits from the groundwater samples collected. Hence, it is evident that no direct ingression of industrial wastewaters or domestic sewages into the groundwater is envisaged.

Salinity:

In general, the Inland salinity in groundwater is prevalent mainly in the arid and semi-arid regions of various states including Punjab which is also reflected in terms of TDS concentration in the region. The salinity as NaCl concentrations in the groundwater samples collected is in the range of 220 mg/l to 739 mg/l. The contour map is presented in **Figure 5.8** and the graphical representation is presented in **Figure 5.9**.

There are no drinking water standards particularly for Salinity as NaCl. But higher concentrations of salinity in agricultural water impacts on plant growth and yield.

It can be inferred from the analytical data that the background baseline concentrations of salinity as NaCl are reported in the range of 220 mg/l to 439 mg/l. Whereas it is in the range of 258 mg/l to 667 mg/l and precisely varying from 588 mg/l to 667 mg/l in the upstream of drain from plant discharge, around 659 mg/l near the plant discharge and from 257 mg/l to 579 mg/l in the downstream of drain from plant discharge. The salinity as NaCl concentrations ranging from 502 mg/l to 739 mg/l is recorded from the samples collected within the onsite irrigation borewells. Based on the salinity level mapping, it can be inferred that it is a regional phenomenon.

Figure 5.8: Salinity as NaCl in Groundwater Contour Map

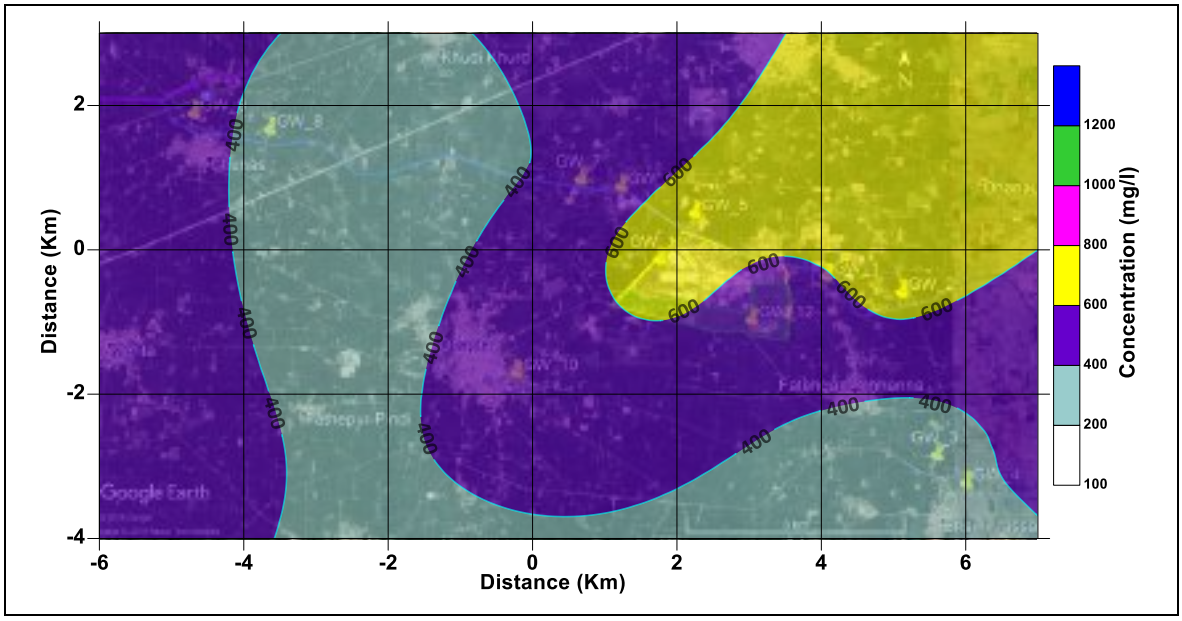
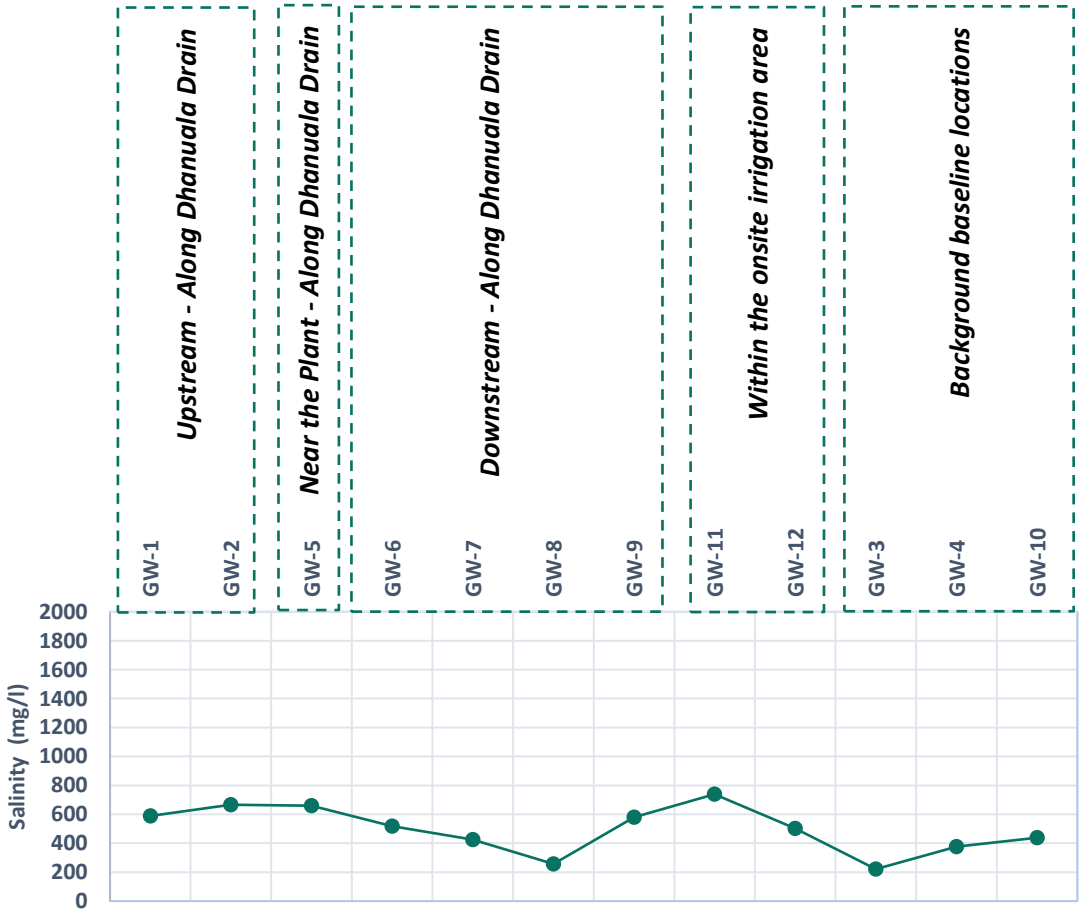


Figure 5.9: Salinity as NaCl in the Groundwater Samples Collected



Nutrients (NPK):

Nitrogen, Phosphorous, and Potassium are three primary nutrients that play an important role in agriculture for plant nutrition. Based on the analytical results of groundwater water samples collected, both nitrogen and phosphorous are concentrations do not exhibit or insignificant or below the detectable limits. Whereas, the potassium is varying in the range of 4.9 mg/l to 8.3 mg/l. There are no specific limiting concentrations for drinking water requirement whereas potassium is one of the primary nutrients for agriculture.

Heavy Metals:

The analytical results of groundwater samples collected and analyzed for Heavy metals concentrations were found to be below the intervention values as per Dutch International Standards. Hence, the groundwater in this region is not contaminated to the level of remediation and no further assessment and delineation of heavy metals contamination in the groundwater are necessarily required. Whereas, comparing the concentrations with the drinking water acceptable limits published by Indian Standards inferences that Aluminium, Iron and Manganese concentrations in the groundwater samples collected from borewell located in onsite irrigation land.

5.3. Summary of Soil Quality

The soil samples collected at various locations mentioned above were analyzed for 18 parameters. The values were then compared with the standard soil classification from the Handbook of Agriculture, Indian Council of Agricultural Research, New Delhi, 2012 to understand the suitability for agriculture and Dutch standards to evaluate the contamination if any.

pH:

The pH of the soil was found to be in the range of 8.39 to 9.25. pH above 7 is normally classified as alkaline and the high values of alkalinity. The pH in soil could be due to nitrogen-rich fertilizers in the soil. However, the alkaline soils could contribute to the growth of the plants rather than the acidic soils.

Electrical Conductivity:

The electrical conductivity of the soil was found to be in the range of 108 µmhos/cm to 280 µmhos/cm which could be a regional phenomenon and may be attributed to the use of fertilizers or could be due to the salinity intrusion in groundwater.

Organic Content & Total Nitrogen:

The organic content in the soil ranged from 0.42% wt/wt to 1.01% wt/wt. This could be due to the potential release of the nitrogen in the soil. The total nitrogen in the soil was found in the range of 0.043% wt/wt to 0.21% wt/wt. A typical agricultural soil would contain 0.10% to 0.15% N and hence the soil can be considered good for crop growth in terms of total nitrogen.

Available Phosphorus:

The available phosphorus in the soil was found between 0.033% wt/wt and 0.101% wt/wt. The cool, wet soils show low values of phosphorus. High values of available phosphorus will induce excessive plant growth due to the supply of essential primary nutrients. The phosphorus values could be increased by the use of phosphorus-rich fertilizers.

Salinity:

The salinity as NaCl in soil was found to be in the range of 0.09% wt/wt to 0.17% wt/wt. Since sodium does not contribute to the growth of the plants, its significance is less. Excessive sodium levels could be attributed to the irrigation waters which is the groundwater in this region.

Moisture:

The moisture in the soil samples was found to be between 1.89 % wt/wt and 13.95 % wt/wt. The higher moisture content implies that the water holding capacity of the soil is more and hence it is good for plant growth.

Zinc:

The values of Zinc ranged from 19.19 mg/kg to 74.56 mg/kg. These were found to be less than the target/Intervention values as per the Dutch Intervention Standards. This shows that the soil is not contaminated and non-toxic. Since the concentration of zinc is found to be moderate, the levels are found to be good for plant growth.

Total Chromium:

The values of Total chromium in the soil was in the range of 10.42 mg/kg to 30.19 mg/kg. This means that the soil is not contaminated. High values of chromium could be toxic.

Nickel:

The values of Nickel were found to be between 5.39 mg/kg and 23.6 mg/kg. The high content of nickel in the soil will cause toxicity. Since the values were found to be less than 35 mg/kg, it acts as a good source of nutrients that could be transferred as an important element in the diet of the human being.

Lead:

The lead values were found to Below Detection Limit (BDL) at all the locations except at the onsite irrigation areas where the traces were found.

All the other parameters such as Oil & grease, Cadmium, Total Arsenic, Mercury, Copper, Polychlorinated biphenyl (PCB) and Polynuclear aromatic hydrocarbons (PAH) were found to be Below Detection Limit (BDL) in all the soil samples collected.

6. SUMMARY AND CONCLUSIONS

The summary of soil and groundwater quality assessment carried out in the area is presented below:

- Based on the collected information regarding groundwater survey and exploration data published by CGWB for Barnala block, the groundwater flow direction in the area was evaluated to be towards the west. The land elevation slope in the area is also in line with the flow direction.
- The Water level as per the published EIA report in the region ranges from 8.72m to 23.89m bgl during the pre-monsoon period and 9.95 m to 25.41 m bgl during the post-monsoon

period. The seasonal fluctuation varies from 1.05 m to 5.32 m in the study area. The long-term fluctuation trend indicates the average fall of 0.65m/year. Barnala block is categorized as an Over Exploited Zone by CGWB.

- Based on the details obtained from during the assessment, the utilisation of treated wastewater for irrigation is in the order of 150 m^3 per Ha per day which is in line with the loading rates recommended for the soil texture (for loamy and sandy loamy soil type: 110 to 225 m^3/Ha/day) as per the notification of MoEF&CC published on 14 Jan, 2016.
- For the purpose of this assessment, the soil and groundwater samples have been collected (i) Along the Dhanuala drain (less than 100m from the Drain), (ii) at the upgradient locations to map the baseline background levels and (iii) at the onsite irrigation area. Groundwater samples were collected from the existing private borewells which were drilled up to the deeper aquifer which are in use.
    - pH in the groundwater samples collected was reported in the range of 7.1 to 8.0 which is within the acceptable range as per drinking water standards published by IS 10500:2012. Whereas the pH in soil was found to be more alkaline in the entire region.
    - TDS in the samples collected from the existing borewells were recorded to be in the range of 524 to 1276 mg/l. The TDS levels in groundwater from the samples collected is a regional phenomenon and is in line with the published regional level data. The groundwater's Salinity as NaCl is in-line with TDS which contributes to 50% to 60%. Similarly, the electrical conductivity in the soil is also high and depicting regional scenario which reflects the equivalent salinity as NaCl in soil.
    - Total hardness in the samples collected from the existing borewells was recorded to be in the range of 140 to 595 mg/l.
    - Minor traces of nutrients and Heavy metal were found in the groundwater and soil samples collected but the impact is totally insignificant.

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Annexure I

Laboratory Analytical Test Reports for Groundwater Samples

Annexure II

Laboratory Analytical Test Reports for Soil Samples

Comparative data of Ground Water by different agencies												
Sr. no.	**Parameters**	**Units**	**Trident Complex Tubewell-1**			**Gobind Haveli, Mansa Road, Dhaula**			**New Sidhu B.K.O, Fatehgarh Channa**			
			PBTI Mohali	**CPPRI Saharanpur**	**Joint Committee**	**PBTI Mohali**	**CPPRI Saharanpur**	**Joint Committee**	**PBTI Mohali**	**CPPRI Saharanpur**	**Joint Committee**	
	Date of sampling		**23.01.2020**	**12.09.2021**	**23.01.2020**	**23.01.2020**	**12.09.2021**	**23.01.2020**	**23.01.2020**	**12.09.2021**	**23.01.2020**	
1	pH	-	8.16	7.7	7.9	8.29	7.9	7.4	8.46	7.7	7.8	
2	Total Dissolved Solids	mg/l	941	759	891	1077	665	998	604	646	596	
3	Electrical Conductivity	µmhos/cm	-	-	-	-	-	-	-	-	-	
4	Total Hardness (as CaCO3)	mg/l	216	291	285	248	252	354	208	262	280	
5	Chemical Oxygen Demand (COD)	mg/l	12	Nil	BDL	12	-	BDL	14	-	BDL	
6	BOD at 27ºC for 3 days	mg/l	<1	Nil	BDL	<1	-	BDL	<1	-	BDL	
7	Dissolved Oxygen	mg/l	-	-	-		-	-		-	-	
8	Salinity (as NaCl)	mg/l	-	-	-		-	-		-	-	
9	Nitrogen (as N)	mg/l	-	-	-		-	-		-	-	
10	Phosphorus(as P)	mg/l	-	-	-		-	-		-	-	
11	Potassium (as K)	mg/l	-	-	-		-	-		-	-	
12	Aluminium (as Al)	mg/l	BDL	-	-	BDL	-	-	BDL	-	-	
13	Barium (as Ba)	mg/l	-	-	-		-	-		-	-	
14	Copper (as Cu)	mg/l	-	-	-		-	-		-	-	
15	Iron (as Fe)	mg/l	BDL	-	BDL	BDL	-	BDL	BDL	-	BDL	
16	Manganese (as Mn)	mg/l	-	-	-		-	-		-	-	
17	Selenium (as Se)	mg/l	-	-	-		-	-		-	-	
18	Silver (as Ag)	mg/l	-	-	-		-	-		-	-	
19	Zinc (as Zn)	mg/l	-	-	BDL		-	BDL		-	BDL	
20	Molybdenum (as Mo)	mg/l	-	-	-		-	-		-	-	
21	Cadmium (as Cd)	mg/l	-	-	BDL		-	BDL		-	BDL	
22	Lead (as Pb)	mg/l	-	-	BDL		-	BDL		-	BDL	
23	Mercury (as Hg)	mg/l	BDL	-	-	BDL	-	-	BDL	-	-	
24	Nickel (as Ni)	mg/l	-	-	BDL		-	BDL		-	BDL	
25	Total Arsenic (as As)	mg/l	BDL	-	-	BDL	-	-	BDL	-	-	
26	Total Chromium (as Cr)	mg/l	BDL	-	BDL	BDL	-	BDL	BDL	-	BDL	
27	Polychlorinated biphenyl (PCB)	µg/l	-	-	-		-	-		-	-	

28	Polynuclear Aromatic hydrocarbons (PAH)	µg/l	-	-	-		-	-		-	-
29	Residual Pesticides	µg/l	-	-	-		-	-		-	-
30	Ammonia Nitrogen	mg/l	BDL	0.21	BDL	BDL	0.10	BDL	BDL	0.06	BDL
31	Oil & Grease	mg/l	BDL	-	BDL	BDL	-	BDL	BDL	-	BDL
32	Sulphide	mg/l	BDL	Nil	BDL	BDL	Nil	BDL	BDL	Nil	BDL
33	Phenolic compounds (as C6H5OH)	mg/l	BDL	-	BDL		-	BDL		-	BDL
34	Chloride (as Cl)	mg/l	160	203	178	97	173	114	96	178	106
35	Sulphate (as SO4)	mg/l	295	94	180	220	88	168	86	64	58
36	Sodium Absorption Ratio (SAR)	mg/l	10.3	3.8	5.83	8.3	3.0	5.55	6.5	3.2	4.68
37	Total Suspended Solids	Mg/l	9.5	Nil	BDL	4.2	Nil	BDL	14	Nil	BDL
38	Color	Pt-Co	-	-	-		-	-		-	-
39	Phosphate	Mg/l	-	-	-		-	-		-	-
40	Cyanide	Mg/l	-	-	-		-	-		-	-